

Dual Buffer with 3-State Outputs

NL27WZ125

The NL27WZ125 is a high performance dual noninverting buffer operating from a 1.65 V to 5.5 V supply.

Features

- Designed for 1.65 V to 5.5 V V_{CC} Operation
- 2.4 ns t_{PD} at $V_{CC} = 5$ V (typ)
- Inputs/Outputs Overvoltage Tolerant up to 5.5 V
- I_{OFF} Supports Partial Power Down Protection
- Source/Sink 24 mA at 3.0 V
- Available in US8, UDFN8 and UQFN8 Packages
- Chip Complexity < 100 FETs
- -Q Suffix 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

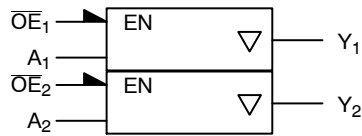
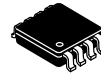
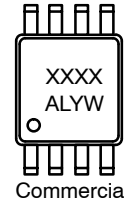


Figure 1. Logic Symbol

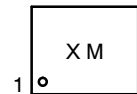
MARKING DIAGRAMS



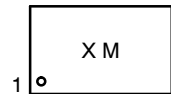
US8
US SUFFIX
CASE 493



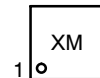
UDFN8, 1.45x1.0
MU3 SUFFIX
CASE 517BZ



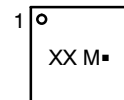
UDFN8, 1.95x1.0
MU1 SUFFIX
CASE 517CA



UQFN8, 1.4x1.2
MQ2 SUFFIX
CASE 523AS



UQFN8, 1.6x1.6
MQ1 SUFFIX
CASE 523AN



- X, XX, XXXX = Specific Device Code
- A = Assembly Location
- L = Lot Code
- Y = Year Code
- W = Week Code
- M = Date Code
- = Pb-Free Package

ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 7 of this data sheet.

NL27WZ125

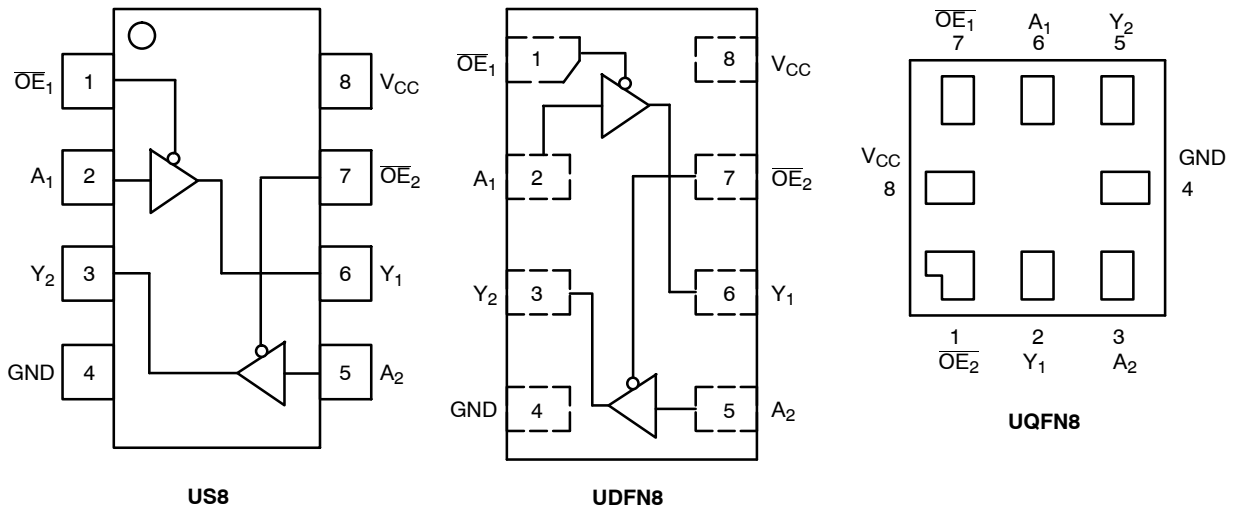


Figure 2. Pinout

PIN ASSIGNMENT (US8 / UDFN8)

| Pin | Function |
|-----|-------------------|
| 1 | \overline{OE}_1 |
| 2 | A_1 |
| 3 | Y_2 |
| 4 | GND |
| 5 | A_2 |
| 6 | Y_1 |
| 7 | \overline{OE}_2 |
| 8 | V_{CC} |

