



Low-Voltage Dual SPST Analog Switch

FEATURES

- Wide Operation Voltage (+2.7 to +12 V)
- Low Charge Injection - Q_{INJ} : 1 pC
- Low Power Consumption
- TTL/CMOS Logic Compatible Over The Full Operating Voltage range
- Available in MSOP-8 and SOT23-8

BENEFITS

- Reduced Power Consumption
- Simple Logic Interface
- High Accuracy
- Reduce Board Space

APPLICATIONS

- Battery Operated Systems
- Portable Test Equipment
- Sample and Hold Circuits
- Cellular Phones
- Communication Systems
- Military Radio
- PBX, PABX Guidance and Control Systems

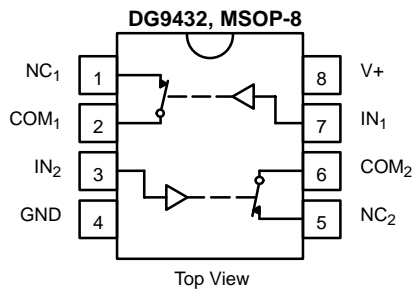
DESCRIPTION

The DG9432/9433/9434 is a dual single-pole/single-throw monolithic CMOS analog switch designed for high performance switching of analog signals. Combining low power, high speed (t_{ON} : 25 ns, t_{OFF} : 20 ns), the DG9432/9433/9434 is ideal for portable and battery powered applications requiring high performance and efficient use of board space.

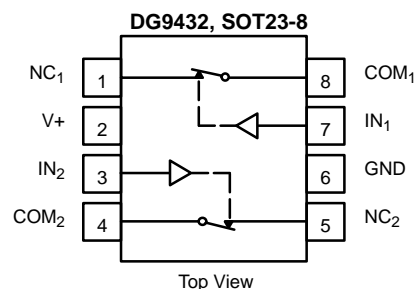
The DG9432/9433/9434 is built on Vishay Siliconix's low voltage BCD-15 process. An epitaxial layer prevents latchup. Break-before -make is guaranteed for DG9432/9433/9434.

Each switch conducts equally well in both directions when on, and blocks up to the power supply level when off.

FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION—DG9432



Device Marking: 9432

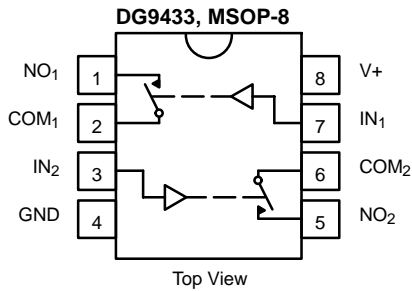


Device Marking: 4G

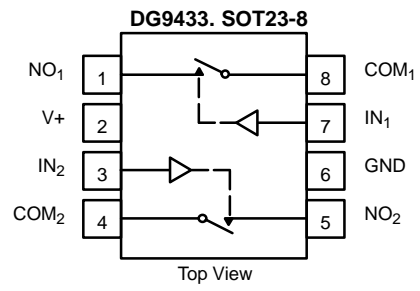
TRUTH TABLE DG9432	
Logic	Switch
0	On
1	Off



FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION—DG9433/DG9434

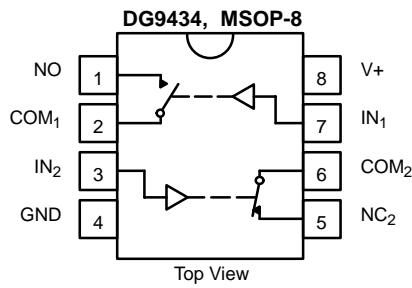


Device Marking: 9433

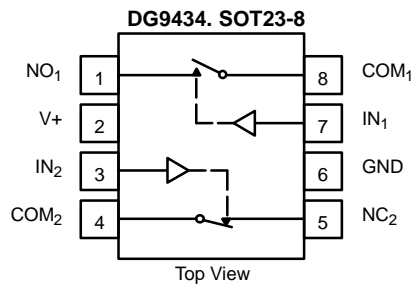


Device Marking: 4H

TRUTH TABLE DG9433	
Logic	Switch
0	Off
1	On



Device Marking: 9434



Device Marking: 4I

TRUTH TABLE DG9434		
Logic	Switch-1	Switch-2
0	Off	On
1	On	Off

ORDERING INFORMATION		
Temp Range	Package	Part Number
-40 to 85°C	MSOP-8	DG9432DQ
		DG9433DQ
		DG9434DQ
	SOT23-8	DG9432DS
		DG9433DS
		DG9434DS



