## PACKAGE/ORDERING INFORMATION

| MODEL | PACKAGE DESCRIPTION | SPECIFIED TEMPERATURE RANGE | ORDERING NUMBER | PACKAGE MARKING | PACKING OPTION |
|---|---|---|---|---|---|
| SGM44603 | TQFN-2.6×1.8-16L | -40℃ to +85℃ | SGM44603YTQA16/TR | 44603 XXXXX | Tape and Reel, 3000 |

## MARKING INFORMATION

NOTE: XXXXX = Date Code and Vendor Code.

**X X X X X**
- Vendor Code
- Date Code - Week
- Date Code - Year

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

$V_+$ to GND ........................................................... -0.3V to 6V
Analog, Digital Voltage Range [(1)] ............. -0.3V to ($V_+$) +0.3V
Continuous Current NO, NC, or COM....................... ±100mA
Junction Temperature.................................................+150℃
Storage Temperature Range ........................-65℃ to +150℃
Lead Temperature (Soldering, 10s)...........................+260℃

NOTE:
1. Signals on NC, NO, or COM or $IN_X$ exceeding $V_+$ will be clamped by internal diodes. Limit forward diode current to maximum current ratings.

## RECOMMENDED OPERATING CONDITIONS

Operating Temperature Range .......................-40℃ to +85℃

## OVERSTRESS CAUTION

Stresses beyond those listed in Absolute Maximum Ratings may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect reliability. Functional operation of the device at any conditions beyond those indicated in the Recommended Operating Conditions section is not implied.

## 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, or specifications without prior notice.

## PIN CONFIGURATION

**(TOP VIEW)**



**TQFN-2.6×1.8-16L**

## PIN DESCRIPTION

| NAME | PIN | FUNCTION |
|---|---|---|
| $V_+$ | 14 | Power Supply. |
| GND | 6 | Ground. |
| IN | 15 | Digital Control Pin to Connect the COM Terminal to the NO or NC Terminals. |
| $\overline{EN}$ | 13 | Digital Enable Input. Normally connect to GND. Drive to logic high to set all switches off. |
| $COM_X$ | 2, 5, 7, 10 | Common Terminal. |
| $NO_X$ | 1, 4, 8, 11 | Normally-Open Terminal. |
| $NC_X$ | 16, 3, 9, 12 | Normally-Closed Terminal. |

NOTE: $NO_X$, $NC_X$ and $COM_X$ terminals may be an input or output.

## FUNCTION TABLE

| $\overline{EN}$ | IN | NO | NC |
|---|---|---|---|
| L | L | OFF | ON |
| L | H | ON | OFF |
| H | √ | All Switches Open | |

√ = Don't Care.

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## ELECTRICAL CHARACTERISTICS

