

SGM3158

4.5Ω Dual SPDT Analog Switch in 12-pin TDFN

GENERAL DESCRIPTION

The SGM3158 is a dual, bidirectional, single-pole/double-throw (SPDT) CMOS analog switches 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.

SGM3158 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.

SGM3158 is available in a TDFN-12 package.

APPLICATIONS

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

PIN DESCRIPTION

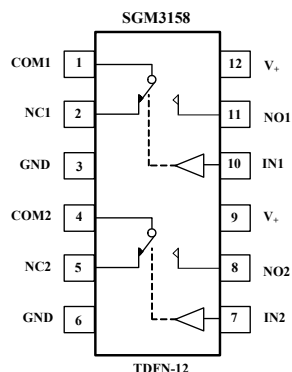
NAME	FUNCTION
NO1, NO2	Normally-open terminal
GND	ground
NC1, NC2	Normally-closed terminal
COM1, COM2	Common terminal
V ₊	Power supply
IN1, IN2	Digital control pin to connect the COM terminal to the NO or NC terminals

Note: NO1 or NO2, NC1 or NC2, and COM1 or COM2 terminal may be an input or output.

FEATURES

- Voltage Operation : 1.8 V to 5.5 V
- On-Resistance: 4.5Ω (typ) at 5.0V
- Fast Switching Time
 t_{ON} 20 ns
 t_{OFF} 15 ns
- High Bandwidth: 300 MHz
- 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 TDFN-12 Package

PIN CONFIGURATIONS (TOP VIEW)



FUNCTION TABLE

LOGIC	NO	NC
0	OFF	ON
1	ON	OFF

Switches Shown For Logic "0" Input



Shengbang Microelectronics Co, Ltd
 Tel: 86/451/84348461
 www.sg-micro.com

REV. B

ELECTRICAL CHARACTERISTICS

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

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

Specifications subject to change without notice.

ELECTRICAL CHARACTERISTICS

($V_+ = +4.5V$ to $+5.5V$, $V_{IH} = +2.0V$, $V_{IL} = +0.8V$, $T_A = -40^\circ C$ to $+85^\circ C$, Typical values are at $V_+ = 5.0V$, $T_A = +25^\circ C$, 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 $V_{NC} = 3.5V,$ $I_{COM} = -10$ mA, 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 $V_{NC} = 3.5V,$ $I_{COM} = -10$ mA, 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 $V_{NC} = 1.0V, 2.0V,$ $3.5V, I_{COM} = -10$ mA, 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 $V_{NC} = 1.0V, 4.5V,$ $V_{COM} = 1.0V, 4.5V,$	-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}	$V_+ = +5.5V, V_{IN} = 0$ or $5.5V$	-40°C to +85°C			1	μA
DYNAMIC CHARACTERISTICS							
Turn-On Time	t_{ON}	V_{NO} or $V_{NC} = 3.0V,$ $R_L = 300\Omega, C_L = 35pF,$ Test Circuit 2; $V_{IH} = 1.5V, V_{IL} = 0V$	+25°C		20		ns
Turn-Off Time	t_{OFF}	V_{NO} or $V_{NC} = 3.0V,$ $R_L = 300\Omega, C_L = 35pF,$ Test Circuit 2; $V_{IH} = 1.5V, V_{IL} = 0V$	+25°C		15		ns
Break-Before-Make Time Delay	t_d	V_{NO1} or $V_{NC1} = V_{NO2}$ or $V_{NC2} = 3V,$ $R_L = 300\Omega, C_L = 35pF,$ Test Circuit 4	+25°C		5		ns
Skew	t_{SKEW}	$R_S = 39\Omega, C_L = 50pF,$ Test Circuit 5	+25°C		5		ns
Off Isolation	O_{ISO}	$R_L = 50\Omega, C_L = 5pF,$ Signal = 0dBm, Test Circuit 6	$f = 10MHz$	+25°C		-51	dB
			$f = 1MHz$	+25°C		-72	dB
Bandwidth -3 dB	BW	Signal = 0dBm, $R_L = 50\Omega, C_L = 5pF,$ Test Circuit 7	+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.

