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
PDAs

FUNCTION TABLE

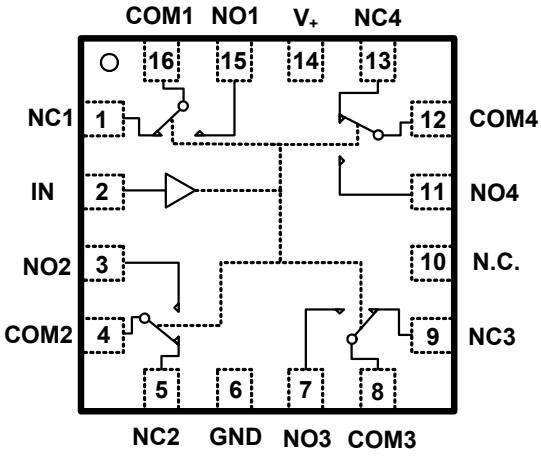
IN	Function	
	NC1, 2, 3 and 4	NO1, 2, 3 and 4
0	ON	OFF
1	OFF	ON

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℃ to +85℃

PIN CONFIGURATION (TOP VIEW)

SGM44600YTQ16



TQFN-16 (3mm × 3mm)

ORDERING INFORMATION

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

ABSOLUTE MAXIMUM RATINGS

V_+ to GND.....0V to 6V
Analog, Digital voltage range….....-0.3V to (V_+) + 0.3V
Continuous Current NO, NC, or COM .....±100mA
Operating Temperature Range.....-40℃ to +85℃
Junction Temperature.....150℃
Storage Temperature.....-65℃ to +150℃
Lead Temperature (soldering, 10s).....260℃
ESD Susceptibility
HBM..... 2000V
MM.....200V

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.

CAUTION

This integrated circuit can be damaged by ESD if you don’t pay attention to ESD protection. SGMICRO 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.

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
Exposed Pad	GND	Exposed pad should be soldered to PCB board and connected to GND.

Note: NO_X, NC_X and COM_X terminals 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℃ to + 85℃. Typical values are at V_+ = +5.0V, T_A = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS		TEMP	MIN	TYP	MAX	UNITS
ANALOG SWITCH								
Analog Signal Range	V_{NO}, V_{NC}, V_{COM}			-40℃ to +85℃	0		V_+	V
On-Resistance	R_{ON}	V_+ = 4.5V, V_{NO} or V_{NC} = 1.2V, I_{COM} = -100mA, Test Circuit 1		+25℃		4	6	Ω
				-40℃ to +85℃			7	Ω
On-Resistance Match Between Channels	ΔR_{ON}	V_+ = 4.5V, V_{NO} or V_{NC} = 1.2V, I_{COM} = -100mA, Test Circuit 1		+25℃		0.4	2.5	Ω
				-40℃ to +85℃			3	Ω
On-Resistance Flatness	$R_{FLAT(ON)}$	V_+ = 4.5V, V_{NO} or V_{NC} = 1.2V, 4.5V, I_{COM} = -100mA, Test Circuit 1		+25℃		2	3	Ω
				-40℃ to +85℃			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℃ to +85℃			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℃ to +85℃			1	μA
DIGITAL INPUTS								
Input High Voltage	V_{INH}			-40℃ to +85℃	1.6			V
Input Low Voltage	V_{INL}			-40℃ to +85℃			0.5	V
Input Leakage Current	I_{IN}	V_+ = 5.5V, V_{IN} = 0V or 5.5V		-40℃ to +85℃			1	μA
DYNAMIC CHARACTERISTICS								
Turn-On Time	t_{ON}	V_{IH} = 3V, V_{IL}= 0V, Test Circuit2		+25℃		29.5		ns
Turn-Off Time	t_{OFF}			+25℃		29.5		ns
Break-Before-Make Time Delay	t_D	V_{IH} = 3V, V_{IL}= 0V, Test Circuit4		+25℃		10.0		ns
Charge Injection	Q	V_G = GND, R_G = 0Ω, V_{IH} = 3V, V_{IL}= 0V, C_L = 1.0nF, Q = C_L × V_{OUT}, Test Circuit3		+25℃		4.8		pC
Off Isolation	O_{ISO}	V_{BIAS} = 2.1V, Signal = 0dBm, V_{IH} = 3V, V_{IL}= 0V, Test Circuit5	1MHz	+25℃		-75		dB
			10MHz	+25℃		-55		
Channel-to-Channel Crosstalk	X_{TALK}	V_{BIAS} = 2.1V, Signal = 0dBm, V_{IH} = 3V, V_{IL}= 0V, Test Circuit6	1MHz	+25℃		-100		dB
			10MHz	+25℃		-60		
–3dB Bandwidth	BW	V_{BIAS} = 2.1V, Signal = 0dBm, V_{IH} = 3V, V_{IL}= 0V, Test Circuit7		+25℃		300		MHz
Channel ON Capacitance	$C_{NC(ON)}$, $C_{NO(ON)}$, $C_{COM(ON)}$			+25℃		43.0		pF
POWER REQUIREMENTS								
Power Supply Range	V_+			-40℃ to +85℃	1.8		5.5	V
Power Supply Current	I_+	V_+ = 5.5V, V_{IN} = 0V or V_+		-40℃ to +85℃			1	μA

