

# ON Semiconductor

## Is Now

# onsemi™

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# Non-Inverting 3-State Buffer

## NLV68SZ126

The NLV68SZ126 is 6-channel non-inverting 3-state buffer in a tiny footprint package.

### Features

- Designed for 1.65 V to 5.5 V  $V_{CC}$  Operation
- 3.4 ns  $t_{PD}$  at 5 V (Typ)
- Inputs/Outputs Over-Voltage Tolerant up to 5.5 V
- $I_{OFF}$  Supports Partial Power Down Protection
- Source/Sink 24 mA at 3.0 V
- Available in 2.5 mm x 3.5 mm QFN20 and TSSOP-20 WB Packages
- NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

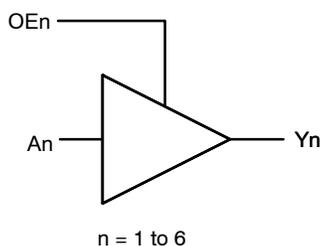


Figure 1. Logic Diagram



Figure 2. Channel Logic Symbol

### FUNCTION TABLE

Input		Output
OEn	An	Yn
L	X	Z
H	L	L
H	H	H

X = Don't Care



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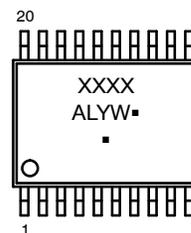
### MARKING DIAGRAMS



QFN20, 2.5X3.5, 0.4P  
CASE 485CB



TSSOP-20 WB  
DT SUFFIX  
CASE 948E



XXXX = Specific Device Code  
A = Assembly Location  
L = Wafer Lot Number  
Y = Year  
W = Work Week  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

### ORDERING INFORMATION

See detailed ordering and shipping information on page 6 of this data sheet.

# NLV68SZ126

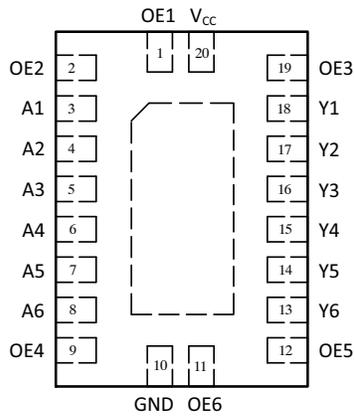


Figure 3. QFN Pinout (Top Through View)

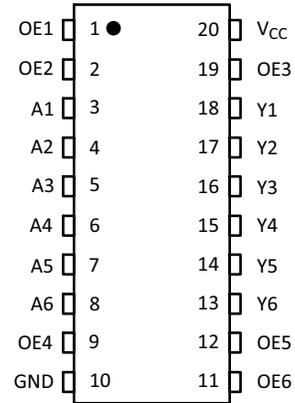


Figure 4. TSSOP Pinout (Top View)

## PIN ASSIGNMENT

Number	Name	Type	Description
1	OE1	Input	Channel 1 Control Input
2	OE2	Input	Channel 2 Control Input
3	A1	Input	Channel 1 Data Input
4	A2	Input	Channel 2 Data Input
5	A3	Input	Channel 3 Data Input
6	A4	Input	Channel 4 Data Input
7	A5	Input	Channel 5 Data Input
8	A6	Input	Channel 6 Data Input
9	OE4	Input	Channel 4 Control Input
10	GND	Power	Ground
11	OE6	Input	Channel 6 Control Input
12	OE5	Input	Channel 5 Control Input
13	Y6	Output	Channel 6 Data Output
14	Y5	Output	Channel 5 Data Output
15	Y4	Output	Channel 4 Data Output
16	Y3	Output	Channel 3 Data Output
17	Y2	Output	Channel 2 Data Output
18	Y1	Output	Channel 1 Data Output
19	OE3	Input	Channel 3 Control Input
20	V <sub>CC</sub>	Power	Positive Supply

