⚡ PERICOM®

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

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} = 15ns max., t_{OFF} = 7ns 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

Top View
Switches shown for Logic "0" input

Truth Table

	PI5A4599A	
Logic	NC	NO
0	ON	OFF
1	OFF	ON
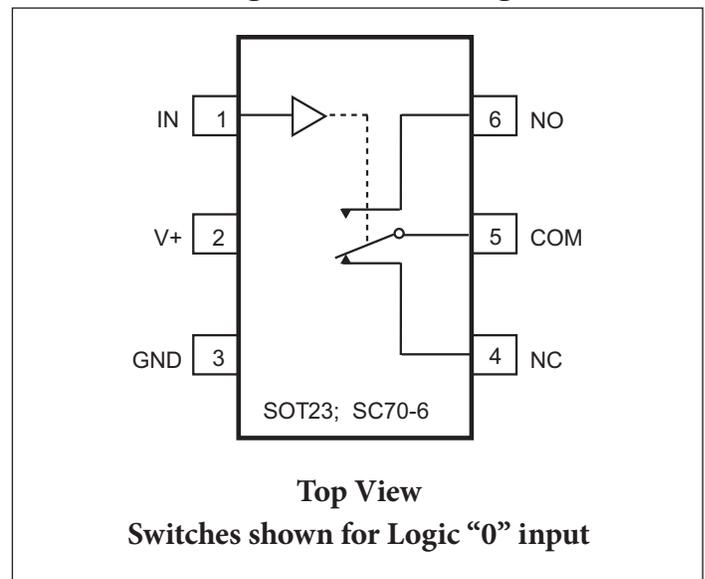
Absolute Maximum Ratings

Voltages Referenced to GND

V+..−0.5V to +7V

V_{IN}, V_{COM}, V_{NC}, V_{NO} (Note 1)........................−0.5V to V_{CC} +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/ºC above +70ºC)...........................245mW

Storage Temperature..−65ºC to +150ºC

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

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. [1]	Typ. [2]	Max. [1]	Units
Analog Switch							
Analog Signal Range [3]	V_{ANALOG}		Full			V+	V
On Resistance	R_{ON}	V+ = 4.5V, I_{COM} = -30mA, V_{NO} or V_{NC} = +2.5V	25		7	8	Ω
			Full			10	
On-Resistance Match Between Channels [4]	ΔR_{ON}		25		0.1	0.5	
			Full			1	
On-Resistance Flatness [5]	$RFLAT_{(ON)}$	V+ = 5V, I_{COM} = -30mA, V_{NO} or V_{NC} = 1V, 2.5V, 4V	25		2.72	3.5	
			Full			4	
NO or NC Off Leakage Current [6]	$I_{NO(OFF)}$ or $I_{NC(OFF)}$	V+ = 5.5V, V_{COM} = 0V, V_{NO} or V_{NC} = 4.5V	25	−0.5	0.18	0.5	nA
			Full	−5		5	
COM Off Leakage Current [6]	$I_{COM(OFF)}$	V+ = 5.5V, V_{COM} = + 4.5V, V_{NO} or V_{NC} = ± 0V	25	−1.0	20	1.0	
			Full	−10		10	
On Leakage Current [6]	$I_{COM(ON)}$	V+ = 5.5V , V_{COM} = +4.5V V_{NO} or V_{NC} = +4.5V	25	−1.0	20	1.0	
			Full	−10		10	

Continued

Electrical Specifications - Single +5V Supply (V+ = +5V ±10%, GND = 0V, VINH = 2.4V, VINL = 0.8V)

Parameter	Symbol	Conditions	Temp. (C°)	Min. [1]	Typ. [2]	Max. [1]	Units
Logic Input							
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	μA
Input Current with Voltage Low	I_{INL}	V_{IN} = 0.8V, all others = 2.4V		−1	0.005	1	
Dynamic							
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 [3]	Q	C_L =1nF, V_{GEN} = 0V, R_{GEN} = 0Ω, Figure 2	25		1.5	5	pC
Off Isolation	OIRR	R_L = 50Ω, C_L = 5pF, f = 1MHz, Figure 4			80		dB
Crosstalk [8]	X_{TALK}	R_L = 50Ω, 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 = 50Ω, Figure 8	Full		300		MHz
Supply							
Power Supply Range	V+		Full	2		6	V
Positive Supply Current	I+	V_{CC} = 5.5V, V_{IN} = 0V or V+				1	μA

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.

