# SGM8774-1
# High Voltage, High Precision, Single Differential Comparator

## GENERAL DESCRIPTION

The SGM8774-1 is a single, high precision voltage comparator optimized for high voltage operation. The device can operate from 2.8V to 36V single supply or from ±1.4V to ±18V dual power supplies. It consumes low supply current without being affected by the supply voltage. Input common mode voltage is 1.5V lower than $+V_S$. The SGM8774-1 has an open-drain output structure that needs external pull-up resistor.

The SGM8774-1 features low input offset voltage of 2.8mV (MAX). It is suitable for applications requiring precision.

The SGM8774-1 is available in a Green SOT-23-5 package. It is rated over the -40℃ to +125℃ operating temperature range.

## FEATURES

- **Wide Supply Ranges**
  **Single Supply: 2.8V to 36V**
  **Dual Supplies: ±1.4V to ±18V**
- **Low Supply Current: 240μA (TYP)**
- **Low Input Offset Voltage: 2.8mV (MAX)**
- **Low Input Bias Current: ±20pA (TYP)**
- **Open-Drain Output Structure**
- **Supports CMOS or TTL Logic**
- **-40℃ to +125℃ Operating Temperature Range**
- **Available in a Green SOT-23-5 Package**

## APPLICATIONS

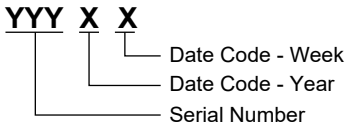
Power System Monitor
Medical Equipment
Industrial Application
Battery Management System

# PACKAGE/ORDERING INFORMATION

| MODEL | PACKAGE DESCRIPTION | SPECIFIED TEMPERATURE RANGE | ORDERING NUMBER | PACKAGE MARKING | PACKING OPTION |
|---|---|---|---|---|---|
| SGM8774A-1 | SOT-23-5 | -40℃ to +125℃ | SGM8774A-1XN5G/TR | OP6XX | Tape and Reel, 3000 |
| SGM8774B-1 | SOT-23-5 | -40℃ to +125℃ | SGM8774B-1XN5G/TR | OP7XX | Tape and Reel, 3000 |
| SGM8774C-1 | SOT-23-5 | -40℃ to +125℃ | SGM8774C-1XN5G/TR | OP8XX | Tape and Reel, 3000 |
| SGM8774D-1 | SOT-23-5 | -40℃ to +125℃ | SGM8774D-1XN5G/TR | RCBXX | Tape and Reel, 3000 |

## MARKING INFORMATION

NOTE: XX = Date Code.




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 $-V_S$ ..... 40V
Differential Input Voltage, $|V_{ID}|$ ..... 40V
Input/Output Voltage Range..... $(-V_S)$ - 0.3V to $(+V_S)$ + 0.3V
Junction Temperature ..... +150℃
Storage Temperature Range..... -65℃ to +150℃
Lead Temperature (Soldering, 10s) ..... +260℃
ESD Susceptibility
HBM..... 3000V
CDM ..... 1000V

## RECOMMENDED OPERATING CONDITIONS

Operating Temperature Range ..... -40℃ to +125℃
Power Supply Range ..... 2.8V to 36V

## 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

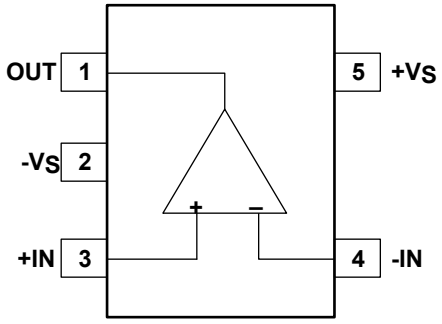
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance 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.

