

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

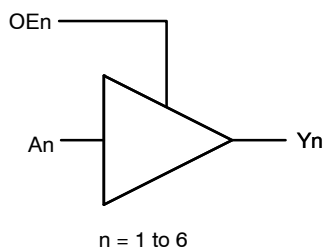


Figure 1. Logic Diagram

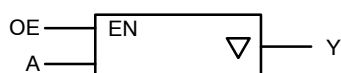


Figure 2. Channel Logic Symbol

FUNCTION TABLE

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

X = Don't Care



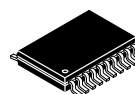
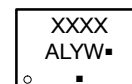
ON Semiconductor®

www.onsemi.com

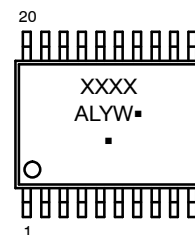
MARKING DIAGRAMS



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.

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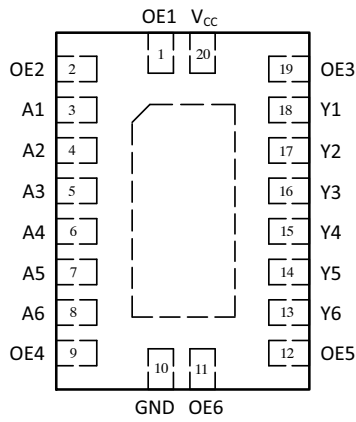


Figure 3. QFN Pinout (Top Through View)

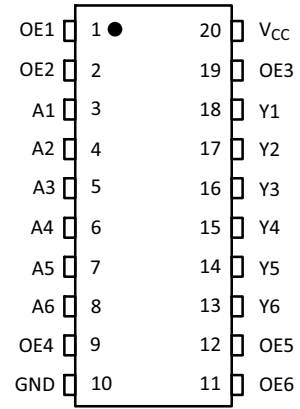


Figure 4. TSSOP Pinout (Top View)

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 _{CC} | Power | Positive Supply |

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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 | ± 50 | mA |
| I_{CC} or I_{GND} | DC Supply Current Per Supply Pin or Ground Pin | ± 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) | ± 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 _{CC} (V) | T _A = 25°C | | | T _A = -55°C to +125°C | | Unit |
|------------------|--------------------------------|---|---------------------|------------------------|-----------------|------------------------|----------------------------------|------------------------|------|
| | | | | Min | Typ | Max | Min | Max | |
| V _{IH} | High-Level Input Voltage | | 1.65 to 1.95 | 0.65 × V _{CC} | - | - | 0.65 × V _{CC} | - | V |
| | | | 2.3 to 5.5 | 0.70 × V _{CC} | - | - | - | - | |
| V _{IL} | Low-Level Input Voltage | | 1.65 to 1.95 | - | - | 0.35 × V _{CC} | - | 0.35 × V _{CC} | V |
| | | | 2.3 to 5.5 | - | - | 0.30 × V _{CC} | - | 0.30 × V _{CC} | |
| V _{OH} | High-Level Output Voltage | V _{IN} = V _{IH} or V _{IL} I _{OH} = -100 μA I _{OH} = -4 mA I _{OH} = -8 mA I _{OH} = -12 mA I _{OH} = -16 mA I _{OH} = -24 mA I _{OH} = -32 mA | 1.65 to 5.5 | V _{CC} - 0.1 | V _{CC} | - | V _{CC} - 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 _{OL} | Low-Level Output Voltage | V _{IN} = V _{IH} or V _{IL} I _{OL} = 100 μA I _{OL} = 4 mA I _{OL} = 8 mA I _{OL} = 12 mA I _{OL} = 16 mA I _{OL} = 24 mA I _{OL} = 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 _{IN} | Input Leakage Current | V _{IN} = 5.5 V or GND | 1.65 to 5.5 | - | - | ±1.0 | - | ±10.0 | μA |
| I _{OZ} | 3-State Output Leakage Current | V _{OUT} = 0 V to 5.5 V | 1.65 to 5.5 | - | - | ±1.0 | - | ±10.0 | μA |
| I _{OFF} | Power Off Leakage Current | V _{IN} = 5.5 V or V _{OUT} = 5.5 V | 0 | - | - | 1.0 | - | 10 | μA |
| I _{CC} | Quiescent Supply Current | V _{IN} = V _{CC} or GND | 5.5 | - | - | 5.0 | - | 50 | μA |

