



# SGM3157

## 4.5Ω Low Voltage SPDT Analog Switch in 6-Pin SC70

### GENERAL DESCRIPTION

The SGM3157 is a single, bidirectional, single-pole/double-throw (SPDT) CMOS analog switch that is designed to operate from a single +1.8V to +5.5V supply. It features high-bandwidth (300MHz) and low on-resistance (4.5Ω TYP), Targeted applications for audio switching.

SGM3157 features guaranteed on-resistance matching (0.3Ω MAX) between switches and guaranteed on-resistance flatness over the signal range (2.3Ω TYP). This ensures excellent linearity and low distortion when switching audio signals.

SGM3157 is available in Green SC70-6 package.

### APPLICATIONS

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

### FUNCTION TABLE

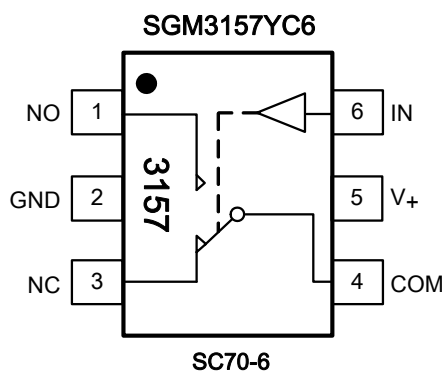
LOGIC	NO	NC
0	OFF	ON
1	ON	OFF

Switches Shown for Logic "0" Input

### FEATURES

- Voltage Operation: 1.8V to 5.5V
- On-Resistance: 4.5Ω (TYP) at 5.0V
- Fast Switching Times
  - t<sub>ON</sub> 20ns
  - t<sub>OFF</sub> 15ns
- High Bandwidth: 300MHz
- High Off-Isolation: -51dB at 10MHz
- Rail-to-Rail Operation
- TTL/CMOS Compatible
- Break-Before-Make Switching
- Extended Industrial Temperature Range:
  - 40°C to +85°C
- Available in Green SC70-6 Package

### PIN CONFIGURATION (TOP VIEW)



**PACKAGE/ORDERING INFORMATION**

MODEL	PIN-PACKAGE	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKAGE OPTION
SGM3157	SC70-6	-40°C to +85°C	SGM3157YC6/TR	3157	Tape and Reel, 3000

**ABSOLUTE MAXIMUM RATINGS**

V <sub>+</sub> , IN to GND.....	-0.3V to 6V	Storage Temperature Range.....	-65°C to +150°C
Analog, Digital voltage range <sup>(1)</sup> .....	-0.3V to (V <sub>+</sub> ) + 0.3V	Lead Temperature (soldering, 10s).....	260°C
Continuous Current NO, NC, or COM.....	±50mA	ESD (HBM).....	2000V
Peak Current NO, NC, or COM.....	±80mA	ESD (MM).....	400V
Operating Temperature Range.....	-40°C to +85°C		
Junction Temperature.....	150°C		

## 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.

**PIN DESCRIPTION**

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

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

**ELECTRICAL CHARACTERISTICS**

( $V_+$  = +4.5V to +5.5V,  $V_{IH}$  = +2.0V,  $V_{IL}$  = +0.8V,  $T_A$  = -40°C to +85°C, Typical values are at  $V_+$  = 5.0V,  $T_A$  = +25°C, unless otherwise noted.)