PIN ASSIGNMENT (UQFN8)

| Pin | Function |
|-----|-------------------|
| 1 | \overline{OE}_2 |
| 2 | Y_1 |
| 3 | A_2 |
| 4 | GND |
| 5 | Y_2 |
| 6 | A_1 |
| 7 | \overline{OE}_1 |
| 8 | V_{CC} |

FUNCTION TABLE

| Input | | Output |
|-------------------|-------|--------|
| \overline{OE}_n | A_n | Y_n |
| L | L | L |
| L | H | H |
| H | X | Z |

X = Don't Care
n = 1, 2

NL27WZ125

MAXIMUM RATINGS

| Symbol | Characteristics | Value | Unit |
|-------------------------------------|--|---|------|
| V _{CC} | DC Supply Voltage | -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 | °C |
| T _L | Lead Temperature, 1 mm from Case for 10 secs | 260 | °C |
| T _J | Junction Temperature Under Bias | +150 | °C |
| θ _{JA} | Thermal Resistance (Note 2) US8 UQFN8 UDFN8 | 250 210 231 | °C/W |
| P _D | Power Dissipation in Still Air US8 UQFN8 UDFN8 | 500 595 541 | mW |
| 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 3) Human Body Model Charged Device Model | 2000 1000 | V |
| I _{Latchup} | Latchup Performance (Note 4) | ±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. Measured with minimum pad spacing on an FR4 board, using 10mm-by-1inch, 2 ounce copper trace no air flow per JESD51-7.
3. HBM tested to ANSI/ESDA/JEDEC JS-001-2017. CDM tested to EIA/JESD22-C101-F. JEDEC recommends that ESD qualification to EIA/JESD22-A115-A (Machine Model) be discontinued per JEDEC/JEP172A.
4. Tested to EIA/JESD78 Class II.

RECOMMENDED OPERATING CONDITIONS

| Symbol | Characteristics | Min | Max | Unit |
|---------------------------------|--|------------------|-------------------------------|------|
| V _{CC} | Positive DC Supply Voltage | 1.65 | 5.5 | V |
| V _{IN} | DC Input Voltage | 0 | 5.5 | 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 0 0 | V _{CC} 5.5 5.5 | |
| T _A | Operating Temperature Range | -55 | +125 | °C |
| t _r , t _f | Input Rise and Fall Time 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.

