Precision Wide Bandwidth Quad Analog Switches

Features

- Single-Supply Operation (+2V to +6V)
- Rail-to-Rail Analog Signal Range
- Low On-Resistance (6-ohm typ @ 5V) Minimizes Distortion and Error Voltages
- R_{ON} Matching Between Channels, 0.4-ohm typ
- On-Resistance Flatness, 2-ohm typ
- Low Charge Injection. Q=4pC typ. Reduces Step errors, "clicking, popping" noise
- High Speed. t_{ON}, 10ns typ
- Very Low Crosstalk: -72dB @ 30 MHz
- Wide -3dB Bandwidth: >200 MHz
- High-Current Channel Capability: >100mA
- TTL/CMOS Logic Compatible
- Low Power Consumption (0.5µW typ)
- Pin-compatible with DG3XX, DG4XX, MAX39X
- Packaging (Pb-free & Green):
  - 16-pin QSOP (Q)

Description

The 392A is a monolithic analog switches designed for low-voltage, single-supply operation. This high-precision device is ideal for low-distortion audio, video, signal switching and routing applications.

The PI5A392A has four normally open (NO) switches. Each switch conducts current equally well in either direction when on. When off they block voltages up to the power-supply rails.

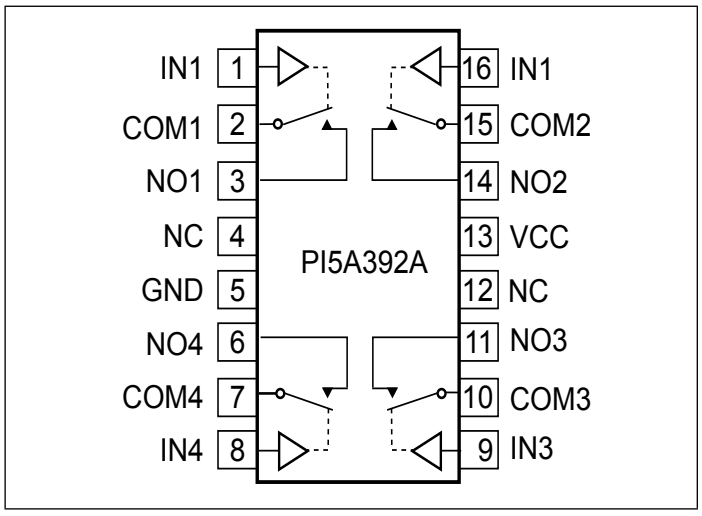
The 392A is fully specified with +5V, and +3.3V supplies. With +5V, they guarantee <12-ohm on-resistance. On-resistance matching between channels is within 2-ohm. On-resistance flatness is less than 4ohm over the full signal range. The PI5A39X family guarantees fast switching speeds (tON < 20ns).

This product is available in the 16-pin QSOP package for operation over the industrial (-40oC to +85 oC) temperature range.

Applications

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

Functional Diagram, Pin Configuration and Truth Tables



Logic	Switch
0	OFF
1	ON

Switch IS shown with logic "0" input.

Absolute Maximum Ratings

Parameter	Min.	Max.	Units
Storage Temperature	-65	150	°C
Ambient Temperature with Power Applied	-40	85	°C
Supply Voltage to Ground Potential	-0.5	7.0	V
DC Input Voltage	-0.5	0.5	V
DC Output Current		120	mA
Power Dissipation		0.5	W

Stress beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device.

DC Characteristics (Over the Operating Range, $T_A = -40°C$ to $+85°C$, $V_{CC} = 5V \pm 10\%$, GND = 0V)

Parameters	Description	Test Conditions[1]	Min	Typ	Max	Units
V_{ANALOG}	Analog Signal Range		0		V_{CC}	V
R_{ON}	ON-Resistance	$I_{NC\ or\ NO}$ = 10 mA to 30 mA		6	18	ohm
ΔR_{ON}	Match Between Channels			0.4	2	
$R_{FLAT(ON)}$	R_{ON} Flatness	I_{ON} = 1 mA, V_{NO}, V_{NC} = 0V TO 5V		1	2	
$I_{NO(OFF)}$ $I_{NO(ON)}$	On/Off Leakage Current	V_{NO}, V_{NC} = 4.5V	-30		30	nA
I_{CC}	Quiescent Supply Current	V_{CC} = 5.5V, V_{IN} = 0V OR VCC			100	
I_O	Output Current	V_{NO}, V_{NC} or V_{COM} = 0V to 5V	100			mA
V_{IH}	Input High Voltage	Guaranteed Logic HIGH Level	2.0			V
V_{IL}	Input Low Voltage	Guaranteed Logic LOW Level	-0.5		0.8	
I_{IH}	Input High Current	V_{CC} = Max., V_{IN} = VCC			±1	µA
I_{IL}	Input Low Current	V_{CC} = Max., V_{IN} = GND			±1	

Notes:
1. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for applicable device type.