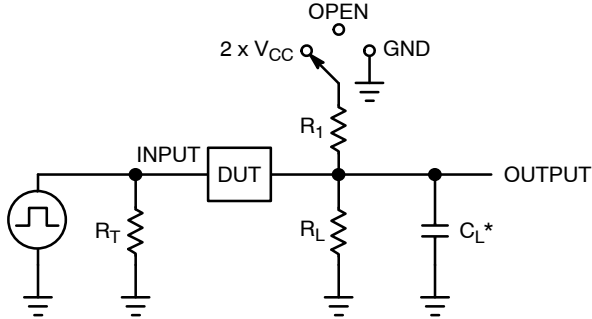
AC ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | Conditions | V _{CC} (V) | T _A = 25°C | | | T _A = -55°C to +125°C | | Unit |
|-------------------------------------|--|--|---------------------|-----------------------|------|------|----------------------------------|------|------|
| | | | | Min | Typ | Max | Min | Max | |
| t _{PLH} , t _{PHL} | Propagation Delay, A to Y (Figures 5 and 6) | R _L = 1 MΩ, C _L = 15 pF | 1.65 to 1.95 | - | 13.0 | 21.0 | - | 22.0 | ns |
| | | R _L = 1 MΩ, C _L = 15 pF | 2.3 to 2.7 | - | 6.9 | 10 | - | 11.0 | |
| | | R _L = 1 MΩ, C _L = 15 pF | 3.0 to 3.6 | - | 4.8 | 6.5 | - | 7.5 | |
| | | R _L = 500 Ω, C _L = 50 pF | | - | 5.3 | 7.0 | - | 8.0 | |
| | | R _L = 1 MΩ, C _L = 15 pF | 4.5 to 5.5 | - | 3.4 | 4.5 | - | 4.8 | |
| | | R _L = 500 Ω, C _L = 50 pF | | - | 3.8 | 5.0 | - | 5.3 | |
| t _{PZH} , t _{PZL} | 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 _{PHZ} , t _{PLZ} | 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 _A = 25°C) | Unit |
|------------------|--|---|---------------------------------|------|
| C _{IN} | Input Capacitance | V _{CC} = 5.5 V, V _{IN} = 0 V or V _{CC} | 2.5 | pF |
| C _{OUT} | Output Capacitance | V _{CC} = 5.5 V, V _{IN} = 0 V or V _{CC} | 2.5 | pF |
| C _{PD} | Power Dissipation Capacitance (Note 5) | 10 MHz, V _{CC} = 3.3 V, V _{IN} = 0 V or V _{CC} | 9 | pF |
| | | 10 MHz, V _{CC} = 5.5 V, V _{IN} = 0 V or V _{CC} | 11 | |

5. C_{PD} 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_{CC(OPR)} = C_{PD} × V_{CC} × f_{in} + I_{CC}. C_{PD} is used to determine the no-load dynamic power consumption: P_D = C_{PD} × V_{CC}² × f_{in} + I_{CC} × V_{CC}.



C_L includes probe and jig capacitance
 R_T is Z_{OUT} of pulse generator (typically 50 Ω)
 f = 1 MHz

| Test | Switch Position | C _L (pF) | R _L (Ω) | R ₁ (Ω) |
|------------------------------------|---------------------|------------------------------|--------------------|--------------------|
| t _{PLH} /t _{PHL} | Open | See AC Characteristics Table | | |
| t _{PLZ} /t _{PZL} | 2 × V _{CC} | 50 | 500 | 500 |
| t _{PHZ} /t _{PZH} | GND | 50 | 500 | 500 |

