

SGM44600

4Ω, High Speed, Low Voltage Dual, DPDT Analog Switch

GENERAL DESCRIPTION

The SGM44600 is a dual, high-speed, low-voltage, double-pole/double-throw (DPDT) CMOS analog switch that is designed to operate from a single 1.8V to 5.5V power supply. It features high-bandwidth (300MHz) and low ON-resistance (4Ω TYP), targeted applications for audio switching.

The SGM44600 consists of four SPDT switches. The configuration can be used as a bidirectional quad 2-channel multiplexer/demultiplexer with a single switch-enable (IN) input.

SGM44600 can handle rail-to-rail analog signals and is available in Pb-free TQFN-16(3mm × 3mm) package.

APPLICATIONS

- Communication Systems
- Cell Phones
- Portable Instrumentation
- Audio Signal Routing
- Audio and Video Switching
- PCMCIA Cards
- Computer Peripherals
- Modems
- PDA's

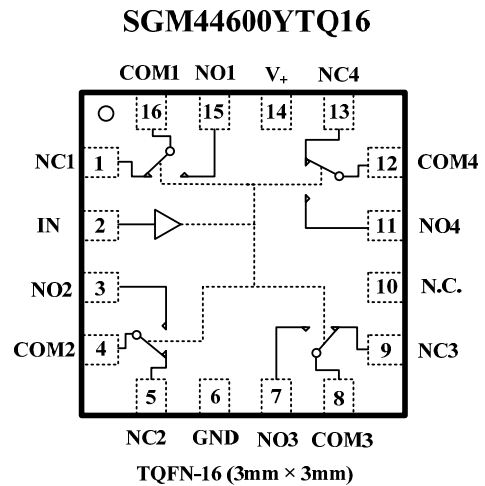
FUNCTION TABLE

IN	Function	
	NC1, 2, 3 and 4	NO1, 2, 3 and 4
0	ON	OFF
1	OFF	ON

FEATURES

- Low Voltage Operation : 1.8V to 5.5V
- Low On-Resistance: 4Ω (TYP)
- Low On-Resistance Flatness
- -3dB Bandwidth: 300MHz
- High Off-Isolation: -75dB at 1MHz
- Low Crosstalk: -100dB at 1MHz
- Rail-to-Rail Input and Output Operation
- Typical Power Consumption (<0.01μW)
- TTL/CMOS Compatible
- Lead (Pb) Free TQFN-16 (3mm × 3mm) Package
- Extended Industrial Temperature Range:
-40°C to +85°C

PIN CONFIGURATION (TOP VIEW)



ORDERING INFORMATION

MODEL	PIN-PACKAGE	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKAGE OPTION
SGM44600	TQFN-16 (3mm × 3mm)	- 40°C to +85°C	SGM44600YTQ16/TR	44600	Tape and Reel, 3000

ABSOLUTE MAXIMUM RATINGS

V ₊ to GND.....	0V to +6V	Storage Temperature.....	- 65°C to +150°C
Analog, Digital voltage range.....	-0.3V to (V ₊ + 0.3V)	Lead Temperature (soldering, 10s).....	+260°C
Continuous Current NO, NC, or COM.....	±200mA	ESD Susceptibility	
Peak Current NO, NC, or COM.....	±350mA	HBM.....	2000V
Operating Temperature Range.....	- 40°C to +85°C	MM.....	200V
Junction Temperature.....	+150°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.

PIN DESCRIPTION

NAME	TQFN PIN	FUNCTION
V ₊	14	Power supply
GND	6	Ground
IN	2	Digital control pin to connect the COM terminal to the NO or NC terminals
N.C.	10	Not internally connected.
COM _x	16, 4, 8, 12	Common terminal
NO _x	15, 3, 7, 11	Normally-open terminal
NC _x	1, 5, 9, 13	Normally-closed terminal

Note: NO_x, NC_x and COM_x terminal may be an input or output.

