



SGM9149

13MHz, Triple-Channel, 5th-Order, Standard Definition Video Filter Driver

PRODUCT DESCRIPTION

The SGM9149 is a low voltage, triple channel video amplifier with integrated reconstruction filters and input clamps. Specially suited for standard definition video signals, this device is ideal for a wide range of television and set-top box applications.

SGM9149 offers 6dB gain rail-to-rail output driver and 5th-order output reconstruction filter on all three channels. It has a -3dB bandwidth of 13MHz and 61V/ μ s slew rate. SGM9149 provides improved image quality compared with passive LC filters and discrete drivers solution. Operating from single power supply ranging from 3.0V to 5.5V and sinking a low 21mA quiescent current, the SGM9149 is ideally suited for battery powered applications.

SGM9149 can be DC-coupled or AC-coupled with input video signal, such as the output stage of DAC to eliminate out-of-band noise. The output in SGM9149 can be configured as DC- or AC-coupled output.

The SGM9149 is available in Green SOIC-8 and MSOP-8 packages. It operates over an ambient temperature range of -40°C to +85°C.

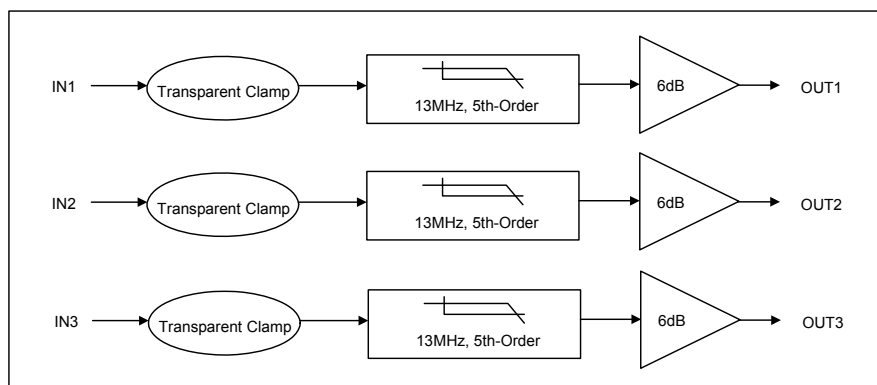
FEATURES

- Triple 5th-Order 13MHz (SD) Filters
- Transparent Input Clamping
- 6dB Output Driver Gain
- Rail-to-Rail Output
- Input Voltage Range Includes Ground
- AC- or DC-Coupled Inputs
- AC- or DC-Coupled Outputs
- Operates from 3.0V to 5.5V Power Supply
- Supply Current (7mA/Channel)
21mA Total Supply Current
- Available in Green SOIC-8 and MSOP-8 Packages
- -40°C to +85°C Operating Temperature Range

APPLICATIONS

- Cable and Satellite Set-Top Boxes
- Video Amplifiers
- Communication Devices
- Personal Video Recorders
- Video on Demand
- DVD Players

BLOCK DIAGRAM

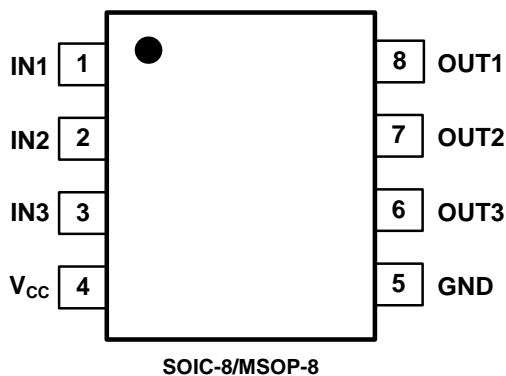


PACKAGE/ORDERING INFORMATION

| MODEL | PACKAGE DESCRIPTION | TEMPERATURE RANGE | ORDER NUMBER | MARKING INFORMATION | PACKAGE OPTION |
|---------|---------------------|-------------------|-----------------|--------------------------|---------------------|
| SGM9149 | SOIC-8 | -40°C to +85°C | SGM9149YS8G/TR | SGM 9149YS8 XXXXX | Tape and Reel, 2500 |
| | MSOP-8 | -40°C to +85°C | SGM9149YMS8G/TR | SGM9149 YMS8 XXXXX | Tape and Reel, 3000 |

NOTE: XXXXX = Date Code and Vendor Code.

