Low Voltage, Dual DPDT in miniQFN16

DESCRIPTION

The DG2599 is a CMOS 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 W 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 5.5 V
- Low on-resistance: 2.8 W at V+ = 3 V
- Power off protection on COM1 and COM2 pins
- Latch up current great than 300 mA per JESD78
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

RoHS COMPLIANT

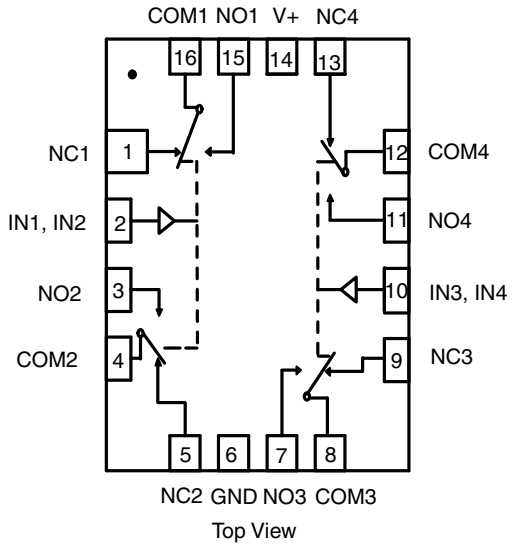
HALOGEN FREE

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

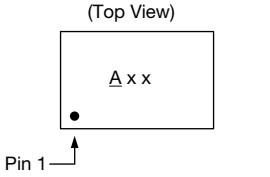


Top View

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



Note: Pin 1 has long lead

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C, unless otherwise noted)				
PARAMETER		**SYMBOL**	**LIMIT**	**UNIT**
Reference to GND	V+		-0.3 to +6	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	°C
Package solder reflow conditions [d]	miniQFN16		250	
Power dissipation (packages) [b]	miniQFN16 [c]		525	mW

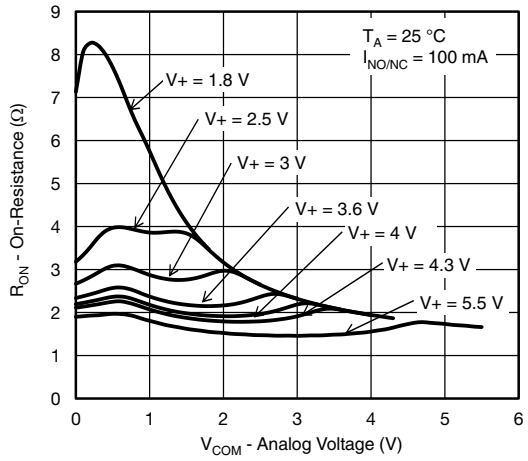
Note

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

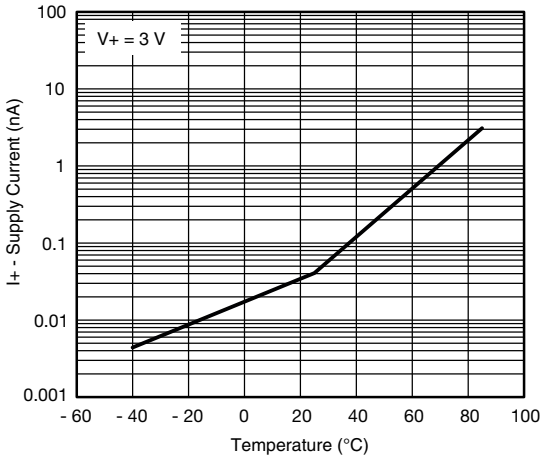
ELECTRICAL CHARACTERISTICS (V+ = 3 V)						
PARAMETER	**TEST CONDITIONS**	**TEMP.**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Power Supply and Signal						
V+ supply voltage		Full	1.65	-	5.5	V
V+ supply current	V_{IN} = 0 or V+	Full	-	0.001	2	µA
Analog signal range		Full	0	-	V+	V
Switch On-Resistance and Leakage						
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	W
		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	-	
3 dB bandwith	C_L = 5 pF, R_L = 50 Ω		-	186	-	MHz

ELECTRICAL CHARACTERISTICS (V+ = 3 V)						
PARAMETER	TEST CONDITIONS	TEMP.	MIN.	TYP.	MAX.	UNIT
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	-	

