

Features

- CMOS Technology for Bus and Analog Applications
- Low On-Resistance: 2Ω at 3.0V
- Wide V_{CC} Range: +1.8V to +5.5V
- Low Power Consumption : 5μW
- Rail-to-Rail switching throughout Signal Range
- Fast Switching Speed: 30ns max. at 5V
- High Off Isolation: -57dB at 10MHz
- -57dB (1 MHz) Crosstalk Rejection Reduces Signal Distortion
- Break-Before-Make Switching
- Extended Industrial Temperature Range: -40°C to 85°C
- Low On-Resistance Replacement for NC7SB3157
- Packaging (Pb-free & Green available):
 - 6-pin SOT-23 (T)
 - 6-contact TDFN-6 (ZC)

Applications

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

Pin Description

Pin Number	Name	Description
1	B ₁	Data Port
2	GND	Ground
3	B ₀	Data Port (Normally Closed)
4	A	Common Output/Data Port
5	V _{CC}	Positive Power Supply
6	S	Logic Control

Logic Function Table

Logic Input(s)	Function
0	B ₀ Connected to A
1	B ₁ Connected to A

Description

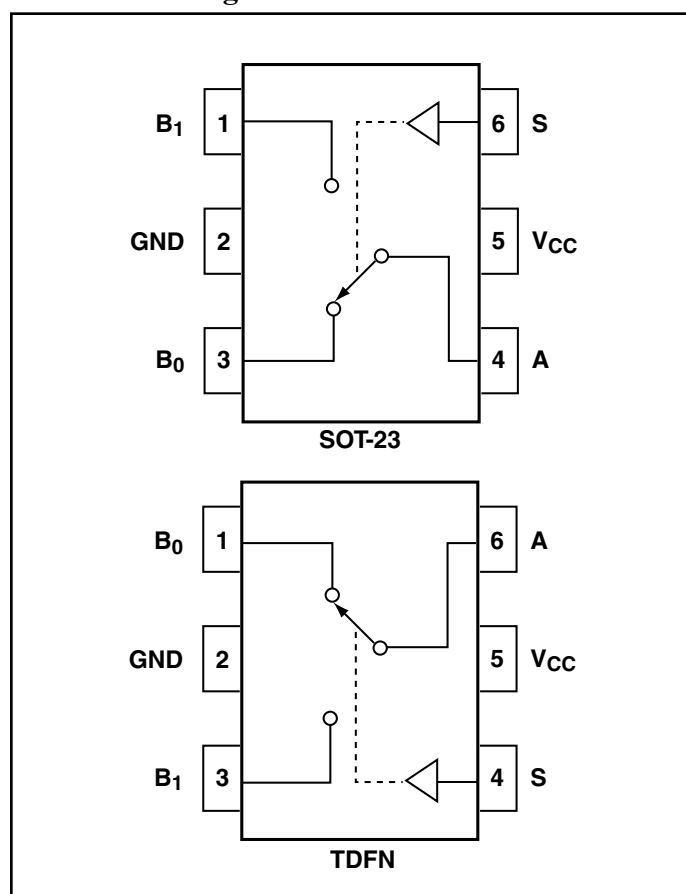
The PI5A3159 is a high-bandwidth, fast single-pole double-throw (SPDT) CMOS switch. It can be used as an analog switch or as a low-delay bus switch. Specified over a wide operating power supply voltage range, 1.8V to 5.5V, the PI5A3159 has a maximum On-Resistance of 4Ω at 1.8V, 2.4Ω at 2.3V & 1Ω at 4.5V.

Break-before-make switching prevents both switches being enabled simultaneously. This eliminates signal disruption during switching.

Control input, S, tolerates input drive signals up to 5.5V, independent of supply voltage.

PI5A3159 is a low On-Resistance replacement for the PI5A3157 and NC7SB3157.

