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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

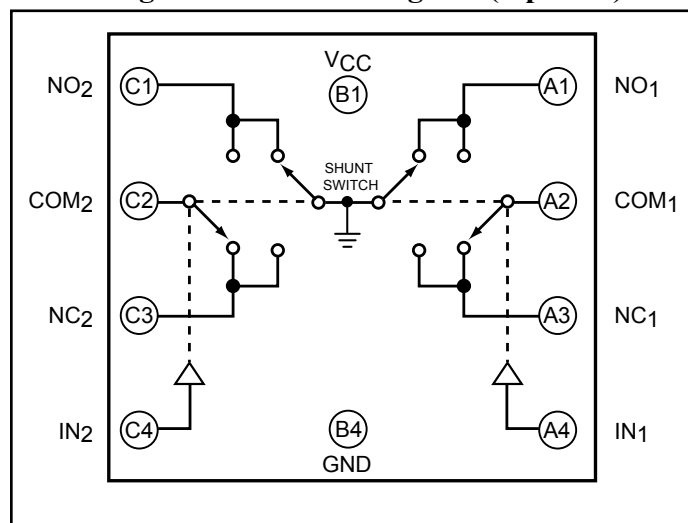
Description

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⁽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
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⁽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

Notes:

1. Absolute Maximum Ratings³ 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 $3.3V$, $T_A = -40\text{ C}$ to $+85\text{ C}$, unless otherwise noted. Typical values are at $3V$ and $+25\text{ C}$.)

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	$R_{ON(NO)}$	$V_{CC} = 2.7V, I_{COM} = 100mA, V_{NO} = 0$ to V_{CC}		0.5	0.6	
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}		.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
Digital I/O						
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	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}		4	12	μA

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 & 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 & 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

