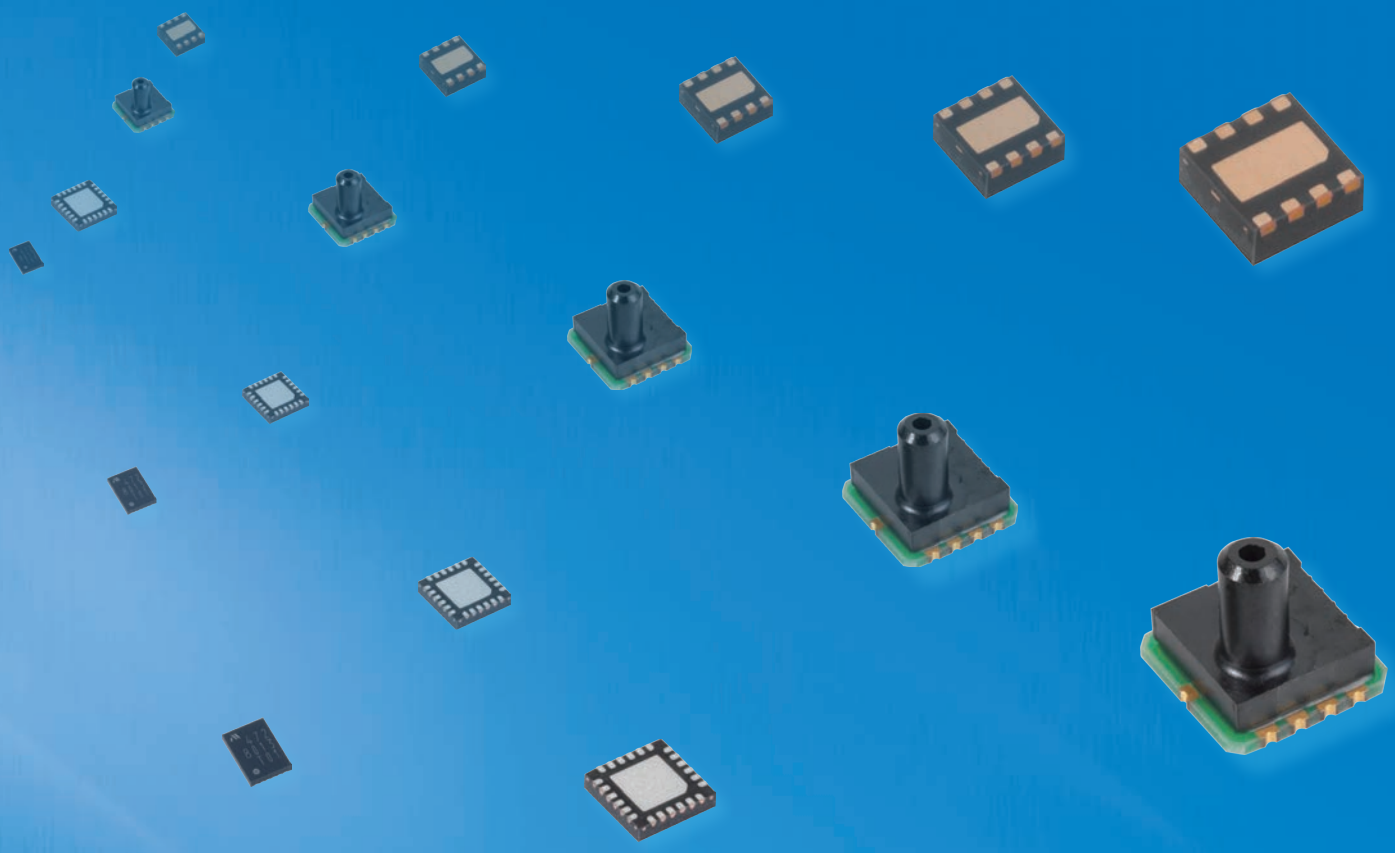
MinebeaMitsumi Inc.

MITSUMI

IC selection guide

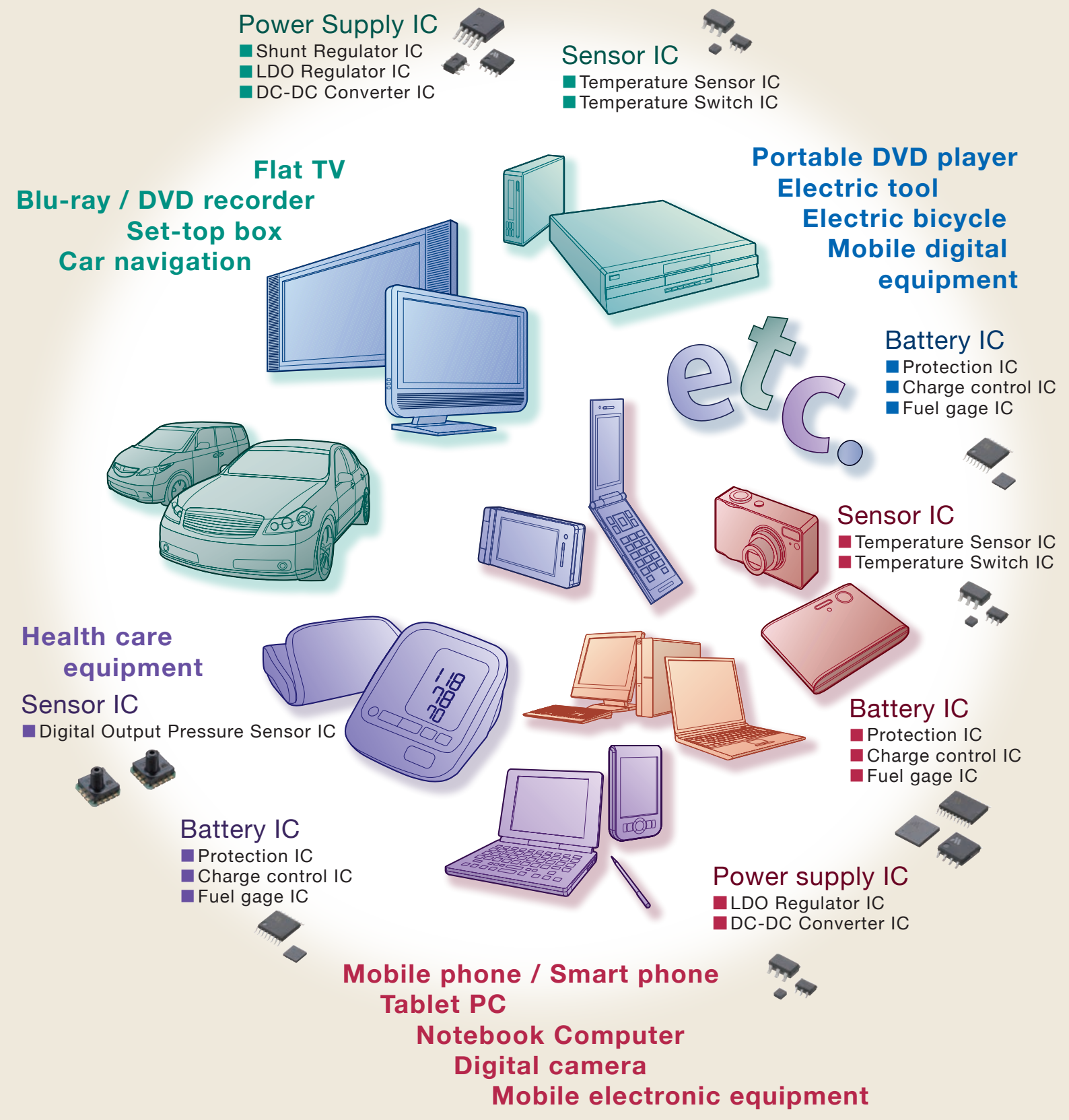
2019–2020



This catalog shows only outline specifications. When using the products, please obtain formal for specification supply.

English

MinebeaMitsumi's ICs implement high characteristics, high function, space saving, and low power consumption. They provide their optimum performance to meet various requirements.



1 SECONDARY BATTERY IC

- Various types of battery IC for single cell to multy–cells are lined up. They are applicable to various devices from mobile gadgets to Electric bicycle.
- The battery IC is provided with a high detection accuracy and abundant functions, enabling safe battery charging and protection.
- MITSUMI's Fuel Gauge IC achieves safe and effective use of batteries by detecting the battery level.

2 POWER SUPPLY IC

- The regulator IC lineup is available with an output current of 150mA to 1.5A. Suited to various applications with a range of products offering features such as high–precision and low consumption current.
- DC–DC converter ICs are available in step–up/step–down/ inversion type variations. Delivers high–efficiency, high–precision output over a wide input voltage range.

3 SENSOR IC

- The sensor IC is characterized by high detecting temperature accuracy and low current consumption. Digital pressure sensors are being developed by MEMS technology.
- The sensor IC is applicable to various applications through abundant rank expansion and I^2C BUS intended interface.

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IC LINEUP

1 SECONDARY BATTERY ICs

Protection for lithium-Ion batteries

				PLP-4D	PLP-4E	PLP-4-1228	PLP-6G	PLP-6J	PLP-10A	SON-6C	SON-6F	SOT-26A	SOT-26B	SSON-6A	SSON-6E	SSON-6J	SSON-6K	SSON-6M	SSON-6N	SSON-8F	SSON-8G	TSOP-8A	TSOP-16B	TSOP-20D	VSOP-20A	VSOP-24A	WLCSP-6B	WLCSP-6C	WLCSP-10A
For 1 cell	Small package	Built-in delay timer	MM3280							●		●	●		●	●	●												
		Built-in delay timer	MM3511							●				●		●														
		High accuracy current detection	MM3638							●						●														
		Temperature detection	MM3645																			●								
		Multi overcurrent protection	MM3721							●						●														
		High accuracy short detection	MM3722							●						●														
		High accuracy overcharge precision	MM3723																								●			
		High accuracy overcharge precision	MM3724							●						●														
		High accuracy overcharge precision	MM3725, MM3726							●						●		●												
		N channel high side FET drive	MM3746																											●
		High accuracy overcharge detection	MM3855																	●	●									
		Multi overcurrent protection	MM3856							●						●		●												
		Very high accuracy current detection	MM3860								●					●		●												
	Built-in FET	Low on state resistance 10.6mΩ	MC3002	●																										
		On state resistance 13.4mΩ	MC3011	●																										
		Super small package	MD1421ExxCPAL			●																								
		Wearable	MC3651		●																									
		Very low current consumption	MC3761					●																						
		Customization by OTP	MJ3401				●																							
		Customization by OTP	MJ3542																●											
For 2 cells		Built-in delay timer	MM3220									●																		
		Built-in delay timer	MM3766										●																	
For 3 cells		Delay time set by external capacitor	MM3783																				●							
For 3 to 5 cells		Delay time set by external capacitor	MM3474																					●						
		Built-in delay timer	MM3575																							●				
		Delay time set by external capacitor	MM3684																							●				
		Delay time set by external capacitor	MM3694																							●				
For 4 to 7 cells		Built-in delay timer	MM3877																						●					
For secondary protection		For 1 cell	MM3734							●																				
		For 2 to 4 cells with latch function	MM3508A									●		●																
		For 2 to 4 cells without latch function	MM3508B									●		●																
		For 2 to 3 cells with terminal CT	MM3508C									●		●																
		For 1 to 3 cells	MM3563									●		●																
		For 3–4 cells with RTC control function	MM3625						●																					

Voltage Monitering IC for li-ion battery

			PLP-6H	PLP-8G	PLP-8H	SOT-25A
Voltage monitoring	Protection EEPROM	MW3790		●		
	Protection	MW3793			●	
	Monitering	MM3757	●			

		SOT-25A
Cell balance control	MM3513	●

Fuel gauge IC for li-ion battery

			PLP-8F	PLP-10D	PLP-12A	PLP-12B	WLCSP-9A
For 1 cell	High accurach	Battery degradation judgment	MM8013			●		
		Super low consumption	MM8013W				●	
		Small package	MM8033		●			●
			MM3556	●				

Lithium–ion battery charge control ICs

			SSON-6E	SSON-10A	WLCSP-25A	SQFN-32A	WLCSP-48B
For 1 cell	Single function	Linear charger	MM3458		●			
			MM3635		●			
			MM3835W		●			
			MM3658		●			
			MM3865	●				
	Built-in System path	Linear charger	MM3538			●		
		Switching charger	MM3439				●	
			MM3539					●

2 POWER SUPPLY ICs

Voltage regulator ICs

			HSOP-8E	HSOP-8A	PLP-4C	PLP-6C	PLP-8E	SC-82ABB	SOT-25A	SOT89-5A	SSON-6A	SSON-6E	TO-252C	TO-252-5A
Less than 150mA LDO regulators	Reverse current protection	MM3376						●	●					
	Low current consumption	MM3534						●	●					
		MM3755			●									
Less than 200mA LDO regulators	Rush current protection	MM3411						●	●					
		MM3763			●									
	Capacitorless, ultralow quiescent current	MM3566						●	●					
		MM3866			●									
	15V withstand voltage	MM1836							●					
		MM1856						●	●					
	16V withstand voltage	MM1839							●			●		
	Low noise, Negative output voltage	MM1898							●		●			
Less than 300mA LDO regulators	Rush current protection	MM3571						●	●	●				
		MM3871			●									
	Thermal shoutdown circuit	MM3608							●					
	15V withstand voltage	MM1886							●	●				
	Low noise	MM1899							●		●			
Less than 500mA LDO regulator	Soft start function	MM3526							●	●	●			
		MM3478								●				
Less than 1000mA LDO regulators	15V withstand voltage	MM1877		●										
	Soft start function	MM3529								●	●			
		MM3479								●				
	Soft start function	MM3702								●				
		MM3703	●							●	●			
Less than 1500mA LDO regulator	Low output voltage	MM1870		●										●
Less than 150mA 2–channel LDO regulator		MM3548				●								
Less than 300mA 2–channel LDO regulator		MM3549					●							

IC LINEUP

Shunt regulators

			SC82ABB	SOT-23A	SOT-25A
Adjustable shunt regulator	Vref 2.495V	MM1431	●	●	●
	Vref 1.240V / 1.250V/1.270V	MM1530	●	●	

DC–DC converters

				HSOP-8A	HSOP-8C	SOP-8D	SOT-26B	SQFN-16A	SQFN-16B	SQFN-24A	SSON-6L	SSON-8E	TSOP-20E
Boost	Built–in powerFET	100mA	MM3333				●						
		200mA	MM3355			●							
Buck	Output 1ch	Synchronous rectification	3A	MM3370	●								
		Diode rectification	0.6A	MM3472							●		
			1.0A	MM3617							●		
			2A	MM3542BF			●						
			3A	MM3543BH		●							
			2.5A	MM3630BV									●
			1.5A	MM3630BR						●			
			0.9A	MM3690ARBE								●	
	External power FET		20A	MM3736BRLE					●				
Inverter	Charge pump			MM3558				●					
Double buck	Output 2ch + LDO			MM3631			●						

AC–DC converters

			SOP-8D	SOP-8J	SOP-10A
Primary–side	QR controller	MM3661			●
	PWM controller	MM3663		●	
Secondary–side	Synchronous rectifier	MM3667		●	
		MM3669AF			●

LED lighting ICs

			SOT-25A	SOP-8C	SOP-8D	SOP-10A
DC Input	White LED driver 7 LEDs	MM3097	●			
AC Input	Isolated	Including PFC 1 convertor for flyback	MM3460			●	
		Dual OPAMP and shunt regulator	MM1837		●		
	Non–isolated	Triac dimmer power control	MM3760				●

Reset ICs (Voltage detectors)

				PLP-4A	SC-82ABB	SOT-23A	SOT-25A	SSON-4B
No delay function	Active-low	CMOS output	IC-PST81		●		●	●
		Open drain output	IC-PST82		●		●	●
		Open drain output	IC-PST86		●		●	
Separated sense line	Active-low	CMOS/Open drain output	PST851A, PST852A		●		●	●
		CMOS/Open drain output + Built-in delay function	PST853A, PST854A				●	
Delay function included (external capacitor)	Active-low	CMOS output	IC-PST83		●		●	●
		Open drain output	IC-PST84		●		●	●
		CMOS/Open drain output	PST893A, PST894A	●	●		●	
		CMOS/Open drain output + High accuracy	PST893B, PST894B		●		●	
		CMOS/Open drain output + With manual reset	PST893R, PST894R				●	
Built-in delay function	Active-low	CMOS output	PST87		●		●	●
			PST88		●		●	●
		Open drain output	PST807, PST809			●		
			PST803, PST805			●		
	Active-high	CMOS output	PST808, PST810			●		
		Open drain output	PST804, PST806			●		

3 SENSOR ICs

Temperature sensor ICs

			PLP-4A	SC-82ABB	SOT-25A	SOT-26A	SSON-4B
Detection output type (Temperature switch IC)	Active-high	MM3488					●
	Ultra low current consumption, Active-high	MM3688	●				
Sensor type	Analog output	MM3154		●			●
	I^2C BUS digital output (Adress set pin2)	MM3285			●	●	

Pressure sensor

Pressure sensor of digital output		MMR901XA	*Original package
	Low supply voltage	MMR902	
	Small package	MMR906	

Absolute Pressure sensor module

Absolute Pressure Sensor Module	MMR931XA	*Original package

AC current sensor

AC current sensor	Operational amplifier with a built-in spiral inductor	MM1969	SOP-8G

Flame detection amplifier

			SOP-8D
Flame detection sensor	Contains a comparator	MM1217	●
	Dual amplifiern	MM1278	●

Analog signal convert IC

Analog Front End IC	MM3609	PLP-24

1 SECONDARY BATTERY ICs

Electrical characteristics (Unless otherwise specified, Ta=+25°C)

Protection for lithium–ion batteries

Product series	Product name	Overcharge detection voltage (Accuracy)	Overdischarge detection voltage (Accuracy)	Discharging overcurrent detection voltage (Accuracy)	Detection delay time	Package
For one-cell	**MM3280 series** Overcurrent detection by external resistor	3.8V to 4.5V (±20mV)	2.0V to 3.0V (±35mV)	50mV to 300mV (±10mV)	Delay timer (Built–in)	SON–6C SOT–26A /26B SSON–6E /6J /6K
	MM3511 series Standard	4.0V to 4.5V (±20mV)	2.0V to 3.0V (±35mV)	50mV to 300mV (±10mV)	Delay timer (Built–in)	SON–6C SSON–6A /6J
	MM3638 series High accuracy Overcurrent detection	4.0V to 4.5V (±20mV)	2.0V to 3.0V (±35mV)	20mV to 65mV (±15%) 65mV to 300mV (±10mV)	Delay timer (Built–in)	SON–6C SSON–6J
	MM3645 series High accuracy Overcurrent detection	4.0V to 4.5V (±20mV)	2.0V to 3.0V (±35mV)	20mV to 300mV (±15%)	Delay timer (Built–in)	TSOP–8A
	MM3721 series High accuracy Overcurrent detection	3.8V to 4.5V (±20mV)	2.0V to 3.0V (±35mV)	20mV to 150mV (Refer to product page)	Delay timer (Built–in)	SON–6C SSON-6J
	MM3722 series High accuracy Overcurrent detection	3.8V to 4.5V (±20mV)	2.0V to 3.0V (±35mV)	20mV to 150mV (Refer to product page)	Delay timer (Built–in)	SON–6C SSON–6J
	MM3723 series High accuracy over voltage detection	3.6V to 4.6V (±12mV)	2.0V to 3.0V (±35mV)	20mV to 100mV (Refer to product page)	Delay timer (Built–in)	WLCSP-6B
	MM3724 series High accuracy Overcurrent detection	3.8V to 4.5V (±20mV)	2.0V to 3.0V (±35mV)	20mV to 300mV (Refer to product page)	Delay timer (Built–in)	SON–6C SSON-6J
	MM3725 /MM3726 series High accuracy overcurrent detection	3.6V to 5.0V (±20mV)	2.0V to 3.0V (±35mV)	20mV to 300mV (Refer to product page)	Delay timer (Built–in)	SON–6C SSON-6J SSON-6M
	MM3746 series N channel high side FET driver	4.2V to 4.6V (±15mV)	2.0V to 3.0V (±40mV)	10mV to 150mV (Refer to product page)	Delay timer (Built–in)	WLCSP-10A
	MM3855series High accuracy overcurrent detection	4.0V to 4.5V (±20mV)	2.1V to 3.0V (±35mV)	6mV to 100mV (±2.5mV) 15mV to 100mV (±3.5mV)	Delay timer (Built–in)	SSON-8F SSON-8G
	MM3856series NEW High Accuracy two step discharge overcurrent detection	4.1V to 5.0V (±20mV)	2.1V to 3.0V (±35mV)	Please Refer to Data-Sheet	Delay timer (Built-in)	SSON-6J/6M SON-6C
	MM3860series NEW Very high Accuracy two step discharge overcurrent detection	4.1V to 5.0V (±20mV)	2.1V to 3.0V (±35mV)	6mV to 50mV (±1mV)	Delay timer (Built-in)	SSON-6J/6M SON-6F
	MC3002 series Built in FET, Low on state resistance 10.6mΩ	4.15V to 4.5V (±22mV)	2.0V to 3.0V (±100mV)	30mV to 130mV (±6mV)	Delay timer (Built–in)	PLP–4D
	MC3011 series Built in FET, On state resistance 13.4mΩ	4.15V to 4.5V (±22mV)	2.0V to 3.0V (±100mV)	30mV to 130mV (±6mV)	Delay timer (Built–in)	PLP–4D
	MD1421ExxCPAL series	4.1V to 4.45V (±20mV)	2.0V to 3.0V (±100mV)	40mV to 180mV (±5mV)	Delay timer (Built–in)	PLP–4–1228
	MC3651 series Built in FET, for Wearable	4.15V to 4.5V (±20mV)	2.00V to 3.00V (±100mV)	20mV to 65mV (±5mV)	Delay timer (Built–in)	PLP-4E
	MC3761 series NEW Very low current consumption	4.2V to 4.7V (±20mV)	2.0V to 3.3V (±30mV)	Please Refer to Data-Sheet	Delay timer (Built-in)	PLP-6J
	MJ3401 series Built in FET, OTP (Built–in)	4.10V to 4.60V (±10mV)	2.0V to 3.0V (±35mV)	---	Delay timer (Built–in)	PLP-6G
	MJ3542 series NEW Possible by OTP technology to detect very high accuracy	4.1V to 4.6V (±10mV)	2.0V to 2.8V (±35mV)	Please Refer to Data-Sheet	Delay timer (Built-in)	SSON-6N
For 2-cells	**MM3220 series**	4.0V to 4.5V (±20mV)	2.0V to 3.0V (±35mV)	50mV to 300mV (±10mV)	Delay timer (Built–in)	SOT–26A
	MM3766 series NEW	3.6V to 4.5V (±15mV)	2.0V to 3.0V (±35mV)	Please Refer to Data-Sheet	Delay timer (Built-in)	SOT-26B
For 3-cells	**MM3783 series** Temperature protect	3.6V to 4.5V (±25mV)	2.0V to 3.0V (±80mV)	30mV to 300mV (±10mV)	Delay timer (External)	TSOP–16B

Electrical characteristics

(Unless otherwise specified, Ta=+25°C)

Product series	Product name	Overcharge detection voltage (Accuracy)	Overdischarge detection voltage (Accuracy)	Discharging overcurrent detection voltage (Accuracy)	Detection delay time	Package
For 3 to 5 cells	**MM3474 series**	3.6 to 4.5 (±25mV) (Top=0 to 50°C)	2.0V to 3.0V (±80mV)	50mV to 300mV (±15mV)	Delay timer (External)	TSOP-20D
	MM3575 series Cell balance	3.6 to 4.5 (±25mV)	2.0V to 3.0V (±80mV)	30mV to 300mV (±15mV)	Delay timer (Built–in)	VSOP–24A
	MM3684 series Temperature protect, Second protect	3.6 to 4.5 (±25mV)	2.0V to 3.0V (±80mV)	30mV to 300mV (±15%)	Delay timer (External)	VSOP–24A
	MM3694 series NEW	3.6V to 4.5V (±25mV)	2.0V to 3.0V (±80mV)	30mV to 300mV (±15%)	Delay timer (External)	VSOP-24A
For 4 to 7 cells	**MM3877 series** NEW	3.6V to 4.5V (±20mV)	2.0V to 3.0V (±50mV)	30mV to 300mV (±10%)	Delay timer (Built-in)	VSOP-20A
For 1 cell secondary protection	**MM3734 series** Low current consumption	4.0V to 5.0V (±20mV)	–	–	Delay timer (Built–in)	SON–6C
For 2 to 4 cells secondary protection	**MM3508A series** For 2 to 4 cells built in latch function	4.0V to 4.5V (±20mV) (Top=0 to 50°C)	–	–	Delay timer (Built–in)	SOT–26A SSON–6A
	MM3508B series For 2 to 4 cells no built in latch function					
	MM3508C series For 2 to 3 cells with terminal CT					
For 1 to 3 cells secondary protection	**MM3563 series**	4.0V to 4.5V (±25mV) (Top=0 to 50°C)	–	–	Delay timer (Built–in)	SOT–26A SSON–6A
For 3 to 4 cells secondary protection	**MM3625 series** RTC control function	3.6V to 4.5V (±25mV)	–	–	Delay timer (Built–in)	PLP–10A

Product series	Product name	cell balance	Monitoring(I/F)	Protection(Chip)	Memory	Packages
Voltage monitoring IC	**MW3790**	1 cell	○ (MIPI®)	○ (MM3722)	○ (EEPROM)	PLP-8G
	MW3793	1 cell	○ (MIPIz®)	○ (MM3722)	-	PLP-8H
	MM3757	1 cell	○ (MIPI®)	-	-	PLP-6A

Product series	Product name	Detection voltage (Accuracy)	Hysteresis voltage	Detection delay	Packages
Voltage monitor IC cell-balance control	**MM3513 series**	3.5V to 4.5V (±20mV)	0.0V to 0.4V	Delay timer (Built–in)	SOT–25A

Lithium-ion fuel gage ICs

Product series	Product name	Algorithm	Oparating voltage	Main program	SOC unit	Deterioration judgement	Current consumption	Traceability	Packages
For one-cell	**MM8013**	Intelligent gage 3 current integratio	2.5V to 5.5V	Flash	% mAh	●	60μA Typ.	●	PLP–12A
	MM8013W NEW	Intelligent gage 2 current integration, Ultra low power consumption	2.5V to 5.5V	Flash	% mAh	●	6.4μA Typ. IA (Interval Active) mode 20μA Typ. LPA (Low Power Active) mode	●	PLP–12B
	MM8033	Intelligent gage 2 Current integration	2.5V to 5.5V	ROM	% mAh	●	32μA Typ.	–	PLP–10D WLCSP–9A
	MM3556	Intelligent gage, Voltage monitor	2.2V to 5.0V	Logic	%	–	28μA Typ.	–	PLP–8F

Electrical characteristics (Unless otherwise specified, Ta=+25°C)

Lithium-ion battery charge control ICs

Product series	Product name	Operating voltage	BAT regulation voltage	Fast charge current (max.)	FET output	Timer	JEITA charge profile	System pass SW	Charge system	Packages
For one-cell	**MM3458**	4.0V to 6.0V	4.2V±30mV (±0.7%)	1.5A	Built–in	Built–in	●	–	Linear	SSON–10A
	MM3635	4.5V to 5.5V	4.2V±30mV (±0.7%) 4.05V±50mV (±1.2%)	0.7A	Built–in	Built–in	–	–	Linear	SSON–10A
	MM3835W For wearable	4.35V to 5.8V	4.1V±30mV 4.2V±30mV 4.35V±30mV	1.0A	Built–in	Built–in	●	–	Linear	SSON–10A
	MM3658	4.0V to 6.0V	3.6V±30mV (±0.8%)	1.5A	Built–in	Built–in	–	–	Linear	SSON–10A
	MM3865 NEW Ultra small type	4.4V to 6.0V	4.10V to 4.45V (±30mV)	0.5A	Built–in	Built–in	●	–	Linear	SSON–6E
	MM3538	4.35V to 5.5V	4.2V±30mV (±0.7%)	1.5A	Built–in	Built–in	●	Built–in	Linear	WLCSP–25A
	MM3439	4.5V to 5.5V	4.2V±30mV (±0.7%)	2.0A	Built–in	Built–in	●	Built–in	Switching	SQFN–32A
	MM3539 Built–in RTC/ ADC	4.5V to 5.5V	4.2V±30mV (±0.7%)	2.0A	Built–in	Built–in	●	Built–in	Switching	WLCSP–48B

1 SECONDARY BATTERY ICs

1 cell lithium–ion/lithium–polymer battery protection IC

MM3280 Series

Outline

MM3280 series are protection IC using high voltage CMOS process for protection of the rechargeable lithium-ion or lithium-polymer battery. The overcharge, overdischarge and discharging and charging (optional) overcurrent protection of the rechargeable one–cell lithium-ion or lithium-polymer battery can be detected.

Features

(Unless otherwise specified, Ta=25°C)

(1) Range and accuracy of detection/release voltage

- Overcharge detection voltage ..... 3.8V to 4.5V, 5mV steps ..... Accuracy±20mV
  Accuracy±25mV (Topr=–5 to +60°C)
- Overcharge release voltage ..... 3.6V to 4.5V, 50mV steps ..... Accuracy±30mV
- Overdischarge detection voltage ..... 2.0V to 3.0V, 50mV steps ..... Accuracy±35mV
- Overdischarge release voltage ..... 2.0V to 3.5V, 50mV steps ..... Accuracy±100mV
- Discharging overcurrent detection voltage ..... 50mV to 300mV, 5mV steps ..... Accuracy±10mV
- Charging overcurrent detection voltage* ..... –300mV to –50mV, 5mV steps ..... Accuracy±20mV
- Short detection voltage ..... Selection for 0.7, 0.8, 0.9V ..... Accuracy±100mV
- Over voltage charger detection voltage* ..... VDD–8.0V fixed ..... Accuracy±2.0V
- Over voltage charger release voltage* ..... VDD–7.3V fixed ..... Accuracy±2.0V

(2) Range of detection delay time

- Overcharge detection delay time ..... Selection from 0.25s, 1.0s, 1.2s, 4.5s
- Overdischarge detection delay time ..... Selection from 20ms, 24ms, 96ms, 125ms, 128ms, 144ms
- Discharging overcurrent detection delay time ..... Selection from 8ms, 12ms, 16ms, 20ms, 24ms, 48ms, 96ms, 160ms
- Charging overcurrent detection delay time ..... Selection from 4ms, 6ms, 8ms, 10ms, 12ms, 16ms, 96ms
- Short detection delay time ..... Selection from 200µs, 300µs, 400µs

(3) 0V battery charge function ..... Selection from “Permission” or “Prohibition”

(4) The overcharge detection delay timer reset time function (function for the pulse charge) is provided. *

* Optional function

(5) Low current consumption

- Normal mode ..... Typ. 3.0µA, Max. 6.0µA
- Stand-by mode ..... Max. 0.1µA
  (For “Charger connection release” the overdischarge release condition.)
  Max. 0.5µA
  (For “Voltage release” the overdischarge release condition.)

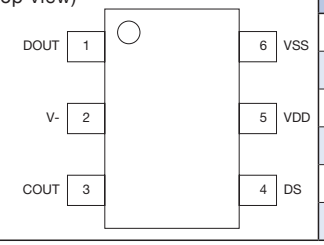
(6) Absolute maximum ratings

- VDD pin ..... VSS–0.3V to +12V
- COUT pin and V- pin ..... VDD–28V to VDD+0.3V
- DOUT pin ..... VSS–0.3V to VDD+0.3V
- Storage temperature ..... –55 to +125°C
- Operation temperature ..... –40 to +85°C

Pin assignment

SOT-26A SOT-26B

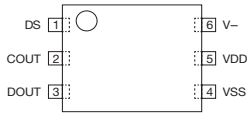
(Top view)



Pin no.	Symbol	Function
1	DOUT	Output of overdischarge detection (Output type is CMOS)
2	V–	Input terminal connected to charger negative voltage
3	COUT	Output of overcharge detection (Output type is CMOS)
4	DS	Delay shorten terminal
5	VDD	VDD terminal (Connected to IC substrait)
6	VSS	VSS terminal (Connected to ground)

SON-6C

(Top view)

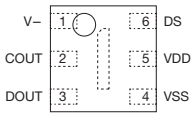


Pin no.	Symbol	Function
1	DS	Delay shorten terminal
2	COUT	Output of overcharge detection (Output type is CMOS)
3	DOUT	Output of overdischarge detection (Output type is CMOS)
4	VSS	VSS terminal (Connected to ground)
5	VDD	VDD terminal (Connected to IC substrait)
6	V–	Input terminal connected to charger negative voltage

SSON-6 Pin Assignment is different depending on rank.

SSON-6J MM3280A01RRE, MM3280F02RRE, MM3280G01RRE, MM3280G02RRE, MM3280S02RRE, MM3280T02RRE, MM3280R03RRE

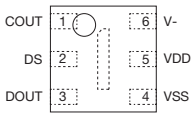
(Top view)



Pin no.	Symbol	Function
1	V–	Input terminal connected to charger negative voltage
2	COUT	Output of overcharge detection (Output type is CMOS)
3	DOUT	Output of overdischarge detection (Output type is CMOS)
4	VSS	VSS terminal (Connected to ground)
5	VDD	VDD terminal (Connected to IC substrait)
6	DS	Delay shorten terminal

SSON-6E, 6J MM3280B04RRE,MM3280B05RRE, MM3280P09RRE, MM3280P10RRE, MM3280P12RRE, MM3280P16RRE, MM3280P17RRE, MM3280P20RRE, MM3280P21RRE, MM3280P22RRE, MM3280P23RRE, MM3280P25RRE, MM3280PA1RRE

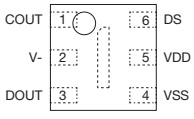
(Top view)



Pin no.	Symbol	Function
1	COUT	Output of overcharge detection (Output type is CMOS)
2	DS	Delay shorten terminal
3	DOUT	Output of overdischarge detection (Output type is CMOS)
4	VSS	VSS terminal (Connected to ground)
5	VDD	VDD terminal (Connected to IC substrait)
6	V–	Input terminal connected to charger negative voltage

SSON-6K MM3280C01RRE

(Top view)



Pin no.	Symbol	Function
1	COUT	Output of overcharge detection (Output type is CMOS)
2	V–	Input terminal connected to charger negative voltage
3	DOUT	Output of overdischarge detection (Output type is CMOS)
4	VSS	VSS terminal (Connected to ground)
5	VDD	VDD terminal (Connected to IC substrait)
6	DS	Delay shorten terminal

Selection guide

MODEL	Package	Optional function				Detection / Release voltage							Detection delay time				
		0V battery charge function	Charging overcurrent detection	Over voltage charger detection	Overcharge detection delay timer reset time	Overcharge detection voltage	Overcharge release voltage	Overdischarge detection voltage	Overdischarge release voltage	Discharging overcurrent detection voltage	Charging overcurrent detection voltage	Short detection voltage	Overcharge detection delay time	Overdischarge detection delay time	Discharging overcurrent detection delay time	Charging overcurrent detection delay time	Short detection delay time
		※1	※2			Vdet1	Vrel1	Vdet2	Vrel2	Vdet3	Vdet4	Vshort	tVdet1	tVdet2	tVdet3	tVdet4	tshort
						V	V	V	V	V	V	V	s	ms	ms	ms	us
MM3280A01RRE	SSON6J	○	○	○	○	4.300	4.100	2.300	2.300	0.105	-0.100	0.9	4.500	125	12	16	400
MM3280A01YRE	SON6C	○	○	○	○	4.300	4.100	2.300	2.300	0.105	-0.100	0.9	4.500	125	12	16	400
MM3280B04RRE	SSON6J	×	○	○	○	4.445	4.245	2.300	2.300	0.060	-0.070	0.9	4.500	96	12	8	400
MM3280B05RRE	SSON6J	×	○	○	○	4.445	4.245	2.300	2.300	0.050	-0.070	0.3	4.500	96	160	8	400
MM3280B07RRE	SSON6J	×	○	○	○	4.445	4.245	2.300	2.300	0.055	-0.060	0.3	1.000	96	12	10	300
MM3280C01RRE	SSON6K	○	○	○	×	4.225	4.025	2.800	2.800	0.150	-0.150	0.9	1.000	96	12	6	400
MM3280C01NRH	SOT26A/B	○	○	○	×	4.225	4.025	2.800	2.800	0.150	-0.150	0.9	1.000	96	12	6	400
MM3280C04RRE	SSON6K	○	○	○	×	4.275	4.175	2.300	2.300	0.150	-0.150	0.9	1.000	96	12	6	400
MM3280C05RRE	SSON6K	○	○	○	×	4.375	4.275	2.300	2.300	0.200	-0.150	0.9	1.000	96	12	6	400
MM3280D01NRH	SOT25A	○	○	×	×	4.275	4.075	2.800	3.100	0.100	-0.100	0.9	0.250	144	16	8	400
MM3280E01YRE	SON6C	○	○	×	×	4.275	4.275	2.300	2.300	0.100	-0.100	0.9	1.000	20	6	8	400
MM3280EA1YRE	SON6C	○	○	×	×	4.275	4.075	2.500	2.900	0.130	-0.130	0.7	1.024	96	12	8	300
MM3280EA2RRE	SSON6J	○	○	×	×	4.425	4.225	2.500	2.900	0.130	-0.130	0.7	1.024	96	12	8	300
MM3280EA3YRE	SON6C	○	○	×	×	4.415	4.215	2.500	2.900	0.100	-0.100	0.3	1.024	96	12	8	300
MM3280EA4YRE	SON6C	○	○	×	×	4.425	4.225	3.000	3.200	0.130	-0.130	0.7	1.024	96	12	8	300
MM3280EA5YRE	SON6C	○	○	×	×	4.425	4.225	2.800	3.000	0.130	-0.130	0.7	1.024	96	12	8	300
MM3280EA6YRE	SON6C	○	○	×	×	4.420	4.220	2.500	2.900	0.050	-0.040	0.3	1.024	64	12	8	300
MM3280EA9YRE	SON6C	○	○	×	×	4.425	4.225	2.500	2.800	0.130	-0.100	0.5	1.024	32	8	8	250
MM3280EAAYRE	SON6C	○	○	×	×	4.425	4.225	2.500	2.900	0.200	-0.150	0.5	1.024	96	12	10	300
MM3280EACNRH	SOT26A/B	○	○	×	×	4.400	4.200	2.500	2.900	0.250	-0.150	0.5	1.024	96	12	8	300
MM3280EADYRE	SON6C	○	○	×	×	4.425	4.225	2.400	3.000	0.175	-0.130	0.8	1.024	20	12	8	300
MM3280EAFYRE	SON6C	○	○	×	×	4.475	4.275	2.500	2.900	0.100	-0.100	0.3	1.024	96	12	8	300
MM3280EAGYRE	SON6C	○	○	×	×	4.475	4.275	2.500	2.900	0.080	-0.080	0.3	1.024	96	12	8	300
MM3280EAHYRE	SON6C	○	○	×	×	4.475	4.275	2.500	2.900	0.050	-0.050	0.3	1.024	96	12	8	300
MM3280EAKYRE	SON6C	○	○	×	×	4.475	4.275	2.500	2.600	0.200	-0.150	0.7	1.024	96	12	8	300
MM3280EAMYRE	SON6C	○	○	×	×	4.475	4.275	2.500	2.900	0.130	-0.125	0.38	1.024	64	8	8	250
MM3280EANYRE	SON6C	○	○	×	×	4.425	4.225	2.800	3.000	0.050	-0.050	0.4	1.024	96	12	8	300
MM3280EASYRE	SON6C	○	○	×	×	4.425	4.225	2.500	2.900	0.130	-0.130	0.7	1.024	96	8	8	300
MM3280EAVYRE	SON6C	○	○	×	×	4.425	4.225	2.500	2.800	0.190	-0.150	0.5	1.024	32	8	8	250
MM3280EAWYRE	SON6C	○	○	×	×	4.475	4.275	2.500	2.600	0.130	-0.100	0.5	1.024	96	12	8	300
MM3280EAYYRE	SON6C	○	○	×	×	4.475	4.275	2.500	2.600	0.080	-0.060	0.3	1.024	96	12	8	300
MM3280EB1RRE	SSON6J	×	○	×	×	4.425	4.225	2.500	2.900	0.130	-0.130	0.7	1.024	96	12	8	300
MM3280EB2YRE	SON6C	×	○	×	×	4.415	4.215	2.500	2.900	0.100	-0.100	0.3	1.024	96	12	8	300
MM3280EB3YRE	SON6C	×	○	×	×	4.450	4.250	2.500	2.900	0.100	-0.100	0.3	1.024	96	12	8	300
MM3280EB4YRE	SON6C	×	○	×	×	4.420	4.220	2.500	2.900	0.050	-0.040	0.3	1.024	64	12	8	300
MM3280EB5YRE	SON6C	×	○	×	×	4.475	4.275	2.500	2.900	0.130	-0.100	0.3	1.024	96	12	8	300
MM3280EB7YRE	SON6C	×	○	×	×	4.400	4.200	2.500	2.900	0.250	-0.250	0.5	1.024	96	12	8	300
MM3280EBAYRE	SON6C	×	○	×	×	4.475	4.275	2.500	2.900	0.110	-0.100	0.3	1.024	96	12	8	300
MM3280EC3NRH	SOT26A/B	○	○	×	×	4.425	4.225	2.500	2.800	0.130	-0.130	0.5	1.024	96	10	10	280
MM3280EC5NRH	SOT26A/B	○	○	×	×	4.475	4.275	2.500	2.900	0.150	-0.150	0.5	1.024	64	8	8	280
MM3280EC6NRH	SOT26A/B	○	○	×	×	4.280	4.080	2.400	2.800	0.235	-0.100	0.5	1.024	96	10	10	280
MM3280EC7NRH	SOT26A/B	○	○	×	×	4.280	4.080	2.800	3.000	0.200	-0.100	0.5	1.024	96	10	10	280
MM3280EG1RRE	SSON6J	×	○	×	×	4.475	4.375	2.000	2.000	0.075	-0.075	0.5	0.576	144	4.25	4	300
MM3280EJ1NRH	SOT26A/B	×	○	×	×	4.280	4.080	2.800	2.800	0.150	-0.100	0.5	1.216	144	8	8	320
MM3280EL1NRH	SOT26A/B	○	○	×	×	4.400	4.200	3.250	3.250	0.200	-0.150	0.5	1.024	128	8	8	250

※1 0V battery charge function　　○ : Permission　× : Prohibition
※2 Optional functions　　○ : Provided.　× : Not provided.

Please inquire to us, if you request a rank other than the above.

Selection guide

MODEL	Package	Optional function				Detection / Release voltage							Detection delay time				
		0V battery charge function	Charging overcurrent detection	Over voltage charger detection	Overcharge detection delay timer reset time	Overcharge detection voltage	Overcharge release voltage	Overdischarge detection voltage	Overdischarge release voltage	Discharging overcurrent detection voltage	Charging overcurrent detection voltage	Short detection voltage	Overcharge detection delay time	Overdischarge detection delay time	Discharging overcurrent detection delay time	Charging overcurrent detection delay time	Short detection delay time
		※1	※2			Vdet1	Vrel1	Vdet2	Vrel2	Vdet3	Vdet4	Vshort	tVdet1	tVdet2	tVdet3	tVdet4	tshort
						V	V	V	V	V	V	V	s	ms	ms	ms	us
MM3280F02RRE	SSON6J	○	×	○	×	4.300	4.100	2.300	2.300	0.130	-	0.9	1.000	24	12	-	400
MM3280G01RRE	SSON6J	×	×	○	×	4.280	4.100	2.300	2.300	0.050	-	0.9	1.000	24	12	-	400
MM3280G02RRE	SSON6J	×	×	○	×	4.280	4.100	2.800	2.800	0.050	-	0.9	1.000	24	12	-	400
MM3280H01NRH	SOT26A/B	○	×	○	×	4.275	4.175	3.000	3.200	0.150	-	0.9	1.000	125	12	-	400
MM3280H02NRH	SOT26A/B	○	×	○	×	4.280	4.100	2.300	2.500	0.150	-	0.9	1.000	24	12	-	400
MM3280H03NRH	SOT26A/B	○	×	○	×	4.215	4.115	2.800	2.900	0.150	-	0.9	1.000	24	12	-	400
MM3280H04NRH	SOT26A/B	○	×	○	×	3.800	3.600	2.300	2.500	0.100	-	0.9	1.000	125	12	-	400
MM3280HB6YRE	SON6C	○	×	○	×	4.450	4.265	2.500	2.700	0.200	-	0.9	1.000	24	12	-	400
MM3280I01NRH	SOT26A/B	○	×	○	×	4.250	4.050	2.500	3.000	0.150	-	0.9	1.000	24	12	-	400
MM3280I02NRH	SOT26A/B	○	×	○	×	4.250	4.050	2.500	3.000	0.100	-	0.9	1.000	24	12	-	400
MM3280I04NRH	SOT26A/B	○	×	○	×	4.250	4.050	2.500	3.000	0.150	-	0.9	1.000	512	288	-	400
MM3280J01NRH	SOT26A/B	○	○	×	×	4.250	4.050	2.500	3.000	0.200	-0.100	0.8	1.000	20	12	8	300
MM3280J03NRH	SOT26A/B	○	○	×	×	3.800	3.600	2.000	2.380	0.100	-0.100	0.8	1.000	96	20	12	300
MM3280J04NRH	SOT26A/B	○	○	×	×	4.275	4.215	3.000	3.200	0.150	-0.100	0.8	1.000	96	20	12	300
MM3280J05NRH	SOT26A/B	○	○	×	×	4.250	4.190	2.800	3.000	0.150	-0.100	0.8	1.000	96	20	12	300
MM3280J07NRH	SOT26A/B	○	○	×	×	4.250	4.190	2.500	3.000	0.100	-0.100	0.7	1.000	96	20	12	300
MM3280J12NRH	SOT26A/B	○	○	×	×	4.280	4.100	2.300	2.500	0.200	-0.200	0.8	1.000	20	12	8	300
MM3280J16NRH	SOT26A/B	○	○	×	×	4.280	4.230	2.500	3.000	0.100	-0.100	0.7	1.000	96	20	12	300
MM3280J17NRH	SOT26A/B	○	○	×	×	3.900	3.800	2.000	2.500	0.100	-0.100	0.6	1.200	144	32	12	300
MM3280J18NRH	SOT26A/B	○	○	×	×	4.250	4.190	3.000	3.200	0.150	-0.100	0.8	1.000	96	20	12	300
MM3280JA1YRE	SON6C	○	○	×	×	4.425	4.225	2.500	2.900	0.130	-0.130	0.7	1.000	96	12	10	300
MM3280JB1NRH	SOT26A/B	○	○	×	×	4.425	4.225	2.500	2.900	0.130	-0.130	0.7	1.000	96	12	10	300
MM3280JB2NRH	SOT26A/B	○	○	×	×	4.350	4.150	2.500	2.900	0.200	-0.100	0.7	1.000	96	12	10	300
MM3280JB3NRH	SOT26A/B	○	○	×	×	4.375	4.275	2.800	3.000	0.170	-0.150	0.7	1.000	96	12	10	300
MM3280JB4NRH	SOT26A/B	○	○	×	×	4.375	4.175	2.300	2.700	0.150	-0.150	0.7	1.000	96	12	10	300
MM3280JB5NRH	SOT26A/B	○	○	×	×	4.400	4.300	2.800	3.000	0.150	-0.150	0.7	1.000	96	12	10	300
MM3280JB7NRH	SOT26A/B	○	○	×	×	4.425	4.225	2.500	2.900	0.160	-0.160	0.7	1.000	96	12	10	300
MM3280JC1YRE	SON6C	○	○	×	×	4.380	4.180	2.600	3.000	0.180	-0.130	0.9	1.000	96	12	10	300
MM3280JC2YRE	SON6C	×	○	×	×	4.425	4.225	2.500	2.900	0.130	-0.130	0.7	1.000	96	12	10	300
MM3280JC3YRE	SON6C	×	○	×	×	4.425	4.225	2.500	2.900	0.210	-0.130	0.3	1.000	96	12	10	300
MM3280JD2YRE	SON6C	×	○	×	×	4.425	4.225	2.500	2.900	0.130	-0.130	0.7	1.000	96	12	10	300
MM3280JD4YRE	SON6C	×	○	×	×	4.425	4.225	2.300	2.650	0.170	-0.130	0.7	1.000	96	12	10	300
MM3280JD5NRH	SOT26A/B	×	○	×	×	4.250	4.100	3.000	3.200	0.100	-0.100	0.6	1.000	96	16	12	300
MM3280JF1YRE	SON6C	○	○	×	×	4.425	4.225	2.500	2.500	0.100	-0.100	0.5	1.000	96	12	10	300
MM3280JF2YRE	SON6C	○	○	×	×	4.425	4.225	2.500	2.500	0.150	-0.100	0.5	1.000	96	12	10	300
MM3280JF3NRH	SOT25A	○	○	×	×	4.280	4.080	2.800	2.800	0.150	-0.100	0.5	0.250	144	18	10	300
MM3280JH1YRE	SON6C	○	○	×	×	4.415	4.215	2.500	2.900	0.045	-0.045	0.3	1.000	96	12	10	300
MM3280JH1RRE	SSON6J	○	○	×	×	4.415	4.215	2.500	2.900	0.045	-0.045	0.3	1.000	96	12	10	300
MM3280JH2YRE	SON6C	○	○	×	×	4.415	4.215	2.500	2.900	0.080	-0.080	0.3	1.000	96	12	10	300
MM3280JH2RRE	SSON6J	○	○	×	×	4.415	4.215	2.500	2.900	0.080	-0.080	0.3	1.000	96	12	10	300
MM3280JH3YRE	SON6C	○	○	×	×	4.425	4.200	2.300	2.800	0.100	-0.060	0.3	1.000	96	12	10	300
MM3280JH4YRE	SON6C	○	○	×	×	4.425	4.200	2.300	2.800	0.055	-0.060	0.25	1.000	96	12	10	300
MM3280JH5YRE	SON6C	○	○	×	×	4.470	4.270	2.500	2.900	0.130	-0.130	0.4	1.000	96	12	10	300
MM3280JH6NRH	SOT26A/B	○	○	×	×	4.375	4.275	2.800	3.000	0.200	-0.150	0.6	1.000	96	12	10	300
MM3280JH7NRH	SOT26A/B	○	○	×	×	4.425	4.325	2.800	3.000	0.200	-0.150	0.6	1.000	96	12	10	300

※1 0V battery charge function　　○ : Permission　× : Prohibition
※2 Optional functions　　○ : Provided.　× : Not provided.

Please inquire to us, if you request a rank other than the above.

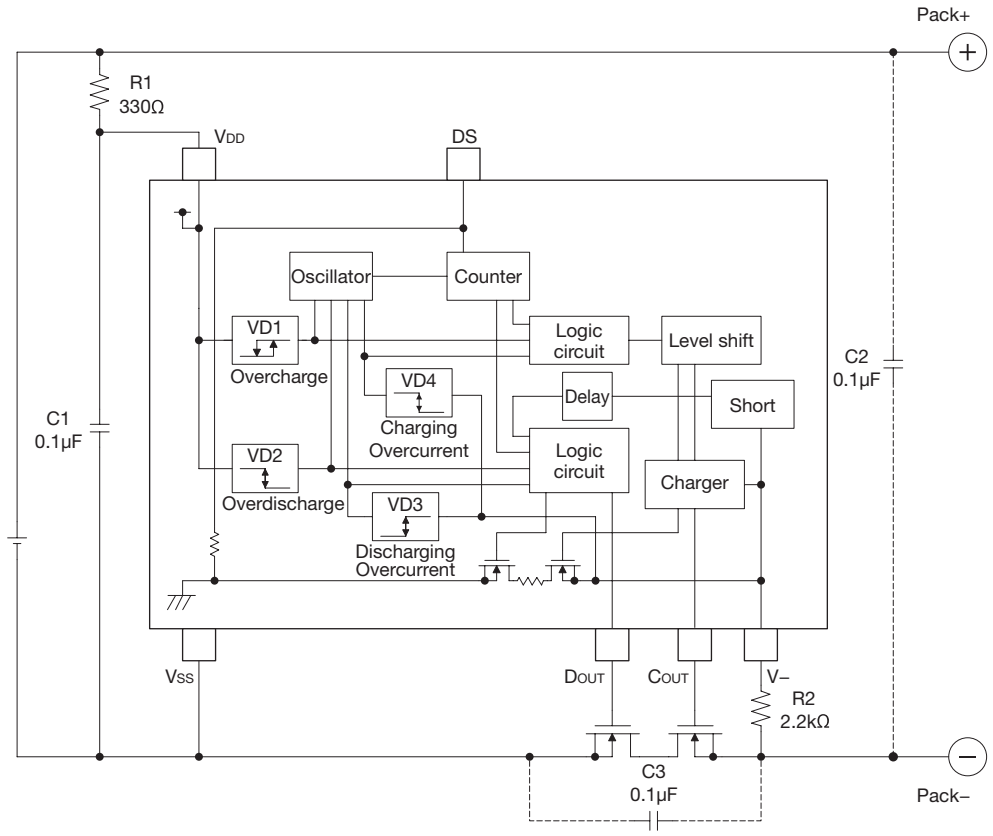
Selection guide

MODEL	Package	Optional function				Detection / Release voltage							Detection delay time				
		0V battery charge function	Charging overcurrent detection	Over voltage charger	Overcharge detection delay timer reset time	Overcharge detection voltage	Overcharge release voltage	Overdischarge detection voltage	Overdischarge release voltage	Discharging overcurrent detection voltage	Charging overcurrent detection voltage	Short detection voltage	Overcharge detection delay time	Overdischarge detection delay time	Discharging overcurrent detection delay time	Charging overcurrent detection delay time	Short detection delay time
		※1	※2			Vdet1	Vrel1	Vdet2	Vrel2	Vdet3	Vdet4	Vshort	tVdet1	tVdet2	tVdet3	tVdet4	tshort
						V	V	V	V	V	V	V	s	ms	ms	ms	us
MM3280JH8NRH	SOT26A/B	○	○	×	×	4.280	4.080	2.800	3.000	0.150	-0.150	0.5	1.200	144	9	8	320
MM3280JHANRH	SOT26A/B	○	○	×	×	4.475	4.275	2.500	2.600	0.200	-0.150	0.7	1.000	96	12	8	300
MM3280JL1YRE	SON6C	×	○	×	×	4.400	4.200	2.900	2.900	0.100	-0.100	0.4	1.000	96	12	10	300
MM3280JL2YRE	SON6C	×	○	×	×	4.425	4.225	2.500	2.500	0.180	-0.125	0.5	1.000	32	8	8	250
MM3280JM1YRE	SON6C	×	○	×	×	4.400	4.200	2.900	2.900	0.100	-0.100	0.4	1.000	96	12	10	300
MM3280JP1NRH	SOT26A/B	○	○	×	×	4.250	4.150	2.800	3.000	0.100	-0.050	0.45	1.000	1,000	500	1,000	400
MM3280JP2NRH	SOT26A/B	○	○	×	×	4.200	4.100	2.800	3.000	0.100	-0.050	0.45	1.000	1,000	500	1,000	400
MM3280JP3NRH	SOT26A/B	○	○	×	×	4.250	4.150	2.500	3.000	0.150	-0.080	0.45	1.000	3,000	1,000	1,000	400
MM3280JP4NRH	SOT26A/B	○	○	×	×	4.250	4.150	2.800	3.000	0.150	-0.080	0.45	1.000	3,000	1,000	1,000	400
MM3280N01YRE	SON6C	○	○	×	×	4.280	4.180	2.300	2.300	0.160	-0.160	0.9	1.000	96	20	16	400
MM3280P09RRE	SSON6J	×	○	×	×	4.280	4.180	2.700	2.700	0.065	-0.075	0.9	1.000	96	20	18	400
MM3280P10RRE	SSON6J	×	○	×	×	4.280	4.100	2.300	2.300	0.170	-0.170	0.9	1.000	24	12	4	400
MM3280P12RRE	SSON6E	○	○	×	×	4.280	4.100	2.300	2.300	0.150	-0.220	0.9	1.000	24	12	4	400
MM3280P16RRE	SSON6J	×	○	×	×	4.280	4.100	2.300	2.300	0.160	-0.150	0.9	1.000	24	12	4	400
MM3280P17RRE	SSON6J	×	○	×	×	4.280	4.100	2.300	2.300	0.120	-0.120	0.9	1.000	24	12	4	400
MM3280P18RRE	SSON6J	○	○	×	×	4.420	4.240	3.000	3.000	0.150	-0.220	0.9	1.000	24	12	4	400
MM3280P20RRE	SSON6J	×	○	×	×	4.280	4.100	2.300	2.300	0.200	-0.120	0.9	1.000	24	12	4	400
MM3280P21RRE	SSON6J	×	○	×	×	4.430	4.190	2.300	2.300	0.240	-0.250	0.9	1.000	24	12	4	400
MM3280P22RRE	SSON6J	×	○	×	×	4.420	4.240	2.300	2.300	0.210	-0.220	0.9	1.000	24	12	4	400
MM3280P23RRE	SSON6J	○	○	×	×	4.430	4.250	2.300	2.300	0.120	-0.120	0.9	1.000	24	12	4	400
MM3280P25RRE	SSON6J	×	○	×	×	4.280	4.100	2.300	2.300	0.160	-0.100	0.9	1.000	128	24	4	400
MM3280P26RRE	SSON6J	×	○	×	×	4.420	4.240	2.300	2.300	0.170	-0.170	0.9	1.000	24	12	4	400
MM3280P33RRE	SSON6J	×	○	×	×	4.430	4.230	2.700	2.700	0.080	-0.080	0.5	1.000	24	12	4	400
MM3280PA1RRE	SSON6J	×	○	×	×	4.420	4.420	2.300	2.300	0.115	-0.130	0.9	1.000	24	12	4	400
MM3280PA6RRE	SSON6J	○	○	×	×	4.370	4.370	2.300	2.300	0.140	-0.130	0.5	1.000	24	12	4	400
MM3280PA7RRE	SSON6J	×	○	×	×	4.430	4.430	2.800	2.800	0.080	-0.080	0.5	1.000	24	12	4	400
MM3280PA9RRE	SSON6J/6M	×	○	×	×	4.280	4.280	2.700	2.700	0.070	-0.090	0.5	1.000	24	12	4	400
MM3280S01NRH	SOT26A/B	○	×	○	×	4.280	4.080	3.000	3.000	0.080	-	0.9	1.200	144	8	-	400
MM3280S02RRE	SSON6J	○	×	○	×	4.300	4.100	3.000	3.000	0.250	-	0.9	1.200	144	8	-	400
MM3280SB9YRE	SON6C	×	○	×	×	4.475	4.275	2.500	2.900	0.160	-0.125	0.7	1.000	96	12	8	300
MM3280T01NRH	SOT26A/B	×	○	×	×	4.280	4.280	2.800	2.800	0.050	-0.100	0.9	1.000	20	6	8	200
MM3280T02RRE	SSON6J	×	○	×	×	4.280	4.280	2.800	2.800	0.050	-0.100	0.9	1.000	20	6	8	200
MM3280T03NRH	SOT26A/B	×	○	×	×	3.670	3.670	2.050	2.050	0.050	-0.060	0.4	1.000	96	96	96	400
MM3280T04NRH	SOT26A/B	×	○	×	×	4.280	4.280	2.400	2.400	0.050	-0.060	0.4	1.000	96	96	96	400
MM3280W01NRH	SOT26A/B	○	○	○	×	4.280	4.280	2.300	2.500	0.150	-0.150	0.9	1.000	24	12	8	400
MM3280W06NRH	SOT26A/B	×	○	○	×	4.325	4.325	2.500	2.900	0.150	-0.150	0.7	1.000	24	12	8	400
MM3280W07NRH	SOT26A/B	○	○	○	×	4.350	4.350	2.300	2.500	0.150	-0.150	0.7	1.000	24	12	8	400

※1 0V battery charge function　　○ : Permission　× : Prohibition
※2 Optional functions　　○ : Provided.　× : Not provided.

Please inquire to us, if you request a rank other than the above.

Typical application circuit



- R1 and C1 stabilize a supply voltage ripple. However, the detection voltage rises by the current of penetration in IC of the voltage detection when R1 is enlarged, and the value of R1 is adjusted to 1kohm or less. Moreover, adjust the value of C1 to 0.01µF or more to do the stability operation, please.

- R1 and R2 resistors are current limit resistance if a charger is connected reversibly or a high-voltage charger that exceeds the absolute maximum rating is connected. R1 and R2 may cause a power consumption will be over rating of power dissipation, therefore the “R1+R2” should be more than 1kohm. Moreover, if R2 is too enlarged, the charger connection release cannot be occasionally done after the overdischarge is detected, so adjust the value of R2 to 10kohm or less, please.

- C2 and C3 capacitors have effect that the system stability about voltage ripple or imported noise. After check characteristics, decide that these capacitors should be inserted or not, where should be inserted, and capacitance value, please.

1 SECONDARY BATTERY ICs

1 cell lithium–ion/lithium–polymer battery protection IC

MM3511 Series

Outline

MM3511 series are protection IC using high voltage CMOS process for protection of the rechargeable lithium–ion or lithium–polymer battery. The overcharge, overdischarge, discharging overcurrent, charging overcurrent, and short protection of the rechargeable one-cell lithium-ion or lithium-polymer battery can be detected.

Features

(Unless otherwise specified, Ta=25°C)

(1) Range and accuracy of detection/release voltage

- Overcharge detection voltage ..... 4.0V to 4.5V, 5mV steps ..... Accuracy±20mV
  Accuracy±25mV (Topr=-5 to +60°C)
- Overcharge release voltage ..... 3.9V to 4.5V, 50mV steps ..... Accuracy±30mV
- Overdischarge detection voltage ..... 2.0V to 3.0V, 50mV steps ..... Accuracy±35mV
- Overdischarge release voltage ..... 2.0V to 3.5V, 50mV steps ..... Accuracy±100mV
- Discharging overcurrent detection voltage ..... 50mV to 300mV, 5mV steps ..... Accuracy±10mV
- Charging overcurrent detection voltage ..... -300mV to -50mV, 5mV steps ..... Accuracy±20mV
- Short detection voltage ..... 0.5V standard ..... Accuracy±100mV

(2) Range of detection delay time

- Overcharge detection delay time ..... Selection from 143ms, 573ms, 1.0s, 1.2s
- Overdischarge detection delay time ..... Selection from 38ms, 64ms, 75ms, 150ms, 300ms
- Discharging overcurrent detection delay time ... Selection from 4.5ms, 8ms, 9ms, 12ms, 18ms
- Charging overcurrent detection delay time ..... Selection from 4.5ms, 6ms, 8ms, 9ms
- Short detection delay time ..... 300µs, 400µs standard

(3) 0V battery charge function ..... Selection from “Permission” or “Prohibition”

(4) Low current consumption

- Normal mode ..... Typ. 3.0µA, Max. 5.5µA
- Stand-by mode ..... Max. 0.1µA

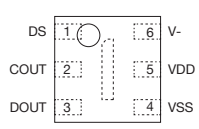
(5) Absolute maximum ratings

- VDD pin ..... VSS-0.3V to +12V
- COUT pin and V– pin ..... VDD-28V to VDD+0.3V
- DOUT pin ..... VSS-0.3V to VDD+0.3V
- Storage temperature ..... -55 to +125°C
- Operation temperature ..... -40 to +85°C

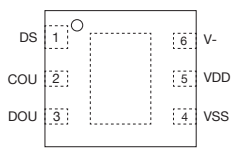
Pin assignment

SSON-6J **SSON-6A** **SON-6C**

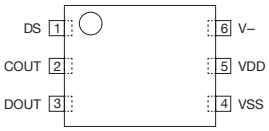
(Top view)



(Top view)



(Top view)



Pin no.	Symbol	Function
1	DS	Delay shorten terminal
2	COUT	Output of overcharge detection (Output type is CMOS)
3	DOUT	Output of overdischarge detection (Output type is CMOS)
4	VSS	VSS terminal (Connected to ground)
5	VDD	VDD terminal (Connected to IC substrait)
6	V-	Input terminal connected to charger negative voltage

Selection guide

Product name	Package	Detection / Release voltage						0V battery charge function	Delay time combination *1	Current consumption at stand-by (MAX)[μA]
		Overcharge detection voltage [V]	Overcharge release voltage [V]	Overdischarge detection voltage[V]	Overdischarge release voltage [V]	Discharging overcurrent detection voltage [V]	Charging overcurrent detection voltage [V]			
		Vdet1	Vrel1	Vdet2	Vrel2	Vdet3	Vdet4			
MM3511A16Y	SON–6C	4.275	4.175	2.300	2.400	0.100	–0.100	Permission	1	0.1
MM3511A26Y	SON–6C	4.280	4.080	2.300	2.300	0.080	–0.100	Permission	1	0.1
MM3511A36Y	SON–6C	4.280	4.080	2.300	2.300	0.100	–0.100	Permission	1	0.1
MM3511A46Y	SON–6C	4.275	4.075	2.300	2.300	0.150	–0.100	Permission	1	0.1
MM3511A56Y	SON–6C	4.280	4.280	2.800	2.800	0.050	–0.100	Permission	1	0.1
MM3511A66Y	SON–6C	4.280	4.280	3.000	3.000	0.075	–0.100	Permission	1	0.1
MM3511A76Y	SON–6C	4.275	4.175	2.300	2.400	0.050	–0.100	Permission	1	0.1
MM3511A86Y	SON–6C	4.300	4.100	2.300	2.300	0.130	–0.100	Permission	1	0.1
MM3511AA6Y	SON–6C	4.225	4.025	2.800	2.800	0.150	–0.100	Permission	9	0.1
MM3511AB6Y	SON–6C	4.225	4.025	3.000	3.000	0.060	–0.060	Permission	9	0.1
MM3511B16Y	SON–6C	3.900	3.800	2.300	2.400	0.100	–0.100	Permission	1	0.1
MM3511B26Y	SON–6C	3.950	3.850	2.300	2.400	0.100	–0.100	Permission	1	0.1
MM3511B36Y	SON–6C	4.000	3.900	2.300	2.400	0.100	–0.100	Permission	1	0.1
MM3511B46Y	SON–6C	4.050	3.950	2.300	2.400	0.100	–0.100	Permission	1	0.1
MM3511B56Y	SON–6C	4.100	4.000	2.300	2.400	0.100	–0.100	Permission	1	0.1
MM3511C16Y	SON–6C	4.280	4.080	2.300	2.300	0.100	–0.100	Prohibition	1	0.1
MM3511C26Y	SON–6C	4.280	4.080	2.300	2.300	0.130	–0.100	Prohibition	1	0.1
MM3511C36Y	SON–6C	4.280	4.130	2.600	3.100	0.150	–0.100	Prohibition	1	0.1
MM3511C46Y	SON–6C	4.280	4.130	2.800	3.100	0.150	–0.100	Prohibition	1	0.1
MM3511C56Y	SON–6C	4.200	4.100	2.800	2.900	0.150	–0.100	Prohibition	1	0.1
MM3511C66Y	SON–6C	4.280	4.130	2.800	3.100	0.100	–0.100	Prohibition	1	0.1
MM3511C76Y	SON–6C	4.280	4.130	2.800	3.100	0.050	–0.100	Prohibition	1	0.1
MM3511C96Y	SON–6C	4.280	4.130	2.800	2.800	0.150	–0.100	Prohibition	1	0.1
MM3511CA6Y	SON–6C	4.225	4.025	2.300	2.300	0.150	–0.120	Prohibition	1	0.1
MM3511CC6Y	SON–6C	4.280	4.130	2.800	3.100	0.150	–0.100	Prohibition	1	0.1
MM3511E16Y	SON–6C	4.325	4.075	2.500	2.900	0.150	–0.100	Permission	2	0.1
MM3511G16Y	SON–6C	4.350	4.150	2.300	3.000	0.200	–0.100	Permission	3	0.1
MM3511H16Y	SON–6C	4.280	4.180	2.300	2.300	0.120	–0.100	Permission	4	0.1
MM3511H26Y	SON–6C	4.275	4.075	2.800	3.100	0.100	–0.100	Permission	4	0.1
MM3511H46Y	SON–6C	4.275	4.175	2.400	2.400	0.100	–0.100	Permission	4	0.1
MM3511H56Y	SON–6C	4.280	4.180	2.300	2.300	0.090	–0.075	Permission	4	0.1
MM3511K16Y	SON–6C	4.275	4.275	2.300	2.300	0.100	–0.100	Permission	5	0.1
MM3511K26R	SSON–6J	4.275	4.075	2.300	2.300	0.120	–0.100	Permission	5	0.1
MM3511K26Y	SON–6C	4.275	4.075	2.300	2.300	0.120	–0.100	Permission	5	0.1
MM3511K36R	SSON–6A	4.275	4.075	2.300	2.300	0.130	–0.100	Permission	5	0.1
MM3511K36R	SSON–6J	4.275	4.075	2.300	2.300	0.130	–0.100	Permission	5	0.1
MM3511K36Y	SON–6C	4.275	4.075	2.300	2.300	0.130	–0.100	Permission	5	0.1
MM3511K46R	SSON–6J	4.275	4.075	2.300	2.300	0.150	–0.100	Permission	5	0.1

SON-6C ... 5,000pcs/Reel, SSON-6J ... 3,000pcs/Reel

*1: Delay time combination

		1	2	3	4	5	6	7	8	9	10	11
Overcharge detection delay time	tVdet1	1.2s	1.2s	143ms	1.2s	1.2s	1.2s	573ms	1.0s	1.2s	1.0s	1.2s
Overdischarge detection delay time	tVdet2	150ms	150ms	38ms	150ms	38ms	150ms	150ms	96ms	75ms	64ms	150ms
Discharging overcurrent detection delay time	tVdet3	9ms	9ms	18ms	18ms	9ms	4.5ms	4.5ms	12ms	9ms	8ms	4.5ms
Charging overcurrent detection delay time	tVdet4	9ms	9ms	9ms	9ms	9ms	9ms	4.5ms	6ms	9ms	8ms	9ms
Short detection delay time	tshort	300μs	400μs	300μs	300μs	300μs	300μs	300μs	400μs	300μs	250μs	300μs

Please inquire to us, if you request a rank other than the above.

Selection guide

Product name	Package	Detection / Release voltage						0V battery charge function	Delay time combination *1	Current consumption at stand-by (MAX)[μA]
		Overcharge detection voltage [V]	Overcharge release voltage [V]	Overdischarge detection voltage[V]	Overdischarge release voltage [V]	Discharging overcurrent detection voltage [V]	Charging overcurrent detection voltage [V]			
		Vdet1	Vrel1	Vdet2	Vrel2	Vdet3	Vdet4			
MM3511K46Y	SON-6C	4.275	4.075	2.300	2.300	0.150	-0.100	Permission	5	0.1
MM3511K56Y	SON-6C	4.275	4.275	2.300	2.300	0.050	-0.100	Permission	5	0.1
MM3511K66R	SSON-6J	4.270	4.070	2.300	2.300	0.100	-0.100	Permission	5	0.1
MM3511K66Y	SON-6C	4.270	4.070	2.300	2.300	0.100	-0.100	Permission	5	0.1
MM3511K76Y	SON-6C	4.275	4.075	2.300	2.300	0.130	-0.130	Permission	5	0.1
MM3511K86R	SSON-6J	4.275	4.075	2.600	2.600	0.110	-0.085	Permission	5	0.1
MM3511K86Y	SON-6C	4.275	4.075	2.600	2.600	0.110	-0.085	Permission	5	0.1
MM3511K96Y	SON-6C	4.275	4.075	2.600	2.600	0.190	-0.085	Permission	5	0.1
MM3511L16R	SSON-6J	4.275	4.075	2.600	2.600	0.100	-0.085	Permission	5	0.1
MM3511L16Y	SON-6C	4.275	4.075	2.600	2.600	0.100	-0.085	Permission	5	0.1
MM3511L36R	SSON-6J	4.275	4.075	2.600	2.600	0.180	-0.120	Permission	5	0.1
MM3511L36Y	SON-6C	4.275	4.075	2.600	2.600	0.180	-0.120	Permission	5	0.1
MM3511L56Y	SON-6C	4.350	4.150	2.300	2.300	0.130	-0.100	Permission	5	0.1
MM3511L66Y	SON-6C	4.275	4.075	2.600	2.600	0.150	-0.100	Permission	5	0.1
MM3511L76Y	SON-6C	4.275	4.275	2.300	2.300	0.125	-0.100	Permission	5	0.1
MM3511L86Y	SON-6C	4.275	4.075	2.600	2.600	0.100	-0.080	Prohibition	5	0.1
MM3511L96Y	SON-6C	4.275	4.275	2.600	2.600	0.100	-0.080	Prohibition	5	0.1
MM3511LA6Y	SON-6C	4.375	4.375	3.000	3.000	0.150	-0.150	Prohibition	5	0.1
MM3511M16RR	SSON-6A	4.275	4.275	2.500	2.500	0.160	-0.100	Prohibition	1	0.1
MM3511M16RL	SSON-6A	4.275	4.275	2.500	2.500	0.160	-0.100	Prohibition	1	0.1
MM3511M16YR	SON-6C	4.275	4.275	2.500	2.500	0.160	-0.100	Prohibition	1	0.1
MM3511M16YL	SON-6C	4.275	4.275	2.500	2.500	0.160	-0.100	Prohibition	1	0.1
MM3511N16Y	SON-6C	4.280	4.080	2.400	2.400	0.050	-0.100	Prohibition	11	0.1
MM3511P16Y	SON-6C	4.225	4.125	2.000	2.000	0.200	-0.100	Prohibition	7	0.1
MM3511W16Y	SON-6C	4.225	4.025	2.500	2.900	0.150	-0.150	Permission	8	0.1
MM3511W26Y	SON-6C	4.375	4.175	2.400	2.800	0.145	-0.145	Permission	6	0.1
MM3511WA6Y	SON-6C	4.390	4.190	2.500	2.500	0.130	-0.125	Prohibition	10	0.1
MM3511WB6Y	SON-6C	4.390	4.190	2.500	2.500	0.200	-0.125	Prohibition	10	0.1

SSON-6J ... 3,000pcs/Reel
SON-6C ... 5,000pcs/Reel

*1: Delay time combination		1	2	3	4	5	6	7	8	9	10	11
Overcharge detection delay time	tVdet1	1.2s	1.2s	143ms	1.2s	1.2s	1.2s	573ms	1.0s	1.2s	1.0s	1.2s
Overdischarge detection delay time	tVdet2	150ms	150ms	38ms	150ms	38ms	150ms	150ms	96ms	75ms	64ms	150ms
Discharging overcurrent detection delay time	tVdet3	9ms	9ms	18ms	18ms	9ms	4.5ms	4.5ms	12ms	9ms	8ms	4.5ms
Charging overcurrent detection delay time	tVdet4	9ms	9ms	9ms	9ms	9ms	9ms	4.5ms	6ms	9ms	8ms	9ms
Short detection delay time	tshort	300μs	400μs	300μs	300μs	300μs	300μs	300μs	400μs	300μs	250μs	300μs

Please inquire to us, if you request a rank other than the above.

1 SECONDARY BATTERY ICs

1 cell lithium–ion/lithium–polymer battery protection IC

MM3638 Series

Outline

MM3638 series are protection IC for lithium–ion and lthium–polymer battery. MM3638 protects the battery pack from overcharge, overdischarge, and overcurrent, etc. by controlling FET SW.

In the One–cell battery pack, on resistance of the FET SW has been used for overcurrent detection. MM3638 realize overcurrent protection with high accuracy and with no temperature dependence by using a chip resistor.

Features

(Unless otherwise specified, Ta=25°C)

(1) Range and accuracy of detection/release voltage

- Overcharge detection voltage ..... 4.0V to 4.5V, 5mV steps ..... Accuracy±20mV
  Accuracy±25mV (Ta=–20 to +60°C)
- Overdischarge detection voltage ..... 2.0V to 3.0V, 50mV steps ..... Accuracy±35mV
- Discharging overcurrent detection voltage ..... 20mV to 65mV, 1mV steps ..... Accuracy±15%
  65mV to 300mV, 5mV steps ..... Accuracy±10mV
- Charging overcurrent detection voltage..... –65mV to –20mV, 1mV steps ..... Accuracy±15%
  –300mV to –65mV, 5mV steps ..... Accuracy±10mV
- Short detection voltage..... 0.4V, 0.5V, 0.6V ..... Accuracy±150mV
  0.9V ..... Accuracy±300mV

(2) Release condition from each protection mode

- Overcharge release condition ..... "VDD < Overcharge release voltage" and "Connecting load (V– > 0.4V)"
- Overdischarge release condition ..... "VDD > Overdischarge release voltage" and "Connecting charger (V– < 0.2V)"
- Discharging overcurrent release condition ..... "Removing load (V– <0.2V)"
- Charging overcurrent release condition ..... "Connecting load (V– >0.4V)"

(3) Range of detection delay time

- Overcharge detection delay time ..... Selection from 0.25s, 0.5s, 1.0s
- Overdischarge detection delay time ..... Selection from 20ms, 24ms, 96ms, 125ms
- Discharging overcurrent detection delay time ... Selection from 8ms, 12ms, 16ms, 20ms, 48ms
- Charging overcurrent detection delay time..... Selection from 8ms, 12ms, 16ms, 20ms, 48ms
- Short detection delay time..... 250µs standard

(4) 0V battery charge function ..... Selection from "Permission" or "Prohibition"

(5) Low current consumption

- Normal mode ..... Typ. 3.0µA, Max. 6.0µA
- Stand-by mode ..... Max. 0.1µA (For "Charger connection release" the overdischarge release condition)
  Max. 0.6µA (For "Voltage release" the overdischarge release condition.)

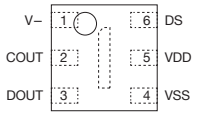
(6) Absolute maximum ratings

- VDD pin ..... VSS–0.3V to +12V
- COUT pin and V- pin ..... VDD–28V to VDD+0.3V
- DOUT pin and CS pin ..... VSS–0.3V to VDD+0.3V
- Storage temperature ..... –55 to +125°C
- Operation temperature..... –40 to +85°C

Pin assignment

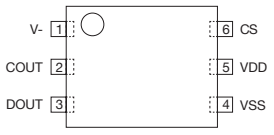
SSON-6J

(Top view)



SON-6C

(Top view)



Pin no.	Symbol	Function
1	V-	Input terminal connected to charger negative voltage
2	COUT	Output of overcharge detection (Output type is CMOS)
3	DOUT	Output of overdischarge detection (Output type is CMOS)
4	VSS	VSS terminal (Connected to ground)
5	VDD	VDD terminal (Connected to IC substrait)
6	CS	Input of overcurrent detection

Selection guide

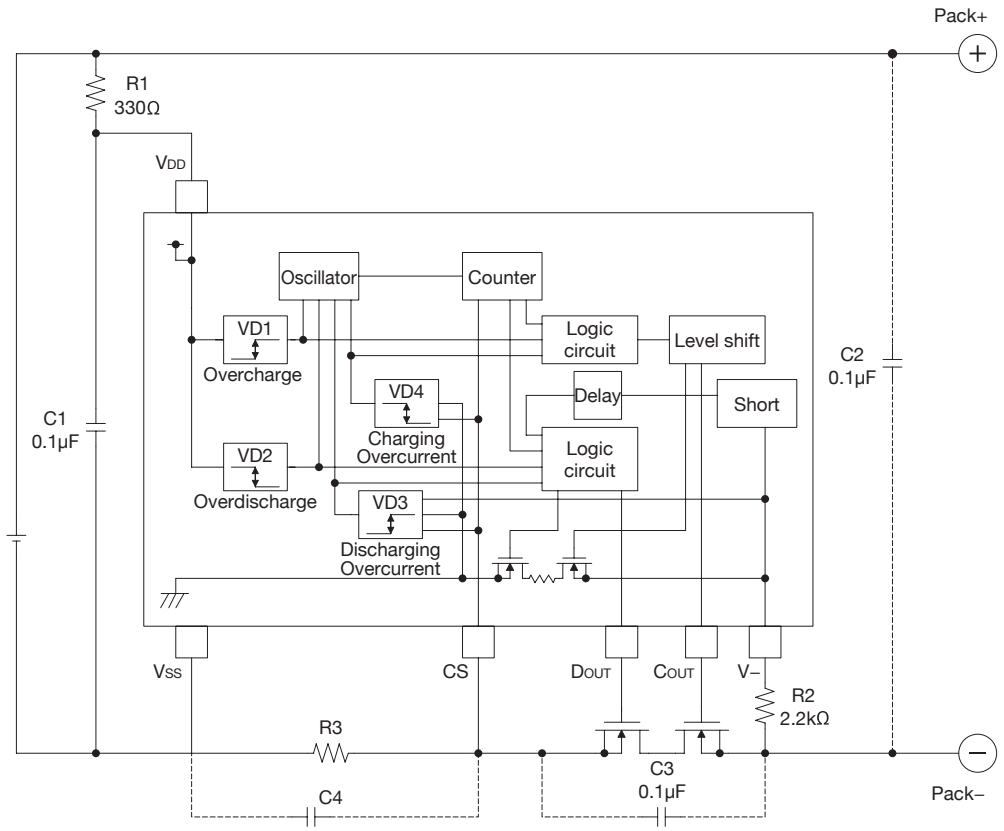
Product name	Package	Detection / Release voltage						0V battery charge function	Delay time combination *1	Current consumption at stand-by (MAX)[μA]
		Overcharge detection voltage [V]	Overcharge release voltage [V]	Overdischarge detection voltage[V]	Overdischarge release voltage [V]	Discharging overcurrent detection voltage [mV]	Charging overcurrent detection voltage [mV]			
		Vdet1	Vrel1	Vdet2	Vrel2	Vdet3	Vdet4			
MM3638A01RRE	SSON-6J	4.280	4.280	2.400	2.400	25.0	-20.0	Prohibition	1	0.1
MM3638A01YRE	SON-6C	4.280	4.280	2.400	2.400	25.0	-20.0	Prohibition	1	0.1
MM3638A02RRE	SSON-6J	4.405	4.405	2.400	2.400	32.0	-20.0	Prohibition	1	0.1
MM3638A02YRE	SON-6C	4.405	4.405	2.400	2.400	32.0	-20.0	Prohibition	1	0.1
MM3638A03RRE	SSON-6J	4.280	4.280	2.400	2.400	32.0	-30.0	Prohibition	1	0.1
MM3638B01RRE	SSON-6J	4.275	4.275	2.100	2.100	47.0	-25.0	Prohibition	1	0.1
MM3638B01YRE	SON-6C	4.275	4.275	2.100	2.100	47.0	-25.0	Prohibition	1	0.1
MM3638B02YRE	SON-6C	4.425	4.425	2.100	2.100	47.0	-25.0	Prohibition	1	0.1
MM3638D01YRE	SON-6C	4.225	4.025	2.500	2.500	75.0	-48.0	Prohibition	2	0.1
MM3638D02YRE	SON-6C	4.225	4.025	2.500	2.500	75.0	-48.0	Prohibition	2	0.1
MM3638D03YRE	SON-6C	4.225	4.025	2.500	2.500	75.0	-60.0	Prohibition	2	0.1
MM3638D04YRE	SON-6C	4.275	4.075	2.500	2.500	75.0	-48.0	Prohibition	2	0.1
MM3638D05YRE	SON-6C	4.225	4.025	2.500	2.500	50.0	-38.0	Prohibition	2	0.1
MM3638D06YRE	SON-6C	4.375	4.175	2.500	2.500	75.0	-60.0	Prohibition	2	0.1
MM3638D07YRE	SON-6C	4.325	4.125	2.500	2.500	75.0	-60.0	Prohibition	2	0.1
MM3638DA1YRE	SON-6C	4.400	4.200	2.500	2.900	75.0	-60.0	Prohibition	2	0.6
MM3638E01RRE	SSON-6J	4.280	4.280	2.400	2.400	80.0	-60.0	Prohibition	1	0.1
MM3638E02RRE	SSON-6J	4.280	4.280	2.400	2.400	90.0	-60.0	Prohibition	1	0.1
MM3638E04RRE	SSON-6J	4.405	4.405	2.400	2.400	80.0	-50.0	Prohibition	1	0.1
MM3638E09YRE	SON-6C	4.280	4.280	2.800	2.800	75.0	-60.0	Prohibition	1	0.1
MM3638E12RRE	SSON-6J	4.380	4.380	2.800	2.800	85.0	-50.0	Prohibition	1	0.1
MM3638E13RRE	SSON-6J	4.380	4.380	2.800	2.800	85.0	-50.0	Prohibition	4	0.1
MM3638E15RRE	SSON-6J	4.280	4.080	2.800	2.800	25.0	-20.0	Prohibition	1	0.1
MM3638F01YRE	SON-6C	4.425	4.425	2.500	2.500	30.0	-30.0	Prohibition	1	0.1
MM3638F03RRE	SSON-6J	4.275	4.275	2.350	2.350	47.0	-25.0	Prohibition	1	0.1
MM3638F04RRE	SSON-6J	4.280	4.280	2.400	2.400	32.0	-30.0	Prohibition	1	0.1
MM3638F07RRE	SSON-6J	4.405	4.405	2.400	2.400	32.0	-25.0	Prohibition	1	0.1
MM3638F09RRE	SSON-6J	4.230	4.230	2.800	2.800	80.0	-60.0	Prohibition	5	0.1
MM3638F11RRE	SSON-6J	4.430	4.330	2.400	2.400	32.0	-30.0	Prohibition	6	0.1
MM3638F12YRE	SON-6C	4.225	4.025	2.500	2.500	25.0	-23.0	Prohibition	7	0.1
MM3638F14RRE	SSON-6J	4.420	4.420	2.300	2.300	24.0	-20.0	Prohibition	1	0.1
MM3638F16RRE	SSON-6J	4.370	4.370	2.300	2.300	24.0	-20.0	Prohibition	1	0.1
MM3638F17RRE	SSON-6J	4.420	4.320	2.300	2.300	29.0	-27.0	Prohibition	1	0.1
MM3638F19YRE	SON-6C	4.425	4.425	2.400	2.400	30.0	-30.0	Prohibition	1	0.1
MM3638F20YRE	SON-6C	4.425	4.425	2.400	2.400	30.0	-30.0	Prohibition	3	0.1
MM3638F21YRE	SON-6C	4.425	4.425	2.400	2.400	37.0	-23.0	Prohibition	3	0.1
MM3638F22RRE	SSON-6J	4.425	4.425	2.800	2.800	30.0	-23.0	Prohibition	3	0.1
MM3638F22YRE	SON-6C	4.425	4.425	2.800	2.800	30.0	-23.0	Prohibition	3	0.1
MM3638F23RRE	SSON-6J	4.375	4.275	2.300	2.300	29.0	-27.0	Prohibition	1	0.1
MM3638FH1RRE	SSON-6J	4.470	4.470	2.465	2.465	40.0	-25.0	Prohibition	1	0.1
MM3638G05YRE	SON-6C	4.225	4.025	2.500	2.500	25.0	-23.0	Prohibition	2	0.1
MM3638H01YRE	SON-6C	4.280	4.180	2.300	2.500	32.0	-32.0	Permission	3	0.6

SSON-6J ... 3,000pcs/Reel
SON-6C ... 5,000pcs/Reel

*1: Delay time combination		1	2	3	4	5	6	7
Overcharge detection delay time	tVdet1	1.0s	1.0s	1.0s	1.0s	1.0s	1.0s	1.0s
Overdischarge detection delay time	tVdet2	125ms	96ms	125ms	125ms	20ms	20ms	20ms
Discharging overcurrent detection delay time	tVdet3	8ms	12ms	16ms	48ms	12ms	8ms	16ms
Charging overcurrent detection delay time	tVdet4	8ms	6ms	8ms	8ms	16ms	8ms	8ms
Short detection delay time	tshort	250μs	250μs	250μs	250μs	250μs	250μs	250μs

Please inquire to us, if you request a rank other than the above.

Typical application circuit



- R1 and C1 stabilize a supply voltage ripple. However, the detection voltage rises by the current of penetration in IC of the voltage detection when R1 is enlarged, and the value of R1 is adjusted to 1kohm or less. Moreover, adjust the value of C1 to 0.01µF or more to do the stability operation, please.

- R1 and R2 resistors are current limit resistance if a charger is connected reversibly or a high-voltage charger that exceeds the absolute maximum rating is connected. R1 and R2 may cause a power consumption will be over rating of power dissipation, therefore the "R1+R2" should be more than 1kohm. Moreover, if R2 is too enlarged, the charger connection release cannot be occasionally done after the overdischarge is detected, so adjust the value of R2 to 10kohm or less, please.

- R3 is resistor to sense the discharge or charging current. R3 is shown by the following expression by discharging current IODCP, discharging overcurrent detection voltage Vdet3, charging current IOCCP, and charging overcurrent detection voltage Vdet4.
  IODCP=Vdet3/R3 IOCCP=Vdet4/R3
  If R3 is too enlarged, the power loss increases. Moreover, the power might exceed a dissipation of resistance by the overcurrent, please select R3 according to the cell spec, after confirming the characteristic.

- C2, C3 and C4 capacitors have effect that the system stability about voltage ripple or imported noise. After check characteristics, decide that these capacitors should be inserted or not, where should be inserted, and capacitance value, please.
  Please arrange C4 near the terminal and use a few µF from tens of pF.

Symbol	Part	Min.	Typ.	Max.	Unit
R1	Resistor	100	330	1k	Ω
C1	Capacitor	0.01	0.1	1.0	µF
R2	Resistor	1k	2.2k	10k	Ω
R3	Sense resistor	-	10	-	mΩ

1 SECONDARY BATTERY ICs

1 cell lithium–ion/lithium–polymer battery protection IC

MM3645 Series

Outline

MM3645 series are protection ICs for lithium–ion or lithium–polymer secondary battery using high voltage CMOS process. They protect the battery pack/system from overcharge, overdischarge, and overcurrent, etc. by controlling FET SW. They realize overcurrent detection with high accuracy and improved temperature dependence by using an external chip resistor. In addition, by using charging off mode, it reduces the off current of system and prevents lithium-ion battery from discharging when the system is off.

Features

(Unless otherwise specified, Ta=25°C)

(1) Range and accuracy of detection/release voltage

- Overcharge detection voltage.....4.0V to 4.5V, 5mV steps ..... Accuracy±20mV
  Accuracy±25mV (Topr=-20°C to +60°C)
- Overdischarge detection voltage.....2.0V to 3.0V, 50mV steps ..... Accuracy±35mV
- Discharging overcurrent detection voltage.....20mV to 300mV, 1mV steps ..... Accuracy±15%
- Charging overcurrent detection voltage.....-300mV to -20mV, 1mV steps ..... Accuracy±15%
- Short detection voltage.....0.45V to 0.9V, 50mV steps ..... Accuracy±100mV

(2) Release condition from each protection mode

- Overcharge release condition .....“VDD < Overcharge release voltage” and “Connecting load (V- > 0.4V)”
- Overdischarge release condition .....“VDD > Overdischarge release voltage” and “Connecting charger(V- < 0.2V)”
- Discharging overcurrent release condition .....“Removing load (V- < 0.2V)”
- Charging overcurrent release condition.....“Connecting load (V- > 0.4V)”

(3) Range of detection delay time

- Overcharge detection delay time.....Selection from 0.25s, 0.5s, 1.0s
- Overdischarge detection delay time .....Selection from 20ms, 24ms, 96ms, 125ms
- Discharging overcurrent detection delay time ...Selection from 8ms, 12ms, 16ms, 20ms, 48ms
- Charging overcurrent detection delay time.....Selection from 8ms, 12ms, 16ms, 20ms, 48ms
- Short detection delay time.....250µs standard

(4) 0V battery charge function .....Selection from “Permission” or “Prohibition”

(5) Forcible discharge OFF mode .....CNT>VDD-0.4: DOUT=L Discharge=OFF
CNT<VSS-0.4: DOUT=H Discharge=ON

(6) Low current consumption

- Normal mode .....Typ. 3.0µA, Max. 5.5µA
- Stand-by mode .....Max. 0.1µA

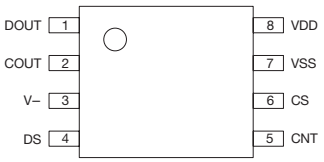
(7) Absolute maximum ratings

- VDD pin.....VSS-0.3V to +12V
- COUT pin and V- pin.....VDD-28V to VDD+0.3V
- DOUT pin and CS and CNTpin.....VSS-0.3V to VDD+0.3V
- Storage temperature.....-55°C to +125°C
- Operation temperature.....-40°C to +85°C

Pin assignment

TSOP-8A

(Top view)



Pin no.	Symbol	Function
1	DOUT	Discharge FET control terminal
2	COUT	Charge FET control terminal
3	V-	Charger negative voltage input terminal
4	DS	Delay short terminal
5	CNT	Discharge FET mode control terminal
6	CS	Overcurrent detection input terminal
7	VSS	Positive power supply voltage input terminal
8	VDD	Negative power supply voltage input terminal

Selection guide

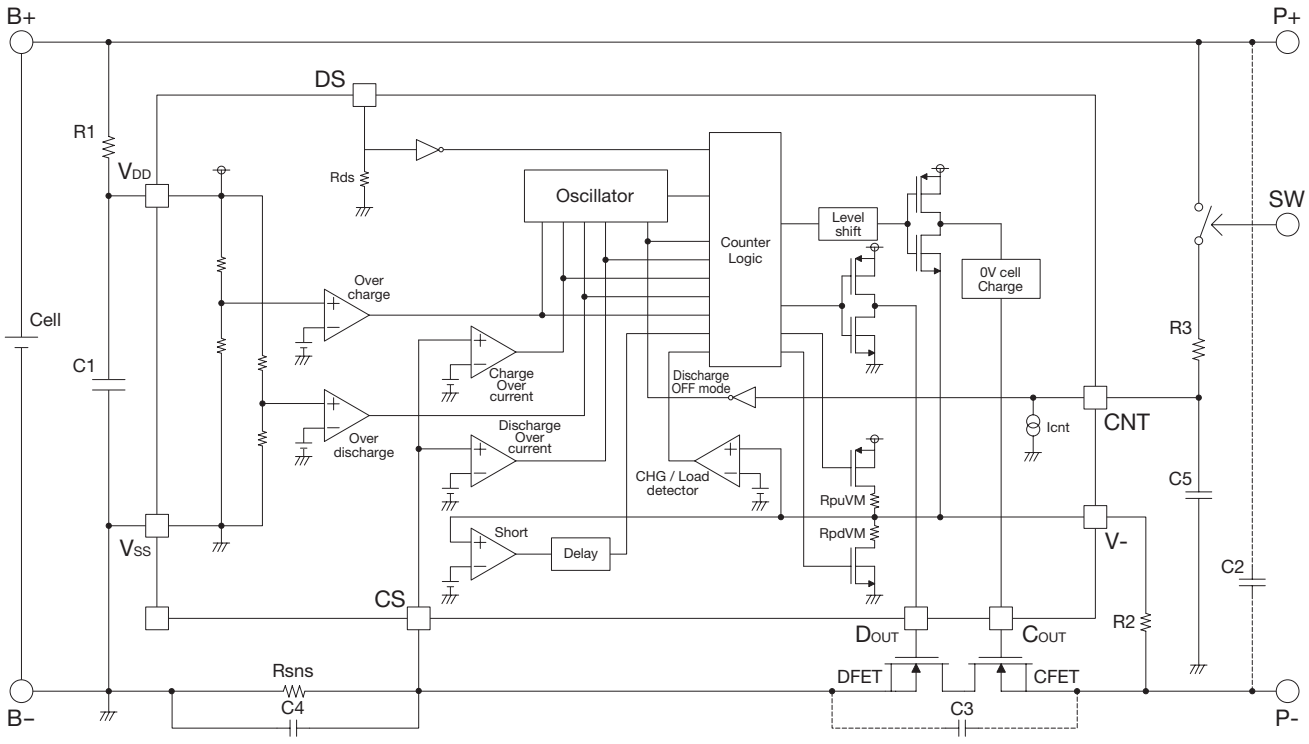
Product name	Package	Detection / Release voltage							0V battery charge function	Delay time combination *1	Current consumption at stand-by (MAX)[µA]
		Overcharge detection voltage [V]	Overcharge release voltage [V]	Overdischarge detection voltage[V]	Overdischarge release voltage [V]	Discharging overcurrent detection voltage [mV]	Charging overcurrent detection voltage [mV]	Shortdetection voltage [V]			
		Vdet1	Vrel1	Vdet2	Vrel2	Vdet3	Vdet4	Vshort			
MM3645A01VRE	TSOP-8A	4.430	4.330	2.300	2.300	37.0	-25.0	0.9	Permission	1	0.1
MM3645A02VRE	TSOP-8A	4.405	4.305	2.500	2.500	37.0	-37.0	0.9	Permission	1	0.1
MM3645B01VRE	TSOP-8A	4.430	4.330	2.400	2.400	43.0	-35.0	0.9	Prohibition	1	0.1
MM3645B02VRE	TSOP-8A	4.430	4.330	2.400	2.400	43.0	-35.0	0.6	Prohibition	1	0.1

TSOP-8A ... 3,000pcs/Reel

*1: Delay time combination		1
Overcharge detection delay time	tVdet1	1.0s
Overdischarge detection delay time	tVdet2	125ms
Discharging overcurrent detection delay time	tVdet3	16ms
Charging overcurrent detection delay time	tVdet4	8ms
Short detection delay time	tshort	250µs

Please inquire to us, if you request a rank other than the above.

Typical application circuit



- R1 and C1 stabilize a supply voltage fluctuation. However, the detection voltage rises by the current consumption of IC when R1 is too large, and the value of R1 is adjusted to 1kohm or less. Moreover, adjust the value of C1 to 0.01µF or more to do the stability operation, please.

- R1 and R2 resistors are current limit resistance if a charger is connected reversibly or a high-voltage charger that exceeds the absolute maximum rating is connected. R1 and R2 may cause a power consumption will be over rating of power dissipation, therefore the “R1+R2” should be more than 1kohm. Moreover, if R2 is too enlarged, the charger connection release cannot be occasionally done after the overdischarge is detected, so adjust the value of R2 to 10kohm or less, please.

- Rsns is sense resistance for detect charge current and discharge current. If R3 is too enlarged, the power loss increases. Moreover, the power might exceed a dissipation of resistance by the overcurrent, please select R3 according to the battery spec, after confirming the characteristic.

- Current threshold of discharging overcurrent detection and short detection (Idoc, Ishort) are expressed in the following equations.
  Idoc = Vdet3 / Rsns
  Ishort = Vshort / (Rsns + 2Ron)
  * Ron: ON resistance of CFET and DFET

- Current threshold of charging overcurrent detection (Icoc) is expressed in the following equation.
  Icoc = Vdet4 / Rsns

- C4 has removed the exogenous noise to CS terminal. Similarly R3 and C5 have removed the exogenous noise to a CNT terminal. Please select required value in consideration of the system characteristic, and arrange near the each terminal.

Typical application circuit

- C2 and C3 have effect that the system stability about voltage ripple and exogenous noise. Please decide that these capacitors should be inserted or not, where should be inserted, and capacitance value in consideration of the system characteristic.

- In the over discharge mode V- terminal pulled up to VDD by RpuVM. If charger is connected, Iv- flow to Pterminal from P+ and the voltage drop (⊿V) arises in R1. Therefore the cell voltage (Vcell) at overdischarge release is expressed in the following equation.

  Vcell = Vrel2 + ⊿V
  = Vrel2 + R1 * Iv-
  = Vrel2 + R1 * Vchg / (R1 + RpuVM + R2)
  * Vchg: Charger voltage

Symbol	Part	Min.	Typ.	Max.	Unit
R1	Resistor	-	330	1k	Ω
C1	Capacitor	0.01	0.1	1.0	μF
R2	Resistor	-	2.2k	10k	Ω
Rsns	Sense resistor	-	-	-	mΩ
C2	Capacitor	-	0.1	-	μF
R3	Resistor	1k	-	100k	Ω
C3	Capacitor	-	0.01	-	μF
C4 / C5	Capacitor	-	0.1	-	μF
DFET / CFET	Nch MOS FET	-	-	-	-

1 SECONDARY BATTERY ICS

1 cell lithium–ion/lithium–polymer battery protection IC

MM3721 Series

Outline

MM3721 series are lithiumz–ion / lithium–polymer battery protection IC and detect charge current / discharge current with high precision by current sensing resistor (Rsns).

MM3721 have two step discharge overcurrent detection. And system is protected appropriately in the next 2 state, Normal discharge mode and large current discharge mode.

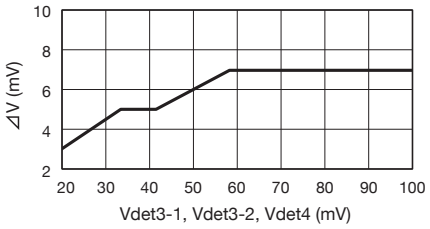
Features

(Unless otherwise specified, Ta=25°C)

(1) Range and accuracy of detection/release voltage

- Overcharge detection voltage.....3.6V to 4.5V, 5mV steps ..... Accuracy±20mV (Topr=-5°C to +55°C)
- Overcharge release voltage .....Vdet1–0.2V to Vdet1, 5mV steps..... Accuracy±30mV
- Overdischarge detection voltage .....2.0V to 3.0V, 50mV steps ..... Accuracy±35mV
- Overdischarge release voltage.....2.0V to 3.0V, 50mV steps ..... Accuracy+65/ -35mV (In case Vdet2=Vrel2)
  Accuracy+90/ -65mV (In case Vdet2≠Vrel2)
- Discharging overcurrent detection voltage1 .....20mV to 150mV, 1mV steps ..... Accuracy±ΔV *1
- Discharging overcurrent detection voltage2 .....Vdet3-1 + 10mV to 200mV..... Accuracy±ΔV *1
- Charging overcurrent detection voltage.....20mV to 50mV, 1mV steps ..... Accuracy±ΔV *1
- Short detection voltage.....0.4V to 0.9V, 0.05V steps ..... Accuracy±100mV
- 0V battery charge inhibition battery voltage .....1.3V to 1.8V, 0.1V steps ..... Accuracy±100mV
  0.9V ..... Accuracy±300mV

*1 Current detection voltage accuracy



(2) Delay time setting

- Overcharge detection delay time ..... 256msec to 4.6sec
- Overdischarge detection delay time ..... 8msec to 256msec
- Discharging overcurrent 1 detection delay time ..... 8msec to 256msec
- Discharging overcurrent 2 detection delay time ..... 6msec to 64msec
  tVdet3-2 < tVdet3-1
- Charging overcurrent detection delay time..... 256sec to 400sec

(3) Current consumption

- Normal mode .....Typ. 3.0A, Max. 6.0A
- Stand-by mode .....Max. 0.1A (In case Overdischarge latch function Enable)
  Max 0.6A (In case Overdischarge latch function Disable)

(4) 0V battery Charge function.....Selectable “Permission” or “Prohibition”

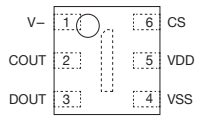
(5) Absolute maximum ratings

- VDD pin.....VSS–0.3V to +12V
- COUT pin and V- pin .....VDD–28V to VDD+0.3V
- DOUT pin and CS pin .....VSS–0.3V to VDD+0.3V
- Storage temperature .....–55°C to +125°C
- Operation temperature.....–40°C to +85°C

Pin assignment

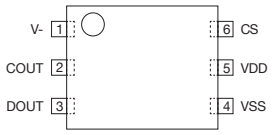
SSON-6J

(Top view)



SON-6C

(Top view)



Pin no.	Symbol	Function
1	V-	Charger negative voltage input terminal
2	COUT	Charge FET control terminal
3	DOUT	Discharge FET control terminal
4	VSS	Negative power supply voltage input terminal
5	VDD	Positive power supply voltage input terminal
6	CS	Current detection terminal

LINE UP

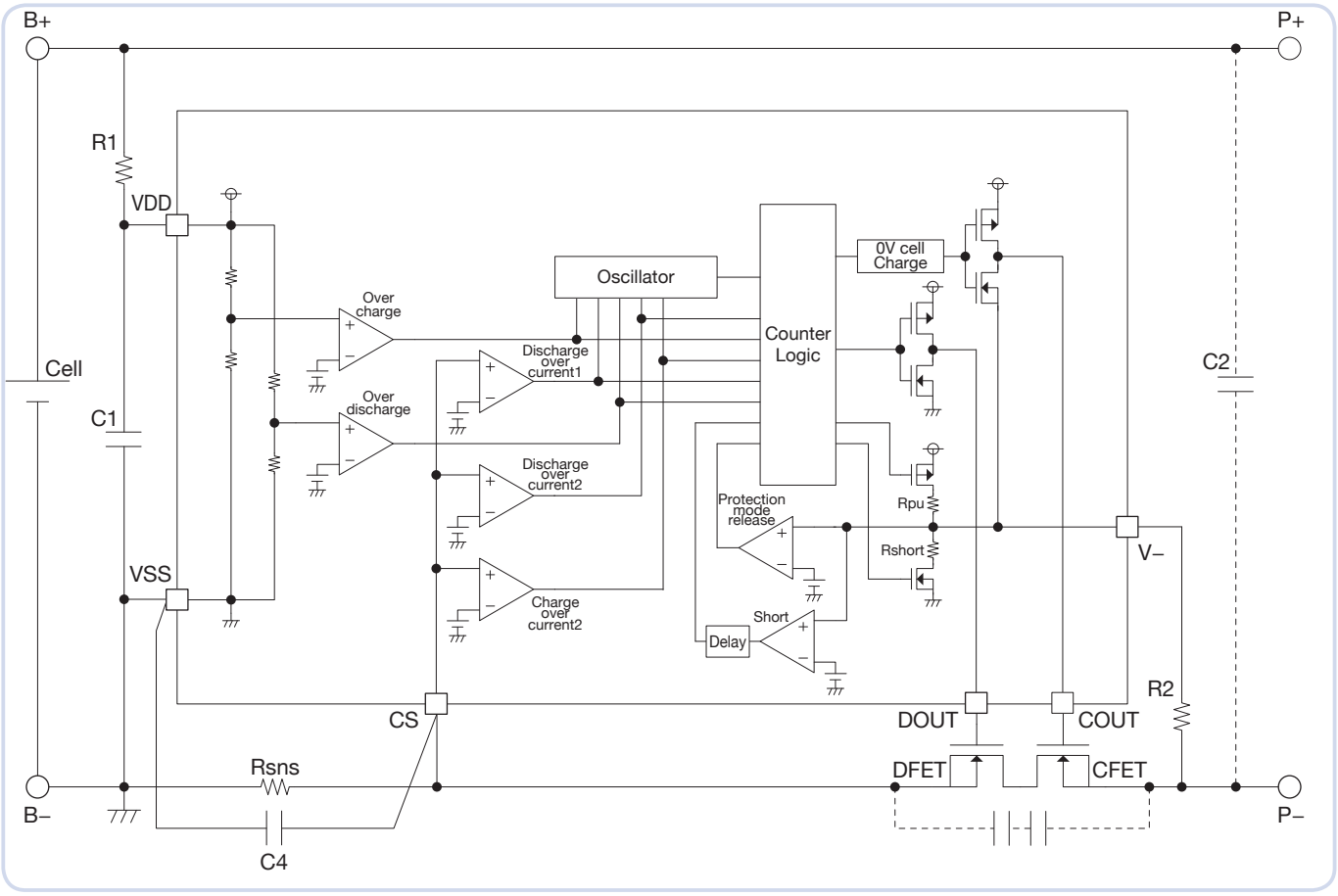
MODEL	Package	0V charge	Protection mode latch function			Hys-Cancel		Discharging overcurrent release range extended function.	Overcharge detection voltage	Overcharge release voltage	Overdischarge detection voltage	Overdischarge release voltage	Discharging overcurrent detection voltage 1	Discharging overcurrent detection voltage 2	Charging overcurrent detection voltage	Short detection voltage	Delay time *1
			Overcharge	Overdischarge	Discharge overcurrent	Overcharge	Overdischarge		Vdet1	Vrel1	Vdet2	Vrel2	Vdet3-1	Vdet3-2	Vdet4	Vshort	
									V	V	V	V	V	V	V	V	
MM3721CK1RRE	SSON-6J	0.9	Disable	Enable	Enable	Enable	-	Yes(1.0V)	4.425	4.325	2.300	2.300	0.029	0.043	-0.027	0.400	G
MM3721CK2RRE	SSON-6J	0.9	Disable	Enable	Enable	Enable	-	Yes(1.0V)	4.335	4.225	2.300	2.300	0.029	0.043	-0.027	0.400	G
MM3721EF1RRE	SSON-6J	0.9	Enable	Enable	Disable	-	-	Yes(1.0V)	4.425	4.425	2.400	2.400	0.040	0.072	-0.022	0.600	A
MM3721EF2RRE	SSON-6J	0.9	Enable	Enable	Disable	-	-	Yes(1.0V)	4.420	4.420	2.300	2.300	0.030	0.040	-0.020	0.400	B
MM3721EF5RRE	SSON-6J	0.9	Enable	Enable	Disable	-	-	Yes(1.0V)	4.420	4.420	2.300	2.300	0.032	0.047	-0.028	0.400	F
MM3721EF6RRE	SSON-6J	0.9	Enable	Enable	Disable	-	-	Yes(1.0V)	4.470	4.470	2.300	2.300	0.037	0.054	-0.021	0.400	B
MM3721EF7RRE	SSON-6J	0.9	Enable	Enable	Disable	-	-	Yes(1.0V)	4.430	4.430	2.300	2.300	0.034	0.050	-0.020	0.400	B
MM3721EF8RRE	SSON-6J	0.9	Enable	Enable	Disable	-	-	Yes(1.0V)	4.275	4.275	2.300	2.300	0.030	0.040	-0.020	0.400	B
MM3721EFBRRE	SSON-6J	0.9	Enable	Enable	Disable	-	-	Yes(1.0V)	4.470	4.470	2.300	2.300	0.032	0.047	-0.028	0.400	F
MM3721EFDRRE	SSON-6J	0.9	Enable	Enable	Disable	-	-	Yes(1.0V)	4.275	4.275	2.300	2.300	0.030	0.040	-0.020	0.400	L
MM3721EFERRE	SSON-6J	0.9	Enable	Enable	Disable	-	-	Yes(1.0V)	4.400	4.400	2.300	2.300	0.030	0.040	-0.020	0.400	L
MM3721EL2RRE	SSON-6J	Permission	Enable	Enable	Disable	-	-	Yes(1.0V)	4.475	4.475	2.600	2.600	0.030	0.045	-0.025	0.250	K
MM3721FF1RRE	SSON-6J	1.6	Disable	Disable	Disable	Disable	Enable	Yes(1.0V)	4.440	4.240	2.300	2.600	0.040	0.063	-0.020	0.800	C
MM3721FF2YRE	SON-6C	1.6	Disable	Disable	Disable	Disable	Enable	Yes(1.0V)	4.440	4.240	2.300	2.600	0.064	0.095	-0.022	0.800	D
MM3721HF1RRE	SSON-6J	0.9	Disable	Enable	Disable	Disable	-	Yes(1.0V)	4.440	4.240	2.300	2.300	0.025	0.038	-0.020	0.400	E
MM3721HF2RRE	SSON-6J	0.9	Disable	Enable	Disable	Disable	-	Yes(1.0V)	4.440	4.240	2.300	2.300	0.025	0.034	-0.020	0.400	E
MM3721HF4RRE	SSON-6J	0.9	Disable	Enable	Disable	Disable	-	Yes(1.0V)	4.485	4.285	2.300	2.300	0.025	0.034	-0.020	0.400	E
MM3721HF7RRE	SSON-6J	0.9	Disable	Enable	Disable	Disable	-	Yes(1.0V)	4.470	4.250	2.400	2.400	0.024	0.035	-0.020	0.400	I
MM3721HF8RRE	SSON-6J	0.9	Disable	Enable	Disable	Disable	-	Yes(1.0V)	4.520	4.310	2.300	2.300	0.024	0.035	-0.020	0.300	J
MM3721HL1RRE	SSON-6J	Permission	Disable	Enable	Disable	Disable	-	Yes(1.0V)	4.475	4.275	2.500	2.500	0.025	0.034	-0.025	0.400	H
MM3721JF1YRE	SON-6C	0.9	Enable	Disable	Disable	-	Enable	Yes(1.0V)	4.275	4.275	2.300	2.600	0.028	0.042	-0.024	0.400	B

*1 Delay time

	tVdet1	tVrel1	tVdet2	tVrel2	tVdet3-1	tVrel3-1	tVdet3-2	tVrel3-2	tVdet4	tVrel4	tshort
	s	ms	ms	ms	ms	ms	ms	ms	ms	ms	µs
A	1.02	16.00	125.00	1.00	3072.00	1.00	10.00	1.00	8.00	1.00	300
B	1.02	16.00	125.00	1.00	5120.00	1.00	8.00	1.00	8.00	1.00	300
C	4.60	16.00	96.00	1.00	160.00	1.00	16.00	1.00	8.00	1.00	300
D	4.60	16.00	96.00	1.00	160.00	1.00	16.00	1.00	8.00	1.00	400
E	4.60	16.00	96.00	1.00	448.00	1.00	24.00	1.00	8.00	1.00	300
F	1.02	16.00	125.00	1.00	2304.00	1.00	8.00	1.00	8.00	1.00	300
G	1.02	16.00	125.00	1.00	80.00	1.00	8.00	1.00	8.00	1.00	250
H	1.02	16.00	96.00	1.00	448.00	1.00	24.00	1.00	8.00	1.00	427
I	1.02	16.00	96.00	1.00	160.00	2.00	8.00	2.00	8.00	1.00	400
J	1.02	16.00	96.00	1.00	256.00	2.00	16.00	2.00	16.00	1.00	400
K	1.02	16.00	125.00	1.00	5120.00	1.00	16.00	1.00	8.00	1.00	250
L	1.02	16.00	125.00	1.00	5120.00	1.00	32.00	1.00	8.00	1.00	300

Please inquire to us, if you need another spec.

Typical application circuit



Symbol	Part	Min.	Typ.	Max.	Purpose
R1	Resistor	-	100	1.0KΩ	For voltage fluctuation, For ESD
C1	Capacitor	0.01μF	0.1μF	1.0μF	For voltage fluctuation
R2	Resistor	-	1.0KΩ	10KΩ	Current limit for charger reverse connection
C2	Capacitor	-	0.1μF	-	For exogenous noise
C3	Capacitor	-	0.1μF	-	For exogenous noise
Rsns	Resistor	-	-	20mΩ	Current detection resistance
C4	Capacitor	-	0.1μF	-	For exogenous noise
DFET CFET	Nch MOS FET	-	-	-	Charge and discharge control

This typical application circuit and constant value do not guarantee proper operation. Please evaluate thoroughly by actual application to set up constants.

1 SECONDARY BATTERY ICS

1 cells lithium–ion/lithium–polymer battery protection IC

MM3722 Series

Outline

MM3722 series are li–ion battery protection IC and detect charge current / discharge current with high precision by current sensing resistor (Rsns). In the One–cell battery pack, on resistance of the FET SW has been used for over-current/short-current detection.

MM3722 realize over–current/short-current protection with high accuracy and with no temperature dependence by using a chip resistor.

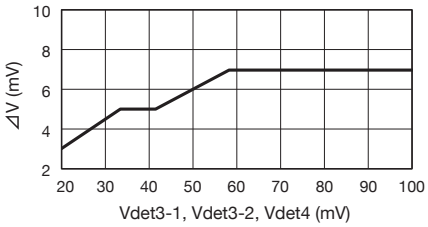
Features

(Unless otherwise specified, Ta=25°C)

(1) Range and accuracy of detection/release voltage

- Overcharge detection voltage.....3.8V to 4.5V, 5mV steps ..... Accuracy±20mV (Topr=–5°C to +55°C)
- Overcharge release voltage .....Vdet1-0.2V to Vdet1, 5mV steps..... Accuracy±30mV
- Overdischarge detection voltage .....2.0V to 3.0V, 50mV steps ..... Accuracy±35mV
- Overdischarge release voltage.....2.0V to 3.0V, 50mV steps ..... Accuracy+65/ –35mV (In case Vdet2=Vrel2)
  Accuracy+90/ –65mV(In case Vdet2≠Vrel2)
- Discharging overcurrent detection voltage .....20mV to 150mV, 1mV steps ..... Accuracy±ΔV *1
- Charging overcurrent detection voltage.....-150mV to -20mV, 1mV steps ..... Accuracy±ΔV *1
- Short detection voltage.....40mV to 250mV, 1mV steps ..... Accuracy±20%
- 0V battery charge inhibition battery voltage .....1.3V to 1.8V, 0.1V steps ..... Accuracy±100mV
  0.9V ..... Accuracy±300mV

*1 Current detection voltage accuracy



(2) Delay time setting

- Overcharge detection delay time .....256msec to 4.6sec
- Overdischarge detection delay time .....8msec to 256msec
- Discharging overcurrent detection delay time ...8msec to 256msec
- Charging overcurrent detection delay time.....6msec to 64msec
- Short detection delay time.....250µsec to 400µsec

(3) Current consumption

- Normal mode .....Typ. 3.0µA, Max. 6.0µA
- Stand-by mode .....Max. 0.1µA (In case Overdischarge latch function Enable)
  Max. 0.6µA (In case Overdischarge latch function Disable)

(4) 0V battery Charge function.....Selectable “Permission” or “Prohibition”

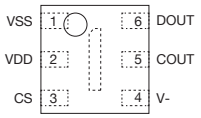
(5) Absolute maximum ratings

- VDD pin.....VSS–0.3V to +12V
- COUT pin and V- pin .....VDD–28V to VDD+0.3V
- DOUT pin and CS pin .....VSS–0.3V to VDD+0.3V
- Storage temperature .....–55°C to +125°C
- Operation temperature.....–40°C to +85°C

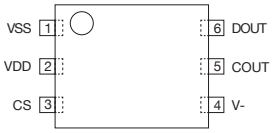
Pin assignment

SSON-6J/SSON-6M　SON-6C

(Top view)



(Top view)



Pin no.	Symbol	Function
1	VSS	Negative power supply voltage input terminal
2	VDD	Positive power supply voltage input terminal
3	CS	Current detection terminal
4	V-	Charger negative voltage input terminal
5	COUT	Charge FET control terminal
6	DOUT	Discharge FET control terminal

LINE UP

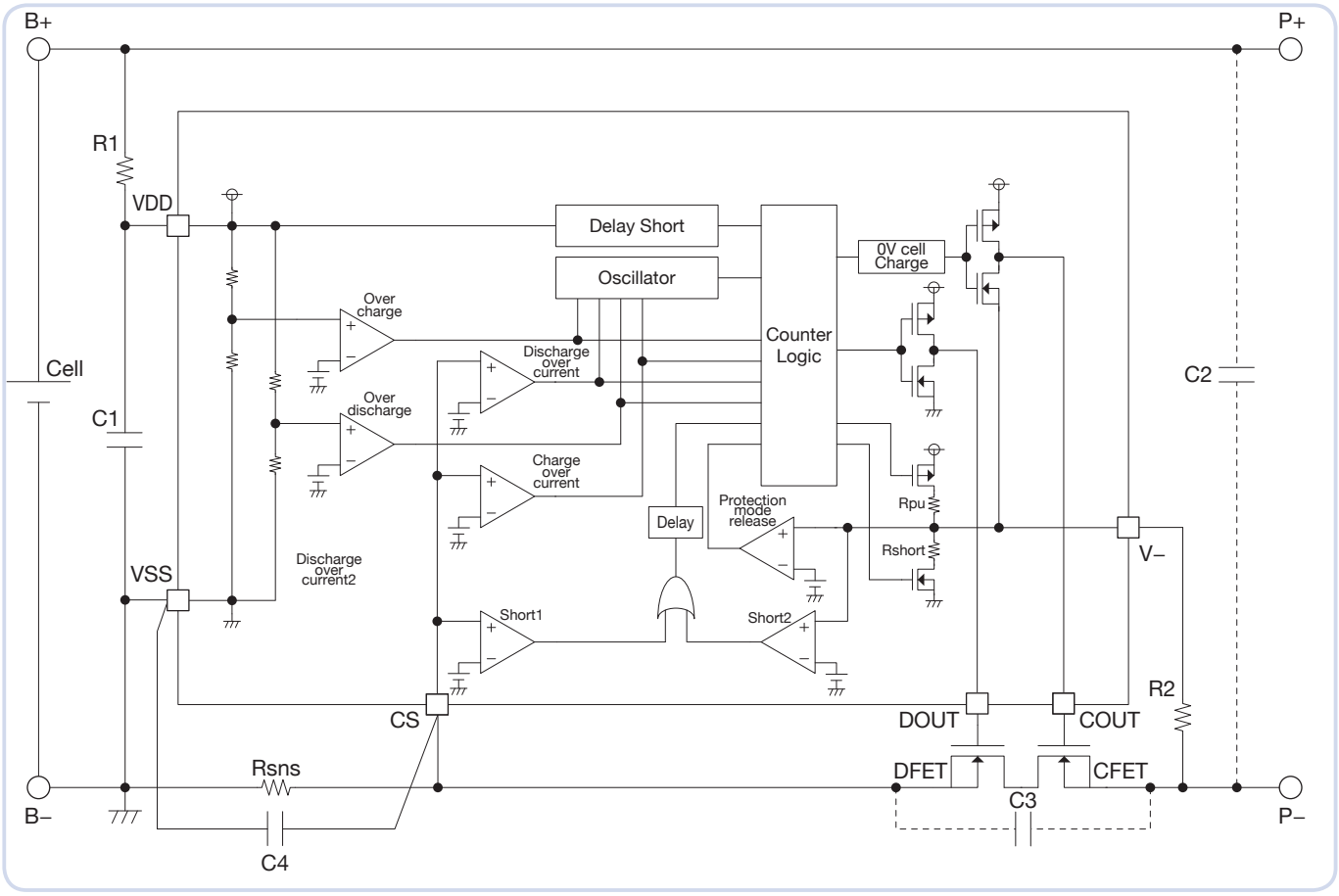
MODEL	Package	0V charge	Protection mode latch function			Hys-Cancel		Discharging overcurrent release range extended function.	Overcharge detection voltage	Overcharge detection voltage	Overdischarge detection voltage	Overdischarge release voltage	Discharging overcurrent detection voltage	Charging overcurrent detection voltage	Short detection voltage	Delay time *1
			Overcharge	Overdischarge	Discharge overcurrent	Overcharge	Overdischarge		Vdet1	Vrel1	Vdet2	Vrel2	Vdet3	Vdet4	Vshort	
									V	V	V	V	V	V	V	
MM3722AC1YRE	SON-6C	0.9	Disable	Disable	Disable	Enable	Enable	Yes(VDD−0.9V)	4.425	4.225	2.500	2.900	0.032	-0.020	0.060	B
MM3722AJ1YRE	SON-6C	Permission	Disable	Disable	Disable	Enable	Enable	Yes(VDD−0.9V)	4.425	4.225	2.500	2.900	0.036	-0.020	0.060	B
MM3722AJ4RRE	SSON-6J	Permission	Disable	Disable	Disable	Enable	Enable	Yes(VDD−0.9V)	4.470	4.270	2.500	2.900	0.049	-0.031	0.160	C
MM3722AJ4YRE	SON-6C	Permission	Disable	Disable	Disable	Enable	Enable	Yes(VDD−0.9V)	4.470	4.270	2.500	2.900	0.049	-0.031	0.160	C
MM3722AM1RRE	SSON-6J	0.9	Disable	Disable	Disable	Enable	Enable	Yes(VDD−0.9V)	4.475	4.275	2.500	2.900	0.032	-0.020	0.060	B
MM3722CM1RRE	SSON-6JorM	0.9	Disable	Enable	Disable	Enable	Disable	Yes(VDD−0.9V)	4.275	4.075	2.400	2.400	0.034	-0.022	0.180	D
MM3722CM2RRE	SSON-6JorM	0.9	Disable	Enable	Disable	Enable	Disable	Yes(VDD−0.9V)	4.380	4.180	2.400	2.400	0.034	-0.022	0.180	D
MM3722KF1RRE	SSON-6J	0.9	Enable	Enable	Disable	-	-	Yes(1.0V)	4.280	4.280	2.400	2.400	0.032	-0.030	0.180	A
MM3722KF2RRE	SSON-6J	0.9	Enable	Enable	Disable	-	-	Yes(1.0V)	4.425	4.425	2.400	2.400	0.034	-0.022	0.180	A
MM3722KF3RRE	SSON-6J	0.9	Enable	Enable	Disable	-	-	Yes(1.0V)	4.425	4.425	2.800	2.800	0.040	-0.030	0.180	A
MM3722KF4RRE	SSON-6J	1.5	Enable	Enable	Disable	-	-	Yes(1.0V)	4.425	4.425	2.600	2.600	0.040	-0.030	0.180	A
MM3722KF6RRE	SSON-6J	0.9	Enable	Enable	Disable	-	-	Yes(1.0V)	4.475	4.475	2.400	2.400	0.040	-0.025	0.180	A
MM3722KF7RRE	SSON-6J	0.9	Enable	Enable	Disable	-	-	Yes(1.0V)	4.475	4.475	2.400	2.400	0.020	-0.030	0.180	A
MM3722KF8RRE	SSON-6J	0.9	Enable	Enable	Disable	-	-	Yes(1.0V)	4.475	4.475	2.400	2.400	0.034	-0.022	0.180	A
MM3722KF9RRE	SSON-6J	0.9	Enable	Enable	Disable	-	-	Yes(1.0V)	4.525	4.525	2.300	2.300	0.020	-0.030	0.180	A
MM3722KFARRE	SSON-6J	0.9	Enable	Enable	Disable	-	-	Yes(1.0V)	4.425	4.425	2.800	2.800	0.034	-0.022	0.180	A
MM3722KFCRRE	SSON-6J	0.9	Enable	Enable	Disable	-	-	Yes(1.0V)	4.475	4.475	2.800	2.800	0.040	-0.025	0.180	A

*1 Delay time

	tVdet1	tVrel1	tVdet2	tVrel2	tVdet3	tVrel3	tVdet4	tVrel4	tshort
	s	ms	ms	ms	ms	ms	ms	ms	μs
A	1.000	16.00	20.00	1.00	12.00	1.00	16.00	1.00	250
B	1.024	16.00	96.00	1.00	12.00	1.00	10.00	1.00	300
C	1.024	16.00	125.00	1.00	16.00	1.00	8.00	1.00	250
D	1.024	16.00	20.00	1.00	32.00	4.00	16.00	1.00	250

Please inquire to us, if you need another spec.

Typical application circuit



Symbol	Part	Min.	Typ.	Max.	Purpose
R1	Resistor	-	100Ω	1.0KΩ	For voltage fluctuation, For ESD
C1	Capacitor	0.01μF	0.1μF	1.0μF	For voltage fluctuation
R2	Resistor	-	1.0KΩ	10KΩ	Current limit for charger reverse connection
C2	Capacitor	-	0.1μF	-	For exogenous noise
C3	Capacitor	-	0.1μF	-	For exogenous noise
Rsns	Resistor	-	-	20mΩ	Current detection resistance
C4	Capacitor	-	0.1μF	-	For exogenous noise
DFET CFET	Nch MOS FET	-	-	-	Charge and discharge control

This typical application circuit and constant value do not guarantee proper operation. Please evaluate thoroughly by actual application to set up constants.

MM3723 Series

High-accuracy overcharge detection

Outline

The MM3723 series integrates into 1.09mm × 0.81mm × 0.46mm WLCSP Package. It's using high voltage CMOS process for overcharge, overdischarge and overcurrent protection of the rechargeable Lithium-ion and Lithium-polymer battery. The overcharge, overdischarge, discharging overcurrent, charging overcurrent and short protection of the rechargeable one-cell Lithium-ion and Lithium-polymer battery can be detected.

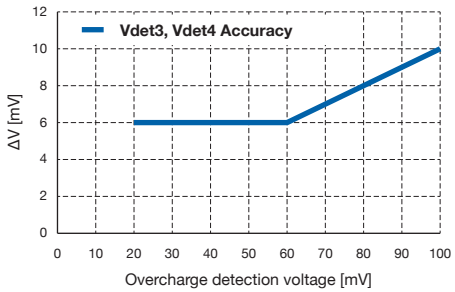
Features

(Unless otherwise specified, Ta=25°C)

(1) Range and accuracy of detection/release voltage

- Overcharge detection voltage..... Vdet1 ..... 3.6V to 4.6V, 5mV steps..... Accuracy±12mV
  Accuracy±20m(Ta=-20 to +60°C)
- Overdischarge detection voltage ..... Vdet2 ..... 2.0V to 3.0V, 50mV steps..... Accuracy±35mV
- Discharging overcurrent detection voltage..... Vdet3 ..... 20mV to +100mV, 1mV steps..... Accuracy±ΔV *1
- Charging overcurrent detection voltage ..... Vdet4 ..... -100mV to -20mV, 1mV steps ..... Accuracy±ΔV *1
- Short detection voltage1..... Vshort ..... 100mV to 300mV,10mV steps .....Accuracy±8%

*1 Accuracy of overcurrent detection voltage (Ta=25°C)



(2) Range of detection delay time

- Overcharge detection delay time.....Selection from 1.0s, 1.2s, 4.0s
- Overdischarge detection delay time .....Selection from 20ms, 24ms, 32ms, 96ms, 128ms
- Discharging overcurrent detection delay time ...Selection from 8ms, 12ms, 16ms, 20ms, 256ms, 512ms
- Charging overcurrent detection delay time.....Selection from 4ms, 6ms, 8ms, 10ms, 12ms, 16ms, 96ms
- Short detection delay time.....Selection from 250µßs to 400µs

(3) 0V battery charge function .....Selection from “Permission” or “Prohibition”

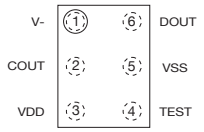
(4) Low current consumption (Not include NTC bias current)

- Normal mode .....Typ. 2.5µA, Max. 4.0µA
- Stand-by mode .....Max. 0.1µA (Overdischarge latch function Enable)
  Max. 0.6µA (Overdischarge latch function Disable)

Pin assignment

WLCSP-6B

(Top view)



Pin no.	Symbol	Function
A1	V-	Negative power supply voltage input terminal
A2	COUT	Charge FET control terminal
B1	VDD	Positive power supply voltage input terminal
B2	TEST	Test mode control terminal
C1	VSS	Negative power supply voltage input terminal
C2	DOUT	Discharge FET control terminal

Detection / Release voltage

LINE UP

Product name	Package	0V battery charge function	Detection / Release voltage							*1 Delay time	Protedtion mode latch function		
			Overcharge detection voltage	Overcharge release voltage	Overdischarge detection voltage	Overdischarge release voltage	Discharging overcurrent detection voltage	Charging overcurrent detection voltage	Short detection voltage		Overcharge	Overdischarge	Discharge overcurrent
			Vdet1	Vrel1	Vdet2	Vrel2	Vdet3	Vdet4	Vshort				
			V	V	V	V	V	V	V				
MM3723CL3LRE	WLCSP-6B	Permission	4.425	4.225	2.300	2.300	0.060	-0.020	0.150	A	Disable	Enable	Disable
MM3723CL4LRE	WLCSP-6B	Permission	4.475	4.275	2.200	2.200	0.070	-0.030	0.200	B	Disable	Enable	Disable

*1 Delay time

Function	tVdet1	tVdet2	tVdet3	tVdet4	tshort1
	ms	ms	ms	ms	µs
A	1.0	96	12	10	300
B	1.0	96	24	20	650

Please inquire to us, if you request a rank other than the above.

1 SECONDARY BATTERY ICS

1 cell lithium–ion/lithium–polymer battery protection IC

MM3724 Series

Outline

The **MM3724** series are protection IC using high voltage CMOS process for overcharge, overdischarge and overcurrent protection of the rechargeable lithium–ion or lithium–polymer battery.
The overcharge, overdischarge, discharging overcurrent, charging overcurrent, and short protection of the rechargeable one-cell Lithium-ion or Lithium-polymer battery can be detected.
Each of these IC composed of four voltage detectors, short detection circuit, reference voltage sources, oscillator, counter circuit and logical circuits.

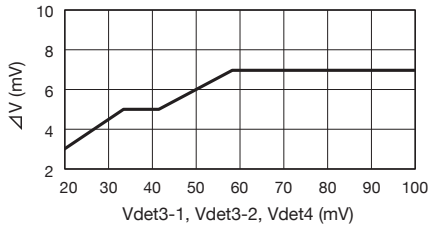
Features

(Unless otherwise specified, Ta=25°C)

(1) Range and accuracy of detection/release voltage

- Overcharge detection voltage.....3.8V to 4.5V, 5mV steps ..... Accuracy±20mV (Topr=-5°C to +55°C)
- Overcharge release voltage .....Vdet1-0.2V to Vdet1, 5mV steps..... Accuracy±30mV
- Overdischarge detection voltage.....2.0V to 3.0V, 50mV steps ..... Accuracy±35mV
- Overdischarge release voltage.....2.0V to 3.0V, 50mV steps ..... Accuracy+65/ –35mV(In case Vdet2=Vrel2)
  Accuracy+90/ –65mV(In case Vdet2≠Vrel2)
- Discharging overcurrent detection voltage.....20mV to 300mV, 1mV steps ..... Accuracy±ΔV *1
- Charging overcurrent detection voltage.....-300mV to -20mV, 1mV steps ..... Accuracy±ΔV *1
- Short detection voltage.....0.4V to 0.9V, 0.05V steps ..... Accuracy±100mV
- 0V battery charge inhibition battery voltage .....1.3V to 1.8V, 0.1V steps ..... Accuracy±100mV
  0.9V ..... Accuracy±300mV

*1 Current detection voltage accuracy



(2) Delay time setting

- Overcharge detection delay time.....256msec to 4.6sec
- Overdischarge detection delay time .....8msec to 256msec
- Discharging overcurrent detection delay time ...8msec to 256msec
- Charging overcurrent detection delay time.....6msec to 64msec
- Short detection delay time.....250µsec to 400µsec

(3) Current consumption

- Normal mode .....Typ. 3.0µA, Max. 6.0µA
- Stand-by mode .....Max. 0.1µA (In case Overdischarge latch function Enable)
  Max 0.6µA (In case Overdischarge latch function Disable)

4) 0V battery Charge function.....Selectable “Permission” or “Prohibition”

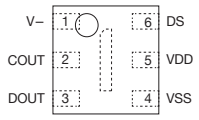
5) Absolute maximum ratings

- VDD pin.....VSS–0.3V to +12V
- COUT pin and V- pin .....VDD–28V to VDD+0.3V
- DOUT pin and CS pin .....VSS–0.3V to VDD+0.3V
- Storage temperature .....–55°C to +125°C
- Operation temperature.....–40°C to +85°C

Pin assignment

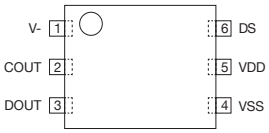
SSON-6J

(Top view)



SON-6C

(Top view)



Pin no.	Symbol	Function
1	V-	Charger negative voltage input terminal
2	COUT	Charge FET control terminal
3	DOUT	Discharge FET control terminal
4	VSS	Negative power supply voltage input terminal
5	VDD	Positive power supply voltage input terminal
6	CS	Current detection terminal

LINE UP

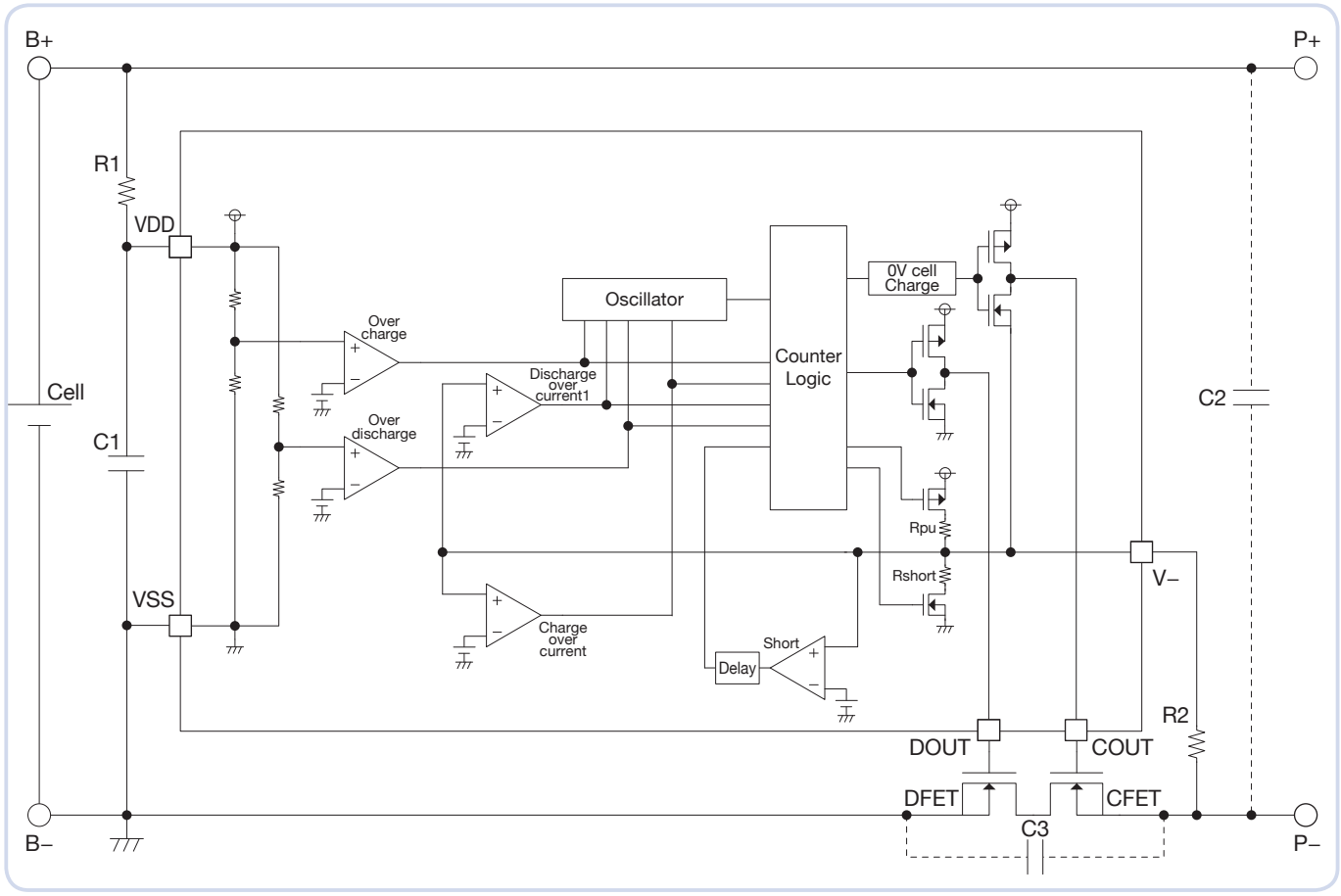
Peoduct Name	Package	0V charge	Protection mode latch function			Hys–cancel		Discharging overcurrent release range extended function	Overcharge detection voltage	Overdischarge release voltage	Overdischarge detection voltage	Overdischarge release voltage	Discharging overcurrent detection voltage	Charging overcurrent detection voltage	Short detection voltage	Delay time *2
			Overcharge	Overdischarge	Dischage overcuurent	Overcharge	Overdischarge		Vdet1	Vrel1	Vdet2	Vrel2	Vdet3–1	Vdet4	Vshort	
									V	V	V	V	V	V	V	
MM3724AC1RRE	SSON-6J	0.9	Disable	Disable	Disable	Enable	Enable	Yes (VDD-0.9V)	4.425	4.225	2.500	2.900	0.032	-0.020	0.150	A
MM3724CF3RRE	SSON-6J	0.9	Disable	Enable	Disable	Enable	-	Yes(VDD-0.9V)	4.280	4.080	2.300	2.300	0.064	-0.020	0.150	A
MM3724VK1RRE	SSON-6J	2.4	Disable	Enable	Disable	Enable	-	Disable	4.415	4.240	2.800	2.800	0.050	-	0.900	B

*Delay time 2

	tVdet1	tVrel1	tVdet2	tVrel2	tVdet3	tVrel3	tVdet4	tVrel4	tshort
	sec	msec	msec	msec	msec	msec	msec	msec	µsec
A	1.024	16.00	96.00	1.00	12.00	1.00	10.00	1.00	300
B	1.024	8.00	24.00	4.00	12.00	4.00	-	-	400

*Please inquire to us, if you need another spec.

