PI3A3159

3.0V, SOTiny™ 0.4Ω SPDT Analog Switch

Features

- CMOS Technology for Bus and Analog Applications
- Low ON-Resistance: 0.4Ω (+2.7V Supply)
- Wide V_{CC} 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_{CC}	Positive Power Supply
6	IN	Logic Control

Logic Function Table

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

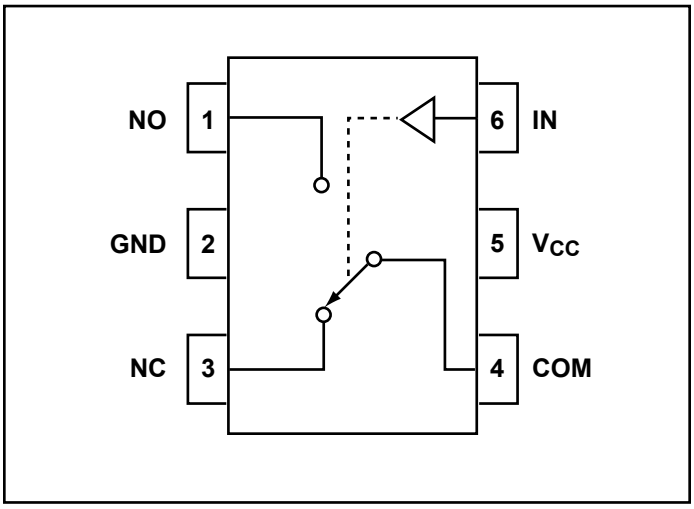
Description

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/ºC above +70ºC)..... 0.5W

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

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

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

Parameter	Symbol	Conditions	Package	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	Ω
			SOT-23	Full			0.5	
			TDFN				0.6	
On-Resistance Match Between Channels(4)	ΔR_{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_{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			20	ns
			Full			20	
Turn-Off-Time	t_{OFF}		25			10	
			Full			15	
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 = 1MHz, Figure 5			90		pF
COM Off Capacitance	$C_{COM(OFF)}$				90		
COM On Capacitance	$C_{COM(ON)}$	f = 1MHz, Figure 6			240		
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. $DR_{ON} = R_{ON}$ 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			0.55	
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			0.09	
			Full			0.09	
On-Resistance Flatness(5)	$R_{FLAT(ON)}$		25			0.02	
			Full			0.02	
Dynamic							
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(3)	Q	C_L = 1nF, V_{GEN} = 0V, R_{GEN} = 0Ω, 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			0.07	
			Full			0.09	
On-Resistance Flatness(5)	$R_{FLAT(ON)}$		25			0.8	
			Full			0.8	
Dynamic							
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(3)	Q	C_L = 1nF, V_{GEN} = 0V, R_{GEN} = 0Ω, 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

