



# SGM4157YC

## SPDT 0.8Ω Analog Switch

### GENERAL DESCRIPTION

The SGM4157YC is a single low on-resistance (0.8Ω), fast single-pole double-throw (SPDT) CMOS switch. It is designed for low operating voltage, high current switching of speaker output for cell phone applications. The SGM4157YC can handle a balanced microphone/speaker/ring tone generator in a monophone mode. The device contains a break-before-make (BBM) feature.

The control input, IN, tolerates input drive signals up to 5.5V, independent of supply voltage.

SGM4157YC is available in Green SC70-6 package.

### APPLICATIONS

- Portable Instrumentation
- Battery-Operated Equipment
- Computer Peripherals
- Cell Phones
- PDA's
- MP3's

### FUNCTION TABLE

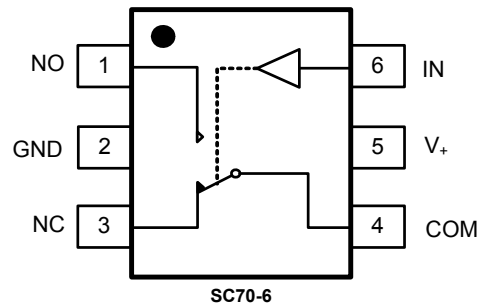
LOGIC	NO	NC
0	OFF	ON
1	ON	OFF

Switches Shown For Logic "0" Input

### FEATURES

- Voltage Operation: 1.8V to 5.5V
- On-Resistance: 0.8Ω (TYP)
- -3dB Bandwidth: 90MHz
- High Off-Isolation: -45dB at 10MHz
- Rail-to-Rail Operation
- Low Static Power
- TTL/CMOS Compatible
- Break-Before-Make Switching
- Extended Industrial Temperature Range: -40°C to +85°C
- Microsize Package

### PIN CONFIGURATION (TOP VIEW)



### PIN DESCRIPTION

NAME	PIN	FUNCTION
NO	1	Normally-Open Terminal.
GND	2	Ground.
NC	3	Normally-Closed Terminal.
COM	4	Common Terminal.
V+	5	Power Supply.
IN	6	Digital Control Pin to Connect the COM Terminal to the NO or NC Terminals.

NOTE: NO, NC and COM terminal may be an input or output.

**PACKAGE/ORDERING INFORMATION**

MODEL	PIN-PACKAGE	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKAGE OPTION
SGM4157YC	SC70-6	-40°C to +85°C	SGM4157YC6/TR	4157	Tape and Reel, 3000

**ABSOLUTE MAXIMUM RATINGS**

V <sub>+</sub> , IN to GND.....	-0.3V to 6V
Analog, Digital voltage range <sup>(1)</sup> .....	-0.3V to (V <sub>+</sub> ) + 0.3V
Continuous Current NO, NC, or COM.....	±150mA
Peak Current NO, NC, or COM.....	±250mA
Operating Temperature Range.....	-40°C to +85°C
Junction Temperature.....	150°C
Storage Temperature Range.....	-65°C to +150°C
Lead Temperature (soldering, 10s).....	260°C
ESD Susceptibility	
HBM.....	8000V
MM.....	400V

## NOTES:

1. Signals on NC, NO, or COM or IN exceeding V<sub>+</sub> will be clamped by internal diodes. Limit forward diode current to maximum current ratings.
2. 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.

