

NMLU1210

Full Bridge Rectifier

Dual 20 V N-Channel with dual 3.2 A Schottky Barrier Diode, 4.0 x 4.0 x 0.5 mm μ Cool™ Package

Features

- Full-Bridge Rectifier Block
- Up to 3.2 A operation
- Low $R_{DS(on)}$ MOSFET to minimize conduction loss
- Low gate charge MOSFET
- Low V_F Schottky diode
- Ultra Low Inductance Package
- This Device uses Halogen-Free Molding Compound
- These are Pb-Free Devices

Applications

- Wireless Charging
- AC-DC Rectification
- Optimized for Power Management Applications for Portable Products, such as Cell Phones, PMP, DSC, GPS, and others

RECTIFIER MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise stated)

| Parameter | Symbol | Value | Unit | |
|---|----------------|--------------------------|------------------|---|
| Input voltage between two MOSFET drain | V_{LL} | 20 | V | |
| Bridge Operating Junction and Storage Temperature | T_J, T_{STG} | -55 to 125 | $^\circ\text{C}$ | |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s) | T_L | 260 | $^\circ\text{C}$ | |
| Continuous Drain Current R_{JA} (Note 1) | I_O | $T_A = 25^\circ\text{C}$ | 2.2 | A |
| | | $T_A = 85^\circ\text{C}$ | 1.16 | |
| Power Dissipation R_{JA} (Note 1) | P_D | $T_A = 25^\circ\text{C}$ | 1.2 | W |
| | | $T_A = 85^\circ\text{C}$ | 0.47 | |
| Continuous Drain Current $R_{JA} t < 5$ s (Note 1) | I_O | $T_A = 25^\circ\text{C}$ | 3.2 | A |
| | | $T_A = 85^\circ\text{C}$ | 1.88 | |
| Power Dissipation $R_{JA} t < 5$ s (Note 1) | P_D | $T_A = 25^\circ\text{C}$ | 2.34 | W |
| | | $T_A = 85^\circ\text{C}$ | 0.94 | |
| Continuous Drain Current R_{JA} (Note 2) | I_O | $T_A = 25^\circ\text{C}$ | 1.16 | A |
| | | $T_A = 85^\circ\text{C}$ | 0.6 | |
| Power Dissipation R_{JA} (Note 2) | P_D | $T_A = 25^\circ\text{C}$ | 0.47 | W |
| | | $T_A = 85^\circ\text{C}$ | 0.185 | |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [2 oz] including traces).
2. Surface-mounted on FR4 board using the minimum recommended pad size of 30 mm², 2 oz. Cu.



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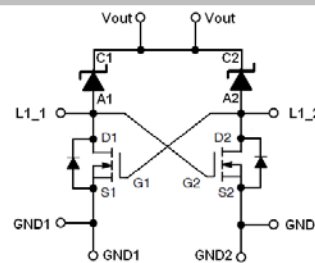
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MOSFET

| $V_{(BR)DSS}$ | $R_{DS(on)}$ TYP | I_D MAX |
|---------------|-----------------------|-----------|
| 20 V | 23 m Ω @ 4.5 V | 3.2 A |
| | 17 m Ω @ 10 V | |

SCHOTTKY DIODE

| V_R MAX | V_F TYP | I_F MAX |
|-----------|-----------|-----------|
| 20 V | 0.45 V | 3.2 A |



RECTIFIER

4.0 4.0 mm μ Cool Pin Connections (Top View)

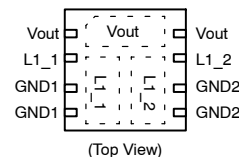
MARKING DIAGRAM



1210 = Specific Device Code
 A = Assembly Location
 Y = Year
 WW = Work Week
 ■ = Pb-Free Package

(*Note: Microdot may be in either location)

PIN CONNECTIONS



ORDERING INFORMATION

| Device | Package | Shipping† |
|-------------|----------------|--------------------|
| NMLU1210TWG | UDFN (Pb-Free) | 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.

