



# SGM8706

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

### GENERAL DESCRIPTION

The SGM8706 is a single, rail-to-rail input and output comparator with typical 2.2 $\mu$ A 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 SGM8706 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. It also has a latch enable input ( $\overline{LE}$ ) pin.

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 voltage reference offers low 42 $\mu$ V/ $^{\circ}$ C drift, is stable at 10nF capacitive load, and can produce output current up to 2mA (TYP).

The SGM8706 is available in Green SOT-23-6, SOT-23-8 and SOIC-8 packages. The small packages make this device ideal for use in hand-held electronics and mobile phone applications. It is rated over the -40 $^{\circ}$ C to +85 $^{\circ}$ C temperature range.

### FEATURES

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

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

## SGM8706

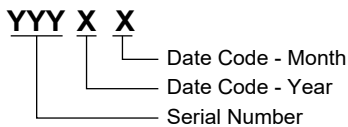
### PACKAGE/ORDERING INFORMATION

| 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<br>8706YS8<br>XXXXX | Tape and Reel, 2500 |

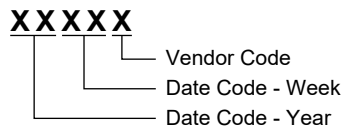
### MARKING INFORMATION

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

#### SOT-23-6/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 <sub>S</sub> to -V <sub>S</sub> ..... | 6V   |
| V <sub>IN</sub> Differential .....                       | ±(+V <sub>S</sub> - (-V <sub>S</sub> ))                |
| Voltage at Input/Output Pins .....                       | (-V <sub>S</sub> ) - 0.3V to (+V <sub>S</sub> ) + 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   |

### 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.

### RECOMMENDED OPERATING CONDITIONS

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

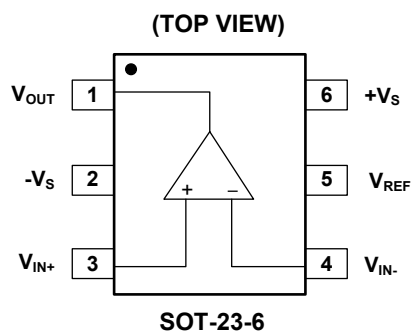
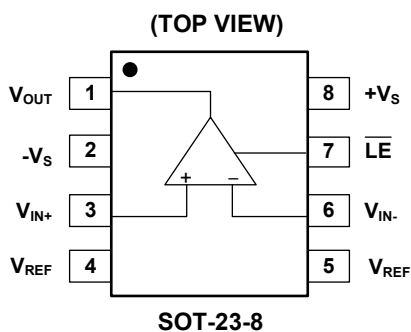
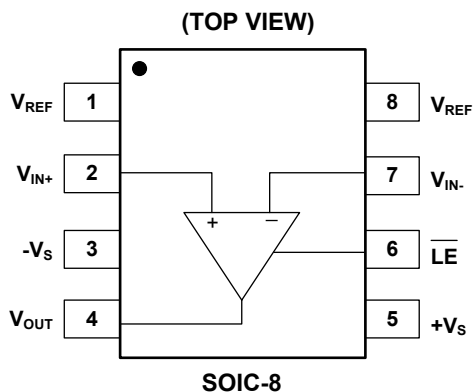
### DISCLAIMER

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

### 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.

PIN CONFIGURATIONS



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

## 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                           | $I_S$               | $I_{OUT} = 0$   |       | 2.2   | 3.8   | $\mu\text{A}$                |
| 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 $1.8\text{V}$   | 55    | 68    |       | dB                           |
| Power Supply Rejection Ratio             | PSRR                | $V_S = 1.8\text{V}$ to $5.5\text{V}$ , $V_{CM} = 0\text{V}$                       | 74    | 102   |       | dB                           |
| Power Supply Ramp-Up Rate <sup>(1)</sup> |                     |   | 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  |       | $\mu\text{s}$                |
|  |                     | Overdrive = 100mV   |       | 5.6   |       |                              |
| Propagation Delay (Low to High)          |                     | Overdrive = 10mV  |       | 24.2  |       | $\mu\text{s}$                |
|  |                     | 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 $10\text{Hz}$   |       | 0.3   |       | $\text{mV}_{P-P}$            |
| <b>Voltage Reference</b>                 |                     |   |       |       |       |                              |
| 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                           |

