



XTP2038

500mA Low Dropout Voltage Linear Regulator

XTX Technology Inc.

Tel: (+86 755) 28229862

Fax: (+86 755) 28229847

Web Site: <http://www.xtxtech.com/>

Technical Contact: fae@xtxtech.com

* Information furnished is believed to be accurate and reliable. However, XTX Technology Inc. assumes no responsibility for the consequences of use of such information or for any infringement of patents of other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent rights of XTX Technology Inc. Specifications mentioned in this publication are subjected to change without notice. This publication supersedes and replaces all information previously supplied. XTX Technology Inc. products are not authorized for use as critical components in life support devices or systems without express written approval of XTX Technology Inc. The XTX logo is a registered trademark of XTX Technology Inc. All other names are the property of their respective own.

15 μ A, 500mA Low Dropout Voltage Linear Regulator

General Description

The XTP2038 is a ultra-low-power, low-step-down linear regulator that supports a wide voltage input of 1.8V to 5.5V and a standby current of 15 μ A, making these devices ideal for battery-powered systems that spend most of their time in standby mode, requiring minimal standby power consumption to extend the life of the device. Integrated enable control mode that reduces current to only 10nA(typical) when the low level enable signal is turned off.

XTP2038 only needs 1 μ F ceramic capacitor to work normally. The XTP2038 integrated short-circuit current limiting and thermal shutdown protection. And has automatic discharge function, can be disabled in the state of rapid discharge V_{OUT} .

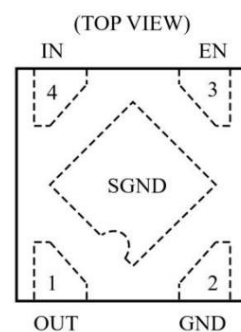
The operating temperature range is -40 $^{\circ}$ C~ +85 $^{\circ}$ C.

Features

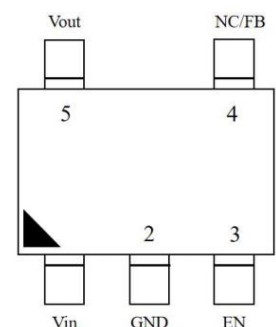
- 15 μ A Ground Current at no Load
- $\pm 2\%$ Output Accuracy
- 500mA Output Current
- 10nA Shutdown Current
- Input Voltage Range: 1.8V to 5.5V
- Dropout Voltage: 0.18V at 300mA
- Fixed Output Voltage 0.9V, 1.05V, 1.2V, 1.5V, 1.8V, 1.9V, 2.5V, 2.7V, 2.8V, 2.85V, 2.9V, 3.0V, 3.3V, 3.6V, 4.0V and 5.0V
- Adjustable Output from 0.8V to 5.0V
- Stable with Ceramic or Tantalum Capacitor
- Current Limit Protection
- Over-Temperature Protection
- DFN1x1-4L, SOT-23-5 Packages Available
- MSL-3 Classification

Applications

- Portable, Battery Powered Equipment
- Low Power Micro-controllers
- Laptop, Palmtops and PDAs
- Wireless Communication Equipment
- Audio/Video Equipment
- Car Navigation System



