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Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: info@chipsmall.com Web: www.chipsmall.com

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



Dual, Wide Bandwidth Analog Switches

Features

- Single-Supply Operation (+2V to +6V)
- Rail-to-Rail Analog Signal Dynamic Range
- Low On-Resistance (7.2-Ohms with 5V supply)
Minimizes Distortion and Error Voltages
- On-Resistance Flatness, 30hm typ.
- Low Charge Injection Reduces Glitch Errors. Q = 1.6pC typ.
- High Speed. $t_{ON} = 7ns$ typ.
- Wide -3dB Bandwidth: 326 MHz
- High-Current Channel Capability: >100mA
- TTL/CMOS Logic Compatible
- Low Power Consumption (5µW 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

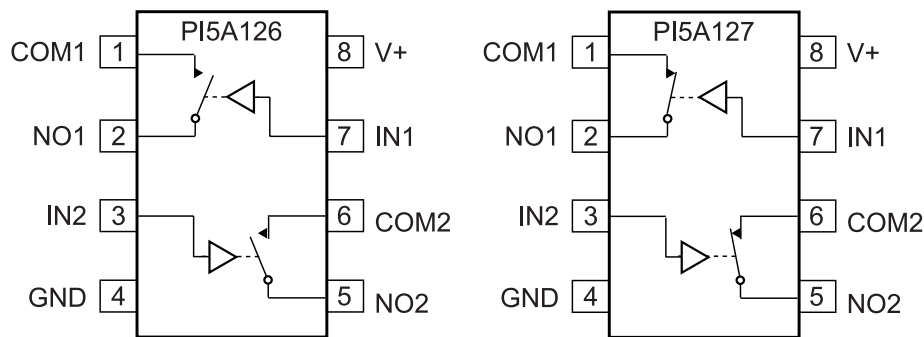
The PI5A126/PI5A127 are dual SPST (single-pole single-throw) analog switches designed for single supply operation. These high-precision devices are ideal for low-distortion audio, video, signal switching and routing.

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+	.....	-0.5V to +7V
V _{IN} , V _{COM} , V _{NC} , V _{NO} (Note 1)	.....	-0.5V to V ₊ +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₊ 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. ⁽²⁾	Typ. ⁽¹⁾	Max. ⁽²⁾	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	
		25		0.20	2		
		Full			4		
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	Ω
			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	-200		200	
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	-200		200	
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	-200		200	

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	
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	Xtalk	R _L = 50Ω, 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	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		MHz
Distortion	D	R _L = 10			0.2		%
Supply							
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	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_{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.

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. ⁽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)	$R_{FLAT(ON)}$		25		3.5	4	
			Full			5	
Dynamic							
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}		25		4.5	12	
			Full			20	
Charge Injection ⁽³⁾	Q	$C_L = 1nF$, $V_{GEN} = 0V$, $R_{GEN} = 0V$, Figure 2	25		1.3	10	pC
Supply							
Supply Current	I_+	$V_+ = 3.6V$, $V_{IN} = 0V$ or V_+ All Channels on or off	Full			1	μA

