

**Features**

- Single-Supply Operation (+2V to +6V)
- Rail-to-Rail Analog Signal Dynamic Range
- Low On-Resistance (6-Ohm typical with 5V supply)  
Minimizes Distortion and Error Voltages
- On-Resistance Flatness, 3-Ohm typical
- Low Charge Injection Reduces Glitch Errors.  
Q=4pC (typical)
- Replaces Mechanical Relays
- High Speed:  $t_{ON} = 10\text{ns}$  typical
- Wide -3dB Bandwidth: 300 MHz (typical)
- High-Current Channel Capability: >100mA
- TTL/CMOS Logic Compatible
- Low Power Consumption (0.5 $\mu\text{W}$  typical)
- Small outline transistor package minimizes board area  
-65 mil wide SOT23-5 (T5)

**Applications**

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

**Truth Table**

$\overline{\text{OE}}$	PI5A125
0	ON
1	OFF

Switch shown for Logic "0" input

**Description**

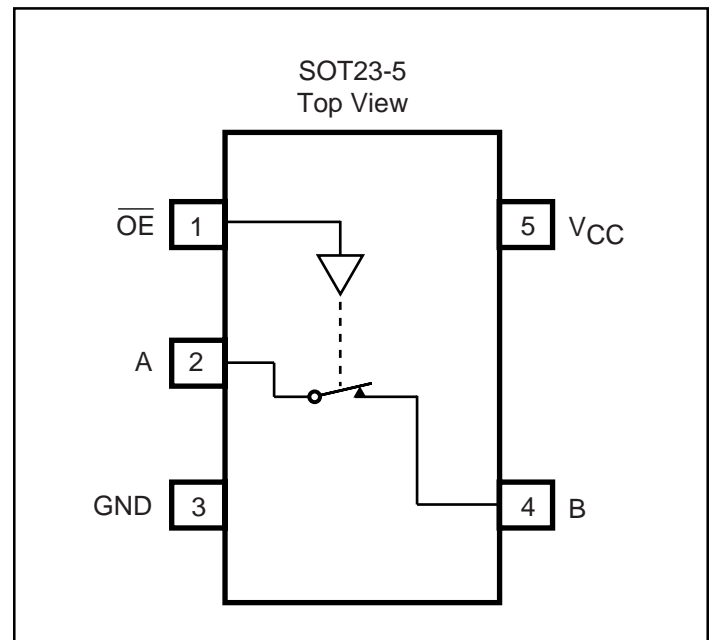
The PI5A125 is a single analog switch designed for single-supply operation. This high-precision device is ideal for low-distortion audio, video, signal switching and routing.

The PI5A125 is a single-pole single-throw (SPST), normally closed (NC) switch. The switch is open when  $\overline{\text{OE}}$  is HIGH.

This switch conducts current equally well in either direction when on. When off, it blocks voltages up to  $V_{CC}$ .

The PI5A125 is fully specified with +5V, and +3.3V supplies. With +5V, it guarantees <10-ohms ON-resistance. ON-resistance flatness is less than 5-ohms over the specified range. The switch also guarantees fast switching speeds ( $t_{ON} < 20\text{ns}$ ).

This product is available in a 5-pin SOT23 plastic package for operation over the industrial (-40°C to +85°C) temperature range.

