

## 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  $+7\ \text{V}$  to  $36\ \text{V}$  supply or from dual  $\pm 4.5\ \text{V}$  to  $\pm 20\ \text{V}$  supplies. It is offered in the very popular, small SOT23-8 package.

### FEATURES

- $\pm 15\ \text{V}$  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

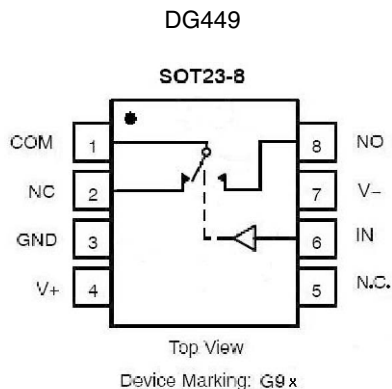
### BENEFITS

- Wide dynamic range
- Low signal errors and distortion
- Break-before-make switching action
- Simple interfacing
- Small SOT23-8 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



### TRUTH TABLE

Logic	NC	NO
0	ON	OFF
1	OFF	ON

Logic "0"  $\leq 0.8\ \text{V}$   
Logic "1"  $\geq 2.4\ \text{V}$



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

ABSOLUTE MAXIMUM RATINGS (T <sub>A</sub> = 25 °C, unless otherwise noted)			
Parameter (Voltages Referenced to V-)	Symbol	Limit	Unit
V+		44	V
GND		25	
Digital Inputs <sup>a</sup> , V <sub>no/nc</sub> , V <sub>COM</sub>		(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) <sup>b</sup>	8-Pin SOT-23 <sup>c</sup>	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 <sup>a</sup>							
Parameter	Symbol	Test Conditions Unless Otherwise Specified V <sub>+</sub> = 15 V, V <sub>-</sub> = - 15 V V <sub>IN</sub> = 2.4 V, 0.8 V <sup>f</sup>	Temp. <sup>b</sup>	D Suffix - 40 °C to 85 °C			Unit
				Min. <sup>d</sup>	Typ. <sup>c</sup>	Max. <sup>d</sup>	
<b>Analog Switch</b>							
Analog Signal Range <sup>e</sup>	V <sub>ANALOG</sub>		Full	- 15		15	V
On-Resistance	R <sub>ON</sub>	I <sub>no/nc</sub> = 1 mA, V <sub>COM</sub> = ± 8.5 V V <sub>+</sub> = 13.5 V, V <sub>-</sub> = - 13.5 V	Room		38	45	Ω
On Resistance MATCH	ΔR <sub>ON</sub>		Full			5	
On-Resistance Flatness	R <sub>ON</sub> Flatness	I <sub>no/nc</sub> = 1 mA, V <sub>COM</sub> = ± 5 V, 0 V V <sub>+</sub> = 13.5 V, V <sub>-</sub> = - 13.5 V	Room		2.6	7	Ω
			Full			8	
Switch Off Leakage Current	I <sub>no/nc(off)</sub>	V <sub>+</sub> = 16.5, V <sub>-</sub> = - 16.5 V V <sub>COM</sub> = ± 15.5 V V <sub>no/nc</sub> = -/+ 15.5 V	Room	- 1	- 0.1	1	nA
	I <sub>COM(off)</sub>		Full	- 10		10	
Channel On Leakage Current	I <sub>COM(on)</sub>	V <sub>+</sub> = 16.5 V, V <sub>-</sub> = - 16.5 V V <sub>COM</sub> = V <sub>no/nc</sub> = ± 15.5 V	Room	- 2	- 0.1	2	nA
			Full	- 20		20	
<b>Digital Control</b>							
Input, High Voltage	I <sub>INH</sub>		Full	2.4			V
Input, Low Voltage	I <sub>INL</sub>		Full			0.8	
Input Capacitance <sup>e</sup>	C <sub>IN</sub>		Room		4		pF
Input Current V <sub>IN</sub> High or Low	I <sub>IN</sub>	V <sub>IN</sub> = 0 or 5 V		- 1		1	μA
<b>Dynamic Characteristics</b>							
Turn-On Time	t <sub>ON</sub>	R <sub>L</sub> = 300 Ω, C <sub>L</sub> = 35 pF V <sub>no/nc</sub> = ± 10 V	Room		107	146	ns
Turn-Off Time	t <sub>OFF</sub>		Full			155	
Charge Injection <sup>e</sup>	Q	C <sub>L</sub> = 1 nF, V <sub>gen</sub> = 0 V, R <sub>gen</sub> = 0 Ω	Room		5		pC
Off-Isolation <sup>e</sup>	OIRR	R <sub>L</sub> = 50 Ω, C <sub>L</sub> = 5 pF, f = 1 MHz	Room		- 69		dB
Crosstalk <sup>e</sup>	X <sub>TALK</sub>	R <sub>L</sub> = 50 Ω, C <sub>L</sub> = 5 pF, f = 1 MHz			- 80		
Source NO, NC Off Capacitance <sup>e</sup>	C <sub>no/nc(off)</sub>	f = 1 MHz	Room		8		pF
Channel On Capacitance <sup>e</sup>	C <sub>COM(on)</sub>	f = 1 MHz	Room		18		
<b>Power Supplies</b>							
Positive Supply Current	I <sub>+</sub>	V <sub>+</sub> = 16.5 V, V <sub>-</sub> = - 16.5 V V <sub>IN</sub> = 0, 5 V or, V <sub>+</sub>	Room		4	20	μA
Negative Supply Current	I <sub>-</sub>		Full	- 1		30	
			Full	- 3			

