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## 6-Ω, Low Voltage, Dual SPST Analog Switch

### DESCRIPTION

The DG2737, DG2738 and DG2739 are high performance, low on-resistance analog switches of dual SPST configuration.

Built on Vishay Siliconix's sub-micro CMOS technology, the DG2737, DG2738, DG2739 achieve switch on-resistance of 6 Ω at 3 V V+. Its -3 dB bandwidth is typically 720 MHz.

It can switch signals with amplitudes of up to V<sub>CC</sub> to be transmitted in either direction.

Combining low power, high speed, low on-resistance and small physical size, the DG2737, DG2738, DG2739 are ideal for portable and battery powered applications requiring high performance and efficient use of board space.

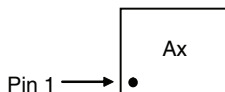
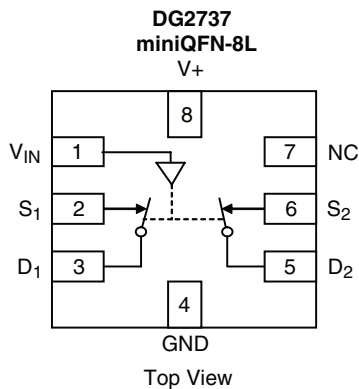
The DG2737, DG2738, DG2739 come in a small miniQFN8 lead package (1.4 x 1.4 x 0.55 mm). As a committed partner to the community and the environment, Vishay Siliconix manufactures this product with the lead (Pb)-free device terminations and is 100 % RoHS compliant.

### FEATURES

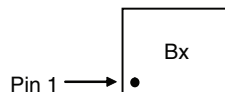
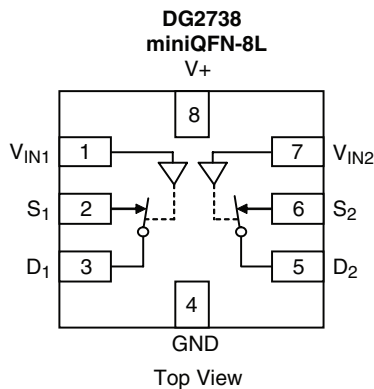
- Voltage range: 2.3 V to 4.3 V
- Low on-resistance: 6 Ω typ. at 3 V
- -48 dB crosstalk at 240 MHz
- Low power consumption
- Ultra small miniQFN8 package of 1.4 x 1.4 x 0.55 mm
- > 300 mA latch up current per JEDEC78
- Switch exceeds 5 kV ESD/HBM


**RoHS**  
COMPLIANT

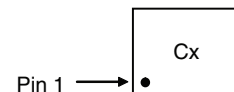
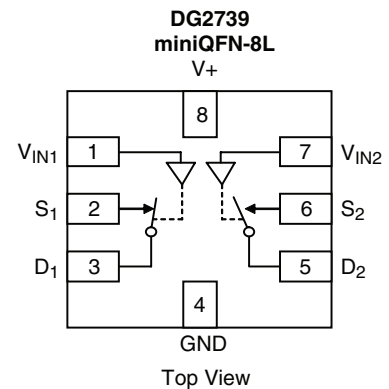
### FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION



Device Marking: Ax for DG2737  
x = Date/Lot Traceability Code



Device Marking: Bx for DG2738  
x = Date/Lot Traceability Code



Device Marking: Cx for DG2739  
x = Date/Lot Traceability Code

TRUTH TABLE 1			
Input	Logic	DG2737	
		S <sub>1</sub> and D <sub>1</sub>	S <sub>2</sub> and D <sub>2</sub>
V <sub>IN</sub>	Low	ON	ON
	High	OFF	OFF

TRUTH TABLE 2					
Input	Logic	DG2738		DG2739	
		S <sub>1</sub> and D <sub>1</sub>	S <sub>2</sub> and D <sub>2</sub>	S <sub>1</sub> and D <sub>1</sub>	S <sub>2</sub> and D <sub>2</sub>
V <sub>IN1</sub>	Low	ON	X	ON	X
	High	OFF	X	OFF	X
V <sub>IN2</sub>	Low	X	ON	X	OFF
	High	X	OFF	X	ON

