

SGM4782

0.5Ω, High Speed, Low Voltage Analog Switch / Multiplexer

GENERAL DESCRIPTION

The SGM4782 is high-speed, low-voltage, low on-resistance, CMOS analog multiplexer/switch that configured as two 4-channel multiplexers. It operates from a single +1.8V to +4.2V power supply. Targeted applications include battery powered equipment that benefit from low R_{ON} (0.5Ω) and fast switching speeds ($t_{ON} = 20$ ns, $t_{OFF} = 20$ ns).

The SGM4782 can handle rail-to-rail analog signals and is available in TQFN-16 and TSSOP-16 packages.

APPLICATIONS

Communication Systems
Cell Phones
Portable Instrumentation
Audio Signal Routing
Audio and Video Switching
Computer Peripherals
Low-Voltage Data-Acquisition Systems

Function table

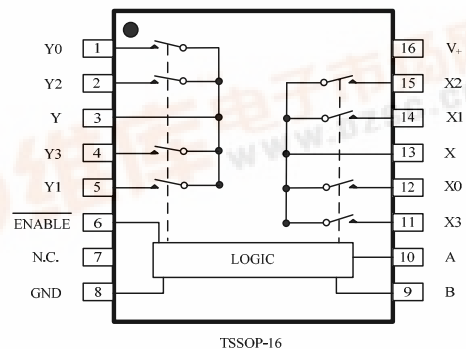
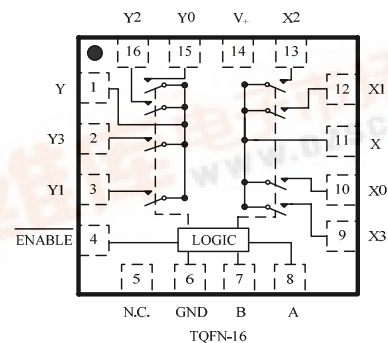
Control Inputs			ON Switches	
ENABLE	Select			
	B	A		
L	L	L	X-X0	Y-Y0
L	L	H	X-X1	Y-Y1
L	H	L	X-X2	Y-Y2
L	H	H	X-X3	Y-Y3
H	√	√	All Switches Open	

√ = Don't Care.

FEATURES

- Voltage Operation: 1.8 V to 4.2 V
- Low On-Resistance: 0.5 Ω (TYP) at 4.2 V
- Low On-Resistance Flatness
- -3 dB Bandwidth: 30 MHz
- Fast Switching Time (+4.2V)
 - t_{ON} 20 ns
 - t_{OFF} 20 ns
- Low Crosstalk: -108 dB at 1 MHz
- Typical Power Consumption (<0.01 μW)
- TTL/CMOS Compatible
- Rail-to-Rail Input and Output Operation
- Break-Before-Make Switching
- Extended Industrial Temperature Range:
 - 40°C to +85°C
- Lead (Pb) Free TQFN-16 and TSSOP-16 packages

PIN CONFIGURATIONS (TOP VIEW)



ORDERING INFORMATION

MODEL	PIN-PACKAGE	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKAGE OPTION
SGM4782	TQFN-16	- 40°C to +85°C	SGM4782YTQ16/TR	4782TQ	Tape and Reel, 3000
	TSSOP-16	- 40°C to +85°C	SGM4782YTS/TR	SGM4782YTS	Tape and Reel, 3000

ABSOLUTE MAXIMUM RATINGS

V_+ to GND.....0V to +4.6V
 Analog, Digital voltage range(1)..... - 0.3V to (V_+ + 0.3V)
 Continuous Current X_+ , Y_+ , X or Y ±250mA
 Peak Current X_+ , Y_+ , X or Y ±400mA
 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 Susceptibility
 HBM.....4000V
 MM.....400V

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

PIN		NAME	FUNCTION
TSSOP-16	TQFN-16		
1,5,2,4	15,3,16,2	Y0-Y3	Analog Switch Y Inputs Y0-Y3.
3	1	Y	Analog Switch Y Output.
6	4	$\overline{\text{ENABLE}}$	Digital Enable Input. Normally connect to GND. Drive to logic high to set all switches off.
7	5	N.C.	Not internally connected.
8	6	GND	Ground.
9	7	B	Digital Address B Input.
10	8	A	Digital Address A Input.
12,14,15,11	10,12,13,9	X0-X3	Analog Switch X Inputs X0-X3.
13	11	X	Analog Switch X Output.
16	14	V+	Positive Analog and Digital Supply Voltage Input.