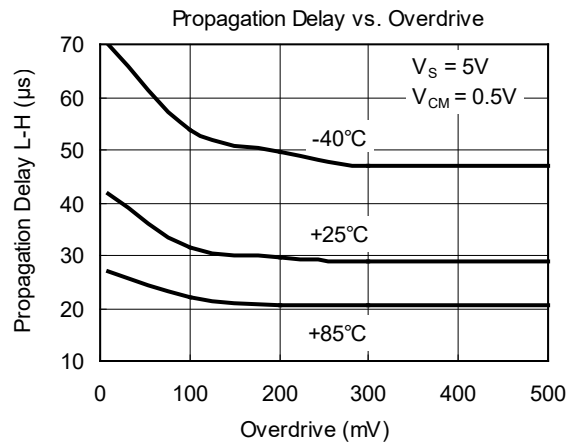
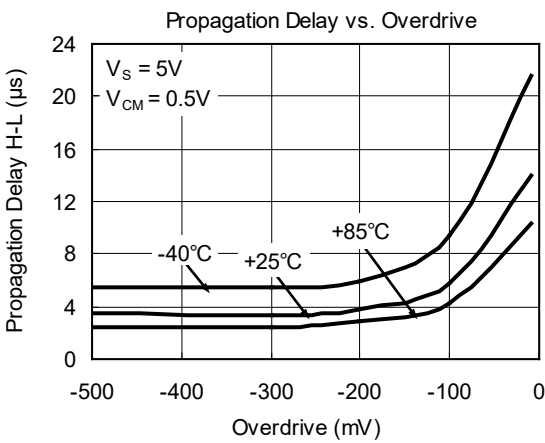
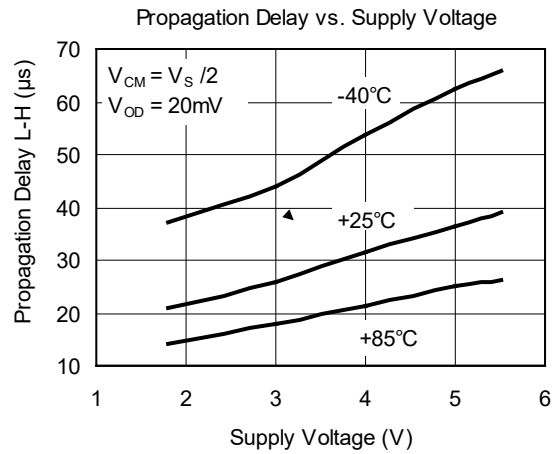
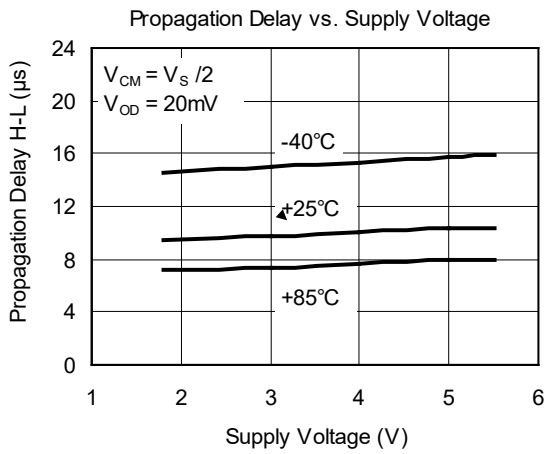
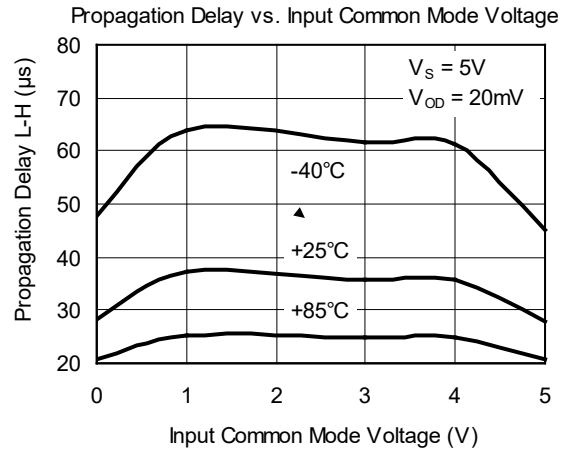
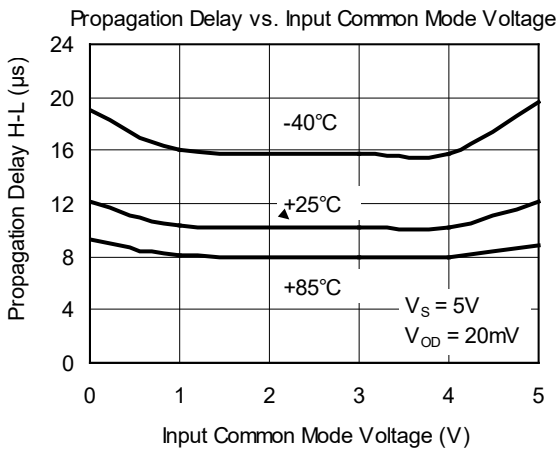
**ELECTRICAL CHARACTERISTICS (continued)**(At  $T_A = +25^\circ\text{C}$ ,  $+V_S = 5\text{V}$ ,  $-V_S = 0\text{V}$ ,  $V_{LE} = 5\text{V}$ ,  $V_{CM} = +V_S/2$ , unless otherwise noted.)

