

Low Voltage, Fault Protection, SP3T Analog Switch (3:1 Multiplexer/Demultiplexer)

DESCRIPTION

The DG2522 is a low on-resistance SP3T analog switch design to operation from 1.6 V to 5.5 V.

The DG2522 switches signals in either direction with amplitudes up to V_+ . Protection circuit is built in to isolate the signals if any of them swings above V_+ . It guaranteed low leakage level for isolation in power down mode.

Built on Vishay Siliconix's sub-micro CMOS technology, the DG2522 achieves switch on-resistance of $0.8\ \Omega$ at 4.5 V V_+ with $0.6\ \Omega$ flatness. It has superior 0.008 % THD (total harmonic distortion) over frequency of 20 Hz to 20 kHz. It provides - 59 dB off-Isolation, - 65 dB crosstalk at 1 MHz, and 105 MHz - 3 dB bandwidth.

The select pin of the control logic input can tolerate voltages above V_+ up to 5.5 V. Logic high 1.8 V is guaranteed over the full V_+ range that makes it compatible with many low voltage digital control circuits.

The features of ultra small package size, wide V_+ range, low on-resistance, low logic threshold, and switch isolation under fault condition make it an ideal device for battery operated devices to handle signals such as audio, video, data stream, and other high accuracy signals.

The DG2522 comes in a small miniQFN-8 lead package of 1.4 mm x 1.4 mm 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 termination and is 100 % RoHS compliant.

FEATURES

- Isolation at $V_+ = 0\text{ V}$ and signal above V_+
- Logic input tolerates up to 5.5 V
- 1.6 V to 5.5 V operation voltage range
- Guaranteed 1.8 V $V_{TH(high)}$ at $V_+ = 4.5\text{ V}$
- 0.008 % total harmonic distortion
- Low switch on-resistance
- 300 mA latch up current per JESD78



RoHS
COMPLIANT

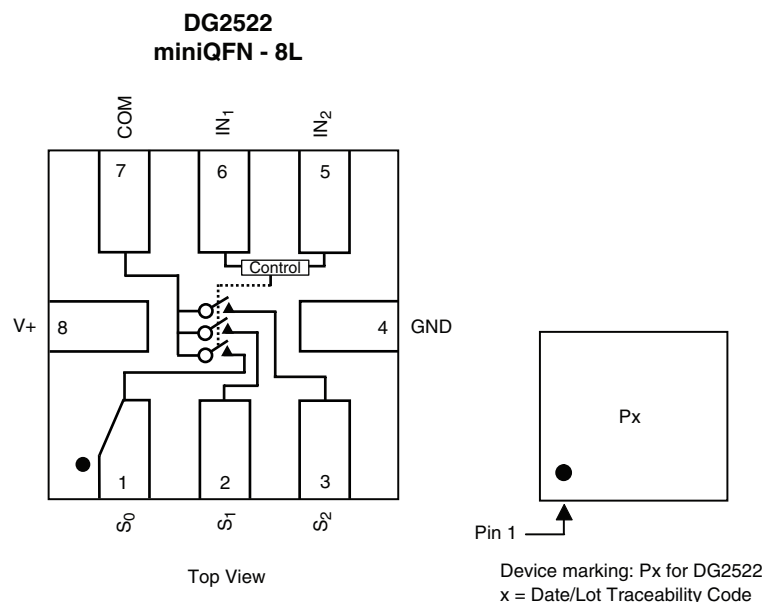
BENEFITS

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

APPLICATIONS

- Cellular phones and PDAs
- GPS and portable media players
- Modems and wireless cards
- Computers peripherals
- Communication and network circuits
- Low voltage data acquisition systems
- Portable instrumentation

FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION



TRUTH TABLE DG2522

IN ₁ (Pin 6)	IN ₂ (Pin 5)	Function
0	0	COM disconnect
1	0	COM (Pin 7) = S ₀ (Pin 1)
0	1	COM (Pin 7) = S ₁ (Pin 2)
1	1	COM (Pin 7) = S ₂ (Pin 3)

ORDERING INFORMATION

Temp. Range	Package	Part Number
- 40 °C to 85 °C	miniQFN-8L	DG2522DN-T1-E4

ABSOLUTE MAXIMUM RATINGS T_A = 25 °C, unless otherwise noted

Parameter		Limit	Unit
Reference to GND	V+	- 0.3 to 6.0	V
	IN, COM, S _X ^a	- 0.3 to (V+ + 0.3)	
Current (Any terminal except S _X or COM)		30	mA
Continuous Current (S _X 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 S₀, S₁, S₂ and 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.