ELECTRICAL CHARACTERISTICS

(V₊ = +4.2 V, GND = 0 V, V_{IH} = +1.6 V, V_{IL} = +0.6 V, T_A = - 40°C to +85°C. Typical values are at V₊ = +4.2 V, T_A = + 25°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TPY	MAX	UNITS
ANALOG SWITCH							
Analog Signal Range	V _X , V _Y , V _X , V _Y		- 40°C to +85°C	0		V ₊	V
On-Resistance	R _{ON}	V ₊ = 4.2 V, I _X , I _Y = -100 mA, V _X , V _Y = 1 V, Test Circuit 1	+25°C - 40°C to +85°C		0.5 0.8	0.7 0.8	Ω
On-Resistance Match Between Channels	ΔR _{ON}	V ₊ = 4.2 V, I _X , I _Y = -100 mA, V _X , V _Y = 1 V, Test Circuit 1	+25°C - 40°C to +85°C		0.05 0.24	0.2 0.24	Ω
On-Resistance Flatness	R _{FLAT(ON)}	V ₊ = 4.2 V, I _X , I _Y = -100 mA, V _X , V _Y = 1 V, Test Circuit 1	+25°C - 40°C to +85°C		0.1 0.24	0.2 0.24	Ω
Source OFF Leakage current	I _{X(OFF)} , I _{Y(OFF)}	V ₊ = 4.2 V, V _X , V _Y = 3.3 V, 0.3 V, V _X , V _Y = 0.3 V, 3.3 V	- 40°C to +85°C			1	μA
Channel ON Leakage current	I _{X(ON)} , I _{Y(ON)} , I _{X(ON)} , I _{Y(ON)}	V ₊ = 4.2 V, V _X , V _Y = 0.3 V, 3.3 V, V _X , V _Y = 0.3 V, 3.3 V or floating	- 40°C to +85°C			1	μA
DIGITAL INPUTS							
Input High Voltage	V _{INH}		- 40°C to +85°C	1.6			V
Input Low Voltage	V _{INL}		- 40°C to +85°C			0.5	V
Input Leakage Current	I _{IN}	V _A , V _B = V _{ENABLE} = 0 V or 4.2 V	- 40°C to +85°C			1	μA
DYNAMIC CHARACTERISTICS							
Turn-On Time	t _{ON}	V _{IN} = 1.5 V to 0.5 V, V _X or V _Y = 2.1 V R _L = 50 Ω, C _L = 35 pF, Test Circuit 2	+25°C		20		ns
Turn-Off Time	t _{OFF}		+25°C		20		
Address Transition Time	t _{TRANS}	V _{IN} = 4.2 V to 0 V, V _X or V _Y = 2.1 V, R _L = 50 Ω, C _L = 35 pF, Test Circuit 3	+25°C		30		ns
Break-Before-Make Time Delay	t _D	V _{IN} = 4.2 V to 0 V, V _X or V _Y = 2.1 V, R _L = 50 Ω, C _L = 35 pF, Test Circuit 4	+25°C		20		ns
Charge Injection	Q	C _L = 1 nF, Test Circuit 5	+25°C		-18		pC
Off Isolation	O _{ISO}	V _{IN} = 0 dBm, V _{BIAS} = 2.1 V, R _L = 50 Ω, C _L = 35 pF, Test Circuit 6	100KHz	+25°C		-75	dB
			1MHz	+25°C		-55	
Channel-to-Channel Crosstalk	X _{TALK}	V _{IN} = 0 dBm, V _{BIAS} = 2.1 V, R _L = 50 Ω, C _L = 35 pF, Test Circuit 6	100KHz	+25°C		-106	dB
			1MHz	+25°C		-108	
Bandwidth -3 dB	BW	V _{IN} = 0 dBm, V _{BIAS} = 2.1 V, R _L = 50 Ω, Test Circuit 6	+25°C		30		MHz
Channel ON Capacitance	C _{X(ON)} , C _{Y(ON)} , C _{X(ON)} , C _{Y(ON)}		+25°C		146		pF
POWER REQUIREMENTS							
Power Supply Range	V ₊		- 40°C to +85°C	1.8		4.2	V
Power Supply Current	I ₊	V ₊ = 4.2 V, V _A , V _B , V _{ENABLE} = 4.2 V or 0 V	- 40°C to +85°C			1	μA

