

# SGM3157

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

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### 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.

The 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.

The SGM3157 is available in Green SC70-6 package.

### FEATURES

- **Supply Voltage Range: 1.8V to 5.5V**
- **On-Resistance: 4.5Ω (TYP) at 5.0V**
- **Fast Switching Times**
  - $t_{ON}$  20ns
  - $t_{OFF}$  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**

### APPLICATIONS

Portable Instrumentation  
Battery-Operated Equipment  
Computer Peripherals  
Cell Phones  
PDAs  
MP3s

**PACKAGE/ORDERING INFORMATION**

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

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**

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

**NOTE:**

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.

**RECOMMENDED OPERATING CONDITIONS**

Operating Temperature Range.....-40°C to +85°C

**OVERSTRESS CAUTION**

Stresses beyond those listed may cause permanent damage to the device. Functional operation of the device at these or any other conditions beyond those indicated in the operational section of the specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

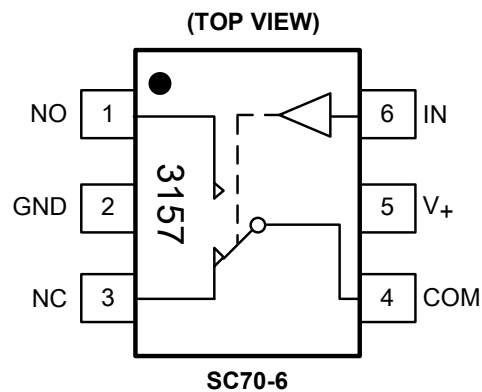
**ESD SENSITIVITY CAUTION**

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.

**DISCLAIMER**

SG Micro Corp reserves the right to make any change in circuit design, specification or other related things if necessary without notice at any time.

## PIN CONFIGURATION



## PIN DESCRIPTION

PIN	NAME	FUNCTION
1	NO	Normally-Open Terminal.
2	GND	Ground.
3	NC	Normally-Closed Terminal.
4	COM	Common Terminal.
5	V+	Power Supply.
6	IN	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  $5.5V$ ,  $V_{IH} = 2.0V$ ,  $V_{IL} = 0.8V$ , Full =  $-40^\circ C$  to  $+85^\circ C$ , typical values are at  $V_+ = 5.0V$ ,  $T_A = +25^\circ C$ , unless otherwise noted.)

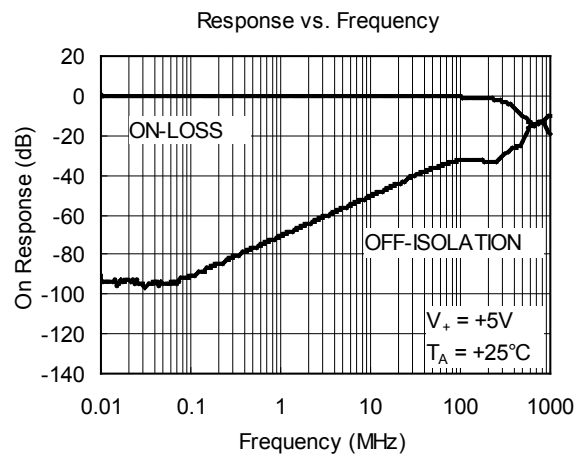
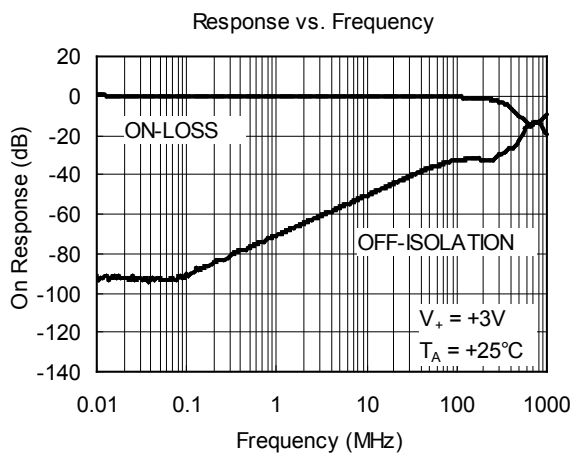
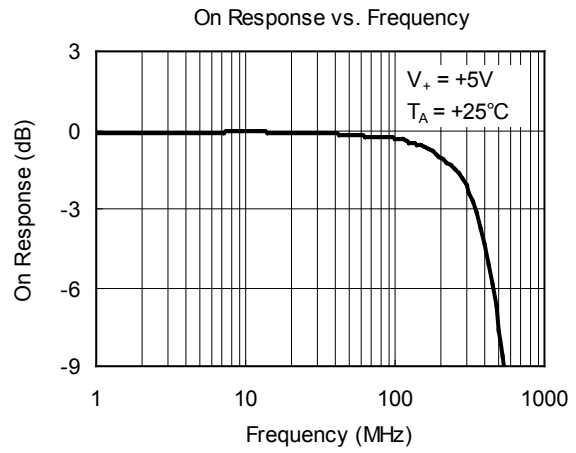
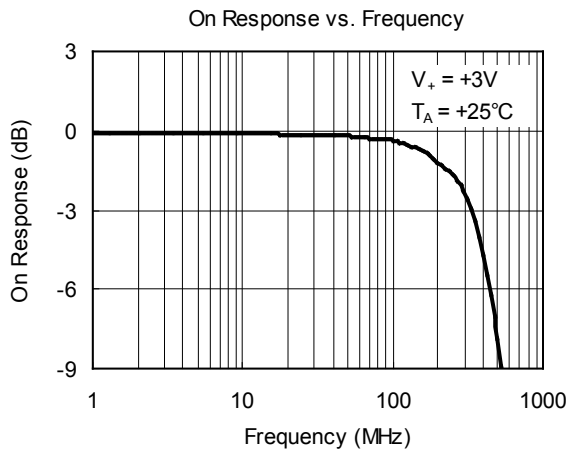
PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
<b>ANALOG SWITCH</b>							
Analog Signal Range	$V_{NO}, V_{NC}, V_{COM}$		Full	0		$V_+$	V
On-Resistance	$R_{ON}$	$V_+ = 4.5V, V_{NO}$ or $V_{NC} = 3.5V,$ $I_{COM} = -10mA$ , Test Circuit 1	$+25^\circ C$		4.5	8	$\Omega$
			Full			8.5	$\Omega$
On-Resistance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

