



## PI5A126/PI5A127

### 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.  $Q = 4\text{pC}$  typ.
- High Speed.  $t_{\text{ON}} = 10\text{ns}$  typ.
- Wide -3dB Bandwidth: 230 MHz
- High-Current Channel Capability:  $>100\text{mA}$
- 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

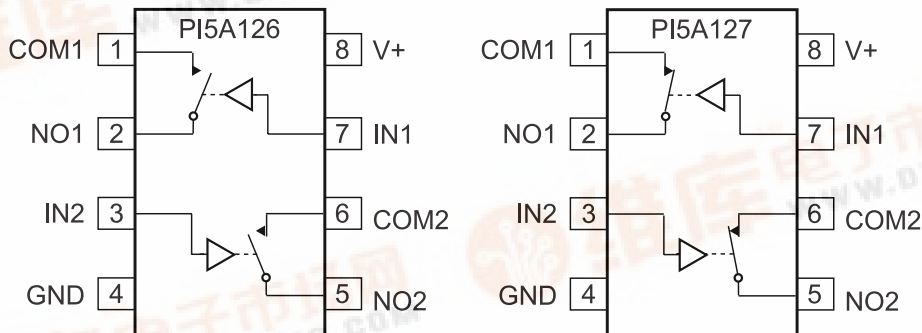
The PI5A126/PI5A127 are dual SPST (single-pole single-throw) analog switches designed for single supply operation. These high-precision devices are ideal for low-distortion audio, video, signal switching and routing.

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  $<10\text{-ohm}$  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 ( $t_{\text{ON}} < 20\text{ns}$ ).

These products are available in 8-pin SOIC and MSOP plastic packages for operation over the industrial temperature range ( $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ ).

#### Functional Diagrams, Pin Configurations and Truth Tables



Top View

Switches shown for logic "0" input

Logic	PI5A126	PI5A127
1	ON	OFF
0	OFF	ON



# PI5A126/PI5A127 Dual, Wide Bandwidth Analog Switch

## 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
			Full			12	
On-Resistance Match Between Channels <sup>(4)</sup>	ΔR <sub>ON</sub>		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	



**PI5A126/PI5A127**  
**Dual, Wide Bandwidth Analog Switch**

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

(V+ = + 5V ±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
Logic Input							
Input High Voltage	V <sub>IH</sub>	Guaranteed logic High Level	Full	2			V
Input Low Voltage	V <sub>IL</sub>	Guaranteed logic Low Level				0.8	
Input Current with Voltage High	I <sub>INH</sub>	V <sub>IN</sub> = 2.4V, all others = 0.8V		-1	0.005	1	
Input Current with Voltage Low	I <sub>INL</sub>	V <sub>IN</sub> = 0.8V, all others = 2.4V		-1	0.005	1	
Dynamic							
Turn-On Time	t <sub>ON</sub>	V <sub>CC</sub> = 5V, Figure 1	25		7	15	ns
			Full			20	
Turn-Off Time	t <sub>OFF</sub>		25		1	7	
			Full			10	
Charge Injection <sup>(3)</sup>	Q	C <sub>L</sub> = 1nF, V <sub>gen</sub> = 0V, R <sub>gen</sub> = 0Ω, Figure 2	25		1.6	10	pC
Off Isolation	OIRR	R <sub>L</sub> = 50Ω, C <sub>L</sub> = 5pF, f = 10MHz, Figure 3			-43		dB
Crosstalk	Xtalk	R <sub>L</sub> = 50Ω, C <sub>L</sub> = 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 <sub>L</sub> = 50Ω, Figure 7	Full		326		MHz
Distortion	D	R <sub>L</sub> = 10			0.2		%
Supply							
Power-Supply Range	V+		Full	2		6	V
Positive Supply Current	I+	V+ = 5.5V, V <sub>IN</sub> = 0V or V <sub>CC</sub> , V+ All Channels on or off				1	μA