ORDERING INFORMATION

MODEL	PIN-PACKAGE	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKAGE OPTION
SGM3158	TDFN-12	- 40°C to +85°C	SGM3158YD	3158	Tape and Reel, 3000

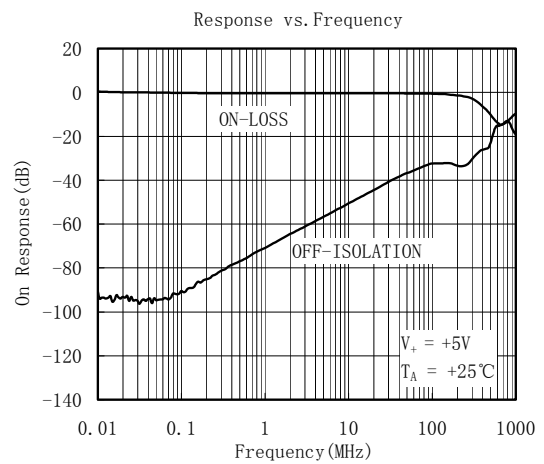
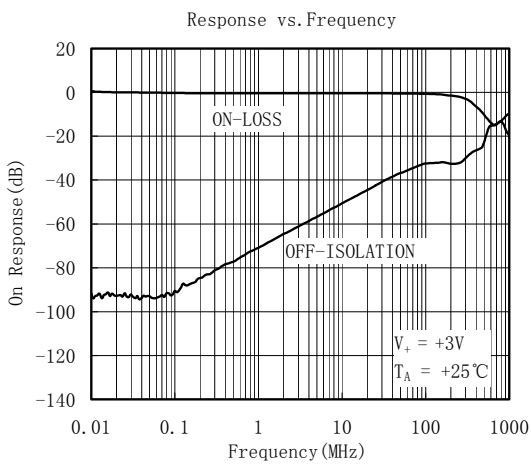
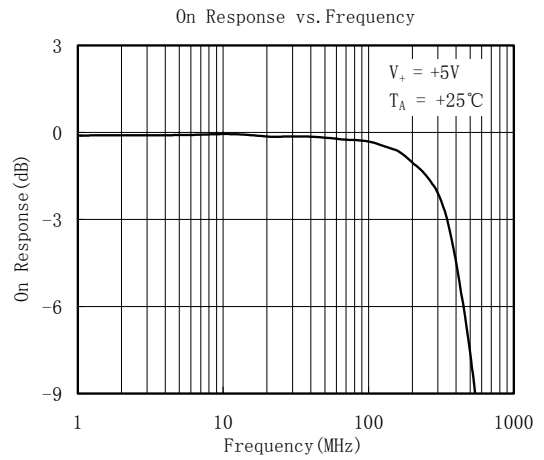
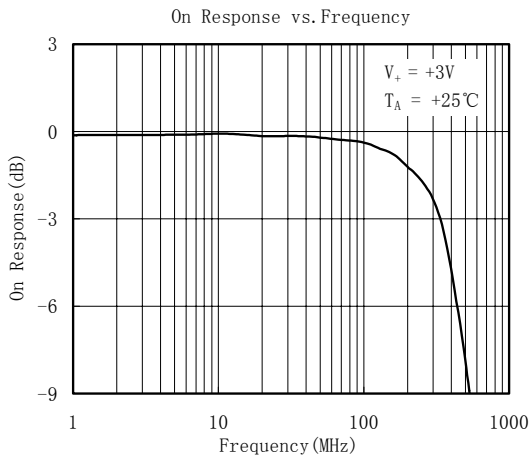
ABSOLUTE MAXIMUM RATINGS

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

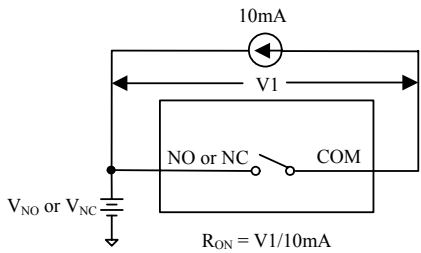
Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure 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.

