



SGM3167

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

GENERAL DESCRIPTION

The SGM3167 is a single, bidirectional, single-pole/double-throw (SPDT) CMOS analog switches designed to operate from a single 1.8V to 5.5V supply. It features high-bandwidth (600MHz) and low on-resistance (9Ω TYP), targeted applications for audio switching.

The SGM3167 features guaranteed on-resistance matching (0.3Ω MAX) between switches and guaranteed on-resistance flatness over the signal range (2.5Ω TYP). This ensures excellent linearity and low distortion when switching audio signals.

The SGM3167 is available in Green SC70-6 package.

FEATURES

- **Supply Voltage Range: 1.8V to 5.5V**
- **On-Resistance: 9Ω (TYP) at 5.0V**
- **Fast Switching Times**
 - t_{ON} 20ns
 - t_{OFF} 15ns
- **High Bandwidth: 600MHz**
- **High Off-Isolation: -63dB 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
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 ⁽¹⁾.....-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.

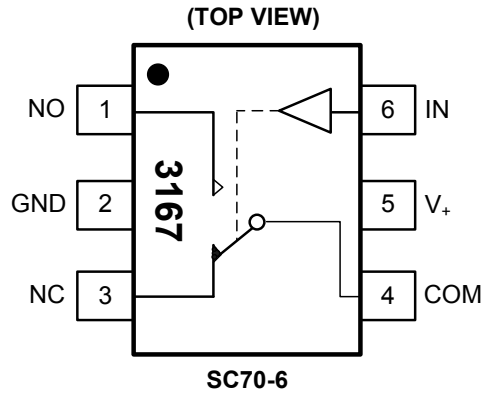
ESD SENSITIVITY CAUTION

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 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 terminal 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 = $-40^\circ C$ to $+85^\circ C$, typical values are at $V_+ = 5.0V$, $T_A = +25^\circ C$, unless otherwise noted.)

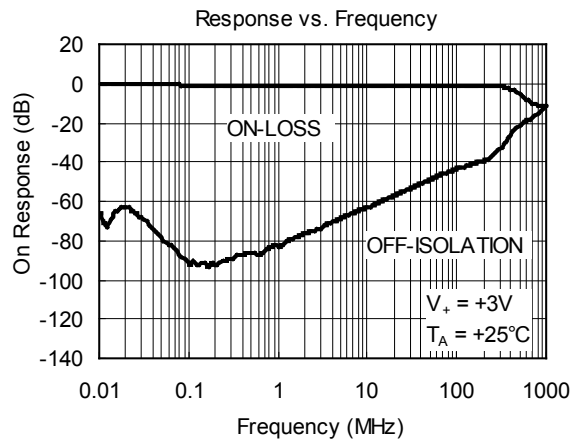
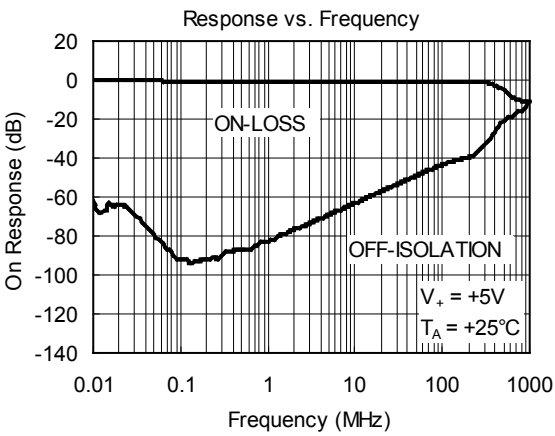
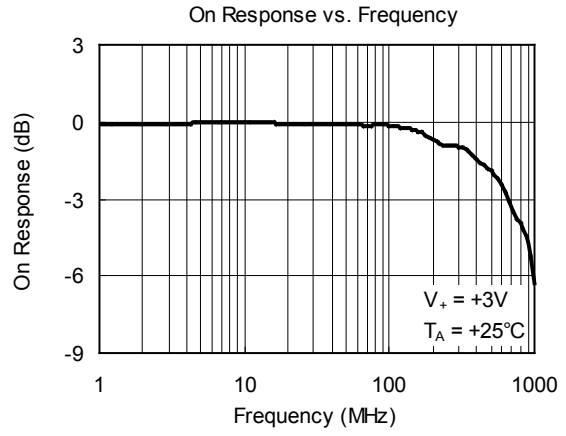
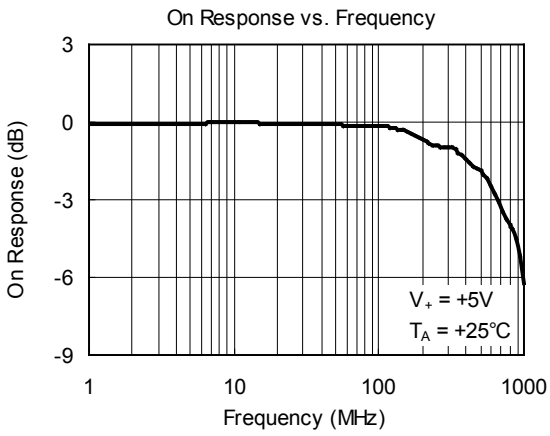
PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
ANALOG SWITCH							
Analog Signal Range	V_{NO}, V_{NC}, V_{COM}		Full	0		V_+	V
On-Resistance	R_{ON}	$V_+ = 4.5V, V_{NO}$ or $V_{NC} = 3.5V,$ $I_{COM} = -10mA$, Test Circuit 1	$+25^\circ C$		9	14	Ω
			Full			16	Ω
On-Resistance Match Between Channels	ΔR_{ON}	$V_+ = 4.5V, V_{NO}$ or $V_{NC} = 3.5V,$ $I_{COM} = -10mA$, Test Circuit 1	$+25^\circ C$		0.3	0.6	Ω
			Full			0.8	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	$+25^\circ C$		4	5.5	Ω
			Full			6	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}		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	μA
DYNAMIC CHARACTERISTICS							
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}	$R_L = 50\Omega, V_{NO}$ 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
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)

