SGM8708

Micro-Power, RRIO, 1.8V, Dual Push-Pull Output Comparator with Integrated Voltage Reference

GENERAL DESCRIPTION

The SGM8708 is a dual, rail-to-rail input and output comparator with typical 2.2μA low power supply current. The comparator operates from a wide range of 1.8V to 5.5V supply voltage, and is guaranteed to operate at 1.8V and 5V. This feature is suitable for battery-powered applications.

The product features an uncommitted internal voltage reference, comparator input common-mode around 200mV outside the power supply rails and can be operated from 1.8V to 5.5V. The internal 1.2V series reference voltage offers low 42μV/℃ drift, is stable at 10nF capacitive load, and can produce output current up to 2mA (TYP).

The SGM8708 is optimized for micro-power, single-supply operation. The push-pull output stage supports rail-to-rail output swing and allows the operation with absolute minimum power consumption when driving any capacitive or resistive load. The SGM8708 also has a latch enable input pin ($\overline{LE}$) and complementary outputs.

The SGM8708 is available in Green SOT-23-8 and SOIC-8 packages. It is rated over the -40°C to +85°C temperature range.

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FEATURES

- **Low Quiescent Current:**
  2.2μA (TYP) at V_S = 1.8V
- **V_{OUT} and $\overline{V_{OUT}}$ Dual Outputs**
- **Wide Single-Supply Voltage Range: 1.8V to 5.5V**
- **Latch Function Included**
- **Rail-to-Rail Input and Output**
- **Push-Pull Output Current Drive:**
  18mA (TYP) at V_S = 5V
- **Internal 1.2V Reference Voltage**
- **-40℃ to +85℃ Operating Temperature Range**
- **Available in Green SOT-23-8 and SOIC-8 Packages**

APPLICATIONS

Portable and Battery-Powered Applications
Alarm and Surveillance Circuits
Mobile Phones
RC Timers
Hand-Held Electronics
Window Detectors
IR Receiver

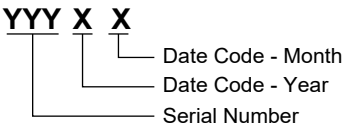
PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM8708	SOT-23-8	-40℃ to +85℃	SGM8708YN8G/TR	SH7XX	Tape and Reel, 3000
	SOIC-8	-40℃ to +85℃	SGM8708YS8G/TR	SGM 8708YS8 XXXXX	Tape and Reel, 2500

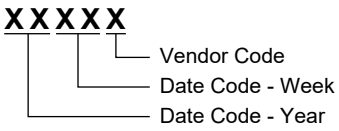
MARKING INFORMATION

NOTE: XX = Date Code. XXXXX = Date Code and Vendor Code.

SOT-23-8



SOIC-8



Green (RoHS & HSF): SG Micro Corp defines "Green" to mean Pb-Free (RoHS compatible) and free of halogen substances. If you have additional comments or questions, please contact your SGMICRO representative directly.

ABSOLUTE MAXIMUM RATINGS

Supply Voltage, $+V_S$ to $-V_S$ 6V
V_{IN} Differential ..... $\pm(+V_S - (-V_S))$
Voltage at Input/Output Pins ..... $(-V_S)$ - 0.3V to $(+V_S)$ + 0.3V
Junction Temperature ..... +150℃
Storage Temperature Range ..... -65℃ to +150℃
Lead Temperature (Soldering, 10s) ..... +260℃
ESD Susceptibility
HBM 4000V
MM 400V

RECOMMENDED OPERATING CONDITIONS

Operating Temperature Range ..... -40℃ to +85℃

OVERSTRESS CAUTION

Stresses beyond those listed in Absolute Maximum Ratings may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect reliability. Functional operation of the device at any conditions beyond those indicated in the Recommended Operating Conditions section is not implied.

ESD SENSITIVITY CAUTION

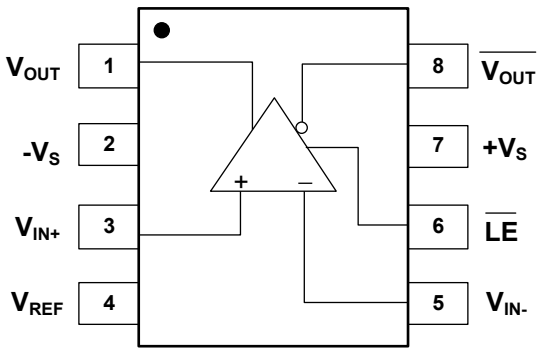
This integrated circuit can be damaged by ESD if you don't pay attention to ESD protection. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

DISCLAIMER

SG Micro Corp reserves the right to make any change in circuit design, or specifications without prior notice.

