SGM9111
8MHz Rail-to-Rail Composite Video Driver with 6dB Gain

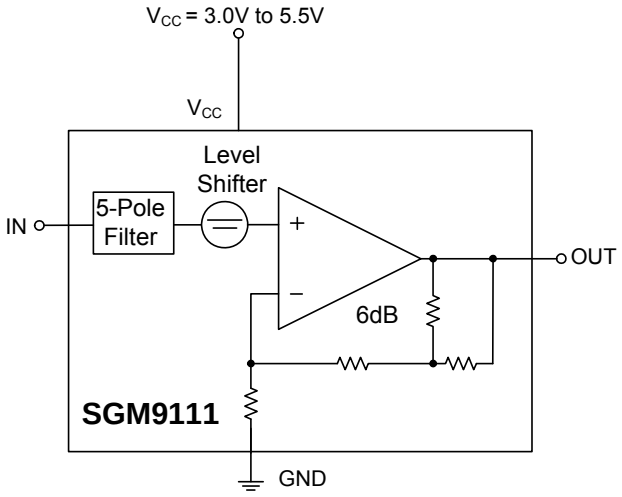
PRODUCT DESCRIPTION

The SGM9111 is a single rail-to-rail 5-pole output reconstruction filter with a -3dB bandwidth of 8MHz and 34.8V/μs slew rate. Operating from single power supply ranging from 3.0V to 5.5V and sinking an ultra-low 7mA quiescent current, the SGM9111 is ideally suited for low power, battery-operated applications.

The SGM9111 employs an internal level shift circuit that avoids sync-pulse clipping and allows DC-coupled output.

The SGM9111 is available in Green SOIC-8 and SC70-5 packages. It is specified over the extended -40℃ to +85℃ temperature range.

BLOCK DIAGRAM



FEATURES

- **Low Cost**
- **Excellent Video Performance**
- **5-Pole Reconstruction Filter**
- **Internal Gain: 6dB**
- **Rail-to-Rail Output**
- **Input Voltage Range Includes Ground**
- **AC- and DC-Coupled Input**
- **Operates from 3.0V to 5.5V Single Power Supply**
- **Low Power**
  7mA Typical Supply Current
- **Available in Green SOIC-8 and SC70-5 Packages**

APPLICATIONS

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

PACKAGE/ORDERING INFORMATION

ORDER NUMBER	PACKAGE DESCRIPTION	TEMPERATURE RANGE	PACKAGE OPTION	MARKING INFORMATION
SGM9111YS/TR	SOIC-8	-40℃ to +85℃	Tape and Reel, 2500	SGM9111YS
SGM9111YC5/TR	SC70-5	-40℃ to +85℃	Tape and Reel, 3000	9111

ABSOLUTE MAXIMUM RATINGS

Supply Voltage, V_{CC} to GND.....6V
Input Voltage..... GND - 0.3V to V_{CC} + 0.3V
Storage Temperature Range .....-65℃ to +150℃
Junction Temperature.....160℃
Operating Temperature Range.....-40℃ to +85℃
Lead Temperature (Soldering 10 sec)
.....260℃
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.

PIN DESCRIPTION

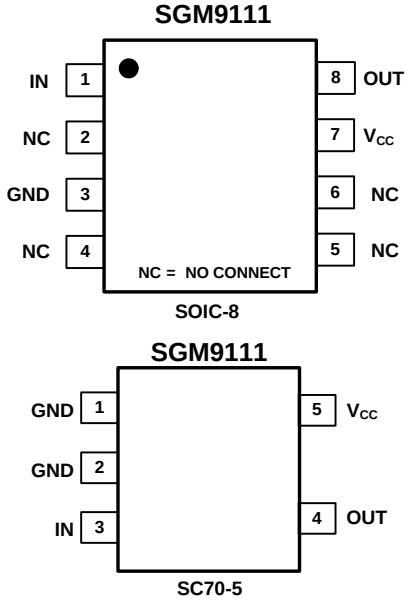
NAME	SOIC-8 PIN	SC70-5 PIN	FUNCTION
IN	1	3	Video Input.
GND	3	1, 2	Ground.
V_{CC}	7	5	Power Supply.
OUT	8	4	Filtered Video Output.
NC	2, 4, 5, 6	—	No Connect.

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.