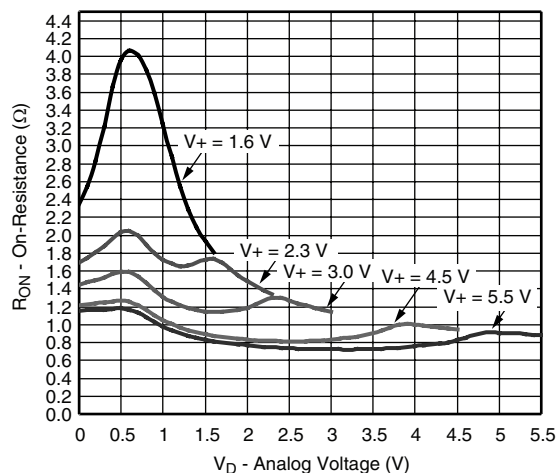
SPECIFICATIONS V+ = 5 V							
Parameter	Symbol	Test Conditions Unless Otherwise Specified V+ = 5 V, ± 10 %,VIN = 0.6 V or 1.8 V ^e	Temp. ^a	Limits - 40 °C to 85 °C			Unit
				Min. ^b	Typ. ^c	Max. ^b	
Analog Switch							
Analog Signal Range ^d	V _{analog}	R _{DS(on)}	Full	0		V+	V
On-Resistance	R _{DS(on)}	V+ = 4.5 V, I _{SX} = 100 mA, V _{COM} = 2.5 V	Room		0.8	1.1	Ω
		V+ = 4.5 V, I _{SX} = 100 mA, V _{COM} = 2.5 V	Full			1.5	
R _{ON} Match	ΔR _{ON}	V+ = 4.5 V, I _{SX} = 100 mA, V _{COM} = 2.5 V	Room			0.1	
R _{ON} Resistance Flatness	R _{ON} flatness	V+ = 4.5 V, I _{SX} = 100 mA, V _{COM} = 0.5 V, 2.5 V	Room		0.2	0.6	
Switch Off Leakage Current	I _{SX(off)}	V+ = 5.5 V, V _{SX} = 1 V/4.5 V, V _{COM} = 4.5 V/1 V	Room	- 20		20	nA
			Full	- 120		120	
	I _{COM(off)}		Room	- 20		20	
			Full	- 120		120	
Channel-On Leakage Current	I _{COM(on)}	V+ = 4.3 V, V _{SX} = V _{COM} = 4.5 V/1 V	Room	- 20		20	
			Full	- 120		120	
Power Down Leakage		V+ = 0 V, V _{SX} = 0 V/5.5 V, V _{COM} = 5.5 V/0 V	Room	- 1	0.001	1	μA
			Full	- 25		25	
Digital Control							
Input High Voltage	VINH	V+ = 2.7 V	Full	1.6			V
		V+ = 4.5 V	Full	1.8			
Input Low Voltage	VINL			Full			
Input Capacitance	CIN	f = 1 MHz, VINx = 0 V	Room		5		pF
Input Current	IINL or IINH	VIN = 0 or V+	Full	- 1		1	μA
Dynamic Characteristics							
Break-Before-Make Time ^e	tBBM	V+ = 5.0 V, VSX = V+, RL = 50 Ω, CL = 35 pF (see figure 2)	Room		8		ns
			Full	14			
Enable Turn-On Time ^e	tON	V+ = 5.0 V, VSX = V+, RL = 50 Ω, CL = 35 pF (see figure 1)	Room		53	75	
			Full			85	
Enable Turn-Off Time ^e	tOFF		Room		40	60	
			Full			70	
Charge Injection ^d	Q	CL = 1 nF, RGEN = 0 Ω, VGEN = 0 V	Room		27		pC
Off-Isolation ^d	OIRR	RL = 50 Ω, CL = 5 pF, f = 1 MHz	Room		- 59		dB
Crosstalk ^d	XTALK	RL = 50 Ω, CL = 5 pF, f = 1 MHz			- 64		
- 3 dB Bandwidth ^d	BW	RL = 50 Ω, CL = 5 pF	Room		105		MHz
Source Off Capacitance ^d	CSX(off)	f = 1 MHz, VNX = 0 V	Room		17		pF
Drain Off Capacitance ^d	CCOM(off)	f = 1 MHz, VCOM = 0 V	Room		51		
Drain On Capacitance ^d	CCOM(on)	f = 1 MHz, VCOM = VNX = 0 V	Room		70		
Total Harmonic Distortion ^d	THD	V+ = 5 V, VIN = 1 VRMS, RL = 600 Ω f = 20 Hz to 20 kHz	Room		0.008		%
Power Supply							
Power Supply Range	V+			1.6		5.5	V
Power Supply Current	I+	VIN = 0 or V+	Full			1.0	μA