Typical application circuit



Symbol	Part	Min.	Typ.	Max.	Purpose
R1	Resistor	100Ω	330Ω	1.0KΩ	For voltage fluctuation, For ESD
C1	Capacitor	0.01μF	0.1μF	1.0μF	For voltage fluctuation
R2	Resistor	1.0KΩ	2.2KΩ	10KΩ	Current limit for charger reverse connection
C2	Capacitor	-	0.1μF	-	For exogenous noise
C3	Capacitor	-	0.1μF	-	For exogenous noise
DFET CFET	Nch MOS FET	-	-	-	Charge and discharge control

This typical application circuit and constant value do not guarantee proper operation. Please evaluate thoroughly by actual application to set up constants.

1 SECONDARY BATTERY ICS

1 cell lithium–ion/lithium–polymer battery protection IC

MM3725/MM3726 Series

Outline

The MM3725/MM3726 series are protection IC using high voltage CMOS process for overcharge, overdischarge andovercurrent protection of the rechargeable Lithium-ion or Lithium-polymer battery. The overcharge, overdischarge,discharging overcurrent, charging overcurrent, and short protection of the rechargeable one-cell Lithium-ion or Lithium-polymer battery can be detected. Each of these IC composed of four voltage detectors, short detection circuit, referencevoltage sources, oscillator, counter circuit and logical circuits.

Features

(Unless otherwise specified, Ta=25°C)

(1) Range and accuracy of detection/release voltage

- Overcharge detection voltage ..... Vdet1 ..... 3.6V to 5.0V ..... ±20m
  5mVstep ..... ±25mV
  (Ta=-20 to 60°C)
- Overcharge release voltage ..... Vrel1 ..... Vdet1-0.2V to Vdet1 ..... ±30mV
  5mV step
- Overdischarge detection voltage ..... Vdet2 ..... 2.0V to 3.0V ..... ±35m
  50mV step
- Overdischarge release voltage ..... Vrel2 ..... 2.0V to 3.0V ..... +50 / -35mV
  (In case Vdet2=Vrel2)
  50mV step ..... +90 / -65mV
  (In case Vdet2≠Vrel2)
- Discharging overcurrent detection voltage ..... Vdet3 ..... 20mV to 300mV ..... ±5mV
  1mV step
- Charging overcurrent detection voltage ..... Vdet4 ..... -300mV to -20mV ..... ±5mV
  1mV step
- Short detection voltage ..... Vshort ..... 40mV to 350mV ..... ±8%
  1mV step
- 0V battery charge inhibition battery voltage ..... Vst ..... 1.3V to 1.8V/0.1V step... ±100mV
  0.9V ..... ±300mV

(2) Range of detection delay time

- Overcharge detection delay time ..... tVdet1 ..... 256ms to 4.6s
- Overdischarge detection delay time ..... tVdet2 ..... 8ms to 256ms
- Discharging overcurrent detection delay time ... tVdet3 ..... 8ms to 256ms
- Charging overcurrent detection delay time ..... tVdet4 ..... 6ms to 64ms
- Short detection delay time ..... tVshort ..... 250µs to 400µs

(3) Current consumption

- Normal mode ..... Typ. 3.0µA, Max. 6.0µA
- Stand-by mode ..... Max. 0.1µA (In case Overdischarge latch function Enable)
  Max 0.6µA (In case Overdischarge latch function Disable)

4) 0V battery Charge function ..... Selectable “Permission” or “Prohibition”

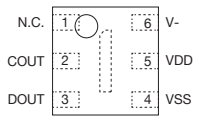
5) Absolute maximum ratings

- VDD pin ..... VSS–0.3V to +12V
- COUT pin and V- pin ..... VDD–28V to VDD+0.3V
- DOUT pin and CS pin ..... VSS–0.3V to VDD+0.3V
- Storage temperature ..... –55 to +125°C
- Operation temperature ..... –40 to +85°C

Pin assignment

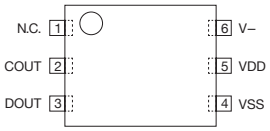
SSON-6J

(Top view)



SON-6C

(Top view)



Pin no.	Symbol	Function
1	N.C.	None connection
2	COUT	Charge FET control terminal
3	DOUT	Discharge FET control terminal
4	VSS	Negative power supply voltage input terminal
5	VDD	Positive power supply voltage input terminal
6	V-	Current detection terminal

LINE UP

MODEL	Package	0V charge	Protection mode latch function			Hys-Cancel		Overcharge detection voltage	Overcharge release voltage	Overdischarge detection voltage	Overdischarge release voltage	Discharging overcurrent detection voltage	Charging overcurrent detection voltage	Short detection voltage	Delay time *1
			Overcharge	Overdischarge	Discharge overcurrent	Overcharge	Overdischarge	Vdet1	Vrel1	Vdet2	Vrel2	Vdet3	Vdet4	Vshort	
								V	V	V	V	V	V	V	
MM3725AC2YRE	SON-6C	0.9	Disable	Disable	Disable	Enable	Enable	4.475	4.275	2.500	2.900	0.045	-0.040	0.100	A
MM3725AC7YLE	SON-6C	1.2	Disable	Disable	Disable	Enable	Enable	4.550	4.250	2.300	2.500	0.025	-0.030	0.075	J
MM3725AC9YRE	SON-6C	0.9	Disable	Disable	Disable	Enable	Enable	4.475	4.275	2.500	2.900	0.055	-0.045	0.100	L
MM3725ACCYLE	SON-6C	0.9	Disable	Disable	Disable	Enable	Enable	4.475	4.275	2.500	2.900	0.020	-0.020	0.070	F
MM3725AM1YRE	SON-6C	0.9	Disable	Disable	Disable	Enable	Enable	4.475	4.275	2.500	2.900	0.065	-0.050	0.190	B
MM3725AM4YRE	SON-6C	0.9	Disable	Disable	Disable	Enable	Enable	4.425	4.225	2.500	2.800	0.025	-0.025	0.075	E
MM3725AM5YRE	SON-6C	0.9	Disable	Disable	Disable	Enable	Enable	4.475	4.275	2.500	2.900	0.045	-0.040	0.095	F
MM3725AMHYLE	SON-6C	0.9	Disable	Disable	Disable	Enable	Enable	4.475	4.275	2.500	2.800	0.024	-0.024	0.070	O
MM3725AN1YRE	SON-6C	Permission	Disable	Disable	Disable	Enable	Enable	4.425	4.225	2.500	2.900	0.080	-0.080	0.230	G
MM3725ANBYRE	SON-6C	Permission	Disable	Disable	Disable	Enable	Enable	4.475	4.275	2.500	2.800	0.060	-0.050	0.160	E
MM3725AR1YLE	SON-6C	Permission	Disable	Disable	Disable	Enable	Enable	4.475	4.275	2.500	2.900	0.055	-0.055	0.150	M
MM3725CM2YLE	SON-6C	0.9	Disable	Enable	Disable	Enable	-	4.470	4.270	2.500	2.500	0.025	-0.025	0.100	N
MM3725CM2RLE	SSON-6J	0.9	Disable	Enable	Disable	Enable	-	4.470	4.270	2.500	2.500	0.025	-0.025	0.100	N
MM3725CM3YRE	SON-6C	0.9	Disable	Enable	Disable	Enable	-	4.275	4.075	2.500	2.500	0.025	-0.020	0.080	M
MM3725CN2YRE	SON-6C	Permission	Disable	Enable	Disable	Enable	-	4.280	4.080	3.000	3.000	0.030	-0.030	0.205	E
MM3726AM6YRE	SON-6C	0.9	Disable	Disable	Disable	Enable	Enable	4.475	4.275	2.400	2.800	0.150	-0.125	0.350	G
MM3726AM7YRE	SON-6C	0.9	Disable	Disable	Disable	Enable	Enable	4.550	4.250	2.000	2.400	0.075	-0.055	0.250	C
MM3726AN2YLE	SON-6C	Permission	Disable	Disable	Disable	Enable	Enable	4.425	4.225	2.500	2.800	0.055	-0.055	0.255	G
MM3726ANAYLE	SON-6C	Permission	Disable	Disable	Disable	Enable	Enable	4.475	4.275	2.500	2.800	0.055	-0.055	0.255	G

*1 Delay time

	tVdet1	tVrel1	tVdet2	tVrel2	tVdet3	tVrel3	tVdet4	tVrel4	tshort
	s	ms	ms	ms	ms	ms	ms	ms	µs
A	1.024	16.00	20.00	1.00	12.00	1.00	8.00	1.00	300
B	1.024	16.00	32.00	1.00	16.00	1.00	4.00	1.00	280
C	1.024	16.00	64.00	1.00	16.00	1.00	8.00	1.00	280
D	1.024	16.00	64.00	1.00	8.00	1.00	4.00	1.00	280
E	1.024	16.00	32.00	1.00	8.00	1.00	8.00	1.00	280
F	1.024	16.00	64.00	1.00	16.00	1.00	16.00	1.00	280
G	1.024	16.00	64.00	1.00	8.00	1.00	8.00	1.00	280
H	1.024	16.00	64.00	1.00	32.00	1.00	16.00	1.00	280
I	1.024	16.00	32.00	1.00	16.00	1.00	16.00	1.00	280
J	1.024	16.00	32.00	1.00	16.00	1.00	16.00	1.00	530
K	1.024	16.00	128.00	1.00	8.00	1.00	8.00	1.00	280
L	1.024	16.00	20.00	1.00	12.00	1.00	8.00	1.00	280
M	1.024	16.00	20.00	1.00	12.00	1.00	8.00	1.00	250
N	1.024	16.00	32.00	1.00	12.00	1.00	12.00	1.00	280
O	1.024	16.00	20.00	1.00	10.00	1.00	8.00	1.00	300

*Please inquire to us, if you need another spec.

1 SECONDARY BATTERY ICS

N channel high side FET drive by charge pump

MM3746 Series

Outline

MM3746 series are protection ICs with charger pump and drive high side N channel FET for Lithium-ion and Lithium-polymer secondary battery. This IC is most suitable for the intelligent battery pack with which I communicate data between the battery pack and the system.
And MM3746 series has a temperature detection by using a NTC Thermistor, protects the battery pack and system from over temperature.

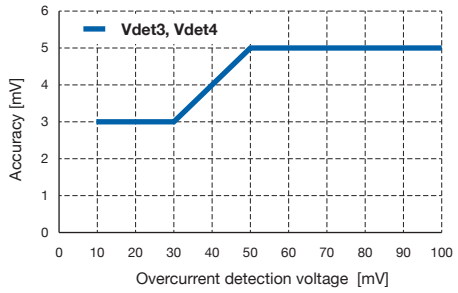
Features

(Unless otherwise specified, Ta=25°C)

(1) Range and accuracy of detection/release voltage

- Overcharge detection voltage ..... Vdet1 ..... 4.2V to 4.6V, 5mV steps ..... Accuracy±15mV
- Overdischarge detection voltage ..... Vdet2 ..... 2.0V to 3.0V, 50mV steps ..... Accuracy±40mV
- Discharging overcurrent detection voltage ..... Vdet3 ..... 10mV to 150mV, 1mV steps ..... Accuracy±3.0mV *1
- Charging overcurrent detection voltage ..... Vdet4 ..... –150mV to –10mV, 1mV steps ..... Accuracy±3.0mV *1
- Short detection voltage ..... Vshort ..... 40mV to 300mV, 50mV steps ..... Accuracy±5.0mV
- 0V battery charge inhibition battery voltage ..... Vst ..... ±1.3V fixed ..... Accuracy±150mV
- Temperature detection ..... Tdet ..... 55 to 85°C ..... Accuracy±5.0°C

*1 Accuracy of overcurrent detection voltage (Ta=25°C)



(2) Temperature detection function ..... Selectable “Enable” or “Disable”

(3) 0V battery charge function ..... Selection from “Permission” or “Inhibition”

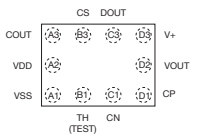
(4) Current consumption (Not include NTC bias current)

- Normal mode ..... Typ. 6.0μA, Max. 10.0μA
- Stand-by mode ..... Max. 0.1μA (Overdischarge latch function Enable)
  Max. 1.2μA (Overdischarge latch function Disable)

Pin assignment

WLCSP-10A

(Top view)



Pin no.	Symbol	Function
A1	VSS	Negative power supply voltage input terminal
A2	VDD	Positive power supply voltage input terminal
A3	COUT	Charge FET control terminal
B1	TH(TEST)	Temperature level detect terminal (Test terminal)
B3	CS	Current level detect terminal
C1	CN	Flying capacitor connecting terminal
C3	DOUT	Discharge FET control terminal
D1	CP	Flying capacitor connecting terminal
D2	VOUT	Charge pump output terminal
D3	V+	Charger positive voltage input terminal

LINE UP

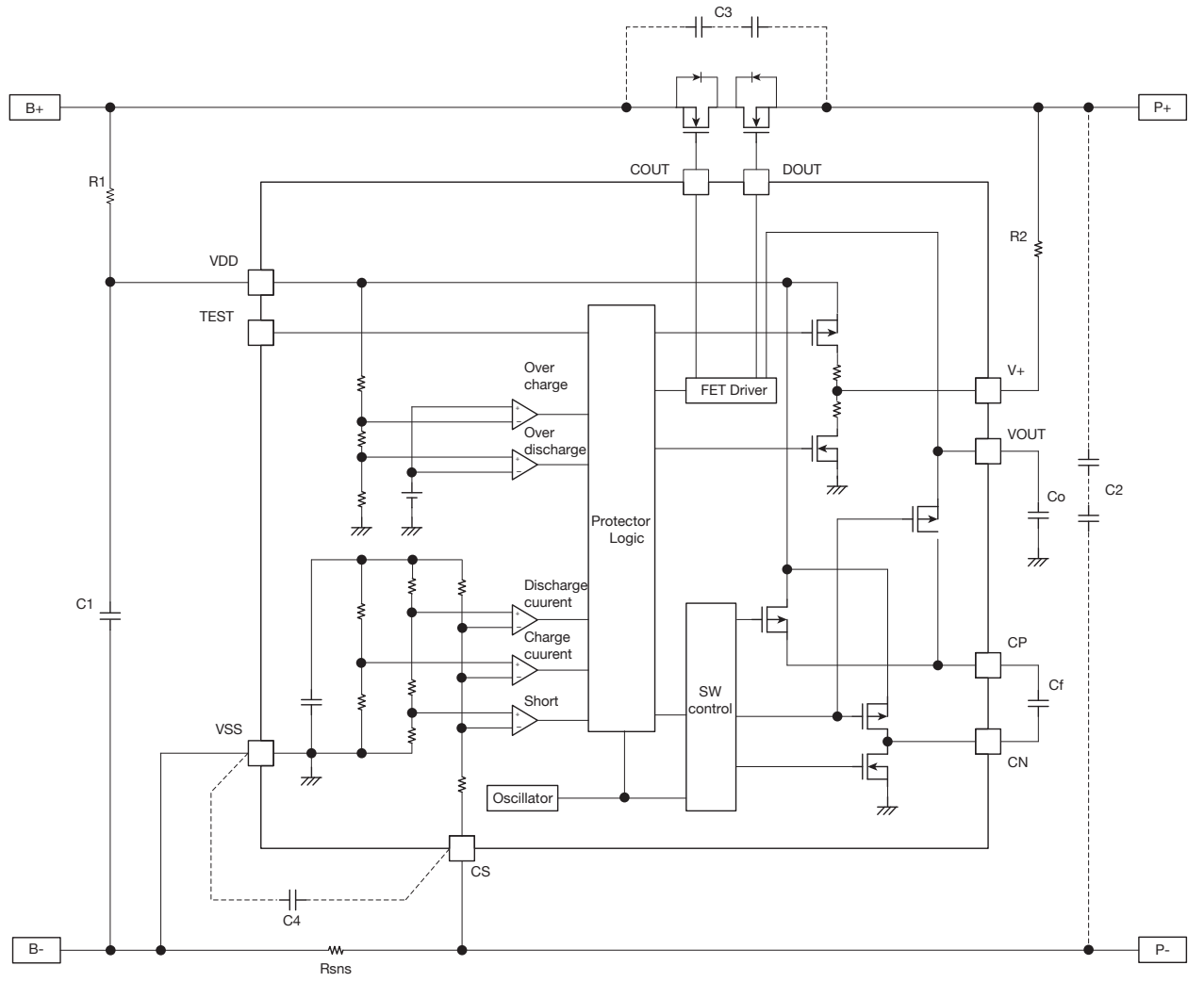
Product name	Package	Overcharge detection	Overdischarge detection	Discharging overcurrent detection	Charging overcurrent detection	Short detection	Temperature detection resistance	Overcharge detection latch function	Overcharge hysteresis cancel	Overdischarge detection latch function	Overdischarge hysteresis cancel	0V battery charge function	Temperature detection function	Delay time *1
		Vdet1	Vdet2	Vdet3	Vdet4	Vshort	RdetTH							
		V	V	mV	mV	mV	---							
MM3746BB1LBE	WLCSP-10A	4.270	2.300	13.0	-10.0	40.0	---	Disable	Enable	Enable	Disable	Inhibition	Disable	A
MM3746BC1LBE	WLCSP-10A	4.490	2.900	33.0	-17.0	140.0	---	Disable	Enable	Enable	Disable	Inhibition	Disable	B

*1 Delay time

	tVdet1	tVdet2	tVdet3	tVdet4	tshort1	tVtdet
	ms	ms	ms	ms	µs	---
A	1020	128	16.0	8.0	250	---
B	1020	16	16.0	8.0	250	---

Please inquire to us, if you request a rank other than the above.

Typical application circuit



- The characteristics of the charge pump (ripple voltage, output current ability, etc.) are decided by the capacitor (C1, Cf, Co). Please select ceramic capacitor with a small ESR(Equivalent Series Resistance). Please arrange Cf near the CN and CP terminal.
- R1 and C1 help to stabilize a supply voltage fluctuation. 0.1μF or more is recommended for C1 to secure stable operation. The value of Cf and Co affects the output current drivability and the output voltage ripple respectively. The recommend value of Cf and Co is 0.047μF to drive CFET and DFET with no fail.
- The detection voltage rises by the current consumption (IDD) of IC when R1 is too large. 300Ω or less is recommended for R1. The variation of overcharge detection voltage (ΔVdet1) is expressed in the following equation.

  $\Delta Vdet1 = R1 * IDD$
- R1 and R2 are useful for the current limiting resistance if a charger is connected reversely or a high-voltage charger that exceeds the absolute maximum rating is connected. If total value of “R1+R2” is too small, it may exceed allowed power dissipation of IC. Please have total value of “R1 and R2” should be more than 300ohm. If R2 is too large, CFET may not be able to turn off, therefore please use 10kohm or less.
- C2, C3 and C4 are useful to improve the system stability against the voltage ripple and exogenous noise. Please consider whether or not capacitors should be placed, the area should be placed, and capacitance value in consideration of the system characteristic. Especially C4 prevents false discharge overcurrent detection.
- Current threshold of discharging overcurrent detection and short detection (Idoc, Icoc, Ishort) are expressed in the following equations.

  Idoc = Vdet3 / Rsns
  Icoc = Vdet4 / Rsns
  Ishort = Vshort / Rsns

1 SECONDARY BATTERY ICS

Thermal protection and control terminal for charge and discharge off mode protection IC

MM3855 Series

Outline

MM3855 series are protection ICs with thermal protection and control teminal for charge and discharge off mode for Lithium-ion and Lithium-polymer rechargeable battery.
By using external thermistor, this protects the battery pack and system over temperature. In addition, it reduces the current consumption of system by using charge and dischrge off mode , when the system is shutdown.

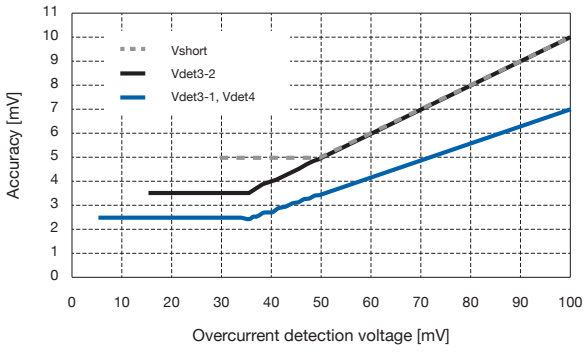
Features

(Unless otherwise specified, Ta=25°C)

(1) Range and accuracy of detection/release voltage

● Overcharge detection voltage	Vdet1	4.1V to 5.0V	±20mV
		5mVstep	±20mV(Ta=-20 to +60°C)
● Overdischarge detection voltage	Vdet2	2.1V to 3.0V	±35m
		50mV step	±40mV(Ta=-20 to +60°C)
● Discharging overcurrent detection voltage1	Vdet3-1	6mV to 100mV	±2.5mV
		1mV step	±3.0mV (Ta=-20 to +60°C)*1
● Discharging overcurrent detection voltage2	Vdet3-2	15mV to 100mV	±3.5mV
		1mV step	±4.0mV (Ta=-20 to +60°C)*1
● Charging overcurrent detection voltage	Vdet4	-6mV to -100mV	±2.5mV
		1mV step	±3.0mV(Ta=-20 to +60°C)*1
● Short detection voltage	tShort	30mV to 200mV	±5.0mV
		10mV step	±5.5mV (Ta=-20 to +60°C)*1
● 0V battery charge inhibition battery voltage	Vst	0.9V	±0.3V

*1 Accuracy of overcurrent detection voltage (Ta=25 °C)



(2) Temperature detection function.....Selectable “Enable” or “Disable”

(3) 0V battery charge function .....Selectable “Permission” or “Inhibition”

4) Control terminal for charge and discharge off mode

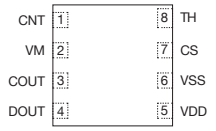
5) Current consumption..... (Not include NTC bias current)

● Normal mode	Temperature detection function “Enable”	3.0μA typ.	
		5.0μA max.	(Ta=-20 to +85°C)
	Temperature detection function “Disable”	2.5μA typ.	
		4.5μA max.	(Ta=-20 to +85°C)
● Standby mode	Overdischarge latch function “Enable”	0.1μA max.	(Ta=-20 to +60°C)
	Overdischarge latch function “Disable”	0.8μA max.	(Ta=-20 to +85°C)

Pin assignment

SSON-8F SSON-8G

(Top view)



Pin no.	Symbol	Function
1	CNT	Control terminal for charge and discharge FET
2	VM	Input terminal for charger negative voltage
3	COUT	Control terminal for charge FET
4	DOUT	Control terminal for discharge FET
5	VDD	Input terminal for negative power supply voltage
6	VSS	Input terminal for positive power supply voltage
7	CS	Input terminal for overcurrent detection
8	TH	Input terminal for temperature detection

LINE UP

Model	Overcharge detection	Overdischarge detection	Discharging overcurrent detection 1	Discharging overcurrent detection 2	Charging overcurrent detection	Short detection1	Temperature detection resistance	Overcharge detection latch function	Overdischarge detection latch function	Discharging overcurrent latch functio	Charging overcurrent latch function	0V battery charge function	Temperature detection function	Delay time *1
	Vdet1	Vdet2	Vdet3-1	Vdet3-2	Vdet4	Vshort1	RdetTH							
	V	V	mV	mV	mV	V	---							
MM3855AJ1	4.475	2.400	35.0	50.000	-35.0	100.0	90kΩ	Disable	Disable	Disable	Enable	Permission	Enable	(A)
MM3855AL1	4.475	2.500	20.5	29.500	-26.5	70.0	No function	Disable	Disable	Disable	Enable	Permission	Disable	(B)
MM3855AL2	4.475	2.500	22.5	No function	-21.0	100.0	No function	Disable	Disable	Disable	Enable	Permission	Disable	(C)
MM3855EN5	4.470	2.465	13.0	No function	-15.0	50.0	90kΩ	Enable	Enable	Disable	Enable	Permission	Enable	(D)
MM3855EN7	4.450	2.600	36.0	No function	-21.0	90.0	48kΩ	Enable	Enable	Disable	Enable	Permission	Enable	(E)

Delay time *1

	tVdet1	tVdet2	tVdet3-1	tVdet3-2	tVdet4	tShort1	tCDGdet	tRdetTH
	sec	msec	msec	msec	msec	µsec	msec	msec
A	1.024	64	4096	16	16	280	48	512
B	1.024	64	4096	16	16	280	48	No function
C	1.024	20	16	No function	16	300	48	No function
D	1.024	128	8	No function	8	250	48	512
E	1.024	2048	2048	No function	8	280	48	64

*Please inquire to us, if you need another spec.

1 SECONDARY BATTERY ICS

1 cell lithium–ion/lithium–polymer battery protection IC

MM3856 Series

Outline

MM3856 series are Li-ion battery protection IC and detect charge current / discharge current with high precision by current sensing resistor (Rsns). MM3856 have two step discharge overcurrent detection. And system is protected appropriately in the next 2 state, Normal discharge mode and large current discharge mode.

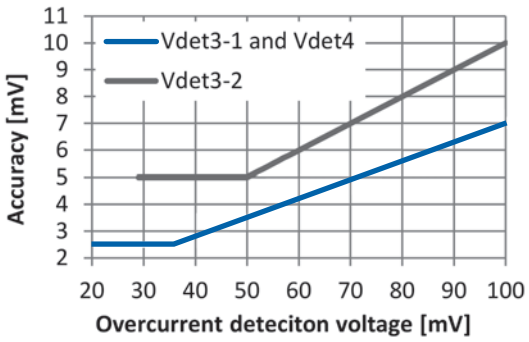
Features

(Unless otherwise specified, Ta=25°C)

(1) Range and accuracy of detection/release voltage

- Overcharge detection voltage.....4.1V to 5.0V, 5mV steps ..... +/-20mV(Ta=-20 to +60 degC)
- Overdischarge detection voltage.....2.1V to 3.0V, 50mV steps ..... +/-35mV
- Discharging overcurrent detection voltage1 .....15mV to +100mV, 1mV steps ..... ※1
- Discharging overcurrent detection voltage2 .....30mV to +100mV, 1mV steps ..... ※1
- Charging overcurrent detection voltage.....-15mV to -100mV, 1mV steps ..... ※1
- Short detection voltage1.....50mV to 200mV, 50mV steps ..... ※2
- 0V battery charge inhibition battery voltage .....1.3 to 1.8V, 0.1V steps..... +/-0.1V
  0.9V fixed..... +/-0.3V

※1 Accuracy of overcurrent detection voltage



※2 Accuracy of Short detection voltage1
+/-20mV (Discharging overcurrent detection voltage 2 disable.)
+/-25mV (Discharging overcurrent detection voltage 2 enable.)

(2) 0V battery charge function .....Selectable "Permission" or "inhibition"

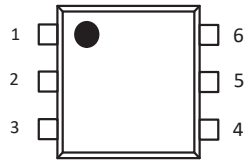
(3) Current consumption at Ta=25 degC

- Normal mode .....2.5uA typ.4.0uA max.
- Standby mode .....0.1uA max. (Overdischarge latch function enable.)
  0.6uA max. (Overdischarge latch function disable.)

Pin assignment

SON-6C

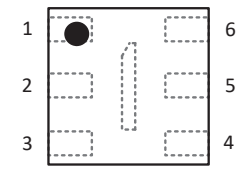
(Top view)



Pin no.	Symbol	Function
1	V-	Input terminal for charger negative voltage
2	COUT	Control terminal for charge FET
3	DOUT	Control terminal for discharge FET
4	VSS	Input terminal for negative power supply voltage
5	VDD	Input terminal for positive power supply voltage
6	CS	Input terminal for overcurrent detection

SSON-6J/6M

(Top view)



Pin no.	Symbol	Function
1	VSS	Input terminal for negative power supply voltage
2	VDD	Input terminal for positive power supply voltage
3	CS	Input terminal for overcurrent detection
4	V-	Input terminal for charger negative voltage
5	COUT	Control terminal for charge FET
6	DOUT	Control terminal for discharge FET

LINE UP

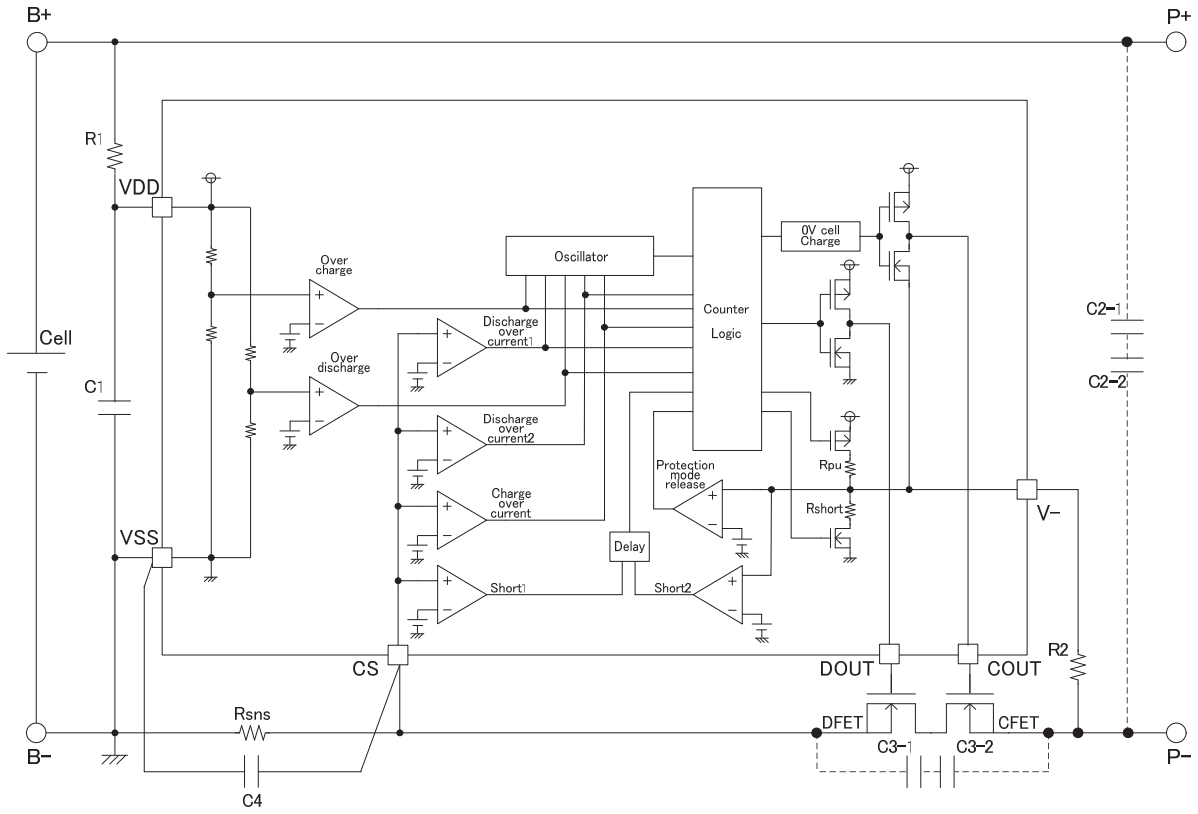
MODEL	Package	0V charge	Protection mode latch function			Hys-Cancel		Overcharge detection voltage	Overcharge release voltage	Overdischarge detection voltage	Overdischarge release voltage	Discharging overcurrent detection voltage1	Discharging overcurrent detection voltage2	Charging overcurrent detection voltage	Short detection voltage1	Delay time *1
			Overcharge	Overdischarge	Discharge overcurrent	Overcharge	Overdischarge	Vdet1	Vrel1	Vdet2	Vrel2	Vdet3-1	Vdet3-2	Vdet4	Vshort1	
								V	V	V	V	mV	mV	mV	mV	
MM3856AF1RRE	SSON-6JorM	1.6	Disable	Disable	Disable	Enable	Enable	4.475	4.275	2.800	3.000	17.0	30.0	-17.0	55.0	J
MM3856AJ2YLE	SON-6C	Permission	Disable	Disable	Disable	Enable	Enable	4.525	4.350	2.100	2.300	20.5	29.5	-33.5	70.0	A
MM3856AM1YLE	SON-6C	0.9	Disable	Disable	Disable	Enable	Enable	4.475	4.275	2.500	2.900	21.0	-	-21.0	80.0	D
MM3856AM2YLE	SON-6C	0.9	Disable	Disable	Disable	Enable	Enable	4.520	4.320	2.100	2.300	21.0	-	-24.0	100.0	E
MM3856AM4YLE	SON-6C	0.9	Disable	Disable	Disable	Enable	Enable	4.220	4.165	2.500	2.900	22.5	-	-22.5	45.0	E
MM3856AN2YLE	SON-6C	Permission	Disable	Disable	Disable	Enable	Enable	4.520	4.320	2.300	2.700	36.0	-	-30.0	100.0	C
MM3856AN3RLE	SSON-6JorM	Permission	Disable	Disable	Disable	Enable	Enable	4.475	4.275	2.500	2.900	21.0	-	-27.0	80.0	D
MM3856AN3YLE	SON-6C	Permission	Disable	Disable	Disable	Enable	Enable	4.475	4.275	2.500	2.900	21.0	-	-27.0	80.0	D
MM3856AN4RLE	SSON-6JorM	Permission	Disable	Disable	Disable	Enable	Enable	4.520	4.320	2.100	2.300	21.0	-	-33.0	100.0	E
MM3856AN4YLE	SON-6C	Permission	Disable	Disable	Disable	Enable	Enable	4.520	4.320	2.100	2.300	21.0	-	-33.0	100.0	E
MM3856AN5YLE	SON-6C	Permission	Disable	Disable	Disable	Enable	Enable	4.475	4.275	2.500	2.900	21.0	-	-21.0	80.0	D
MM3856AN6YLE	SON-6C	Permission	Disable	Disable	Disable	Enable	Enable	4.520	4.320	2.100	2.300	21.0	-	-24.0	100.0	E
MM3856AN7YRE	SON-6C	Permission	Disable	Disable	Disable	Enable	Enable	4.475	4.275	2.600	3.000	21.0	-	-21.0	50.0	G
MM3856AN8YRE	SON-6C	Permission	Disable	Disable	Disable	Enable	Enable	4.520	4.320	2.300	2.700	21.0	-	-21.0	70.0	H
MM3856AN9YLE	SON-6C	Permission	Disable	Disable	Disable	Enable	Enable	4.520	4.320	2.300	2.700	22.5	-	-27.0	110.0	I
MM3856KF5RRE	SSON-6JorM	1.2	Enable	Enable	Disable	-	-	4.500	4.500	2.400	2.400	36.0	-	-28.0	90.0	F

*Please inquire to us, if you need another spec.

*1 Delay time

	tVdet1	tVrel1	tVdet2	tVrel2	tVdet3-1	tVrel3-1	tVdet3-2	tVrel3-2	tVdet4	tVrel4	tshort
	s	ms	ms	ms	ms	ms	ms	ms	ms	ms	µs
A	1.024	1.00	64.00	1.00	4096.00	8.00	16.00	8.00	16.00	4.00	280
B	1.024	1.00	64.00	1.00	16.00	8.00	-	-	16.00	1.00	280
C	1.024	1.00	64.00	1.00	32.00	8.00	-	-	16.00	1.00	400
D	1.024	1.00	64.00	1.00	224.00	8.00	-	-	16.00	1.00	250
E	1.024	1.00	64.00	1.00	448.00	8.00	-	-	16.00	1.00	250
F	1.024	1.00	2048.00	1.00	2048.00	4.00	-	-	16.00	1.00	280
G	1.024	1.00	64.00	1.00	16.00	8.00	-	-	8.00	1.00	280
H	1.024	1.00	64.00	1.00	32.00	8.00	-	-	16.00	1.00	530
I	1.024	1.00	40.00	1.00	64.00	8.00	-	-	16.00	1.00	280
J	1.024	16.00	256.00	1.00	128.00	1.00	16.00	1.00	64.00	1.00	300

Typical application circuit



Symbol	Part	Min.	Typ.	Max.	Unit	Purpose
R1	Resistor	-	100	1k	Ω	For voltage fluctuation and ESD
R2	Resistor	-	1k	10k	Ω	For current limit of charger reverse connection
Rsns	Resistor	-	-	-	-	Charge and discharge curent sensing
C1	Capacitor	0.01u	0.1u	1.0u	F	For voltage fluctuation
C2	Capacitor	-	0.1u	-	F	For exogenous noise
C3	Capacitor	-	0.1u	-	F	For exogenous noise
C4	Capacitor	-	0.1u	-	F	For exogenous noise
DFET CFET	Nch MOS FET	-	-	-	-	Charge and discharge control

*The above application circuit and constant value do not guarantee proper operation.
*Please evaluate thoroughly by actual application to set up constants.

1 SECONDARY BATTERY ICS

1 cell lithium–ion/lithium–polymer battery protection IC

MM3860 Series

Outline

MM3860 series are Li-ion battery protection IC and detect charge current / discharge current with high precision by current sensing resistor (Rsns). MM3860 have two step discharge overcurrent detection. And system is protected appropriately in the next 2 state, Normal discharge mode and large current discharge mode.

Features

(Unless otherwise specified, Ta=25°C)

(1) Range and accuracy of detection/release voltage

- Overcharge detection voltage.....4.1V to 5.0V, 5mV steps ..... +/-20mV(Ta=-20 to +60 degC)
- Overdischarge detection voltage.....2.1V to 3.0V, 50mV steps ..... +/-35mV
- Discharging overcurrent detection voltage 1 .....6mV to +50mV, 1mV steps ..... +/-1mV
- Discharging overcurrent detection voltage 2 .....10mV to +100mV, 1mV steps ..... +/-2mV
- Charging overcurrent detection voltage.....-6mV to -50mV, 1mV steps ..... +/-1mV
- Short detection voltage1.....30mV to 200mV, 10mV steps ..... +/-5mV
- 0V battery charge inhibition battery voltage .....0.9V fixed.....+/-0.3V

(2) 0V battery charge function .....Selectable "Permission" or "inhibition"

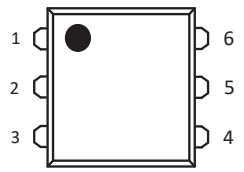
(3) Current consumption at Ta=25 degC

- Normal mode .....2.5uA typ.4.0uA max.
- Standby mode .....0.1uA max. (Overdischarge latch function enable.)
  0.6uA max. (Overdischarge latch function disable.)

Pin assignment

SON-6F

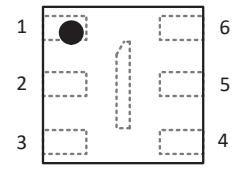
(Top view)



Pin no.	Symbol	Function
1	VM	Input terminal for charger negative voltage
2	COUT	Control terminal for charge FET
3	DOUT	Control terminal for discharge FET
4	VSS	Input terminal for negative power supply voltage
5	VDD	Input terminal for positive power supply voltage
6	CS	Input terminal for overcurrent detection

SSON-6J/6M

(Top view)



Pin no.	Symbol	Function
1	VSS	Input terminal for negative power supply voltage
2	VDD	Input terminal for positive power supply voltage
3	CS	Input terminal for overcurrent detection
4	VM	Input terminal for charger negative voltage
5	COUT	Control terminal for charge FET
6	DOUT	Control terminal for discharge FET

LINE UP

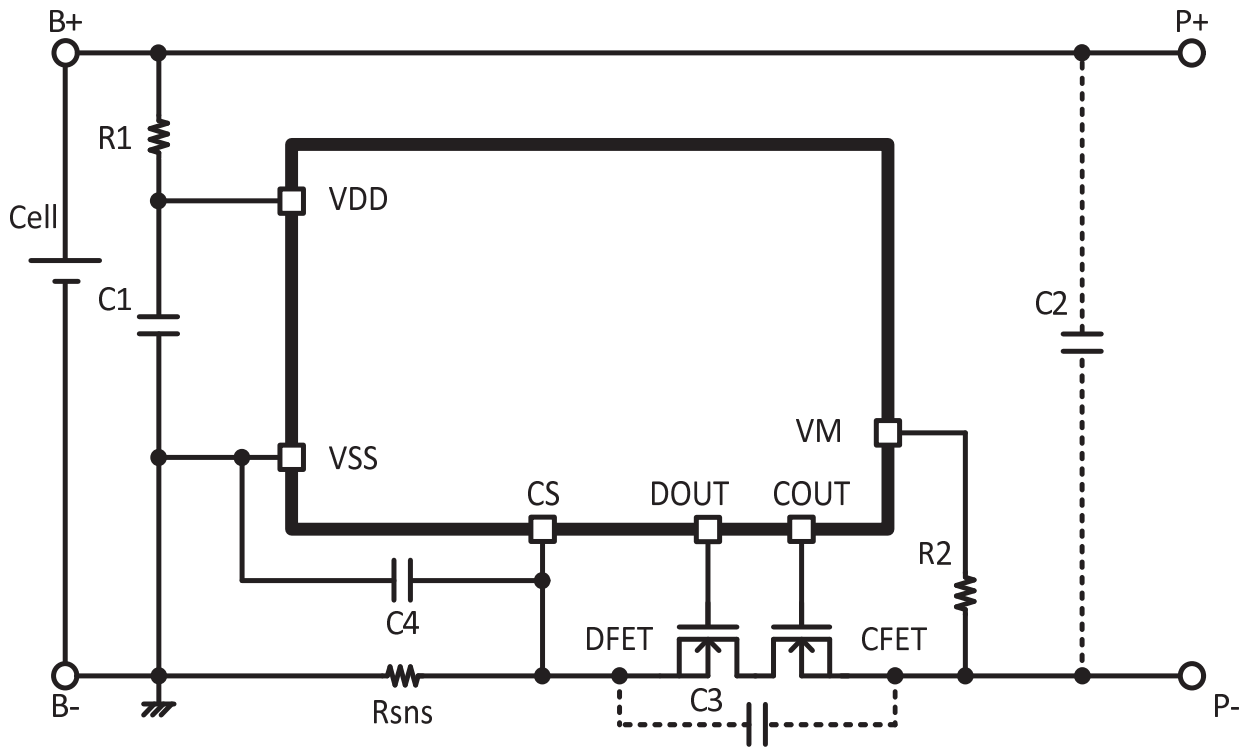
MODEL	Package	0V charge	Protection mode latch function			Hys-Cancel		Overcharge detection voltage	Overcharge release voltage	Overdischarge detection voltage	Overdischarge release voltage	Discharging overcurrent detection voltage1	Discharging overcurrent detection voltage2	Charging overcurrent detection voltage	Short detection voltage1	Delay time *1
			Overcharge	Overdischarge	Discharge overcurrent	Overcharge	Overdischarge	Vdet1	Vrel1	Vdet2	Vrel2	Vdet3-1	Vdet3-2	Vdet4	Vshort1	
								V	V	V	V	mV	mV	mV	mV	
MM3860AL1ZRE	SON-6F	Permission	Disable	Disable	Disable	Enable	Enable	4.475	4.275	2.500	2.900	7.0	20.0	-7.0	70.0	A
MM3860AL2ZRE	SON-6F	Permission	Disable	Disable	Disable	Enable	Enable	4.530	4.330	2.100	2.300	14.0	20.0	-20.0	55.0	B
MM3860AL3ZRE	SON-6F	Permission	Disable	Disable	Disable	Enable	Enable	4.530	4.330	2.100	2.300	10.5	15.0	-15.0	40.0	B
MM3860AL4ZRE	SON-6F	Permission	Disable	Disable	Disable	Enable	Enable	4.550	4.350	2.100	2.300	7.0	10.0	-10.0	27.0	B
MM3860AL5ZRE	SON-6F	0.9	Disable	Disable	Disable	Enable	Enable	4.475	4.275	2.500	2.900	15.0	-	-15.0	32.0	C
MM3860AL6ZRE	SON-6F	0.9	Disable	Disable	Disable	Enable	Enable	4.520	4.320	2.300	2.500	15.0	-	-15.0	36.0	D
MM3860AL7ZRE	SON-6F	Permission	Disable	Disable	Disable	Enable	Enable	4.500	4.300	2.100	2.300	7.0	10.0	-13.0	27.0	B
MM3860ALDZRE	SON-6F	Permission	Disable	Disable	Disable	Enable	Enable	4.530	4.330	2.350	2.550	21.0	33.0	-24.0	80.0	I
MM3860ALEZRE	SON-6F	Permission	Disable	Disable	Disable	Enable	Enable	4.550	4.350	2.100	2.300	21.0	33.0	-30.0	80.0	I
MM3860ALFZRE	SON-6F	Permission	Disable	Disable	Disable	Enable	Enable	4.530	4.330	2.350	2.550	7.0	12.0	-12.0	28.0	I
MM3860ALGZRE	SON-6F	Permission	Disable	Disable	Disable	Enable	Enable	4.550	4.350	2.100	2.300	7.0	12.0	-14.0	28.0	I
MM3860AN1ZRE	SON-6F	Permission	Disable	Disable	Disable	Enable	Enable	4.445	4.245	2.500	2.900	21.0	-	-16.0	60.0	G
MM3860AN2ZRE	SON-6F	Permission	Disable	Disable	Disable	Enable	Enable	4.480	4.380	2.300	2.700	23.0	-	-18.0	60.0	H
MM3860AN3ZRE	SON-6F	Permission	Disable	Disable	Disable	Enable	Enable	4.445	4.245	2.500	2.900	21.0	-	-22.0	60.0	G
MM3860AN4ZRE	SON-6F	Permission	Disable	Disable	Disable	Enable	Enable	4.480	4.380	2.300	2.700	23.0	-	-24.0	60.0	H
MM3860AN5ZRE	SON-6F	Permission	Disable	Disable	Disable	Enable	Enable	4.445	4.245	2.500	2.900	11.0	-	-12.5	30.0	G
MM3860AN6ZRE	SON-6F	Permission	Disable	Disable	Disable	Enable	Enable	4.480	4.380	2.300	2.700	13.0	-	-14.0	30.0	H
MM3860AN7ZRE	SON-6F	Permission	Disable	Disable	Disable	Enable	Enable	4.480	4.380	2.300	2.700	7.0	-	-7.5	18.0	H
MM3860AN8ZRE	SON-6F	Permission	Disable	Disable	Disable	Enable	Enable	4.450	4.250	2.500	2.900	14.5	22.0	-16.0	60.0	J
MM3860AN9ZRE	SON-6F	Permission	Disable	Disable	Disable	Enable	Enable	4.485	4.385	2.300	2.700	14.5	24.0	-18.0	60.0	K
MM3860ANAZRE	SON-6F	Permission	Disable	Disable	Disable	Enable	Enable	4.450	4.250	2.500	2.900	7.5	12.0	-12.5	30.0	J
MM3860ANBZRE	SON-6F	Permission	Disable	Disable	Disable	Enable	Enable	4.485	4.385	2.300	2.700	7.5	14.0	-14.0	30.0	K
MM3860CF1ZRE	SON-6F	0.9	Disable	Enable	Disable	Enable	Disable	4.390	4.190	2.400	2.400	6.0	-	-6.0	30.0	E
MM3860EF2RRE	SSON-6JorM	0.9	Enable	Enable	Disable	-	-	4.525	4.525	2.300	2.300	6.5	11.0	-7.5	20.0	F
MM3860EF3RRE	SSON-6JorM	0.9	Enable	Enable	Disable	-	-	4.535	4.535	2.300	2.300	6.5	12.0	-7.5	20.0	F

*1 Delay time

	tVdet1	tVrel1	tVdet2	tVrel2	tVdet3-1	tVdet3-2	tVrel3	tVdet4	tVrel4	tshort
	s	ms	ms	ms	ms	ms	ms	ms	ms	µs
A	1.024	1.00	64.00	1.00	4096.00	16.00	8.00	16.00	4.00	280
B	1.024	1.00	64.00	1.00	3584.00	16.00	8.00	16.00	1.00	280
C	1.024	1.00	32.00	1.00	64.00	-	8.00	16.00	4.00	250
D	1.024	1.00	64.00	1.00	128.00	-	8.00	64.00	4.00	250
E	1.024	16.00	20.00	1.00	12.00	-	2.00	16.00	1.00	250
F	1.024	16.00	32.00	1.00	3584.00	32.00	8.00	32.00	1.00	250
G	1.024	16.00	128.00	4.00	16.00	-	4.00	8.00	4.00	280
H	1.024	16.00	128.00	1.00	32.00	-	4.00	32.00	4.00	530
I	1.024	1.00	64.00	1.00	3584.00	16.00	8.00	16.00	4.00	280
J	1.024	16.00	128.00	4.00	3584.00	16.00	4.00	8.00	4.00	280
K	1.024	16.00	128.00	1.00	3584.00	32.00	4.00	32.00	4.00	530

*Please inquire to us, if you need another spec.

Typical application circuit



Symbol	Part	Min.	Typ.	Max.	Unit	Purpose
R1	Resistor	-	100	1k	Ω	For voltage fluctuation and ESD
R2	Resistor	-	1k	10k	Ω	For current limit of charger reverse connection
Rsns	Resistor	-	-	-	-	Charge and discharge curent sensing
C1	Capacitor	0.01u	0.1u	1.0u	F	For voltage fluctuation
C2	Capacitor	-	0.1u	-	F	For exogenous noise
C3	Capacitor	-	0.1u	-	F	For exogenous noise
C4	Capacitor	-	0.1u	-	F	For exogenous noise
DFET CFET	Nch MOS FET	-	-	-	-	Charge and discharge control

*The above application circuit and constant value do not guarantee proper operation.
*Please evaluate thoroughly by actual application to set up constants.

1 SECONDARY BATTERY ICS

1 cell lithium–ion/lithium–polymer battery protection IC

MC3002 Series

Outline

MC3002 series are protection IC with integrated MOS-FET for protection of the rechargeable Lithium–ion or Lithium–polymer battery.The overcharge, overdischarge and discharging and charging overcurrent protection of the rechargeable one-cell Lithium–ion or Lithium–polymer battery can be detected.

Features

(Unless otherwise specified, Ta=25°C)

(1) Range and accuracy of detection/release voltage

- Overcharge detection voltage.....4.15V to 4.50V, 5mV steps ..... Accuracy±22mV
  Accuracy±27mV
  (Topr=–5°C to +60°C)
- Overcharge release voltage .....4.00V to 4.35V *1..... Accuracy±50mV
- Overdischarge detection voltage .....2.00V to 3.00V *2..... Accuracy±100mV
- Overdischarge release voltage.....2.00V to 3.00V *2..... Accuracy±100mV
- Discharge overcurrent detection voltage .....30mV to 100mV, 1mV steps ..... Accuracy±6mV
- Charging overcurrent detect voltage .....–100mV to –30mV, 1mV steps..... Accuracy±9mV
- Short detection voltage.....Selection from 0.36, 0.56, 0.90V ..... Accuracy±100mV
- Over voltage charger detection voltage.....VDD–8.0V fixed ..... Accuracy±2.0V
- Over voltage charger release voltage .....VDD–7.3V fixed..... Accuracy±1.5V

(2) Range of detection delay time

- Overcharge detection delay time .....Selection from 1.0s, 4.5s, 6.25s
- Overdischarge detection delay time .....Selection from 100ms, 256ms
- Discharging overcurrent detection delay time ...Selection from 8ms, 12ms, 16ms, 20ms, 34ms
- Charging overcurrent detection delay time.....Selection from 8.5ms, 25ms, 32.5ms
- Short detection delay time.....Selection from 0.50ms, 0.75ms

(3) 0V battery charge function .....Selection from “Permission” or “Prohibition”

(4) The overcharge detection delay timer reset time function (function for the pulse charge) is provided. fixed

(5) Low current consumption

- Normal mode .....Typ. 3.0μA, Max. 5.2μA
- Stand-by mode .....Max. 0.1μA
  (For “Charger connection release” the overdischarge release condition.)
  Max. 0.5μA
  (For “Voltage release” the overdischarge release condition.)

(6) MOS-FET

- Source to Source on state resistance.....Typ. 10.6mΩ (@VCC=3.7V)

(7) Absolute maximum ratings

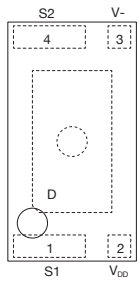
- VDD pin.....–0.3V to +8V
- V– pin.....VCC–12V to VCC+0.3V
- Drain-source voltage.....Max. 12V
- Drain current .....Max. 12V
- Total Power Dissipation .....Max. 1.0W
- Storage temperature.....–40°C to +125°C
- Operation temperature.....–40°C to +85°C

*1 Hysteresis voltagebetween Overcharge detection and release voltage is selectable from 0.10V/0.15V/0.20V/0.25V.
*2 Please inquire to us about details of the setting of Overdischarge detection and release voltage.

Pin assignment

PLP-4D

(Top view)



Pin no.	Symbol	Function
1	S1	S1 is a source pin of Discharge MOS-FET and a negative power supply, which is connected to the negative terminal of the battery.
2	VDD	VCC is a positive power supply pin, which is connected to the positive terminal of the battery through Rvcc (330 to 470 ohm).
3	V-	V- is an input pin that detects overcurrent. This pin is connected to the source terminal of Charge MOS-FET through Ridt (2.7 KΩ).
4	S2	S2 is a source pin of Charge MOS-FET, which is connected to a negative power supply terminal of chargers.
–	D	D is a common pin of two drains of Charge MOS-FET and Discharge MOS-FET. D must be open electrically.

LINE UP

Product name	Package	Optional function		Detection / Release voltage							Detection delay time					Optional function	
		0V battery charge function	Dicharge overcuttent detection voltage becomes dependent on VDD	Overcharge detection voltage	Overcharge release voltage	Overdischarge detection voltage	Overdischarge release voltage	Discharging overcurrent detection voltage (@VCC=3.5V)	Charging overcurrent detection voltage (@VCC=3.5V)	Short detection voltage	Overcharge detection delay time	Overdischarge detection delay time	Discharging overcurrent detection delay time	Charging overcurrent detection delay time	Short detection delay time	Discharge current limit (@VCC=3.5V)	Charge current limit (@VCC=3.5V)
		*1	*2	Vdet1	Vrel1	Vdet2	Vrel2	Vdet3	Vdet4	Vshort	tVdet1	tVdet2	tVdet3	tVdet4	tshort	Idischg	Icharge
				V	V	V	V	V	V	V	s	ms	ms	ms	µs	A	A
MC3002CL1GAM	PLP-4D	○	○	4.425	4.225	2.500	2.900	0.073	–0.073	0.360	1.0	100.0	12.0	8.5	500	6.75	6.75
MC3002CL2GAM	PLP-4D	○	○	4.275	4.275	2.300	2.900	0.084	–0.084	0.360	1.0	100.0	20.0	32.5	500	7.80	7.80

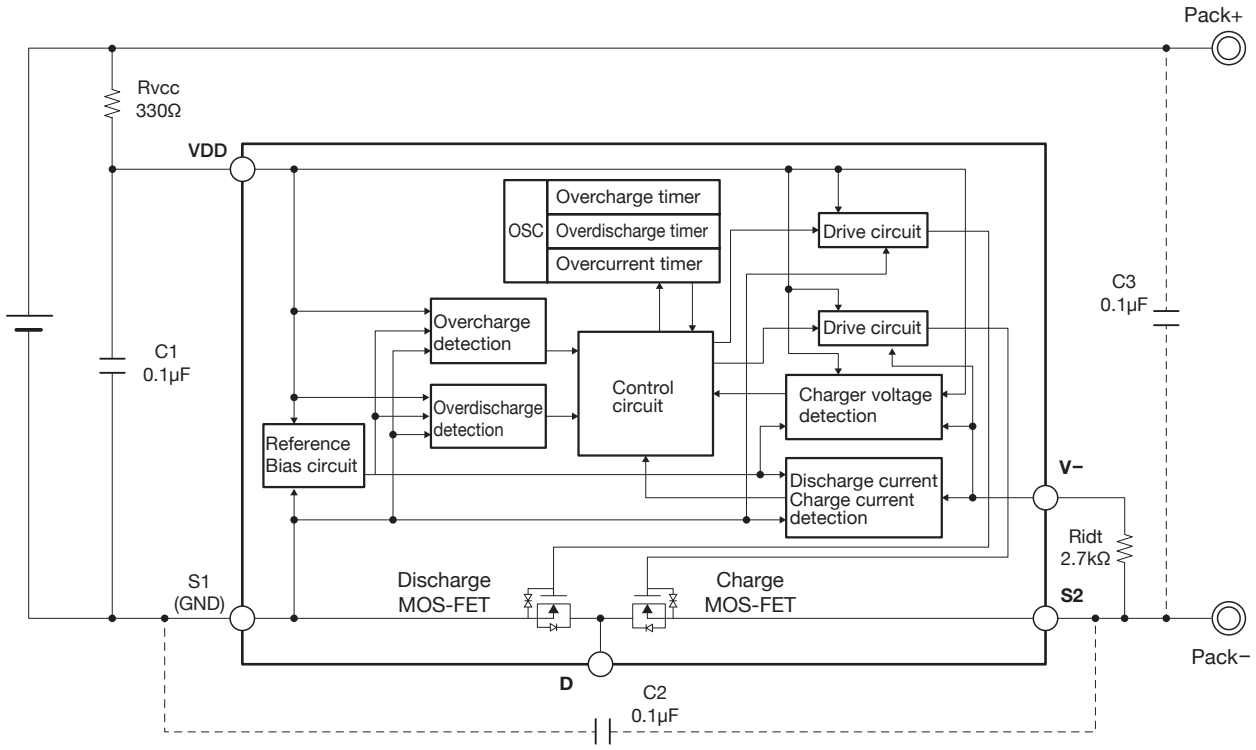
*1 0V battery charge function ○ Permission × Prohibition

*2 Optional functions ○ Provided. × Not provided.

PLP-4D ... 5,000pcs/Reel

Please inquire to us, if you request a rank other than the above.

Typical application circuit



- The resistors that are inserted into each pin are to protect the IC. They help to remove ESD and latch-up damages.
- The capacitors help to reduce the effects of transient variations in voltage and electromagnetic waves, and to improve ESD tolerance of the IC.
  Please use either C2 or C3, or both of them by request of your application.
- These values in the above figure are for example. Please choose appropriate values.

1 SECONDARY BATTERY ICS

1 cell lithium–ion/lithium–polymer battery protection IC

MC3011 Series

Outline

MC3011 series are protection IC with integrated MOS-FET for protection of the rechargeable lithium-ion or lithium-polymer battery. The overcharge, overdischarge and discharging and charging overcurrent protection of the rechargeable one-cell lithium–ion or lithium–polymer battery can be detected.

Features

(Unless otherwise specified, Ta=25°C)

(1) Range and accuracy of detection/release voltage

- Overcharge detection voltage ..... 4.15V to 4.50V, 5mV steps ..... Accuracy±22mV
  Accuracy±27mV (Topr=–5°C to +60°C)
- Overcharge release voltage ..... 4.00V to 4.35V *1 ..... Accuracy±50mV
- Overdischarge detection voltage ..... 2.00V to 3.00V *2 ..... Accuracy±100mV
- Overdischarge release voltage ..... 2.00V to 3.00V *2 ..... Accuracy±100mV
- Discharging overcurrent detection voltage ..... Selection from 30mV to 130mV, 1mV ..... Accuracy±6mV
- Charging overcurrent detection voltage * ..... Selection from –130mV to –30mV, 1mV .... Accuracy±9mV
- Short detection voltage ..... Selection from 0.36V, 0.56V, 0.90V ..... Accuracy±100mV

*1 Hysteresis voltagebetween Overcharge detection and release voltage is selectable from 0.10V/0.15V/0.20V/0.25V.
*2 Please inquire to us about details of the setting of Overdischarge detection and release voltage.

(2) Range of detection delay time

- Overcharge detection delay time ..... Selection from 1.0s, 4.5s, 6.25s
- Overdischarge detection delay time ..... Selection from 100ms, 256ms
- Discharging overcurrent detection delay time ... Selection from 8ms, 12ms, 16ms, 20ms, 34ms
- Charging overcurrent detection delay time..... Selection from 8.5ms, 25ms, 32.5ms
- Short detection delay time..... Selection from 0.50ms, 0.75ms

(3) 0V battery charge function .....Selection from “Permission” or “Prohibition”

(4) The overcharge detection delay timer reset time function (function for the pulse charge) is provided. fixed

(5) Low current consumption

- Normal mode .....Typ. 3.0μA, Max. 5.2μA
- Stand-by mode .....Max. 0.1μA
  (For “Charger connection release” the overdischarge release condition.)
  Max. 0.5μA
  (For “Voltage release” the overdischarge release condition.)

(6) MOS-FET

- Source to Source on state resistance.....Typ. 13.4mΩ (@VDD=3.7V)

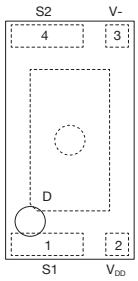
(7) Absolute maximum ratings

- VCC pin.....–0.3V to +12V
- V- pin.....VDD-24V to VDD+0.3V
- Drain-source voltage.....Max. 24V
- Drain current .....Max. 9A
- Total Power Dissipation .....Max. 1.0W
- Storage temperature.....–40°C to +125°C
- Operation temperature.....–40°C to +85°C

Pin assignment

PLP-4D

(Top view)



Pin no.	Symbol	Function
1	S1	S1 is a source pin of Discharge MOS-FET and a negative power supply, which is connected to the negative terminal of the battery.
2	VDD	VCC is a positive power supply pin, which is connected to the positive terminal of the battery through Rvcc (330 to 470 ohm).
3	V−	V− is an input pin that detects overcurrent. This pin is connected to the source terminal of Charge MOS-FET through Ridt (2.7 kohm).
4	S2	S2 is a source pin of Charge MOS-FET, which is connected to a negative power supply terminal of chargers.
–	D	D is a common pin of two drains of Charge MOS-FET and Discharge MOS-FET. D must be open electrically.

LINE UP

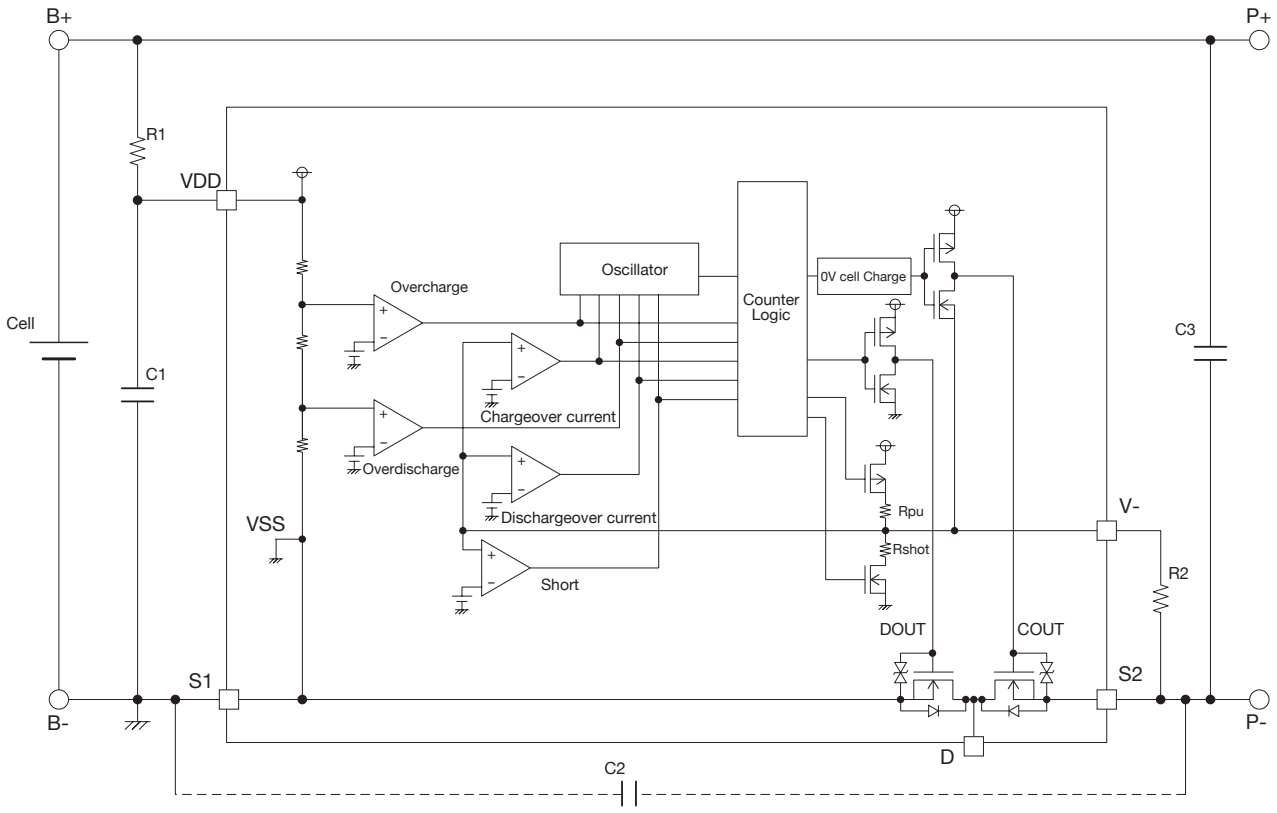
Product name	Package	Optional function		Detection / Release voltage							Detection delay time					Optional function	
		0V battery charge function	Dicharge overcuttent detection voltage becomes dependent on VDD	Overcharge detection voltage	Overcharge release voltage	Overdischarge detection voltage	Overdischarge release voltage	Discharging overcurrent detection voltage	Charging overcurrent detection voltage	Short detection voltage	Overcharge detection delay time	Overdischarge detection delay time	Discharging overcurrent detection delay time	Charging overcurrent detection delay time	Short detection delay time	Discharge current limit (@VCC=3.5V)	Charge current limit (@VCC=3.5V)
		*1	*2	Vdet1	Vrel1	Vdet2	Vrel2	Vdet3-1	Vdet4	Vshort	tVdet1	tVdet2	tVdet3	tVdet4	tshort	Idischg	Icharge
				V	V	V	V	V	V	V	s	ms	ms	ms	µs	A	A
MC3011CL1GAM	PLP-4D	○	○	4.425	4.225	2.500	2.900	0.064	-0.073	0.36	1.0	100	12.0	8.50	500	4.50	5.40

PLP-4D … 5,000pcs/Reel

*1 0V battery charge function ○ Permission × Prohibition
*2 Optional functions ○ Provide × Not provided

Please inquire to us, if you request a rank other than the above.

Typical application circuit



- R1 and C1 stabilize a supply voltage ripple. However, the detection voltage rises by the current of penetration in IC of the voltage detection when R1 is enlarged, and the value of R1 is adjusted to 1KΩ or less. Moreover, adjust the value of C1 to 0.01μF or more to do the stability operation, please.

- R1 and R2 resistors are current limit resistance if a charger is connected reversibly or a high–voltage charger that exceeds the absolute maximum rating is connected. R1 and R2 may cause a power consumption will be over rating of power dissipation, therefore the “R1+R2” should be more than 1KΩ. Moreover, if R2 is too enlarged, the charger connection release cannot be occasionally done after the overdischarge is detected, so adjust the value of R2 to 10KΩ or less, please.

- C2 and C3 capacitors have effect that the system stability about voltage ripple or imported noise. After check characteristics, decide that these capacitors should be inserted or not, where should be inserted, and capacitance value, please.

1 SECONDARY BATTERY ICS

1 cell lithium-ion/lithium-polymer battery protection IC

MD1421ExxCPAL Series

Outline

MD1421ExxCPAL series are protection IC with integrated MOS-FET for protection of the rechargeable lithium-ion or lithium-polymer battery. The overcharge, overdischarge and discharging and charging overcurrent protection of the rechargeable one-cell lithium-ion or lithium-polymer battery can be detected.

Features

(Unless otherwise specified, Ta=25°C)

(1) Range and accuracy of detection/release voltage

- Overcharge detection voltage.....4.10V to 4.45V, 5mV steps ..... Accuracy±20mV
  Accuracy±25mV (Topr=–5°C to +60°C)
- Overcharge release voltage .....3.90V to 4.30V *1..... Accuracy±50mV
- Overdischarge detection voltage .....2.00V to 3.00V *2..... Accuracy±100mV
- Overdischarge release voltage.....2.00V to 3.20V *2..... Accuracy±100mV
- Discharge overcurrent detection voltage .....40mV to 180mV, 5mV steps ..... Accuracy±5mV
- Charging overcurrent detect voltage .....-180mV to -50mV, 5mV steps ..... Accuracy±15mV
- Short detection voltage.....Selection from 0.56, 0.90V ..... Accuracy±100mV
- Over voltage charger detection voltage.....VDD–8.0V fixed ..... Accuracy±2.0V
- Over voltage charger release voltage .....VDD–7.3V fixed..... Accuracy±1.5V

(2) Range of detection delay time

- Overcharge detection delay time .....Selection from 1.0s, 4.5s, 6.25s
- Overdischarge detection delay time .....Selection from 100ms, 256ms
- Discharging overcurrent detection delay time ...Selection from 8ms, 12ms, 16ms, 20ms, 34ms
- Charging overcurrent detection delay time.....Selection from 8.5ms, 25ms, 32.5ms
- Short detection delay time.....Selection from 0.50ms, 0.75ms, 1.00ms

(3) 0V battery charge function .....Selection from “Permission” or “Prohibition”

(4) The overcharge detection delay timer reset time function (function for the pulse charge) is provided. fixed

(5) Low current consumption

- Normal mode .....Typ. 3.0μA, Max. 5.2μA
- Stand-by mode .....Max. 0.1μA
  (For “Charger connection release” the overdischarge release condition.)
  Max. 0.5μA
  (For “Voltage release” the overdischarge release condition.)

(6) MOS-FET

- Source to Source on state resistance.....Typ. 38.0mΩ (@VCC=3.7V)

(7) Absolute maximum ratings

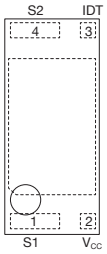
- VCC pin.....–0.3V to +12V
- V– pin.....VCC–24V to VCC+0.3V
- Drain-source voltage.....Max. 24V
- Drain current .....Max. 6A
- Total Power Dissipation .....Max. 1.0W
- Storage temperature.....–40°C to +125°C
- Operation temperature.....–40°C to +85°C

*1 Hysteresis voltagebetween Overcharge detection and release voltage is selectable from 0.10V/0.15V/0.20V/0.25V.
*2 Please inquire to us about details of the setting of Overdischarge detection and release voltage.

Pin assignment

PLP-4-1228

(Top view)



Pin no.	Symbol	Function
1	S1	S1 is a source pin of Discharge MOS-FET and a negative power supply, which is connected to the negative terminal of the battery
2	VCC	VCC is a positive power supply pin, which is connected to the positive terminal of the battery through Rvcc (330 to 470 ohm)
3	IDT	V- is an input pin that detects overcurrent This pin is connected to the source terminal of Charge MOS-FET through Ridt (2.7 kohm)
4	S2	S2 is a source pin of Charge MOS-FET, which is connected to a negative power supply terminal of chargers
-	D	D is a common pin of two drains of Charge MOS-FET and Discharge MOS-FET. D must be open electrically

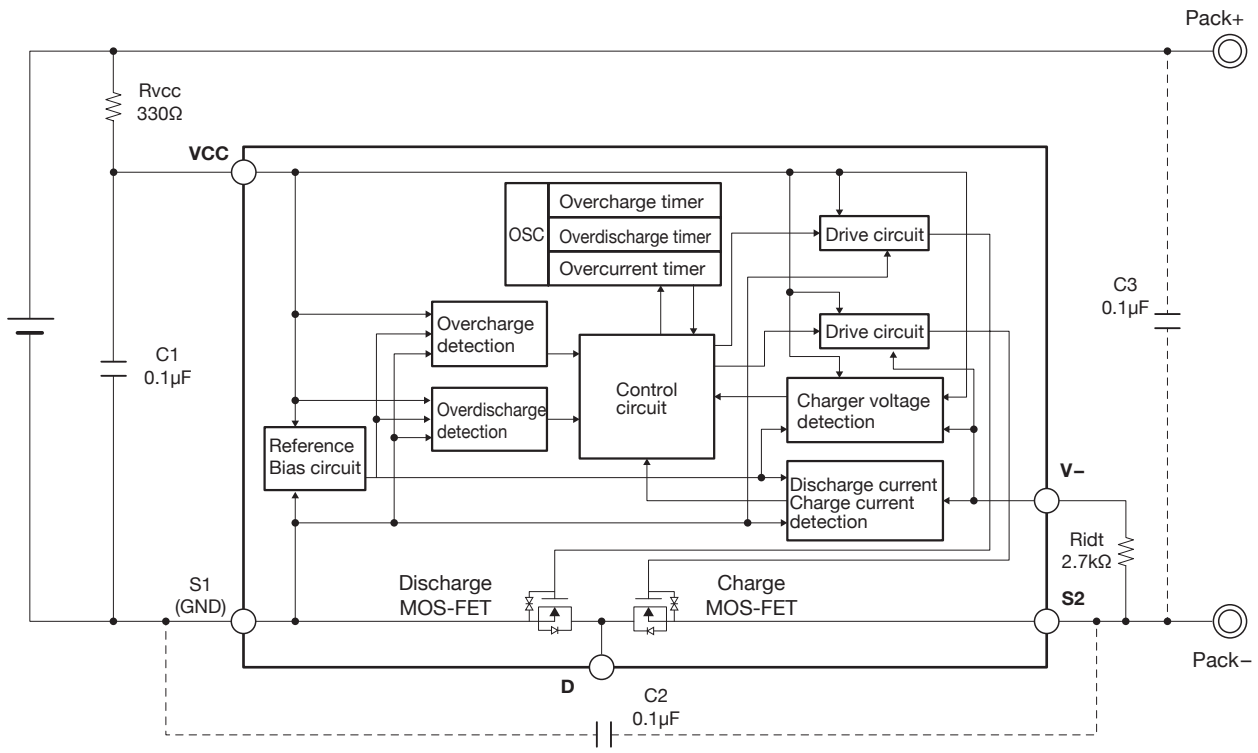
LINE UP

Product name	Package	Optional function		Detection / Release voltage							Detection delay time					Optional function	
		0V battery charge function	Dicharge overcuttent detection voltage becomes dependent on VDD	Overcharge detection voltage	Overcharge release voltage	Overdischarge detection voltage	Overdischarge release voltage	Discharging overcurrent detection voltage (@VCC=3.5V)	Charging overcurrent detection voltage (@VCC=3.5V)	Short detection voltage	Overcharge detection delay time	Overdischarge detection delay time	Discharging overcurrent detection delay time	Charging overcurrent detection delay time	Short detection delay time	Discharge current limit (@VCC=3.5V)	Charge current limit (@VCC=3.5V)
		*1	*2	V1	V2	V4	V3	V5	V9	V6	Tsp3	Tsp1	Tsp2	Tsp5	Tsp4	Idischg	Icharge
				V	V	V	V	V	V	V	s	ms	ms	ms	µs	A	A
MD1421E28CPAL-R	PLP-4-1228	○	×	4.375	4.175	3.000	3.000	0.040	–0.050	0.900	1.0	100.0	12.0	8.5	500	1.05	1.30
MD1421E34CPAL-R	PLP-4-1228	○	×	4.375	4.175	3.000	3.200	0.040	–0.050	0.900	1.0	100.0	12.0	8.5	500	1.05	1.30
MD1421E35CPAL-R	PLP-4-1228	×(0.65V)	○	4.425	4.225	2.700	2.700	0.070	–0.070	0.560	1.0	100.0	20.0	8.5	750	1.80	1.80
MD1421E36CPAL-R	PLP-4-1228	○	○	4.425	4.225	2.800	2.800	0085	–0.095	0.900	1.0	100.0	20.0	8.5	750	2.20	2.45
MD1421E39CPAL-R	PLP-4-1228	×(0.90V)	×	4.280	-	2.700	2.700	0.080	–0.080	0.900	1.0	100.0	20.0	8.5	750	2.05	2.05

*1 0V battery charge function ○ Permission × Prohibition
*2 Optional functions ○ Provided. × Not provided.

PLP–4–1228 … 5,000pcs/Reel
Please inquire to us, if you request a rank other than the above.

Typical application circuit



- The resistors that are inserted into each pin are to protect the IC. They help to remove ESD and latch-up damages.
- The capacitors help to reduce the effects of transient variations in voltage and electromagnetic waves, and to improve ESD tolerance of the IC.
  Please use either C2 or C3, or both of them by request of your application.
- These values in the above figure are for example. Please choose appropriate values.

1 SECONDARY BATTERY ICS

1 cell lithium–ion/lithium–polymer battery protection IC

MC3651 Series

Outline

MC3651 series are protection IC with integrated MOS-FET for protection of the rechargeable Lithium-ion or Lithium-polymer battery.The overcharge, overdischarge and discharging and charging overcurrent protection of the rechargeable one-cell Lithium-ion or Lithium-polymer battery can be detected.

Features

(Unless otherwise specified, Ta=25°C)

(1) Range and accuracy of detection/release voltage

- Overcharge detection voltage ..... 4.15V to 4.50V, 5mV step ..... Accuracy±20mV
  Accuracy±25mV
  (Topr=–5°C to +60°C)
- Overcharge release voltage ..... 4.00V to 4.35V *1 ..... Accuracy±50mV
- Overdischarge detection voltage ..... 2.00V to 3.00V *2 ..... Accuracy±100mV
- Overdischarge release voltage ..... 2.00V to 3.00V *2 ..... Accuracy±100mV
- Discharging overcurrent detection voltage ..... 20mV to 65mV, 1mV ..... Accuracy±5mV
  (Discharge current limit) ..... (0.310A to 1.00A)
- Charging overcurrent detection voltage ..... –65mV to –25mV, 1mV ..... Accuracy±5mV
  (Charge current limit) ..... (0.385A to 1.00A)
- Short detection voltage ..... Selection from 0.19V, 0.36V ..... Accuracy±50mV

(2) Range of detection delay time

- Overcharge detection delay time ..... Selection from 1.0s fixed
- Overdischarge detection delay time ..... Selection from 100ms, 256ms
- Discharging overcurrent detection delay time ... Selection from 8ms, 12ms, 16ms, 20ms, 48ms, 224ms
- Charging overcurrent detection delay time ..... Selection from 8.5ms, 16.5ms, 32.5ms
- Short detection delay time ..... Selection from 0.50ms, 0.75ms

(3) 0V battery charge function .....Selection from “Permission” or “Prohibition” *3

(4) Low current consumption

- Normal mode .....Typ. 3.0μA, Max. 4.5μA
- Stand-by mode .....Max. 0.1μA (In case Overdischarge latch function “Enable”)
  Max. 0.5μA (In case Overdischarge latch function “Disable”)

(6) MOS-FET

- Source to Source on state resistance .....Typ. 65.0mΩ (@VDD=3.5V)

(7) Absolute maximum ratings

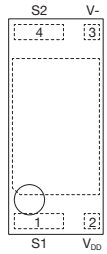
- VCC pin .....–0.3V to +12V
- V- pin .....VDD–24V to VDD+0.3V
- Drain-source voltage .....Max. 24V
- Drain current .....Max. 1.2A
- Total Power Dissipation .....Max. 0.4W
- Storage temperature .....–40°C to +125°C
- Operation temperature .....–40°C to +85°C

*1 Hysteresis voltagebetween Overcharge detection and release voltage is selectable from 0.10V/0.15V/0.20V/0.25V.
*2 Please inquire to us about details of the setting of Overdischarge detection and release voltage.
*3 In the case of "0V battery charge inhibition", the setting voltage is selectable from 0.65V/0.90V.
*4 Please inquire to us, if you need another specifications.

Pin assignment

PLP-4E

(Top view)



Pin no.	Symbol	Function
1	S1	Negative power supply and source of discharge MOS-FET terminal. Connect to the negative terminal of the battery.
2	VDD	Positive power supply voltage input terminal. Connect to the positive terminal of the battery through R1.
3	V−	Charger negative voltage input terminal. Connect to S2 terminal through R2.
4	S2	Source terminal of charge MOS-FET. Connect to a negative power supply terminal of charger.
−	D	Drain terminal of discharge and charge MOS-FET. Drain terminal must be open electrically.

LINE UP

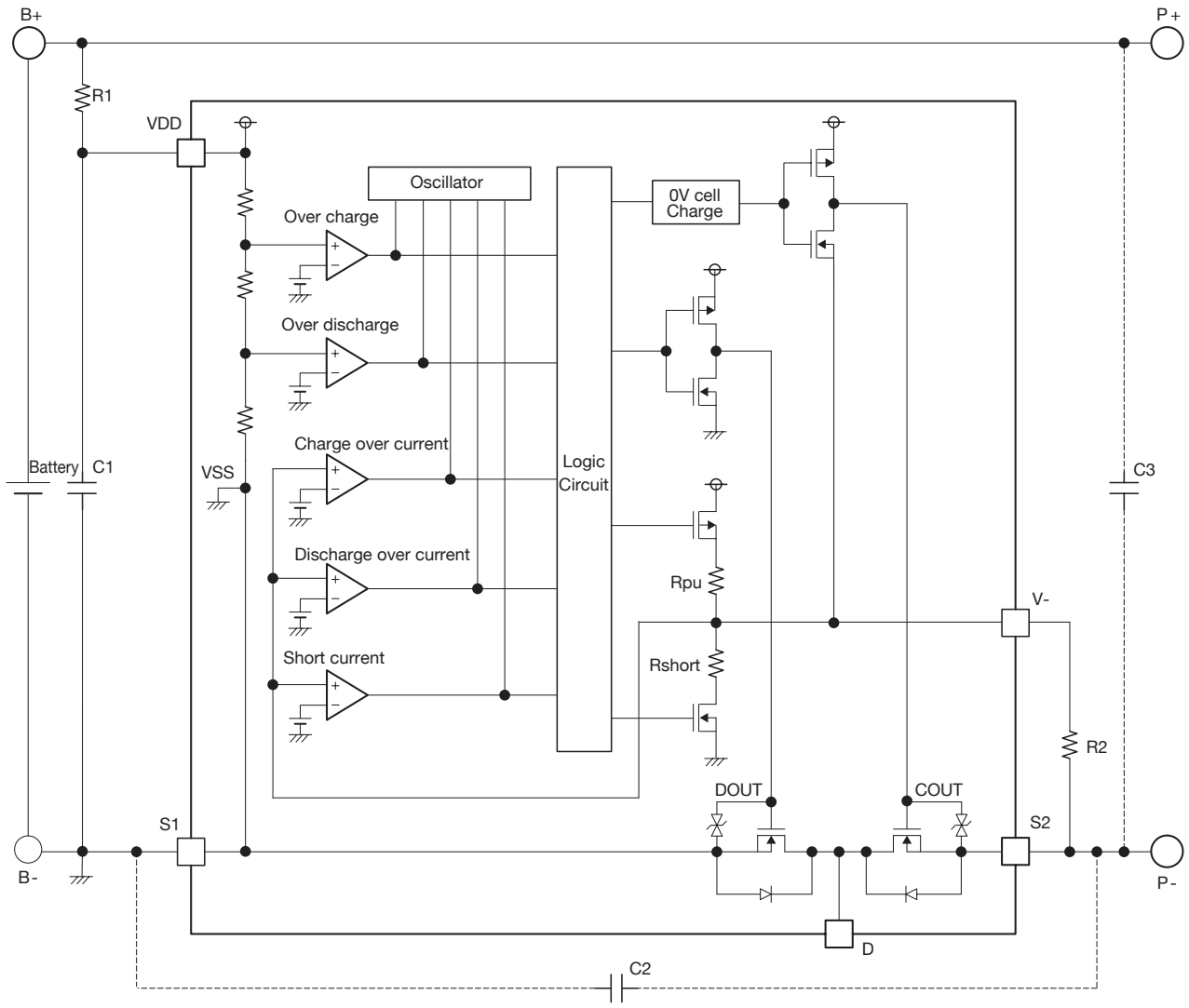
Product name	Package	Optional function			Detection / Release voltage							Detection delay time					Optional function		MOS -FET
		0V battery charge function	Overcharge detection Latch function	Overdischarge detection Latch function	Overcharge detection voltage	Overcharge release voltage	Overdischarge detection voltage	Overdischarge release voltage	Discharging overcurrent detection voltage (@VDD=3.5V)	Charging overcurrent detection voltage (@VDD=3.5V)	Short detection voltage	Overcharge detection delay time	Overdischarge detection delay time	Discharging overcurrent detection delay time	Charging overcurrent detection delay time	Short detection delay time	Discharge current limit (@VCC=3.5V)	Charge current limit (@VCC=3.5V)	Source to source on-state resistance (@VCC=3.5V)
			*1	*1	Vdet1	Vrel1	Vdet2	Vrel2	Vdet3	Vdet4	Vshort	tVdet1	tVdet2	tVdet3	tVdet4	tshort	Idischg	Icharge	Rss(on)
					V	V	V	V	mV	mV	V	s	ms	ms	ms	µs	A	A	mΩ
MC3651DF1AAM	PLP-4E	0.65V	×	○	4.280	4.180	2.700	2.700	20.0	-25.0	0.190	1.0	100.0	20.0	8.5	750	0.315	0.390	65.0
MC3651DF3AAM	PLP-4E	0.90V	×	○	4.265	4.065	3.000	3.000	20.0	-25.0	0.190	1.0	100.0	20.0	8.5	500	0.315	0.390	65.0

*1 Optional functions ○ Provided. × Not provided.

PLP-4E ... 5,000pcs/Reel

Please inquire to us, if you request a rank other than the above.

Typical application circuit



Symbol	Parts	Min.	Typ.	Max.	Purpose
R1	Resistor	-	330Ω	470Ω	For voltage fluctuation, For ESD
C1	Capacitor	-	0.1μF	-	For voltage fluctuation
R2	Resistor	-	2.7kΩ	-	Current limit for charger reverse connection
C2	Capacitor	-	0.1μF	-	For exogenous noise
C3	Capacitor	-	0.1μF	-	For exogenous noise

1 SECONDARY BATTERY ICS

1 cell lithium–ion/lithium–polymer battery protection IC

MC3761 Series

Outline

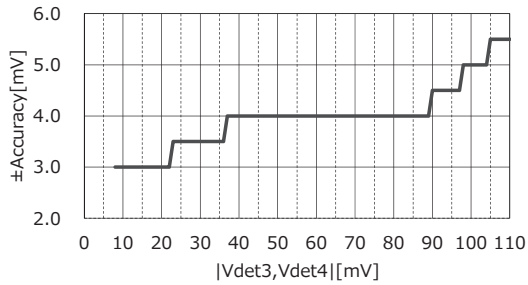
MC3761 series are protection IC with integrated MOS-FET for protection of the rechargeable Lithium-ion or Lithium-polymer battery. The overcharge, overdischarge and discharging and charging overcurrent protection of the rechargeable one-cell Lithium-ion or Lithium-polymer battery can be detected.

Features

(Unless otherwise specified, Ta=25°C)

(1) Range and accuracy of detection/release voltage

- Overcharge detection voltage.....4.20V to 4.70V, 5mV step ..... Accuracy ±20mV
  Accuracy -50/+25mV(Ta=-40 to +85°C)
- Overcharge release voltage .....Vdet1-0.4V to Vdet1,100mV step..... Accuracy -30/+20mV (Vdet1=Vrel1)
  Accuracy ±30mV (Vdet1≠Vrel1)
- Overdischarge detection voltage .....2.00V to 3.30V, 50mV step ..... Accuracy ±30mV
- Overdischarge release voltage.....Vdet2+0.4V to Vdet2,100mV step ..... Accuracy -30/+40mV (Vdet2=Vrel2)
  Accuracy ±90mV (Vdet2≠Vrel2)
- Discharging overcurrent detection voltage .....+8mV to +110mV, 1mV step..... Accuracy *1
  (Discharging overcurrent detection current).....(0.140A to 1.95A)
- Discharging overcurrent release voltage.....Selection from
  VDD-0.7V, Vdet3, 1.4V
- Charging overcurrent detection voltage.....-100mV to -8mV, 1mV step ..... Accuracy *1
  (Charging overcurrent detection current) .....(-0.140A to -1.75A)
- Short detection voltage.....0.040V to 0.700V, 5mV step ..... Accuracy ±20 to 50mV



※1
These range and accuracy are the one of the standard setting.
It may differ each product.
Please refer to an individual specifications
about detail parameters.

(2) Range of detection delay time

- Overcharge detection delay time .....1.0s fixed
- Overdischarge detection delay time .....Selection from 20ms, 96ms, 144ms
- Discharging overcurrent detection delay time .....Selection from 6ms, 8ms, 12ms, 16ms, 20ms, 32ms, 128ms, 256ms, 512ms
- Charging overcurrent detection delay time.....Selection from 8ms, 16ms, 32ms
- Short detection delay time.....150us to 550us, 50us step

(3) 0V battery charge function ..... Selection from "Inhibition" or "Permission"*2

(4) Low current consumption

- Normal mode .....Typ. 1.0μA, Max. 1.4μA
- Standby mode .....Max. 0.025μA (In case Overdischarge latch function "Enable")
  Max. 0.550μA (In case Overdischarge latch function "Disable")

(5) MOS-FET

- Source to Source on state resistance.....Typ. 56.5mΩ (@VDD=3.5V)

(6) Absolute maximum ratings

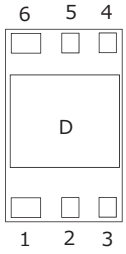
- VDD pin .....-0.3V to +12V
- V- pin .....VDD-24V to VDD+0.3V
- Drain-source voltage.....Max. 24V
- Source current 2.0A
- Total Power Dssipation 0.3W
- Storage temperature.....-55 to +125°C
- Operation temperature.....-40 to +85°C

※2 In the case of "0V battery charge inhibition", the setting voltage is 0.90V.
※3 Please inquire to us, if you need another specifications.

Pin assignment

PLP-6J

(Top view)



Pin no.	Symbol	Function
1	S1	Source terminal of discharge FET
2	VSS	Negative power supply voltage input terminal
3	VDD	Positive power supply voltage input terminal
4	NC	No connection
5	VM	Charger negative voltage input terminal
6	S2	Source tarminal of charge FET
-	D	Drain terminal of discharge FET and charge FET

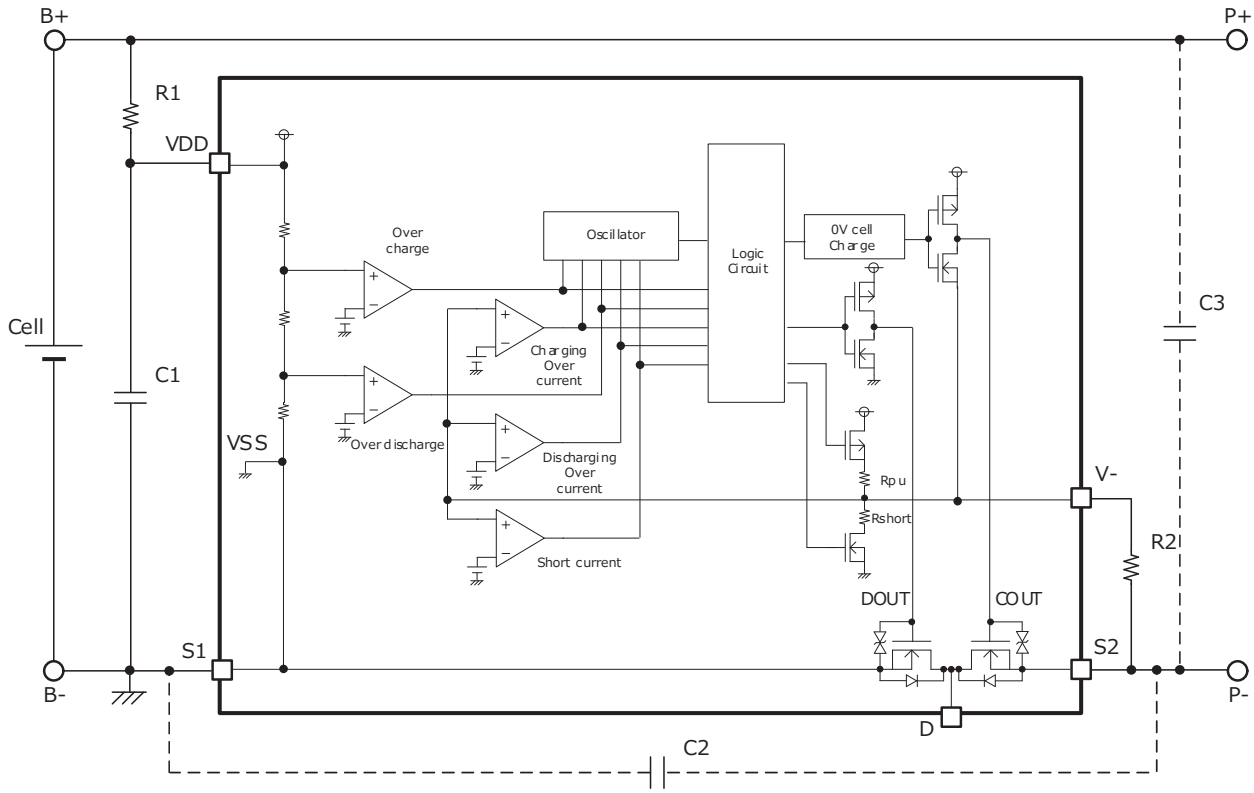
LINE UP

Product name	Package	Model Code.	Optional function			Detection / Release voltage							Detection delay time					Overcurrent		MOS -FET
			0V battery charge function	Overcharge detection Latch function	Overdischarge detection Latch function	Overcharge detection voltage	Overcharge release voltage	Overcharge release voltage	Overdischarge release voltage	Discharging overcurrent detection voltage (@VDD=3.5V)	Charging overcurrent detection voltage (@VDD=3.5V)	Short detection voltage	Overcharge detection delay time	Overdischarge detection delay time	Discharging overcurrent detection delay time	Charging overcurrent detection delay time	Short detection delay time	Discharge current limit (@VDD=3.5V)	Charge current limit (@VDD=3.5V)	Source to source on-state resistance (@VDD=3.5V)
				*1	*1	Vdet1	Vrel1	Vdet2	Vrel2	Vdet3	Vdet4	Vshort	tVdet1	tVdet2	tVdet3	tVdet4	tshort	Idischg	Icharge	Rss(on)
						V	V	V	V	mV	mV	V	s	ms	ms	ms	µs	A	A	mΩ
MC3761PK1HAU	PLP-6J	761PK1U	Inhibition	×	○	4.280	4.180	2.700	2.700	30.0	-30.0	0.060	1.0	96.0	20.0	8.0	300	0.530	0.535	56.5
MC3761AJ2HAU	PLP-6J	761AJ2U	Permission	×	×	4.455	4.255	2.800	3.200	110.0	-100.0	0.270	1.0	96.0	12.0	8.0	300	1.945	1.785	56.5
MC3761AJ3HAU	PLP-6J	761AJ3U	Permission	×	×	4.225	4.025	2.800	3.200	37.0	-36.0	0.080	1.0	96.0	12.0	8.0	300	0.655	0.645	56.5

*1 Optional functions ○ Enable × Disable

Please inquire to us, if you request a rank other than the above.

Typical application circuit



Symbol	Part	Min.	Typ.	Max.	Purpose
R1	Resistor	-	100Ω	1.0kΩ	For voltage fluctuation, For ESD
C1	Capacitor	0.01uF	0.1uF	1.0uF	For voltage fluctuation
R2	Resistor	-	1.0kΩ	-	Current limit for charger reverse connection
C2	Capacitor	-	0.1uF	-	For exogenous noise
C3	Capacitor	-	0.1uF	-	For exogenous noise

Application hints
The resistors that are inserted into each pin are to protect the IC. They help to remove ESD and latch-up damages. The capacitors help to reduce the effects of transient variations in voltage and electromagnetic waves,and to improve ESD tolerance of the IC.
Please use either C2 or C3, or both of them by request of your application.
These values in the above figure are for example. Please choose appropriate values.

1 SECONDARY BATTERY ICS

1 cell lithium–ion/lithium–polymer battery protection IC

MJ3401 Series

Outline

MJ3401 series are protection IC with integrated MOS-FET for protection of the rechargeable Lithium-ion or Lithium-polymer battery. The overcharge, overdischarge and discharging and charging overcurrent protection of the rechargeable one-cell Lithium-ion or Lithium-polymer battery can be detected.
It's possible by OTP technology to detect unusual state of a Li-ion battery with very high accuracy.

Features

(Unless otherwise specified, Ta=25°C)

(1) Range and accuracy of detection/release voltage

- Overcharge detection voltage ..... 4.15V to 4.50V, 5mV step ..... Accuracy±10mV
  Accuracy-20mV to +15mV
  (Topr=–5°C to +60°C)
- Overcharge release hysteresis voltage ..... Selection from 0V, 0.1V, 0.2V
- Overdischarge detection voltage ..... 2.00V to 3.00V, 100mV step ..... Accuracy±35mV
- Overdischarge release hysteresis voltage..... Selection from 0V, 0.2V, 0.3V, 0.4V
- Discharging overcurrent detection current ..... 4.0A to 8.0A, 0.1A step *1
- Charging overcurrent detection current ..... 4.0A to 8.0A, 0.1A step *1
- Short detection voltage..... 180mV to 360mV, 10mV step ..... Accuracy±15mV

(2) Range of detection delay time

- Overcharge detection delay time ..... Selection from 1.024s, 4.60s
- Overdischarge detection delay time ..... Selection from 20ms, 96ms, 144ms
- Discharging overcurrent detection delay time ... Selection from 6ms, 8ms, 12ms, 16ms, 20ms, 32ms, 128ms, 256ms
- Charging overcurrent detection delay time..... Selection from 8ms, 16ms, 32ms
- Short detection delay time..... Selection from 500µs, 820µs

(3) 0V battery charge function .....Selection from “Permission” or “Prohibition” *2

(4) Low current consumption

- Normal mode .....Typ. 4.5µA, Max. 7.0µA
- Stand-by mode .....Max. 0.1µA (In case Overdischarge latch function “Enable”)
  Max. 0.3µA (In case Overdischarge latch function “Disable”)

(5) MOS-FET

- Source to Source on state resistance.....Typ. 11.0mΩ (@VDD=3.6V)

(6) Absolute maximum ratings

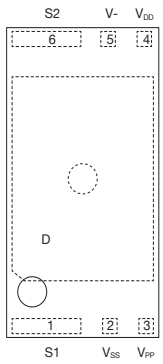
- VCC pin.....–0.3V to +10V
- V- pin.....VDD–24V to VDD+0.3V
- VPP pin .....VDD–0.3V to VDD+0.3V
- Drain-source voltage.....Max. 24V
- Drain current .....Max. 1.2A
- Total Power Dissipation .....Max. 1.0W
- Storage temperature.....–55°C to +125°C
- Operation temperature.....–40°C to +85°C

*1 Please inquire to us about details of the accuracy of Overcurrent detection current, which is varies depending on the setting value.
*2 In the case of "0V battery charge inhibition", the setting voltage is selectable from 0.90V/1.25V.
*3 Please inquire to us, if you need another specifications.

Pin assignment

PLP-6G

(Top view)



Pin no.	Symbol	Function
1	S1	Source terminal of discharge MOS-FET.Connect to the negative terminal of the battery.
2	VDD	Negative power supply voltage input terminal. Connect to the negative terminal of the battery.
3	VPP	Test terminal. VPP terminal must be connected to VSS terminal .
4	VDD	Positive power supply voltage input terminal. Connect to the positive terminal of the battery through R1.
5	V-	Charger negative voltage input terminal. Connect to the S2 terminal through R2.
6	S2	Source terminal of charge MOS-FET. Connect to a negative power supply terminal of charger.
-	D	Drain terminal of discharge and charge MOS-FET. Drain terminal must be open electrically.

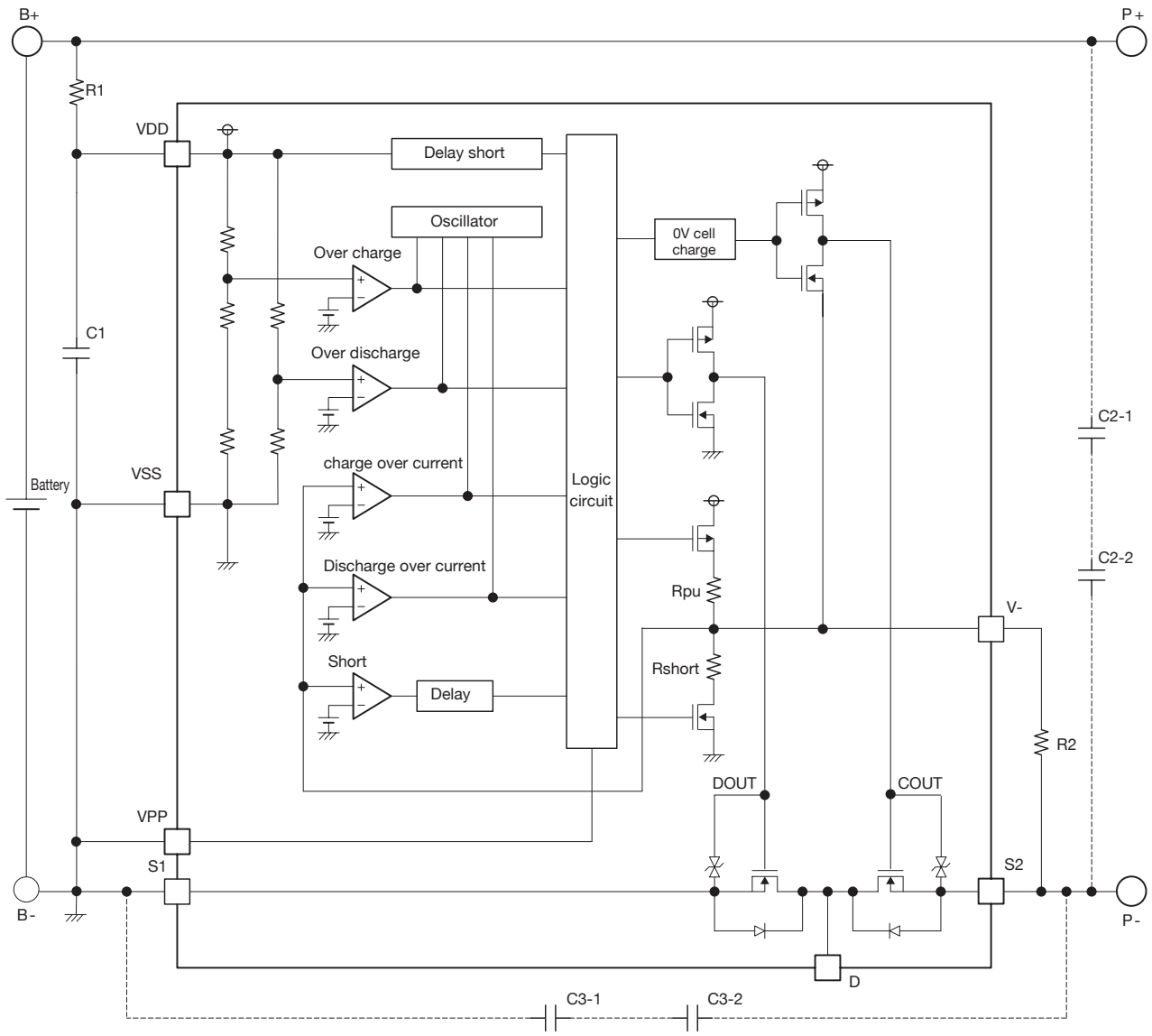
LINE UP

Product name	Package	Optional function			Detection / Release voltage							Detection delay time					Optional function		MOS -FET
		0V battery charge function	Overcharge detection Latch function	Overdischarge detection Latch function	Overcharge detection voltage	Overcharge release voltage	Overdischarge detection voltage	Overdischarge release voltage	Discharging overcurrent detection voltage (@VDD=3.6V)	Charging overcurrent detection voltage (@VDD=3.6V)	Short detection voltage	Overcharge detection delay time	Overdischarge detection delay time	Discharging overcurrent detection delay time	Charging overcurrent detection delay time	Short detection delay time	Discharge current limit (@VCC=3.6V)	Charge current limit (@VCC=3.6V)	Source to source on-state resistance (@VCC=3.6V)
			*1	*1	Vdet1	Vrel1	Vdet2	Vrel2	Vdet3	Vdet4	Vshort	tVdet1	tVdet2	tVdet3	tVdet4	tshort	Idsc36	Ichg36	Rss(on)
					V	V	V	V	mV	mV	V	s	ms	ms	ms	µs	A	A	mΩ
MJ3401A01DAM	PLP-6G	Permission	×	×	4.425	4.220	2.500	2.925	*2	*3	0.360	1.024	96.0	12.0	8.0	500	6.00	6.60	11.0
MJ3401A07DAM	PLP-6G	Permission	×	×	4.425	4.220	2.500	2.925	*2	*3	0.180	1.024	96.0	12.0	8.0	500	8.00	6.00	11.0
MJ3401A08DAM	PLP-6G	Permission	×	×	4.475	4.265	2.300	2.690	*2	*3	0.360	1.024	96.0	20.0	32.0	500	9.20	6.90	11.0
MJ3401C01DAM	PLP-6G	0.90V	○	○	4.425	4.425	2.800	2.800	*2	*3	0.180	1.024	144.0	16.0	8.0	500	7.50	6.00	11.0
MJ3401C02DAM	PLP-6G	0.90V	○	○	4.435	4.435	2.800	2.800	*2	*3	0.180	1.024	144.0	16.0	8.0	500	7.50	6.00	11.0

*1 Optional functions ○ Provided. × Not provided.
*2 Discharging overcurrent detection voltage (Vdet3) = Idch36 * Rss(on)36
*3 Charging overcurrent detection voltage (Vdet4) = Ichg36 * Rss(on)36

PLP-6G ... 5,000pcs/Reel
Please inquire to us, if you request a rank other than the above.

Typical application circuit



Symbol	Parts	Min.	Typ.	Max.	Purpose
R1	Resistor	-	330Ω	-	For voltage fluctuation, For ESD
C1	Capacitor	0.01μF	0.1μF	1.0μF	For voltage fluctuation
R2	Resistor	-	1.0kΩ	10kΩ	Current limit for charger reverse connection
C2	Capacitor	-	0.1μF	-	For exogenous noise
C3	Capacitor	-	0.1μF	-	For exogenous noise

1 cell lithium–ion/lithium–polymer battery protection IC

MJ3542 Series

Outline

MJ3542 series are protection IC with integrated MOS-FET for protection of the rechargeable Lithium-ion or Lithium-polymer battery. The overcharge, overdischarge and discharging and charging overcurrent protection of the rechargeable one-cell Lithium-ion or Lithium-polymer battery can be detected.

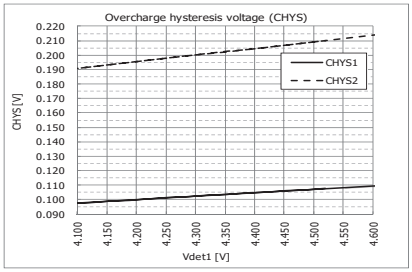
Features

(Unless otherwise specified, Ta=25°C)

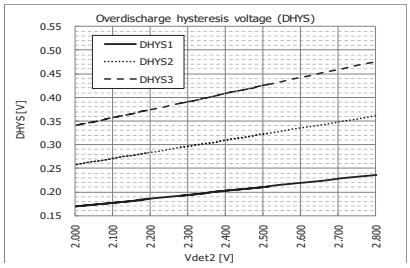
(1) Range and accuracy of detection/release voltage

- Overcharge detection voltage.....4.10V to 4.60V, 5mV step ±10mV (Ta=25°C) -40mV/+17mV (Ta=-40~+85°C)
- Overcharge release voltage .....Vdet1 - CHYS *1 -
- Overdischarge detection voltage .....2.00V to 2.80V, 100mV step ±35mV
- Overdischarge release voltage.....Vdet2 + DHYS *2 -
- Discharge current limit .....3.0A to 12.0A, 0.1A step *3
- Charge overcurrent limit.....0A to 12.0A, 0.1A step *3
- Short detection voltage.....90mV to 180mV, 5mV step ±10mV

*1 "CHYS" is selectable from "None(0V)","CHYS1","CHYS2" "CHYS1", "CHYS2" depend on setting value of Vdet1



*2 "DHYS" is selectable from "None(0V)","DHYS1","DHYS2","DHYS3" "DHYS1", "DHYS2", "DHYS3" depend on setting value of Vdet2



*3 Please inquire to us about details of the accuracy of Overcurrent detection current,which is varies depending on the setting value.

(2) Range of detection/release delay time

- Overcharge detection delay time.....Selection from 1.024s, 4.6s
- Overcharge release delay time.....Selection from 8ms, 16ms
- Overdischarge detection delay time .....Selection from 20ms, 96ms, 144ms
- Discharging overcurrent detection delay time ...Selection from 6ms, 8ms, 12ms, 16ms, 20ms, 32ms, 128ms, 256ms
- Charging overcurrent detection delay time.....4Selection from 8ms, 16ms, 32ms
- Short detection delay time.....300us to 600us, 50us step

(3)0V battery charge function .....Selection from "Inhibition" or "Permission"
In the case of "Inhibition", the setting voltage is 0.90V or 1.25V.

(4) Current consumption

- Normal mode .....Typ. 4.5μA, Max. 7.0μA
- Stand-by mode.....Max. 0.1μA (In case Overdischarge latch function "Enable")
  Max. 0.3μA (In case Overdischarge latch function "Disable")

(5) MOS-FET

- Source to Source on state resistance.....Typ. 4.7mΩ (@VDD=3.5V)

(6) Absolute maximum ratings

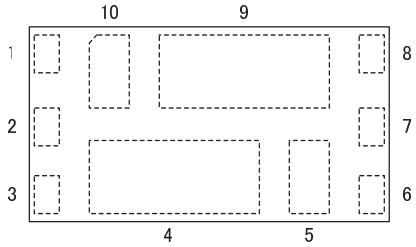
- Supply voltage .....-0.3V to +8.0V
- V- terminal voltage .....VDD-15V to VDD+0.3V
- Test terminal voltage .....VSS-0.3V to VDD+0.3V
- Source to source voltage.....Max. 15.0V
- Source current .....Max. 12.0A
- Total power dissipation .....Max. 1.0W

*4 These range and accuracy are the one of the standard setting.It may differ each product.
Please refer to an individual specifications about detail parameters.
*5 Please inquire to us, if you need another specifications.

Pin assignment

SSON-6N

(Top view)



Pin no.	Symbol	Function
1	DOUT	Discharge MOS-FET control terminal (Connected to G1)
2	VSS	Negative power supply voltage input terminal
3	VPP	Test terminal (Connected to VSS)
4	S2	Source terminal of charge MOS-FET
5	G2	Gate terminal of charge MOS-FET (Connected to COUT)
6	COUT	Charge MOS-FET control terminal (Connected to G2)
7	V-	Charger negative voltage input terminal
8	VDD	Positive power supply voltage input terminal
9	S1	Source terminal of discharge MOS-FET
10	G1	Gate terminal of discharge MOS-FET (Connected to DOUT)

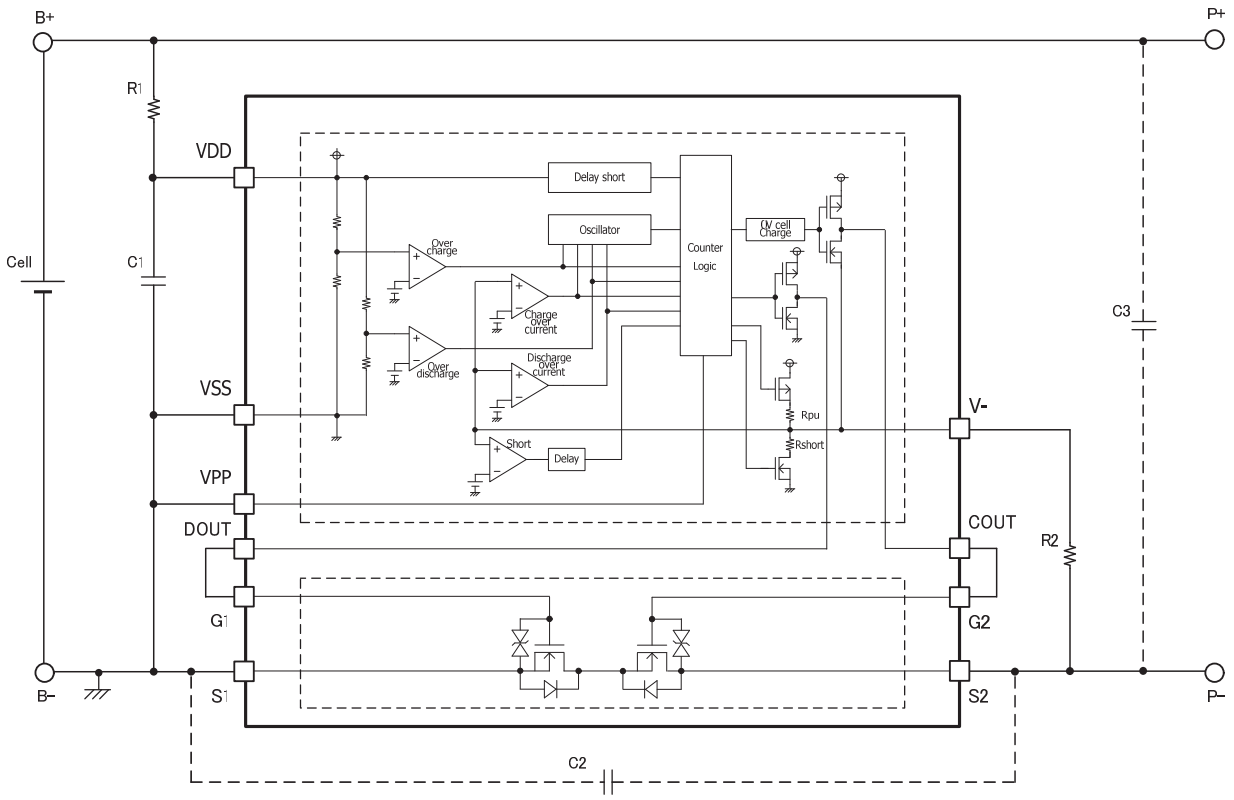
LINE UP

Product name	Package	Optional function			Detection / Release voltage							Detection delay time					Overcurrent		MOS -FET
		0V battery charge function	Overcharge detection Latch function	Overdischarge detection Latch function	Overcharge detection voltage	Overcharge release voltage	Overcharge release voltage	Overdischarge release voltage	Discharging overcurrent detection voltage (@VDD=3.5V)	Charging overcurrent detection voltage (@VDD=3.5V)	Short detection voltage	Overcharge detection delay time	Overdischarge detection delay time	Discharging overcurrent detection delay time	Charging overcurrent detection delay time	Short detection delay time	Discharge current limit (@VDD=3.5V)	Charge current limit (@VDD=3.5V)	Source to source on-state resistance (@VDD=3.5V)
			*1	*1	Vdet1	Vrel1	Vdet2	Vrel2	Vdet3	Vdet4	Vshort	tVdet1	tVdet2	tVdet3	tVdet4	tshort	Idch	Ichg	Rss(on)
					V	V	V	V	mV	mV	mV	s	ms	ms	ms	µs	A	A	mΩ
MJ3542CM1EBU	SSON-6N	Permission	×	×	4.425	4.220	2.500	2.925	*1	*2	90	1.0	96.0	12.0	8.0	270	6.10	6.10	4.7
MJ3542CM2EBU	SSON-6N	Permission	×	×	4.475	4.265	2.300	2.690	*1	*2	120	1.0	96.0	20.0	32.0	460	6.80	6.80	4.7
MJ3542CM5EBU	SSON-6N	Permission	×	×	4.450	4.245	2.000	2.340	*1	*2	90	1.0	96.0	12.0	8.0	350	6.10	6.10	4.7
MJ3542CM6EBU	SSON-6N	Permission	×	×	4.425	4.220	2.500	2.925	*1	*2	90	1.0	96.0	12.0	8.0	500	9.10	6.45	4.7
MJ3542CM7EBU	SSON-6N	Permission	×	×	4.475	4.265	2.300	2.690	*1	*2	150	1.0	96.0	20.0	32.0	500	10.00	7.30	4.7
MJ3542KM2EBU	SSON-6N	Permission	○	×	4.475	4.475	2.300	2.690	*1	*2	120	1.0	96.0	20.0	32.0	460	6.80	6.80	4.7
MJ3542KT1EBU	SSON-6N	Inhibition	○	×	4.475	4.475	2.300	2.690	*1	*2	120	1.0	96.0	32.0	32.0	460	6.80	6.80	4.7
MJ3542LM1EBU	SSON-6N	Permission	○	○	4.435	4.435	2.300	2.300	*1	*2	90	1.0	144.0	16.0	8.0	460	8.10	6.40	4.7
MJ3542LT1EBU	SSON-6N	Inhibition	○	○	4.435	4.435	2.300	2.300	*1	*2	90	1.0	144.0	16.0	8.0	460	8.10	6.40	4.7
MJ3542LT2EBU	SSON-6N	Inhibition	○	○	4.435	4.435	2.300	2.300	*1	*2	90	1.0	144.0	16.0	8.0	460	7.60	6.40	4.7

*1 Optional functions ○ Enable × Disable
*2 Discharging overcurrent detection voltage (Vdet3) = Idch36 * Rss(on)36
*3 Charging overcurrent detection voltage (Vdet4) = - Ichg36 * Rss(on)36

Please inquire to us, if you request a rank other than the above.

Typical application circuit



Symbol	Part	Min.	Typ.	Max.	Purpose
R1	Resistor	-	330Ω	-	For voltage fluctuation, For ESD
C1	Capacitor	0.01uF	0.1uF	1.0uF	For voltage fluctuation
R2	Resistor	-	1.0kΩ	10kΩ	Current limit for charger reverse connection
C2	Capacitor	-	0.1uF	-	For exogenous noise
C3	Capacitor	-	0.1uF	-	For exogenous noise

Application hints
The resistors that are inserted into each pin are to protect the IC. They help to remove ESD and latch-up damages. The capacitors help to reduce the effects of transient variations in voltage and electromagnetic waves,and to improve ESD tolerance of the IC.
Please use either C2 or C3, or both of them by request of your application.
These values in the above figure are for example. Please choose appropriate values.

1 SECONDARY BATTERY ICs

2 cells lithium–ion/lithium–polymer battery protection IC

MM3220 Series

Outline

MM3220 series are protection IC using high voltage CMOS process for overcharge, overdischarge and overcurrent protection of the rechargeable lithium–ion or lithium–polymer battery.
The overcharge, overdischarge and discharging overcurrent protection of the rechargeable two-cell lithium-ion or lithium-polymer battery can be detected.
In addition, the IC has a built–in timer circuit (for each detection delay time), so that the protection circuitry can be comprised with fewer external components.

Features

(Unless otherwise specified, Ta=25°C)

(1) Range and accuracy of detection/release voltage

- Overcharge detection voltage ..... 4.0V to 4.5V, 5mV steps ..... Accuracy±20mV
  Accuracy±25mV (Topr=–5°C to +60°C)
- Overcharge release voltage ..... 3.9V to 4.5V, 50mV steps ..... Accuracy±30mV
- Overdischarge detection voltage ..... 2.0V to 3.0V, 50mV steps ..... Accuracy±35mV
- Overdischarge release voltage ..... 2.0V to 3.5V, 50mV steps ..... Accuracy±100mV
- Discharging overcurrent detection voltage 1 ..... 50mV to 300mV, 5mV steps ..... Accuracy±10mV
- Discharging overcurrent detection voltage 2 ..... *50mV to 700mV, 50mV steps ..... Accuracy typ±20%
- Charging overcurrent detection voltage *1 ..... –300mV to –50mV, 5mV steps ..... Accuracy±20mV
- Short detection voltage ..... 0.9V standard ..... Accuracy±100mV
  Accuracy±300mV *2

(2) Range of detection delay time

- Overcharge detection delay time ..... Selection from 0.25s, 1.0s, 1.2s, 4.5s
- Overdischarge detection delay time ..... Selection from 12ms, 20ms, 24ms, 96ms, 125ms, 144ms
- Discharging overcurrent detection delay time 1 ..... Selection from 6ms, 9ms, 10.8ms, 20ms, 48ms, 256ms
- Discharging overcurrent detection delay time 2 ..... Selection from 0.5ms, 2.5ms, 4ms
- Charging overcurrent detection delay time ..... Selection from 4ms, 6ms, 8ms, 16ms
- Short detection delay time ..... 300µs, 400µs standard

(3) Low current consumption

- Normal mode ..... Typ. 4.0µA, Max. 8.0µA
- Stand-by mode ..... Max. 0.1µA

(4) Absolute maximum ratings

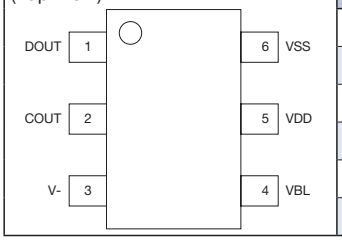
- VDD pin ..... VSS–0.3V to +12V
- COUT pin and V- pin ..... VDD–28V to VDD+0.3V
- DOUT pin ..... VSS–0.3V to VDD+0.3V
- Storage temperature ..... –55°C to +125°C
- Operation temperature ..... –40°C to +85°C

*1 Optional function
*2 When the discharging overcurrent detection voltage 2 function having

Pin assignment

SOT-26A

(Top view)



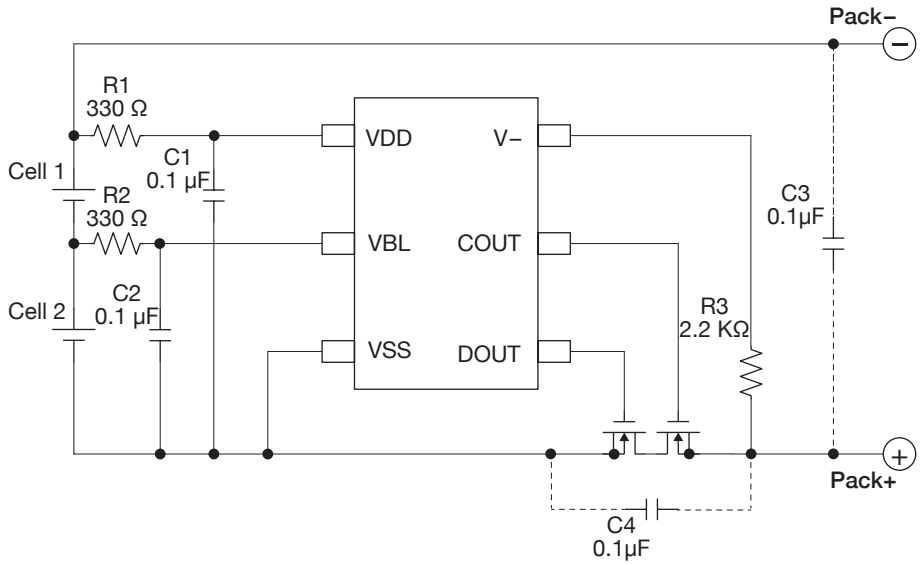
Pin no.	Symbol	Function
1	DOUT	Output of overdischarge detection (Output type is CMOS)
2	COUT	Output of overcharge detection (Output type is CMOS)
3	V-	Input terminal connected to charger negative voltage
4	VBL	Input terminal of the low side cell
5	VDD	Input terminal of the high side cell (Supply terminal)
6	VSS	VSS terminal (Connected to ground)

Selection guide

MODEL	Package	Detection / Release voltage							Detection delay time					0V charge
		Overcharge detection voltage	Overcharge release voltage	Overdischarge detection voltage	Overdischarge release voltage	Discharging overcurrent detection voltage 1	Discharging overcurrent detection voltage 2	Charging overcurrent detection voltage	Overcharge detection delay time	Overdischarge detection delay time	Discharging overcurrent detection delay time 1	Discharging overcurrent detection delay time 2	Charging overcurrent detection delay time	
		Vdet1	Vrel1	Vdet2	Vrel2	Vdet3-1	Vdet3-2	Vdet4	tVdet1	tVdet2	tVdet3-1	tVdet3-2	tVdet4	
MM3220AA1NRH	SOT26A	4.250V	4.050V	2.800V	3.000V	0.200V	-	-0.200V	1.00s	128.0ms	12.0ms	-	8.0ms	Permission
MM3220AA2NRH	SOT26A	4.250V	4.050V	2.800V	3.000V	0.100V	-	-0.100V	1.00s	128.0ms	12.0ms	-	8.0ms	Permission
MM3220B01NRH	SOT26A	4.300V	4.100V	2.000V	2.000V	0.220V	-	-	1.00s	12.0ms	12.0ms	-	-	Permission
MM3220C01NRH	SOT26A	4.300V	4.100V	2.000V	2.000V	0.085V	0.450V	-	1.15s	10.8ms	10.8ms	0.5ms	-	Permission
MM3220C02NRH	SOT26A	4.300V	4.100V	2.000V	2.000V	0.100V	0.200V	-	1.00s	12.0ms	48.0ms	4.0ms	-	Permission
MM3220C03NRH	SOT26A	4.300V	4.100V	2.000V	2.000V	0.100V	0.200V	-	1.00s	12.0ms	256.0ms	2.5ms	-	Permission
MM3220C08NRH	SOT26A	4.300V	4.100V	2.000V	2.000V	0.065V	0.200V	-	1.00s	12.0ms	256.0ms	0.5ms	-	Permission
MM3220D01NRH	SOT26A	4.250V	4.100V	3.000V	3.000V	0.200V	-	-	1.15s	144.0ms	9.0ms	-	-	Permission
MM3220D05NRH	SOT26A	4.250V	4.100V	2.500V	2.500V	0.150V	-	-	1.15s	144.0ms	9.0ms	-	-	Permission
MM3220F01NRH	SOT26A	4.225V	4.075V	2.550V	2.550V	0.200V	-	-	1.15s	144.0ms	9.0ms	-	-	Permission
MM3220G01NRH	SOT26A	4.290V	4.050V	3.000V	3.200V	0.200V	-	-0.200V	1.00s	128.0ms	12.0ms	-	8.0ms	Permission
MM3220G06NRH	SOT26A	4.250V	4.100V	2.500V	3.000V	0.150V	-	-0.100V	1.00s	12.0ms	256.0ms	-	8.0ms	Permission
MM3220G07NRH	SOT26A	4.400V	4.250V	2.500V	3.000V	0.150V	-	-0.100V	1.00s	12.0ms	256.0ms	-	8.0ms	Permission
MM3220H01NRH	SOT26A	4.225V	4.075V	3.000V	3.000V	0.200V	-	-0.200V	1.15s	144.0ms	9.0ms	-	8.0ms	Permission
MM3220H02NRH	SOT26A	4.300V	4.150V	2.400V	2.400V	0.200V	-	-0.200V	1.15s	144.0ms	9.0ms	-	8.0ms	Prohibition
MM3220H03NRH	SOT26A	4.250V	4.100V	3.200V	3.200V	0.200V	-	-0.200V	1.15s	144.0ms	9.0ms	-	8.0ms	Permission
MM3220H04NRH	SOT26A	4.230V	4.080V	2.400V	2.400V	0.200V	-	-0.200V	1.15s	144.0ms	9.0ms	-	8.0ms	Prohibition
MM3220H06NRH	SOT26A	4.230V	4.080V	2.865V	2.865V	0.200V	-	-0.200V	1.15s	144.0ms	9.0ms	-	8.0ms	Prohibition
MM3220H09NRH	SOT26A	4.225V	4.150V	2.600V	2.600V	0.250V	-	-0.200V	1.15s	1.15s	9.0ms	-	8.0ms	Prohibition
MM3220H10NRH	SOT26A	4.250V	4.175V	2.600V	2.600V	0.250V	-	-0.200V	1.15s	1.15s	9.0ms	-	8.0ms	Prohibition
MM3220H11NRH	SOT26A	4.300V	4.150V	2.300V	2.300V	0.150V	-	-0.150V	1.00s	96.0ms	20.0ms	-	8.0ms	Permission
MM3220H13NRH	SOT26A	4.250V	4.050V	2.400V	2.400V	0.200V	-	-0.200V	1.00s	128.0ms	12.0ms	-	8.0ms	Permission
MM3220H15NRH	SOT26A	4.280V	4.130V	2.800V	2.800V	0.150V	-	-0.150V	1.00s	128.0ms	9.0ms	-	8.0ms	Prohibition
MM3220H16NRH	SOT26A	4.250V	4.100V	3.000V	3.000V	0.200V	-	-0.200V	1.00s	128.0ms	8.0ms	-	8.0ms	Permission
MM3220J01NRH	SOT26A	4.275V	4.275V	2.500V	2.500V	0.085V	-	-0.060V	0.25s	20.0ms	6.0ms	-	16.0ms	Prohibition
MM3220JA1NRH	SOT26A	4.250V	4.250V	2.800V	2.800V	0.100V	-	-0.100V	1.00s	96.0ms	10.0ms	-	6.0ms	Permission
MM3220K01NRH	SOT26A	4.300V	4.100V	2.000V	2.000V	0.125V	0.300V	-0.090V	1.15s	144.0ms	12.0ms	0.5ms	8.0ms	Permission
MM3220M01NRH	SOT26A	4.280V	4.080V	2.000V	2.000V	0.200V	-	-0.100V	1.00s	128.0ms	12.0ms	-	8.0ms	Prohibition
MM3220M04NRH	SOT26A	4.280V	4.080V	2.600V	2.600V	0.135V	-	-0.085V	1.00s	128.0ms	12.0ms	-	8.0ms	Prohibition
MM3220N01NRH	SOT26A	4.250V	4.100V	2.500V	3.000V	0.150V	-	-	1.15s	144.0ms	9.0ms	-	-	Permission
MM3220N02NRH	SOT26A	4.250V	4.100V	2.500V	3.000V	0.150V	-	-	1.15s	512.0ms	288.0ms	-	-	Permission
MM3220U01NRH	SOT26A	4.250V	4.100V	2.500V	3.000V	0.150V	-	-	1.15s	512.0ms	288.0ms	-	-	Permission
MM3220Z01NRH	SOT26A	4.300V	4.100V	2.000V	2.000V	0.100V	0.180V	-	1.00s	12.0ms	256.0ms	2.5ms	-	Permission

Please inquire to us, if you request a rank other than the above.

Typical application circuit



- R1 , C1 , R2 , C2 stabilize a supply voltage ripple. However, R1 is enlarged, the detection voltage shifts by voltage when current consumption flows into R1. Please decide it after confirming the characteristic. Moreover, adjust the value of C1 , C2 to 0.01µF or more to do the stability operation, please.

- R1 and R3 resistors are current limit resistance if a charger is connected reversibly or a high-voltage charger that exceeds the absolute maximum rating is connected. R1 and R3 may cause a power consumption will be over rating of power dissipation, therefore the “R1+R3” should be more than 1kohm. Moreover, if R3 is too enlarged, the charger connection release cannot be occasionally done after the overdischarge is detected, so adjust the value of R3 to 10kohm or less, please.

- In the state of overdischarge, The current flows through overdischarge pull-up resistance built into between VDD terminal and V- terminal when the charger is connected. As a result, current that flows into VDD terminal increases. When current increases, the voltage is generated in R1. And hysteresis might be caused. Please use it after confirming the characteristic.

- C3 and C4 capacitors have effect that the system stability about voltage ripple or imported noise. After check characteristics, decide that these capacitors should be inserted or not, where should be inserted, and capacitance value, please.

1 SECONDARY BATTERY ICs

2 cells lithium–ion/lithium–polymer battery protection IC

MM3766 Series

Outline

The MM3766 series are protection IC using high voltage CMOS process for overcharge, overdischarge and overcurrent protection of the rechargeable Lithium-ion or Lithium-polymer battery. The overcharge, overdischarge, discharging rechargeable two cells Lithium-ion or Lithium-polymer battery can be detected. Each of these IC composed of four voltage detectors, short detection circuit, reference voltage sources, oscillator, counter circuit and logical circuits.