PIN CONFIGURATIONS (TOP VIEW)



PIN DESCRIPTION

| PIN | NAME | FUNCTION |
|-----|-----------------|-----------------------------|
| 1 | IN1 | Video Input. Channel 1. |
| 2 | IN2 | Video Input. Channel 2. |
| 3 | IN3 | Video Input. Channel 3. |
| 4 | V _{CC} | Power Supply. |
| 5 | GND | Ground. |
| 6 | OUT3 | Filtered Output. Channel 3. |
| 7 | OUT2 | Filtered Output. Channel 2. |
| 8 | OUT1 | Filtered Output. Channel 1. |

ABSOLUTE MAXIMUM RATINGS

| | |
|---|--------------------------------------|
| Supply Voltage, V _{CC} to GND..... | 6V |
| Input Voltage..... | GND - 0.3V to V _{CC} + 0.3V |
| Storage Temperature Range | -65°C to +150°C |
| Junction Temperature | 150°C |
| Operating Temperature Range..... | -40°C to +85°C |
| Lead Temperature (Soldering 10s)..... | 260°C |
| ESD Susceptibility | |
| HBM | 8000V |
| MM | 400V |

NOTE:

Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

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.

SGMICRO reserves the right to make any change in circuit design, specification or other related things if necessary without notice at any time. Please contact SGMICRO sales office to get the latest datasheet.

