NLAS3899B

Dual DPDT Low R_{ON}, Low Capacitance Switch

The NLAS3899B is a dual DPDT analog switch designed for low power audio and dual SIM card applications. The low R_{ON} of 3.0 Ω (typical) is ideal for routing audio signals to or from a moderately high impedance load. In addition, the low C_{ON} of 20 pF (typical) gives the NLAS3899B a high bandwidth of 280 MHz, perfect for dual SIM card applications.

Features

- Single Supply Operation
  - 1.65 to 4.3 V V_{CC}
  - Function Directly from Li−Ion Battery
- Low ON Resistance (3.0 Ω Typical Across V_{CC})
- Low C_{ON} (20 pF Typical)
- Bandwidth 280 MHz
- Maximum Breakdown Voltage: 5.5 V
- Low Static Power
- Interfaces with 1.8 V Chipset
- These are Pb−Free Devices

Typical Applications

- Cell Phone Speaker/Microphone Switching
- Ringtone−Chip/Amplifier Switching
- Dual SIM Card Data Switching
- Four Unbalanced (Single−Ended) Switches

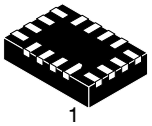
Important Information

- ESD Protection:
  - Human Body Model (HBM) 1000 V − All Pins
  - 5000 V − I/O to GND
- Continuous Current Rating Through each Switch ±300 mA
- Conforms to: JEDEC MO−220, Issue H, Variation VEED−6
- Package:
  - 1.8 x 2.6 x 0.75 mm WQFN16 Pb−Free
  - 3.0 x 3.0 x 0.9 mm QFN16 Pb−Free

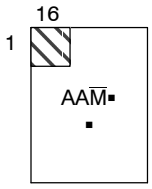
ON Semiconductor®

http://onsemi.com

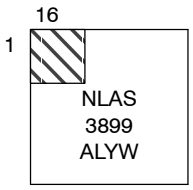
MARKING DIAGRAMS



WQFN16
CASE 488AP

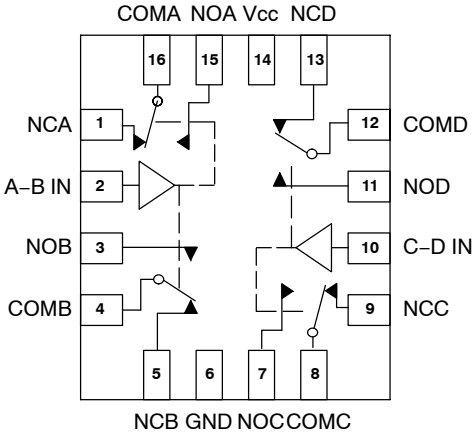


QFN16
CASE 485AE



XX = Specific Device Code
A = Assembly Location
M = Date Code/Assembly Location
L = Wafer Lot
Y = Year
W = Work Week
▪ = Pb−Free Package

(Note: Microdot may be in either location)



ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 8 of this data sheet.

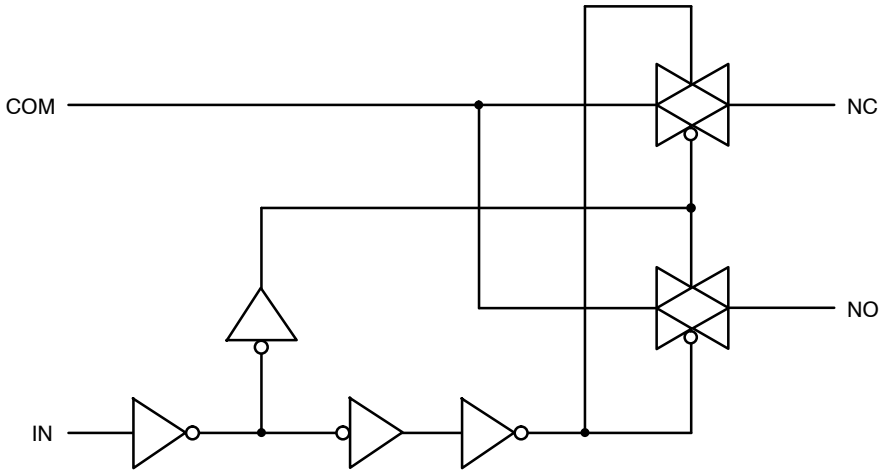


Figure 1. Input Equivalent Circuit

PIN DESCRIPTION

QFN PIN #	Symbol	Name and Function
1, 3, 5, 7, 9, 11, 13, 15	NO A−D, NC A−D	Independent Channels
2, 10	A−B IN, C−D IN	Controls
4, 8, 12, 16	COM A−D	Common Channels
6	GND	Ground (V)
14	V_{CC}	Positive Supply Voltage

TRUTH TABLE

IN	NO	NC
H	ON	OFF*
L	OFF*	ON

*High impedance.