6. Leakage parameters are 100% tested at maximum rated hot temperature and guaranteed by correlation at +25ºC.

7. Off Isolation = $20 log10$ [V_{COM} / (V_{NO} or V_{NC})]. See Figure 3.

8. 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. [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} = -30mA, V_{NO} or V_{NC} = 1.5V	25		12	14.0	Ω
			Full			17	
On-Resistance Match Between Channels [4]	ΔR_{ON}	V+ = 3.3V, I_{COM} = -30mA, V_{NO} or V_{NC} = 0.8V, 2.5V	25		0.2	0.5	Ω
			Full			1	
On-Resistance Flatness [3, 5]	$RFLAT_{(ON)}$		25		5	4	
			Full			5	
Logic Input							
Input High Voltage	V_{IH}	Guaranteed logic High Level	Full	2			V
Input Low Voltage	V_{IL}	Guaranteed logic Low Level				0.8	
Input High Current	I_{INH}	V_{IN} = 2.4V, all others = 0.8V		−1		1	μA
Input Low Current	I_{INL}	V_{IN} = 0.8V, all others = 2.4V		−1		1	
Dynamic							
Turn-On Time	t_{ON}	V+ = 3.3V, V_{NO} or V_{NC} = 1.5V, Figure 1	25		15	25	ns
			Full			40	
Turn-Off Time	t_{OFF}		25		1.5	12	
			Full			20	
Break-Before-Make	t_{BBM}	Figure 3	25		10		
			Full	5			
Charger Injection [3]	Q	C_L =1nF, V_{GEN} = 0V, R_{GEN} = 0Ω, Figure 2	25		1.3	5	pC
Supply							
Positive Supply Current	I+	V+ = 3.6V, V_{IN} = 0V or V+ All channels on or off	Full			1	μA

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.

6. Leakage parameters are 100% tested at maximum rated hot temperature and guaranteed by correlation at +25ºC.

7. Off Isolation = 20log10 [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+ = +2.5V ±10%, GND = 0V, VINH = 2.4V, VINL = 0.8V)

Parameter	Symbol	Test 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+ = 2.5V, I_{COM} = -30mA, V_{NO} or V_{NC} = 1.5V	25		20	22	Ω
			Full			26	
On-Resistance Match Between Channels [4]	ΔR_{ON}	V+ = 2.5V, I_{COM} = -30mA, V_{NO} or V_{NC} = 0.8V, 2.5V	25		0.3	0.5	
			Full			1	
On-Resistance Flatness [3, 5]	$RFLAT_{(ON)}$		25		0.5	6	
			Full			6	
Logic Input							
Input High Voltage	V_{IH}	Guaranteed logic High Level	Full	2			V
Input Low Voltage	V_{IL}	Guaranteed logic Low Level				0.8	
Input High Current	I_{INH}	V_{IN} = 2.4V, all others = 0.8V		−1		1	µA
Input Low Current	I_{INL}	V_{IN} = 0.8V, all others = 2.4V		−1		1	
Dynamic							
Turn-On Time	t_{ON}	V+ = 2.5V, V_{NO} or V_{NC} = 1.5V, Figure 1	25		20	30	ns
			Full		–	45	
Turn-Off Time	t_{OFF}		25			20	
			Full		–	30	
Break-Before-Make	t_{BBM}	Figure 3	25		10		
			Full	5			
Charger Injection [3]	Q	C_L =1nF, V_{GEN} = 0V, R_{GEN} = 0Ω, Figure 2	25		0.9	5	pC
Supply							
Positive Supply Current	I+	V+ = 2.5V, V_{IN} = 0V or V+ All channels on or off	Full			1	µA

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.