PIN CONFIGURATIONS (TOP VIEW)



ELECTRICAL CHARACTERISTICS: V_{CC} = 5.0V

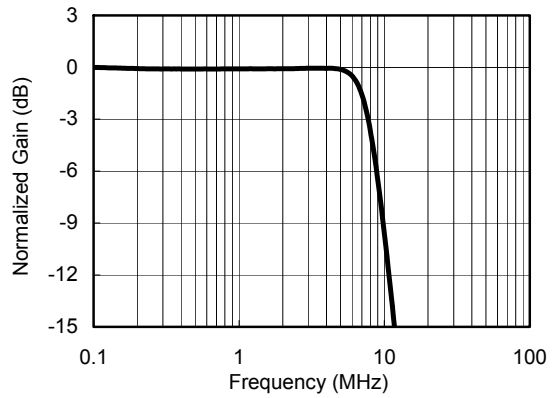
(At R_L = 150Ω connected to GND, V_{IN} = 1V_{PP} and C_{IN} = 0.1μF, all outputs AC-coupled with 220μF, referenced to 400kHz, unless otherwise noted.)

PARAMETER	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
INPUT CHARACTERISTICS						
Output Level Shift Voltage (V_{OLS})	V_{IN} = 0V, No load	+25℃		352	480	mV
		-40℃ to +85℃			604	
Input Voltage Clamp (V_{CLAMP})	I_{IN} = -3.5mA	+25℃	-180	-109		mV
		-40℃ to +85℃	-263			
Clamp Charge Current	V_{IN} = V_{CLAMP} - 100mV	+25℃	-6.0	-4.8		mA
		-40℃ to +85℃	-6.3			
Clamp Discharge Current	V_{IN} = 500mV	+25℃		1.8	3.0	μA
		-40℃ to +85℃			3.2	
Voltage Gain (A_V)	R_L = 150Ω	+25℃	5.6	6	6.4	dB
		-40℃ to +85℃	5.5		6.5	
OUTPUT CHARACTERISTICS						
Output Voltage High Swing	V_{IN} = 3.0V, R_L = 150Ω to GND	+25℃	4.6	4.78		V
		-40℃ to +85℃	4.5			
Output Short-Circuit Current (I_{SC})	V_{IN} = 0.5V, Out shorted to GND through 10Ω	+25℃	90	120		mA
		-40℃ to +85℃	80			
	V_{IN} = 1.5V, Out shorted to V_{CC} through 10Ω	+25℃		-124	-100	mA
		-40℃ to +85℃			-88	
POWER SUPPLY						
Operating Voltage Range		+25℃	3.0		5.5	V
Power Supply Rejection Ratio (PSRR)	V_{CC} = 3.5V to 5.0V	+25℃	45	51		dB
		-40℃ to +85℃	42			
Quiescent Current (I_Q)	V_{IN} = 0.5V	+25℃		7.0	9.5	mA
		-40℃ to +85℃			10.1	
DYNAMIC PERFORMANCE						
-0.1dB Bandwidth		+25℃		5.56		MHz
-1dB Bandwidth		+25℃		6.6		MHz
-3dB Bandwidth		+25℃		7.76		MHz
Filter Response (Normalized Gain)	f_{IN} = 27MHz	+25℃		42.4		dB
Slew Rate	2V Output step, 80% to 20%	+25℃		34.8		V/μs
Differential Gain Error (DG)	PAL DC-coupled	+25℃		0.53		%
	PAL AC-coupled	+25℃		0.47		%
Differential Phase Error (DP)	PAL DC-coupled	+25℃		1.30		°
	PAL AC-coupled	+25℃		1.47		°
Group Delay Variation (D/DT)	Difference between 400kHz and 6.5MHz	+25℃		30.3		ns
Fall Time	2V Output step, 80% to 20%	+25℃		34.5		ns
Rise Time	2V Output step, 80% to 20%	+25℃		35.7		ns

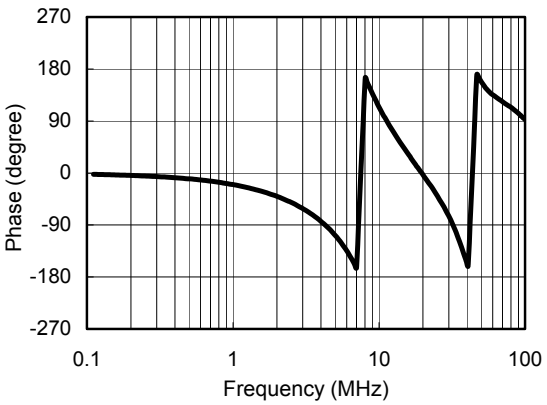
TYPICAL PERFORMANCE CHARACTERISTICS

At V_{CC} = 5V, T_A = +25℃, R_L = 150Ω, all outputs AC-coupled with 220μF, unless otherwise noted.

