



SGM8771

High Voltage, High Precision, Single Comparator with Voltage Reference

GENERAL DESCRIPTION

The SGM8771 is a single, high precision voltage comparator with a 1.225V voltage reference. The device optimized for high voltage operation from 2.8V to 36V single supply or $\pm 1.4V$ to $\pm 18V$ 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 SGM8771 has an open-drain output structure that needs external pull-up resistor. It also has a 1.225V voltage reference that saves external reference and reduces system cost.

The SGM8771 features low input offset voltage of 2.4mV (MAX). It is suitable for applications requiring precision.

The SGM8771 is available in Green SOIC-8 and TDFN-3x3-8L packages. It is operated over the $-40^{\circ}C$ to $+125^{\circ}C$ temperature range.

FEATURES

- **Wide Supply Ranges**
Single Supply: 2.8V to 36V
Dual Supplies: $\pm 1.4V$ to $\pm 18V$
- **Low Supply Current: 180 μ A (TYP)**
- **Low Input Offset Voltage: 2.4mV (MAX)**
- **Low Input Bias Current: $\pm 20pA$ (TYP)**
- **Minimum Input Common Mode Voltage: $-V_S$**
- **Maximum Differential Input Voltage: $+36V/-36V$**
- **Internal Voltage Reference: 1.225V**
- **Open-Drain Output Structure**
- **Low Output Saturation Voltage**
- **Supports CMOS or TTL Logic**
- **$-40^{\circ}C$ to $+125^{\circ}C$ Operating Temperature Range**
- **Available in Green SOIC-8 and TDFN-3x3-8L Packages**

APPLICATIONS

Power System Monitor
Medical Equipment
Industrial Application
Battery Management System

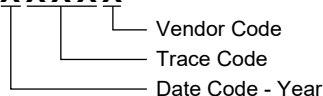
PACKAGE/ORDERING INFORMATION

| MODEL | PACKAGE DESCRIPTION | SPECIFIED TEMPERATURE RANGE | ORDERING NUMBER | PACKAGE MARKING | PACKING OPTION |
|---------|---------------------|-----------------------------|------------------|-------------------------|---------------------|
| SGM8771 | SOIC-8 | -40°C to +125°C | SGM8771XS8G/TR | SGM 8771XS8 XXXXX | Tape and Reel, 4000 |
| | TDFN-3x3-8L | -40°C to +125°C | SGM8771XTDB8G/TR | SGM 8771DB XXXXX | Tape and Reel, 4000 |

MARKING INFORMATION

NOTE: XXXXX = Date Code, Trace Code and Vendor Code.

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 40V
- Differential Input Voltage, $|V_{ID}|$ 40V
- Input Voltage Range $(-V_S) - 0.3V$ to $(+V_S) + 0.3V$
- Output Voltage Range, V_{OUT} $(-V_S) - 0.3V$ to $(+V_S) + 0.3V$
- Output Voltage Range, V_{REF} $(-V_S) - 0.3V$ to $(-V_S) + 5.5V$
- Junction Temperature..... +150°C
- Storage Temperature Range -65°C to +150°C
- Lead Temperature (Soldering, 10s)..... +260°C
- ESD Susceptibility
- HBM..... 2000V
- CDM 1000V

RECOMMENDED OPERATING CONDITIONS

- Operating Temperature Range -40°C to +125°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.

