# Dual 2-Input OR Gate

# NL27WZ32

The NL27WZ32 is a high performance dual 2−input OR Gate operating from a 1.65 V to 5.5 V supply.

**MARKING DIAGRAMS**

## Features

- Designed for 1.65 V to 5.5 V $V_{CC}$ Operation
- 2.5 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
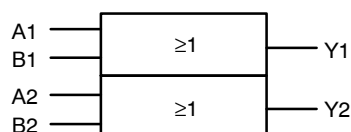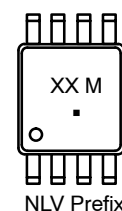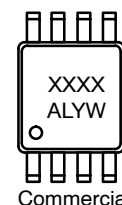- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant



**US8**
**US SUFFIX**
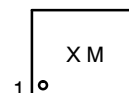**CASE 493**

XXXX
ALYW

Commercial

XX M

NLV Prefix

**UDFN8, 1.45x1.0**
**MU3 SUFFIX**
**CASE 517BZ**

X M
1

**UDFN8, 1.95x1.0**
**MU1 SUFFIX**
**CASE 517CA**

X M
1
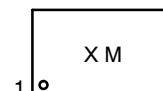
**UQFN8, 1.4x1.2**
**MQ2 SUFFIX**
**CASE 523AS**

XM
1

**UQFN8, 1.6x1.6**
**MQ1 SUFFIX**
**CASE 523AN**

1
XX M■
1     8
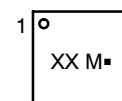
| | |
|---|---|
| X, XX, XXXX | = Specific Device Code |
| A | = Assembly Location |
| L | = Lot Code |
| Y | = Year Code |
| W | = Week Code |
| M | = Date Code |
| ■ | = Pb−Free Package |



**Figure 1. Logic Symbol**

A1
B1     ≥1     Y1
A2
B2     ≥1     Y2

## ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 6 of this data sheet.
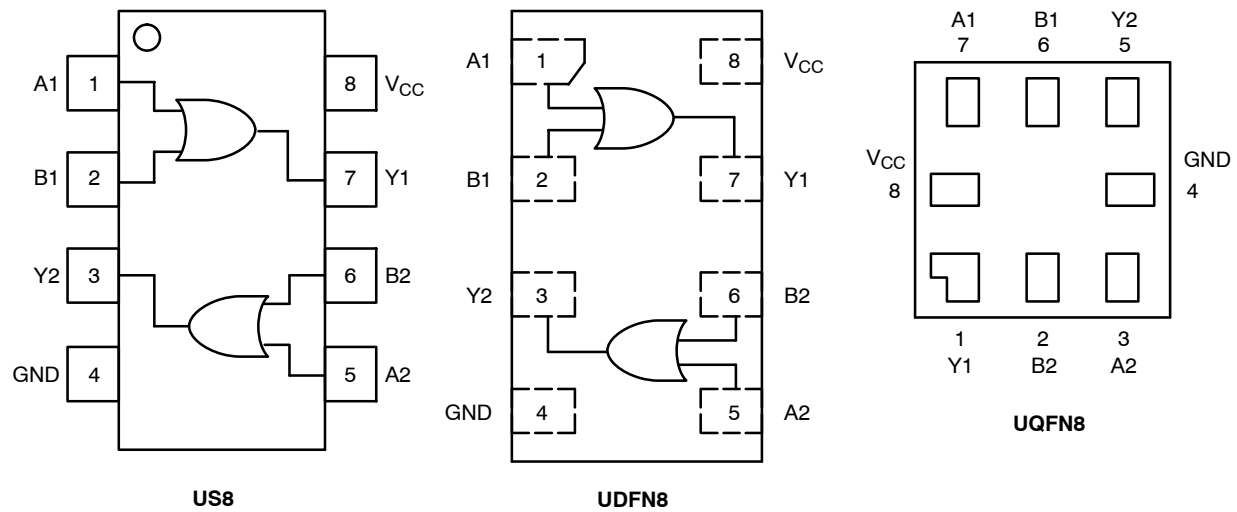
# NL27WZ32



