

Small Plastic Package, Dual SPDT Analog Switch with -1.5V Signal Support for AC Coupled Audio Signals and D-Class Audio Signals

Features

- CMOS Technology for Bus and Analog Applications
- Low On-Resistance: 0.6Ω.
- Wide V_{DD} Range: 2.5V to 4.2V
- High Off Isolation: -80dB @ 100kHz
- Crosstalk Rejection Reduces Signal Distortion:
-72dB @ 100kHz
- Input signals can be from -1.5V up to V_{DD} without distortion.
- Break-Before-Make Switching
- Extended Industrial Temperature Range: -40°C to 85°C
- Packaging (Pb-free & Green):
-10-contact UQFN (ZM10) 1.4 × 1.8

Applications

- Cell Phones
- PDAs
- MP3 players
- Portable Instrumentation
- Computer Peripherals
- Speaker Headset Switching
- Power Routing
- Relay Replacement
- Audio and Video Signal Routing
- PCMCIA Cards
- Modems

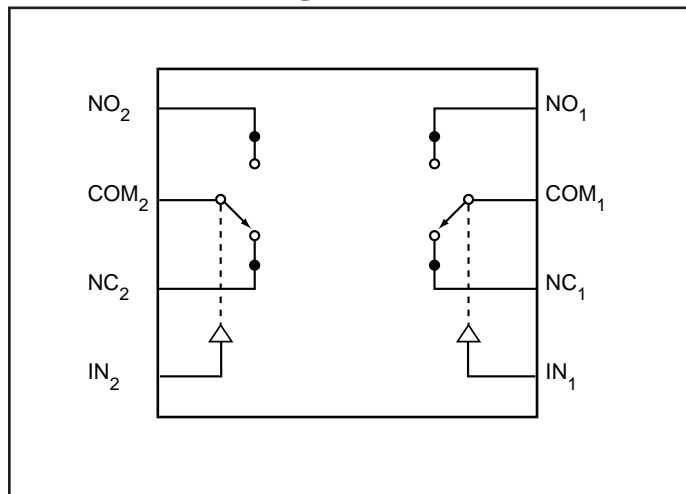
Description

Pericom Semiconductor's PI3A268C is a dual, fast single-pole double throw (SPDT) CMOS switch. It can be used as an analog switch or as a low-delay bus switch.

Break-before-make switching prevents both switches being enabled simultaneously. This eliminates signal disruption during switching.

With the use of 3rd party headsets, AC coupling is required to protect against EOS damage caused by DC offsets. Pericom's PI3A268C can support these AC coupled audio signals, since the switch can tolerate signals down to -1.5V without a negative power supply.

Functional Block Diagram



Pin Description

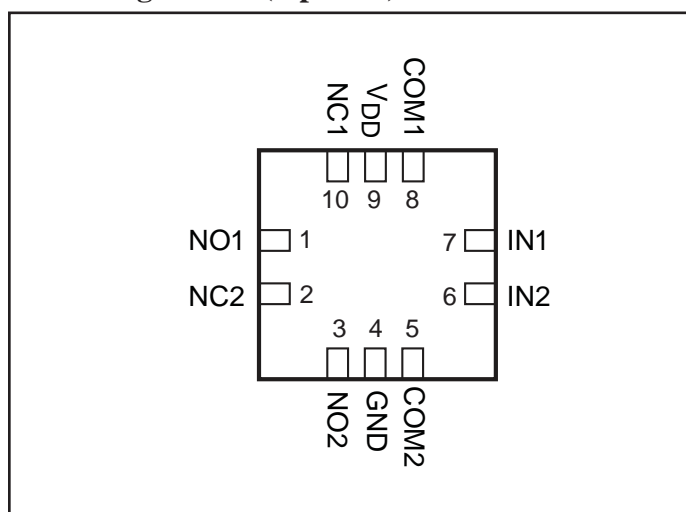
| Pin # | Name | Description |
|-------|------------------|-----------------------------|
| 1, 3 | NO _X | Data Port (Normally open) |
| 4 | GND | Ground |
| 2, 10 | NC _X | Data Port (Normally closed) |
| 5, 8 | COM _X | Common Output / Data Port |
| 9 | V _{DD} | Positive Power Supply |
| 6, 7 | IN _X | Logic Control |

Logic Function Table

| Logic Input (IN _X) | Function |
|--------------------------------|---|
| 0 | NC _X Connected to COM _X |
| 1 | NO _X Connected to COM _X |