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DC ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | Condition | V _{CC} (V) | T _A = 25°C | | | -55°C ≤ T _A ≤ 125°C | | Units |
|------------------|---------------------------|---|------------------------|------------------------|-----------------|------------------------|--------------------------------|------------------------|-------|
| | | | | Min | Typ | Max | Min | Max | |
| V _{IH} | High-Level Input Voltage | | 1.65 to 1.95 | 0.65 x V _{CC} | - | - | 0.65 x V _{CC} | - | V |
| | | | 2.3 to 5.5 | 0.70 x V _{CC} | - | - | 0.70 x V _{CC} | - | |
| V _{IL} | Low-Level Input Voltage | | 1.65 to 1.95 | - | - | 0.35 x V _{CC} | - | 0.35 x V _{CC} | V |
| | | | 2.3 to 5.5 | - | - | 0.30 x V _{CC} | - | 0.30 x 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 | - | - | ±0.1 | - | ±1.0 | 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 | - | - | 1.0 | - | 10 | μA |
| I _{OZ} | 3-State Output Leakage | V _{IN} = V _{IL} or V _{IH} V _{OUT} = 0 V to 5.5 V | 1.65 to 5.5 | - | - | ±0.5 | - | ±5 | μA |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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AC ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | V _{CC} (V) | Condition | T _A = 25°C | | | -55°C ≤ T _A ≤ 125°C | | Units |
|--|--------------------------------|------------------------|-------------------------------------|-----------------------|------|------|--------------------------------|------|-------|
| | | | | Min | Typ | Max | Min | Max | |
| t _{PLH} , t _{PHL} | Propagation Delay, A to Y | 1.65 to 1.95 | CL = 15 pF, RL = 1 MΩ R1 = Open | - | 6.0 | 12.0 | - | 13.0 | ns |
| | | 2.3 to 2.7 | | - | 3.5 | 7.5 | - | 8.0 | |
| | | 3.0 to 3.6 | | - | 2.6 | 5.2 | - | 5.5 | |
| | | 4.5 to 5.5 | | - | 2.0 | 4.5 | - | 4.8 | |
| | | 3.0 to 3.6 | CL = 50 pF, RL = 500 Ω R1 = Open | - | 3.0 | 5.7 | - | 6.0 | |
| | | 4.5 to 5.5 | | - | 2.4 | 5.0 | - | 5.3 | |
| t _{OSLH} , t _{OSHL} | Output to Output Skew | 3.0 to 3.6 | RL = 500 Ω, CL = 50 pF | - | 0.08 | 1.0 | - | 1.0 | ns |
| | | 4.5 to 5.5 | | - | 0.05 | 0.8 | - | 0.8 | |
| t _{PZH} , t _{PZL} | Output Enable Time, OE to Y | 1.65 to 1.95 | | - | 6.5 | 14.0 | - | 15.0 | ns |
| | | 2.3 to 2.7 | | - | 3.7 | 8.5 | - | 9.0 | |
| | | 3.0 to 3.6 | | - | 2.8 | 6.2 | - | 6.5 | |
| | | 4.5 to 5.5 | | - | 2.1 | 5.5 | - | 5.8 | |
| t _{PHZ} , t _{PLZ} | Output Enable Time, OE to Y | 1.65 to 1.95 | | - | 4.2 | 12.0 | - | 13.0 | ns |
| | | 2.3 to 2.7 | | - | 3.1 | 8.0 | - | 8.5 | |
| | | 3.0 to 3.6 | | - | 2.6 | 5.7 | - | 6.0 | |
| | | 4.5 to 5.5 | | - | 2.6 | 4.7 | - | 5.0 | |

CAPACITIVE CHARACTERISTICS

| Symbol | Parameter | Condition | Typical | Units |
|------------------|---|---|---------|-------|
| 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 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}.

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

Figure 3. Test Circuit

| 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} | $2 \times V_{CC}$ | 50 | 500 | 500 |
| t_{PHZ} / t_{PZH} | GND | 50 | 500 | 500 |