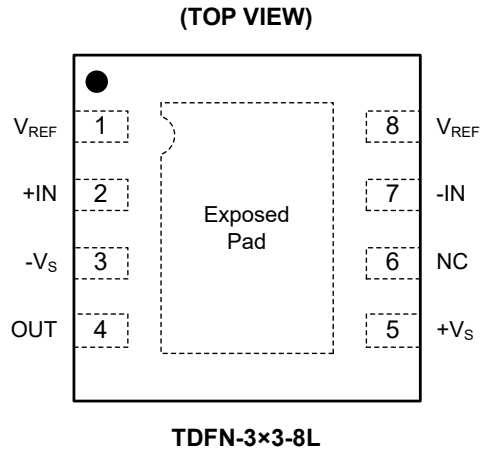
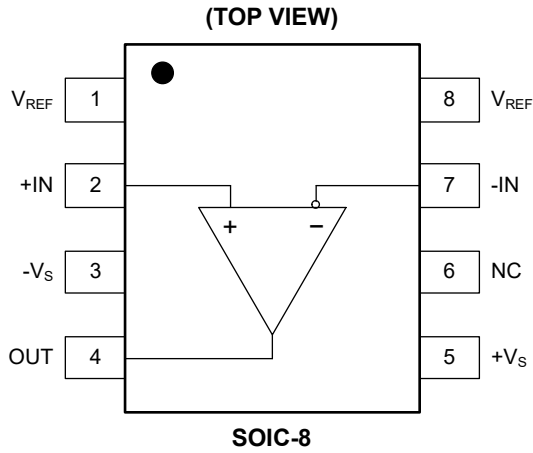
ESD SENSITIVITY CAUTION

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



PIN DESCRIPTION

| PIN | NAME | FUNCTION |
|-------------|-------------|--|
| 1, 8 | V_{REF} | Reference Output. |
| 2 | +IN | Non-Inverting Input of Comparator. |
| 3 | $-V_S$ | Negative Power Supply. |
| 4 | OUT | Output of Comparator. |
| 5 | $+V_S$ | Positive Power Supply. |
| 6 | NC | No Connection. |
| 7 | -IN | Inverting Input of Comparator. |
| Exposed Pad | Exposed Pad | Exposed Pad (TDFN-3x3-8L Package Only). Exposed pad should be left floating. |

ELECTRICAL CHARACTERISTICS

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

| PARAMETER | SYMBOL | CONDITIONS | TEMP | MIN | TYP | MAX | UNITS |
|---|-------------------|---|-------|-------------------------------|-------------------------------|-------------------------------|-------|
| Input Offset Voltage | V _{OS} | V _{CM} = 0V | +25°C | | 0.6 | 2.4 | mV |
| | | | Full | | | 2.8 | |
| Input Bias Current | I _B | V _{CM} = 0V | +25°C | | ±20 | ±200 | pA |
| Input Offset Current | I _{OS} | V _{CM} = 0V | +25°C | | ±20 | ±200 | pA |
| Maximum Input Difference Bias Current | I _{ID} | V _S = ±18V, V _{ID} = ±18V | +25°C | | 2.2 | 4 | μA |
| | | | Full | | | 5 | |
| Input Common Mode Voltage Range ⁽¹⁾ | V _{CM} | | Full | -V _S | | (+V _S) - 1.5V | V |
| Common Mode Rejection Ratio | CMRR | V _S = ±18V, V _{CM} = (-V _S) to (+V _S) - 1.5V | +25°C | 90 | 116 | | dB |
| | | | Full | 87 | | | |
| Power Supply Rejection Ratio | PSRR | V _S = 2.8V to 36V | +25°C | 96 | 116 | | dB |
| | | | Full | 93 | | | |
| Large-Signal Differential Voltage Amplification | A _{VD} | V _S = 36V, V _{OUT} = 0.1V to 28.8V, R _L = 120kΩ to V _S | +25°C | 90 | 100 | | dB |
| | | | Full | 85 | | | |
| Output Voltage Swing from Rail | V _{OL} | I _{SINK} = 8mA, V _{ID} = -0.2V | +25°C | | 210 | 280 | mV |
| | | | Full | | | 400 | |
| Output Short-Circuit Current | I _{SINK} | V _{OL} = (-V _S) + 1.5V, V _{ID} = -0.2V | +25°C | 25 | 36 | | mA |
| High-Level Output Current | I _{OH} | V _{OH} = 2.8V, V _{ID} = 0.2V | +25°C | | 0.4 | 0.7 | μA |
| | | | Full | | | 1 | |
| | | | +25°C | | 6 | 8.5 | |
| | | | Full | | | 35 | |
| Supply Current | I _S | I _{OUT} = 0mA | +25°C | | 180 | 210 | μA |
| | | | Full | | | 250 | |
| Voltage Reference | V _{REF} | I _{REF} = 0 to 5mA | +25°C | (-V _S) + 1.205 | (-V _S) + 1.225 | (-V _S) + 1.245 | V |

