



SGM48760

Single SPST Analog Switch

GENERAL DESCRIPTION

The SGM48760 is a single SPST analog switch which is designed for 1.65V to 5.5V V_{CC} operation. The device can support up to 5.5V bidirectional signal transmission. It can be flexibly applied to digital and analog signal processing systems.

The SGM48760 is available in Green SC70-5 and SOT-23-5 packages.

FEATURES

- **Supply Voltage Range: 1.65V to 5.5V**
- **Low On-Resistance: 4.8 Ω (TYP) at $V_{CC} = 4.5V$**
- **With No V_{CC} Connected in the System, the Control Pin can Accept Voltages up to 5.5V**
- **Propagation Delay Time: 0.8ns (TYP) at $V_{CC} = 3.3V$**
- **Rail-to-Rail Input and Output Operation**
- **-40 $^{\circ}C$ to +125 $^{\circ}C$ Operating Temperature Range**
- **Available in Green SC70-5 and SOT-23-5 Packages**

APPLICATIONS

ADC and DAC
 Computer Peripherals
 Portable Equipment
 Sample-and-Hold Circuits

LOGIC DIAGRAM

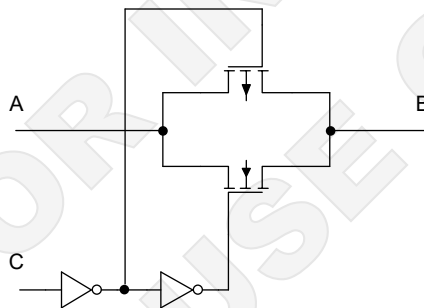


Figure 1. Logic Diagram

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM48760	SC70-5	-40°C to +125°C	SGM48760XC5G/TR	048XX	Tape and Reel, 3000
	SOT-23-5	-40°C to +125°C	SGM48760XN5G/TR	049XX	Tape and Reel, 3000

MARKING INFORMATION

NOTE: XX = Date Code.

SC70-5/SOT-23-5

YYY X X

Date Code - Week
 Date Code - Year
 Serial Number

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

Supply Voltage, $V_{CC}^{(1)}$	-0.5V to 6.5V
Control Input Voltage, $V_{IN}^{(1)(2)}$	-0.5V to 6.5V
Switch I/O Voltage, $V_{I/O}^{(1)(2)(3)}$	-0.5V to ($V_{CC} + 0.5V$)
Control Input Clamp Current, $I_{IK}, V_{IN} < 0V$	-50mA
I/O Port Diode Current, $I_{I/O}, V_{I/O} < 0V$	-50mA
On-State Switch Current, $I_T, V_{I/O} = 0V$ to V_{CC}	$\pm 50mA$
Junction Temperature	+150°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (Soldering, 10s)	+260°C

RECOMMENDED OPERATING CONDITIONS

Supply Voltage, V_{CC}	1.65V to 5.5V
I/O Port Voltage, $V_{I/O}$	0V to V_{CC}
Control Input Voltage, V_{IN}	0V to 5.5V
Input Transition Rise or Fall Time, $\Delta t/\Delta V$	
$V_{CC} = 1.65V$ to $1.95V$	20ns/V
$V_{CC} = 2.3V$ to $2.7V$	20ns/V
$V_{CC} = 3.0V$ to $3.6V$	10ns/V
$V_{CC} = 4.5V$ to $5.5V$	10ns/V
Operating Temperature Range, T_A	-40°C to +125°C

NOTES:

1. All voltages reference ground, unless otherwise noted.
2. If the input and output clamp-current ratings are observed, the input and output negative voltage ratings may be exceeded.
3. The maximum value is 5.5V.

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.

