2:1 Multiplexer

DESCRIPTION

The SUM3157 is an advanced CMOS analog switch fabricated with silicon gate CMOS technology. It achieves very low propagation delay while maintaining CMOS low power dissipation. Analog and digital voltages that may vary across the full power−supply range (from V_{CC} to GND).

The Select pin has over voltage protection that allows voltages above V_{CC}, up to 7.0 V to be present on the pin without damage or disruption of operation of the part, regardless of the operating voltage.

FEATURES

- Low power dissipation
- High speed
- Standard CMOS logic levels
- High bandwidth, improved linearity
- Switches Standard NTSC/PAL Video, Audio, SPDIF and HDTV
- be used for Clock Switching, Data Mux'ing,etc.
- Low R_{DSON}
- Break Before Make Circuitry, Prevents Inadvertent Shorts
- Operating temperature -55℃ ~ +125℃
- package : SC70-6, DFN1.45 × 1.0-6, SOT23-6

ORDER INFORMATION

Model	Package	Ordering Number	Packing Option
SUM3157	DFN1.45 × 1.0-6	SUM3157DN	Tape and Reel, 5000
	SC70-6	SUM3157SC	Tape and Reel, 3000
	SOT23-6	SUM3157KA6	Tape and Reel, 3000

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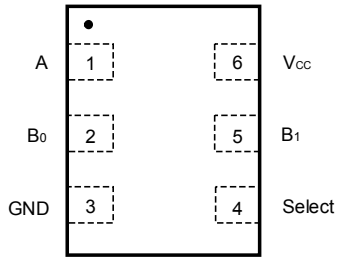
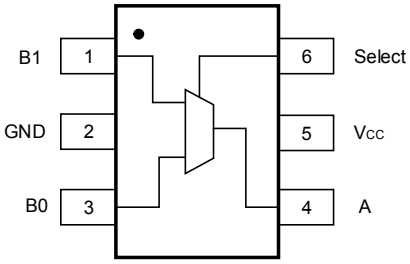
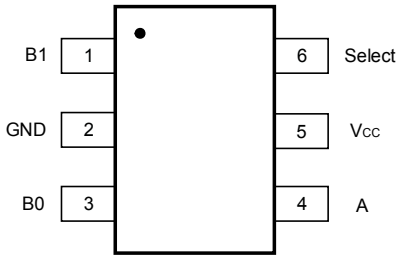
PIN CONFIGURATION (Top View)



DFN1.45 × 1.0-6



SC70-6



SOT23-6

PIN DESCRIPTIONS

Pin	I/O	Pin Function
A, B_0, B_1	I/O	Data port
Select	I	Controlling choice
V_{CC}	/	Power supply port
GND	/	Ground

FUNCTIONS DESCRIPTION

Select input port	Function
L	B_0 Connected to A
H	B_1 Connected to A

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ABSOLUTE MAXIMUM RATINGS

Characteristic	Symbol	Value	Unit
Supply Voltage	V_{CC}	-0.5 ~ +7.0	V
DC Switch Voltage (1)	V_S	-0.5 ~ V_{CC}+0.5	V
DC Input Voltage (1)	V_{IN}	-0.5 ~ +7.0	V
DC Input Diode Current @ V_{IN} < 0 V	I_{IK}	-50	mA
DC Output Current	Iout	128	mA
DC V_{CC} or Ground Current	Icc/I_{GND}	100	mA
Storage Temperature Range	Tstg	-65 ~ +150	℃
Junction Temperature Under Bias	T_J	150	℃
Junction Lead Temperature (Soldering, 10 Seconds)	T_L	260	℃
Power Dissipation @ +85°C	P_D	180	mW

NOTE:

Stresses beyond those listed under “ABSOLUTE MAXIMUM RATINGS” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

1. The input and output negative voltage ratings may be exceeded if the input and output diode current ratings are observed.

CAUTION

This integrated circuit can be damaged by ESD if you don’t pay attention to ESD protection. SUMSEMI 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.

