3.0V, SOTINY™ 0.4Ω Single-Supply SPDT Analog Switch

Features

- Low On-Resistance: 0.4Ω (+2.7V Supply)
- R_{ON} Matching: 0.1Ω Max.at 25 °C
- R_{ON} 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 avaliable):
  – 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

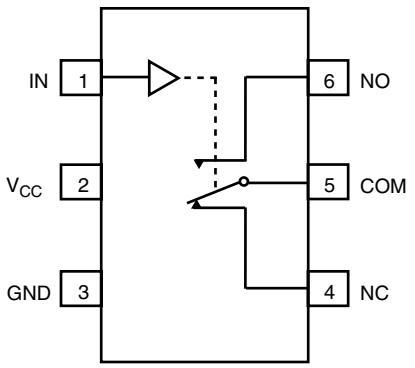
Description

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.

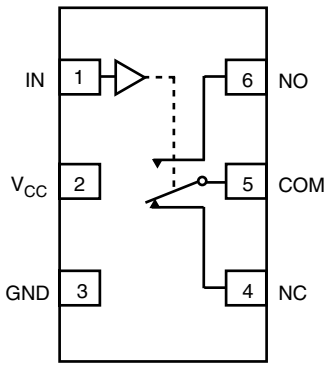
Specifications are given for 1.8V, 2.5V and 3.3V power supply operation. Operating voltage range is +1.5V to +3.6V.

To minimize PC board area use, the device is available in the ultra compact TDFN, and the small compact SOT-23 6-pin packages. Operating temperature range is – 40°C to 85°C.

Functional Diagram, Pin Configuration



SOT23



TDFN

Top View
Switches shown for Logic "0" input

Absolute Maximum Ratings

Voltages Referenced to GND
V_{CC} .....–0.5V to +3.6V

V_{IN}, V_{COM}, V_{NC}, V_{NO} (Note 1).....–0.5V to V_{CC} +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/ºC above +70ºC) 0.5W

Storage Temperature .....–65ºC to +150ºC

Lead Temperature (soldering, 10s) ..... +300ºC

Notes:

1. Signals on NC, NO, COM, or IN exceeding V_{CC} 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_{CC} = +3.3V ± 10%, GND = 0V, V_{IH} = 1.4V, V_{IL} = 0.5V)

Parameter	Symbol	Conditions	Temp. (°C)	Min.(1)	Typ.(2)	Max.(1)	Units
Analog Switch							
Analog Signal Range (3)	V_{ANALOG}		Full	0		V_{CC}	V
On-Resistance	R_{ON}	V_{CC} = 2.7V, I_{COM} = 100mA, V_{NO} or V_{NC} = +1.5V	25		0.4	0.5	Ω
			Full			0.55	
On-Resistance Match Between Channels(4)	ΔR_{ON}		25			0.1	
			Full			0.1	
On-Resistance Flatness(5)	$R_{FLAT(ON)}$	V_{CC} = 2.7V, I_{COM} = 100mA, V_{NO} or V_{NC} = 0.8V, 2.0V	25			0.1	
			Full			0.1	
NO or NC Off Leakage Current(6)	$I_{NO(OFF)}$ or $I_{NC(OFF)}$	V_{CC} = 3.3V, V_{COM} = 0V, V_{NO} or V_{NC} = +2.0V	25	–1		1	nA
			Full	–10		10	
COM On Leakage Current(6)	$I_{COM(ON)}$	V_{CC} = 3.3V, V_{COM} = +2.0V, V_{NO} or V_{NC} = +2.0V	25	–2		2	
			Full	–20		20	

Electrical Specifications - Single +3.3V Supply (continued)

(V_{CC} = +3.3V ± 10%, GND = 0V, V_{IH} = 1.4V, V_{IL} = 0.5V)

