

## 3.0V, SOTINY<sup>™</sup> 0.4Ω Single-Supply SPDT Analog Switch

### Features

- Low On-Resistance: 0.4Ω (+2.7V Supply)
- R<sub>ON</sub> Matching: 0.1Ω Max. at 25 °C
- R<sub>ON</sub> Flatness: 0.1Ω Max. (+3.0V Supply) at 25 °C
- Low 2nA Input Leakage at 25 °C
- +1.5V to +3.6V Single-Supply Operation
- Fast Switching Time: 30ns Max.
- Make-Before-Break Switching Guaranteed
- -41dB Off-Isolation at 100KHz
- TTL/CMOS Logic Compatible
- Low Power Consumption: 5μW
- Packages (Pb-free available):
  - 6-pin Small Compact SOT-23
  - 6-pin Ultra Compact Thin Dual in-line Flat No Lead (TDFN)

### Applications

- Communication Circuits
- Cellular Phones
- Audio and Video Signal Routing
- Portable Battery-Operated Equipment
- Data Acquisition Systems
- Computer Peripherals
- Telecommunications
- Relay Replacement
- Wireless Terminals and Peripherals
- Hard Drives
- Modems

### Truth Table

Logic	NC	NO
0	ON	OFF
1	OFF	ON

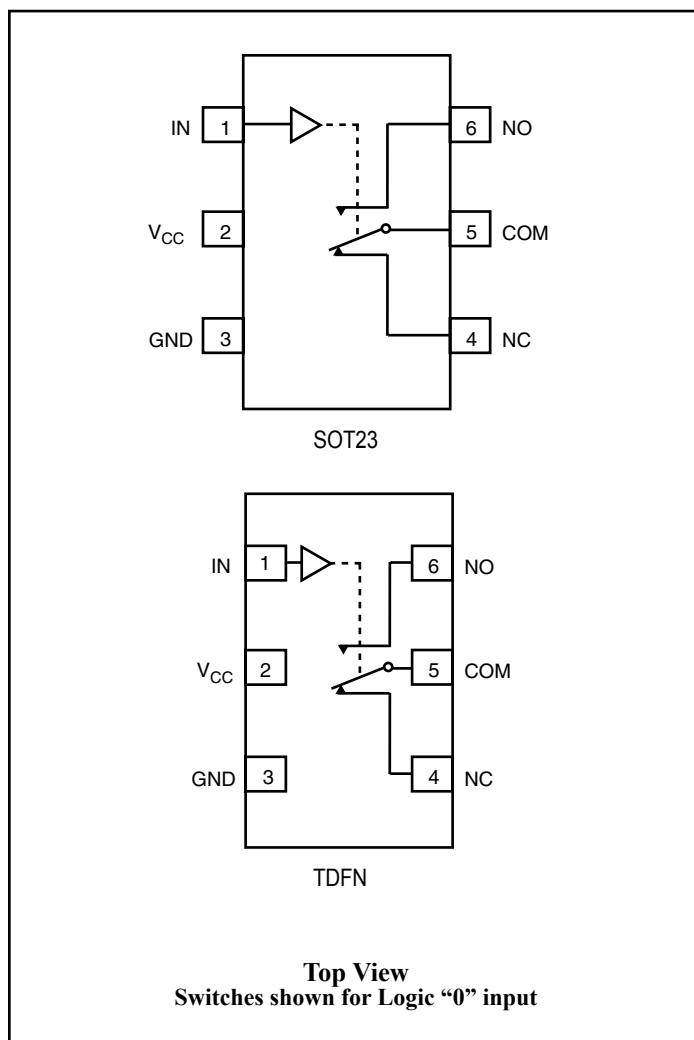
### Description

The PI3A4625 is a single-pole, double-throw (SPDT) analog switch. Improved specifications include a low On-Resistance of 0.4Ω, and fast switching times (30ns Max.) with 3.0V supply operation.

Specifications are given for 1.8V, 2.5V and 3.3V power supply operation. Operating voltage range is +1.5V to +3.6V.

To minimize PC board area use, the device is available in the ultra compact TDFN, and the small compact SOT-23 packages. Operating temperature range is – 40°C to 85°C.