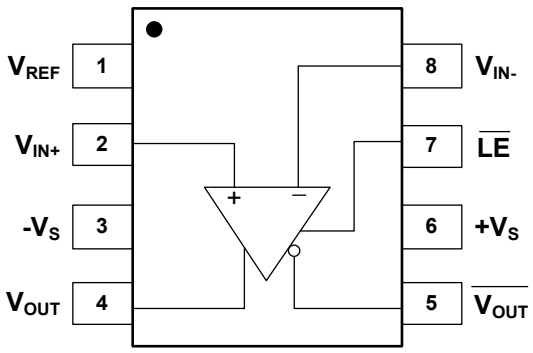
PIN CONFIGURATIONS

(TOP VIEW)



SOT-23-8

(TOP VIEW)



SOIC-8

ELECTRICAL CHARACTERISTICS

(At T_A = +25℃, $+V_S$ = 1.8V, $-V_S$ = 0V, $V_{\overline{LE}}$ = 1.8V, V_{CM} = $+V_S$/2, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Supply Current	I_S	I_{OUT} = 0			2.2	3.8	μA
Input Offset Voltage	V_{OS}	V_{CM} = 0V			0.5	3	mV
		V_{CM} = 1.8V			0.5	3	
Input Offset Average Drift					2		μV/℃
Common Mode Rejection Ratio	CMRR	V_{CM} = 0V to 1.8V		55	68		dB
Power Supply Rejection Ratio	PSRR	V_S = 1.8V to 5.5V, V_{CM} = 0V		74	102		dB
Power Supply Ramp-Up Rate (1)				5			V/s
Latch Enable Pin High Input Voltage	V_{IH}			1.0			V
Latch Enable Pin Low Input Voltage	V_{IL}					0.25	V
Latch Enable Pin Bias Current	I_{IH}, I_{IL}	$V_{\overline{LE}}$ = 0V or $V_{\overline{LE}}$ = 1.8V, V_{CM} = 0V			3		nA
Large Signal Voltage Gain	A_{VO}				100		dB
Output Swing High	V_{OH}	V_{OUT}, $\overline{V_{OUT}}$	I_{OUT} = 500μA	1.617	1.675		V
			I_{OUT} = 500μA, -40℃ ≤ T_A ≤ +85℃	1.572			
			I_{OUT} = 1mA	1.412	1.525		
			I_{OUT} = 1mA, -40℃ ≤ T_A ≤ +85℃	1.330			
Output Swing Low	V_{OL}	V_{OUT}, $\overline{V_{OUT}}$	I_{OUT} = -500μA		84	124	mV
			I_{OUT} = -500μA, -40℃ ≤ T_A ≤ +85℃			163	
			I_{OUT} = -1mA		173	249	
			I_{OUT} = -1mA, -40℃ ≤ T_A ≤ +85℃			347	
Output Current	I_{OUT}	V_{OUT}, $\overline{V_{OUT}}$	Source	1.15	2		mA
			Source, -40℃ ≤ T_A ≤ +85℃	1.0			
			Sink		-3.5	-2.0	
			Sink, -40℃ ≤ T_A ≤ +85℃			-1.4	
Propagation Delay (High to Low)		V_{OUT}, $\overline{V_{OUT}}$	Overdrive = 10mV		11.7		μs
			Overdrive = 100mV		5.6		
Propagation Delay (Low to High)		V_{OUT}, $\overline{V_{OUT}}$	Overdrive = 10mV		24.2		μs
			Overdrive = 100mV		14.7		
Rise Time	t_{RISE}	V_{OUT}, $\overline{V_{OUT}}$	Overdrive = 10mV, C_L = 30pF, R_L = 1MΩ		168		ns
			Overdrive = 100mV, C_L = 30pF, R_L = 1MΩ		174		
Fall Time	t_{FALL}	V_{OUT}, $\overline{V_{OUT}}$	Overdrive = 10mV, C_L = 30pF, R_L = 1MΩ		75		ns
			Overdrive = 100mV, C_L = 30pF, R_L = 1MΩ		50		
Noise of V_{REF}			f = 0.1Hz to 10Hz		0.3		mV_{P-P}
Voltage Reference							
Reference Voltage	V_{REF}	I_{REF} = 0mA		1.182	1.200	1.218	V
Reference Voltage Drift					42		μV/℃
Reference Output Current (Source)					2		mA

ELECTRICAL CHARACTERISTICS (continued)

(At T_A = +25℃, $+V_S$ = 5V, $-V_S$ = 0V, $V_{\overline{LE}}$ = 5V, V_{CM} = $+V_S$/2, unless otherwise noted.)