| PARAMETER                                | SYMBOL              | CONDITIONS  | MIN   | TYP   | MAX   | UNITS                        |
|--|---------------------|---|-------|-------|-------|------------------------------|
| Supply Current                           | $I_S$               | $I_{OUT} = 0$   |       | 2.3   | 3.9   | $\mu\text{A}$                |
| 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 $5\text{V}$   | 63    | 76    |       | dB                           |
| Power Supply Rejection Ratio             | PSRR                | $V_S = 1.8\text{V}$ to $5.5\text{V}$ , $V_{CM} = 0\text{V}$                       | 74    | 102   |       | dB                           |
| Power Supply Ramp-Up Rate <sup>(1)</sup> |                     |   | 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<br>(High to Low)       |                     | Overdrive = 10mV  |       | 12.7  |       | $\mu\text{s}$                |
|  |                     | Overdrive = 100mV   |       | 5.6   |       |                              |
| Propagation Delay<br>(Low to High)       |                     | Overdrive = 10mV  |       | 38.1  |       | $\mu\text{s}$                |
|  |                     | 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 $10\text{Hz}$   |       | 0.32  |       | $\text{mV}_{P-P}$            |
| <b>Voltage Reference</b>                 |                     |   |       |       |       |                              |
| 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                           |

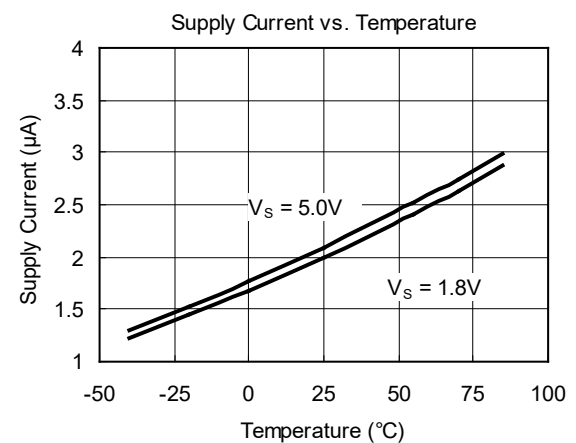
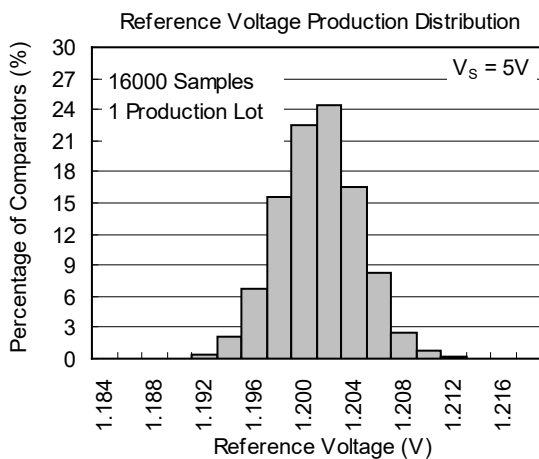
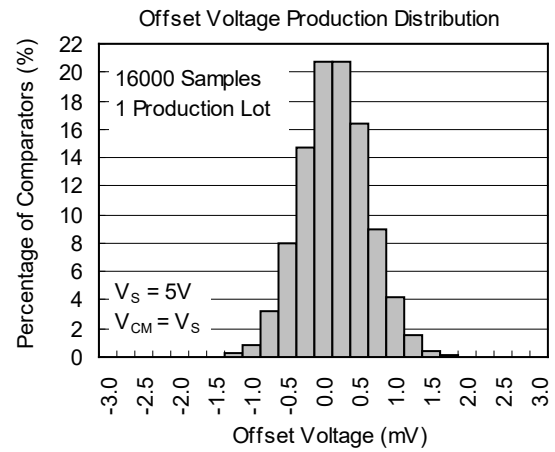
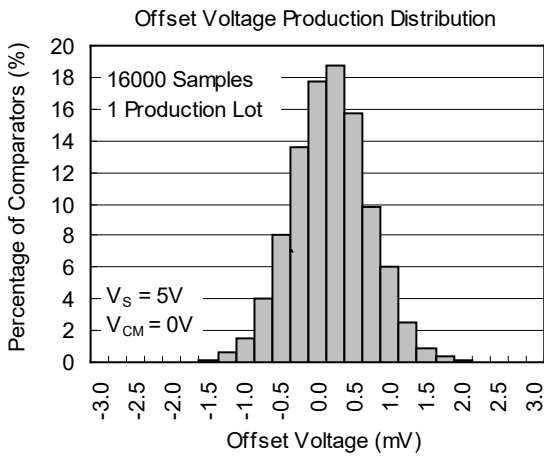
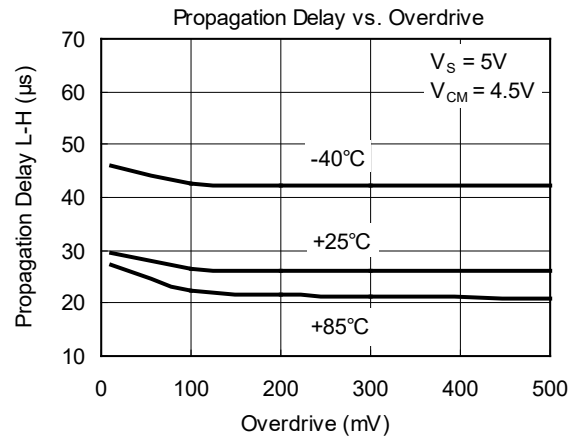
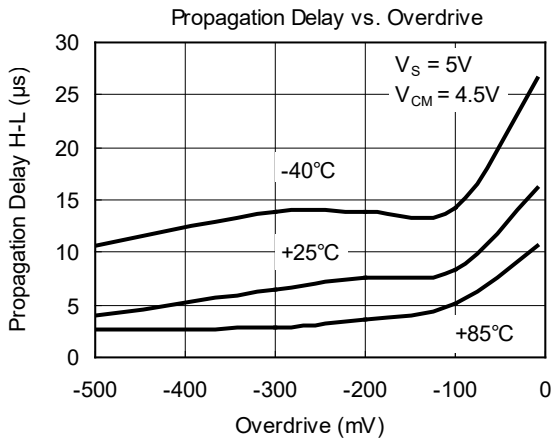
## NOTE:

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

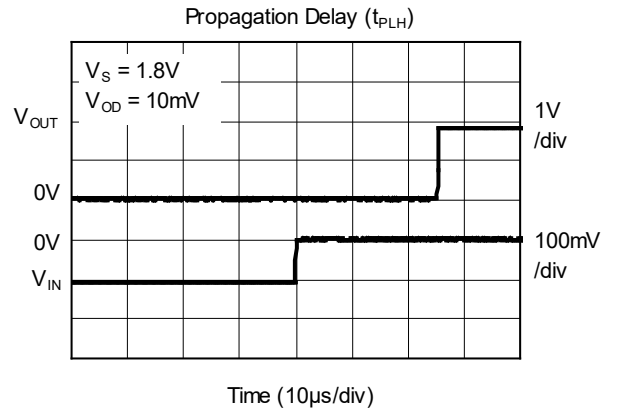
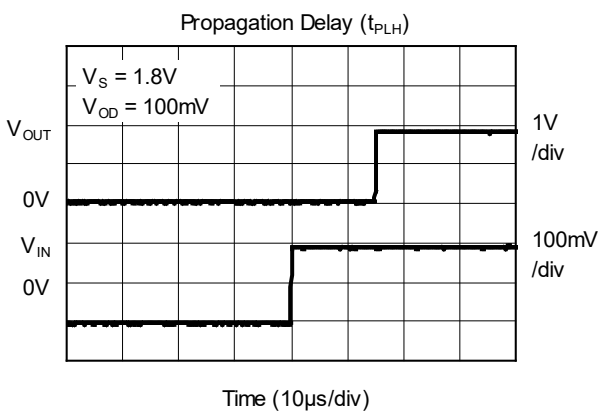
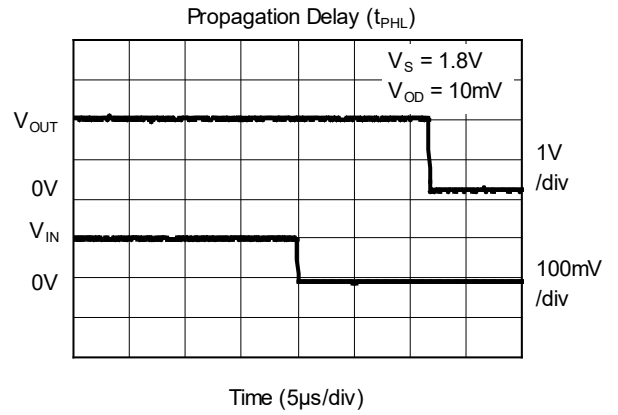
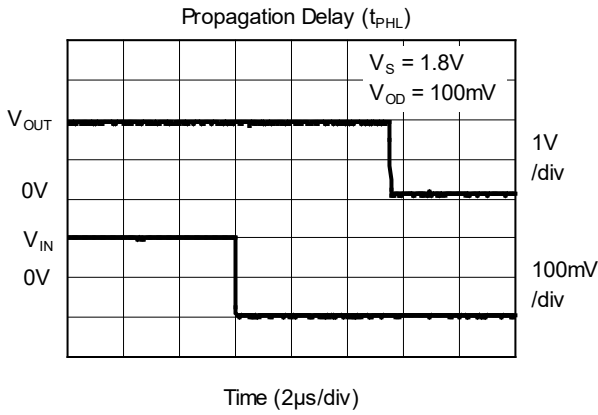
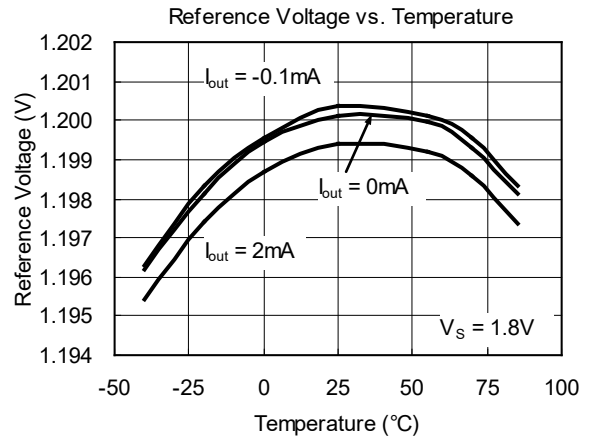
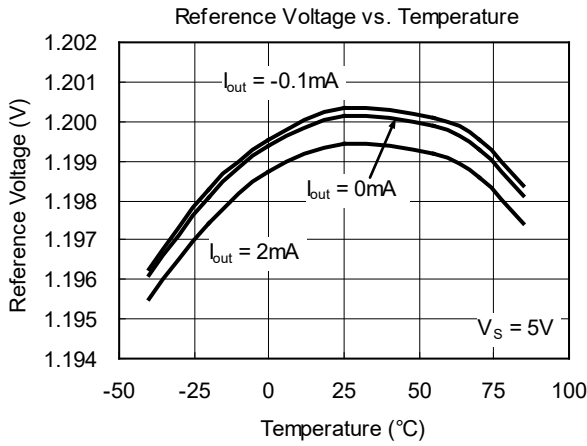
TYPICAL PERFORMANCE CHARACTERISTICS