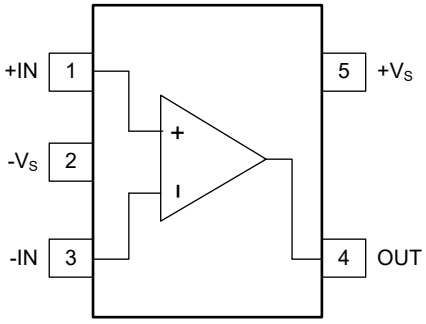
## PIN CONFIGURATIONS

SGM8774A-1 (TOP VIEW)



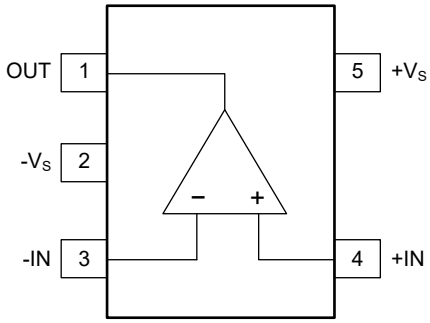

SOT-23-5

SGM8774B-1 (TOP VIEW)



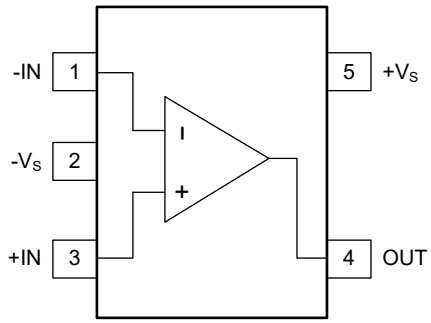

SOT-23-5

SGM8774C-1 (TOP VIEW)




SOT-23-5

SGM8774D-1 (TOP VIEW)




SOT-23-5

## ELECTRICAL CHARACTERISTICS

($V_S$ = ±1.4V to ±18V, Full = -40℃ to +125℃, typical values are at $T_A$ = +25℃, unless otherwise noted.)

| PARAMETER | SYMBOL | CONDITIONS | TEMP | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|---|
| Input Offset Voltage | $V_{OS}$ | $V_{CM}$ = 0V | +25℃ | | 0.8 | 2.8 | mV |
| | | | Full | | | 3 | |
| Input Bias Current | $I_B$ | $V_{CM}$ = 0V | +25℃ | | ±20 | ±200 | pA |
| Input Bias Current | $I_{OS}$ | $V_{CM}$ = 0V | +25℃ | | ±20 | ±200 | pA |
| Input Common Mode Voltage Range (1) | $V_{CM}$ | | Full | $-V_S$ | | $(+V_S)$ - 1.5 | V |
| Common Mode Rejection Ratio | CMRR | $V_S$ = ±18V, $V_{CM}$ = $(-V_S)$ to $(+V_S)$ - 1.5V | +25℃ | 84 | 100 | | dB |
| | | | Full | 78 | | | |
| Power Supply Rejection Ratio | PSRR | | +25℃ | 102 | 120 | | dB |
| | | | Full | 99 | | | |
| Large-Signal Differential Voltage Amplification | $A_{VD}$ | $V_S$ = 36V, $V_{OUT}$ = 0.1V to 28.8V, $R_L$ = 120kΩ to $V_S$ | +25℃ | 100 | 110 | | dB |
| | | | Full | 97 | | | |
| Low-Level Output Voltage | $V_{OL}$ | $I_{OL}$ = -8mA, $V_{ID}$ = -0.2V | +25℃ | | 230 | 300 | mV |
| | | | Full | | | 400 | |
| Output Short-Circuit Current | $I_{SINK}$ | $V_{OL}$ = $(-V_S)$ + 1.5V, $V_{ID}$ = -0.2V | +25℃ | 29 | 36 | | mA |
| High-Level Output Current | $I_{OH}$ | $V_{OH}$ - $(-V_S)$ = 2.8V, $V_{ID}$ = 0.2V | +25℃ | | 0.7 | 1 | μA |
| | | | Full | | | 3 | |
| | | $V_{OH}$ - $(-V_S)$ = 36V, $V_{ID}$ = 0.2V | +25℃ | | 4 | 12 | |
| | | | Full | | | 22 | |
| Supply Current | $I_S$ | $I_{OUT}$ = 0A | +25℃ | | 240 | 290 | μA |
| | | | Full | | | 320 | |