Features

(Unless otherwise specified, Ta=25°C)

(1) Range and accuracy of detection and release voltage

- Overcharge detection voltage.....3.6V to 4.5V, 5mV Step..... ±15mV
  ±20mV (Topr=-5 to +60°C)
- Overcharge release voltage .....3.4V to 4.5V, 50mV Step..... ±30mV
- Overdischarge detection voltage .....2.0V to 3.0V, 50mV Step..... ±35mV
- Overdischarge release voltage.....2.0V to 3.5V, 50mV Step..... ±50mV
- Discharging overcurrent detection voltage 1 .....20mV to 300mV, 5mV Step..... ±ΔV
  Rerfer to p.2 ..... ±7% (Min.±10mV)
- Discharging overcurrent detection voltage 2 .....40mV to 600mV, 10mV Step..... ±ΔV
  Rerfer to p.2 ..... ±15% (Min.±20mV)
- Short detection voltage.....Selection from 0.7V, 0.8V, 0.9V.... ±300mV or ±ΔV
  Rerfer to p.2 ..... ±300mV
- Charging overcurrent detection voltage.....-300mV to -40mV, 5mV Step..... ±ΔV
  Rerfer to p.2 ..... ±10% (Min.±20mV)

(2) Range of detection delay time

- Overcharge detection delay time.....Selection from 256ms to 4.6s ..... ±20%
- Overdischarge detection delay time .....Selection from 8ms to 2s ..... ±20%
- Discharging overcurrent detection delay time 1 .....Selection from 8ms to 512ms ..... ±20%
- Discharging overcurrent detection delay time 2 .....Selection from 0.5ms to 6ms ..... ±20%
- Charging overcurrent detection delay time.....Selection from 4ms to 64ms ..... ±20%
- Short detection delay time.....300usec fixed ..... -50% , +100%

(3) 0V battery Charge functionSelectable "Permission" or "inhibition"

(4) Current consumption

- Current consumption of VDD pin(Vcell=4.0V).....Typ. 4.0uA Max. 8.0uA
- Current consumption of VDD pin(Vcell=2.0V).....Max. 0.1uA
  In case Overdischarge latch function Enable.
  Max. 2.5uA
  In case Overdischarge latch function Disable.
- Current consumption of VBL pin (Vcell=4.0V).....Min. -0.3uA, Max. 0.3uA

(5) Absolute maximum ratings

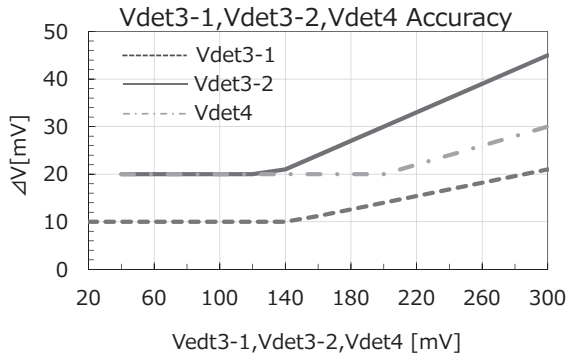
- VDD Pin.....VSS-0.3V to VSS+12V
- VBL Pin .....VSS-0.3V to VDD+0.3V
- Voltage between cell input pins .....-0.3V to +10V
- DOUT Pin .....VSS-0.3V to VDD+0.3V
- COUT Pin, V- Pin .....VDD-28V to VDD+0.3V
- Storage temperature.....-55 to +125°C

(6) Recommend operating conditions

- Operation temperature.....-40 to +85°C
- Operation voltage .....VSS+1.5V to +10.0V

Please inquire to us, if you need another spec.

※ Current detection voltage Accuracy

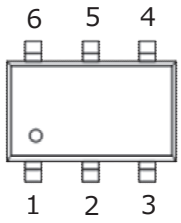


※ When there is not Vdet3-2,
detection accuracy of Vshort is equivalent to Vdet3-2.

These range and accuracy are the one of the standard setting.
It may be different in each IC rank.Please refer to an individual specifications about detail parameters.

Pin assignment

SOT-26B



Pin no.	Symbol	Function
1	DOUT	Discharge FET control terminal
2	COUT	Charge FET control terminal
3	V-	Charger negative voltage input terminal
4	VBL	Input terminal of the low side cell
5	VDD	Positive power supply voltage input terminal
6	VSS	Negative power supply voltage input terminal

Please inquire to us, if you request a rank other than the above.

LINE UP

MODEL	Package	0V charge	Protection mode latch function						Hys-Cancel	
			Overcharge	Overcharge release V- release voltage	Overdischarge	Overdischarge release V- release voltage	Discharging overcurrent	Discharge overcurrent V- release voltage	Overcharge	Overdischarge
MM3766A01NRH	SOT-26B	Permission	Enable	Vdet4	Enable	Vdet3-1	Disable	Vdet3-1	Enable	Enable
MM3766C01NRH	SOT-26B	Permission	Disable	-	Enable	Vdet3-1	Disable	Vdet3-1	Enable	Enable
MM3766C02NRH	SOT-26B	Permission	Disable	-	Enable	Vdet3-1	Disable	Vdet3-1	Enable	Enable
MM3766C03NRH	SOT-26B	Permission	Disable	-	Enable	Vdet3-1	Disable	Vdet3-1	Enable	Enable
MM3766C11NRH	SOT-26B	Inhibition※9	Disable	-	Enable	Vdet3-1	Disable	Vdet3-1	Enable	Enable
MM3766D01NRH	SOT-26B	Permission	Disable	-	Enable	Vdet3-1	Disable	Vdet3-1	Enable	Disable

MODEL	Overcharge detection voltage	Overcharge release voltage	Overdischarge detection voltage	Overdischarge release voltage	Discharging overcurrent detection voltage 1	Discharging overcurrent detection voltage 2	Charging overcurrent detection voltage	Short detection voltage	Delay time *1	Discharge overcurrent release resistance	Pull-up resistance of V- Pin
	Vdet1	Vrel1	Vdet2	Vrel2	Vdet3-1	Vdet3-2	Vdet4	Vshort	Rshort	Rpu	Vshort1
	V	V	V	V	V	-	V	V	V	kΩ	kΩ
MM3766A01NRH	4.250	4.050	2.800	3.000	0.100	-	-0.100	1.000	A	100	300
MM3766C01NRH	4.300	4.150	2.800	3.000	0.150	-	-0.150	0.500	B	100	300
MM3766C02NRH	4.425	4.225	2.750	3.050	0.150	-	-0.100	0.500	B	100	300
MM3766C03NRH	4.250	4.050	2.400	3.000	0.200	-	-0.200	1.100	C	50	300
MM3766C11NRH	4.250	4.100	2.500	3.000	0.200	-	-0.100	0.500	B	100	300
MM3766D01NRH	4.250	4.100	3.000	3.000	0.200	-	-0.200	0.500	B	100	300

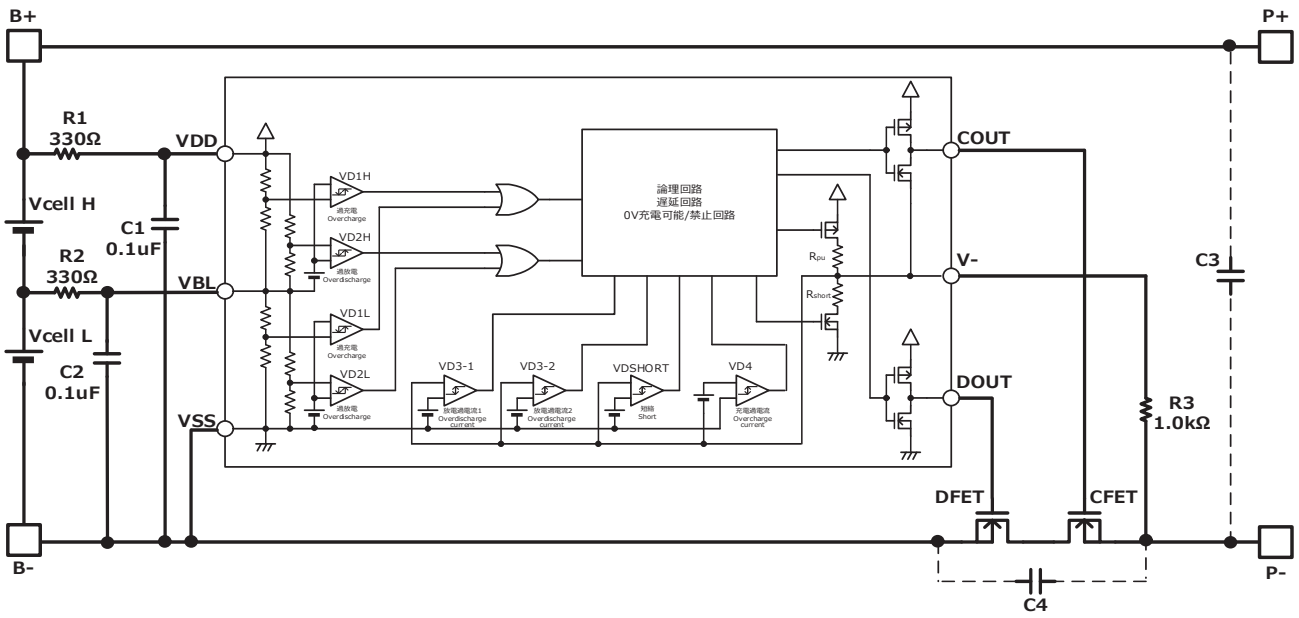
*1 Delay time

	tVdet1	tVrel1	tVdet2	tVrel2	tVdet3-1	tVrel3-1	tVdet3-2	tVrel3-2	tVdet4	tVrel4	tshort
	s	ms	ms	ms	ms	ms	ms	ms	ms	ms	μs
A	1.02	16.0	96.0	1.0	10.0	1.0	-	-	6.0	1.0	300
B	1.02	16.0	128.0	1.0	8.0	1.0	-	-	8.0	1.0	300
C	1.02	16.0	128.0	1.0	12.0	1.0	-	-	8.0	1.0	300

※9 0V battery charge inhibition battery voltage" of C11 is Typ. 1.3V.

*Please inquire to us, if you need another spec.

Typical application circuit



Symbol	Part	Min.	Typ.	Max.	Purpose
R1,R2	Resistor	-	330Ω	1KΩ	For voltage fluctuation, For ESD
C1,C2	Capacitor	0.033uF	0.1uF	1.0uF	For voltage fluctuation
R3	Resistor	-	1.0kΩ	2.2kΩ	Current limit for charger reverse connection
C3	Capacitor	-	0.1uF	-	For exogenous noise
C4	Capacitor	-	0.1uF	-	For exogenous noise
DFET CFET	Nch MOS FET	-	-	-	Charge and discharge control

This typical application circuit and constant value do not guarantee proper operation.
Please evaluate thoroughly by actual application to set up constants.

1 SECONDARY BATTERY ICS

3 cells lithium–ion/lithium–polymer battery protection IC

MM3783 Series

Outline

MM3783 series are an overcharge, overdischarge, overcurrent and temperature protection IC for a lithium-ion / lithiumpolymer rechargeable battery. lithium–ion / lithium–polymer battery overcharge each cell, over discharge, and discharge and charging overcurrent, short circuits can be detected.
The detection of the temperature is enabled by connecting resistance between thermistor, TH terminal -VSS terminals between REG terminal –TH terminals.
Each of these IC composed of six voltage detectors, short detection circuit, reference voltage sources, delay time generation circuit , logical circuits and regulator circuit etc.

Features

(Unless otherwise specified, Ta=25°C)

(1) Range and accuracy of detection/release voltage

- Overcharge detection voltage.....3.6V to 4.5V, 5mV steps ..... Accuracy±25mV (Topr=0°C to +50°C)
- Overcharge release voltage .....3.4V to 4.5V, 50mV steps ..... Accuracy±50mV
- Overdischarge detection voltage .....2.0V to 3.0V, 50mV steps ..... Accuracy±80mV
- Overdischarge release voltage.....2.0V to 3.5V, 50mV steps ..... Accuracy±100mV
- Discharge overcurrent detection voltage 1 ....30mV to 300mV, 5mV steps ..... Accuracy±15mV /±10mV
- Discharge overcurrent detection voltage 2 ....Twice or 4 times of discharging overcurrent 1 .... Accuracy±20%
- Short detection voltage.....4 or 8 times of discharging overcurrent 1 ..... Accuracy±30%
- Charging overcurrent detect voltage .....–300mV to –20mV, 5mV steps..... Accuracy±15%/±10mV
- Temperature protection detection voltage .....–30°C to +80°C step 3 level setting is possible..... Accuracy±3°C

(2) Each detection delay time set by the external capacitor

(3) Range and accuracy of regulator output voltage

- VOUT pin output voltage .....1.5V to 3.0V, 50mV steps ..... Accuracy±25mV

(4) Low current consumption

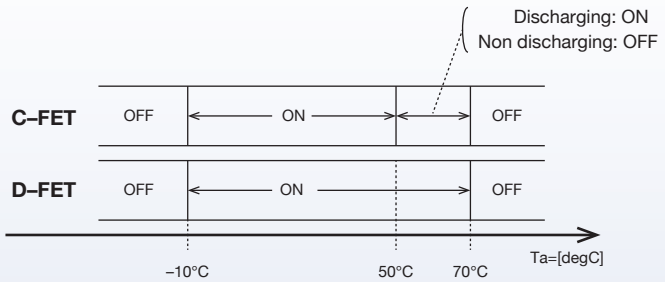
- Consumption current1 (VDD), Vcell=4.3V ..... Typ. 20.0µA, Max. 30.0µA
- Consumption current2 (VDD), Vcell=3.5V ..... Typ. 18.0µA, Max. 23.0µA
- Consumption current3 (VDD), Vcell=2.0V ..... Typ. 1.5µA, Max. 3.0µA

(5) Absolute maximum ratings

- VDD pin ..... V_{SS}–0.3V to V_{SS}+21V
- Between the input terminals of voltage of battery ..... –0.3 to +10V
- V– pin, 0V pin ..... V_{DD}–30V to V_{DD}+0.3V
- DCHG pin, CS pin, VSS_CS pin ..... V_{SS}–0.3V to V_{DD}+0.3V
- REG, TH pin ..... V_{SS}–0.3V to V_{DD}+0.3V
- COV pin, CUV pin ..... V_{SS}–0.3V to V_{DD}+0.3V
- CCOC pin, CDOC pin, CTH pin ..... V_{SS}–0.3V to V_{DD}+0.3V
- Storage temperature ..... –55°C to +125°C
- Operation temperature..... –30°C to +80°C

(6) Charge and discharge FET control to temperature

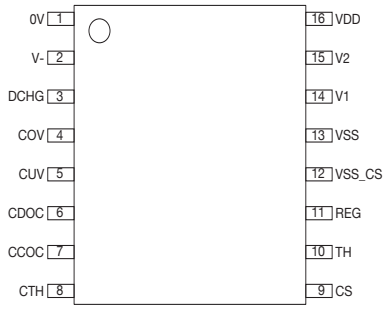
- The high low temperature detection protection of the 3 level is possible
- Ta<–10°C Charge and discharge prohibition Ta>50°C Charge prohibition Ta>70°C Charge and discharge prohibition



Pin assignment

TSOP-16B

(Top view)



Pin no.	Symbol	Pin no.	Symbol
1	0V	9	VDD
2	V-	10	V2
3	DCHG	11	V1
4	COV	12	VSS
5	CUV	13	VSS_CS
6	CDOC	14	REG
7	CCOC	15	TH
8	CTH	16	CS

Selection guide

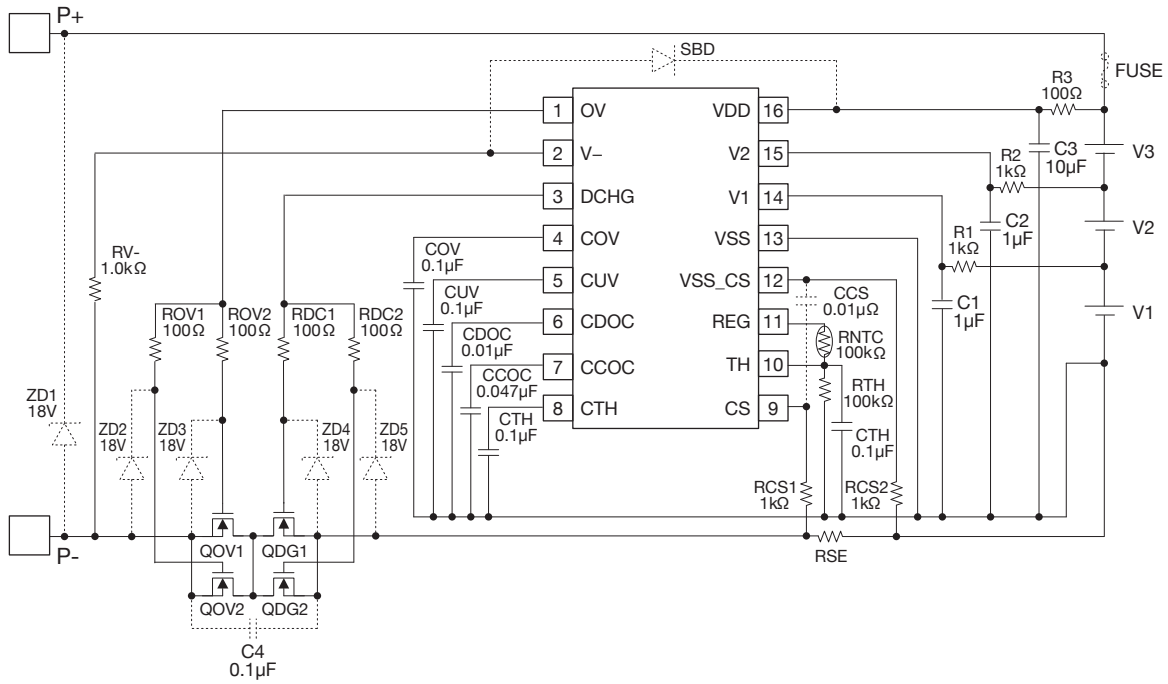
MODEL	detection voltage / release voltage								Temperature protection detection			0V charge
	Overcharge detection voltage	Overcharge release voltage	Overdischarge detection voltage	Overdischarge release voltage	Discharging overcurrent detection voltage 1	Discharging overcurrent detection voltage 2	Short detection voltage	Charging overcurrent detection voltage	Temperature protection detection temperature 1	Temperature protection detection temperature 2	Temperature protection detection temperature 3	
	V_{DET1}	V_{REL1}	V_{DET2}	V_{REL2}	V_{DET3-1}	V_{DET3-2}	V_{SHORT}	V_{DET4}	T_{THD1}	T_{THD2}	T_{THD3}	
	V	V	V	V	V	V	V	V	°C	°C	°C	
MM3783A01VBH	4.250	4.100	2.750	3.000	0.040	0.080	0.160	–0.020	–10	50	70	Permission
MM3783A02VBH	4.200	4.050	2.750	3.000	0.040	0.080	0.160	–0.020	–10	50	70	Permission
MM3783C01VBH	4.180	4.100	2.750	3.000	0.090	0.180	0.360	–0.020	0	55	65	Permission
MM3783C02VBH	4.200	4.100	2.750	3.000	0.090	0.180	0.360	–0.020	–10	55	75	Permission
MM3783C06VBH	4.250	4.100	2.750	3.000	0.040	0.080	0.160	–0.020	NA	60	75	Permission
MM3783C07VBH	4.250	4.150	2.500	3.000	0.090	0.180	0.360	–0.020	–20	60	75	Permission

MODEL	detection delay time / release delay time											
	Overcharge detection delay time (at COV=0.1uF)	Overcharge release delay time (at COV=0.1uF)	Overdischarge detection delay time (at CUV=0.1uF)	Overdischarge release delay time (at COV=0.1uF)	Discharging overcurrent detection delay time 1 (at CDOC=0.01uF)	Discharging overcurrent detection delay time 2 (at CDOC=0.01uF)	Discharging overcurrent release delay time (at CDOC=0.01uF)	Short detection delay time	Charging overcurrent detection delay time (at CCOC=0.047uF)	Charging overcurrent release delay time (at CCOC=0.047uF)	Temperature protection detection delay time (at CTH=0.1uF)	Temperature protection release delay time (at CTH=0.1uF)
	t_{VDET1}	t_{VREL1}	t_{VDET2}	t_{VREL2}	$t_{VDET3-1}$	$t_{VDET3-2}$	t_{VREL3}	t_{SHORT}	t_{VDET4}	t_{VREL4}	t_{VDETS}	t_{VRELS}
	sec	msec	sec	msec	msec	msec	msec	µsec	msec	msec	sec	sec
MM3783A01VBH	1.0	100	1.0	100	100	25.0	100	200	470	47.0	1.0	0.1
MM3783A02VBH	1.0	100	1.0	100	100	25.0	100	200	470	47.0	1.0	0.1
MM3783C01VBH	1.0	100	1.0	100	100	10.0	100	200	470	47.0	1.0	0.1
MM3783C02VBH	1.0	100	1.0	100	100	10.0	100	200	470	47.0	1.0	0.1
MM3783C06VBH	1.0	100	1.0	100	100	10.0	10	200	470	94.0	1.0	0.1
MM3783C07VBH	1.0	100	1.0	100	100	10.0	10	200	470	94.0	1.0	0.1

Please inquire to us, if you request a rank other than the above.

Typical application circuit

3 cells protection circuit



1 SECONDARY BATTERY ICS

3 to 5 cells lithium–ion/lithium–polymer battery protection IC

MM3474 Series

Outline

MM3280 series are an overcharge, overdischarge and overcurrent protection IC for a lithium–ion / lithium–polymer rechargeable battery. Lithium–ion / Lithium–polymer battery overcharge each cell, over discharge, and discharge overcurrent, short circuits can be detected.
This supports 3 to 5 serial cells connected in series, and switches over to the desired no. of cells by sending High/Low signal to SEL terminal.
This also provides the control terminals of output over discharge detection (SDC) and output over charge detection (SOC), which allows configuring an application with fewer external parts for 6 or more cells connected in series.

Features

(Unless otherwise specified, Ta=25°C)

(1) Range and accuracy of detection/release voltage

- Overcharge detection voltage.....3.6V to 4.5V, 5mV steps ..... Accuracy±25mV (Topr=0 to +50°C)
- Overcharge release voltage .....3.4V to 4.5V, 50mV steps ..... Accuracy±50mV
- Overdischarge detection voltage .....2.0V to 3.0V, 50mV steps ..... Accuracy±80mV
- Overdischarge release voltage.....2.0V to 3.4V, 50mV steps ..... Accuracy±100mV
- Overcurrent detect voltage .....50mV to 300mV, 5mV steps ..... Accuracy±15mV
- Short detection voltage.....0.2V to 1.0V, 50mV steps ..... Accuracy±100mV

(2) Each detection delay time set by the external capacitor

(3) The setting for three cell , for four cell , and for five cell protection can be set with the SEL1 pin and the SEL2 pin

(4) The charge and discharge of the battery can be controlled with SDC pin and SOC pin

(5) Low current consumption

- Consumption current1 (Vdd), Vcell=4.4V.....Typ. 10.0μA, Max. 20.0μA
- Consumption current2 (Vdd), Vcell=3.5V.....Typ. 5.0μA, Max. 10.0μA
- Consumption current3 (Vdd), Vcell=1.8V.....Typ. 1.5μA, Max. 3.0μA
- Consumption current1 (V5), Vcell=4.4V.....Typ. 4.0μA, Max. 8.0μA
- Consumption current2 (V5), Vcell=3.5V.....Typ. 3.0μA, Max. 6.0μA
- Consumption current3 (V5), Vcell=1.8V.....Typ. 1.5μA, Max. 3.0μA

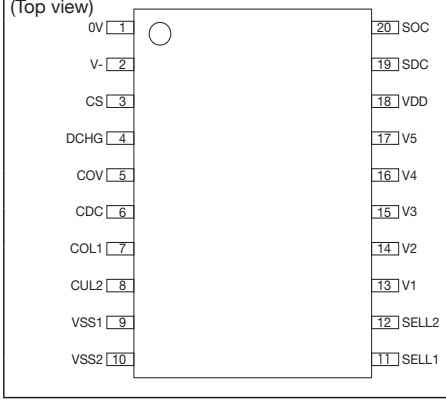
(6) Absolute maximum ratings

- VDD pin ..... V_{SS2}–0.3V to V_{SS2}+30V
- V5 pin ..... V_4–0.3V to V_{DD}+0.3V
- Between the input terminals of voltage of battery ..... –0.3 to +10V
- V– pin, CS pin..... V_{DD}–30V to V_{DD}+0.3V
- 0V pin, DCHG pin..... V_{SS2}–0.3V to V_{DD}+0.3V
- SEL pin..... V_{SS2}–0.3V to V_{DD}+0.3V
- SDC pin, SOC pin ..... V_{SS2}–0.3V to V_{DD}+0.3V
- Storage temperature ..... –55°C to +125°C
- Operation temperature..... –40°C to +85°C

Pin assignment

TSOP-20D

(Top view)



Pin no.	Symbol	Pin no.	Symbol
1	0V	11	SEL1
2	V-	12	SEL2
3	CS	13	V1
4	DCHG	14	V2
5	COV	15	V3
6	CDC	16	V4
7	COL1	17	V5
8	CUL2	18	VDD
9	VSS1	19	SDC
10	VS2	20	SOC

Selection guide

Product name	Detection / Release voltage						Detection / Release voltage						Optional function
	Overcharge detection voltage	Overcharge release voltage	Overdischarge detection voltage	Overdischarge release voltage	Overcurrent detection voltage	Short detection voltage	Overcharge detection dead time	Overcharge release dead time	Overdischarge detection dead time	Overdischarge release dead time	Overcurrent detection dead time	Overcurrent release dead time	Overdischarge release
	V_{CELLU}	V_{CELLO}	V_{CELLS}	V_{CELLD}	V_{OC}	V_{SHORT}	t_{OV1}	t_{OV2}	t_{DC1}	t_{DC2}	t_{OC1}	t_{OC2}	*1
	V	V	V	V	mV	V	sec	msec	sec	msec	msec	msec	
MM3474C01VBE	4.250	4.150	2.800	3.000	250	1.00	1.0	0.1	1.0	Max.15	10.0	10.0	Non Latch
MM3474C02VBE	4.250	4.150	2.400	2.600	250	1.00	1.0	0.1	1.0	Max.15	10.0	10.0	Non Latch
MM3474C03VBE	4.250	4.150	2.800	3.000	250	0.80	1.0	0.1	1.0	Max.15	10.0	10.0	Non Latch
MM3474C04VBE	4.250	4.150	2.800	3.000	150	0.25	1.0	0.1	1.0	Max.15	10.0	10.0	Latch
MM3474C05VBE	4.250	4.150	2.800	3.000	150	0.25	1.0	0.1	1.0	Max.15	10.0	10.0	Non Latch
MM3474D01VBE	3.850	3.650	2.300	2.500	150	1.00	1.0	0.1	1.0	Max.15	10.0	10.0	Non Latch
MM3474D03VBE	3.800	3.600	2.000	2.500	150	0.60	1.0	0.1	1.0	Max.15	10.0	10.0	Non Latch
MM3474E01VBE	4.250	4.150	2.800	3.000	150	1.00	1.0	0.1	1.0	Max.15	10.0	10.0	Non Latch
MM3474E02VBE	4.200	4.100	2.800	3.000	150	1.00	1.0	0.1	1.0	Max.15	10.0	10.0	Non Latch
MM3474E03VBE	4.175	4.100	2.800	3.000	150	0.50	1.0	0.1	1.0	Max.15	10.0	10.0	Non Latch
MM3474E04VBE	4.250	4.150	2.800	3.000	100	0.50	1.0	0.1	1.0	Max.15	10.0	10.0	Non Latch
MM3474E05VBE	4.250	4.150	2.800	3.000	50	0.40	1.0	0.1	1.0	Max.15	10.0	10.0	Non Latch
MM3474F01VBE	4.250	4.150	2.500	3.000	150	1.00	1.0	0.1	1.0	Max.15	10.0	10.0	Non Latch
MM3474F02VBE	4.200	4.100	2.500	3.000	100	1.00	1.0	0.1	1.0	Max.15	10.0	10.0	Non Latch
MM3474F03VBE	4.250	4.150	2.500	3.000	100	0.30	1.0	0.1	1.0	Max.15	10.0	10.0	Latch
MM3474F04VBE	4.250	4.210	2.500	3.000	100	0.80	1.0	0.1	1.0	Max.15	10.0	10.0	Non Latch
MM3474F05VBE	4.250	4.150	2.500	3.000	100	0.25	1.0	0.1	1.0	Max.15	10.0	10.0	Non Latch
MM3474F06VBE	4.225	4.150	2.000	3.000	50	0.20	1.0	0.1	1.0	Max.15	10.0	10.0	Non Latch
MM3474F08VBE	4.400	4.300	2.500	3.000	120	0.25	1.0	0.1	1.0	Max.15	10.0	10.0	Non Latch
MM3474G01VBE	4.200	4.100	2.750	3.000	100	1.00	1.0	0.1	1.0	Max.15	10.0	10.0	Non Latch
MM3474G02VBE	4.250	4.150	2.750	3.000	100	1.00	1.0	0.1	1.0	Max.15	10.0	10.0	Non Latch
MM3474G03VBE	4.200	4.100	2.750	3.000	100	0.40	1.0	0.1	1.0	Max.15	10.0	10.0	Non Latch
MM3474G05VBE	4.250	4.150	2.750	3.000	100	0.40	1.0	0.1	1.0	Max.15	10.0	10.0	Non Latch
MM3474G06VBE	4.225	4.100	2.750	3.000	100	0.80	1.0	0.1	1.0	Max.15	10.0	10.0	Non Latch
MM3474G07VBE	4.250	4.150	2.750	3.000	100	0.20	1.0	0.1	1.0	Max.15	10.0	10.0	Non Latch
MM3474J01VBE	4.250	4.100	2.800	3.000	50	1.00	1.0	0.1	1.0	Max.15	10.0	10.0	Non Latch
MM3474K02VBE	4.250	4.100	3.000	3.225	100	0.40	1.0	0.1	1.0	Max.15	10.0	10.0	Non Latch
MM3474K03VBE	4.250	4.190	3.000	3.200	80	0.70	1.0	0.1	1.0	Max.15	10.0	10.0	Latch

Product name	Detection / Release voltage						Detection / Release voltage						Optional function
	Overcharge detection voltage	Overcharge release voltage	Overdischarge detection voltage	Overdischarge release voltage	Overcurrent detection voltage	Short detection voltage	Overcharge detection dead time	Overcharge release dead time	Overdischarge detection dead time	Overdischarge release dead time	Overcurrent detection dead time	Overcurrent release dead time	Overdischarge release
	V_{CELLU}	V_{CELLO}	V_{CELLS}	V_{CELLD}	V_{OC}	V_{SHORT}	t_{OV1}	t_{OV2}	t_{DC1}	t_{DC2}	t_{OC1}	t_{OC2}	*1
	V	V	V	V	mV	V	sec	msec	sec	msec	msec	msec	
MM3474K04VBE	4.175	4.100	3.000	3.200	100	0.50	1.0	0.1	1.0	Max.15	10.0	10.0	Non Latch
MM3474L02VBE	3.750	3.550	2.200	2.700	100	0.40	1.0	0.1	1.0	Max.15	10.0	10.0	Non Latch
MM3474L03VBE	3.650	3.500	2.000	2.700	200	0.25	1.0	0.1	1.0	Max.15	10.0	10.0	Non Latch
MM3474L04VBE	3.750	3.550	2.200	2.700	100	0.40	1.0	0.1	1.0	Max.15	10.0	10.0	Latch
MM3474M01VBE	4.350	4.150	2.300	3.000	150	0.50	1.0	0.1	1.0	Max.15	10.0	10.0	Non Latch
MM3474N01VBE	3.900	3.600	2.000	3.000	100	0.20	1.0	0.1	1.0	Max.15	10.0	10.0	Latch
MM3474P03VBE	4.230	4.220	2.800	3.400	100	0.80	1.0	0.1	1.0	Max.15	10.0	10.0	Non Latch
MM3474P04VBE	4.200	4.170	2.750	2.800	100	1.00	1.0	0.1	1.0	Max.15	10.0	10.0	Non Latch
MM3474P05VBE	4.200	4.140	2.750	2.810	100	0.50	1.0	0.1	1.0	Max.15	10.0	10.0	Latch
MM3474P06VBE	4.230	4.220	2.800	3.000	100	0.80	1.0	0.1	1.0	Max.15	10.0	10.0	Non Latch
MM3474S01VBE	3.600	3.500	2.800	3.000	100	0.40	1.0	0.1	1.0	Max.15	10.0	10.0	Non Latch

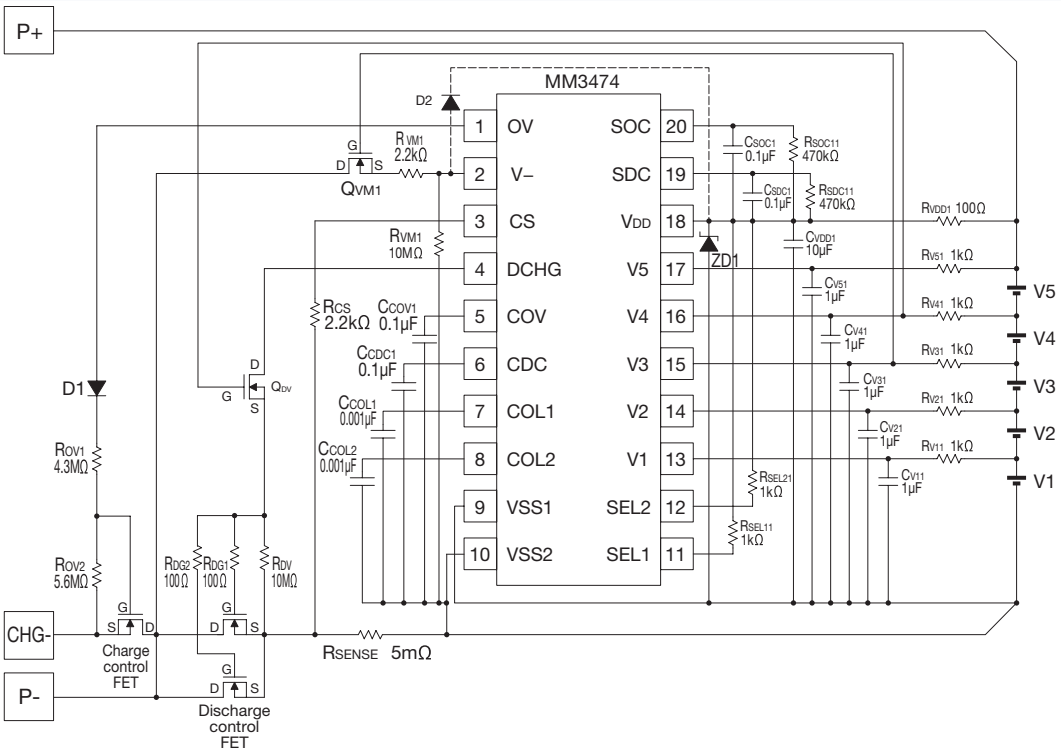
*1 Non Latch : voltage release
Latch : voltage release + load remove

2,000pcs/Reel

Please inquire to us, if you request a rank other than the above.

Typical application circuit

5 cells protection circuit

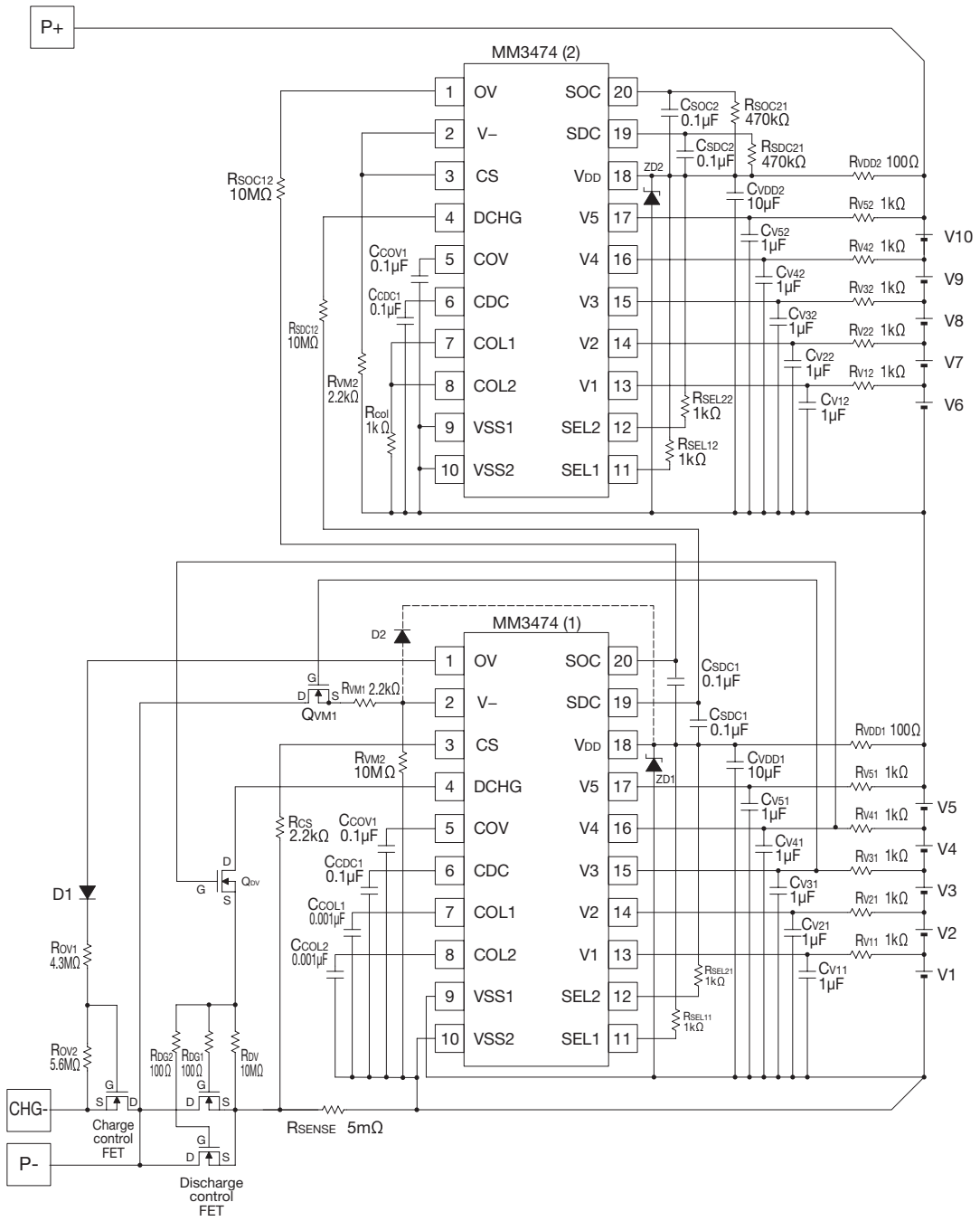


SEL1	SEL2	Mode
H	H	5Cell in series
H	L	4Cell in series (Connect V1 and VSS terminal)
L	H	3Cell in series (Connect V2,V1 and VSS terminal)

*It becomes a static test mode in SEL1=SEL2=Low.

Typical application circuit

10 cells protection circuit



1 SECONDARY BATTERY ICS

3 to 5 cells lithium–ion/lithium–polymer battery protection IC

MM3575 Series

Outline

The **MM3575** series are protection IC using high voltage CMOS process for overcharge, overdischarge and overcurrent protection of the rechargeable lithium–ion or lithium-polymer battery. The overcharge, overdischarge, discharging overcurrent, charging overcurrent, cell balance and V5 to V3 pin disconnect of the rechargeable 3 to 5cell Lithium-ion or Lithium-polymer battery can be detected. By using cascade connection, it is also possible to protect 6 or more cells rechargeable Lithium-ion battery. And the regulator can be constructed by using external Nch MOS FET. The internal circuit of IC is composed by the voltage detector, the reference voltage source, delay time control circuit, and the logical circuit, etc.

Features

(Unless otherwise specified, Ta=25°C)

(1) Range and accuracy of detection/release voltage

- Overcharge detection voltage ..... 3.6V to 4.5V, 5mV steps ..... Accuracy±25mV (Topr=0°C to +50°C)
- Overcharge release voltage ..... 3.4V to 4.5V, 50mV steps ..... Accuracy±50mV
- Overdischarge detection voltage ..... 2.0V to 3.0V, 50mV steps ..... Accuracy±80mV
- Overdischarge release voltage *4 ..... 2.0V to 3.5V, 50mV steps ..... Accuracy±100mV
- Discharging overcurrent detection voltage1 ..... 30mV to 300mV, 5mV steps ..... Accuracy±15mV (Typ. ±50mV to)
- Discharging overcurrent detection voltage2 ..... Twice or 4 times of discharging overcurrent1*1 .... Accuracy±15%
- Short detection voltage ..... 4 or 8 times or discharging overcurrent 1 *1 ..... Accuracy±100mV
- Charging overcurrent detect voltage ..... -300mV to -20mV, 5mV steps ..... Accuracy±10mV
- Cell balance detection voltage ..... 3.6V to 4.5V, 5mV steps ..... Accuracy±30mV (Ta=0°C to +50°C)

(2) Ragen of detection delay time

- Overcharge detection delay time ..... Selection from 0.25s, 1.0s, 1.2s, 4.1s ..... Accuracy±25%
- Overcharge release delay time ..... Selection from 10ms, 24ms, 48ms, 100ms ... Accuracy±25%
- Overdischarge detection delay time ..... Selection from 0.25s, 1.0s, 1.2s, 4.1s ..... Accuracy±25%
- Overdischarge release delay time ..... Selection from 4ms, 8ms, 12ms, 24ms ..... Accuracy±25%
- Discharging overcurrent detection delay time1 .... Setting by capacitor of COC pin. *2 ..... Accuracy±30%
- Discharging overcurrent detection delay time2 .... Setting by capacitor of COC pin. *2 ..... Accuracy±30%
- Short detection delay time ..... Selection from 100µs, 200µs, 300µs ..... Accuracy±50%
- Short detection release time ..... Selection from 100µs, 200µs, 300µs ..... Accuracy±50%
- Discharging overcurrent release delay time ..... Setting by capacitor of COC pin. *2 ..... Accuracy±30%
- Charging overcurrent detection delay time ..... Setting by capacitor of COC pin. *2 ..... Accuracy±30%
- Charging overcurrent release delay time ..... Setting by capacitor of COC pin. *2 ..... Accuracy±30%
- Disconnected detection delay time ..... Selection from 25ms, 50ms, 100ms ..... Accuracy±25%
- Disconnected release delay time ..... Selection from 1024ms, 2048ms, 4096ms ... Accuracy±25%
- Cell balance detection delay time ..... Selection from 0.1s, 0.25s, 0.5s *3 ..... Accuracy±25%
- Cell balance releaes delay time ..... Selection from 4ms, 8ms, 12ms ..... Accuracy±25%

*1 Optional function.

*2 Since the capacity is the same, each delay times will change when a value is changed without short detection delay time.

*3 Cannot do shorter than disconnect detection delay time.

*4 The discharge state release method can choose a voltage release and a load open.

(3)Protected operation can be detectof V5 to V1 pin disconnection

- When any of V5 to V1 pin open, it will detect disconnection and charge and discharge prohibited state.
- Protection mode of disconnection can be chosen from three, prohibition of charge, prohibition of discharge and prohibition of charge and discharge (Optional) .
- The release from disconnection protection is done by disconnection point being connected.

(4) The setting for three cell , for four cell , and for five cell protection can be set with the SEL pin.

(5) The charge and discharge of the battery can be controlled with SDC pin and SOC pin.

(6) 0V battery charge function Selection from “Permission” or “Prohibition”

(7) Power save mode Built–in

- It is possible to make it shift to low consumption current mode arbitrarily.
- Transition of power save mode is used by SDC,SOC pins.
- It shifts to a power save mode by making SDC and SOC pin into a VSS level.

(8) Regulator function Built–in
- Connecting drain of external Nch MOS FET gate to DRIVE pin and source to REG_IN pin,it can operate as a regulator.
- The regulator operates independently with protected operation, such as overcharge detection.
- Regulator voltage can be chosen at 0.1V step among 3.3V to 5.0V.

(9) Low current consumption
- VDD pin current consumption(Vcell=4.3V) ..... Typ. 25.0μA Max. 35.0μA
- VDD pin current consumption(Vcell=3.5V) ..... Typ. 20.0μA Max. 30.0μA
- VDD pin current consumption(Vcell=2.0V) ..... Typ. 10.0μA, Max. 15.0μA
- VDD pin current consumption at power save1(Vcell=3.5V) ..... Typ. 12.0μA, Max. 16.0μA
- VDD pin current consumption at power save2(Vcell=3.5V) ..... Typ. 4.0μA, Max. 6.0μA
- V5 pin current consumption(Vcell=4.3V) ..... Typ. 4.0μA, Max. 6.0μA
- V5 pin current consumption(Vcell=3.5V) ..... Typ. 2.0μA, Max. 3.0μA
- V5 pin current consumption(Vcell=2.0V) ..... Typ. 1.0μA, Max. 1.5μA
- V5 pin current consumption at power save(Vcell=3.5V) ..... Max. 0.05μA

(10) input current
- V4 pin input current(Vcell=3.5V) ..... Max. 1.0μA
- V3 pin input current(Vcell=3.5V) ..... Max. 1.0μA
- V2 pin input current(Vcell=3.5V) ..... Max. 1.0μA
- V1 pin input current(Vcell=3.5V) ..... Max. 1.0μA

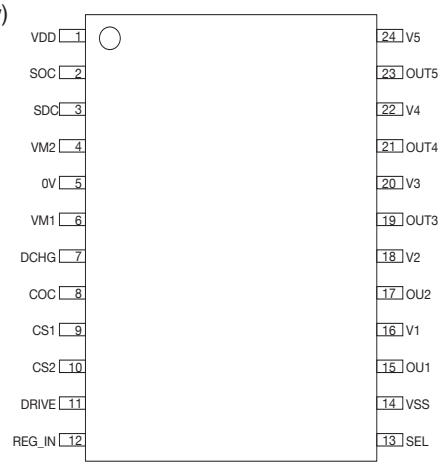
(11) Absolute maximum ratings
- VDD, CS1, CS2 pin ..... VSS0.3V to VSS+30V
- V5 pin ..... V40.3V to VDD+0.3V
- Voltage between the input terminals ..... 0.3V to +10V
- 0V, VM1, VM2 pin ..... VDD30V to VDD+0.3V
- OUT1 to 5 pin ..... Vn–10.3V to VDD+0.3V
- DCHG, SEL, SDC, SOC pin, DRIVE, REG_IN pin ..... VSS0.3V to VDD+0.3V
- Storage temperature ..... –55°C to +125°C

(12) Recommended operating conditions
- Operating Temperature ..... –40°C to +85°C
- Supply Voltage ..... VSS 3.5V to 22.5V

Pin assignment

VSOP-24A

(Top view)



Pin no.	Symbol	Pin no.	Symbol
1	VDD	13	SEL
2	SOC	14	VSS
3	SDC	15	OUT1
4	VM2	16	V1
5	0V	17	OUT2
6	VM1	18	V2
7	DCHG	19	OUT3
8	COC	20	V3
9	CS1	21	OUT4
10	CS2	22	V4
11	DRIVE	23	OUT5
12	REG_IN	24	V5

Selection guide

Product name	Detection voltage / Release voltage									0V battery charge function *1	prptection mode of disconnection *2
	Overcharge detection voltage	Overcharge release voltage	Overdischarge detection voltage	Overdischarge release voltage	Discharging overcurrent detection voltage1	Discharging overcurrent detection voltage2	Short detection voltage	Charging overcurrent detection voltage	Cell balance detection voltage		
	V_{DET1}	V_{REL1}	V_{DET2}	V_{REL2}	V_{DET3-1}	V_{DET3-2}	V_{SHORT}	V_{DET4}	V_{DET_CB}		
	V	V	V	V	V	V	V	V	V		
MM3575A02WBE	4.250	4.175	2.800	2.900	0.100	0.200	0.400	-0.020	4.180	×	3
MM3575A08WBE	4.250	4.100	2.600	3.200	0.090	0.180	0.360	-0.030	4.180	×	3

*1 ○ : Permission × : Prohibition

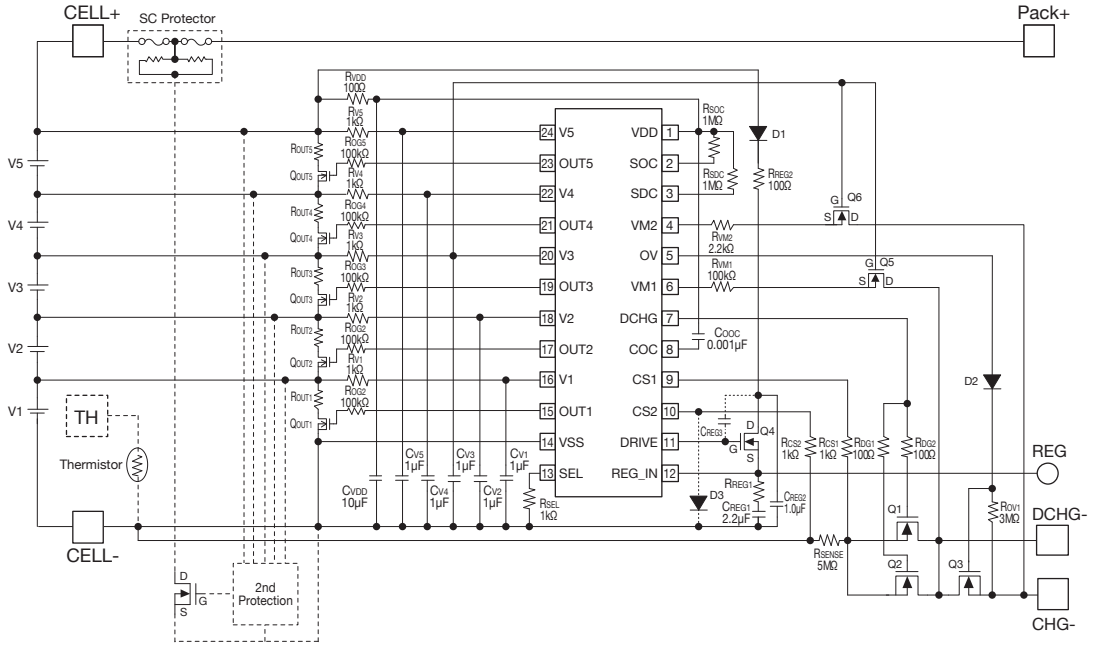
*2 1 : Prohibition of charge 2 : Prohibition of discharge 3 : Prohibition of charge and discharge

Product name	Detection delay time / Release delay time													
	Overcharge detection delay time	Overcharge release delay time	Overdischarge detection delay time	Overdischarge release delay time	Discharging overcurrent detection delay time1	Discharging overcurrent detection delay time2	Discharging overcurrent release delay time2	Short detection delay time	Charging overcurrent detection delay time	Charging overcurrent release delay time	Disconnect detection delya time	Disconnect release delya time	Cell balance detection delay time	Cell balance release delay time
	t_{DET1}	t_{VREL1}	t_{DET2}	t_{VREL2}	$t_{VDET3-1}$	$t_{VDET3-2}$	t_{VREL3}	t_{SHORT}	t_{VDET4}	t_{VREL4}	t_{VDET5}	t_{VREL5}	t_{VDET_CB}	t_{VREL_CB}
	sec	msec	sec	msec	msec	msec	msec	µsec	msec	msec	msec	msec	msec	msec
MM3575A02WBE	1.0	100	1.0	4.0	10	2.0	4.0	200	1024	128	200	4096	256	8.0
MM3575A08WBE	1.0	100	2.0	4.0	1536	60.0	4.0	200	100	128	200	4096	256	8.0

Please inquire to us, if you request a rank other than the above.

Typical application circuit

5 cells protection circuit

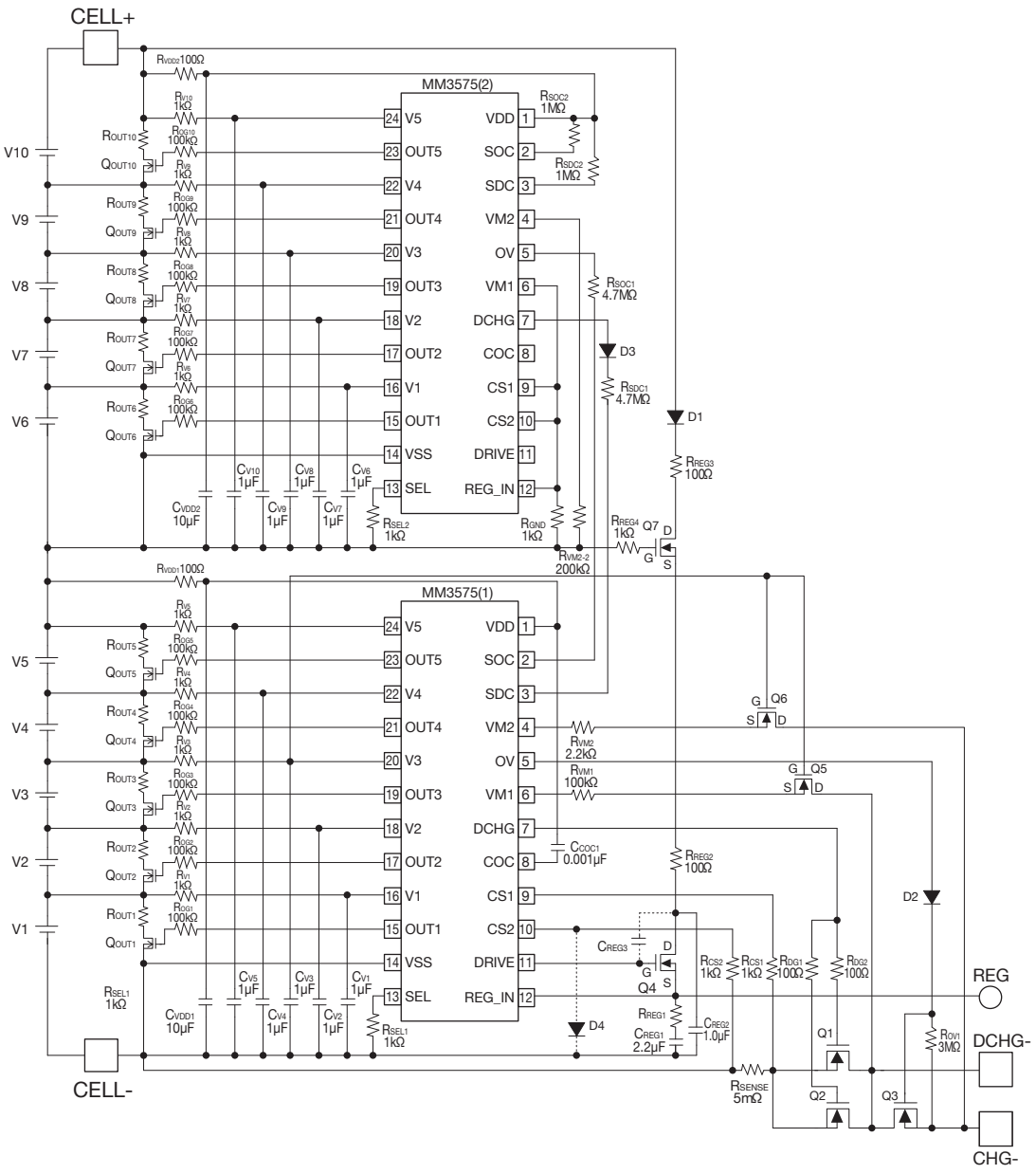


Explanation of external parts

Parts name	Roles of part
R_{VDD}, R_{V5} ,R_{V4} ,R_{V3}, R_{V2},R_{V1}	CR low-pass filter to stabilize a supply ripple of VDD pin, V5pin, V4pin, V3pin, V2pin, V1 pin
C_{VDD}, C_{V5}, C_{V4}, C_{V3}, C_{V2}, C_{V1}	
R_{OUT1}, R_{OUT2}, R_{OUT3}, R_{OUT4}, R_{OUT5}	Resistance of discharging during cell balance control
R_{SEL}, R_{CS1}, R_{CS2}, R_{VM1}, R_{VM2}	Resistor to protect terminal
R_{SDC}, R_{SOC}	Current limitation resistor (The voltage signal is converted into the current signal by)
C_{COC}	Capacitor to sets discharging overcurrent, charging overcurrent detection/ release dead time.
R_{SENSE}	Sense resistance to observe charging/discharging current
R_{DG1}, R_{DG2}	Resistor for preventing the gate destruction due to parasitic oscillation
R_{OV1}	Pulldown resistance of OV pin
R_{REG1}	Resistance of regulator for phase compensation
R_{REG2}	Resistance of current control when Q4 shorted out
C_{REG1}	Capacity of regulator for phase compensation
C_{REG2}	Capacitor to stabilize drain electric potential of Q4
D1	Diode for preventing backflow from regulator
D2	Diode for preventing voltage more than VDD pin voltage from applying to OV pin
Q_1, Q_2	Nch MOS FET to control discharging current
Q_3	Nch MOS FET to control charging current
Q_4	Power transistor of regulator
Q_5	FET for preventing voltage more than VDD pin voltage from applying to VM1 pin
Q_6	FET for preventing voltage more than VDD pin voltage from applying to VM2 pin
Q_{OUT1}, Q_{OUT2}, Q_{OUT3}, Q_{OUT4}, Q_{OUT5}	FET for controling discharging switch during cell balance control

Typical application circuit

10 cells protection circuit



1 SECONDARY BATTERY ICS

3 to 5 cells lithium–ion/lithium–polymer battery protection IC

MM3684 Series

Outline

The **MM3684** series are protection IC using high voltage CMOS process for overcharge, secondary overcharge, overdischarge, overcurrent and temperature protection of the rechargeable lithium–ion or lithium–polymer battery. The overcharge, overdischarge, discharging overcurrent, charging overcurrent, temperature of the rechargeable 3 to 5 cells Lithium-ion or lithium-polymer battery can be detected. The internal circuit of IC is composed by the voltage detector, the reference voltage source, delay time control circuit, and the logical circuit, etc.

Features

(Unless otherwise specified, Ta=25°C)

(1) Range and accuracy of detection/release voltage

- Overcharge detection voltage 1 (0V output) .....3.6V to 4.5V, 5mV steps ..... Accuracy ±25mV (Topr=±0°C to +50°C)
- Overcharge release voltage 1 (0V output) *1.....3.4V to 4.5V, 50mV steps ..... Accuracy ±50mV
- Overcharge detection voltage 2 (PF output).....3.6V to 4.5V, 5mV steps ..... Accuracy ±25mV (Topr=±0°C to +50°C)
- Overdischarge detection voltage 1 .....2.0V to 3.0V, 50mV steps ..... Accuracy ±80mV
- Overdischarge detection voltage 2 .....2.0V to 3.0V, 50mV steps ..... Accuracy ±100mV
- Overdischarge release voltage *2 .....2.0V to 3.5V, 50mV steps ..... Accuracy ±100mV
- Discharging overcurrent detection voltage 1 .....30mV to 300mV, 5mV steps ..... Accuracy ±15%
- Discharging overcurrent detection voltage 2 .....Twice or 4 times of discharging overcurrent 1 *3..... Accuracy ±20%
- Short detection voltage.....4 or 8 times of discharging overcurrent 1 *3..... Accuracy ±100mV
- Charging overcurrent detect voltage .....–300mV to –20mV, 5mV steps..... Accuracy ±10mV

(2) Range of detection delay time

- Overcharge detection delay time 1 .....Setting by a capacitor of COV pin..... Accuracy ±50%
- Overcharge release delay time 1.....Setting by a capacitor of COV pin..... Accuracy ±50%
- Overcharge detection delay time 2 .....Setting by a capacitor of CPF pin. ..... Accuracy ±50%
- Overdischarge detection delay time .....Setting by a capacitor of CUV pin..... Accuracy ±50%
- Overdischarge release delay time.....Setting by a capacitor of CUV pin..... Accuracy ±50%
- Discharging overcurrent detection delay time 1 .....Setting by a capacitor of DCOC pin..... Accuracy ±50%
- Discharging overcurrent detection delay time 2 .....Setting by a capacitor of DCOC pin..... Accuracy ±50%
- Short detection delay time.....Selection from 100µs, 200µs, 300µs..... Accuracy –50%, +100%
- Discharging overcurrent release delay time.....Setting by a capacitor of DCOC pin..... Accuracy ±50%
- Charging overcurrent detection delay time.....Setting by a capacitor of CCOC pin..... Accuracy ±50%
- Charging overcurrent release delay time .....Setting by a capacitor of CCOC pin..... Accuracy ±50%
- Temperature protection detection ON time .....Setting by a capacitor of CIOT pin. ..... Accuracy ±50%
- Temperature protection detection OFF time.....Setting by a capacitor of CIOT pin. ..... Accuracy ±50%

*1 Overcharge release function is selectable from 3 options(voltage decrease, charger remove, load connect).

*2 Overdischarge release function is selectable from 3 options(voltage increase , charger remove, load connect).

*3 option

(3) The setting for three cell , for four cell , and for five cell protection can be set with the SEL1,2 pin.

(4) Threshold of over-discharge detection can be switched to over-discharge detection voltage 1, 2 at the DVSEL terminal.

(5) 0V battery charge function Selection from “Permission” or “Prohibition”

(6) Power save mode Built–in

- When all cells is detected overdischarge and charger disconnecting, IC becomes low consumption mode.

(7) Achieve low consumption by making the temperature detection for regulator and temperature detection circuit to intermittent operation

Features

(Unless otherwise specified, Ta=+25°C)

(8) Low current consumption

- VDD pin current consumption (Vcell=4.3V)..... Typ. 15.0μA Max. 25.0μA
- VDD pin current consumption (Vcell=3.5V)..... Typ. 10.0μA Max. 20.0μA
- VDD pin current consumption at power save (Vcell=1.8V)..... Typ. 3.0μA, Max. 6.0μA
- V5 pin current consumption (Vcell=4.3V)..... Typ. 1.0μA, Max. 2.0μA
- V5 pin current consumption (Vcell=3.5V)..... Typ. 0.8μA, Max. 1.5μA
- V5 pin current consumption (Vcell=1.8V)..... Max. 0.5μA

(9) Input cerrent

- V4 pin input current (Vcell=3.5V)..... Max. 0.3μA
- V3 pin input current (Vcell=3.5V)..... Max. 0.3μA
- V2 pin input current (Vcell=3.5V)..... Max. 0.3μA
- V1 pin input current (Vcell=3.5V)..... Max. 0.3μA

(10) Absolute maximum ratings

- VDD pin..... VSS-0.3V to VSS+30V
- V5 pin..... V4-0.3V to VDD+0.3V
- Voltage between the input terminals..... -0.3V to +10V
- V–, 0V pin..... VDD-30V to VDD+0.3V
- PF, DCHG, CS pin..... VSS-0.3V to VDD+0.3V
- SEL1, SEL2, DVSEL pin..... VSS-0.3V to VDD+0.3V
- CPF, COV, CUV pin..... VSS-0.3V to VDD+0.3V
- CDOC, CCOC, CIOT pin..... VSS-0.3V to VDD+0.3V
- REG, TH pin..... VSS-0.3V to VDD+0.3V
- Storage temperature..... -55°C to +125°C

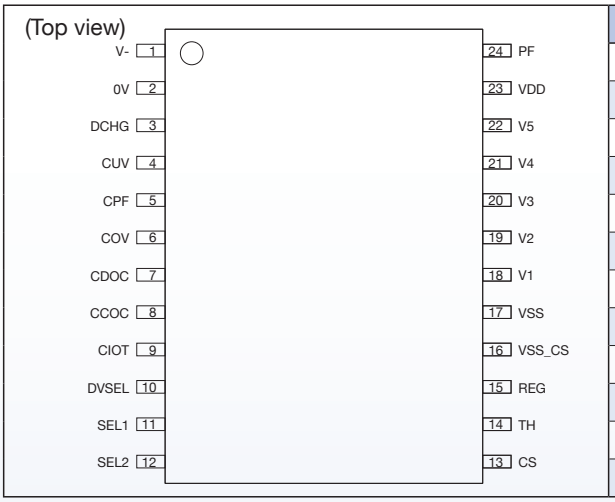
(11) Recommended operating conditions

- Operating Temperature..... -40°C to +85°C
- Supply Voltage..... VSS 3.5V to 22.5V

Pin assignment

VSOP-24A

(Top view)



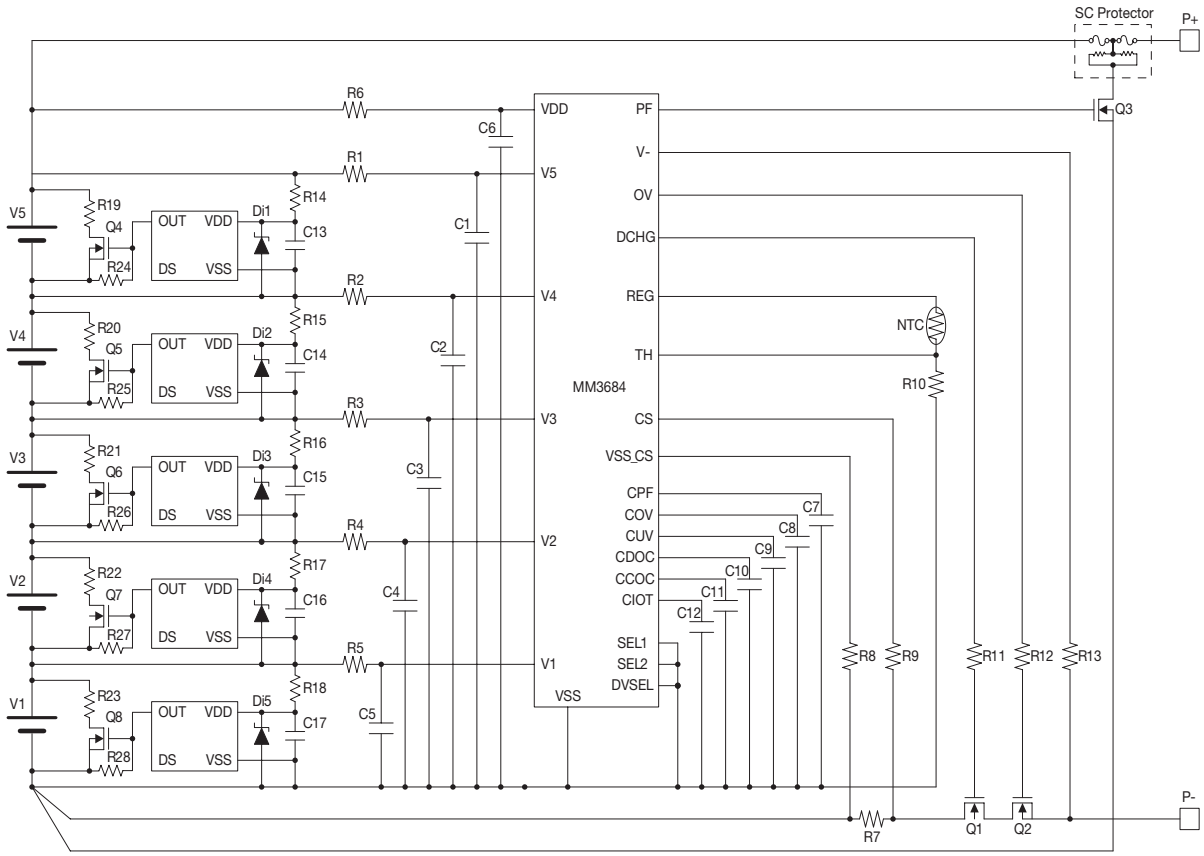
Pin no.	Symbol	Pin no.	Symbol
1	V-	13	CS
2	0V	14	TH
3	DCHG	15	REG
4	CUV	16	VSS_CS
5	CPF	17	VSS
6	COV	18	V1
7	CDOC	19	V2
8	CCOC	20	V3
9	CIOT	21	V4
10	DVSEL	22	V5
11	SEL1	23	VDD
12	SEL2	24	PF

Pin assignment

Pin No.	Pin Name	Function	
1	V-	Input terminal connected to charger negative voltage. Detected charger connection and load connection	
2	OV	Charge control output pin. Output type is N-Ch FET open drain. Normal mode → “High” Charge prohibited mode → “Low”	
3	DCHG	Discharge control output pin. Output type is CMOS. Normal mode → “High” Discharge prohibited mode → “Low”	
4	CUV	This pin is delay time setting of overdischarge detection and overdischarge release. If a capacitor is connected between CUV pin and VSS pin, overdischarge detection delay time setting becomes possible	
5	CPF	This pin is delay time setting of overcharge detection 2. If a capacitor is connected between CPF pin and VSS pin, overcharge detection 2 delay time setting becomes possible	
6	COV	This pin is delay time setting of overcharge detection 1 and overcharge release 1. If a capacitor is connected between COV pin and VSS pin, overcharge detection 1 delay time setting becomes possible	
7	CDOC	This pin is delay time setting of discharging overcurrent detection and discharging overcurrent release. If a capacitor is connected between CDOC pin and VSS pin, discharging overcurrent delay time setting becomes possible	
8	CCOC	This pin is delay time setting of charging overcurrent detection and charging overcurrent release. If a capacitor is connected between CCOC pin and VSS pin, charging overcurrent delay time setting becomes possible	
9	CIOT	This pin is delay time setting of intermittent operation of temperature detection. If a capacitor is connected between CIOT pin and VSS pin, temperature delay time setting becomes possible	
10	DVSEL	This pin is for changing function for overdischarge detection voltage 1,2 “High”→Overdischarge detection voltage 1 “Low”→Overdischarge detection voltage 2	
11	SEL1	This pin is for changing function for 3cell in series or 4cell in series , 5cell in series.	SEL1=“L”, SEL2=“L” → 5Cell in series
			SEL1=“H”, SEL2=“L” → 4Cell in series
12	SEL2		SEL1=“L”, SEL2=“H” → 3Cell in series
			SEL1=“H”, SEL2=“H” → test mode
13	CS	Input of overcurrent detection. Detected overcurrent by sense resistor between CS pin and VSS pin. Detection of an discharging overcurrent will output a High level from a DCHG pin. It protects from high current by these control	
14	TH	Temperature detection pin	
15	REG	The regulator output pin for a thermo sense resistor drive	
16	VSS_CS	Common pin of overcurrent detection circuit	
17	VSS	The input pin of the negative voltage of V1 cell. The input pin of the ground of IC	
18	V1	The input pin of the positive voltage of V1 cell, and the negative voltage of V2 cell	
19	V2	The input pin of the positive voltage of V2 cell, and the negative voltage of V3 cell	
20	V3	The input pin of the positive voltage of V3 cell, and the negative voltage of V4 cell	
21	V4	The input pin of the positive voltage of V4 cell, and the negative voltage of V5 cell	
22	V5	The input pin of the positive voltage of V5 cell	
23	VDD	The input terminal of the power supply of IC	
24	PF	Charge control output pin. Output type is CMOS. Normal mode → “Low” Charge prohibited mode → “High”	

Application circuit

5 cells protection circuit



Explanation of external parts

Parts name	Roles of parts
R1, R2, R3, R4, R5, R6	CR low-pass filter to stabilize a supply ripple of VDD pin, V5 pin, V4 pin, V3 pin, V2 pin and V1 pin
C1, C2, C3, C4, C5, C6	
R8, R9, R13	Resistor to protect terminal
R11, R12	Resistor for preventing the gate destruction due to parasitic oscillation
R7	Sense resistance to observe charging/discharging current
NTC	NTC thermistor to observe to temperature
R10	The REG voltage is divided by NTC and RTH, and it's input to TH pin
C7	Capacitor to sets overcharge detection delay time 2
C8	Capacitor to sets overcharge detection/release delay time 1
C9	Capacitor to sets overdischarge detection/release delay time
C10	Capacitor to sets discharging overcurrent detection/release delay time
C11	Capacitor to sets charging overcurrent detection/release delay time
C12	Capacitor to set the ON / OFF time of the intermittent operation of the temperature protection
Q_1	Nch MOS FET to control discharging current
Q_2	Nch MOS FET to control charging current
Q_3	Nch MOS FET to fuse cut at secondary protection detection

1 SECONDARY BATTERY ICS

3 to 5 cells lithium–ion/lithium–polymer battery protection IC MM3694 Series

Outline

The MM3684 series are protection IC using high voltage CMOS process for overcharge, overdischarge, overcurrent and temperature protection of the rechargeable Lithium-ion or Lithium-polymer battery. The overcharge, overdischarge, discharging overcurrent, charging overcurrent, temperature of the rechargeable 3 to 5cell Lithium-ion or Lithium-polymer battery can be detected. The internal circuit of IC is composed by the voltage detector, the reference voltage source, delay time control circuit, and the logical circuit, etc.

Features (Unless otherwise specified, Ta=25°C)

(1) Range and accuracy of detection/release voltage

- Overcharge detection voltage ..... 3.6V to 4.5V, 5mV steps ..... Accuracy ±25mV(Topr=±0 to +50°C)
- Overcharge release voltage ※1 ..... 3.4V to 4.5V, 50mV steps ..... Accuracy ±50mV
- Overdischarge detection voltage ..... 2.0V to 3.0V, 50mV steps ..... Accuracy ±80mV
- Overdischarge release voltage ※2 ..... 2.0V to 3.5V, 50mV steps ..... Accuracy ±100mV
- Discharging overcurrent detection voltage 1 ..... 30mV to 300mV, 5mV steps ..... Accuracy ±15%
- Discharging overcurrent detection voltage 2 ..... Twice or 4 times of discharging overcurrent 1 ※3 ..... Accuracy ±20%
- Short detection voltage ..... 4 or 8 times of discharging overcurrent 1 ※3 ..... Accuracy ±100mV
- Charging overcurrent detect voltage ..... -300mV to -20mV, 5mV steps ..... Accuracy ±10mV

(2) Range of detection delay time

- Overcharge detection delay time ..... Setting by a capacitor of COV pin. ..... Accuracy ±50%
- Overcharge release delay time ..... Setting by a capacitor of COV pin. ..... Accuracy ±50%
- Overdischarge detection delay time ..... Setting by a capacitor of CUV pin. ..... Accuracy ±50%
- Overdischarge release delay time ..... Setting by a capacitor of CUV pin. ..... Accuracy ±50%
- Discharging overcurrent detection delay time 1 ..... Setting by a capacitor of DCOC1 pin. ..... Accuracy ±50%
- Discharging overcurrent detection delay time 2 ..... Setting by a capacitor of DCOC2 pin. ..... Accuracy ±50%
- Short detection delay time ..... Selection from 100us, 200us, 300us ..... Accuracy -50%, +100%
- Discharging overcurrent release delay time ..... Setting by a capacitor of DCOC1 pin. ..... Accuracy ±50%
- Charging overcurrent detection delay time ..... Setting by a capacitor of CCOC pin. ..... Accuracy ±50%
- Charging overcurrent release delay time ..... Setting by a capacitor of CCOC pin. ..... Accuracy ±50%
- Temperature protection detection ON time ..... Setting by a capacitor of CIOT pin. ..... Accuracy ±50%
- Temperature protection detection OFF time ..... Setting by a capacitor of CIOT pin. ..... Accuracy ±50%

*1 Overcharge release function is selectable from 3 options(voltage decrease, charger remove, load connect).

*2 Overdischarge release function is selectable from 3 options(voltage increase , charger remove, load connect).

*3 option

(3) The setting for three cell , for four cell , and for five cell protection can be set with the SEL1,2 pin.

(4) 0V battery charge function Selection from "Prohibition" or "Permission"

(5) Power save mode built-in

- When all cells is detected overdischarge and charger disconnecting, IC becomes low consumption mode.

(6) Achieve low consumption by making the temperature detection for regulator and temperature detection circuit to intermittent operation

Features

(Unless otherwise specified, Ta=+25°C)

(7) Low current consumption

- VDD pin current consumption(Vcell=4.3V) ..... Typ. 15.0uA Max. 25.0uA
- VDD pin current consumption(Vcell=3.5V) ..... Typ. 10.0uA Max. 20.0uA
- VDD pin current consumption at power save (Vcell=1.8V) ..... Typ. 3.0uA, Max. 6.0uA
- V5 pin current consumption (Vcell=4.3V) ..... Typ. 1.0uA, Max. 2.0uA
- V5 pin current consumption (Vcell=3.5V) ..... Typ. 0.8uA, Max. 1.5uA
- V5 pin current consumption (Vcell=1.8V) ..... Max. 0.5uA

(8) Input current

- V4 pin input current (Vcell=3.5V) ..... Max. 0.3uA
- V3 pin input current (Vcell=3.5V) ..... Max. 0.3uA
- V2 pin input current (Vcell=3.5V) ..... Max. 0.3uA
- V1 pin input current (Vcell=3.5V) ..... Max. 0.3uA

(9) Absolute maximum ratings

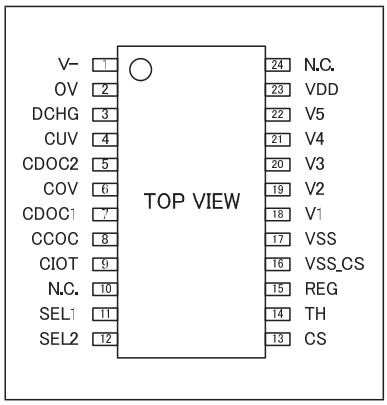
- VDD pin ..... VSS-0.3V to VSS+30V
- V5 pin ..... V4-0.3V to VDD+0.3V
- Voltage between the input terminals ..... -0.3V to +10V
- V-, OV pin ..... VDD-30V to VDD+0.3V
- DCHG, CS pin ..... VSS-0.3V to VDD+0.3V
- SEL1, SEL2 pin ..... VSS-0.3V to VDD+0.3V
- COV, CUV pin ..... VSS-0.3V to VDD+0.3V
- CDOC1, CDOC2, CCOC, CIOT pin ..... VSS-0.3V to VDD+0.3V
- REG, TH pin ..... VSS-0.3V to VDD+0.3V
- Storage temperature ..... -55 to +125°C

(10) Recommended operating conditions

- Operating Temperature ..... -40 to +85°C
- Supply Voltage ..... VSS+3.5V to +22.5V

Pin assignment

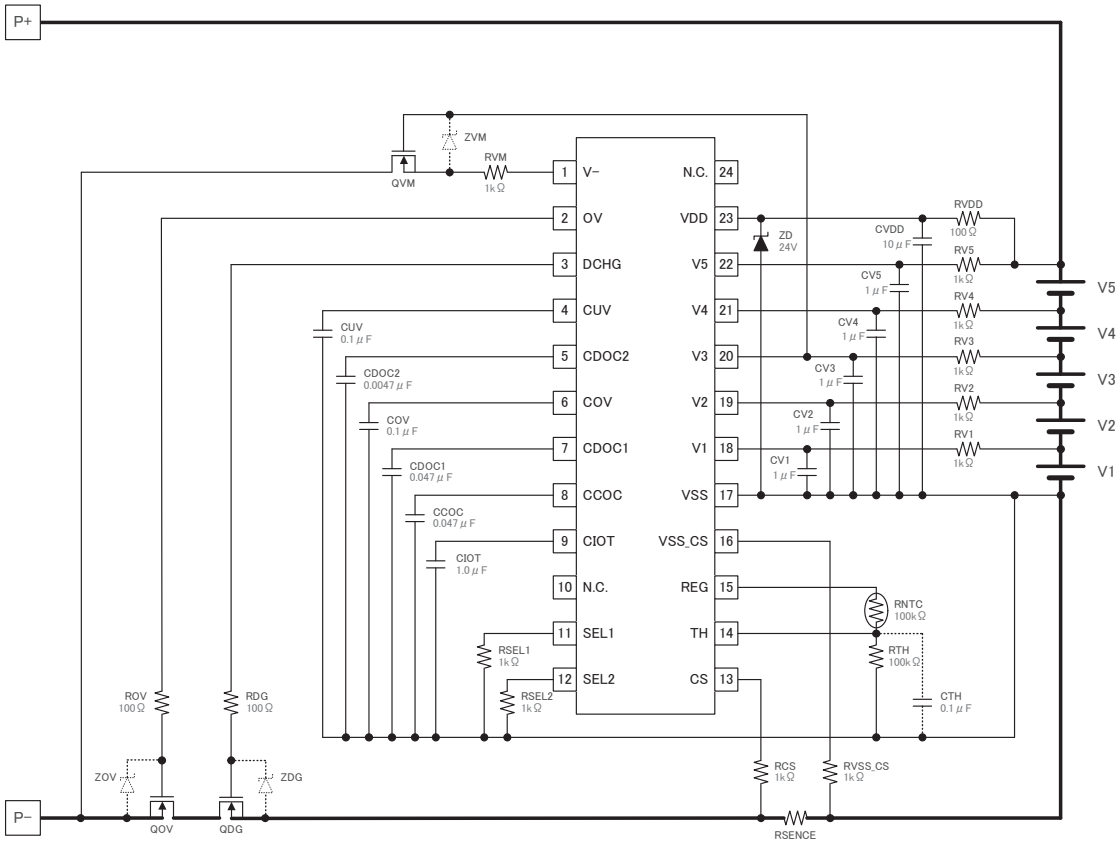
VSOP-24A



Pin No.	Pin Name	Function	
1	V-	Input terminal connected to charger negative voltage. Detected charger connection and load connection."	
2	OV	Charge control output pin. Output type is N-Ch FET open drain. Normal mode → "High" → Charge prohibited mode → "Low"	
3	DCHG	Discharge control output pin. Output type is CMOS. Normal mode → "High" Discharge prohibited mode → "Low"	
4	CUV	This pin is delay time setting of overdischarge detection and overdischarge release. If a capacitor is connected between CUV pin and VSS pin , overdischarge detection delay time setting becomes possible.	
5	CDOC2	This pin is delay time setting of discharging overcurrent detection 2. If acapacitor is connected between CDOC2 pin and VSS pin , discharging overcurrent delay time setting becomes possible.	
6	COV	This pin is delay time setting of overcharge detection 1 and overcharge release 1. If a capacitor is connected between COV pin and VSS pin , overcharge detection 1 delay time setting becomes possible.	
7	CDOC1	This pin is delay time setting of discharging overcurrent detection1 and discharging overcurrent release. If a capacitor is connected between CDOC pin and VSS pin , discharging overcurrent delay time setting becomes possible.	
8	CCOC	This pin is delay time setting of charging overcurrent detection and charging overcurrent release. If a capacitor is connected between CCOC pin and VSS pin , charging overcurrent delay time setting becomes possible.	
9	CIOT	This pin is delay time setting of intermittent operation of temperature detection. If a capacitor is connected between CIOT pin and VSS pin , temperature delay time setting becomes possible.	
10	N.C.	No Connection.	
11	SEL1	This pin is for changing function for 3cell in series or 4cell in series , 5cell in series.	SEL1="L", SEL2="L" → 5Cell in series
			SEL1="H", SEL2="L" → 4Cell in series
12	SEL2		SSEL1="L", SEL2="H" → 3Cell in series
			SEL1="H", SEL2="H" → test mode
13	CS	nput of overcurrent detection. Detected overcurrent by sense resistor between CS pin and VSS pin. Detection of an discharging overcurrent will output a High level from a DCHG pin. It protects from high current by these control	
14	TH	Temperature detection pin.	
15	REG	The regulator output pin for a thermo sense resistor drive.	
16	VSS_CS	Common pin of overcurrent detection circuit.	
17	VSS	The input pin of the negative voltage of V1 cell. The input pin of the ground of IC.	
18	V1	The input pin of the positive voltage of V1 cell, and the negative voltage of V2 cell.	
19	V2	The input pin of the positive voltage of V2 cell, and the negative voltage of V3 cell .	
20	V3	The input pin of the positive voltage of V3 cell, and the negative voltage of V4 cell .	
21	V4	The input pin of the positive voltage of V4 cell, and the negative voltage of V5 cell .	
22	V5	The input pin of the positive voltage of V5 cell .	
23	VDD	The input terminal of the power supply of IC.	
24	N.C.	No Connection.	

Application circuit

5 cells protection circuit



Explanation of external parts

Parts name	Roles of parts
RV1, RV2, RV3, RV4, RV5, RVDD	CR low-pass filter to stabilize a supply ripple of VDD pin, V5 pin, V4 pin, V3 pin, V2 pin and V1 pin.
CV1, CV2, CV3, CV4, CV5, CVDD	
RCS, RVSS_CS, RVM, RSEL1/2	Resistor to protect terminal.
ROV, RDG	Resistor for preventing the gate destruction due to parasitic oscillation.
RSENCE	Sense resistance to observe charging/discharging current.
RNTC	NTC thermistor to observe to temperature.
RTH	The REG voltage is divided by NTC and RTH, and it's input to TH pin.
COV	Capacitor to sets overcharge detection/release delay time 1.
CUV	Capacitor to sets overdischarge detection/release delay time.
CDOC1	Capacitor to sets discharging overcurrent detection 1/release delay time.
CDOC2	Capacitor to sets discharging overcurrent detection 2 delay time.
CCOC	Capacitor to sets charging overcurrent detection/release delay time.
CIOT	Capacitor to set the ON / OFF time of the intermittent operation of the temperature protection.
QDG	Nch MOS FET to control discharging current.
QOV	Nch MOS FET to control charging current.
QVM	FET to prevent voltage input to V-pin from rising more than voltage of VDD pin.
ZD	Zener diode to prevent destruction of IC by surge voltage.

1 SECONDARY BATTERY ICS

4 to 7 cells lithium–ion/lithium–polymer battery protection IC MM3877 Series

Outline

The MM3787 series are protection IC using high voltage CMOS process for overcharge, overdischarge, overcurrent, temperature protection, and cell balance control of the rechargeable Lithium-ion or Lithium-polymer battery.
The overcharge, overdischarge, discharging overcurrent, charging overcurrent, and short of the rechargeable 4-7cells lithium-ion or lithium-polymer battery can detected. In addition, the temperature detection by external NTC thermistor and cell balance control are also possible. The internal circuit of IC is composed by the voltage detector, the reference voltage source, oscillator, counter circuit and the logical circuit, etc. A stacking configuration using multiple ICs is also possible, so a low-cost, space-saving protection circuit can be configured for applications with more than 7 cells.

Features

(Unless otherwise specified, Ta=25°C)

(1) Range and accuracy of detection/release voltage/temperature(Unless otherwise specified, Topr=+25°C)

- Overcharge detection voltage.....3.6V to 4.5V, 5mV step ..... ±20mV
- Overcharge release voltage *1 .....3.4V to 4.5V, 50mV step ..... ±30mV
- Overdischarge detection voltage .....2.0V to 3.0V, 50mV step ..... ±50mV
- Overdischarge release voltage *2 .....2.0V to 3.5V, 50mV step ..... ±100mV
- Cell balance detection voltage.....3.6V to 4.5V, 5mV step ..... ±25mV
- Discharging overcurrent detection voltage1 .....30mV to 300mV, 5mV step ..... ±10% (Min.±5mV)
- Discharging overcurrent detection voltage2 .....60mV to 600mV, 6mV step ..... ±15% (Min.±15mV)
- Short detection voltage.....200mV to 1.0V, 50mV step ..... ±20%
- Charging overcurrent detection voltage.....-300mV to -20mV, 5mV step ..... ±10% (Min.±5mV)
- High/low temp protection detection temperature *3.....-40°C to 75°C , 5°C step..... ±5°C

(2) Range and accuracy of various delay time

- Overcharge detection delay time .....100ms to 2.048s..... *4
- Overdischarge detection delay time .....100ms to 2.048s..... *4
- Cell balance detection delay time.....100ms to 4.096s..... *4
- Discharging overcurrent detection delay time1 .....100ms to 2560ms, COC=0.01uF ..... ±25%
- Discharging overcurrent detection delay time2 .....10ms to 640ms, COC=0.01uF ..... ±25%
- Short detection delay time.....200us to 500us, 50us step ..... ±50%
- Discharging overcurrent release delay time.....4ms to 2.048s..... ±25%
- Charging overcurrent detection delay time.....4ms to 2.048s..... ±25%
- Charging overcurrent release delay time .....4ms to 2.048s..... ±25%
- Temperature protection detection delay time .....4ms to 2.048s..... ±25%
- Temperature protection release delay time.....4ms to 2.048s..... ±25%

*1 Overcharge release function is selectable from 2 options(voltage decrease, charger remove).
*2 Overdischarge release function is selectable from 2 options(voltage increase , load remove).
*3 High/Low temp protection detection temperature accuracy is guaranteed by design.
Detection accuracy may change with the specification of the used NTC thermistor.
*4 Voltage monitoring of overcharge protection, overdischarge protection and cell balance control measures the voltage of each cell in turn at [Cell voltage monitoring period(=Typ.71.75ms)].
For that reason, each detection time and release time fluctuates within the range of Spec depending on the difference between the timing at which the voltage changes and the timing at which the voltage changes and the timing at which the voltage in monitored.

(3) SEL pin can be set from 4cell protection to 7 cell protection.

(4) Power save function
After overdischarge detection, if the charger is not connected and any cell voltage is below the overdischarge release voltage and the power save delay time has elapsed, the IC enters power save mode.
In power save mode, the IC stops unnecessary circuits and reduces current consumption.

Features

(Unless otherwise specified, Ta=+25°C)

(5) Cascade connection

By cascading two ICs, it is possible to protect batteries of 8 cells or more.
By connecting the OV pin and DCHG pin of the high side IC to the SOC pin and SDC pin of the low side IC respectively, it is possible to transmit charge/discharge control signal from high side IC to low side IC and the charge/load connection signal from the low side IC to high side IC. Various functions can be supported without increasing the number of external circuits in cascade connection.

(6) 0V battery charge functionSelection from "Permission" or " Inhibition"

(7) Low current consumption

- Ave. current consumption (Normal mode) ..... Typ. 20.0uA Max. 30.0uA (VCELL=3.5V)
- Current consumption (power save mode)..... Typ. 1.0uA Max. 1.5uA (VCELL=1.8V)

(8) Input current

- V7 pin input current (Normal mode)..... Typ. 0.2uA Max. 0.5uA (VCELL=3.5V)
- Vn pin input current (Normal mode)..... n=1~6Min. -0.3uA Max. +0.3uA (VCELL=3.5V)
- Vn pin input current (Cell balance mode)..... n=1~7Min. 3.0mA Typ. 6.0mA (VCELL=4.5V)

(9) Absolute maximum ratings

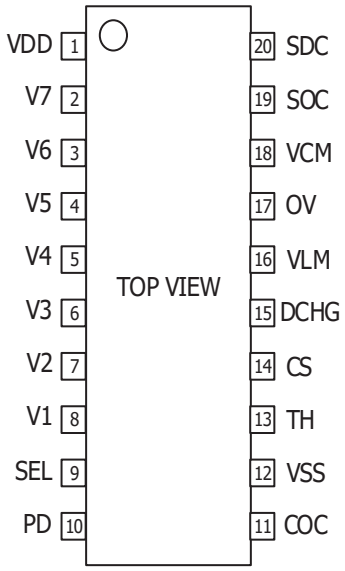
- Supply voltage (VDD pin) ..... VSS-0.3V to VSS+42V
- V7 pin supply voltage..... VSS-0.3 to VDD+0.3
- Voltage between cell input pins ..... -0.3V to +6.0V
- SEL pin, COC pin input supply voltage ..... VSS-0.3 to VDD+0.3
- PD pin supply voltage..... VSS-0.3 to VDD+0.3
- TH pin, CS pin supply voltage ..... VSS-0.3 to VDD+0.3
- DCHG pin supply voltage ..... VDD-42.0 to VDD+10V
- OV pin supply voltage..... VDD-42.0 to VDD+0.3V
- VLM pin, VCM pin supply voltage..... VDD-42V to VDD+0.3V
- SOC pin, SDC pin supply voltage..... VSS-0.3V to VDD+0.3V
- Storage temperature..... -55 to +125°C
- Power Dissipation 340mW

(10) Recommended operating conditions

- Operating temperature..... -40 to +85°C
- Supply voltage ..... VSS+3.5V to +31.5V

Pin assignment

VSOP-20A



Pin No.	Function
1	The input pin of the power supply of IC.
2	The input pin of the positive voltage of V7 cell and the output pin of cell balance control of V7 cell.
3	The input pin of the positive voltage of V6, and the negative voltage of V7 cell.And the output pin of cell balance control of V6 cell.
4	The input pin of the positive voltage of V5, and the negative voltage of V6 cell.And the output pin of cell balance control of V5 cell.
5	The input pin of the positive voltage of V4, and the negative voltage of V5 cell.And the output pin of cell balance control of V4 cell.
6	The input pin of the positive voltage of V3, and the negative voltage of V4 cell.And the output pin of cell balance control of V3 cell.
7	The input pin of the positive voltage of V2, and the negative voltage of V3 cell.And the output pin of cell balance control of V2 cell.
8	The input pin of the positive voltage of V1, and the negative voltage of V2 cell.And the output pin of cell balance control of V1 cell.
9	This input pin is changing function for 4cell, 5cell, 6cell, and 7cell in series.SEL=VDD : 7cell mode, SEL=V4 : 6cell mode, SEL=V2 : 5cell mode, SEL=VSS=4cell mode
10	The output pin for controlling pull-down of load negative voltage.
11	This input pin sets delay time of discharging overcurrent detection, and selects mode.
12	The input pin of the negative voltage of V1 cell. The input pin the ground of IC.
13	Temperature detection pin.
14	The input pin of over current detection.
15	When charge/discharge control FET drive mode, DCHG pin is discharge control output pin.When cascade mode, DCHG pin is discharge control output pin and load connect signal input pin.
16	The input pin connected to load negative voltage.
17	When charge/discharge control FET drive mode, OV pin is charge control output pin.When cascade mode, OV pin is charge control output pin and charger connect signal input pin.
18	The input pin connected to charger negative voltage.
19	The input pin for charge control. And, charger connect signal output pin.
20	The input pin for discharge control. And, load connect signal output pin.

Selection guide

Product name	Detection voltage / Release voltage									
	Overcharge detection voltage	Overcharge release voltage	Overdischarge detection voltage	Overdischarge release voltage	Cell balance detection voltage	Cell balance hysteresis voltage	Discharging overcurrent detection voltage 1	Discharging overcurrent detection voltage 2	Short detection voltage	Charging overcurrent detection voltage
	Vovp	Vovr	Vuvp	Vuvr	Vcbd	Vcbr	Vdocp1	Vdocp2	Vscp	Vcocp
	V	V	V	V	V	V	V	V	V	V
MM3877C05WBE	4.250	4.100	2.750	3.000	4.200	0.010	0.100	0.200	0.350	-0.030
MM3877C06WBE	3.700	3.550	2.300	2.700	3.550	0.010	0.100	0.200	0.350	-0.030

Product name	Temperature protection detection / release temperature									
	High temp protection detection temperature for discharging	High temp protection release temperature for discharging	High temp protection detection temperature for charging	High temp protection release temperature for charging	Low temp protection detection temperature for charging	Low temp protection release temperature for charging	Low temp protection detection temperature for discharging	Low temp protection release temperature for discharging	Temp protection monitoring time	Temp protection monitoring period
	Tthp1	Tthr1	Tthp2	Tthr2	Tthp3	Tthr3	Tthp4	Tthr4	tthm	ttmon
	°C	°C	°C	°C	°C	°C	°C	°C	msec	sec
MM3877C05WBE	75	65	50	40	0	10	-	-	16.0	2.68
MM3877C06WBE	75	65	50	40	0	10	-	-	16.0	2.68

Please inquire to us, if you request a rank other than the above.

Selection guide

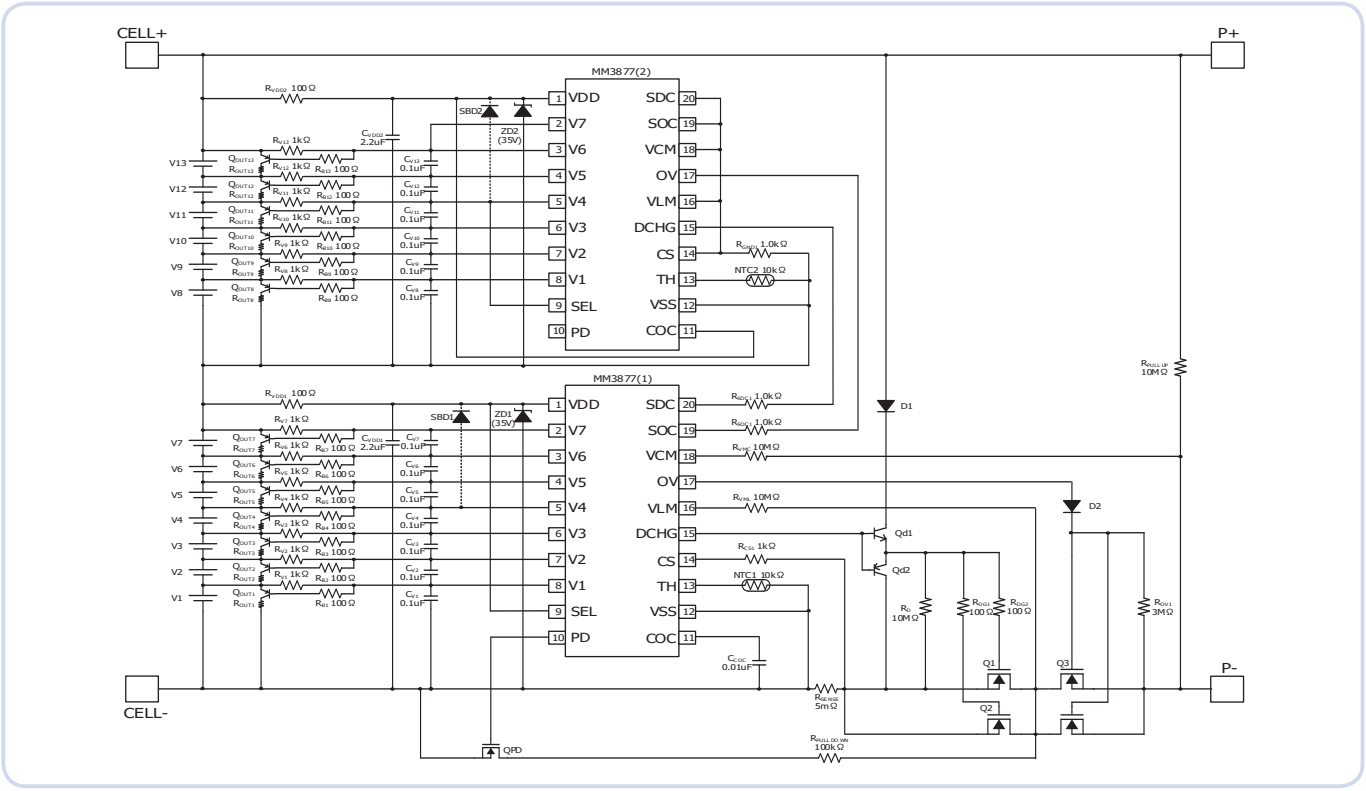
Product name	Detection delay time / Release delay time										
	Overcharge detection delay time	Overdischarge detection delay time	Cell balance detection delay time	Discharging overcurrent detection delay time 1 (at COC = 0.01uF)	Discharging overcurrent detection delay time 2 (at COC = 0.01uF)	Discharging overcurrent release delay time	Short detection delay time	Changing overcurrent detection delay time	Charging overcurrent release delay time	Temp protection detection delay time	Temp protection release delay tim
	tovp	tuvp	tcbd	tdocp1	tdocp2	tdocr	tscp	tcocp	tcocr	tthp	tthr
	sec	sec	sec	msec	msec	msec	usec	msec	msec	sec	msec
MM3877C05WBE	1.024	1.024	0.256	100	10	1024	350	1024	128	2.048	100
MM3877C06WBE	1.024	1.024	0.256	100	10	1024	350	1024	128	2.048	100

Product name	Option function							
	Cell balance function	Overcharge release function	Overdischarge hysteresis cancel function	Overdischarge release function	Discharging overcurrent release function	Charging overcurrent release function	Temp protection release function	0V battery charge function
MM3877C05WBE	Enable	Latch	Enable	Latch	Load remove	Charger remove	Temp	Prohibition
MM3877C06WBE	Enable	Latch	Enable	Latch	Load remove	Charger remove	Temp	Prohibition

Please inquire to us, if you request a rank other than the above.

Application circuit

1) 13cells protection circuit (Current pathway : common)



2) Explanation of external parts : 13cells protection circuit

Parts name	Roles of parts
R_{VDD1},R_{VDD2},R_{V1}-R_{V13}	CR low-pass filter to stabilize a supply ripple of VDD pin, V1 to V7 pins. This resistor is used to drive an external pnp transistor during cell balance control."
C_{VDD1},C_{VDD2},C_{V1}-C_{V13}	
ZD1,ZD2	Zener diode to prevent destruction of IC by surge voltage and motor back electromotive voltage.
SBD1,SBD2	This is a Schottky barrier diode to prevent the V4 pin voltage from exceeding VDD.
R_{B1}-R_{B13}	This resistor is the base resistor of the pnp transistor for cell balance control.
R_{OUT1}-R_{OUT13}	This resistor is the discharge resistor curing cell balance control.
Q_{OUT1}-Q_{OUT13}	PNP transistor for cell balance control.
R_{CS1},R_{VCM},R_{VLM},R_{SOC},R_{SDC},R_{GND1}	Resistor to protect terminal.
Q_{PD}	Nch MOS FET that controls the pull-down resistor when monitoring the load connection.
$R_{PULLDOWN}$	This is pull-down resistor for monitoring the load connection.
R_{SENSE}	Sense resistor to monitor charging/discharging current.
C_{COC}	Capacitor to sets discharging overcurrent detection delay time.
NTC1,NTC2	NTC thermistor to monitor to temperature.
Q_{DG1},Q_{DG2},R_D,D1	Parts for driving the discharge control FET.
R_{OV1}	Pull-down resistor to turn off the charge control FET.
R_{DG1},R_{DG2}	Resistors for preventing the gate destruction due to parasitic oscillation.
D2	This diode prevents current from flowing back to the OV pin.
Q1,Q2	Nch MOS FET to control discharging current.
Q3,Q4	Nch MOS FET to control charging current.
R_{PULLUP}	This is pull-up resistor for monitoring the charger connection.

1 SECONDARY BATTERY ICs

Voltage monitor IC for lithim–ion battery secondary protect

MM3734 Series

Outline

The **MM3734** series are voltage monitor ICs for rechargeable Lithium-ion or Lithium–polymer batteries secondary protection, using a high voltage CMOS process. 1–cell lithium-ion or lithium-polymer battery can be detected overcharge state. Internal circuit is composed of voltage detectors, reference voltage sources, an oscillator, a counter circuit and logical circuits.

Features

(Unless otherwise specified, Ta=25°C)

(1) High-accuracy detection voltage

- Detection voltage .....4.0V to 4.5V, 5mV steps
  Accuracy±20mV, Accuracy±25mV (Topr=–5°C to +60°C)
- Hysteresis voltage.....0V to 1.0V, 50mV steps.
  However, “Detection voltage-Hysteresis voltage<4.0V” is disabled.

(2) Range of Detection delay time

- Detection delay time .....Selectable from 0.25s, 1.02s, 2.048s, 4.096s.

(3) Low current consumption

- Normal mode .....Typ. 1.5µA, Max. 3.0µA
- Stand-by mode .....Max. 0.8µA

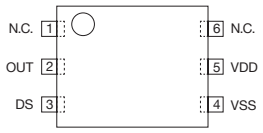
(4) Absolute maximum ratings

- VDD pin.....VSS–0.3V to +12V
- OUT pin.....VDD–0.3V to VDD+0.3V
- DS pin .....VSS–0.3V to VDD+0.3V
- Storage temperature.....–55°C to +125°C
- Operation temperature.....Í40°C to +85°C

Pin assignment

SON-6C

(Top view)



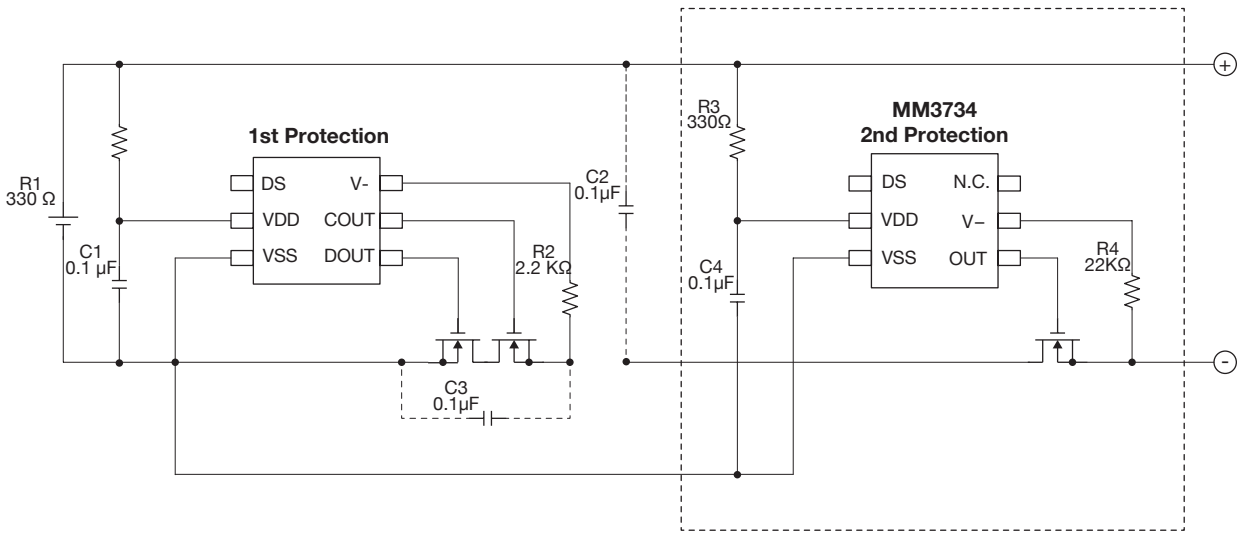
Pin No.	Symbol	Function
1	N.C.	Non connection
2	OUT	Output of detecting voltage. Output type is CMOS
3	DS	Delay shorten terminal
4	VSS	VSS terminal. Connected to ground
5	VDD	VDD terminal. Connected to IC substrait
6	N.C.	Non connection

PRODUCT LINEUP

PRODUCT	Package	Detection voltage	Release voltage	Detection delay time	Release delay time
		Vdet	Vrel	tVdet	tVrel
MM3734A01YRE	SON-6C	4.500V	4.150V	2.048s	16ms

Please inquire to us, if you request a rank other than the above.

TYPICAL APPLICATION CIRCUIT



- R3 and C4 stabilize a supply voltage ripple. However, the detection voltage rises by the current of penetration in IC of the voltage detection when R3 is enlarged, and the value of R3 is adjusted to 1KΩ or less. Moreover, adjust the value of C4 to 0.01µF or more to do the stability operation, please.

1 SECONDARY BATTERY ICs

2 to 4 cells lithium–ion/lithium–polymer battery secondary protection IC

MM3508A Series

Outline

MM3508A series are double protection IC for 2 to 4 serial cells lithium–ion / lithium–polymer battery for secondary protection IC. Since it has a built–in timer circuit, it is able to set the detection delay time. It can hold the output of detection for a certain period by latch function. Therefore, it can maintain Fuse cutting time. In addition, it can lower the cell voltage when it is high after Fuse cutting.

Features

(Unless otherwise specified, Ta=25°C)

(1) Range and accuracy of overcharge detection/hysteresis voltage

- Overcharge detection voltage4.0V to 4.5V, 5mV step ..... Accuracy±20mV (Topr=0 to +50°C)
- Overcharge hysteresis voltage.....50mV to 500mV, 50mV step ..... Accuracy±100mV

(2) Range of detection delay time

- Overcharge detection delay time.....1ms to $(1ms \times 2^{n1})+(1ms \times 2^{n2})$

*n1 and n2 can select two arbitrary integers between 0 to 13. (However n1≠n2)

(3) Low current consumption

- Typ. 3.5μA, Max. 5.0μA (Vcell=4.0V)
- Typ. 0.15μA, Max. 0.30μA (Vcell=2.3V)

(4) Absolute maximum ratings

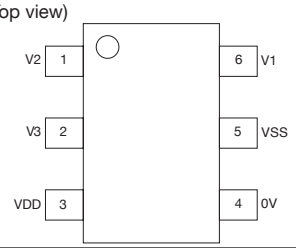
- VDD pin..... VSS–0.3V to VSS+28V
- 0V pin..... VSS–0.3V to VDD+0.3V
- Storage temperature..... –55°C to +125°C
- Operation temperature..... –40°C to +110°C

(5) The FUSE cutting signal is the output between period of time. And the CELL voltage is released by electric discharge resistance of "60KΩ(Typ.)" after FUSE was cut.
And CELL stops an electric discharge if the CELL voltage becomes less than the electric discharge release voltage.

Pin assignment

SOT-26A

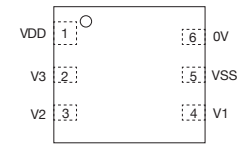
(Top view)



Pin no.	Symbol	Function
1	V2	The input terminal of the positive voltage of V2 cell, and the negative voltage of V3 cell
2	V3	The input terminal of the positive voltage of V3 cell, and the negative voltage of V4 cell
3	VDD	The input terminal of the power supply of IC, and the positive voltage of V4 cell
4	0V	Output of over charge detection (Output type is CMOS)
5	VSS	The input terminal of the ground of IC, and the negative voltage of V1 cell
6	V1	The input terminal of the positive voltage of V1 cell, and the negative voltage of V2 cell

SSON-6A

(Top view)



Pin no.	Symbol	Function
1	VDD	The input terminal of the power supply of IC, and the positive voltage of V4 cell
2	V3	The input terminal of the positive voltage of V3 cell, and the negative voltage of V4 cell
3	V2	The input terminal of the positive voltage of V2 cell, and the negative voltage of V3 cell
4	V1	The input terminal of the positive voltage of V1 cell, and the negative voltage of V2 cell
5	VSS	The input terminal of the ground of IC, and the negative voltage of V1 cell
6	0V	Output of over charge detection (Output type is CMOS)

1 SECONDARY BATTERY ICs

2 to 4 cells lithium-ion/lithium-polymer battery secondary protection IC

MM3508B Series

Outline

MM3508B series are double protection IC for 2 to 4 serial cells lithium-ion / lithium-polymer secondary battery. It detects battery voltage for each cell.

Each of these IC composed of four voltage detectors, reference voltage sources, oscillator, counter circuit and logical circuits.

Features

(Unless otherwise specified, Ta=25°C)

(1) Range and accuracy of overcharge detection/hysteresis voltage

- Overcharge detection voltage.....4.0V to 4.5V, 5mV step ..... Accuracy±20mV (Topr=0 to +50°C)
- Overcharge hysteresis voltage.....50mV to 500mV, 50mV step ..... Accuracy±100mV

(2) Range of detection delay time

- Overcharge detection delay time.....1ms to $(1ms \times 2^{n1})+(1ms \times 2^{n2})$

*n1 and n2 can select two arbitrary integers between 0 to 13. (However n1≠n2)

(3) Low current consumption

- Typ. 3.5μA, Max. 5.0μA (Vcell=4.0V)
- Typ. 0.15μA, Max. 0.30μA (Vcell=2.3V)

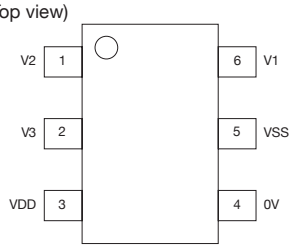
(4) Absolute maximum ratings

- VDD pin.....VSS-0.3V to VSS+28V
- 0V pin.....VSS-0.3V to VDD+0.3V
- Storage temperature.....-55°C to +125°C
- Operation temperature.....-40°C to +110°C

Pin assignment

SOT-26A

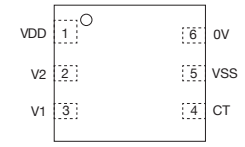
(Top view)



Pin no.	Symbol	Function
1	V2	The input terminal of the positive voltage of V2 cell, and the negative voltage of V3 cell
2	V3	The input terminal of the positive voltage of V3 cell, and the negative voltage of V4 cell
3	VDD	The input terminal of the power supply of IC, and the positive voltage of V4 cell
4	0V	Output of over charge detection (Output type is CMOS)
5	VSS	The input terminal of the ground of IC, and the negative voltage of V1 cell
6	V1	The input terminal of the positive voltage of V1 cell, and the negative voltage of V2 cell

SSON-6A

(Top view)



Pin no.	Symbol	Function
1	VDD	The input terminal of the power supply of IC, and the positive voltage of V4 cell
2	V3	The input terminal of the positive voltage of V3 cell, and the negative voltage of V4 cell
3	V2	The input terminal of the positive voltage of V2 cell, and the negative voltage of V3 cell
4	V1	The input terminal of the positive voltage of V1 cell, and the negative voltage of V2 cell
5	VSS	The input terminal of the ground of IC, and the negative voltage of V1 cell
6	0V	Output of over charge detection (Output type is CMOS)

1 SECONDARY BATTERY ICs

2 to 3 cells lithium–ion/lithium–polymer battery secondary protection IC

MM3508C Series

Outline

MM3508C series are double protection IC for 2 to 3 serial cells lithium–on / lithium–polymer battery for secondary protection IC. It detects overcharge voltage with high accuracy for each cell.

The terminal CT is used to control the output voltage of the terminal 0V.

Features

(Unless otherwise specified, Ta=25°C)

(1) Range and accuracy of overcharge detection/hysteresis voltage

- Overcharge detection voltage.....4.0V to 4.5V, 5mV step ..... Accuracy±20mV (Ta=0 to +50°C)
- Overcharge hysteresis voltage.....50mV to 500mV, 50mV step ..... Accuracy±160mA

(2) Range of detection delay time

- Overcharge detection delay time.....1ms to $(1ms \times 2^{n1})+(1ms \times 2^{n2})$

*n1 and n2 can select two arbitrary integers between 0 to 13. (However n1≠n2)

(3) Low current consumption

- Typ. 3.0μA, Max. 5.0μA (Vcell=4.0V)
- Typ. 2.5μA, Max. 4.0μA (Vcell=2.3V)

(4) Absolute maximum ratings

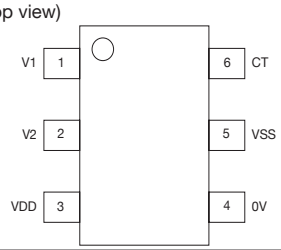
- VDD pin.....VSS-0.3V to VSS+18V
- OV pin .....VSS-0.3V to VDD+0.3V
- Storage temperature.....-55°C to +125°C
- Operation temperature.....-40°C to +110°C

(5) The terminal CT is used to control the output voltage of the terminal 0V.

Pin assignment

SOT-26A

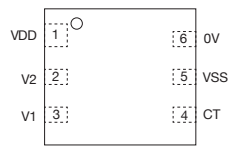
(Top view)



Pin no.	Symbol	Function
1	V1	The input terminal of the positive voltage of V1 cell, and the negative voltage of V2 cell
2	V2	The input terminal of the positive voltage of V2 cell, and the negative voltage of V3 cell
3	VDD	The input terminal of the power supply of IC, and the positive voltage of V4 cell
4	0V	Output of over charge detection (Output type is CMOS)
5	VSS	The input terminal of the ground of IC, and the negative voltage of V1 cell
6	CT	The input terminal of OV output control signal

SSON-6A

(Top view)



Pin no.	Symbol	Function
1	VDD	The input terminal of the power supply of IC, and the positive voltage of V3 cell
2	V2	The input terminal of the positive voltage of V2 cell, and the negative voltage of V3 cell
3	V1	The input terminal of the positive voltage of V1 cell, and the negative voltage of V2 cell
4	CT	The input terminal of OV output control signal
5	VSS	The input terminal of the ground of IC, and the negative voltage of V1 cell
6	0V	Output of over charge detection (Output type is CMOS)

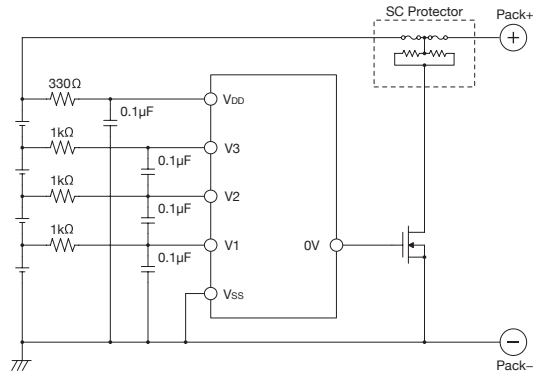
Selection guide

MODEL	Package	Function	Overcharge detection voltage [V]	Overcharge hysteresis voltage [mV]	Detection delay time [s]	Latch function	Standby function	Terminal CT
			V_{CELLU}	V_{HYS}	T_{OV}			
MM3508A01RRE	SSON-6A	2~4cell	4.220±0.02	500±100	4.10±0.9	○	○	-
MM3508A02RRE	SSON-6A	2~4cell	4.350±0.02	500±100	4.10±0.9	○	○	-
MM3508A03RRE	SSON-6A	2~4cell	4.450±0.02	500±100	4.10±0.9	○	○	-
MM3508A04RRE	SSON-6A	2~4cell	4.320±0.02	500±100	4.10±0.9	○	○	-
MM3508A05RRE	SSON-6A	2~4cell	4.370±0.02	500±100	4.10±0.9	○	○	-
MM3508A06RRE	SSON-6A	2~4cell	4.500±0.02	500±100	4.10±0.9	○	○	-
MM3508A07RRE	SSON-6A	2~4cell	4.375±0.02	500±100	4.10±0.9	○	○	-
MM3508B01RRE	SSON-6A	2~4cell	4.450±0.02	500±100	5.00±1.5	-	○	-
MM3508B06RRE	SSON-6A	2~4cell	4.350±0.02	V4:620±100 V3~V1:270±100	4.00±1.2	-	○	-
MM3508B07RRE	SSON-6A	2~4cell	4.300±0.02	V4:620±100 V3~V1:270±100	4.00±1.2	-	○	-
MM3508B08RRE	SSON-6A	2~4cell	4.450±0.02	V4:620±100 V3~V1:270±100	4.00±1.2	-	○	-
MM3508B09RRE	SSON-6A	2~4cell	4.500±0.02	V4:620±100 V3~V1:270±100	4.00±1.2	-	○	-
MM3508B10RRE	SSON-6A	2~4cell	4.400±0.02	V4:620±100 V3~V1:270±100	4.50±1.35	-	○	-
MM3508C01RRE	SSON-6A	2~3cell	4.350±0.02	390±160	4.00±1.2	-	-	○
MM3508C01NRH	SOT-26A	2~3cell	4.350±0.02	390±160	4.00±1.2	-	-	○
MM3508C02RRE	SSON-6A	2~3cell	4.350±0.02	390±160	5.65±1.7	-	-	○
MM3508C02NRH	SOT-26A	2~3cell	4.350±0.02	390±160	5.65±1.7	-	-	○
MM3508C03RRE	SSON-6A	2~3cell	4.450±0.02	390±160	5.65±1.7	-	-	○
MM3508C03NRH	SOT-26A	2~3cell	4.450±0.02	390±160	5.65±1.7	-	-	○
MM3508C04RRE	SSON-6A	2~3cell	4.450±0.02	390±160	4.00±1.2	-	-	○

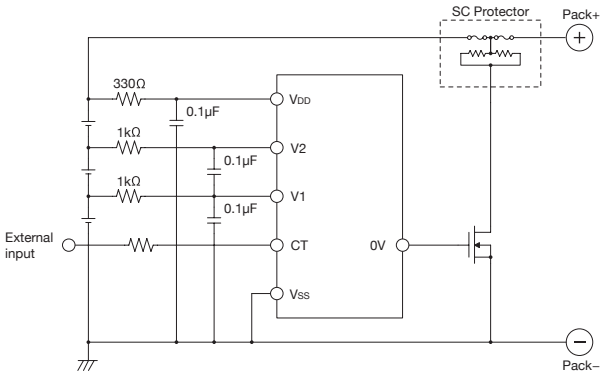
Please inquire to us, if you request a rank other than the above.

Typical application circuit

MM3508A MM3508B Series (When using it for 4 cells)



MM3508C Series (When using it for 3 cells)



1 SECONDARY BATTERY ICs

1 to 3 cells lithium–ion/lithium–polymer battery secondary protection IC

MM3563 Series

Outline

MM3563 series are secondary protection IC using high voltage CMOS process for overcharge protection of the rechargeable lithium–ion or lithium-polymer battery.
The high accuracy overcharge detection of each cell of the rechargeable 1 to 3–cell Lithium-ion or Lithium-polymer battery is possible.
Each of these IC composed of four voltage detectors, reference voltage sources, oscillator, counter circuit and logical circuits.
The ultra-small package SSON-6A is used to minimize footprints.

Features

(Unless otherwise specified, Ta=25°C)

(1) Range and accuracy of overcharge detection/hysteresis voltage
- Overcharge detection voltage4.0V to 4.5V, 5mV step ..... Accuracy±25mV (Topr=0 to +60°C)
- Overcharge hysteresis voltage.....detection voltage -50mV to 500mV..... Accuracy±50mV to 100mV

(2) Range of overcharge detection delay time
- Overcharge detection delay time.....1ms to $(1ms \times 2^{n1})+(1ms \times 2^{n2})$

*n1 and n2 can select two arbitrary integers between 0 to 13. (However n1≠n2)

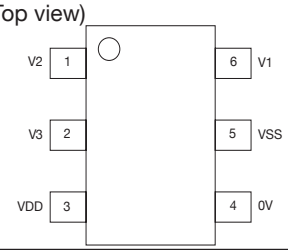
(3) Low current consumption
- Typ. 1.5μA Max. 3.0μA (Vcell=4.0V)
- Typ. 0.15μA Max. 0.30μA (Vcell=2.3V)

(4) Absolute maximum ratings
- VDD pin..... VSS-0.3V to 18V
- 0V pin..... VSS-0.3V to VDD+0.3V
- Storage temperature..... -55°C to +125°C
- Operation temperature..... -40°C to +110°C

Pin assignment

SOT-26A

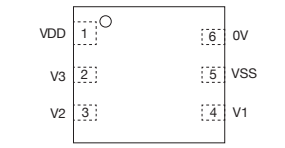
(Top view)



Pin no.	Symbol	Function
1	V2	The input terminal of the positive voltage of V2 cell, and the negative voltage of V3 cell
2	V3	The input terminal of the positive voltage of V3 cell
3	VDD	The input terminal of the power supply of IC
4	0V	Output of over charge detection. Output type is CMOS
5	VSS	The input terminal of the ground of IC, and the negative voltage of V1 cell
6	V1	The input terminal of the positive voltage of V1 cell, and the negative voltage of V2 cell

SSON-6A

(Top view)



Pin no.	Symbol	Function
1	VDD	The input terminal of the power supply of IC
2	V3	The input terminal of the positive voltage of V3 cell
3	V2	The input terminal of the positive voltage of V2 cell, and the negative voltage of V3 cell
4	V1	The input terminal of the positive voltage of V1 cell, and the negative voltage of V2 cell
5	VSS	The input terminal of the ground of IC, and the negative voltage of V1 cell
6	0V	Output of over charge detection. Output type is CMOS

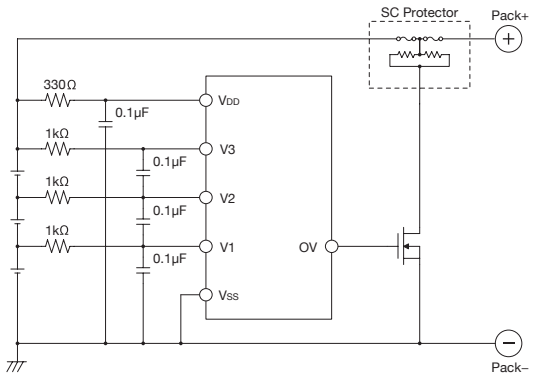
Selection guide

Product name	Overcharge detection voltage [V]	Overcharge hysteresis voltage [mV]	Detection delay time [s]	Stand by function
	$V_{CELL}U$	V_{HYS}	T_{OV}	
MM3563B01NRH	4.350±0.025	340±100	2.0±30%	○
MM3563B02NRH	4.350±0.025	100±50	2.0±30%	○
MM3563B02RRE	4.350±0.025	100±50	2.0±30%	○
MM3563B03NRH	4.350±0.025	100±50	6.0±30%	○
MM3563B03RRE	4.350±0.025	100±50	6.0±30%	○
MM3563B04NRH	4.450±0.025	200±70	2.0±30%	○
MM3563B04RRE	4.450±0.025	200±70	2.0±30%	○
MM3563B05RRE	4.350±0.025	500±100	4.1±30%	○
MM3563B06RRE	4.450±0.025	500±100	4.1±30%	○
MM3563B07RRE	4.300±0.025	100±50	2.0±30%	○
MM3563B08RRE	4.400±0.025	200±70	2.0±30%	○
MM3563B09RRE	4.220±0.025	500±100	4.1±30%	○
MM3563B11RRE	4.350±0.025	300±80	6.0±30%	○
MM3563B13RRE	4.500±0.025	500±100	4.1 ±30%	○

Please inquire to us, if you request a rank other than the above.

Typical application circuit

When using it for 3 cells



1 SECONDARY BATTERY ICS

3, 4cells lithium–ion/lithium–polymer battery secondary potection protection IC

MM3625 Series

Outline

The **MM3625** series are secondary protection IC using high voltage CMOS process for overcharge protection of the rechargeable lithium–ion or lithium–polymer battery.
The high accuracy overcharge detection of each cell ofthe rechargeable 3,4 cell Lithium-ion or Lithium-polymer battery is possible.

The IC has a regulator and it ispossible to stop regulator by detected overdischarge.
The internal circuit of IC is composed by the voltagedetector, the reference voltage source, delay time control circuit, the logical circuit, and regulator circuit etc.

Features

(Unless otherwise specified, Ta=25°C)

(1) Range and accuracy of detection/release voltage

● Overcharge detection voltage	3.6V to 4.5V, 5mV steps	Accuracy±25mV (Topr=0 to +50°C)
● Overcharge release voltage	3.4V to 4.5V, 50mV steps	Accuracy±50mV
● VOU OFF voltage	2.1V to 3.2V, 10mV steps	Accuracy±50mV
● VOUT ON voltage *1	2.3V to 3.4V, 50mV steps	Accuracy±75mV

*1 This parameter can set when starting conditions of VOUT are voltage release

(2) Range and accuracy of detection/release delay time *2

● Overcharge detection delay time	.....time1ms to $(1ms\times2^{n1})+(1ms\times2^{n2})+(1ms\times2^{n3})$....	Accuracy±25%
● Overcharge release delay time	.....1ms to $(1ms\times2^{n1})$.....	Accuracy±25%
● VOUT OFF delay time	.....1ms to $(1ms\times2^{n1})+(1ms\times2^{n2})+(1ms\times2^{n3})$.....	Accuracy±25%

*2 n1,n2 and n3 can select arbitrary integers between 0 to 17. (However n1≠n2≠n3)

(3) Range and accuracy of regulator output voltage

● VOUT pin output voltage	.....1.8V to 5.0V, 50mV steps	Accuracy±100mV

(4) The setting for three cell and for four cell protection can be set with the SEL pin

(5) Regulator output can be control with the EN pin
- ● It does not stop regulator during “H” level is applied to EN pin. When EN pin is “L” level and cell voltage lower than VOUT OFF voltage, it stop regulator

(6) FUSE pin can control with the CTL pin
If “H” level is applied to CTL pin without cell voltage, FUSE pin outputs “H” level. In case of “L” level is applied to CTL pin, FUSE pin outputs “H” level by overcharge detecton

(7) Low current consumption

● Current consumption1(VDD pin) Vcell=3.5V	.....Typ. 4.5μA Max. 6.5μA
● Current consumption1(VDD pin) Vcell=2.5V	.....Max. 0.1μA(When starting conditions of VOUT are EN pin.) Max. 1.0μA(When starting conditions of VOUT are cell voltage.

(8) Absolute maximum ratings

● VDD pin	VSS-0.3V to VSS+20V
● Voltage between the input pins of voltage of battery	-0.3V to +10V
● FUSE pin, EN pin, SEL pin,CTL pin supply voltage	VSS-0.3V to VDD+0.3V
● VOUT pin output voltage	VSS-0.3V to VSS+20V
● VOUT pin output current	150μA
● Storage temperature	-55°C to +125°C
● Operating temperature	-55°C to +125°C

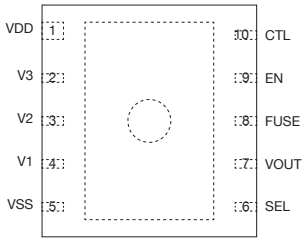
(9) Recommened operating conditions

● Operating temperature	-40°C to +85°C
● Supply Voltage	VSS 4.5V to VSS 18.0V
● VOUT pin output current	0 to 100μA

Pin assignment

PLP-10A

(Top view)



Pin no.	Symbol
1	VDD
2	V3
3	V2
4	V1
5	VSS
6	SEL
7	VOUT
8	FUSE
9	EN
10	CTL

Selection guide

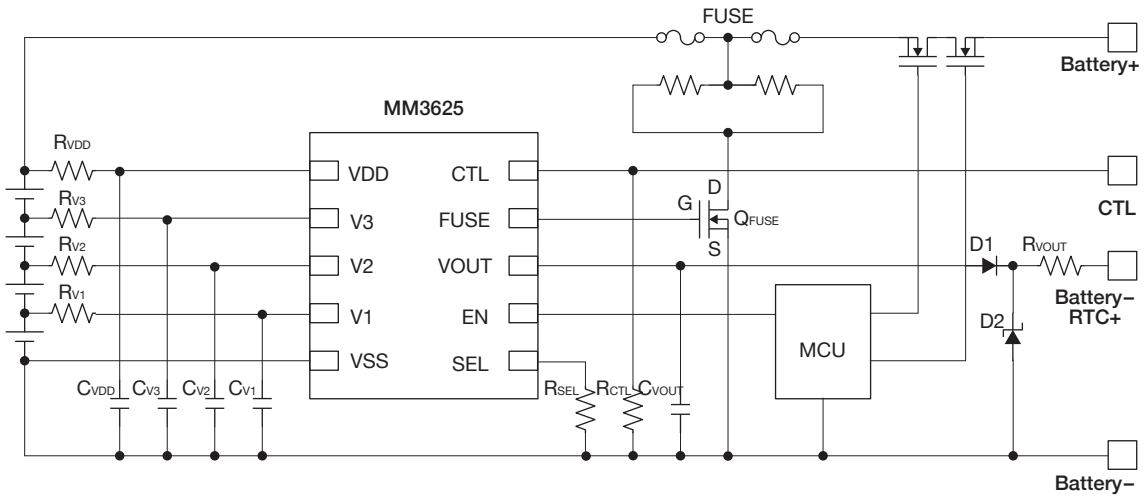
Product name	Overcharge detection voltage	Overcharge release voltage	VOUT OFF voltage	VOUT ON voltege	Overcharge detection delay time	Overcharge output keep time	Overcharge release delay time	VOUT OFF delya time	VOUT pin output voltage	Current consumption1(VDD)	Current consumption1(VDD)	Overcharger output latch function	Overcharge timer reset delay function	VOUT output starting conditions
	V_{DET1}	V_{REL1}	V_{OFF}	V_{REL2}	t_{VDET1}	$t_{VDET1-2}$	t_{VREL1}	t_{VDET2}	V_{OUT}	I_{DD1}	I_{DD2}			
	V	V	V	V	sec	sec	msec	msec	V	μA	μA			
MM3625A01RRE	4.425	-	2.750	-	4.10	90.11	-	10.0	2.900	6.0	0.1	○	-	EN pin
MM3625A02RRE	4.300	-	2.500	-	4.10	90.11	-	10.0	3.300	6.0	0.1	○	-	EN pin
MM3625B02RRE	4.450	4.250	2.500	-	4.10	-	16.0	10.0	3.300	6.0	0.1	-	-	EN pin
MM3625B03RRE	4.450	4.250	2.750	-	7.17	-	16.0	10.0	3.300	6.0	0.1	-	-	EN pin
MM3625B04RRE	4.500	4.300	2.750	-	7.17	-	16.0	10.0	3.300	6.0	0.1	-	-	EN pin
MM3625Y01RRE	4.425	-	2.750	-	4.10	90.11	-	4096.0	2.900	6.0	0.1	○	-	EN pin
MM3625Z01RRE	4.425	-	2.750	-	4.10	90.11	-	4096.0	2.900	6.0	0.1	○	-	EN pin

* Y01 and Z01 rank do not have a SEL pin. Y01 rank is 3cells protection. Z01 rank is 4cells protection.
Y01 rank and Z01 rank differ in other rank and operation. Please check by specifications individual for details.

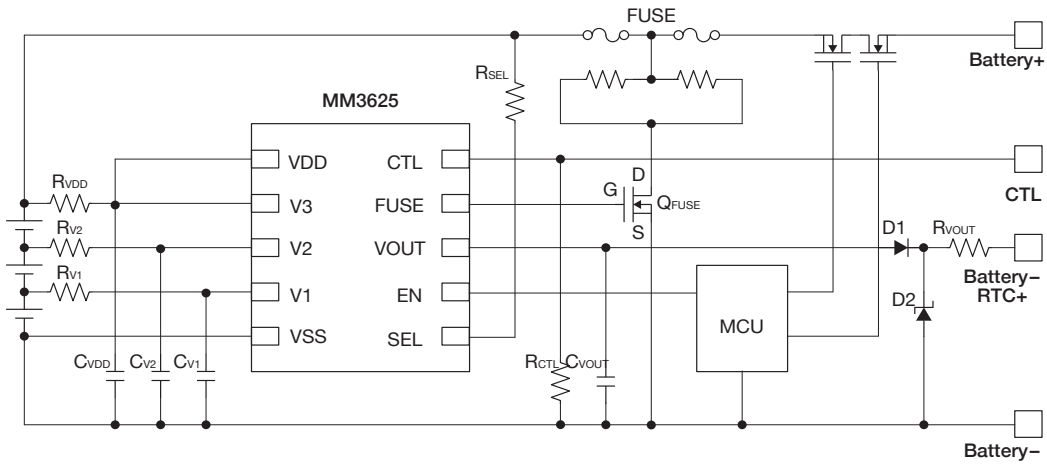
Please inquire to us, if you request a rank other than the above.

Typical application circuit

4 cells protection circuit



3 cells protection circuit



1 SECONDARY BATTERY ICs

Voltage monitoring IC with protection IC

MW3790 Series

Outline

The MW3790 is a voltage monitoring IC with a function of the protection IC for lithium ion batteries.
For a solution including a charge circuit, the MW3790 on the battery pack realizes accurate measurement of the battery voltage. This solution can maximize the CC (constant current) charge mode of the charge circuit,and reduce the charge. As a communication interface, MIPI® BIF, which is a battery interface developed byMIPI® Alliance (an international organization), is used.