Dynamic Electrical Characteristics (Over the Operating Range, T_A = –40°C to +85°C, V_{CC} = 5V ±10%, GND = 0V)

Parameters	Description	Test Conditions[1]	Min	Typ	Max	Units
t_{ON}	Turn-on Time	V_{COM} = 3.0V, see Figure 1		10	20	NS
t_{OFF}	Turn-off Time	V_{COM} = 3.0V, see Figure 1		5	10	NS
X_{TALK}	Crosstalk	R_L = 100 ohm, f = 30 MHz, see Figure 4		-72		dB
$C_{(OFF)}$	NC or NO Capacitance	f = 1 kHz		13		pF
OIRR	Off Isolation	R_L = 100 ohm, f = 30 MHz, see Figure 5		-55		dB
BW	Bandwidth –3 dB	R_L = 100 ohm, see Figure 3		200		MHz
D	Distortion ΔRON/RL[2]	R_L = 100 ohm		2		%
Q	Charge Injection	C_L = 1 nF, V_{Gen} = 0V		3	5	pC

DC Characteristics (Over the Operating Range, T_A = –40°C to +85°C, V_{CC} = 3.3V ±10%, GND = 0V)

Parameters	Description	Test Conditions[1]	Min	Typ	Max	Units
V_{ANALOG}	Analog Signal Range		0		V_{CC}	V
R_{ON}	ON-Resistance	$I_{NC\ or\ NO}$ = 10 mA to 30 mA		15	28	ohm
ΔR_{ON}	Match Between Channels			0.4	2	
$R_{FLAT(ON)}$	R_{ON} Flatness	I_{ON} = 1 mA, V_{NO}, V_{NC} = 0V TO 5V		1	2	
$I_{NO(OFF)}$ $I_{NO(ON)}$	On/Off Leakage Current	V_{NO}, V_{NC} = 4.5V	-30		30	nA
I_{CC}	Quiescent Supply Current	V_{CC} = 5.5V, V_{IN} = 0V OR VCC			100	
I_O	Output Current	V_{NO}, V_{NC} or V_{COM} = 0V to 5V	80			mA
V_{IH}	Input High Voltage	Guaranteed Logic HIGH Level	2.0			V
V_{IL}	Input Low Voltage	Guaranteed Logic LOW Level	-0.5		0.8	
I_{IH}	Input High Current	V_{CC} = Max., V_{IN} = VCC			±1	µA
I_{IL}	Input Low Current	V_{CC} = Max., V_{IN} = GND			±1	

Dynamic Electrical Characteristics (Over the Operating Range, T_A = –40°C to +85°C, V_{CC} = 5V ±10%, GND = 0V)

Parameters	Description	Test Conditions[1]	Min	Typ	Max	Units
t_{ON}	Turn-on Time	V_{COM} = 3.0V, see Figure 1		20	40	NS
t_{OFF}	Turn-off Time	V_{COM} = 3.0V, see Figure 1		10	20	NS
X_{TALK}	Crosstalk	R_L = 100 ohm, f = 30 MHz, see Figure 4		-72		dB
$C_{(OFF)}$	NC or NO Capacitance	f = 1 kHz		15		pF
OIRR	Off Isolation	R_L = 100 ohm, f = 30 MHz, see Figure 5		-55		dB
BW	Bandwidth –3 dB	R_L = 100 ohm, see Figure 3		190		MHz
D	Distortion ΔRON/RL[2]	R_L = 100 ohm		2		%
Q	Charge Injection	C_L = 1 nF, V_{Gen} = 0V		3	10	pC

Notes:
1. For conditions shown as Max or Min, use appropriate value specified under Electrical Characteristics for applicable device type.
2. $\Delta R_{ON} = \Delta R_{ON\,max} - R_{ON\,min}$.
3. Flatness is defined as the difference between the maximum and minimum value of on-resistance as measured over the specified analog signal range.