**Figure 2. Pinout**

US8

UDFN8

UQFN8

| Pin | Function |
|-----|----------|
| 1 | A1 |
| 2 | B1 |
| 3 | Y2 |
| 4 | GND |
| 5 | A2 |
| 6 | B2 |
| 7 | Y1 |
| 8 | $V_{CC}$ |

**PIN ASSIGNMENT (US8 / UDFN8)**

| Pin | Function |
|-----|----------|
| 1 | Y1 |
| 2 | B2 |
| 3 | A2 |
| 4 | GND |
| 5 | Y2 |
| 6 | B1 |
| 7 | A1 |
| 8 | $V_{CC}$ |

**PIN ASSIGNMENT (UQFN8)**

**FUNCTION TABLE**

| Inputs | | Output Y = A + B |
|--------|--------|------------------|
| **A** | **B** | **Y** |
| L | L | L |
| L | H | H |
| H | L | H |
| H | H | H |

H = HIGH Logic Level
L = LOW Logic Level

**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)<br>Tri−State Mode (Note 1)<br>Power−Down Mode ($V_{CC}$ = 0 V) | −0.5 to $V_{CC}$ + 0.5<br>−0.5 to +6.5<br>−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 |
| $\theta_{JA}$ | Thermal Resistance  (Note 2) | US8<br>UQFN8<br>UDFN8 | 250<br>210<br>231 | °C/W |
| $P_D$ | Power Dissipation in Still Air | US8<br>UQFN8<br>UDFN8 | 500<br>595<br>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<br>Charged Device Model | 2000<br>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)<br>Tri−State Mode (Note 1)<br>Power−Down Mode ($V_{CC}$ = 0 V) | 0<br>0<br>0 | $V_{CC}$<br>5.5<br>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<br>$V_{CC}$ = 2.3 V to 2.7 V<br>$V_{CC}$ = 3.0 V to 3.6 V<br>$V_{CC}$ = 4.5 V to 5.5 V | 0<br>0<br>0<br>0 | 20<br>20<br>10<br>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.

# NL27WZ32

## DC ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | Condition | $V_{CC}$ (V) | $T_A = 25°C$ Min | $T_A = 25°C$ Typ | $T_A = 25°C$ Max | $-55°C ≤ T_A ≤ 125°C$ Min | $-55°C ≤ T_A ≤ 125°C$ Max | Units |
|---|---|---|---|---|---|---|---|---|---|
| $V_{IH}$ | 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 1.65 2.3 2.7 3.0 3.0 4.5 | $V_{CC} - 0.1$ 1.29 1.9 2.2 2.4 2.3 3.8 | $V_{CC}$ 1.4 2.1 2.4 2.7 2.5 4.0 | – – – – – – – | $V_{CC} - 0.1$ 1.29 1.9 2.2 2.4 2.3 3.8 | – – – – – – – | V |
| $V_{OL}$ | 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 1.65 2.3 2.7 3.0 3.0 4.5 | – – – – – – – | – 0.08 0.2 0.22 0.28 0.38 0.42 | 0.1 0.24 0.3 0.4 0.4 0.55 0.55 | – – – – – – – | 0.1 0.24 0.3 0.4 0.4 0.55 0.55 | V |
| $I_{IN}$ | 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 |

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.

