



# SGM3167

## 600MHz, Low Voltage SPDT Analog Switch in 6-Pin SC70

### GENERAL DESCRIPTION

The SGM3167 is a bidirectional, SPDT (single-pole/double-throw), CMOS analog switch. It operates from a 1.8V to 5.5V single power supply

The SGM3167 features high bandwidth, low on-resistance and low distortion. 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 SGM3167 is available in a Green SC70-6 package. It operates over an ambient temperature range of -40°C to +85°C.

### FEATURES

- **Single Supply Voltage Range: 1.8V to 5.5V**
- **-3dB Bandwidth: 600MHz**
- **Low On-Resistance: 9Ω (TYP) at  $V_+ = 5V$**
- **Low On-Resistance Flatness**
- **Fast Switching Times:**
  - $t_{ON}$ : 20ns (TYP)
  - $t_{OFF}$ : 15ns (TYP)
- **High Off-Isolation: -63dB at 10MHz**
- **TTL/CMOS Compatible**
- **Rail-to-Rail Input and Output Operation**
- **Break-Before-Make Switching**
- **-40°C to +85°C 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
SGM3167	SC70-6	-40°C to +85°C	SGM3167YC6/TR	3167	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..... ±30mA  
 Peak Current NO, NC, or COM..... ±50mA  
 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+ 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.

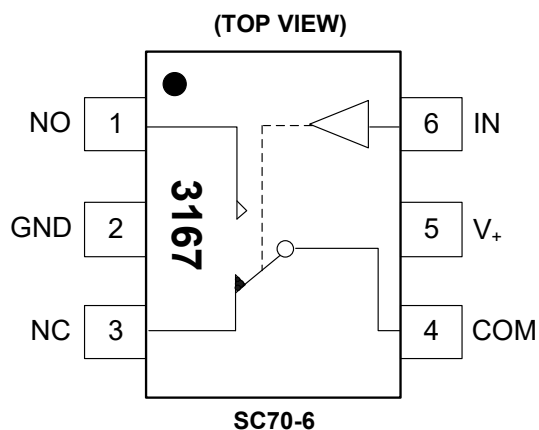
**ESD SENSITIVITY CAUTION**

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 Pin.
2	GND	Ground.
3	NC	Normally Closed Pin.
4	COM	Common Pin.
5	V+	Positive Power Supply.
6	IN	Digital Control Input Pin to Connect the COM Pin to the NO or NC Pins.

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

**FUNCTION TABLE**

LOGIC	NO	NC
0	OFF	ON
1	ON	OFF

NOTE: Switches shown for logic "0" input.