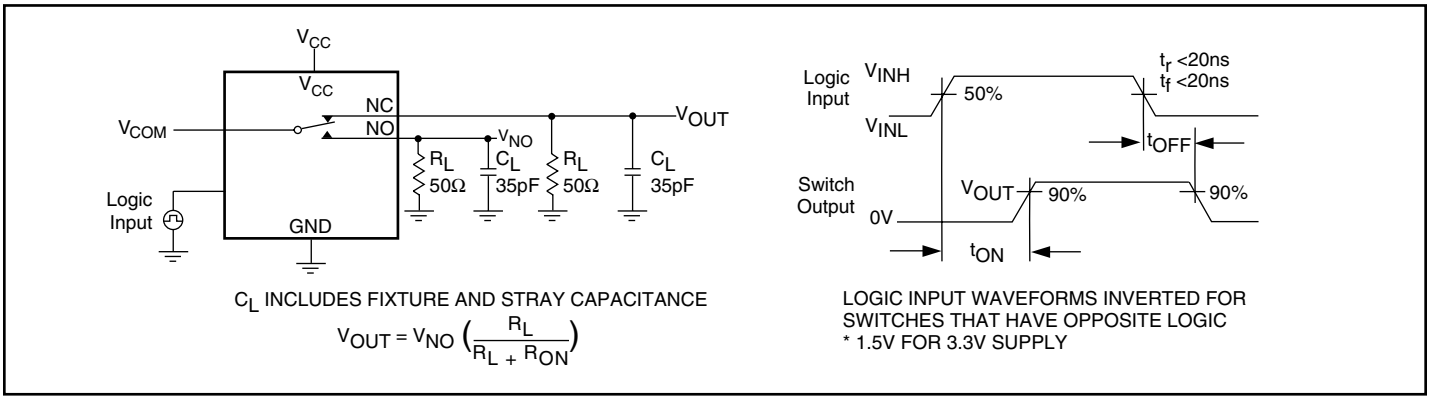


Figure 1. Switching Time

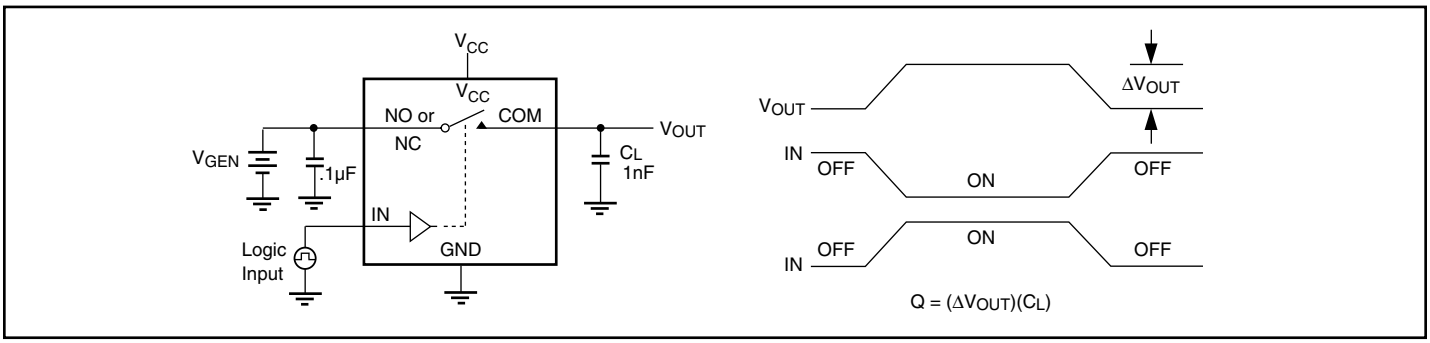


Figure 2. Charge Injection

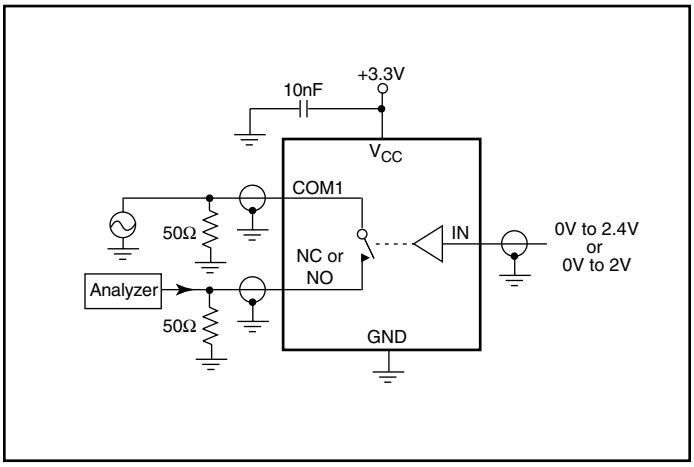


Figure 3. Off Isolation

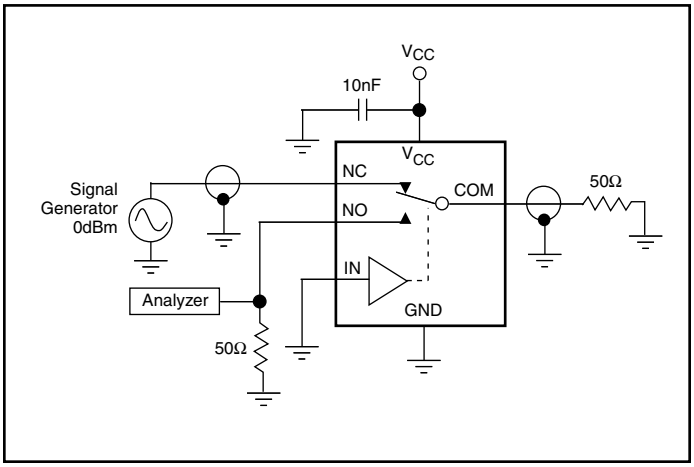


Figure 4. Crosstalk

Test Circuits/Timing Diagrams (continued)