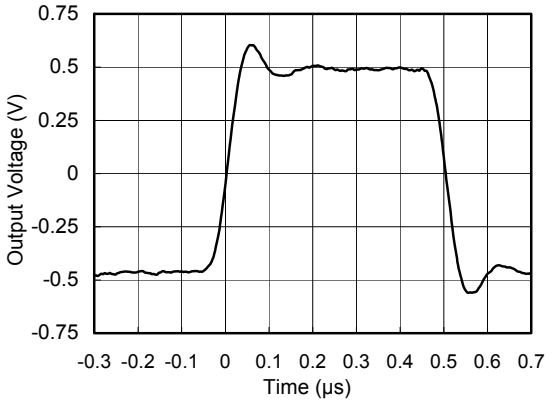
Frequency Response



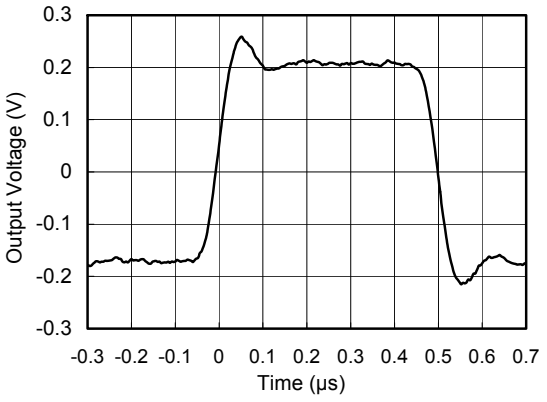
Phase vs. Frequency



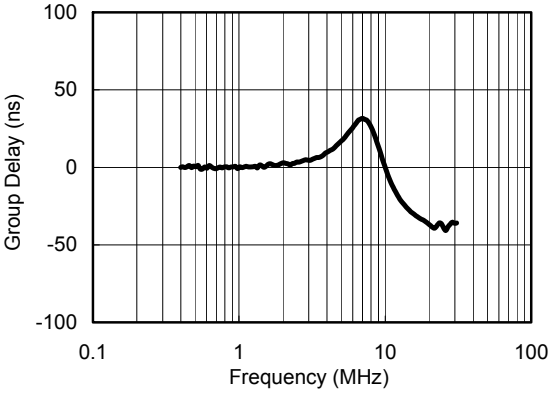
Large Signal Step Response



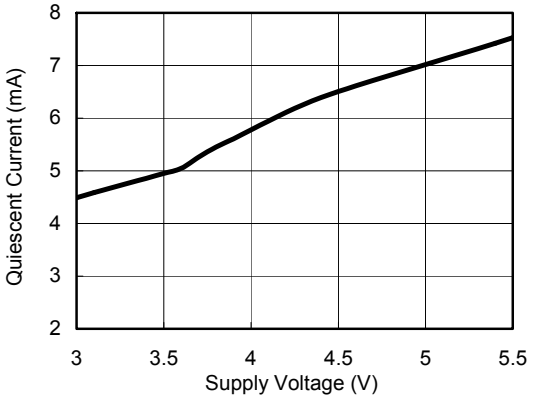
Small Signal Step Response



Group Delay vs. Frequency



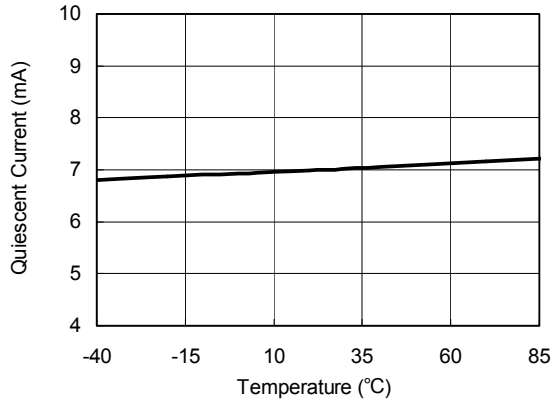
Quiescent Current vs. Supply Voltage



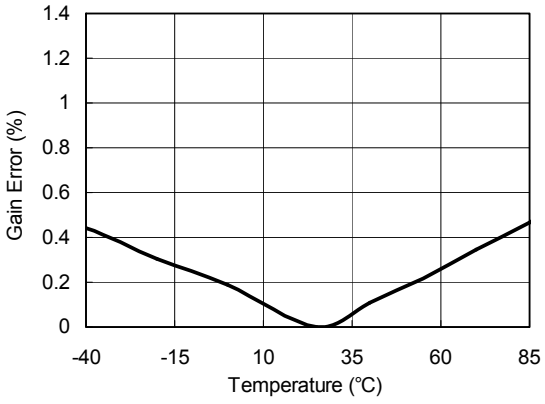
TYPICAL PERFORMANCE CHARACTERISTICS

At V_{CC} = 5V, T_A = +25℃, R_L = 150Ω, all outputs AC-coupled with 220μF, unless otherwise noted.

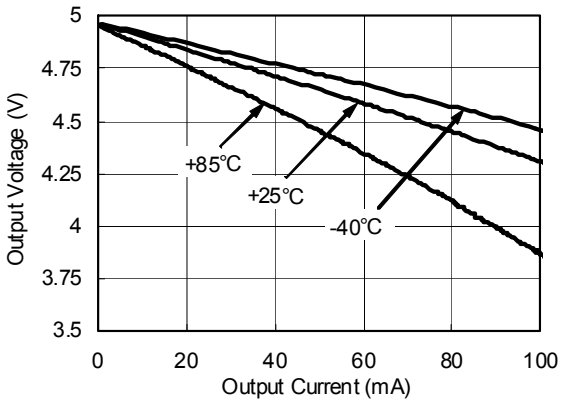
Quiescent Current vs. Temperature



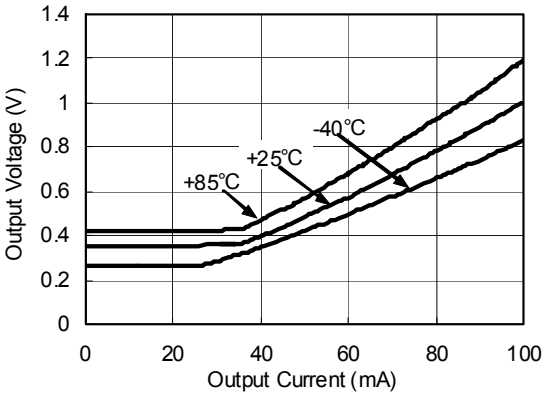
Gain Error vs. Temperature



Output Voltage Swing to the Positive Rail vs. Output Current



Output Voltage Swing to the Negative Rail vs. Output Current



APPLICATION INFORMATION

Functional Description

SGM9111 operates from a single 3.0V to 5.5V supply. In application, SGM9111 is a fully integrated solution for filtering and buffering SDTV signals in front of video decoder or behind video encoder. For example, SGM9111 can replace a passive LC filter and an amplifier driver at CVBS 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. SGM9111 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 SGM9111 also can be DC-coupled or AC-coupled.

Input Considerations

Besides AC coupling, the SGM9111 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 SGM9111 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 SGM9111 is driven by an unknown external source or a SCART switch which has its own clamping circuit, AC coupling is needed.