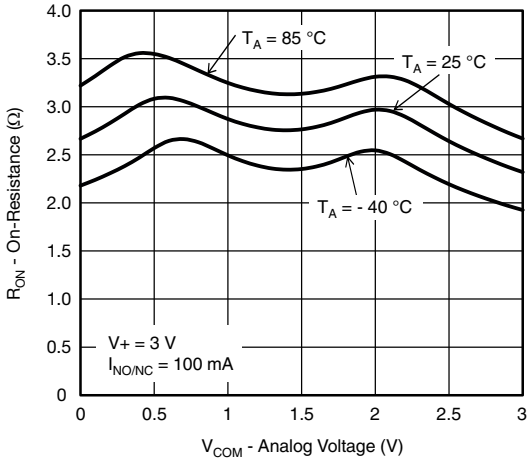
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



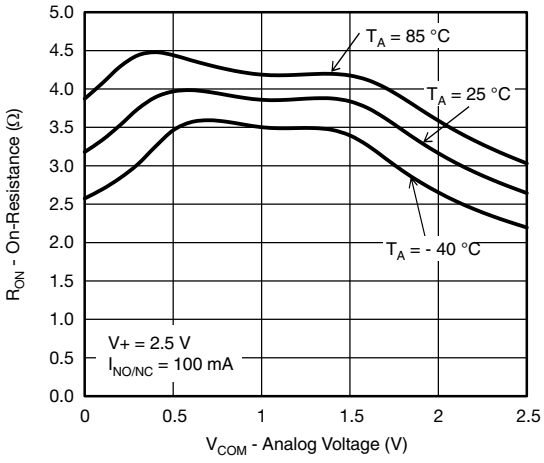
R_{ON} vs. V_{COM} and Single Supply Voltage



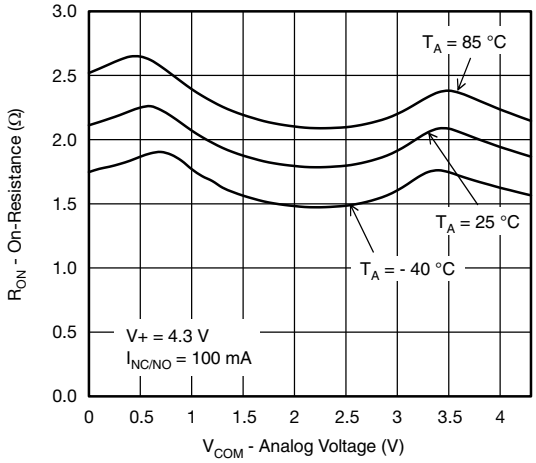
Supply Current vs. Temperature



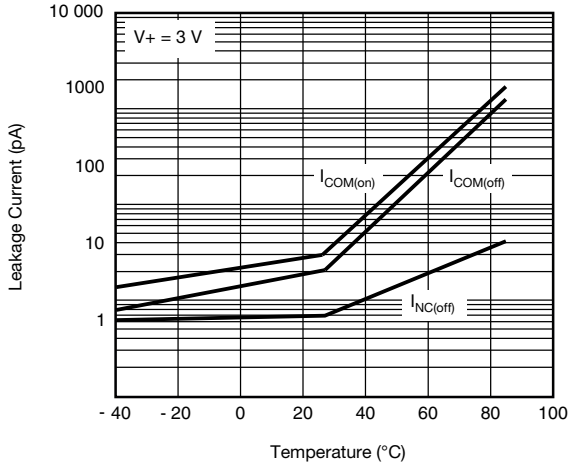
R_{ON} vs. Analog Voltage and Temperature



