

# Low Voltage Dual SPDT Analog Switch with Negative Swing Audio Capability

## DESCRIPTION

The DG2750 is a dual SPDT low on-resistance switch designed to from a single 1.8 V to 5.0 V power supply. It is a bi-directional switch, and is capable of switching negative swing audio without the need for a coupling capacitor. With a single power supply, the audio signal can swing over the range from  $((V+) - 5.0)$  to  $V+$ .

Guaranteed to operate with 1.4 V logic when  $V+$  is in the range of 2.7 V to 5.0 V, the DG2750 will allow an easy interface with low voltage DSP or ASIC control logic.

The DG2750 is built on sub micron CMOS low voltage process technology, has very low quiescent current, and provides greater than 300 mA latch-up protection, as tested per JESD78.

The DG2750 is assembled in ultra compact mQFN10 package of 1.4 mm x 1.8 mm.

As a committed partner to the community and the environment, Vishay Siliconix manufactures this product with lead (Pb)-free device termination. The miniQFN-10 package has a nickel-palladium-gold device termination and is represented by the lead (Pb)-free “-E4” suffix to the ordering part number. The nickel-palladium-gold device terminations meet all JEDEC standards for reflow and MSL rating.

As a further sign of Vishay Siliconix's commitment, the DG2750 is fully RoHS complaint and Halogen free.

## FEATURES

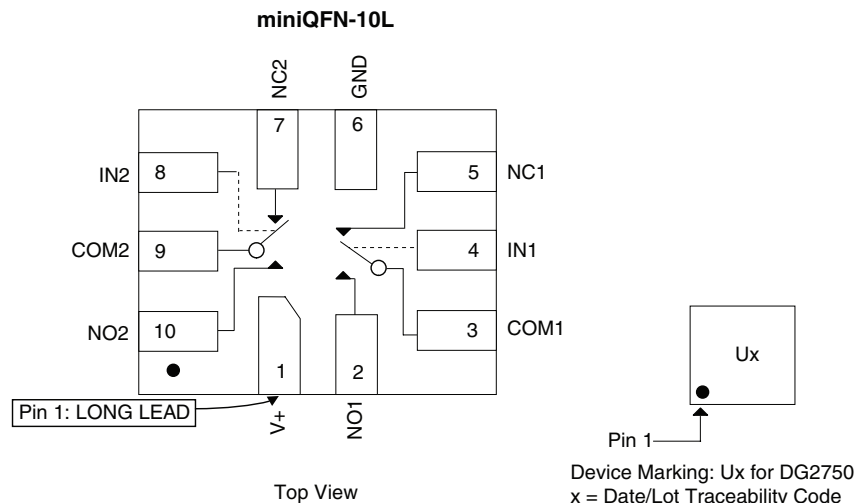
- Capable to switch negative swing audio without dc blocking capacitor
- Low on-resistance
- 1.4 V high logic
- Latch-up current > 300 mA (JESD78)
- Reduced power consumption
- Reduce board space
- Compliant to RoHS directive 2002/95/EC


**RoHS**  
COMPLIANT

## APPLICATIONS

- Cellular phones
- Portable media players
- Computer and game machine
- Handheld healthcare and instruments

## FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION



## ORDERING INFORMATION

Temp. Range	Package	Part Number
- 40 °C to 85 °C	miniQFN-10	DG2750DN-T1-E4



TRUTH TABLE, DG2750		
IN1 (Pin 4)	IN2 (Pin 8)	Function
0	X	COM1 = NC1
1	X	COM1 = NO1
X	0	COM2 = NC2
X	1	COM2 = NO2

ABSOLUTE MAXIMUM RATINGS $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted			
Parameter		Limit	Unit
Reference to GND	V+, IN	- 0.3 to 5.5	V
	COM, NO, NC <sup>a</sup>	(V+) - 5.5 or - 2.5 whichever higher, (V+ + 0.3)	
Current (Any Terminal except COM, NO, NC, IN)		30	mA
Continuous Current (COM, NO, NC, IN)		$\pm 250$	
Peak Current (Pulsed at 1 ms, 10 % Duty Cycle)		$\pm 500$	
Storage Temperature (D Suffix)		- 65 to 150	$^\circ\text{C}$
Power Dissipation (Packages) <sup>b</sup>	miniQFN-10 <sup>c</sup>	208	mW
ESD (Human Body Model) I/O to GND		8	kV
Latch-up (per JESD78)		500	mA

Notes:

a. Signals on COM, NO, NC, 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 2.6 mW/ $^\circ\text{C}$  above 70  $^\circ\text{C}$ .

