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DG2727, DG2728, DG2729

Vishay Siliconix

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



RoHS
COMPLIANT
HALOGEN
FREE

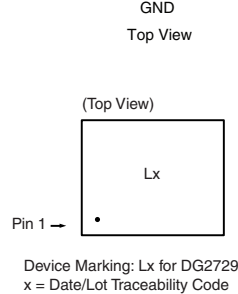
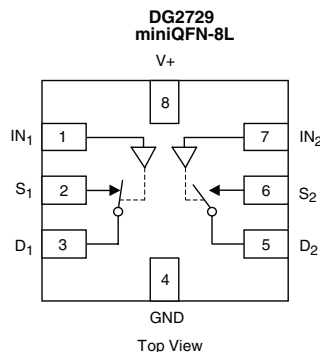
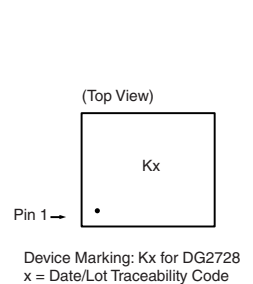
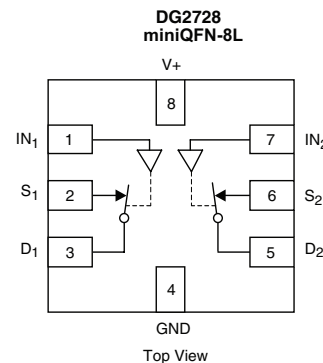
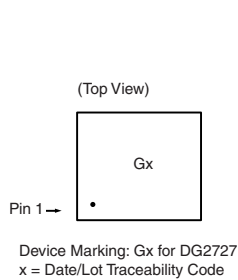
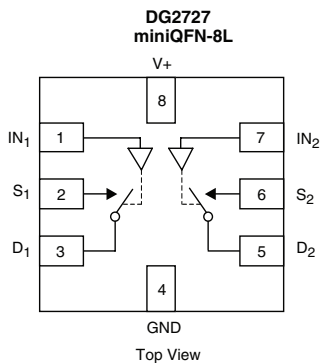
BENEFITS

- 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, DG2728, DG2729

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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.


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

- 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.

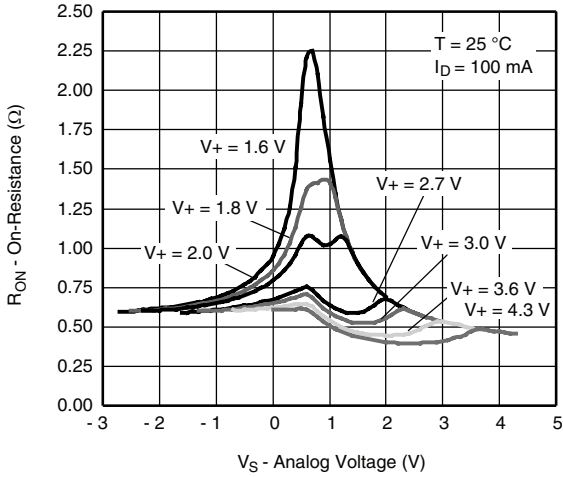
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

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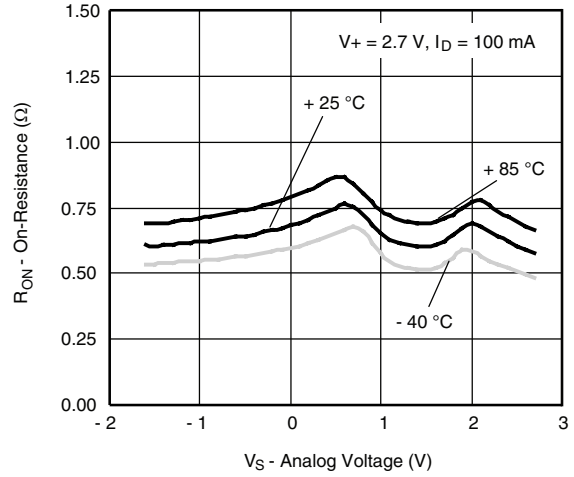
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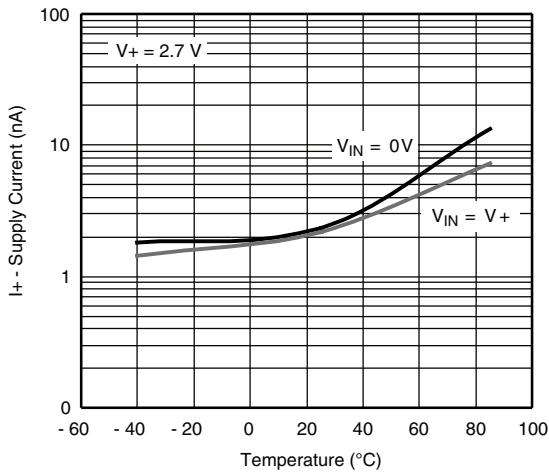
TYPICAL CHARACTERISTICS $T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted



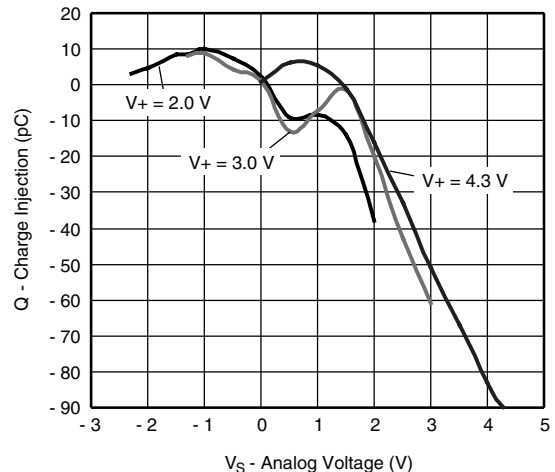
R_{DS(ON)} vs. Analog Voltage and Supply Voltage



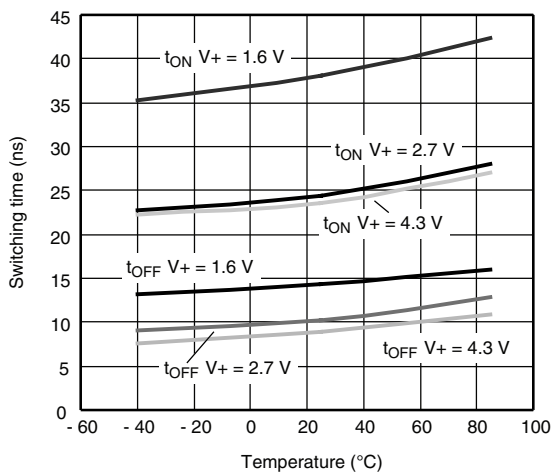
R_{DS(ON)} vs. Analog Voltage and Temperature



