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Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

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Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

PERICOM®

PI5A121/PI5A122/PI5A124

Wide Bandwidth Analog Switches

Features

- Single-Supply Operation (+2V to +6V)
- Rail-to-Rail Analog Signal Dynamic Range
- Low On-Resistance (6Ω typ. with 5V supply)
  Minimizes Distortion and Error Voltages
- On-Resistance Flatness, 3Ω typ.
- Low Charge Injection Reduces Glitch Errors. Q = 4pC typ.
- High Speed. t_{ON} = 10ns typ.
- Wide -3dB Bandwidth: 326 MHz (typ.)
- High-Current Channel Capability: >100mA
- TTL/CMOS Logic Compatible
- Low Power Consumption (0.5µW typ)
- Small outline transistor package minimizes board area
- Packaging (Pb-free & Green available):
  - 5-pin 65-mil wide SOT23 (T) for PI5A121 and PI5A122
  - 6-pin 65-mil wide SOT23 (T) for PI5A124
  - 5-pin 50-mil wide SC70 (C) for PI5A121/PI5A122

Applications

- Audio, Video Switching, and Routing
- Battery-Powered Communication Systems
- Computer Peripherals
- Telecommunications
- Portable Instrumentation
- Mechanical Relay Replacement
- Cell Phones
- PDAs

Description

The PI5A121/PI5A122/PI5A124 are analog switches designed for single-supply operation. These high-precision devices are ideal for low-distortion audio, video, signal switching and routing.

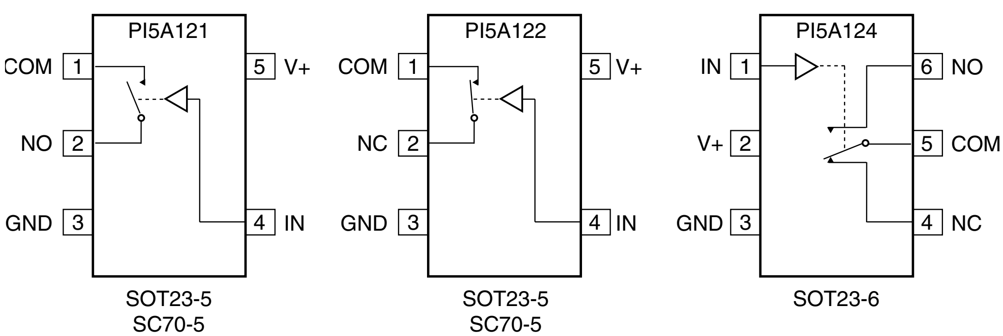
The PI5A121 is a single-pole throw (SPST) normally open (NO) switch. The switch is open when IN is LOW. The PI5A122 is a single-pole single-throw (SPST) normally closed (NC) switch.

Each switch conducts current equally well in either direction when on. When off, they block voltages up to V+.

These switches are fully specified with +5V, and +3.3V supplies. With +5V, they guarantee <10Ω On-Resistance. On-Resistance matching between channels is within 2Ω. On-Resistance flatness is less than 55Ω over the specified range. These switches also guarantee fast switching speeds (t_{ON} <20ns).

These products are available in 5-pin SC70 and/or 6-pin SOT23 plastic packages for operation over the industrial (-40°C to +85°C) temperature range.

Functional Diagrams, Pin Configurations and Truth Tables



Switches shown for Logic "0" input

IN	PI5A121	PI5A122
0	OFF	ON
1	ON	OFF

	PI5A124	
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)... ±25mA
Peak Current, COM, NO, NC
(Pulsed at 1ms, 10% duty cycle)..................................... ±25mA

Thermal Information

Continuous Power Dissipation
SOT23-6 (derate 7mW/ºC above +70ºC)........................ 550mW
Storage Temperature ....-65ºC to +150ºC
Lead Temperature (soldering, 10s) .... +300ºC

