

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 ($t_{ON} = 20\text{ ns}$, $t_{OFF} = 20\text{ ns}$).

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

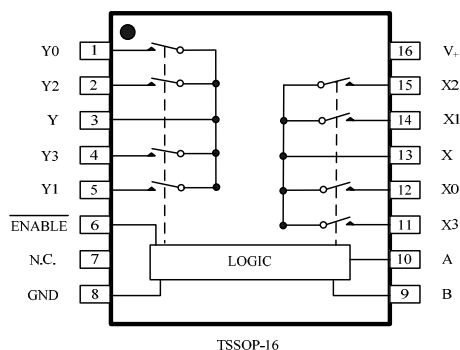
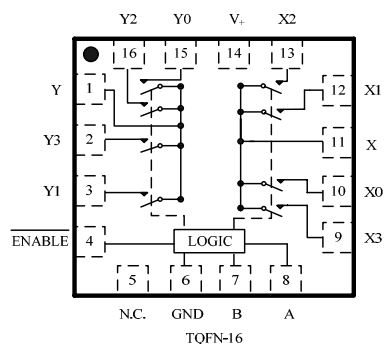
| Control Inputs | | | ON Switches | |
|----------------|----------|---|-------------------|------|
| ENABLE | Select B | A | | |
| L | L | L | X-X0 | Y-Y0 |
| L | L | H | X-X1 | Y-Y1 |
| L | H | L | X-X2 | Y-Y2 |
| L | H | H | X-X3 | Y-Y3 |
| H | √ | √ | All Switches Open | |

√ = 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)



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REV. A

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 | Storage Temperature..... | - 65°C to +150°C |
| Analog, Digital voltage range(1)..... | - 0.3V to (V ₊ + 0.3V) | Lead Temperature (soldering, 10s)..... | +260°C |
| Continuous Current X ₋ , Y ₋ , X or Y | ±250mA | ESD Susceptibility | |
| Peak Current X ₋ , Y ₋ , X or Y | ±400mA | HBM..... | 4000V |
| Operating Temperature Range..... | - 40°C to +85°C | MM..... | 400V |
| 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