X = Don't Care

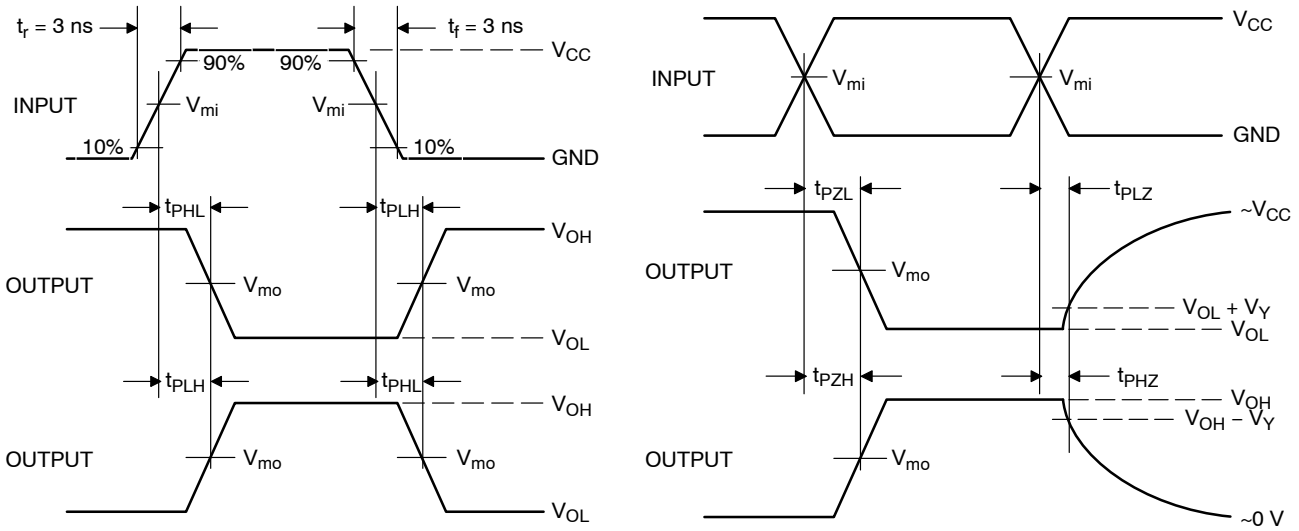


Figure 4. Switching Waveforms

| V_{CC} , V | V_{mi} , V | V_{mo} , V | | V_Y , V |
|--------------|--------------|-----------------------|---|-----------|
| | | t_{PLH} , t_{PHL} | t_{PZL} , t_{PLZ} , t_{PZH} , t_{PHZ} | |
| 1.65 to 1.95 | $V_{CC}/2$ | $V_{CC}/2$ | $V_{CC}/2$ | 0.15 |
| 2.3 to 2.7 | $V_{CC}/2$ | $V_{CC}/2$ | $V_{CC}/2$ | 0.15 |
| 3.0 to 3.6 | $V_{CC}/2$ | $V_{CC}/2$ | $V_{CC}/2$ | 0.3 |
| 4.5 to 5.5 | $V_{CC}/2$ | $V_{CC}/2$ | $V_{CC}/2$ | 0.3 |

NL27WZ125

DEVICE ORDERING INFORMATION

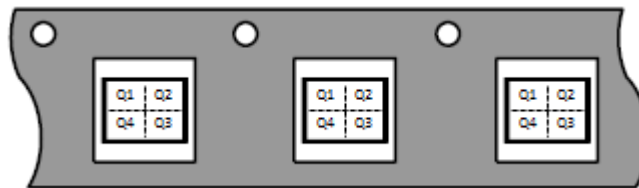
| Device | Packages | Specific Device Code | Pin 1 Orientation (See below) | Shipping [†] |
|--|--------------------------|----------------------|-------------------------------|-----------------------|
| NL27WZ125USG | US8 | M0 | Q4 | 3000 / Tape & Reel |
| NL27WZ125USG-Q* (Please contact onsemi) | US8 | M0 | Q4 | 3000 / Tape & Reel |
| NL27WZ125MQ1TCG (Please contact onsemi) | UQFN8, 1.6 x 1.6, 0.5P | TBD | TBD | 3000 / Tape & Reel |
| NL27WZ125MU1TCG (Please contact onsemi) | UDFN8, 1.95 x 1.0, 0.5P | TBD | TBD | 3000 / Tape & Reel |
| NL27WZ125MU3TCG (Please contact onsemi) | UDFN8, 1.45 x 1.0, 0.35P | TBD | TBD | 3000 / Tape & Reel |
| NL27WZ125MQ2TCG (Please contact onsemi) | UQFN8, 1.4 x 1.2, 0.4P | TBD | TBD | 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.

