0.65-Ω, Low Voltage, Negative Swing Capable, Dual SPST Analog Switch

DESCRIPTION

The DG2727, DG2728, and DG2729 are 0.6 Ω dual SPST analog switches. When Sx are used as signal input, these devices support AC-coupled audio signals with single rail power supply. Audio signals can swing below ground down to V+ - 4.3 V.

Built on Vishay Siliconix's sub-micro CMOS technology, the DG2747/2748/2749 achieve 0.6 Ω on-resistance and 0.2 Ω flatness at 2.7 V power supply. Its total harmonic distortion is 0.006 % (frequency ranges 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 78 MHz.

Select pin of control logic can tolerate voltage above power supply up to 4.3 V. It has guaranteed 1.2 V logic high for the power supply 2.7 V to 4.3 V range. This makes 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-8L package (1.4 mm x 1.4 mm x 0.55 mm) and operate over - 40 °C to + 85 °C extended temperature range.

FEATURES

- **Halogen-free according to IEC 61249-2-21 definition**
- Wide operation voltage range: 1.6 V to 4.3 V
- Low 0.6 Ω (typical at 2.7 V) on-resistance
- Guaranteed logic high threshold: $V_{th(high)}$ = 1.2 V at V+ = 4.3 V
- - 82 dB crosstalk and - 76 dB off-isolation at 100 kHz
- 250 MHz, - 3 dB bandwidth
- 0.006 % total harmonic distortion
- > 250 mA latch up current per JESD78
- > 8 kV ESD/HBM per MIL-STD 883 (method 3015)
- Compliant to RoHS directive 2002/95/EC

Pb-free
RoHS COMPLIANT
HALOGEN FREE

BENEFITS

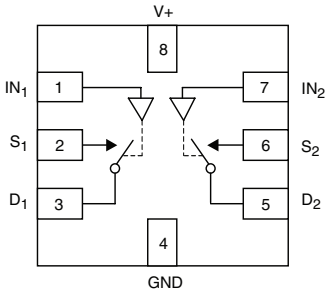
- Ultra small miniQFN-8L package of 1.4 mm x 1.4 mm x 0.55 mm
- High fidelity audio switch
- Reed relay replacement
- Low power consumption

APPLICATIONS

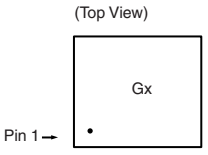
- Cellular phones
- GPS and portable media player
- Audio and video signal routing
- Modems
- Hard drives and computer peripherals
- Low voltage data-acquisition circuits
- Medical and test equipment

FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION

DG2727
miniQFN-8L

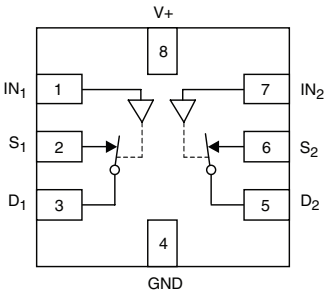


Top View

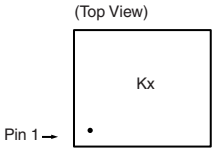


Device Marking: Gx for DG2727
x = Date/Lot Traceability Code

DG2728
miniQFN-8L

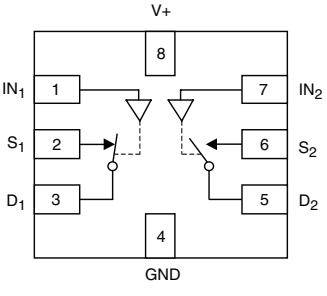


Top View

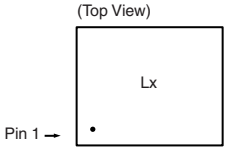


Device Marking: Kx for DG2728
x = Date/Lot Traceability Code

DG2729
miniQFN-8L



Top View



Device Marking: Lx for DG2729
x = Date/Lot Traceability Code

TRUTH TABLE

Logic	DG2727		DG2728		DG2729	
	S_1 and D_1	S_2 and D_2	S_1 and D_1	D_2 and D_2	S_1 and D_1	S_2 and D_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	DG2727DN-T1-E4 DG2728DN-T1-E4 DG2729DN-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
	IN, D, S[a]	- 0.3 to (V+ + 0.3)	
Current (Any terminal except S or D)		30	mA
Continuous Current (S or D)		± 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