| 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

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

| PARAMETER | SYMBOL | CONDITIONS | TEMP | MIN | TPY | MAX | UNITS |
|--------------------------------------|--|--|--|---------------------|------|-------|---------------|
| ANALOG SWITCH | | | | | | | |
| Analog Signal Range | V_{X-}, V_{Y-}, V_X, V_Y | | -40°C to $+85^\circ\text{C}$ | 0 | | V_+ | V |
| On-Resistance | R_{ON} | $V_+ = 4.2\text{ V}$, $I_{X-}, I_{Y-} = -100\text{ mA}$, $V_X, V_Y = 1\text{ V}$, Test Circuit 1 | $+25^\circ\text{C}$ | | 0.5 | 0.7 | Ω |
| | | | -40°C to $+85^\circ\text{C}$ | | | 0.8 | |
| On-Resistance Match Between Channels | ΔR_{ON} | $V_+ = 4.2\text{ V}$, $I_{X-}, I_{Y-} = -100\text{ mA}$, $V_X, V_Y = 1\text{ V}$, Test Circuit 1 | $+25^\circ\text{C}$ | | 0.05 | 0.2 | Ω |
| | | | -40°C to $+85^\circ\text{C}$ | | | 0.24 | |
| On-Resistance Flatness | $R_{FLAT(ON)}$ | $V_+ = 4.2\text{ V}$, $I_{X-}, I_{Y-} = -100\text{ mA}$, $V_X, V_Y = 1\text{ V}$, 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 | $I_{X(OFF)}, I_{Y(OFF)}$ | $V_+ = 4.2\text{ V}$, $V_{X-}, V_{Y-} = 3.3\text{ V}$, 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 | $I_{X(ON)}, I_{Y(ON)}, I_{X(OH)}, I_{Y(OH)}$ | $V_+ = 4.2\text{ V}$, $V_X, V_Y = 0.3\text{ V}$, 3.3 V , $V_{X-}, V_{Y-} = 0.3\text{ V}$, 3.3 V or floating | -40°C to $+85^\circ\text{C}$ | | | 1 | μA |
| DIGITAL INPUTS | | | | | | | |
| Input High Voltage | V_{INH} | | -40°C to $+85^\circ\text{C}$ | 1.6 | | | V |
| Input Low Voltage | V_{INL} | | -40°C to $+85^\circ\text{C}$ | | | 0.5 | V |
| Input Leakage Current | I_{IN-} | $V_A, V_B = V_{ENABLE} = 0\text{ V}$ or 4.2 V | -40°C to $+85^\circ\text{C}$ | | | 1 | μA |
| DYNAMIC CHARACTERISTICS | | | | | | | |