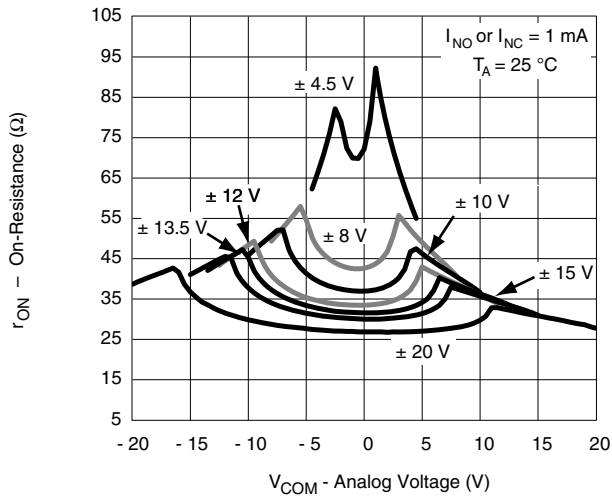
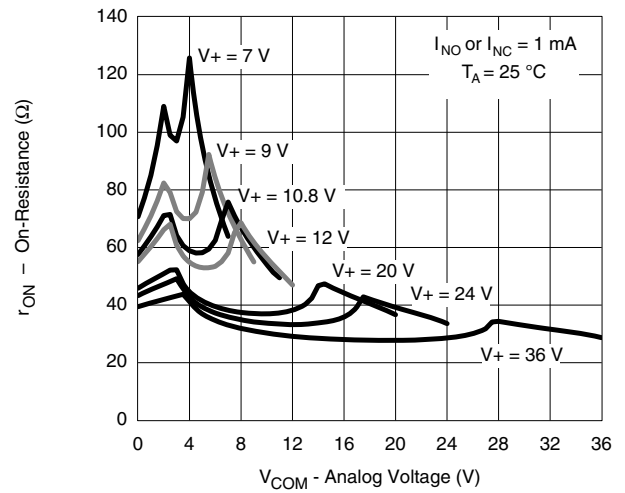
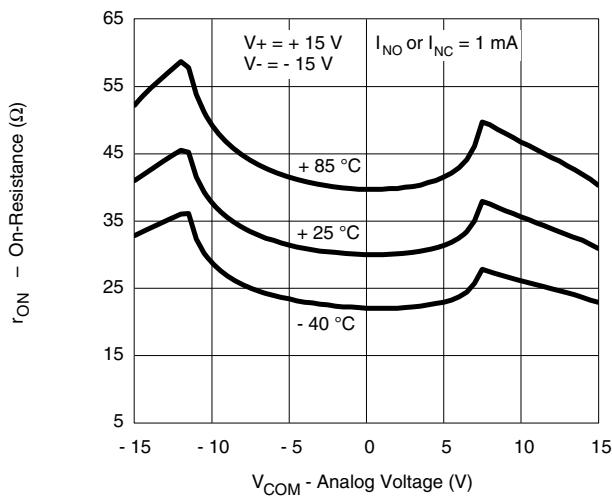
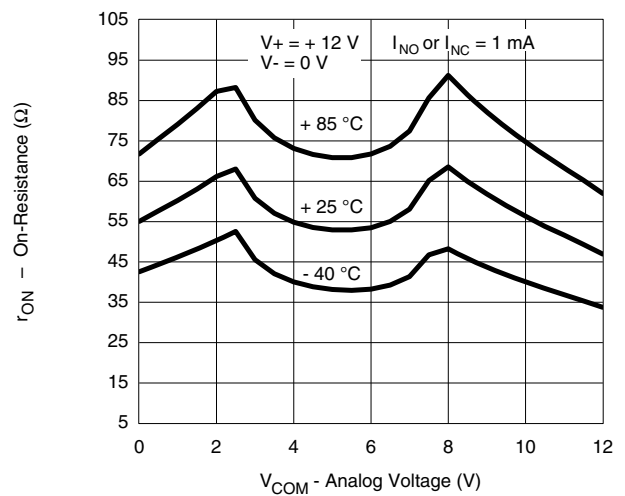
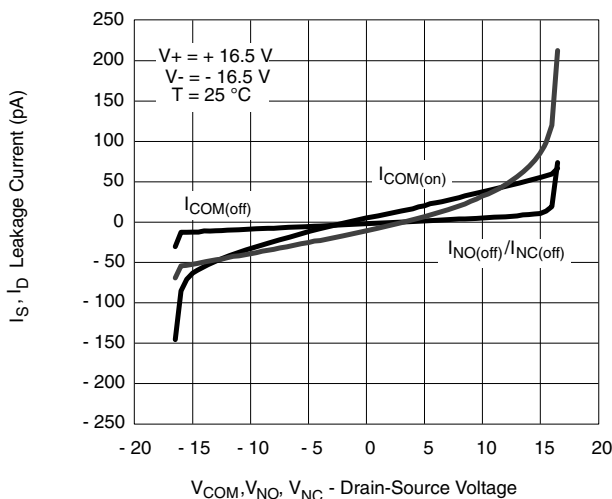
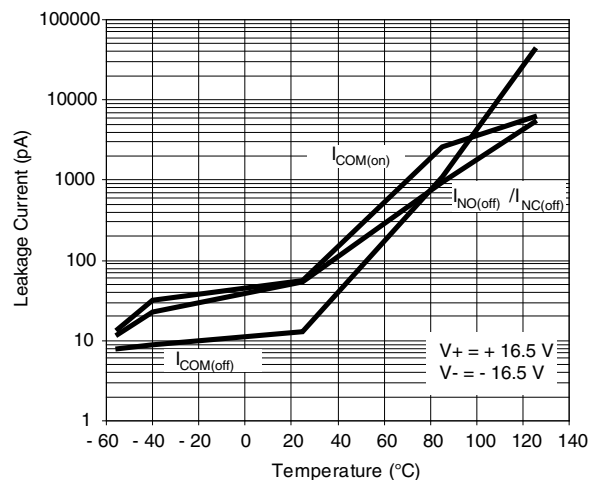


