

High Speed, Low Voltage, 3 Ω , Quad SPDT CMOS Analog Switch

DESCRIPTION

The DG2706 is a high speed, low voltage, low On-resistance, quad SPDT (single pole double throw) analog switch. It operates from a 1.65 V to 4.3 V single power supply and achieves 3 Ω switch On-resistance. When turned on, each switch conducts equally in both directions. Its switch on resistance flatness is 0.6 Ω and channel to channel matching is of 0.3 Ω when powered with single 3.15 V supply. All channels guaranteed break before make switching.

Control logic input has 0.5 V to 1.65 V logic threshold. It features a 190 MHz - 3 dB bandwidth, - 90 dB crosstalk and - 70 dB off-isolation at 1 MHz.

The DG2706 is an ideal fit for low voltage battery powered devices switching audio, video, multi-media data streams, and control signals between different functional circuits or ports.

The DG2707 comes in a small miniQFN-16 lead package (1.8 mm x 2.6 mm x 0.75 mm). As a committed partner to community and the environment, Vishay Siliconix manufactures this product with the lead(Pb)-free device terminations and is 100 % RoHS compliant.

FEATURES

- Operation voltage range: 1.65 V to 4.3 V
- Guaranteed On-resistance: 3.0 Ω at 3.15 V
- Low voltage logic threshold
- Low crosstalk: - 70 dB
- High off-isolation: - 90 dB
- Ultra small package: miniQFN16 of 1.8 mm x 2.6 mm

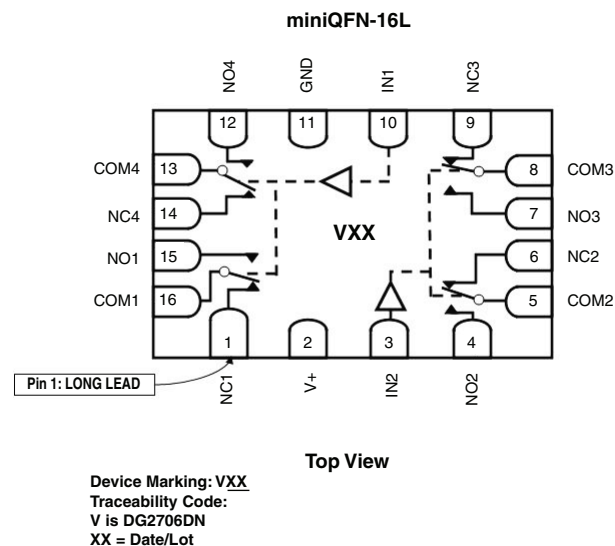


RoHS
COMPLIANT

APPLICATIONS

- Dual SIM card switch
- A/V and analog signal routing
- Battery operated devices
- Data acquisition systems
- Communications systems
- Medical and ATE equipments

FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION



ORDERING INFORMATION

Temp. Range	Package	Part Number
- 40 °C to 85 °C	miniQFN-16	DG2706DN-T1-E4

TRUTH TABLE DG2706 QUAD SPDT, miniQFN-16L

Select Input		On Switches	
IN1 (Pin 10)	IN2 (Pin 3)	Description (Pin)	Common (Pin)
0	X	NC1 (Pin 1)	COM1 (Pin 16)
1	X	NO1 (Pin 15)	
0	X	NC4 (Pin 14)	COM4 (Pin 13)
1	X	NO4 (Pin 12)	
X	0	NC2 (Pin 6)	COM2 (Pin 5)
	1	NO2 (Pin 4)	
X	0	NC3 (Pin 9)	COM3 (Pin 3)
	1	NO3 (Pin 7)	

ABSOLUTE MAXIMUM RATINGS ($T_A = 25\text{ }^{\circ}\text{C}$, 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)		± 250	
Peak Current (Pulsed at 1 ms, 10 % Duty Cycle)		± 500	
Storage Temperature (D Suffix)		- 65 to 150	°C
Thermal Resistance (Package) ^b	miniQFN-16	152	°C/W
Power Dissipation (Package) ^b	miniQFN-16 ^{c, d}	525	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 6.6 mW/°C above 70 °C
- d. Manual soldering with iron is not recommended for leadless components. The miniQFN-16 is a leadless package. The end of the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at the exposed copper lip cannot be guaranteed and is not required to ensure adequate bottom side solder interconnection.



