

0.9Ω/ 1Ω Dual SPDT Analog Switch

Features

- Maximum 0.9Ω ON-State Resistance at 2.7V Supply for NC Switch
- Maximum 1Ω ON-State Resistance at 2.7V Supply for NO Switch
- Low Charge Injection
- Excellent ON Resistance Matching
- +2.7V to +5.5V Single-Supply Operation
- Low Total Harmonic Distortion
- Low supply Current (<0.2μA)
- Break-before-make Enable Circuitry
- Control Inputs 5V Tolerant
- WLCSP Package and TDFN 3X3 Package

Applications

- Speaker Headset Switching
- MP3 Players
- Power Routing
- Battery-Operated Equipment
- Relay Replacement
- Audio and Video Signal Routing
- Communication circuits
- PCMCIA Cards
- Cellular Phones
- Modems

General Description

The G3203 is a low on-resistance, dual SPDT (Single-Pole/Double-Throw) analog switch that operates from a 2.7V to 5.5V supply. The G3203 features a 0.9Ω (max) R_{ON} for its NC switch and a 1Ω(max) R_{ON} for its NO switch at a +2.7V supply. The device offers an excellent ON-resistance matching, and low total harmonic distortion (THD) performance. The device is designed for fast switching speeds with the break-before-make feature to prevent signal distortion during the transferring of signal from one channel to another. These features make this device suitable for portable audio applications.

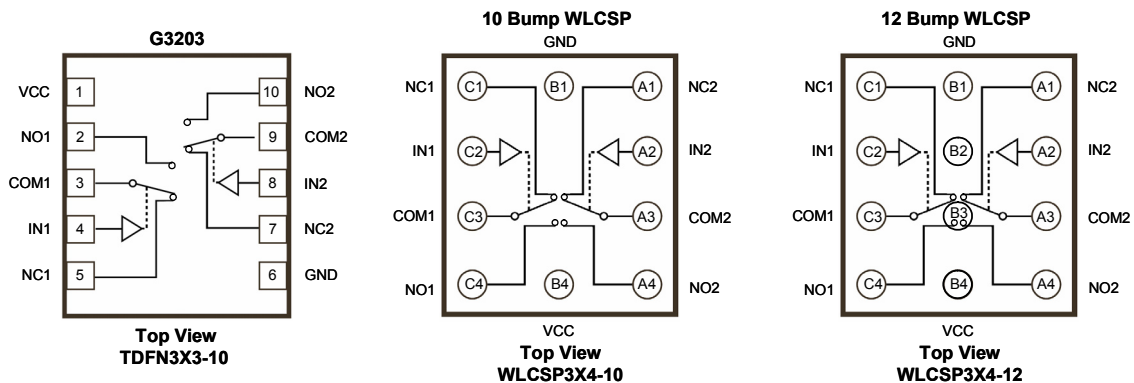
The G3203 is available in the WLCSP3X4-10, WLCSP3X4-12 and TDFN3X3-10 package.

Ordering Information

| ORDER NUMBER | MARKING | TEMP. RANGE | PACKAGE (Pb free) |
|--------------|---------|---------------|-------------------|
| G3203RE1U | 3203 | -40°C to 85°C | TDFN3X3-10 |
| G3203B51U | 323x | -40°C to 85°C | WLCSP3X4-12 |
| G3203B52D | 32032 | -40°C to 85°C | WLCSP3X4-10 |

Note :RE: TDFN3X3-10 B51: WLCSP3X4-12 B52: WLCSP3X4-10
 1: Bonding Code (only TDFN3X3-10)
 U & D: Tape & Reel

Pin Configuration



**Summary of Characteristics ⁽¹⁾**

| CONFIGURATION | DUAL SPST |
|--|---------------------------------------|
| Number of channels | 2 |
| On-State resistance (r_{on}) of NC/NO | 0.9Ω/1Ω |
| On-State resistance match (Δr_{on}) of NC/NO | 0.25Ω/0.25Ω |
| On-State resistance flatness ($r_{on(flat)}$) of NC/NO | 0.4Ω/0.4Ω |
| Turn-on / Turn-off time (t_{ON} / t_{OFF}) | 15ns / 14ns |
| Charge injection (Q_C) | 20pC |
| Bandwidth (BW) | 20MHz |
| OFF isolation (O_{ISO}) | - 74dB at 100kHz |
| Crosstalk (X_{TALK}) | - 72dB at 100kHz |
| Total harmonic distortion (THD) | 0.1% |
| Power-supply current (I_+) | 0.2μA |
| Package options | WCSP3X4-10, WCSP3X4-12 and TDFN3X3-10 |

(1) $V_+ = 5V$, $T_A = 25^\circ C$ and the value are the worst one.

Function Table

| IN_ | NO_ | NC_ |
|-----|-----|-----|
| 0 | OFF | ON |
| 1 | ON | OFF |

**Absolute Maximum Ratings**

VCC supply voltage to GND. -0.3V to +7V
 IN1, IN2 input voltage to GND -0.3 to +7V
 NO, NC, COM switch I/O voltage to GND. . -0.3 to +7V
 Output Short-Current Indefinite
 Maximum Junction Temperature 150°C

Continuous Current NO_NC_COM ±500mA
 Operating Temperature Range -40°C to 85 °C
 Storage Temperature Range. -65 °C to 150°C
 Reflow Temperature (soldering, 10sec) 260°C
 ESD(HBM)(Note 1) 2KV

Note 1 : Human body model is a 100pF capacitor discharged through a 1.5kΩ resistor into each pin.