Specifications subject to change without notice.

ELECTRICAL CHARACTERISTICS

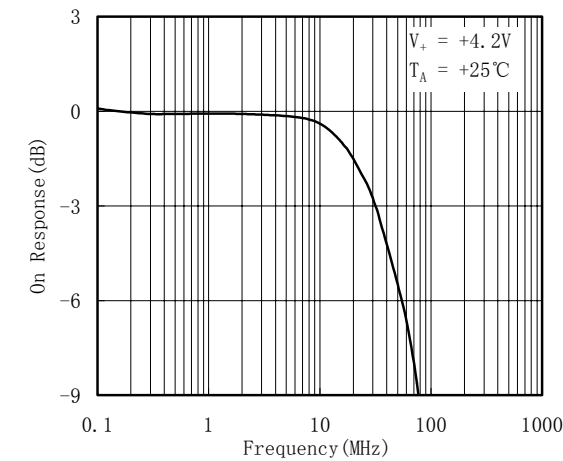
($V_+ = +2.7\text{ V}$ to $+3.6\text{ V}$, $\text{GND} = 0\text{ V}$, $V_{\text{IH}} = +1.6\text{ V}$, $V_{\text{IL}} = +0.4\text{ V}$, $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$. Typical values are at $V_+ = +3.0\text{ V}$, $T_A = +25^\circ\text{C}$, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TPY	MAX	UNITS
ANALOG SWITCH							
Analog Signal Range	$V_{X_{\text{L}}}, V_{Y_{\text{L}}}$ V_X, V_Y		-40°C to $+85^\circ\text{C}$	0		V_+	V
On-Resistance	R_{ON}	$V_+ = 2.7\text{ V}$, $I_{X_{\text{L}}}, I_{Y_{\text{L}}} = -100\text{ mA}$, $V_X, V_Y = 1\text{ V}$, Test Circuit 1	$+25^\circ\text{C}$		0.6	0.8	Ω
			-40°C to $+85^\circ\text{C}$			0.9	
On-Resistance Match Between Channels	ΔR_{ON}	$V_+ = 2.7\text{ V}$, $I_{X_{\text{L}}}, I_{Y_{\text{L}}} = -100\text{ mA}$, $V_X, V_Y = 1\text{ V}$, Test Circuit 1	$+25^\circ\text{C}$		0.05	0.2	Ω
			-40°C to $+85^\circ\text{C}$			0.24	
On-Resistance Flatness	$R_{\text{FLAT(ON)}}$	$V_+ = 2.7\text{ V}$, $I_{X_{\text{L}}}, I_{Y_{\text{L}}} = -100\text{ mA}$, $V_X, V_Y = 1\text{ V}$, Test Circuit 1	$+25^\circ\text{C}$		0.1	0.2	Ω
			-40°C to $+85^\circ\text{C}$			0.24	
Source OFF Leakage current	$I_{X_{\text{L}}(\text{OFF})}$, $I_{Y_{\text{L}}(\text{OFF})}$	$V_+ = 3.6\text{ V}$, $V_{X_{\text{L}}}, V_{Y_{\text{L}}} = 3.3\text{ V}$, 0.3 V , $V_X, V_Y = 0.3\text{ V}$, 3.3 V	-40°C to $+85^\circ\text{C}$			1	μA
Channel ON Leakage current	$I_{X_{\text{L}}(\text{ON})}$, $I_{Y_{\text{L}}(\text{ON})}$, $I_{X_{\text{H}}(\text{ON})}$, $I_{Y_{\text{H}}(\text{ON})}$	$V_+ = 3.6\text{ V}$, $V_X, V_Y = 0.3\text{ V}$, 3.3 V , $V_{X_{\text{L}}}, V_{Y_{\text{L}}} = 0.3\text{ V}$, 3.3 V or floating	-40°C to $+85^\circ\text{C}$			1	μA
DIGITAL INPUTS							