NMLU1210

THERMAL RESISTANCE RATINGS

| Parameter | Symbol | Max | Unit |
|---|-----------------|------|------|
| Junction-to-Ambient – Steady State (Note 3) | $R_{\theta JA}$ | 82.5 | °C/W |
| Junction-to-Ambient – $t \leq 5$ s (Note 3) | $R_{\theta JA}$ | 42.5 | |
| Junction-to-Ambient – Steady State min Pad (Note 4) | $R_{\theta JA}$ | 209 | |

3. Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [2 oz] including traces).
 4. Surface-mounted on FR4 board using the minimum recommended pad size of 30 mm², 2 oz. Cu.

BRIDGE ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise specified)

| Parameter | Symbol | Test Condition | Min | Typ | Max | Unit |
|-------------------------------------|-------------|---|-----|------|------|------|
| ON CHARACTERISTICS | | | | | | |
| Rectifying Forward Voltage (Note 5) | V_{fd2} | Input voltage $V_{LL} = \pm 5$ V; The output current of Rectifier $I_{out} = 2$ A | | 0.45 | .56 | V |
| Rectifier leakage current | I_{leak} | Input voltage $V_{LL} = 16$ V; No Load on the Rectifier output | | 31 | 1000 | uA |
| Rectifier Reverse leakage current | I_{rleak} | Input voltage $V_{LL} = 0$ V; The output voltage of the Rectifier $V_{out} = 5$ V | | 21 | 1000 | uA |

5. Pulse Test: pulse width ≤ 300 μs , duty cycle $\leq 2\%$

MOSFET ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise specified)

| Parameter | Symbol | Test Condition | Min | Typ | Max | Unit |
|--|--------------------|---|-----|-----|-----|------------|
| ON CHARACTERISTICS | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{GS} = V_{DS}$, $I_D = 250$ μA | 1.2 | | 2.2 | V |
| Negative Threshold Temperature Coefficient | $V_{GS(TH)} / T_J$ | | | 4 | | mV/°C |
| Drain-to-Source On Resistance (Note 6) | $R_{DS(on)}$ | $V_{GS} = 10$ V, $I_D = 3.2$ A | | 17 | 26 | m Ω |
| | | $V_{GS} = 4.5$ V, $I_D = 3.2$ A | | 23 | 32 | |
| Forward Transconductance | g_{FS} | $V_{DS} = 10$ V, $I_D = 2.0$ A | | 3.5 | | S |

DRAIN-SOURCE DIODE CHARACTERISTICS

| | | | | | | |
|--------------------------------|----------|-------------------------------|---------------------------|--|------|---|
| Forward Diode Voltage (Note 6) | V_{SD} | $V_{GS} = 0$ V, $I_S = 2.0$ A | $T_J = 25^\circ\text{C}$ | | 0.79 | V |
| | | | $T_J = 125^\circ\text{C}$ | | 0.65 | |

6. Pulse Test: pulse width ≤ 300 μs , duty cycle $\leq 2\%$

SCHOTTKY DIODE ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise specified)

| Parameter | Symbol | Test Condition | Min | Typ | Max | Unit |
|--|--------|----------------|-----|------|-----|------|
| Maximum Instantaneous Forward Voltage (Note 7) | V_F | $I_F = 1.0$ A | | 0.36 | | V |
| | | $I_F = 2.0$ A | | 0.41 | | |
| Maximum Instantaneous Reverse Current | I_R | $V_R = 20$ V | | 0.04 | | mA |

7. Pulse Test: pulse width ≤ 300 μs , duty cycle $\leq 2\%$

SCHOTTKY DIODE ELECTRICAL CHARACTERISTICS ($T_J = 100^\circ\text{C}$ unless otherwise specified)

| Parameter | Symbol | Test Condition | Min | Typ | Max | Unit |
|--|--------|----------------|-----|------|-----|------|
| Maximum Instantaneous Forward Voltage (Note 8) | V_F | $I_F = 1.0$ A | | 0.29 | | V |
| | | $I_F = 2.0$ A | | 0.36 | | |
| Maximum Instantaneous Reverse Current | I_R | $V_R = 20$ V | | 4 | | mA |

8. Pulse Test: pulse width ≤ 300 μs , duty cycle $\leq 2\%$
 9. For detailed MOSFET and Diode parameters, please refer to the ON Semiconductor datasheets of NTTFS4930N and MBR230LSFT1G. The test on each individual die is limited to the system package.

