

Chip Scale Packaging, Dual SPDT Analog Switch

Features

- CMOS Technology for Bus and Analog Applications
- Low On-Resistance: 0.5Ω.
- Wide V_{CC} Range: 1.65V to 5.5V
- Rail-to-Rail Signal Range
- Control Input Overvoltage Tolerance: 5.5V min.
- High Off Isolation: -42dB
- Crosstalk Rejection Reduces Signal Distortion: -70dB
- Low THD (0.05% @ V_{CC} = 2.7V)
- Break-Before-Make Switching
- Extended Industrial Temperature Range: -40°C to 85°C
- Packaging (Pb-free & Green):
 - 10-ball Chip Scale Packaging (CSP)

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

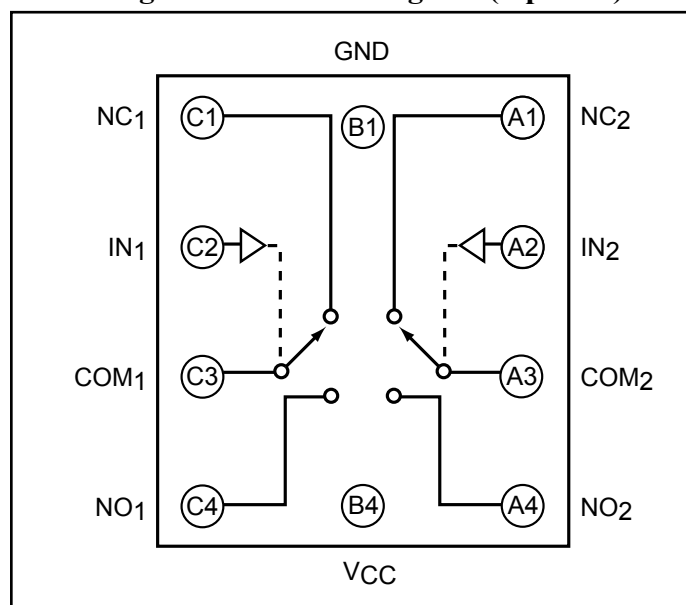
Description

Pericom Semiconductor's PI5A4684 is a dual high-bandwidth, fast single-pole double throw (SPDT) CMOS switch. It can be used as an analog switch or as a low-delay bus switch. Specified over a wide operating power supply voltage, 1.65V to 5.5V, the PI5A4684 has a maximum On-Resistance of 0.5Ω at +2.7V.

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

The control input, IN_x, tolerates input drive signals up to 6.0V, independent of supply voltage.

Pin Configuration/ Block Diagram (top view) CSP



Pin Description

| Pin # CSP | Name | Description |
|-----------|------------------|-----------------------------|
| A4, C4 | NO _x | Data Port (Normally open) |
| B1 | GND | Ground |
| A1, C1 | NC _x | Data Port (Normally closed) |
| A3, C3 | COM _x | Common Output / Data Port |
| B4 | V _{CC} | Postive Power Supply |
| A2, C2 | 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:

1. x = 1, or 2

Absolute Maximum Ratings⁽¹⁾

| | |
|--|--------------------------|
| Supply Voltage V_{CC} | -0.5V to +7V |
| DC Switch Voltage (V_S) ⁽²⁾ | -0.5V to $V_{CC} + 0.5V$ |
| DC Input Voltage (V_{IN}) ⁽²⁾ | -0.5V to +7.0V |
| Continuous Current NO_NC_COM_ | ±500mA |
| Peak Current NO_NC_COM_ | |
| (pulsed at 1ms 50% duty cycle) | ±650mA |
| Peak Current NO_NC_COM_ | |
| (pulsed at 1ms 10% duty cycle) | ±800mA |
| Storage Temperature Range (T_{STG}) | -65°C to +150°C |
| Junction Temperature under Bias (T_J) | 150°C |
| Junction Lead Temperature (T_L) | |
| (Soldering, 10 seconds) | 260°C |
| Power Dissipation (P_D) @ +85°C | 250mW |

