SGM3157

4.5Ω Low Voltage SPDT Analog Switch in 6-pin SC70

GENERAL DESCRIPTION

The SGM3157 is a single, bidirectional, single-pole/ double-throw (SPDT) CMOS analog switch that is designed to operate from a single +1.8V to +5.5V supply. It features high-bandwidth (300MHz) and low on- resistance (4.5Ω TYP), Targeted applications for audio switching.

SGM3157 features guaranteed on-resistance matching (0.3Ω max) between switches and guaranteed on-resistance flatness over the signal range (2.3Ω TYP). This ensures excellent linearity and low distortion when switching audio signals.

SGM3157 is available in a SC70-6 package.

APPLICATIONS

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

FUNCTION TABLE

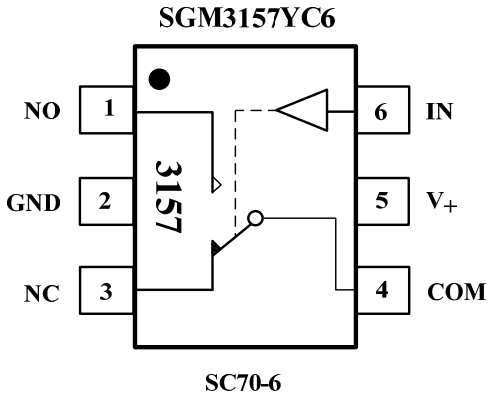
LOGIC	NO	NC
0	OFF	ON
1	ON	OFF

Switches Shown for Logic "0" Input

FEATURES

- **Voltage Operation: 1.8V to 5.5V**
- **On-Resistance: 4.5Ω (TYP) at 5.0V**
- **Fast Switching Times**
  - **t_{ON} 20ns**
  - **t_{OFF} 15ns**
- **High Bandwidth: 300MHz**
- **High Off-Isolation: -51dB at 10MHz**
- **Rail-to-Rail Operation**
- **TTL/CMOS Compatible**
- **Break-Before-Make Switching**
- **Extended Industrial Temperature Range: -40°C to 85°C**
- **Lead (Pb) Free SC70-6 Package**

PIN CONFIGURATION (TOP VIEW)



ORDERING INFORMATION

MODEL	PIN-PACKAGE	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKAGE OPTION
SGM3157	SC70-6	-40°C to +85°C	SGM3157YC6/TR	3157	Tape and Reel, 3000

Note: SC70-6 package is same as SOT-363 package.

ABSOLUTE MAXIMUM RATINGS

V_+ , IN to GND.....- 0.3V to +6V
Analog, Digital voltage range(1)..... - 0.3V to (V_+ + 0.3V)
Continuous Current NO, NC, or COM.....±200mA
Peak Current NO, NC, or COM.....±300mA
Operating Temperature Range.....-40°C to +85°C
Junction Temperature.....+150°C
Storage Temperature.....- 65°C to +150°C
Lead Temperature (soldering, 10s).....+260°C
ESD (HBM).....2000V

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.

PIN DESCRIPTION

NAME	PIN	FUNCTION
NO	1	Normally-open terminal
GND	2	Ground
NC	3	Normally-closed terminal
COM	4	Common terminal
V_+	5	Power supply
IN	6	Digital control pin to connect the COM terminal to the NO or NC terminals

Note: NO, NC and COM terminals may be an input or output.