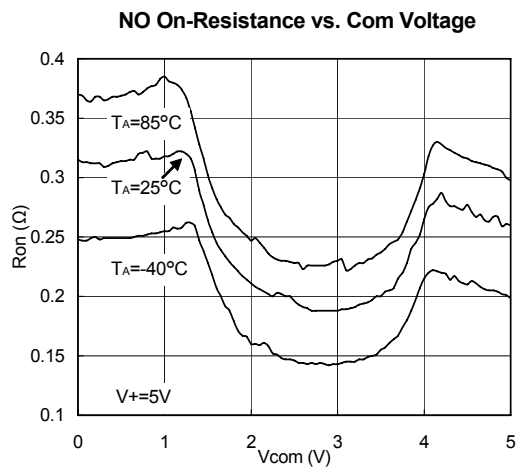
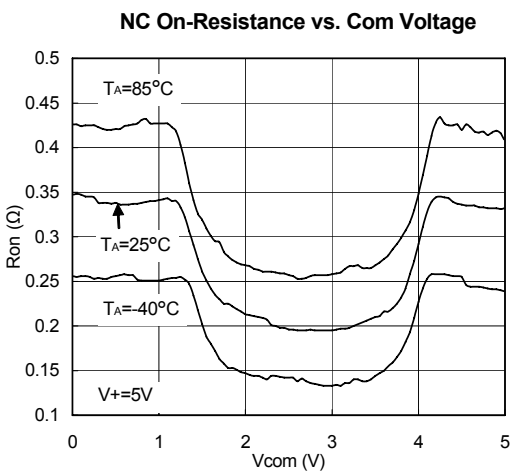
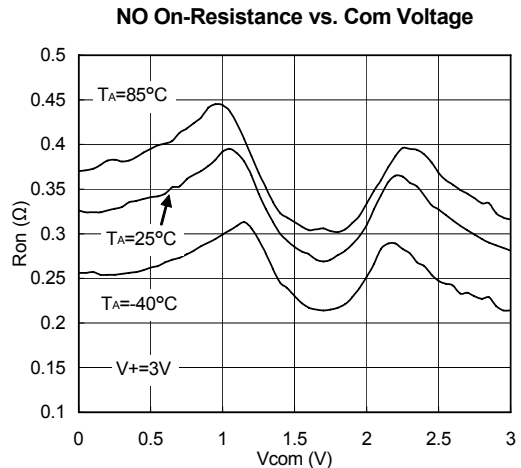
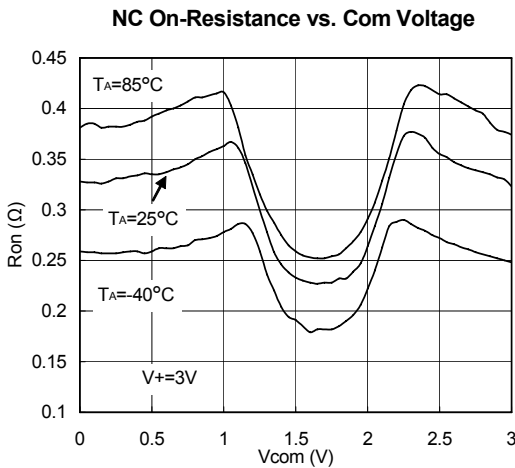
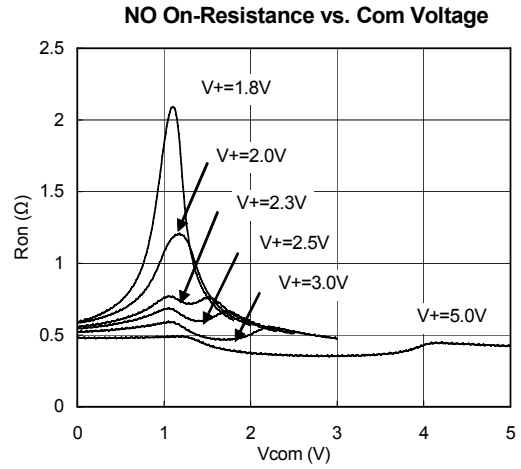
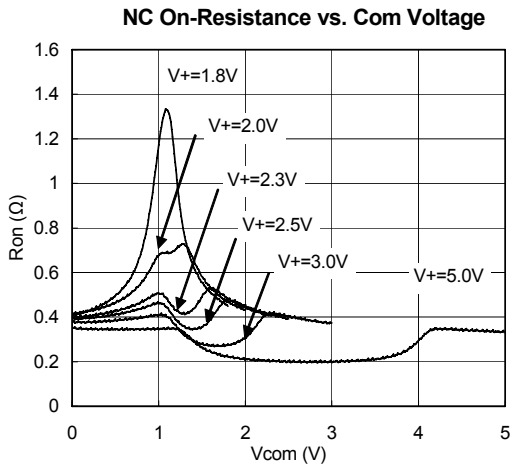
Electrical Characteristics

T_A=25°C, unless otherwise noted.

