

**Dual, Wide Bandwidth Analog Switches**
**Features**

- Single-Supply Operation (+2V to +6V)
- Rail-to-Rail Analog Signal Dynamic Range
- Low On-Resistance (7.2-ohm with 5V supply)  
Minimizes Distortion and Error Voltages
- On-Resistance Flatness, 3-ohm typ.
- Low Charge Injection Reduces Glitch Errors.  $Q = 1.6\text{pC typ.}$
- High Speed.  $t_{\text{ON}} = 7\text{ns typ.}$
- Wide -3dB Bandwidth: 326 MHz
- High-Current Channel Capability: >100mA
- TTL/CMOS Logic Compatible
- Low Power Consumption (5 $\mu\text{W typ.}$ )
- Packaging (Pb-free & Green Available)
  - 8-pin, 118 mil plastic MSOP (U)
  - 8-pin, 150 mil plastic SOIC (W)

**Applications**

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

**Description**

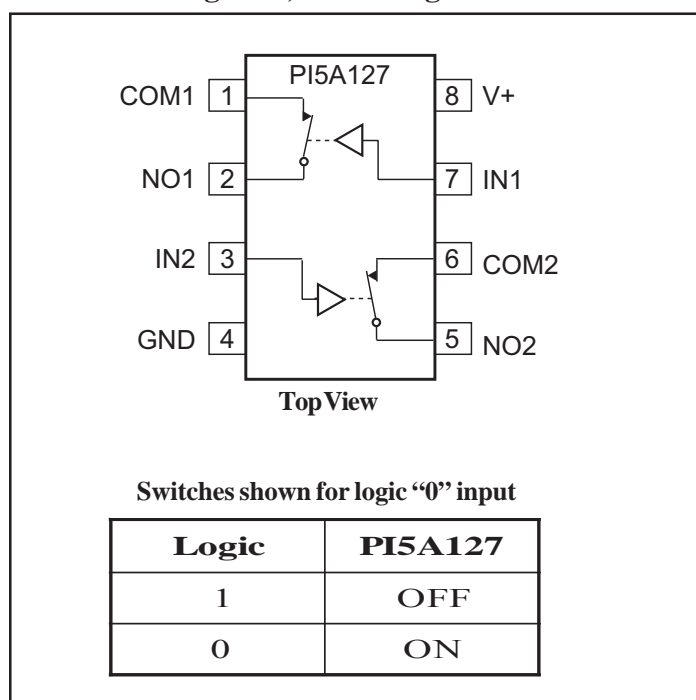
The PI5A127 is a dual SPST (single-pole single-throw) analog switches designed for single supply operation. These high-precision devices are ideal for low-distortion audio, video, signal switching and routing.

The 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-ohm. On-resistance flatness is less than 5-ohm 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**


### Absolute Maximum Ratings

Voltages Referenced to GND

V+	..... -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+	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	

**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.

**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			
-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

**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.

**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>	$R_{FLAT(ON)}$		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	$t_{OFF}$			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	$\mu A$	

**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.  $\Delta R_{ON} = R_{ONmax} - R_{ONmin}$ .
5. Flatness is defined as the difference between the maximum and minimum value of ON-resistance measured.

