

SGM8750

150ns, Low-Power, Dual Channels, Rail-to-Rail Input Single-Supply Comparator

GENERAL DESCRIPTION

The SGM8750 is a dual channel high-speed comparator optimized for systems powered from a 3V or 5V supply. The device features high-speed response, low-power consumption, and rail-to-rail input range and open drain output. Propagation delay is 150ns, while supply current is only 22 μ A/channel.

The input common mode range of the SGM8750 extends beyond both power supply rails. The output pulls to within 0.1V of either supply rail without external pull-up circuitry, making the device ideal for interface with both CMOS and TTL logics. All input and output pins can tolerate a continuous short-circuit fault condition to either rail.

The SGM8750 is available in Green SOIC-8 and MSOP-8 packages. It is rated over the -40°C to +85°C temperature range.

FEATURES

- **Fast, 150ns Propagation Delay (10mV Overdrive)**
- **Low Power Consumption:**
 - **22 μ A/Channel (TYP) at $V_S = 3V$**
- **Wide Supply Voltage Range: 2.7V to 5.5V**
- **Optimized for 3V and 5V Applications**
- **Open Drain Output**
- **Rail-to-Rail Input Voltage Range**
- **Low Offset Voltage: 0.8mV (TYP)**
- **Output Swing 185mV with 4mA Output Current**
- **CMOS/TTL-Compatible Output**
- **-40°C to +85°C Operating Temperature Range**
- **Available in Green SOIC-8 and MSOP-8 Packages**

APPLICATIONS

Line Receivers
Battery-Powered Systems
Threshold Detectors/Discriminators
3V/5V Systems
Zero-Crossing Detectors
Sampling Circuits

PACKAGE/ORDERING INFORMATION

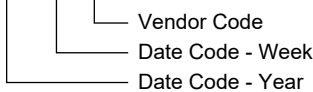
| MODEL | PACKAGE DESCRIPTION | SPECIFIED TEMPERATURE RANGE | ORDERING NUMBER | PACKAGE MARKING | PACKING OPTION |
|---------|---------------------|-----------------------------|-----------------|--------------------------|---------------------|
| SGM8750 | SOIC-8 | -40°C to +85°C | SGM8750YS8G/TR | SGM 8750YS8 XXXXX | Tape and Reel, 2500 |
| | MSOP-8 | -40°C to +85°C | SGM8750YMS8G/TR | SGM8750 YMS8 XXXXX | Tape and Reel, 4000 |

MARKING INFORMATION

NOTE: XXXXX = Date Code and Vendor Code.

SOIC-8/MSOP-8

XXXXX



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 | 2000V |
| MM | 400V |

RECOMMENDED OPERATING CONDITIONS

| | |
|--------------------------------------|----------------|
| Operating Temperature Range | -40°C to +85°C |
| Operating Supply Voltage Range | 2.7V to 5.5V |

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

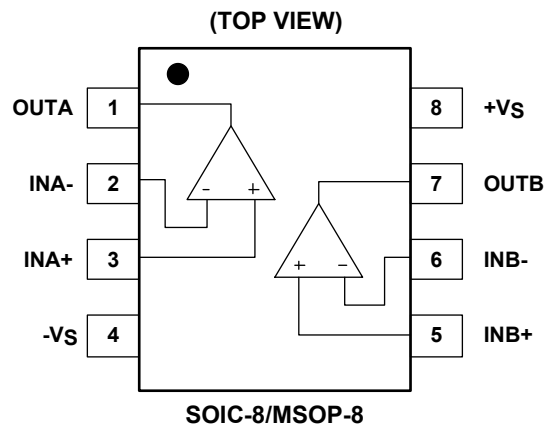
This integrated circuit can be damaged by ESD if you don't pay attention to ESD protection. SGMICRO recommends that all integrated circuits be handled with appropriate precautions.