*-Q Suffix 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

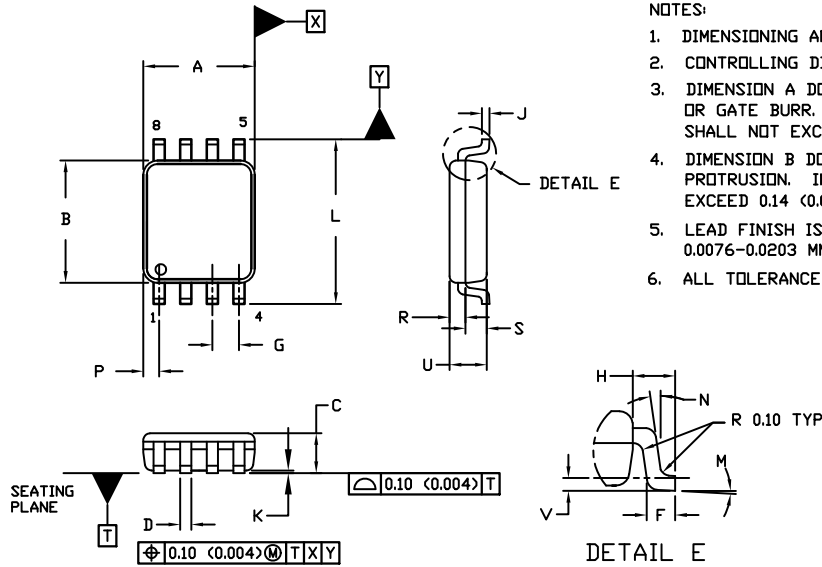
Direction of Feed



NL27WZ125

PACKAGE DIMENSIONS

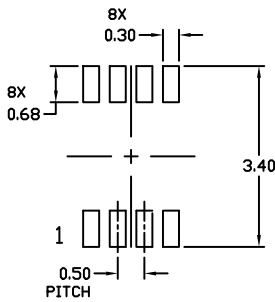
US8
CASE 493
ISSUE F



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSION, OR GATE BURR. MOLD FLASH, PROTRUSION, OR GATE BURR SHALL NOT EXCEED 0.14 (0.0055") PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH AND PROTRUSION SHALL NOT EXCEED 0.14 (0.0055") PER SIDE.
5. LEAD FINISH IS SOLDER PLATING WITH THICKNESS OF 0.0076-0.0203 MM (0.003-0.008").
6. ALL TOLERANCE UNLESS OTHERWISE SPECIFIED ±0.0508 MM (0.002").

| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|------|-----------|-------|
| | MIN. | MAX. | MIN. | MAX. |
| A | 1.90 | 2.10 | 0.075 | 0.083 |
| B | 2.20 | 2.40 | 0.087 | 0.094 |
| C | 0.60 | 0.90 | 0.024 | 0.035 |
| D | 0.17 | 0.25 | 0.007 | 0.010 |
| F | 0.20 | 0.35 | 0.008 | 0.014 |
| G | 0.50 BSC | | 0.020 BSC | |
| H | 0.40 REF | | 0.016 REF | |
| J | 0.10 | 0.18 | 0.004 | 0.007 |
| K | 0.00 | 0.10 | 0.000 | 0.004 |
| L | 3.00 | 3.25 | 0.118 | 0.128 |
| M | 0° | 6° | 0° | 6° |
| N | 0° | 10° | 0° | 10° |
| P | 0.23 | 0.34 | 0.010 | 0.013 |
| R | 0.23 | 0.33 | 0.009 | 0.013 |
| S | 0.37 | 0.47 | 0.015 | 0.019 |
| U | 0.60 | 0.80 | 0.024 | 0.031 |
| V | 0.12 BSC | | 0.005 BSC | |



