# High Voltage Single SPDT Analog Switch in SOT23-8

## DESCRIPTION

The DG449 is a dual supply single-pole/double-throw (SPDT) switches. On resistance is 38 $\Omega$ and flatness is 2.6 $\Omega$ 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 DG449 is also ideally suited for portable and battery powered industrial and military equipment.

The DG449 operates either from a single + 7 V to 36 V supply or from dual ± 4.5 V to ± 20 V supplies. It is offered in the very popular, small SOT23-8 package.

## FEATURES

- ± 15 V analog signal range
- On-resistance - $R_{DS(on)}$: 38 $\Omega$ max.
- $V_L$ 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
- Small SOT23-8ld package; 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



DG449

SOT23-8

Top View
Device Marking: G9 x
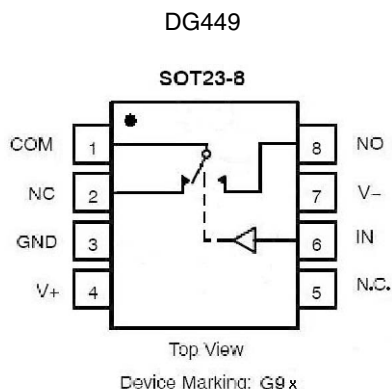
### TRUTH TABLE

| Logic | NC | NO |
|-------|-----|-----|
| 0 | ON | OFF |
| 1 | OFF | ON |

Logic "0" $\leq$ 0.8 V
Logic "1" $\geq$ 2.4 V

## ORDERING INFORMATION

| Temp. Range | Package | Part Number |
|---|---|---|
| - 40 to 85 °C | 8-Pin SOT23 | DG449DS-T1-E3 |

## ABSOLUTE MAXIMUM RATINGS  ($T_A$ = 25 °C, unless otherwise noted)

| Parameter (Voltages 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, NC or COM) Pulsed at 1 ms, 10 % duty cycle | | | 100 | |
| Storage Temperature | | | - 65 to 150 | °C |
| Power Dissipation (Package)[b] | 8-Pin SOT-23[c] | | 675 | 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 8.4 mW/°C above 70 °C.

## SPECIFICATIONS[a]

| 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 °C to 85 °C Min.[d] | Typ.[c] | Max.[d] | Unit |
|---|---|---|---|---|---|---|---|
| **Analog Switch** | | | | | | | |
| Analog Signal Range[e] | V$_{ANALOG}$ | | Full | - 15 | | 15 | V |
| On-Resistance | R$_{ON}$ | I$_{no/nc}$ = 1 mA, V$_{COM}$ = ± 8.5 V V+ = 13.5 V, V- = - 13.5 V | Room Full | | 38 | 45 57 | Ω |
| On Resistance MATCH | ΔR$_{ON}$ | | Room Full | | | 5 6 | |
| On-Resistance Flatness | R$_{ON}$ Flatness | I$_{no/nc}$ = 1 mA, V$_{COM}$ = ± 5 V, 0 V V+ = 13.5 V, V- = - 13.5 V | Room Full | | 2.6 | 7 8 | |
| Switch Off Leakage Current | I$_{no/nc(off)}$ | V+ = 16.5 V, 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 | - 2 - 20 | - 0.1 | 2 20 | |
| **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 | | 4 | | pF |
| Input Current V$_{IN}$ High or Low | 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 | | 107 | 146 155 | ns |
| Turn-Off Time | t$_{OFF}$ | | Room Full | | 69 | 104 116 | |
| Charge Injection[e] | Q | C$_L$ = 1 nF, V$_{gen}$ = 0 V, R$_{gen}$ = 0 Ω | Room | | 5 | | pC |
| Off-Isolation[e] | OIRR | R$_L$ = 50 Ω, C$_L$ = 5 pF, f = 1 MHz | Room | | - 69 | | dB |
| Crosstalk[e] | X$_{TALK}$ | R$_L$ = 50 Ω, C$_L$ = 5 pF, f = 1 MHz | | | - 80 | | |
| Source NO, NC Off Capacitance[e] | C$_{no/nc(off)}$ | f = 1 MHz | Room | | 8 | | pF |
| Channel On Capacitance[e] | C$_{COM(on)}$ | f = 1 MHz | Room | | 18 | | |
| **Power Supplies** | | | | | | | |
| Positive Supply Current | I+ | V+ = 16.5 V, V- = - 16.5 V V$_{IN}$ = 0, 5 V or, V+ | Room Full | | 4 | 20 30 | µA |
| Negative Supply Current | I- | | Room Full | - 1 - 3 | | | |