ABSOLUTE MAXIMUM RATINGS

Reference to GND

V+	-0.3 to +13.5 V
IN, COM, NC, NO ^a	-0.3 to (V+ + 0.3 V)
Continuous Current (Any terminal)	±10 mA
Peak Current	±20 mA
(Pulsed at 1ms, 10% duty cycle)	
Storage Temperature (D Suffix)	-65 to 150°C

Power Dissipation (Packages)^b

MSOP-8 ^c	320 mW
SOT23-8 ^c	515 mW

Notes:

- a. Signals on S_X, D_X, or IN_X exceeding V+ or V- will be clamped by internal diodes. Limit forward diode current to maximum current ratings.
- b. All leads welded or soldered to PC Board.
- c. Derate 6.5 mW/°C above 75°C

SPECIFICATIONS (V+ = 3 V)							
Parameter	Symbol	Test Conditions Otherwise Unless Specified V+ = 3.3 V, ±10%, V _{IN} = 0.4 or 1.8 V ^e	Temp ^a	Limits -40 to 85°C			Unit
				Min ^c	Typ ^b	Max ^c	
Switch On Resistance							
Analog Signal Range ^e	V _{ANALOG}		Full	V-		V+	V
Drain-Source On-Resistance	r _(on)	V+ = 2.7 V, I _{COM} = 1 mA, V _{COM} = 1.5 V	Room		81	100	Ω
r _(on) Match ^d	Δr _(on)		Room		0.4	3.0	
Digital Control							
Input, High Voltage	V _{INH}	V+ Ranges 2.7 to 5 V	Full	1.8			V
Input, Low Voltage	V _{INL}		Full			0.4	
Input Current	I _{INH}			-1		1	μA
Dynamic Characteristics							
Break-Before-Make ^{d,g}	t _{OPEN}	V+ = 3 V, R _L = 300 Ω V _{NO} = V _{NC} = 1.5 V C _L = 35 pF, V _{IN} = 0 V, 3 V	Room	1			ns
Turn-On Time ^d	t _{ON}		Full		60	80	
Turn-Off Time ^d	t _{OFF}		Full		14	25	
Charge Injection ^d	Q	C _L = 1 nF, R _{GEN} = 0 Ω, V _g = 0 V	Room		0.16		pC
Off-Isolation ^d	OIRR	C _L = 5 pF, R _L = 50 Ω, f = 1 MHz	Room		77		dB
		C _L = 5 pF, R _L = 50 Ω, f = 10 MHz	Room		55		
Crosstalk ^d	X _{TALK}	R _L = 50 Ω, f = 1 MHz, V+ = 2.5 V	Room		98		
Source Off Capacitance ^d	C _{NC/NO(off)}	f = 1 MHz, V _{NC/NO} = 0 V	Room		7.5		pF
Drain Off Capacitance ^d	C _{COM(off)}	f = 1 MHz, V _{COM} = 0 V	Room		7.8		
Drain On Capacitance ^d	C _{COM(on)}		Room		22		
Supply Current	I ₊	V+ = 3.3 V, V _{IN} = 0 or V+	Room	-1		-1	μA

Notes:

- a. Room = 25°C, Full = as determined by the operating suffix.
- b. Typical values are for design aid only, not guaranteed nor subject to production testing.
- c. The algebraic convention whereby the most negative value is a minimum and the most positive a maximum, is used in this data sheet.
- d. Guarantee by design, not subjected to production test.
- e. V_{IN} = input voltage to perform proper function.
- f. Guaranteed by 12-V leakage testing, not production tested.
- g. Applies for DG9434 only.



