



# SGM44599

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

### GENERAL DESCRIPTION

The SGM44599 is a dual-independent double-pole/double-throw (DPDT), TTL/CMOS compatible analog switch. It operates from a 1.8V to 5.5V single power supply.

The SGM44599 features high-speed, low on-resistance, low voltage and high bandwidth. The high performances make it very suitable for multiple applications, such as portable equipment, audio and video signal routing, etc. In addition, the SGM44599 can be used as a dual 2-to-1 multiplexer because it has two logic control inputs. Low power consumption is also one of the important reasons that make it a good choice.

The SGM44599 is available in Green TQFN-3×3-16L and TQFN-2.5×2.5-16L packages. It operates over an ambient temperature range of -40°C to +85°C.

### FEATURES

- **Single Supply Voltage Range: 1.8V to 5.5V**
- **-3dB Bandwidth: 300MHz**
- **Low On-Resistance: 4Ω (TYP)**
- **Low On-Resistance Flatness**
- **High Off-Isolation: -75dB at 1MHz**
- **Low Crosstalk: -100dB at 1MHz**
- **Fast Switching Times:**
  - t<sub>ON</sub>: 31.5ns**
  - t<sub>OFF</sub>: 30ns**
- **Rail-to-Rail Input and Output Operation**
- **TTL/CMOS Compatible**
- **-40°C to +85°C Operating Temperature Range**
- **Available in Green TQFN-3×3-16L and TQFN-2.5×2.5-16L Packages**

### APPLICATIONS

Cellular Phones  
Portable Equipment  
Medical Equipment  
Sample-and-Hold Circuits  
Personal Digital Assistants  
Battery-Powered Systems  
Audio and Video Signal Routing

**PACKAGE/ORDERING INFORMATION**

| MODEL    | PACKAGE DESCRIPTION | SPECIFIED TEMPERATURE RANGE | ORDERING NUMBER   | PACKAGE MARKING | PACKING OPTION      |
|----------|---------------------|-----------------------------|-------------------|-----------------|---------------------|
| SGM44599 | TQFN-3×3-16L        | -40°C to +85°C              | SGM44599YTQ16/TR  | 44599<br>XXXXX  | Tape and Reel, 3000 |
|          | TQFN-2.5×2.5-16L    | -40°C to +85°C              | SGM44599YTQB16/TR | 44599<br>XXXXX  | Tape and Reel, 3000 |

NOTE: XXXXX = Date Code and Vendor Code.

Green (RoHS & HSF): SG Micro Corp defines "Green" to mean Pb-Free (RoHS compatible) and free of halogen substances. If you have additional comments or questions, please contact your SGMICRO representative directly.

**ABSOLUTE MAXIMUM RATINGS**

V<sub>+</sub> to GND ..... -0.3V to 6V  
 Analog, Digital Voltage Range ..... -0.3V to (V<sub>+</sub>) + 0.3V  
 Continuous Current NO, NC, or COM ..... ±100mA  
 Junction Temperature ..... +150°C  
 Storage Temperature Range ..... -65°C to +150°C  
 Lead Temperature (Soldering, 10s) ..... +260°C  
 ESD Susceptibility  
 HBM ..... 2000V  
 MM ..... 200V

**RECOMMENDED OPERATING CONDITIONS**

Supply Voltage Range ..... 1.8V to 5.5V  
 Operating Temperature Range ..... -40°C to +85°C

**OVERSTRESS CAUTION**

Stresses beyond those listed may cause permanent damage to the device. Functional operation of the device at these or any other conditions beyond those indicated in the operational section of the specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

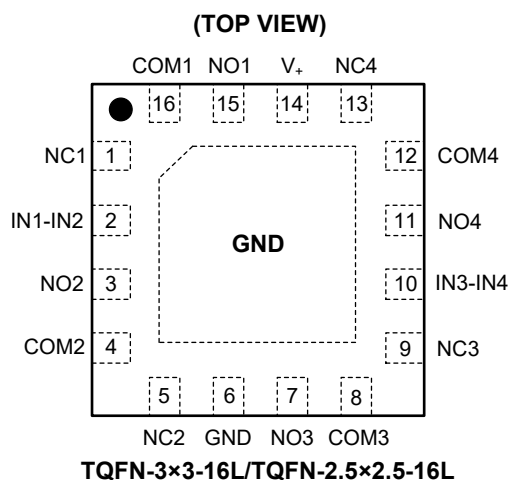
**ESD SENSITIVITY CAUTION**

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.

**DISCLAIMER**

SG Micro Corp reserves the right to make any change in circuit design, specification or other related things if necessary without notice at any time.

