Low Power, High Voltage SPST Analog Switches

DESCRIPTION

The DG467 and DG468 are dual supply single-pole/single-throw (SPST) switches. On resistance is 10 Ω maximum and flatness is 2 Ω max over the specified analog signal range. These analog switches were designed to provide high speed, low error switching of precision analog signals. The primary application areas are in the routing and switching in telecommunications and test equipment. Combining low power, low leakages, low on-resistance and small physical size, the DG467/468 are also ideally suited for portable and battery powered industrial and military equipment.

The DG467 has one normally closed switch, while the DG468 switch is normally open. They operate either from a single + 7 V to 36 V supply or from dual ± 4.5 V to ± 20 V supplies. They are offered in the very popular, small TSOP6 package.

FEATURES

- ± 15 V Analog Signal Range
- On-Resistance - $r_{DS(on)}$: 10 Ω max
- Fast Switching Action - T_{ON}: 100 ns
- V_L Logic Supply Not Required
- TTL CMOS Input Compatible
- Rail To Rail Signal Handling
- Dual Or Single Supply Operation

Pb-free
RoHS COMPLIANT

BENEFITS

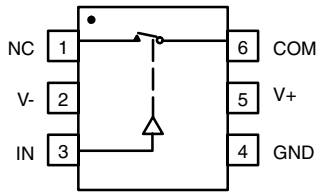
- Wide Dynamic Range
- Low Signal Errors and Distortion
- Break-Before-Make Switching Action
- Simple Interfacing
- Reduced Board Space
- Improved Reliability

APPLICATIONS

- Precision Test Equipment
- Precision Instrumentation
- Communications Systems
- PBX, PABX Systems
- Audio Equipment
- Redundant Systems
- PC Multimedia Boards
- Hard Disc Drives

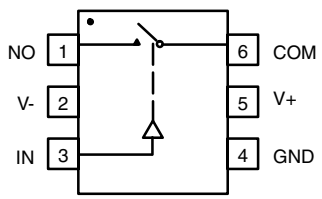
FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION

DG467



TSOP6

DG468



TSOP6

TRUTH TABLE		
Logic	**DG467**	**DG468**
0	ON	OFF
1	OFF	ON

Logic "0" ≤ 0.8 V
Logic "1" ≥ 2.4 V

Device Marking:
DG467DV = G7xxx
DG468DV = G8xxx

ORDERING INFORMATION

Temp Range	Package	Part Number
DG467/DG468		
- 40 to 85 °C	6-Pin TSOP	DG467DV-T1-E3
		DG468DV-T1-E3

ABSOLUTE MAXIMUM RATINGS T_A = 25 °C, unless otherwise noted

Parameter Referenced To V-		Symbol	Limit	Unit
V+			44	V
GND			25	
Digital Inputs[a], $V_{NO/NC}$, V_{COM}			(V-) - 2 V to (V+) + 2 V or 30 mA, whichever occurs first	
Current, (Any Terminal) Continuous			30	mA
Current (NO or NC or COM) Pulsed at 1 ms, 10 % duty cycle			100	
Storage Temperature			- 65 to 150	°C
Power Dissipation (Package)[b]	6-Pin TSOP[c]		570	mW

Notes:
a. Signals on NO, NC, COM, or IN 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 7 mW/°C above 70 °C.

SPECIFICATIONS[a] (V± = ± 15 V)