Notes:

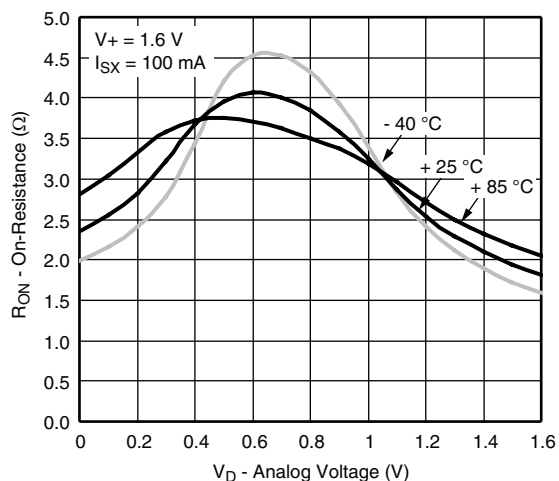
- Room = 25 °C, Full = as determined by the operating suffix.
- The algebraic convention whereby the most negative value is a minimum and the most positive a maximum, is used in this data sheet.
- Typical values are for design aid only, not guaranteed nor subject to production testing.
- Guarantee by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

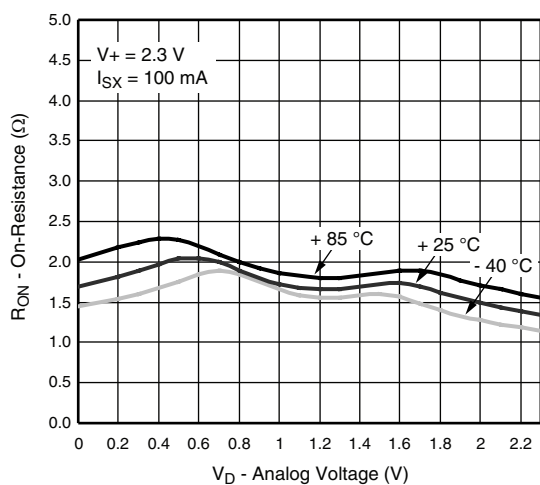
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



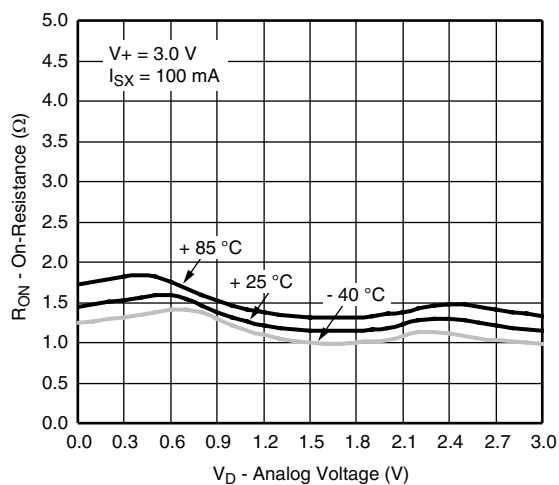
R_{ON} vs. V_D and Single Supply Voltage



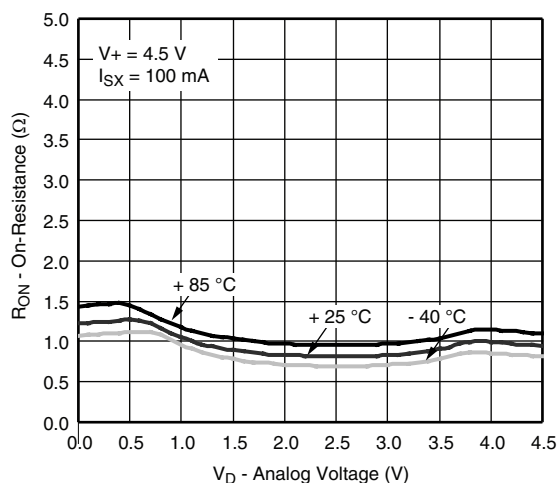
R_{ON} vs. Analog Voltage and Temperature