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)	V_{ANALOG}		Full	0		V+	V
On-Resistance	R_{ON}	V+ = 4.5V, I_{COM} = -30mA, V_{NO} or V_{NC} = +2.5V	25		7.2	10	Ω
			Full			12	
On-Resistance Match Between Channels(4)	ΔR_{ON}		25		0.2	2	
			Full			4	
On-Resistance Flatness(5)	$R_{FLAT(ON)}$	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		0.18		nA
			Full	-80		80	
COM Off Leakage Current(6)	$I_{COM(OFF)}$	V+ = 5.5V, V_{COM} = + 4.5V, V_{NO} or V_{NC} = ± 0V	25		0.20		
			Full	-80		80	
COM On Leakage Current(6)	$I_{COM(ON)}$	V+ = 5.5V, V_{COM} = +4.5V V_{NO} or V_{NC} = +4.5V	25		0.20		
			Full	-80		80	

Electrical Specifications - Single +5V Supply (continued)

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

Parameter	Symbol	Conditions	Temp(ºC)	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	
Charge Injection(3)	Q	C_L = 1nF, V_{GEN} = 0V, R_{GEN} = 0Ω, Figure 2	25		1.6	10	pC
Off Isolation	O_{IRR}	R_L = 50Ω, C_L = 5pF, f = 10MHz, Figure 3			-43		dB
Crosstalk(8)	X_{TALK}	R_L = 50Ω, C_L = 5pF, f = 10MHz, Figure 4			-43		
NC or NO Capacitance	$C_{(OFF)}$	f = 1kHz, Figure 5			5.5		pF
COM Off Capacitance	$C_{COM(OFF)}$				5.5		
COM On Capacitance	$C_{COM(ON)}$	f = 1kHz, Figure 6			13		
-3dB Bandwidth	BW	R_L = 50Ω, Figure 7	Full		326		MHz
Supply							
Power-Supply Range	V+		Full	2		6	V
Positve Supply Current	I+	V_{CC} = 5.5V, V_{IN} = 0V or V+				1	µA

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.
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 3.
8. Between any two switches. See Figure 4.

Electrical Specifications - Single +3.3V Supply
($V+ = +3.3V \pm 10\%$, GND = 0V, $V_{INH} = 2.4V$, $V_{INL} = 0.8V$)

Parameter	Symbol	Conditions	Temp.(ºC)	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	18	Ω
			Full			22	
On-Resistance Match Between Channels(4)	ΔR_{ON}	V+ = 3.3V, I_{COM} = -30mA, V_{NO} or V_{NC} = 0.8V, 2.5V	25		1	1	
			Full			2	
On-Resistance Flat-ness(3,5)	$R_{FLAT(ON)}$		25		0.5	4	
			Full			5	
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	
Charge Injection(3)	Q	C_L = 1nF, V_{GEN} = 0V, R_{GEN} = 0V, Figure 2	25		1.3	10	pC
Supply							
Positve Supply Current	I+	V+ = 3.6V, V_{IN} = 0V or V+ All Channels on or off	Full			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			0.8	
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	