## SWITCHING CHARACTERISTICS

(At $T_A$ = +25℃, $V_S$ = ±2.5V, $V_{CM}$ = 0V, $C_L$ = 15pF (2), unless otherwise specified.)

| PARAMETER | SYMBOL | CONDITIONS | TEMP | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|---|
| Propagation Delay (High to Low) | $t_{PHL}$ | Overdrive = 10mV | +25℃ | | 90 | | ns |
| | | Overdrive = 100mV | +25℃ | | 50 | | |
| Fall Time | $t_{FALL}$ | Overdrive = 10mV | +25℃ | | 20 | | ns |
| | | Overdrive = 100mV | +25℃ | | 20 | | |

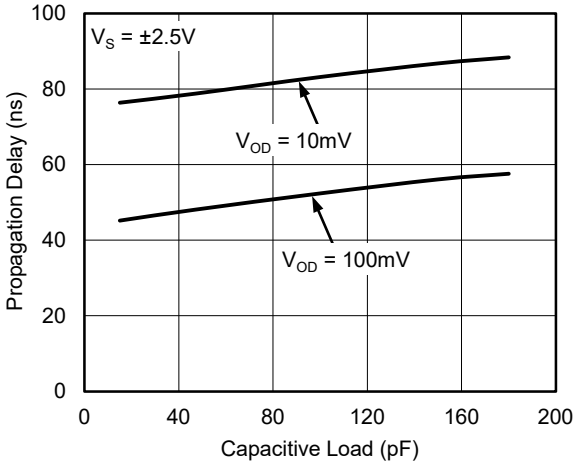
NOTES:

1. Any input voltage should not be lower than $(-V_S)$ - 0.3V. The maximum input common mode voltage is $(+V_S)$ - 1.5V, but it will not be damaged when the upper limit of the input voltage reaches 36V.
2. $C_L$: Load capacitance (jig and probe included).

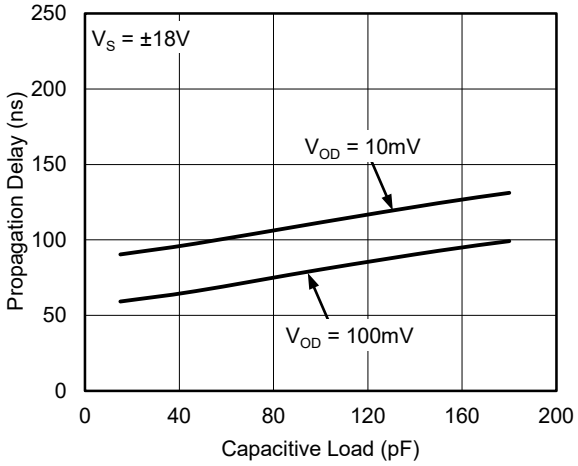
## TYPICAL PERFORMANCE CHARACTERISTICS

At $T_A$ = +25℃, $V_S$ = ±18V and $C_L$ = 15pF, unless otherwise noted.