Input High Voltage	V_{INH}		-40°C to $+85^\circ\text{C}$	1.5			V
Input Low Voltage	V_{INL}		-40°C to $+85^\circ\text{C}$			0.4	V
Input Leakage Current	$I_{\text{IN}_{\text{L}}}$	$V_A, V_B = V_{\text{ENABLE}} = 0\text{ V}$ or 2.7 V	-40°C to $+85^\circ\text{C}$			1	μA
DYNAMIC CHARACTERISTICS							
Turn-On Time	t_{ON}	$V_{\text{IN}} = 1.5\text{ V}$ to 0.5 V , V_X or $V_Y = 1.5\text{ V}$, $R_L = 50\text{ }\Omega$, $C_L = 35\text{ pF}$, Test Circuit 2	$+25^\circ\text{C}$		33		ns
Turn-Off Time	t_{OFF}		$+25^\circ\text{C}$		20		
Address Transition Time	t_{TRANS}	$V_{\text{IN}} = 1.5\text{ V}$ to 0 V , V_X or $V_Y = 1.5\text{ V}$, $R_L = 50\text{ }\Omega$, $C_L = 35\text{ pF}$, Test Circuit 3	$+25^\circ\text{C}$		36		ns
Break-Before-Make Time Delay	t_d	$V_{\text{IN}} = 1.5\text{ V}$ to 0 V , V_X or $V_Y = 1.5\text{ V}$, $R_L = 50\text{ }\Omega$, $C_L = 35\text{ pF}$, Test Circuit 4	$+25^\circ\text{C}$		18		ns
Charge Injection	Q	$C_L = 1\text{ nF}$, Test Circuit 5	$+25^\circ\text{C}$		-18		pC
Off Isolation	O_{ISO}	$V_{\text{IN}} = 0\text{ dBm}$, $V_{\text{BIAS}} = 1.5\text{ V}$, $R_L = 50\text{ }\Omega$, $C_L = 35\text{ pF}$, Test Circuit 6	100KHz	$+25^\circ\text{C}$		-75	dB
			1MHz	$+25^\circ\text{C}$		-55	
Channel-to-Channel Crosstalk	X_{TALK}	$V_{\text{IN}} = 0\text{ dBm}$, $V_{\text{BIAS}} = 1.5\text{ V}$, $R_L = 50\text{ }\Omega$, $C_L = 35\text{ pF}$, Test Circuit 6	100KHz	$+25^\circ\text{C}$		-106	dB
			1MHz	$+25^\circ\text{C}$		-108	
Bandwidth -3 dB	BW	$V_{\text{IN}} = 0\text{ dBm}$, $V_{\text{BIAS}} = 1.5\text{ V}$, $R_L = 50\text{ }\Omega$ Test Circuit 6	$+25^\circ\text{C}$		30		MHz
Channel ON Capacitance	$C_{X_{\text{L}}(\text{ON})}$, $C_{Y_{\text{L}}(\text{ON})}$, $C_{X_{\text{H}}(\text{ON})}$, $C_{Y_{\text{H}}(\text{ON})}$		$+25^\circ\text{C}$		146		pF

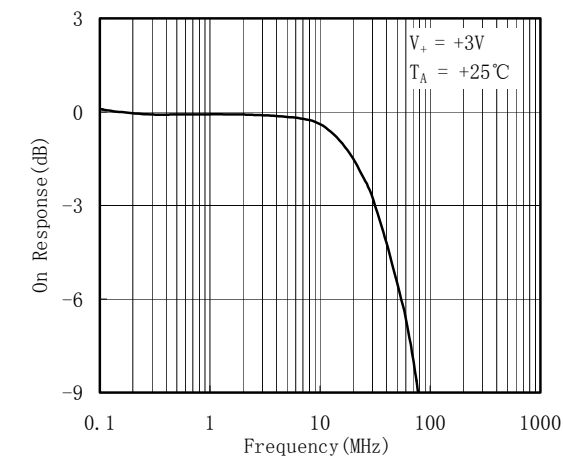
Specifications subject to change without notice.

