

## SOTiny™ Low Resistance, Low -Voltage Single-Supply SPDT Switch

### Features

- Low On-Resistance: 10-ohm max.
- $R_{ON}$  Matching: 2-ohm max.
- $R_{ON}$  Flatness: 3.5-ohm max.
- Low 0.5nA Input Leakage at 25 °C
- 2V to 6V Single-Supply Operation
- Fast Switching Time
  - 15ns  $t_{ON}$
  - 7ns  $t_{OFF}$
- Break-Before-Make Switching Guaranteed
- 5pC max Charge Injection
- 225MHz Channel Bandwidth
- 76dB Off-Isolation at 1MHz
- TTL/CMOS Logic Compatible
- Low Power Consumption: 5μW
- Improved Direct Replacement for MAX4599
- Packaging (Pb-free & Green available):
  - 6-pin Small Compact SC70 (C)
  - 6-pin SOT23 (T)

### 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

### Truth Table

	PI5A4599A	
Logic	NC	NO
0	ON	OFF
1	OFF	ON

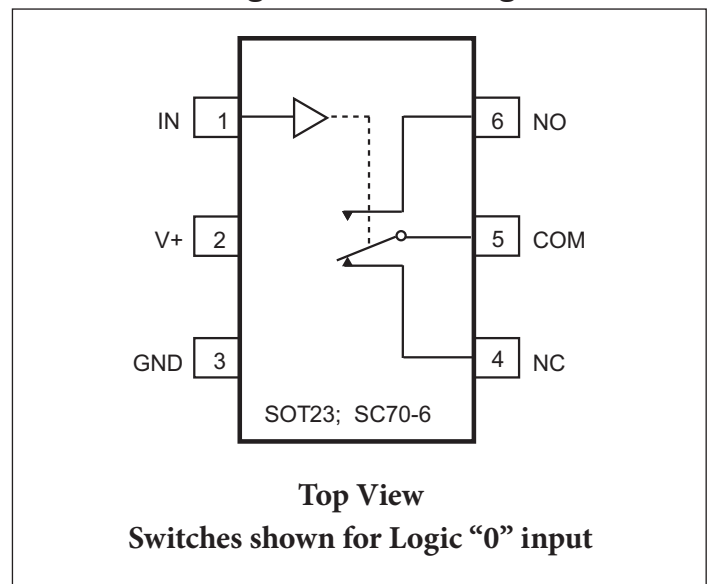
### Description

The PI5A4599A is an improved, direct replacement for the MAX4599 single-pole, double-throw (SPDT) analog switch. Improved specifications include a low maximum ON resistance of 10-ohm and fast switching times ( $t_{ON} = 15\text{ns}$  max.,  $t_{OFF} = 7\text{ns}$  max.) with 5V supply operation. With a 2.5V supply, resistance is a low 400-ohm max.

Specifications are given for 2.5V, 3.3V and 5V power supply operation. Operating voltage range is 2.0V to 6.0V.

To minimize PC board area use, the PI5A4599A is available in a compact 6-pin SC70 package. Operating temperature range is -40°C to 85°C.

### Functional Diagram, Pin Configuration



### Absolute Maximum Ratings

Voltages Referenced to GND

V+.....-0.5V to +7V

V<sub>IN</sub>, V<sub>COM</sub>, V<sub>NC</sub>, V<sub>NO</sub> (Note 1).....-0.5V to V<sub>CC</sub> +2V  
 or 30mA, whichever occurs first

