

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 \pm 4.5 V to \pm 20 V supplies. They are offered in the very popular, small TSOP6 package.

FEATURES

- \pm 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


RoHS
 COMPLIANT

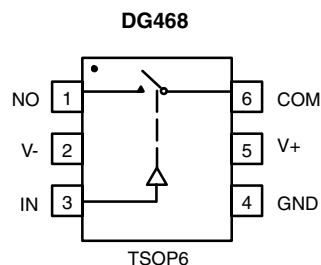
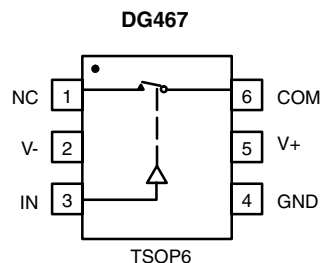
BENEFITS

- 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



TRUTH TABLE

| Logic | DG467 | DG468 |
|-------|-------|-------|
| 0 | ON | OFF |
| 1 | OFF | ON |

Logic "0" \leq 0.8 V
 Logic "1" \geq 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 $T_A = 25\text{ }^\circ\text{C}$, 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 ($V_{\pm} = \pm 15\text{ V}$) | | | | | | | |
|---|----------------------|---|-------------------|---------------------------|------------------|------------------|---------------|
| Parameter | Symbol | Test Conditions Unless Otherwise Specified $V_{+} = 15\text{ V}$, $V_{-} = -15\text{ V}$ $V_{IN} = 2.4\text{ V}$, 0.8 V^f | Temp ^b | D Suffix - 40 to 85 °C | | | Unit |
| | | | | Min ^d | Typ ^c | Max ^d | |
| Analog Switch | | | | | | | |
| Analog Signal Range ^e | V_{ANALOG} | | Full | - 15 | | 15 | V |
| Drain-Source On-Resistance | r_{ON} | $I_{NO/NC} = 10\text{ mA}$, $V_{COM} = 10\text{ V}$ $V_{+} = 13.5\text{ V}$, $V_{-} = -13.5\text{ V}$ | Room Full | | 7 | 9 10 | Ω |
| On-Resistance Flatness | r_{ON} Flatness | $I_{NO/NC} = 10\text{ mA}$, $V_{COM} = \pm 5\text{ V}$, 0 V $V_{+} = 13.5\text{ V}$, $V_{-} = -13.5\text{ V}$ | Room Full | | 0.7 | 1 2 | |
| Switch Off Leakage Current | $I_{NO/NC(off)}$ | $V_{+} = 16.5$, $V_{-} = -16.5\text{ V}$ $V_{COM} = \pm 15.5\text{ V}$ $V_{NO/NC} = -/+ 15.5\text{ V}$ | Room Full | - 1 - 10 | - 0.1 | 1 10 | nA |
| | $I_{COM(off)}$ | | Room Full | - 1 - 10 | - 0.1 | 1 10 | |
| Channel On Leakage Current | $I_{COM(on)}$ | $V_{+} = 16.5\text{ V}$, $V_{-} = -16.5$ $V_{COM} = V_{NO/NC} = \pm 15.5\text{ V}$ | 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} | $R_L = 300\ \Omega$, $C_L = 35\text{ pF}$ $V_{NO/NC} = \pm 10\text{ V}$ | Room Full | | 100 | 140 160 | ns |
| Turn-Off Time | t_{OFF} | | Room Full | | 50 | 80 100 | |
| Charge Injection ^e | Q | $C_L = 1\text{ nF}$, $V_{gen} = 0\text{ V}$, $R_{gen} = 0\ \Omega$ | Room | | 21 | | pC |
| Off-Isolation ^e | OIRR | $C_L = 5\text{ pF}$, $R_L = 50\ \Omega$, $f = 1\text{ MHz}$ | Room | | - 61 | | dB |
| Source Off Capacitance ^e | $C_{S(off)}$ | $f = 1\text{ MHz}$ | Room | | 30 | | pF |
| Drain Off Capacitance ^e | $C_{D(off)}$ | | Room | | 15 | | |
| Channel On Capacitance ^e | $C_{D(on)}$ | | Room | | 76 | | |
| Power Supplies | | | | | | | |
| Positive Supply Current | I+ | $V_{+} = 16.5\text{ V}$, $V_{-} = -16.5\text{ V}$ $V_{IN} = 0$ or 5 V | Room Full | | 5 | 15 20 | μA |
| Negative Supply Current | I- | | Room Full | - 1 - 10 | - 0.02 | | |