Note: x = 1 or 2

Pin Configuration (top view)



| Absolute Maximum Ratings ⁽¹⁾ | Recommended Operating Conditions ⁽³⁾ |
|---|--|
| Supply Voltage V_{DD} 2.5V to 4.6V | Supply Voltage Operating (V_{DD}) 2.5V to 4.2V |
| DC Control Switch Voltage (V_{INX}) 0V to 5.0V | Control Input Voltage (V_{IN}) 0V to V_{DD} |
| DC Input Voltage (V_{IN}) ⁽²⁾ -1.5V to V_{DD} | Switch Input Voltage (V_{INPUT}) -1.5V to V_{DD} |
| Continuous Current NO_NC_COM_ ± 300 mA | Operating Temperature (T_A) -40°C to $+85^{\circ}\text{C}$ |
| Peak Current NO_NC_COM_ (pulsed at 1ms 50% duty cycle) ± 400 mA | Input Rise and Fall Time ($t_{r,f}$) Control Input $V_{DD} = 2.3\text{V} - 3.6\text{V}$ 0ns/V to 10ns/V |
| Peak Current NO_NC_COM_ (pulsed at 1ms 10% duty cycle) ± 500 mA | Thermal Resistance (θ_{JA}) $350^{\circ}\text{C}/\text{W}$ |
| Storage Temperature Range (T_{STG}) -65°C to $+150^{\circ}\text{C}$ | Lead Temperature (soldering 10s) $+300^{\circ}\text{C}$ |
| Junction Temperature under Bias (T_J) 150°C | Bump Temperature (soldering notes) Infrared (15s) $+220^{\circ}\text{C}$ |
| Junction Lead Temperature (T_L) (Soldering, 10 seconds) 260°C | Vapor Phase (60ns) $+215^{\circ}\text{C}$ |

Notes:

1. "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied.
2. The input and output negative voltage ratings may be exceeded if the input and output diode current ratings are observed.
3. Control input must be held HIGH or LOW; it must not float.

Power Supply

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Units |
|----------------|----------|--|-----|-----|-----|---------------|
| Supply Current | I_{CC} | $V_{DD} = 2.7\text{V}, V_{IN} = 0\text{V}$ or V_{DD} | | | 20 | μA |
| | | $V_{DD} = 3.3\text{V}, V_{IN} = 0\text{V}$ or V_{DD} | | | 36 | |
| | | $V_{DD} = 4.2\text{V}, V_{IN} = 0\text{V}$ or V_{DD} | | | 80 | |

DC Electrical Characteristics

($V_{DD} = 2.5V$ to $2.7V \pm 10\%$, $T_A = -40^\circ C$ to $85^\circ C$, unless otherwise noted. Typical values are at $25^\circ C$.)

| Parameter | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|--------------------------------------|--------------------------------|---|------|-------|----------|-------|
| Analog Switch | | | | | | |
| Analog Signal Range | V_{NO}, V_{NC}, V_{COM} | | -1.5 | | V_{DD} | V |
| NC On-Resistance | $R_{ON(NC)}$ | $V_{DD} = 2.25V, I_{COM} = 100mA,$ $V_{NC} = -1.5V$ to V_{DD} | | 0.9 | | Ω |
| NO On-Resistance | $R_{ON(NO)}$ | $V_{DD} = 2.25V, I_{COM} = 100mA,$ $V_{NO} = -1.5V$ to V_{DD} | | 0.9 | | |
| On-Resistance Match Between Channels | ΔR_{ON} | $V_{DD} = 2.25V, I_{COM} = 100mA,$ V_{NO} or $V_{NC} = -1.5V$ to V_{DD} | | 0.1 | | |
| NC On-Resistance Flatness | $R_{ONF(NC)}$ | $V_{DD} = 2.25V, I_{COM} = 100mA,$ $V_{NC} = -1.5V$ to V_{DD} | | 0.25 | | |
| NO On-Resistance Flatness | $R_{ONF(NO)}$ | $V_{DD} = 2.25V, I_{COM} = 100mA,$ $V_{NO} = -1.5V$ to V_{DD} | | 0.25 | | |
| NO or NC Off Leakage Current | $I_{OFF(NO)}$ or $I_{OFF(NC)}$ | $V_{DD} = 2.25V, V_{NO}$ or $V_{NC} = -1.5V$ to $+3.3V$ | -400 | | 400 | nA |
| COM On Leakage Current | $I_{COM(ON)}$ | $V_{DD} = 2.25V, V_{NO}$ or $V_{NC} = 0.3V, V_{COM} = 3V,$ $0.3V,$ or floating | -250 | | 250 | |
| Total Harmonic Distortion | THD | Load = 8Ω pulled to GND, $V_{DD} = 2.7V,$ freq = 20Hz to 20KHz, $V_{input} = 2V_{pp}$ | | 0.035 | | % |
| | | Load = 16Ω pulled to GND, $V_{DD} = 2.7V,$ freq = 20Hz to 20KHz, $V_{input} = 2V_{pp}$ | | 0.025 | | |
| Digital I/O | | | | | | |
| Input Logic High | V_{IH} | | 1.3 | | | V |
| Input Logic Low | V_{IL} | | | | 0.6 | |
| Input Hysteresis | V_H | $V_{DD} = 2.7V$ | | 100 | | mV |
| IN Input Leakage Current | I_{IN} | $V_{IN} = 0$ or V_{DD} | -0.5 | | 0.5 | μA |

