



SGM8418-1/SGM8418-2/SGM8418-4 24V, 3A Peak Output Current Rail-to-Rail I/O Operational Amplifiers

GENERAL DESCRIPTION

The SGM8418-1(single), SGM8418-2 (dual) and SGM8418-4 (quad) are high slew rate, low power operational amplifiers optimized for high voltage systems. These devices can operate on single or dual power supply. They support rail-to-rail input and output operation.

The SGM8418-1/2/4 feature 10mV maximum offset voltage, 3A peak output current, and 65V/ μ s high slew rate. The combination of characteristics makes them suitable for TFT-LCDs.

The SGM8418-1 is available in a Green TDFN-3 \times 3-8L package. The SGM8418-2 is available in a Green MSOP-8 (Exposed Pad) package. The SGM8418-4 is available in a Green TSSOP-14 (Exposed Pad) package. They are specified over the -40°C to +85°C temperature range.

FEATURES

- **Peak Output Current: 3A**
- **High Slew Rate: 65V/ μ s**
- **Unity-Gain Stable**
- **Rail-to-Rail Input and Output**
- **Supply Voltage Range: 4.5V to 26.5V**
- **-40°C to +85°C Operating Temperature Range**
- **Small Packaging:**
 - SGM8418-1 Available in a Green TDFN-3 \times 3-8L Package**
 - SGM8418-2 Available in a Green MSOP-8 (Exposed Pad) Package**
 - SGM8418-4 Available in a Green TSSOP-14 (Exposed Pad) Package**

APPLICATIONS

TFT-LCD Panels
LCD TVs
Monitors
Laptops

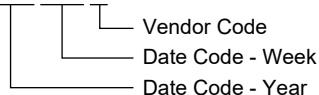
PACKAGE/ORDERING INFORMATION

| MODEL | PACKAGE DESCRIPTION | SPECIFIED TEMPERATURE RANGE | ORDERING NUMBER | PACKAGE MARKING | PACKING OPTION |
|-----------|---------------------------|-----------------------------|---------------------|-----------------------------|---------------------|
| SGM8418-1 | TDFN-3×3-8L | -40°C to +85°C | SGM8418-1YTDB8G/TR | SGM G41DB XXXXX | Tape and Reel, 4000 |
| SGM8418-2 | MSOP-8 (Exposed Pad) | -40°C to +85°C | SGM8418-2YPMS8G/TR | SGM84182 YPMS8 XXXXX | Tape and Reel, 4000 |
| SGM8418-4 | TSSOP-14 (Exposed Pad) | -40°C to +85°C | SGM8418-4YPTS14G/TR | SGM84184 YPTS14 XXXXX | Tape and Reel, 4000 |

MARKING INFORMATION

NOTE: XXXXX = Date 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 to -V _S | -0.3V to 28V |
| Input/Output Voltage to -V _S | -0.3V to (+V _S) + 0.3V |
| +IN to -IN | ±5V |
| Package Thermal Resistance | |
| TDFN-3×3-8L, θ _{JA} | 84°C/W |
| MSOP-8 (Exposed Pad), θ _{JA} | 82°C/W |
| TSSOP-14 (Exposed Pad), θ _{JA} | 50°C/W |
| Junction Temperature..... | +150°C |
| Storage Temperature Range | -65°C to +150°C |
| Lead Temperature (Soldering, 10s)..... | +260°C |
| ESD Susceptibility | |
| HBM..... | 8000V |
| MM..... | 300V |
| CDM | 1000V |

RECOMMENDED OPERATING CONDITIONS

| | |
|-----------------------------------|----------------|
| Supply Voltage Range | 4.5V to 26.5V |
| 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