# NLV68SZ126

## MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$V_{CC}$	DC Supply	-0.5 to +6.5	V
$V_{IN}$	DC Input Voltage	-0.5 to +6.5	V
$V_{OUT}$	DC Output Voltage Active-Mode (High or Low State) Tri-State Mode (Note 1) Power-Down Mode ( $V_{CC} = 0$ V)	-0.5 to $V_{CC} + 0.5$ -0.5 to +6.5 -0.5 to +6.5	V
$I_{IK}$	DC Input Diode Current, $V_{IN} < GND$	-50	mA
$I_{OK}$	DC Output Diode Current, $V_{OUT} < GND$	-50	mA
$I_{OUT}$	DC Output Source/Sink Current	$\pm 50$	mA
$I_{CC}$ or $I_{GND}$	DC Supply Current Per Supply Pin or Ground Pin	$\pm 100$	mA
$T_{STG}$	Storage Temperature Range	-65 to +150	$^{\circ}C$
$T_L$	Lead Temperature, 1 mm from Case for 10 Seconds	260	$^{\circ}C$
$T_J$	Junction Temperature Under Bias	+150	$^{\circ}C$
MSL	Moisture Sensitivity	Level 1	
$F_R$	Flammability Rating Oxygen Index: 28 to 34	UL 94 V-0 @ 0.125 in	
$V_{ESD}$	ESD Withstand Voltage (Note 2) Human Body Model Charged Device Model	2000 2000	V
$I_{LATCHUP}$	Latchup Performance (Note 3)	$\pm 100$	mA

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Applicable to devices with outputs that may be tri-stated.
2. HBM tested to EIA/JESD22-A114-A. CDM tested to JESD22-C101-A. JEDEC recommends that ESD qualification to EIA/JESD22-A115A (Machine Model) be discontinued.
3. Tested to EIA/JESD78 Class II.

## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
$V_{CC}$	Positive DC Supply Voltage	1.65	5.5	V
$V_{IN}$	Digital Input Voltage	0	5.5	V
$V_{OUT}$	Output Voltage Active Mode (High or Low State) Tri-State Mode (Note 4) Power Down Mode ( $V_{CC} = 0$ V)	0 0 0	$V_{CC}$ 5.5 5.5	V
$T_A$	Operating Free-Air Temperature	-55	+125	$^{\circ}C$
$t_r, t_f$	Input Transition Rise or Fall Rate $V_{CC} = 1.65$ V to 1.95 V $V_{CC} = 2.3$ V to 2.7 V $V_{CC} = 3.0$ V to 3.6 V $V_{CC} = 4.5$ V to 5.5 V	0 0 0 0	20 20 10 5	nS/V

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

4. Applicable to devices with outputs that may be tri-stated.

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## DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Conditions	V <sub>CC</sub> (V)	T <sub>A</sub> = 25°C			T <sub>A</sub> = -55°C to +125°C		Unit
				Min	Typ	Max	Min	Max	
V <sub>IH</sub>	High-Level Input Voltage		1.65 to 1.95	0.65 × V <sub>CC</sub>	-	-	0.65 × V <sub>CC</sub>	-	V
			2.3 to 5.5	0.70 × V <sub>CC</sub>	-	-	-	-	
V <sub>IL</sub>	Low-Level Input Voltage		1.65 to 1.95	-	-	0.35 × V <sub>CC</sub>	-	0.35 × V <sub>CC</sub>	V
			2.3 to 5.5	-	-	0.30 × V <sub>CC</sub>	-	0.30 × V <sub>CC</sub>	
V <sub>OH</sub>	High-Level Output Voltage	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> I <sub>OH</sub> = -100 μA I <sub>OH</sub> = -4 mA I <sub>OH</sub> = -8 mA I <sub>OH</sub> = -12 mA I <sub>OH</sub> = -16 mA I <sub>OH</sub> = -24 mA I <sub>OH</sub> = -32 mA	1.65 to 5.5	V <sub>CC</sub> - 0.1	V <sub>CC</sub>	-	V <sub>CC</sub> - 0.1	-	V
			1.65	1.29	1.4	-	1.29	-	
			2.3	1.9	2.1	-	1.9	-	
			2.7	2.2	2.4	-	2.2	-	
			3.0	2.4	2.7	-	2.4	-	
			3.0	2.3	2.5	-	2.3	-	
			4.5	3.8	4.0	-	3.8	-	
V <sub>OL</sub>	Low-Level Output Voltage	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> I <sub>OL</sub> = 100 μA I <sub>OL</sub> = 4 mA I <sub>OL</sub> = 8 mA I <sub>OL</sub> = 12 mA I <sub>OL</sub> = 16 mA I <sub>OL</sub> = 24 mA I <sub>OL</sub> = 32 mA	1.65 to 5.5	-	-	0.1	-	0.1	V
			1.65	-	0.08	0.24	-	0.24	
			2.3	-	0.2	0.3	-	0.3	
			2.7	-	0.22	0.4	-	0.4	
			3.0	-	0.28	0.4	-	0.4	
			3.0	-	0.38	0.55	-	0.55	
			4.5	-	0.42	0.55	-	0.55	
I <sub>IN</sub>	Input Leakage Current	V <sub>IN</sub> = 5.5 V or GND	1.65 to 5.5	-	-	±1.0	-	±10.0	μA
I <sub>OZ</sub>	3-State Output Leakage Current	V <sub>OUT</sub> = 0 V to 5.5 V	1.65 to 5.5	-	-	±1.0	-	±10.0	μA
I <sub>OFF</sub>	Power Off Leakage Current	V <sub>IN</sub> = 5.5 V or V <sub>OUT</sub> = 5.5 V	0	-	-	1.0	-	10	μA
I <sub>CC</sub>	Quiescent Supply Current	V <sub>IN</sub> = V <sub>CC</sub> or GND	5.5	-	-	5.0	-	50	μA