Parameter	Symbol	Test Conditions Unless Otherwise Specified V+ = 15 V, V- = - 15 V V_{IN} = 2.4 V, 0.8 V[f]	Temp[b]	D Suffix - 40 to 85 °C Min[d]	Typ[c]	Max[d]	Unit
Analog Switch							
Analog Signal Range[e]	V_{ANALOG}		Full	- 15		15	V
Drain-Source On-Resistance	r_{ON}	$I_{NO/NC}$ = 10 mA, V_{COM} = 10 V V+ = 13.5 V, V- = - 13.5 V	Room Full		7	9 10	Ω
On-Resistance Flatness	r_{ON} Flatness	$I_{NO/NC}$ = 10 mA, V_{COM} = ± 5 V, 0 V V+ = 13.5 V, V- = - 13.5 V	Room Full		0.7	1 2	Ω
Switch Off Leakage Current	$I_{NO/NC(off)}$	V+ = 16.5, V- = - 16.5 V V_{COM} = ± 15.5 V $V_{NO/NC}$ = -/+ 15.5 V	Room Full	- 1 - 10	- 0.1	1 10	nA
	$I_{COM(off)}$		Room Full	- 1 - 10	- 0.1	1 10	
Channel On Leakage Current	$I_{COM(on)}$	V+ = 16.5 V, V- = - 16.5 V_{COM} = $V_{NO/NC}$ = ± 15.5 V	Room Full	- 1 - 10	- 0.1	1 10	
Digital Control							
Input, High Voltage	I_{INH}		Full	2.4			V
Input, Low Voltage	I_{INL}		Full			0.8	
Input Capacitance[e]	C_{IN}		Room		5		pF
Input Current	I_{IN}	V_{IN} = 0 or 5 V		- 1		1	µA
Dynamic Characteristics							
Turn-On Time	t_{ON}	R_L = 300 Ω, C_L = 35 pF $V_{NO/NC}$ = ± 10 V	Room Full		100	140 160	ns
Turn-Off Time	t_{OFF}		Room Full		50	80 100	
Charge Injection[e]	Q	C_L = 1 nF, V_{gen} = 0 V, R_{gen} = 0 Ω	Room		21		pC
Off-Isolation[e]	OIRR	C_L= 5 pF, R_L = 50 Ω, f = 1 MHz	Room		- 61		dB
Source Off Capacitance[e]	$C_{S(off)}$	f = 1 MHz	Room		30		pF
Drain Off Capacitance[e]	$C_{D(off)}$		Room		15		
Channel On Capacitance[e]	$C_{D(on)}$	f = 1 MHz	Room		76		
Power Supplies							
Positive Supply Current	I+	V+ = 16.5 V, V- = - 16.5 V V_{IN} = 0 or 5 V	Room Full		5	15 20	µA
Negative Supply Current	I-		Room Full	- 1 - 10	- 0.02		

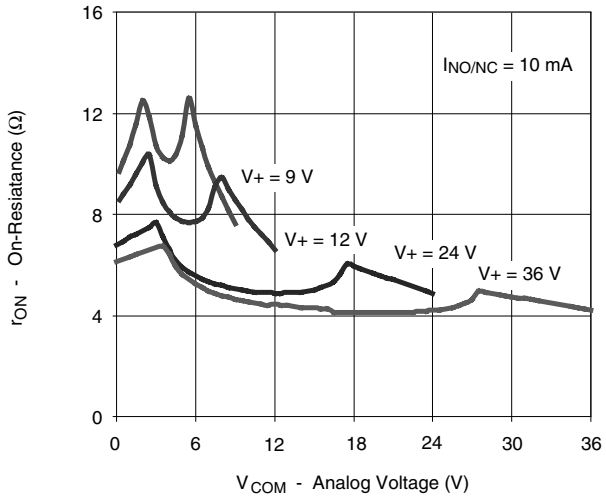
SPECIFICATIONS[a] (V+ = 12 V)

Parameter	Symbol	Test Conditions Unless Otherwise Specified V+ = 12 V, V- = 0 V V_{IN} = 2.4 V, 0.8 V[f]	Temp[b]	D Suffix - 40 to 85 °C Min[d]	Typ[c]	Max[d]	Unit
Analog Switch							
Analog Signal Range[e]	V_{ANALOG}		Full	0		12	V
Drain-Source On-Resistance	r_{ON}	$I_{NO/NC}$ = –10 mA, V_{COM} = 8 V V+ = 10.8 V	Room Full		12	16 20	Ω
On-Resistance Flatness	r_{ON} Flatness	$I_{NO/NC}$ = 10 mA, V_{COM} = 2, 6, 8 V V+ = 10.8 V	Room Full		1.5	3 4	Ω
Dynamic Characteristics							
Turn-On Time	t_{ON}	$V_{NO, NC}$ = ± 10 V, R_L = 300 Ω, C_L = 35 pF	Room Full		130	160 200	nS
Turn-Off Time	t_{OFF}		Room Full		50	80 100	
Charge Injection[e]	Q	C_L = 1 nF, V_{gen} = 0 V, R_{gen} = 0 Ω	Room		8		pC
Power Supplies							
Positive Supply Current	I+	V+ = 13.2 V, V_{IN} = 0 V, 5 V	Room Full		3	7 10	µA