DFN1x1-4L



SOT-23-5

Ordering Information

MODEL	PACKAGE DESCRIPTION	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
XTP2038-0.9	DFN1x1-4L	XTP2038-090AD1CT	3A YW	Tape and Reel, 12000
XTP2038-1.05	DFN1x1-4L	XTP2038-105AD1CT	3B YW	Tape and Reel, 12000
XTP2038-1.2	DFN1x1-4L	XTP2038-120AD1CT	3C YW	Tape and Reel, 12000
XTP2038-1.5	DFN1x1-4L	XTP2038-150AD1CT	3D YW	Tape and Reel, 12000
XTP2038-1.8	DFN1x1-4L	XTP2038-180AD1CT	3E YW	Tape and Reel, 12000
XTP2038-1.9	DFN1x1-4L	XTP2038-190AD1CT	3F YW	Tape and Reel, 12000
XTP2038-2.5	DFN1x1-4L	XTP2038-250AD1CT	3G YW	Tape and Reel, 12000
XTP2038-2.7	DFN1x1-4L	XTP2038-270AD1CT	3H YW	Tape and Reel, 12000
XTP2038-2.8	DFN1x1-4L	XTP2038-280AD1CT	3I YW	Tape and Reel, 12000
XTP2038-2.85	DFN1x1-4L	XTP2038-285AD1CT	3J YW	Tape and Reel, 12000
XTP2038-2.9	DFN1x1-4L	XTP2038-290AD1CT	3K YW	Tape and Reel, 12000
XTP2038-3.0	DFN1x1-4L	XTP2038-300AD1CT	3L YW	Tape and Reel, 12000
XTP2038-3.3	DFN1x1-4L	XTP2038-330AD1CT	3M YW	Tape and Reel, 12000
XTP2038-3.6	DFN1x1-4L	XTP2038-360AD1CT	3N YW	Tape and Reel, 12000
XTP2038-4.0	DFN1x1-4L	XTP2038-400AD1CT	3O YW	Tape and Reel, 12000
XTP2038-5.0	DFN1x1-4L	XTP2038-500AD1CT	3P YW	Tape and Reel, 12000
XTP2038-0.9	SOT-23-5	XTP2038-090AS2CT	P2038A YWZZX	Tape and Reel, 3000
XTP2038-1.05	SOT-23-5	XTP2038-105AS2CT	P2038B YWZZX	Tape and Reel, 3000
XTP2038-1.2	SOT-23-5	XTP2038-120AS2CT	P2038C YWZZX	Tape and Reel, 3000
XTP2038-1.5	SOT-23-5	XTP2038-150AS2CT	P2038D YWZZX	Tape and Reel, 3000
XTP2038-1.8	SOT-23-5	XTP2038-180AS2CT	P2038E YWZZX	Tape and Reel, 3000
XTP2038-1.9	SOT-23-5	XTP2038-190AS2CT	P2038F YWZZX	Tape and Reel, 3000
XTP2038-2.5	SOT-23-5	XTP2038-250AS2CT	P2038G YWZZX	Tape and Reel, 3000
XTP2038-2.7	SOT-23-5	XTP2038-270AS2CT	P2038H YWZZX	Tape and Reel, 3000
XTP2038-2.8	SOT-23-5	XTP2038-280AS2CT	P2038I YWZZX	Tape and Reel, 3000
XTP2038-2.85	SOT-23-5	XTP2038-285AS2CT	P2038J YWZZX	Tape and Reel, 3000
XTP2038-2.9	SOT-23-5	XTP2038-290AS2CT	P2038K YWZZX	Tape and Reel, 3000
XTP2038-3.0	SOT-23-5	XTP2038-300AS2CT	P2038L YWZZX	Tape and Reel, 3000
XTP2038-3.3	SOT-23-5	XTP2038-330AS2CT	P2038M YWZZX	Tape and Reel, 3000
XTP2038-3.6	SOT-23-5	XTP2038-360AS2CT	P2038N YWZZX	Tape and Reel, 3000
XTP2038-4.0	SOT-23-5	XTP2038-400AS2CT	P2038O YWZZX	Tape and Reel, 3000
XTP2038-5.0	SOT-23-5	XTP2038-500AS2CT	P2038P YWZZX	Tape and Reel, 3000
XTP2038-ADJ	SOT-23-5	XTP2038-ADJAS2CT	P2038R YWZZX	Tape and Reel, 3000

MARKING INFORMATION

NOTE:
 1X/P2038X: Device Code.
 YW : Date Code.
 ZZ: Inside Cod

Description of Functional Pins

Pin No	Pin Name	Pin Function
DFN1x1-4L		
1	V _{OUT}	Output of the Regulator
2	GND	Ground
3	EN	Enable Control Input
4	V _{IN}	Input of Supply Voltage
Exposed Pad	S _{GND}	Substrate of Chip. Leave floating or tie to GND