SPECIFICATIONS (V ₊ = 5 V)							
Parameter	Symbol	Test Conditions Otherwise Unless Specified V ₊ = 5 V, ± 10%, V _{IN} = 0.4 or 1.8 V ^e	Temp ^a	Limits -40 to 85°C			Unit
				Min ^c	Typ ^b	Max ^c	
Switch On Resistance							
Analog Signal Range ^e	V _{ANALOG}		Full	V ₋		V ₊	V
Drain-Source On-Resistance	r _(on)	V ₊ = 4.5 V, I _{COM} = 1 mA, V _{COM} = 2.5 or 3.5 V	Room Full		39	60 70	Ω
r _{DS(on)} Match	Δr _(on)	V ₊ = 4.5 V, I _{COM} = 1 mA, V _{COM} = 3.5 V	Room		0.3	3.0	
Switch Off Leakage Current ^f	I _{NC/NO(off)}	V ₊ = 5 V, V _{COM} = 0.5 V, 4.5 V V _{NC/NO} = 4.5 V, 0.5 V	Room Full	-1 -10	0.3	1 10	nA
	I _{COM(off)}		Room Full	-1 -10	0.3	1 10	
Channel On Leakage Current ^f	I _{COM(on)}		Room Full	-1 10	0.3	1 10	
Digital Control							
Input, High Voltage	V _{INH}	V ₊ Ranges 2.7 to 5 V	Full	1.8			V
Input, Low Voltage	V _{INL}		Full			0.4	
Input Current	I _{INH}			-1		1	μA
Dynamic Characteristics							
Break-Before-Make ^{d,g}	t _{OPEN}	V ₊ = 5 V, R _L = 300 Ω V _{NO} = V _{NC} = 3 V C _L = 35 pF, V _{IN} = 0 V, 5 V	Room Full	1			ns
Turn-On Time	t _{ON}		Room Full		33	60 70	
Turn-Off Time	t _{OFF}		Room Full		10	20 30	
Charge Injection ^d	Q	C _L = 1 nF, R _{GEN} = 0 Ω, V _g = 0 V	Room		0.56		pC
Off-Isolation ^d	OIRR	C _L = 5 pF, R _L = 50 Ω, f = 1 MHz	Room		76		dB
		C _L = 5 pF, R _L = 50 Ω, f = 10 MHz, V ₊ = 5 V	Room		54		
Crosstalk ^d	X _{TALK}	R _L = 50 Ω, f = 1 MHz, V ₊ = 5 V	Room		96		
Source Off Capacitance ^d	C _{NC/NO(off)}	f = 1 MHz, V _{NO/NC} = 0 V	Room		7.5		pF
Drain Off Capacitance ^d	C _{COM(off)}	f = 1 MHz, V _{COM} = 0 V	Room		7.8		
Drain On Capacitance ^d	C _{COM(on)}		Room		22		
Supply Current	I ₊	V ₊ = 5.5 V, V _{IN} = 0 or V ₊	Room	-1		-1	μA

Notes:

- a. Room = 25°C, Full = as determined by the operating suffix.
- b. Typical values are for design aid only, not guaranteed nor subject to production testing.
- c. The algebraic convention whereby the most negative value is a minimum and the most positive a maximum, is used in this data sheet.
- d. Guarantee by design, not subjected to production test.
- e. V_{IN} = input voltage to perform proper function.
- f. Guaranteed by 12-V leakage testing, not production tested.
- g. Applies to DG9434 only.