(V$_+$ = +4.5V to +5.5V, GND = 0V, V$_{IH}$ = +1.6V, V$_{IL}$ = +0.5V, Full = -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$_{COM}$ | | | Full | 0 | | V$_+$ | V |
| On-Resistance | R$_{ON}$ | V$_+$ = 4.5V, 0V ≤ V$_{NO}$ or V$_{NC}$ ≤ V$_+$, I$_{COM}$ = -100mA, Test Circuit 1 | | +25℃ | | 4.5 | 7 | Ω |
| | | | | Full | | | 8 | |
| On-Resistance Match between Channels | ΔR$_{ON}$ | V$_+$ = 4.5V, 0V ≤ V$_{NO}$ or V$_{NC}$ ≤ V$_+$, I$_{COM}$ = -100mA, Test Circuit 1 | | +25℃ | | 0.8 | 3.6 | Ω |
| | | | | Full | | | 4.2 | |
| On-Resistance Flatness | R$_{FLAT(ON)}$ | V$_+$ = 4.5V, 0V ≤ V$_{NO}$ or V$_{NC}$ ≤ V$_+$, I$_{COM}$ = -100mA, Test Circuit 1 | | +25℃ | | 3 | 3.7 | Ω |
| | | | | Full | | | 4.5 | |
| 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 | | Full | | | 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 | | Full | | | 1 | µA |
| **Digital Inputs** | | | | | | | | |
| 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$_{IN}$, V$_{\overline{EN}}$ = 0V or V$_+$ | | Full | | | 1 | µA |
| **Dynamic Characteristics** | | | | | | | | |
| Turn-On Time | t$_{ON}$ | V$_{NO}$ or V$_{NC}$ = 3V, C$_L$ = 35pF, R$_L$ = 300Ω, Test Circuit 2 | | +25℃ | | 40 | | ns |
| Turn-Off Time | t$_{OFF}$ | | | +25℃ | | 30 | | ns |
| Charge Injection Select Input to Common I/O | Q | V$_G$ = GND, R$_G$ = 0Ω, C$_L$ = 1nF, Q = C$_L$ × V$_{OUT}$, Test Circuit 3 | | +25℃ | | 20 | | pC |
| Break-Before-Make Time Delay | t$_D$ | V$_{NO}$ or V$_{NC}$ = 3V, R$_L$ = 300Ω, C$_L$ = 35pF, Test Circuit 4 | | +25℃ | | 18 | | ns |
| Off Isolation | O$_{ISO}$ | R$_L$ = 50Ω, Signal = 0dBm, Test Circuit 5 | 1MHz | +25℃ | | -70 | | dB |
| | | | 10MHz | +25℃ | | -50 | | |
| Channel-to-Channel Crosstalk | X$_{TALK}$ | R$_L$ = 50Ω, Signal = 0dBm, Test Circuit 6 | 1MHz | +25℃ | | -90 | | dB |
| | | | 10MHz | +25℃ | | -60 | | |
| -3dB Bandwidth | BW | R$_L$ = 50Ω, Signal = 0dBm, Test Circuit 7 | | +25℃ | | 300 | | MHz |
| Channel On Capacitance | C$_{ON}$ | | | +25℃ | | 64 | | pF |
| **Power Requirements** | | | | | | | | |
| Power Supply Range | V$_+$ | | | Full | 1.8 | | 5.5 | V |
| Power Supply Current | I$_+$ | V$_+$ = 5.5V, V$_S$, V$_{\overline{EN}}$ = 0V or V$_+$ | | Full | | | 1 | µA |

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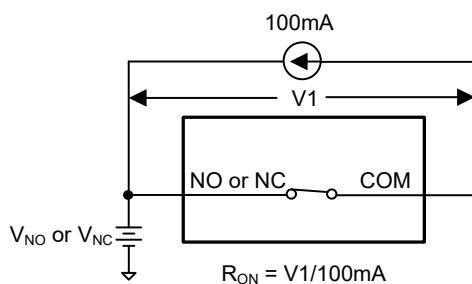
($V_+$ = +2.7V to +3.6V, $V_{IH}$ = +1.6V, $V_{IL}$ = +0.4V, Full = -40℃ to +85℃. Typical values are at $V_+$ = +3.0V, $T_A$ = +25℃, unless otherwise noted.)