Features

(Unless otherwise specified, Ta=25°C)

(1) 0V battery charge function permission or inhibition....Inhibition
1.5V ..... Accuracy±0.10V

(2) High accuracy of voltage detection circuit
- Overcharge detection voltage.....4.425V ..... Accuracy±0.020V
- Overdischarge detection voltage.....2.450V ..... Accuracy±0.035V
- Discharge overcurrent detection voltage.....34.0mV ..... Accuracy±5.0mV
- Charge overcurrent detection voltage .....–22.0mV ..... Accuracy±3.3mV
- Short detection voltage1.....80.0mV ..... Accuracy±9.0mV

(3) Low current consumption

(4) Protection mode latch function
- Overcharge.....Disable
- Overdischarge.....Disable
- Discharge overcurrent.....Disable
- Charge overcurrent .....Enable

(5) EEPROM.....equipped

(6) Communication method.....MIPI® BIF compliant

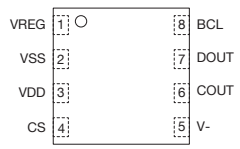
Applications

(1) Voltage monitoring
(2) Li-ion battery protection

Pin assignment

PLP-8G

(Top view)



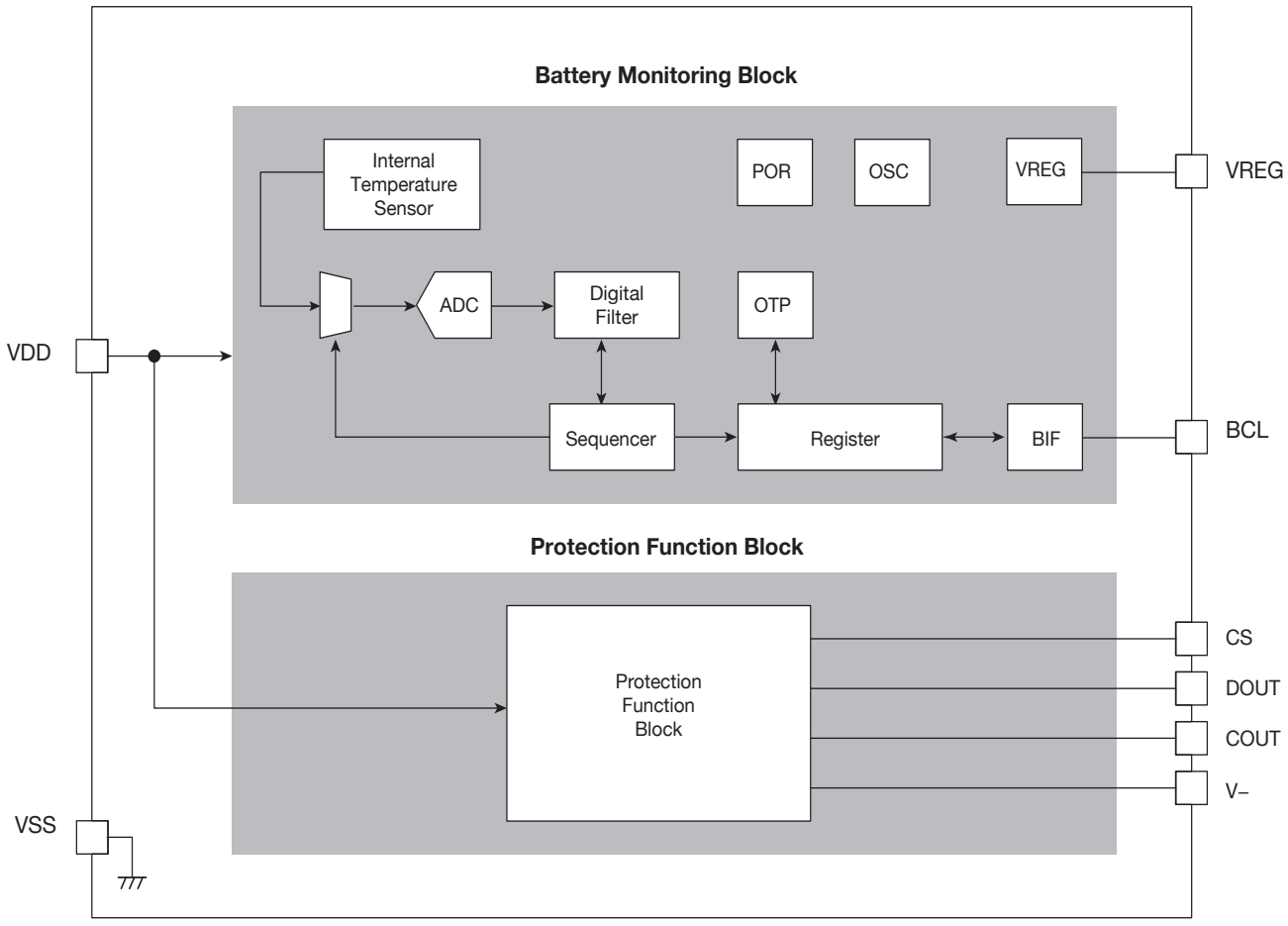
Pin no.	Symbol	Function
1	VREG	Regulator output terminal
2	VSS	VSS terminal
3	VDD	VDD terminal
4	CS	Current detection terminal
5	V-	Negative power supply voltage input terminal
6	COUT	Charge FET control terminal
7	DOUT	Discharge FET control terminal
8	BCL	BCL terminal for BIF communication

Selection guide

Product name	Package	Overcharge detection voltage	Overcharge release voltage	Overdischarge detection voltage	Overdischarge release voltage	Discharging overcurrent detection voltage	Charging overcurrentCharging detection voltage	Short detection voltage1	Short detection voltage2
		Vdet1	Vrel1	Vdet2	Vrel2	Vdet3	Vdet4	Vshort1	Vshort12
MW3790MT1RRE	PLP-8G	4.425	4.225	2.450	2.800	0.034	-0.022	0.080	VDD-0.9
MW3790MT4RRE	PLP-8G	4.475	4.275	2.450	2.800	0.034	-0.028	0.080	VDD-0.9
MW3790MT5RRE	PLP-8G	4.425	4.225	2.450	2.800	0.035	-0.035	0.080	VDD-0.9

Please inquire to us, if you request a rank other than the above.

Bock diagram



1 SECONDARY BATTERY ICs

Voltage monitoring IC with protection IC

MW3793 Series

Outline

The MW3793 is a voltage monitoring IC with a function of the protection IC for lithium ion batteries.
For a solution including a charge circuit, the MW3793 on the battery pack realizes accurate measurement of the battery voltage. This solution can maximize the CC (constant current) charge mode of the charge circuit, and reduce the charge. As a communication interface, MIPI® BIF, which is a battery interface developed by MIPI® Alliance (an international organization), is used.

Features

(Unless otherwise specified, Ta=25°C)

(1) 0V battery charge function permission or inhibition.....Inhibition
1.5V ..... Accuracy±0.10V

(2) High accuracy of voltage detection circuit
- Overcharge detection voltage.....4.425V ..... Accuracy±0.020V
- Overdischarge detection voltage.....2.450V ..... Accuracy±0.035V
- Discharge overcurrent detection voltage.....34.0mV ..... Accuracy±5.0mV
- Charge overcurrent detection voltage .....–22.0mV ..... Accuracy±3.3mV
- Short detection voltage1.....80.0mV ..... Accuracy±9.0mV

(3) Low current consumption

(4) Protection mode latch function
- Overcharge.....Disable
- Overdischarge.....Disable
- Discharge overcurrent.....Disable
- Charge overcurrent .....Enable

(5) Communication method.....MIPI® BIF compliant

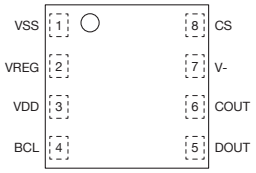
Applications

(1) Voltage monitoring
(2) Li-ion battery protection

Pin assignment

PLP-8H

(Top view)



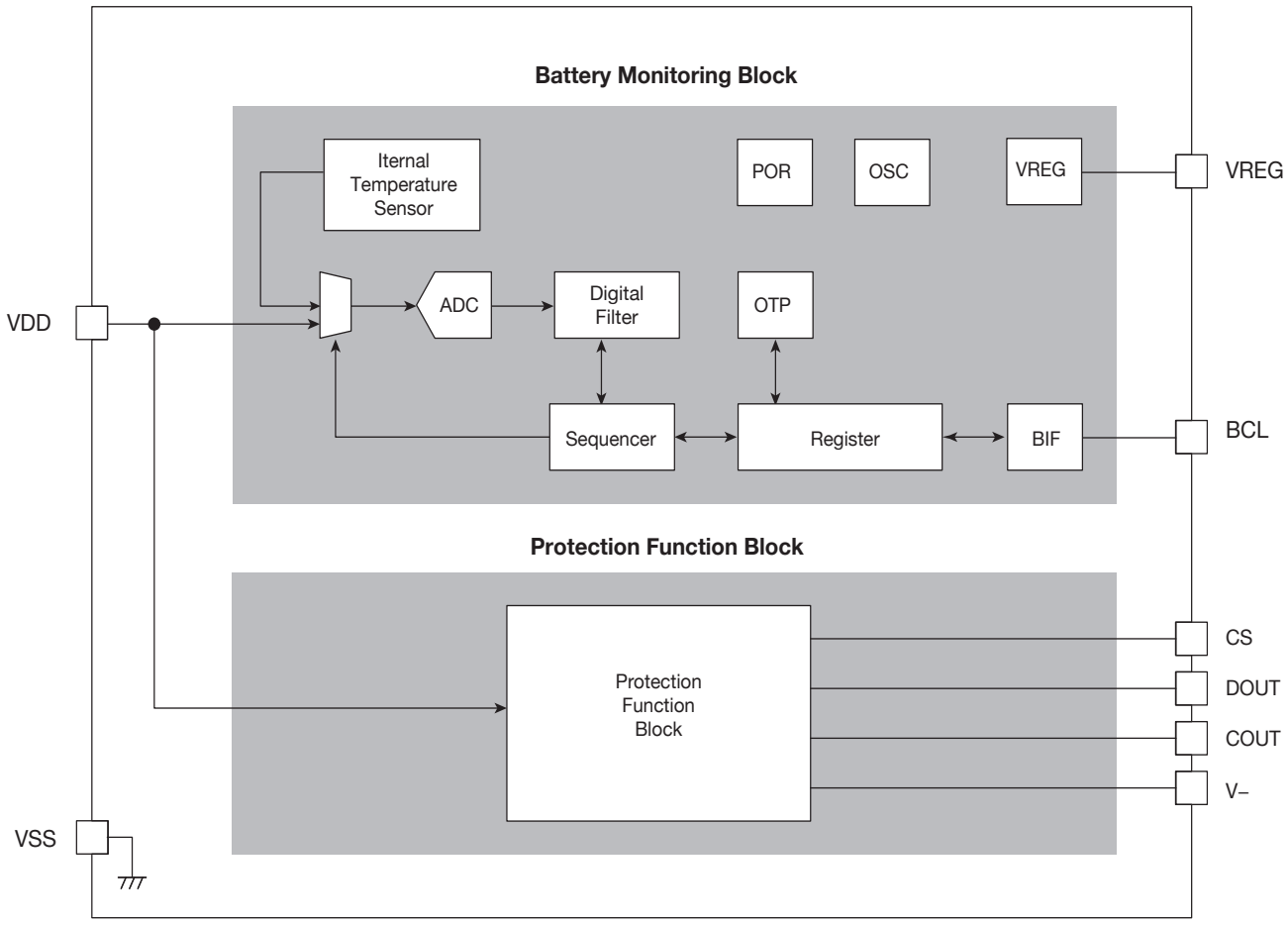
Pin no.	Symbol	Function
1	VSS	VSS terminal
2	VREG	Regulator output terminal
3	VDD	VDD terminal
4	BCL	BCL terminal for BIF communication
5	DOUT	Discharge FET control terminal
6	COUT	Charge FET control terminal
7	V-	Negative power supply voltage input terminal
8	CS	Current detection terminal

Selection guide

Product name	Package	Overcharge detection voltage	Overcharge release voltage	Overdischarge detection voltage	Overdischarge release voltage	Discharging overcurrent detection voltage	Charging overcurrentCharging detection voltage	Short detection voltage1	Short detection voltage2
		Vdet1	Vrel1	Vdet2	Vrel2	Vdet3	Vdet4	Vshort1	Vshort12
MW3793MT1RRE	PLP-8H	4.425	4.225	2.450	2.800	0.034	-0.022	0.080	VDD-0.9
MW3793MT4RRE	PLP-8H	4.475	4.275	2.450	2.800	0.034	-0.028	0.080	VDD-0.9
MW3793MT5RRE	PLP-8H	4.425	4.225	2.450	2.800	0.035	-0.035	0.080	VDD-0.9

Please inquire to us, if you request a rank other than the above.

Block diagram



1 SECONDARY BATTERY ICs

Voltage and temperature monitoring IC with BIF

MM3757 Series

Outline

The MM3757 is a voltage and temperature monitoring IC. For a solution including a charge circuit, the MM3757 on the battery pack realizes accurate measurement of the battery voltage.
This solution can maximize the CC (constant current) charge mode of the charge circuit, and reduce the charge. As a communication interface, MIPI® BIF, which is a battery interface developed by MIPI® Alliance (an international organization), is used.

Features

(Unless otherwise specified, Ta=25°C)

(1) Highly accurate measurement of battery voltage and temperature

(2)) Communication method.....MIPI® BIF compliant

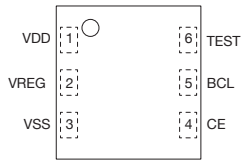
Applications

Voltage monitoring

Pin assignment

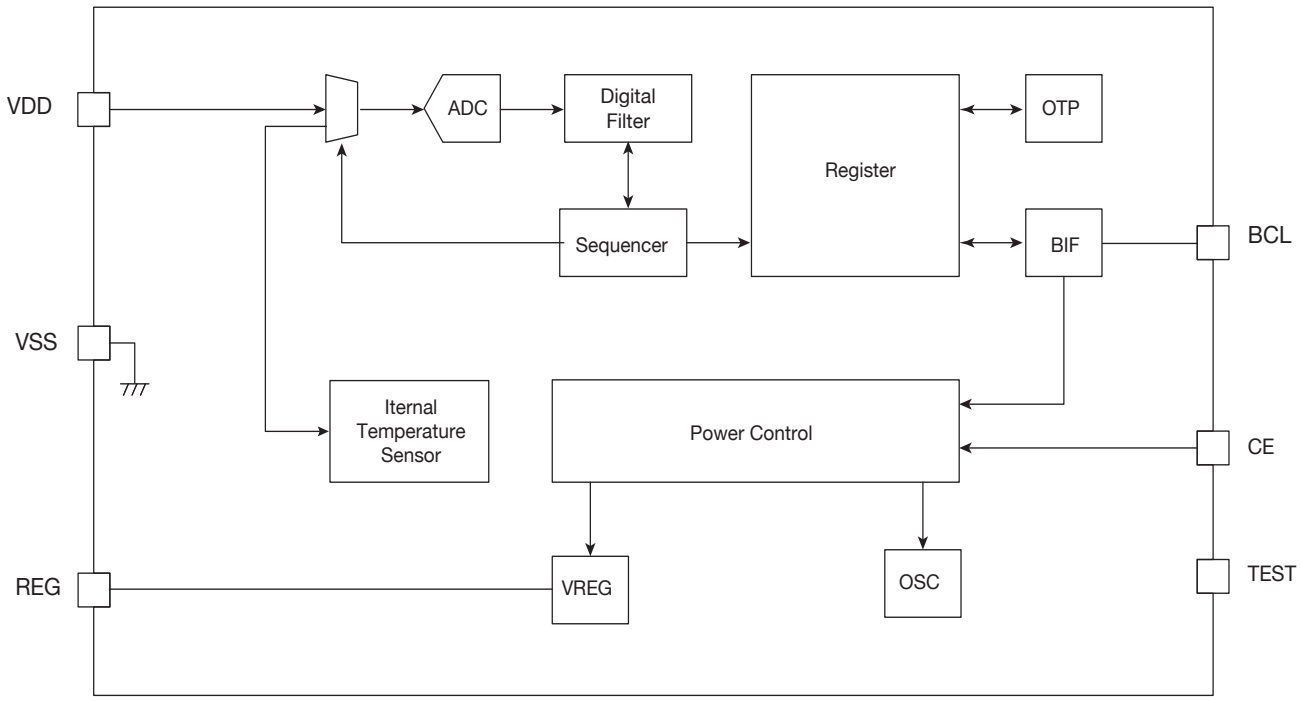
PLP-6H

(Top view)



Pin no.	Symbol	Function
1	VDD	VDD terminal
2	VREG	Regulator output terminal
3	VSS	VSS terminal. Connected to ground
4	CE	Chip enable terminal
5	BCL	MIPI® BIF BCL terminal
6	TEST	Test terminal

Block diagram



1 SECONDARY BATTERY ICs

Voltage monitor IC for lithium–ion/lithium–polymer cell balance

MM3513 Series

Outline

MM3513 series are voltage monitor ICs for rechargeable lithium–ion or lithium–polymer batteries, using a high voltage CMOS process.
Each lithium-ion or lithium-polymer battery can be balanced.

Each of these ICs is composed of voltage detectors, reference voltage sources, an oscillator, a counter circuit and logical circuits.

Features

(Unless otherwise specified, Ta=25°C)

(1) High-accuracy detection voltage

- Detection voltage.....3.5V to 4.5V, 5mV steps ..... Accuracy±20mV
  Accuracy±25mV (Topr=-5°C to +60°C)
- Hysteresis voltage.....0V to 0.4V, 50mV steps.
  However, “Detection voltage-Hysteresis voltage<3.5V” is disabled.

(2) Range of Detection delay time

- Detection delay time .....Selectable from 0.25s, 1.0s, 1.2s, 3.0s, 4.5s.

(3) Low current consumption

- Normal mode .....Typ. 1.5μA, Max. 3.0μA
- Stand-by mode .....Max. 0.5μA

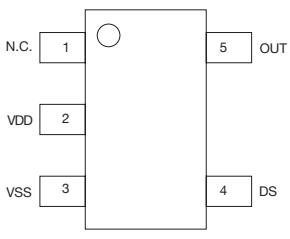
(4) Absolute maximum ratings

- VDD pin.....VSS-0.3V to +12V
- OUT pin.....VDD-0.3V to VDD+0.3V
- DS pin .....VSS-0.3V to VDD+0.3V
- Storage temperature.....-55°C to +125°C
- Operation temperature.....-40°C to +85°C

Pin assignment

SOT-25A

(Top view)



Pin no.	Symbol	Function
1	N.C.	Non connection
2	VDD	VDD terminal (Connected to IC substrait)
3	VSS	VSS terminal (Connected to ground)
4	DS	Delay shorten terminal
5	OUT	Output of detecting voltage (Output type is CMOS)

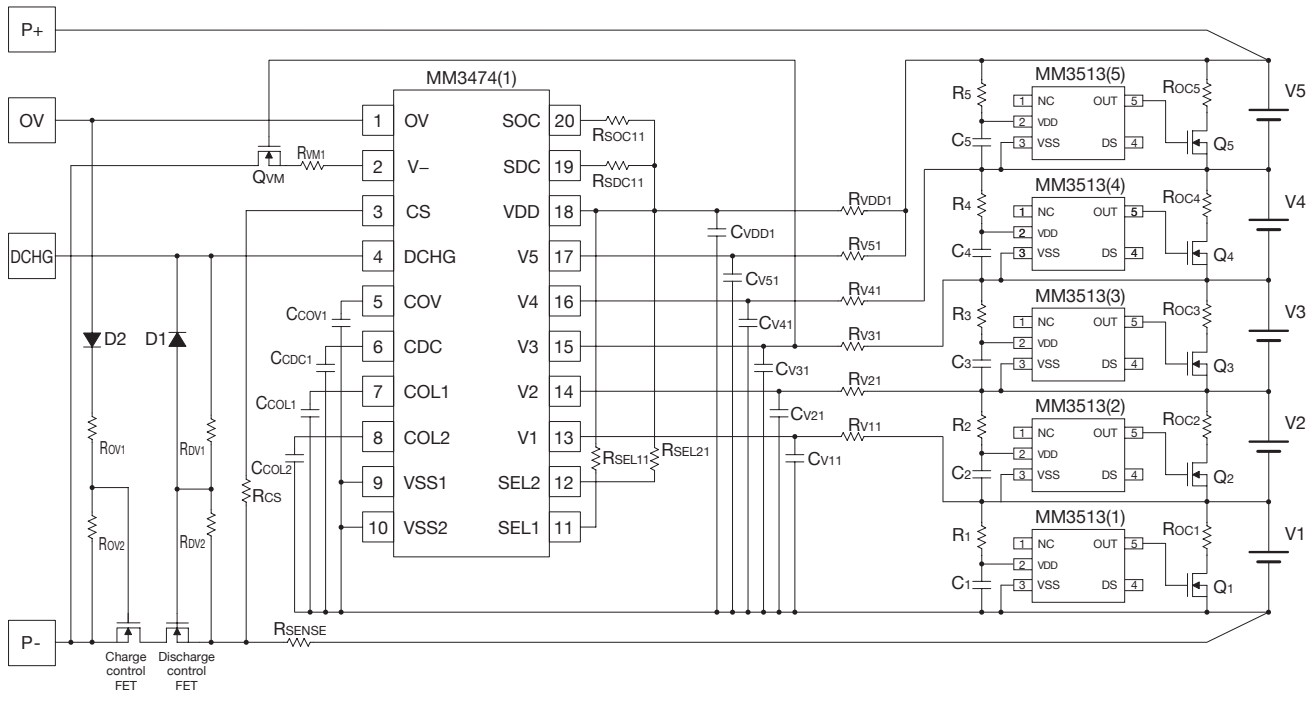
Selection guide

Product name	Package	Detection voltage [V]	Hysteresis voltage [V]	Detection delay time [sec]
		Vdet	Vhys	tVdet
MM3513A01NRH	SOT–25A	4.150	0.010	0.25
MM3513B01NRH	SOT–25A	3.750	0.010	0.25
MM3513C01NRH	SOT–25A	4.200	0.010	0.25
MM3513D01NRH	SOT–25A	3.600	0.010	0.25
MM3513D02NRH	SOT–25A	3.600	0.100	0.25
MM3513E03NRH	SOT–25A	4.350	0.380	3.0
MM3513F01NRH	SOT–25A	3.650	0.010	0.25
MM3513H01NRH	SOT–25A	4.175	0.010	0.25
MM3513J01NRH	SOT–25A	3.475	0.010	0.25
MM3513K01NRH	SOT–25A	4.180	0.010	0.25
MM3513L01NRH	SOT–25A	4.175	0.000	0.25

3,000pcs/Reel

Please inquire to us, if you request a rank other than the above.

Typical application circuit



- Resistors R1 to R5 and capacitors C1 to C5 stabilize a supply voltage ripple. However, if the resistors R1 to R5 are increased, the detection voltage raises due to through-current in the IC. Therefore, adjust the value to 1k ohm or less. Moreover, the capacitors C1 to C5 should be 0.01μF or more to ensure stable operation.

- For resistors RDC1 to RDC5, the value of bypass current is determined.

1 SECONDARY BATTERY ICs

Fuel gage IC for lithium–ion battery

MM8013

Outline

MM8013 is a high accuracy fuel gauge IC for 1–cell lithium–ion battery or lithium-polymer battery.
MM8013 measures temperature, voltage and current by high-precision delta-sigma AD converter and executes current integration both at discharging and charging using specific battery characteristics parameter and the measurement values.
The MM8013 offers excellent management ability for battery power.
The MM8013 achieves safety and security by following functions: battery degradation detection using capacitance change, anomaly detection.

Features

(Unless otherwise specified, Ta=25°C)

(1) High accuracy battery power management
- Battery power is based on current integration value which is measured periodically and is controlled to minimize its error by correction using open voltage (OCV) and battery characteristics parameter.

(2) High precision voltage measurement
- Electric current and voltage value are measured by high accuracy 16bit delta-sigma AD converter.
- The current resolution is 1mA and the voltage resolution is 1mV.

(3) Battery degradation detection
- Total capacity of battery is measured periodically and capacitance change status is monitored. Degradation detection is done using the depth of capacitance change.

(4) Low Current Consumption
- Current consumption .....60μA (operation)
  20μA (Low Power Active)
  1μA (Shutdown mode)

(5) Correspondence interface .....I²C interface

(6) Traceability
- Battery ID and manufacture / shipment information are stored in nonvolatile memory and are accessible.

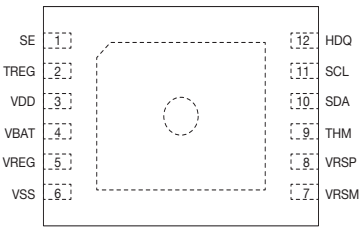
(7) Operating Ambient temperature .....-20°C to +85°C

(8) Operating voltage .....2.5V to 5.5V

Pin assignment

PLP-12A

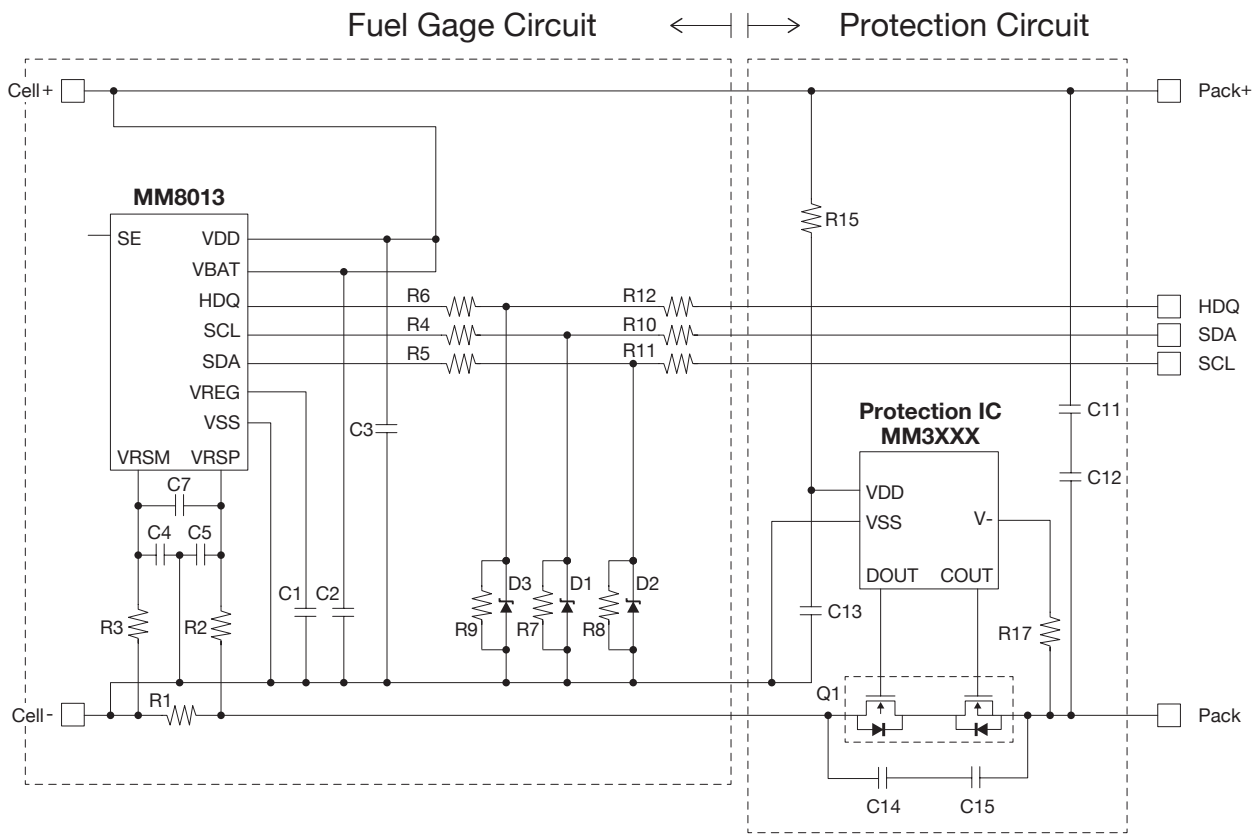
(Top view)



Pin no.	Symbol	Function
1	SE	General purpose output pin
2	TREG	Not Supported
3	VDD	Power supply pin
4	VBAT	Voltage sensor input pin
5	VREG	Regulator output pin
6	VSS	Power supply pin
7	VRSM	Current sensor input pin
8	VRSP	Current sensor input pin
9	THM	Thermistor input
10	SDA	I^2C data input/output
11	SCL	I^2C clock input
12	HDQ	General purpose output pin

Typical application circuit

Example of the battery pack side loading



1 SECONDARY BATTERY ICs

Fuel gage IC for lithium–ion battery

MM8013W

Outline

The **MM8013W** is a high accuracy fuel gauge IC for 1-cell lithium-ion battery or lithium-polymer battery.
The MM8013W measures temperature, voltage and current by high-precision delta-sigma AD converter and executes current integration both at discharging and charging using specific battery characteristics parameter and the measurement values.
The MM8013W offers excellent management ability for battery power.
MM8013W01 achieves both of high-accuracy battery power prediction and ultra-low power consumption if the host MCU actively controls operation mode of the MM8013W01.

oprFeatures

(Unless otherwise specified, Ta=25°C

(1) Host-controllable operation mode for ultra-low power consumption
- MM8013W01 achieves both of high-accuracy battery power prediction and ultra-low power consumption if the host MCU actively controls operation mode of the MM8013W01 (using “Interval Active Mode”).

(2) High precision voltage measurement
- Electric current and voltage value are measured by high accuracy 16bit delta-sigma AD converter.
- The current resolution is 1mA and the voltage resolution is 1mV.

(3) Battery degradation detection
- Total capacity of battery is measured periodically and capacitance change status is monitored. Degradation detection is done using the depth of capacitance change.

(4) Low Current Consumption
- Current consumption .....60μA (Operation)
  20μA (Low Power Active)
  6.4μA (Interval Active mode)
  1μA (Shutdown mode)

(5) Correspondence interface .....I^2C interface

(6) Traceability
- Battery ID and manufacture / shipment information are stored in nonvolatile memory and are accessible.

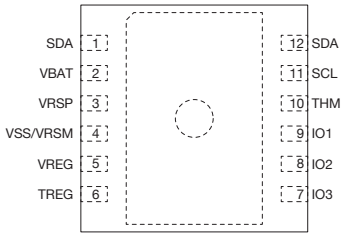
(7) Operating Ambient temperature .....-20°C to +85°C

(8) Operating voltage .....2.5V to 5.5V

Pin assignment

PLP-12B

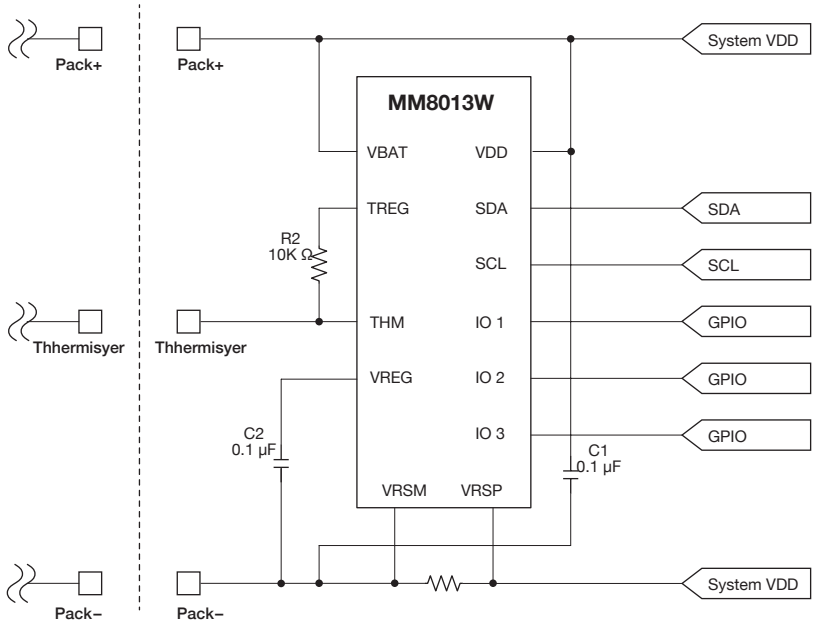
(Top view)



Pin no.	Symbol	Function
1	VDD	Power supply pin
2	VBAT	Voltage sensor input pin
3	VRSP	Current sensor input pin
4	VSS/VRSM	Power supply pin / Current sensor input pin
5	VREG	Regulator output pin
6	TREG	Regulator output for Thermistor
7	IO3	General purpose port
8	IO2	General purpose port
9	IO1	General purpose port
10	THM	Thermistor input
11	SCL	I^2C clock input
12	SDA	I^2C data input/output

Typical application circuit

Example of the set side loading



1 SECONDARY BATTERY ICs

Fuel gage IC for lithium–ion battery

MM8033

Outline

The **MM8033** is a high accuracy fuel gage IC for 1–cell lithium–ion battery or lithium-polymer battery.
The MM8033 measures temperature, voltage and current by high-precision delta-sigma AD converter and executes current integration both at discharging and charging using specific battery characteristics parameter and the measurement values.
The MM8033 offers excellent management ability for battery power.
The MM8033 achieves safety and security by following functions: battery degradation detection using capacitance change, anomaly detection.

Features

(Unless otherwise specified, Ta=25°C)

(1) High accuracy battery power management
- Battery power is based on current integration value which is measured periodically and is controlled to minimize its error by correction using open voltage (OCV) and battery characteristics parameter.

(2) High precision voltage measurement
- Electric current and voltage value are measured by high accuracy 16bit delta-sigma AD converter.
- The current resolution is 1mA and the voltage resolution is 1mV.

(3) Battery degradation detection
- Total capacity of battery is measured periodically and capacitance change status is monitored. Degradation detection is done using the depth of capacitance change.

(4) Low Current Consumption
- Current consumption 32µA (Operation)
  20µA (Low Power Active)
  1µA (Shutdown)

(5) Correspondence interface .....I²C interface

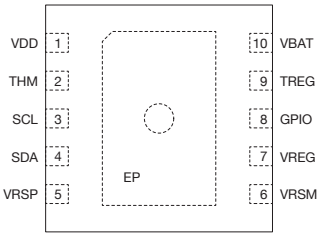
(6) Operating Ambient temperature .....–20°C to +85°C

(7) Operating voltage .....2.5V to 5.5V

Pin assignment

PLP-10D

(Top view)

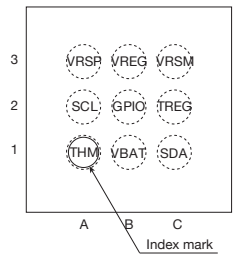


Pin no.	Symbol	Function
1	VDD	Power supply pin
2	THM	Thermistor input
3	SCL	I²C clock input
4	SDA	I²C data input/output
5	VRSP	Current sensor input pin
6	VRSM	Current sensor input pin
7	VREG	Regulator output pin
8	GPIO	Alert Indication output
9	TREG	Regulator output for Thermistor
10	VBAT	Voltage sensor input pin
–	EP	Exposed Pad.Connect to VRSM.

Pin assignment

WLCSP-9A

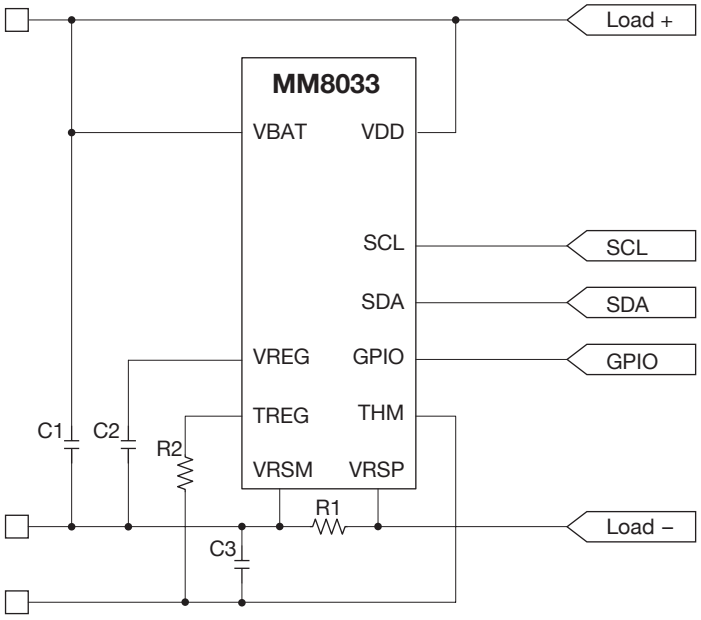
(Top view)



Pin no.	Symbol	Function
A1	THM	Thermistor input
A2	SCL	I²C clock input
A3	VRSP	Current sensor input pin
B1	VBAT	Voltage sensor input pin
B2	GPIO	Alert Indication output
B3	VREG	Regulator output pin
C1	SDA	I²C data input/output
C2	TREG	Regulator output for Thermistor
C3	VRSM	Current sensor input pin

Typical application circuit

Example of the set side loading



1 SECONDARY BATTERY ICs

Fuel gauge IC for lithium–ion battery

MM3556

Outline

The **MM3556** is a high accuracy fuel gage IC for 1–cell lithium–ion battery or lithium-polymer battery.
The MM3556 calculates battery relative state of charge (RSOC [%]) using temperature, voltage value, which are measured by high precision ⊿ΣADC, and internal battery model. Electric current data is not needed for this calculation. Hence the MM3556 offers smarter system than general coulomb type fuel gage which needs sense resistor.
The MM3556 achieves low cost, small footprint and low power consumption and is the best solution for battery power prediction of mobile devices.

Features

(Unless otherwise specified, Ta=25°C)

(1) High accuracy prediction of RSOC
- The MM3556 predicts high accuracy RSOC corresponding to the host device's various operating conditions.
- The predicted value is continuous value. Under standard operating condition, voltage is minimum operation voltage value when RSOC is 0%. And battery power is 0 then.

(2) High precision voltage measurement
- Voltage is accurately measured by 16 bit ⊿ΣADC. The resolution is 1mV.

(3) Sense resistor is not necessary
- Circuit becomes simple, low cost and small.
- The system is free from accumulated error induced by coulomb counter.

(4) OTPROM for battery parameter storage
- OTPROM can store plural battery parameters for high accuracy RSOC prediction. Host device can decrease load for controlling parameters.

(5) Thermistor voltage-to-temperature conversion circuit
- The IC has battery pack thermistor voltage input pin and uses converted battery temperature for RSOC calculation.
- Host device can get this temperature value via I2C.

(6) Low Current Consumption
- Operating current.....Typ. 28μA / MAX. 45μA
- Sleep mode current .....Typ. 5μA / MAX. 10μA

(7) Correspondence interface.....I^2C interface

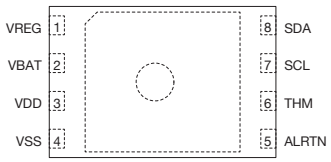
(8) Operating Ambient temperature.....–20°C to +85°C

(9) Operating voltage.....2.2V to 5.0V

Pin assignment

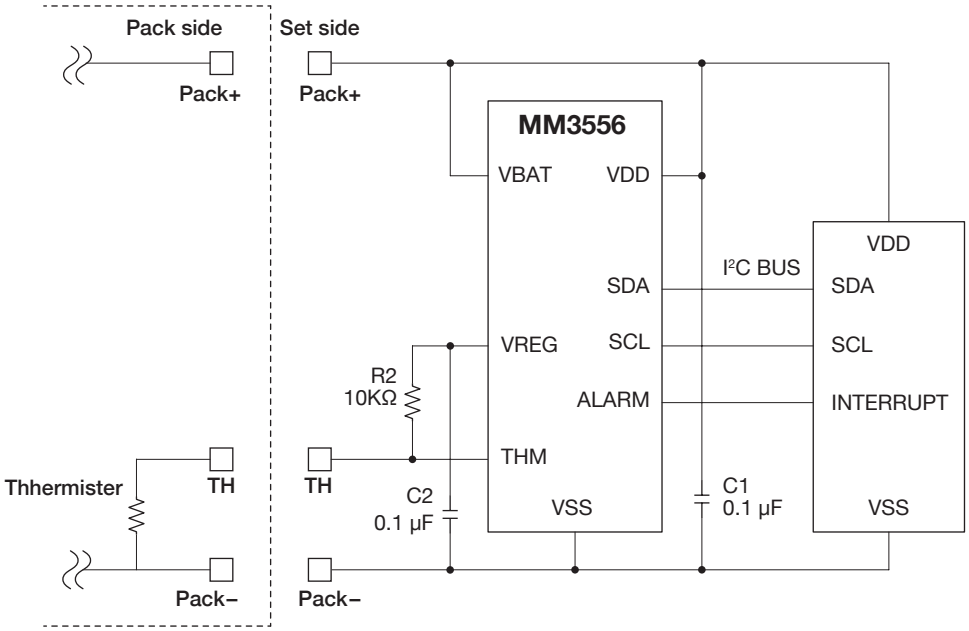
PLP-8F

(Top view)



Pin no.	Symbol	Function
1	VREG	Regulator Output Pin
2	VBAT	Pin for measurement of battery voltage
3	VDD	Power supply pin
4	VSS	Power supply pin
5	ALRTN	Alert output pin
6	THM	External temperature input pin
7	SCL	I^2C clock input
8	SDA	I^2C data output

Typical application circuit



- If the impedance of VDD and GND wire is high, it causes noise and instable operation of the IC. Reconsider the wiring and suppress the impedance. Input capacitance should be placed as close to the IC as possible.
- Impedance of wiring from pack+ (P+) to VBAT and from pack- (P-) to VSS should be suppressed as low as possible. Voltage drop by wiring resistance looks detection voltage error and affects accuracy of battery power prediction.
- ALRTN pin is open–drain output. When using the pin, pull up the pin with external resistance.
- Output capacitance, C2, is necessary for phase compensation of the regulator. To suppress property fluctuation by noise, the capacitance should be placed as close to the IC as possible.

1 SECONDARY BATTERY ICs

1cell Lithium–ion battery linear charge cotrol IC /Single function

MM3458

Outline

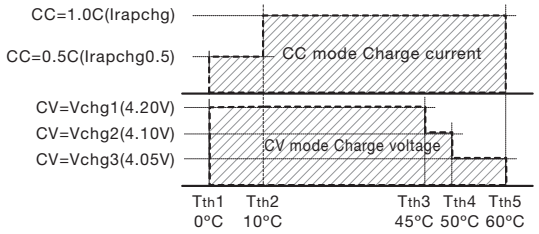
This IC is a linear charge control IC for 1–cell lithium–ion and lithium-polymer batteries.
This IC does not require an externally provided sensing resistor or reverse-current protection diode, enabling reductions in the component count and the amount of generated heat.
A function to detect rises in IC temperature during high-power charging is also included to allow charging at the optimal charging rate for any given temperature.

Features

(Unless otherwise specified, Ta=25°C)

(1) BAT Regulation Voltage .....4.2V±30mV (±0.7%)
(2) Fast Charge Current .....558mA±5% (RICHG=2.32kΩ)
(3) Trickle-charge current, Fast-charge current, Charge completion current can be set using external resistors (maximum charging current is 1.5A).
(4) Battery temperature detection function is provided via a thermistor, and so the charging voltage and current can be controlled according to the battery temperature.
(5) Chip temperature detection enables control of IC temperature rises at high-power charging. The battery can therefore be charged with optimal charging regulation.
(6) Built-in charging timer ..... Charging timer time can be freely set using external resistor.
(7) LED Driver.....Charging status 1ch

*Battery temperature detection
(Constant Current Mode/Constant Voltage Mode)



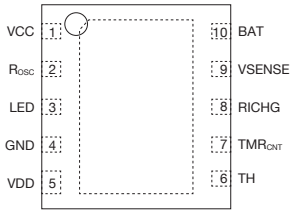
Applications

(1) Mobile phones, Smart phones
(2) Portable music players
(3) Tablet PCs
(4) Digital still cameras
(5) Portable games

Pin assignment

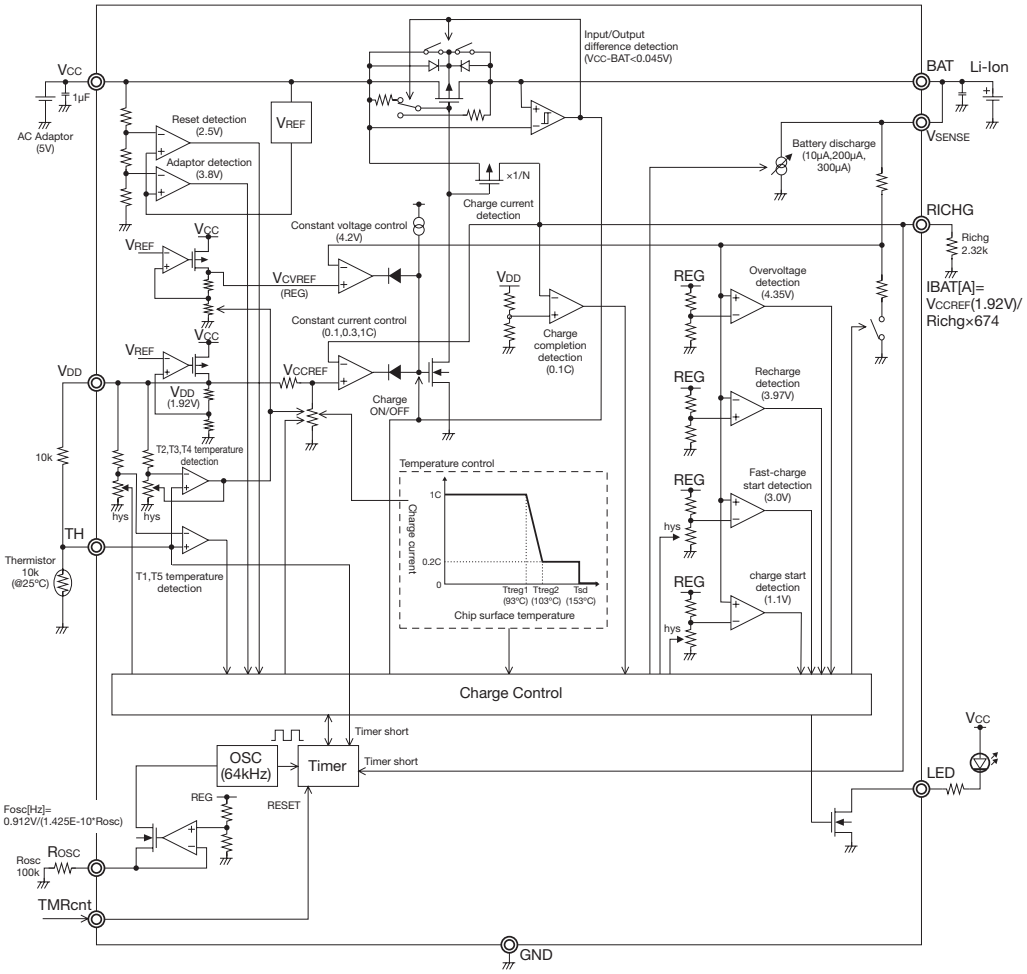
SSON-10A

(Top view)

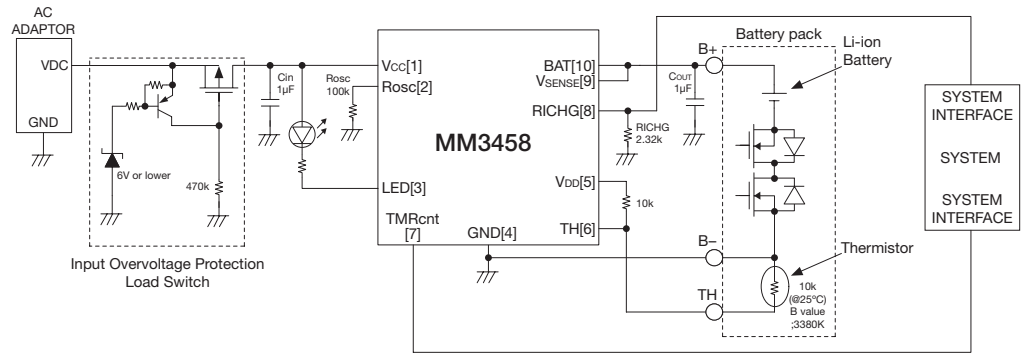


Pin no.	Symbol	Function
1	VCC	Power supply, charge Tr input pin. Connect to an AC adaptor
2	Rosc	Oscillation frequency setting resistance connection pin. fosc=0.912V/(1.425E-10*Rosc) Estimation: The fosc value for each Rosc value is specified on Data sheet
3	LED	LED connect pin (Nch open drain output) Turn on during charging
4	GND	Ground pin
5	VDD	Battery temperature detecting reference voltage pin It is not recommended to be used other than as battery temperature detecting reference voltage (resistance connection) since it is also used for internal charge current reference voltage
6	TH	Battery temperature detection input pin. Connect to a thermistor
7	TMRcnt	Timer (trickle charge timer, fast charge timer) ON/OFF control pin High: Timer stops, Low/open: Timer is valid
8	RICHG	Charge current setting resistance connection pin. ICHG=674×1.92V/RICHG Estimation: The Charge Current value for each RICHG value is specified on product specifications
9	VSENSE	Battery voltage detection, constant voltage charge control pin (Connect to the positive side of a battery pack)
10	BAT	Charge Tr output pin(Connect to the positive side of a battery pack)

Block diagram



Typical application circuit



1 SECONDARY BATTERY ICs

1cell Lithium–ion battery linear charge cotrol IC /Single function (CV adjustable type)

MM3635

Outline

This IC is a linear charge control IC for 1-cell lithium-ion and lithium-polymer batteries.
It is capable of charging from 0V of battery voltage, so it is adaptive for low capacity battery (coin) .
It is capable of setting of BAT regulation voltage according to various battery.

It does not require an externally provided sensing resistor or reverse-current protection diode, enabling reductions in the component count and the amount of generated heat.
A function to charge control (ON/OFF) at high/low battery temperature ensures the safety of battery.

Features

(Unless otherwise specified, Ta=25°C)

(1) BAT Regulation Voltage .....4.2V±30mV / 4.05V±50mV (Setting by CVSEL pin)
(2) Fast Charge Current .....15mA±1.8mA (RICHG=74.2kΩ)
(3) Charging from 0V of battery voltage
(4) Trickle-charge current, Fast-charge current, Charge completion current can be set using external resistors
maximum charging current is 0.7A
(5) Battery temperature detection function is provided via a thermistor, and so the charging ON/OFF can becontrolled according to the battery temperature.
(6) Chip temperature detection enables control of IC temperature rises at high-power charging. The battery can therefore be charged with optimal charging regulation.
(7) Built-in charging timer.
(8) LED Driver .....Charging status 1ch

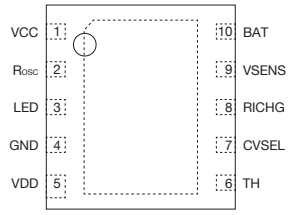
Applications

(1) Mobile phones , Smart phones
(2) Portable music players
(3) Tablet PCs
(4) Digital still cameras
(5) Portable games

Pin assignment

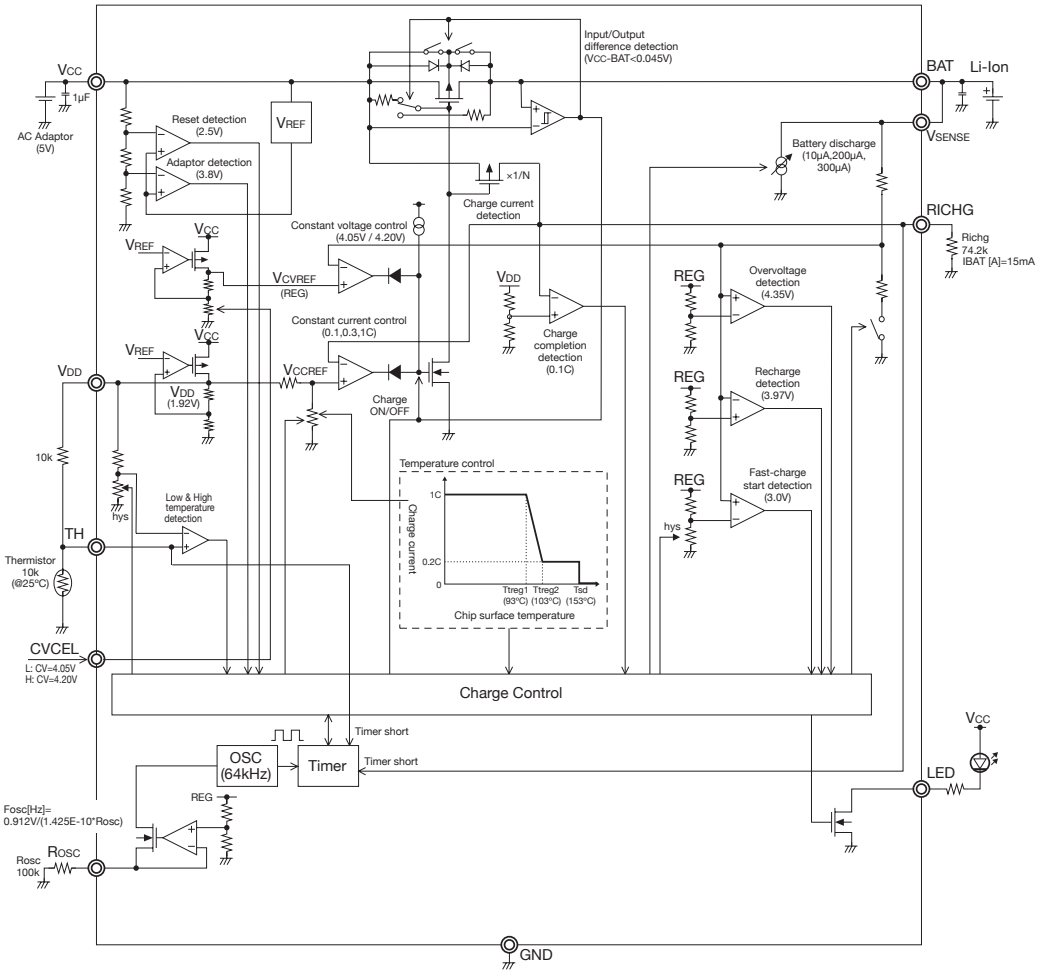
SSON-10A

(Top view)

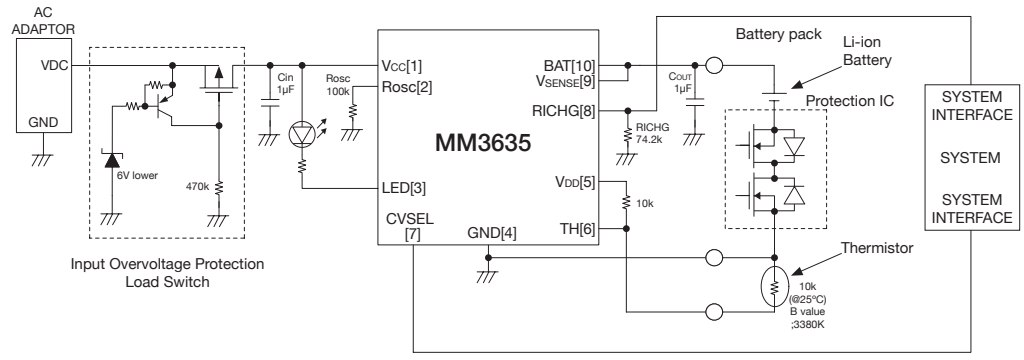


Pin no.	Symbol	Function
1	VCC	Power supply, charge Tr input pin. Connect to an AC adaptor
2	Rosc	Oscillation frequency setting resistance connection pin. fosc=0.912V/(1.425E-10*Rosc) Estimation: The fosc value for each Rosc value is specified on Data sheet
3	LED	LED connect pin (Nch open drain output) Turn on during charging
4	GND	Ground pin
5	VDD	Battery temperature detecting reference voltage pin It is not recommended to be used other than as battery temperature detecting reference voltage (resistance connection) since it is also used for internal charge current reference voltage
6	TH	Battery temperature detection input pin. Connect to a thermistor
7	CVSEL	A change pin of the charge constant voltage L or Open: CV=4.05V, H: CV=4.20V
8	RICHG	Charge current setting resistance connection pin. ICHG=674×1.92V/RICHG Estimation: The Charge Current value for each RICHG value is specified on product specifications
9	VSENSE	Battery voltage detection, constant voltage charge control pin (Connect to the positive side of a battery pack)
10	BAT	Charge Tr output pin(Connect to the positive side of a battery pack)

Block diagram



Typical application circuit



1 SECONDARY BATTERY ICs

1cell Lithium–ion battery linear charge cotrol IC /Single function

MM3835W

Outline

This IC is a linear charge control IC for 1–cell lithium–ion and lithium-polymer battery.
This IC can control accurate charge current, so it is suitable for wearable devices used low-capacitance battery.

This IC have multiple rank matched BAT regulation voltage for each battery .
Charging voltage and current can be controlled safely according to the battery temperature based on JEITA guideline.

Features

(Unless otherwise specified, Ta=25°C)

(1) BAT Regulation Voltage 4.1V, 4.2V, 4.35V
(2) Fast Charge Current .....3mA to 1000mA
(3) BAT leakage current (Input is unconnected)....100nA (max)
(4) A change pin of the charge completion current. (TERMSEL)
L/Open:1/10 of fast charge current
H: 1/20 of fast charge current
(5) Battery temperature detection function is provided via a thermistor, and so the charging voltage and current can be controlled according to the battery temperature.
(6) Chip temperature detection enables control of IC temperature rises at high-power charging. The battery can therefore be charged with optimal charging regulation.
(7) Built-in charging timer. Charging timer time can be freely set using external resistor.
(8) LED Driver .....Charging status 1ch

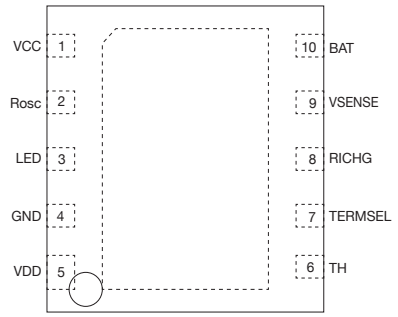
Applications

(1) Mobile phones , Smart phones
(2) Portable music players
(3) Tablet PCs
(4) Digital still cameras
(5) Portable games

Pin assignment

SSON-10A

(Top view)

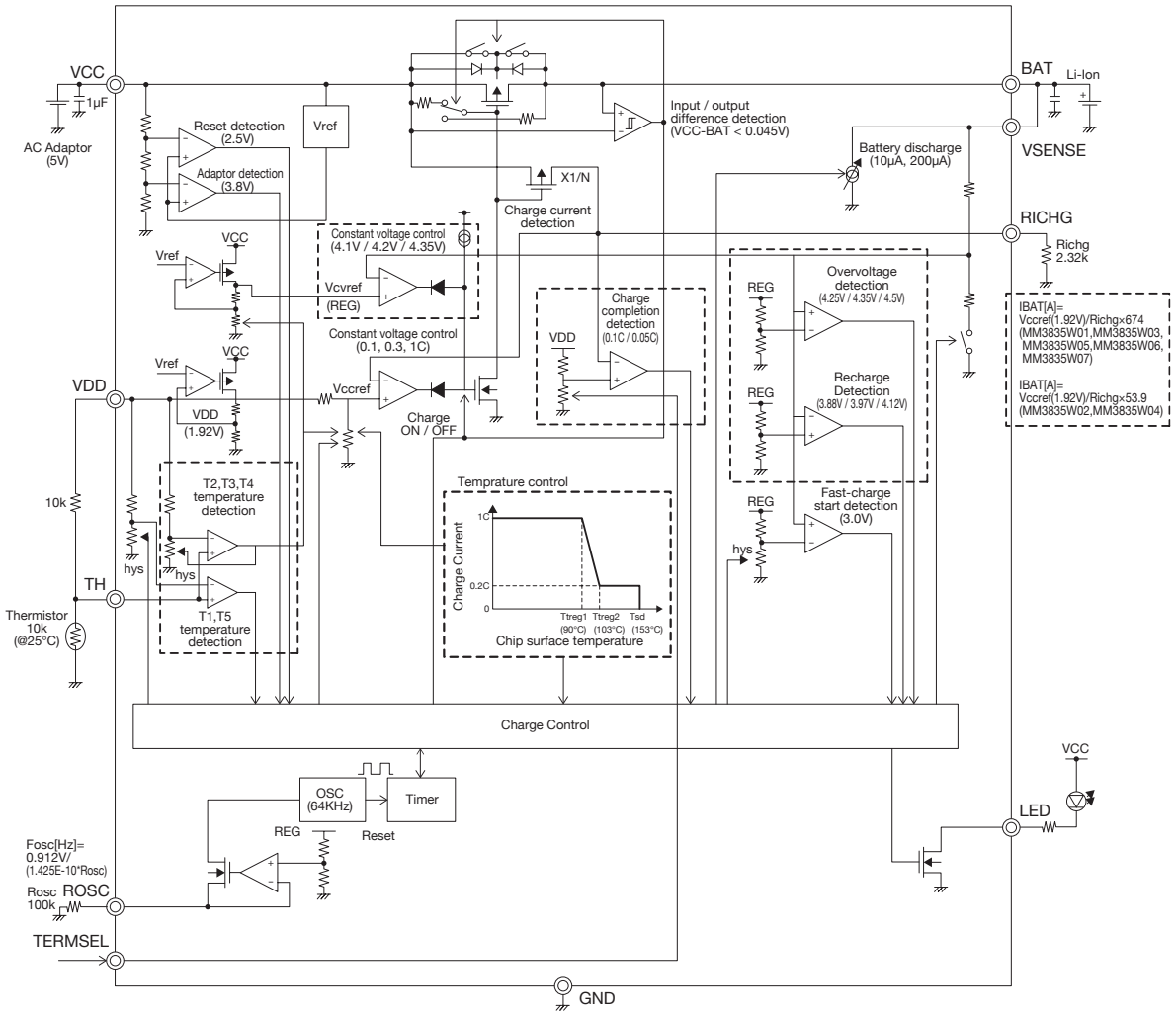


Pin no.	Symbol	Function
1	VCC	Power supply, charge Tr input pin. Connect to an AC adaptor.
2	Rosc	Oscillation frequency setting resistance connection pin fosc=0.912V/(1.425E-10*Rosc) Estimation: The fosc value for each Rosc value is specified on Data sheet.
3	LED	LED connect pin (Nch open drain output) Turn on during charging.
4	GND	Ground pin
5	VDD	Battery temperature detecting reference voltage pin It is not recommended to be used other than as battery temperature detecting reference voltage (resistance connection) since it is also used for internal charge current reference voltage.
6	TH	Battery temperature detection input pin. Connect to a thermistor.
7	TERMSEL	A change pin of the charge completion current. L/Open:1/10 of fast charge current,H: 1/20 of fast charge current
8	RICHG	Charge current setting resistance connection pin Estimation: The Charge Current value for each RICHG value is specified on product specifications.
9	VSENSE	Battery voltage detection, constant voltage charge control pin (Connect to the positive side of a battery pack)
10	BAT	Charge Tr output pin(Connect to the positive side of a battery pack)

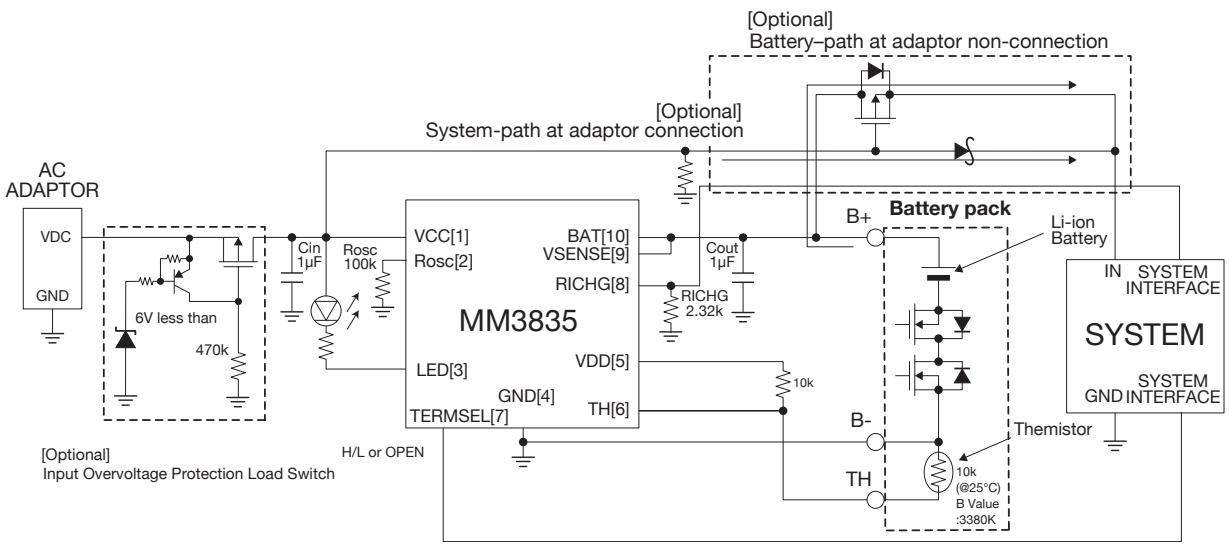
Selection guide

Model name	Setting Current [mA]		BAT Regulation Voltage [V]	Recharge Detection Voltage [V]
	Min.	Max.		
MM3835W01RRE	3	200	4.20	3.97
MM3835W02RRE	200	1000	4.20	3.97
MM3835W03RRE	3	200	4.35	4.12
MM3835W04RRE	200	1000	4.35	4.12
MM3835W05RRE	200	1000	4.20	3.97
MM3835W06RRE	200	1000	4.35	4.12
MM3835W07RRE	200	1000	4.10	3.88

Block diagram



Typical application circuit



1 SECONDARY BATTERY ICs

1cell Lithium–ion battery linear charge cotrol IC /Single function (For iron phosphate Li-Ion)

MM3658

Outline

This IC is a linear charge control IC for 1–cell lithium-ion phosphate battery.
The chip temperature detection function can limit the temperature rise in the IC during high power charging and the temperature detection function enables the temperature for charge to be controlled.
The package is a small size SSON-10pin.

Features

(Unless otherwise specified, Ta=25°C)

(1) BAT Regulation Voltage .....3.6V±30mV (±0.8%)
(2) Fast Charge Current .....558mA±5% (RICHG=2.32kΩ)
(3) The external resistor enables fast-charge current/charge completion current to be set
- Maximum charge current 1.5A

(4) A charge timer is embedded in this IC. The external resistor enables the charge timer to be set arbitrarily.
(5) The chip temperature detection function can limit the temperature rise in the IC during high power charging.
It can be charged at an optimal rate.
(6) The battery temperature detection function with thermistor input enable the temperature for charge to be controlled.
(7) LED Driver..... 1ch

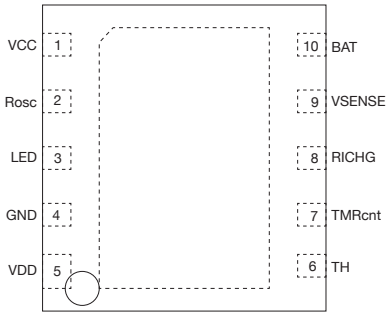
Applications

(1) Shavers
(2) Portable Devices

Pin assignment

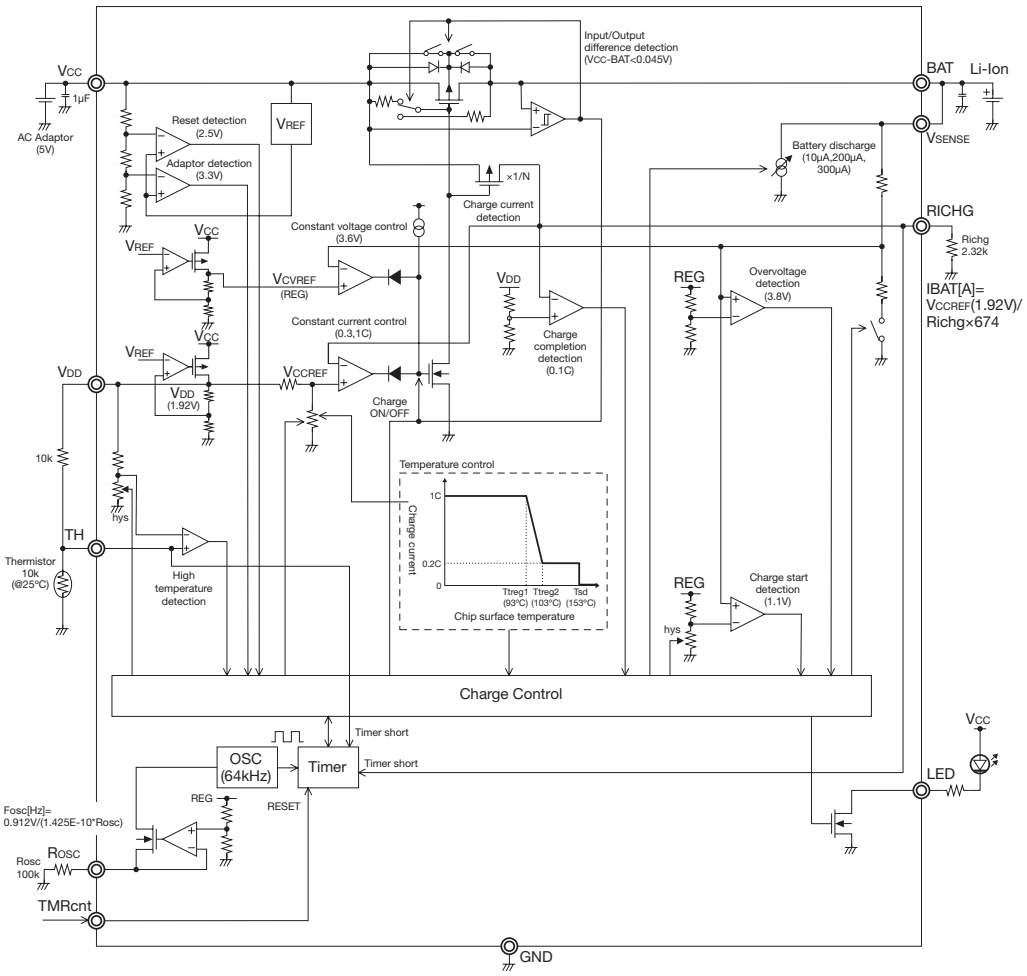
SSON-10A

(Top view)

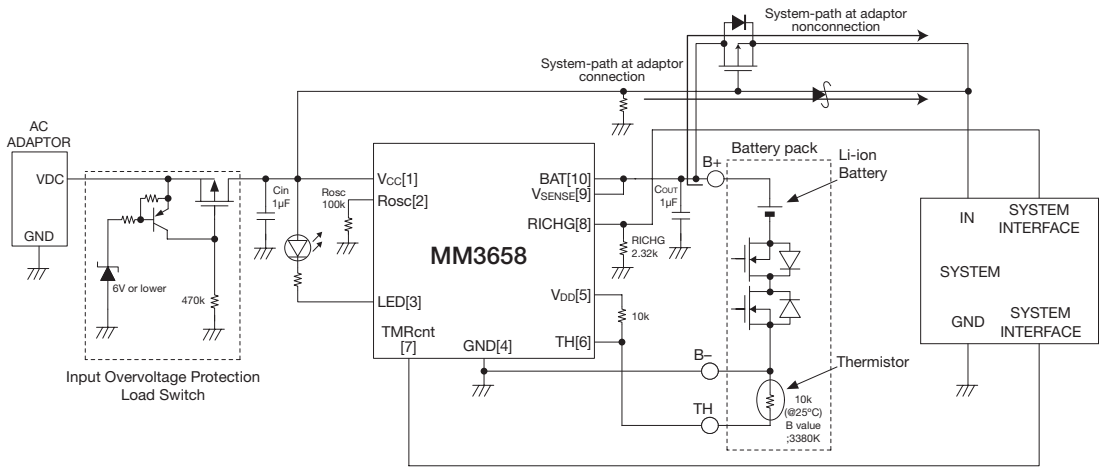


Pin no.	Symbol	Function
1	VCC	Power supply, charge Tr input pin. Connect to an AC adaptor
2	Rosc	Oscillation frequency setting resistance connection pin fosc=0.912V/(1.425E-10 Rosc) Estimation : The fosc value for each Rosc value is specified on Data sheet
3	LED	LED connect pin (Nch open drain output) Turn on during charging
4	GND	Ground pin
5	VDD	Battery temperature detecting reference voltage pin It is not recommended to be used other than as battery temperature detecting reference voltage (resistance connection) since it is also used for internal charge current reference voltage
6	TH	Battery temperature detection input pin. Connect to a thermistor
7	TMRcnt	Timer (fast charge timer) ON/OFF control pin High: Timer stops, Low/open: Timer is valid
8	RICHG	Charge current setting resistance connection pin ICHG=674×1.92V/RICHG Estimation: The Charge Current value for each RICHG value is specified on product specifications
9	VSENSE	Battery voltage detection, constant voltage charge control pin (Connect to the positive side of a battery pack)
10	BAT	Charge Tr output pin (Connect to the positive side of a battery pack)

Block diagram



Typical application circuit



1 SECONDARY BATTERY ICs

1cell Lithium–ion battery linear charge cotrol IC /Single function (Ultra small type)

MM3865

Outline

This IC is a linear charge control IC for 1–cell lithium–ion and lithium-polymer battery. High-accuracy charging current control of 3 to 500mA is possible. It is a compact, low-consumption IC that is ideal for mobile devices with low-capacity batteries.

Features

(Unless otherwise specified, Ta=25°C)

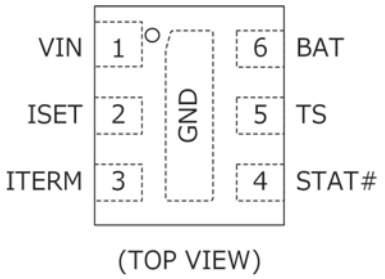
(1) VIN Rating Voltage 13V
(2) Charging votage .....4.1V to 4.45V (50mV step)
(3) Charge current setting .....3 to 500mA
(4) Full charge detection current setting .....0.3mA to 250mA
(5) Ultra low battery leakage current .....10nA(max)
(6) Space saving package .....SSON-6E (1.8mm x 1.6mm x 0.55mm)

Applications

(1) Small mobile device(earphone, Healthcare device, others)

Pin assignment

SSON-6E



(TOP VIEW)

Pin No.	Pin Name	Pin Description
1	VIN	Power supply input pin for charging. Connect a DC power supply (AC adapter or USB port).
2	ISET	Charge current setting pin. Connect a register RISET to GND.
3	ITERM	Full charge current setting pin. Connect a register RITERM to GND.
4	STAT#	Charging status indicator. It is NchMOS open drain output.
5	TS	Thermistor temperature detection pin.
6	BAT	Charge current output pin. Connect to the positive side of the battery.
Exposed pad	GND	Ground pin. It also serves as a heat radiation PAD.

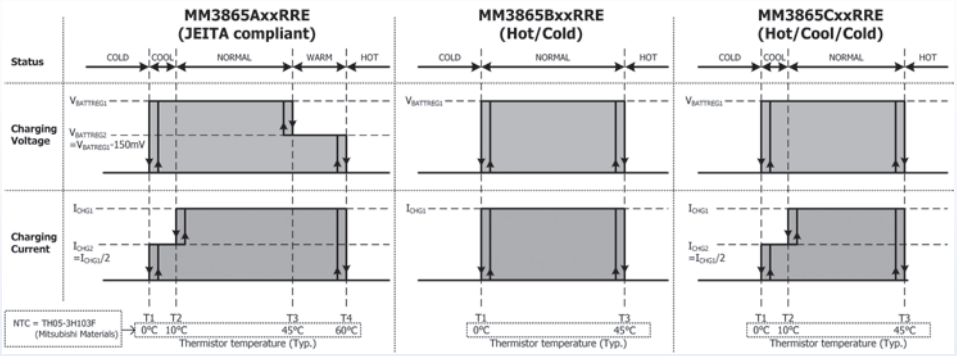
Selection guide

MM3865 x x x RRE

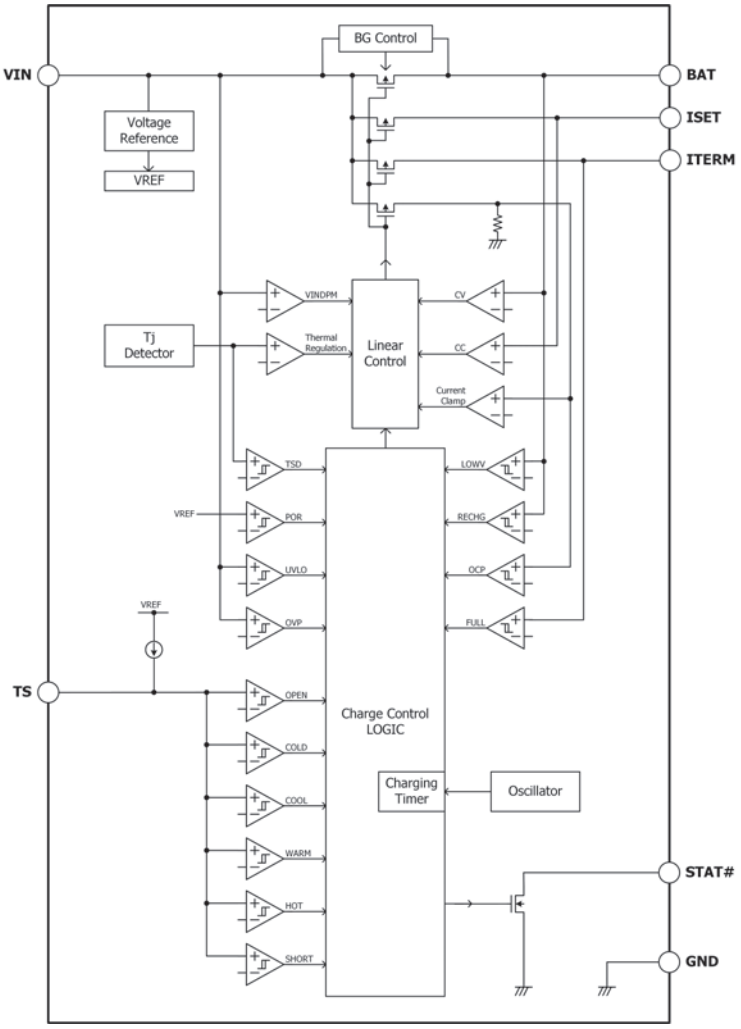
Battery temperature monitoring function
A : JEITA Compliant
B : Hot/Cold
C : Hot/Cool/Cold

Recharge function
0 : exist
1 : none

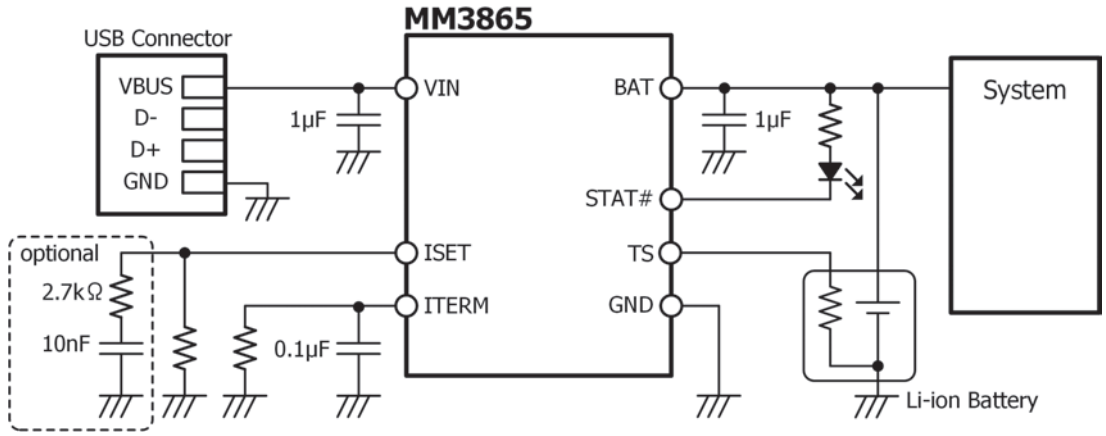
BAT regulation voltage ($V_{BATREG1}$)
1 : 4.10V
2 : 4.15V
3 : 4.20V
4 : 4.25V
5 : 4.30V
6 : 4.35V
7 : 4.40V
8 : 4.45V



Block diagram



Typical application circuit



1 SECONDARY BATTERY ICs

1cell Lithium–ion battery linear charge cotrol IC /built-in system-path

MM3538

Outline

This IC is a linear charging control IC with built–in system paths, and includes a chip with system path function and lithium–ion/ lithium–polymer secondary battery charging function.
The IC features a built-in load switch with overvoltage detection function and input current limit required for system paths, and built-in power FETs, backflow prevention diodes, and current sensor function required for charging and discharging.
The IC comes equipped with an adapter and USB automatic recognition function, and allows the individual settings for charging control voltage and current with I²C communication.

Features

(Unless otherwise specified, Ta=25°C)

(1) ADP/USB charging automatic identification function ..... Available (USB bus D+/D– pin)
(2) I²C bus control function ..... Available (CC/CV/Charge ON/OFF)
(3) Charging battery temperature profile ..... Supports JEITA recommendation (variable by I²C bus communication)
(4) System path current limit of ADP mode ..... Arbitrarily adjustable (ILIM pin)
(5) High Voltage input ..... Tolerates 24V (IN pin)
(6) Operating system out from battery ..... Available (built-in low on resistance FET)
(7) Linear charger control for Lithium–ion and Lithium–polymer Available
(8) Charge current setting ..... Available (ISET pin)
(9) Charge timer setting ..... Available (TMR pin)
(10) Indicator ..... Input power connected (INGOOD pin)
Charge condition (CHG pin)
BAT voltage condition (OUTGOOD pin)
I²C alarm(SAL pin)

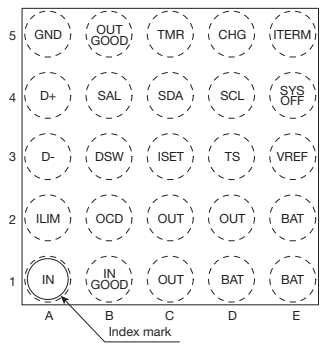
Applications

(1) Tablet PCs
(2) Mobile phones , Smart phones
(3) Digital still cameras
(4) Portable music players
(5) Portable games

Pin assignment

WLCSP-25A

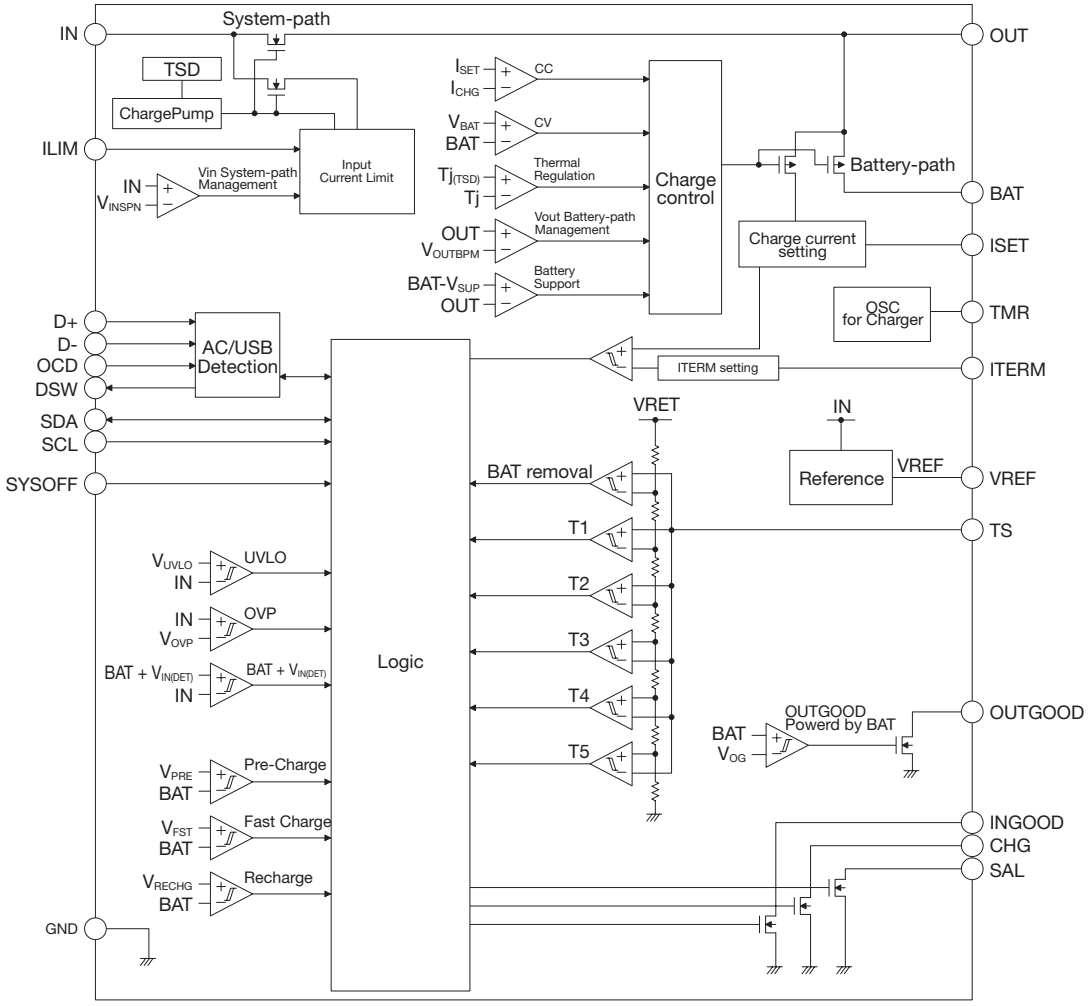
(Top view)



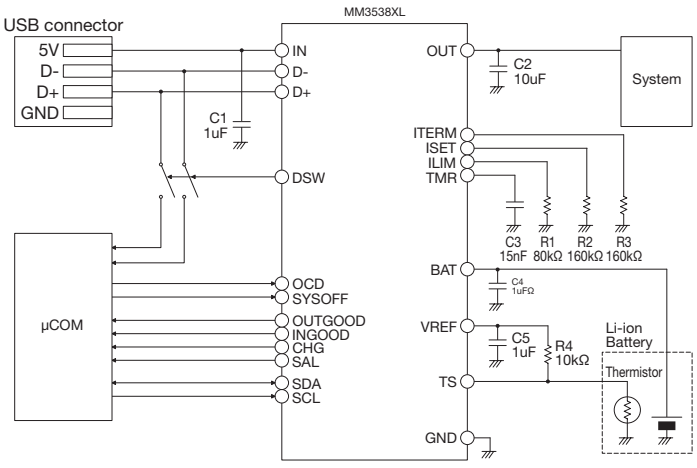
Pin no.	Function
A1	IN
A2	ILIM
A3	D-
A4	D+
A5	GND
B1	INGOOD
B2	OCD
B3	DSW
B4	SAL
B5	OUTGOOD
---	--

Pin no.	Function
C1/C2/D2	OUT
C3	ISET
C4	SDA
C5	TMR
D1/E1/E2	BAT
D3	TS
D4	SCL
D5	CHG
E3	VREF
E4	SYSOFF
E5	ITERM

Block diagram



Typical application circuit



1 SECONDARY BATTERY ICs

1cell Lithium–ion battery switching charge cotrol IC /built-in system-path

MM3439

Outline

This IC contains built-in system path switch for switching between AC adaptor/USB and battery charge control function. With these functions, this IC monitors three power supplies constituted by an AC adaptor, the USB port, and lithium-ion secondary battery and controls system drive power supply and charging.
In order to implement safe and secure charging to comply with JEITA guideline, charging pressure and current can be changed when battery temperature is high or low.

Features

(Unless otherwise specified, Ta=+25°C)

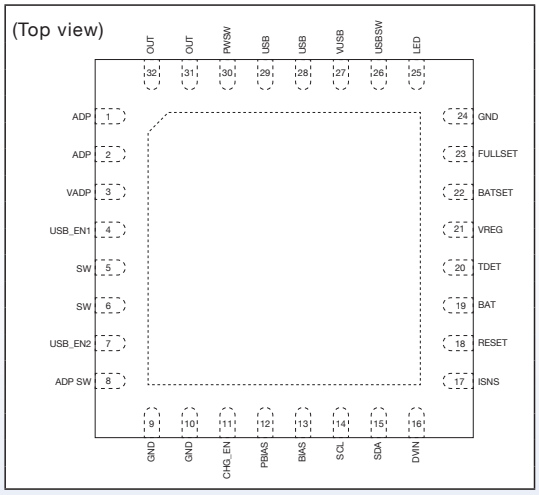
(1) Synchronous buck lithium-ion/lihium-polymer charge control
(2) Built-in system path SW
(3) Overvoltage protection circuit (OVP) control function (PchMOS external controller)
(4) I²C interface allows the charging voltage, and current control and display the state (such as status and configuration of error)
(5) Compliance with JEITA guideline
(6) When the USB current limit is supported by built-in battery
(7) When charging, the system priority function
(8) To reduce heat generation during charging, Built-in thermal regulation
(9) Electrical characteristics(Unless otherwise specified, Ta=+25°C)
- Consumption current 1(ADP mode, USB mode) .....1.5mA typ. 3mA max.
- Consumption current 2(BAT mode).....30µA typ. 50µA max.
- ADP/USB UVLO.....4.20V
- VADP/VUSB OVP.....5.70V
- BAT pin voltage for CV control.....4.20V±30mV
- BAT pin voltage of overvoltage detection.....4.35V
- Current limit of USB path (100mA) .....80mA typ. 100mA max.
  (500mA).....460mA typ. 500mA max.

Applications

(1) Mobile phones, Smart phones
(2) Portable music players
(3) Tablet PCs
(4) Digital still cameras
(5) Portable games

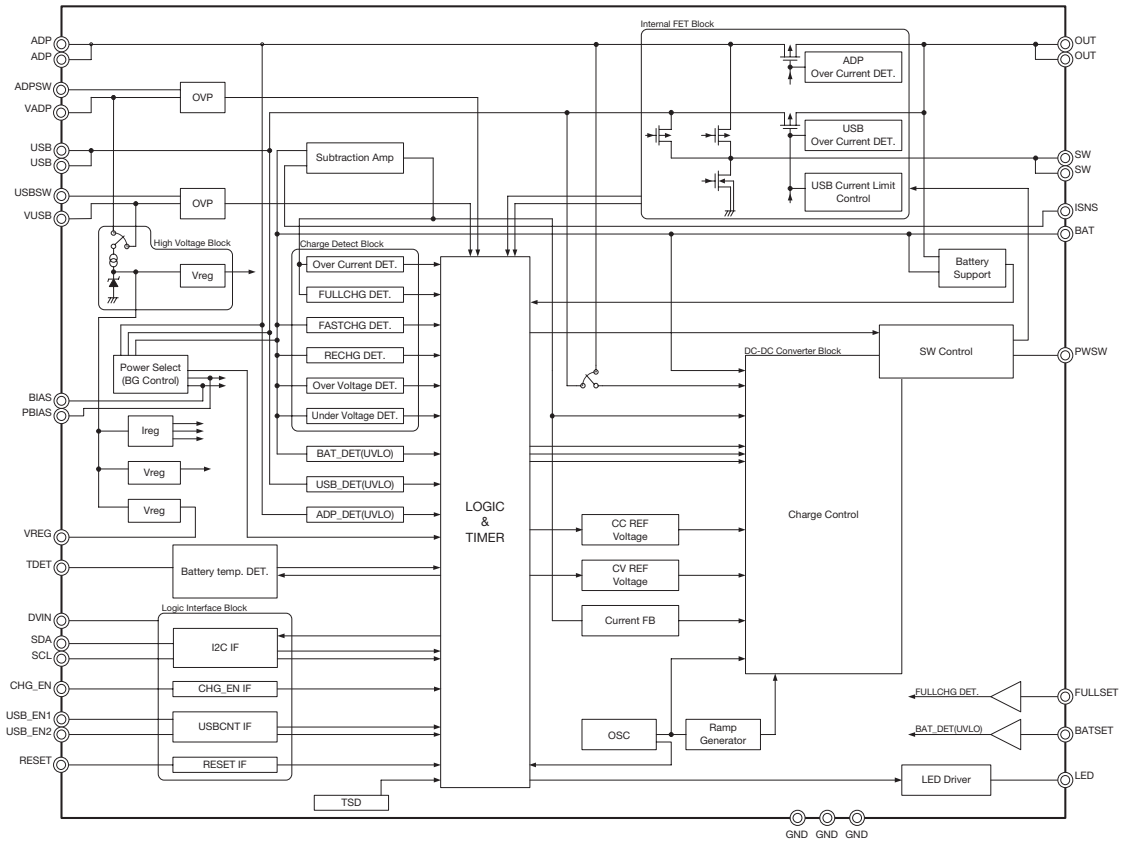
Pin assignment

SQFN-32A

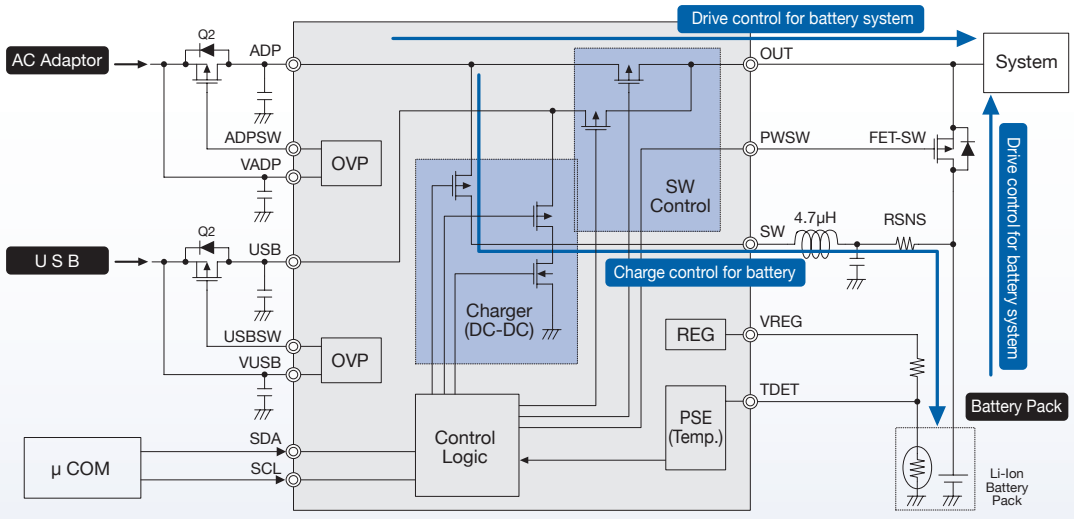


Pin no.	Symbol	Pin no.	Symbol
1	ADP	17	ISNS
2	ADP	18	RESET
3	VADP	19	BAT
4	USB_EN1	20	TDET
5	SW	21	VREG
6	SW	22	BATSET
7	USB_EN2	23	FULLSET
8	ADPSW	24	GND
9	GND	25	LED
10	GND	26	USBSW
11	CHG_EN	27	VUSB
12	PBIAS	28	USB
13	BIAS	29	USB
14	SCL	30	PWSW
15	SDA	31	OUT
16	DVIN	32	OUT

Block diagram



Typical application circuit



1 SECONDARY BATTERY ICs

1cell Lithium–ion battery switching charge cotrol IC /built-in system-path (included ADC/RTC)

MM3539

Outline

This IC contains built–in system path switch for switching between AC adaptor/USB and battery charge control function. With these functions, this IC monitors three power supplies constituted by an AC adaptor, the USB port, and lithium–ion secondary battery and controls system drive power supply and charging. In order to implement safe and secure charging to comply with **JEITA guideline**, charging pressure and current can be changed when battery temperature is high or low. battery status can be monitored in detail by built-in ADC for battery voltage and monitoring temperature. This IC contains built-in real time clock.

Features

(Unless otherwise specified, Ta=25°C)

(1) Synchronous Buck Lithium–ion / Lihium-polymer charge control
(2) Built-in System path SW
(3) Overvoltage protection circuit (OVP) control function (PchMOS external controller)
(4) I²C interface allows the charging voltage, and current control and display the state. (such as status and configuration of error)
(5) Compliance with JEITA guideline
(6) When the USB current limit is supported by built-in battery
(7) When charging, the system priority function
(8) To reduce heat generation during charging, Built-in thermal regulation
(9) Consumption current 1 (ADP mode, USB mode) .....1.5mA typ. 3mA max.
(10) Consumption current 2 (BAT mode).....30μA typ. 50μA max.
(11) ADP/USB UVLO.....4.20V
(12) VADP/VUSB OVP.....5.70V
(13) BAT pin voltage for CV control.....4.20V±30mV
(14) BAT pin voltage of overvoltage detection 4.35V
(15) Current limit of USB path (100mA).....80mA typ. 100mA max.
(500mA).....460mA typ. 500mA max.
(16) ADC included.....Battery voltage (8bit), TDET pin voltage (8bit)
(17) Real time clock included

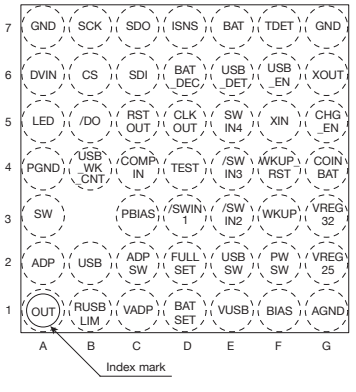
Applications

(1) Mobile phones, Smart phones
(2) Portable music players
(3) Tablet PCs
(4) Digital still cameras
(5) Portable games

Pin assignment

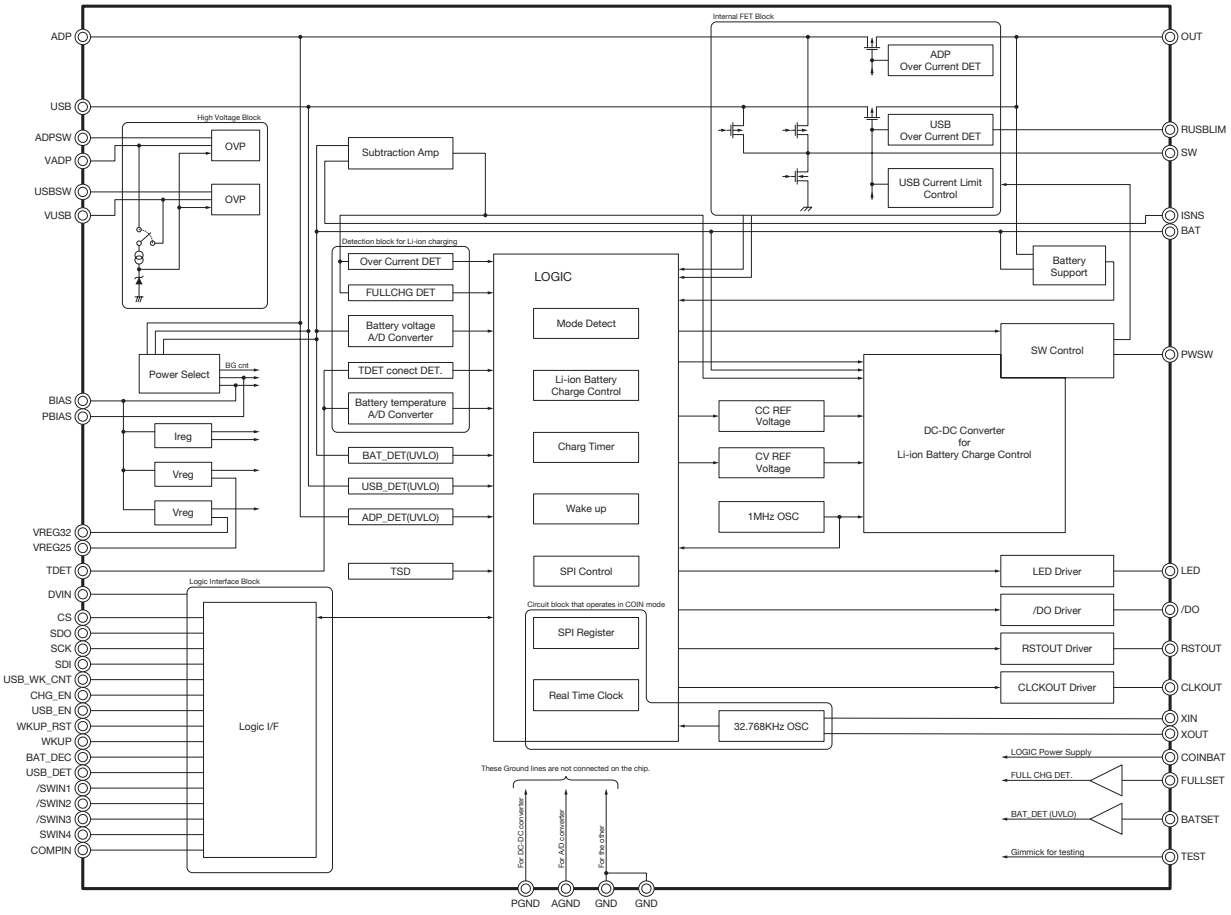
WLCSP-48B

(Top view)

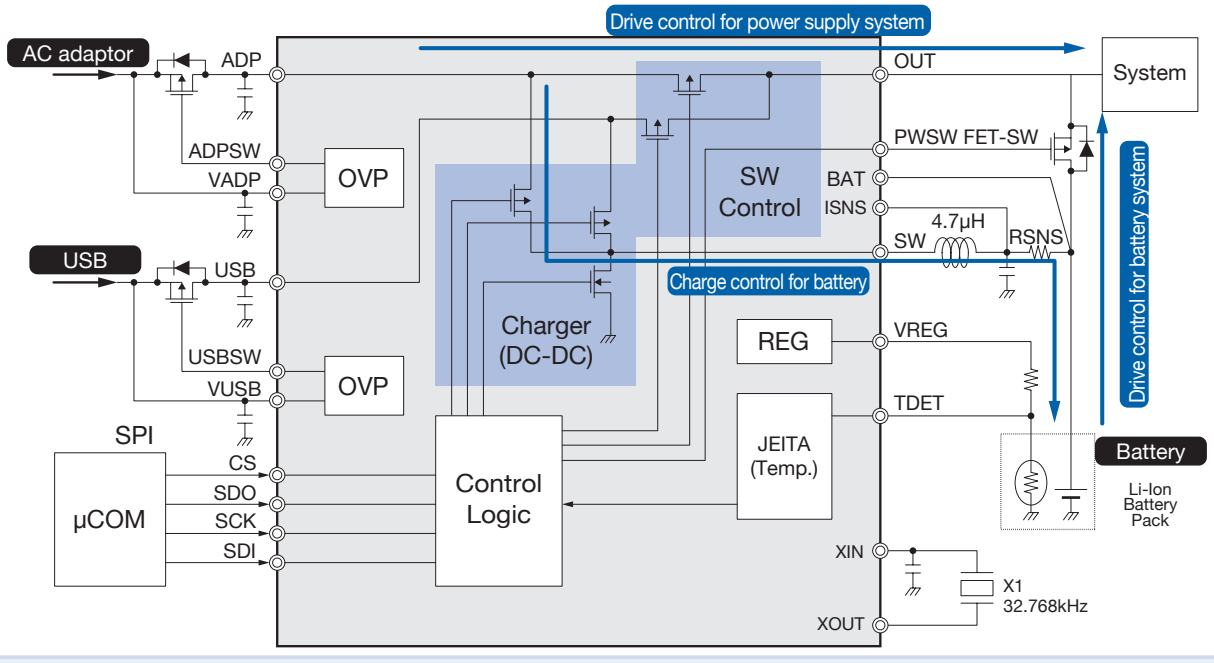


Pin no.	Symbol	Pin no.	Symbol	Pin no.	Symbol
A1	OUT	C4	COMPIN	E6	USB_DET
A2	ADP	C5	RSTOUT	E7	BAT
A3	SW	C6	SDI	F1	BIAS
A4	PGND	C7	SDO	F2	PWSW
A5	LED	D1	BATSET	F3	WKUP
A6	DVIN	D2	FULLSET	F4	/WKUP_RST
A7	GND	D3	/SWIN1	F5	CHG_EN
B1	RUSBLIM	D4	TEST	F6	USB_EN
B2	USB	D5	CLKOUT	F7	TDET
B4	USB/_WK_CNT	D6	BAT_DEC	G1	AGND
B5	/DO	D7	ISNS	G2	VREG25
B6	CS	E1	VUSB	G3	VREG32
B7	SCK	E2	USBSW	G4	COINBAT
C1	VADP	E3	/SWIN2	G5	XIN
C2	ADPSW	E4	/SWIN3	G6	XOUT
C3	PBIAS	E5	SWIN4	G7	GND

Block diagram



Typical application circuit



2 POWER SUPPLY ICs

Electrical characteristics (Unless otherwise specified, Ta=+25°C)

Voltage regulator ICs

Product Series	Product name	Features	Maximum operational input voltage	Output voltage	Accuracy	Current consumption	Standby current consumption	Dropout voltage	Output capacitor	Packages
150mA or less output current LDO regulator	MM3376	Reverse current protection	6.0V	0.8V to 5.0V	±2%	1.7μA	0.6μA (typ.)	50mV (Io=10mA, VOUT=3.0V)	Ceramic 0.1μF	SC-82ABB SOT-25A SSON-4B
	MM3534 MM3755	Low current consumption	6.0V	1.2V to 5.0V	±0.8%	0.9μA	0.1μA (typ.)	240mV (Io=150mA, VOUT=3.0V)	Ceramic 0.1μF	SC-82ABB SOT-25A PLP-4C
200mA or less output current LDO regulator	MM3411 MM3763	Fast transient response / Rush current protection	6.5V	0.8V to 5.0V	±1%	25μA	0.01μA (typ.)	400mV (Io=200mA, VOUT=3.0V)	Ceramic 0.47μF	SC-82ABB SOT-25A PLP-4C
	MM3566 MM3866	Cap less / Low current consumption	6.0V	1.2V to 5.0V	±1%	0.9μA	0.1μA (typ.)	350mV (Io=200mA, VOUT=3.0V)	---	SC-82ABB SOT-25A PLP-4C
	MM1836 MM1856	15V withstand voltage	14.0V	1.5V to 5.0V	±2%	75μA	0μA (typ.)	300mV (Io=200mA)	Ceramic 1.0μF	SC-82ABB SOT-25A
	MM1839	16V withstand voltage / Reverse bias protection	14.0V	1.5V to 5.0V	±2%	85μA	0μA (typ.)	300mV (Io=200mA)	Ceramic 1.0μF	SOT-25A SSON-6E
	MM1898 NEW	Negative output low noise (With noize reduction pin)	10.0V	−5.0V to −0.9V	±1%	160μA	3μA (typ.)	500mV (Io=200mA)	Ceramic 1.0μF	SOT-25A SSON-6A
300mA or less output current LDO regulator	MM3571 MM3871	Fast transient response / Rush current protection	6.5V	1.0V to 5.0V	±1%	20μA	0.01μA (typ.)	240mV (Io=300mA, VOUT=3.0V)	Ceramic 1.0μF	SC-82ABB SOT-25A SOT89-5A PLP-4C
	MM3608	Thermal shutdown function	6.5V	0.8V to 5.0V	±1%	90μA	0.1μA (typ.)	240mV (Io=300mA, VOUT=3.0V)	Ceramic 1.0μF	SOT-25A
	MM1886	15V withstand voltage	14.0V	1.0V to 5.0V	±2%	75μA	0μA (typ.)	450mV (Io=300mA)	Ceramic 1.0μF	SOT-25A SOT89-5A
	MM1899 NEW	Low noise	14.0V	1.5V to 5.4V	±1%	140μA	6μA (typ.)	350mV (Io=300mA)	Ceramic 1.0μF	SOT-25A SSON-6A
500mA or less output current LDO regulator	MM3526 MM3478	Soft start function	6.0V	1.2V to 5.0V	±1%	50μA	0.1μA (typ.)	250mV (Io=500mA, Vout=3.0V)	Ceramic 1.0μF	SOT-25A SOT89-5A SSON-6A
1000mA or less output current LDO regulator	MM1877	15V withstand voltage	14.0V	1.5V to 5.0V	±2%	2mA	0μA (typ.)	250mV (Io=500mA)	Ceramic 1.0μF	HSOP-8A
	MM3529 MM3479	Soft start function	6.0V	1.2V to 5.0V	±1%	50μA	0.1μA (typ.)	500mV (Io=1000mA, VOUT=3.0V)	Ceramic 1.0μF	SOT89-5A SSON-6A
	MM3702 MM3703 NEW	Soft start function	6.5V	1.0V to 5.0V	±1%	60μA	0.1μA (typ.)	460mV (Io=300mA, VOUT=3.0V)	Ceramic 1.0μF	HSOP-8E SOT89-5A SSON-6A
1500mA or less output current LDO regulator	MM1870	Low output voltag low dropout voltage	10.0V	0.9V to 5.0V	±2%	1mA	0μA (typ.)	260mV (Io=1500mA)	Ceramic 1.0μF	HSOP-8A TO-252-5A
150mA or less output current 2ch LDO regulator	MM3548	Small package	6.0V	1.2V to 5.0V	±1%	40μA/ch	0.1μA (typ.)	210mV (Io=150mA, VOUT=3.0V)	Ceramic 1.0μF	PLP-6C
300mA or less output current 2ch LDO regulator	MM3549	Small package	6.0V	1.2V to 5.0V	±1%	40μA/ch	0.1μA (typ.)	220mV (Io=300mA, VOUT=3.0V)	Ceramic 1.0μF	PLP-8E

Electrical characteristics (Unless otherwise specified, Ta=+25°C)

Shunt regulator ICs

Product Series	Product name	Reference voltage	Accuracy	Cathode voltage max.	Cathode current max.	Minimum cathode current	Package
Adjustable shunt regulator	MM1431	2.495V	±0.4% ±0.5% ±0.8%	35V	50mA	0.3mA	SC–82ABB SOT–23A SOT–25A
	MM1530	1.240V 1.250V 1.270V	±0.5% ±0.8%	12V	15mA 30mA	0.05mA 0.15mA	SC–82ABB SOT–23A

2 POWER SUPPLY ICs

150mA CMOS voltage regulators with the reverse current protection

MM3376 Series

Outline

This IC is a regulator IC providing low supply current (1.7μA) and low input voltage (1.2V to 6V), developed using the CMOS process.
In addition, it is ideal to be used for a constant voltage power supply for backup as it includes a reverse current protection function to automatically prevent a current (0.1μA max.) from reversely flowing to the input terminal side if a voltage exceeding the input terminal voltage (V_{DD}) is applied to the output terminal (V_{OUT}) by monitoring the voltages of the output terminal (V_{OUT}) and input terminal (V_{DD}).

Applications

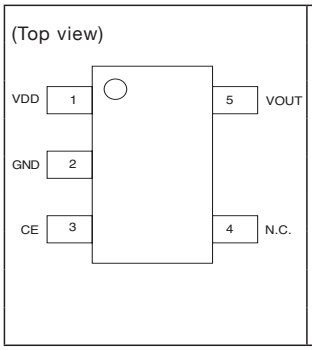
(1) Smart phones
(2) Tablet PCs
(3) Mobile phones
(4) Portable music Players
(5) Digital still cameras
(6) Portable games

Features (Unless otherwise specified, Ta=+25°C)

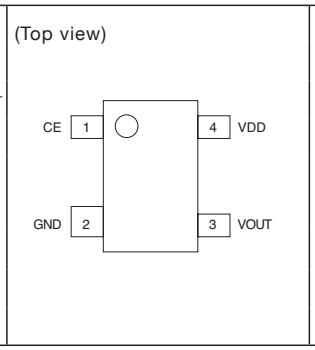
(1) Input voltage range .....1.2V to 6V
(2) Output voltage range .....0.8V to 5.0V
(3) Output voltage accuracy.....V_{OUT}±2%
(4) Maximum output current.....150mA
(5) Current consumption .....1.7μA typ.
(No–Load Input Current)
0.6μA typ. (OFF)
(6) Reverse current.....0.1μA max.
(7) Output capacitor 0.1μF
(8) Dropout voltage.....30mV typ. / 50mV max.
(Io=10mA, 3.3V≤V_{OUT}≤5.0V)
(9) Output short-circuit current...60mA typ.
(10) Line regulation.....0.05% / V typ. (Io=1mA)
(11) Load regulation .....30mV typ. / 90mV max.
(Io=1 to 150mA)

Pin assignment

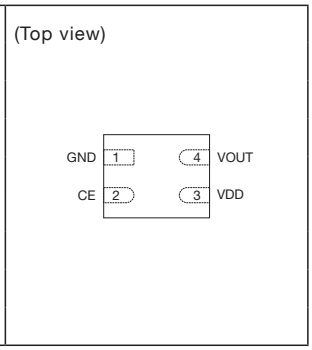
SOT–25A



SC–82ABB



SSON-4B



Pin no.	SOT-25A	SC-82ABB	SSON-4B
1	VDD	CE	GND
2	GND	GND	CE
3	CE	VOUT	VDD
4	N.C.	VDD	VOUT
5	VOUT	---	---

Model name structure

M M 3 3 7 6 A □ □ □ R E

Embossed taping	E
Housing	R
Package code	
SC–82ABB	U
SOT–25A	N
SSON-4B	R
Output voltage	
e.g.) 3.3V	33

Selection guide

Output Voltage	Accuracy	Parts No.			Dropout Voltage (Typ.) Io=10mA	Output Current	No–Load Input Current (Typ.)
		SOT–25A Package (3,000pcs/Reel)	SC–82ABB Package (3,000pcs/Reel)	SSON-4B Package (3,000pcs/Reel)			
0.8V	±30mV	MM3376A08NRE	MM3376A08URE	MM3376A08RRE	*	150mA	1.7μA
0.9V	±30mV	MM3376A09NRE	MM3376A09URE	MM3376A09RRE	*	150mA	1.7μA
1.0V	±30mV	MM3376A10NRE	MM3376A10URE	MM3376A10RRE	*	150mA	1.7μA
1.1V	±30mV	MM3376A11NRE	MM3376A11URE	MM3376A11RRE	*	150mA	1.7μA
1.2V	±30mV	MM3376A12NRE	MM3376A12URE	MM3376A12RRE	*	150mA	1.7μA
1.3V	±30mV	MM3376A13NRE	MM3376A13URE	MM3376A13RRE	*	150mA	1.7μA
1.4V	±30mV	MM3376A14NRE	MM3376A14URE	MM3376A14RRE	*	150mA	1.7μA
1.5V	±2%	MM3376A15NRE	MM3376A15URE	MM3376A15RRE	0.12V	150mA	1.7μA
1.6V	±2%	MM3376A16NRE	MM3376A16URE	MM3376A16RRE	0.12V	150mA	1.7μA
1.7V	±2%	MM3376A17NRE	MM3376A17URE	MM3376A17RRE	0.12V	150mA	1.7μA
1.8V	±2%	MM3376A18NRE	MM3376A18URE	MM3376A18RRE	0.12V	150mA	1.7μA
1.9V	±2%	MM3376A19NRE	MM3376A19URE	MM3376A19RRE	0.12V	150mA	1.7μA
2.0V	±2%	MM3376A20NRE	MM3376A20URE	MM3376A20RRE	0.08V	150mA	1.7μA
2.1V	±2%	MM3376A21NRE	MM3376A21URE	MM3376A21RRE	0.08V	150mA	1.7μA
2.2V	±2%	MM3376A22NRE	MM3376A22URE	MM3376A22RRE	0.08V	150mA	1.7μA
2.3V	±2%	MM3376A23NRE	MM3376A23URE	MM3376A23RRE	0.08V	150mA	1.7μA
2.4V	±2%	MM3376A24NRE	MM3376A24URE	MM3376A24RRE	0.08V	150mA	1.7μA
2.5V	±2%	MM3376A25NRE	MM3376A25URE	MM3376A25RRE	0.06V	150mA	1.7μA
2.6V	±2%	MM3376A26NRE	MM3376A26URE	MM3376A26RRE	0.06V	150mA	1.7μA
2.7V	±2%	MM3376A27NRE	MM3376A27URE	MM3376A27RRE	0.06V	150mA	1.7μA
2.8V	±2%	MM3376A28NRE	MM3376A28URE	MM3376A28RRE	0.06V	150mA	1.7μA
2.9V	±2%	MM3376A29NRE	MM3376A29URE	MM3376A29RRE	0.06V	150mA	1.7μA
3.0V	±2%	MM3376A30NRE	MM3376A30URE	MM3376A30RRE	0.05V	150mA	1.7μA
3.1V	±2%	MM3376A31NRE	MM3376A31URE	MM3376A31RRE	0.05V	150mA	1.7μA
3.2V	±2%	MM3376A32NRE	MM3376A32URE	MM3376A32RRE	0.05V	150mA	1.7μA
3.3V	±2%	MM3376A33NRE	MM3376A33URE	MM3376A33RRE	0.03V	150mA	1.7μA
3.4V	±2%	MM3376A34NRE	MM3376A34URE	MM3376A34RRE	0.03V	150mA	1.7μA
3.5V	±2%	MM3376A35NRE	MM3376A35URE	MM3376A35RRE	0.03V	150mA	1.7μA
3.6V	±2%	MM3376A36NRE	MM3376A36URE	MM3376A36RRE	0.03V	150mA	1.7μA
3.7V	±2%	MM3376A37NRE	MM3376A37URE	MM3376A37RRE	0.03V	150mA	1.7μA
3.8V	±2%	MM3376A38NRE	MM3376A38URE	MM3376A38RRE	0.03V	150mA	1.7μA
3.9V	±2%	MM3376A39NRE	MM3376A39URE	MM3376A39RRE	0.03V	150mA	1.7μA
4.0V	±2%	MM3376A40NRE	MM3376A40URE	MM3376A40RRE	0.03V	150mA	1.7μA
4.1V	±2%	MM3376A41NRE	MM3376A41URE	MM3376A41RRE	0.03V	150mA	1.7μA
4.2V	±2%	MM3376A42NRE	MM3376A42URE	MM3376A42RRE	0.03V	150mA	1.7μA
4.3V	±2%	MM3376A43NRE	MM3376A43URE	MM3376A43RRE	0.03V	150mA	1.7μA
4.4V	±2%	MM3376A44NRE	MM3376A44URE	MM3376A44RRE	0.03V	150mA	1.7μA
4.5V	±2%	MM3376A45NRE	MM3376A45URE	MM3376A45RRE	0.03V	150mA	1.7μA
4.6V	±2%	MM3376A46NRE	MM3376A46URE	MM3376A46RRE	0.03V	150mA	1.7μA
4.7V	±2%	MM3376A47NRE	MM3376A47URE	MM3376A47RRE	0.03V	150mA	1.7μA
4.8V	±2%	MM3376A48NRE	MM3376A48URE	MM3376A48RRE	0.03V	150mA	1.7μA
4.9V	±2%	MM3376A49NRE	MM3376A49URE	MM3376A49RRE	0.03V	150mA	1.7μA
5.0V	±2%	MM3376A50NRE	MM3376A50URE	MM3376A50RRE	0.03V	150mA	1.7μA

* The parameter is not guaranteed in the model less than V_{OUT}=1.5V .

2 POWER SUPPLY ICs

Low current consumption 150mA regulator IC

MM3534, MM3755 Series

Outline

This IC is a low current consumption 150mA LDO.
The IC can be better low current consumption and load transient by bias boost circuit. Therefore the IC is ideal for mobile applications.

Applications

(1) Smart phones
(2) Tablet PCs
(3) Mobile phones
(4) Portable music Players
(5) Digital still cameras
(6) Portable games

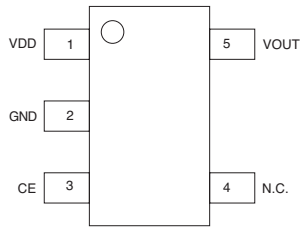
Features (Unless otherwise specified, Ta=+25°C)

(1) Input voltage range .....1.7V to 6.0V
(2) Output voltage range.....1.2V to 5.0V
(3) Output voltage accuracy .....VOUT±0.8% (VOUT>2V)
(4) Maximum output current.....150mA
(5) Current consumption.....0.9µA typ. (No–Load)
(VOUT=1.2V to 3.3V)
0.1µA typ. (OFF)
(6) Output capacitor 0.1µF
(7) Dropout voltage.....0.24V typ.
(Io=150mA, VOUT=3V)
(8) Output short-circuit current....100mA typ.
(9) Line regulation.....0.1% / V max.
(10)Load regulation.....10mV typ. (Io=1mA to 150mA)
(11)Ripple rejection.....50dB typ. (f=1kHz)

Pin assignment

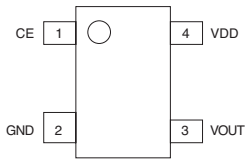
SOT–25A

(Top view)



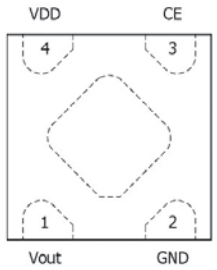
SC–82ABB

(Top view)



PLP–4C

(Top view)



Pin no.	SOT-25A	SC-82ABB	PLP-4C
1	VDD	CE	VOUT
2	GND	GND	GND
3	CE	VOUT	CE
4	N.C.	VDD	VDD
5	VOUT	---	---

Model name structure

M M 3 5 3 4 A □ □ □ R E

Embossed taping	E
Housing	R
Package code	
SC–82ABB	U
SOT–25A	N
Output voltage	
e.g.) 3.3V	33

M M 3 7 5 5 A □ □ □ R E

Embossed taping	E
Housing	R
Package code	
PLP–4C	R
Output voltage	
e.g.) 3.3V	33

Selection guide

Output Voltage	Accuracy	Parts No.			Dropout Voltage (Typ.) Io=150mA	Output Current	No–Load Input Current (Typ.)
		SOT–25A Package (3,000pcs/Reel)	SC–82ABB Package (3,000pcs/Reel)	PLP–4C Package (10,000pcs/Reel)			
1.2V	±16mV	MM3534A12NRE	MM3534A12URE	MM3755A12RRE	0.76V	150mA	0.9μA
1.3V	±16mV	MM3534A13NRE	MM3534A13URE	MM3755A13RRE	0.76V	150mA	0.9μA
1.4V	±16mV	MM3534A14NRE	MM3534A14URE	MM3755A14RRE	0.76V	150mA	0.9μA
1.5V	±16mV	MM3534A15NRE	MM3534A15URE	MM3755A15RRE	0.53V	150mA	0.9μA
1.6V	±16mV	MM3534A16NRE	MM3534A16URE	MM3755A16RRE	0.53V	150mA	0.9μA
1.7V	±16mV	MM3534A17NRE	MM3534A17URE	MM3755A17RRE	0.44V	150mA	0.9μA
1.8V	±16mV	MM3534A18NRE	MM3534A18URE	MM3755A18RRE	0.44V	150mA	0.9μA
1.9V	±16mV	MM3534A19NRE	MM3534A19URE	MM3755A19RRE	0.44V	150mA	0.9μA
2.0V	±16mV	MM3534A20NRE	MM3534A20URE	MM3755A20RRE	0.34V	150mA	0.9μA
2.1V	±0.8%	MM3534A21NRE	MM3534A21URE	MM3755A21RRE	0.34V	150mA	0.9μA
2.2V	±0.8%	MM3534A22NRE	MM3534A22URE	MM3755A22RRE	0.34V	150mA	0.9μA
2.3V	±0.8%	MM3534A23NRE	MM3534A23URE	MM3755A23RRE	0.34V	150mA	0.9μA
2.4V	±0.8%	MM3534A24NRE	MM3534A24URE	MM3755A24RRE	0.34V	150mA	0.9μA
2.5V	±0.8%	MM3534A25NRE	MM3534A25URE	MM3755A25RRE	0.28V	150mA	0.9μA
2.6V	±0.8%	MM3534A26NRE	MM3534A26URE	MM3755A26RRE	0.28V	150mA	0.9μA
2.7V	±0.8%	MM3534A27NRE	MM3534A27URE	MM3755A27RRE	0.28V	150mA	0.9μA
2.8V	±0.8%	MM3534A28NRE	MM3534A28URE	MM3755A28RRE	0.24V	150mA	0.9μA
2.9V	±0.8%	MM3534A29NRE	MM3534A29URE	MM3755A29RRE	0.24V	150mA	0.9μA
3.0V	±0.8%	MM3534A30NRE	MM3534A30URE	MM3755A30RRE	0.24V	150mA	0.9μA
3.1V	±0.8%	MM3534A31NRE	MM3534A31URE	MM3755A31RRE	0.24V	150mA	0.9μA
3.2V	±0.8%	MM3534A32NRE	MM3534A32URE	MM3755A32RRE	0.24V	150mA	0.9μA
3.3V	±0.8%	MM3534A33NRE	MM3534A33URE	MM3755A33RRE	0.24V	150mA	0.9μA
3.4V	±0.8%	MM3534A34NRE	MM3534A34URE	MM3755A34RRE	0.24V	150mA	1.2μA
3.5V	±0.8%	MM3534A35NRE	MM3534A35URE	MM3755A35RRE	0.24V	150mA	1.2μA
3.6V	±0.8%	MM3534A36NRE	MM3534A36URE	MM3755A36RRE	0.24V	150mA	1.2μA
3.7V	±0.8%	MM3534A37NRE	MM3534A37URE	MM3755A37RRE	0.24V	150mA	1.2μA
3.8V	±0.8%	MM3534A38NRE	MM3534A38URE	MM3755A38RRE	0.24V	150mA	1.2μA
3.9V	±0.8%	MM3534A39NRE	MM3534A39URE	MM3755A39RRE	0.24V	150mA	1.2μA
4.0V	±0.8%	MM3534A40NRE	MM3534A40URE	MM3755A40RRE	0.24V	150mA	1.2μA
4.1V	±0.8%	MM3534A41NRE	MM3534A41URE	MM3755A41RRE	0.24V	150mA	1.2μA
4.2V	±0.8%	MM3534A42NRE	MM3534A42URE	MM3755A42RRE	0.24V	150mA	1.2μA
4.3V	±0.8%	MM3534A43NRE	MM3534A43URE	MM3755A43RRE	0.24V	150mA	1.2μA
4.4V	±0.8%	MM3534A44NRE	MM3534A44URE	MM3755A44RRE	0.24V	150mA	1.2μA
4.5V	±0.8%	MM3534A45NRE	MM3534A45URE	MM3755A45RRE	0.24V	150mA	1.2μA
4.6V	±0.8%	MM3534A46NRE	MM3534A46URE	MM3755A46RRE	0.24V	150mA	1.2μA
4.7V	±0.8%	MM3534A47NRE	MM3534A47URE	MM3755A47RRE	0.24V	150mA	1.2μA
4.8V	±0.8%	MM3534A48NRE	MM3534A48URE	MM3755A48RRE	0.24V	150mA	1.2μA
4.9V	±0.8%	MM3534A49NRE	MM3534A49URE	MM3755A49RRE	0.24V	150mA	1.2μA
5.0V	±0.8%	MM3534A50NRE	MM3534A50URE	MM3755A50RRE	0.24V	150mA	1.2μA

2 POWER SUPPLY ICs

Rush current protection 200mA regulator IC

MM3411, MM3763 Series

Outline

This is a 200mA Low dropout regulator IC with Rush current protection circuit.
No load input current is 25μA typ., and it reduce drop voltage for high speed response.
Rush current protection circuit can control rush current.

Applications

(1) Smart phones
(2) Tablet PCs
(3) Mobile phones
(4) Portable music Players
(5) Digital still cameras
(6) Portable games

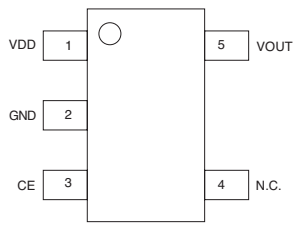
Features (Unless otherwise specified, Ta=+25°C)

(1) Input voltage range .....1.8V to 6.5V
(2) Output voltage range .....0.8V to 5.0V
(3) Output voltage accuracy.....VOUT±1.0%
(4) Maximum output current.....200mA
(5) Current Consumption.....25μA typ.
(No–Load Input Current)
0.01μA typ. (OFF)
(6) Output capacitor 0.47μF
(7) Dropout voltage.....0.40V typ.
(VOUT=3.0V, Io=200mA)
(8) Output short-circuit current...20mA typ.
(9) Line regulation.....0.01% / V typ.
(10) Load regulation .....20mV typ. (Io=1mA to 200mA)
(11) Ripple rejection .....70dB typ. (f=1kHz)

Pin assignment

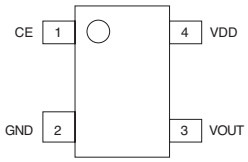
SOT–25A

(Top view)



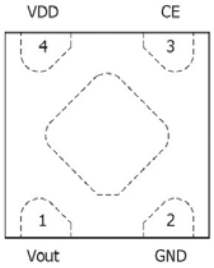
SC–82ABB

(Top view)



PLP–4C

(Top view)



Pin no.	SOT-25A	SC-82ABB	PLP-4C
1	VDD	CE	VOUT
2	GND	GND	GND
3	CE	VOUT	CE
4	N.C.	VDD	VDD
5	VOUT	---	---

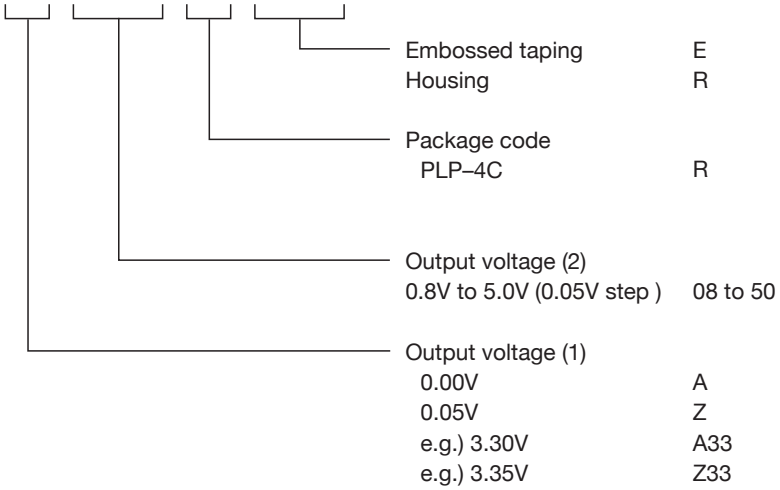
Model name structure

M M 3 4 1 1 □ □ □ □ R E

Embossed taping	E
Housing	R
Package code	
SC–82ABB	U
SOT–25A	N
Output voltage (2)	
0.8V to 5.0V (0.05V step)	08 to 50
Output voltage (1)	
0.00V	A
0.05V	Z
e.g.) 3.30V	A33
e.g.) 3.35V	Z33

Model name structure

M M 3 7 6 3 □ □ □ □ R E



Selection guide

Output Voltage	Accuracy	Parts No.			Dropout Voltage (Typ.) Io=200mA	Output Current	No–Load Input Current (Typ.)
		SOT–25A Package (3,000pcs/Reel)	SC–82ABB Package (3,000pcs/Reel)	PLP-4C Package (10,000pcs/Reel)			
0.80V	±20mV	MM3411A08NRE	MM3411A08URE	MM3763A08RRE	1.00V	200mA	25μA
0.85V	±20mV	MM3411Z08NRE	MM3411Z08URE	MM3763Z08RRE	1.00V	200mA	25μA
0.90V	±20mV	MM3411A09NRE	MM3411A09URE	MM3763A09RRE	1.00V	200mA	25μA
0.95V	±20mV	MM3411Z09NRE	MM3411Z09URE	MM3763Z09RRE	1.00V	200mA	25μA
1.00V	±20mV	MM3411A10NRE	MM3411A10URE	MM3763A10RRE	0.90V	200mA	25μA
1.05V	±20mV	MM3411Z10NRE	MM3411Z10URE	MM3763Z10RRE	0.90V	200mA	25μA
1.10V	±20mV	MM3411A11NRE	MM3411A11URE	MM3763A11RRE	0.90V	200mA	25μA
1.15V	±20mV	MM3411Z11NRE	MM3411Z11URE	MM3763Z11RRE	0.90V	200mA	25μA
1.20V	±20mV	MM3411A12NRE	MM3411A12URE	MM3763A12RRE	0.90V	200mA	25μA
1.25V	±20mV	MM3411Z12NRE	MM3411Z12URE	MM3763Z12RRE	0.90V	200mA	25μA
1.30V	±20mV	MM3411A13NRE	MM3411A13URE	MM3763A13RRE	0.78V	200mA	25μA
1.35V	±20mV	MM3411Z13NRE	MM3411Z13URE	MM3763Z13RRE	0.78V	200mA	25μA
1.40V	±20mV	MM3411A14NRE	MM3411A14URE	MM3763A14RRE	0.78V	200mA	25μA
1.45V	±20mV	MM3411Z14NRE	MM3411Z14URE	MM3763Z14RRE	0.78V	200mA	25μA
1.50V	±20mV	MM3411A15NRE	MM3411A15URE	MM3763A15RRE	0.78V	200mA	25μA
1.55V	±20mV	MM3411Z15NRE	MM3411Z15URE	MM3763Z15RRE	0.78V	200mA	25μA
1.60V	±20mV	MM3411A16NRE	MM3411A16URE	MM3763A16RRE	0.67V	200mA	25μA
1.65V	±20mV	MM3411Z16NRE	MM3411Z16URE	MM3763Z16RRE	0.67V	200mA	25μA
1.70V	±20mV	MM3411A17NRE	MM3411A17URE	MM3763A17RRE	0.67V	200mA	25μA
1.75V	±20mV	MM3411Z17NRE	MM3411Z17URE	MM3763Z17RRE	0.67V	200mA	25μA
1.80V	±20mV	MM3411A18NRE	MM3411A18URE	MM3763A18RRE	0.67V	200mA	25μA
1.85V	±20mV	MM3411Z18NRE	MM3411Z18URE	MM3763Z18RRE	0.67V	200mA	25μA
1.90V	±20mV	MM3411A19NRE	MM3411A19URE	MM3763A19RRE	0.62V	200mA	25μA
1.95V	±20mV	MM3411Z19NRE	MM3411Z19URE	MM3763Z19RRE	0.62V	200mA	25μA
2.00V	±1%	MM3411A20NRE	MM3411A20URE	MM3763A20RRE	0.62V	200mA	25μA
2.05V	±1%	MM3411Z20NRE	MM3411Z20URE	MM3763Z20RRE	0.62V	200mA	25μA
2.10V	±1%	MM3411A21NRE	MM3411A21URE	MM3763A21RRE	0.62V	200mA	25μA
2.15V	±1%	MM3411Z21NRE	MM3411Z21URE	MM3763Z21RRE	0.62V	200mA	25μA
2.20V	±1%	MM3411A22NRE	MM3411A22URE	MM3763A22RRE	0.62V	200mA	25μA
2.25V	±1%	MM3411Z22NRE	MM3411Z22URE	MM3763Z22RRE	0.62V	200mA	25μA

Output Voltage	Accuracy	Parts No.			Dropout Voltage (Typ.) Io=200mA	Output Current	No–Load Input Current (Typ.)
		SOT–25A Package (3,000pcs/Reel)	SC–82ABB Package (3,000pcs/Reel)	PLP-4C Package (10,000pcs/Reel)			
2.30V	±1%	MM3411A23NRE	MM3411A23URE	MM3763A23RRE	0.62V	200mA	25μA
2.35V	±1%	MM3411Z23NRE	MM3411Z23URE	MM3763Z23RRE	0.62V	200mA	25μA
2.40V	±1%	MM3411A24NRE	MM3411A24URE	MM3763A24RRE	0.62V	200mA	25μA
2.45V	±1%	MM3411Z24NRE	MM3411Z24URE	MM3763Z24RRE	0.62V	200mA	25μA
2.50V	±1%	MM3411A25NRE	MM3411A25URE	MM3763A25RRE	0.40V	200mA	25μA
2.55V	±1%	MM3411Z25NRE	MM3411Z25URE	MM3763Z25RRE	0.40V	200mA	25μA
2.60V	±1%	MM3411A26NRE	MM3411A26URE	MM3763A26RRE	0.40V	200mA	25μA
2.65V	±1%	MM3411Z26NRE	MM3411Z26URE	MM3763Z26RRE	0.40V	200mA	25μA
2.70V	±1%	MM3411A27NRE	MM3411A27URE	MM3763A27RRE	0.40V	200mA	25μA
2.75V	±1%	MM3411Z27NRE	MM3411Z27URE	MM3763Z27RRE	0.40V	200mA	25μA
2.80V	±1%	MM3411A28NRE	MM3411A28URE	MM3763A28RRE	0.40V	200mA	25μA
2.85V	±1%	MM3411Z28NRE	MM3411Z28URE	MM3763Z28RRE	0.40V	200mA	25μA
2.90V	±1%	MM3411A29NRE	MM3411A29URE	MM3763A29RRE	0.40V	200mA	25μA
2.95V	±1%	MM3411Z29NRE	MM3411Z29URE	MM3763Z29RRE	0.40V	200mA	25μA
3.00V	±1%	MM3411A30NRE	MM3411A30URE	MM3763A30RRE	0.40V	200mA	25μA
3.05V	±1%	MM3411Z30NRE	MM3411Z30URE	MM3763Z30RRE	0.40V	200mA	25μA
3.10V	±1%	MM3411A31NRE	MM3411A31URE	MM3763A31RRE	0.40V	200mA	25μA
3.15V	±1%	MM3411Z31NRE	MM3411Z31URE	MM3763Z31RRE	0.40V	200mA	25μA
3.20V	±1%	MM3411A32NRE	MM3411A32URE	MM3763A32RRE	0.40V	200mA	25μA
3.25V	±1%	MM3411Z32NRE	MM3411Z32URE	MM3763Z32RRE	0.40V	200mA	25μA
3.30V	±1%	MM3411A33NRE	MM3411A33URE	MM3763A33RRE	0.40V	200mA	25μA
3.35V	±1%	MM3411Z33NRE	MM3411Z33URE	MM3763Z33RRE	0.40V	200mA	25μA
3.40V	±1%	MM3411A34NRE	MM3411A34URE	MM3763A34RRE	0.40V	200mA	25μA
3.45V	±1%	MM3411Z34NRE	MM3411Z34URE	MM3763Z34RRE	0.40V	200mA	25μA
3.50V	±1%	MM3411A35NRE	MM3411A35URE	MM3763A35RRE	0.30V	200mA	25μA
3.55V	±1%	MM3411Z35NRE	MM3411Z35URE	MM3763Z35RRE	0.30V	200mA	25μA
3.60V	±1%	MM3411A36NRE	MM3411A36URE	MM3763A36RRE	0.30V	200mA	25μA
3.65V	±1%	MM3411Z36NRE	MM3411Z36URE	MM3763Z36RRE	0.30V	200mA	25μA
3.70V	±1%	MM3411A37NRE	MM3411A37URE	MM3763A37RRE	0.30V	200mA	25μA
3.75V	±1%	MM3411Z37NRE	MM3411Z37URE	MM3763Z37RRE	0.30V	200mA	25μA
3.80V	±1%	MM3411A38NRE	MM3411A38URE	MM3763A38RRE	0.30V	200mA	25μA
3.85V	±1%	MM3411Z38NRE	MM3411Z38URE	MM3763Z38RRE	0.30V	200mA	25μA
3.90V	±1%	MM3411A39NRE	MM3411A39URE	MM3763A39RRE	0.30V	200mA	25μA
3.95V	±1%	MM3411Z39NRE	MM3411Z39URE	MM3763Z39RRE	0.30V	200mA	25μA
4.00V	±1%	MM3411A40NRE	MM3411A40URE	MM3763A40RRE	0.30V	200mA	25μA
4.05V	±1%	MM3411Z40NRE	MM3411Z40URE	MM3763Z40RRE	0.30V	200mA	25μA
4.10V	±1%	MM3411A41NRE	MM3411A41URE	MM3763A41RRE	0.30V	200mA	25μA
4.15V	±1%	MM3411Z41NRE	MM3411Z41URE	MM3763Z41RRE	0.30V	200mA	25μA
4.20V	±1%	MM3411A42NRE	MM3411A42URE	MM3763A42RRE	0.30V	200mA	25μA
4.25V	±1%	MM3411Z42NRE	MM3411Z42URE	MM3763Z42RRE	0.30V	200mA	25μA
4.30V	±1%	MM3411A43NRE	MM3411A43URE	MM3763A43RRE	0.30V	200mA	25μA
4.35V	±1%	MM3411Z43NRE	MM3411Z43URE	MM3763Z43RRE	0.30V	200mA	25μA
4.40V	±1%	MM3411A44NRE	MM3411A44URE	MM3763A44RRE	0.30V	200mA	25μA
4.45V	±1%	MM3411Z44NRE	MM3411Z44URE	MM3763Z44RRE	0.30V	200mA	25μA
4.50V	±1%	MM3411A45NRE	MM3411A45URE	MM3763A45RRE	0.25V	200mA	25μA
4.55V	±1%	MM3411Z45NRE	MM3411Z45URE	MM3763Z45RRE	0.25V	200mA	25μA
4.60V	±1%	MM3411A46NRE	MM3411A46URE	MM3763A46RRE	0.25V	200mA	25μA
4.65V	±1%	MM3411Z46NRE	MM3411Z46URE	MM3763Z46RRE	0.25V	200mA	25μA
4.70V	±1%	MM3411A47NRE	MM3411A47URE	MM3763A47RRE	0.25V	200mA	25μA
4.75V	±1%	MM3411Z47NRE	MM3411Z47URE	MM3763Z47RRE	0.25V	200mA	25μA
4.80V	±1%	MM3411A48NRE	MM3411A48URE	MM3763A48RRE	0.25V	200mA	25μA
4.85V	±1%	MM3411Z48NRE	MM3411Z48URE	MM3763Z48RRE	0.25V	200mA	25μA
4.90V	±1%	MM3411A49NRE	MM3411A49URE	MM3763A49RRE	0.25V	200mA	25μA
4.95V	±1%	MM3411Z49NRE	MM3411Z49URE	MM3763Z49RRE	0.25V	200mA	25μA
5.00V	±1%	MM3411A50NRE	MM3411A50URE	MM3763A50RRE	0.25V	200mA	25μA

2 POWER SUPPLY ICs

Capacitor–less/Ultralow quiescent current 200mA regulator IC MM3566, MM3866 Series

Outline

MM3566 is a Capacitor–less/Ultralow quiescent current 200mA LDO.
The IC can be stable behavior without Input/Output capacitor. Therefore the number of external capacitor is reduced.
The IC can be better low quiescent current and load transient by bias boost circuit.
Therefore the IC is ideal for mobile applications.