## AC ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | $V_{CC}$ (V) | Test Conditions | $T_A = 25°C$ Min | $T_A = 25°C$ Typ | $T_A = 25°C$ Max | $T_A = -55$ to $125°C$ Min | $T_A = -55$ to $125°C$ Max | Units |
|---|---|---|---|---|---|---|---|---|---|
| $t_{PLH}$, $t_{PHL}$ | Propagation Delay, (A or B) to Y | 1.65 to 1.95 | $C_L = 15$ pF $R_L = 1$ MΩ $R_1 = $ Open | – | 8.0 | 9.5 | – | 10.5 | ns |
| | | 2.3 to 2.7 | | – | 3.5 | 5.8 | – | 6.2 | |
| | | 3.0 to 3.6 | | – | 2.6 | 3.9 | – | 4.3 | |
| | | 4.5 to 5.5 | | – | 1.9 | 3.1 | – | 3.3 | |
| | | 3.0 to 3.6 | $C_L = 50$ pF, $R_L = 500$ Ω, $R_1 = $ Open | – | 3.2 | 4.8 | – | 5.2 | |
| | | 4.5 to 5.5 | | – | 2.5 | 3.7 | – | 4.0 | |

## 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 $V_{CC}$ 10 MHz, $V_{CC} = 5.5$ V, $V_{IN} = 0$ V or $V_{CC}$ | 9 11 | pF |

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: $I_{CC(OPR)} = C_{PD} \cdot V_{CC} \cdot f_{in} + I_{CC}$. $C_{PD}$ is used to determine the no−load dynamic power consumption; $P_D = C_{PD} \cdot V_{CC}^2 \cdot f_{in} + I_{CC} \cdot V_{CC}$.

# NL27WZ32
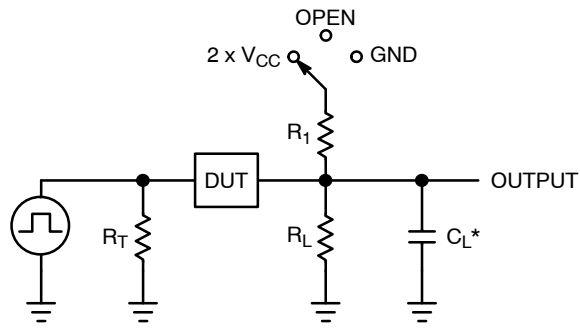


C_L includes probe and jig capacitance
$R_T$ is $Z_{OUT}$ of pulse generator (typically 50 $\Omega$)
f = 1 MHz

**Figure 3. Test Circuit**

| Test | Switch Position | C_L, pF | R_L, $\Omega$ | R_1, $\Omega$ |
|---|---|---|---|---|
| $t_{PLH}$ / $t_{PHL}$ | Open | See AC Characteristics Table | | |
| $t_{PLZ}$ / $t_{PZL}$ | 2 x $V_{CC}$ | 50 | 500 | 500 |
| $t_{PHZ}$ / $t_{PZH}$ | GND | 50 | 500 | 500 |