TYPICAL PERFORMANCE CHARACTERISTICS (continued)

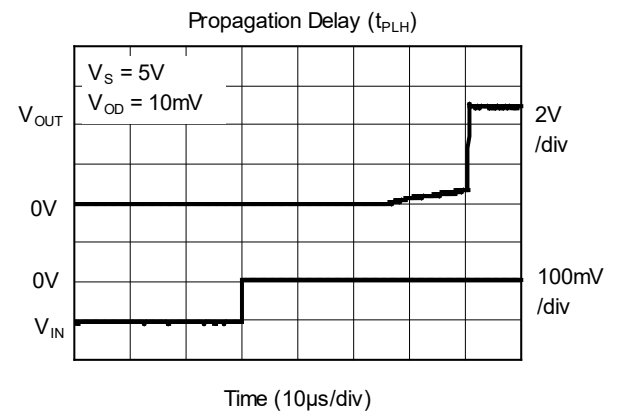
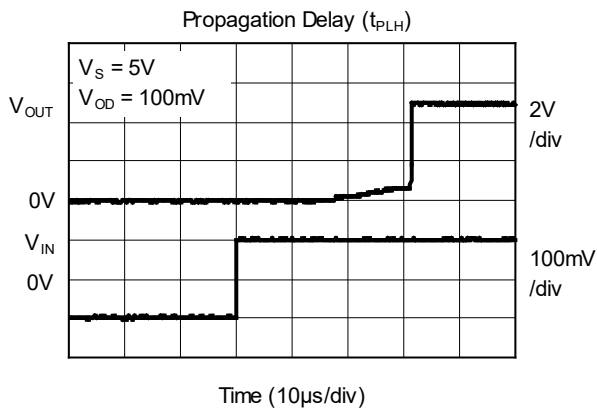
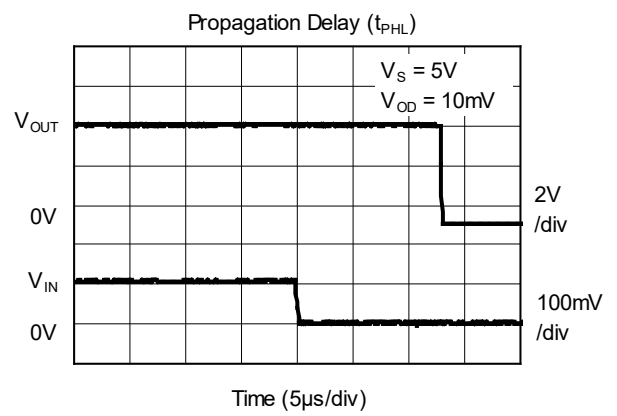
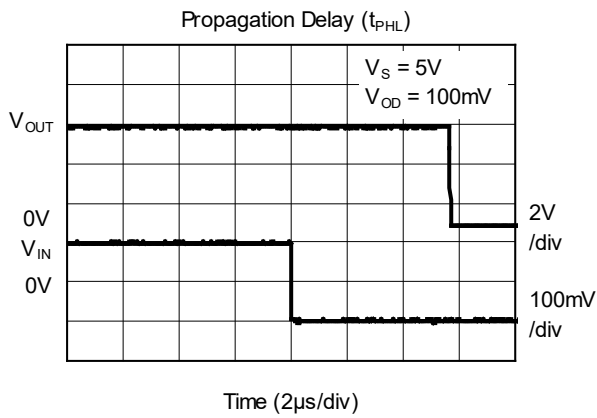


TYPICAL PERFORMANCE CHARACTERISTICS (continued)





TYPICAL PERFORMANCE CHARACTERISTICS (continued)