## ELECTRICAL CHARACTERISTICS

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

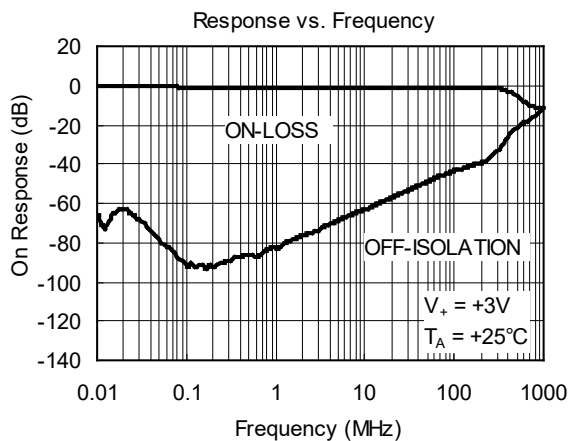
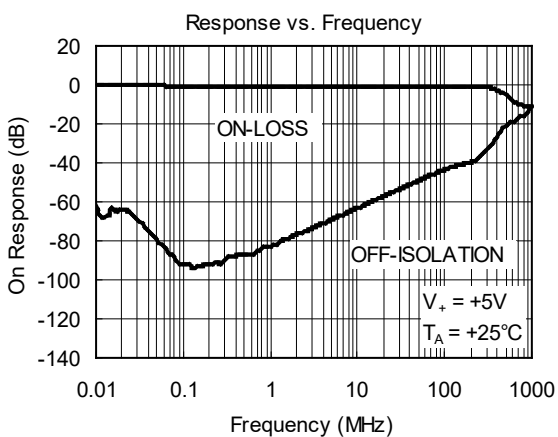
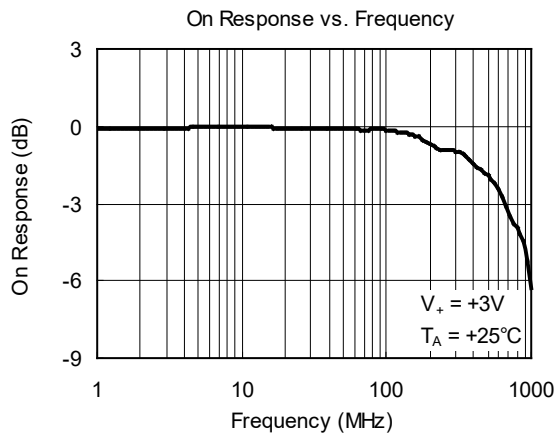
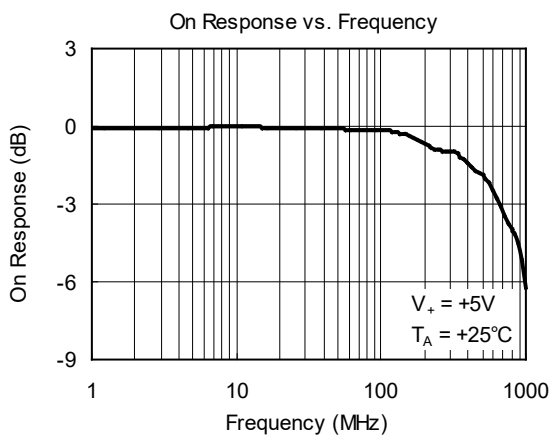
PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
<b>ANALOG SWITCH</b>							
Analog Signal Range	$V_{NO}, V_{NC}, V_{COM}$		Full	0		$V_+$	V
On-Resistance	$R_{ON}$	$V_+ = 4.5V, V_{NO}$ or $V_{NC} = 3.5V,$ $I_{COM} = -10mA, \text{Test Circuit 1}$	+25°C		9	14	$\Omega$
			Full			16	$\Omega$
On-Resistance Match Between Channels	$\Delta R_{ON}$	$V_+ = 4.5V, V_{NO}$ or $V_{NC} = 3.5V,$ $I_{COM} = -10mA, \text{Test Circuit 1}$	+25°C		0.3	0.6	$\Omega$
			Full			0.8	$\Omega$
On-Resistance Flatness	$R_{FLAT(ON)}$	$V_+ = 4.5V, V_{NO}$ or $V_{NC} = 1.0V, 2.0V, 3.5V,$ $I_{COM} = -10mA, \text{Test Circuit 1}$	+25°C		4	5.5	$\Omega$
			Full			6	$\Omega$
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 $V_{NC} = 3.0V, V_{IH} = 1.5V, V_{IL} = 0V,$ $R_L = 300\Omega, C_L = 35pF, \text{Test Circuit 2}$	+25°C		20		ns
Turn-Off Time	$t_{OFF}$	$V_{NO}$ or $V_{NC} = 3.0V, V_{IH} = 1.5V, V_{IL} = 0V,$ $R_L = 300\Omega, C_L = 35pF, \text{Test Circuit 2}$	+25°C		15		ns
Break-Before-Make Time Delay	$t_D$	$V_{NO1}$ or $V_{NC1} = V_{NO2}$ or $V_{NC2} = 3V,$ $R_L = 300\Omega, C_L = 35pF, \text{Test Circuit 3}$	+25°C		5		ns
Propagation Delay Time (Signal Input to Output)	$t_{PD}$	$R_S = 39\Omega, C_L = 50pF, \text{Test Circuit 4}$	+25°C		5		ns
Off Isolation	$O_{ISO}$	$R_L = 50\Omega, V_{NO}$ or $V_{NC} = 1V_{P-P},$ $C_L = 5pF, \text{Test Circuit 5}$	f = 10MHz	+25°C		-63	dB
			f = 1MHz	+25°C		-83	dB
-3dB Bandwidth	BW	Signal = 0dBm, $R_L = 50\Omega, C_L = 5pF,$ Test Circuit 6	+25°C		600		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		9		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)**