Connection Diagrams



Absolute Maximum Ratings

Voltages Referenced to GND

V₊ -0.5V to +5.5V

V_{IN}, V_{COM}, V_{NC}, V_{NO} ⁽¹⁾ -0.5V to V₊ +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 (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₊ 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 +5V Supply

(V₊ = +5V ± 10%, GND = 0V, V_{INH} = 2.4V, V_{INL} = 0.8V)

Parameter	Symbol	Conditions	Temp(°C)	Min ⁽¹⁾	Typ ⁽²⁾	Max ⁽¹⁾	Units
Analog Switch							
Analog Signal Range ^(3, 4)	V _{ANALOG}		Full	0		V ₊	V
On-Resistance	R _{ON}	V ₊ = 4.5V, I _{COM} = -30mA, V _{NO} or V _{NC} = +2.5V	25		0.70	0.90	Ω
			Full			1.1	
On-Resistance Match Between Channels ⁽⁵⁾	ΔR _{ON}		25		0.03	0.05	
			Full			0.10	
On-Resistance Flatness ⁽⁶⁾	R _{FLAT(ON)}	V ₊ = 4.5V, I _{COM} = -30mA, V _{NO} or V _{NC} = 1V, 1.5V, 2.5V	25		0.08	0.12	Ω
			Full			0.15	
NO or NC Off Leakage Current ⁽⁷⁾	I _{NO(OFF)} or I _{NC(OFF)}	V ₊ = 5.5V, V _{COM} = 0V, V _{NO} or V _{NC} = 4.5V	25	2	0.01	2	nA
			Full	-20		20	
COM On Leakage Current ⁽⁷⁾	I _{COM(ON)}	V ₊ = 5.5V, V _{COM} = 4.5V, V _{NO} or V _{NC} = 4.5V	25	-4		4	
			Full	-40	0.3	40	

Electrical Specifications - Single +5V Supply (continued)

(V+ = + 5V ± 10%, GND = 0V, V_{INH} = 2.4V, V_{INL} = 0.8V)

Parameter	Symbol	Conditions	Temp(°C)	Min ⁽¹⁾	Typ ⁽²⁾	Max ⁽¹⁾	Units
Analog Switch							
Input HIGH Voltage	V _{IH}	Guaranteed Logic HIGH level					V
Input LOW Voltage	V _{IL}	Guaranteed Logic LOW level				0.8	
Input Current with HIGH Voltage	I _{INH}	V _{IN} = 2.4V, all others = 0.8V		-1	0.005	1	μA
Input Current with LOW Voltage	I _{INL}	V _{IN} = 0.8V, all others = 2.4V		-1	0.005	1	
Dynamic							
Turn-On-Time	t _{ON}	V _{CC} = 5V, See Fig. 1	25		20	35	ns
			Full			40	
Turn-Off-Time	t _{OFF}		25		15	20	
			Full			35	
Break-Before-Make	t _{BBM}	See Fig. 3	25	1	12	14.5	
			Full	1	17.5		
Charge Injection ⁽³⁾	Q	C _L -1nF, V _{GEN} = 0V, R _{GEN} = 0V, See Fig 2	25		40		pC
Off Isolation	O _{IRR}	R _L = 50Ω, f = 1MHz, See Fig 4			-57		dB
CrossTalk ⁽⁹⁾	X _{TALK}	R _L = 50Ω, f = 1MHz, See Fig 4			-57		
NC or NO Capacitance	C _{NC/NO(OFF)}	f = 1MHz, See Fig 6			42		pF
COM Off Capacitance	C _{COM(OFF)}	f = 1MHz, See Fig 6			83		
COM On Capacitance	C _{COM(ON)}	f = 1MHz, See Fig 7			130		
Supply							
Power-Supply Range	V+		Full	1.8		5.5	V
Positive Supply Current	1+	V+ = 5.5V, V _{IN} = 0V or V+, All Channels ON or OFF	Full		0.5	1	μA

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.
- Device is NOT guaranteed to function per the datasheet specification outside of 0 to V+ range.
- ΔR_{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 +3.3V Supply

(V+ = +3.3V ± 10%, GND = 0V, V_{INH} = 2.0V, V_{INL} = 0.6V)