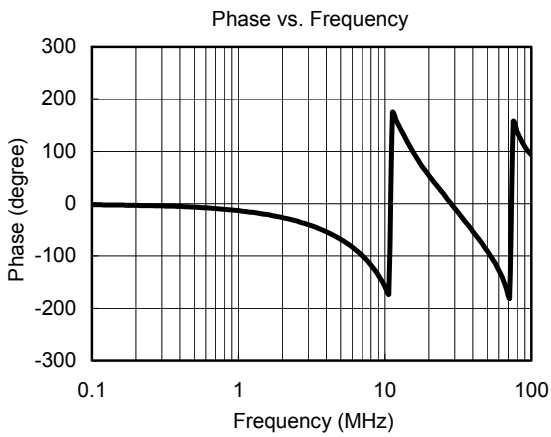
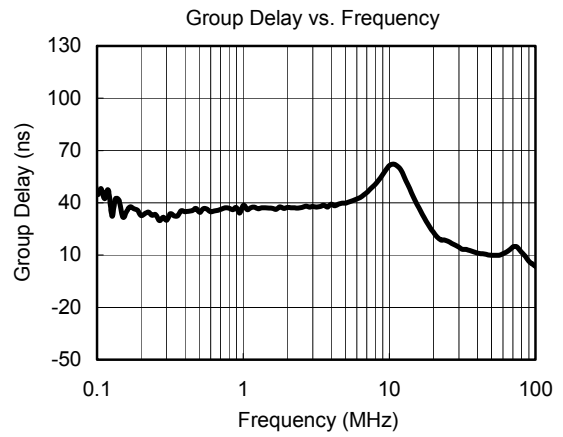
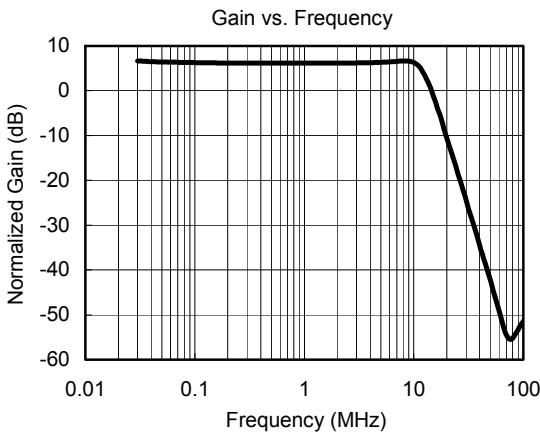
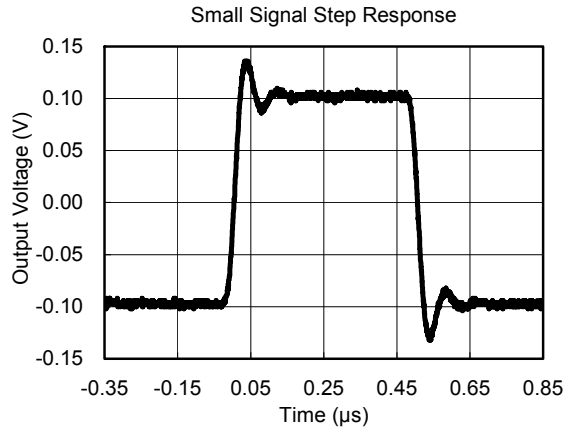
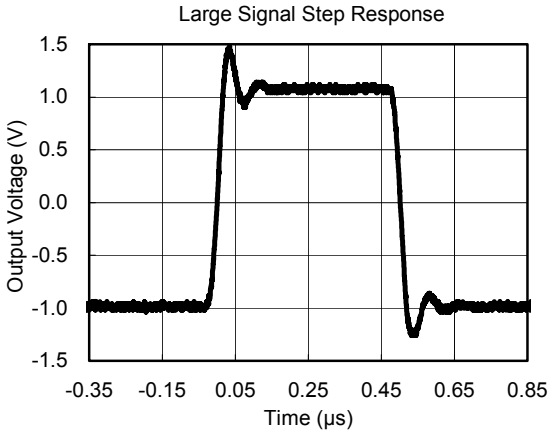
ELECTRICAL CHARACTERISTICS: $V_{CC} = 5.0V$

($T_A = +25^\circ C$, at $R_L = 150\Omega$ connected to GND, $V_{IN} = 1V_{PP}$ and $C_{IN} = 0.1\mu F$, all outputs AC-coupled with $220\mu F$, referenced to 400kHz, unless otherwise noted.)

| PARAMETER | CONDITIONS | MIN | TYP | MAX | UNITS |
|--|--|-----|------|------|------------|
| INPUT CHARACTERISTICS | | | | | |
| Output Level Shift Voltage (V_{OLS}) | $V_{IN} = 0V$, no load | | 370 | 570 | mV |
| Input Voltage Clamp (V_{CLAMP}) | $I_{IN} = -3.5mA$ | | -116 | | mV |
| Clamp Charge Current | $V_{IN} = V_{CLAMP} - 100mV$ | | -5.1 | | mA |
| Voltage Gain (A_v) | $R_L = 150\Omega$ | 5.6 | 6 | 6.4 | dB |
| OUTPUT CHARACTERISTICS | | | | | |
| Output Voltage High Swing | $V_{IN} = 3.0V$, $R_L = 150\Omega$ to GND | | 4.69 | | V |
| POWER SUPPLY | | | | | |
| Operating Voltage Range | | 3 | | 5.5 | V |
| Power Supply Rejection Ratio (PSRR) | $V_{CC} = 3.5V$ to $5.0V$ | | 50 | | dB |
| Quiescent Current (I_Q) | $V_{IN} = 0V$ | | 21 | 28.5 | mA |
| AC PERFORMANCE | | | | | |
| -0.1dB Bandwidth | $R_L = 150\Omega$ | | 10.7 | | MHz |
| -1dB Bandwidth | $R_L = 150\Omega$ | | 11.7 | | MHz |
| -3dB Bandwidth | $R_L = 150\Omega$ | | 13.2 | | MHz |
| Filter Response (Normalized Gain) | $f_{IN} = 27MHz$ | | 25.7 | | dB |
| Slew Rate | 2V output step, 80% to 20% | | 61 | | V/ μs |
| Differential Gain (DG) | PAL DC-coupled | | 0.29 | | % |
| | PAL AC-coupled | | 0.29 | | % |
| Differential Phase (DP) | PAL DC-coupled | | 0.60 | | $^\circ$ |
| | PAL AC-coupled | | 0.58 | | $^\circ$ |
| Group Delay Variation (D/DT) | Difference between 400kHz and 6.5MHz | | 5.2 | | ns |
| Crosstalk (Channel-to-Channel) | $f = 1MHz$ | | -64 | | dB |
| Fall Time | 2V output step, 80% to 20% | | 19.5 | | ns |
| Rise Time | 2V output step, 80% to 20% | | 19.8 | | ns |