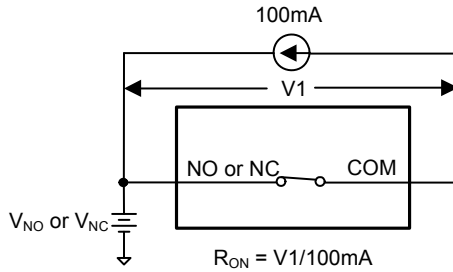
**ELECTRICAL CHARACTERISTICS**(V<sub>+</sub> = 4.5V to 5.5V, GND = 0V. Typical values are at T<sub>A</sub> = +25°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
<b>ANALOG SWITCH</b>							
Analog Signal Range	V <sub>NO</sub> , V <sub>NC</sub> , V <sub>COM</sub>		+25°C	0		V <sub>+</sub>	V
On-Resistance	R <sub>ON</sub>	V <sub>+</sub> = 4.5V, 0V ≤ V <sub>NO</sub> or V <sub>NC</sub> ≤ V <sub>+</sub> I <sub>COM</sub> = -100mA, Test Circuit 1	+25°C		0.8		Ω
On-Resistance Match Between Channels	ΔR <sub>ON</sub>	V <sub>+</sub> = 4.5V, 0V ≤ V <sub>NO</sub> or V <sub>NC</sub> ≤ V <sub>+</sub> I <sub>COM</sub> = -100mA, Test Circuit 1	+25°C		0.02	0.2	Ω
			-40°C to +85°C			0.3	
On-Resistance Flatness	R <sub>FLAT(ON)</sub>	V <sub>+</sub> = 4.5V, 0V ≤ V <sub>NO</sub> or V <sub>NC</sub> ≤ V <sub>+</sub> I <sub>COM</sub> = -100mA, Test Circuit 1	+25°C		0.25	0.45	Ω
			-40°C to +85°C			0.6	
Source OFF Leakage Current	I <sub>NC(OFF)</sub> , I <sub>NO(OFF)</sub>	V <sub>+</sub> = 5.5V, V <sub>NO</sub> or V <sub>NC</sub> = 4.5V/1V V <sub>COM</sub> = 1V/4.5V	+25°C		0.1		μA
			-40°C to +85°C			1	
Channel ON Leakage Current	I <sub>NC(ON)</sub> , I <sub>NO(ON)</sub> , I <sub>COM(ON)</sub>	V <sub>+</sub> = 5.5V, V <sub>COM</sub> = 1V/4.5V V <sub>NO</sub> or V <sub>NC</sub> = floating	+25°C		0.1		μA
			-40°C to +85°C			1	
<b>DIGITAL INPUTS</b>							
Input High Voltage	V <sub>INH</sub>	V <sub>+</sub> = 4.5V	+25°C	1.6			V
Input Low Voltage	V <sub>INL</sub>	V <sub>+</sub> = 4.5V	+25°C			0.4	V
Input Leakage Current	I <sub>IN</sub>	V <sub>+</sub> = 4.5V, V <sub>IN</sub> = 0V or V <sub>+</sub>	+25°C		0.1		μA
<b>DYNAMIC CHARACTERISTICS</b>							
Turn-On Time	t <sub>ON</sub>	V <sub>+</sub> = 4.5V, V <sub>NO</sub> or V <sub>NC</sub> = 3.0V R <sub>L</sub> = 300Ω, C <sub>L</sub> = 35pF, Test Circuit 2	+25°C		56		ns
Turn-Off Time	t <sub>OFF</sub>	V <sub>+</sub> = 4.5V, V <sub>NO</sub> or V <sub>NC</sub> = 3.0V R <sub>L</sub> = 300Ω, C <sub>L</sub> = 35pF, Test Circuit 2	+25°C		32		ns
Break-Before-Make Time Delay	t <sub>D</sub>	V <sub>+</sub> = 4.5V, V <sub>NO</sub> or V <sub>NC</sub> = 3.0V R <sub>L</sub> = 300Ω, C <sub>L</sub> = 35pF, Test Circuit 3	+25°C		28		ns
Skew	t <sub>SKREW</sub>	R <sub>S</sub> = 39Ω, C <sub>L</sub> = 50pF, Test Circuit 4	+25°C		7		ns
Off Isolation	O <sub>ISO</sub>	V <sub>+</sub> = 4.5V, R <sub>L</sub> = 50Ω Signal = 0dBm, Test Circuit 5	10MHz	+25°C	-45		dB
			1MHz	+25°C	-65		dB
-3dB Bandwidth	BW	V <sub>+</sub> = 4.5V, Signal = 0dBm, R <sub>L</sub> = 50Ω Test Circuit 6	+25°C		90		MHz
Channel ON Capacitance	C <sub>NC(ON)</sub> , C <sub>NO(ON)</sub> , C <sub>COM(ON)</sub>	V <sub>+</sub> = 4.5V, f = 1MHz	+25°C		40		pF
Channel OFF Capacitance	C <sub>NC(OFF)</sub> , C <sub>NO(OFF)</sub> , C <sub>COM(OFF)</sub>	V <sub>+</sub> = 4.5V, f = 1MHz	+25°C		8.5		pF
<b>POWER REQUIREMENTS</b>							
Power Supply Range	V <sub>+</sub>		+25°C	1.8		5.5	V
Power Supply Current	I <sub>+</sub>	V <sub>+</sub> = 5.5V, V <sub>IN</sub> = 0V or V <sub>+</sub>	+25°C		0.1		μA