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



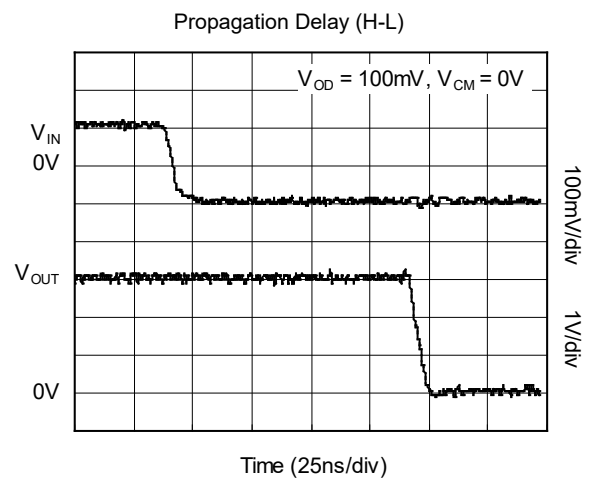
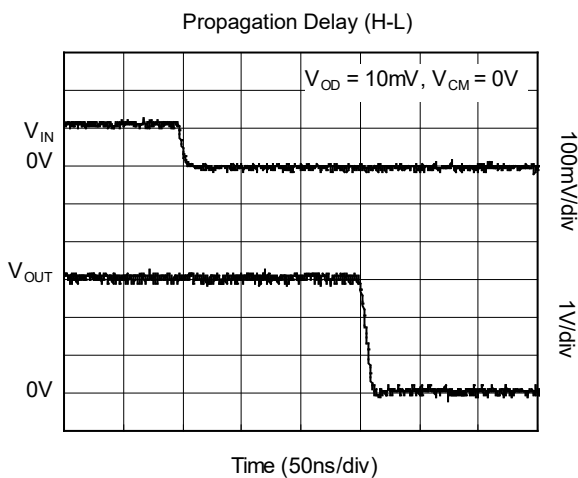
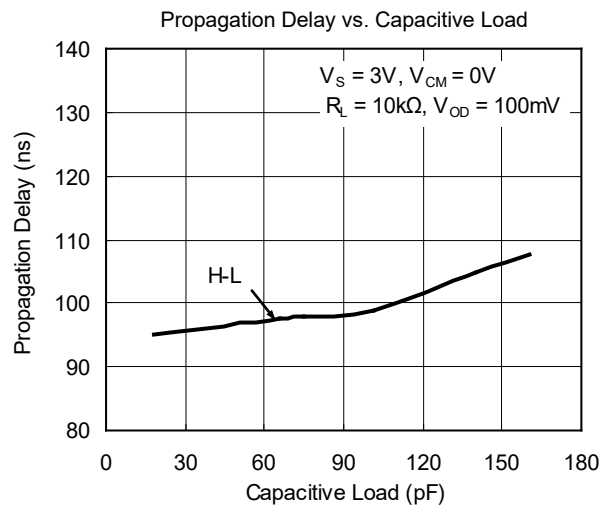
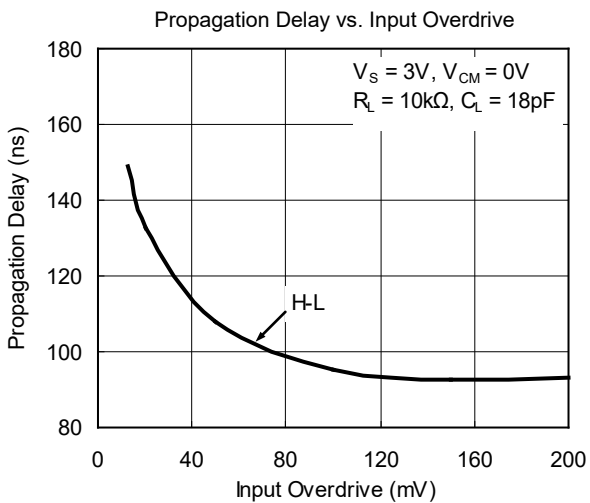
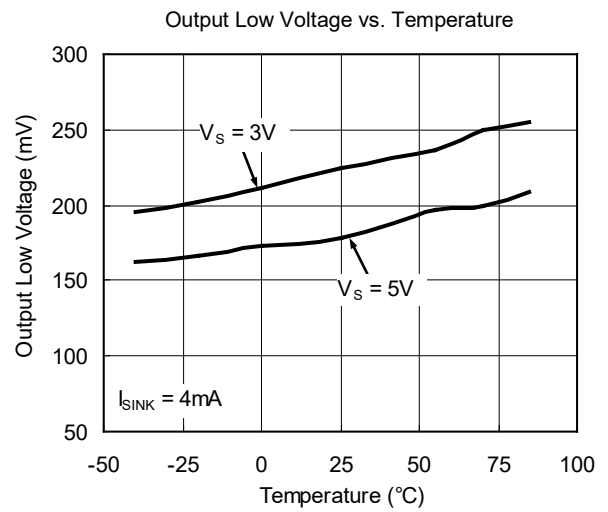
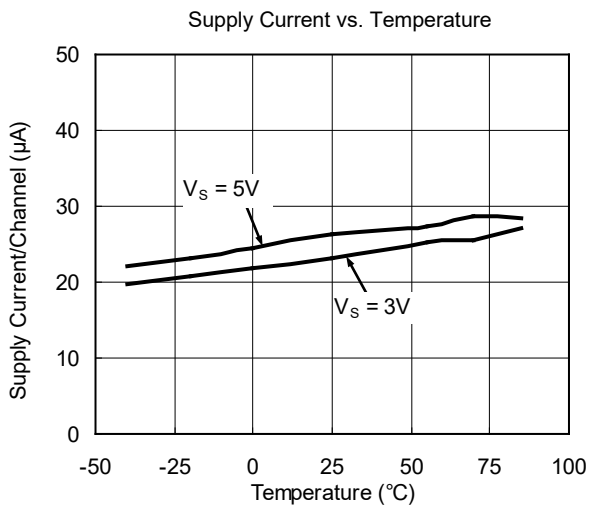
ELECTRICAL CHARACTERISTICS(V_S = 5V, V_{CM} = 0V, C_L = 15pF, typical values are at T_A = +25°C, unless otherwise noted.)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|--|-------------------|---|------|-----|----------------------|-------|
| Operating Supply Voltage Range ⁽¹⁾ | V _S | | 2.7 | | 5.5 | V |
| Input Common Mode Voltage Range ⁽²⁾ | V _{CM} | | -0.1 | | V _S + 0.1 | V |
| Input Offset Voltage | V _{OS} | V _S = 5V, V _{CM} = 0V, Out = 0V | | 0.8 | 4.5 | mV |
| | | -40°C to +85°C | | | 4.7 | |
| | | V _S = 5V, V _{CM} = 5V, Out = 0V | | 0.9 | 4.8 | |
| | | -40°C to +85°C | | | 4.9 | |