OPERATING CONDITIONS

MAXIMUM RATINGS

Symbol	Pins	Parameter	Value	Condition	Unit
V_{CC}	V_{CC}	Positive DC Supply Voltage	−0.5 to +5.5		V
V_{IS}	NOx, NCx, or COMx	Analog Signal Voltage	−0.5 to V_{CC} + 0.5		V
V_{IN}	A−B IN, C−D IN	Control Input Voltage	−0.5 to 5.5		V
I_{IS_CON}	NOx, NCx, or COMx	Analog Signal Continuous Current	±300	Closed Switch	mA
I_{IS_PK}	NOx, NCx, or COMx	Analog Signal Peak Current	±500	10% Duty Cycle	mA
I_{IN}	A−B IN, C−D IN	Control Input Current	±20		mA
T_{STG}		Storage Temperature Range	−65 to 150		°C

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

RECOMMENDED OPERATING CONDITIONS

Symbol	Pins	Parameter	Value	Condition	Unit
V_{CC}	V_{CC}	Positive DC Supply Voltage	1.65 to 4.3		V
V_{IS}	NOx, NCx, or COMx	Analog Signal Voltage	GND to V_{CC}		V
V_{IN}	A−B IN, C−D IN	Control Input Voltage	GND to 4.3		V
T_A		Operating Temperature Range	−40 to +85		°C
t_r, t_f		Input Rise or Fall Time	20	V_{CC} = 1.6 V – 2.7 V	ns/V
			10	V_{CC} = 3.0 V – 4.5 V	

Minimum and maximum values are guaranteed through test or design across the **Recommended Operating Conditions**, where applicable. Typical values are listed for guidance only and are based on the particular conditions listed for each section, where applicable. These conditions are valid for all values found in the characteristics tables unless otherwise specified in the test conditions.

ESD PROTECTION

Pins	Description	Minimum Voltage
All Pins	Human Body Model	1 kV
I/O to GND	Human Body Model	5 kV

DC Electrical Characteristics

Typical: T = 25°C; V_{CC} = 3.0 V

CONTROL INPUT (Typical: T = 25°C; V_{CC} = 3.0 V)

Symbol	Pins	Parameter	Test Conditions	V_{CC} (V)	–40°C to +85°C			Unit
					Min	Typ	Max	
V_{IH}	A–B IN, C–D IN	Control Input High		3.0 4.3	1.3 1.6			V
V_{IL}	A–B IN, C–D IN	Control Input Low		3.0 4.3			0.5 0.6	V
I_{IN}	A–B IN, C–D IN	Control Input Leakage	$0 \le V_{IN} \le V_{CC}$	4.3		±0.1	±1.0	μA

SUPPLY CURRENT AND LEAKAGE (Typical: T = 25°C; V_{CC} = 3.0 V)

Symbol	Pins	Parameter	Test Conditions	V_{CC} (V)	–40°C to +85°C			Unit
					Min	Typ	Max	
$I_{NO/NC}$ (OFF)	NCx, NOx	OFF State Leakage	$V_{IN} = V_{IL}$ or V_{IH} $V_{NC/NO}$ = 0.3 V V_{COM} = 4.0 V	4.3		±10	±300	nA
I_{COM} (ON)	COMx	ON State Leakage	$V_{IN} = V_{IL}$ or V_{IH} V_{NO} = 0.3 V or 4.0 V with V_{NC} floating or V_{NC} = 0.3 V or 4.0 V with V_{NO} floating V_{COM} = 0.3 V or 4.0 V	4.3		±10	±300	nA
I_{CC}	V_{CC}	Quiescent Supply	V_{IN} and $V_{IS} = V_{CC}$ or GND I_D = 0 A	1.65 – 4.3		±1.0	±2.0	μA
I_{OFF}	A–B IN, C–D IN	Power Off Leakage	V_{IN} = 4.3 V or GND	0		±0.5	±2.0	μA