**PIN CONFIGURATIONS**



**PIN DESCRIPTION**

| PIN                              | NAME             | FUNCTION  |
|----------------------------------|------------------|---|
| TQFN-3×3-16L<br>TQFN-2.5×2.5-16L |                  |   |
| 14                               | V <sub>+</sub>   | Positive Power Supply Pin.  |
| 6                                | GND              | Ground.   |
| 2, 10                            | IN <sub>x</sub>  | Digital Control Input Pin to Connect the COM Pins to the NO or NC Pins. |
| 16, 4, 8, 12                     | COM <sub>x</sub> | Common Pins.  |
| 15, 3, 7, 11                     | NO <sub>x</sub>  | Normally Open Pins.   |
| 1, 5, 9, 13                      | NC <sub>x</sub>  | Normally Closed Pins.   |

NOTE: NO<sub>x</sub>, NC<sub>x</sub> and COM<sub>x</sub> pins may be an input or output.

**FUNCTION TABLE**

| IN1-IN2 | FUNCTION    |             |
|---------|-------------|-------------|
|         | NC1 and NC2 | NO1 and NO2 |
| 0       | ON          | OFF         |
| 1       | OFF         | ON          |

| IN3-IN4 | FUNCTION    |             |
|---------|-------------|-------------|
|         | NC3 and NC4 | NO3 and NO4 |
| 0       | ON          | OFF         |
| 1       | OFF         | ON          |

## ELECTRICAL CHARACTERISTICS

( $V_+ = 4.5V$  to  $5.5V$ ,  $GND = 0V$ ,  $V_{IH} = 1.6V$ ,  $V_{IL} = 0.5V$ , Full =  $-40^\circ C$  to  $+85^\circ C$ . Typical values are at  $V_+ = 5V$ ,  $T_A = +25^\circ C$ , unless otherwise noted.)

| PARAMETER                            | SYMBOL                                | CONDITIONS  | TEMP  | MIN   | TYP  | MAX   | UNITS    |
|--------------------------------------|---------------------------------------|---|-------|-------|------|-------|----------|
| <b>ANALOG SWITCH</b>                 |                                       |   |       |       |      |       |          |
| Analog Signal Range                  | $V_{NO}, V_{NC}, V_{COM}$             |   | Full  | 0     |      | $V_+$ | V        |
| On-Resistance                        | $R_{ON}$                              | $V_+ = 4.5V, 0V \leq V_{NO} \text{ or } V_{NC} \leq V_+, I_{COM} = -100mA$ , Test Circuit 1 | +25°C |       | 4    | 6.2   | $\Omega$ |
|                                      |                                       |   | Full  |       |      | 7.2   | $\Omega$ |
| On-Resistance Match Between Channels | $\Delta R_{ON}$                       | $V_+ = 4.5V, 0V \leq V_{NO} \text{ or } V_{NC} \leq V_+, I_{COM} = -100mA$ , Test Circuit 1 | +25°C |       | 0.4  | 2.6   | $\Omega$ |
|                                      |                                       |   | Full  |       |      | 3.1   | $\Omega$ |
| On-Resistance Flatness               | $R_{FLAT(ON)}$                        | $V_+ = 4.5V, 0V \leq V_{NO} \text{ or } V_{NC} \leq V_+, I_{COM} = -100mA$ , Test Circuit 1 | +25°C |       | 2    | 3.1   | $\Omega$ |
|                                      |                                       |   | Full  |       |      | 3.6   | $\Omega$ |
