

MOSFET – Power, N-Channel With ESD Protection 30 V, 3.3 A NVNJWS200N031L

Features

- Low $R_{DS(on)}$ and Low Gate Threshold
- Low Input Capacitance
- ESD Protected Gate
- Wettable Flank for Enhanced Optical Inspection
- AEC-Q101 Qualified and PPAP Capable
- This is a Pb-Free Device

Applications

- Low Side Load Switch
- DC-DC Converters (Buck and Boost Circuits)

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

| Parameter | | Symbol | Value | Unit | |
|---|------------------------|---------------------------|-------------|------------------|---|
| Drain-to-Source Voltage | | V_{DSS} | 30 | V | |
| Gate-to-Source Voltage | | V_{GS} | ± 8 | V | |
| Continuous Drain Current (Note 1) | Steady State | $T_A = 25^\circ\text{C}$ | I_D | 2.2 | A |
| | | $T_A = 100^\circ\text{C}$ | | 1.5 | |
| Continuous Drain Current $R_{\theta JC}$ (Note 1) | | $T_C = 25^\circ\text{C}$ | | 3.3 | |
| | | $T_C = 100^\circ\text{C}$ | | 2.3 | |
| Power Dissipation (Note 1) | Steady State | $T_A = 25^\circ\text{C}$ | P_D | 1.8 | W |
| | | $T_A = 100^\circ\text{C}$ | | 0.9 | |
| Power Dissipation $R_{\theta JC}$ (Note 1) | | $T_C = 25^\circ\text{C}$ | | 4.1 | |
| | | $T_C = 100^\circ\text{C}$ | | 2.0 | |
| Pulsed Drain Current | $t_p = 10 \mu\text{s}$ | I_{DM} | 25 | A | |
| Operating Junction and Storage Temperature Range | | T_J, T_{STG} | -55 to +175 | $^\circ\text{C}$ | |
| Source Current (Body Diode) | | I_S | 3.4 | A | |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s) | | T_L | 260 | $^\circ\text{C}$ | |

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.

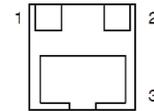
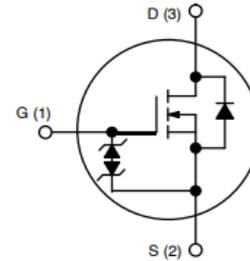
THERMAL RESISTANCE RATINGS

| Parameter | Symbol | Value | Unit |
|------------------------------------|-----------------|-------|---------------------------|
| Junction-to-Ambient – Steady State | $R_{\theta JA}$ | 83.6 | $^\circ\text{C}/\text{W}$ |
| Junction-to-Case – Steady State | $R_{\theta JC}$ | 36.8 | |

1. Surface mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [2 oz] including traces).

| $V_{(BR)DSS}$ | $R_{DS(on)}$ MAX | I_D Max |
|---------------|------------------------|-----------|
| 30 V | 200 m Ω @ 4.5 V | 3.3 A |
| | 250 m Ω @ 3 V | |

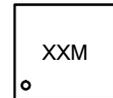
N-CHANNEL MOSFET



XDFNW3
CASE 521AC

- XX = Specific Device Code
M = Month Code

MARKING DIAGRAM



ORDERING INFORMATION

See detailed ordering and shipping information on page 5 of this data sheet.

NVNJWS200N031L

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

| Parameter | Symbol | Test Condition | Min | Typ | Max | Unit |
|---|-------------------|--|--------------------------|------|----------|----------------------|
| OFF CHARACTERISTICS | | | | | | |
| Drain-to-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$ | 30 | | | V |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | $V_{(BR)DSS}/T_J$ | $I_D = 250\ \mu\text{A}$, ref to 25°C | | 27.4 | | mV/ $^\circ\text{C}$ |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{GS} = 0\text{ V}, V_{DS} = 24\text{ V}$ | $T_J = 25^\circ\text{C}$ | | 1.0 | μA |
| | | | $T_J = 85^\circ\text{C}$ | | 10 | |
| Gate-to-Source Leakage Current | I_{GSS} | $V_{DS} = 0\text{ V}, V_{GS} = \pm 8\text{ V}$ | | | ± 10 | μA |

