4 Ohms, Low Voltage, Single-Pole Double-Throw (SPDT) Analog Switch

Summary

The SL3157 is a single-channel, low-voltage, bidirectional single-pole double-throw (SPDT) CMOS analog switch. Powered by a single supply voltage, the chip operates within a voltage range of 1.8V to 5.5 V. Featuring low on-resistance R_{ON} and high bandwidth, it is particularly well-suited for audio regulation switching applications.

The impedance of the chip is flat in the whole range of analog signal input, which ensures low distortion and superior linearity in the application of audio signal.

SL 3157 is available in SC70-6 and SOT23-6 packages.

Features

- Operating voltage range: 1.8V to 5.5V
- Conduction impedance: 4Ω (typical)
- High bandwidth: 300MHz
- switching time：
  - Conduction time: 30ns
  - Turn-off time: 20ns
- track-to-track working range
- Compatible with TTL/CMOS
- Operating temperature range: -40℃ to +85℃
- Provide SC70-6 and SOT23-6 packages

Application

- portable instrument
- battery powered device
- computer peripheral
- mobile telephone
- palm computer
- Audio Player

Pin Distribution

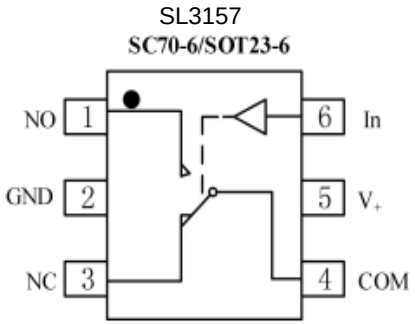


Figure 1 Pin Distribution

Pin Description

Pin number	Symbol	Description
1	NO	Constant conduction terminal
2	GND	Earth terminal
3	NC	Constant cutoff end
4	COM	Common port
5	V+	Power source end.
6	IN	Digital control pin, connects the common terminal to the normally off or normally on terminal

Note: The common open end, common conductive end, and common end may be inputs or outputs.

Function Table

Logic	NO	NC
0	OFF	ON
1	ON	OFF

Order Information

Model	Package	Package quantity	Silk-screen
SL3157XC6	SC70-6	Spool, 3000	S57XX
SL3157XT6	SOT23-6	Spool, 3000	S57XX

Absolute Maximum Rated Value (ambient Temperature 25°C)

Symbol	Parameter	Rating	Unit
	V_+or IN to GND	-0.3 to 6	V
	Analog and digital voltage range(1)	-0.3 to (V+) +0.3	V
	Continuous current, NO, NC, or COM	±50	mA
	Peak current, NO, NC, or COM	±80	mA
T_{STG}	Storage temperature	-65 to +150	℃
T_J	Junction temperature	150	℃
T_A	Operating temperature range	-45 to +85	℃
	Welding temperature (10 seconds of welding)	260	℃
ESD	Human Body Model (HBM)	4000	V
	Charging Model (CDM)	1000	V

remarks：

(1) If the NC, NO, or COM signal exceeds V_+, the internal diode will be clamped to limit the diode current to the maximum rated current.

(2) Exceeding the 'absolute maximum rated value' may cause permanent damage to the equipment. These pressure levels apply only to specific hardware operations and do not include other recommended operating conditions beyond these specifications. Prolonged operation at the 'absolute maximum rated value' may compromise the reliability of the components.

Electrical Parameters

(V_+=+4.5V, GND=0V,T_A=25℃, unless otherwise specified.)