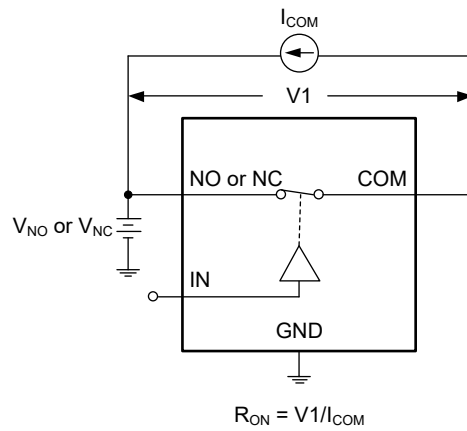
( $V_+ = 2.7V$  to  $3.6V$ ,  $V_{IH} = 1.4V$ ,  $V_{IL} = 0.5V$ , Full =  $-40^\circ C$  to  $+85^\circ C$ , typical values are at  $V_+ = 3.0V$ ,  $T_A = +25^\circ C$ , unless otherwise noted.)

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	$+25^\circ C$		14	25	$\Omega$
			Full			28	$\Omega$
On-Resistance Match Between Channels	$\Delta R_{ON}$	$V_+ = 2.7V$ , $V_{NO}$ or $V_{NC} = 1.5V$ , $I_{COM} = -10mA$ , Test Circuit 1	$+25^\circ C$		0.3	0.6	$\Omega$
			Full			0.8	$\Omega$
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	$+25^\circ C$		2.5	8	$\Omega$
			Full			10	$\Omega$
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
Propagation Delay Time (Signal Input to Output)	$t_{PD}$	$R_S = 39\Omega$ , $C_L = 50pF$ , Test Circuit 4	$+25^\circ C$		2		ns
Off Isolation	$O_{ISO}$	$R_L = 50\Omega$ , $V_{NO}$ or $V_{NC} = 1V_{P-P}$ , $C_L = 5pF$ , Test Circuit 5	$f = 10MHz$	$+25^\circ C$		-63	dB
			$f = 1MHz$	$+25^\circ C$		-83	dB
-3dB Bandwidth	BW	Signal = 0dBm, $R_L = 50\Omega$ , $C_L = 5pF$ , Test Circuit 6	$+25^\circ C$		600		MHz
Source Off Capacitance	$C_{NC(OFF)}, C_{NO(OFF)}$	$f = 1MHz$	$+25^\circ C$		5.5		pF
Channel On Capacitance	$C_{NC(ON)}, C_{NO(ON)}, C_{COM(ON)}$	$f = 1MHz$	$+25^\circ C$		9		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	$\mu A$