ON CHARACTERISTICS (Note 2)

| | | | | | | |
|--|------------------|---|-----|------|-----|----------------------|
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{GS} = V_{DS}, I_D = 250\ \mu\text{A}$ | 0.4 | | 1.5 | V |
| Negative Threshold Temperature Coefficient | $V_{GS(TH)}/T_J$ | | | -3.2 | | mV/ $^\circ\text{C}$ |
| Drain-to-Source On Resistance | $R_{DS(on)}$ | $V_{GS} = 4.5\text{ V}, I_D = 1.5\text{ A}$ | | 153 | 200 | m Ω |
| | | $V_{GS} = 3\text{ V}, I_D = 0.5\text{ A}$ | | 185 | 250 | |
| Forward Transconductance | g_{FS} | $V_{DS} = 4\text{ V}, I_D = 0.15\text{ A}$ | | 1.28 | | S |

CHARGES AND CAPACITANCES

| | | | | | | |
|------------------------------|--------------|---|--|-----|--|----|
| Input Capacitance | C_{ISS} | $V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = 15\text{ V}$ | | 89 | | pF |
| Output Capacitance | C_{OSS} | | | 15 | | |
| Reverse Transfer Capacitance | C_{RSS} | | | 8.3 | | |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V}, I_D = 1.5\text{ A}$ | | 1.4 | | nC |
| Threshold Gate Charge | $Q_{G(TH)}$ | | | 0.2 | | |
| Gate-to-Source Charge | Q_{GS} | | | 0.4 | | |
| Gate-to-Drain Charge | Q_{GD} | | | 0.3 | | |

SWITCHING CHARACTERISTICS (Note 3)

| | | | | | | |
|---------------------|--------------|--|--|------|--|----|
| Turn-On Delay Time | $t_{d(on)}$ | $V_{GS} = 4.5\text{ V}, V_{DD} = 15\text{ V}, I_D = 1\text{ A}, R_G = 6\ \Omega$ | | 5.2 | | ns |
| Rise Time | t_r | | | 2.6 | | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 10.2 | | |
| Fall Time | t_f | | | 2.2 | | |

DRAIN-SOURCE DIODE CHARACTERISTICS

| | | | | | | | |
|-----------------------|----------|---|--------------------------|--|-----|-----|---|
| Forward Diode Voltage | V_{SD} | $V_{GS} = 0\text{ V}, I_S = 1\text{ A}$ | $T_J = 25^\circ\text{C}$ | | 0.8 | 1.2 | V |
| | | | $T_J = 85^\circ\text{C}$ | | 0.7 | | |

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.

