



PI5A121/PI5A122/PI5A124

Wide Bandwidth Analog Switches

Features

- Single-Supply Operation (+2V to +6V)
- Rail-to-Rail Analog Signal Dynamic Range
- Low On-Resistance (6Ω typ. with 5V supply)
- Minimizes Distortion and Error Voltages
- On-Resistance Flatness, 3Ω typ
- Low Charge Injection Reduces Glitch Errors. $Q = 4pC$ typ.
- High Speed. $t_{ON} = 10ns$ typ.
- Wide -3dB Bandwidth: 326 MHz (typ)
- High-Current Channel Capability: $>100mA$
- TTL/CMOS Logic Compatible
- Low Power Consumption ($0.5\mu W$ typ)
- Small outline transistor package minimizes board area
 - 65mil Wide SOT23-5 (T5) for PI5A121/PI5A122
 - 65mil Wide SOT23-6 (T6) for PI5A124

Applications

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

Description

The PI5A121/PI5A122/PI5A124 are analog switches designed for single-supply operation. These high-precision devices are ideal for low-distortion audio, video, signal switching and routing.

The PI5A121 is a single-pole throw (SPST) normally open (NO) switch. The switch is open when IN is LOW. The PI5A122 is a single-pole single-throw (SPST) normally closed (NC) switch.

Each switch conducts current equally well in either direction when on. When off, they block voltages up to $V+$.

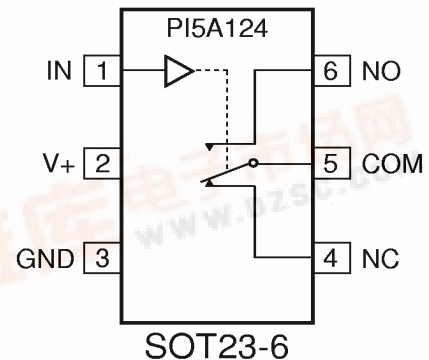
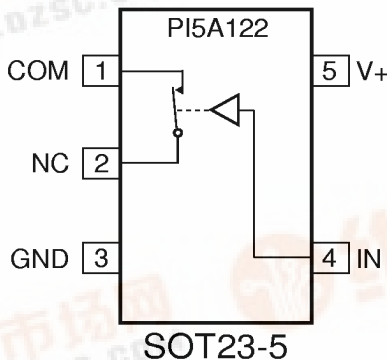
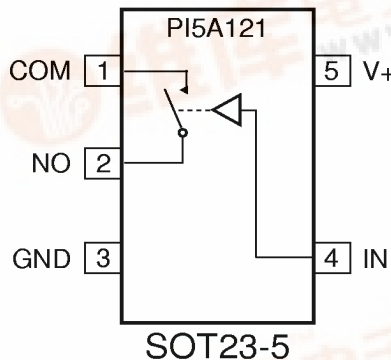
These switches are fully specified with +5V, and +3.3V supplies. With +5V, they guarantee $<10\Omega$ on-resistance. On-resistance matching between channels is within 2Ω . On-resistance flatness is less than 5Ω over the specified range. These switches also guarantee fast switching speeds ($t_{ON} < 20ns$).

These products are available in 5-pin and 6-pin SOT23 plastic packages for operation over the industrial ($-40^\circ C$ to $+85^\circ C$) temperature range.

Ordering Information

P/N	Package
PI5A121T	SOT23-5
PI5A122T	SOT23-5
PI5A124T	SOT23-6

Functional Diagrams, Pin Configurations and Truth Tables



Top Views

IN	PI5A121	PI5A122
0	OFF	ON
1	ON	OFF

Top View

Logic	NC	NO
0	ON	OFF
1	OFF	ON

Switches shown for Logic "0" input

For free samples and the latest data sheet visit: www.pericom.com, or phone 1800-435-2336





PI5A121/PI5A122/PI5A124 Wide Bandwidth Analog Switch

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_{CC} +2V
or 30mA, whichever occurs first

Current (any terminal) ±25mA

Peak Current, COM, NO, NC

(Pulsed at 1ms, 10% duty cycle) ±25mA

Thermal Information

Continuous Power Dissipation

SOT23-6 (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 ⁽¹⁾	Typ ⁽²⁾	Max ⁽¹⁾	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		8	10	Ω
			Full			12	
On-Resistance Match Between Channels ⁽⁴⁾	ΔR _{ON}		25		0.8	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		2.7	3	
			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	-80		80	
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	-80		80	
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	-80		80	