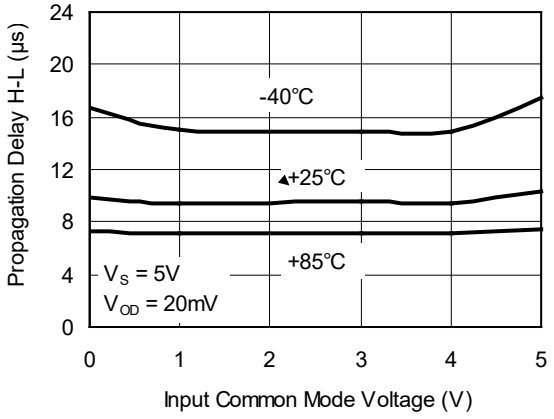
PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Supply Current	I_S	I_{OUT} = 0			2.3	3.9	μA
Input Offset Voltage	V_{OS}	V_{CM} = 0V			0.5	3	mV
		V_{CM} = 5V			0.5	3	
Input Offset Average Drift					2		μV/℃
Common Mode Rejection Ratio	CMRR	V_{CM} = 0V to 5V		63	76		dB
Power Supply Rejection Ratio	PSRR	V_S = 1.8V to 5.5V, V_{CM} = 0V		74	102		dB
Power Supply Ramp-Up Rate (1)				5			V/s
Latch Enable Pin High Input Voltage	V_{IH}			2			V
Latch Enable Pin Low Input Voltage	V_{IL}					0.8	V
Latch Enable Pin Bias Current	I_{IH}, I_{IL}	$V_{\overline{LE}}$ = 0V or $V_{\overline{LE}}$ = 5V, V_{CM} = 0V			60		nA
Latch Propagation Delay	t_{LPD}	V_S = 3V			90		ns
Large Signal Voltage Gain	A_{VO}				110		dB
Output Swing High	V_{OH}	V_{OUT}, $\overline{V_{OUT}}$	I_{OUT} = 500μA	4.935	4.952		V
			I_{OUT} = 500μA, -40℃ ≤ T_A ≤ +85℃	4.926			
			I_{OUT} = 1mA	4.874	4.904		
			I_{OUT} = 1mA, -40℃ ≤ T_A ≤ +85℃	4.855			
Output Swing Low	V_{OL}	V_{OUT}, $\overline{V_{OUT}}$	I_{OUT} = -500μA		54	72	mV
			I_{OUT} = -500μA, -40℃ ≤ T_A ≤ +85℃			79	
			I_{OUT} = -1mA		106	140	
			I_{OUT} = -1mA, -40℃ ≤ T_A ≤ +85℃			154	
Output Current	I_{OUT}	V_{OUT}, $\overline{V_{OUT}}$	Source	14.0	18		mA
			Source, -40℃ ≤ T_A ≤ +85℃	10.5			
			Sink		-18	-15.5	
			Sink, -40℃ ≤ T_A ≤ +85℃			-12.5	
Propagation Delay (High to Low)		V_{OUT}, $\overline{V_{OUT}}$	Overdrive = 10mV		12.7		μs
			Overdrive = 100mV		5.6		
Propagation Delay (Low to High)		V_{OUT}, $\overline{V_{OUT}}$	Overdrive = 10mV		38.1		μs
			Overdrive = 100mV		29.5		
Rise Time	t_{RISE}	V_{OUT}, $\overline{V_{OUT}}$	Overdrive = 10mV, C_L = 30pF, R_L = 1MΩ		39		ns
			Overdrive = 100mV, C_L = 30pF, R_L = 1MΩ		40		
Fall Time	t_{FALL}	V_{OUT}, $\overline{V_{OUT}}$	Overdrive = 10mV, C_L = 30pF, R_L = 1MΩ		33		ns
			Overdrive = 100mV, C_L = 30pF, R_L = 1MΩ		30		
Noise of V_{REF}			f = 0.1Hz to 10Hz		0.32		mV_{P-P}
Voltage Reference							
Reference Voltage	V_{REF}	I_{REF} = 0mA		1.182	1.200	1.218	V
Reference Voltage Drift					41		μV/℃
Reference Output Current (Source)					2		mA

NOTE:

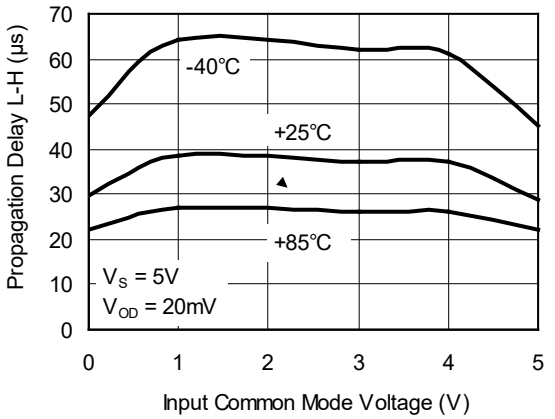
1. If the power supply ramp-up rate is lower than 5V/s, the reference voltage output is not guaranteed to start up.

TYPICAL PERFORMANCE CHARACTERISTICS

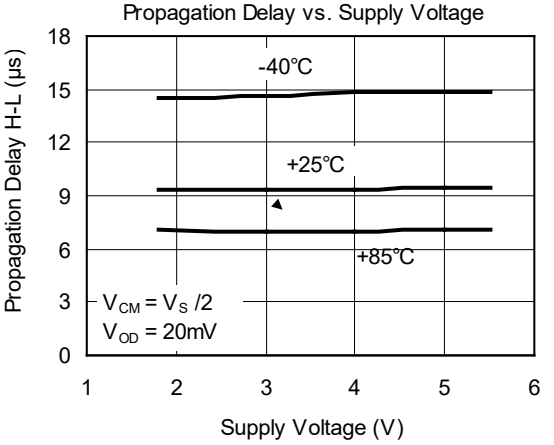
Propagation Delay vs. Input Common Mode Voltage