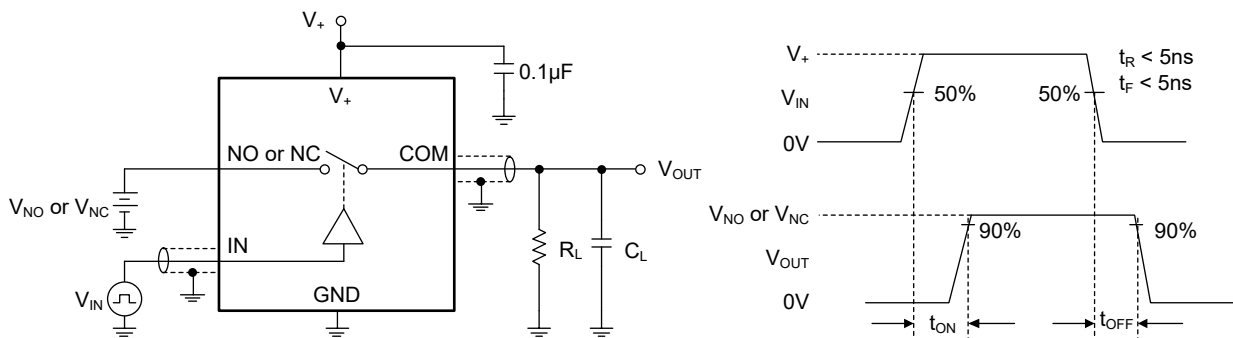
TYPICAL PERFORMANCE CHARACTERISTICS



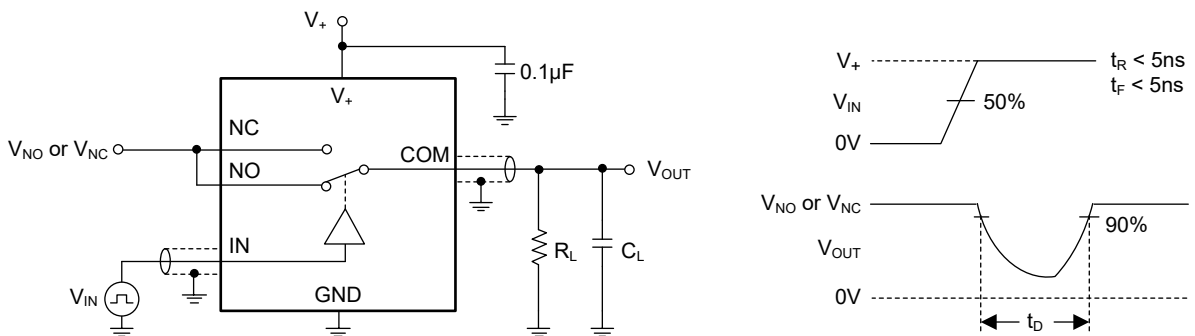
TEST CIRCUITS



Test Circuit 1. On-Resistance

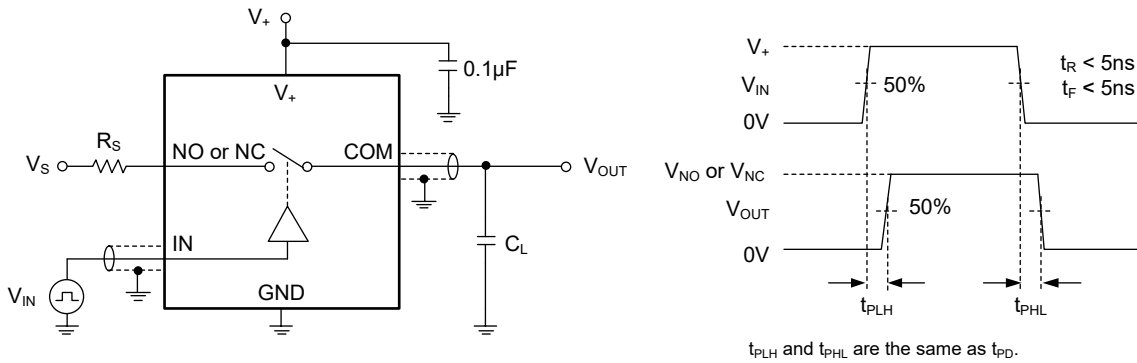


Test Circuit 2. Switching Times

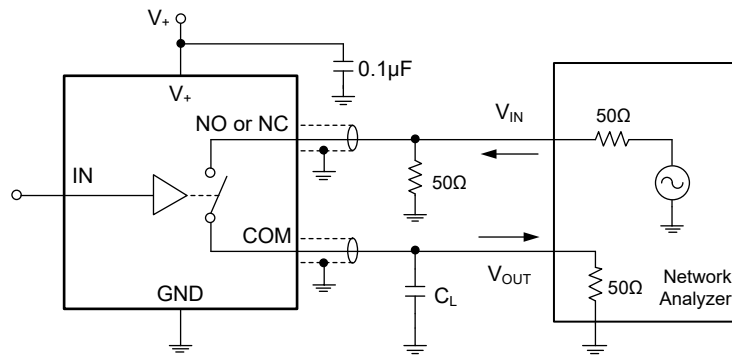


Test Circuit 3. Break-Before-Make Time Delay,  $t_b$

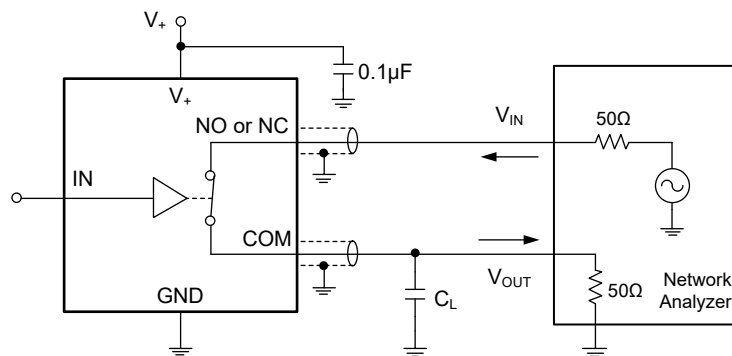
TEST CIRCUITS (continued)



