

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

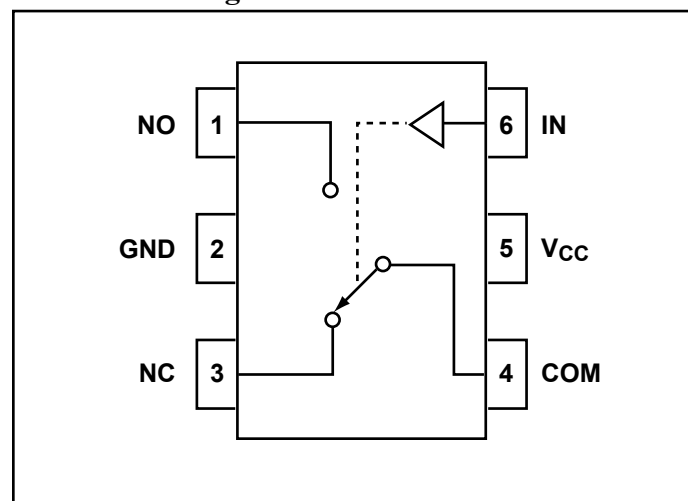
Description

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) $\pm 200mA$

Peak Current, COM, NO, NC

(Pulsed at 1ms, 10% duty cycle) $\pm 400mA$

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
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 Volt- age High	I _{INH}	V _{IN} = 1.4V, all others = 0.5V		−1		1	μA
Input Current with Volt- age 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:

- The algebraic convention, where most negative value is a minimum and most positive is a maximum, is used in this data sheet.
- Typical values are for DESIGN AID ONLY, not guaranteed or subject to production testing.
- Guaranteed by design.
- DR_{ON} = R_{ON} max. - R_{ON} min.
- Flatness is defined as the difference between the maximum and minimum value of On-Resistance measured.
- Leakage parameters are 100% tested at maximum rated hot temperature and guaranteed by correlation at +25°C.
- Off Isolation = 20log₁₀ [V_{COM} / (V_{NO} or V_{NC})]. See Figure 4.
- 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. ⁽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. $\Delta R_{ON} = R_{ON} \text{ max.} - R_{ON} \text{ min.}$
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 ± 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. ΔR_{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