TYPICAL PERFORMANCE CHARACTERISTICS

$T_A = +25^\circ\text{C}$, at $R_L = 150\Omega$ connected to GND, $V_{IN} = 1V_{PP}$ and $C_{IN} = 0.1\mu\text{F}$, all outputs AC-coupled with $220\mu\text{F}$, referenced to 400kHz, unless otherwise noted.



APPLICATION INFORMATION

Functional Description

SGM9149 operates from a single 3.0V to 5.5V supply. In application, SGM9149 is a fully integrated solution for filtering and buffering SDTV signals in front of video decoder or behind video encoder. For example, SGM9149 can replace three passive LC filters and three amplifier drivers at CVBS and S-video output side in set-top box and DVD player. This solution can help reduce PCB size and production cost, and it also improves video signal performance comparing with traditional design using discrete components. SGM9149 features a DC-coupled input buffer, a 5-pole low-pass filter to eliminate out-of-band noise of video encoder, and a gain of 6dB in the output amplifier to drive 75Ω load. The AC- or DC-coupled input buffer eliminates sync crush, droop, and field tilt. The output of SGM9149 also can be DC-coupled or AC-coupled.

Input Considerations

Besides AC coupling, the SGM9149 inputs also can be DC-coupled. In DC coupling application, no input coupling capacitors are needed because the amplitude of input video signal from DAC includes ground and extends up to 1.4V, and SGM9149 can be directly connected to the output of a single-supply, current-output DAC without any external bias network. In applications where DAC's output level exceeds the range from 0V to 1.4V, or SGM9149 is driven by an unknown external source or a SCART switch which has its own clamping circuit, AC coupling is needed.

Output Considerations

The SGM9149 outputs can be DC-coupled or AC-coupled. When input is 0V, the SGM9149 output voltage is 370mV typically. In DC coupling design, one 75Ω resistor is used to connect SGM9149's output pin with external load directly, and this serial back-termination resistor is used to match the impedance of the transmission line between SGM9149 and external load to cancel the signal reflection. The SGM9149 outputs can sink and source current allowing the device to be AC-coupled with external load. In AC coupling, at least 220μF capacitor will be used in order to eliminate field tilt.

Power-Supply Bypassing and Layout

Correct power supply bypassing is very important for optimizing video performance in design. One 0.1μF and one 10μF capacitors are always used to bypass V_{CC} pin of SGM9149. Place these two capacitors as close to the SGM9149 supply pin as possible. A large ground plane is also needed to ensure optimum performance. The input and output termination resistors should be placed as close to the related pins of SGM9149 as possible to avoid performance degradation. The PCB traces at the output side should have 75Ω characteristic impedance in order to match the 75Ω characteristic impedance of the cable connecting external load. In design, keep the board trace at the inputs and outputs of the SGM9149 as short as possible to minimize the parasitic stray capacitance and noise pickup.