SUMSEMI reserves the right to make any change in circuit design, specification or other related things if necessary without notice at any time. Please contact SUMSEMI sales office to get the latest datasheet.

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RECOMMENDED OPERATING CONDITIONS (2)

Characteristic		Symbol	Min	Max	Unit
Supply Voltage Operating		V_{CC}	1.65	5.5	V
Select Input Voltage		V_{IN}	0	V_{CC}	V
Switch Input Voltage		V_{IN}	0	V_{CC}	V
Output Voltage		V_{OUT}	0	V_{CC}	V
Operating Temperature		T_A	-55	+125	℃
Input Rise and Fall Time	Control Input V_{CC} = 2.3 V ~ 3.6 V	tr,tf	0	10	ns/V
	Control Input V_{CC} = 4.5 V ~ 5.5 V		0	5.0	

Note:

2. Select input must be held HIGH or LOW, it must not float.

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ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	V_{CC}	T_A = 25℃			T_A = -40℃ ~ +85℃		Unit
				Min	Typ	Max	Min	Max	
DC ELECTRICAL CHARACTERISTICS									
V_{IH}	High Level Input Voltage		1.65 ~ 1.95				0.75Vcc		V
			2.3 ~ 2.8				1.5		
			3 ~ 4.2				2.4		
			4.5 ~ 5.5				0.6Vcc		
V_{IL}	Low Level Input Voltage		1.65 ~ 1.95					$0.25V_{CC}$	V
			2.3 ~ 2.8					0.4	
			3 ~ 5.5					0.3Vcc	
I_{IN}	Input Leakage Current	0 < V_{IN} < 5.5 V	0 ~ 5.5		±0.05	±0.1		±1	μA
I_{OFF}	OFF State Leakage Current	0 < A, B < Vcc	1.65 ~ 5.5		±0.05	±0.1		±1	μA
I_{CC}	Quiescent Supply	V_{IN} = Vcc or GND I_{OUT} = 0	5.5			1.0		10	μA
	Analog Signal Range		V_{CC}	0		V_{CC}	0	V_{CC}	V
R_{ON}	Switch On Resistance(3)	V_{IN} = 0 V, I_O = 30 mA	4.5		3.0			7.0	Ω
		V_{IN} = 2.4 V, I_O = -30 mA			5.0			12	Ω
		V_{IN} = 4.5 V, I_O = -30 mA			7.0			15	Ω
		V_{IN} = 0 V, I_O = 24 mA	3.0		4.0			9.0	Ω
		V_{IN} = 3 V , I_O = -24 mA			10			20	Ω
		V_{IN} = 0 V, I_O = 8 mA	2.3		5.0			12	Ω
		V_{IN} = 2.3 V, I_O = -8 mA			13			30	Ω
		V_{IN}=0V, I_O=4 mA	1.65		6.5			20	Ω
		V_{IN} = 1.65 V, I_O = -4 mA			17			50	Ω
R_{RANGE}	On Resistance Over Signal Range(3)(7)	I_A = -30 mA 0 ≤ V_{Bn} ≤ V_{CC}	4.5					25	Ω
		I_A = -24 mA 0 ≤ V_{Bn} ≤ V_{CC}	3					50	Ω

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ELECTRICAL CHARACTERISTICS (continued)

