



SGM8706

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

GENERAL DESCRIPTION

The SGM8706 is a low power comparator with an uncommitted on-chip voltage reference, which consumes only 2.2 μ A (TYP) supply current at 1.8V. The device can operate from 1.8V to 5.5V single supply, and is guaranteed to operate at 1.8V and 5V. The input common mode voltage range of comparator is 200mV beyond the supply rails. The above features make the SGM8706 a good choice for battery-powered applications.

The SGM8706 integrates a 1.2V series voltage reference. The voltage reference features a 42 μ V/ $^{\circ}$ C low drift. It is designed for driving the 10nF capacitive load with stable, and sourcing an output current up to 2mA (TYP).

The SGM8706 has a latch enable input (\overline{LE}) and a push-pull output structure. When driving any resistive or capacitive load, it is capable of consuming the absolute minimum power.

In addition, the SGM8706 fits in small packages, so it is also suitable for mobile phone and handheld electronic devices.

The SGM8706 is available in Green SOT-23-6, SOT-23-8 and SOIC-8 packages. It is rated over the -40 $^{\circ}$ C to +85 $^{\circ}$ C temperature range.

FEATURES

- **Low Supply Current: 2.2 μ A (TYP) at $V_S = 1.8V$**
- **Supply Voltage Range: 1.8V to 5.5V**
- **Push-Pull Output**
- **Output Drive Capability: 18mA (TYP) at $V_S = 5V$**
- **Rail-to-Rail Input and Output**
- **Internal Voltage Reference: 1.2V**
- **Latch Function Included**
- **-40 $^{\circ}$ C to +85 $^{\circ}$ C Operating Temperature Range**
- **Available in Green SOT-23-6, SOT-23-8 and SOIC-8 Packages**

APPLICATIONS

Infrared Receivers
Window Detectors
RC Timers
Monitoring and Alarm Systems
Multivibrators

1.8V, Micro-Power, RRIO, Push-Pull Output SGM8706 Comparator with Integrated Voltage Reference

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM8706	SOT-23-6	-40°C to +85°C	SGM8706YN6G/TR	SGDXX	Tape and Reel, 3000
	SOT-23-8	-40°C to +85°C	SGM8706YN8G/TR	SGEXX	Tape and Reel, 3000
	SOIC-8	-40°C to +85°C	SGM8706YS8G/TR	SGM 8706YS8 XXXXX	Tape and Reel, 2500

MARKING INFORMATION

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

SOT-23-6/SOT-23-8

YYY X X

_____ Date Code - Month
 _____ Date Code - Year
 _____ Serial Number

SOIC-8

XXXXX

_____ Vendor Code
 _____ Date Code - Week
 _____ Date Code - Year

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 ±(+V_S - (-V_S))
 Voltage at Input/Output Pins (-V_S) - 0.3V to (+V_S) + 0.3V
 Junction Temperature +150°C
 Storage Temperature Range -65°C to +150°C
 Lead Temperature (Soldering, 10s) +260°C
 ESD Susceptibility
 HBM 4000V
 MM 400V

RECOMMENDED OPERATING CONDITIONS

Operating Temperature Range -40°C to +85°C

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.

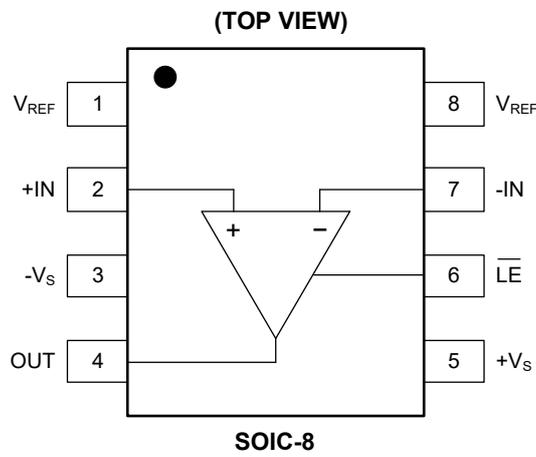
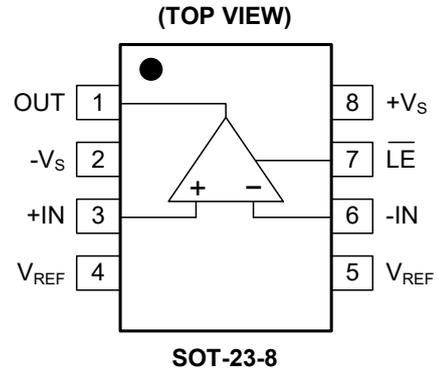
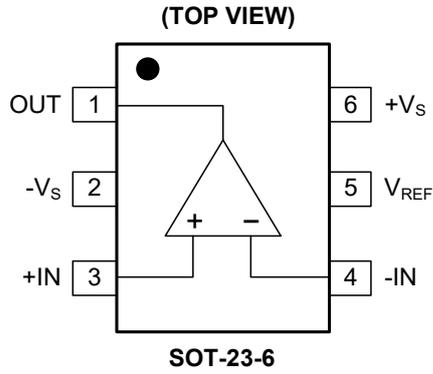
ESD SENSITIVITY CAUTION