Specifications subject to changes without notice.

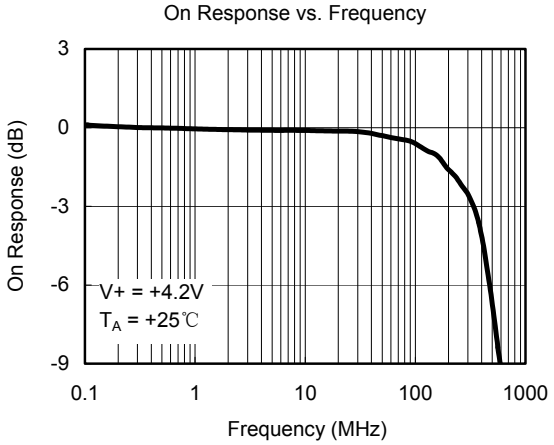
ELECTRICAL CHARACTERISTICS

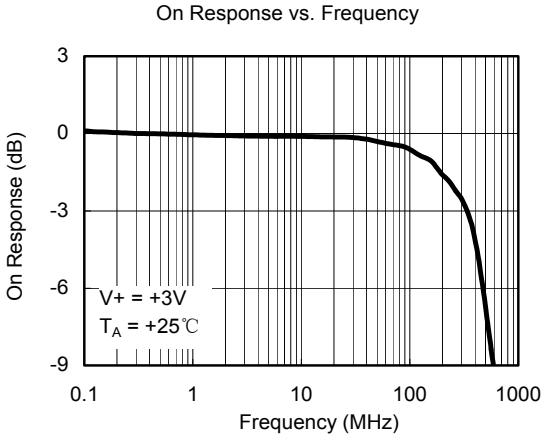
(V_+ = +2.7V to +3.6V, V_{IH} = +1.6V, V_{IL} = +0.4V, T_A = -40℃ to +85℃. Typical values are at V_+ = +3.0V, T_A = +25℃, unless otherwise noted.)