Pin No	Pin Name	Pin Function
SOT-23-5L		
1	V _{IN}	Input of Supply Voltage
2	GND	Ground
3	EN	Enable Control Input
4	NC/FB	No internal connection FB Pin for adjustable output version
5	V _{OUT}	Output of the Regulator

Typical Application Circuit

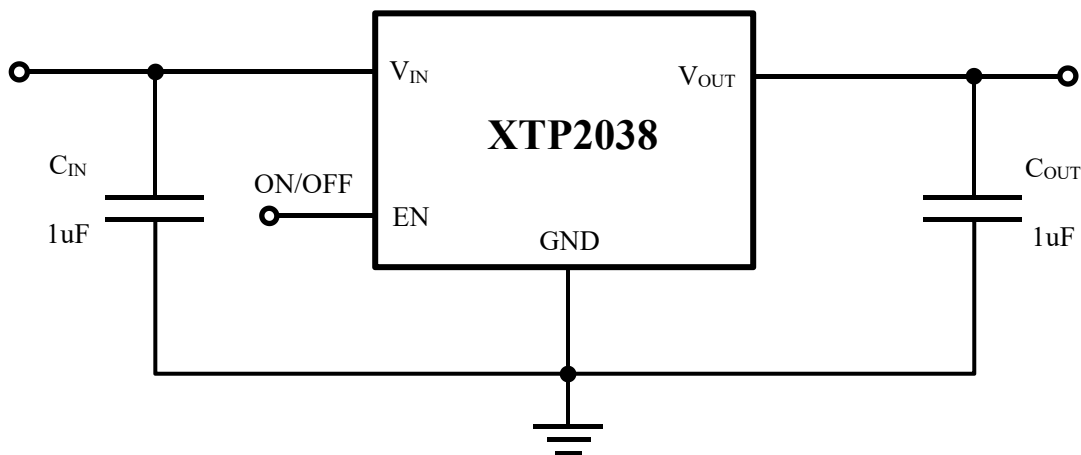


Figure 1: Application circuit of Fixed V_{OUT} LDO with enable function

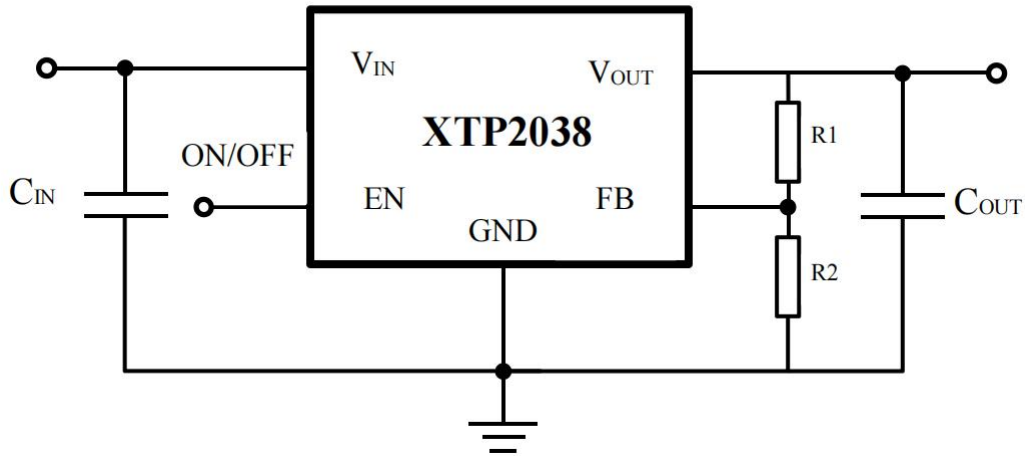
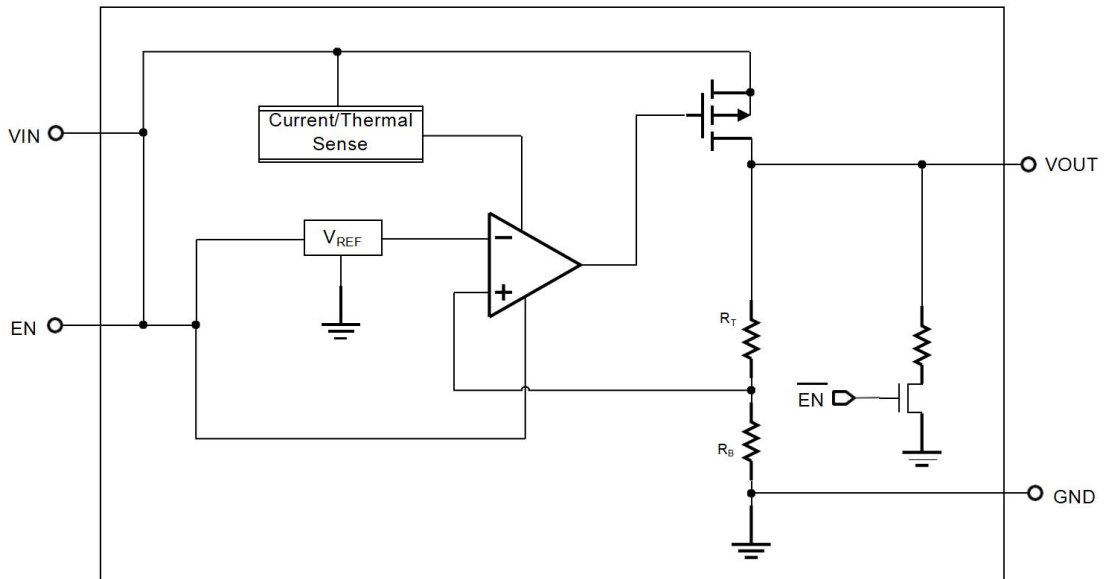


Figure 2. Adjustable Voltage Typical Application Circuit

Equation: $V_{OUT} = (1 + R1/R2) \times V_{FB}$ (Note 1)

Function Block Diagram



Absolute Maximum Ratings (Note 2)

PARAMETER		Min	Typ	Max	Unit
V_{IN} to GND		-0.3		6.5	V
V_{OUT} , EN to GND		-0.3		6	V
V_{OUT} to V_{IN}		-6		0.3	V
Package Thermal Resistance, θ_{JA} (Note 3)	DFN1x1-4L		195		°C/W
	SOT-23-5L		200		°C/W
Power Dissipation, P_D @ $T_A=25^\circ\text{C}$	DFN1x1-4L		0.48		W
	SOT-23-5L		0.5		W
Lead Temperature (Soldering, 10 sec)				260	°C
Junction Temperature		-40		150	°C
Storage Temperature Range		-60		150	°C

ESD Susceptibility

	Symbol		Value	Unit
Electrostatic discharge	V_{ESD}	HBM	2	KV
		MM	200	V
		CDM	1	KV

Recommended Operating Conditions

	Symbol	Min	Typ	Max	Unit
Input Voltage	V_{IN}	1.8		5.5	V
Junction Temperature Range	T_J	-40		125	°C
Ambient Temperature Range	T_A	-40		85	°C