R_{ON} vs. Analog Voltage and Temperature

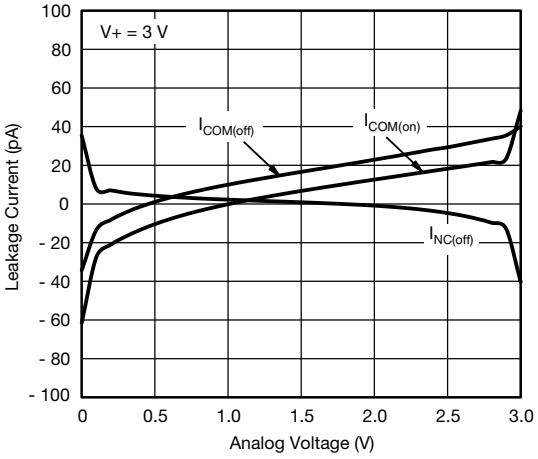


R_{ON} vs. Analog Voltage and Temperature

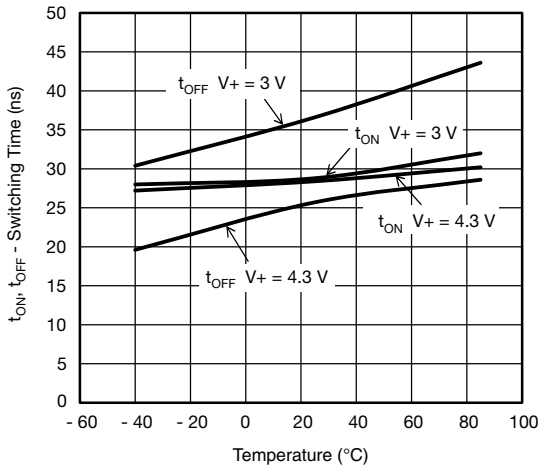


Leakage Current vs. Temperature

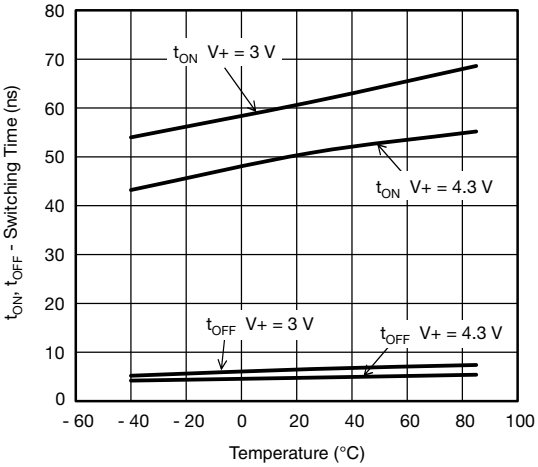
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