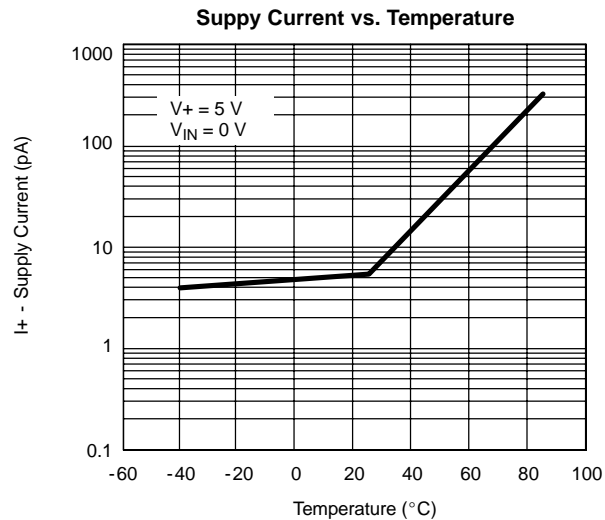
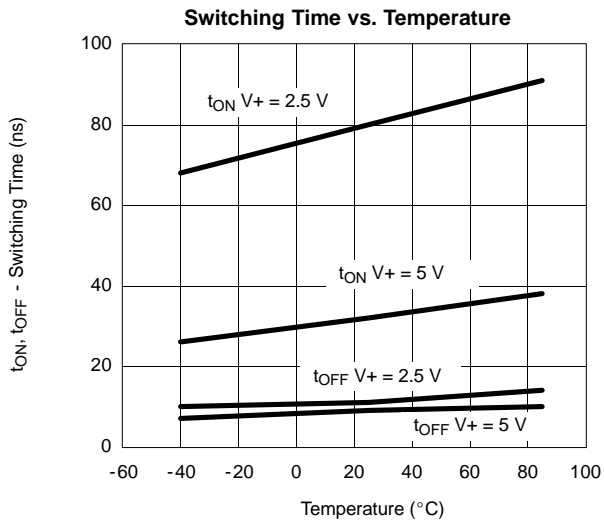
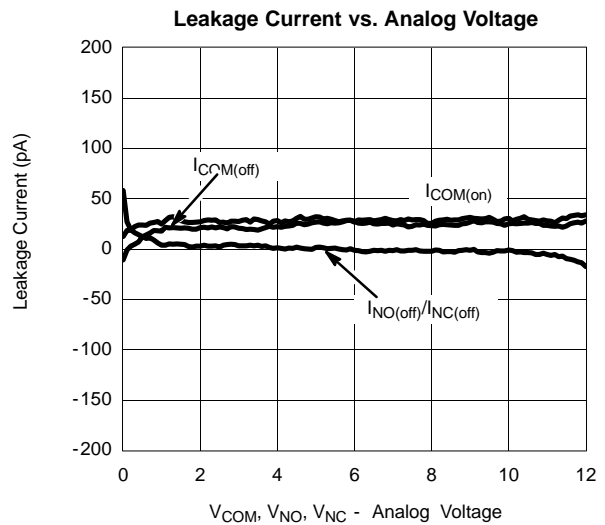
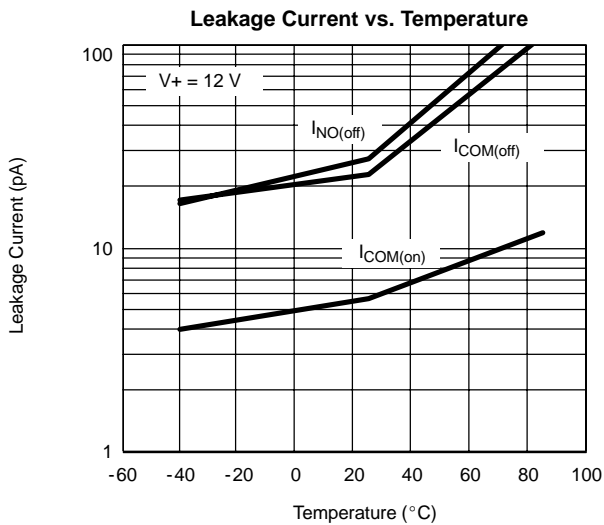
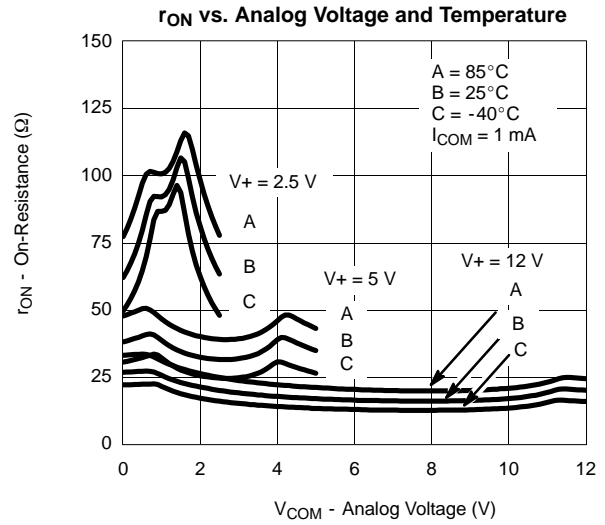
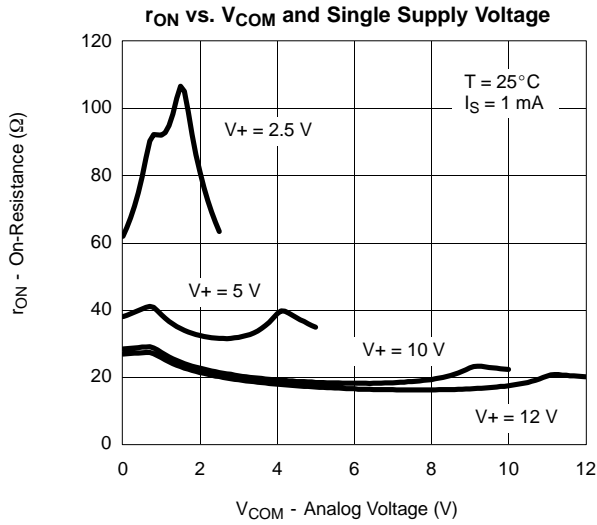
SPECIFICATIONS (V ₊ = 12 V)							
Parameter	Symbol	Test Conditions Otherwise Unless Specified V ₊ = 12 V, ±10%, V _{IN} = 0.8 or 2.4 V ^e	Temp ^a	Limits -40 to 85°C			Unit
				Min ^c	Typ ^b	Max ^c	
Switch On Resistance							
Analog Signal Range ^e	V _{ANALOG}		Full	V ₋		V ₊	V
Drain-Source On-Resistance	r _(on)	V ₊ = 10.8 V, I _{COM} = 1 mA, V _{COM} = 9 V	Room Full		19	30 40	Ω
r _{DS(on)} Match	Δr _(on)	V ₊ = 10.8 V, I _{COM} = 1 mA, V _{COM} = 9 V	Room		0.3	3.0	
Switch Off Leakage Current ^a	I _{NC/NO(off)}	V ₊ = 12 V, V _S = 1/11 V, V _{COM} = 11/1 V	Room Full	-1 -10	0.3	1 10	nA
	I _{COM(off)}		Room Full	-1 -10	0.3	1 10	
Channel On Leakage Current ^a	I _{COM(on)}		Room Full	-1 10	0.3	1 10	