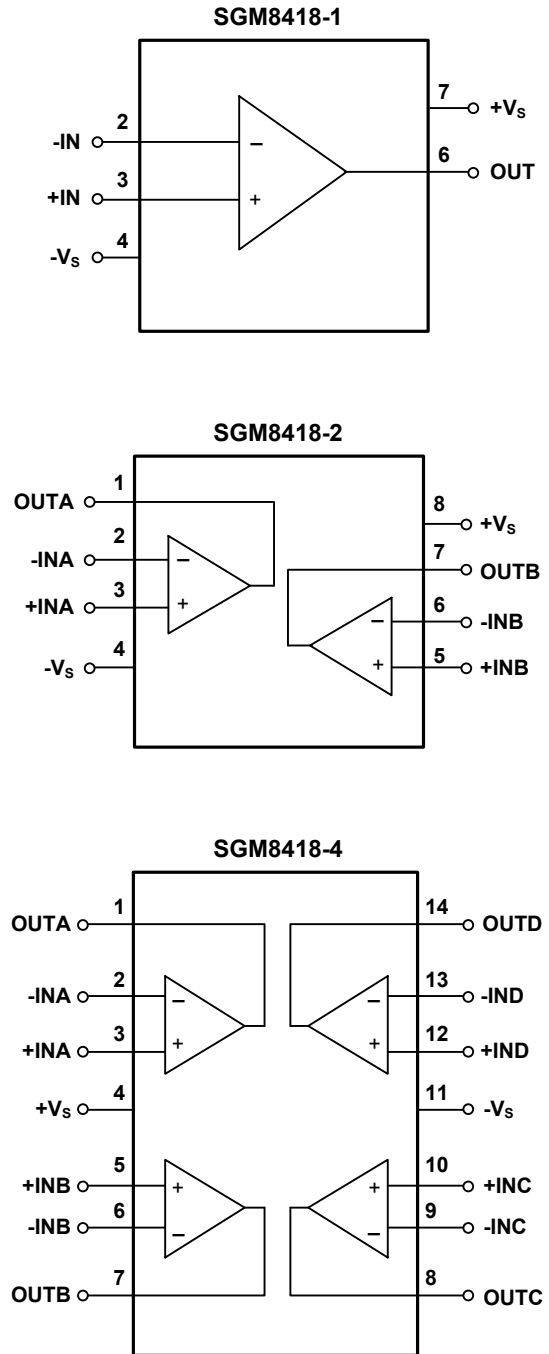
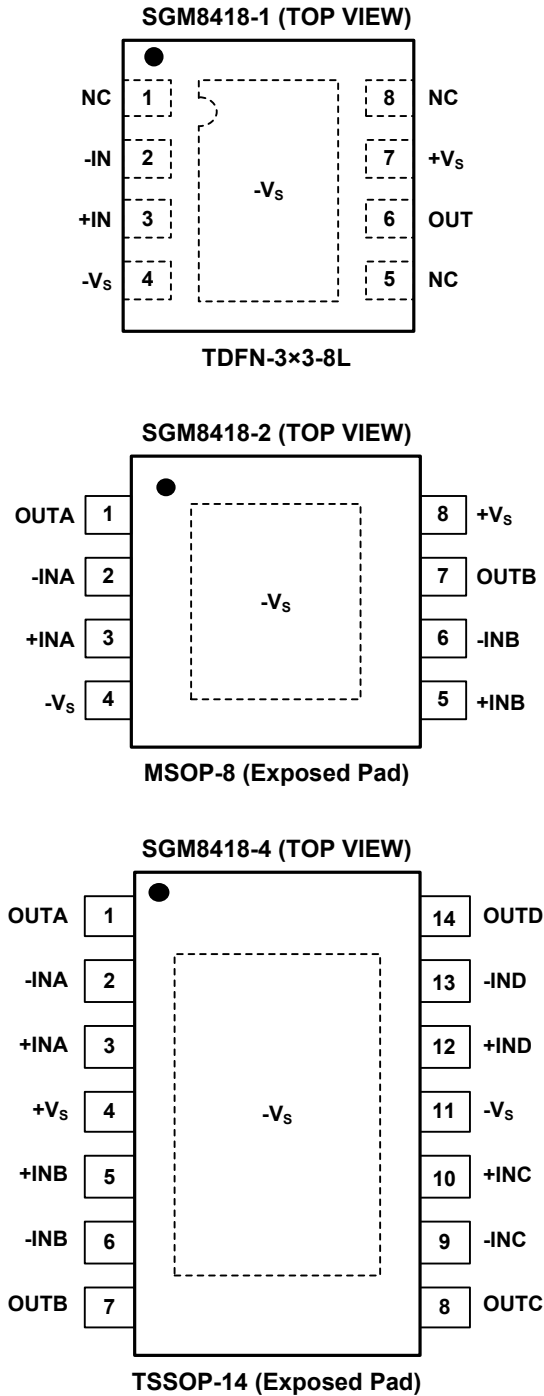
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance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