| Turn-On Time | t_{ON} | $V_{IN} = 1.5\text{ V}$ to 0.5 V , V_X or $V_Y = 2.1\text{ V}$ | $+25^\circ\text{C}$ | | 20 | | ns |
| Turn-Off Time | t_{OFF} | $R_L = 50\ \Omega$, $C_L = 35\text{ pF}$, Test Circuit 2 | $+25^\circ\text{C}$ | | 20 | | |
| Address Transition Time | t_{TRANS} | $V_{IN} = 4.2\text{ V}$ to 0 V , V_X or $V_Y = 2.1\text{ V}$, $R_L = 50\ \Omega$, $C_L = 35\text{ pF}$, Test Circuit 3 | $+25^\circ\text{C}$ | | 30 | | ns |
| Break-Before-Make Time Delay | t_D | $V_{IN} = 4.2\text{ V}$ to 0 V , V_X or $V_Y = 2.1\text{ V}$, $R_L = 50\ \Omega$, $C_L = 35\text{ pF}$, Test Circuit 4 | $+25^\circ\text{C}$ | | 20 | | ns |
| Charge Injection | Q | $C_L = 1\text{ nF}$, Test Circuit 5 | $+25^\circ\text{C}$ | | -18 | | pC |
| Off Isolation | O_{ISO} | $V_{IN} = 0\text{ dBm}$, $V_{BIAS} = 2.1\text{ V}$, $R_L = 50\ \Omega$, $C_L = 35\text{ pF}$, Test Circuit 6 | 100KHz | $+25^\circ\text{C}$ | | -75 | dB |
| | | | 1MHz | $+25^\circ\text{C}$ | | -55 | |
| Channel-to-Channel Crosstalk | X_{TALK} | $V_{IN} = 0\text{ dBm}$, $V_{BIAS} = 2.1\text{ V}$, $R_L = 50\ \Omega$, $C_L = 35\text{ pF}$, Test Circuit 6 | 100KHz | $+25^\circ\text{C}$ | | -106 | dB |
| | | | 1MHz | $+25^\circ\text{C}$ | | -108 | |
| Bandwidth -3 dB | BW | $V_{IN} = 0\text{ dBm}$, $V_{BIAS} = 2.1\text{ V}$, $R_L = 50\ \Omega$, Test Circuit 6 | $+25^\circ\text{C}$ | | 30 | | MHz |
| Channel ON Capacitance | $C_{X(ON)}, C_{Y(ON)}, C_{X(OH)}, C_{Y(OH)}$ | | $+25^\circ\text{C}$ | | 146 | | pF |
| POWER REQUIREMENTS | | | | | | | |
| Power Supply Range | V_+ | | -40°C to $+85^\circ\text{C}$ | 1.8 | | 4.2 | V |
| Power Supply Current | I_+ | $V_+ = 4.2\text{ V}$, $V_A, V_B, V_{ENABLE} = 4.2\text{ V}$ or 0 V | -40°C to $+85^\circ\text{C}$ | | | 1 | μA |

Specifications subject to change without notice.

