

## Dual, Wide Bandwidth Analog Switches

### Features

- Single-Supply Operation (+2V to +6V)
- Rail-to-Rail Analog Signal Dynamic Range
- Low On-Resistance (6-Ohms typ. with 5V supply)  
Minimizes Distortion and Error Voltages
- On-Resistance Flatness, 3W typ.
- Low Charge Injection Reduces Glitch Errors. Q = 4pC typ.
- High Speed.  $t_{ON} = 10ns$  typ.
- Wide -3dB Bandwidth: 230 MHz
- High-Current Channel Capability: >100mA
- TTL/CMOS Logic Compatible
- Low Power Consumption (0.5mW typ.)
- Small MSOP-8 package minimizes board area

### Applications

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

### Description

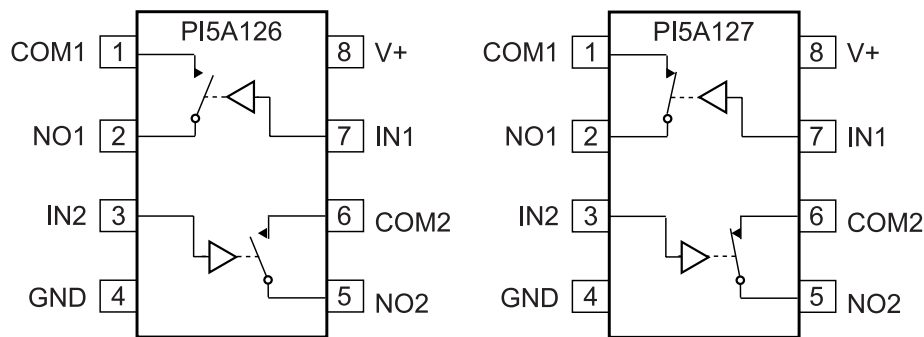
The PI5A126/PI5A127 are dual SPST (single-pole single-throw) analog switches designed for single supply operation. These high-precision devices are ideal for low-distortion audio, video, signal switching and routing.

The PI5A126 is a normally open (NO) switch. The switch is open when IN is LOW. The PI5A127 is a 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-ohm ON-resistance. On-resistance matching between channels is within 2 ohms. On-resistance flatness is less than 5 ohms over the specified range. These switches also guarantee fast switching speeds ( $t_{ON} < 20ns$ ).

These products are available in 8-pin SOIC and MSOP plastic packages for operation over the industrial temperature range (-40°C to +85°C).

### Functional Diagrams, Pin Configurations and Truth Tables



Top View

Switches shown for logic "0" input

Logic	PI5A126	PI5A127
1	ON	OFF
0	OFF	ON

### Absolute Maximum Ratings

Voltages Referenced to GND

V <sub>+</sub> .....	-0.5V to +7V
V <sub>IN</sub> , V <sub>COM</sub> , V <sub>NC</sub> , V <sub>NO</sub> (Note 1) .....	-0.5V to V <sub>+</sub> +2V
..... or 30mA, whichever occurs first	
Current (any terminal except COM, NO, NC) .....	30mA
Current, COM, NO, NC .....	100mA
(Pulsed at 1ms, 10% duty cycle) .....	120mA

### Thermal Information

Continuous Power Dissipation

-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<sub>+</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 +5V Supply

(V<sub>+</sub> = +5V ±10%, GND = 0V, V<sub>INH</sub> = 2.4V, V<sub>INL</sub> = 0.8V)