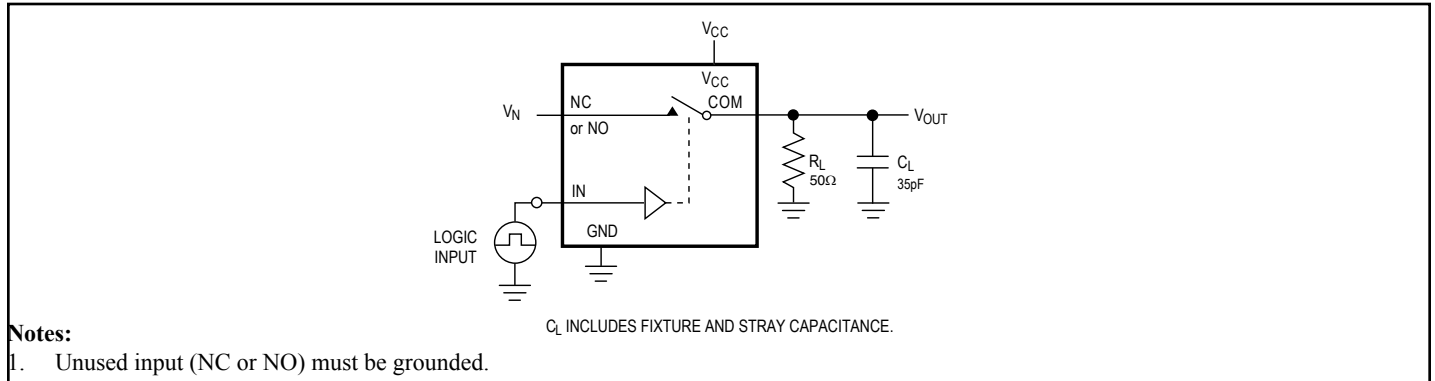


Figure 1. AC Test Circuit

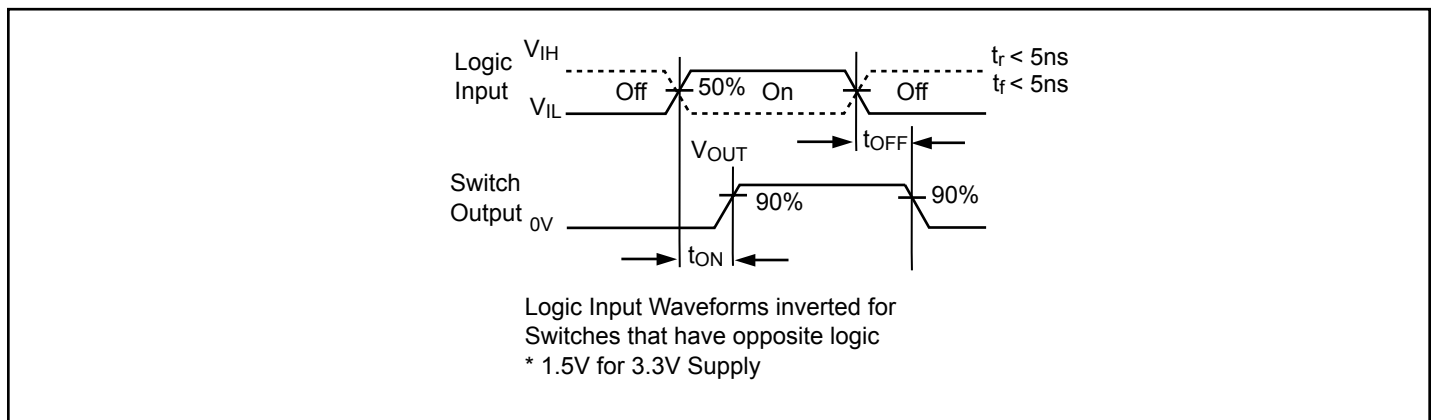


Figure 2. AC Waveforms

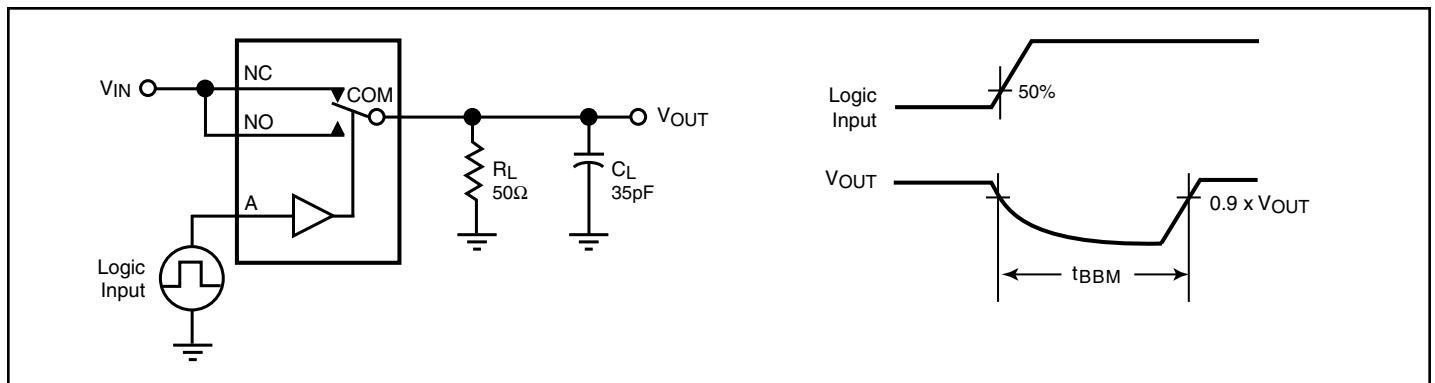


Figure 3. Break Before Make Interval Timing

