SPDT 1Ω Analog Switch

DESCRIPTION

The SUM4157 is a single low on-resistance (1 Ω), fast single-pole/double-throw (SPDT) CMOS switch. It is designed for low operating voltage, high current switching of speaker output for cell phone applications. The SUM4157 can handle a balanced microphone/speaker/ring tone generator in a monophone mode. The device contains a break-before-make (BBM) feature.

The control input, IN, tolerates input drive signals up to 5.5 V, independent of supply voltage. The SUM4157 is available in a Green SC70-6 and SOT23-6 packages.

FEATURES

- Supply Voltage Range: 1.8 V to 5.5 V
- On-Resistance: 1 Ω (TYP)
- -3dB Bandwidth: 100 MHz
- High Off-Isolation: -45 dB at 10 MHz
- Rail-to-Rail Operation
- Low Static Power
- TTL/CMOS Compatible
- Break-Before-Make Switching
- -40°C to +85°C Operating Temperature Range
- Package : SC70-6; SOT23-6

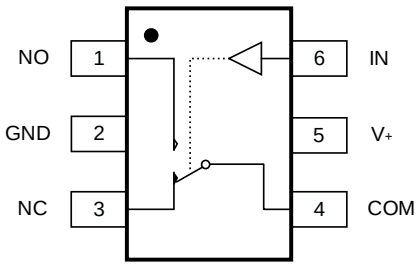
APPLICATIONS

- Portable Instrumentation
- Battery-Operated Equipment
- Computer Peripherals
- Cell Phones
- PDAs
- MP3s

ORDER INFORMATION

Model	Package	Ordering Number	Packing Option
SUM4157	SC70-6	SUM4157SC6	Tape and Reel, 3000
	SOT23-6	SUM4157KA6	Tape and Reel, 3000

PIN CONFIGURATION (Top View)



SC70-6/SOT23-6

PIN DESCRIPTIONS

Pin	Symbol		Description
	SOT23-6	SC70-6	
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.

ABSOLUTE MAXIMUM RATINGS

Parameters		Rating	Unit
IN to GND, V_+		-0.3 to 6	V
Analog, Digital Voltage Range(1)		-0.3 to (V_+) + 0.3	V
Continuous Current NO, NC, or COM		±150	mA
Peak Current NO, NC, or COM		±250	mA
Junction Temperature		+150	°C
Operating Temperature Range		-40 to +85	°C
Storage Temperature Range		-65 to +150	°C
Lead Temperature (Soldering, 10s)		+260	°C
ESD	HBM	8000	V
	MM	400	

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. Signals on NC, NO, or COM or IN exceeding V_+ will be clamped by internal diodes. Limit forward diode current to maximum current ratings.

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.

ELECTRICAL CHARACTERISTICS

V_+ = 4.5 V to 5.5 V, GND = 0 V, Full = -40°C to +85°C. Typical values are at T_A = +25°C, unless otherwise noted.

