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_{CC} 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 miniQFN-8 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.

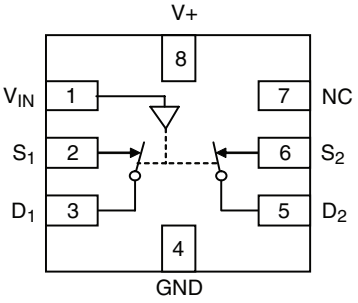
FEATURES

- 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 JESD78
- Switch exceeds 5 kV ESD/HBM

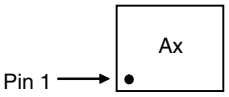
Pb-free
RoHS COMPLIANT

FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION

DG2737
miniQFN-8L

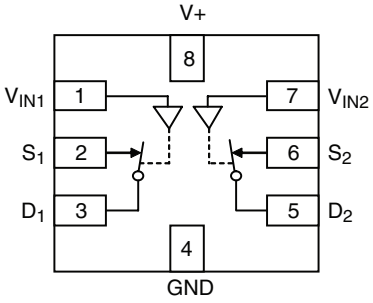


Top View

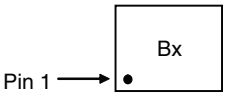


Device Marking: Ax for DG2737
x = Date/Lot Traceability Code

DG2738
miniQFN-8L

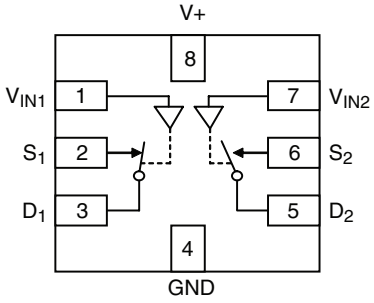


Top View

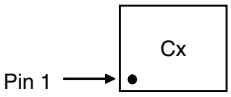


Device Marking: Bx for DG2738
x = Date/Lot Traceability Code

DG2739
miniQFN-8L



Top View



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

TRUTH TABLE 1

Input	Logic	DG2737	
		S_1 and D_1	S_2 and D_2
V_{IN}	Low	ON	ON
	High	OFF	OFF

TRUTH TABLE 2

Input	Logic	DG2738		DG2739	
		S_1 and D_1	S_2 and D_2	S_1 and D_1	S_2 and D_2
V_{IN1}	Low	ON	X	ON	X
	High	OFF	X	OFF	X
V_{IN2}	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_A = 25 °C, unless otherwise noted

Parameter		Limit	Unit
Reference to GND	V+	- 0.3 to 5.0	V
	V_{IN}, D, S[a]	- 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)[b]	miniQFN-8L[c]	190	mW

Notes:
a. Signals on V_{IN}, 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

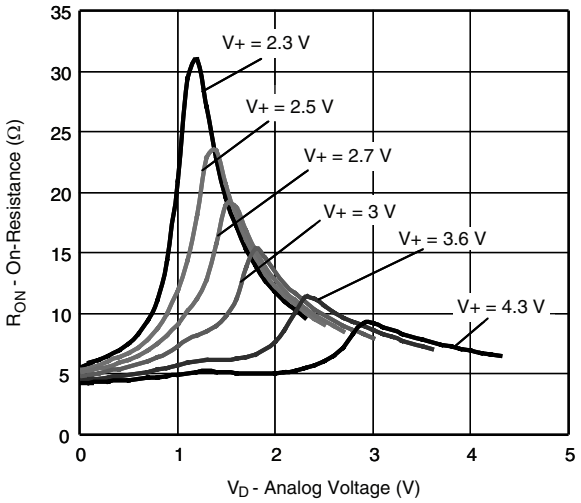
Parameter	Symbol	Test Conditions Unless Otherwise Specified V+ = 3 V, V_{IN} = 0.4 V or 1.4 V[e]	Temp.[a]	Limits - 40 °C to 85 °C Min.[b]	Typ.[c]	Max.[b]	Unit
Analog Switch							
Analog Signal Range[d]	V_{analog}	R_{ON}	Full	0		V+	V
On-Resistance	R_{ON}	V+ = 3 V, I_S = 8 mA, V_D = 0.4 V	Room		6	8	Ω
			Full			9	
R_{ON} Match[d]	ΔR_{ON}	V+ = 3 V, I_S = 8 mA, V_D = 0.4 V	Room		0.1	0.5	
R_{ON} Flatness[d]	R_{ON} Flatness	V+ = 3 V, I_S = 8 mA, V_D = 0 V, 1 V	Room		2.6	4	

