# SGM4515
# 1Ω/11Ω, High Voltage, Rail-to-Rail, Dual, SPDT Analog Switch

## GENERAL DESCRIPTION

The SGM4515 is a high voltage, rail-to-rail signal passing, dual single-pole/double-throw (SPDT) analog switch that is designed to operate for single power supply or dual power supply. Targeted applications include battery powered equipment that benefit from the SGM4515's low 1Ω (TYP) on-resistance for dual NO to COM switches, and 11Ω (TYP) on-resistance for dual NC to COM switches.

The SGM4515 is a committed dual single-pole/double-throw (SPDT) switches that consist of two normally open (NO) and two normally closed (NC) switches. This configuration can be used as a dual 2-to-1 multiplexer.

The SGM4515 can pass $V_{EE}$ to $V_{CC}$ wide range rail-to-rail signals with very low distortion.

The SGM4515 is available in Green TQFN-2.6×1.8-16L and SOIC-16 packages. It operates over an ambient temperature range of -40℃ to +85℃.

## FEATURES

- **Dual Supply Range: ±2.7V to ±12V**
- **Single Supply Range: 2.7V to 24V**
- **Low On-Resistance for Dual NO to COM Switches: 1Ω (TYP)**
- **On-Resistance for Dual NC to COM Switches: 11Ω (TYP)**
- **$V_{EE}$ to $V_{CC}$ Rail-to-Rail Low Distortion Signal Passing**
- **$V_{EE}$ Can be Connected to Negative Power Supply or GND**
- **Fast Switching Times**
- **High Off-Isolation**
- **Very Low Crosstalk**
- **1.8V Logic Compatible Control Pin**
- **Break-Before-Make Switching**
- **-40℃ to +85℃ Operating Temperature Range**
- **Available in Green TQFN-2.6×1.8-16L and SOIC-16 Packages**

## APPLICATIONS

Portable Instrumentation
Battery-Operated Equipment

# PACKAGE/ORDERING INFORMATION

| MODEL | PACKAGE DESCRIPTION | SPECIFIED TEMPERATURE RANGE | ORDERING NUMBER | PACKAGE MARKING | PACKING OPTION |
|---|---|---|---|---|---|
| SGM4515 | TQFN-2.6×1.8-16L | -40℃ to +85℃ | SGM4515YTQA16G/TR | 4515<br>XXXXX | Tape and Reel, 3000 |
| | SOIC-16 | -40℃ to +85℃ | SGM4515YS16G/TR | SGM4515YS16<br>XXXXX | Tape and Reel, 2500 |

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

$V_{CC}$ to $V_{EE}$ ..... 0V to 26.4V
IN1, IN2, EN to GND ..... 0V to 6V
Analog Voltage Range (1) ..... ($V_{EE}$ - 0.3V) to ($V_{CC}$ + 0.3V)
Continuous Current from NO to COM ..... ±200mA
Continuous Current from NC to COM ..... ±50mA
Peak Current from NO to COM ..... ±250mA
Peak Current from NC to COM ..... ±80mA
I/O Clamp Current ($V_I$ < 0) ..... -30mA
Junction Temperature ..... +150℃
Storage Temperature Range ..... -65℃ to +150℃
Lead Temperature (Soldering, 10s) ..... +260℃
ESD Susceptibility
HBM ..... 7000V
MM ..... 300V
CDM ..... 1000V

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

## RECOMMENDED OPERATING CONDITIONS

Dual Supply Range ..... ±2.7V to ±12V
Single Supply Range ..... 2.7V to 24V
Operating Temperature Range ..... -40℃ to +85℃

## 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

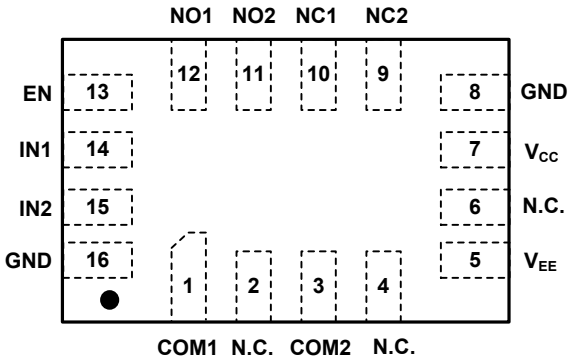
This integrated circuit can be damaged by ESD if you don't pay attention to ESD protection. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance 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.

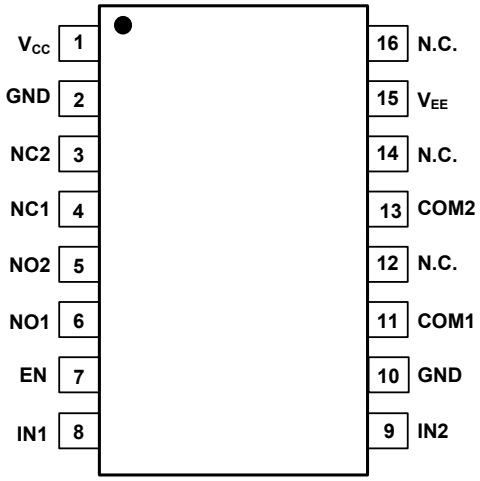
## PIN CONFIGURATIONS

(TOP VIEW)




TQFN-2.6×1.8-16L

(TOP VIEW)




SOIC-16

## PIN DESCRIPTION

| PIN | | NAME | FUNCTION |
|---|---|---|---|
| TQFN-2.6×1.8-16L | SOIC-16 | | |
| 1 | 11 | COM1 | Common Terminal. |
| 2, 4, 6 | 12, 14, 16 | N.C. | No Connection. |
| 3 | 13 | COM2 | Common Terminal. |
| 5 | 15 | $V_{EE}$ | The Low Side Power Supply of the SGM4515. Connect it to negative power supply for dual power supply application or connect it to GND for single power supply application. |
| 7 | 1 | $V_{CC}$ | Power Supply. |
| 8, 16 | 2, 10 | GND | Ground. |
| 9 | 3 | NC2 | Normally-Closed Terminal. |
| 10 | 4 | NC1 | Normally-Closed Terminal. |
| 11 | 5 | NO2 | Normally-Open Terminal. |
| 12 | 6 | NO1 | Normally-Open Terminal. |
| 13 | 7 | EN | Enable Control. When EN = “Low”, both NC and NO will be disconnected with COM, and the SGM4515 will be in shutdown state. When EN = “High”, the SGM4515 will be in working state, and NC or NO will be connected with COM depending on the logical state of IN. |
| 14 | 8 | IN1 | Digital Control Pin to Connect the COM Terminal to the NO or NC Terminal. |
| 15 | 9 | IN2 | Digital Control Pin to Connect the COM Terminal to the NO or NC Terminal. |

NOTE: NO, NC and COM terminals may be an input or output.

## FUNCTION TABLE

**Table 1. Function Table of Switch 1:**

| EN | IN1 | COM1 |
|---|---|---|
| 0 | X | COM1 is disconnected with NO1 and NC1 |
| 1 | 0 | COM1 = NC1 |
| 1 | 1 | COM1 = NO1 |

**Table 2. Function Table of Switch 2:**

| EN | IN2 | COM2 |
|---|---|---|
| 0 | X | COM2 is disconnected with NO2 and NC2 |
| 1 | 0 | COM2 = NC2 |
| 1 | 1 | COM2 = NO2 |

## ELECTRICAL CHARACTERISTICS

($V_{CC}$ = 5.0V, $V_{EE}$ = -5.0V, GND = 0V, Full = -40℃ to +85℃. Typical values are at $T_A$ = +25℃, unless otherwise noted.)