SPECIFICATIONS $V_+ = 2.7\text{ V}$ , $\pm 10\%$							
Parameter	Symbol	Test Conditions Otherwise Unless Specified	Temp. <sup>a</sup>	Limits - 40 $^\circ\text{C}$ to 85 $^\circ\text{C}$			Unit
				Min. <sup>b</sup>	Typ. <sup>c</sup>	Max. <sup>b</sup>	
<b>Analog Switch</b>							
Analog Signal Range <sup>d</sup>	$V_{\text{ANALOG}}$		Full	- 2.5		V+	V
On-Resistance	$R_{\text{DS(on)}}$	$V_+ = 2.7\text{ V}$ , $V_S = ((V_+) - 4.5\text{ V}, - 1\text{ V}, 0\text{ V}, 1\text{ V}, 2\text{ V}, V_+)$ , $I_S = 100\text{ mA}$	Room		0.6	1.0	$\Omega$
On-Resistance Match	$\Delta R_{\text{ON}}$		Full			1.3	
On-Resistance Resistance Flatness	$R_{\text{ON}}$ Flatness		Room		0.1		
Switch Off Leakage Current	$I_{\text{NO/NC(off)}}$	$V_+ = 2.7\text{ V}$ , $V_{\text{NC/NO}} = - 2.5\text{ V}$ or $2.5\text{ V}$ , $V_{\text{COM}} = 2.5\text{ V}$ or $- 2.5\text{ V}$	Room		50		nA
	$I_{\text{COM(off)}}$		Full	- 250		250	
Channel On Leakage Current	$I_{\text{COM(on)}}$		Room		50		
			Full	- 250		250	
<b>Digital Control</b>							
Input Voltage High	$V_{\text{INH}}$	$V_+ = 2.7\text{ V}$ to $4.3\text{ V}$	Full	1.4			V
Input Voltage Low	$V_{\text{INL}}$		Full			0.6	
Input Capacitance	$C_{\text{IN}}$		Room		6.5		pF
Input Current	$I_{\text{INL}}$ or $I_{\text{INH}}$	$V_{\text{IN}} = 0$ or $V_+$	Full	- 1		1	$\mu\text{A}$
<b>Dynamic Characteristics</b>							
Break-Before-Make Time <sup>e, d</sup>	$t_{\text{BBM}}$	$V_+ = 3.0\text{ V}$ , $V_S = 1.5\text{ V}$ , $R_L = 50\ \Omega$ , $C_L = 35\text{ pF}$	Room	800	1040		ns
			Full	1000			
Enable Turn-On Time <sup>e, d</sup>	$t_{\text{ON(EN)}}$		Room		1140	1350	
			Full			1700	
Enable Turn-Off Time <sup>e, d</sup>	$t_{\text{OFF(EN)}}$		Room		90	130	
			Full			150	

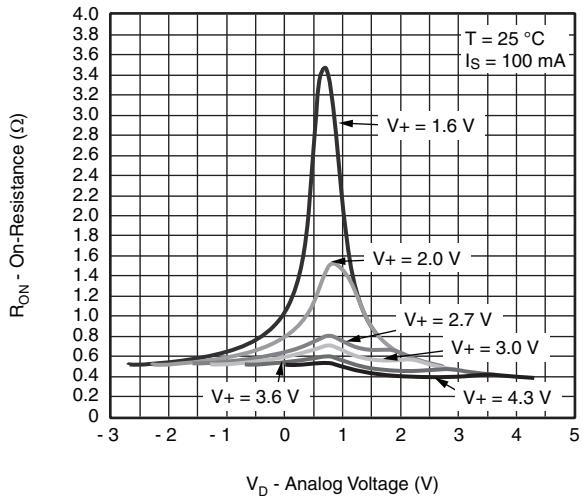
<b>SPECIFICATIONS</b> $V_+ = 2.7\text{ V}, \pm 10\%$							
Parameter	Symbol	Test Conditions Otherwise Unless Specified	Temp. <sup>a</sup>	Limits - 40 °C to 85 °C			Unit
				Min. <sup>b</sup>	Typ. <sup>c</sup>	Max. <sup>b</sup>	
<b>Dynamic Characteristics</b>							
Charge Injection <sup>d</sup>	$Q_{INJ}$	$C_L = 1\text{ nF}, R_{GEN} = 0\ \Omega, V_{GEN} = 0\text{ V}$	Room		4		pC
Off-Isolation <sup>d</sup>	OIRR	$V_+ = 3.0\text{ V}, R_L = 50\ \Omega, C_L = 5\text{ pF},$ $f = 300\text{ kHz}$			- 54.7		dB
Crosstalk <sup>d</sup>	$X_{TALK}$				- 60.8		
Bandwidth <sup>d</sup>	BW	$V_+ = 3.0\text{ V}, R_L = 50\ \Omega, - 3\text{ dB}$			34		MHz
Channel-Off Capacitance <sup>d</sup>	$C_{NC/NO(off)}$	$V_+ = 3.0\text{ V}, f = 1\text{ MHz}$			30		pF
Channel-On Capacitance <sup>d</sup>	$C_{COM/NC/NO(on)}$				81		
<b>Power Supply</b>							
Power Supply Range	$V_+$			1.8		5.0	V
Power Supply Current	$I_+$	$V_{IN} = 0\text{ V}, \text{ or } V_+$	Full			2	$\mu\text{A}$