Current (any terminal).....±30mA

Peak Current, COM, NO, NC

(Pulsed at 1ms, 10% duty cycle).....±30mA

### Thermal Information

Continuous Power Dissipation

SC70-6 (derate 3.1mW/°C above +70°C).....245mW

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

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

**Note:** 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, VINH = 2.4V, VINL = 0.8V)

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 <sub>ANALOG</sub>		Full			V+	V
On Resistance	R <sub>ON</sub>	V+ = 4.5V, I <sub>COM</sub> = -30mA,	25		7	8	Ω
		V <sub>NO</sub> or V <sub>NC</sub> = +2.5V	Full			10	
On-Resistance Match Between Channels <sup>(4)</sup>	ΔR <sub>ON</sub>		25		0.1	0.5	
			Full			1	
On-Resistance Flatness <sup>(5)</sup>	RFLAT <sub>(ON)</sub>	V+ = 5V, I <sub>COM</sub> = -30mA,	25		2.72	3.5	Ω
		V <sub>NO</sub> or V <sub>NC</sub> = 1V, 2.5V, 4V	Full			4	
NO or NC Off Leakage Current <sup>(6)</sup>	I <sub>NO(OFF)</sub> or I <sub>NC(OFF)</sub>	V+ = 5.5V, V <sub>COM</sub> = 0V,	25	-0.5	0.18	0.5	nA
		V <sub>NO</sub> or V <sub>NC</sub> = 4.5V	Full	-5		5	
COM Off Leakage Current <sup>(6)</sup>	I <sub>COM(OFF)</sub>	V+ = 5.5V, V <sub>COM</sub> = +4.5V,	25	-1.0	20	1.0	
		V <sub>NO</sub> or V <sub>NC</sub> = ±0V	Full	-10		10	
On Leakage Current <sup>(6)</sup>	I <sub>COM(ON)</sub>	V+ = 5.5V, V <sub>COM</sub> = +4.5V	25	-1.0	20	1.0	nA
		V <sub>NO</sub> or V <sub>NC</sub> = +4.5V	Full	-10		10	

Continued

**Electrical Specifications - Single +5V Supply** ( $V_+ = +5V \pm 10\%$ ,  $GND = 0V$ ,  $V_{INH} = 2.4V$ ,  $V_{INL} = 0.8V$ )

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	$V_{IH}$	Guaranteed logic High Level	Full	2			V	
Input Low Voltage	$V_{IL}$	Guaranteed logic Low Level				0.8		
Input Current with Voltage High	$I_{INH}$	$V_{IN} = 2.4V$ , all others = 0.8V		-1	0.005	1	$\mu A$	
Input Current with Voltage Low	$I_{INL}$	$V_{IN} = 0.8V$ , all others = 2.4V		-1	0.005	1		
<b>Dynamic</b>								
Turn-On Time	$t_{ON}$	$V_{CC} = 5V$ , Figure 1	25		7	15	ns	
			Full			20		
Turn-Off Time	$t_{OFF}$		25		1	7		
			Full			10		
Break-Before-Make	$t_{BBM}$	Figure 3	25			10		
			Full	5				
Charger Injection <sup>(3)</sup>	Q		$C_L = 1nF$ , $V_{GEN} = 0V$ , $R_{GEN} = 0\Omega$ , Figure 2	25		1.5	5	pC
Off Isolation	OIRR		$R_L = 50\Omega$ , $C_L = 5pF$ , $f = 1MHz$ , Figure 4			80		dB
Crosstalk <sup>(8)</sup>	$X_{TALK}$	$R_L = 50\Omega$ , $C_L = 5pF$ , $f = 1MHz$ , Figure 5			80			
NC or NO Capacitance	$C_{(OFF)}$	$f = 1MHz$ , Figure 6			5.0		pF	
COM Off Capacitance	$C_{COM(OFF)}$				5.0			
COM ON Capacitance	$C_{COM(ON)}$		$f = 1MHz$ , Figure 7			13		
-3dB Bandwidth	BW	$R_L = 50\Omega$ , Figure 8	Full		300		MHz	
<b>Supply</b>								
Power Supply Range	$V_+$		Full	2		6	V	
Positive Supply Current	$I_+$	$V_{CC} = 5.5V$ , $V_{IN} = 0V$ or $V_+$				1	$\mu A$	

- 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.
- $\Delta R_{ON} = R_{ON \text{ max.}} - R_{ON \text{ min.}}$
- 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 =  $20\log_{10} [ V_{COM} / (V_{NO} \text{ or } V_{NC}) ]$ . See Figure 3.
- Between any two switches. See Figure 4.

### Electrical Specifications - Single +3.3V Supply

(V+ = +3.3V ±10%, GND = 0V, VINH = 2.4V, VINL = 0.8V)