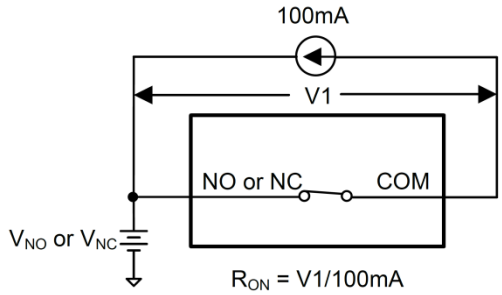
Parameter	Symbol	Conditions	Temp	Min	Typ	Max	Units
Analog Switch							
Analog Signal Range	V_{NO}, V_{NC}, V_{COM}		+25°C	0		V_+	V
On-Resistance	R_{ON}	V_+ = 4.5 V, 0 V ≤ V_{NO} or V_{NC} ≤ V_+, I_{COM} = -100 mA, Test Circuit 1	+25°C		1		Ω
On-Resistance Match Between Channels	ΔR_{ON}	V_+ = 4.5 V, 0 V ≤ V_{NO} or V_{NC} ≤ V_+, I_{COM} = -100 mA, Test Circuit 1	+25°C		0.02	0.2	Ω
			Full			0.3	
On-Resistance Flatness	$R_{FLAT(ON)}$	V_+ = 4.5 V, 0 V ≤ V_{NO} or V_{NC} ≤ V_+, I_{COM} = -100 mA, Test Circuit 1	+25°C		0.25	0.45	Ω
			Full			0.6	
Source Off Leakage Current	$I_{NC(OFF)}$, $I_{NO(OFF)}$	V_+ = 5.5 V, V_{NO} or V_{NC} = 4.5V / 1V, V_{COM} = 1V / 4.5V	+25°C		0.1		µA
			Full			1	
Channel On Leakage Current	$I_{NC(ON)}$, $I_{NO(ON)}$, $I_{COM(ON)}$	V_+ = 5.5 V, V_{COM} = 1V / 4.5V, V_{NO} or V_{NC} = floating	+25°C		0.1		µA
			Full			1	
Digital Inputs							
Input High Voltage	V_{INH}	V_+ = 4.5 V	+25°C	1.6			V
Input Low Voltage	V_{INL}	V_+ = 4.5 V	+25°C			0.4	V
Input Leakage Current	I_{IN}	V_+ = 4.5 V, V_{IN} = 0 V or V_+	+25°C		0.1		µA
Dynamic Characteristics							
Turn-On Time	t_{ON}	V_+ = 4.5 V, V_{NO} or V_{NC} = 3 V, R_L = 300 Ω, C_L = 35 pF, Test Circuit 2	+25°C		56		ns
Turn-Off Time	t_{OFF}	V_+ = 4.5 V, V_{NO} or V_{NC} = 3 V, R_L = 300 Ω, C_L = 35 pF, Test Circuit 2	+25°C		32		ns
Break-Before-Make Time Delay	t_D	V_+ = 4.5 V, V_{NO} or V_{NC} = 3 V, R_L = 300 Ω, C_L = 35 pF, Test Circuit 3	+25°C		28		ns
Skew	t_{SKEW}	R_S = 39 Ω, C_L = 50 pF, Test Circuit 4	+25°C		7		ns
Off Isolation	O_{ISO}	V_+ = 4.5 V, R_L = 50 Ω, Signal = 0 dBm, Test Circuit 5 — 10 MHz	+25°C		-45		dB
		1 MHz	+25°C		-65		dB
-3dB Bandwidth	BW	V_+ = 4.5 V, Signal = 0 dBm,	+25°C		100		MHz
Channel On Capacitance	$C_{NC(ON)}$, $C_{NO(ON)}$, $C_{COM(ON)}$	V_+ = 4.5 V, f = 1 MHz	+25°C		40		pF
Channel Off Capacitance	$C_{NC(OFF)}$, $C_{NO(OFF)}$, $C_{COM(OFF)}$	V_+ = 4.5 V, f = 1 MHz	+25°C		8.5		pF
Power Requirements							
Power Supply Range	V_+		+25°C	1.8		5.5	V
Power Supply Current	I_+	V_+ = 5.5 V, V_{IN} = 0 V or V_+	+25°C		0.1		µA

ELECTRICAL CHARACTERISTICS (continued)