# DG449

## Vishay Siliconix

## SPECIFICATIONS[a]

| 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 °C to 85 °C Min.[d] | Typ.[c] | Max.[d] | Unit |
|---|---|---|---|---|---|---|---|
| **Analog Switch** | | | | | | | |
| Analog Signal Range[e] | $V_{ANALOG}$ | | Full | 0 | | 12 | V |
| On-Resistance | $R_{ON}$ | $I_{no/nc}$ = 1 mA, $V_{COM}$ = 3, 8 V V+ = 10.8 V | Room Full | | 67 | 85 96 | Ω |
| On-Resistance MATCH | $\Delta R_{ON}$ | | Room Full | | | 4 5 | |
| On-Resistance Flatness | $R_{ON}$ Flatness | $I_{no/nc}$ = 1 mA, $V_{COM}$ = 2, 6, 10 V V+ = 10.8 V | Room Full | | 17 | 25 31 | |
| **Dynamic Characteristics** | | | | | | | |
| Turn-On Time | $t_{ON}$ | $V_{NO, NC}$ = 10 V, $R_L$ = 300 Ω, $C_L$ = 35 pF | Room Full | | 133 | 168 192 | nS |
| Turn-Off Time | $t_{OFF}$ | | Room Full | | 58 | 92 96 | |
| Charge Injection[e] | Q | $C_L$ = 1 nF, $V_{gen}$ = 0 V, $R_{gen}$ = 0 Ω | Room | | 6 | | pC |
| **Power Supplies** | | | | | | | |
| Positive Supply Current | I+ | V+ = 13.2 V, $V_{IN}$ = 0 V, 5 V or V+ | Room Full | | 3 | 20 30 | 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)
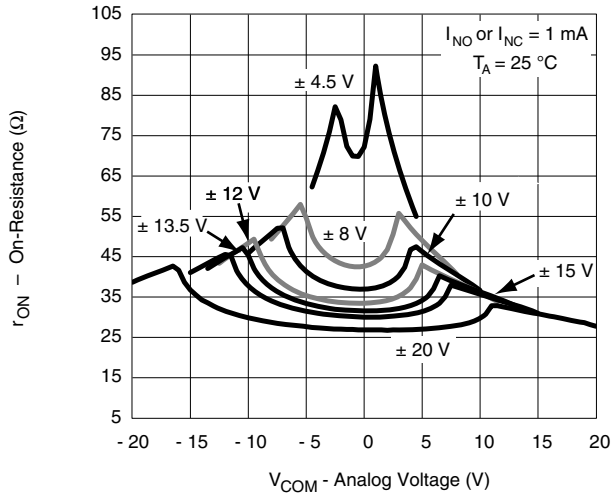


