

Features

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

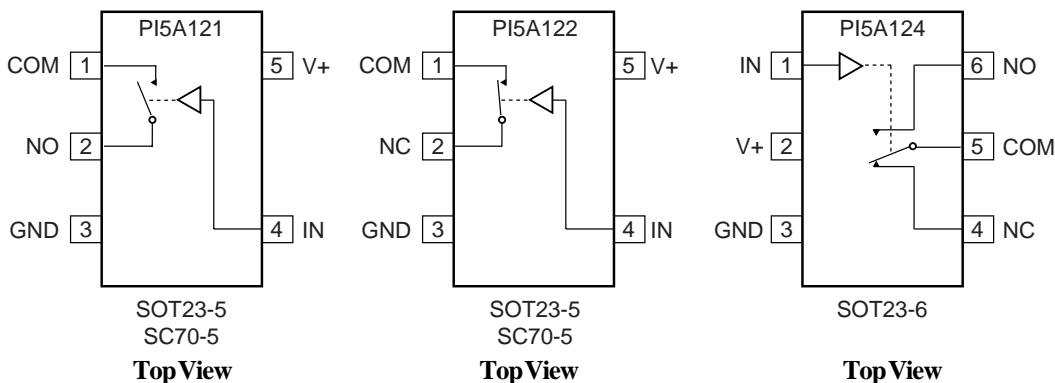
The PI5A121 is a single-pole throw (SPST) normally open (NO) switch. The switch is open when IN is LOW. The PI5A122 is a single-pole single-throw (SPST) normally closed (NC) switch.

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 $<10\text{-ohm}$ ON-resistance. ON-resistance matching between channels is within 2ohms. ON-resistance flatness is less than 5ohms over the specified range. These switches also guarantee fast switching speeds ($t_{ON} < 20\text{ns}$).

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

Functional Diagrams, Pin Configurations and Truth Tables



Switches shown for Logic "0" input

IN	PI5A121	PI5A122
0	OFF	ON
1	ON	OF

	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/°C above +70°C) 550mW
 Storage Temperature -65°C to +150°C
 Lead Temperature (soldering, 10s) +300°C

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
On-Resistance Match Between Channels ⁽⁴⁾	ΔR _{ON}		Full			12	
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(°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	
Charge Injection ⁽³⁾	Q	C _L = 1nF, V _{GEN} = 0V, R _{GEN} = 0Ω, Figure 2	25		1.6	10	pC
Off Isolation	OIRR	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	
Supply							
Power-Supply Range	V+	V _{CC} = 5.5V, V _{IN} = 0V or V+	Full	2		6	V
Positive Supply Current	I+						1