Recommended Operating Conditions⁽³⁾

| | |
|---|-----------------|
| Supply Voltage Operating (V_{CC}) | 1.65V to 5.5V |
| Control Input Voltage (V_{IN}) | 0V to V_{CC} |
| Switch Input Voltage (V_{IN}) | 0V to V_{CC} |
| Output Voltage (V_{OUT}) | 0V to V_{CC} |
| Operating Temperature (T_A) | -40°C to +85°C |
| Input Rise and Fall Time (t_r, t_f) | |
| Control Input $V_{CC} = 2.3V - 3.6V$ | 0ns/V to 10ns/V |
| Control Input $V_{CC} = 4.5V - 5.5V$ | 0ns/V to 5ns/V |
| Thermal Resistance (θ_{JA}) | 350°C/W |
| Lead Temperature (soldering 10s) | +300°C |
| Bump Temperature (soldering notes) | |
| Infrared (15s) | +220°C |
| Vapor Phase (60ns) | +215°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.

DC Electrical Characteristics +3V Supply

($V_{CC} = 2.7V$ to $3.3V$, $T_A = -40$ C to $+85$ C, unless otherwise noted. Typical values are at $3V$ and $+25^\circ C$.)

| Parameter | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|--------------------------------------|-----------------------------------|--|------|------|----------|----------|
| Analog Switch | | | | | | |
| Analog Signal Range | V_{NO}, V_{NC}, V_{COM} | | 0 | | V_{CC} | V |
| NC On-Resistance | $R_{ON(NC)}$ | $V_{CC} = 2.7V, I_{COM} = 100mA,$ $V_{NC} = 0$ to V_{CC} | | 0.5 | 0.6 | Ω |
| NO On-Resistance | $R_{ON(NO)}$ | $V_{CC} = 2.7V, I_{COM} = 100mA,$ $V_{NC} = 0$ to V_{CC} | | 0.4 | 0.5 | |
| On-Resistance Match Between Channels | ΔR_{ON} | $V_{CC} = 2.7V, I_{COM} = 100mA,$ V_{NO} or $V_{NC} = 1.5V$ | | 0.01 | 0.06 | |
| NC On-Resistance Flatness | $R_{ONF(NC)}$ | $V_{CC} = 2.7V, I_{COM} = 100mA,$ $V_{NC} = 0$ to V_{CC} | | | 0.25 | |
| NO On-Resistance Flatness | $R_{ONF(NO)}$ | $V_{CC} = 2.7V, I_{COM} = 100mA,$ $V_{NO} = 0$ to V_{CC} | | | 0.15 | |
| NO or NC Off Leakage Current | $I_{OFF(NO)}$ or $I_{OFF(NC)}$ | $V_{CC} = 3.3V, V_{NO}$ or $V_{NC} = 3V, 0.3V,$ $V_{COM} = 0.3V, 3V$ | -80 | | 80 | |
| COM On Leakage Current | $I_{COM(ON)}$ | $V_{CC} = 3.3V, V_{NO}$ or $V_{NC} = 3V, 0.3V,$ $V_{COM} = 0.3V, 3V,$ or floating | -160 | | 160 | |
| Digital I/O | | | | | | |
| Input Logic High | V_{IH} | | 1.3 | | | V |
| Input Logic Low | V_{IL} | | | | 0.6 | |
| Input Hysteresis | V_H | $V_{CC} = 3.3V$ | | 200 | | mV |
| IN Input Leakage Current | I_{IN} | $V_{IN} = 0$ or V_{CC} | -1 | | 1 | μA |
| Power Supply | | | | | | |
| Power-Supply Range | V_{CC} | | 1.65 | | 5.5 | V |
| Supply Current | I_{CC} | $V_{CC} = 5.5V, V_{IN} = 0$ or V_{CC} | | | 200 | nA |

Switch and AC Characteristics

(V_{CC} = 2.7V to 3.3V, T_a = -40 C to +85 C, unless otherwise noted. Typical values are at 3V and +25°C)