Notes:

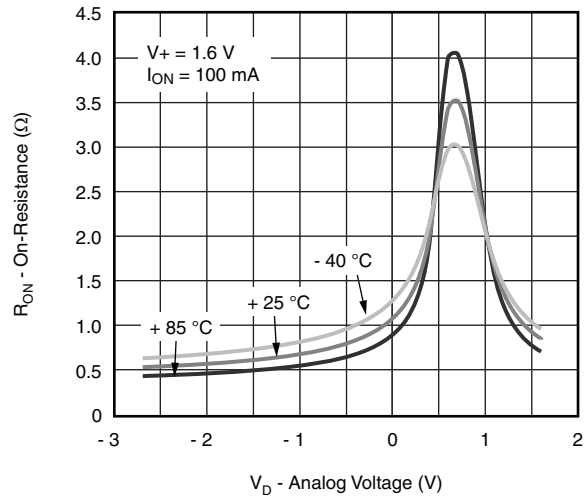
- a. Room = 25 °C, Full = as determined by the operating suffix.
- b. The algebraic convention whereby the most negative value is a minimum and the most positive a maximum, is used in this data sheet.
- c. Typical values are for design aid only, not guaranteed nor subject to production testing.
- d. Guarantee by design, not subjected to production test.
- e.  $V_{IN}$  = input voltage to perform proper function.
- f. Crosstalk measured between channels.