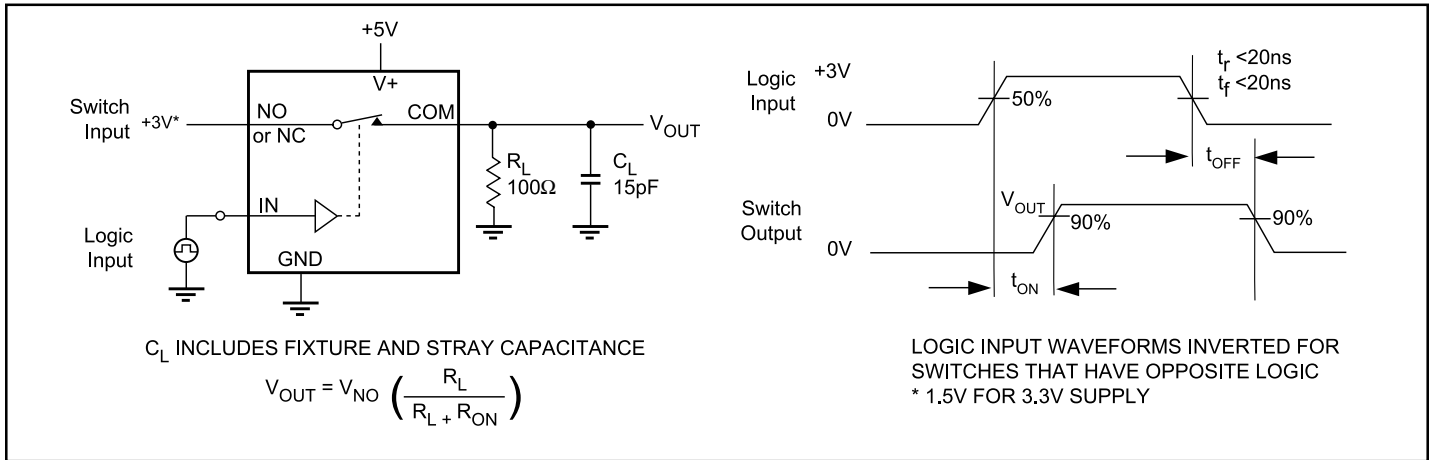
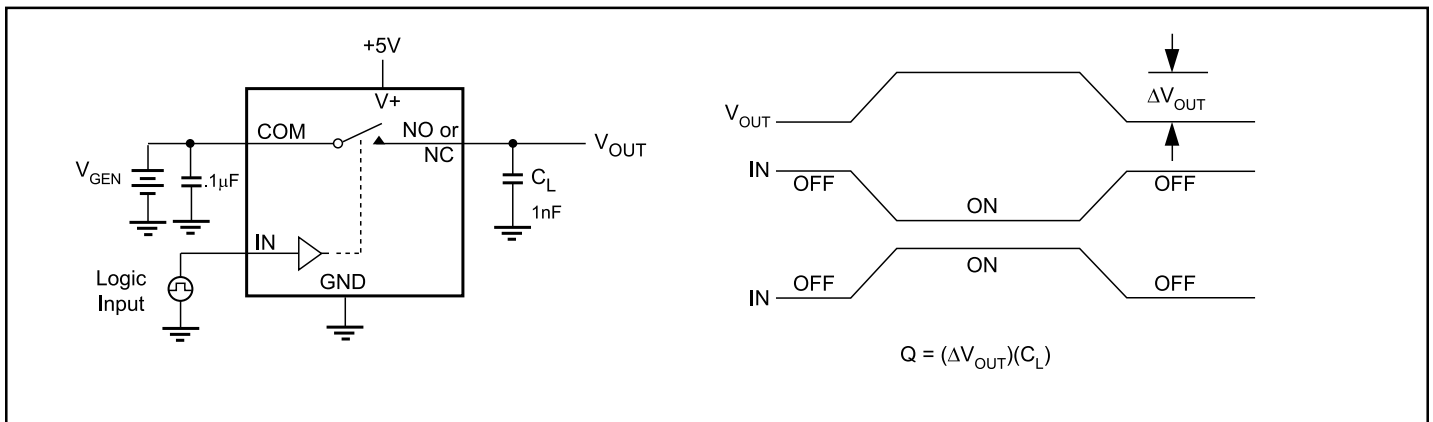
Notes:

- 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_{ON} = R_{ON max} - R_{ON 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 = 20log₁₀ [V_{COM} / (V_{NO} 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, 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+	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 Flatness ^(3,5)	R _{FLAT(ON)}	V+ = 3.3V, I _{COM} = -30mA, V _{NO} or V _{NC} = 0.8V, 2.5V	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}	V+ = 3.3V, V _{NO} or V _{NC} = 1.5V, Figure 1	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							
Positive 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	V
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	μA

Test Circuits/Timing Diagrams

Figure 1. Switching Time

Figure 2. Charge Injection

Test Circuits/Timing Diagrams (continued)