Test Circuits/Timing Diagrams

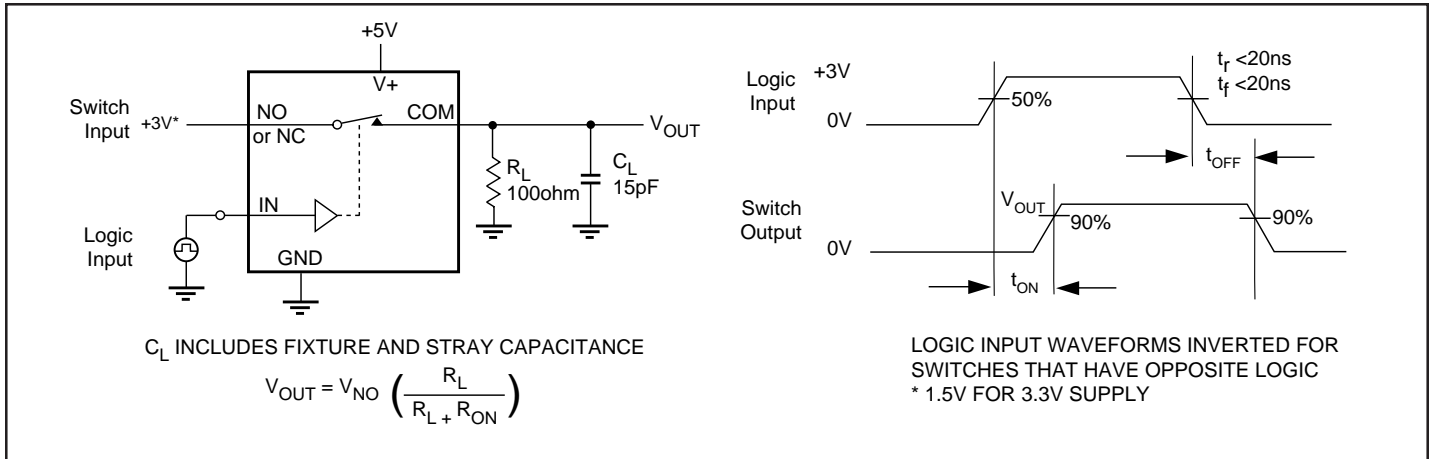


Figure 1. Switching Time