TIMING DIAGRAM

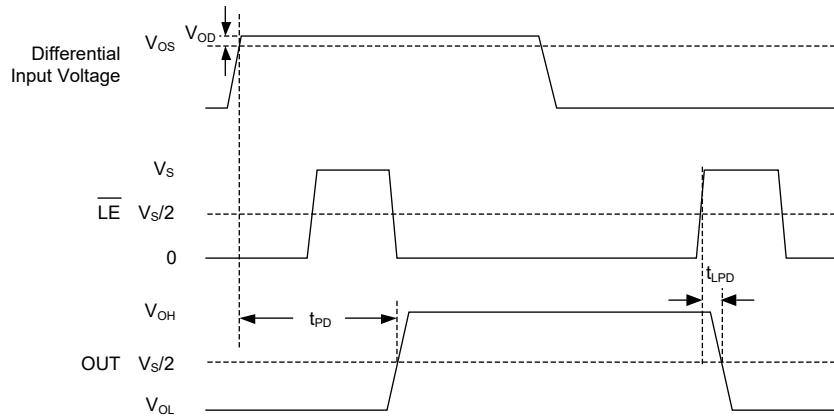


Figure 1. Timing Diagram with Latch Operator

REVISION HISTORY

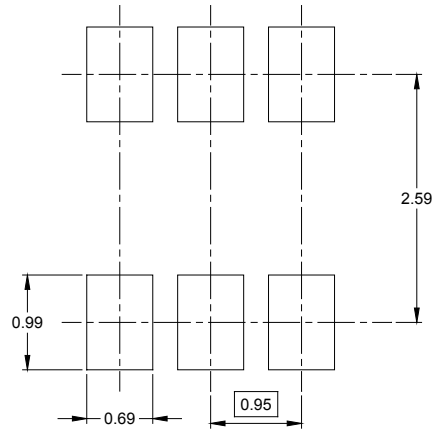
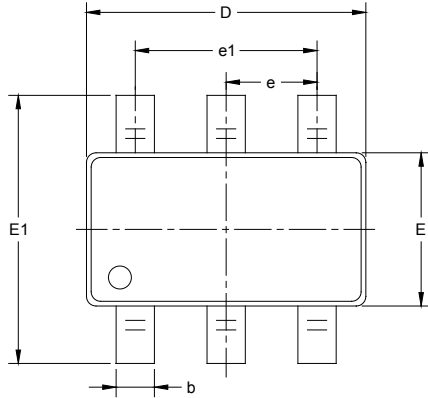
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

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

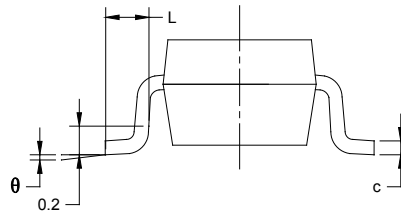
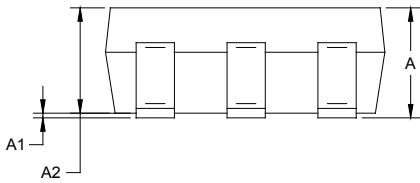
| Changes from Original (NOVEMBER 2012) to REV.A        | Page |
|---|------|
| Changed from product preview to production data ..... | All  |

PACKAGE OUTLINE DIMENSIONS

SOT-23-6



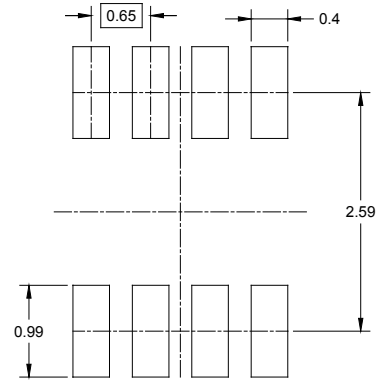
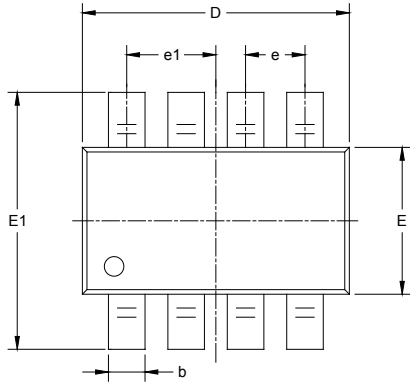
RECOMMENDED LAND PATTERN (Unit: mm)