Test Circuits/Timing Diagrams

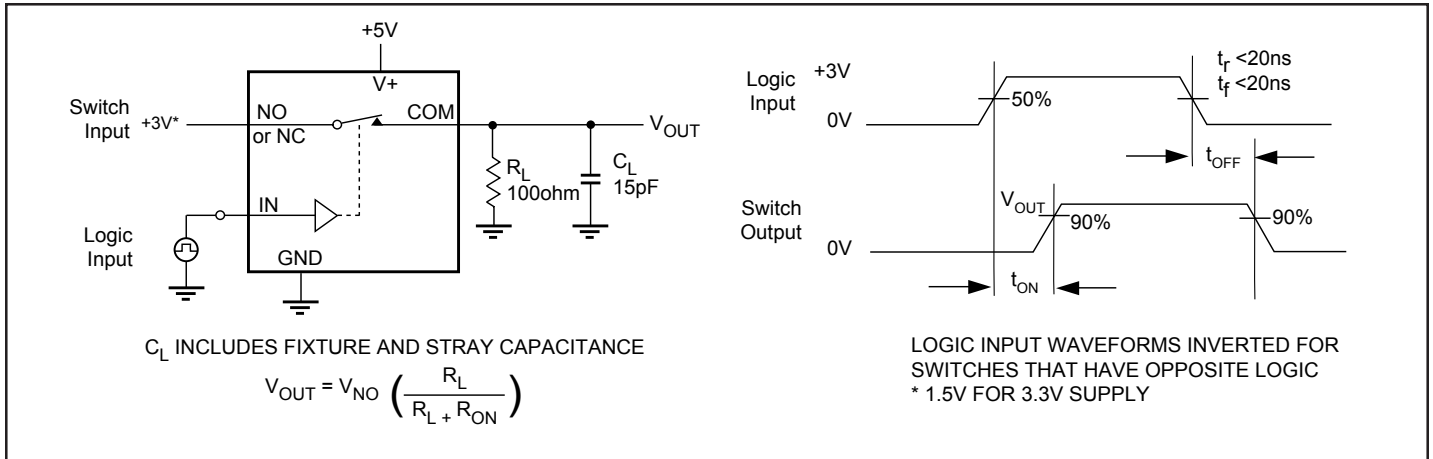


Figure 1. Switching Time

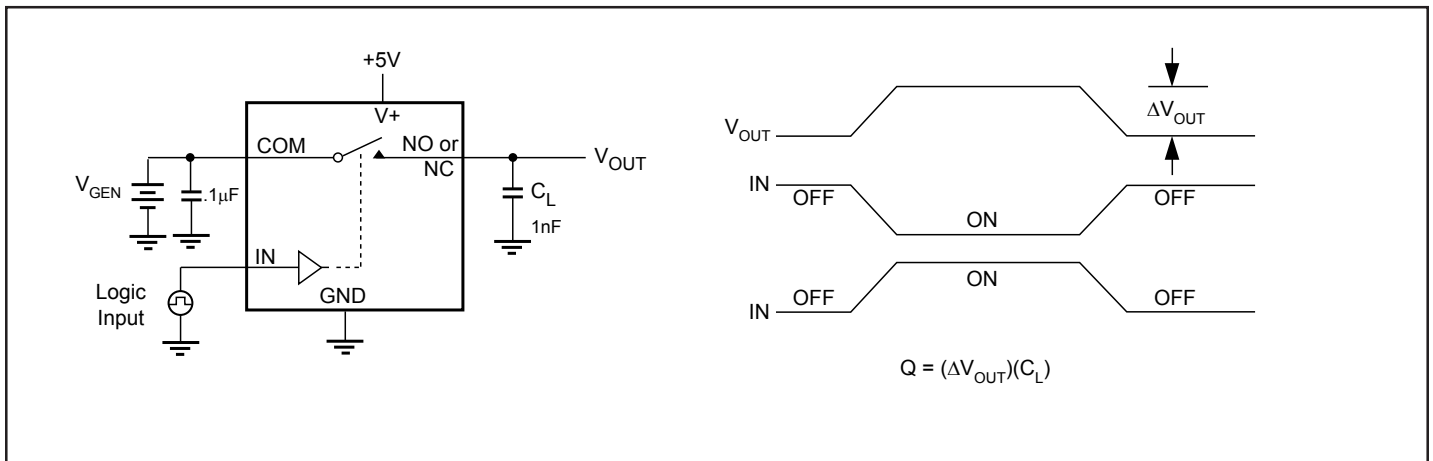


Figure 2. Charge Injection

Test Circuits/Timing Diagrams (continued)