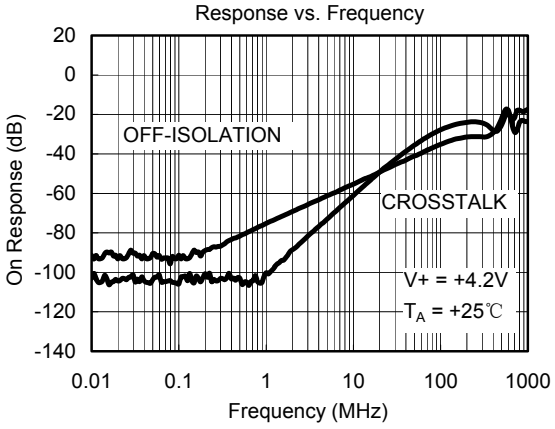
PARAMETER	SYMBOL	CONDITIONS		TEMP	MIN	TYP	MAX	UNITS
ANALOG SWITCH								
Analog Signal Range	V_{NO}, V_{NC}, V_{COM}			-40℃ to +85℃	0		V_+	V
On-Resistance	R_{ON}	V_+ = 2.7V, V_{NO} or V_{NC} = 1.2V, I_{COM} = -10mA, Test Circuit 1		+25℃		10	15	Ω
				-40℃ to +85℃			18	Ω
On-Resistance Match Between Channels	ΔR_{ON}	V_+ = 2.7V, V_{NO} or V_{NC} = 1.2V, I_{COM} = -100mA, Test Circuit 1		+25℃		1	3	Ω
				-40℃ to +85℃			4	Ω
On-Resistance Flatness	$R_{FLAT(ON)}$	V_+ = 2.7V, V_{NO} or V_{NC} = 1.2V, 4.5V, I_{COM} = -100mA, Test Circuit 1		+25℃		6	9	Ω
				-40℃ to +85℃			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℃ to +85℃			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℃ to +85℃			1	μA
DIGITAL INPUTS								
Input High Voltage	V_{INH}			-40℃ to +85℃	1.5			V
Input Low Voltage	V_{INL}			-40℃ to +85℃			0.4	V
Input Leakage Current	I_{IN}	V_+ = 5.5V, V_{IN} = 0V or 3.6V		-40℃ to +85℃			1	μA
DYNAMIC CHARACTERISTICS								
Turn-On Time	t_{ON}	V_{IH} = 1.5V, V_{IL}= 0V, Test Circuit2		+25℃		38.0		ns
Turn-Off Time	t_{OFF}			+25℃		45.0		ns
Break-Before-Make Time Delay	t_D	V_{IH} = 1.5V, V_{IL}= 0V, Test Circuit4		+25℃		5.6		ns
Charge Injection	Q	V_G = GND, R_G = 0Ω, V_{IH} = 1.5V, V_{IL}= 0V, C_L = 1.0nF, Q = C_L x V_{OUT}, Test Circuit3		+25℃		2.6		pC
Off Isolation	O_{ISO}	V_{BIAS} = 1.5V, Signal = 0dBm, V_{IH} = 1.5V, V_{IL}= 0V, Test Circuit5	1MH	+25℃		-75		dB
			10MHz	+25℃		-55		dB
Channel-to-Channel Crosstalk	X_{TALK}	V_{BIAS} = 1.5V, Signal = 0dBm, V_{IH} = 1.5V, V_{IL}= 0V, Test Circuit6	1MHz	+25℃		-100		dB
			10MHz	+25℃		-60		dB
–3dB Bandwidth	BW	V_{BIAS} = 1.5V, Signal = 0dBm, V_{IH} = 1.5V, V_{IL}= 0V, Test Circuit7		+25℃		300		MHz
Channel ON Capacitance	$C_{NC(ON)}$, $C_{NO(ON)}$, $C_{COM(ON)}$			+25℃		43.0		pF

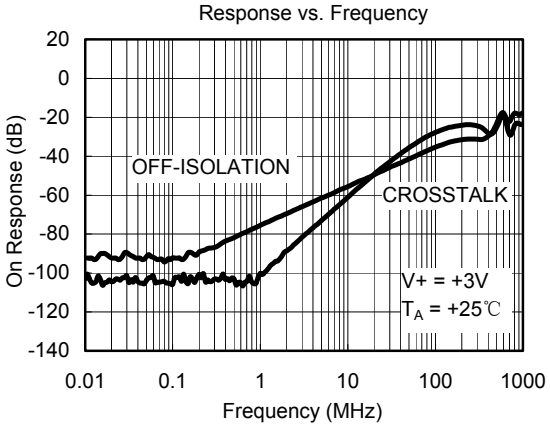
Specifications subject to changes without notice.