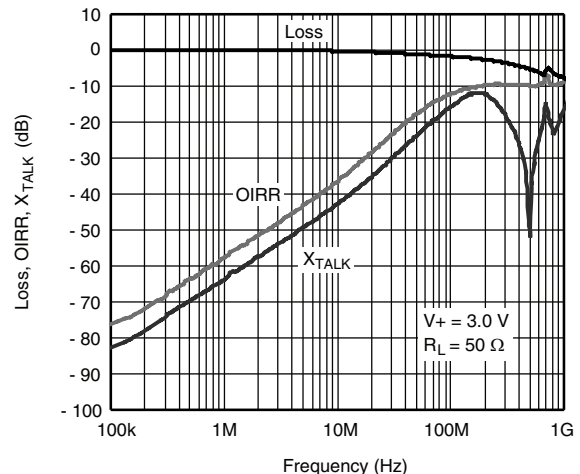
Supply Current vs. Temperature



Charge Injection vs. Analog Voltage



Switching Time vs. Temperature

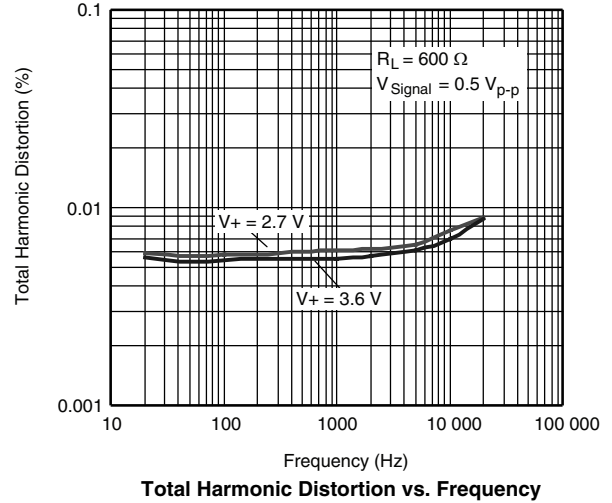
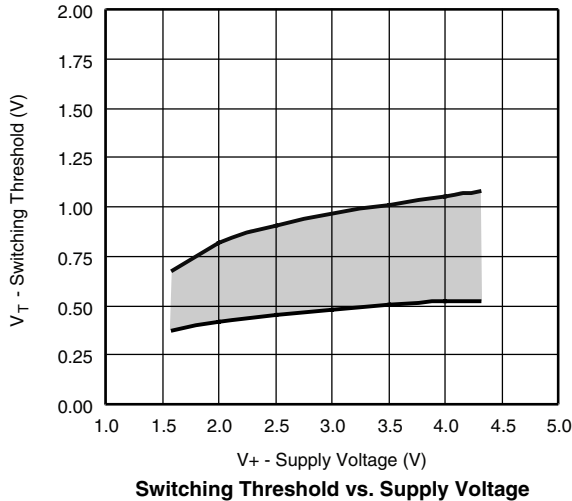


Insertion Loss, Off-Isolation and Crosstalk vs. Frequency

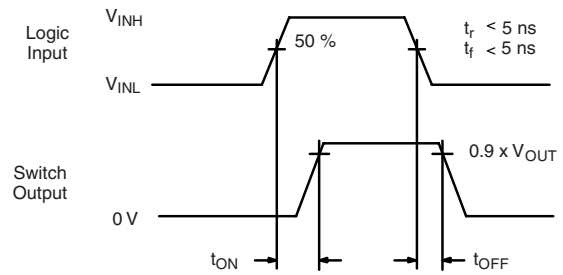
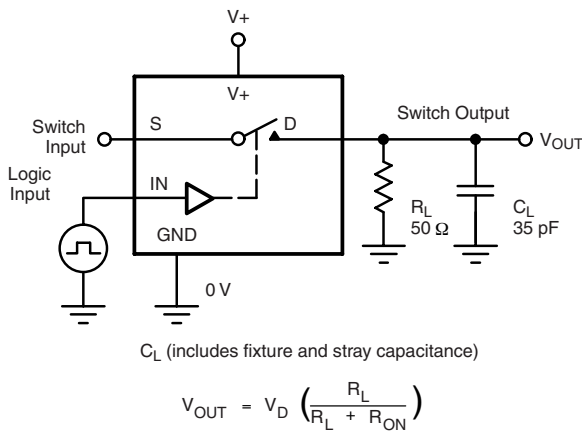


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TYPICAL CHARACTERISTICS $T_A = 25^\circ\text{C}$, unless otherwise noted



TEST CIRCUITS



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

Figure 1. Switching Time

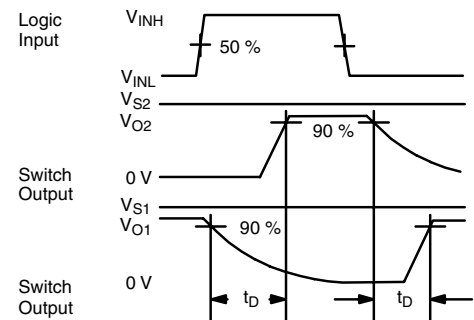
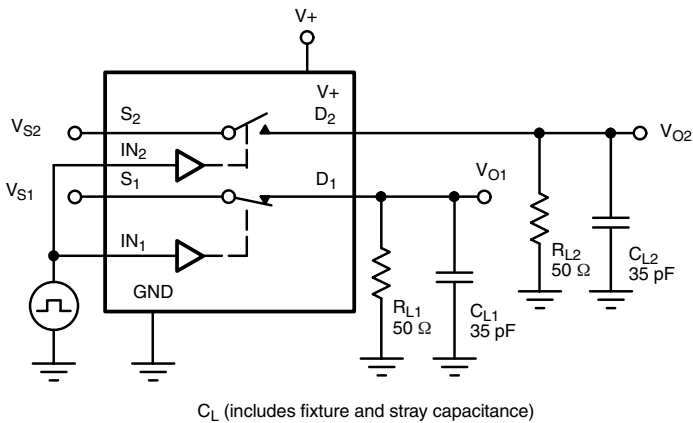


Figure 2. Break-Before-Make (DG2729)