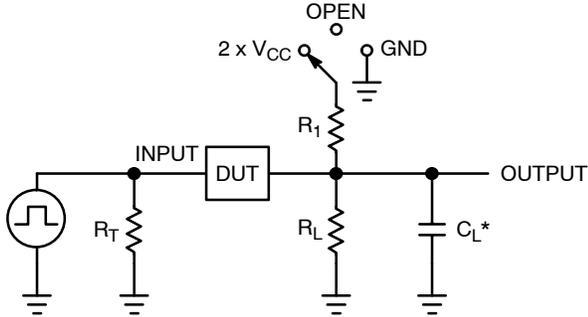
## AC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Conditions	V <sub>CC</sub> (V)	T <sub>A</sub> = 25°C			T <sub>A</sub> = -55°C to +125°C		Unit
				Min	Typ	Max	Min	Max	
t <sub>PLH</sub> , t <sub>PHL</sub>	Propagation Delay, A to Y (Figures 5 and 6)	R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF	1.65 to 1.95	-	13.0	21.0	-	22.0	ns
		R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF	2.3 to 2.7	-	6.9	10	-	11.0	
		R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF	3.0 to 3.6	-	4.8	6.5	-	7.5	
		R <sub>L</sub> = 500 Ω, C <sub>L</sub> = 50 pF		-	5.3	7.0	-	8.0	
		R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF	4.5 to 5.5	-	3.4	4.5	-	4.8	
		R <sub>L</sub> = 500 Ω, C <sub>L</sub> = 50 pF		-	3.8	5.0	-	5.3	
t <sub>PZH</sub> , t <sub>PZL</sub>	Output Enable Time, OE to Y (Figures 5 and 6)		1.65 to 1.95	-	12.4	23.0	-	24.0	ns
			2.3 to 2.7	-	6.7	10.5	-	12.0	
			3.0 to 3.6	-	4.6	7.0	-	8.5	
			4.5 to 5.5	-	3.3	5.5	-	5.8	
t <sub>PHZ</sub> , t <sub>PLZ</sub>	Output Disable Time, OE to Y (Figures 5 and 6)		1.65 to 1.95	-	9.0	14.5	-	15.0	ns
			2.3 to 2.7	-	5.2	8.0	-	8.5	
			3.0 to 3.6	-	4.2	7.0	-	7.5	
			4.5 to 5.5	-	2.8	5.5	-	6.0	

CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Test Conditions	Typical (T <sub>A</sub> = 25°C)	Unit
C <sub>IN</sub>	Input Capacitance	V <sub>CC</sub> = 5.5 V, V <sub>IN</sub> = 0 V or V <sub>CC</sub>	2.5	pF
C <sub>OUT</sub>	Output Capacitance	V <sub>CC</sub> = 5.5 V, V <sub>IN</sub> = 0 V or V <sub>CC</sub>	2.5	pF
C <sub>PD</sub>	Power Dissipation Capacitance (Note 5)	10 MHz, V <sub>CC</sub> = 3.3 V, V <sub>IN</sub> = 0 V or V <sub>CC</sub>	9	pF
		10 MHz, V <sub>CC</sub> = 5.5 V, V <sub>IN</sub> = 0 V or V <sub>CC</sub>	11	