ELECTRICAL CHARACTERISTICS

(V_+ = +2.7V to +3.6V, V_{IH} = +1.4V, V_{IL} = +0.5V, T_A = -40°C to +85°C, Typical values are at V_+ = 3.0V, T_A = +25°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TPY	MAX	UNITS
ANALOG SWITCH							
Analog Signal Range	V_{NO}, V_{NC}, V_{COM}		-40°C to +85°C	0		V_+	V
On-Resistance	R_{ON}	V_+ = 2.7V, V_{NO} or V_{NC} = 1.5V, I_{COM} = -10mA, Test Circuit 1	+25°C		7	10	Ω
			-40°C to +85°C			10.5	Ω
On-Resistance Match Between Channels	ΔR_{ON}	V_+ = 2.7V, V_{NO} or V_{NC} = 1.5V, I_{COM} = -10mA, Test Circuit 1	+25°C		0.15	0.3	Ω
			-40°C to +85°C			0.4	Ω
On-Resistance Flatness	$R_{FLAT(ON)}$	V_+ = 2.7V, V_{NO} or V_{NC} = 1.0V, 1.5V, 2.0V, I_{COM} = -10mA, Test Circuit 1	+25°C		3	4	Ω
			-40°C to +85°C			4.3	Ω
Source OFF Leakage Current	$I_{NC(OFF)}$, $I_{NO(OFF)}$	V_+ = 3.6V, V_{NO} or V_{NC} = 0.3V, 3.3V, V_{COM} = 3.3V, 0.3V,	-40°C to +85°C			1	μA
Channel ON Leakage Current	$I_{NC(ON)}$, $I_{NO(ON)}$, $I_{COM(ON)}$	V_+ = 3.6V, V_{COM} = 0.3V, 3.3V, V_{NO} or V_{NC} = 0.3V, 3.3V, or floating	-40°C to +85°C			1	μA
DIGITAL INPUTS							
Input High Voltage	V_{INH}		-40°C to +85°C	1			V
Input Low Voltage	V_{INL}		-40°C to +85°C			0.5	V
Input Leakage Current	I_{IN}	V_+ = +5.5V, V_{IN} = 0V or 3.6V	-40°C to +85°C			1	μA
DYNAMIC CHARACTERISTICS							
Turn-On Time	t_{ON}	V_{NO} or V_{NC} = 1.5V, V_{IH} = 1.5V, V_{IL} = 0V, R_L = 300Ω, C_L = 35pF, Test Circuit 2	+25°C		30		ns
Turn-Off Time	t_{OFF}	V_{NO} or V_{NC} = 1.5V, V_{IH} = 1.5V, V_{IL} = 0V, R_L = 300Ω, C_L = 35pF, Test Circuit 2	+25°C		25		ns
Break-Before-Make Time Delay	t_D	V_{NO1} or V_{NC1} = V_{NO2} or V_{NC2} = 3V, R_L = 300Ω, C_L = 35pF, Test Circuit 3	+25°C		8		ns
Skew	t_{SKEW}	R_S = 39Ω, C_L = 50pF, Test Circuit 4	+25°C		2		ns
Off Isolation	O_{ISO}	R_L = 50Ω, C_L = 5pF, Signal = 0dBm, Test Circuit 5, f = 10MHz	+25°C		-51		dB
		R_L = 50Ω, C_L = 5pF, Signal = 0dBm, Test Circuit 5, f = 1MHz	+25°C		-72		dB
–3dB Bandwidth	BW	Signal = 0dBm, R_L = 50Ω, C_L = 5pF, Test Circuit 6	+25°C		300		MHz
Source OFF Capacitance	$C_{NC(OFF)}$, $C_{NO(OFF)}$	f = 1MHz	+25°C		5.5		pF
Channel ON Capacitance	$C_{NC(ON)}$, $C_{NO(ON)}$, $C_{COM(ON)}$	f = 1MHz	+25°C		15.5		pF
POWER REQUIREMENTS							
Power Supply Range	V_+		-40°C to +85°C	1.8		5.5	V
Power Supply Current	I_+	V_+ = +5.5V, V_{IN} = 0V or V_+	-40°C to +85°C			5	μA

Specifications subject to change without notice.