| PARAMETER | SYMBOL | CONDITIONS | | TEMP | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|---|---|
| **Analog Switch** | | | | | | | | |
| Analog Signal Range | $V_{NO}$, $V_{NC}$, $V_{COM}$ | | | Full | 0 | | $V_+$ | V |
| On-Resistance | $R_{ON}$ | $V_+$ = 2.7V, 0V ≤ $V_{NO}$ or $V_{NC}$ ≤ $V_+$, $I_{COM}$ = -100mA, Test Circuit 1 | | +25℃ | | 11 | 15.5 | Ω |
| | | | | Full | | | 18.5 | |
| On-Resistance Match between Channels | $\Delta R_{ON}$ | $V_+$ = 2.7V, 0V ≤ $V_{NO}$ or $V_{NC}$ ≤ $V_+$, $I_{COM}$ = -100mA, Test Circuit 1 | | +25℃ | | 1.6 | 4 | Ω |
| | | | | Full | | | 4.6 | |
| On-Resistance Flatness | $R_{FLAT(ON)}$ | $V_+$ = 2.7V, 0V ≤ $V_{NO}$ or $V_{NC}$ ≤ $V_+$, $I_{COM}$ = -100mA, Test Circuit 1 | | +25℃ | | 7 | 9.4 | Ω |
| | | | | Full | | | 13 | |
| 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 | | Full | | | 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 | | Full | | | 1 | µA |
| **Digital Inputs** | | | | | | | | |
| 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, $V_{IN}$, $V_{\overline{EN}}$ = 0V or $V_+$ | | Full | | | 1 | µA |
| **Dynamic Characteristics** | | | | | | | | |
| Turn-On Time | $t_{ON}$ | $V_{NO}$ or $V_{NC}$ = 1.5V, $C_L$ = 35pF, $R_L$ = 300Ω, Test Circuit 2 | | +25℃ | | 48 | | ns |
| Turn-Off Time | $t_{OFF}$ | | | +25℃ | | 45 | | ns |
| Charge Injection Select Input to Common I/O | Q | $V_G$ = GND, $R_G$ = 0Ω, $C_L$ =1nF, Q = $C_L$ × $V_{OUT}$, Test Circuit 3 | | +25℃ | | 20 | | pC |
| Break-Before-Make Time Delay | $t_D$ | $V_{NO}$ or $V_{NC}$ = 1.5V, $R_L$ = 300Ω, $C_L$ = 35pF, Test Circuit 4 | | +25℃ | | 20 | | ns |
| Off Isolation | $O_{ISO}$ | $R_L$ = 50Ω, Signal = 0dBm, Test Circuit 5 | 1MHz | +25℃ | | -70 | | dB |
| | | | 10MHz | +25℃ | | -50 | | |
| Channel-to-Channel Crosstalk | $X_{TALK}$ | $R_L$ = 50 Ω, Signal = 0dBm, Test Circuit 6 | 1MHz | +25℃ | | -90 | | dB |
| | | | 10MHz | +25℃ | | -60 | | |
| -3dB Bandwidth | BW | $R_L$ = 50Ω, Signal = 0dBm, Test Circuit 7 | | +25℃ | | 300 | | MHz |
| Channel On Capacitance | $C_{ON}$ | | | +25℃ | | 64 | | pF |

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# TYPICAL PERFORMANCE CHARACTERISTICS