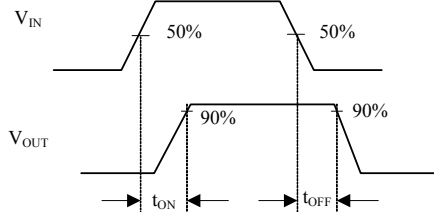
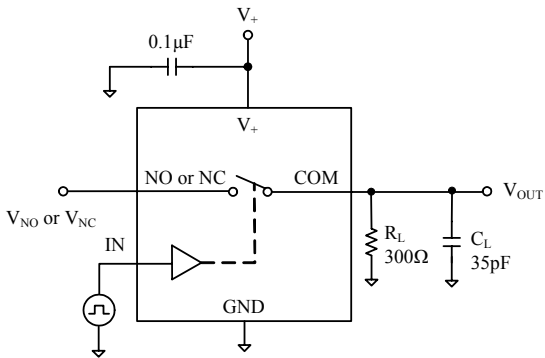
TYPICAL PERFORMANCE CHARACTERISTICS



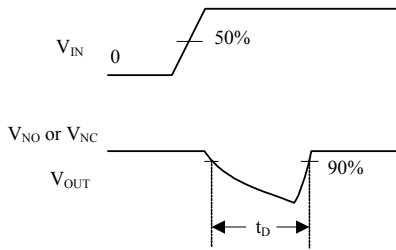
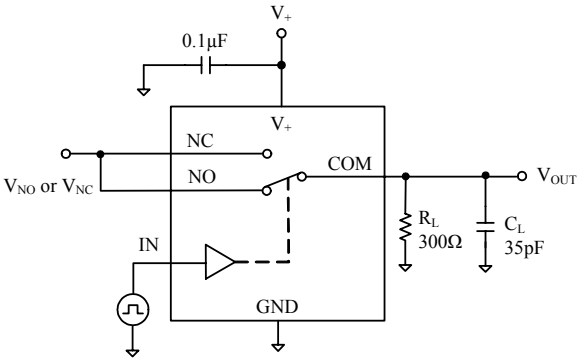
TEST CIRCUITS