ELECTRICAL CHARACTERISTICS

($V_+ = +4.5V$ to $+5.5V$, $GND = 0V$, $V_{IH} = +1.6V$, $V_{IL} = +0.6V$, $T_A = -40^\circ C$ 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}		$-40^\circ C$ to $+85^\circ C$	0		V_+	V
On-Resistance	R_{ON}	$V_+ = 4.5V, V_{NO}$ or $V_{NC} = 1.2V,$ $I_{COM} = -100mA, \text{Test Circuit 1}$	$+25^\circ C$		4	6	Ω
			$-40^\circ C$ to $+85^\circ C$			7	Ω
On-Resistance Match Between Channels	ΔR_{ON}	$V_+ = 4.5V, V_{NO}$ or $V_{NC} = 1.2V,$ $I_{COM} = -100mA, \text{Test Circuit 1}$	$+25^\circ C$		0.4	2.5	Ω
			$-40^\circ C$ to $+85^\circ C$			3	Ω
On-Resistance Flatness	$R_{FLAT(ON)}$	$V_+ = 4.5V, V_{NO}$ or $V_{NC} = 1.2V,$ $I_{COM} = -100mA, \text{Test Circuit 1}$	$+25^\circ C$		2	3	Ω
			$-40^\circ C$ to $+85^\circ C$			3.5	Ω
Source OFF Leakage current	$I_{NC(OFF)}, I_{NO(OFF)}$	$V_+ = 5.5V, V_{NO}$ or $V_{NC} = 3.3V/0.3V,$ $V_{COM} = 0.3V/3.3V$	$-40^\circ C$ to $+85^\circ C$			1	μA
Channel ON Leakage current	$I_{NC(ON)}, I_{NO(ON)},$ $I_{COM(ON)}$	$V_+ = 5.5V, V_{COM} = 0.3V/3.3V,$ 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 $+85^\circ C$	1.6			V
Input Low Voltage	V_{INL}		$-40^\circ C$ to $+85^\circ C$			0.5	V
Input Leakage Current	I_{IN}	$V_+ = 5.5V, V_{IN} = 0V$ or $5.5V$	$-40^\circ C$ to $+85^\circ C$			1	μA
DYNAMIC CHARACTERISTICS							
Turn-On Time	t_{ON}	$V_{IH} = 3V, V_{IL} = 0V, \text{Test Circuit 2}$	$+25^\circ C$		29.5		ns
Turn-Off Time	t_{OFF}		$+25^\circ C$		29.5		ns
Break-Before-Make Time Delay	t_d	$V_{IH} = 3V, V_{IL} = 0V, \text{Test Circuit 4}$	$+25^\circ C$		10.0		ns
Charge Injection,	Q	$V_{IN} = GND, R_G = 0\Omega,$ $C_L = 1.0nF, Q = C_L \times V_{OUT},$ $V_{IH} = 3V, V_{IL} = 0V, \text{Test Circuit 3}$	$+25^\circ C$		4.8		pC
Off Isolation	O_{ISO}	$V_{BIAS} = 2.1V, V_{IN} = 0dBm$ $V_{IH} = 3V, V_{IL} = 0V,$ Test Circuit 5	1MHz	$+25^\circ C$		-75	dB
			10MHz	$+25^\circ C$		-55	
Channel-to-Channel Crosstalk	X_{TALK}	$V_{BIAS} = 2.1V, V_{IN} = 0dBm$ $V_{IH} = 3V, V_{IL} = 0V,$ Test Circuit 6	1MHz	$+25^\circ C$		-100	dB
			10MHz	$+25^\circ C$		-60	
Bandwidth -3 dB	BW	$V_{BIAS} = 2.1V, V_{IN} = 0dBm,$ $V_{IH} = 3V, V_{IL} = 0V, \text{Test Circuit 7}$	$+25^\circ C$		300		MHz
Channel ON Capacitance	$C_{NC(ON)}, C_{NO(ON)},$ $C_{COM(ON)}$		$+25^\circ C$		43.0		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 $+85^\circ C$			1	μA

Specifications subject to changes without notice.