| Parameter | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|---------------------------|-------------------|---|------|------|------|-------|
| Turn-On Time | t _{ON} | V _{CC} = 2.7V, V _{NO} or V _{NC} = 1.5V, R _L = 50Ω, C _L = 35pF, <i>See Test Circuit Figure 1 & 2.</i> | | 25 | 60 | ns |
| Turn-Off Time | t _{OFF} | V _{CC} = 2.7V, V _{NO} or V _{NC} = 1.5V, R _L = 50Ω, C _L = 35pF, <i>See Test Circuit Figure 1 & 2.</i> | | 7 | 20 | |
| Break-Before-Make Delay | t _{BBM} | V _{CC} = 2.7V, V _{NO} or V _{NC} = 1.5V, R _L = 50Ω, C _L = 35pF, <i>See Test Circuit Figure 3.</i> | | 25 | | |
| Charge Injection | Q | COM = 0, R _S = 0, C _L = 1nF, <i>See Test Circuit Figure 4.</i> | | 54 | | pC |
| Off-Isolation | O _{IRR} | C _L = 5pF, R _L = 50Ω, f = 100kHz, V _{COM} = 1 V _{RMS} , <i>See Test Circuit Figure 5.</i> | | -42 | | dB |
| Crosstalk | X _{TALK} | C _L = 5pF, R _L = 50Ω, f = 100kHz, V _{COM} = 1 V _{RMS} , <i>See Test Circuit Figure 6.</i> | | -70 | | |
| 3dB Bandwidth | f _{3dB} | <i>See Test Circuit Figure 9.</i> | | 27 | | MHz |
| Total Harmonic Distortion | THD | R _L = 32Ω, V _{IN} = 3.5V, V _{CC} = 4.5V f = 20Hz to 20kHz | | 0.07 | | % |
| | | R _L = 32Ω, V _{IN} = 2.0V, V _{CC} = 3.4V f = 20Hz to 20kHz | | 0.06 | | |
| | | R _L = 32Ω, V _{IN} = 1.5V, V _{CC} = 2.7V f = 20Hz to 20kHz | | 0.05 | | |

Capacitance

| Parameter | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|--------------------|-----------------------|---|------|------|------|-------|
| NC Off Capacitance | C _{NC (OFF)} | f = 1MHz, <i>See Test Circuit Figure 7.</i> | | 84 | | pF |
| NO Off Capacitance | C _{NO (OFF)} | f = 1MHz, <i>See Test Circuit Figure 7.</i> | | 65 | | |
| NC On Capacitance | C _{NC (ON)} | f = 1MHz, <i>See Test Circuit Figure 8.</i> | | 240 | | |
| NO On Capacitance | C _{NO (ON)} | f = 1MHz, <i>See Test Circuit Figure 8.</i> | | 225 | | |

Test Circuits and Timing Diagrams

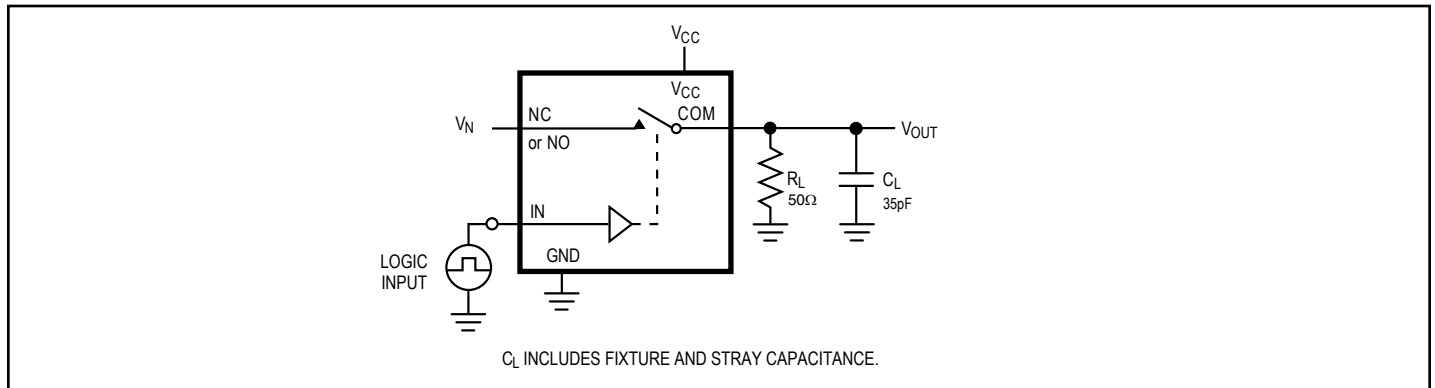


Figure 1. AC Test Circuit

Notes:

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

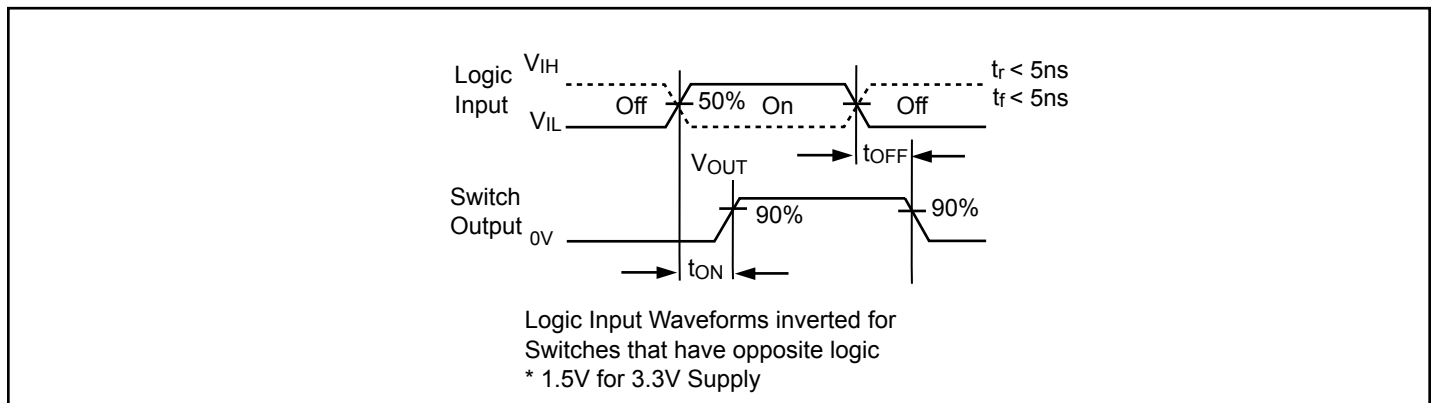


Figure 2. AC Waveforms

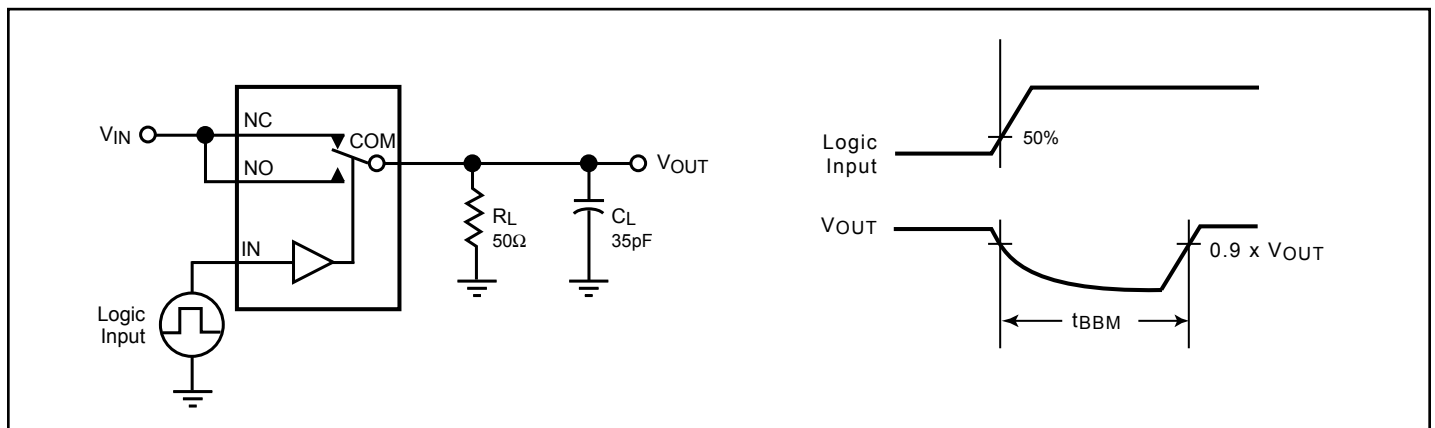


Figure 3. Break Before Make Interval Timing

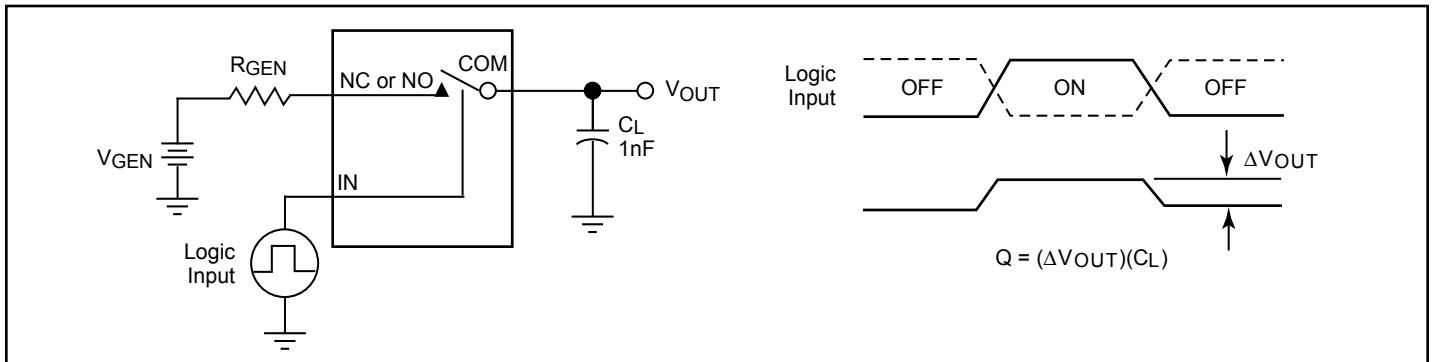