Test Circuits/Timing Diagrams

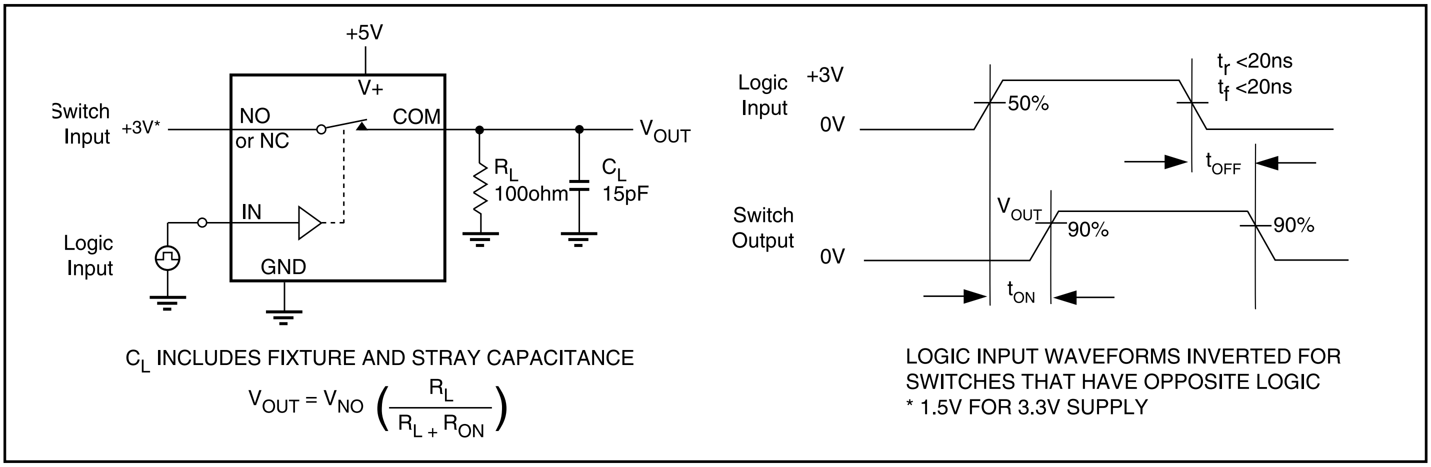


Figure 1. Switching Time

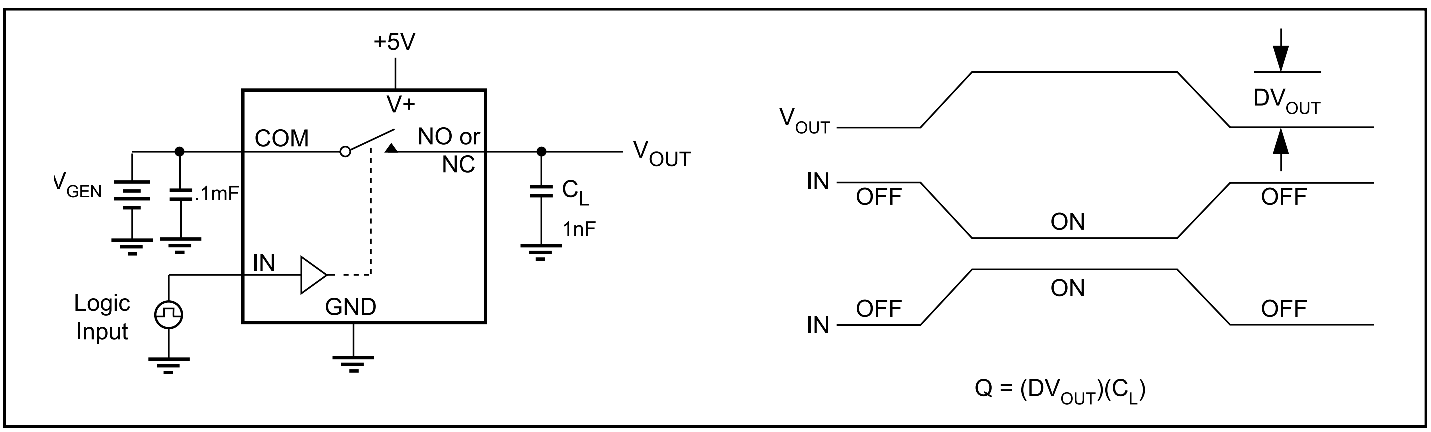


Figure 2. Charge Injection

Test Circuits/Timing Diagrams (continued)