### Functional Diagram, Pin Configuration



### Absolute Maximum Ratings

Voltages Referenced to GND

V <sub>CC</sub> .....	-0.5V to +3.6V
V <sub>IN</sub> , V <sub>COM</sub> , V <sub>NC</sub> , V <sub>NO</sub> (Note 1) .....	-0.5V to V <sub>CC</sub> +0.3V or 30mA, whichever occurs first
Current (any terminal).....	±200mA
Peak Current, COM, NO, NC (Pulsed at 1ms, 10% duty cycle).....	±400mA

### Thermal Information

Continuous Power Dissipation	
SOT-23 6-pin (derate 7.1mW/°C above +70°C) .....	0.5W
Storage Temperature .....	-65°C to +150°C
Lead Temperature (soldering, 10s) .....	+300°C

#### Notes:

1. Signals on NC, NO, COM, or IN exceeding V<sub>CC</sub> or GND are clamped by internal diodes. Limit forward diode current to 30mA.

**Caution:** Stresses beyond those listed under “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.

### Electrical Specifications - Single +3.3V Supply

(V<sub>CC</sub> = +3.3V ± 10%, GND = 0V, V<sub>IH</sub> = 1.4V, V<sub>IL</sub> = 0.5V)

Parameter	Symbol	Conditions	Temp. (°C)	Min. <sup>(1)</sup>	Typ. <sup>(2)</sup>	Max. <sup>(1)</sup>	Units	
<b>Analog Switch</b>								
Analog Signal Range <sup>(3)</sup>	V <sub>ANALOG</sub>		Full	0		V <sub>CC</sub>	V	
On-Resistance	R <sub>ON</sub>	V <sub>CC</sub> = 2.7V, I <sub>COM</sub> = 100mA, V <sub>NO</sub> or V <sub>NC</sub> = +1.5V	25		0.4	0.5	Ω	
			Full			0.55		
On-Resistance Match Between Channels <sup>(4)</sup>	ΔR <sub>ON</sub>		25			0.1		
			Full			0.1		
On-Resistance Flatness <sup>(5)</sup>	R <sub>FLAT(ON)</sub>	V <sub>CC</sub> = 2.7V, I <sub>COM</sub> = 100mA, V <sub>NO</sub> or V <sub>NC</sub> = 0.8V, 2.0V	25			0.1		
			Full			0.1		
NO or NC Off Leakage Current <sup>(6)</sup>	I <sub>NO(OFF)</sub> or I <sub>NC(OFF)</sub>		V <sub>CC</sub> = 3.3V, V <sub>COM</sub> = 0V, V <sub>NO</sub> or V <sub>NC</sub> = +2.0V	25	-1		1	nA
				Full		-10		
COM On Leakage Current <sup>(6)</sup>	I <sub>COM(ON)</sub>	V <sub>CC</sub> = 3.3V, V <sub>COM</sub> = +2.0V, V <sub>NO</sub> or V <sub>NC</sub> = +2.0V		25	-2		2	
				Full		-20		

### Electrical Specifications - Single +3.3V Supply (continued)

(V<sub>CC</sub> = +3.3V ± 10%, GND = 0V, V<sub>IH</sub> = 1.4V, V<sub>IL</sub> = 0.5V)

Parameter	Symbol	Conditions	Temp. (°C)	Min. <sup>(1)</sup>	Typ. <sup>(2)</sup>	Max. <sup>(1)</sup>	Units	
<b>Logic Input</b>								
Input High Voltage	V <sub>IH</sub>	Guaranteed Logic High Level	Full	1.4			V	
Input Low Voltage	V <sub>IL</sub>	Guaranteed Logic LowLevel				0.5		
Input Current with Voltage High	I <sub>INH</sub>	V <sub>IN</sub> = 1.4V, all others = 0.5V		-1		1	μA	
Input Current with Voltage Low	I <sub>INL</sub>	V <sub>IN</sub> = 0.5V, all others = 1.4V		-1		1		
<b>Dynamic</b>								
Turn-On-Time	t <sub>ON</sub>	V <sub>CC</sub> = 3.3V, V <sub>NO</sub> or V <sub>NC</sub> = 2.0V, Figure 1	25			10	ns	
			Full			20		
Turn-Off-Time	t <sub>OFF</sub>		25			15		
			Full			30		
Make-Before-Break	T <sub>BBM</sub>	Figure 3	25	1		20		
			Full	1		25		
Charge Injection <sup>(3)</sup>	Q		C <sub>L</sub> = 1nF, V <sub>GEN</sub> = 0V, R <sub>GEN</sub> = 0Ω, Figure 2	25		40		pC
Off Isolation <sup>(7)</sup>	O <sub>IRR</sub>		R <sub>L</sub> = 50Ω, f = 100 KHz, Figure 3			-27		dB
CrossTalk <sup>(8)</sup>	X <sub>TALK</sub>	R <sub>L</sub> = 50Ω, f = 100 KHz, Figure 4			-41			
NC or NO Capacitance	C <sub>NC/NO (OFF)</sub>	f = 1 MHz, Figure 5			75		pF	
COM Off Capacitance	C <sub>COM(OFF)</sub>				75			
COM On Capacitance	C <sub>COM(ON)</sub>		f = 1 MHz, Figure 6			200		
<b>Supply</b>								
Power-Supply Range	V <sub>CC</sub>		Full	1.5		3.6	V	
Positive Supply Current	I <sub>CC</sub>	V <sub>CC</sub> = 3.6V, V <sub>IN</sub> = 0V or V <sub>CC</sub>					100	nA

