

### Features

- CMOS Technology for Bus and Analog Applications
- Low ON-Resistance: 0.4Ω (+2.7V Supply)
- Wide V<sub>CC</sub> Range: +1.5V to +3.6V
- Low Power Consumption : 5μW
- Rail-to-Rail switching throughout Signal Range
- Fast Switching Speed: 20ns max. at 3.3V
- High Off Isolation: -27dB at 100 KHz
- -41dB (100KHz) Crosstalk Rejection Reduces Signal Distortion
- Extended Industrial Temperature Range: -40°C to 85°C
- Packaging (Pb-free & Green available):
  - 6-pin Small Compact SOT-23 (T)
  - 6-pin Ultra Compact (ZC)

### Applications

- Cell Phones
- PDAs
- Portable Instrumentation
- Battery Powered Communications
- Computer Peripherals

### Pin Description

Pin Number	Name	Description
1	NO	Data Port (Normally Open)
2	GND	Ground
3	NC	Data Port (Normally Closed)
4	COM	Common Output/Data Port
5	V <sub>CC</sub>	Positive Power Supply
6	IN	Logic Control

### Logic Function Table

Logic Input	Function
0	NC Connected to COM
1	NO Connected to COM

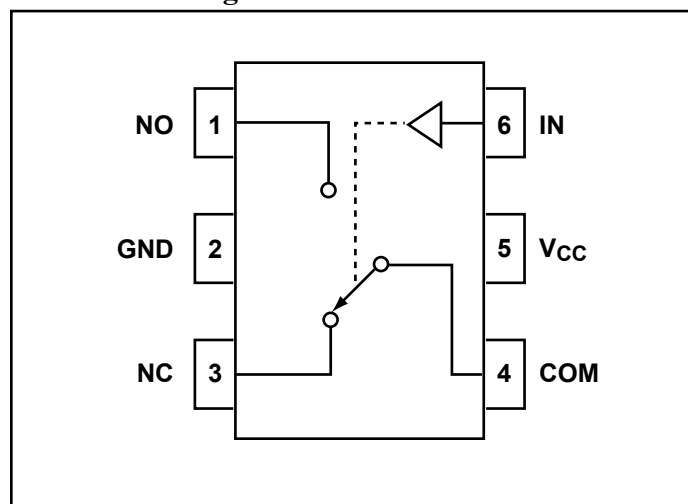
### Description

The PI3A3159 is a, 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 range, +1.5V to +3.6V, the PI3A3159 has an On-Resistance of 0.4Ω at 3.0V.

Control input, IN, tolerates input drive signals up to 3.3V, independent of supply voltage.

PI3A3159 is a lower voltage and On-Resistance replacement for the PI5A3159.

### Connection Diagram



### 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

SOT23-6 (derate 7.1mW/°C above +70°C)..... 0.5W

Storage Temperature ..... -65°C to +150°C

Lead Temperature (soldering, 10s) ..... +300°C

**Note:**

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

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

Parameter	Symbol	Conditions	Package	Temp. (°C)	Min. (1)	Typ. (2)	Max. (1)	Units
<b>Analog Switch</b>								
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 $V_{NC} = +1.5V$	SOT-23	25			0.4	$\Omega$
			TDFN	Full			0.5	
On-Resistance Match Between Channels (4)	$\Delta R_{ON}$			25			0.08	
				Full			0.09	
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<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 Volt- age High	I <sub>INH</sub>	V <sub>IN</sub> = 1.4V, all others = 0.5V		-1		1	μA
Input Current with Volt- age 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			20	ns
			Full			20	
Turn-Off-Time	t <sub>OFF</sub>		25			10	
			Full			15	
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 = 1MHz, Figure 5			90		pF
COM Off Capacitance	C <sub>COM(OFF)</sub>				90		
COM On Capacitance	C <sub>COM(ON)</sub>		f = 1MHz, Figure 6			240	
<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

**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. DR<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** ( $V_{CC} = +2.5V \pm 10\%$ ,  $GND = 0V$ ,  $V_{IH} = 1.4V$ ,  $V_{IL} = 0.5V$ )