Parameter	Symbol	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 <sub>ANALOG</sub>		Full	0		V <sub>+</sub>	V
On Resistance	R <sub>ON</sub>	V <sub>+</sub> = 4.5V, I <sub>COM</sub> = -30mA, V <sub>NO</sub> or V <sub>NC</sub> = +2.5V	25		7.2	10	Ω
On-Resistance Match Between Channels <sup>(4)</sup>	ΔR <sub>ON</sub>		Full			12	
		25		0.20	2		
		Full			4		
On-Resistance Flatness <sup>(5)</sup>	R <sub>FLAT(ON)</sub>	V <sub>+</sub> = 5V, I <sub>COM</sub> = -30mA, V <sub>NO</sub> or V <sub>NC</sub> = 1V, 2.5V, 4V	25		2.72	3.5	Ω
			Full			4	
NO or NC Off Leakage Current <sup>(6)</sup>	I <sub>NO(OFF)</sub> or I <sub>NC(OFF)</sub>	V <sub>+</sub> = 5.5V, V <sub>COM</sub> = 0V, V <sub>NO</sub> or V <sub>NC</sub> = 4.5V	25		0.18		nA
			Full	-200		200	
COM Off Leakage Current <sup>(6)</sup>	I <sub>COM(OFF)</sub>	V <sub>+</sub> = 5.5V, V <sub>COM</sub> = +4.5V, V <sub>NO</sub> or V <sub>NC</sub> = ±0V	25		0.20		
			Full	-200		200	
COM On Leakage Current <sup>(6)</sup>	I <sub>COM(ON)</sub>	V <sub>+</sub> = 5.5V, V <sub>COM</sub> = +4.5V V <sub>NO</sub> or V <sub>NC</sub> = +4.5V	25		0.20		
			Full	-200		200	