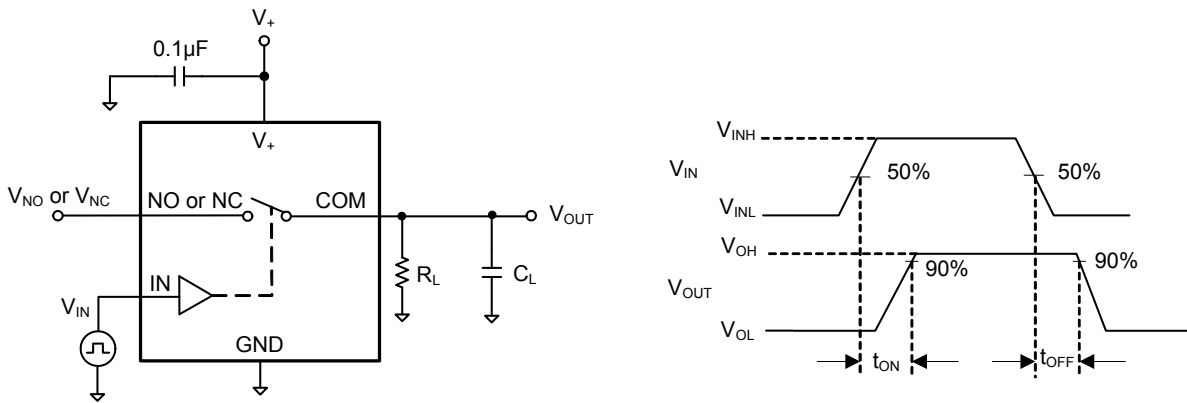
**ELECTRICAL CHARACTERISTICS**(V<sub>+</sub> = 2.7V to 3.6V, GND = 0V. Typical values are at T<sub>A</sub> = +25°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
<b>ANALOG SWITCH</b>							
Analog Signal Range	V <sub>NO</sub> , V <sub>NC</sub> , V <sub>COM</sub>		+25°C	0		V <sub>+</sub>	V
On-Resistance	R <sub>ON</sub>	V <sub>+</sub> = 2.7V, 0V ≤ V <sub>NO</sub> or V <sub>NC</sub> ≤ V <sub>+</sub> I <sub>COM</sub> = -100mA, Test Circuit 1	+25°C		1.4		Ω
On-Resistance Match Between Channels	ΔR <sub>ON</sub>	V <sub>+</sub> = 2.7V, 0V ≤ V <sub>NO</sub> or V <sub>NC</sub> ≤ V <sub>+</sub> I <sub>COM</sub> = -100mA, Test Circuit 1	+25°C		0.03	0.3	Ω
			-40°C to +85°C			0.31	
On-Resistance Flatness	R <sub>FLAT(ON)</sub>	V <sub>+</sub> = 2.7V, 0V ≤ V <sub>NO</sub> or V <sub>NC</sub> ≤ V <sub>+</sub> I <sub>COM</sub> = -100mA, Test Circuit 1	+25°C		0.9	1.2	Ω
			-40°C to +85°C			1.25	
Source OFF Leakage Current	I <sub>NC(OFF)</sub> , I <sub>NO(OFF)</sub>	V <sub>+</sub> = 3.6V, V <sub>NO</sub> or V <sub>NC</sub> = 3.3V/0.3V V <sub>COM</sub> = 0.3V/3.3V	+25°C		0.1		μA
			-40°C to +85°C			1	
Channel ON Leakage Current	I <sub>NC(ON)</sub> , I <sub>NO(ON)</sub> , I <sub>COM(ON)</sub>	V <sub>+</sub> = 3.6V, V <sub>COM</sub> = 0.3V/3.3V V <sub>NO</sub> or V <sub>NC</sub> = floating	+25°C		0.1		μA
			-40°C to +85°C			1	
<b>DIGITAL INPUTS</b>							
Input High Voltage	V <sub>INH</sub>	V <sub>+</sub> = 2.7V	+25°C	1.4			V
Input Low Voltage	V <sub>INL</sub>	V <sub>+</sub> = 2.7V	+25°C			0.4	V
Input Leakage Current	I <sub>IN</sub>	V <sub>+</sub> = 2.7V, V <sub>IN</sub> = 0V or V <sub>+</sub>	+25°C		0.1		μA
<b>DYNAMIC CHARACTERISTICS</b>							
Turn-On Time	t <sub>ON</sub>	V <sub>+</sub> = 3V, V <sub>NO</sub> or V <sub>NC</sub> = 1.5V R <sub>L</sub> = 300Ω, C <sub>L</sub> = 35pF, Test Circuit 2	+25°C		88		ns
Turn-Off Time	t <sub>OFF</sub>	V <sub>+</sub> = 3V, V <sub>NO</sub> or V <sub>NC</sub> = 1.5V R <sub>L</sub> = 300Ω, C <sub>L</sub> = 35pF, Test Circuit 2	+25°C		46		ns
Break-Before-Make Time Delay	t <sub>D</sub>	V <sub>+</sub> = 3V, V <sub>NO</sub> or V <sub>NC</sub> = 1.5V R <sub>L</sub> = 300Ω, C <sub>L</sub> = 35pF, Test Circuit 3	+25°C		43		ns
Skew	t <sub>SKREW</sub>	R <sub>S</sub> = 39Ω, C <sub>L</sub> = 50pF, Test Circuit 4	+25°C		7		ns
Off Isolation	O <sub>ISO</sub>	V <sub>+</sub> = 3V, R <sub>L</sub> = 50Ω Signal = 0dBm, Test Circuit 5	10MHz	+25°C		-45	dB
			1MHz	+25°C		-65	dB
-3dB Bandwidth	BW	V <sub>+</sub> = 3V, Signal = 0dBm, R <sub>L</sub> = 50Ω Test Circuit 6	+25°C		90		MHz
Channel ON Capacitance	C <sub>NC(ON)</sub> , C <sub>NO(ON)</sub> , C <sub>COM(ON)</sub>	V <sub>+</sub> = 3V, f = 1MHz	+25°C		40		pF
Channel OFF Capacitance	C <sub>NC(OFF)</sub> , C <sub>NO(OFF)</sub> , C <sub>COM(OFF)</sub>	V <sub>+</sub> = 3V, f = 1MHz	+25°C		8.5		pF
<b>POWER REQUIREMENTS</b>							
Power Supply Current	I <sub>+</sub>	V <sub>+</sub> = 3.6V, V <sub>IN</sub> = 0V or V <sub>+</sub>	+25°C		0.1		μA

