SGM3157
6Ω, Low Voltage SPDT Analog Switch in 6-Pin SC70

GENERAL DESCRIPTION

The SGM3157 is a bidirectional, SPDT (single-pole/double-throw), CMOS analog switch. It operates from a 1.8V to 5.5V single power supply

The SGM3157 features low on-resistance, low voltage and high bandwidth. The high performances make it very suitable for multiple applications, such as portable equipment, audio and video signal routing, etc. Low power consumption is also one of the important reasons that make it a good choice.

The SGM3157 is available in a Green SC70-6 package. It operates over an ambient temperature range of -40℃ to +85℃.

FEATURES

- **Single Supply Voltage Range: 1.8V to 5.5V**
- **Low On-Resistance: 6Ω (TYP) at V_+ = 4.5V**
- **Fast Switching Times:**
  - **t_{ON}: 20ns (TYP)**
  - **t_{OFF}: 15ns (TYP)**
- **Low On-Resistance Flatness**
- **-3dB Bandwidth: 300MHz**
- **High Off-Isolation: -51dB at 10MHz**
- **TTL/CMOS Compatible**
- **Rail-to-Rail Input and Output Operation**
- **Break-Before-Make Switching**
- **-40℃ to +85℃ Operating Temperature Range**
- **Available in a Green SC70-6 Package**

APPLICATIONS

Cellular Phones
Portable Equipment
Computer Peripherals
Sample-and-Hold Circuits
Personal Digital Assistants
Battery-Powered Systems
Audio and Video Signal Routing

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM3157	SC70-6	-40℃ to +85℃	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 (1) ..... -0.3V to (V_+) + 0.3V
Continuous Current NO, NC, or COM ..... ±50mA
Peak Current NO, NC, or COM ..... ±80mA
Junction Temperature ..... +150℃
Storage Temperature Range ..... -65℃ to +150℃
Lead Temperature (Soldering, 10s) ..... +260℃
ESD Susceptibility
HBM 2000V
MM 400V

NOTE:
1. Signals on NC, NO, or COM or IN exceeding V_+ will be clamped by internal diodes. Limit forward diode current to maximum current ratings.

RECOMMENDED OPERATING CONDITIONS

Operating Temperature Range ..... -40℃ to +85℃

OVERSTRESS CAUTION

Stresses beyond those listed in Absolute Maximum Ratings may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect reliability. Functional operation of the device at any conditions beyond those indicated in the Recommended Operating Conditions section is not implied.

ESD SENSITIVITY CAUTION

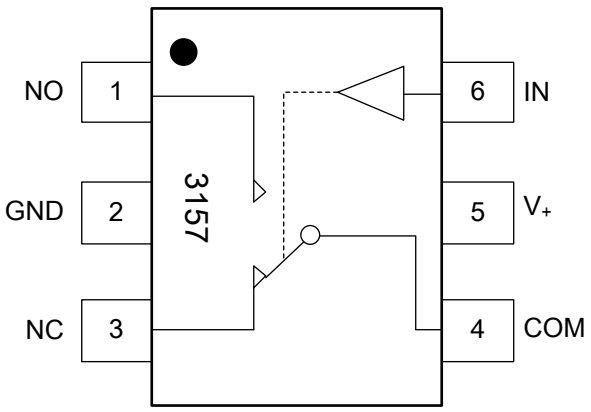
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because even small parametric changes could cause the device not to meet the published specifications.

DISCLAIMER

SG Micro Corp reserves the right to make any change in circuit design, or specifications without prior notice.

PIN CONFIGURATION

(TOP VIEW)