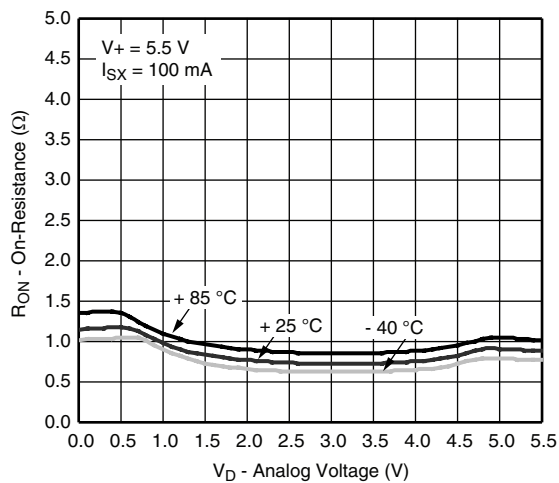
R_{ON} vs. Analog Voltage and Temperature



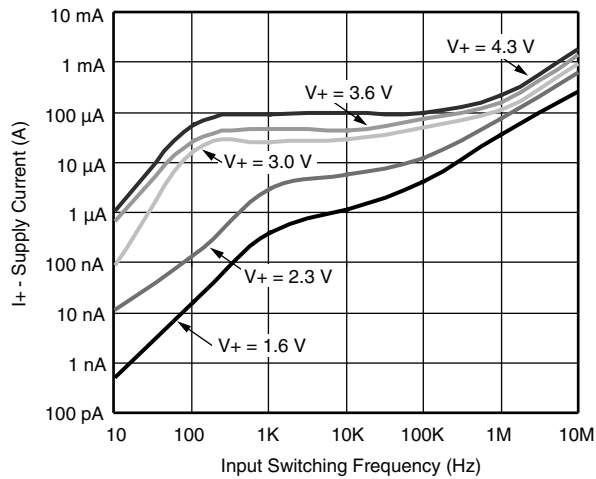
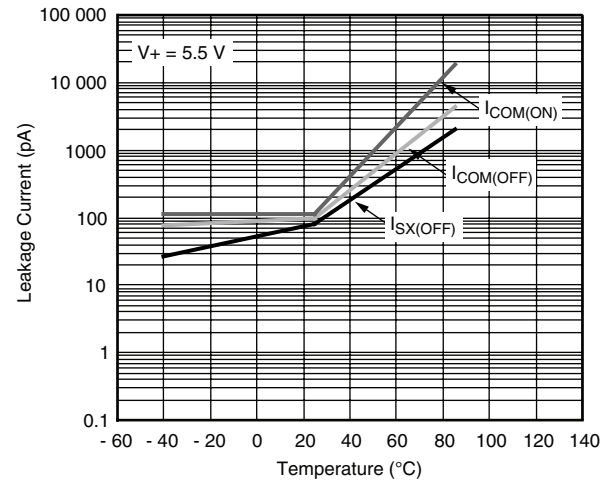
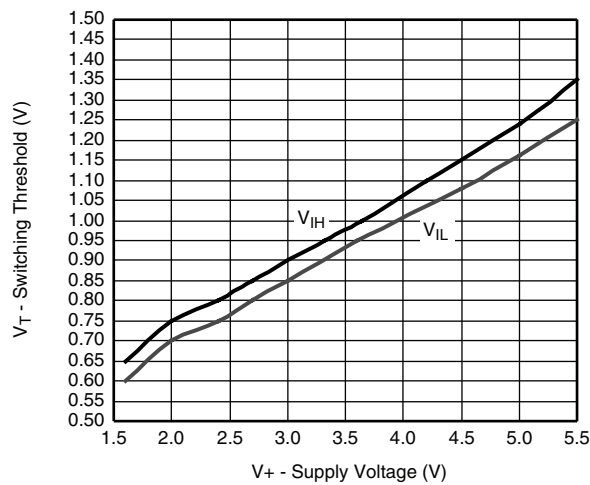
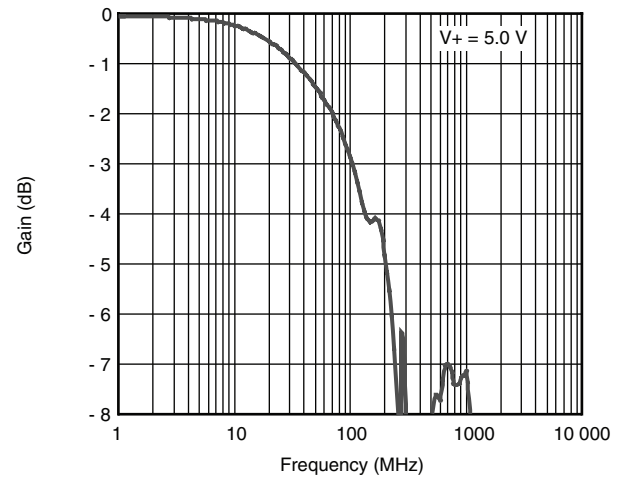
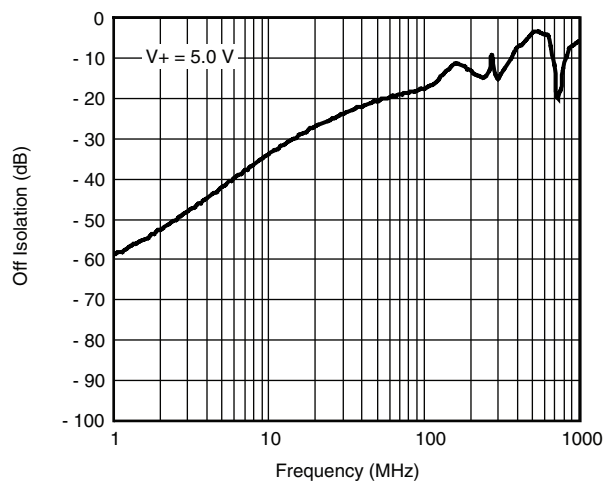
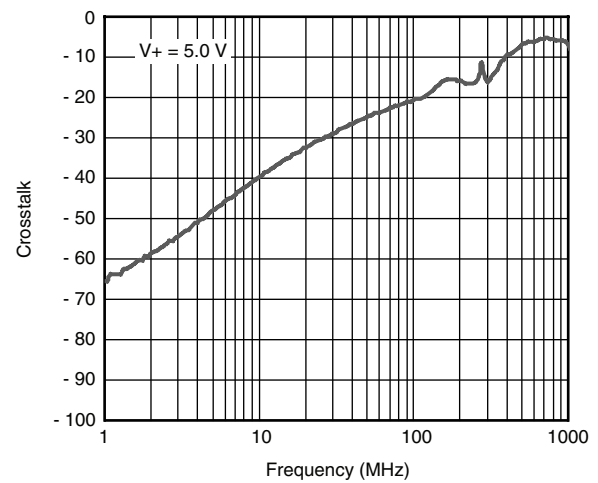
R_{ON} vs. Analog Voltage and Temperature



