

Low Voltage, Dual DPDT in miniQFN16

DESCRIPTION

The DG2599 is a C_{MOS} Dual DPDT (Dual Double Pole Double Throw) analog switch that operates over a wide voltage range of 1.65 V to 5 V. It is optimized for portable applications switching audio, SIM card signals, and other low power signals.

The DG2599 features low ON resistance of $2.8\ \Omega$ at 3 V power supply, fast switching speed, and low power consumption even when control logic signals are below $V+$ power supply voltage. The well matched dual DPDT switches conduct signals equally in both directions. The DG2599 is designed to guarantee break before make switching.

As a committed partner to the community and the environment, Vishay Siliconix manufactures this product with lead (Pb)-free device terminations. DG2599 are offered in a miniQFN package. The miniQFN package has a nickel palladium- gold device termination and is represented by the lead (Pb)-free “-E4” suffix. The nickel-palladium-gold device terminations meet all JEDEC standards for reflow and MSL ratings.

FEATURES

- **Halogen-free according to IEC 61249-2-21 definition**
- Low voltage operation - 1.65 V to 5 V
- Low on-resistance - $2.8\ \Omega$ at $V+ = 3\text{ V}$
- Power off protection on COM1 and COM2 pins
- Latch up current great than 300 mA per JESD78
- **Compliant to RoHS Directive 2002/95/EC**



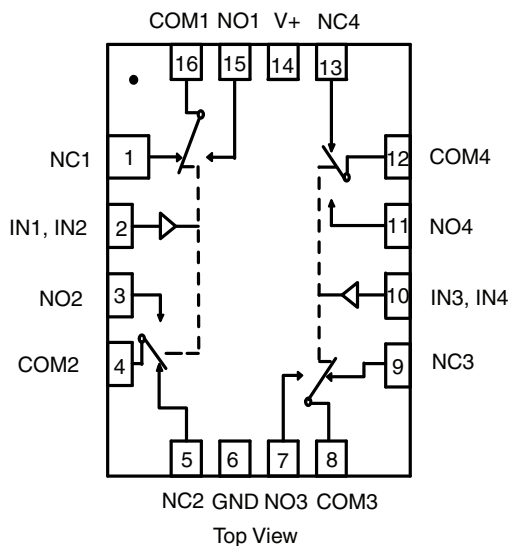
RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- Cellular phones
- PMPs and PDAs
- Modems and peripherals
- Computers and ebooks
- Tablet devices
- Displays and gaming
- STB

ORDERING INFORMATION

Part Number	Package
DG2599DN-T1-GE4	miniQFN16 1.8 mm x 2.6 mm

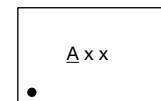


TRUTH TABLE (DG2599)

Logic	NC1, 2, 3 and 4	NO 1, 2, 3 and 4
0	ON	OFF
1	OFF	ON

Device Marking: A xx
xx = Date/Lot Traceability Code

(Top View)



Pin 1

Note: Pin 1 has long lead

ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$, unless otherwise noted)

Parameter	Symbol	Limit	Unit
Reference to GND	V+	- 0.3 to 5	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)		± 300	
Peak Current (pulsed at 1 ms, 10 % duty cycle)		± 500	
Storage Temperature (D Suffix)		- 65 to 150	$^\circ\text{C}$
Package Solder Reflow Conditions ^d	miniQFN16	250	
Power Dissipation (Packages) ^b	miniQFN16 ^c	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.