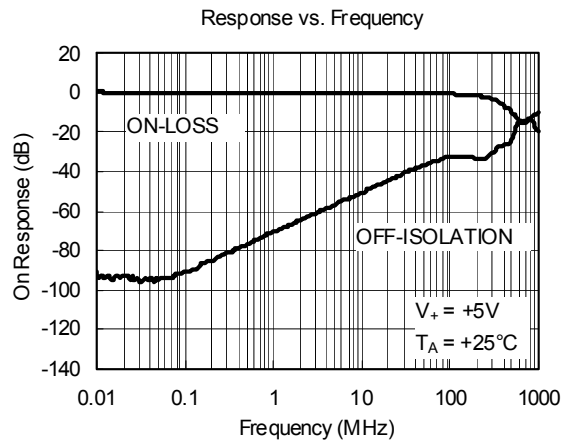
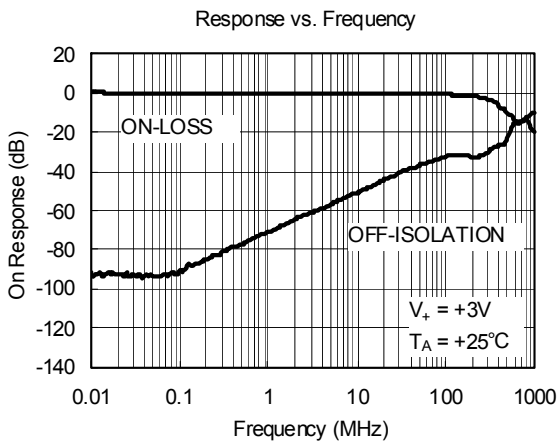
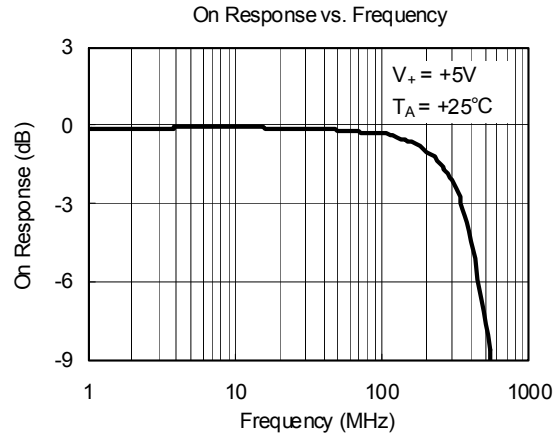
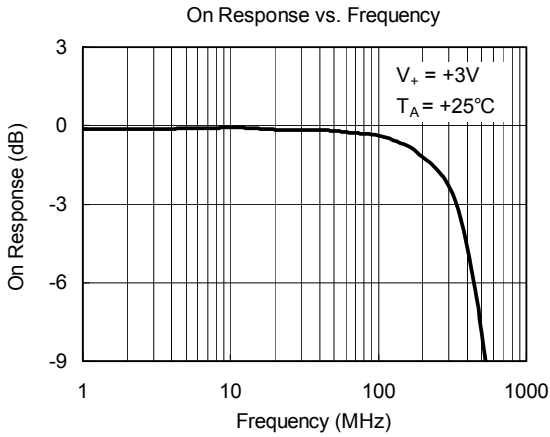
PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
<b>ANALOG SWITCH</b>							
Analog Signal Range	$V_{NO}, V_{NC}, V_{COM}$		-40°C to +85°C	0		$V_+$	V
On-Resistance	$R_{ON}$	$V_+$ = 4.5V, $V_{NO}$ or $V_{NC}$ = 3.5V, $I_{COM}$ = -10mA, Test Circuit 1	+25°C		4.5	8	Ω
			-40°C to +85°C			8.5	Ω
On-Resistance Match Between Channels	$\Delta R_{ON}$	$V_+$ = 4.5V, $V_{NO}$ or $V_{NC}$ = 3.5V, $I_{COM}$ = -10mA, Test Circuit 1	+25°C		0.15	0.3	Ω
			-40°C to +85°C			0.4	Ω
On-Resistance Flatness	$R_{FLAT(ON)}$	$V_+$ = 4.5V, $V_{NO}$ or $V_{NC}$ = 1.0V, 2.0V, 3.5V, $I_{COM}$ = -10mA, Test Circuit 1	+25°C		2.3	3.3	Ω
			-40°C to +85°C			3.7	Ω
Source OFF Leakage Current	$I_{NC(OFF)}, I_{NO(OFF)}$	$V_+$ = 5.5V, $V_{NO}$ or $V_{NC}$ = 1.0V, 4.5V, $V_{COM}$ = 4.5V, 1.0V	-40°C to +85°C			1	μA
Channel ON Leakage Current	$I_{NC(ON)}, I_{NO(ON)}, I_{COM(ON)}$	$V_+$ = 5.5V, $V_{COM}$ = 1.0V, 4.5V, $V_{NO}$ or $V_{NC}$ = 1.0V, 4.5V, or floating	-40°C to +85°C			1	μA
<b>DIGITAL INPUTS</b>							
Input High Voltage	$V_{INH}$		-40°C to +85°C	1.5			V