X = Don't Care
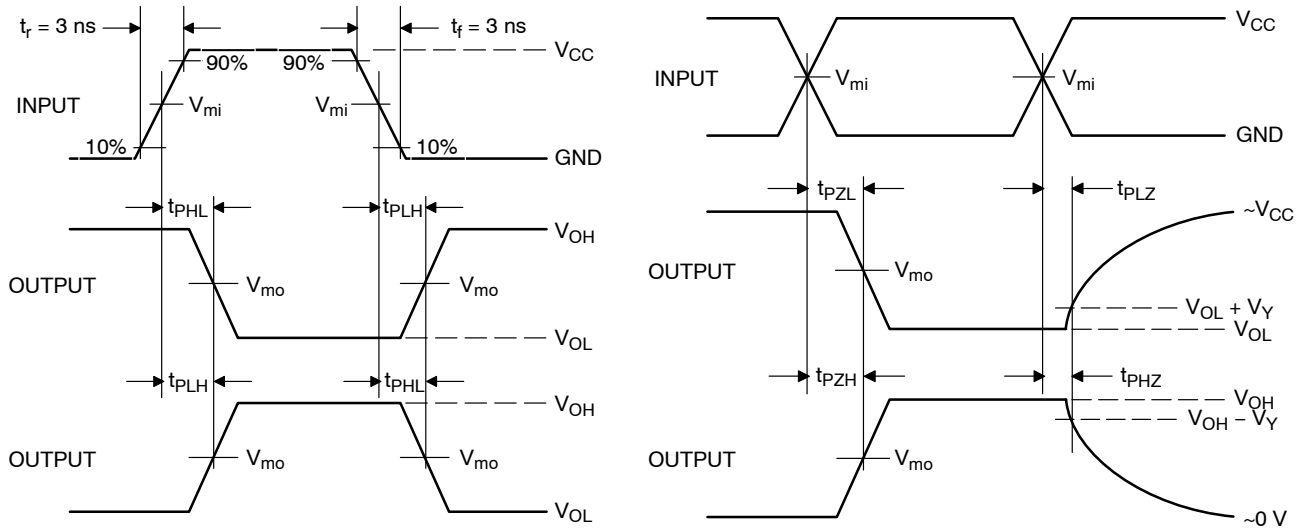


**Figure 4. Switching Waveforms**

| 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 |

**DEVICE ORDERING INFORMATION**

| Device | Packages | Specific Device Code | Pin 1 Orientation (See below) | Shipping† |
|---|---|---|---|---|
| NL27WZ32USG | US8 | L4 | Q4 | 3000 / Tape & Reel |
| NL27WZ32USG−Q* (Please contact **onsemi**) | US8 | L4 | Q4 | 3000 / Tape & Reel |
| NL27WZ32MQ1TCG (Please contact **onsemi**) | UQFN8, 1.6 x 1.6, 0.5P | TBD | TBD | 3000 / Tape & Reel |
| NL27WZ32MU1TCG (Please contact **onsemi**) | UDFN8, 1.95 x 1.0, 0.5P | AG | Q4 | 3000 / Tape & Reel |
| NL27WZ32MU3TCG (Please contact **onsemi**) | UDFN8, 1.45 x 1.0, 0.35P | TBD | TBD | 3000 / Tape & Reel |
| NL27WZ32MQ2TCG (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

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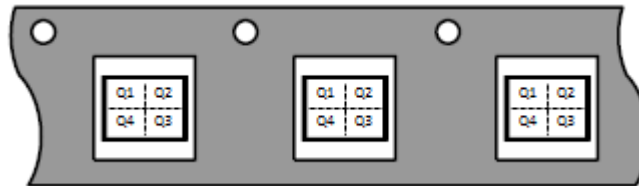
## PACKAGE DIMENSIONS