Electrical Characteristics

($V_{IN}=5V$, $V_{EN}=5V$, $T_A=25^{\circ}C$ unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Supply Voltage	V_{IN}		1.8		5.5	V
DC Output Voltage Accuracy		$I_{LOAD}=0.1mA$	-2		2	%
Dropout Voltage ($V_{OUT}=3.3V$) (Note 4)	V_{DROP}	$I_{LOAD}=150mA$		69		mV
	V_{DROP}	$I_{LOAD}=300mA$		180		
	V_{DROP}	$I_{LOAD}=500mA$		250		
Ground Current	I_Q	$V_{IN}=V_{OUT}+0.3V$, $I_{LOAD}=0mA$		15	18	μA
Shutdown Ground Current	I_{SD}	$V_{EN}=0V$			0.01	μA
Feedback Voltage	V_{FB}	XTP2038-ADJ		0.8		V
Enable Threshold Voltage	V_{IH}	V_{EN} Rising	1.2			V
	V_{IL}	V_{EN} Falling			0.4	
EN Input Current	I_{EN}	$V_{EN}=5V$	0.001	0.005	0.01	μA
Line Regulation	Δ_{LINE}	$I_{LOAD}=1mA$, $2V \leq V_{IN} \leq 5V$		0.05	0.1	%/V
Load Regulation	Δ_{LOAD}	$0.1mA \leq I_{LOAD} \leq 300mA$, $V_{IN}=V_{NOM}+1V$		4	20	mV
Output Current Limit	I_{LIM}	$V_{OUT}=3.3V$	750		780	mA
Short Current Limit	I_{SHORT}	$V_{OUT}=0V$	218		234	mA
Power Supply Rejection Ratio ($I_{LOAD}=5mA$)	PSRR	$V_{OUT}=3.3V$ $V_{IN}=4.6V$		77		dB
Output Voltage Noise(BW = 10Hz to 100kHz, $C_{OUT}=1\mu F$)		$V_{IN}=3.5V$ $I_{LOAD}=0.3A$		76		μV_{RMS}
Thermal Shutdown Temperature	T_{SD}	$I_{LOAD}=10mA$		150		$^{\circ}C$
Thermal Shutdown Hysteresis	ΔT_{SD}			20		$^{\circ}C$
Discharge Resistance		$V_{EN}=0V, V_{OUT}=0.1V$		130		Ω

Note 1. When $V_{FB}=0.8V$,

$V_{OUT}(V)$	$R2(K\Omega)$	$R1(K\Omega)$
0.8	100	0
0.9	100	12.5
1.05	100	31.25
1.2	100	50
1.5	100	87.5
1.8	100	125
2	100	150
2.5	100	212.5
2.8	100	250
3	100	275
3.3	100	312.5
3.6	100	350
4	100	400
4.2	100	425
4.5	100	462.5
5.0	100	525

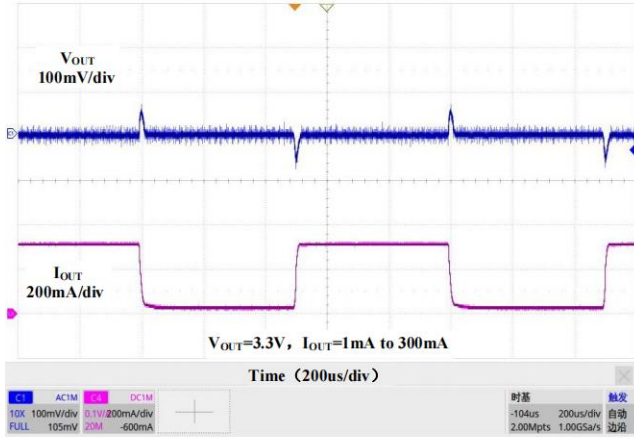
Note 2. Stresses beyond those listed “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions may affect device reliability.

Note 3. θ_{JA} is measured at $T_A = 25^\circ C$ on EVB board.