Symbol	Parameter	Test Conditions	V_{CC}	T_A = 25℃			T_A = -40℃ ~ +85℃		Unit
				Min	Typ	Max	Min	Max	
R_{RANGE}	On Resistance Over Signal Range(3)(7)	I_A = -8 mA 0 ≤ V_{Bn} ≤ V_{CC}	2.3					100	Ω
		I_A = -4 mA 0 ≤ V_{Bn} ≤ V_{CC}	1.65					300	Ω
ΔR_{ON}	On Resistance Match Between Channels(3)(4)(5)	I_A = -30 mA V_{Bn} = 3.15	4.5		0.15				Ω
		I_A = -24 mA V_{Bn} = 2.1	3		0.2				Ω
		I_A = -8 mA V_{Bn} = 1.6	2.3		0.5				Ω
		I_A = -4 mA V_{Bn} = 1.15	1.65		0.5				Ω
R_{FLAT}	On Resistance Flatness(3)(4)(6)	I_A = -30 mA 0 ≤ V_{Bn} ≤ V_{CC}	5		6.0				Ω
		I_A = -24 mA 0 ≤ V_{Bn} ≤ V_{CC}	3.3		12				Ω
		I_A = -8 mA 0 ≤ V_{Bn} ≤ V_{CC}	2.5		28				Ω
		I_A = -4 mA 0 ≤ V_{Bn} ≤ V_{CC}	1.8		125				Ω
AC ELECTRICAL CHARACTERISTICS									
t_{PHL} t_{PLH}	Propagation Delay Bus to Bus (8)	Figure 1 V_I = OPEN	1.65 ~ 1.95						nS
			2.3 ~ 2.7					1.2	nS
			3.0 ~ 3.5					0.8	nS
			4.5 ~ 5.5					0.3	nS
t_{PZL} t_{PZH}	Output Enable Time, Turn On Time (A to Bn)	Figure 1 V_I = 2*V_{CC} for t_{PZL}, V_I = 0 V for t_{PZH}	1.65 ~ 1.95			23	7.0	24	nS
			2.3 ~ 2.7			13	3.5	14	nS
			3.0 ~ 3.5			6.9	2.5	7.6	nS
			4.5 ~ 5.5			5.2	1.7	5.7	nS
t_{PLZ} t_{PHZ}	Output Disable Time, Turn Off Time (A Port to B Port)	Figure 1 V_I = 2*V_{CC} for t_{PLZ} , V_I = 0 V for t_{PHZ}	1.65 ~ 1.95			12.5	3.0	13	nS
			2.3 ~ 2.7			7.0	2.0	7.5	nS
			3.0 ~ 3.5			5.0	1.5	5.3	nS
			4.5 ~ 5.5			3.5	0.8	3.8	nS

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ELECTRICAL CHARACTERISTICS (continued)

Symbol	Parameter	Test Conditions	V_{CC}	T_A = 25℃			T_A = -40℃ ~ +85℃		Unit
				Min	Typ	Max	Min	Max	
t_{B-M}	Break Before Make Time (7)	Figure2 , C_L = 50 pF , R_L = 600 Ω	1.65 ~ 1.95				0.5		nS
			2.3 ~ 2.7				0.5		nS
			3.0 ~ 3.5				0.5		nS
			4.5 ~ 5.5				0.5		nS
Q	Charge Injection (7)	Figure 3, C_L = 0.1 nF , V_{GEN} = 0 V , R_{GEN} = 0 Ω	5.0		7.0				pC
			3.3		3.0				pC
OIRR	Off Isolation (9)	Figure 4, R_L = 50 Ω, f = 10MHz	1.65 ~ 5.5		-57				dB
Xtalk	Crosstalk	Figure 5, R_L= 50 Ω , f = 10MHz	1.65 ~ 5.5		-54				dB
BW	−3 dB Bandwidth	Figure 8, R_L = 50 Ω	1.65 ~ 5.5		350M				Hz
THD	Total Harmonic Distortion (7)	R_L = 600 Ω, 0.5V_{P-P} f = 600 Hz ~ 20 kHz	5.0		0.011				%
C_{IN}	Select Pin Input Capacitance (10)		0		2.3				pF
C_{IO-B}	B Port Off Capacitance (10)	Figure 6	5.0		5.0				pF
C_{IOA-ON}	A Port Capacitance when Switch is Enabled (10)	Figure 7	5.0		15.5				pF

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Note:

3. Measured by the voltage drop between A and B pins at the indicated current through the switch. On Resistance is determined by the lower of the voltages on the two (A or B Ports).

4. Parameter is characterized but not tested in production.

5. $\Delta R_{ON} = R_{ON}$ max − R_{ON} min measured at identical V_{CC}, temperature and voltage levels.