SC70-6

PIN DESCRIPTION

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

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

ELECTRICAL CHARACTERISTICS

(V_+ = 4.5V to 5.5V, Full = -40℃ to +85℃, typical values are at V_+ = 5.0V, T_A = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
ANALOG SWITCH							
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} = 0V to 4.5V, I_{COM} = -10mA, Test Circuit 1	+25℃		6	7.5	Ω
			Full			8.5	Ω
On-Resistance Match Between Channels	ΔR_{ON}	V_+ = 4.5V, V_{NO} or V_{NC} = 0V to 4.5V, I_{COM} = -10mA, Test Circuit 1	+25℃		0.3	0.7	Ω
			Full			0.8	Ω
On-Resistance Flatness	$R_{FLAT(ON)}$	V_+ = 4.5V, V_{NO} or V_{NC} = 0V to 4.5V, I_{COM} = -10mA, Test Circuit 1	+25℃		2.3	3.3	Ω
			Full			4.5	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	Full			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	Full			1	μA
DIGITAL INPUTS							
Input High Voltage	V_{INH}	V_+ = 4.5V	Full	1.8			V
Input Low Voltage	V_{INL}	V_+ = 4.5V	Full			0.4	V
Input Leakage Current	I_{IN}	V_+ = 5.5V, V_{IN} = 0V or 5.5V	Full			1	μA
DYNAMIC CHARACTERISTICS							
Turn-On Time	t_{ON}	V_{NO} or V_{NC} = 3V, R_L = 300Ω, C_L = 35pF, Test Circuit 2	+25℃		20		ns
Turn-Off Time	t_{OFF}	V_{NO} or V_{NC} = 3V, R_L = 300Ω, C_L = 35pF, Test Circuit 2	+25℃		15		ns
Break-Before-Make Time Delay	t_D	V_{NO} = V_{NC} = 3V, R_L = 300Ω, C_L = 35pF, Test Circuit 3	+25℃		5		ns
Propagation Delay Time (Signal Input to Output)	t_{PD}	R_S = 39Ω, C_L = 50pF, Test Circuit 4	+25℃		5		ns
Off Isolation	O_{ISO}	R_L = 50Ω, C_L = 5pF, Signal = 0dBm, Test Circuit 5, f = 10MHz	+25℃		-51		dB
		R_L = 50Ω, C_L = 5pF, Signal = 0dBm, Test Circuit 5, f = 1MHz	+25℃		-72		dB
-3dB Bandwidth	BW	Signal = 0dBm, R_L = 50Ω, C_L = 5pF, Test Circuit 6	+25℃		300		MHz
Source Off Capacitance	$C_{NC(OFF)}$, $C_{NO(OFF)}$	f = 1MHz	+25℃		5.5		pF
Channel On Capacitance	$C_{NC(ON)}$, $C_{NO(ON)}$, $C_{COM(ON)}$	f = 1MHz	+25℃		15.5		pF
POWER REQUIREMENTS							
Power Supply Range	V_+		Full	1.8		5.5	V
Power Supply Current	I_+	V_+ = 5.5V, V_{IN} = 0V or V_+	Full			5	μA

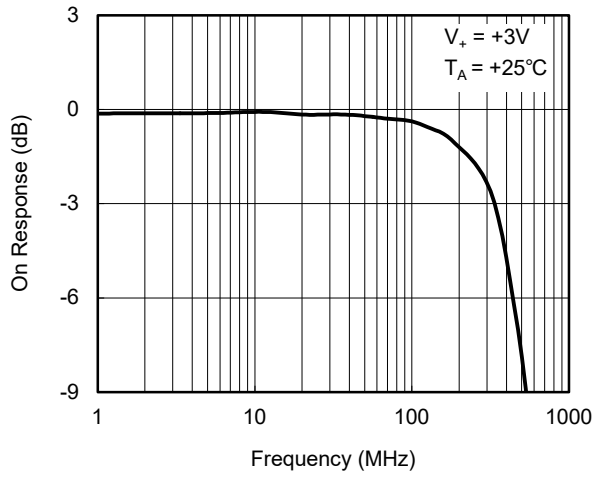
ELECTRICAL CHARACTERISTICS (continued)

(V_+ = 2.7V to 3.6V, Full = -40℃ to +85℃, typical values are at V_+ = 3.0V, T_A = +25℃, unless otherwise noted.)