ON RESISTANCE (Typical: T = 25°C; V_{CC} = 3.0 V)

Symbol	Pins	Parameter	Test Conditions	V_{CC} (V)	–40°C to +85°C			Unit
					Min	Typ	Max	
R_{ON}	NOx, NCx COMx	ON Resistance	I_{ON} = –100 mA V_{IS} = 0 to V_{CC}	2.5 3.0 3.6 4.3		3.0 2.6 2.5 2.2	4.0 3.0 3.0 2.5	Ω
R_{FLAT}	NOx, NCx COMx	R_{ON} Flatness	I_{ON} = –100 mA V_{IS} = 0 to V_{CC}	3.0 4.3		0.8 1.1		Ω
ΔR_{ON}	NOx, NCx COMx	R_{ON} Matching	I_{ON} = –100 mA V_{IS} = 0 to V_{CC}	3.0 4.3		0.8 0.7		Ω

AC ELECTRICAL CHARACTERISTICS

TIMING/FREQUENCY (Typical: T = 25°C; V_{CC} = 3.0 V, R_L = 50 Ω, C_L = 35 pF, f = 1 MHz)

Symbol	Pins	Parameter	Test Conditions	V_{CC} (V)	–40°C to +85°C			Unit
					Min	Typ	Max	
t_{ON}	IN to NCx or NOx	Turn On Time		2.3 – 4.3		30	40	ns
t_{OFF}	IN to NCx or NOx	Turn Off Time		2.3 – 4.53		20	30	ns
t_{BBM}	IN to NCx or NOx	Break Before Make		3.0	2	15		ns
BW		–3dB Bandwidth	C_L = 5 pF	1.65 – 4.3		280		MHz

ISOLATION AND THD (Typical: T = 25°C; V_{CC} = 3.0 V, RL = 50 Ω, CL = 5 pF, f = 1 MHz)

Symbol	Pins	Parameter	Test Conditions	V_{CC} (V)	–40°C to +85°C			Unit
					Min	Typ	Max	
Q		Charge Injection	V_{IN} = V_{CC} to GND R_{IS} = 0 Ω, C_L = 1.0 nF Q = C_L – ΔV_{OUT}	1.65 – 4.3		111		pC
THD		Total Harmonic Distortion	F_{IS} = 20 Hz to 20 kHz R_L = R_{gen} = 600 Ω, C_L = 1.0 pF V_{IS} = 1.0 V_{PP}	3.0		0.007		%
V_{ONL}		Maximum Feedthrough On Loss	V_{IN} = 0 dBm @ 100 kHz to 50 MHz V_{IN} centered between V_{CC} & GND	1.65 – 4.3		–0.06		dB
O_{IRR}	NOx	Off Isolation	V_{IN} = 0 V_{NO} or V_{NC} (pk–pk) = 1.0 V	1.65 – 4.3		–67		dB
Xtalk	COMx to COMy	Non–Adjacent Channel	V_{NO} or V_{NC} (pk–pk) = 1.0 V	1.65 – 4.3		–100		dB

CAPACITANCE (Typical: T = 25°C; V_{CC} = 3.0 V, R_L = 50 Ω, C_L = 5 pF, f = 1 MHz)

Symbol	Pins	Parameter	Test Conditions	V_{CC} (V)	–40°C to +85°C			Unit
					Min	Typ	Max	
C_{IN}	A–B IN, C–D IN	Control Input		0 V		5.0		pF
C_{ON}	NCx to COMx	Through Switch	V_{IN} = 0V	3.0 V		20		pF
C_{OFF}	NCx NOx	Unselected Port	V_{IS} = 3.0V, V_{IN} = 3.0V	3.0 V		10		pF