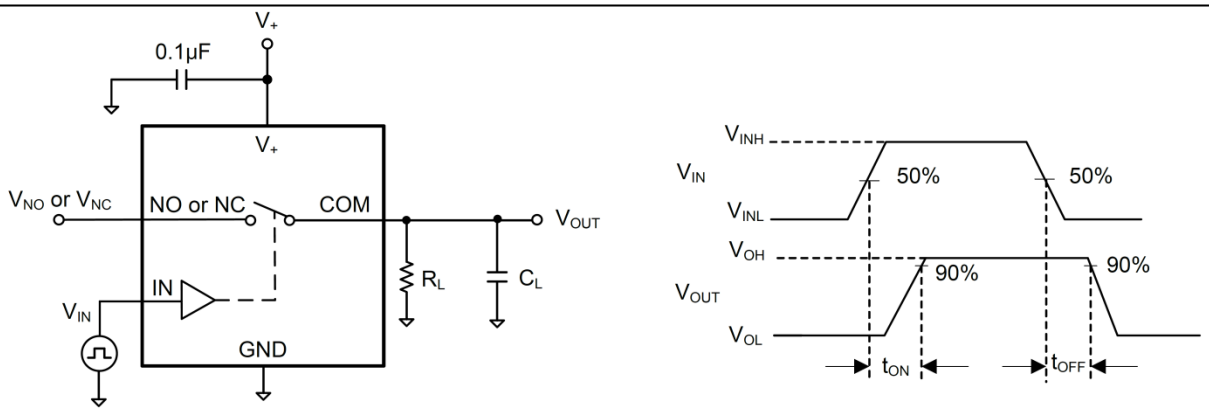
V_+ = 2.7 V to 3.6 V, GND = 0 V, Full = -40°C to +85°C. Typical values are at T_A = +25°C, unless otherwise noted.

Parameter	Symbol	Conditions	Temp	Min	Typ	Max	Units
Analog Switch							
Analog Signal Range	V_{NO}, V_{NC}, V_{COM}		+25°C	0		V+	V
On-Resistance	R_{ON}	V_+ = 2.7 V, 0 V ≤ V_{NO} or V_{NC} ≤ V_+, I_{COM} = -100 mA, Test Circuit 1	+25°C		1.4		Ω
On-Resistance Match Between Channels	ΔR_{ON}	V_+ = 2.7 V, 0 V ≤ V_{NO} or V_{NC} ≤ V_+, I_{COM} = -100 mA, Test Circuit 1	+25°C		0.03	0.3	Ω
			Full			0.31	
On-Resistance Flatness	$R_{FLAT(ON)}$	V_+ = 2.7 V, 0 V ≤ V_{NO} or V_{NC} ≤ V_+, I_{COM} = -100 mA, Test Circuit 1	+25°C		0.9	1.2	Ω
			Full			1.25	
Source Off Leakage Current	$I_{NC(OFF)}$, $I_{NO(OFF)}$	V_+ = 3.6 V, V_{NO} or V_{NC} = 3.3V / 0.3V, V_{COM} = 0.3V / 3.3V	+25°C		0.1		µA
			Full			1	
Channel On Leakage Current	$I_{NC(ON)}$, $I_{NO(ON)}$, $I_{COM(ON)}$	V_+ = 3.6 V, V_{COM} = 0.3V / 3.3V, V_{NO} or V_{NC} = floating	+25°C		0.1		µA
			Full			1	
Digital Inputs							
Input High Voltage	V_{INH}	V_+ = 2.7 V	+25°C	1.4			V
Input Low Voltage	V_{INL}	V_+ = 2.7 V	+25°C			0.4	V
Input Leakage Current	I_{IN}	V_+ = 2.7 V, V_{IN} = 0 V or V_+	+25°C		0.1		µA
Dynamic Characteristics							
Turn-On Time	t_{ON}	V_+ = 3 V, V_{NO} or V_{NC} = 1.5 V, R_L = 300 Ω, C_L = 35 pF, Test Circuit 2	+25°C		88		ns
Turn-Off Time	t_{OFF}	V_+ = 3 V, V_{NO} or V_{NC} = 1.5 V, R_L = 300 Ω, C_L = 35 pF, Test Circuit 2	+25°C		46		ns
Break-Before-Make Time Delay	t_D	V_+ = 3 V, V_{NO} or V_{NC} = 1.5 V, R_L = 300 Ω, C_L = 35 pF, Test Circuit 3	+25°C		43		ns
Skew	t_{SKEW}	R_S = 39 Ω, C_L = 50 pF, Test Circuit 4	+25°C		7		ns
Off Isolation	O_{ISO}	V_+ = 3 V, R_L = 50 Ω, Signal = 0 dBm, Test Circuit 5 — 10 MHz	+25°C		-45		dB
		1 MHz	+25°C		-65		dB
-3dB Bandwidth	BW	V_+ = 3 V, Signal = 0 dBm, R_L = 50 Ω, Test Circuit 6	+25°C		100		MHz
Channel On Capacitance	$C_{NC(ON)}$, $C_{NO(ON)}$, $C_{COM(ON)}$	V_+ = 3 V, f = 1 MHz	+25°C		40		pF
Channel Off Capacitance	$C_{NC(OFF)}$, $C_{NO(OFF)}$, $C_{COM(OFF)}$	V_+ = 3 V, f = 1 MHz	+25°C		8.5		pF
Power Requirements							
Power Supply Current	I_+	V_+ = 3.6 V, V_{IN} = 0 V or V_+	+25°C		0.1		µA