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>	$V_{ANALOG}$			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			0.55	
On-Resistance Match Between Channels <sup>(4)</sup>	$\Delta R_{ON}$	$V_{CC} = 2.5V$ , $I_{COM} = -8mA$ , $V_{NO}$ or $V_{NC} = 0.8V$ , $1.8V$	25			0.09	
			Full			0.09	
On-Resistance Flatness <sup>(5)</sup>	$R_{FLAT(ON)}$	$V_{CC} = 2.5V$ , $I_{COM} = -8mA$ , $V_{NO}$ or $V_{NC} = 0.8V$ , $1.8V$	25			0.02	
			Full			0.02	
<b>Dynamic</b>							
Turn-On-Time	$t_{ON}$	$V_{CC} = 2.5V$ , $V_{NO}$ or $V_{NC} = 1.8V$ , Figure 1	25			30	ns
			Full			30	
Turn-Off-Time	$t_{OFF}$		25			15	
			Full			15	
Charge Injection <sup>(3)</sup>	Q	$C_L = 1nF$ , $V_{GEN} = 0V$ , $R_{GEN} = 0\Omega$ , Figure 2	25		40		pC
<b>Logic Input</b>							
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.  $\Delta R_{ON} = R_{ON} \text{ max.} - R_{ON} \text{ min.}$
5. Flatness is defined as the difference between the maximum and minimum value of On-Resistance measured.

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

( $V_{CC} = +1.8V \pm 10\%$ ,  $GND = 0V$ ,  $V_{IH} = 1.4V$ ,  $V_{IL} = 0.5V$ )

Parameter	Symbol	Conditions	Temp. (°C)	Min. (1)	Typ. (2)	Max. (1)	Units
<b>Analog Switch</b>							
Analog Signal Range <sup>(3)</sup>	$V_{ANALOG}$			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 <sup>(4)</sup>	$\Delta R_{ON}$	$V_{CC} = 1.8V$ , $I_{COM} = -4mA$ , $V_{NO}$ or $V_{NC} = 0.8V, 1.5V$	25			0.07	
			Full			0.09	
On-Resistance Flatness <sup>(5)</sup>	$R_{FLAT(ON)}$	$V_{CC} = 1.8V$ , $I_{COM} = -4mA$ , $V_{NO}$ or $V_{NC} = 0.8V, 1.5V$	25			0.8	
			Full			0.8	
<b>Dynamic</b>							
Turn-On-Time	$t_{ON}$	$V_{CC} = 1.8V$ , $V_{NO}$ or $V_{NC} = 1.5V$ , Figure 1	25			50	ns
			Full			50	
Turn-Off-Time	$t_{OFF}$		25			25	
			Full			25	
Charge Injection <sup>(3)</sup>	Q	$C_L = 1nF$ , $V_{GEN} = 0V$ , $R_{GEN} = 0\Omega$ , Figure 2	25		36		pC
<b>Logic Input</b>							
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.  $\Delta R_{ON} = R_{ON} \text{ max.} - R_{ON} \text{ min.}$
5. Flatness is defined as the difference between the maximum and minimum value of On-Resistance measured.