PI5A121/PI5A122/PI5A124 Wide Bandwidth Analog Switch

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	µA
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		8	15	ns
			Full			20	
Turn-Off Time	t _{off}		25		3.5	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 ⁽⁸⁾	X _{TALK}	R _L = 50Ω, C _L = 5pF, f = 10MHz, Figure 4			-43		
NC or NO Capacitance	C _(OFF)	f = 1kHz, Figure 5			8		pF
COM Off Capacitance	C _{COM(OFF)}				14		
COM On Capacitance	C _{COM(ON)}	f = 1kHz, Figure 6			18		
-3dB Bandwidth	BW	R _L = 50Ω, Figure 7	Full		326		MHz
Supply							
Power-Supply Range	V+		Full	2		6	V
Positive Supply Current	I+	V _{CC} = 5.5V, V _{IN} = 0V or V+				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. ΔR_{ON} = R_{ON} max - R_{ON} min
5. Flatness is defined as the difference between the maximum and minimum value of on-resistance measured.
6. Leakage parameters are 100% tested at maximum rated hot temperature and guaranteed by correlation at +25°C.
7. Off Isolation = 20log₁₀ [V_{COM} / (V_{NO} or V_{NC})]. See figure 3.
8. Between any two switches. See figure 4.



PI5A121/PI5A122/PI5A124
Wide Bandwidth Analog Switch

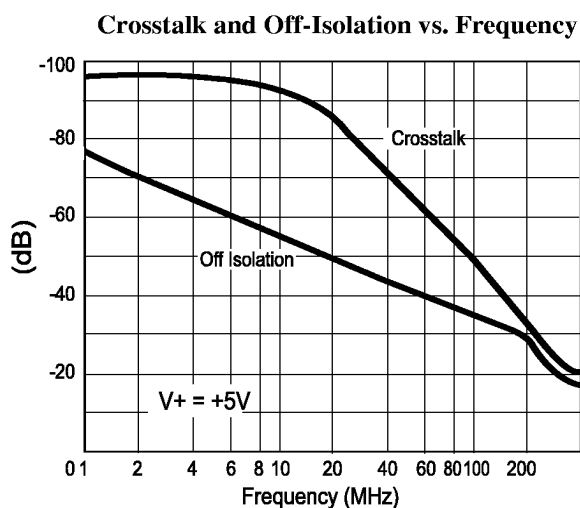
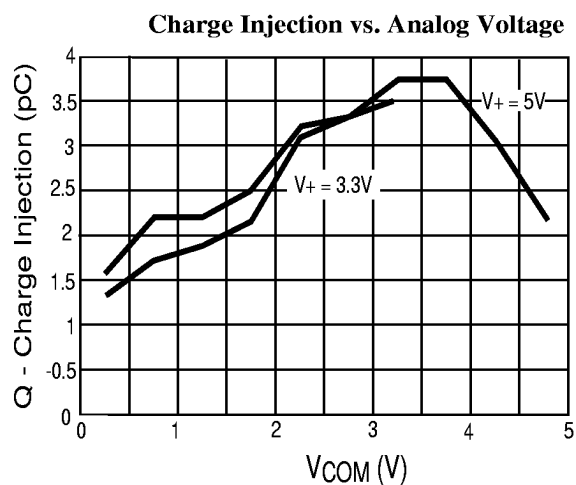
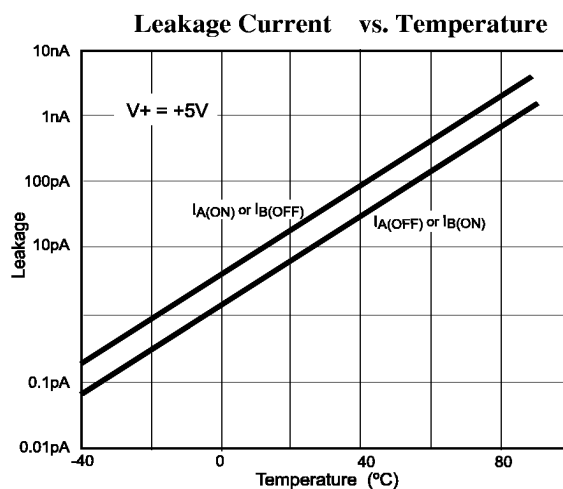
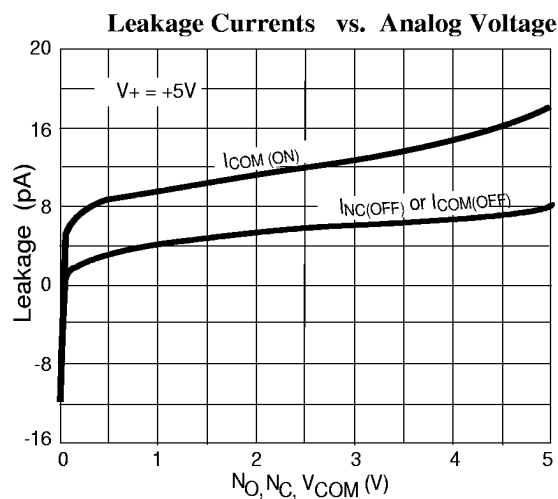
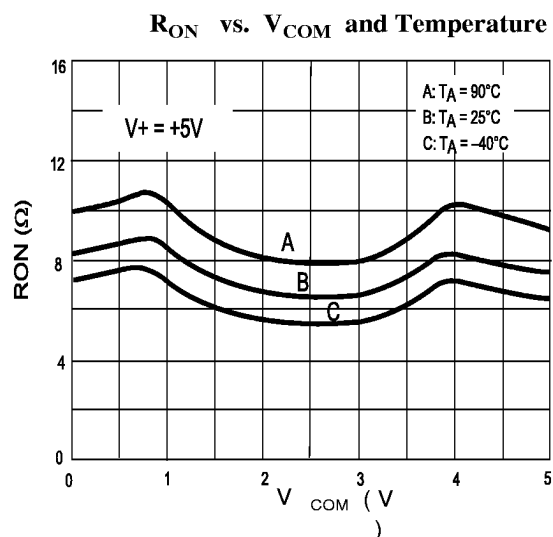
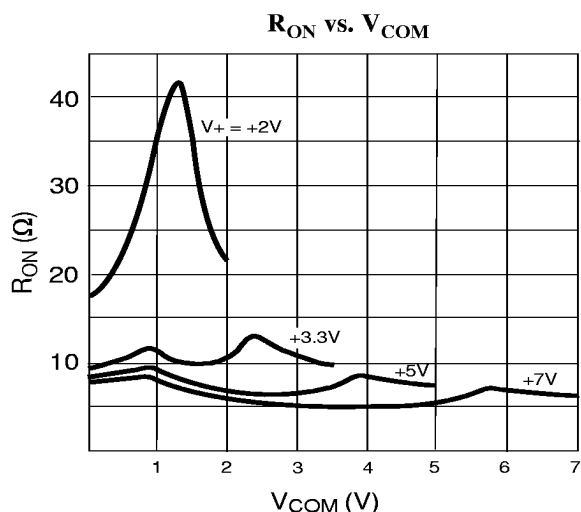
Electrical Specifications - Single +3.3V Supply
(V+ = +3.3V ±10%, GND = 0V, V_{INH} = 2.4V, V_{INL} = 0.8V)