On Response vs. Frequency

$V_+ = +4.2V$
$T_A = +25℃$

On Response vs. Frequency

$V_+ = +3V$
$T_A = +25℃$

Response vs. Frequency

OFF-ISOLATION

CROSSTALK

$V_+ = +4.2V$
$T_A = +25℃$

Response vs. Frequency

OFF-ISOLATION

CROSSTALK

$V_+ = +3V$
$T_A = +25℃$
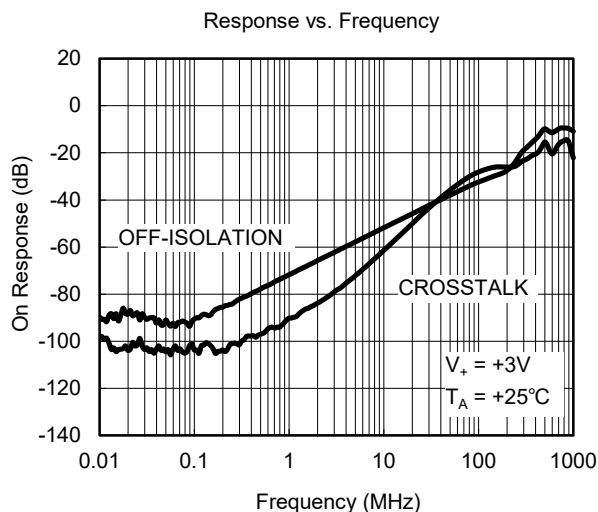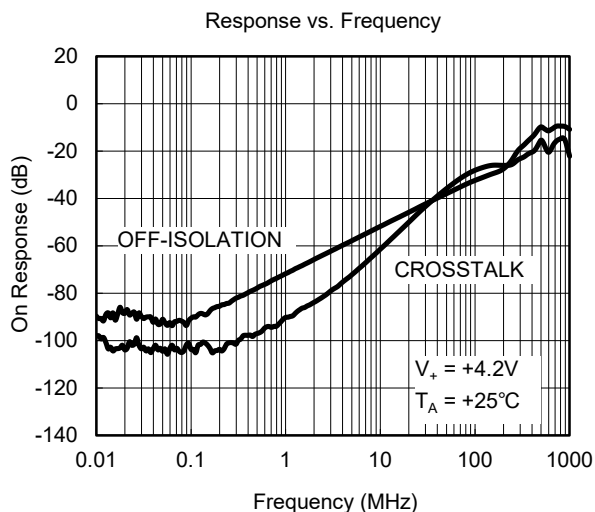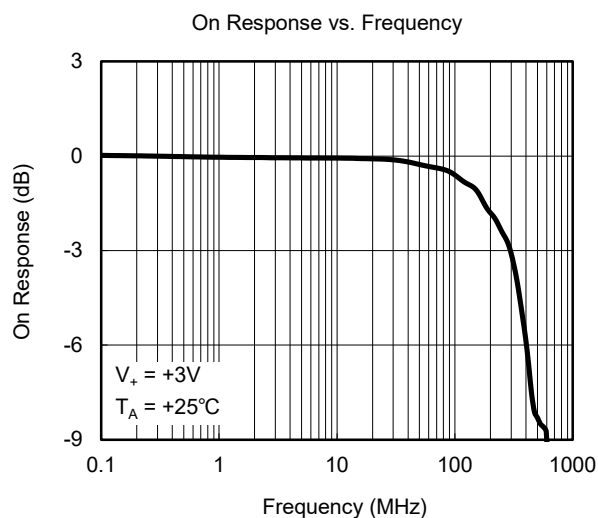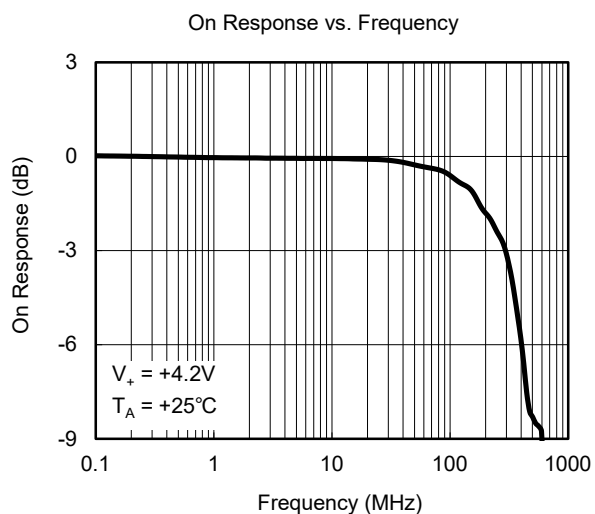
# TEST CIRCUITS