| Source Off Leakage Current           | $I_{NC(OFF)}, I_{NO(OFF)}$            | $V_+ = 5.5V, V_{NO} \text{ or } V_{NC} = 3.3V/0.3V, V_{COM} = 0.3V/3.3V$                    | Full  |       |      | 1     | $\mu A$  |
| Channel On Leakage Current           | $I_{NC(ON)}, I_{NO(ON)}, I_{COM(ON)}$ | $V_+ = 5.5V, V_{COM} = 0.3V/3.3V, V_{NO} \text{ or } V_{NC} = 0.3V/3.3V$ or floating        | Full  |       |      | 1     | $\mu A$  |
| <b>DIGITAL INPUTS</b>                |                                       |   |       |       |      |       |          |
| Input High Voltage                   | $V_{INH}$                             |   | Full  | 1.6   |      |       | V        |
| Input Low Voltage                    | $V_{INL}$                             |   | Full  |       |      | 0.5   | V        |
| Input Leakage Current                | $I_{IN}$                              | $V_+ = 5.5V, V_{IN} = 0V$ or $5.5V$   | Full  |       |      | 1     | $\mu A$  |
| <b>DYNAMIC CHARACTERISTICS</b>       |                                       |   |       |       |      |       |          |
| Turn-On Time                         | $t_{ON}$                              | $V_{NC} \text{ or } V_{NO} = 3V, R_L = 300\Omega, C_L = 35pF$ , Test Circuit 2              | +25°C |       | 31.5 |       | ns       |
| Turn-Off Time                        | $t_{OFF}$                             |   | +25°C |       | 30.0 |       | ns       |
| Break-Before-Make Time Delay         | $t_D$                                 | $V_{NC} \text{ or } V_{NO} = 3V, R_L = 300\Omega, C_L = 35pF$ , Test Circuit 4              | +25°C |       | 11.5 |       | ns       |
| Charge Injection                     | Q                                     | $V_S = GND, R_S = 0\Omega, C_L = 1nF, Q = C_L \times V_{OUT}$ , Test Circuit 3              | +25°C |       | 3.5  |       | pC       |
| Off Isolation                        | $O_{ISO}$                             | Signal = 0dBm, $R_L = 50\Omega$ , Test Circuit 5  | 1MHz  | +25°C |      | -75   | dB       |
|                                      |                                       |   | 10MHz | +25°C |      | -55   |          |
| Channel-to-Channel Crosstalk         | $X_{TALK}$                            | Signal = 0dBm, $R_L = 50\Omega$ , Test Circuit 6  | 1MHz  | +25°C |      | -100  | dB       |
|                                      |                                       |   | 10MHz | +25°C |      | -60   |          |
| -3dB Bandwidth                       | BW                                    | Signal = 0dBm, $R_L = 50\Omega$ , Test Circuit 7  | +25°C |       | 300  |       | MHz      |
| Channel On Capacitance               | $C_{NC(ON)}, C_{NO(ON)}, C_{COM(ON)}$ |   | +25°C |       | 43.2 |       | pF       |
| <b>POWER REQUIREMENTS</b>            |                                       |   |       |       |      |       |          |
| Power Supply Range                   | $V_+$                                 |   | Full  | 1.8   |      | 5.5   | V        |
| Power Supply Current                 | $I_+$                                 | $V_+ = 5.5V, V_{IN} = 0V$ or $V_+$  | Full  |       |      | 1     | $\mu A$  |