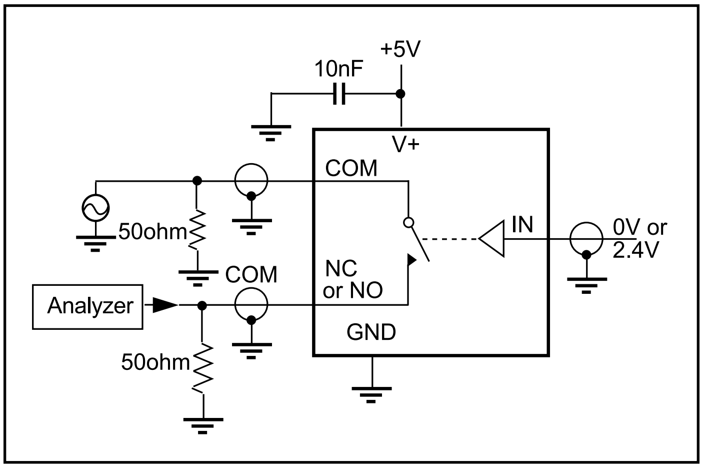


Figure 3. Off Isolation

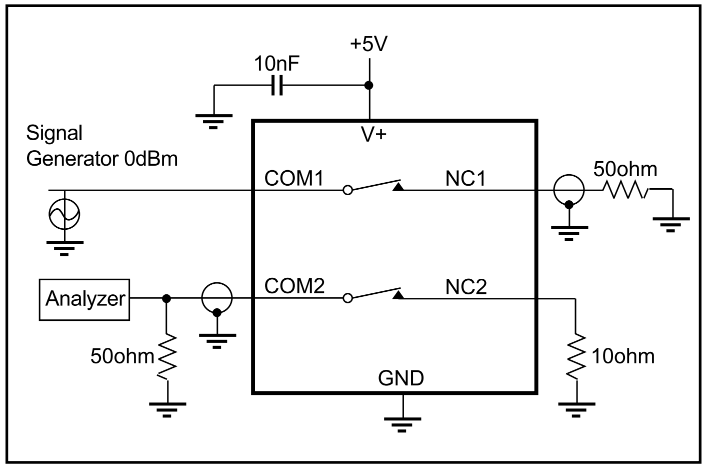


Figure 4. Crosstalk (124 only)