**Functional Diagram, Pin Configuration**


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

Description	Parameter	Conditions	Temp. (°C)	Min. <sup>(2)</sup>	Typ. <sup>(1)</sup>	Max. <sup>(2)</sup>	Units
<b>Analog Switch</b>							
Analog Signal Range <sup>(3)</sup>	$V_{ANALOG}$		Full	0		$V_{CC}$	V
On-Resistance	$R_{ON}$	$V_{CC} = 4.5V, I_B = -30\text{ mA}, V_A = +2.5V$	25		8	10	$\Omega$
			Full			12	
On-Resistance Flatness <sup>(5)</sup>	$R_{FLAT(ON)}$	$V_{CC} = 5V, I_B = -30\text{ mA}, V_A = 1V, 2.5V, 4V$	25		2.5	3.5	$\Omega$
			Full			4	
Off Leakage Current <sup>(6)</sup>	$I_{A(OFF)}$ or $I_{B(OFF)}$	$V_{CC} = 5.5V, V_B = 0V, V_A = 4.5V$	25		0.20		nA
			Full	-80		80	
On Leakage Current <sup>(6)</sup>	$I_{A(ON)}$ or $I_{B(ON)}$	$V_+ = 5.5V, V_B = V_A = +4.5V$	25		0.20		nA
			Full	-80		80	
<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 Input Voltage High	$I_{INH}$	$V_{IN} = 2.4V$ , all others = 0.8V		-1	0.005	1	$\mu A$
Input Current with Input Voltage Low	$I_{INL}$	$V_{IN} = 0.8V$ , all others = 2.4V					
<b>Dynamic</b>							
Turn-On Time	$t_{ON}$	$V_{CC} = 5V$ , see Figure 1	25		7	15	nc
			Full			20	
Turn-Off Time	$t_{OFF}$	$V_{COM} = \pm 3V$ , see Figure 2	25		1	7	nc
			Full		2	5	
Charge Injection <sup>(3)</sup>	$Q$	$C_L = 1\text{ nF}, V_{GEN} = 0V, R_{GEN} = 0\Omega$ , see Figure 2				10	pC
Off Isolation	$OIRR$	$R_L = 50\Omega, C_L = 5\text{ pF}, f = 10\text{ MHz}$ , see Figure 3	25				dB
A or B Off Capacitance	$C_{(OFF)}$	$f = 1\text{ kHz}$ , see Figure 4			5.5		pF
On Capacitance	$C_{(ON)}$	$f = 1\text{ kHz}$ , see Figure 5			5.5		
-3dB Bandwidth	$BW$	$R_L = 50\Omega$ , see Figure 6			300		MHz
<b>Supply</b>							
Power-Supply Range	$V_{CC}$		Full	2		6	V
Positive Supply Current	$I_{CC}$	$V_+ = 5.5V, V_{IN} = 0V$ or $V_{CC}$ , All channels on or off					1

### Absolute Maximum Ratings

Voltages Referenced to GND	
V <sub>CC</sub> .....	-0.5V to +7V
V <sub>OE</sub> , V <sub>A</sub> , V <sub>B</sub> <sup>(1)</sup> .....	-0.5V to V <sub>CC</sub> +2V
.....	or 30mA, whichever occurs first
Current (any terminal except A, B) .....	30mA
Current: A,B (pulsed at 1ms, 10% duty cycle) .....	120mA

### Thermal Information

Continuous Power Dissipation	
SOT23-5 (derate 7mW/°C above +70°C) .....	550mW
Storage Temperature .....	-65°C to +150°C
Lead Temperature (soldering, 10s) .....	+300°C

**Note 1:**

Signals on  $\overline{OE}$ , A, B exceeding V<sub>CC</sub> or GND are clamped by internal diodes. Limit forward diode current to 30mA.