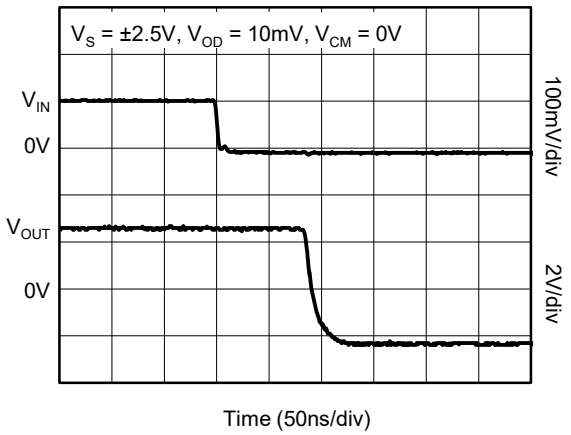
Propagation Delay vs. Capacitive Load



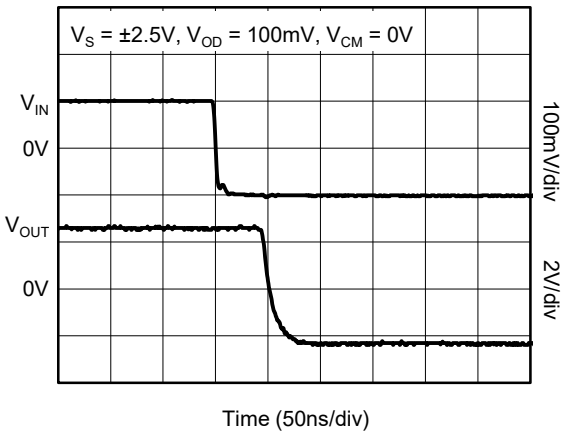

Propagation Delay vs. Capacitive Load



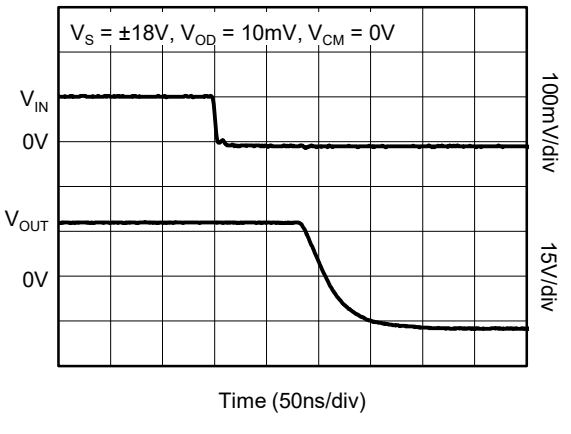

Propagation Delay (H-L)



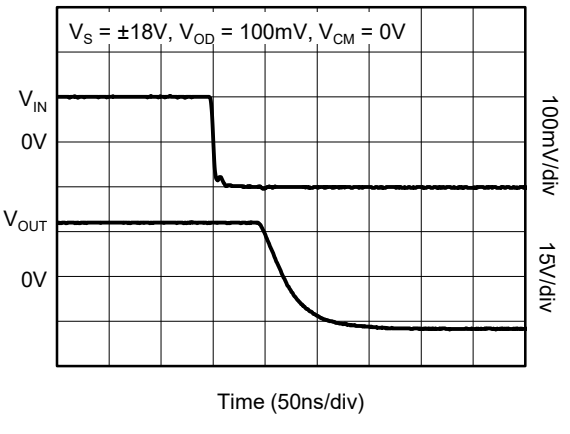

Propagation Delay (H-L)




Propagation Delay (H-L)



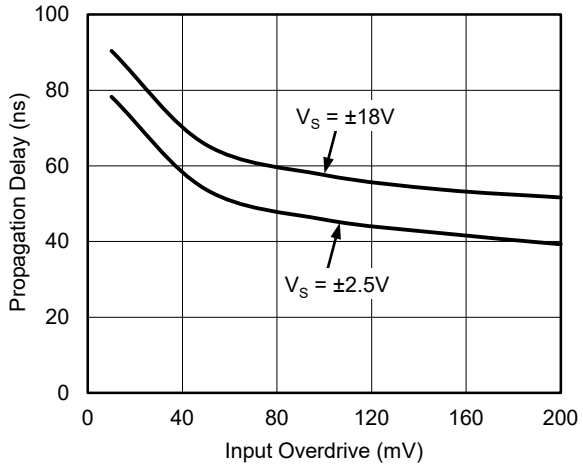

Propagation Delay (H-L)



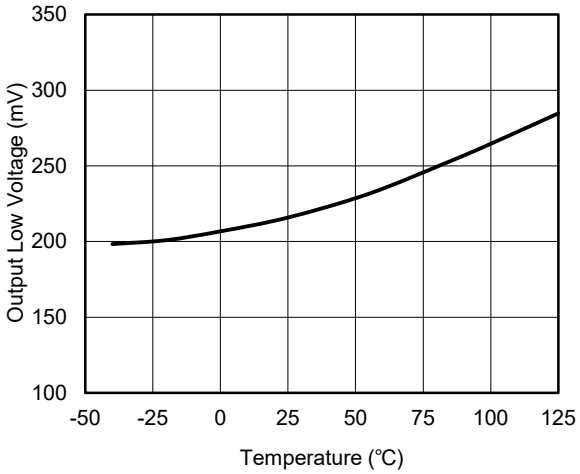
## TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At $T_A$ = +25℃, $V_S$ = ±18V and $C_L$ = 15pF, unless otherwise noted.