SWITCHING CHARACTERISTICS

(At T_A = +25°C, V_S = ±2.5V, C_L = 15pF ⁽²⁾, unless otherwise noted.)

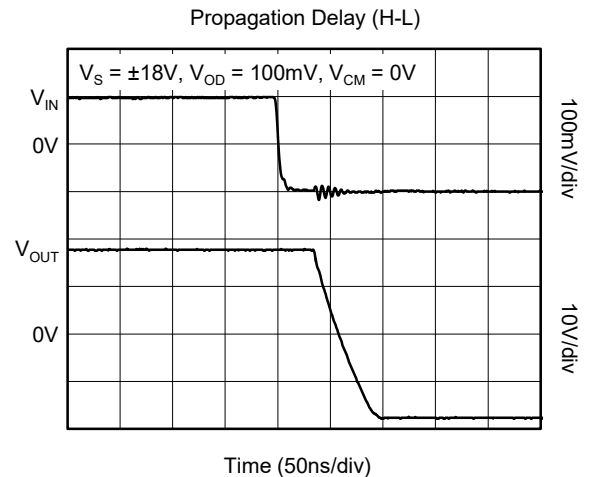
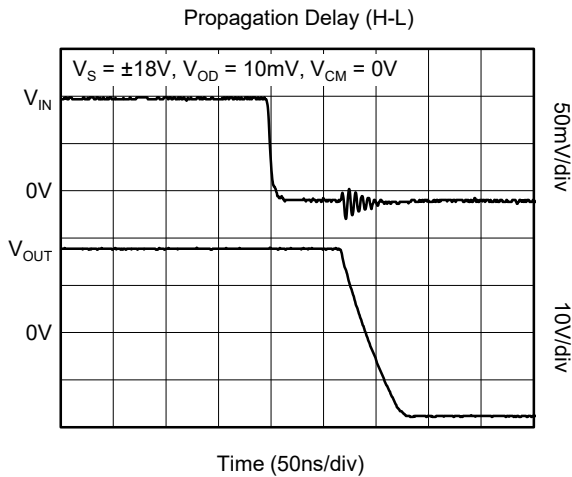
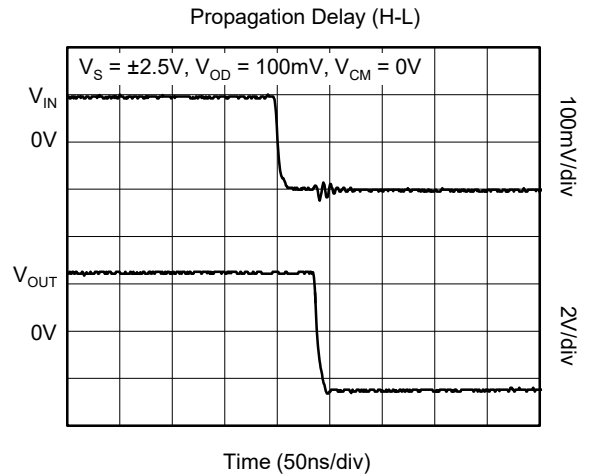
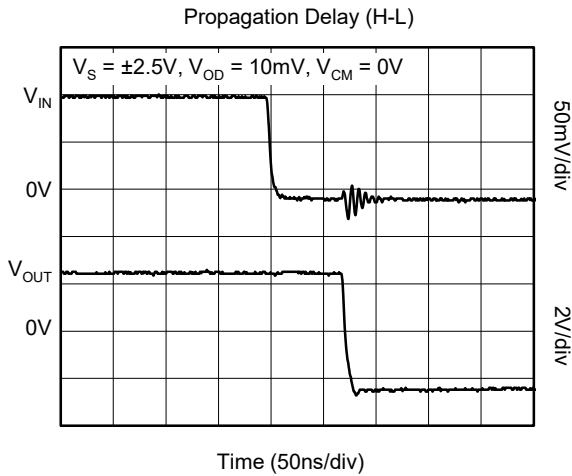
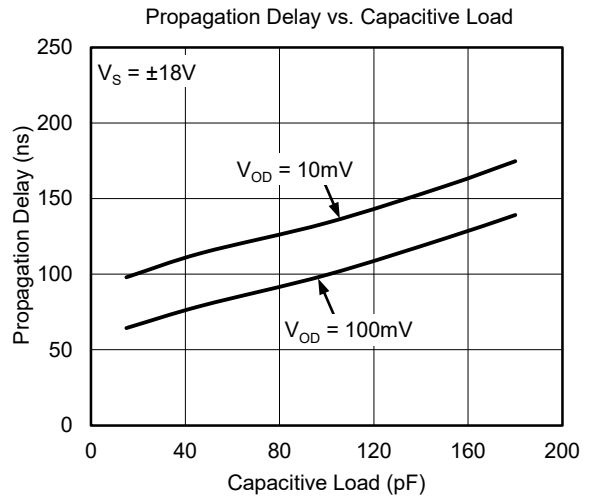
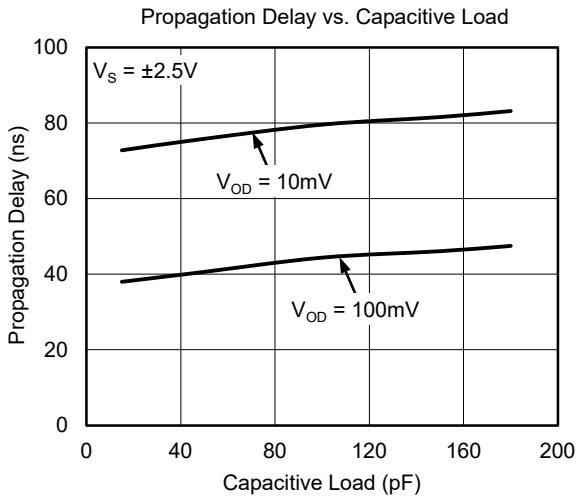
| PARAMETER | SYMBOL | CONDITIONS | TEMP | MIN | TYP | MAX | UNITS |
|---------------------------------|-------------------|-------------------|-------|-----|-----|-----|-------|
| Propagation Delay (High to Low) | t _{PHL} | Overdrive = 10mV | +25°C | | 85 | | ns |
| | | Overdrive = 100mV | +25°C | | 50 | | ns |
| Fall Time | t _{FALL} | Overdrive = 10mV | +25°C | | 12 | | ns |
| | | Overdrive = 100mV | +25°C | | 12 | | ns |

NOTES:

- 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.
- C_L: Load capacitance (jig and probe included).