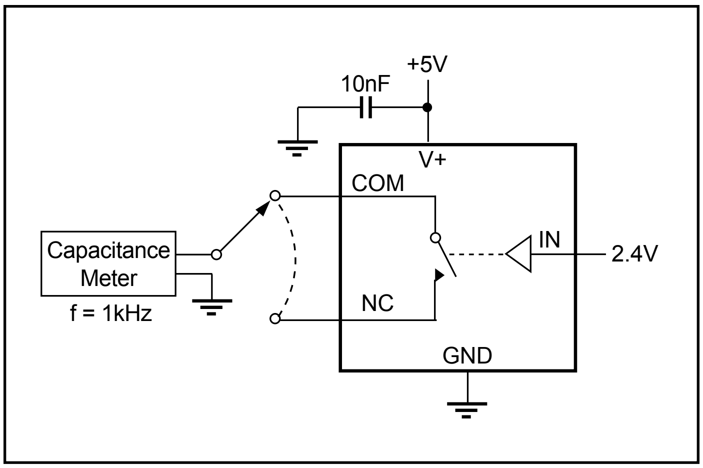


Figure 5. Channel-Off Capacitance

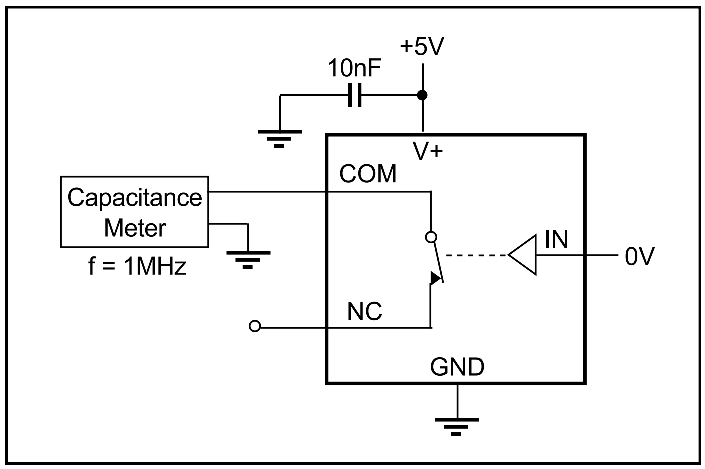


Figure 6. Channel-On Capacitance