SPECIFICATIONS <sup>a</sup>							
Parameter	Symbol	Test Conditions Unless Otherwise Specified V <sub>+</sub> = 12 V, V <sub>-</sub> = 0 V V <sub>IN</sub> = 2.4 V, 0.8 V <sup>f</sup>	Temp. <sup>b</sup>	D Suffix - 40 °C to 85 °C			Unit
				Min. <sup>d</sup>	Typ. <sup>c</sup>	Max. <sup>d</sup>	
<b>Analog Switch</b>							
Analog Signal Range <sup>e</sup>	V <sub>ANALOG</sub>		Full	0		12	V
On-Resistance	R <sub>ON</sub>	I <sub>no/nc</sub> = 1 mA, V <sub>COM</sub> = 3, 8 V V <sub>+</sub> = 10.8 V	Room		67	85	Ω
On-Resistance MATCH	ΔR <sub>ON</sub>		Full			4	
On-Resistance Flatness	R <sub>ON</sub> Flatness	I <sub>no/nc</sub> = 1 mA, V <sub>COM</sub> = 2, 6, 10 V V <sub>+</sub> = 10.8 V	Room		17	25	
			Full			31	
<b>Dynamic Characteristics</b>							
Turn-On Time	t <sub>ON</sub>	V <sub>NO, NC</sub> = 10 V, R <sub>L</sub> = 300 Ω, C <sub>L</sub> = 35 pF	Room		133	168	nS
Turn-Off Time	t <sub>OFF</sub>		Full		58	92	
Charge Injection <sup>e</sup>	Q	C <sub>L</sub> = 1 nF, V <sub>gen</sub> = 0 V, R <sub>gen</sub> = 0 Ω	Room		6		pC
<b>Power Supplies</b>							
Positive Supply Current	I <sub>+</sub>	V <sub>+</sub> = 13.2 V, V <sub>IN</sub> = 0 V, 5 V or V <sub>+</sub>	Room		3	20	μA
			Full			30	