| PARAMETER | CONDITIONS | MIN | TYP | MAX | UNITS | |
|--|--|-----------|------|------|-------|---|
| DC Characteristics | | | | | | |
| Analog signal range | | 0 | --- | V+ | V | |
| NC On-Resistance, R _{ON(NC)} | V+=2.7, I _{COM} =100mA, V _{NC} =0 to V+ | G3203B5XU | --- | 0.45 | 0.9 | Ω |
| | V+=4.5, I _{COM} =100mA, V _{NC} =0 to V+ | | --- | 0.35 | 0.7 | |
| | V+=2.7, I _{COM} =100mA, V _{NC} =0 to V+ | G3203RE1U | --- | 0.45 | 0.9 | |
| | V+=4.5, I _{COM} =100mA, V _{NC} =0 to V+ | | --- | 0.35 | 0.7 | |
| NO On-Resistance, R _{ON(NO)} | V+=2.7; I _{COM} =100mA; V _{NO} =0 to V+ | --- | 0.6 | 1 | Ω | |
| | V+=4.5, I _{COM} =100mA, V _{NO} =0 to V+ | --- | 0.6 | 1 | | |
| On-Resistance Match Between Switches, ΔR _{ON} | V+=2.7, I _{COM} =100mA, V _{NO} or V _{NC} =1.5V | --- | 0.1 | 0.25 | Ω | |
| | V+=4.5, I _{COM} =100mA, V _{NO} or V _{NC} =2.5V | --- | 0.1 | 0.25 | | |
| NC On-Resistance Flatness, R _{FLAT(NC)} | 0 ≤ V _{NC} ≤ V+, I _{COM} =100mA, V+=2.7V | --- | 0.12 | 0.4 | Ω | |
| | 0 ≤ V _{NC} ≤ V+, I _{COM} =100mA, V+=4.5V | --- | 0.16 | 0.4 | | |
| NO On-Resistance Flatness, R _{FLAT(NO)} | 0 ≤ V _{NO} ≤ V+, I _{COM} =100mA, V+=2.7V | --- | 0.2 | 0.4 | Ω | |
| | 0 ≤ V _{NO} ≤ V+, I _{COM} =100mA, V+=4.5V | --- | 0.16 | 0.4 | | |
| NO or NC Off leakage current, I _{NO(OFF)} or I _{NC(OFF)} | V+=5.5V, V _{NO} or V _{NC} =1V, 4.5V, V _{COM} =4.5V, 1V | --- | --- | 20 | nA | |
| COM On Leakage Current, I _{COM(ON)} | V+=5.5V, V _{NO} =1V or 4.5V with V _{NC} floating, or V _{NC} =1V or 4.5V with V _{NO} floating, V _{COM} =1V or 4.5V | --- | --- | 20 | nA | |
| Input Logic High, V _{IH} | V+=3V | 1.4 | --- | --- | V | |
| | V+=5V | 2 | --- | --- | | |
| Input Logic Low, V _{IL} | V+=3V | --- | --- | 0.5 | V | |
| | V+=5V | --- | --- | 0.8 | | |
| Input leakage Current | V _{IN} =5.5V or 0V, V+=5.5V | --- | --- | 1 | μA | |
| Supply Current, I+ | V _{IN} =0 or 5.5V, V+=5.5V | --- | --- | 0.2 | μA | |
| Dynamic | | | | | | |
| Turn-On Time, t _{ON} | V+=3V, V _{NO} or V _{NC} =1.5V, R _L =50Ω; C _L =35pF | --- | 26 | 50 | ns | |
| | V+=5V, V _{NO} or V _{NC} =2.5V, R _L =50Ω; C _L =35pF | --- | 16 | 40 | | |
| Turn-Off Time, t _{OFF} | V+=3V, V _{NO} or V _{NC} =1.5V, R _L =50Ω; C _L =35pF | --- | 14 | 40 | ns | |
| | V+=5V, V _{NO} or V _{NC} =2.5V, R _L =50Ω; C _L =35pF | --- | 16 | 30 | | |
| Break-Before Make Time, t _{BBM} | V+=3V, V _{NO} =V _{NC} =1.5V, R _L =300 ohm; C _L =35pF | 7.8 | 10 | --- | ns | |
| Charge injection, Q _C | V+=3V, COM =0V; R _S =0V, C _L =1nF | --- | 30 | --- | pC | |
| OFF isolation, O _{ISO} | V+=3V, R _L =50Ω, C _L =5pF; f=100kHz, V _{COM} =1V _{RMS} , Switch OFF | --- | -74 | --- | dB | |
| Crosstalk, X _{Talk} | V+=3V, R _L =50Ω, C _L =5pF; f=100kHz, V _{COM} =1V _{RMS} , Switch OFF | --- | -72 | --- | dB | |
| Total harmonic distortion, THD | V+=3V, R _L =600Ω, C _L =50pF, V _{IN} =1V _{RMS} , f= 20Hz to 20kHz | --- | 0.1 | --- | % | |
| 3 db Bandwidth, BW | Input centered between V+ and GND, R _L =50Ω | --- | 20 | --- | MHz | |
| NO OFF capacitance, C _{NO(OFF)} | V+=5V, f=1MHz | --- | 79 | --- | pF | |
| NC OFF capacitance, C _{NC(OFF)} | V+=5V, f=1MHz | --- | 95 | --- | pF | |
| NO ON capacitance, C _{NO(ON)} | V+=5V, f=1MHz | --- | 211 | --- | pF | |
| NC ON capacitance, C _{NC(ON)} | V+=5V, f=1MHz | --- | 273 | --- | pF | |

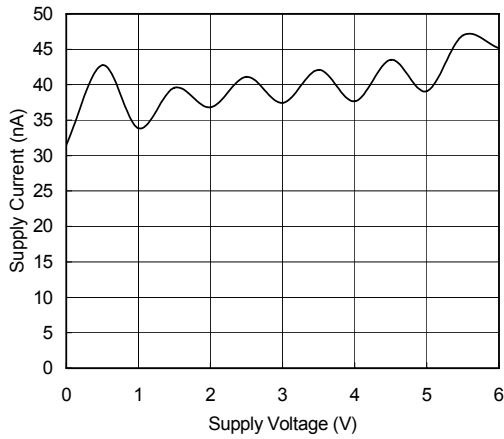
Typical Performance Characteristics

$T_A = 25^\circ\text{C}$, unless otherwise specified.