This integrated circuit can be damaged if ESD protections are not considered carefully. 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 even small parametric changes could cause the device not to meet the published specifications.

DISCLAIMER

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

PIN CONFIGURATIONS



ELECTRICAL CHARACTERISTICS

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

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

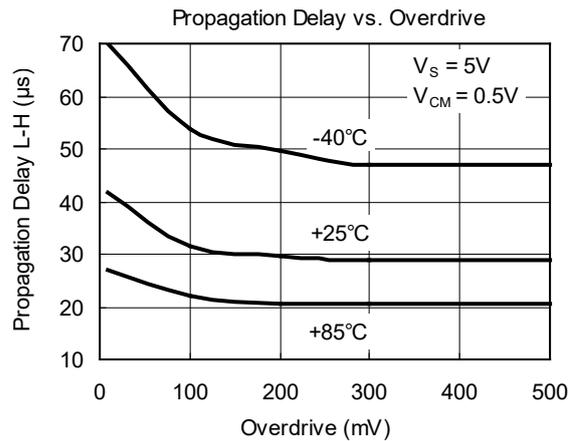
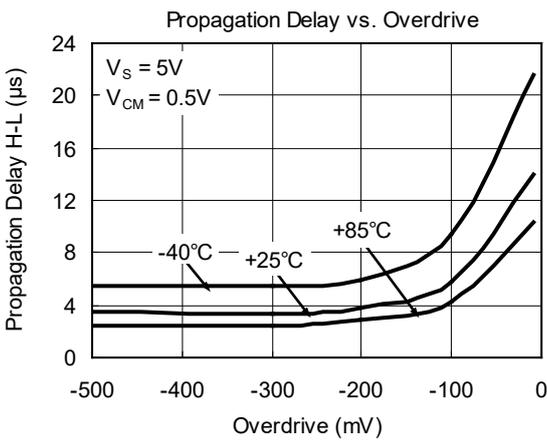
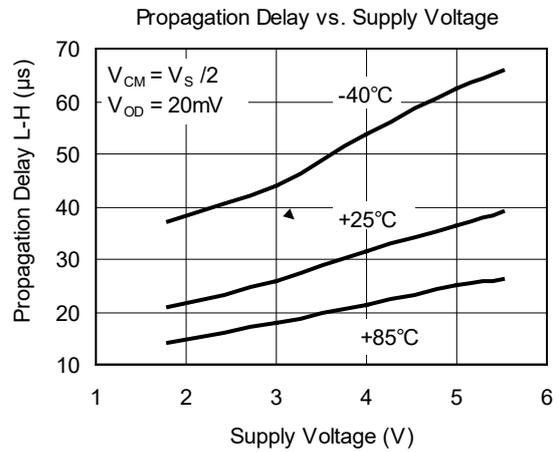
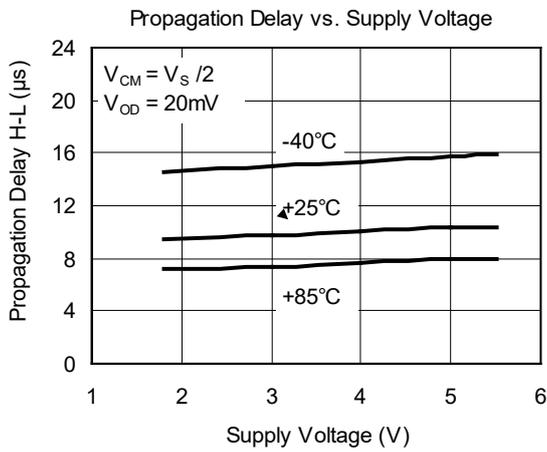
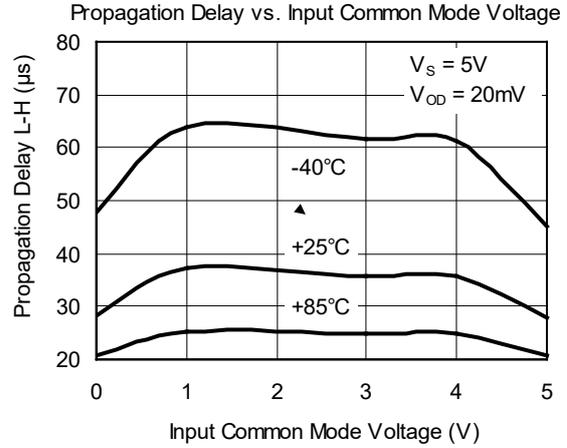
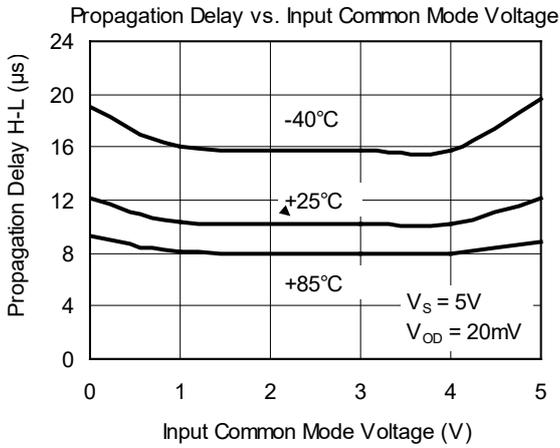
ELECTRICAL CHARACTERISTICS (continued)(At $T_A = +25^\circ\text{C}$, $+V_S = 5\text{V}$, $-V_S = 0\text{V}$, $V_{LE} = 5\text{V}$, $V_{CM} = +V_S/2$, unless otherwise noted.)