Symbol	Parameter	Condition	Least value	value	Crest value	Unit
Analog switch						
V_{NO} V_{NC} V_{COM}	Analog signal range		0		V_+	V
R_{ON}	Conduction impedance	V_{NO} or V_{NC}=0 to 4.5V(1) I_{COM}=-10mA, Test Circuit 1		4	8	Ω
		TA=-40℃ to +85℃			8.5	Ω
ΔR_{ON}	Interchannel conductance impedance matching	V_{NO} or V_{NC}=0 to 4.5V(1) I_{COM}=-10mA, Test Circuit 1		0.15	0.4	Ω
		TA=-40℃ to +85℃			0.5	Ω
$R_{FLAT(ON)}$	Conductance impedance flatness	V_{NO} or V_{NC}=0 to 4.5V(1) I_{COM}=-10mA, Test Circuit 1		2.	3	Ω
		TA=-40℃ to +85℃			4	Ω
Leakage current						
$I_{NC(OFF)}$ $I_{NO(OFF)}$)	Turn-off leakage current	V_+=5.5V V_{NO} or V_{NC}=1.0V,4.5V V_{COM}=1.0V,4.5V TA=-40℃ to +85℃			1	μA
$I_{NC(ON)}$ $I_{NO(ON)}$ $I_{COM(ON)}$	Conduction leakage current	V_+=5.5V,V_{COM}=1.0V,4.5V V_{NO} or V_{NC}=1.0V,4.5V TA=-40℃ to +85℃			1	μA
Digital input						
V_{INH}	Input high voltage	TA=-40℃ to +85℃	2.4			V
V_{INL}	Low voltage input	TA=-40℃ to +85℃			0.5	V
I_{IN}	Input leakage current	V_+=+5.5V,V_{IN}=0V or 5.5V TA=-40℃ to +85℃			1	μA
Dynamic characteristis						
t_{ON}	Conduction time	VNO or VNC=3.0V R_L=300Ω,C_L=35pF Test Circuit 2		30		nS
t_{OFF}	Turn-off time	VNO or VNC=3.0V R_L=300Ω,C_L=35pF Test Circuit 2		20		nS
t_D	Delayed on-off	V_{NO} or V_{NC}=3.0V,R_L=300Ω C_L=35pF, Test Circuit 3		5		nS
t_{PD}	Propagation delay time	R_S=39Ω,C_L=50pF, Test Circuit 4		5		nS
O_{ISO}	Turn-off isolation degree	R_L=50Ω,C_L=5pF, Signal=0dBm Test Circuit 5, f=10kHz		-50		dB
		R_L=50Ω,C_L=5pF, Signal=0dBm Test Circuit 5, f=1kHz		-70		dB

Electrical Parameters

(V_+=+4.5V, GND=0V,T_A=25℃, unless otherwise specified.)

Symbol	Parameter	Condition	Least value	value	Crest value	Unit
BW	-3dB bandwidth	Signal=0dBm,R_L=50Ω,C_L=5pF Test Circuit 6		300		MHz
$C_{NC(OFF)}$ $C_{NO(OFF)}$	Turn-off capacitor	f=1MHz		5.6		PF
$C_{NC(ON)}$ $C_{NO(ON)}$ $C_{COM(ON)}$	Conduction capacitance	f=1MHz		15.6		PF
Power requirement						
V_+	Supply voltage		1.8		5.5	V
I_+	Source current	V_+=+5.5V,V_{IN}=0V or V_+ TA=-40℃ to +85℃			2	μA

remarks：

1. V_{NC} or V_{NO} test voltage is 0V,0.5V,1V,1.5V,2V,2.5V,3V,3.5V,4V,4.5V.

Electrical Parameters

(V_+=+2.7V, GND=0V,T_A=25℃, unless otherwise specified.)