**Notes:**

1. The algebraic convention, where most negative value is a minimum and most positive is a maximum, is used in this data sheet.
2. Typical values are for DESIGN AID ONLY, not guaranteed or subject to production testing.
3. Guaranteed by design.
4. ΔR<sub>ON</sub> = R<sub>ON</sub> max. - R<sub>ON</sub> min.
5. Flatness is defined as the difference between the maximum and minimum value of On-resistance measured.
6. Leakage parameters are 100% tested at maximum rated hot temperature and guaranteed by correlation at +25°C.
7. Off Isolation = 20log<sub>10</sub> [ V<sub>COM</sub> / (V<sub>NO</sub> or V<sub>NC</sub>) ]. See Figure 4
8. Between any two switches. See Figure 5

### Electrical Specifications - Single +2.5V Supply

(V<sub>CC</sub> = +2.5V ± 10%, GND = 0V, V<sub>IH</sub> = 1.4V, V<sub>IL</sub> = 0.5V)

Parameter	Symbol	Conditions	Temp. (°C)	Min. <sup>(1)</sup>	Typ. <sup>(2)</sup>	Max. <sup>(1)</sup>	Units
<b>Analog Switch</b>							
Analog Signal Range <sup>(3)</sup>	V <sub>ANALOG</sub>			0		V <sub>CC</sub>	V
On-Resistance	R <sub>ON</sub>	V <sub>CC</sub> = 2.5V, I <sub>COM</sub> = -8mA, V <sub>NO</sub> or V <sub>NC</sub> = 1.8V	25			0.5	Ω
			Full			0.6	
On-Resistance Match Between Channels <sup>(4)</sup>	ΔR <sub>ON</sub>	V <sub>CC</sub> = 2.5V, I <sub>COM</sub> = -8mA, V <sub>NO</sub> or V <sub>NC</sub> = 0.8V, 1.8V	25			0.1	
			Full			0.1	
On-Resistance Flatness <sup>(5)</sup>	R <sub>FLAT(ON)</sub>	V <sub>CC</sub> = 2.5V, I <sub>COM</sub> = -8mA, V <sub>NO</sub> or V <sub>NC</sub> = 0.8V, 1.8V	25			0.1	
			Full			0.1	
<b>Dynamic</b>							
Turn-On-Time	t <sub>ON</sub>	V <sub>CC</sub> = 2.5V, V <sub>NO</sub> or V <sub>NC</sub> = 1.8V, Figure 1	25			10	ns
			Full			20	
Turn-Off-Time	t <sub>OFF</sub>	V <sub>CC</sub> = 2.5V, V <sub>NO</sub> or V <sub>NC</sub> = 1.8V, Figure 1	25			20	
			Full			40	
Make- Before-Break	t <sub>BBM</sub>	Figure 3	25	1		20	
Charge Injection <sup>(3)</sup>	Q	C <sub>L</sub> = 1nF, V <sub>GEN</sub> = 0V, R <sub>GEN</sub> = 0V, Figure 2	25		40		pC
<b>Logic Input</b>							
Input High Voltage	V <sub>IH</sub>	Guaranteed Logic High Level	Full	1.4			V
Input Low Voltage	V <sub>IL</sub>	Guaranteed Logic LowLevel	Full			0.5	
Input High Current	I <sub>INH</sub>	V <sub>IN</sub> = 1.4V, all others = 0.5V	Full	-1		1	μA
Input Low Current	I <sub>INL</sub>	V <sub>IN</sub> = 0.5V, all others = 1.4V	Full	-1		1	

**Notes:**

1. The algebraic convention, where most negative value is a minimum and most positive is a maximum, is used in this data sheet.
2. Typical values are for DESIGN AID ONLY, not guaranteed or subject to production testing.
3. Guaranteed by design.
4. ΔR<sub>ON</sub> = R<sub>ON</sub> max. - R<sub>ON</sub> min.
5. Flatness is defined as the difference between the maximum and minimum value of On-resistance measured.