FUNCTIONAL BLOCK DIAGRAMS



NOTE: For all packages, connect thermal die pad to -V_s. Connect it to -V_s plane to maximize thermal performance.

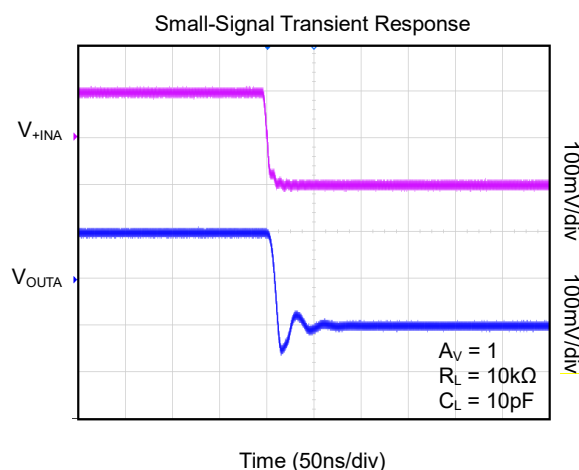
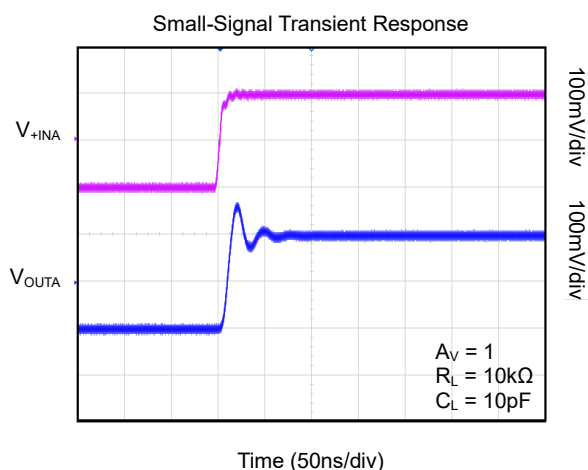
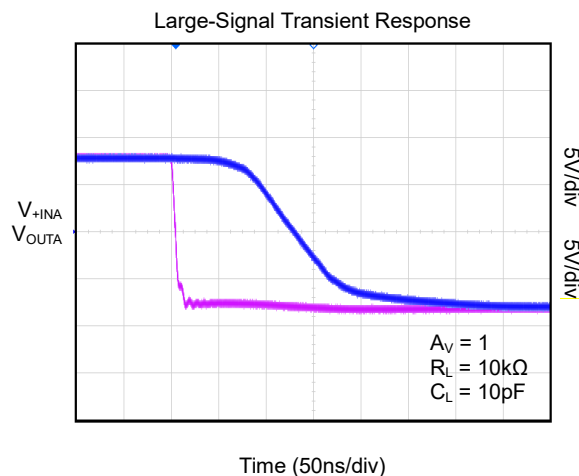
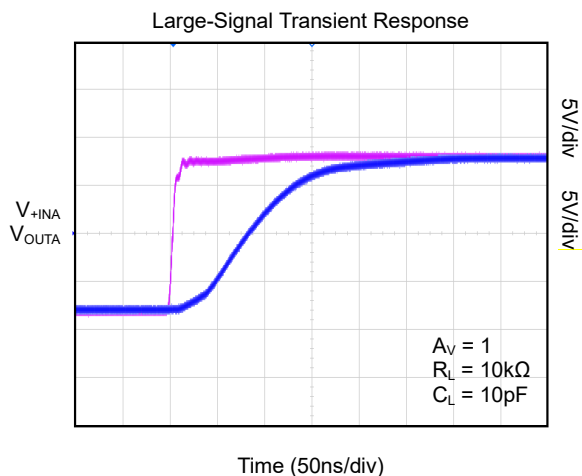
ELECTRICAL CHARACTERISTICS