Applications

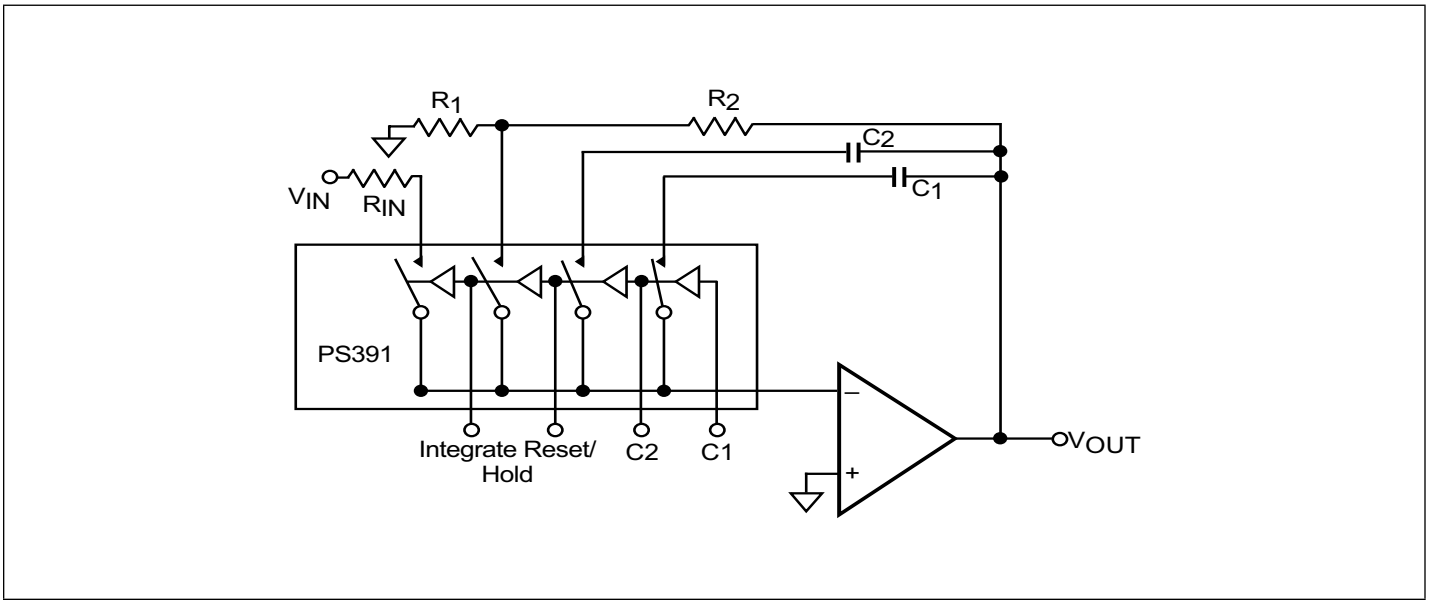


Figure 1. Programmable Integrator and Sample/Hold

The 5A39X can be used to insert various capacitors (C_1, C_2) and set proper RC times for integration. Resistors R_1 and R_2 set initial gain. The R_{IN} resistor X C_1 or C_2 sets the RC time. The reset switch discharges the hold capacitor through R_{IN}.

