

0.4-Ω, Low Voltage, Dual SPST Analog Switch

DESCRIPTION

The DG2747, DG2748, and DG2749 are high performance, low on-resistance analog switches of dual SPST configuration.

Built on Vishay Siliconix's sub-micro CMOS technology, the DG2747, DG2748, DG2749 achieve switch on-resistance of 0.4 Ω at 2.7 V V+ and 0.3 Ω at 4.3 V V+. It provides 0.1 Ω flatness at 2.7 V V+, and total harmonic distortion to 0.03 % (frequency range 20 Hz to 20 kHz). It achieves - 72 dB off-isolation and - 100 dB crosstalk at 100 kHz. Its - 3 dB bandwidth is up to 93 MHz.

It can switch signals with amplitudes of up to V_{CC} to be transmitted in either direction.

The select pins of the control logic can tolerate voltages above V+. Logic high is 1.4 V to make it compatible with many low voltage digital control circuits.

Combining wide operation voltage, low power, high speed, low on-resistance and small physical size, the DG2747, DG2748, DG2749 are ideal for portable and battery powered applications requiring high performance and efficient use of board space.

The DG2747, DG2748, DG2749 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

- Wide operation voltage range: 1.6 V to 4.3 V
- Low on-resistance: 0.4 Ω typ. at 2.7 V
- Low voltage logic threshold:
V_{th(high)} = 1.4 V at V+ = 3 V
- - 100 dB crosstalk at 100 kHz
- > 250 mA latch up current per JESD78
- Switch exceeds 7 kV ESD/HBM