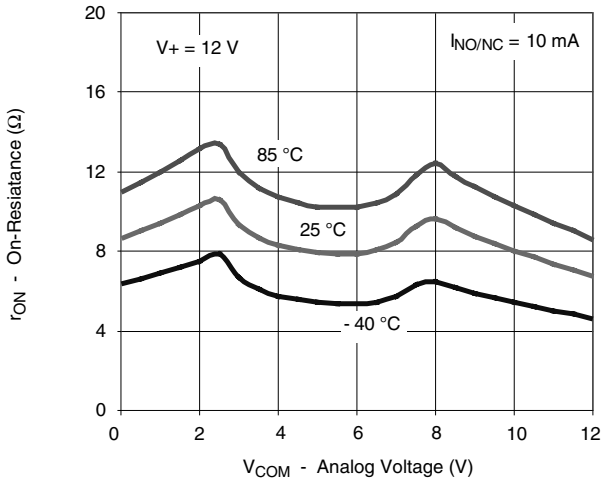
Notes:
a. Refer to PROCESS OPTION FLOWCHART.
b. Room = 25 °C, Full = as determined by the operating temperature suffix.
c. Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.
d. The algebraic convention whereby the most negative value is a minimum and the most positive a maximum, is used in this data sheet.
e. Guaranteed by design, not subject to production test.
f. V_{IN} = input voltage to perform proper function.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

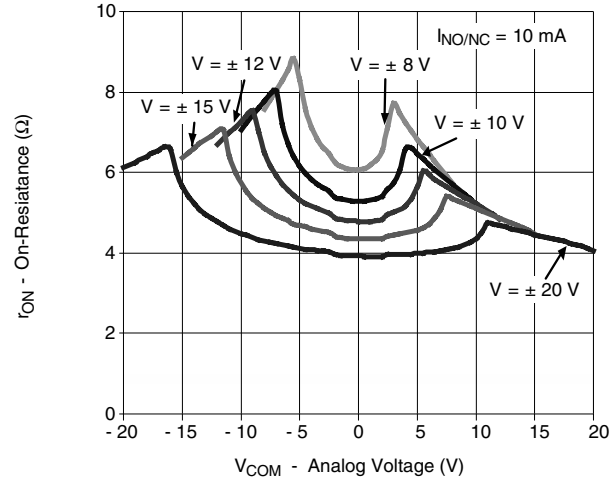
TYPICAL CHARACTERISTICS T_A = 25 °C, unless otherwise noted



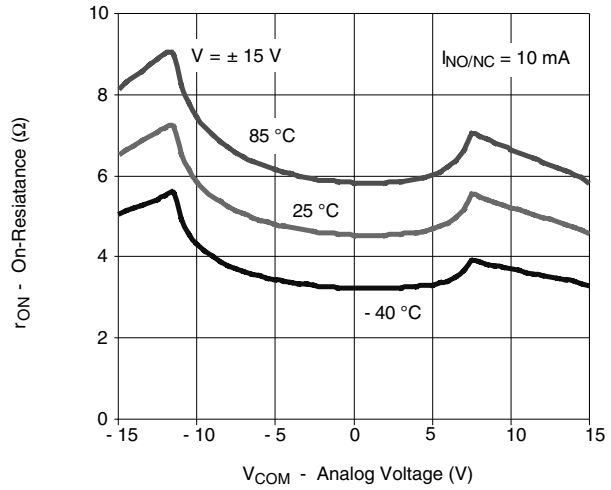
r_{ON} vs. V_{COM} and Single Supply Voltage



