

**Chip Scale Packaging, Dual SPDT Analog Switch**
**Features**

- CMOS Technology for Bus and Analog Applications
- Low On-Resistance: 0.5Ω.
- Wide V<sub>CC</sub> 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<sub>CC</sub> = 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**

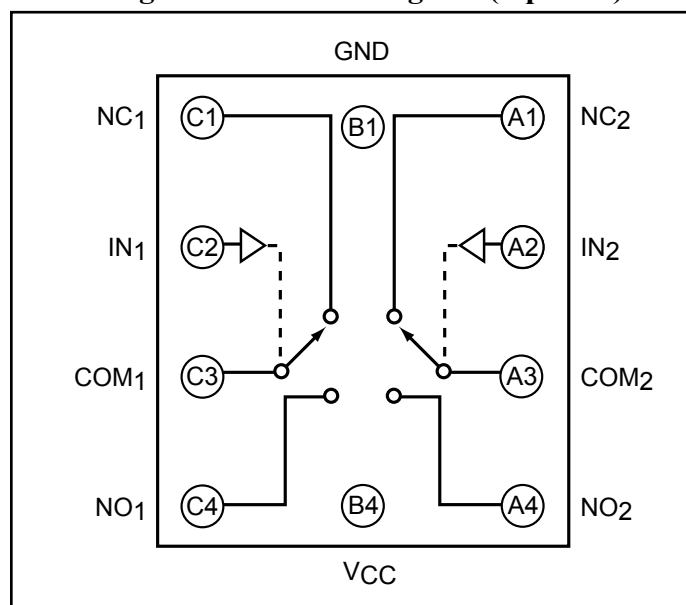
- Cell Phones
- PDAs
- MP3 players
- Portable Instrumentation
- Computer Peripherals
- Speaker Headset Switching
- Power Routing
- Relay Replacement
- Audio and Video Signal Routing
- PCMCIA Cards
- Modems

**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<sub>x</sub>, 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 <sub>x</sub>	Data Port (Normally open)
B1	GND	Ground
A1, C1	NC <sub>x</sub>	Data Port (Normally closed)
A3, C3	COM <sub>x</sub>	Common Output / Data Port
B4	V <sub>CC</sub>	Postive Power Supply
A2, C2	IN <sub>x</sub>	Logic Control

**Logic Function Table**

Logic Input (IN <sub>x</sub> )	Function
0	NC <sub>x</sub> Connected to COM <sub>x</sub>
1	NO <sub>x</sub> Connected to COM <sub>x</sub>

Note:

1. x = 1, or 2

**Absolute Maximum Ratings**<sup>(1)</sup>

Supply Voltage $V_{CC}$	-0.5V to +7V
DC Switch Voltage ( $V_S$ ) <sup>(2)</sup>	-0.5V to $V_{CC} + 0.5V$
DC Input Voltage ( $V_{IN}$ ) <sup>(2)</sup>	-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**<sup>(3)</sup>

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 ( $\theta_{JA}$ )	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
<b>Analog Switch</b>						
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	$\Omega$
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	$\Delta R_{ON}$	$V_{CC} = 2.7V, I_{COM} = 100mA,$ $V_{NO}$ 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	
<b>Digital I/O</b>						
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	$\mu A$
<b>Power Supply</b>						
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

