

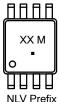
Dual 2-Input Exclusive-OR Gate **NL27WZ86**

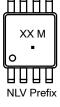
The NL27WZ86 is a high performance dual 2-input Exclusive-OR Gate operating from a 1.65 V to 5.5 V supply.

US8 **US SUFFIX CASE 493**



MARKING DIAGRAMS















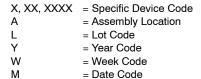




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UQFN8, 1.6x1.6 **MQ1 SUFFIX** CASE 523AN





ORDERING INFORMATION

= Pb-Free Package

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

Features

- Designed for 1.65 V to 5.5 V V_{CC} Operation
- 2.9 ns t_{PD} at $V_{CC} = 5 \text{ V (typ)}$
- 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
- 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

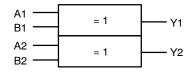


Figure 1. Logic Symbol

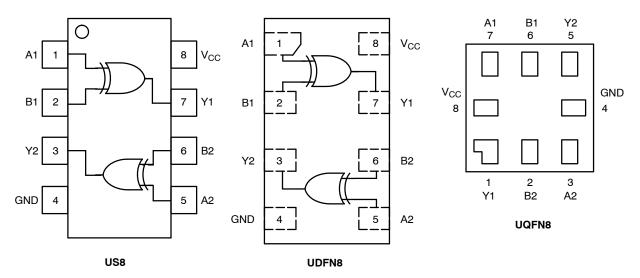


Figure 2. Pinout

PIN ASSIGNMENT (US8 / UDFN8)

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

PIN ASSIGNMENT (UQFN8)

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

FUNCTION TABLE

| Inp | Output | |
|-----|--------|---|
| Α | В | Y |
| L | L | L |
| L | Н | Н |
| Н | L | Н |
| Н | Н | L |

H = HIGH Logic Level L = LOW Logic Level

MAXIMUM RATINGS

| Symbol | Char | acteristics | Value | Unit |
|-------------------------------------|-------------------------------------|---|---|------|
| V _{CC} | DC Supply Voltage | NLV | -0.5 to +7.0 -0.5 to +6.5 | V |
| V _{IN} | DC Input Voltage | NLV | -0.5 to +7.0 -0.5 to +6.5 | V |
| V _{OUT} | DC Output Voltage (NLV) | 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 +7.0 -0.5 to +7.0 | V |
| | DC Output Voltage | Active–Mode (High or Low State) Tri–State Mode (Note 1) Power–Down Mode ($V_{\rm CC}$ = 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 | -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 |
| TL | Lead Temperature, 1 mm from Case | for 10 secs | 260 | °C |
| TJ | Junction Temperature Under Bias | | +150 | °C |
| $\theta_{\sf JA}$ | 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.
- Applicable to devices with outputs that may be the stated.
 Measured with minimum pad spacing on an FR4 board, using 10mm-by-1inch, 2 ounce copper trace no air flow per JESD51-7.
 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 ($V_{\rm CC}$ = 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.

DC ELECTRICAL CHARACTERISTICS

| | | V _{CC} T _A = 25°C | | С | -55°C ≤ T | A ≤ 125°C | | | |
|------------------|------------------------------|--|--|--|---|--|--|--|-------|
| Symbol | Parameter | Condition | (V) | Min | Тур | Max | Min | Max | Units |
| V _{IH} | High-Level Input | | 1.65 to 1.95 | 0.75 x V _{CC} | | | 0.75 x V _{CC} | | V |
| | Voltage (NLV) | | 2.3 to 5.5 | 0.70 x V _{CC} | | | 0.70 x V _{CC} | | |
| | High-Level Input | | 1.65 to 1.95 | 0.65 x V _{CC} | | | 0.65 x V _{CC} | | V |
| | Voltage | | 2.3 to 5.5 | 0.70 x V _{CC} | | | 0.70 x V _{CC} | | |
| V _{IL} | Low-Level Input | | 1.65 to 1.95 | | | 0.25 x V _{CC} | | 0.25 x V _{CC} | V |
| | Voltage (NLV) | | 2.3 to 5.5 | | | 0.30 x V _{CC} | | 0.30 x V _{CC} | |
| | Low-Level Input | | 1.65 to 1.95 | | | 0.35 x V _{CC} | | 0.35 x V _{CC} | V |
| | Voltage | | 2.3 to 5.5 | | | 0.30 x V _{CC} | | 0.30 x V _{CC} | |
| V _{OH} | High-Level Output Voltage | $\begin{split} V_{IN} &= V_{IH} \text{ or } V_{IL} \\ I_{OH} &= -100 \mu\text{A} \\ I_{OH} &= -4 \text{ mA} \\ I_{OH} &= -8 \text{ mA} \\ I_{OH} &= -12 \text{ mA} \\ I_{OH} &= -16 \text{ mA} \\ I_{OH} &= -24 \text{ mA} \\ I_{OH} &= -32 \text{ mA} \end{split}$ | 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 | $\begin{split} &V_{IN} = V_{IH} \text{ or } V_{IL} \\ &I_{OL} = 100 \mu\text{A} \\ &I_{OL} = 4 \text{ mA} \\ &I_{OL} = 8 \text{ mA} \\ &I_{OL} = 12 \text{ mA} \\ &I_{OL} = 16 \text{ mA} \\ &I_{OL} = 32 \text{ mA} \end{split}$ | 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 | - | 0.1 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 | μΑ |
| l _{OFF} | Power Off Leakage Current | V _{IN} = 5.5 V or V _{OUT} = 5.5 V | 0 | - | - | 1.0 | - | 10 | μΑ |
| I _{CC} | Quiescent Supply Current | V _{IN} = V _{CC} or GND | 5.5 | - | - | 1.0 | - | 10 | μΑ |