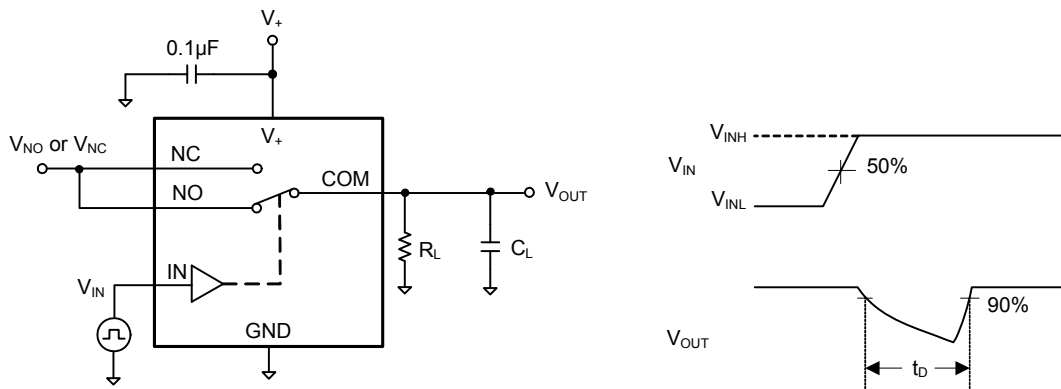
TEST CIRCUITS



Test Circuit 1. On Resistance

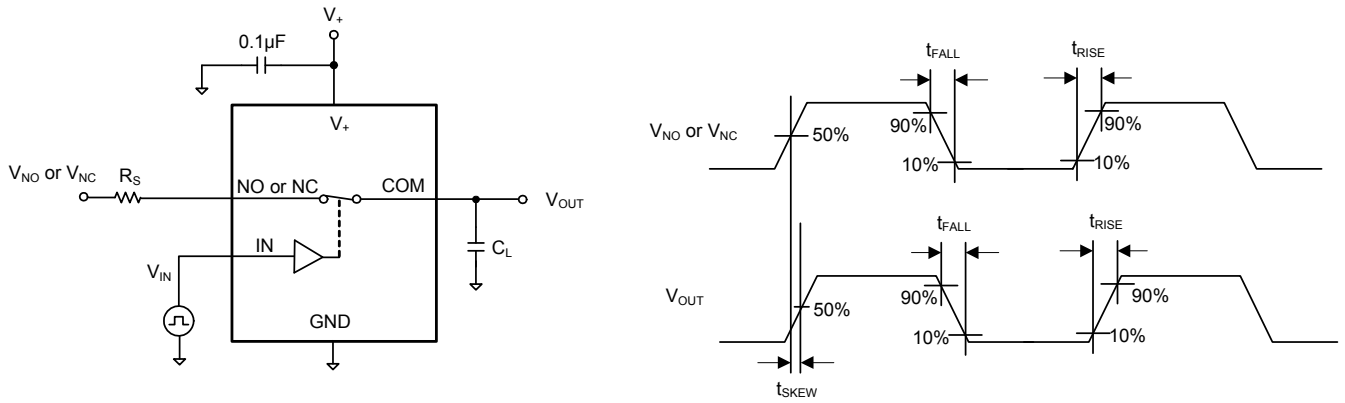


Test Circuit 2. Switching Times

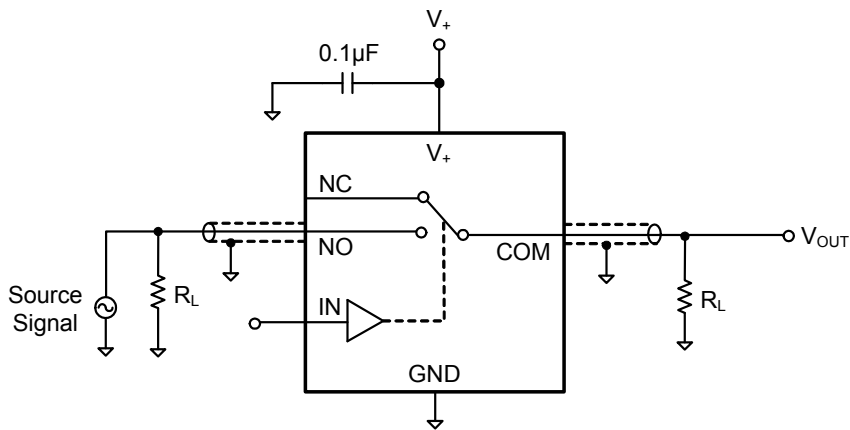


Test Circuit 3. Break-Before-Make Time Delay,  $t_D$

