

## 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  $\Omega$  max. and flatness is 2  $\Omega$  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 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  $\Omega$  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
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

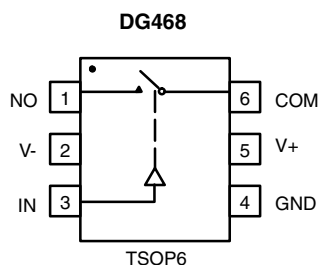
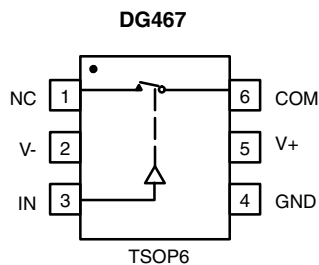
### BENEFITS

- Wide Dynamic Range
- Low Signal Errors and Distortion
- Break-Befor-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 Drivers

### 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 °C to 85 °C	6-Pin TSOP	DG467DV-T1-E3
		DG468DV-T1-E3

ABSOLUTE MAXIMUM RATINGS (T <sub>A</sub> = 25 °C, unless otherwise noted)			
Parameter 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 to (V+) + 2 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) <sup>b</sup>	6-Pin TSOP <sup>c</sup>	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 <sup>a</sup> ( $V_{\pm} = \pm 15 V$ )							
Parameter	Symbol	Test Conditions Unless Otherwise Specified $V_{+} = 15 V, V_{-} = -15 V$ $V_{IN} = 2.4 V, 0.8 V^f$	Temp. <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,ron</sup>	$V_{ANALOG}$		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	$\Omega$
On-Resistance Flatness	$R_{ON}$ Flatness	$I_{NO/NC} = 10 mA, V_{COM} = \pm 5 V, 0 V$ $V_{+} = 13.5 V, V_{-} = -13.5 V$	Room Full		0.7	1 2	
Switch Off Leakage Current	$I_{NO/NC(off)}$	$V_{+} = 16.5 V, V_{-} = -16.5 V$ $V_{COM} = \pm 15.5 V$ $V_{NO/NC} = -/+ 15.5 V$	Room Full	- 1 - 10	- 0.1	1 10	nA
	$I_{COM(off)}$		Room Full	- 1 - 10	- 0.1	1 10	
Channel On Leakage Current	$I_{COM(on)}$	$V_{+} = 16.5 V, V_{-} = -16.5 V$ $V_{COM} = V_{NO/NC} = \pm 15.5 V$	Room Full	- 1 - 10	- 0.1	1 10	
<b>Digital Control</b>							
Input, High Voltage	$V_{INH}$		Full	2.4			V
Input, Low Voltage	$V_{INL}$		Full			0.8	
Input Capacitance <sup>e</sup>	$C_{IN}$		Room		5		pF
Input Current	$I_{IN}$	$V_{IN} = 0$ or $5 V$		- 1		1	$\mu A$
<b>Dynamic Characteristics</b>							
Turn-On Time	$t_{ON}$	$R_L = 300 \Omega, C_L = 35 pF$ $V_{NO/NC} = \pm 10 V$	Room Full			100 140 160	ns
Turn-Off Time	$t_{OFF}$		Room Full			50 80 100	
Charge Injection <sup>e</sup>	Q	$C_L = 1 nF, V_{gen} = 0 V, R_{gen} = 0 \Omega$	Room			21	pC
Off-Isolation <sup>e</sup>	OIRR	$C_L = 5 pF, R_L = 50 \Omega, f = 1 MHz$	Room			- 61	dB
Source Off Capacitance <sup>e</sup>	$C_{S(off)}$	f = 1 MHz	Room			30	pF
Drain Off Capacitance <sup>e</sup>	$C_{D(off)}$		Room			15	
Channel On Capacitance <sup>e</sup>	$C_{D(on)}$		Room			76	
<b>Power Supplies</b>							
Positive Supply Current	I+	$V_{+} = 16.5 V, V_{-} = -16.5 V$ $V_{IN} = 0$ or $5 V$	Room Full			5 15 20	$\mu A$
Negative Supply Current	I-		Room Full	- 1 - 10	- 0.02		