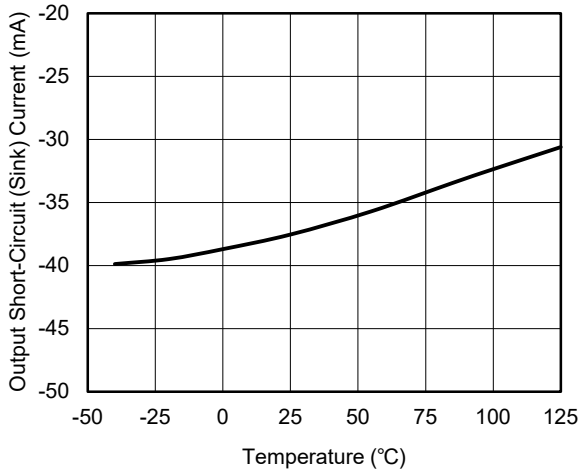
Propagation Delay (H-L) vs. Input Overdrive



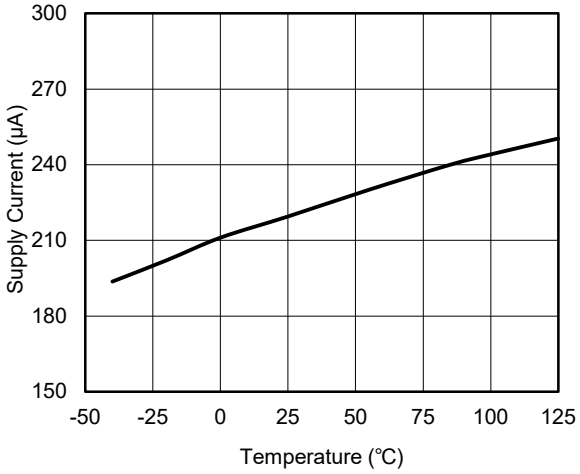

Output Low Voltage vs. Temperature



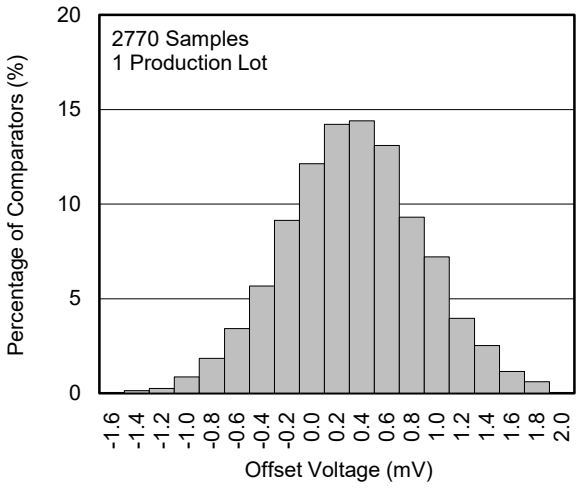

Output Short-Circuit (Sink) Current vs. Temperature




Supply Current vs. Temperature




Offset Voltage Production Distribution



# DETAILED DESCRIPTION

The SGM8774-1 is a single, high precision, low power comparator. The wide input voltage range and power supply range make the device a good choice for industrial equipment. Open-drain structure needs external pull-up resistor. The SGM8774-1 can be compatible with CMOS and TTL logics.

## Output Structure

In Figure 1, the SGM8774-1 has an open-drain output stage. When output is changed from logic high to low, the changed sink current pulls output pin to logic low. Beginning this transition, larger sink current is used to create a high slew rate transit from high to low. Once the output voltage reaches $V_{OL}$, it will reduce the sink current to a just right value to maintain the $V_{OL}$ static condition. This current-driven open-drain output stage will significantly reduce the power consumption in application system.