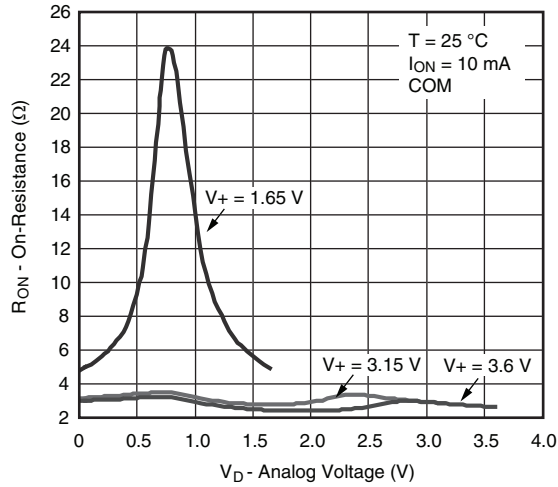
SPECIFICATIONS (V+ = 3.15 V)								
Parameter	Symbol	Test Conditions Otherwise Unless Specified	Temp. ^b	Limits - 40 °C to 85 °C			Unit	
				Min. ^d	Typ. ^c	Max. ^d		
Analog Switch								
Analog Signal Range ^e	V _{ANALOG}	R _{DS(on)}	Full	0		V+	V	
On-Resistance	R _{DS(on)}	V+ = 3.15 V, I _{NO/NC} = 10 mA, V _{COM} = 1.0 V	Room		3	5.5	Ω	
			Full			6		
R _{ON} Match	ΔR _(ON)	V+ = 3.15 V, I _{NO/NC} = 10 mA, V _{COM} = 1.0 V	Room		0.3			
R _{ON} Resistance Flatness	R _{ON}	V+ = 3.15 V, I _{NO/NC} = 10 mA,	Room		0.6			
Channel Off Leakage Current	I _{NO/NC(off)}	V+ = 3.6 V, V _{NO/NC} = 0.5 V/3 V, V _{COM} = 3 V/0.5 V	Room	- 5		5	nA	
			Full	- 10		10		
	I _{COM(off)}		Room	- 5		5		
			Full	- 10		10		
Channel-On Leakage Current	I _{COM(on)}	Room	- 10		10			
		Full	- 20		20			
Digital Control								
Input High Voltage	V _{INH}		Full	1.65			V	
Input Low Voltage	V _{INL}		Full			0.4		
Input Current	I _{INL} or I _{INH}	V _{IN} = 0 or V+	Full	- 1		1	μA	
Dynamic Characteristics								
Break-Before-Make Time	t _{BBM}	V _{NO} , V _{NC} = 1.5 V, R _L = 50 Ω, C _L = 35 pF	Room		1		ns	
			Full	5				
Enable Turn-On Time	t _{ON(EN)}		Room		20	45		
			Full			55		
Enable Turn-Off Time	t _{OFF(EN)}		Room		15	35		
			Full			45		
Charge Injection ^d	Q _{INJ}	C _L = 1 nF, R _{GEN} = 0 Ω, V _{NC/NO} = 2 V	Room		3		pC	
Off-Isolation ^d	OIRR	V+ = 3.15 V, f = 1 MHz, R _L = 50 Ω, C _L = 5 pF	Room		- 70		dB	
Crosstalk ^{d, f}	X _{TALK}		Room		- 90			
Bandwidth ^d	BW	V+ = 3.15 V, R _L = 50 Ω, C _L = 5 pF, - 3 dB	Room		190		MHz	
Total Harmonic Distortion ^d	THD	V+ = 3.15 V, R _{LOAD} = 600 Ω	Room		0.02		%	
N _O , N _C Off Capacitance ^d	CS _{NC(off)}	V+ = 3.15 V, f = 1 MHz	Room		16		pF	
	CS _{NO(on)}				15			
Channel-On Capacitance ^d	C _{COM(on)}					31		
Power Supply								
Power Supply Range	V+			1.65		4.3	V	
Power Supply Current	I+	V _{IN} = 0 or V+	Full			1	μA	

Notes:

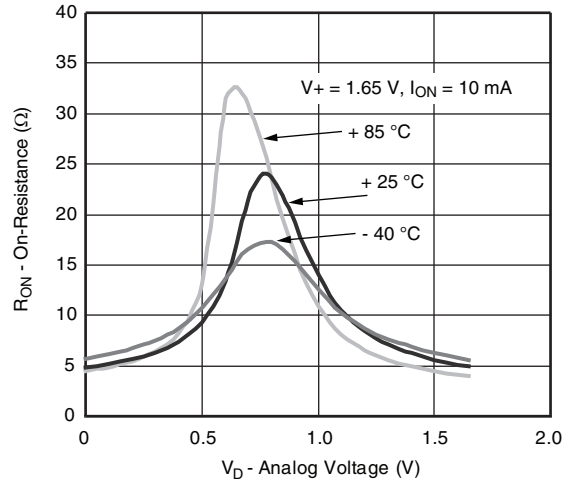
- Room = 25 °C, Full = as determined by the operating suffix.
- The algebraic convention whereby the most negative value is a minimum and the most positive a maximum, is used in this data sheet.
- Typical values are for design aid only, not guaranteed nor subject to production testing.
- Guarantee by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

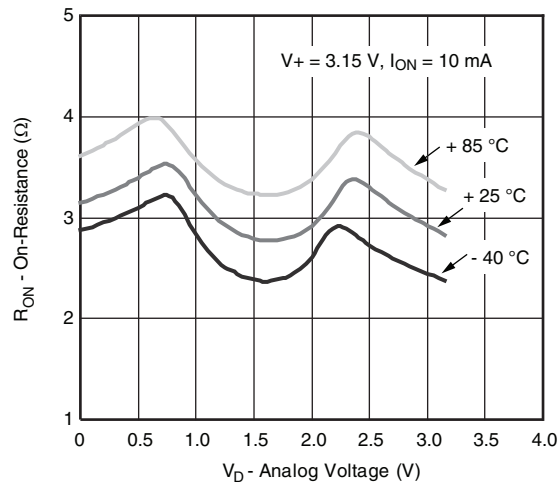
TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$, unless otherwise noted)



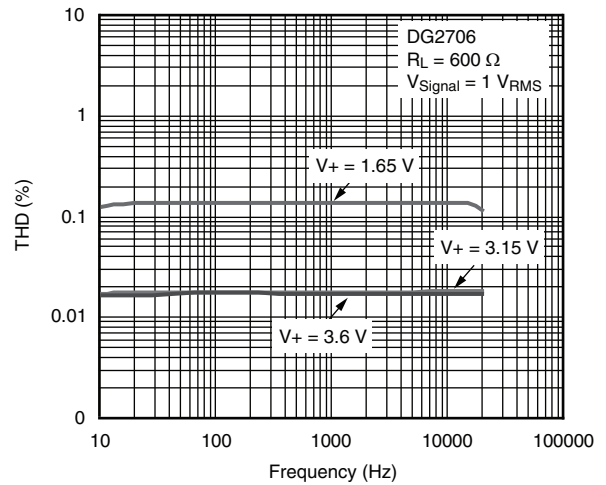
R_{ON} vs. V_D and Single Supply Voltage



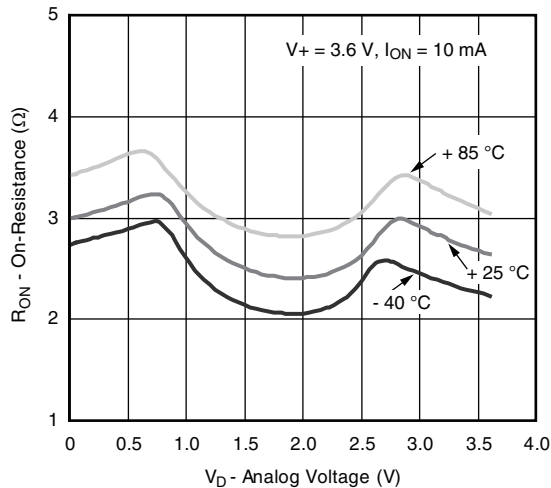
R_{ON} vs. Analog Voltage and Temperature



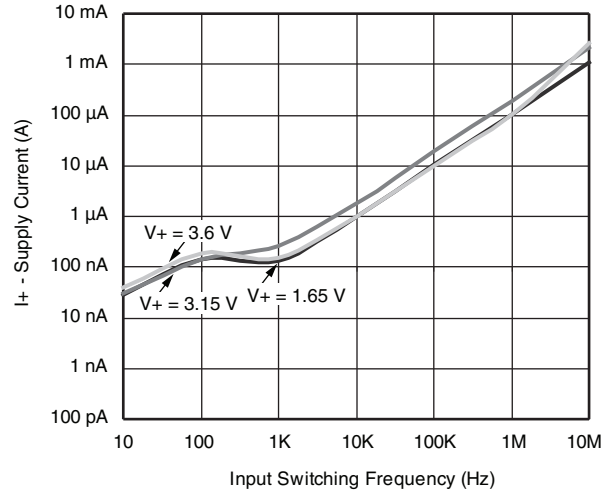
R_{ON} vs. Analog Voltage and Temperature