**ELECTRICAL CHARACTERISTICS (continued)**

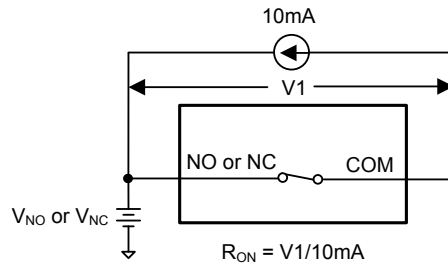
( $V_+ = 2.7V$  to  $3.6V$ ,  $V_{IH} = 1.4V$ ,  $V_{IL} = 0.5V$ , Full =  $-40^\circ C$  to  $+85^\circ C$ , typical values are at  $V_+ = 3.0V$ ,  $T_A = +25^\circ C$ , unless otherwise noted.)

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

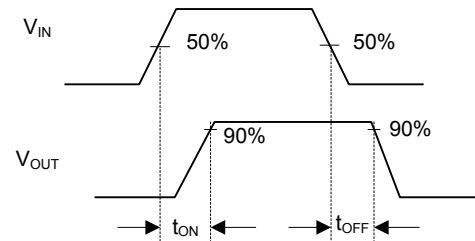
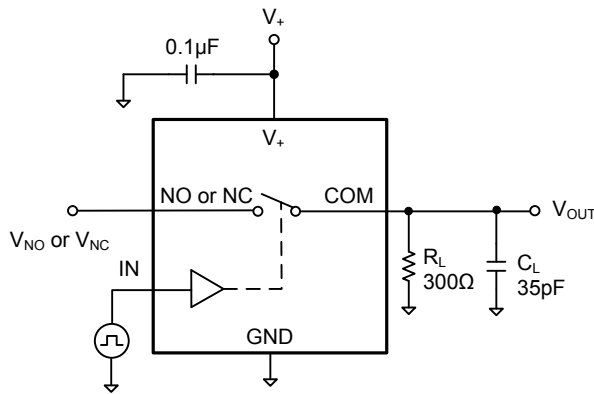
TYPICAL PERFORMANCE CHARACTERISTICS



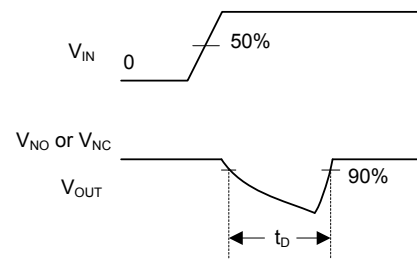
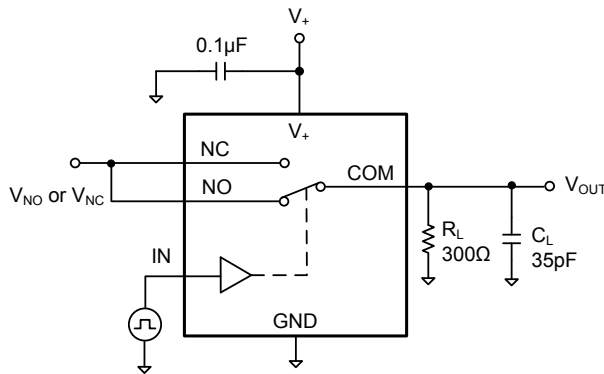
TEST CIRCUITS