($+V_S = 16V$, $-V_S = 0V$, $+V_{IN} = V_{OUT} = +V_S/2$, typical values are at $T_A = +25^\circ C$, unless otherwise specified.)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|-------------------------------------|--------------------------|--|------------------|-----------------|----------------|------------------|
| Input Characteristics | | | | | | |
| Input Offset Voltage | V_{OS} | $V_{CM} = +V_S/2$ | | 2 | 10 | mV |
| Input Offset Voltage Drift | $\Delta V_{OS}/\Delta T$ | $V_{CM} = +V_S/2$ | | 3.6 | | $\mu V/^\circ C$ |
| Input Bias Current | I_B | $V_{CM} = +V_S/2$ | | 1 | | nA |
| Load Regulation | ΔV_{LOAD} | $I_{OUT} = 0mA$ to $-80mA$ | | 0.01 | | mV/mA |
| | | $I_{OUT} = 0mA$ to $80mA$ | | -0.01 | | |
| Input Common Mode Voltage Range | V_{CM} | | -0.1 | | $(+V_S) + 0.1$ | V |
| Common Mode Rejection Ratio | CMRR | $-0.1V \leq V_{CM} \leq (+V_S) + 0.1V$ | | 72 | | dB |
| Open-Loop Voltage Gain | A_{OL} | $0.5V \leq V_{OUT} \leq (+V_S) - 0.5V$ | | 120 | | dB |
| Output Characteristics | | | | | | |
| Low Output Voltage Swing from Rail | V_{OL} | $I_L = -50mA$ | | 0.07 | 0.115 | V |
| High Output Voltage Swing from Rail | V_{OH} | $I_L = 50mA$ | $(+V_S) - 0.155$ | $(+V_S) - 0.11$ | | V |
| Transient Peak Output Current | I_{PK} | | | ± 3 | | A |
| Continuous Output Current | I_{OUT} | | | ± 400 | | mA |
| Power Supply | | | | | | |
| Supply Voltage Range | | | 4.5 | | 26.5 | V |
| Power Supply Rejection Ratio | PSRR | $+V_S = 4.5V$ to $26.5V$, $V_{CM} = 3V$ | | 94 | | dB |
| Quiescent Current/Amplifier | I_Q | No load | | 4.8 | | mA |
| Dynamic Performance | | | | | | |
| Slew Rate | SR | 4V step, $C_L = 50pF$, $R_L = 10k\Omega$, 20% to 80%, $A_V = 1$ | | 65 | | V/ μs |
| Settling Time to $\pm 0.1\%$ | t_s | $A_V = 1$, $V_{OUT} = 2V$ step, $R_L = 10k\Omega$, $C_L = 10pF$ | | 140 | | ns |
| -3dB Bandwidth | BW | $R_L = 10k\Omega$, $C_L = 10pF$ | | 75 | | MHz |
| Gain-Bandwidth Product | GBP | $R_L = 10k\Omega$, $C_L = 10pF$ | | 28 | | MHz |
| Phase Margin | | $R_L = 10k\Omega$, $C_L = 10pF$ | | 33 | | $^\circ$ |
| Noise Performance | | | | | | |
| Input Voltage Noise Density | e_n | $f = 1kHz$ | | 115 | | nV/ \sqrt{Hz} |
| Thermal Protection | | | | | | |
| Thermal Shutdown Temperature | T_{SHDN} | | | 150 | | $^\circ C$ |
| Thermal Shutdown Hysteresis | ΔT_{SHDN} | | | 25 | | $^\circ C$ |

TYPICAL PERFORMANCE CHARACTERISTICS

At $T_A = +25^\circ\text{C}$, $+V_S = 16\text{V}$, $-V_S = 0\text{V}$, unless otherwise specified.