Test Circuits

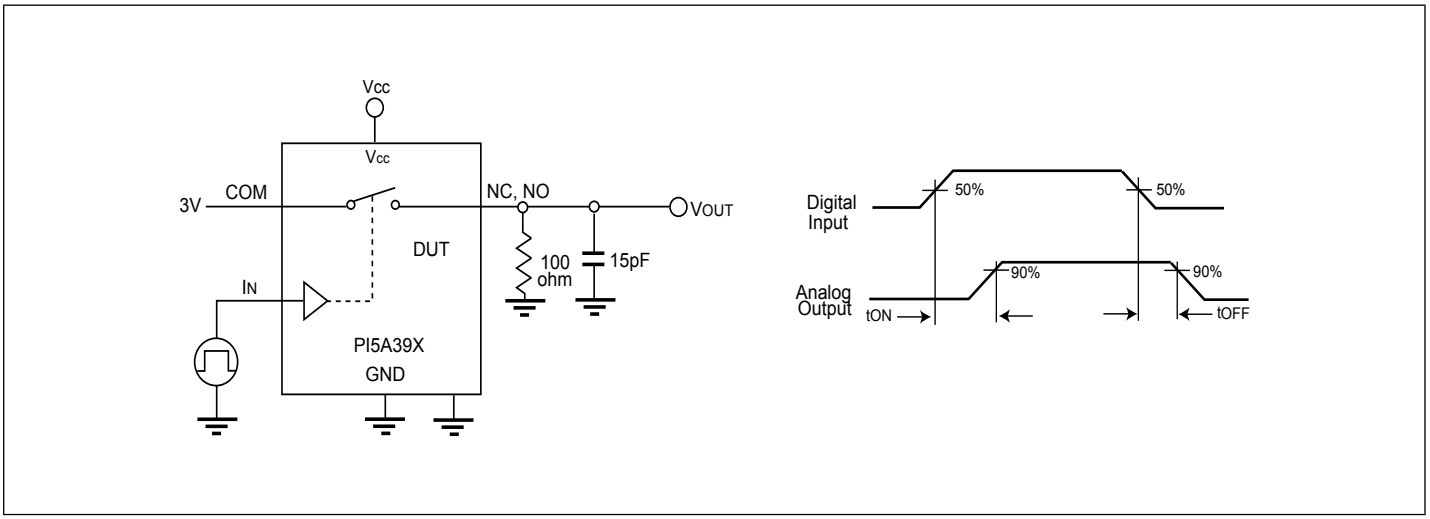


Figure 2. Switching Time

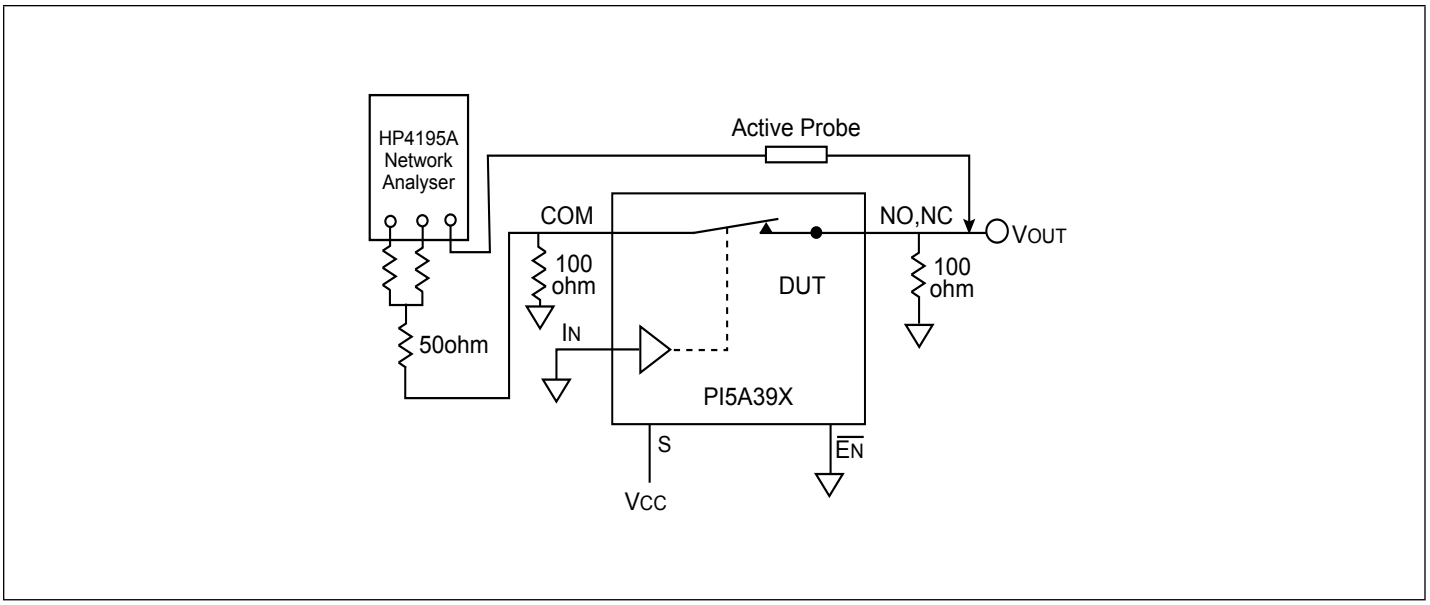


Figure 3. Bandwidth

Typical Operating Characteristics

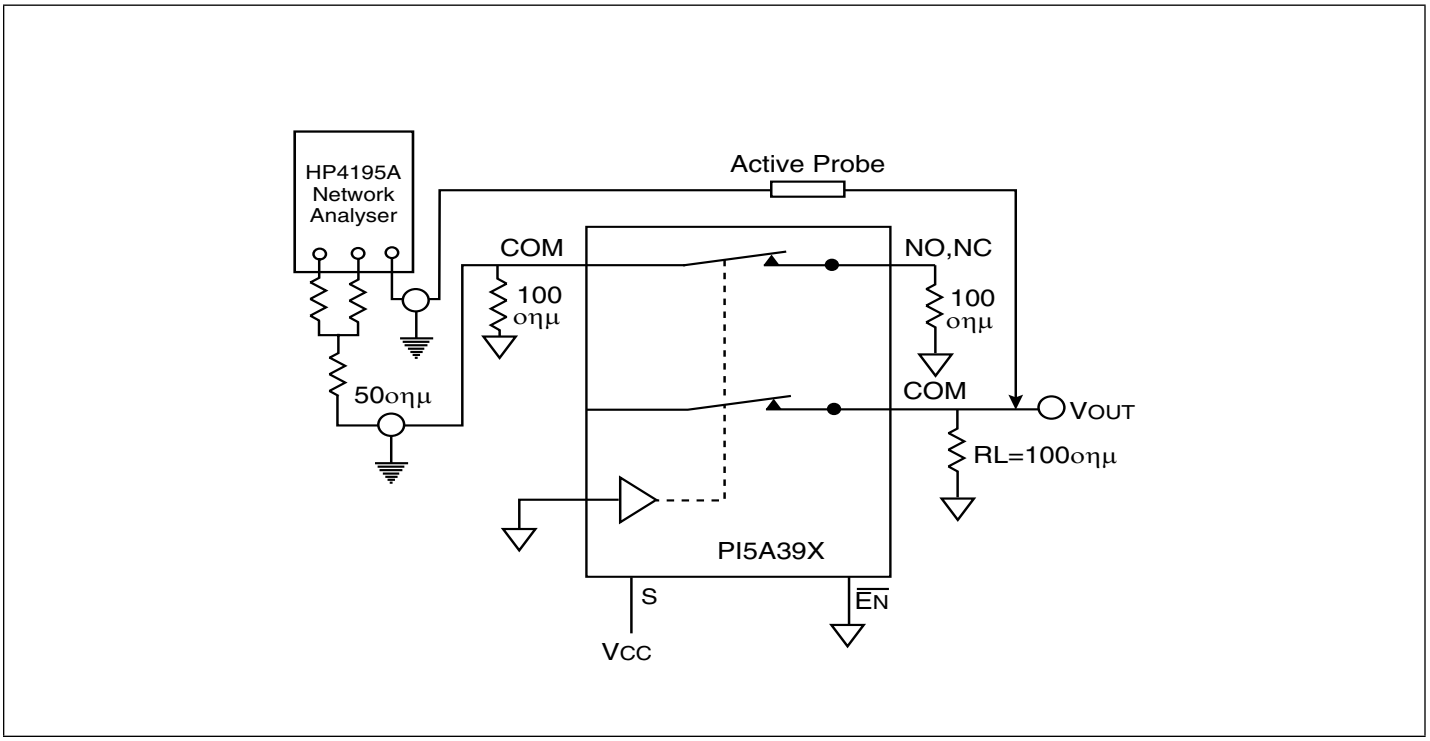