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

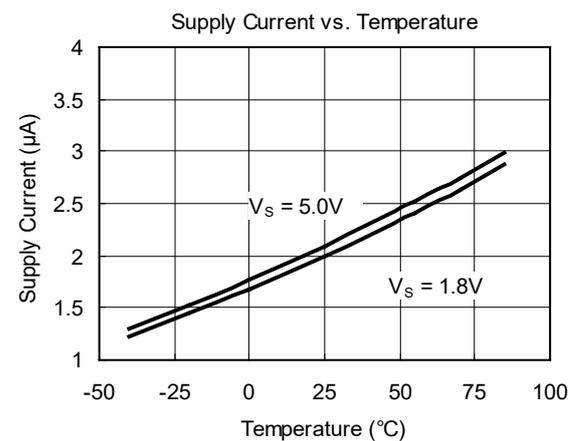
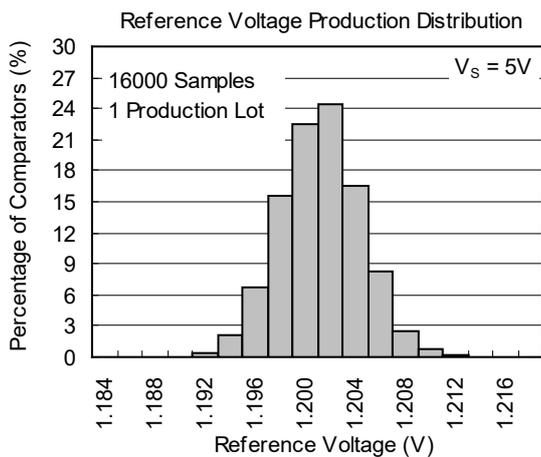
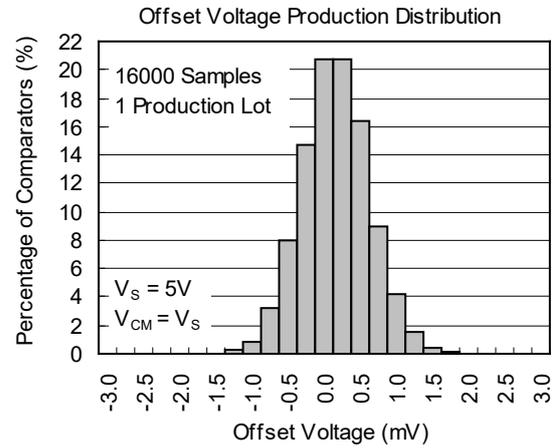
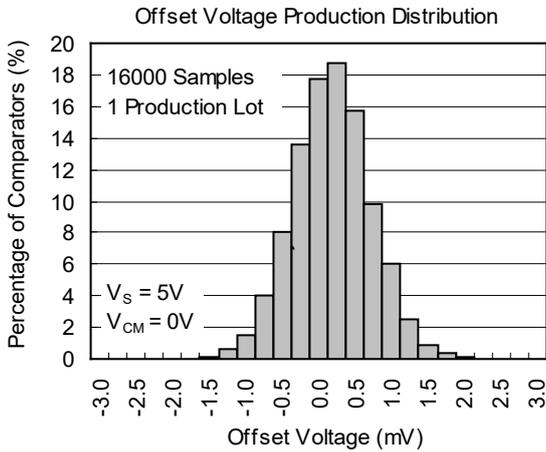
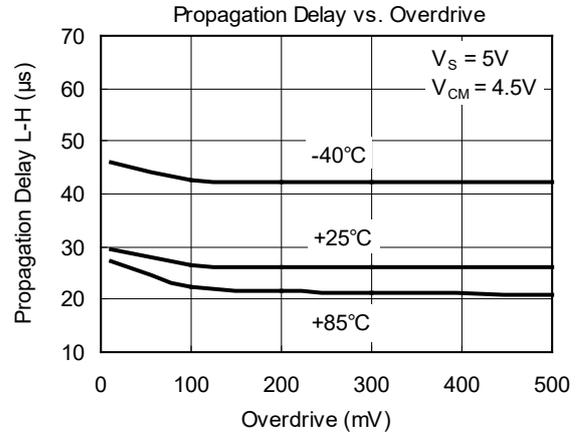
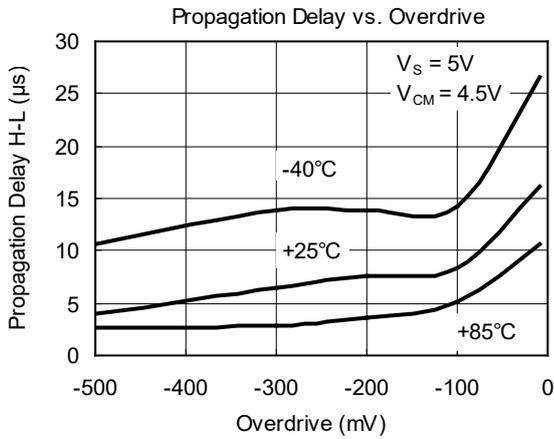
NOTE:

1. If the ramp-up rate of the power supply is less than 5V/s, the start-up of the voltage reference output cannot be guaranteed.

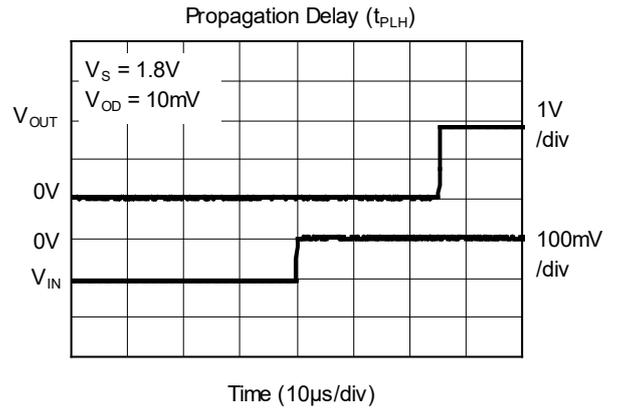
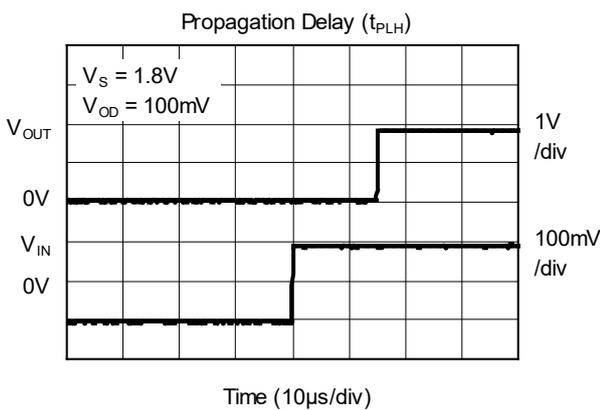
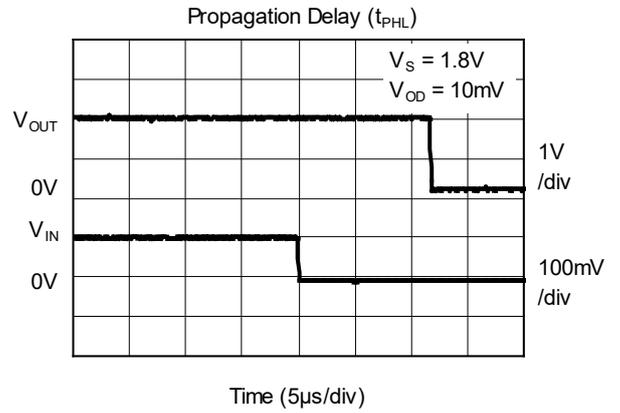
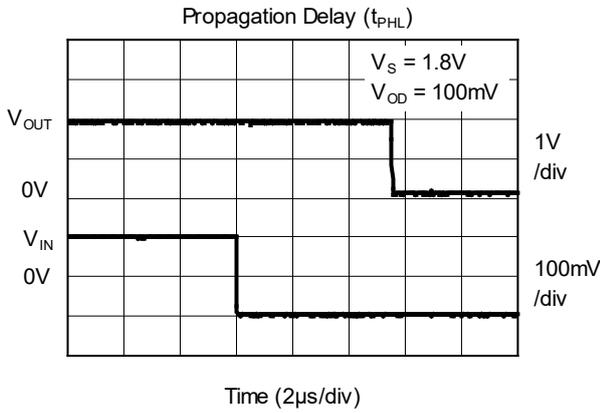
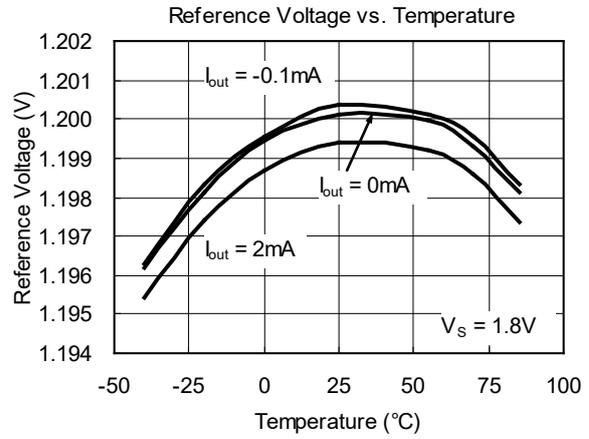