**Electrical Specifications - Single +5V Supply** (continued)

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

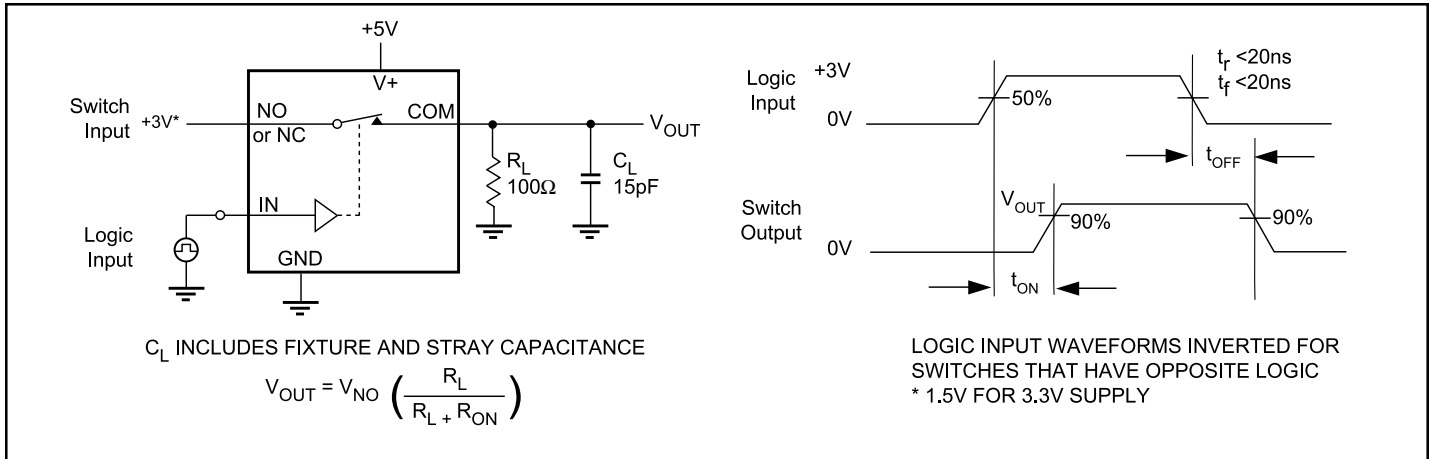
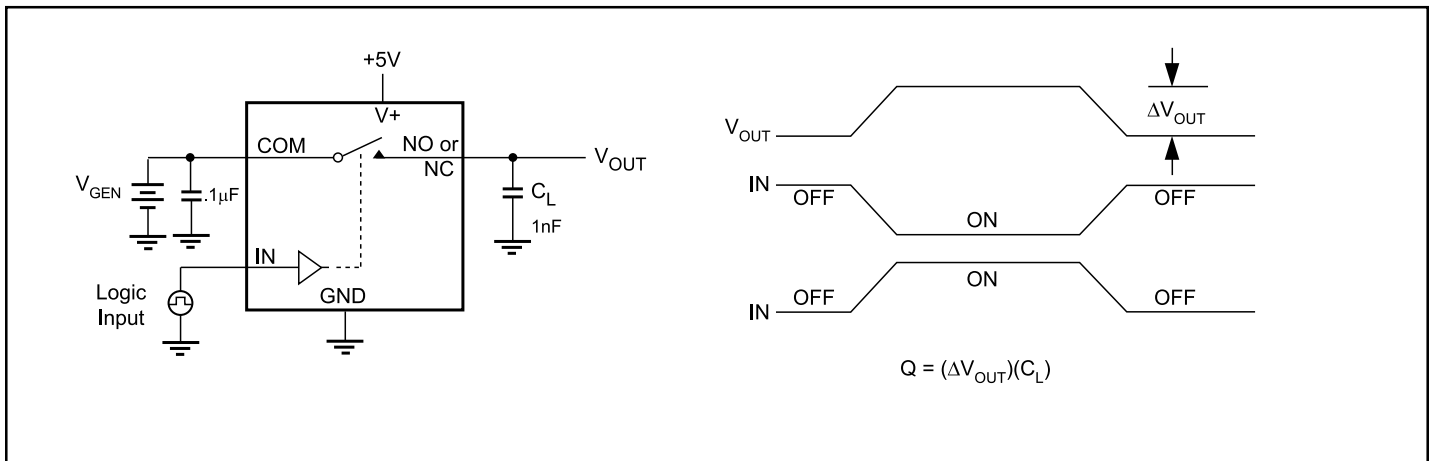
Parameter	Symbol	Conditions	Temp(°C)	Min. <sup>(1)</sup>	Typ. <sup>(2)</sup>	Max. <sup>(1)</sup>	Units
<b>Logic Input</b>							
Input High Voltage	$V_{IH}$	Guaranteed logic High Level	Full	2			V
Input Low Voltage	$V_{IL}$	Guaranteed logic Low Level				0.8	
Input Current with Voltage High	$I_{INH}$	$V_{IN} = 2.4V$ , all others = 0.8V		-1	0.005	1	
Input Current with Voltage Low	$I_{INL}$	$V_{IN} = 0.8V$ , all others = 2.4V		-1	0.005	1	
<b>Dynamic</b>							
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 <sup>(3)</sup>	Q	$C_L = 1nF$ , $V_{gen} = 0V$ , $R_{gen} = 0\Omega$ , Figure 2	25		1.6	10	pC
Off Isolation	OIRR	$R_L = 50\Omega$ , $C_L = 5pF$ , $f = 10MHz$ , Figure 3			-43		dB
Crosstalk	Xtalk	$R_L = 50\Omega$ , $C_L = 5pF$ , $f = 10 MHz$ , Figure 4			-43		
NC or NO Capacitance	C(off)	$f = 1kHz$ , Figure 5			5.5		pF
COM Off Capacitance	Ccom(off)				5.5		
COM On Capacitance	Ccom(on)			$f = 1kHz$ , Figure 6		13	
-3dB Bandwidth	BW	$R_L = 50\Omega$ , Figure 7	Full		326		MHz
Distortion	D	$R_L = 10$			0.2		%
<b>Supply</b>							
Power-Supply Range	$V_+$		Full	2		6	V
Positive Supply Current	$I_+$	$V_+ = 5.5V$ , $V_{IN} = 0V$ or $V_{CC}$ , $V_+$ All Channels on or off				1	$\mu A$

**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
- $\Delta R_{ON} = R_{ON\ max} - R_{ON\ min}$ .
- 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 =  $20\log_{10} [V_{COM} / (V_{NO\ or\ V_{NC}})]$ . See Figure 3.