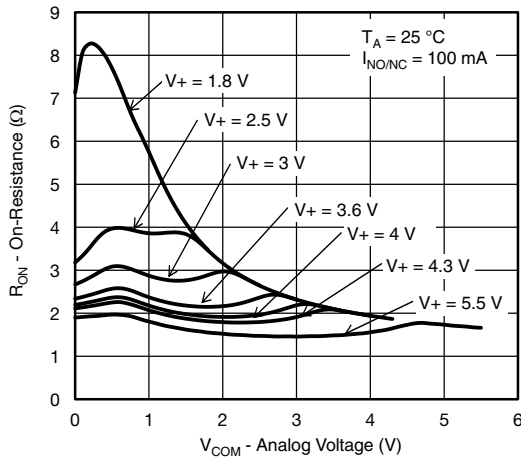
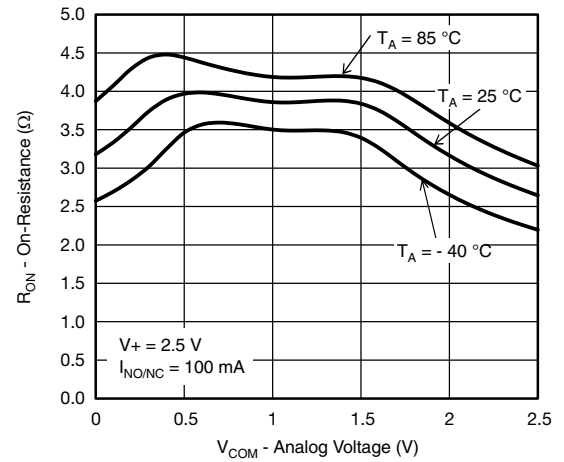
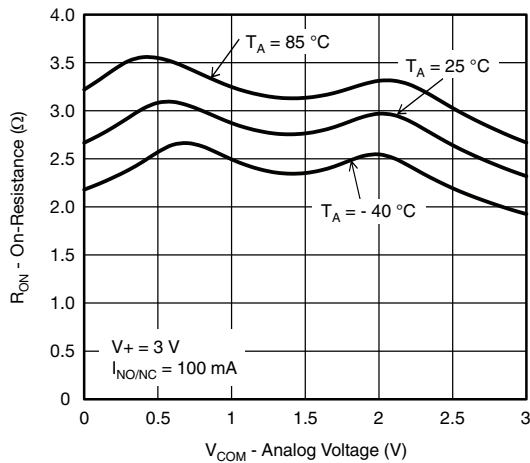
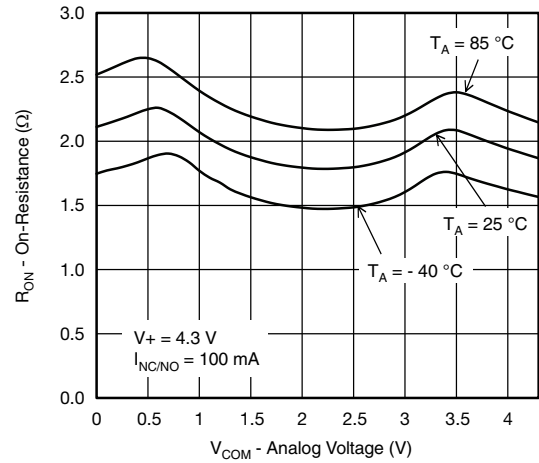
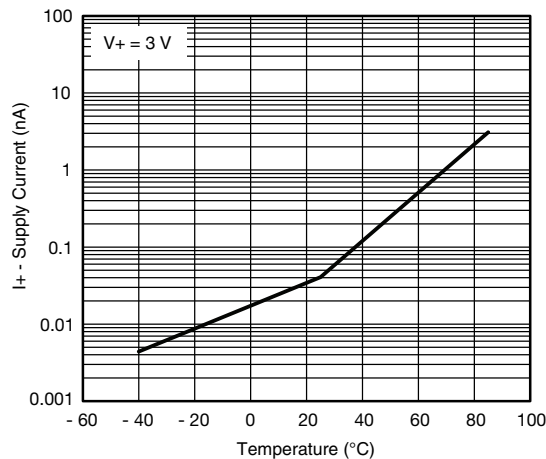
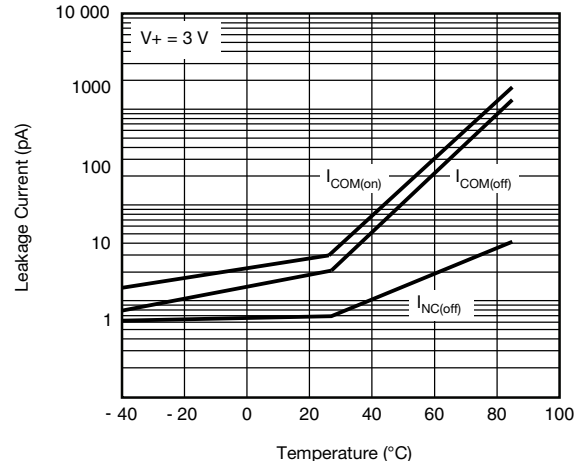
b. All leads welded or soldered to PC board.

c. Derate 6.6 mW/ $^\circ\text{C}$ above 70°C .