**US8**
**US SUFFIX**
CASE 493
ISSUE F
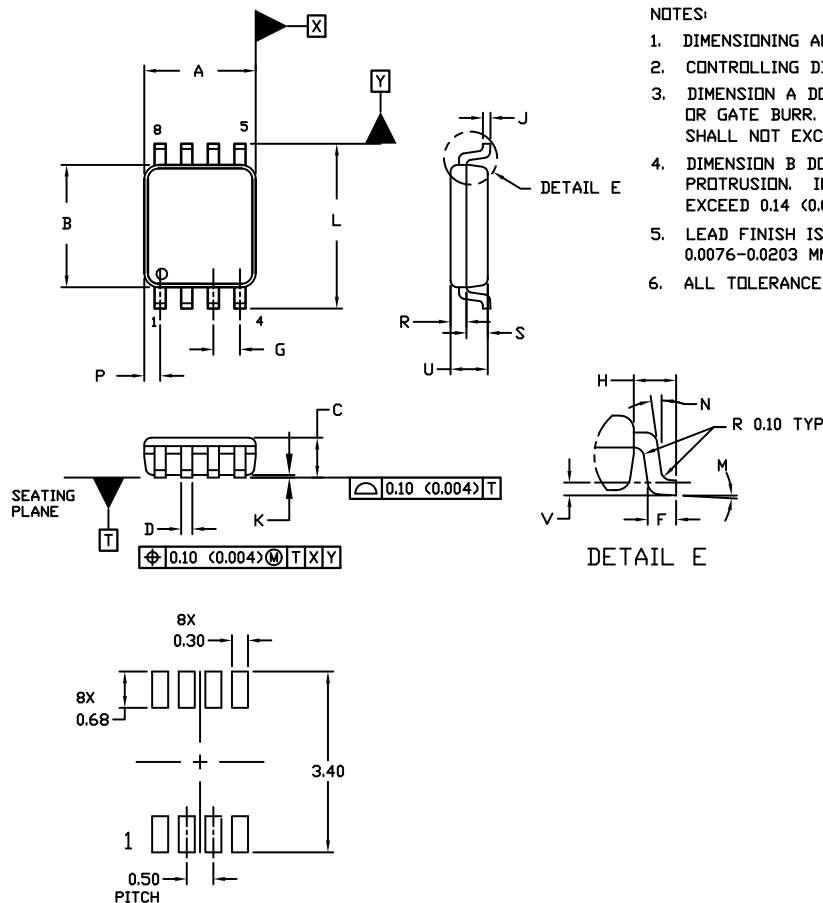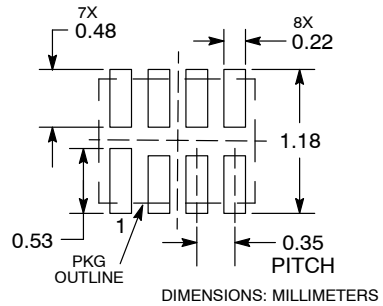
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSION, OR GATE BURR. MOLD FLASH, PROTRUSION, OR GATE BURR SHALL NOT EXCEED 0.14 (0.0055") PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. 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").



DETAIL E

| 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 ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

# NL27WZ32

## PACKAGE DIMENSIONS

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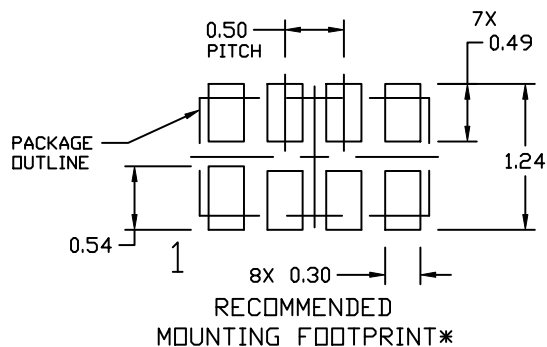CASE 517BZ
ISSUE O
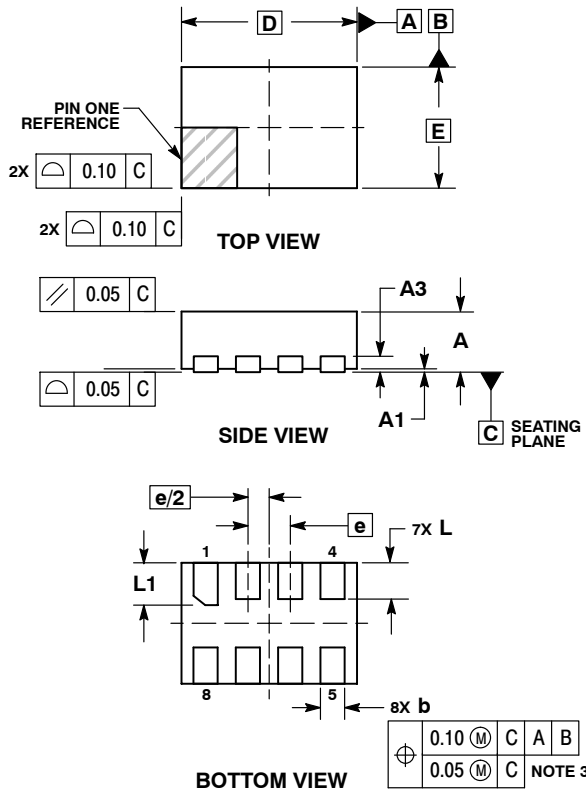


**TOP VIEW**

**SIDE VIEW**

**BOTTOM VIEW**

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.