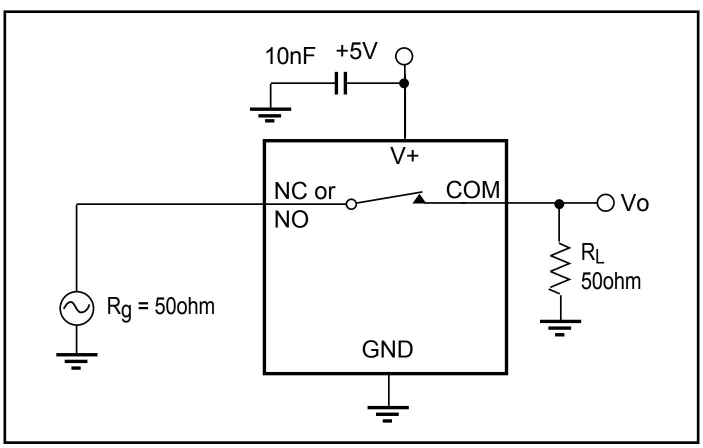
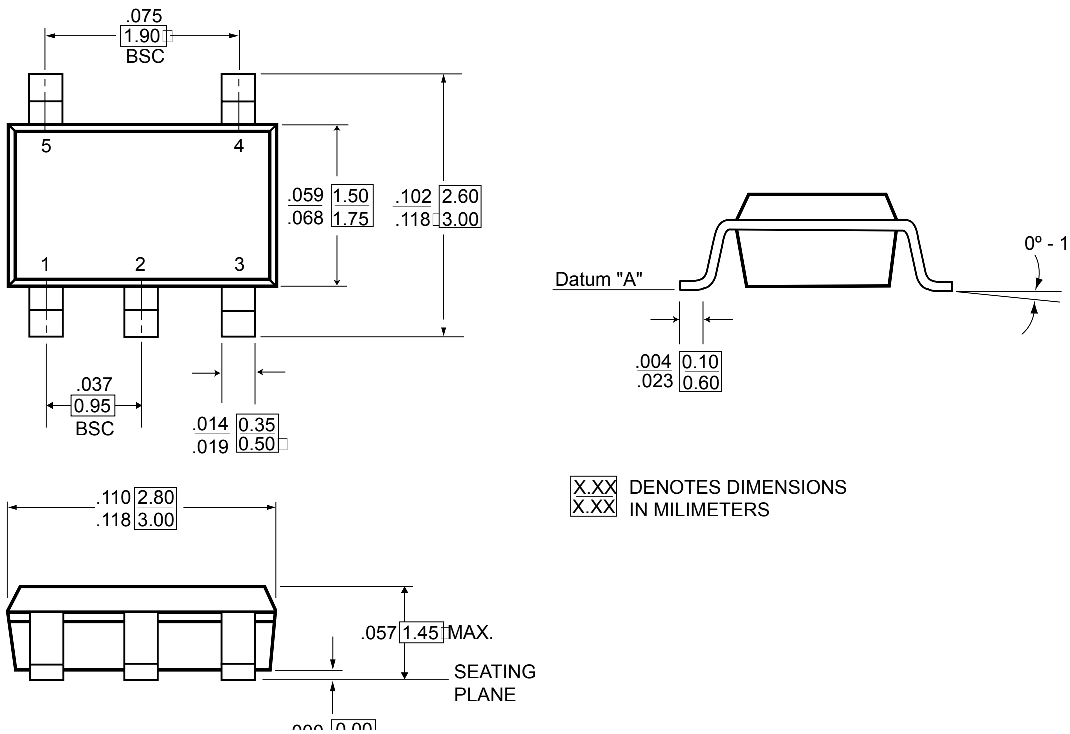
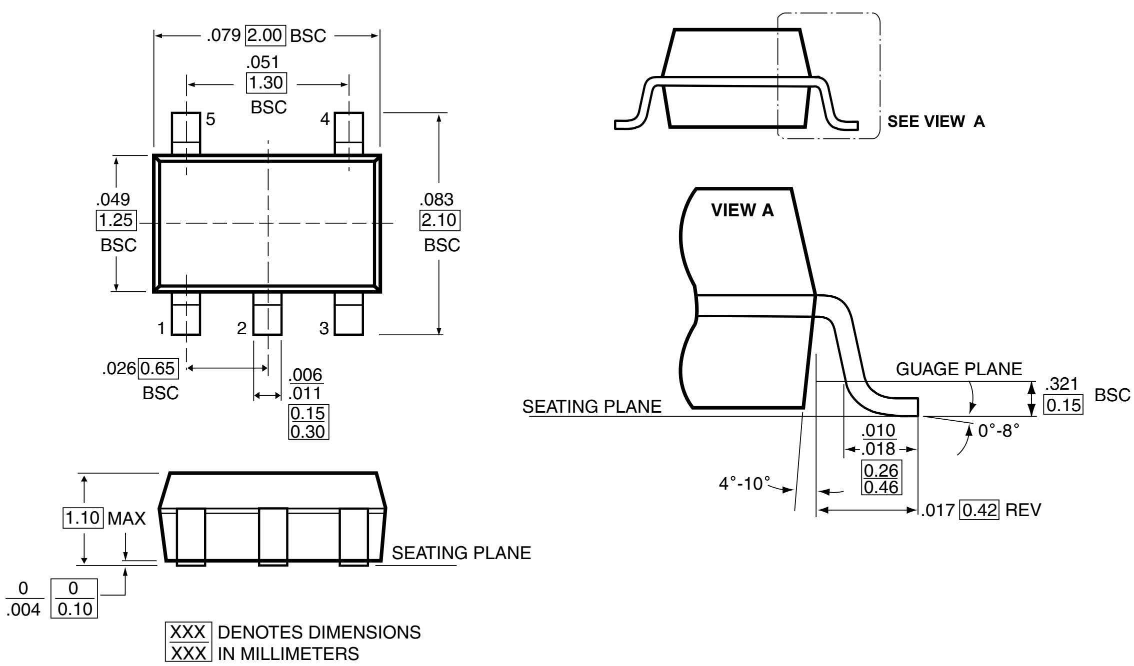