DC Electrical Characteristics

($V_{DD} = 2.7V$ to $3.3V$, $T_A = -40^{\circ}C$ to $85^{\circ}C$, unless otherwise noted. Typical values are at $25^{\circ}C$.)

| Parameter | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|--------------------------------------|--------------------------------|---|------|-------|----------|-------|
| Analog Switch | | | | | | |
| Analog Signal Range | V_{NO}, V_{NC}, V_{COM} | | -1.5 | | V_{DD} | V |
| NC On-Resistance | $R_{ON(NC)}$ | $V_{DD} = 2.7V, I_{COM} = 100mA,$ $V_{NC} = -1.5V$ to V_{DD} | | 0.7 | | Ω |
| NO On-Resistance | $R_{ON(NO)}$ | $V_{DD} = 2.7V, I_{COM} = 100mA,$ $V_{NO} = -1.5V$ to V_{DD} | | 0.7 | | |
| On-Resistance Match Between Channels | ΔR_{ON} | $V_{DD} = 2.7V, I_{COM} = 100mA,$ V_{NO} or $V_{NC} = -1.5V$ to V_{DD} | | 0.1 | | |
| NC On-Resistance Flatness | $R_{ONF(NC)}$ | $V_{DD} = 2.7V, I_{COM} = 100mA,$ $V_{NC} = -1.5V$ to V_{DD} | | 0.2 | | |
| NO On-Resistance Flatness | $R_{ONF(NO)}$ | $V_{DD} = 2.7V, I_{COM} = 100mA,$ $V_{NO} = -1.5V$ to V_{DD} | | 0.2 | | |
| NO or NC Off Leakage Current | $I_{OFF(NO)}$ or $I_{OFF(NC)}$ | $V_{DD} = 3.3V, V_{NO}$ or $V_{NC} = -1.5V$ to $+3.3V$ | -400 | | 400 | nA |
| COM On Leakage Current | $I_{COM(ON)}$ | $V_{DD} = 3.3V, V_{NO}$ or $V_{NC} = 0.3V, V_{COM} = 3V,$ $0.3V,$ or floating | -250 | | 250 | |
| Total Harmonic Distortion | THD | Load = 8Ω pulled to GND, $V_{DD} = 2.7V,$ freq = 20Hz to 20KHz, $V_{input} = 2V_{pp}$ | | 0.04 | | % |
| | | Load = 16Ω pulled to GND, $V_{DD} = 2.7V,$ freq = 20Hz to 20KHz, $V_{input} = 2V_{pp}$ | | 0.035 | | |
| Digital I/O | | | | | | |
| Input Logic High | V_{IH} | | 1.3 | | | V |
| Input Logic Low | V_{IL} | | | | 0.6 | |
| Input Hysteresis | V_H | $V_{DD} = 2.7V$ | | 100 | | mV |
| IN Input Leakage Current | I_{IN} | $V_{IN} = 0$ or V_{DD} | -0.5 | | 0.5 | μA |

DC Electrical Characteristics

($V_{DD} = 3.3V$ to $4.4V$, $T_A = -40^{\circ}C$ to $85^{\circ}C$, unless otherwise noted. Typical values are at $25^{\circ}C$.)