ELECTRICAL CHARACTERISTICS

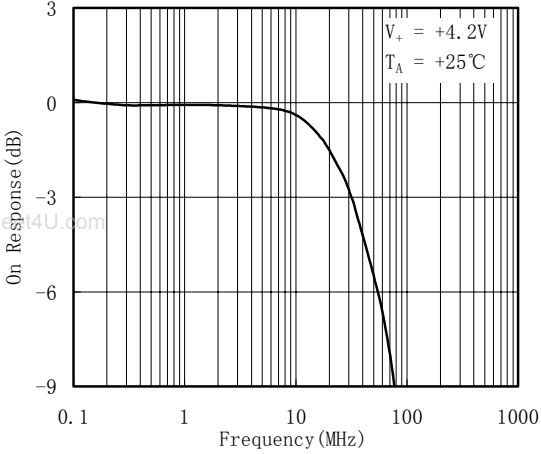
($V_+ = +2.7\text{ V}$ to $+3.6\text{ V}$, $GND = 0\text{ V}$, $V_{IH} = +1.6\text{ V}$, $V_{IL} = +0.4\text{ V}$, $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$. Typical values are at $V_+ = +3.0\text{ V}$, $T_A = +25^\circ\text{C}$, unless otherwise noted.)

| PARAMETER | SYMBOL | CONDITIONS | TEMP | MIN | TPY | MAX | UNITS |
|--------------------------------------|--|--|--|---------------------|------|-------|---------------|
| ANALOG SWITCH | | | | | | | |
| Analog Signal Range | V_{X-}, V_{Y-}, V_X, V_Y | | -40°C to $+85^\circ\text{C}$ | 0 | | V_+ | V |
| On-Resistance | R_{ON} | $V_+ = 2.7\text{ V}$, $I_{X-}, I_{Y-} = -100\text{ mA}$, $V_X, V_Y = 1\text{ V}$, 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} | $V_+ = 2.7\text{ V}$, $I_{X-}, I_{Y-} = -100\text{ mA}$, $V_X, V_Y = 1\text{ V}$, Test Circuit 1 | $+25^\circ\text{C}$ | | 0.05 | 0.2 | Ω |
| | | | -40°C to $+85^\circ\text{C}$ | | | 0.24 | |
| On-Resistance Flatness | $R_{FLAT(ON)}$ | $V_+ = 2.7\text{ V}$, $I_{X-}, I_{Y-} = -100\text{ mA}$, $V_X, V_Y = 1\text{ V}$, 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 | $I_{X-(OFF)}, I_{Y-(OFF)}$ | $V_+ = 3.6\text{ V}$, $V_{X-}, V_{Y-} = 3.3\text{ V}$, 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 | $I_{X-(ON)}, I_{Y-(ON)}, I_{X(ON)}, I_{Y(ON)}$ | $V_+ = 3.6\text{ V}$, $V_X, V_Y = 0.3\text{ V}$, 3.3 V , $V_{X-}, V_{Y-} = 0.3\text{ V}$, 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_{IN-} | $V_A, V_B = V_{ENABLE} = 0\text{ V}$ or 2.7 V | -40°C to $+85^\circ\text{C}$ | | | 1 | μA |
| DYNAMIC CHARACTERISTICS | | | | | | | |
| Turn-On Time | t_{ON} | $V_{IN} = 1.5\text{ V}$ to 0.5 V , V_X or $V_Y = 1.5\text{ V}$, $R_L = 50\ \Omega$, $C_L = 35\text{ pF}$, Test Circuit 2 | $+25^\circ\text{C}$ | | 33 | | ns |
| Turn-Off Time | t_{OFF} | | $+25^\circ\text{C}$ | | 20 | | |
| Address Transition Time | t_{TRANS} | $V_{IN} = 1.5\text{ V}$ to 0 V , V_X or $V_Y = 1.5\text{ V}$, $R_L = 50\ \Omega$, $C_L = 35\text{ pF}$, Test Circuit 3 | $+25^\circ\text{C}$ | | 36 | | ns |
| Break-Before-Make Time Delay | t_D | $V_{IN} = 1.5\text{ V}$ to 0 V , V_X or $V_Y = 1.5\text{ V}$, $R_L = 50\ \Omega$, $C_L = 35\text{ pF}$, 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} | $V_{IN} = 0\text{ dBm}$, $V_{BIAS} = 1.5\text{ V}$, $R_L = 50\ \Omega$, $C_L = 35\text{ pF}$, Test Circuit 6 | 100KHz | $+25^\circ\text{C}$ | | -75 | dB |
| | | | 1MHz | $+25^\circ\text{C}$ | | -55 | |
| Channel-to-Channel Crosstalk | X_{TALK} | $V_{IN} = 0\text{ dBm}$, $V_{BIAS} = 1.5\text{ V}$, $R_L = 50\ \Omega$, $C_L = 35\text{ pF}$, Test Circuit 6 | 100KHz | $+25^\circ\text{C}$ | | -106 | dB |
| | | | 1MHz | $+25^\circ\text{C}$ | | -108 | |
| Bandwidth -3 dB | BW | $V_{IN} = 0\text{ dBm}$, $V_{BIAS} = 1.5\text{ V}$, $R_L = 50\ \Omega$, Test Circuit 6 | $+25^\circ\text{C}$ | | 30 | | MHz |
| Channel ON Capacitance | $C_{X-(ON)}, C_{Y-(ON)}, C_{X(ON)}, C_{Y(ON)}$ | | $+25^\circ\text{C}$ | | 146 | | pF |