5. C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the dynamic operating current consumption without load. Average operating current can be obtained by the equation I<sub>CC(OPR)</sub> = C<sub>PD</sub> × V<sub>CC</sub> × f<sub>in</sub> + I<sub>CC</sub>. C<sub>PD</sub> is used to determine the no-load dynamic power consumption: P<sub>D</sub> = C<sub>PD</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>in</sub> + I<sub>CC</sub> × V<sub>CC</sub>.



C<sub>L</sub> includes probe and jig capacitance  
 R<sub>T</sub> is Z<sub>OUT</sub> of pulse generator (typically 50 Ω)  
 f = 1 MHz

Test	Switch Position	C <sub>L</sub> (pF)	R <sub>L</sub> (Ω)	R <sub>1</sub> (Ω)
t <sub>PLH</sub> /t <sub>PHL</sub>	Open	See AC Characteristics Table		
t <sub>PLZ</sub> /t <sub>PZL</sub>	2 × V <sub>CC</sub>	50	500	500
t <sub>PHZ</sub> /t <sub>PZH</sub>	GND	50	500	500

Figure 5. Test Circuit

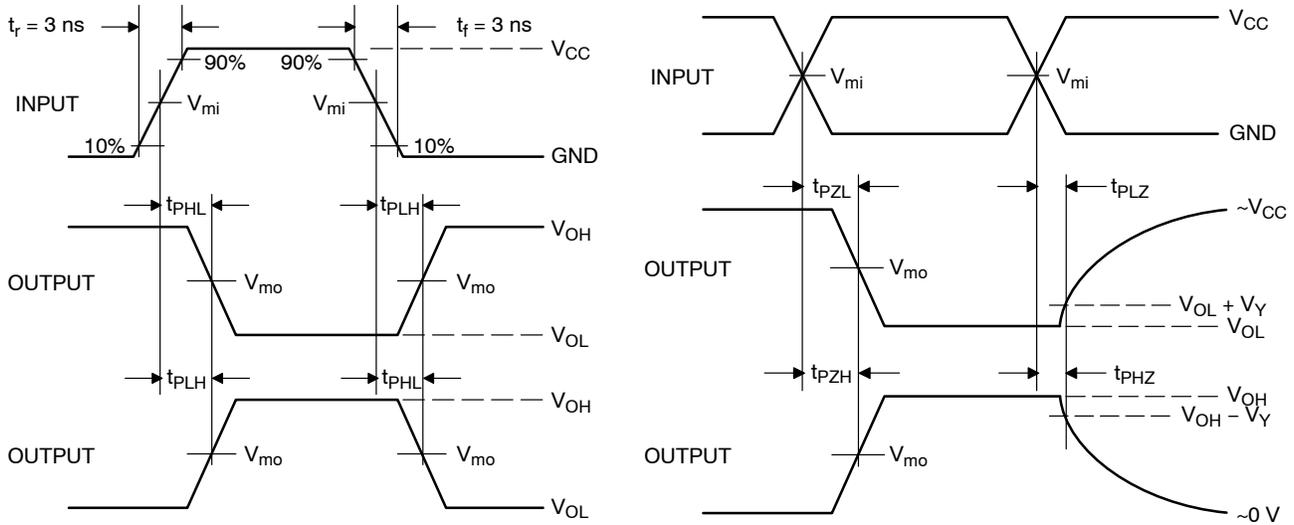


Figure 6. Switching Waveforms

V <sub>CC</sub> (V)	V <sub>mi</sub> (V)	V <sub>mo</sub> (V)	V <sub>Y</sub> (V)
1.65 to 1.95	V <sub>CC</sub> /2	V <sub>CC</sub> /2	0.15
2.3 to 2.7	V <sub>CC</sub> /2	V <sub>CC</sub> /2	0.15
3.0 to 3.6	V <sub>CC</sub> /2	V <sub>CC</sub> /2	0.3
4.5 to 5.5	V <sub>CC</sub> /2	V <sub>CC</sub> /2	0.3