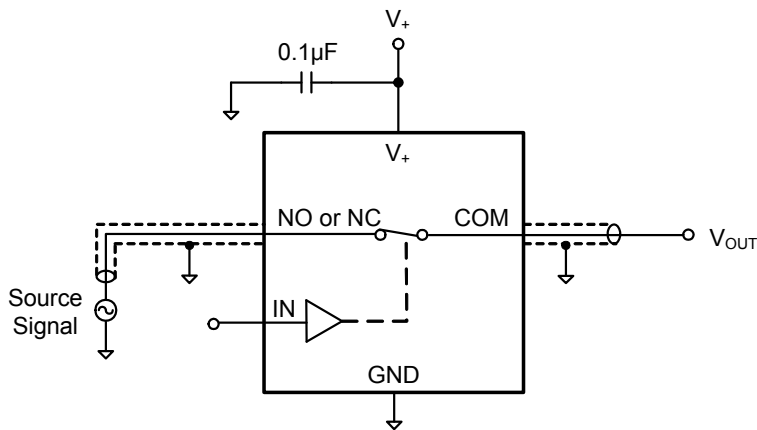
TEST CIRCUITS (Cont.)



Test Circuit 4. Skew Test



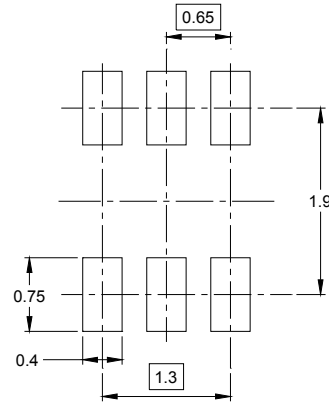
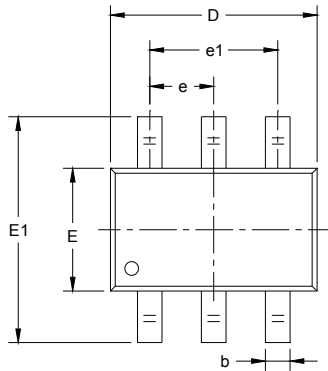
Test Circuit 5. Off Isolation