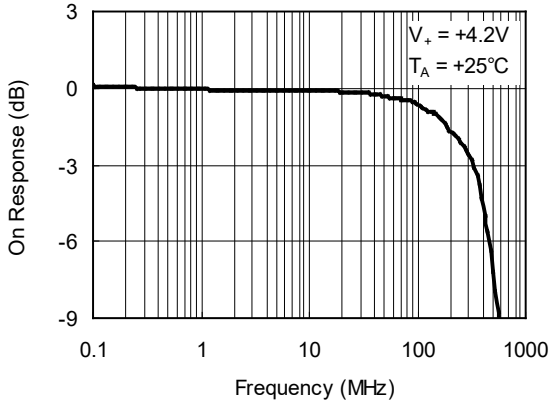
**ELECTRICAL CHARACTERISTICS (continued)**

( $V_+ = 2.7V$  to  $3.6V$ ,  $V_{IH} = 1.6V$ ,  $V_{IL} = 0.4V$ , Full =  $-40^\circ C$  to  $+85^\circ C$ . Typical values are at  $V_+ = 3V$ ,  $T_A = +25^\circ C$ , unless otherwise noted.)

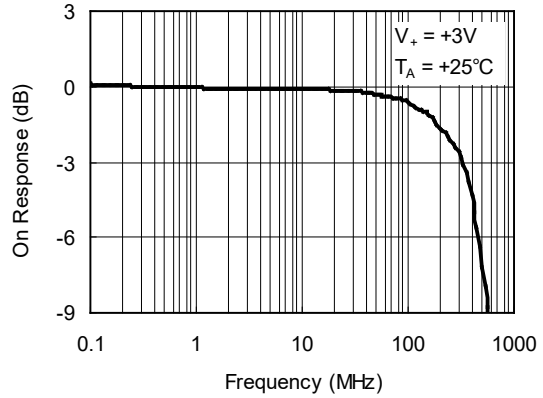
| PARAMETER                            | SYMBOL                                | CONDITIONS  | TEMP  | MIN   | TYP  | MAX   | UNITS    |
|--------------------------------------|---------------------------------------|---|-------|-------|------|-------|----------|
| <b>ANALOG SWITCH</b>                 |                                       |   |       |       |      |       |          |
| Analog Signal Range                  | $V_{NO}, V_{NC}, V_{COM}$             |   | Full  | 0     |      | $V_+$ | V        |
| On-Resistance                        | $R_{ON}$                              | $V_+ = 2.7V, 0V \leq V_{NO} \text{ or } V_{NC} \leq V_+, I_{COM} = -100mA$ , Test Circuit 1 | +25°C |       | 10   | 15    | $\Omega$ |
|                                      |                                       |   | Full  |       |      | 18    | $\Omega$ |
| On-Resistance Match Between Channels | $\Delta R_{ON}$                       | $V_+ = 2.7V, 0V \leq V_{NO} \text{ or } V_{NC} \leq V_+, I_{COM} = -100mA$ , Test Circuit 1 | +25°C |       | 1    | 3     | $\Omega$ |
|                                      |                                       |   | Full  |       |      | 4     | $\Omega$ |
| On-Resistance Flatness               | $R_{FLAT(ON)}$                        | $V_+ = 2.7V, 0V \leq V_{NO} \text{ or } V_{NC} \leq V_+, I_{COM} = -100mA$ , Test Circuit 1 | +25°C |       | 6    | 9     | $\Omega$ |
|                                      |                                       |   | Full  |       |      | 12    | $\Omega$ |
| Source Off Leakage Current           | $I_{NC(OFF)}, I_{NO(OFF)}$            | $V_+ = 3.6V, V_{NO} \text{ or } V_{NC} = 3.3V/0.3V, V_{COM} = 0.3V/3.3V$                    | Full  |       |      | 1     | $\mu A$  |
| Channel On Leakage Current           | $I_{NC(ON)}, I_{NO(ON)}, I_{COM(ON)}$ | $V_+ = 3.6V, V_{COM} = 0.3V/3.3V, V_{NO} \text{ or } V_{NC} = 0.3V/3.3V$ or floating        | Full  |       |      | 1     | $\mu A$  |
| <b>DIGITAL INPUTS</b>                |                                       |   |       |       |      |       |          |
| Input High Voltage                   | $V_{INH}$                             |   | Full  | 1.5   |      |       | V        |
| Input Low Voltage                    | $V_{INL}$                             |   | Full  |       |      | 0.4   | V        |
| Input Leakage Current                | $I_{IN}$                              | $V_+ = 2.7V, V_{IN} = 0V$ or $2.7V$   | Full  |       |      | 1     | $\mu A$  |
| <b>DYNAMIC CHARACTERISTICS</b>       |                                       |   |       |       |      |       |          |
| Turn-On Time                         | $t_{ON}$                              | $V_{NC} \text{ or } V_{NO} = 1.5V, R_L = 300\Omega, C_L = 35pF$ , Test Circuit 2            | +25°C |       | 38.0 |       | ns       |
| Turn-Off Time                        | $t_{OFF}$                             |   | +25°C |       | 44.0 |       | ns       |
| Break-Before-Make Time Delay         | $t_D$                                 | $V_{NC} \text{ or } V_{NO} = 1.5V, R_L = 300\Omega, C_L = 35pF$ , Test Circuit 4            | +25°C |       | 5.8  |       | ns       |
| Charge Injection                     | Q                                     | $V_S = GND, R_S = 0\Omega, C_L = 1nF, Q = C_L \times V_{OUT}$ , Test Circuit 3              | +25°C |       | 2.6  |       | pC       |
| Off Isolation                        | $O_{ISO}$                             | Signal = 0dBm, $R_L = 50\Omega$ , Test Circuit 5  | 1MHz  | +25°C |      | -75   | dB       |
|                                      |                                       |   | 10MHz | +25°C |      | -55   |          |
| Channel-to-Channel Crosstalk         | $X_{TALK}$                            | Signal = 0dBm, $R_L = 50\Omega$ , Test Circuit 6  | 1MHz  | +25°C |      | -100  | dB       |
|                                      |                                       |   | 10MHz | +25°C |      | -60   |          |
| -3dB Bandwidth                       | BW                                    | Signal = 0dBm, $R_L = 50\Omega$ , Test Circuit 7  | +25°C |       | 300  |       | MHz      |
| Channel On Capacitance               | $C_{NC(ON)}, C_{NO(ON)}, C_{COM(ON)}$ |   | +25°C |       | 43.2 |       | pF       |