RoHS
COMPLIANT

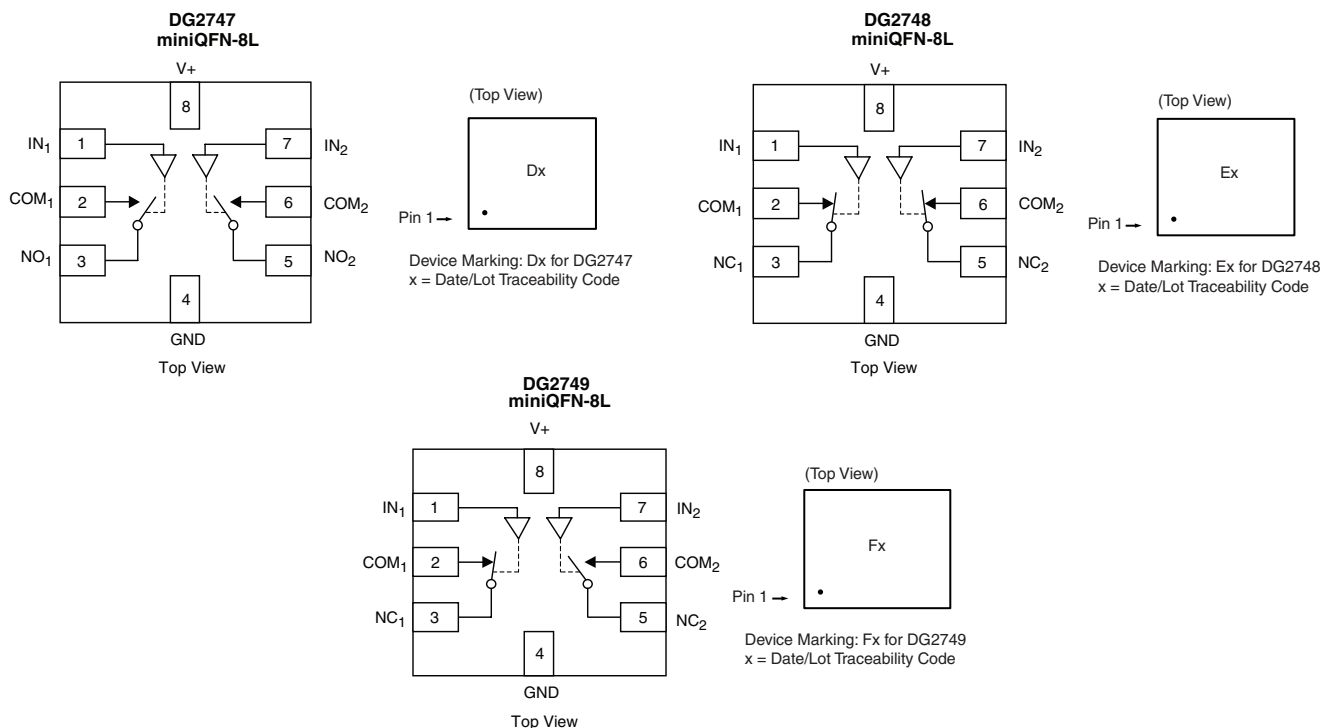
BENEFITS

- Ultra small miniQFN8 package of 1.4 x 1.4 x 0.55 mm
- High fidelity audio switch
- Reed relay replacement
- Low power consumption

APPLICATIONS

- Cellular phones
- Portable media player
- GPS
- PCMCIA cards
- Medical and test equipment

FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION





TRUTH TABLE						
Logic	DG2747		DG2748		DG2749	
	COM ₁ and NO ₁	COM ₂ and NO ₂	COM ₁ and NC ₁	COM ₂ and NC ₂	COM ₁ and NC ₁	COM ₂ and NO ₂
Low	OFF	OFF	ON	ON	ON	OFF
High	ON	ON	OFF	OFF	OFF	ON

ORDERING INFORMATION		
Temp. Range	Package	Part Number
- 40 °C to 85°C	miniQFN-8L	DG2747DN-T1-E4 DG2748DN-T1-E4 DG2749DN-T1-E4

ABSOLUTE MAXIMUM RATINGS $T_A = 25\text{ °C}$, unless otherwise noted			
Parameter		Limit	Unit
Reference to GND	V+	- 0.3 to 5.0	V
	IN, COM, NC, NO ^a	- 0.3 to (V+ + 0.3)	
Current (Any terminal except NO, NC or COM)		30	mA
Continuous Current (NO, NC, or COM)		± 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 NC, NO, or COM or IN 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.