**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.(°C)	Min. <sup>(1)</sup>	Typ. <sup>(2)</sup>	Max. <sup>(1)</sup>	Units
<b>Analog Switch</b>							
Analog Signal Range <sup>(3)</sup>	$V_{ANALOG}$			0		$V_+$	V
On-Resistance	$R_{ON}$	$V_+ = 3V$ , $I_{COM} = -30mA$ , $V_{NO}$ or $V_{NC} = 1.5V$	25		12	18	$\Omega$
			Full			22	
On-Resistance Match Between Channels <sup>(4)</sup>	$\Delta R_{ON}$	$V_+ = 3.3V$ , $I_{COM} = -30mA$ , $V_{NO}$ or $V_{NC} = 0.8V, 2.5V$	25		1	1	
			Full			2	
On-Resistance Flatness <sup>(3,5)</sup>	$R_{FLAT(ON)}$	$V_+ = 3.3V$ , $I_{COM} = -30mA$ , $V_{NO}$ or $V_{NC} = 0.8V, 2.5V$	25		3.5	4	
			Full			5	
<b>Dynamic</b>							
Turn-On Time	$t_{ON}$	$V_+ = 3.3V$ , $V_{NO}$ or $V_{NC} = 1.5V$ , Figure 1	25		14	25	ns
			Full			40	
Turn-Off Time	$t_{OFF}$	$V_+ = 3.3V$ , $V_{NO}$ or $V_{NC} = 1.5V$ , Figure 1	25		4.5	12	
			Full			20	
Charge Injection <sup>(3)</sup>	$Q$	$C_L = 1nF$ , $V_{GEN} = 0V$ , $R_{GEN} = 0V$ , Figure 2	25		1.3	10	pC
<b>Supply</b>							
Supply Current	$I_+$	$V_+ = 3.6V$ , $V_{IN} = 0V$ or $V_+$ All Channels on or off	Full			1	$\mu A$

**Test Circuits/Timing Diagrams**

**Figure 1. Switching Time**

**Figure 2. Charge Injection**

Test Circuits/Timing Diagrams (continued)