**$R_{ON}$ vs. $V_{COM}$ and Dual Supply Voltage**
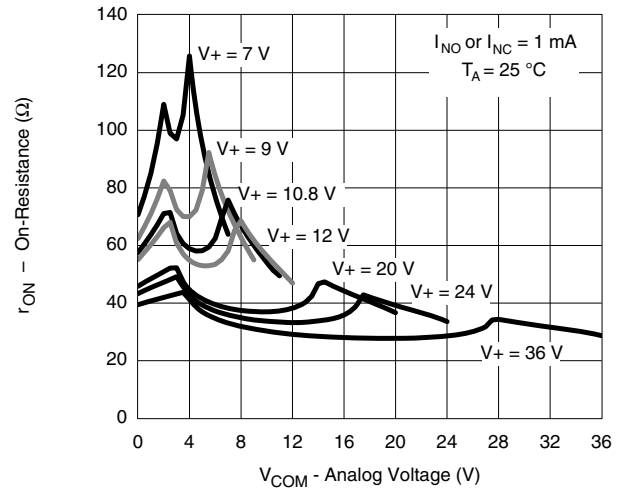


**On Resistance vs. $V_{COM}$ and Single Supply Voltage**
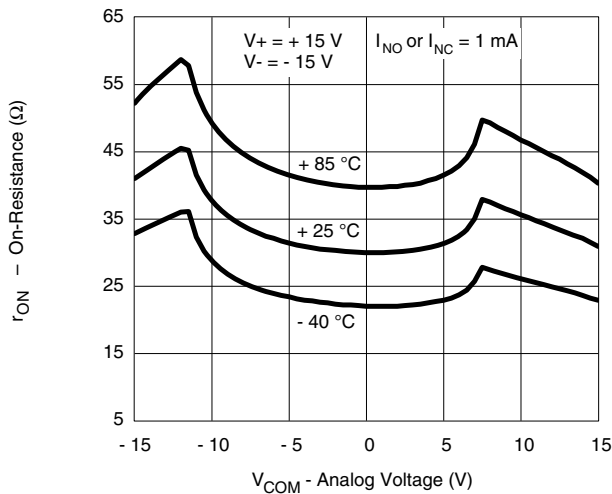


**On Resistance vs. $V_{COM}$ and Temperature**
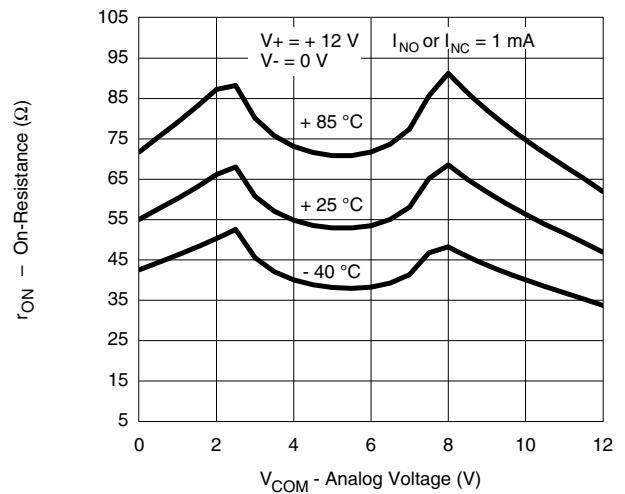


**On Resistance vs. $V_{COM}$ and Temperature**
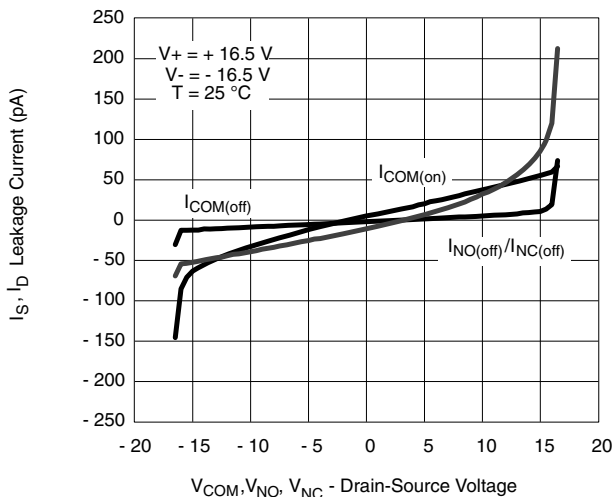


