

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. $t_{ON} = 7\text{ns typ.}$
- Wide -3dB Bandwidth: 326 MHz
- High-Current Channel Capability: $>100\text{mA}$
- 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.

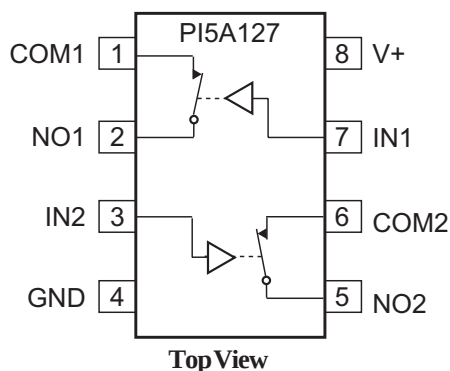
The PI5A127 is a normally closed (NC) switch.

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

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

Functional Diagrams, Pin Configurations and Truth Tables



Switches shown for logic "0" input

Logic	PI5A127
1	OFF
0	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
			Full			12	
On-Resistance Match Between Channels ⁽⁴⁾	ΔR _{ON}		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	

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.

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	Ccom(off)				5.5		
COM On Capacitance	Ccom(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.

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

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

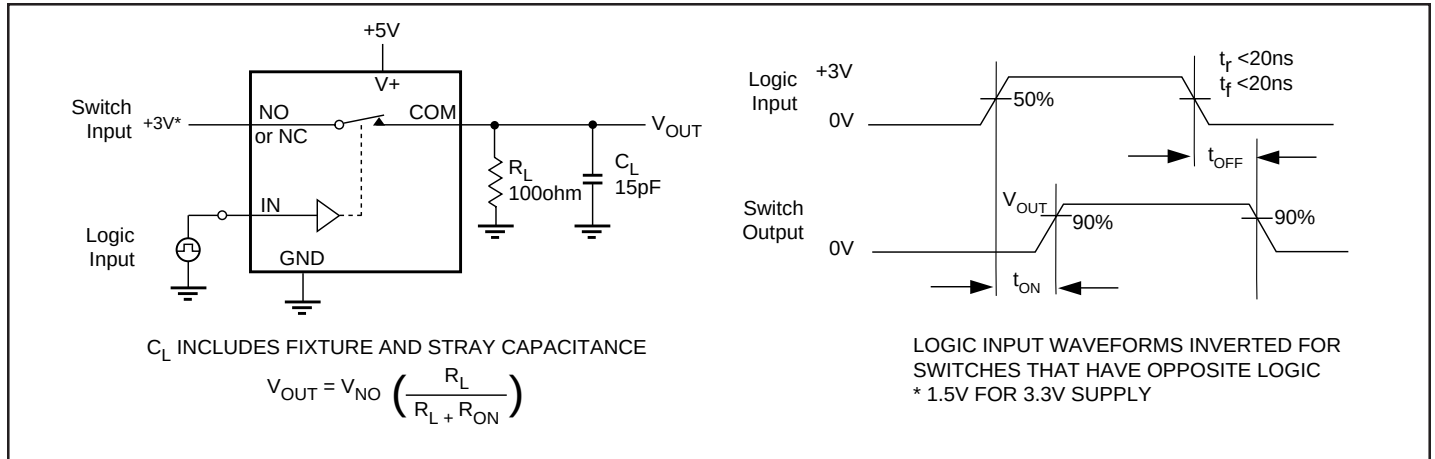


Figure 1. Switching Time

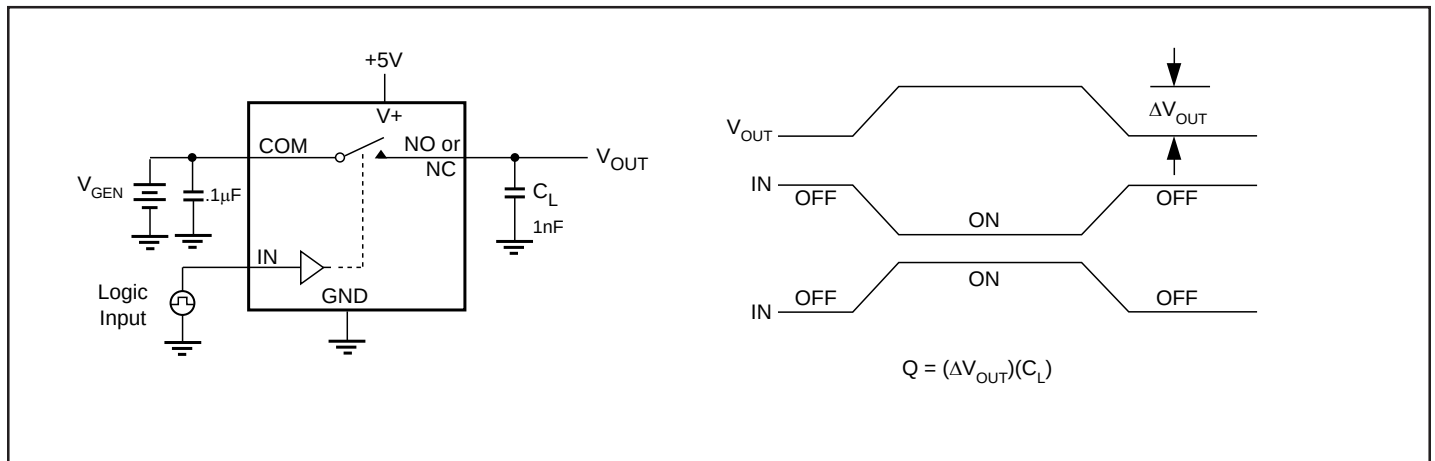


Figure 2. Charge Injection

Test Circuits/Timing Diagrams (continued)