6. Leakage parameters are 100% tested at maximum rated hot temperature and guaranteed by correlation at +25ºC.

7. Off Isolation = 20log10 [V_{COM} / (V_{NO} or V_{NC})]. See Figure 4.
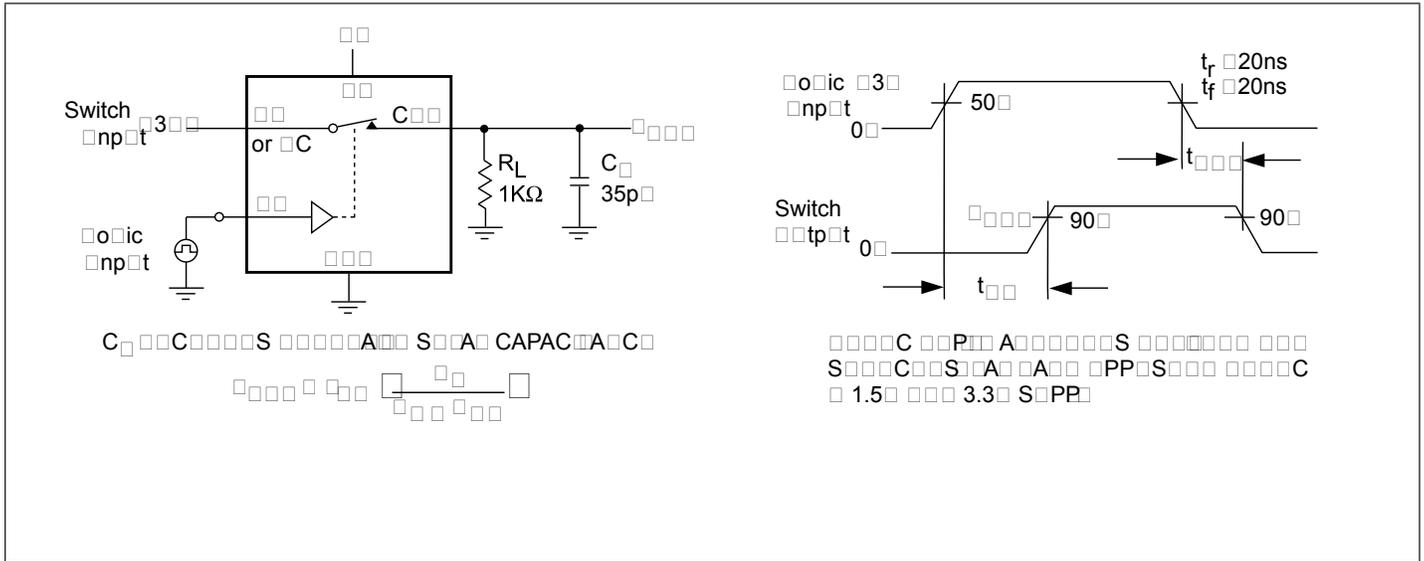
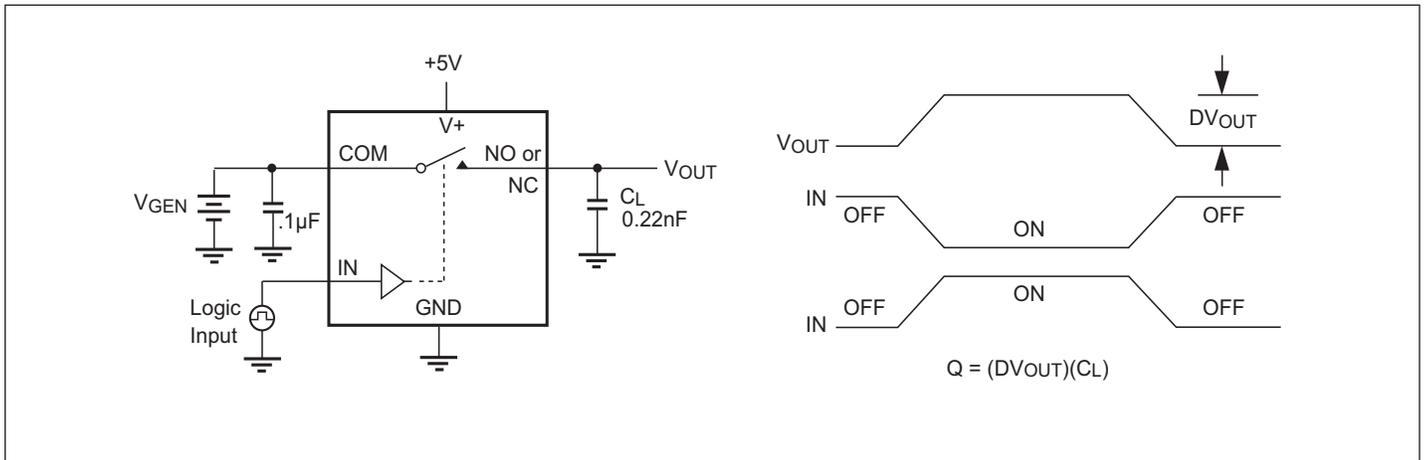8. Between any two switches. See Figure 5.

