

## Small Package, Dual SPDT Audio Clickless Analog Switch

### Features

- CMOS Technology for Bus and Analog Applications
- Low On-Resistance:  $0.6\Omega @ 2.7V$
- Wide  $V_{CC}$  Range: 1.65V TO 5.5V
- Rail-to-Rail Signal Range
- Control Input Overvoltage Tolerance: 5.5V min.
- High Off Isolation: -53dB
- Crosstalk Rejection Reduces Signal Distortion: -84dB
- Break-Before-Make Switching
- Low THD (0.017% @  $V_{CC} = 2.7V$ )
- Extended Industrial Temperature Range:  $-40^{\circ}C$  to  $85^{\circ}C$
- Packaging (Pb-free & Green):
  - 10-ball 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

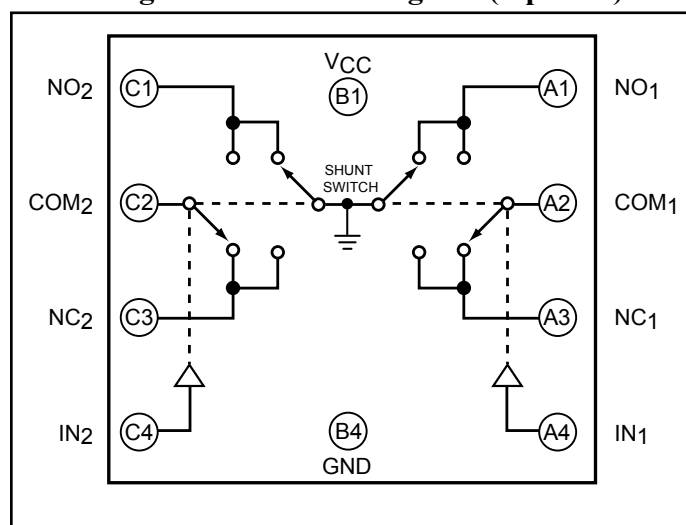
### Description

Pericom Semiconductor's PI5A4764 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 PI5A4764 has a low On-Resistance of  $0.6\Omega @ 2.7V$ .

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.

The PI5A4764 shunt switches connected to ground in order to dissipate capacitance that builds up on the unconnected NC or NO line. As a result, reduction of popping and clicking sounds is achieved when switching between audio sources.

### Pin Configuration /Block Diagram (top view) CSP



### Pin Description

Pin #	Name	Description
A1, C1	$NO_X$	Data Port (Normally open)
B1	$V_{CC}$	Positive Power Supply
A3, C3	$NC_X$	Data Port (Normally closed)
B4	GND	Ground
A2, C2	$COM_X$	Common Output/Data Port
A4, C4	$IN_X$	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.  $x = 1, \text{ or } 2$

**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
DC Output Current ( $V_{OUT}$ )	128mA
DC $V_{CC}$ or Ground Current ( $I_{CC}/I_{GND}$ )	$\pm 100mA$
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	180mW

**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

**Notes:**

1. Absolute Maximum Ratings<sup>7</sup> 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	$R_{ON(NO)}$	$V_{CC} = 2.7V, I_{COM} = 100mA, V_{NO} = 0$ to $V_{CC}$		0.5	0.6	
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 $V_{CC}$		.15	0.4	
NO On-Resistance Flatness	$R_{ONF(NO)}$	$V_{CC} = 2.7V, I_{COM} = 100mA, V_{NO} = 0$ to $V_{CC}$		.15	0.4	
Shunt Switch Resistance	$R_{SH}$	$I_{NO}$ or $I_{NC} = 10mA, V_{CC} = 2.7V$		30		
COM On Leakage Current	$I_{COM(ON)}$	$V_{CC} = 2.7V, V_{NC}$ or $V_{NO} = 0.3V, +2.5V, V_{COM} = +2.5V, 0.3V$	-160		160	nA
<b>Digital I/O</b>						
Input Logic High	$V_{IH}$	$V_{CC} = 2.7V$ to $3.3V$	1.8			V
		$V_{CC} = 4.2V$ to $5.5V$	2.0			
Input Logic Low	$V_{IL}$	$V_{CC} = 2.7V$ to $3.3V$			0.6	
		$V_{CC} = 4.2V$ to $5.5V$			0.8	
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 $V_{CC}$		4	12	$\mu A$