ORDERING INFORMATION		
Temp. Range	Package	Part Number
- 40 °C to 85°C	miniQFN-8L	DG2737DN-T1-E4 DG2738DN-T1-E4 DG2739DN-T1-E4

ABSOLUTE MAXIMUM RATINGS T <sub>A</sub> = 25 °C, unless otherwise noted			
Parameter		Limit	Unit
Reference to GND	V+	- 0.3 to 5.0	V
	V <sub>IN</sub> , D, S <sup>a</sup>	- 0.3 to (V+ + 0.3)	
Current (Any terminal except D or S)		30	mA
Continuous Current (D or S)		± 300	
Peak Current (Pulsed at 1 ms, 10 % Duty Cycle)		± 500	
Storage Temperature (D Suffix)		- 65 to 150	°C
Power Dissipation (Packages) <sup>b</sup>	miniQFN-8L <sup>c</sup>	190	mW

Notes:

- a. Signals on V<sub>IN</sub>, D, or S exceeding 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 2.4 mW/°C above 70 °C.

SPECIFICATIONS V+ = 3 V							
Parameter	Symbol	Test Conditions Unless Otherwise Specified V+ = 3 V, V <sub>IN</sub> = 0.4 V or 1.4 V <sup>e</sup>	Temp. <sup>a</sup>	Limits - 40 °C to 85 °C			Unit
				Min. <sup>b</sup>	Typ. <sup>c</sup>	Max. <sup>b</sup>	
<b>Analog Switch</b>							
Analog Signal Range <sup>d</sup>	V <sub>analog</sub>	R <sub>ON</sub>	Full	0		V+	V
On-Resistance	R <sub>ON</sub>	V+ = 3 V, I <sub>S</sub> = 8 mA, V <sub>D</sub> = 0.4 V	Room		6	8	Ω
			Full			9	
R <sub>ON</sub> Match <sup>d</sup>	ΔR <sub>ON</sub>	V+ = 3 V, I <sub>S</sub> = 8 mA, V <sub>D</sub> = 0.4 V	Room		0.1	0.5	
R <sub>ON</sub> Flatness <sup>d</sup>	R <sub>ON</sub> Flatness	V+ = 3 V, I <sub>S</sub> = 8 mA, V <sub>D</sub> = 0 V, 1 V	Room		2.6	4	