ELECTRICAL CHARACTERISTICS

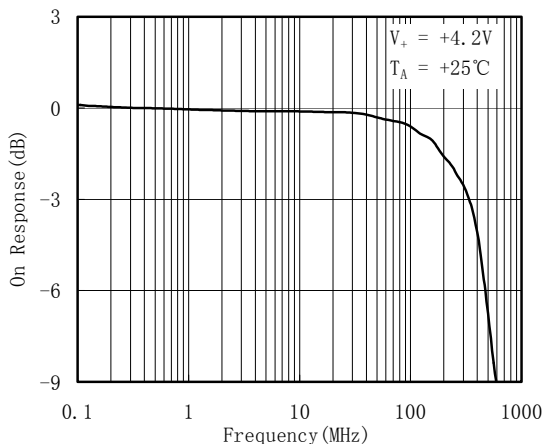
($V_+ = +2.7V$ to $+3.6V$, $V_{IH} = +1.6V$, $V_{IL} = +0.4V$, $T_A = -40^\circ C$ to $+85^\circ C$. Typical values are at $V_+ = +3.0V$, $T_A = +25^\circ C$, unless otherwise noted.)

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 $V_{NC} = 1.2V,$ $I_{COM} = -10mA$, Test Circuit 1	$+25^\circ C$		10	15	Ω
			$-40^\circ C$ to $+85^\circ C$			18	Ω
On-Resistance Match Between Channels	ΔR_{ON}	$V_+ = 2.7V, V_{NO}$ or $V_{NC} = 1.2V,$ $I_{COM} = -100mA$, Test Circuit 1	$+25^\circ C$		1	3	Ω
			$-40^\circ C$ to $+85^\circ C$			4	Ω
On-Resistance Flatness	$R_{FLAT(ON)}$	$V_+ = 2.7V, V_{NO}$ or $V_{NC} = 1.2V,$ $I_{COM} = -100mA$, Test Circuit 1	$+25^\circ C$		6	9	Ω
			$-40^\circ C$ to $+85^\circ C$			12	Ω
Source OFF Leakage current	$I_{NC(OFF)}, I_{NO(OFF)}$	$V_+ = 3.6V, V_{NO}$ or $V_{NC} = 3.3V / 0.3V,$ $V_{COM} = 0.3V / 3.3V$	$-40^\circ C$ 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 $+85^\circ C$	1.5			V
Input Low Voltage	V_{INL}		$-40^\circ C$ to $+85^\circ C$			0.4	V
Input Leakage Current	I_{IN}	$V_+ = 5.5V, V_{IN} = 0V$ or $3.6V$	$-40^\circ C$ to $+85^\circ C$			1	μA
DYNAMIC CHARACTERISTICS							
Turn-On Time	t_{ON}	$V_{IH} = 1.5V, V_{IL} = 0V$, Test Circuit2	$+25^\circ C$		38.0		ns
Turn-Off Time	t_{OFF}		$+25^\circ C$		45.0		ns
Break-Before-Make Time Delay	t_D	$V_{IH} = 1.5V, V_{IL} = 0V$, Test Circuit4	$+25^\circ C$		5.6		ns
Charge Injection,	Q	$V_{IN} = GND, R_G = 0\Omega,$ $C_L = 1.0nF, Q = C_L \times V_{OUT},$ $V_{IH} = 1.5V, V_{IL} = 0V$, Test Circuit3	$+25^\circ C$		2.6		pC
Off Isolation	O_{ISO}	$V_{BIAS} = 1.5V, V_{IN} = 0dBm$ $V_{IH} = 1.5V, V_{IL} = 0V,$ Test Circuit5	1MH	$+25^\circ C$		-75	dB
			10MHz	$+25^\circ C$		-55	dB
Channel-to-Channel Crosstalk	X_{TALK}	$V_{BIAS} = 1.5V, V_{IN} = 0dBm$ $V_{IH} = 1.5V, V_{IL} = 0V,$ Test Circuit6	1MHz	$+25^\circ C$		-100	dB
			10MHz	$+25^\circ C$		-60	dB
Bandwidth -3 dB	BW	$V_{BIAS} = 1.5V, V_{IN} = 0dBm,$ $V_{IH} = 1.5V, V_{IL} = 0V$, Test Circuit7	$+25^\circ C$		300		MHz
Channel ON Capacitance	$C_{NC(ON)}, C_{NO(ON)},$ $C_{COM(ON)}$		$+25^\circ C$		43.0		pF