**Notes:**

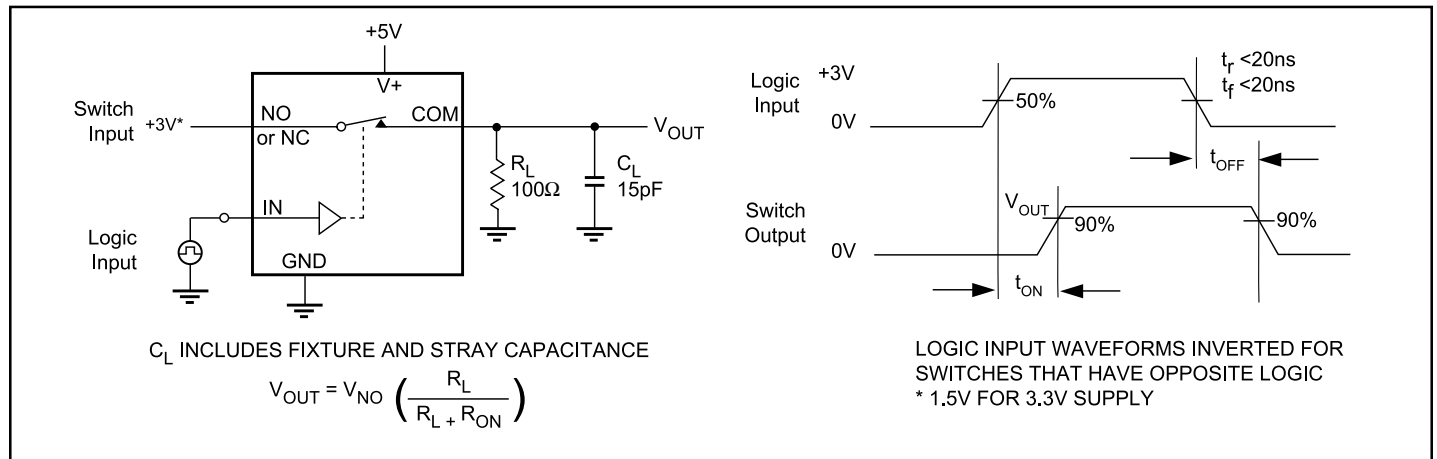
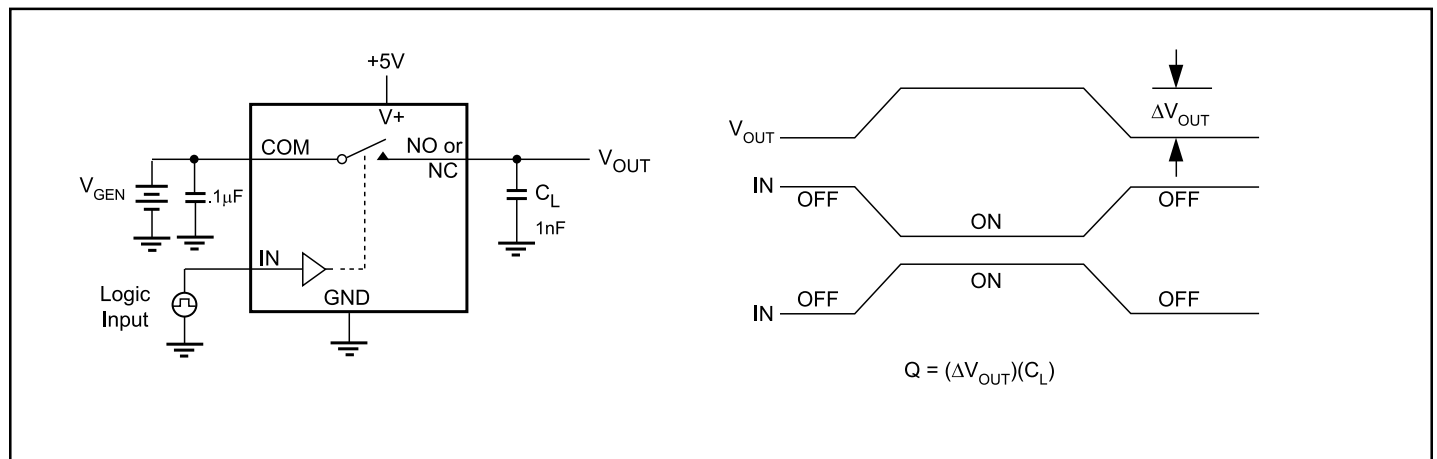
- The algebraic convention, where the most negative value is a minimum and the most positive is a maximum, is used in this data sheet.
- Typical values are for DESIGN AID ONLY, not guaranteed or subject to production testing.
- Guaranteed by design
- ΔR<sub>ON</sub> = R<sub>ON</sub> max - R<sub>ON</sub> 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>COM</sub> / (V<sub>NO</sub> or V<sub>NC</sub>) ]. See Figure 3.