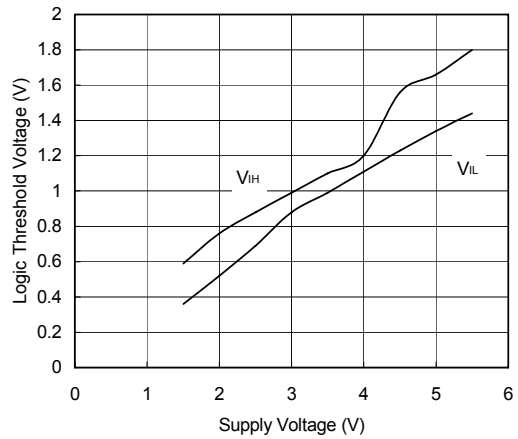


Typical Performance Characteristics (Continued)

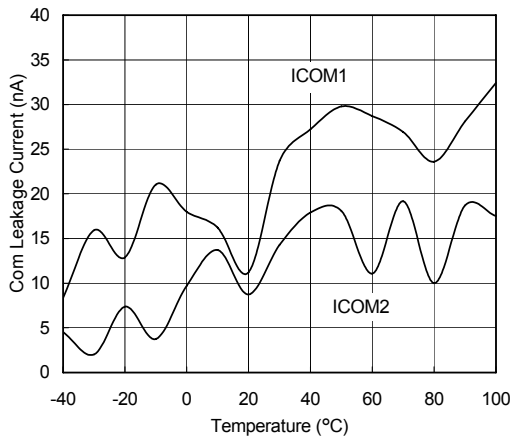
Supply Current vs. Supply Voltage



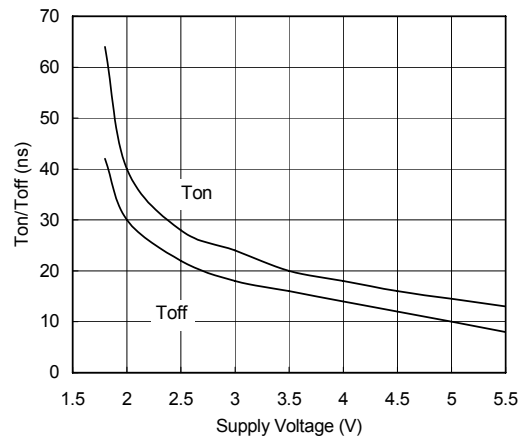
Logic Threshold Voltage vs. Supply Voltage



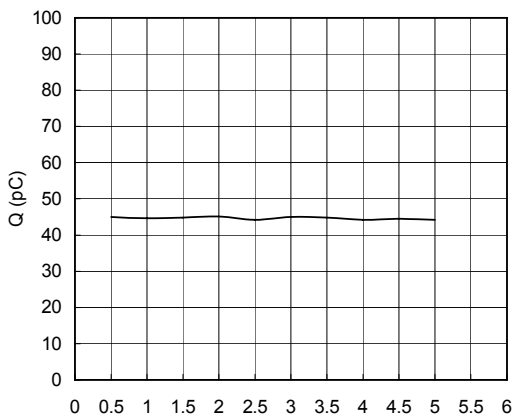
Com Leakage Current vs. Temperature



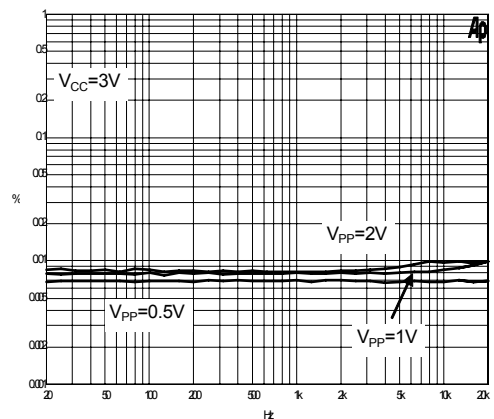
Turn -on/Turn-off Times vs. Supply Voltage



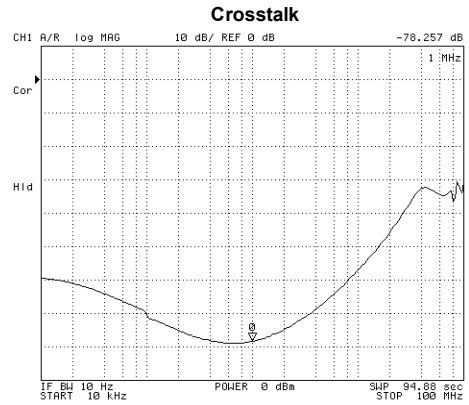
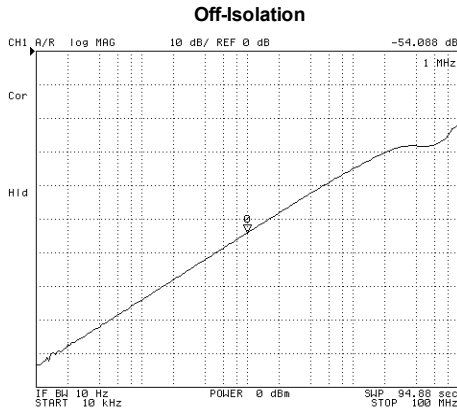
Charge Injection vs. Com Voltage