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TEST CIRCUITS

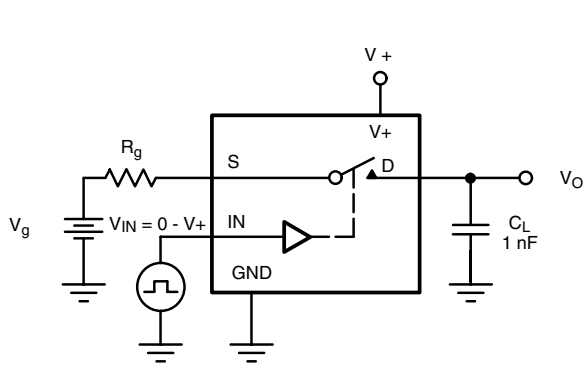


Figure 3. Charge Injection

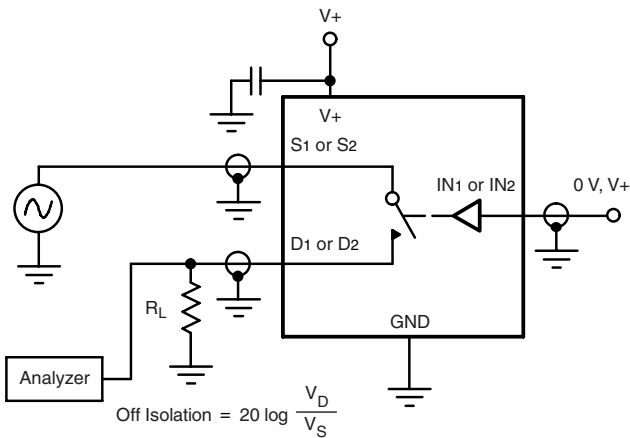
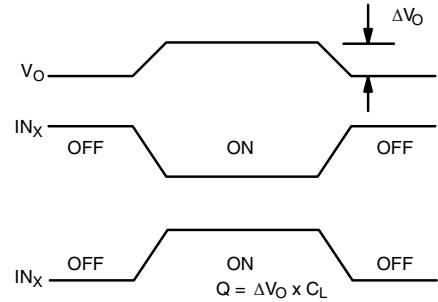