6. Flatness is defined as the difference between the maximum and minimum value of On Resistance over the specified range of conditions.

7. Guaranteed by Design.

8. This parameter is guaranteed by design but not tested. The bus switch contributes no propagation delay other than the RC delay of the On Resistance of the switch and the 50 pF load capacitance, when driven by an ideal voltage source (zero output impedance).

9. Off Isolation = 20 log10 [V_A/V_{Bn}].

10. T_A = +25°C, f = 1 MHz, Capacitance is characterized but not tested in production.

TEST CIRCUITS

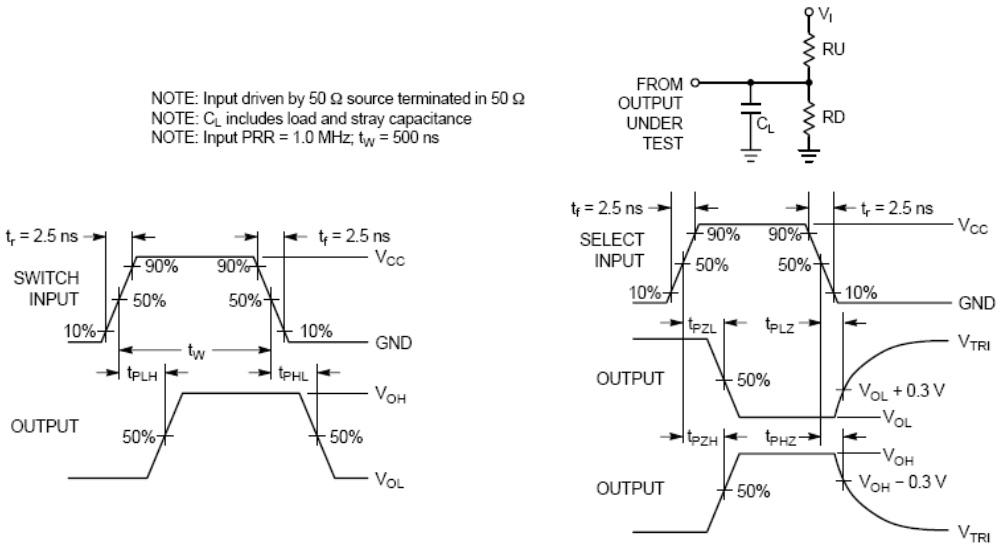

Figure 1. AC Test Circuit ,AC Waveforms

Figure 2. Break Before Make Interval Timing

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TEST CIRCUITS (continued)

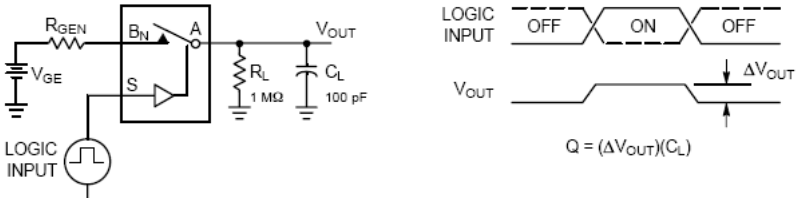

Figure 3. Charge Injection Test

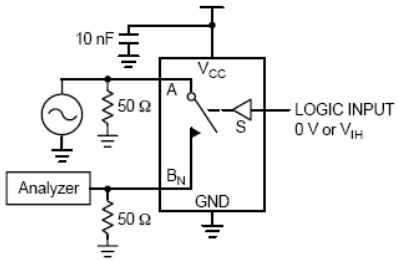

Figure 4. Off Isolation

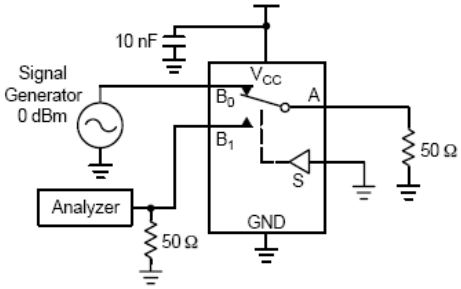

Figure 5.Crosstalk

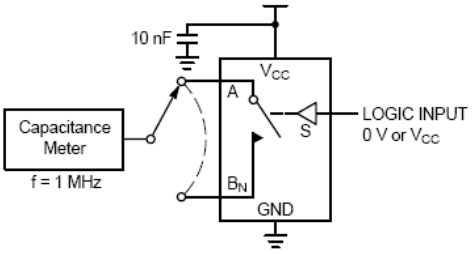

Figure 6. Channel Off Capacitance

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TEST CIRCUITS (continued)