TYPICAL PERFORMANCE CHARACTERISTICS

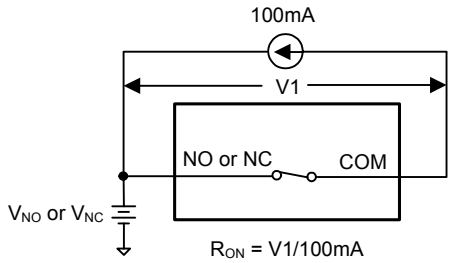




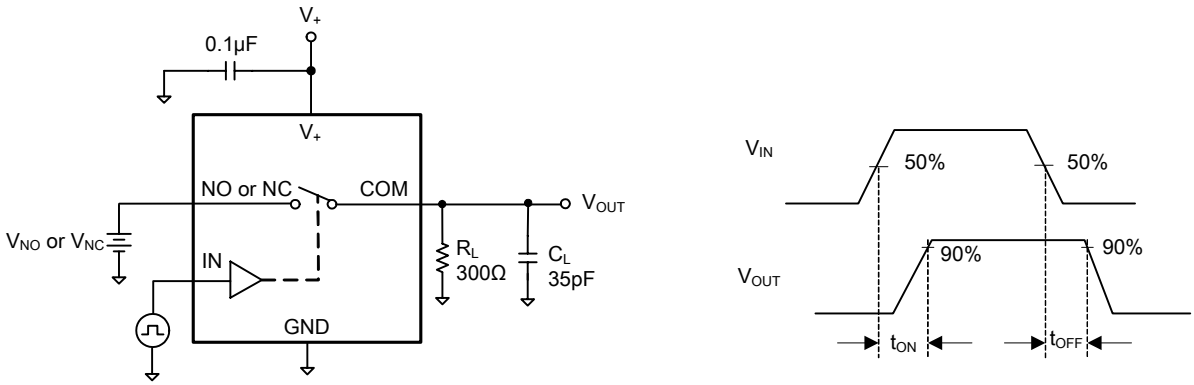




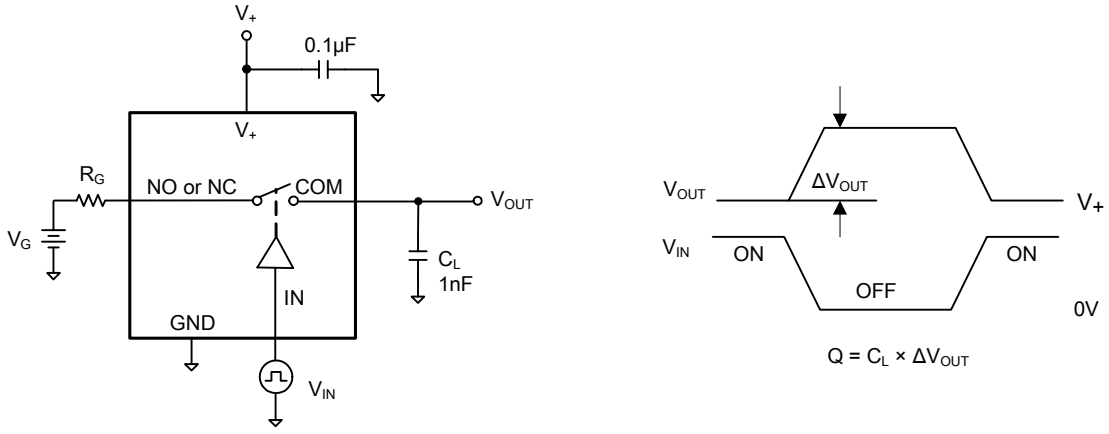
TEST CIRCUITS



Test Circuit 1. On Resistance

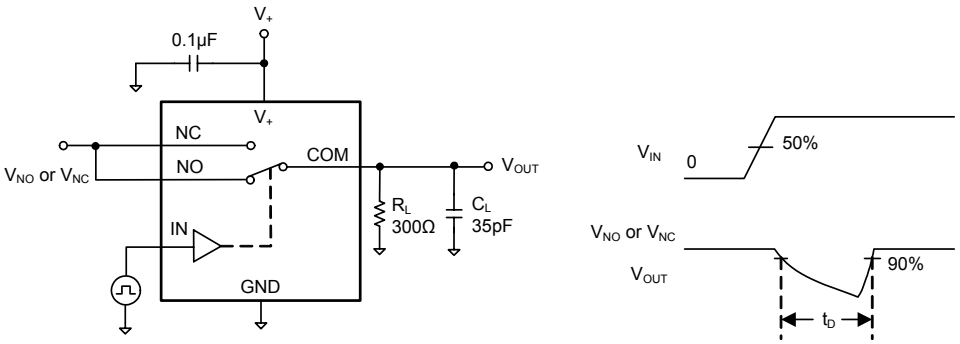