APPLICATION INFORMATION

The SGM8418-1/2/4 are specifically designed to drive high current load. These devices support rail-to-rail input and output operation, and consume low quiescent current. They can also provide a high slew rate. The combination of characteristics makes SGM8418-1/2/4 suitable for LCD applications.

Operating Voltage

The SGM8418-1/2/4 are guaranteed to operate from 4.5V to 26.5V, and the operation is extremely stable over the whole specified range of the temperature. The output voltage swing can be closer to the supply rail by reducing the load current.

LCD Panel Application

The SGM8418-1/2/4 can provide optimal performance in LCD V_{COM} buffer. They feature $\pm 3A$ transient peak source/sink current.

Output Current Limit

The SGM8418-1/2/4 can drive $\pm 3A$ transient peak output current. These devices have a $\pm 3A$ (TYP) current limit, which is accomplished with the characteristics of the internal metal interconnects. Maximum reliability is maintained if the output continuous current never exceeds $\pm 400mA$.

Thermal Consideration

When operating the devices, the users need to make sure that the junction temperature is below the absolute maximum one. The junction temperature is increasing because the power dissipation is higher than before. And a lot of possibilities can cause the thermal considerations, such as the width of trace in PCB, the package of the devices, the gap between ambient and junction temperature and rate of environmental airflow.

The following equation indicates the calculation of power dissipation:

$$P_{D(MAX)} = (T_{J(MAX)} - T_A) / \theta_{JA} \quad (1)$$

where:

$T_{J(MAX)}$ = Maximum junction temperature.

T_A = Ambient temperature.

θ_{JA} = Junction to ambient thermal resistance.

It is recommended that the junction temperature should not exceed $+125^\circ C$ for normal operation. The parameter of ambient thermal resistance is determined by the width of trace in PCB layout.

In addition, the ambient temperature and thermal resistance will affect the power dissipation of SGM8418-1/2/4.

Layout

For the circuits with high power path, a good PCB design is essential. It is recommended to use the following layout method to improve the performance of SGM8418-1/2/4 at most.

- ◆ The power component should be close enough to SGM8418-1/2/4 for better performance. Also, if the high current is necessary, the corresponding trace in PCB should be short and wide.

- ◆ For some applications such as filtering, a series resistor is necessary to be added at the output of the devices.

- ◆ Choosing a suitable bypass capacitor can enhance the stability when driving the loads with high transient. For single-supply operation, the bypass capacitor should be placed as close to $+V_S$ pin as possible. For dual-supply operation, both $+V_S$ and $-V_S$ supplies should be bypassed to ground with separate $0.1\mu F$ ceramic capacitors. Using a $10\mu F$ tantalum capacitor is a good choice to improve the operating stability of the devices when driving high transient load.

- ◆ A $0.1\mu F$ capacitor should be connected with $+IN$ pin to GND for better operation of SGM8418-1/2/4 and the distance between this capacitor and $+IN$ pin should be minimized.

- ◆ It is recommended to connect exposed pad to $-V_S$ directly in the PCB.

REVISION HISTORY

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

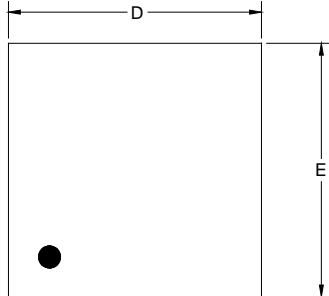
| JULY 2023 – REV.A.1 to REV.A.2 | Page |
|--|-------------|
| Updated Package Outline Dimensions section | 10 |
| Updated Tape and Reel Information section | 11 |

| JULY 2020 – REV.A to REV.A.1 | Page |
|---|-------------|
| Updated TSSOP-14 (Exposed Pad) package | 10 |
| Updated Tape and Reel Information section | 11 |