| Parameter | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|--------------------------------------|--------------------------------|---|------|-------|----------|----------|
| Analog Switch | | | | | | |
| Analog Signal Range | V_{NO}, V_{NC}, V_{COM} | | -1.5 | | V_{DD} | V |
| NC On-Resistance | $R_{ON(NC)}$ | $V_{DD} = 4.2V, I_{COM} = 100mA,$ $V_{NC} = -1.5V$ to V_{DD} | | 0.6 | | Ω |
| NO On-Resistance | $R_{ON(NO)}$ | $V_{DD} = 4.2V, I_{COM} = 100mA,$ $V_{NO} = -1.5V$ to V_{DD} | | 0.6 | | |
| On-Resistance Match Between Channels | ΔR_{ON} | $V_{DD} = 4.2V, I_{COM} = 100mA,$ V_{NO} or $V_{NC} = -1.5V$ to V_{DD} | | 0.1 | | |
| NC On-Resistance Flatness | $R_{ONF(NC)}$ | $V_{DD} = 4.2V, I_{COM} = 100mA,$ $V_{NC} = -1.5V$ to V_{DD} | | 0.2 | | |
| NO On-Resistance Flatness | $R_{ONF(NO)}$ | $V_{DD} = 4.2V, I_{COM} = 100mA,$ $V_{NO} = -1.5V$ to V_{DD} | | 0.2 | | |
| NO or NC Off Leakage Current | $I_{OFF(NO)}$ or $I_{OFF(NC)}$ | $V_{DD} = 4.2V, V_{NO}$ or $V_{NC} = -1.5V$ to $+3.3V$ | -700 | | 700 | nA |
| COM On Leakage Current | $I_{COM(ON)}$ | $V_{DD} = 4.2V, V_{NO}$ or $V_{NC} = 0.3V, V_{COM} = 3V,$ $0.3V,$ or floating | -550 | | 550 | |
| Total Harmonic Distortion | THD | Load = 8Ω pulled to GND, $V_{DD} = 3.3V,$ freq = 20Hz to 20KHz, $V_{input} = 2V_{pp}$ | | 0.025 | | % |
| | | Load = 16Ω pulled to GND, $V_{DD} = 3V,$ freq = 20Hz to 20KHz, $V_{input} = 2V_{pp}$ | | 0.02 | | |
| Digital I/O | | | | | | |
| Input Logic High | V_{IH} | | 1.3 | | | V |
| Input Logic Low | V_{IL} | | | | 0.6 | |
| Input Hysteresis | V_H | $V_{DD} = 4.2V$ | | 150 | | mV |
| IN Input Leakage Current | I_{IN} | $V_{IN} = 0$ or V_{DD} | -0.5 | | 0.5 | μA |

Switch and AC Characteristics

| Parameter | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|-------------------------|------------|---|------|------|------|-------|
| Turn-On Time | t_{ON} | $V_{DD} = 2.5V$, V_{NO} or $V_{NC} = 1.5V$, $R_L = 50\Omega$, $C_L = 35pF$, <i>See Test Circuit Figure 1 & 2.</i> | | | 85 | ns |
| Turn-Off Time | t_{OFF} | $V_{DD} = 2.5V$, V_{NO} or $V_{NC} = 1.5V$, $R_L = 50\Omega$, $C_L = 35pF$, <i>See Test Circuit Figure 1 & 2.</i> | | | 85 | |
| Break-Before-Make Delay | t_{BBM} | $V_{DD} = 2.7V$, V_{NO} or $V_{NC} = 1.5V$, $R_L = 50\Omega$, $C_L = 35pF$, <i>See Test Circuit Figure 3.</i> | | | 20 | |
| Charge Injection | Q | <i>See Test Circuit Figure 4.</i> | | 35 | | pC |
| Off-Isolation | O_{IRR} | $C_L = 5pF$, $R_L = 50\Omega$, $f = 100kHz$, $V_{DD} = 2.5V$ to $4.2V$ $V_{COM} = 1 V_{RMS}$, <i>See Test Circuit Figure 5.</i> | | -80 | | dB |
| Crosstalk | X_{TALK} | $C_L = 5pF$, $R_L = 50\Omega$, $f = 100kHz$, $V_{DD} = 2.5V$ to $4.2V$ $V_{COM} = 1 V_{RMS}$, <i>See Test Circuit Figure 6.</i> | | -72 | | |
| 3dB Bandwidth | f_{3dB} | <i>See Test Circuit Figure 9</i> , $V_{DD} = 2.5V$ to $4.2V$ | | 100 | | MHz |

Capacitance ($V_{DD} = 2.5V$ to $4.2V$)

| Parameter | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|--------------------|---------------|--|------|------|------|-------|
| NC Off Capacitance | $C_{NC(OFF)}$ | $f = 1MHz$, <i>See Test Circuit Figure 7.</i> | | 18 | | pF |
| NO Off Capacitance | $C_{NO(OFF)}$ | $f = 1MHz$, <i>See Test Circuit Figure 7.</i> | | 18 | | |
| NC On Capacitance | $C_{NC(ON)}$ | $f = 1MHz$, <i>See Test Circuit Figure 8.</i> | | 55 | | |
| NO On Capacitance | $C_{NO(ON)}$ | $f = 1MHz$, <i>See Test Circuit Figure 8.</i> | | 55 | | |