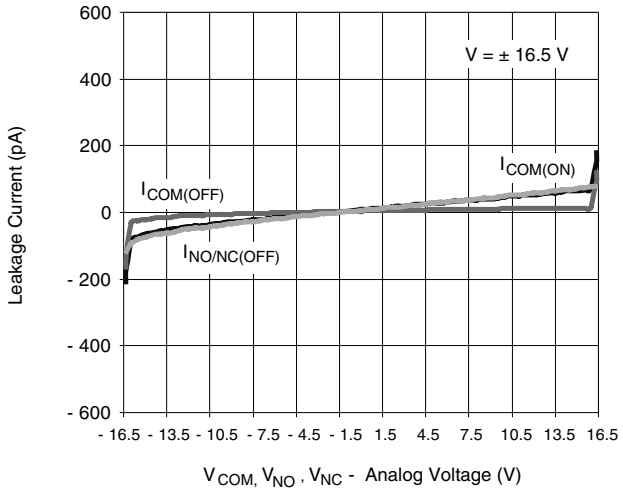
r_{ON} vs. Analog Voltage and Temperature



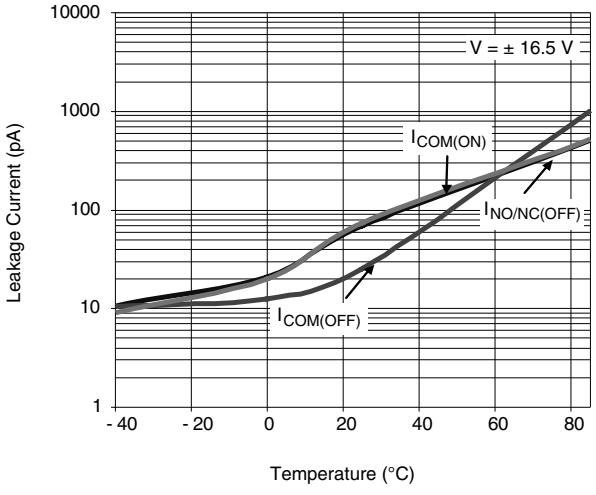
r_{ON} vs. V_{COM} and Dual Supply Voltage