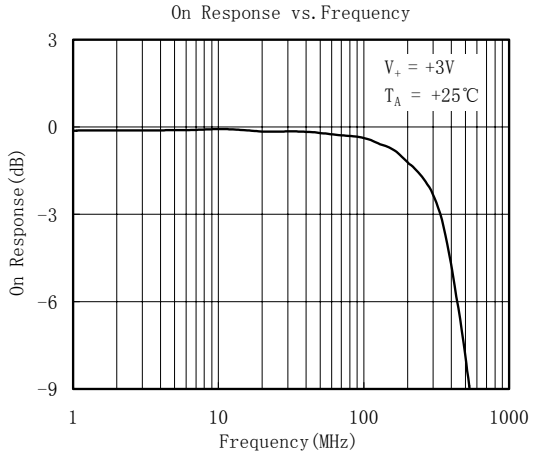
ELECTRICAL CHARACTERISTICS

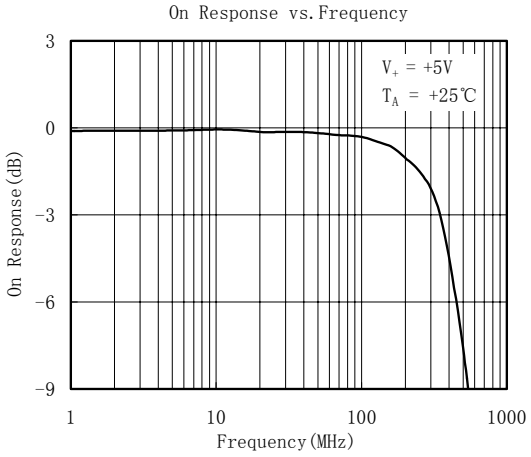
(V_+ = +4.5V to +5.5V, V_{IH} = +2.0V, V_{IL} = +0.8V, T_A = -40°C to +85°C, Typical values are at V_+ = 5.0V, T_A = +25°C, unless otherwise noted.)

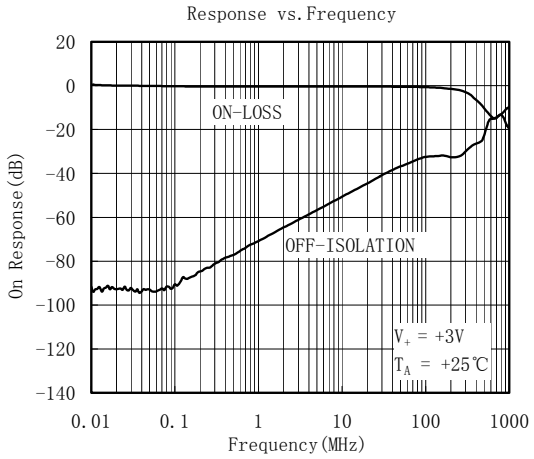
PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TPY	MAX	UNITS
ANALOG SWITCH							
Analog Signal Range	V_{NO}, V_{NC}, V_{COM}		-40°C to +85°C	0		V_+	V
On-Resistance	R_{ON}	V_+ = 4.5V, V_{NO} or V_{NC} = 3.5V, I_{COM} = -10mA, Test Circuit 1	+25°C		4.5	8	Ω
			-40°C to +85°C			8.5	Ω
On-Resistance Match Between Channels	ΔR_{ON}	V_+ = 4.5V, V_{NO} or V_{NC} = 3.5V, I_{COM} = -10mA, Test Circuit 1	+25°C		0.15	0.3	Ω
			-40°C to +85°C			0.4	Ω
On-Resistance Flatness	$R_{FLAT(ON)}$	V_+ = 4.5V, V_{NO} or V_{NC} = 1.0V, 2.0V, 3.5V, I_{COM} = -10mA, Test Circuit 1	+25°C		2.3	3.3	Ω
			-40°C to +85°C			3.7	Ω
Source OFF Leakage Current	$I_{NC(OFF)}$, $I_{NO(OFF)}$	V_+ = 5.5V, V_{NO} or V_{NC} = 1.0V, 4.5V, V_{COM} = 4.5V, 1.0V	-40°C to +85°C			1	μA
Channel ON Leakage Current	$I_{NC(ON)}$, $I_{NO(ON)}$, $I_{COM(ON)}$	V_+ = 5.5V, V_{COM} = 1.0V, 4.5V, V_{NO} or V_{NC} = 1.0V, 4.5V, or floating	-40°C to +85°C			1	μA