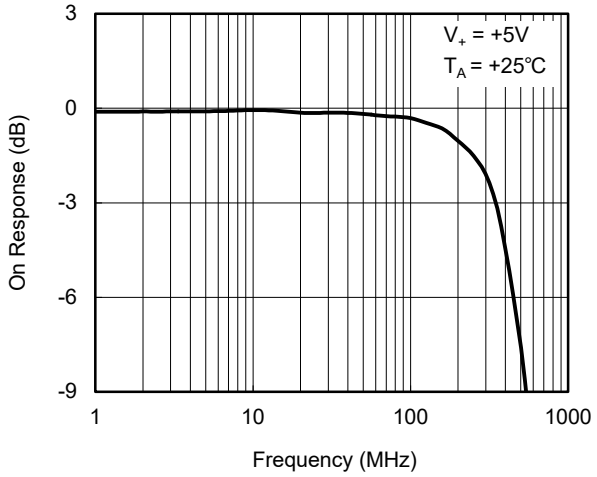
PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
ANALOG SWITCH							
Analog Signal Range	V_{NO}, V_{NC}, V_{COM}		Full	0		V_+	V
On-Resistance	R_{ON}	V_+ = 2.7V,V_{NO} or V_{NC} = 0V to 2.7V, I_{COM} = -10mA, Test Circuit 1	+25℃		14	19	Ω
			Full			21	Ω
On-Resistance Match Between Channels	ΔR_{ON}	V_+ = 2.7V,V_{NO} or V_{NC} = 0V to 2.7V, I_{COM} = -10mA, Test Circuit 1	+25℃		0.3	1	Ω
			Full			1.2	Ω
On-Resistance Flatness	$R_{FLAT(ON)}$	V_+ = 2.7V, V_{NO} or V_{NC} = 0V to 2.7V, I_{COM} = -10mA, Test Circuit 1	+25℃		9	14	Ω
			Full			15	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,	Full			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	Full			1	μA
DIGITAL INPUTS							
Input High Voltage	V_{INH}	V_+ = 2.7V	Full	1.5			V
Input Low Voltage	V_{INL}	V_+ = 2.7V	Full			0.3	V
Input Leakage Current	I_{IN}	V_+ = 3.6V, V_{IN} = 0V or 3.6V	Full			1	μA
DYNAMIC CHARACTERISTICS							
Turn-On Time	t_{ON}	V_{NO} or V_{NC} = 1.5V, R_L = 300Ω, C_L = 35pF, Test Circuit 2	+25℃		30		ns
Turn-Off Time	t_{OFF}	V_{NO} or V_{NC} = 1.5V, R_L = 300Ω, C_L = 35pF, Test Circuit 2	+25℃		25		ns
Break-Before-Make Time Delay	t_D	V_{NC} = V_{NO} = 1.5V, R_L = 300Ω, C_L = 35pF, Test Circuit 3	+25℃		8		ns
Propagation Delay Time (Signal Input to Output)	t_{PD}	R_S = 39Ω, C_L = 50pF, Test Circuit 4	+25℃		2		ns
Off Isolation	O_{ISO}	R_L = 50Ω, C_L = 5pF, Signal = 0dBm, Test Circuit 5, f = 10MHz	+25℃		-51		dB
		R_L = 50Ω, C_L = 5pF, Signal = 0dBm, Test Circuit 5, f = 1MHz	+25℃		-72		dB
-3dB Bandwidth	BW	Signal = 0dBm, R_L = 50Ω, C_L = 5pF, Test Circuit 6	+25℃		300		MHz
Source Off Capacitance	$C_{NC(OFF)}$, $C_{NO(OFF)}$	f = 1MHz	+25℃		5.5		pF
Channel On Capacitance	$C_{NC(ON)}$, $C_{NO(ON)}$, $C_{COM(ON)}$	f = 1MHz	+25℃		15.5		pF
POWER REQUIREMENTS							
Power Supply Range	V_+		Full	1.8		5.5	V
Power Supply Current	I_+	V_+ = 3.6V, V_{IN} = 0V or V_+	Full			5	μA