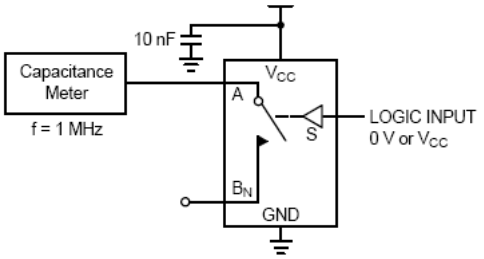

Figure 7. Channel On Capacitance

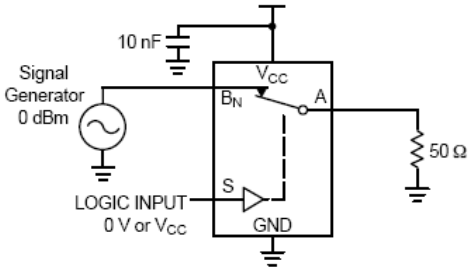

Figure 8. Bandwidth

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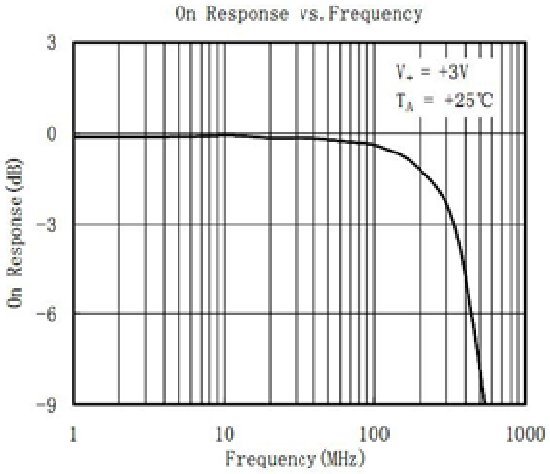
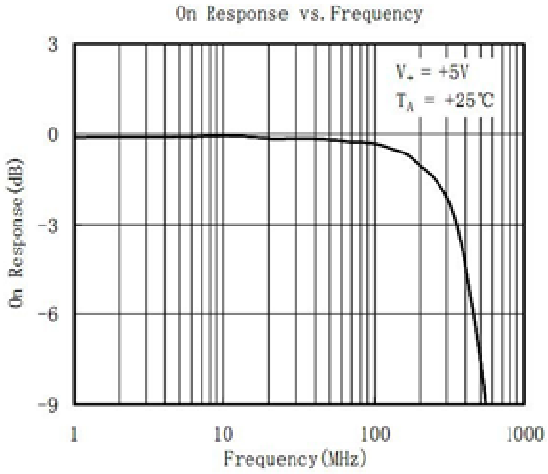
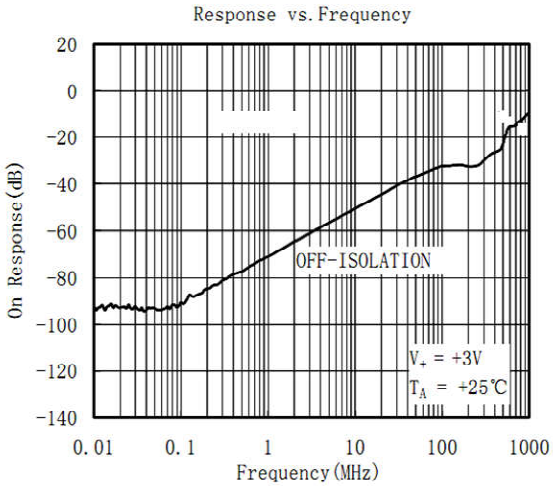
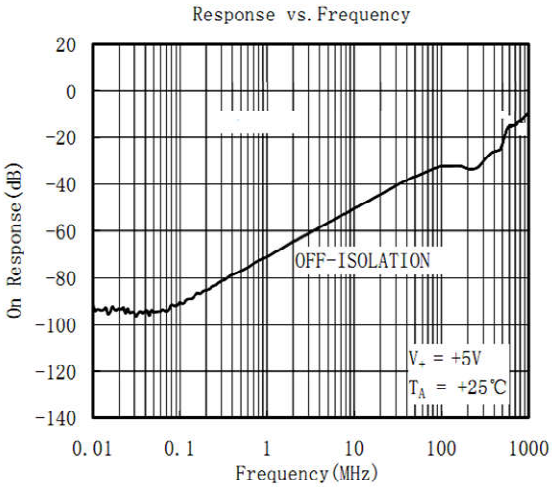
TYPICAL PERFORMANCE CHARACTERISTICS