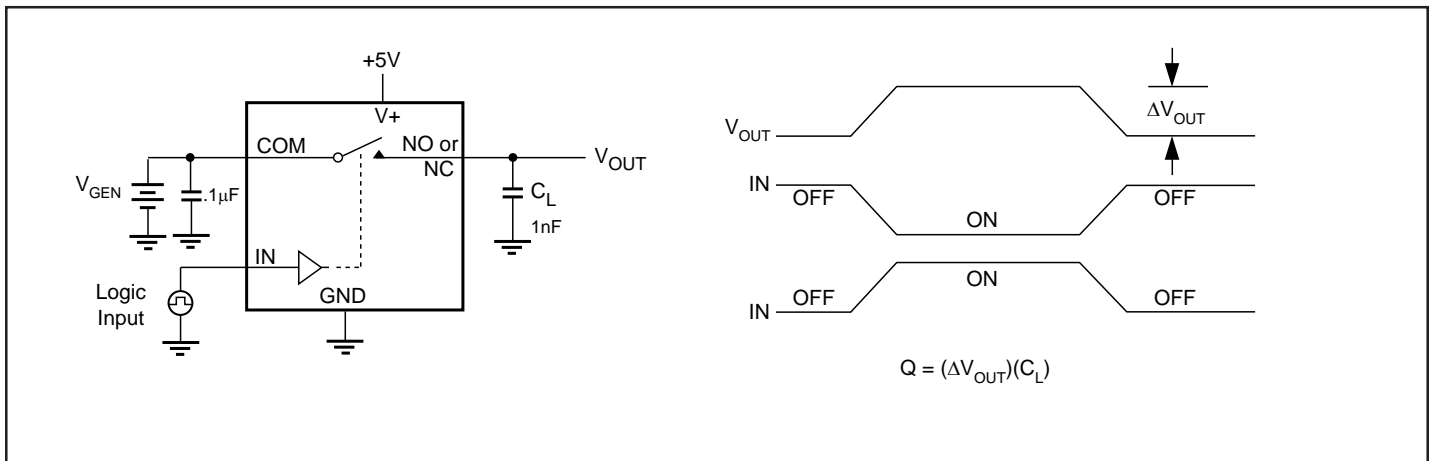
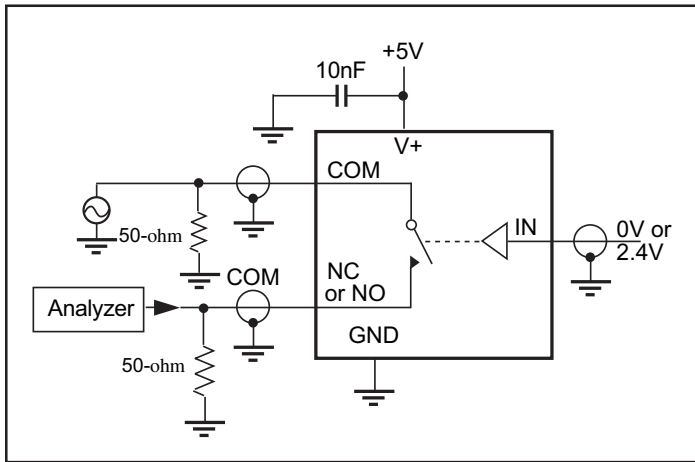
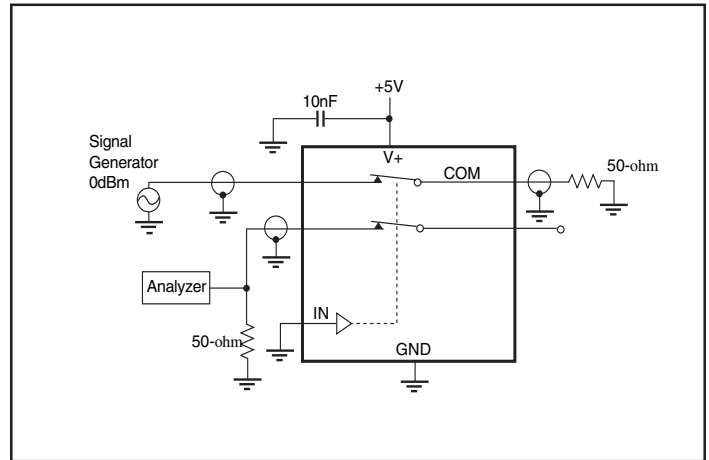