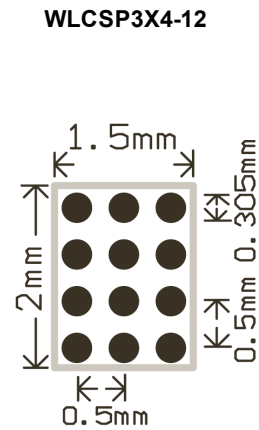
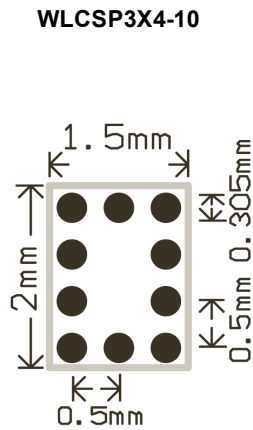
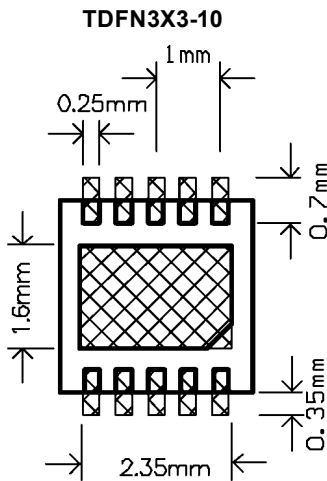
THD+N vs. Frequency



Typical Performance Characteristics (Continued)



Recommended Minimum Footprint



Pin Descriptions

| PIN | | | NAME | FUNCTION |
|------------|-------------|-------------|------|---------------------|
| TDFN3X3-10 | WLCSP3X4-10 | WLCSP3X4-12 | | |
| 1 | B4 | B4 | VCC | Power supply |
| 2 | C4 | C4 | NO1 | Normally open |
| 3 | C3 | C3 | COM1 | Common |
| 4 | C2 | C2 | IN1 | Digital control pin |
| 5 | C1 | C1 | NC1 | Normally close |
| 6 | B1 | B1 | GND | Digital ground |
| 7 | A1 | A1 | NC2 | Normally close |
| 8 | A2 | A2 | IN2 | Digital control pin |
| 9 | A3 | A3 | COM2 | Common |
| 10 | A4 | A4 | NO2 | Normally open |
| --- | --- | B2,B3 | NC | No connection |