| PARAMETER | | SYMBOL | CONDITIONS | TEMP | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|---|---|
| **ANALOG SWITCH** | | | | | | | | |
| Analog Signal Range | | $V_{NO}$, $V_{NC}$, $V_{COM}$ | | Full | $V_{EE}$ | | $V_{CC}$ | V |
| On-Resistance | NO to COM | $R_{ON}$ | $V_{EE} \le V_{NO} \le V_{CC}$ - 3V, $I_{COM}$ = -50mA, Test Circuit 1 | +25℃ | | 1 | 1.25 | Ω |
| | | | | Full | | | 1.7 | |
| | NC to COM | | $V_{EE}$ + 3V ≤ $V_{NC} \le V_{CC}$ - 3V, $I_{COM}$ = -10mA, Test Circuit 1 | +25℃ | | 11 | 13 | Ω |
| | | | | Full | | | 18 | |
| On-Resistance Match Between Channels | NO to COM | $\Delta R_{ON}$ | $V_{EE} \le V_{NO} \le V_{CC}$ - 3V, $I_{COM}$ = -50mA, Test Circuit 1 | +25℃ | | 0.03 | 0.09 | Ω |
| | | | | Full | | | 0.12 | |
| | NC to COM | | $V_{EE}$ + 3V ≤ $V_{NC} \le V_{CC}$ - 3V, $I_{COM}$ = -10mA, Test Circuit 1 | +25℃ | | 0.1 | 0.4 | Ω |
| | | | | Full | | | 0.45 | |
| On-Resistance Flatness | NO to COM | $R_{FLAT(ON)}$ | $V_{EE} \le V_{NO} \le V_{CC}$ - 3V, $I_{COM}$ = -10mA, Test Circuit 1 | +25℃ | | 0.05 | 0.1 | Ω |
| | | | | Full | | | 0.13 | |
| | NC to COM | | $V_{EE}$ + 3V ≤ $V_{NC} \le V_{CC}$ - 3V, $I_{COM}$ = -10mA, Test Circuit 1 | +25℃ | | 0.15 | 0.5 | Ω |
| | | | | Full | | | 0.55 | |
| Source OFF Leakage Current | | $I_{NC(OFF)}$, $I_{NO(OFF)}$ | $V_{NO}$ or $V_{NC}$ = -4.5V, 4.5V, $V_{COM}$ = 4.5V, -4.5V | +25℃ | | 0.01 | 0.4 | μA |
| | | | | Full | | | 1 | |
| Channel ON Leakage Current | | $I_{NC(ON)}$, $I_{NO(ON)}$, $I_{COM(ON)}$ | $V_{NO}$ or $V_{NC}$ = -4.5V, 4.5V, $V_{COM}$ = floating, or $V_{NO}$ or $V_{NC}$ = floating, $V_{COM}$ = -4.5V, 4.5V | +25℃ | | 0.01 | 0.4 | μA |
| | | | | Full | | | 1 | |
| **DIGITAL INPUTS** | | | | | | | | |
| Input High Voltage | | $V_{INH}$ | | Full | 1.4 | | | V |
| Input Low Voltage | | $V_{INL}$ | | Full | | | 0.4 | V |
| Pull Down Resistor | | $R_{PULL\ DOWN}$ | | +25℃ | | 600 | | kΩ |
| **DYNAMIC CHARACTERISTICS** | | | | | | | | |
| Turn-On Time | | $t_{ON}$ | $V_{NO}$ or $V_{NC}$ = 1.0V, $R_L$ = 50Ω, $C_L$ = 35pF, Test Circuit 2 | +25℃ | | 200 | | ns |
| Turn-Off Time | | $t_{OFF}$ | $V_{NO}$ or $V_{NC}$ = 1.0V, $R_L$ = 50Ω, $C_L$ = 35pF, Test Circuit 2 | +25℃ | | 60 | | ns |
| Break-Before-Make Time Delay | | $t_D$ | $V_{NO1}$ or $V_{NC1}$ = $V_{NO2}$ or $V_{NC2}$ = 1.0V, $R_L$ = 50Ω, $C_L$ = 35pF, Test Circuit 3 | +25℃ | | 100 | | ns |
| Off Isolation | NO to COM | $O_{ISO}$ | f = 1kHz, $R_L$ = 32Ω, Signal = 0dBm, Test Circuit 4 | +25℃ | | -120 | | dB |
| | | | f = 1MHz, $R_L$ = 50Ω, $C_L$ = 5pF, Signal = 0dBm, Test Circuit 4 | | | -80 | | |
| | NC to COM | | f = 1kHz, $R_L$ = 32Ω, Signal = 0dBm, Test Circuit 4 | | | -130 | | |
| | | | f = 1MHz, $R_L$ = 50Ω, $C_L$ = 5pF, Signal = 0dBm, Test Circuit 4 | | | -90 | | |
| Channel-to-Channel Crosstalk | | $X_{TALK}$ | f = 1kHz, $R_L$ = 32Ω, Signal = 0dBm, Test Circuit 5 | +25℃ | | -110 | | dB |
| | | | f = 1MHz, $R_L$ = 50Ω, $C_L$ = 5pF, Signal = 0dBm, Test Circuit 5 | | | -75 | | |
| -3dB Bandwidth | NO to COM | BW | Signal = 0dBm, $R_L$ = 50Ω, $C_L$ = 5pF, Test Circuit 6 | +25℃ | | 160 | | MHz |
| | NC to COM | | | | | 130 | | |
| Channel ON Capacitance | NO to COM | $C_{ON}$ | | +25℃ | | 30 | | pF |
| | NC to COM | | | | | 40 | | |

## ELECTRICAL CHARACTERISTICS (continued)

($V_{CC}$ = 5.0V, $V_{EE}$ = -5.0V, GND = 0V, Full = -40℃ to +85℃. Typical values are at $T_A$ = +25℃, unless otherwise noted.)

| PARAMETER | | SYMBOL | CONDITIONS | | TEMP | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|---|---|---|
| **DYNAMIC CHARACTERISTICS** | | | | | | | | | |
| Charge Injection | NO to COM | Q | $V_G$ = GND, $R_G$ = 0Ω, $C_L$ = 1.0nF, Test Circuit 7 | | +25℃ | | 600 | | pC |
| | NC to COM | | | | | | 600 | | |
| Total Harmonic Distortion | NO to COM | THD | A-Weighting, Test Circuit 8 | $V_{NO}$ = 2$V_{PP}$, $R_L$ = 600Ω | +25℃ | | -115 | | % |
| | | | | $V_{NO}$ = 2$V_{PP}$, $R_L$ = 32Ω | | | -113 | | |
| | | | | $V_{NO}$ = 1$V_{PP}$, $R_L$ = 600Ω | | | -110 | | |
| | | | | $V_{NO}$ = 1$V_{PP}$, $R_L$ = 32Ω | | | -110 | | |
| | | | | $V_{NO}$ = 0.5$V_{PP}$, $R_L$ = 600Ω | | | -107 | | |
| | | | | $V_{NO}$ = 0.5$V_{PP}$, $R_L$ = 32Ω | | | -105 | | |
| | NC to COM | | | $V_{NC}$ = 2$V_{PP}$, $R_L$ = 600Ω | | | -113 | | |
| | | | | $V_{NC}$ = 2$V_{PP}$, $R_L$ = 32Ω | | | -93 | | |
| | | | | $V_{NC}$ = 1$V_{PP}$, $R_L$ = 600Ω | | | -110 | | |
| | | | | $V_{NC}$ = 1$V_{PP}$, $R_L$ = 32Ω | | | -103 | | |
| | | | | $V_{NC}$ = 0.5$V_{PP}$, $R_L$ = 600Ω | | | -106 | | |
| | | | | $V_{NC}$ = 0.5$V_{PP}$, $R_L$ = 32Ω | | | -102 | | |
| **POWER REQUIREMENTS** | | | | | | | | | |
| Power Supply Current | | $I_{CC}$ | $V_{IN}$ = 0V or 1.4V, $V_{EN}$ = 1.4V | | +25℃ | | 70 | 82 | μA |
| | | | | | Full | | | 85 | |
| | | $I_{EE}$ | | | +25℃ | | -40 | -49 | |
| | | | | | Full | | | -60 | |
| Power Supply Current in Shutdown State | | $I_{CC}$ | $V_{IN}$ = 0V or 1.4V, $V_{EN}$ = 0V | | +25℃ | | 0.3 | 0.8 | μA |
| | | | | | Full | | | 1.2 | |

## ELECTRICAL CHARACTERISTICS (continued)

($V_{CC}$ = 12V, $V_{EE}$ = -12V, GND = 0V, Full = -40℃ to +85℃. Typical values are at $T_A$ = +25℃, unless otherwise noted.)