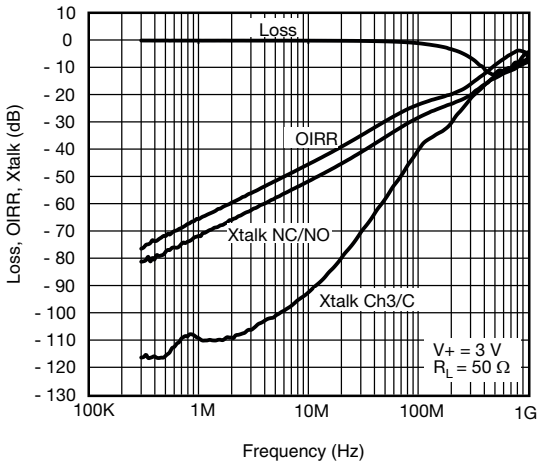
Leakage vs. Analog Voltage



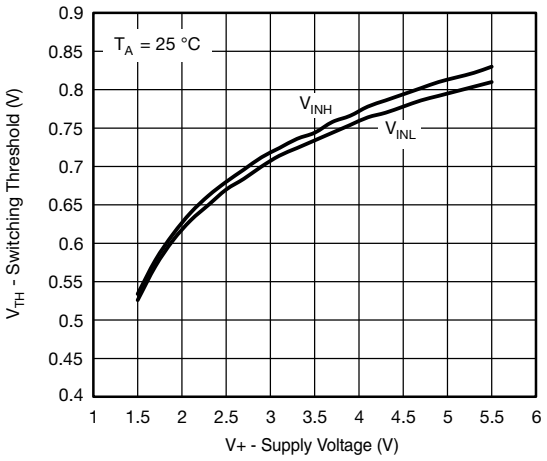
(NO) Switching Time vs. Temperature



(NC) Switching Time vs. Temperature

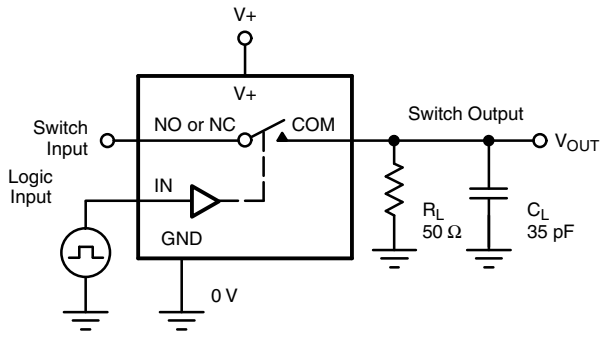


Insertion Loss, Off Isolation and Crosstalk



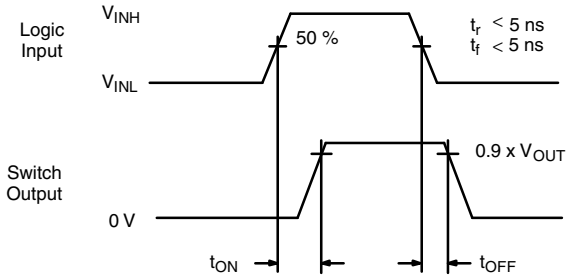
Switching Threshold vs. Supply Voltage

TEST CIRCUITS



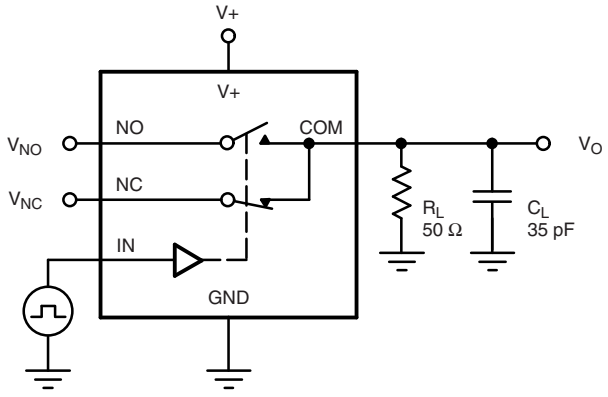
C_L (includes fixture and stray capacitance)

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

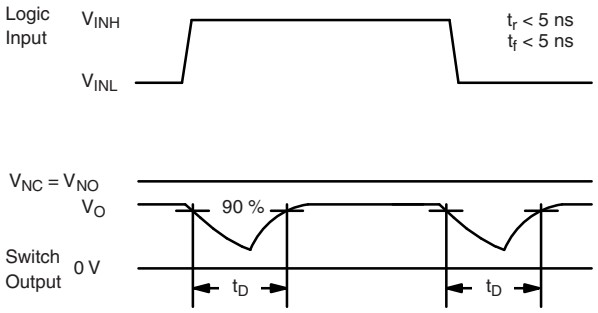


Logic "1" = Switch On
Logic input waveforms inverted for switches that have the opposite logic sense.

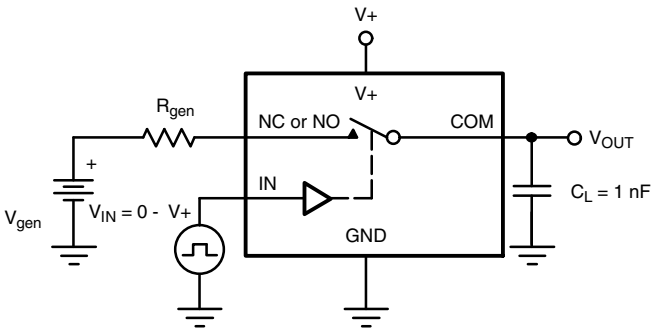
Switching Time

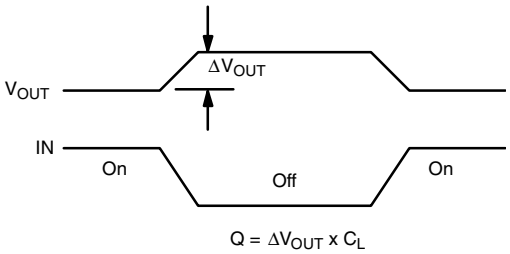


C_L (includes fixture and stray capacitance)



Break-Before-Make Interval

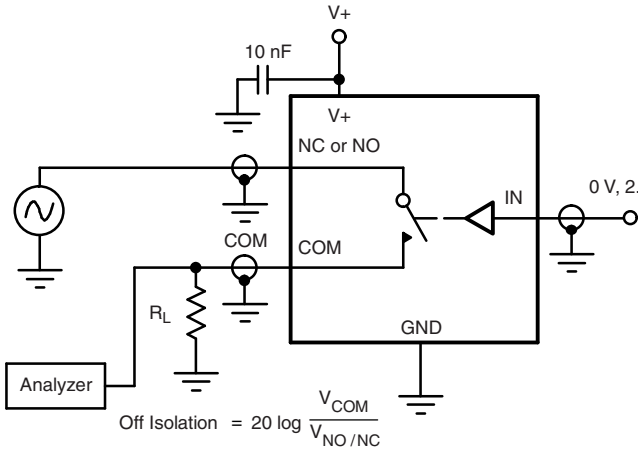




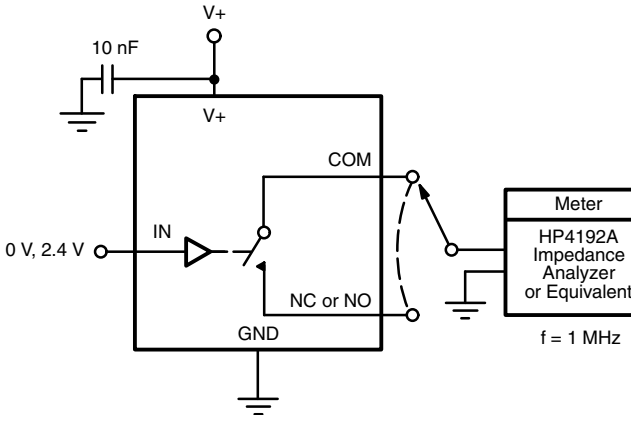
IN depends on switch configuration: input polarity determined by sense of switch.