Parameter	Symbol	Conditions	Temp(°C)	Min ⁽¹⁾	Typ ⁽²⁾	Max ⁽¹⁾	Units	
Analog Switch								
Analog Signal Range ⁽³⁾	V _{ANALOG}			0		V+	V	
On-Resistance	R _{ON}	V+ = 3V, I _{COM} = -24mA, V _{NO} or V _{NC} = 2.0V	25		1.4	1.8	Ω	
			Full			2.2		
On-Resistance Match Between Channels ⁽⁴⁾	ΔR _{ON}	V+ = 3.3V, I _{COM} = -24mA, V _{NO} or V _{NC} = 0.8V, 2.0V	25		0.04	0.05		
			Full		0.11			
On-Resistance Flatness	R _{FLAT(ON)}		25		0.17	0.2		
			Full		0.25			
Dynamic								
Turn-On-Time	t _{ON}		V _{CC} = 5V, See Fig. 1	25		30	40	ns
		Full				55		
Turn-Off-Time	t _{OFF}	25			20	25		
		Full				40		
Break-Before-Make	t _{BBM}	See Fig. 3	25	1	21	29		
Charge Injection ⁽³⁾	Q	C _L -1nF, V _{GEN} = 0V, R _{GEN} = 0V, See Fig 2	25		30		pC	
Supply								
Positive Supply Current	I+	V+ = 3.6V, V _{IN} = 0V or V+, All Channels ON or OFF	Full		0.5	1	μA	
Logic Input								
Input HIGH Voltage	V _{IH}	Guaranteed Logic HIGH level	Full	2			V	
Input LOW Voltage	V _{IL}	Guaranteed Logic LOW level	Full			0.6		
Input HIGH Current	I _{INH}	V _{IN} = 2.4V, all others = 0.8V	Full	-1		1	μA	
Input LOW Current	I _{INL}	V _{IN} = 0.8V, all others = 2.4V	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.

Electrical Specifications - Single +2.5V Supply

(V+ = +2.5V ± 10%, GND = 0V, V_{INH} = 1.8V, V_{INL} = 0.6V)

Parameter	Symbol	Conditions	Temp(°C)	Min ⁽¹⁾	Typ ⁽²⁾	Max ⁽¹⁾	Units	
Analog Switch								
Analog Signal Range ⁽³⁾	V _{ANALOG}			0		V+	V	
On-Resistance	R _{ON}	V+ = 1.8V, I _{COM} = -2mA, V _{NO} or V _{NC} = 1.5V	25		1.6	2	Ω	
			Full			2.7		
On-Resistance Match Between Channels ⁽⁴⁾	ΔR _{ON}	V+ = 1.8V, I _{COM} = -2mA, V _{NO} or V _{NC} = 0.8V, 1.5V	25		0.13	0.16		
			Full		0.2			
On-Resistance Flatness	R _{FLAT(ON)}		25		0.25	0.3		
			Full		0.45			
Dynamic								
Turn-On-Time	t _{ON}		V+ = 2.5V, V _{NO} or V _{NC} = 1.8V, See Fig. 1	25		40	55	ns
		Full				70		
Turn-Off-Time	t _{OFF}	25			30	40		
		Full				55		
Break-Before-Make	t _{BBM}	See Fig. 3		25	1	33	39	
Make-Before-Break	t _{MBB}	See Fig. 4		25	1	9	13	
Charge Injection ⁽³⁾	Q	C _L -1nF, V _{GEN} = 0V, R _{GEN} = 0V, See Fig 2	25		20		pC	
Supply								
Positive Supply Current	1+	V+ = 2.75V, V _{IN} = 0V or V+, All Channels ON or OFF	Full		0.5	1	μA	
Logic Input								
Input HIGH Voltage	V _{IH}	Guaranteed Logic HIGH level	Full	1.8			V	
Input LOW Voltage	V _{IL}	Guaranteed Logic LOW level	Full			0.6		
Input HIGH Current	I _{INH}	V _{IN} = 2.0V, all others = 0.8V	Full	-1		1	μA	
Input LOW Current	I _{INL}	V _{IN} = 0.8V, all others = 2.0V	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.