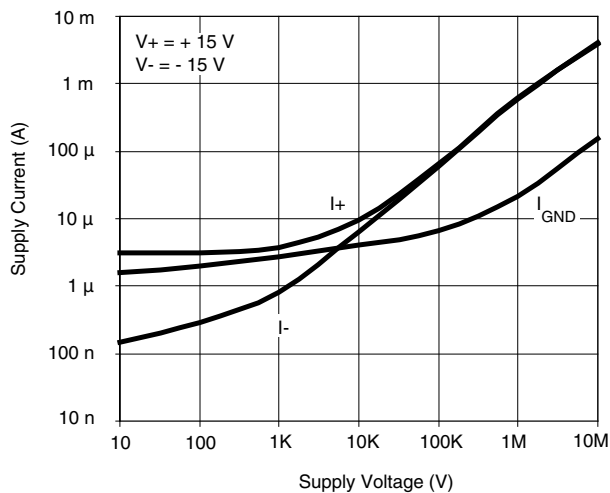**Leakage Current vs. Analog Voltage**
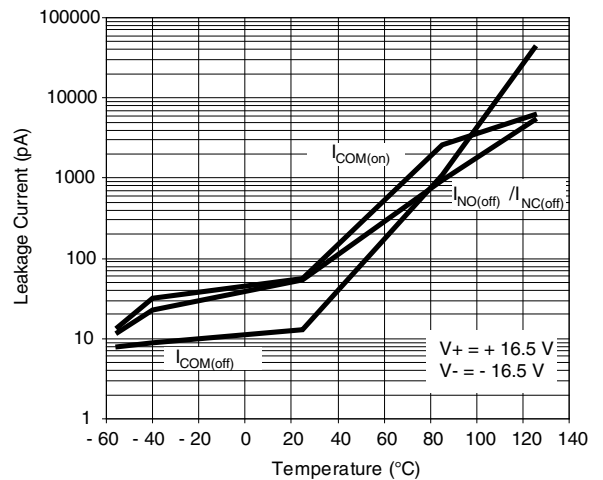


**Leakage Current vs. Temperature**

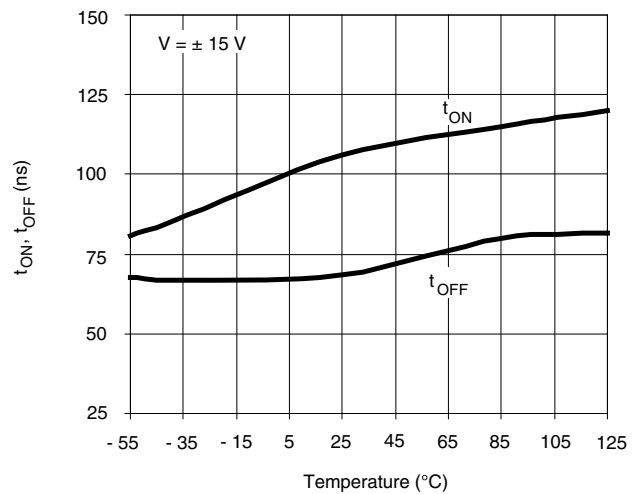## TYPICAL CHARACTERISTICS ($T_A$ = 25 °C, unless otherwise noted)
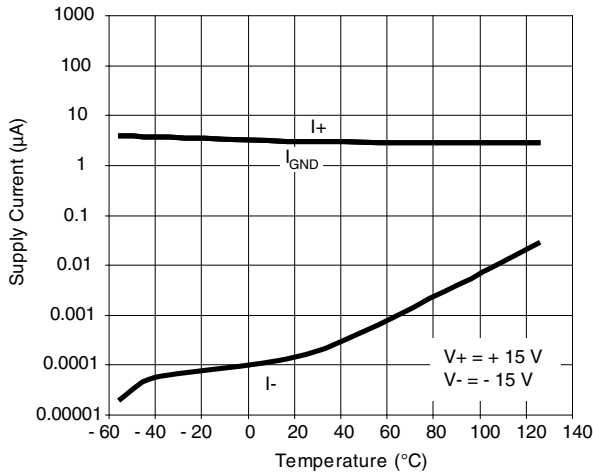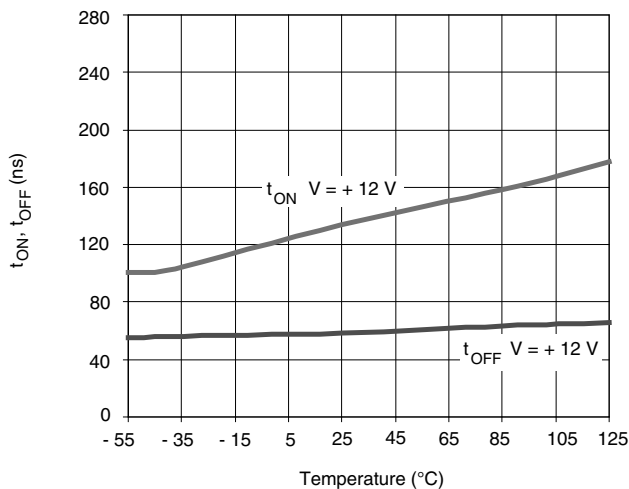


