



PI5A125

Single Wide Bandwidth Analog Switch

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.
 $Q = 4\text{pC}$ (typical)
- Replaces Mechanical Relays
- High Speed: $t_{\text{ON}} = 10\text{ns}$ typical
- Wide -3dB Bandwidth: 300 MHz (typical)
- High-Current Channel Capability: $>100\text{mA}$
- 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.

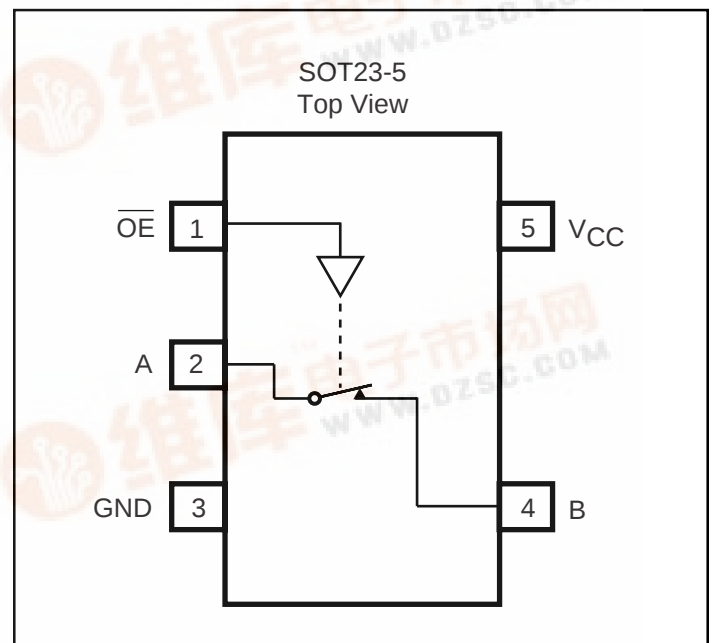
The PI5A125 is a single-pole single-throw (SPST), normally closed (NC) switch. The switch is open when OE is HIGH.

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 $<10\text{-ohms}$ ON-resistance. ON-resistance flatness is less than 5-ohms over the specified range. The switch also guarantees fast switching speeds ($t_{\text{ON}} < 20\text{ns}$).

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

Functional Diagram, Pin Configuration





PI5A125

Single Wide Bandwidth Analog Switch

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. ⁽²⁾	Typ. ⁽¹⁾	Max. ⁽²⁾	Units
Analog Switch							
Analog Signal Range ⁽³⁾	V _{ANALOG}		Full	0		V _{CC}	V
On-Resistance	R _{ON}	V _{CC} = 4.5V, I _B = −30 mA, V _A = +2.5V	25		8	10	Ω
			Full			12	
On-Resistance Flatness ⁽⁵⁾	R _{FLAT(ON)}	V _{CC} = 5V, I _B = −30 mA, V _A = 1V, 2.5V, 4V	25		2.5	3.5	
			Full			4	
Off Leakage Current ⁽⁶⁾	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 ⁽⁶⁾	I _{A(ON)} or I _{B(ON)}	V ₊ = 5.5V, V _B = V _A = +4.5V	25		0.20		
			Full	−80		80	
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 Input Voltage High	I _{INH}	V _{IN} =2.4V, all others = 0.8V		−1	0.005	1	μA
Input Current with Input Voltage Low	I _{INL}	V _{IN} =0.8V, all others = 2.4V					
Dynamic							
Turn-On Time	t _{ON}	V _{CC} = 5V, see Figure 1	25		7	15	nC
			Full			20	
Turn-Off Time	t _{OFF}	V _{COM} = ±3V, see Figure 2	25		1	7	
			Full		2	5	
Charge Injection ⁽³⁾	Q	C _L = 1nF, V _{GEN} = 0V, R _{GEN} = 0Ω, see Figure 2	25			10	pC
Off Isolation	OIRR	R _L = 50Ω, C _L = 5pF, f = 10 MHz, see Figure 3					dB
A or B Off Capacitance	C _(OFF)	f = 1kHz, see Figure 4			5.5		pF
On Capacitance	C _(ON)	f = 1kHz, see Figure 5			5.5		
−3dB Bandwidth	BW	R _L = 50Ω, see Figure 6			300		MHz
Supply							
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	μA