r_{ON} vs. Analog Voltage and Temperature

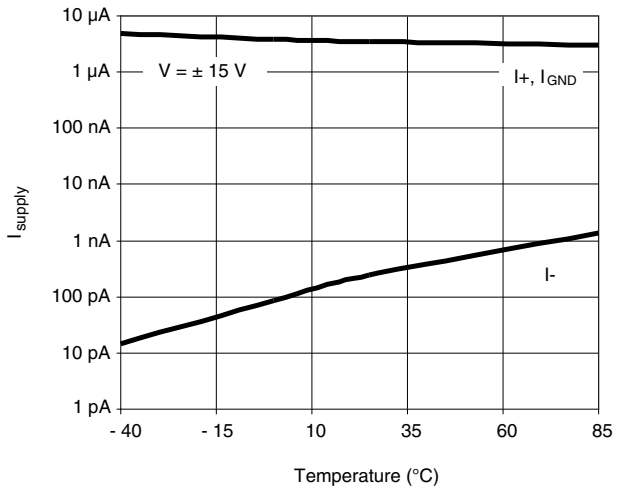


Leakage vs. Analog Voltage

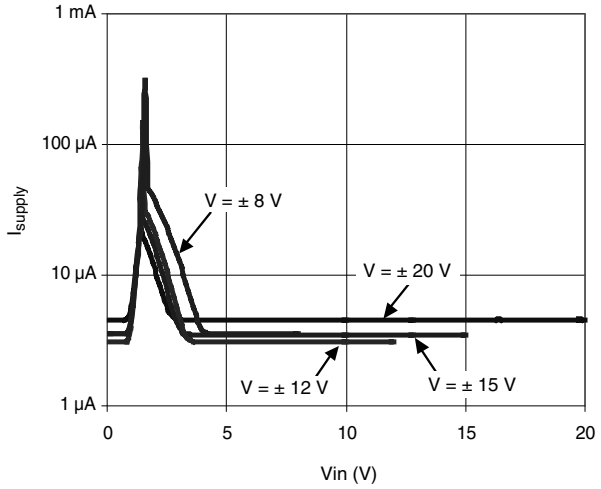


Leakage Current vs. Temperature

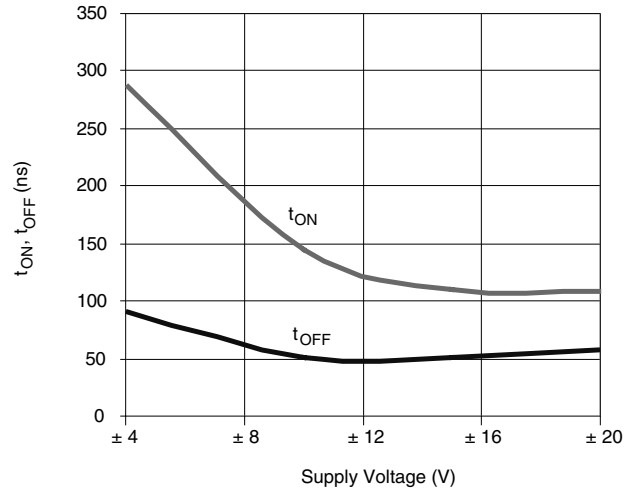
TYPICAL CHARACTERISTICS T_A = 25 °C, unless otherwise noted