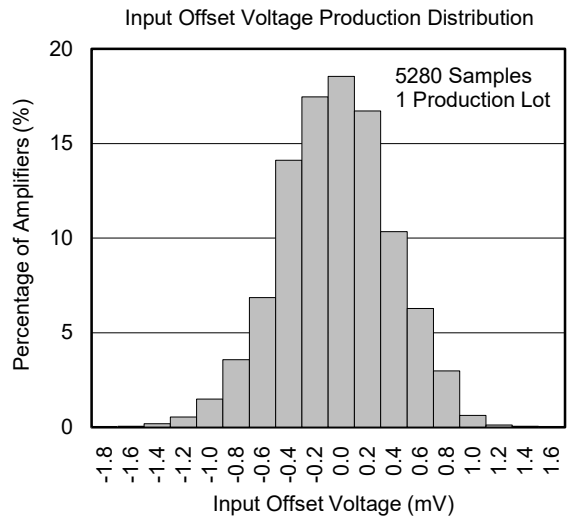
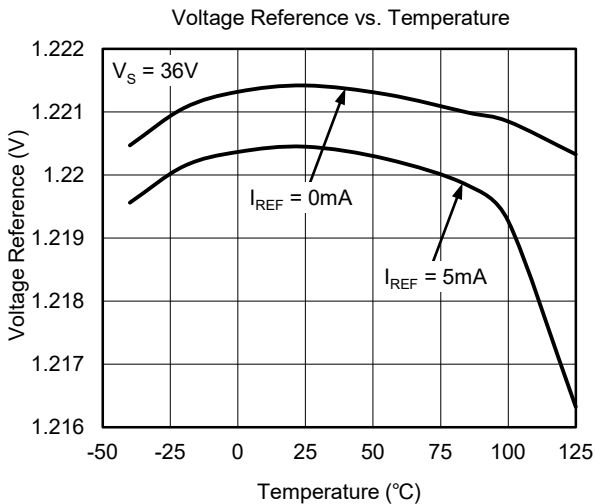
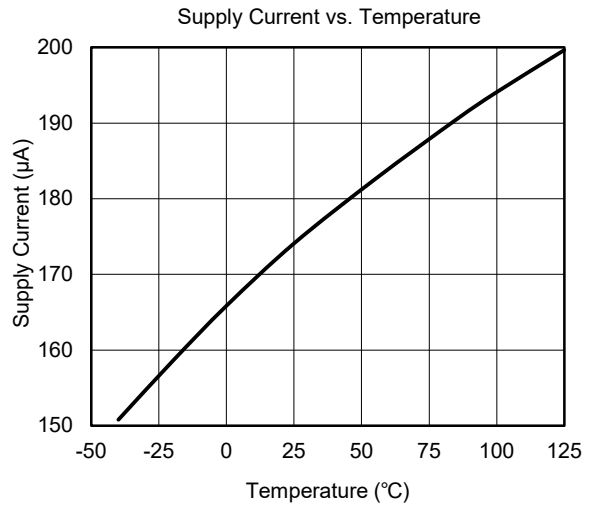
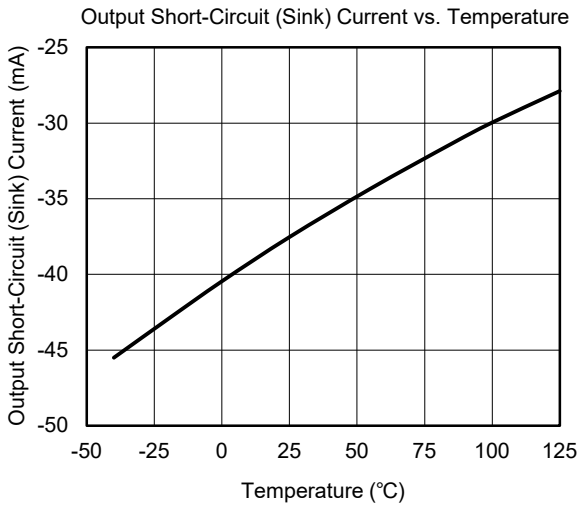
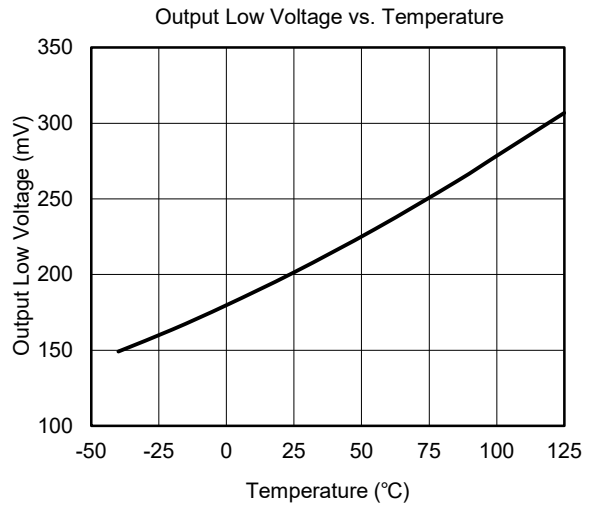
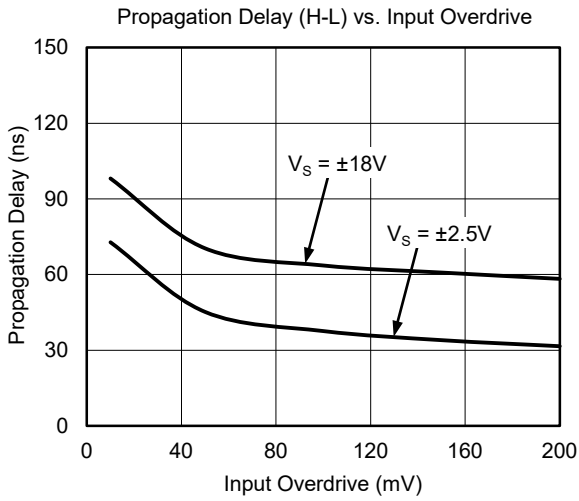
TYPICAL PERFORMANCE CHARACTERISTICS