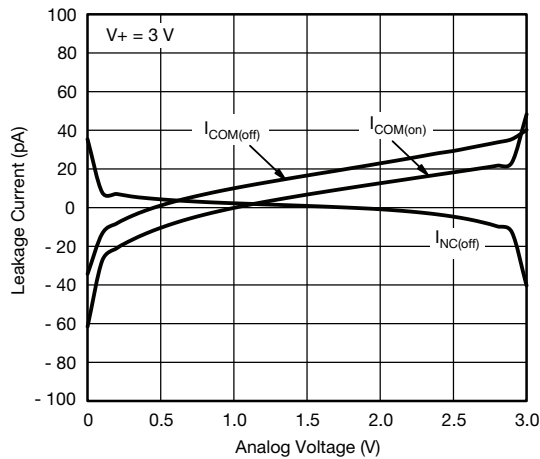
d. Manual soldering with iron is not recommended for leadless components. The miniQFN-16 is a leadless package. The end of the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at the exposed copper lip cannot be guaranteed and is not required to ensure adequate bottom side solder interconnection.

ELECTRICAL CHARACTERISTICS ($V_+ = 3\text{ V}$)

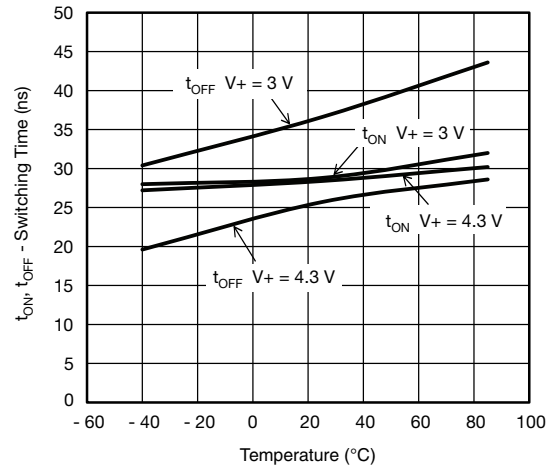
Parameter	Test Conditions	Temp.	Min.	Typ.	Max.	Unit
Power Supply and Signal						
V+ Supply Voltage		Full	1.65		5	V
V+ Supply Current	V _{IN} = 0 or V+	Full		0.001	2	μA
Analog Signal Range		Full	0		V+	V
Switch On-Resistance and Leakage						
Drain-Source On-Resistance	V+ = 3 V, I _{NO/NC} = 100 mA, V _{COM} = 0.9 V, 2.3 V	Room		2.8	3.3	Ω
		Full			3.6	
On-Resistance Flatness	V+ = 3 V, I _{NO/NC} = 100 mA, V _{COM} = 0 to V+	Room		0.24	1.1	
		Full			1.3	
Switch Off Leakage Current	V+ = 4.3 V, V _{NO/NC} = 0.3 V/4 V, V _{COM} = 4 V / 0.3 V	Room	- 10	0.1	10	nA
		Full	- 100		100	
Channel On-Leakage Current	V+ = 4.3 V, V _{NO/NC} and V _{COM} = 0.3 V / 4 V	Room	- 10	0.1	10	
		Full	- 100		100	
Digital Control						
Input, High Voltage	V+ = 4.3 V	Full	1.6			V
	V+ = 3 V		1.3			
Input, Low Voltage	V+ = 4.3 V	Full			0.6	
	V+ = 3 V				0.5	
Input, Bias Current	V _{IN} = V+	Full	- 1	0.01	1	μA
Dynamic Characteristics						
Turn On-Time	V _{COM} or V _{NO/NC} = 3 V, R _L = 50 Ω, C _L = 35 pF	Room			90	ns
		Full			115	
Turn Off-Time	V _{COM} or V _{NO/NC} = 3 V, R _L = 50 Ω, C _L = 35 pF	Room			70	
		Full			85	
Break Before Make Time	V _{COM} or V _{NO/NC} = 3 V, R _L = 50 Ω, C _L = 35 pF	Room	2			
		Full	2			
Charge Injection	C _L = 1 nF, R _{GEN} = 0 Ω	Room		± 10		pC
Off Isolation	R _L = 50 Ω, C _L = 5 pF, f = 1 MHz			- 66		dB
Crosstalk	R _L = 50 Ω, C _L = 5 pF, f = 1 MHz Non-adjacent channels			- 110		
3dB Bandwith	C _L = 5 pF, R _L = 50 Ω			186		MHz
Source Off Capacitance	V _{IN} = 0 or V+, f = 1 MHz			9		pF
Channel On Capacitance	V _{IN} = 0 or V+, f = 1 MHz			26		