**Test Circuit 1. On-Resistance**

$R_{ON} = V1/100mA$
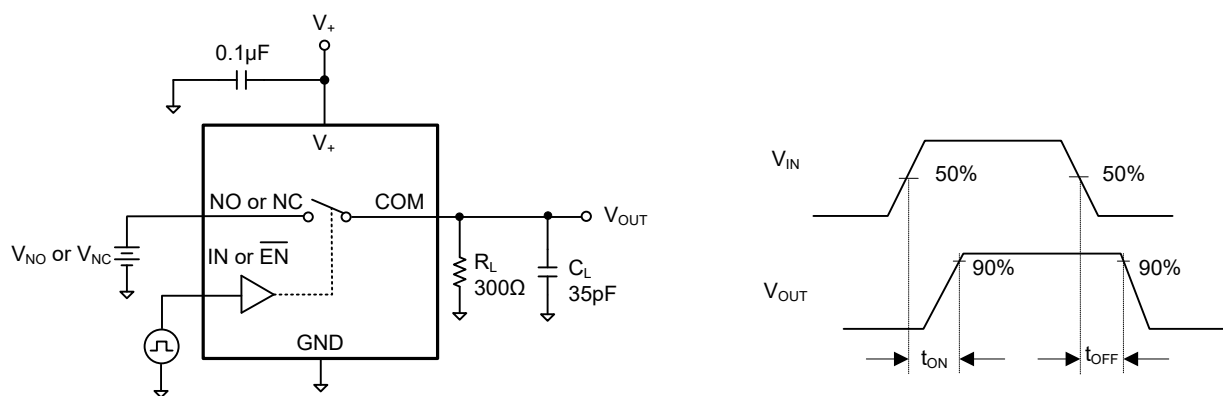


**Test Circuit 2. Switching Times**



$Q = C_L \times \Delta V_{OUT}$
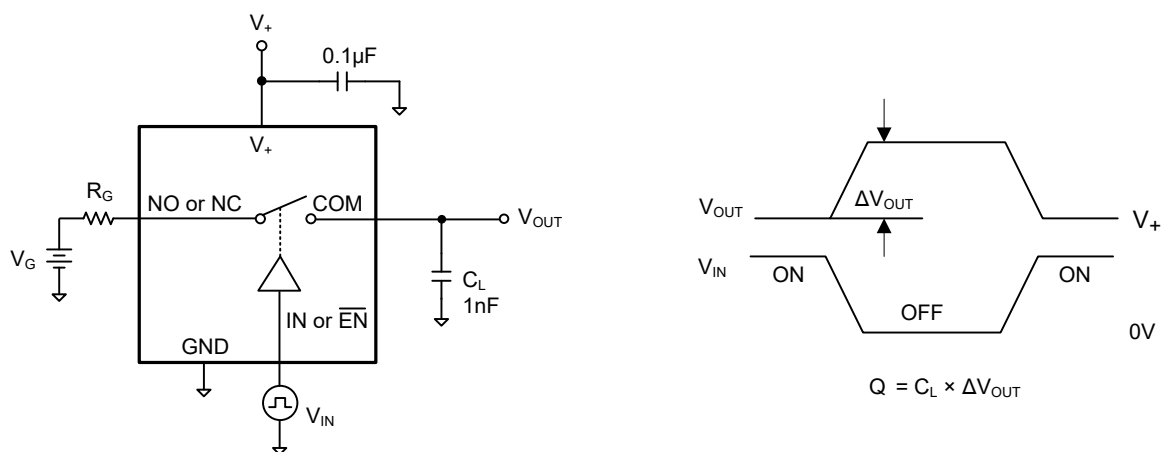
**Test Circuit 3. Charge Injection**