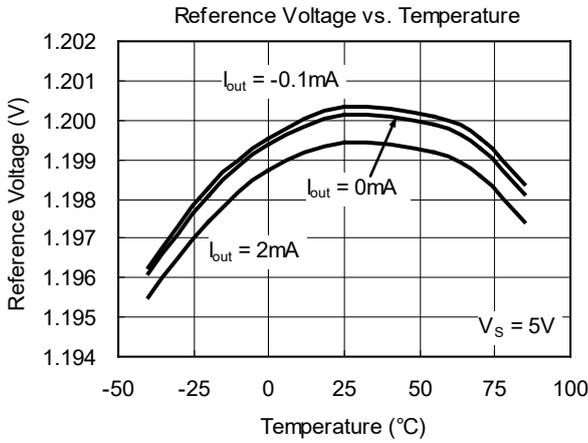
TYPICAL PERFORMANCE CHARACTERISTICS



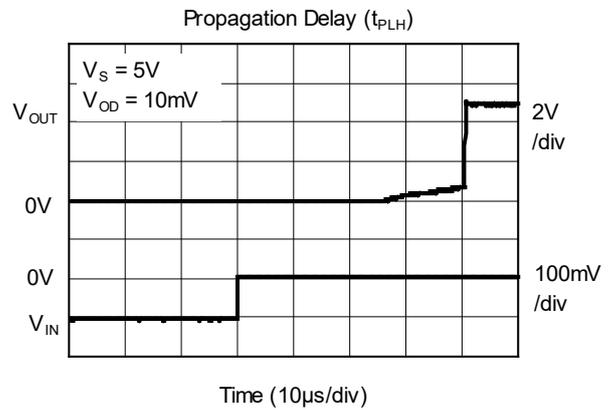
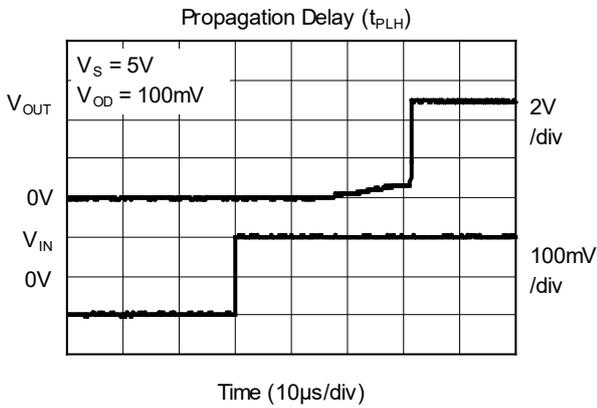
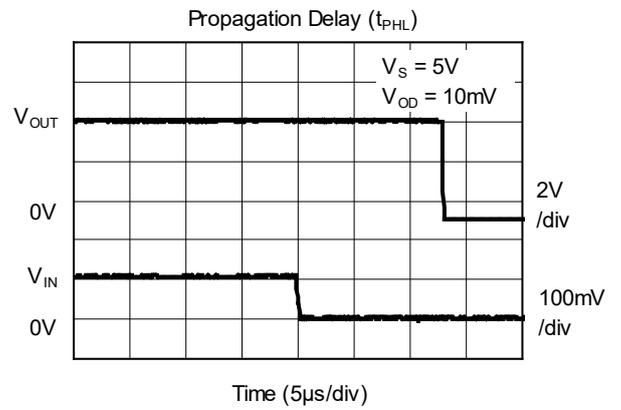
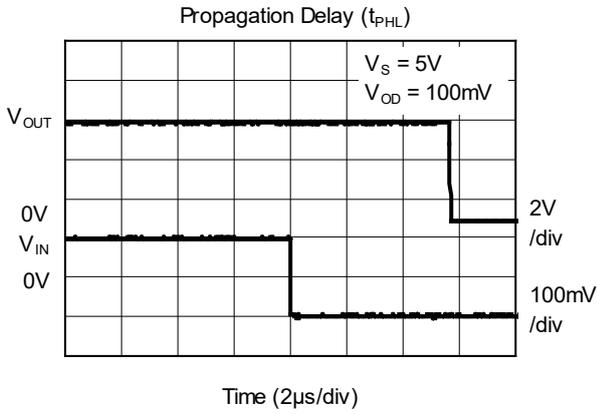
TYPICAL PERFORMANCE CHARACTERISTICS (continued)