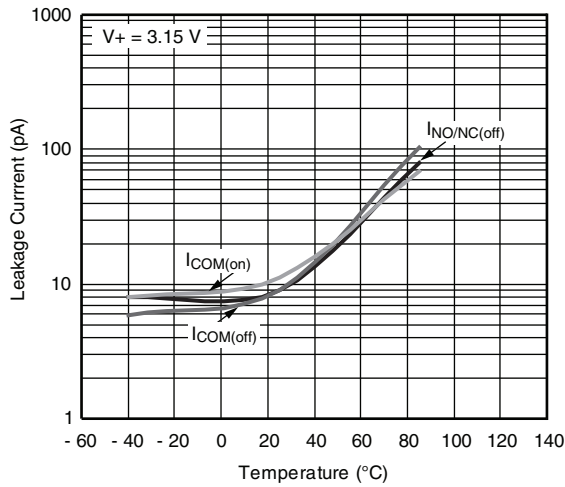
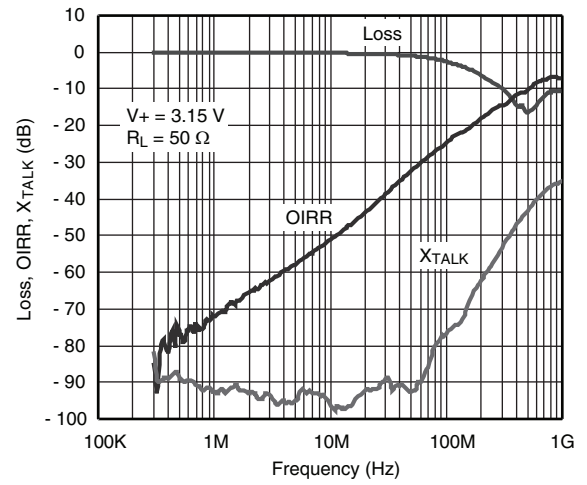
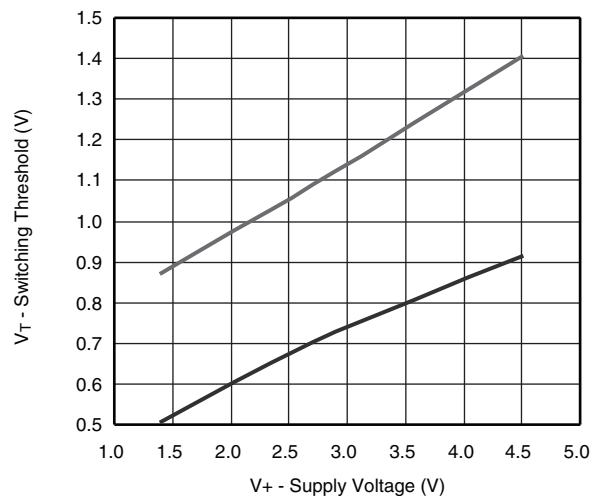
Switching Threshold vs. Supply Voltage



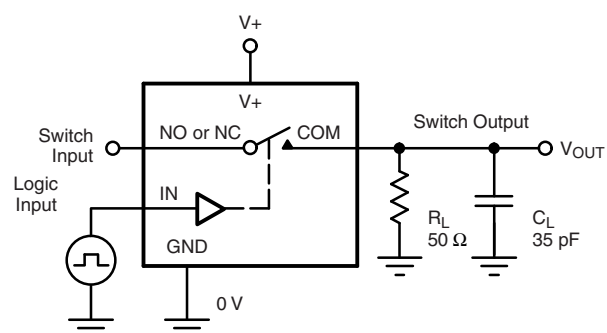
R_{ON} vs. Analog Voltage and Temperature



Supply Current vs. Input Switching Frequency

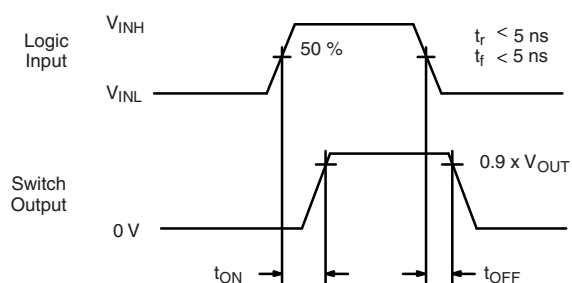
TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$, unless otherwise noted)