R_{ON} vs. Analog Voltage and Temperature



R_{ON} vs. Analog Voltage and Temperature

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

Supply Current vs. Input Switching Frequency

Leakage Current vs. Temperature

Switching Threshold vs. Supply Voltage

Gain vs. Frequency

Off Isolation vs. Frequency

Crosstalk vs. Frequency

TEST CIRCUITS

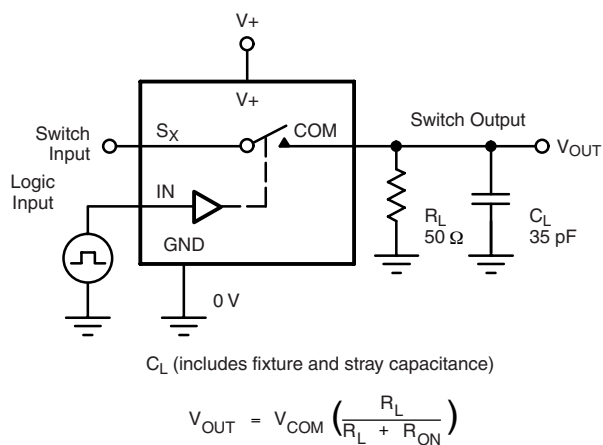
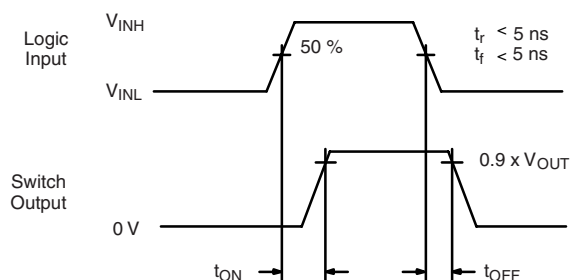