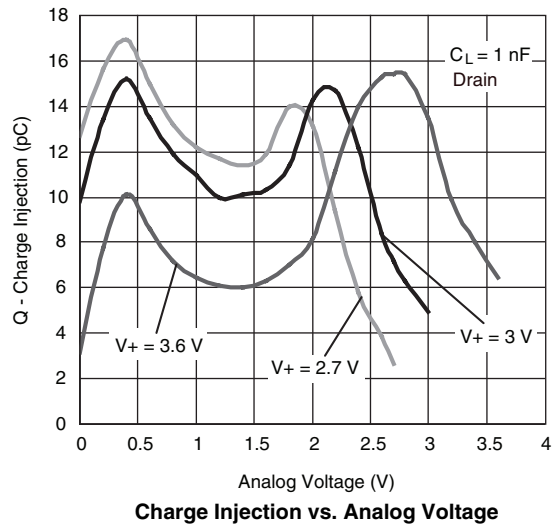
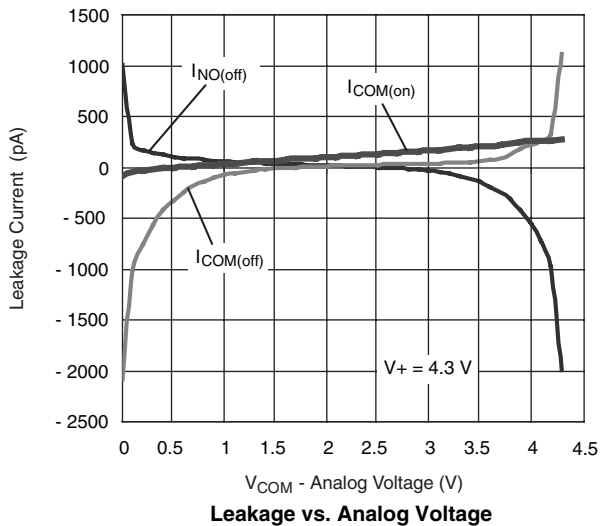
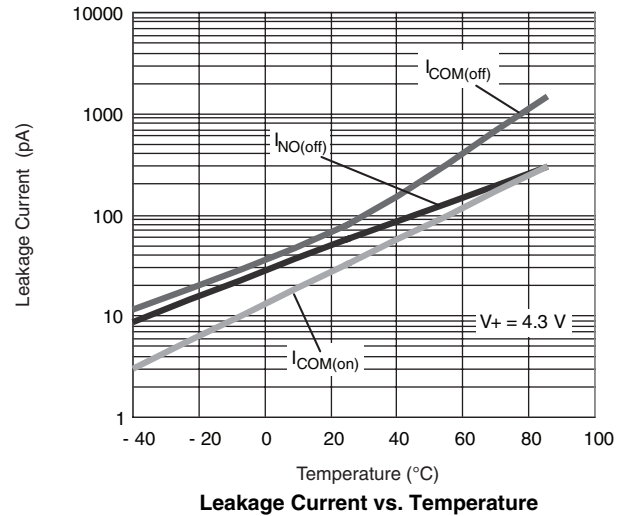
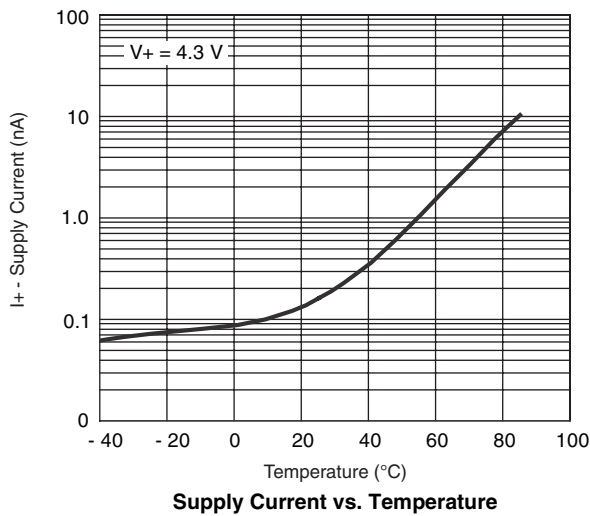
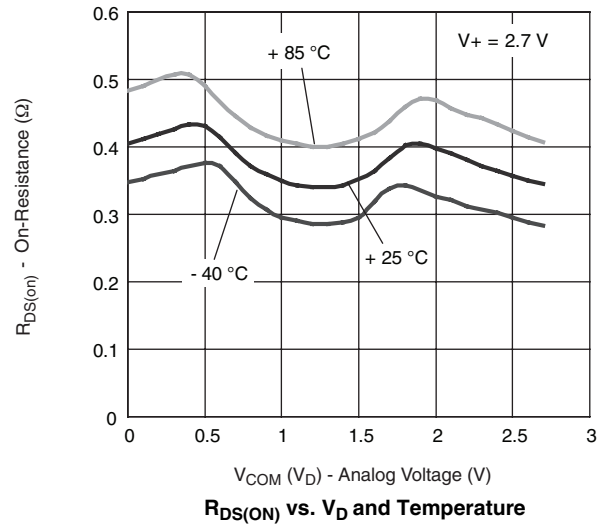
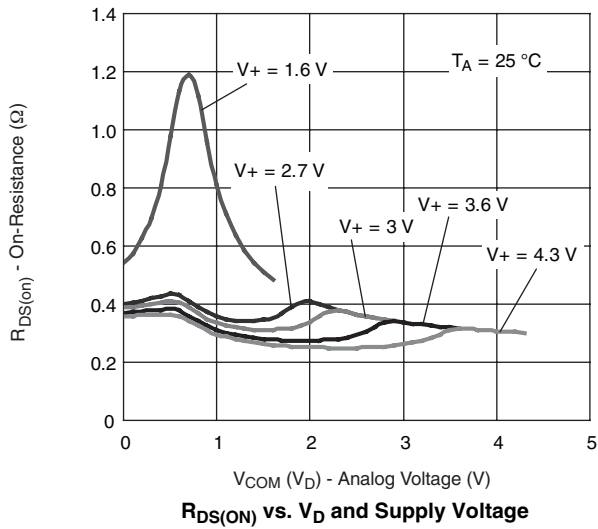
SPECIFICATIONS $V_+ = 3\text{ V}$									
Parameter	Symbol	Test Conditions Unless Otherwise Specified $V_+ = 3\text{ V}, \pm 10\%, V_{IN} = 0.4\text{ V}$ or 1.4 V^e	Temp. ^a	Limits - 40 °C to 85 °C			Unit		
				Min. ^b	Typ. ^c	Max. ^b			
Analog Switch									
Analog Signal Range ^d	V_{analog}	$R_{\text{DS(on)}}$	Full	0		V_+	V		
On-Resistance	$R_{\text{DS(on)}}$	$V_+ = 2.7\text{ V}, I_{\text{NO/NC}} = 100\text{ mA}, V_{\text{COM}} = 0.5\text{ V}$	Room		0.4	0.6	Ω		
		$V_+ = 2.7\text{ V}, I_{\text{NO/NC}} = 100\text{ mA}, V_{\text{COM}} = 1.5\text{ V}$							
		$V_+ = 2.7\text{ V}, I_{\text{NO/NC}} = 100\text{ mA}, V_{\text{COM}} = 0.5\text{ V}$	Full			0.7			
		$V_+ = 2.7\text{ V}, I_{\text{NO/NC}} = 100\text{ mA}, V_{\text{COM}} = 1.5\text{ V}$							
R_{ON} Match ^d	ΔR_{ON}	$V_+ = 2.7\text{ V}, I_{\text{NO/NC}} = 100\text{ mA}, V_{\text{COM}} = 0.5\text{ V}, 1.5\text{ V}$	Room			0.03			
R_{ON} Resistance Flatness ^d	R_{ON} flatness	$V_+ = 2.7\text{ V}, I_{\text{NO/NC}} = 100\text{ mA}, V_{\text{COM}} = 0.5\text{ V}, 1.5\text{ V}$	Room		0.1	0.2			
Switch Off Leakage Current	$I_{\text{NO/NC(off)}}$	$V_+ = 4.3\text{ V}, V_{\text{NO/NC}} = 1.0\text{ V}/3.3\text{ V}, V_{\text{COM}} = 3.3\text{ V}/1.0\text{ V}$	Room	- 2		2	nA		
			Full	- 10		10			
	Room		- 2		2				
	Full		- 10		10				
Channel-On Leakage Current	$I_{\text{COM(on)}}$	$V_+ = 4.3\text{ V}, V_{\text{NO/NC}} = V_{\text{COM}} = 3.3\text{ V}/1.0\text{ V}$	Room	- 2		2			