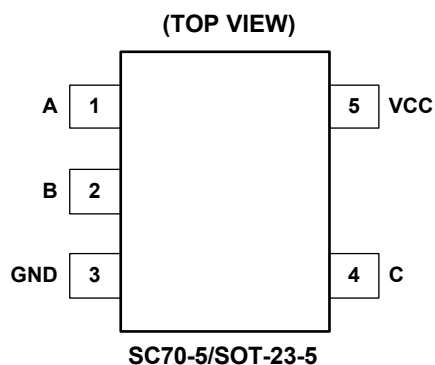
ESD SENSITIVITY CAUTION

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 CONFIGURATIONS



PIN DESCRIPTION

PIN	NAME	I/O	FUNCTION
1	A	I/O	Analog Switch A Input/Output Port.
2	B	I/O	Analog Switch B Input/Output Port.
3	GND	-	Ground Pin.
4	C	I	Control Signal Input Port of Switch (L = OFF, H = ON).
5	VCC	-	Power Supply Input Pin.

FUNCTION TABLE

CONTROL INPUT (C)	SWITCH
L	OFF
H	ON

ELECTRICAL CHARACTERISTICS

(Typical values are at T_A = +25°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	V _{CC} (V)	MIN	TYP	MAX	UNITS
Control Input High Voltage	V _{INH}		4.5 to 5.5	2.9			V
			3.0 to 3.6	1.9			
			2.3 to 2.7	1.4			
			1.65 to 1.95	1.0			
Control Input Low Voltage	V _{INL}		4.5 to 5.5			1.8	V
			3.0 to 3.6			1.2	
			2.3 to 2.7			0.9	
			1.65 to 1.95			0.4 × V _{CC}	
On-Resistance	R _{ON}	V _I = 0V to V _{CC} , V _{IN} = V _{INH} , Test Circuit 2	I _S = 4mA	1.65		52	Ω
			I _S = 8mA	2.3		12	
			I _S = 24mA	3.0		7	
			I _S = 32mA	4.5		4.8	
On-Resistance Flatness	R _{FLAT(ON)}	V _I = 0V to V _{CC} , V _{IN} = V _{INH} , Test Circuit 2	I _S = 4mA	1.65		45	Ω
			I _S = 8mA	2.3		5.6	
			I _S = 24mA	3.0		2	
			I _S = 32mA	4.5		1.2	
Off Leakage Current	I _{S(OFF)}	V _I = V _{CC} and V _O = 0V or V _I = 0V and V _O = V _{CC} , V _{IN} = V _{INL} , Test Circuit 3	5.5		0.1		μA
On Leakage Current	I _{S(ON)}	V _I = V _{CC} or 0V, V _{IN} = V _{INH} , V _O = Open, Test Circuit 4	5.5		0.1		μA
Control Input Current	I _{IN}	V _{IN} = V _{CC} or 0V	5.5		0.1		μA
Supply Current	I _{CC}	V _{IN} = V _{CC} or 0V	5.5		0.1		μA
Supply Current Change	ΔI _{CC}	V _{IN} = V _{CC} - 0.6V	5.5		0.1		μA
Control Input Capacitance	C _{INC}	f = 1MHz	5.0		3		pF
Switch Input/Output Capacitance	C _{IO(OFF)}	f = 1MHz	5.0		6		pF
Switch Input/Output Capacitance	C _{IO(ON)}	f = 1MHz	5.0		13		pF

SWITCHING CHARACTERISTICS

(Typical values are at T_A = +25°C, unless otherwise noted.)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC} = 1.8V ± 0.15V			V _{CC} = 2.5V ± 0.2V			V _{CC} = 3.3V ± 0.3V			V _{CC} = 5.0V ± 0.5V			UNITS
			MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
t _{PD}	A or B	B or A		1			0.5			0.8			0.7		ns
t _{EN}	C	A or B		7.5			4.5			6			3.2		ns
t _{DIS}	C	A or B		8			5			4.5			3.7		ns