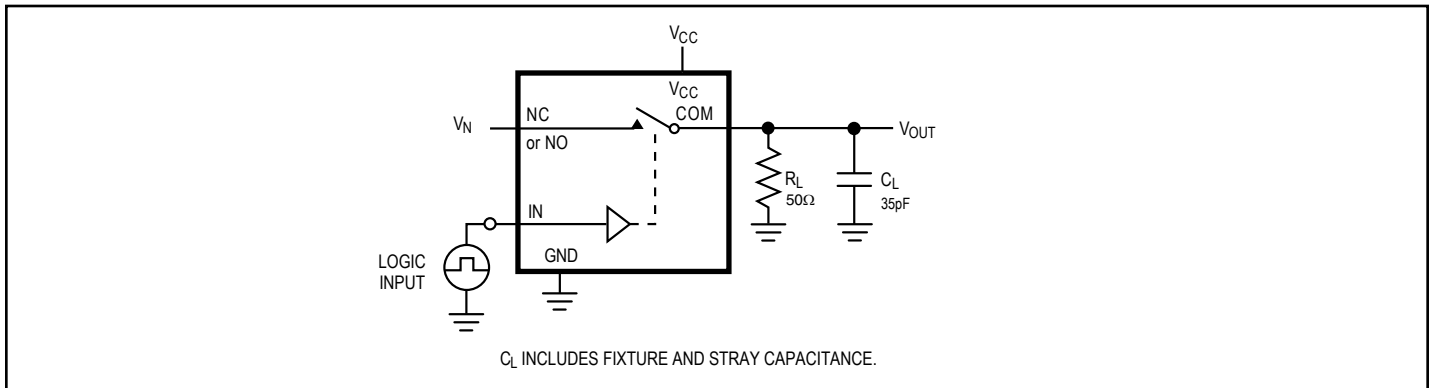
### Switch and AC Characteristics

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

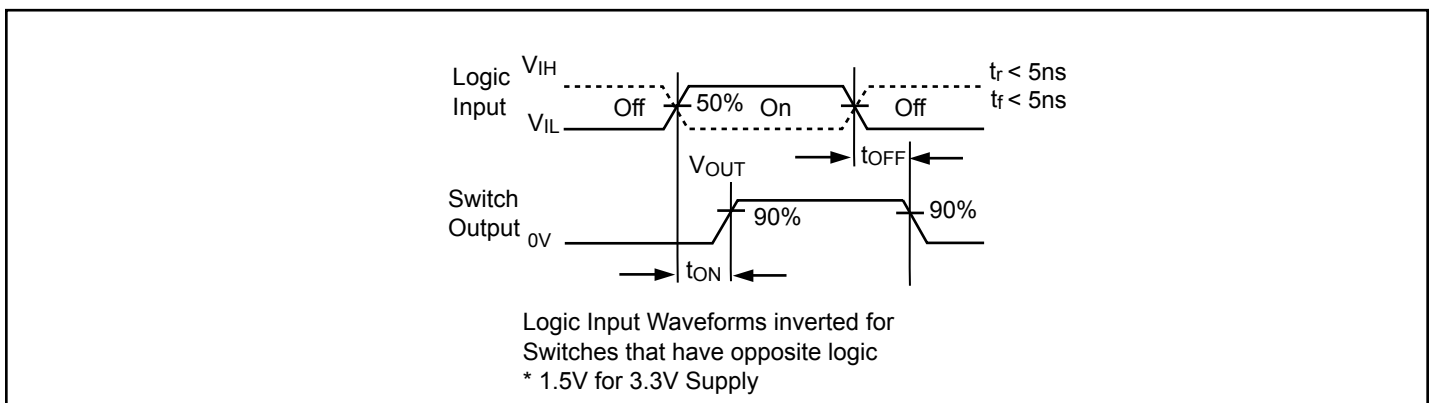
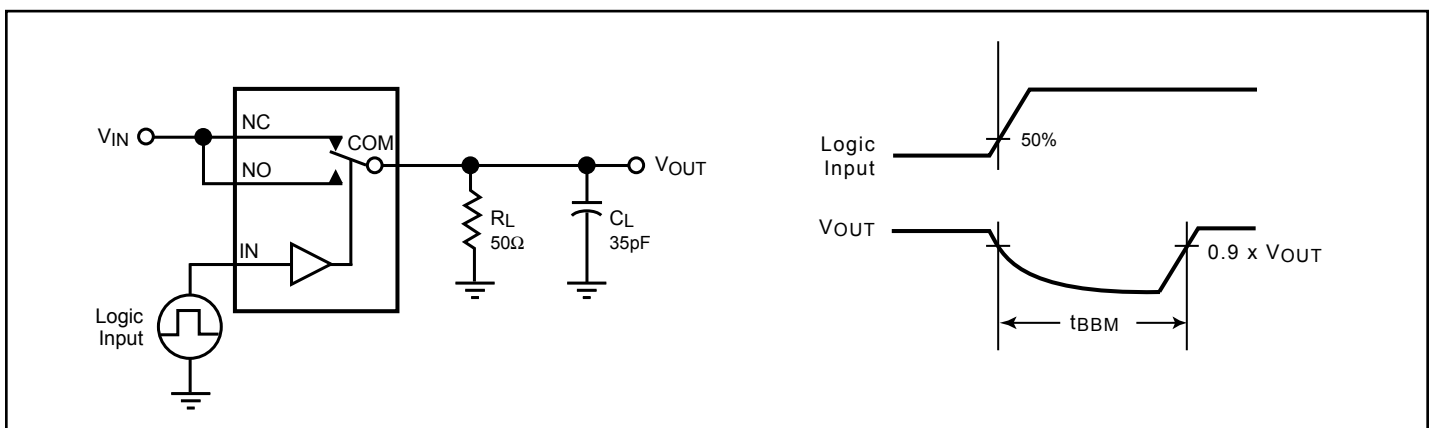
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Turn-On Time	$t_{ON}$	$V_{CC} = 2.7V$ , $V_{NO}$ or $V_{NC} = 1.5V$ , $R_L = 50\Omega$ , $C_L = 35pF$ , <i>See Test Circuit Figure 1 &amp; 2.</i>		25	60	ns
Turn-Off Time	$t_{OFF}$	$V_{CC} = 2.7V$ , $V_{NO}$ or $V_{NC} = 1.5V$ , $R_L = 50\Omega$ , $C_L = 35pF$ , <i>See Test Circuit Figure 1 &amp; 2.</i>		7	20	
Break-Before-Make Delay	$t_{BBM}$	$V_{CC} = 2.7V$ , $V_{NO}$ or $V_{NC} = 1.5V$ , $R_L = 50\Omega$ , $C_L = 35pF$ , <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	$O_{IRR}$	$C_L = 5pF$ , $R_L = 50\Omega$ , $f = 100kHz$ , $V_{COM} = 1 V_{RMS}$ , <i>See Test Circuit Figure 5.</i>		-42		dB
Crosstalk	$X_{TALK}$	$C_L = 5pF$ , $R_L = 50\Omega$ , $f = 100kHz$ , $V_{COM} = 1 V_{RMS}$ , <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	$R_L = 32\Omega$ , $V_{IN} = 3.5V$ , $V_{CC} = 4.5V$ $f = 20Hz$ to $20kHz$		0.07		%
		$R_L = 32\Omega$ , $V_{IN} = 2.0V$ , $V_{CC} = 3.4V$ $f = 20Hz$ to $20kHz$		0.06		
		$R_L = 32\Omega$ , $V_{IN} = 1.5V$ , $V_{CC} = 2.7V$ $f = 20Hz$ to $20kHz$		0.05		