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

 R_{ON} vs. V_{COM} 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

Supply Current vs. Temperature

Leakage Current vs. Temperature

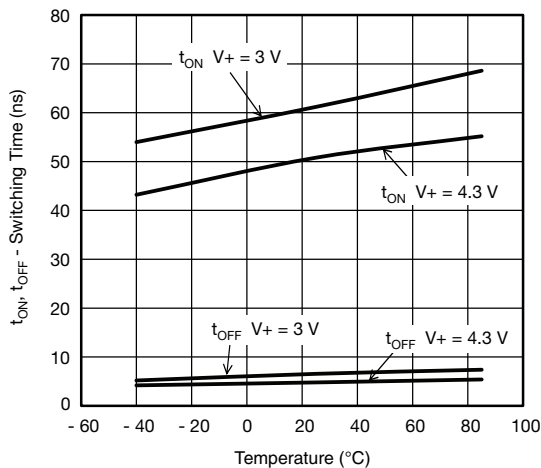
TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$, unless otherwise noted)



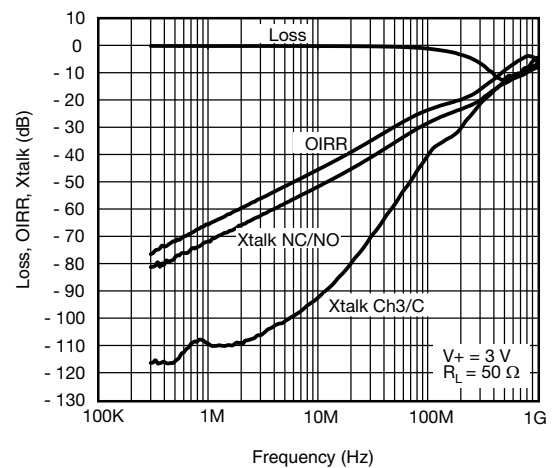
Leakage vs. Analog Voltage



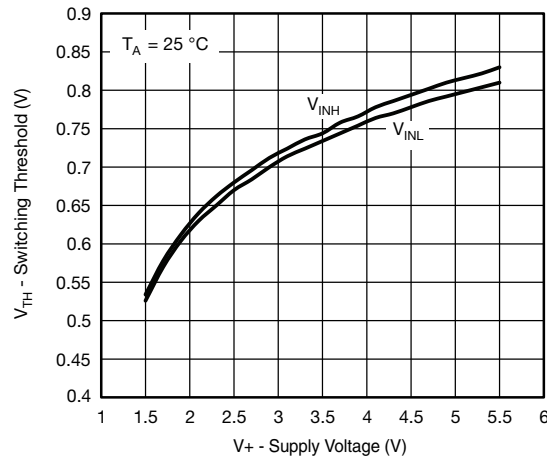
(NO) Switching Time vs. Temperature



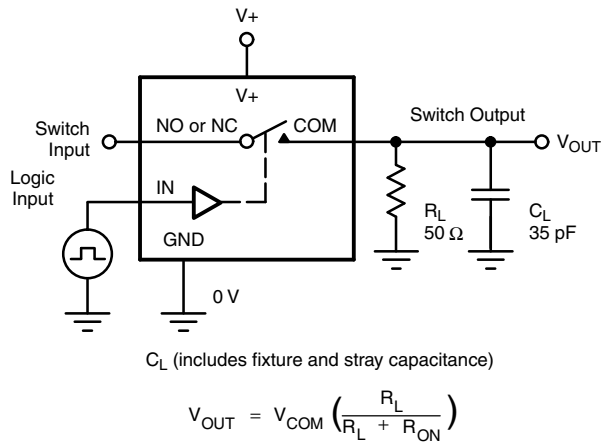
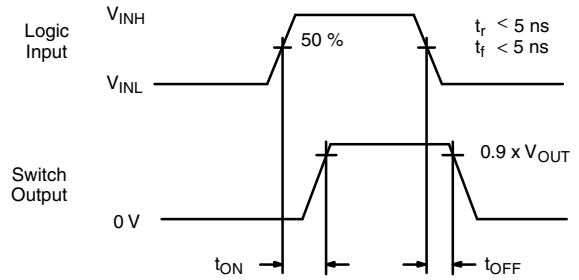
(NC) Switching Time vs. Temperature