Electrical Specifications - Single +1.8V Supply

(V+ = +1.8V ± 10%, GND = 0V, V_{INH} = 1.5V, V_{INL} = 0.6V)

Parameter	Symbol	Conditions	Temp(°C)	Min ⁽¹⁾	Typ ⁽²⁾	Max ⁽¹⁾	Units	
Analog Switch								
Analog Signal Range ⁽³⁾	V _{ANALOG}			0		V+	V	
On-Resistance	R _{ON}	V+ = 1.8V, I _{COM} = -2mA, V _{NO} or V _{NC} = 1.5V	25		2.8	4	Ω	
			Full			5		
On-Resistance Match Between Channels ⁽⁴⁾	ΔR _{ON}	V+ = 1.8V, I _{COM} = -2mA, V _{NO} or V _{NC} = 0.6V, 1.5V	25		0.44	0.6		
			Full		0.7			
On-Resistance Flatness	R _{FLAT(ON)}		25		0.5	0.6		
			Full		0.9			
Dynamic								
Turn-On-Time	t _{ON}		V+ = 1.8V, V _{NO} or V _{NC} = 1.5V, See Fig. 1	25		65	70	ns
		Full				95		
Turn-Off-Time	t _{OFF}	25			40	55		
		Full				70		
Break-Before-Make	t _{BBM}	See Fig. 3	25	1	60	72		
Charge Injection ⁽³⁾	Q	C _L -1nF, V _{GEN} = 0V, R _{GEN} = 0V, See Fig 2	25		10		pC	
Supply								
Positive Supply Current	I+	V+ = 2.0, V _{IN} = 0V or V+, All Channels ON or OFF	Full		0.5	1	μA	
Logic Input								
Input HIGH Voltage	V _{IH}	Guaranteed Logic HIGH level	Full	1.8			V	
Input LOW Voltage	V _{IL}	Guaranteed Logic LOW level	Full			0.6		
Input HIGH Current	I _{INH}	V _{IN} = 1.5V, all others = 0.8V	Full	-1		1	μA	
Input LOW Current	I _{INL}	V _{IN} = 0.8V, all others = 1.5V	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

