

## Small Plastic Package, Dual SPDT Audio Clickless Analog Switch (with Shunt Switches)

### Features

- CMOS Technology for Bus and Analog Applications
- Low On-Resistance:  $0.6\Omega @ 2.7V$
- Wide  $V_{CC}$  Range:  $2.7V TO 4.2V \pm 10\%$
- Rail-to-Rail Signal Range
- High Off Isolation:  $-80dB @ 100 kHz$
- Crosstalk Rejection Reduces Signal Distortion:  $-90dB @ 100 kHz$
- Break-Before-Make Switching
- Extended Industrial Temperature Range:  $-40^{\circ}C$  to  $85^{\circ}C$
- Packaging: Pb-free & Green, 10-contact TQFN (ZL10)

### 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

### Pin Description

Pin #	Name	Description
2,5	NO <sub>X</sub>	Data Port (Normally open)
9	V <sub>CC</sub>	Positive Power Supply
7, 10	NC <sub>X</sub>	Data Port (Normally closed)
3	GND	Ground
1, 6	COM <sub>X</sub>	Common Output/Data Port
4, 8	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: x = 1, or 2

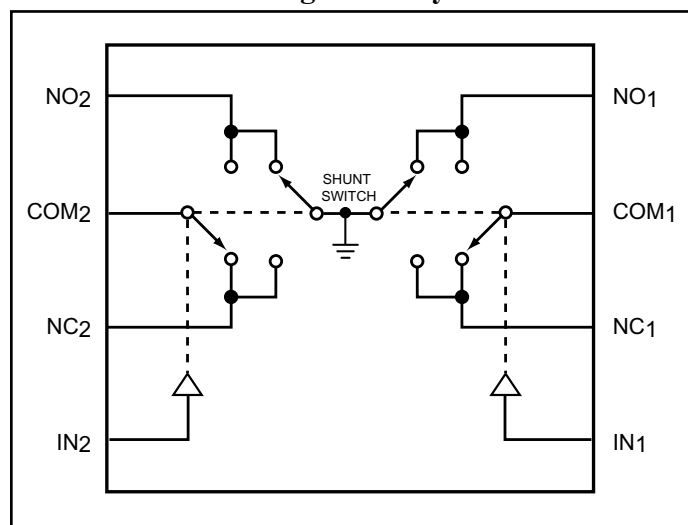
### Description

Pericom Semiconductor's PI3A212S 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, 2.7V to 4.2V, the PI3A212S has a low On-Resistance of  $0.6\Omega @ 2.7V$ .

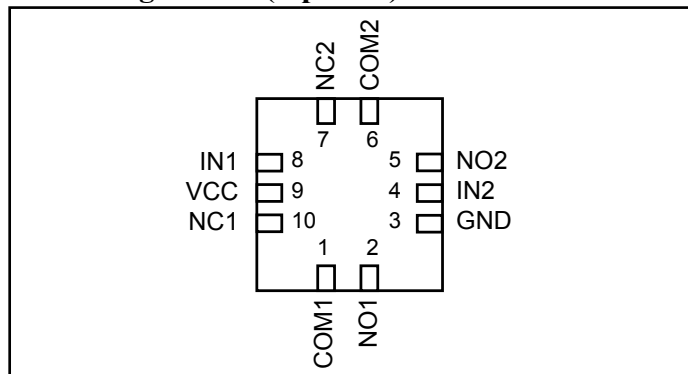
Break-before-make switching prevents both switches being enabled simultaneously. This eliminates signal disruption during switching.

The PI3A212S 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.

### Functional Block Diagram Only



### Pin Configuration (top view)



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

Supply Voltage $V_{CC}$	-0.5V to +4.6V
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 +4.6V
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 ( $V_{CC}$ )	2.7V to 4.2V
Control Input Voltage ( $V_{IN}$ )	0V to $V_{CC}$
Switch Input Voltage ( $V_{IN}$ )	-0.3V 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
Thermal Resistance ( $\theta_{JA}$ )	350°C/W