Figure 4. Crosstalk

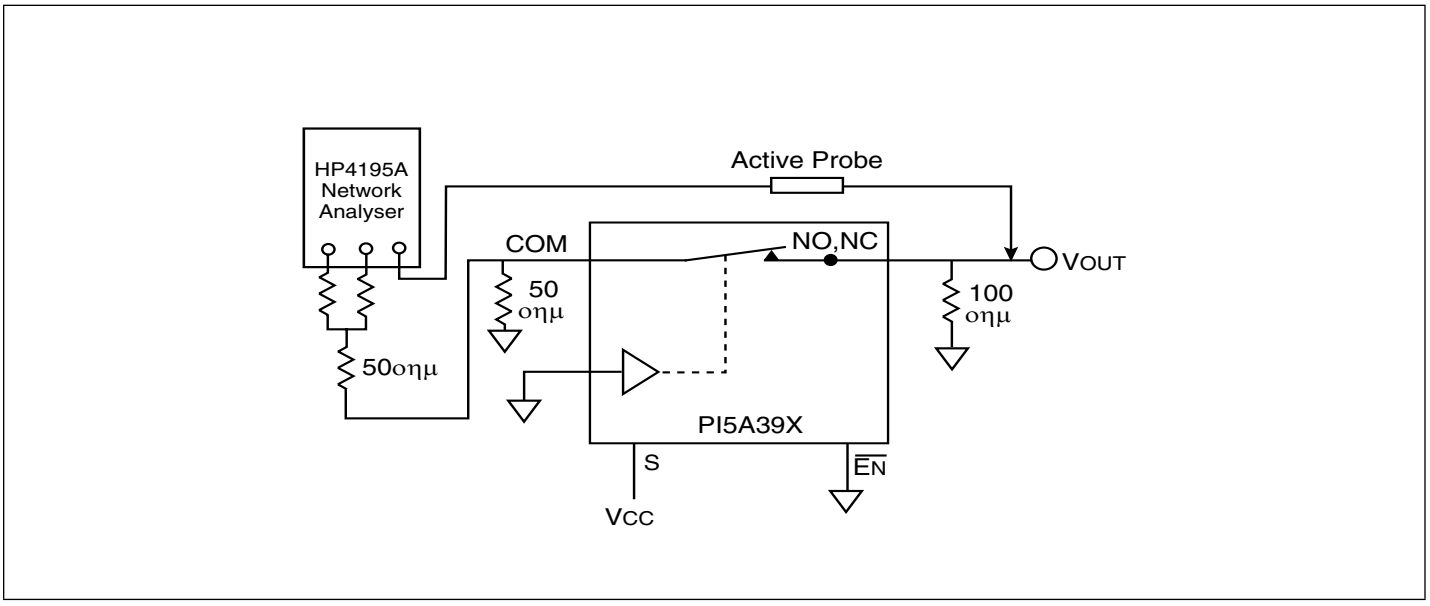


Figure 5. Off Isolation

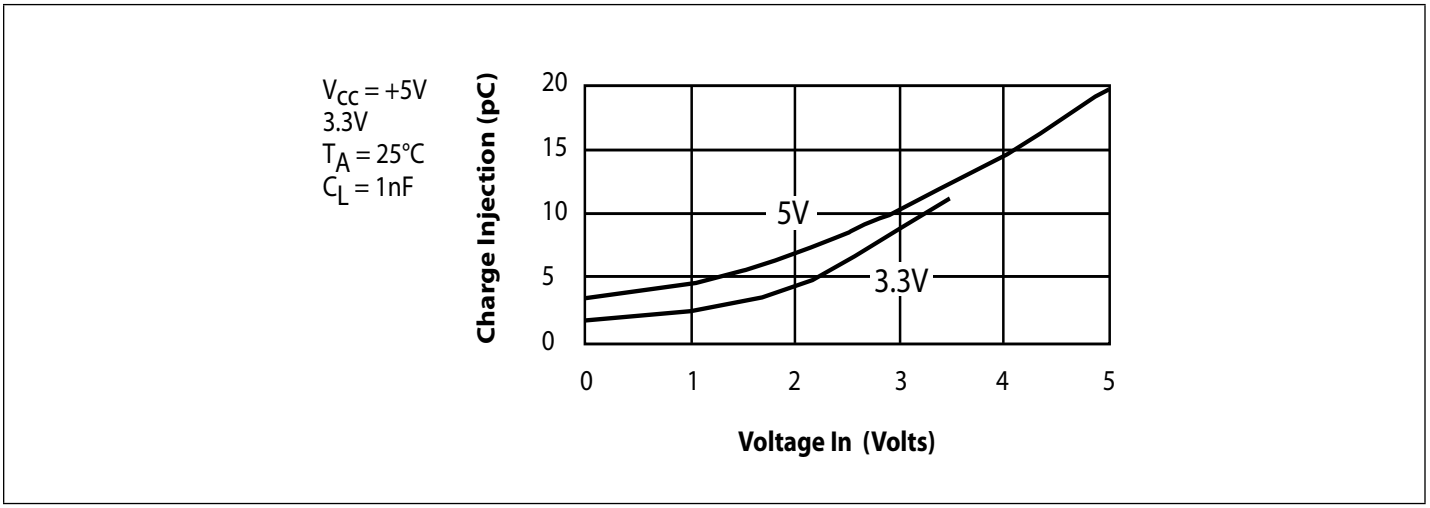


Figure 6. Charge Injection vs Voltage In

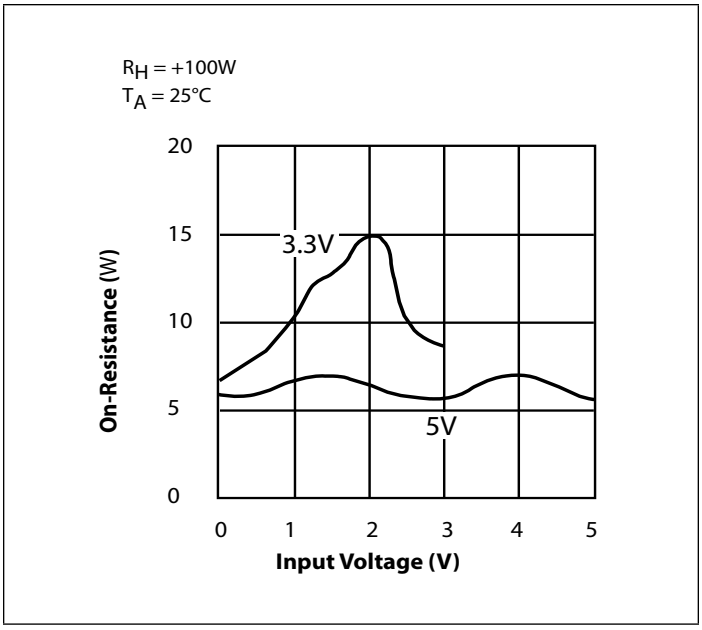