Applications

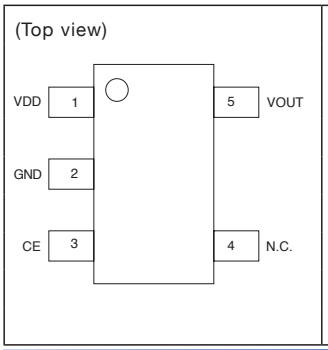
(1) Smart phones
(2) Tablet PCs
(3) Mobile phones
(4) Portable music Players
(5) Digital still cameras
(6) Portable games

Features (Unless otherwise specified, Ta=+25°C)

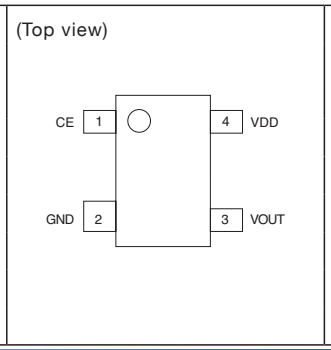
(1) Input voltage range ..... 1.7V to 6.0V
(2) Output voltage range..... 1.2V to 5.0V
(3) Output voltage accuracy. VOUT±1.0%(Vo>2V)
(4) Maximum output current. 200mA
(5) Current Consumption ..... 0.1μA typ. (OFF)
0.9μA typ.
(No–Load, Vo=1.2V to 3.3V)
1.2μA typ.
(No–Load, Vo=3.4V to 5.0V)
(6) Dropout voltage ..... 0.35V typ. / 0.50V max
(Io=200mA, Vo=3.0 to 3.3V)
(7) Line regulation ..... 0.02%/V typ. / 0.1%/V max. (Io=1mA)
(8) Load regulation..... 15mV typ. / 40mV max.
(Io=1mA to 200mA)
(9) Vout Temperature coefficient
±80ppm/°C typ.
(10) Output capacitor ..... Unnecessary

Pin assignment

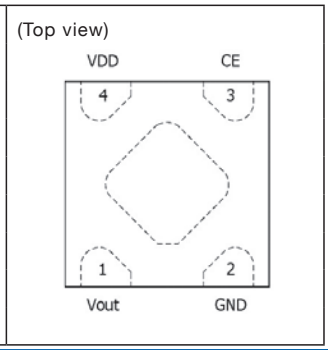
SOT–25A



SC–82ABB



PLP–4C



Pin no.	SOT-25A	SC-82ABB	PLP-4C
1	VDD	CE	VOUT
2	GND	GND	GND
3	CE	VOUT	CE
4	N.C.	VDD	VDD
5	VOUT	---	---

Model name structure

M M 3 5 6 6 □ □ □ □ R E

Embossed taping		E
Housing		R
Package code		
SC–82ABB		U
SOT–25A		N
Output voltage		
1.2V to 5.0V (0.1V step)		12 to 50
Function type		
CE=H-Active, with Discharge Function		A
CE=L-Active, with Discharge Function		B
CE=H-Active, without Discharge Function		C

Model name structure

M M 3 8 6 6 A □ □ □ R E

Embossed taping	E
Housing	R
Package code PLP–4C	R
Output voltage 1.2V to 5.0V (0.1V step)	1.2 to 5.0

Selection guide

Output Voltage	Accuracy	Parts No.			Dropout Voltage (Typ.) Io=200mA	Output Current	No–Load Input Current (Typ.)
		SOT–25A Package (3,000pcs/Reel)	SC–82ABB Package (3,000pcs/Reel)	PLP-4C Package (10,000pcs/Reel)			
1.2V	±20mV	MM3566A12NRE	MM3566A12URE	MM3866A12RRE	1.01V	200mA	0.9μA
1.3V	±20mV	MM3566A13NRE	MM3566A13URE	MM3866A13RRE	1.01V	200mA	0.9μA
1.4V	±20mV	MM3566A14NRE	MM3566A14URE	MM3866A14RRE	1.01V	200mA	0.9μA
1.5V	±20mV	MM3566A15NRE	MM3566A15URE	MM3866A15RRE	0.71V	200mA	0.9μA
1.6V	±20mV	MM3566A16NRE	MM3566A16URE	MM3866A16RRE	0.71V	200mA	0.9μA
1.7V	±20mV	MM3566A17NRE	MM3566A17URE	MM3866A17RRE	0.59V	200mA	0.9μA
1.8V	±20mV	MM3566A18NRE	MM3566A18URE	MM3866A18RRE	0.59V	200mA	0.9μA
1.9V	±20mV	MM3566A19NRE	MM3566A19URE	MM3866A19RRE	0.59V	200mA	0.9μA
2.0V	±20mV	MM3566A20NRE	MM3566A20URE	MM3866A20RRE	0.45V	200mA	0.9μA
2.1V	±1%	MM3566A21NRE	MM3566A21URE	MM3866A21RRE	0.45V	200mA	0.9μA
2.2V	±1%	MM3566A22NRE	MM3566A22URE	MM3866A22RRE	0.45V	200mA	0.9μA
2.3V	±1%	MM3566A23NRE	MM3566A23URE	MM3866A23RRE	0.45V	200mA	0.9μA
2.4V	±1%	MM3566A24NRE	MM3566A24URE	MM3866A24RRE	0.45V	200mA	0.9μA
2.5V	±1%	MM3566A25NRE	MM3566A25URE	MM3866A25RRE	0.42V	200mA	0.9μA
2.6V	±1%	MM3566A26NRE	MM3566A26URE	MM3866A26RRE	0.42V	200mA	0.9μA
2.7V	±1%	MM3566A27NRE	MM3566A27URE	MM3866A27RRE	0.42V	200mA	0.9μA
2.8V	±1%	MM3566A28NRE	MM3566A28URE	MM3866A28RRE	0.42V	200mA	0.9μA
2.9V	±1%	MM3566A29NRE	MM3566A29URE	MM3866A29RRE	0.42V	200mA	0.9μA
3.0V	±1%	MM3566A30NRE	MM3566A30URE	MM3866A30RRE	0.35V	200mA	0.9μA
3.1V	±1%	MM3566A31NRE	MM3566A31URE	MM3866A31RRE	0.35V	200mA	0.9μA
3.2V	±1%	MM3566A32NRE	MM3566A32URE	MM3866A32RRE	0.35V	200mA	0.9μA
3.3V	±1%	MM3566A33NRE	MM3566A33URE	MM3866A33RRE	0.35V	200mA	0.9μA
3.4V	±1%	MM3566A34NRE	MM3566A34URE	MM3866A34RRE	0.32V	200mA	1.2μA
3.5V	±1%	MM3566A35NRE	MM3566A35URE	MM3866A35RRE	0.32V	200mA	1.2μA
3.6V	±1%	MM3566A36NRE	MM3566A36URE	MM3866A36RRE	0.32V	200mA	1.2μA
3.7V	±1%	MM3566A37NRE	MM3566A37URE	MM3866A37RRE	0.32V	200mA	1.2μA
3.8V	±1%	MM3566A38NRE	MM3566A38URE	MM3866A38RRE	0.32V	200mA	1.2μA
3.9V	±1%	MM3566A39NRE	MM3566A39URE	MM3866A39RRE	0.32V	200mA	1.2μA
4.0V	±1%	MM3566A40NRE	MM3566A40URE	MM3866A40RRE	0.32V	200mA	1.2μA
4.1V	±1%	MM3566A41NRE	MM3566A41URE	MM3866A41RRE	0.32V	200mA	1.2μA
4.2V	±1%	MM3566A42NRE	MM3566A42URE	MM3866A42RRE	0.32V	200mA	1.2μA
4.3V	±1%	MM3566A43NRE	MM3566A43URE	MM3866A43RRE	0.32V	200mA	1.2μA
4.4V	±1%	MM3566A44NRE	MM3566A44URE	MM3866A44RRE	0.32V	200mA	1.2μA
4.5V	±1%	MM3566A45NRE	MM3566A45URE	MM3866A45RRE	0.32V	200mA	1.2μA
4.6V	±1%	MM3566A46NRE	MM3566A46URE	MM3866A46RRE	0.32V	200mA	1.2μA
4.7V	±1%	MM3566A47NRE	MM3566A47URE	MM3866A47RRE	0.32V	200mA	1.2μA
4.8V	±1%	MM3566A48NRE	MM3566A48URE	MM3866A48RRE	0.32V	200mA	1.2μA
4.9V	±1%	MM3566A49NRE	MM3566A49URE	MM3866A49RRE	0.32V	200mA	1.2μA
5.0V	±1%	MM3566A50NRE	MM3566A50URE	MM3866A50RRE	0.32V	200mA	1.2μA

2 POWER SUPPLY ICs

15V withstand voltage 200mA regulator IC

MM1836, MM1856 Series

Outline

This IC is a 200mA Low dropout regulator IC with ON/OFF control of the output voltage.
The IC applies to a standard home equipments, for a maximum operating voltage is 14V.

Applications

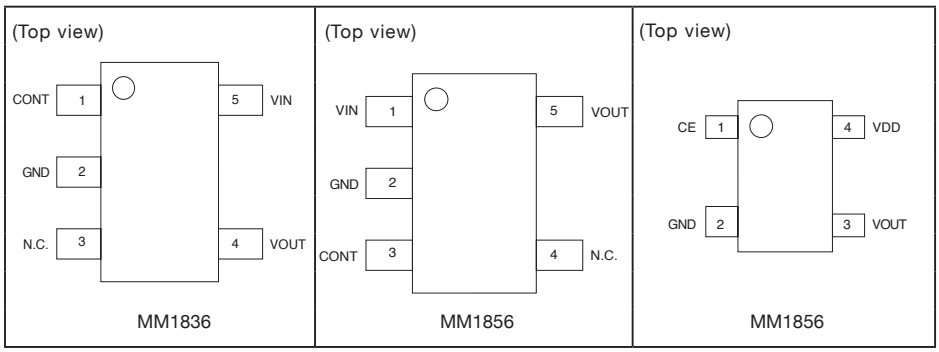
(1) Smart phones
(2) Tablet PCs
(3) Mobile phones
(4) Portable music Players
(5) Digital still cameras
(6) Portable games

Features (Unless otherwise specified, Ta=+25°C)

(1) Input voltage range .....1.8V to 14.0V
(2) Output voltage range .....1.5V to 5.0V
(3) Output voltage accuracy.....VOUT±2.0%
(4) Maximum output current.....200mA
(5) Current consumption .....75µA typ. (No–Load)
0µA typ. (OFF)
(6) Output capacitor 1µF
(7) Dropout voltage.....300mV typ. (Io=200mA)
(8) Line regulation.....0.1% / V max.
(9) Load regulation .....15mV max.
(Io=1mA to 200mA)
(10) Ripple rejection .....70dB typ. (f=1kHz)

Pin assignment

SOT–25A **SOT–25A** **SC–82ABB**



Pin no.	SOT-25A MM1836	SOT-25A MM1856	SC82-ABB MM1856
1	CONT	VIN	CE
2	GND	GND	GND
3	N.C.	CONT	VOUT
4	VOUT	N.C.	VDD
5	VIN	VOUT	---

Model name structure

M M 1 8 3 6 A □ □ □ R E
M M 1 8 5 6 A □ □ □ R E

Embossed taping	E
Housing	R
Package code	
SC–82ABB	U
SOT–25A	N
Output voltage	
e.g.) 3.3V	33

Selection guide

Output Voltage	Accuracy	Parts No.			Dropout Voltage (Typ.) Io=200mA	Output Current	No-Load Input Current (Typ.)
		MM1836 Series	MM1856 Series				
		SOT-25A Package (3,000pcs/Reel)	SOT-25A Package (3,000pcs/Reel)	SC-82ABB Package (3,000pcs/Reel)			
1.5V	±2.0%	MM1836A15NRE	MM1856A15NRE	MM1856A15URE	*	200mA	75μA
1.6V	±2.0%	MM1836A16NRE	MM1856A16NRE	MM1856A16URE	*	200mA	75μA
1.7V	±2.0%	MM1836A17NRE	MM1856A17NRE	MM1856A17URE	*	200mA	75μA
1.8V	±2.0%	MM1836A18NRE	MM1856A18NRE	MM1856A18URE	*	200mA	75μA
1.9V	±2.0%	MM1836A19NRE	MM1856A19NRE	MM1856A19URE	*	200mA	75μA
2.0V	±2.0%	MM1836A20NRE	MM1856A20NRE	MM1856A20URE	*	200mA	75μA
2.1V	±2.0%	MM1836A21NRE	MM1856A21NRE	MM1856A21URE	0.30V	200mA	75μA
2.2V	±2.0%	MM1836A22NRE	MM1856A22NRE	MM1856A22URE	0.30V	200mA	75μA
2.3V	±2.0%	MM1836A23NRE	MM1856A23NRE	MM1856A23URE	0.30V	200mA	75μA
2.4V	±2.0%	MM1836A24NRE	MM1856A24NRE	MM1856A24URE	0.30V	200mA	75μA
2.5V	±2.0%	MM1836A25NRE	MM1856A25NRE	MM1856A25URE	0.30V	200mA	75μA
2.6V	±2.0%	MM1836A26NRE	MM1856A26NRE	MM1856A26URE	0.30V	200mA	75μA
2.7V	±2.0%	MM1836A27NRE	MM1856A27NRE	MM1856A27URE	0.30V	200mA	75μA
2.8V	±2.0%	MM1836A28NRE	MM1856A28NRE	MM1856A28URE	0.30V	200mA	75μA
2.9V	±2.0%	MM1836A29NRE	MM1856A29NRE	MM1856A29URE	0.30V	200mA	75μA
3.0V	±2.0%	MM1836A30NRE	MM1856A30NRE	MM1856A30URE	0.30V	200mA	75μA
3.1V	±2.0%	MM1836A31NRE	MM1856A31NRE	MM1856A31URE	0.30V	200mA	75μA
3.2V	±2.0%	MM1836A32NRE	MM1856A32NRE	MM1856A32URE	0.30V	200mA	75μA
3.3V	±2.0%	MM1836A33NRE	MM1856A33NRE	MM1856A33URE	0.30V	200mA	75μA
3.4V	±2.0%	MM1836A34NRE	MM1856A34NRE	MM1856A34URE	0.30V	200mA	75μA
3.5V	±2.0%	MM1836A35NRE	MM1856A35NRE	MM1856A35URE	0.30V	200mA	75μA
3.6V	±2.0%	MM1836A36NRE	MM1856A36NRE	MM1856A36URE	0.30V	200mA	75μA
3.7V	±2.0%	MM1836A37NRE	MM1856A37NRE	MM1856A37URE	0.30V	200mA	75μA
3.8V	±2.0%	MM1836A38NRE	MM1856A38NRE	MM1856A38URE	0.30V	200mA	75μA
3.9V	±2.0%	MM1836A39NRE	MM1856A39NRE	MM1856A39URE	0.30V	200mA	75μA
4.0V	±2.0%	MM1836A40NRE	MM1856A40NRE	MM1856A40URE	0.30V	200mA	75μA
4.1V	±2.0%	MM1836A41NRE	MM1856A41NRE	MM1856A41URE	0.30V	200mA	75μA
4.2V	±2.0%	MM1836A42NRE	MM1856A42NRE	MM1856A42URE	0.30V	200mA	75μA
4.3V	±2.0%	MM1836A43NRE	MM1856A43NRE	MM1856A43URE	0.30V	200mA	75μA
4.4V	±2.0%	MM1836A44NRE	MM1856A44NRE	MM1856A44URE	0.30V	200mA	75μA
4.5V	±2.0%	MM1836A45NRE	MM1856A45NRE	MM1856A45URE	0.30V	200mA	75μA
4.6V	±2.0%	MM1836A46NRE	MM1856A46NRE	MM1856A46URE	0.30V	200mA	75μA
4.7V	±2.0%	MM1836A47NRE	MM1856A47NRE	MM1856A47URE	0.30V	200mA	75μA
4.8V	±2.0%	MM1836A48NRE	MM1856A48NRE	MM1856A48URE	0.30V	200mA	75μA
4.9V	±2.0%	MM1836A49NRE	MM1856A49NRE	MM1856A49URE	0.30V	200mA	75μA
5.0V	±2.0%	MM1836A50NRE	MM1856A50NRE	MM1856A50URE	0.30V	200mA	75μA

* The parameter is not guaranteed in the model less than V_{OUT}=2.0V .

2 POWER SUPPLY ICs

200mA LDO with reverse bias protection

MM1839 Series

Outline

This IC is a 200mA LDO with a reverse bias protection function. The IC applies to a standard home equipments, for a maximum operating voltage is 14V.
In addition, a protection diode is not necessary because a reverse bias protection function is built in it.

Applications

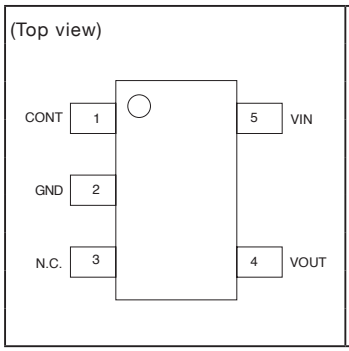
(1) Smart phones
(2) Tablet PCs
(3) Mobile phones
(4) Portable music Players
(5) Digital still cameras
(6) Portable games

Features (Unless otherwise specified, Ta=+25°C)

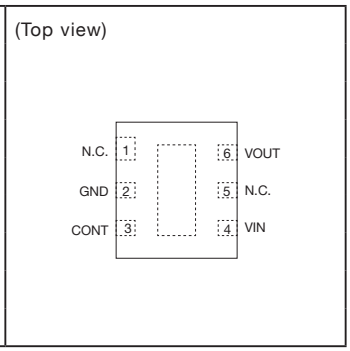
(1) Input voltage range .....1.8V to 14.0V
(2) Output voltage range .....1.5V to 5.0V
(3) Output voltage accuracy.....VOUT±2.0%
(4) Maximum output current.....200mA
(5) Current consumption .....85µA typ.
(No–Load Input Current)
0µA typ. (OFF)
(6) Output capacitor 1µF
(7) Dropout voltage.....0.30V typ.
(VOUT=3.0V, Io=200mA)
(8) Line regulation.....0.1% / V max.
(9) Load regulation .....15mV typ. (Io=1mA to 200mA)
(10) Ripple rejection .....70dB typ. (f=1kHz)

Pin assignment

SOT–25A



SSON–6E



Pin no.	SOT-25A	SSON-6E
1	CONT	N.C.
2	GND	GND
3	N.C.	CONT
4	VOUT	VIN
5	VIN	N.C.
6	---	VOUT

Model name structure

M M 1 8 3 9 A □ □ □ R E

Embossed taping	E
Housing	R
Package code	
SOT–25A	N
SSON–6E	R
Output voltage	
e.g.) 3.3V	33

Selection guide

Output Voltage	Accuracy	Parts No.		Dropout Voltage (Typ.) Io=200mA	Output Current	No-Load Input Current (Typ.)
		SOT-25A Package (3,000pcs/Reel)	SSON-6E Package (3,000pcs/Reel)			
1.5V	±2.0%	MM1839A15NRE	MM1839A15RRE	0.30V	200mA	85μA
1.6V	±2.0%	MM1839A16NRE	MM1839A16RRE	0.30V	200mA	85μA
1.7V	±2.0%	MM1839A17NRE	MM1839A17RRE	0.30V	200mA	85μA
1.8V	±2.0%	MM1839A18NRE	MM1839A18RRE	0.30V	200mA	85μA
1.9V	±2.0%	MM1839A19NRE	MM1839A19RRE	0.30V	200mA	85μA
2.0V	±2.0%	MM1839A20NRE	MM1839A20RRE	0.30V	200mA	85μA
2.1V	±2.0%	MM1839A21NRE	MM1839A21RRE	0.30V	200mA	85μA
2.2V	±2.0%	MM1839A22NRE	MM1839A22RRE	0.30V	200mA	85μA
2.3V	±2.0%	MM1839A23NRE	MM1839A23RRE	0.30V	200mA	85μA
2.4V	±2.0%	MM1839A24NRE	MM1839A24RRE	0.30V	200mA	85μA
2.5V	±2.0%	MM1839A25NRE	MM1839A25RRE	0.30V	200mA	85μA
2.6V	±2.0%	MM1839A26NRE	MM1839A26RRE	0.30V	200mA	85μA
2.7V	±2.0%	MM1839A27NRE	MM1839A27RRE	0.30V	200mA	85μA
2.8V	±2.0%	MM1839A28NRE	MM1839A28RRE	0.30V	200mA	85μA
2.9V	±2.0%	MM1839A29NRE	MM1839A29RRE	0.30V	200mA	85μA
3.0V	±2.0%	MM1839A30NRE	MM1839A30RRE	0.30V	200mA	85μA
3.1V	±2.0%	MM1839A31NRE	MM1839A31RRE	0.30V	200mA	85μA
3.2V	±2.0%	MM1839A32NRE	MM1839A32RRE	0.30V	200mA	85μA
3.3V	±2.0%	MM1839A33NRE	MM1839A33RRE	0.30V	200mA	85μA
3.4V	±2.0%	MM1839A34NRE	MM1839A34RRE	0.30V	200mA	85μA
3.5V	±2.0%	MM1839A35NRE	MM1839A35RRE	0.30V	200mA	85μA
3.6V	±2.0%	MM1839A36NRE	MM1839A36RRE	0.30V	200mA	85μA
3.7V	±2.0%	MM1839A37NRE	MM1839A37RRE	0.30V	200mA	85μA
3.8V	±2.0%	MM1839A38NRE	MM1839A38RRE	0.30V	200mA	85μA
3.9V	±2.0%	MM1839A39NRE	MM1839A39RRE	0.30V	200mA	85μA
4.0V	±2.0%	MM1839A40NRE	MM1839A40RRE	0.30V	200mA	85μA
4.1V	±2.0%	MM1839A41NRE	MM1839A41RRE	0.30V	200mA	85μA
4.2V	±2.0%	MM1839A42NRE	MM1839A42RRE	0.30V	200mA	85μA
4.3V	±2.0%	MM1839A43NRE	MM1839A43RRE	0.30V	200mA	85μA
4.4V	±2.0%	MM1839A44NRE	MM1839A44RRE	0.30V	200mA	85μA
4.5V	±2.0%	MM1839A45NRE	MM1839A45RRE	0.30V	200mA	85μA
4.6V	±2.0%	MM1839A46NRE	MM1839A46RRE	0.30V	200mA	85μA
4.7V	±2.0%	MM1839A47NRE	MM1839A47RRE	0.30V	200mA	85μA
4.8V	±2.0%	MM1839A48NRE	MM1839A48RRE	0.30V	200mA	85μA
4.9V	±2.0%	MM1839A49NRE	MM1839A49RRE	0.30V	200mA	85μA
5.0V	±2.0%	MM1839A50NRE	MM1839A50RRE	0.30V	200mA	85μA

2 POWER SUPPLY ICs

Low noise 200mA negative output regulator

MM1898 Series

Outline

MM1898 is a low noise negative output 200mA LDO by bipolar process.
The target applications by noise reduction pin are for a power supply of highly sensitive image sensor.
The output range is from -0.9V to -5.0V (0.1V steps), it can use to the negative power supply of CMOS image sensor.

Applications

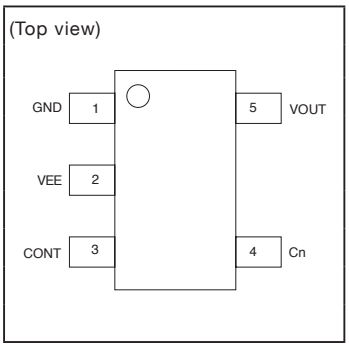
(1) Power supply for Image sensor

Features (Unless otherwise specified, Ta=+25°C)

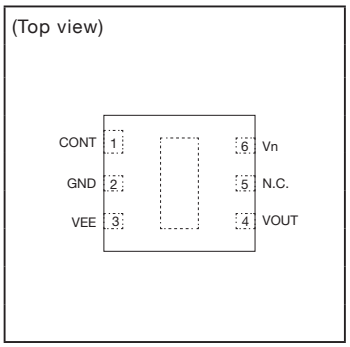
(1) Input voltage range ..... –2V to –10V
(2) Output voltage range ..... –0.9V to –5.0V
(3) Output voltage accuracy .. VOUT±1% (Vo<–1.5V)
VOUT±15mV (–1.5≦Vo≦–0.9V)
(4) Maximum output current..... 200mA
(5) Current consumption ..... 3μA typ. (OFF)
160μA typ. (No–Load)
(6) Dropout voltage..... 0.5V typ. / 0.8V max. (Io=200mA)
(7) Line regulation..... 0.01%/V typ. / 0.10%/V max.
(8) Load regulation ..... 15mV typ. / 100mV max.
(Io=1mA to 200mA)
(9) Ripple rejection ..... 70dB typ. (f=1kHz)
(10) Output noise voltage..... 30μVrms typ.(Vo=-1.4V, Cn=0.01μF)
(11) Output rise time..... 5ms typ. (Cn=0.01μF, Iout=0mA)

Pin assignment

SOT–25A



SSON–6A



Pin no.	SOT-25A	SSON-6A
1	GND	CONT
2	VEE	GND
3	CONT	VEE
4	Cn	VOUT
5	VOUT	N.C.
6	---	Vn

Model name structure

M M 1 8 9 8 □ □ □ □ R E

Embossed taping	E
Housing	R
Package code	
SOT–25A	N
SSON–6A	R
Output voltage	
-0.9V to -5.0 (0.1V step)	09 to 50
Function type	
CE=H-Active	A

Selection guide

Output Voltage	Accuracy	Parts No.		Dropout Voltage (Typ.) Io=200mA	Output Current	No-Load Input Current (Typ.)
		SOT-25A Package (3,000pcs/Reel)	SSON-6A Package (3,000pcs/Reel)			
–0.9V	±15mV	MM1898A09NRE	MM1898A09RRE	0.5V	200mA	160μA
–1.0V	±15mV	MM1898A10NRE	MM1898A10RRE	0.5V	200mA	160μA
–1.1V	±15mV	MM1898A11NRE	MM1898A11RRE	0.5V	200mA	160μA
–1.2V	±15mV	MM1898A12NRE	MM1898A12RRE	0.5V	200mA	160μA
–1.3V	±15mV	MM1898A13NRE	MM1898A13RRE	0.5V	200mA	160μA
–1.4V	±15mV	MM1898A14NRE	MM1898A14RRE	0.5V	200mA	160μA
–1.5V	±1%	MM1898A15NRE	MM1898A15RRE	0.5V	200mA	160μA
–1.6V	±1%	MM1898A16NRE	MM1898A16RRE	0.5V	200mA	160μA
–1.7V	±1%	MM1898A17NRE	MM1898A17RRE	0.5V	200mA	160μA
–1.8V	±1%	MM1898A18NRE	MM1898A18RRE	0.5V	200mA	160μA
–1.9V	±1%	MM1898A19NRE	MM1898A19RRE	0.5V	200mA	160μA
–2.0V	±1%	MM1898A20NRE	MM1898A20RRE	0.5V	200mA	160μA
–2.1V	±1%	MM1898A21NRE	MM1898A21RRE	0.5V	200mA	160μA
–2.2V	±1%	MM1898A22NRE	MM1898A22RRE	0.5V	200mA	160μA
–2.3V	±1%	MM1898A23NRE	MM1898A23RRE	0.5V	200mA	160μA
–2.4V	±1%	MM1898A24NRE	MM1898A24RRE	0.5V	200mA	160μA
–2.5V	±1%	MM1898A25NRE	MM1898A25RRE	0.5V	200mA	160μA
–2.6V	±1%	MM1898A26NRE	MM1898A26RRE	0.5V	200mA	160μA
–2.7V	±1%	MM1898A27NRE	MM1898A27RRE	0.5V	200mA	160μA
–2.8V	±1%	MM1898A28NRE	MM1898A28RRE	0.5V	200mA	160μA
–2.9V	±1%	MM1898A29NRE	MM1898A29RRE	0.5V	200mA	160μA
–3.0V	±1%	MM1898A30NRE	MM1898A30RRE	0.5V	200mA	160μA
–3.1V	±1%	MM1898A31NRE	MM1898A31RRE	0.5V	200mA	160μA
–3.2V	±1%	MM1898A32NRE	MM1898A32RRE	0.5V	200mA	160μA
–3.3V	±1%	MM1898A33NRE	MM1898A33RRE	0.5V	200mA	160μA
–3.4V	±1%	MM1898A34NRE	MM1898A34RRE	0.5V	200mA	160μA
–3.5V	±1%	MM1898A35NRE	MM1898A35RRE	0.5V	200mA	160μA
–3.6V	±1%	MM1898A36NRE	MM1898A36RRE	0.5V	200mA	160μA
–3.7V	±1%	MM1898A37NRE	MM1898A37RRE	0.5V	200mA	160μA
–3.8V	±1%	MM1898A38NRE	MM1898A38RRE	0.5V	200mA	160μA
–3.9V	±1%	MM1898A39NRE	MM1898A39RRE	0.5V	200mA	160μA
–4.0V	±1%	MM1898A40NRE	MM1898A40RRE	0.5V	200mA	160μA
–4.1V	±1%	MM1898A41NRE	MM1898A41RRE	0.5V	200mA	160μA
–4.2V	±1%	MM1898A42NRE	MM1898A42RRE	0.5V	200mA	160μA
–4.3V	±1%	MM1898A43NRE	MM1898A43RRE	0.5V	200mA	160μA
–4.4V	±1%	MM1898A44NRE	MM1898A44RRE	0.5V	200mA	160μA
–4.5V	±1%	MM1898A45NRE	MM1898A45RRE	0.5V	200mA	160μA
–4.6V	±1%	MM1898A46NRE	MM1898A46RRE	0.5V	200mA	160μA
–4.7V	±1%	MM1898A47NRE	MM1898A47RRE	0.5V	200mA	160μA
–4.8V	±1%	MM1898A48NRE	MM1898A48RRE	0.5V	200mA	160μA
–4.9V	±1%	MM1898A49NRE	MM1898A49RRE	0.5V	200mA	160μA
–5.0V	±1%	MM1898A50NRE	MM1898A50RRE	0.5V	200mA	160μA

2 POWER SUPPLY ICs

Rush current protection 300mA regulator IC

MM3571, MM3871 Series

Outline

This IC is a 300mA Low dropout regulator IC with a prevention circuit of rush current.
No load input current is 25μA typ, and it reduce transient drop in voltage with high speed response circuit.
A rush current prevention circuit can control rush current at start up.

Features (Unless otherwise specified, Ta=+25°C)

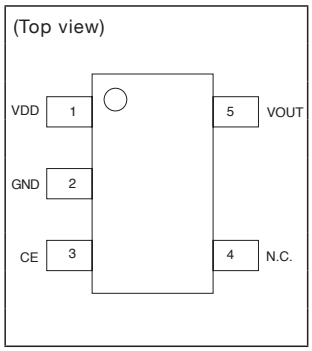
(1) Input voltage range .....2.0V to 6.5V
(2) Output voltage range .....1.0V to 5.0V
(3) Output voltage accuracy.....V_{OUT}±20mV (V_{OUT}≦1.9V)
V_{OUT}±1.0% (V_{OUT}≧2.0V)
(4) Maximum output current.....300mA
(5) Current consumption .....25μA typ.
(No–Load Input Current)
0.01μA typ. (OFF)
(6) Output capacitor 0.47μF
(7) Dropout voltage.....0.62V typ.
(V_{OUT}=3.0V, Io=300mA)
(8) Output short-circuit current...50mA typ.
(9) Line regulation.....0.01% / V typ.
(10) Load regulation .....30mV typ. (Io=1mA to 300mA)
(11) Ripple rejection .....70dB typ. (f=1kHz)

Applications

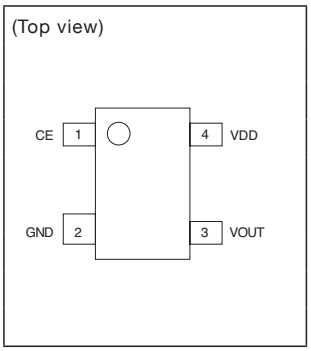
(1) Smart phones
(2) Tablet PCs
(3) Mobile phones
(4) Portable music Players
(5) Digital still cameras
(6) Portable games

Pin assignment

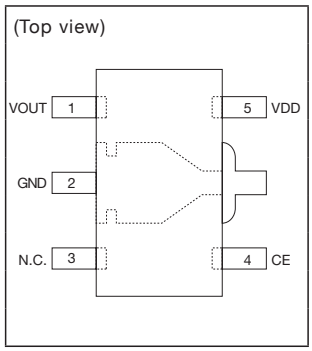
SOT–25A



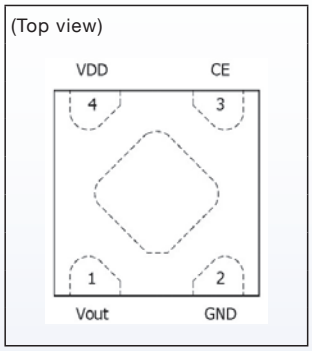
SC–82ABB



SOT89–5A



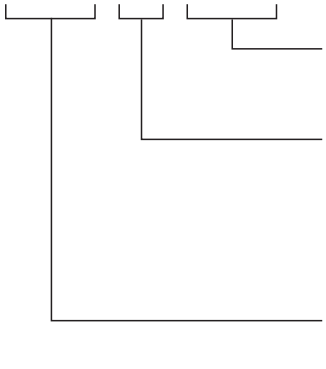
PLP–4C



Pin no.	SOT-25A	SC-82ABB	SOT89-5A	PLP-4C
1	VDD	CE	VOUT	VOUT
2	GND	GND	GND	GND
3	CE	VOUT	N.C.	CE
4	N.C.	VDD	CE	VDD
5	VOUT	---	VDD	---

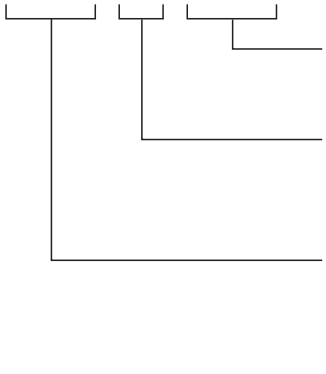
Model name structure

M M 3 5 7 1 A □ □ □ R E



Embossed taping	E
Housing	R
Package code	
SC–82ABB	U
SOT–25A	N
SOT89–5A	P
Output voltage	
e.g.) 3.30V	33

M M 3 8 7 1 A □ □ □ R E



Embossed taping	E
Housing	R
Package code	
PLP–4C	R
Output voltage	
e.g.) 3.3V	33

Selection guide

Output Voltage	Accuracy	Parts No.				Dropout Voltage (Typ.) Io=300mA	Output Current	No-Load Input Current (Typ.)
		SOT-25A Package (3,000pcs/Reel)	SC-82ABB Package (3,000pcs/Reel)	SOT89-5A Package (1,000pcs/Reel)	PLP-4C Package (10,000pcs/Reel)			
1.0V	±20mV	MM3571A10NRE	MM3571A10URE	MM3571A10PRE	MM3871A10RRE	1.38V	300mA	25μA
1.1V	±20mV	MM3571A11NRE	MM3571A11URE	MM3571A11PRE	MM3871A11RRE	1.38V	300mA	25μA
1.2V	±20mV	MM3571A12NRE	MM3571A12URE	MM3571A12PRE	MM3871A12RRE	1.38V	300mA	25μA
1.3V	±20mV	MM3571A13NRE	MM3571A13URE	MM3571A13PRE	MM3871A13RRE	1.20V	300mA	25μA
1.4V	±20mV	MM3571A14NRE	MM3571A14URE	MM3571A14PRE	MM3871A14RRE	1.20V	300mA	25μA
1.5V	±20mV	MM3571A15NRE	MM3571A15URE	MM3571A15PRE	MM3871A15RRE	1.20V	300mA	25μA
1.6V	±20mV	MM3571A16NRE	MM3571A16URE	MM3571A16PRE	MM3871A16RRE	1.02V	300mA	25μA
1.7V	±20mV	MM3571A17NRE	MM3571A17URE	MM3571A17PRE	MM3871A17RRE	1.02V	300mA	25μA
1.8V	±20mV	MM3571A18NRE	MM3571A18URE	MM3571A18PRE	MM3871A18RRE	1.02V	300mA	25μA
1.9V	±20mV	MM3571A19NRE	MM3571A19URE	MM3571A19PRE	MM3871A19RRE	0.94V	300mA	25μA
2.0V	±1.0%	MM3571A20NRE	MM3571A20URE	MM3571A20PRE	MM3871A20RRE	0.94V	300mA	25μA
2.1V	±1.0%	MM3571A21NRE	MM3571A21URE	MM3571A21PRE	MM3871A21RRE	0.94V	300mA	25μA
2.2V	±1.0%	MM3571A22NRE	MM3571A22URE	MM3571A22PRE	MM3871A22RRE	0.94V	300mA	25μA
2.3V	±1.0%	MM3571A23NRE	MM3571A23URE	MM3571A23PRE	MM3871A23RRE	0.94V	300mA	25μA
2.4V	±1.0%	MM3571A24NRE	MM3571A24URE	MM3571A24PRE	MM3871A24RRE	0.94V	300mA	25μA
2.5V	±1.0%	MM3571A25NRE	MM3571A25URE	MM3571A25PRE	MM3871A25RRE	0.62V	300mA	25μA
2.6V	±1.0%	MM3571A26NRE	MM3571A26URE	MM3571A26PRE	MM3871A26RRE	0.62V	300mA	25μA
2.7V	±1.0%	MM3571A27NRE	MM3571A27URE	MM3571A27PRE	MM3871A27RRE	0.62V	300mA	25μA
2.8V	±1.0%	MM3571A28NRE	MM3571A28URE	MM3571A28PRE	MM3871A28RRE	0.62V	300mA	25μA
2.9V	±1.0%	MM3571A29NRE	MM3571A29URE	MM3571A29PRE	MM3871A29RRE	0.62V	300mA	25μA
3.0V	±1.0%	MM3571A30NRE	MM3571A30URE	MM3571A30PRE	MM3871A30RRE	0.62V	300mA	25μA
3.1V	±1.0%	MM3571A31NRE	MM3571A31URE	MM3571A31PRE	MM3871A31RRE	0.62V	300mA	25μA
3.2V	±1.0%	MM3571A32NRE	MM3571A32URE	MM3571A32PRE	MM3871A32RRE	0.62V	300mA	25μA
3.3V	±1.0%	MM3571A33NRE	MM3571A33URE	MM3571A33PRE	MM3871A33RRE	0.62V	300mA	25μA
3.4V	±1.0%	MM3571A34NRE	MM3571A34URE	MM3571A34PRE	MM3871A34RRE	0.62V	300mA	25μA
3.5V	±1.0%	MM3571A35NRE	MM3571A35URE	MM3571A35PRE	MM3871A35RRE	0.46V	300mA	25μA
3.6V	±1.0%	MM3571A36NRE	MM3571A36URE	MM3571A36PRE	MM3871A36RRE	0.46V	300mA	25μA
3.7V	±1.0%	MM3571A37NRE	MM3571A37URE	MM3571A37PRE	MM3871A37RRE	0.46V	300mA	25μA
3.8V	±1.0%	MM3571A38NRE	MM3571A38URE	MM3571A38PRE	MM3871A38RRE	0.46V	300mA	25μA
3.9V	±1.0%	MM3571A39NRE	MM3571A39URE	MM3571A39PRE	MM3871A39RRE	0.46V	300mA	25μA
4.0V	±1.0%	MM3571A40NRE	MM3571A40URE	MM3571A40PRE	MM3871A40RRE	0.46V	300mA	25μA
4.1V	±1.0%	MM3571A41NRE	MM3571A41URE	MM3571A41PRE	MM3871A41RRE	0.46V	300mA	25μA
4.2V	±1.0%	MM3571A42NRE	MM3571A42URE	MM3571A42PRE	MM3871A42RRE	0.46V	300mA	25μA
4.3V	±1.0%	MM3571A43NRE	MM3571A43URE	MM3571A43PRE	MM3871A43RRE	0.46V	300mA	25μA
4.4V	±1.0%	MM3571A44NRE	MM3571A44URE	MM3571A44PRE	MM3871A44RRE	0.46V	300mA	25μA
4.5V	±1.0%	MM3571A45NRE	MM3571A45URE	MM3571A45PRE	MM3871A45RRE	0.38V	300mA	25μA
4.6V	±1.0%	MM3571A46NRE	MM3571A46URE	MM3571A46PRE	MM3871A46RRE	0.38V	300mA	25μA
4.7V	±1.0%	MM3571A47NRE	MM3571A47URE	MM3571A47PRE	MM3871A47RRE	0.38V	300mA	25μA
4.8V	±1.0%	MM3571A48NRE	MM3571A48URE	MM3571A48PRE	MM3871A48RRE	0.38V	300mA	25μA
4.9V	±1.0%	MM3571A49NRE	MM3571A49URE	MM3571A49PRE	MM3871A49RRE	0.38V	300mA	25μA
5.0V	±1.0%	MM3571A50NRE	MM3571A50URE	MM3571A50PRE	MM3871A50RRE	0.38V	300mA	25μA

2 POWER SUPPLY ICs

300mA LDO with thermal shutdown circuit IC

MM3608 Series

Outline

MM3608 is a 300mA LDO with thermal shut–down.
The overcurrent protection is included, It is prevented to destroy IC by sensing extraordinary thermal and shut–down output voltage.

Applications

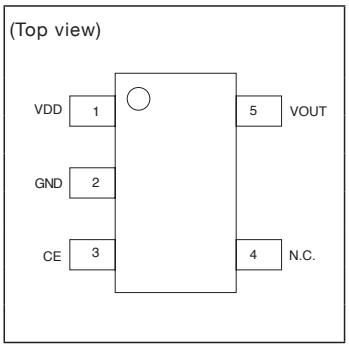
(1) Flat-TV
(2) BD Player/ Recorders
(3) PCs
(4) Games

Features (Unless otherwise specified, Ta=+25°C)

(1) Input voltage range .....1.8V to 6.5V
(2) Output voltage range .....0.8V to 5.0V
(3) Output voltage accuracy.....VOUT±1% (VO≧2.0V)
(4) Maximum output current.....300mA
(5) Current consumption .....0.1µA typ. (OFF)
90µA typ. (No–Load)
(6) Dropout voltage.....0.24V typ. / 0.39V max.
(IO=300mV, Vo=3.0 to 5.0V)
(7) Line regulation.....0.02%/V typ.
/ 0.1%/V max.(Io=1mA)
(8) Load regulation .....10mV typ.
/ 60mV max.
(Io=1mA to 300mA)
(9) Vout Temperature coefficient .....±100ppm / typ.
(10) TSD detect temperature.....150°C typ.
(11) TSD release temperature .....110°C typ.
(12) Output capacitor .....1µF (ceramic)

Pin assignment

SOT–25A



Pin no.	SOT-25A
1	VDD
2	GND
3	CE
4	N.C.
5	VOUT

Model name structure

M M 3 6 0 8 □ □ □ □ R H

Embossed taping	H	
Housing	R	
Package code		
SOT–25A	N	
Output voltage		
0.8V to 5.0V (0.1V step)		08 to 50
Function type		
CE=H-Active, with Discharge Function		A

Selection guide

Output Voltage	Accuracy	Parts No. SOT-25A Package (3,000pcs/Reel)	Dropout Voltage (Typ.) Io=300mA	Output Current	No-Load Input Current (Typ.)
0.8V	±20mV	MM3608A08NRH	0.85V	300mA	90μA
0.9V	±20mV	MM3608A09NRH	0.85V	300mA	90μA
1.0V	±20mV	MM3608A10NRH	0.72V	300mA	90μA
1.1V	±20mV	MM3608A11NRH	0.72V	300mA	90μA
1.2V	±20mV	MM3608A12NRH	0.63V	300mA	90μA
1.3V	±20mV	MM3608A13NRH	0.63V	300mA	90μA
1.4V	±20mV	MM3608A14NRH	0.55V	300mA	90μA
1.5V	±20mV	MM3608A15NRH	0.55V	300mA	90μA
1.6V	±20mV	MM3608A16NRH	0.55V	300mA	90μA
1.7V	±20mV	MM3608A17NRH	0.50V	300mA	90μA
1.8V	±20mV	MM3608A18NRH	0.50V	300mA	90μA
1.9V	±20mV	MM3608A19NRH	0.50V	300mA	90μA
2.0V	±20mV	MM3608A20NRH	0.40V	300mA	90μA
2.1V	±1%	MM3608A21NRH	0.40V	300mA	90μA
2.2V	±1%	MM3608A22NRH	0.40V	300mA	90μA
2.3V	±1%	MM3608A23NRH	0.40V	300mA	90μA
2.4V	±1%	MM3608A24NRH	0.40V	300mA	90μA
2.5V	±1%	MM3608A25NRH	0.31V	300mA	90μA
2.6V	±1%	MM3608A26NRH	0.31V	300mA	90μA
2.7V	±1%	MM3608A27NRH	0.31V	300mA	90μA
2.8V	±1%	MM3608A28NRH	0.31V	300mA	90μA
2.9V	±1%	MM3608A29NRH	0.31V	300mA	90μA
3.0V	±1%	MM3608A30NRH	0.24V	300mA	90μA
3.1V	±1%	MM3608A31NRH	0.24V	300mA	90μA
3.2V	±1%	MM3608A32NRH	0.24V	300mA	90μA
3.3V	±1%	MM3608A33NRH	0.24V	300mA	90μA
3.4V	±1%	MM3608A34NRH	0.24V	300mA	90μA
3.5V	±1%	MM3608A35NRH	0.24V	300mA	90μA
3.6V	±1%	MM3608A36NRH	0.24V	300mA	90μA
3.7V	±1%	MM3608A37NRH	0.24V	300mA	90μA
3.8V	±1%	MM3608A38NRH	0.24V	300mA	90μA
3.9V	±1%	MM3608A39NRH	0.24V	300mA	90μA
4.0V	±1%	MM3608A40NRH	0.24V	300mA	90μA
4.1V	±1%	MM3608A41NRH	0.24V	300mA	90μA
4.2V	±1%	MM3608A42NRH	0.24V	300mA	90μA
4.3V	±1%	MM3608A43NRH	0.24V	300mA	90μA
4.4V	±1%	MM3608A44NRH	0.24V	300mA	90μA
4.5V	±1%	MM3608A45NRH	0.24V	300mA	90μA
4.6V	±1%	MM3608A46NRH	0.24V	300mA	90μA
4.7V	±1%	MM3608A47NRH	0.24V	300mA	90μA
4.8V	±1%	MM3608A48NRH	0.24V	300mA	90μA
4.9V	±1%	MM3608A49NRH	0.24V	300mA	90μA
5.0V	±1%	MM3608A50NRH	0.24V	300mA	90μA

2 POWER SUPPLY ICs

15V withstand voltage 300mA regulator IC

MM1886 Series

Outline

This IC is a 250mA / 300mA Low dropout regulator IC with ON / OFF control.
Since the IC has a high ripple rejection characteristic of 70dB / 1kHz, it enables the use in a wide range of input voltage. Therefore, it permits the use under the circumstances of various power supplies.
The IC applies to a standard home equipments, for a maximum operating voltage is 14V.

Applications

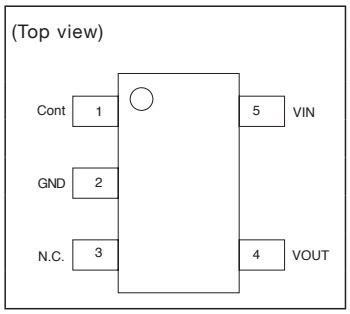
(1) Flat TVs
(2) DVD/Blu–ray recorders
(3) Printers, multifunction machines
(4) Game equipments

Features (Unless otherwise specified, Ta=+25°C)

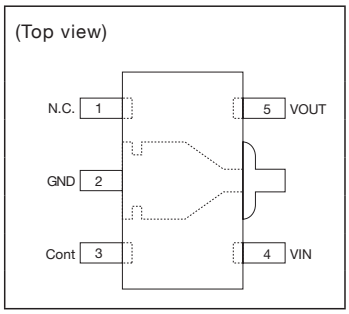
(1) Input voltage range .....1.8V to 14.0V
(2) Output voltage range .....1.5V to 5.0V
(3) Output voltage accuracy.....VOUT±2.0%
(4) Maximum output current.....250mA (VOUT=1.5V to 2.9V)
300mA (VOUT=3.0V to 5.0V)
(5) Current consumption .....75µA typ.
(No–Load Input Current)
0.0µA typ. (OFF)
(6) Output capacitor 1µF
(7) Dropout voltage.....0.40V typ. (Io=250mA)
0.45V typ. (Io=300mA)
(8) Line regulation.....0.1% / V typ.
(9) Load regulation .....18mV typ. (Io=1mA to 250mA)
20mV typ. (Io=1mA to 300mA)
(10) Ripple rejection .....70dB typ. (f=1kHz)

Pin assignment

SOT–25A



SOT89–5A



Pin no.	SOT-25A	SOT89-5A
1	Cont	N.C.
2	GND	GND
3	N.C.	Cont
4	VOUT.	VIN
5	VIN	VOUT

Model name structure

M M 1 8 8 6 A □ □ □ R E

Embossed taping	E
Housing	R
Package code	
SOT–25A	N
SOT–89–5A	P
Output voltage	
e.g.) 3.3V	33

Selection guide

Output Voltage	Accuracy	Parts No.		Dropout Voltage (Typ.) Io=300mA	Output Current	No-Load Input Current (Typ.)
		SOT-25A Package (3,000pcs/Reel)	SOT89-5A Package (1,000pcs/Reel)			
1.5V	±2.0%	MM1886A15NRE	MM1886A15PRE	0.53V	300mA	0.9μA
1.6V	±2.0%	MM1886A16NRE	MM1886A16PRE	0.53V	300mA	0.9μA
1.7V	±2.0%	MM1886A17NRE	MM1886A17PRE	0.44V	300mA	0.9μA
1.8V	±2.0%	MM1886A18NRE	MM1886A18PRE	0.44V	300mA	0.9μA
1.9V	±2.0%	MM1886A19NRE	MM1886A19PRE	0.44V	300mA	0.9μA
2.0V	±2.0%	MM1886A20NRE	MM1886A20PRE	0.34V	300mA	0.9μA
2.1V	±2.0%	MM1886A21NRE	MM1886A21PRE	0.34V	300mA	0.9μA
2.2V	±2.0%	MM1886A22NRE	MM1886A22PRE	0.34V	300mA	0.9μA
2.3V	±2.0%	MM1886A23NRE	MM1886A23PRE	0.34V	300mA	0.9μA
2.4V	±2.0%	MM1886A24NRE	MM1886A24PRE	0.34V	300mA	0.9μA
2.5V	±2.0%	MM1886A25NRE	MM1886A25PRE	0.28V	300mA	0.9μA
2.6V	±2.0%	MM1886A26NRE	MM1886A26PRE	0.28V	300mA	0.9μA
2.7V	±2.0%	MM1886A27NRE	MM1886A27PRE	0.28V	300mA	0.9μA
2.8V	±2.0%	MM1886A28NRE	MM1886A28PRE	0.24V	300mA	0.9μA
2.9V	±2.0%	MM1886A29NRE	MM1886A29PRE	0.24V	300mA	0.9μA
3.0V	±2.0%	MM1886A30NRE	MM1886A30PRE	0.24V	300mA	0.9μA
3.1V	±2.0%	MM1886A31NRE	MM1886A31PRE	0.24V	300mA	0.9μA
3.2V	±2.0%	MM1886A32NRE	MM1886A32PRE	0.24V	300mA	0.9μA
3.3V	±2.0%	MM1886A33NRE	MM1886A33PRE	0.24V	300mA	0.9μA
3.4V	±2.0%	MM1886A34NRE	MM1886A34PRE	0.24V	300mA	1.2μA
3.5V	±2.0%	MM1886A35NRE	MM1886A35PRE	0.24V	300mA	1.2μA
3.6V	±2.0%	MM1886A36NRE	MM1886A36PRE	0.24V	300mA	1.2μA
3.7V	±2.0%	MM1886A37NRE	MM1886A37PRE	0.24V	300mA	1.2μA
3.8V	±2.0%	MM1886A38NRE	MM1886A38PRE	0.24V	300mA	1.2μA
3.9V	±2.0%	MM1886A39NRE	MM1886A39PRE	0.24V	300mA	1.2μA
4.0V	±2.0%	MM1886A40NRE	MM1886A40PRE	0.24V	300mA	1.2μA
4.1V	±2.0%	MM1886A41NRE	MM1886A41PRE	0.24V	300mA	1.2μA
4.2V	±2.0%	MM1886A42NRE	MM1886A42PRE	0.24V	300mA	1.2μA
4.3V	±2.0%	MM1886A43NRE	MM1886A43PRE	0.24V	300mA	1.2μA
4.4V	±2.0%	MM1886A44NRE	MM1886A44PRE	0.24V	300mA	1.2μA
4.5V	±2.0%	MM1886A45NRE	MM1886A45PRE	0.24V	300mA	1.2μA
4.6V	±2.0%	MM1886A46NRE	MM1886A46PRE	0.24V	300mA	1.2μA
4.7V	±2.0%	MM1886A47NRE	MM1886A47PRE	0.24V	300mA	1.2μA
4.8V	±2.0%	MM1886A48NRE	MM1886A48PRE	0.24V	300mA	1.2μA
4.9V	±2.0%	MM1886A49NRE	MM1886A49PRE	0.24V	300mA	1.2μA
5.0V	±2.0%	MM1886A50NRE	MM1886A50PRE	0.24V	300mA	1.2μA

2 POWER SUPPLY ICs

Low noise 300mA regulator IC

MM1899 Series

Outline

This IC is a low noise 300mA LDO by bipolar process.
The applications by new noise reduction circuit are for a power supply of highly sensitive CMOS image sensor.
The package includes a standard SOT-25A and a small SSON-6A.

Applications

(1) Image sensor
(2) Sensor power supply
(3) Analog power supply

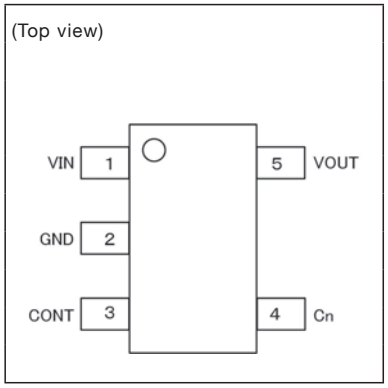
Features (Unless otherwise specified, Ta=+25°C)

(1) Input voltage range .....2.0~14
(2) Output voltage range .....1.5~5.4V
(3) Output voltage accuracy.....VOUT±1%
(4) Maximum output current.....300mA
(5) Current Consumption.....140μA typ.
(No–Load Input Current)
(6) Output capacitor 1μF
(7) Dropout voltage.....0.35V typ.
(Io=300mA)
(8) Line regulation.....0.01%/V typ.
(9) Load regulation .....10mV typ.
(Io=1mA~300mA)
(10) Ripple rejection .....70dB typ. (f=1kHz)
(11) Output noise voltage.....30uVrms typ.(fBW=10kHz~100kHz, Cn=0.01uF)

Pin assignment

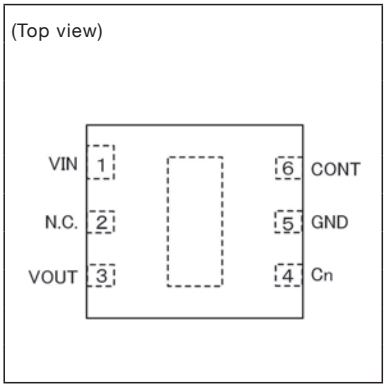
SOT-25A

(Top view)



SSON-6A

(Top view)



Pin no.	SOT-25A	SSON-6A
1	VIN	VIN
2	GND	N.C.
3	CONT	VOUT
4	Cn	Cn
5	VOUT	GND
6	---	CONT

Model name structure

M M 1 8 9 9 A □ □ □ R E

- Embossed taping E
- Housing R
- Package code
  - SOT-25A N
  - SSON-6A R
- Output voltage
  - 1.5V~5.4V (0.1V step) 15~54

Selection guide

Output Voltage	Accuracy	Parts No.		Dropout Voltage (Typ.) Iio=300mA	Output Current	No-Load Input Current (Typ.)
		SOT-25A Package (3,000pcs/Reel)	SSON-6A Package (3,000pcs/Reel)			
1.5V	±1%	MM1899A15NRE	MM1899A15RRE	0.35V	300mA	140μA
1.6V	±1%	MM1899A16NRE	MM1899A16RRE	0.35V	300mA	140μA
1.7V	±1%	MM1899A17NRE	MM1899A17RRE	0.35V	300mA	140μA
1.8V	±1%	MM1899A18NRE	MM1899A18RRE	0.35V	300mA	140μA
1.9V	±1%	MM1899A19NRE	MM1899A19RRE	0.35V	300mA	140μA
2.0V	±1%	MM1899A20NRE	MM1899A20RRE	0.35V	300mA	140μA
2.1V	±1%	MM1899A21NRE	MM1899A21RRE	0.35V	300mA	140μA
2.2V	±1%	MM1899A22NRE	MM1899A22RRE	0.35V	300mA	140μA
2.3V	±1%	MM1899A23NRE	MM1899A23RRE	0.35V	300mA	140μA
2.4V	±1%	MM1899A24NRE	MM1899A24RRE	0.35V	300mA	140μA
2.5V	±1%	MM1899A25NRE	MM1899A25RRE	0.35V	300mA	140μA
2.6V	±1%	MM1899A26NRE	MM1899A26RRE	0.35V	300mA	140μA
2.7V	±1%	MM1899A27NRE	MM1899A27RRE	0.35V	300mA	140μA
2.8V	±1%	MM1899A28NRE	MM1899A28RRE	0.35V	300mA	140μA
2.9V	±1%	MM1899A29NRE	MM1899A29RRE	0.35V	300mA	140μA
3.0V	±1%	MM1899A30NRE	MM1899A30RRE	0.35V	300mA	140μA
3.1V	±1%	MM1899A31NRE	MM1899A31RRE	0.35V	300mA	140μA
3.2V	±1%	MM1899A32NRE	MM1899A32RRE	0.35V	300mA	140μA
3.3V	±1%	MM1899A33NRE	MM1899A33RRE	0.35V	300mA	140μA
3.4V	±1%	MM1899A34NRE	MM1899A34RRE	0.35V	300mA	140μA
3.5V	±1%	MM1899A35NRE	MM1899A35RRE	0.35V	300mA	140μA
3.6V	±1%	MM1899A36NRE	MM1899A36RRE	0.35V	300mA	140μA
3.7V	±1%	MM1899A37NRE	MM1899A37RRE	0.35V	300mA	140μA
3.8V	±1%	MM1899A38NRE	MM1899A38RRE	0.35V	300mA	140μA
3.9V	±1%	MM1899A39NRE	MM1899A39RRE	0.35V	300mA	140μA
4.0V	±1%	MM1899A40NRE	MM1899A40RRE	0.35V	300mA	140μA
4.1V	±1%	MM1899A41NRE	MM1899A41RRE	0.35V	300mA	140μA
4.2V	±1%	MM1899A42NRE	MM1899A42RRE	0.35V	300mA	140μA
4.3V	±1%	MM1899A43NRE	MM1899A43RRE	0.35V	300mA	140μA
4.4V	±1%	MM1899A44NRE	MM1899A44RRE	0.35V	300mA	140μA
4.5V	±1%	MM1899A45NRE	MM1899A45RRE	0.35V	300mA	140μA
4.6V	±1%	MM1899A46NRE	MM1899A46RRE	0.35V	300mA	140μA
4.7V	±1%	MM1899A47NRE	MM1899A47RRE	0.35V	300mA	140μA
4.8V	±1%	MM1899A48NRE	MM1899A48RRE	0.35V	300mA	140μA
4.9V	±1%	MM1899A49NRE	MM1899A49RRE	0.35V	300mA	140μA
5.0V	±1%	MM1899A50NRE	MM1899A50RRE	0.35V	300mA	140μA
5.1V	±1%	MM1899A51NRE	MM1899A51RRE	0.35V	300mA	140μA
5.2V	±1%	MM1899A52NRE	MM1899A52RRE	0.35V	300mA	140μA
5.3V	±1%	MM1899A53NRE	MM1899A53RRE	0.35V	300mA	140μA
5.4V	±1%	MM1899A54NRE	MM1899A54RRE	0.35V	300mA	140μA

2 POWER SUPPLY ICs

500mA regulator IC with the soft-start

MM3526, MM3478 Series

Outline

This IC is a 500mA LDO with soft-start.
The soft–start can reduce rush current by the Cs capacitor at start–up.
The Package is SOT89–5A which can be the high radiation of heat on small space.

Applications

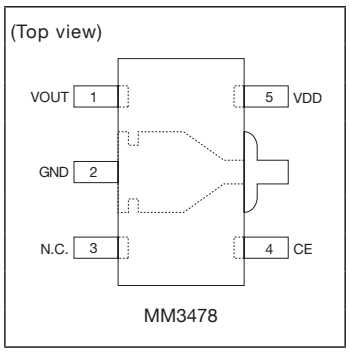
(1) Flat TVs
(2) DVD/Blu–ray recorders
(3) Printers, multifunction machines
(4) Game equipments

Features (Unless otherwise specified, Ta=+25°C)

(1) Input voltage range .....1.6V to 6.0V
(2) Output voltage range .....1.2V to 5.0V
(3) Output voltage accuracy.....VOUT±15mV (VOUT<1.5V)
VOUT±1.0% (VOUT≧1.5V)
(4) Maximum output current.....500mA
(5) Current consumption .....50µA typ.
(No–Load Input Current)
0.1µA typ. (OFF)
(6) Output capacitor 1µF
(7) Dropout voltage.....0.25V typ.
(VOUT=3.0V, Io=500mA)
(8) Output short-circuit current 30mA typ.
(9) Line regulation.....0.05% / V typ.
(10) Load regulation .....40mV typ. (Io=1mA to 500mA)
(11) Ripple rejection .....70dB typ. (f=1kHz)

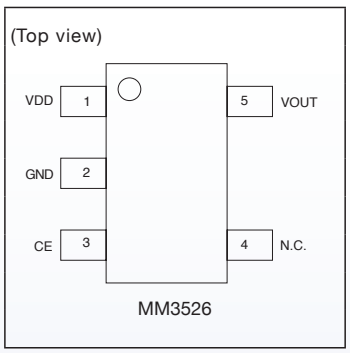
Pin assignment

SOT89–5A

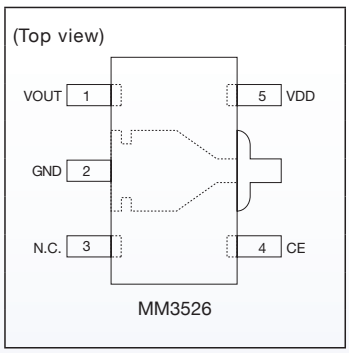


Pin no.	SOT-25A	SOT-25A	SC89-5A	SSON-6A
	MM3478	MM3526		
1	VOUT	VDD	VOUT	VOUT
2	GND	GND	GND	CS
3	N.C.	CE	N.C.	GND
4	CE	N.C.	CE	CE
5	VDD	VOUT	VDD	N.C.
6	---	---	---	VDD

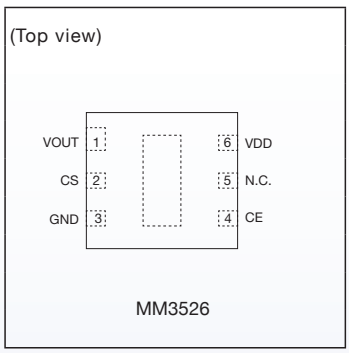
SOT–25A



SOT89–5A

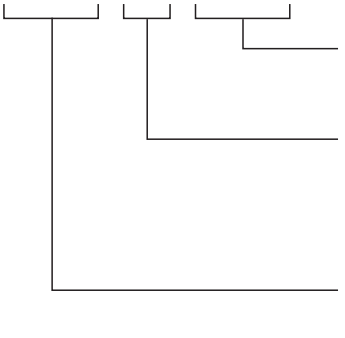


SSON–6A



Model name structure

M M 3 5 2 6 A □ □ □ R E
M M 3 4 7 8 A □ □ □ R E



Embossed taping	E
Housing	R
Package code	
SOT–25A	N
SOT–89–5A	P
SSON–6A	R
Output voltage	
e.g.) 3.3V	33

Selection guide

Output Voltage	Accuracy	Parts No.				Dropout Voltage (Typ.) Io=500mA	Output Current	No-Load Input Current (Typ.)
		MM3526 Series			MM3478 Series			
		SOT–25A Package (3,000pcs/Reel)	SOT89–5A Package (1,000pcs/Reel)	SSON–6A Package (3,000pcs/Reel)	SOT89–5A Package (1,000pcs/Reel)			
1.2V	±15mV	MM3526A12NRE	MM3526A12PRE	MM3526A12RRE	MM3478A12PRE	1.00V	500mA	50μA
1.3V	±15mV	MM3526A13NRE	MM3526A13PRE	MM3526A13RRE	MM3478A13PRE	1.00V	500mA	50μA
1.4V	±15mV	MM3526A14NRE	MM3526A14PRE	MM3526A14RRE	MM3478A14PRE	1.00V	500mA	50μA
1.5V	±1.0%	MM3526A15NRE	MM3526A15PRE	MM3526A15RRE	MM3478A15PRE	0.35V	500mA	50μA
1.6V	±1.0%	MM3526A16NRE	MM3526A16PRE	MM3526A16RRE	MM3478A16PRE	0.35V	500mA	50μA
1.7V	±1.0%	MM3526A17NRE	MM3526A17PRE	MM3526A17RRE	MM3478A17PRE	0.35V	500mA	50μA
1.8V	±1.0%	MM3526A18NRE	MM3526A18PRE	MM3526A18RRE	MM3478A18PRE	0.35V	500mA	50μA
1.9V	±1.0%	MM3526A19NRE	MM3526A19PRE	MM3526A19RRE	MM3478A19PRE	0.35V	500mA	50μA
2.0V	±1.0%	MM3526A20NRE	MM3526A20PRE	MM3526A20RRE	MM3478A20PRE	0.35V	500mA	50μA
2.1V	±1.0%	MM3526A21NRE	MM3526A21PRE	MM3526A21RRE	MM3478A21PRE	0.35V	500mA	50μA
2.2V	±1.0%	MM3526A22NRE	MM3526A22PRE	MM3526A22RRE	MM3478A22PRE	0.35V	500mA	50μA
2.3V	±1.0%	MM3526A23NRE	MM3526A23PRE	MM3526A23RRE	MM3478A23PRE	0.35V	500mA	50μA
2.4V	±1.0%	MM3526A24NRE	MM3526A24PRE	MM3526A24RRE	MM3478A24PRE	0.35V	500mA	50μA
2.5V	±1.0%	MM3526A25NRE	MM3526A25PRE	MM3526A25RRE	MM3478A25PRE	0.35V	500mA	50μA
2.6V	±1.0%	MM3526A26NRE	MM3526A26PRE	MM3526A26RRE	MM3478A26PRE	0.35V	500mA	50μA
2.7V	±1.0%	MM3526A27NRE	MM3526A27PRE	MM3526A27RRE	MM3478A27PRE	0.25V	500mA	50μA
2.8V	±1.0%	MM3526A28NRE	MM3526A28PRE	MM3526A28RRE	MM3478A28PRE	0.25V	500mA	50μA
2.9V	±1.0%	MM3526A29NRE	MM3526A29PRE	MM3526A29RRE	MM3478A29PRE	0.25V	500mA	50μA
3.0V	±1.0%	MM3526A30NRE	MM3526A30PRE	MM3526A30RRE	MM3478A30PRE	0.25V	500mA	50μA
3.1V	±1.0%	MM3526A31NRE	MM3526A31PRE	MM3526A31RRE	MM3478A31PRE	0.25V	500mA	50μA
3.2V	±1.0%	MM3526A32NRE	MM3526A32PRE	MM3526A32RRE	MM3478A32PRE	0.25V	500mA	50μA
3.3V	±1.0%	MM3526A33NRE	MM3526A33PRE	MM3526A33RRE	MM3478A33PRE	0.25V	500mA	50μA
3.4V	±1.0%	MM3526A34NRE	MM3526A34PRE	MM3526A34RRE	MM3478A34PRE	0.25V	500mA	50μA
3.5V	±1.0%	MM3526A35NRE	MM3526A35PRE	MM3526A35RRE	MM3478A35PRE	0.25V	500mA	50μA
3.6V	±1.0%	MM3526A36NRE	MM3526A36PRE	MM3526A36RRE	MM3478A36PRE	0.25V	500mA	50μA
3.7V	±1.0%	MM3526A37NRE	MM3526A37PRE	MM3526A37RRE	MM3478A37PRE	0.25V	500mA	50μA
3.8V	±1.0%	MM3526A38NRE	MM3526A38PRE	MM3526A38RRE	MM3478A38PRE	0.25V	500mA	50μA
3.9V	±1.0%	MM3526A39NRE	MM3526A39PRE	MM3526A39RRE	MM3478A39PRE	0.25V	500mA	50μA
4.0V	±1.0%	MM3526A40NRE	MM3526A40PRE	MM3526A40RRE	MM3478A40PRE	0.25V	500mA	50μA
4.1V	±1.0%	MM3526A41NRE	MM3526A41PRE	MM3526A41RRE	MM3478A41PRE	0.25V	500mA	50μA
4.2V	±1.0%	MM3526A42NRE	MM3526A42PRE	MM3526A42RRE	MM3478A42PRE	0.25V	500mA	50μA
4.3V	±1.0%	MM3526A43NRE	MM3526A43PRE	MM3526A43RRE	MM3478A43PRE	0.25V	500mA	50μA
4.4V	±1.0%	MM3526A44NRE	MM3526A44PRE	MM3526A44RRE	MM3478A44PRE	0.25V	500mA	50μA
4.5V	±1.0%	MM3526A45NRE	MM3526A45PRE	MM3526A45RRE	MM3478A45PRE	0.25V	500mA	50μA
4.6V	±1.0%	MM3526A46NRE	MM3526A46PRE	MM3526A46RRE	MM3478A46PRE	0.25V	500mA	50μA
4.7V	±1.0%	MM3526A47NRE	MM3526A47PRE	MM3526A47RRE	MM3478A47PRE	0.25V	500mA	50μA
4.8V	±1.0%	MM3526A48NRE	MM3526A48PRE	MM3526A48RRE	MM3478A48PRE	0.25V	500mA	50μA
4.9V	±1.0%	MM3526A49NRE	MM3526A49PRE	MM3526A49RRE	MM3478A49PRE	0.25V	500mA	50μA
5.0V	±1.0%	MM3526A50NRE	MM3526A50PRE	MM3526A50RRE	MM3478A50PRE	0.25V	500mA	50μA

2 POWER SUPPLY ICs

1000mA regulator IC

MM1877 Series

Outline

This IC is 1000mA maximum output current regulatorIC.
Output voltage accuracy ± 2%, dropout voltage 0.25V typ. (Io =500mA) with the characteristics of a small regulator.
The output noise reduction pin and the output ON / OFF control pin has.
This regulator is ideal for stationary equipment to reduce standby power consumption.

Applications

(1) Flat TVs
(2) DVD/Blu–ray players
(3) DVD/Blu–ray recorders
(4) Portable games

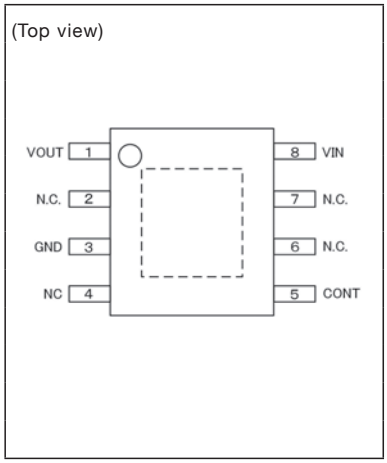
Features (Unless otherwise specified, Ta=+25°C)

(1) Input voltage range .....Vo(Typ.)+0.7~14
(2) Output voltage range .....1.5~5.0V
(3) Output voltage accuracy.....VOUT±2%
(4) Maximum output current.....1000mA
(5) Current Consumption.....2mA typ.
(No–Load Input Current)
(6) Output capacitor 1μF
(7) Dropout voltage.....0.25V typ.
(Io=500mA)
(8) Line regulation.....0.05%/V typ.
(9) Load regulation .....20mV typ.
(Io=1mA~1000mA)
(10) Ripple rejection .....70dB typ. (f=1kHz)

Pin assignment

HSOP-8A

(Top view)



Pin no.	HSOP-8A
1	VOUT
2	N.C.
3	GND
4	N.C.
5	CONT
6	N.C.
7	N.C.
8	VIN

Model name structure

M M 1 8 7 7 A □ □ □ R E

Embossed taping E
Housing R

Package code
HSOP–8A H

Output voltage
1.5V~5.0V (0.1V step) 15~50

Selection guide

Output Voltage	Accuracy	Parts No. HSOP–8A Package (2,000pcs/Reel)	Dropout Voltage (Typ.) Io=500mA	Output Current	No–Load Input Current (Typ.)
1.5V	±2%	MM1877A15HBE	0.25V	1000mA	2mA
1.6V	±2%	MM1877A16HBE	0.25V	1000mA	2mA
1.7V	±2%	MM1877A17HBE	0.25V	1000mA	2mA
1.8V	±2%	MM1877A18HBE	0.25V	1000mA	2mA
1.9V	±2%	MM1877A19HBE	0.25V	1000mA	2mA
2.0V	±2%	MM1877A20HBE	0.25V	1000mA	2mA
2.1V	±2%	MM1877A21HBE	0.25V	1000mA	2mA
2.2V	±2%	MM1877A22HBE	0.25V	1000mA	2mA
2.3V	±2%	MM1877A23HBE	0.25V	1000mA	2mA
2.4V	±2%	MM1877A24HBE	0.25V	1000mA	2mA
2.5V	±2%	MM1877A25HBE	0.25V	1000mA	2mA
2.6V	±2%	MM1877A26HBE	0.25V	1000mA	2mA
2.7V	±2%	MM1877A27HBE	0.25V	1000mA	2mA
2.8V	±2%	MM1877A28HBE	0.25V	1000mA	2mA
2.9V	±2%	MM1877A29HBE	0.25V	1000mA	2mA
3.0V	±2%	MM1877A30HBE	0.25V	1000mA	2mA
3.1V	±2%	MM1877A31HBE	0.25V	1000mA	2mA
3.2V	±2%	MM1877A32HBE	0.25V	1000mA	2mA
3.3V	±2%	MM1877A33HBE	0.25V	1000mA	2mA
3.4V	±2%	MM1877A34HBE	0.25V	1000mA	2mA
3.5V	±2%	MM1877A35HBE	0.25V	1000mA	2mA
3.6V	±2%	MM1877A36HBE	0.25V	1000mA	2mA
3.7V	±2%	MM1877A37HBE	0.25V	1000mA	2mA
3.8V	±2%	MM1877A38HBE	0.25V	1000mA	2mA
3.9V	±2%	MM1877A39HBE	0.25V	1000mA	2mA
4.0V	±2%	MM1877A40HBE	0.25V	1000mA	2mA
4.1V	±2%	MM1877A41HBE	0.25V	1000mA	2mA
4.2V	±2%	MM1877A42HBE	0.25V	1000mA	2mA
4.3V	±2%	MM1877A43HBE	0.25V	1000mA	2mA
4.4V	±2%	MM1877A44HBE	0.25V	1000mA	2mA
4.5V	±2%	MM1877A45HBE	0.25V	1000mA	2mA
4.6V	±2%	MM1877A46HBE	0.25V	1000mA	2mA
4.7V	±2%	MM1877A47HBE	0.25V	1000mA	2mA
4.8V	±2%	MM1877A48HBE	0.25V	1000mA	2mA
4.9V	±2%	MM1877A49HBE	0.25V	1000mA	2mA
5.0V	±2%	MM1877A50HBE	0.25V	1000mA	2mA

2 POWER SUPPLY ICs

1000mA regulator IC with the soft-start

MM3529, MM3479 Series

Outline

This IC is a 1000mA LDO with soft-start.
The soft-start can reduce rush current by the Cs capacitor at start–up.
The Package is SOT89–5A which can be the high radiation of heat on small space.

Applications

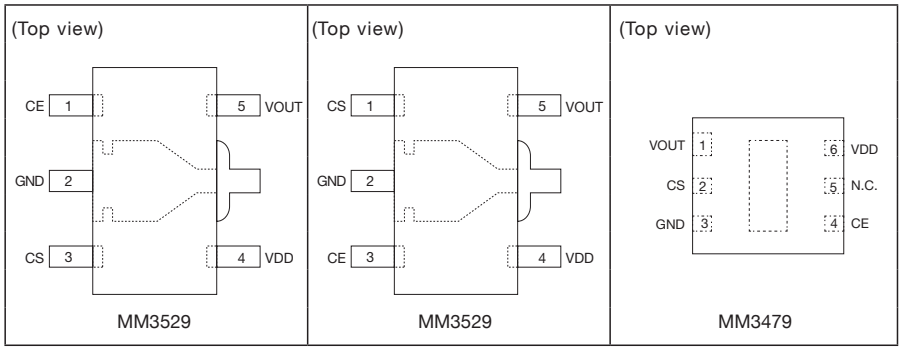
(1) Flat TVs
(2) DVD/Blu–ray recorders
(3) Printers, multifunction machines
(4) Game equipments

Features (Unless otherwise specified, Ta=+25°C)

(1) Input voltage range .....1.6V to 6.0V
(2) Output voltage range .....1.2V to 5.0V
(3) Output voltage accuracy.....V_{OUT}±15mV (V_{OUT}<1.5V)
V_{OUT}±1.0% (V_{OUT}≧1.5V)
(4) Maximum output current.....1000mA
(5) Current consumption .....50μA typ.
(No–Load Input Current)
0.1μA typ. (OFF)
(6) Output capacitor 1μF
(7) Dropout voltage.....0.50V typ.
(V_{OUT}=3.0V, Io=1000mA)
(8) Output short-circuit current....30mA typ.
(9) Line regulation.....0.05% / V typ.
(10) Load regulation .....75mV typ.
(Io=1mA to 1000mA)
(11) Ripple rejection .....70dB typ. (f=1kHz)

Pin assignment

■ SOT89–5A ■ SOT89–5A ■ SSON–6A



Pin no.	SOT89-5A	SOT89-5A	SSON-6A
	MM3529	MM3529	MM3479
1	CE	CS	VOUT
2	GND	GND	CS
3	CS	CE	GND
4	VDD	VDD	CE
5	VOUT	VOUT	N.C.
6	---	---	VDD

Model name structure

M M 3 5 2 9 A □ □ □ R E
M M 3 4 7 9 A □ □ □ R E

Embossed taping	E	
Housing	R	
Package code		
SOT89–5A	P	MM3529, MM3479
SSON–6A	R	MM3529
Output voltage		
e.g.) 3.3V	33	

Selection guide

Output Voltage	Accuracy	Parts No.			Dropout Voltage (Typ.) Io=1,000mA	Output Current	No-Load Input Current (Typ.)
		MM3529 Series		MM3479 Series			
		SOT89-5A Package (1,000pcs/Reel)	SSON-6A Package (3,000pcs/Reel)	SOT89-5A Package (1,000pcs/Reel)			
1.2V	±15mV	MM3529A12PRE	MM3529A12RRE	MM3479A12PRE	1.00V	1000mA	50μA
1.3V	±15mV	MM3529A13PRE	MM3529A13RRE	MM3479A13PRE	1.00V	1000mA	50μA
1.4V	±15mV	MM3529A14PRE	MM3529A14RRE	MM3479A14PRE	1.00V	1000mA	50μA
1.5V	±1.0%	MM3529A15PRE	MM3529A15RRE	MM3479A15PRE	0.70V	1000mA	50μA
1.6V	±1.0%	MM3529A16PRE	MM3529A16RRE	MM3479A16PRE	0.70V	1000mA	50μA
1.7V	±1.0%	MM3529A17PRE	MM3529A17RRE	MM3479A17PRE	0.70V	1000mA	50μA
1.8V	±1.0%	MM3529A18PRE	MM3529A18RRE	MM3479A18PRE	0.70V	1000mA	50μA
1.9V	±1.0%	MM3529A19PRE	MM3529A19RRE	MM3479A19PRE	0.70V	1000mA	50μA
2.0V	±1.0%	MM3529A20PRE	MM3529A20RRE	MM3479A20PRE	0.70V	1000mA	50μA
2.1V	±1.0%	MM3529A21PRE	MM3529A21RRE	MM3479A21PRE	0.70V	1000mA	50μA
2.2V	±1.0%	MM3529A22PRE	MM3529A22RRE	MM3479A22PRE	0.70V	1000mA	50μA
2.3V	±1.0%	MM3529A23PRE	MM3529A23RRE	MM3479A23PRE	0.70V	1000mA	50μA
2.4V	±1.0%	MM3529A24PRE	MM3529A24RRE	MM3479A24PRE	0.70V	1000mA	50μA
2.5V	±1.0%	MM3529A25PRE	MM3529A25RRE	MM3479A25PRE	0.70V	1000mA	50μA
2.6V	±1.0%	MM3529A26PRE	MM3529A26RRE	MM3479A26PRE	0.70V	1000mA	50μA
2.7V	±1.0%	MM3529A27PRE	MM3529A27RRE	MM3479A27PRE	0.50V	1000mA	50μA
2.8V	±1.0%	MM3529A28PRE	MM3529A28RRE	MM3479A28PRE	0.50V	1000mA	50μA
2.9V	±1.0%	MM3529A29PRE	MM3529A29RRE	MM3479A29PRE	0.50V	1000mA	50μA
3.0V	±1.0%	MM3529A30PRE	MM3529A30RRE	MM3479A30PRE	0.50V	1000mA	50μA
3.1V	±1.0%	MM3529A31PRE	MM3529A31RRE	MM3479A31PRE	0.50V	1000mA	50μA
3.2V	±1.0%	MM3529A32PRE	MM3529A32RRE	MM3479A32PRE	0.50V	1000mA	50μA
3.3V	±1.0%	MM3529A33PRE	MM3529A33RRE	MM3479A33PRE	0.50V	1000mA	50μA
3.4V	±1.0%	MM3529A34PRE	MM3529A34RRE	MM3479A34PRE	0.50V	1000mA	50μA
3.5V	±1.0%	MM3529A35PRE	MM3529A35RRE	MM3479A35PRE	0.50V	1000mA	50μA
3.6V	±1.0%	MM3529A36PRE	MM3529A36RRE	MM3479A36PRE	0.50V	1000mA	50μA
3.7V	±1.0%	MM3529A37PRE	MM3529A37RRE	MM3479A37PRE	0.50V	1000mA	50μA
3.8V	±1.0%	MM3529A38PRE	MM3529A38RRE	MM3479A38PRE	0.50V	1000mA	50μA
3.9V	±1.0%	MM3529A39PRE	MM3529A39RRE	MM3479A39PRE	0.50V	1000mA	50μA
4.0V	±1.0%	MM3529A40PRE	MM3529A40RRE	MM3479A40PRE	0.50V	1000mA	50μA
4.1V	±1.0%	MM3529A41PRE	MM3529A41RRE	MM3479A41PRE	0.50V	1000mA	50μA
4.2V	±1.0%	MM3529A42PRE	MM3529A42RRE	MM3479A42PRE	0.50V	1000mA	50μA
4.3V	±1.0%	MM3529A43PRE	MM3529A43RRE	MM3479A43PRE	0.50V	1000mA	50μA
4.4V	±1.0%	MM3529A44PRE	MM3529A44RRE	MM3479A44PRE	0.50V	1000mA	50μA
4.5V	±1.0%	MM3529A45PRE	MM3529A45RRE	MM3479A45PRE	0.50V	1000mA	50μA
4.6V	±1.0%	MM3529A46PRE	MM3529A46RRE	MM3479A46PRE	0.50V	1000mA	50μA
4.7V	±1.0%	MM3529A47PRE	MM3529A47RRE	MM3479A47PRE	0.50V	1000mA	50μA
4.8V	±1.0%	MM3529A48PRE	MM3529A48RRE	MM3479A48PRE	0.50V	1000mA	50μA
4.9V	±1.0%	MM3529A49PRE	MM3529A49RRE	MM3479A49PRE	0.50V	1000mA	50μA
5.0V	±1.0%	MM3529A50PRE	MM3529A50RRE	MM3479A50PRE	0.50V	1000mA	50μA

2 POWER SUPPLY ICs

1000mA regulator IC with the soft-start

MM3702, MM3703 Series

Outline

MM3703 is a 1A LDO with the soft start circuit.
The soft start function can set a rise time with an external capacitor. The package is selectable from HSOP-8E(High heat radiation), SOT89-5(standard) and SSON-6A(small/leadless).

Features (Unless otherwise specified, Ta=+25°C)

(1) Input voltage range .....1.6~6.5
(2) Output voltage range .....1.0~5.0V
(3) Output voltage accuracy.....VOUT±15mV (VOUT<1.5V)
VOUT±1% (VOUT≧1.5V)
(4) Maximum output current.....1000mA
(5) Current Consumption.....60μA typ.
(No–Load Input Current)
(6) Output capacitor 1μF
(7) Dropout voltage.....0.46V typ.(VOUT=3.0V, Io=1000mA)
(8) Line regulation.....0.05%/V typ.
(9) Load regulation .....50mV typ.
(Io=1mA~1000mA)
(10) Ripple rejection .....70dB typ.(f=1kHz, VOUT<1.3V)
65dB typ. (f=1kHz, 1.3V≦VOUT<3.4V)
60dB typ. (f=1kHz, 3.4V≦VOUT≦5.0V)

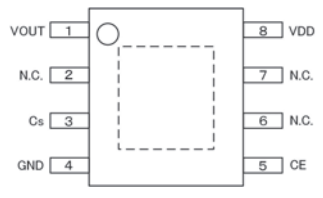
Applications

(1) Flat TVs
(2) DVD/Blu–ray recorders
(3) Printers, multifunction machines
(4) Game equipments

Pin assignment

HSOP-8E

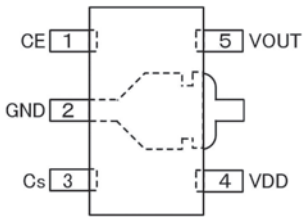
(Top view)



MM3703

SOT89-5A

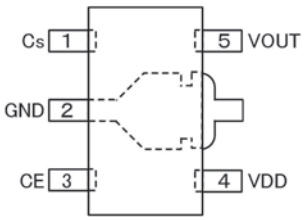
(Top view)



MM3702

SOT89-5A

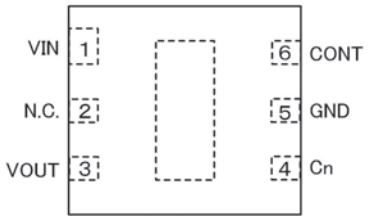
(Top view)



MM3703

SSON-6A

(Top view)

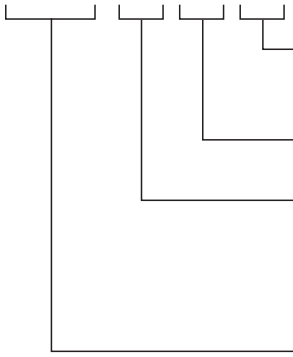


MM3703

Pin no.	HSOP-8E	SOT89-5A	SOT89-5A	SSON-6A
	MM3703	MM3703	MM3702	MM3703
1	VOUT	Cs	CE	VOUT
2	N.C.	GND	GND	Cs
3	Cs	CE	Cs	GND
4	GND	VDD	VDD	CE
5	CE	VOUT	VOUT	N.C.
6	N.C.	---	---	VDD
7	N.C.	---	---	---
8	VDD	---	---	---

Model name structure

M M 3 5 2 9 A □ □ □ □ □
M M 3 4 7 9 A □ □ □ □ □



Embossed taping	E	HSOP-8E, SSON-6A
	H	SOT89-5A
Housing	R	SOT89-5A, SSON-6A
	B	HSOP-8E
Package code		
HSOP-8E	H	MM3703
SOT89-5A	P	MM3702, MM3703
SSON-6A	R	MM3703
Output voltage		
1.0V~5.0V (0.1V step)	10~50	

Selection guide

1.0V	±15mV	MM3703A10HBE	MM3702A10PRH	MM3703A10PRH	MM3703A10RRE	1.00V	1000mA	60μA
1.1V	±15mV	MM3703A11HBE	MM3702A11PRH	MM3703A11PRH	MM3703A11RRE	1.00V	1000mA	60μA
1.2V	±15mV	MM3703A12HBE	MM3702A12PRH	MM3703A12PRH	MM3703A12RRE	1.00V	1000mA	60μA
1.3V	±15mV	MM3703A13HBE	MM3702A13PRH	MM3703A13PRH	MM3703A13RRE	1.00V	1000mA	60μA
1.4V	±15mV	MM3703A14HBE	MM3702A14PRH	MM3703A14PRH	MM3703A14RRE	1.00V	1000mA	60μA
1.5V	±1%	MM3703A15HBE	MM3702A15PRH	MM3703A15PRH	MM3703A15RRE	0.70V	1000mA	60μA
1.6V	±1%	MM3703A16HBE	MM3702A16PRH	MM3703A16PRH	MM3703A16RRE	0.70V	1000mA	60μA
1.7V	±1%	MM3703A17HBE	MM3702A17PRH	MM3703A17PRH	MM3703A17RRE	0.70V	1000mA	60μA
1.8V	±1%	MM3703A18HBE	MM3702A18PRH	MM3703A18PRH	MM3703A18RRE	0.70V	1000mA	60μA
1.9V	±1%	MM3703A19HBE	MM3702A19PRH	MM3703A19PRH	MM3703A19RRE	0.70V	1000mA	60μA
2.0V	±1%	MM3703A20HBE	MM3702A20PRH	MM3703A20PRH	MM3703A20RRE	0.70V	1000mA	60μA
2.1V	±1%	MM3703A21HBE	MM3702A21PRH	MM3703A21PRH	MM3703A21RRE	0.70V	1000mA	60μA
2.2V	±1%	MM3703A22HBE	MM3702A22PRH	MM3703A22PRH	MM3703A22RRE	0.70V	1000mA	60μA
2.3V	±1%	MM3703A23HBE	MM3702A23PRH	MM3703A23PRH	MM3703A23RRE	0.70V	1000mA	60μA
2.4V	±1%	MM3703A24HBE	MM3702A24PRH	MM3703A24PRH	MM3703A24RRE	0.70V	1000mA	60μA
2.5V	±1%	MM3703A25HBE	MM3702A25PRH	MM3703A25PRH	MM3703A25RRE	0.70V	1000mA	60μA
2.6V	±1%	MM3703A26HBE	MM3702A26PRH	MM3703A26PRH	MM3703A26RRE	0.70V	1000mA	60μA
2.7V	±1%	MM3703A27HBE	MM3702A27PRH	MM3703A27PRH	MM3703A27RRE	0.46V	1000mA	60μA
2.8V	±1%	MM3703A28HBE	MM3702A28PRH	MM3703A28PRH	MM3703A28RRE	0.46V	1000mA	60μA
2.9V	±1%	MM3703A29HBE	MM3702A29PRH	MM3703A29PRH	MM3703A29RRE	0.46V	1000mA	60μA
3.0V	±1%	MM3703A30HBE	MM3702A30PRH	MM3703A30PRH	MM3703A30RRE	0.46V	1000mA	60μA
3.1V	±1%	MM3703A31HBE	MM3702A31PRH	MM3703A31PRH	MM3703A31RRE	0.46V	1000mA	60μA
3.2V	±1%	MM3703A32HBE	MM3702A32PRH	MM3703A32PRH	MM3703A32RRE	0.46V	1000mA	60μA
3.3V	±1%	MM3703A33HBE	MM3702A33PRH	MM3703A33PRH	MM3703A33RRE	0.46V	1000mA	60μA
3.4V	±1%	MM3703A34HBE	MM3702A34PRH	MM3703A34PRH	MM3703A34RRE	0.46V	1000mA	60μA
3.5V	±1%	MM3703A35HBE	MM3702A35PRH	MM3703A35PRH	MM3703A35RRE	0.46V	1000mA	60μA
3.6V	±1%	MM3703A36HBE	MM3702A36PRH	MM3703A36PRH	MM3703A36RRE	0.46V	1000mA	60μA
3.7V	±1%	MM3703A37HBE	MM3702A37PRH	MM3703A37PRH	MM3703A37RRE	0.46V	1000mA	60μA
3.8V	±1%	MM3703A38HBE	MM3702A38PRH	MM3703A38PRH	MM3703A38RRE	0.46V	1000mA	60μA
3.9V	±1%	MM3703A39HBE	MM3702A39PRH	MM3703A39PRH	MM3703A39RRE	0.46V	1000mA	60μA
4.0V	±1%	MM3703A40HBE	MM3702A40PRH	MM3703A40PRH	MM3703A40RRE	0.46V	1000mA	60μA
4.1V	±1%	MM3703A41HBE	MM3702A41PRH	MM3703A41PRH	MM3703A41RRE	0.46V	1000mA	60μA
4.2V	±1%	MM3703A42HBE	MM3702A42PRH	MM3703A42PRH	MM3703A42RRE	0.46V	1000mA	60μA
4.3V	±1%	MM3703A43HBE	MM3702A43PRH	MM3703A43PRH	MM3703A43RRE	0.46V	1000mA	60μA
4.4V	±1%	MM3703A44HBE	MM3702A44PRH	MM3703A44PRH	MM3703A44RRE	0.46V	1000mA	60μA
4.5V	±1%	MM3703A45HBE	MM3702A45PRH	MM3703A45PRH	MM3703A45RRE	0.46V	1000mA	60μA
4.6V	±1%	MM3703A46HBE	MM3702A46PRH	MM3703A46PRH	MM3703A46RRE	0.46V	1000mA	60μA
4.7V	±1%	MM3703A47HBE	MM3702A47PRH	MM3703A47PRH	MM3703A47RRE	0.46V	1000mA	60μA
4.8V	±1%	MM3703A48HBE	MM3702A48PRH	MM3703A48PRH	MM3703A48RRE	0.46V	1000mA	60μA
4.9V	±1%	MM3703A49HBE	MM3702A49PRH	MM3703A49PRH	MM3703A49RRE	0.46V	1000mA	60μA
5.0V	±1%	MM3703A50HBE	MM3702A50PRH	MM3703A50PRH	MM3703A50RRE	0.46V	1000mA	60μA

2 POWER SUPPLY ICs

Low-saturation voltage 1.5A LDO

MM1870 Series

Outline

This IC is a 1.5A LDO with a low saturation voltage.
In addition to a low-saturation voltage (0.26V typ., Io=1.5 A), the device has a low voltage output with a minimum of 0.9 V, and is therefore capable of low-voltage operation.
This device is offered in the PKG TO–252–5A package featuring high heat dissipation and the small-sized PKG HSOP–8A package.
For protection, it includes an over-current protection circuit and a thermal shutdown circuit.

Applications

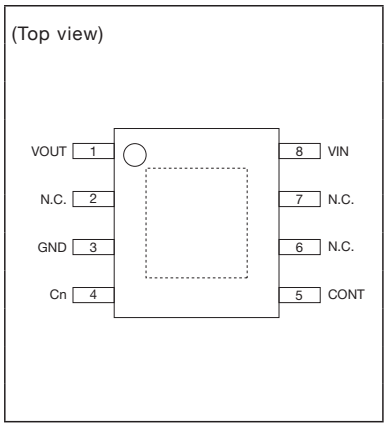
(1) Flat TVs
(2) DVD/Blu–ray recorders
(3) Set top boxes

Features (Unless otherwise specified, Ta=+25°C)

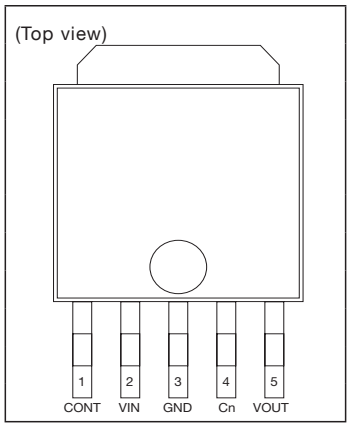
(1) Input voltage range .....1.25V to 10V
(2) Output voltage range .....0.9V to 5.0V
(3) Output voltage accuracy.....VOUT±2%
(4) Output current.....1.5A
(5) Current consumption .....1mA typ.
(No–Load Input Current)
(6) Output capacitor 1µF
(7) Dropout voltage.....0.26V typ. (Io=1500mA)
(8) Line regulation.....10mV typ. ,20mV max.
(Io=1mA)
(9) Load regulation .....19mV typ. ,50mV max.
(Io=1mA to 1500mA)
(10) Ripple rejection .....65dB typ. (f=1kHz)

Pin assignment

HSOP–8A



TO–252–5A



Pin no.	HSOP-8A	TO-252-5A
1	VOUT	CONT
2	N.C.	VIN
3	GND	GND
4	Cn	Cn
5	CONT	VOUT
6	N.C.	---
7	N.C.	---
8	VIN	---

Model name structure

M M 1 8 7 0 A □ □ □ □ E

Embossed taping	E
Housing	
HSOP–8A	B
TO–252–5A	R
Package code	
HSOP–8A	H
TO–252–5A	T
Output voltage	
e.g.) 3.0V	30
3.5V	35

Selection guide

Output Voltage	Accuracy	Parts No.		Dropout Voltage (Typ.) Io=1,500mA	Output Current	No-Load Input Current (Typ.)
		HSOP-8A Package (2,000pcs/Reel)	TO-252-5A Package (3,000pcs/Reel)			
0.9V	±30mV	MM1870A09HBE	MM1870A09TRE	*	1500mA	1mA
1.0V	±30mV	MM1870A10HBE	MM1870A10TRE	*	1500mA	1mA
1.1V	±30mV	MM1870A11HBE	MM1870A11TRE	0.26V	1500mA	1mA
1.2V	±30mV	MM1870A12HBE	MM1870A12TRE	0.26V	1500mA	1mA
1.3V	±30mV	MM1870A13HBE	MM1870A13TRE	0.26V	1500mA	1mA
1.4V	±30mV	MM1870A14HBE	MM1870A14TRE	0.26V	1500mA	1mA
1.5V	±2%	MM1870A15HBE	MM1870A15TRE	0.26V	1500mA	1mA
1.6V	±2%	MM1870A16HBE	MM1870A16TRE	0.26V	1500mA	1mA
1.7V	±2%	MM1870A17HBE	MM1870A17TRE	0.26V	1500mA	1mA
1.8V	±2%	MM1870A18HBE	MM1870A18TRE	0.26V	1500mA	1mA
1.9V	±2%	MM1870A19HBE	MM1870A19TRE	0.26V	1500mA	1mA
2.0V	±2%	MM1870A20HBE	MM1870A20TRE	0.26V	1500mA	1mA
2.1V	±2%	MM1870A21HBE	MM1870A21TRE	0.26V	1500mA	1mA
2.2V	±2%	MM1870A22HBE	MM1870A22TRE	0.26V	1500mA	1mA
2.3V	±2%	MM1870A23HBE	MM1870A23TRE	0.26V	1500mA	1mA
2.4V	±2%	MM1870A24HBE	MM1870A24TRE	0.26V	1500mA	1mA
2.5V	±2%	MM1870A25HBE	MM1870A25TRE	0.26V	1500mA	1mA
2.6V	±2%	MM1870A26HBE	MM1870A26TRE	0.26V	1500mA	1mA
2.7V	±2%	MM1870A27HBE	MM1870A27TRE	0.26V	1500mA	1mA
2.8V	±2%	MM1870A28HBE	MM1870A28TRE	0.26V	1500mA	1mA
2.9V	±2%	MM1870A29HBE	MM1870A29TRE	0.26V	1500mA	1mA
3.0V	±2%	MM1870A30HBE	MM1870A30TRE	0.26V	1500mA	1mA
3.1V	±2%	MM1870A31HBE	MM1870A31TRE	0.26V	1500mA	1mA
3.2V	±2%	MM1870A32HBE	MM1870A32TRE	0.26V	1500mA	1mA
3.3V	±2%	MM1870A33HBE	MM1870A33TRE	0.26V	1500mA	1mA
3.4V	±2%	MM1870A34HBE	MM1870A34TRE	0.26V	1500mA	1mA
3.5V	±2%	MM1870A35HBE	MM1870A35TRE	0.26V	1500mA	1mA
3.6V	±2%	MM1870A36HBE	MM1870A36TRE	0.26V	1500mA	1mA
3.7V	±2%	MM1870A37HBE	MM1870A37TRE	0.26V	1500mA	1mA
3.8V	±2%	MM1870A38HBE	MM1870A38TRE	0.26V	1500mA	1mA
3.9V	±2%	MM1870A39HBE	MM1870A39TRE	0.26V	1500mA	1mA
4.0V	±2%	MM1870A40HBE	MM1870A40TRE	0.26V	1500mA	1mA
4.1V	±2%	MM1870A41HBE	MM1870A41TRE	0.26V	1500mA	1mA
4.2V	±2%	MM1870A42HBE	MM1870A42TRE	0.26V	1500mA	1mA
4.3V	±2%	MM1870A43HBE	MM1870A43TRE	0.26V	1500mA	1mA
4.4V	±2%	MM1870A44HBE	MM1870A44TRE	0.26V	1500mA	1mA
4.5V	±2%	MM1870A45HBE	MM1870A45TRE	0.26V	1500mA	1mA
4.6V	±2%	MM1870A46HBE	MM1870A46TRE	0.26V	1500mA	1mA
4.7V	±2%	MM1870A47HBE	MM1870A47TRE	0.26V	1500mA	1mA
4.8V	±2%	MM1870A48HBE	MM1870A48TRE	0.26V	1500mA	1mA
4.9V	±2%	MM1870A49HBE	MM1870A49TRE	0.26V	1500mA	1mA
5.0V	±2%	MM1870A50HBE	MM1870A50TRE	0.26V	1500mA	1mA

* The parameter is not guaranteed in the model less than V_{OUT}=1.0V .

2 POWER SUPPLY ICs

150mA dual LDO

MM3548 Series

Outline

MM3548 is 150mA dual LDO by small package. The IC is used for a mobile phone's RF or CMOS sensor power supply by high PSRR and load response.

Applications

(1) Smart phones
(2) Tablet PCs
(3) Mobile phones
(4) Portable music Players
(5) Digital still cameras
(6) Portable games

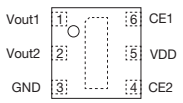
Features (Unless otherwise specified, Ta=+25°C)

(1) Input voltage range .....1.6V to 6.0V
(2) Output voltage range .....1.2V to 5.0V
(3) Output voltage accuracy.....VOUT±1%(Vo>2V)
VOUT±20mV(Vo≦2V)
(4) Maximum output current .....150mA / 1ch
(5) Current Consumption .....0.1μA typ. (OFF)
40μA typ. / 1ch (No–Load)
(6) Dropout voltage .....0.21V typ. / 0.32V max.
(Io=150mA, Vo=3.0V)
(7) Line regulation.....0.02%/V typ. / 0.1%/V max.
(8) Load regulation .....10mV typ. / 40mV max.
(Io=1mA to 150mA)
(9) Vout Temperature coefficient ...±80ppm/°C typ.
(10) Output capacitor .....70dB typ. (f=1kHz)

Pin assignment

PLP-6C

(Top view)



Pin no.	Symbol
1	VOUT1
2	VOUT2
3	GND
4	CE2
5	VDD
6	CE1

Model name structure

M M 3 5 4 8 □ □ □ □ R E

Embossed taping		E
Housing		R
Package code		
	PLP-6C	R
Output voltage		
	Refer to “selection guide”	
Function type		
	CE=H-Active, with Discharge Function	A

Selection guide

Part No.	Vout1			Vout2			Output Current (1ch)	No–Load Input Current (1ch typ.)
PLP-6C Package (5,000pcs/Reel)	Output Voltage	Accuracy	Dropout Voltage (typ.) Io=150mA	Output Voltage	Accuracy	Dropout Voltage (typ.) Io=150mA		
MM3548A01RRE	3.30V	±1%	0.21V	3.00V	±1%	0.21V	150mA	40μA
MM3548A02RRE	3.00V	±1%	0.21V	2.80V	±1%	0.27V	150mA	40μA
MM3548A03RRE	1.50V	±20mV	0.37V	1.20V	±20mV	0.42V	150mA	40μA
MM3548A04RRE	3.30V	±1%	0.21V	1.20V	±20mV	0.42V	150mA	40μA
MM3548A05RRE	2.85V	±1%	0.27V	2.85V	±1%	0.27V	150mA	40μA
MM3548A06RRE	2.80V	±1%	0.27V	2.80V	±1%	0.27V	150mA	40μA
MM3548A07RRE	1.80V	±20mV	0.31V	2.80V	±1%	0.27V	150mA	40μA
MM3548A08RRE	1.80V	±20mV	0.31V	1.80V	±20mV	0.31V	150mA	40μA
MM3548A09RRE	3.30V	±1%	0.21V	3.30V	±1%	0.21V	150mA	40μA
MM3548A10RRE	5.00V	±1%	0.21V	3.30V	±1%	0.21V	150mA	40μA
MM3548A11RRE	1.50V	±20mV	0.37V	2.85V	±1%	0.27V	150mA	40μA
MM3548A12RRE	2.85V	±1%	0.27V	3.10V	±1%	0.21V	150mA	40μA
MM3548A13RRE	1.80V	±20mV	0.31V	3.30V	±1%	0.21V	150mA	40μA
MM3548A14RRE	3.30V	±1%	0.21V	1.80V	±20mV	0.31V	150mA	40μA
MM3548A15RRE	2.50V	±1%	0.27V	2.50V	±1%	0.27V	150mA	40μA
MM3548A16RRE	3.00V	±1%	0.21V	4.20V	±1%	0.21V	150mA	40μA

2 POWER SUPPLY ICs

300mA dual LDO

MM3549 Series

Outline

MM3549 is 300mA dual LDO by small package. The IC is used for a mobile phone's RF or CMOS sensor power supply by high PSRR and load response.

Applications

(1) Smart phones
(2) Tablet PCs
(3) Mobile phones
(4) Portable music Players
(5) Digital still cameras
(6) Portable games

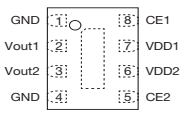
Features (Unless otherwise specified, Ta=+25°C)

(1) Input voltage range.....1.6V to 6.0V
(2) Output voltage range.....1.2V to 5.0V
(3) Output voltage accuracy .....VOUT±1%(Vo>2V)
VOUT±20mV(Vo≦2V)
(4) Maximum output current.....300mA / 1ch
(5) Current Consumption.....0.1μA typ. (OFF)
40μA typ. / 1ch (No–Load)
(6) Dropout voltage.....0.22V typ. / 0.29V max.
(Io=300mA, Vo=3.0V)
(7) Line regulation .....0.02%/V typ. /0.1%/V max.
(8) Load regulation.....10mV typ. / 40mV max.
(Io=1mA to 300mA)
(9) Vout Temperature coefficient...±100ppm/°C typ.
(10) Output capacitor .....65dB typ. (f=1kHz)

Pin assignment

PLP-8E

(Top view)



Pin no.	Symbol
1	GND
2	VOUT1
3	VOUT2
4	GND
5	CE2
6	VDD2
7	VDD1
8	CE1

Model name structure

M M 3 5 4 9 □ □ □ □ B E

- Embossed taping — E
- Housing — B
- Package code: PLP–8E — R
- Output voltage: Refer to "selection guide"
- Function type: CE=H–Active, with Discharge Function — A

Selection guide

Part No.	Vout1			Vout2			Output Current (1ch)	No–Load Input Current (1ch typ.)
PLP-8E Package (5,000pcs/Reel)	Output Voltage	Accuracy	Dropout Voltage (typ.) Io=300mA	Output Voltage	Accuracy	Dropout Voltage (typ.) Io=300mA		
MM3549A01RBE	3.30V	±1%	0.22V	3.00V	±1%	0.22V	300mA	40µA
MM3549A02RBE	3.00V	±1%	0.22V	2.80V	±1%	0.25V	300mA	40µA
MM3549A03RBE	1.50V	±20mV	0.35V	1.20V	±20mV	0.42V	300mA	40µA
MM3549A04RBE	3.30V	±1%	0.22V	1.20V	±20mV	0.42V	300mA	40µA
MM3549A05RBE	2.85V	±1%	0.25V	2.85V	±1%	0.25V	300mA	40µA
MM3549A06RBE	2.80V	±1%	0.25V	2.80V	±1%	0.25V	300mA	40µA
MM3549A07RBE	1.80V	±20mV	0.30V	2.80V	±1%	0.25V	300mA	40µA
MM3549A08RBE	1.80V	±20mV	0.30V	1.80V	±20mV	0.30V	300mA	40µA
MM3549A09RBE	3.30V	±1%	0.22V	3.30V	±1%	0.22V	300mA	40µA
MM3549A10RBE	5.00V	±1%	0.22V	3.30V	±1%	0.22V	300mA	40µA
MM3549A11RBE	1.50V	±20mV	0.35V	2.85V	±1%	0.25V	300mA	40µA
MM3549A12RBE	2.85V	±1%	0.25V	3.10V	±1%	0.22V	300mA	40µA
MM3549A13RBE	1.80V	±20mV	0.30V	3.30V	±1%	0.22V	300mA	40µA
MM3549A14RBE	3.30V	±1%	0.22V	1.80V	±20mV	0.30V	300mA	40µA
MM3549A15RBE	2.50V	±1%	0.25V	2.50V	±1%	0.25V	300mA	40µA

2 POWER SUPPLY ICs

Precision adjustable shunt regulator

MM1431 Series

Outline

This IC is 3–termial adjustable shunt regulator, which provides a highly accurate 0.4% bandgap reference voltage. The output voltage can be adjusted to any value between reference voltage V_{REF} and 35 volts with two external resistors. Moreover, there are a lot of ranges of the application as a zener diode besides the replacement is possible because it has steep turn-on characteristics.

Features

(Unless otherwise specified, Ta=+25°C)

(1) Reference voltage tolerance ..... V_{REF}=2.495V±0.8% (MM1431C, MM1431E, MM1431G)
2.495V±0.5% (MM1431F)
2.495V±0.4% (MM1431D)

(2) Output voltage can be adjusted ..... $V_{REF} \leqq Vo \leqq 35V$

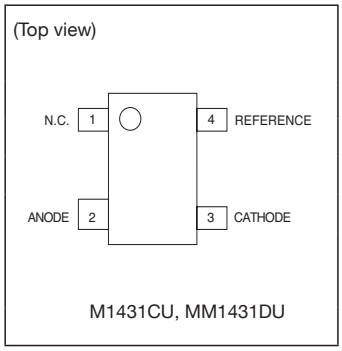
(3) Low Dynamic Output Impedance..... $|ZKA| \leqq 0.4\Omega$ typ.

(4) Specifications

- Operating Temperature ..... –30°C to +105°C
- Cathode to Anode voltage ..... V_{KA} ..... V_{REF} to 35 V
- Cathode current ..... I_K ..... 0.6mA to 50mA
- Reference voltage deviation over temperature range ..... ±10mV (V_{KA}=V_{REF}, I_K=10mA Ta=−30°C to +85°C)
- Minimum Cathode Current..... I_{Kmin} ..... 0.6mA max.
- Off-state Cathode Current I_{OFF} ..... 0.1μA typ.

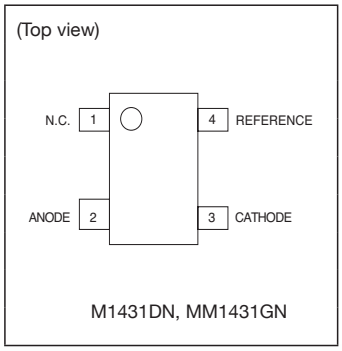
Pin assignment

SC–82ABB



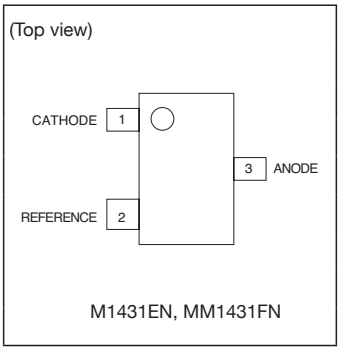
M1431CU, MM1431DU

SOT-23A



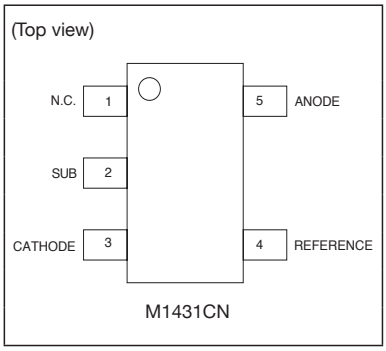
M1431DN, MM1431GN

SOT-23A



M1431EN, MM1431FN

SOT–25A *



M1431CN

* note : The second terminal is SUB, so connect the terminal to GND.

Pin no.	SC-82ABB		SOT-23A				SOT-25A
	MM1431CU	MM1431DU	MM1431DN	MM1431GN	MM1431EN	MM1431FN	MM1431CN
1	N.C.	N.C.	N.C.	N.C.	CATHODE	CATHODE	N.C.
2	ANODE	ANODE	REFERENCE	REFERENCE	REFERENCE	REFERENCE	SUB
3	CATHODE	CATHODE	ANODE	ANODE	ANODE	ANODE	CATHODE
4	REFERENCE	REFERENCE	---	---	---	---	REFERENCE
5	---	---	---	---	---	---	ANODE

Selection guide

Parts no.	Package	Reference voltage	Cathode current	Dynamic impedance
MM1431CURE	SC–82ABB	2.495V±0.8%	0.6 to 50 mA	0.4Ω typ. / 0.8Ω Max
MM1431DURE	SC–82ABB	2.495V±0.4%	0.6 to 50 mA	0.4Ω typ. / 0.8Ω Max
MM1431CNRE	SOT–25A	2.495V±0.8%	0.6 to 50 mA	0.4Ω typ. / 0.8Ω Max
MM1431DNRE	SOT-23A	2.495V±0.4%	0.6 to 50 mA	0.4Ω typ. / 0.8Ω Max
MM1431ENRE	SOT-23A	2.495V±0.8%	0.6 to 50 mA	0.4Ω typ. / 0.8Ω Max
MM1431FNRE	SOT-23A	2.495V±0.5%	0.6 to 50 mA	0.4Ω typ. / 0.8Ω Max
MM1431GNRE	SOT-23A	2.495V±0.8%	0.6 to 50 mA	0.4Ω typ. / 0.8Ω Max

2 POWER SUPPLY ICs

Precision adjustable shunt regulator

MM1530 Series

Outline

This IC is 3–termial adjustable shunt regulator, which provides a highly accurate 0.5% bandgap reference voltage. The output voltage can be adjusted to any value between reference voltage V_{REF} and 35 volts with two external resistors. Maoreover, there are a lot of ranges of the application as a zener diode besides the replacement is possible because it has steep turn-on characteristics.

Features

(Unless otherwise specified, Ta=+25°C)

(1) Reference voltage tolerance ..... V_{REF}=1.270V±0.8% (MM1530CU, MM1530EN)
1.250V±0.8% (MM1530DU)
1.240V±0.5% (MM1530DN, MM1530JN)

(2) Output voltage can be adjusted ..... $V_{REF} \leqq Vo \leqq 12V$

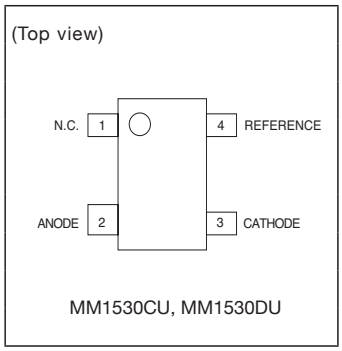
(3) Low Dynamic Output Impedance ..... $|ZKA| \leqq 0.4\Omega$ typ.

(4) Specifications

- Operating Temperature ..... –30°C to +105°C
- Cathode current ..... I_K .....0.3 to 30 mA
- Reference voltage deviation over temperature range ..... 6mV ($V_{KA}=V_{REF}$, I_K=10mA Ta=0 to +70°C)
- Minimum Cathode Current ..... I_{Kmin} ... 0.3mA max.
- Off-state Cathode Current ..... I_{OFF} ..... 0.1μA typ.

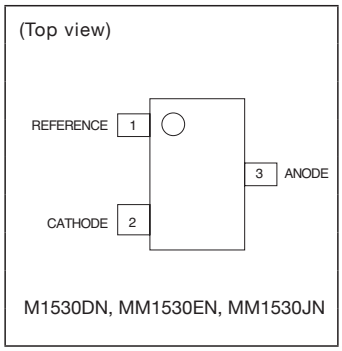
Pin assignment

SC–82ABB



MM1530CU, MM1530DU

SOT-23A



M1530DN, MM1530EN, MM1530JN

Pin no.	SC-82ABB		SOT-23A		
	MM1531CU	MM1531DU	MM1531DN	MM1531EN	MM1531JN
1	N.C.	N.C.	REFERENCE	REFERENCE	REFERENCE
2	ANODE	ANODE	CATHODE	CATHODE	CATHODE
3	CATHODE	CATHODE	ANODE	ANODE	ANODE
4	REFERENCE	REFERENCE	---	---	---

Selection guide

Parts no.	Package	Reference voltage	Cathode current	Minimum Cathode Current	Dynamic impedance
MM1530CURE	SC–82ABB	1.270V±0.8%	0.3 to 15 mA	0.15mA typ. / 0.3mA Max	0.4Ω typ. / 0.8Ω Max
MM1530DURE	SC–82ABB	1.250V±0.8%	0.3 to 30 mA	0.15mA typ. / 0.3mA Max	0.4Ω typ. / 0.8Ω Max
MM1530DNRE	SOT-23A	1.240V±0.5%	0.3 to 30 mA	0.15mA typ. / 0.3mA Max	0.2Ω typ. / 0.6Ω Max
MM1530ENRE	SOT-23A	1.270V±0.8%	0.3 to 15 mA	0.15mA typ. / 0.3mA Max	0.4Ω typ. / 0.8Ω Max
MM1530JNRE	SOT-23A	1.240V±0.5%	0.08 to 30 mA	0.05mA typ. / 0.08mA Max	0.2Ω typ. / 0.6Ω Max

2 POWER SUPPLY ICs

Electrical characteristics (Unless otherwise specified, Ta=+25°C)

DC-DC converters

Type	Power MOSFET	Model	Control	Input voltage	Output voltage	Output voltage accuracy	Maximum output current	Frequency	Current consumption	Packages
Boost	Built–in	MM3333	PWM/PFM	1.8V to 5.5V	2.5V to 4.5V	±2.4%	100mA	250kHz	74μA	SOT–26B
	Built–in	MM3355	PWM/PFM	0.9V to 5.5V	1.8V to 5.5V	±3%	200mA	100kHz	100μA	SOP–8D
Buck	Built–in	MM3370	PWM	7V to 27V	0.92V or more	±2%	3A	500kHz	0.8mA	HSOP–8A
	Built–in	MM3472 MM3617 NEW	PWM/PFM	2.0V to 5.5V	0.8V to 3.3V	±1.5%	600mA 1000mA	2.25MHz	11μA	SSON–6L
	Built–in	MM3542	PWM	4.5V to 20V	0.8V to 16.0V	±1%	2A	500kHz	1.0mA	SOP–8D
	Built–in	MM3543	PWM	4.5V to 20V	0.8V to 16.0V	±1%	3A	500kHz	1.0mA	HSOP–8C
	Built–in	MM3630BV NEW	PWM	4.5V to 33V	3V to 7V	±1.5%	2.5A	200KHz to 1MHz	1.5mA	TSOP–20E
	Built–in	MM3630BR NEW	PWM	4.5V to 33V	3V to 7V	±1%	1.5A	200KHz to 1MHz	1.5mA	SQFN–24A
	Built–in	MM3690ARBE NEW	PWM	2.7V to 5.5V	0.8V to 5.5V	±1.5%	0.9A	2MHz	6mA (Switching)	SSON-8E
	External	MM3736BRLE NEW	PWM/PSM	4.5V to 20V	4V to 5.5V	±1%	20A	250KHz to 490KHz	0.42mA	SQFN-16A
	2ch Built–in +LDO	MM3558	PWM	3.0V to 5.5V	DCDC:1V to 5.5V LDO:3.3V	±2%	1.5A/1.5A	2MHz	0.6mA	SQFN–16A
Inverter	-	MM3631	Charge pump	1.5V to 3.4V (Vin)	-Vin	-	50mA	120kHz	70μA	SOT–26B

AC-DC converters

Use		Model	Toporogy	Input voltage	Rated	Frequency	Package
[Primary–side]	QR controller	MM3661	Flyback QR	10V to 24V	30V (Startup-pin 500V)	25kHz to 75kHz	SOP–10A
	PWM controller	MM3663 NEW	Flyback PWM	10V to 24V	30V (Startup-pin 500V)	22KHz to 66KHz 23KHz to 100KHz	SOP–8J
[Secondary–side]	Synchronous rectifier	MM3667	Flyback QR Half-bridge LLC	6V to 15V	17V (Usable more than 17V with a diode)	A rank :500KHz or less (LLC) 200KHz or less (QR) B rank :170KHz or less (QR)	SOP–8J
		MM3669AF NEW	Half-bridge LLC	7.5V to 10V	17V (Usable more than 17V with a diode)	500K or less	SOP–10A

LED lighting ICs

White LED drivers

Type	Model	Control	Dimming	Input Voltage	Frequency	Efficiency (typ.)	Package
7 LEDs	MM3097	PWM	DC / PWM	2.5V to 6.0V	1.2MHz	85%	SOT–25A

LED lighting power controller

Type	Model	PCB	AC input	Applications	LED output	Dimming	Package
Built in PFC	MM3460	Isolated	100V/200V	10V to 25.5V	5W to 60W	DC / PWM	SOP–8D
Built in PFC	MM1837	Isolated	100V/200V	10V to 25.5V	5W to 60W	DC / PWM	SOP–8C
Supported phase dimming	MM3760	Non–Isolated	100V	10V to 25.5V	1W to 25W	DC / PWM / Phase (Triac)	SOP–10A

2 POWER SUPPLY ICs

Step–up DC–DC converter IC

MM3333

Outline

This IC is a boost DC–DC converter with automatic PWM/PFM switching function.
A boost DC–DC converter can be configured by using only coil, capacitor, and diode as external components.
It is optimal for applications for mobile equipment that will need high efficiency due to characteristics of small package or low current consumption.

Applications

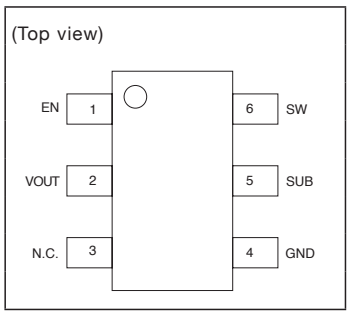
(1) Power supply for mobile equipment such as digital still cameras, Tablet PCs, etc.
(2) Power supply for mobile music player.
(3) Power supply for microprocessor.

Features (Unless otherwise specified, Ta=+25°C)

(1) It has realized high efficiency with low current consumption.
(2) Built–in phase compensation circuit.
(3) Electrical characteristics
- Operating supply voltage ....1.8V to 5.5V
- Consumption current .....74.3μA typ. (operation)
  0.5μA typ. (power-off)
- Oscillator frequency 250kHz
- Maximum duty cycle .....78% typ.
- Output voltage.....3.2V
- Output voltage accuracy.....± 2.4%
- External parts .....Inductors, Capacitors, Diodes

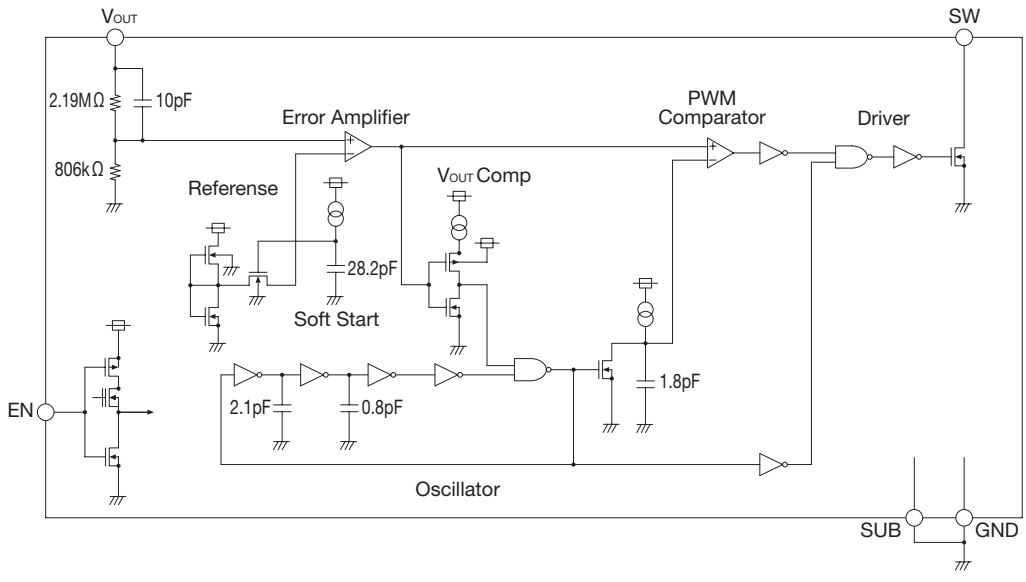
Pin assignment

SOT-26B

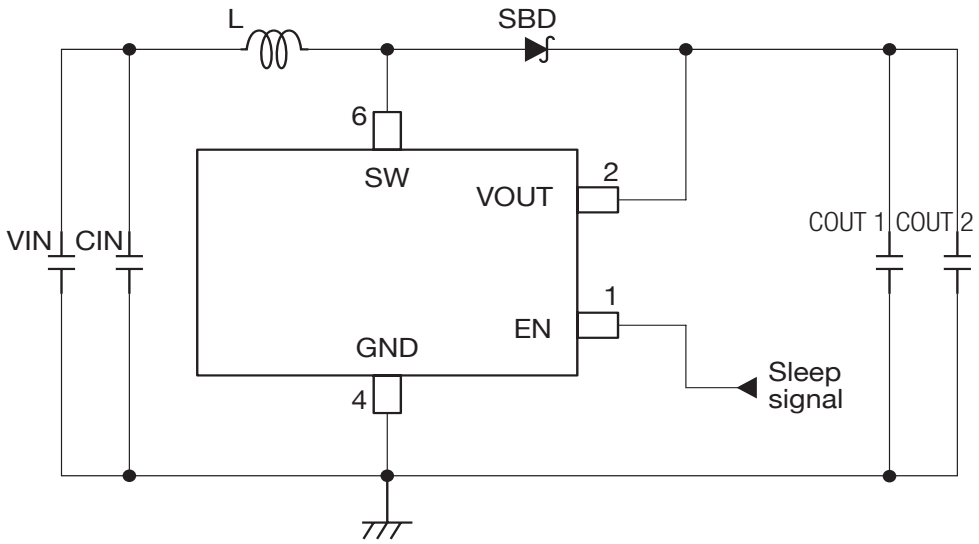


Pin no.	SOT-26B
1	EN
2	VOUT
3	N.C.
4	GND
5	SUB
6	SW

Block diagram



Typical application circuit



2 POWER SUPPLY ICs

Boost DC–DC converter with UVLO function

MM3355

Outline

This is a PWM/PFM controlled Boost DC–DC converter IC.
Its UVLO(Under Voltage Lock Out) function prevents dry–cell leakage due to overdischage.
UVLO detection 0.9V, support a single dry-cell battery.

Applications

(1) Power supply for mobile equipment such as digital still cameras, Tablet PCs, etc.
(2) Power supply for mobile music player.
(3) Power supply for microprocessor.

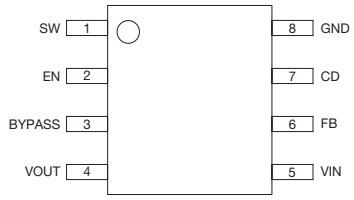
Features (Unless otherwise specified, Ta=+25°C)

(1) Under voltage lock out (UVLO)
(2) Automatic PWM/PFM control
(3) Internal bypass SW (0.3Ω typ.)
(4) Electrical characteristics
- Operating supply voltage ... 0.9V to 5.5V
- Output voltage..... 1.8V to 5.0V
- Output voltage accuracy.... ± 3%
- Oscillator frequency 100kHz
- Consumption current ..... 100μA typ. (operation)
  0.1μA typ. (power–off)

Pin assignment

SOP-8D

(Top view)



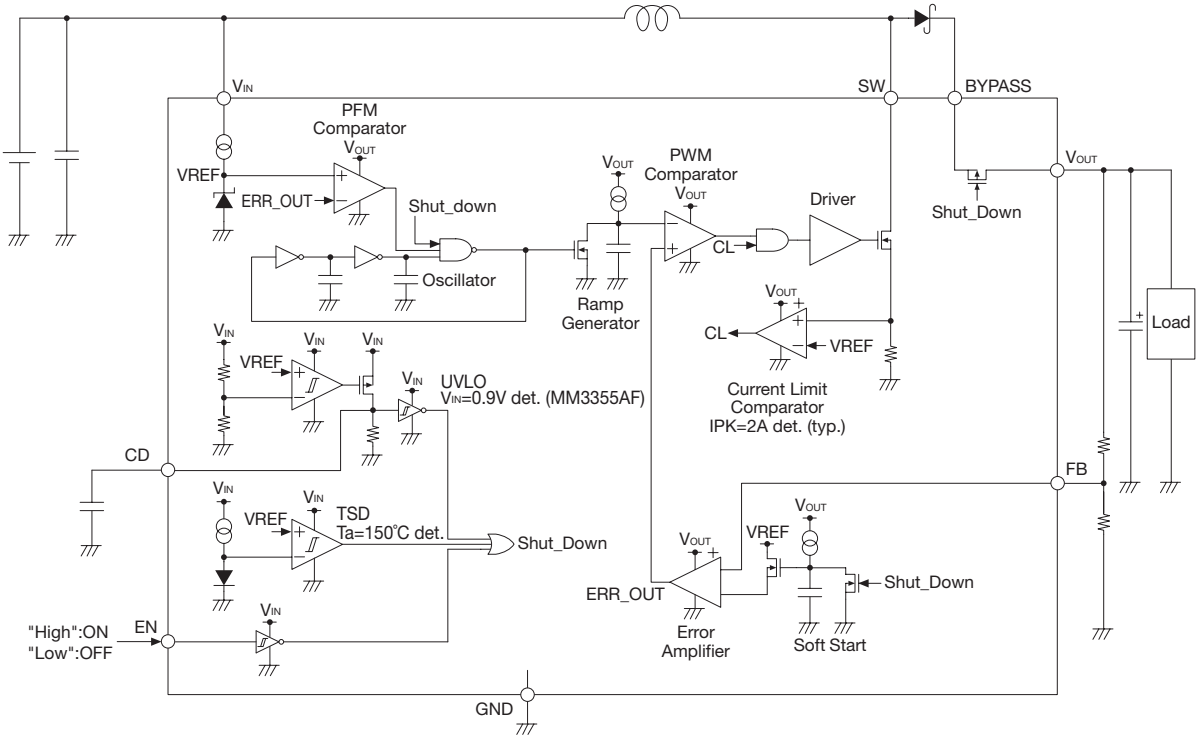
Pin no.	Symbol	Function
1	SW	Power Switch PIN
2	EN	Enable Pin For ON/OFF
3	BYPASS	Bypass Switch Input PIN
4	VOUT	Output Voltage PIN
5	VIN	Supply Voltage PIN
6	FB	Feedback PIN
7	CD	Capacitor Connect PIN For UVLO Dead Time
8	GND	Ground PIN

Product list

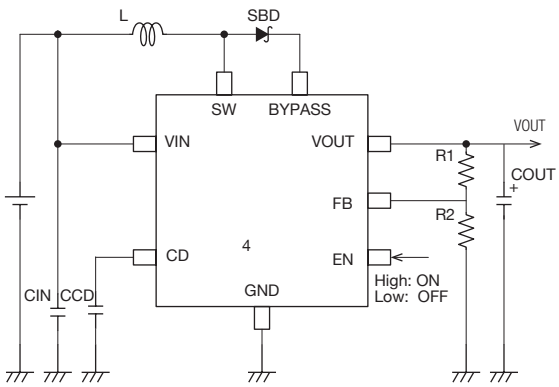
Product name	Power FET	Input voltage range	Output voltage	Maximum Output Current	IC's current consumption (operating)	IC's current consumption (power-off)	Package
MM3355AFFE	Built–in	0.9 to 5.5V	1.8 to 5.0V	200mA	100μA	0.1μA	SOP–8D

Block diagram

MM3355AF



Typical application circuit



2 POWER SUPPLY ICs

Buck DC–DC converter IC

MM3370

Outline

This is a diode rectifier–type buck DC–DC converter IC with integrated Power MOS FET.The IC operates at a maximum output current of 3A. This is suitable for power supplies of Flat TVs and DVD/Blu–ray recorders because of its more stable load transient response (changes from 1A to 2A, approx. 50mV)and wider input voltage range (7 to 27V).