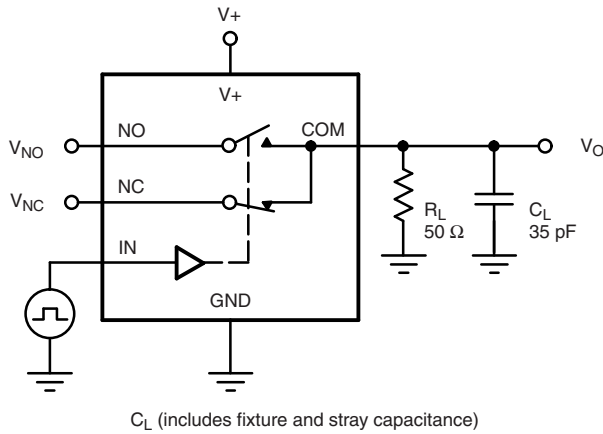
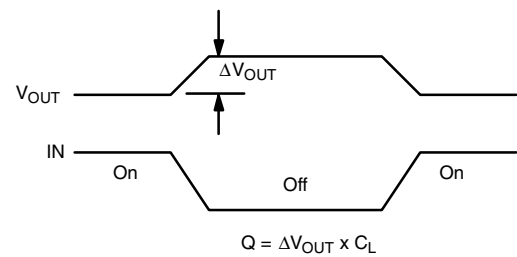
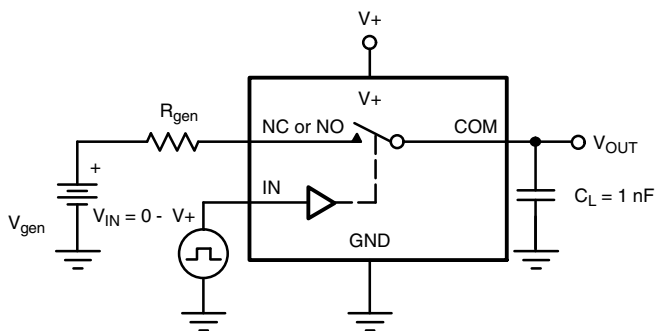
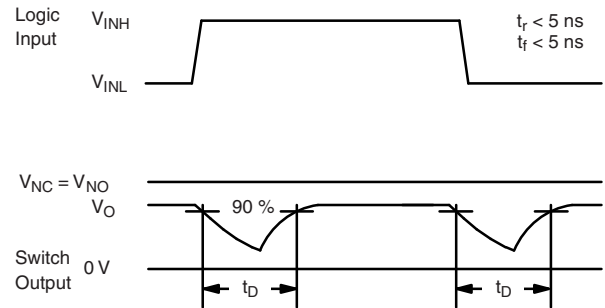
Insertion Loss, Off Isolation and Crosstalk