DIGITAL INPUTS							
Input High Voltage	V_{INH}		-40°C to +85°C	1.5			V
Input Low Voltage	V_{INL}		-40°C to +85°C			0.6	V
Input Leakage Current	I_{IN}	V_+ = +5.5V, V_{IN} = 0V or 5.5V	-40°C to +85°C			1	μA
DYNAMIC CHARACTERISTICS							
Turn-On Time	t_{ON}	V_{NO} or V_{NC} = 3.0V, V_{IH} = 1.5V, V_{IL} = 0V, R_L = 300Ω, C_L = 35pF, Test Circuit 2	+25°C		20		ns
Turn-Off Time	t_{OFF}	V_{NO} or V_{NC} = 3.0V, V_{IH} = 1.5V, V_{IL} = 0V, R_L = 300Ω, C_L = 35pF, Test Circuit 2	+25°C		15		ns
Break-Before-Make Time Delay	t_D	V_{NO1} or V_{NC1} = V_{NO2} or V_{NC2} = 3V, R_L = 300Ω, C_L = 35pF, Test Circuit 3	+25°C		5		ns
Skew	t_{SKEW}	RS = 39Ω, C_L = 50pF, Test Circuit 4	+25°C		5		ns
Off Isolation	O_{ISO}	R_L = 50Ω, C_L = 5pF, Signal = 0dBm, Test Circuit 5, f = 10MHz	+25°C		-51		dB
		f = 1MHz	+25°C		-72		dB
–3dB Bandwidth	BW	Signal = 0dBm, R_L = 50Ω, C_L = 5pF, Test Circuit 6	+25°C		300		MHz
Source OFF Capacitance	$C_{NC(OFF)}$, $C_{NO(OFF)}$	f = 1MHz	+25°C		5.5		pF
Channel ON Capacitance	$C_{NC(ON)}$, $C_{NO(ON)}$, $C_{COM(ON)}$	f = 1MHz	+25°C		15.5		pF
POWER REQUIREMENTS							
Power Supply Range	V_+		-40°C to +85°C	1.8		5.5	V
Power Supply Current	I_+	V_+ = +5.5V, V_{IN} = 0V or V_+	-40°C to +85°C			5	μA