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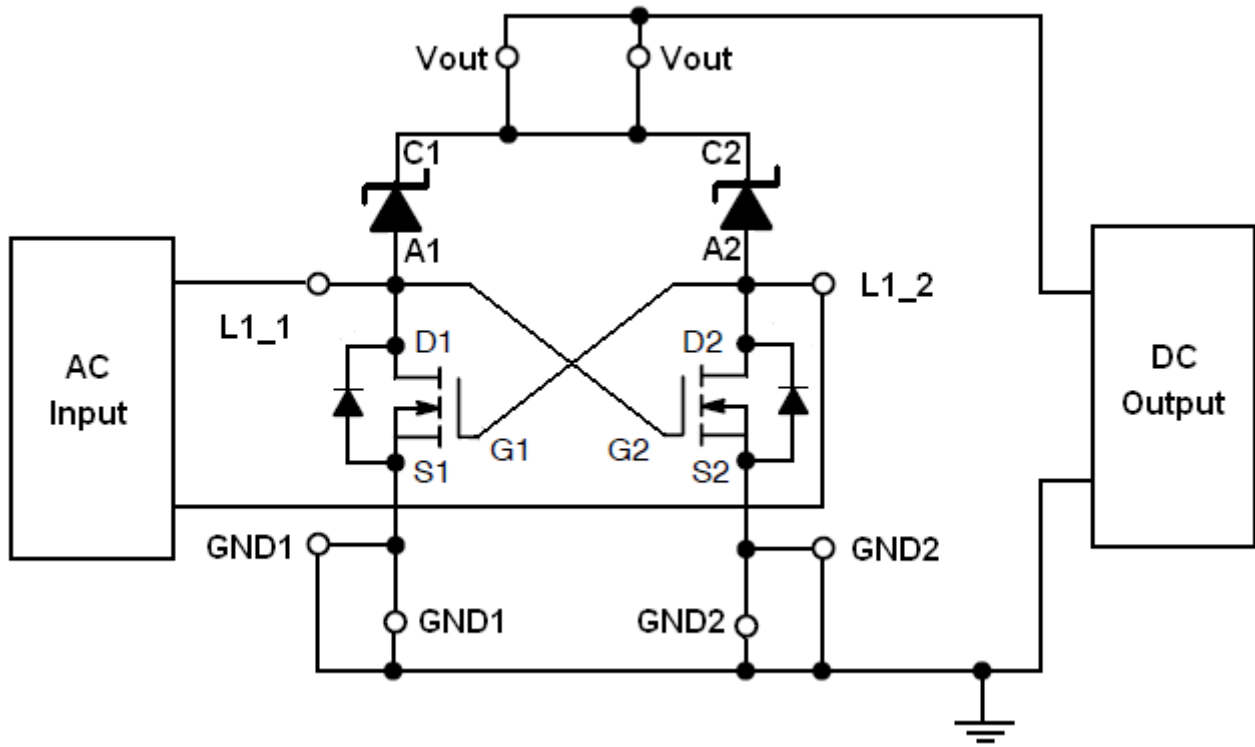


Figure 1. Typical Application Circuit

GND1 and GND2 are not internally connected. The user should make the connection in the PCB design.

TYPICAL PERFORMANCE CURVES

($T_J = 25^\circ\text{C}$ unless otherwise specified)