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

### RECOMMENDED SOLDERING FOOTPRINT*
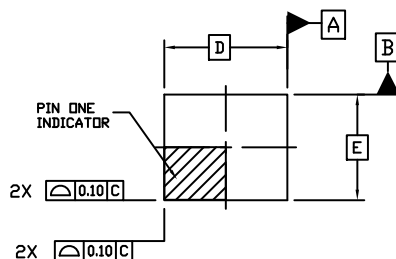


DIMENSIONS: MILLIMETERS

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

# NL27WZ32

## PACKAGE DIMENSIONS

**UDFN8, 1.95x1, 0.5P**
CASE 517CA
ISSUE A



PIN 1 REFERENCE

TOP VIEW

DETAIL B

//  0.05 C

⌒  0.05 C

NOTE 4        SIDE VIEW

DETAIL B

A3

A1        DETAIL B

SEATING PLANE
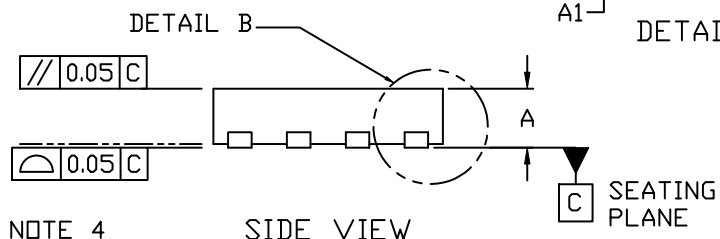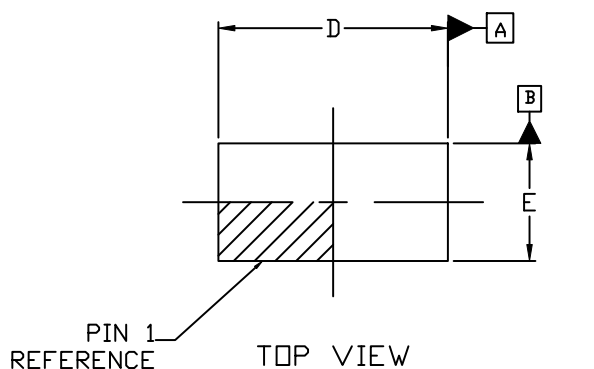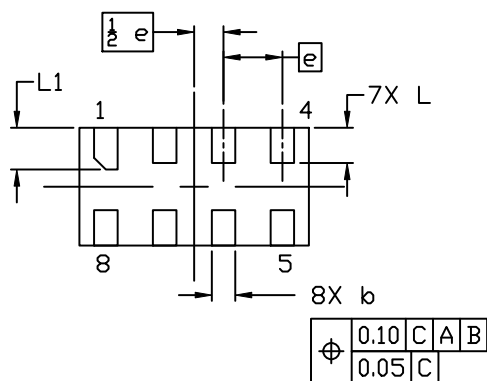
NOTES:

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 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 |

BOTTOM VIEW    NOTE 3

⊕  0.10 C A B
   0.05 C

RECOMMENDED 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.