| PARAMETER | | SYMBOL | CONDITIONS | TEMP | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|---|---|
| **ANALOG SWITCH** | | | | | | | | |
| Analog Signal Range | | $V_{NO}$, $V_{NC}$, $V_{COM}$ | | Full | $V_{EE}$ | | $V_{CC}$ | V |
| On-Resistance | NO to COM | $R_{ON}$ | $V_{EE} \le V_{NO} \le V_{CC}$ - 3V, $I_{COM}$ = -50mA, Test Circuit 1 | +25℃ | | 1 | 1.25 | Ω |
| | | | | Full | | | 1.7 | |
| | NC to COM | | $V_{EE}$ + 3V ≤ $V_{NC} \le V_{CC}$ - 3V, $I_{COM}$ = -10mA, Test Circuit 1 | +25℃ | | 11 | 13 | Ω |
| | | | | Full | | | 18 | |
| On-Resistance Match Between Channels | NO to COM | $\Delta R_{ON}$ | $V_{EE} \le V_{NO} \le V_{CC}$ - 3V, $I_{COM}$ = -50mA, Test Circuit 1 | +25℃ | | 0.03 | 0.09 | Ω |
| | | | | Full | | | 0.12 | |
| | NC to COM | | $V_{EE}$ + 3V ≤ $V_{NC} \le V_{CC}$ - 3V, $I_{COM}$ = -10mA, Test Circuit 1 | +25℃ | | 0.1 | 0.4 | Ω |
| | | | | Full | | | 0.45 | |
| On-Resistance Flatness | NO to COM | $R_{FLAT(ON)}$ | $V_{EE} \le V_{NO} \le V_{CC}$ - 3V, $I_{COM}$ = -10mA, Test Circuit 1 | +25℃ | | 0.05 | 0.1 | Ω |
| | | | | Full | | | 0.13 | |
| | NC to COM | | $V_{EE}$ + 3V ≤ $V_{NC} \le V_{CC}$ - 3V, $I_{COM}$ = -10mA, Test Circuit 1 | +25℃ | | 0.15 | 0.5 | Ω |
| | | | | Full | | | 0.55 | |
| Source OFF Leakage Current | | $I_{NC(OFF)}$, $I_{NO(OFF)}$ | $V_{NO}$ or $V_{NC}$ = -11.5V, 11.5V, $V_{COM}$ = 11.5V, -11.5V | +25℃ | | 0.05 | 1 | μA |
| | | | | Full | | | 3 | |
| Channel ON Leakage Current | | $I_{NC(ON)}$, $I_{NO(ON)}$, $I_{COM(ON)}$ | $V_{NO}$ or $V_{NC}$ = -11.5V, 11.5V, $V_{COM}$ = floating, or $V_{NO}$ or $V_{NC}$ = floating, $V_{COM}$ = -11.5V, 11.5V | +25℃ | | 0.05 | 1 | μA |
| | | | | Full | | | 3 | |
| **DIGITAL INPUTS** | | | | | | | | |
| Input High Voltage | | $V_{INH}$ | | Full | 1.4 | | | V |
| Input Low Voltage | | $V_{INL}$ | | Full | | | 0.4 | V |
| Pull Down Resistor | | $R_{PULL\ DOWN}$ | | +25℃ | | 600 | | kΩ |
| **DYNAMIC CHARACTERISTICS** | | | | | | | | |
| Turn-On Time | | $t_{ON}$ | $V_{NO}$ or $V_{NC}$ = 1.0V, $R_L$ = 50Ω, $C_L$ = 35pF, Test Circuit 2 | +25℃ | | 200 | | ns |
| Turn-Off Time | | $t_{OFF}$ | $V_{NO}$ or $V_{NC}$ = 1.0V, $R_L$ = 50Ω, $C_L$ = 35pF, Test Circuit 2 | +25℃ | | 60 | | ns |
| Break-Before-Make Time Delay | | $t_D$ | $V_{NO1}$ or $V_{NC1}$ = $V_{NO2}$ or $V_{NC2}$ = 1.0V, $R_L$ = 50Ω, $C_L$ = 35pF, Test Circuit 3 | +25℃ | | 100 | | ns |
| Off Isolation | NO to COM | $O_{ISO}$ | f = 1kHz, $R_L$ = 32Ω, Signal = 0dBm, Test Circuit 4 | +25℃ | | -120 | | dB |
| | | | f = 1MHz, $R_L$ = 50Ω, $C_L$ = 5pF, Signal = 0dBm, Test Circuit 4 | | | -80 | | |
| | NC to COM | | f = 1kHz, $R_L$ = 32Ω, Signal = 0dBm, Test Circuit 4 | | | -130 | | |
| | | | f = 1MHz, $R_L$ = 50Ω, $C_L$ = 5pF, Signal = 0dBm, Test Circuit 4 | | | -90 | | |
| Channel-to-Channel Crosstalk | | $X_{TALK}$ | f = 1kHz, $R_L$ = 32Ω, Signal = 0dBm, Test Circuit 5 | +25℃ | | -110 | | dB |
| | | | f = 1MHz, $R_L$ = 50Ω, $C_L$ = 5pF, Signal = 0dBm, Test Circuit 5 | | | -75 | | |
| -3dB Bandwidth | NO to COM | BW | Signal = 0dBm, $R_L$ = 50Ω, $C_L$ = 5pF, Test Circuit 6 | +25℃ | | 160 | | MHz |
| | NC to COM | | | | | 130 | | |
| Channel ON Capacitance | NO to COM | $C_{ON}$ | | +25℃ | | 30 | | pF |
| | NC to COM | | | | | 40 | | |

## ELECTRICAL CHARACTERISTICS (continued)

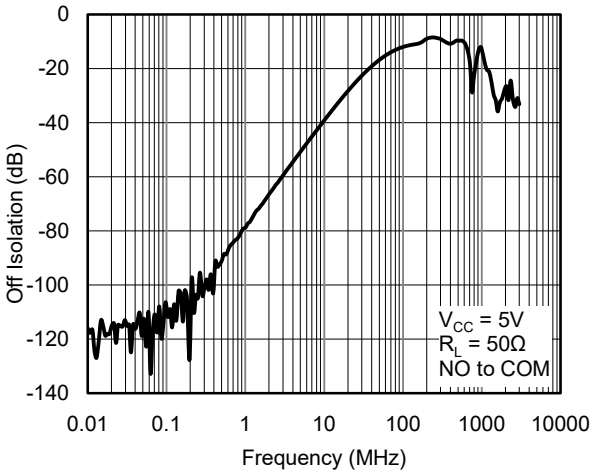
($V_{CC}$ = 12V, $V_{EE}$ = -12V, GND = 0V, Full = -40℃ to +85℃. Typical values are at $T_A$ = +25℃, unless otherwise noted.)

| PARAMETER | | SYMBOL | CONDITIONS | | TEMP | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|---|---|---|
| **DYNAMIC CHARACTERISTICS** | | | | | | | | | |
| Charge Injection | NO to COM | Q | $V_G$ = GND, $R_G$ = 0Ω, $C_L$ = 1.0nF, Test Circuit 7 | | +25℃ | | 800 | | pC |
| | NC to COM | | | | | | 800 | | |
| Total Harmonic Distortion | NO to COM | THD | A-Weighting, Test Circuit 8 | $V_{NO}$ = 2$V_{PP}$, $R_L$ = 600Ω | +25℃ | | -115 | | dB |
| | | | | $V_{NO}$ = 2$V_{PP}$, $R_L$ = 32Ω | | | -113 | | |
| | | | | $V_{NO}$ = 1$V_{PP}$, $R_L$ = 600Ω | | | -110 | | |
| | | | | $V_{NO}$ = 1$V_{PP}$, $R_L$ = 32Ω | | | -110 | | |
| | | | | $V_{NO}$ = 0.5$V_{PP}$, $R_L$ = 600Ω | | | -107 | | |
| | | | | $V_{NO}$ = 0.5$V_{PP}$, $R_L$ = 32Ω | | | -105 | | |
| | NC to COM | | | $V_{NC}$ = 2$V_{PP}$, $R_L$ = 600Ω | | | -113 | | |
| | | | | $V_{NC}$ = 2$V_{PP}$, $R_L$ = 32Ω | | | -93 | | |
| | | | | $V_{NC}$ = 1$V_{PP}$, $R_L$ = 600Ω | | | -110 | | |
| | | | | $V_{NC}$ = 1$V_{PP}$, $R_L$ = 32Ω | | | -103 | | |
| | | | | $V_{NC}$ = 0.5$V_{PP}$, $R_L$ = 600Ω | | | -106 | | |
| | | | | $V_{NC}$ = 0.5$V_{PP}$, $R_L$ = 32Ω | | | -102 | | |
| **POWER REQUIREMENTS** | | | | | | | | | |
| Power Supply Current | | $I_{CC}$ | $V_{IN}$ = 0V or 1.4V, $V_{EN}$ = 1.4V | | +25℃ | | 70 | 85 | μA |
| | | | | | Full | | | 90 | |
| | | $I_{EE}$ | | | +25℃ | | -40 | -49 | |
| | | | | | Full | | | -60 | |
| Power Supply Current in Shutdown State | | $I_{CC}$ | $V_{IN}$ = 0V or 1.4V, $V_{EN}$ = 0V | | +25℃ | | 0.5 | 1.2 | μA |
| | | | | | Full | | | 1.5 | |

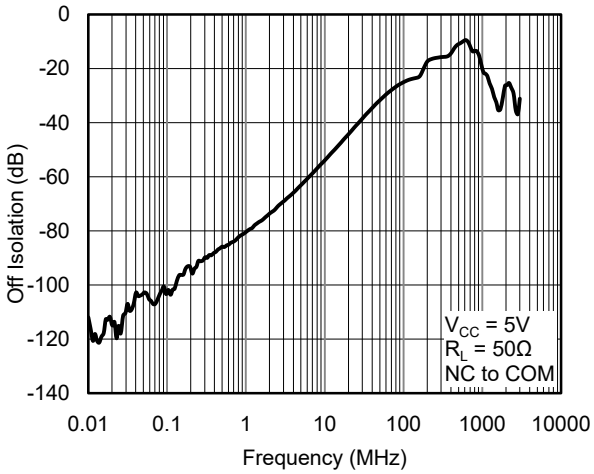
## TYPICAL PERFORMANCE CHARACTERISTICS

$T_A$ = +25℃, unless otherwise noted.