TYPICAL PERFORMANCE CHARACTERISTICS

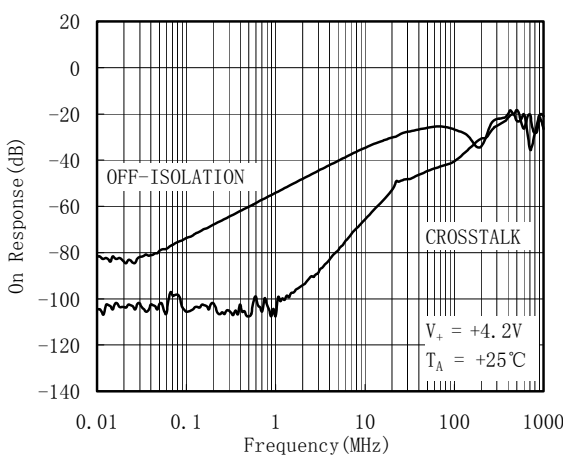
On Response vs. Frequency



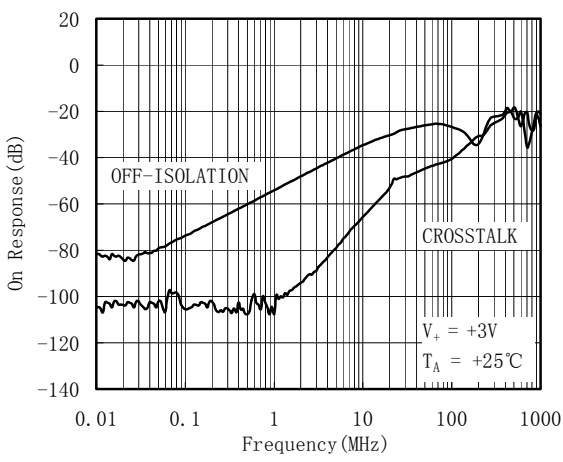
On Response vs. Frequency



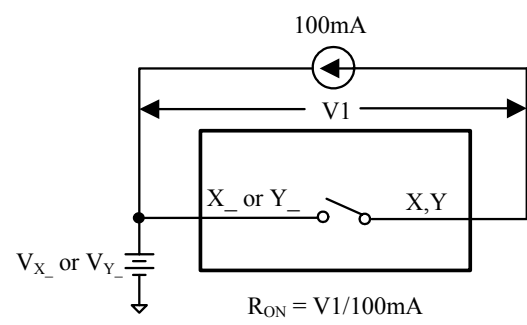
Response vs. Frequency



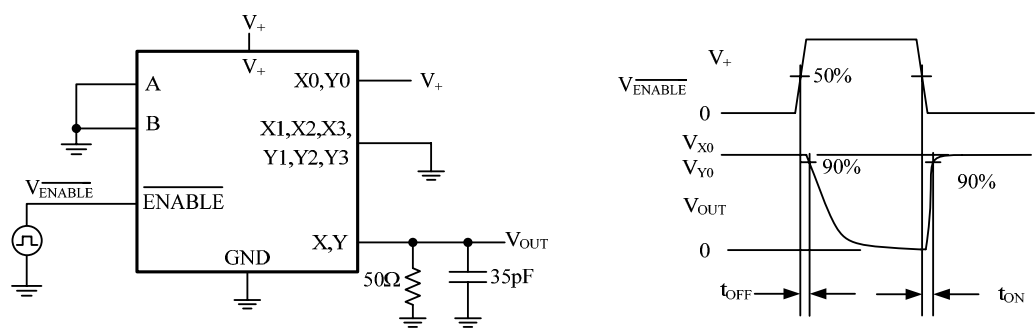
Response vs. Frequency