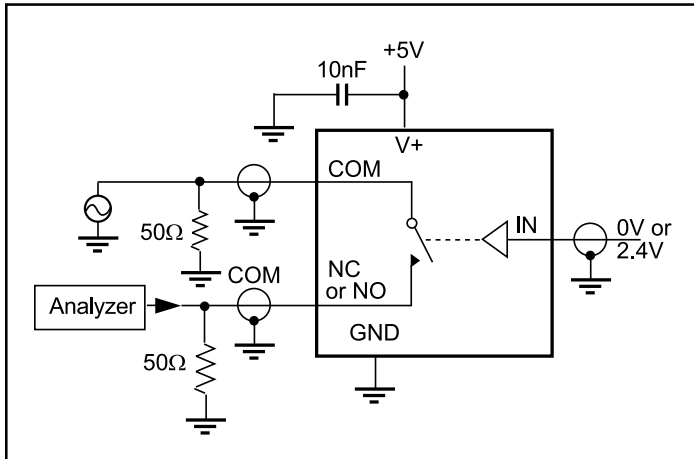


Figure 3. Off Isolation

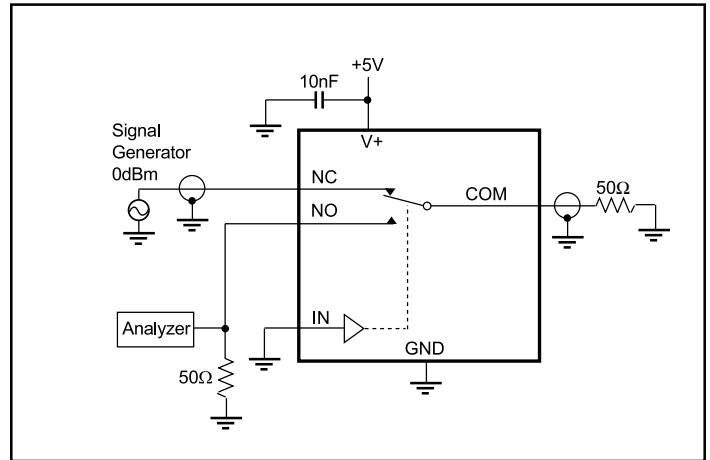


Figure 4. Crosstalk (124 only)

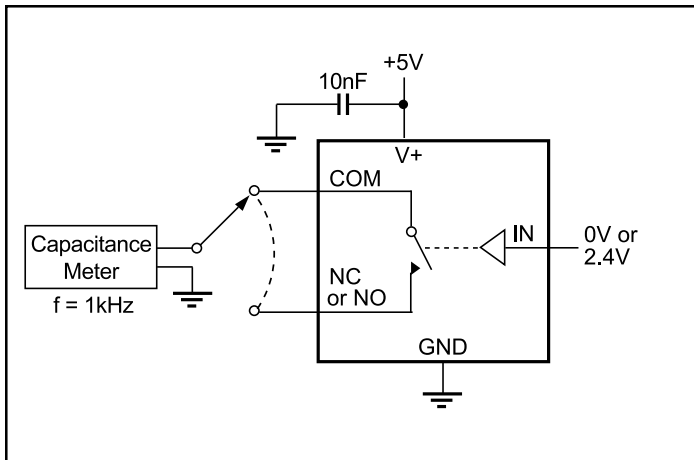


Figure 5. Channel-Off Capacitance

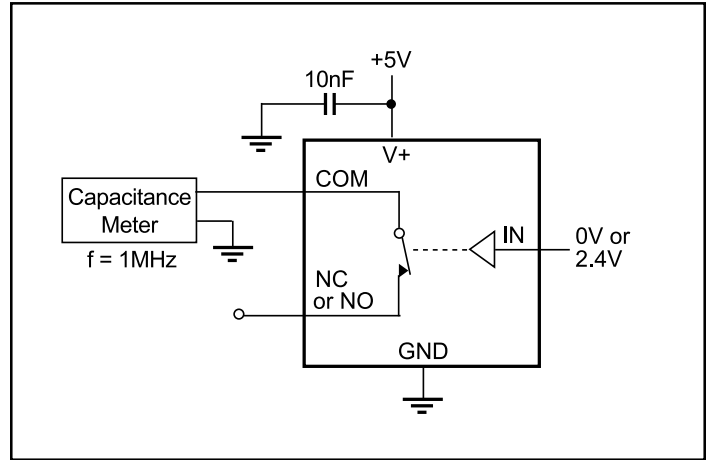


Figure 6. Channel-On Capacitance

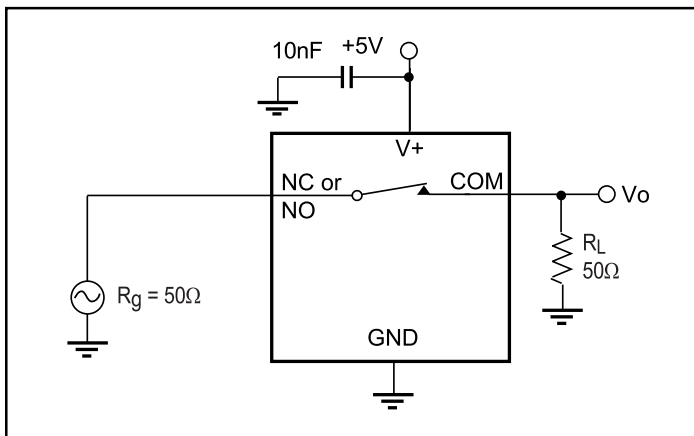


Figure 7. Bandwidth

Ordering Information

P/N	Package
PI5A121TX	SOT23-5
PI5A122TX	SOT23-5
PI5A124TX	SOT23-6
PI5A121CX	SC70-5
PI5A122CX	SC70-5