**Supply Current vs. Temperature**
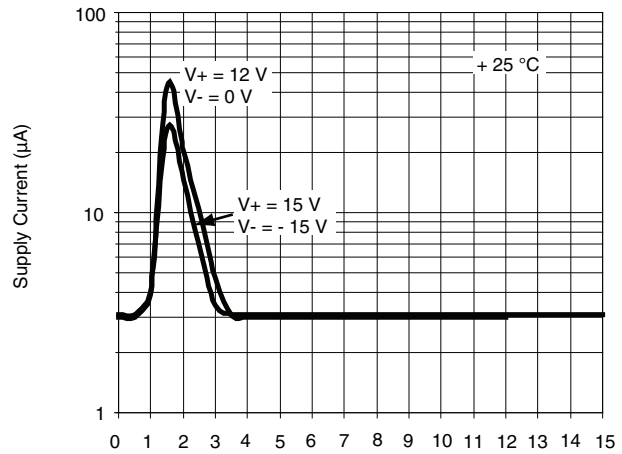


**Supply Current vs. Input Voltage**



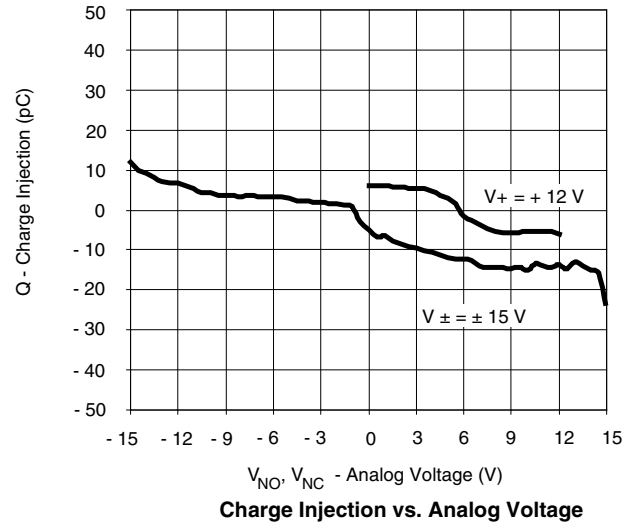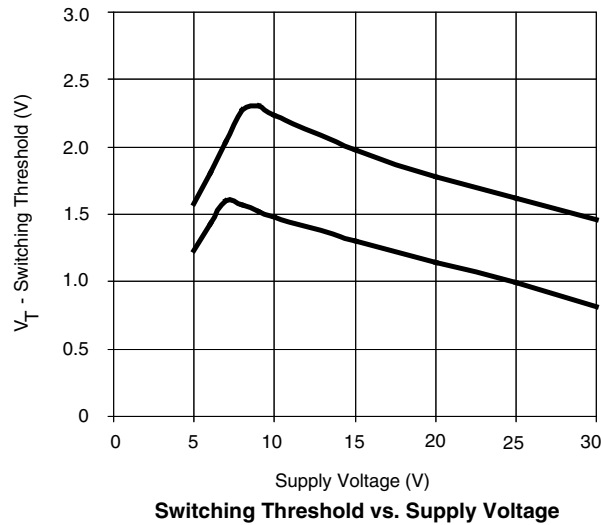**Supply Current vs. Input Switching Frequency**