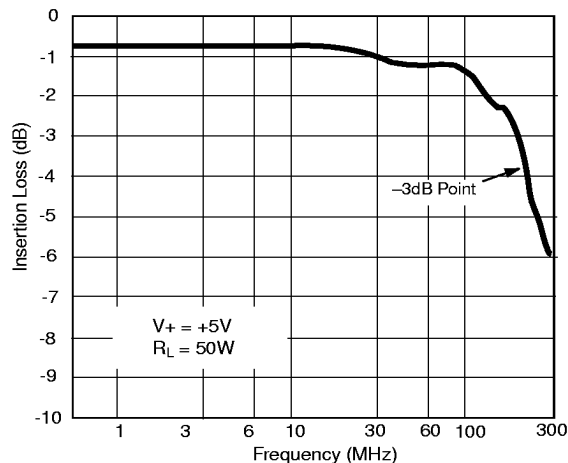
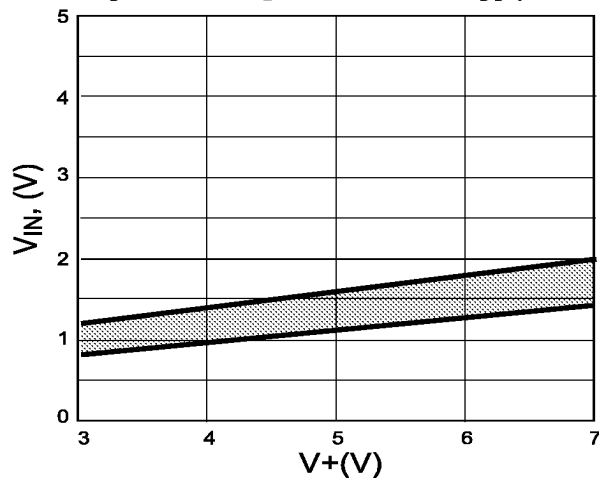
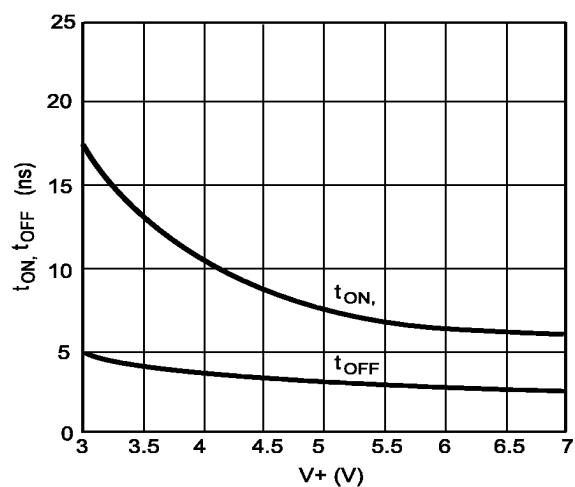
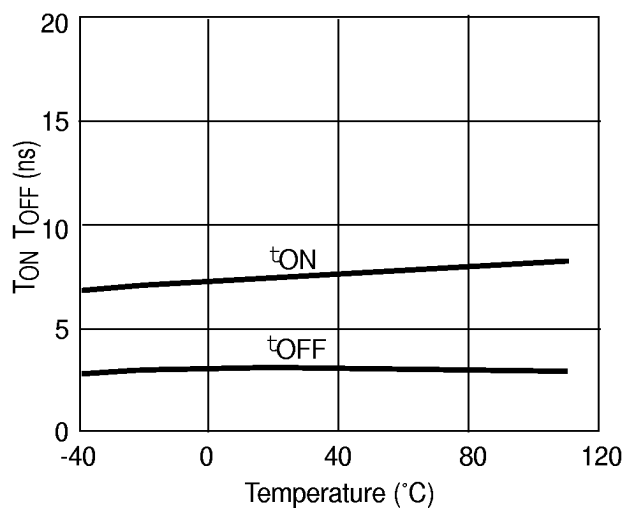
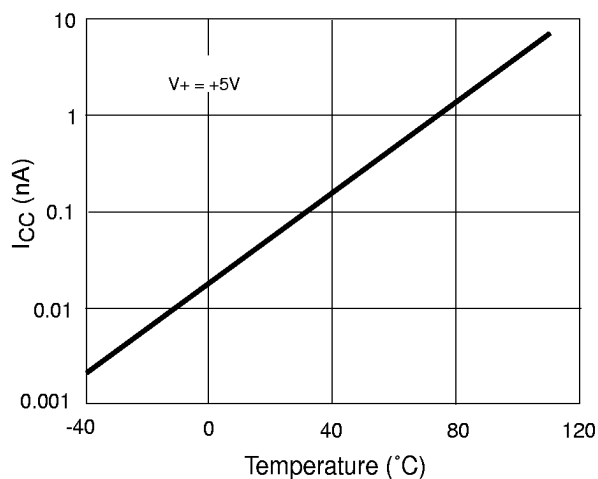
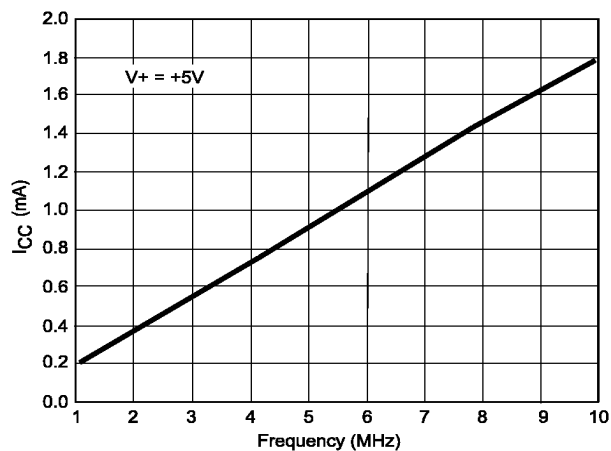
Parameter	Symbol	Conditions	Temp.(°C)	Min. ⁽¹⁾	Typ. ⁽²⁾	Max. ⁽¹⁾	Units
Analog Switch							
Analog Signal Range ⁽³⁾	V _{ANALOG}			0		V+	V
On-Resistance	R _{ON}	V ₊ = 3V, I _{COM} = -30mA, V _{NO} or V _{NC} = 1.5V	25		12	18	Ω
			Full			22	
On-Resistance Match Between Channels ⁽⁴⁾	ΔR _{ON}	V ₊ = 3.3V, I _{COM} = -30mA, V _{NO} or V _{NC} = 0.8V, 2.5V	25		5	1	
			Full			2	
On-Resistance Flatness ^(3,5)	R _{FLAT(ON)}		25		2	4	
			Full			5	
Dynamic							
Turn-On Time	t _{ON}	V ₊ = 3.3V, V _{NO} or V _{NC} = 1.5V, Figure 1	25		15	25	ns
			Full			40	
Turn-Off Time	t _{OFF}		25		1.5	5	
			Full			10	
Charge Injection ⁽³⁾	Q	C _L = 1nF, V _{GEN} = 0V, R _{GEN} = 0V, Figure 2	25		1.3	10	pC
Supply							
Positive Supply Current	I+	V ₊ = 3.6V, V _{IN} = 0V or V+ All Channels on or off	Full			1	μA
Logic Input							
Input High Voltage	V _{IH}	Guaranteed logic high level	Full	2			V
Input Low Voltage	V _{IL}	Guaranteed logic low level	Full			0.8	V
Input High Current	I _{INH}	V _{in} = 2.4V, all others = 0.8V	Full	-1		1	μA
Input Low Current	I _{INL}	V _{in} = 0.8V, all others = 2.4V	Full	-1		1	μA