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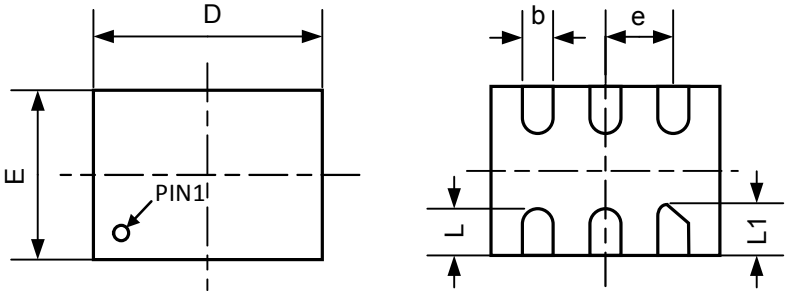
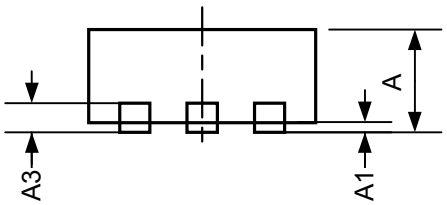
PACKAGE OUTLINE

DFN1.45 × 1.0-6



TOP VIEW BOTTOM VIEW



SIDE VIEW

Symbol	Dimensions in Millimeters		
	Min	Nom	Max
A	0.50	0.55	0.60
A1	0.00		0.05
A3		0.15REF	
D	1.40	1.45	1.50
E	0.95	1.00	1.05
b	0.18	0.23	0.28
e		0.50BSC	
L	0.25	0.35	0.45
L1	0.30	0.40	0.50

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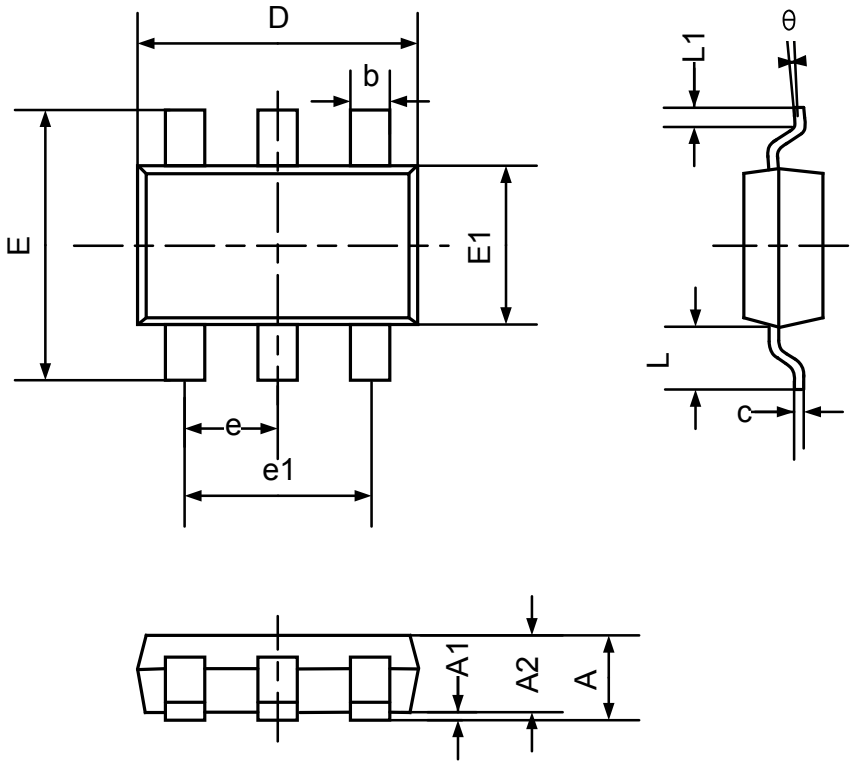
PACKAGE OUTLINE