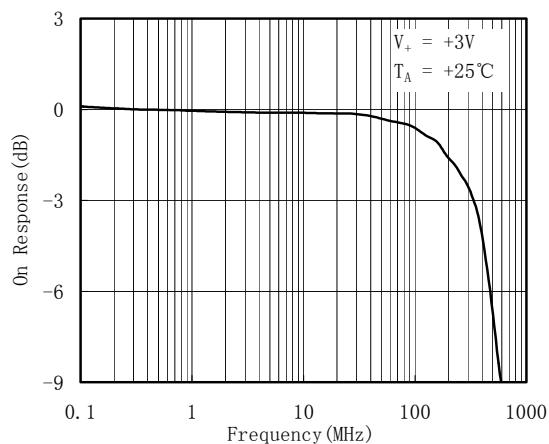
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TYPICAL PERFORMANCE CHARACTERISTICS

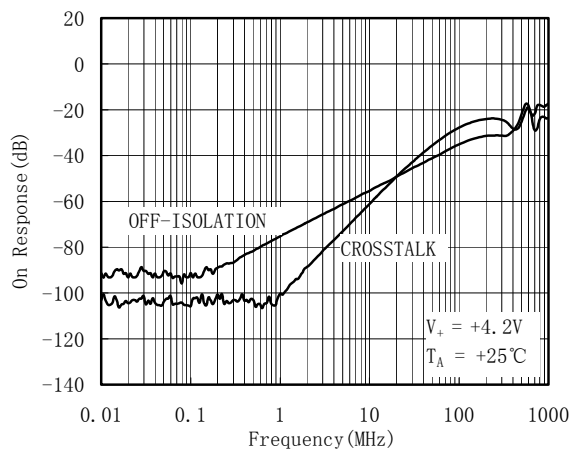
On Response vs. Frequency



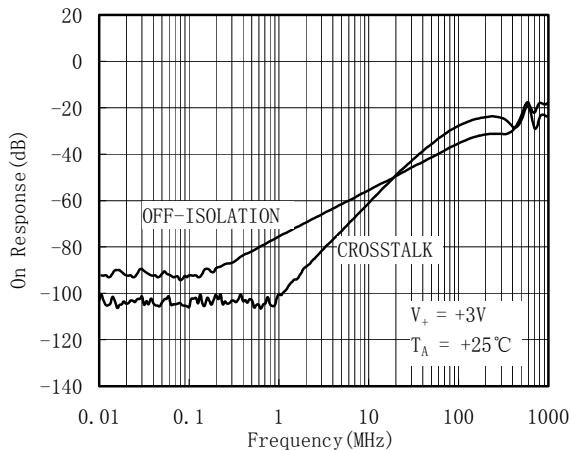
On Response vs. Frequency



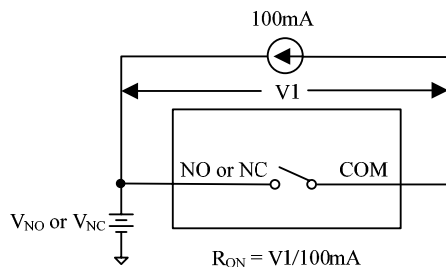