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

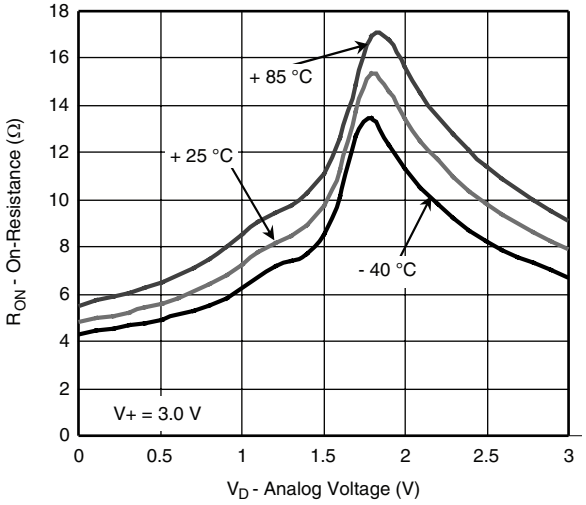
Notes:
a. Room = 25 °C, Full = as determined by the operating suffix.
b. The algebraic convention whereby the most negative value is a minimum and the most positive a maximum, is used in this data sheet.
c. Typical values are for design aid only, not guaranteed nor subject to production testing.
d. Guarantee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

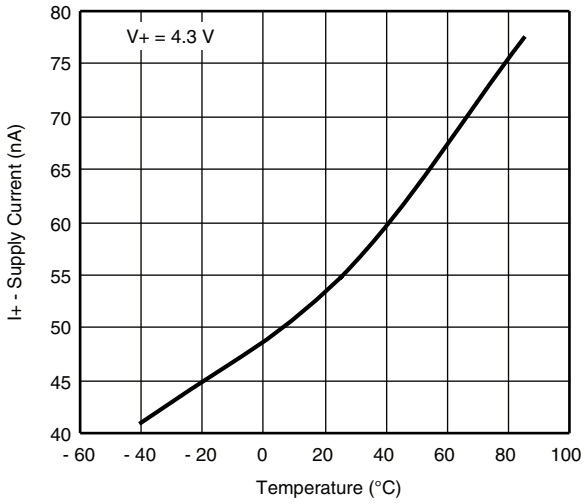
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