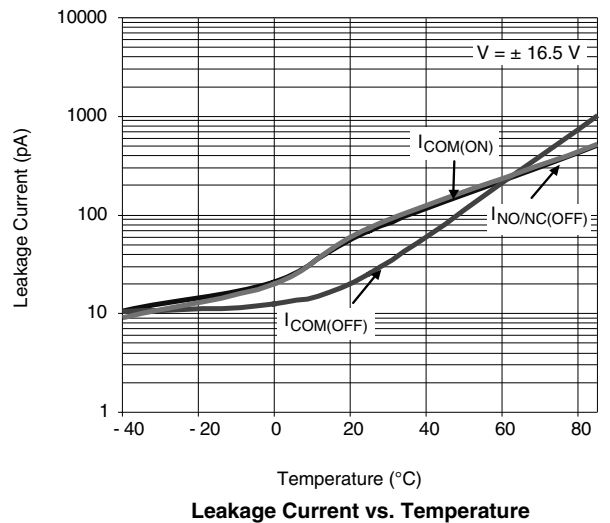
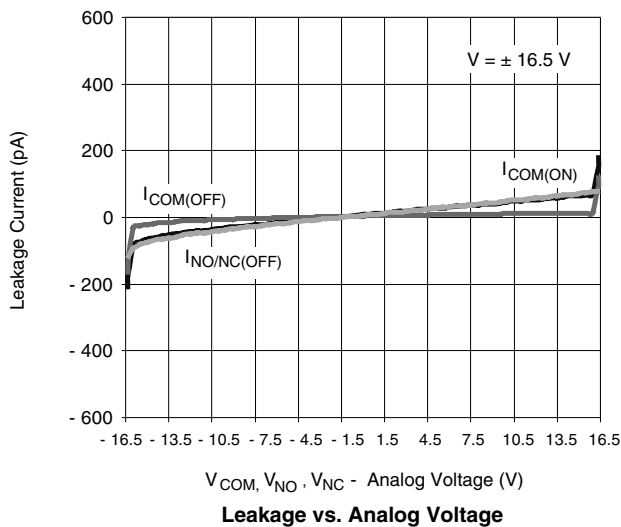
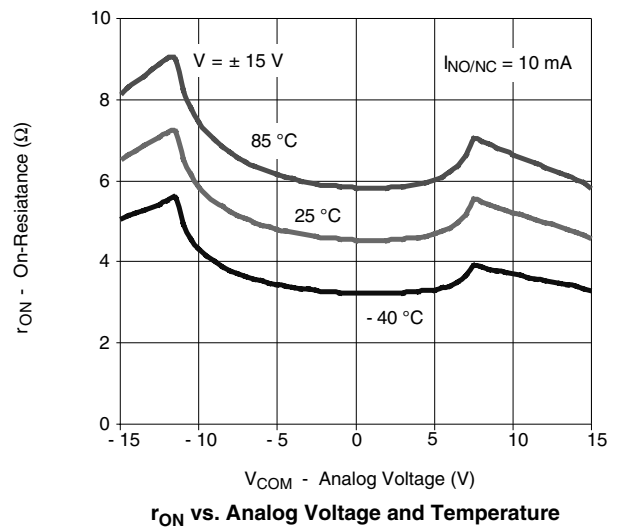
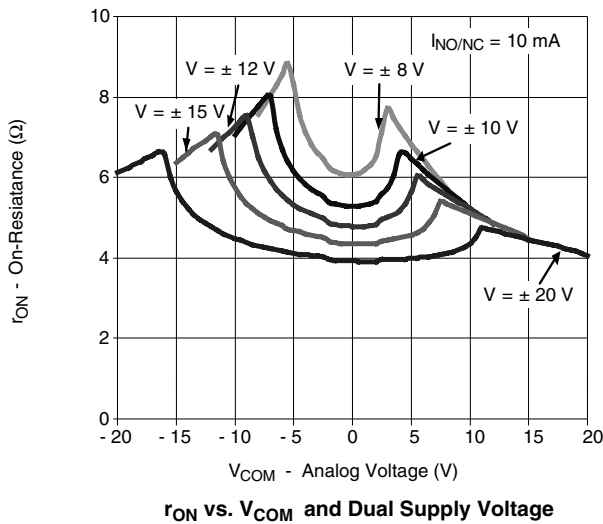
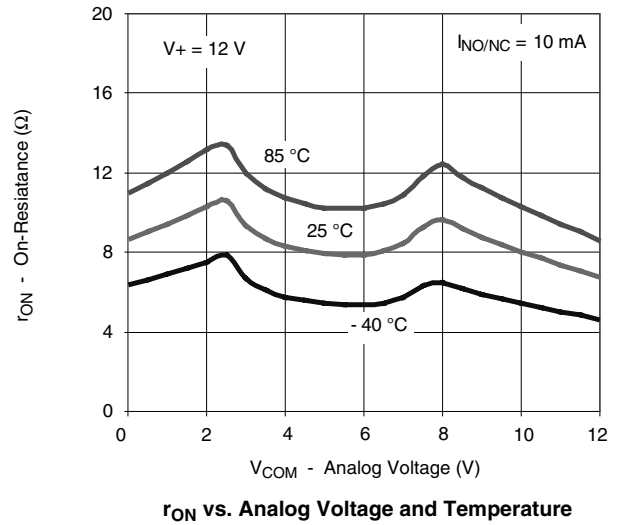
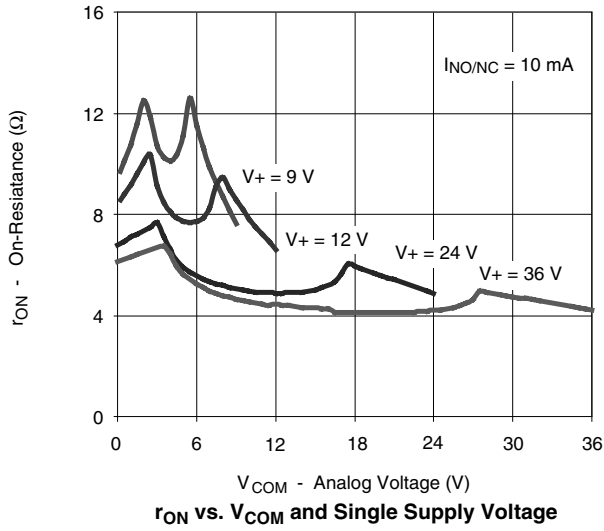
| SPECIFICATIONS ^a (V ₊ = 12 V) | | | | | | | |
|---|-----------------------------|---|-------------------|---------------------------|------------------|------------------|------|
| Parameter | Symbol | Test Conditions Unless Otherwise Specified V ₊ = 12 V, V ₋ = 0 V V _{IN} = 2.4 V, 0.8 V ^f | Temp ^b | D Suffix - 40 to 85 °C | | | Unit |
| | | | | Min ^d | Typ ^c | Max ^d | |
| 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:

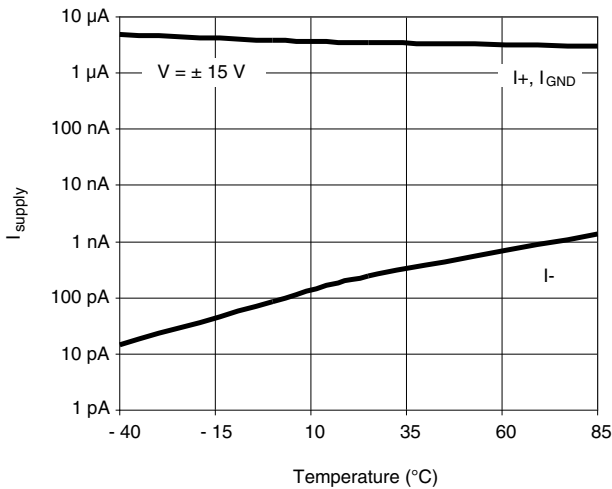
- a. Refer to PROCESS OPTION FLOWCHART.
- b. Room = 25 °C, Full = as determined by the operating temperature suffix.
- c. Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.
- d. The algebraic convention whereby the most negative value is a minimum and the most positive 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.

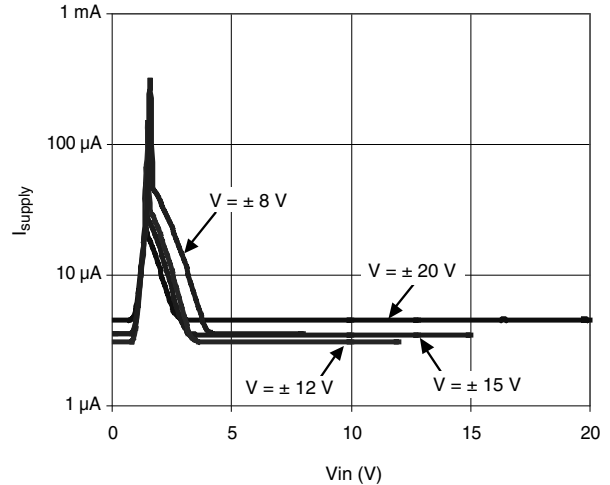
TYPICAL CHARACTERISTICS $T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted



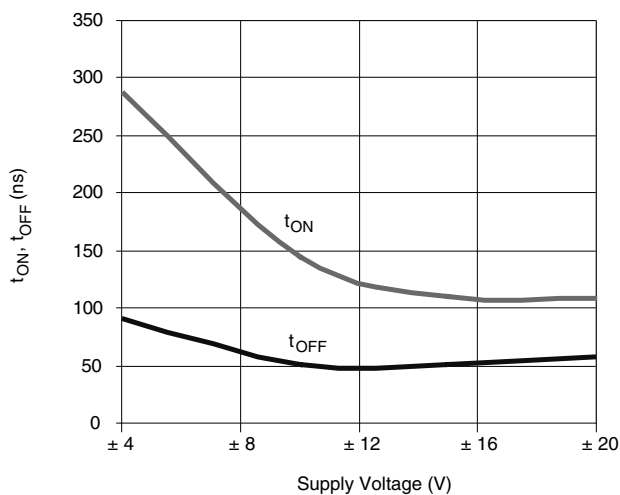
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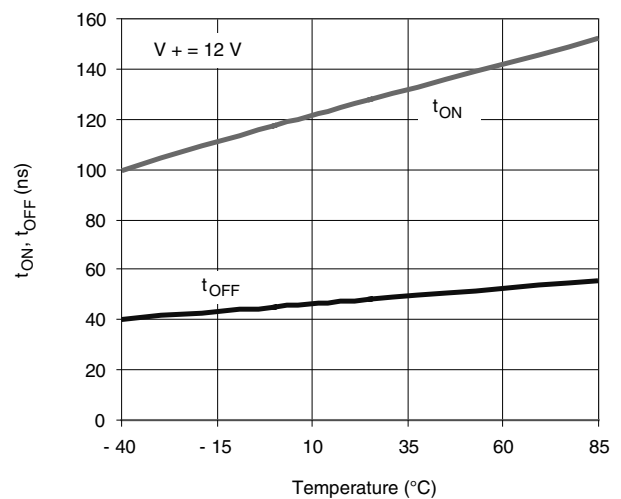
Supply Current vs. Temperature