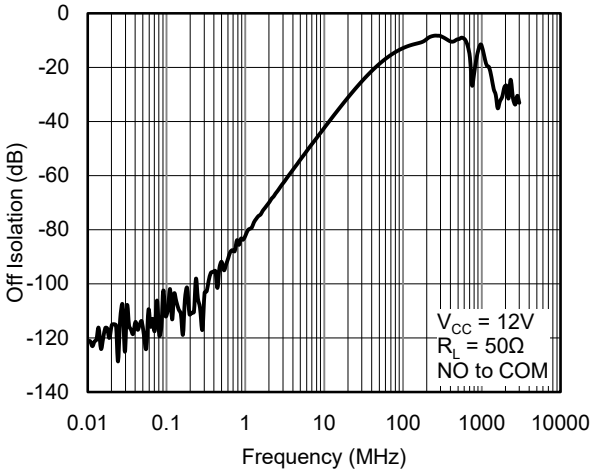
Off Isolation vs. Frequency



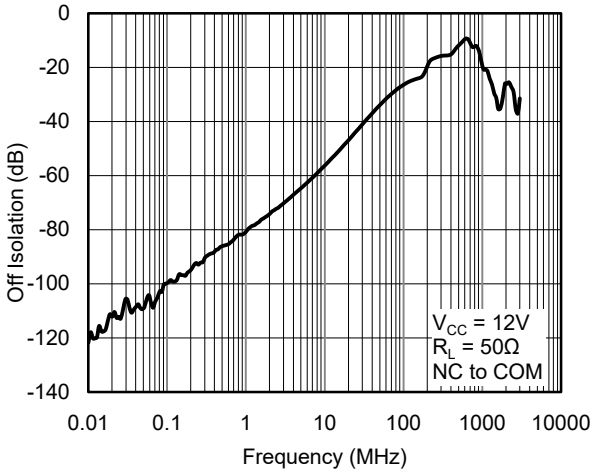

Off Isolation vs. Frequency



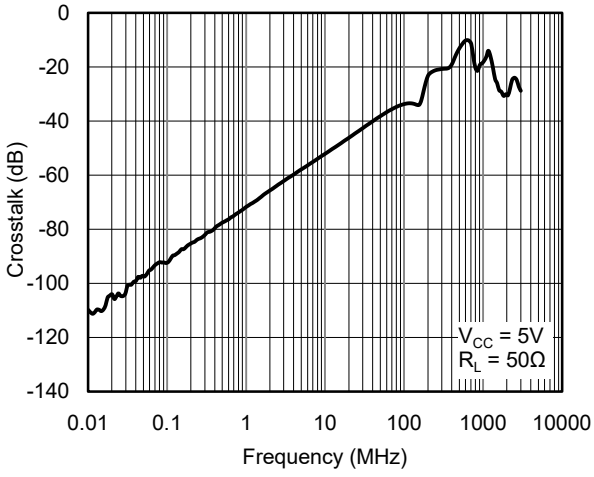

Off Isolation vs. Frequency



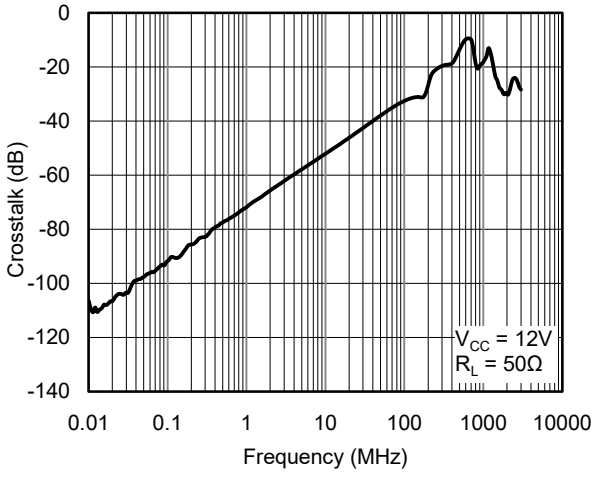

Off Isolation vs. Frequency




Crosstalk vs. Frequency



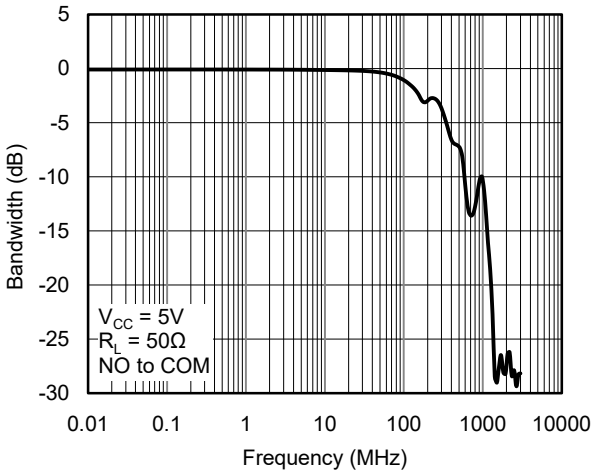

Crosstalk vs. Frequency



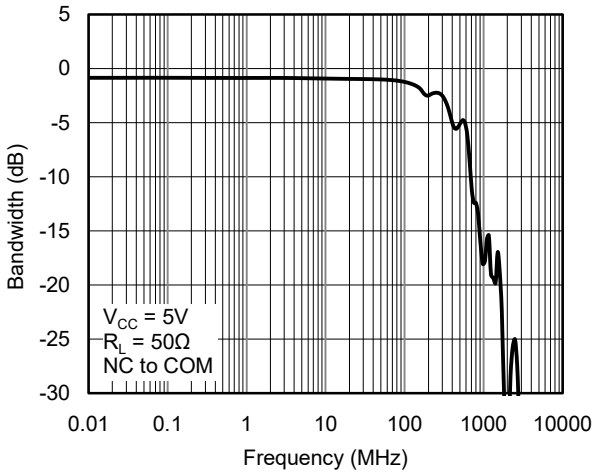
## TYPICAL PERFORMANCE CHARACTERISTICS (continued)

$T_A$ = +25℃, unless otherwise noted.