ANALOG SWITCH CHARACTERISTICS

(T_A = +25°C, unless otherwise noted.)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	CONDITIONS	V _{CC} (V)	TYP	UNITS
Frequency Response (Switch On)	A or B	B or A	C _L = 20pF, R _L = 600Ω, f = sine wave, Test Circuit 5	1.65	100	MHz
				2.3	170	
				3.0	190	
				4.5	210	
			C _L = 5pF, R _L = 50Ω, f = sine wave, Test Circuit 5	1.65	360	
				2.3	360	
				3.0	360	
				4.5	360	
Crosstalk (Control Input to Signal Output)	C	A or B	C _L = 50pF, R _L = 600Ω, f = 1MHz (square wave), Test Circuit 6	1.65	35	mV
				2.3	60	
				3.0	90	
				4.5	150	
Feedthrough Attenuation (Switch Off)	A or B	B or A	C _L = 50pF, R _L = 600Ω, f = 1MHz (sine wave), Test Circuit 7	1.65	-54	dB
				2.3	-54	
				3.0	-54	
				4.5	-54	
			C _L = 5pF, R _L = 50Ω, f = 1MHz (sine wave), Test Circuit 7	1.65	-75	
				2.3	-75	
				3.0	-75	
				4.5	-75	
Sine-Wave Distortion	A or B	B or A	C _L = 50pF, R _L = 10kΩ to V _{CC} /2, f = 1kHz (sine wave), Test Circuit 8	1.65	0.05	%
				2.3	0.015	
				3.0	0.005	
				4.5	0.005	
			C _L = 50pF, R _L = 10kΩ to V _{CC} /2, f = 10kHz (sine wave), Test Circuit 8	1.65	0.05	
				2.3	0.015	
				3.0	0.005	
				4.5	0.005	

OPERATING CHARACTERISTICS

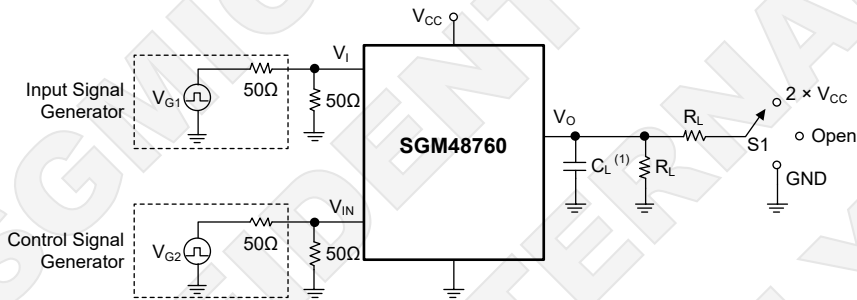
(T_A = +25°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	V _{CC} = 1.8V	V _{CC} = 2.5V	V _{CC} = 3.3V	V _{CC} = 5.0V	UNITS
			TYP	TYP	TYP	TYP	
Power Dissipation Capacitance	C _{PD}	f = 10MHz	7	8	8.5	9	pF