| Output Short-Circuit Current | I _{SINK} | V _S = 5V, Out to V _S /2 | | -33 | -28 | mA |
| | | -40°C to +85°C | | | -22 | |
| Common Mode Rejection Ratio ⁽³⁾ | CMRR | V _S = 5V, V _{CM} = 0V to 5V | 60 | 77 | | dB |
| | | -40°C to +85°C | 58 | | | |
| Power Supply Rejection Ratio | PSRR | V _{CM} = 0V, V _S = 2.7V to 5.5V | 68 | 79 | | dB |
| | | -40°C to +85°C | 66 | | | |
| Output Voltage Swing from Rail | V _{OL} | V _S = 5V, I _{OUT} = -4mA | | 185 | 218 | mV |
| | | -40°C to +85°C | | | 262 | |
| Supply Current/Channel | I _S | V _S = 3V, I _{OUT} = 0 | | 22 | 32 | μA |
| | | -40°C to +85°C | | | 38 | |
| | | V _S = 5V, I _{OUT} = 0 | | 25 | 35 | |
| | | -40°C to +85°C | | | 44 | |
| Propagation Delay (High to Low) | | V _S = 3V, Overdrive = 10mV | | 150 | | ns |
| | | V _S = 3V, Overdrive = 100mV | | 97 | | |
| Fall Time | t _{FALL} | Overdrive = 10mV | | 8 | | ns |
| | | Overdrive = 100mV | | 6 | | |