Parameter	Symbol	Test 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 <sub>ANALOG</sub>			0		V+	V
On Resistance	R <sub>ON</sub>	V+ = 3V, I <sub>COM</sub> = -30mA, V <sub>NO</sub> or V <sub>NC</sub> = 1.5V	25		12	14.0	Ω
			Full			17	
On-Resistance Match Between Channels <sup>(4)</sup>	ΔR <sub>ON</sub>	V+ = 3.3V, I <sub>COM</sub> = -30mA, V <sub>NO</sub> or V <sub>NC</sub> = 0.8V, 2.5V	25		0.2	0.5	
			Full			1	
On-Resistance Flatness <sup>(3,5)</sup>	RFLAT <sub>(ON)</sub>	V <sub>NO</sub> or V <sub>NC</sub> = 0.8V, 2.5V	25		5	4	
			Full			5	
<b>Logic Input</b>							
Input High Voltage	V <sub>IH</sub>	Guaranteed logic High Level	Full	2			V
Input Low Voltage	V <sub>IL</sub>	Guaranteed logic Low Level				0.8	
Input High Current	I <sub>INH</sub>	V <sub>IN</sub> = 2.4V, all others = 0.8V		-1		1	μA
Input Low Current	I <sub>INL</sub>	V <sub>IN</sub> = 0.8V, all others = 2.4V		-1		1	
<b>Dynamic</b>							
Turn-On Time	t <sub>ON</sub>	V+ = 3.3V, V <sub>NO</sub> or V <sub>NC</sub> = 1.5V, Figure 1	25		15	25	ns
			Full			40	
Turn-Off Time	t <sub>OFF</sub>		25		1.5	12	
			Full			20	
Break-Before-Make	t <sub>BBM</sub>	Figure 3	25		10		
			Full	5			
Charger Injection <sup>(3)</sup>	Q	C <sub>L</sub> = 1nF, V <sub>GEN</sub> = 0V, R <sub>GEN</sub> = 0Ω, Figure 2	25		1.3	5	pC
<b>Supply</b>							
Positive Supply Current	I+	V+ = 3.6V, V <sub>IN</sub> = 0V or V+ All channels on or off	Full			1	μA

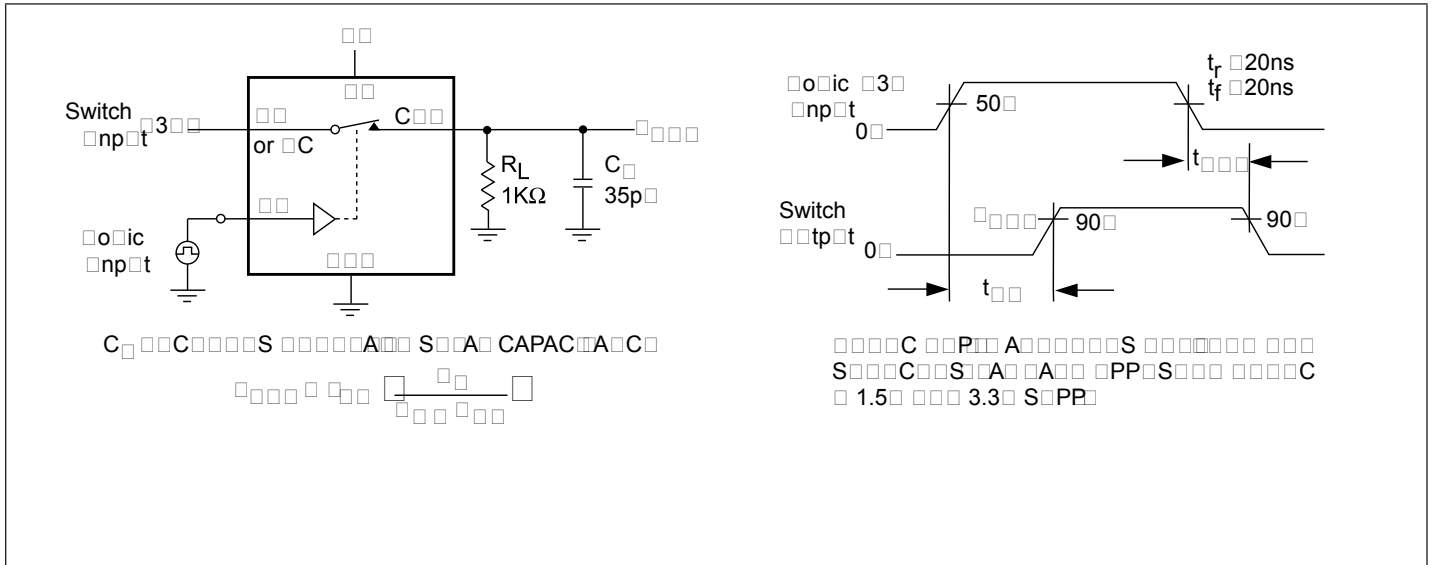
- The algebraic convention, where most negative value is a minimum and most positive is a maximum, is used in this data sheet.
- Typical values are for DESIGN AID ONLY, not guaranteed or subject to production testing.
- Guaranteed by design.
- ΔR<sub>ON</sub> = R<sub>ON</sub> max. - R<sub>ON</sub> min.
- 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 = 20log<sub>10</sub> [ V<sub>COM</sub> / (V<sub>NO</sub> or V<sub>NC</sub>) ]. See Figure 4.
- Between any two switches. See Figure 5.