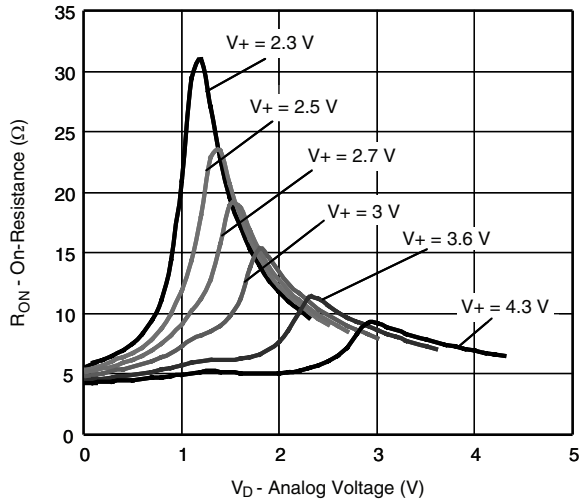
SPECIFICATIONS $V_+ = 3\text{ V}$								
Parameter	Symbol	Test Conditions Unless Otherwise Specified $V_+ = 3\text{ V}$ , $V_{IN} = 0.4\text{ V}$ or $1.4\text{ V}^e$	Temp. <sup>a</sup>	Limits - 40 °C to 85 °C			Unit	
				Min. <sup>b</sup>	Typ. <sup>c</sup>	Max. <sup>b</sup>		
<b>Analog Switch</b>								
Switch Off Leakage Current	$I_{S(off)}$	$V_+ = 4.3\text{ V}$ , $V_S = 0.3\text{ V}/3.3\text{ V}$ , $V_D = 3.3\text{ V}/0.3\text{ V}$	Room	- 10		10	nA	
			Full	- 100		100		
	$I_{D(off)}$		Room	- 10		10		
			Full	- 100		100		
Channel-On Leakage Current	$I_{D(on)}$	$V_+ = 4.3\text{ V}$ , $V_S = V_D = 4\text{ V}/0.3\text{ V}$	Room	- 10		10		
			Full	- 100		100		
<b>Digital Control</b>								
Input High Voltage	$V_{INH}$	$V_+ = 2.3\text{ V}$ to $4.3\text{ V}$	Full	1.3			V	
Input Low Voltage	$V_{INL}$		Full			0.5		
Input Current	$I_{INL}$ or $I_{INH}$	$V_{IN} = 0$ or $V_+$	Full	- 1		1	$\mu\text{A}$	
<b>Dynamic Characteristics</b>								
Turn-On Time <sup>e</sup>	$t_{ON}$	$V_+ = 2.3\text{ V}$ to $3.6\text{ V}$ , $V_{NO}$ or $V_S = 1.5\text{ V}$ , $R_L = 50\ \Omega$ , $C_L = 35\text{ pF}$	Room		23	60	ns	
			Full			70		
Turn-Off Time <sup>e</sup>	$t_{OFF}$		Room		13	50		
			Full			60		
Break-Before-Make Time	$t_{BBM}$		$V_+ = 2.3\text{ V}$ to $4.3\text{ V}$	Room		6		ns
				Full	1			
Charge Injection <sup>d</sup>	Q	$C_L = 1\text{ nF}$ , $R_{GEN} = 0\ \Omega$ , $V_{GEN} = 0\text{ V}$	Room		10.4		pC	
Off-Isolation <sup>d</sup>	$O_{IRR}$	$R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ , $f = 1\text{ MHz}$ $R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ , $f = 10\text{ MHz}$ $R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ , $f = 240\text{ MHz}$	Room		- 79		dB	
					- 59			
					- 28			
Crosstalk <sup>d</sup>	$X_{TALK}$			$R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ , $f = 1\text{ MHz}$		- 109		
				$R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ , $f = 10\text{ MHz}$		- 99		
				$R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ , $f = 240\text{ MHz}$		- 48		
3 dB bandwidth <sup>d</sup>		$R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$	Room		720		MHz	
Channel to Channel skew <sup>d</sup>		$R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$	Room		25		ps	
Skew of Opposite Transitions of the Same Output <sup>d</sup>				20				
Total Jitter <sup>d</sup>				200				
Source Off Capacitance <sup>d</sup>	$C_{S(off)}$			$f = 1\text{ MHz}$ , $V_S = 0\text{ V}$	Room			4.4
Drain Off Capacitance <sup>d</sup>	$C_{D(off)}$	$f = 1\text{ MHz}$ , $V_D = 0\text{ V}$	Room		3.8			
Drain On Capacitance <sup>d</sup>	$C_{D(on)}$	$f = 1\text{ MHz}$ , $V_D = V_S = 0\text{ V}$	Room		10			
Control Pin Capacitance <sup>d</sup>	$C_{IN}$	$f = 1\text{ MHz}$	Room		8.3			
<b>Power Supply</b>								
Power Supply Range	$V_+$			2.3		4.3	V	
Power Supply Current	$I_+$	$V_{IN} = 0$ or $V_+$	Full			1.0	$\mu\text{A}$	

Notes:

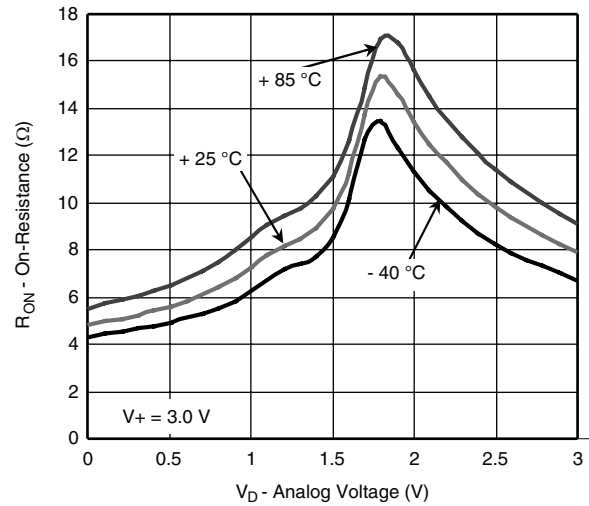
- a. Room = 25 °C, Full = as determined by the operating suffix.
- b. The algebraic convention whereby the most negative value is a minimum and the most positive a maximum, is used in this data sheet.
- c. Typical values are for design aid only, not guaranteed nor subject to production testing.
- d. Guarantee by design, not subjected to production test.
- e.  $V_{IN}$  = 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.