Test Circuits and Timing Diagrams

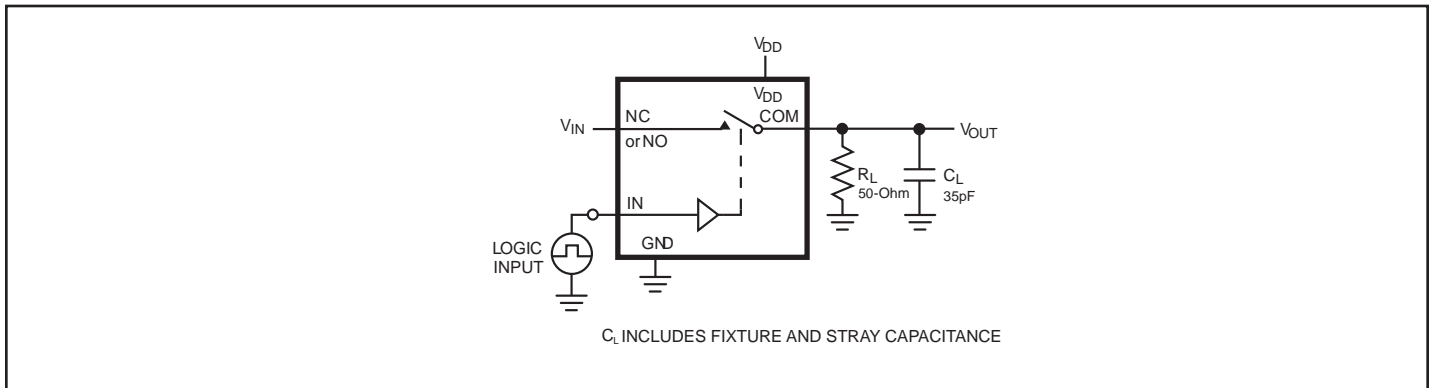


Figure 1. AC Test Circuit

Notes:

1. Unused input (NC or NO) must be grounded.

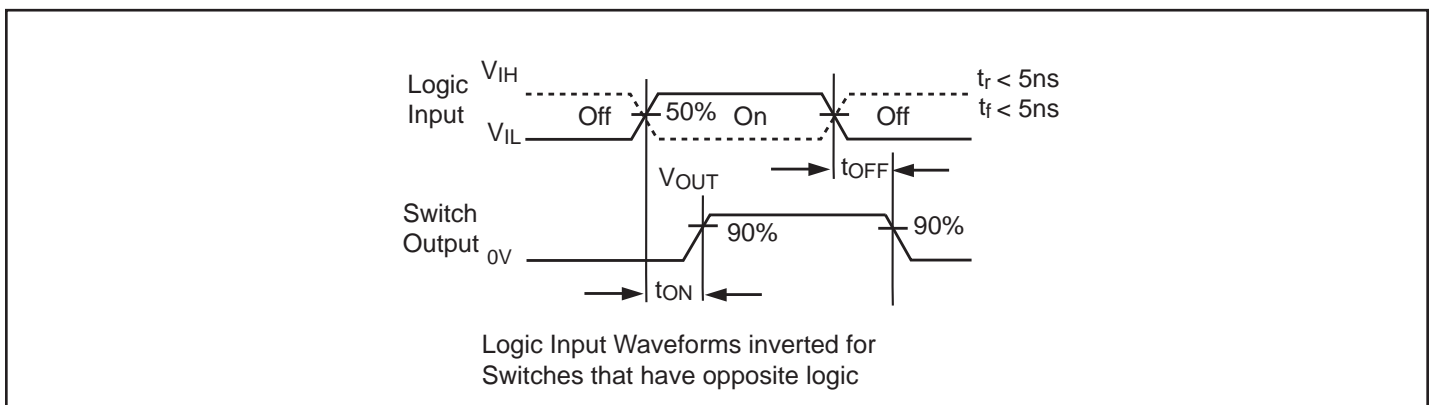


Figure 2. AC Waveforms

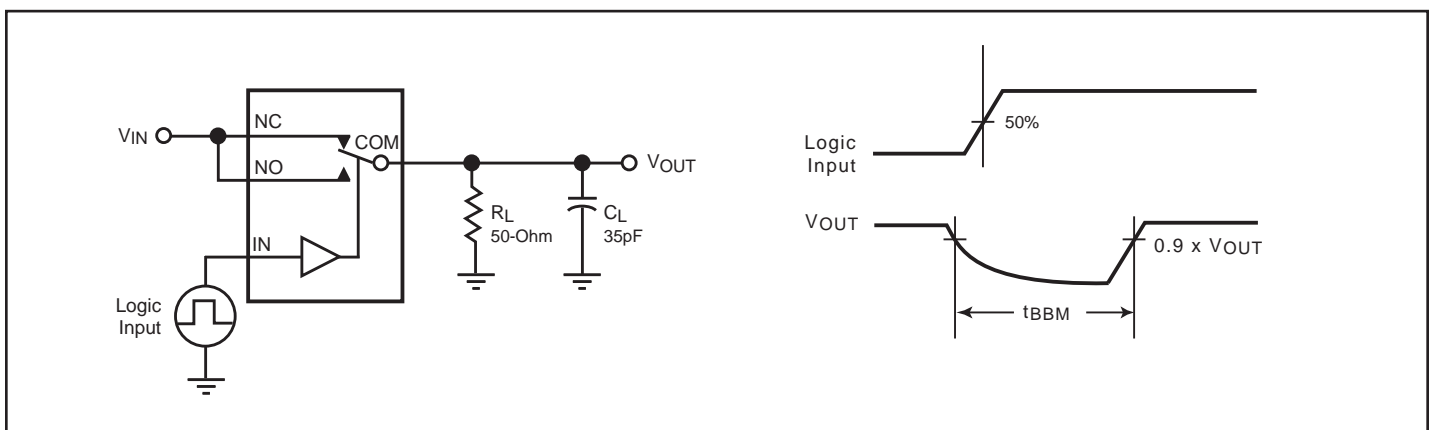


Figure 3. Break Before Make Interval Timing

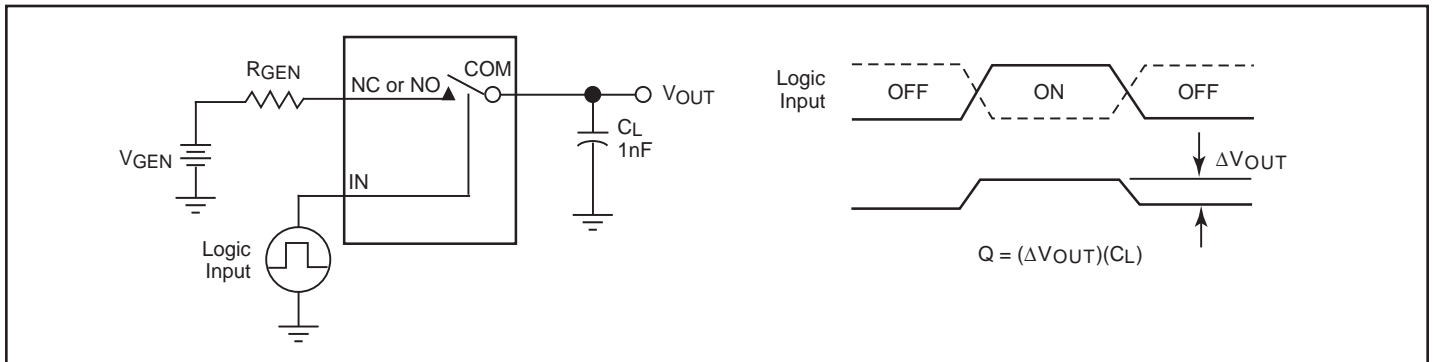


Figure 4. Charge Injection Test

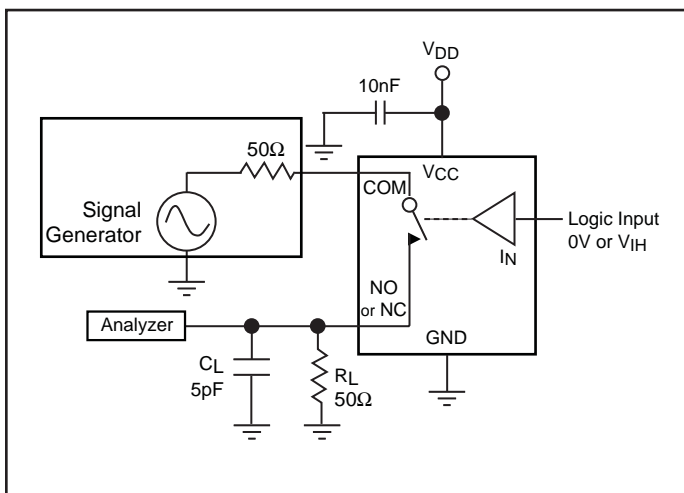


Figure 5. Off Isolation

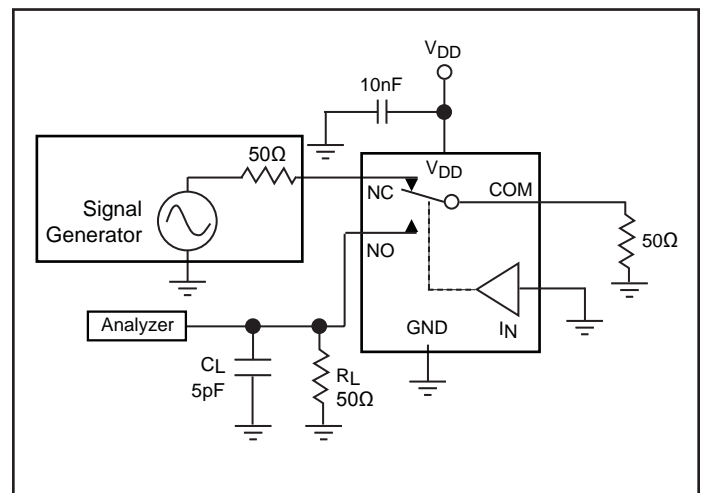


Figure 6. Crosstalk

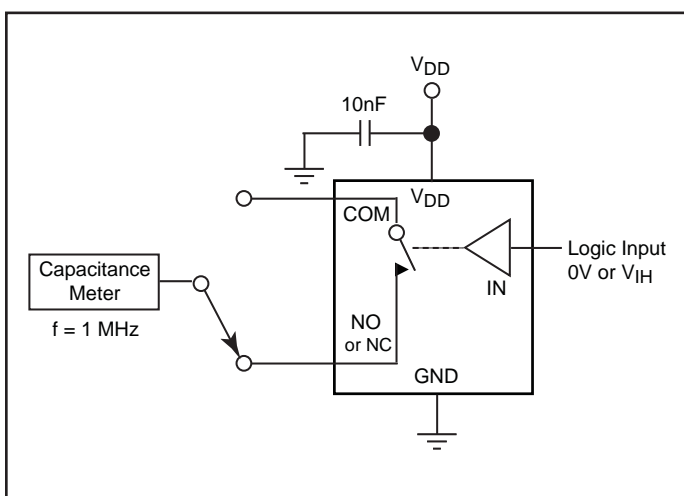


Figure 7. Channel Off Capacitance

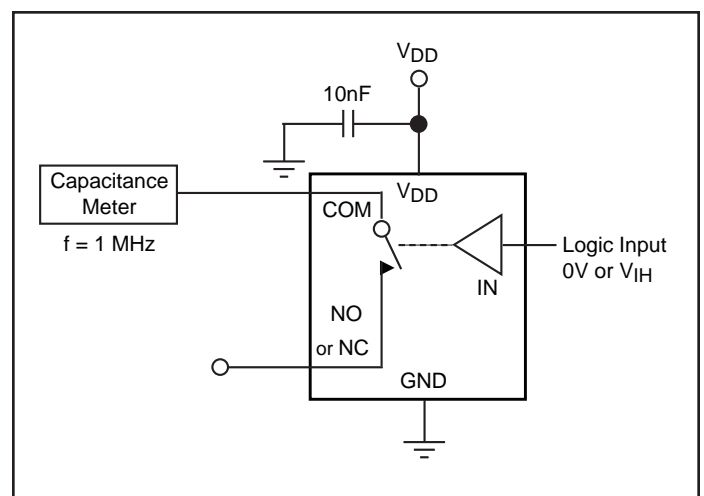