NOTES:

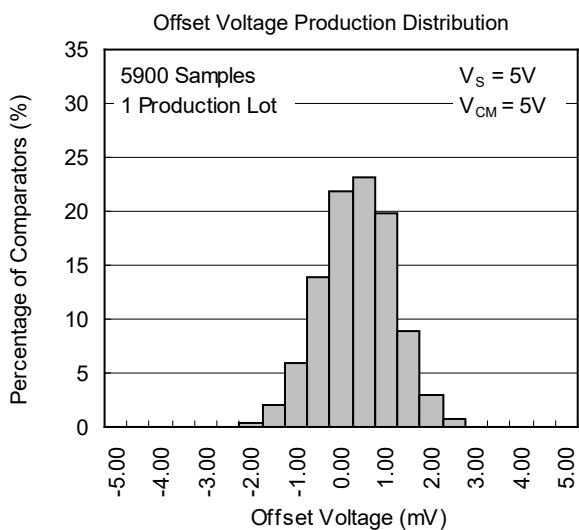
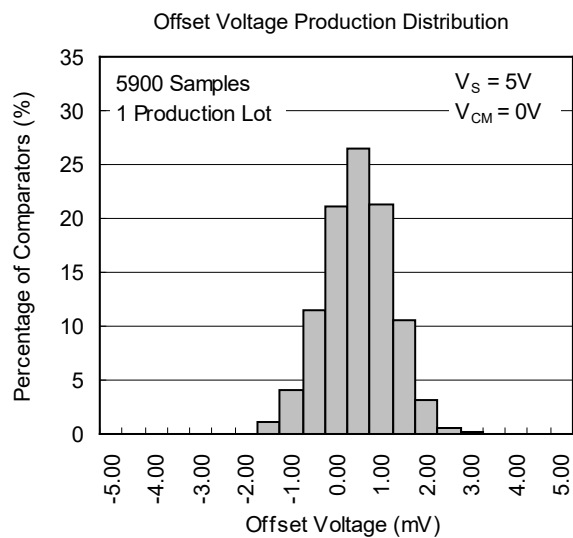
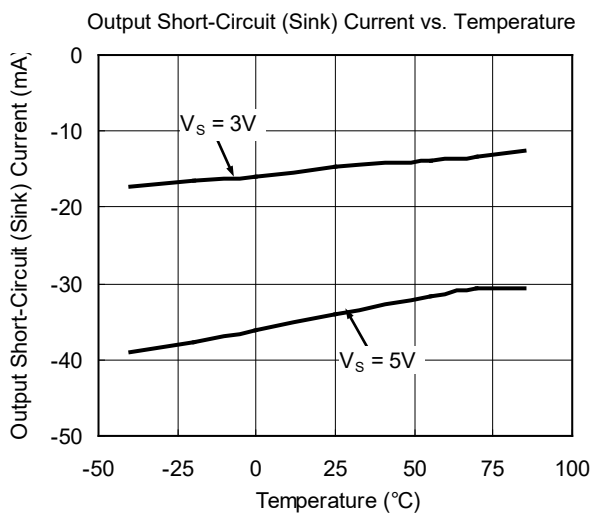
1. Inferred from PSRR test.
2. Inferred from PD test. Note also that either or both inputs can be driven to the absolute maximum limit (0.1V beyond either supply rail) without damage or false output inversion.
3. Specified over the full input common mode voltage range (V_{CM}).

TYPICAL PERFORMANCE CHARACTERISTICS



SGM8750 150ns, Low-Power, Dual Channels, Rail-to-Rail Input Single-Supply Comparator

TYPICAL PERFORMANCE CHARACTERISTICS (continued)



DETAILED DESCRIPTION

The SGM8750 is a single-supply comparator that features high speed, and low power. Its output is pulled to within 185mV of either supply rail without external pull-up or pull-down circuitry. Rail-to-rail input voltage range and low-voltage single-supply operation make the device ideal for portable equipment. The SGM8750 interfaces directly to CMOS and TTL logics.

Output Stage Circuitry

The SGM8750 contains an open drain current-driven output stage as shown in Figure 1. During an output transition, I_{SINK} is pulled output pin to Logic Low. The output sink current is high during the transition, creating a rapid slew rate. Once the output voltage reaches V_{OL} , the sink current decreases to a small value, capable of maintaining the V_{OL} static condition. This significant decrease in current conserves power after an output transition has occurred.

One consequence of a current-driven output stage is a linear dependence between the slew rate and the load capacitance. A heavy capacitive load will slow down a

voltage output transition. This can be useful in noise-sensitive applications where fast edges may cause interference.