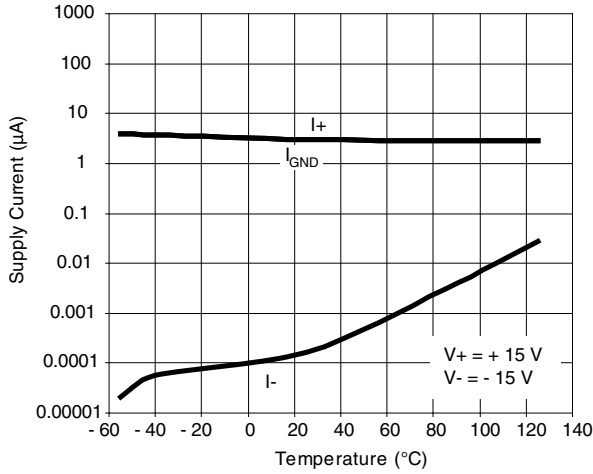
Notes:

- 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<sub>IN</sub> = input voltage to perform proper function.

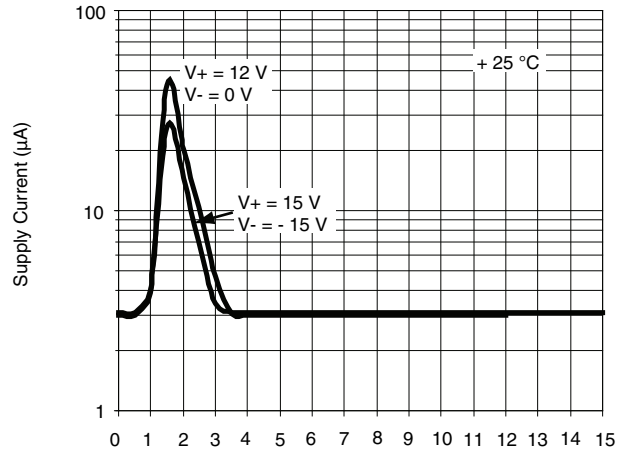
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

**TYPICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$ , 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**

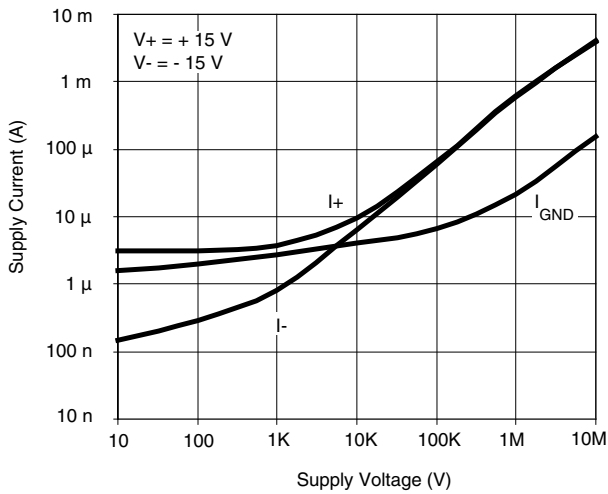
**TYPICAL CHARACTERISTICS** ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted)