Test Circuit 2. Switching Times (t_{ON}, t_{OFF})

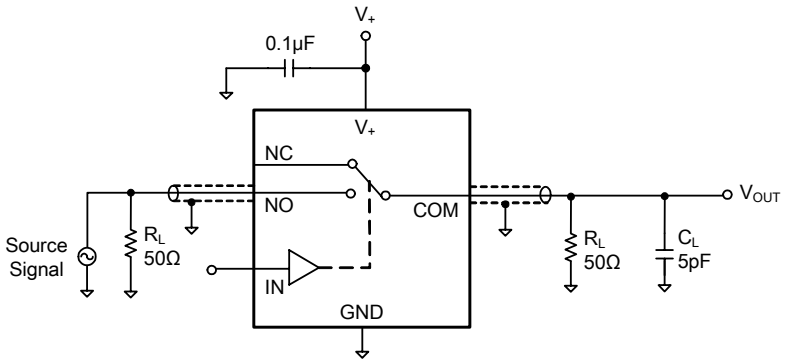


Test Circuit 3. Charge Injection

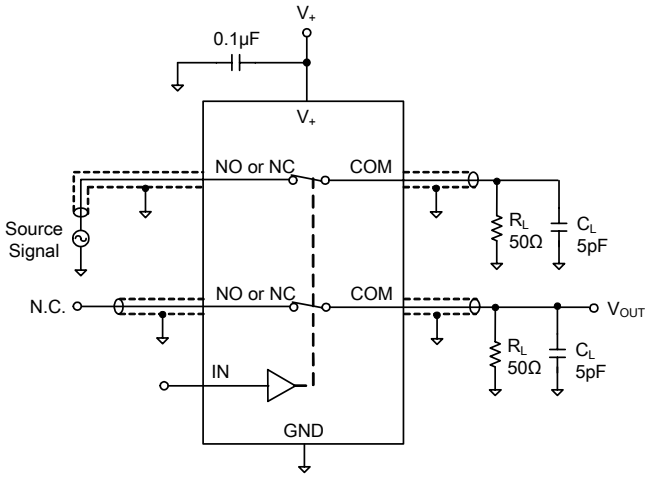
TEST CIRCUITS (Cont.)



Test Circuit 4. Break-Before-Make Time Delay (t_D)