Figure 7. On-Resistance vs Input Voltage

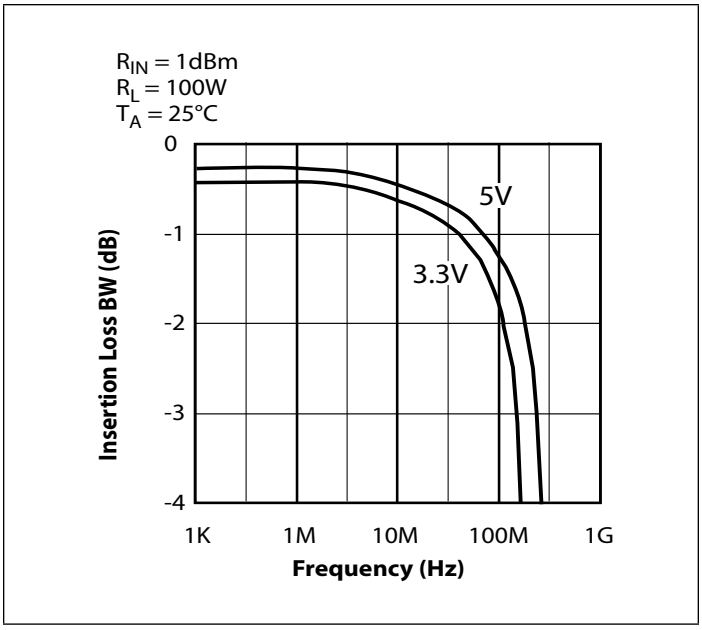


Figure 8. Insertion Loss vs Frequency

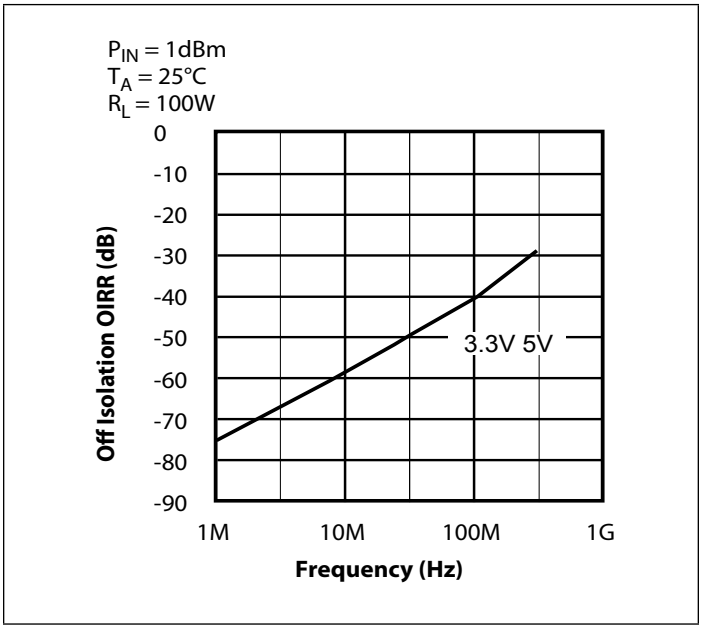


Figure 9. Off Isolation vs Frequency