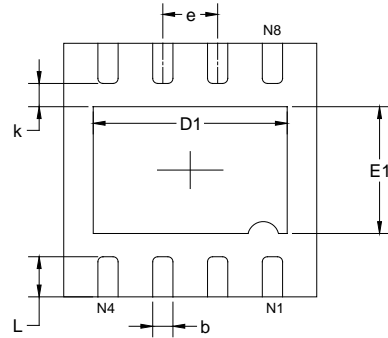
| Changes from Original (MAY 2016) to REV.A | Page |
|---|-------------|
| Changed from product preview to production data | All |

PACKAGE OUTLINE DIMENSIONS

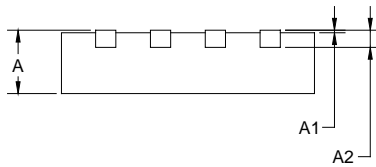
TDFN-3x3-8L



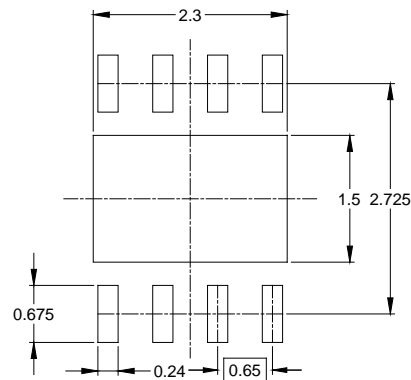
TOP VIEW



BOTTOM VIEW



SIDE VIEW



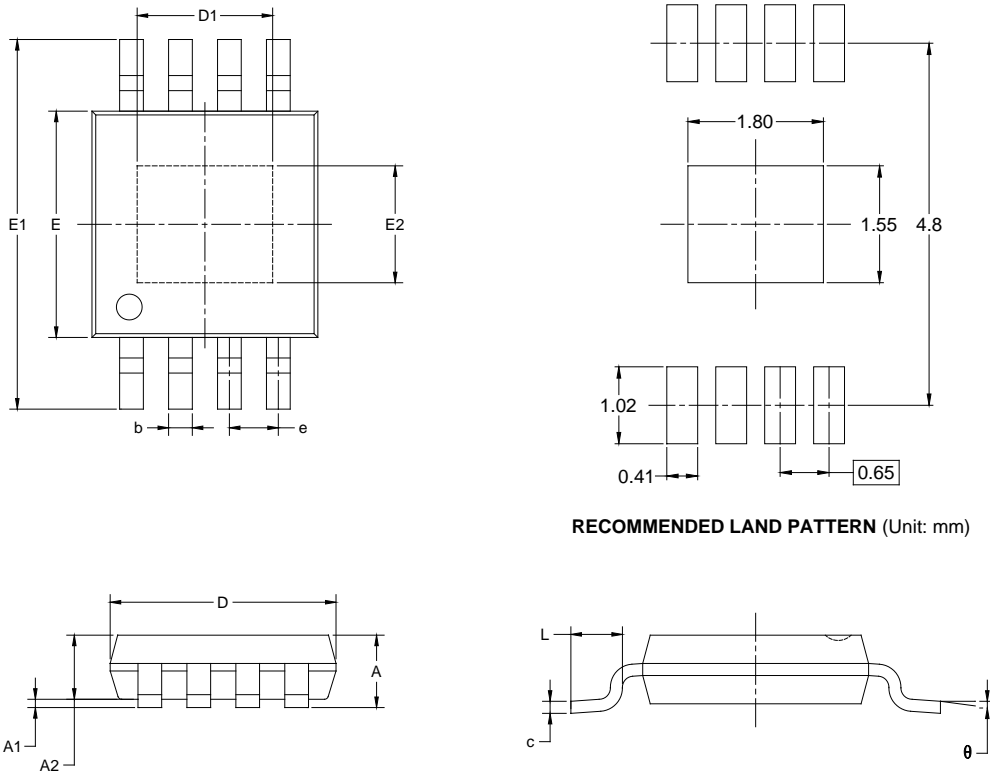
RECOMMENDED LAND PATTERN (Unit: mm)

| 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.