At $T_A = +25^\circ\text{C}$, $V_S = \pm 18\text{V}$ and $C_L = 15\text{pF}$, unless otherwise noted.



TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At $T_A = +25^\circ\text{C}$, $V_S = \pm 18\text{V}$ and $C_L = 15\text{pF}$, unless otherwise noted.



DETAILED DESCRIPTION

The SGM8771 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 SGM8771 can be compatible with CMOS and TTL logics.

Output Structure

In Figure 1, the SGM8771 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.

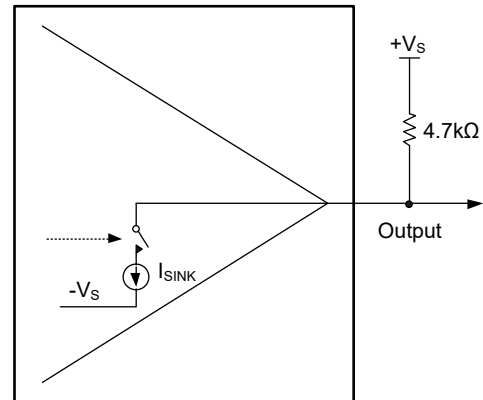


Figure 1. Open-Drain Output Structure

APPLICATION INFORMATION

Layout and Bypassing

Good power supply decoupling, layout and grounding are very important for SGM8771 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. SGM8771 must be soldered directly to the PCB and the socket is not recommended.