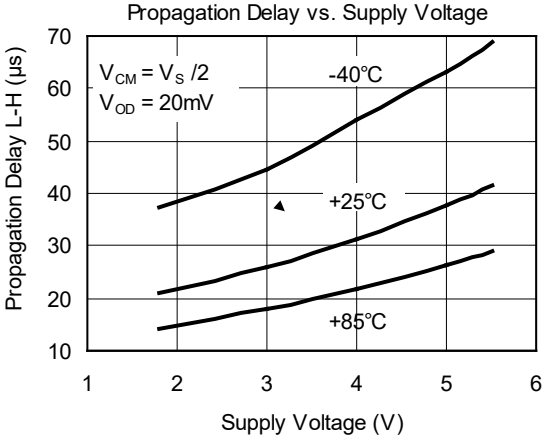
Propagation Delay vs. Input Common Mode Voltage



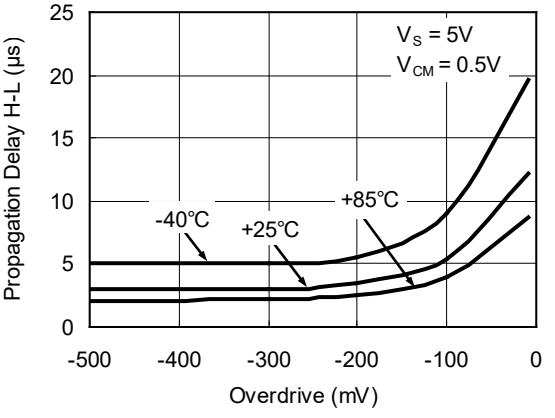
Propagation Delay vs. Supply Voltage



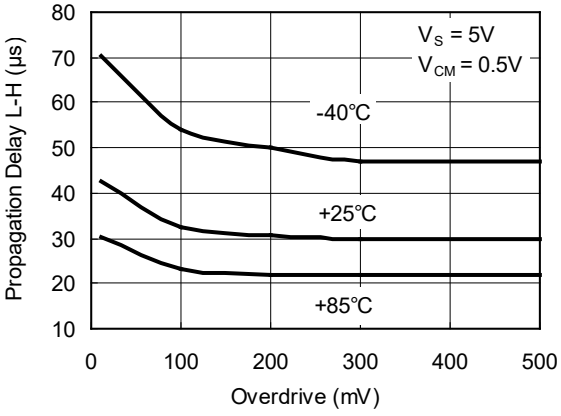
Propagation Delay vs. Supply Voltage



Propagation Delay vs. Overdrive

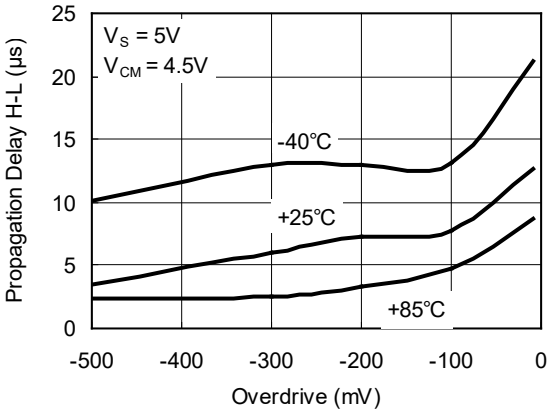


Propagation Delay vs. Overdrive

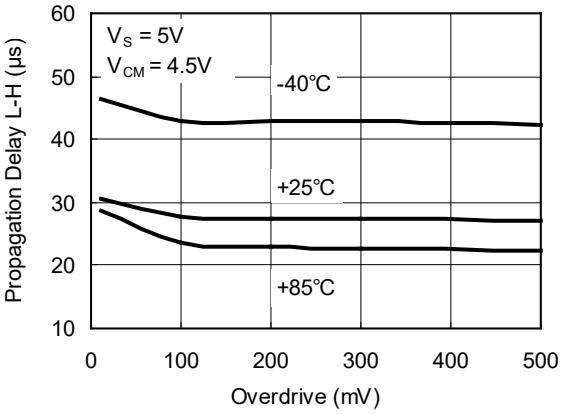


TYPICAL PERFORMANCE CHARACTERISTICS (continued)