### Test Circuits/Timing Diagrams

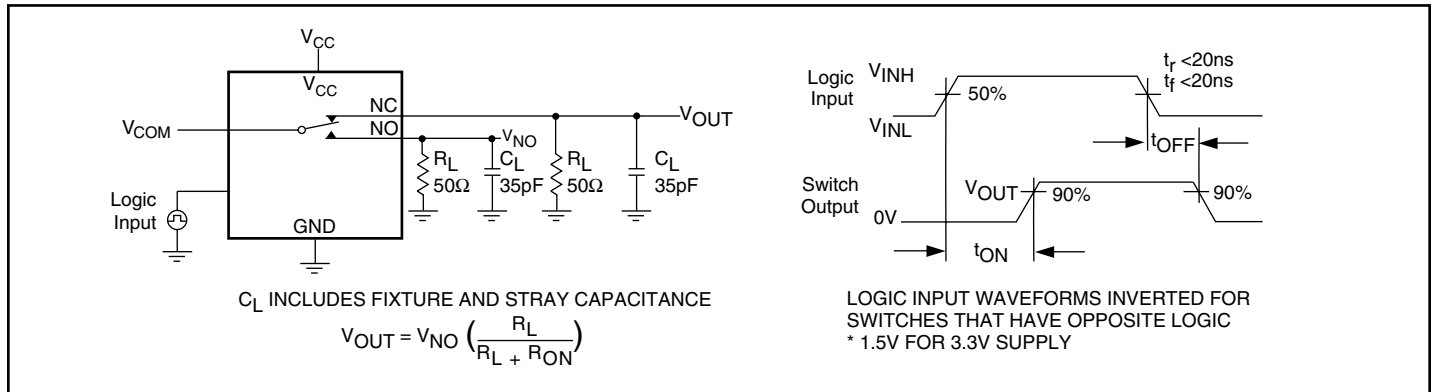


Figure 1. Switching Time

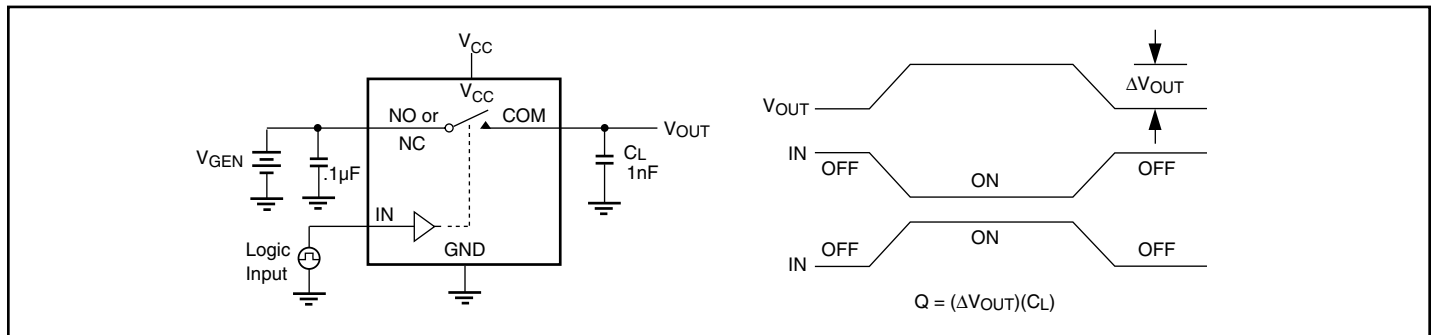


Figure 2. Charge Injection

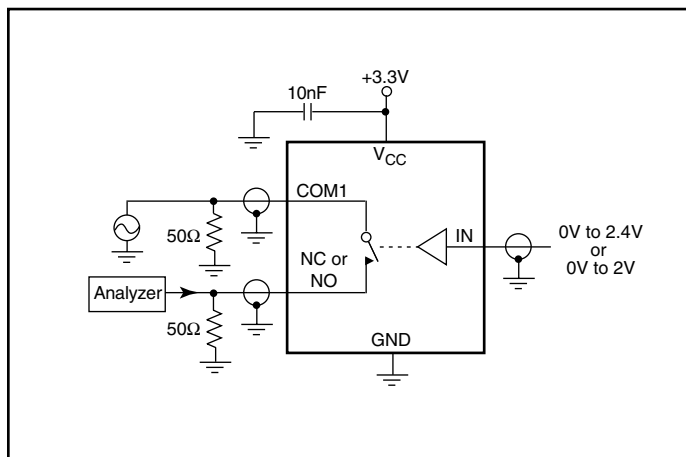


Figure 3. Off Isolation

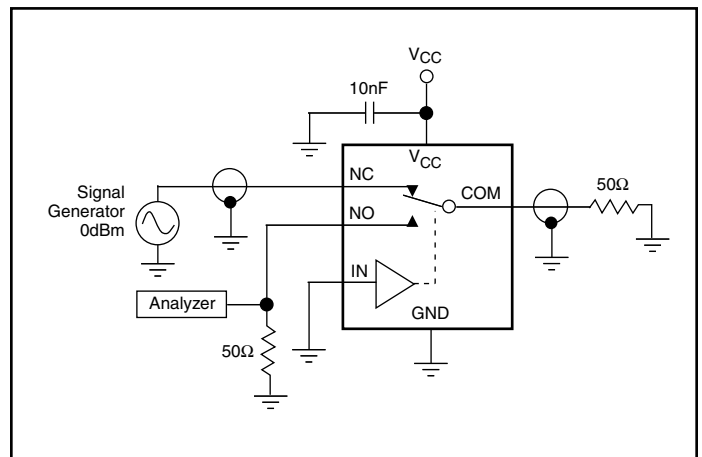


Figure 4. Crosstalk

Test Circuits/Timing Diagrams (continued)