REVISION HISTORY

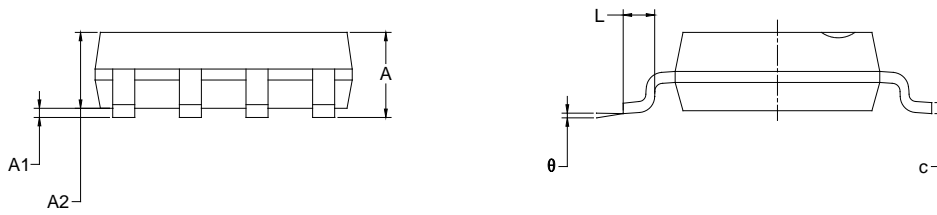
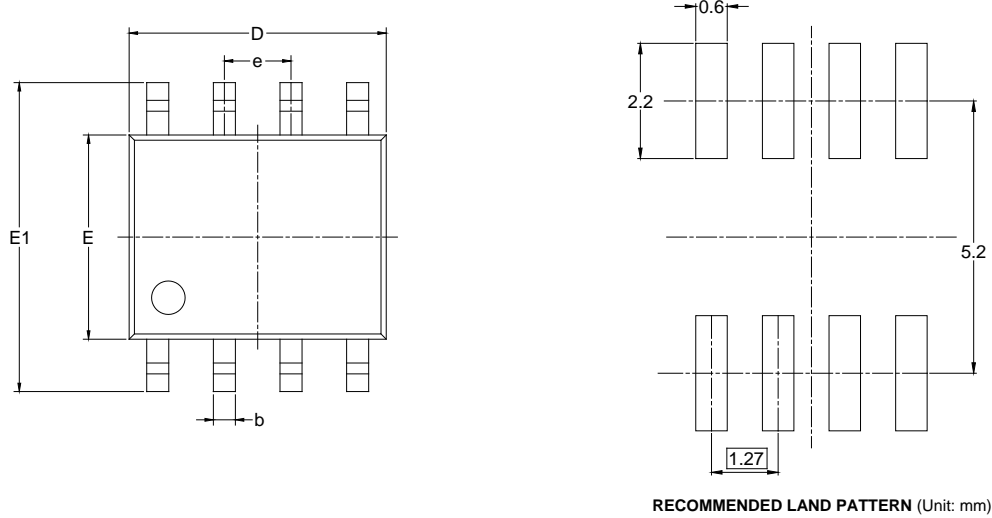
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

| OCTOBER 2023 – REV.A to REV.A.1 | Page |
|---|-------------|
| Updated Absolute Maximum Ratings section..... | 2 |
| Updated Recommended Operating Conditions section..... | 2 |
| Updated Pin Configurations section..... | 3 |
| Updated Pin Description section..... | 3 |
| Updated Electrical Characteristics section..... | 4 |

| Changes from Original (DECEMBER 2019) to REV.A | Page |
|---|-------------|
| Changed from product preview to production data..... | All |

PACKAGE OUTLINE DIMENSIONS

SOIC-8

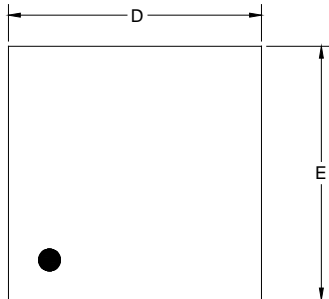


| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|------------------------------|-------|-------------------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 1.350 | 1.750 | 0.053 | 0.069 |
| A1 | 0.100 | 0.250 | 0.004 | 0.010 |
| A2 | 1.350 | 1.550 | 0.053 | 0.061 |
| b | 0.330 | 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° |

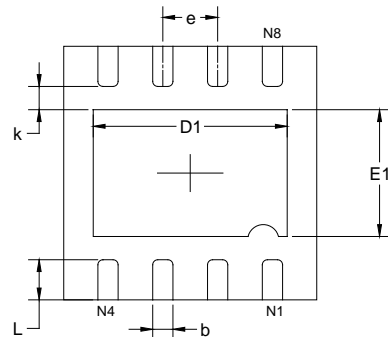
- NOTES:
 1. Body dimensions do not include mode flash or protrusion.
 2. This drawing is subject to change without notice.