**Switch and AC Characteristics**

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 Fig. 1 &amp; 2</i>		25.0	60.0	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 Fig. 1 &amp; 2</i>		6	20.0	
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 Fig. 3</i>		25		
Charge Injection	Q	COM = 0, $R_S = 0$ , $C_L = 1nF$ , <i>See Test Circuit Fig. 4</i>		47		pC
Off-Isolation	$O_{IRR}$	$C_L = 5pF$ , $R_L = 50\Omega$ , $f = 100kHz$ , $V_{COM} = 1 V_{RMS}$ , <i>See Test Circuit Fig. 5</i>		-53		dB
Crosstalk	$X_{TALK}$	$C_L = 5pF$ , $R_L = 50\Omega$ , $f = 100kHz$ , $V_{COM} = 1 V_{RMS}$ , <i>See Test Circuit Fig. 6</i>		-84		
3dB Bandwidth	$f_{3dB}$	<i>See Test Circuit Fig. 9</i>		37		MHz
Total Harmonic Distortion	THD	$R_L = 32\Omega$ , $V_{IN} = 3.5V$ , $V_{CC} = 4.5V$ $f = 20Hz$ to $20kHz$			0.03	%
		$R_L = 32\Omega$ , $V_{IN} = 2.0V$ , $V_{CC} = 3.4V$ $f = 20Hz$ to $20kHz$			0.026	
		$R_L = 32\Omega$ , $V_{IN} = 1.5V$ , $V_{CC} = 2.7V$ $f = 20Hz$ to $20kHz$			0.17	

**Capacitance**

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
NC On Capacitance	$C_{NC(ON)}$	$f = 1 MHz$ , <i>See Test Circuit Fig. 8</i>		167		
NO On Capacitance	$C_{NO(ON)}$	$f = 1 MHz$ , <i>See Test Circuit Fig. 8</i>		167		