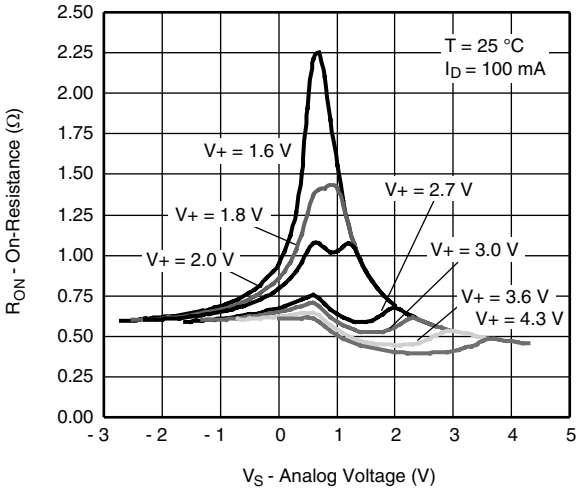
Notes:
a. Signals on S or D or IN exceeding V+ will be clamped by internal diodes. Limit forward diode current to maximum current ratings.
b. All leads welded or soldered to PC board.
c. Derate 2.4 mW/°C above 70 °C.

SPECIFICATIONS V+ = 3 V							
Parameter	**Symbol**	**Test Conditions Unless Otherwise Specified** V+ = 3 V, ± 10 %, V_{IN} = 0.4 V or 1.2 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}		Full	V+ - 4.3 V		V+	V
On-Resistance	R_{ON}	V+ = 2.7 V, I_D = 100 mA, V_S = - 1.6 V, - 1 V, 0 V, 2 V, 2.7 V	Room		0.65	1.0	Ω
			Full			1.15	
R_{ON} Match	ΔR_{ON}	V+ = 2.7 V, I_D = 100 mA, V_S = - 1.6 V, - 1 V, 0 V, 2 V, 2.7 V	Room			0.1	
R_{ON} Resistance Flatness	R_{ON} flatness	V+ = 2.7 V, I_D = 100 mA, V_S = - 1.6 V, - 1 V, 0 V, 2 V, 2.7 V	Room		0.2	0.3	
Switch Off Leakage Current	$I_{S(off)}$	V+ = 2.7 V, V_S = - 1.8 V, 2.4 V V_D = 0 V	Room	- 100		100	nA
			Full	- 500		500	
	$I_{D(off)}$		Room	- 100		100	
			Full	- 500		500	
Channel-On Leakage Current	$I_{D(on)}$	V+ = 2.7 V, V_S = V_D = - 1.8 V, 2.4 V	Room	- 100		100	
			Full	- 500		500	
Digital Control							
High Level Input Voltage	V_{INH}	V+ = 1.6 V to 2.6 V	Full	1.0			V
		V+ = 2.7 V to 4.3 V		1.2			
Low Level Input Voltage	V_{INL}	V+ = 1.6 V to 2.6 V				0.3	
		V+ = 2.7 V to 4.3 V				0.4	
Input Current	I_{INL} or I_{INH}	V_{IN} = 0 or V+		- 1		1	µA
Dynamic Characteristics							
Turn-On Time	t_{ON}	V+ = 1.6 V to 4.3 V, V_S = 1.5 V, R_L = 50 Ω, C_L = 35 pF	Room		38	67	ns
			Full			72	
Turn-Off Time	t_{OFF}		Room		14	40	
			Full			42	
Break-Before-Make Time (DG2729 only)	t_{BBM}		Full	2	14		ns
Charge Injection[d]	Q	C_L = 1 nF, R_{GEN} = 0 Ω, V_{GEN} = 0 V	Room		1.2		pC
Off-Isolation[d]	O_{IRR}	R_L = 50 Ω, C_L = 5 pF, f = 1 MHz	Room		- 58		dB
		R_L = 50 Ω, C_L = 5 pF, f = 100 kHz			- 76		
Crosstalk[d]	X_{TALK}	R_L = 50 Ω, C_L = 5 pF, f = 1 MHz			- 64		
		R_L = 50 Ω, C_L = 5 pF, f = 100 kHz			- 82		
3 dB Bandwidth[d]		R_L = 50 Ω, C_L = 5 pF	Room		252		MHz
Total Harmonic Distortion[d]	THD	R_L = 600 Ω, 0.5 Vp-p, f = 20 Hz to 20 kHz	Room		0.006		%
Source Off Capacitance[d]	$C_{S(off)}$	f = 1 MHz, V_S = 0 V	Room		31		pF
Drain Off Capacitance[d]	$C_{D(off)}$	f = 1 MHz, V_D = 0 V	Room		31		
Drain On Capacitance[d]	$C_{D(on)}$	f = 1 MHz, V_D = V_S = 0 V	Room		46		
Power Supply							
Power Supply Range	V+			1.6		4.3	V
Power Supply Current	I+	V_{IN} = 0 or V+	Full			1.0	µA