Test Circuit 1. On-Resistance

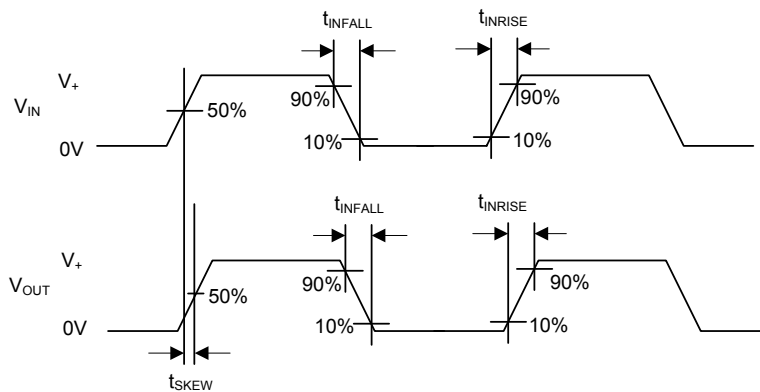
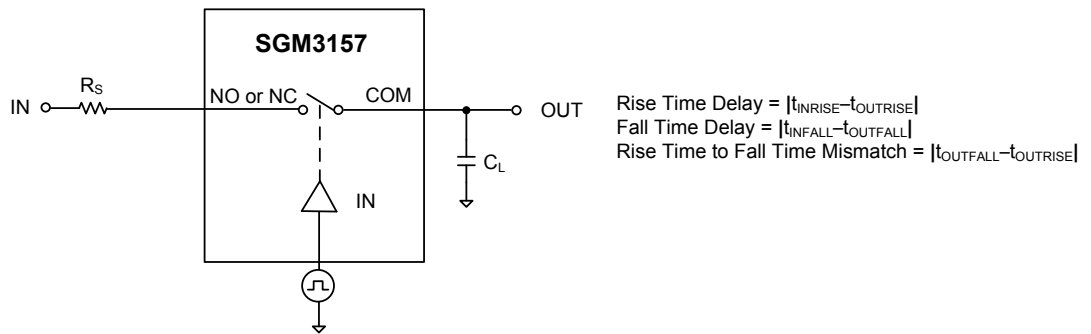


Test Circuit 2. Switching Times

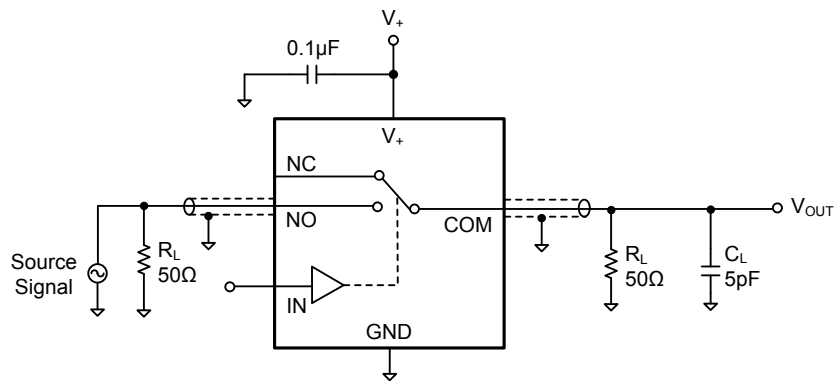


Test Circuit 3. Break-Before-Make Time Delay,  $t_D$

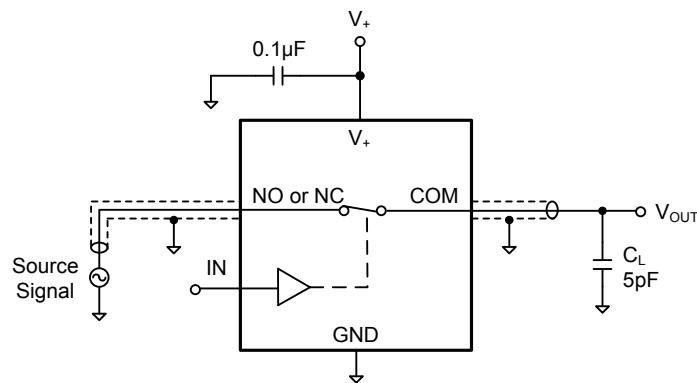
TEST CIRCUITS (continued)