Parameter	Symbol	Conditions	Temp. (°C)	Min.(1)	Typ.(2)	Max.(1)	Units
Logic Input							
Input High Voltage	V_{IH}	Guaranteed Logic High Level	Full	1.4			V
Input Low Voltage	V_{IL}	Guaranteed Logic LowLevel				0.5	
Input Current with Voltage High	I_{INH}	V_{IN} = 1.4V, all others = 0.5V		–1		1	µA
Input Current with Voltage Low	I_{INL}	V_{IN} = 0.5V, all others = 1.4V		–1		1	
Dynamic							
Turn-On-Time	t_{ON}	V_{CC} = 3.3V, V_{NO} or V_{NC} = 2.0V, Figure 1	25			10	ns
			Full			20	
Turn-Off-Time	t_{OFF}		25			15	
			Full			30	
Make-Before-Break	T_{BBM}	Figure 3	25	1		20	
			Full	1		25	
Charge Injection(3)	Q	C_L =1nF, V_{GEN} = 0V, R_{GEN} = 0Ω, Figure 2	25		40		pC
Off Isolation(7)	O_{IRR}	R_L = 50Ω, f = 100 KHz, Figure 3			-27		dB
CrossTalk(8)	X_{TALK}	R_L = 50Ω, f = 100 KHz, Figure 4			-41		
NC or NO Capacitance	$C_{NC/NO\ (OFF)}$	f = 1 MHz, Figure 5			75		pF
COM Off Capacitance	$C_{COM(OFF)}$				75		
COM On Capacitance	$C_{COM(ON)}$	f = 1 MHz, Figure 6			200		
Supply							
Power-Supply Range	V_{CC}		Full	1.5		3.6	V
Positive Supply Current	I_{CC}	V_{CC} = 3.6V, V_{IN} = 0V or V_{CC}				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. $\Delta R_{ON} = R_{ON}$ max. - R_{ON} 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 +25ºC.
7. Off Isolation = $20\log_{10}$ [V_{COM} / (V_{NO} or V_{NC})]. See Figure 4
8. Between any two switches. See Figure 5

Electrical Specifications - Single +2.5V Supply

(V_{CC} = +2.5V ± 10%, GND = 0V, V_{IH} = 1.4V, V_{IL} = 0.5V)

Parameter	Symbol	Conditions	Temp. (°C)	Min.(1)	Typ.(2)	Max.(1)	Units
Analog Switch							
Analog Signal Range(3)	V_{ANALOG}			0		V_{CC}	V
On-Resistance	R_{ON}	V_{CC} = 2.5V, I_{COM} = –8mA, V_{NO} or V_{NC} = 1.8V	25			0.5	Ω
			Full			0.6	
On-Resistance Match Between Channels(4)	ΔR_{ON}	V_{CC} =2.5V, I_{COM} = –8mA, V_{NO} or V_{NC} = 0.8V, 1.8V	25			0.1	
			Full			0.1	
On-Resistance Flatness(5)	$R_{FLAT(ON)}$		25			0.1	
			Full			0.1	
Dynamic							
Turn-On-Time	t_{ON}	V_{CC} = 2.5V, V_{NO} or V_{NC} = 1.8V, Figure 1	25			10	ns
			Full			20	
Turn-Off-Time	t_{OFF}		25			20	
			Full			40	
Make- Before-Break	t_{BBM}	Figrue 3	25	1		20	
Charge Injection(3)	Q	C_L = 1nF, V_{GEN} = 0V, R_{GEN} = 0V, Figure 2	25		40		pC
Logic Input							
Input High Voltage	V_{IH}	Guaranteed Logic High Level	Full	1.4			V
Input Low Voltage	V_{IL}	Guaranteed Logic LowLevel	Full			0.5	
Input High Current	I_{INH}	V_{IN} = 1.4V, all others = 0.5V	Full	–1		1	µA
Input Low Current	I_{INL}	V_{IN} = 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. $\Delta R_{ON} = R_{ON}$ max. - R_{ON} 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_{CC} = +1.8V ± 10%, GND = 0V, V_{IH} = 1.4V, V_{IL} = 0.5V)

Parameter	Symbol	Conditions	Temp. (°C)	Min.(1)	Typ.(2)	Max.(1)	Units
Analog Switch							
Analog Signal Range(3)	V_{ANALOG}			0		V_{CC}	V
On-Resistance	R_{ON}	V_{CC} =1.8V, I_{COM} = –4mA, V_{NO} or V_{NC} = 1.5V	25			0.6	Ω
			Full			0.6	
On-Resistance Match Between Channels(4)	ΔR_{ON}	V_{CC} =1.8V, I_{COM} = –4mA, V_{NO} or V_{NC} = 0.8V, 1.5V	25			0.1	
			Full			0.2	
On-Resistance Flatness(5)	$R_{FLAT(ON)}$		25			0.9	
			Full			1.2	
Dynamic							
Turn-On-Time	t_{ON}	V_{CC} =1.8V, V_{NO} or V_{NC} = 1.5V, Figure 1	25			15	ns
			Full			30	
Turn-Off-Time	t_{OFF}		25			20	
			Full			40	
Make-Before-Break	t_{BBM}	Figure 3	25	1		15	
Charge Injection(3)	Q	C_L = 1nF, V_{GEN} = 0V, R_{GEN} = 0V, Figure 2	25		36		pC
Logic Input							
Input High Voltage	V_{IH}	Guaranteed Logic High Level	Full	1.4			V
Input Low Voltage	V_{IL}	Guaranteed Logic LowLevel	Full			0.5	
Input High Current	I_{INH}	V_{IN} = 1.4V, all others = 0.5V	Full	–1		1	µA
Input Low Current	I_{INL}	V_{IN} = 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. $\Delta R_{ON} = R_{ON}$ max. - R_{ON} min.
5. Flatness is defined as the difference between the maximum and minimum value of On-resistance measured.