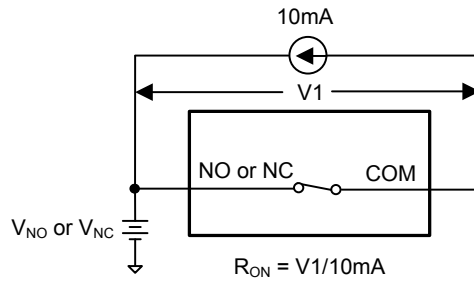
($V_+ = 2.7V$ to $3.6V$, $V_{IH} = 1.4V$, $V_{IL} = 0.5V$, Full = $-40^\circ C$ to $+85^\circ C$, typical values are at $V_+ = 3.0V$, $T_A = +25^\circ C$, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
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 $V_{NC} = 1.5V$, $I_{COM} = -10mA$, Test Circuit 1	$+25^\circ C$		14	25	Ω
			Full			28	Ω
On-Resistance Match Between Channels	ΔR_{ON}	$V_+ = 2.7V$, V_{NO} or $V_{NC} = 1.5V$, $I_{COM} = -10mA$, Test Circuit 1	$+25^\circ C$		0.3	0.6	Ω
			Full			0.8	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	$+25^\circ C$		2.5	8	Ω
			Full			10	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}		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	μA
DYNAMIC CHARACTERISTICS							
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}	$R_L = 50\Omega$, 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
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

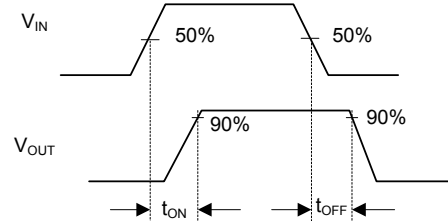
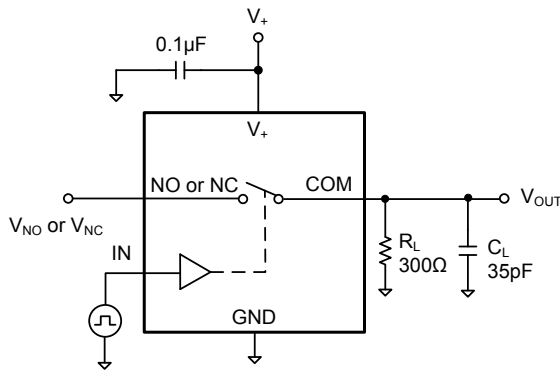
TYPICAL PERFORMANCE CHARACTERISTICS



