2.7Ω Low Voltage SPDT Analog Switch

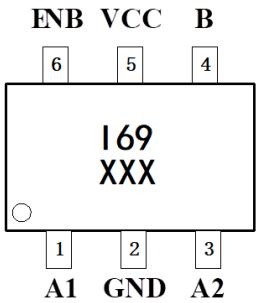
Features

- Wide Power Supply Range: 1.8V to 5.5V
- High Bandwidth: 350MHz
- High Off-Isolation:
  84dB at 1MHz
  51dB at 10MHz
- On-Resistance: 2.7Ω (typ) at 5.0V
- Fast Switching Time
  t_{on} = 25ns; t_{off} = 17ns
- TTL/CMOS Compatible
- Break-Before-Make Switching
- Rail-to-Rail Signal Range
- Operation Temperature Range:
  -40℃ to 125℃
- Lead (Pb) Free SC70-6 Package

Applications

- Wireless Handsets
- MP3 Players
- Portable Electronic Devices
- Relay Replacement
- PDAs
- Audio & Video Signal Routing
- PCMCIA Cards
- Computer Peripherals
- Modems

Pin Configuration

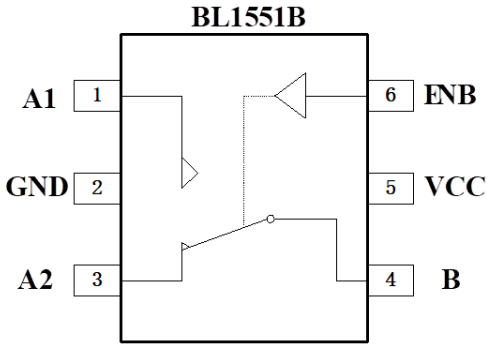


I69: Product ID
XXX: Date Code

Description

The BL1551B is a Single Wide-Bandwidth, fast single-pole double-throw (SPDT) analog switch featuring an On-Resistance of 2.7Ω at V_{CC}=5.0V and wide power supply range from 1.8V to 5.5V. It can be used as an analog switch or as a low-delay bus switch. The 350MHz high bandwidth performance supports the high frequency application.
Break-before-make function for both parts eliminates signal disruption during switching from preventing both switches being enabled simultaneously.

Block Diagram



Function Table

ENB	Function
1	A1 Connected to B
0	A2 Connected to B

Pin Description

Pin Name	Type	Description
VCC	PWR	Power Supply
GND	Ground	Ground
B	Input/Output	Data Port
A1	Input/Output	Data Port
A2	Input/Output	Data Port
ENB	Input	Logic Control Signal

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Units
DC Supply Voltage	V_{CC}	-0.3	6	V
DC Switch Voltage	V_{A1}/ V_{A2}/ V_B	-0.3	V_{SUP} + 0.3	V
DC Input Voltage	V_{ENB}	-0.3	V_{SUP} + 0.3	V
Continuous Current	$I_{(A1/A2/B)}$	-200	+200	mA
Peak Current(1)	$I_{PEAK(A1/A2/B)}$	-300	+300	mA
Operating Temperature Range	T_A	-40	125	℃

Notes:

(1) Pulsed at 1ms, 50% duty circle

(2) Stress beyond above listed “Absolute Maximum Ratings” may lead permanent damage to the device. These are stress ratings only and operations of the device at these or any other conditions beyond those indicated in the operational sections of the specifications are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

(3) Control input(V_{ENB}) must be held HIGH or LOW, and mustn’t be floated.

RECOMMENDED OPERATING CONDITIONS

DC Supply Voltage (V_{CC}) ……1.8V to 5.5V

Switch Input Voltage (V_S) ……...0V to V_{CC}

Control Input Voltage (V_{ENB})…… 0V to V_{CC}

Operation Temperature (TA)……-40℃ to +125℃

ORDERING INFORMATION

Part No.	Package	Packing	Operation Temp.
BL1551B	SC70-6	Tape and Reel, 3000	-40°C to +125°C