2. Pulse Test: pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.

3. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

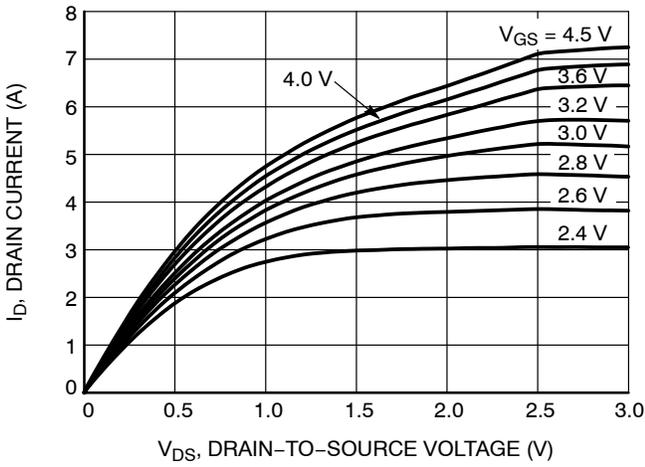


Figure 1. On-Region Characteristics

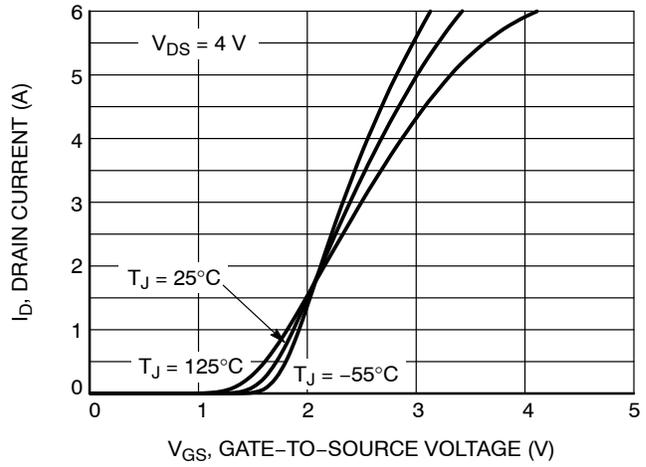


Figure 2. Transfer Characteristics

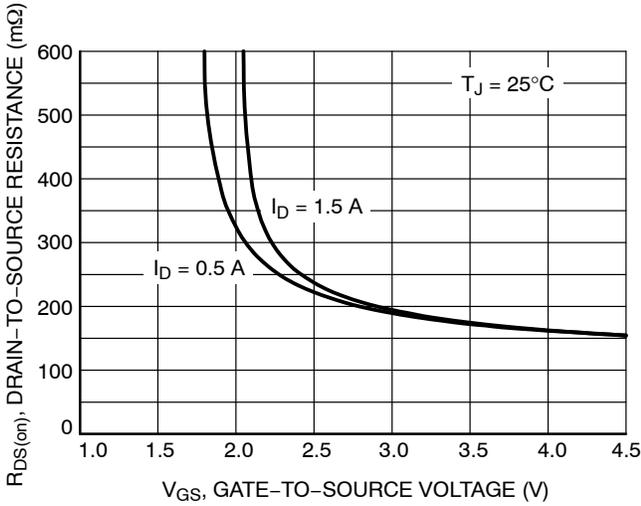


Figure 3. On-Resistance vs. Gate-to-Source Voltage

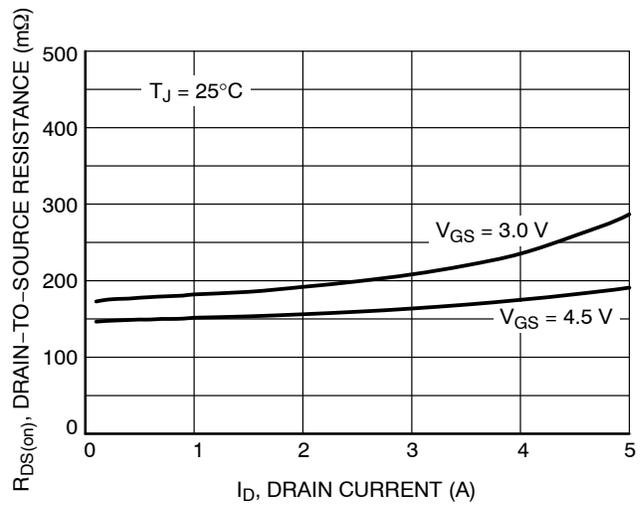


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

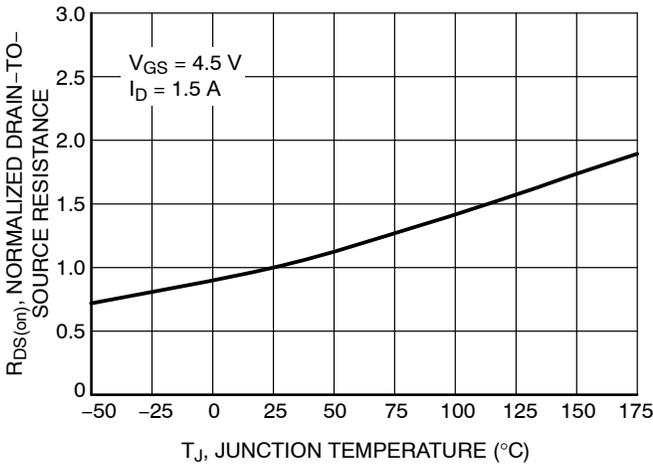


Figure 5. On-Resistance Variation with Temperature

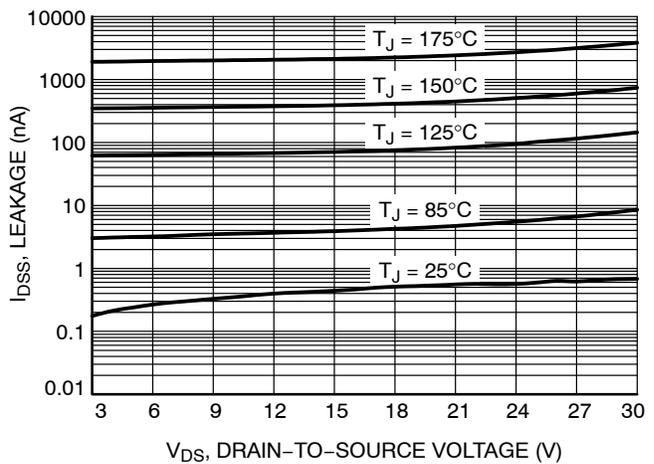


Figure 6. Drain-to-Source Leakage Current vs. Voltage