### Electrical Specifications - Single +2.5V Supply

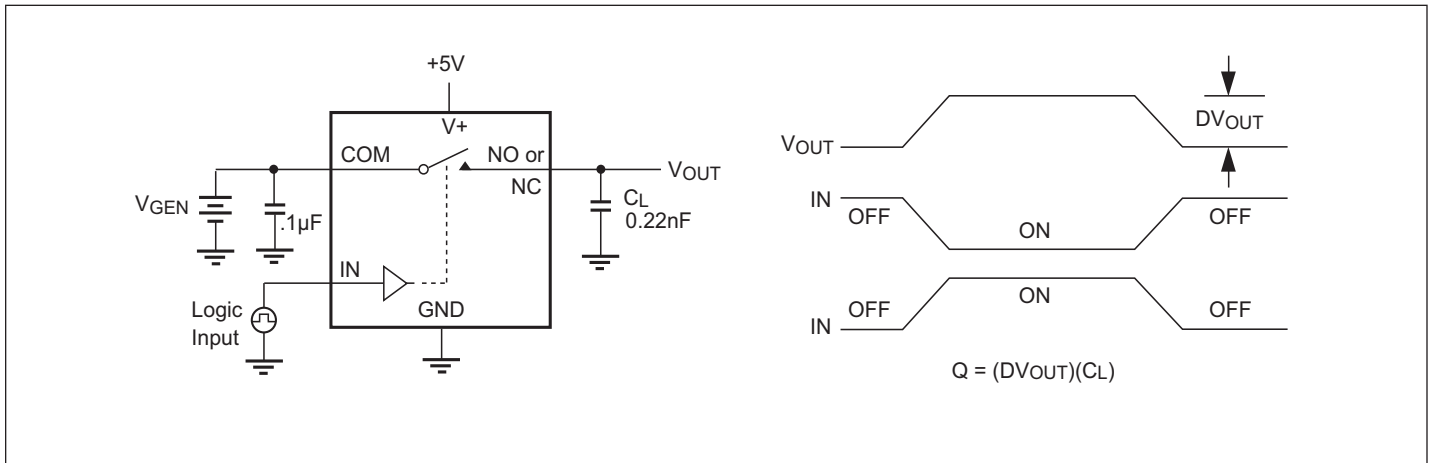
(V+ = +2.5V ±10%, GND = 0V, VINH = 2.4V, VINL = 0.8V)

Parameter	Symbol	Test 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 <sub>ANALOG</sub>			0		V+	V
On Resistance	R <sub>ON</sub>	V+ = 2.5V, I <sub>COM</sub> = -30mA, V <sub>NO</sub> or V <sub>NC</sub> = 1.5V	25		20	22	Ω
			Full			26	
On-Resistance Match Between Channels <sup>(4)</sup>	ΔR <sub>ON</sub>	V+ = 2.5V, I <sub>COM</sub> = -30mA, V <sub>NO</sub> or V <sub>NC</sub> = 0.8V, 2.5V	25		0.3	0.5	
			Full			1	
On-Resistance Flatness <sup>(3, 5)</sup>	RFLAT <sub>(ON)</sub>	V <sub>NO</sub> or V <sub>NC</sub> = 0.8V, 2.5V	25		0.5	6	
			Full			6	
<b>Logic Input</b>							
Input High Voltage	V <sub>IH</sub>	Guaranteed logic High Level	Full	2			V
Input Low Voltage	V <sub>IL</sub>	Guaranteed logic Low Level				0.8	
Input High Current	I <sub>INH</sub>	V <sub>IN</sub> = 2.4V, all others = 0.8V		-1		1	μA
Input Low Current	I <sub>INL</sub>	V <sub>IN</sub> = 0.8V, all others = 2.4V		-1		1	
<b>Dynamic</b>							
Turn-On Time	t <sub>ON</sub>	V+ = 2.5V, V <sub>NO</sub> or V <sub>NC</sub> = 1.5V, Figure 1	25		20	30	ns
			Full		-	45	
Turn-Off Time	t <sub>OFF</sub>		25			20	
			Full		-	30	
Break-Before-Make	t <sub>BBM</sub>	25		10			
		Full	5				
Charger Injection <sup>(3)</sup>	Q	C <sub>L</sub> = 1nF, V <sub>GEN</sub> = 0V, R <sub>GEN</sub> = 0Ω, Figure 2	25		0.9	5	pC
<b>Supply</b>							
Positive Supply Current	I+	V+ = 2.5V, V <sub>IN</sub> = 0V or V+ All channels on or off	Full			1	μA