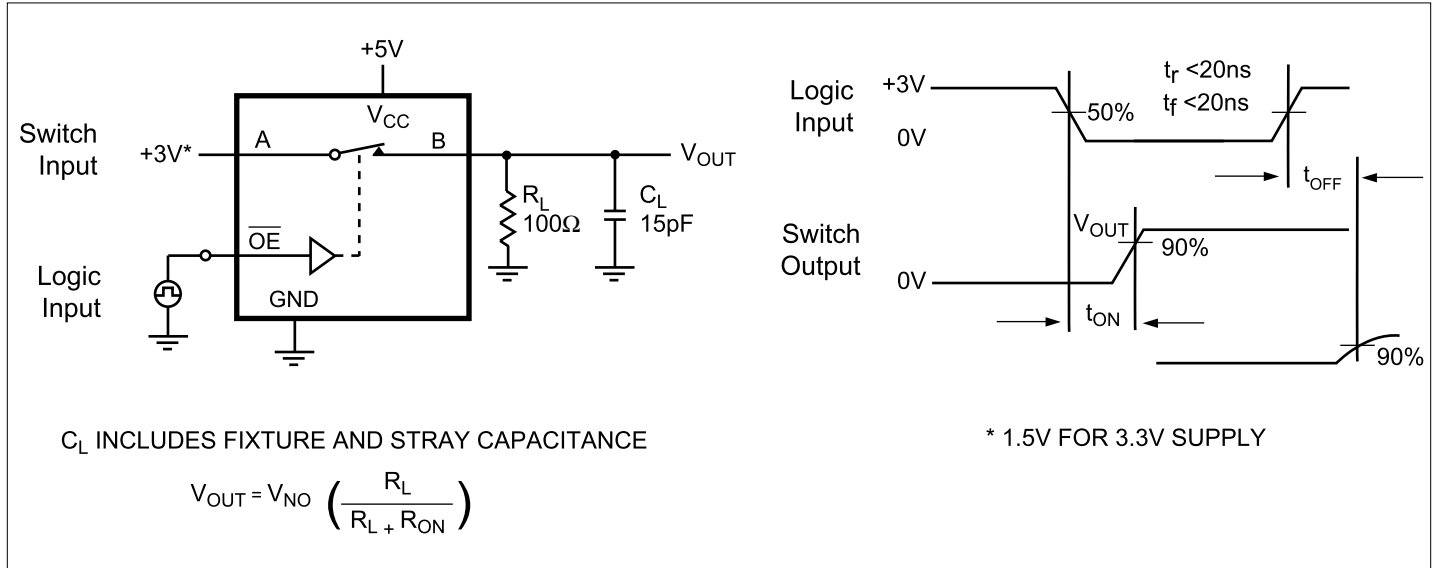
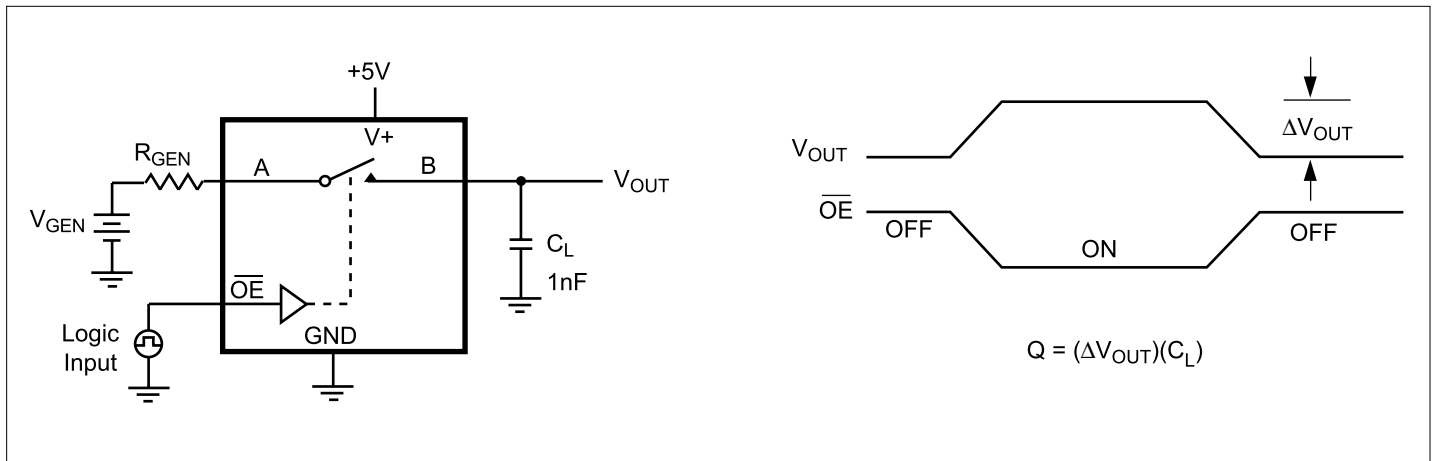
**Caution:** Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied.