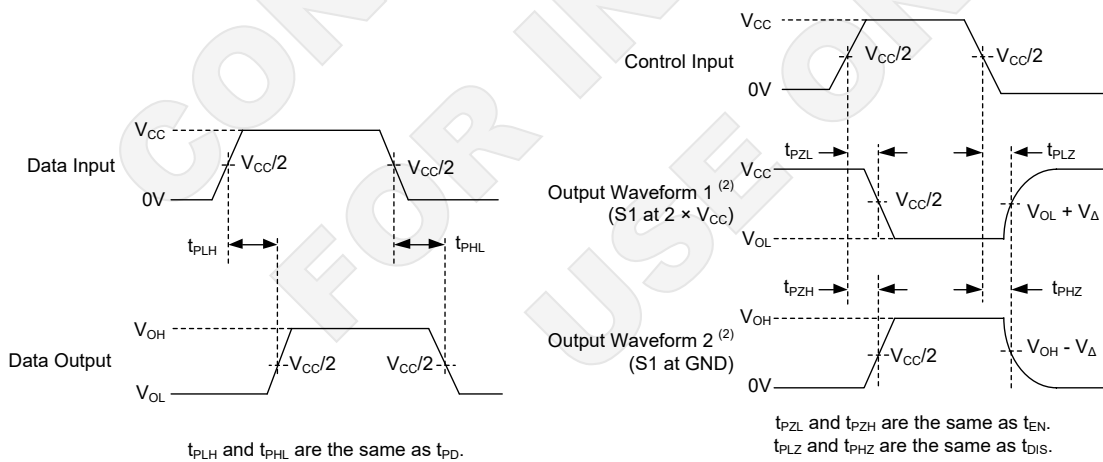
TEST CIRCUITS

Table 1. Parameter Test Information

PARAMETER	V _{CC}	S1	INPUTS		V _M	C _L	R _L	V _Δ
			V _{IN}	t _R /t _F				
t _{PLH} /t _{PHL}	1.8V ± 0.15V	Open	V _{CC}	≤ 2ns	V _{CC} /2	30pF	1kΩ	0.15V
	2.5V ± 0.2V	Open	V _{CC}	≤ 2ns	V _{CC} /2	30pF	500Ω	0.15V
	3.3V ± 0.3V	Open	V _{CC}	≤ 2.5ns	V _{CC} /2	50pF	500Ω	0.3V
	5.0V ± 0.5V	Open	V _{CC}	≤ 2.5ns	V _{CC} /2	50pF	500Ω	0.3V
t _{PLZ} /t _{PZL}	1.8V ± 0.15V	2 × V _{CC}	V _{CC}	≤ 2ns	V _{CC} /2	30pF	1kΩ	0.15V
	2.5V ± 0.2V	2 × V _{CC}	V _{CC}	≤ 2ns	V _{CC} /2	30pF	500Ω	0.15V
	3.3V ± 0.3V	2 × V _{CC}	V _{CC}	≤ 2.5ns	V _{CC} /2	50pF	500Ω	0.3V
	5.0V ± 0.5V	2 × V _{CC}	V _{CC}	≤ 2.5ns	V _{CC} /2	50pF	500Ω	0.3V
t _{PHZ} /t _{PZH}	1.8V ± 0.15V	GND	V _{CC}	≤ 2ns	V _{CC} /2	30pF	1kΩ	0.15V
	2.5V ± 0.2V	GND	V _{CC}	≤ 2ns	V _{CC} /2	30pF	500Ω	0.15V
	3.3V ± 0.3V	GND	V _{CC}	≤ 2.5ns	V _{CC} /2	50pF	500Ω	0.3V
	5.0V ± 0.5V	GND	V _{CC}	≤ 2.5ns	V _{CC} /2	50pF	500Ω	0.3V



Test Circuit 1. Propagation Delay Time (t_{PD}), Enable and Disable Times (t_{EN}, t_{DIS})



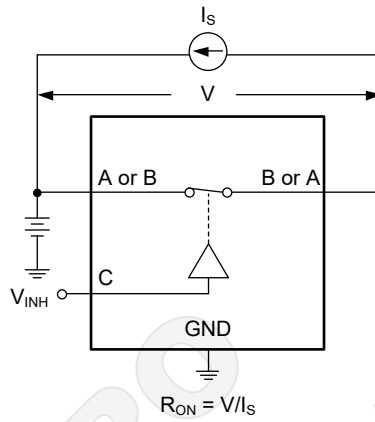
(1) Voltage Waveforms & Propagation Delay Times (t_{PD})

(2) Voltage Waveforms & Enable and Disable Times

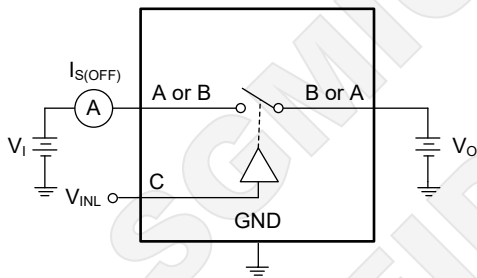
NOTES:

1. The C_L includes probe capacitance and clamp capacitance.
2. Waveform 1 indicates the output when internal conditions force the output to low, except the output port is disabled through the output control. Waveform 2 indicates the output when internal conditions force the output to high, except the output port is disabled through the output control.
3. For all input signals from signal generator equipment, the following conditions are required: PRR ≤ 10MHz, Z_O = 50Ω.
4. Only one output port is measured with one transition at a time.