TYPICAL PERFORMANCE CHARACTERISTICS

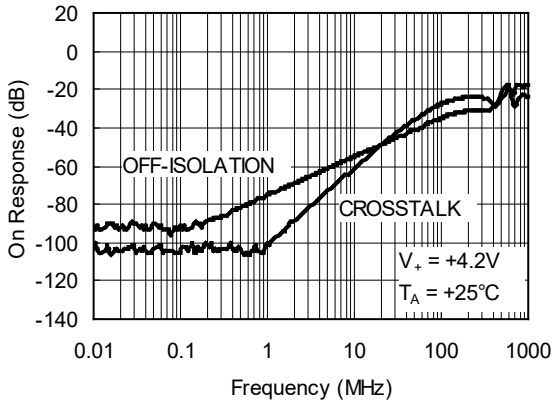
On Response vs. Frequency



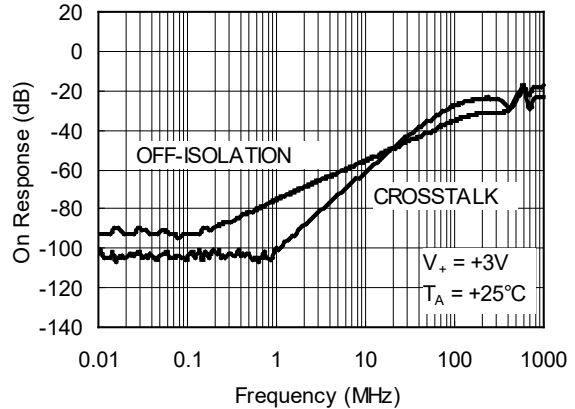
On Response vs. Frequency



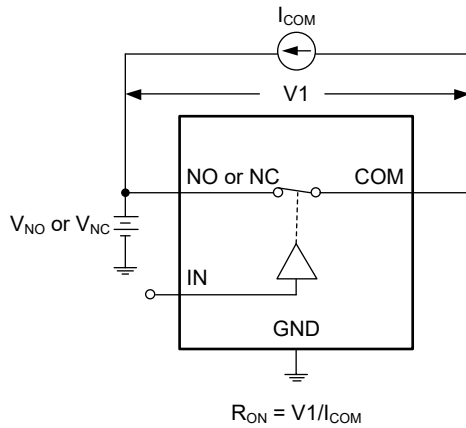
Response vs. Frequency



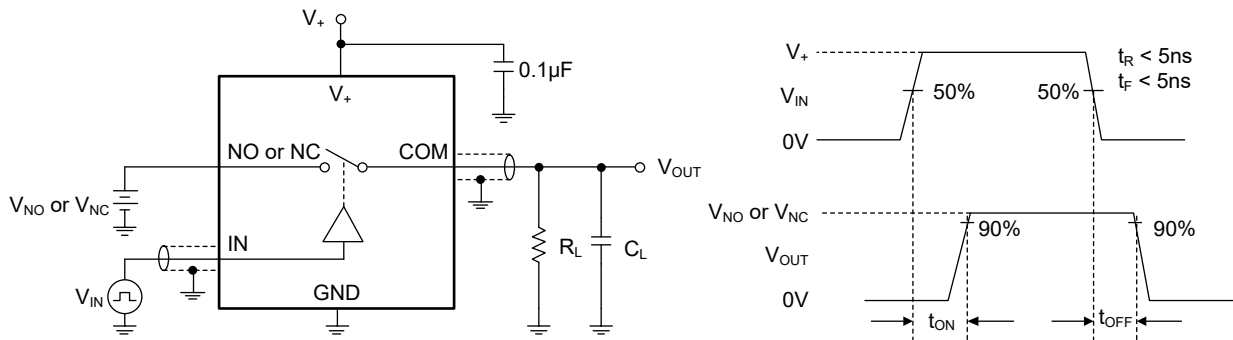
Response vs. Frequency



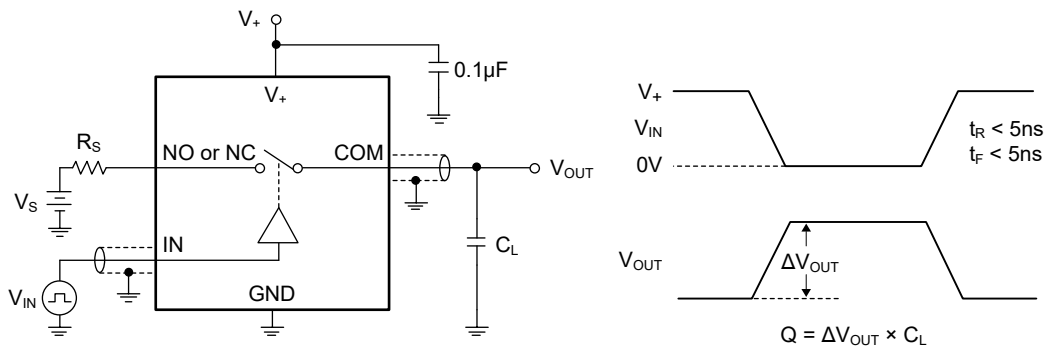
TEST CIRCUITS



Test Circuit 1. On-Resistance

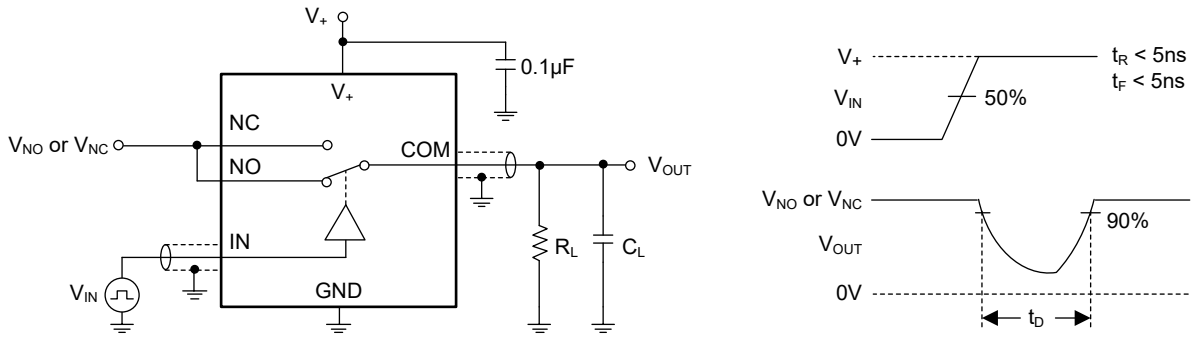


Test Circuit 1. Switching Times ( $t_{ON}$ ,  $t_{OFF}$ )