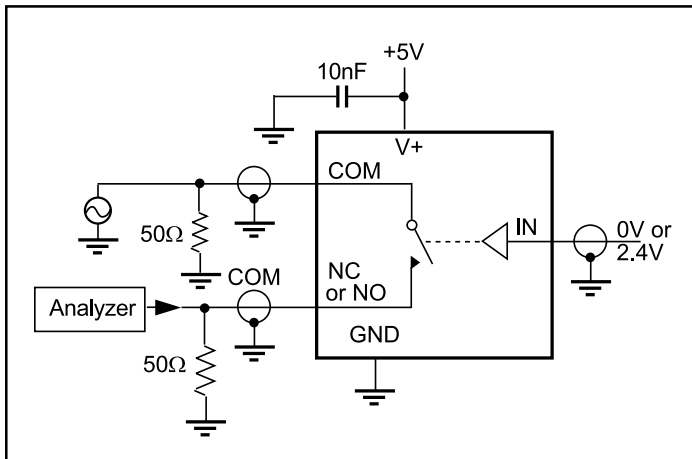
**PI5A126/PI5A127**  
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**Electrical Specifications - Single +3.3V Supply** ( $V_+ = +3.3V \pm 10\%$ ,  $GND = 0V$ ,  $V_{INH} = 2.4V$ ,  $V_{INL} = 0.8V$ )

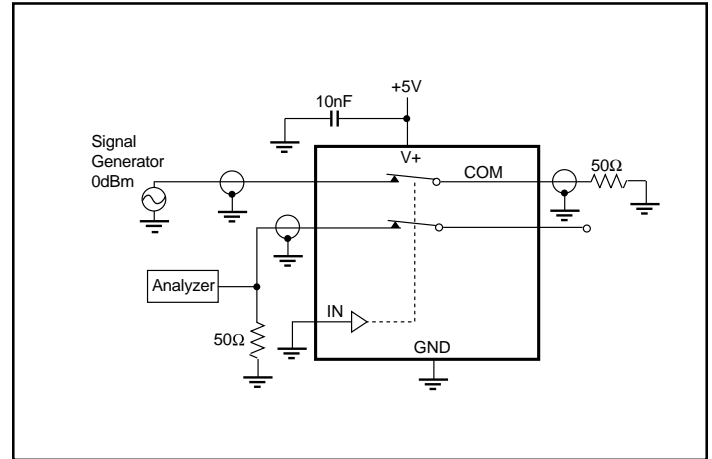
Parameter	Symbol	Conditions	Temp.(°C)	Min. <sup>(1)</sup>	Typ. <sup>(2)</sup>	Max. <sup>(1)</sup>	Units
Analog Switch							
Analog Signal Range <sup>(3)</sup>	V <sub>ANALOG</sub>			0		V+	V
On-Resistance	R <sub>ON</sub>	V+ = 3V, I <sub>COM</sub> = −30mA, V <sub>NO</sub> or V <sub>NC</sub> = 1.5V	25		12	18	Ω
			Full			22	
On-Resistance Match Between Channels <sup>(4)</sup>	ΔR <sub>ON</sub>	V+ = 3.3V, I <sub>COM</sub> = −30mA, V <sub>NO</sub> or V <sub>NC</sub> = 0.8V, 2.5V	25		1	1	
			Full			2	
On-Resistance Flatness <sup>(3,5)</sup>	R <sub>FLAT(ON)</sub>		25		3.5	4	
			Full			5	
Dynamic							
Turn-On Time	t <sub>ON</sub>	V+ = 3.3V, V <sub>NO</sub> or V <sub>NC</sub> = 1.5V, Figure 1	25		14	25	ns
			Full			40	
Turn-Off Time	t <sub>OFF</sub>		25		4.5	12	
			Full			20	
Charge Injection <sup>(3)</sup>	Q	C <sub>L</sub> = 1nF, V <sub>GEN</sub> = 0V, R <sub>GEN</sub> = 0V, Figure 2	25		1.3	10	pC
Supply							
Supply Current	I+	V+ = 3.6V, V <sub>IN</sub> = 0V or V+ All Channels on or off	Full			1	μA