Leakage Current vs. Temperature

Insertion Loss, Off-Isolation Crosstalk vs. Frequency

Switching Threshold vs. Supply Voltage

TEST CIRCUITS



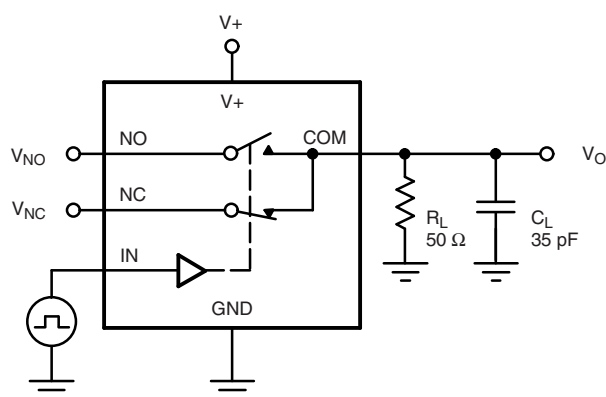
C_L (includes fixture and stray capacitance)

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



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)

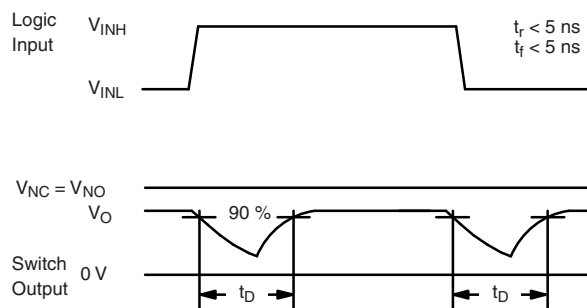
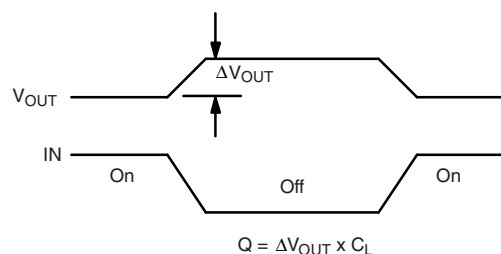
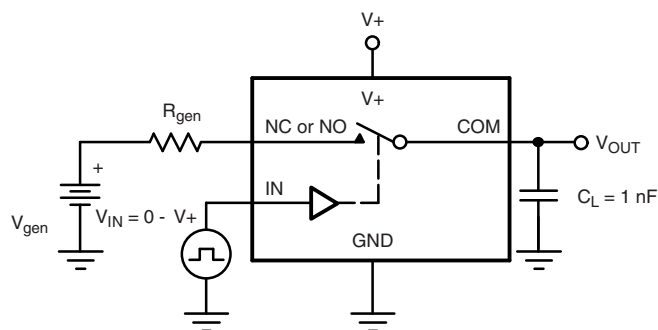
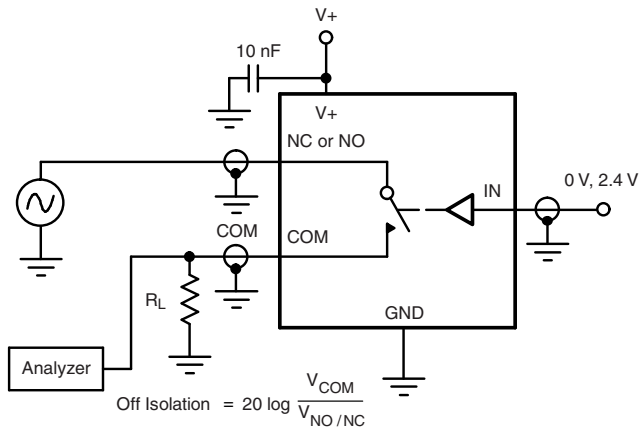
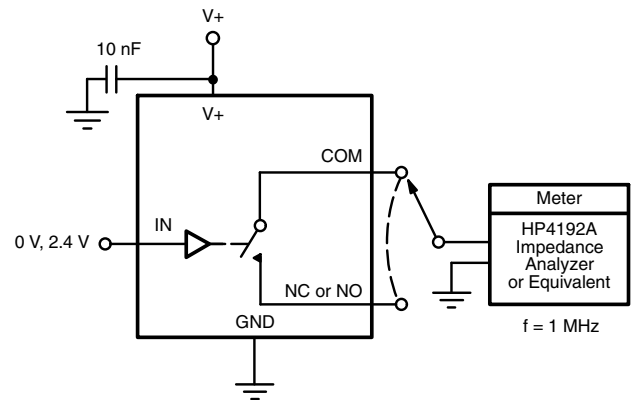