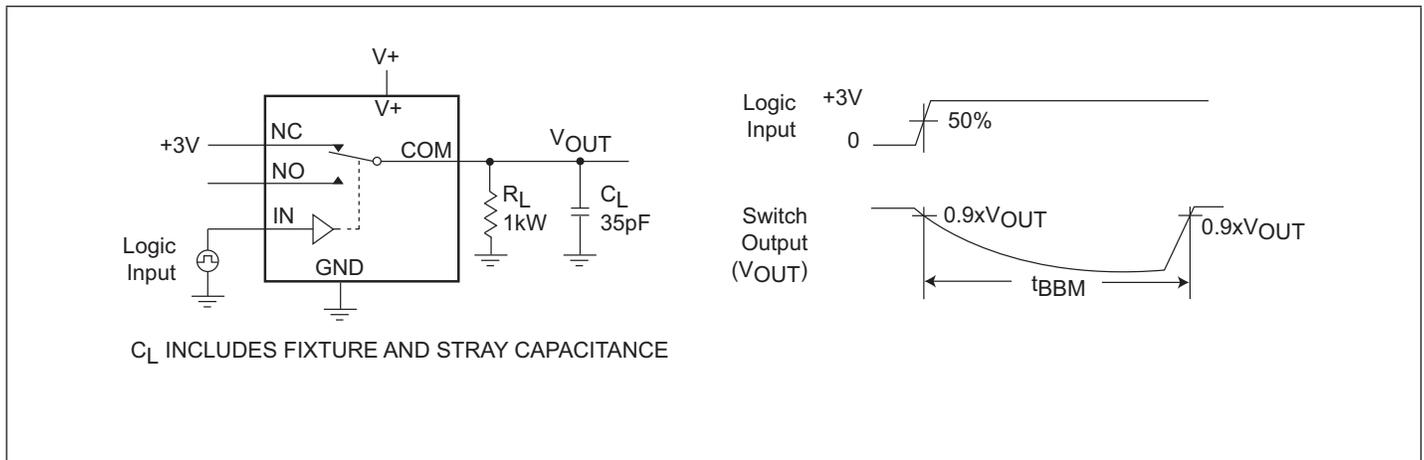**Figure 1. Switching Time**

Figure 2. Charge Injection

Q = (DV_OUT)(CL)