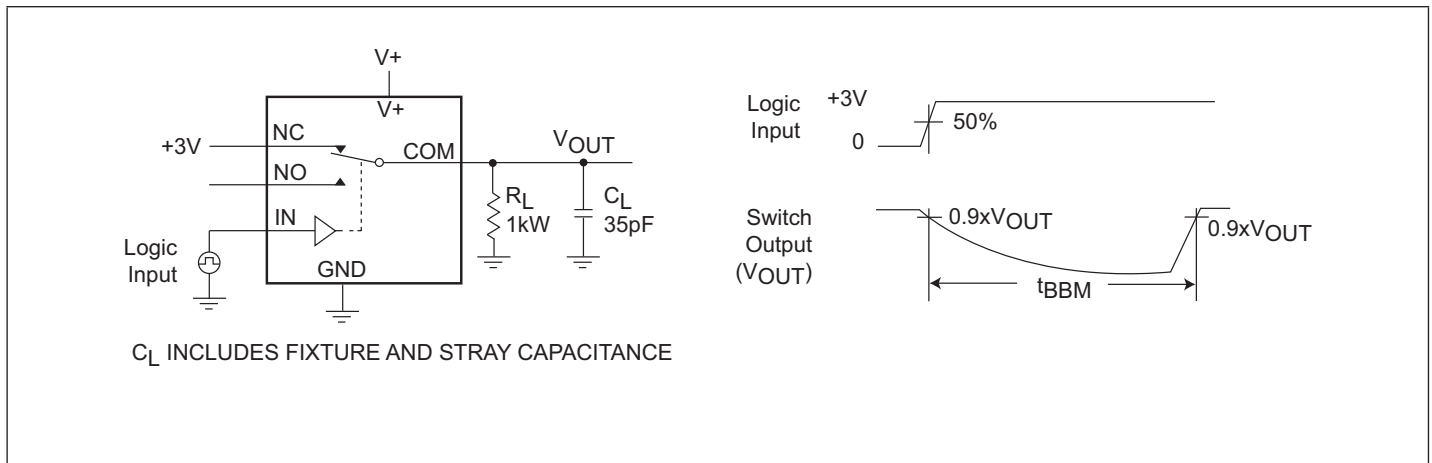
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- Typical values are for DESIGN AID ONLY, not guaranteed or subject to production testing.
- Guaranteed by design.
- ΔR<sub>ON</sub> = R<sub>ON</sub> max. - R<sub>ON</sub> min.
- Flatness is defined as the difference between the maximum and minimum value of On-resistance measured.
- Leakage parameters are 100% tested at maximum rated hot temperature and guaranteed by correlation at +25°C.
- Off Isolation = 20log<sub>10</sub> [ V<sub>COM</sub> / (V<sub>NO</sub> or V<sub>NC</sub>) ]. See Figure 4.
- Between any two switches. See Figure 5.