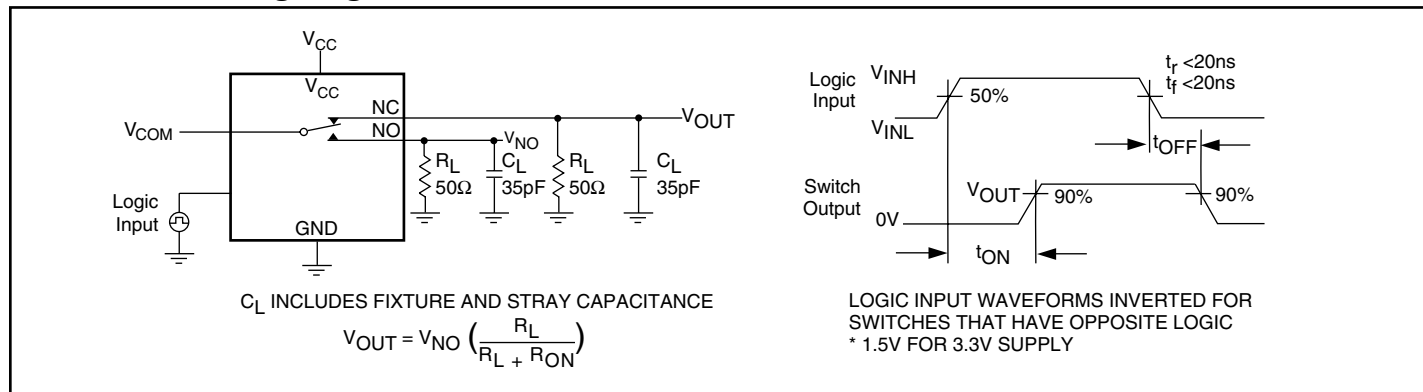


Figure 1. Switching Time

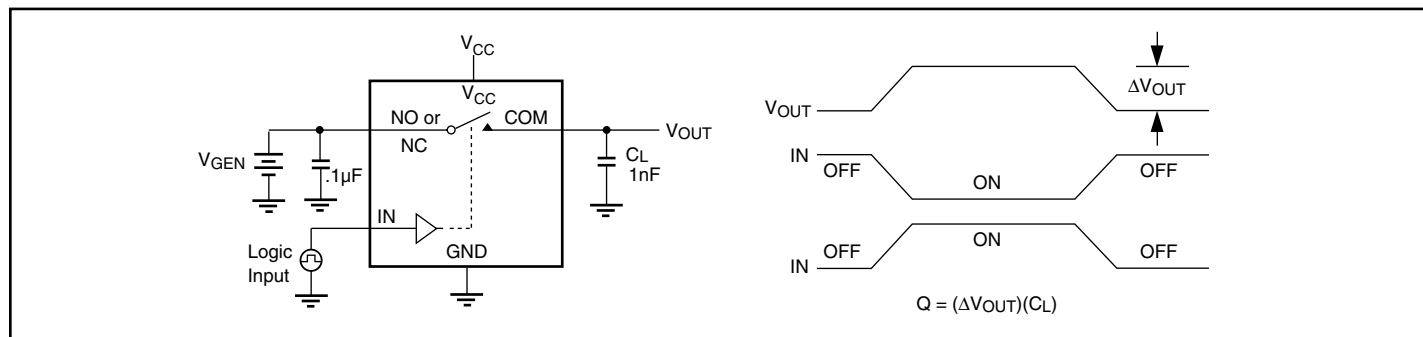


Figure 2. Charge Injection

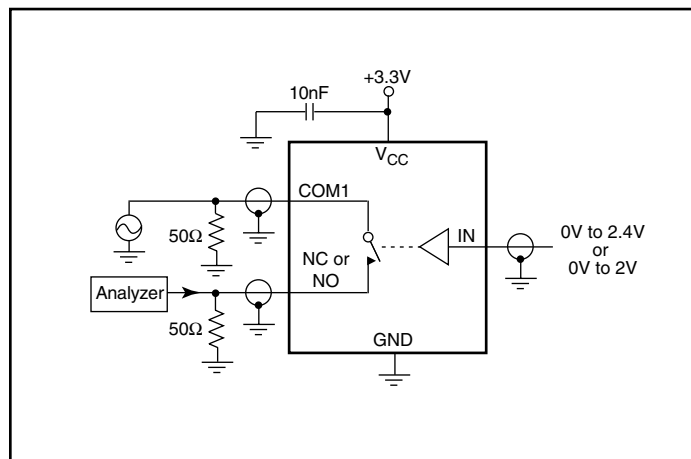