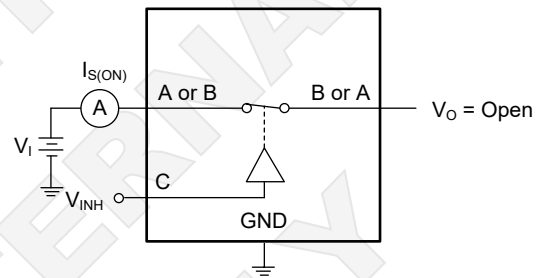
TEST CIRCUITS (continued)



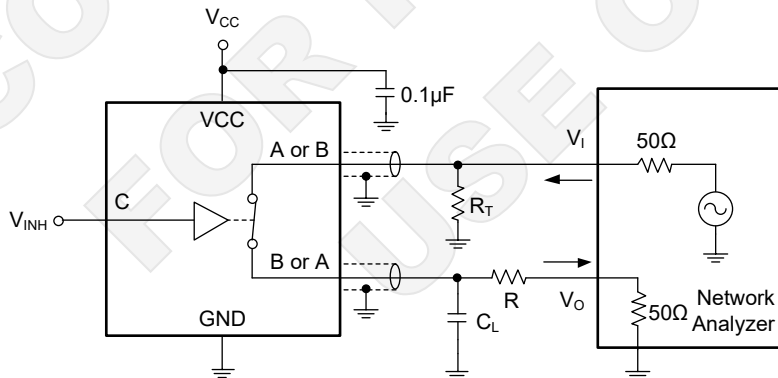
Test Circuit 2. On-Resistance



Test Circuit 3. Off Leakage Current



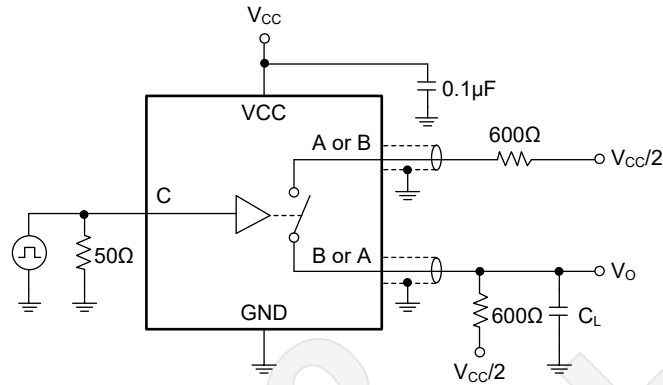
Test Circuit 4. On Leakage Current



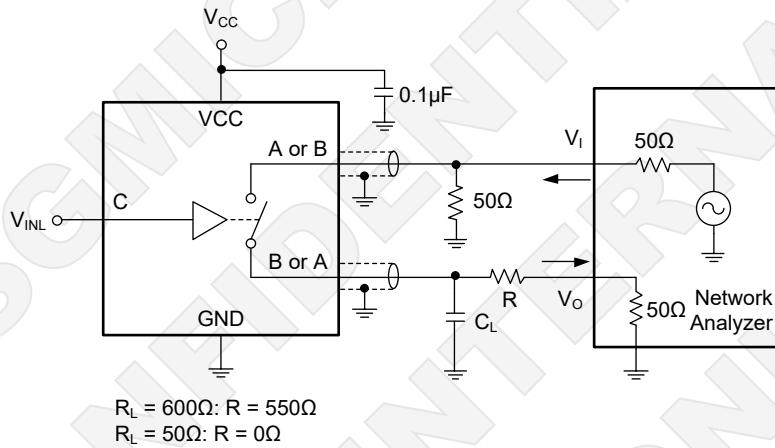
$R_L = 600\Omega$: $R = 550\Omega$, $R_T = 50\Omega$
 $R_L = 50\Omega$: $R = 0\Omega$, $R_T = \text{Open}$