Input Low Voltage	$V_{INL}$		-40°C to +85°C			0.6	V
Input Leakage Current	$I_{IN}$	$V_+$ = +5.5V, $V_{IN}$ = 0V or 5.5V	-40°C to +85°C			1	μA
<b>DYNAMIC CHARACTERISTICS</b>							
Turn-On Time	$t_{ON}$	$V_{NO}$ or $V_{NC}$ = 3.0V, $V_{IH}$ = 1.5V, $V_{IL}$ = 0V, $R_L$ = 300Ω, $C_L$ = 35pF, Test Circuit 2	+25°C		20		ns
Turn-Off Time	$t_{OFF}$	$V_{NO}$ or $V_{NC}$ = 3.0V, $V_{IH}$ = 1.5V, $V_{IL}$ = 0V, $R_L$ = 300Ω, $C_L$ = 35pF, Test Circuit 2	+25°C		15		ns
Break-Before-Make Time Delay	$t_D$	$V_{NO1}$ or $V_{NC1}$ = $V_{NO2}$ or $V_{NC2}$ = 3V, $R_L$ = 300Ω, $C_L$ = 35pF, Test Circuit 3	+25°C		5		ns
Skew	$t_{SKEW}$	$R_S$ = 39Ω, $C_L$ = 50pF, Test Circuit 4	+25°C		5		ns
Off Isolation	$O_{ISO}$	$R_L$ = 50Ω, $C_L$ = 5pF, Signal = 0dBm, Test Circuit 5	f = 10MHz	+25°C		-51	dB
			f = 1MHz	+25°C		-72	dB
-3dB Bandwidth	BW	Signal = 0dBm, $R_L$ = 50Ω, $C_L$ = 5pF, Test Circuit 6	+25°C		300		MHz
Source OFF Capacitance	$C_{NC(OFF)}, C_{NO(OFF)}$	f = 1MHz	+25°C		5.5		pF
Channel ON Capacitance	$C_{NC(ON)}, C_{NO(ON)}, C_{COM(ON)}$	f = 1MHz	+25°C		15.5		pF
<b>POWER REQUIREMENTS</b>							
Power Supply Range	$V_+$		-40°C to +85°C	1.8		5.5	V
Power Supply Current	$I_+$	$V_+$ = +5.5V, $V_{IN}$ = 0V or $V_+$	-40°C to +85°C			5	μA