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

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
<b>Analog Switch</b>						
Analog Signal Range	$V_{NO}, V_{NC}, V_{COM}$		-0.3		$V_{CC}$	V
NC On-Resistance	$R_{ON(NC)}$	$V_{CC} = 2.7V, I_{COM} = 100mA,$ $V_{NC} = 0$ to $V_{CC}$		0.6	0.8	$\Omega$
NO On-Resistance	$R_{ON(NO)}$	$V_{CC} = 2.7V, I_{COM} = 100mA,$ $V_{NO} = 0$ to $V_{CC}$		0.6	0.8	
On-Resistance Match Between Channels	$\Delta R_{ON}$	$V_{CC} = 2.7V, I_{COM} = 100mA,$ $V_{NO}$ or $V_{NC} = 1.5V$		0.01	0.08	
NC On-Resistance Flatness	$R_{ONF(NC)}$	$V_{CC} = 2.7V, I_{COM} = 100mA,$ $V_{NC} = 0$ to $V_{CC}$		.15		
NO On-Resistance Flatness	$R_{ONF(NO)}$	$V_{CC} = 2.7V, I_{COM} = 100mA,$ $V_{NO} = 0$ to $V_{CC}$		.15		
Shunt Switch Resistance	$R_{SH}$	$I_{NO}$ or $I_{NC} = 10mA, V_{CC} = 2.7V$			35	
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 $3.3V$	1.3			V
		$V_{CC} = 4.2V$	1.4			
Input Logic Low	$V_{IL}$	$V_{CC} = 2.7V$ to $3.3V$			0.6	
		$V_{CC} = 4.2V$			0.8	
IN Input Leakage Current	$I_{IN}$	$V_{IN} = 0$ or $V_{CC}$	-0.5		0.5	$\mu A$
<b>Power Supply</b>						
Power-Supply Range	$V_{CC}$		2.7		4.6	V
Supply Current	$I_{CC}$	$V_{CC} = 4.2V, V_{IN} = 0$ or $V_{CC}$				nA
					400	

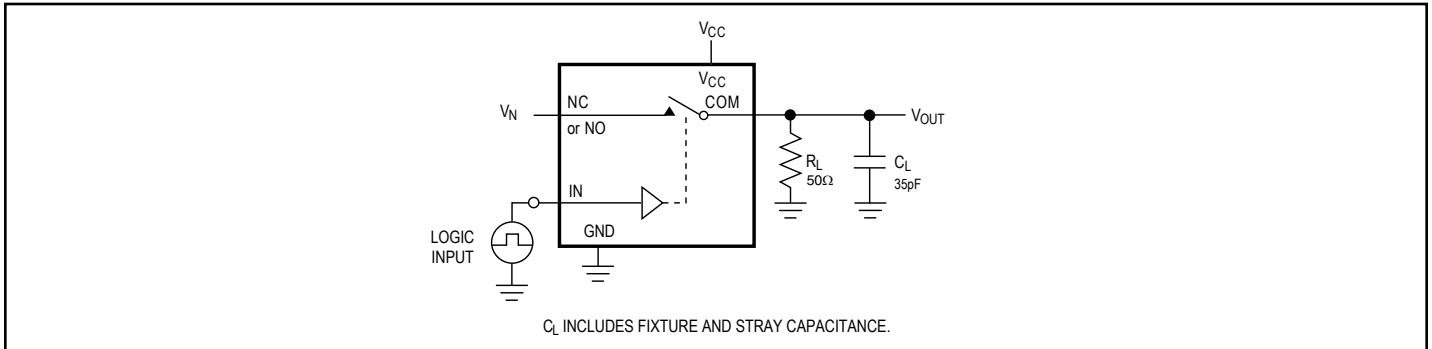
### Switch and AC Characteristics

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		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>		10		
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>		20		
Charge Injection	Q	COM = 0, $R_S = 0$ , $C_L = 1nF$ , <i>See Test Circuit Fig. 4</i>		55		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>		-80		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>		-90		
3dB Bandwidth	$f_{3dB}$	<i>See Test Circuit Fig. 9</i>		60		MHz

### Capacitance

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
NC On Capacitance	$C_{NC (ON)}$	$f = 1MHz$ , <i>See Test Circuit Fig. 8</i>		95		pF
NO On Capacitance	$C_{NO (ON)}$	$f = 1MHz$ , <i>See Test Circuit Fig. 8</i>		95		