Digital Control							
Input, High Voltage	V _{INH}	V ₊ = 12 V	Full			2.4	V
Input, Low Voltage	V _{INL}		Full	0.8			
Input Current	I _{INH}			-1		1	μA
Dynamic Characteristics							
Break-Before-Make ^{d,g}	t _{OPEN}	V ₊ = 12 V, R _L = 300 Ω V _{NO} = V _{NC} = 8 V C _L = 35 pF, V _{IN} = 0 V, 12 V	Room Full	1			ns
Turn-On Time	t _{ON}		Room Full		21	35 40	
Turn-Off Time	t _{OFF}		Room Full		6	18 25	
Charge Injection ^d	Q	C _L = 1 nF, R _{GEN} = 0 Ω, V _G = 0 V, V ₊ = 5 V	Room		0.36		pC
Off-Isolation ^d	OIRR	C _L = 5 pF, R _L = 50 Ω, f = 1 MHz	Room		75		dB
		C _L = 5 pF, R _L = 50 Ω, f = 10 MHz	Room		53		
Crosstalk ^d	X _{TALK}	R _L = 50 Ω, f = 1 MHz, V ₊ = 5 V	Room		96		
Source Off Capacitance ^d	C _{NC/NO(off)}	f = 1 MHz, V _{NC/NO} = 0 V	Room		7.5		pF
Drain Off Capacitance ^d	C _{COM(off)}	f = 1 MHz, V _{COM} = 0 V	Room		7.8		
Drain On Capacitance ^d	C _{COM(on)}		Room		22		
Supply Current	I ₊	V ₊ = 12 V, V _{IN} = 0 or V ₊	Room	-1		-1	μA