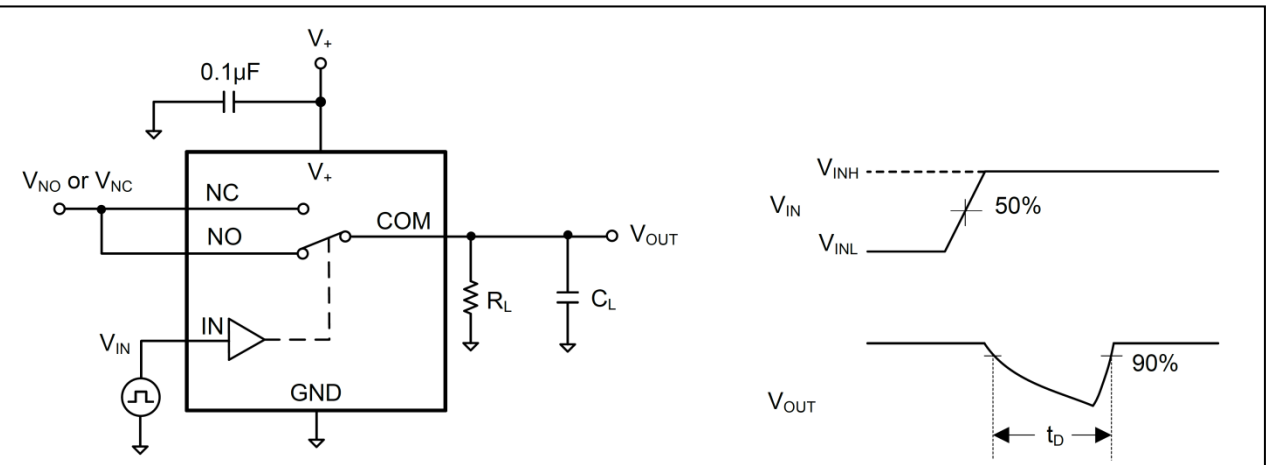
TEST CIRCUITS



Test Circuit 1. On-Resistance

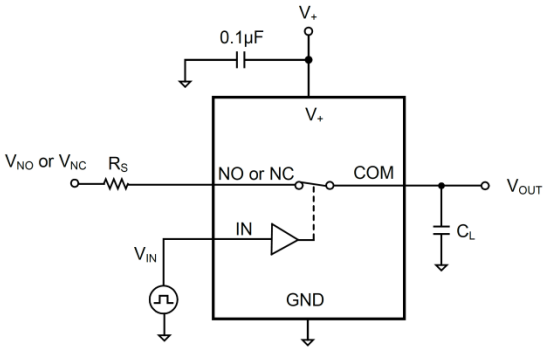


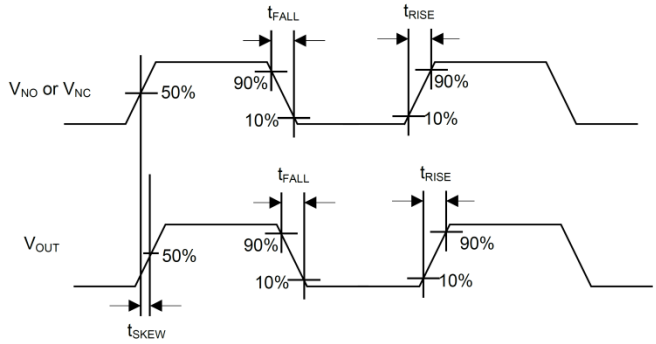
Test Circuit 2. Switching Times (t_{ON}, t_{OFF})



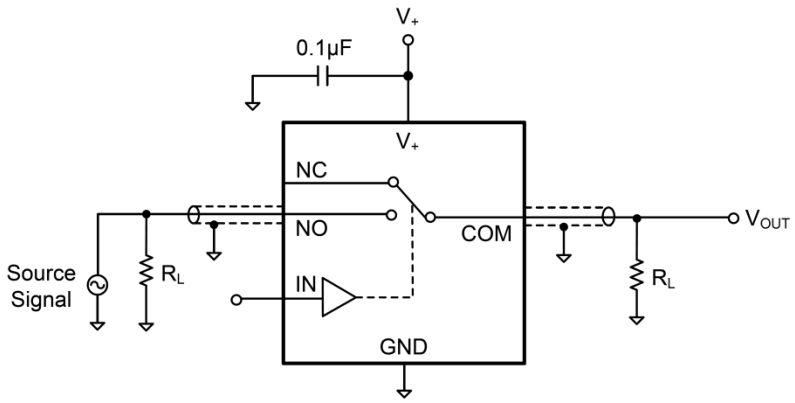
Test Circuit 3. Break-Before-Make Time Delay (t_D)

TEST CIRCUITS (continued)