Test Circuits/ Timing Diagrams

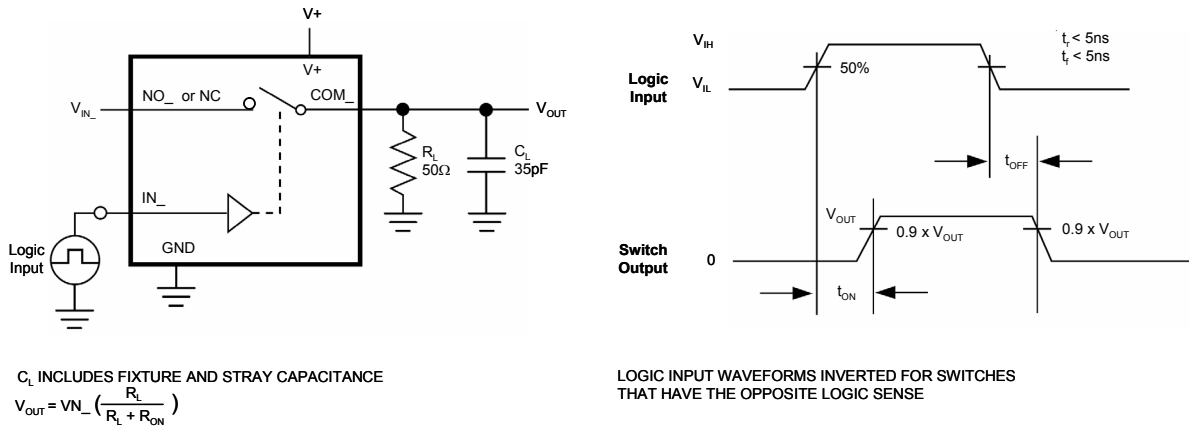


Figure 1. Switching Time

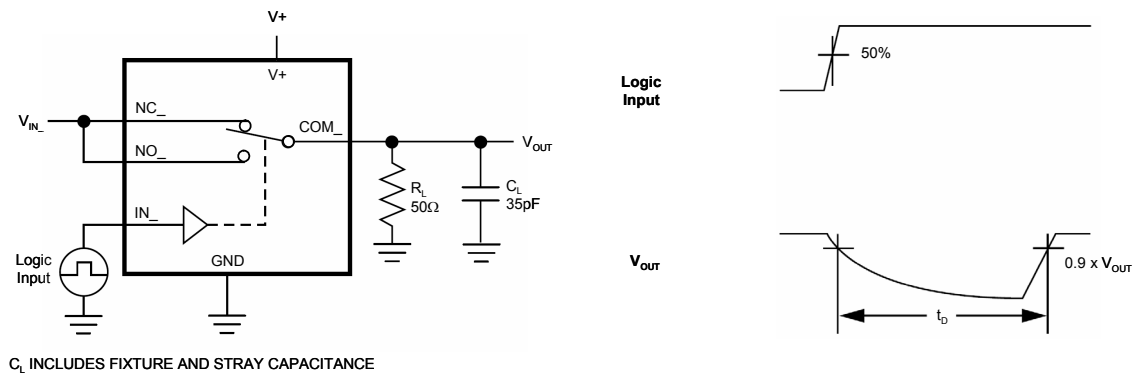


Figure 2. Break Before Make Interval

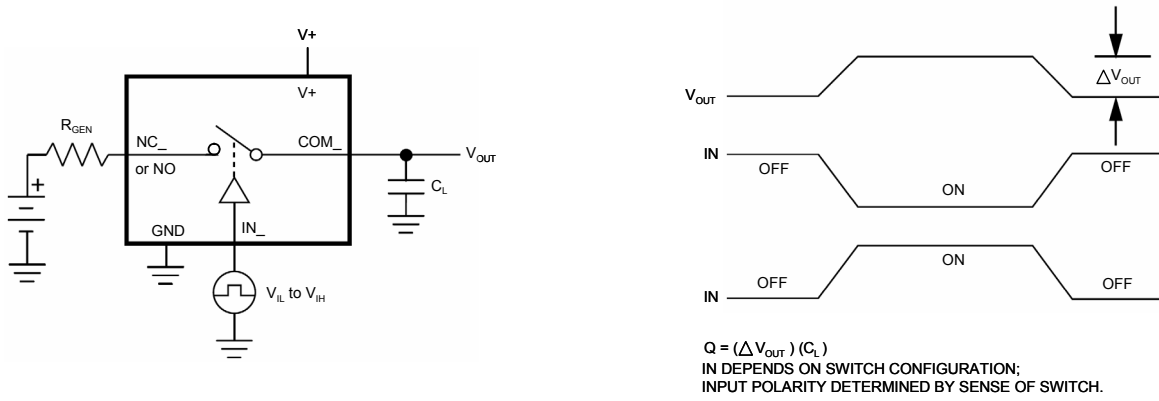
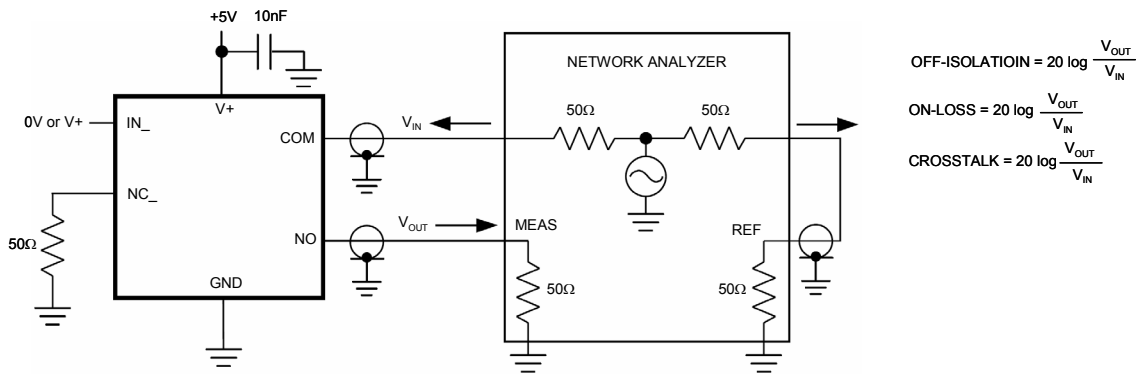


Figure 3. Charge Injection



MEASUREMENTS ARE STANDARDIZED AGAINST SHORTS AT IC TERMINALS.