TYPICAL APPLICATION

The following schematic in Figure 1 is normally used for AC-coupled output and DC-coupled input with DAC which has an output voltage range from 0V to 1.4V. AC-coupled output offers slightly lower power dissipation and high ESD protection ability.

The schematic in Figure 2 is also popular in design.

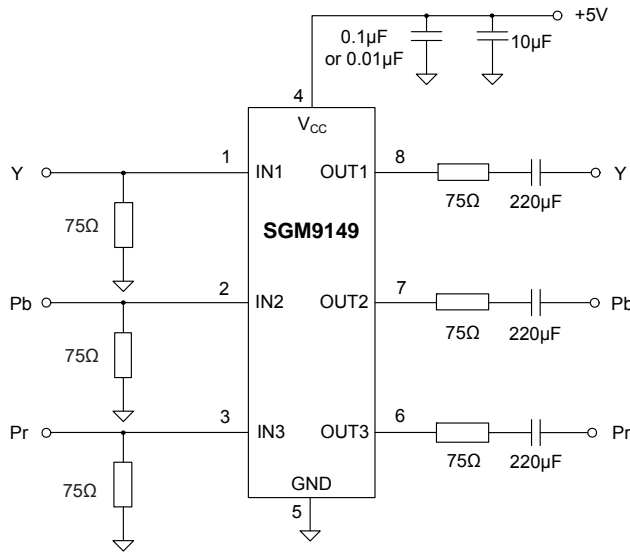


Figure 1. Input DC Coupling and Output AC Coupling Application Schematic

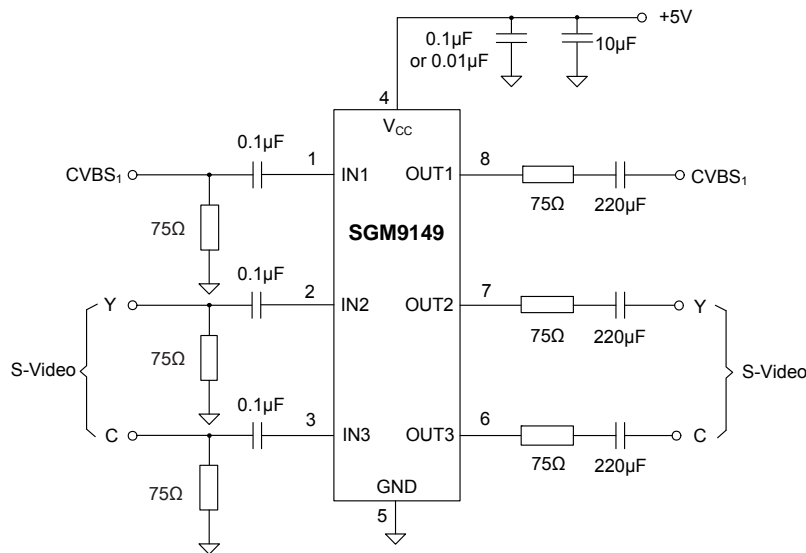
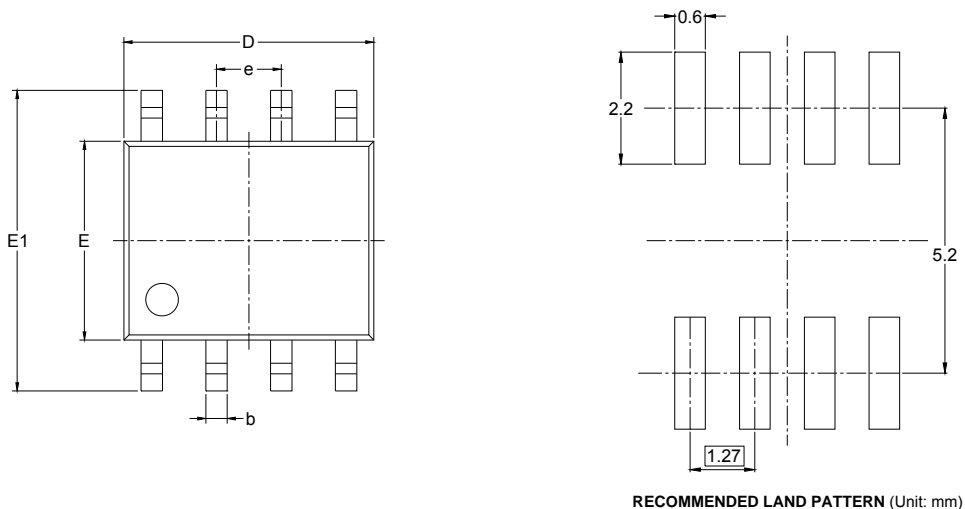