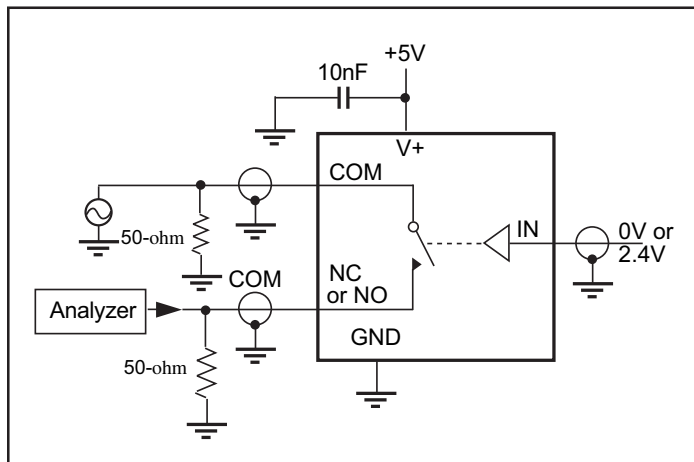


Figure 3. Off Isolation

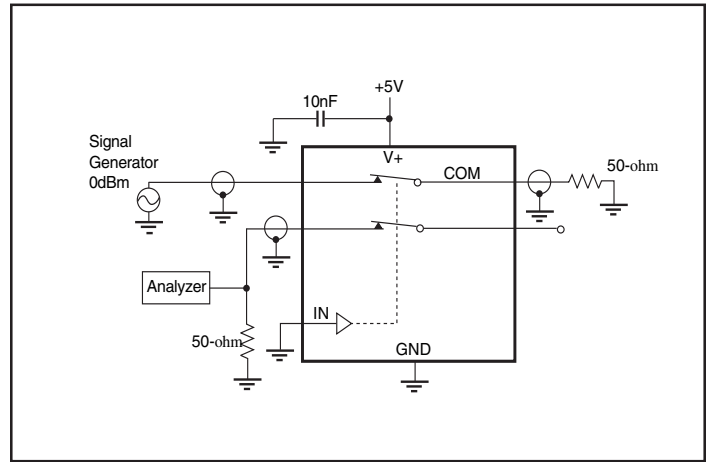


Figure 4. Crosstalk

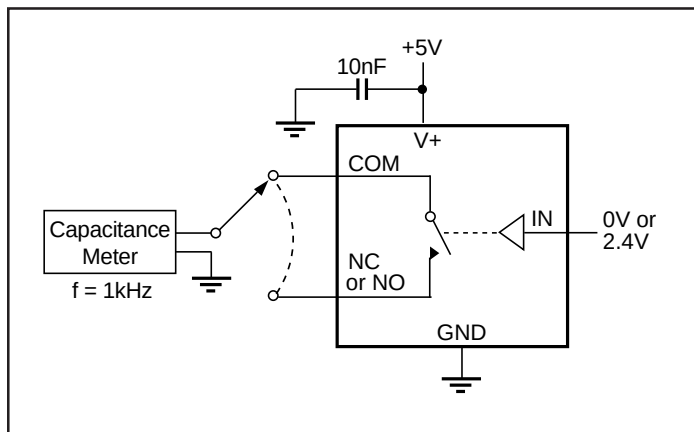