Figure 3. Break-Before-Make Interval

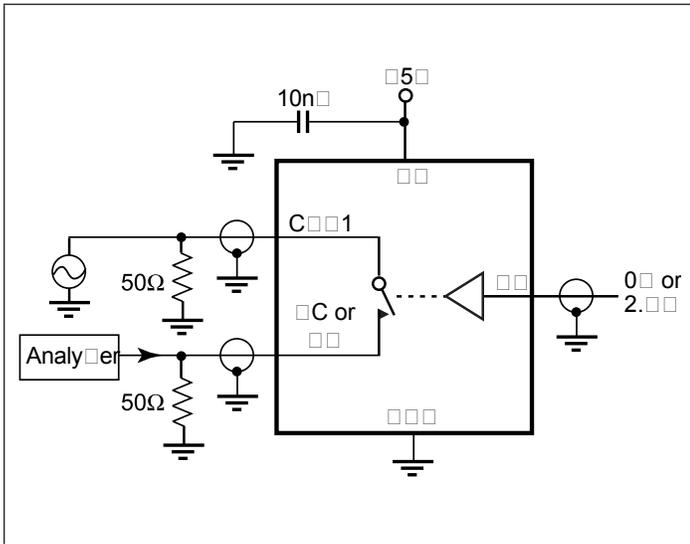C_L INCLUDES FIXTURE AND STRAY CAPACITANCE
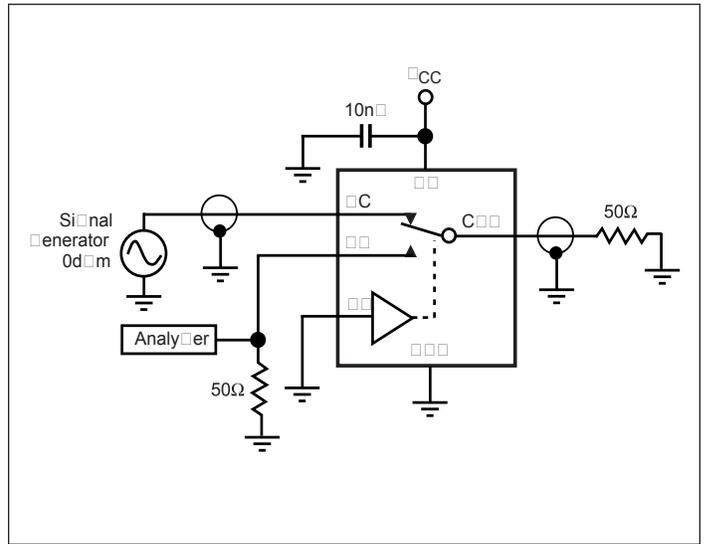
Figure 4. Off Isolation/On-Channel Bandwidth
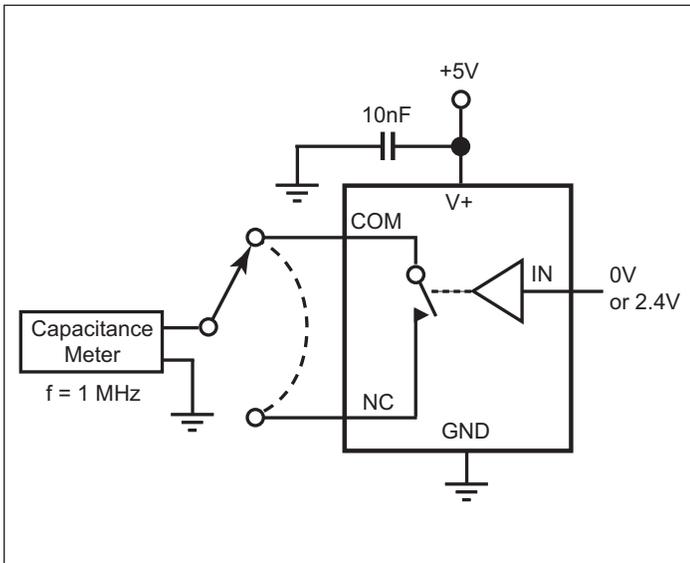
Figure 5. Crosstalk