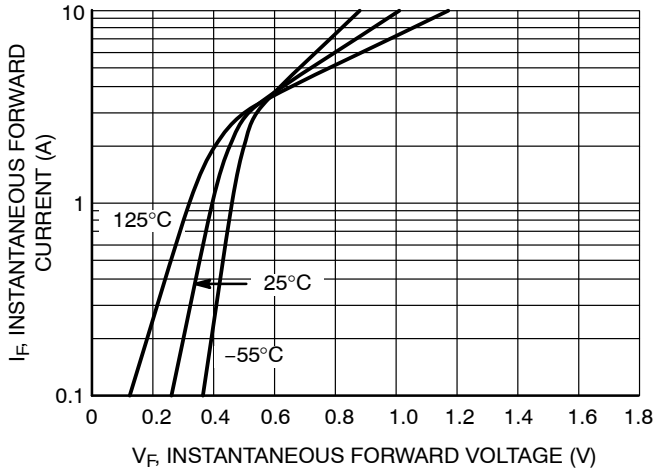


Figure 2. Bridge Typical Forward Voltage Drop at $V_{in} \geq 5\text{ V}$

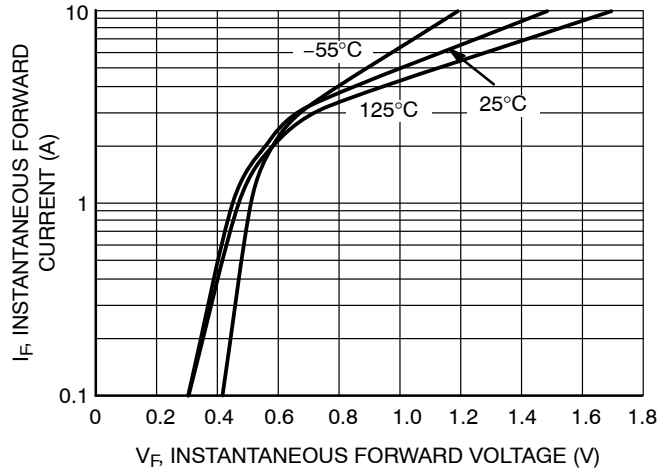


Figure 3. Bridge Maximum Forward Voltage Drop at $V_{in} \geq 5\text{ V}$

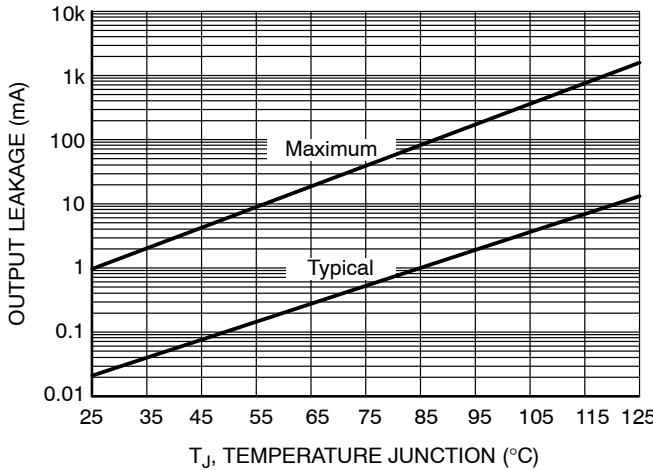


Figure 4. Output Leakage at 5 V Bias vs. Junction Temperature

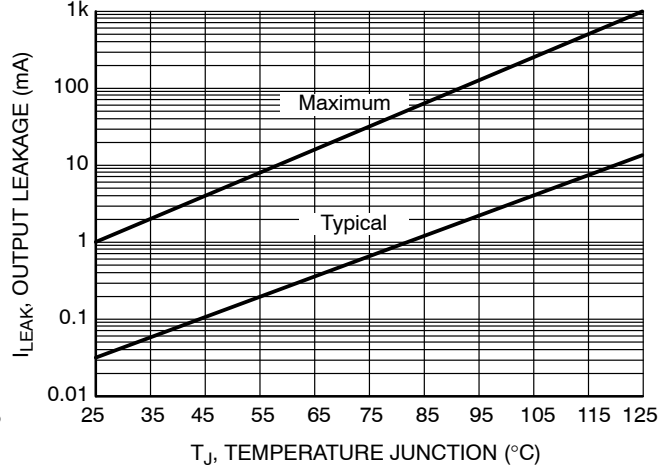


Figure 5. Input Leakage at 16 V vs. Junction Temperature

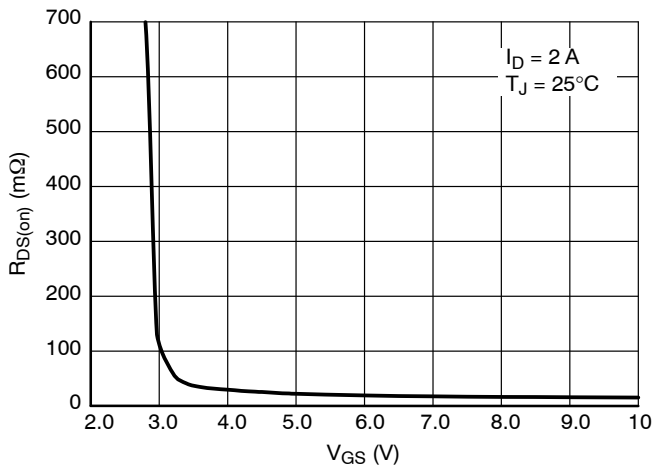


Figure 6. FET Typical On-Resistance vs. Gate-to-Source Voltage (from 3 V to 10 V)