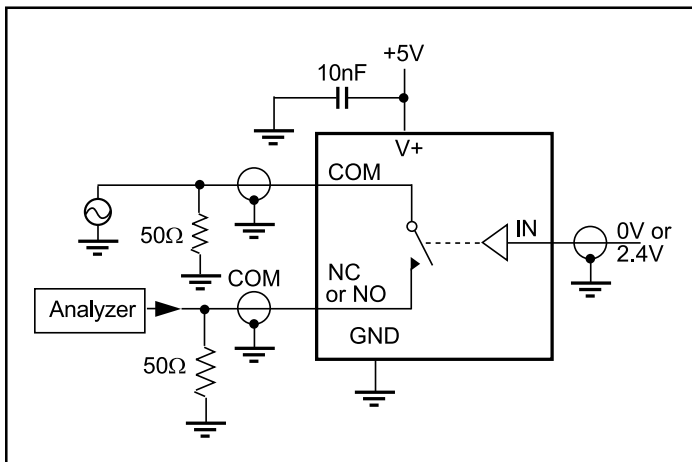


Figure 3. Off Isolation

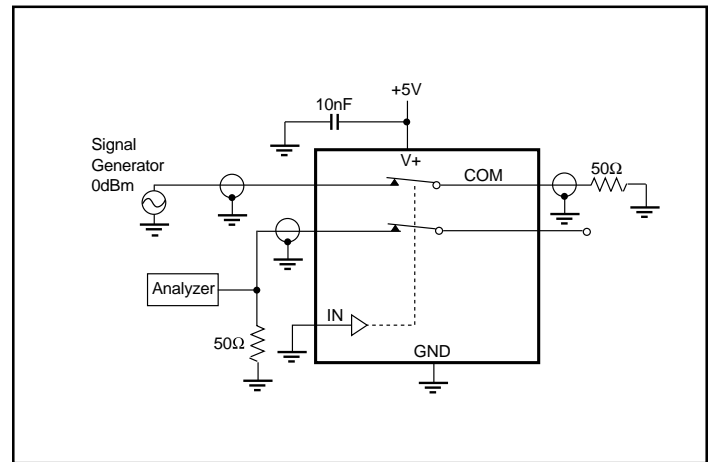


Figure 4. Crosstalk

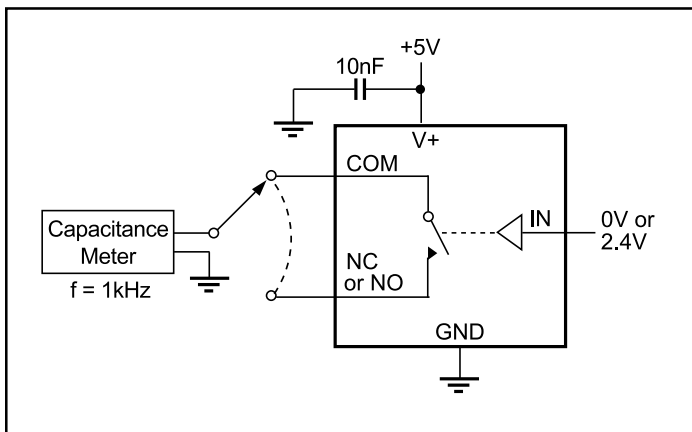


Figure 5. Channel-Off Capacitance

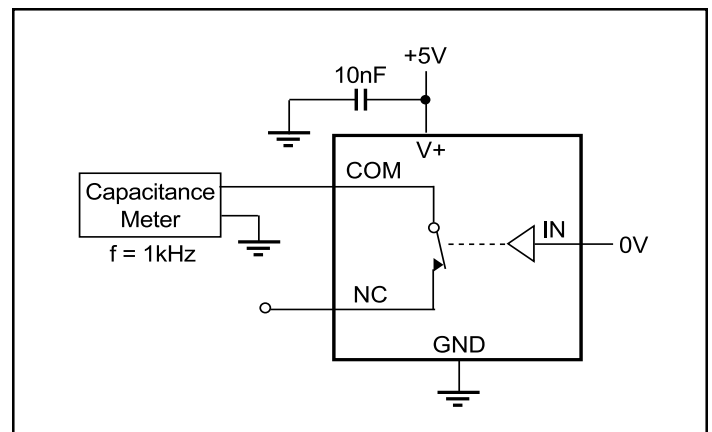


Figure 6. Channel-On Capacitance

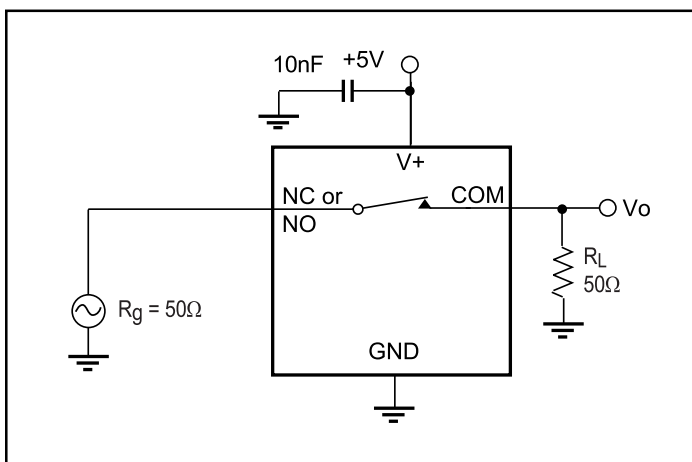


Figure 7. Bandwidth

Ordering Information

P/N	Package
PI5A126W	Narrow SOIC-8
PI5A126UX	MSOP-8
PI5A127W	Narrow SOIC-8
PI5A127UX	MSOP-8