Notes:

- a. Room = 25°C, Full = as determined by the operating suffix.
- b. Typical values are for design aid only, not guaranteed nor subject to production testing.
- c. The algebraic convention whereby the most negative value is a minimum and the most positive a maximum, is used in this data sheet.
- d. Guarantee by design, not subjected to production test.
- e. V_{IN} = input voltage to perform proper function.
- f. Guaranteed by 12-V leakage testing, not production tested.
- g. Applies for DG9434 only.



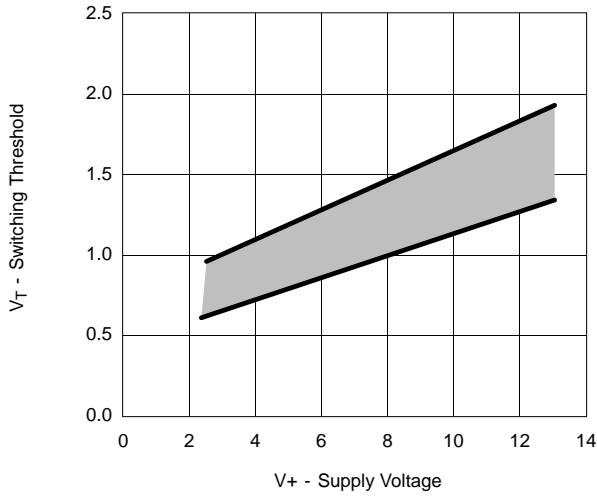
TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)