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

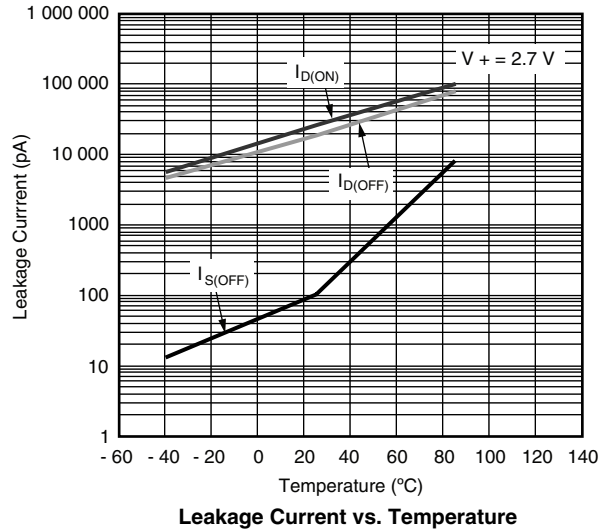
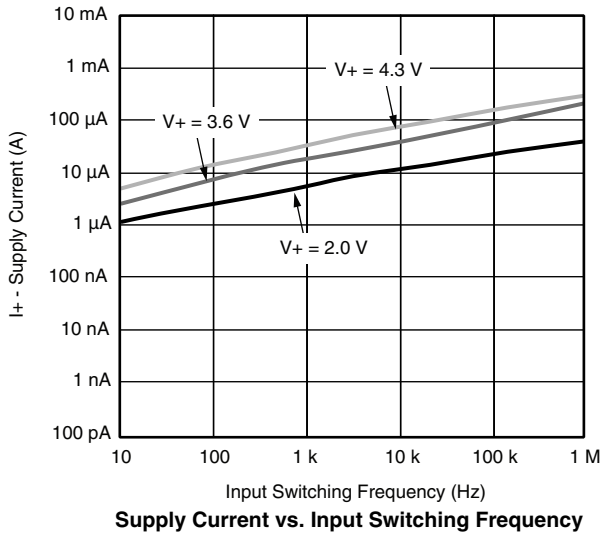
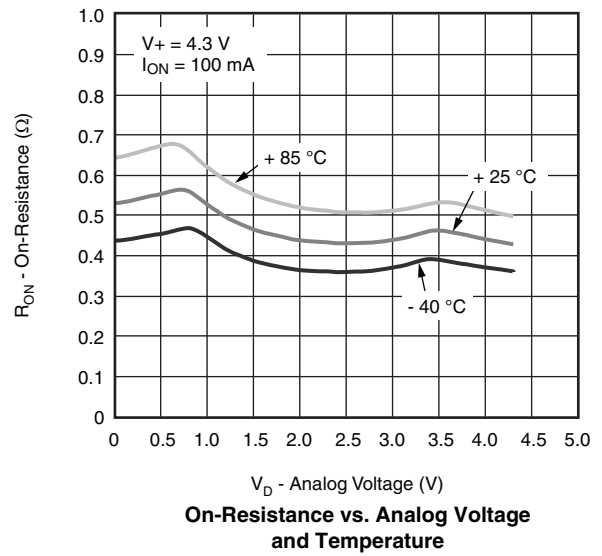
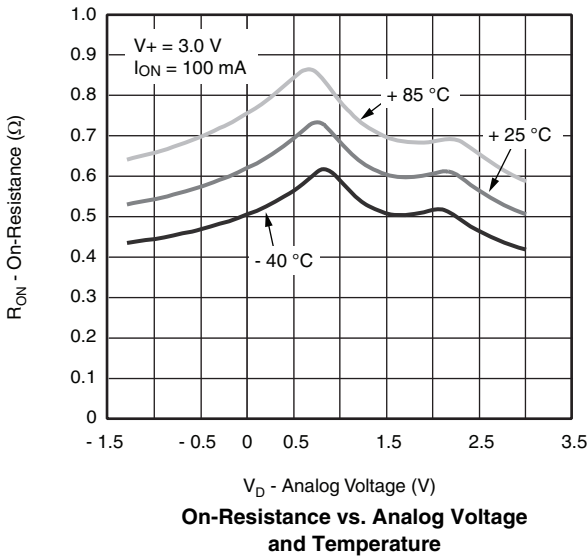
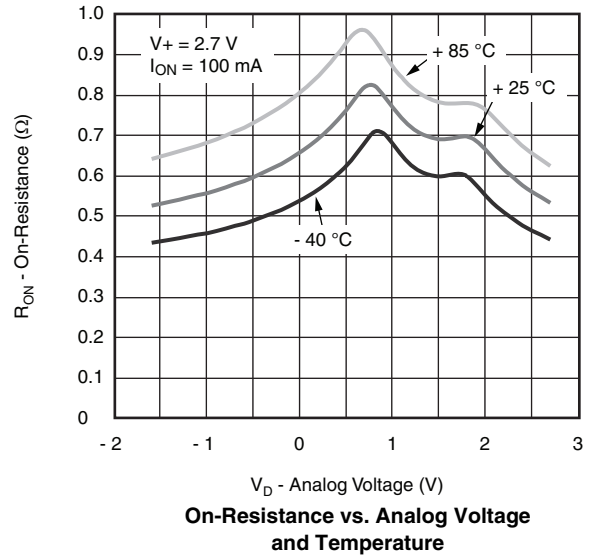
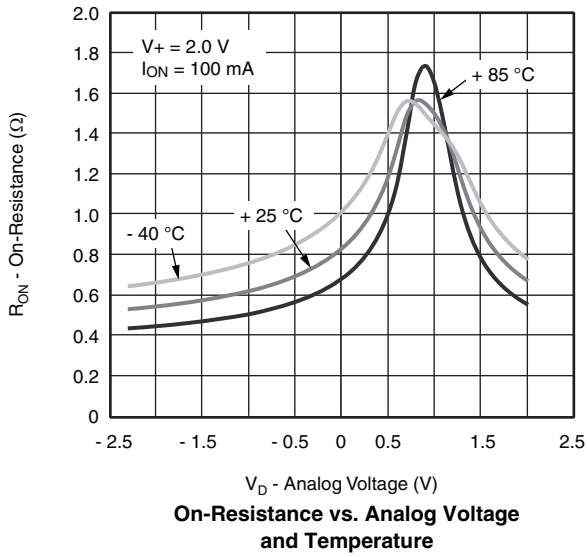