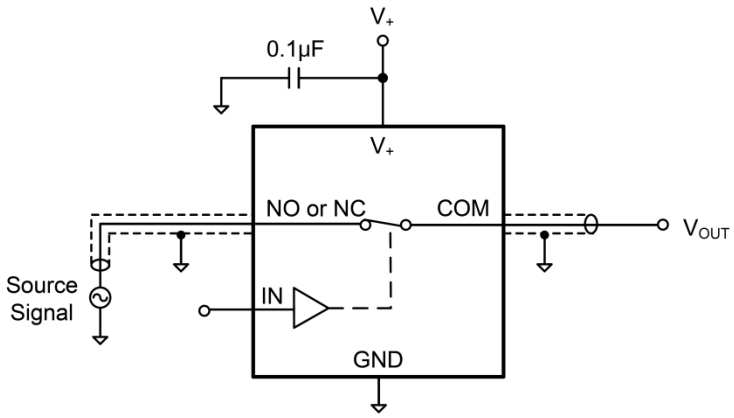




Test Circuit 4. Skew Test



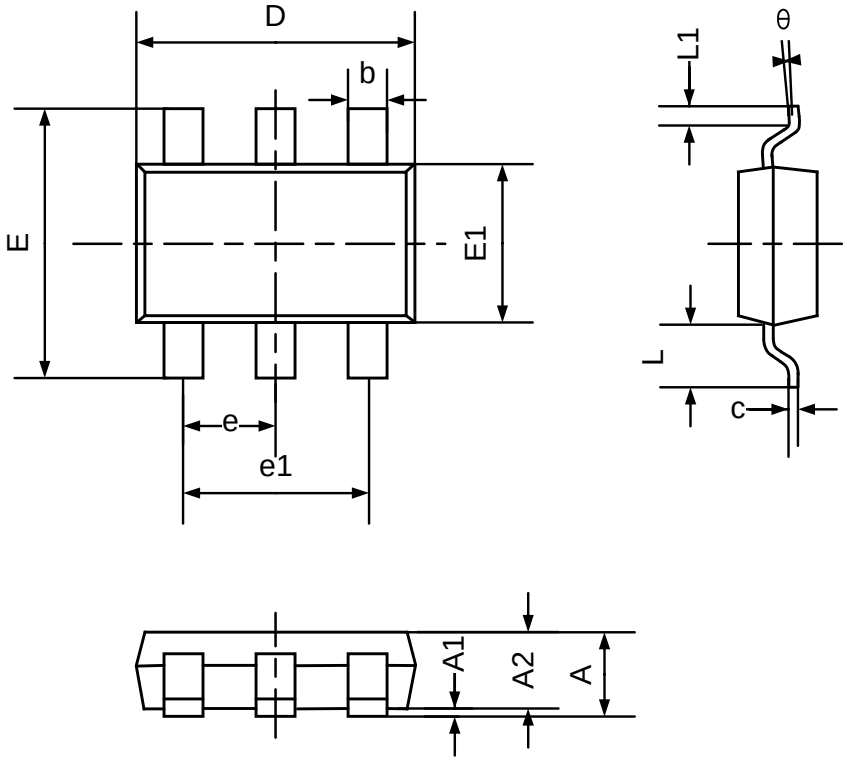
Test Circuit 5. Off Isolation



Test Circuit 6. -3dB Bandwidth

PACKAGE OUTLINE

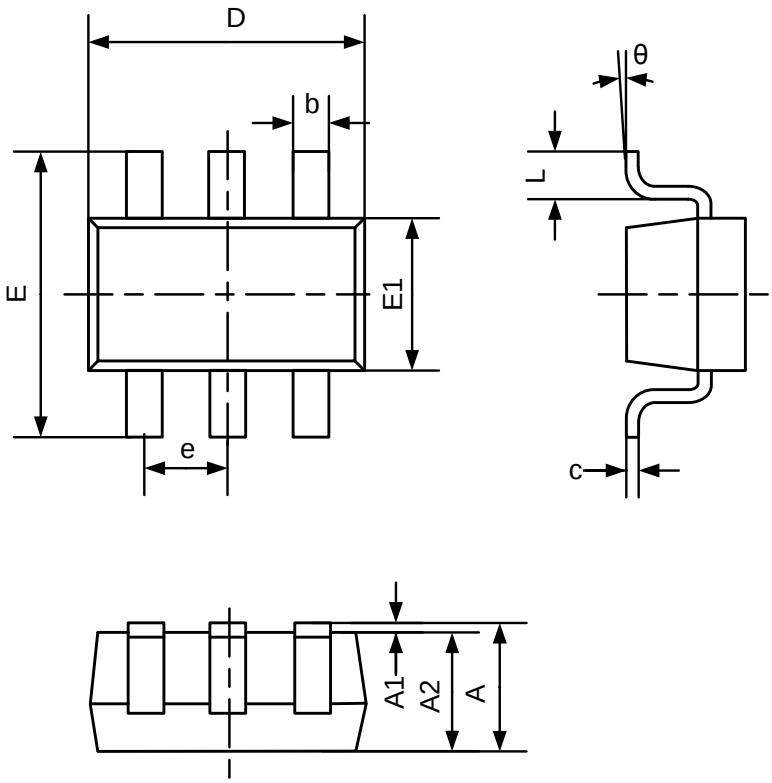
SC70-6



Symbol	Dimensions In Millimeters	
	Min	Max
A	0.800	1.100
A1	0.000	0.100
A2	0.800	1.000
b	0.150	0.350
c	0.080	0.220
D	2.000	2.200
E	2.150	2.450
E1	1.150	1.350
e	0.650BSC	
e1	1.300BSC	
L	0.525REF	
L1	0.260	0.460
θ	0°	8°

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°

V 1.1