Test Circuit 5. Frequency Response (Switch On)

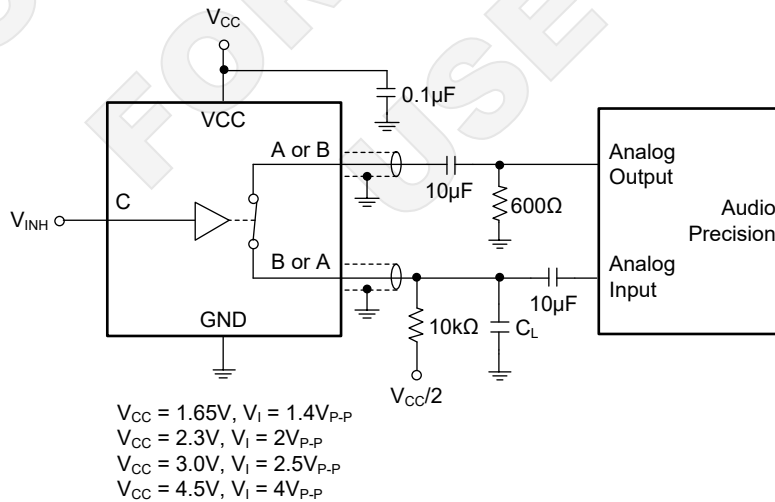
TEST CIRCUITS (continued)



Test Circuit 6. Crosstalk (Control Input to Signal Output)



Test Circuit 7. Feedthrough (Switch Off)



Test Circuit 8. Sine-Wave Distortion

DETAILED DESCRIPTION

The SGM48760 operates power supply voltage range from 1.65V to 5.5V and it can support up to 5.5V bidirectional signal transmission. When the input control pin (C) accepts a high-level voltage, the analog switch is turned on and the signal transmission is started. When the input control pin (C) accepts a low-level voltage, the analog switch is turned off and the signal transmission is prohibited.

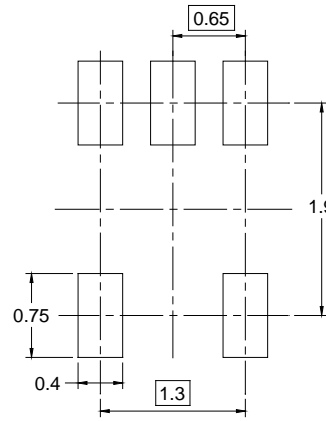
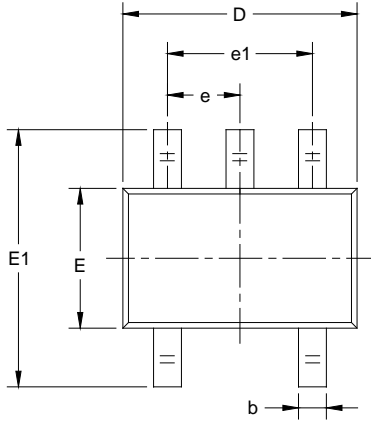
Feature Description

The SGM48760 has low on-resistance of 4.8Ω (TYP) at $V_{CC} = 4.5V$ and low t_{PD} of 0.8ns (TYP) at $V_{CC} = 3.3V$, so that it can be applied to high-speed signal transmission. Besides, its quick enable and disable times make this device suitable for high-speed signal switching applications. In particular, the control pin can accept a higher voltage than V_{CC} because the SGM48760 has no equivalent diodes between the control pin and VCC pin. The maximum input voltage of control pin can reach to 5.5V when V_{CC} is 0V. This feature allows the SGM48760 to be used in applications where the control pin voltage is higher than the power supply.