Figure 8. Channel On Capacitance

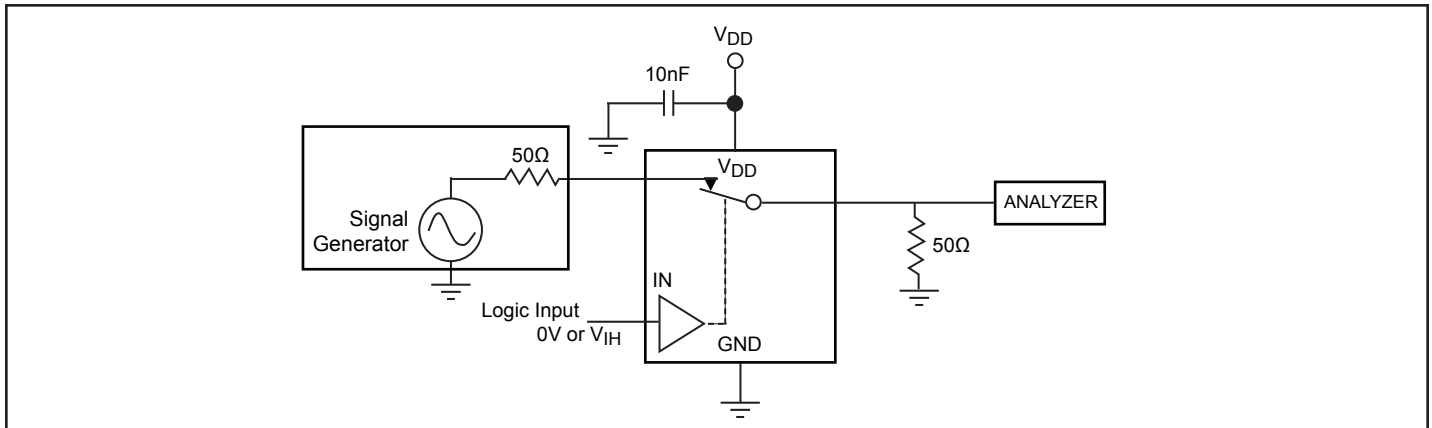
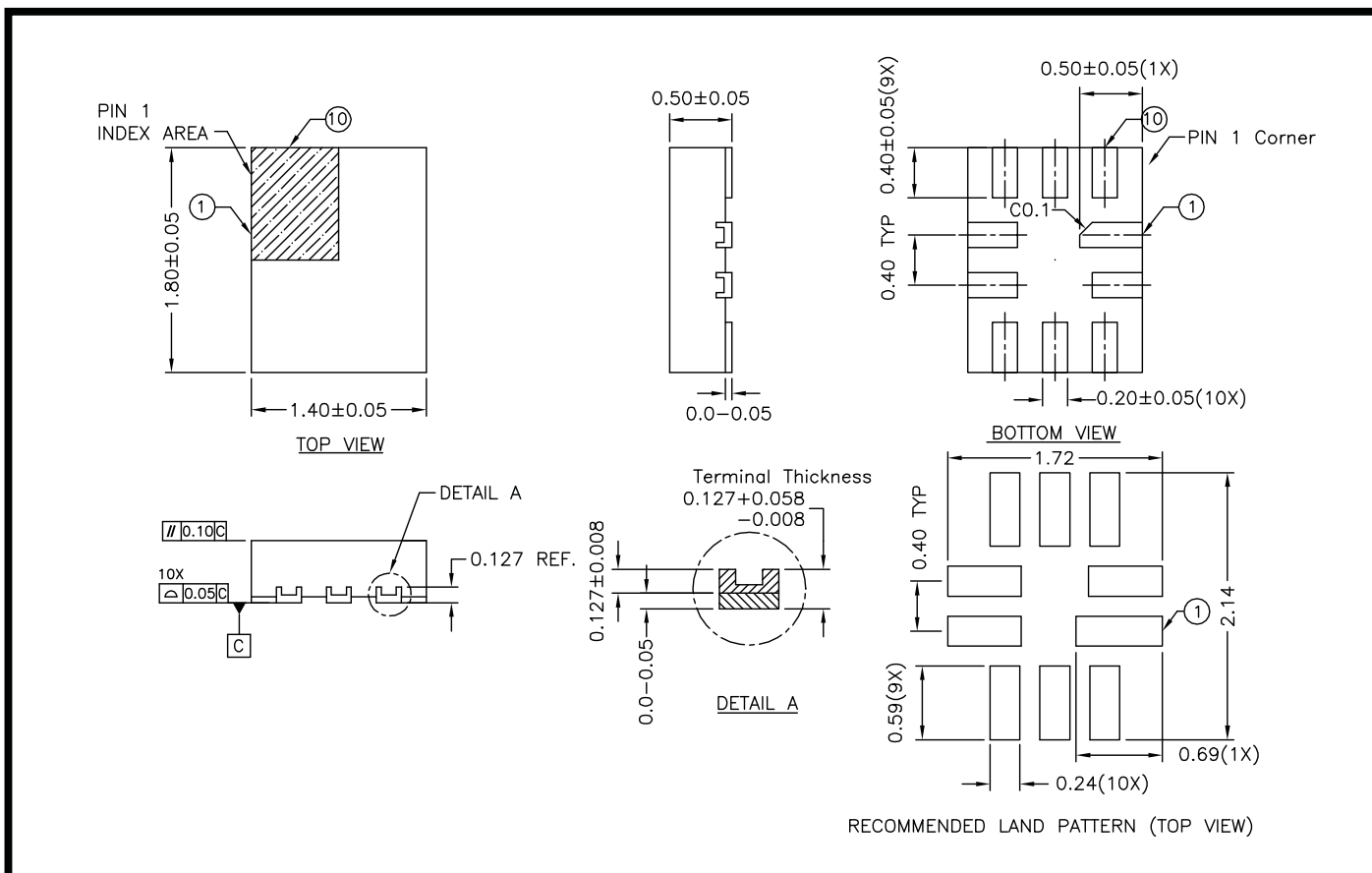



Figure 9. Bandwidth



NOTE :

1. ALL DIMENSIONS ARE IN mm. ANGLES IN DEGREES.
2. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.
3. REFER JEDEC MO-236/MO-248
4. RECOMMENDED LAND PATTERN IS FOR REFERENCE ONLY.

| | |
|--|--------------------|
|  | DATE: 01/29/09 |
| DESCRIPTION: 10-contact, Ultra-thin Quad Flat No-Lead (UQFN) | |
| PACKAGE CODE: ZM10 | |
| DOCUMENT CONTROL #: PD-2066 | REVISION: A |

09-0072

Note:

- For latest package info, please check: <http://www.pericom.com/products/packaging/mechanicals.php>

Ordering Information

| Ordering Code | Packaging Code | Package Type | Top Mark |
|---------------|----------------|---|----------|
| PI3A268CZME | ZM | 1.4 X 1.8, Pb-Free & Green, 10-contact UQFN | FP |

Notes:

- Thermal characteristics can be found on the company web site at www.pericom.com/packaging/
- E = Pb-free & Green
- X suffix = Tape/Reel