Figure 3. Off Isolation

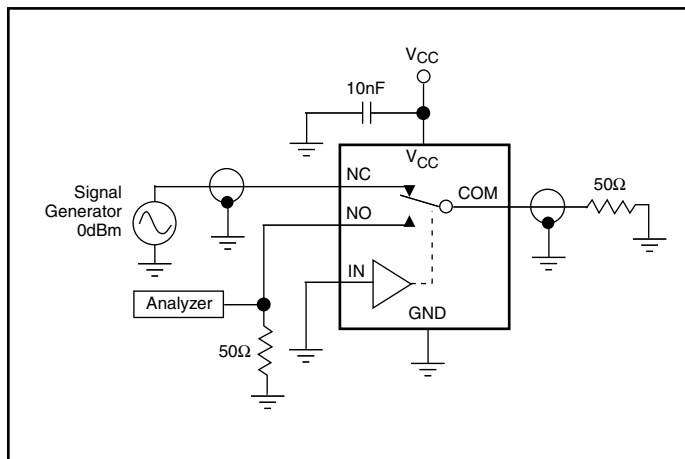
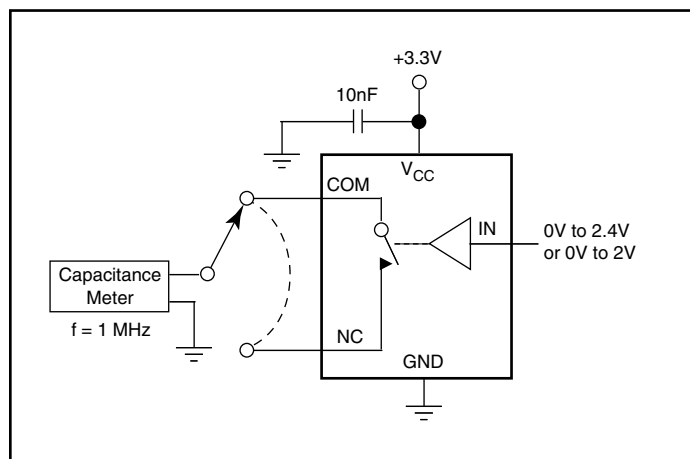
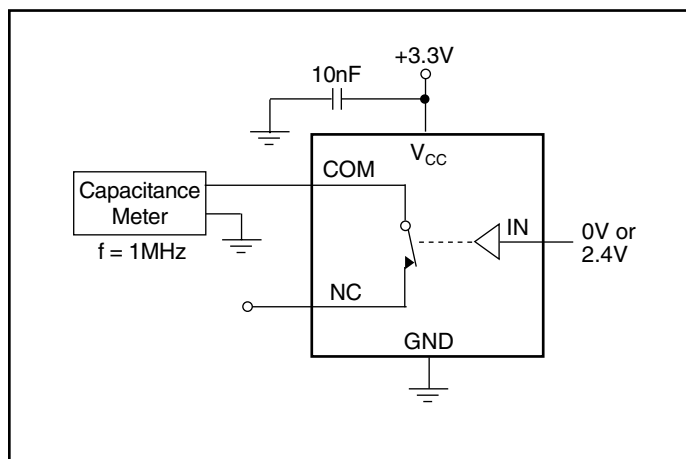
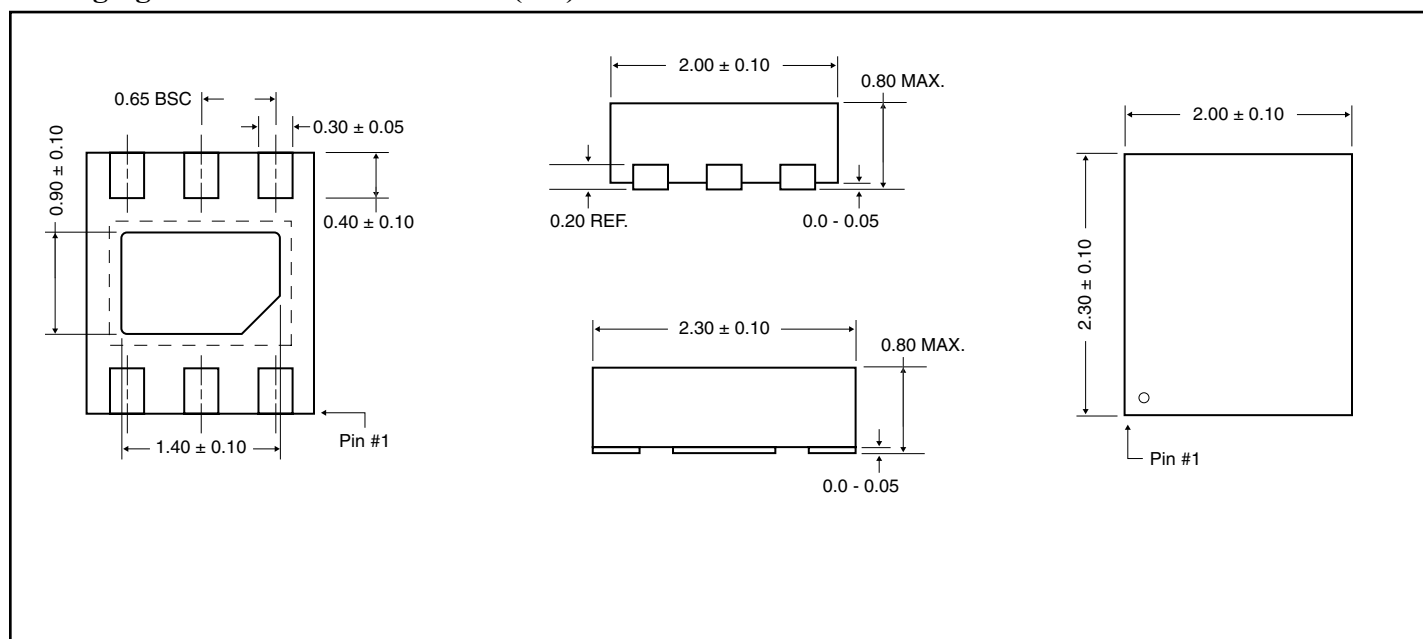