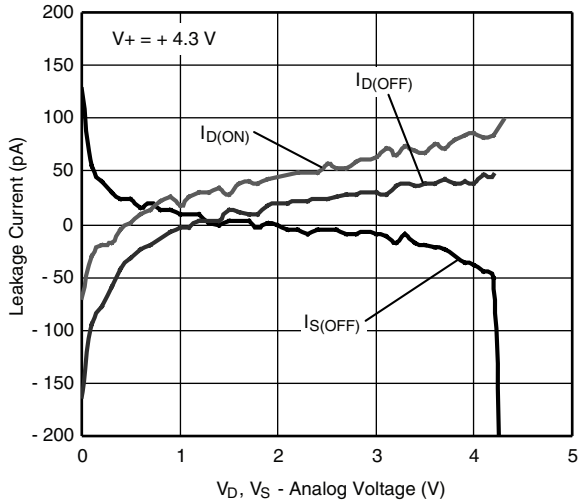
R_{ON} vs. V_D and Supply Voltage



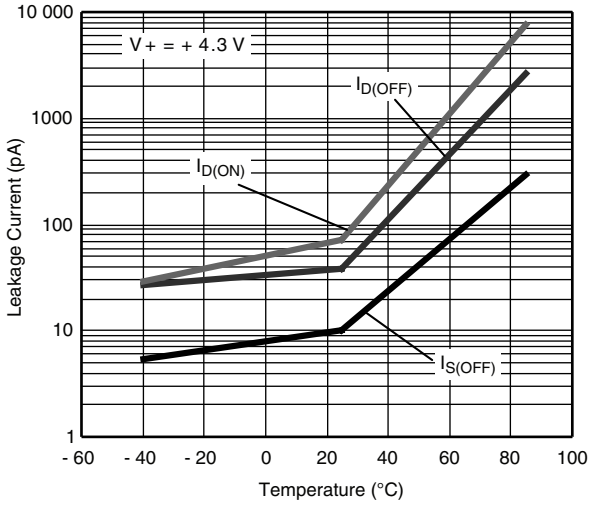
R_{ON} vs. V_D and Temperature



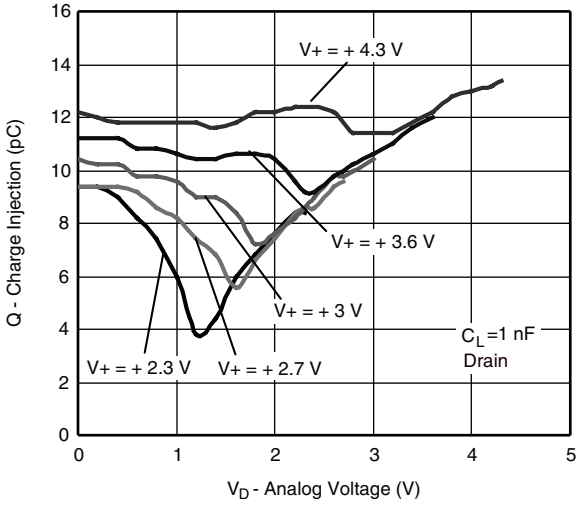
Supply Current vs. Temperature



Leakage vs. Analog Voltage

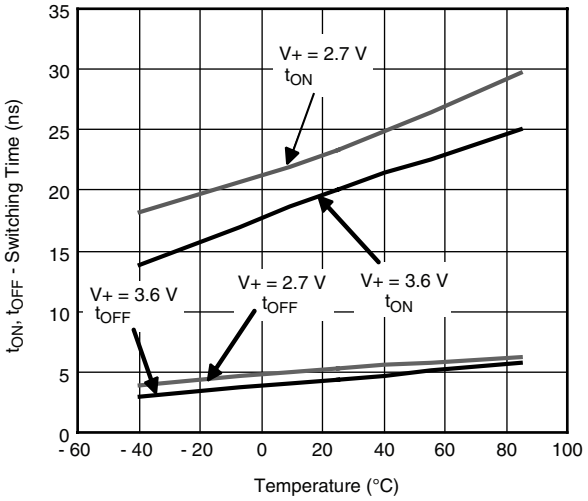


Leakage Current vs. Temperature

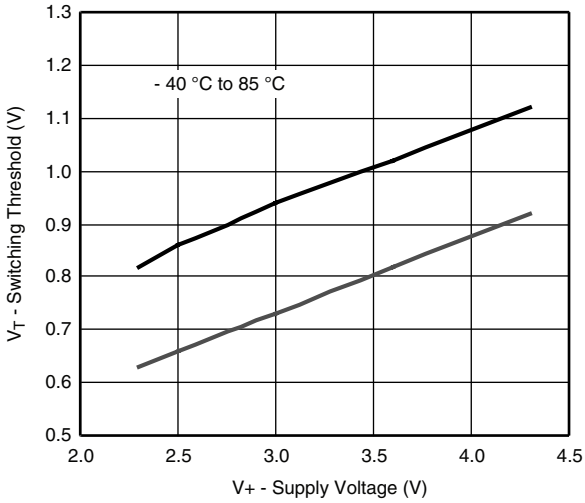


Charge Injection vs. Analog Voltage

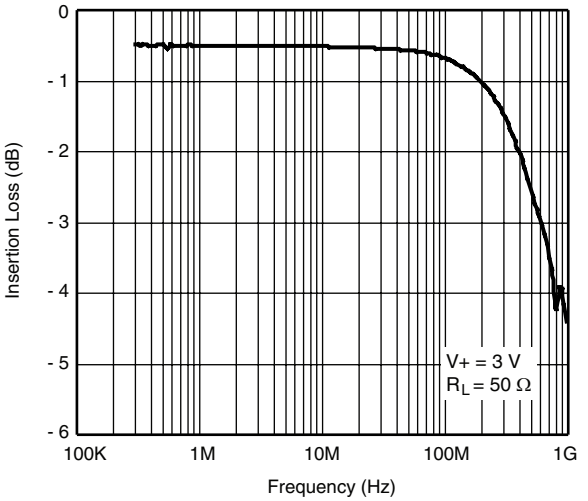
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