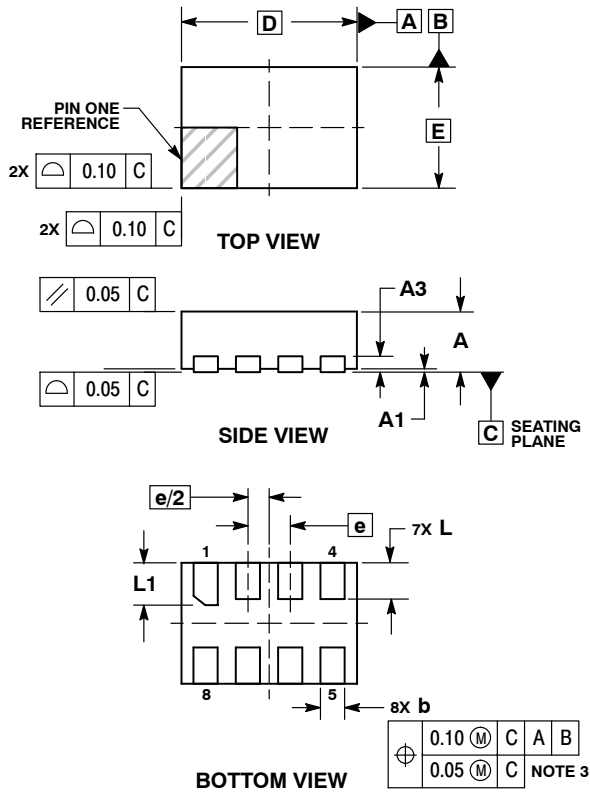
RECOMMENDED *
MOUNTING FOOTPRINT

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

NL27WZ125

PACKAGE DIMENSIONS

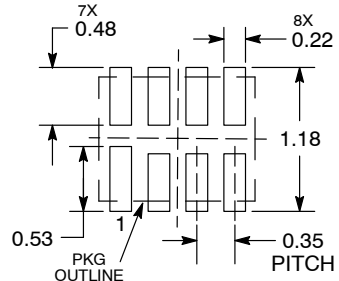
UDFN8, 1.45x1, 0.35P
CASE 517BZ
ISSUE O



- 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 0.15 AND 0.20 MM FROM TERMINAL TIP.
 4. PACKAGE DIMENSIONS EXCLUSIVE OF BURRS AND MOLD FLASH.

| MILLIMETERS | | |
|-------------|----------|------|
| DIM | MIN | MAX |
| A | 0.45 | 0.55 |
| A1 | 0.00 | 0.05 |
| A3 | 0.13 REF | |
| b | 0.15 | 0.25 |
| D | 1.45 BSC | |
| E | 1.00 BSC | |
| e | 0.35 BSC | |
| L | 0.25 | 0.35 |
| L1 | 0.30 | 0.40 |

RECOMMENDED SOLDERING FOOTPRINT*



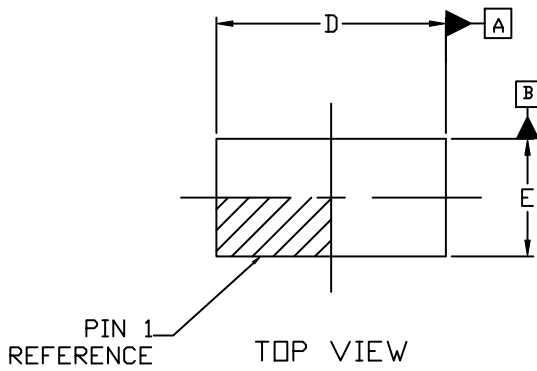
DIMENSIONS: MILLIMETERS

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

NL27WZ125

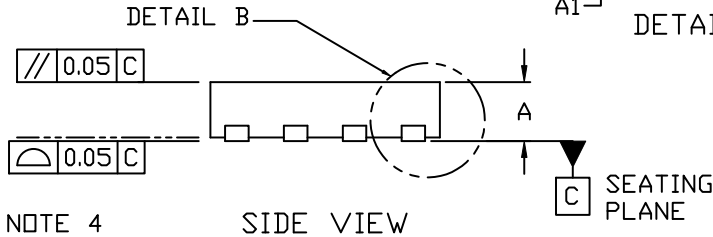
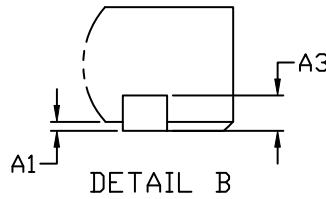
PACKAGE DIMENSIONS