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.

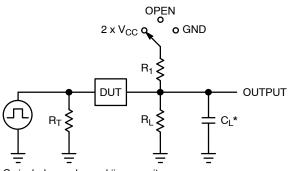
AC ELECTRICAL CHARACTERISTICS

| | | | | 1 | Γ _A = 25°C |) | T _A = -55 | to 125°C | |
|--------------------|--------------------|---------------------|-----------------------------------|-----|-----------------------|-----|----------------------|----------|-------|
| Symbol | Parameter | V _{CC} (V) | Test Conditions | Min | Тур | Max | Min | Max | Units |
| t _{PLH} , | Propagation Delay, | 1.65 to 1.95 | C _L = 15 pF | - | 7.9 | 9.0 | _ | 10.5 | ns |
| t _{PHL} | (A or B) to Y | 2.3 to 2.7 | $R_L = 1 M\Omega$ $R_1 = Open$ | - | 4.1 | 7.0 | - | 7.5 | |
| | | 3.0 to 3.6 | ' ' | - | 3.0 | 4.8 | _ | 5.2 | |
| | | 4.5 to 5.5 | | - | 2.2 | 3.5 | _ | 3.8 | |
| | | 3.0 to 3.6 | C _L = 50 pF, | - | 3.8 | 5.4 | _ | 5.9 | |
| | | 4.5 to 5.5 | $R_L = 500 \Omega$, $R_1 = Open$ | _ | 2.9 | 4.2 | _ | 4.6 | |

CAPACITIVE CHARACTERISTICS

| Symbol | Parameter | Condition | Typical | Units |
|------------------|--|--|---------|-------|
| C _{IN} | Input Capacitance | $V_{CC} = 5.5 \text{ V}, V_{IN} = 0 \text{ V or } V_{CC}$ | 2.5 | pF |
| C _{OUT} | Output Capacitance | $V_{CC} = 5.5 \text{ V}, V_{IN} = 0 \text{ V or } V_{CC}$ | 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} • 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}.



| 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 x V _{CC} | 50 | 500 | 500 |
| t _{PHZ} / t _{PZH} | GND | 50 | 500 | 500 |

X = Don't Care

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

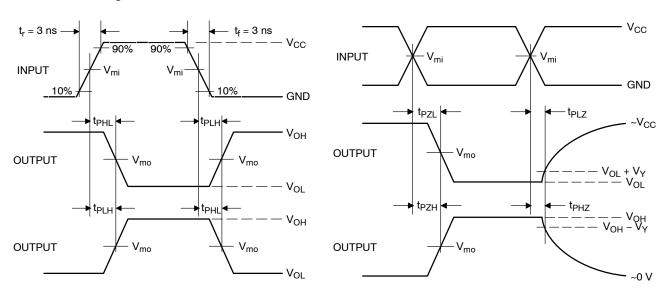


Figure 4. Switching Waveforms

| | | V _m | V _{mo} , V | | |
|---------------------|---------------------|-------------------------------------|---|--------------------|--|
| V _{CC} , V | V _{mi} , V | t _{PLH} , t _{PHL} | t _{PZL} , t _{PLZ} , t _{PZH} , t _{PHZ} | V _Y , V | |
| 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 | |