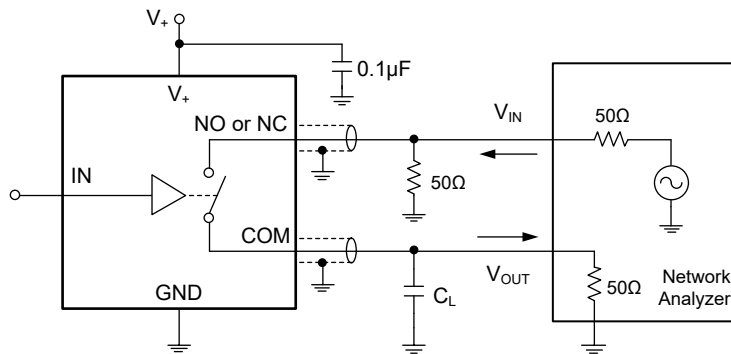


Test Circuit 2. Charge Injection

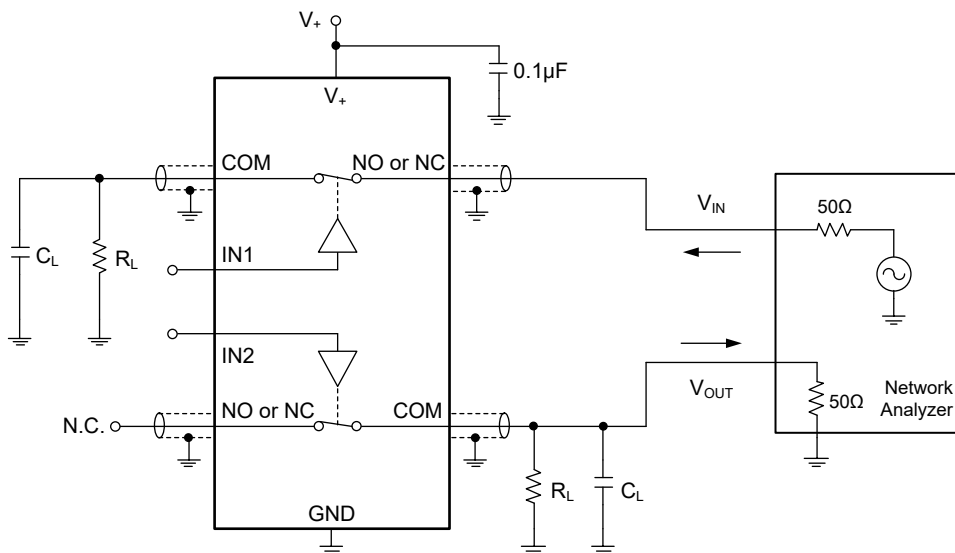
TEST CIRCUITS (continued)



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



Test Circuit 3. Off Isolation

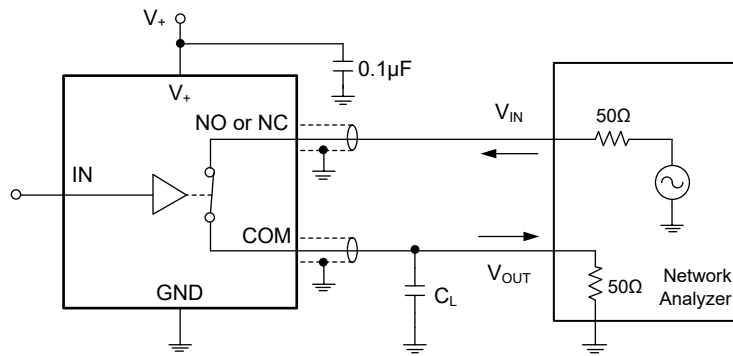


Channel-to-Channel Crosstalk =  $-20 \log (V_{NO} \text{ or } V_{NC}/V_{OUT})$

Test Circuit 4. Channel-to-Channel Crosstalk



TEST CIRCUITS (continued)



Test Circuit 5. -3dB Bandwidth

REVISION HISTORY

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

JANUARY 2013 – REV.A.3 to REV.A.4

|  |        |
|--|--------|
| Added Recommended Land Pattern Information ..... | 10, 11 |
| Added Tape and Reel Information.....             | 12, 13 |

MAY 2011 – REV.A.2 to REV.A.3

|                                   |     |
|-----------------------------------|-----|
| Updated Package Description ..... | All |
|-----------------------------------|-----|