 OFF-ISOLATION IS MEASURED BETWEEN COM_ AND "OFF" NO_ OR NC_ TERMINAL ON EACH SWITCH.
 ON-LOSS IS MEASURED BETWEEN COM_ AND "ON" NO_ OR NC_ TERMINAL ON EACH SWITCH.
 CROSSTALK IS MEASURED FROM ONE CHANNEL TO ALL OTHER CHANNELS.
 SIGNAL DIRECTION THROUGH SWITCH IS REVERSED; WORST VALUES ARE RECORDED.

Figure 4. On-Loss, Off-Isolation, and Crosstalk

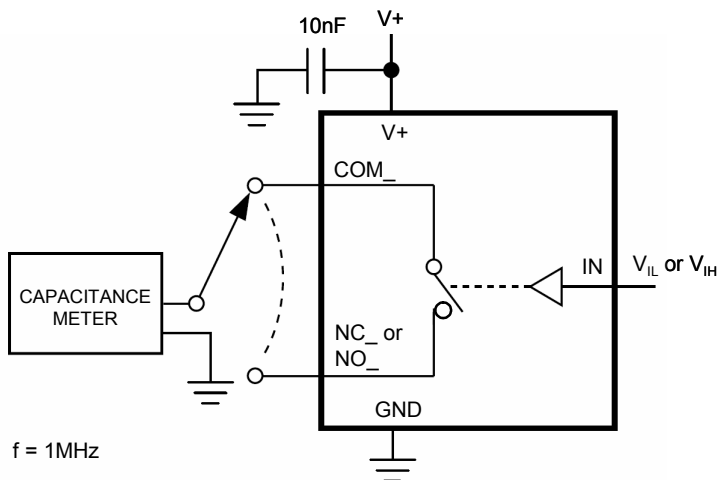
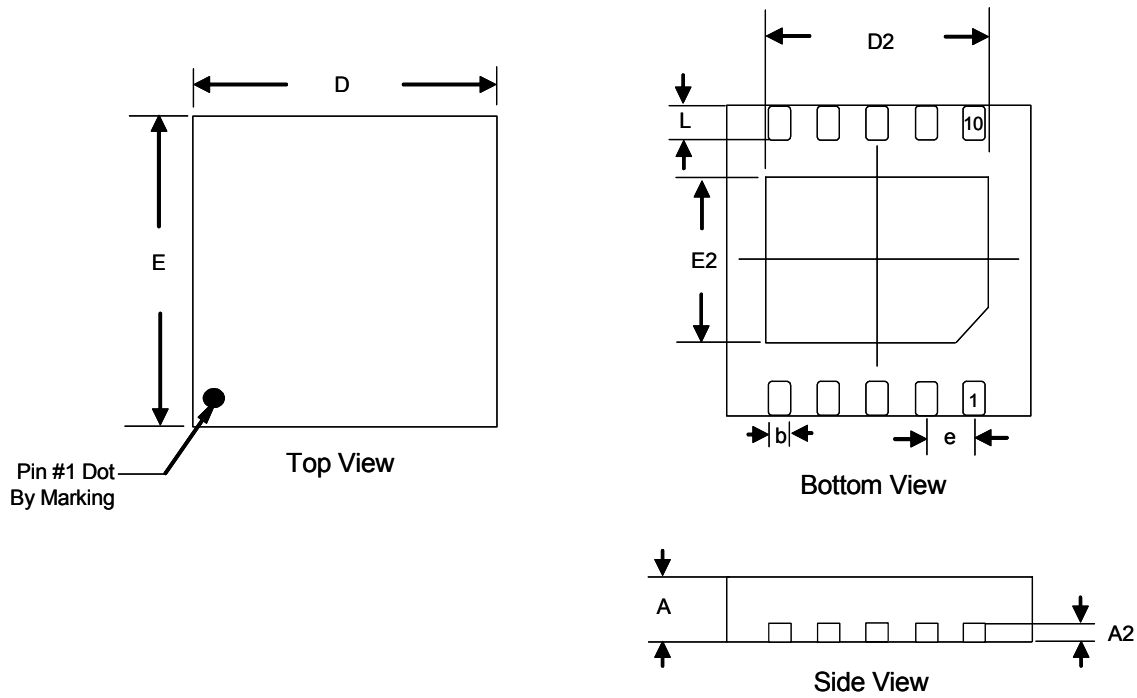