NVNJWS200N031L

TYPICAL CHARACTERISTICS

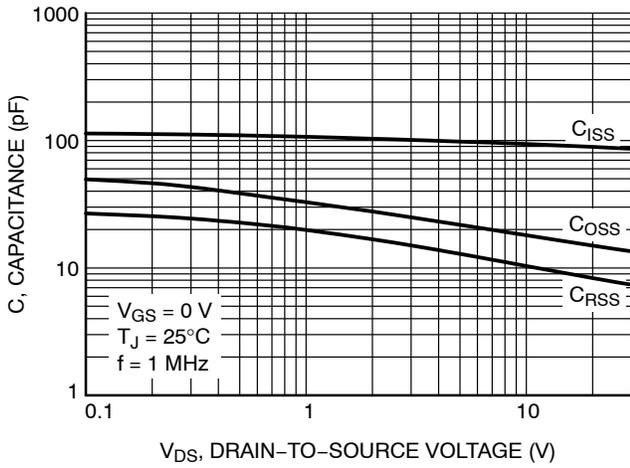


Figure 7. Capacitance Variation

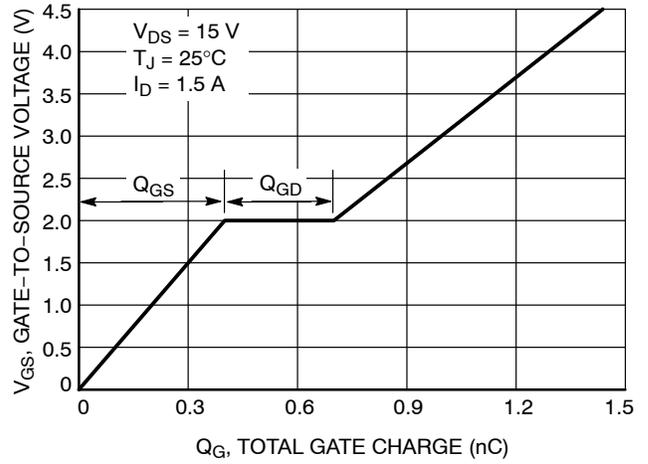


Figure 8. Gate-to-Source Voltage vs. Total Charge

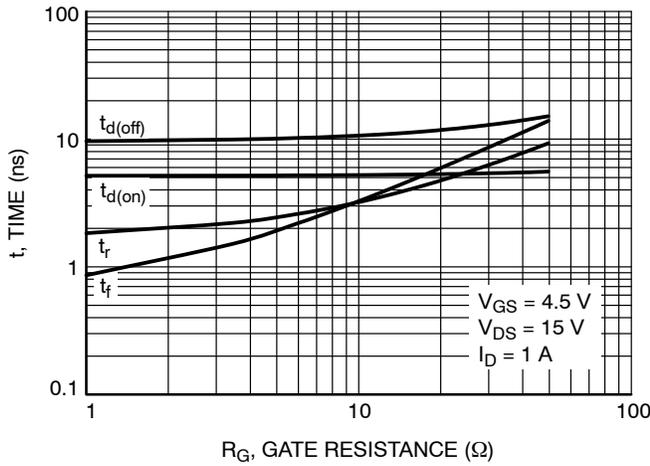


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

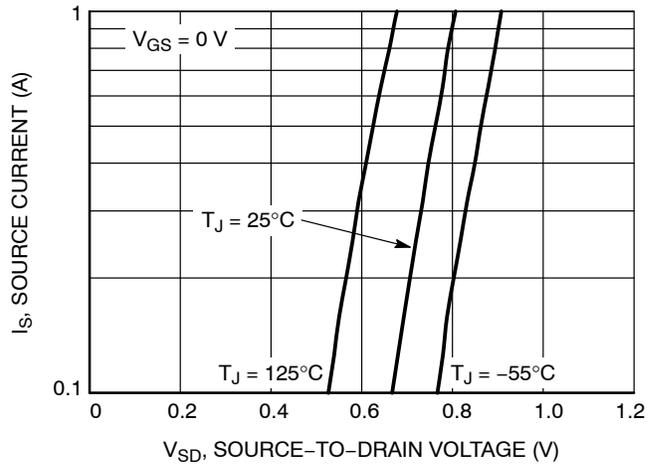


Figure 10. Diode Forward Voltage vs. Current

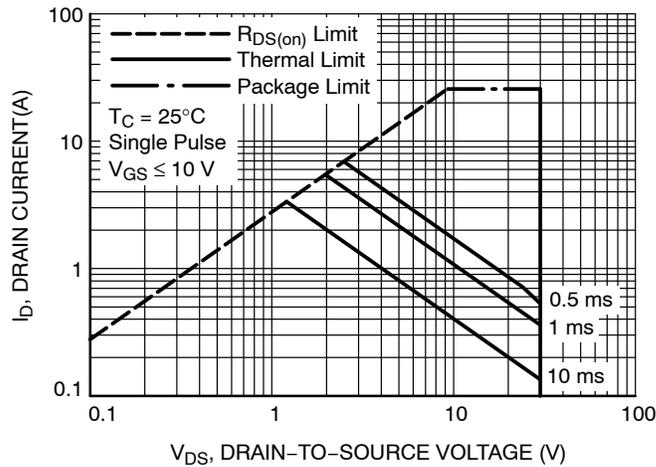


Figure 11. Maximum Rated Forward Biased Safe Operating Area

NVNJWS200N031L

TYPICAL CHARACTERISTICS

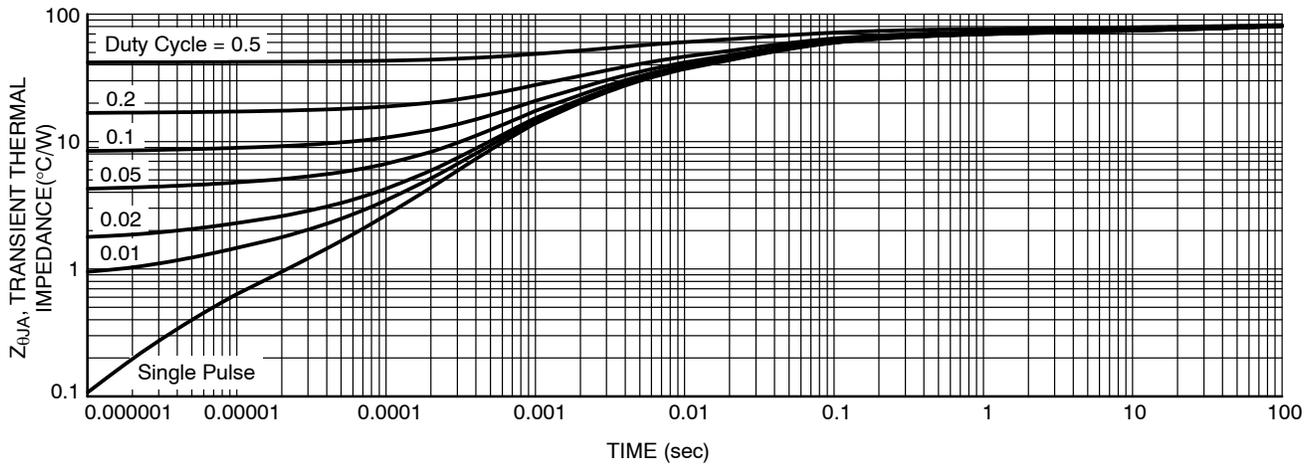


Figure 12. Thermal Response

Table 1. ORDERING INFORMATION

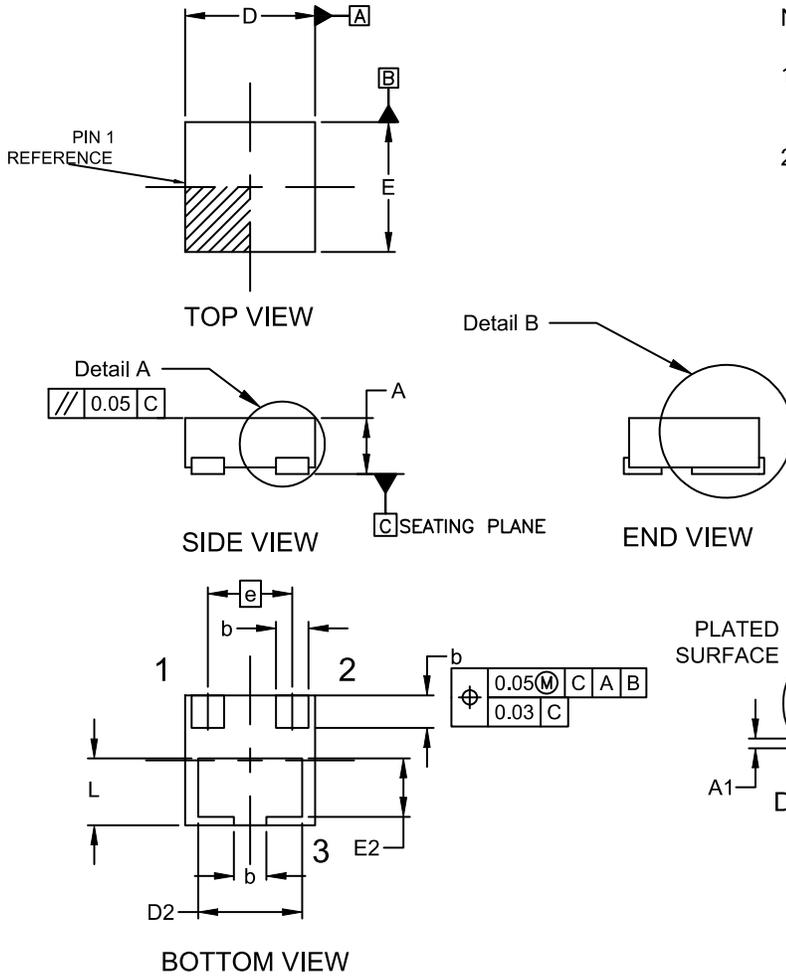