**Electrical Specifications - Single +1.8V Supply**

 (V<sub>CC</sub> = +1.8V ± 10%, GND = 0V, V<sub>IH</sub> = 1.4V, V<sub>IL</sub> = 0.5V)

Parameter	Symbol	Conditions	Temp. (°C)	Min. <sup>(1)</sup>	Typ. <sup>(2)</sup>	Max. <sup>(1)</sup>	Units
<b>Analog Switch</b>							
Analog Signal Range <sup>(3)</sup>	V <sub>ANALOG</sub>			0		V <sub>CC</sub>	V
On-Resistance	R <sub>ON</sub>	V <sub>CC</sub> = 1.8V, I <sub>COM</sub> = -4mA, V <sub>NO</sub> or V <sub>NC</sub> = 1.5V	25			0.6	Ω
			Full			0.6	
On-Resistance Match Between Channels <sup>(4)</sup>	ΔR <sub>ON</sub>	V <sub>CC</sub> = 1.8V, I <sub>COM</sub> = -4mA, V <sub>NO</sub> or V <sub>NC</sub> = 0.8V, 1.5V	25			0.1	
			Full			0.2	
On-Resistance Flatness <sup>(5)</sup>	R <sub>FLAT(ON)</sub>	V <sub>CC</sub> = 1.8V, I <sub>COM</sub> = -4mA, V <sub>NO</sub> or V <sub>NC</sub> = 0.8V, 1.5V	25			0.9	
			Full			1.2	
<b>Dynamic</b>							
Turn-On-Time	t <sub>ON</sub>	V <sub>CC</sub> = 1.8V, V <sub>NO</sub> or V <sub>NC</sub> = 1.5V, Figure 1	25			15	ns
			Full			30	
Turn-Off-Time	t <sub>OFF</sub>	V <sub>CC</sub> = 1.8V, V <sub>NO</sub> or V <sub>NC</sub> = 1.5V, Figure 1	25			20	
			Full			40	
Make-Before-Break	t <sub>BBM</sub>	Figure 3	25	1		15	
Charge Injection <sup>(3)</sup>	Q	C <sub>L</sub> = 1nF, V <sub>GEN</sub> = 0V, R <sub>GEN</sub> = 0V, Figure 2	25		36		pC
<b>Logic Input</b>							
Input High Voltage	V <sub>IH</sub>	Guaranteed Logic High Level	Full	1.4			V
Input Low Voltage	V <sub>IL</sub>	Guaranteed Logic LowLevel	Full			0.5	
Input High Current	I <sub>INH</sub>	V <sub>IN</sub> = 1.4V, all others = 0.5V	Full	-1		1	μA
Input Low Current	I <sub>INL</sub>	V <sub>IN</sub> = 0.5V, all others = 1.4V	Full	-1		1	

**Notes:**

1. The algebraic convention, where most negative value is a minimum and most positive is a maximum, is used in this data sheet.
2. Typical values are for DESIGN AID ONLY, not guaranteed or subject to production testing.
3. Guaranteed by design.
4. ΔR<sub>ON</sub> = R<sub>ON</sub> max. - R<sub>ON</sub> min.
5. Flatness is defined as the difference between the maximum and minimum value of On-resistance measured.