## TEST CIRCUITS (continued)
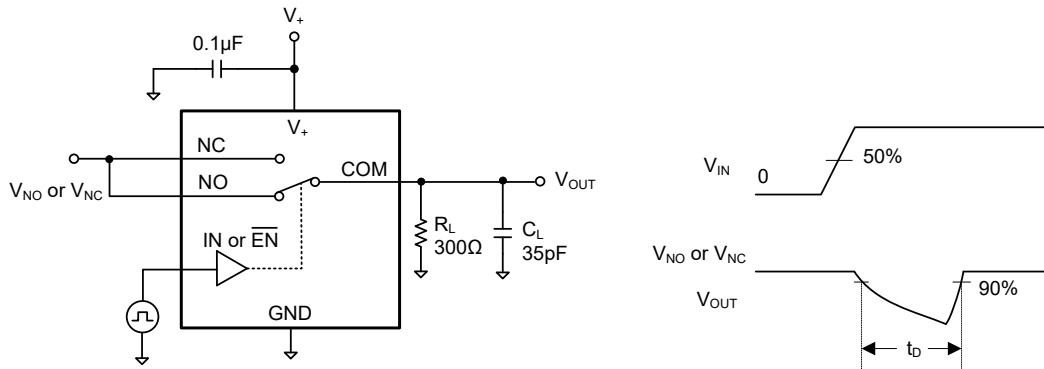


**Test Circuit 4. Break-Before-Make Time Delay (t_D)**
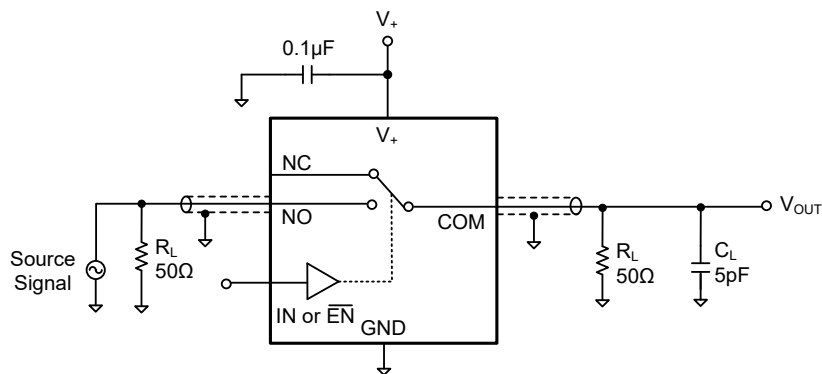


**Test Circuit 5. Off Isolation**
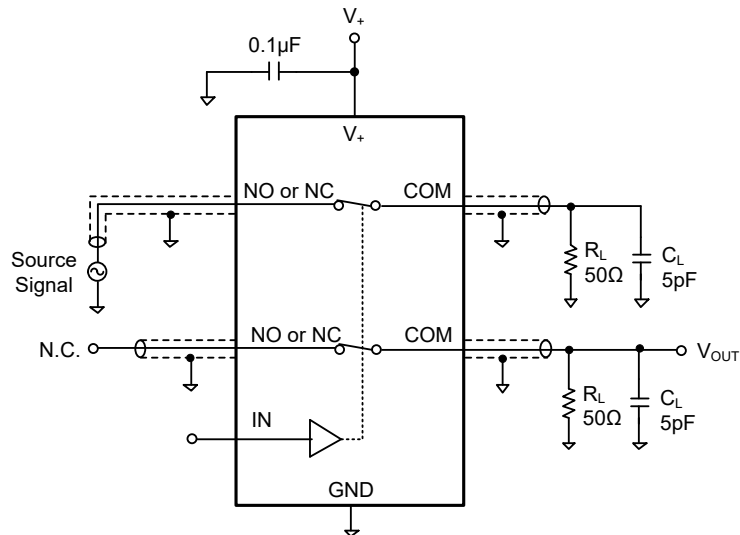


$$\text{Channel-to-Channel Crosstalk} = -20 \times \log \frac{V_{NO} \text{ or } V_{NC}}{V_{OUT}}$$

**Test Circuit 6. Channel-to-Channel Crosstalk**

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# TEST CIRCUITS (continued)
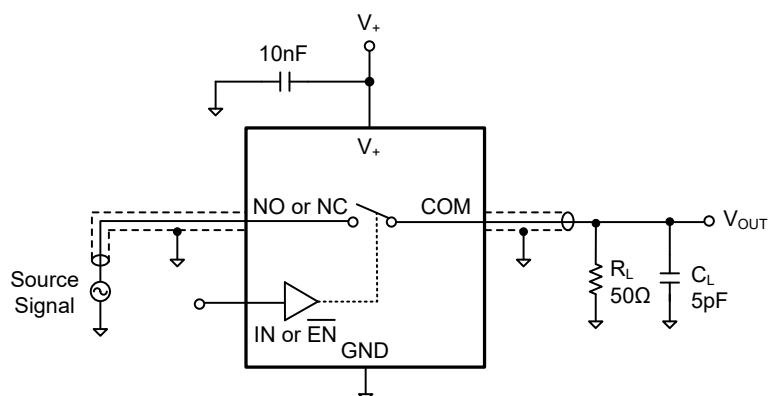