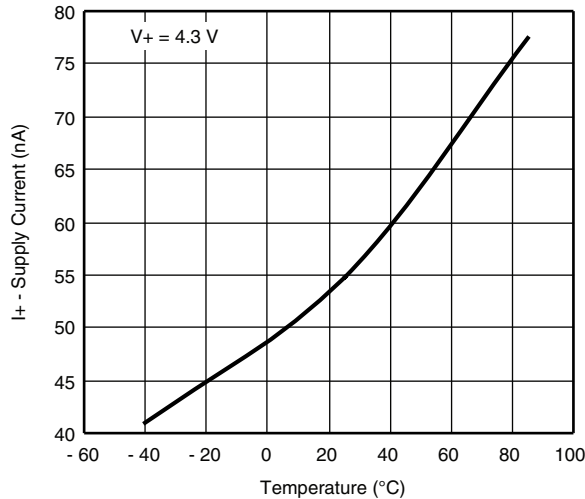
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



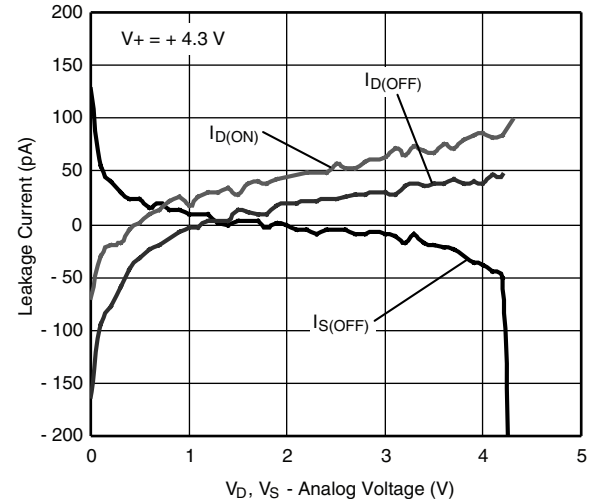
**RON vs. VD and Supply Voltage**



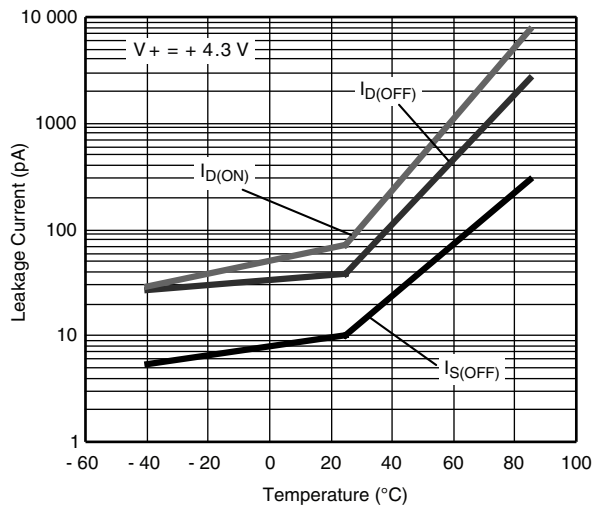
**RON vs. VD and Temperature**



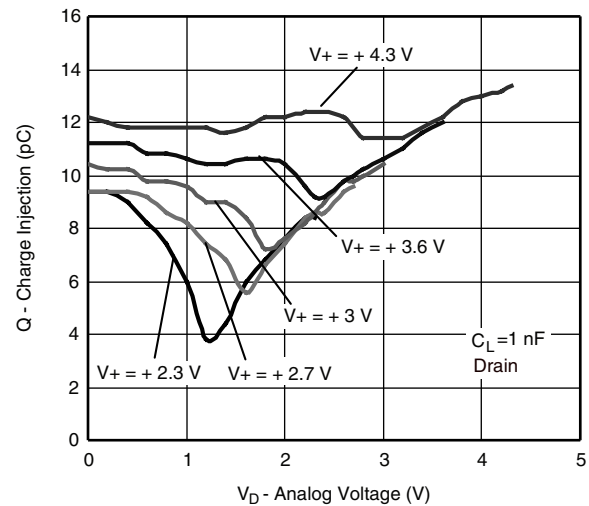