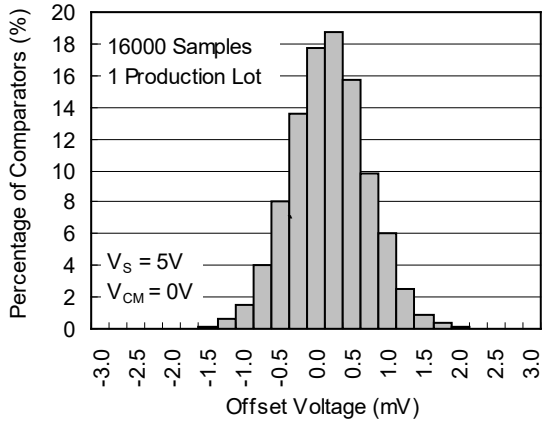
Propagation Delay vs. Overdrive



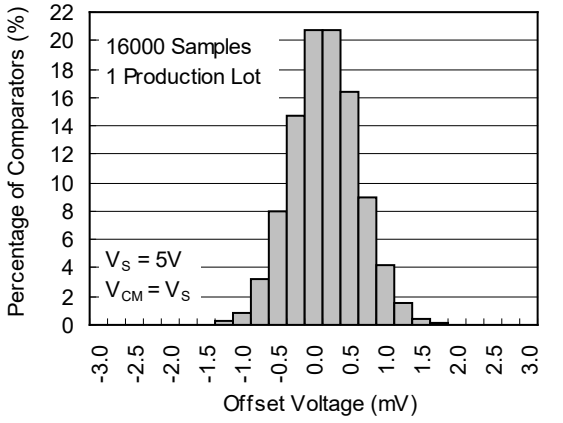
Propagation Delay vs. Overdrive



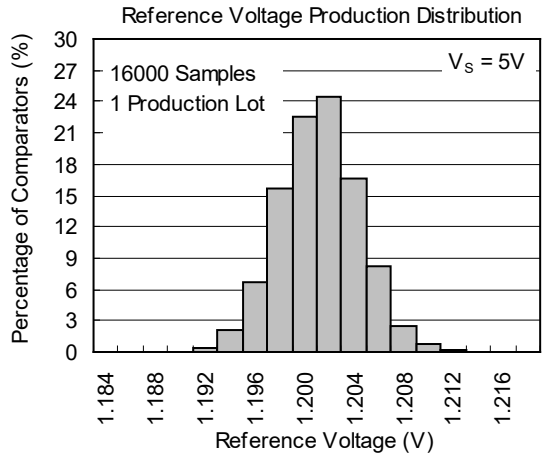
Offset Voltage Production Distribution



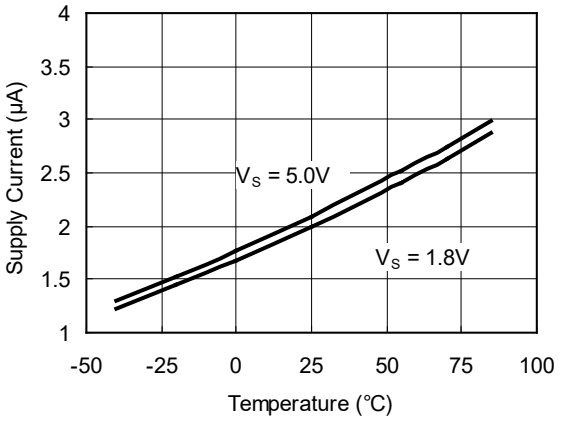
Offset Voltage Production Distribution



Reference Voltage Production Distribution

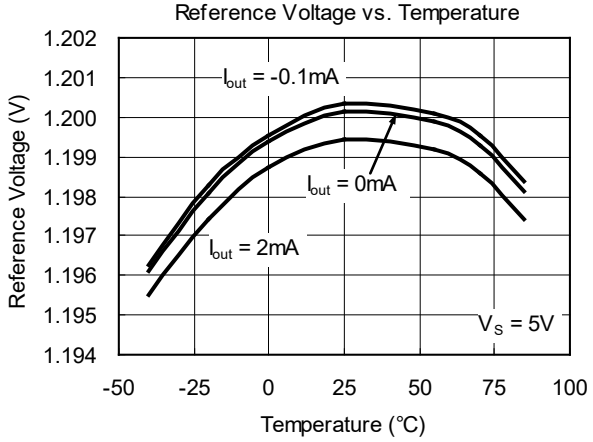


Supply Current vs. Temperature

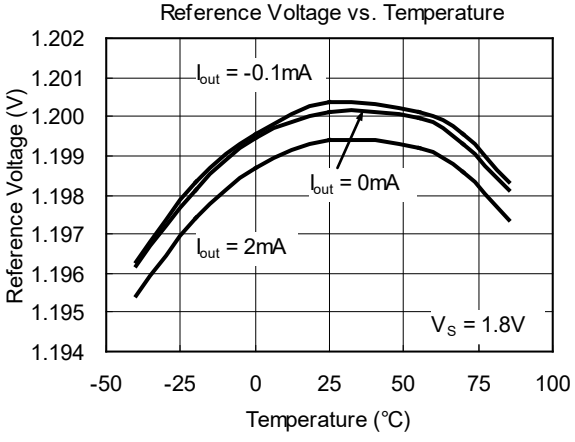


TYPICAL PERFORMANCE CHARACTERISTICS (continued)