Applications

(1) Flat TVs
(2) DVD/Blu–ray recorder

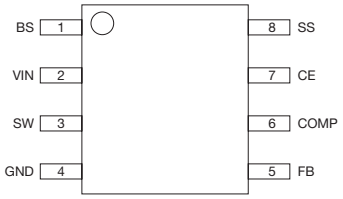
Features (Unless otherwise specified, Ta=+25°C)

(1) Soft Start Function
(2) Shut Down Function
(3) Current Limit Function
(4) Electrical characteristics
- Operating supply voltage ..... 7V to 27V
- Output voltage..... 0.92V to
- Reference Voltage accuracy ..... ±2%
- Maximum Output Current 3A
- Oscillation Frequency..... 500kHz
- Consumption current ..... 0.8mA (operation)
  20μA (power-off)

Pin assignment

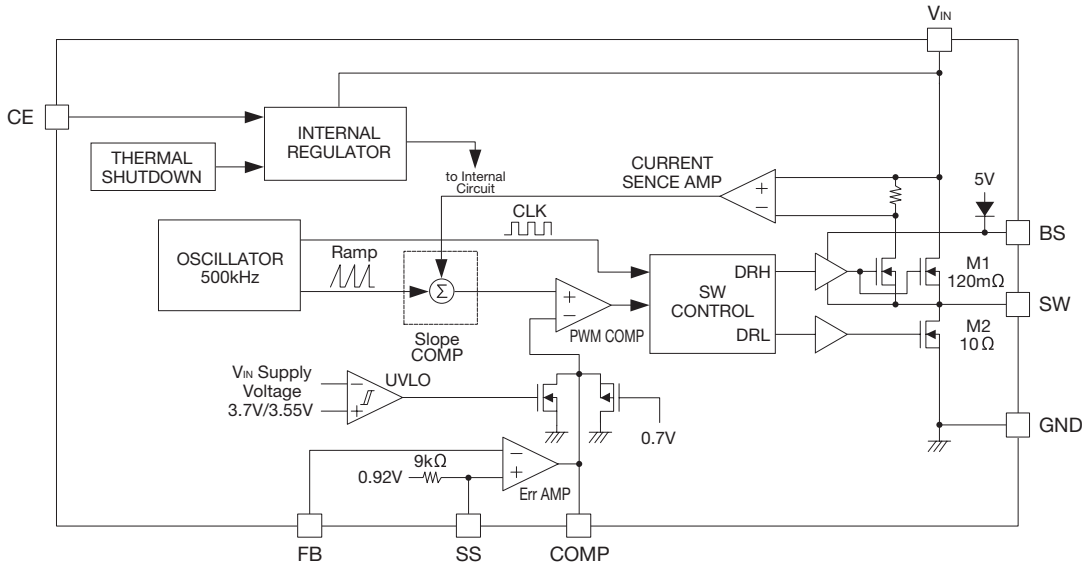
HSOP-8A

(Top view)

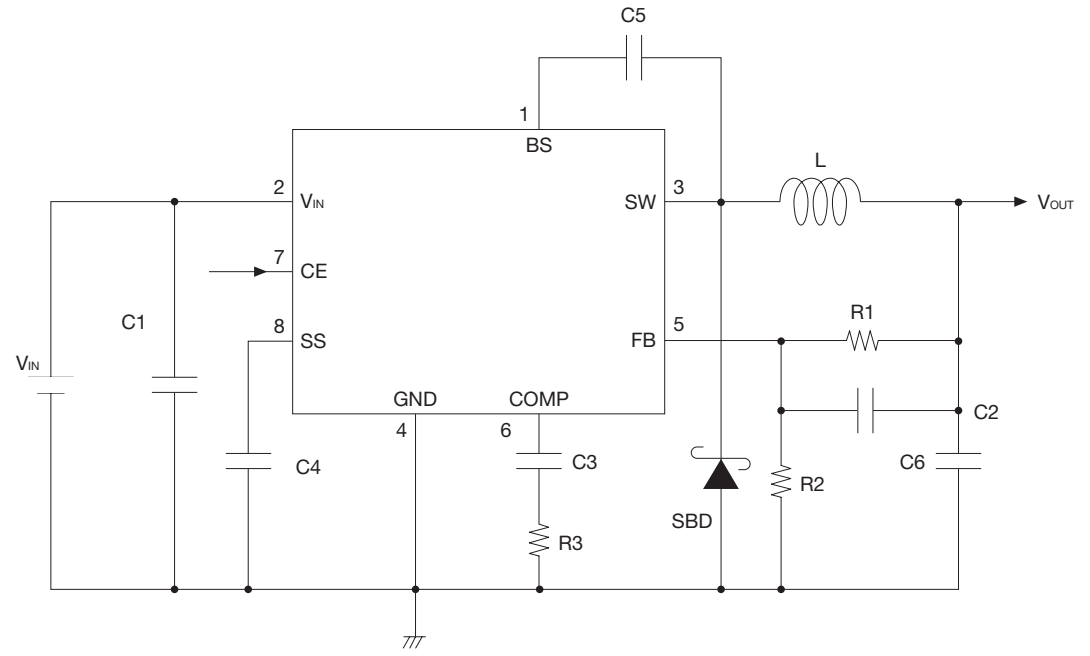


Pin no.	Symbol	Function
1	BS	Boost Flying-Capacitor Connection
2	VIN	Power Supply Voltage Input
3	SW	Inductor Connection
4	GND	Ground
5	FB	Feedback Input
6	COMP	Compensation Node
7	CE	Chip Enable Input
8	SS	Soft Start Control Input

Block diagram



Typical application circuit



2 POWER SUPPLY ICs

Buck, low Iq and high efficiency, 0.6A/1.0A output

MM3472/MM3617

Outline

This IC is a synchronous rectifying step-down DC/DC converter which is foucused on space minimizing design, high oscillation frequency (2.25MHz) and high efficiency by fewer external components (1 coil and 2 capacitors) in order to meet miniaturization and low power consumption.
Package is realizes space reduction of the mount area by mounting to the small SSON-6L.

Applications

(1) Mobile Phone
(2) Digital Still Cameras
(3) Battery–Operating Devices

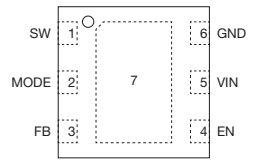
Features (Unless otherwise specified, Ta=+25°C)

(1) Input Voltage Range.....2.0V to 5.5V
(2) Output Voltage Range.....0.8V to 3.3V
(3) FB Voltage (PWM).....V_{FB}±1.5%
(4) FB Voltage (PFM).....V_{FB}±2.0%
(5) Output Current.....600mA (MM3472)
1000mA (MM3617)
(6) Oscillation Frequency.....2.25MHz
(7) Quiecent Current.....11μA
(8) Efficiency.....(VIN=3.6V, VOUT=1.8V)
I_{OUT}=0.01mA : 25%
I_{OUT}=100mA : 90%
(9) Protection.....UVLO, Soft start,
Current limit, Thermal shutdown
(10) PWM/PFM.....Automatic

Pin assignment

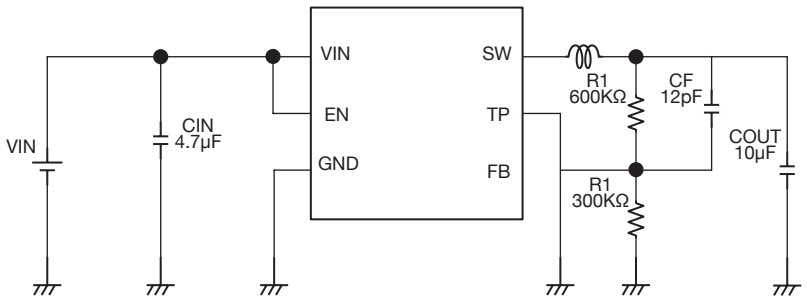
SSON-6L

(Top view)



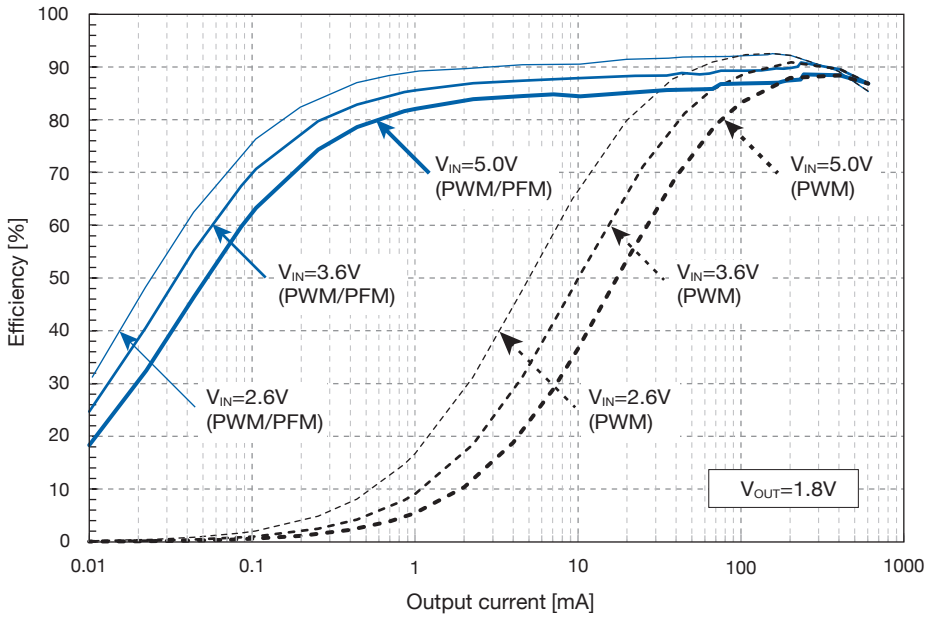
Pin no.	Symbol	Function
1	SW	Power Switch PIN
2	MODE	Mode pin
3	FB	Output voltage feedback pin
4	EN	Enable pin
5	VIN	Power supply input pin
6	GND	Ground pin
7	---	Thermal pad

Application circuit

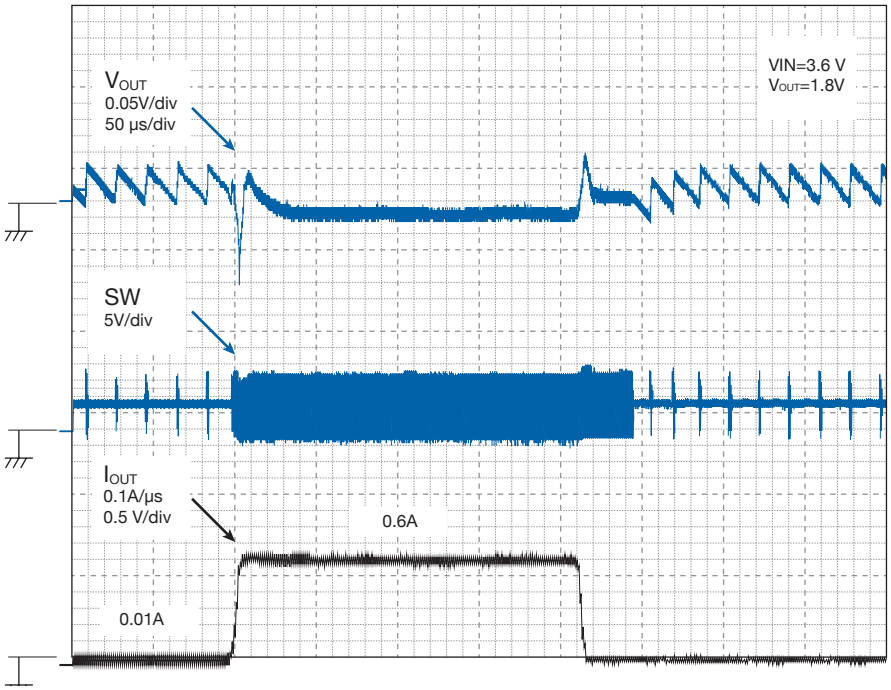


Performance characteristics

Efficiency



Load transient



2 POWER SUPPLY ICs

Buck 2A/3A output DC–DC converter IC

MM3542BF / MM3543BH

Outline

This is a Synchronous Buck DC–DC converter IC with integrated Power MOS FET.
Wide voltage input range (4.5V to 20V) ensures the operation at the maximum output current of 2A/3A.
The integrated low ON resistor power transistor achieves high efficiency, space saving, and cost reduction.

Applications

(1) Flat TVs
(2) DVD/Blu–ray recorder

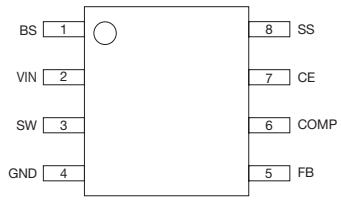
Features (Unless otherwise specified, Ta=+25°C)

(1) Wide voltage input range (4.5V to 20V) ensures the operation at the maximum output current of 2A/3A.
(2) High-speed transient response achieved by current mode control
(3) Safety by latch protection circuit when over-current and short-circuited
(4) It enabled the parts nearby to downsize with its higher frequency.
(5) Electrical characteristics
- Input voltage range ..... 4.5V to 20V
- Output voltage range ..... 0.8V to 16V
- Reference voltage accuracy..... ±1%
- Maximum output current..... 2A (MM3542)
  3A (MM3543)
- Oscillation frequency..... 500kHz typ.
- Current limit..... 3.5A typ.(MM3542)
  4.5A typ.(MM3543)
- Timer latch time..... 1ms typ.
- Soft start function..... Built–in
- Shut down function (CE pin) ..... Built–in

Pin assignment

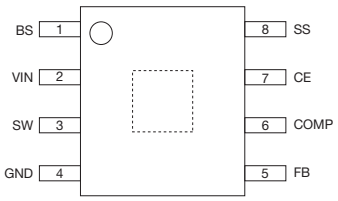
SOP-8D

(Top view)



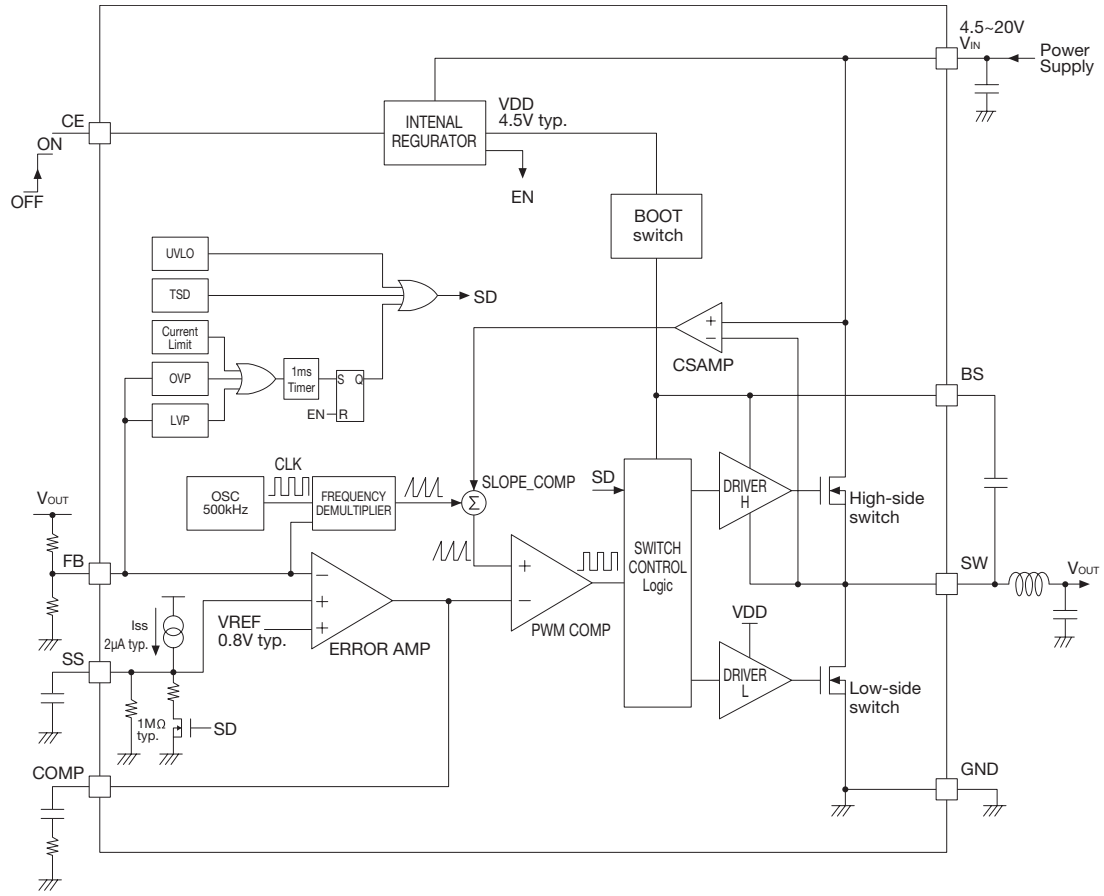
HSOP-8C

(Top view)

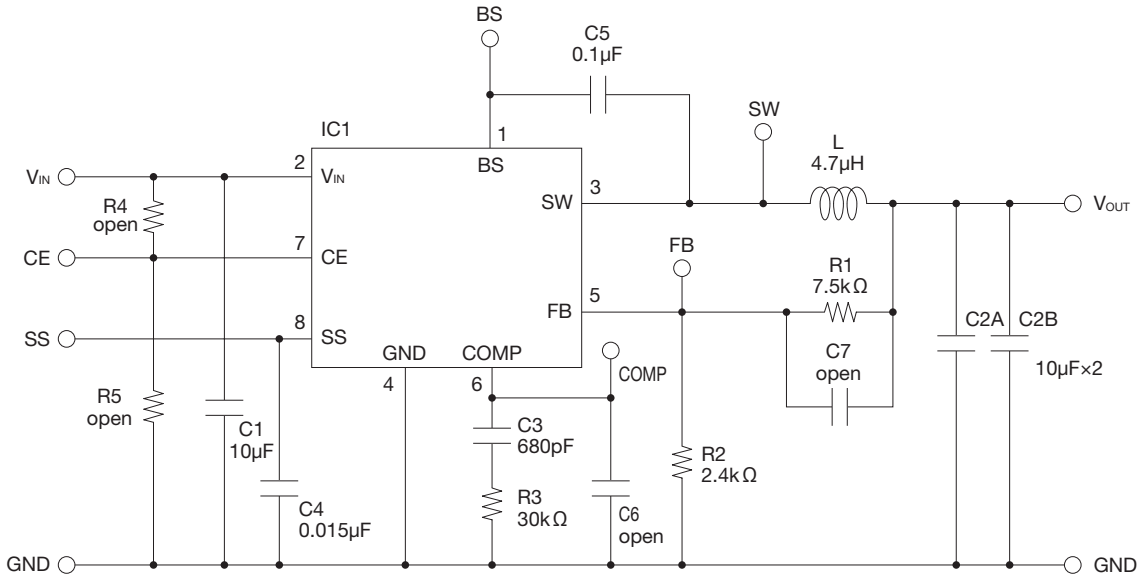


Pin no.	Symbol	Function
1	BS	Bootstrap capacitor connection pin
2	VIN	Power supply pin
3	SW	Inductor connection pin
4	GND	Ground pin
5	FB	Output voltage feedback pin
6	COMP	Phase compensation pin
7	CE	Chip enable pin
8	SS	Soft start control pin

Block diagram



Typical application circuit



2 POWER SUPPLY ICs

Output voltage compensation DC–DC converter IC for USB

MM3630BV/BR

Outline

This IC is an output voltage compensation with buck DC–DC converter IC that are intended for use USB power supply in–vehicle accessories.

It supplies a stable output voltage on a wide load range, by compensating the output loss caused bycable resistance.

Series line-up the MM3630BV(2.5A) and MM3630BR(1.5A). Selectable according to the your application.

Applications

(1) Car Audio
(2) Car Navigation
(3) Connector Box

Features (Unless otherwise specified, Ta=+25°C)

(1) Output voltage compensation for USB powr supply.
- Supports to be able to meet the USB standard by compensating a loss due to cable resistance.

(2) Can be set in the range of 200kHz to 1MHz switching frequency by external resistor or SYNC.
- Avoid noise interference to the AM band by this function.

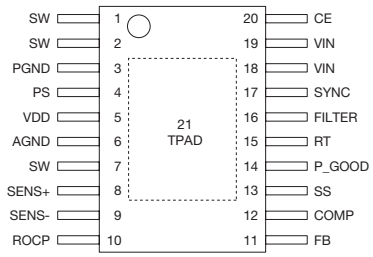
(3) Built–in MOSFET and synchronous rectification operating.
- To reduce external component.

(4) Characteristics
- Absolute maximum rating 40V
- Operating voltage .....4.5V to 33V
- Output voltage .....3V to 7V
- Referance voltage .....0.8V±1.5%
- Switching frequency .....200kHz to 1000kHz
- Output current limit .....Adjustable
- Output current 2.5A (MM3630BV)
  1.5A (MM3630BR)

Pin assignment

TSOP-20E (MM3630BV)

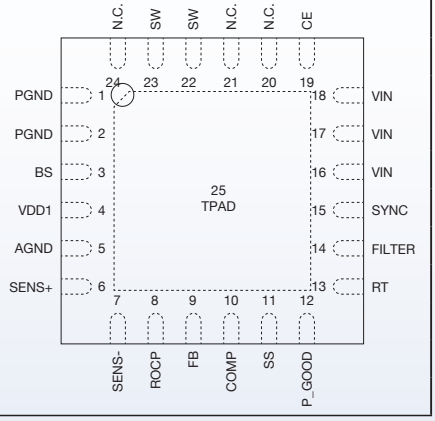
(Top view)



Pin no.	Symbol	Pin no.	Symbol
1	SW	11	FB
2	SW	12	COMP
3	PGND	13	SS
4	PS	14	P_GOOD
5	VDD	15	RT
6	AGND	16	FILTER
7	SW	17	SYNC
8	SENS+	18	VIN
9	SENS-	19	VIN
10	ROCP	20	CE

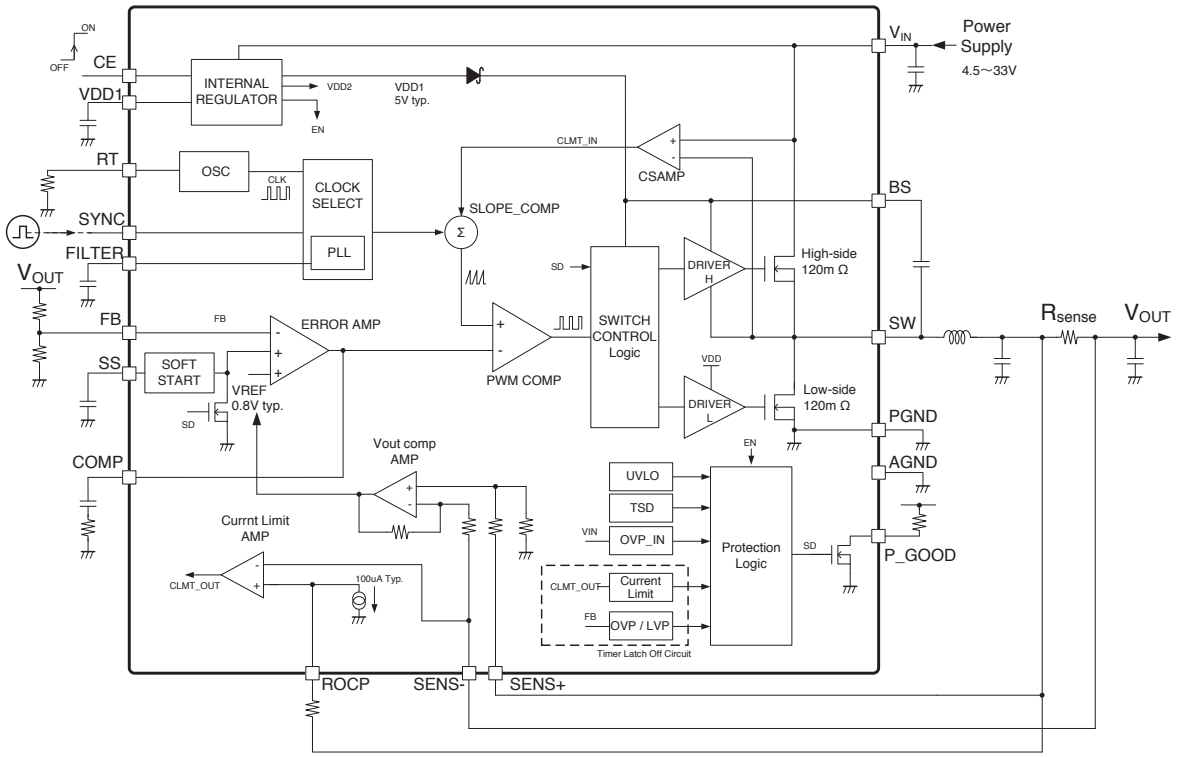
SQFN-24A (MM3630BR)

(Top view)

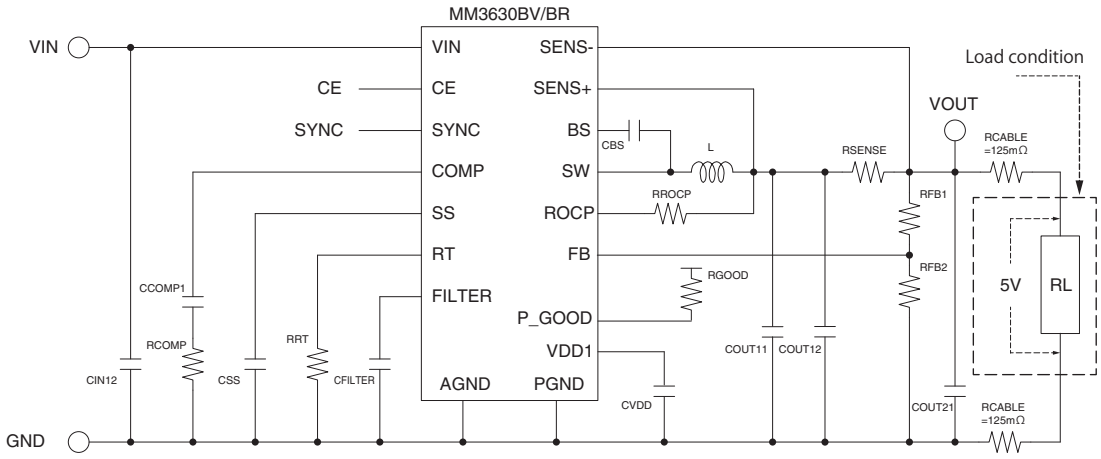


Pin no.	Symbol	Pin no.	Symbol	Pin no.	Symbol	Pin no.	Symbol
1	PGND	7	SENS-	13	RT	19	CE
2	PGND	8	ROCP	14	FILTER	20	N.C.
3	BS	9	FB	15	SYNC	21	N.C.
4	VDD1	10	COMP	16	VIN	22	SW
5	AGND	11	SS	17	VIN	23	SW
6	SENS+	12	P_GOOD	18	VIN	24	N.C.

Block diagram



Application circuit



2 POWER SUPPLY ICs

0.9A High-Accuracy Buck DC/DC Converter

MM3690ARBE

Outline

MM3690 is a single type synchronous rectification buck DC/DC converter. 0.9 A output current from the 2.7V to 5.5V input power supply. With high-accuracy reference voltage, stable output is possible without being influenced by temperature and load fluctuation.
The overcurrent protection of MM3690 has qualified safety certification according to UL2367 / IEC60950-1 standard. Ideal for power supply of port connector where the output terminal is exposed outside the equipment.
Adopts a compact 8-pin package of 2020 size, contributing to the space saving of the PCB.

Applications

(1) Point of Load for general purpose equipment
(2) Port-connector power supply of the stationary devices

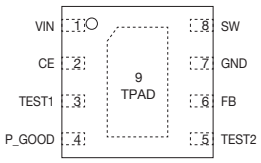
Features (Unless otherwise specified, Ta=+25°C)

(1) Input voltage ..... 2.7V to 5.5V
(2) Output voltage ..... 0.8V to 5.0V
(3) Output current 0.9A
(4) Reference voltage 0.6V
(5) Reference accuracy ..... ±2% @Tj=0 to 125°C
VIN=4.75 to 5.25V
IOUT=0 to 0.9A
(6) Switching frequency 2MHz
(7) Power good
(8) Output discharge
(9) OCP qualified for UL2367 / IEC60950-1

Pin assignment

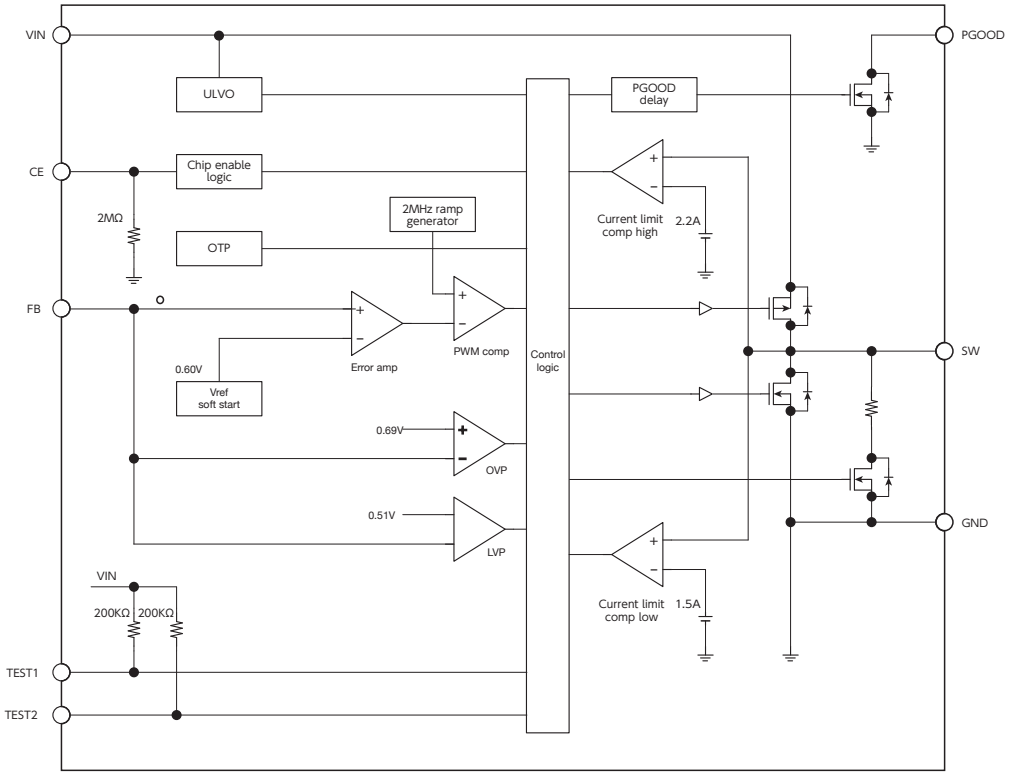
SSON-8E

(Top view)

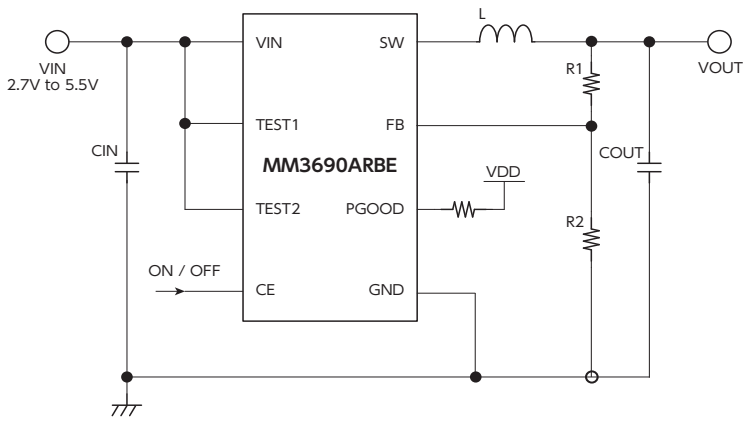


No.	Symbol	Function
1	VIN	Power supply input pin
2	CE	Chip enable pin
3	TEST1	Test pin (Connect to VIN for normal use)
4	PGOOD	Power Good pin
5	TEST2	Test pin (Connect to VIN for normal use)
6	FB	Output voltage feedback pin
7	GND	Ground pin
8	SW	Inductor connection pin
9	TPAD	Thermal pad (Connect to GND)

Block diagram



Application circuit



2 POWER SUPPLY ICs

Single Synchronous Rectification Buck DC/DC Controller

MM3736BRLE

Outline

MM3736 is a high-efficiency synchronous rectification buck DC/DC controller. Wide input voltage range and low output voltage suitable for the POL of system power supply. Ceramic capacitors can be used. And, fast transient response is realized with fixed on-time control.
It operates in the auto-pulse-skipping mode at light load and high efficiency operation is possible in wide load range.

Applications

(1) Notebook PC
(2) Tablet PC
(3) Home Server
(4) Industrial equipment

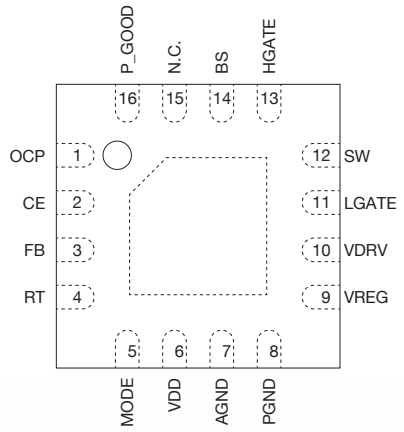
Features (Unless otherwise specified, Ta=+25°C)

(1) Input voltage.....4.5V to 20V
(2) Output voltage.....4.0V to 5.5V
(3) Load current .....Max. 20A or more
(4) Reference voltage.....0.613V±1%
(5) Switching frequency 250k/300k/400k/490kHz
(6) Fast transient response
(7) High efficiency at light load
(8) CCM / Auto-skip.....Mode selectable
(9) Output discharge

Pin assignment

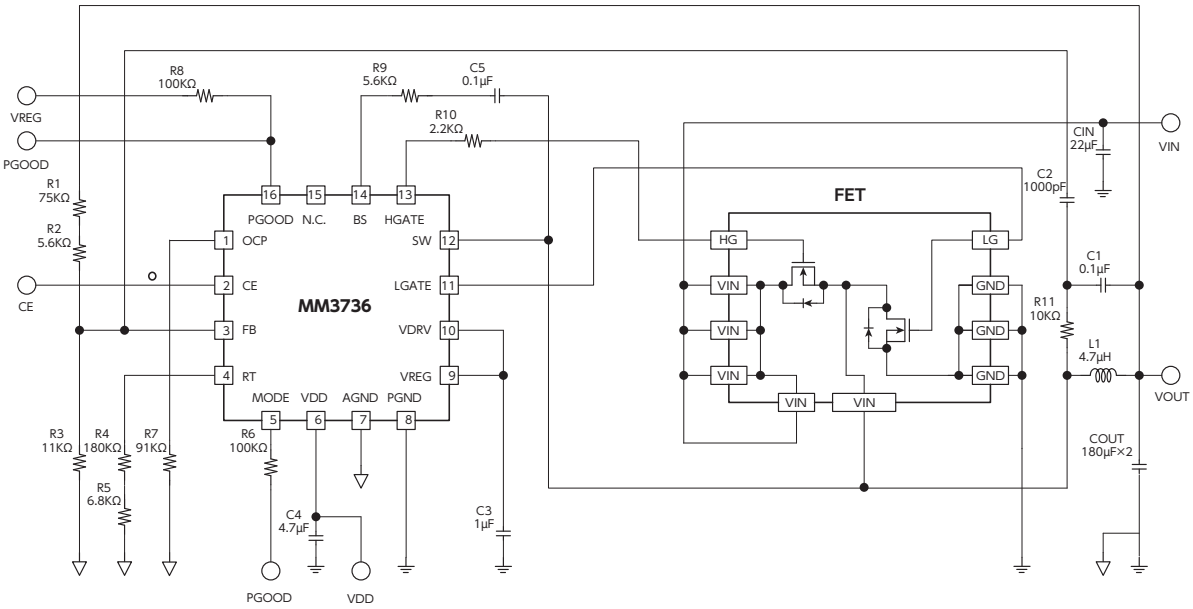
SQFN-16B

(Top view)

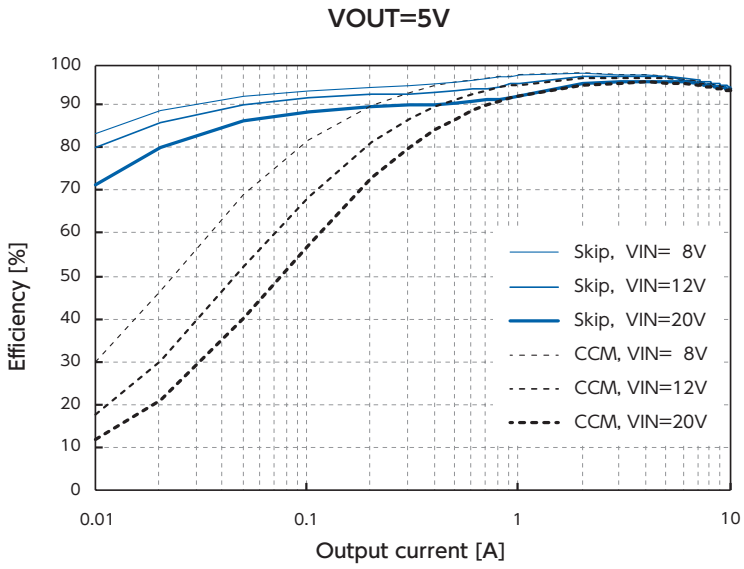


Pin no.	Symbol	Function
1	OCP	Current Limit detection value setting pin
2	CE	Chip enable pin
3	FB	Output voltage feedback pin
4	RT	External frequency setting pin
5	MODE	SoftStart and Auto-skip•CCM selection pin
6	VDD	Controller power supply input pin
7	AGND	Ground pin
8	PGND	Ground pin
9	VREG	LDO output voltage pin
10	VDRV	Gate drive supply voltage input pin
11	LGATE	Low-side MOSFET driver output pin
12	SW	Inductor connection pin
13	HGATE	High-side MOSFET driver output pin
14	BS	Bootstrap capacitor connection pin
15	N.C.	No connection pin
16	PGOOD	Power Good output pin

Application circuit



Efficiency



2 POWER SUPPLY ICs

Multifunction PMIC

MM3558

Outline

This IC is compound power supply IC which built in Synchronous Buck DC–DC converter 2ch, LDO 1ch, and P-GOOD 2ch.
The ripple of the input current is decreased so that the DC–DC converter of 2ch may work by the opposite phase, and a low noise is achieved. Because the output voltage can be set by external resistance, it is possible to use it according to various output conditions.

Applications

(1) Printers, multifunction machines

Features (Unless otherwise specified, Ta=+25°C)

(1) Input operating voltage range ..... 3.0V to 5.5V
(2) Shutdown supply current ..... 0.1μA Typ.
(3) Temperature range ..... –30°C to +85°C
(4) DC–DC converters
- Output voltage..... 1.0V to PVIN ±2%
- Maximum output current..... 1.5A
- Oscillator frequency ..... 2MHz Typ.
- Output voltage is changeable in external parts.
- start/stop sequence circuit ..... Built–in
- Output overVoltage protection function ... 0.72V Typ.
- Built–in softstart circuit..... 1.5ms Typ.
- Built–in overcurrent detection timer ..... 1.5ms Typ.

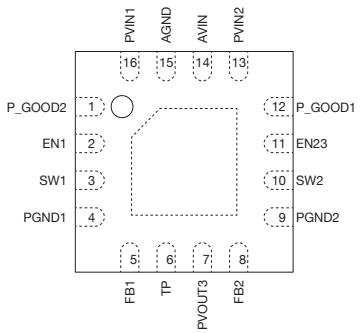
(5) LDO
- Output voltage..... 3.3V ±1%
- Dropout voltage..... 0.10V Typ.
  (IOUT=10mA/VIN=3.1V)

(6) P–GOOD
- Input/Output Over voltage/Low voltage, Over current, and Thermal detection

Pin assignment

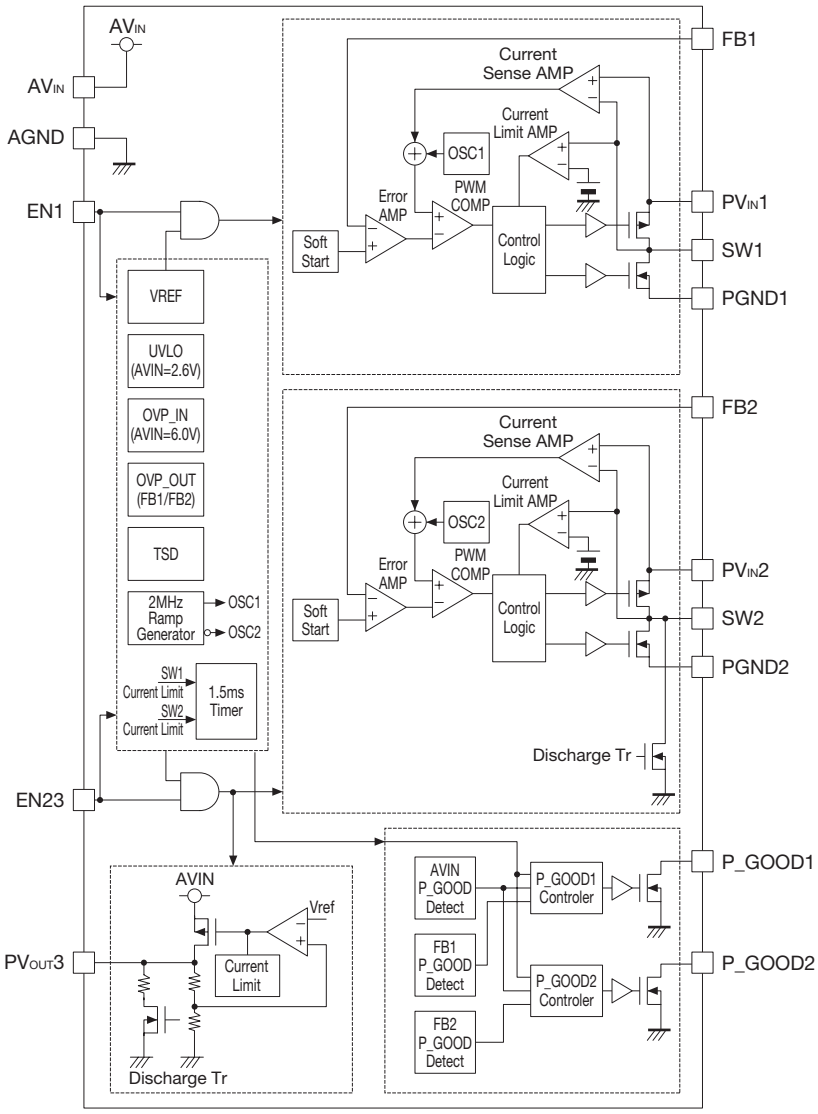
SQFN-16A

(Top view)

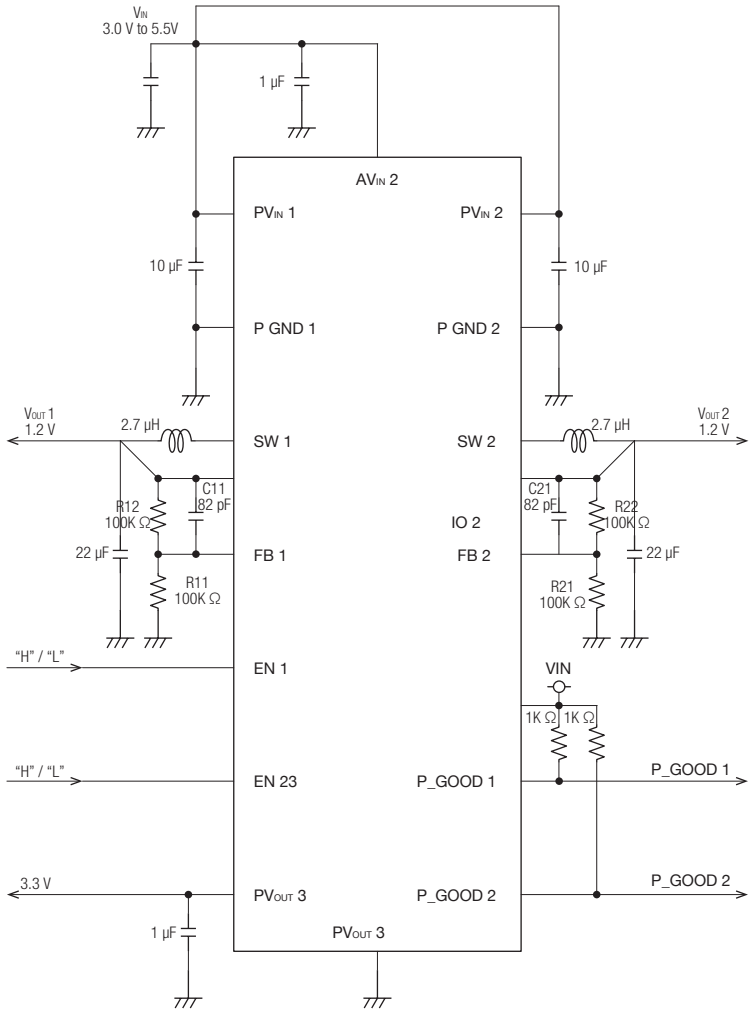


Pin no.	Symbol	Function
1	P_GOOD	Power Good output pin
2	EN1	Enable pin for ON/OFF
3	SW1	Power switched pin
4	PGND1	Ground pin
5	FB1	DC–DC output voltage feedback pin
6	TP	Test pin
7	PVOUT3	Regulator output pin
8	FB2	DC–DC output voltage feedback pin
9	PGND2	Ground pin
10	SW2	Power switched pin
11	EN23	Enable pin for ON/OFF
12	P_GOOD1	Power Good output pin
13	PVIN2	Power supply input pin
14	PVIN	Power supply input pin
15	AGND	Ground pin
16	PVIN1	Power supply input pin

Block diagram



Typical application circuit



2 POWER SUPPLY ICs

Charge pump voltage inverter

MM3631

Outline

This IC is a charge pump voltage inverter. A positive input voltage(+1.5V to +3.4V) is converted to a negative voltage using two external capacitors.
The device is small packaged in a 6-pin SOT-26B (2.9×2.8×1.15mm). CE circuit included. Stand-by current is less than 1 µA,reduce the quiecent current.

Applications

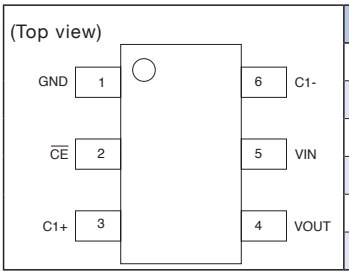
(1) Portable devices
(2) Operational Amplifier Negative Power Supply

Features (Unless otherwise specified, Ta=+25°C)

(1) Input voltage range ..... 1.5V to 3.4V
(2) Output voltage range ..... –Vin
(3) Operating temperature range..... –30°C to +80°C
(4) Output current..... 50mA
(5) consumption current (CE=L) ..... 70µA typ.
(6) Stand-by consumption current(CE=H)... 1µA
(7) Efficiency..... 93% (IL=1mA, VIN=2.8V)
(8) Oscillation frequency..... 120kHz typ.
(9) Protective function ..... VIN voltage protection

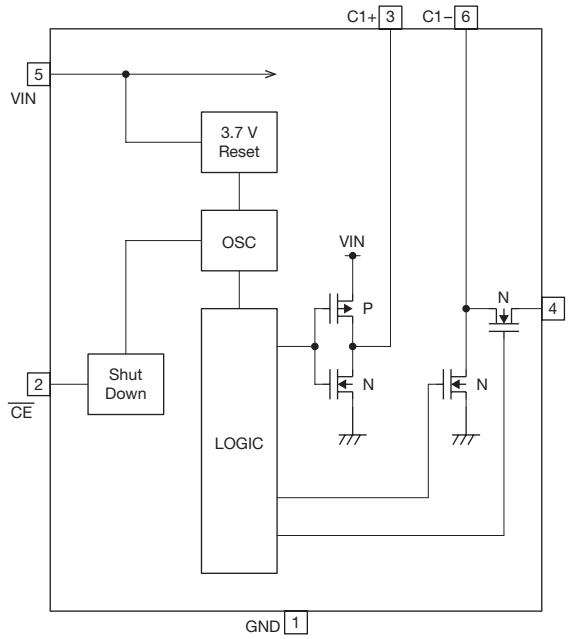
Pin assignment

SOT-26B

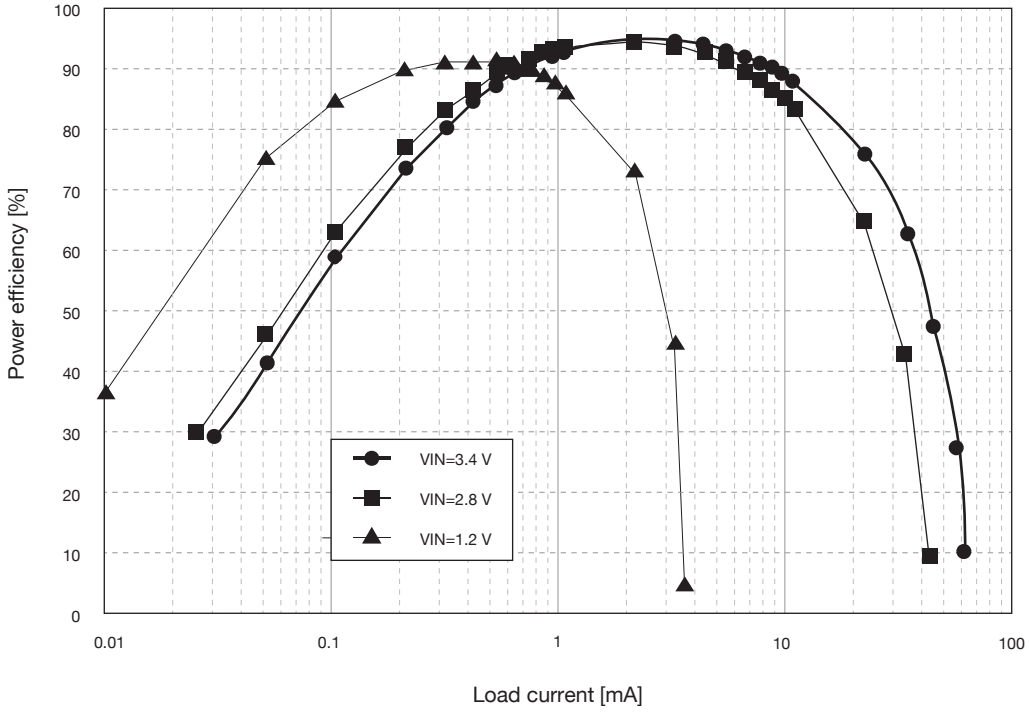


Pin no.	Symbol	Function
1	GND	GND
2	CE	Chip Enable Input
3	C1+	Positive charge pump capacitor terminal
4	VOUT	Negative output terminal
5	VIN	VDD terminal
6	C1-	Negative charge pump capacitor terminal

Block diagram



Efficiency characteristic



2 POWER SUPPLY ICs

Primary-side QR controller

MM3661

Outline

MM3661 is a quasi resonant control IC for AC–DC converter. This control helps to keep the EMI low by soft switching. This IC has a Built–in Start–up circuit that 500V tolerates voltage. It helps to which improve Start–up speed with the Start–up circuit loss reduction. This IC contributes to the high efficiency at light-load by frequency decrease function with Burst operation.
In addition, This IC is equipped with AC detection function and load detection function or adedicated output terminal. Thereby it is possible to realize a the start-stop control and outputvoltage control of the PFC circuit .

Features (Unless otherwise specified, Ta=+25°C

(1) Absolute maximum rating(HV pin)..... 500V
(2) Recommended operating voltage..... 10V to 24V
(3) PFC drive voltage..... Vcc
(4) Operating current..... 0.72mA (typ.)
(5) Frequency ..... 27.7kHz to 75kHz (typ.)
(6) Operating temperature range..... –30°C to +85°C
(7) Protective function :
Vcc over voltage, External latch protection, soft-start,
Over current, CS–pin OPEN
(8) Light load burst operation
(9) PFC circuit control function (AC detection, Load detection)

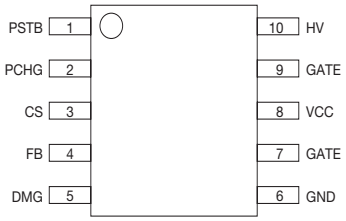
Applications

(1) AC adapters
(2) Game console
(3) TV
(4) Printer
(5) Various consumer electronics

Pin assignment

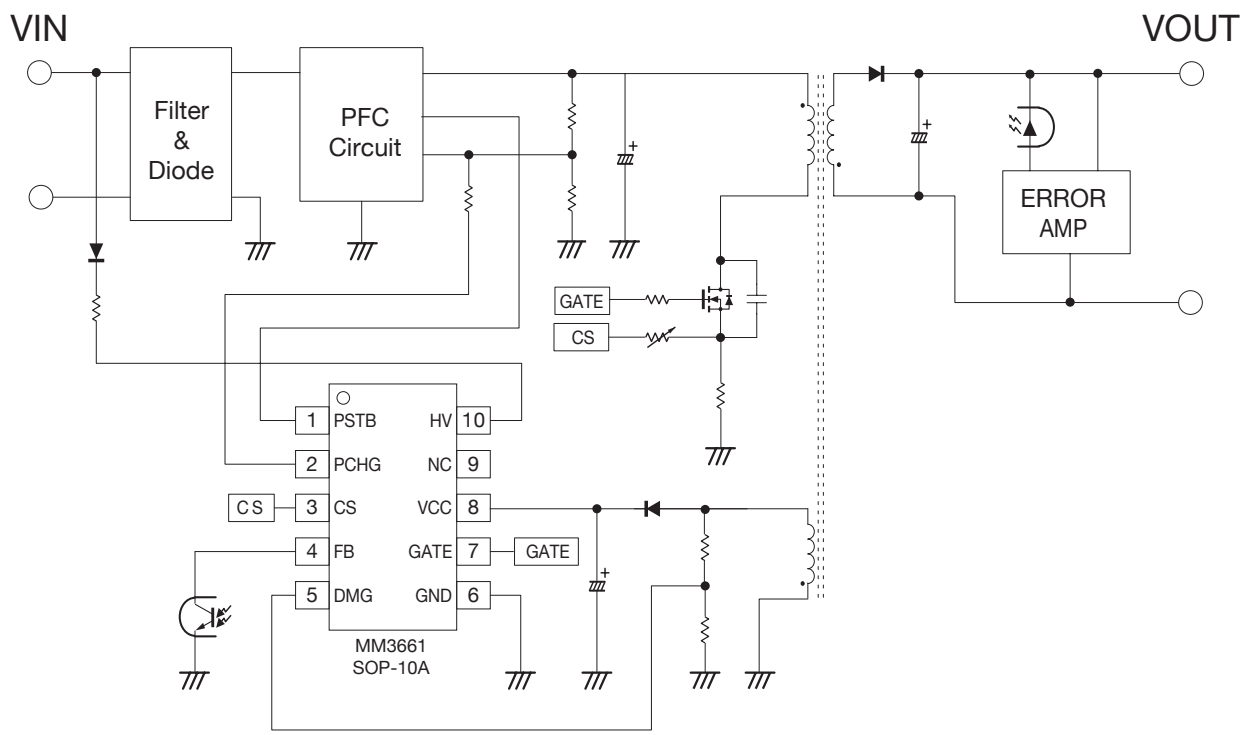
SOP-10A

(Top view)



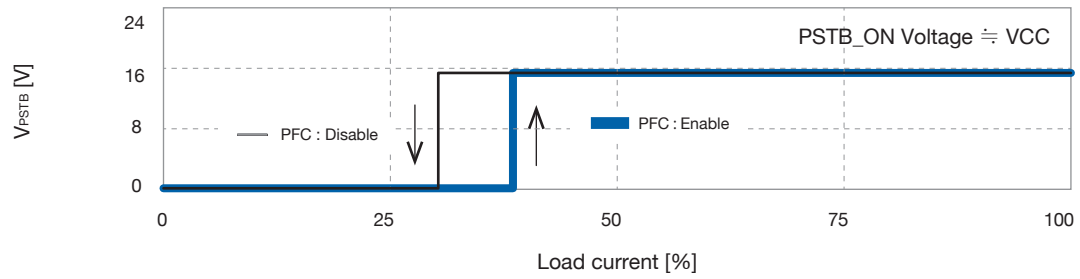
Pin no.	Symbol	Function
1	PSTB	PFC Circuit Drive (Power supply)
2	PCHG	PFC Circuit Output-Voltage Change
3	CS	Current Detection
4	FB	Feedback Detection
5	DMG	Zero-Cross Detection
6	GND	GND
7	GATE	External MOS drive
8	VCC	Power supply
9	GATE	No Connection
10	HV	High Voltage Startup

Block diagram

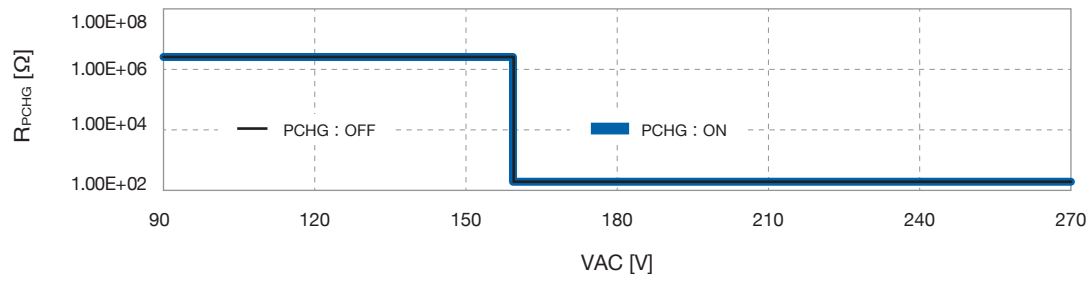


Efficiency characteristic

Light load detection



AC detection



2 POWER SUPPLY ICs

The PWM control IC for AC-DC converter

MM3663

Outline

The MM3663 is the current mode PWM controller IC, designed for flyback converter.
This IC can substantially reduce standby power by the start up circuit using the 500V high breakdown process, burst mode operating in low load, and optimization of supply current. Frequency reduction function in load of middle range and minimum frequency limit function prevent chattering noise in low load, and improve average efficiency. Select function of maximum frequency (66kHz or 100kHz) and adjustment function of FB pin voltage for oscillation stop which is innovation expand flexibility of the power supply design. Others,
frequency jittering function, X capacitor discharge function make the measures of EMI easy. The M3663
which has various protection functions can assist safety design of power supply.

Applications

(1) Flat panel TV
(2) DVD Player, BD Player, BD Recorder
(3) Printer, Copying Machine, FAX
(4) AaC/DC Adapters
(5) Various Power Supplies

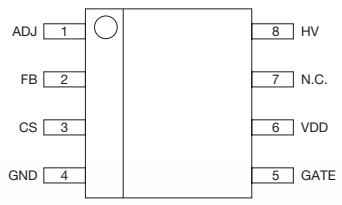
Features (Unless otherwise specified, Ta=+25°C)

(1) Start up circuit by 500V high breakdown process reduce start up circuit loss.
(2) Current mode PWM controller (select function of maximum oscillating frequency, 66kHz or 100kHz)
(3) Frequency reduction function in load of middle range improve avearge efficiency.
(4) Low voltage of UVLO and low supply current in oscillation stop reduce standby power more.
(5) Noise diffusion, downsize filter by frequency jitter function in all range.
(6) X capacitor discharge function which don't increase standby power can make the measures of EMI easy.
(7) Seam of burst mode and continuous oscillation mode can be arbitrarily adjusted.Balance adjustment between standby power and output ripple.
(8) Input voltage correction function of load current in over current protection realize flat correction characteristics.
(9) Substantial protection functions included, current detect pin open detection, auxiliary winding short detection, and so on.
(10) The CB certification in the X capacitor discharge function is acquired.
(IEC60065, IEC60950-1, IEC62368-1)

Pin assignment

SOP-8J

(Top view)

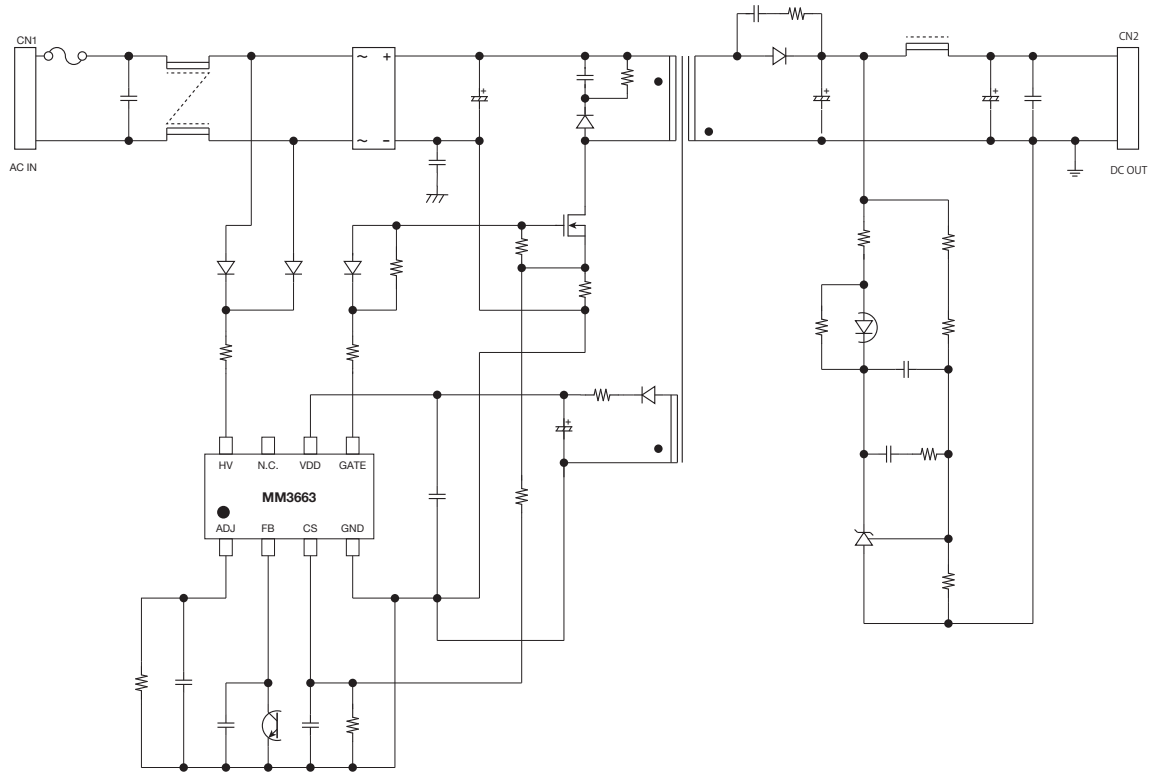


No.	Symbol	Function
1	ADJ	GATE output stop voltage setting, external latch input, and oscillator frequency select pin
2	FB	Feedback input pin
3	CS	Current sense pin
4	GND	Ground pin
5	GATE	Output pin
6	VDD	Power supply input pin
7	N.C.	No connection
8	HV	High voltage startup pin

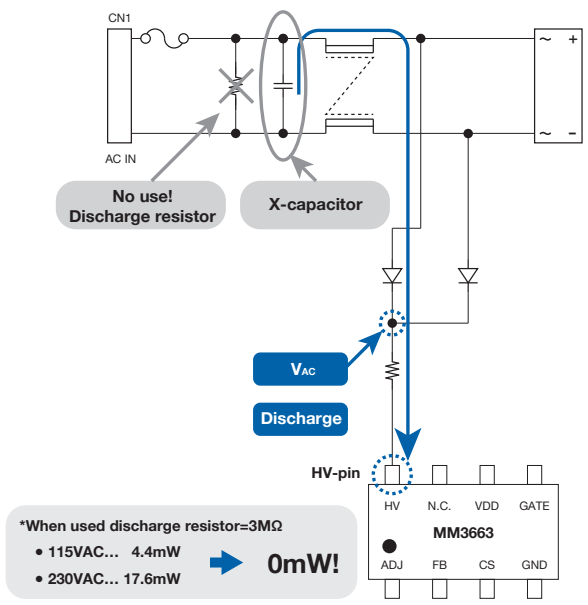
Lineup

Product	Package	X-capacitor discharge	Function
MM3663AFFE	SOP-8J	○	Latch off in Over Load Protection
MM3663BFFE	SOP-8J	○	Auto restart in Over Load Protection
MM3663CFFE	SOP-8J	-	Latch off in Over Load Protection
MM3663DFFE	SOP-8J	-	Auto restart in Over Load Protection

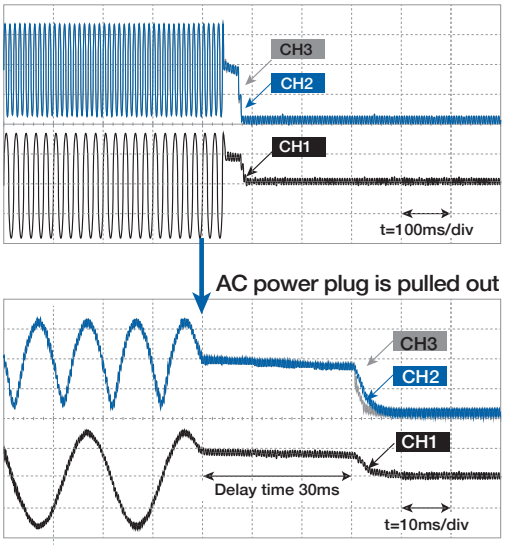
Application circuit



X-capacitor discharge



Discharge waveform (No Load, AC230V)



Condition	Input :230VAC	
	Output :19V / 0.0A	
CH1	V_X-capacitor	CH3 200V / div
CH2	VAC_Rectification	CH2 100V / div
CH3	V_HV-pin	CH1 100V / div

2 POWER SUPPLY ICs

Secondary-side synchronouse rectifier for QR/LLC

MM3667 series

Outline

MM3667AF is secondary side synchronous rectification control IC to drive MOSFETs in isolated AC–DC converter.
It is able to achieve very high efficiency by replacing secondary rectifier diode with power MOSFET and MM3667.
It is effective for the miniaturization of the power supply by decreasing of heat generation.
MM3667 controls Turn-ON/OFF of MOSFET by detecting only secondary signals.
MM3667 has standby mode. Using this mode, the standby power requirement is able to be suppressed to low.

Features (Unless otherwise specified, Ta=+25°C)

(1) Supply voltage ..... 6.0V to 15.0V
(2) Gate drive voltage ..... 6.0V to 15.0V
(Equal to VCC)
(3) Turn–OFF threshold voltage ..... Variable
(4) OFF timming detect ..... Drain voltage detecting.
(5) Equipped with standby mode

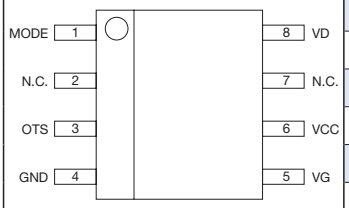
Applications

(1) LCD-TV
(2) Gaming consoles
(3) AC Adapter
(4) Switching power supply

Pin assignment

SOP-8J (MM3667A)

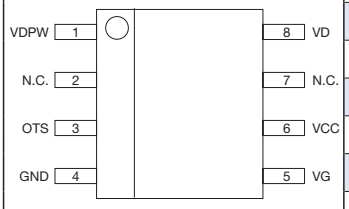
(Top view)



Pin no.	Symbol	Function
1	MODE	Operation mode setting / Internal parameter setting
2	N.C.	Non connection
3	OTS	Turn–Off threshold setting / Standby detection
4	GND	Ground / MOSFET source connect
5	VG	Gate driver output
6	VCC	IC and gate driver power supply input
7	N.C.	N.C.
8	VD	MOSFET drain voltage detection

SOP-8J (MM3667B)

(Top view)

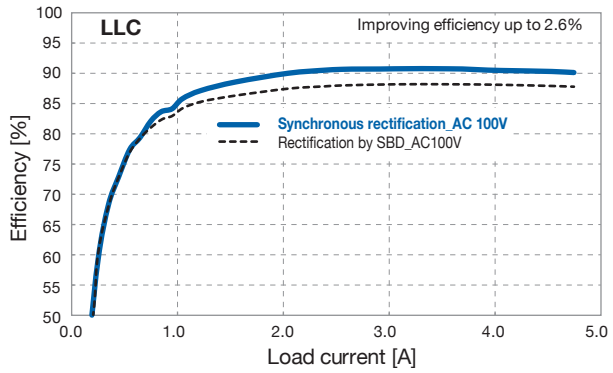


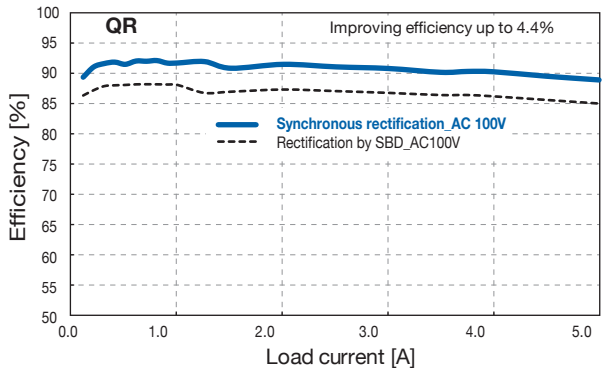
Pin no.	Symbol	Function
1	VDPW	VDPW setting / Stanby mode detection
2	N.C.	N.C.
3	OTS	Turn-Off threshold setting
4	GND	Ground / MOSFET source connect
5	VG	Gate driver output
6	VCC	IC and gate driver power supply input
7	N.C.	N.C.
8	VD	MOSFET drain voltage detection

Lineup

Product name	Supports	Frequency	minimum on–time setting	VDPW setting range	Stanby mode detectoin terminal
MM3667A	Half-Bridge LLC resonant Quasi-Resonant flyback.	500kHz or less (LLC) 200kHz or less (QR)	External resistor	0.29µs to 1.71µs	OTS
MM3667B	Quasi-Resonant flyback.	170kHz or less (QR)	Built–in	0.48 to 3.35µs	VDPW

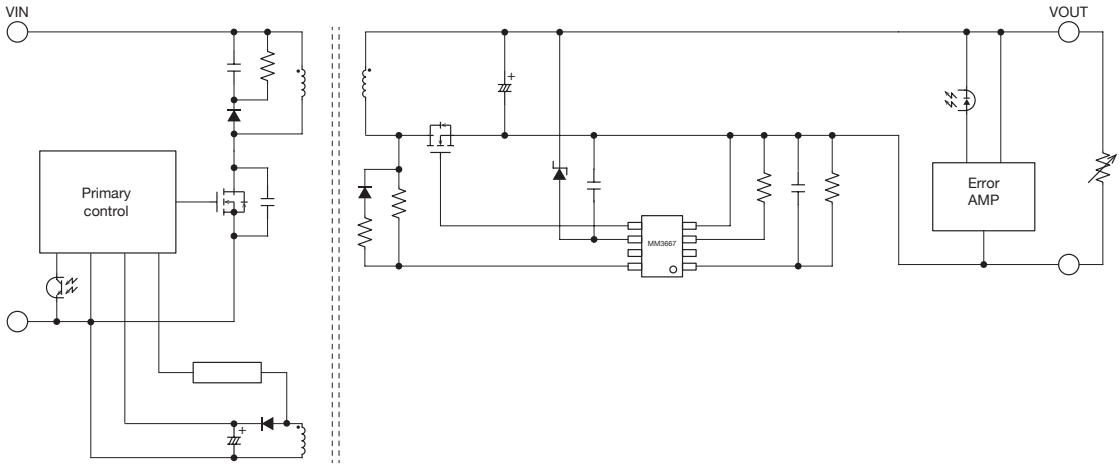
Performance characteristics

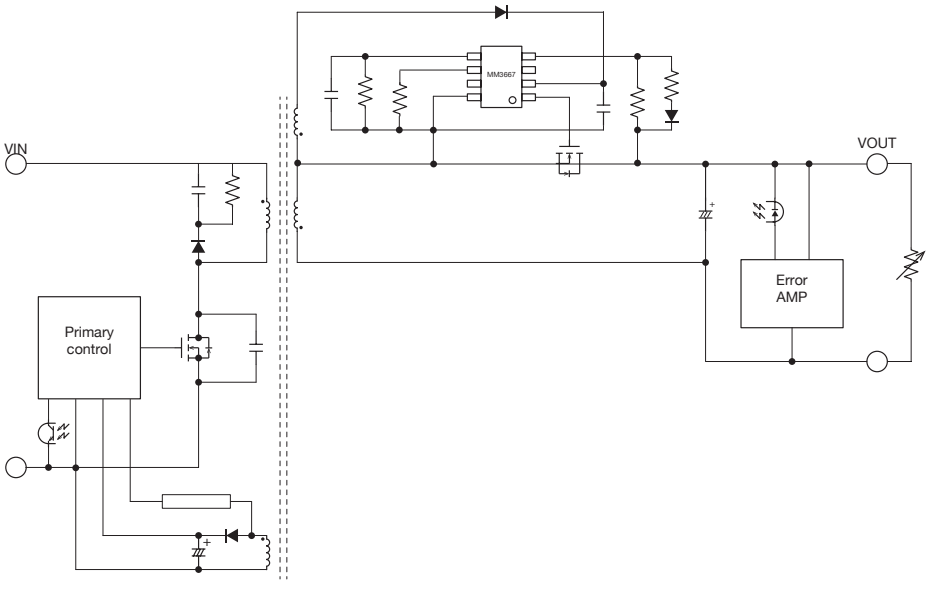




Application circuit

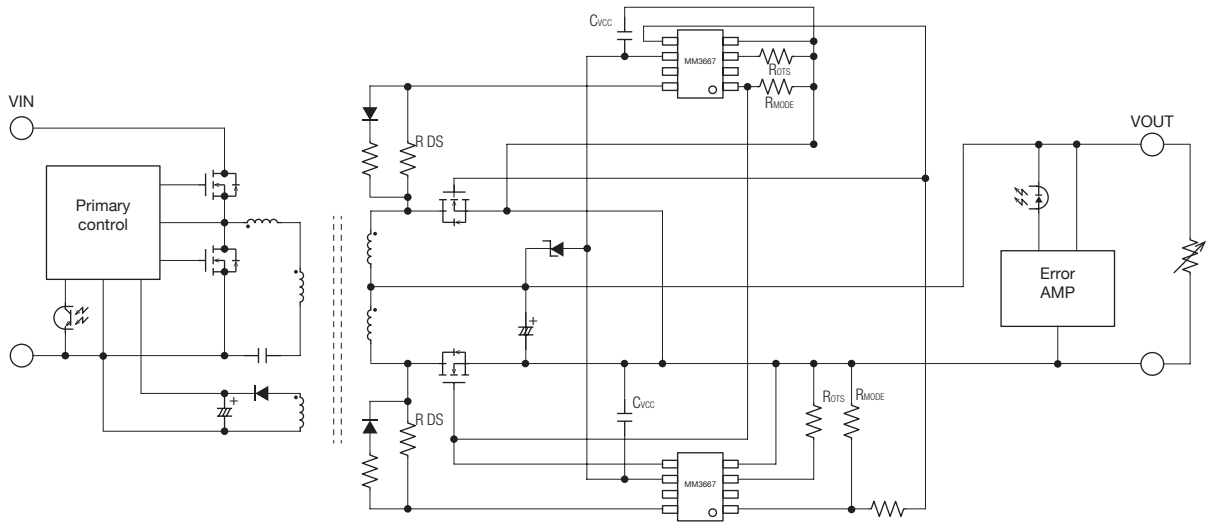
For QR





Application circuit

For LLC



2 POWER SUPPLY ICs

The synchronous rectification control IC for AC-DC converter

MM3669AF

Outline

MM3669 is secondary side synchronous rectification control IC to drive MOSFETs in isolated AC-DC converter.
It is able to achieve very high efficiency by replacing secondary rectifier diode with MOSFET and MM3669.
It is possible to correspond to various efficiency restrictions. And it is effective for the miniaturization of the power supply by the heat sink reduction and so on.
MM3669 has 2 gate driver, this constitution is specialized in Half-Bridge LLC resonant converter.
MM3669 controls turn-ON/OFF of MOSFET by detecting the voltage between drain and source of MOSFET. This turn-OFF threshold voltage is adjustable by the external resistor.
MM3669 has safety controller for LLC converter, as an example, preventing that VG is turned on at the same time.

Applications

(1) Flat TV
(2) High-Power AC-DC Adaptor
(3) Gaming Consoles
(4) High-Power SMPS
(5) Others

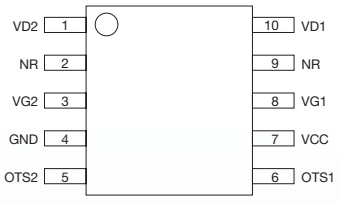
Features (Unless otherwise specified, Ta=+25°C)

(1) Supply Voltage .....7.5 to 15V
(2) Gate Output Voltage.....7.5 to 15V
It is equal to
(3) Two output driver for the half-bridge LLC current resonant converter
(4) Operating frequency .....500kHz less than more
(5) Safety controller for LLC converter
Prevent simultaneous "ON" between channels

Pin assignment

SOP-10A

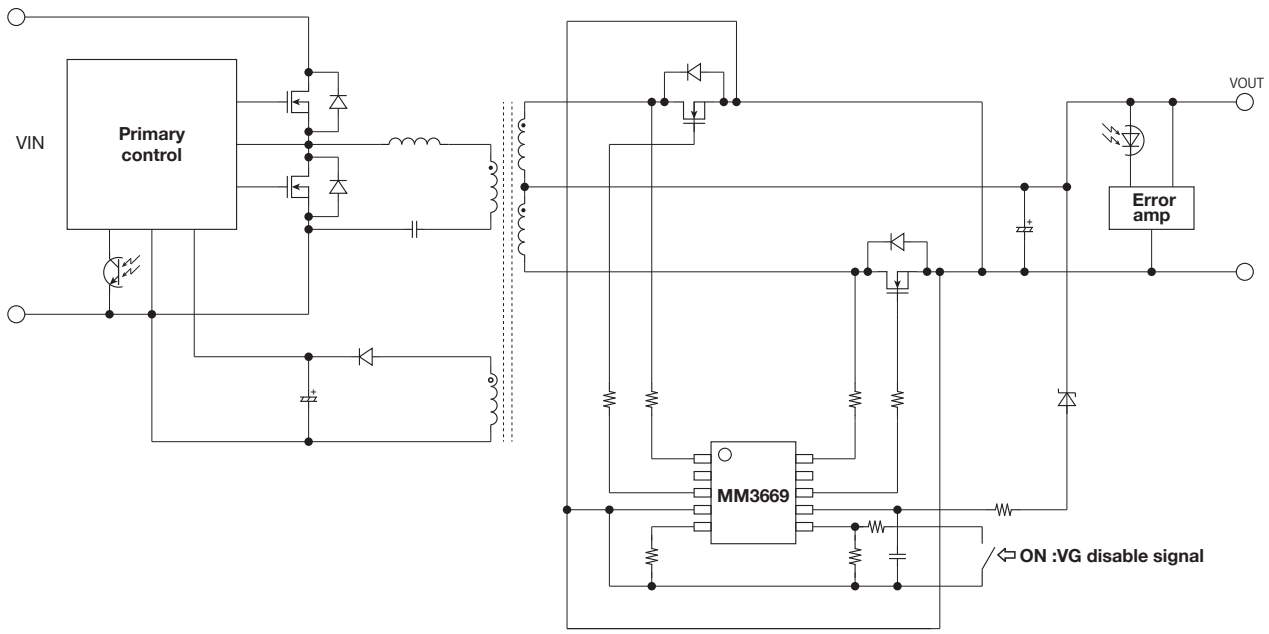
(Top view)



No.	Symbol	Function
1	VD2	MOSFET Drain Voltage Detection (Line2)
2	NR	Noise Reduction *1
3	VG2	Gate Driver Output (Line2)
4	GND	Ground / MOSFET Source Connection
5	OTS2	Turn-Off Threshold Setting (Line2) / VG Output Disable
6	OTS1	Turn-Off Threshold Setting (Line1) / VG Output Disable
7	VCC	IC Power Input / Gate Driver Voltage Source
8	VG1	Gate Driver Output (Line1)
9	NR	Noise Reduction *1
10	VD1	MOSFET Drain Voltage Detection (Line1)

*1 NR pin is connected to GND pin in this IC. Prohibition of connection to other wiring.

Application circuit



2 POWER SUPPLY ICs

White LED driver IC

MM3097

Outline

This IC is a white LED driver IC.
It is a boost DC–DC converter IC designed to drive up to 7 LEDs and suitable for backlight drivers.
Feedback voltage is as low as 95mV, which can reduce power consumption in a current set resistor.
A small 0.22µF capacitor can be used, so that not only space but costs can be reduced.

Features (Unless otherwise specified, Ta=+25°C)

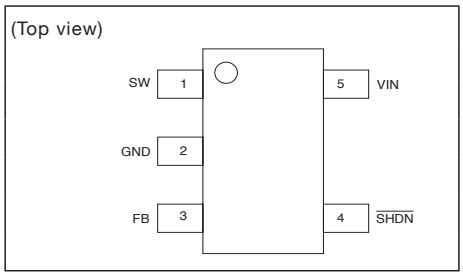
(1) Enables to drive up to 7 white LEDs in a series connection
(2) Input voltage range .....2.5V to 6.0V
(3) Shutdown current.....0.1µA typ.
(4) High efficiency.....85% typ.
(5) Luminance control.....PWM system
(6) Feedback voltage.....95mV

Applications

(1) Smart phones, Mobile phones
(2) Digital video cameras
(3) Digital still cameras
(4) Portable games
(5) Tablet PCs

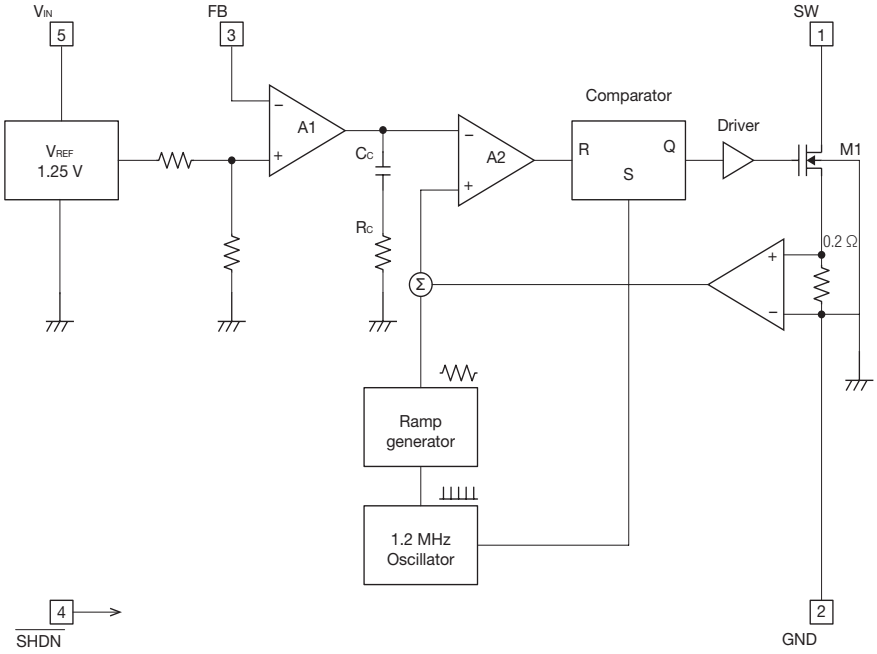
Pin assignment

SOT-25A

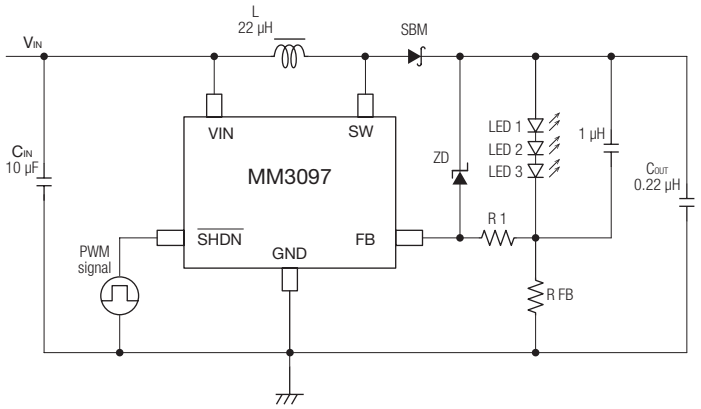


Pin no.	Symbol	function
1	SW	Switch
2	GND	Ground
3	FB	Feed back
4	SHDN	Shut down
5	VIN	IC power input

Block diagram



Typical application circuit



2 POWER SUPPLY ICs

PFC switching power control IC for LED lights

MM3460+MM1837

Outline

This IC is a PFC (Power Factor Correction) switching power control IC for LED lights.
Steady current and steady voltage application for LED lights can be achieved by using MM3460 for primary-side and MM1837 (operational amplifier and shunt regulator) for secondary side.
It uses a one-converter system into which a PFC circuit and an AC–DC converter become integrated. Compared to a regular two–converter, a high-efficient power supply circuit can be achieved due to reduction in the number of parts and little power loss. In addition, as a protection circuit, it has internal input low voltage and overvoltage protection, output overvoltage with delay and a short protection circuit.
Moreover, the consumption of Start–up current and current during operation are lowered for low standby mode electricity.

Applications

(1) LED lighting devices
(2) LED bulbs
(3) Other power supplies

Features (Unless otherwise specified, Ta=+25°C)

MM3460XFBE

(1) Limits for harmonic current emissions
(one-converter system)
(2) PF=0.99 (reference value)
(3) High efficiency: 88% (reference value, at rated load)
(4) Reduction in the number of parts by not using an active filter (PFC) control circuit
Longer life can be achieved by not using the primary electrolytic capacitor
(5) Electrical characteristics
- High voltage input 28V
- LED output : 5W to 60W
- Critical conduction current mode
- Built–in input UVLO, overvoltage protection (28V Zener) circuits
- Built–in output (FB) short, overvoltage protection circuits (with a delay feature)

*This Function is original protection

- Start–up current (30μA typ.), current during operation (1mA typ.)

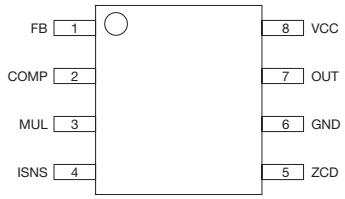
MM1837XFBE

(1) Dual op-amp and shunt regulator
(2) Electrical characteristics
- Input offset voltage..... 0.2mV typ.
- Input offset current..... 5nA typ.
- Reference voltage of shunt regulator .. 2.5V typ.
- Reference voltage deviation..... 5mV typ. (-20°C to +80°C)
- Minimum cathode current ..... 0.4mA typ.

Pin assignment

SOP-8D (MM3460XFBE)

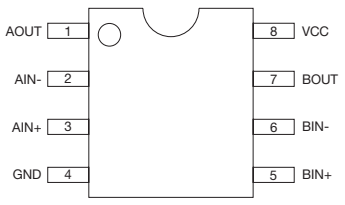
(Top view)



Pin no.	Symbol	Function
1	FB	Secondary side voltage feedback input pin.
2	COMP	Error amplifier output pin
3	MUL	AC voltage input pin
4	ISNS	Inductor current detection input pin
5	ZCD	Zero current detection pin
6	GND	Ground
7	OUT	Gate drive pin
8	VCC	IC supply voltage pin

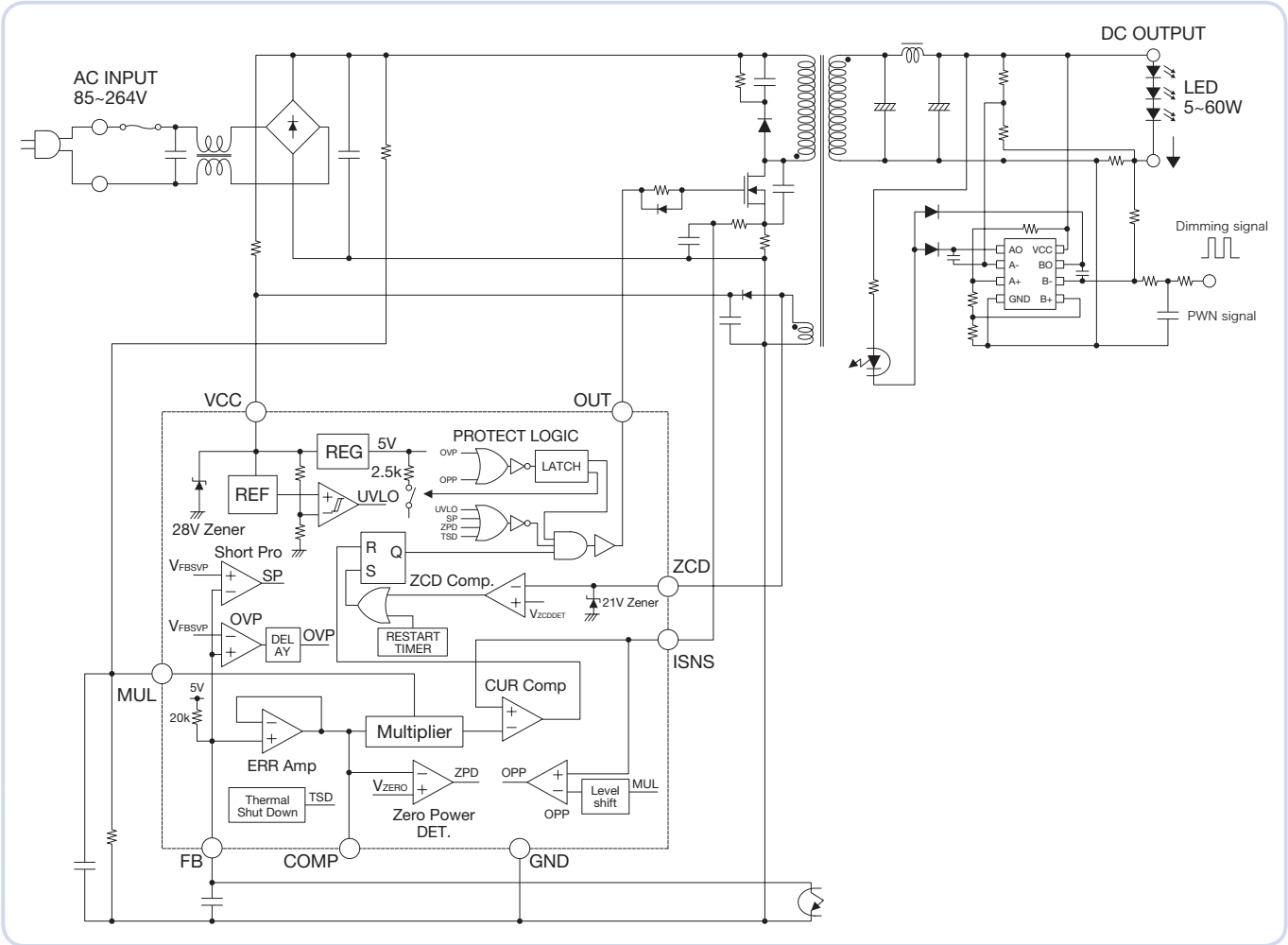
SOP-8C (MM1837XFBE)

(Top view)



Pin no.	Symbol	Function
1	AOUT	A OUTPUT
2	AIN-	A INPUT-
3	AIN+	A INPUT+
4	GND	GND
5	BIN+	B INPUT+
6	BIN-	B INPUT-
7	BOUT	B OUTPUT
8	VCC	IC supply voltage pin

Typical application circuit



Dimmer control function
(1) Steady current control for LED current is run on secondary side control circuit (MM1837).
(2) PWM dimmer method is used for dimmer control.
(3) Dimmer signal changes PWM to DC using outside filter. Then, it is used as a reference voltage for secondary side control IC.
(4) Phase control dimmer is not supported for MM3460 by itself.

2 POWER SUPPLY ICs

Triac dimmer power control for LED lighting

MM3760

Outline

MM3760 LED Lighting power supply IC is corresponding to the TRIAC dimming,
PWM dimming and DC dimming.
It adopts a quasi resonant switching, and has realized the low loss and low noise.
This IC is realized non-linear current curve by combination of peak current control and OFF-time variable control, thereby it to allow visually smooth dimming curve.
And equipped with output terminal of phase detector for bleeder current control, it to allow reduce parts.

Applications

(1) Downlight
(2) Power supply input

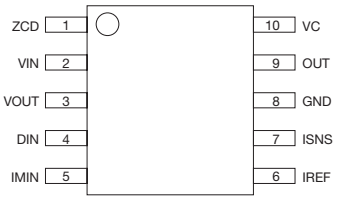
Features (Unless otherwise specified, Ta=+25°C)

(1) Supported Phase / PWM / DC dimming
(2) Low loss and low noise by Quasi resonant switching
(3) Smooth dimming by combination of peak current control and OFF-time variable control.
(4) Equipped with OUTPUT of phase detector for bleeder current control
(5) Equipped with Minimum current clamp function
(6) Corresponding to Hotal switch (Parallel connection of up to five)
(7) Equipped with various protect function (OCP, SWP, UVLO, TSD, ISNS terminal open protection)
(8) Operating voltage range.....10 to 25.5V
(9) Current consumption .....3.5mA (typ.)
(10) Load resistance for Hotal switch .....10KΩ (typ.)
(11) Maximun ISNS detect voltage.....0.6V (typ.)
(12) Over current detect voltage.....0.8V (typ.)
(13) Short winding protection detect voltage .....2.5V (typ.)

Pin assignment

SOP-10A

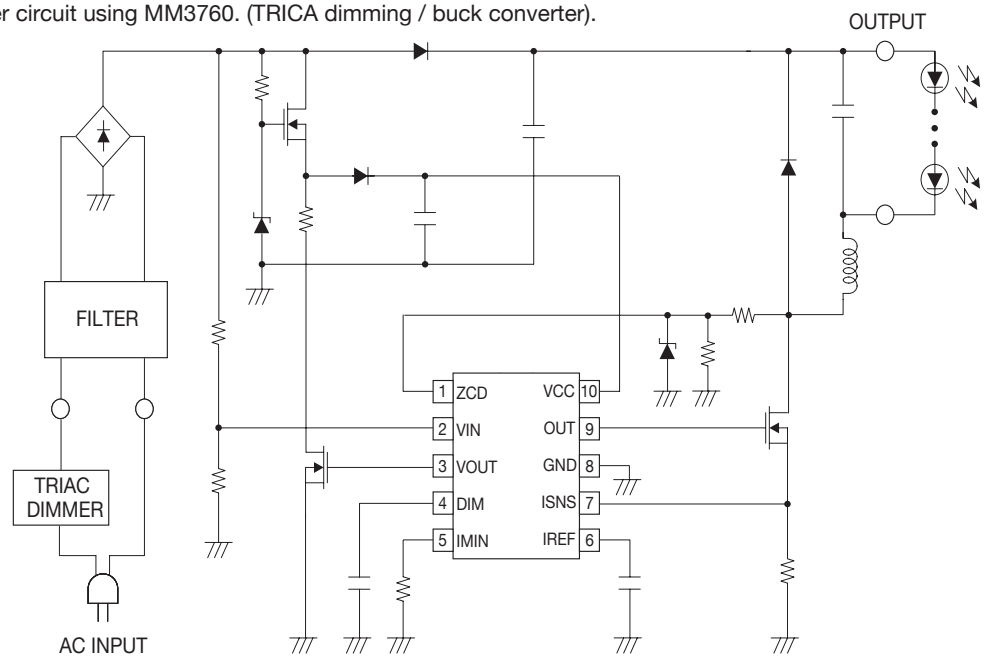
(Top view)



Pin no.	Symbol	Function
1	ZCD	Zero-current detect
2	VIN	Phase detect Input
3	VOUT	Phase detect Outpu
4	DIN	Light dimming
5	IMIN	Mnimum LED current control
6	IREF	LED current sensing reference voltage
7	ISNS	LED current sensing
8	GND	GND
9	OUT	Gate drive
10	VCC	Power supply input

Application circuit

Typical LED driver circuit using MM3760. (TRICA dimming / buck converter).



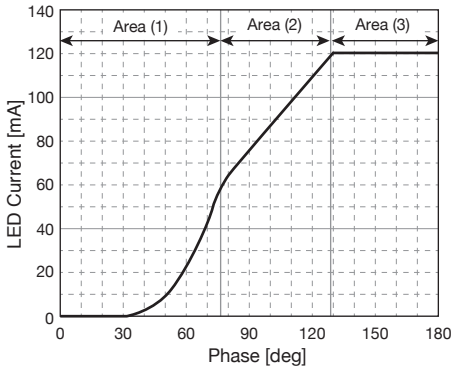
Dimming characteristic

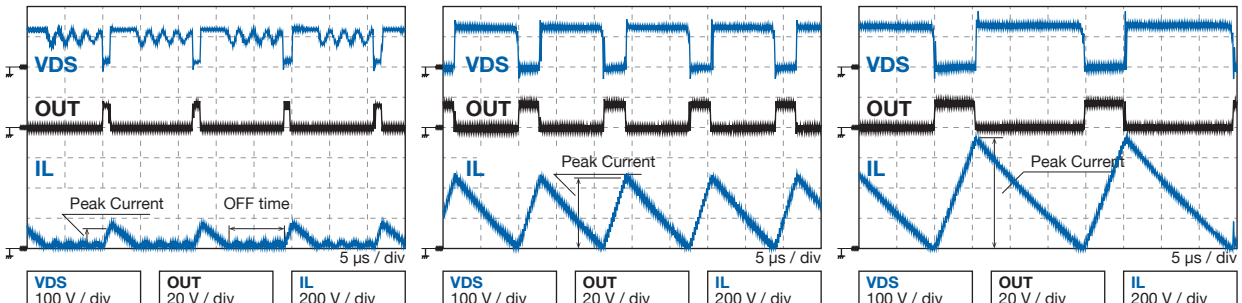
Right Graph is example of LED light using MM3760.
Horizontal axis is Phase of TRIAC dimmer, and vertical axis is LED-current.
To allow visually smooth dimming curve by non-linear current curve of "Area(1)".
Operation of each area is determined by the peak current control and OFF-time variable control.

(1) Peak& OFF-time variable area
LED-current is determined by peak current control and OFF-time variable control.
(2) Area of peak current control
LED-current is determined by peak current control only.
(3) Peak fixed area

LED-current is fixed Max.
Under diagram is Waveform of each area.

VDS : Drain voltage **OUT : Gate drive terminal voltage** **IL : Inductor current**





2 RESET IC (Voltage detector)

Electrical characteristics

(Unless otherwise specified, Ta=+25°C)

Product series	Product name	Rank of detection voltage (Typ.)	Detection voltage accuracy	Operating voltage	Current consumption (typ.)	Output type	Delay time	Packages
No delay function (Standard)	IC-PST81 series	0.8V to 6.0V	±0.5% (2.0V to 6.0V) ±0.8% (0.8V to 1.9V)	0.70V to 10.0V	0.25μA	CMOS output active low	–	SC–82ABB SOT–25A SSON–4B
	IC-PST82 series	0.8V to 6.0V	±0.5% (2.0V to 6.0V) ±0.8% (0.8V to 1.9V)	0.70V to 10.0V	0.25μA	Open drain output active low	–	SC–82ABB SOT–25A SSON–4B
	IC-PST86 series NEW	1.2V to 5.2V	±10%	0.95V to 6.5V	0.25μA	Open drain output active low	–	SC–82ABB SOT–25A
Separated sense line	PST851A series PST852A series	0.8V to 6.0V	±0.5% (2.0V to 5.2V) ±0.8% (0.8V to 1.9V)	0.70V to 6.0V	0.35μA	CMOS output open drain output active low	–	SC–82ABB SOT–25A SSON–4B
Delay function included (External capacitor)	IC-PST83 series	0.8V to 6.0V	±0.5% (2.0V to 6.0V) ±0.8% (0.8V to 1.9V)	0.70V to 10.0V	0.35μA	CMOS output active low	External	SC–82ABB SOT–25A SSON–4B
	IC-PST84 series	0.8V to 6.0V	±0.5% (2.0V to 6.0V) ±0.8% (0.8V to 1.9V)	0.70 to 10.0V	0.35μA	Open drain output active low	External	SC–82ABB SOT–25A SSON–4B
	PST893A series PST894A series NEW	1.2V to 5.2V	±1.0%	0.95V to 6.5V	0.35μA	CMOS output open drain output active low	External	SC–82ABB SOT–25A PLP–4A
	PST893B series PST894B series NEW	1.2V to 5.2V	±1.0%	0.95V to 6.5V	0.35μA	CMOS output open drain output active low	External	SC–82ABB SOT–25A
	PST893R series PST894R series NEW	0.8V to 5.2V	±1.0%	0.70V to 6.0V	0.35μA	CMOS output open drain output active low	External	SOT–25A
========== ==========	PST853A series PST854A series NEW	0.8V to 5.2V	±1.0% (2.0V to 6.0V) ±20mV (0.8V to 1.9V)	0.70V to 10.0V	0.35μA	CMOS output open drain output active low	External	SOT–25A
Built-in delay function	PST87 series	1.6V to 4.6V	±1.5%	1.0V to 5.5V	1.0μA	CMOS output active low	Built–in	SC–82ABB SOT–25A SSON–4B
	PST88 series	1.6V to 4.6V	±1.5%	1.0V to 5.5V	1.0μA	Open drain output active low	Built–in	SC–82ABB SOT–25A SSON–4B
	PST803 series PST805 series	1.6V to 5.0V	±1.0%	1.0V to 6.0V	0.5μA	Open drain output active low	Built–in	SOT–23A
	PST804 series PST806 series	1.6V to 5.0V	±1.0%	1.0V to 6.0V	0.5μA	Open drain output active high	Built–in	SOT–23A
	PST807 series PST809 series	1.6V to 5.0V	±1.0%	1.0V to 6.0V	0.5μA	CMOS output active low	Built–in	SOT–23A
	PST808 series PST810 series	1.6V to 5.0V	±1.0%	1.0V to 6.0V	0.5μA	CMOS output active high	Built–in	SOT–23A

2 RESET IC (Voltage detector)

High accuracy CMOS system reset

IC-PST81 / IC-PST82 Series

Outline

This IC functions in a variety of CPU systems and other logic systems, to detect supply voltage and reset the system accurately when the power is turned on or interrupted.
To ±1.5% of detection voltage accuracy of the conventional models, a maximum of ±0.5% of super-high precision is realized, and it is more suitable for battery detection etc. Moreover, the mounting area significantly contributes to space saving using the SSON package.

Features (Unless otherwise specified, Ta=+25°C)

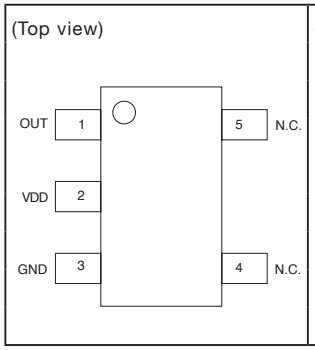
(1) High Accuracy ..... ±0.5% typ. / 2.0 to 6.0V
±0.8% typ. / 0.8 to 1.9V
(2) Ultra-low current consumption . 0.25μA typ.
(3) Ultra-small package ..... 1.10×1.40mm(SS0N–4B)
(4) Operating temperature range ... –40°C to +105°C
(5) Detecting voltage rank ..... 0.8V to 6.0V(0.1V step)
(6) Output configuration ..... IC-PST81 series :CMOS output
IC-PST82 series :Open drain output

Applications

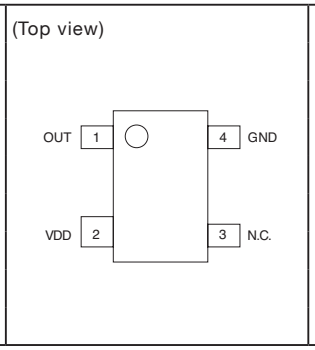
(1) Reset circuits for microcomputers, CPUs and MPUs
(2) Reset circuits for logic circuit
(3) Battery voltage check circuit
(4) Back-up power supply switching circuit
(5) Level detection circuit

Pin assignment

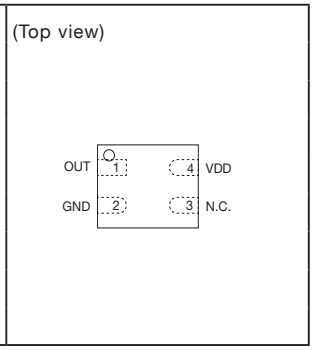
SOT-25A



SC-82ABB



SSON-4B



端子番号	SOT-25A	SC82-ABB	SSON-4B
1	OUT	OUT	OUT
2	VDD	VDD	GND
3	GND	N.C.	N.C.
4	N.C.	GND	VDD
5	N.C.	---	---

Model name structure

■SC-82ABB/SOT-25A Halogen–conteined Product

I C - P S T 8 1 □ □ □ □
I C - P S T 8 2 □ □ □ □

Housing
R housing R
L housing L

Package code
SC–82ABB U
SOT–25A N

Output voltage
0.8V to 6.0V 08 to 60

CMOS output IC-PST81
Open drain output IC-PST82

Model name structure

■SSON-4B Halogen–free Product

IC-PST81□□□□
IC-PST82□□□□

Housing	
R housing	R
L housing	L
Package code	
SSON-4B	R
Output voltage	
0.8V to 6.0V	08 to 60
CMOS output	IC-PST81
Open drain output	IC-PST82

■SC-82ABB/SOT-25A Halogen–free Product

PST81□□□□H
PST82□□□□H

Halogen free	
Housing	
R housing	R
L housing	L
Package code	
SC–82ABB	U
SOT–25A	N
Output voltage	
0.8V to 6.0V	08 to 60
CMOS output	PST81
Open drain output	PST82

Selection guide

Detection Voltage	Accuracy	Reset Threshold Hysteresis (typ.)	CMOS output		
			SOT–25A Package (3,000pcs/Reel)	SC–82ABB Package (3,000pcs/Reel)	SSON–4B Package (3,000pcs/Reel)
0.8V	±0.8%	0.040V	IC–PST8108NR	IC–PST8108UR	IC–PST8108RL
0.9V	±0.8%	0.045V	IC–PST8109NR	IC–PST8109UR	IC–PST8109RL
1.0V	±0.8%	0.050V	IC–PST8110NR	IC–PST8110UR	IC–PST8110RL
1.1V	±0.8%	0.055V	IC–PST8111NR	IC–PST8111UR	IC–PST8111RL
1.2V	±0.8%	0.060V	IC–PST8112NR	IC–PST8112UR	IC–PST8112RL
1.3V	±0.8%	0.065V	IC–PST8113NR	IC–PST8113UR	IC–PST8113RL
1.4V	±0.8%	0.070V	IC–PST8114NR	IC–PST8114UR	IC–PST8114RL
1.5V	±0.8%	0.075V	IC–PST8115NR	IC–PST8115UR	IC–PST8115RL
1.6V	±0.8%	0.080V	IC–PST8116NR	IC–PST8116UR	IC–PST8116RL
1.7V	±0.8%	0.085V	IC–PST8117NR	IC–PST8117UR	IC–PST8117RL
1.8V	±0.8%	0.090V	IC–PST8118NR	IC–PST8118UR	IC–PST8118RL
1.9V	±0.8%	0.095V	IC–PST8119NR	IC–PST8119UR	IC–PST8119RL
2.0V	±0.5%	0.100V	IC–PST8120NR	IC–PST8120UR	IC–PST8120RL
2.1V	±0.5%	0.105V	IC–PST8121NR	IC–PST8121UR	IC–PST8121RL
2.2V	±0.5%	0.110V	IC–PST8122NR	IC–PST8122UR	IC–PST8122RL
2.3V	±0.5%	0.115V	IC–PST8123NR	IC–PST8123UR	IC–PST8123RL
2.4V	±0.5%	0.120V	IC–PST8124NR	IC–PST8124UR	IC–PST8124RL
2.5V	±0.5%	0.125V	IC–PST8125NR	IC–PST8125UR	IC–PST8125RL
2.6V	±0.5%	0.130V	IC–PST8126NR	IC–PST8126UR	IC–PST8126RL
2.7V	±0.5%	0.135V	IC–PST8127NR	IC–PST8127UR	IC–PST8127RL
2.8V	±0.5%	0.140V	IC–PST8128NR	IC–PST8128UR	IC–PST8128RL
2.9V	±0.5%	0.145V	IC–PST8129NR	IC–PST8129UR	IC–PST8129RL
3.0V	±0.5%	0.150V	IC–PST8130NR	IC–PST8130UR	IC–PST8130RL
3.1V	±0.5%	0.155V	IC–PST8131NR	IC–PST8131UR	IC–PST8131RL
3.2V	±0.5%	0.160V	IC–PST8132NR	IC–PST8132UR	IC–PST8132RL
3.3V	±0.5%	0.165V	IC–PST8133NR	IC–PST8133UR	IC–PST8133RL
3.4V	±0.5%	0.170V	IC–PST8134NR	IC–PST8134UR	IC–PST8134RL
3.5V	±0.5%	0.175V	IC–PST8135NR	IC–PST8135UR	IC–PST8135RL
3.6V	±0.5%	0.180V	IC–PST8136NR	IC–PST8136UR	IC–PST8136RL
3.7V	±0.5%	0.185V	IC–PST8137NR	IC–PST8137UR	IC–PST8137RL
3.8V	±0.5%	0.190V	IC–PST8138NR	IC–PST8138UR	IC–PST8138RL
3.9V	±0.5%	0.195V	IC–PST8139NR	IC–PST8139UR	IC–PST8139RL
4.0V	±0.5%	0.200V	IC–PST8140NR	IC–PST8140UR	IC–PST8140RL
4.1V	±0.5%	0.205V	IC–PST8141NR	IC–PST8141UR	IC–PST8141RL
4.2V	±0.5%	0.210V	IC–PST8142NR	IC–PST8142UR	IC–PST8142RL
4.3V	±0.5%	0.215V	IC–PST8143NR	IC–PST8143UR	IC–PST8143RL
4.4V	±0.5%	0.220V	IC–PST8144NR	IC–PST8144UR	IC–PST8144RL
4.5V	±0.5%	0.225V	IC–PST8145NR	IC–PST8145UR	IC–PST8145RL
4.6V	±0.5%	0.230V	IC–PST8146NR	IC–PST8146UR	IC–PST8146RL
4.7V	±0.5%	0.235V	IC–PST8147NR	IC–PST8147UR	IC–PST8147RL
4.8V	±0.5%	0.240V	IC–PST8148NR	IC–PST8148UR	IC–PST8148RL
4.9V	±0.5%	0.245V	IC–PST8149NR	IC–PST8149UR	IC–PST8149RL
5.0V	±0.5%	0.250V	IC–PST8150NR	IC–PST8150UR	IC–PST8150RL
5.1V	±0.5%	0.255V	IC–PST8151NR	IC–PST8151UR	IC–PST8151RL
5.2V	±0.5%	0.260V	IC–PST8152NR	IC–PST8152UR	IC–PST8152RL
5.3V	±0.5%	0.265V	IC–PST8153NR	IC–PST8153UR	IC–PST8153RL
5.4V	±0.5%	0.270V	IC–PST8154NR	IC–PST8154UR	IC–PST8154RL
5.5V	±0.5%	0.275V	IC–PST8155NR	IC–PST8155UR	IC–PST8155RL
5.6V	±0.5%	0.280V	IC–PST8156NR	IC–PST8156UR	IC–PST8156RL
5.7V	±0.5%	0.285V	IC–PST8157NR	IC–PST8157UR	IC–PST8157RL
5.8V	±0.5%	0.290V	IC–PST8158NR	IC–PST8158UR	IC–PST8158RL
5.9V	±0.5%	0.295V	IC–PST8159NR	IC–PST8159UR	IC–PST8159RL
6.0V	±0.5%	0.300V	IC–PST8160NR	IC–PST8160UR	IC–PST8160RL

Selection guide

Detection Voltage	Accuracy	Reset Threshold Hysteresis (typ.)	Open drain output		
			SOT-25A Package (3,000pcs/Reel)	SC-82ABB Package (3,000pcs/Reel)	SSON-4B Package (3,000pcs/Reel)
0.8V	±0.8%	0.040V	IC-PST8208NR	IC-PST8208UR	IC-PST8208RL
0.9V	±0.8%	0.045V	IC-PST8209NR	IC-PST8209UR	IC-PST8209RL
1.0V	±0.8%	0.050V	IC-PST8210NR	IC-PST8210UR	IC-PST8210RL
1.1V	±0.8%	0.055V	IC-PST8211NR	IC-PST8211UR	IC-PST8211RL
1.2V	±0.8%	0.060V	IC-PST8212NR	IC-PST8212UR	IC-PST8212RL
1.3V	±0.8%	0.065V	IC-PST8213NR	IC-PST8213UR	IC-PST8213RL
1.4V	±0.8%	0.070V	IC-PST8214NR	IC-PST8214UR	IC-PST8214RL
1.5V	±0.8%	0.075V	IC-PST8215NR	IC-PST8215UR	IC-PST8215RL
1.6V	±0.8%	0.080V	IC-PST8216NR	IC-PST8216UR	IC-PST8216RL
1.7V	±0.8%	0.085V	IC-PST8217NR	IC-PST8217UR	IC-PST8217RL
1.8V	±0.8%	0.090V	IC-PST8218NR	IC-PST8218UR	IC-PST8218RL
1.9V	±0.8%	0.095V	IC-PST8219NR	IC-PST8219UR	IC-PST8219RL
2.0V	±0.5%	0.100V	IC-PST8220NR	IC-PST8220UR	IC-PST8220RL
2.1V	±0.5%	0.105V	IC-PST8221NR	IC-PST8221UR	IC-PST8221RL
2.2V	±0.5%	0.110V	IC-PST8222NR	IC-PST8222UR	IC-PST8222RL
2.3V	±0.5%	0.115V	IC-PST8223NR	IC-PST8223UR	IC-PST8223RL
2.4V	±0.5%	0.120V	IC-PST8224NR	IC-PST8224UR	IC-PST8224RL
2.5V	±0.5%	0.125V	IC-PST8225NR	IC-PST8225UR	IC-PST8225RL
2.6V	±0.5%	0.130V	IC-PST8226NR	IC-PST8226UR	IC-PST8226RL
2.7V	±0.5%	0.135V	IC-PST8227NR	IC-PST8227UR	IC-PST8227RL
2.8V	±0.5%	0.140V	IC-PST8228NR	IC-PST8228UR	IC-PST8228RL
2.9V	±0.5%	0.145V	IC-PST8229NR	IC-PST8229UR	IC-PST8229RL
3.0V	±0.5%	0.150V	IC-PST8230NR	IC-PST8230UR	IC-PST8230RL
3.1V	±0.5%	0.155V	IC-PST8231NR	IC-PST8231UR	IC-PST8231RL
3.2V	±0.5%	0.160V	IC-PST8232NR	IC-PST8232UR	IC-PST8232RL
3.3V	±0.5%	0.165V	IC-PST8233NR	IC-PST8233UR	IC-PST8233RL
3.4V	±0.5%	0.170V	IC-PST8234NR	IC-PST8234UR	IC-PST8234RL
3.5V	±0.5%	0.175V	IC-PST8235NR	IC-PST8235UR	IC-PST8235RL
3.6V	±0.5%	0.180V	IC-PST8236NR	IC-PST8236UR	IC-PST8236RL
3.7V	±0.5%	0.185V	IC-PST8237NR	IC-PST8237UR	IC-PST8237RL
3.8V	±0.5%	0.190V	IC-PST8238NR	IC-PST8238UR	IC-PST8238RL
3.9V	±0.5%	0.195V	IC-PST8239NR	IC-PST8239UR	IC-PST8239RL
4.0V	±0.5%	0.200V	IC-PST8240NR	IC-PST8240UR	IC-PST8240RL
4.1V	±0.5%	0.205V	IC-PST8241NR	IC-PST8241UR	IC-PST8241RL
4.2V	±0.5%	0.210V	IC-PST8242NR	IC-PST8242UR	IC-PST8242RL
4.3V	±0.5%	0.215V	IC-PST8243NR	IC-PST8243UR	IC-PST8243RL
4.4V	±0.5%	0.220V	IC-PST8244NR	IC-PST8244UR	IC-PST8244RL
4.5V	±0.5%	0.225V	IC-PST8245NR	IC-PST8245UR	IC-PST8245RL
4.6V	±0.5%	0.230V	IC-PST8246NR	IC-PST8246UR	IC-PST8246RL
4.7V	±0.5%	0.235V	IC-PST8247NR	IC-PST8247UR	IC-PST8247RL
4.8V	±0.5%	0.240V	IC-PST8248NR	IC-PST8248UR	IC-PST8248RL
4.9V	±0.5%	0.245V	IC-PST8249NR	IC-PST8249UR	IC-PST8249RL
5.0V	±0.5%	0.250V	IC-PST8250NR	IC-PST8250UR	IC-PST8250RL
5.1V	±0.5%	0.255V	IC-PST8251NR	IC-PST8251UR	IC-PST8251RL
5.2V	±0.5%	0.260V	IC-PST8252NR	IC-PST8252UR	IC-PST8252RL
5.3V	±0.5%	0.265V	IC-PST8253NR	IC-PST8253UR	IC-PST8253RL
5.4V	±0.5%	0.270V	IC-PST8254NR	IC-PST8254UR	IC-PST8254RL
5.5V	±0.5%	0.275V	IC-PST8255NR	IC-PST8255UR	IC-PST8255RL
5.6V	±0.5%	0.280V	IC-PST8256NR	IC-PST8256UR	IC-PST8256RL
5.7V	±0.5%	0.285V	IC-PST8257NR	IC-PST8257UR	IC-PST8257RL
5.8V	±0.5%	0.290V	IC-PST8258NR	IC-PST8258UR	IC-PST8258RL
5.9V	±0.5%	0.295V	IC-PST8259NR	IC-PST8259UR	IC-PST8259RL
6.0V	±0.5%	0.300V	IC-PST8260NR	IC-PST8260UR	IC-PST8260RL

2 RESET IC (Voltage detector)

CMOS system reset IC

IC-PST86 Series

Outline

This IC is a reset IC for turning on/off power supply and power flicker in CPU or logic systems.
The IC applies to the small battery(Li–ion, Li–pol) equipment by high accuracy ±1.0%. and low supply current 0.25μA typ.
IC-PST86 is compatible with IC-PST82.

Features (Unless otherwise specified, Ta=+25°C)

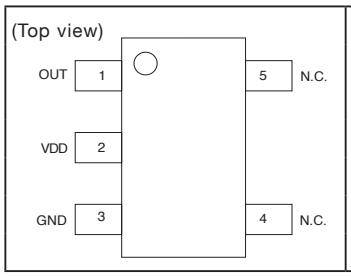
(1) High Accuracy ..... ±1.0% typ.
(2) Ultra-low current consumption.... 0.25μA typ.
(3) Operating-voltage range ..... 0.95V to 6.5V
(4) Operating temperature range ... –40°C to +105°C
(5) Detecting voltage rank ..... 1.2V to 5.2V (0.1Vstep)
(6) Output configuration ..... Open drain output

Applications

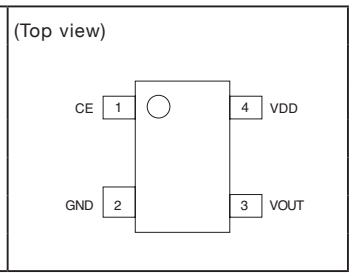
(1) Reset circuits for microcomputers, CPUs and MPUs
(2) Reset circuits for logic circuit
(3) Battery voltage check circuit
(4) Back-up power supply switching circuit
(5) Level detection circuit

Pin assignment

SOT-25A



SC-82ABB



Pin no.	SOT-25A	SC82-ABB
1	OUT	OUT
2	VDD	VDD
3	GND	N.C.
4	N.C.	GND
5	N.C.	---

Model name structure

■Halogen–conteined Product

I C - P S T 8 6 □ □ □ □

Housing	
R housing	R
L housing	L
Package code	
SC–82ABB	U
SOT–25A	N
Output voltage	
1.2V to 5.2V	12 to 52
Open drain output	IC-PST86

■Halogen–free Product

P S T 8 6 □ □ □ □ H
P S T 8 6 □ □ □ □ H

Halogen free	
Housing	
R housing	R
L housing	L
Package code	
SC–82ABB	U
SOT–25A	N
Output voltage	
1.2V to 5.2V	12 to 52
Open drain output	PST86

Selection guide

Detection Voltage	Accuracy	Reset Threshold Hysteresis (typ.)	Open drain output	
			SOT-25A Package (3,000pcs/Reel)	SC-82ABB Package (3,000pcs/Reel)
1.2V	±1.0%	0.060V	IC-PST8612NR	IC-PST8612UR
1.3V	±1.0%	0.065V	IC-PST8613NR	IC-PST8613UR
1.4V	±1.0%	0.070V	IC-PST8614NR	IC-PST8614UR
1.5V	±1.0%	0.075V	IC-PST8615NR	IC-PST8615UR
1.6V	±1.0%	0.080V	IC-PST8616NR	IC-PST8616UR
1.7V	±1.0%	0.085V	IC-PST8617NR	IC-PST8617UR
1.8V	±1.0%	0.090V	IC-PST8618NR	IC-PST8618UR
1.9V	±1.0%	0.095V	IC-PST8619NR	IC-PST8619UR
2.0V	±1.0%	0.100V	IC-PST8620NR	IC-PST8620UR
2.1V	±1.0%	0.105V	IC-PST8621NR	IC-PST8621UR
2.2V	±1.0%	0.110V	IC-PST8622NR	IC-PST8622UR
2.3V	±1.0%	0.115V	IC-PST8623NR	IC-PST8623UR
2.4V	±1.0%	0.120V	IC-PST8624NR	IC-PST8624UR
2.5V	±1.0%	0.125V	IC-PST8625NR	IC-PST8625UR
2.6V	±1.0%	0.130V	IC-PST8626NR	IC-PST8626UR
2.7V	±1.0%	0.135V	IC-PST8627NR	IC-PST8627UR
2.8V	±1.0%	0.140V	IC-PST8628NR	IC-PST8628UR
2.9V	±1.0%	0.145V	IC-PST8629NR	IC-PST8629UR
3.0V	±1.0%	0.150V	IC-PST8630NR	IC-PST8630UR
3.1V	±1.0%	0.155V	IC-PST8631NR	IC-PST8631UR
3.2V	±1.0%	0.160V	IC-PST8632NR	IC-PST8632UR
3.3V	±1.0%	0.165V	IC-PST8633NR	IC-PST8633UR
3.4V	±1.0%	0.170V	IC-PST8634NR	IC-PST8634UR
3.5V	±1.0%	0.175V	IC-PST8635NR	IC-PST8635UR
3.6V	±1.0%	0.180V	IC-PST8636NR	IC-PST8636UR
3.7V	±1.0%	0.185V	IC-PST8637NR	IC-PST8637UR
3.8V	±1.0%	0.190V	IC-PST8638NR	IC-PST8638UR
3.9V	±1.0%	0.195V	IC-PST8639NR	IC-PST8639UR
4.0V	±1.0%	0.200V	IC-PST8640NR	IC-PST8640UR
4.1V	±1.0%	0.205V	IC-PST8641NR	IC-PST8641UR
4.2V	±1.0%	0.210V	IC-PST8642NR	IC-PST8642UR
4.3V	±1.0%	0.215V	IC-PST8643NR	IC-PST8643UR
4.4V	±1.0%	0.220V	IC-PST8644NR	IC-PST8644UR
4.5V	±1.0%	0.225V	IC-PST8645NR	IC-PST8645UR
4.6V	±1.0%	0.230V	IC-PST8646NR	IC-PST8646UR
4.7V	±1.0%	0.235V	IC-PST8647NR	IC-PST8647UR
4.8V	±1.0%	0.240V	IC-PST8648NR	IC-PST8648UR
4.9V	±1.0%	0.245V	IC-PST8649NR	IC-PST8649UR
5.0V	±1.0%	0.250V	IC-PST8650NR	IC-PST8650UR
5.1V	±1.0%	0.255V	IC-PST8651NR	IC-PST8651UR
5.2V	±1.0%	0.260V	IC-PST8652NR	IC-PST8652UR

2 RESET IC (Voltage detector)

CMOS system reset IC with separated sense line

PST851A / PST852A Series

Outline

This IC has separated the detecting voltage monitor terminal (VS) and the VDD terminal. Even if monitor voltage VS falls, when an operating limit is reached for another power supply, an output does not become unfixed, and the power supply of IC can maintain low level. It is especially suitable for the power supply surveillance of the low power supply (1V system).

Applications

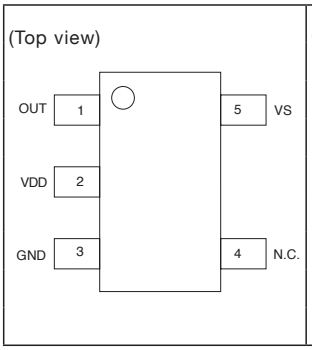
(1) Reset circuits for microcomputers, CPUs and MPUs
(2) Reset circuits for logic circuit
(3) Battery voltage check circuit
(4) Back-up power supply switching circuit
(5) Level detection circuit

Features (Unless otherwise specified, Ta=+25°C)

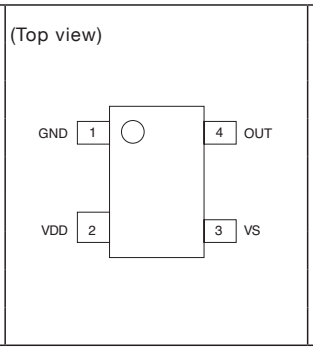
(1) Separated Sence Pin
(2) High Accuracy .....±0.5% typ. (2.0 to 6.0V)
±0.8% typ. (0.8 to 1.9V)
(3) Ultra-low current consumption .0.35μA typ.
(4) Operating-voltage range 0.7 to10.0V
(5) Ultra-small package .....1.10×1.40mm (SS0N–4B)
(6) Operating temperature range....–40°C to +105°C
(7) Detecting voltage rank .....0.8V to 6.0V (0.1Vstep)
(8) Output configuration
PST851A : CMOS output, Active–Low
PST852A : Open drain output, Active–Low

Pin assignment

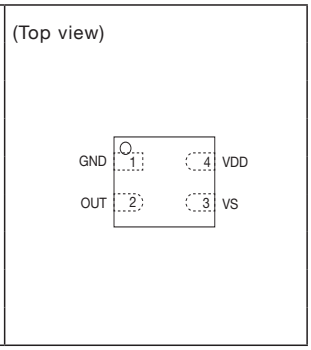
SOT-25A



SC-82ABB



SSON-4B



Pin no.	SOT-25A	SC82-ABB	SSON-4B
1	OUT	GND	GND
2	VDD	VDD	OUT
3	GND	VS	VS
4	N.C.	OUT	VDD
5	VS	---	---

Model name structure

■SC-82ABB/SOT-25A Halogen–conteined Product

P S T 8 5 1 A □ □ □ □ □
P S T 8 5 2 A □ □ □ □ □

Housing
R housing R
L housing L

Package code
SC–82ABB U
SOT–25A N

Output voltage
0.80V to 6.00V 080 to 600

CMOS output PST851A
Open drain output PST852A

Model name structure

■SSON-4B Halogen–free Product

PST851A□□□□□
PST852A□□□□□

- Housing
  - R housing — R
  - L housing — L
- Package code
  - SSON-4B — R
- Output voltage
  - 0.80V to 6.00V — 080 to 600
- CMOS output — PST851A
- Open drain output — PST852A

■SC-82ABB/SOT-25A Halogen–free Product

PST851A□□□□□
PST852A□□□□□

- Housing
  - R housing — R
  - L housing — L
- Package code
  - SC–82ABB — U
  - SOT–25A — N
- Output voltage
  - 0.80V to 6.00V — 080 to 600
- CMOS output — PST851A
- Open drain output — PST852A

Selection guide

Detection Voltage	Accuracy	Reset Threshold Hysteresis (typ.)	CMOS output		
			SOT-25A Package (3,000pcs/Reel)	SC-82ABB Package (3,000pcs/Reel)	SSON-4B Package (3,000pcs/Reel)
0.8V	±0.8%	0.040V	PST851A080NM	PST851A080UM	PST851A080RL
0.9V	±0.8%	0.045V	PST851A090NM	PST851A090UM	PST851A090RL
1.0V	±0.8%	0.050V	PST851A100NM	PST851A100UM	PST851A100RL
1.1V	±0.8%	0.055V	PST851A110NM	PST851A110UM	PST851A110RL
1.2V	±0.8%	0.060V	PST851A120NM	PST851A120UM	PST851A120RL
1.3V	±0.8%	0.065V	PST851A130NM	PST851A130UM	PST851A130RL
1.4V	±0.8%	0.070V	PST851A140NM	PST851A140UM	PST851A140RL
1.5V	±0.8%	0.075V	PST851A150NM	PST851A150UM	PST851A150RL
1.6V	±0.8%	0.080V	PST851A160NM	PST851A160UM	PST851A160RL
1.7V	±0.8%	0.085V	PST851A170NM	PST851A170UM	PST851A170RL
1.8V	±0.8%	0.090V	PST851A180NM	PST851A180UM	PST851A180RL
1.9V	±0.8%	0.095V	PST851A190NM	PST851A190UM	PST851A190RL
2.0V	±0.5%	0.100V	PST851A200NM	PST851A200UM	PST851A200RL
2.1V	±0.5%	0.105V	PST851A210NM	PST851A210UM	PST851A210RL
2.2V	±0.5%	0.110V	PST851A220NM	PST851A220UM	PST851A220RL
2.3V	±0.5%	0.115V	PST851A230NM	PST851A230UM	PST851A230RL
2.4V	±0.5%	0.120V	PST851A240NM	PST851A240UM	PST851A240RL
2.5V	±0.5%	0.125V	PST851A250NM	PST851A250UM	PST851A250RL
2.6V	±0.5%	0.130V	PST851A260NM	PST851A260UM	PST851A260RL
2.7V	±0.5%	0.135V	PST851A270NM	PST851A270UM	PST851A270RL
2.8V	±0.5%	0.140V	PST851A280NM	PST851A280UM	PST851A280RL
2.9V	±0.5%	0.145V	PST851A290NM	PST851A290UM	PST851A290RL
3.0V	±0.5%	0.150V	PST851A300NM	PST851A300UM	PST851A300RL
3.1V	±0.5%	0.155V	PST851A310NM	PST851A310UM	PST851A310RL
3.2V	±0.5%	0.160V	PST851A320NM	PST851A320UM	PST851A320RL
3.3V	±0.5%	0.165V	PST851A330NM	PST851A330UM	PST851A330RL
3.4V	±0.5%	0.170V	PST851A340NM	PST851A340UM	PST851A340RL
3.5V	±0.5%	0.175V	PST851A350NM	PST851A350UM	PST851A350RL
3.6V	±0.5%	0.180V	PST851A360NM	PST851A360UM	PST851A360RL
3.7V	±0.5%	0.185V	PST851A370NM	PST851A370UM	PST851A370RL
3.8V	±0.5%	0.190V	PST851A380NM	PST851A380UM	PST851A380RL
3.9V	±0.5%	0.195V	PST851A390NM	PST851A390UM	PST851A390RL
4.0V	±0.5%	0.200V	PST851A400NM	PST851A400UM	PST851A400RL
4.1V	±0.5%	0.205V	PST851A410NM	PST851A410UM	PST851A410RL
4.2V	±0.5%	0.210V	PST851A420NM	PST851A420UM	PST851A420RL
4.3V	±0.5%	0.215V	PST851A430NM	PST851A430UM	PST851A430RL
4.4V	±0.5%	0.220V	PST851A440NM	PST851A440UM	PST851A440RL
4.5V	±0.5%	0.225V	PST851A450NM	PST851A450UM	PST851A450RL
4.6V	±0.5%	0.230V	PST851A460NM	PST851A460UM	PST851A460RL
4.7V	±0.5%	0.235V	PST851A470NM	PST851A470UM	PST851A470RL
4.8V	±0.5%	0.240V	PST851A480NM	PST851A480UM	PST851A480RL
4.9V	±0.5%	0.245V	PST851A490NM	PST851A490UM	PST851A490RL
5.0V	±0.5%	0.250V	PST851A500NM	PST851A500UM	PST851A500RL
5.1V	±0.5%	0.255V	PST851A510NM	PST851A510UM	PST851A510RL
5.2V	±0.5%	0.260V	PST851A520NM	PST851A520UM	PST851A520RL
5.3V	±0.5%	0.265V	PST851A530NM	PST851A530UM	PST851A530RL
5.4V	±0.5%	0.270V	PST851A540NM	PST851A540UM	PST851A540RL
5.5V	±0.5%	0.275V	PST851A550NM	PST851A550UM	PST851A550RL
5.6V	±0.5%	0.280V	PST851A560NM	PST851A560UM	PST851A560RL
5.7V	±0.5%	0.285V	PST851A570NM	PST851A570UM	PST851A570RL
5.8V	±0.5%	0.290V	PST851A580NM	PST851A580UM	PST851A580RL
5.9V	±0.5%	0.295V	PST851A590NM	PST851A590UM	PST851A590RL
6.0V	±0.5%	0.300V	PST851A600NM	PST851A600UM	PST851A600RL

Selection guide

Detection Voltage	Accuracy	Reset Threshold Hysteresis (typ.)	Open drain output		
			SOT-25A Package (3,000pcs/Reel)	SC-82ABB Package (3,000pcs/Reel)	SSON-4B Package (3,000pcs/Reel)
0.8V	±0.8%	0.040V	PST852A080NM	PST852A080UM	PST852A080RL
0.9V	±0.8%	0.045V	PST852A090NM	PST852A090UM	PST852A090RL
1.0V	±0.8%	0.050V	PST852A100NM	PST852A100UM	PST852A100RL
1.1V	±0.8%	0.055V	PST852A110NM	PST852A110UM	PST852A110RL
1.2V	±0.8%	0.060V	PST852A120NM	PST852A120UM	PST852A120RL
1.3V	±0.8%	0.065V	PST852A130NM	PST852A130UM	PST852A130RL
1.4V	±0.8%	0.070V	PST852A140NM	PST852A140UM	PST852A140RL
1.5V	±0.8%	0.075V	PST852A150NM	PST852A150UM	PST852A150RL
1.6V	±0.8%	0.080V	PST852A160NM	PST852A160UM	PST852A160RL
1.7V	±0.8%	0.085V	PST852A170NM	PST852A170UM	PST852A170RL
1.8V	±0.8%	0.090V	PST852A180NM	PST852A180UM	PST852A180RL
1.9V	±0.8%	0.095V	PST852A190NM	PST852A190UM	PST852A190RL
2.0V	±0.5%	0.100V	PST852A200NM	PST852A200UM	PST852A200RL
2.1V	±0.5%	0.105V	PST852A210NM	PST852A210UM	PST852A210RL
2.2V	±0.5%	0.110V	PST852A220NM	PST852A220UM	PST852A220RL
2.3V	±0.5%	0.115V	PST852A230NM	PST852A230UM	PST852A230RL
2.4V	±0.5%	0.120V	PST852A240NM	PST852A240UM	PST852A240RL
2.5V	±0.5%	0.125V	PST852A250NM	PST852A250UM	PST852A250RL
2.6V	±0.5%	0.130V	PST852A260NM	PST852A260UM	PST852A260RL
2.7V	±0.5%	0.135V	PST852A270NM	PST852A270UM	PST852A270RL
2.8V	±0.5%	0.140V	PST852A280NM	PST852A280UM	PST852A280RL
2.9V	±0.5%	0.145V	PST852A290NM	PST852A290UM	PST852A290RL
3.0V	±0.5%	0.150V	PST852A300NM	PST852A300UM	PST852A300RL
3.1V	±0.5%	0.155V	PST852A310NM	PST852A310UM	PST852A310RL
3.2V	±0.5%	0.160V	PST852A320NM	PST852A320UM	PST852A320RL
3.3V	±0.5%	0.165V	PST852A330NM	PST852A330UM	PST852A330RL
3.4V	±0.5%	0.170V	PST852A340NM	PST852A340UM	PST852A340RL
3.5V	±0.5%	0.175V	PST852A350NM	PST852A350UM	PST852A350RL
3.6V	±0.5%	0.180V	PST852A360NM	PST852A360UM	PST852A360RL
3.7V	±0.5%	0.185V	PST852A370NM	PST852A370UM	PST852A370RL
3.8V	±0.5%	0.190V	PST852A380NM	PST852A380UM	PST852A380RL
3.9V	±0.5%	0.195V	PST852A390NM	PST852A390UM	PST852A390RL
4.0V	±0.5%	0.200V	PST852A400NM	PST852A400UM	PST852A400RL
4.1V	±0.5%	0.205V	PST852A410NM	PST852A410UM	PST852A410RL
4.2V	±0.5%	0.210V	PST852A420NM	PST852A420UM	PST852A420RL
4.3V	±0.5%	0.215V	PST852A430NM	PST852A430UM	PST852A430RL
4.4V	±0.5%	0.220V	PST852A440NM	PST852A440UM	PST852A440RL
4.5V	±0.5%	0.225V	PST852A450NM	PST852A450UM	PST852A450RL
4.6V	±0.5%	0.230V	PST852A460NM	PST852A460UM	PST852A460RL
4.7V	±0.5%	0.235V	PST852A470NM	PST852A470UM	PST852A470RL
4.8V	±0.5%	0.240V	PST852A480NM	PST852A480UM	PST852A480RL
4.9V	±0.5%	0.245V	PST852A490NM	PST852A490UM	PST852A490RL
5.0V	±0.5%	0.250V	PST852A500NM	PST852A500UM	PST852A500RL
5.1V	±0.5%	0.255V	PST852A510NM	PST852A510UM	PST852A510RL
5.2V	±0.5%	0.260V	PST852A520NM	PST852A520UM	PST852A520RL
5.3V	±0.5%	0.265V	PST852A530NM	PST852A530UM	PST852A530RL
5.4V	±0.5%	0.270V	PST852A540NM	PST852A540UM	PST852A540RL
5.5V	±0.5%	0.275V	PST852A550NM	PST852A550UM	PST852A550RL
5.6V	±0.5%	0.280V	PST852A560NM	PST852A560UM	PST852A560RL
5.7V	±0.5%	0.285V	PST852A570NM	PST852A570UM	PST852A570RL
5.8V	±0.5%	0.290V	PST852A580NM	PST852A580UM	PST852A580RL
5.9V	±0.5%	0.295V	PST852A590NM	PST852A590UM	PST852A590RL
6.0V	±0.5%	0.300V	PST852A600NM	PST852A600UM	PST852A600RL

2 RESET IC

Separated sense pin System Reset IC with delay

PST853A / PST854A Series

Outline

This IC has separated the detecting voltage monitor terminal (VS) and the VDD terminal. Even if monitor voltage VS falls, when an operating limit is reached for another power supply, an output does not become unfixed, and the power supply of IC can maintain low level. It is especially suitable for the power supply surveillance of the low power supply (1V system).