Figure 4. Charge Injection Test

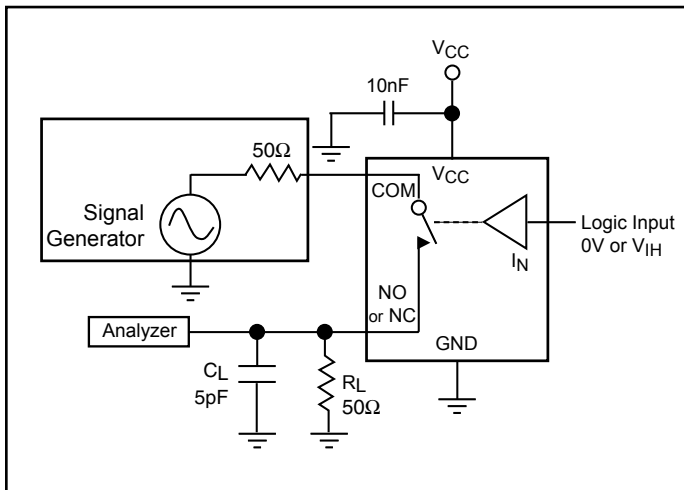


Figure 5. Off Isolation

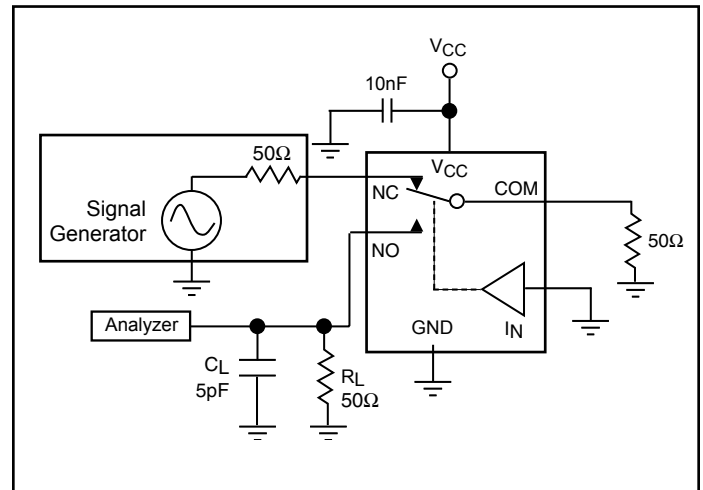


Figure 6. Crosstalk

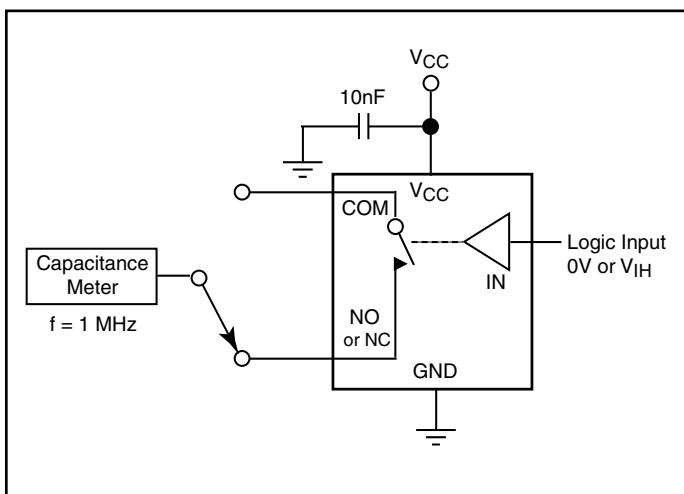