Figure 5. Channel-Off Capacitance

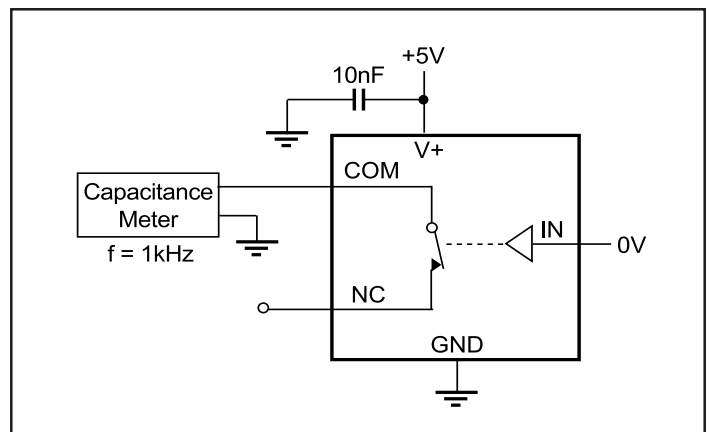


Figure 6. Channel-On Capacitance

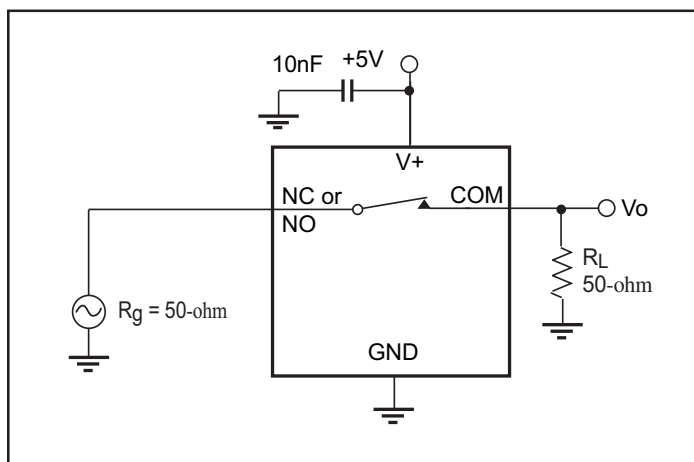