TYPICAL PERFORMANCE CHARACTERISTICS

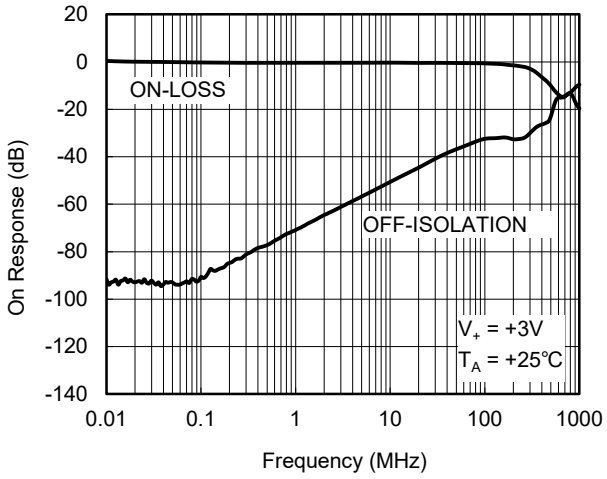
On Response vs. Frequency



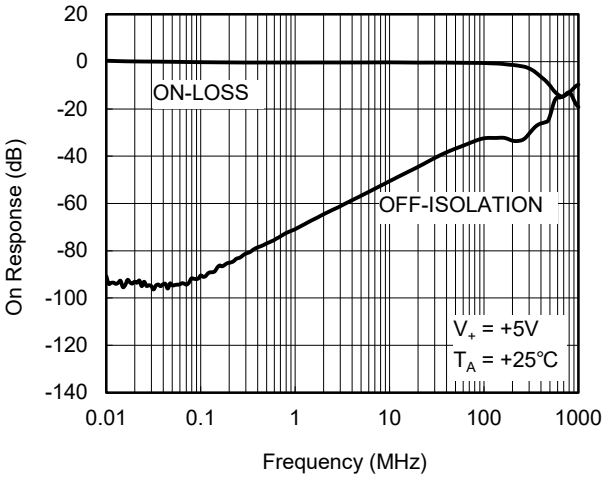
On Response vs. Frequency



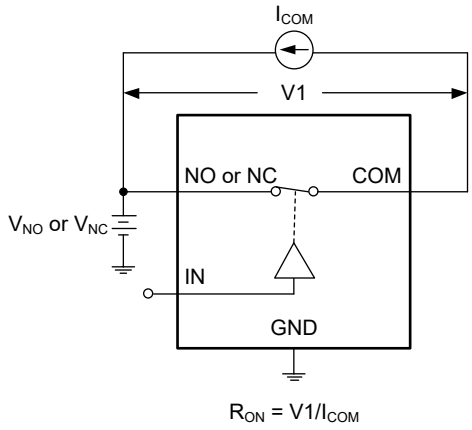
Response vs. Frequency



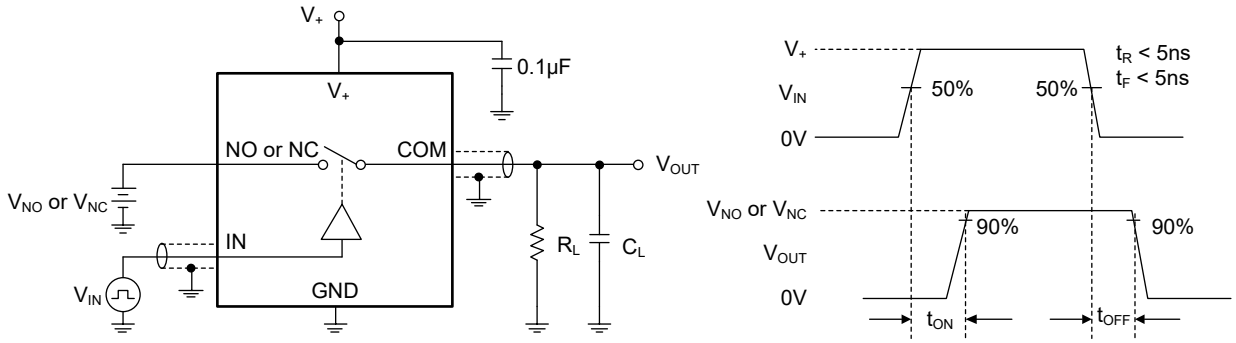
Response vs. Frequency



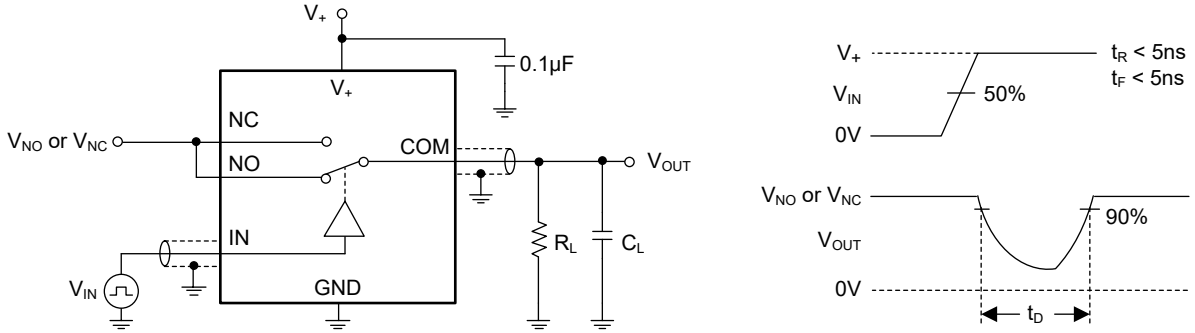
TEST CIRCUITS



Test Circuit 1. On-Resistance

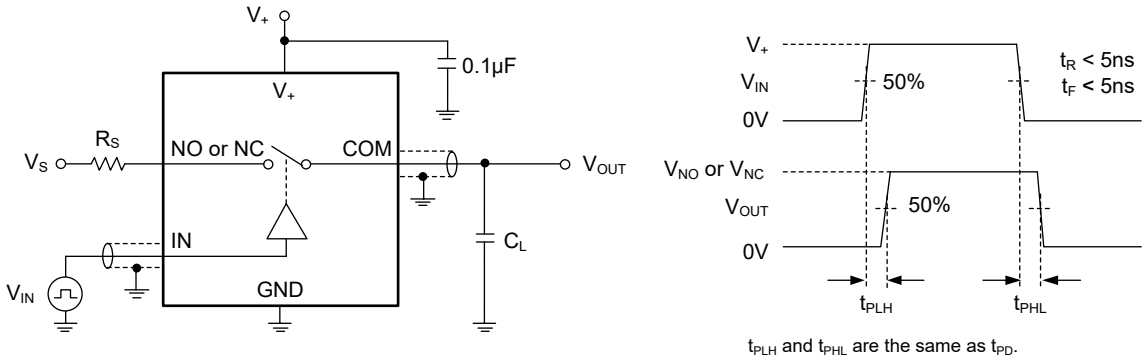


Test Circuit 2. Switching Times

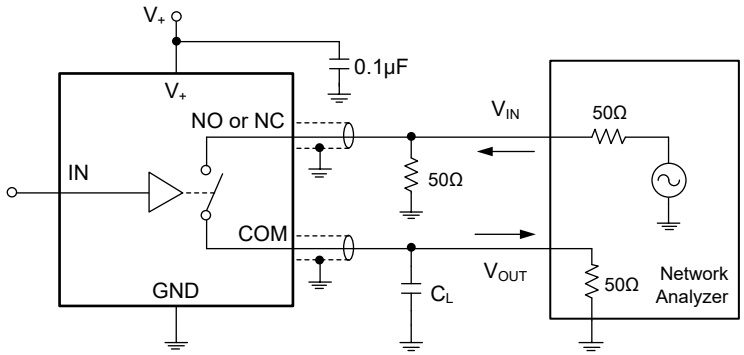