UDFN8, 1.95x1.0, 0.5P
CASE 517CA
ISSUE A

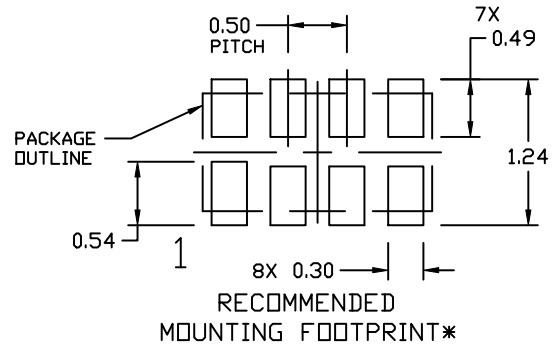
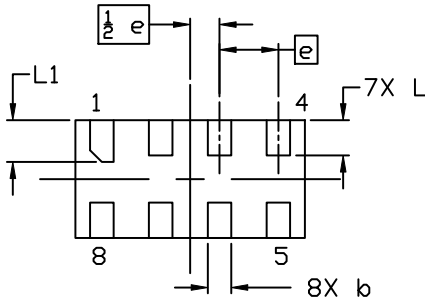


NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.20 MM FROM THE TERMINAL TIP.
4. COPLANARITY APPLIES TO ALL THE TERMINALS.
5. PACKAGE DIMENSIONS EXCLUSIVE OF BURRS AND MOLD FLASH.



| DIM | MILLIMETERS | | |
|-----|-------------|------|------|
| | MIN. | NOM. | MAX. |
| A | 0.45 | 0.50 | 0.55 |
| A1 | 0.00 | --- | 0.05 |
| A3 | 0.13 REF | | |
| b | 0.15 | 0.20 | 0.25 |
| D | 1.85 | 1.95 | 2.05 |
| E | 0.90 | 1.00 | 1.10 |
| e | 0.50 BSC | | |
| L | 0.25 | 0.30 | 0.35 |
| L1 | 0.30 | 0.35 | 0.40 |



| | | | | |
|---|------|---|---|---|
| ⊕ | 0.10 | C | A | B |
| | 0.05 | C | | |

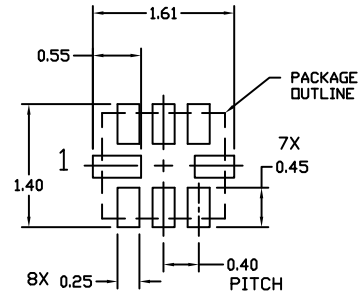
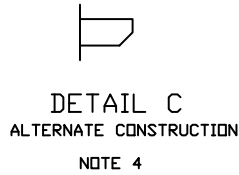
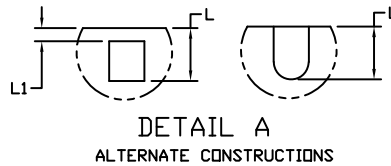
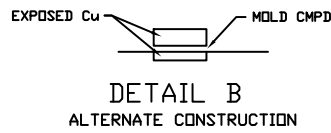
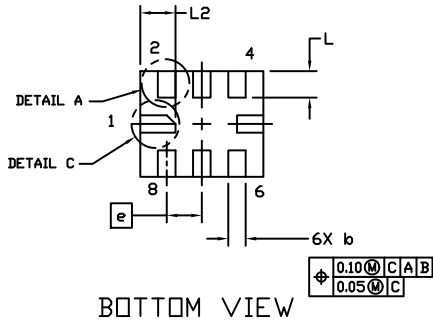
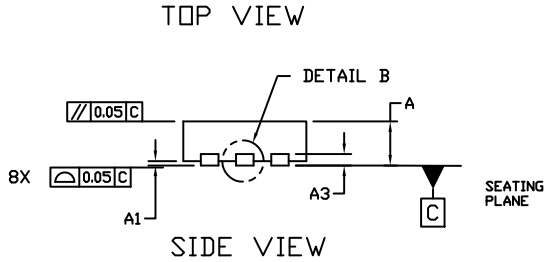
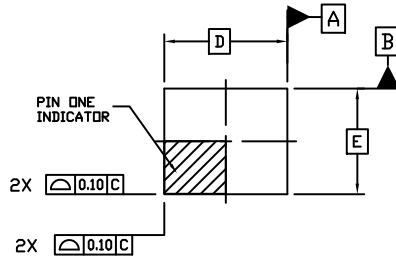
NOTE 3

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

NL27WZ125

PACKAGE DIMENSIONS

UQFN8, 1.40x1.20, 0.40P
CASE 523AS
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 0.15 AND 0.25MM FROM THE TERMINAL TIP.
4. REFER TO SPECIFIC DEVICE DATA SHEET FOR PIN 1 NOTCH LOCATION.