Figure 1. Switching Time



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

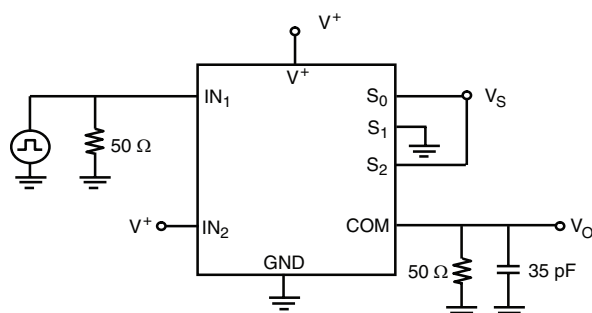


Figure 2. Break-Before-Make (DG2749)

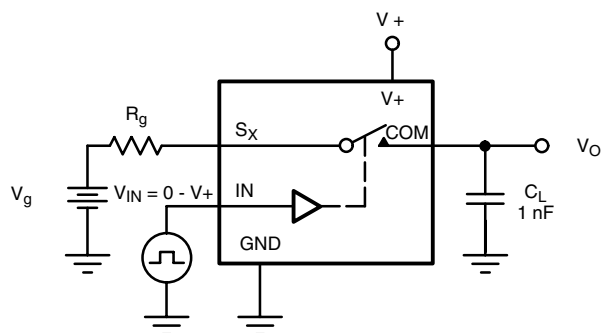
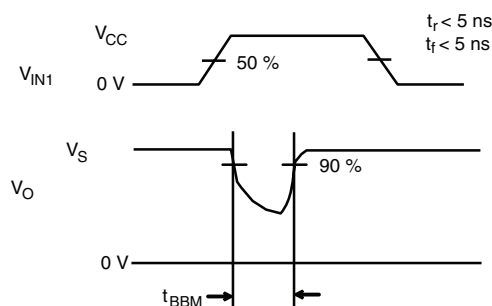
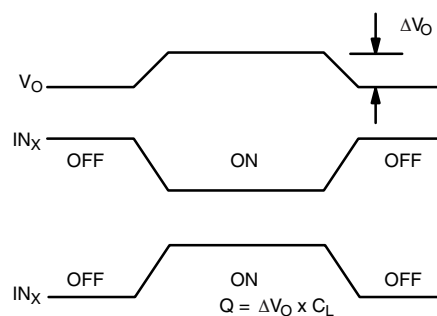
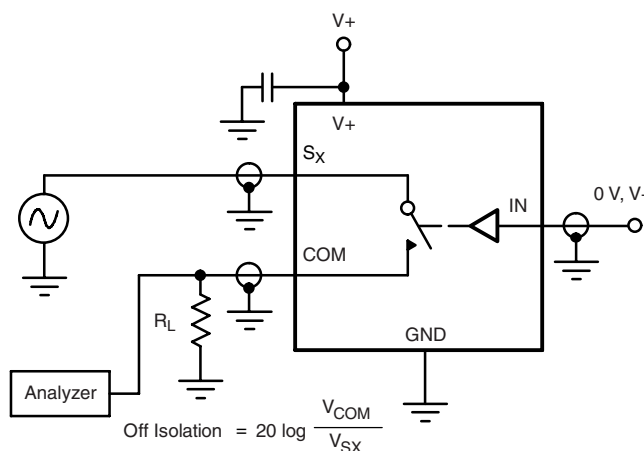
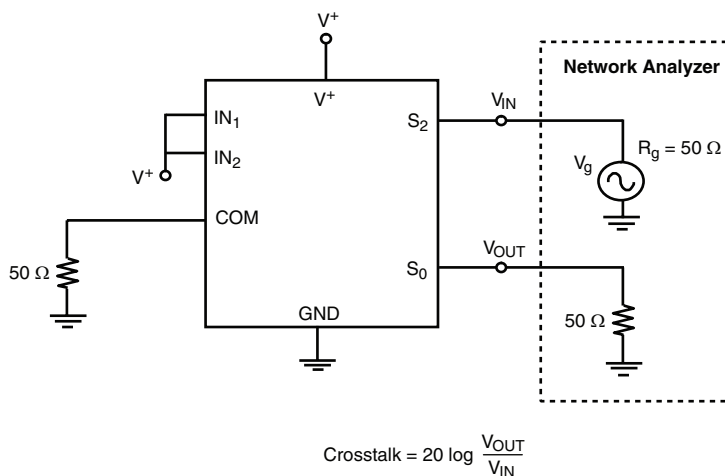
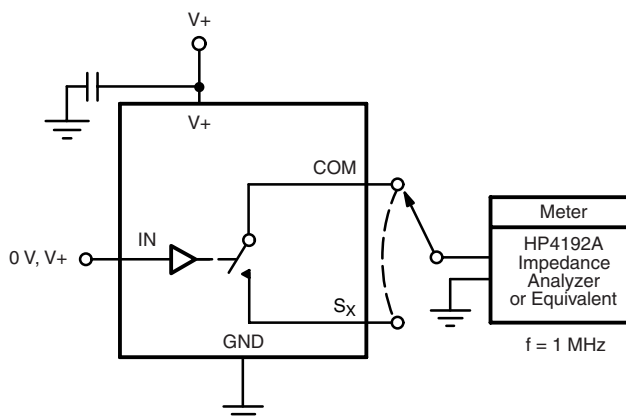