Test Circuit 3. Break-Before-Make Time Delay (t_D)

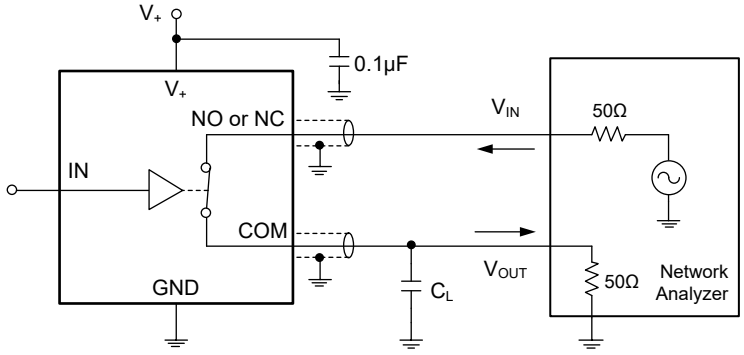
TEST CIRCUITS (continued)



Test Circuit 4. Propagation Delay Time (t_{PD})



Test Circuit 5. Off Isolation



Test Circuit 6. -3dB Bandwidth

REVISION HISTORY

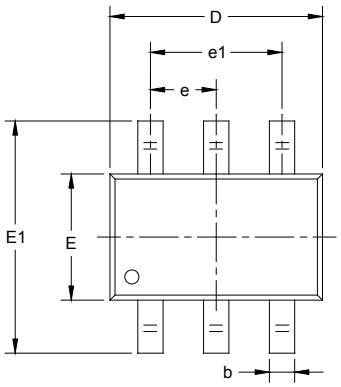
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

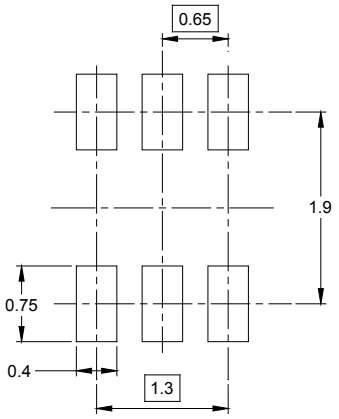
MAY 2021 – REV.C.1 to REV.C.2	Page
Changed Electrical Characteristics section	4, 5