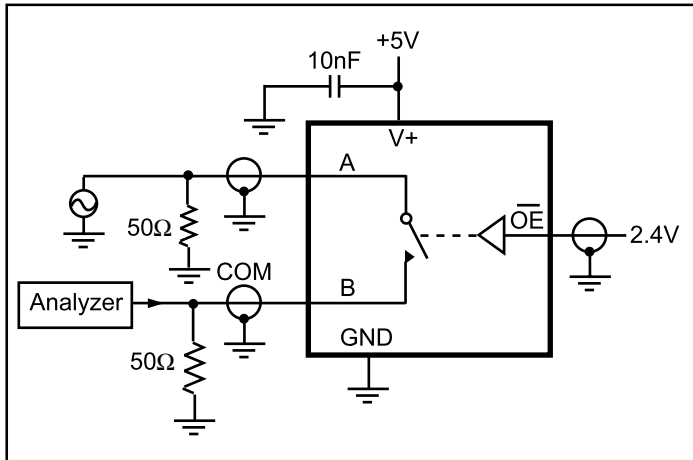
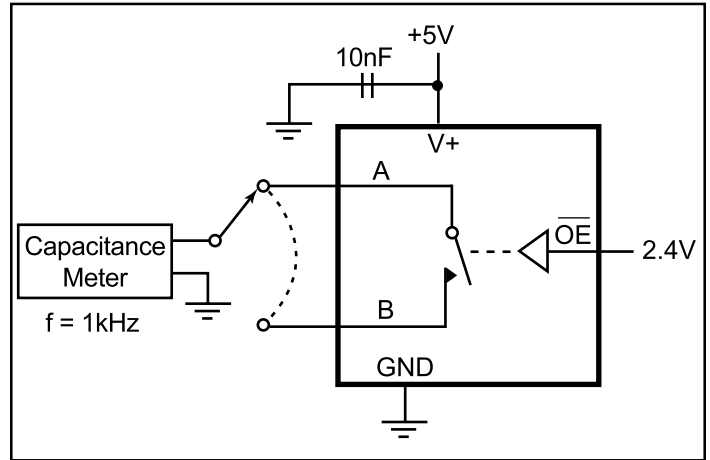
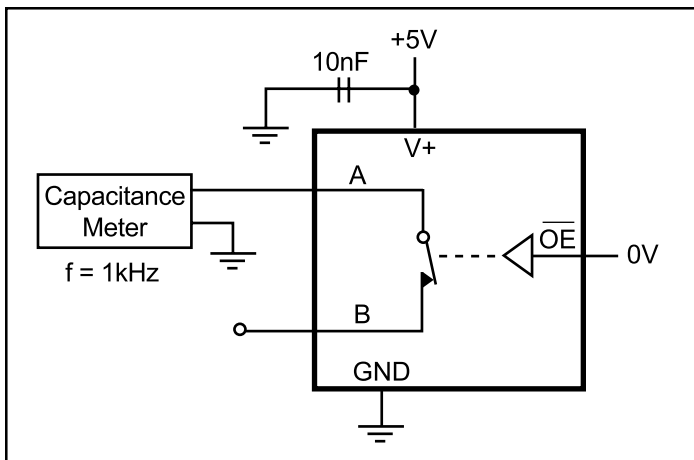
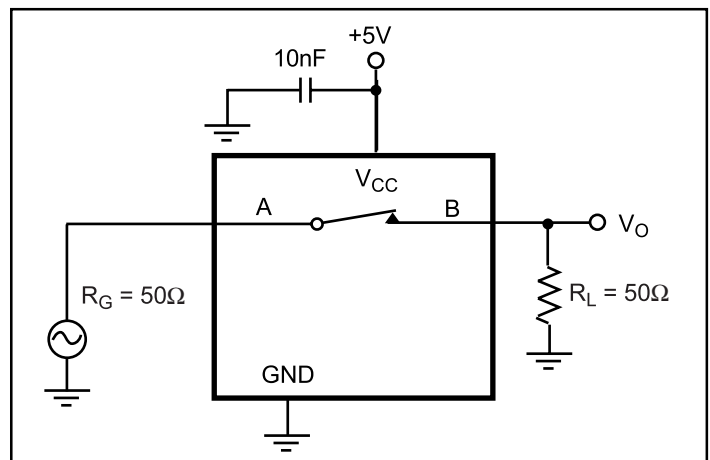
### Electrical Specifications-Single +3.3V Supply (V<sub>CC</sub> = +3.3V ± 10%, GND = 0V, V<sub>INH</sub> = 2.4V, V<sub>INL</sub> = 0.8V)

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>			0		V <sub>CC</sub>	V
On-Resistance	R <sub>ON</sub>	V <sub>CC</sub> = 3V, I <sub>B</sub> = -30mA, V <sub>A</sub> = 1.5V	25		12	18	Ω
			Full			22	
On-Resistance Flatness <sup>(3,5)</sup>	R <sub>FLAT(ON)</sub>	V <sub>CC</sub> = 3.3V, I <sub>B</sub> = -30mA, V <sub>A</sub> = 0.8V, 2.5V	25		0.5	4	
			Full			5	
<b>Dynamic</b>							
Turn-On Time	t <sub>ON</sub>	V <sub>CC</sub> = 3.3V to V <sub>NO</sub> or V <sub>NC</sub> = 1.5V, Fig.1	25		15	25	ns
			Full			40	
Turn-Off Time	t <sub>OFF</sub>		25		1.5	12	
			Full			20	
Charge Injection <sup>(3)</sup>	Q	C <sub>L</sub> = 1nf, V <sub>GEN</sub> = 0V, R <sub>GEN</sub> = 0V, Fig.2	25		1.3	10	pC
<b>Supply</b>							
I <sub>CC</sub>	Positive Supply Current	V <sub>CC</sub> = 3.6V, V <sub>in</sub> = 0V or V <sub>CC</sub> All channels on or off	Full			1	μA