**ELECTRICAL CHARACTERISTICS**

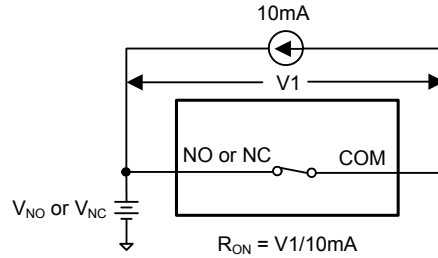
( $V_+$  = +2.7V to +3.6V,  $V_{IH}$  = +1.4V,  $V_{IL}$  = +0.5V,  $T_A$  = -40°C to +85°C, Typical values are at  $V_+$  = 3.0V,  $T_A$  = +25°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
<b>ANALOG SWITCH</b>							
Analog Signal Range	$V_{NO}, V_{NC}, V_{COM}$		-40°C to +85°C	0		$V_+$	V
On-Resistance	$R_{ON}$	$V_+$ = 2.7V, $V_{NO}$ or $V_{NC}$ = 1.5V, $I_{COM}$ = -10mA, Test Circuit 1	+25°C		7	10	Ω
			-40°C to +85°C			10.5	Ω
On-Resistance Match Between Channels	$\Delta R_{ON}$	$V_+$ = 2.7V, $V_{NO}$ or $V_{NC}$ = 1.5V, $I_{COM}$ = -10mA, Test Circuit 1	+25°C		0.15	0.3	Ω
			-40°C to +85°C			0.4	Ω
On-Resistance Flatness	$R_{FLAT(ON)}$	$V_+$ = 2.7V, $V_{NO}$ or $V_{NC}$ = 1.0V, 1.5V, 2.0V, $I_{COM}$ = -10mA, Test Circuit 1	+25°C		3	4	Ω
			-40°C to +85°C			4.3	Ω
Source OFF Leakage Current	$I_{NC(OFF)}, I_{NO(OFF)}$	$V_+$ = 3.6V, $V_{NO}$ or $V_{NC}$ = 0.3V, 3.3V, $V_{COM}$ = 3.3V, 0.3V,	-40°C to +85°C			1	μA
Channel ON Leakage Current	$I_{NC(ON)}, I_{NO(ON)}, I_{COM(ON)}$	$V_+$ = 3.6V, $V_{COM}$ = 0.3V, 3.3V, $V_{NO}$ or $V_{NC}$ = 0.3V, 3.3V, or floating	-40°C to +85°C			1	μA
<b>DIGITAL INPUTS</b>							
Input High Voltage	$V_{INH}$		-40°C to +85°C	1			V
Input Low Voltage	$V_{INL}$		-40°C to +85°C			0.5	V
Input Leakage Current	$I_{IN}$	$V_+$ = +5.5V, $V_{IN}$ = 0V or 3.6V	-40°C to +85°C			1	μA
<b>DYNAMIC CHARACTERISTICS</b>							
Turn-On Time	$t_{ON}$	$V_{NO}$ or $V_{NC}$ = 1.5V, $V_{IH}$ = 1.5V, $V_{IL}$ = 0V, $R_L$ = 300Ω, $C_L$ = 35pF, Test Circuit 2	+25°C		30		ns
Turn-Off Time	$t_{OFF}$	$V_{NO}$ or $V_{NC}$ = 1.5V, $V_{IH}$ = 1.5V, $V_{IL}$ = 0V, $R_L$ = 300Ω, $C_L$ = 35pF, Test Circuit 2	+25°C		25		ns
Break-Before-Make Time Delay	$t_D$	$V_{NO1}$ or $V_{NC1}$ = $V_{NO2}$ or $V_{NC2}$ = 3V, $R_L$ = 300Ω, $C_L$ = 35pF, Test Circuit 3	+25°C		8		ns
Skew	$t_{SKEW}$	$R_S$ = 39Ω, $C_L$ = 50pF, Test Circuit 4	+25°C		2		ns
Off Isolation	$O_{ISO}$	$R_L$ = 50Ω, $C_L$ = 5pF, Signal = 0dBm, Test Circuit 5	f = 10MHz	+25°C		-51	dB
			f = 1MHz	+25°C		-72	dB
-3dB Bandwidth	BW	Signal = 0dBm, $R_L$ = 50Ω, $C_L$ = 5pF, Test Circuit 6	+25°C		300		MHz
Source OFF Capacitance	$C_{NC(OFF)}, C_{NO(OFF)}$	f = 1MHz	+25°C		5.5		pF
Channel ON Capacitance	$C_{NC(ON)}, C_{NO(ON)}, C_{COM(ON)}$	f = 1MHz	+25°C		15.5		pF
<b>POWER REQUIREMENTS</b>							
Power Supply Range	$V_+$		-40°C to +85°C	1.8		5.5	V
Power Supply Current	$I_+$	$V_+$ = +5.5V, $V_{IN}$ = 0V or $V_+$	-40°C to +85°C			5	μA