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.

**JANUARY 2013 – REV.C.2**

**Page**

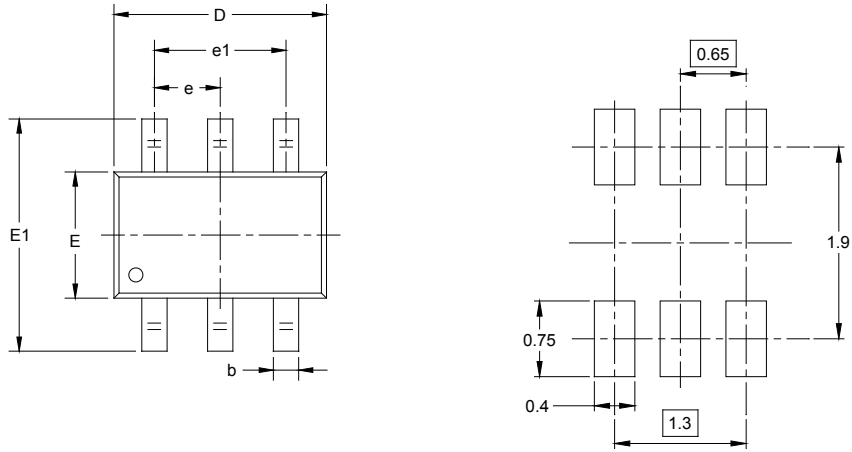
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Added the Recommended Land Pattern and Tape and Reel Information section ..... 9, 10, 11

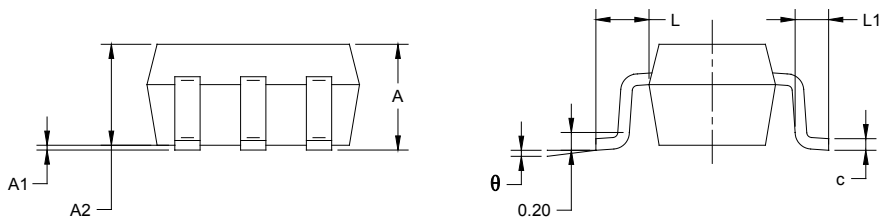
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PACKAGE OUTLINE DIMENSIONS