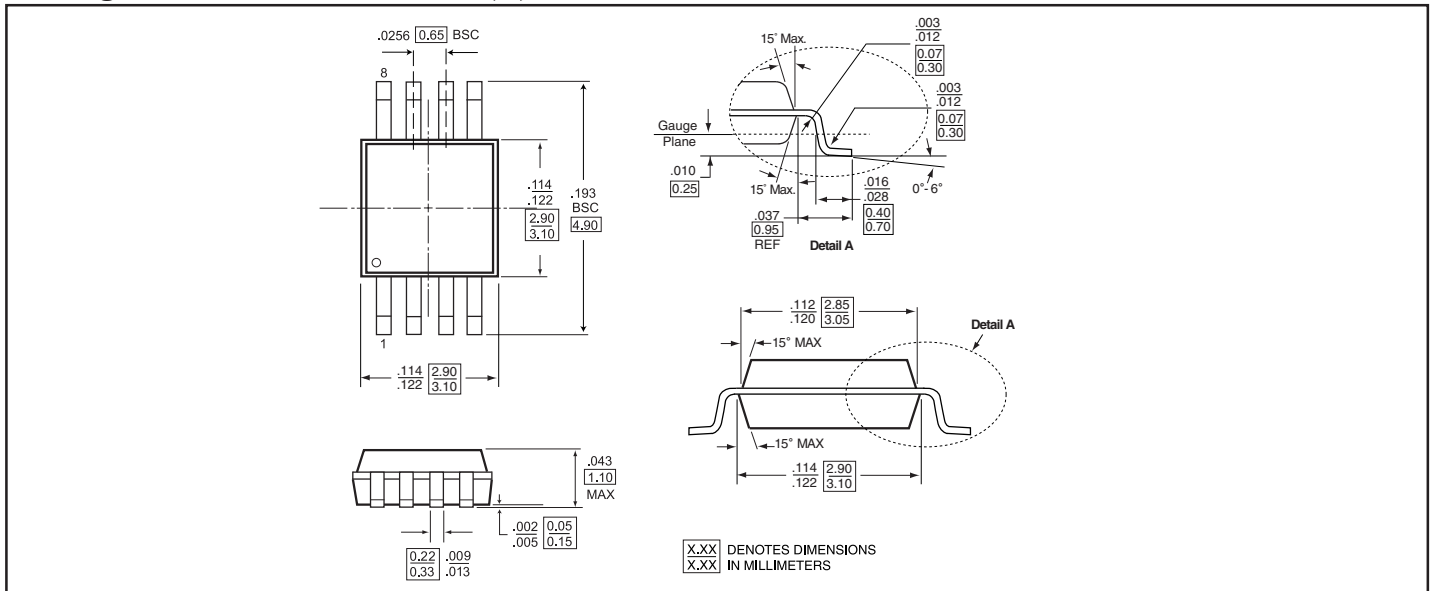
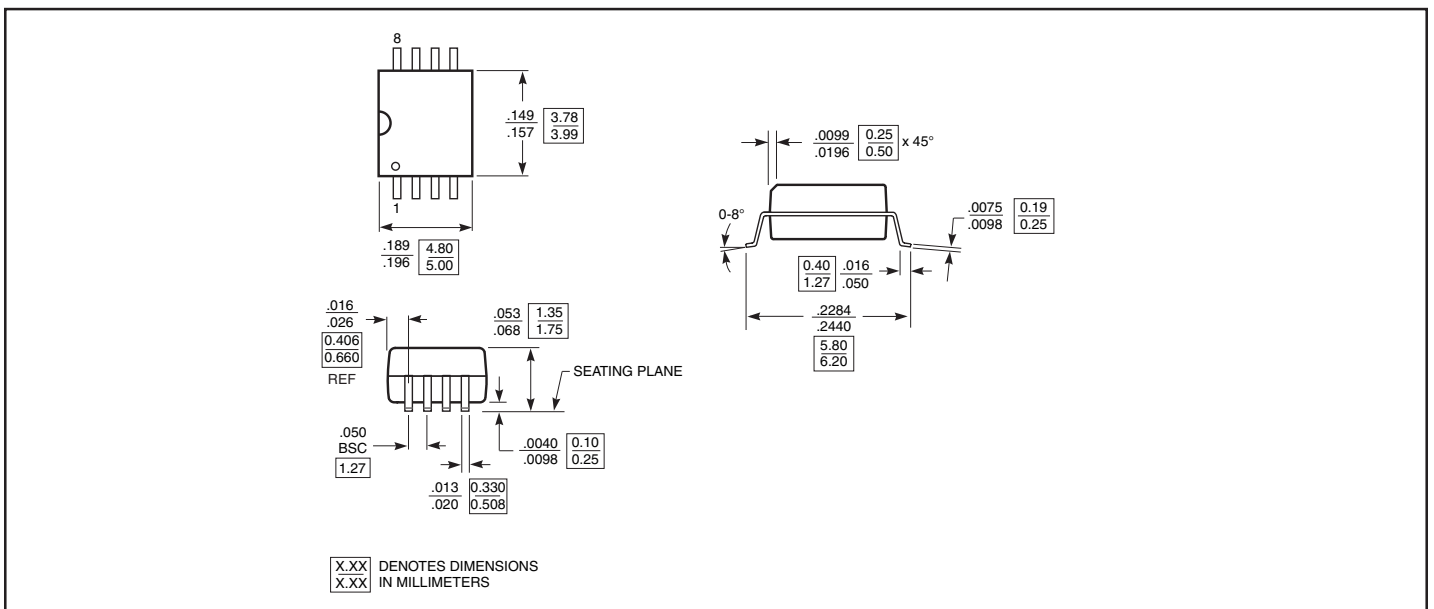


Figure 7. Bandwidth

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)