Applications

(1) Reset circuits for microcomputers, CPUs and MPUs
(2) Reset circuits for logic circuit
(3) Low voltage detector

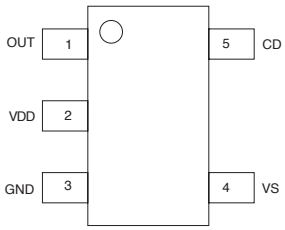
Features (Unless otherwise specified, Ta=+25°C)

(1) Maximum supply voltage 6.5V
(2) Operating voltage range .....VDD (0.7V to 6.0V)
(3) Operating temperature range....–40°C to +85°C
(4) Reset voltage range .....0.8V to 5.2V (0.1V step)
(5) Reset voltage accuracy.....±1.0% max. (Vth=2.0 to5.2V)
(6) Supply current .....0.35uA typ. /1.00uA max.
(7) Reset temperature coefficient ...±100ppm/°C typ.
(8) Delay resistance .....1MΩ typ.
(9) Output configuration .....CMOS output, Open drain

Pin assignment

SOT-25A

(Top view)



Model name structure

■Halogen–conteined Product

P S T 8 5 3 A □ □ □ □ □
P S T 8 5 4 A □ □ □ □ □

Housing	
R housing	R
L housing	L
Package code	
SOT–25A	N
Output voltage	
0.80V to 5.20V	080 to 520
CMOS output	PST853A
Open drain output	PST854A

Selection guide

Detection Voltage	Accuracy	Reset Threshold Hysteresis (typ.)	SOT-25A Package (3,000pcs/Reel)	
			CMOS output	Open drain output
0.8V	±20mV	0.040V	PST853A080NR	PST854A080NR
0.9V	±20mV	0.045V	PST853A090NR	PST854A090NR
1.0V	±20mV	0.050V	PST853A100NR	PST854A100NR
1.1V	±20mV	0.055V	PST853A110NR	PST854A110NR
1.2V	±20mV	0.060V	PST853A120NR	PST854A120NR
1.3V	±20mV	0.065V	PST853A130NR	PST854A130NR
1.4V	±20mV	0.070V	PST853A140NR	PST854A140NR
1.5V	±20mV	0.075V	PST853A150NR	PST854A150NR
1.6V	±20mV	0.080V	PST853A160NR	PST854A160NR
1.7V	±20mV	0.085V	PST853A170NR	PST854A170NR
1.8V	±20mV	0.090V	PST853A180NR	PST854A180NR
1.9V	±20mV	0.095V	PST853A190NR	PST854A190NR
2.0V	±1.0%	0.100V	PST853A200NR	PST854A200NR
2.1V	±1.0%	0.105V	PST853A210NR	PST854A210NR
2.2V	±1.0%	0.110V	PST853A220NR	PST854A220NR
2.3V	±1.0%	0.115V	PST853A230NR	PST854A230NR
2.4V	±1.0%	0.120V	PST853A240NR	PST854A240NR
2.5V	±1.0%	0.125V	PST853A250NR	PST854A250NR
2.6V	±1.0%	0.130V	PST853A260NR	PST854A260NR
2.7V	±1.0%	0.135V	PST853A270NR	PST854A270NR
2.8V	±1.0%	0.140V	PST853A280NR	PST854A280NR
2.9V	±1.0%	0.145V	PST853A290NR	PST854A290NR
3.0V	±1.0%	0.150V	PST853A300NR	PST854A300NR
3.1V	±1.0%	0.155V	PST853A310NR	PST854A310NR
3.2V	±1.0%	0.160V	PST853A320NR	PST854A320NR
3.3V	±1.0%	0.165V	PST853A330NR	PST854A330NR
3.4V	±1.0%	0.170V	PST853A340NR	PST854A340NR
3.5V	±1.0%	0.175V	PST853A350NR	PST854A350NR
3.6V	±1.0%	0.180V	PST853A360NR	PST854A360NR
3.7V	±1.0%	0.185V	PST853A370NR	PST854A370NR
3.8V	±1.0%	0.190V	PST853A380NR	PST854A380NR
3.9V	±1.0%	0.195V	PST853A390NR	PST854A390NR
4.0V	±1.0%	0.200V	PST853A400NR	PST854A400NR
4.1V	±1.0%	0.205V	PST853A410NR	PST854A410NR
4.2V	±1.0%	0.210V	PST853A420NR	PST854A420NR
4.3V	±1.0%	0.215V	PST853A430NR	PST854A430NR
4.4V	±1.0%	0.220V	PST853A440NR	PST854A440NR
4.5V	±1.0%	0.225V	PST853A450NR	PST854A450NR
4.6V	±1.0%	0.230V	PST853A460NR	PST854A460NR
4.7V	±1.0%	0.235V	PST853A470NR	PST854A470NR
4.8V	±1.0%	0.240V	PST853A480NR	PST854A480NR
4.9V	±1.0%	0.245V	PST853A490NR	PST854A490NR
5.0V	±1.0%	0.250V	PST853A500NR	PST854A500NR
5.1V	±1.0%	0.255V	PST853A510NR	PST854A510NR
5.2V	±1.0%	0.260V	PST853A520NR	PST854A520NR

2 RESET IC (Voltage detectot)

High accuracy CMOS system reset IC with delay time circuit

IC-PST83 / IC-PST84 Series

Outline

In various CPU systems or other logic systems, when the time of a power supply injection and a power supply are severed for a moment, this IC detects supply voltage and applies reset to a system. To ±1.5% of detection voltage accuracy of the conventional product, a maximum of ±0.5% of super-high precision is realized, and it is more suitable for battery detection etc. The accuracy from elegance is conventionally raised from +100 / −50% to ±10% also about delay resistance. Moreover, the component-side product is realizing the small space using SSON-4.

Features (Unless otherwise specified, Ta=+25°C)

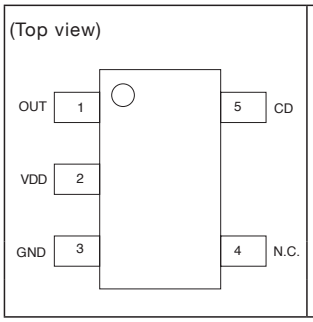
(1) High Accuracy..... ±0.5% typ. / 2.0V to 6.0V
±0.8% typ. / 0.8V to 1.9V
(2) Super low supply current ..... 0.35μA typ.
(3) Component-side product..... 1.10×1.40mm (SS0N–4B)
(4) Operating-temperature range.. –40°C to +105°C
(5) Delay resistance accuracy .... 0.8V to 6.0V (0.1V step)
(6) Detecting voltage rank ..... 10MΩ±10%
(7) Output configuration
IC-PST83 series :CMOS output
IC-PST84 series :Open drain output

Applications

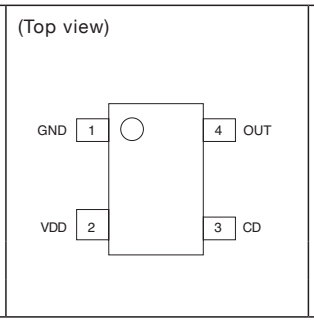
(1) Reset circuits for microcomputers, CPUs and MPUs
(2) Reset circuits for logic circuit
(3) Battery voltage check circuit
(4) Back-up power supply switching circuit
(5) Level detection circuit

Pin assignment

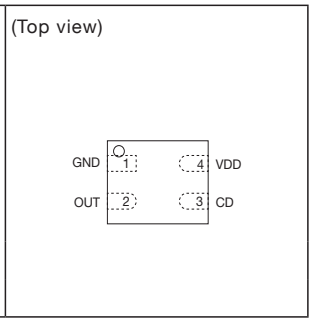
SOT-25A



SC-82ABB



SSON-4B



Pin no.	SOT-25A	SC82-ABB	SSON-4B
1	OUT	GND	GND
2	VDD	VDD	OUT
3	GND	CD	CD
4	N.C.	OUT	VDD
5	CD	---	---

Model name structure

■SC-82ABB/SOT-25A Halogen–conteined Product

I C - P S T 8 3 □ □ □ □
I C - P S T 8 4 □ □ □ □

Housing	
R housing	R
L housing	L
Package code	
SC–82ABB	U
SOT–25A	N
Output voltage	
0.8V to 6.0V	08 to 60
CMOS output	IC-PST83
Open drain output	IC-PST84

Model name structure

■SSON-4B Halogen–free Product

IC-PST83□□□□
IC-PST84□□□□

Housing	
R housing	R
L housing	L
Package code	
SSON-4B	R
Output voltage	
0.8V to 6.0V	08 to 60
CMOS output	IC-PST83
Open drain output	IC-PST84

■SC-82ABB/SOT-25A Halogen–free Product

PST83□□□□H
PST84□□□□H

Halogen free	
Housing	
R housing	R
L housing	L
Package code	
SC–82ABB	U
SOT–25A	N
Output voltage	
0.8V to 6.0V	08 to 60
CMOS output	PST83
Open drain output	PST84

Selection guide

Detection Voltage	Accuracy	Reset Threshold Hysteresis (typ.)	CMOS output		
			SOT–25A Package (3,000pcs/Reel)	SC–82ABB Package (3,000pcs/Reel)	SSON–4B Package (3,000pcs/Reel)
0.8V	±0.8%	0.040V	IC–PST8308NR	IC–PST8308UR	IC–PST8308RL
0.9V	±0.8%	0.045V	IC–PST8309NR	IC–PST8309UR	IC–PST8309RL
1.0V	±0.8%	0.050V	IC–PST8310NR	IC–PST8310UR	IC–PST8310RL
1.1V	±0.8%	0.055V	IC–PST8311NR	IC–PST8311UR	IC–PST8311RL
1.2V	±0.8%	0.060V	IC–PST8312NR	IC–PST8312UR	IC–PST8312RL
1.3V	±0.8%	0.065V	IC–PST8313NR	IC–PST8313UR	IC–PST8313RL
1.4V	±0.8%	0.070V	IC–PST8314NR	IC–PST8314UR	IC–PST8314RL
1.5V	±0.8%	0.075V	IC–PST8315NR	IC–PST8315UR	IC–PST8315RL
1.6V	±0.8%	0.080V	IC–PST8316NR	IC–PST8316UR	IC–PST8316RL
1.7V	±0.8%	0.085V	IC–PST8317NR	IC–PST8317UR	IC–PST8317RL
1.8V	±0.8%	0.090V	IC–PST8318NR	IC–PST8318UR	IC–PST8318RL
1.9V	±0.8%	0.095V	IC–PST8319NR	IC–PST8319UR	IC–PST8319RL
2.0V	±0.5%	0.100V	IC–PST8320NR	IC–PST8320UR	IC–PST8320RL
2.1V	±0.5%	0.105V	IC–PST8321NR	IC–PST8321UR	IC–PST8321RL
2.2V	±0.5%	0.110V	IC–PST8322NR	IC–PST8322UR	IC–PST8322RL
2.3V	±0.5%	0.115V	IC–PST8323NR	IC–PST8323UR	IC–PST8323RL
2.4V	±0.5%	0.120V	IC–PST8324NR	IC–PST8324UR	IC–PST8324RL
2.5V	±0.5%	0.125V	IC–PST8325NR	IC–PST8325UR	IC–PST8325RL
2.6V	±0.5%	0.130V	IC–PST8326NR	IC–PST8326UR	IC–PST8326RL
2.7V	±0.5%	0.135V	IC–PST8327NR	IC–PST8327UR	IC–PST8327RL
2.8V	±0.5%	0.140V	IC–PST8328NR	IC–PST8328UR	IC–PST8328RL
2.9V	±0.5%	0.145V	IC–PST8329NR	IC–PST8329UR	IC–PST8329RL
3.0V	±0.5%	0.150V	IC–PST8330NR	IC–PST8330UR	IC–PST8330RL
3.1V	±0.5%	0.155V	IC–PST8331NR	IC–PST8331UR	IC–PST8331RL
3.2V	±0.5%	0.160V	IC–PST8332NR	IC–PST8332UR	IC–PST8332RL
3.3V	±0.5%	0.165V	IC–PST8333NR	IC–PST8333UR	IC–PST8333RL
3.4V	±0.5%	0.170V	IC–PST8334NR	IC–PST8334UR	IC–PST8334RL
3.5V	±0.5%	0.175V	IC–PST8335NR	IC–PST8335UR	IC–PST8335RL
3.6V	±0.5%	0.180V	IC–PST8336NR	IC–PST8336UR	IC–PST8336RL
3.7V	±0.5%	0.185V	IC–PST8337NR	IC–PST8337UR	IC–PST8337RL
3.8V	±0.5%	0.190V	IC–PST8338NR	IC–PST8338UR	IC–PST8338RL
3.9V	±0.5%	0.195V	IC–PST8339NR	IC–PST8339UR	IC–PST8339RL
4.0V	±0.5%	0.200V	IC–PST8340NR	IC–PST8340UR	IC–PST8340RL
4.1V	±0.5%	0.205V	IC–PST8341NR	IC–PST8341UR	IC–PST8341RL
4.2V	±0.5%	0.210V	IC–PST8342NR	IC–PST8342UR	IC–PST8342RL
4.3V	±0.5%	0.215V	IC–PST8343NR	IC–PST8343UR	IC–PST8343RL
4.4V	±0.5%	0.220V	IC–PST8344NR	IC–PST8344UR	IC–PST8344RL
4.5V	±0.5%	0.225V	IC–PST8345NR	IC–PST8345UR	IC–PST8345RL
4.6V	±0.5%	0.230V	IC–PST8346NR	IC–PST8346UR	IC–PST8346RL
4.7V	±0.5%	0.235V	IC–PST8347NR	IC–PST8347UR	IC–PST8347RL
4.8V	±0.5%	0.240V	IC–PST8348NR	IC–PST8348UR	IC–PST8348RL
4.9V	±0.5%	0.245V	IC–PST8349NR	IC–PST8349UR	IC–PST8349RL
5.0V	±0.5%	0.250V	IC–PST8350NR	IC–PST8350UR	IC–PST8350RL
5.1V	±0.5%	0.255V	IC–PST8351NR	IC–PST8351UR	IC–PST8351RL
5.2V	±0.5%	0.260V	IC–PST8352NR	IC–PST8352UR	IC–PST8352RL
5.3V	±0.5%	0.265V	IC–PST8353NR	IC–PST8353UR	IC–PST8353RL
5.4V	±0.5%	0.270V	IC–PST8354NR	IC–PST8354UR	IC–PST8354RL
5.5V	±0.5%	0.275V	IC–PST8355NR	IC–PST8355UR	IC–PST8355RL
5.6V	±0.5%	0.280V	IC–PST8356NR	IC–PST8356UR	IC–PST8356RL
5.7V	±0.5%	0.285V	IC–PST8357NR	IC–PST8357UR	IC–PST8357RL
5.8V	±0.5%	0.290V	IC–PST8358NR	IC–PST8358UR	IC–PST8358RL
5.9V	±0.5%	0.295V	IC–PST8359NR	IC–PST8359UR	IC–PST8359RL
6.0V	±0.5%	0.300V	IC–PST8360NR	IC–PST8360UR	IC–PST8360RL

Selection guide

Detection Voltage	Accuracy	Reset Threshold Hysteresis (typ.)	Open drain output		
			SOT–25A Package (3,000pcs/Reel)	SC–82ABB Package (3,000pcs/Reel)	SSON-4B Package (3,000pcs/Reel)
0.8V	±0.8%	0.040V	IC–PST8408NR	IC–PST8408UR	IC–PST8408RL
0.9V	±0.8%	0.045V	IC–PST8409NR	IC–PST8409UR	IC–PST8409RL
1.0V	±0.8%	0.050V	IC–PST8410NR	IC–PST8410UR	IC–PST8410RL
1.1V	±0.8%	0.055V	IC–PST8411NR	IC–PST8411UR	IC–PST8411RL
1.2V	±0.8%	0.060V	IC–PST8412NR	IC–PST8412UR	IC–PST8412RL
1.3V	±0.8%	0.065V	IC–PST8413NR	IC–PST8413UR	IC–PST8413RL
1.4V	±0.8%	0.070V	IC–PST8414NR	IC–PST8414UR	IC–PST8414RL
1.5V	±0.8%	0.075V	IC–PST8415NR	IC–PST8415UR	IC–PST8415RL
1.6V	±0.8%	0.080V	IC–PST8416NR	IC–PST8416UR	IC–PST8416RL
1.7V	±0.8%	0.085V	IC–PST8417NR	IC–PST8417UR	IC–PST8417RL
1.8V	±0.8%	0.090V	IC–PST8418NR	IC–PST8418UR	IC–PST8418RL
1.9V	±0.8%	0.095V	IC–PST8419NR	IC–PST8419UR	IC–PST8419RL
2.0V	±0.5%	0.100V	IC–PST8420NR	IC–PST8420UR	IC–PST8420RL
2.1V	±0.5%	0.105V	IC–PST8421NR	IC–PST8421UR	IC–PST8421RL
2.2V	±0.5%	0.110V	IC–PST8422NR	IC–PST8422UR	IC–PST8422RL
2.3V	±0.5%	0.115V	IC–PST8423NR	IC–PST8423UR	IC–PST8423RL
2.4V	±0.5%	0.120V	IC–PST8424NR	IC–PST8424UR	IC–PST8424RL
2.5V	±0.5%	0.125V	IC–PST8425NR	IC–PST8425UR	IC–PST8425RL
2.6V	±0.5%	0.130V	IC–PST8426NR	IC–PST8426UR	IC–PST8426RL
2.7V	±0.5%	0.135V	IC–PST8427NR	IC–PST8427UR	IC–PST8427RL
2.8V	±0.5%	0.140V	IC–PST8428NR	IC–PST8428UR	IC–PST8428RL
2.9V	±0.5%	0.145V	IC–PST8429NR	IC–PST8429UR	IC–PST8429RL
3.0V	±0.5%	0.150V	IC–PST8430NR	IC–PST8430UR	IC–PST8430RL
3.1V	±0.5%	0.155V	IC–PST8431NR	IC–PST8431UR	IC–PST8431RL
3.2V	±0.5%	0.160V	IC–PST8432NR	IC–PST8432UR	IC–PST8432RL
3.3V	±0.5%	0.165V	IC–PST8433NR	IC–PST8433UR	IC–PST8433RL
3.4V	±0.5%	0.170V	IC–PST8434NR	IC–PST8434UR	IC–PST8434RL
3.5V	±0.5%	0.175V	IC–PST8435NR	IC–PST8435UR	IC–PST8435RL
3.6V	±0.5%	0.180V	IC–PST8436NR	IC–PST8436UR	IC–PST8436RL
3.7V	±0.5%	0.185V	IC–PST8437NR	IC–PST8437UR	IC–PST8437RL
3.8V	±0.5%	0.190V	IC–PST8438NR	IC–PST8438UR	IC–PST8438RL
3.9V	±0.5%	0.195V	IC–PST8439NR	IC–PST8439UR	IC–PST8439RL
4.0V	±0.5%	0.200V	IC–PST8440NR	IC–PST8440UR	IC–PST8440RL
4.1V	±0.5%	0.205V	IC–PST8441NR	IC–PST8441UR	IC–PST8441RL
4.2V	±0.5%	0.210V	IC–PST8442NR	IC–PST8442UR	IC–PST8442RL
4.3V	±0.5%	0.215V	IC–PST8443NR	IC–PST8443UR	IC–PST8443RL
4.4V	±0.5%	0.220V	IC–PST8444NR	IC–PST8444UR	IC–PST8444RL
4.5V	±0.5%	0.225V	IC–PST8445NR	IC–PST8445UR	IC–PST8445RL
4.6V	±0.5%	0.230V	IC–PST8446NR	IC–PST8446UR	IC–PST8446RL
4.7V	±0.5%	0.235V	IC–PST8447NR	IC–PST8447UR	IC–PST8447RL
4.8V	±0.5%	0.240V	IC–PST8448NR	IC–PST8448UR	IC–PST8448RL
4.9V	±0.5%	0.245V	IC–PST8449NR	IC–PST8449UR	IC–PST8449RL
5.0V	±0.5%	0.250V	IC–PST8450NR	IC–PST8450UR	IC–PST8450RL
5.1V	±0.5%	0.255V	IC–PST8451NR	IC–PST8451UR	IC–PST8451RL
5.2V	±0.5%	0.260V	IC–PST8452NR	IC–PST8452UR	IC–PST8452RL
5.3V	±0.5%	0.265V	IC–PST8453NR	IC–PST8453UR	IC–PST8453RL
5.4V	±0.5%	0.270V	IC–PST8454NR	IC–PST8454UR	IC–PST8454RL
5.5V	±0.5%	0.275V	IC–PST8455NR	IC–PST8455UR	IC–PST8455RL
5.6V	±0.5%	0.280V	IC–PST8456NR	IC–PST8456UR	IC–PST8456RL
5.7V	±0.5%	0.285V	IC–PST8457NR	IC–PST8457UR	IC–PST8457RL
5.8V	±0.5%	0.290V	IC–PST8458NR	IC–PST8458UR	IC–PST8458RL
5.9V	±0.5%	0.295V	IC–PST8459NR	IC–PST8459UR	IC–PST8459RL
6.0V	±0.5%	0.300V	IC–PST8460NR	IC–PST8460UR	IC–PST8460RL

2 RESET IC

CMOS system reset IC with delay

PST893A / PST894A series

Outline

This IC is a reset IC for turning on/off power supply and power flicker in CPU or logic systems.
This IC can change delay time by an external capacitor.
This IC is pin compatible with IC-PST83 and IC-PST84.

Applications

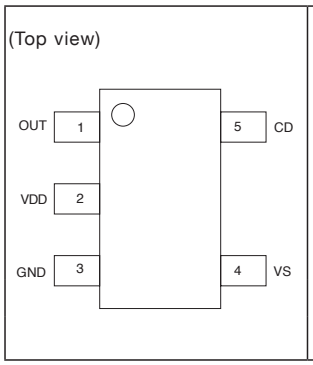
(1) Reset circuits for microcomputers, CPUs and MPUs
(2) Reset circuits for logic circuit
(3) Battery voltage check circuit
(4) Back–up power supply switching circuit
(5) Level detection circuit

Features (Unless otherwise specified, Ta=+25°C)

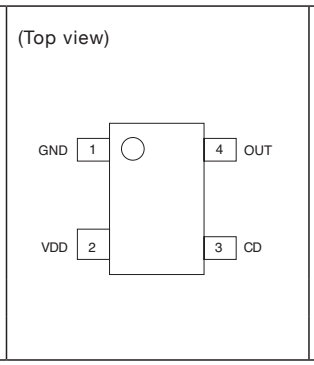
(1) High Accuracy .....±1.0% typ.
(2) Ultra-low current consumption ...0.35μA typ.
(3) Operating–voltage range.....0.95V to 6.5V
(4) Small package .....1.0×1.0mm (PLP-4A)
(5) Operating temperature range.....–40°C to +105°C
(6) Detecting voltage rank .....1.2V to 5.2V (0.1Vstep)
(7) Delay Resistance.....10MΩ±10%
(8) Output configuration
PST893A :CMOS output
PST894A :Open drain output

Pin assignment

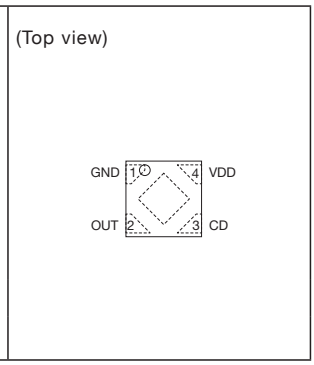
SOT-25A



SC-82ABB



PLP-4A



Pin no.	SOT-25A	SC82-ABB	PLP-4A
1	OUT	GND	GND
2	VDD	VDD	OUT
3	GND	CD	CD
4	N.C.	OUT	VDD
5	CD	---	---

Model name structure

■SC-82ABB/SOT-25A Halogen–conteined Product

P S T 8 9 3 A □ □ □ □ □
P S T 8 9 4 A □ □ □ □ □

Housing
R housing R
L housing L

Package code
SC–82ABB U
SOT–25A N

Output voltage
1.20V to 5.20V 120 to 520

CMOS output PST893A
Open drain output PST894A

Model name structure

■PLP-4A Halogen–free Product

P S T 8 9 3 A □ □ □ □ □
P S T 8 9 4 A □ □ □ □ □

Housing	
R housing	R
L housing	L
Package code	
PLP-4A	R
Output voltage	
1.20V to 5.20V	120 to 520
CMOS output	PST893A
Open drain output	PST894A

■SC-82ABB/SOT-25A Halogen–free Product

P S T 8 9 3 A □ □ □ □ □
P S T 8 9 4 A □ □ □ □ □

Housing	
R housing	M
L housing	H
Package code	
SC–82ABB	U
SOT–25A	N
Output voltage	
1.20V to 5.20V	120 to 520
CMOS output	PST893A
Open drain output	PST894A

Selection guide

Detection Voltage	Accuracy	Reset Threshold Hysteresis (typ.)	CMOS output		
			SOT-25A Package (3,000pcs/Reel)	SC-82ABB Package (3,000pcs/Reel)	PLP-4A Package (3,000pcs/Reel)
1.2V	±1.0%	0.060V	PST893A120NM	PST893A120UR	PST893A120RR
1.3V	±1.0%	0.065V	PST893A130NM	PST893A130UR	PST893A130RR
1.4V	±1.0%	0.070V	PST893A140NM	PST893A140UR	PST893A140RR
1.5V	±1.0%	0.075V	PST893A150NM	PST893A150UR	PST893A150RR
1.6V	±1.0%	0.080V	PST893A160NM	PST893A160UR	PST893A160RR
1.7V	±1.0%	0.085V	PST893A170NM	PST893A170UR	PST893A170RR
1.8V	±1.0%	0.090V	PST893A180NM	PST893A180UR	PST893A180RR
1.9V	±1.0%	0.095V	PST893A190NM	PST893A190UR	PST893A190RR
2.0V	±1.0%	0.100V	PST893A200NM	PST893A200UR	PST893A200RR
2.1V	±1.0%	0.105V	PST893A210NM	PST893A210UR	PST893A210RR
2.2V	±1.0%	0.110V	PST893A220NM	PST893A220UR	PST893A220RR
2.3V	±1.0%	0.115V	PST893A230NM	PST893A230UR	PST893A230RR
2.4V	±1.0%	0.120V	PST893A240NM	PST893A240UR	PST893A240RR
2.5V	±1.0%	0.125V	PST893A250NM	PST893A250UR	PST893A250RR
2.6V	±1.0%	0.130V	PST893A260NM	PST893A260UR	PST893A260RR
2.7V	±1.0%	0.135V	PST893A270NM	PST893A270UR	PST893A270RR
2.8V	±1.0%	0.140V	PST893A280NM	PST893A280UR	PST893A280RR
2.9V	±1.0%	0.145V	PST893A290NM	PST893A290UR	PST893A290RR
3.0V	±1.0%	0.150V	PST893A300NM	PST893A300UR	PST893A300RR
3.1V	±1.0%	0.155V	PST893A310NM	PST893A310UR	PST893A310RR
3.2V	±1.0%	0.160V	PST893A320NM	PST893A320UR	PST893A320RR
3.3V	±1.0%	0.165V	PST893A330NM	PST893A330UR	PST893A330RR
3.4V	±1.0%	0.170V	PST893A340NM	PST893A340UR	PST893A340RR
3.5V	±1.0%	0.175V	PST893A350NM	PST893A350UR	PST893A350RR
3.6V	±1.0%	0.180V	PST893A360NM	PST893A360UR	PST893A360RR
3.7V	±1.0%	0.185V	PST893A370NM	PST893A370UR	PST893A370RR
3.8V	±1.0%	0.190V	PST893A380NM	PST893A380UR	PST893A380RR
3.9V	±1.0%	0.195V	PST893A390NM	PST893A390UR	PST893A390RR
4.0V	±1.0%	0.200V	PST893A400NM	PST893A400UR	PST893A400RR
4.1V	±1.0%	0.205V	PST893A410NM	PST893A410UR	PST893A410RR
4.2V	±1.0%	0.210V	PST893A420NM	PST893A420UR	PST893A420RR
4.3V	±1.0%	0.215V	PST893A430NM	PST893A430UR	PST893A430RR
4.4V	±1.0%	0.220V	PST893A440NM	PST893A440UR	PST893A440RR
4.5V	±1.0%	0.225V	PST893A450NM	PST893A450UR	PST893A450RR
4.6V	±1.0%	0.230V	PST893A460NM	PST893A460UR	PST893A460RR
4.7V	±1.0%	0.235V	PST893A470NM	PST893A470UR	PST893A470RR
4.8V	±1.0%	0.240V	PST893A480NM	PST893A480UR	PST893A480RR
4.9V	±1.0%	0.245V	PST893A490NM	PST893A490UR	PST893A490RR
5.0V	±1.0%	0.250V	PST893A500NM	PST893A500UR	PST893A500RR
5.1V	±1.0%	0.255V	PST893A510NM	PST893A510UR	PST893A510RR
5.2V	±1.0%	0.260V	PST893A520NM	PST893A520UR	PST893A520RR

Selection guide

Detection Voltage	Accuracy	Reset Threshold Hysteresis (typ.)	Open drain output		
			SOT–25A Package (3,000pcs/Reel)	SC–82ABB Package (3,000pcs/Reel)	PLP-4A Package (3,000pcs/Reel)
1.2V	±1.0%	0.060V	PST894A120NM	PST894A120UR	PST894A120RR
1.3V	±1.0%	0.065V	PST894A130NM	PST894A130UR	PST894A130RR
1.4V	±1.0%	0.070V	PST894A140NM	PST894A140UR	PST894A140RR
1.5V	±1.0%	0.075V	PST894A150NM	PST894A150UR	PST894A150RR
1.6V	±1.0%	0.080V	PST894A160NM	PST894A160UR	PST894A160RR
1.7V	±1.0%	0.085V	PST894A170NM	PST894A170UR	PST894A170RR
1.8V	±1.0%	0.090V	PST894A180NM	PST894A180UR	PST894A180RR
1.9V	±1.0%	0.095V	PST894A190NM	PST894A190UR	PST894A190RR
2.0V	±1.0%	0.100V	PST894A200NM	PST894A200UR	PST894A200RR
2.1V	±1.0%	0.105V	PST894A210NM	PST894A210UR	PST894A210RR
2.2V	±1.0%	0.110V	PST894A220NM	PST894A220UR	PST894A220RR
2.3V	±1.0%	0.115V	PST894A230NM	PST894A230UR	PST894A230RR
2.4V	±1.0%	0.120V	PST894A240NM	PST894A240UR	PST894A240RR
2.5V	±1.0%	0.125V	PST894A250NM	PST894A250UR	PST894A250RR
2.6V	±1.0%	0.130V	PST894A260NM	PST894A260UR	PST894A260RR
2.7V	±1.0%	0.135V	PST894A270NM	PST894A270UR	PST894A270RR
2.8V	±1.0%	0.140V	PST894A280NM	PST894A280UR	PST894A280RR
2.9V	±1.0%	0.145V	PST894A290NM	PST894A290UR	PST894A290RR
3.0V	±1.0%	0.150V	PST894A300NM	PST894A300UR	PST894A300RR
3.1V	±1.0%	0.155V	PST894A310NM	PST894A310UR	PST894A310RR
3.2V	±1.0%	0.160V	PST894A320NM	PST894A320UR	PST894A320RR
3.3V	±1.0%	0.165V	PST894A330NM	PST894A330UR	PST894A330RR
3.4V	±1.0%	0.170V	PST894A340NM	PST894A340UR	PST894A340RR
3.5V	±1.0%	0.175V	PST894A350NM	PST894A350UR	PST894A350RR
3.6V	±1.0%	0.180V	PST894A360NM	PST894A360UR	PST894A360RR
3.7V	±1.0%	0.185V	PST894A370NM	PST894A370UR	PST894A370RR
3.8V	±1.0%	0.190V	PST894A380NM	PST894A380UR	PST894A380RR
3.9V	±1.0%	0.195V	PST894A390NM	PST894A390UR	PST894A390RR
4.0V	±1.0%	0.200V	PST894A400NM	PST894A400UR	PST894A400RR
4.1V	±1.0%	0.205V	PST894A410NM	PST894A410UR	PST894A410RR
4.2V	±1.0%	0.210V	PST894A420NM	PST894A420UR	PST894A420RR
4.3V	±1.0%	0.215V	PST894A430NM	PST894A430UR	PST894A430RR
4.4V	±1.0%	0.220V	PST894A440NM	PST894A440UR	PST894A440RR
4.5V	±1.0%	0.225V	PST894A450NM	PST894A450UR	PST894A450RR
4.6V	±1.0%	0.230V	PST894A460NM	PST894A460UR	PST894A460RR
4.7V	±1.0%	0.235V	PST894A470NM	PST894A470UR	PST894A470RR
4.8V	±1.0%	0.240V	PST894A480NM	PST894A480UR	PST894A480RR
4.9V	±1.0%	0.245V	PST894A490NM	PST894A490UR	PST894A490RR
5.0V	±1.0%	0.250V	PST894A500NM	PST894A500UR	PST894A500RR
5.1V	±1.0%	0.255V	PST894A510NM	PST894A510UR	PST894A510RR
5.2V	±1.0%	0.260V	PST894A520NM	PST894A520UR	PST894A520RR

2 RESET IC

CMOS system reset IC with delay

PST893B / PST894B Series

Outline

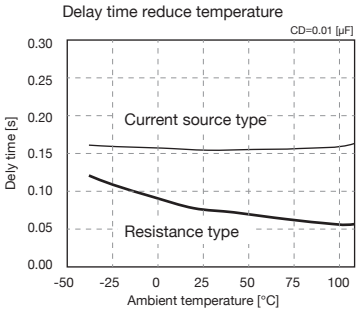
This IC is a reset IC for turning on/off power supply and power flicker in CPU or logic systems. This IC can change delay time by an external capacitor. Charging method of the capacitor, is current source type.
Current source type can reduce temperature fluctuations in the delay time typ. ±6% (Ta=−40°C to +105°C), It is ideal for a wide set the operating temperature range.
This IC is pin compatible with PST83XX and PST84XX

Features (Unless otherwise specified, Ta=+25°C)

(1) Delay time reduced temperature fluctuations
(2) High Accuracy ..... ±1.0% typ.
(2) Ultra-low current consumption ... 0.35μA typ.
(3) Operating-voltage range ..... 0.95V to 6.5V
(4) Operating temperature range..... –40°C to +105°C
(5) Detecting voltage rank ..... 1.2V to 5.2V (0.1Vstep)
(6) Delay Resistance..... Current source type
100nA±10%
(7) Output configuration ..... PST893B: CMOS output
PST894B: Open drain output

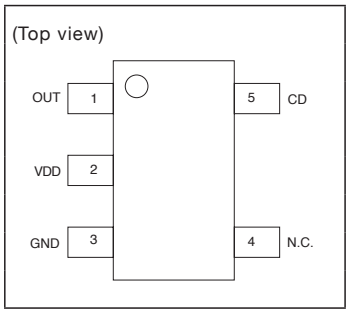
Applications

(1) Reset circuits for microcomputers, CPUs and MPUs
(2) Reset circuits for logic circuit
(3) Battery voltage check circuit
(4) Back-up power supply switching circuit
(5) Level detection circuit

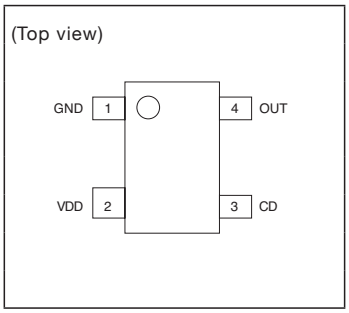


Pin assignment

SOT-25A



SC-82ABB



Pin no.	SOT-25A	SC82-ABB
1	OUT	GND
2	VDD	VDD
3	GND	CD
4	N.C.	OUT
5	CD	---

Model name structure

■Halogen–free Product

P S T 8 9 3 B □ □ □ □ □
P S T 8 9 4 B □ □ □ □ □

Housing
R housing M
L housing H

Package code
SC–82ABB U
SOT–25A N

Output voltage
1.20V to 5.20V 120 to 520

CMOS output PST893B
Open drain output PST894B

Selection guide

Detection Voltage	Accuracy	Reset Threshold Hysteresis (typ.)	CMOS output	
			SOT–25A Package (3,000pcs/Reel)	SC–82ABB Package (3,000pcs/Reel)
1.2V	±1.0%	0.060V	PST893B120NM	PST893B120UM
1.3V	±1.0%	0.065V	PST893B130NM	PST893B130UM
1.4V	±1.0%	0.070V	PST893B140NM	PST893B140UM
1.5V	±1.0%	0.075V	PST893B150NM	PST893B150UM
1.6V	±1.0%	0.080V	PST893B160NM	PST893B160UM
1.7V	±1.0%	0.085V	PST893B170NM	PST893B170UM
1.8V	±1.0%	0.090V	PST893B180NM	PST893B180UM
1.9V	±1.0%	0.095V	PST893B190NM	PST893B190UM
2.0V	±1.0%	0.100V	PST893B200NM	PST893B200UM
2.1V	±1.0%	0.105V	PST893B210NM	PST893B210UM
2.2V	±1.0%	0.110V	PST893B220NM	PST893B220UM
2.3V	±1.0%	0.115V	PST893B230NM	PST893B230UM
2.4V	±1.0%	0.120V	PST893B240NM	PST893B240UM
2.5V	±1.0%	0.125V	PST893B250NM	PST893B250UM
2.6V	±1.0%	0.130V	PST893B260NM	PST893B260UM
2.7V	±1.0%	0.135V	PST893B270NM	PST893B270UM
2.8V	±1.0%	0.140V	PST893B280NM	PST893B280UM
2.9V	±1.0%	0.145V	PST893B290NM	PST893B290UM
3.0V	±1.0%	0.150V	PST893B300NM	PST893B300UM
3.1V	±1.0%	0.155V	PST893B310NM	PST893B310UM
3.2V	±1.0%	0.160V	PST893B320NM	PST893B320UM
3.3V	±1.0%	0.165V	PST893B330NM	PST893B330UM
3.4V	±1.0%	0.170V	PST893B340NM	PST893B340UM
3.5V	±1.0%	0.175V	PST893B350NM	PST893B350UM
3.6V	±1.0%	0.180V	PST893B360NM	PST893B360UM
3.7V	±1.0%	0.185V	PST893B370NM	PST893B370UM
3.8V	±1.0%	0.190V	PST893B380NM	PST893B380UM
3.9V	±1.0%	0.195V	PST893B390NM	PST893B390UM
4.0V	±1.0%	0.200V	PST893B400NM	PST893B400UM
4.1V	±1.0%	0.205V	PST893B410NM	PST893B410UM
4.2V	±1.0%	0.210V	PST893B420NM	PST893B420UM
4.3V	±1.0%	0.215V	PST893B430NM	PST893B430UM
4.4V	±1.0%	0.220V	PST893B440NM	PST893B440UM
4.5V	±1.0%	0.225V	PST893B450NM	PST893B450UM
4.6V	±1.0%	0.230V	PST893B460NM	PST893B460UM
4.7V	±1.0%	0.235V	PST893B470NM	PST893B470UM
4.8V	±1.0%	0.240V	PST893B480NM	PST893B480UM
4.9V	±1.0%	0.245V	PST893B490NM	PST893B490UM
5.0V	±1.0%	0.250V	PST893B500NM	PST893B500UM
5.1V	±1.0%	0.255V	PST893B510NM	PST893B510UM
5.2V	±1.0%	0.260V	PST893B520NM	PST893B520UM

Selection guide

Detection Voltage	Accuracy	Reset Threshold Hysteresis (typ.)	Open drain output	
			SOT-25A Package (3,000pcs/Reel)	SC-82ABB Package (3,000pcs/Reel)
1.2V	±1.0%	0.060V	PST894B120NM	PST894B120UM
1.3V	±1.0%	0.065V	PST894B130NM	PST894B130UM
1.4V	±1.0%	0.070V	PST894B140NM	PST894B140UM
1.5V	±1.0%	0.075V	PST894B150NM	PST894B150UM
1.6V	±1.0%	0.080V	PST894B160NM	PST894B160UM
1.7V	±1.0%	0.085V	PST894B170NM	PST894B170UM
1.8V	±1.0%	0.090V	PST894B180NM	PST894B180UM
1.9V	±1.0%	0.095V	PST894B190NM	PST894B190UM
2.0V	±1.0%	0.100V	PST894B200NM	PST894B200UM
2.1V	±1.0%	0.105V	PST894B210NM	PST894B210UM
2.2V	±1.0%	0.110V	PST894B220NM	PST894B220UM
2.3V	±1.0%	0.115V	PST894B230NM	PST894B230UM
2.4V	±1.0%	0.120V	PST894B240NM	PST894B240UM
2.5V	±1.0%	0.125V	PST894B250NM	PST894B250UM
2.6V	±1.0%	0.130V	PST894B260NM	PST894B260UM
2.7V	±1.0%	0.135V	PST894B270NM	PST894B270UM
2.8V	±1.0%	0.140V	PST894B280NM	PST894B280UM
2.9V	±1.0%	0.145V	PST894B290NM	PST894B290UM
3.0V	±1.0%	0.150V	PST894B300NM	PST894B300UM
3.1V	±1.0%	0.155V	PST894B310NM	PST894B310UM
3.2V	±1.0%	0.160V	PST894B320NM	PST894B320UM
3.3V	±1.0%	0.165V	PST894B330NM	PST894B330UM
3.4V	±1.0%	0.170V	PST894B340NM	PST894B340UM
3.5V	±1.0%	0.175V	PST894B350NM	PST894B350UM
3.6V	±1.0%	0.180V	PST894B360NM	PST894B360UM
3.7V	±1.0%	0.185V	PST894B370NM	PST894B370UM
3.8V	±1.0%	0.190V	PST894B380NM	PST894B380UM
3.9V	±1.0%	0.195V	PST894B390NM	PST894B390UM
4.0V	±1.0%	0.200V	PST894B400NM	PST894B400UM
4.1V	±1.0%	0.205V	PST894B410NM	PST894B410UM
4.2V	±1.0%	0.210V	PST894B420NM	PST894B420UM
4.3V	±1.0%	0.215V	PST894B430NM	PST894B430UM
4.4V	±1.0%	0.220V	PST894B440NM	PST894B440UM
4.5V	±1.0%	0.225V	PST894B450NM	PST894B450UM
4.6V	±1.0%	0.230V	PST894B460NM	PST894B460UM
4.7V	±1.0%	0.235V	PST894B470NM	PST894B470UM
4.8V	±1.0%	0.240V	PST894B480NM	PST894B480UM
4.9V	±1.0%	0.245V	PST894B490NM	PST894B490UM
5.0V	±1.0%	0.250V	PST894B500NM	PST894B500UM
5.1V	±1.0%	0.255V	PST894B510NM	PST894B510UM
5.2V	±1.0%	0.260V	PST894B520NM	PST894B520UM

2 RESET IC

CMOS system reset IC with delay

PST893R / PST894R Series

Outline

PST853/854 is a system reset IC that detect the power turning-off or the power flicker in power supply of CPU or logic systems. PST893R/894R has the delay time pin by an external capacitor and a manual reset pin.

The manual reset pin is possible to reset signal forcibly by external singnal.

Applications

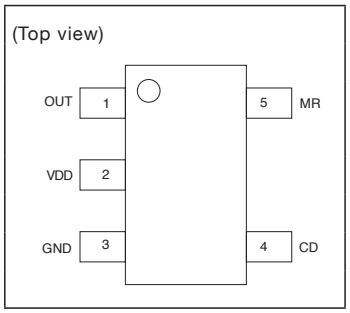
(1) Reset circuits for microcomputers, CPUs and MPUs
(2) Reset circuits for logic circuit
(3) Voltage detector

Features (Unless otherwise specified, Ta=+25°C)

(1) Maximum supply voltage 6.5V
(2) Operating voltage range (VDD) ... 0.7V to 6.0V
(3) Operating temperature range..... –40 to +85°C
(4) Reset voltage range ..... 0.8V to 5.2V (0.1Vstep)
(5) Reset voltage accuracy..... ±1.0% max.
(6) Supply current..... 0.35μA typ.
(7) Reset temperature coefficient..... ±100ppm/°C typ.
(8) Delay resistance 1MΩ typ.
(9) Manual reset pin
(10) Output configuration ..... PST893 :CMOS output
PST894 :Open drain

Pin assignment

SOT-25A



Pin no.	SOT-25A
1	OUT
2	VDD
3	GND
4	CD
5	MR

Model name structure

■Halogen–conteined Product

P S T 8 9 3 R □ □ □ □ □
P S T 8 9 4 R □ □ □ □ □

Housing	
R housing	R
L housing	L
Package code	
SOT-25A	N
Output voltage	
0.80V to 5.20V	080 to 520
CMOS output	PST893R
Open drain output	PST894R

Selection guide

Detection Voltage	Accuracy	Reset Threshold Hysteresis (typ.)	SOT–25A Package (3,000pcs/Reel)	
			CMOS output	Open drain output
0.8V	±20mV	0.040V	PST893R080NR	PST894R080NR
0.9V	±20mV	0.045V	PST893R090NR	PST894R090NR
1.0V	±20mV	0.050V	PST893R100NR	PST894R100NR
1.1V	±20mV	0.055V	PST893R110NR	PST894R110NR
1.2V	±20mV	0.060V	PST893R120NR	PST894R120NR
1.3V	±20mV	0.065V	PST893R130NR	PST894R130NR
1.4V	±20mV	0.070V	PST893R140NR	PST894R140NR
1.5V	±20mV	0.075V	PST893R150NR	PST894R150NR
1.6V	±20mV	0.080V	PST893R160NR	PST894R160NR
1.7V	±20mV	0.085V	PST893R170NR	PST894R170NR
1.8V	±20mV	0.090V	PST893R180NR	PST894R180NR
1.9V	±20mV	0.095V	PST893R190NR	PST894R190NR
2.0V	±1.0%	0.100V	PST893R200NR	PST894R200NR
2.1V	±1.0%	0.105V	PST893R210NR	PST894R210NR
2.2V	±1.0%	0.110V	PST893R220NR	PST894R220NR
2.3V	±1.0%	0.115V	PST893R230NR	PST894R230NR
2.4V	±1.0%	0.120V	PST893R240NR	PST894R240NR
2.5V	±1.0%	0.125V	PST893R250NR	PST894R250NR
2.6V	±1.0%	0.130V	PST893R260NR	PST894R260NR
2.7V	±1.0%	0.135V	PST893R270NR	PST894R270NR
2.8V	±1.0%	0.140V	PST893R280NR	PST894R280NR
2.9V	±1.0%	0.145V	PST893R290NR	PST894R290NR
3.0V	±1.0%	0.150V	PST893R300NR	PST894R300NR
3.1V	±1.0%	0.155V	PST893R310NR	PST894R310NR
3.2V	±1.0%	0.160V	PST893R320NR	PST894R320NR
3.3V	±1.0%	0.165V	PST893R330NR	PST894R330NR
3.4V	±1.0%	0.170V	PST893R340NR	PST894R340NR
3.5V	±1.0%	0.175V	PST893R350NR	PST894R350NR
3.6V	±1.0%	0.180V	PST893R360NR	PST894R360NR
3.7V	±1.0%	0.185V	PST893R370NR	PST894R370NR
3.8V	±1.0%	0.190V	PST893R380NR	PST894R380NR
3.9V	±1.0%	0.195V	PST893R390NR	PST894R390NR
4.0V	±1.0%	0.200V	PST893R400NR	PST894R400NR
4.1V	±1.0%	0.205V	PST893R410NR	PST894R410NR
4.2V	±1.0%	0.210V	PST893R420NR	PST894R420NR
4.3V	±1.0%	0.215V	PST893R430NR	PST894R430NR
4.4V	±1.0%	0.220V	PST893R440NR	PST894R440NR
4.5V	±1.0%	0.225V	PST893R450NR	PST894R450NR
4.6V	±1.0%	0.230V	PST893R460NR	PST894R460NR
4.7V	±1.0%	0.235V	PST893R470NR	PST894R470NR
4.8V	±1.0%	0.240V	PST893R480NR	PST894R480NR
4.9V	±1.0%	0.245V	PST893R490NR	PST894R490NR
5.0V	±1.0%	0.250V	PST893R500NR	PST894R500NR
5.1V	±1.0%	0.255V	PST893R510NR	PST894R510NR
5.2V	±1.0%	0.260V	PST893R520NR	PST894R520NR

2 RESET IC(Voltage detector)

CMOS system reset IC built-in delay time circuit

IC-PST87 / IC-PST88 Series

Outline

This IC is a system reset IC builtin delay time circuit.
PST87 / PST88 is not required with an external capacitor, and then can use a small package.
Therefore a space of PC board can be small.

Applications

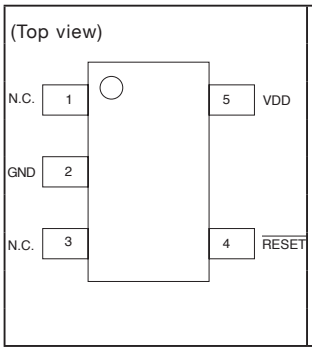
(1) Reset circuits for microcomputers, CPUs and MPUs
(2) Reset circuits for logic circuit
(3) Battery voltage check circuit
(4) Back-up power supply switching circuit
(5) Level detection circuit
(6) Mechanical reset circuit

Features (Unless otherwise specified, Ta=+25°C)

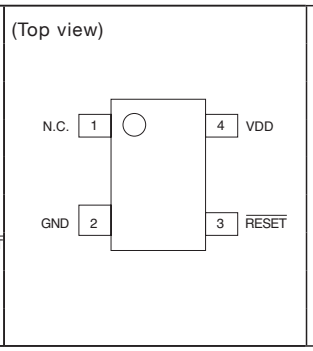
(1) Operating supply voltage .....1.0V to 5.5V
(2) Supply current.....1μA typ.
(3) Detection voltage range .....1.6V to 4.6V
(4) Accuracy .....±1.5% typ.
(5) Reset threshold hysteresis.....50mV typ.
(6) Reset active timeout period 20mS/50mS/100ms/200mS
(7) Output type
IC-PST87: CMOS output,Active–Low
IC-PST88: Open drain output,Acrive-Low

Pin assignment

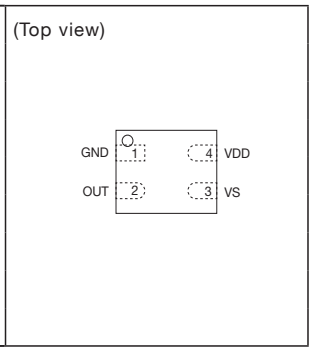
SOT-25A



SC-82ABB



SSON-4B



Pin no.	SOT-25A	SC82-ABB	SSON-4B
1	N.C.	N.C.	GND
2	GND	GND	N.C.
3	N.C.	RESET	VDD
4	RESET	VDD	RESET
5	VDD	---	---

Model name structure

■SC-82ABB/SOT-25A Halogen–conteined Product

P S T 8 7 □ □ □ □ □ □ □
P S T 8 8 □ □ □ □ □ □ □

Housing	
R housing	R
L housing	L
Package code	
SC-82ABB	U
SOT-25A	N
Output voltage	
1.60V to 4.60V	160 to 460
	A
	R
20ms	0
50ms	1
100ms	2
200ms	3
CMOS output	PST87
Open drain output	PST88

Model name structure

■SSON-4B Halogen–free Product

PST87□□□□□□□□
PST88□□□□□□□□

Housing	
R housing	R
L housing	L
Package code	
SSON-4B	R
Output voltage	
1.60V to 4.60V	160 to 460
	A
	R
20ms	0
50ms	1
100ms	2
200ms	3
CMOS output	PST87
Open drain output	PST88

■SC-82ABB/SOT-25A Halogen–free Product

PST87□□□□□□□□
PST88□□□□□□□□

Housing	
R housing	M
L housing	H
Package code	
SC-82ABB	U
SOT-25A	N
Output voltage	
1.60V to 4.60V	160 to 460
	A
	R
20ms	0
50ms	1
100ms	2
200ms	3
CMOS output	PST87
Open drain output	PST88

Selection guide

Detection Voltage	Accuracy	delay time (typ.)	CMOS output			Open Drain output		
			SOT-25A Package (3,000pcs/Reel)	SC-82ABB Package (3,000pcs/Reel)	SSON-4B Package (3,000pcs/Reel)	SOT-25A Package (3,000pcs/Reel)	SC-82ABB Package (3,000pcs/Reel)	SSON-4B Package (3,000pcs/Reel)
1.60V	±1.5%	20ms	PST870A160NR	PST870A160UR	PST870A160RL	PST880A160NR	PST880A160UR	PST880A160RL
		50ms	PST871A160NR	PST871A160UR	PST871A160RL	PST881A160NR	PST881A160UR	PST881A160RL
		100ms	PST872A160NR	PST872A160UR	PST872A160RL	PST882A160NR	PST882A160UR	PST882A160RL
		200ms	PST873A160NR	PST873A160UR	PST873A160RL	PST883A160NR	PST883A160UR	PST883A160RL
1.70V	±1.5%	20ms	PST870A170NR	PST870A170UR	PST870A170RL	PST880A170NR	PST880A170UR	PST880A170RL
		50ms	PST871A170NR	PST871A170UR	PST871A170RL	PST881A170NR	PST881A170UR	PST881A170RL
		100ms	PST872A170NR	PST872A170UR	PST872A170RL	PST882A170NR	PST882A170UR	PST882A170RL
		200ms	PST873A170NR	PST873A170UR	PST873A170RL	PST883A170NR	PST883A170UR	PST883A170RL
1.80V	±1.5%	20ms	PST870A180NR	PST870A180UR	PST870A180RL	PST880A180NR	PST880A180UR	PST880A180RL
		50ms	PST871A180NR	PST871A180UR	PST871A180RL	PST881A180NR	PST881A180UR	PST881A180RL
		100ms	PST872A180NR	PST872A180UR	PST872A180RL	PST882A180NR	PST882A180UR	PST882A180RL
		200ms	PST873A180NR	PST873A180UR	PST873A180RL	PST883A180NR	PST883A180UR	PST883A180RL
1.90V	±1.5%	20ms	PST870A190NR	PST870A190UR	PST870A190RL	PST880A190NR	PST880A190UR	PST880A190RL
		50ms	PST871A190NR	PST871A190UR	PST871A190RL	PST881A190NR	PST881A190UR	PST881A190RL
		100ms	PST872A190NR	PST872A190UR	PST872A190RL	PST882A190NR	PST882A190UR	PST882A190RL
		200ms	PST873A190NR	PST873A190UR	PST873A190RL	PST883A190NR	PST883A190UR	PST883A190RL
2.00V	±1.5%	20ms	PST870A200NR	PST870A200UR	PST870A200RL	PST880A200NR	PST880A200UR	PST880A200RL
		50ms	PST871A200NR	PST871A200UR	PST871A200RL	PST881A200NR	PST881A200UR	PST881A200RL
		100ms	PST872A200NR	PST872A200UR	PST872A200RL	PST882A200NR	PST882A200UR	PST882A200RL
		200ms	PST873A200NR	PST873A200UR	PST873A200RL	PST883A200NR	PST883A200UR	PST883A200RL
2.10V	±1.5%	20ms	PST870A210NR	PST870A210UR	PST870A210RL	PST880A210NR	PST880A210UR	PST880A210RL
		50ms	PST871A210NR	PST871A210UR	PST871A210RL	PST881A210NR	PST881A210UR	PST881A210RL
		100ms	PST872A210NR	PST872A210UR	PST872A210RL	PST882A210NR	PST882A210UR	PST882A210RL
		200ms	PST873A210NR	PST873A210UR	PST873A210RL	PST883A210NR	PST883A210UR	PST883A210RL
2.20V	±1.5%	20ms	PST870A220NR	PST870A220UR	PST870A220RL	PST880A220NR	PST880A220UR	PST880A220RL
		50ms	PST871A220NR	PST871A220UR	PST871A220RL	PST881A220NR	PST881A220UR	PST881A220RL
		100ms	PST872A220NR	PST872A220UR	PST872A220RL	PST882A220NR	PST882A220UR	PST882A220RL
		200ms	PST873A220NR	PST873A220UR	PST873A220RL	PST883A220NR	PST883A220UR	PST883A220RL
2.30V	±1.5%	20ms	PST870A230NR	PST870A230UR	PST870A230RL	PST880A230NR	PST880A230UR	PST880A230RL
		50ms	PST871A230NR	PST871A230UR	PST871A230RL	PST881A230NR	PST881A230UR	PST881A230RL
		100ms	PST872A230NR	PST872A230UR	PST872A230RL	PST882A230NR	PST882A230UR	PST882A230RL
		200ms	PST873A230NR	PST873A230UR	PST873A230RL	PST883A230NR	PST883A230UR	PST883A230RL
2.40V	±1.5%	20ms	PST870A240NR	PST870A240UR	PST870A240RL	PST880A240NR	PST880A240UR	PST880A240RL
		50ms	PST871A240NR	PST871A240UR	PST871A240RL	PST881A240NR	PST881A240UR	PST881A240RL
		100ms	PST872A240NR	PST872A240UR	PST872A240RL	PST882A240NR	PST882A240UR	PST882A240RL
		200ms	PST873A240NR	PST873A240UR	PST873A240RL	PST883A240NR	PST883A240UR	PST883A240RL
2.50V	±1.5%	20ms	PST870A250NR	PST870A250UR	PST870A250RL	PST880A250NR	PST880A250UR	PST880A250RL
		50ms	PST871A250NR	PST871A250UR	PST871A250RL	PST881A250NR	PST881A250UR	PST881A250RL
		100ms	PST872A250NR	PST872A250UR	PST872A250RL	PST882A250NR	PST882A250UR	PST882A250RL
		200ms	PST873A250NR	PST873A250UR	PST873A250RL	PST883A250NR	PST883A250UR	PST883A250RL
2.60V	±1.5%	20ms	PST870A260NR	PST870A260UR	PST870A260RL	PST880A260NR	PST880A260UR	PST880A260RL
		50ms	PST871A260NR	PST871A260UR	PST871A260RL	PST881A260NR	PST881A260UR	PST881A260RL
		100ms	PST872A260NR	PST872A260UR	PST872A260RL	PST882A260NR	PST882A260UR	PST882A260RL
		200ms	PST873A260NR	PST873A260UR	PST873A260RL	PST883A260NR	PST883A260UR	PST883A260RL
2.70V	±1.5%	20ms	PST870A270NR	PST870A270UR	PST870A270RL	PST880A270NR	PST880A270UR	PST880A270RL
		50ms	PST871A270NR	PST871A270UR	PST871A270RL	PST881A270NR	PST881A270UR	PST881A270RL
		100ms	PST872A270NR	PST872A270UR	PST872A270RL	PST882A270NR	PST882A270UR	PST882A270RL
		200ms	PST873A270NR	PST873A270UR	PST873A270RL	PST883A270NR	PST883A270UR	PST883A270RL
2.80V	±1.5%	20ms	PST870A280NR	PST870A280UR	PST870A280RL	PST880A280NR	PST880A280UR	PST880A280RL
		50ms	PST871A280NR	PST871A280UR	PST871A280RL	PST881A280NR	PST881A280UR	PST881A280RL
		100ms	PST872A280NR	PST872A280UR	PST872A280RL	PST882A280NR	PST882A280UR	PST882A280RL
		200ms	PST873A280NR	PST873A280UR	PST873A280RL	PST883A280NR	PST883A280UR	PST883A280RL
2.90V	±1.5%	20ms	PST870A290NR	PST870A290UR	PST870A290RL	PST880A290NR	PST880A290UR	PST880A290RL
		50ms	PST871A290NR	PST871A290UR	PST871A290RL	PST881A290NR	PST881A290UR	PST881A290RL
		100ms	PST872A290NR	PST872A290UR	PST872A290RL	PST882A290NR	PST882A290UR	PST882A290RL
		200ms	PST873A290NR	PST873A290UR	PST873A290RL	PST883A290NR	PST883A290UR	PST883A290RL
3.00V	±1.5%	20ms	PST870A300NR	PST870A300UR	PST870A300RL	PST880A300NR	PST880A300UR	PST880A300RL
		50ms	PST871A300NR	PST871A300UR	PST871A300RL	PST881A300NR	PST881A300UR	PST881A300RL
		100ms	PST872A300NR	PST872A300UR	PST872A300RL	PST882A300NR	PST882A300UR	PST882A300RL
		200ms	PST873A300NR	PST873A300UR	PST873A300RL	PST883A300NR	PST883A300UR	PST883A300RL

Selection guide

Detection Voltage	Accuracy	delay time (typ.)	CMOS output			Open Drain output		
			SOT-25A Package (3,000pcs/Reel)	SC-82ABB Package (3,000pcs/Reel)	SSON-4B Package (3,000pcs/Reel)	SOT-25A Package (3,000pcs/Reel)	SC-82ABB Package (3,000pcs/Reel)	SSON-4B Package (3,000pcs/Reel)
3.10V	±1.5%	20ms	PST870A310NR	PST870A310UR	PST870A310RL	PST880A310NR	PST880A310UR	PST880A310RL
		50ms	PST871A310NR	PST871A310UR	PST871A310RL	PST881A310NR	PST881A310UR	PST881A310RL
		100ms	PST872A310NR	PST872A310UR	PST872A310RL	PST882A310NR	PST882A310UR	PST882A310RL
		200ms	PST873A310NR	PST873A310UR	PST873A310RL	PST883A310NR	PST883A310UR	PST883A310RL
3.20V	±1.5%	20ms	PST870A320NR	PST870A320UR	PST870A320RL	PST880A320NR	PST880A320UR	PST880A320RL
		50ms	PST871A320NR	PST871A320UR	PST871A320RL	PST881A320NR	PST881A320UR	PST881A320RL
		100ms	PST872A320NR	PST872A320UR	PST872A320RL	PST882A320NR	PST882A320UR	PST882A320RL
		200ms	PST873A320NR	PST873A320UR	PST873A320RL	PST883A320NR	PST883A320UR	PST883A320RL
3.30V	±1.5%	20ms	PST870A330NR	PST870A330UR	PST870A330RL	PST880A330NR	PST880A330UR	PST880A330RL
		50ms	PST871A330NR	PST871A330UR	PST871A330RL	PST881A330NR	PST881A330UR	PST881A330RL
		100ms	PST872A330NR	PST872A330UR	PST872A330RL	PST882A330NR	PST882A330UR	PST882A330RL
		200ms	PST873A330NR	PST873A330UR	PST873A330RL	PST883A330NR	PST883A330UR	PST883A330RL
3.40V	±1.5%	20ms	PST870A340NR	PST870A340UR	PST870A340RL	PST880A340NR	PST880A340UR	PST880A340RL
		50ms	PST871A340NR	PST871A340UR	PST871A340RL	PST881A340NR	PST881A340UR	PST881A340RL
		100ms	PST872A340NR	PST872A340UR	PST872A340RL	PST882A340NR	PST882A340UR	PST882A340RL
		200ms	PST873A340NR	PST873A340UR	PST873A340RL	PST883A340NR	PST883A340UR	PST883A340RL
3.50V	±1.5%	20ms	PST870A350NR	PST870A350UR	PST870A350RL	PST880A350NR	PST880A350UR	PST880A350RL
		50ms	PST871A350NR	PST871A350UR	PST871A350RL	PST881A350NR	PST881A350UR	PST881A350RL
		100ms	PST872A350NR	PST872A350UR	PST872A350RL	PST882A350NR	PST882A350UR	PST882A350RL
		200ms	PST873A350NR	PST873A350UR	PST873A350RL	PST883A350NR	PST883A350UR	PST883A350RL
3.60V	±1.5%	20ms	PST870A360NR	PST870A360UR	PST870A360RL	PST880A360NR	PST880A360UR	PST880A360RL
		50ms	PST871A360NR	PST871A360UR	PST871A360RL	PST881A360NR	PST881A360UR	PST881A360RL
		100ms	PST872A360NR	PST872A360UR	PST872A360RL	PST882A360NR	PST882A360UR	PST882A360RL
		200ms	PST873A360NR	PST873A360UR	PST873A360RL	PST883A360NR	PST883A360UR	PST883A360RL
3.70V	±1.5%	20ms	PST870A370NR	PST870A370UR	PST870A370RL	PST880A370NR	PST880A370UR	PST880A370RL
		50ms	PST871A370NR	PST871A370UR	PST871A370RL	PST881A370NR	PST881A370UR	PST881A370RL
		100ms	PST872A370NR	PST872A370UR	PST872A370RL	PST882A370NR	PST882A370UR	PST882A370RL
		200ms	PST873A370NR	PST873A370UR	PST873A370RL	PST883A370NR	PST883A370UR	PST883A370RL
3.80V	±1.5%	20ms	PST870A380NR	PST870A380UR	PST870A380RL	PST880A380NR	PST880A380UR	PST880A380RL
		50ms	PST871A380NR	PST871A380UR	PST871A380RL	PST881A380NR	PST881A380UR	PST881A380RL
		100ms	PST872A380NR	PST872A380UR	PST872A380RL	PST882A380NR	PST882A380UR	PST882A380RL
		200ms	PST873A380NR	PST873A380UR	PST873A380RL	PST883A380NR	PST883A380UR	PST883A380RL
3.90V	±1.5%	20ms	PST870A390NR	PST870A390UR	PST870A390RL	PST880A390NR	PST880A390UR	PST880A390RL
		50ms	PST871A390NR	PST871A390UR	PST871A390RL	PST881A390NR	PST881A390UR	PST881A390RL
		100ms	PST872A390NR	PST872A390UR	PST872A390RL	PST882A390NR	PST882A390UR	PST882A390RL
		200ms	PST873A390NR	PST873A390UR	PST873A390RL	PST883A390NR	PST883A390UR	PST883A390RL
4.00V	±1.5%	20ms	PST870A400NR	PST870A400UR	PST870A400RL	PST880A400NR	PST880A400UR	PST880A400RL
		50ms	PST871A400NR	PST871A400UR	PST871A400RL	PST881A400NR	PST881A400UR	PST881A400RL
		100ms	PST872A400NR	PST872A400UR	PST872A400RL	PST882A400NR	PST882A400UR	PST882A400RL
		200ms	PST873A400NR	PST873A400UR	PST873A400RL	PST883A400NR	PST883A400UR	PST883A400RL
4.10V	±1.5%	20ms	PST870A410NR	PST870A410UR	PST870A410RL	PST880A410NR	PST880A410UR	PST880A410RL
		50ms	PST871A410NR	PST871A410UR	PST871A410RL	PST881A410NR	PST881A410UR	PST881A410RL
		100ms	PST872A410NR	PST872A410UR	PST872A410RL	PST882A410NR	PST882A410UR	PST882A410RL
		200ms	PST873A410NR	PST873A410UR	PST873A410RL	PST883A410NR	PST883A410UR	PST883A410RL
4.20V	±1.5%	20ms	PST870A420NR	PST870A420UR	PST870A420RL	PST880A420NR	PST880A420UR	PST880A420RL
		50ms	PST871A420NR	PST871A420UR	PST871A420RL	PST881A420NR	PST881A420UR	PST881A420RL
		100ms	PST872A420NR	PST872A420UR	PST872A420RL	PST882A420NR	PST882A420UR	PST882A420RL
		200ms	PST873A420NR	PST873A420UR	PST873A420RL	PST883A420NR	PST883A420UR	PST883A420RL
4.30V	±1.5%	20ms	PST870A430NR	PST870A430UR	PST870A430RL	PST880A430NR	PST880A430UR	PST880A430RL
		50ms	PST871A430NR	PST871A430UR	PST871A430RL	PST881A430NR	PST881A430UR	PST881A430RL
		100ms	PST872A430NR	PST872A430UR	PST872A430RL	PST882A430NR	PST882A430UR	PST882A430RL
		200ms	PST873A430NR	PST873A430UR	PST873A430RL	PST883A430NR	PST883A430UR	PST883A430RL
4.40V	±1.5%	20ms	PST870A440NR	PST870A440UR	PST870A440RL	PST880A440NR	PST880A440UR	PST880A440RL
		50ms	PST871A440NR	PST871A440UR	PST871A440RL	PST881A440NR	PST881A440UR	PST881A440RL
		100ms	PST872A440NR	PST872A440UR	PST872A440RL	PST882A440NR	PST882A440UR	PST882A440RL
		200ms	PST873A440NR	PST873A440UR	PST873A440RL	PST883A440NR	PST883A440UR	PST883A440RL
4.50V	±1.5%	20ms	PST870A450NR	PST870A450UR	PST870A450RL	PST880A450NR	PST880A450UR	PST880A450RL
		50ms	PST871A450NR	PST871A450UR	PST871A450RL	PST881A450NR	PST881A450UR	PST881A450RL
		100ms	PST872A450NR	PST872A450UR	PST872A450RL	PST882A450NR	PST882A450UR	PST882A450RL
		200ms	PST873A450NR	PST873A450UR	PST873A450RL	PST883A450NR	PST883A450UR	PST883A450RL

2 Reset IC (Voltage detector)

CMOS system reset IC built-in delay time circuit

PST803–810 Series

Outline

These IC series are a system reset IC Built–in delay time circuit. The IC is a small space on PCB by no external capacitor and small package.
The IC is compatible with a standard Reset PST809 **series**, and can choose a detective voltage at 0.1V steps.

Applications

(1) The reset circuits of CPU and MPU
(2) The reset circuits of logic circuit.
(3) Battery voltage check circuits
(4) The change circuit of a backup circuits
(5) Level detection circuits
(6) Level detector

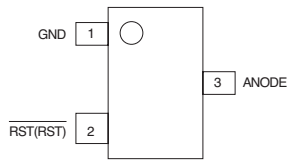
Features (Unless otherwise specified, Ta=+25°C)

(1) Operating supply voltage....1.0V to 6.0V (Ta=0°C to 70°C)
(2) Supply current.....0.5μA typ.
(3) Reset threshold range.....1.6V to 5.0V
(2.63V/2.93V/3.08V/4.38V/4.63V)
(4) Reset threshold accuracy ...±1.0%
(5) Reset temperature coefficient
30ppm/°C typ.
(6) Reset active timeout period 50/100/200/240/400ms
(7) Output voltage L .....0.4V max. (Isink=3.2mA)
(8) Output voltage H.....VDD−1.5V min. (Isource=800μA)
(9) Output type
Open drain output + Active L: PST803, PST805
Open drain output + Active H: PST804, PST806
CMOS output + Active L : PST807, PST809
CMOS output + Active H : PST80, PST810

Pin assignment

SOT-23A

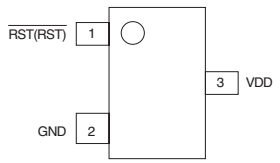
(Top view)



PST803,PST804,PST809,PST810

SOT-23A

(Top view)



PST805,PST806,PST807,PST808

Pin no.	SOT-23A PST803, PST804 PST809, PST810	SOT-23A PST805, PST806 PST807, PST808
1	GND	RST(RST)
2	RST(RST)	GND
3	VDD	VDD

Model name structure

P S T 8 □ □ A □ □ □ N □
a b c d

a		b		c		d	
Output Type		delay time rank		Detection voltage rank		Packing Specification	
03	Open Drain output Active–Low	A	240ms	160	VDET=1.60V	M	R Housing Halogen free
04	Open Drain output Active-High	B	50ms	|	|	H	L Housing Halogen free
05	Open Drain output Active–Low	C	100ms	500	VDET=5.00V	R	R Housing Halogen contained Product
06	Open Drain output Active-High	D	200ms	-	-	L	L Housing Halogen contained Product
07	CMOS output Active–Low	E	400ms				
08	CMOS output Active-High						
09	CMOS output Active–Low						
10	CMOS output Active-High						

Selection guide

The examples of PST809 are shown below.

3,000pcs/Reel

Detection Voltage	delay time (typ.)	CMOS output Active–Low SOT-23A Package	Detection Voltage	delay time (typ.)	CMOS outputActive–Low SOT-23A Package	Detection Voltage	delay time (typ.)	CMOS outputActive–Low SOT-23A Package
1.60V	240ms	PST809A160NM	3.00V	240ms	PST809A300NM	4.40V	240ms	PST809A440NM
	50ms	PST809B160NM		50ms	PST809B300NM		50ms	PST809B440NM
	100ms	PST809C160NM		100ms	PST809C300NM		100ms	PST809C440NM
	200ms	PST809D160NM		200ms	PST809D300NM		200ms	PST809D440NM
	400ms	PST809E160NM		400ms	PST809E300NM		400ms	PST809E440NM
1.70V	240ms	PST809A170NM	3.10V	240ms	PST809A310NM	4.50V	240ms	PST809A450NM
	50ms	PST809B170NM		50ms	PST809B310NM		50ms	PST809B450NM
	100ms	PST809C170NM		100ms	PST809C310NM		100ms	PST809C450NM
	200ms	PST809D170NM		200ms	PST809D310NM		200ms	PST809D450NM
	400ms	PST809E170NM		400ms	PST809E310NM		400ms	PST809E450NM
1.80V	240ms	PST809A180NM	3.20V	240ms	PST809A320NM	4.60V	240ms	PST809A460NM
	50ms	PST809B180NM		50ms	PST809B320NM		50ms	PST809B460NM
	100ms	PST809C180NM		100ms	PST809C320NM		100ms	PST809C460NM
	200ms	PST809D180NM		200ms	PST809D320NM		200ms	PST809D460NM
	400ms	PST809E180NM		400ms	PST809E320NM		400ms	PST809E460NM
1.90V	240ms	PST809A190NM	3.30V	240ms	PST809A330NM	4.70V	240ms	PST809A470NM
	50ms	PST809B190NM		50ms	PST809B330NM		50ms	PST809B470NM
	100ms	PST809C190NM		100ms	PST809C330NM		100ms	PST809C470NM
	200ms	PST809D190NM		200ms	PST809D330NM		200ms	PST809D470NM
	400ms	PST809E190NM		400ms	PST809E330NM		400ms	PST809E470NM
2.00V	240ms	PST809A200NM	3.40V	240ms	PST809A340NM	4.80V	240ms	PST809A480NM
	50ms	PST809B200NM		50ms	PST809B340NM		50ms	PST809B480NM
	100ms	PST809C200NM		100ms	PST809C340NM		100ms	PST809C480NM
	200ms	PST809D200NM		200ms	PST809D340NM		200ms	PST809D480NM
	400ms	PST809E200NM		400ms	PST809E340NM		400ms	PST809E480NM
2.10V	240ms	PST809A210NM	3.50V	240ms	PST809A350NM	4.90V	240ms	PST809A490NM
	50ms	PST809B210NM		50ms	PST809B350NM		50ms	PST809B490NM
	100ms	PST809C210NM		100ms	PST809C350NM		100ms	PST809C490NM
	200ms	PST809D210NM		200ms	PST809D350NM		200ms	PST809D490NM
	400ms	PST809E210NM		400ms	PST809E350NM		400ms	PST809E490NM
2.20V	240ms	PST809A220NM	3.60V	240ms	PST809A360NM	5.00V	240ms	PST809A500NM
	50ms	PST809B220NM		50ms	PST809B360NM		50ms	PST809B500NM
	100ms	PST809C220NM		100ms	PST809C360NM		100ms	PST809C500NM
	200ms	PST809D220NM		200ms	PST809D360NM		200ms	PST809D500NM
	400ms	PST809E220NM		400ms	PST809E360NM		400ms	PST809E500NM
2.30V	240ms	PST809A230NM	3.70V	240ms	PST809A370NM	2.63V	240ms	PST809A263NM
	50ms	PST809B230NM		50ms	PST809B370NM		50ms	PST809B263NM
	100ms	PST809C230NM		100ms	PST809C370NM		100ms	PST809C263NM
	200ms	PST809D230NM		200ms	PST809D370NM		200ms	PST809D263NM
	400ms	PST809E230NM		400ms	PST809E370NM		400ms	PST809E263NM
2.40V	240ms	PST809A240NM	3.80V	240ms	PST809A380NM	2.93V	240ms	PST809A293NM
	50ms	PST809B240NM		50ms	PST809B380NM		50ms	PST809B293NM
	100ms	PST809C240NM		100ms	PST809C380NM		100ms	PST809C293NM
	200ms	PST809D240NM		200ms	PST809D380NM		200ms	PST809D293NM
	400ms	PST809E240NM		400ms	PST809E380NM		400ms	PST809E293NM
2.50V	240ms	PST809A250NM	3.90V	240ms	PST809A390NM	3.08V	240ms	PST809A308NM
	50ms	PST809B250NM		50ms	PST809B390NM		50ms	PST809B308NM
	100ms	PST809C250NM		100ms	PST809C390NM		100ms	PST809C308NM
	200ms	PST809D250NM		200ms	PST809D390NM		200ms	PST809D308NM
	400ms	PST809E250NM		400ms	PST809E390NM		400ms	PST809E308NM
2.60V	240ms	PST809A260NM	4.00V	240ms	PST809A400NM	4.38V	240ms	PST809A438NM
	50ms	PST809B260NM		50ms	PST809B400NM		50ms	PST809B438NM
	100ms	PST809C260NM		100ms	PST809C400NM		100ms	PST809C438NM
	200ms	PST809D260NM		200ms	PST809D400NM		200ms	PST809D438NM
	400ms	PST809E260NM		400ms	PST809E400NM		400ms	PST809E438NM
2.70V	240ms	PST809A270NM	4.10V	240ms	PST809A410NM	4.63V	240ms	PST809A463NM
	50ms	PST809B270NM		50ms	PST809B410NM		50ms	PST809B463NM
	100ms	PST809C270NM		100ms	PST809C410NM		100ms	PST809C463NM
	200ms	PST809D270NM		200ms	PST809D410NM		200ms	PST809D463NM
	400ms	PST809E270NM		400ms	PST809E410NM		400ms	PST809E463NM
2.80V	240ms	PST809A280NM	4.20V	240ms	PST809A420NM			
	50ms	PST809B280NM		50ms	PST809B420NM			
	100ms	PST809C280NM		100ms	PST809C420NM			
	200ms	PST809D280NM		200ms	PST809D420NM			
	400ms	PST809E280NM		400ms	PST809E420NM			
2.90V	240ms	PST809A290NM	4.30V	240ms	PST809A430NM			
	50ms	PST809B290NM		50ms	PST809B430NM			
	100ms	PST809C290NM		100ms	PST809C430NM			
	200ms	PST809D290NM		200ms	PST809D430NM			
	400ms	PST809E290NM		400ms	PST809E430NM			

Please refer to "Model name structure" and contact us for other series (PST803 to PST810).

3 SENSOR ICs

Electrical characteristics (Unless otherwise specified, Ta=+25°C)

Temperature switch IC

Product name	Type	Operating temperature	Operating supply voltage	Detection temperature range	Temperature detection accuracy	Current consumption (typ.)	Package
MM3488	hysteresis	–30 to +105°C	1.6V to 5.0V	60 to 90°C (1.0°C step)	±2.0°C	1.5μA	SSON–4B
MM3688	hysteresis, Low current consumption	–40 to +125°C	1.6V to 5.0V	60 to 90°C (1.0°C step)	±2.0°C	0.12μA	PLP–4A

Analog output temperature sensor IC

Product name	Temperature sensitivity	Operating temperature	Operating supply voltage	Temperature detection accuracy	Current consumption (typ.)	Package
MM3154	-8.20mV / °C	–40 to +100°C	2.4V to 6.5V	±2.5°C (–30 to +100°C)	2.5μA	SC–82ABB SSON–4B

Digital output temperature sensor IC

Product name	Temperature resolution	Operating temperature	Operating supply voltage	Temperature detection accuracy	Current consumption (typ.)	Package
MM3285	0.5°C	–40 to +120°C	3.0V to 5.5V	±2.0°C (–25 to +100°C) ±3.0°C (–40 to +125°C)	75μA	SOT–25A SOT–26A

Pressure sensor

Product name	Operating supply voltage	Pressure medium	Pressure detecting method	Operating pressure range	Accuracy	Package
MMR901XA	2.4V to 3.6V	Air (no condensation)	Piezoresistive method	0 to 300mmHg	±2mmHg (266Pa)	7.0(W)×7.0(D)×7.2(H)mm
MMR902	1.7V to 3.6V	Air (no condensation)	Piezoresistive method	–10 to +330mmHg	±2mmHg (266Pa)	7.0(W)×7.0(D)×7.2(H)mm
MMR906 NEW	1.7V to 3.6V	Air (no condensation)	Piezoresistive method	–10 to +330mmHg	±2mmHg (266Pa)	5.0(W)×6.0(D)×7.2(H)mm

Absolute Pressure Sensor Module

Product name	Operating supply voltage	Pressure medium	Pressure detecting method	Operating pressure range	Accuracy	Package
MMR931XA NEW	1.7V to 3.6V	Air (No condensation)	Piezoresistive method	30K to 110KPa	±100Pa	3.0(W)×3.0(D)×1.1(H)mm

Electrical characteristics (Unless otherwise specified, Ta=+25°C)

AC current sensor

Product name	VCC operating voltage	Operating temperature	Current consumption (typ.)	Current consumption (standby)	Output current	Package
MM1969 NEW	3.3V to 5.5V	–40 to +85°C	0.8mA	2μA Max. (VCC=3.3V)	1mA	SOP–8G

Flame detection amplifiers

Product name	Characteristic	Power supply voltage	Current consumption (typ.)	amplifier section Input voltage range	amplifier section Input offset voltage	Gain	Package
MM1217 NEW	Contains a comparator	1.8V to 6.0V	0.1mA	–0.2 to 0.3V	±0.1mV Typ.	100dB Typ.	SOP–8D
MM1278 NEW	Dual amplifier	1.8V to 6.0V	0.1mA	–0.2 to 0.3V	±0.1mV Typ.	100dB Typ.	SOP–8D

Analog signal convert IC

Product name	Power supply voltage	Operating temperature	Current consumption (typ.)	Current consumption (standby)	Effective resolution	Data output rate	Package
MM3609 NEW	VDD33 1.71 to 3.6V VDD33 1.14 to 3.6V (Typ.3.3V)	–40 to +85°C	540μA	1μA Max.	Up to 22bits	20Hz to 2,560Hz	PLP–24

3 SENSOR ICs

Temperature switch IC with hysteresis

MM3488 Series

Outline

This IC is a temperature switch IC that changes the IC output level from Low to High when the temperature around the IC reaches the detection temperature. With the hysteresis function, IC output level returns to Low when the ambient temperature drops to the hysteresis temperature selected after detection. Detection temperature (TDET) can be selected in 1.0°C steps between the range of 60 to 90°C with rank expansion, with detection temperature accuracy of ±2.0°C.

Features (Unless otherwise specified, Ta=+25°C)

(1) Low current consumption ..... 1.5μA typ.
(2) Small package SSON–4B
(3) High Temperature accuracy ..... ±2.0°C
(4) Low power supply operation range ..... 1.6V to 5.0V
(5) Comes with hysteresis function

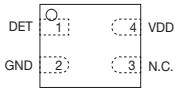
Applications

(1) Smart phones, Mobile phones
(2) Flat TVs
(3) Portable games
(4) Tablet PCs, PCs
(5) System temperature monitoring
(6) Office automation equipment

Pin assignment

SSON–4B

(Top view)



Pin no.	Symbol	Function
1	DET	Temp. Detect output pin
2	GND	Ground pin
3	N.C.	Non connection (Testing pin)
4	VDD	Power supply pin

Note1 : Testing pin is connected with the internal circuit for testing.
When resistance and capacity are connected with Testing pin, this product produce improper operating signals. Please set Testing pin to the open state.

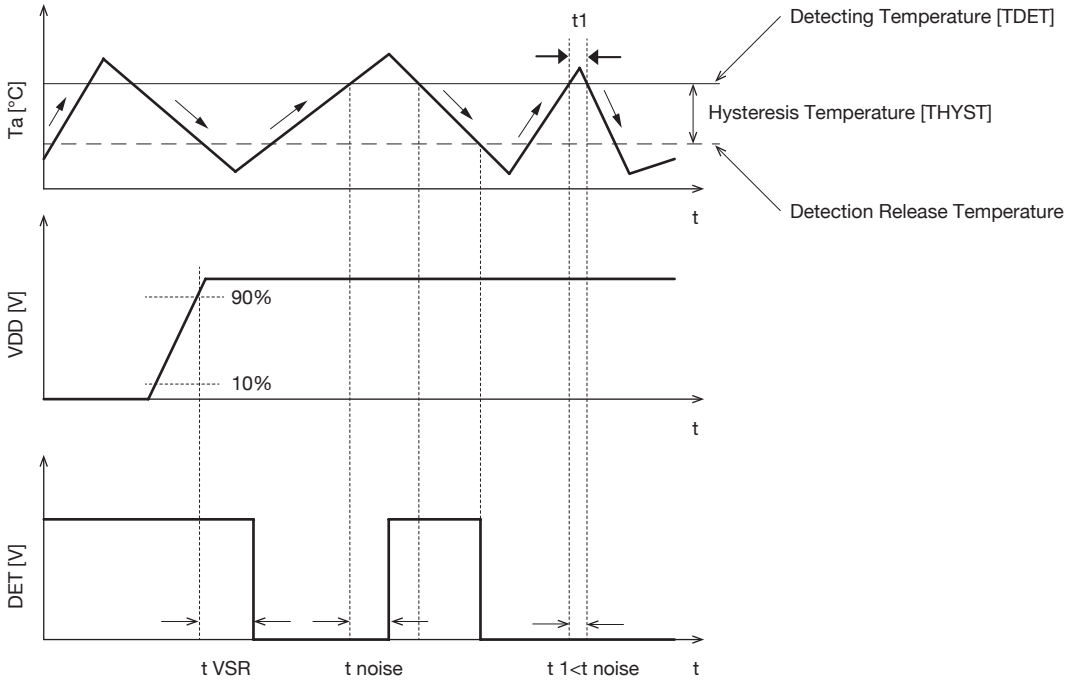
Model name structure

M M 3 4 8 8 □ □ □ R □ E

1 2 3 4

1		2		3		4	
Hysteresis Temperature (THYS)		Detecting Temperature (TDET)		Package		Packing Specifications	
A	THYS=5.0°C	60	TDET=60°C	R	SSON–4B	R	R HOUSING
B	THYS=10°C	|	TDET is 1.0°C steps	-	-	L	L HOUSING
C	THYS=15.0°C	90	TDET=90°C	-	-	-	-

Timing chart



3 SENSOR ICs

Temperature switch IC with hysteresis

MM3688 Series

Outline

This IC is a temperature switch IC that changes the IC output level from Low to High when the temperature around the IC reaches the detection temperature. With the hysteresis function, IC output level returns to Low when the ambient temperature drops to the hysteresis temperature selected after detection. Detection temperature T_{DET} can be selected in 1.0°C steps between the range of 60 to 90°C with rank expansion, with detection temperature accuracy of ±2.0°C.

Features (Unless otherwise specified, Ta=+25°C)

(1) Low current consumption ..... 0.12μA typ.
(2) Small package..... PLP–4A
(3) High Temperature accuracy ..... ±2.0°C
(4) Low power supply operation range ..... 1.6V to 5.0V
(5) Comes with hysteresis function

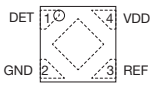
Applications

(1) Smart phones, Mobile phones
(2) Flat-TVs
(3) Game equipments
(4) Tablets, PCs
(5) System thermal monitor
(6) OA equipments

Pin assignment

PLP–4A

(Top view)



Pin no.	Symbol	Function
1	DET	Temperature detect output pin
2	GND	Ground pin
3	REF	REF pin (Testing pin)
4	VDD	Power supply pin

Note1 : Testing pin is connected with the internal circuit for testing.
When resistance and capacity are connected with Testing pin, this product produce improper operating signals. Please set Testing pin to the open state.

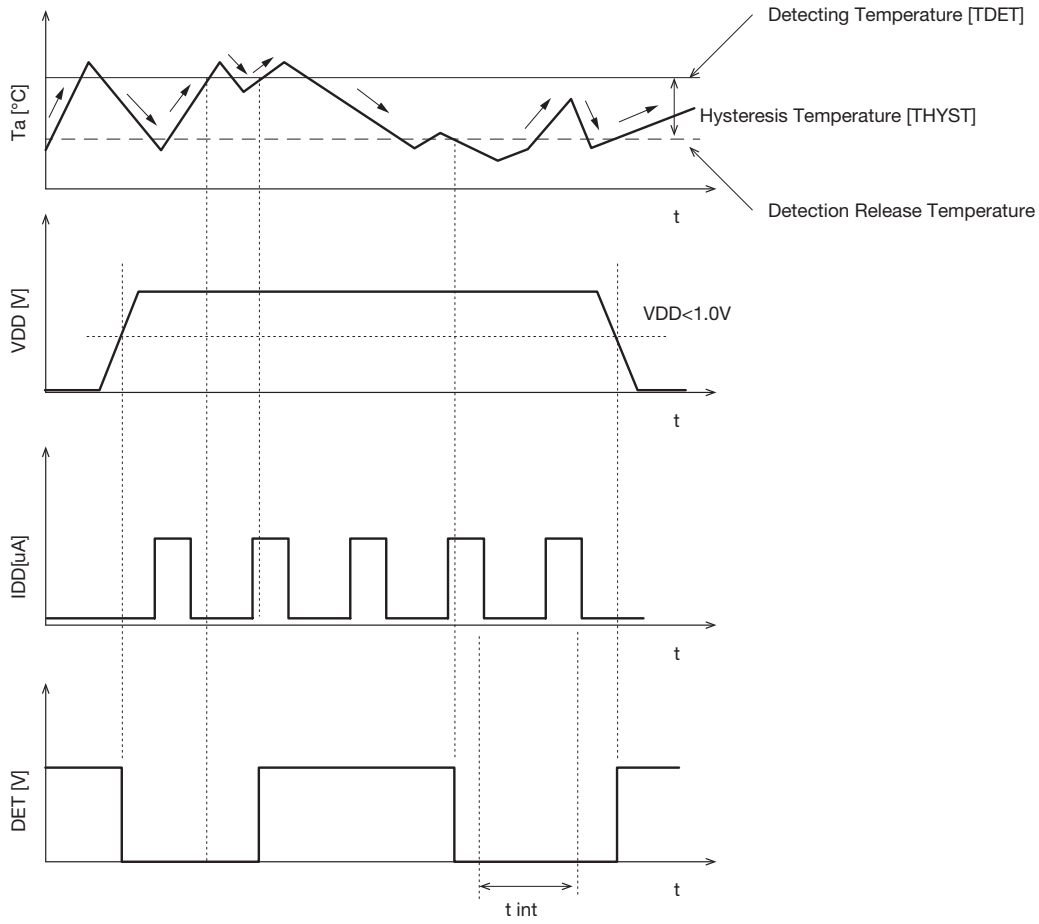
Model name structure

M M 3 6 8 8 □ □ □ R R E

1 2 3 4

1		2		3		4	
Hysteresis Temperature (T_{HYS})		Detecting Temperature (T_{DET})		Package		Packing Specifications	
B	T_{HYS}=10°C	60	T_{DET}=60°C	R	PLP–4A	R	R HOUSING
C	T_{HYS}=15°C	|	T_{DET} is 1.0°C steps	-	-	L	L HOUSING
D	T_{HYS}=20°C	90	T_{DET}=90°C	-	-	-	-
E	T_{HYS}=25°C	-	-	-	-	-	-

Timing chart



3 SENSOR ICs

High-accuracy temperature sensor

MM3154 Series

Outline

This IC is a high-accuracy temperature sensor IC that can linearly output the voltage in response to changes in temperature. The operating temperature range is -40°C to 100°C, and the operating supply voltage range is 2.4V to 6.5V. Compared to conventional thermistors and similar devices, it has superior linearity and a maximum temperature accuracy error of ±2.5°C. It is suitable for use in portable devices as the current consumption is as low as 4.5μA typ. (Ta = 25°C)

Features (Unless otherwise specified, Ta=+25°C)

(1) High temperature accuracy..... ±2.5°C
(2) Low current consumption ..... 4.5μA typ.
(3) Wide operating supply power voltage ..... 2.4V to 6.5V
(4) High input stability
(5) High load stability
(6) Temperature-output voltage high linearity

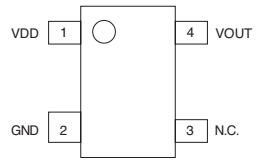
Applications

(1) Smart phones, Mobile phones
(2) Crystal oscillator modules
(3) Tablets, PCs
(4) Power modules
(5) Battery packs and chargers

Pin assignment

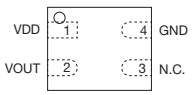
SC–82ABB

(Top view)



SSON–4B

(Top view)



Pin no.	Symbol	
	SC-82ABB	SSON-4B
1	VDD	VDD
2	GND	VOUT
3	N.C.	N.C.
4	VOUT	GND

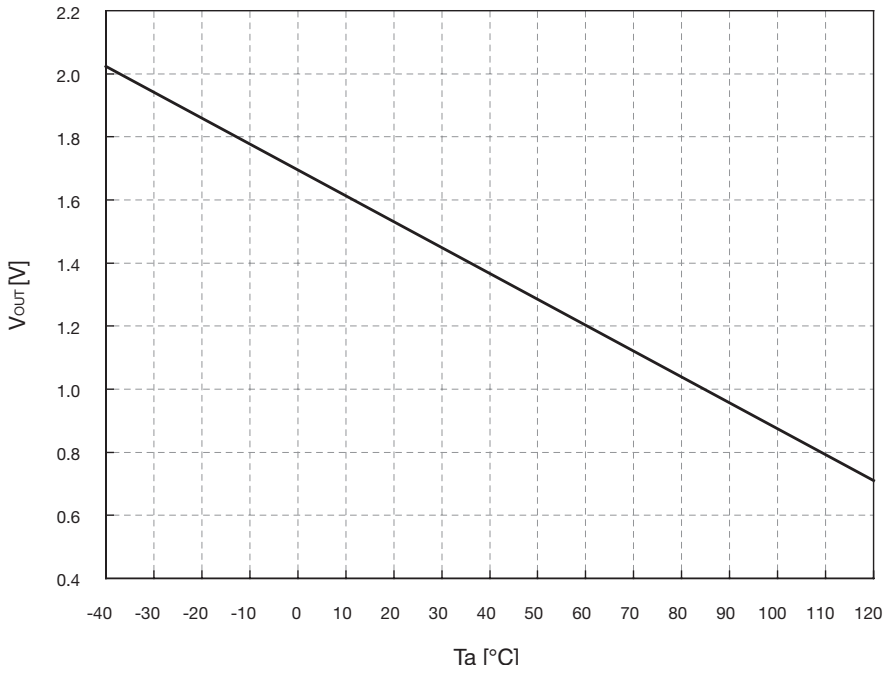
Model name structure

M M 3 1 5 4 X □ □ E □

1 2 3

1		2		3	
Package		Packing specifications		Halogen	
R	SSON-4B	R	R HOUSING	H	Halogen-free
U	SC-82ABB	L	L HOUSING	-	Not compliance

Output voltage vs Temperature



3 SENSOR ICs

Temperature sensor for I²C BUS

MM3285 Series

Outline

This IC is an I²C BUS compatible digital temperature sensor IC incorporating a temperature sensor and sigma-delta AD converter. It provides low current consumption and I²C BUS compatible interface, which makes it ideal for a wide range of applications.

Applications

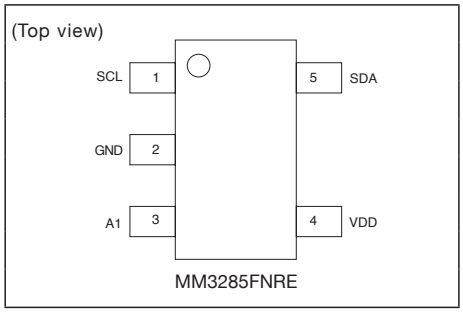
(1) Flat TVs
(2) Tablet PCs, PCs
(3) PC servers /network servers
(4) System temperature monitering
(5) Office automation equipments

Features (Unless otherwise specified, Ta=+25°C)

(1) Low voltage operation.....3.0V to 5.5V
(2) Low current consumption .....75μA typ.
(3) Temperature detection accuracy.....±2.0°C (–25°C to +100°C)
±3.0°C (–40°C to +125°C)
(4) Fast update of time .....2ms typ.
(5) Shutdown mode minimizing current consumption
(6) I²C BUS compatible interface
(7) Up to 4 ICs can be built into a bus
(8) Temperature data 9 bit resolution with a LSB equal to 0.5°C

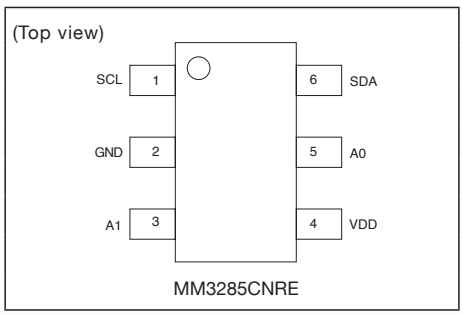
Pin assignment

SOT-25A



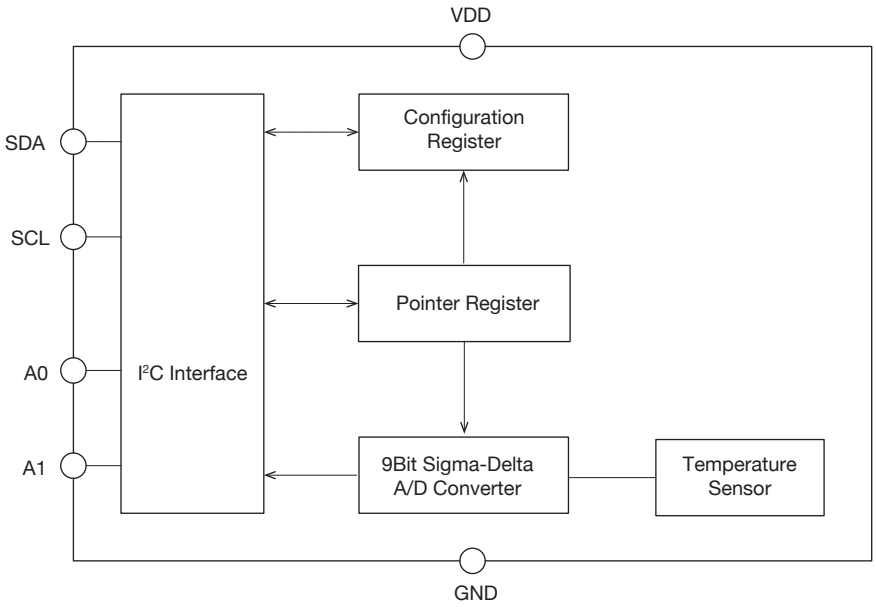
Pin no.	Symbol	Function
1	SCL	I²C BUS clock input pin
2	GND	Ground pin
3	A1	Slave address set pin
4	VDD	Power supply pin
5	SDA	I²C BUS data I/O pin

SOT-26A



Pin no.	Symbol	Function
1	SCL	I²C BUS clock input pin
2	GND	Ground pin
3	A1	Slave address set pin
4	VDD	Power supply pin
5	A0	Slave address set pin
6	SDA	I²C BUS data I/O pin

Block diagram



3 SENSOR ICs

Pressure Sensor of Digital Output

MMR901XA

Outline

This product is a compact piezoresistive pressure sensor that makes use of MEMS*1 technology.
It is equipped with a 16–bit resolution ⊿Σ AD converter and outputs a highly precise pressure value as a digital value.
As interface, an SPI*2 interface is used to communicate to a microcomputer.
Thanks to the builtin temperature sensor and EEPROM*3 data, the dedicated software running on the external microcomputer can correct the property fluctuation caused due to variation in temperature.

*1 MEMS : Micro-Electro-Mechanical Systems
*2 SPI : Serial Peripheral Interface
*3 EEPROM : Electronically Erasable and Programmable Read Only Memory

Applications

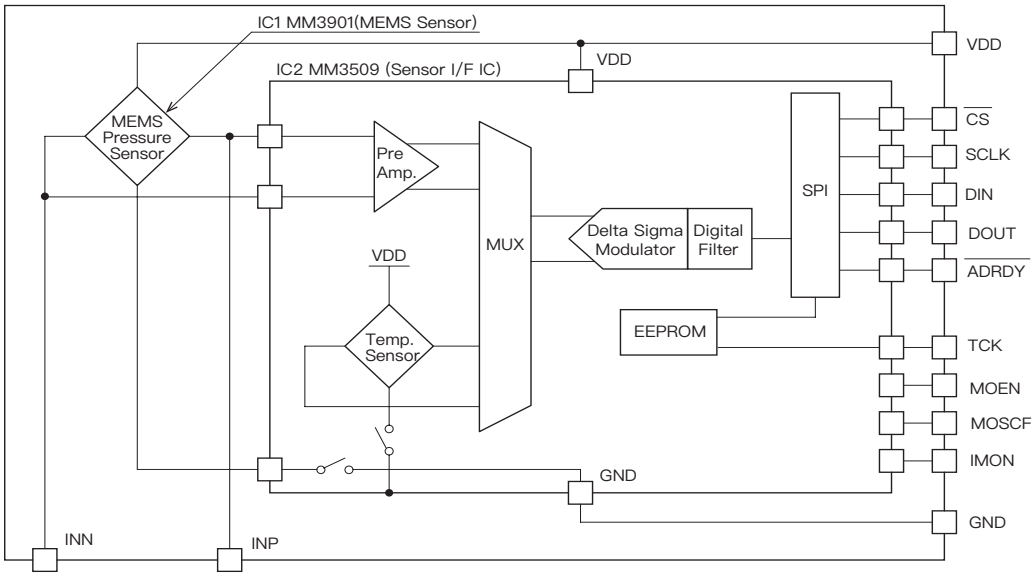
(1) for Sphygmomanometer

Features (Unless otherwise specified, Ta=+25°C)

(1) Small package..... 7.0 (W) ×7.0 (D) ×7.2 (H) mm
(2) Mounting of a ⊿Σ AD converter (16–bit resolution) allows the product to output a highly precise pressure value
(3) The built-in temperature sensor and correction data written on the EEPROM can correct the temperature
*Any calculation function is not built into the product.
(4) Data output rate suitable for detection of the pulsating waveforms synchronized with heart beats (approximately 200 Hz)
(5) Specifications

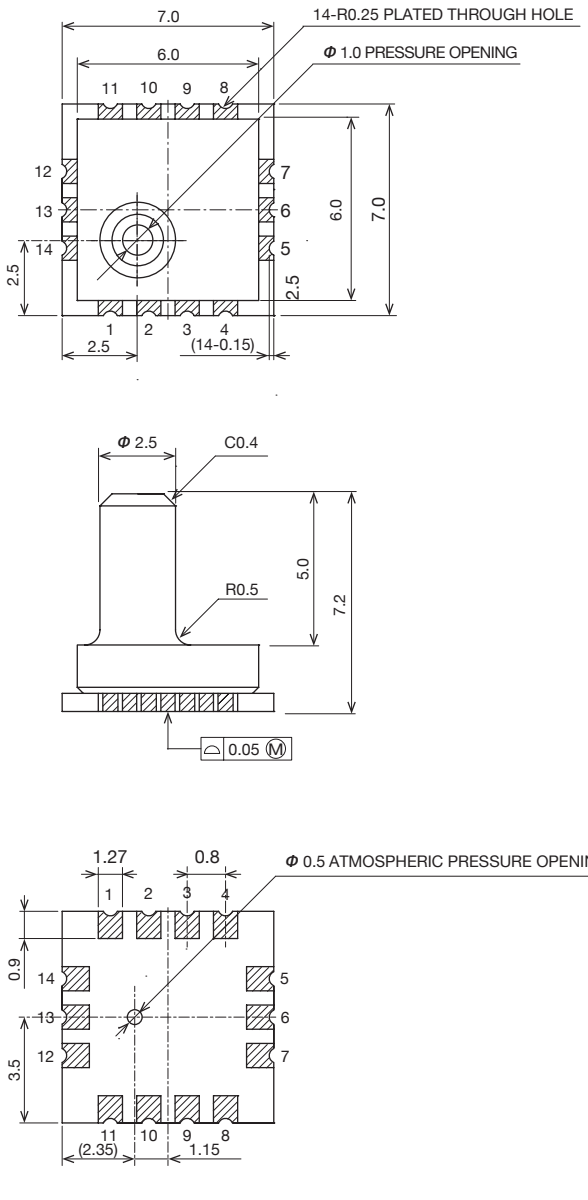
- Pressure type ..... Gauge pressure (Based on atmospheric pressure)
- Pressure medium ..... Air (no condensation)
- Pressure detecting method Piezoresistive method
- Maximum load pressure..... 80kPa (600mmHg)
- Operating pressure range .. 0.40kPa (300mmHg)
- Resolution ..... 3.3Pa(0.025mmHg)
- Accuracy ..... ±266Pa (±2mmHg)
- Power supply voltage range ... 2.4V, 3.6V (3.0V typ.)
- Current consumed when.....Max. 690μA pressure is measured
- Standby current consumption..... Max. 2μA
- Output type ..... 16–bit digital
- Conversion time 5.12msec
- Operating temperature range.... 5°C to 45°C

Block diagram



Dimensions

(Unit : mm)



3 SENSOR ICs

Low Supply Voltage, Digital Output Gage Pressure Sensor

MMR902

Outline

This product is a Gage pressure sensor which MEMS*1 Gage pressure sensor and AFE IC*2 are modularized. It digitally outputs a pressure value which was corrected in the module. Customers need no correction because it corrects and outputs the differences of sensors and temperature characteristics. It does not require complicated sensor drive or control circuit, and devices with high performance can be made only with this module and an external microcontroller which will be the host.

*1 MEMS : Micro-Electro-Mechanical Systems
*2 AFE IC : Analog Front End IC

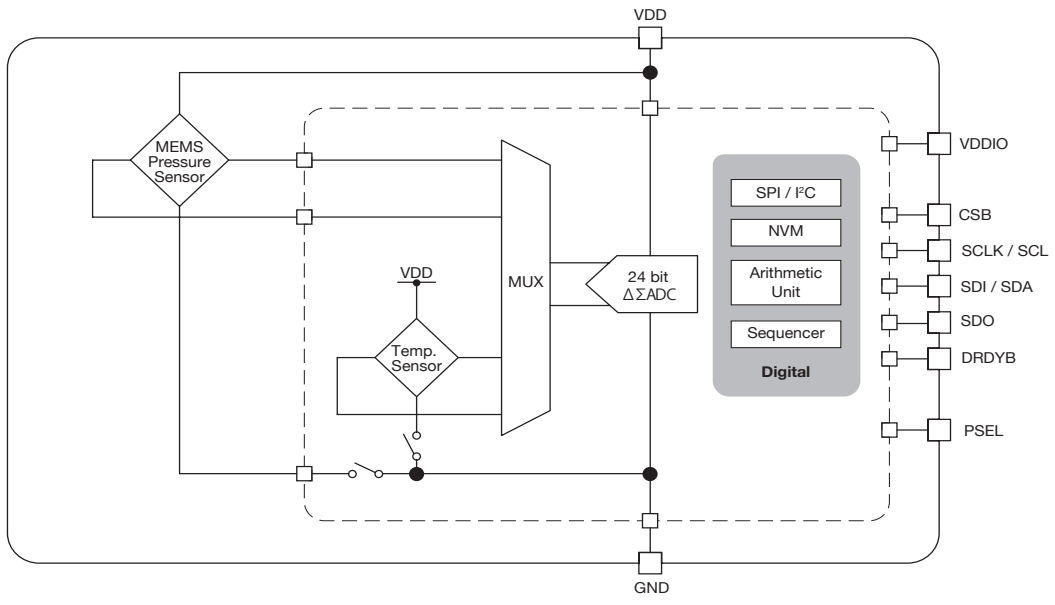
Applications

(1) Sphygmomanometer

Features (Unless otherwise specified, Ta=+25°C)

(1) Small package ..... 7.0 (W) ×7.0 (D) ×7.2 (H) mm
(2) It corrects the differences of sensors and temperature characteristics when shipped from our factor
(3) It digitally outputs pressure value by a built-in sequencer (SPI, I²C)
(4) Specifications
- Pressure type ..... Gage pressure (Based on atmospheric pressure)
- Pressure medium ..... Air (no condensation)
- Operating pressure range ..... −10 to +330mmHg (−1.33 to +43.99kPa)
- Pressure effective resolution .....0.040 / 0.028 / 0.020 / 0.005mmHgRMS
- Accuracy ..... ±2mmHg (266Pa)
- Power supply voltage range ..... 1.7V to 3.6V
- Conversion time ..... 3.91 / 7.81 / 15.625 / 250msec
- Current consumed when pressure is measured 650µA
- Standby current consumption 0.1µA
- Operating temperature range... 5 to 45°C

Block diagram

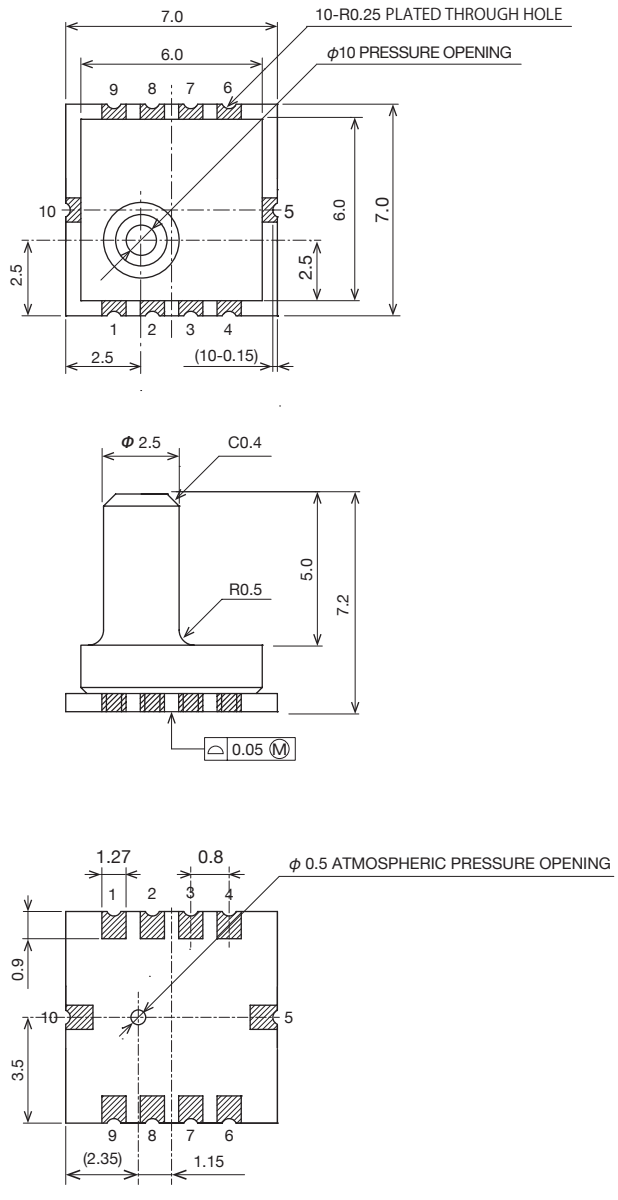


Lineup

Parts No.	Supply voltage	Current consumption	Operating pressure range	Package
MMR902A22A	2.2V typ.	575µA	−10 to +330mmHg	7.0(W) ×7.0(D) ×7.2(H)mm
MMR902A27A	2.7V typ.	605µA	−10 to +330mmHg	7.0(W) ×7.0(D) ×7.2(H)mm
MMR902A34A	3.4V typ.	650µA	−10 to +330mmHg	7.0(W) ×7.0(D) ×7.2(H)mm

Dimensions

(Unit : mm)



3 SENSOR ICs

Low Supply Voltage, Digital Output Gage Pressure Sensor

MMR906

Outline

This product is a Gage pressure sensor which MEMS*1 Gage pressure sensor and AFE IC*2 are modularized. It digitally outputs a pressure value which was corrected in the module. Customers need no correction because it corrects and outputs the differences of sensors and temperature characteristics. It does not require complicated sensor drive or control circuit, and devices with high performance can be made only with this module and an external microcontroller which will be the host.

*1 MEMS : Micro-Electro-Mechanical Systems
*2 AFE IC : Analog Front End IC

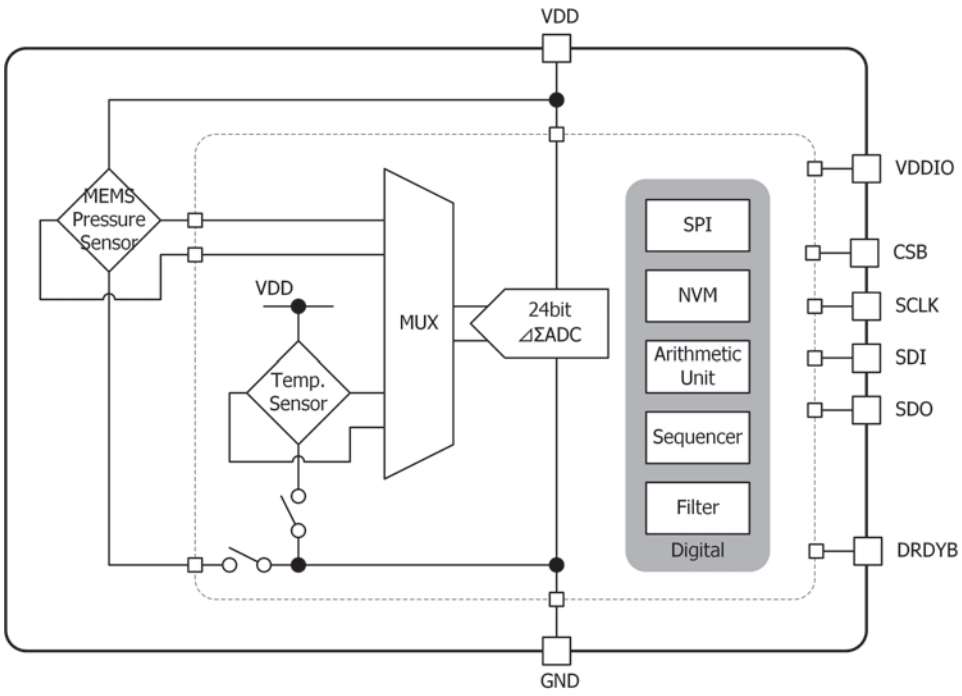
Applications

(1) Sphygmomanometer

Features (Unless otherwise specified, Ta=+25°C)

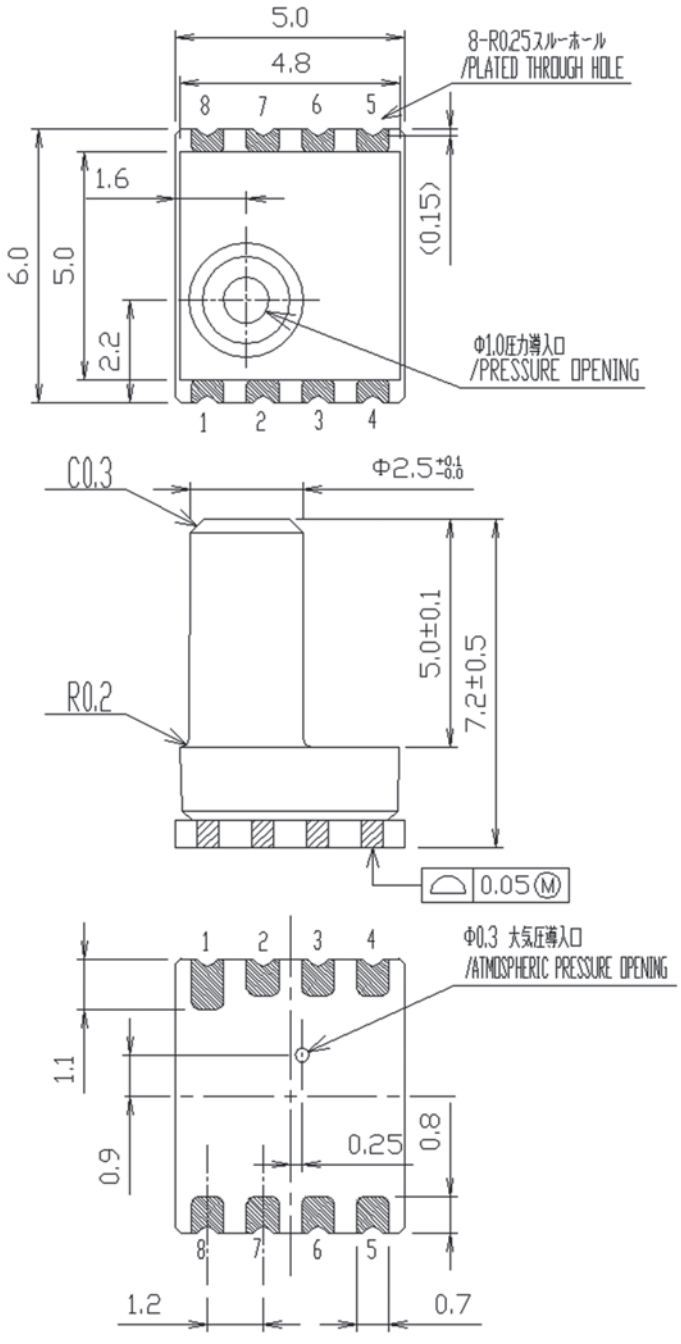
(1) Small package ..... 5.0 (W) ×6.0 (D) ×7.2 (H) mm
(2) It corrects the differences of sensors and temperature characteristics when shipped from our factor
(3) It digitally outputs pressure value by a built-in sequencer (SPI)
(4) Specifications
- Pressure type ..... Gage pressure (Based on atmospheric pressure)
- Pressure medium ..... Air (no condensation)
- Operating pressure range ..... −10 to +330mmHg (−1.33 to +43.99kPa)
- Pressure effective resolution .....0.050 / 0.035 / 0.025 / 0.007mmHgRMS
- Accuracy ..... ±2mmHg (266Pa)
- Power supply voltage range ..... 1.7V to 3.6V
- Conversion time ..... 4.07 / 7.92 / 15.625 / 247msec
- Current consumed when pressure is measured 640µA
- Standby current consumption 0.1µA
- Operating temperature range... 5 to 45°C

Block diagram



Dimensions

(Unit : mm)



3 SENSOR ICs

Absolute Pressure Sensor Module

MMR931XA

Outline

This product is an altitude atmospheric pressure sensor which MEMS absolute pressure sensor and AFE IC are modularized. It digitally outputs a pressure value which was corrected completely in the module.

Customers need no correction at all because it corrects and outputs the differences of sensors and temperature characteristics. It does not require complicated sensor drive or control circuit, and devices with high performance can be made only with this module and an external microcontroller which will be the host.

※1 MEMS : Micro–Electro–Mechanical Systems

Applications

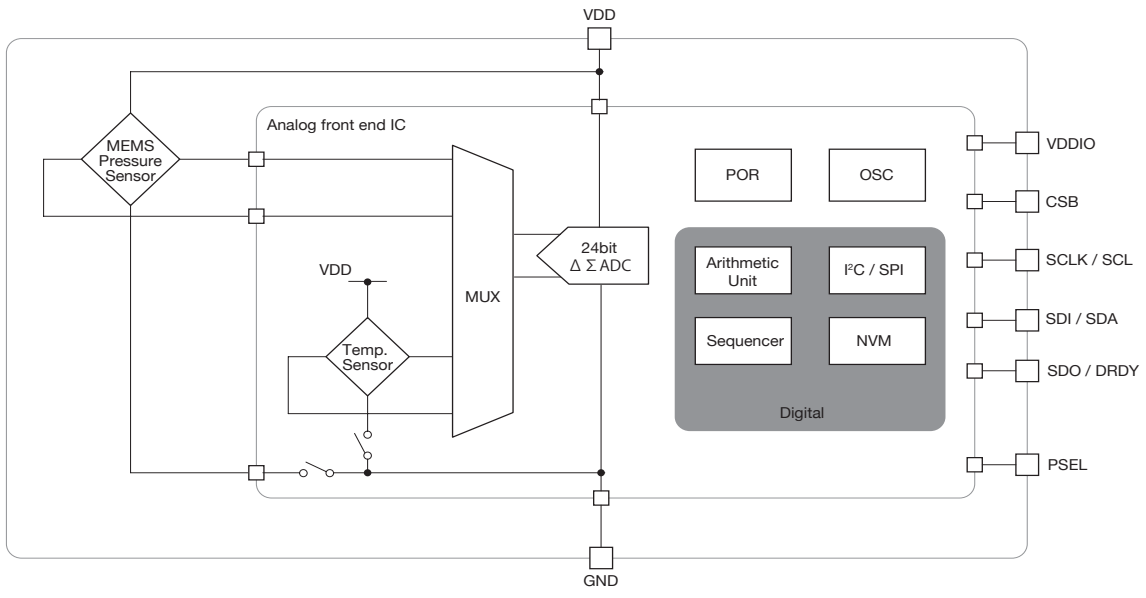
(1) Smartphone
(2) Wearable device
(3) Activity meter
(4) Drone

Features (Unless otherwise specified, Ta=+25°C)

(1) Small package..... 3.0 (W) ×3.0 (D) ×1.1 (H) mm
(2) It is able to measure atmospheric pressure from the altitudes of 0m to 9000m equivalent (from 30kPa to 110kPa)
(3) It has Performs high resolution of max 2.0Pa (0.17m)
(4) It corrects the differences of sensors and temperature characteristics when shipped from our factory (approximately 200Hz)
(5) It digitally outputs a corrected pressure value by a built–in sequencer (SPI, I²C)
(6) Specifications
- Operating voltage range..... VDD 1.7V (3.6V to 3.3V typ.)
  VDDIO 1.14V to 3.6V
- Operating temperature range ..... (-30°C to +85°C)
- Operating pressure range .. 30k to 110kPa
- Current consumption at 1sample *1
  2.4 / 3.8 / 10 / 28μA
- Current consumption at Shutdown
  I_{VDDsd} 0.1μA max.
  $I_{VDDIOsd}$ 0.2μA max.
- Pressure effective resolution... 17 / 7 / 3 / 2PaRMS *3
- Absolute accuracy pressure ... ±100Pa
- Conversion time *2 ..... 4.3 / 6.64 / 16.0 / 44.1msec

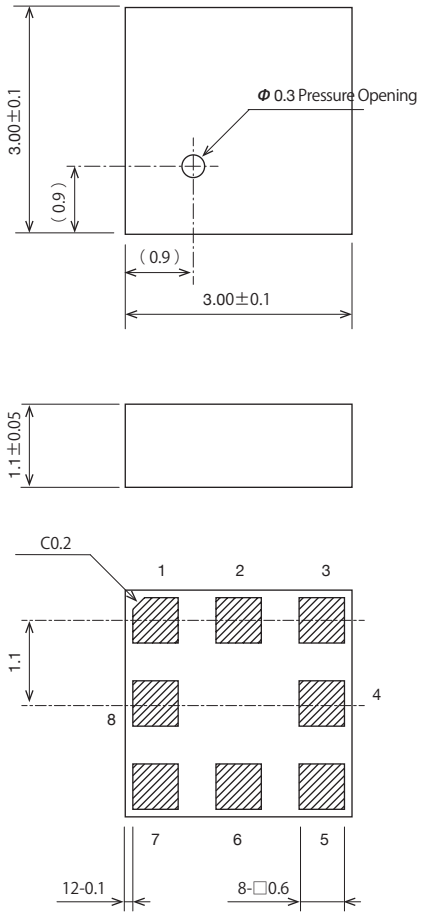
*1. The average of one sample per second.
*2. Time between issuance of command and completion of pressure measurement and calculation correction
*3. Any settings possible (consumption current, resolution and conversion time vary according to one another) corresponding to the application

Block diagram



Dimensions

(Unit : mm)



Caution

(1) The pressure medium which can use directly is only air. Please do not use other media, especially corrosive gases (organic solvent gas, sulfurous acid gas, hydrogen sulfide gas, etc.) and media which include moisture and foreign substance, since they could cause damages or malfunctions
(2) Please handle it noting the foreign body mixing with the pressure opening after opening packing
(3) Please do not put stress on the package. It could cause damages or malfunctions
(4) The light that enters from the pressure entrance reaches the semiconductor chip. Please avoid use in the environment that light enters into the pressure entrance directly, because the semiconductor chip might malfunction because of light

3 Sensor IC

Operational amplifier with a built-in spiral inductor

MM1969

Outline

MM1969 contains a low noise operational amplifier with a spiral inductor.
This inductor detects a magnetic field generated when AC current flows through the power line.
MM1969 amplifies the detected electromotive force with the built-in low noise operational amplifier (the gain can be set by changing external resistance), and transmits analog signals to an external ADC and microcontroller.

Features

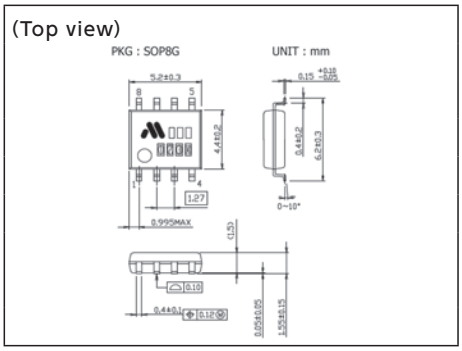
- VCC operating voltage ..... 3.0 to 5.5 V
- Output current ..... 1 mA
- Operating temperature range .. -40 to +85°C
- With standby mode control function
- Current consumption at standby ..... 2 µA (VCC = 3.3 V)
- An LPF of 17.5 kHz built in the spiral inductor suppresses high-frequency noise.

Application

(1) Power monitor
(2) Current detection of inverter, servo motor, and others
(3) Current detection in protection circuits and control circuits of various devices

Package

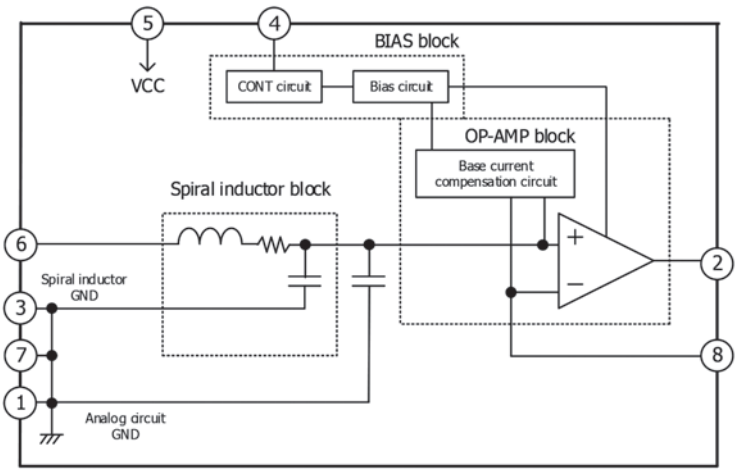
(Top view)



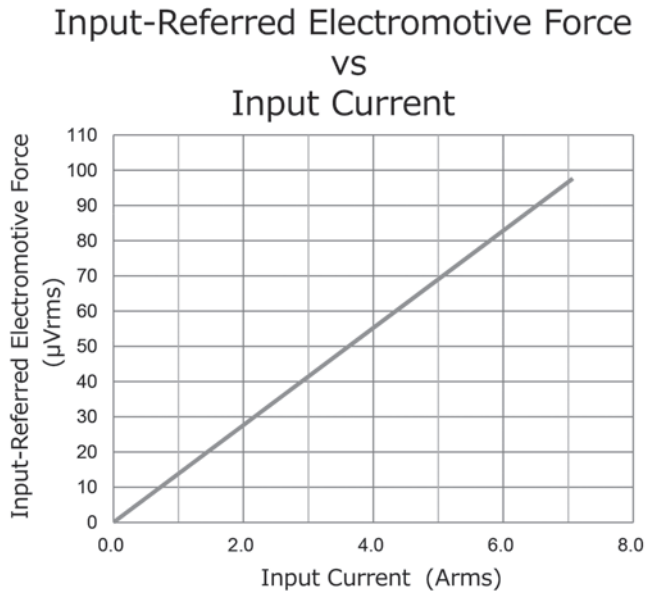
Pin No	Name	Function
1	GND_A	AMP-GND terminal (GND_A is internally connected to GND_S1 and S2.)
2	VO	Output terminal
3	GND_S1	Spiral inductor GND terminal
4	CONT	Standby control terminal
5	VCC	Supply voltage terminal
6	BIAS	Bias voltage connecting terminal
7	GND_S2	Spiral inductor GND terminal
8	IN-	Input (-) terminal

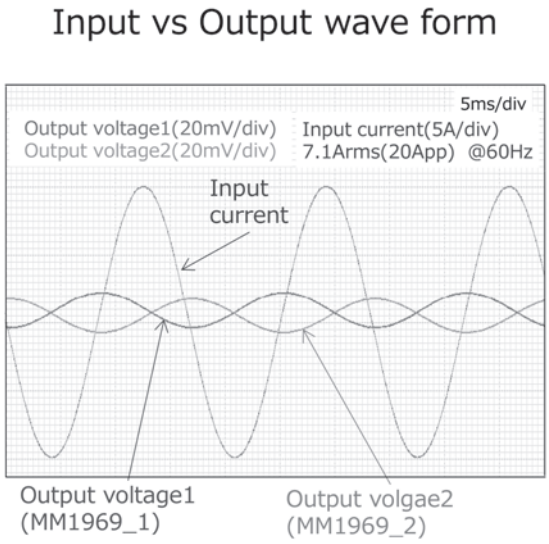
Block Diagram

Pin 1 (GND_A) is internally connected to pin 3 (GND_S1) and pin 7 (GND_S2).



Output characteristics

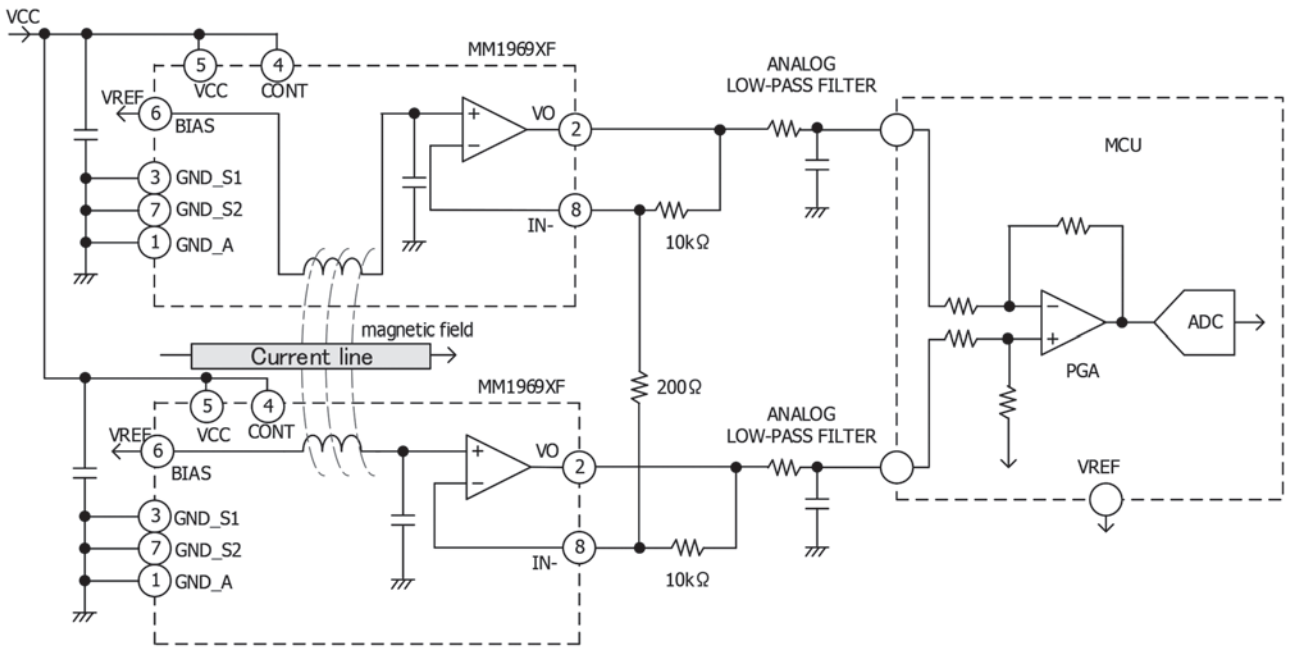




* Gain=101, with Application circuit board

Typical application

Gain=101 times / MCU VREF voltage is used as bias of MM1969XF.



3 Sensor IC

Flame detection amplifier

MM1217

Outline

This IC contains an operational amplifier and a comparator, achieving extremely low offset voltage with a single power supply. Since a single power supply can be used, this IC can be operated with the voltage from two batteries. Through the use of the operational amplifier and the comparator, this IC can amplify thermocouple electromotive force and detect ignition according to output from the amplifier, without using other parts. The low offset voltage improves accuracy of ignition detection.