**Test Circuits/Timing Diagrams**

**Figure 1. Switching Time**

**Figure 2. Charge Injection**

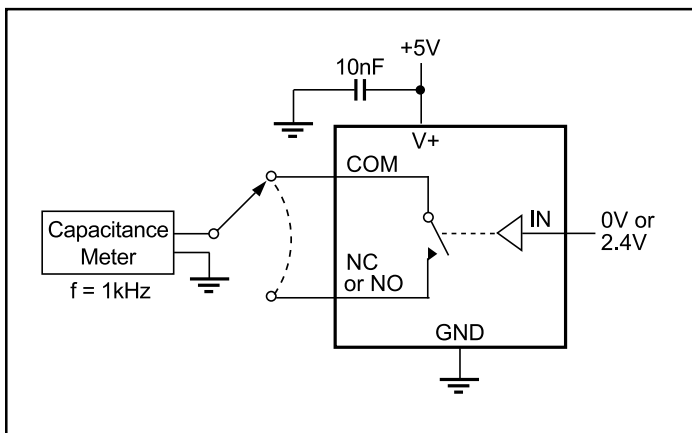
**Test Circuits/Timing Diagrams (continued)**



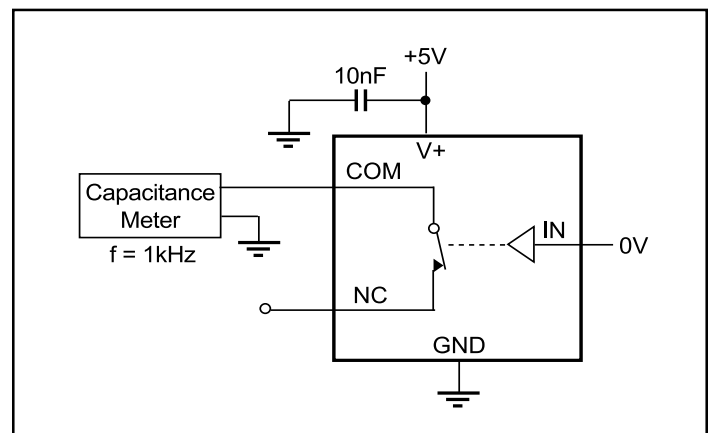
**Figure 3. Off Isolation**



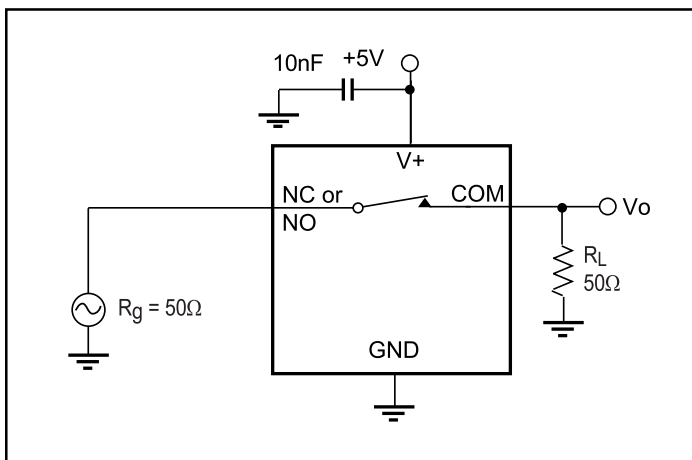
**Figure 4. Crosstalk**



**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