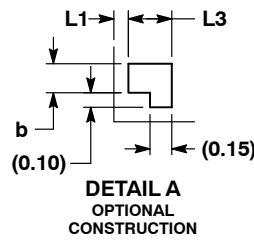
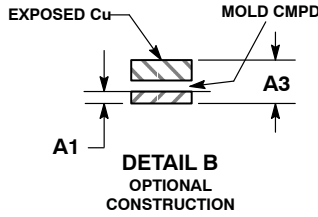
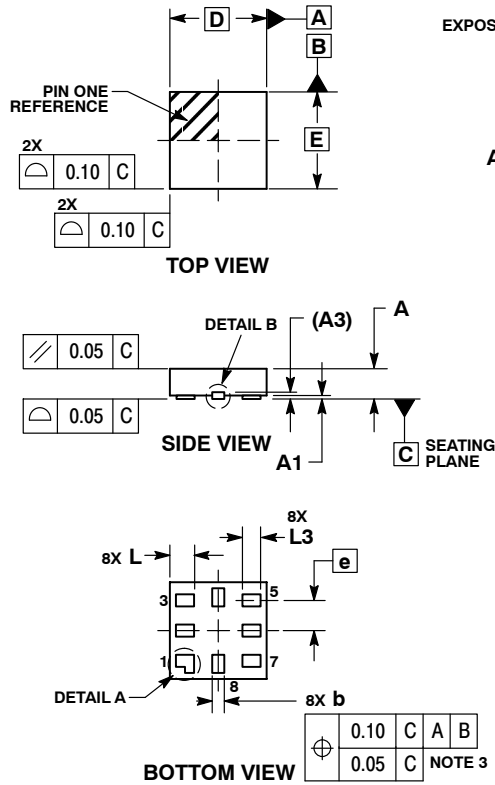
| DIM | MILLIMETERS | |
|-----|-------------|------|
| | MIN. | MAX. |
| A | 0.45 | 0.55 |
| A1 | 0.00 | 0.05 |
| A3 | 0.13 | REF |
| b | 0.15 | 0.25 |
| D | 1.40 | BSC |
| E | 1.20 | BSC |
| e | 0.40 | BSC |
| L | 0.20 | 0.40 |
| L1 | --- | 0.15 |
| L2 | 0.30 | 0.50 |

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

NL27WZ125

PACKAGE DIMENSIONS

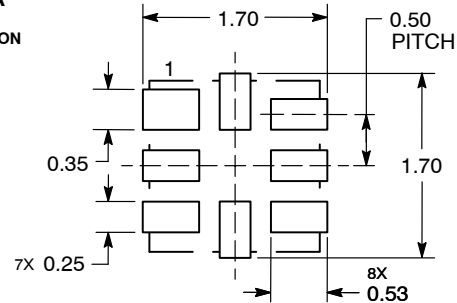
UQFN8, 1.6x1.6, 0.5P CASE 523AN ISSUE O



- 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 0.15 AND 0.30 mm FROM THE TERMINAL TIP.

| MILLIMETERS | | |
|-------------|------|------|
| DIM | MIN | MAX |
| A | 0.45 | 0.60 |
| A1 | 0.00 | 0.05 |
| A3 | 0.13 | REF |
| b | 0.15 | 0.25 |
| D | 1.60 | BSC |
| E | 1.60 | BSC |
| e | 0.50 | BSC |
| L | 0.35 | 0.45 |
| L1 | --- | 0.15 |
| L3 | 0.25 | 0.35 |

SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

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

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