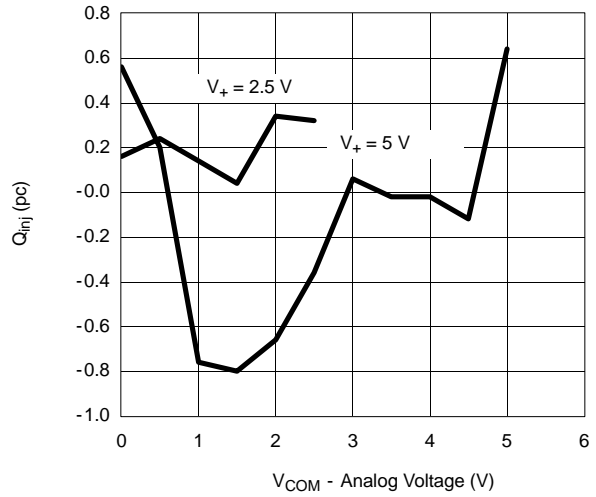


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

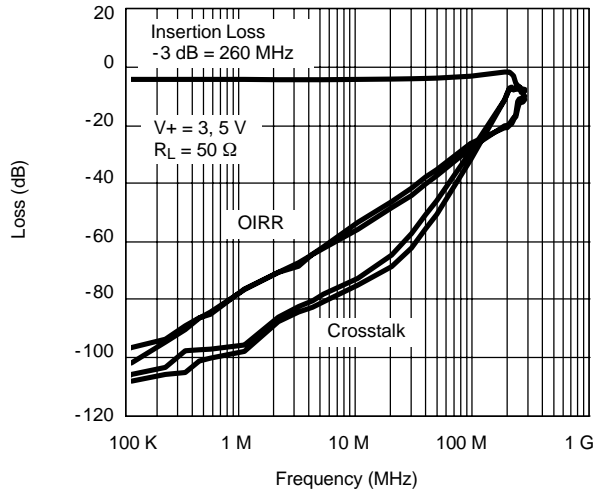
Switching Threshold vs. Supply Voltage



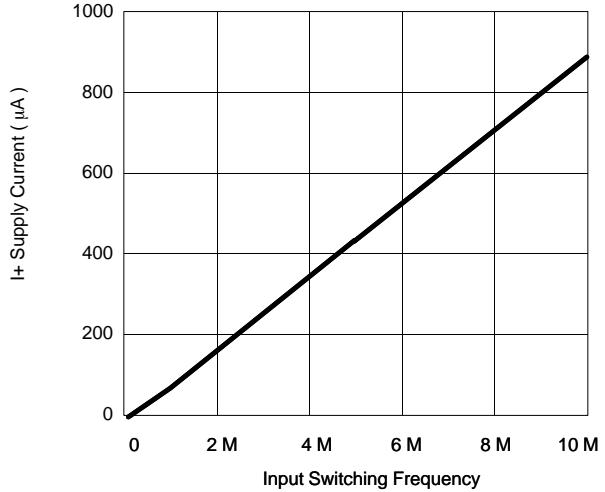
Charge Injection at Source



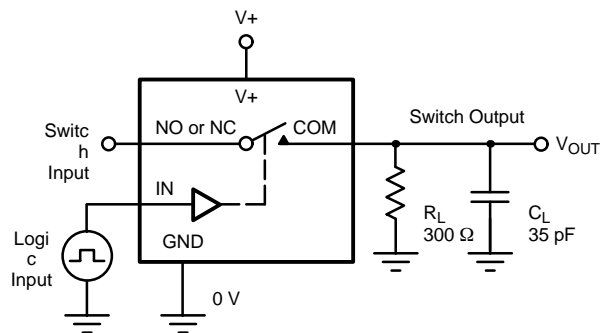
Insertion Loss, Off Isolation and Crosstalk vs. Frequency



Supply Current vs. Input Switching Frequency

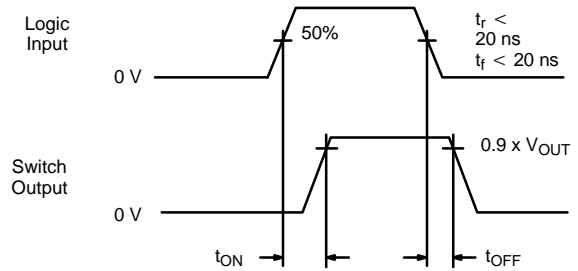


TEST CIRCUITS



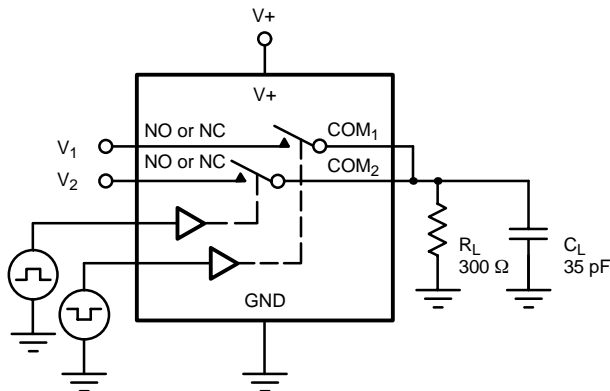
C_L (includes fixture and stray capacitance)

$$V_{OUT} = V_{COM} \left(\frac{R_L}{R_L + R_{ON}} \right)$$



Logic "1" = Switch On
Logic input waveforms inverted for switches that have the opposite logic sense.

FIGURE 1. Switching Time



C_L (includes fixture and stray capacitance)