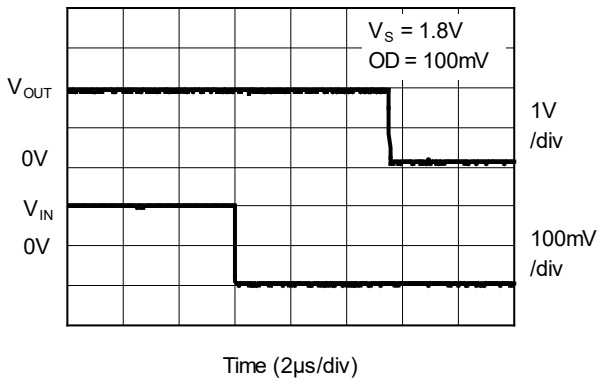
Reference Voltage vs. Temperature



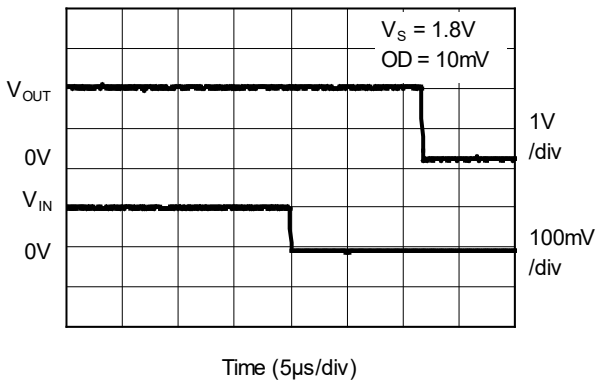
Reference Voltage vs. Temperature



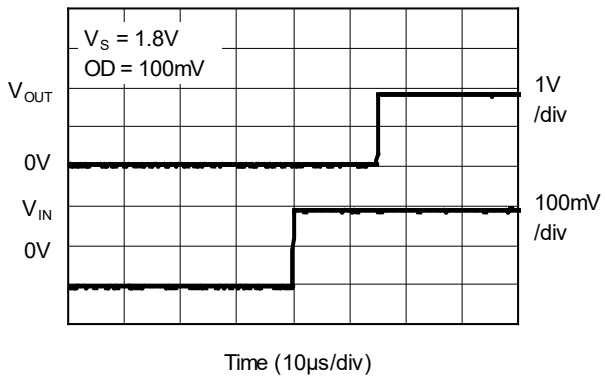
Propagation Delay (t_{PHL})



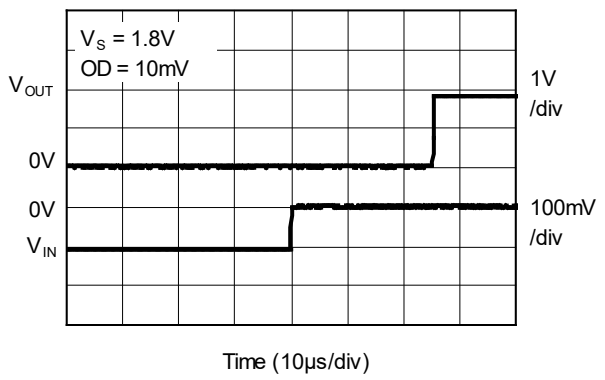
Propagation Delay (t_{PHL})



Propagation Delay (t_{PLH})

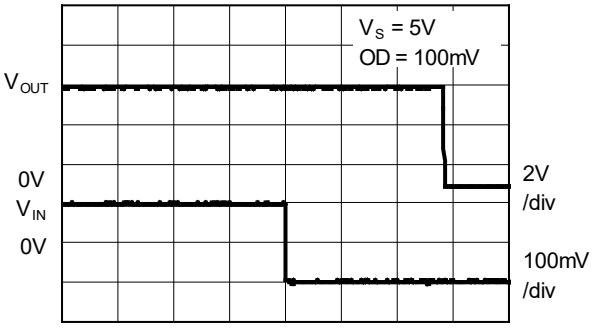


Propagation Delay (t_{PLH})



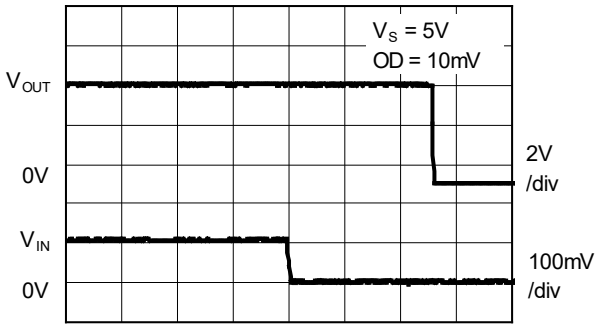
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

Propagation Delay (t_{PHL})



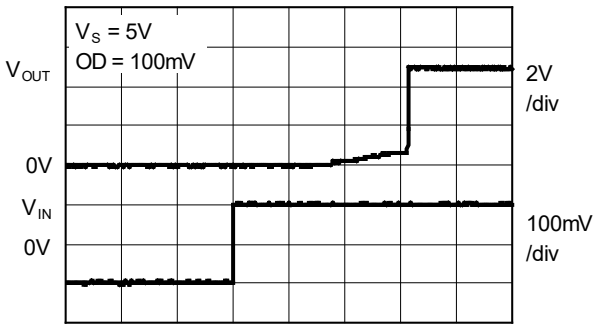
Time (2μs/div)

Propagation Delay (t_{PHL})