### Test Circuits and Timing Diagrams

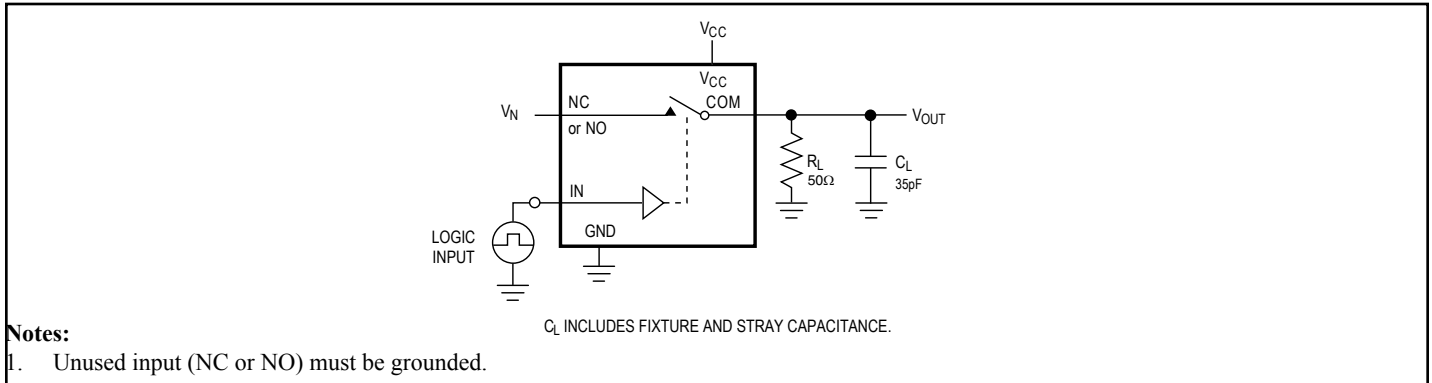


Figure 1. AC Test Circuit

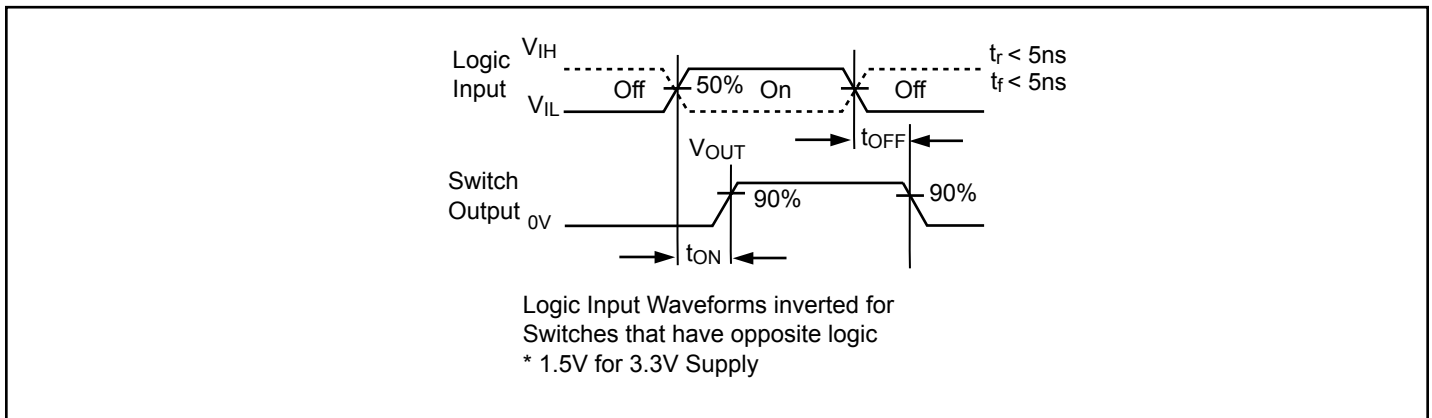


Figure 2. AC Waveforms