			Full	- 10		10			
Digital Control									
Input High Voltage	V_{INH}			Full	1.4			V	
Input Low Voltage	V_{INL}		Full			0.4			
Input Current	I_{INL} or I_{INH}	$V_{\text{IN}} = 0$ or V_+	Full	- 1		1	μA		
Dynamic Characteristics									
Turn-On Time ^e	t_{ON}	$V_+ = 2.7\text{ V}$ to $3.6\text{ V}, V_{\text{NO}}$ or $V_{\text{NC}} = 1.5\text{ V}, R_L = 50\ \Omega, C_L = 35\text{ pF}$	Room		14	25	ns		
			Full			27			
Turn-Off Time ^e	t_{OFF}		Room		12	25			
			Full			27			
Charge Injection ^d	Q		$C_L = 1\text{ nF}, R_{\text{GEN}} = 0\ \Omega, V_{\text{GEN}} = 0\text{ V}$	Room		10			pC
Off-Isolation ^d	O_{IRR}		$R_L = 50\ \Omega, C_L = 5\text{ pF}, f = 1\text{ MHz}$	Room		- 52			dB
		$R_L = 50\ \Omega, C_L = 5\text{ pF}, f = 100\text{ kHz}$			- 72				
Crosstalk ^d	X_{TALK}	$R_L = 50\ \Omega, C_L = 5\text{ pF}, f = 1\text{ MHz}$			- 90				
		$R_L = 50\ \Omega, C_L = 5\text{ pF}, f = 100\text{ kHz}$			- 100				
3 dB bandwidth ^d		$R_L = 50\ \Omega, C_L = 5\text{ pF}$	Room		93		MHz		
Source Off Capacitance ^d	$C_{\text{NX(off)}}$	$f = 1\text{ MHz}, V_{\text{NX}} = 0\text{ V}$	Room		75		pF		
Drain Off Capacitance ^d	$C_{\text{COM(off)}}$	$f = 1\text{ MHz}, V_{\text{COM}} = 0\text{ V}$	Room		55				
Drain On Capacitance ^d	$C_{\text{COM(on)}}$	$f = 1\text{ MHz}, V_{\text{COM}} = V_{\text{NX}} = 0\text{ V}$	Room		100				
Total Harmonic Distortion ^d	THD	$V_+ = 2.7\text{ V}$ to $3.6\text{ V}, V_{\text{IN}} = 0.5\text{ Vp-p}$ $f = 20\text{ Hz}$ to 20 kHz	Room		0.03		%		
Power Supply									
Power Supply Range	V_+			1.6		4.3	V		
Power Supply Current	I_+	$V_{\text{IN}} = 0$ or V_+	Full			1.0	μA		