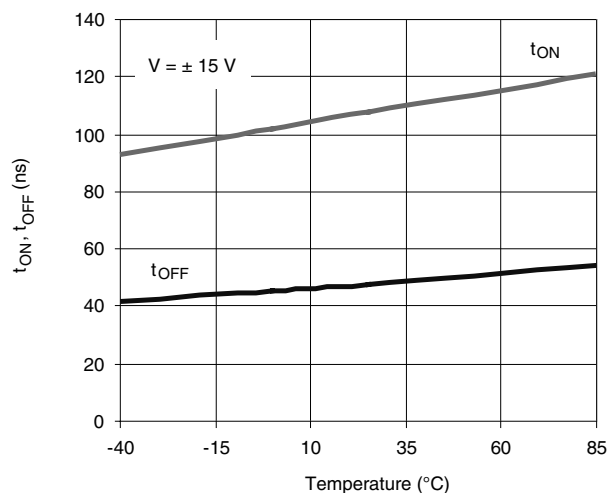
Supply Current vs. V_{IN}



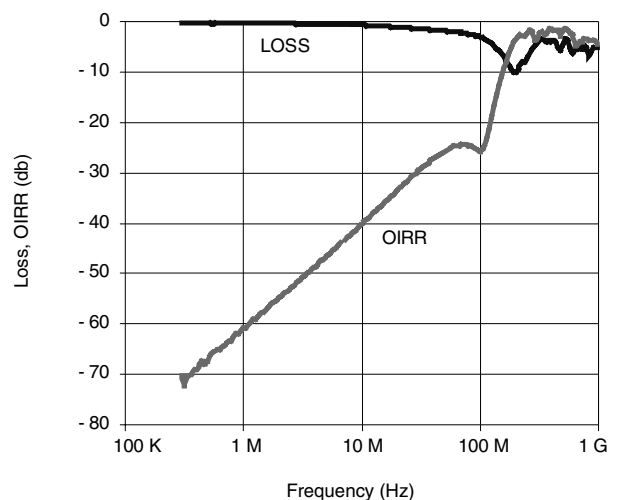
Switching Time vs. Supply Voltages



Switching Time vs. Temperature

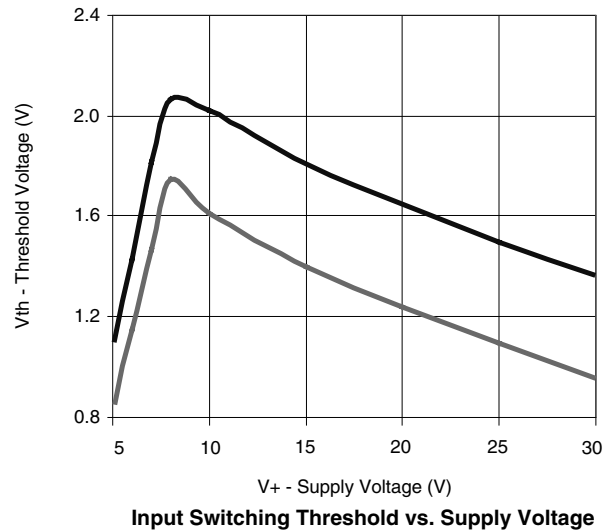
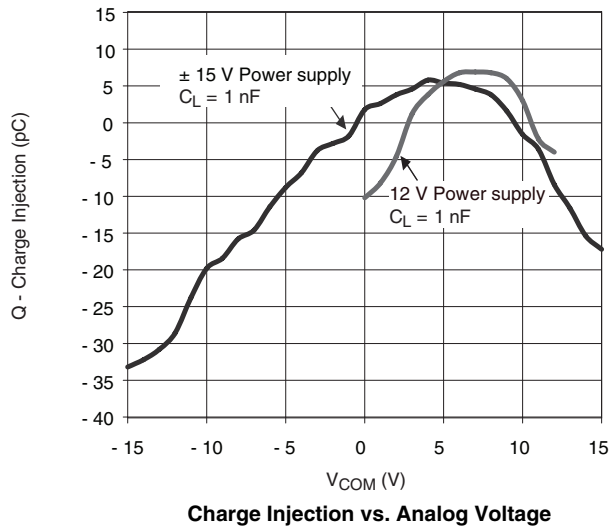


Switching Time vs. Temperature



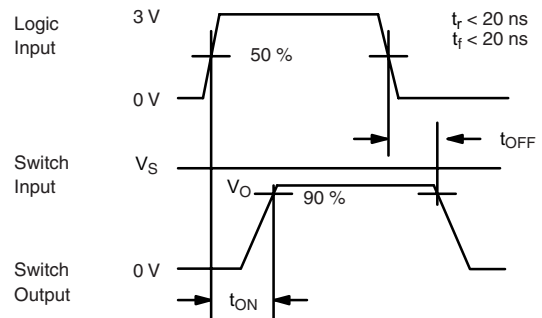
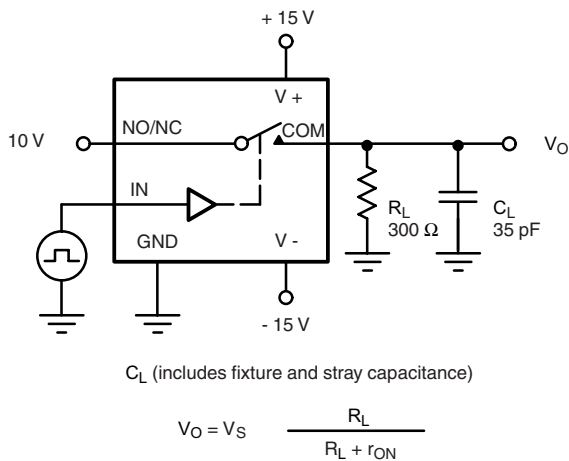
Off Isolation and Insertion Loss vs. Frequency

TYPICAL CHARACTERISTICS $T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted



TEST CIRCUITS

V_O is the steady state output with the switch on.