PI5A121/PI5A122/PI5A124 Wide Bandwidth Analog Switch

Typical Operating Characteristics ($T_A = +25^\circ\text{C}$, unless otherwise noted)



Insertion Loss vs. Frequency

Input Switching Threshold vs. Supply Voltage

 R_{ON} vs. V_{COM} and Single Supply

Switching Times vs. Temperature

Supply Current vs. Temperature

Supply Current vs. Input Switching Frequency


Test Circuits/Timing Diagrams

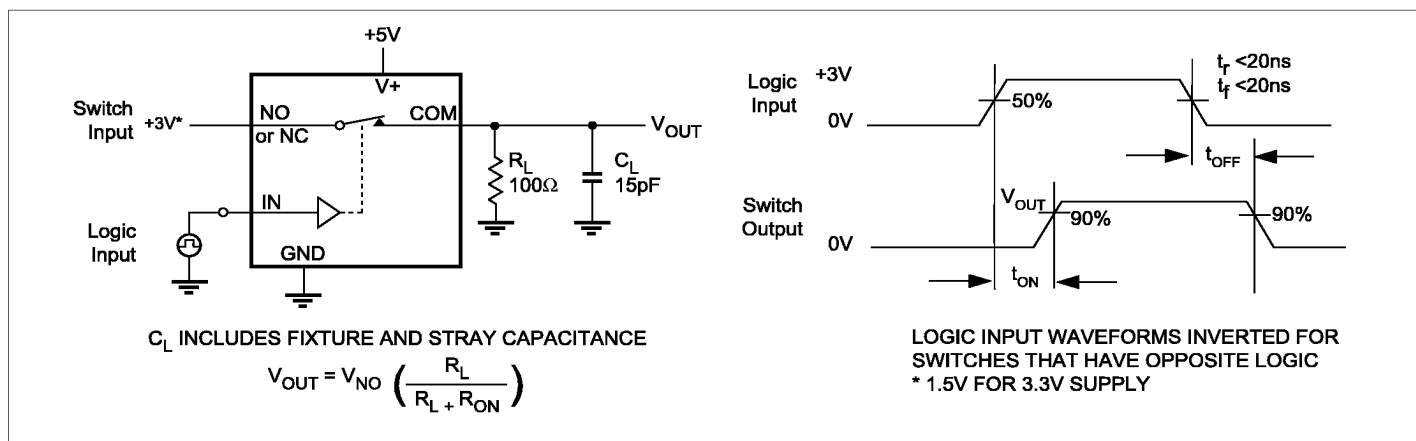


Figure 1. Switching Time

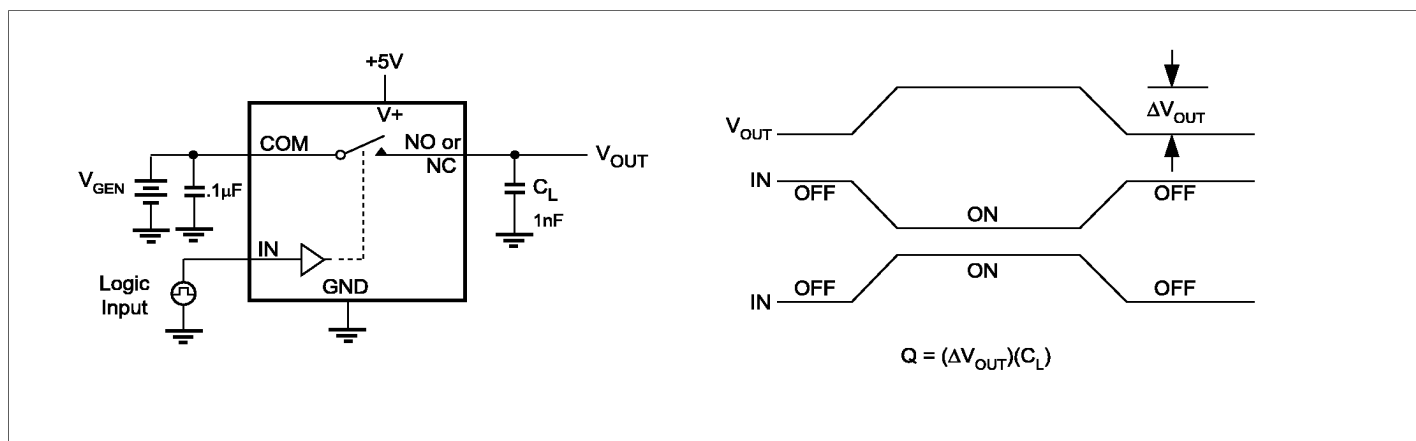


Figure 2. Charge Injection

Test Circuits/Timing Diagrams (continued)