TYPICAL PERFORMANCE CHARACTERISTICS (continued)



TYPICAL PERFORMANCE CHARACTERISTICS (continued)



TIMING DIAGRAM

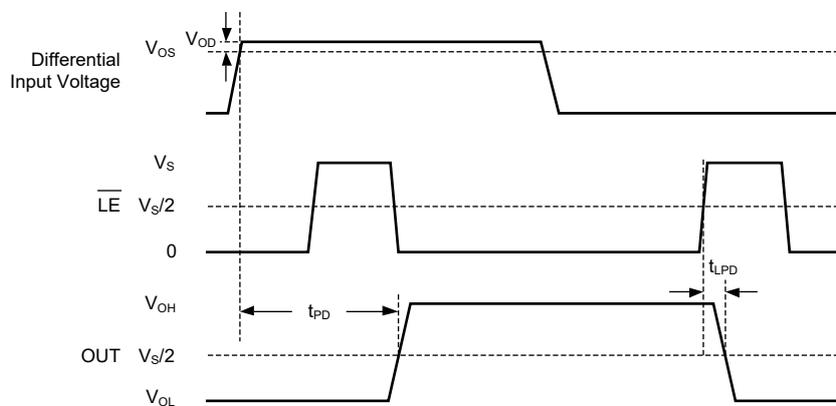


Figure 1. Timing Diagram with Latch Enable Input

REVISION HISTORY

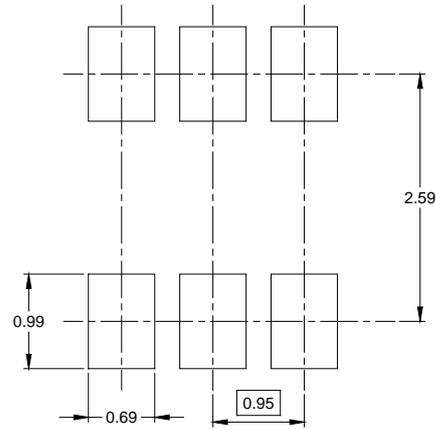
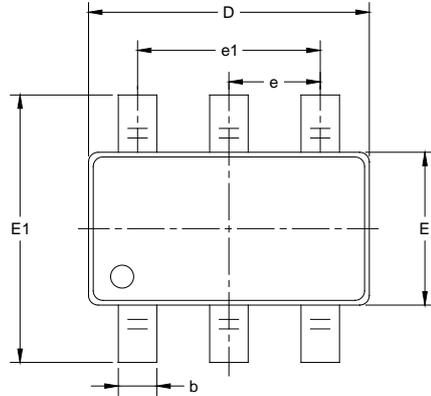
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

DECEMBER 2013 – REV.A to REV.A.1	Page
Added Electrical Characteristics section	5
Added Timing Diagram section	10