Figure 7. Bandwidth

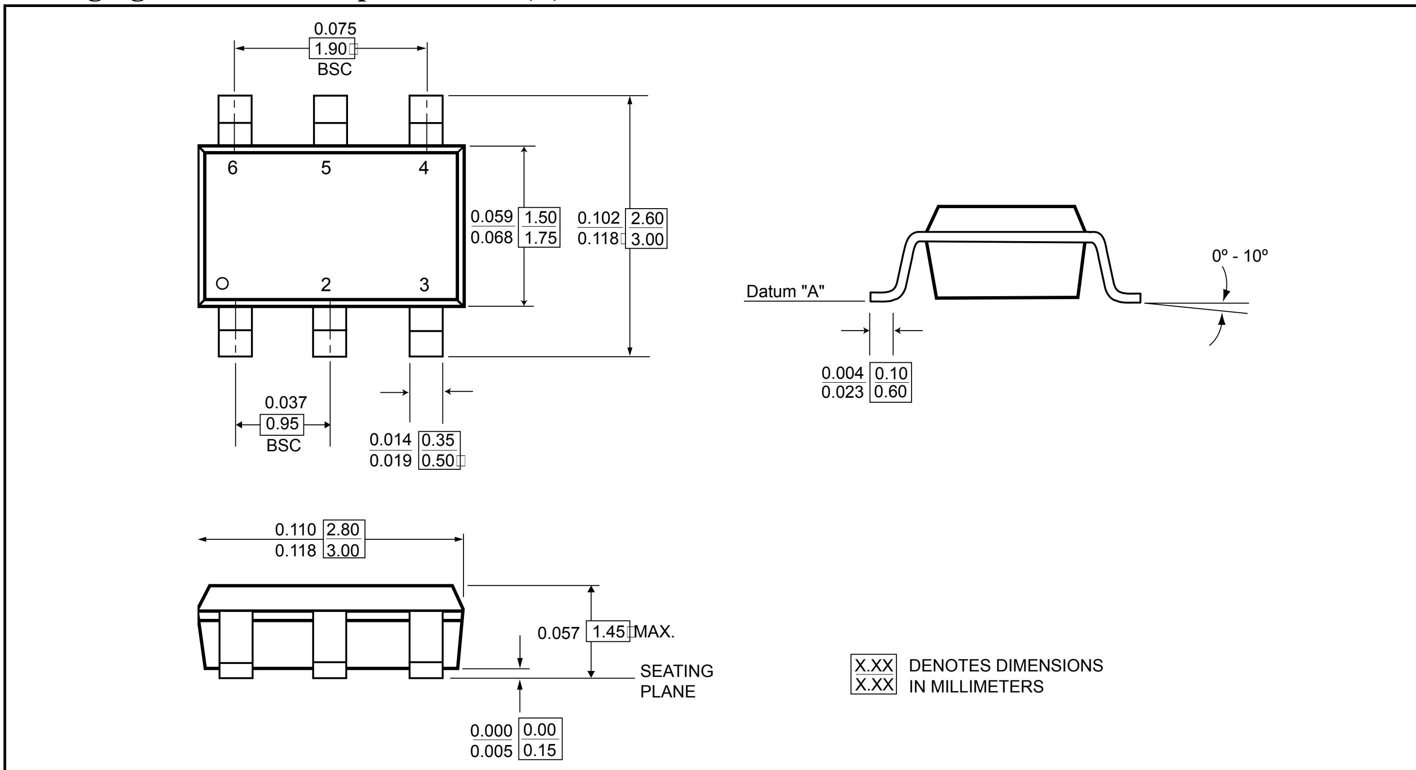
Packaging Mechanical: 5-pin SOT-23 (T)



Packaging Mechanical: 5-pin SC70 (C)



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



Ordering Information

Ordeing Code	Packaging Code	Package Type	Top Marking
PI5A121TX	T	5-pin, 65-mil wide SOT-23	ZV
PI5A121TEX	T	Pb-free & Green, 5-pin, 65-mil wide SOT-23	$\overline{Z}$V
PI5A121CX	C	5-pin, 50-mil wide SOT-23	ZV
PI5A121CEX	C	Pb-free & Green, 5-pin, 50-mil wide SOT-23	$\overline{Z}$V
PI5A122TX	T	5-pin, 65-mil wide SOT-23	ZU
PI5A122TEX	T	Pb-free & Green, 5-pin, 65-mil wide SOT-23	$\overline{Z}$U
PI5A122CX	C	5-pin, 50-mil wide SOT-23	ZU
PI5A122CEX	C	Pb-free & Green, 5-pin, 50-mil wide SOT-23	$\overline{Z}$U
PI5A124TX	T	6-pin, 65-mil wide SOT-23	ZT
PI5A124TEX	T	Pb-free & Green, 6-pin, 65-mil wide SOT-23	$\overline{Z}$T

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