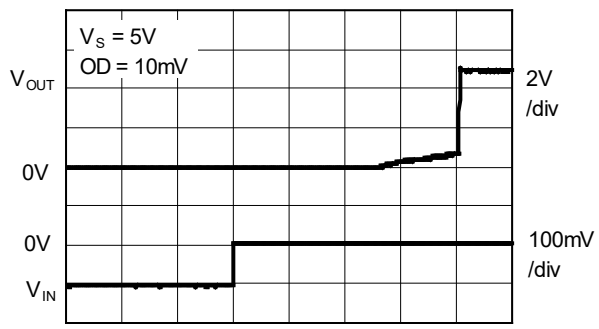
Time (5μs/div)

Propagation Delay (t_{PLH})



Time (10μs/div)

Propagation Delay (t_{PLH})



Time (10μs/div)

TIMING DIAGRAM

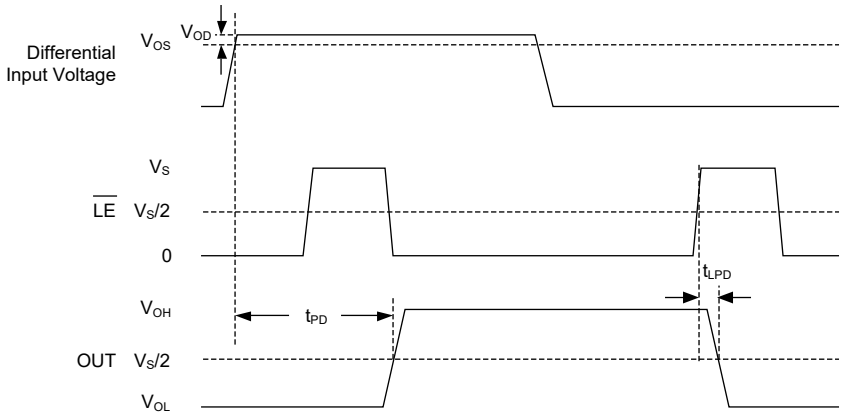


Figure 1. Timing Diagram with Latch Operator

REVISION HISTORY

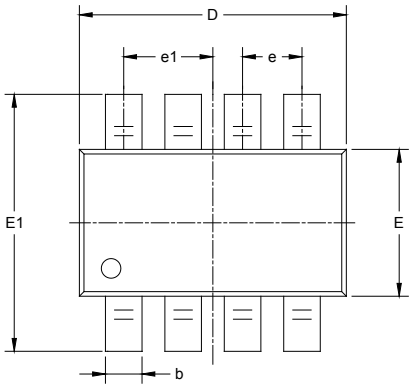
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

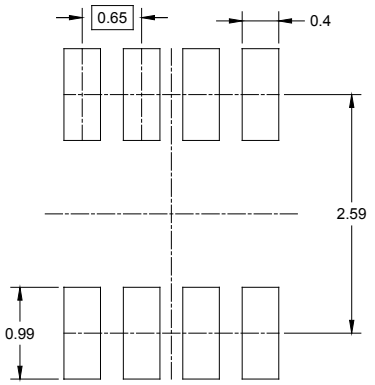
DECEMBER 2013 – REV.A to REV.A.1	Page
Added Electrical Characteristics section	4
Added Timing Diagram section	9

Changes from Original (NOVEMBER 2012) to REV.A	Page
Changed from product preview to production data	All

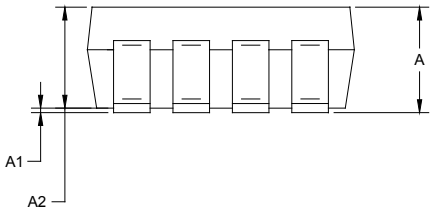
PACKAGE OUTLINE DIMENSIONS

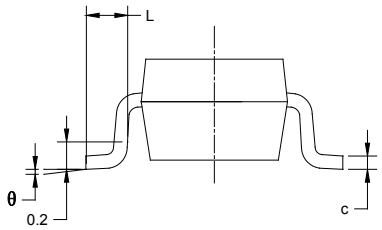
SOT-23-8





RECOMMENDED LAND PATTERN (Unit: mm)

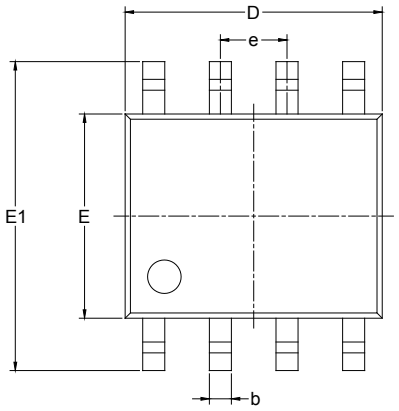


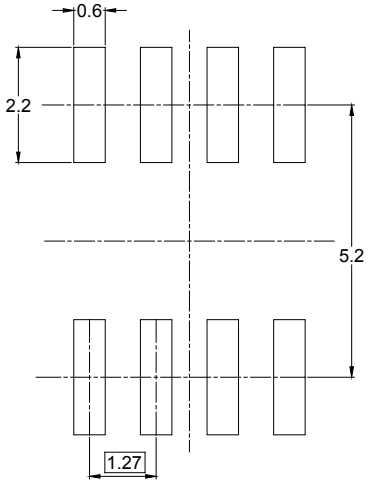


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.650 BSC		0.026 BSC	
e1	0.975 BSC		0.038 BSC	
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