Response vs. Frequency



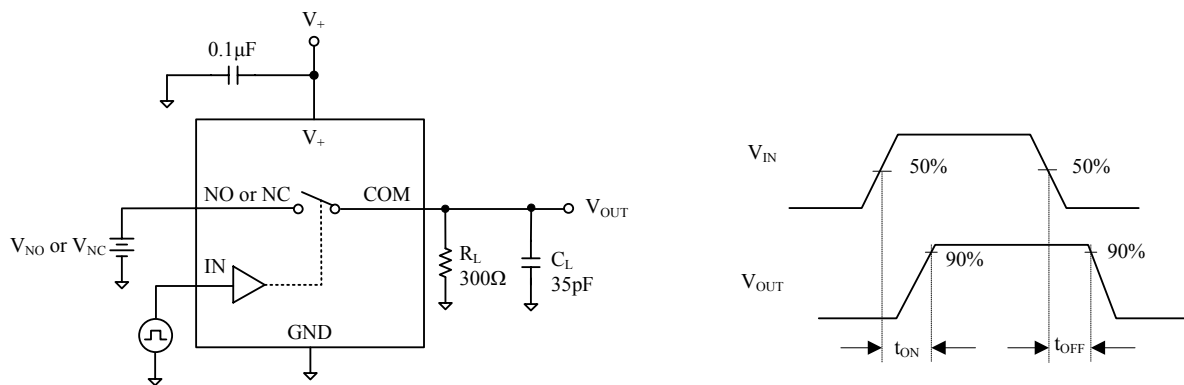
Response vs. Frequency



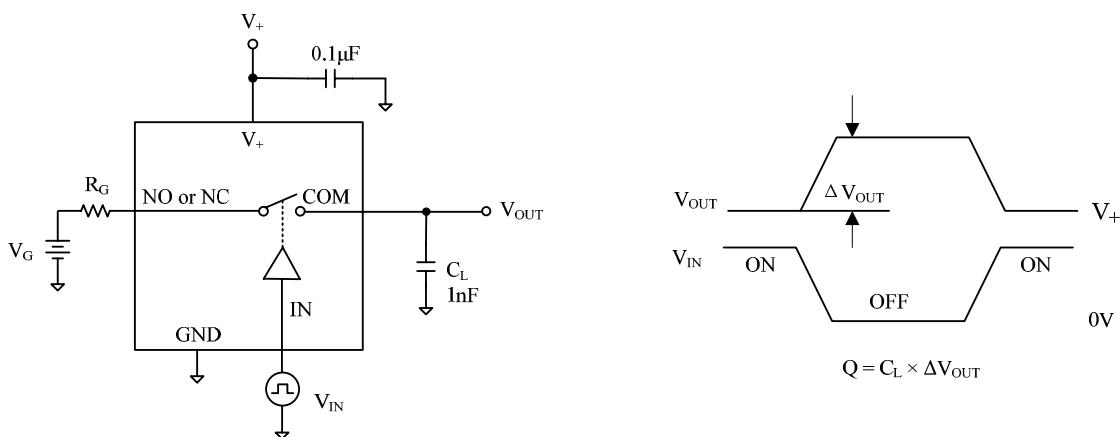
TEST CIRCUITS



Test Circuit 1. On Resistance

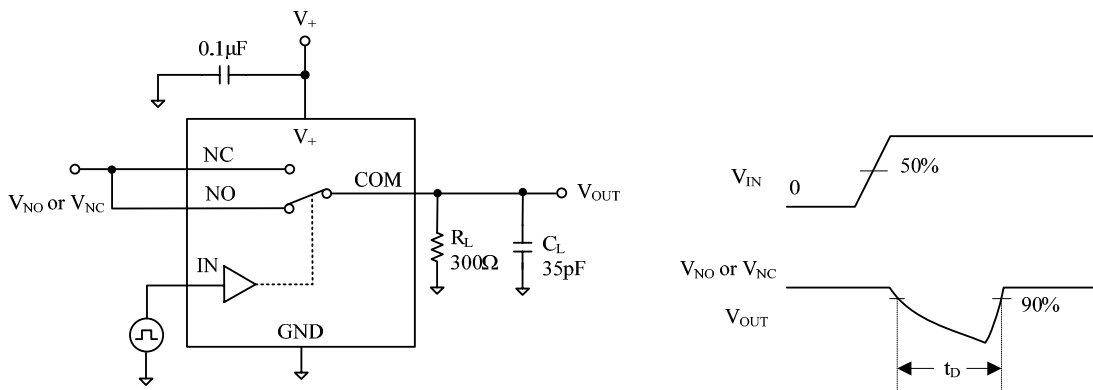


Test Circuit 2. Switching Times, t_{ON} , t_{OFF}

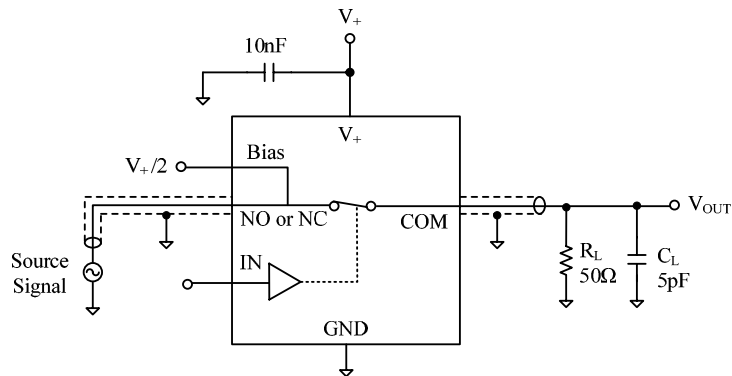