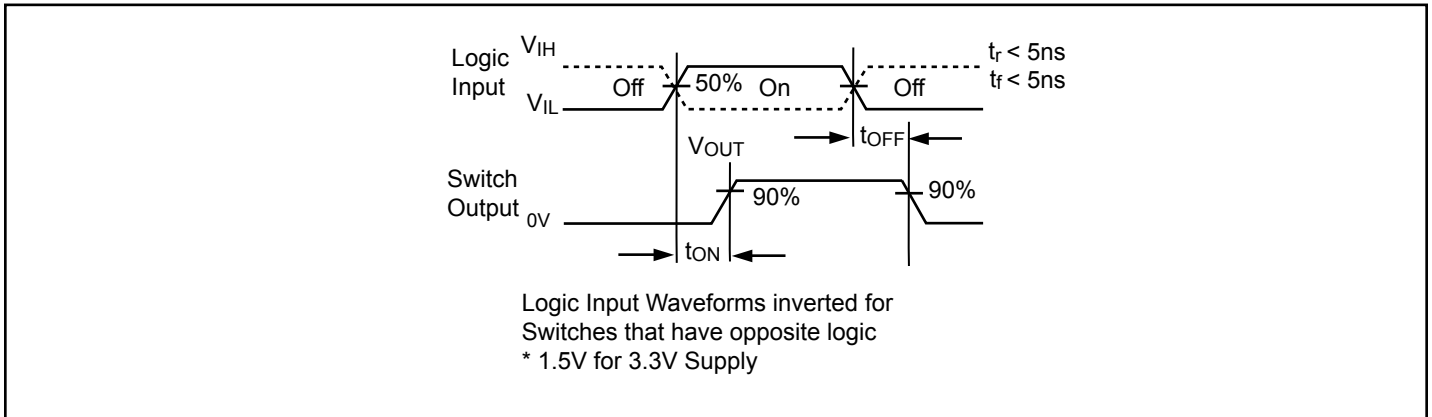
### Test Circuits and Timing Diagrams



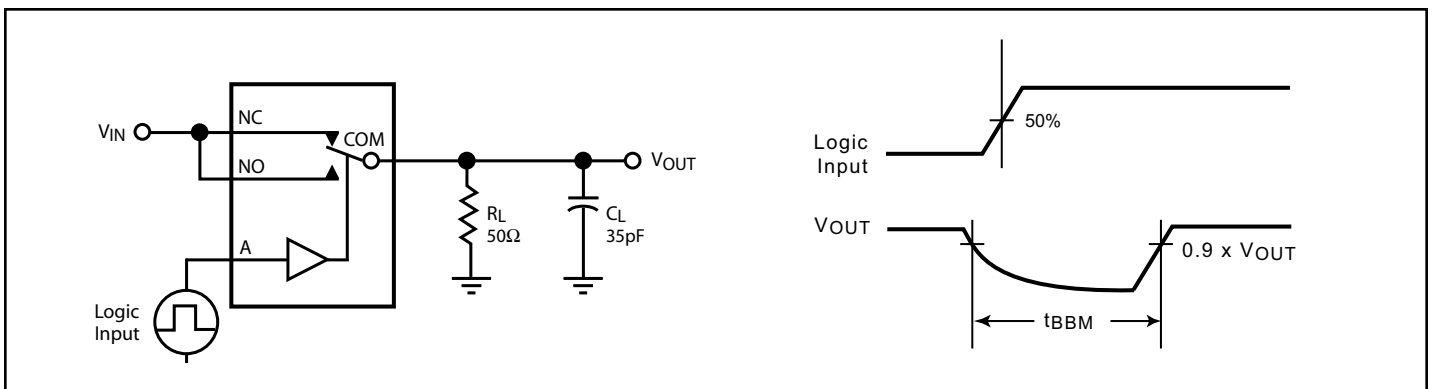
**Figure 1. AC Test Circuit**

**Notes:**

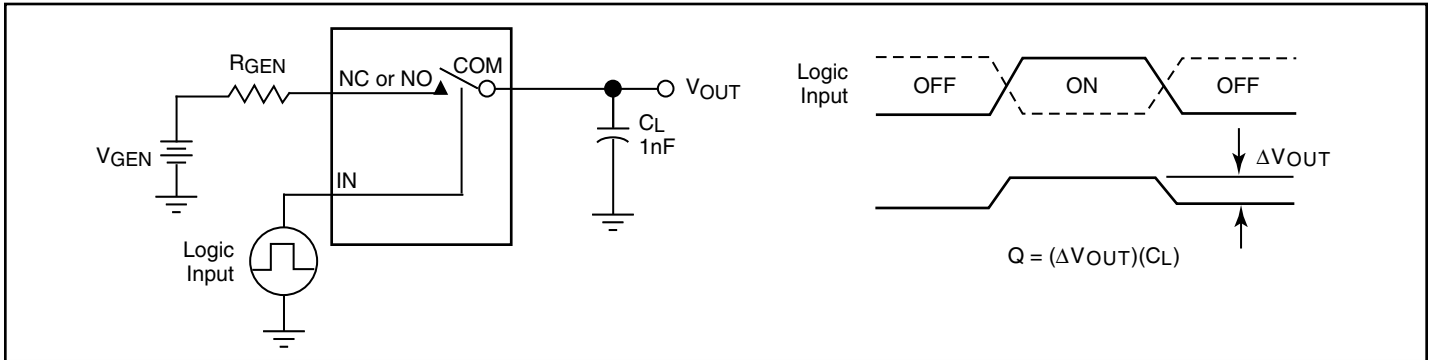