SC70-6



RECOMMENDED LAND PATTERN (Unit: mm)

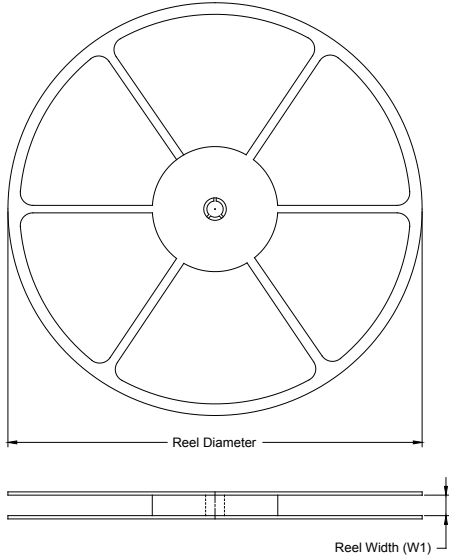


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014
c	0.080	0.150	0.003	0.006
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.65 TYP		0.026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

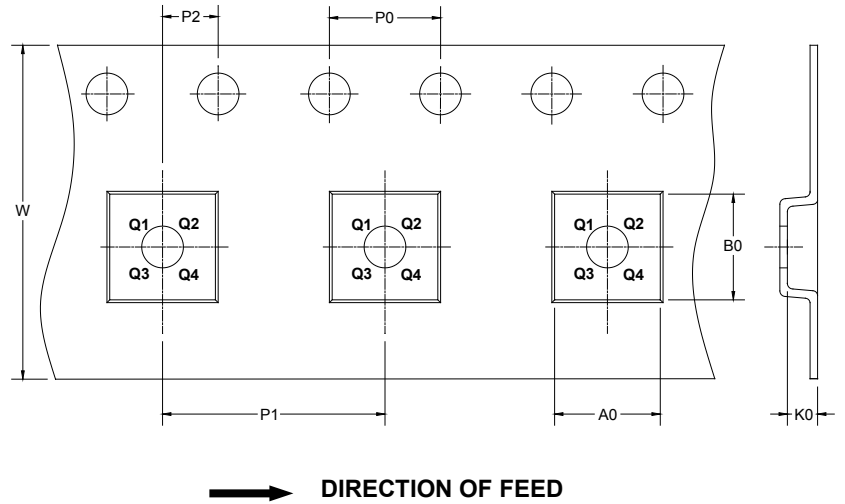
# PACKAGE INFORMATION

## TAPE AND REEL INFORMATION

### REEL DIMENSIONS



### TAPE DIMENSIONS



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

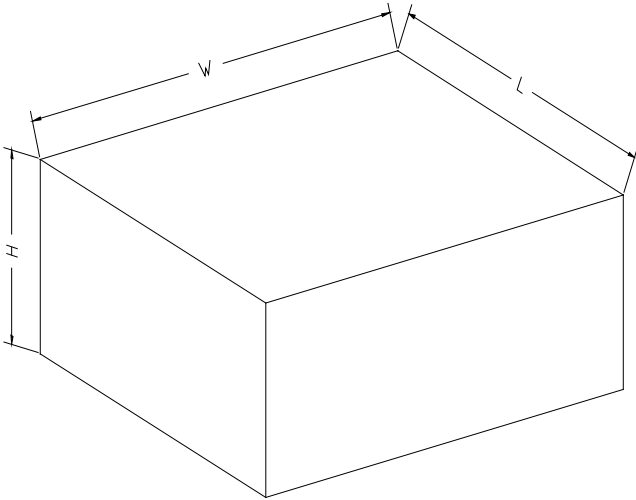
### KEY PARAMETER LIST OF TAPE AND REEL

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

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# 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

单击下面可查看定价，库存，交付和生命周期等信息

[>>SGMICRO\(圣邦微电子\)](#)