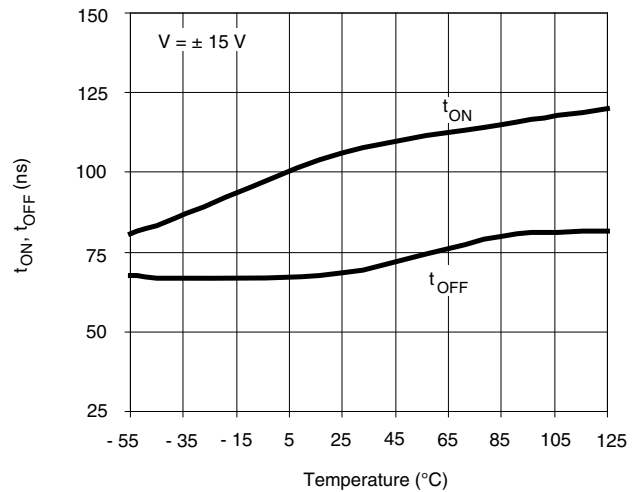
**Supply Current vs. Temperature**



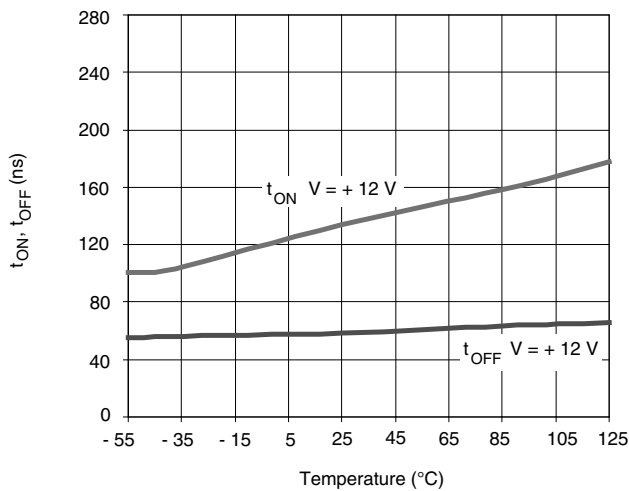
**Supply Current vs. Input Voltage**



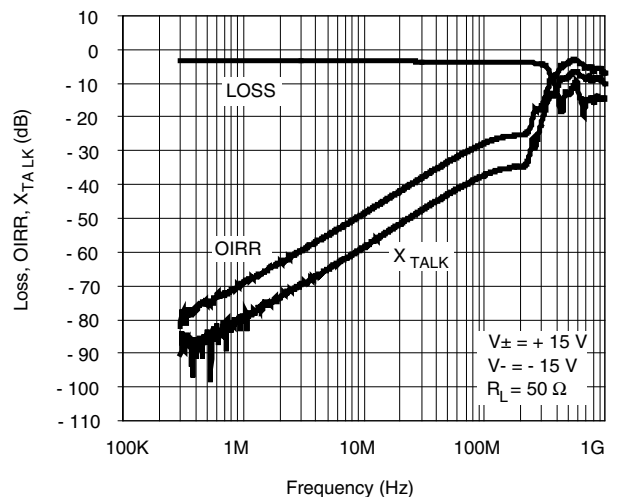
**Supply Current vs. Input Switching Frequency**



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

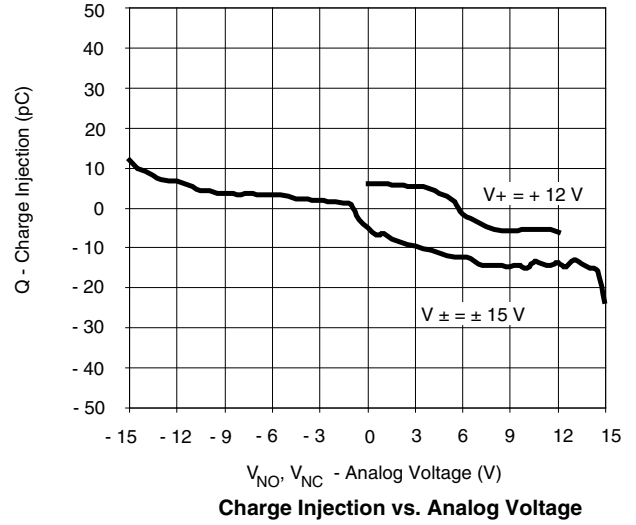
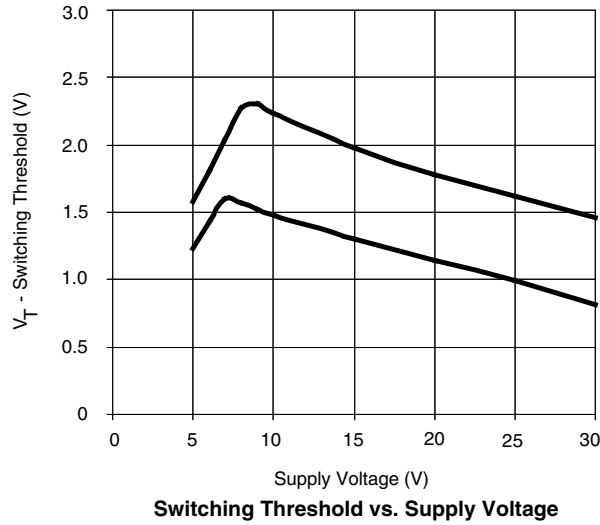