Symbol	Parameter	Condition	Least value	value	Crest value	Unit
Analog switch						
V_{NO} V_{NC} V_{COM}	Analog signal range		0		V+	V
R_{on}	Conduction impedance	V_{NO} or V_{NC}=0V to 2.7V(2) I_{COM}=-10mA, Test Circuit 1		7		Ω
		TA=-40℃ to +85℃		8		Ω
ΔR_{ON}	Conduction resistance matching	V_{NO} or V_{NC}=0V to 2.7V(2) I_{COM}=-10mA, Test Circuit 1		0.2		Ω
		TA=-40℃ to +85℃		0.4		Ω
$R_{FLAT(ON)}$	Conductance flatness	V_{NO} or V_{NC}=0V to 2.7V(2) I_{COM}=-10mA, Test Circuit 1		3		Ω
		TA=-40℃ to +85℃		5		Ω
Leakage current						
$I_{NC(OFF)}$ $I_{NO(OFF)}$	Turn-off leakage current	V_+=3.6V,V_{NO} or V_{NC}=0.3V,3.3V V_{COM}=3.3V,0.3V TA=-40℃ to +85℃			1	μA
$I_{NC(ON)}$ $I_{NO(ON)}$ $I_{COM(O)}$	Conduction leakage current	V_+=3.6V,V_{COM}=0.3V,3.3V V_{NO} or V_{NC}=0.3V,3.3V TA=-40℃ to +85℃			1	μA
Digital input						
V_{INH}	Input high voltage	T_A=-40℃ to +85℃	2			V
V_{INL}	Low voltage input	T_A=-40℃ to +85℃			0.4	V
I_{IN}	Input leakage current	V_+=+3.6V,V_{IN}=0V or 3.6V TA=-40℃ to +85℃			1	μA
Dynamic characteristis						
t_{ON}	Conduction time	VNO or VNC=1.5V R_L=300Ω,C_L=35pF Test Circuit 2		40		nS
t_{OFF}	Turn-off time	VNO or VNC=1.5V R_L=300Ω,C_L=35pF Test Circuit 2		30		nS
t_D	Delayed on-off	V_{NO} or V_{NC}=1.5V,R_L=300Ω C_L=35pF, Test Circuit 3		9		nS
t_{PD}	Propagation delay time	R_S=39Ω,C_L=50pF, Test Circuit 4		5		nS
O_{ISO}	Turn-off isolation degree	R_L=50Ω,C_L=5pF, Signal=0dBm Test Circuit 5, f=10kHz		-50		dB
		R_L=50Ω,C_L=5pF, Signal=0dBm Test Circuit 5, f=1kHz		-70		dB

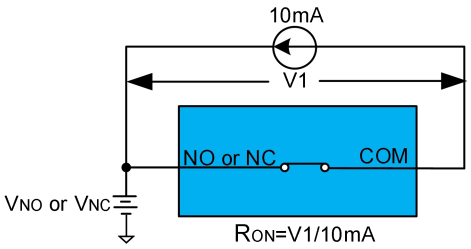
(V_+=+2.7V, GND=0V,T_A=25℃, unless otherwise specified.)

Symbol	Parameter	Condition	Least value	value	Crest value	Unit
BW	-3dB bandwidth	Signal=0dBm,R_L=50Ω,C_L=5pF Test Circuit 6		300		MHz
$C_{NC(OFF)}$ $C_{NO(OFF)}$	Turn-off capacitor	f=1MHz		5.6		PF
$C_{NC(ON)}$ $C_{NO(ON)}$ $C_{COM(ON)}$	Conduction capacitance	f=1MHz		15.6		pF
Power requirement						
V_+	Supply voltage		1.8		5.5	V
I_+	Source current	V_+=+3.6V,V_{IN}=0V or V_+ TA=-40℃ to +85℃			1	μA