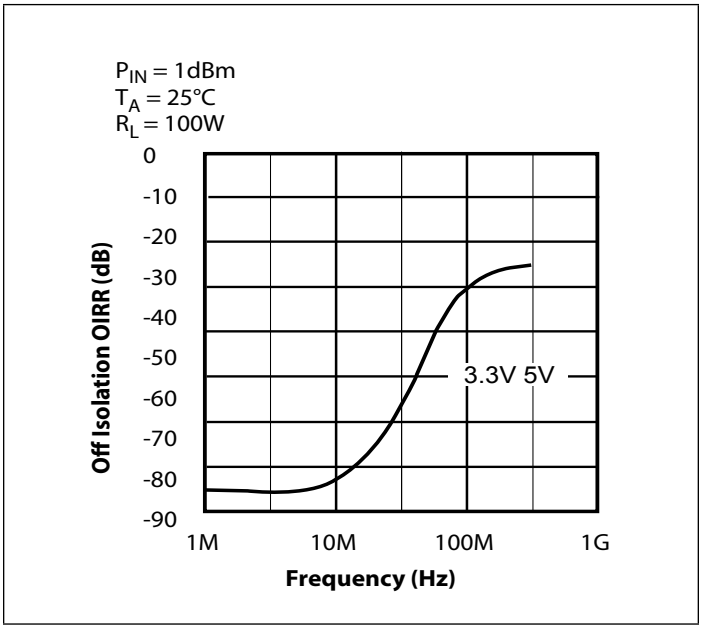
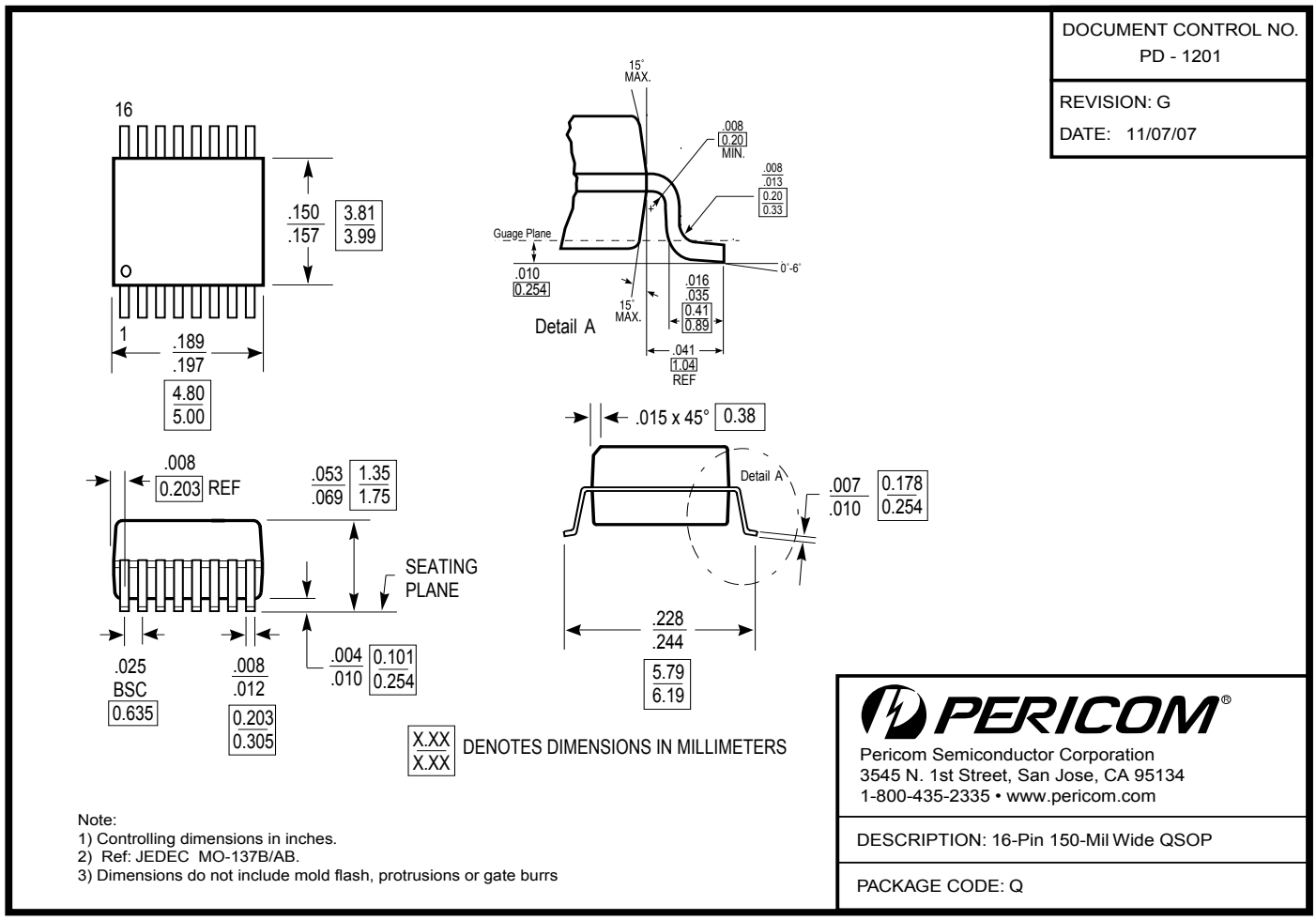


Figure 10. Crosstalk vs Frequency

Packaging Mechanical: 16-Pin QSOP (Q)



Ordering Information

Ordering Code	Package Code	Package Type	Operating Temperature
PI5A392AQE	Q	Pb-free & Green, 16-pin 150-mil QSOP	-40°C to +85°C

1. Thermal characteristics can be found on the company web site at www.pericom.com/packaging/

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