**Switching Time vs. Temperature and Single Supply Voltage**



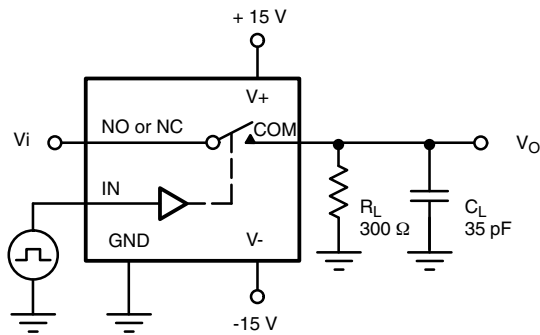
**Insertion Loss, Off-Isolation, Crosstalk vs. Frequency**

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



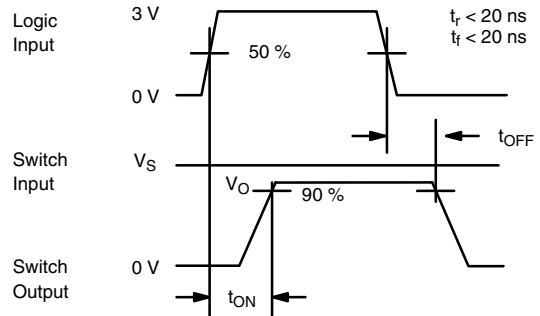
**TEST CIRCUITS**

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



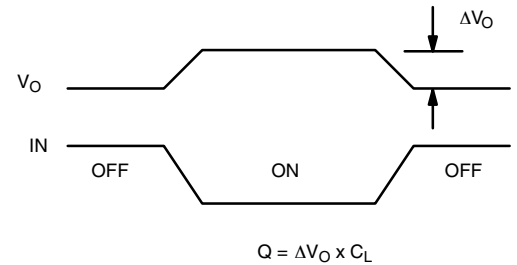
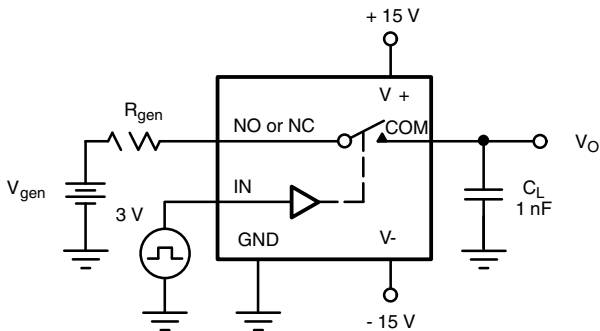
$C_L$  (includes fixture and stray capacitance)