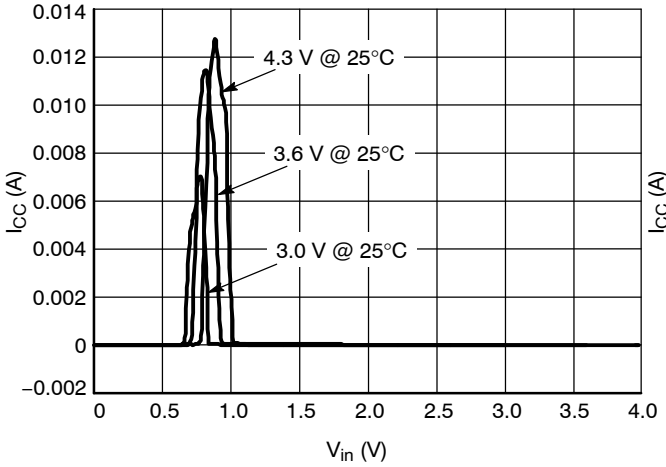


Figure 2. I_{CC} vs. V_{in}

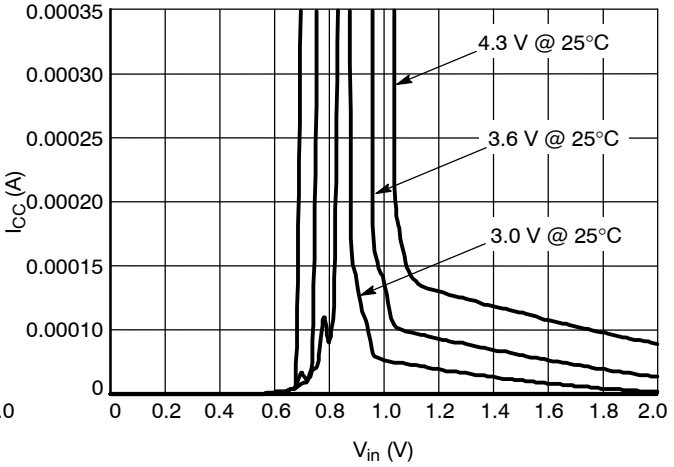
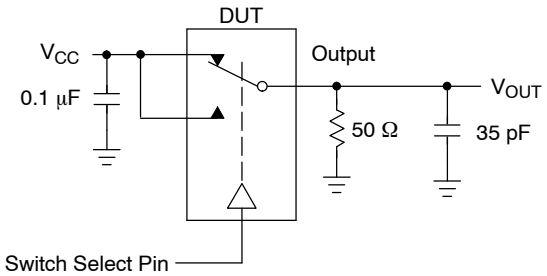


Figure 3. (Expanded View) I_{CC} vs. V_{in}



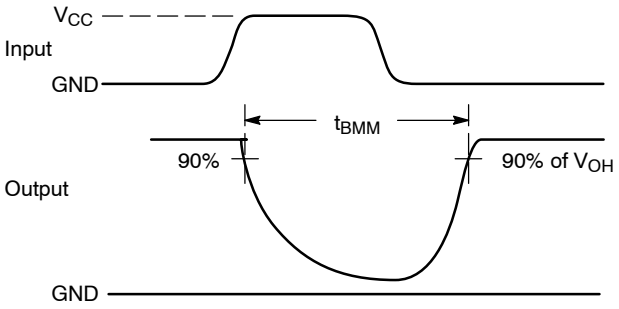
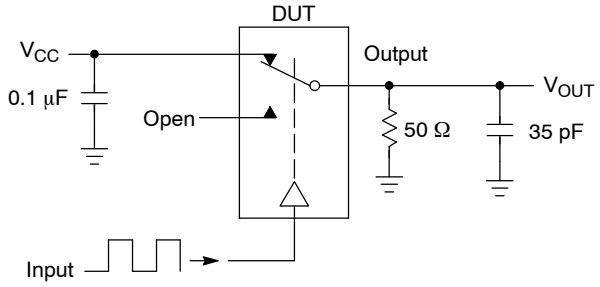


Figure 4. t_{BBM} (Time Break−Before−Make)