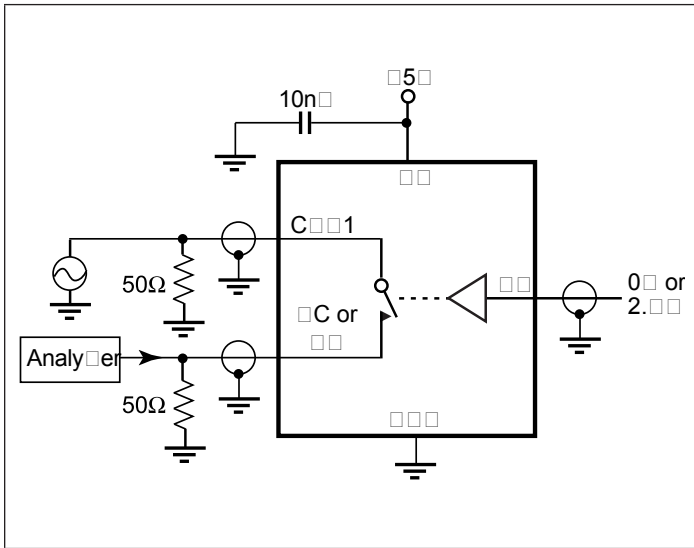
**Figure 1. Switching Time**



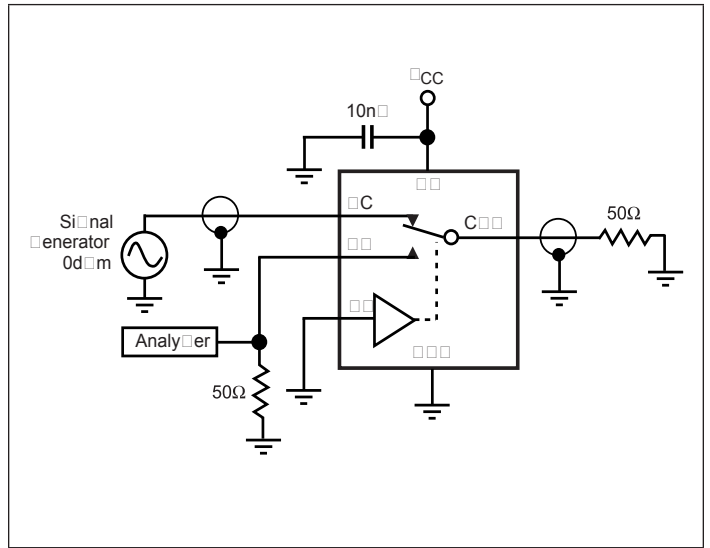
**Figure 2. Charge Injection**



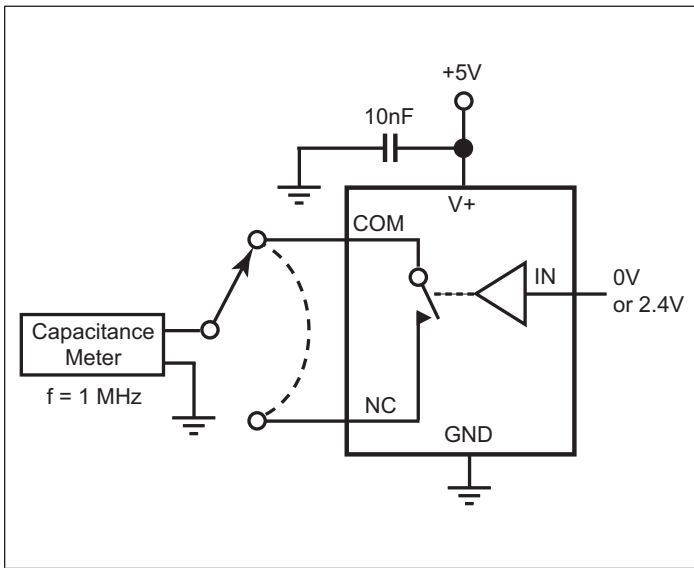
**Figure 3. Break-Before-Make Interval**



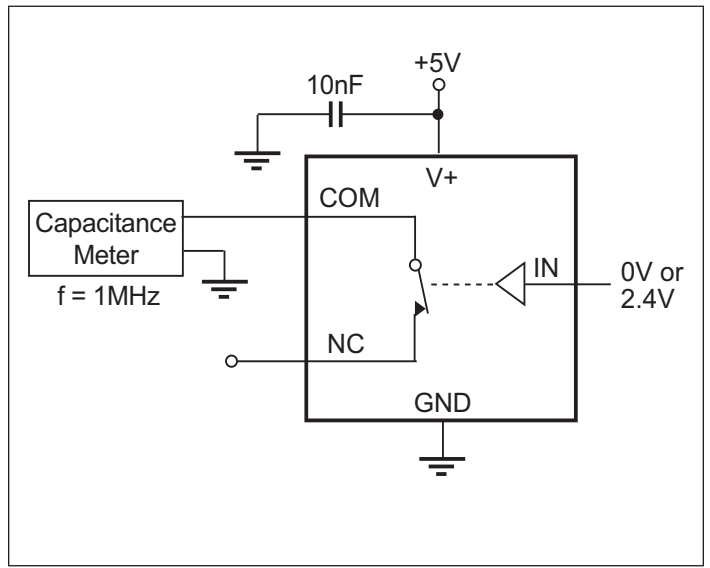
**Figure 4. Off Isolation/On-Channel Bandwidth**