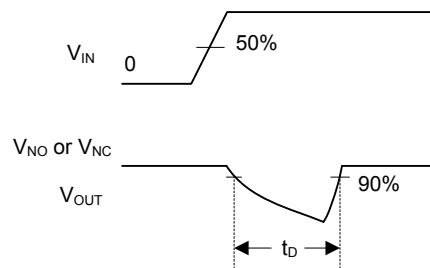
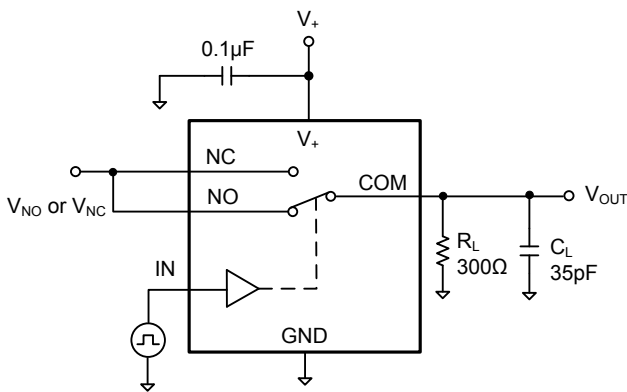
TEST CIRCUITS



Test Circuit 1. On-Resistance

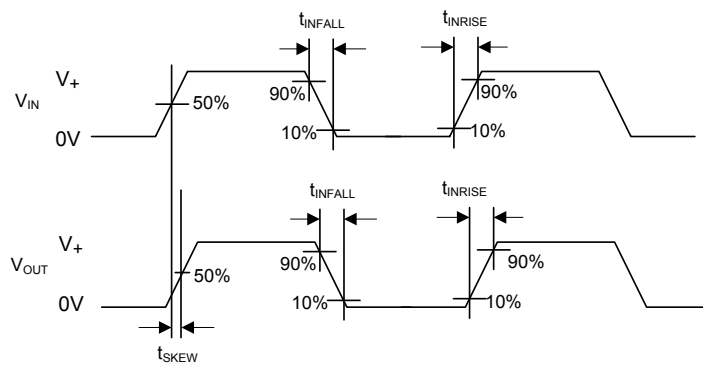
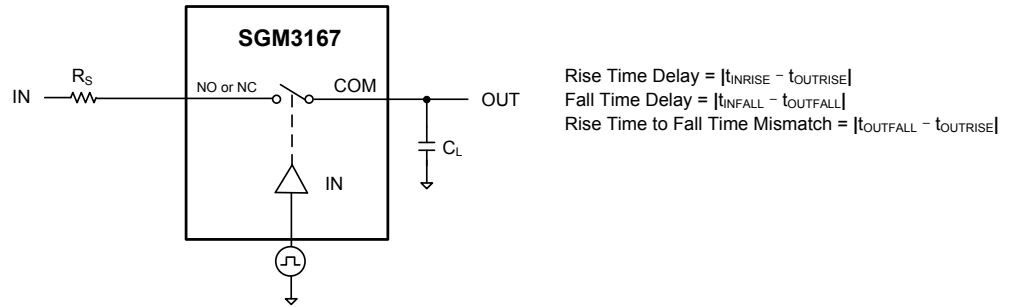


Test Circuit 2. Switching Times

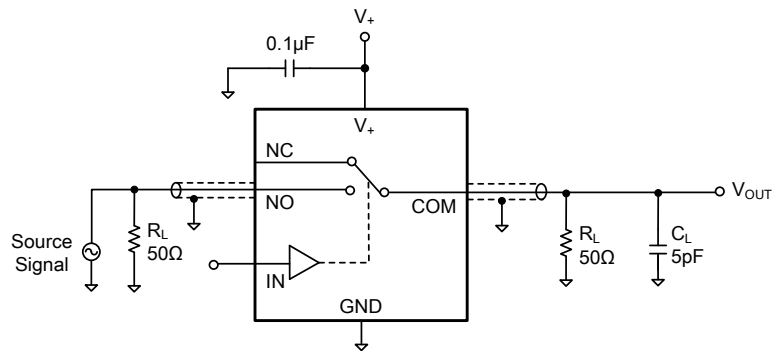


Test Circuit 3. Break-Before-Make Time Delay, t_b

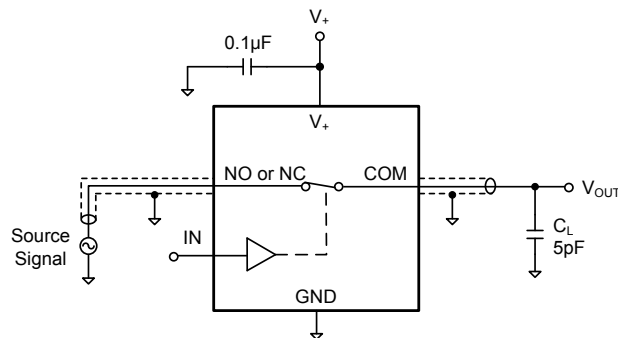
TEST CIRCUITS (continued)