Test Circuit 3. Charge Injection

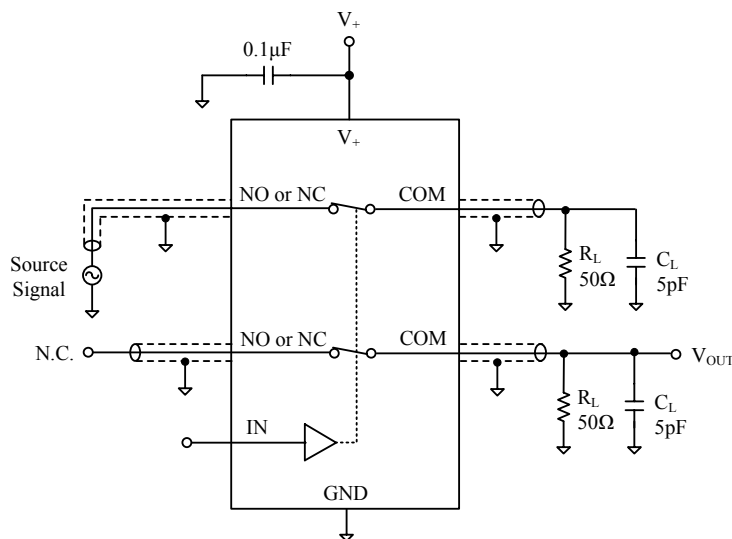
TEST CIRCUITS (Cont.)



Test Circuit 4. Break-Before-Make Time Delay, t_d



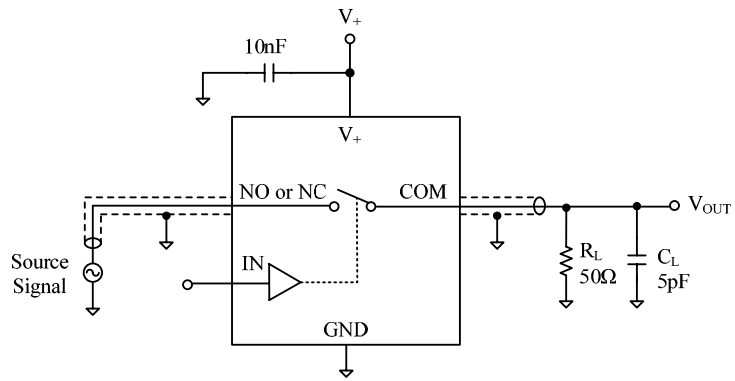
Test Circuit 5. Off Isolation



$$\text{Channel To Channel Crosstalk} = -20 \times \log \frac{V_{NO \text{ or } V_{NC}}}{V_{OUT}}$$