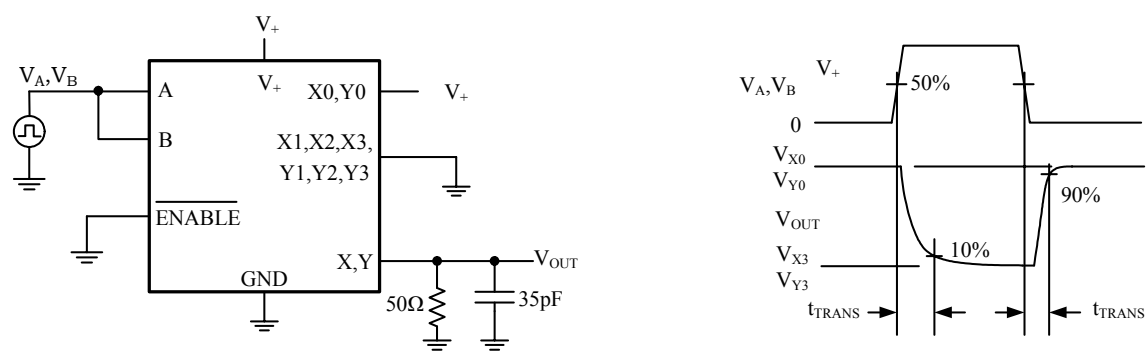
TEST CIRCUITS



Test Circuit 1. On Resistance

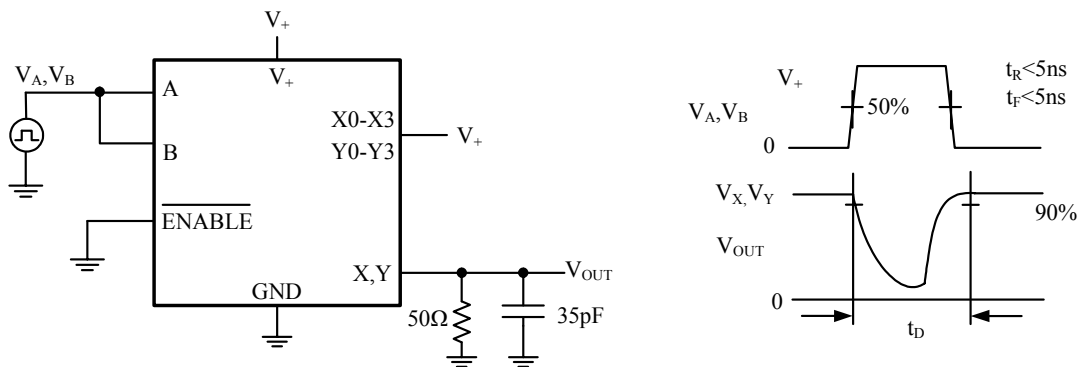


Test Circuit 2. Enable Switching Times (t_{OFF} , t_{ON})

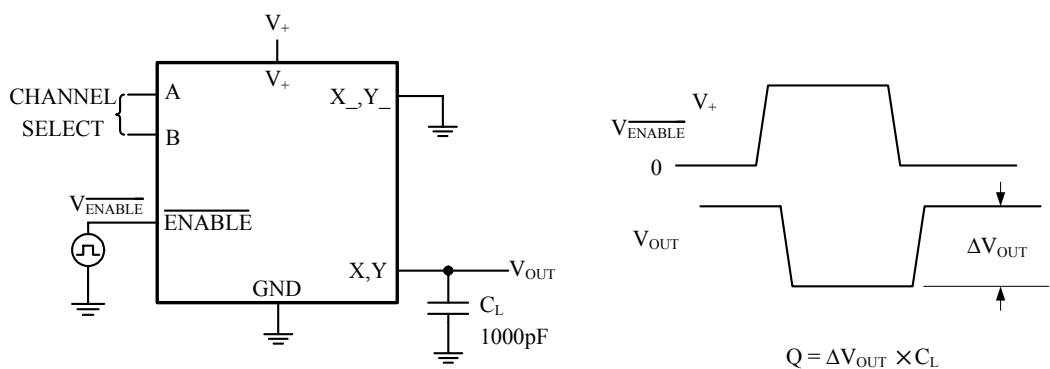


Test Circuit 3. Address Transition Times (t_{TRANS})