**Supply Current vs. Temperature**



**Leakage vs. Analog Voltage**

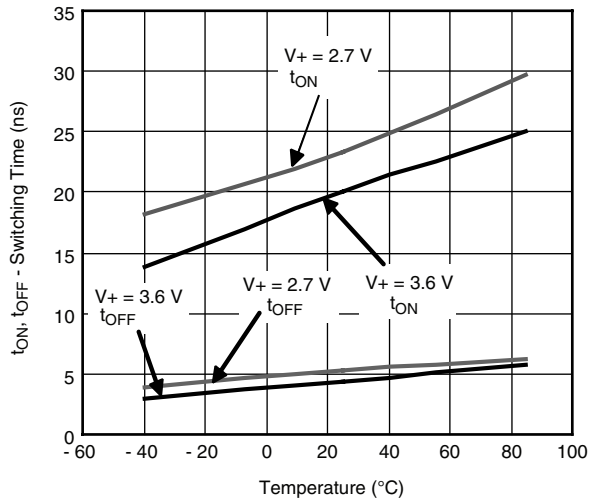


**Leakage Current vs. Temperature**

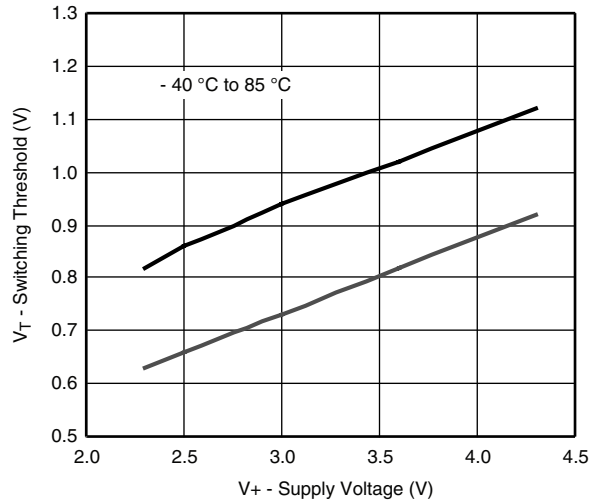


**Charge Injection vs. Analog Voltage**

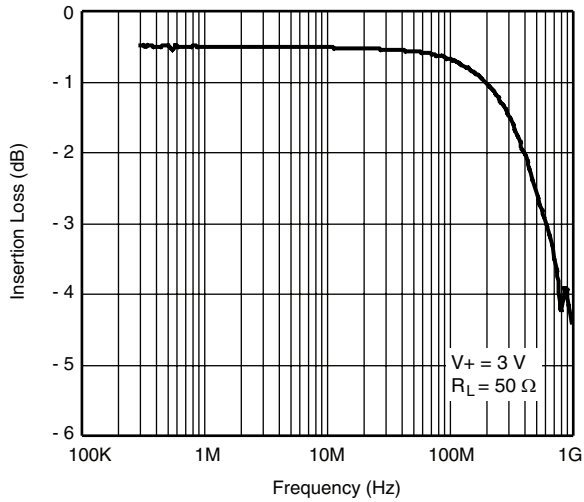
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