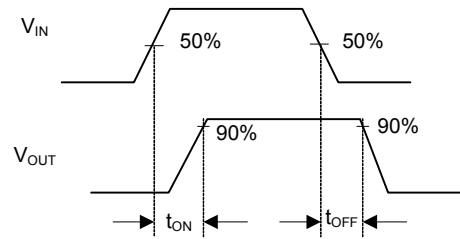
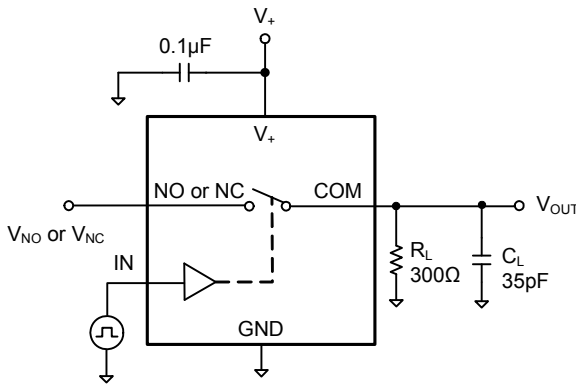
TYPICAL PERFORMANCE CHARACTERISTICS



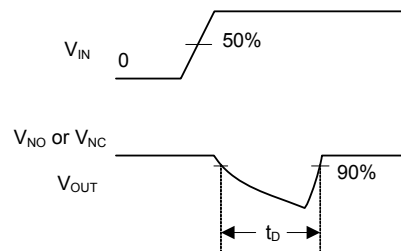
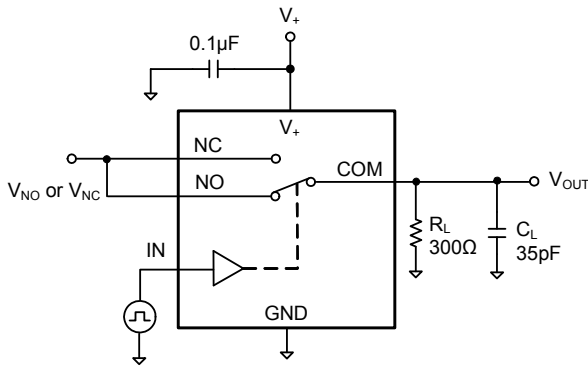
TEST CIRCUITS



Test Circuit 1. On Resistance

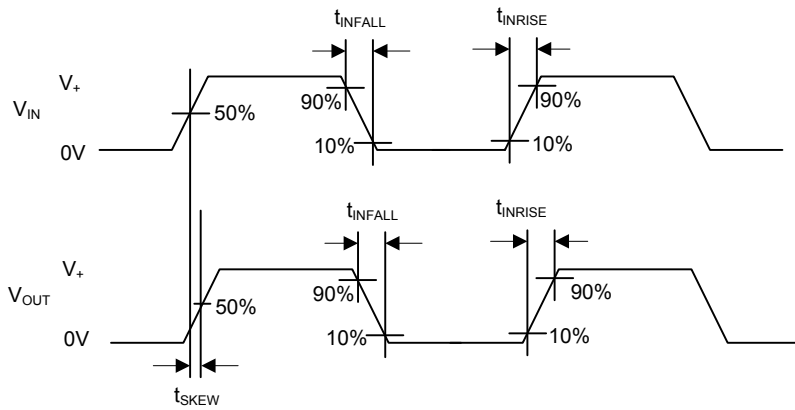
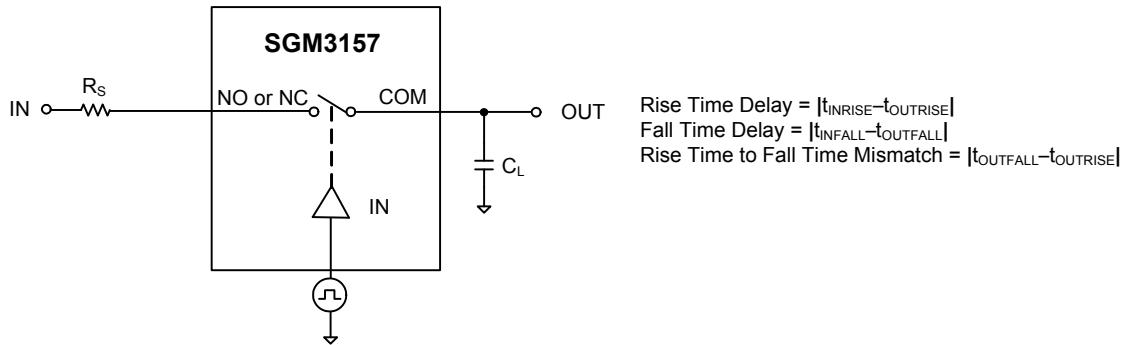