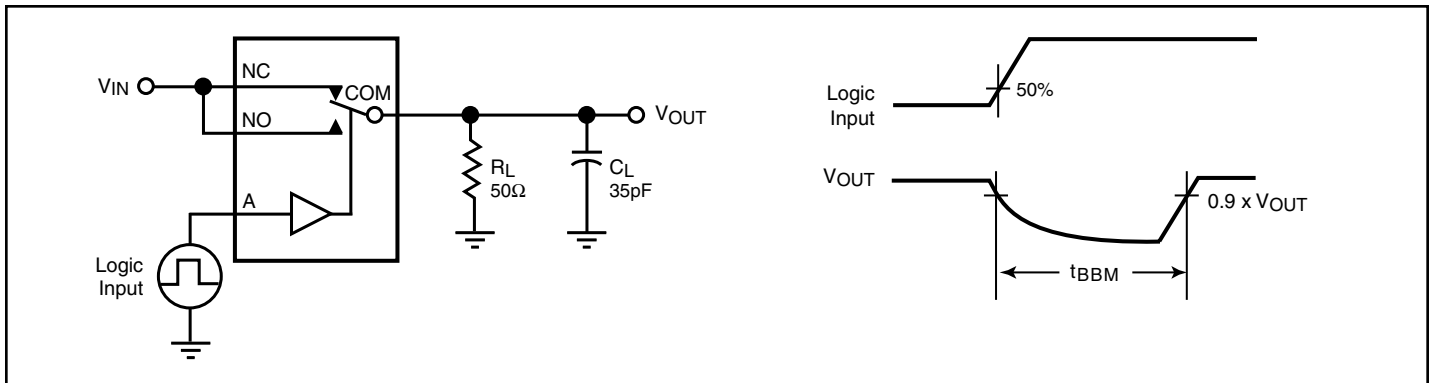
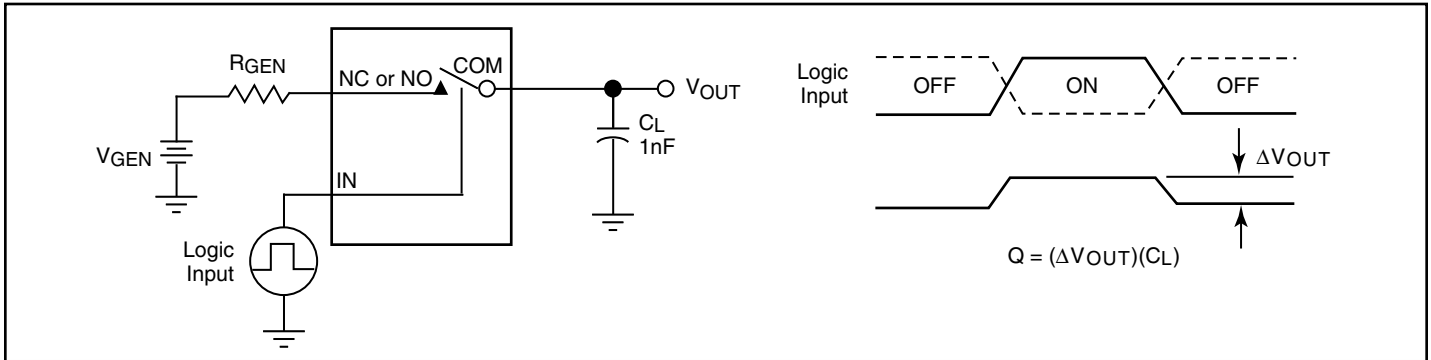
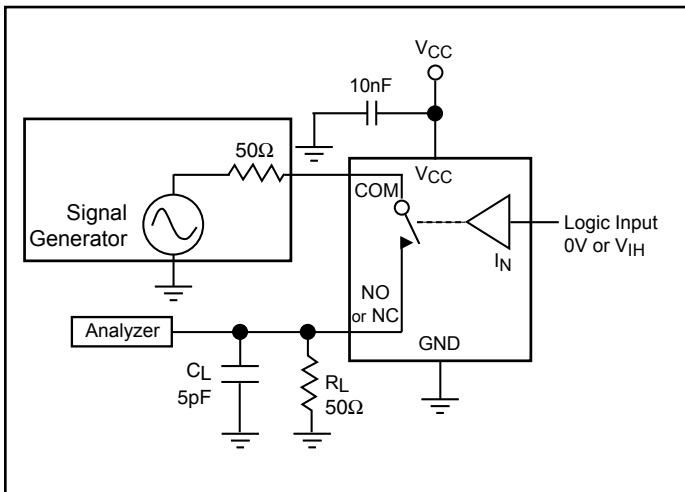


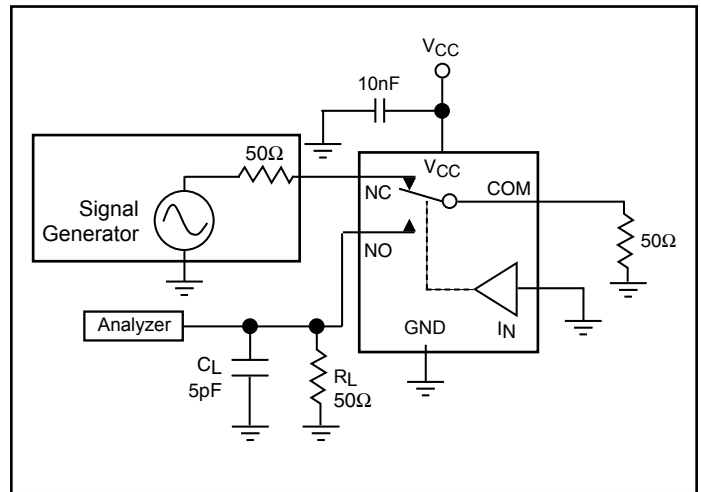
Figure 3. Break Before Make Interval Timing