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

Figure 1. Switching Time

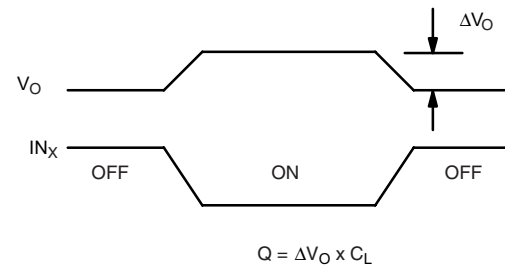
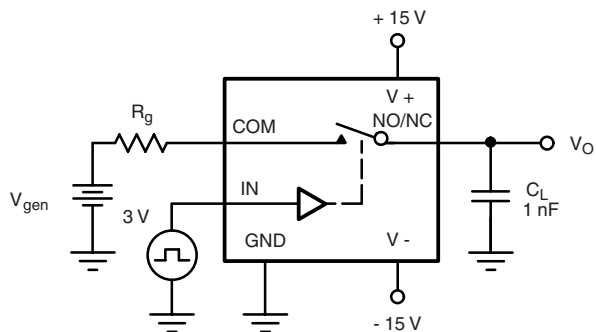


Figure 2. Charge Injection

TEST CIRCUITS

V_O is the steady state output with the switch on.

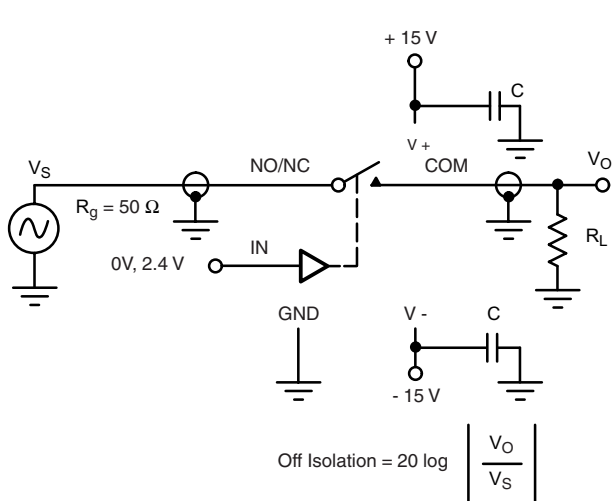


Figure 3. Off Isolation

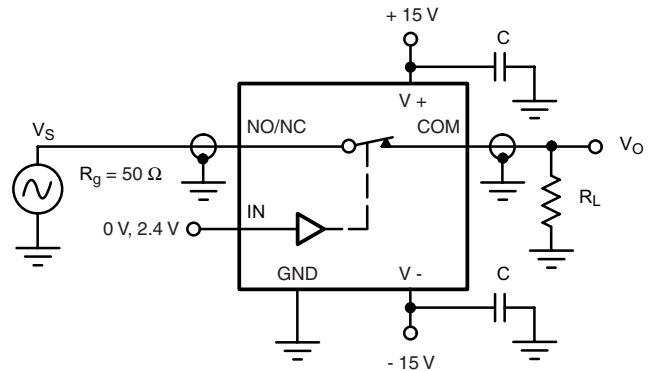


Figure 4. Insertion Loss

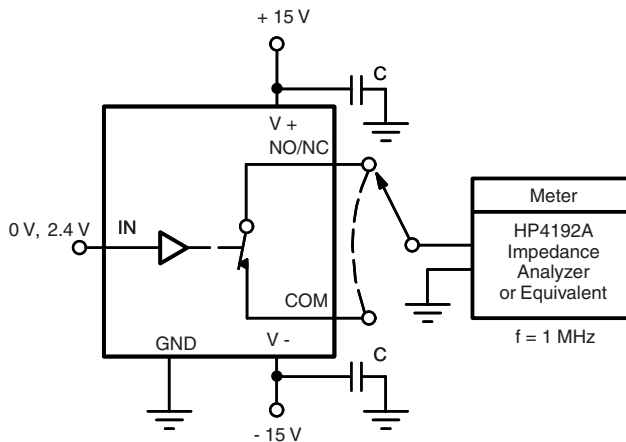


Figure 5. Source/Drain Capacitances

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