Figure 2. Break-Before-Make Interval



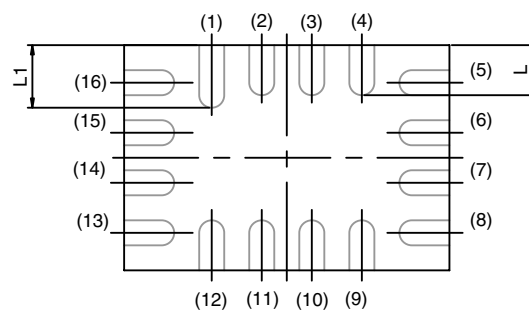
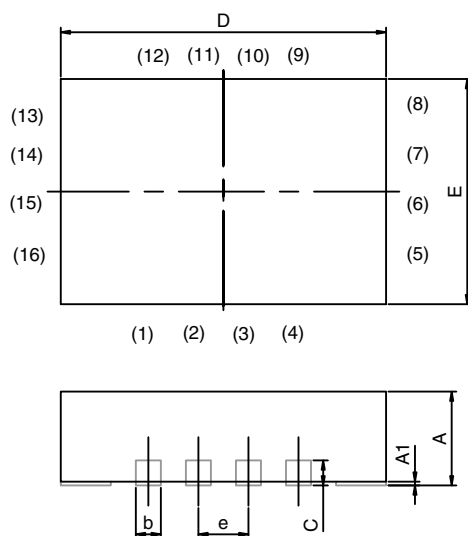
IN depends on switch configuration: input polarity determined by sense of switch.

Figure 3. Charge Injection

TEST CIRCUITS

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?68392.

MINI QFN-16L

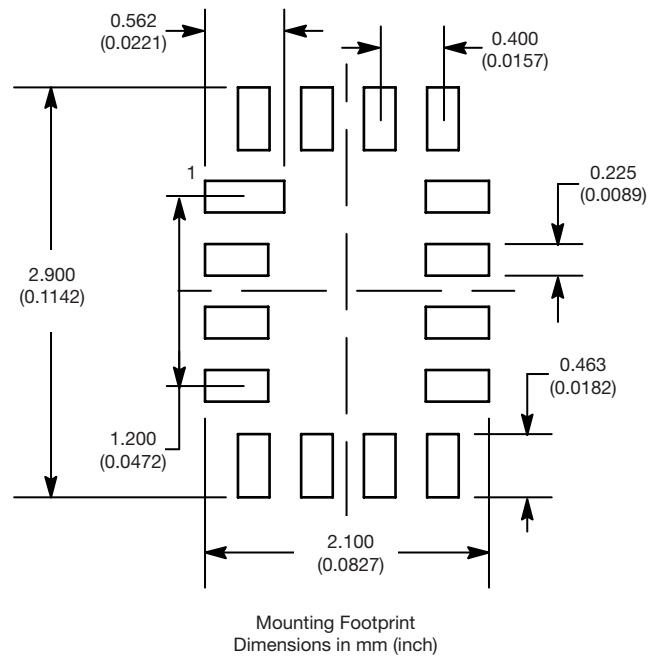


BACK SIDE VIEW

DIM	MILLIMETERS			INCHES		
	MIN.	NAM	MAX.	MIN.	NAM	MAX.
A	0.70	0.75	0.80	0.0275	0.0295	0.0315
A1	0	-	0.05	0	-	0.002
b	0.15	0.20	0.25	0.0059	0.0078	0.0098
C	0.15	0.20	0.25	0.0059	0.0078	0.0098
D	2.60 BSC			0.1023 BSC		
E	1.80 BSC			0.0708 BSC		
e	0.40 BSC			0.0157 BSC		
L	0.35	0.40	0.45	0.0137	0.0157	0.0177
L1	0.45	0.50	0.55	0.0177	0.0196	0.0216

ECN T-06380-Rev. A, 14-Aug-06
DWG: 5954

RECOMMENDED MINIMUM PADS FOR MINI QFN 16L





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. 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.

Material Category Policy

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.

Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.