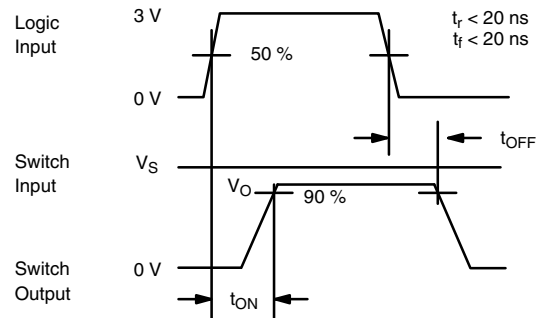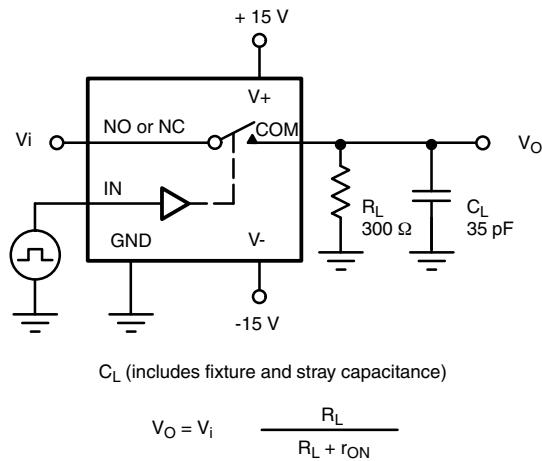**Switching Time vs. Temperature and Single Supply Voltage**



**Switching Time vs. Temperature and Single Supply Voltage**
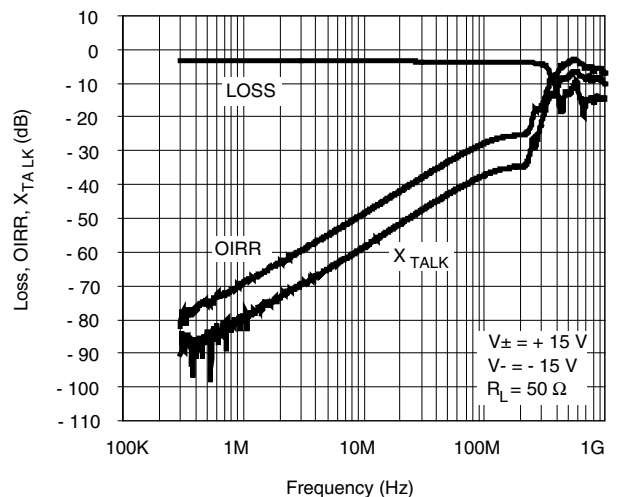


**Insertion Loss, Off-Isolation, Crosstalk vs. Frequency**

## TYPICAL CHARACTERISTICS ($T_A$ = 25 °C, unless otherwise noted)



**Switching Threshold vs. Supply Voltage**



**Charge Injection vs. Analog Voltage**

## TEST CIRCUITS

$V_O$ is the steady state output with the switch on.