# NLV68SZ126

## ORDERING INFORMATION

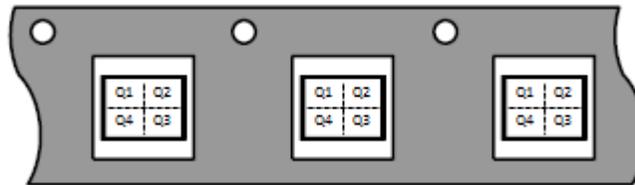
Device	Package	Marking	Pin 1 Orientation (See below)	Shipping <sup>†</sup>
NLV68SZ126MN2TWG	QFN20, 2.5 x 3.5, 0.4P	Z126	Q1	3000 / Tape & Reel
NLV68SZ126DTR2G (Contact ON Semiconductor)	TSSOP-20	TBD	Q1	2500 / Tape & Reel

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

\*NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable.

### Pin 1 Orientation in Tape and Reel

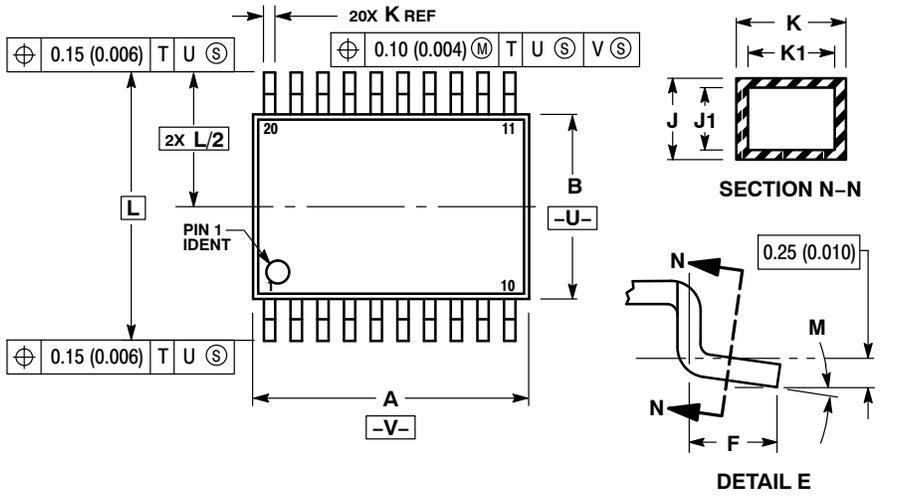
Direction of Feed



# NLV68SZ126

## PACKAGE DIMENSIONS

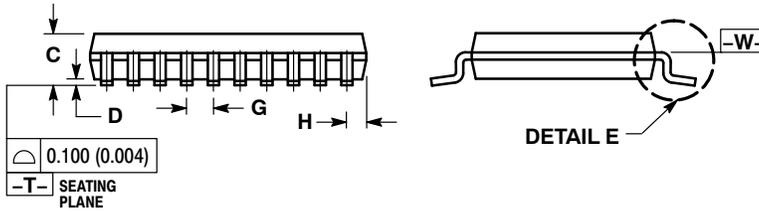
TSSOP-20 WB  
CASE 948E  
ISSUE D



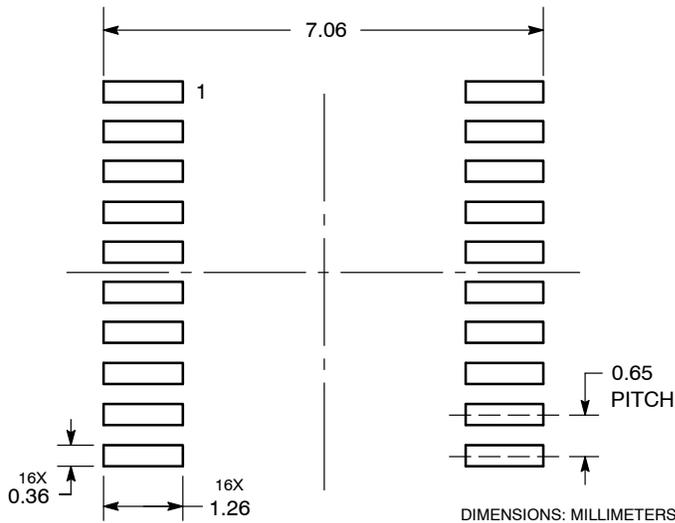
NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
7. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -U-.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	6.40	6.60	0.252	0.260
B	4.30	4.50	0.169	0.177
C	---	1.20	---	0.047
D	0.05	0.15	0.002	0.006
F	0.50	0.75	0.020	0.030
G	0.65 BSC		0.026 BSC	
H	0.27	0.37	0.011	0.015
J	0.09	0.20	0.004	0.008
J1	0.09	0.16	0.004	0.006
K	0.19	0.30	0.007	0.012
K1	0.19	0.25	0.007	0.010
L	6.40 BSC		0.252 BSC	
M	0°	8°	0°	8°