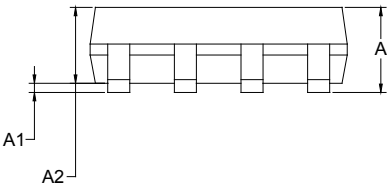
PACKAGE OUTLINE DIMENSIONS

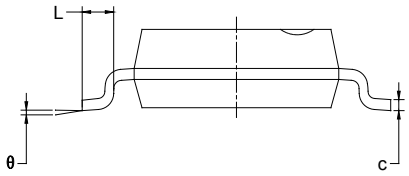
SOIC-8





RECOMMENDED LAND PATTERN (Unit: mm)

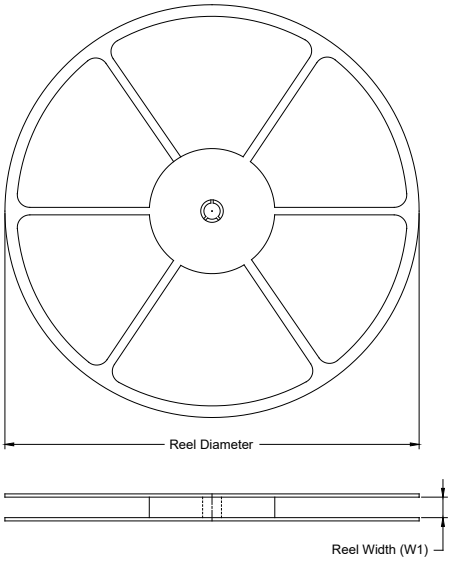




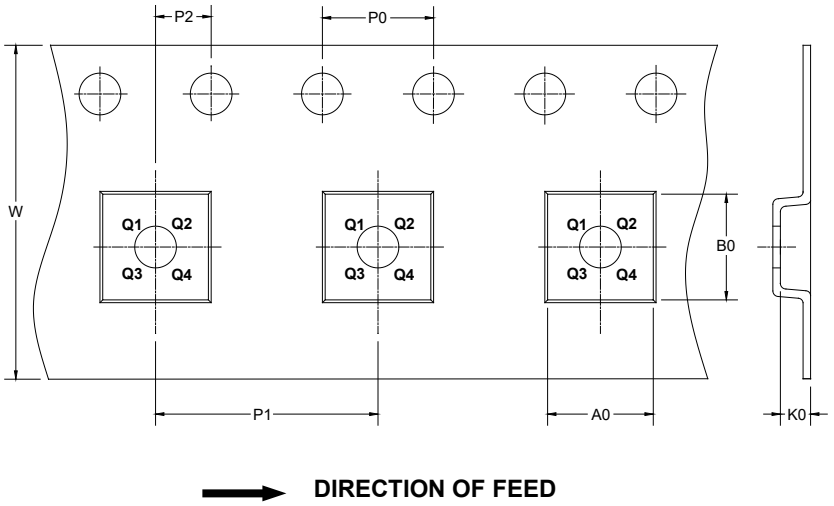
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.27 BSC		0.050 BSC	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



DIRECTION OF FEED

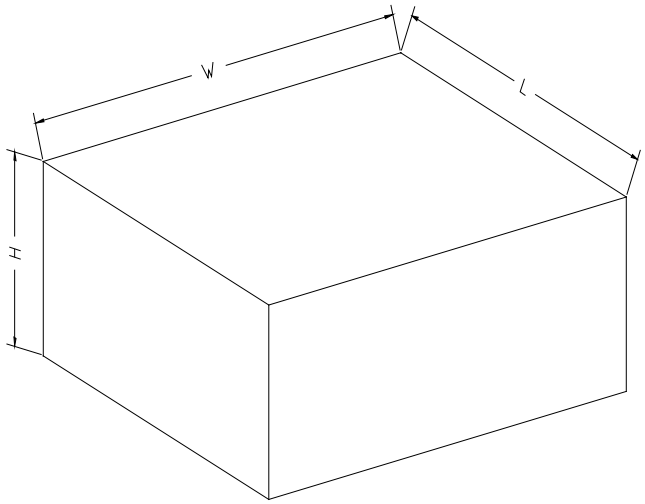
NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
SOT-23-8	7″	9.5	3.17	3.23	1.37	4.0	4.0	2.0	8.0	Q3
SOIC-8	13″	12.4	6.40	5.40	2.10	4.0	8.0	2.0	12.0	Q1

DD0001

CARTON BOX DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF CARTON BOX

Reel Type	Length (mm)	Width (mm)	Height (mm)	Pizza/Carton
7″ (Option)	368	227	224	8
7″	442	410	224	18
13″	386	280	370	5

DD0002