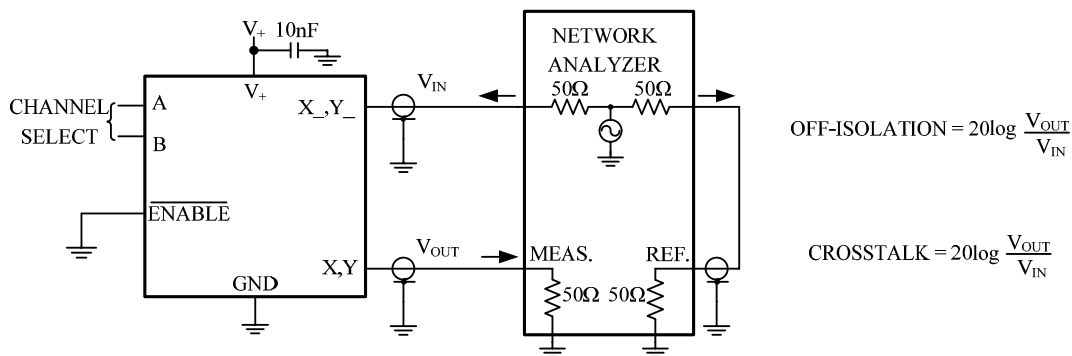
TEST CIRCUITS (Cont.)



Test Circuit 4. Break-Before-Make Interval (t_b)



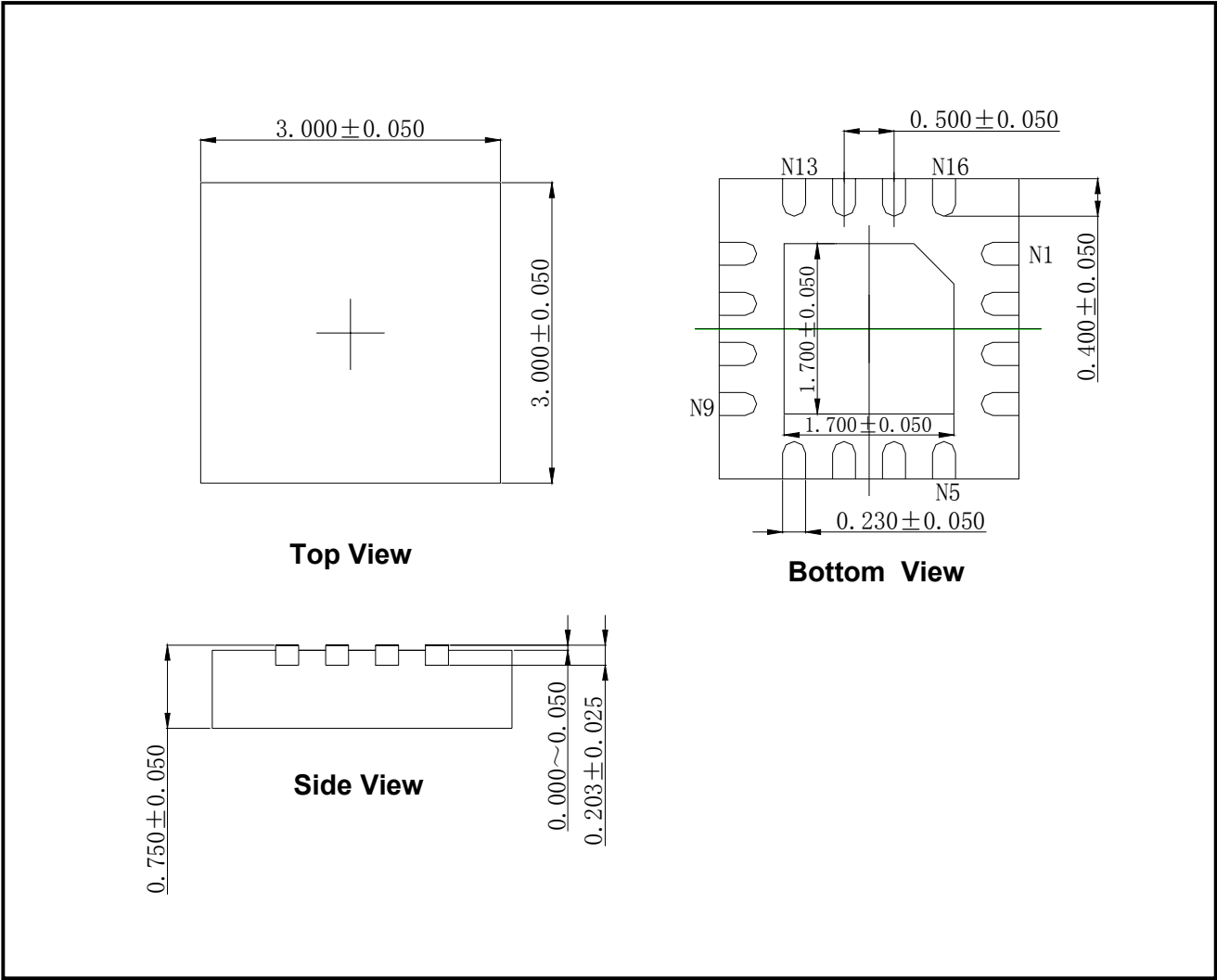
Test Circuit 5. Charge Injection (Q)