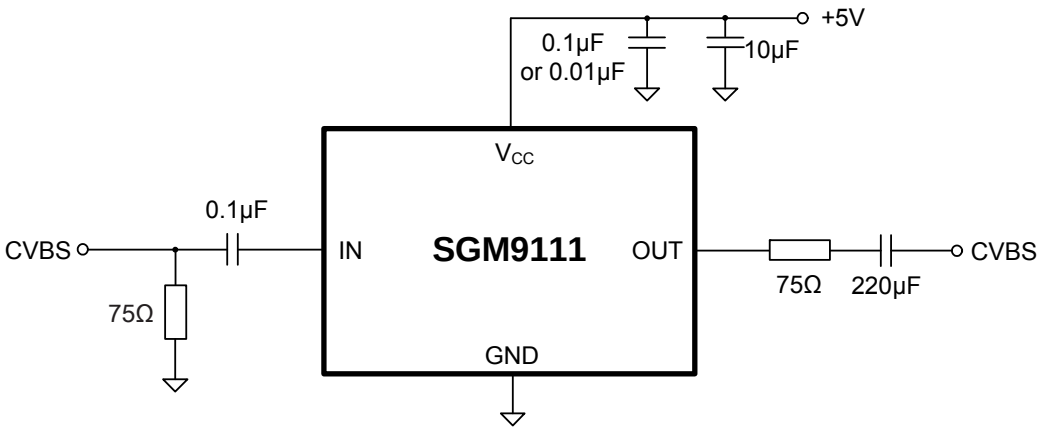
Output Considerations

The SGM9111 outputs can be DC-coupled or AC-coupled. When input is 0V, the SGM9111 output voltage is 340mV typically. In DC coupling design, one 75Ω resistor is used to connect SGM9111's output pin with external load directly, and this serial back-termination resistor is used to match the impedance of the transmission line between SGM9111 and external load to cancel the signal reflection. The SGM9111 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 SGM9111. Place these two capacitors as close to the SGM9111 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 SGM9111 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 SGM9111 as short as possible to minimize the parasitic stray capacitance and noise pickup.

TYPICAL APPLICATION DIAGRAM

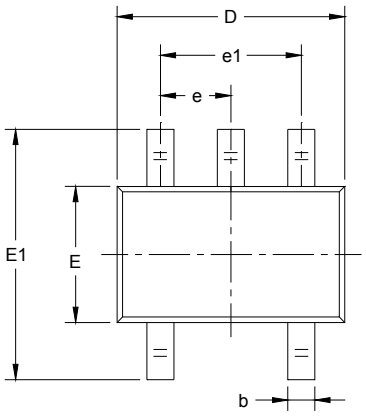


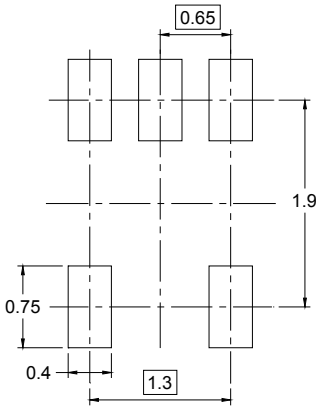
NOTE:
1. Power supply V_{CC} must be sequenced on first before input video signals.

Figure 1. AC Coupling Application Schematic

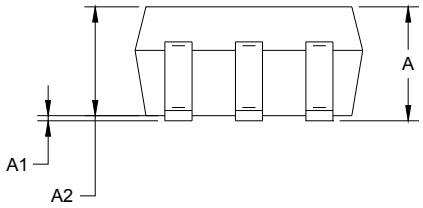
PACKAGE OUTLINE DIMENSIONS

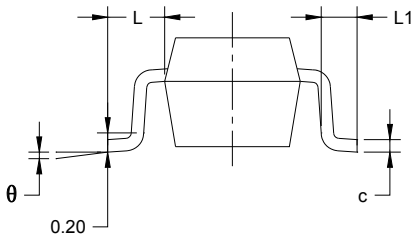
SC70-5





RECOMMENDED LAND PATTERN (Unit: mm)

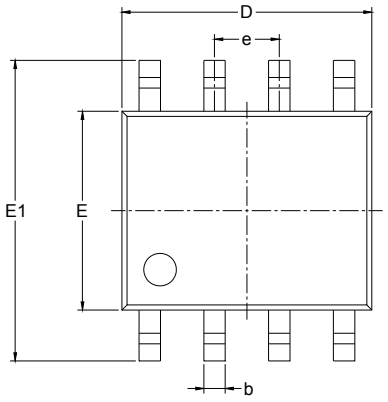


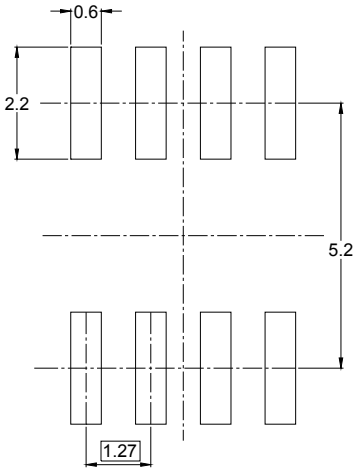


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014
c	0.080	0.150	0.003	0.006
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.65 TYP		0.026 TYP	
e1	1.300 BSC		0.051 BSC	
L	0.525 REF		0.021 REF	
L1	0.260	0.460	0.010	0.018
θ	0°	8°	0°	8°