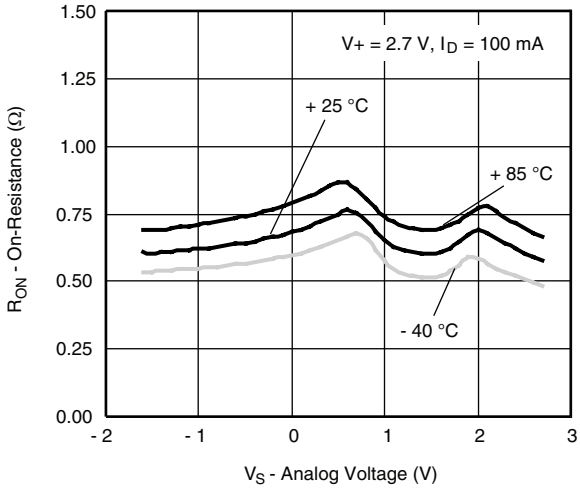
Notes:
a. Room = 25 °C, Full = as determined by the operating suffix.
b. The algebraic convention whereby the most negative value is a minimum and the most positive a maximum, is used in this data sheet.
c. Typical values are for design aid only, not guaranteed nor subject to production testing.
d. Guarantee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

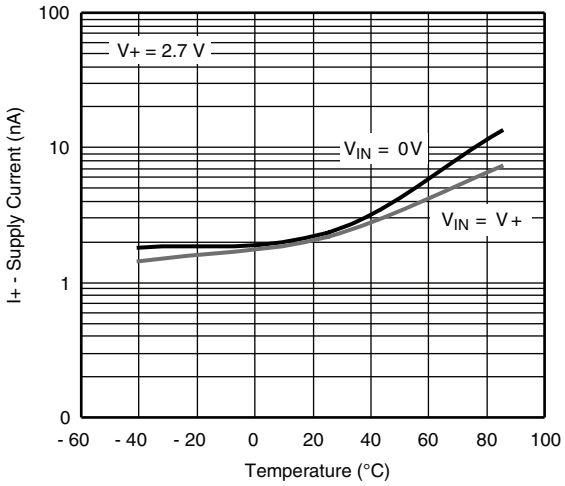
TYPICAL CHARACTERISTICS T_A = 25 °C, unless otherwise noted