Notes:

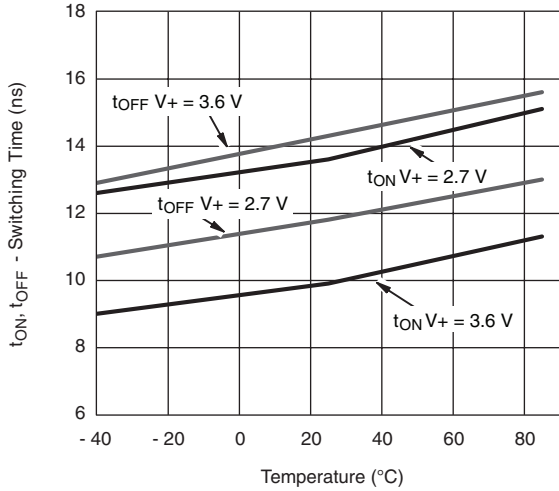
- a. Room = 25 °C, Full = as determined by the operating suffix.
- b. The algebraic convention whereby the most negative value is a minimum and the most positive a maximum, is used in this data sheet.
- c. Typical values are for design aid only, not guaranteed nor subject to production testing.
- d.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

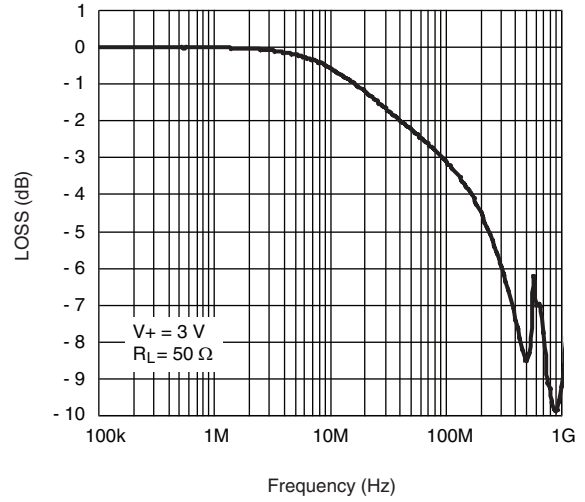
TYPICAL CHARACTERISTICS $T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted



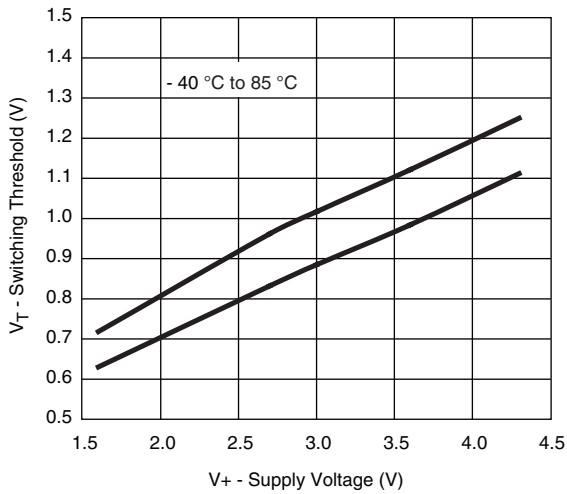
TYPICAL CHARACTERISTICS $T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted



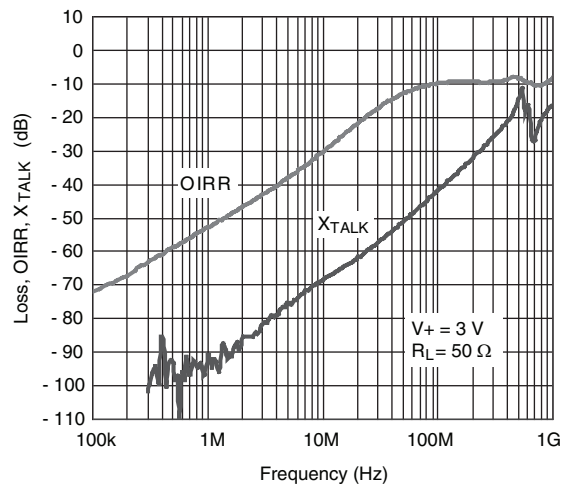
Switching Time vs. Temperature



Insertion Loss vs. Frequency

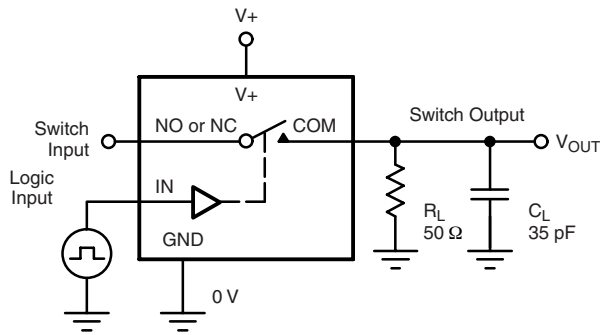


Switching Threshold vs. Supply Voltage



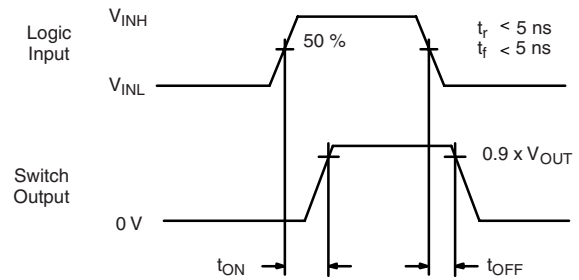
Off-Isolation and Crosstalk vs. Frequency

TEST CIRCUITS



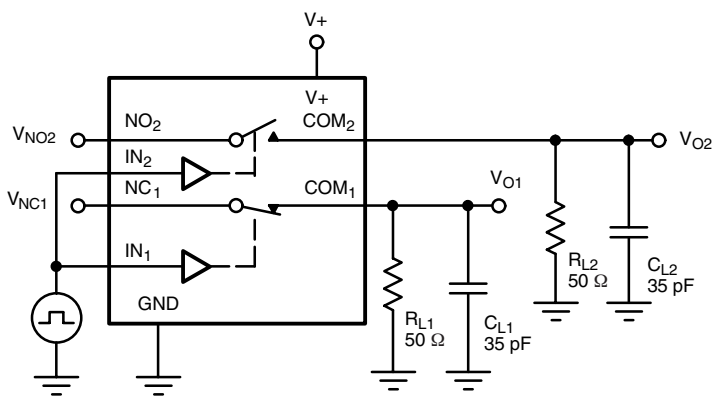
C_L (includes fixture and stray capacitance)

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



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)

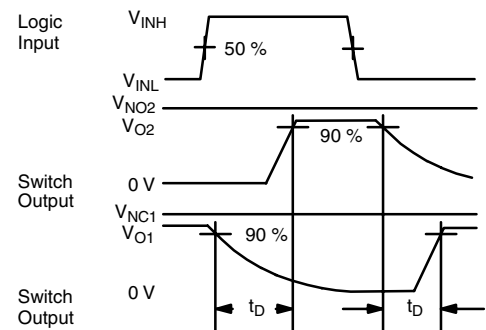


Figure 2. Break-Before-Make (DG2749)