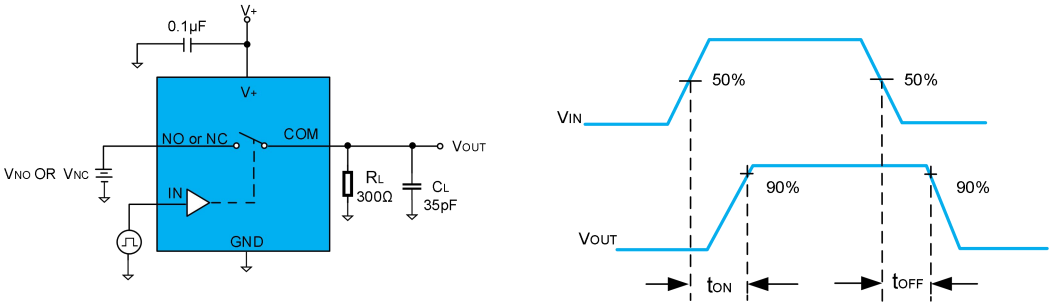
remarks：

2. V_{NC} or V_{NO} test voltage is 0V,0.3V,0.6V,0.9V,1.2V,1.5V,1.8V,2.1V,2.4V,2.7V.

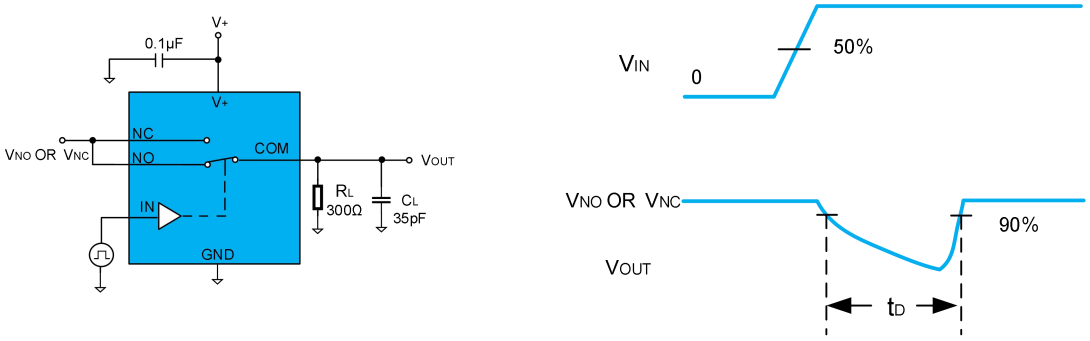
Application Note



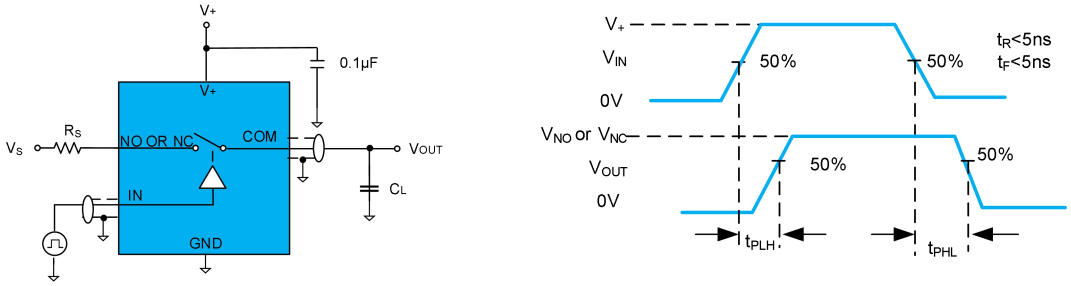
Test Circuit 1 conduction imped-ance



Test Circuit 2 switching time

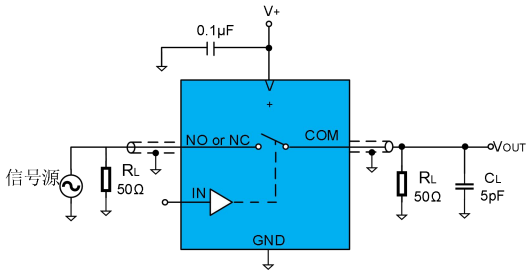


Circuit Test 3 delayed on-off

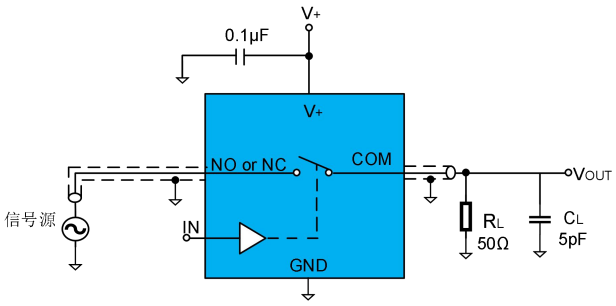


Circuit Test 4 propagation delay time

Application Note



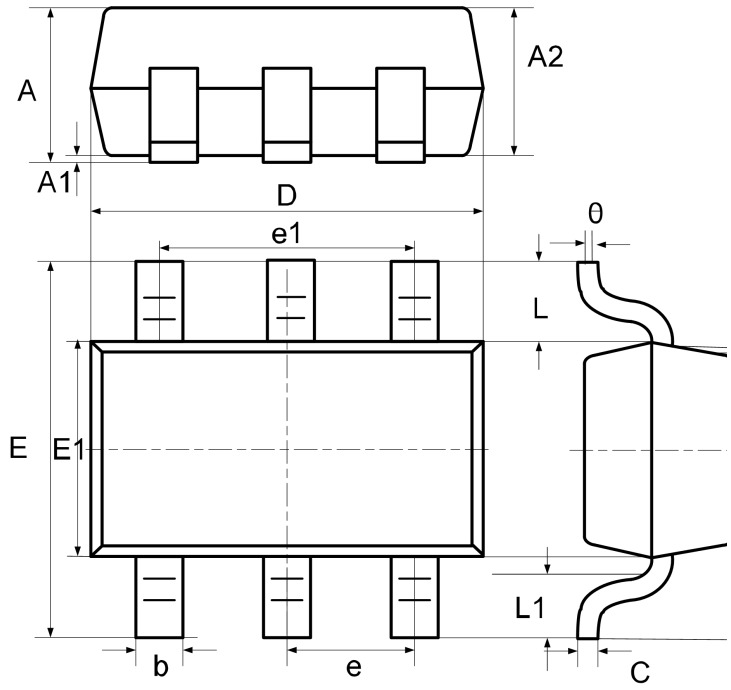
Circuit Test 5 turn-off isolation degree



Circuit test 6-3dB bandwidth