Figure 2. AC Coupling Application Schematic

NOTE:
1. Power supply V_{CC} must be sequenced on first before input video signals.

PACKAGE OUTLINE DIMENSIONS

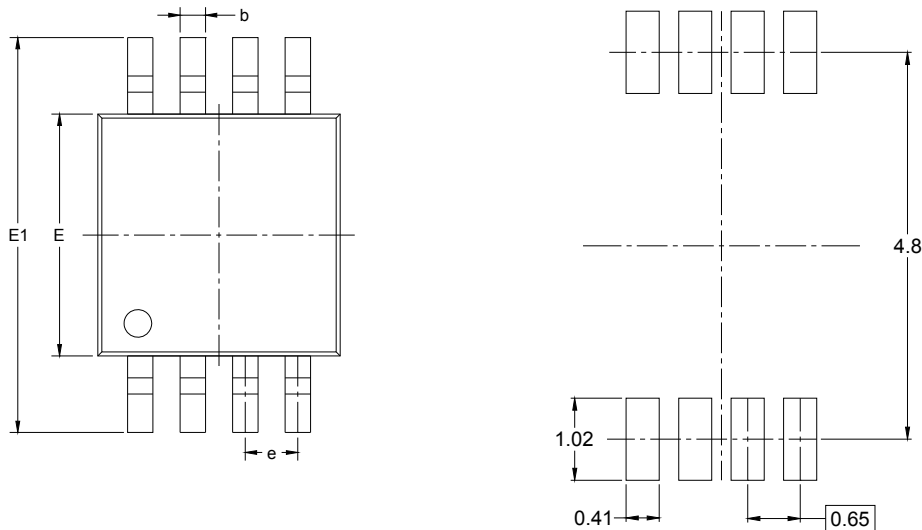
SOIC-8



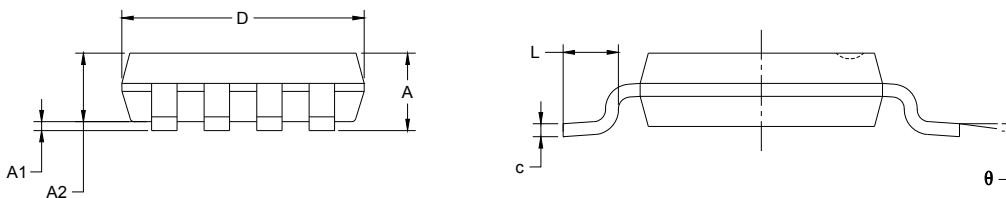
| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|----------|------------------------------|-------|-------------------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 1.350 | 1.750 | 0.053 | 0.069 |
| A1 | 0.100 | 0.250 | 0.004 | 0.010 |
| A2 | 1.350 | 1.550 | 0.053 | 0.061 |
| b |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