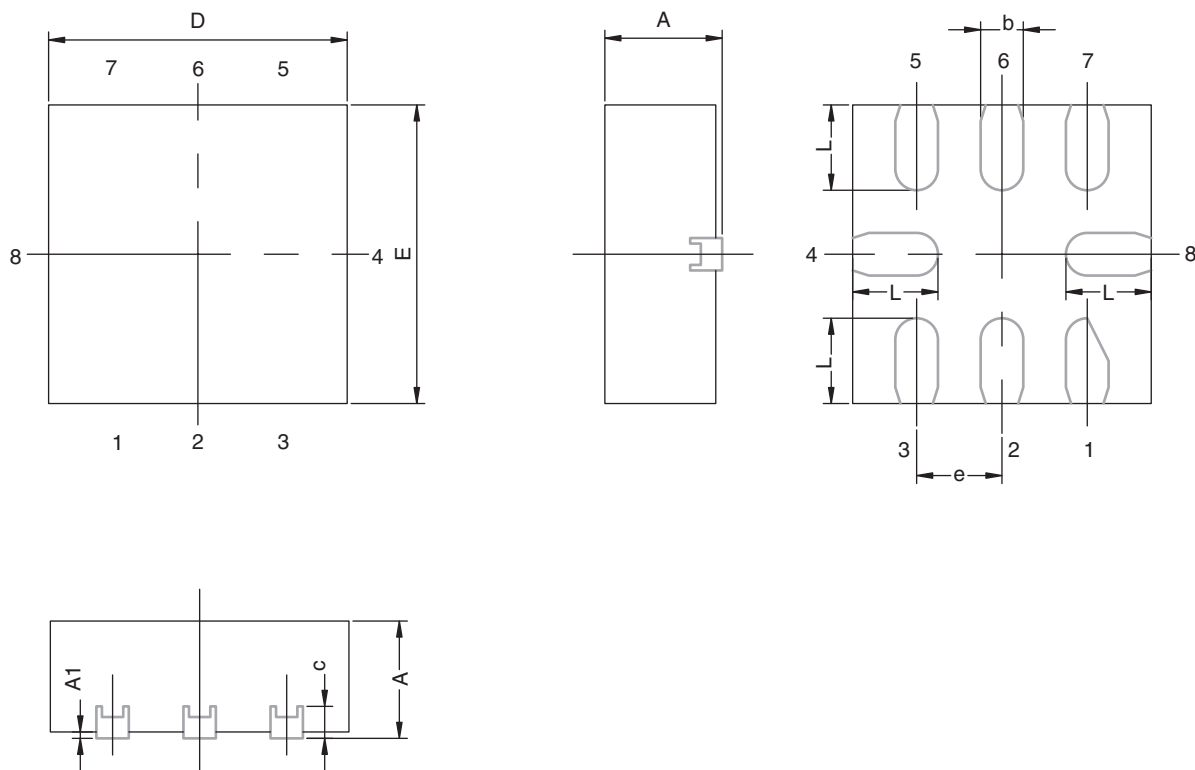
Figure 3. Charge Injection



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?68831.

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.