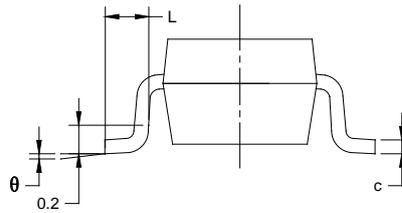
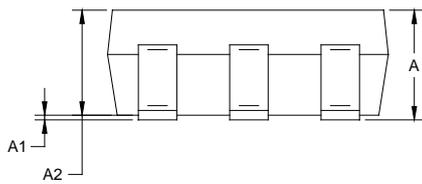
Changes from Original (NOVEMBER 2012) to REV.A	Page
Changed from product preview to production data.....	All

PACKAGE OUTLINE DIMENSIONS

SOT-23-6



RECOMMENDED LAND PATTERN (Unit: mm)



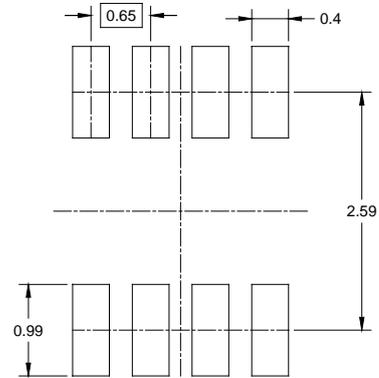
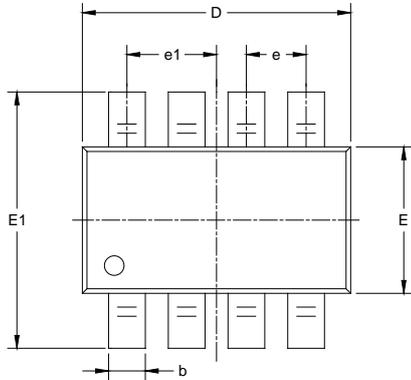
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 BSC		0.037 BSC	
e1	1.900 BSC		0.075 BSC	
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

NOTES:

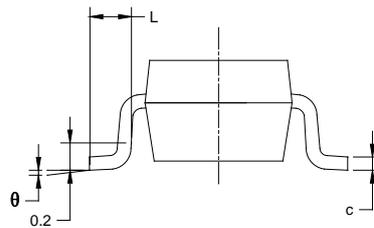
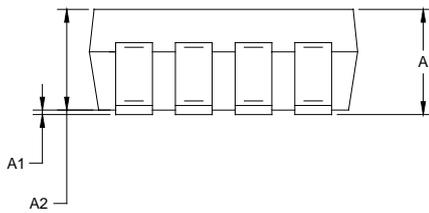
1. Body dimensions do not include mode flash or protrusion.
2. This drawing is subject to change without notice.

PACKAGE OUTLINE DIMENSIONS

SOT-23-8



RECOMMENDED LAND PATTERN (Unit: mm)



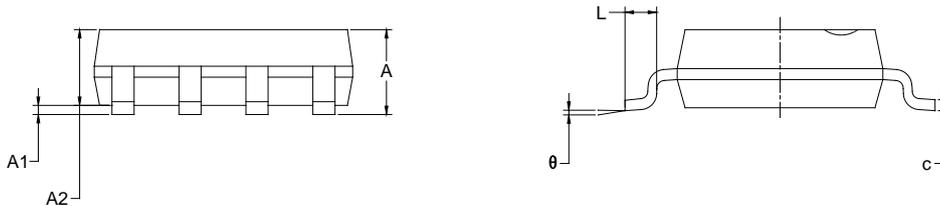
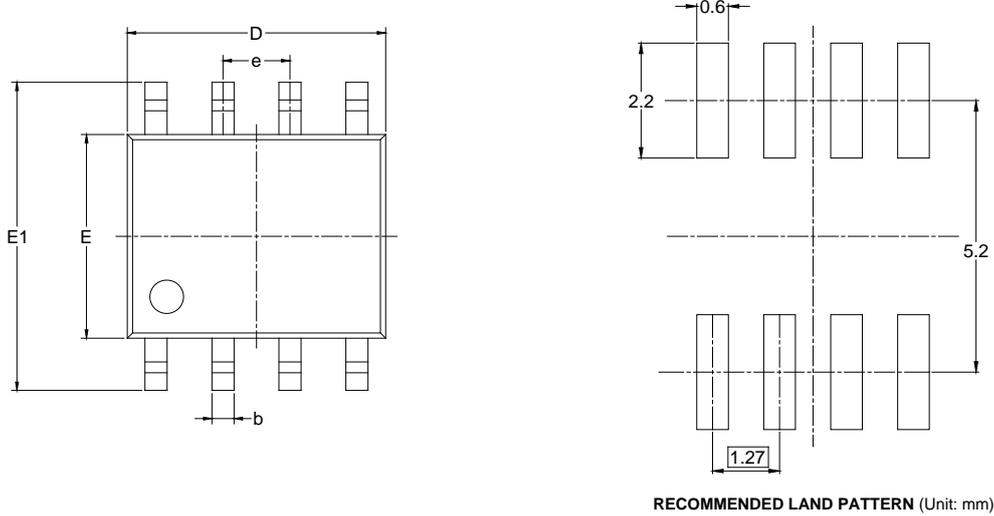
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.650 BSC		0.026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