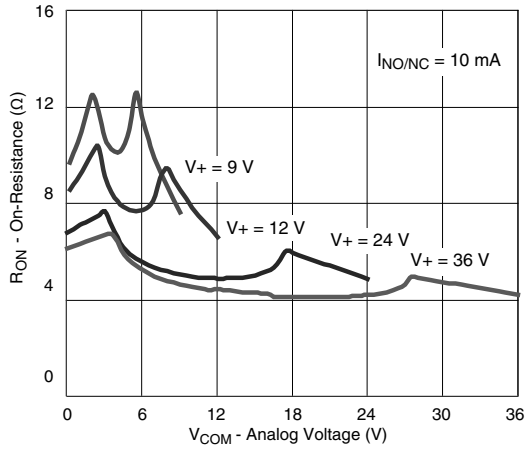
SPECIFICATIONS <sup>a</sup> (V <sub>+</sub> = 12 V)							
Parameter	Symbol	Test Conditions Unless Otherwise Specified V <sub>+</sub> = 12 V, V <sub>-</sub> = 0 V V <sub>IN</sub> = 2.4 V, 0.8 V <sup>f</sup>	Temp. <sup>b</sup>	D Suffix - 40 °C to 85 °C			Unit
				Min. <sup>d</sup>	Typ. <sup>c</sup>	Max. <sup>d</sup>	
<b>Analog Switch</b>							
Analog Signal Range <sup>e</sup>	V <sub>ANALOG</sub>		Full	0		12	V
Drain-Source On-Resistance	R <sub>ON</sub>	I <sub>NO/NC</sub> = -10 mA, V <sub>COM</sub> = 8 V V <sub>+</sub> = 10.8 V	Room Full		12	16 20	Ω
On-Resistance Flatness	R <sub>ON</sub> Flatness	I <sub>NO/NC</sub> = 10 mA, V <sub>COM</sub> = 2, 6, 8 V V <sub>+</sub> = 10.8 V	Room Full		1.5	3 4	Ω
<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 Full		130	160 200	nS
Turn-Off Time	t <sub>OFF</sub>		Room Full		50	80 100	
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		8		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	Room Full		3	7 10	μA

Notes:

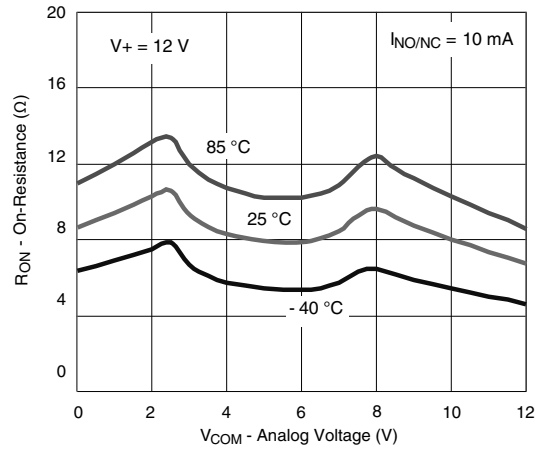
- a. Refer to PROCESS OPTION FLOWCHART.
- b. Room = 25 °C, Full = as determined by the operating temperature suffix.
- c. Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.
- d. The algebraic convention whereby the most negative value is a minimum and the most positive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

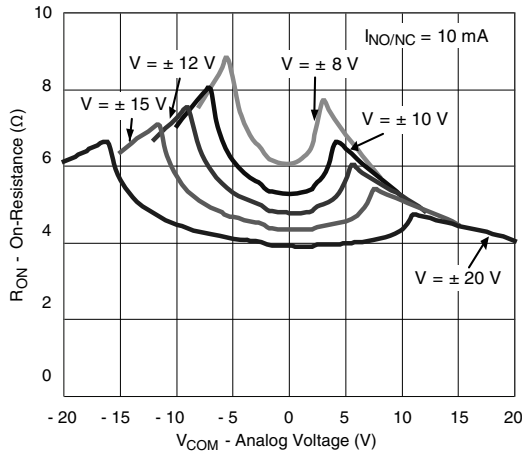
**TYPICAL CHARACTERISTICS** ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted)



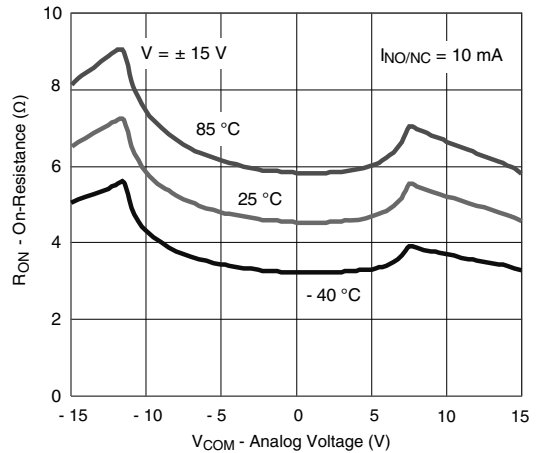
**$R_{ON}$  vs.  $V_{COM}$  and Single Supply Voltage**