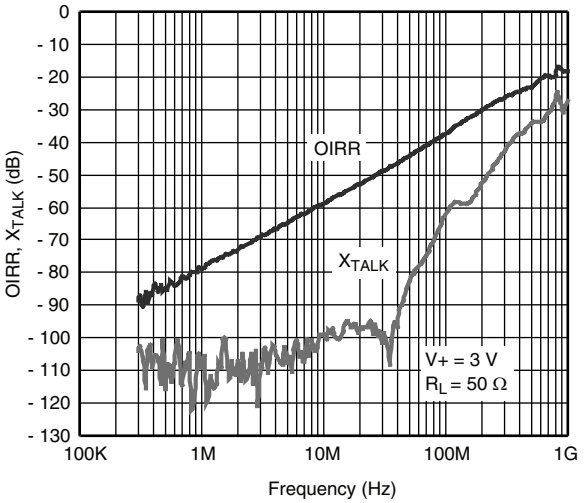
Switching Time vs. Temperature



Switching Threshold vs. Supply Voltage

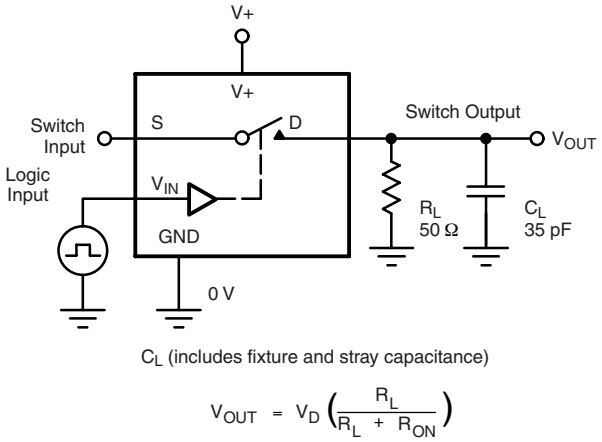


Insertion Loss vs. Frequency



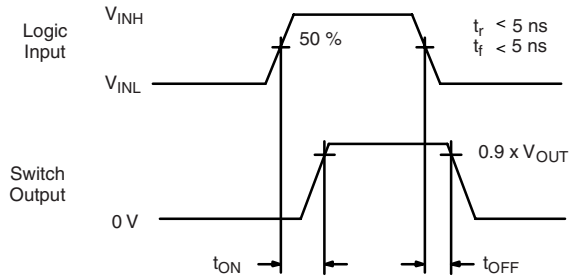
Off-Isolation, Crosstalk vs. Frequency

TEST CIRCUITS



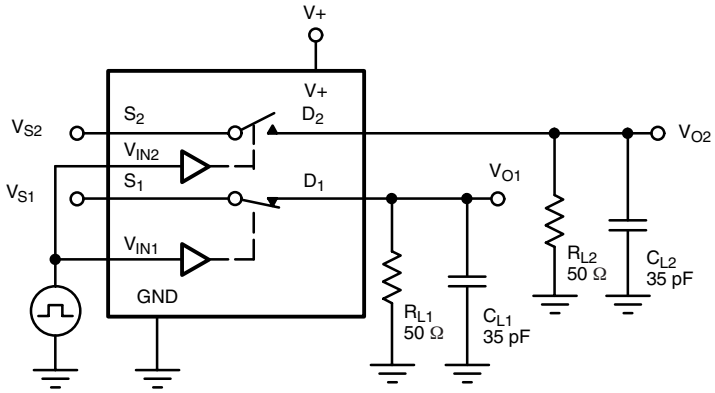
C_L (includes fixture and stray capacitance)

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



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)

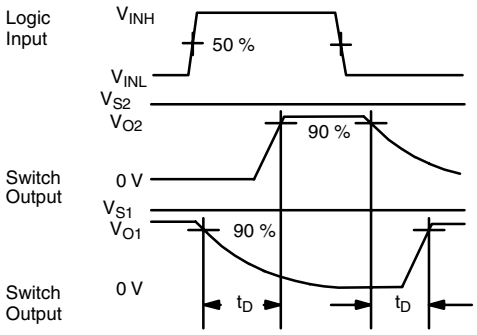
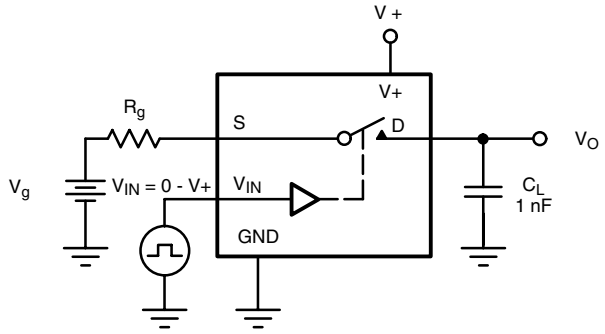