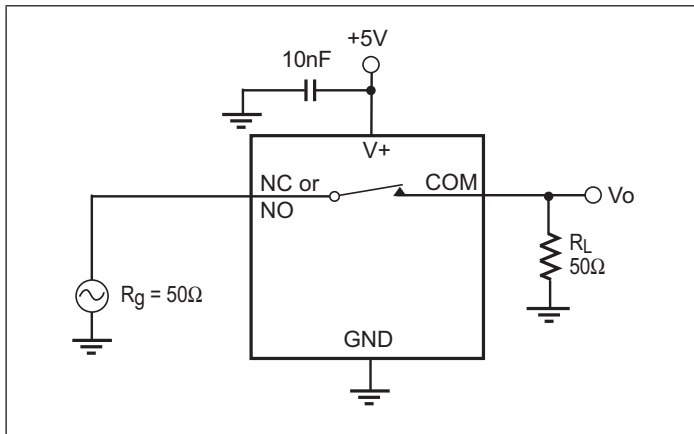
**Figure 5. Crosstalk**



**Figure 6. Channel-Off Capacitance**

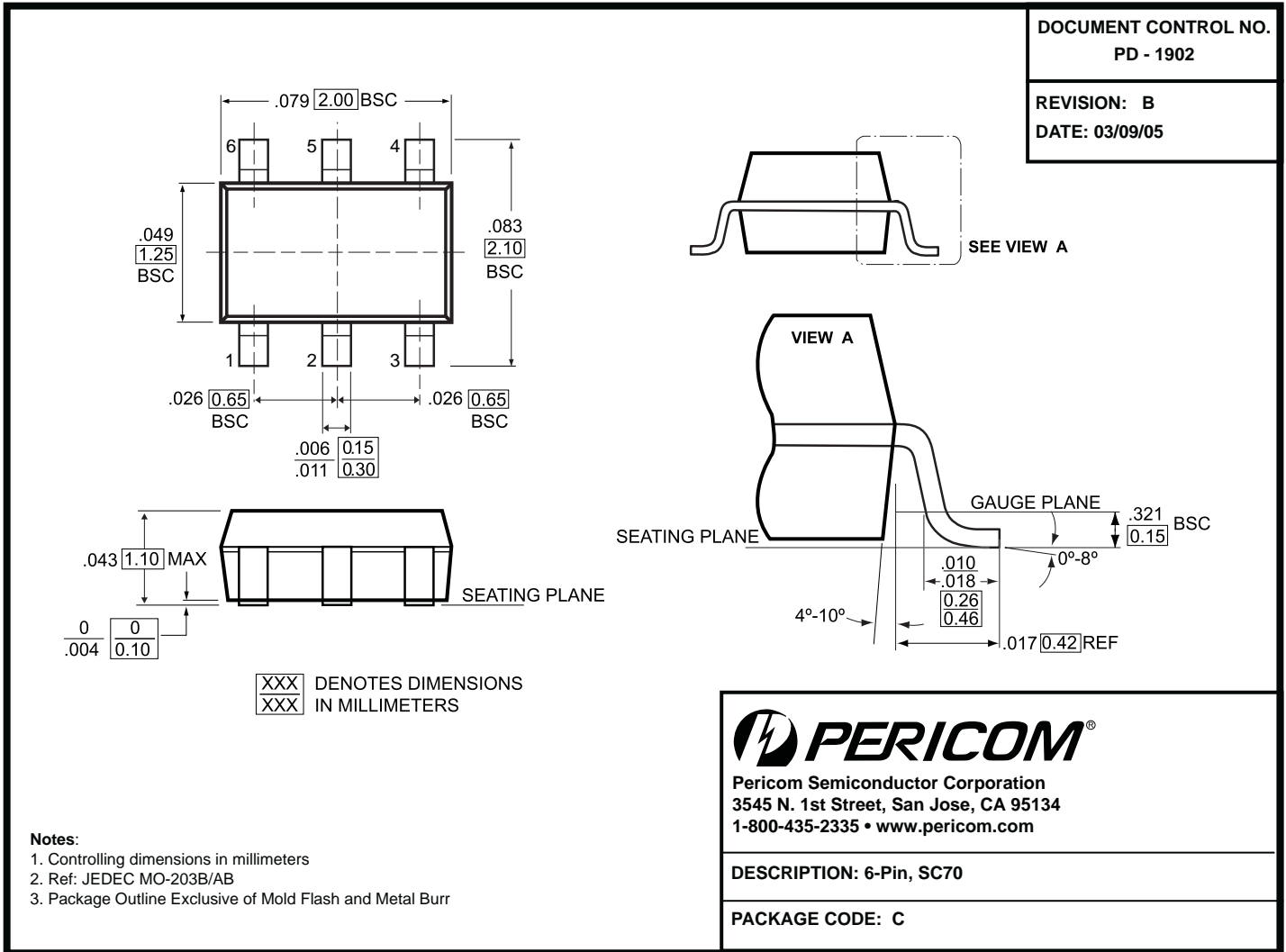


**Figure 7. Channel-On Capacitance**



**Figure 8. Bandwidth**

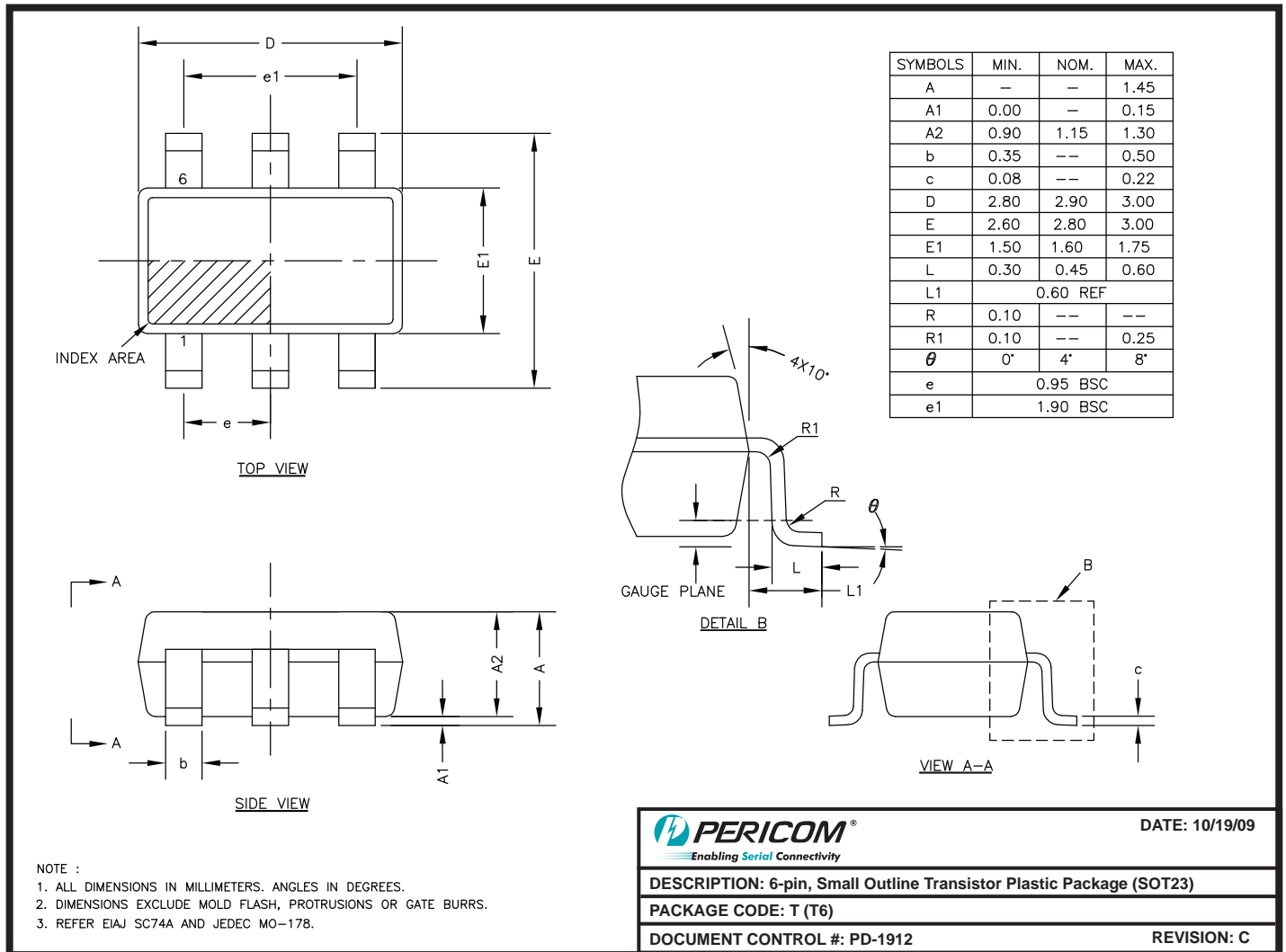
**Packaging Mechanical: 6-Pin SC70 (C)**



Note:

For latest package info, please check: <http://www.pericom.com/products/packaging/mechanicals.php>

### Packaging Mechanical: 6-Pin SOT23 (T)



09-0131

**Note:**

For latest package info, please check: <http://www.pericom.com/products/packaging/mechanicals.php>



### Ordering Information

Ordering Code	Package Code	Package Type	Top Mark
PI5A4599ACEX	C	Pb-free & Green, 6-pin SC70	$\overline{Z}N$
PI5A4599ATX	T	6-pin SOT23	ZN
PI5A4599ATEX	T	Pb-free & Green, 6-pin SOT23	$\overline{Z}N$

1. Thermal characteristics can be found on the company web site at [www.pericom.com/packaging/](http://www.pericom.com/packaging/)
2. "E" denotes Pb-free and Green
3. Adding an "X" at the end of the ordering code denotes tape and reel packaging

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