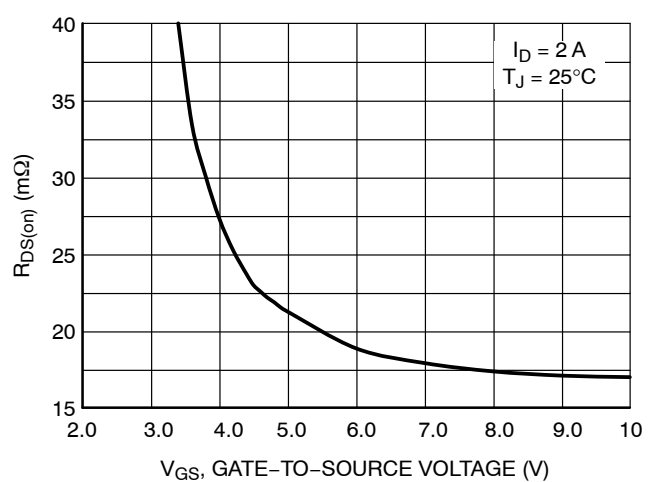


Figure 7. FET Typical On-Resistance vs. Gate-to-Source Voltage

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TYPICAL PERFORMANCE CURVES

($T_J = 25^\circ\text{C}$ unless otherwise specified)