Test Circuit 4. Output Signal Skew



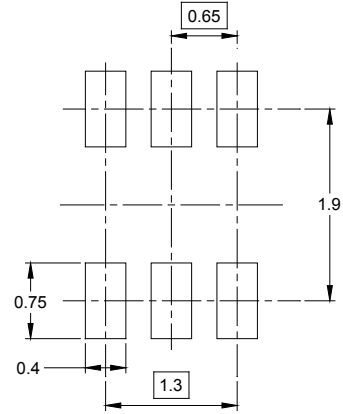
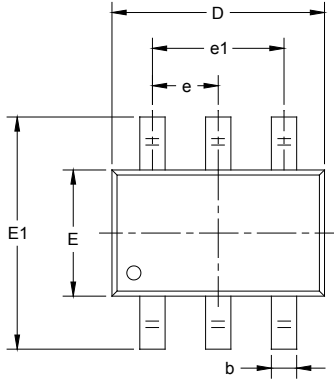
Test Circuit 5. Off Isolation



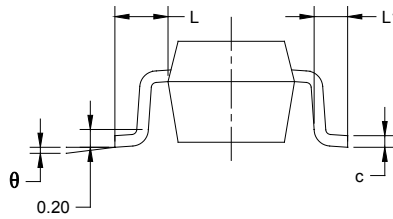
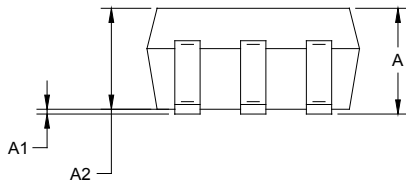
Test Circuit 6. -3dB Bandwidth

PACKAGE OUTLINE DIMENSIONS

SC70-6



RECOMMENDED LAND PATTERN (Unit: mm)

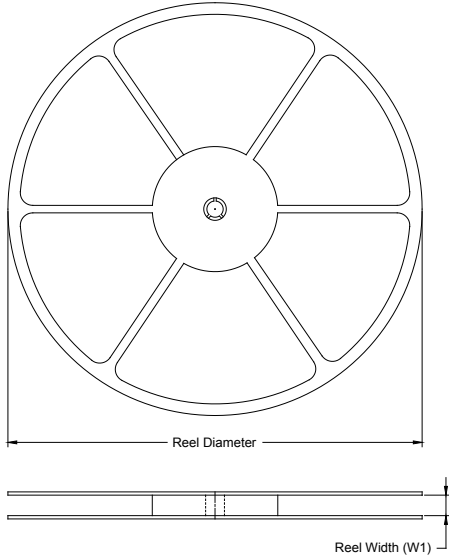


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014
c	0.080	0.150	0.003	0.006
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.65 TYP		0.026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

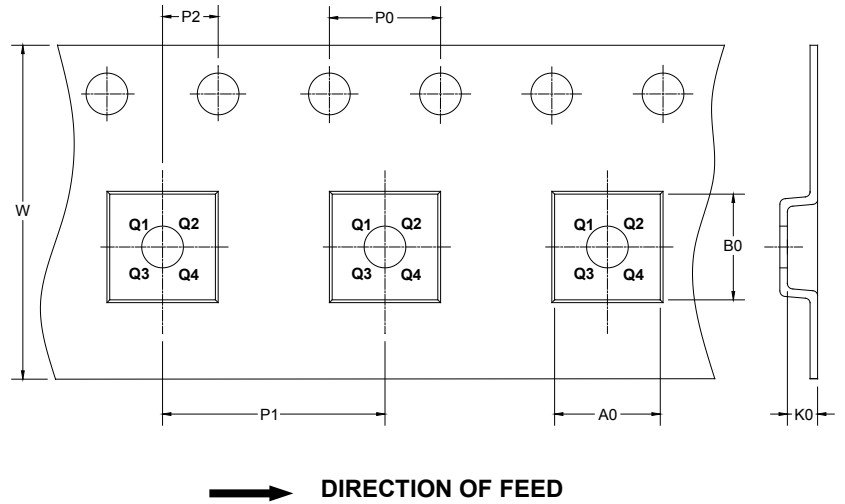
PACKAGE INFORMATION

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