Test Circuit 1. On Resistance

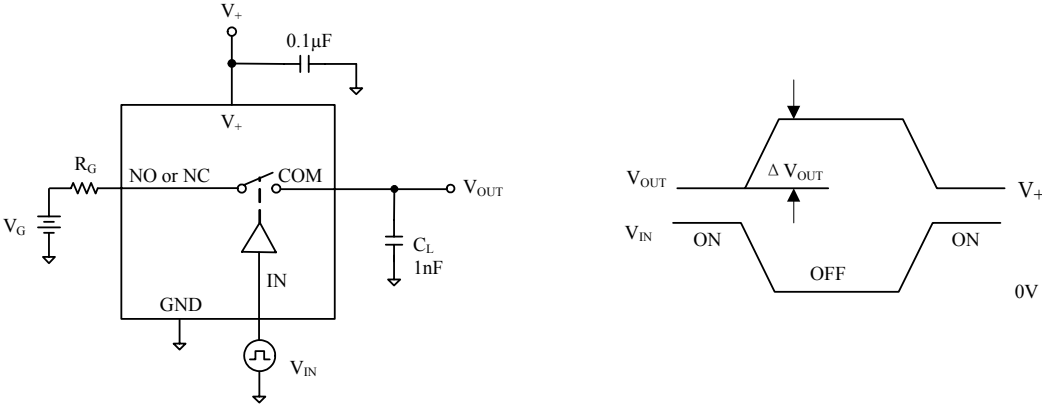


Test Circuit 2. Switching Times

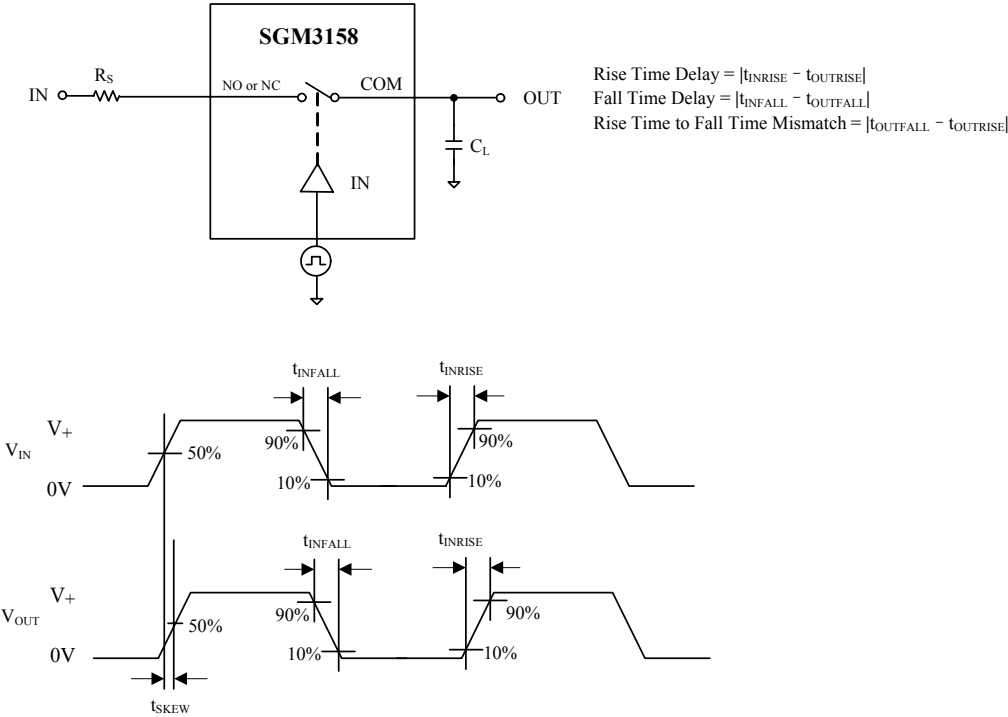


Test Circuit 3. Break-Before-Make Time Delay, t_D

TEST CIRCUITS (Cont.)

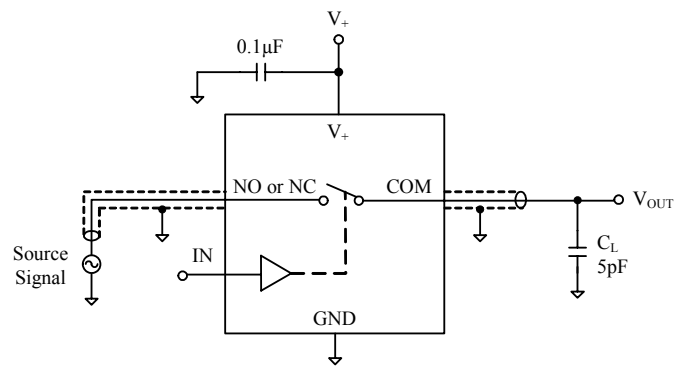


Test Circuit 4. Charge Injection

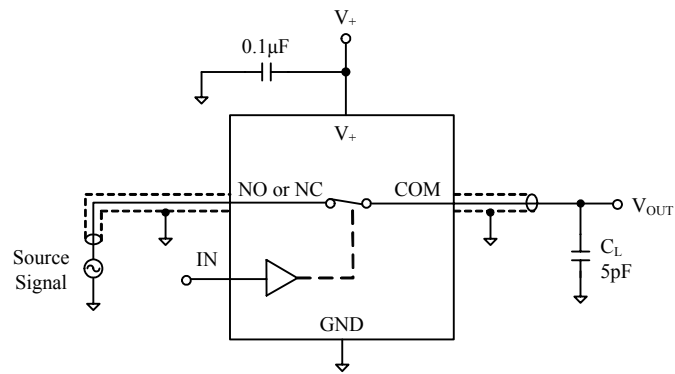


Test Circuit 5. Output Signal Skew

TEST CIRCUITS (Cont.)