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Absolute Maximum Ratings

Voltages Referenced to GND	
V _{CC}	-0.5V to +7V
V _{OE} , V _A , V _B ⁽¹⁾	-0.5V to V _{CC} +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_{CC} 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_{CC} = +3.3V ± 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}			0		V _{CC}	V
On-Resistance	R _{ON}	V _{CC} =3V, I _B =-30mA, V _A =1.5V	25		12	18	Ω
			Full			22	
On-Resistance Flatness ^(3,5)	R _{FLAT(ON)}	V _{CC} = 3.3V, I _B = -30mA, V _A = 0.8V, 2.5V	25		0.5	4	
			Full			5	
Dynamic							
Turn-On Time	t _{ON}	V _{CC} =3.3V to V _{NO} or V _{NC} = 1.5V, Fig.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, Fig.2	25		1.3	10	pC
Supply							
I _{CC}	Positive Supply Current	V _{CC} = 3.6V, V _{in} = 0V or V _{CC} All channels on or off	Full			1	μA

Notes:

1. The algebraic convention, where the most negative value is a minimum and the 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 +25°C.
7. Off Isolation = 20log₁₀ V_B / V_A. See Figure 3.

Test Circuits/Timing Diagrams

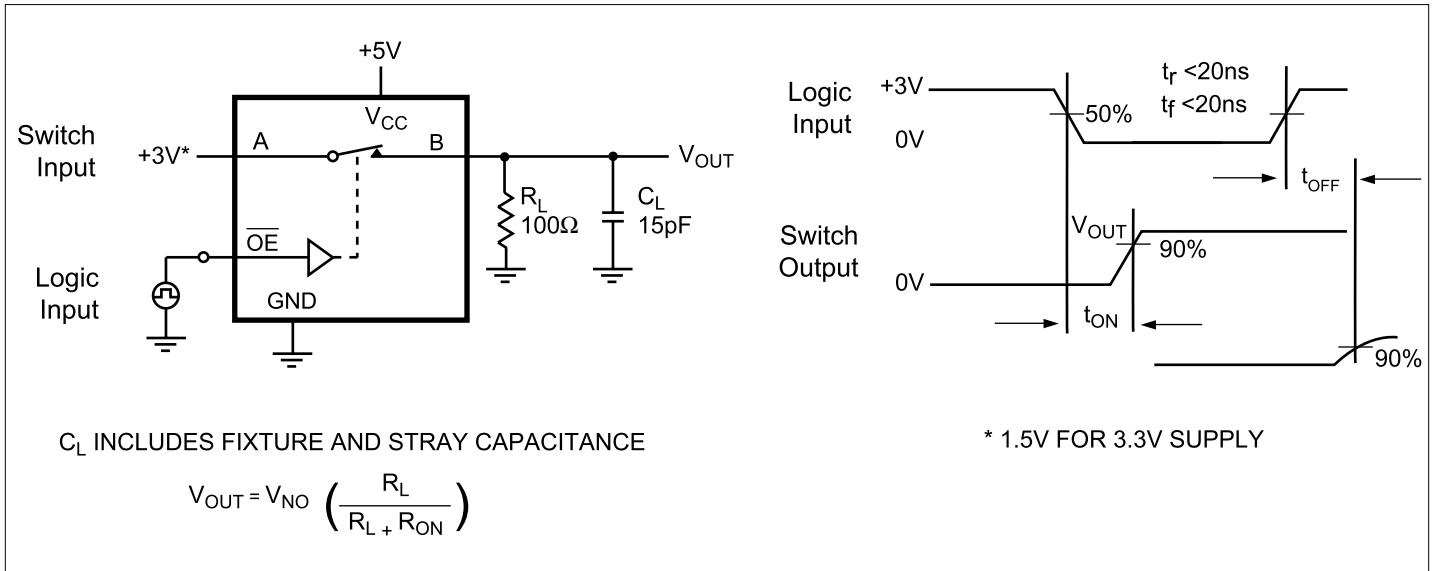


Figure 1. Switching Time

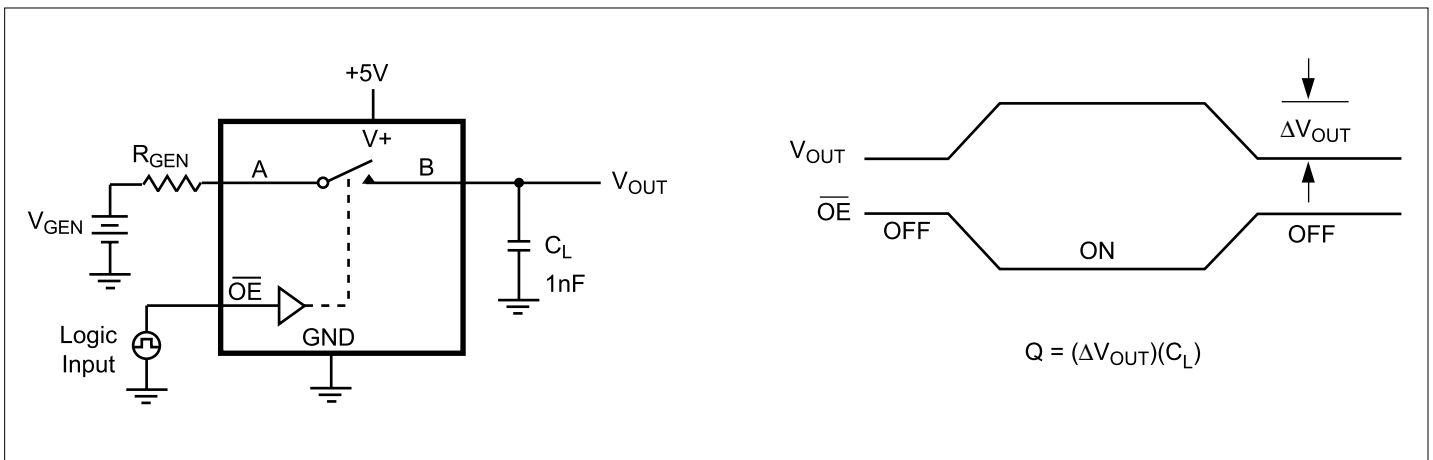
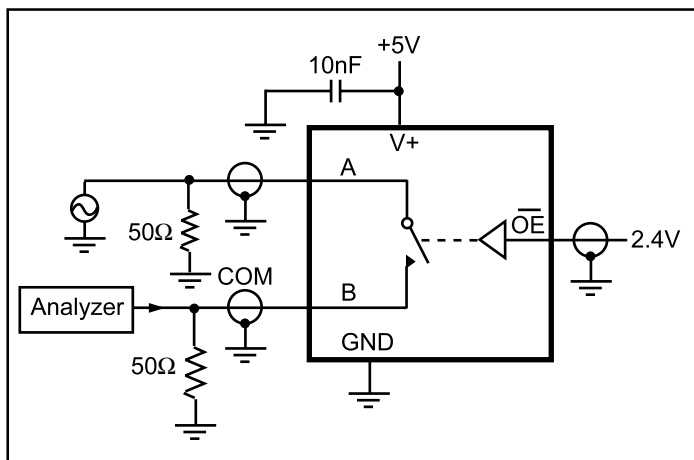
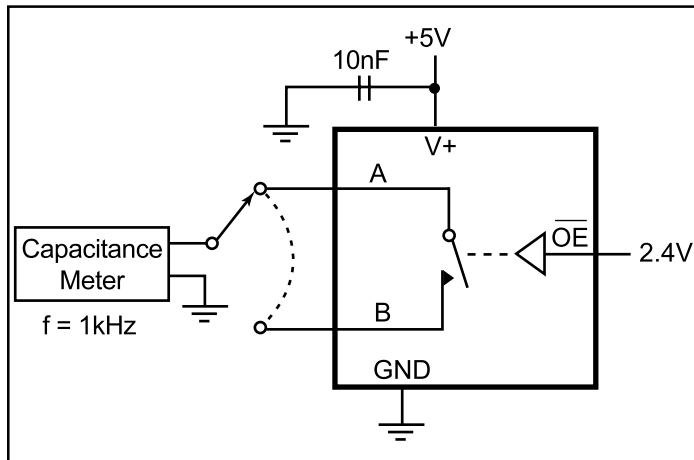
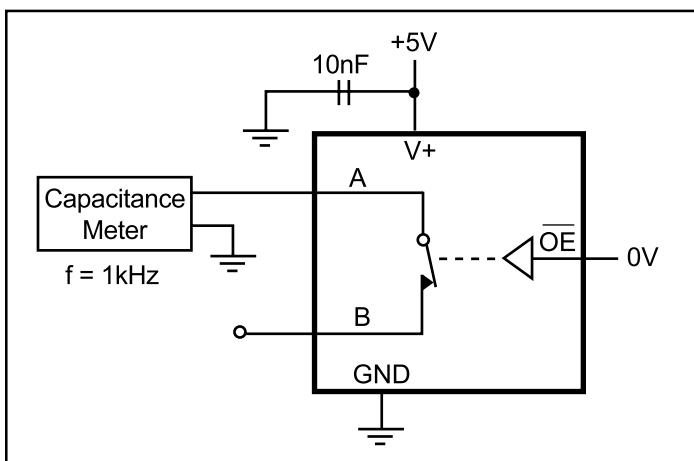
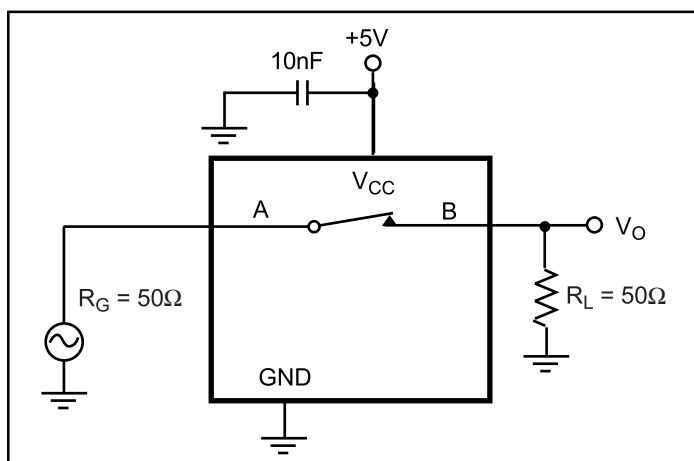