Application

(1) Equipment requiring flame detection, such as gas stoves and water heaters
(2) Amplification and detection of very low voltage

Features (Unless otherwise specified, Topr = +25°C)

General

- Power supply voltage..... 1.8 to 6.0 V (Suitable for battery-powered devices)
- Current consumption .....0.1 mA Typ.
- Power supply line rejection ratio (PSRR).....60 dB Typ.

Amplifier section

- Input voltage range .....-0.2 to 0.3 V
- Input offset voltage .....±0.1 mV Typ.
- Gain.....100 dB Typ.

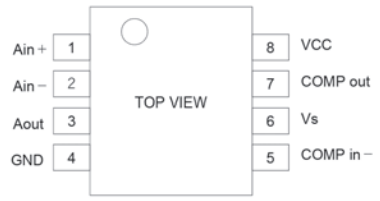
Comparator section

- Input voltage range .....0 to VCC-1.0 V
- Input offset voltage .....±0.1 mV Typ.

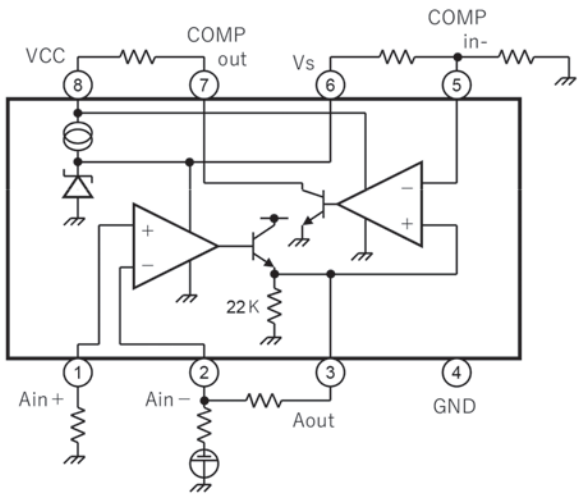
Package

SOP-8D

(Top view)



Block Diagram



3 Sensor IC

Dual amplifier

MM1278

Outline

This IC contains two operational amplifiers and achieves extremely low offset voltage with a single power supply. The input offset voltage and the temperature drift of the input offset voltage of these amplifiers are one digit less than those of our conventional products. Since a single power supply can be used, this IC can be operated with the voltage from two batteries. Because of the single power supply, low current consumption, and low offset voltage, this IC is suitable for equipment amplifying micro signals of portable devices using two batteries.

Application

(1) Amplification of very low voltage for sensors (thermocouples, strain gauges, magnetic sensors)
(2) Amplification and detection of very low voltage
(3) Detection of very low current

Features (Unless otherwise specified, Topr = +25°C)

General

- Power supply voltage..... 1.8 to 6.0 V (Suitable for battery-powered devices)
- Current consumption .....0.1 mA Typ.

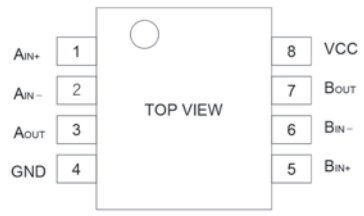
Amplifier section

- Input voltage range .....-0.2 to 0.3 V
- Input offset voltage .....±0.1 mV Typ.
- Temperature drift of input offset voltage.....±1 µV/°C Typ.
- Input offset current.....1 nA Typ.
- Input bias current .....50 nA Typ.
- Gain.....100 dB Typ.

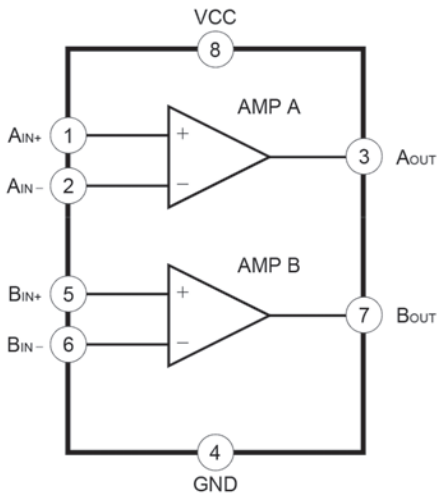
Package

SOP-8D (MM1278XF)

(Top view)



Block Diagram



3 Sensor IC

Analog Front End IC

MM3609

DESCRIPTION

This IC is analog front end IC which converts analog signal output from the sensor to digital signal, conducts digital signal processing and outputs to the host such as microcontroller etc. with digital transmission. It responds to a wide variety of sensors.

FEATURES

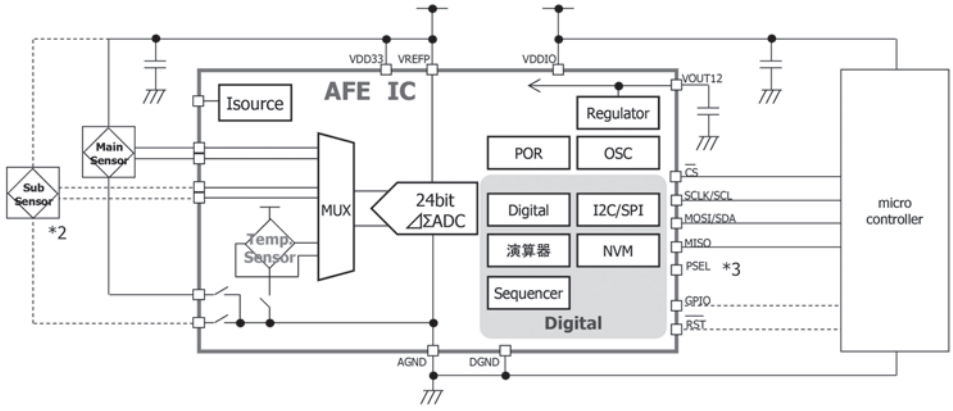
1. It has a 24bit⊿ΣADC with a wide dynamic range.
2. The correction factor needed for correcting sensor can be stored in the non-volatile memory (NVM) inside IC.
3. The sensor correction sequence can be stored in the memory and correction can be completed in IC.
4. The communication interface can be chosen from I2C Hs (max. 3.4Mbps) or SPI 4wire (max. 5Mbps).
5. It operates from the low voltage of 1.71V.
6. It has a temperature sensor and is able to correct the temperature characteristics of the exterior sensor.
7. An effective resolution or data output rate which is the most appropriate to the user can be selected.
8. It has a built-in oscillator and an external oscillator circuit is not needed.
9. There are two modes of sensor driving system – constant current and constant voltage.
10. The standby electricity of the set has been reduced significantly by the ON/OFF switch for external sensor and standby current of TYP. 0.1uA

KEY SPECIFICATIONS

- Operation supply voltage range ... VDD33 1.71V to 3.6V (Typ. 3.3V)
  VDDIO 1.14V to 3.6V (Typ. 3.3V)
- Operation temperature range..... -40°C to +85°C
- Consumption current..... Typ. 540μA
  Typ. 650μA *with Temp. Sensor
- Standby current..... Typ. 0.1μA, Max. 1μA
- Effective resolution ..... Up to 22bits *1
- Integral non-linearity INL ..... Typ. ±30 ppm of FSR
- Input conversion noise voltage..... 1.27μVrms
- Data output rate..... 20Hz to 2,560Hz

*1 Data output rate=20Hz, VDD33=VREFP=3.3V, Ta=25°C

BLOCK DIAGRAM & TYPICAL APPLICATION CIRCUIT



*2 The high-precision temperature sensor, etc. are assumed as Sub Sensor.
*3 For the communication interface, SPI/I2C can be selected at High/Low of protocol select terminal PSEL.

APPLICATION

(1) Gauge pressure sensor/Absolute pressure sensor
(2) Flow sensor
(3) Strain gauge

PACKAGE

PLP-24 (3.0mm□)

SUPPORT

- Possible to provide an evaluation board with memory write function.
- Possible to provide application for creating sensor correction sequence.
- Possible to provide sample firmware for external microcontroller (negotiable).

4 DISCONTINUATION INFOMATION

4 Products to be discontinued

The following products will be phased out or discontinued.
Please note that we will no longer accept any new enquires.

Part Number	Function
LAG665	Stereo Head Phone IC
LAG668	Stereo Head Phone IC
LMF501	Radio receiver IC
LVA519	Synchronous Detector IC
MM1021	Synchronous Detector IC
MM1024	Video amplifier IC for superimpose
MM1025	DRAM Back–up IC
MM1026, 1245	Battery Back–up IC
MM1027	SRAM Back–up IC
MM1028	SRAM Back–up IC
MM1029	Video amplifier IC for superimpose
MM1031	Video Amplifier IC
MM1034	HBS–Compatible Driver and Receiver
MM1035	Watchdog Timer IC
MM1038	Motor control IC
MM1041	Video Amplifier IC
MM1053	Video Switch IC
MM1060	3–Terminal regulator IC
MM1065, 1165	3–Terminal regulator IC
MM1067	Sync Separator + Sync detector IC
MM1069	Sync Separator + Sync detector IC
MM1075	Watchdog Timer IC
MM1081	SRAM Back–up IC
MM1093	4fsc Clock Generator
MM1095	Watchdog Timer IC
MM1096	Watchdog Timer IC
MM1099	Watchdog Timer IC
MM1100	COMPANDOR
MM1106	Watchdog Timer and Battery Back–up IC
MM1108	Synchronous Separator IC
MM1109	Synchronous Separator IC
MM1111~1118	Video Switch IC
MM1120	Video Switch IC
MM1124	Video Switch IC
MM1134	Battery Back–up IC
MM1135, 1136	Watchdog Timer IC
MM1140	Video Switch IC
MM1142	Watchdog Timer IC
MM1166	Video amplifier IC for superimpose
MM1177	Charge control for Coin–type Battery

Part Number	Function
MM1180, 1181	Regulator IC
MM1185	Watchdog Timer IC
MM1186	75Ω driver IC
MM1188	Video Switch IC
MM1196	75Ω driver IC
MM1203	Video Amplifier IC
MM1207, 1205	Video Amplifier IC
MM1206	Voltage Detector IC
MM1210	Voltage Detector IC
MM1215, 1216	Regulator IC
MM1222~1224	75Ω driver IC
MM1225~1228	75Ω driver IC
MM1231~1234	Video Switch IC
MM1238	Video Switch IC
MM1251, 1252, 1253	Voltage Detector IC
MM1257	3–Terminal regulator IC
MM1268	RGB Encoder
MM1288	TFT Liquid Crystal Interface IC
MM1290	Battery Back–up IC
MM1291	Li–ion Battery protection IC for 1cell
MM1292, 1302	Li–ion Battery protection IC for 2cells
MM1293	Li–ion Battery protection IC for 3cells
MM1294	Li–ion Battery protection IC for 4cells
MM1304	VCA with LPF of Y system and BPF of C system
MM1305	Voltage Detector IC
MM1311	Video Switch IC for I^2C BUS
MM1320	3–Terminal regulator IC
MM1327	Wide Video Detection IC
MM1331	DC–DC convertor IC
MM1332	Li–ion Battery protection IC for 1cell
MM1349	Switching Regulator IC
MM1357	Switching Regulator IC
MM1369	Q sound IC
MM1377, 1378	OP–AMP and Shunt Regulator
MM1381, 1382, 1383	Video Amplifier IC
MM1389	Video Switch IC
MM1426	Regulator IC
MM1437	Regulator and System Reset IC
MM159x	Regulator IC
MM1002	Video amplifier IC for superimpose

The following products will be phased out or discontinued.
Please note that we will no longer accept any new enquires.

Part Number	Function
MM6558	Dual OP–AMP
MM6564	Dual OP–AMP
PST518	System Reset IC
PST523	System Reset IC
PST529	System Reset IC
PST531	System Reset IC
PST572	System Reset IC
PST573	System Reset IC (Active–High)
PST574	System Reset IC
PST575	System Reset IC
PST591~595	System Reset IC (built–in delay circuit)
PST600	System Reset IC
PST611	System Reset IC
PST620,621	System Reset IC
PST623	System Reset IC
PST70xx	System Reset IC
PST7512,7801	Second Protect IC
PST90xx	System Reset IC
MM1270	Regulator IC
MM1301	Li–ion Battery protection IC for 1cell
MM1336	Stereo Headphones IC
MM1376	Stereo Headphones IC
MM1407	Audio IC
MM1421	Li–ion Battery protection IC for 1cell
MM1448	Composite regulator IC
MM1516	Composite regulator IC
MM1529	Secondary–side control for AC Adaptor
MM3042~3045	Regulator IC
MM3051~3055	Regulator IC
MM3002	OP–AMP
MM1581	Lithium–Ion Battery Charge Control IC
MM309x, MM310x	Regulator IC(150mA)

4 Phased Out Products

The following products will be phased out or discontinued.
Please note that we will no longer accept any new enquires.
For customers who currently use the products, please contact your distributors for details on user support.

Part Number	Function
MM1333	Lithium–Ion Battery Charge Control IC
MM1373	Second Protect IC
MM1375	RGB Video Amplifier
MM1385	Regulator IC (150mA)
MM1412	Li–ion Battery protection IC for 2cells
MM1424	TCXO IC
MM1434	QXPANDER
MM1422, MM1423 MM1442, MM1443	I²C Bus Controlled 4–input 3–output AV Switch
MM1451	Second Protect IC
MM1478	Regulator IC+System Reset IC
MM1481	Regulator IC+System Reset IC
MM1482	Regulator IC+System Reset IC
MM1491	Li–ion Battery protection IC for 1cell
MM1492	I²C BUS Controlled 5–Input 2–Output AV Switch
MM1495	I²C BUS Control 5–Input 2–Output AV Switch
MM1519	Component Input Video Swich with I²C Bus
MM1522	Linear Temperature Sensor
MM1532	Lithium–Ion Battery Charge Control IC
MM1539	Video Signal Driver for DVD Players
MM1566	Video Signal Driver for DVD Players
MM157x	Regulator IC (150mA)
MM1616	Visibility Correction Light Sensor
MM1623, MM1758	Video Signal Driver for DVD Players
MM1630	I²C Bus Control Broadband Video Switch
MM1699	I²C Bus Control 13–Input 4–Output Audio Switch
MM3005~3010	CMOS Switching Regulator IC
MM302x	Regulator IC (60mA)
MM303x	Regulator IC (100mA)
PST93xx	System Reset IC
PST993,PST994	System Reset IC
MM1433	Lithium–Ion Battery Charge Control IC
PST37xx	System Reset IC
PST38xx	System Reset IC
MM1485	Lithium–Ion Battery Charge Control IC
MM1530A	Shunt Regulator
MM1538	Motor Driver IC
MM1469	Motor Driver IC
MM1669	Motor Driver IC
MM1779	PD IC for DVD Players
MM1567	Video Signal Driver for DVD
MM1568	Video Signal Driver for DVD
MM156x	Regulator IC (500mA)
MM1631	I²Cbus controlled audio switch
MM1687	Regulator IC+System Reset IC
MM1688	Regulator IC+System Reset IC
MM1689	Regulator IC (2ch)

Part Number	Function
MM1692	Video Signal Driver for DVD
MM1697	Video Switch IC
MM1707	Lithium–Ion Battery Charge Control IC
MM1729	PDIC for CD
MM1730	PDIC for DVD
MM1731~MM1734	Video Switch IC
MM1746	PDIC for CD
MM1756	Video Driver IC
MM1757	HD–compatible Video Driver IC
MM1763	AV Switch+75Ω Driver IC
MM1764	AV Switch+75Ω Driver IC
MM1783	Video Switch IC
MM1788	Video Driver IC
MM1792	Regulator IC (3ch)
MM1793	Video Switch IC
MM1794	Video Driver IC
MM1797	HD–compatible 75Ω Driver IC
MM192x	Regulator IC(1A)
MM3018	Regulator IC+System Reset IC
MM3090	Li–ion Battery protection IC for 1cell
MM3099	Li–ion Battery protection IC for 1cell
MM3112	Li–ion Battery protection IC for 2cells
MM3113	Li–ion Battery protection IC for 3cells
MM3114	Li–ion Battery protection IC for 4cells
MM314x	Regulator IC (150mA)
MM3168	VCXO IC
MM3173, MM3174	Regulator IC+System Reset IC
MM3188	Temperature Switch IC
MM329x	Regulator IC (300mA)
PST31xx	System Reset IC
PST32xx	System Reset IC
PST33xx	System Reset IC
PST34xx	System Reset IC
PST92xx	System Reset IC
MM1414	Protection for Lithium–Ion Batteries (3 to 4 cells)
MM1636	Video Driver IC
PST35xx	System Reset IC (external capacitor)
PST36xx	System Reset IC (external capacitor)
PST41xAxxx	Reset IC with Built–In Delay Circuit
PST42xAxxx	Reset IC with Built–In Delay Circuit
PST43xAxxx	Reset IC with Built–In Delay Circuit
PST44xAxxx	Reset IC with Built–In Delay Circuit
MM3204	Lithium–Ion Battery Charge Control IC

The information shown here is current as of February 2013.

5 PACKAGE

5 Packsge Line-up

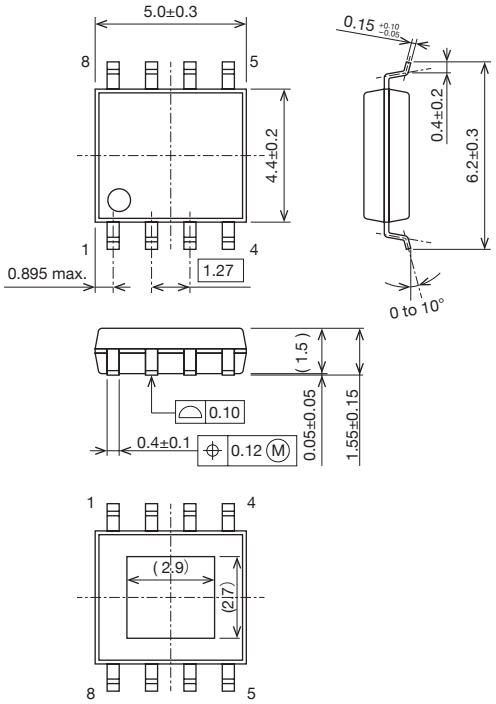
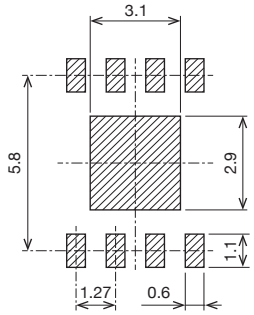
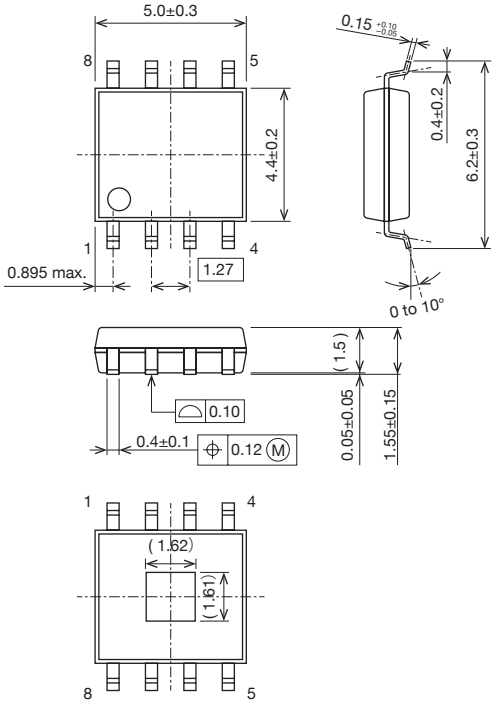
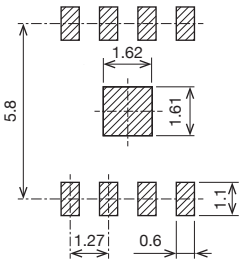
Package Type	Pin Count	Package Name	Package Size (mm)			Pin Pitch (mm)	Refer Number
			He	D	A	C	
Lead–through Type	3	TO–92A	5.40	3.80	7.50	2.50	P.354
Flat Lead Type	6	SON–6A	3.00	1.60	0.80	0.50	P.337
	6	SON–6C	2.00	1.60	0.55	0.50	P.338
	6	SON–6D	3.00	2.90	0.80	0.95	P.338
	6	SON-6F	1.60	1.60	0.80	0.50	P.339
	5	SOT89–5A	4.25	4.50	1.50	1.50	P.345
Gullwing Type	8	HSOP–8A	6.20	5.00	1.55	1.27	P.322
	8	HSOP–8C	6.20	5.00	1.55	1.27	P.322
	8	HSOP-8E	6.00	5.02	1.53	0.805	P.323
	28	HSOP–28A	9.90	18.60	2.30	0.80	P.323
	28	HSOP–28C	9.90	17.60	1.90	0.80	P.324
	4	SC–82ABA	2.10	2.00	0.95	1.30	P.336
	4	SC–82ABB	2.10	2.00	0.90	1.30	P.336
	6	SC–88A	2.10	2.00	0.90	0.65	P.337
	3	SOT–23A	2.80	2.90	1.15	1.90	P.343
	5	SOT–25A	2.80	2.90	1.15	0.95	P.344
	6	SOT–26A	2.80	2.90	1.15	0.95	P.344
	6	SOT–26B	2.80	2.90	1.15	0.95	P.345
	7	SOP–7B	6.20	5.00	1.55	1.27	P.339
	8	SOP–8C	6.20	5.20	1.55	1.27	P.340
	8	SOP–8D	6.20	5.00	1.55	1.27	P.340
	8	SOP-8G	6.20	5.20	1.55	1.27	P.341
	8	SOP–8J	6.00	5.02	1.65	1.27	P.341
	10	SOP–10A	6.20	5.00	1.55	1.00	P.342
	16	SOP–16B	6.20	10.20	1.55	1.27	P.342
	28	SOP–28B	9.90	17.60	1.85	1.27	P.343
	3	TO–252C	9.90	6.60	2.30	2.30	P.354
	5	TO–252–5A	9.90	6.60	2.30	1.27	P.355
	8	TSOP–8A	3.10	2.00	0.75	0.50	P.355
	16	TSOP–16B	6.40	5.00	1.10	0.65	P.356
	16	TSOP–16D	6.40	5.00	1.10	0.65	P.356
	20	TSOP–20A	6.40	6.50	1.10	0.65	P.357
	20	TSOP–20D	6.40	6.50	1.10	0.65	P.357
	20	TSOP–20E	6.40	6.50	1.10	0.65	P.358
	20	TSOP–20F	6.40	6.50	1.20	0.65	P.358
	8	VSOP–8B	4.00	2.90	1.30	0.65	P.359
	8	VSOP–8C	4.00	2.95	1.30	0.65	P.359
	8	VSOP–8D	4.00	2.80	1.30	0.65	P.360
	20	VSOP-20A	7.60	8.66	1.63	0.635	P.360
	24	VSOP–24A	7.60	7.90	1.25	0.65	P.361

Package Type	Pin Count	Package Name	Package Size (mm)			Pin Pitch (mm)	Refer Number
			He	D	A	C	
Non–Lead Type	4	PLP-4A	1.00	1.00	0.60	0.65	P.324
	4	PLP-4B	1.60	1.20	0.60	0.60	P.325
	4	PLP-4C	1.00	1.00	0.60	0.65	P.325
	4	PLP-4D	3.20	1.70	0.48	0.925	P.326
	4	PLP-4E	2.85	1.25	0.50	0.725	P.326
	4	PLP-4-1228	2.85	1.25	0.58	0.48	P.327
	4	PLP-4-2140	4.00	2.10	0.50	0.40	P.327
	6	PLP-6A	2.00	1.80	0.60	0.50	P.328
	6	PLP-6C	0.60	1.20	1.20	0.40	P.328
	6	PLP-6F	0.60	1.50	1.50	0.50	P.329
	6	PLP-6G	2.10	4.10	0.50	0.500	P.329
	6	PLP-6H	1.70	1.80	0.50	0.500	P.330
	6	PLP-6J	1.70	1.80	0.50	0.45	P.330
	6	PLP-6-2130	0.60	3.00	2.10	0.60	P.331
	8	PLP-8E	0.60	1.60	1.20	0.40	P.331
	8	PLP-8F	3.00	2.00	0.60	0.50	P.332
	8	PLP-8G	2.40	2.60	0.60	0.50	P.332
	8	PLP-8H	1.80	1.80	0.58	0.45	P.333
	10	PLP-10A	2.50	2.70	0.60	0.50	P.333
	10	PLP-10D	3.00	3.00	0.60	0.50	P.334
	12	PLP-12A	4.00	2.90	0.60	0.40	P.334
	12	PLP-12B	3.00	3.00	0.60	0.50	P.335
	24	PLP-24A	3.00	3.00	0.60	0.40	P.335
	16	SQFN-16A	3.00	3.00	0.75	0.50	P.346
	16	SQFN-16B	3.00	3.00	0.75	0.500	P.346
	24	SQFN-24A	4.00	4.00	0.75	0.50	P.347
	32	SQFN-32A	5.00	5.00	0.75	0.50	P.347
	4	SSON-4B	1.40	1.10	0.55	0.50	P.348
	6	SSON-6A	2.00	1.80	0.75	0.50	P.348
	6	SSON-6E	1.60	1.80	0.55	0.50	P.349
	6	SSON-6J	1.40	1.40	0.55	0.50	P.349
	6	SSON-6L	2.00	2.00	0.75	0.65	P.350
	6	SSON-6M	1.40	1.40	0.55	0.50	P.350
	6	SSON-6N	3.60	1.80	0.65	0.35	P.351
	8	SSON-8B	2.30	2.30	0.75	0.50	P.351
	8	SSON-8C	3.00	3.00	0.55	0.65	P.352
	8	SSON-8E	2.00	2.00	0.75	0.50	P.352
	8	SSON-8G	1.60	1.60	0.55	0.40	P.353
	10	SSON-10A	2.50	2.70	0.60	0.50	P.353
	6	WLCSP-6B	1.09	0.81	0.38	0.40	P.361
	6	WLCSP-6C	0.38	1.09	0.81	0.40	P.362
	10	WLCSP-10A	1.50	1.10	0.28	0.40	P.362
	25	WLCSP-25A	1.936	1.936	0.345	0.40	P.363
	48	WLCSP-48B	3.47	3.47	0.40	0.50	P.363

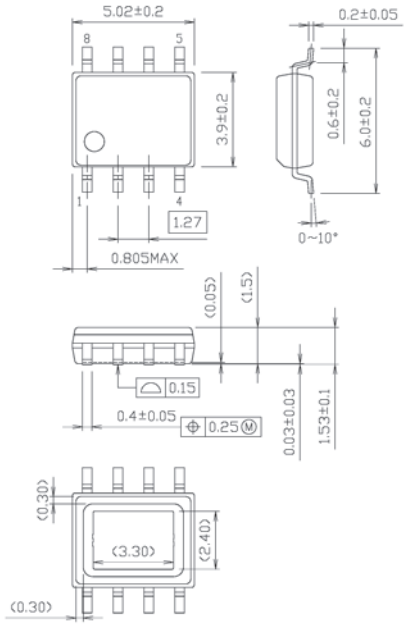
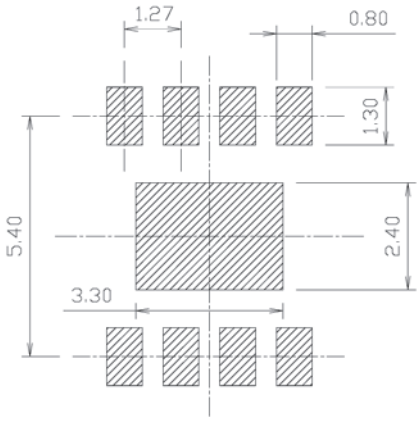
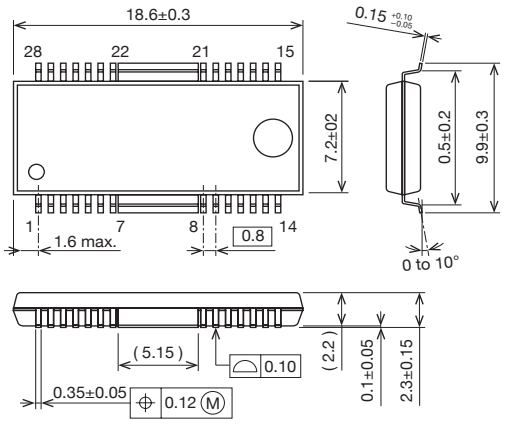
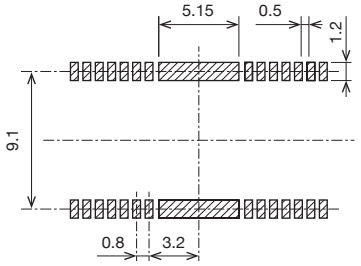
* Recommendation Land Pattern is a reference value. To design practically, correction(s) should be made for optimized dimensions considering the effects of the board type to be mounted, mount(soldering) method, type and coating thickness of cream solder.

5 PACKAGE

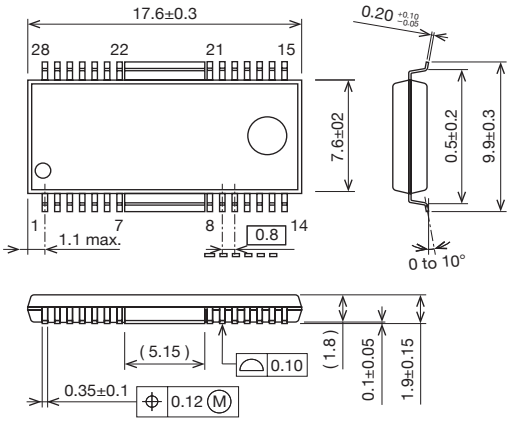
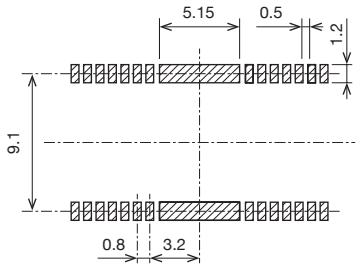
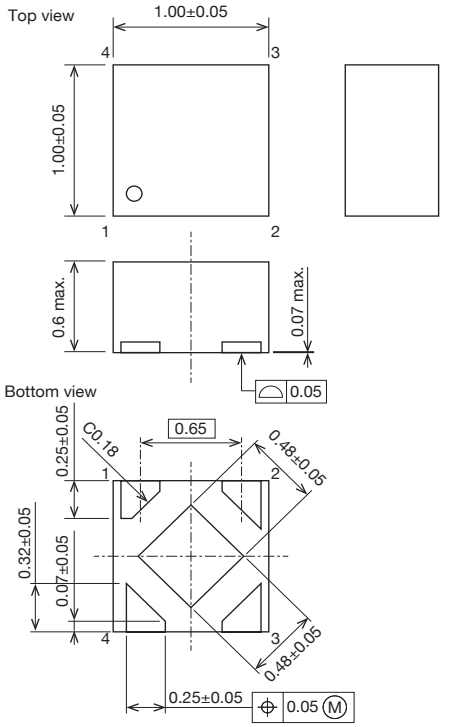
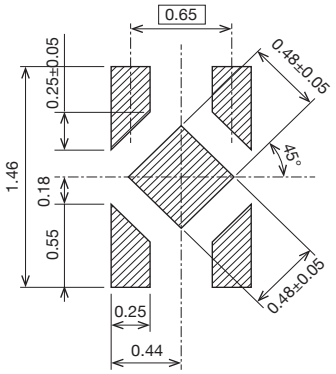
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
HSOP-8A		
HSOP-8C		

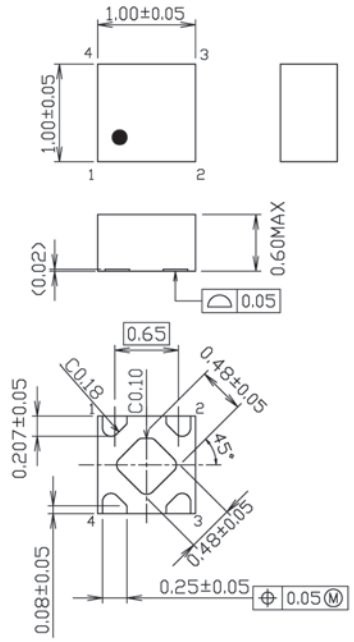
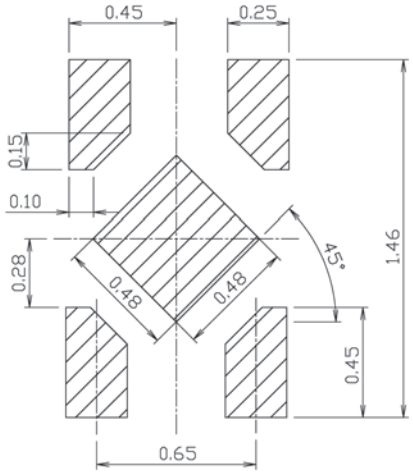
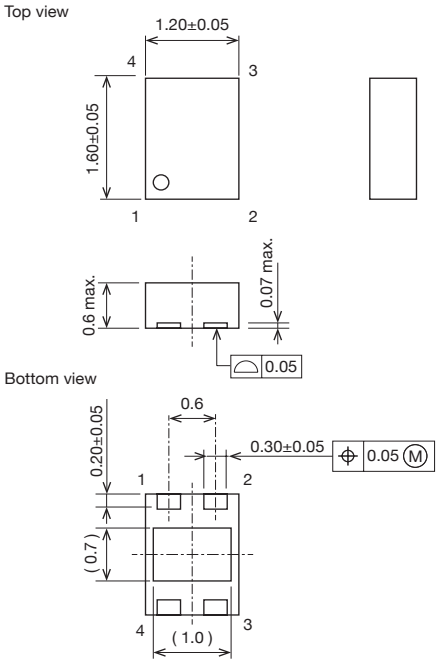
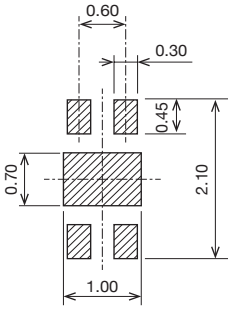
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
HSOP-8E		
HSOP-28A		

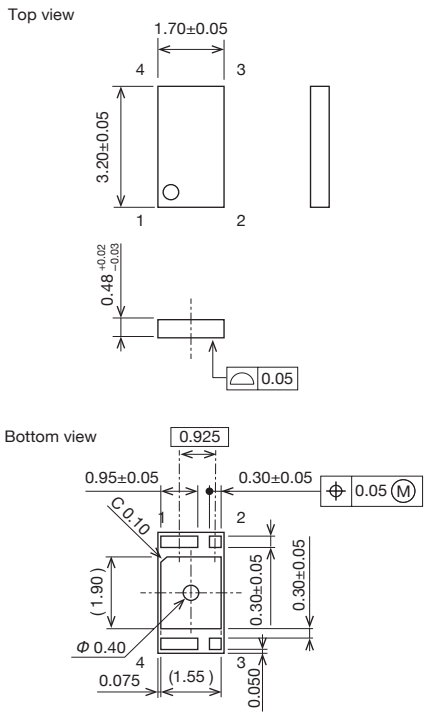
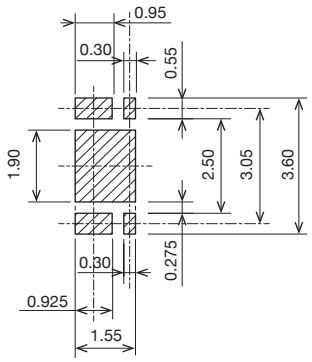
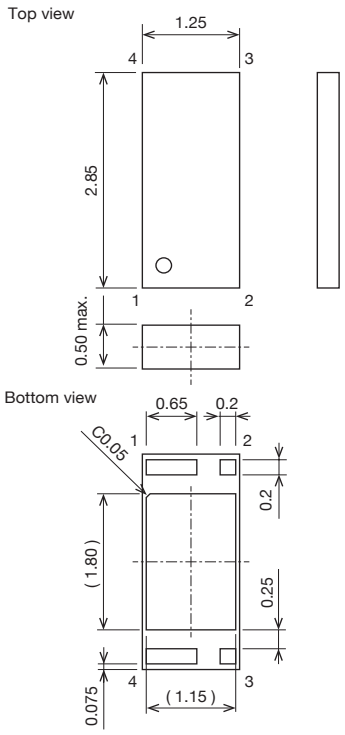
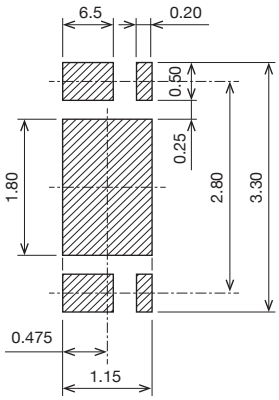
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
HSOP-28C		
PLP-4A		

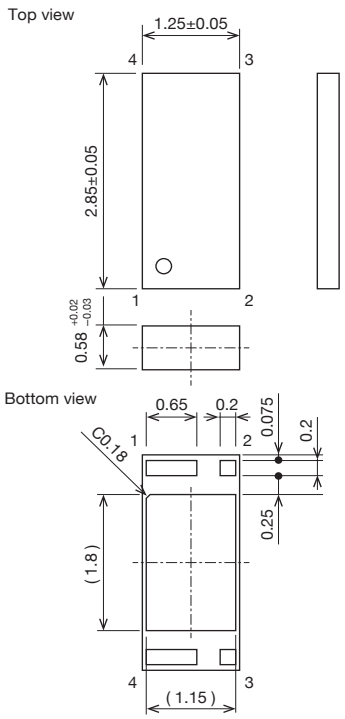
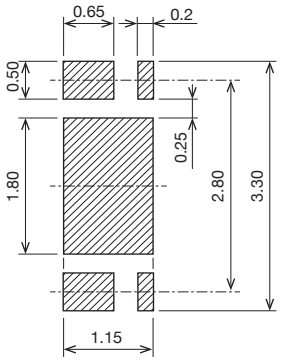
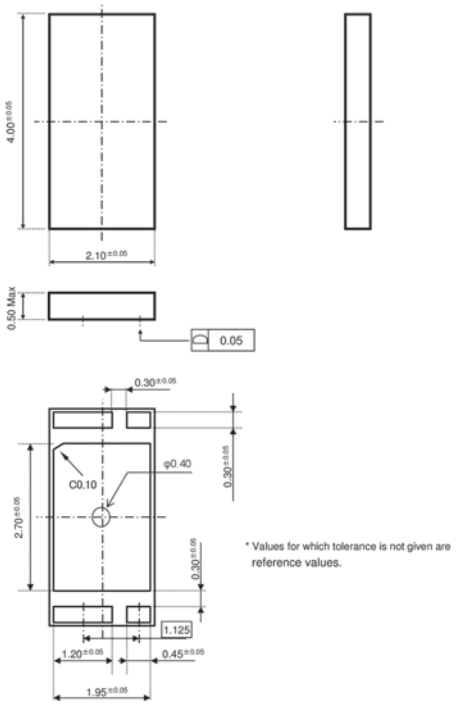
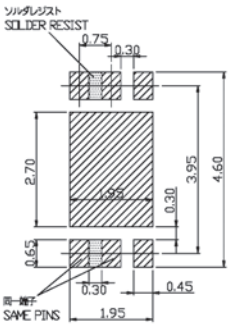
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
PLP-4C		
PLP-4B		

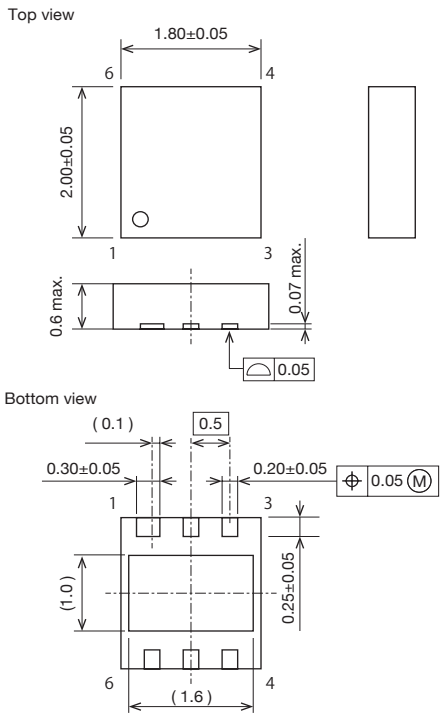
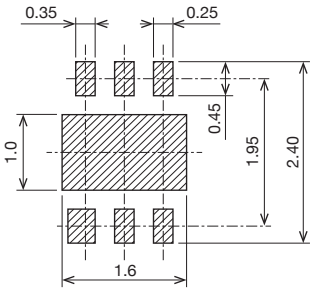
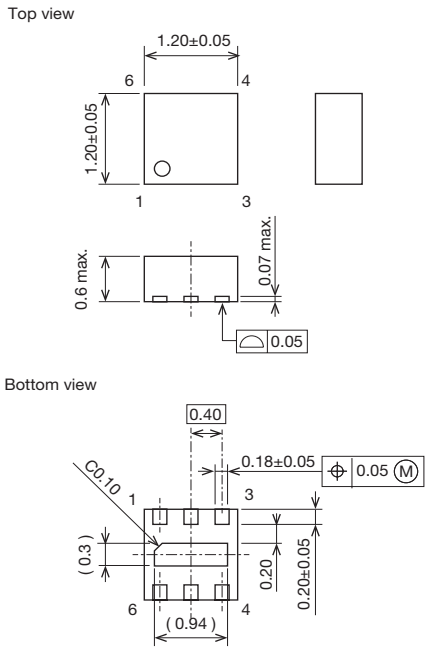
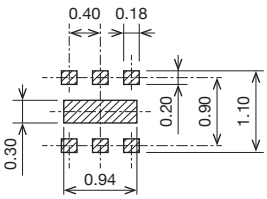
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
PLP-4D		
PLP-4E		

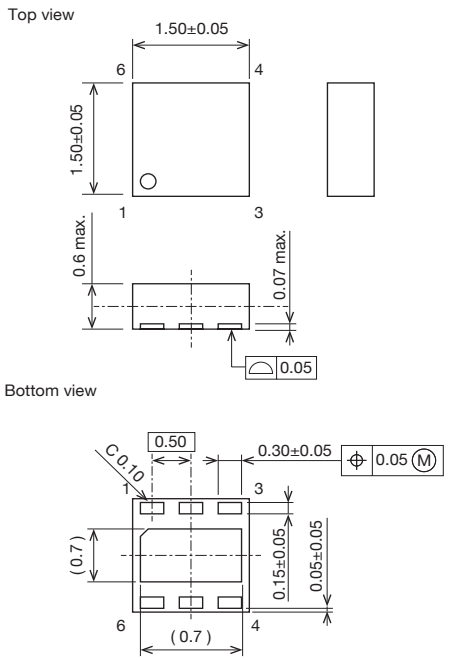
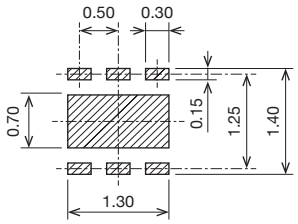
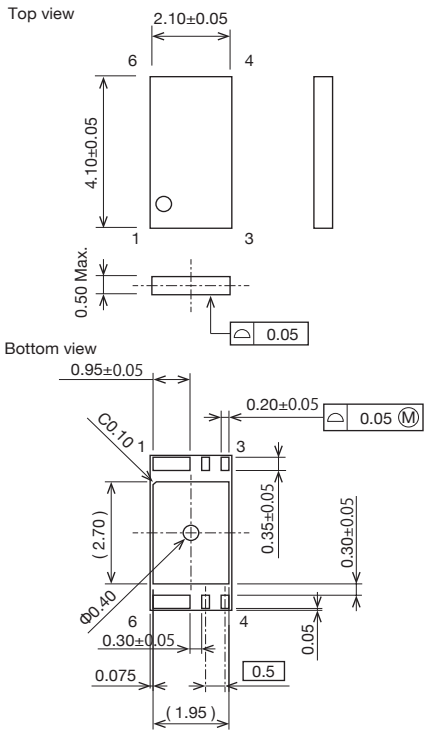
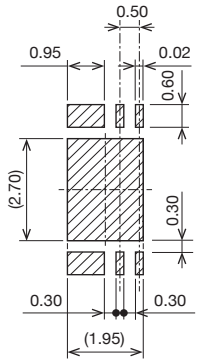
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
PLP-4-1228		
PLP-4-2140		

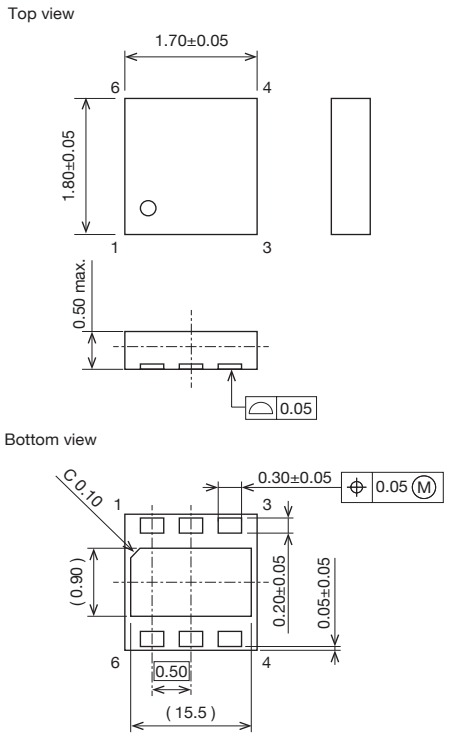
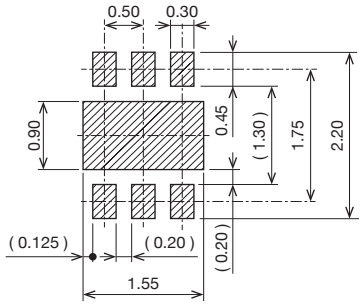
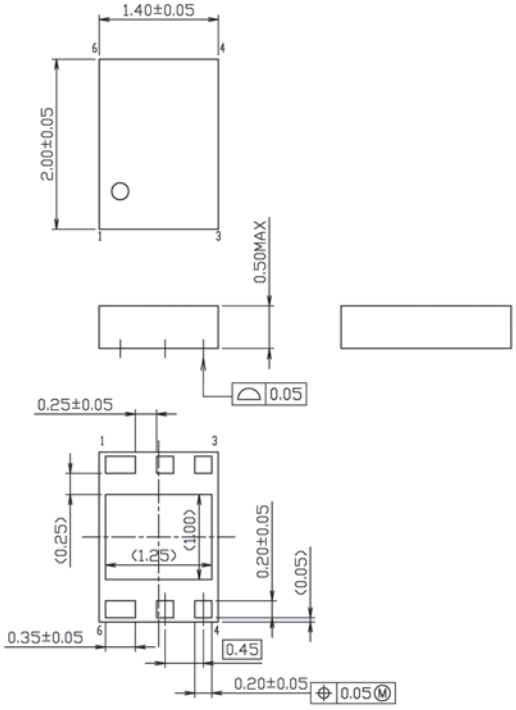
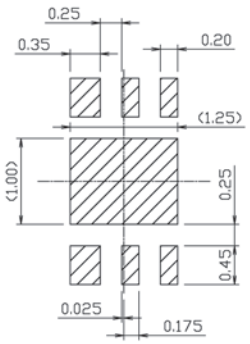
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
PLP-6A		
PLP-6C		

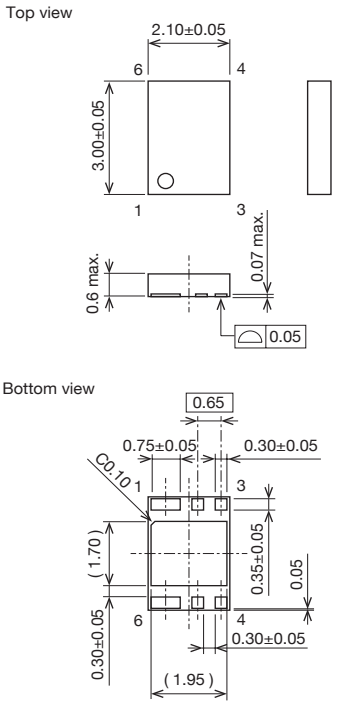
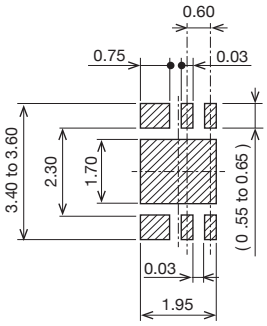
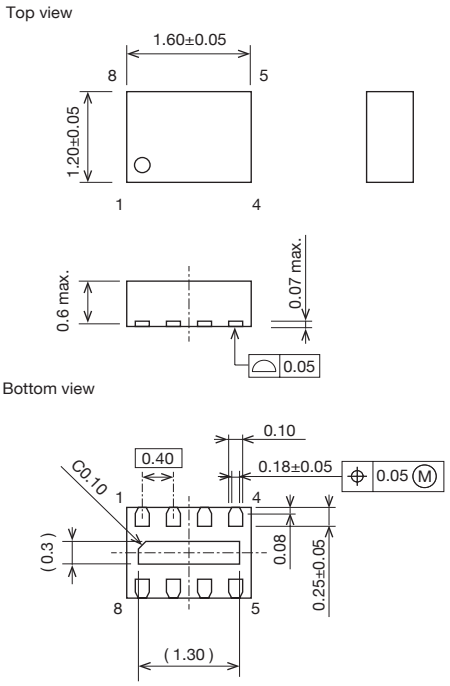
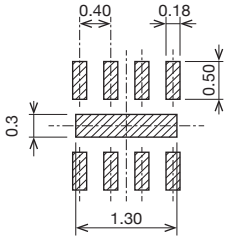
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
PLP-6F		
PLP-6G		

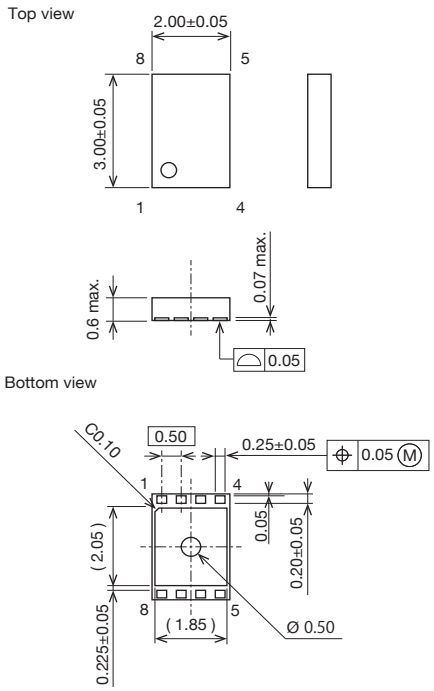
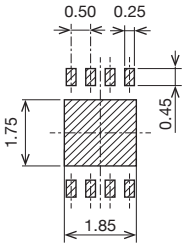
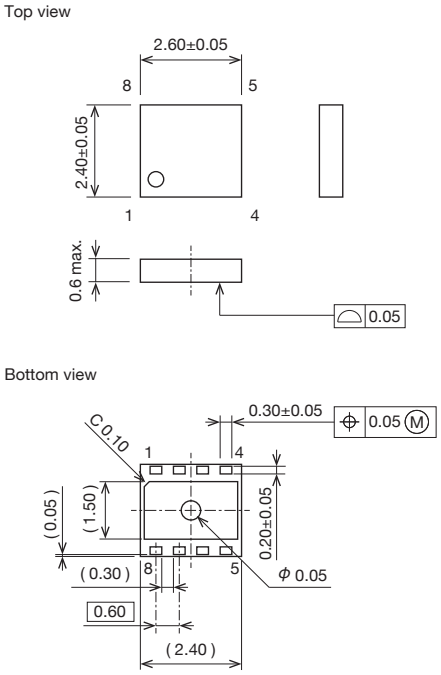
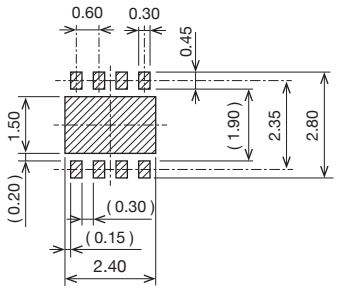
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
PLP-6H		
PLP-6J		

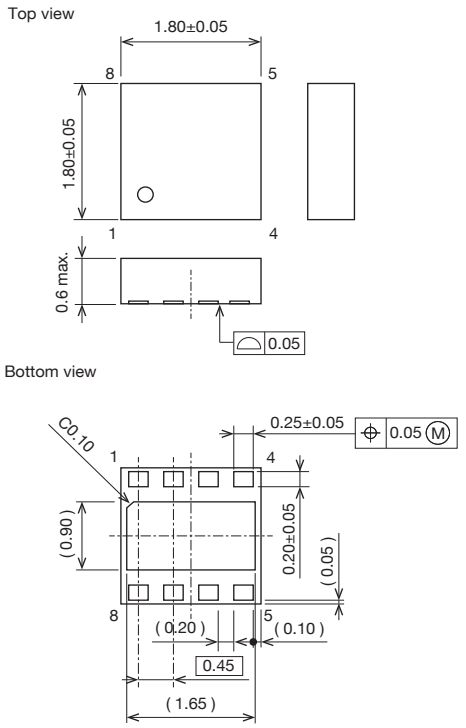
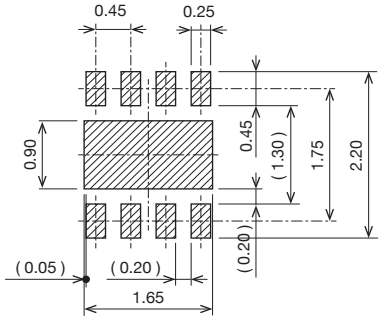
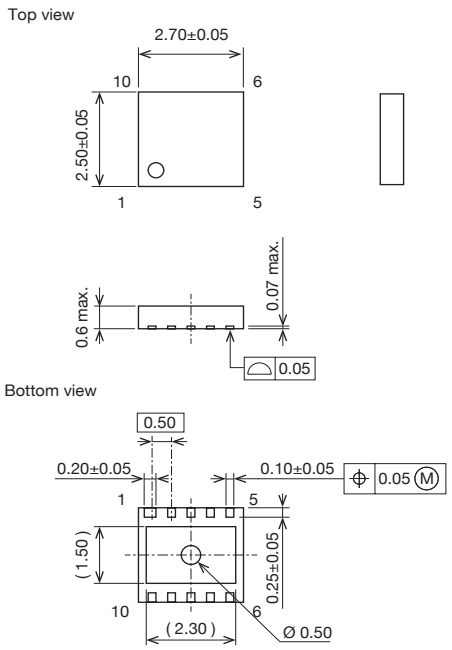
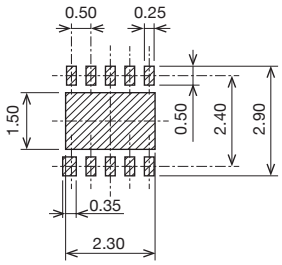
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
PLP-6-2130		
PLP-8E		

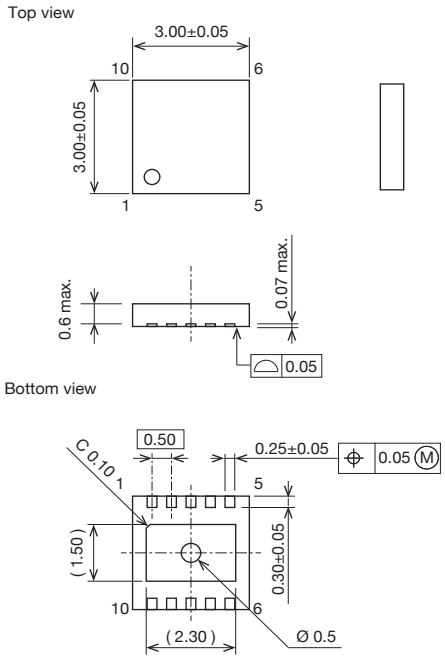
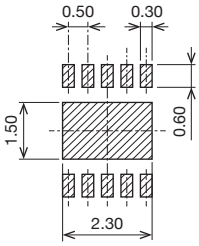
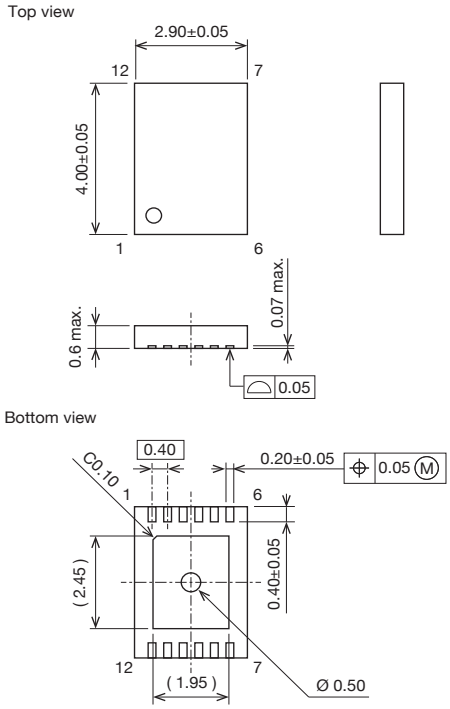
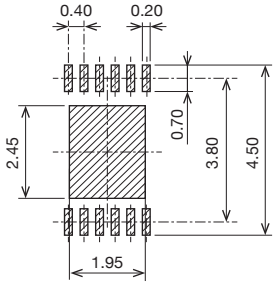
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
PLP-8F		
PLP-8G		

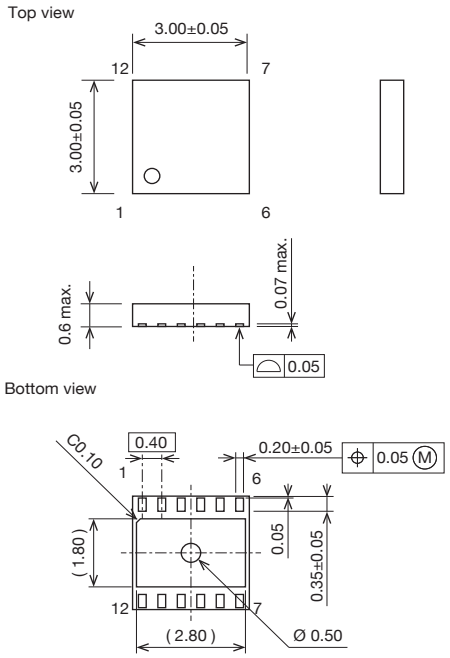
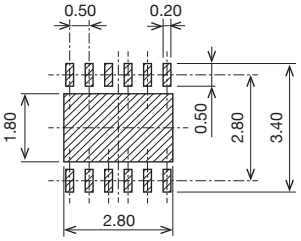
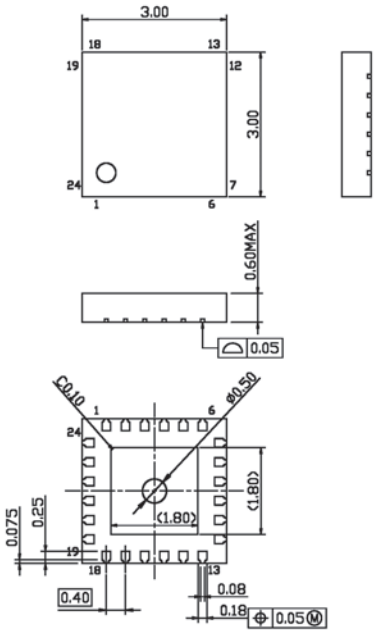
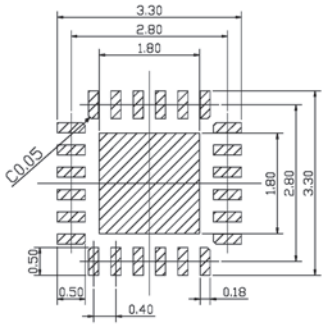
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
PLP-8H		
PLP-10A		

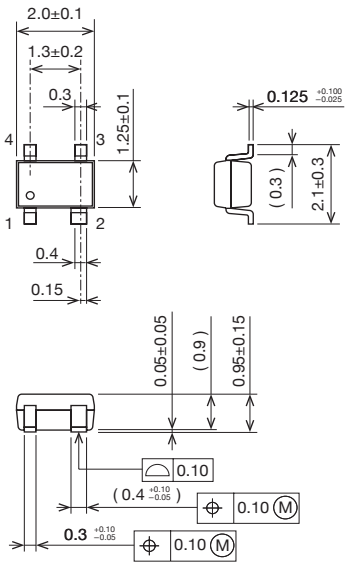
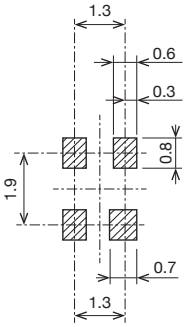
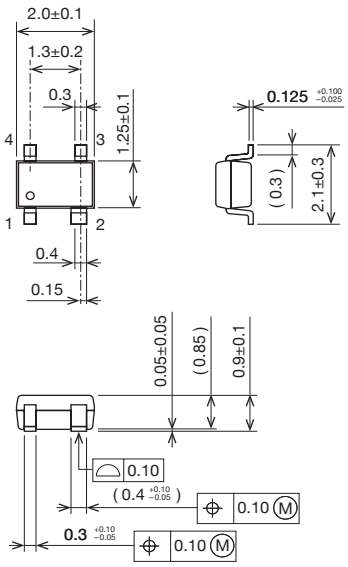
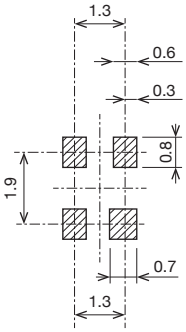
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
PLP-10D		
PLP-12A		

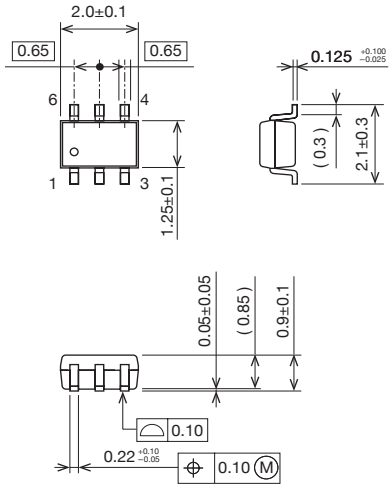
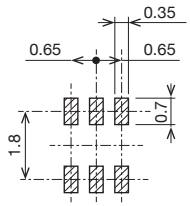
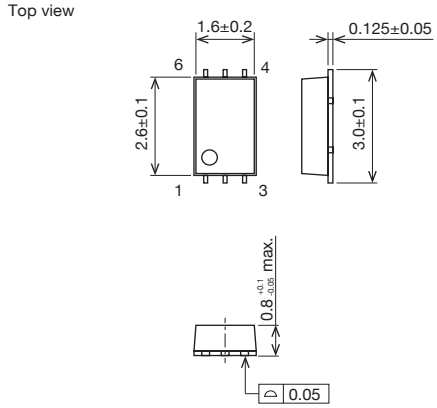
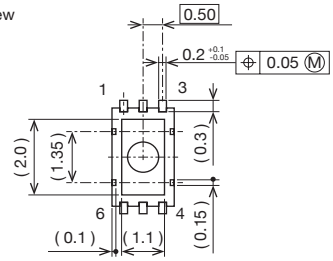
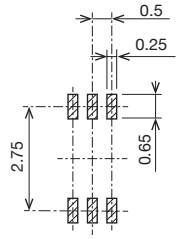
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
PLP-12B		
PLP-24A		

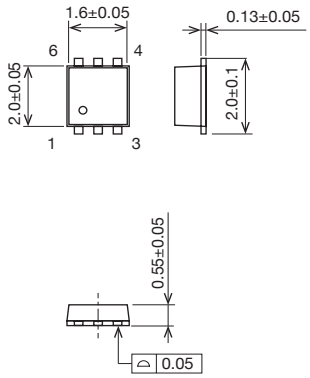
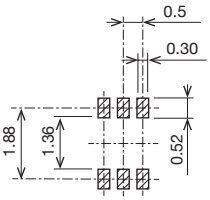
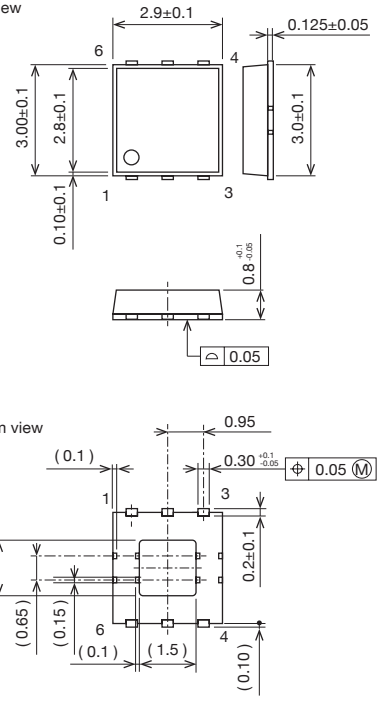
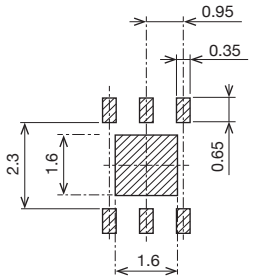
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
SC-82ABA	Top view 	
SC-82ABB	Top view 	

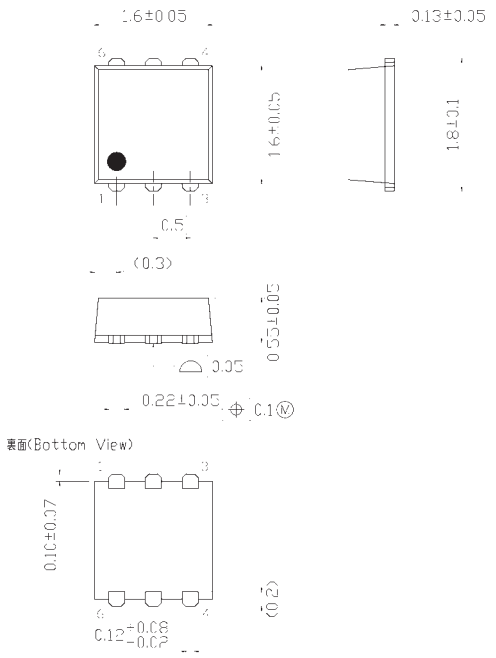
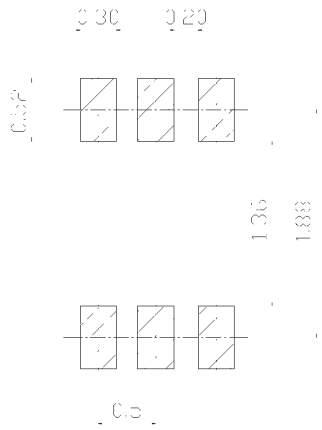
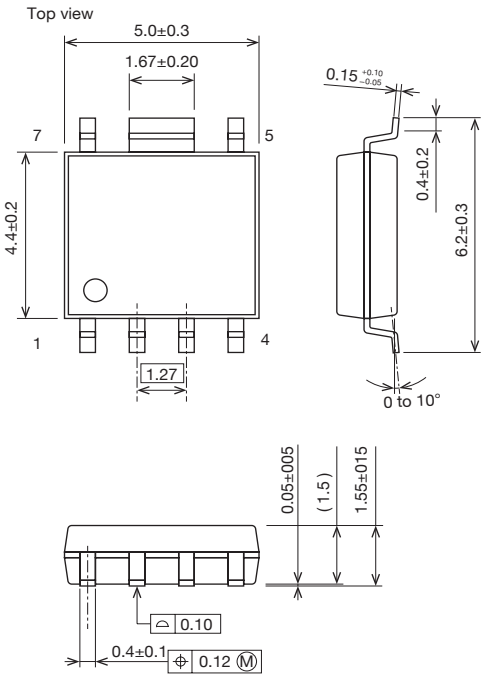
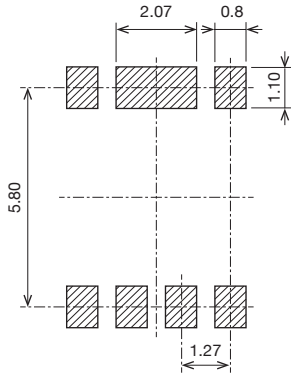
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
SC-88A	Top view 	
SON-6A	Top view  Bottom view 	

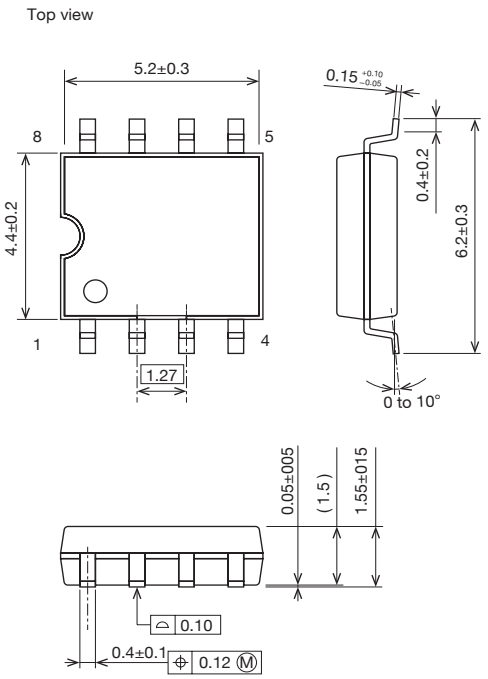
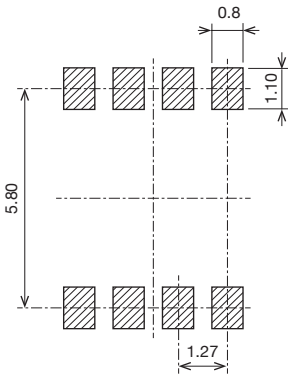
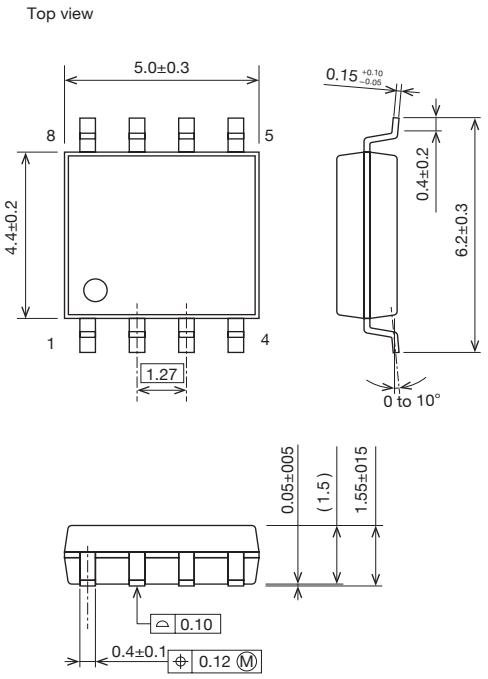
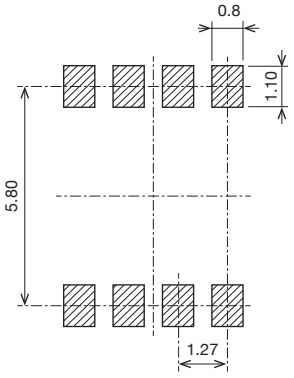
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
SON-6C	Top view  	
SON-6D	Top view  	

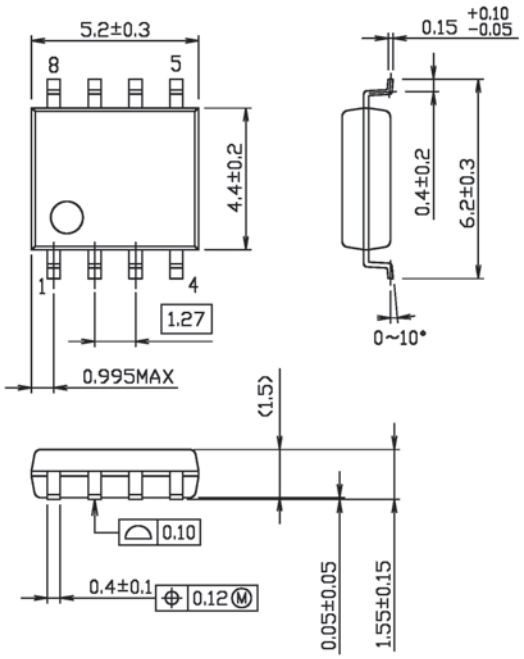
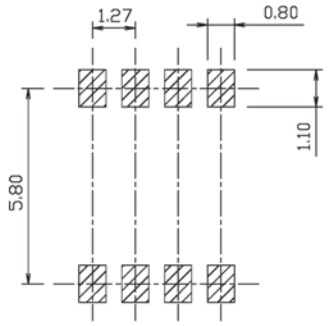
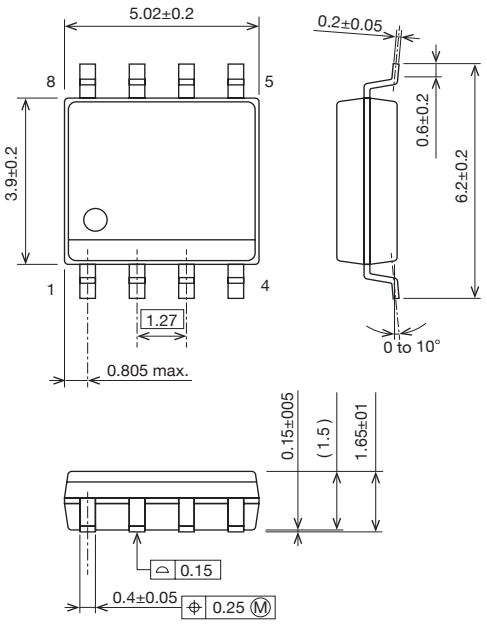
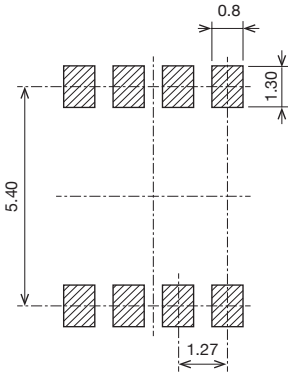
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
SON-6F		
SOP-7B		

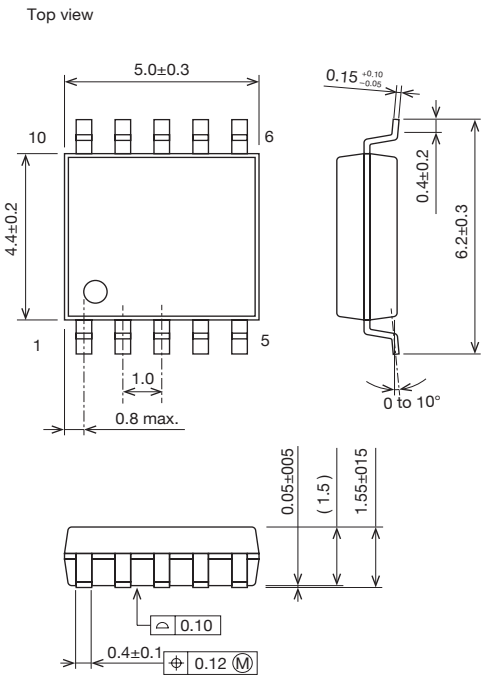
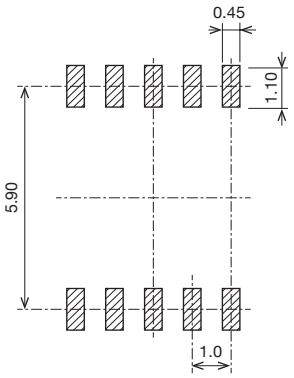
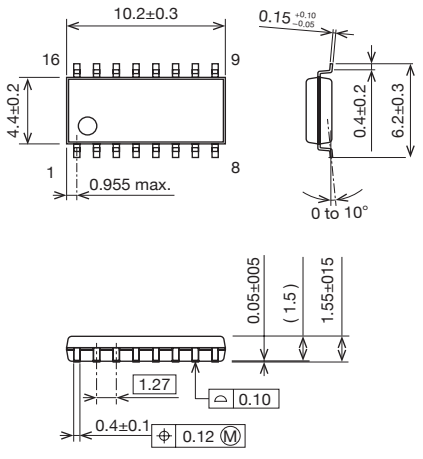
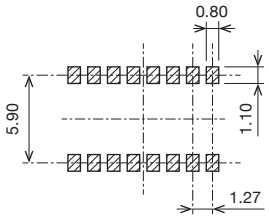
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
SOP-8C		
SOP-8D		

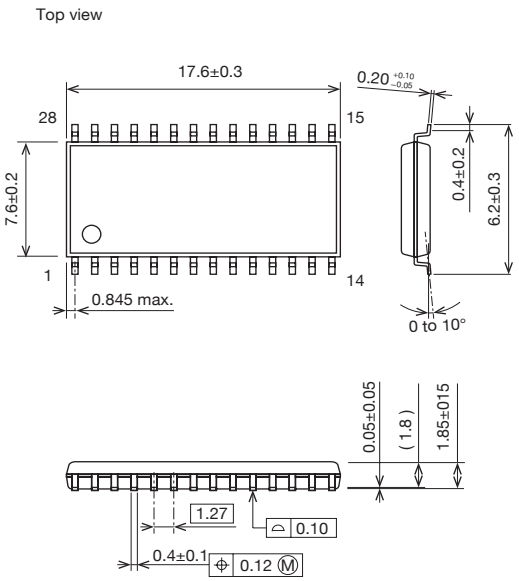
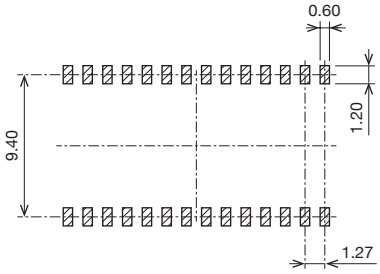
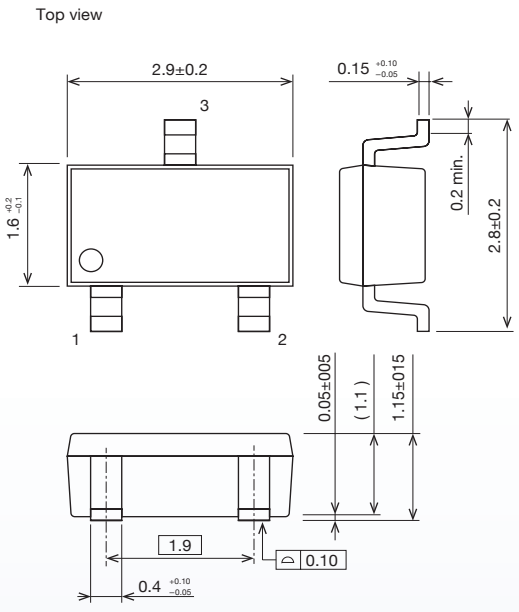
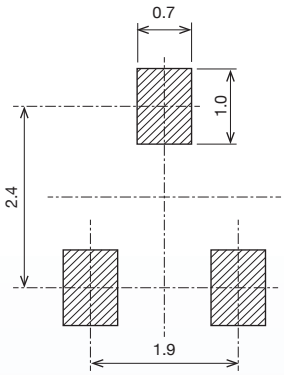
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
SOP-8G		
SOP-8J	Top view 	

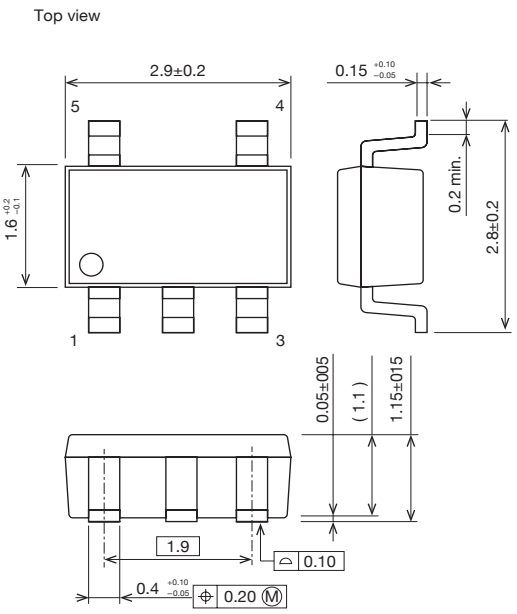
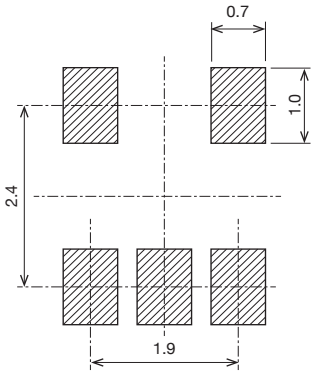
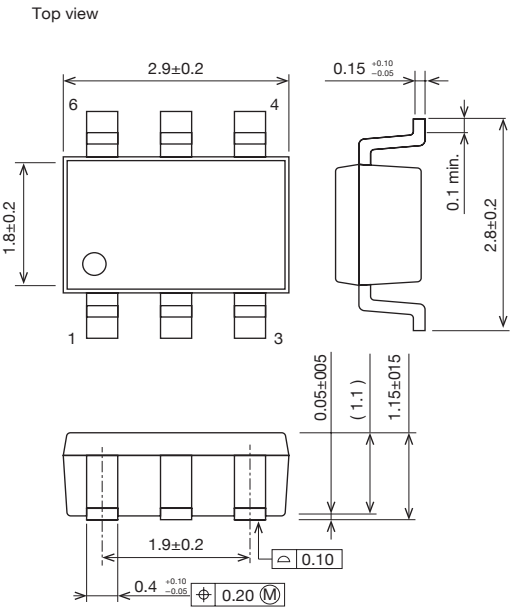
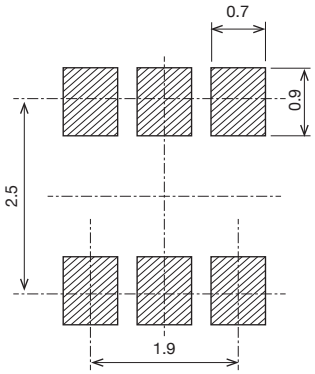
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
SOP-10A		
SOP-16B		

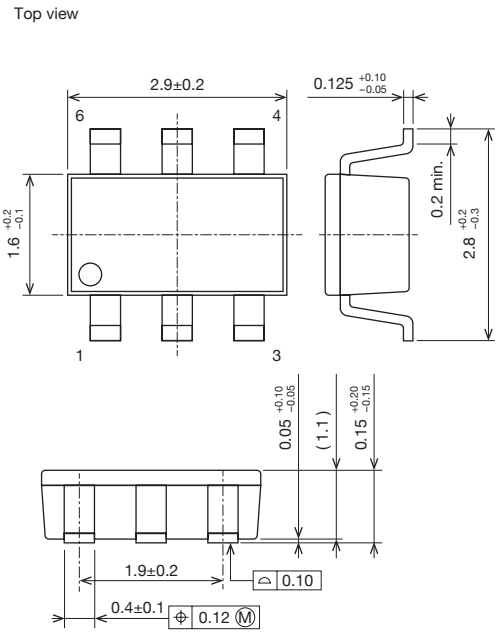
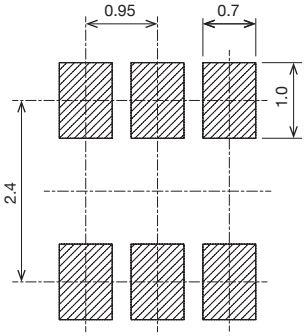
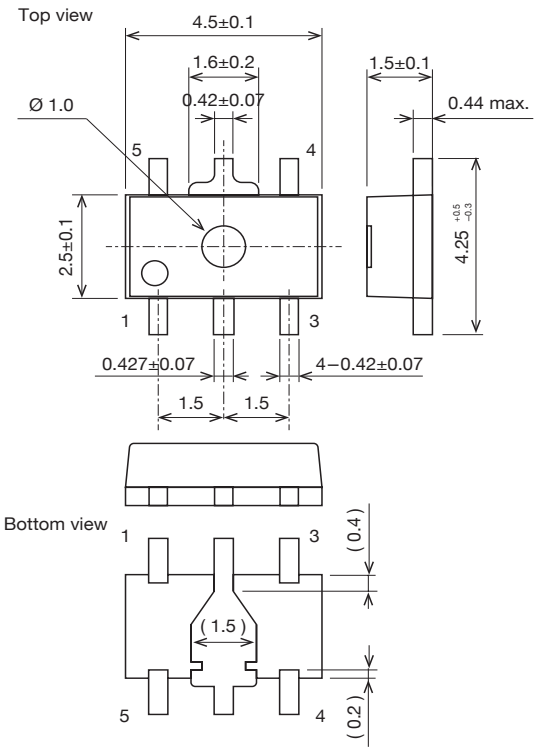
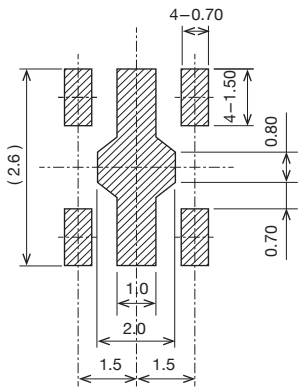
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
SOP-28B		
SOT-23A		

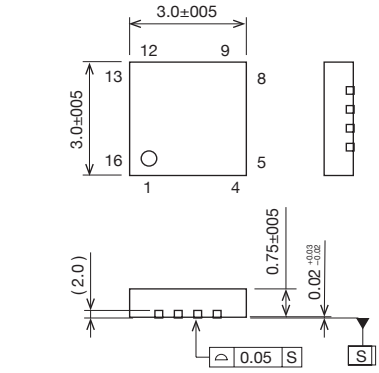
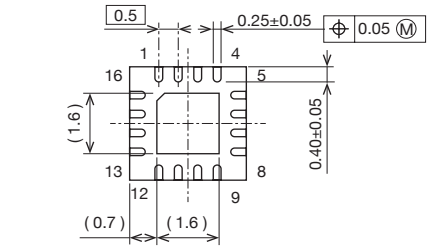
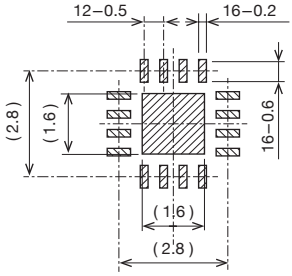
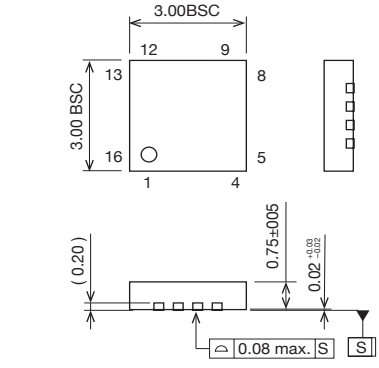
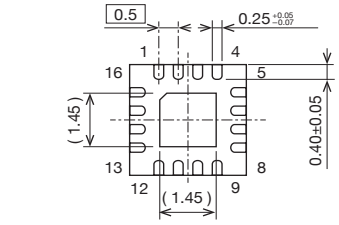
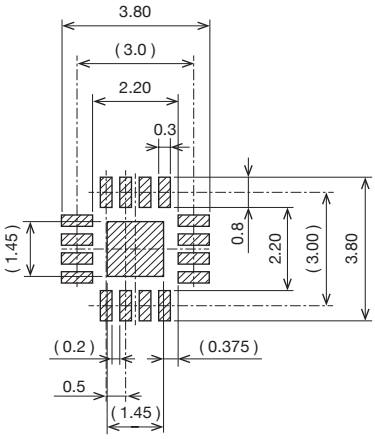
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
SOT-25A		
SOT-26A		

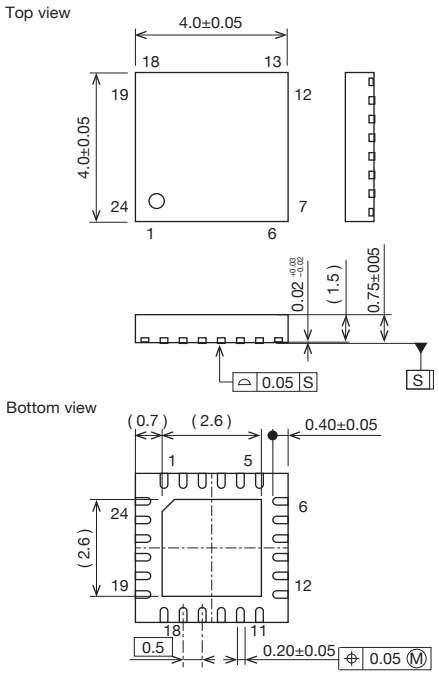
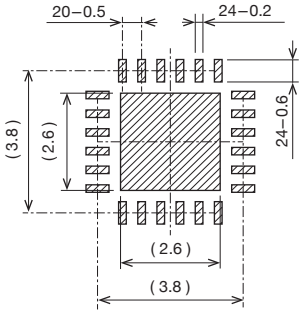
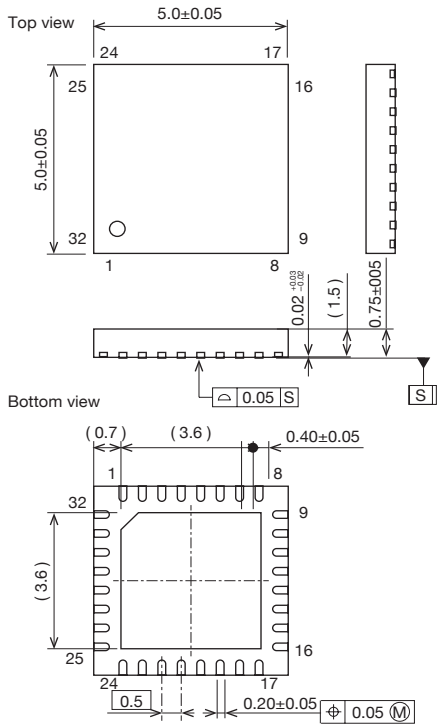
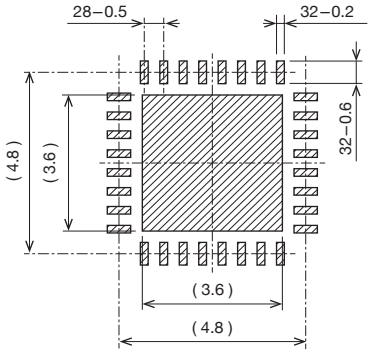
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
SOT-26B		
SOT89-5A		

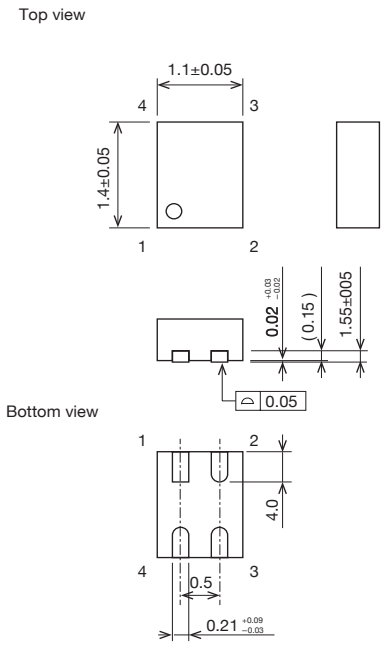
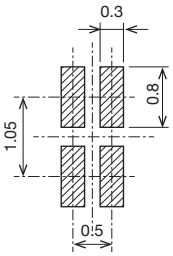
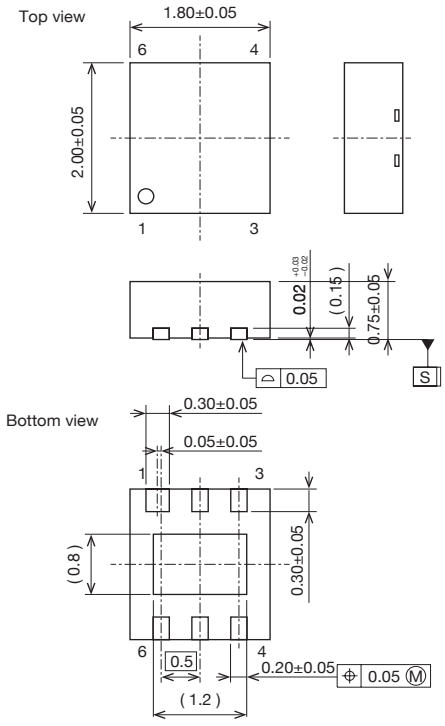
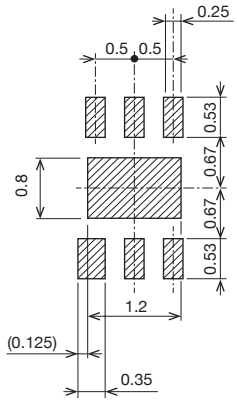
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
SQFN-16A	Top view  Bottom view 	
SQFN-16B	Top view  Bottom view 	

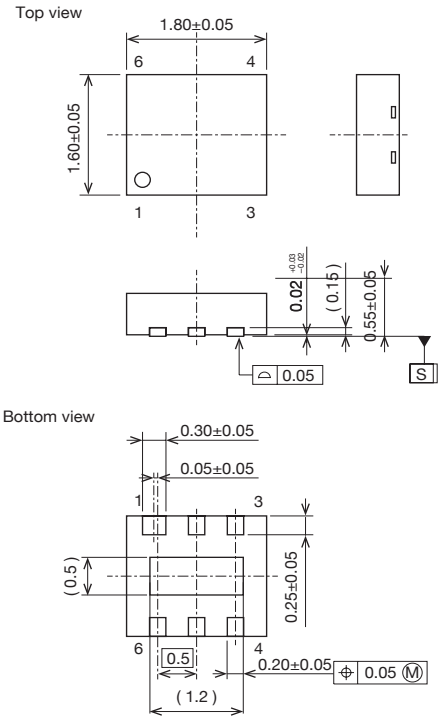
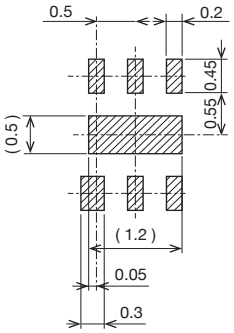
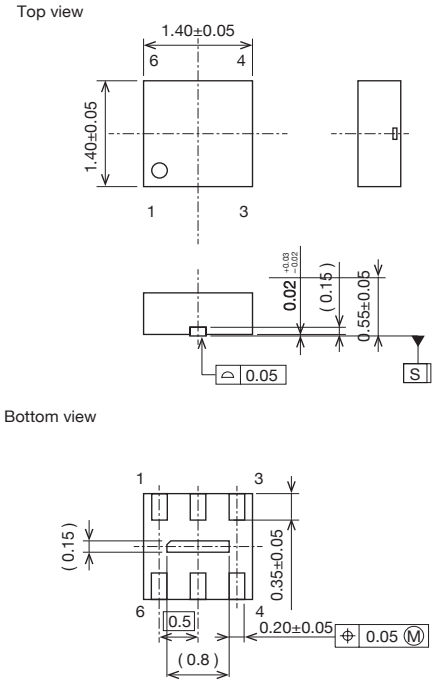
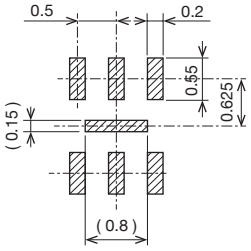
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
SQFN-24A		
SQFN-32A		

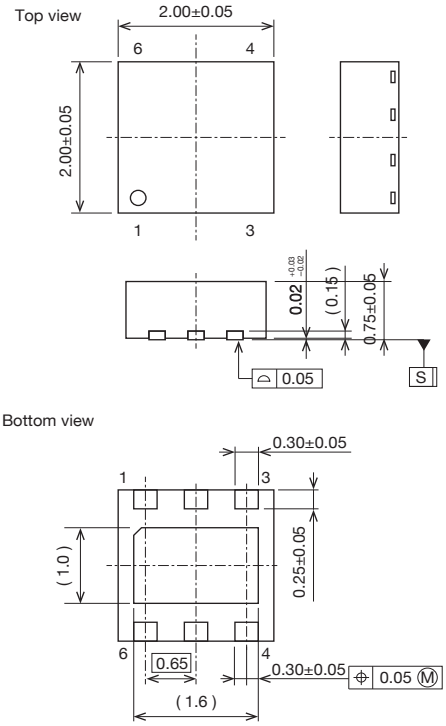
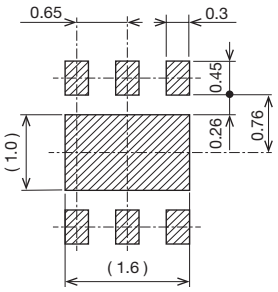
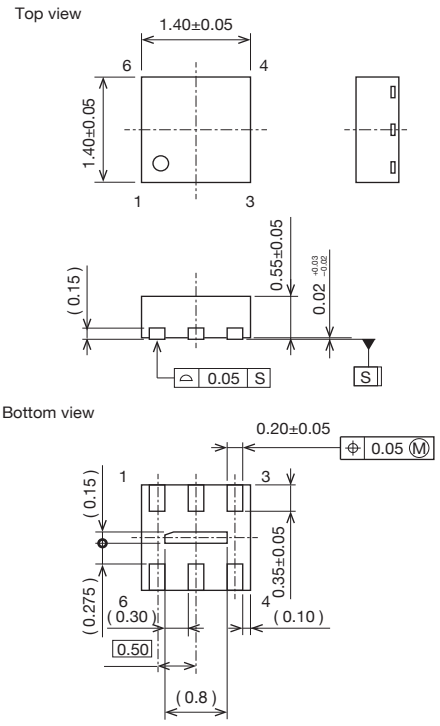
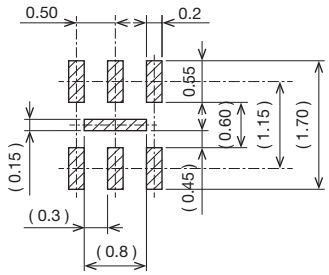
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
SSON-4B		
SSON-6A		

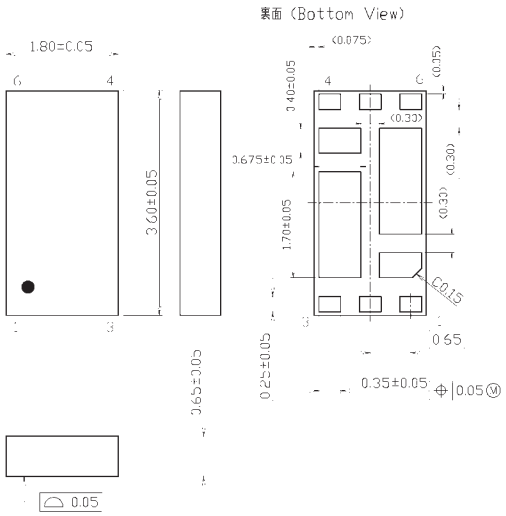
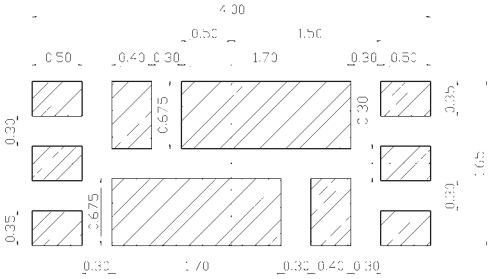
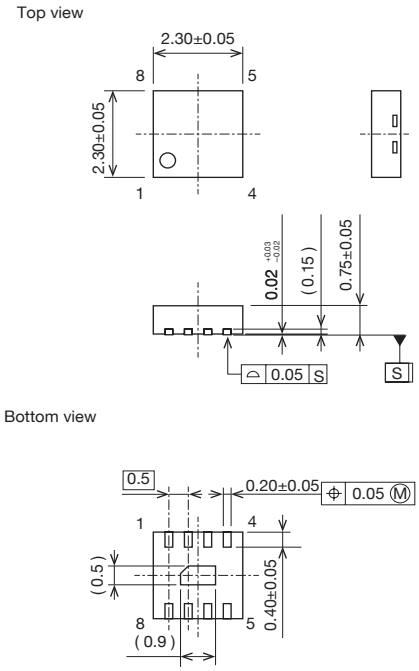
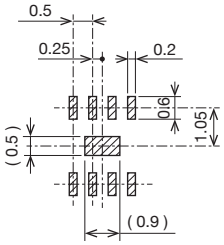
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
SSON-6E		
SSON-6J		

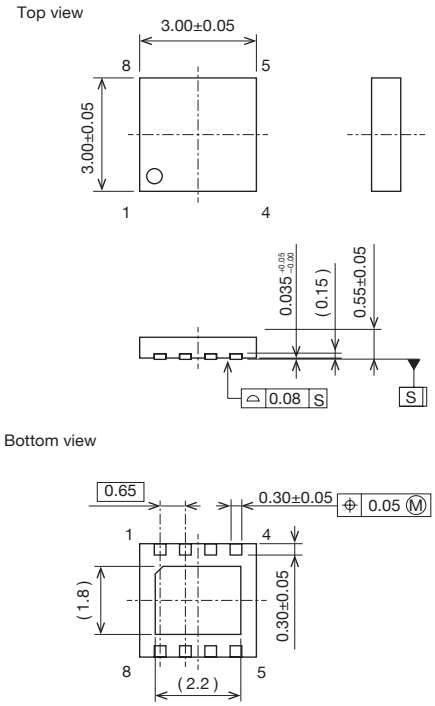
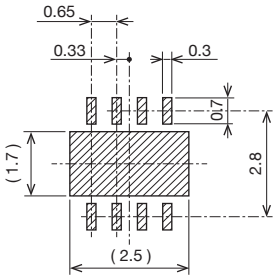
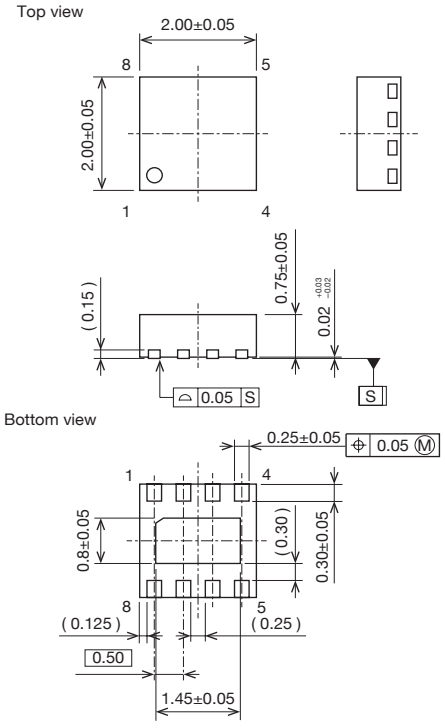
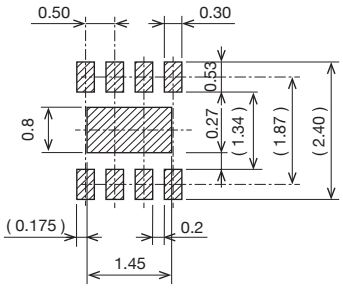
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
SSON-6L		
SSON-6M		

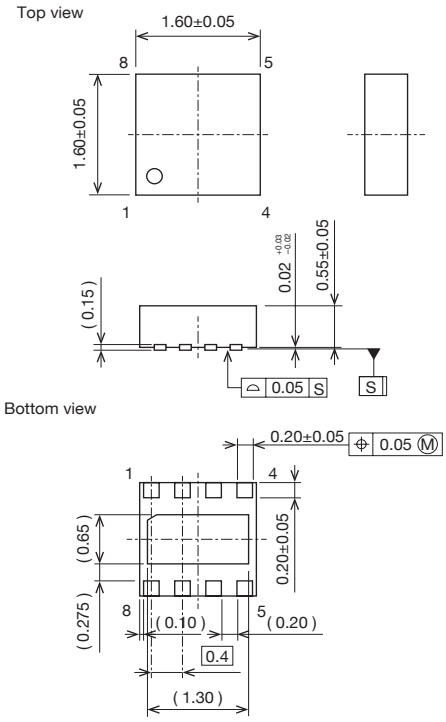
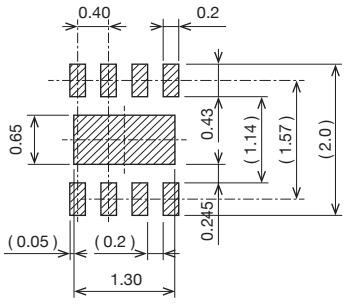
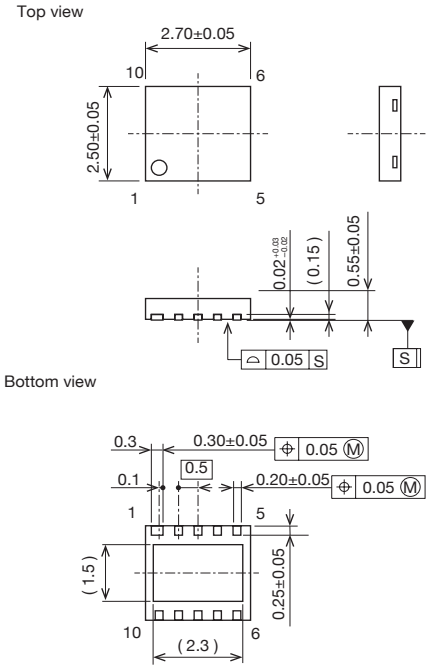
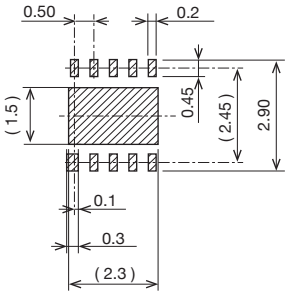
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
SSON-6N		
SSON-8B		

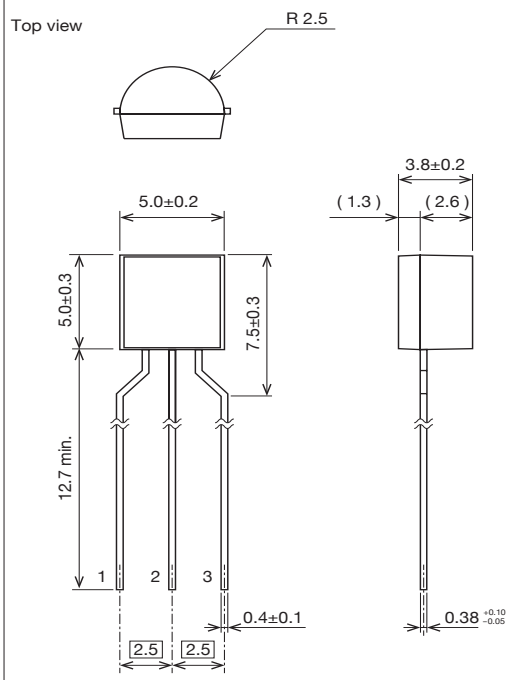
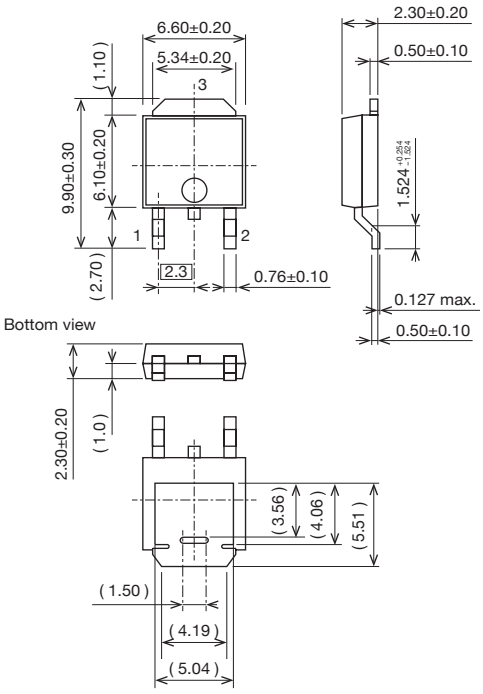
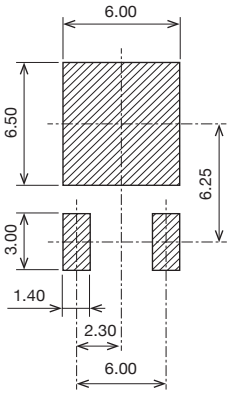
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
SSON-8C		
SSON-8E		

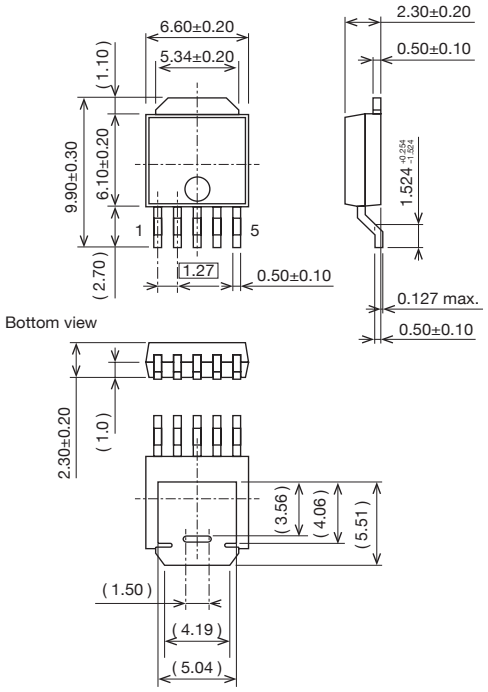
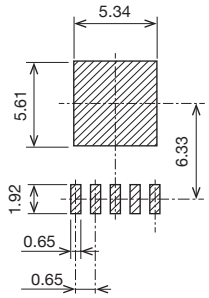
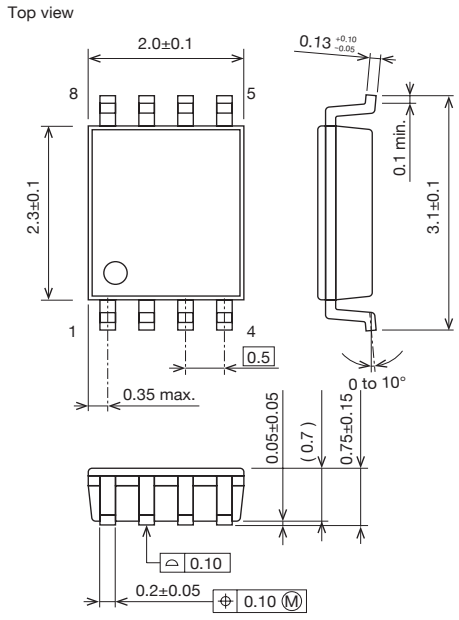
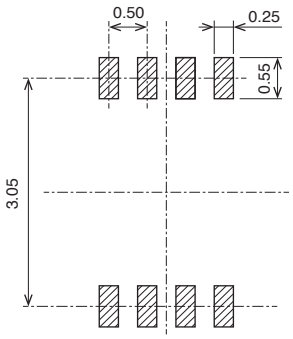
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
SSON-8G		
SSON-10A		

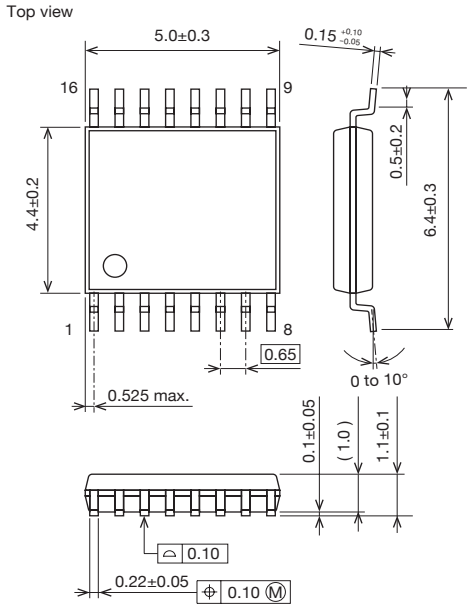
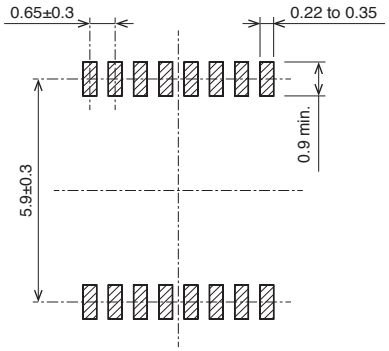
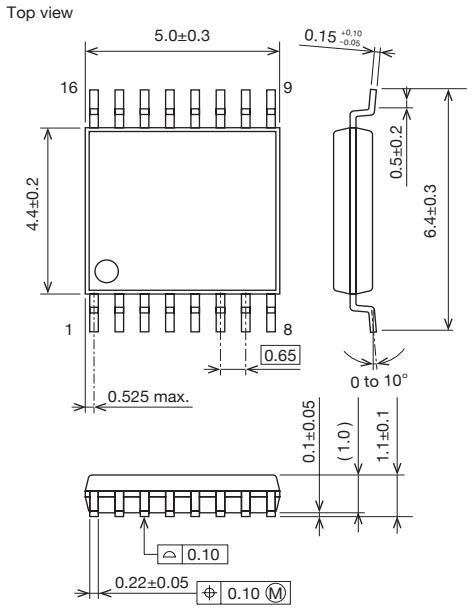
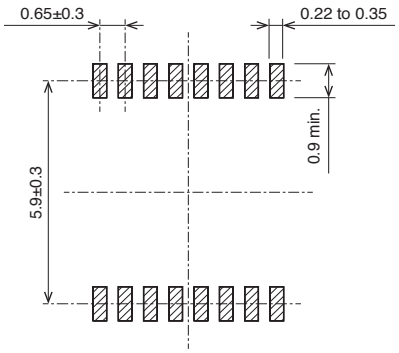
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
TO-92A		
TO-252C		

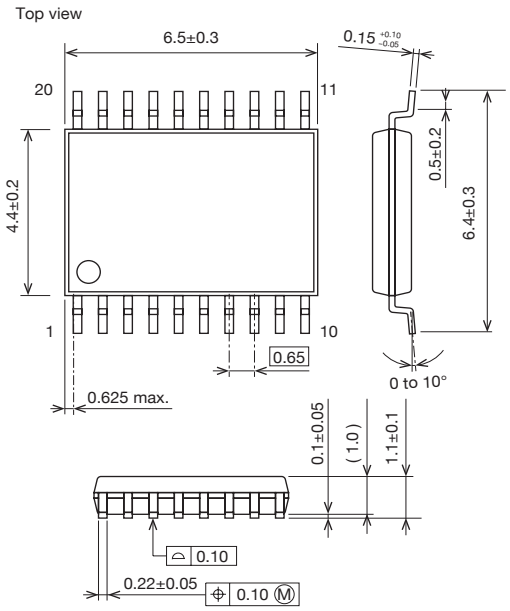
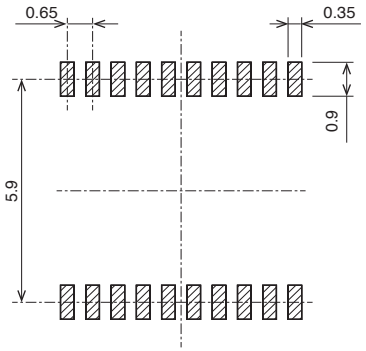
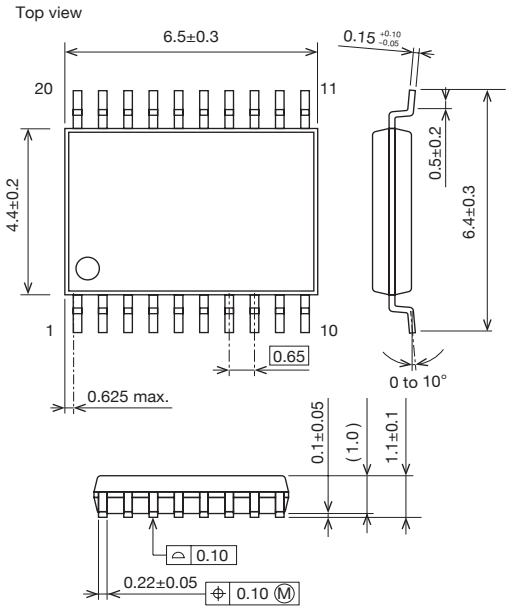
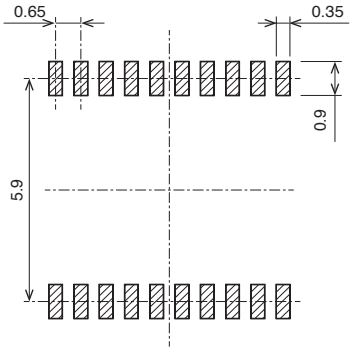
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
TO-252-5A		
TSOP-8A		

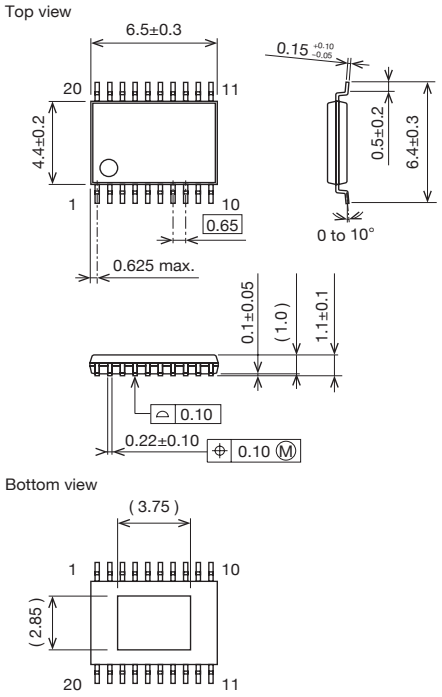
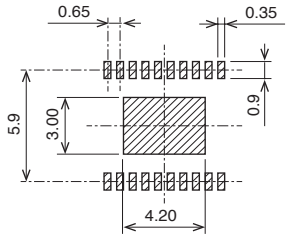
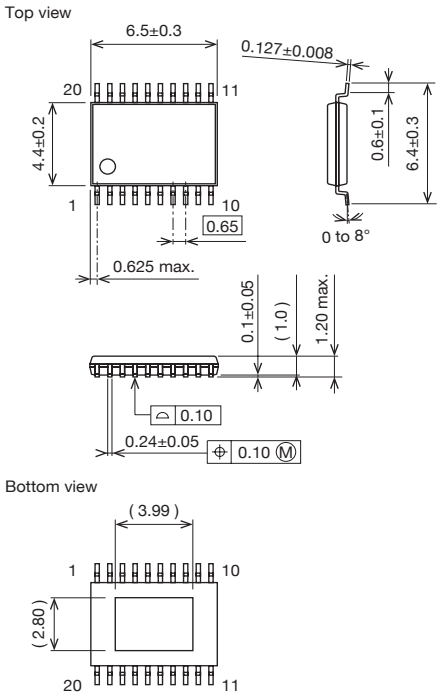
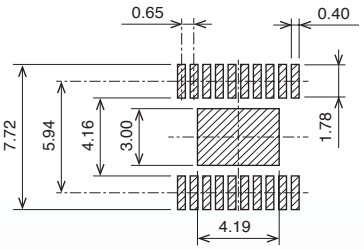
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
TSOP-16B		
TSOP-16D		

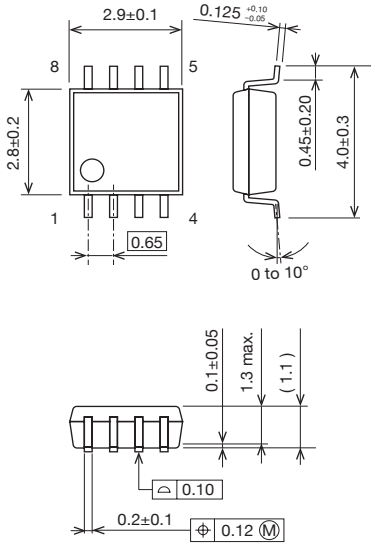
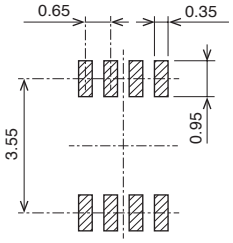
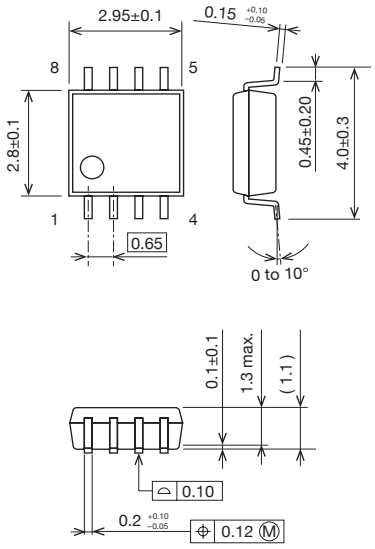
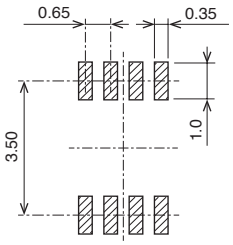
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
TSOP-20A		
TSOP-20D		

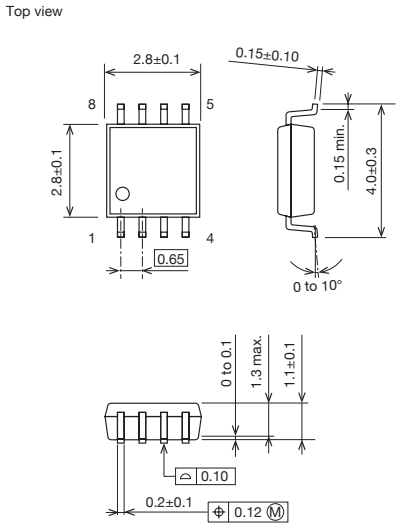
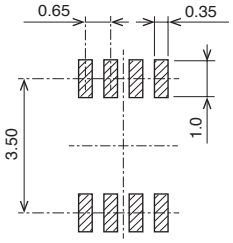
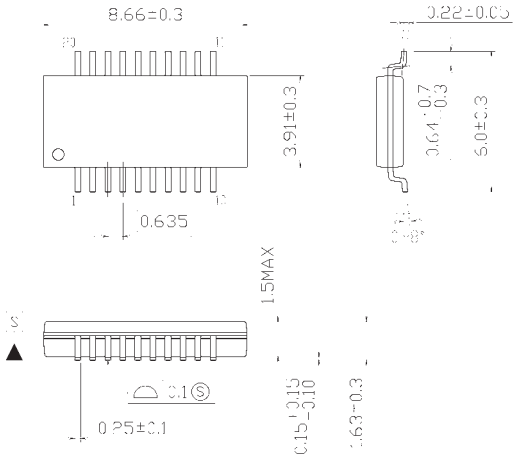
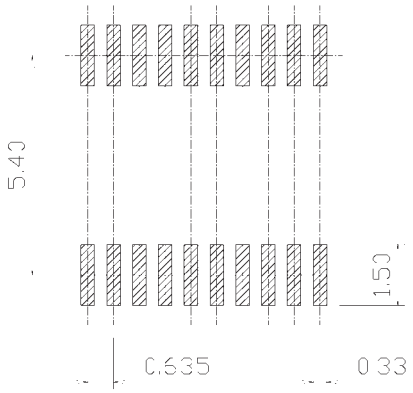
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
TSOP-20E		
TSOP-20F		

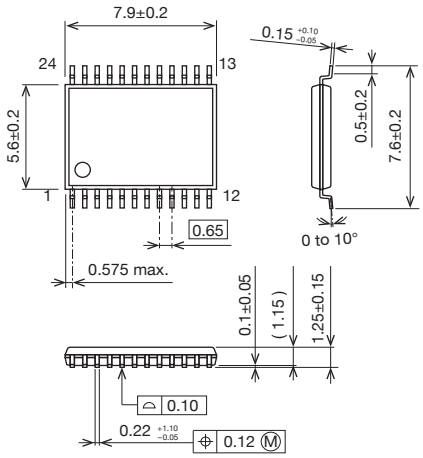
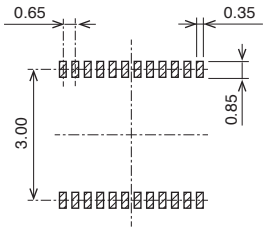
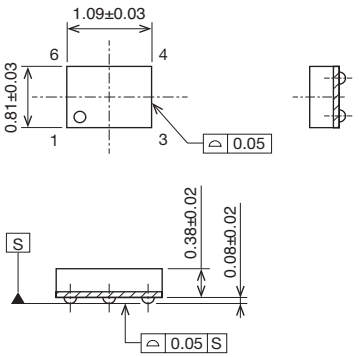
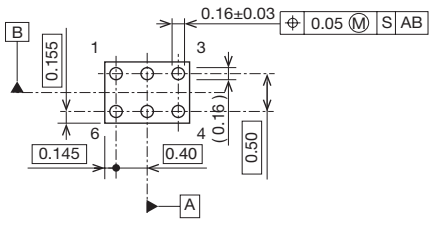
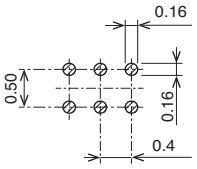
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
VSOP-8B	Top view 	
VSOP-8C	Top view 	

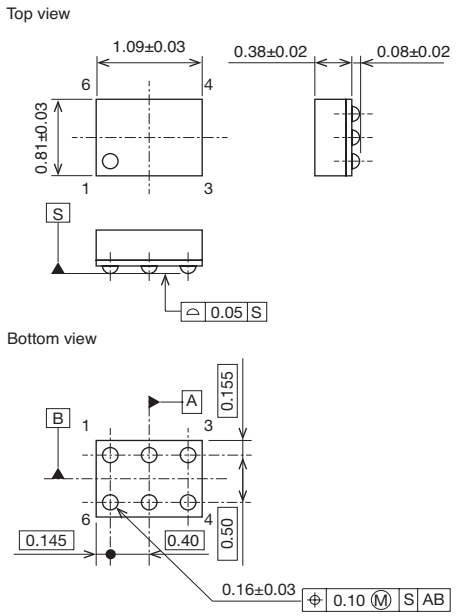
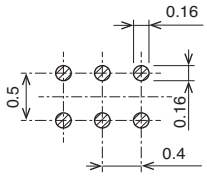
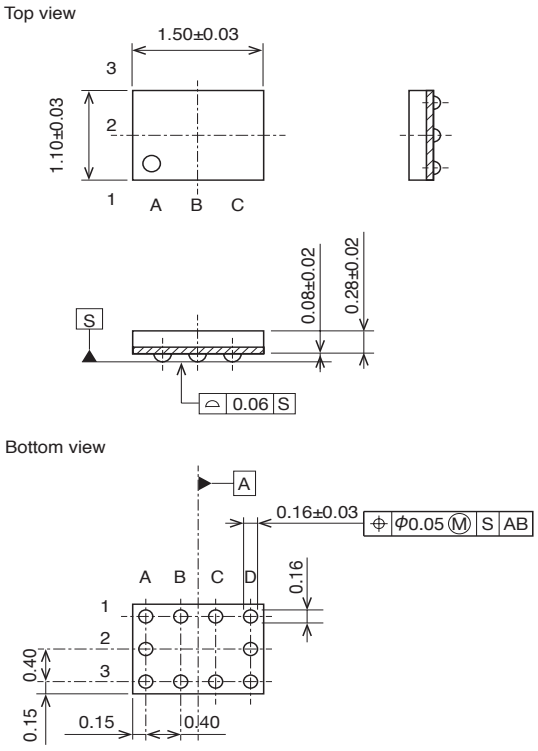
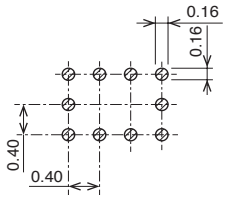
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
VSOP-8D		
VSOP-20A		

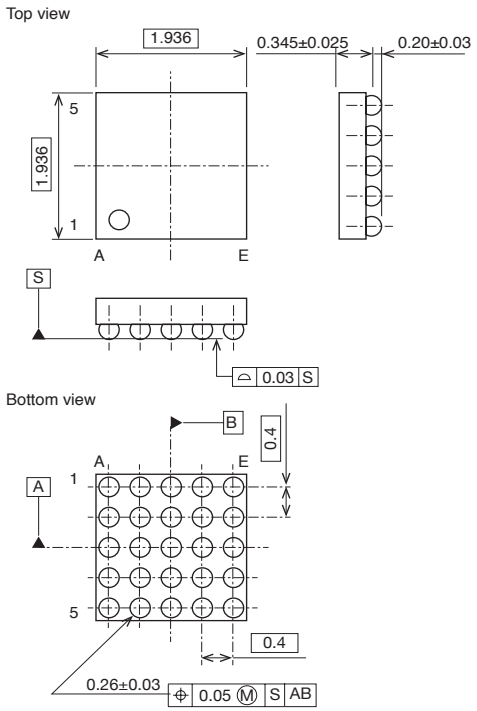
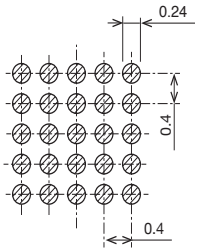
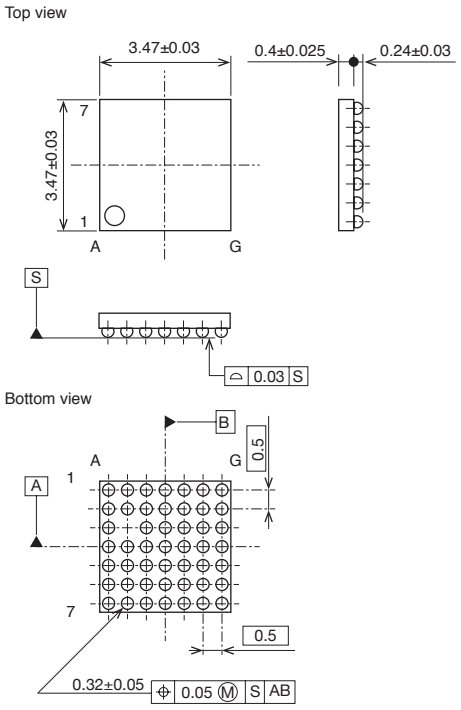
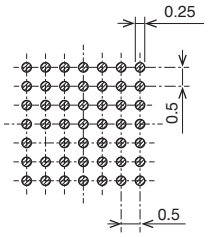
Unit: mm

Package Name	Dimentional Drawing	Recommended Land Pattern
VSOP-24A	Top view 	
WLCSP-6B	Top view  Bottom view 	

Unit: mm

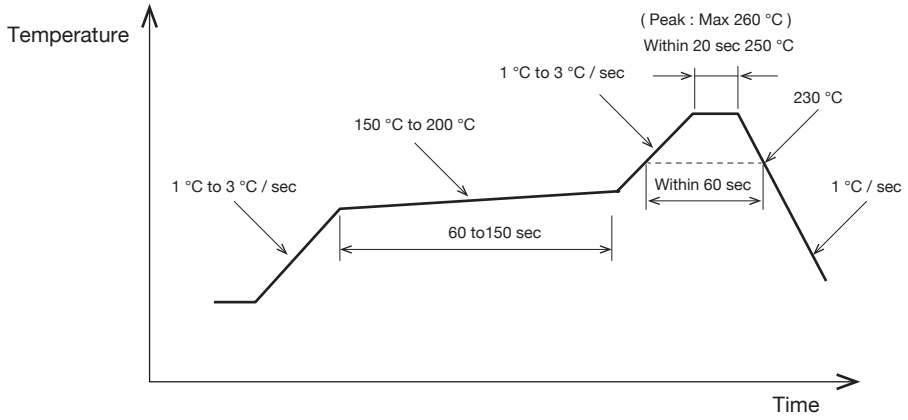
Package Name	Dimentional Drawing	Recommended Land Pattern
WLCSP-6C		
WLCSP-10A		

Unit: mm

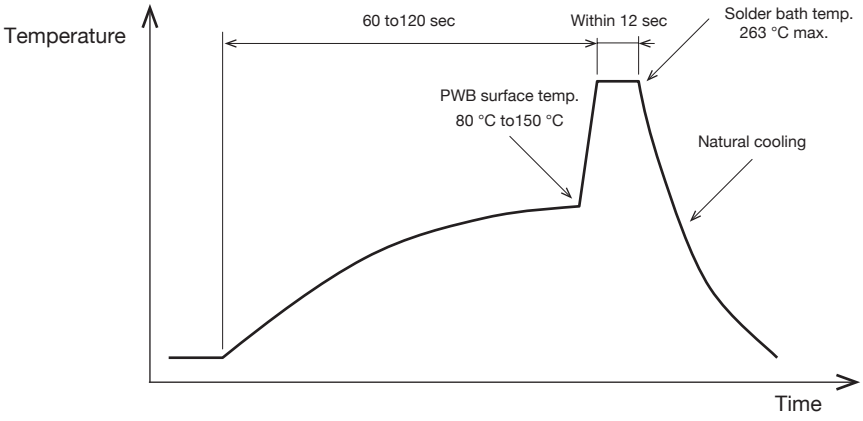
Package Name	Dimentional Drawing	Recommended Land Pattern
WLCSP-25A		
WLCSP-48B		

5 Pb–Free Recommended Profile

Reflow Soldering (max 2 times)



Flow Soldering (max 1 times)



Note : In case of double–wave soldering, the temp. is at its peak during the total time of 2max. temp.

Manual Soldering

Iron tip temp./time	times
400 °C max. / 3 sec	2 max.

Pre Treatment Moisture Soaking Condition of Reliability Test

85 °C 65 %RH 168h (1st), 85 °C 65 %RH 168h (2nd)

note : Please contact us for the CSP package separately.

5 permissible counts of solder methods for each packages

Package type	Package	Reflow soldering	Flow soldering	Manual soldering
Lead type	TO-92A		1	2
Flat-lead type	SON-6A	2		2
	SON-6C	2		2
	SON-6D	2		2
	SON-6F	2		2
	SOT89-5A	2		2
Gullwing type	SC-82ABA	2	1	2
	SC-82ABB	2	1	2
	SC-88A	2	1	2
	SOT-23A	2	1	2
	SOT-25A	2	1	2
	SOT-26A	2	1	2
	SOT-26B	2	1	2
	SOP-7B	2	1	2
	SOP-8C	2	1	2
	SOP-8D	2	1	2
	SOP-8G	2	1	2
	SOP-8J	2	1	2
	SOP-10A	2	1	2
	SOP-16B	2	1	2
	SOP-28B	2	1	2
	TSOP-8A	2		2
	TSOP-16B	2		2
	TSOP-16D	2		2
	TSOP-20A	2		2
	TSOP-20D	2		2
	TSOP-20E	2		2
	TSOP-20F	2		2
	VSOP-8B	2		2
	VSOP-8C	2		2
	VSOP-8D	2		2
	VSOP-20A	2		2
	VSOP-24A	2		2
	HSOP-8A	2		2
	HSOP-8C	2		2
	HSOP-8E	2		2
	HSOP-28A	2	1	2
	HSOP-28C	2	1	2
	TO-252C	2		2
	TO-252-5A	2		2

Package type	Package	Reflow soldering	Flow soldering	Manual soldering
Non-lead type	PLP-4A	2		
	PLP-4B	2		
	PLP-4C	2		
	PLP-4D	2		
	PLP-4E	2		
	PLP-4-1228	2		
	PLP-4-2140	2		
	PLP-6A	2		
	PLP-6C	2		
	PLP-6F	2		
	PLP-6G	2		
	PLP-6H	2		
	PLP-6J	2		
	PLP-6-2130	2		
	PLP-8E	2		
	PLP-8F	2		
	PLP-8G	2		
	PLP-8H	2		
	PLP-10A	2		
	PLP-10D	2		
	PLP-12A	2		
	PLP-12B	2		
	PLP-24A	2		
	SQFN-16A	2		
	SQFN-16B	2		
	SQFN-24A	2		
	SQFN-32A	2		
	SSON-4B	2		
	SSON-6A	2		
	SSON-6E	2		
	SSON-6J	2		
	SSON-6L	2		
	SSON-6M	2		
	SSON-6N	2		
	SSON-8B	2		
	SSON-8C	2		
	SSON-8E	2		
	SSON-8G	2		
	SSON-10A	2		
	WLCSP-6B	2		
	WLCSP-6C	2		
	WLCSP-10A	2		
	WLCSP-25A	2		
	WLCSP-48B	2		

*1 Ask us the temperature.
*2 This packages should be soldered within 168 hours after unpacking because they are moisture–proof packing products.
They should be also soldered within 168 hours in the second or following solder.

MinebeaMitsumi combines Minebea's ultra precision machining technology with MITSUMI ELECTRIC(MITSUMI)'s electronics technology as an "Electro Mechanics Solutions™" provider that contributes to the age of IoT, supporting manufacturing around the world.

* "Electro Mechanics Solutions" is a registered trademark in Japan of MinebeaMitsumi Inc. Its registration No. is 5322479.

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