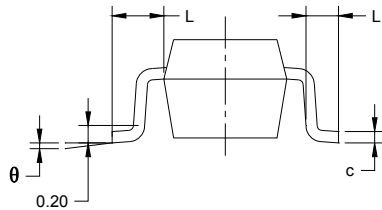
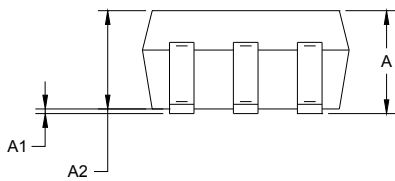
Test Circuit 6. -3dB Bandwidth

PACKAGE OUTLINE DIMENSIONS

SC70-6



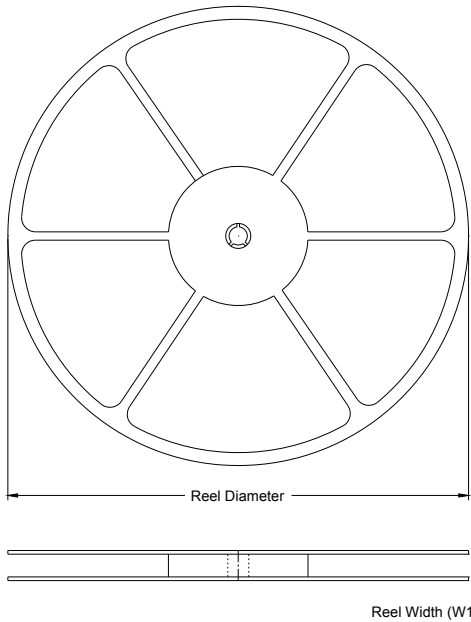
RECOMMENDED LAND PATTERN (Unit: mm)



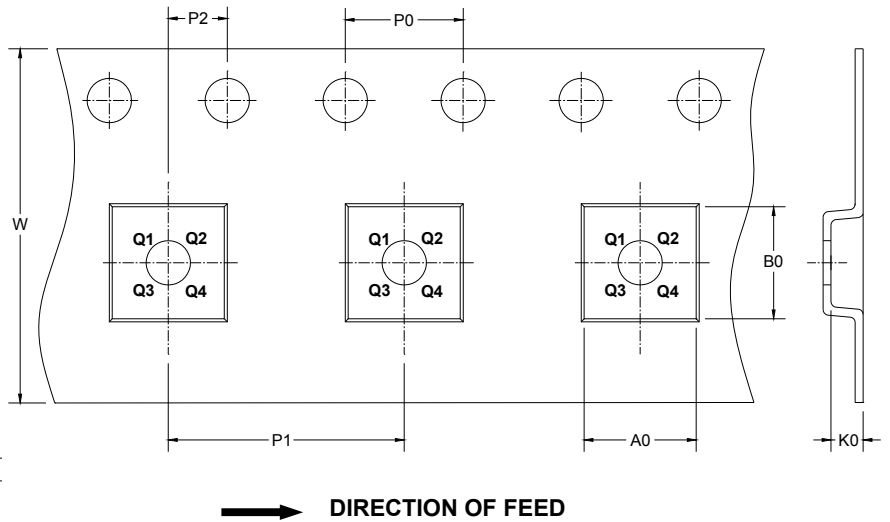
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014
c	0.080	0.150	0.003	0.006
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.65 TYP		0.026 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°

**TAPE AND REEL INFORMATION**

**REEL DIMENSIONS**



**TAPE DIMENSIONS**

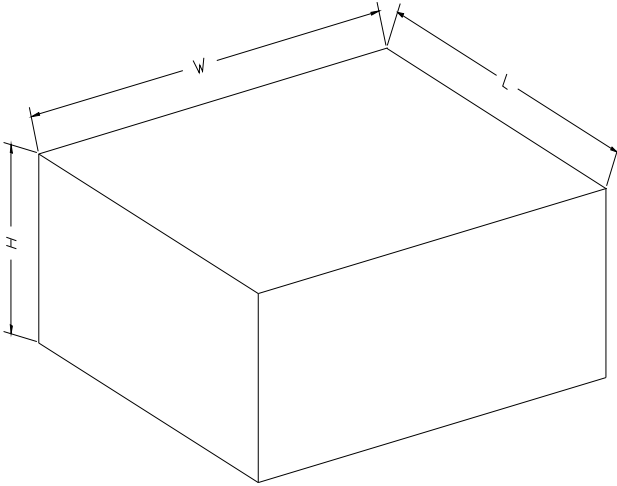


NOTE: The picture is only for reference. Please make the object as the standard.

**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
SC70-6	7"	9.5	2.4	2.5	1.2	4.0	4.0	2.0	8.0	Q3



**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