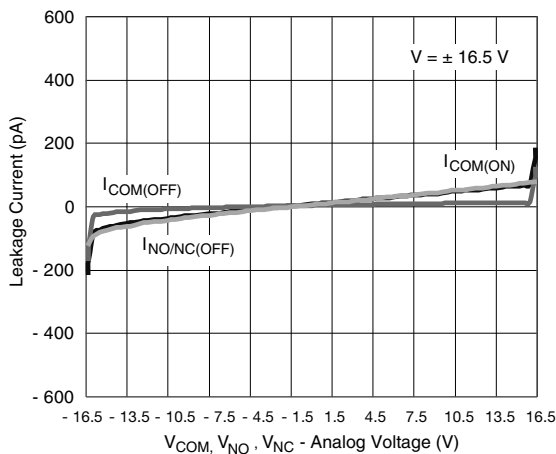
**$R_{ON}$  vs. Analog Voltage and Temperature**



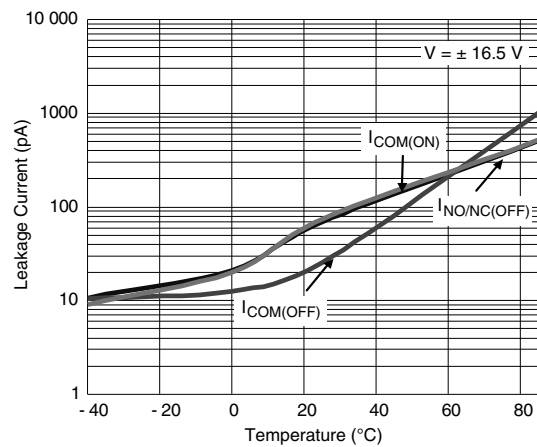
**$R_{ON}$  vs.  $V_{COM}$  and Dual Supply Voltage**