1. Unused input (NC or NO) must be grounded.



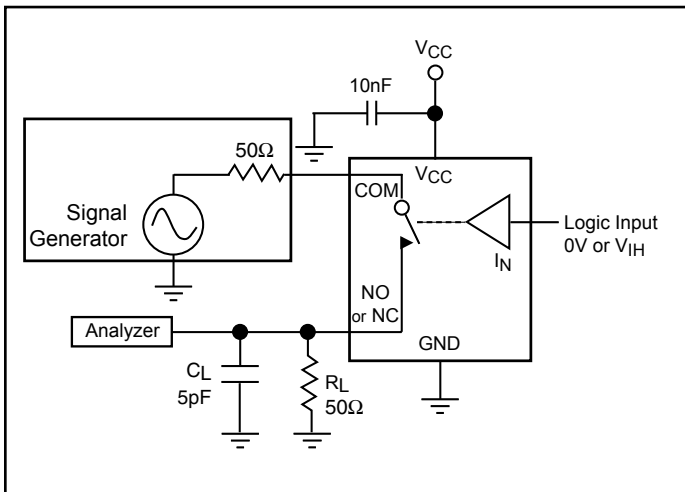
**Figure 2. AC Waveforms**



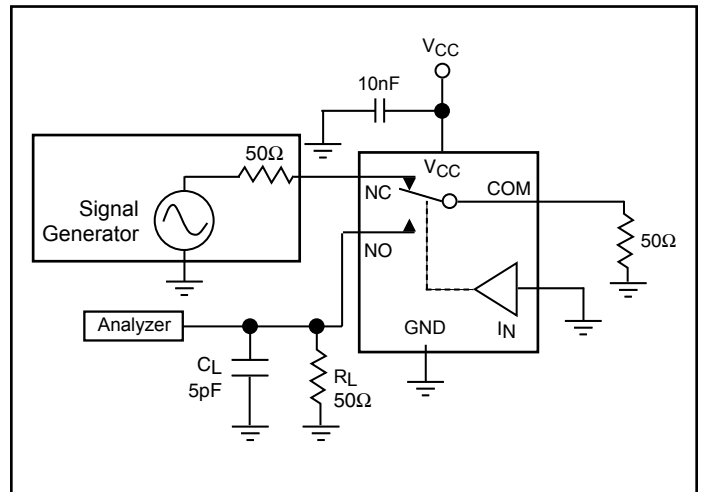
**Figure 3. Break Before Make Interval Timing**