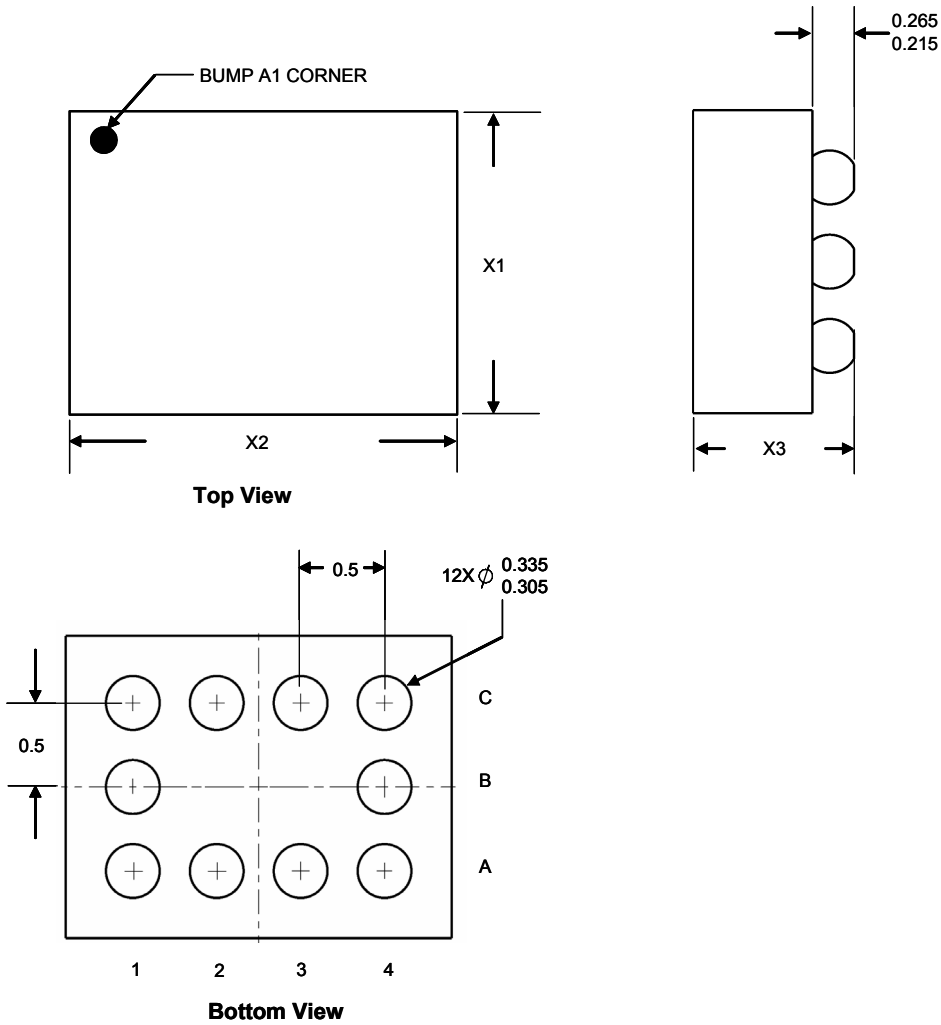
Figure 5. Channel Off/On Capacitance

Package Information



TDFN3X3-10 Package

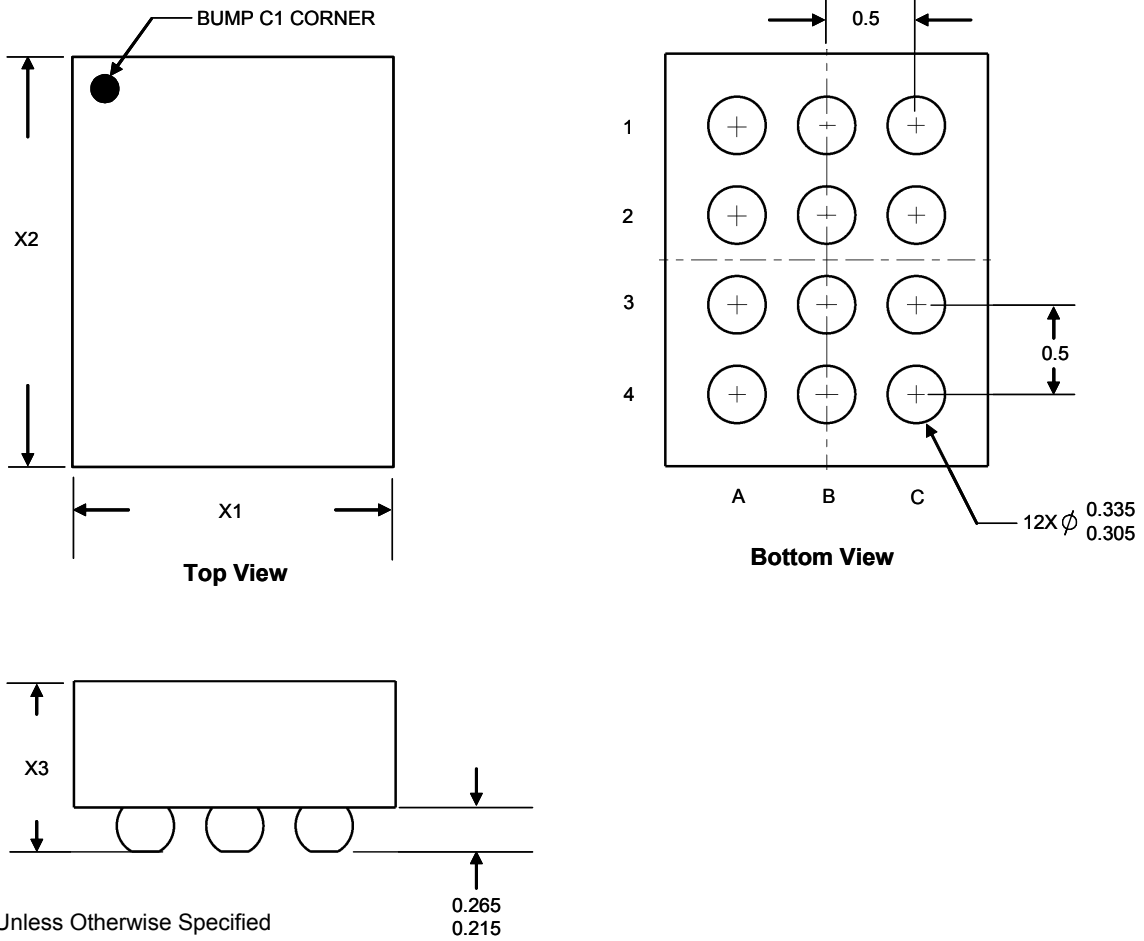
| SYMBOL | DIMENSION IN MM | | | DIMENSION IN INCH | | |
|--------|-----------------|-------|-------|-------------------|-------|-------|
| | MIN. | NOM. | MAX. | MIN. | NOM. | MAX. |
| A | 0.700 | 0.750 | 0.800 | 0.028 | 0.030 | 0.031 |
| A2 | 0.195 | 0.203 | 0.211 | 0.008 | 0.008 | 0.008 |
| b | 0.180 | 0.250 | 0.300 | 0.007 | 0.010 | 0.012 |
| D | 2.950 | 3.000 | 3.050 | 0.116 | 0.118 | 0.120 |
| D2 | 2.300 | 2.350 | 2.400 | 0.091 | 0.093 | 0.094 |
| E | 2.950 | 3.000 | 3.050 | 0.116 | 0.118 | 0.120 |
| E2 | 1.550 | 1.600 | 1.650 | 0.061 | 0.063 | 0.065 |
| e | 0.500 BSC | | | 0.020 BSC | | |
| L | 0.350 | 0.400 | 0.450 | 0.014 | 0.016 | 0.018 |



Note: 1. Unless Otherwise Specified
 2. Reference JEDEC Registration MO-211.

WLCSP3X4-10 Package

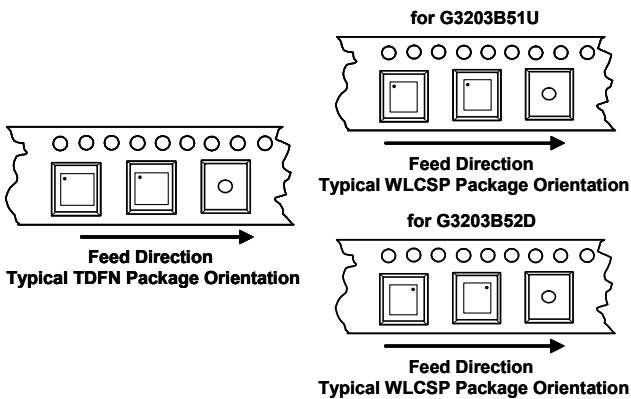
| SYMBOL | DIMENSION IN MM | | | DIMENSION IN INCH | | |
|--------|-----------------|-------|-------|-------------------|-------|-------|
| | MIN. | NOM. | MAX. | MIN. | NOM. | MAX. |
| X1 | 1.450 | 1.470 | 1.500 | 0.057 | 0.058 | 0.059 |
| X2 | 1.950 | 1.970 | 2.000 | 0.077 | 0.078 | 0.079 |
| X3 | 0.560 | 0.600 | 0.640 | 0.022 | 0.024 | 0.025 |



WLCSP3X4-12 Package

| SYMBOL | DIMENSION IN MM | | | DIMENSION IN INCH | | |
|--------|-----------------|-------|-------|-------------------|-------|-------|
| | MIN. | NOM. | MAX. | MIN. | NOM. | MAX. |
| X1 | 1.450 | 1.470 | 1.500 | 0.057 | 0.058 | 0.059 |
| X2 | 1.950 | 1.970 | 2.000 | 0.077 | 0.078 | 0.079 |
| X3 | 0.560 | 0.600 | 0.640 | 0.022 | 0.024 | 0.025 |

Taping Specification



| PACKAGE | Q'TY/REEL |
|------------|-----------|
| TDFN3X3-10 | 3,000 ea |
| WLCSP3X4 | 3,000 ea |

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