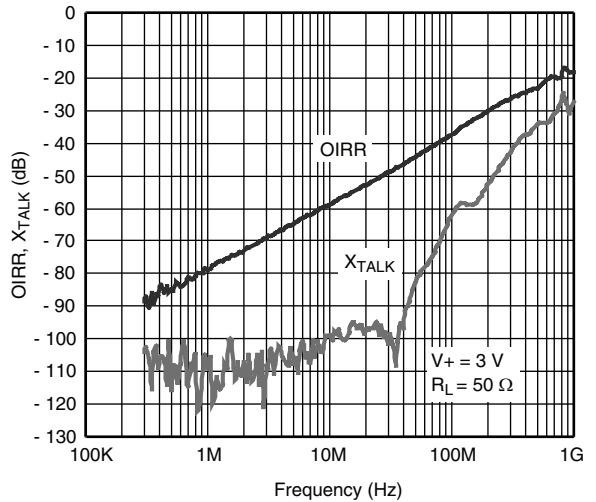
**Switching Time vs. Temperature**



**Switching Threshold vs. Supply Voltage**

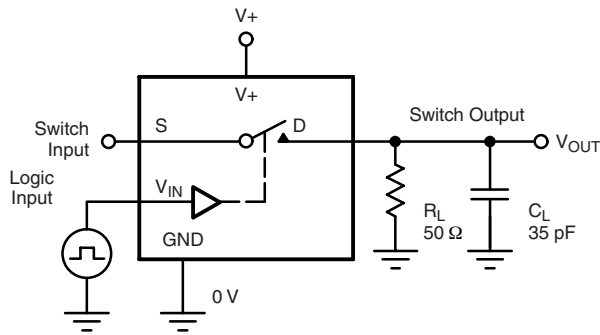


**Insertion Loss vs. Frequency**



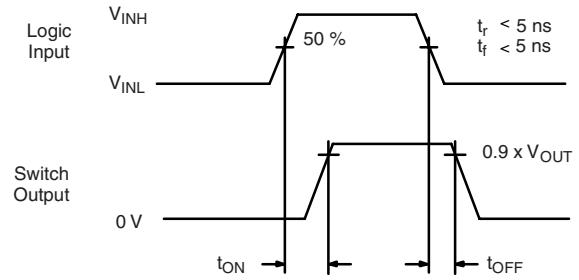
**Off-Isolation, Crosstalk vs. Frequency**

**TEST CIRCUITS**



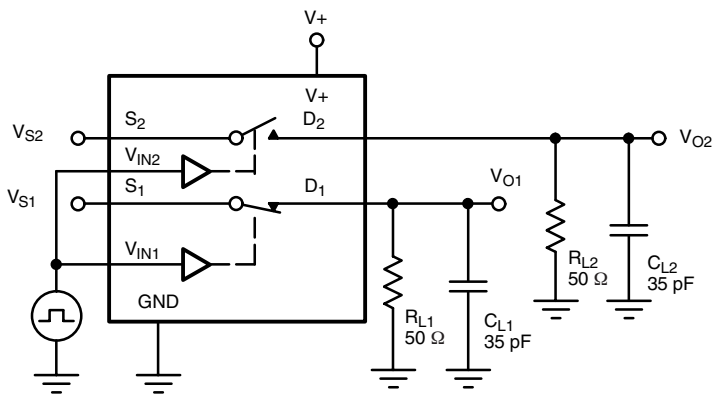
$C_L$  (includes fixture and stray capacitance)

$$V_{OUT} = V_D \left( \frac{R_L}{R_L + R_{ON}} \right)$$

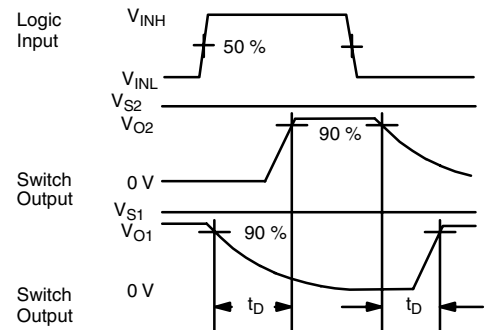


Logic "1" = Switch On  
Logic input waveforms inverted for switches that have the opposite logic sense.

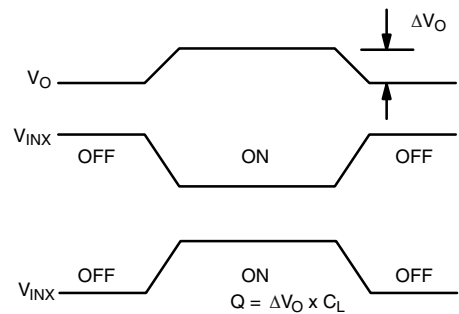
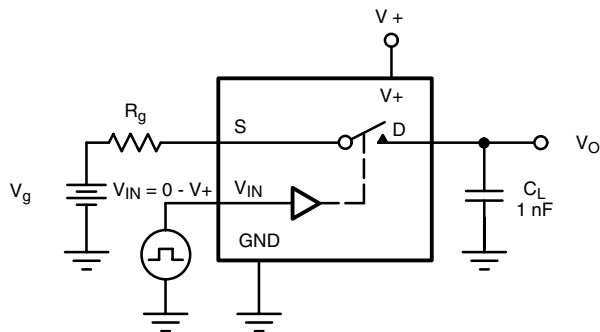
**Figure 1. Switching Time**