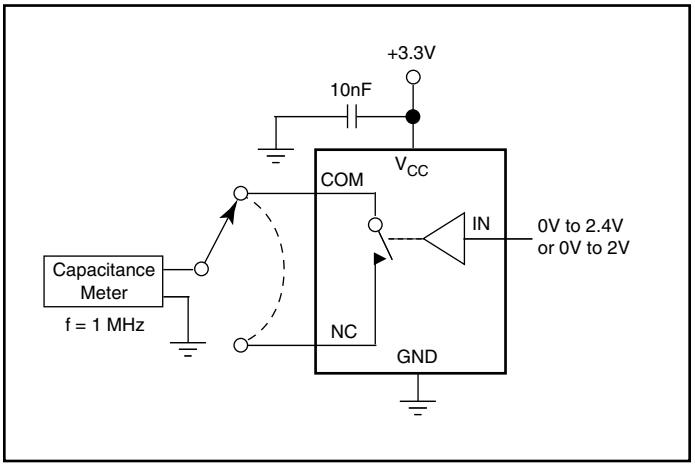


Figure 5. Channel-Off Capacitance

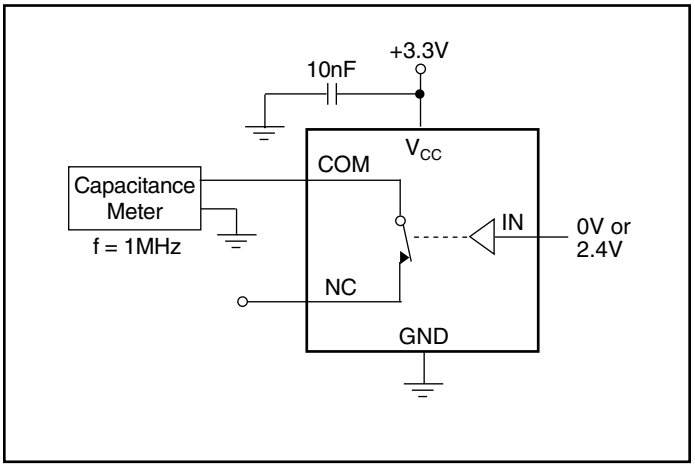
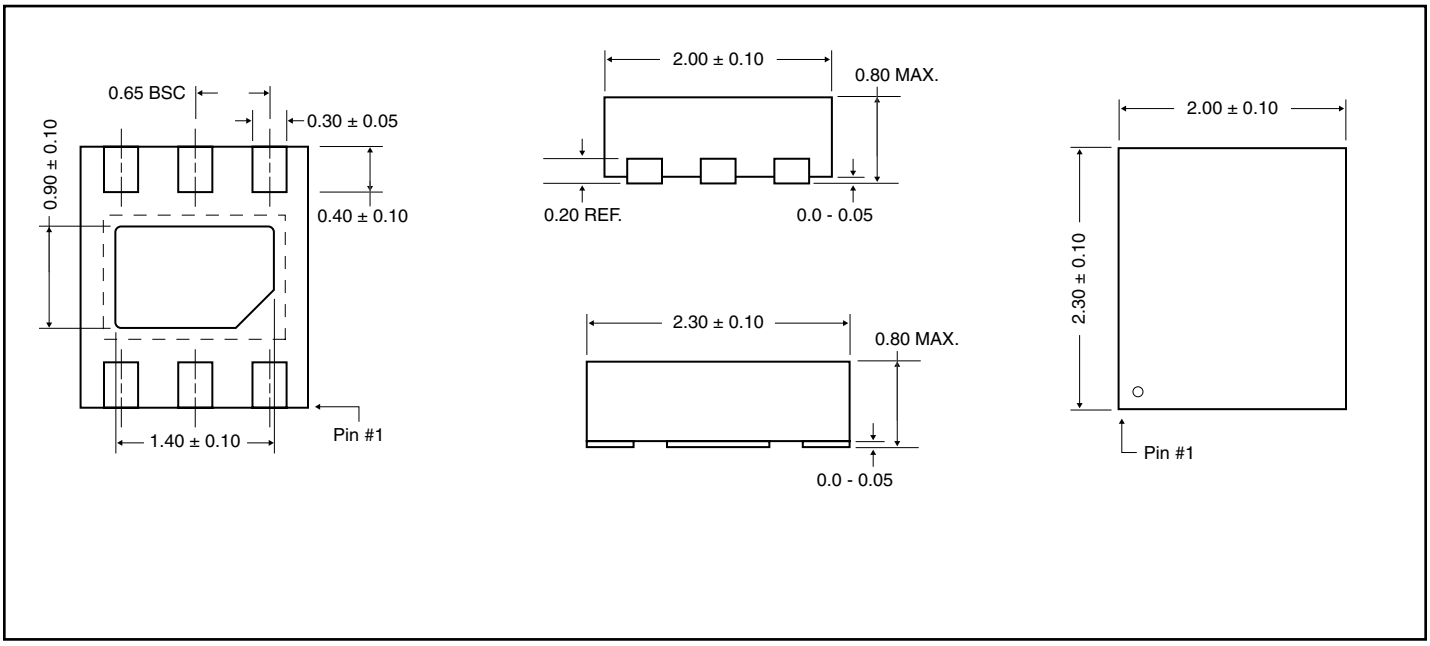