**Test Circuit 7. -3dB Bandwidth**

# REVISION HISTORY

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

## PACKAGE OUTLINE DIMENSIONS

### TQFN-2.6×1.8-16L

2.600± 0.050

1.800± 0.050

PIN #1 DOT
BY MARKING

**TOP VIEW**

0.400± 0.050
(× 15)

0.400 TYP

PIN #1 IDENTIFICATION
CHAMFER 0.100× 45°

1.200 Ref.

0.500± 0.050

N16

N2   N1

0.200± 0.050

**BOTTOM VIEW**

0.750± 0.050

0.050± 0.050
0.203 Ref.

**SIDE VIEW**

3.2

1.8

2.4

1.0

0.8

0.7

0.4

0.2

**RECOMMENDED LAND PATTERN**
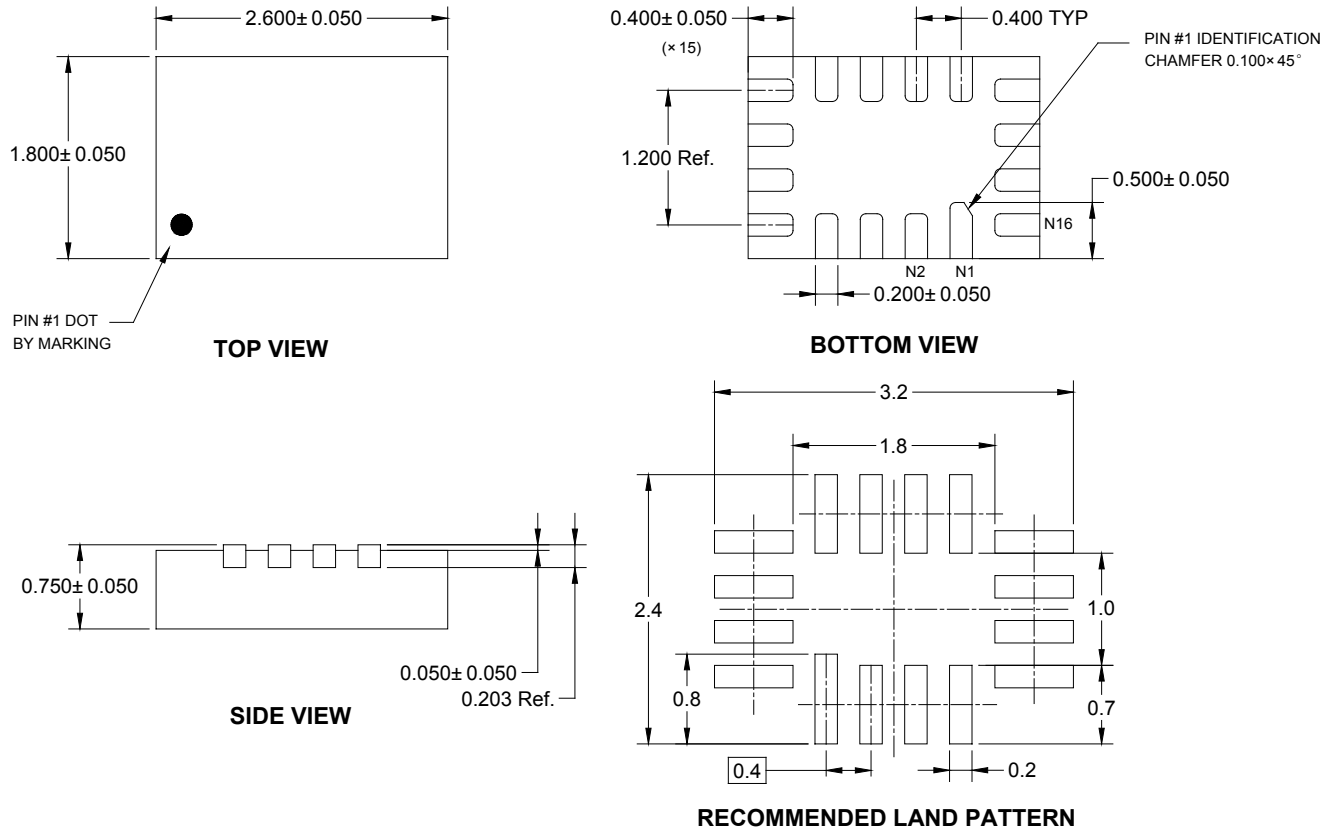
NOTE: All linear dimensions are in millimeters.