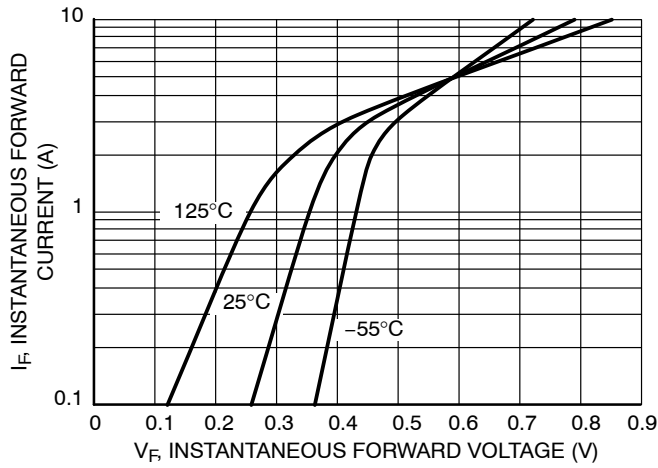


Figure 8. Schottky Typical Forward Current vs. Forward Voltage

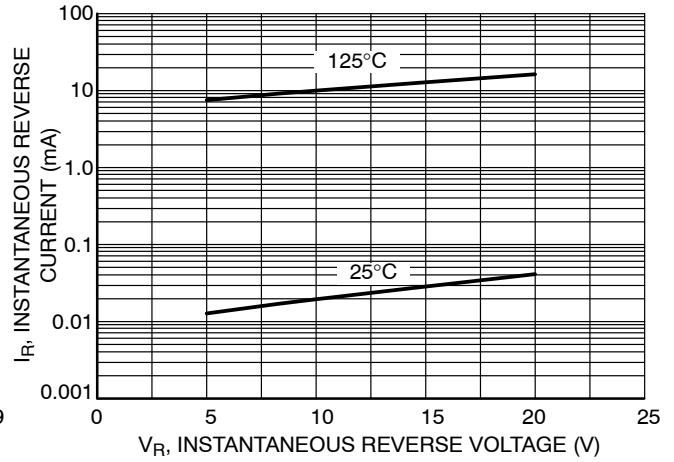


Figure 9. Schottky Typical Reverse Current vs. Reverse Voltage

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

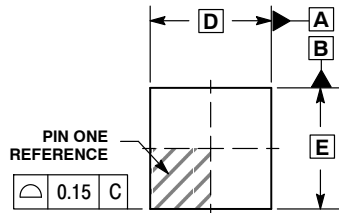
ON Semiconductor®



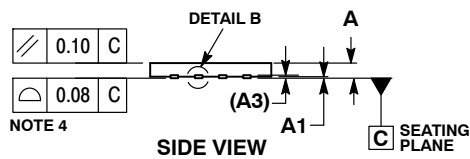
UDFN8 4x4, 0.8P CASE 517BS ISSUE A

DATE 06 SEP 2011

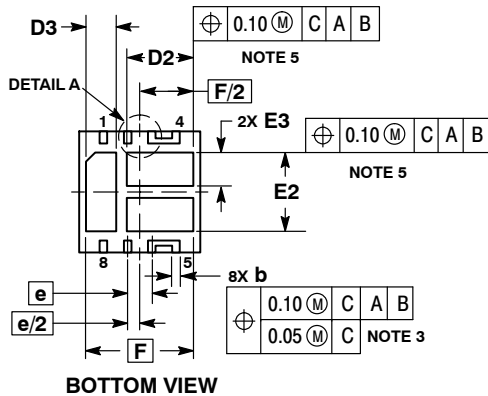
SCALE 2:1



TOP VIEW

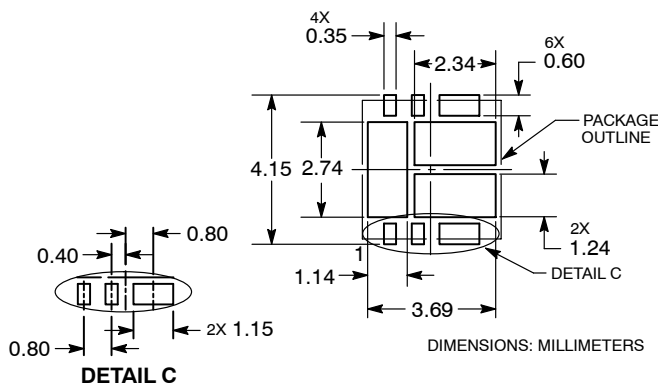


SIDE VIEW



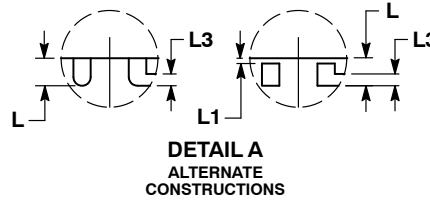
BOTTOM VIEW

RECOMMENDED SOLDERING FOOTPRINT*

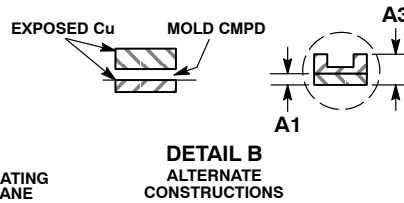


DETAIL C

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



DETAIL A
ALTERNATE
CONSTRUCTIONS



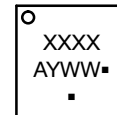
DETAIL B
ALTERNATE
CONSTRUCTIONS

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 TERMINAL TIP.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.
5. POSITIONAL TOLERANCE APPLIES TO ALL OF THE EXPOSED PADS.

| MILLIMETERS | | |
|-------------|------|------|
| DIM | MIN | MAX |
| A | 0.45 | 0.55 |
| A1 | 0.00 | 0.05 |
| A3 | 0.13 | REF |
| b | 0.20 | 0.30 |
| D | 4.00 | BSC |
| D2 | 2.10 | 2.30 |
| D3 | 0.90 | 1.10 |
| E | 4.00 | BSC |
| E2 | 2.50 | 2.70 |
| E3 | 1.00 | 1.20 |
| e | 0.80 | BSC |
| F | 3.55 | BSC |
| L | 0.30 | 0.50 |
| L1 | 0.00 | 0.15 |
| L3 | 0.13 | 0.23 |

GENERIC MARKING DIAGRAM*



- XXXX = Specific Device Code
- A = Assembly Location
- Y = Year
- WW = Work Week
- = 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.

| | | |
|------------------|-----------------|--|
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| DESCRIPTION: | UDFN8 4X4, 0.8P | PAGE 1 OF 1 |

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