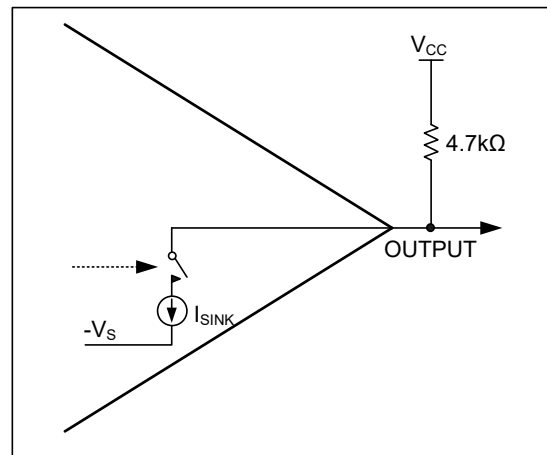


Figure 1. Open Drain Output Stage Circuitry

APPLICATION INFORMATION

Circuit Layout and Bypassing

The high gain-bandwidth product of the SGM8750 requires design precautions to realize the full high-speed capabilities of the comparator. The recommended precautions are:

- 1) Use a PCB with a good, unbroken, low-inductance ground plane.
- 2) Place a decoupling capacitor (a 0.1µF ceramic capacitor is a good choice) as close to +V_S as possible.
- 3) Pay close attention to the decoupling capacitor's bandwidth, keeping leads short.
- 4) On the inputs and output, keep lead lengths short to avoid unwanted parasitic feedback around the comparator.
- 5) Solder the device directly to the PCB instead of using a socket.