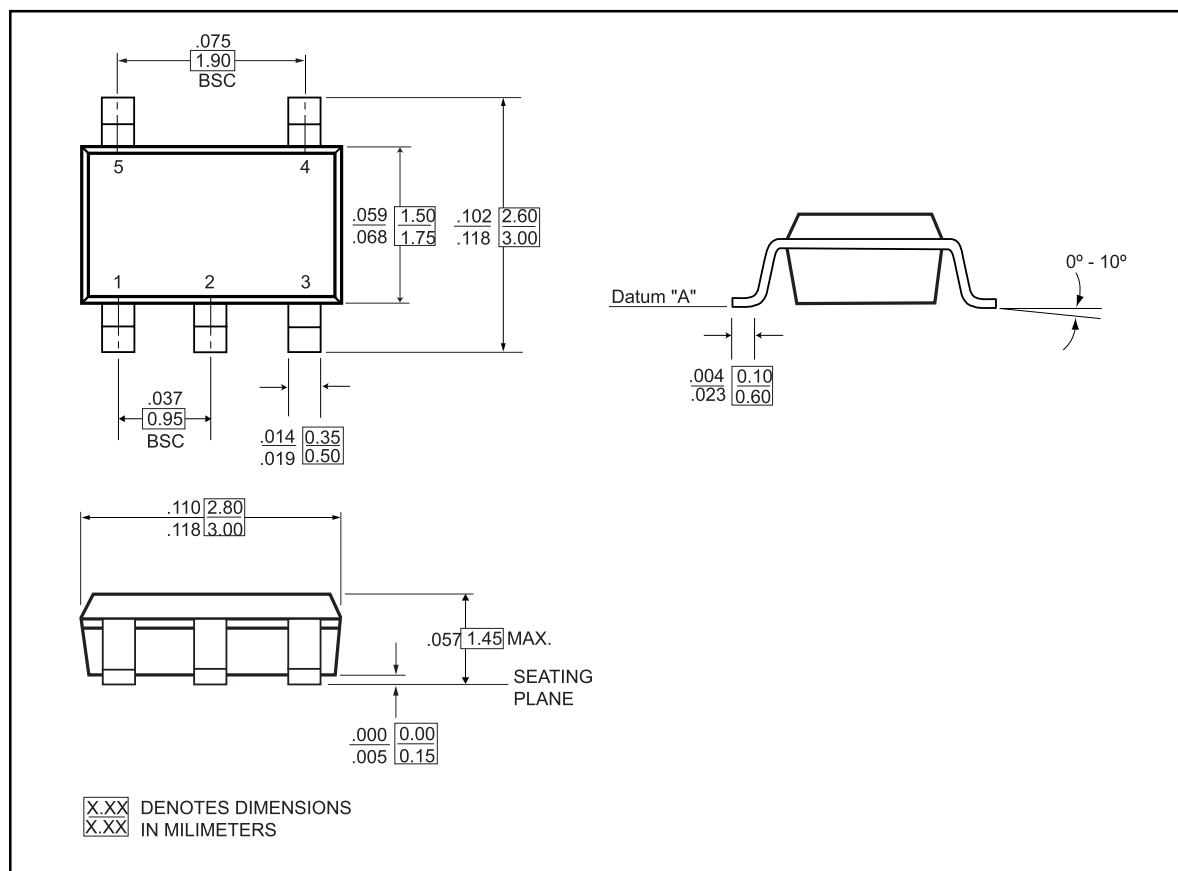
Figure 2. Charge Injection

Test Circuits/Timing Diagrams (continued)

Figure 3. Off Isolation

Figure 4. Channel-Off Capacitance

Figure 5. Channel-On Capacitance

Figure 6. Bandwidth



PI5A125
Single Wide Bandwidth Analog Switch

Small Outline Transistor Package - SOT23-5 (T5)



Ordering Information

P/N	Package
PI5A125TX	SOT23-5