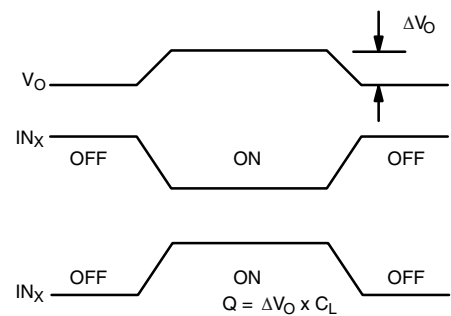
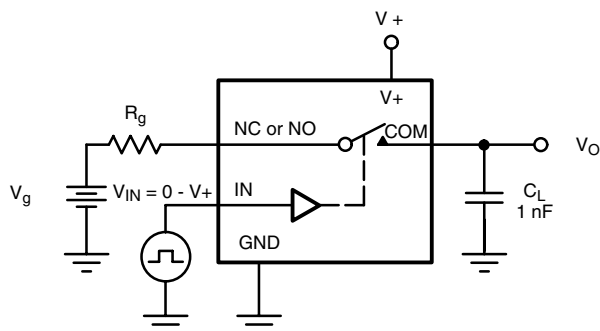


Figure 3. Charge Injection

TEST CIRCUITS

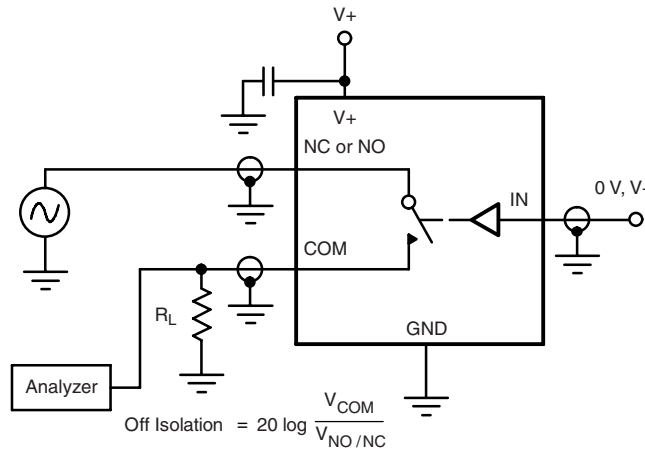


Figure 4. Off-Isolation

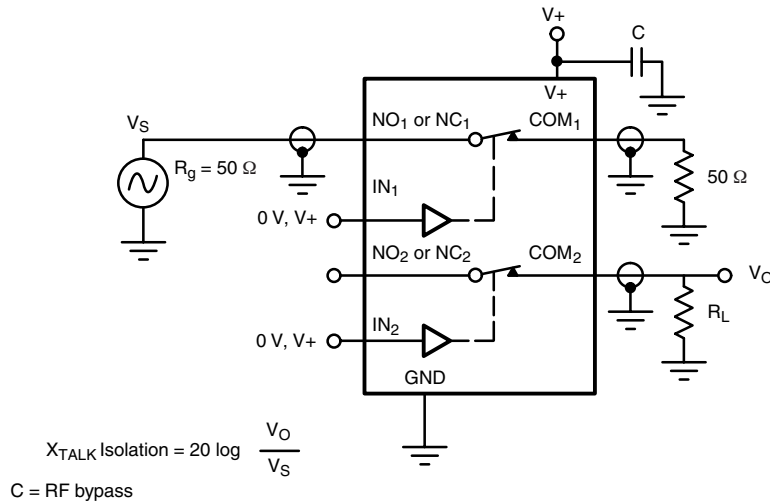


Figure 5. Crosstalk

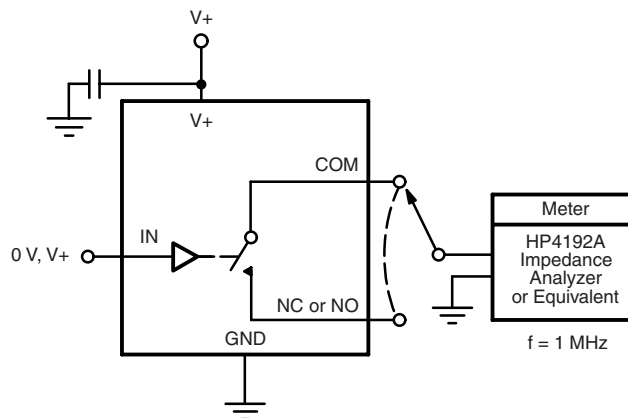
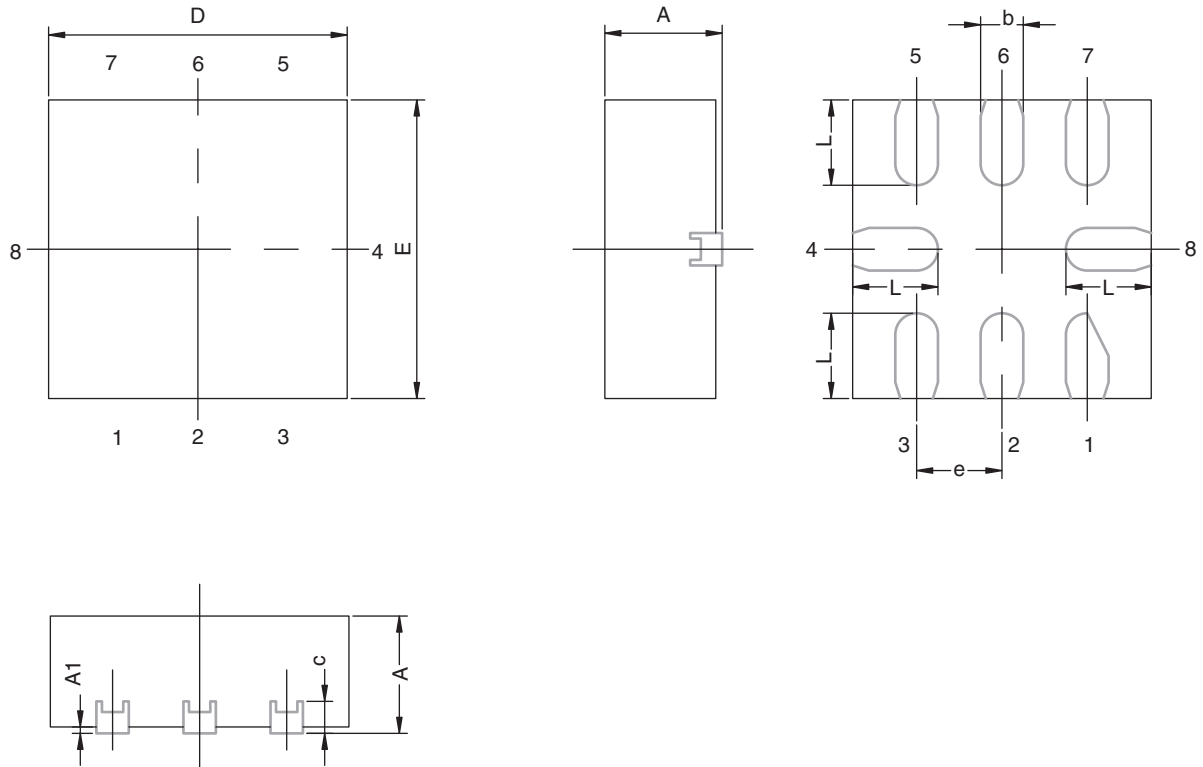


Figure 6. Channel Off/On Capacitance

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 www.vishay.com/ppg?69977.

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						



Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and/or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk and agree to fully indemnify and hold Vishay and its distributors harmless from and against any and all claims, liabilities, expenses and damages arising or resulting in connection with such use or sale, including attorneys fees, even if such claim alleges that Vishay or its distributor was negligent regarding the design or manufacture of the part. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.