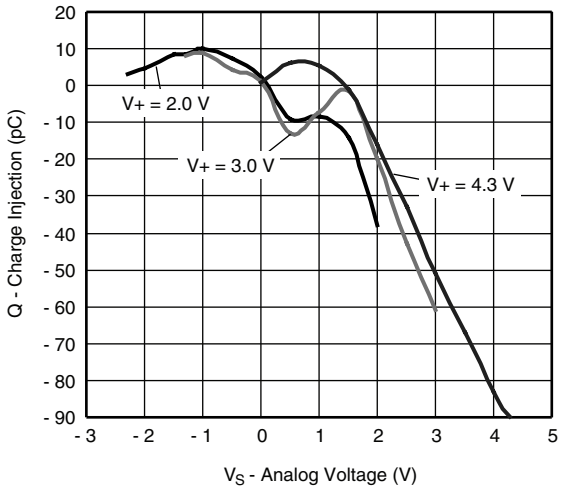
$R_{DS(ON)}$ vs. Analog Voltage and Supply Voltage



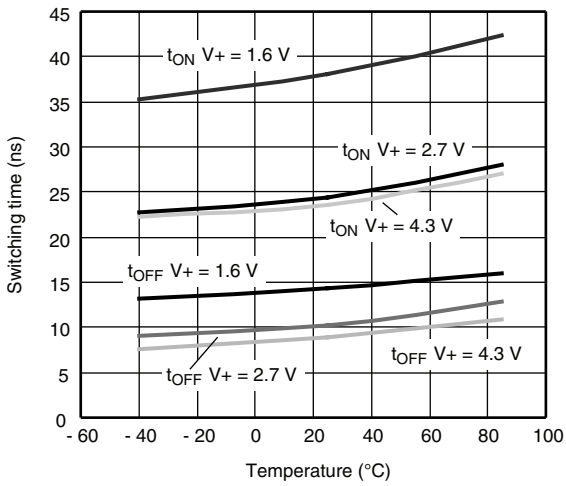
$R_{DS(ON)}$ vs. Analog Voltage and Temperature