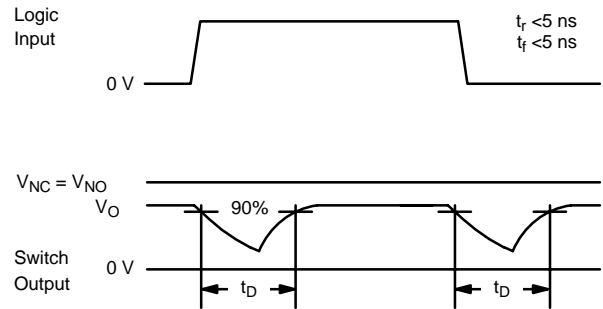
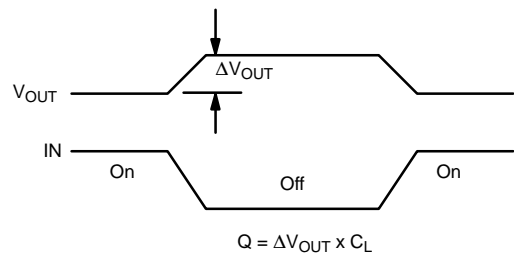
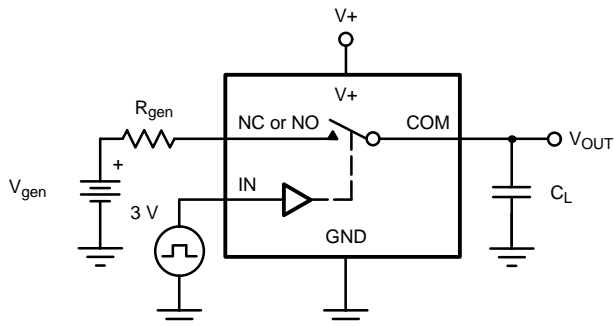


FIGURE 2. Break-Before-Make Interval



IN depends on switch configuration: input polarity determined by sense of switch.

FIGURE 3. Charge Injection

TEST CIRCUITS

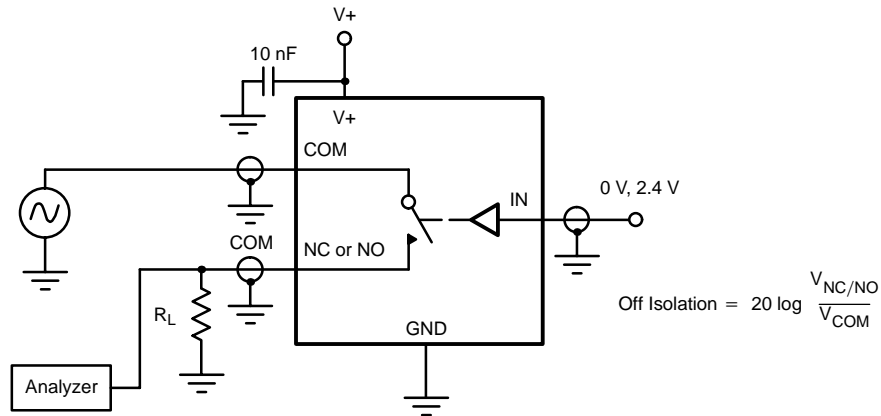


FIGURE 4. Off-Isolation

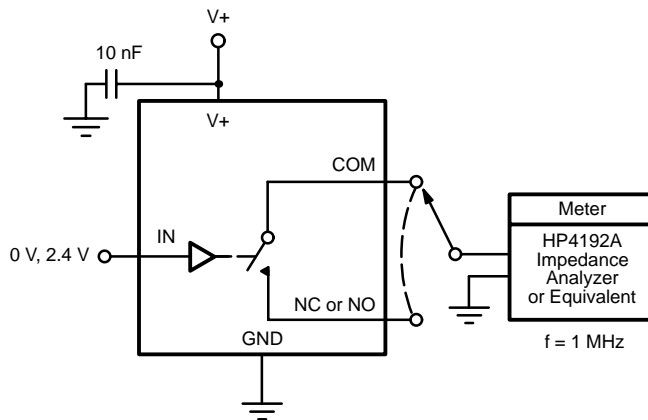


FIGURE 5. Channel Off/On Capacitance



Notice

Specifications of the products displayed herein are subject to change without notice. Vishay Intertechnology, Inc., or anyone on its behalf, assumes no responsibility or liability for any errors or inaccuracies.

Information contained herein is intended to provide a product description only. No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document. Except as provided in Vishay's terms and conditions of sale for such products, Vishay assumes no liability whatsoever, and disclaims any express or implied warranty, relating to sale and/or use of Vishay products including liability or warranties relating to fitness for a particular purpose, merchantability, or infringement of any patent, copyright, or other intellectual property right.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications. Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Vishay for any damages resulting from such improper use or sale.