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



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

**Figure 1. Switching Time**



**Figure 2. Charge Injection**

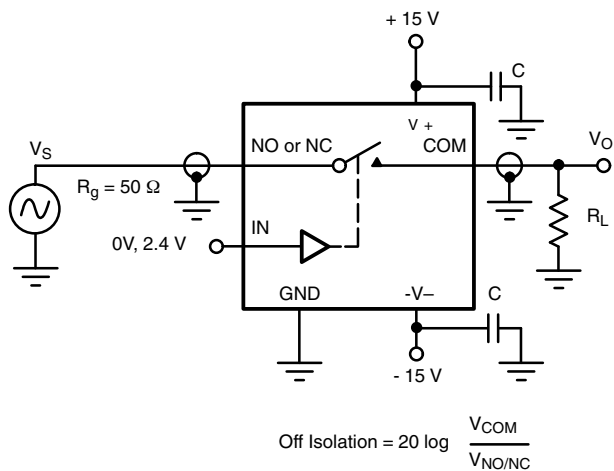


Figure 3. Off Isolation

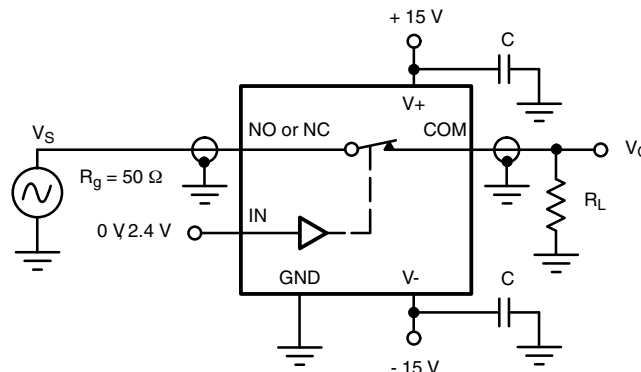


Figure 4. Insertion Loss

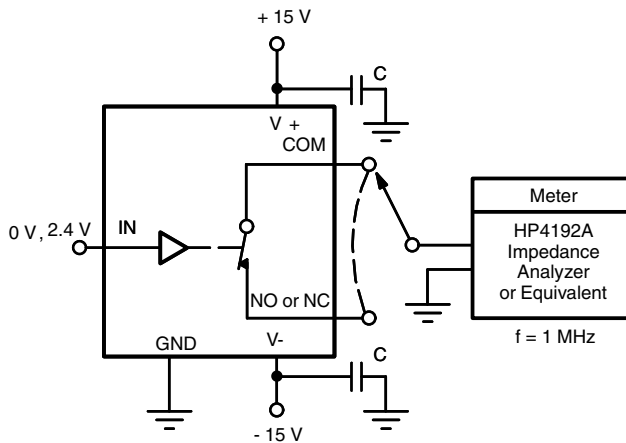
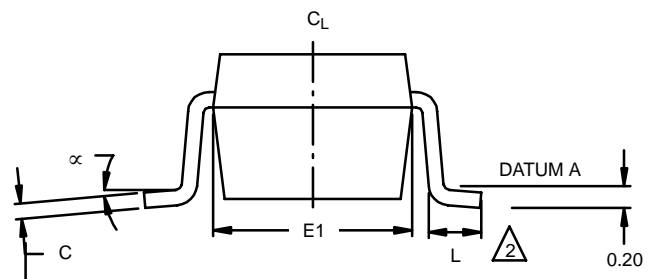
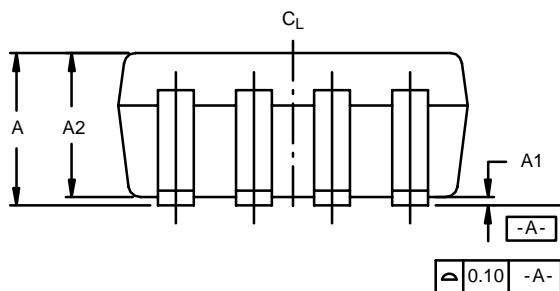
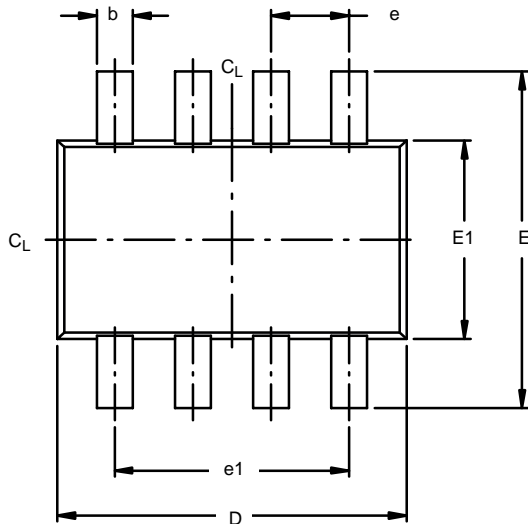


Figure 5. Channel ON/OFF Capacitances

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

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DWG: 5895



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