**On-Resistance vs.  $V_D$  and Single Supply Voltage**

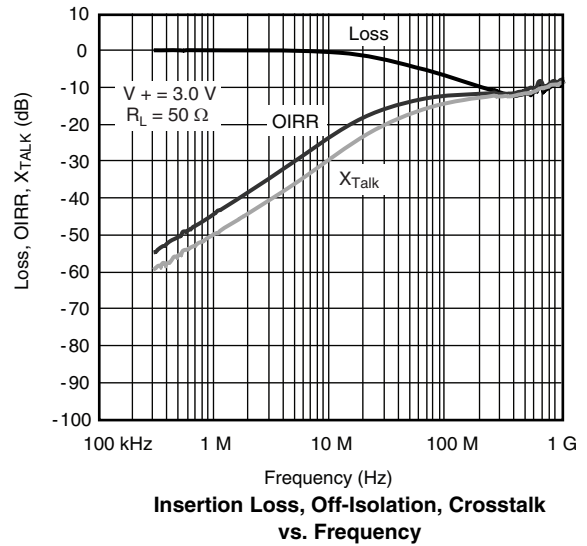
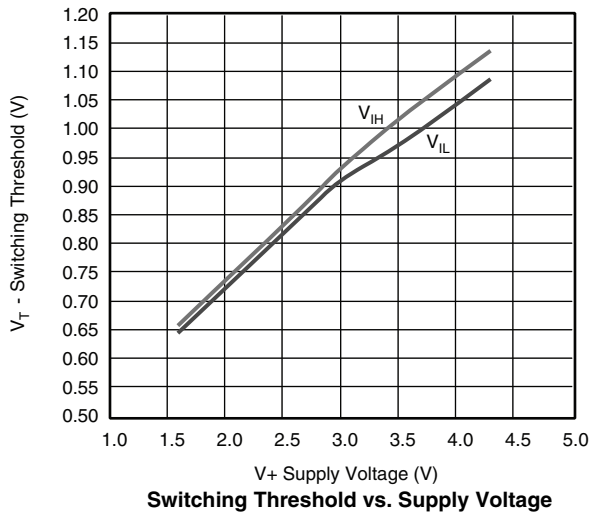


**On-Resistance vs. Analog Voltage and Temperature**

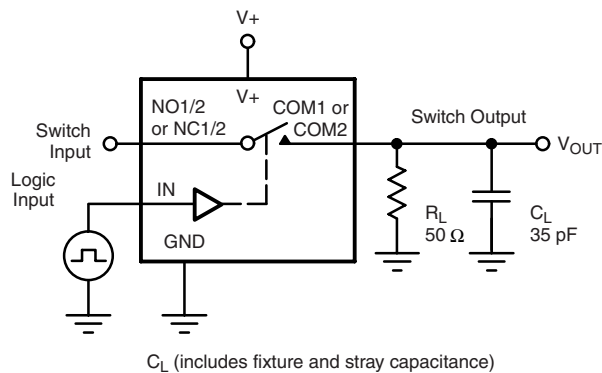
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



## TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

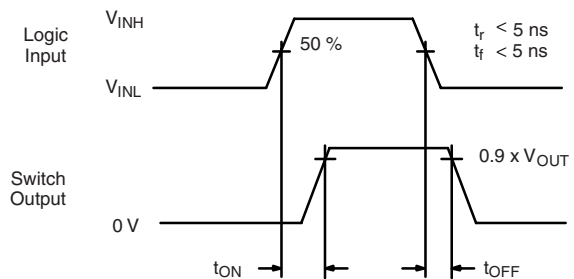


## TEST CIRCUITS

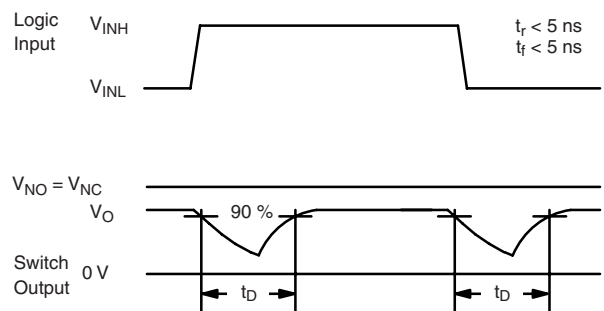
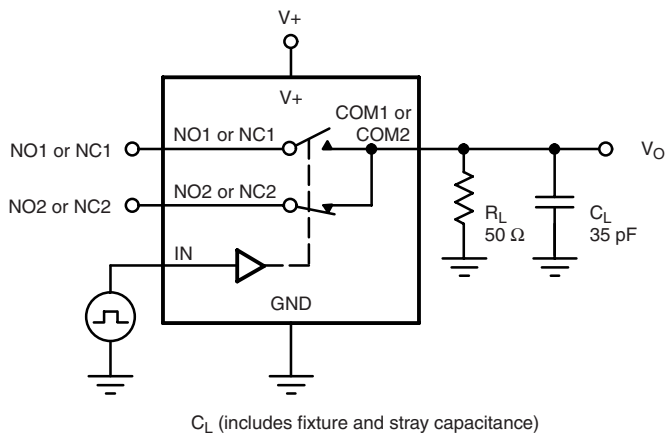


$$V_{OUT} = V_{COM} \left( \frac{R_L}{R_L + R_{ON}} \right)$$

**Figure 1. Switching Time**

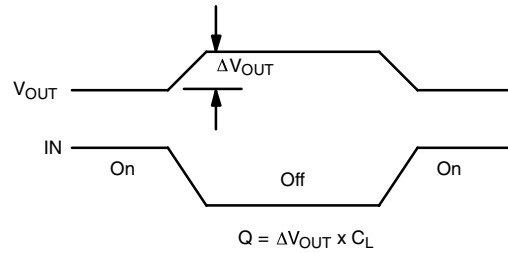
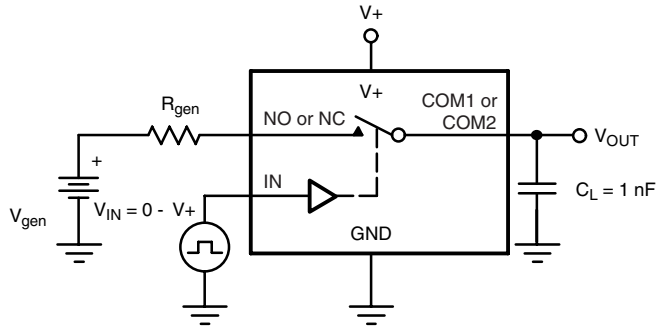


Logic "1" = Switch on  
Logic input waveforms inverted for switches that have the opposite logic sense.



**Figure 2. Break-Before-Make Interval**

TEST CIRCUITS



IN depends on switch configuration: input polarity determined by sense of switch.