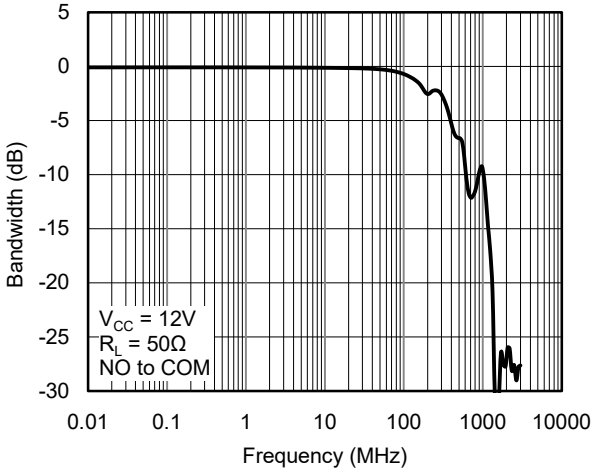
Bandwidth vs. Frequency



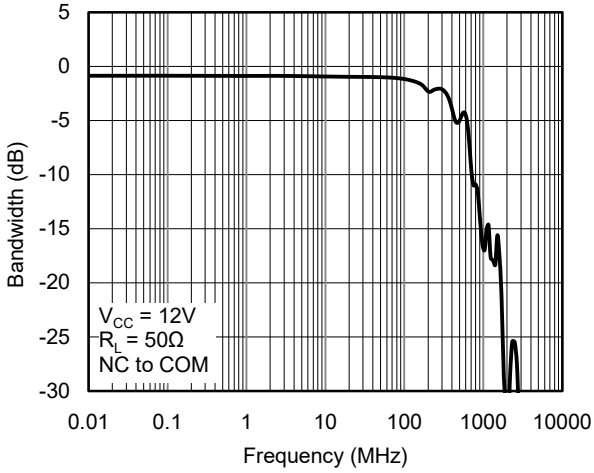

Bandwidth vs. Frequency



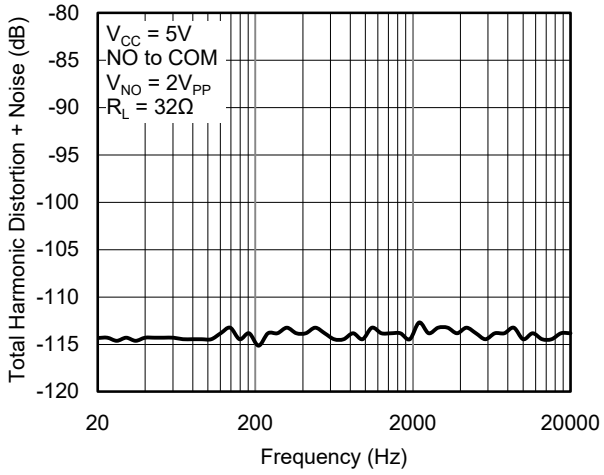

Bandwidth vs. Frequency



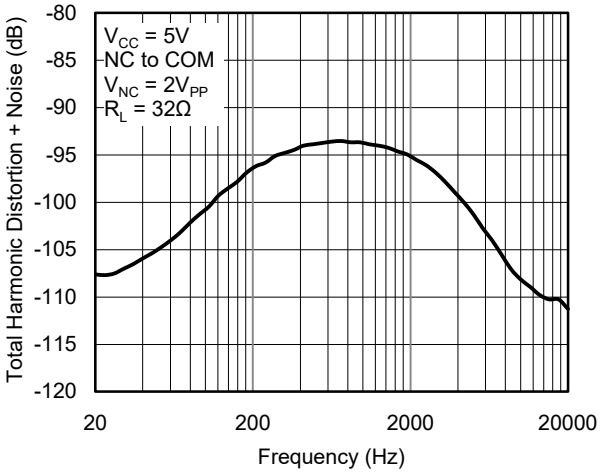

Bandwidth vs. Frequency




Total Harmonic Distortion vs. Frequency



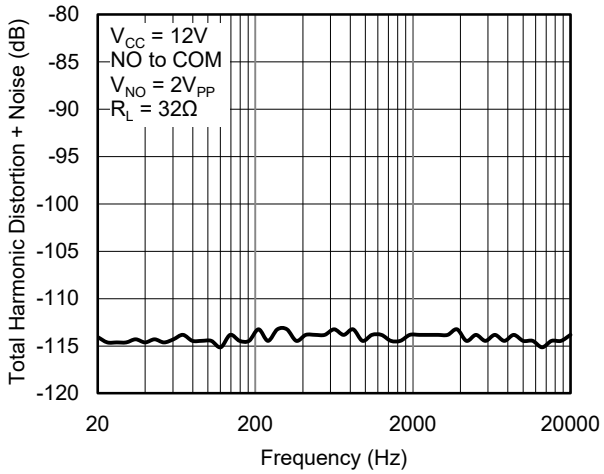

Total Harmonic Distortion vs. Frequency



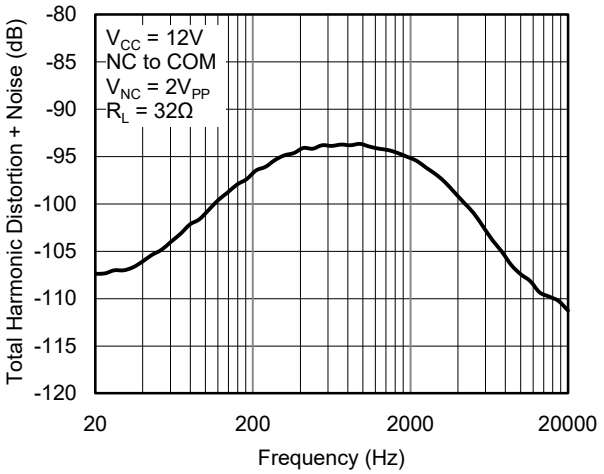
## TYPICAL PERFORMANCE CHARACTERISTICS (continued)

$T_A$ = +25℃, unless otherwise noted.

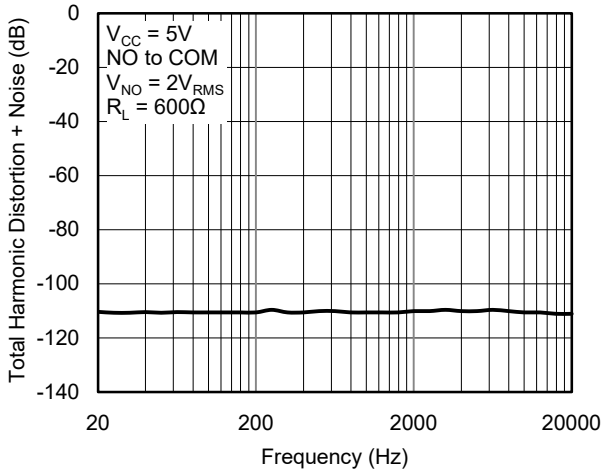
Total Harmonic Distortion vs. Frequency



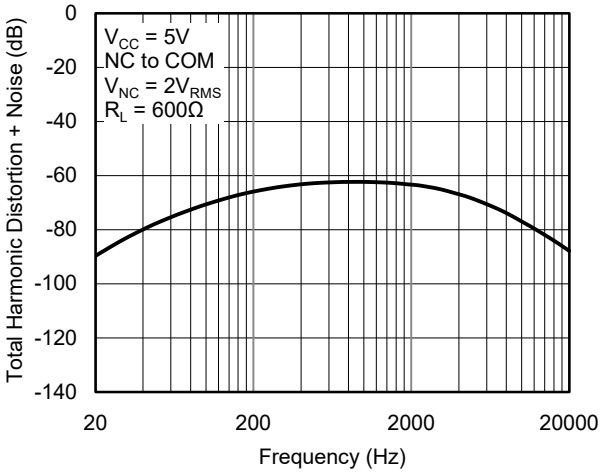

Total Harmonic Distortion vs. Frequency



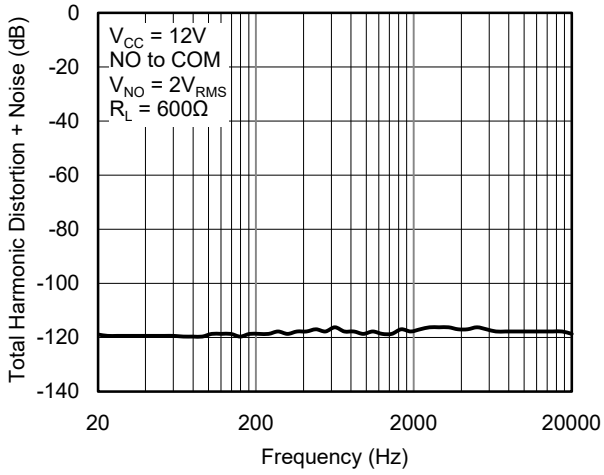

Total Harmonic Distortion vs. Frequency



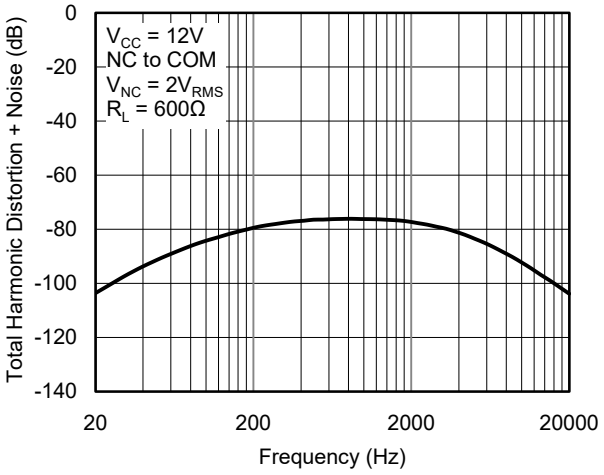

Total Harmonic Distortion vs. Frequency




Total Harmonic Distortion vs. Frequency



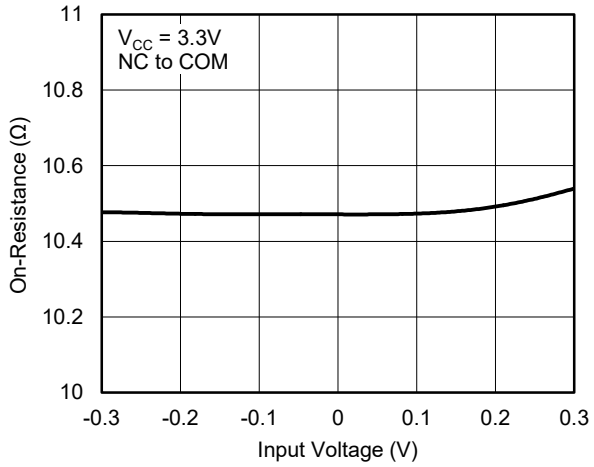

Total Harmonic Distortion vs. Frequency



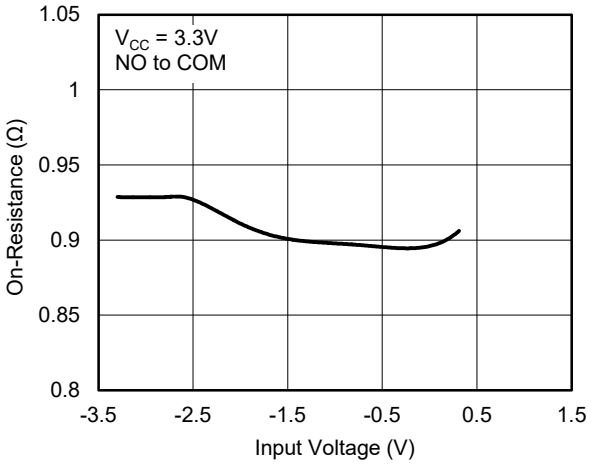
## TYPICAL PERFORMANCE CHARACTERISTICS (continued)

$T_A$ = +25℃, unless otherwise noted.