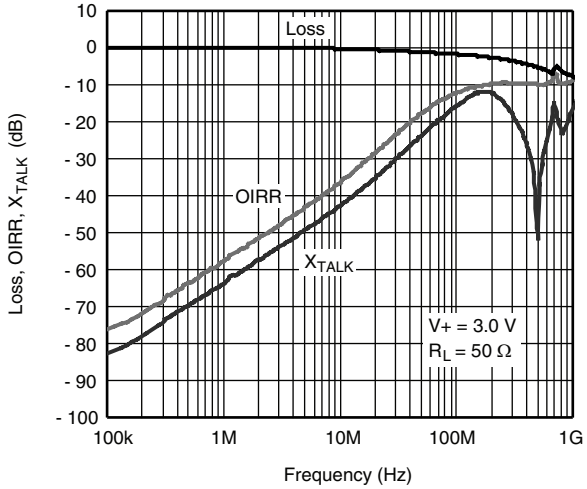
Supply Current vs. Temperature



Charge Injection vs. Analog Voltage

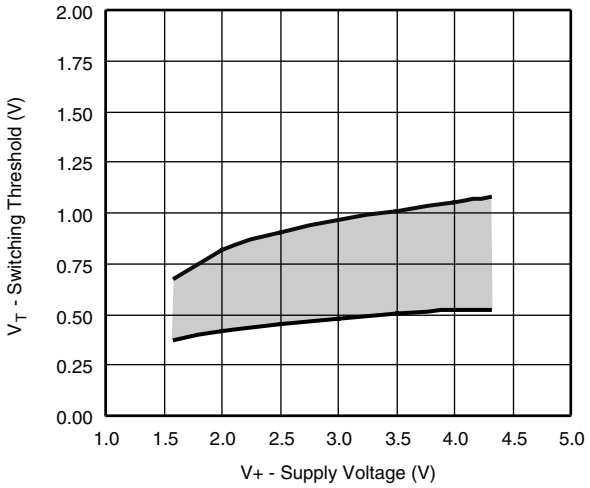


Switching Time vs. Temperature

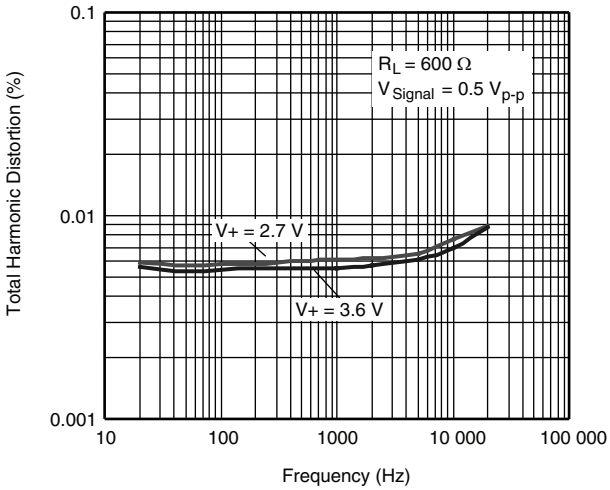


Insertion Loss, Off-Isolation and Crosstalk vs. Frequency

TYPICAL CHARACTERISTICS T_A = 25 °C, unless otherwise noted

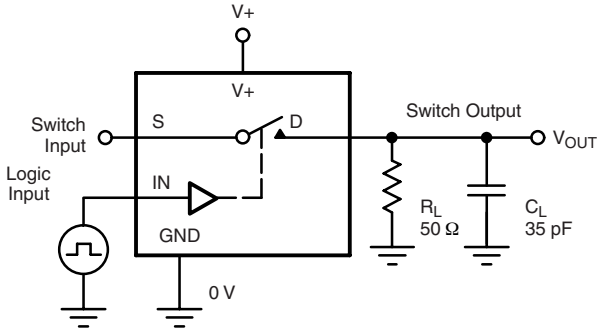


Switching Threshold vs. Supply Voltage



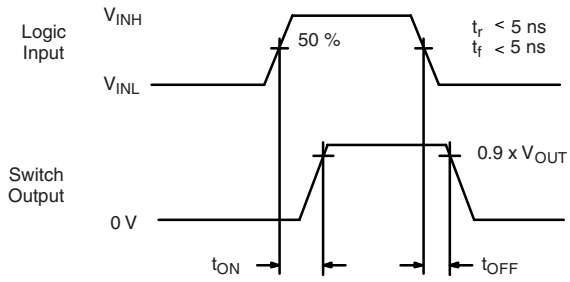
Total Harmonic Distortion vs. Frequency

TEST CIRCUITS



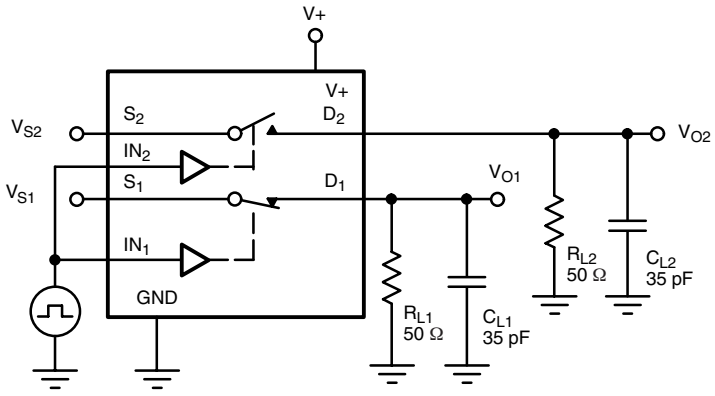
C_L (includes fixture and stray capacitance)

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



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)

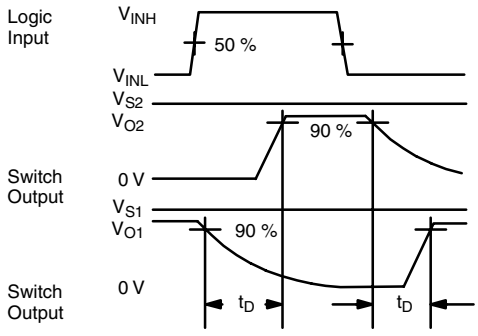


Figure 2. Break-Before-Make (DG2729)