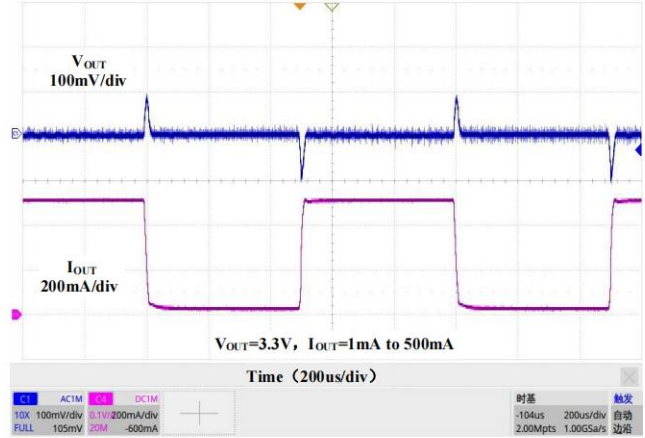
Note 4. $V_{DROP} = V_{IN} - V_{OUT}$ when the V_{OUT} is 98% of its target value.

Typical Characteristics

Load Transient Response I



Load Transient Response II



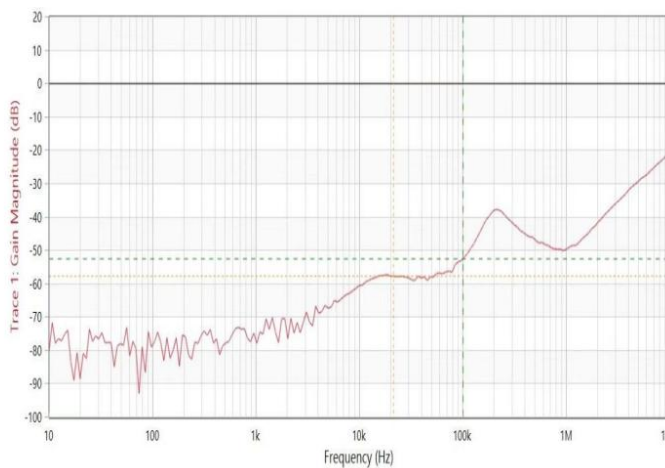
Turn On by EN



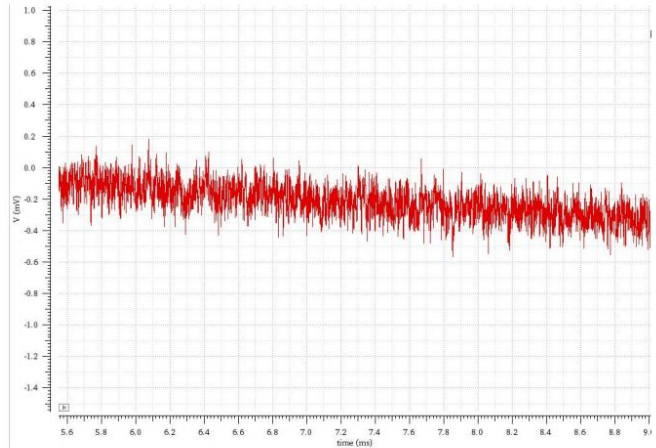
Turn Off by EN



PSRR vs. Frequency

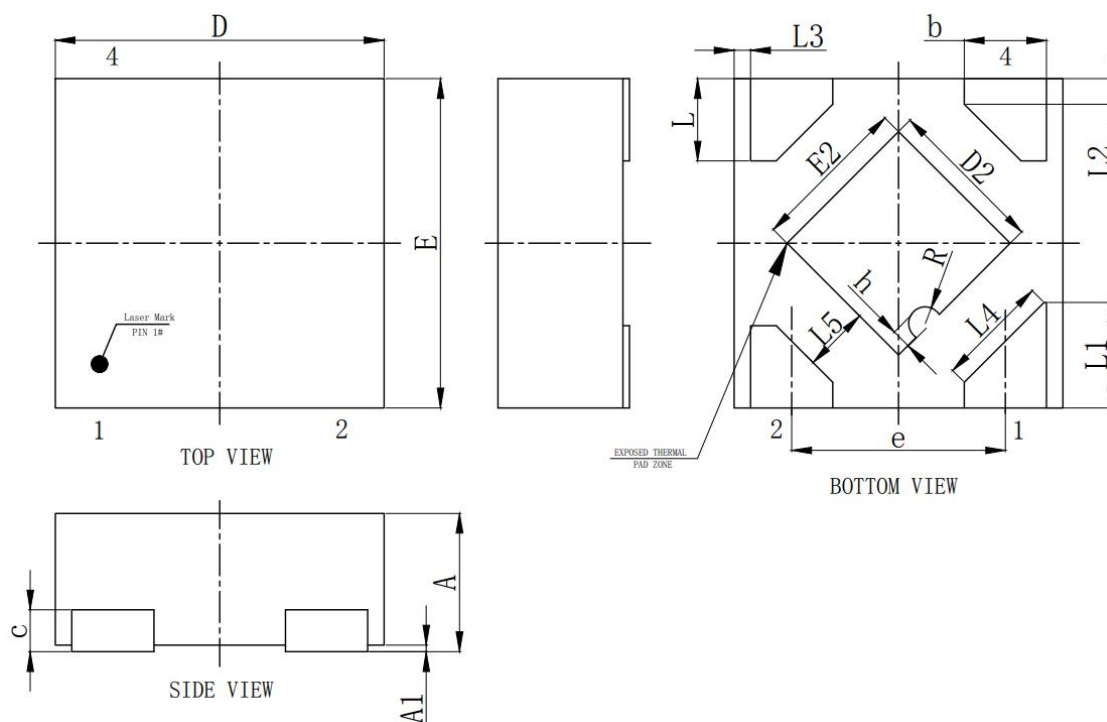