**Figure 4. Charge Injection Test**



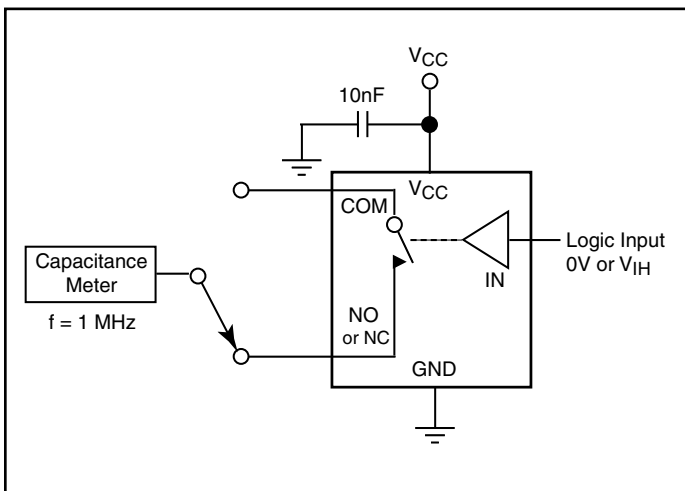
**Figure 5. Off Isolation**



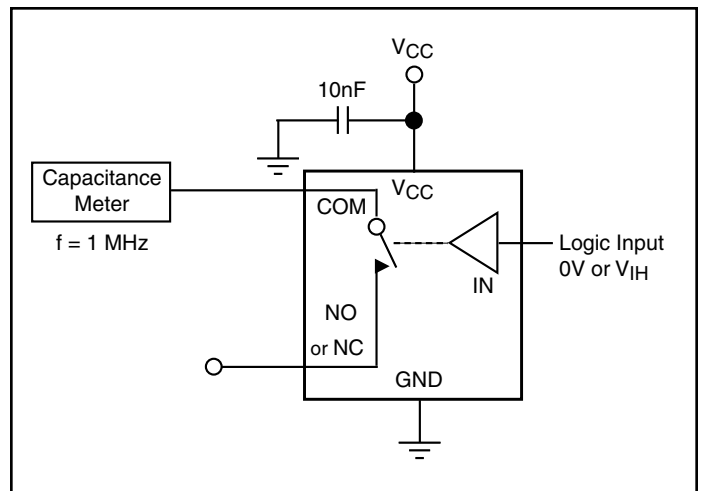
**Figure 6. Crosstalk**

**Note:**

1. Crosstalk measured from one channel to the pins of the other channel.



**Figure 7. Channel Off Capacitance**



**Figure 8. Channel