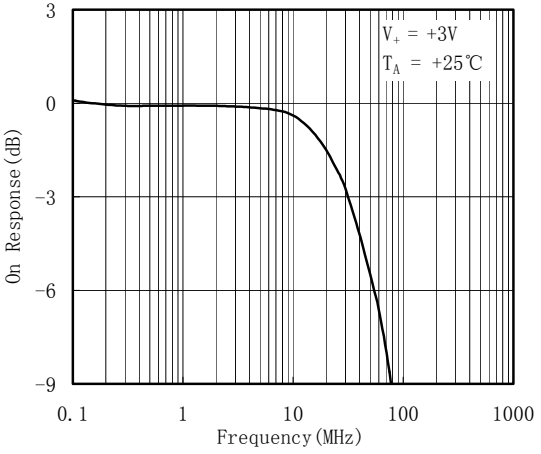
Specifications subject to change without notice.

TYPICAL PERFORMANCE CHARACTERISTICS

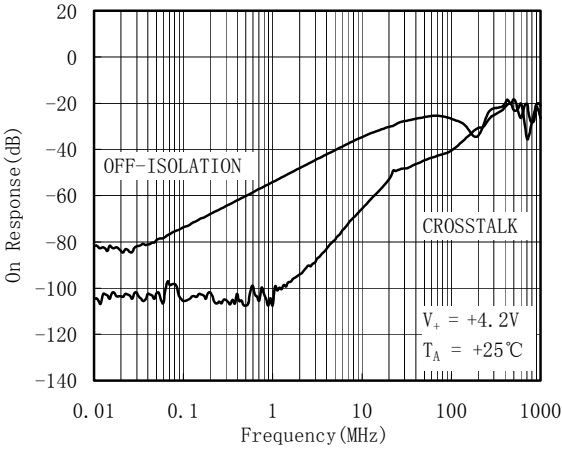
On Response vs. Frequency



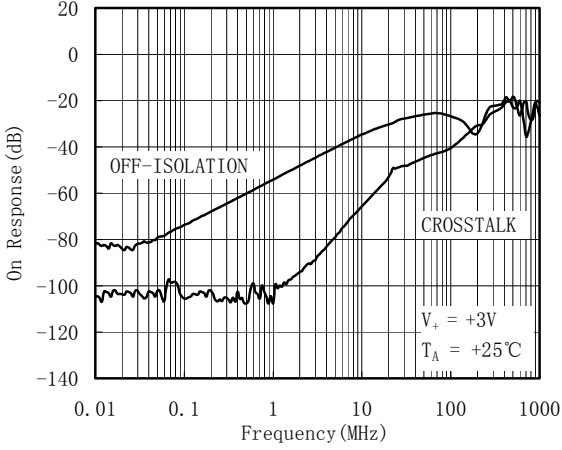
On Response vs. Frequency



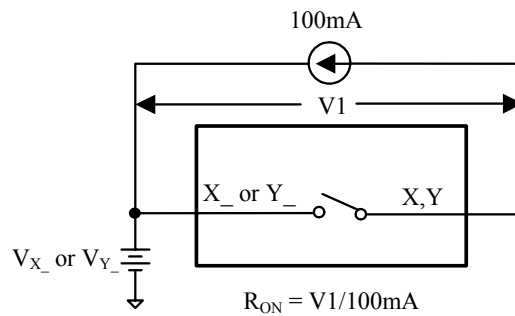
Response vs. Frequency



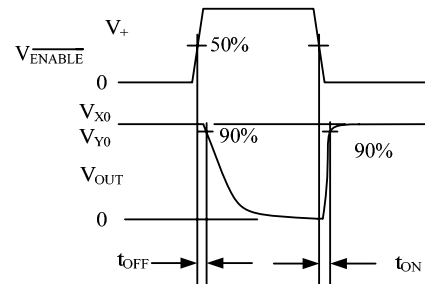
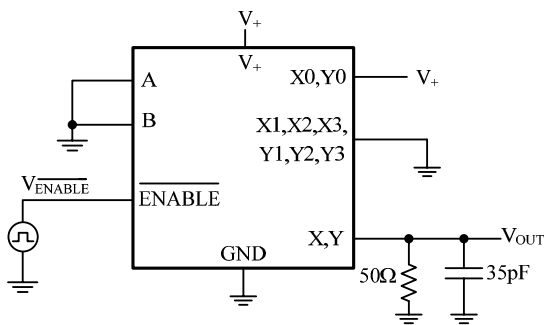
Response vs. Frequency



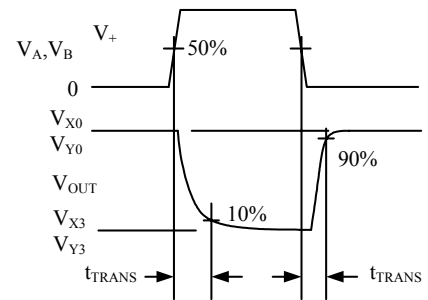
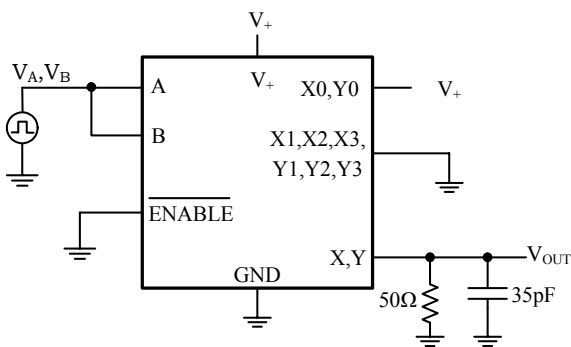
TEST CIRCUITS