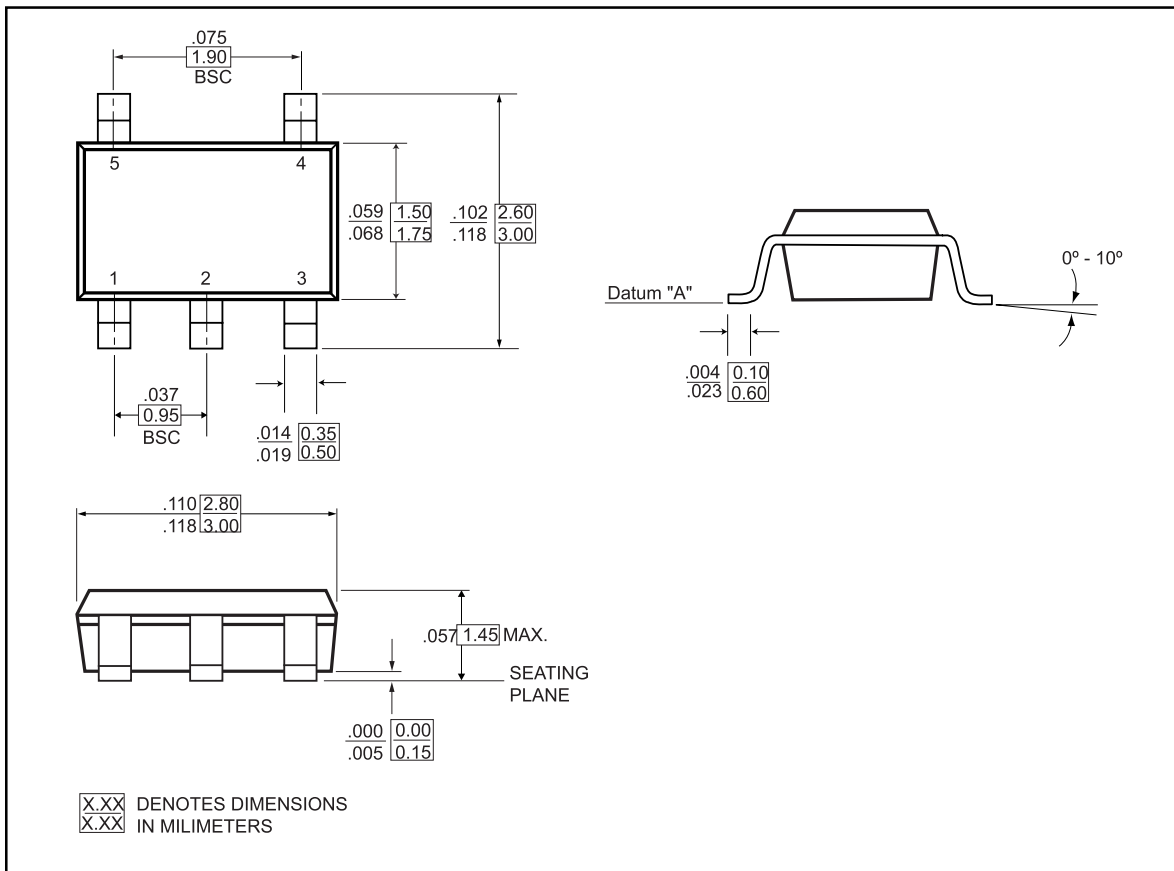
**Notes:**

- The algebraic convention, where the most negative value is a minimum and the 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>B</sub> / V<sub>A</sub>. See Figure 3.

**Test Circuits/Timing Diagrams**

**Figure 1. Switching Time**

**Figure 2. Charge Injection**

**Test Circuits/Timing Diagrams (continued)**

**Figure 3. Off Isolation**

**Figure 4. Channel-Off Capacitance**

**Figure 5. Channel-On Capacitance**

**Figure 6. Bandwidth**

Small Outline Transistor Package - SOT23-5 (T5)



Ordering Information

P/N	Package
PI5A125TX	SOT23-5