Test Circuits/Timing Diagrams

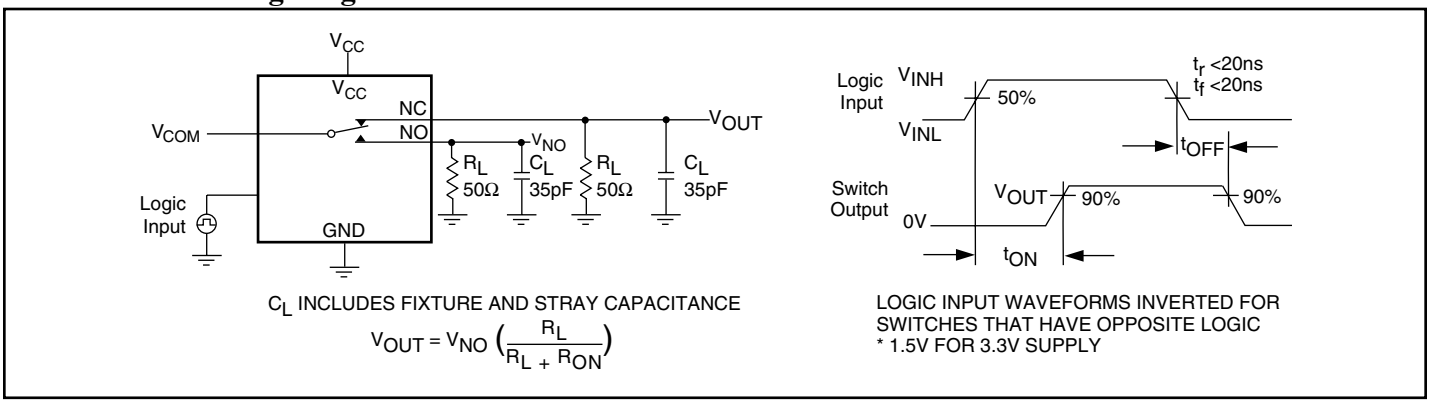


Figure 1. Switching Time

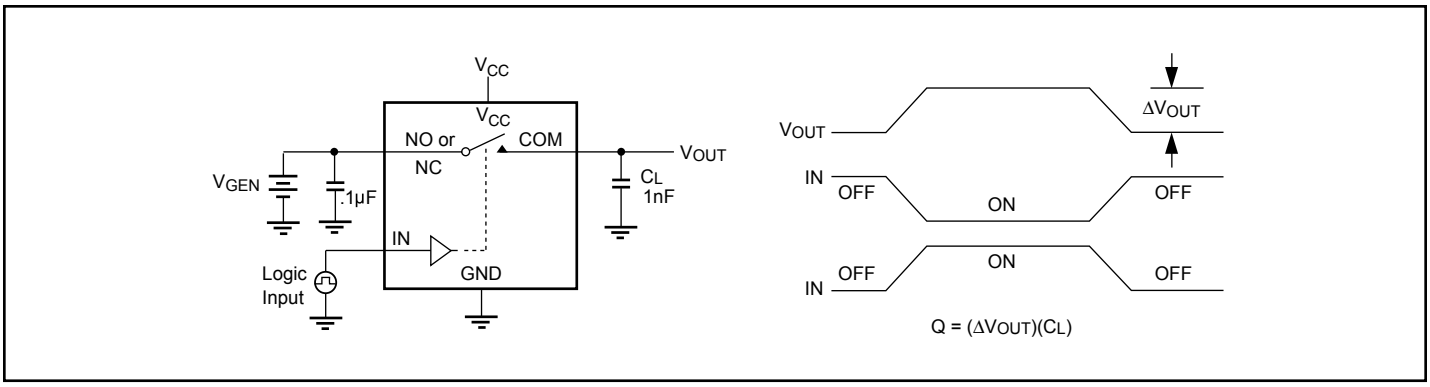


Figure 2. Charge Injection

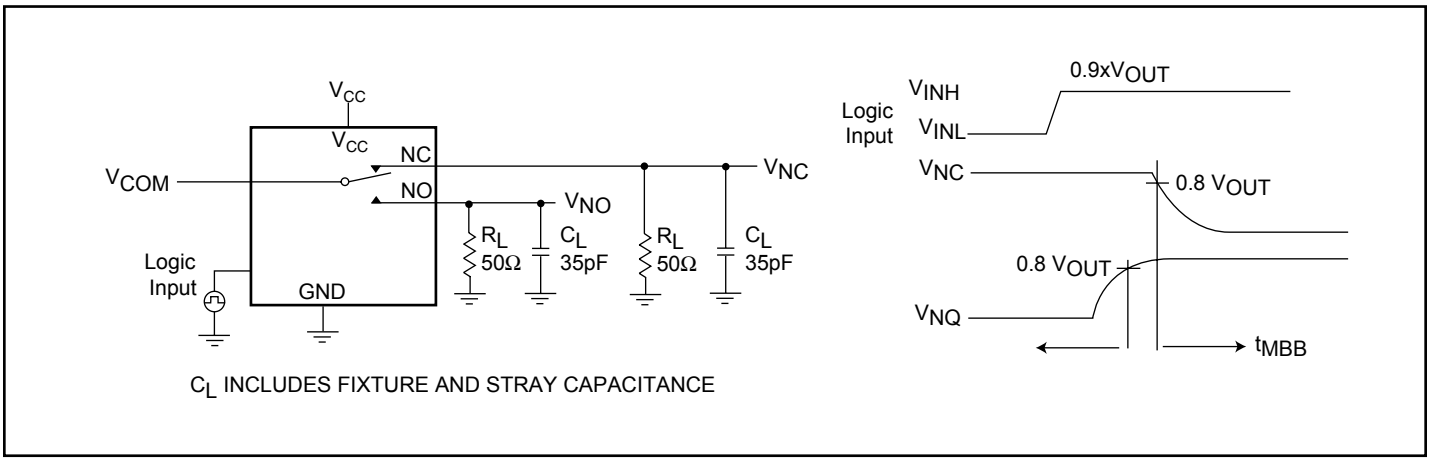


Figure 3. Make-Before-Break Interval

Test Circuits/Timing Diagrams (continued)