PACKAGE OUTLINE DIMENSIONS

SOIC-8





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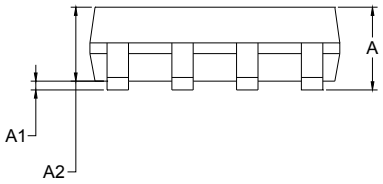
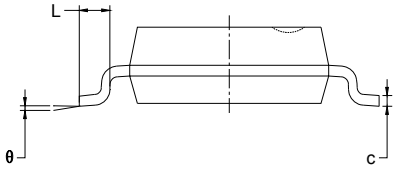
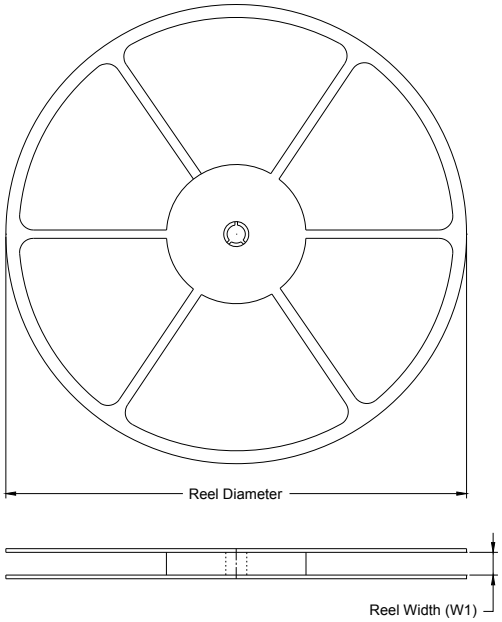




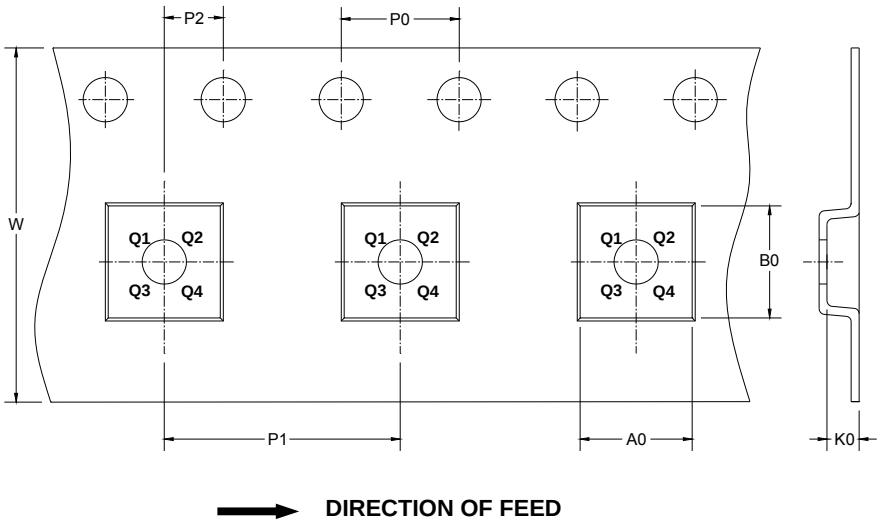
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.27 BSC		0.050 BSC	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS

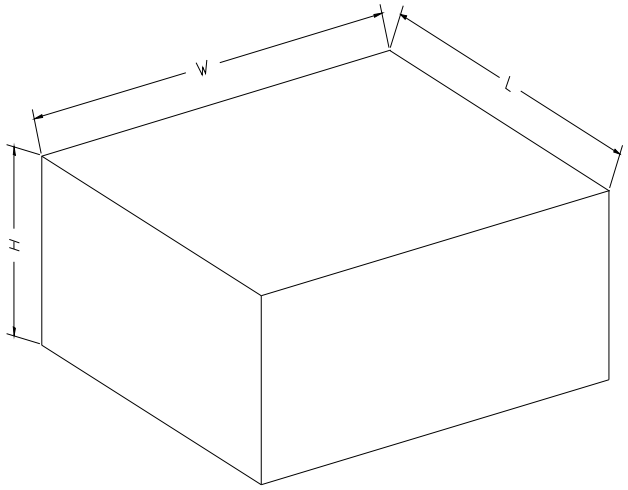


NOTE: The picture is only for reference. Please make the object as the standard.

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
SC70-5	7″	9.5	2.25	2.55	1.20	4.0	4.0	2.0	8.0	Q3
SOIC-8	13″	12.4	6.4	5.4	2.1	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
7″ (Option)	368	227	224	8
7″	442	410	224	18
13″	386	280	370	5