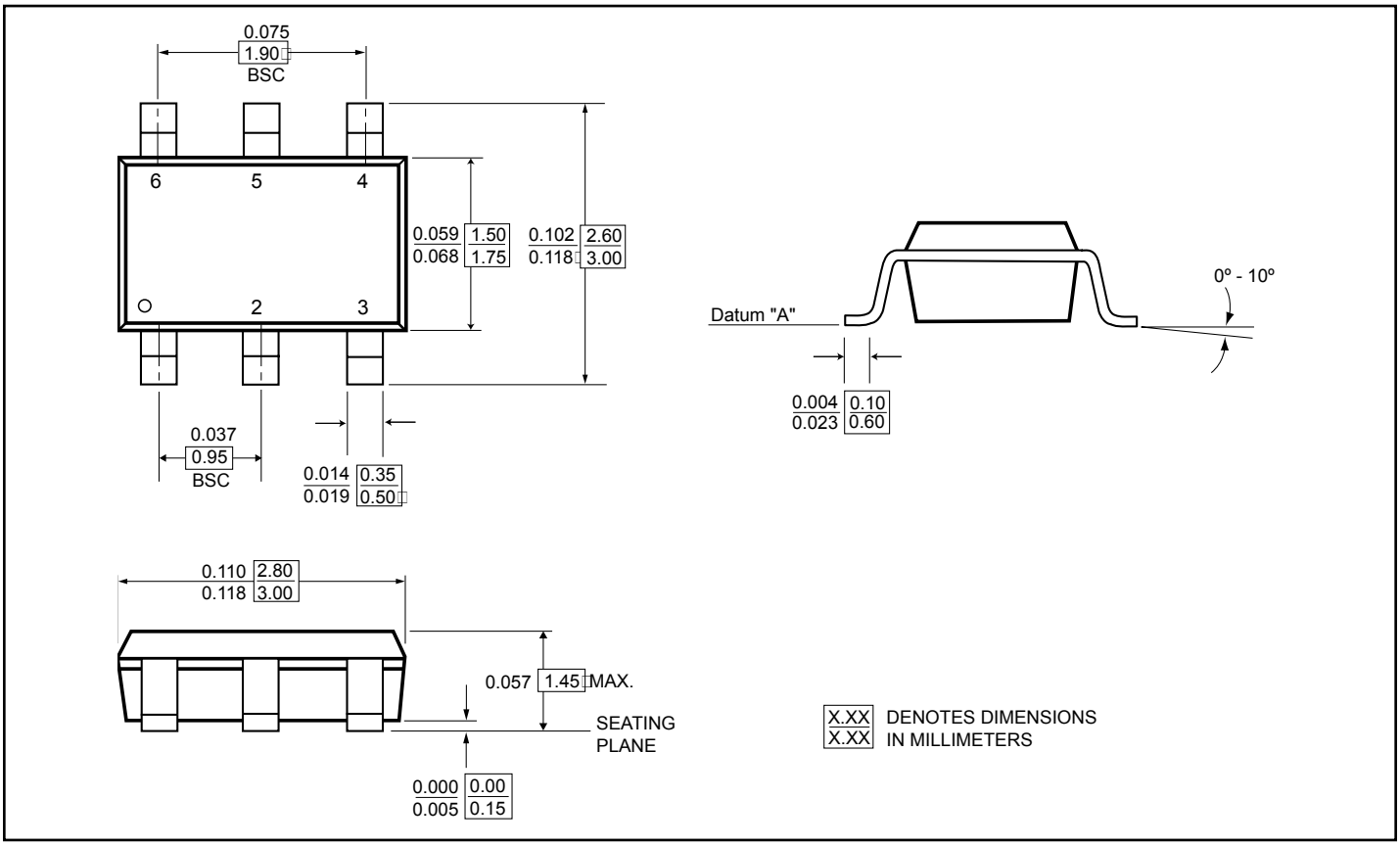


Figure 6. Channel-On Capacitance

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