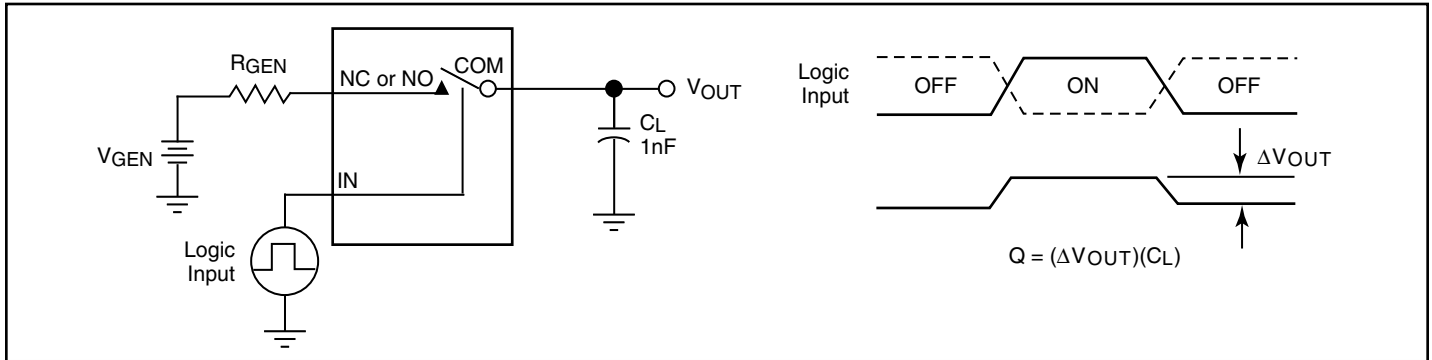


Figure 4. Charge Injection Test

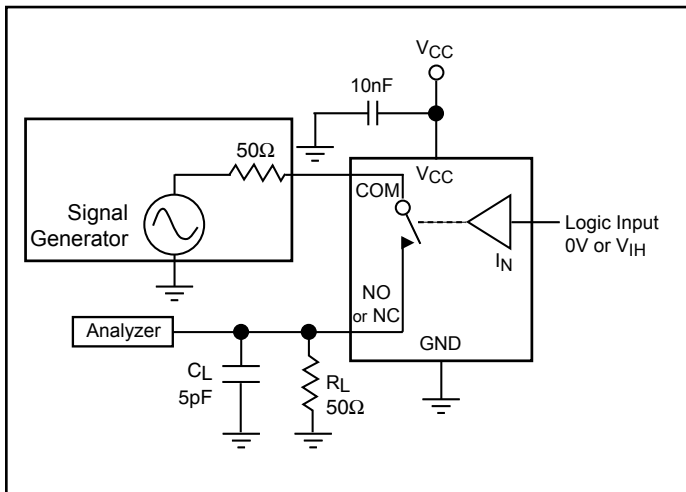


Figure 5. Off Isolation

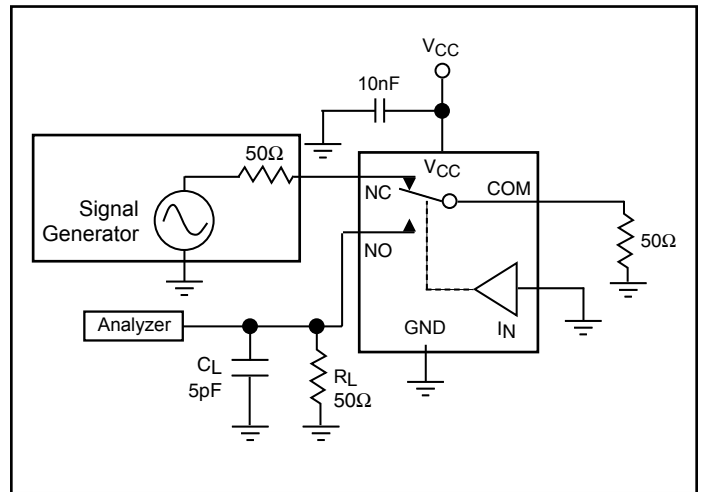


Figure 6. Crosstalk

Note:

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

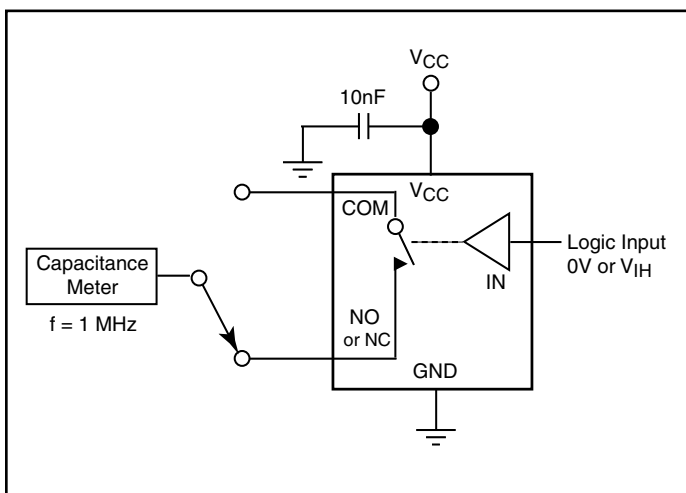


Figure 7. Channel Off Capacitance

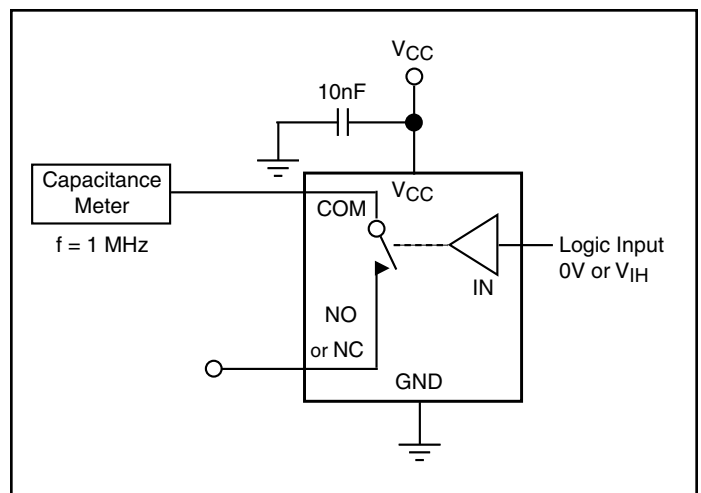


Figure 8. Channel On Capacitance