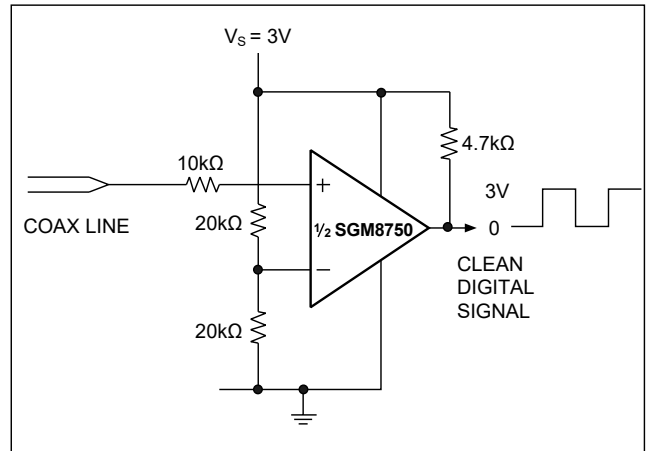


Figure 3. Line Receiver Application

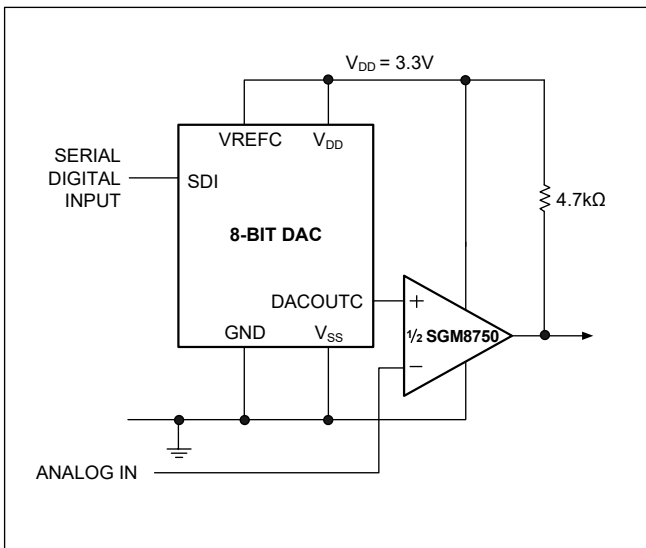
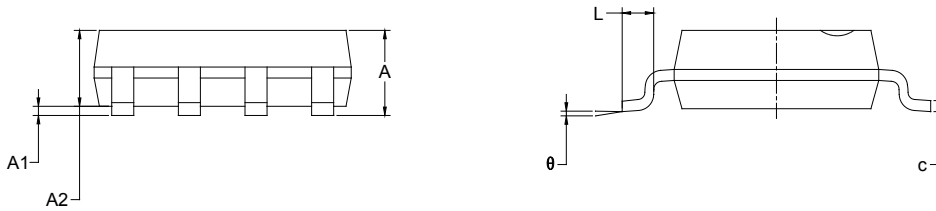
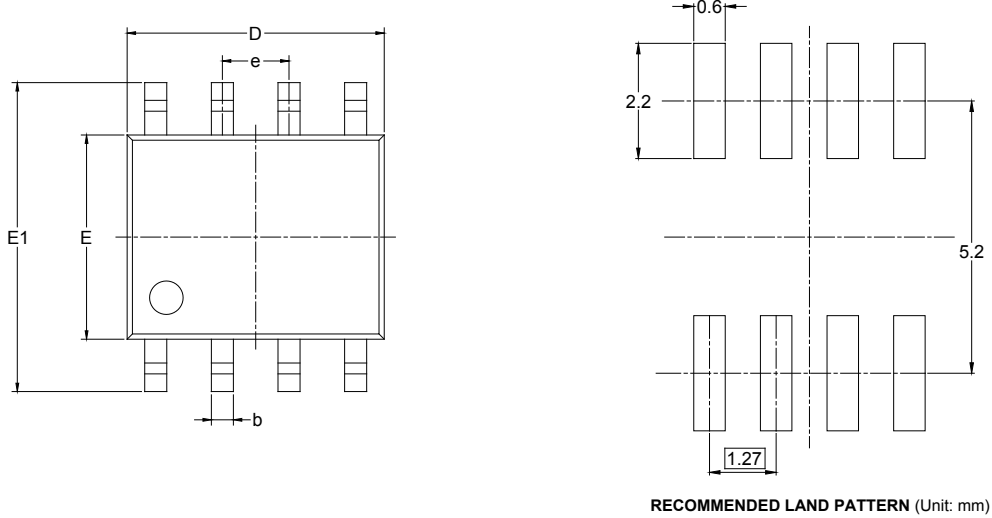


Figure 2. 3.3V Digitally Controlled Threshold Detector

PACKAGE INFORMATION

PACKAGE OUTLINE DIMENSIONS

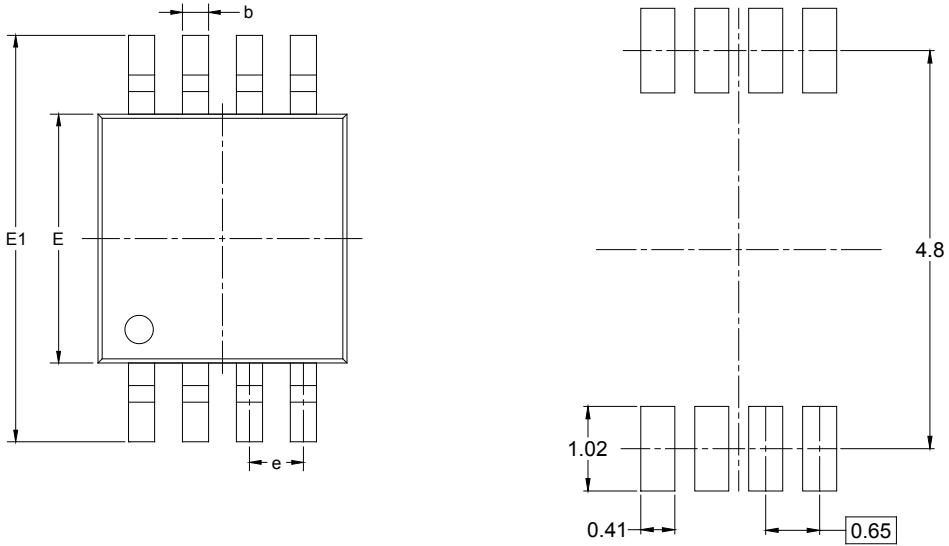
SOIC-8



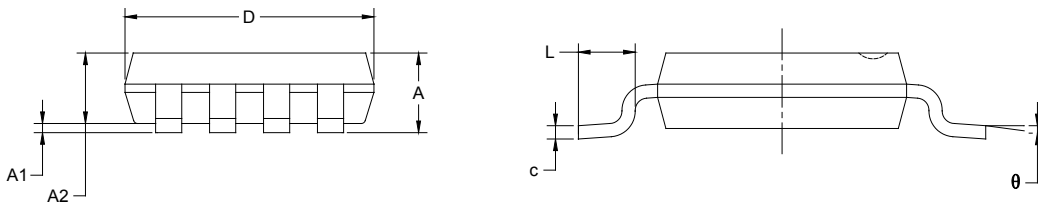
| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|----------|------------------------------|-------|-------------------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 1.350 | 1.750 | 0.053 | 0.069 |
| A1 | 0.100 | 0.250 | 0.004 | 0.010 |
| A2 | 1.350 | 1.550 | 0.053 | 0.061 |
| b | 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° |