Test Circuit 1. On Resistance

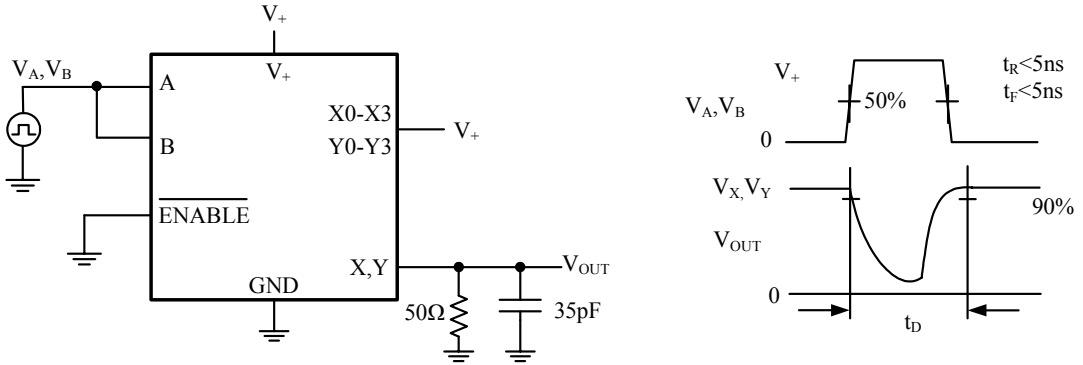


Test Circuit 2. Enable Switching Times (t_{OFF} , t_{ON})

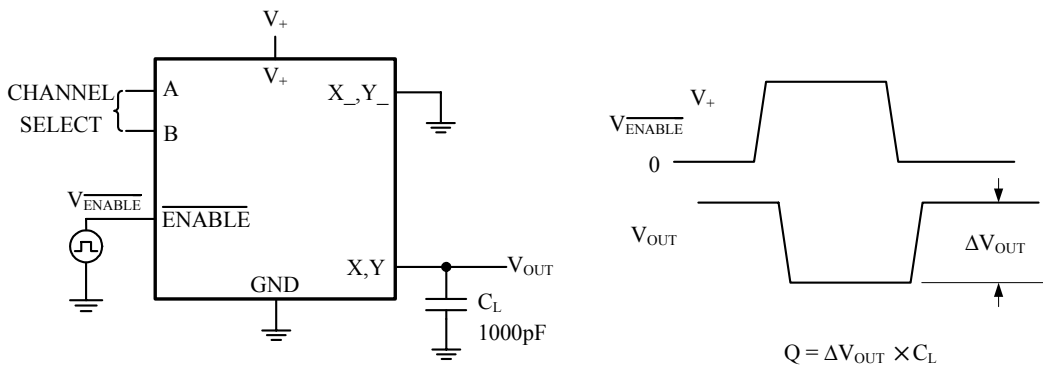


Test Circuit 3. Address Transition Times (t_{TRANS})

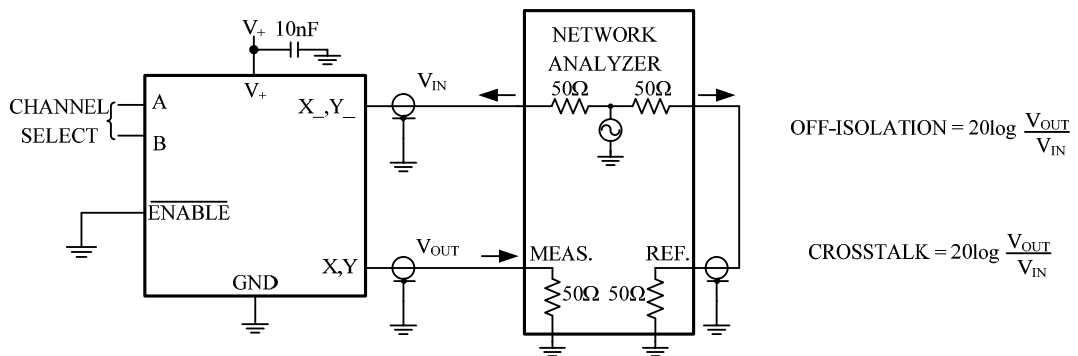
TEST CIRCUITS (Cont.)