Figure 5. Test Circuit

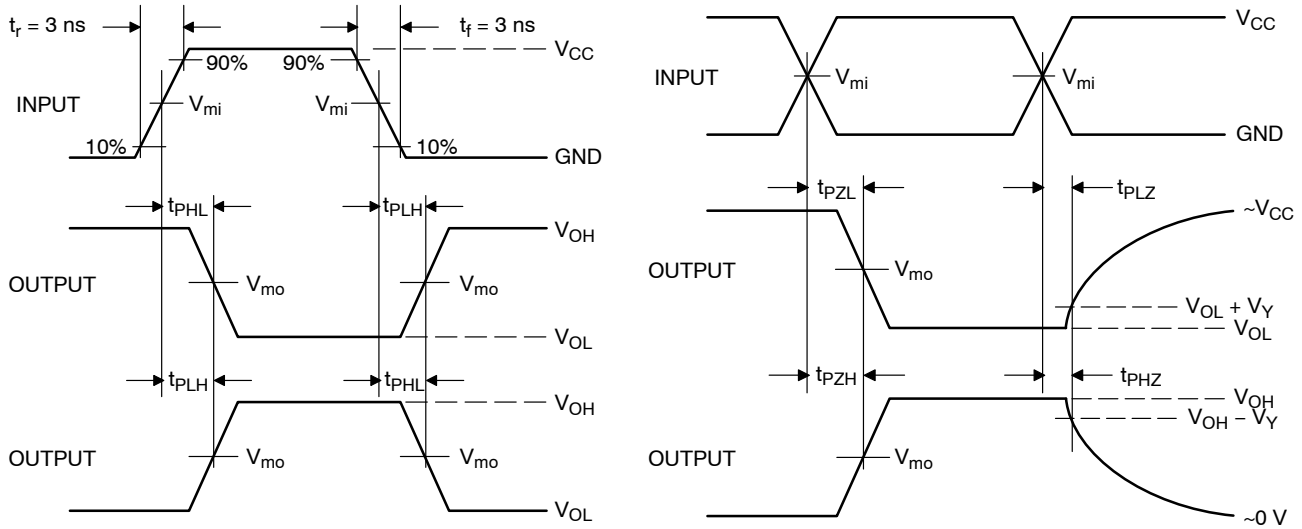


Figure 6. Switching Waveforms

| V _{CC} (V) | V _{mi} (V) | V _{mo} (V) | V _Y (V) |
|---------------------|---------------------|---------------------|--------------------|
| 1.65 to 1.95 | V _{CC} /2 | V _{CC} /2 | 0.15 |
| 2.3 to 2.7 | V _{CC} /2 | V _{CC} /2 | 0.15 |
| 3.0 to 3.6 | V _{CC} /2 | V _{CC} /2 | 0.3 |
| 4.5 to 5.5 | V _{CC} /2 | V _{CC} /2 | 0.3 |

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ORDERING INFORMATION

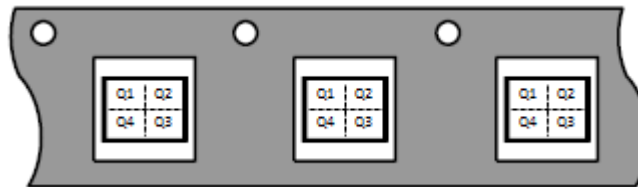
| Device | Package | Marking | Pin 1 Orientation (See below) | Shipping [†] |
|---|------------------------|---------|----------------------------------|-----------------------|
| NLV68SZ126MN2TWG | QFN20, 2.5 x 3.5, 0.4P | Z126 | Q1 | 3000 / Tape & Reel |
| NLV68SZ126DTR2G (Contact ON Semiconductor)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