Test Circuits/Timing Diagrams

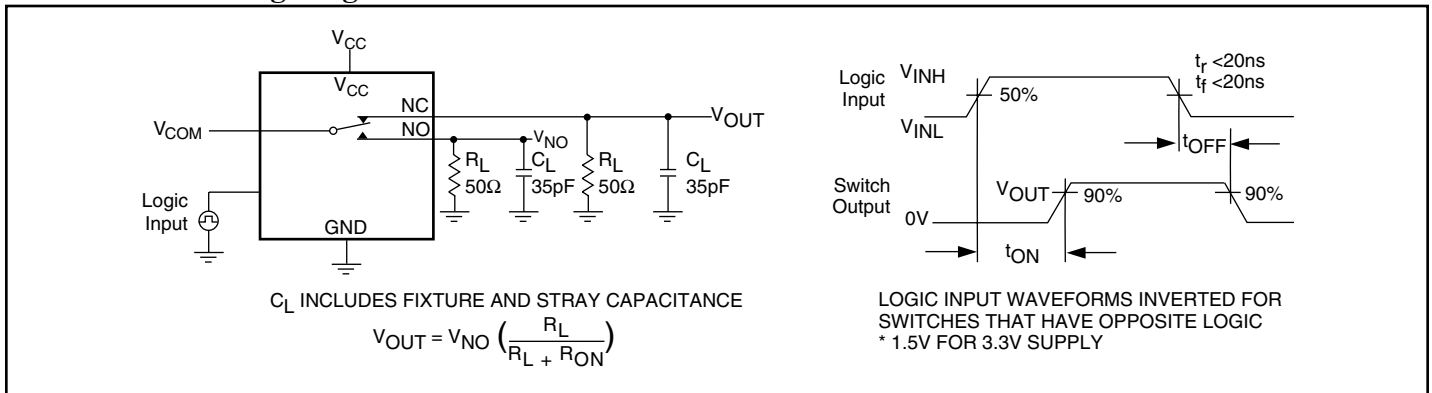


Figure 1. Switching Time

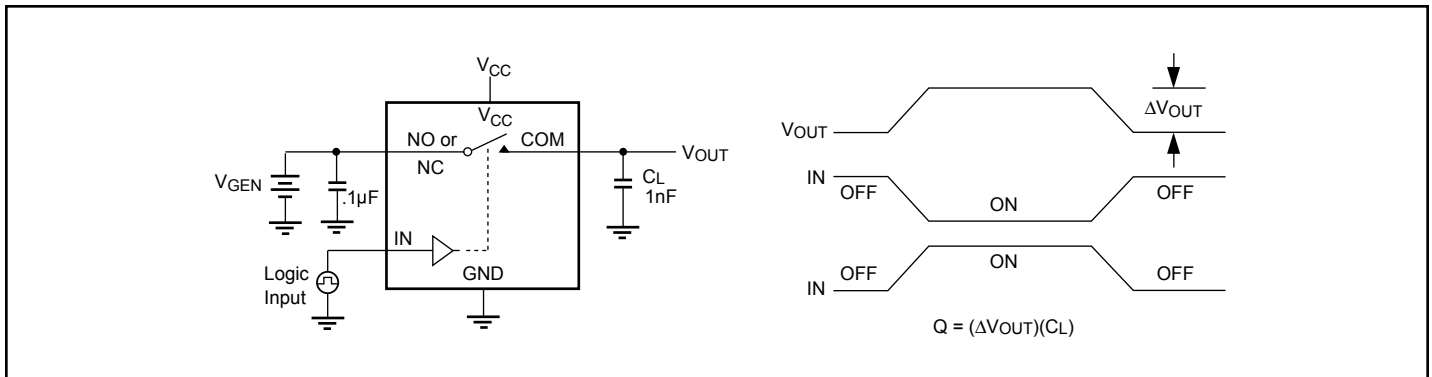


Figure 2. Charge Injection

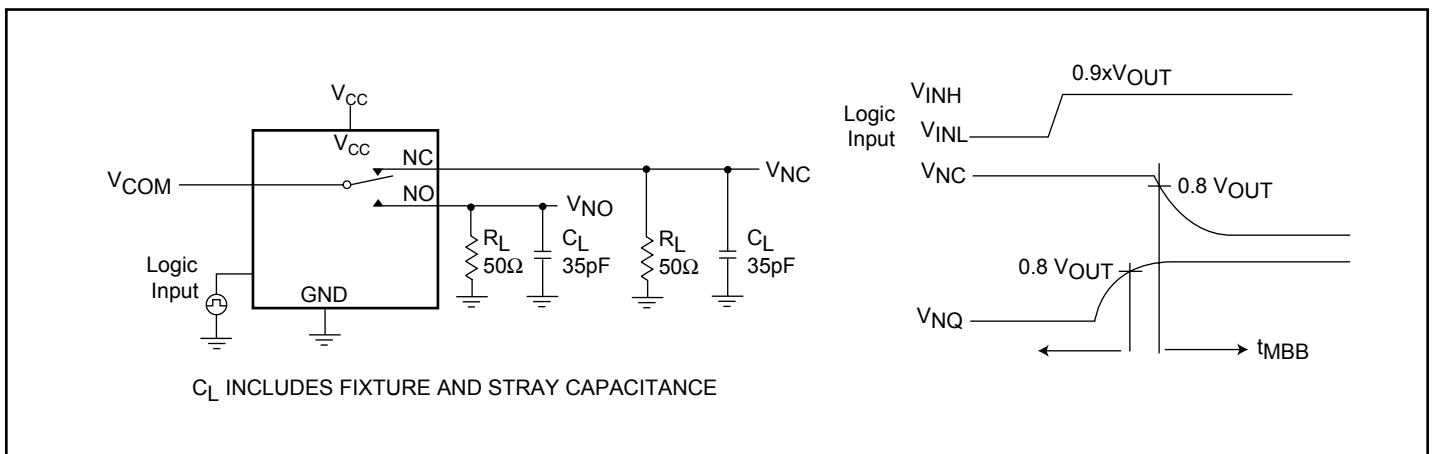


Figure 3. Make-Before-Break Interval

Test Circuits/Timing Diagrams (continued)