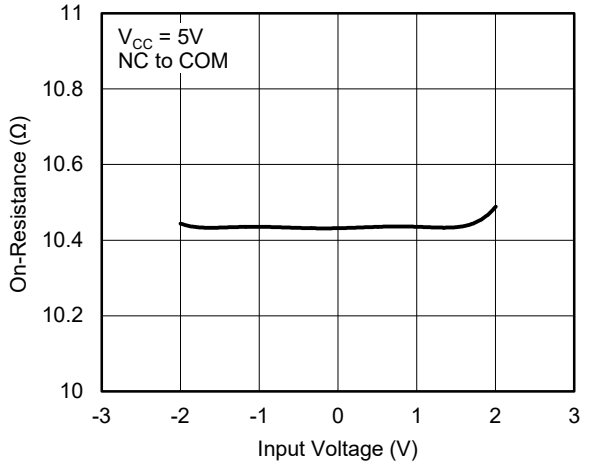
On-Resistance vs. Input Voltage



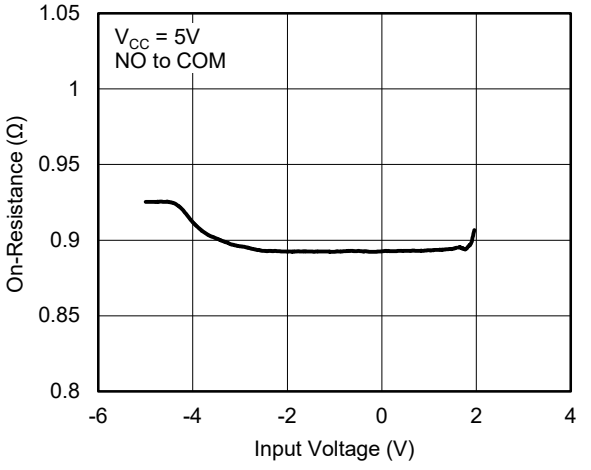

On-Resistance vs. Input Voltage



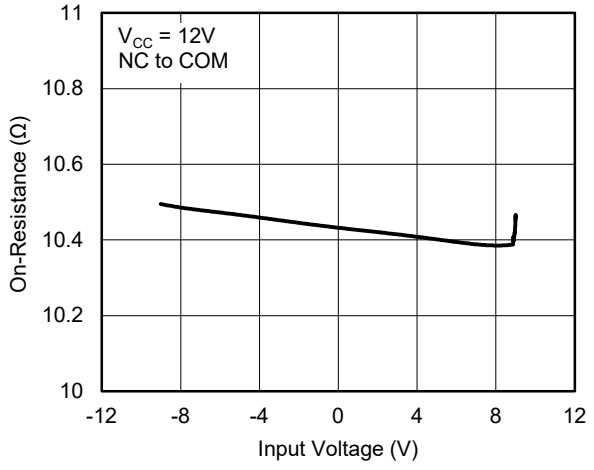

On-Resistance vs. Input Voltage



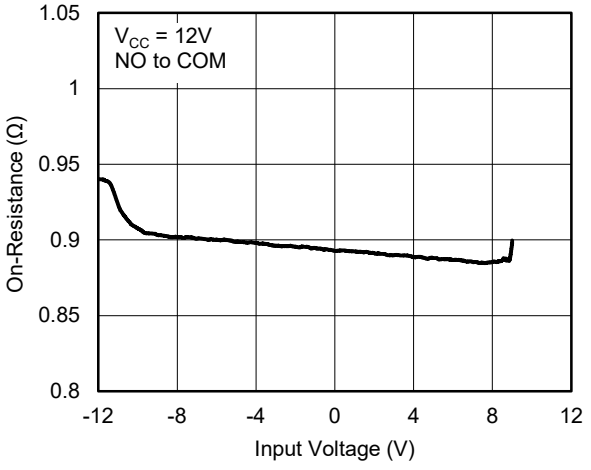

On-Resistance vs. Input Voltage



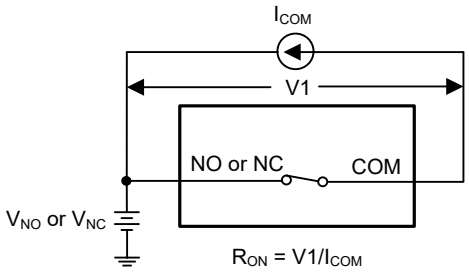

On-Resistance vs. Input Voltage



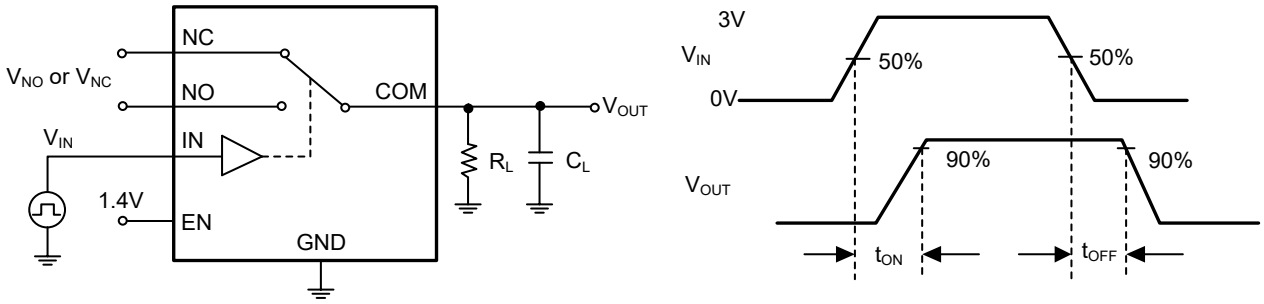

On-Resistance vs. Input Voltage



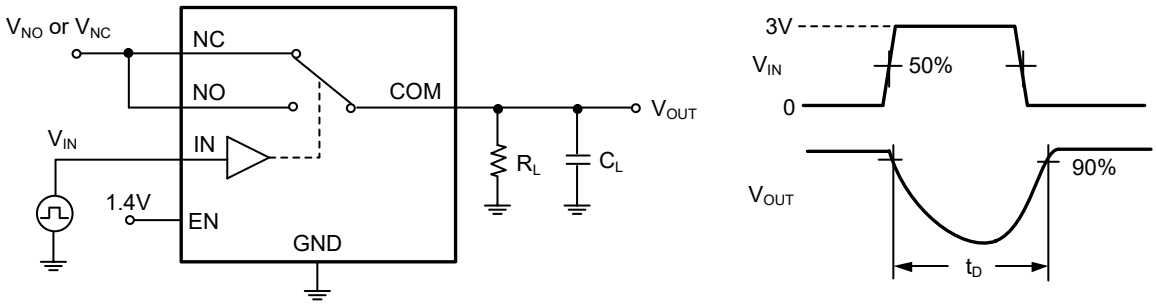
## TEST CIRCUITS




**Test Circuit 1. On-Resistance**

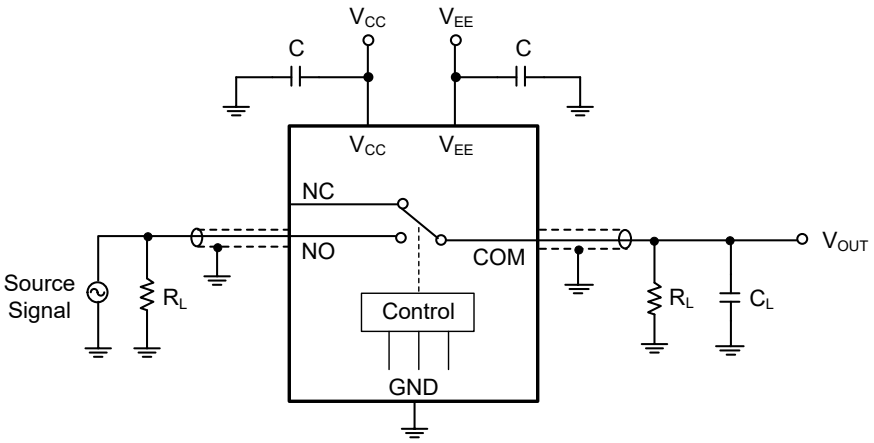



**Test Circuit 2. Switching Times ($t_{ON}$, $t_{OFF}$)**

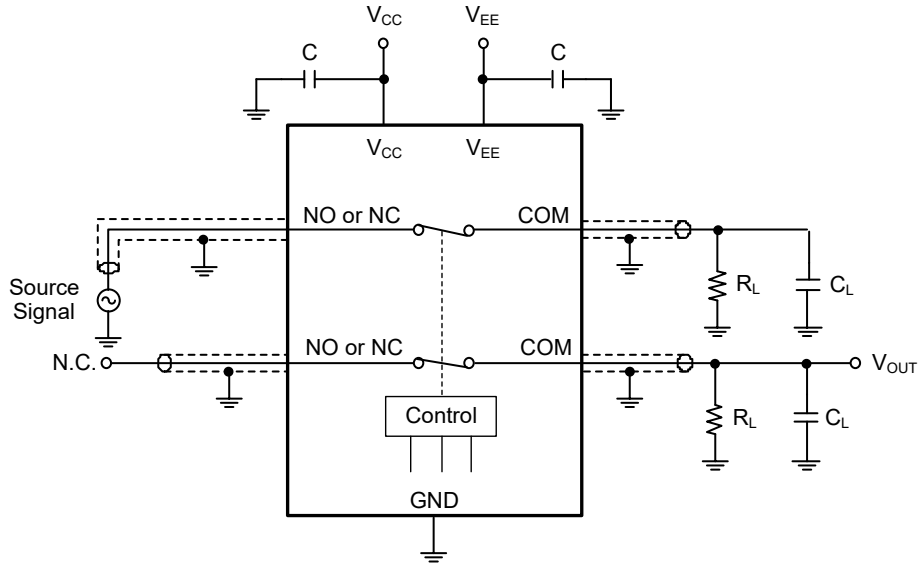



**Test Circuit 3. Break-Before-Make Time Delay ($t_D$)**

## TEST CIRCUITS (continued)



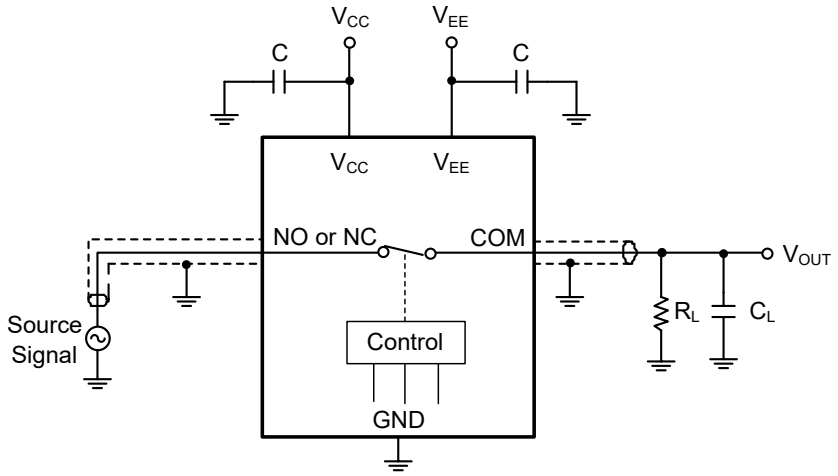

**Test Circuit 4. Off Isolation**



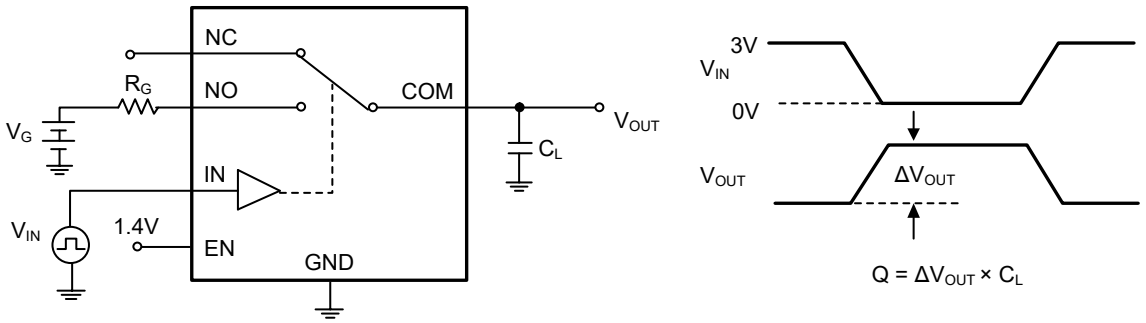

$$\text{Channel-to-Channel Crosstalk} = -20 \times \log \frac{V_{NO} \text{ or } V_{NC}}{V_{OUT}}$$

**Test Circuit 5. Channel-to-Channel Crosstalk**

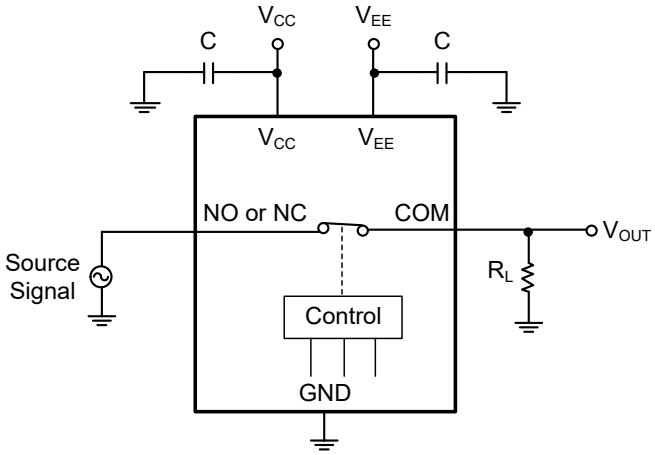
## TEST CIRCUITS (continued)




**Test Circuit 6. -3dB Bandwidth**




**Test Circuit 7. Charge Injection (Q)**




**Test Circuit 8. Total Harmonic Distortion (THD)**

## APPLICATION INFORMATION

The schematic in Figure 1 is for dual power supply application which can pass negative to positive analog signal. The schematic in Figure 2 is for single power supply application which can pass positive analog signal.