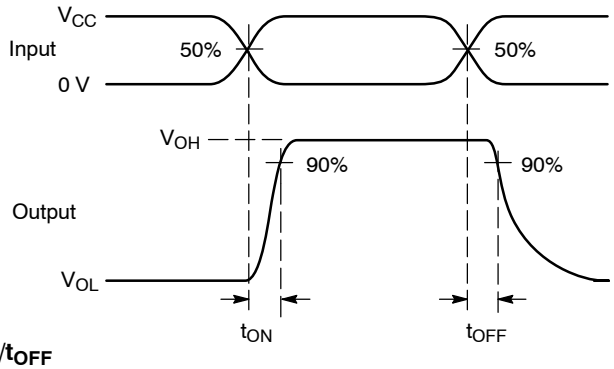
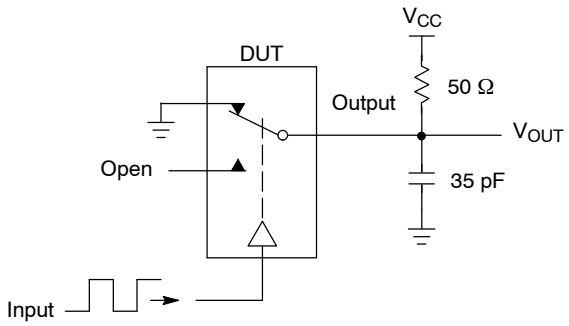


Figure 5. t_{ON}/t_{OFF}



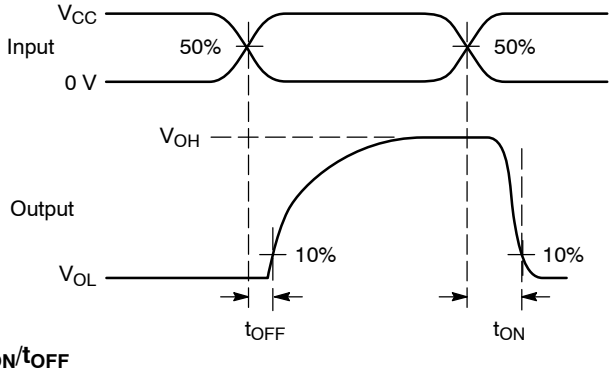
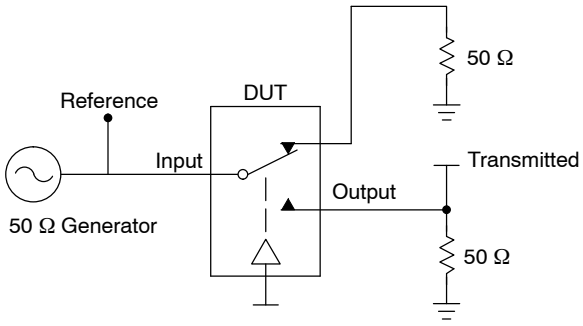


Figure 6. t_{ON}/t_{OFF}



Channel switch control/s test socket is normalized. Off isolation is measured across an off channel. On loss is the bandwidth of an On switch. V_{ISO}, Bandwidth and V_{ONL} are independent of the input signal direction.

V_{ISO} = Off Channel Isolation = 20 Log $\left(\frac{V_{OUT}}{V_{IN}}\right)$ for V_{IN} at 100 kHz

V_{ONL} = On Channel Loss = 20 Log $\left(\frac{V_{OUT}}{V_{IN}}\right)$ for V_{IN} at 100 kHz to 50 MHz

Bandwidth (BW) = the frequency 3 dB below V_{ONL}
V_{CT} = Use V_{ISO} setup and test to all other switch analog input/outputs terminated with 50 Ω

Figure 7. Off Channel Isolation/On Channel Loss (BW)/Crosstalk (On Channel to Off Channel)/V_{ONL}

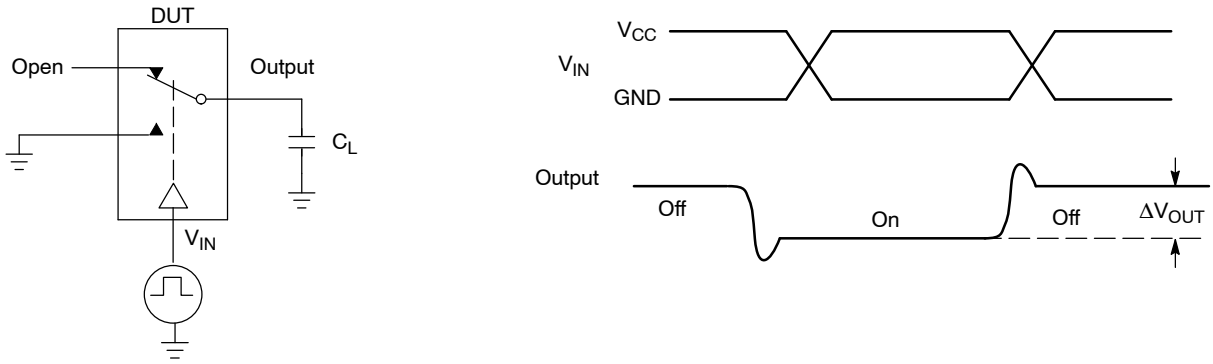


Figure 8. Charge Injection: (Q)