[†]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

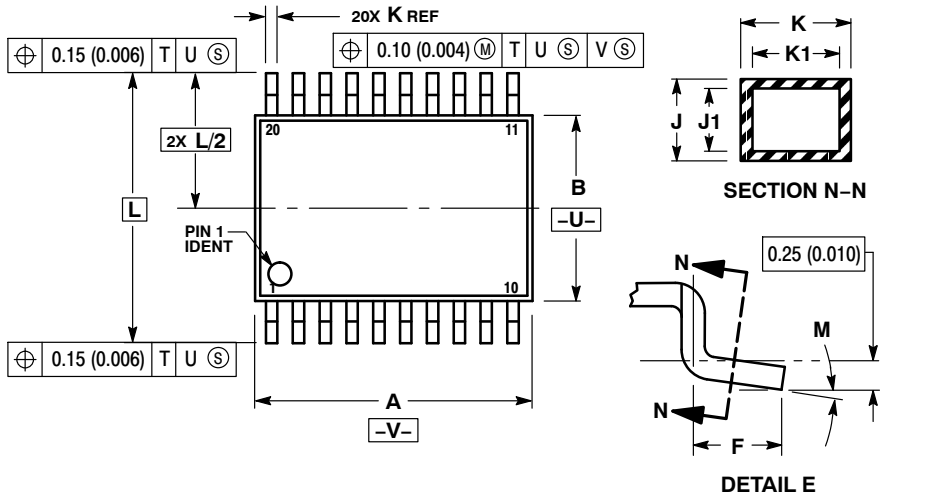
Direction of Feed



NLV68SZ126

PACKAGE DIMENSIONS

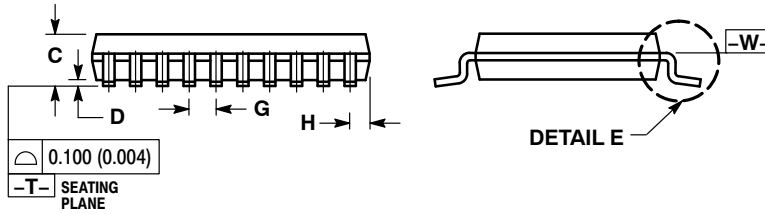
TSSOP-20 WB
CASE 948E
ISSUE D



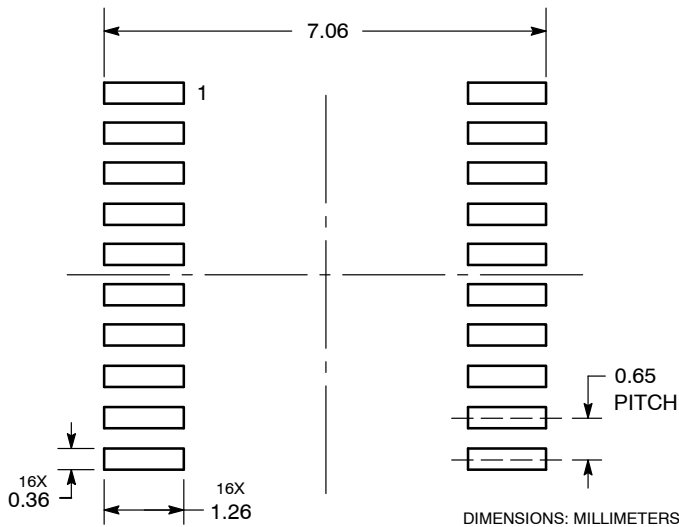
NOTES:

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° |



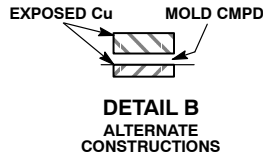
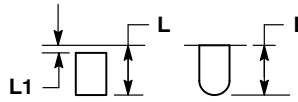
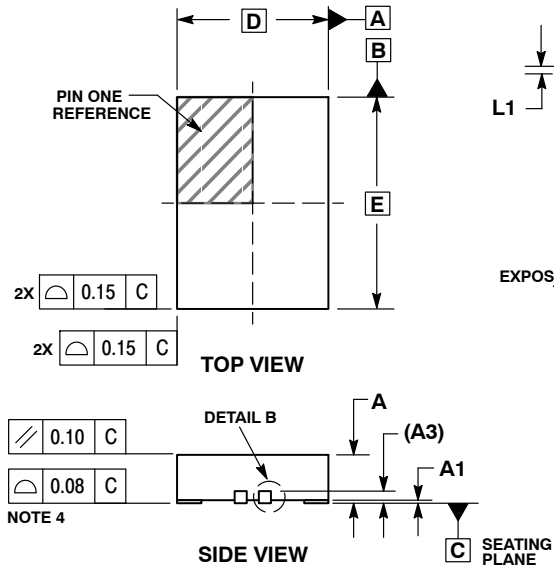
SOLDERING FOOTPRINT



NLV68SZ126

PACKAGE DIMENSIONS

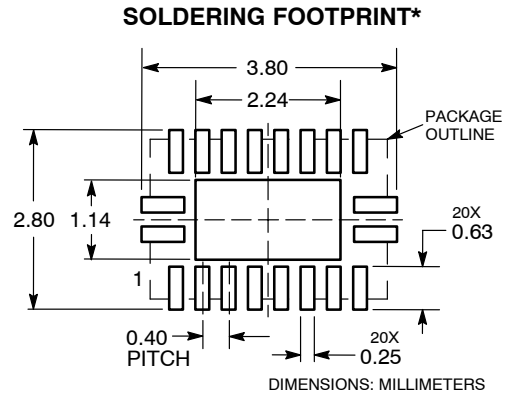
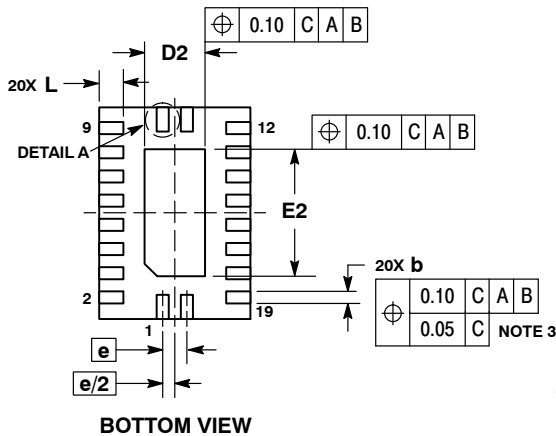
QFN20, 2.5x3.5, 0.4P
CASE 485CB
ISSUE O




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: 011 421 33 790 2910

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Phone: 00421 33 790 2910

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