FEBRUARY 2013 – REV.C to REV.C.1	Page
Added the Tape and Reel Information section	9, 10, 11

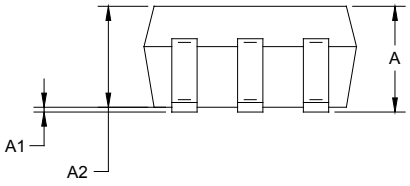
PACKAGE OUTLINE DIMENSIONS

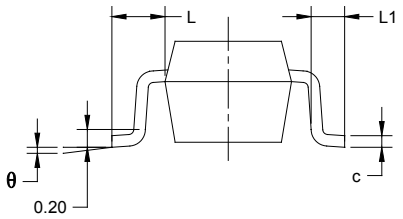
SC70-6





RECOMMENDED LAND PATTERN (Unit: mm)

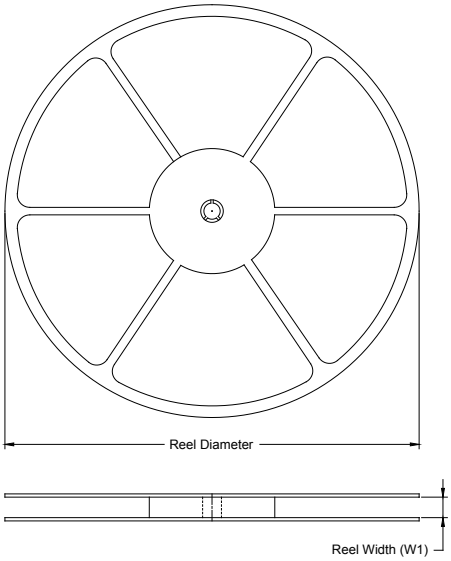




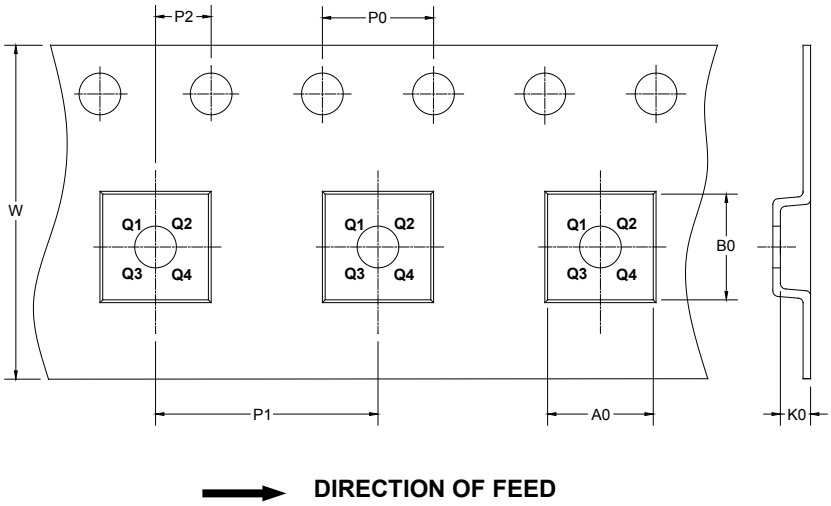
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014
c	0.080	0.150	0.003	0.006
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.65 TYP		0.026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



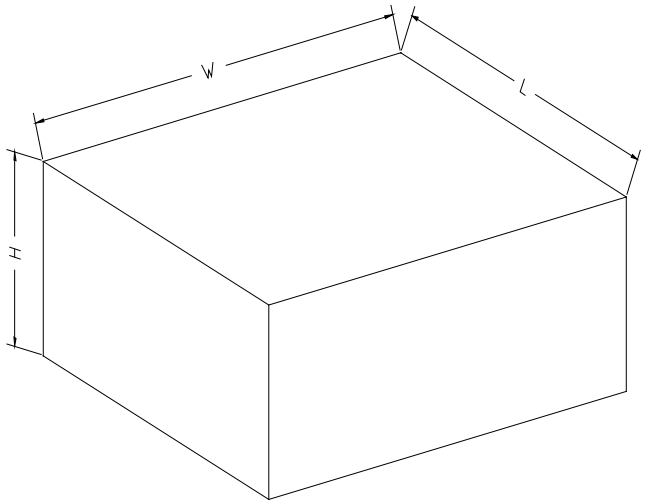
NOTE: The picture is only for reference. Please make the object as the standard.

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	2.40	2.50	1.20	4.0	4.0	2.0	8.0	Q3

DD0001

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