Test Circuit 2. Switching Times

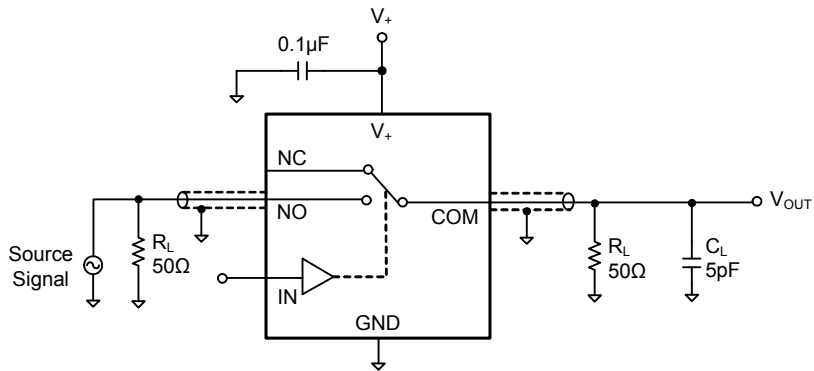


Test Circuit 3. Break-Before-Make Time Delay,  $t_D$

TEST CIRCUITS (Cont.)

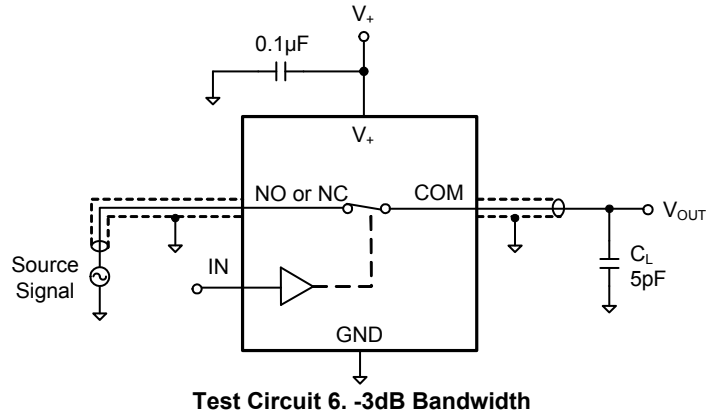


Test Circuit 4. Output Signal Skew



Test Circuit 5. Off Isolation

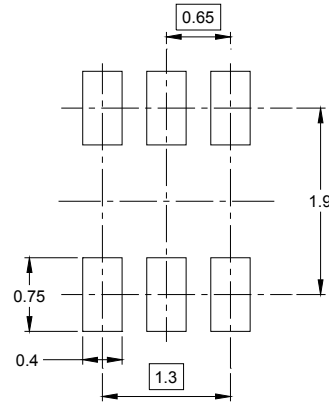
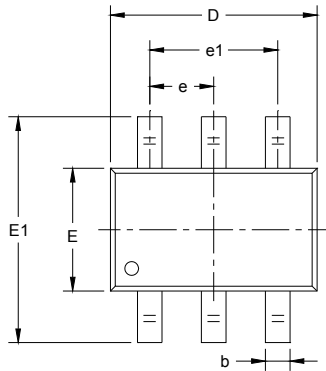
TEST CIRCUITS (Cont.)