**Figure 4. Charge Injection Test**



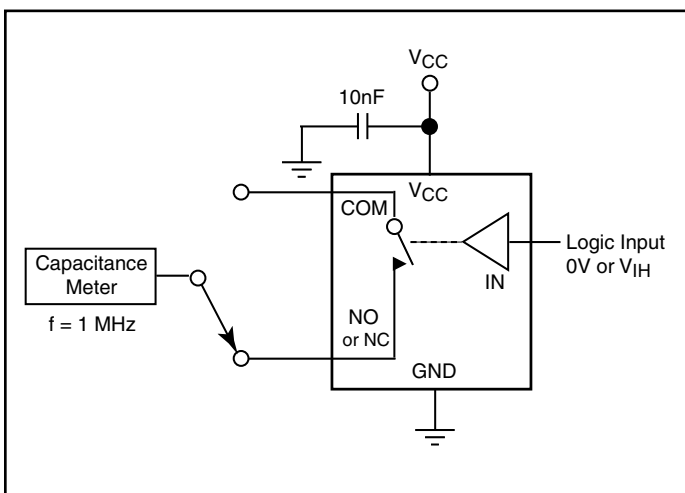
**Figure 5. Off Isolation**



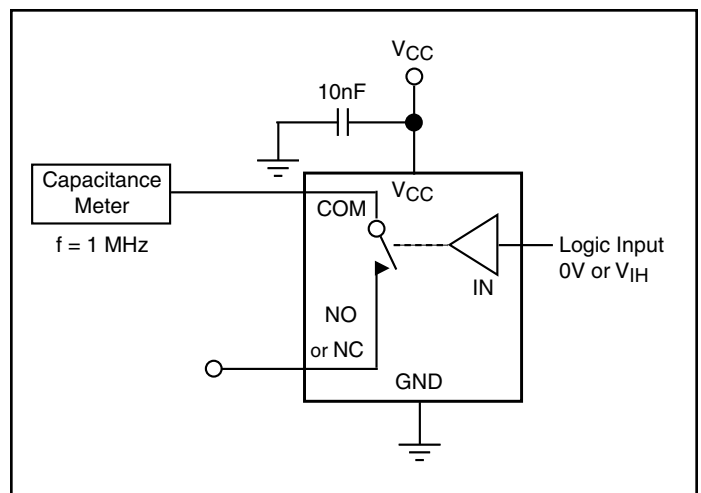
**Figure 6. Crosstalk**

**Note:**

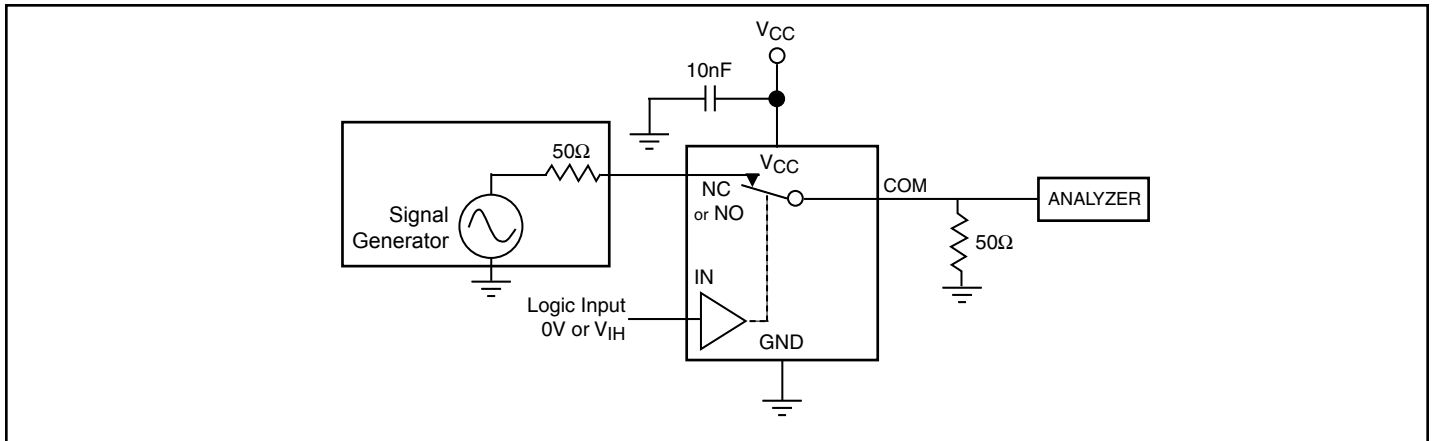
1. Crosstalk measured from one channel to the pins of the other channel.