PACKAGE OUTLINE DIMENSIONS

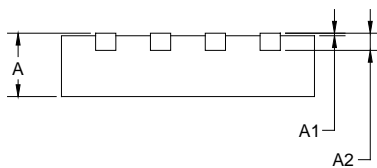
TDFN-3x3-8L



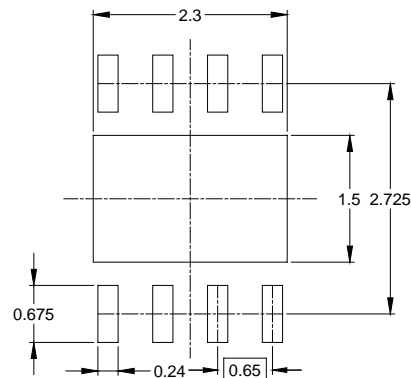
TOP VIEW



BOTTOM VIEW



SIDE VIEW



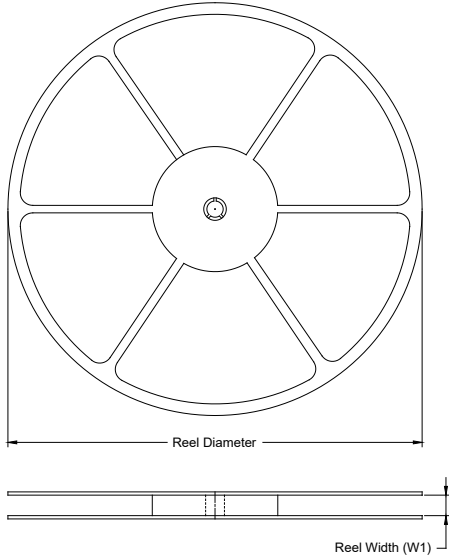
RECOMMENDED LAND PATTERN (Unit: mm)

| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|------------------------------|-------|-------------------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.700 | 0.800 | 0.028 | 0.031 |
| A1 | 0.000 | 0.050 | 0.000 | 0.002 |
| A2 | 0.203 REF | | 0.008 REF | |
| D | 2.900 | 3.100 | 0.114 | 0.122 |
| D1 | 2.200 | 2.400 | 0.087 | 0.094 |
| E | 2.900 | 3.100 | 0.114 | 0.122 |
| E1 | 1.400 | 1.600 | 0.055 | 0.063 |
| k | 0.200 MIN | | 0.008 MIN | |
| b | 0.180 | 0.300 | 0.007 | 0.012 |
| e | 0.650 TYP | | 0.026 TYP | |
| L | 0.375 | 0.575 | 0.015 | 0.023 |

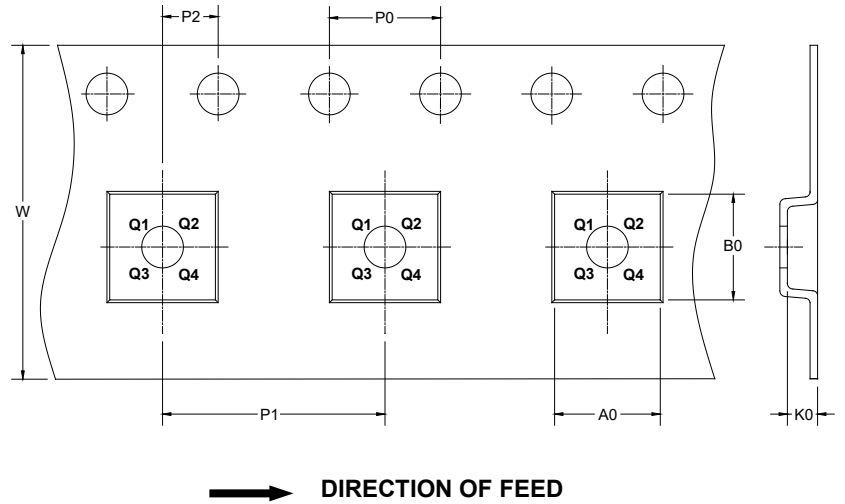
NOTE: This drawing is subject to change without notice.

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 |
| TDFN-3×3-8L | 13" | 12.4 | 3.35 | 3.35 | 1.13 | 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