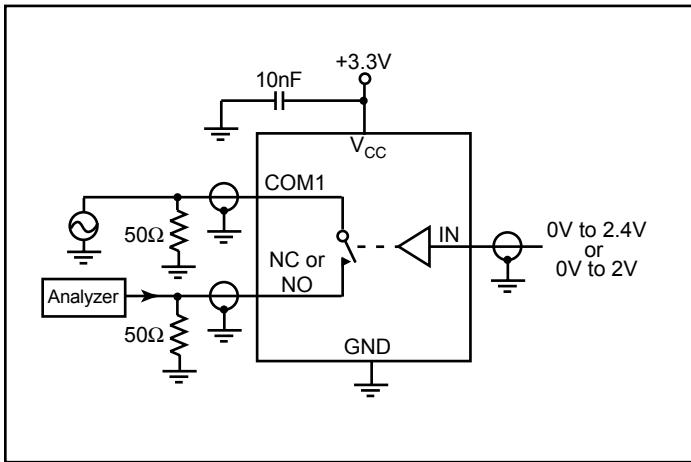


Figure 4. Off Isolation

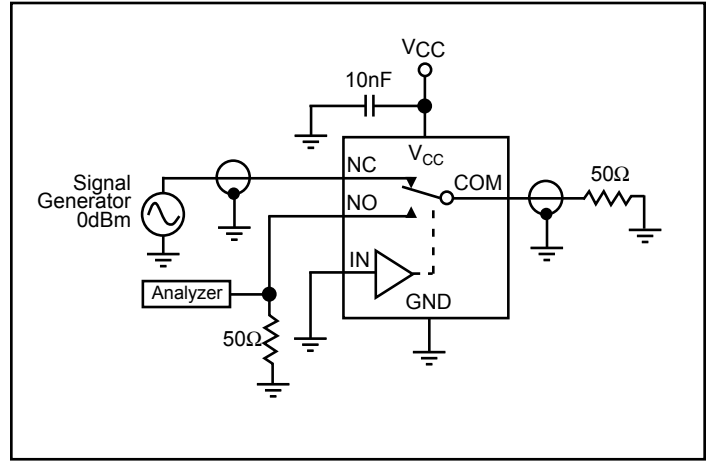


Figure 5. Crosstalk

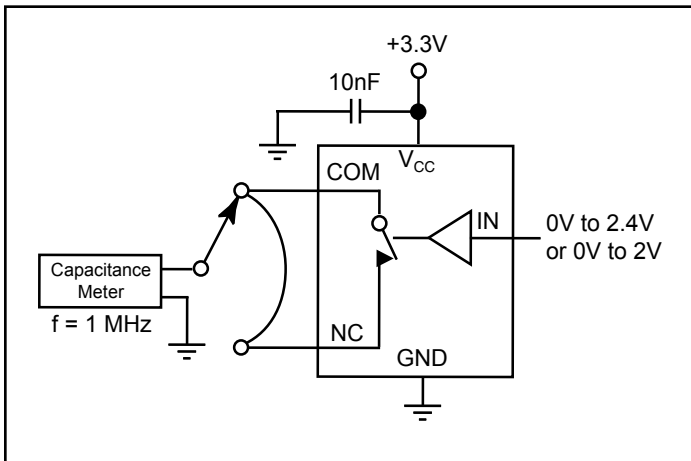


Figure 6. Channel-Off Capacitance

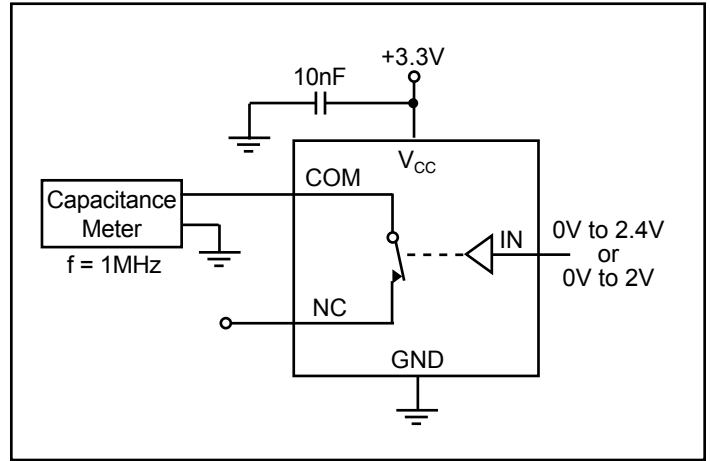
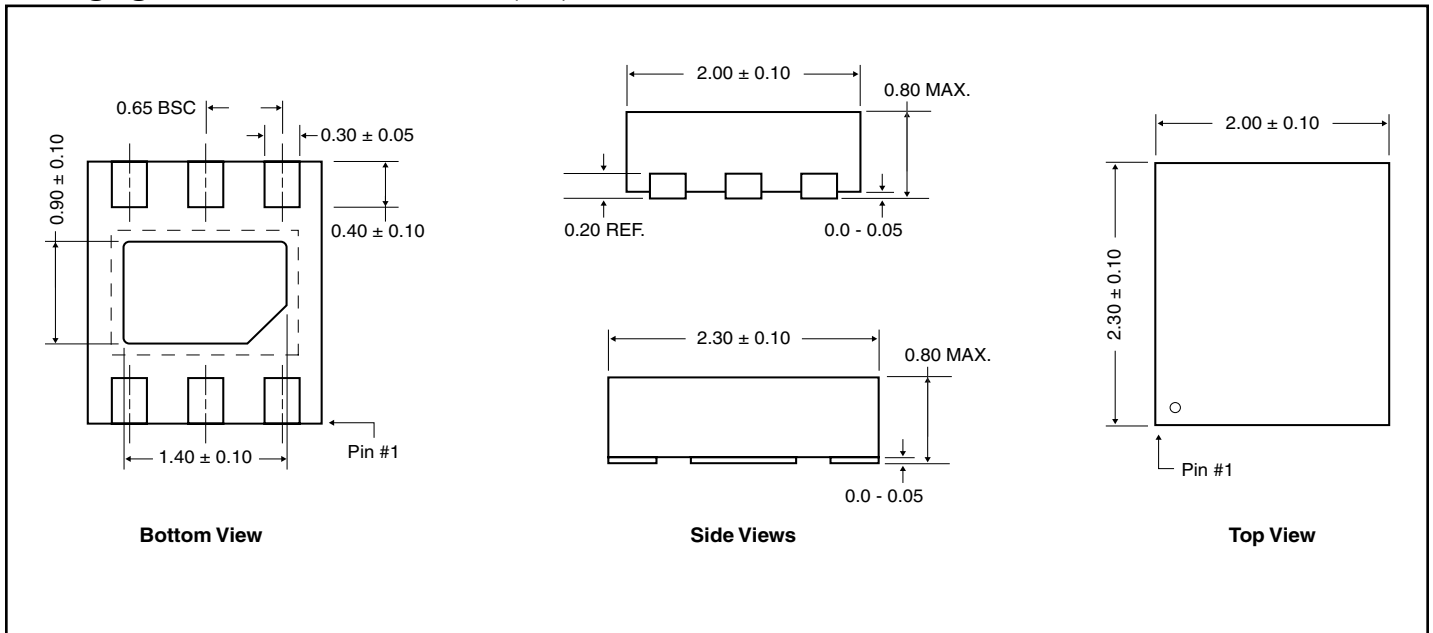