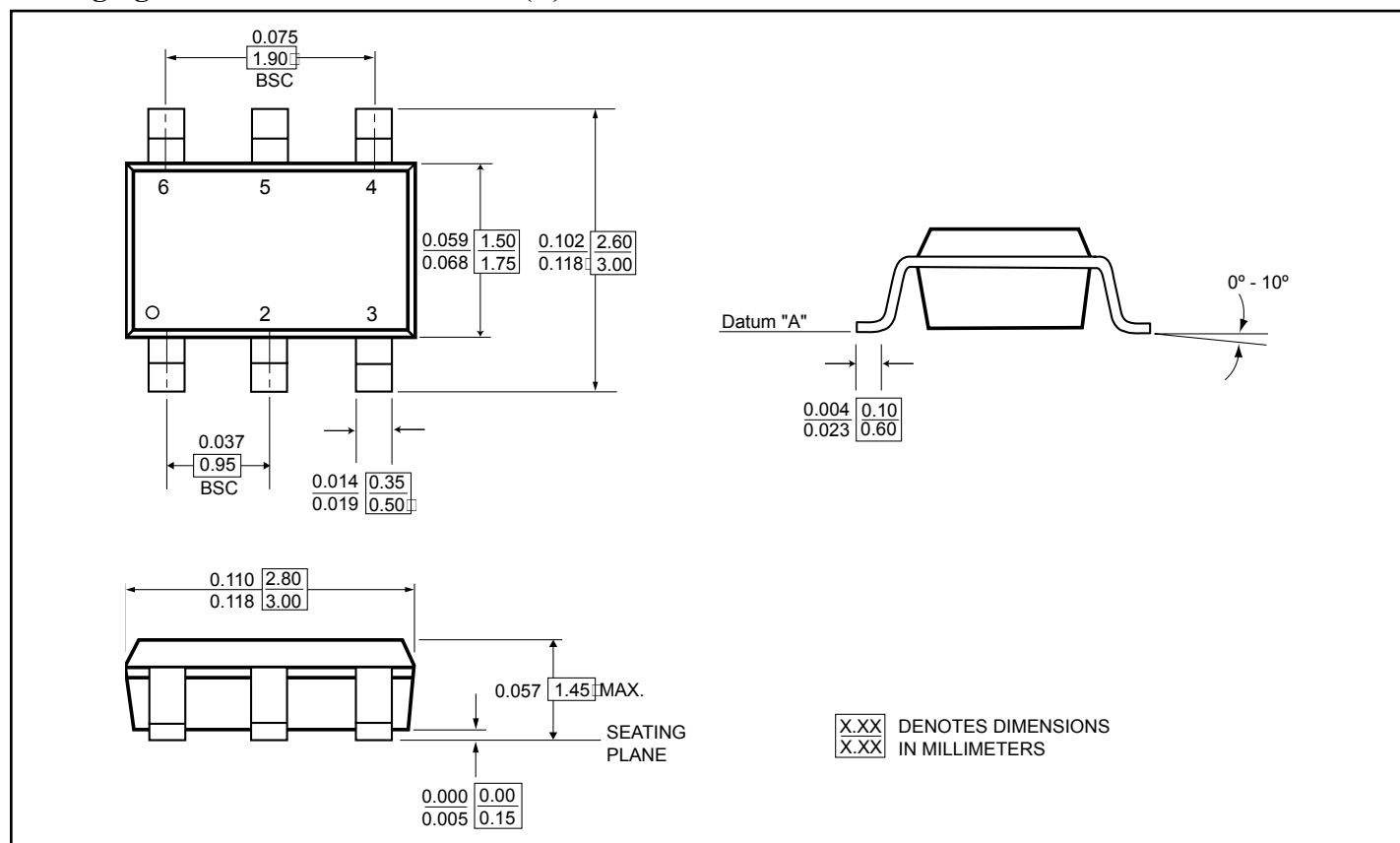


Figure 4. Crosstalk

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:

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