**$R_{ON}$  vs. Analog Voltage and Temperature**

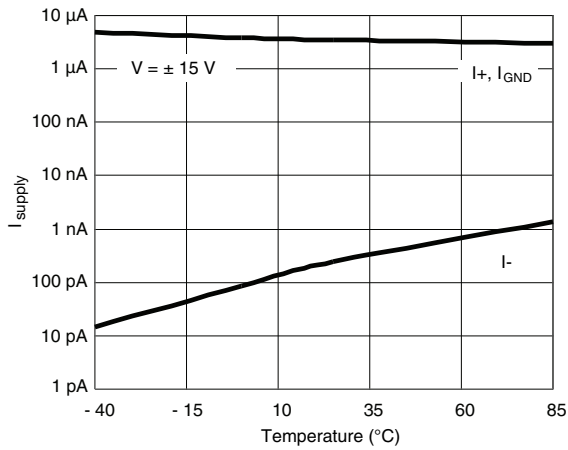


**Leakage vs. Analog Voltage**

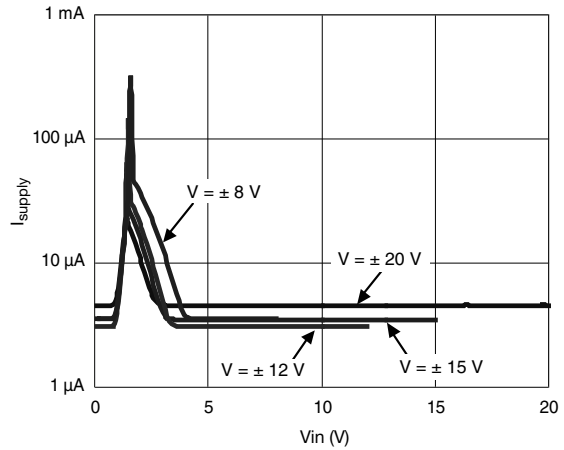


**Leakage Current vs. Temperature**

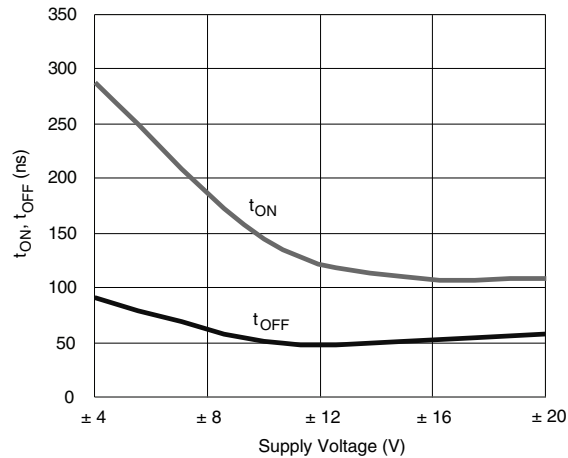
### TYPICAL CHARACTERISTICS ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted)