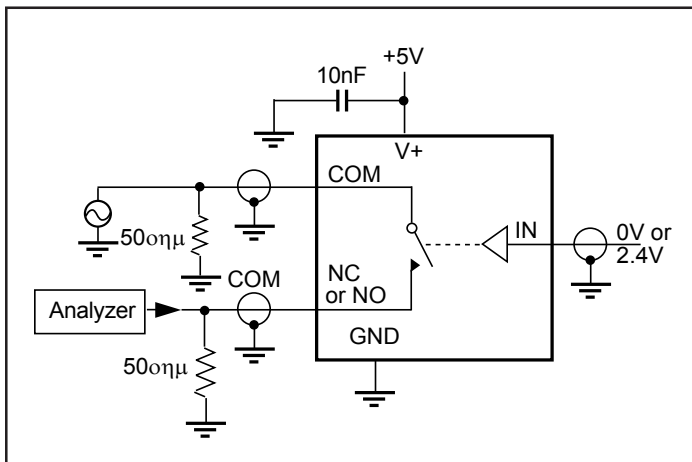


Figure 3. Off Isolation

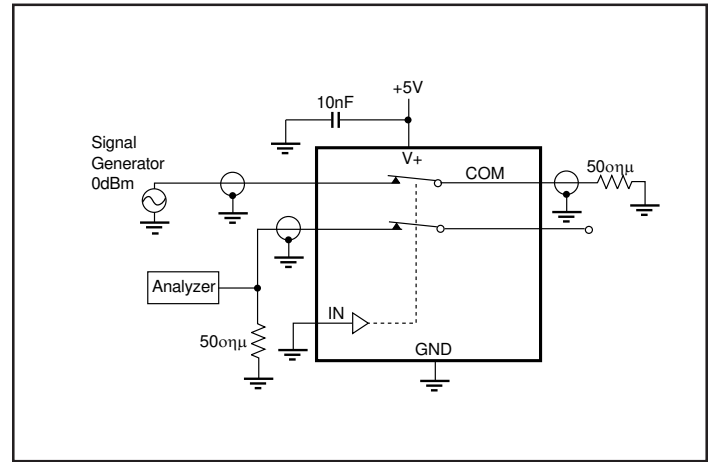


Figure 4. Crosstalk

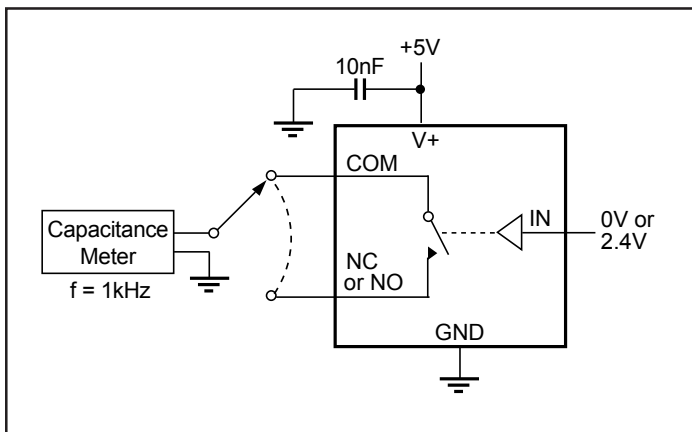


Figure 5. Channel-Off Capacitance

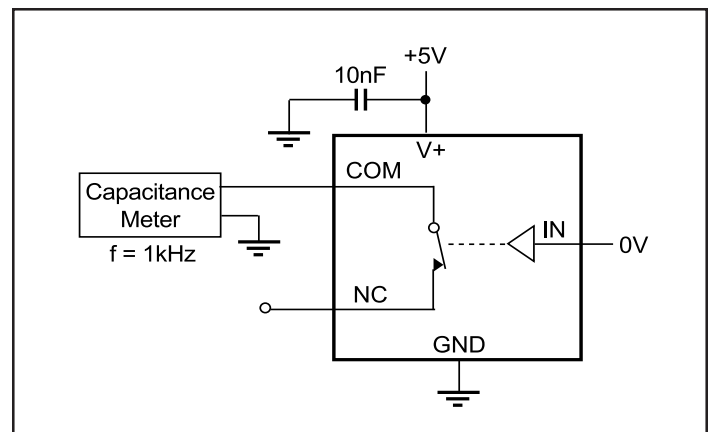


Figure 6. Channel-On Capacitance

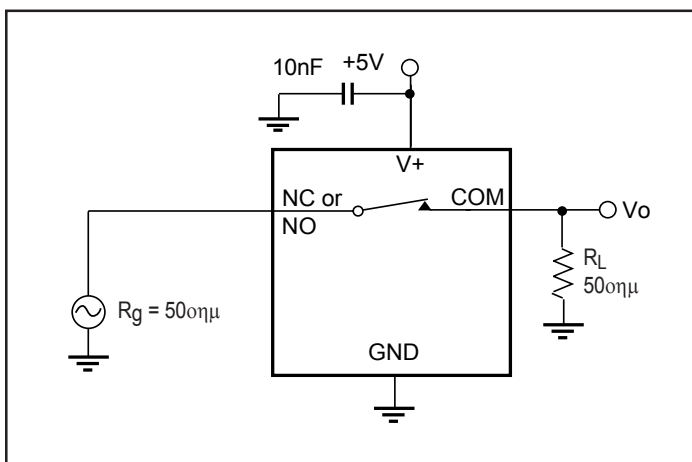


Figure 7. Bandwidth

Ordering Information

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