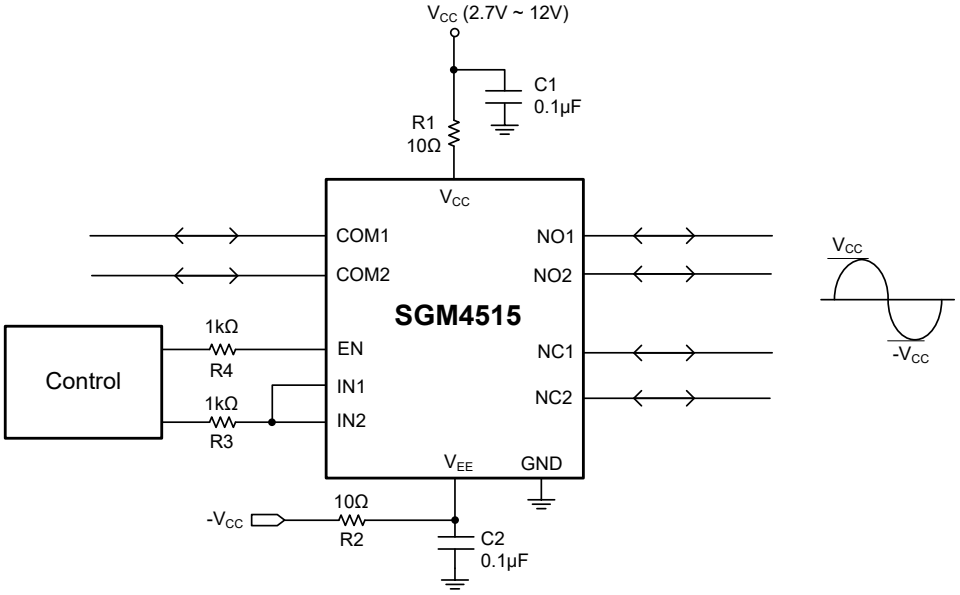



**Figure 1. Application Circuit for Dual Power Supply**

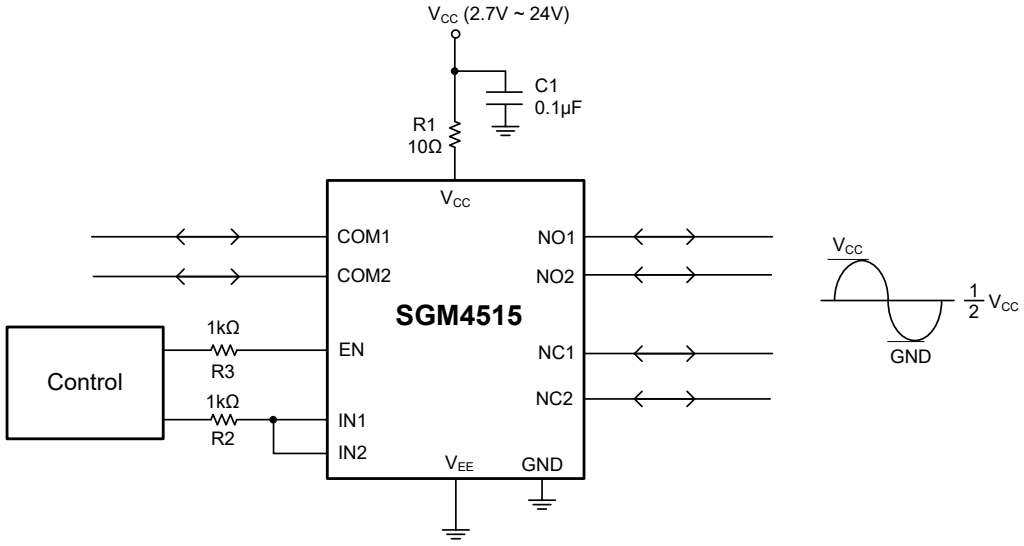



**Figure 2. Application Circuit for Single Power Supply**

# REVISION HISTORY

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

**DECEMBER 2017 – REV.A.1 to REV.A.2**

Added Typical Performance Characteristics section ..... 11

**NOVEMBER 2016 – REV.A to REV.A.1**

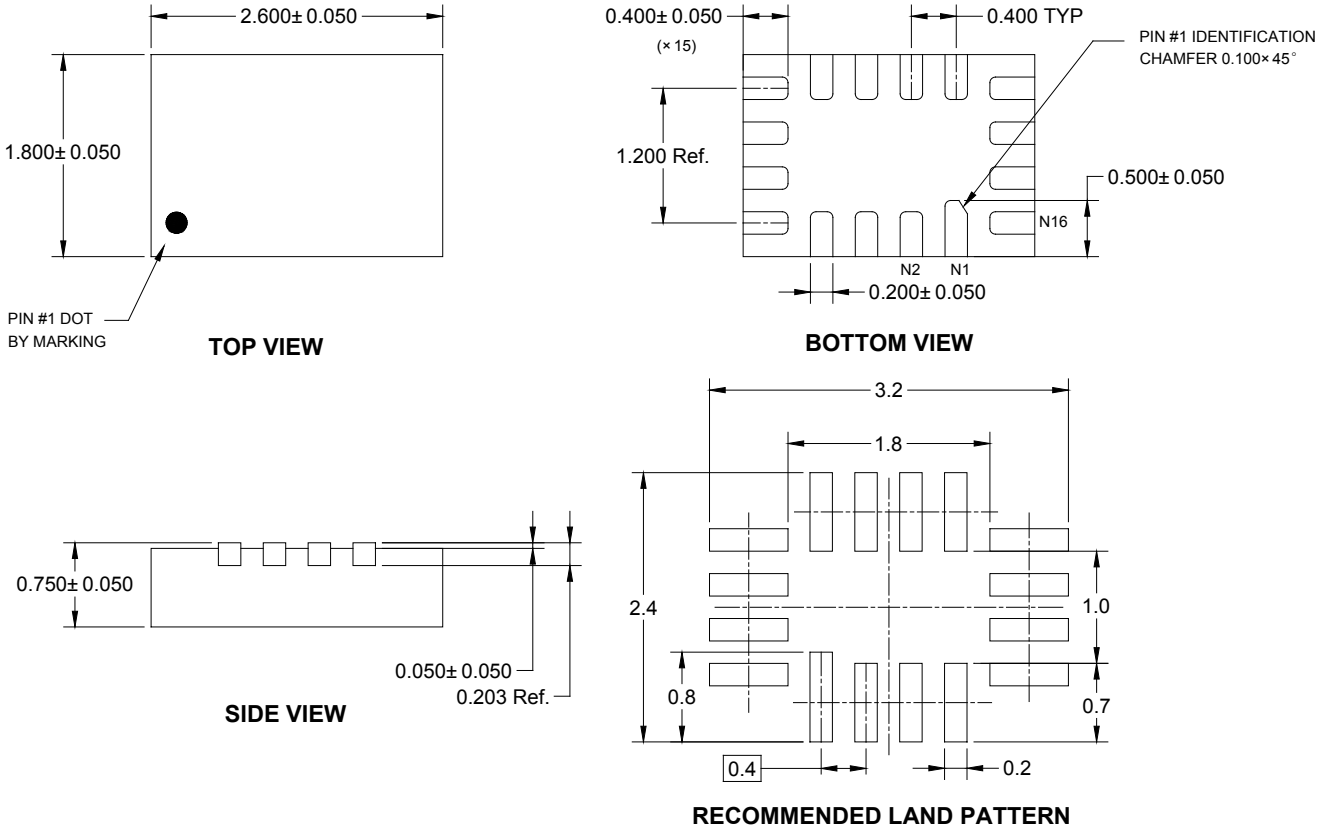
Changed Electrical Characteristics section ..... 4~7
Changed Test Circuits section ..... 12~13

**Changes from Original (AUGUST 2016) to REV.A**

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

# PACKAGE OUTLINE DIMENSIONS

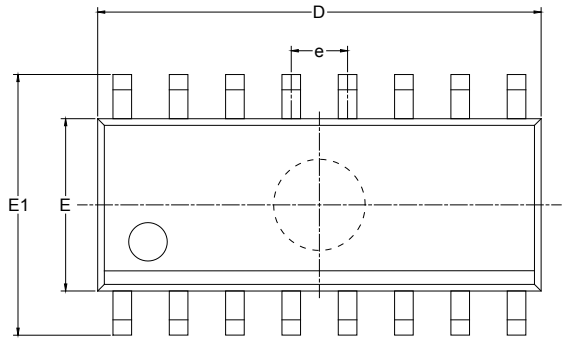
## TQFN-2.6×1.8-16L

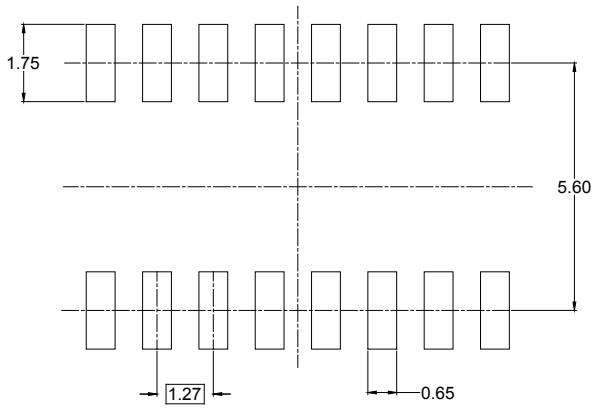



NOTE: All linear dimensions are in millimeters.

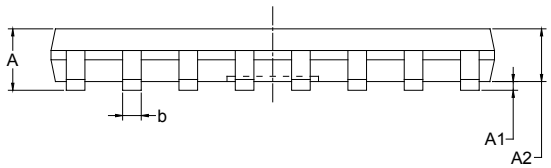
# PACKAGE OUTLINE DIMENSIONS

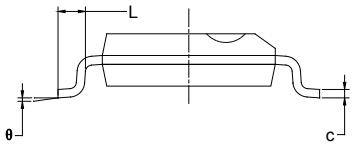
## SOIC-16




**RECOMMENDED LAND PATTERN** (Unit: mm)

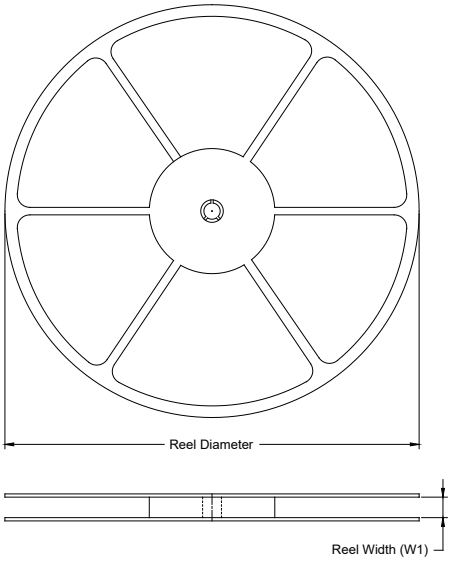