Figure 6. Channel-Off Capacitance
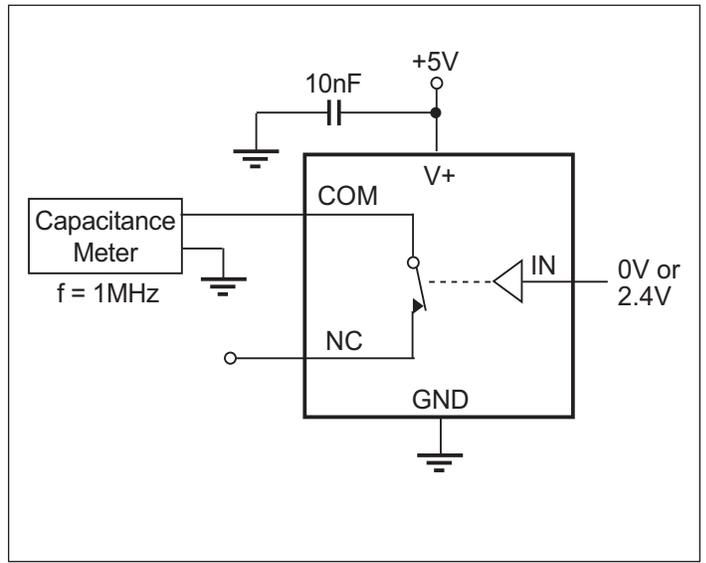
Figure 7. Channel-On Capacitance
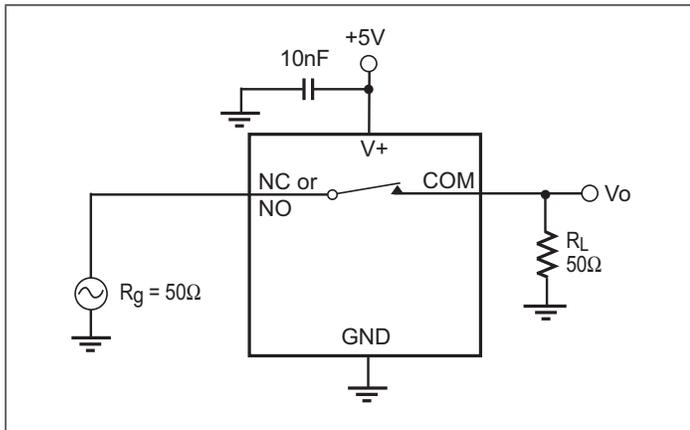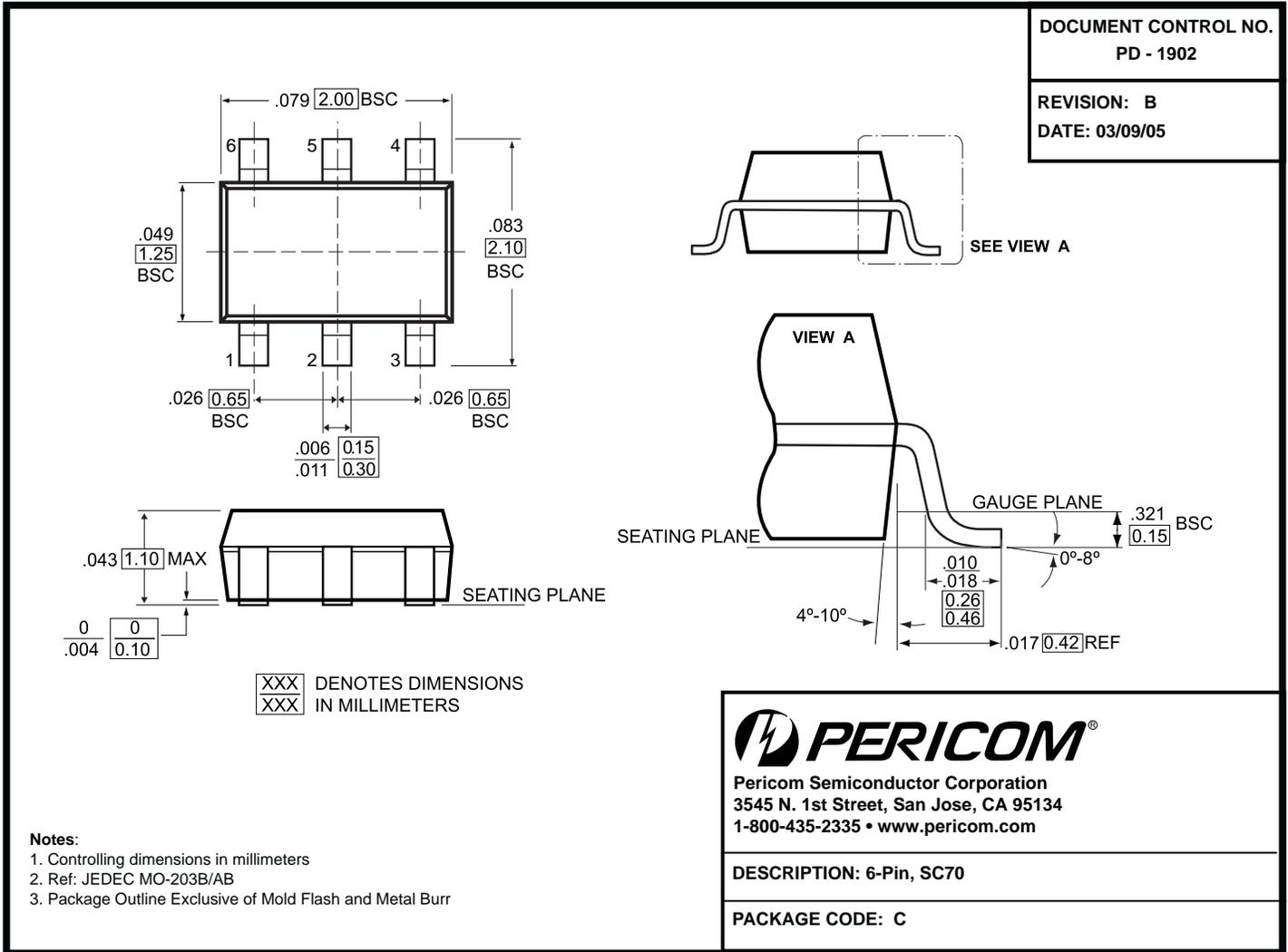
Figure 8. Bandwidth