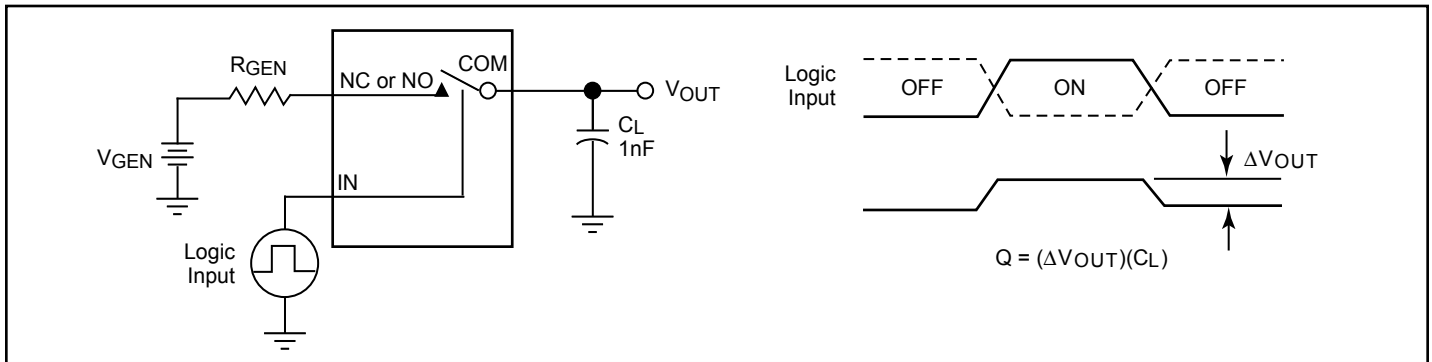
### Capacitance

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		

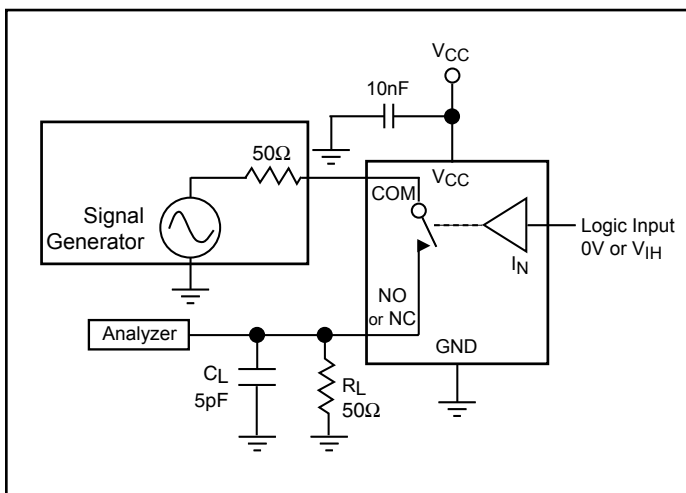
**Test Circuits and Timing Diagrams**

**Figure 1. AC Test Circuit**
**Notes:**

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

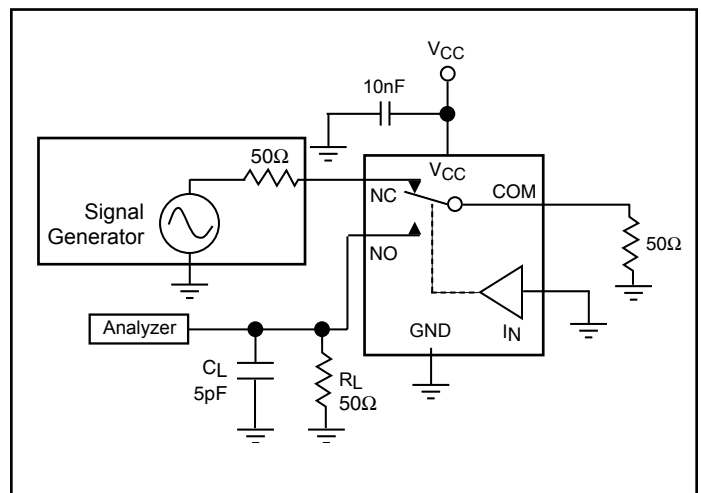

**Figure 2. AC Waveforms**

**Figure 3. Break Before Make Interval Timing**



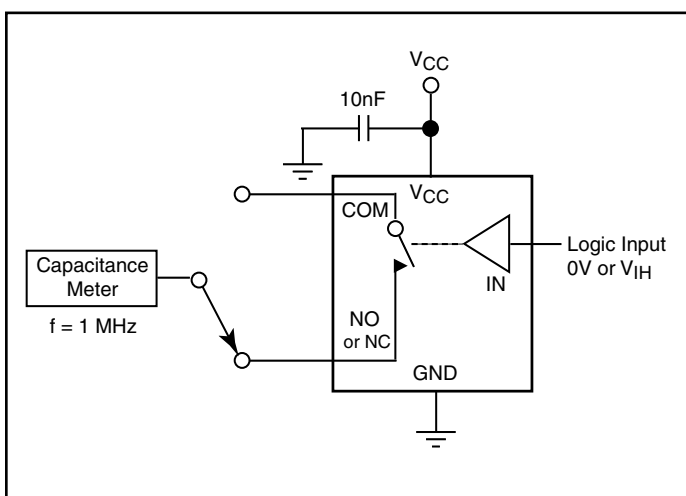
**Figure 4. Charge Injection Test**



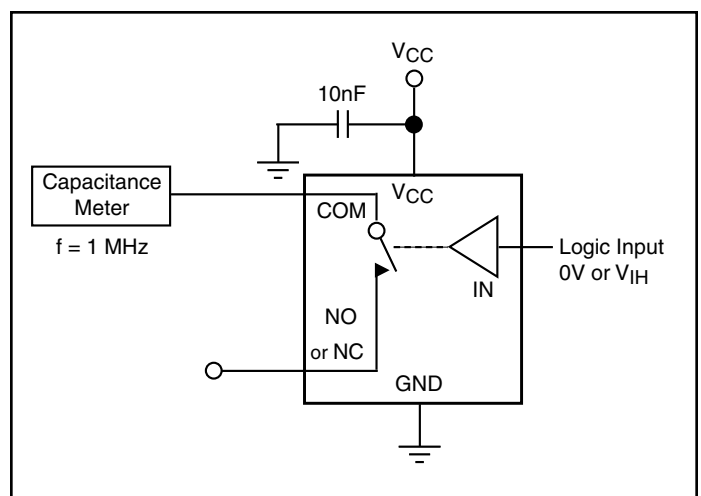
**Figure 5. Off Isolation**



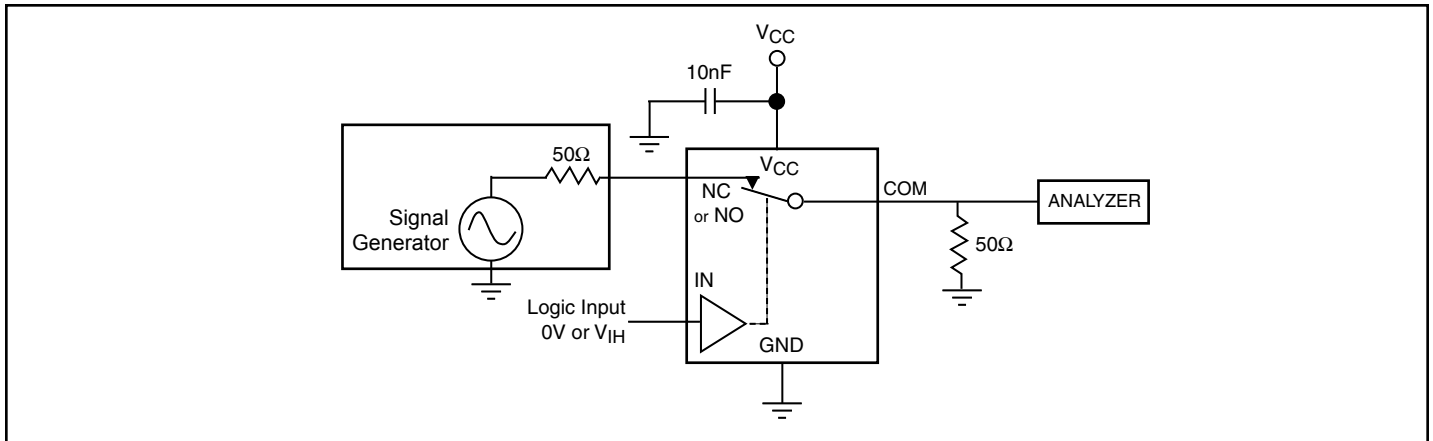