DC ELECTRICAL CHARACTERISTICS @ +5.0V Supply

Parameter	Symbol	Conditions	Guaranteed Limit			Unit
			Min.	Typ.(1)	Max.	
Analog Switch						
Analog Signal Range	$V_{A1}/V_{A2}/V_B$		0		V_{CC}	V
A1 On-Resistance	$R_{ON(A1)}$	V_{CC} = 5.0V; I_B =-10mA ; V_{A1}=3.5V		2.7		Ω
A2 On-Resistance	$R_{ON(A2)}$	V_{CC} = 5.0V; I_B =-10mA ; V_{A2} =3.5V		2.7		Ω
A1 On-Resistance Flatness(2)	$R_{FLAT(A1)}$	V_{CC} = 5.0V; I_B =-10mA ; V_{A1}=0~V_{CC}		0.8		Ω
A2 On-Resistance Flatness(2)	$R_{FLAT(A2)}$	V_{CC} = 5.0V; I_B =-10mA ; V_{A2} =0~V_{CC}		0.8		Ω
On-Resistance Match Between Channels(3)	$\triangle R_{ON}$	V_{CC} = 5.0V; I_B =-10mA ; V_{A2} /V_{A1}=3.5V		0.15		Ω
A1, A2 Off Leakage Current	$I_{OFF(A1)}$ or $I_{OFF(A2)}$	V_{CC} = 5.5V; V_{A1} or V_{A2} = 1.0V, 4.5V; V_B = 4.5V, 1.0V		0.01	1	uA
A1, A2, B On Leakage Current	$I_{ON(A1)}$, $I_{ON(A2)}$, $I_{ON(B)}$	V_{CC} = 5.5V; V_B = 1.0V, 4.5V; V_{A1} or V_{A2} = 1.0V, 4.5V, or floating		0.01	1	uA
Digital I/O						
Input Voltage High	V_{IH}	Minimum High Level Input Voltage	1.5			V
Input Voltage Low	V_{IL}	Maximum Low Level Input Voltage			0.6	V
Input Leakage Current	I_{ENB}	V_{ENB} = 0 or V_{CC}		0.01	1	uA

Note:

(1) Typical characteristics are at +25°C

(2) Flatness is defined as the difference between the maximum and minimum value of on resistance as measured over the specified analog signal ranges.

(3) $\triangle R_{ON}$= $R_{ON(MAX)}$ - $R_{ON(MIN)}$, between A1 and A2 .

DYNAMIC CHARACTERISTICS @ +5V Supply

Parameter	Symbol	Conditions		Guaranteed Limit			Unit
				Min.	Typ. (1)	Max.	
AC ELECTRICAL CHARACTERISTICS							
Turn-On Time	t_{ON}	V_{CC} = 5.0V; V_{A1} or V_{A2} = 3.0V, R_L = 300Ω; C_L = 35pF, V_{IH}=1.5V,V_{IL}=0V			25		ns
Turn-Off Time	t_{OFF}	V_{CC} = 5.0V; V_{A1} or V_{A2} = 3.5V, R_L = 300Ω; C_L = 35pF, V_{IH}=1.5V,V_{IL}=0V			17		ns
Break-Before-Make Time	t_{BBM}	V_{CC} = 5.0V; V_{A1} or V_{A2} = 3.5V, R_L = 300Ω; C_L = 35pF			8.5		ns
NC OFF Capacitance	$C_{OFF(A1)}$	f = 1MHz			5.5		pF
NO OFF Capacitance	$C_{OFF(A2)}$	f = 1MHz			5.5		pF
NC ON Capacitance	$C_{ON(A1)}$	f = 1MHz			15.5		pF
NO ON Capacitance	$C_{ON(A2)}$	f = 1MHz			15.5		pF
ADDITIONAL APPLICATION CHARACTERISTICS							
3dB Bandwidth	f_{3dB}	Signal = 0dBm, R_L = 50Ω, C_L = 5pF			350		MHz
Off Isolation(2)	V_{Iso}	R_L = 50Ω, C_L = 5pF, Signal = 0dBm	f = 1MHz		-84		dB
			f =10MHz		-51		dB
Supply							
Power Supply Range	V_{cc}			1.8		5.5	V

Note:

(1) Typical characteristics are at +25°C

(2) Off Channel Isolation = $20\log_{10}[(V_{A1\backslash A2})/V_B]$

DC ELECTRICAL CHARACTERISTICS @ +2.7V Supply

Parameter	Symbol	Conditions	Guaranteed Limit			Unit
			Min.	Typ.(1)	Max.	
Analog Switch						
Analog Signal Range	$V_{A1}/V_{A2}/V_B$		0		V_{CC}	V
A1 On-Resistance	$R_{ON(A1)}$	V_{CC} = 2.7V; I_B =-10mA ; V_{A1}=1.5V		5.5		Ω
A2 On-Resistance	$R_{ON(A2)}$	V_{CC} = 2.7V; I_B =-10mA ; V_{A2}=1.5V		5.5		Ω
A1 On-Resistance Flatness(2)	$R_{FLAT(A1)}$	V_{CC} = 2.7V; I_B =-10mA ; V_{A1}=0~V_{CC}		2.3		Ω
A2 On-Resistance Flatness(2)	$R_{FLAT(A2)}$	V_{CC} = 2.7V; I_B =-10mA ; V_{A2}=0~V_{CC}		2.3		Ω
On-Resistance Match Between Channels(3)	$\triangle R_{ON}$	V_{CC} = 2.7V; I_B =-10mA ; V_{A2} /V_{A1}=1.5		0.15		Ω
A1 or A2 Off Leakage Current	$I_{OFF(A1)}$ or $I_{OFF(A2)}$	V_{CC} = 3.6V; V_{A1} or V_{A2} = 0.3V, 3.3V; V_B = 3.3V, 0.3 V		0.01	1	uA
A1, A2, B On Leakage Current	$I_{ON(A1)}$, $I_{ON(A2)}$, $I_{ON(B)}$	V_{CC} = 3.6V; V_B = 0.3V, 3.3 V ; V_{A1} or V_{A2} = 0.3V, 3.3V; or floating		0.01	1	uA
Digital I/O						
Input Voltage High	V_{IH}	Minimum High Level Input Voltage	1.2			V
Input Voltage Low	V_{IL}	Maximum Low Level Input Voltage			0.5	V
Input Leakage Current	I_{ENB}	V_{ENB} = 0 or V_{CC}		0.01	1	uA

Note:

(1) Typical characteristics are at +25°C

(2) Flatness is defined as the difference between the maximum and minimum value of on resistance as measured over the specified analog signal ranges.

(3) $\triangle R_{ON}$= $R_{ON(MAX)}$ - $R_{ON(MIN)}$, between A1 and A2 .

DYNAMIC CHARACTERISTICS @ +2.7V Supply

Parameter	Symbol	Conditions		Guaranteed Limit			Unit
				Min.	Typ. (1)	Max.	
AC ELECTRICAL CHARACTERISTICS							
Turn-On Time	t_{ON}	V_{CC} = 2.7V; V_{A1} or V_{A2} = 1.5V, R_L = 300Ω; C_L = 35pF, V_{IH}=1.5V,V_{IL}=0V			30		ns
Turn-Off Time	t_{OFF}	V_{CC} = 2.7V; V_{A1} or V_{A2} = 1.5V, R_L = 300Ω; C_L = 35pF, V_{IH}=1.5V,V_{IL}=0V			20		ns
Break-Before-Make Time	t_{BBM}	V_{CC} = 2.7V; V_{A1} or V_{A2} = 1.5V, R_L = 300Ω; C_L = 35pF			15		ns
NC OFF Capacitance	$C_{OFF(A1)}$	f = 1MHz			5.5		pF
NO OFF Capacitance	$C_{OFF(A2)}$	f = 1MHz			5.5		pF
NC ON Capacitance	$C_{ON(A1)}$	f = 1MHz			15.5		pF
NO ON Capacitance	$C_{ON(A2)}$	f = 1MHz			15.5		pF
ADDITIONAL APPLICATION CHARACTERISTICS							
3dB Bandwidth	f_{3dB}	Signal = 0dBm, R_L = 50Ω, C_L = 5pF			350		MHz
Off Isolation(2)	V_{Iso}	R_L = 50Ω, C_L = 5pF, Signal = 0dBm	f = 1MHz		-84		dB
			f =10MHz		-51		dB
Supply							
Power Supply Range	V_{cc}			1.8		5.5	V

Note:

(1) Typical characteristics are at +25°C

(2) Off Channel Isolation = $20\log_{10}[(V_{A1\backslash A2})/V_B]$

TEST SETUP CIRCUITS

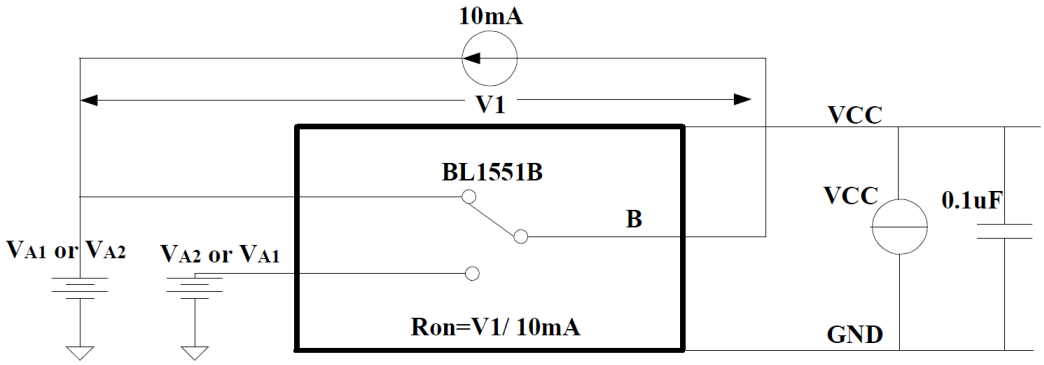


Figure1. Test Circuit for On Resister