| Part Number | Marking | Package | Shipping [†] |
|-------------------|---------|---------------------|-----------------------|
| NVNJWS200N031LTAG | 2A | XDFNW3 (Pb-Free) | 3000 / Tape & Reel |

[†]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.

NVNJWS200N031L

PACKAGE DIMENSIONS

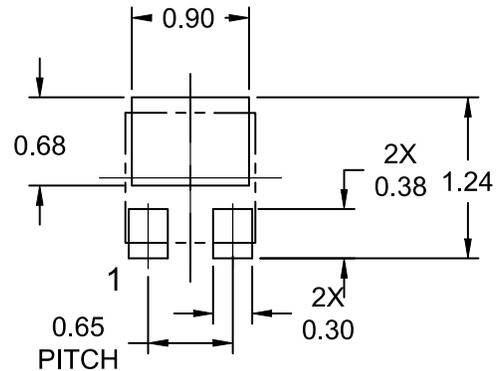
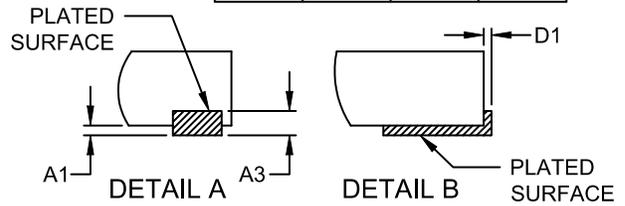
XDFNW3 1x1, 0.65P
CASE 521AC
ISSUE A



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS

| DIM | MILLIMETERS | | |
|-----|-------------|-------|-------|
| | MIN. | NOM. | MAX. |
| A | 0.32 | 0.38 | 0.44 |
| A1 | 0.00 | --- | 0.04 |
| A3 | 0.125 REF | | |
| b | 0.20 | 0.25 | 0.30 |
| D | 0.90 | 1.00 | 1.10 |
| D1 | 0.00 | --- | 0.04 |
| D2 | 0.75 | 0.80 | 0.85 |
| E | 0.90 | 1.00 | 1.10 |
| E2 | 0.40 | 0.45 | 0.50 |
| e | 0.65 BSC | | |
| L | 0.465 | 0.515 | 0.565 |



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.

onsemi, **Onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:

Email Requests to: orderlit@onsemi.com

onsemi Website: www.onsemi.com

TECHNICAL SUPPORT

North American Technical Support:

Voice Mail: 1 800-282-9855 Toll Free USA/Canada

Phone: 011 421 33 790 2910

Europe, Middle East and Africa Technical Support:

Phone: 00421 33 790 2910

For additional information, please contact your local Sales Representative