Packaging Mechanical: 6-Pin SC70 (C)

DOCUMENT CONTROL NO.
PD - 1902

REVISION: B
DATE: 03/09/05

.079 2.00 BSC

.049 1.25 BSC

.083 2.10 BSC

.026 0.65 BSC

.026 0.65 BSC

.006 0.15
.011 0.30

.043 1.10 MAX

0   0
.004 0.10

SEE VIEW A

VIEW A

SEATING PLANE

GAUGE PLANE

.321 BSC
0.15

0º-8º

.010
.018
0.26
0.46

4º-10º

.017 0.42 REF

SEATING PLANE

XXX DENOTES DIMENSIONS
XXX IN MILLIMETERS

Pericom Semiconductor Corporation
3545 N. 1st Street, San Jose, CA 95134
1-800-435-2335 • www.pericom.com

DESCRIPTION: 6-Pin, SC70

PACKAGE CODE: C

Notes:
1. Controlling dimensions in millimeters
2. Ref: JEDEC MO-203B/AB
3. Package Outline Exclusive of Mold Flash and Metal Burr

Note:

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

Packaging Mechanical: 6-Pin SOT23 (T)

SYMBOLS	MIN.	NOM.	MAX.
A	—	—	1.45
A1	0.00	—	0.15
A2	0.90	1.15	1.30
b	0.35	— —	0.50
c	0.08	— —	0.22
D	2.80	2.90	3.00
E	2.60	2.80	3.00
E1	1.50	1.60	1.75
L	0.30	0.45	0.60
L1	0.60 REF		
R	0.10	— —	— —
R1	0.10	— —	0.25
θ	0°	4°	8°
e	0.95 BSC		
e1	1.90 BSC		

NOTE :
1. ALL DIMENSIONS IN MILLIMETERS. ANGLES IN DEGREES.
2. DIMENSIONS EXCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.
3. REFER EIAJ SC74A AND JEDEC MO−178.

DATE: 10/19/09
DESCRIPTION: 6-pin, Small Outline Transistor Plastic Package (SOT23)
PACKAGE CODE: T (T6)
DOCUMENT CONTROL #: PD-1912
REVISION: C

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/
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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