# NL27WZ32

## PACKAGE DIMENSIONS

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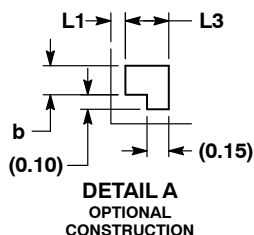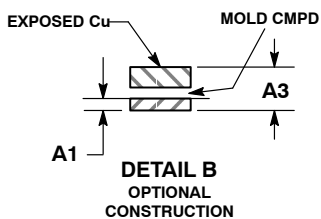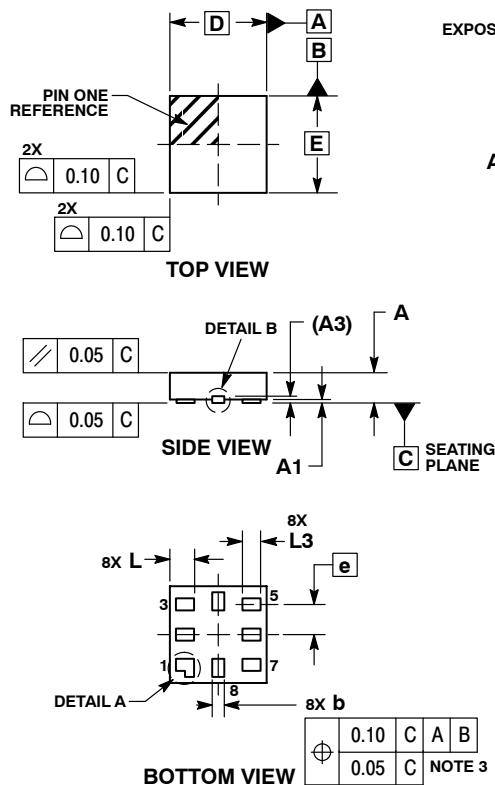
**TOP VIEW**

PIN ONE REFERENCE

2X
0.10 C

2X
0.10 C

0.05 C

0.05 C

DETAIL B

(A3)

**SIDE VIEW**

A1

A

C SEATING PLANE

8X L3

8X L

3  5

1  7

8

DETAIL A

e

8X b

**BOTTOM VIEW**

0.10 C A B

0.05 C  NOTE 3

**DETAIL B**
OPTIONAL CONSTRUCTION

EXPOSED Cu      MOLD CMPD

A3

A1

**DETAIL A**
OPTIONAL CONSTRUCTION

L1      L3

b

(0.10)      (0.15)

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.

| DIM | MILLIMETERS | |
|-----|-----|-----|
|     | 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*
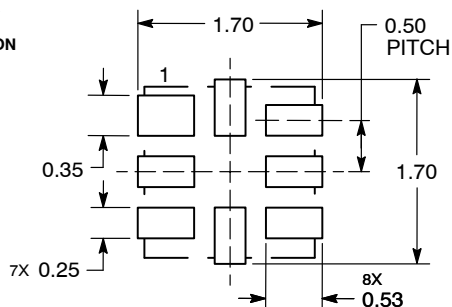
1.70

0.50 PITCH

1

0.35

1.70

7X 0.25

8X 0.53

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.

# NL27WZ32

## PACKAGE DIMENSIONS

**UQFN8, 1.4x1.2, 0.4P**
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.

TOP VIEW
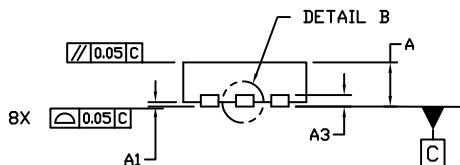
SIDE VIEW
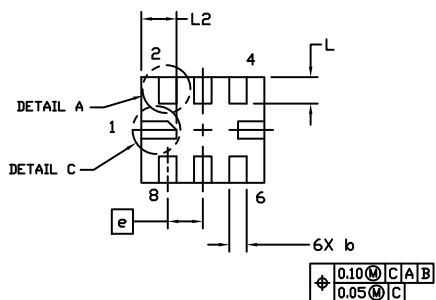
BOTTOM VIEW
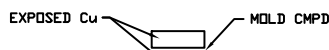
DETAIL B
ALTERNATE CONSTRUCTION
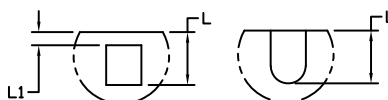
DETAIL A
ALTERNATE CONSTRUCTIONS

DETAIL C
ALTERNATE CONSTRUCTION
NOTE 4

| 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 |

RECOMMENDED
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.

**ADDITIONAL INFORMATION**

◊

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