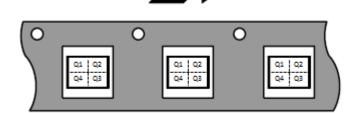
DEVICE ORDERING INFORMATION

| Device | Packages | Specific Device Code | Pin 1 Orientation (See below) | Shipping [†] |
|------------------------------------|--------------------------|----------------------|----------------------------------|-----------------------|
| NL27WZ86USG | US8 | L8 | Q4 | 3000 / Tape & Reel |
| NLV27WZ86USG* | US8 | L8 | Q4 | 3000 / Tape & Reel |
| NL27WZ86MQ1TCG | UQFN8, 1.6 x 1.6, 0.5P | AC | Q1 | 3000 / Tape & Reel |
| NL27WZ86MU1TCG (In Development) | UDFN8, 1.95 x 1.0, 0.5P | TBD | TBD | 3000 / Tape & Reel |
| NL27WZ86MU3TCG (In Development) | UDFN8, 1.45 x 1.0, 0.35P | TBD | TBD | 3000 / Tape & Reel |
| NL27WZ86MQT2CG (In Development) | 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.

Pin 1 Orientation in Tape and Reel

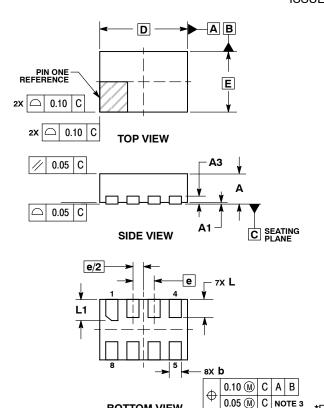
Direction of Feed



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

PACKAGE DIMENSIONS

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

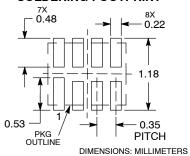


BOTTOM VIEW

- NOTES:
 1. DIMENSIONING AND TOLERANCING PER
- 1. DIMENSIONING AND IOLERANGING FER 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. PACKAGE DIMENSIONS EXCLUSIVE OF BURRS AND MOLD FLASH.

| | MILLIMETERS | | | |
|-----|-------------|------|--|--|
| DIM | MIN | MAX | | |
| Α | 0.45 | 0.55 | | |
| A1 | 0.00 | 0.05 | | |
| А3 | 0.13 REF | | | |
| b | 0.15 | 0.25 | | |
| D | 1.45 | BSC | | |
| E | 1.00 | BSC | | |
| е | 0.35 | BSC | | |
| L | 0.25 | 0.35 | | |
| L1 | 0.30 | 0.40 | | |

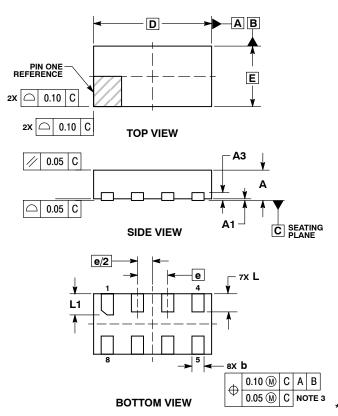
RECOMMENDED SOLDERING FOOTPRINT*



*For additional information on our Pb-Free strategy and soldering details, please download the onsemi Soldering and Mounting

PACKAGE DIMENSIONS

UDFN8, 1.95x1, 0.5P CASE 517CA ISSUE O



NOTES:

- NOTES:

 1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.

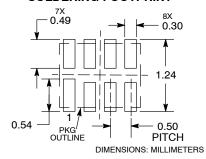
 2. CONTROLLING DIMENSION: MILLIMETERS.

 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 | | |
| Α | 0.45 0.55 | | |
| A1 | 0.00 0.05 | | |
| А3 | 0.13 REF | | |
| b | 0.15 | 0.25 | |
| D | 1.95 BSC 1.00 BSC | | |
| Е | | | |
| е | 0.50 BSC | | |
| L | 0.25 | 0.35 | |
| L1 | 0.30 0.40 | | |

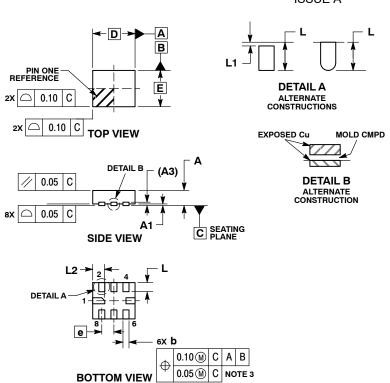
RECOMMENDED SOLDERING FOOTPRINT*



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

PACKAGE DIMENSIONS

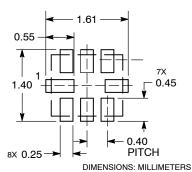
UQFN8, 1.4x1.2, 0.4P CASE 523AS **ISSUE A**