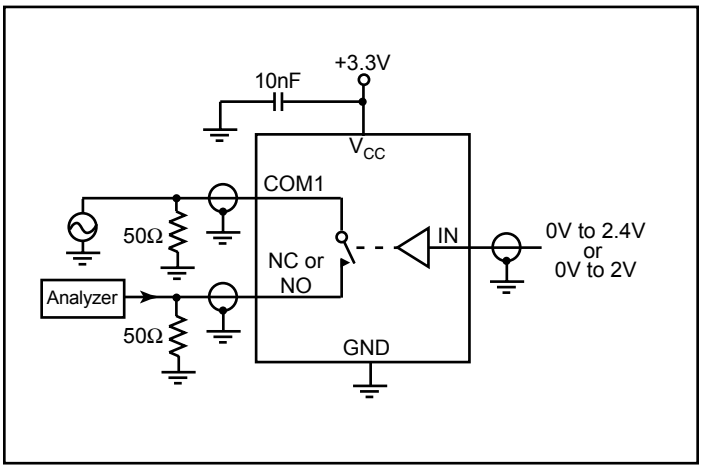


Figure 4. Off Isolation

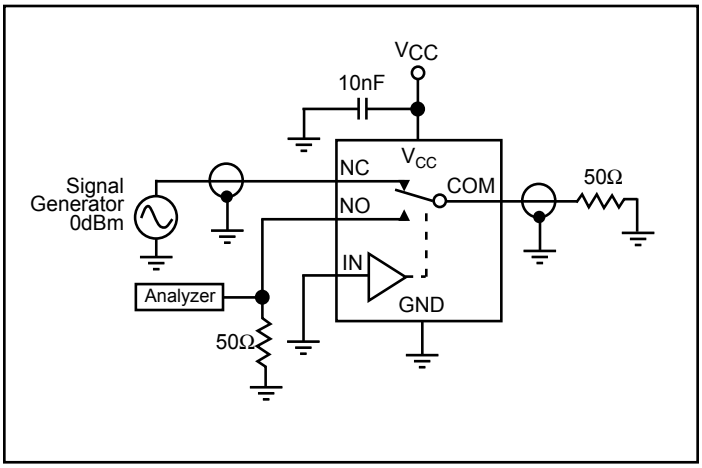


Figure 5. Crosstalk

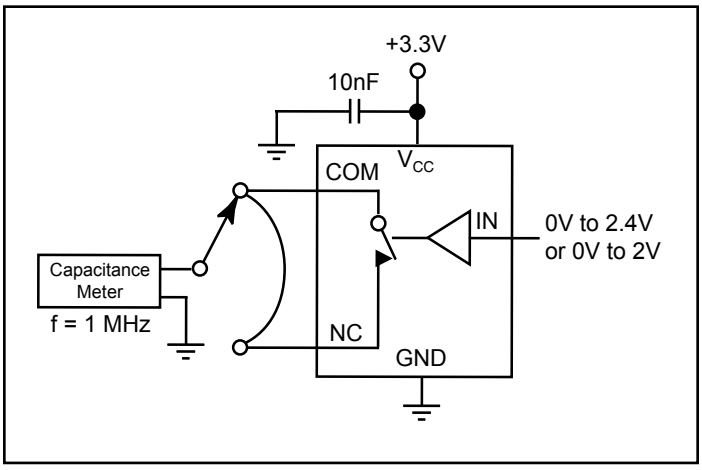


Figure 6. Channel-Off Capacitance