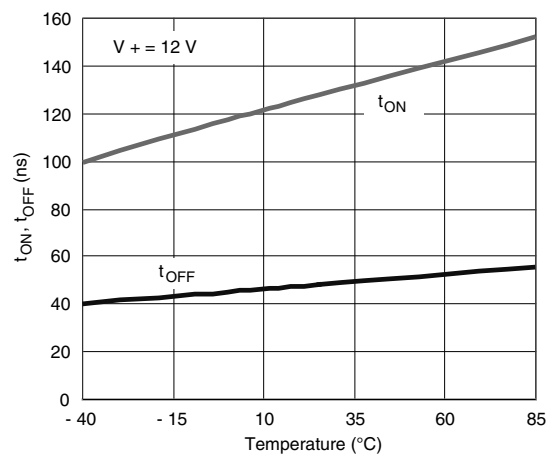
Supply Current vs. Temperature



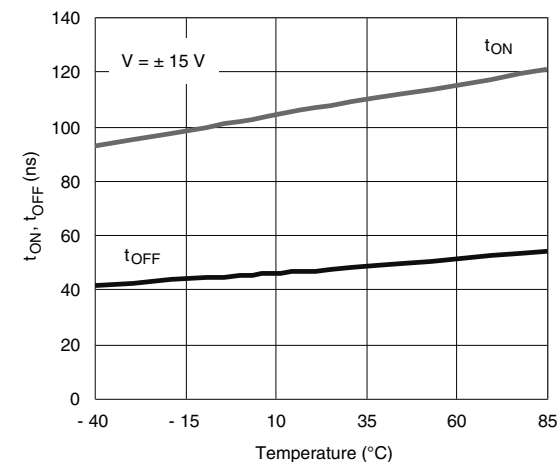
Supply Current vs.  $V_{\text{IN}}$



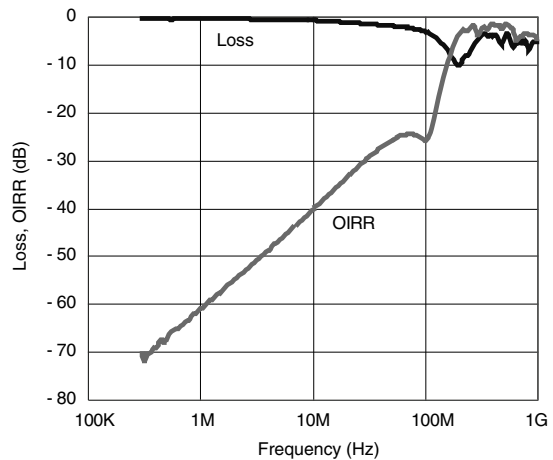
Switching Time vs. Supply Voltages



Switching Time vs. Temperature

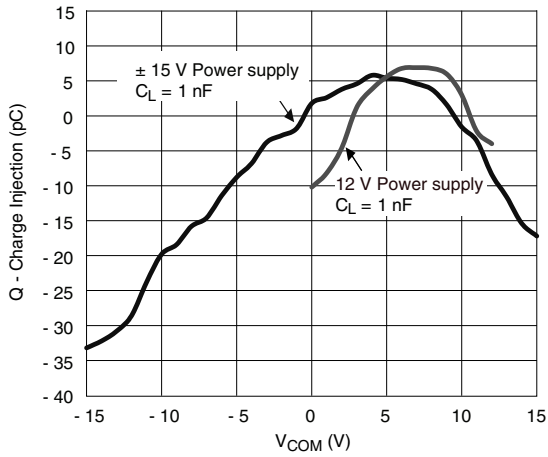


Switching Time vs. Temperature

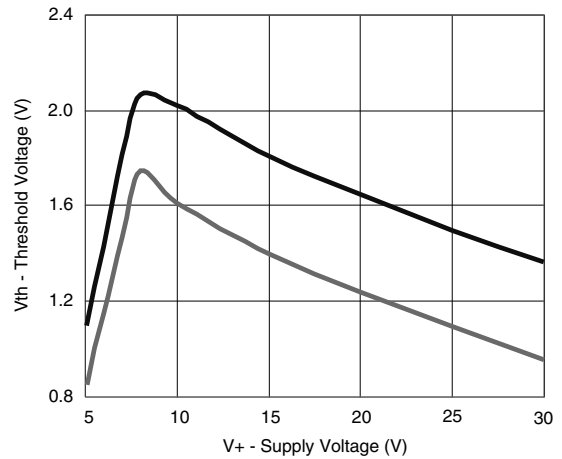


Off Isolation and Insertion Loss vs. Frequency

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



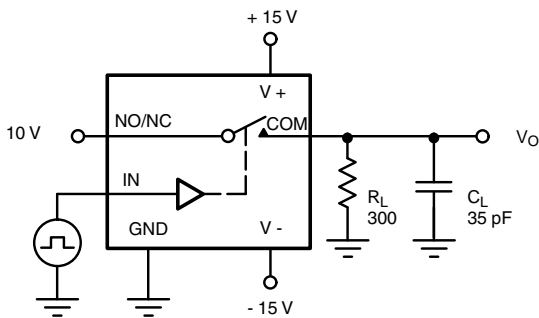
**Charge Injection vs. Analog Voltage**



**Input Switching Threshold vs. Supply Voltage**

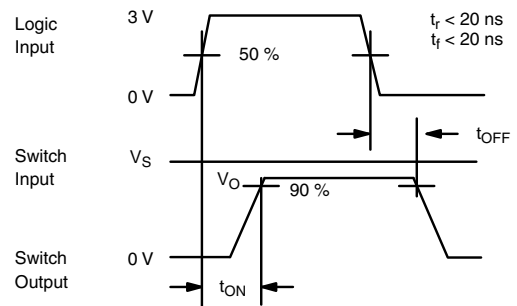
**TEST CIRCUITS**

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



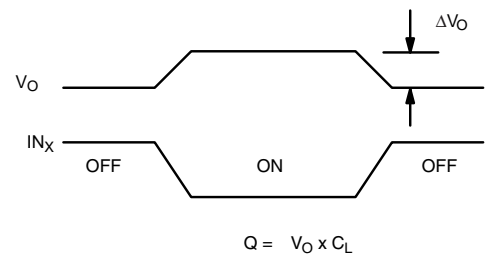
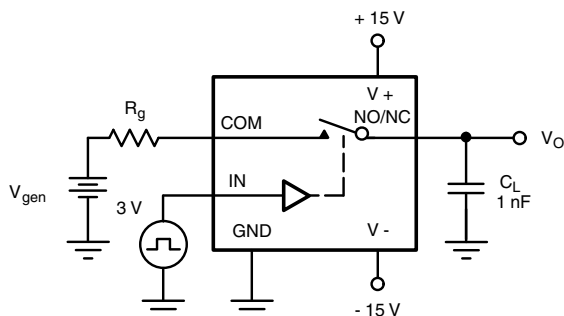
$C_L$  (includes fixture and stray capacitance)