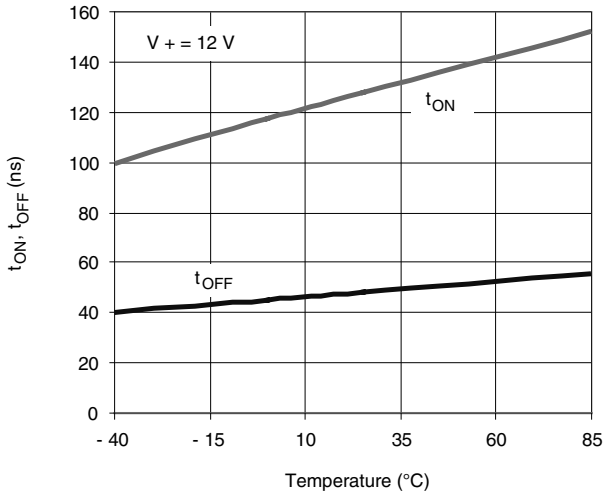
Supply Current vs. Temperature



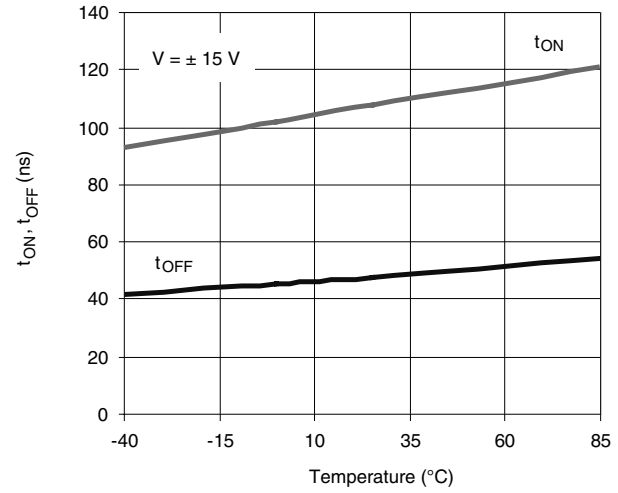
Supply Current vs. V_{IN}



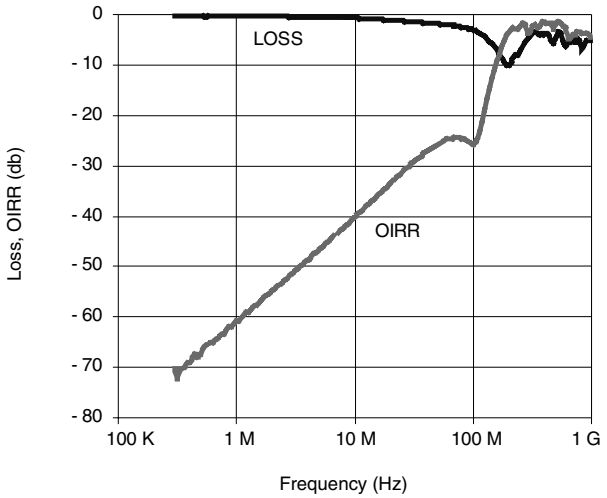
Switching Time vs. Supply Voltages



Switching Time vs. Temperature

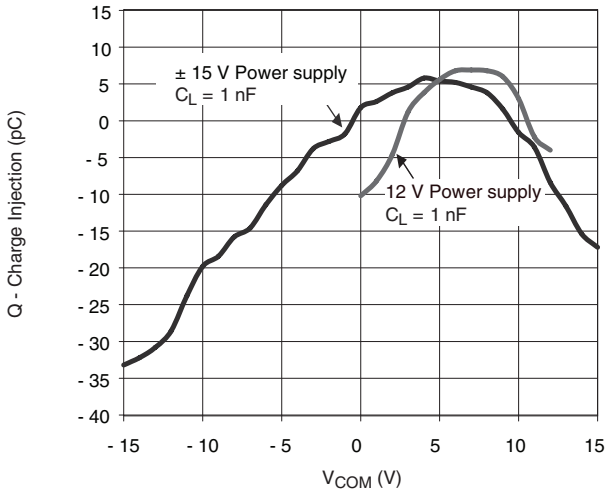


Switching Time vs. Temperature

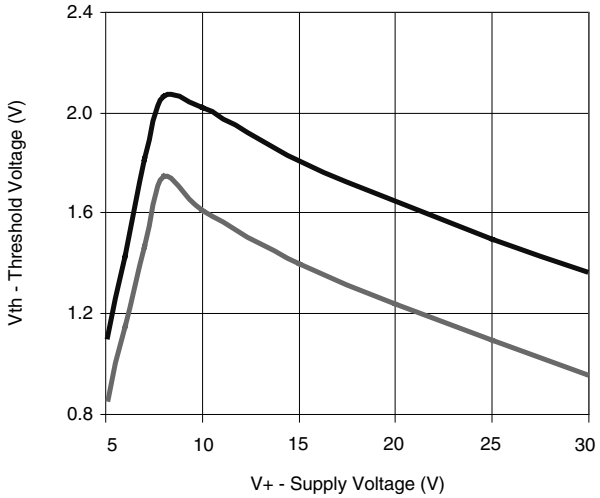


Off Isolation and Insertion Loss vs. Frequency

TYPICAL CHARACTERISTICS T_A = 25 °C, unless otherwise noted



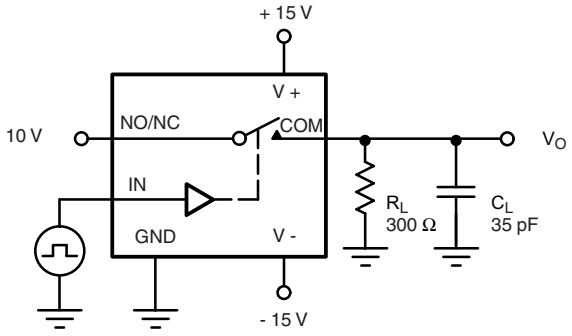
Charge Injection vs. Analog Voltage



Input Switching Threshold vs. Supply Voltage

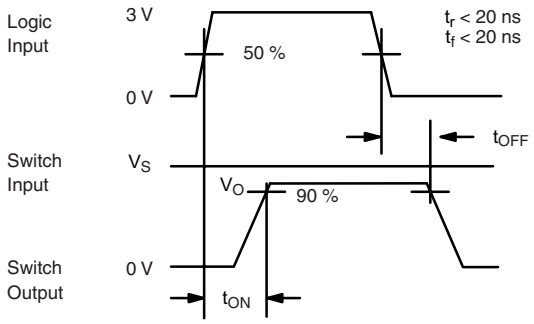
TEST CIRCUITS

V_O is the steady state output with the switch on.