$C_L$ (includes fixture and stray capacitance)

$$V_O = V_i \; \frac{R_L}{R_L + r_{ON}}$$



Note: Logic input waveform is inverted for switches that have the opposite logic sense.
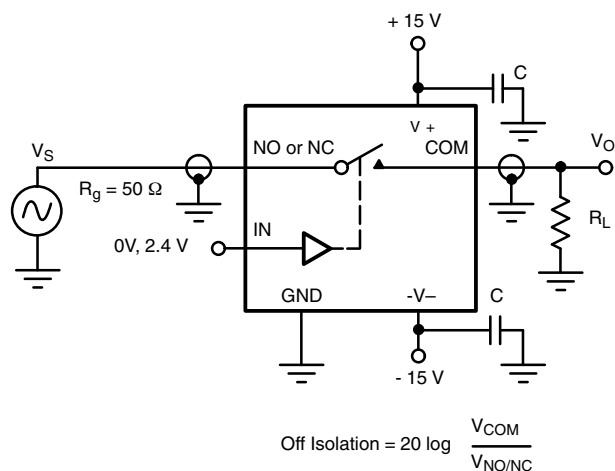
**Figure 1. Switching Time**





$$Q = \Delta V_O \times C_L$$
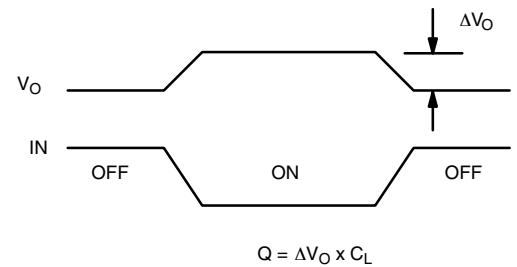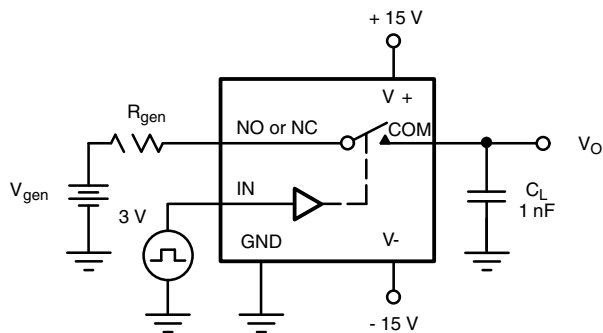
**Figure 2. Charge Injection**

**Figure 3. Off Isolation**



$$\text{Off Isolation} = 20 \log \frac{V_{COM}}{V_{NO/NC}}$$
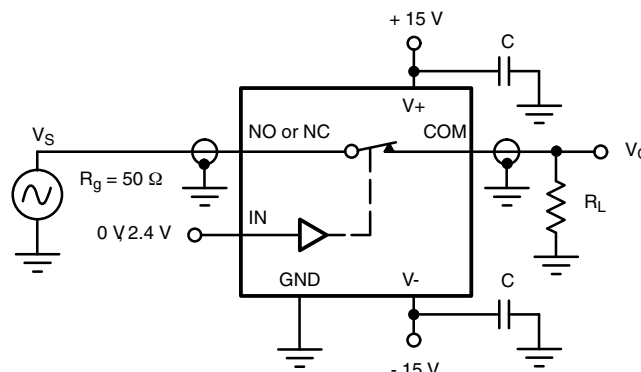