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



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

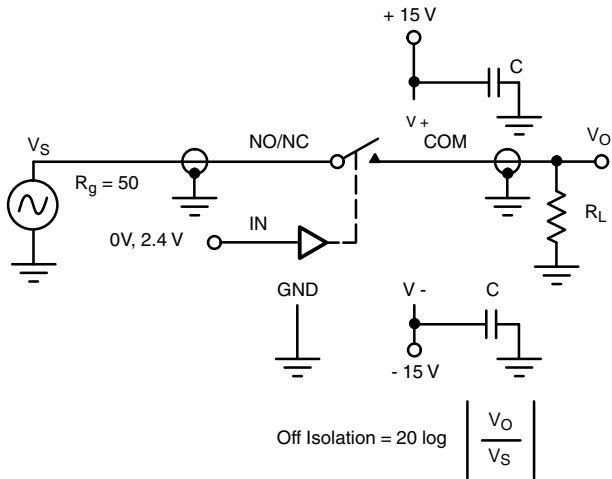
**Figure 1. Switching Time**



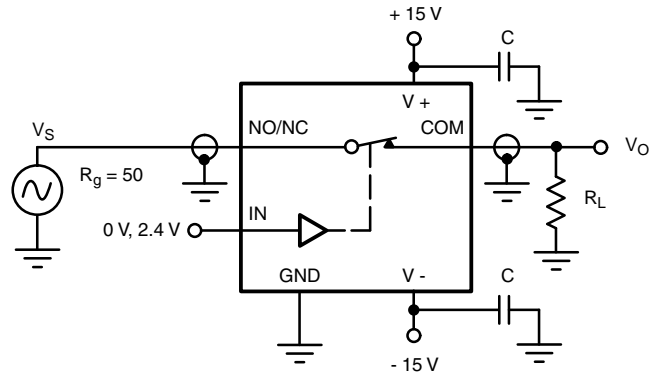
**Figure 2. Charge Injection**

### TEST CIRCUITS

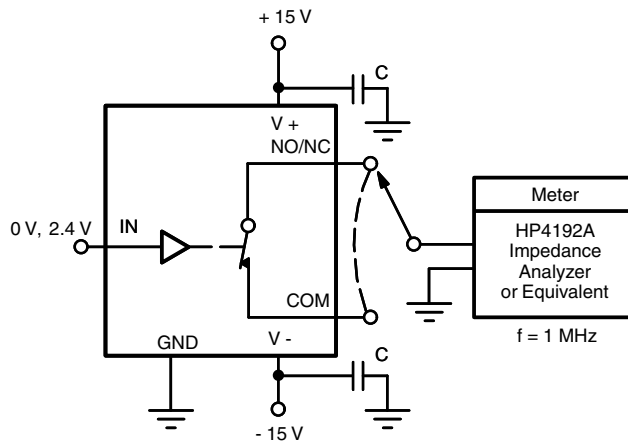
$V_O$  is the steady state output with the switch on.



**Figure 3. Off Isolation**



**Figure 4. Insertion Loss**



**Figure 5. Source/Drain Capacitances**

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## TSOP: 5/6-LEAD

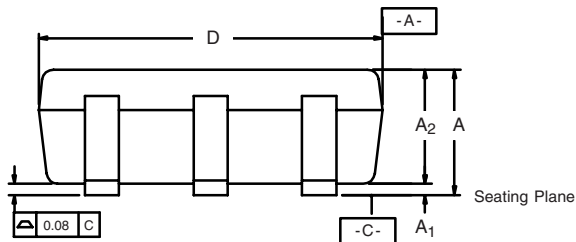
JEDEC Part Number: MO-193C



**5-LEAD TSOP**



**6-LEAD TSOP**



Dim	MILLIMETERS			INCHES		
	Min	Nom	Max	Min	Nom	Max
<b>A</b>	0.91	-	1.10	0.036	-	0.043
<b>A<sub>1</sub></b>	0.01	-	0.10	0.0004	-	0.004
<b>A<sub>2</sub></b>	0.90	-	1.00	0.035	0.038	0.039
<b>b</b>	0.30	0.32	0.45	0.012	0.013	0.018
<b>c</b>	0.10	0.15	0.20	0.004	0.006	0.008
<b>D</b>	2.95	3.05	3.10	0.116	0.120	0.122
<b>E</b>	2.70	2.85	2.98	0.106	0.112	0.117
<b>E<sub>1</sub></b>	1.55	1.65	1.70	0.061	0.065	0.067
<b>e</b>	0.95 BSC			0.0374 BSC		
<b>e<sub>1</sub></b>	1.80	1.90	2.00	0.071	0.075	0.079
<b>L</b>	0.32	-	0.50	0.012	-	0.020
<b>L<sub>1</sub></b>	0.60 Ref			0.024 Ref		
<b>L<sub>2</sub></b>	0.25 BSC			0.010 BSC		
<b>R</b>	0.10	-	-	0.004	-	-
<b>θ</b>	0°	4°	8°	0°	4°	8°
<b>θ<sub>1</sub></b>	7° Nom			7° Nom		
ECN: C-06593-Rev. I, 18-Dec-06						
DWG: 5540						

## RECOMMENDED MINIMUM PADS FOR TSOP-6



Recommended Minimum Pads  
Dimensions in Inches/(mm)

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