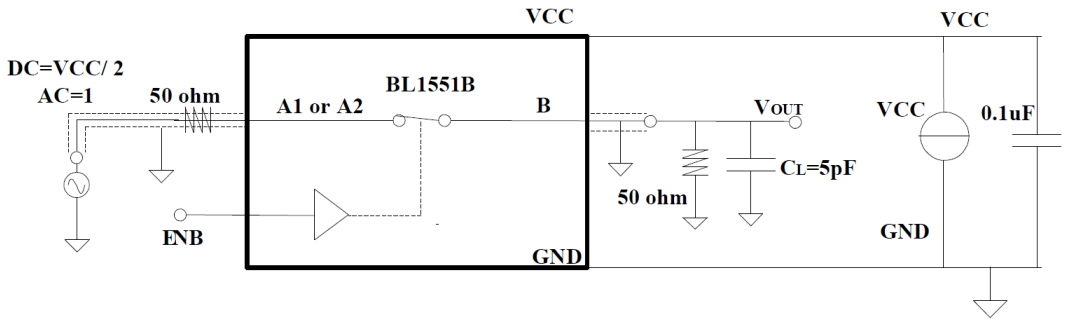


Figure2. Test Circuit for Bandwidth

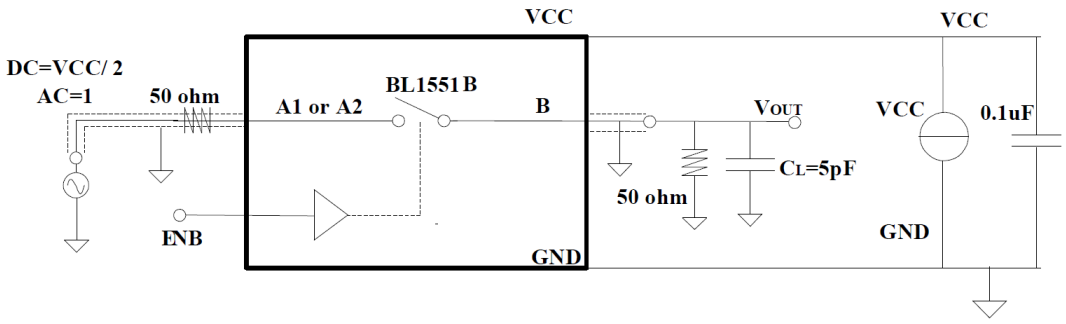
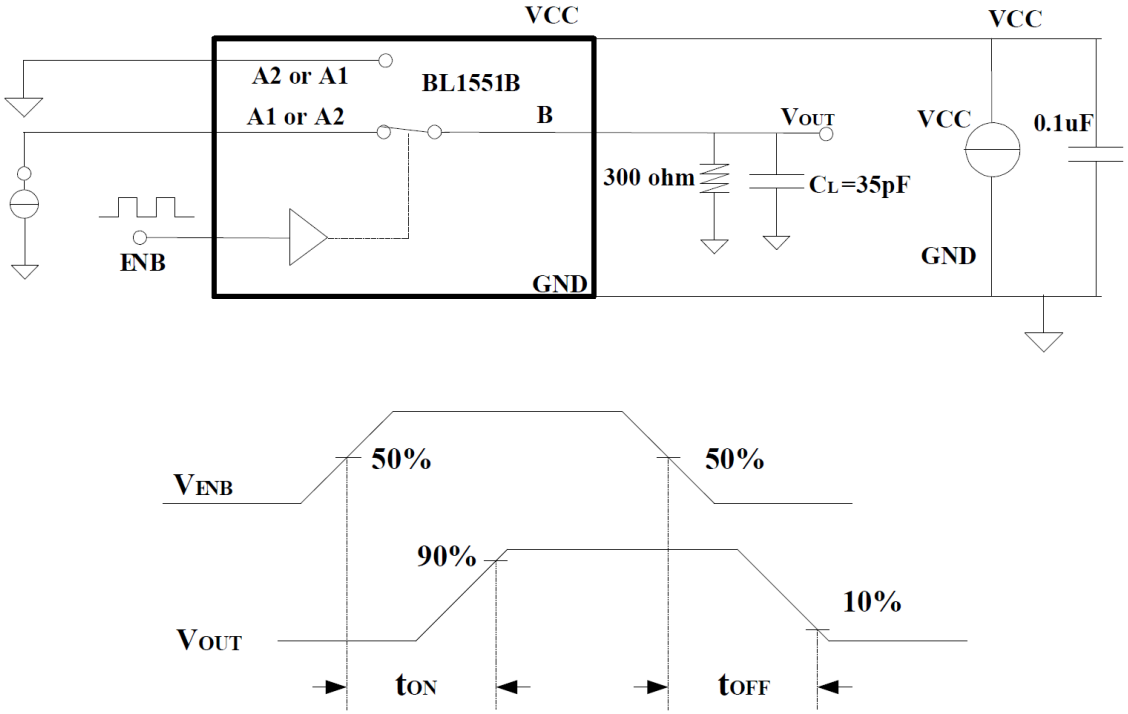
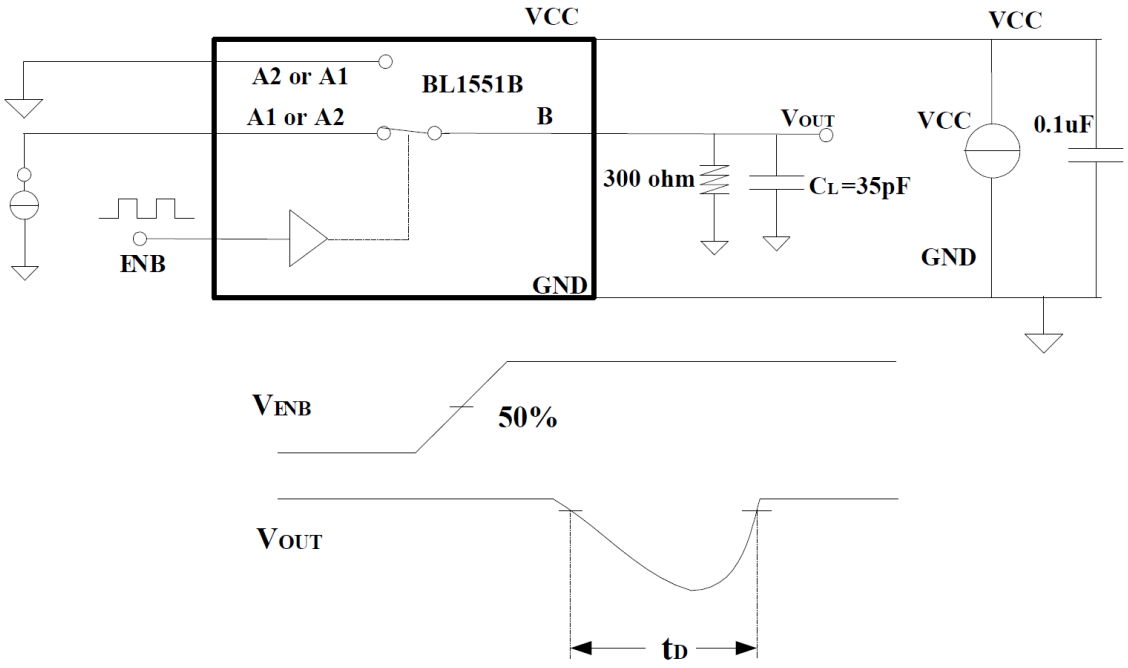