TEST CIRCUITS

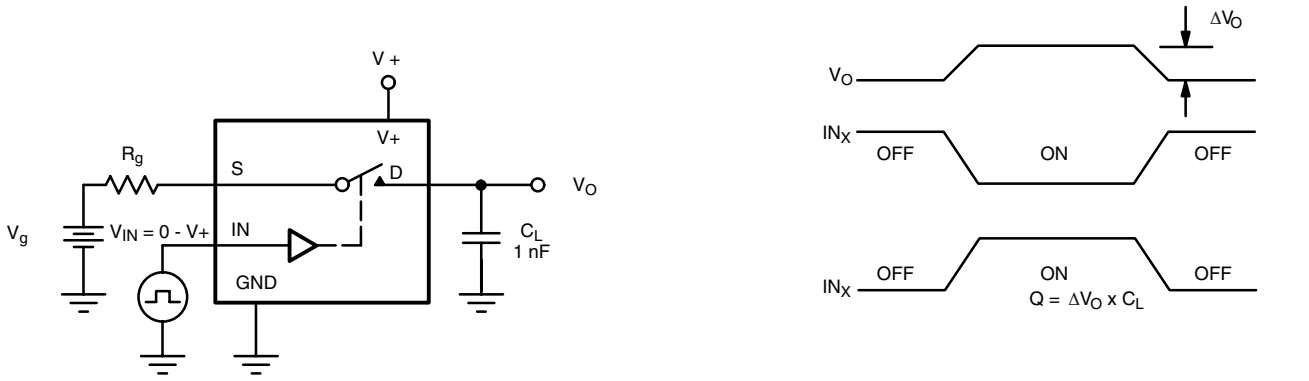


Figure 3. Charge Injection

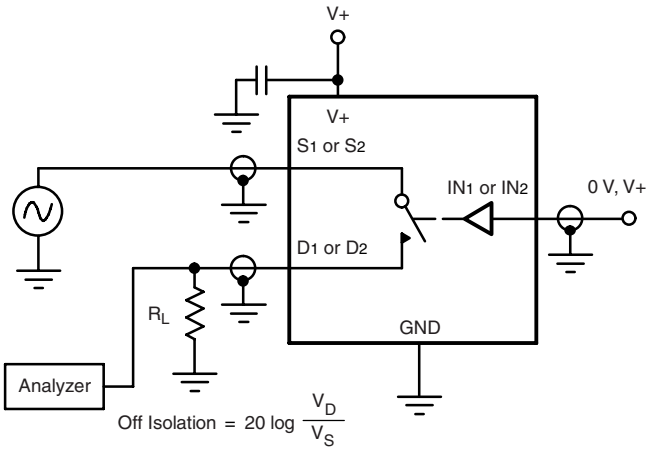


Figure 4. Off-Isolation

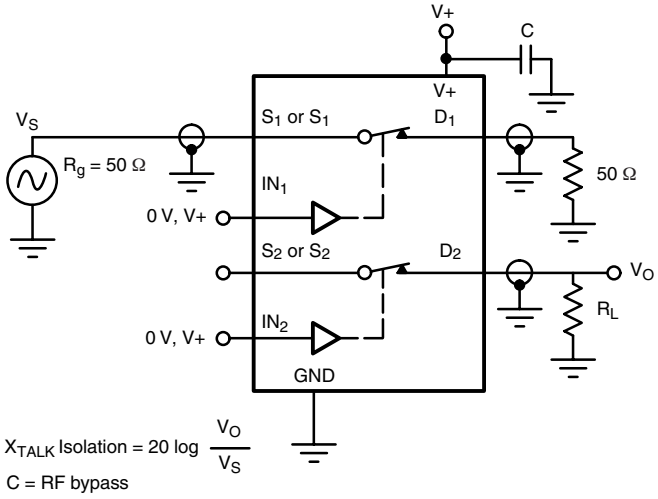


Figure 5. Crosstalk

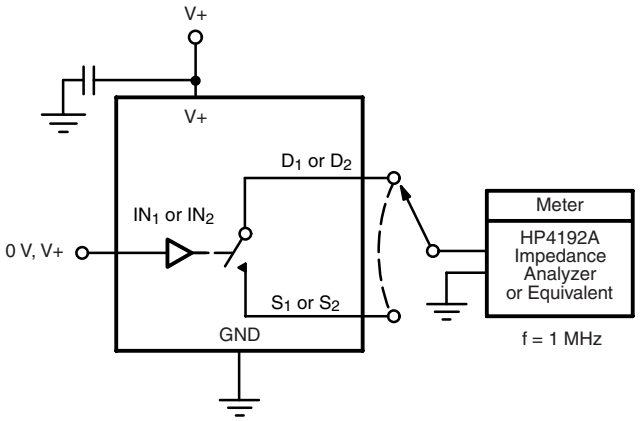