If low slew rate transition is needed in system design, adjusting the load capacitance will change the slew rate. The heavier capacitive load will slow down the output voltage transition. This feature will be used to reduce the interference generated by fast edge of transition between 1 and 0 in noise-sensitive system.

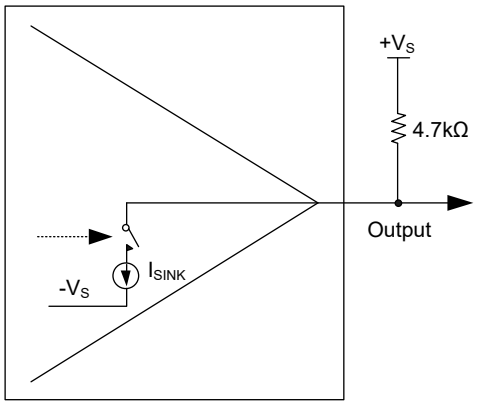



**Figure 1. Open-Drain Output Structure**

# APPLICATION INFORMATION

## Layout and Bypassing

Good power supply decoupling, layout and grounding are very important for SGM8774-1 to realize the full high-speed capabilities in system, following skills will be used:

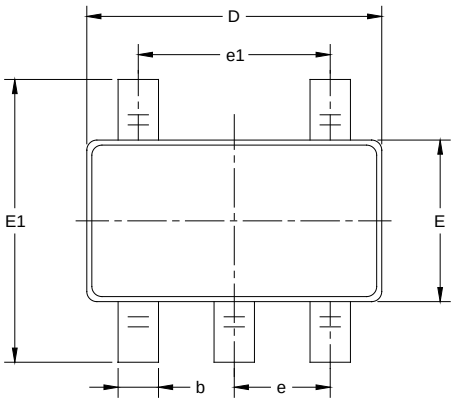
◆ A 0.1μF to 4.7μF range ceramic capacitor is used to provide good power supply decoupling. This ceramic capacitor must be placed as close to $+V_S$ pin as possible.

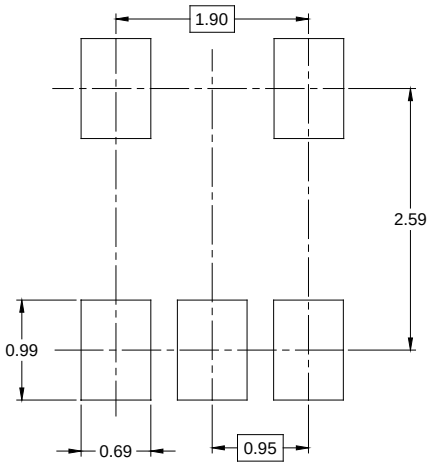
◆ For grounding, unbroken and low-inductance ground plane is a good choice.

◆ For Layout, use short PCB trace to avoid unwanted parasitic feedback around the comparator. SGM8774-1 must be soldered directly to the PCB and the socket is not recommended.