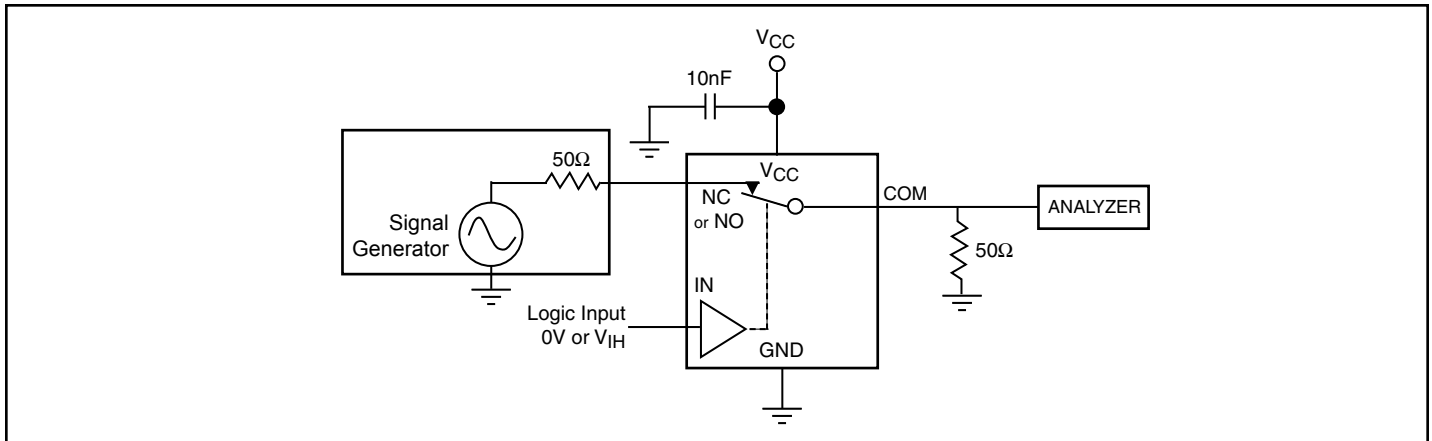
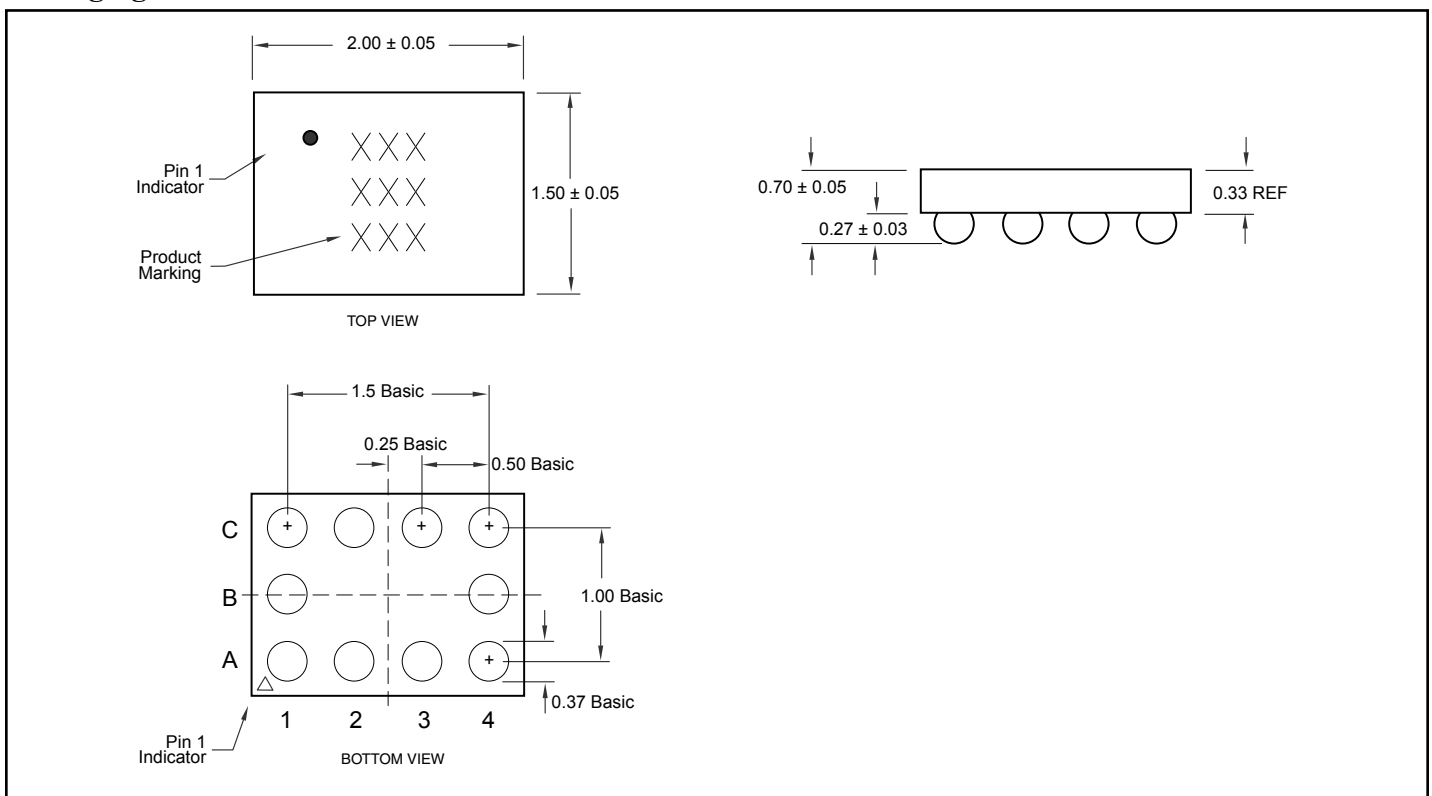


Figure 9. Bandwidth

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/
- X suffix = Tape & Reel