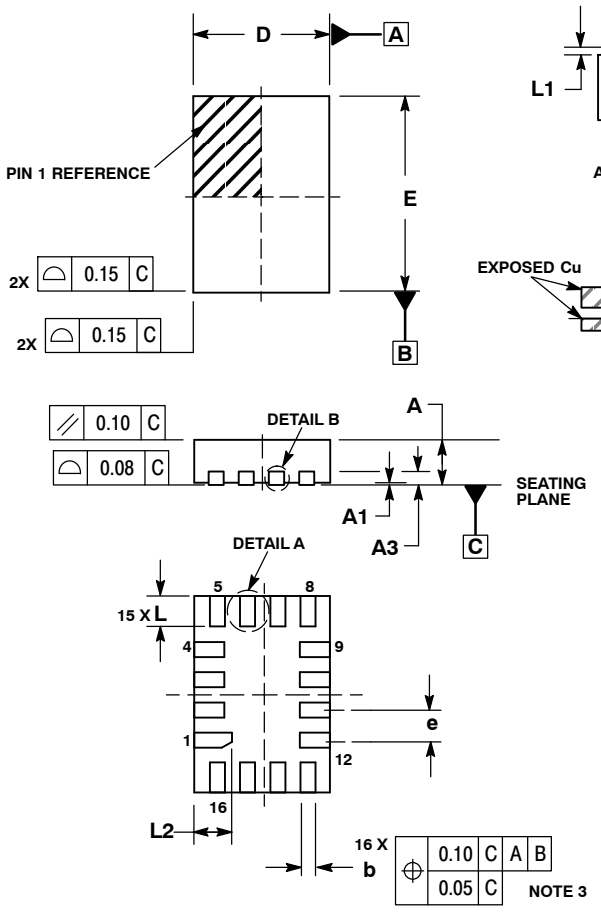
DEVICE ORDERING INFORMATION

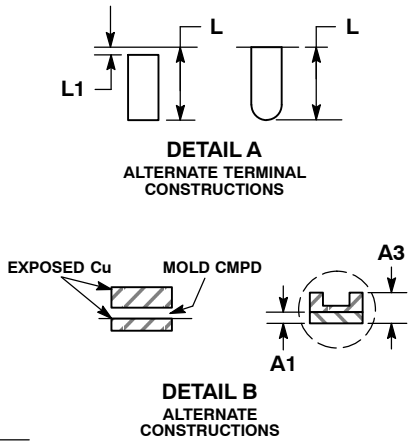
Device Order Number	Package Type	Tape & Reel Size†
NLAS3899BMNTBG	WQFN16 (Pb−Free)	3000 / Tape & Reel
NLAS3899BMNTWG	QFN16 (Pb−Free)	3000 / Tape & Reel
NLAS3899BMNTXG	QFN16 (Pb−Free)	3000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

PACKAGE DIMENSIONS

WQFN16, 1.8x2.6, 0.4P
CASE 488AP
ISSUE B

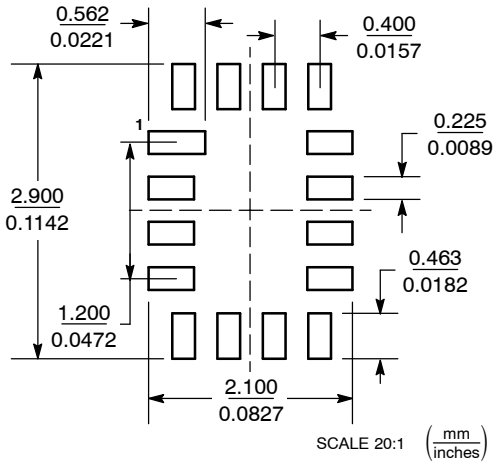




NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.25 AND 0.30 MM FROM TERMINAL.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.
5. EXPOSED PADS CONNECTED TO DIE FLAG. USED AS TEST CONTACTS.