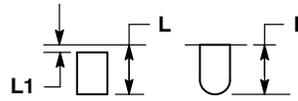
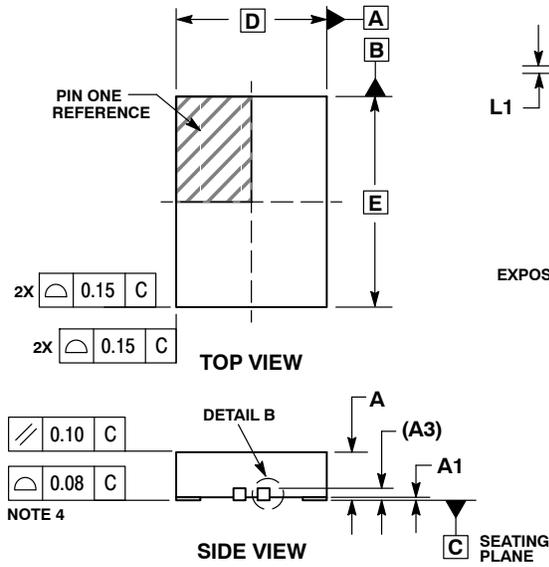
### SOLDERING FOOTPRINT



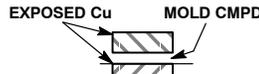
# NLV68SZ126

## PACKAGE DIMENSIONS

QFN20, 2.5x3.5, 0.4P  
CASE 485CB  
ISSUE O



**DETAIL A**  
ALTERNATE TERMINAL  
CONSTRUCTIONS

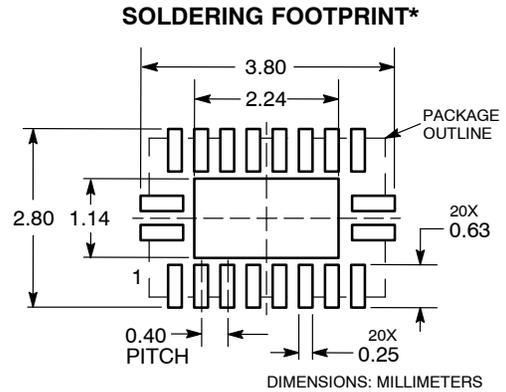
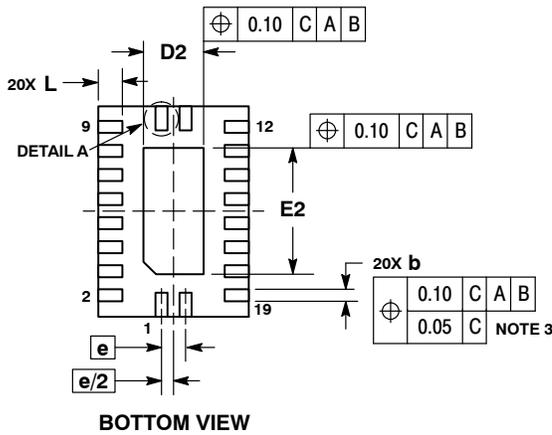


**DETAIL B**  
ALTERNATE  
CONSTRUCTIONS

**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSIONS b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 MM FROM TERMINAL TIP.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

DIM	MILLIMETERS	
	MIN	MAX
A	0.80	1.00
A1	0.00	0.05
A3	0.20 REF	
b	0.15	0.25
D	2.50 BSC	
D2	0.90	1.10
E	3.50 BSC	
e	0.40 BSC	
L	0.35	0.45
L1	---	0.15



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

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Phone: 00421 33 790 2910

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