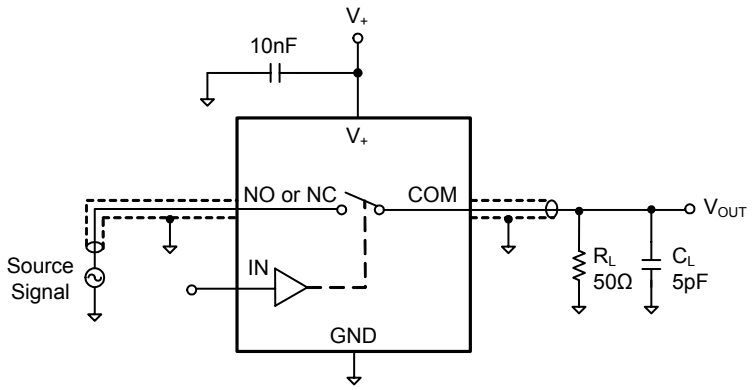
Test Circuit 5. Off Isolation



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

Test Circuit 6. Channel-to-Channel Crosstalk

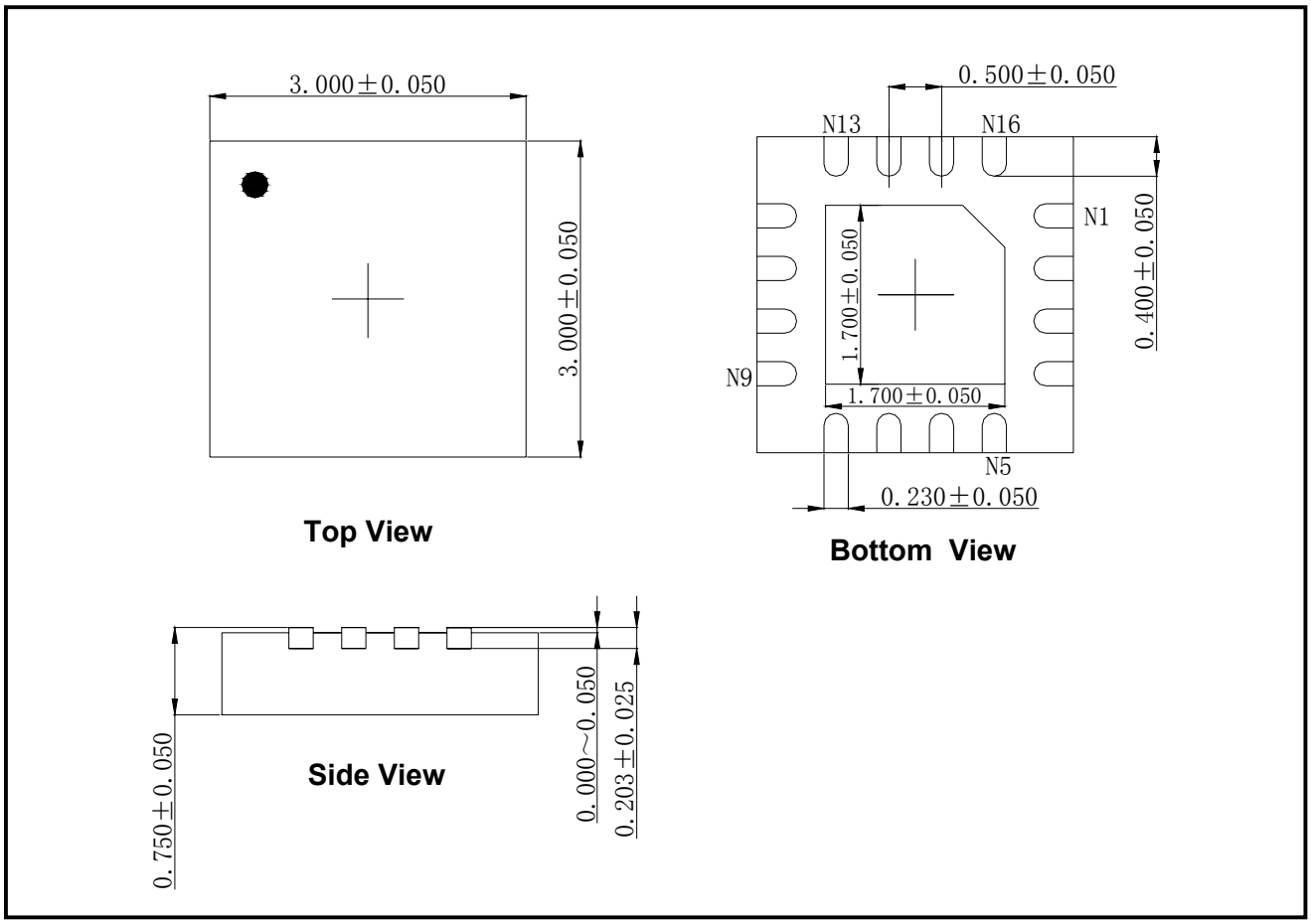
TEST CIRCUITS (Cont.)



Test Circuit 7. -3dB Bandwidth

PACKAGE OUTLINE DIMENSIONS

TQFN-16 (3mm × 3mm)



Note: All linear dimensions are in millimeters.

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