	MILLIMETERS	
DIM	MIN	MAX
A	0.70	0.80
A1	0.00	0.050
A3	0.20 REF	
b	0.15	0.25
D	1.80 BSC	
E	2.60 BSC	
e	0.40 BSC	
L	0.30	0.50
L1	0.00	0.15
L2	0.40	0.60

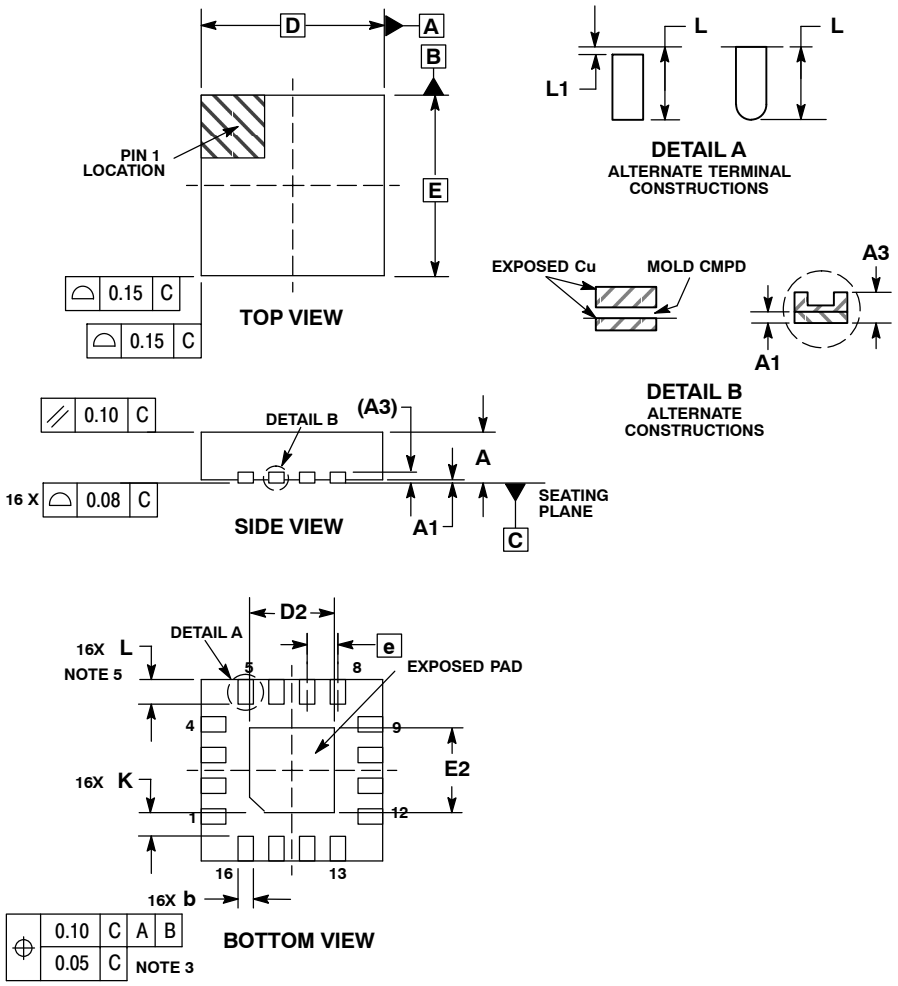
MOUNTING FOOTPRINT



*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PACKAGE DIMENSIONS

QFN16 3x3, 0.5 P
CASE 485AE
ISSUE A



NOTES:
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2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.25 AND 0.30 MM FROM TERMINAL.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.
5. OUTLINE MEETS JEDEC DIMENSIONS PER MO−220, VARIATION VEED−6.

	MILLIMETERS		
DIM	MIN	NOM	MAX
A	0.80	0.90	1.00
A1	0.00	0.03	0.05
A3		0.20 REF	
b	0.18	0.25	0.30
D		3.00 BSC	
D2	1.25	1.40	1.55
E		3.00 BSC	
E2	1.25	1.40	1.55
e		0.50 BSC	
K	0.20	−−−	−−−
L	0.30	0.40	0.50
L1	0.00	−−−	0.15

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

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Japan Customer Focus Center
Phone: 81−3−5817−1050

ON Semiconductor Website: **www.onsemi.com**

Order Literature: http://www.onsemi.com/orderlit

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