Test Circuit 6. -3dB Bandwidth, Off-Isolation and Crosstalk

PACKAGE OUTLINE DIMENSIONS

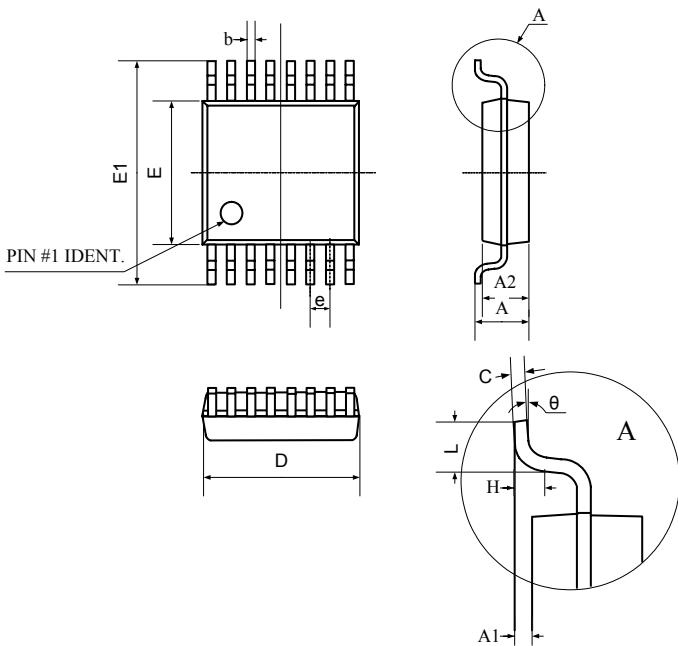
TQFN-16



Note: All linear dimensions are in millimeters.

PACKAGE OUTLINE DIMENSIONS

TSSOP-16



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
D	4.900	5.100	0.193	0.201
E	4.300	4.500	0.169	0.177
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
E1	6.250	6.550	0.246	0.258
A		1.100		0.043
A2	0.800	1.000	0.031	0.039
A1	0.020	0.150	0.001	0.006
e	0.65 (BSC)		0.026 (BSC)	
L	0.500	0.700	0.020	0.028
H	0.25(TYP)		0.01(TYP)	
θ	1°	7°	1°	7°

REVISION HISTORY

Location

Page

10/2007—Preliminary Datasheet

01/2008—Data Sheet REV.A

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