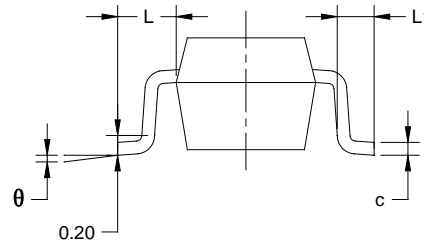
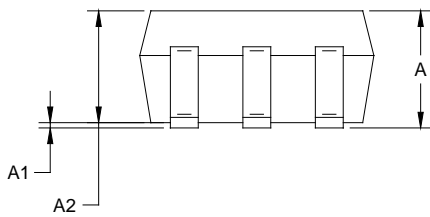
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PACKAGE OUTLINE DIMENSIONS

SC70-5



RECOMMENDED LAND PATTERN (Unit: mm)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.800	1.100	0.031	0.043
A1	0.000	0.100	0.000	0.004
A2	0.800	1.000	0.031	0.039
b	0.150	0.350	0.006	0.014
c	0.080	0.220	0.003	0.009
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°

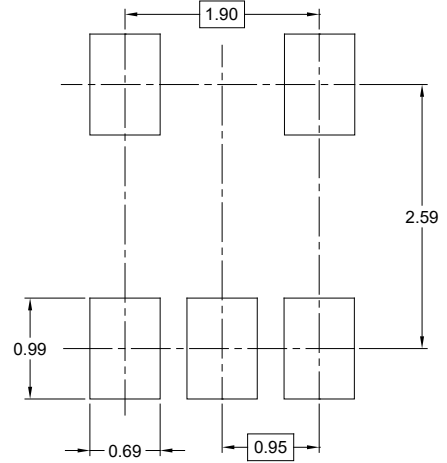
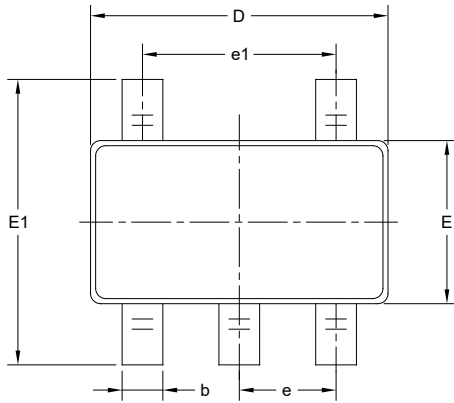
NOTES:

1. Body dimensions do not include mode flash or protrusion.
2. This drawing is subject to change without notice.

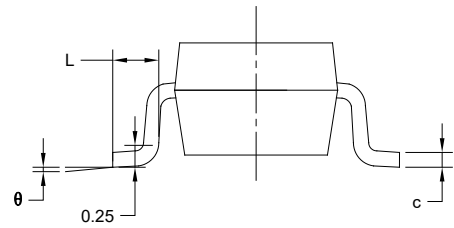
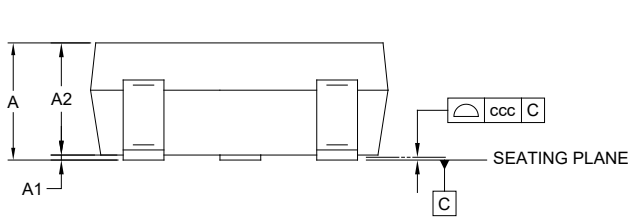
PACKAGE INFORMATION

PACKAGE OUTLINE DIMENSIONS

SOT-23-5



RECOMMENDED LAND PATTERN (Unit: mm)



Symbol	Dimensions In Millimeters		
	MIN	MOD	MAX
A	-	-	1.450
A1	0.000	-	0.150
A2	0.900	-	1.300
b	0.300	-	0.500
c	0.080	-	0.220
D	2.750	-	3.050
E	1.450	-	1.750
E1	2.600	-	3.000
e	0.950 BSC		
e1	1.900 BSC		
L	0.300	-	0.600
θ	0°	-	8°
ccc	0.100		

NOTES:

1. This drawing is subject to change without notice.
2. The dimensions do not include mold flashes, protrusions or gate burrs.
3. Reference JEDEC MO-178.

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
SC70-5	7"	9.5	2.40	2.50	1.20	4.0	4.0	2.0	8.0	Q3
SOT-23-5	7"	9.5	3.20	3.20	1.40	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