Noise Density Spectrum



Package Information

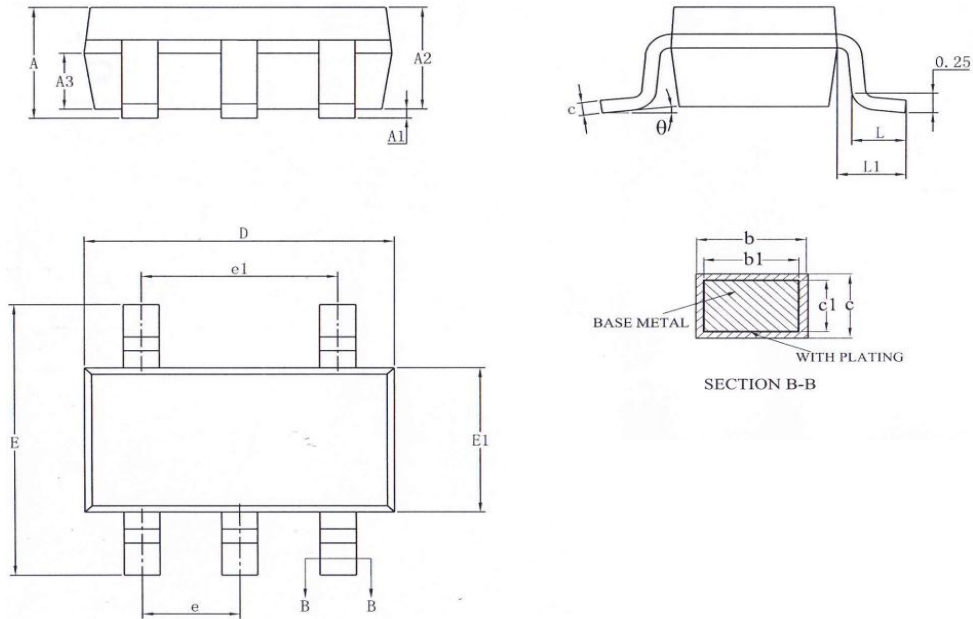
DFN1x1-4L



Symbol	Millimeters		
	Min	Nom	Max
A	0.35	-	0.40
A1	0.00	0.02	0.05
b	0.20	0.25	0.30
c	0.07	0.12	0.17
D	0.95	1.00	1.05
D2	0.38	0.48	0.58
e	0.65BSC		
E	0.95	1.00	1.05
E2	0.38	0.48	0.58
L	0.20	0.25	0.30
L1	0.27	0.32	0.37
L2	0.077REF		
L3	0.05REF		
L4	0.34REF		
L5	0.20REF		
R	0.05REF		
h	0.06REF		