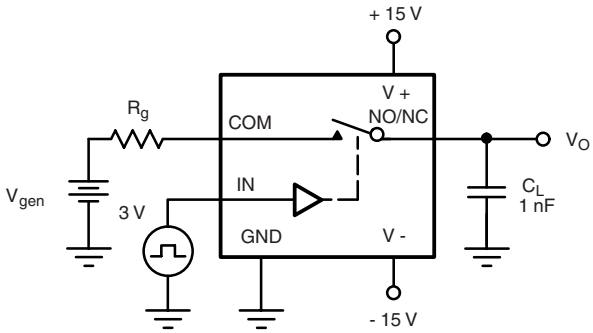
C_L (includes fixture and stray capacitance)

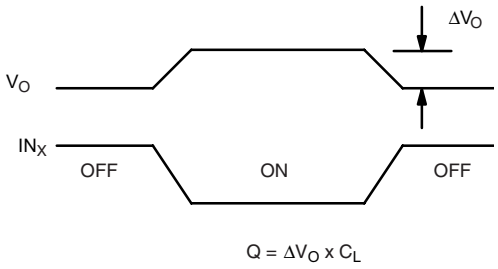
$$V_O = V_S \frac{R_L}{R_L + r_{ON}}$$



Note: Logic input waveform is inverted for switches that have the opposite logic sense.

Figure 1. Switching Time





$Q = \Delta V_O \times C_L$

Figure 2. Charge Injection

TEST CIRCUITS

V_O is the steady state output with the switch on.

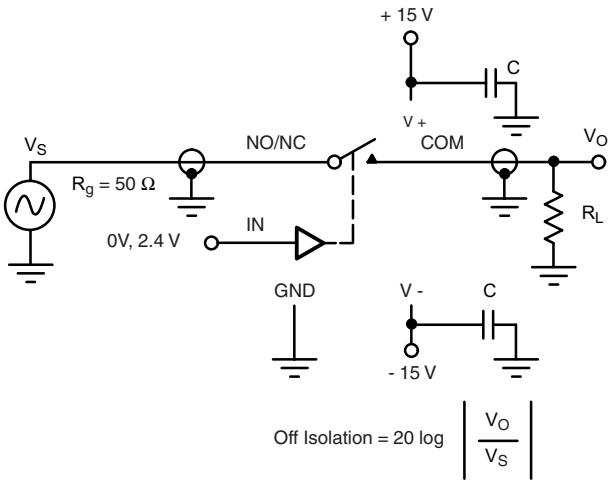


Figure 3. Off Isolation

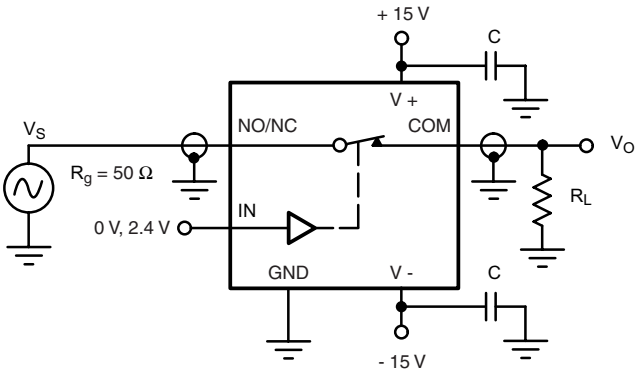


Figure 4. Insertion Loss

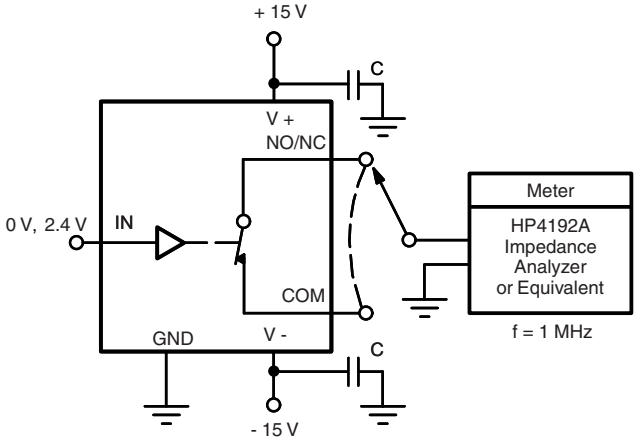


Figure 5. Source/Drain Capacitances

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