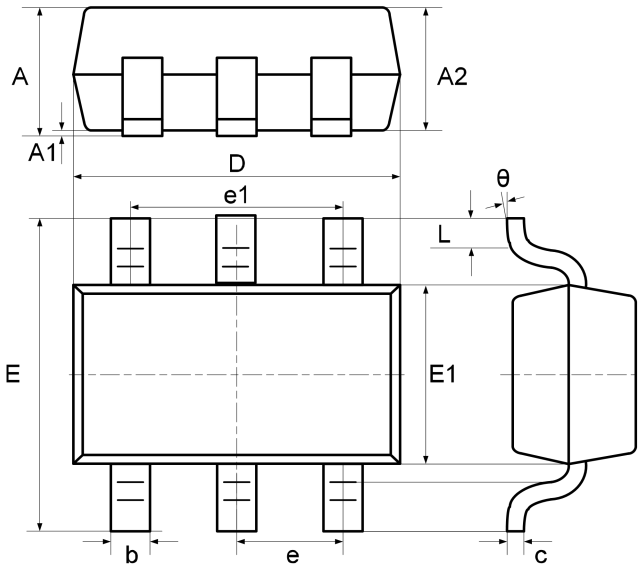
Encapsulation Information

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	2.150	2.450	0.085	0.096
E1	1.150	1.350	0.045	0.053
e	0.650 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°

SOT23-6



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.450	0.0354	0.0570
A1	0.000	0.150	0.000	0.0059
A2	0.900	1.300	0.0354	0.0511
b	0.200	0.500	0.0078	0.0196
c	0.090	0.260	0.0035	0.0102
D	2.700	3.100	0.1062	0.1220
E	2.200	3.200	0.0866	0.1181
E1	1.300	1.800	0.0511	0.0708
e	0.950ref.		0.0374ref.	
e1	1.900ref.		0.0748ref.	
L	0.100	0.600	0.039	0.0236
θ	0°	30°	0°	30°