Figure 2. Charge Injection

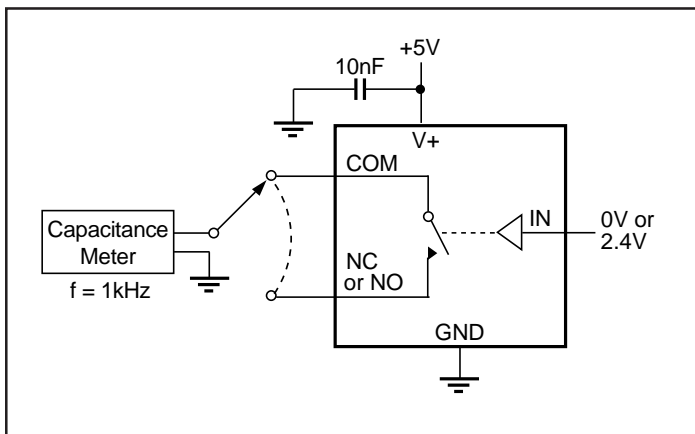
**Test Circuits/Timing Diagrams (continued)**



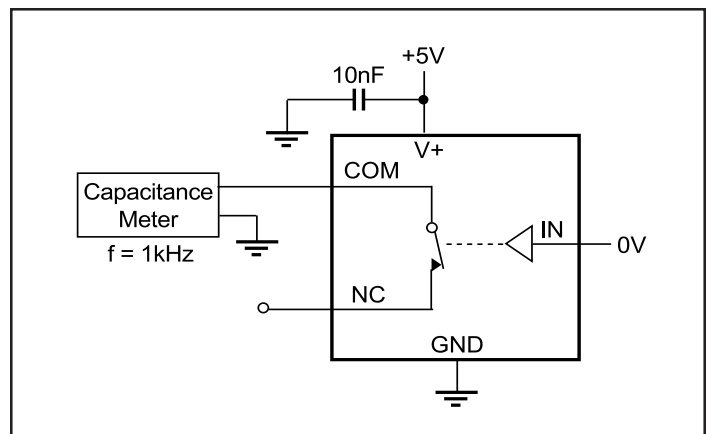
**Figure 3. Off Isolation**



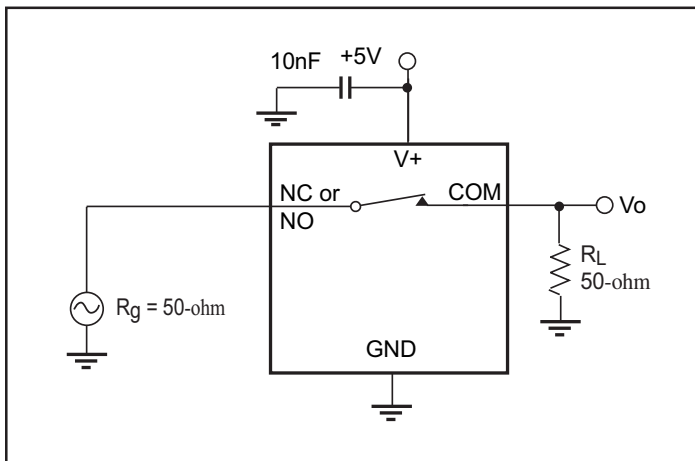
**Figure 4. Crosstalk**



**Figure 5. Channel-Off Capacitance**

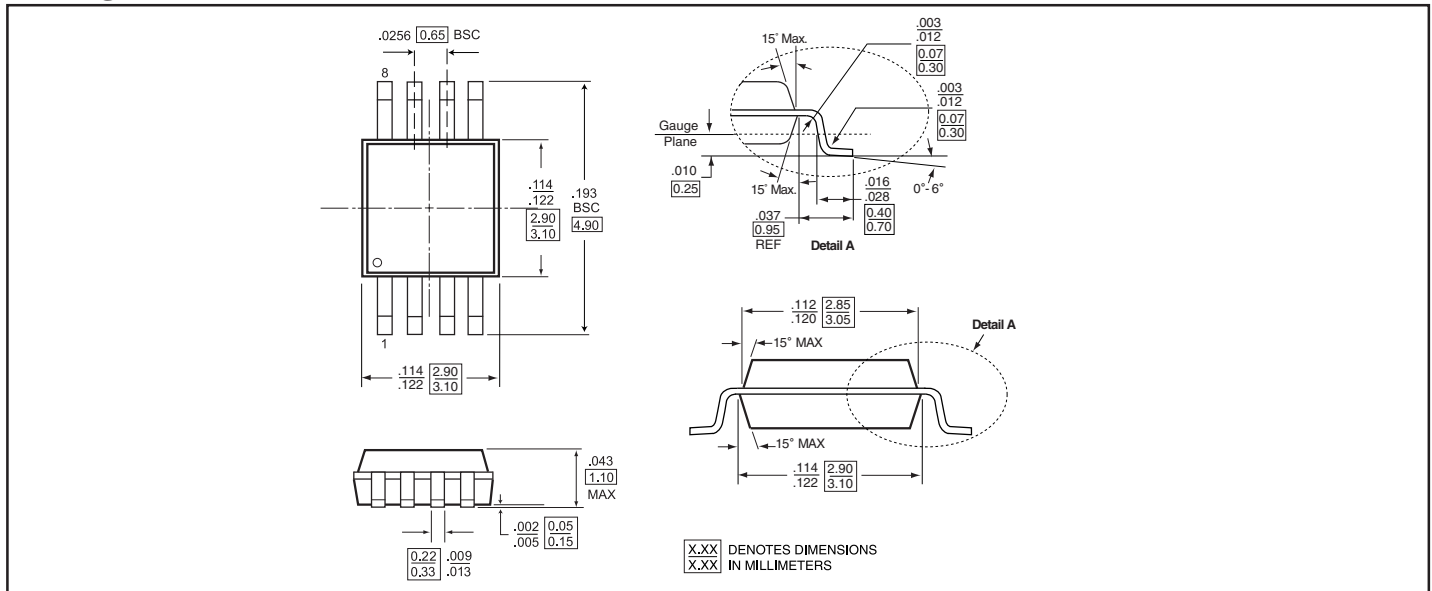