Figure 7. Channel Off Capacitance

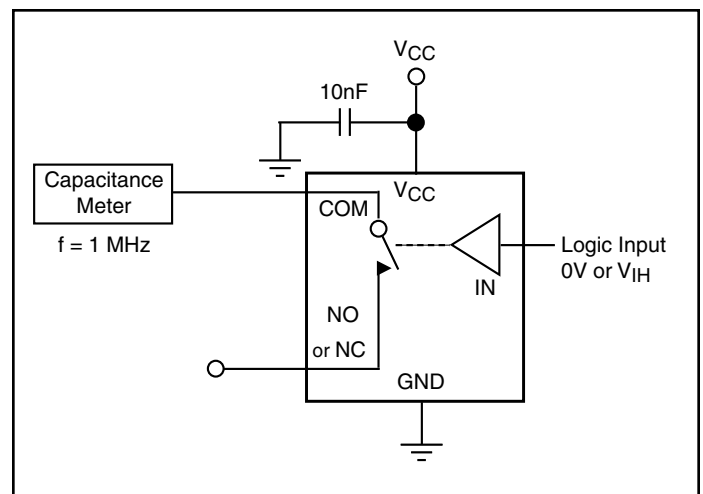


Figure 8. Channel On Capacitance

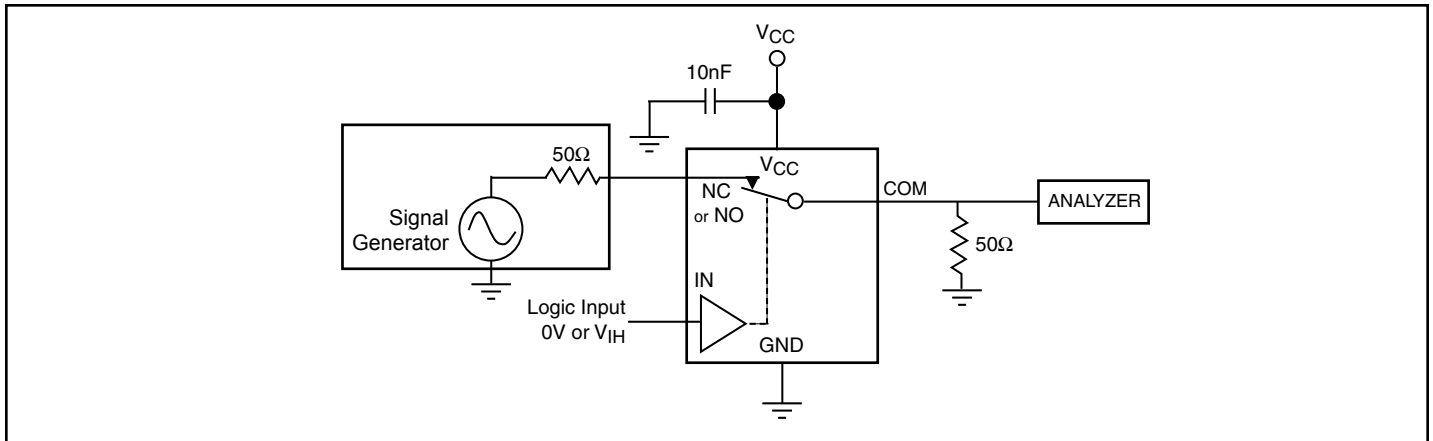
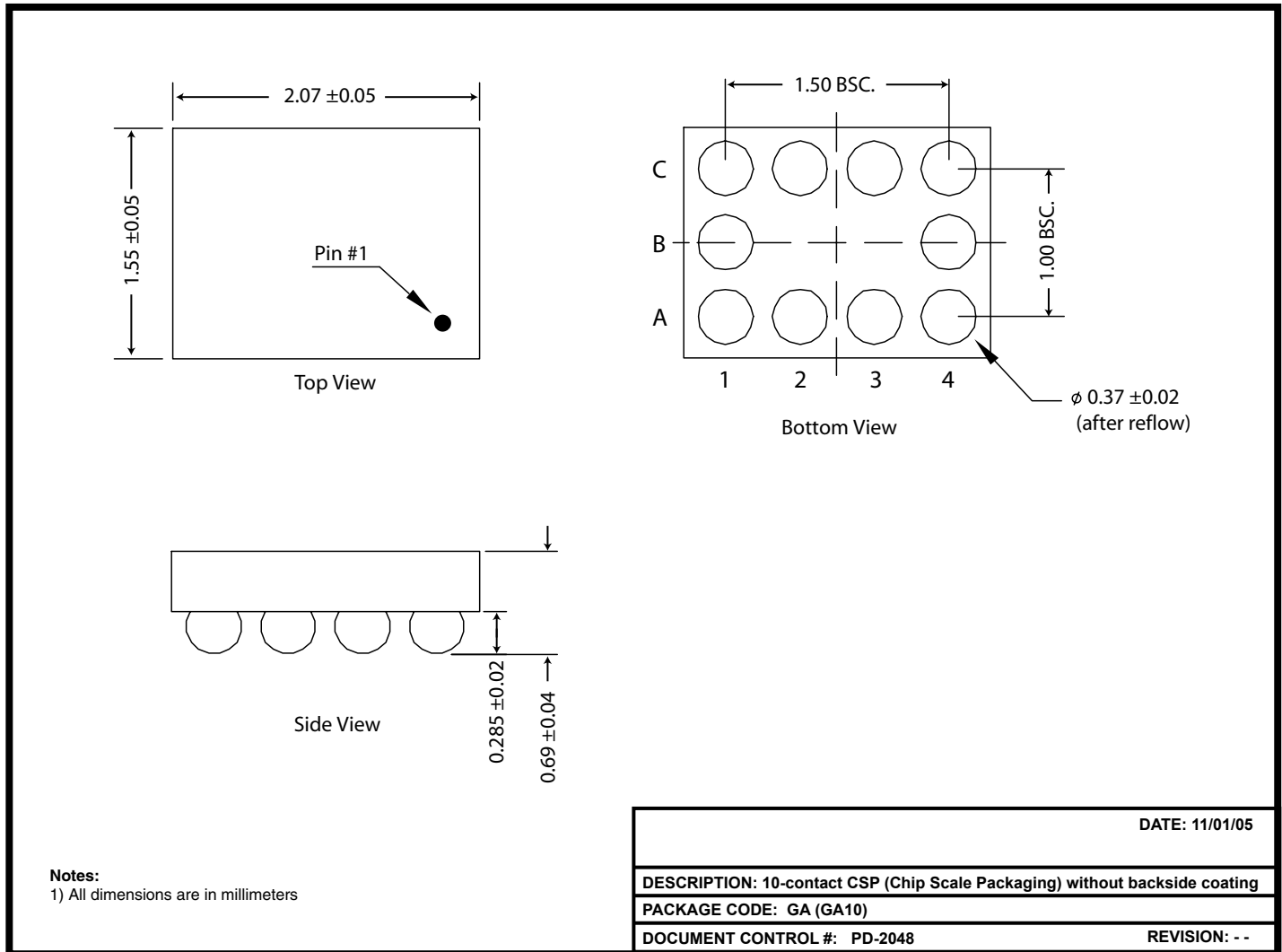


Figure 9. Bandwidth



Ordering Information

| Ordering Code | Packaging Code | Package Type |
|---------------|----------------|------------------------------|
| PI5A4684GAE | GA | Pb-free & Green, 10-ball CSP |

Notes:

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