**Figure 4. Insertion Loss**
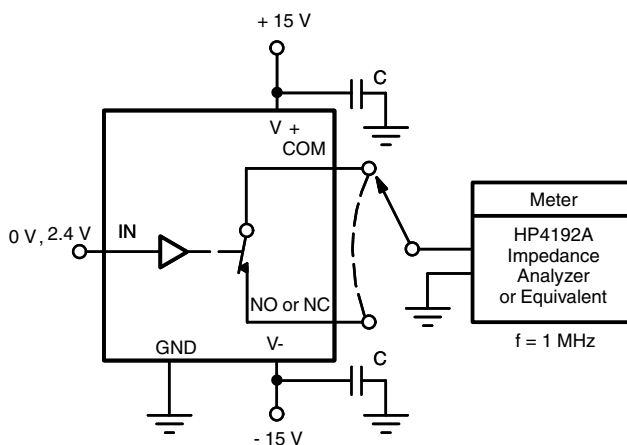


**Figure 5. Channel ON/OFF Capacitances**

**SOT-23 : 8-LEAD**
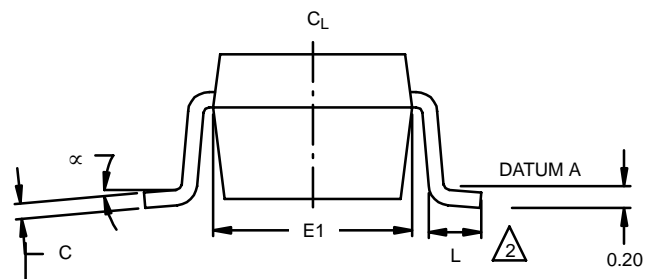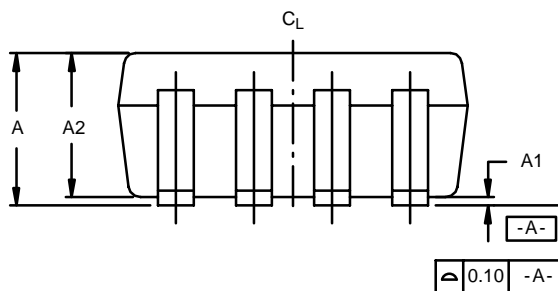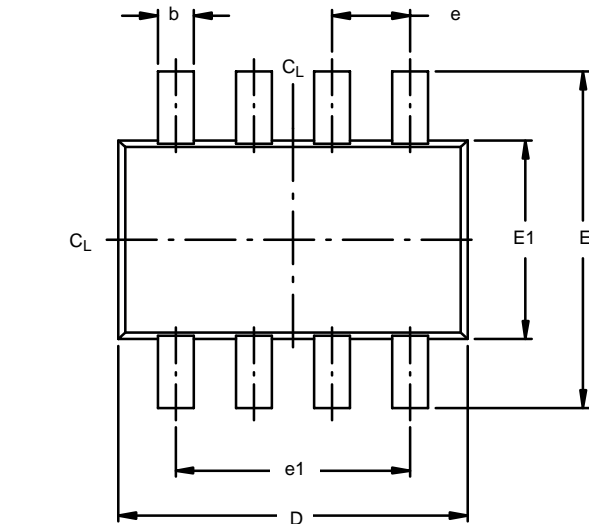


NOTES:

1. All dimensions are in millimeters.

2. Foot length measured at intercept point between Datum A and lead surface.

3. Package outline exclusive of mold flash and metal burr.

4. Package outline inclusive of solder plating.

5. No molding flash allowed on the top and bottom lead surface.

| Dim | MILLIMETERS | | | INCHES | | |
|-----|-----|-----|-----|-----|-----|-----|
| | Min | Nom | Max | Min | Nom | Max |
| A | 0.90 | 1.27 | 1.45 | 0.035 | 0.05 | 0.057 |
| A1 | 0.00 | 0.0762 | 0.15 | 0.000 | 0.003 | 0.006 |
| A2 | 0.90 | 1.20 | 1.30 | 0.035 | 0.047 | 0.051 |
| b | 0.22 | 0.30 | 0.38 | 0.009 | 0.012 | 0.015 |
| C | 0.09 | 0.152 | 0.20 | 0.004 | 0.006 | 0.008 |
| D | 2.80 | 2.9 | 3.00 | 0.11 | 0.114 | 0.118 |
| E | 2.60 | 2.8 | 23.00 | 0.102 | 0.11 | 0.118 |
| E1 | 1.50 | 1.65 | 1.75 | 0.059 | 0.065 | 0.069 |
| e | 0.65 REF | | | 0.026 REF | | |
| e1 | 1.95 REF | | | 0.077 REF | | |
| L | 0.35 | 0.45 | 0.55 | 0.014 | 0.018 | 0.022 |
| ∝ | 0° | 4° | 8° | 0° | 4° | 8° |

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