MAY 2010 – REV.A.1 to REV.A.2

|  |   |
|--|---|
| Updated General Description section..... | 1 |
|--|---|

DECEMBER 2008 – REV.A to REV.A.1

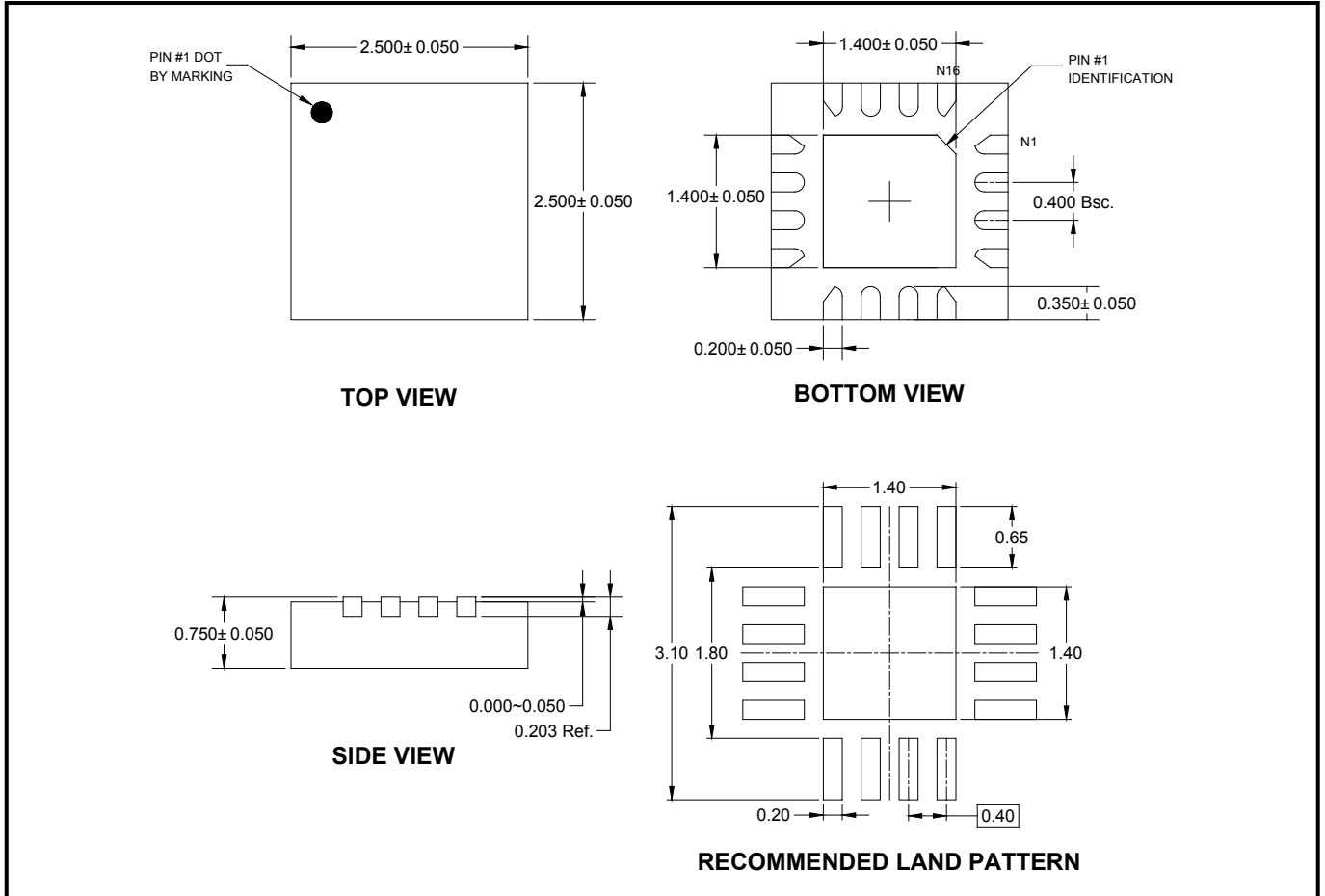
|   |   |
|---|---|
| Changed Absolute Maximum Ratings section..... | 2 |
|---|---|

Changes from Original (JANUARY 2008) to REV.A

|  |     |
|--|-----|
| Changed from product preview to production data..... | All |
|--|-----|

PACKAGE OUTLINE DIMENSIONS

TQFN-2.5×2.5-16L

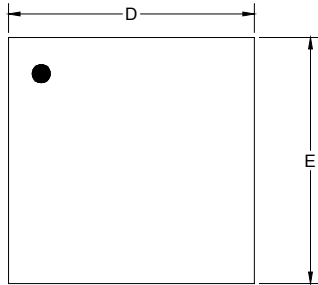


NOTE: All linear dimensions are in millimeters.