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



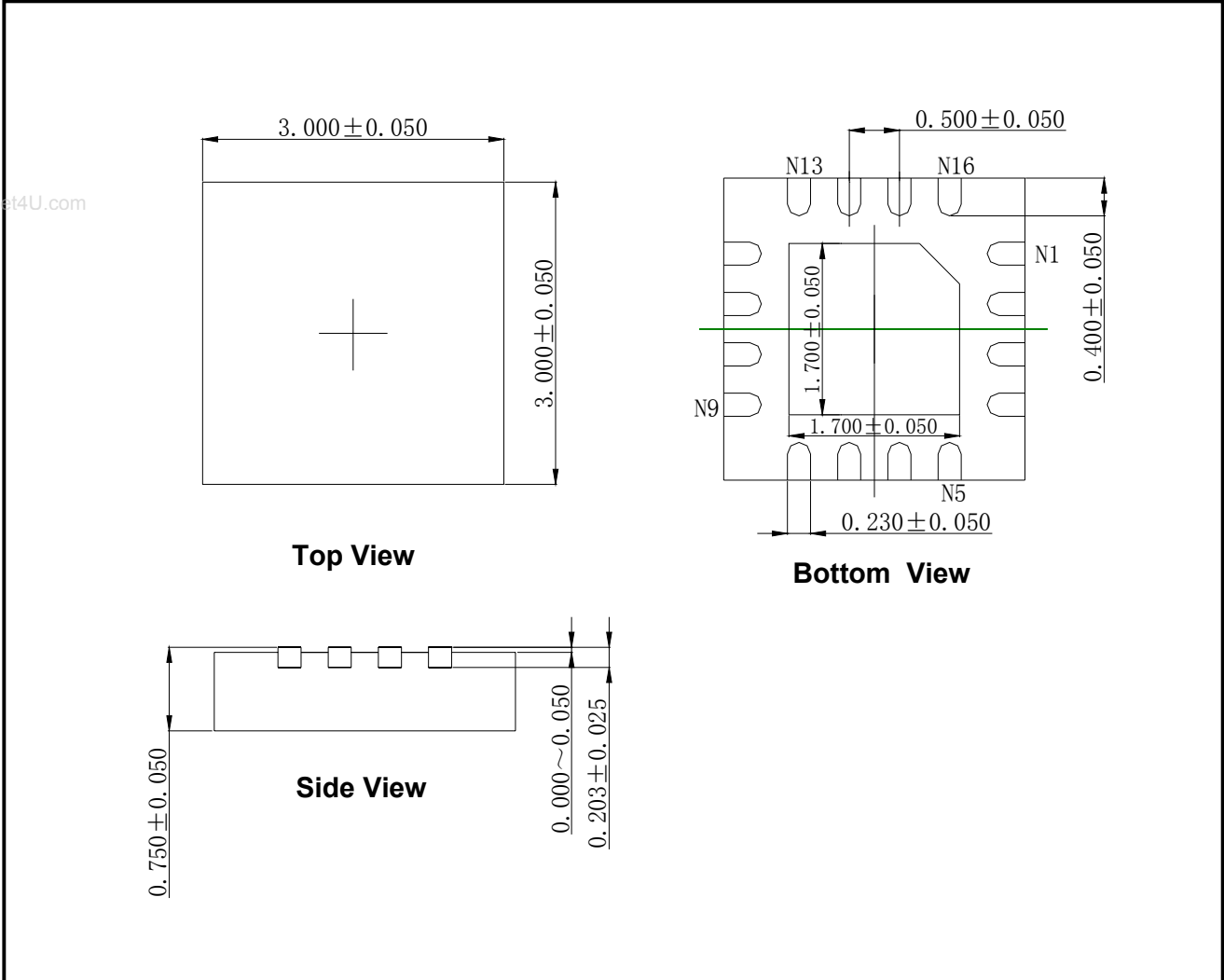
Test Circuit 5. Charge Injection (Q)