PACKAGE OUTLINE DIMENSIONS

MSOP-8 (Exposed Pad)



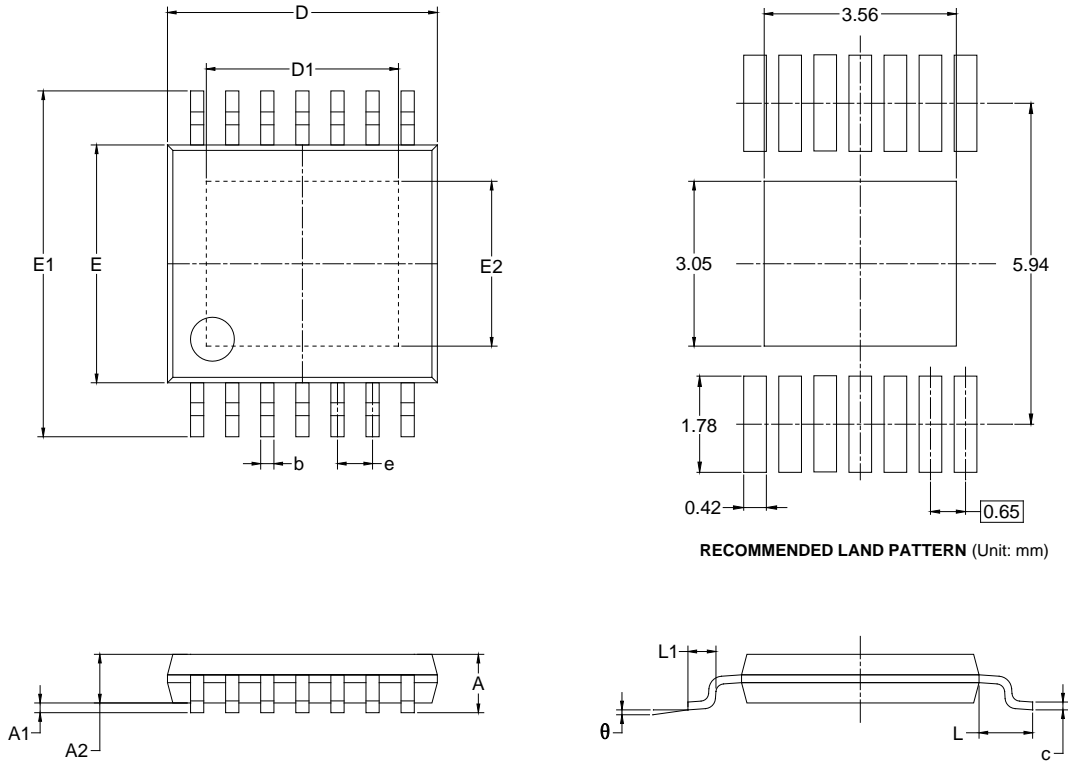
RECOMMENDED LAND PATTERN (Unit: mm)

| 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 |
| D1 | 1.700 | 1.900 | 0.067 | 0.075 |
| e | 0.65 BSC | | 0.026 BSC | |
| E | 2.900 | 3.100 | 0.114 | 0.122 |
| E1 | 4.750 | 5.050 | 0.187 | 0.199 |
| E2 | 1.450 | 1.650 | 0.057 | 0.065 |
| L | 0.400 | 0.800 | 0.016 | 0.031 |
| θ | 0° | 6° | 0° | 6° |

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

PACKAGE OUTLINE DIMENSIONS

TSSOP-14 (Exposed Pad)