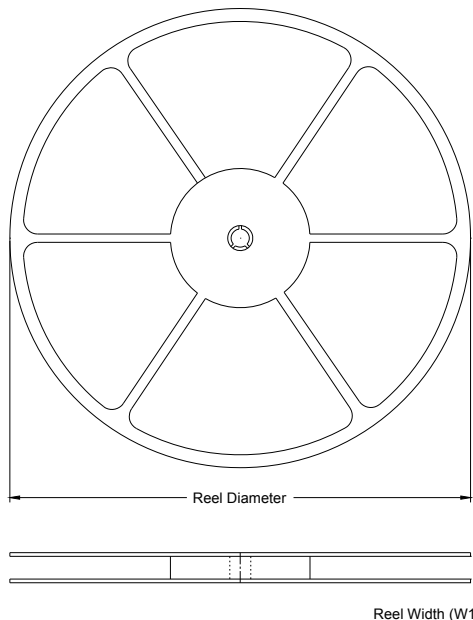
RECOMMENDED LAND PATTERN (Unit: mm)



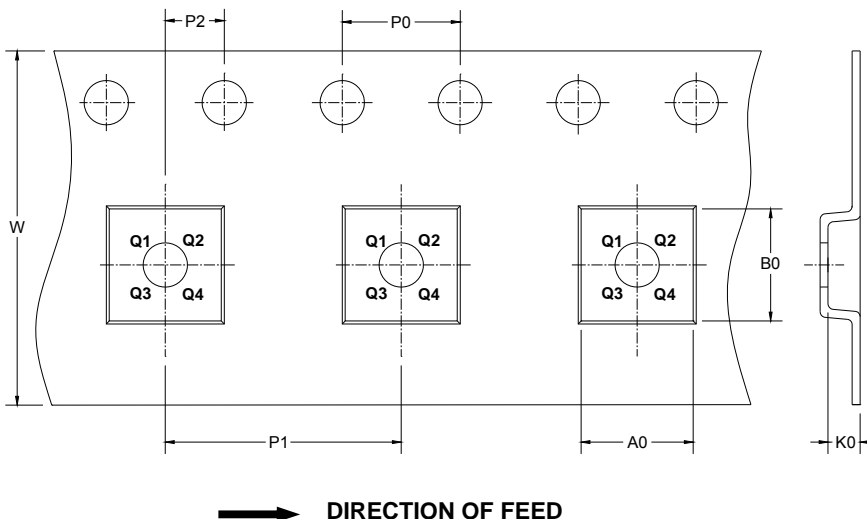
| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|------------------------------|-------|-------------------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.820 | 1.100 | 0.032 | 0.043 |
| A1 | 0.020 | 0.150 | 0.001 | 0.006 |
| A2 | 0.750 | 0.950 | 0.030 | 0.037 |
| b | 0.250 | 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° |

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS

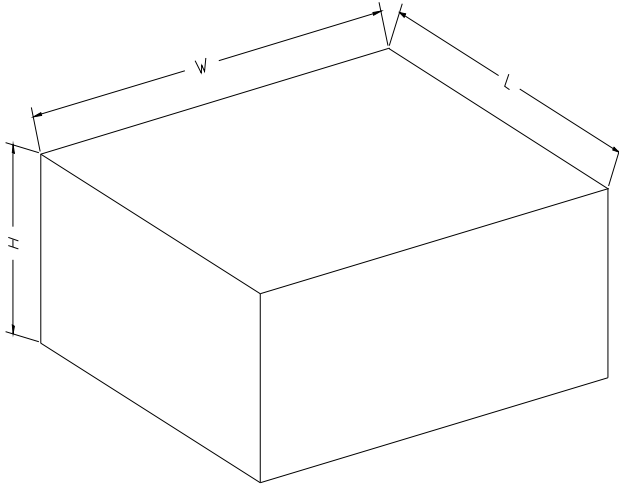


NOTE: The picture is only for reference. Please make the object as the standard.

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 | 6.4 | 5.4 | 2.1 | 4.0 | 8.0 | 2.0 | 12.0 | Q1 |
| MSOP-8 | 13" | 12.4 | 5.2 | 3.3 | 1.5 | 4.0 | 8.0 | 2.0 | 12.0 | Q1 |

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 |