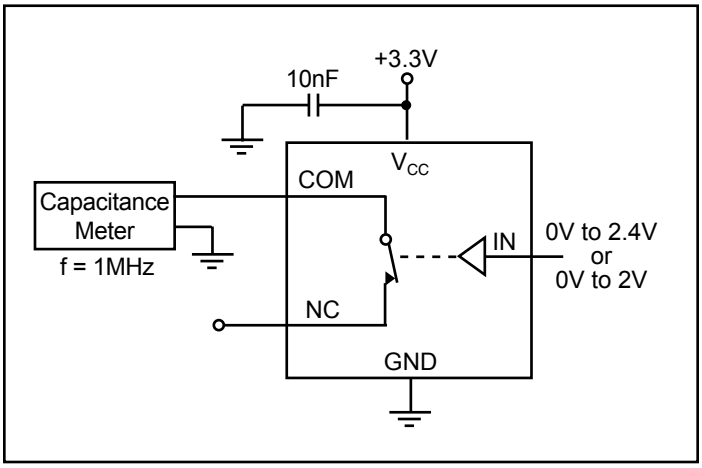
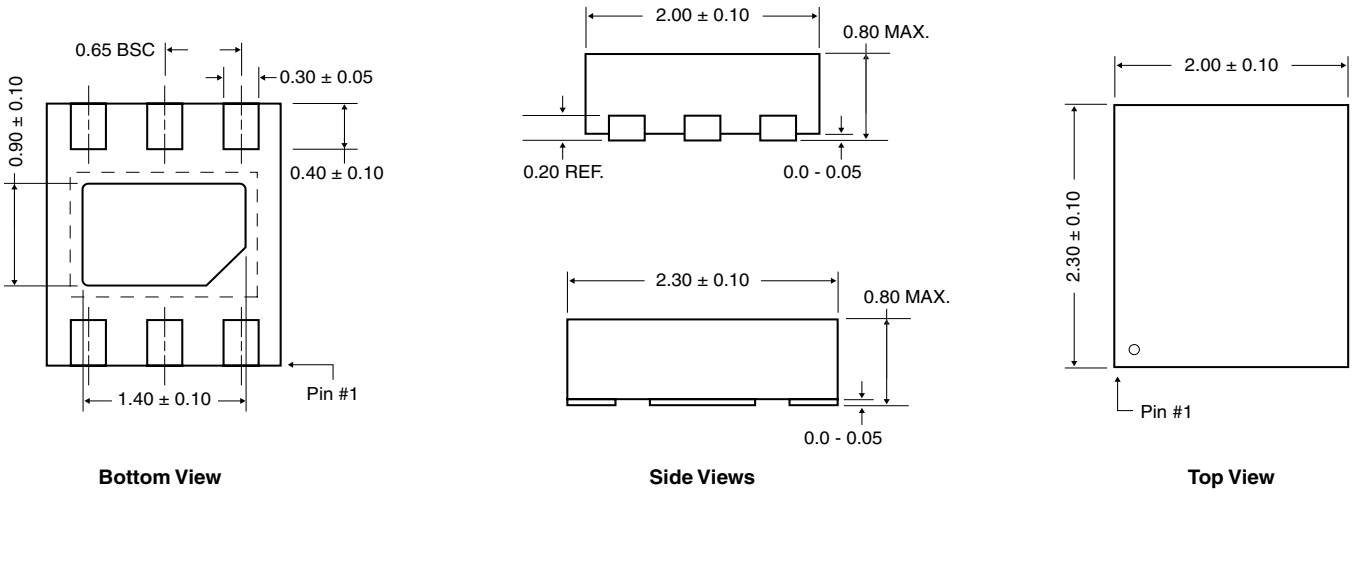
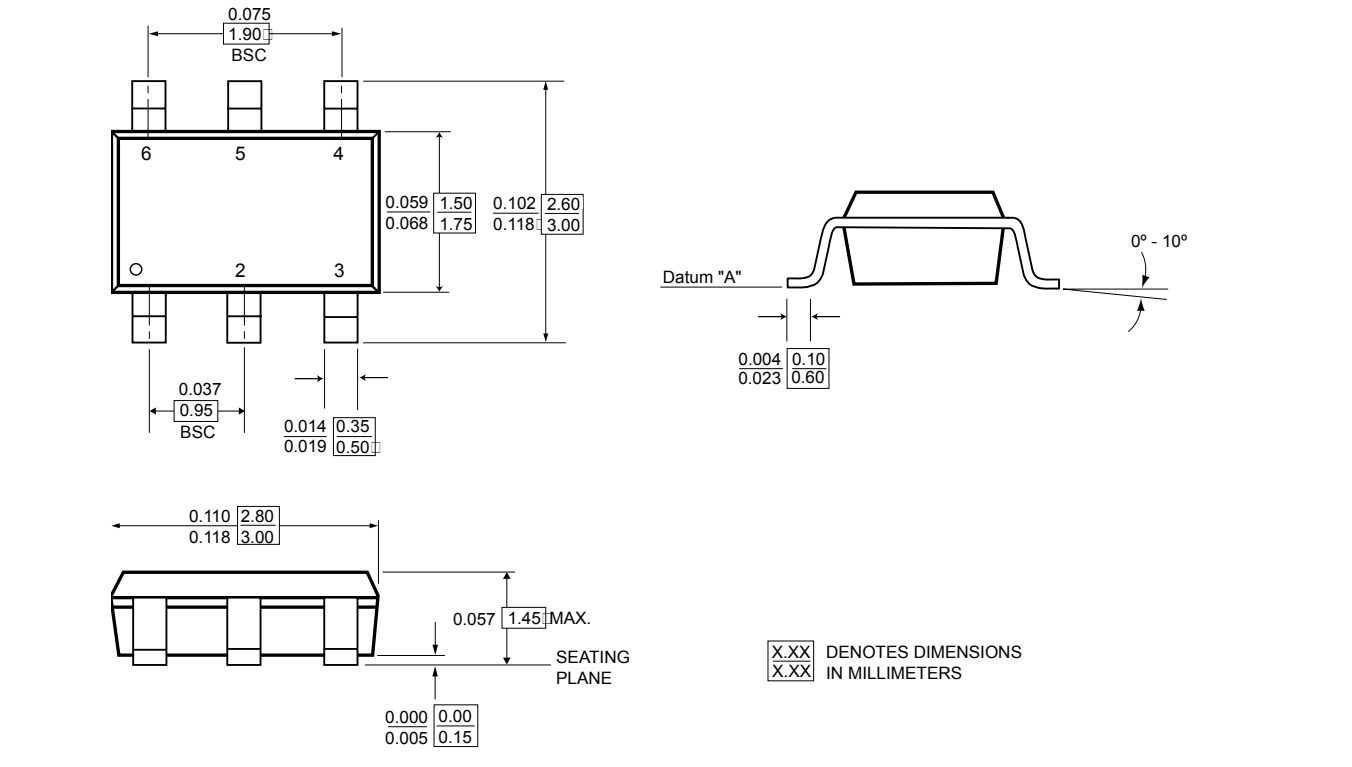


Figure 7. Channel-On Capacitance

Packaging Mechanical: 6-Pin TDFN (ZC)



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



Ordering Information

Order Code	Package Code	Package Type	Package Top Mark
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