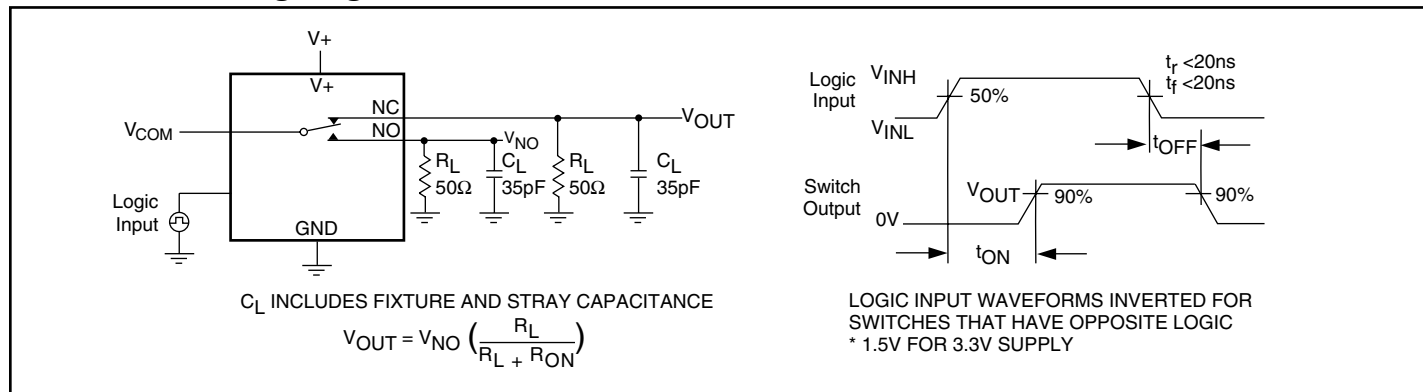


Figure 1. Switching Time

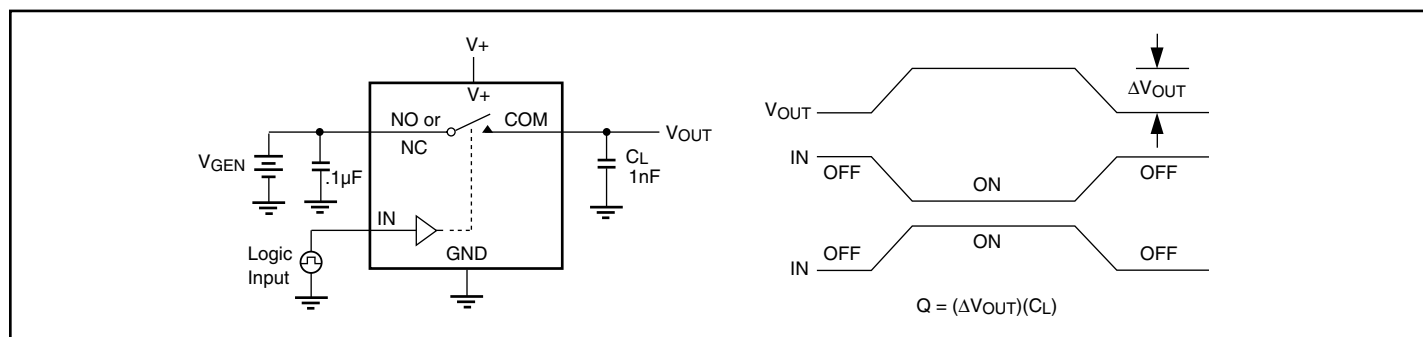


Figure 2. Charge Injection

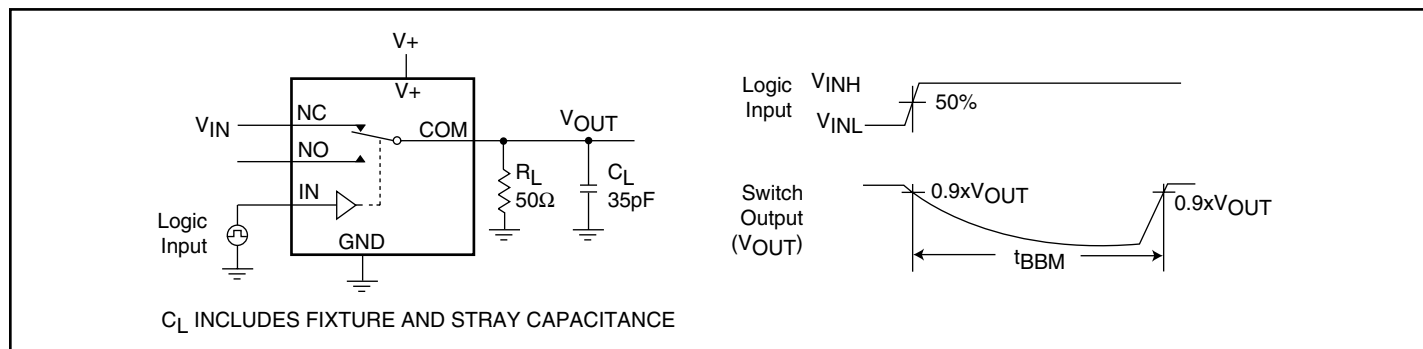


Figure 3. Break-Before-Make Interval

Test Circuits/Timing Diagrams (continued)