- 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 0.25 mm FROM THE TERMINAL TIP.

| | MILLIMETERS | | |
|-----|-------------|------|--|
| DIM | MIN MAX | | |
| Α | 0.45 | 0.55 | |
| A1 | 0.00 0.05 | | |
| А3 | 0.13 REF | | |
| b | 0.15 | 0.25 | |
| D | 1.40 BSC | | |
| Е | 1.20 BSC | | |
| е | 0.40 BSC | | |
| L | 0.20 | 0.40 | |
| L1 | | 0.15 | |
| L2 | 0.30 0.50 | | |

SOLDERING FOOTPRINT*



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

В



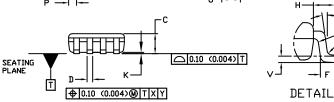


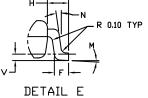
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NOTES:

DETAIL E

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

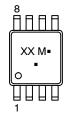




| 8X 0.30 — |
|---|
| 8x 0.68 |
| |
| 1 0 🕪 📗 📗 |
| 0,50 → |
| RECOMMENDED * MOUNTING FOOTPRINT |
| For additional information on our Pb-Free |

| | MILLIMETERS | | INCHES | | |
|----------|-------------|------|-----------|-----------|--|
| DIM | MIN. | MAX. | MIN. | MAX. | |
| Α | 1.90 | 2.10 | 0.075 | 0.083 | |
| В | 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 | 0.020 BSC | |
| H | 0.40 REF | | 0.016 REF | | |
| J | 0.10 | 0.18 | 0.004 | 0.007 | |
| К | 0.00 | 0.10 | 0.000 | 0.004 | |
| L | 3.00 | 3.25 | 0.118 | 0.128 | |
| W | 0* | 6* | 0* | 6* | |
| N | 0* | 10* | 0* | 10* | |
| Э | 0.23 | 0.34 | 0.010 | 0.013 | |
| R | 0.23 | 0.33 | 0.009 | 0.013 | |
| 2 | 0.37 | 0.47 | 0.015 | 0.019 | |
| υ | 0.60 | 0.80 | 0.024 | 0.031 | |
| V | 0.12 | BSC | 0.005 | BSC | |

GENERIC MARKING DIAGRAM*



XX = Specific Device Code = Date Code

M

= Pb-Free Package

(Note: Microdot may be in either location)

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "■", may or may not be present. Some products may not follow the Generic Marking.

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|------------------|-------------|--|-------------|
| DESCRIPTION: | US8 | | PAGE 1 OF 1 |

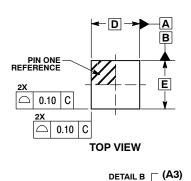
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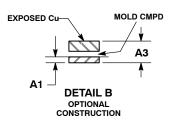
UQFN8, 1.60x1.60, 0.50P CASE 523AN **ISSUE O**

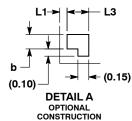
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0.05 C

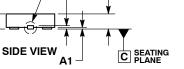
0.05 C

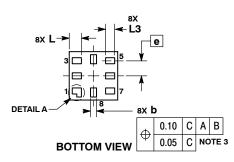




- DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994. CONTROLLING DIMENSION: MILLIMETERS. DIMENSION 6 APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 mm FROM THE TERMINAL TIP.

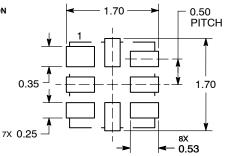
| | MILLIMETERS | | |
|-----|-------------|------|--|
| DIM | MIN | MAX | |
| Α | 0.45 | 0.60 | |
| A1 | 0.00 0.05 | | |
| А3 | 0.13 REF | | |
| b | 0.15 | 0.25 | |
| D | 1.60 BSC | | |
| E | 1.60 BSC | | |
| е | 0.50 BSC | | |
| L | 0.35 | 0.45 | |
| L1 | 0.15 | | |
| L3 | 0.25 0.35 | | |





DETAIL B

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.

GENERIC MARKING DIAGRAM*



XX = Specific Device Code

= Date Code

= Pb-Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "■", may or may not be present. Some products may not follow the Generic Marking.

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| DESCRIPTION: | UQFN8, 1.60X1.60, 0.50P | | PAGE 1 OF 1 |

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