Figure 2. Break-Before-Make (DG2739)



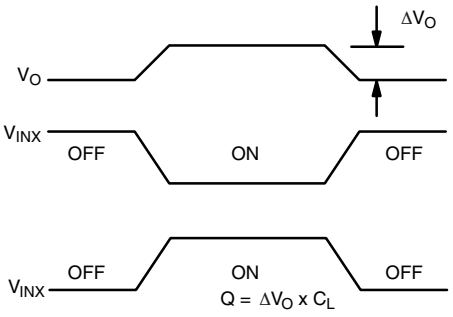


Figure 3. Charge Injection

TEST CIRCUITS

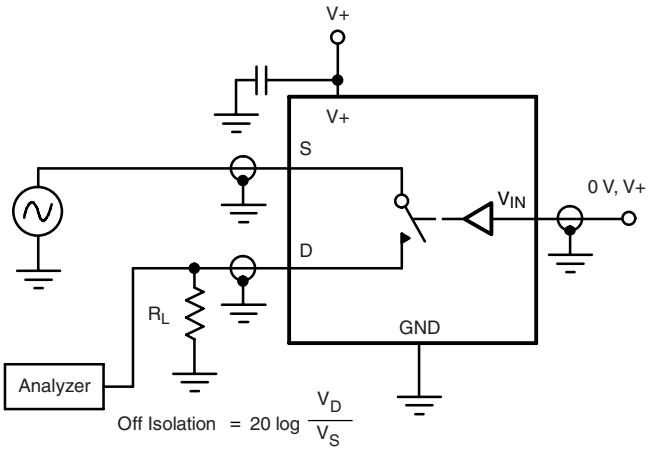


Figure 4. Off-Isolation

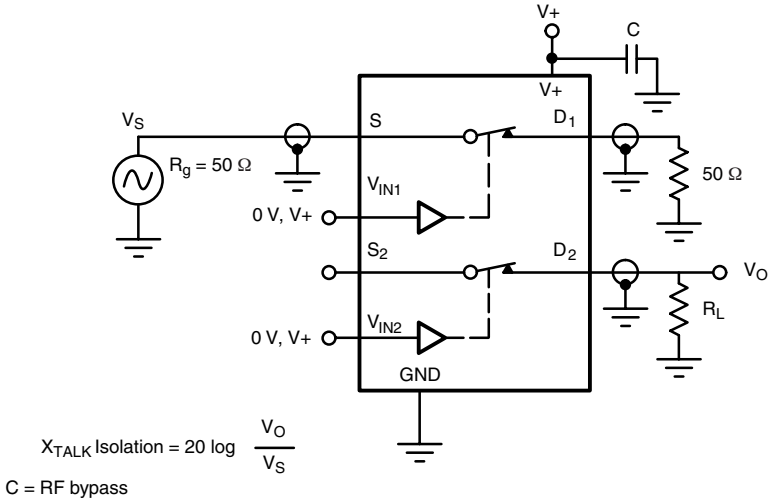


Figure 5. Crosstalk

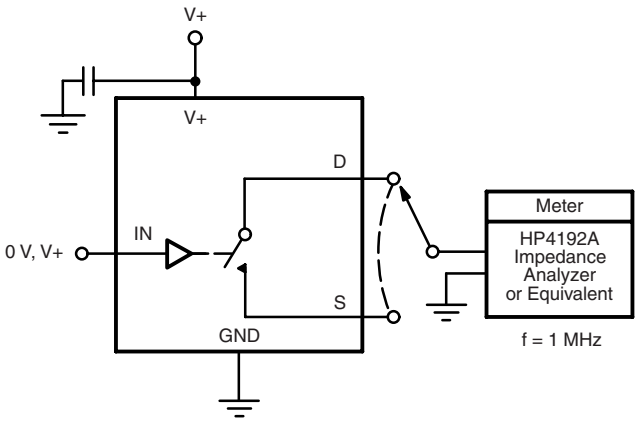
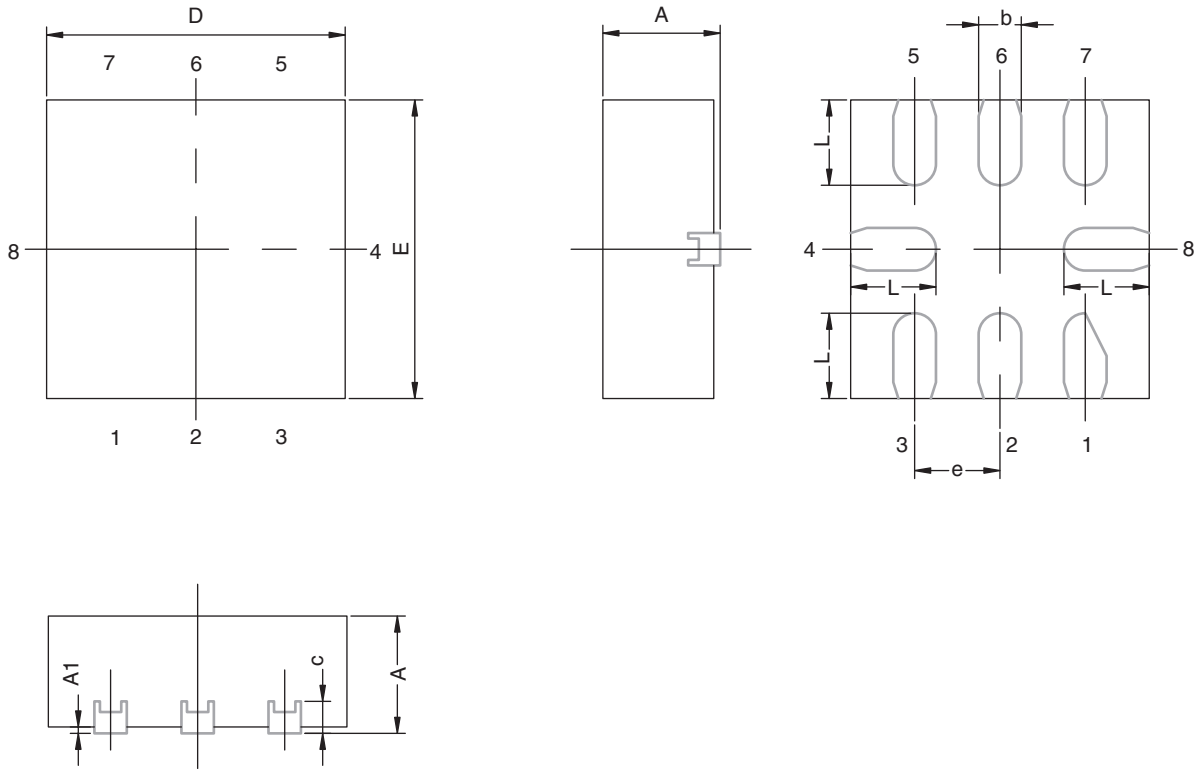


Figure 6. Channel Off/On Capacitance

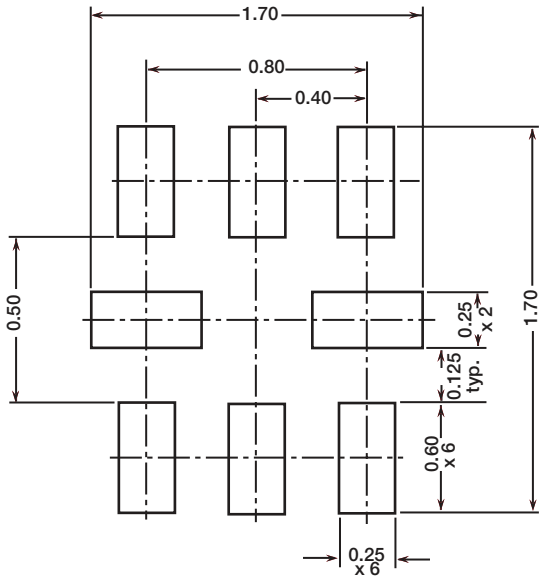
Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see http://www.vishay.com/ppg?68801.

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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Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.

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