PACKAGE OUTLINE DIMENSIONS

MSOP-8



RECOMMENDED LAND PATTERN (Unit: mm)

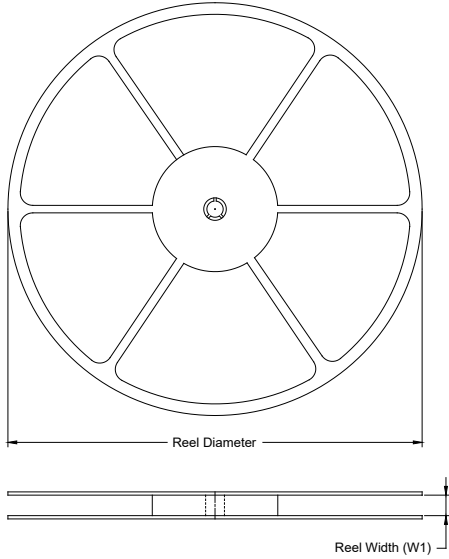


| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|------------------------------|-------|-------------------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.820 | 1.100 | 0.032 | 0.043 |
| A1 | 0.020 | 0.150 | 0.001 | 0.006 |
| A2 | 0.750 | 0.950 | 0.030 | 0.037 |
| b | 0.250 | 0.380 | 0.010 | 0.015 |
| c | 0.090 | 0.230 | 0.004 | 0.009 |
| D | 2.900 | 3.100 | 0.114 | 0.122 |
| E | 2.900 | 3.100 | 0.114 | 0.122 |
| E1 | 4.750 | 5.050 | 0.187 | 0.199 |
| e | 0.650 BSC | | 0.026 BSC | |
| L | 0.400 | 0.800 | 0.016 | 0.031 |
| θ | 0° | 6° | 0° | 6° |

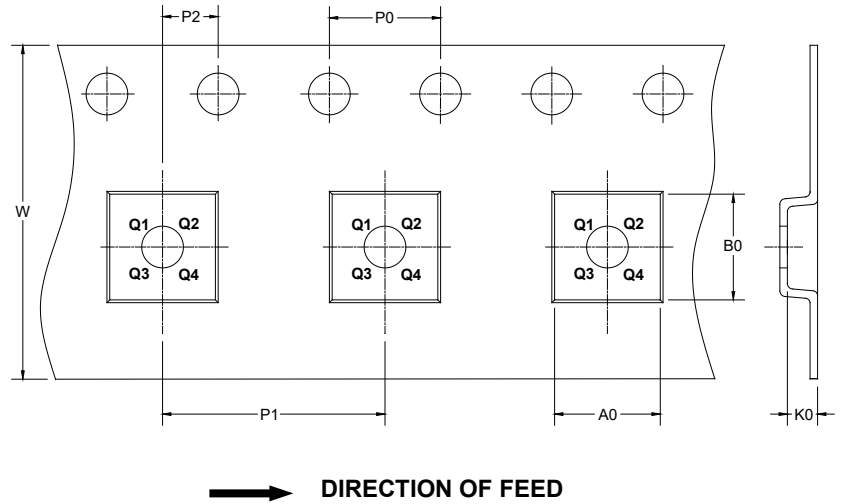
PACKAGE INFORMATION

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 |
|--------------|---------------|--------------------|---------|---------|---------|---------|---------|---------|--------|---------------|
| SOIC-8 | 13" | 12.4 | 6.40 | 5.40 | 2.10 | 4.0 | 8.0 | 2.0 | 12.0 | Q1 |
| MSOP-8 | 13" | 12.4 | 5.20 | 3.30 | 1.50 | 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 |
|-----------|-------------|------------|-------------|--------------|
| 13" | 386 | 280 | 370 | 5 |

DD0002