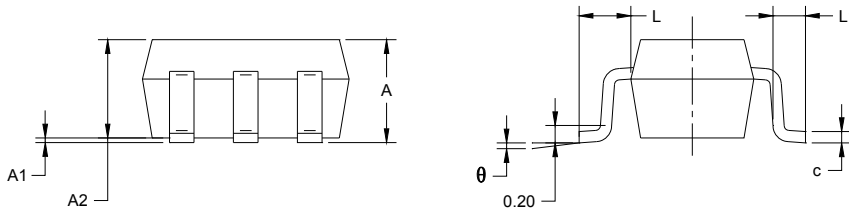


PACKAGE OUTLINE DIMENSIONS

SC70-6



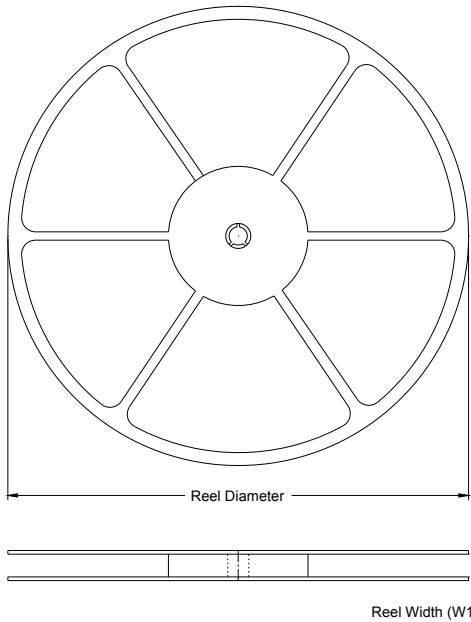
RECOMMENDED LAND PATTERN (Unit: mm)



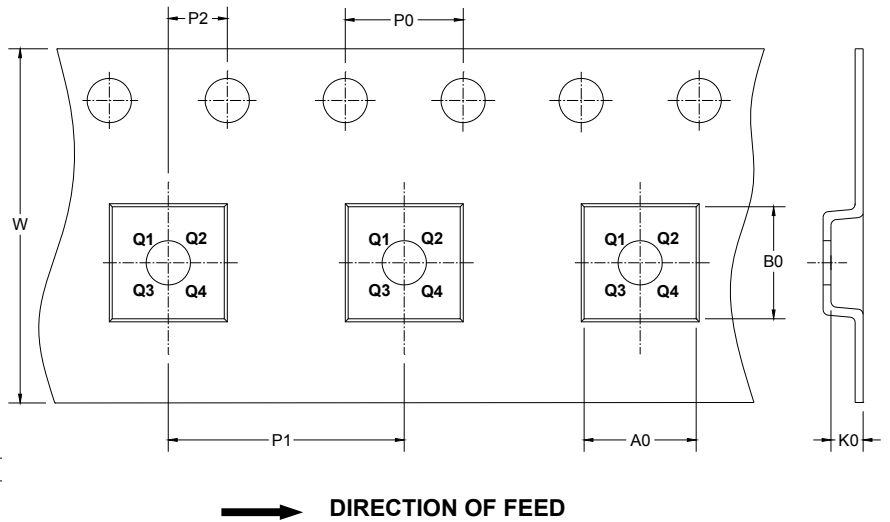
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014
c	0.080	0.150	0.003	0.006
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.65 TYP		0.026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



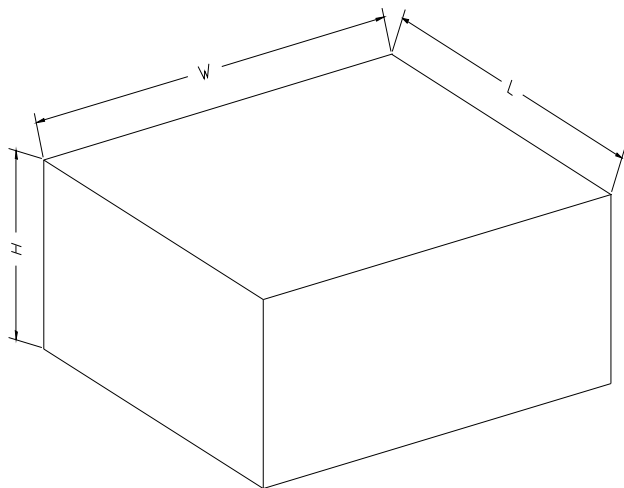
TAPE DIMENSIONS



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

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