**Figure 6. Crosstalk**



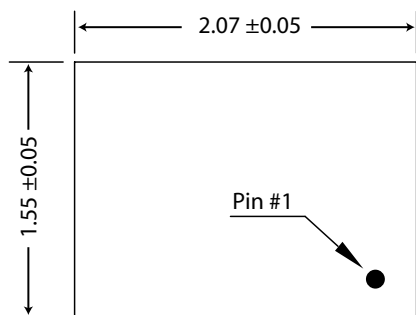
**Figure 7. Channel Off Capacitance**



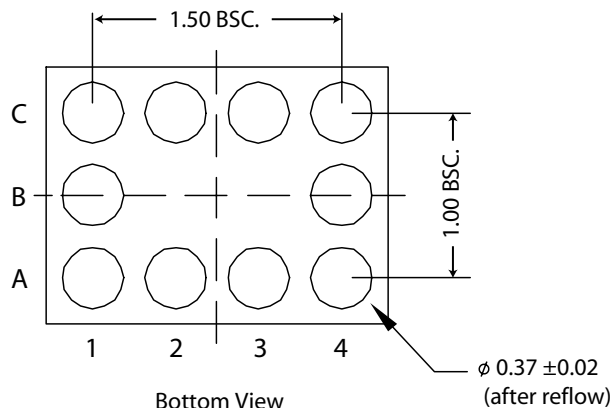
**Figure 8. Channel On Capacitance**



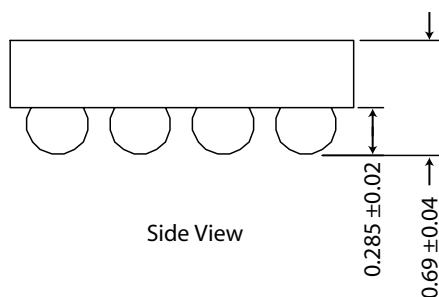
**Figure 9. Bandwidth**



Top View




Bottom View



Side View

**Notes:**

1) All dimensions are in millimeters

	DATE: 11/01/05
	DESCRIPTION: 10-contact CSP (Chip Scale Packaging) without backside coating
	PACKAGE CODE: GA (GA10)
	DOCUMENT CONTROL #: PD-2048
	REVISION: - -

## 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/](http://www.pericom.com/packaging/)
- E = Pb-free and Green
- Adding an X suffix = Tape & Reel