RECOMMENDED LAND PATTERN (Unit: mm)

| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|----------|------------------------------|-------|-------------------------|-------|
| | MIN | MAX | MIN | MAX |
| A | | 1.200 | | 0.047 |
| A1 | 0.050 | 0.150 | 0.002 | 0.006 |
| A2 | 0.800 | 1.050 | 0.031 | 0.041 |
| b | 0.190 | 0.300 | 0.007 | 0.012 |
| c | 0.090 | 0.200 | 0.004 | 0.008 |
| D | 4.900 | 5.100 | 0.193 | 0.201 |
| D1 | 3.300 | 3.660 | 0.130 | 0.144 |
| E | 4.300 | 4.500 | 0.169 | 0.177 |
| E1 | 6.250 | 6.550 | 0.246 | 0.258 |
| E2 | 2.900 | 3.150 | 0.114 | 0.124 |
| e | 0.650 BSC | | 0.026 BSC | |
| L | | 1.000 | | 0.039 |
| L1 | 0.450 | 0.750 | 0.018 | 0.030 |
| θ | 0° | 8° | 0° | 8° |

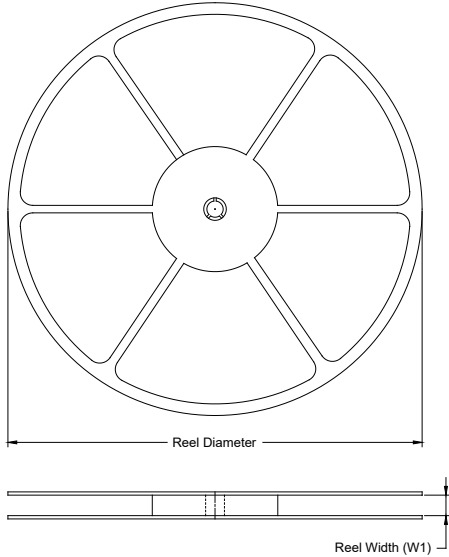
NOTES:

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

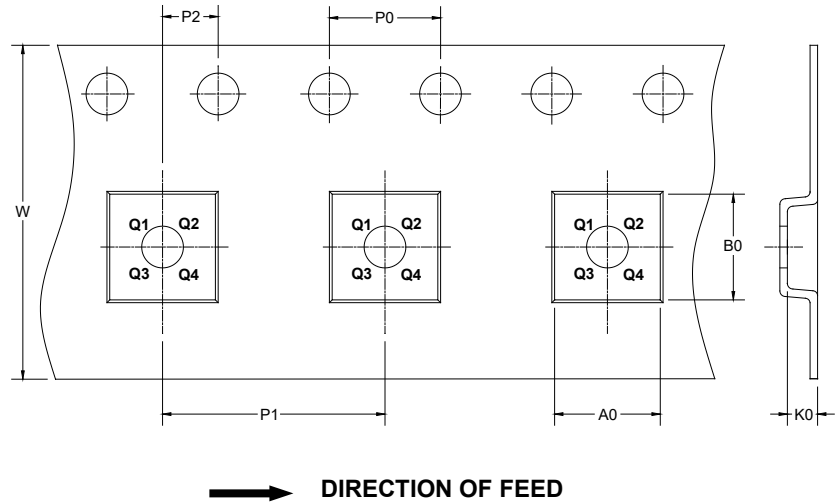
PACKAGE INFORMATION

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 |
|------------------------|---------------|--------------------|---------|---------|---------|---------|---------|---------|--------|---------------|
| TDFN-3×3-8L | 13" | 12.4 | 3.35 | 3.35 | 1.13 | 4.0 | 8.0 | 2.0 | 12.0 | Q1 |
| MSOP-8 (Exposed Pad) | 13" | 12.4 | 5.20 | 3.30 | 1.50 | 4.0 | 8.0 | 2.0 | 12.0 | Q1 |
| TSSOP-14 (Exposed Pad) | 13" | 16.4 | 6.80 | 5.40 | 1.30 | 4.0 | 8.0 | 2.0 | 16.0 | Q1 |
| TSSOP-14 (Exposed Pad) | 13" | 12.4 | 6.80 | 5.40 | 1.30 | 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