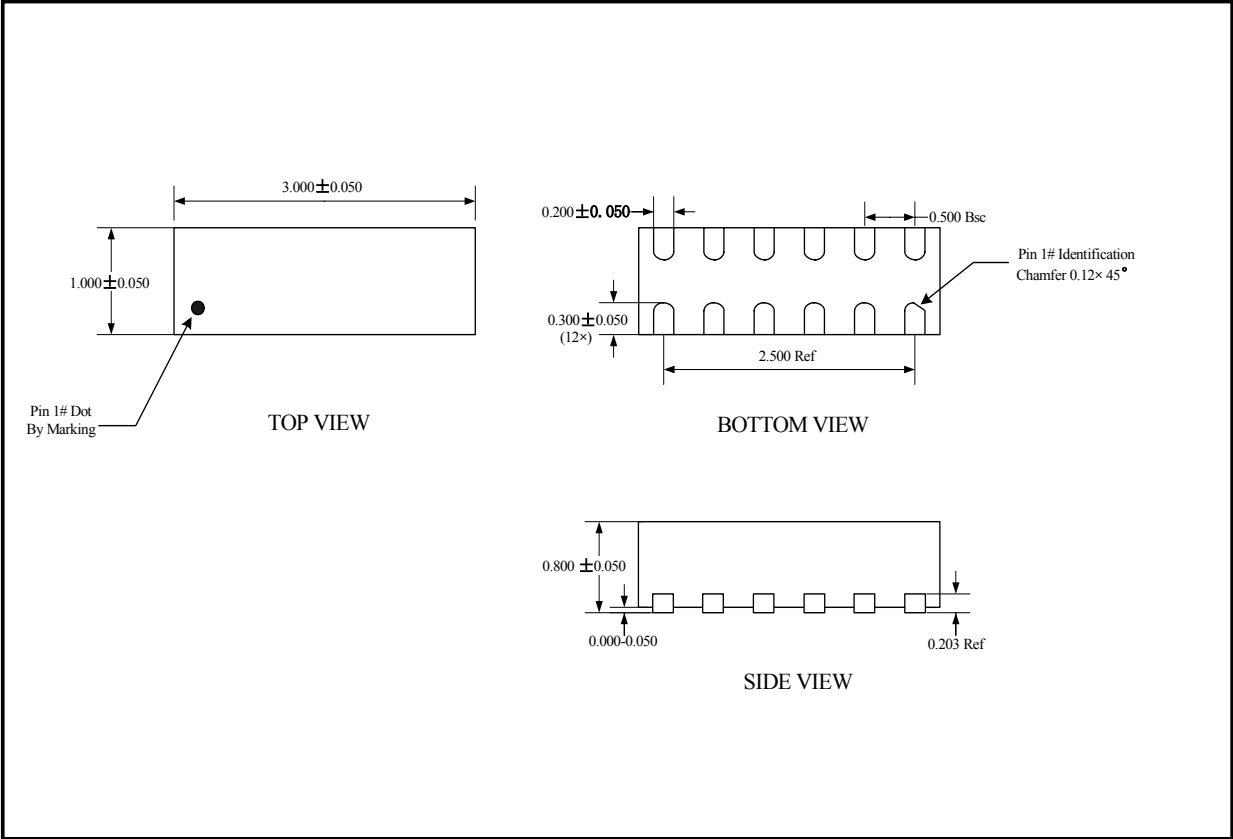
Test Circuit 6. Off Isolation



Test Circuit 7. Bandwidth

PACKAGE OUTLINE DIMENSIONS

TDFN-12



NOTES:
All linear dimensions are in millimeters.

REVISION HISTORY

Location	Page
05/07— Data Sheet REV.A	
10/07— Data Sheet changed from REV.A to REV.B	
Changes to TYPICAL PERFORMANCE CHARACTERISTICS	5

Shengbang Microelectronics Co, Ltd

Unit 3, ChuangYe Plaza
No.5, TaiHu Northern Street, YingBin Road Centralized Industrial Park
Harbin Development Zone
Harbin, HeiLongJiang 150078
P.R. China
Tel.: 86-451-84348461
Fax: 86-451-84308461
www.sg-micro.com