Switching Threshold vs. Supply Voltage

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 Interval


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

Figure 3. Charge Injection

TEST CIRCUITS

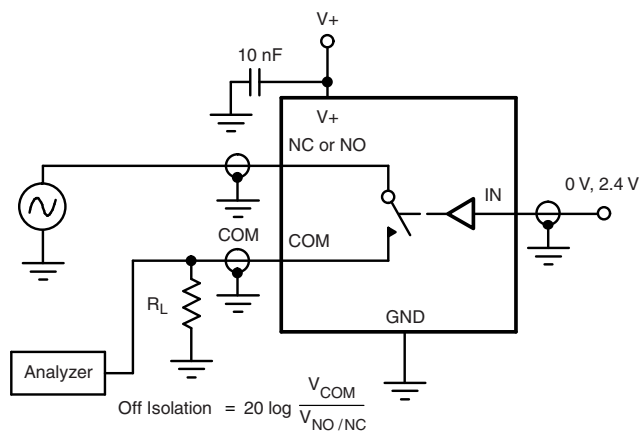


Figure 4. Off-Isolation

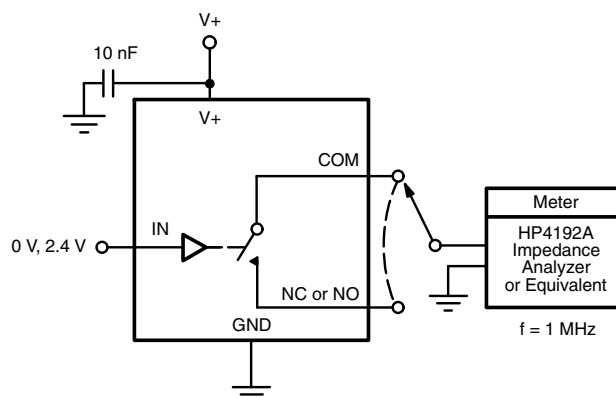
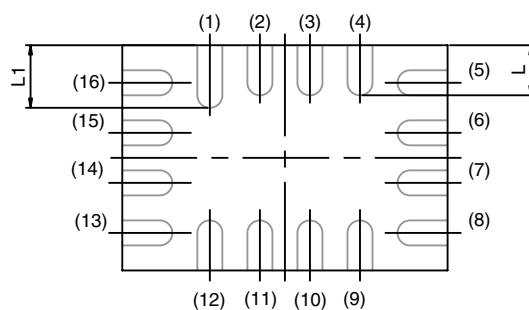
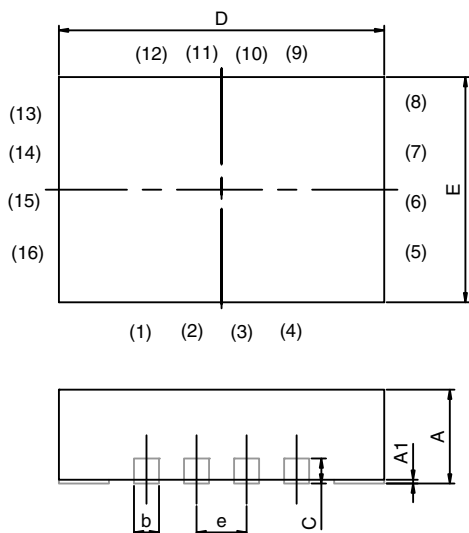


Figure 5. Channel Off/On Capacitance

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?67667.

miniQFN-16L

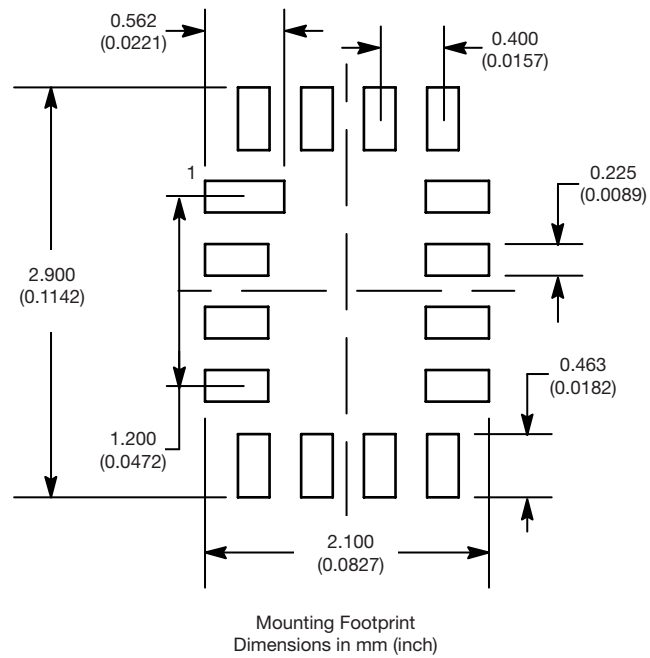


BACK SIDE VIEW

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	2.50	2.60	2.70	0.0984	0.1023	0.1063
E	1.70	1.80	1.90	0.0669	0.0708	0.0748
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 T16-0234-Rev. B, 09-May-16
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.