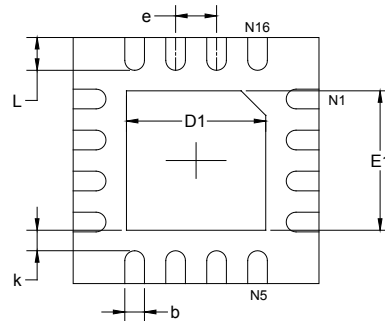
# PACKAGE INFORMATION

## PACKAGE OUTLINE DIMENSIONS

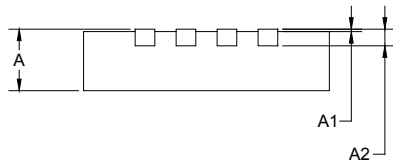
### TQFN-3×3-16L



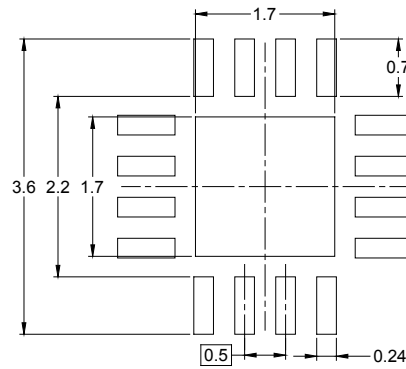
TOP VIEW



BOTTOM VIEW



SIDE VIEW

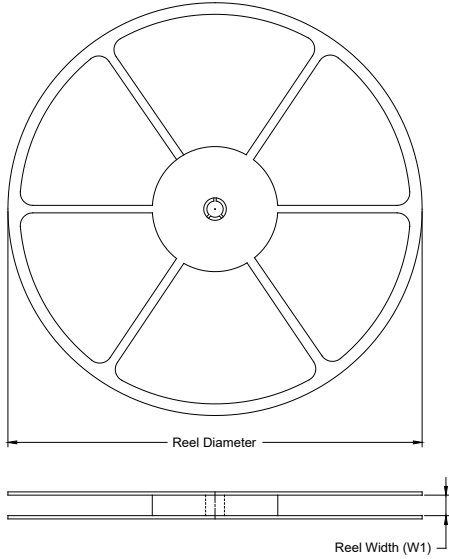


RECOMMENDED LAND PATTERN (Unit: mm)

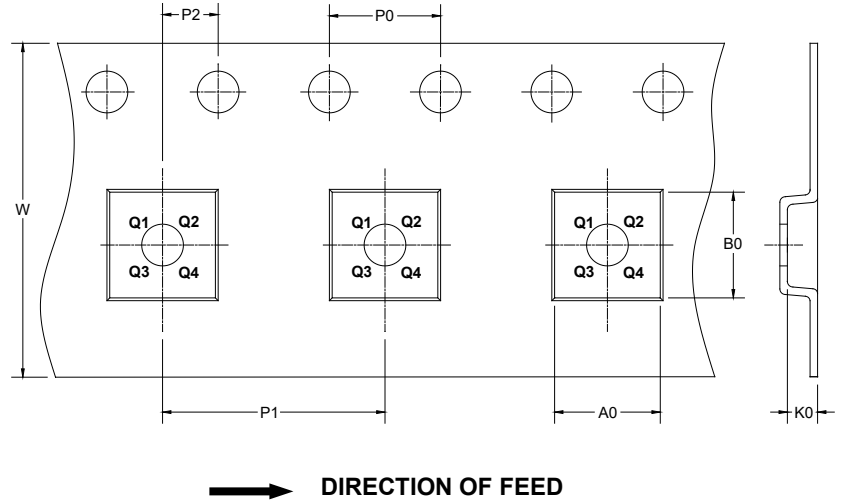
| Symbol | Dimensions<br>In Millimeters |       | Dimensions<br>In Inches |       |
|--------|------------------------------|-------|-------------------------|-------|
|        | MIN                          | MAX   | MIN                     | MAX   |
| A      | 0.700                        | 0.800 | 0.028                   | 0.031 |
| A1     | 0.000                        | 0.050 | 0.000                   | 0.002 |
| A2     | 0.203 REF                    |       | 0.008 REF               |       |
| D      | 2.900                        | 3.100 | 0.114                   | 0.122 |
| D1     | 1.600                        | 1.800 | 0.063                   | 0.071 |
| E      | 2.900                        | 3.100 | 0.114                   | 0.122 |
| E1     | 1.600                        | 1.800 | 0.063                   | 0.071 |
| k      | 0.200 MIN                    |       | 0.008 MIN               |       |
| b      | 0.180                        | 0.300 | 0.007                   | 0.012 |
| e      | 0.500 TYP                    |       | 0.020 TYP               |       |
| L      | 0.300                        | 0.500 | 0.012                   | 0.020 |

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF TAPE AND REEL

| Package Type     | Reel Diameter | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P0 (mm) | P1 (mm) | P2 (mm) | W (mm) | Pin1 Quadrant |
|------------------|---------------|--------------------|---------|---------|---------|---------|---------|---------|--------|---------------|
| TQFN-2.5×2.5-16L | 7"            | 13.0               | 2.80    | 2.80    | 1.10    | 4.0     | 4.0     | 2.0     | 12.0   | Q1            |
| TQFN-3×3-16L     | 13"           | 12.4               | 3.35    | 3.35    | 1.13    | 4.0     | 8.0     | 2.0     | 12.0   | Q1            |

000001

# PACKAGE INFORMATION

## CARTON BOX DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

## KEY PARAMETER LIST OF CARTON BOX

| Reel Type   | Length (mm) | Width (mm) | Height (mm) | Pizza/Carton |
|-------------|-------------|------------|-------------|--------------|
| 7" (Option) | 368         | 227        | 224         | 8            |
| 7"          | 442         | 410        | 224         | 18           |
| 13"         | 386         | 280        | 370         | 5            |

DD0002

单击下面可查看定价，库存，交付和生命周期等信息

[>>SGMICRO\(圣邦微电子\)](#)