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## TAPE AND REEL INFORMATION

### REEL DIMENSIONS
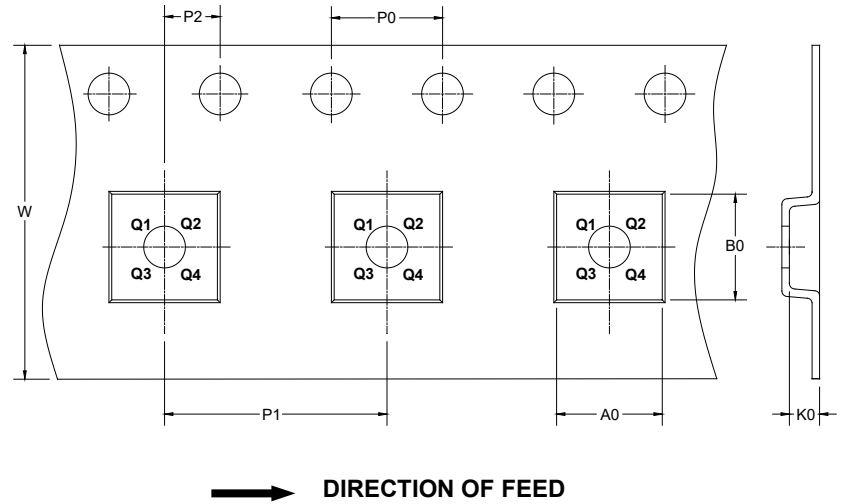


Reel Diameter

Reel Width (W1)

### TAPE DIMENSIONS



**DIRECTION OF FEED**

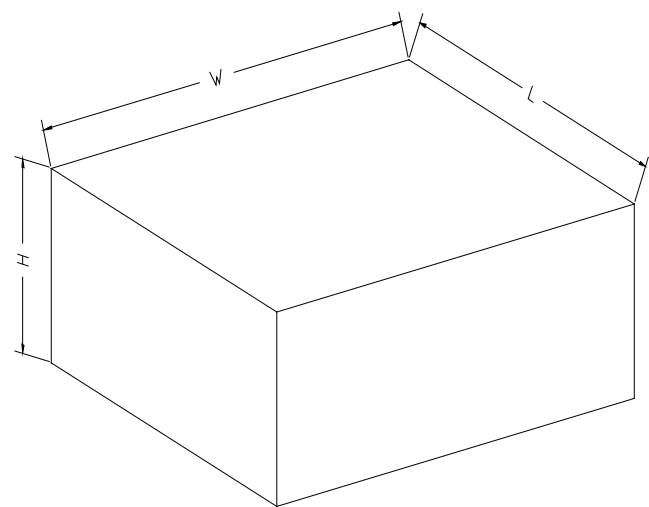NOTE: The picture is only for reference. Please make the object as the standard.

## 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-2.6×1.8-16L | 7″ | 9.0 | 2.01 | 2.81 | 0.93 | 4.0 | 4.0 | 2.0 | 8.0 | Q1 |

DD0001

## 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 |

DD0002

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