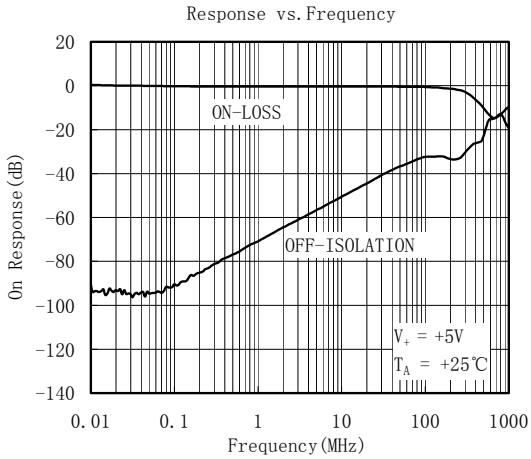
Specifications subject to change without notice.

TYPICAL PERFORMANCE CHARACTERISTICS

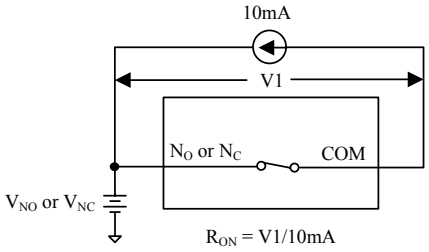




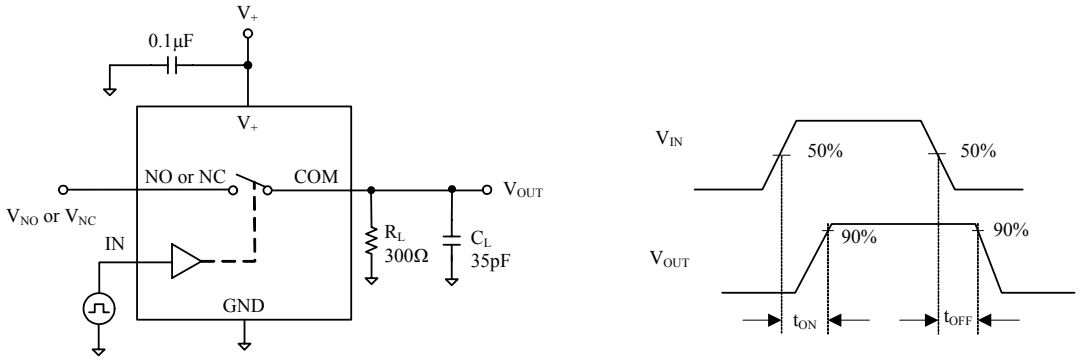




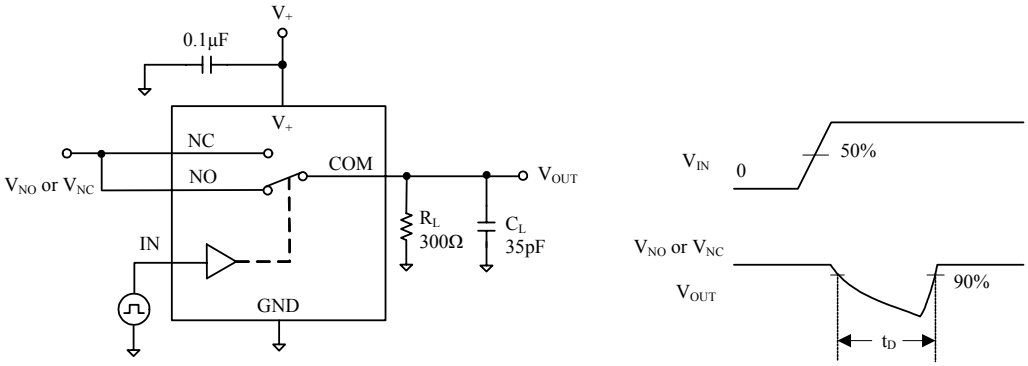
TEST CIRCUITS



Test Circuit 1. On Resistance

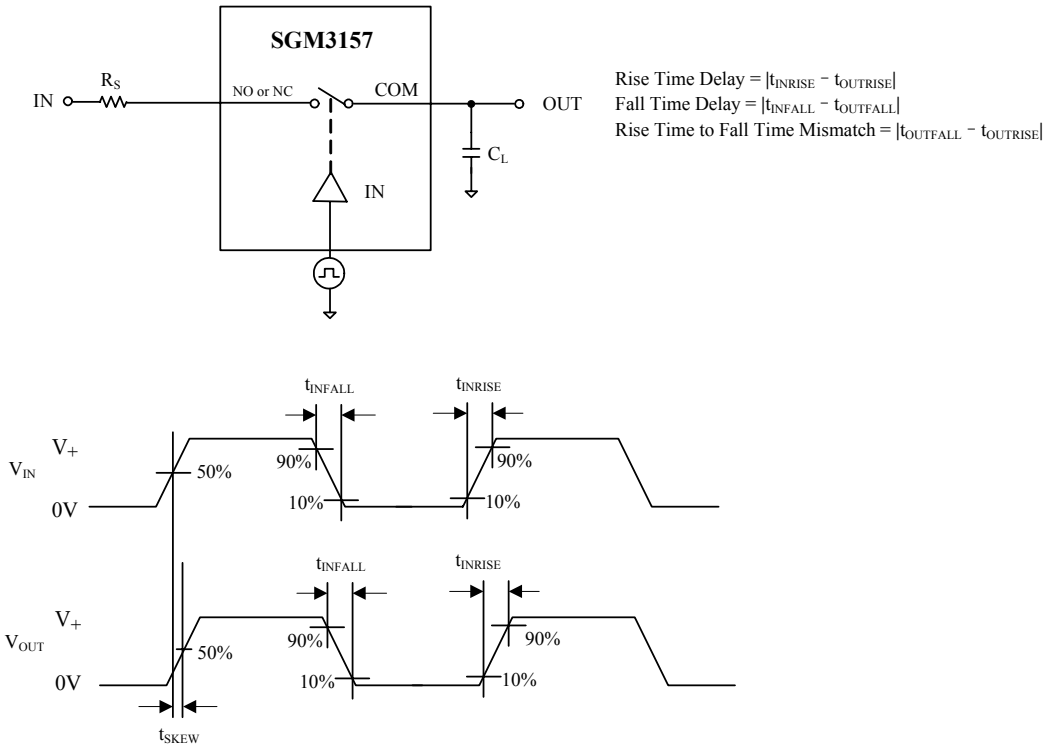


Test Circuit 2. Switching Times

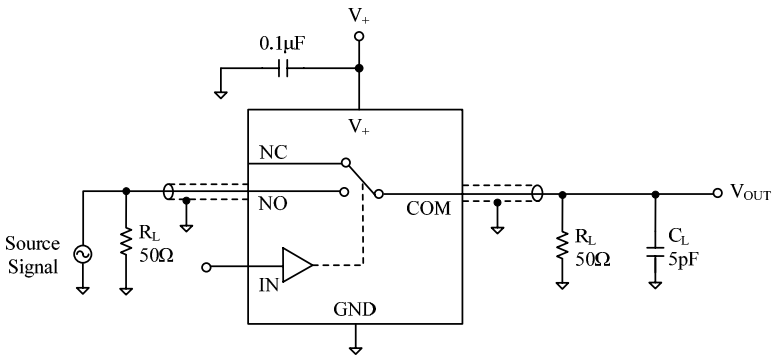


Test Circuit 3. Break-Before-Make Time Delay, t_D

TEST CIRCUITS (Cont.)

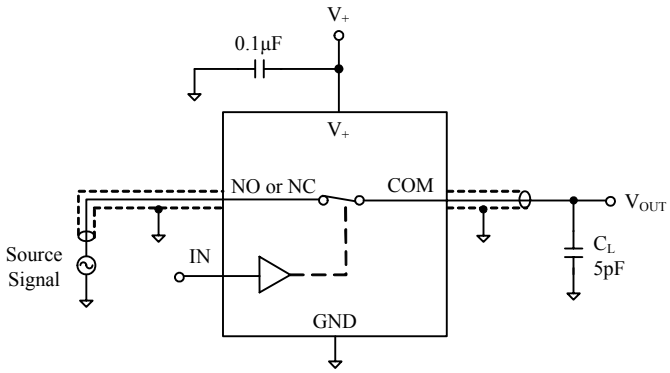


Test Circuit 4. Output Signal Skew