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

PACKAGE OUTLINE DIMENSIONS

TQFN-16

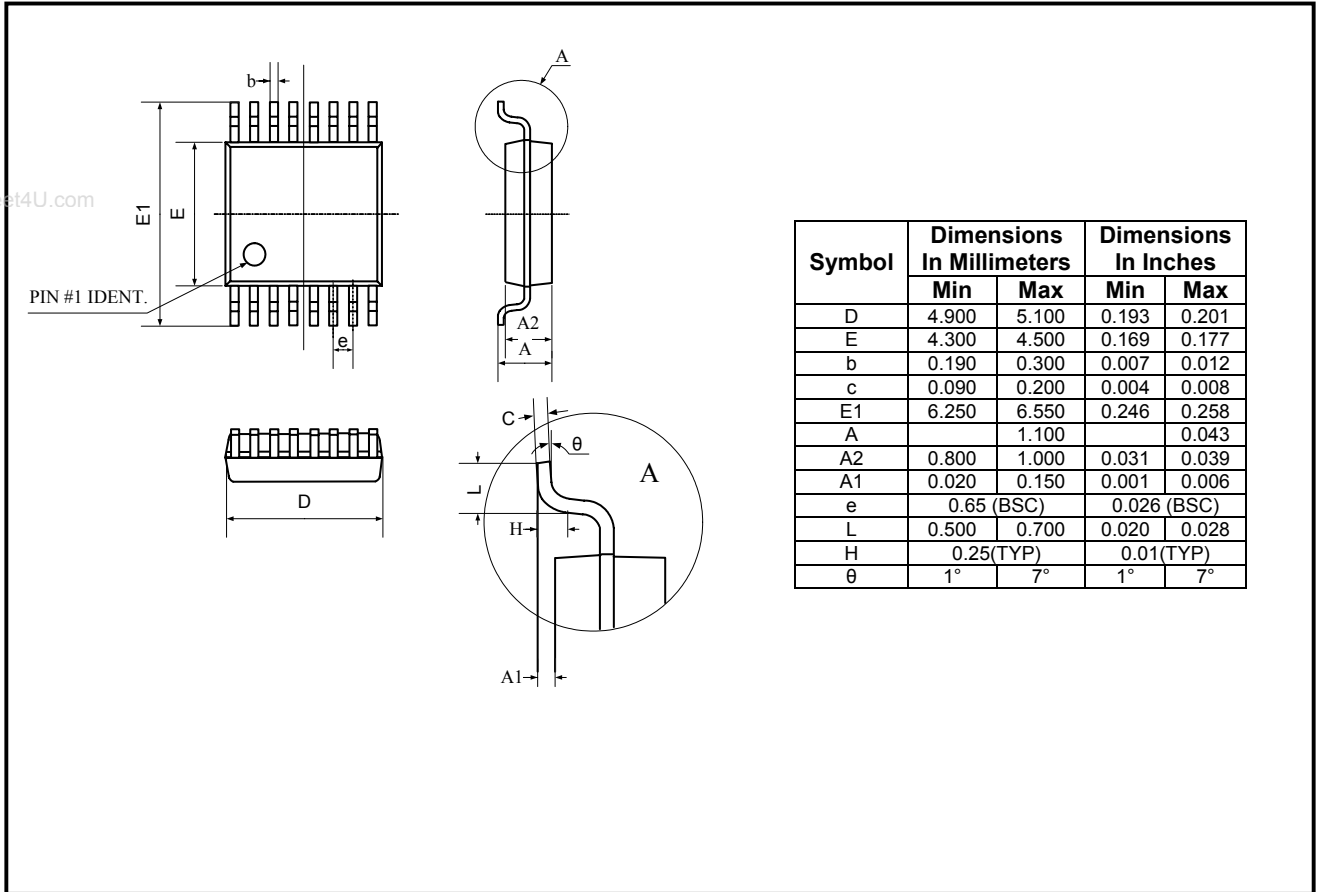


Note: All linear dimensions are in millimeters.

PACKAGE OUTLINE DIMENSIONS

TSSOP-16

www.DataSheet4U.com



REVISION HISTORY

Location

Page

10/2007—Preliminary Datasheet

01/2008—Data Sheet REV.A

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