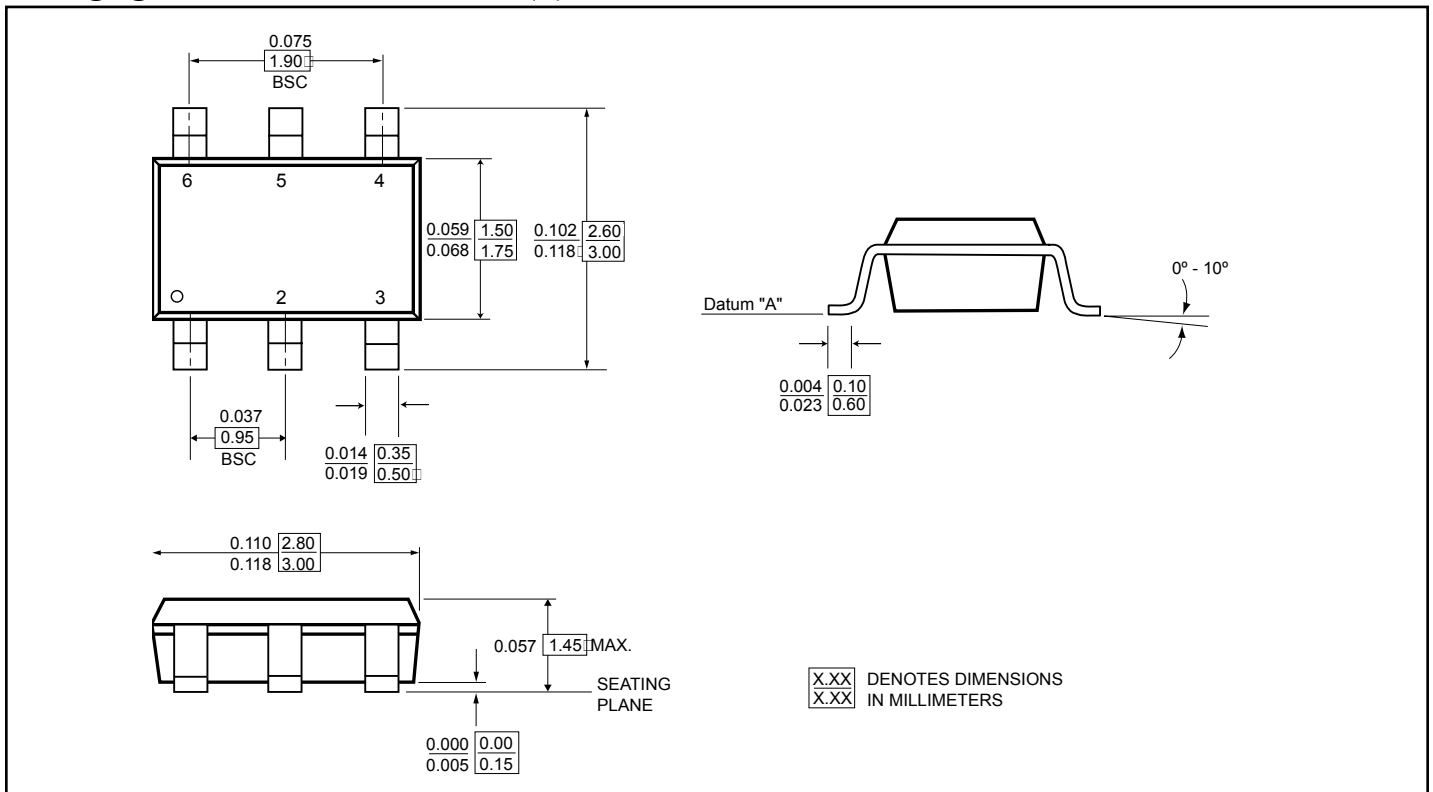


Figure 7. Channel-On Capacitance

**Packaging Mechanical: 6-Pin TDFN (ZC)**



**Packaging Mechanical: 6-Pin SOT-23 (T)**





**Ordering Information**

<b>Order Code</b>	<b>Package Code</b>	<b>Package Type</b>	<b>Package Top Mark</b>
PI3A4625TX	T	6-pin, Small Compact SOT-23	ZE
PI3A4625TEX	T	Pb-free & Green, 6-pin, Small Compact SOT-23	ZE
PI3A4625ZCEX	ZC	Pb-free & Green, 6-pin, Ultra Compact TDFN	ZE

**Notes:**

1. Thermal characteristics can be found on the company web site at <http://www.pericom.com/packaging/>
2. X = Tape/Reel