Test Circuit 5. Off Isolation

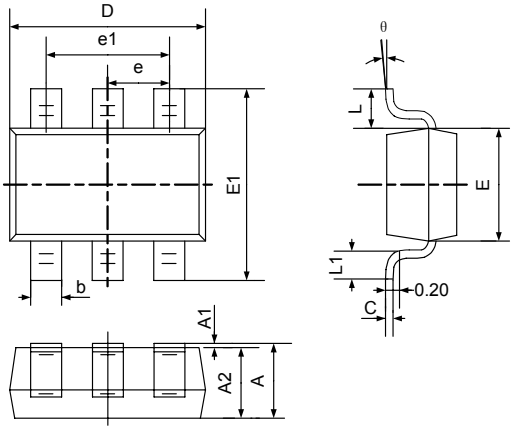
TEST CIRCUITS (Cont.)



Test Circuit 6. -3dB Bandwidth

PACKAGE OUTLINE DIMENSIONS

SC70-6 / SOT-363



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°

REVISION HISTORY

Location **Page**

08/07— Data Sheet REV.A

10/07— Data Sheet changed from REV.A to REV.B

Changes to TYPICAL PERFORMANCE CHARACTERISTICS 5

05/2008— Data Sheet changed from REV.B to REV.B.1

Changes to ELECTRICAL CHARACTERISTICS 3, 4

Changes to TEST CIRCUITS 6, 7

SGMICRO

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