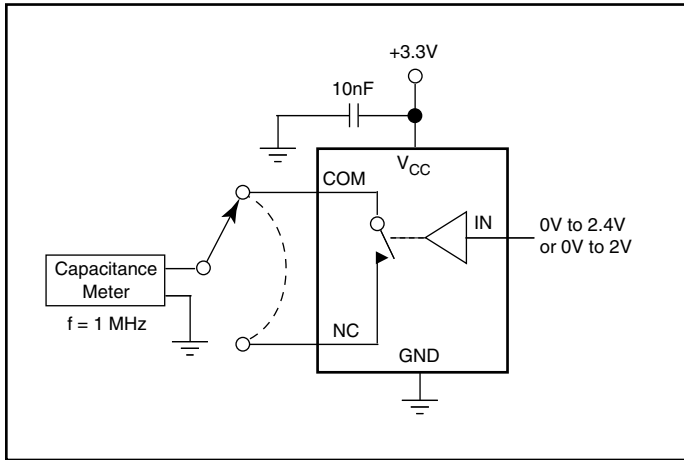


Figure 5. Channel-Off Capacitance

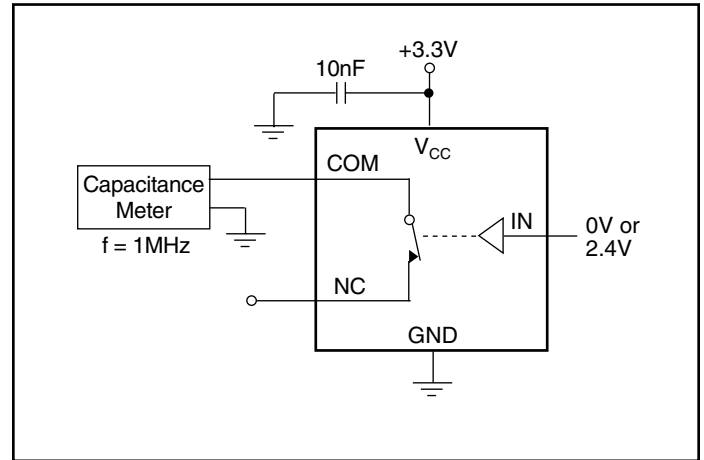
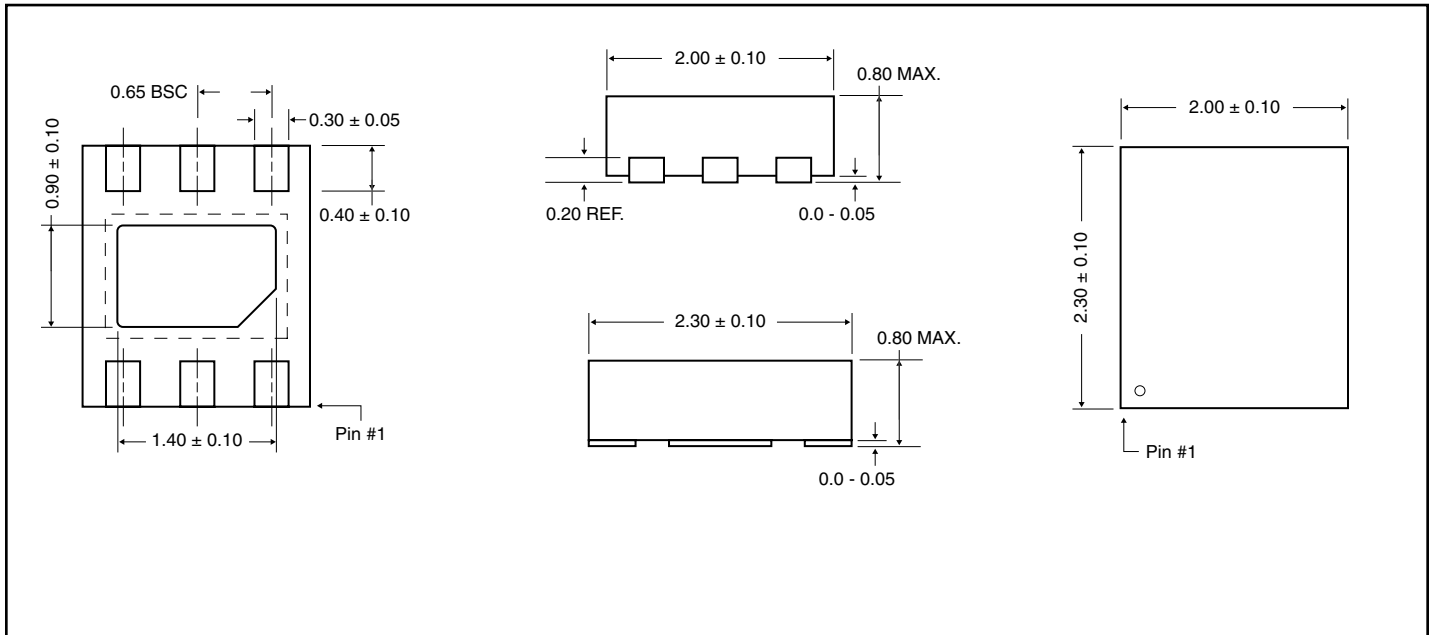
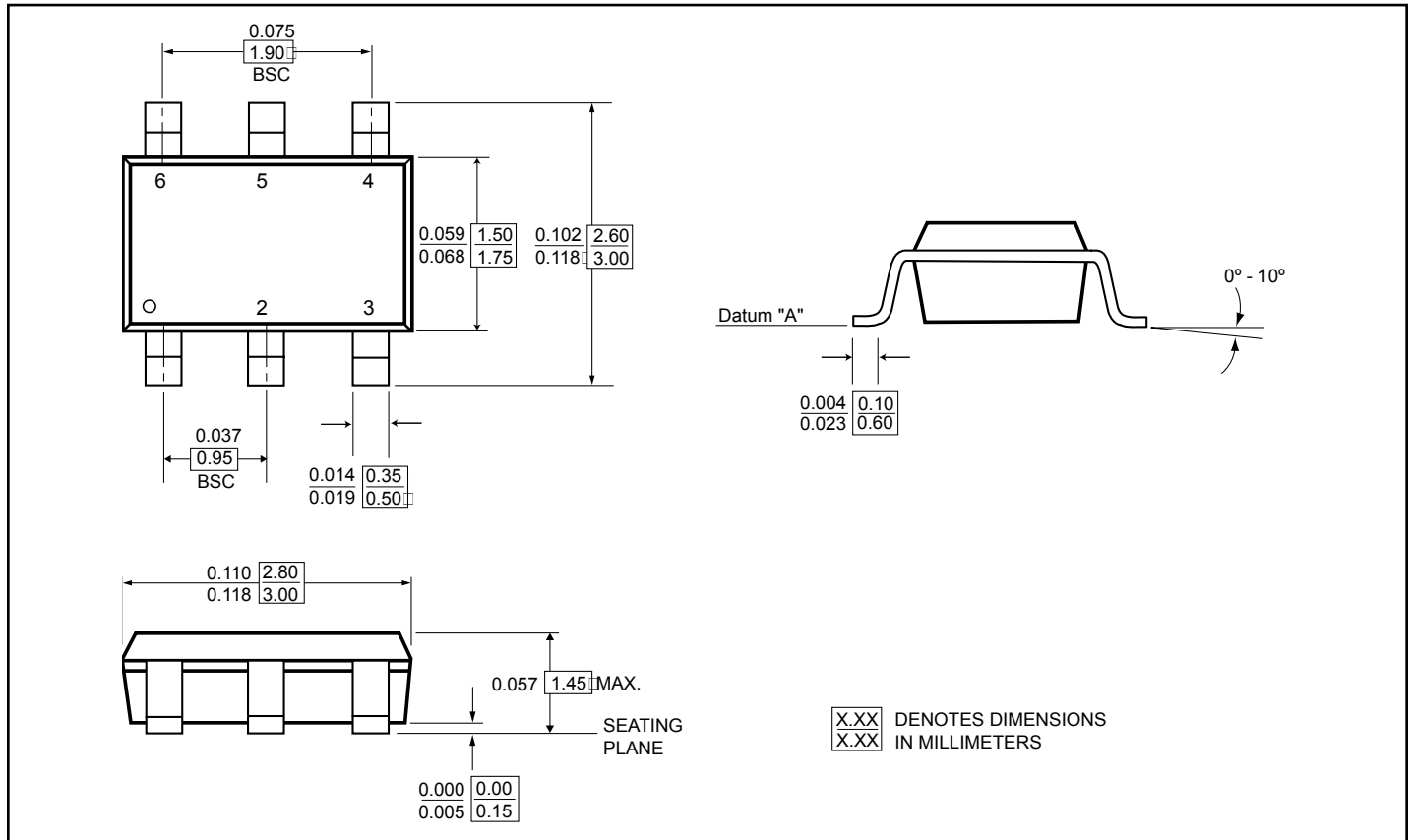


Figure 6. Channel-On Capacitance

Packaging Mechanical: 6-Pin TDFN (ZC)



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



**Ordering Information**

Ordering Code	Package Code	Package Description	Top Mark
PI3A3159TX	T	6-pin, SOT-23	ZG
PI3A3159TEX	T	Pb-free & Green, 6-pin, SOT-23	ZG
PI3A3159ZCEX	ZC	Pb-free & Green, 6-contact, TDFN	ZG

**Notes:**

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