$C_L$  (includes fixture and stray capacitance)



**Figure 2. Break-Before-Make (DG2739)**



**Figure 3. Charge Injection**

TEST CIRCUITS

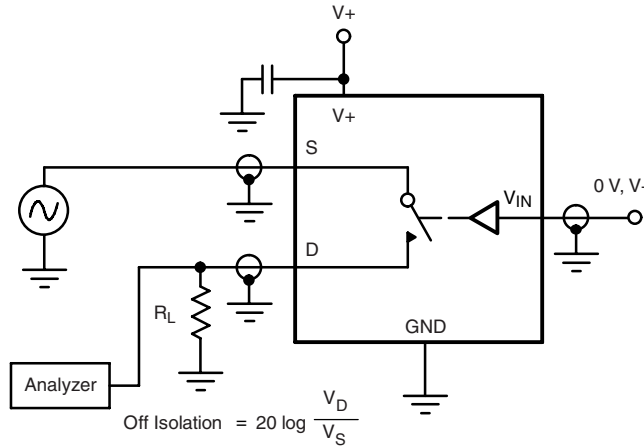


Figure 4. Off-Isolation

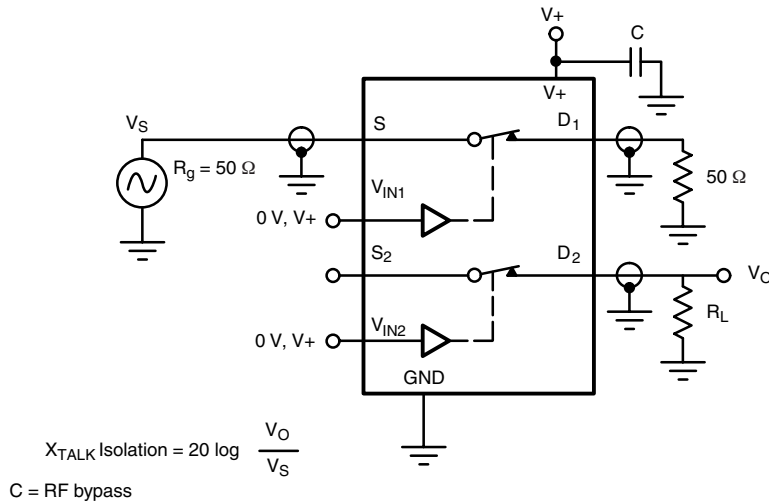


Figure 5. Crosstalk

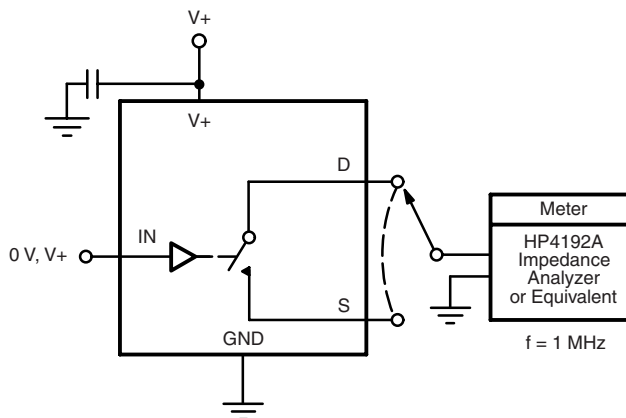
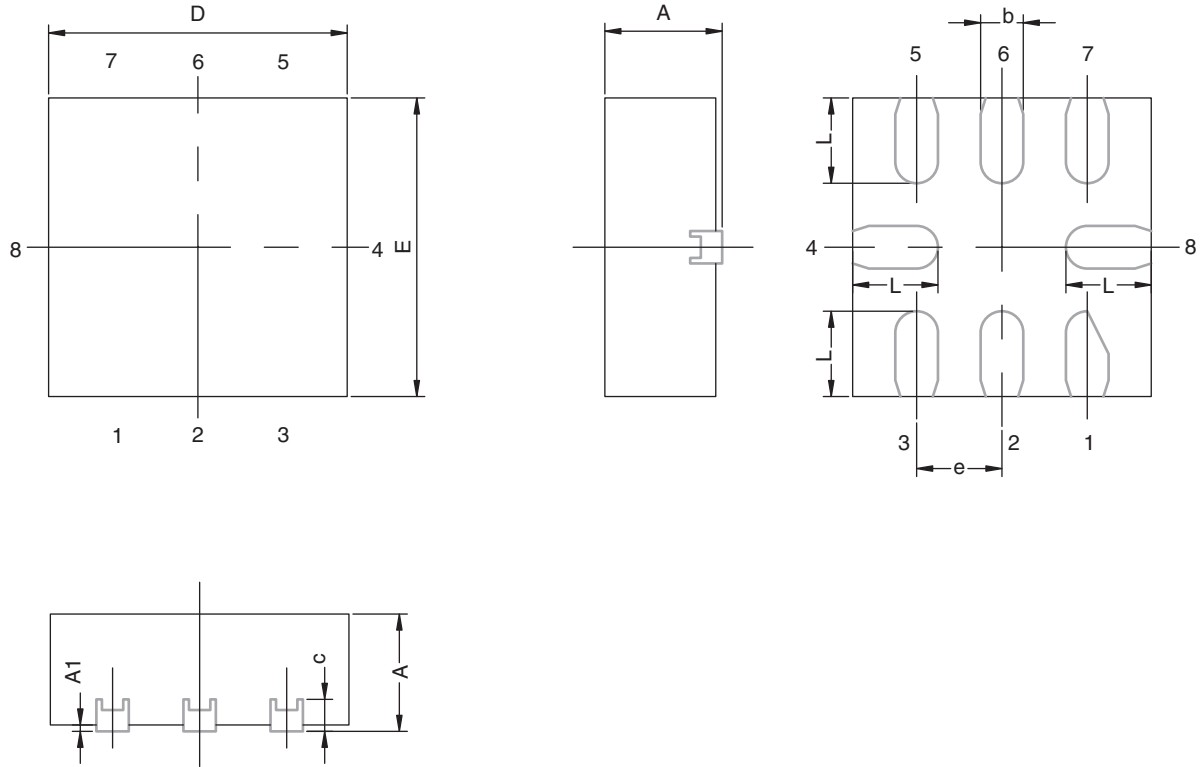


Figure 6. Channel Off/On Capacitance

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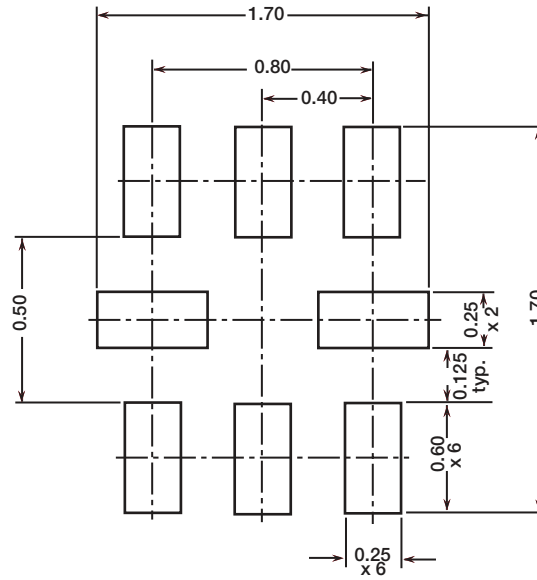


## MINIQFN-8L CASE OUTLINE



DIM	MILLIMETERS			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.50	0.55	0.60	0.0197	0.0217	0.0236
A1	0.00	-	0.05	0.000	-	0.002
b	0.15	0.20	0.25	0.006	0.008	0.010
c	0.15 REF			0.006 REF		
D	1.35	1.40	1.45	0.053	0.055	0.057
E	1.35	1.40	1.45	0.053	0.055	0.057
e	0.40 BSC			0.016 BSC		
L	0.35	0.40	0.45	0.014	0.016	0.018
ECN: C-08336-Rev. A, 05-May-08						
DWG: 5964						

**RECOMMENDED MINIMUM PADS FOR MINI QFN 8L**



Suggested Minimum Pad  
Dimensions in mm



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