Test Circuit 4. Output Signal Skew



Test Circuit 5. Off Isolation



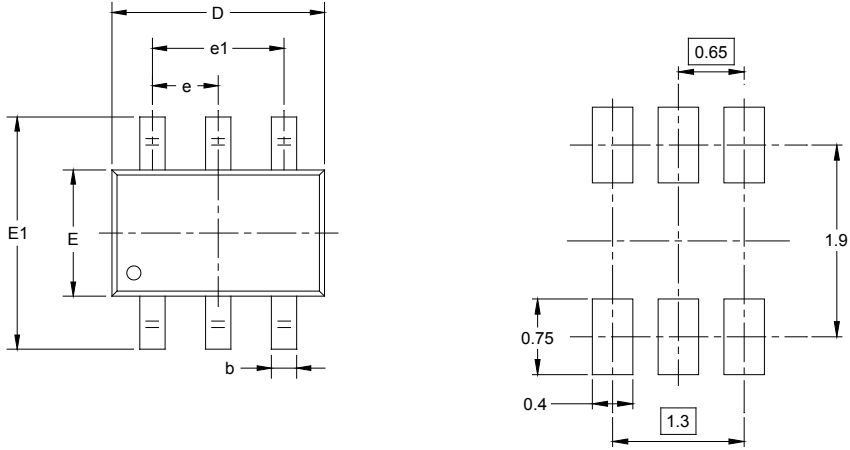
Test Circuit 6. -3dB Bandwidth



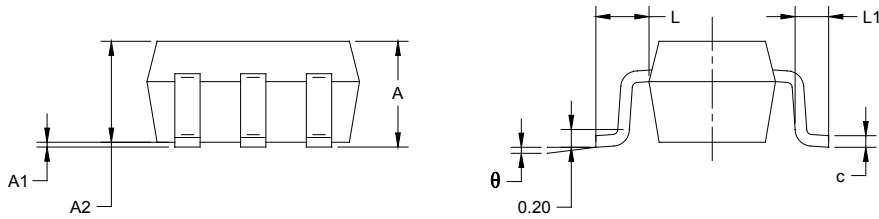
# PACKAGE INFORMATION

## PACKAGE OUTLINE DIMENSIONS

### SC70-6



RECOMMENDED LAND PATTERN (Unit: mm)

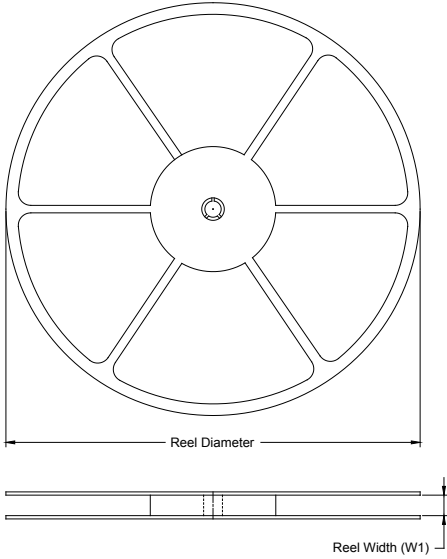


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014
c	0.080	0.150	0.003	0.006
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.65 TYP		0.026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

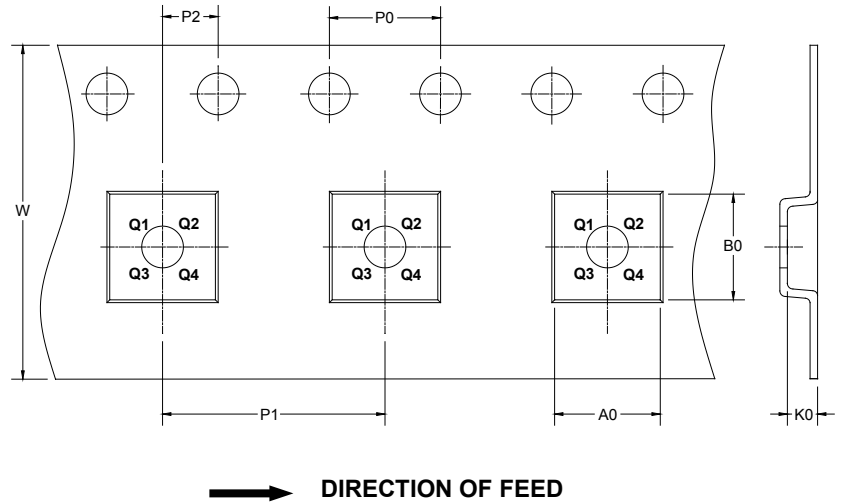
# PACKAGE INFORMATION

## 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
SC70-6	7"	9.5	2.40	2.50	1.20	4.0	4.0	2.0	8.0	Q3

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
7" (Option)	368	227	224	8
7"	442	410	224	18

DD0002