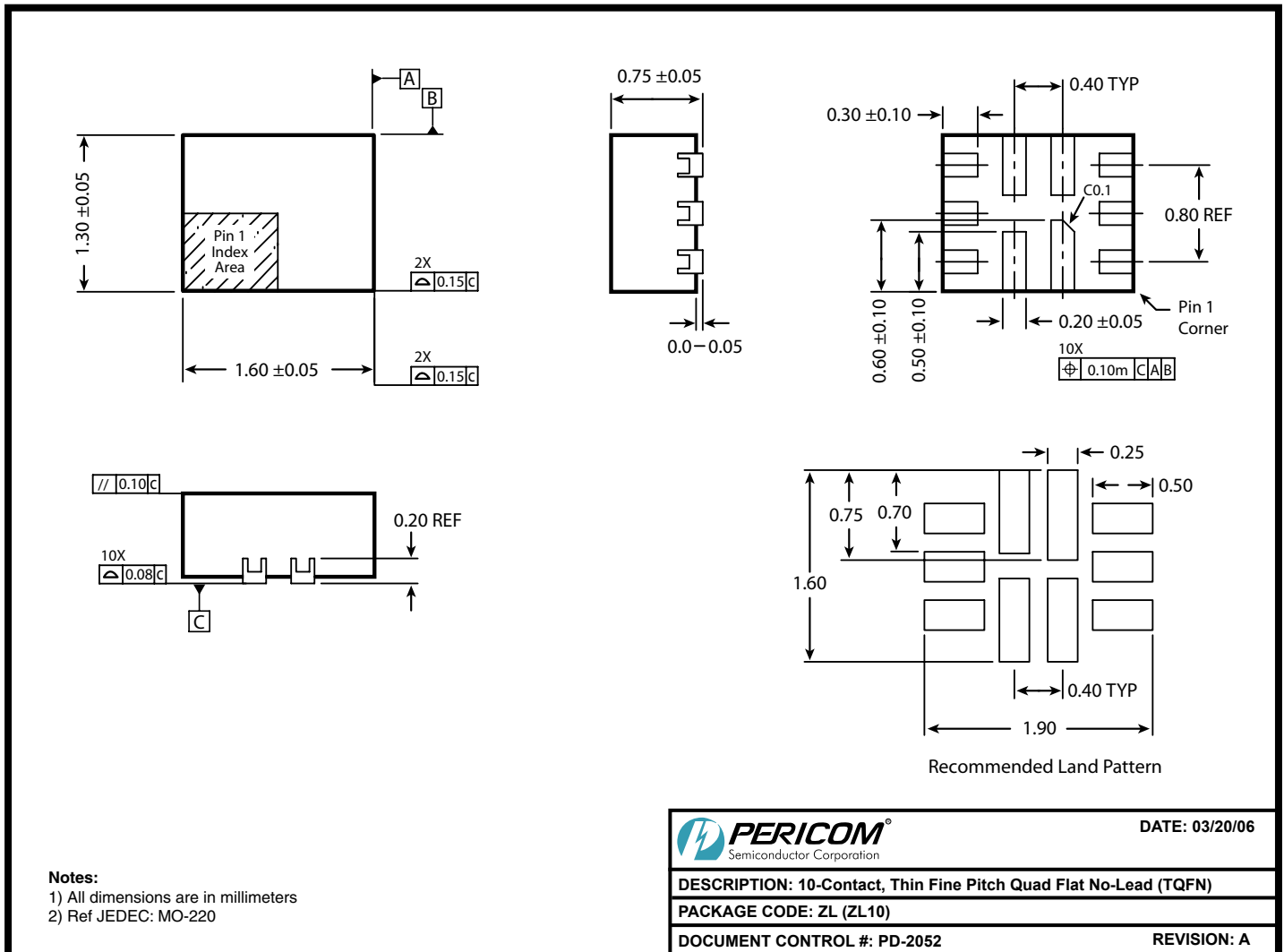
**Figure 7. Channel Off Capacitance**



**Figure 8. Channel On Capacitance**



**Figure 9. Bandwidth**



### Ordering Information

Ordering Code	Packaging Code	Package Type	Top Mark
PI3A212SZLE	ZL	Pb-free & Green, 10-contact TQFN	SC

**Notes:**

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