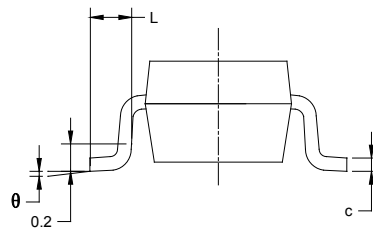
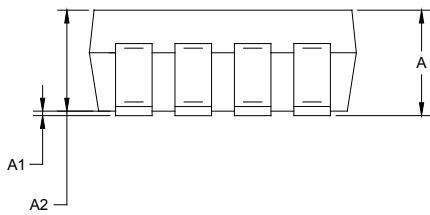
| Symbol   | Dimensions<br>In Millimeters |       | Dimensions<br>In Inches |       |
|----------|------------------------------|-------|-------------------------|-------|
|          | MIN                          | MAX   | MIN                     | MAX   |
| A        | 1.050                        | 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 |
| $\theta$ | 0°                           | 8°    | 0°                      | 8°    |

PACKAGE OUTLINE DIMENSIONS

SOT-23-8



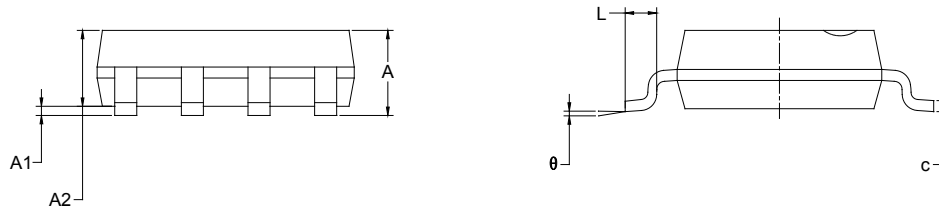
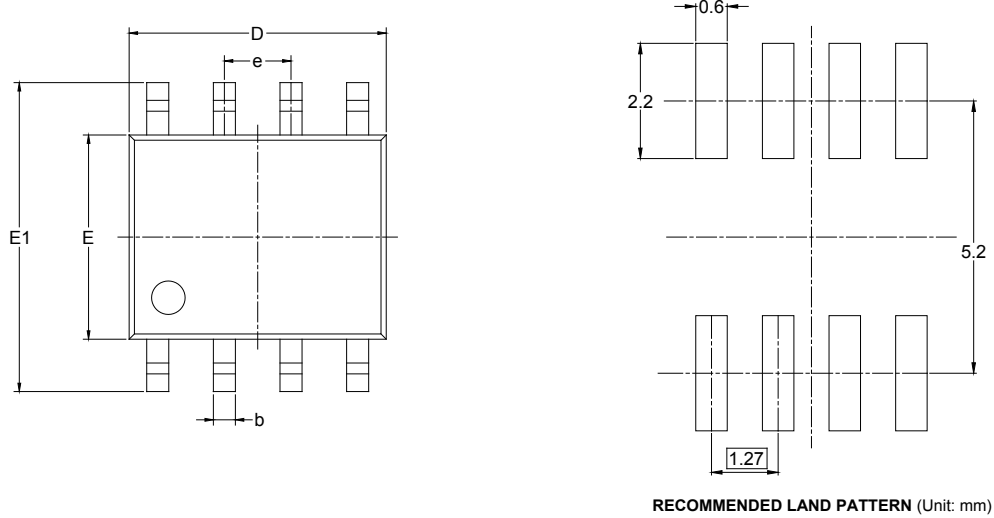
RECOMMENDED LAND PATTERN (Unit: mm)



| Symbol | Dimensions<br>In Millimeters |       | Dimensions<br>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



| Symbol | Dimensions<br>In Millimeters |       | Dimensions<br>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°    |

# 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                | 3.17    | 3.23    | 1.37    | 4.0     | 4.0     | 2.0     | 8.0    | Q3            |
| 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

# 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

单击下面可查看定价，库存，交付和生命周期等信息

[>>SGMICRO\(圣邦微电子\)](#)