Figure 4. Off-Isolation

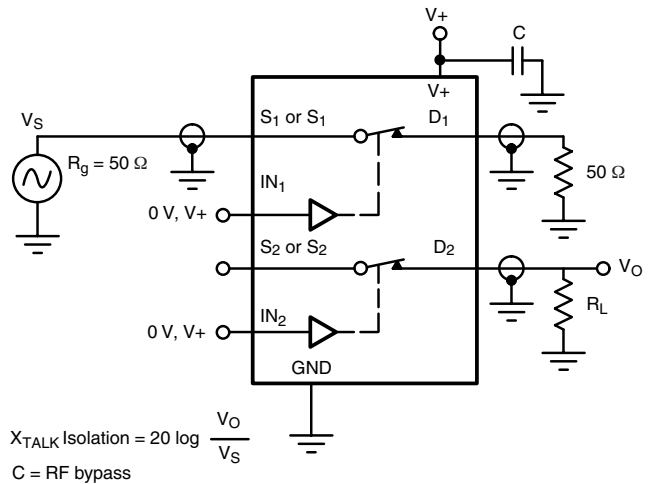


Figure 5. Crosstalk

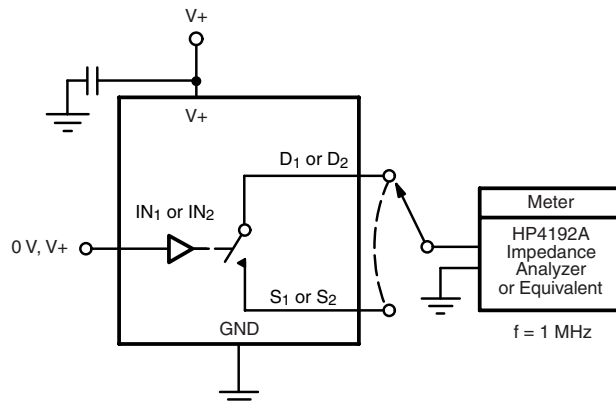


Figure 6. Channel Off/On Capacitance

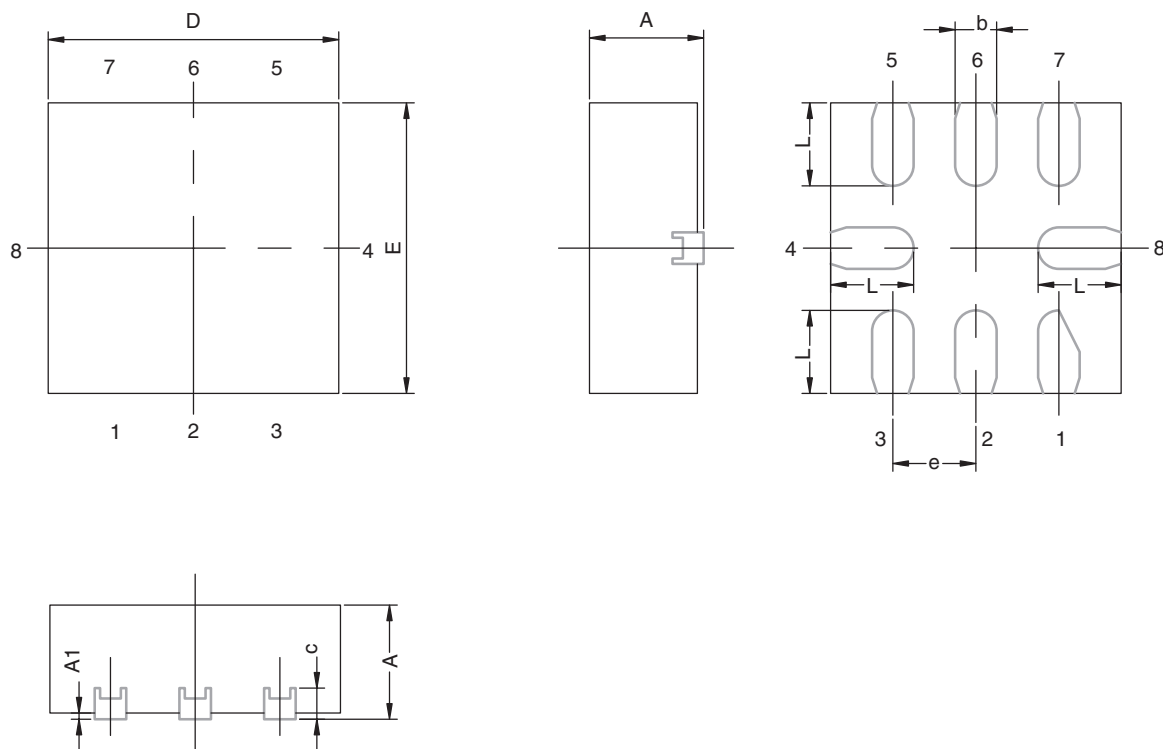
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Package Information

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MINIQFN-8L CASE OUTLINE

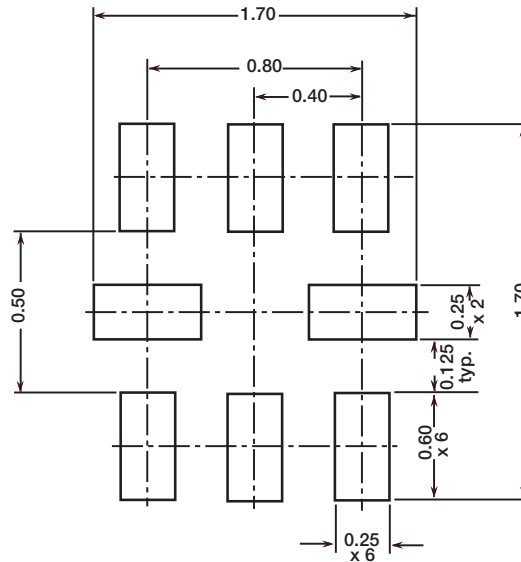


DIM	MILLIMETERS			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.50	0.55	0.60	0.0197	0.0217	0.0236
A1	0.00	-	0.05	0.000	-	0.002
b	0.15	0.20	0.25	0.006	0.008	0.010
c	0.15 REF			0.006 REF		
D	1.35	1.40	1.45	0.053	0.055	0.057
E	1.35	1.40	1.45	0.053	0.055	0.057
e	0.40 BSC			0.016 BSC		
L	0.35	0.40	0.45	0.014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



PAD Pattern
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RECOMMENDED MINIMUM PADS FOR MINI QFN 8L



Suggested Minimum Pad
 Dimensions in mm



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