Test Circuit 6. Channel-to-Channel Crosstalk

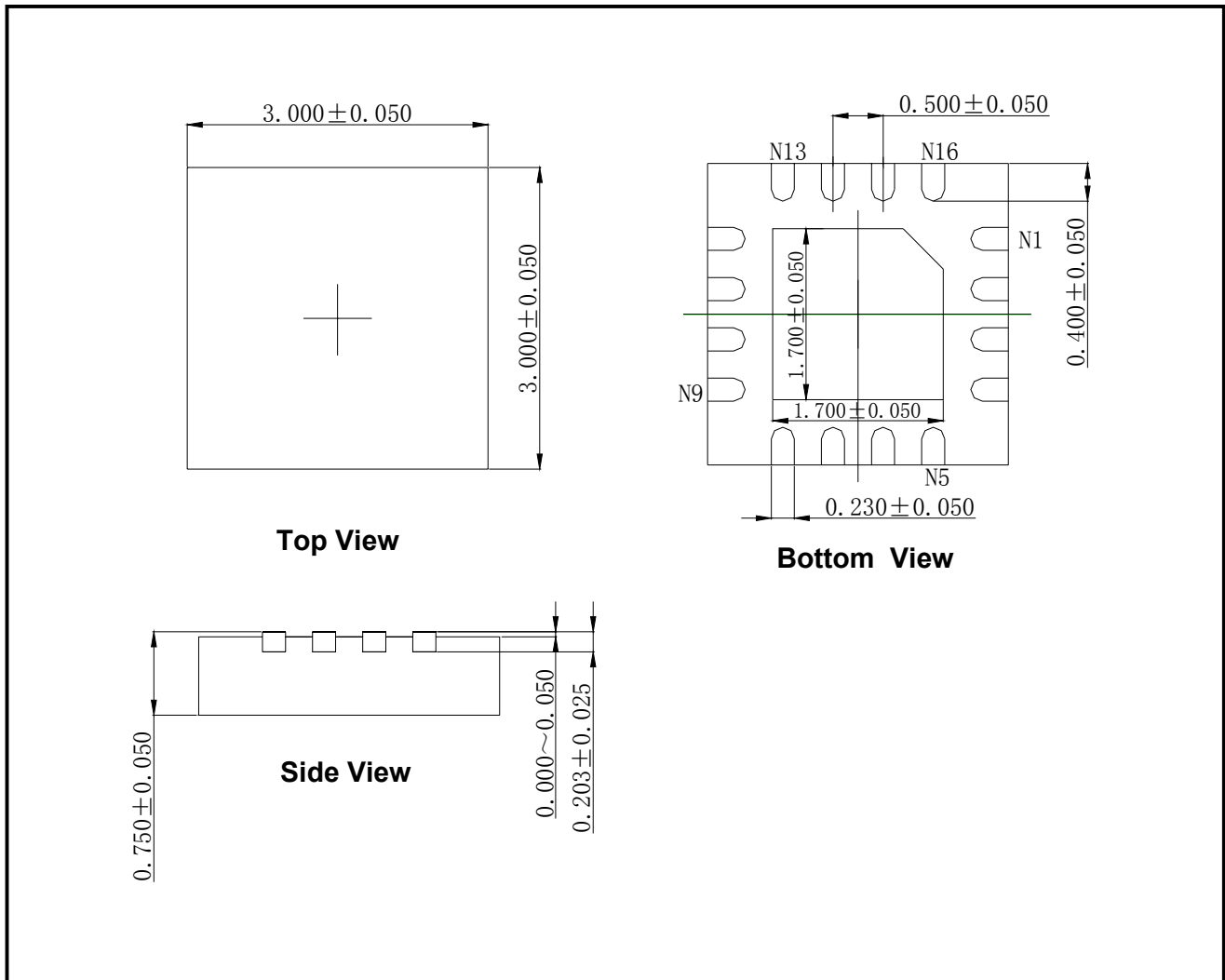
TEST CIRCUITS (Cont.)



Test Circuit 7. Bandwidth -3dB

PACKAGE OUTLINE DIMENSIONS

TQFN-16 (3mm × 3mm)



Note: All linear dimensions are in millimeters.

REVISION HISTORY

Location

Page

11/2007—Preliminary Datasheet

01/2008—Data Sheet REV.A

SG Microelectronics Co., Ltd

A2608, NO.72 North Road
Xisanhuan, Haidian District,
Beijing, China 100037
Tel: 86-10-51798160/80
Fax: 86-10-51798180-803
www.sg-micro.com