Figure3. Test Circuit for Off Isolation



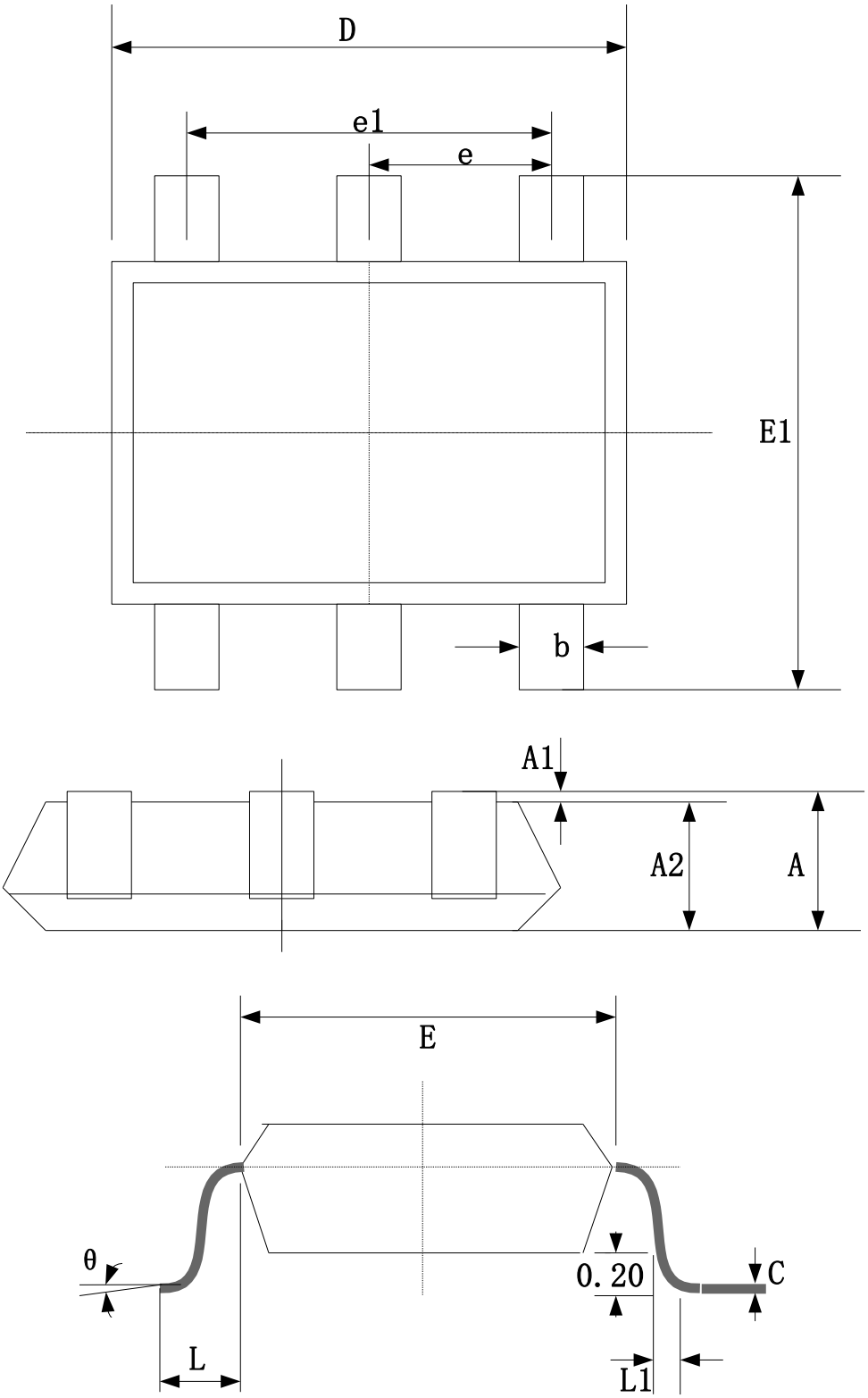
Test Circuit 4. Test Circuit for Switch Times



Test Circuit 5. Test Circuit for Break-Before-Make Time Delay, t_D

PACKAGE OUTLINE DIMENSIONS (SC70-6)

SC70-6



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	0.650TYP		0.026TYP	
e1	1.200	1.400	0.047	0.055
L	0.525REF		0.021REF	
L1	0.260	0.460	0.010	0.018
θ	0°	8°	0°	8°