SC70-6



Symbol	Dimensions in Millimeters	
	Min	Max
A	0.85	1.05
A1	0.00	0.10
A2	0.80	1.00
b	0.15	0.35
c	0.08	0.22
D	2.02	2.12
E	2.20	2.40
E1	1.25	1.35
e	0.65BSC	
e1	1.30BSC	
L	0.50REF	
L1	0.28	0.38
θ	0°	8°

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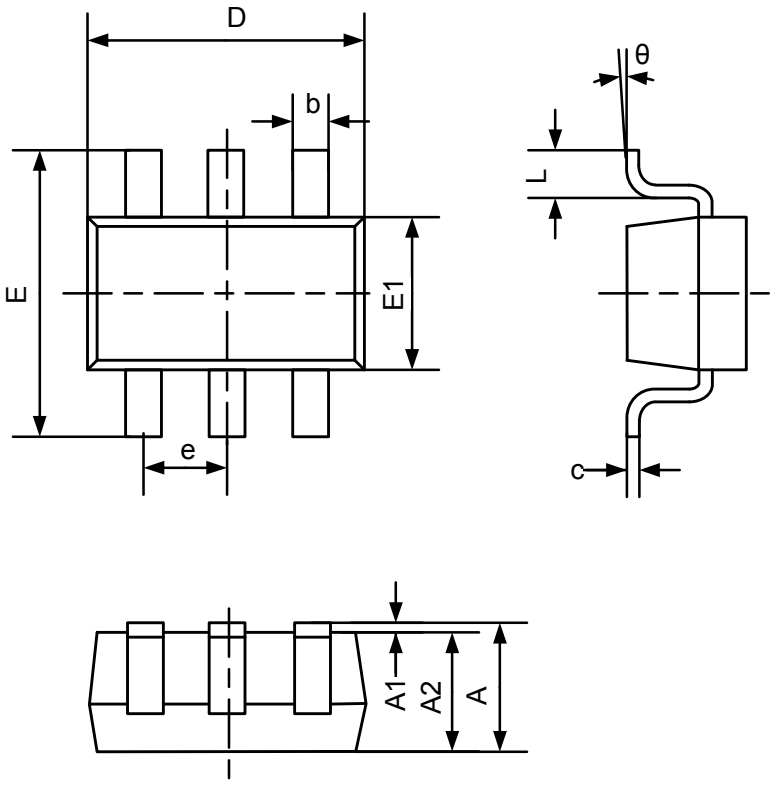
PACKAGE OUTLINE

SOT23-6



Symbol	Dimensions in Millimeters		
	Min	Nom	Max
A			1.240
A1	0.010	0.050	0.090
A2	1.050	1.100	1.150
b	0.300	0.350	0.400
c	0.117		0.157
D	2.870	2.920	2.970
E	2.720	2.800	2.880
E1	1.550	1.600	1.650
e	0.950BSC		
e1	1.900BSC		
L	0.320	0.400	0.480
θ	0°		5°

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