**Figure 6. Channel-On Capacitance**

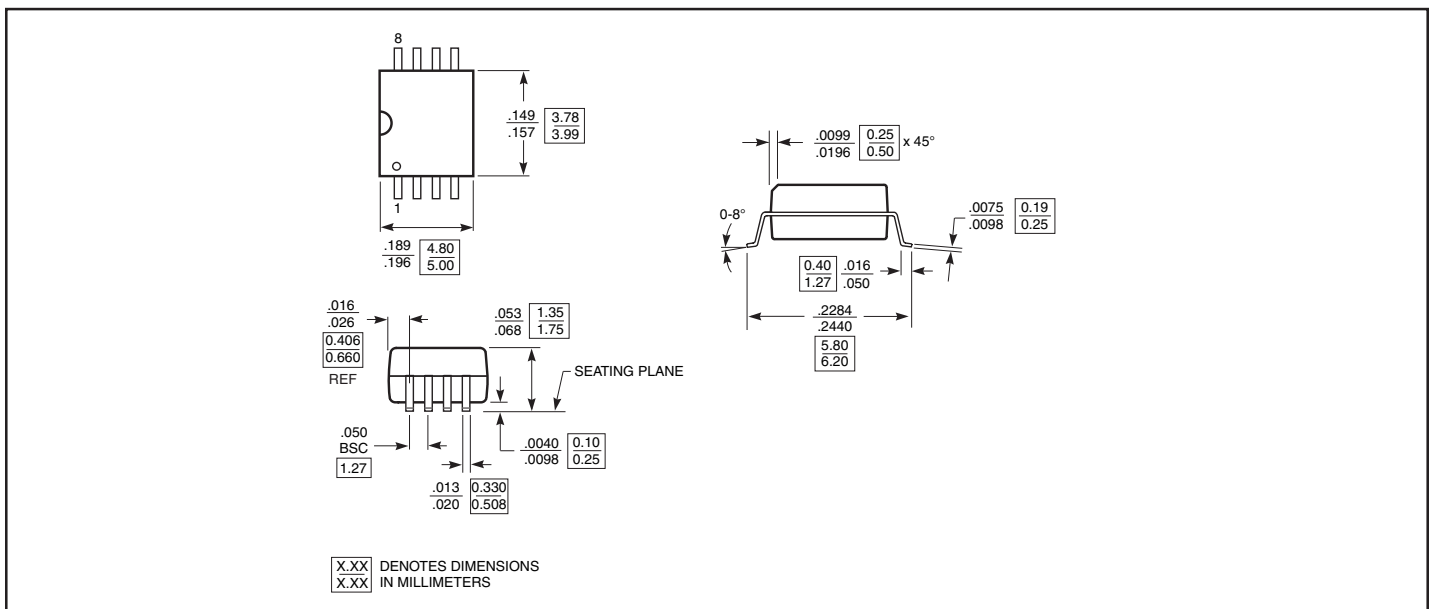


**Figure 7. Bandwidth**

**Package Mechanical: 8-Pin MSOP (U)**



**Package Mechanical: 8-Pin SOIC (W)**



**Ordering Information**

Ordering Code	Package Code	Package Type
PI5A127UX	U	8-pin MSOP
PI5A127UEX	U	Pb-free & Green, 8-pin MSOP (Tape/Reel)
PI5A127W	W	Narrow 8-pin SOIC
PI5A127WX	W	Narrow 8-pin SOIC (Tape/Reel)