Charge Injection

TEST CIRCUITS

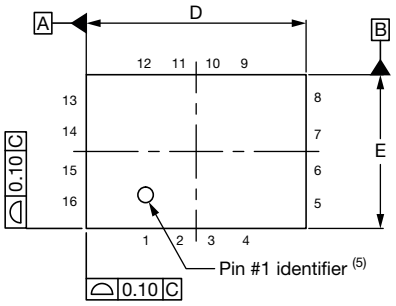


Off-Isolation

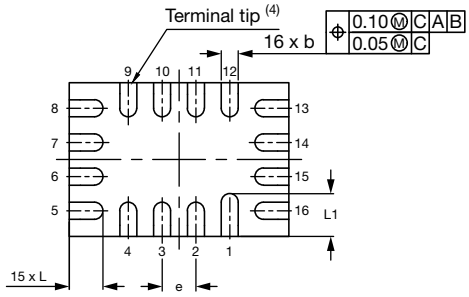


Channel Off / On Capacitance

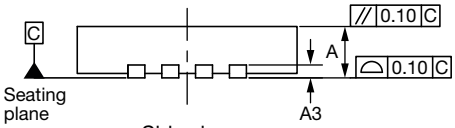
Thin miniQFN16 Case Outline



Top view



Bottom view



Side view

DIMENSIONS	MILLIMETERS (1)			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.50	0.55	0.60	0.020	0.022	0.024
A1	0	-	0.05	0	-	0.002
A3	0.15 ref.			0.006 ref.		
b	0.15	0.20	0.25	0.006	0.008	0.010
D	2.50	2.60	2.70	0.098	0.102	0.106
e	0.40 BSC			0.016 BSC		
E	1.70	1.80	1.90	0.067	0.071	0.075
L	0.35	0.40	0.45	0.014	0.016	0.018
L1	0.45	0.50	0.55	0.018	0.020	0.022
N (3)	16			16		
Nd (3)	4			4		
Ne (3)	4			4		

Notes

(1) Use millimeters as the primary measurement.

(2) Dimensioning and tolerances conform to ASME Y14.5M. - 1994.

(3) N is the number of terminals. Nd and Ne is the number of terminals in each D and E site respectively.

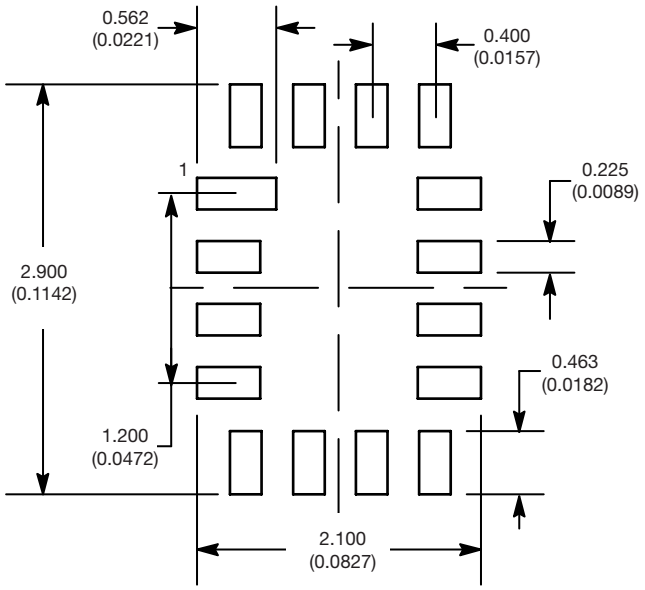
(4) Dimensions b applies to plated terminal and is measured between 0.15 mm and 0.30 mm from terminal tip.

(5) The pin 1 identifier must be existed on the top surface of the package by using identification mark or other feature of package body.

(6) Package warpage max. 0.05 mm.

ECN: T16-0226-Rev. B, 09-May-16
DWG: 6023

RECOMMENDED MINIMUM PADS FOR MINI QFN 16L



Mounting Footprint
Dimensions in mm (inch)

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.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

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.