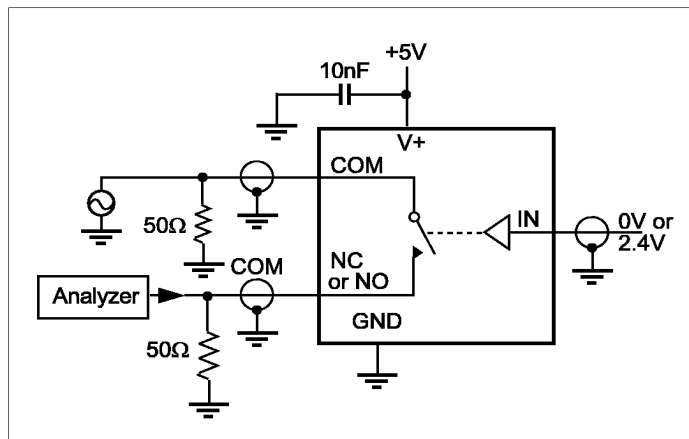


Figure 3. Off Isolation

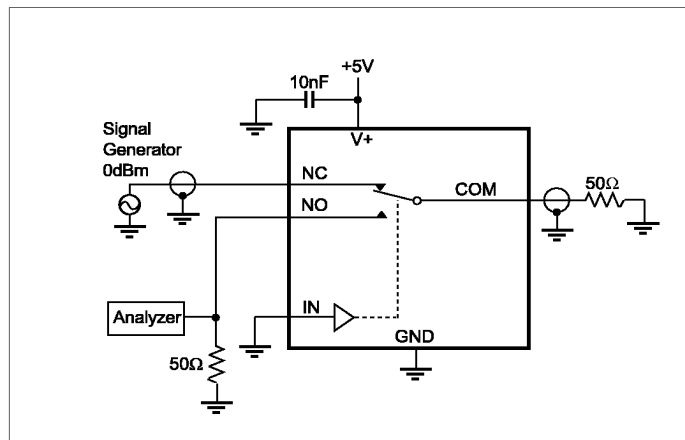


Figure 4. Crosstalk (124 only)

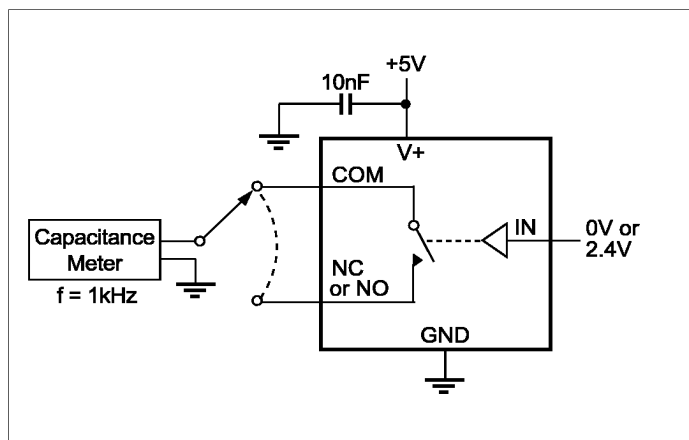


Figure 5. Channel-Off Capacitance

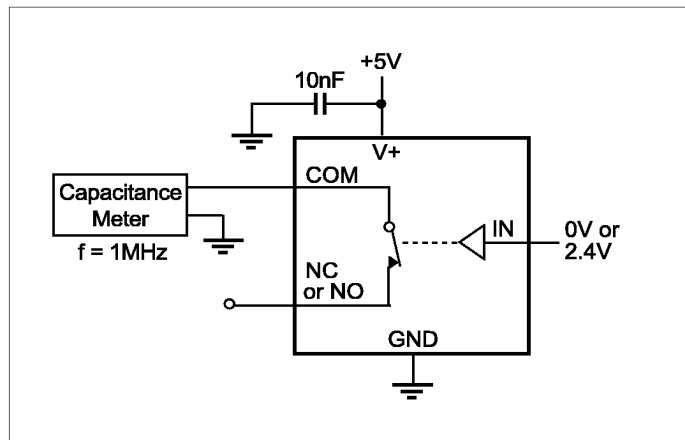


Figure 6. Channel-On Capacitance

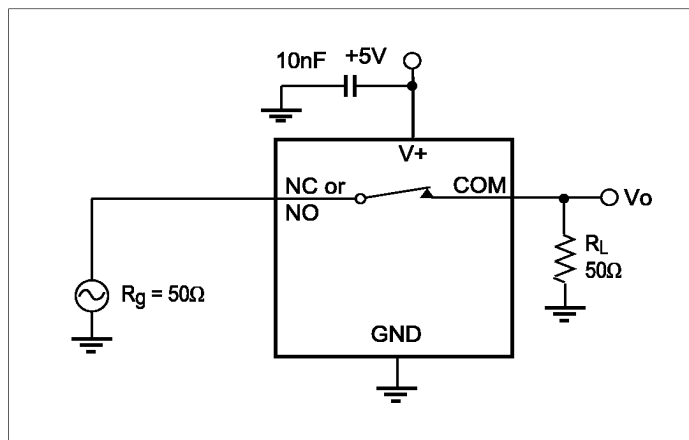


Figure 7. Bandwidth