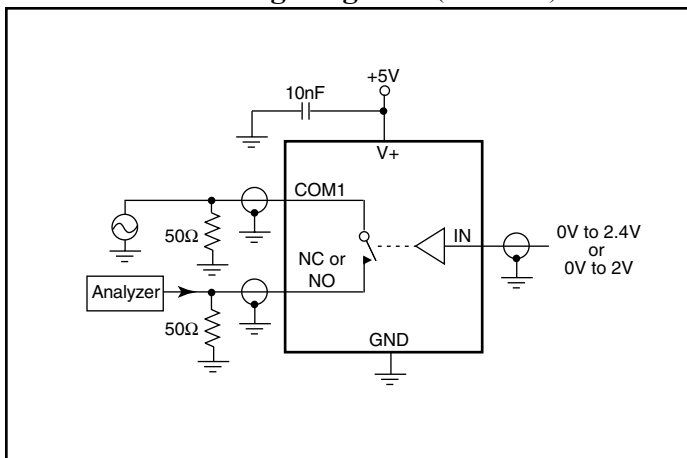


Figure 4. Off Isolation/On-Channel Bandwidth

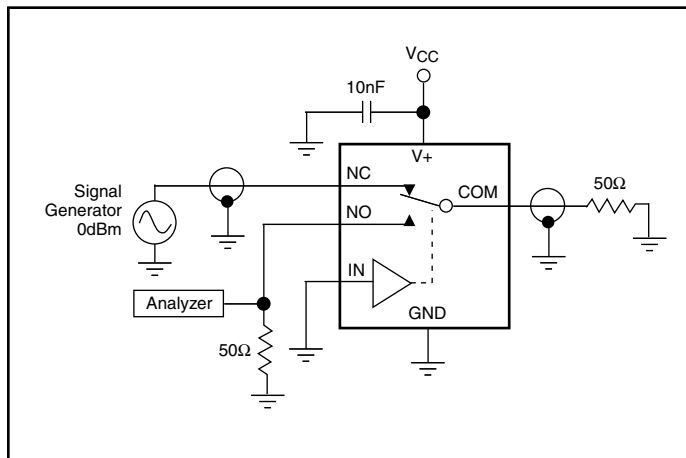


Figure 5. Crosstalk

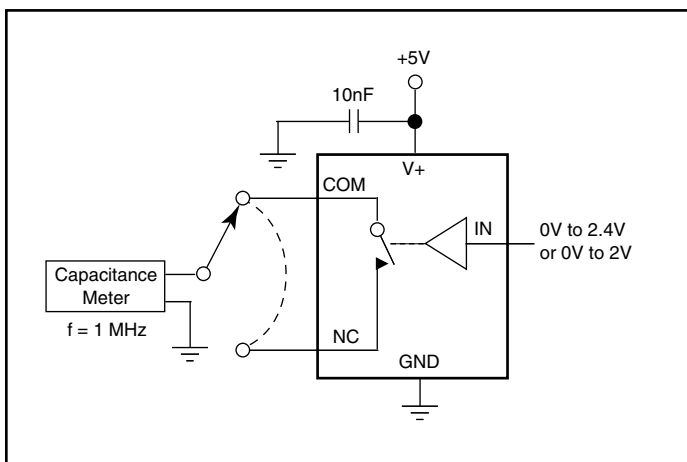


Figure 6. Channel-Off Capacitance

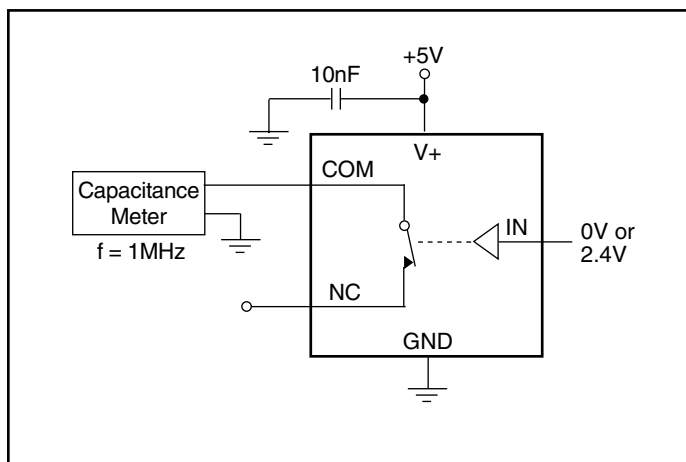


Figure 7. Channel-On Capacitance

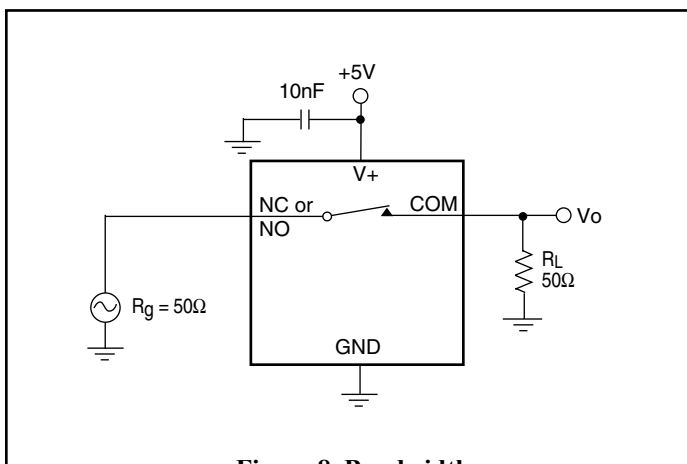
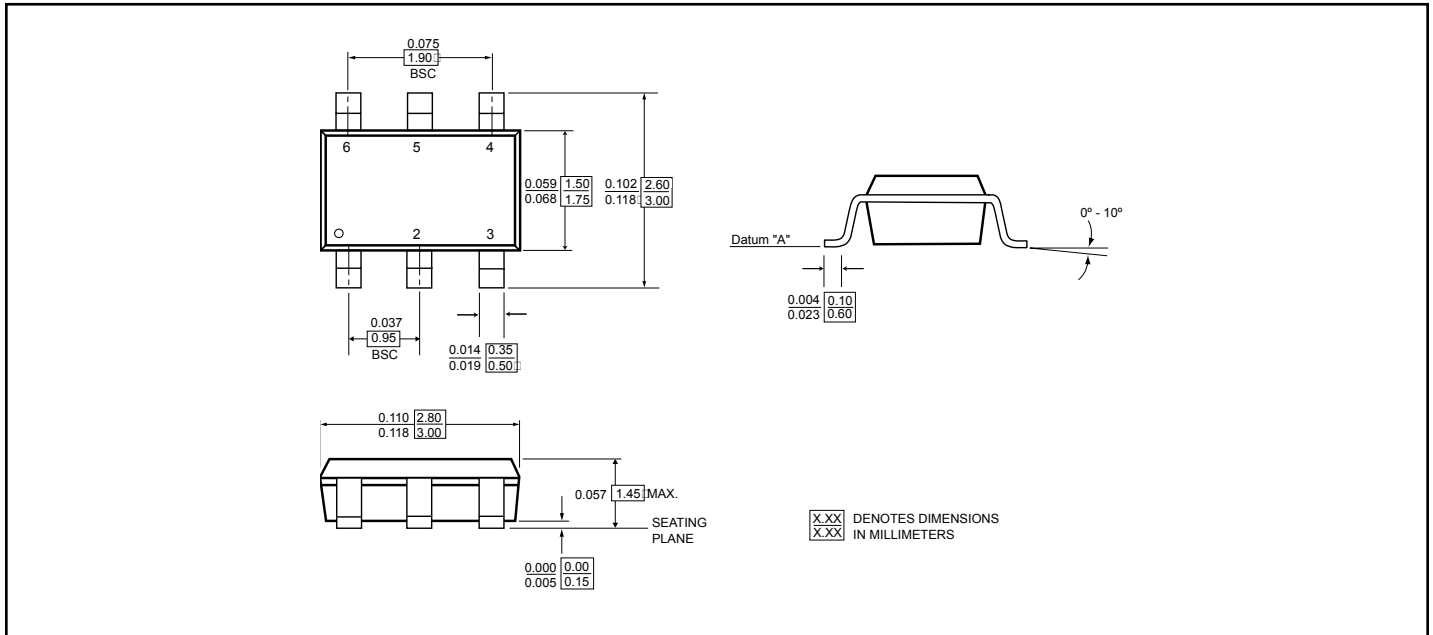
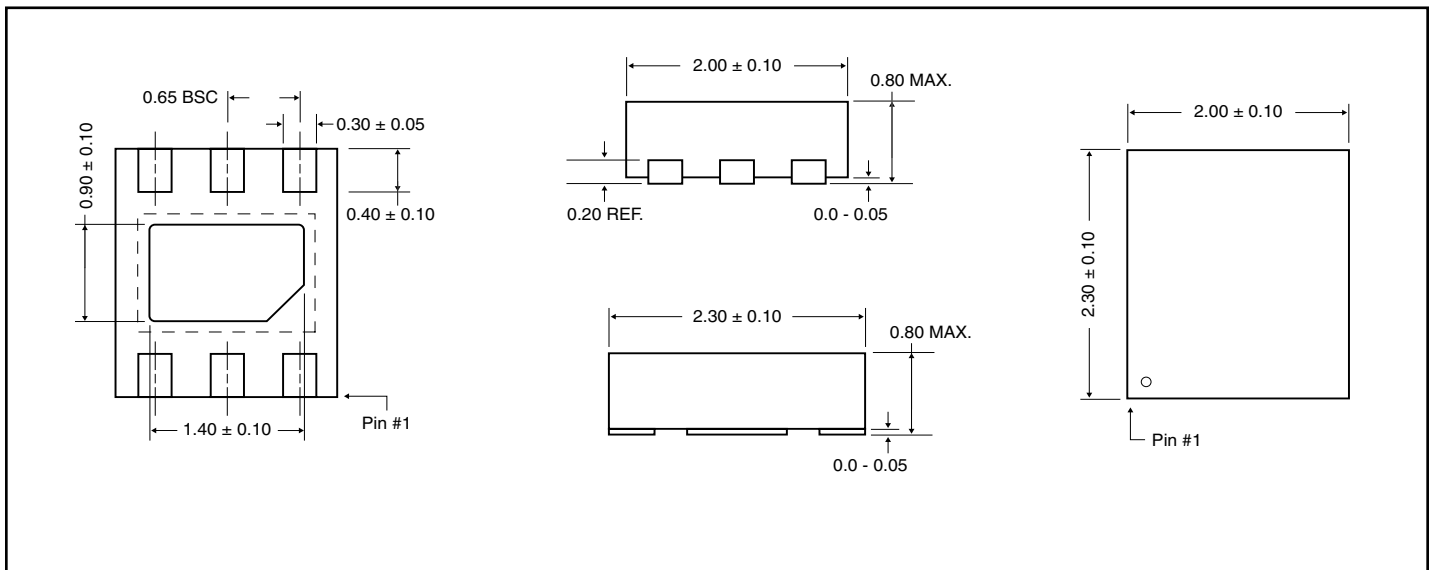


Figure 8. Bandwidth

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

Packaging Mechanical: 6-Pin TDFN (ZC)


Ordering Information

Ordering Code	Package Code	Package Description	Top Marking
PI5A3159TX	T	6-pin SOT-23	ZL
PI5A3159TEX	T	6-pin SOT-23	$\bar{Z}$ L
PI5A3159ZCX ⁽¹⁾	ZC	6-contact TDFN	ZL
PI5A3159ZCEX	ZC	Pb-free & Green 6-contact TDFN	ZL

Notes:

1. This product has always shipped as only a lead free product, but since it was introduced prior to Pericom's strategy of adding an E to all Green/Lead free parts many customers order it without the E suffix. Please migrate new designs and qualification to include the E suffix. Pericom at this point in time will continue to offer devices marked both ways, but may at a later date eliminate the non-E part number.
2. Thermal Characteristics can be found on the world wide web at www.pericom.com/packaging/
3. Number of transistors : 753
4. X = Tape and reel