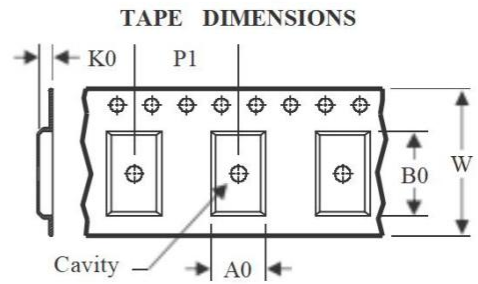
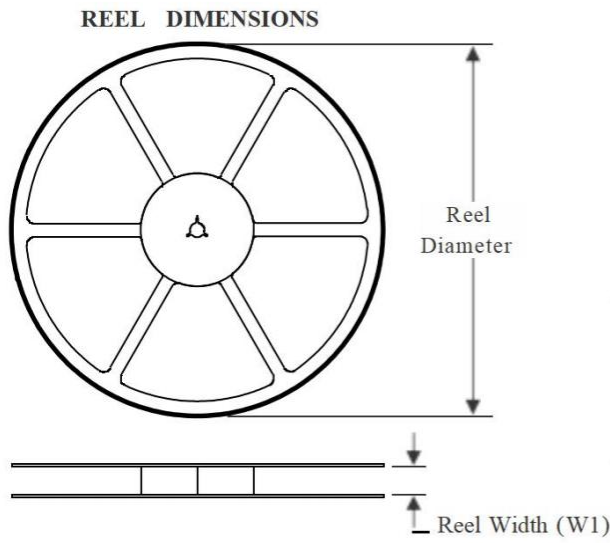
Package Information

SOT-23-5L



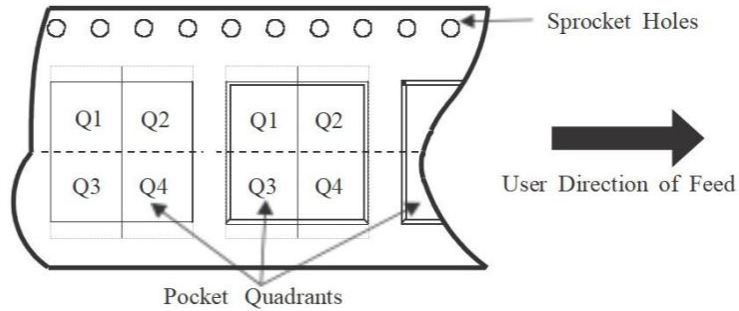
Symbol	Millimeters		
	Min	Nom	Max
A	-	-	1.25
A1	0.04	-	0.10
A2	1.00	1.10	1.20
A3	0.60	0.65	0.70
b	0.33	-	0.41
b1	0.32	0.35	0.38
c	0.15	-	0.19
c1	0.14	0.15	0.16
D	2.82	2.92	3.02
E	2.60	2.80	3.00
E1	1.50	1.60	1.70
e	0.95BSC		
e1	1.90BSC		
L	0.30	-	0.60
L1	0.60REF		
θ	0	-	8°

Tape and Reel Information:



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



Device	Package Type	Pins	SPQ	Reel Diameter(mm)	Reel Width W1 (mm)	A0(mm)	B0(mm)	K0(mm)	P1(mm)	W(mm)	Pin1 Quadrant
XTP2038	SOT-23-5L	5	3,000	177.5	8	3.5	3.33	1.53	4	8	Q3
XTP2038	DFN1x1-4L	4	12,000	180	8.6	3.5	1.16	1.16	4	8	Q2