On Capacitance**

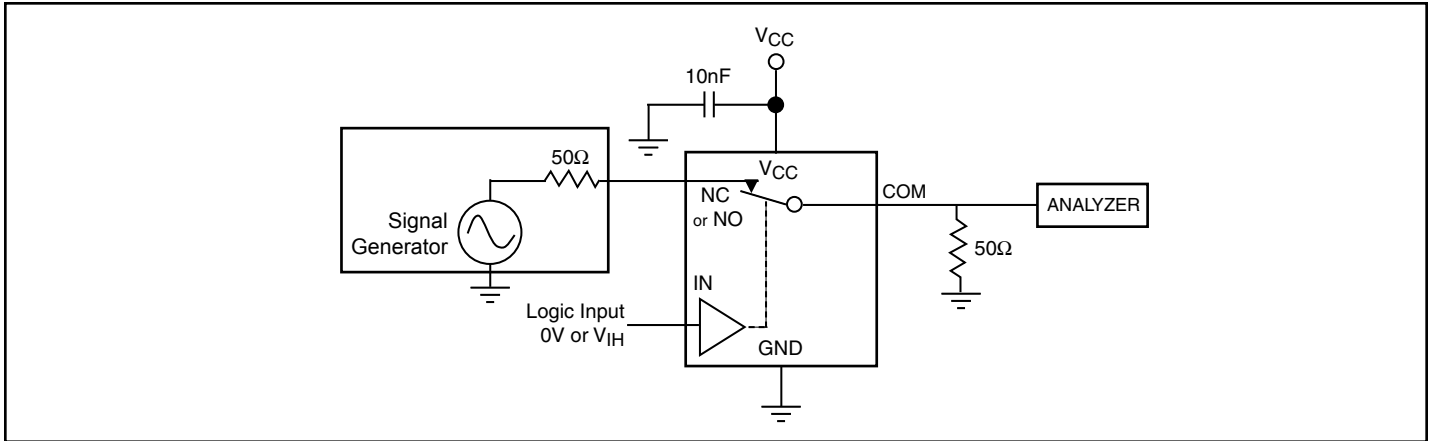
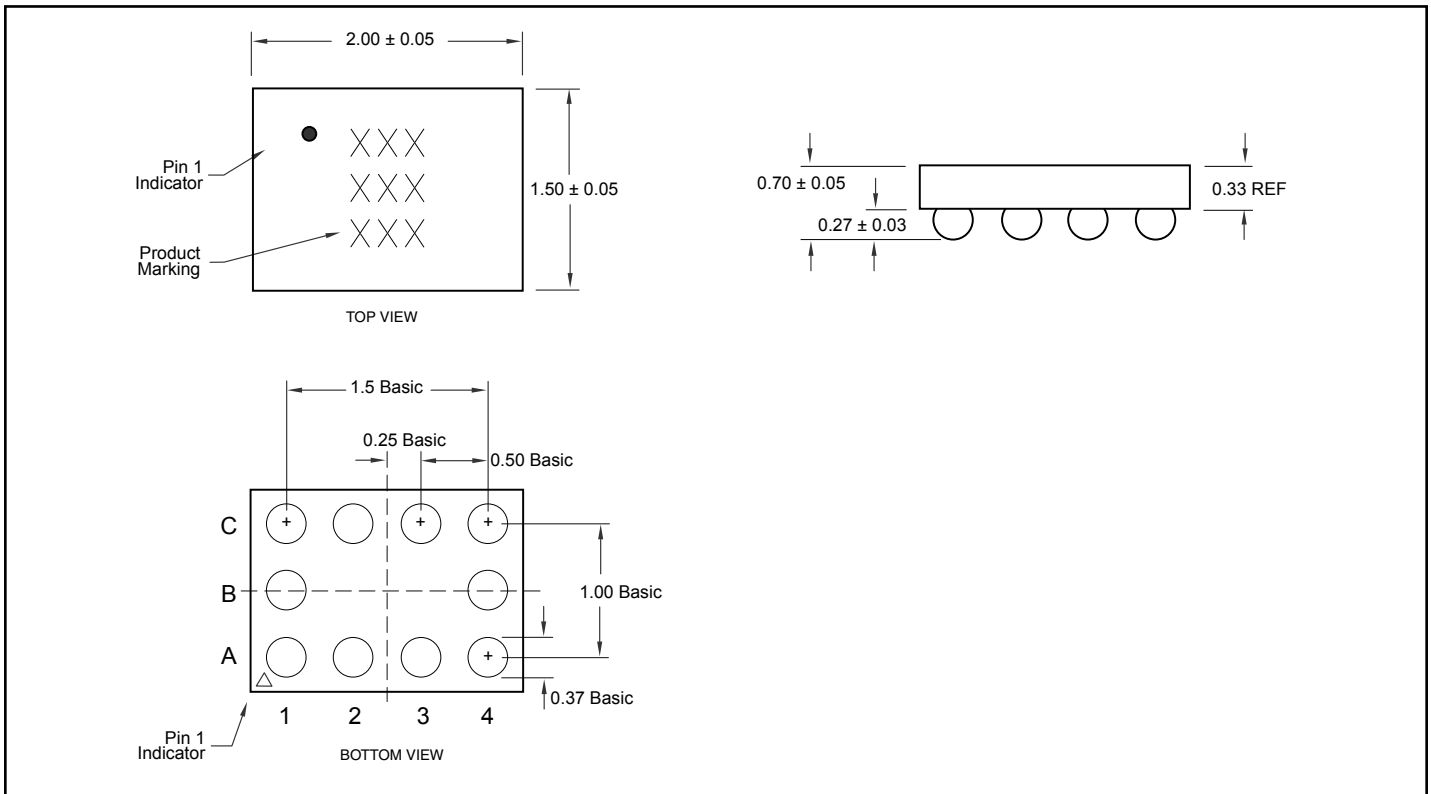


Figure 9. Bandwidth

**Packaging Mechanical : 2x1.5mm CSP**



**Ordering Information**

Ordering Code	Packaging Code	Package Type
PI5A4764GAE	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/)
- X suffix = Tape & Reel