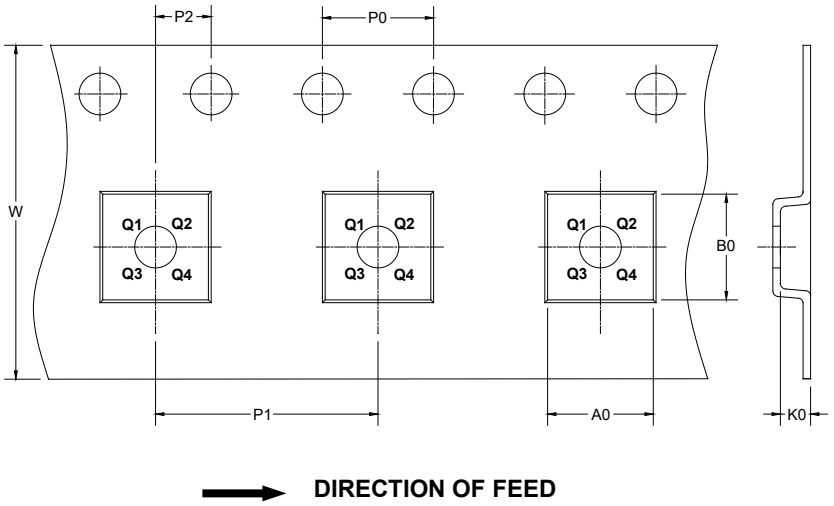

| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 1.350 | 1.750 | 0.053 | 0.069 |
| A1 | 0.100 | 0.250 | 0.004 | 0.010 |
| A2 | 1.350 | 1.550 | 0.053 | 0.061 |
| b | 0.330 | 0.510 | 0.013 | 0.020 |
| c | 0.170 | 0.250 | 0.006 | 0.010 |
| D | 9.800 | 10.200 | 0.386 | 0.402 |
| E | 3.800 | 4.000 | 0.150 | 0.157 |
| E1 | 5.800 | 6.200 | 0.228 | 0.244 |
| e | 1.27 BSC | | 0.050 BSC | |
| L | 0.400 | 1.270 | 0.016 | 0.050 |
| θ | 0° | 8° | 0° | 8° |

# TAPE AND REEL INFORMATION

### REEL DIMENSIONS




### TAPE DIMENSIONS



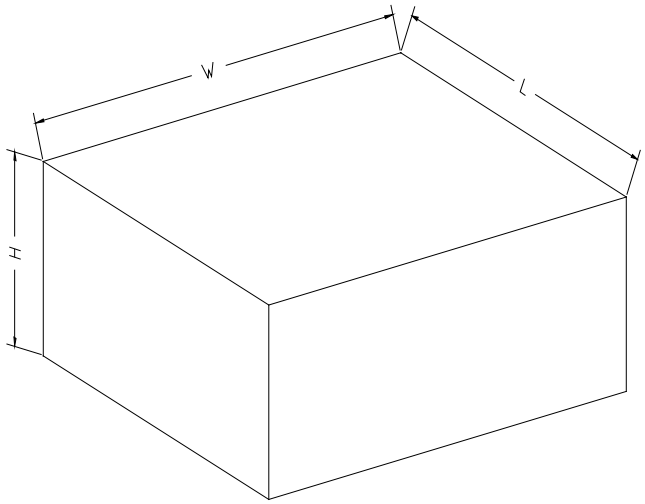

NOTE: The picture is only for reference. Please make the object as the standard.

## 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-2.6×1.8-16L | 7″ | 9.0 | 2.01 | 2.81 | 0.93 | 4.0 | 4.0 | 2.0 | 8.0 | Q1 |
| SOIC-16 | 13″ | 16.4 | 6.50 | 10.30 | 2.10 | 4.0 | 8.0 | 2.0 | 16.0 | 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 |
| 13″ | 386 | 280 | 370 | 5 |

DD0002