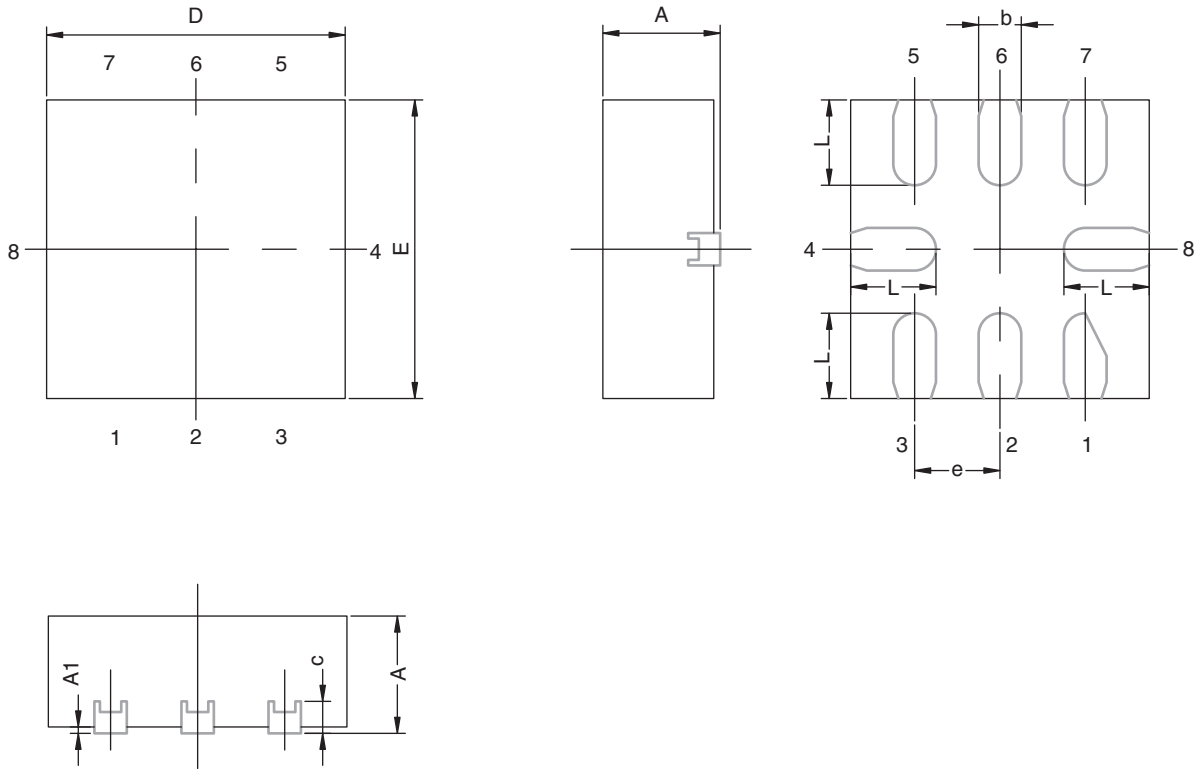


Figure 6. Channel Off/On Capacitance

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?69049.

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						

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