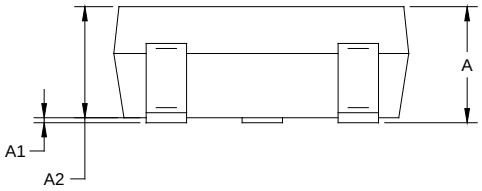
# PACKAGE OUTLINE DIMENSIONS

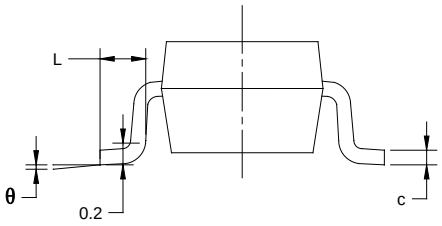
## SOT-23-5




**RECOMMENDED LAND PATTERN** (Unit: mm)



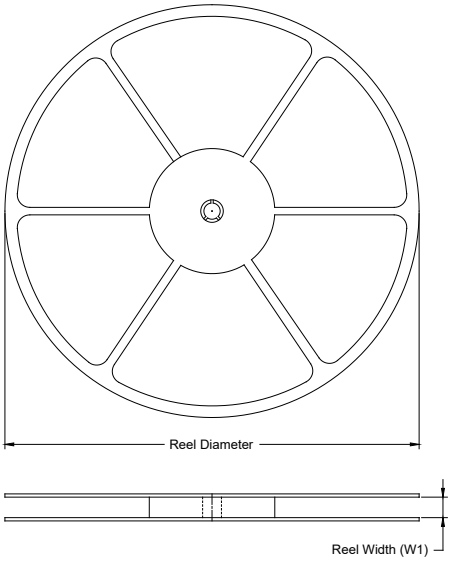




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 1.050 | 1.250 | 0.041 | 0.049 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 1.050 | 1.150 | 0.041 | 0.045 |
| b | 0.300 | 0.500 | 0.012 | 0.020 |
| c | 0.100 | 0.200 | 0.004 | 0.008 |
| 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° |

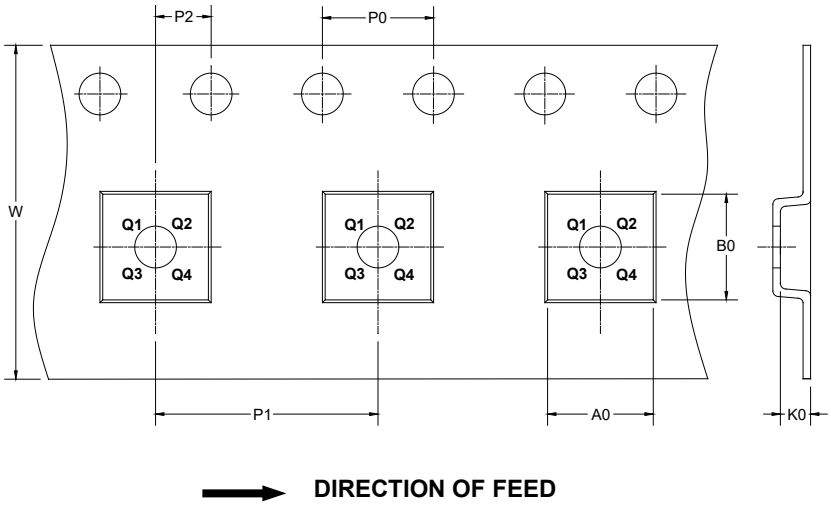
NOTES:
1. Body dimensions do not include mode flash or protrusion.
2. This drawing is subject to change without notice.

# 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-23-5 | 7″ | 9.5 | 3.20 | 3.20 | 1.40 | 4.0 | 4.0 | 2.0 | 8.0 | Q3 |

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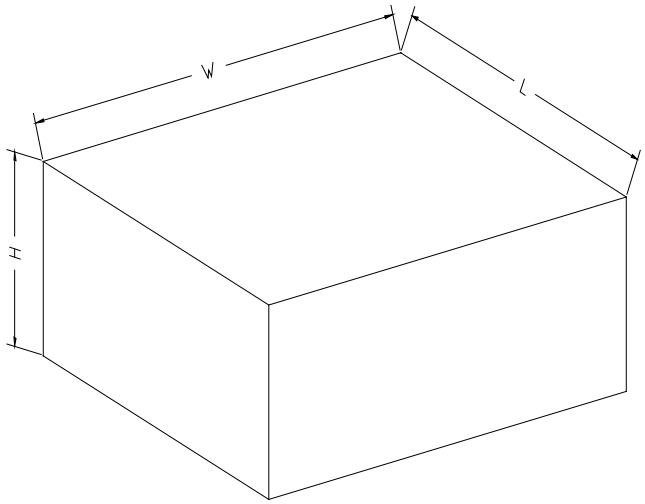
## CARTON BOX DIMENSIONS




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 |

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