NOTES:

1. Body dimensions do not include mode flash or protrusion.
2. This drawing is subject to change without notice.

PACKAGE OUTLINE DIMENSIONS

SOIC-8



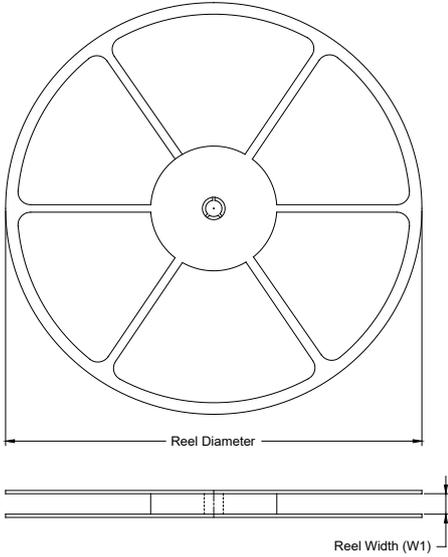
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.27 BSC		0.050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

NOTES:
 1. Body dimensions do not include mode flash or protrusion.
 2. This drawing is subject to change without notice.

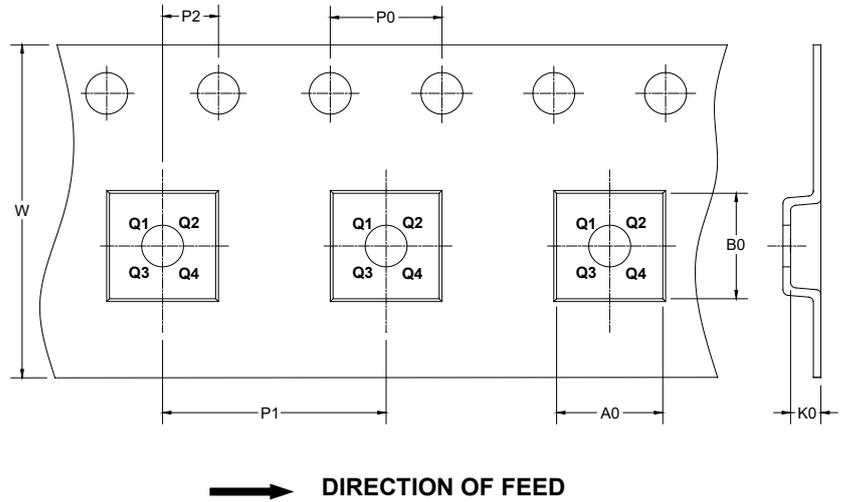
PACKAGE INFORMATION

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



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

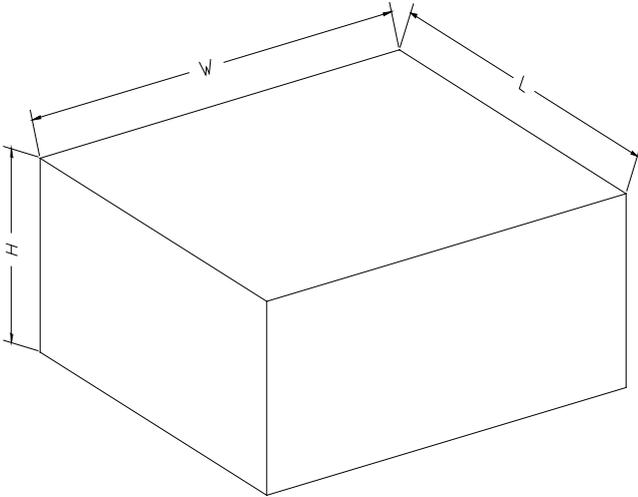
KEY PARAMETER LIST OF TAPE AND REEL

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-23-6	7"	9.5	3.23	3.17	1.37	4.0	4.0	2.0	8.0	Q3
SOT-23-8	7"	9.5	3.23	3.17	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

PACKAGE INFORMATION

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