Figure 3. Charge Injection

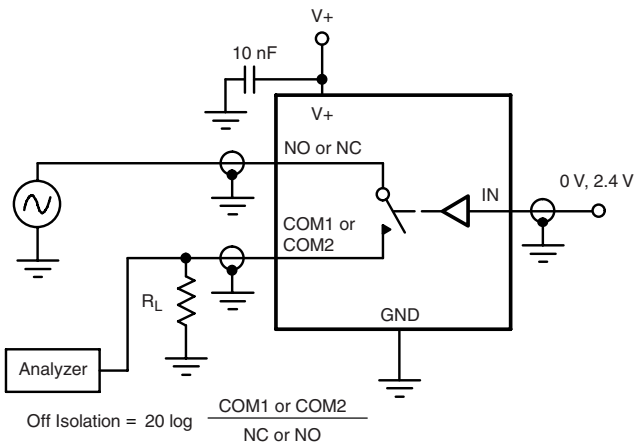


Figure 4. Off-Isolation

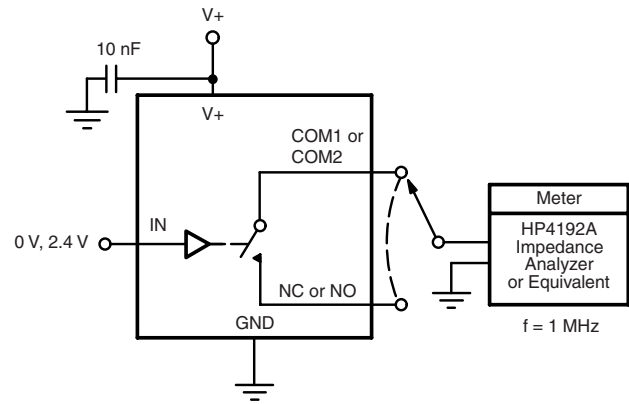
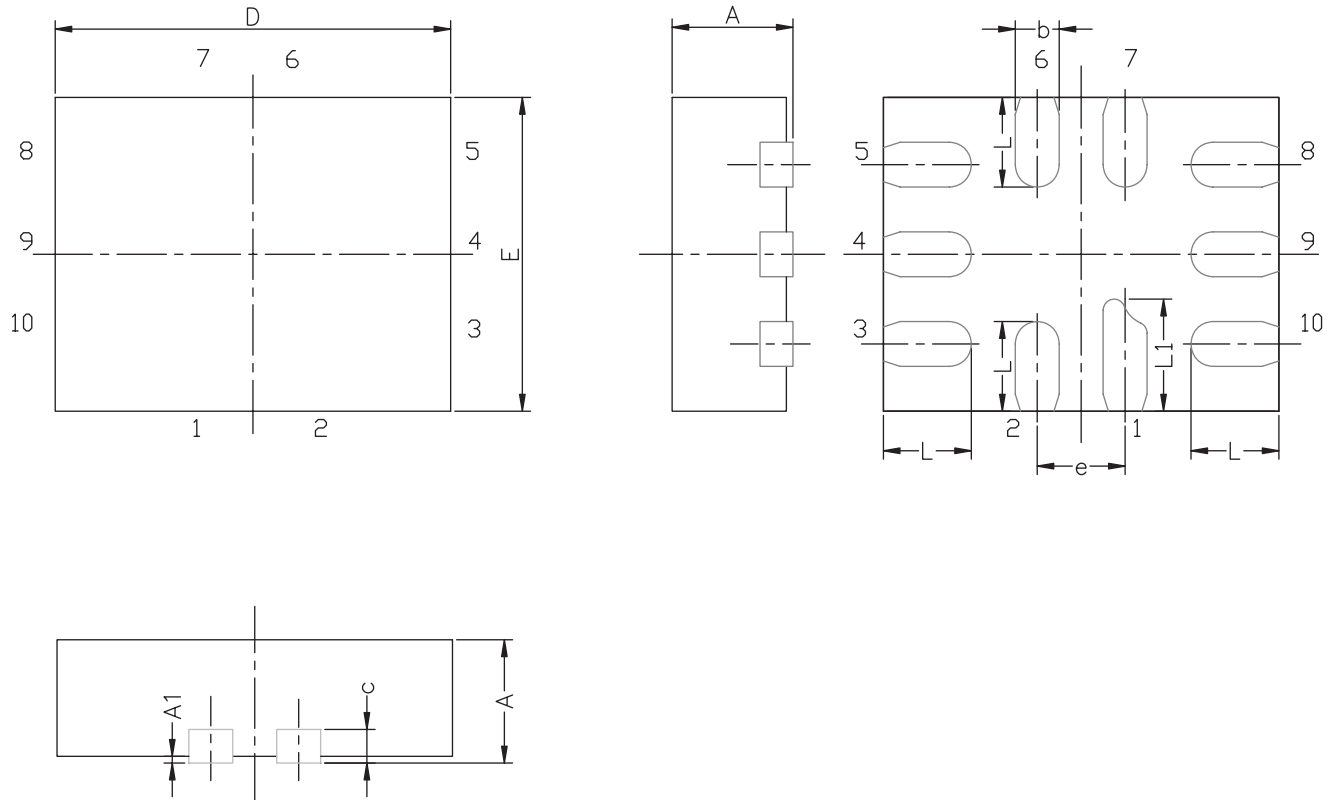


Figure 5. Channel Off/On Capacitance

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?64736](http://www.vishay.com/ppg?64736).

## MINI QFN-10L CASE OUTLINE



DIM	MILLIMETERS			INCHES		
	MIN.	NAM.	MAX.	MIN.	NAM.	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	1.75	1.80	1.85	0.069	0.071	0.073
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
L1	0.45	0.50	0.55	0.0177	0.0197	0.0217

ECN T-07039-Rev. A, 12-Feb-07  
DWG: 5957

**RECOMMENDED MINIMUM PADS FOR MINI QFN 10L**



Mounting Footprint  
Dimensions in mm (inch)





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