

MOSFET – P-Channel, POWER TRENCH® Integrated with Schottky Diode

-20 V, -3.1 A, 95 mΩ

**FDFMA2P029Z,
FDFMA2P029Z-F106**

General Description

This device is designed specifically as a single package solution for the battery charge switch in cellular handset and other ultra-portable applications. It features a MOSFET with very low on-state resistance and an independently connected low forward voltage schottky diode allows for minimum conduction losses.

The MicroFET™ 2X2 package offers exceptional thermal performance for its physical size and is well suited to linear mode applications.

Features

MOSFET

- Max $r_{DS(on)}$ = 95 mΩ at $V_{GS} = -4.5$ V, $I_D = -3.1$ A
- Max $r_{DS(on)}$ = 141 mΩ at $V_{GS} = -2.5$ V, $I_D = -2.5$ A
- HBM ESD Protection Level > 2.5 kV (Note 1)

Schottky

- $V_F < 0.37$ V @ 500 mA
- Low Profile – 0.8 mm Maximum – In the New Package MicroFET 2x2 mm
- These Devices are Pb-Free and are RoHS Compliant

NOTE:

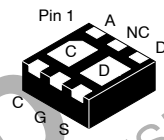
1. The diode connected between the gate and source serves only protection against ESD. No gate overvoltage rating is implied.

MOSFET

| V_{DS} MAX | $r_{DS(on)}$ MAX | I_D MAX |
|--------------|------------------|-----------|
| -20 V | 95 mΩ @ -4.5 V | -3.1 A |
| | 141 mΩ @ -2.5 V | |

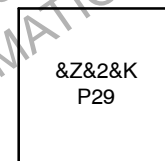
SCHOTTKY DIODE

| V_{RRM} MAX | V_F MAX | I_O MAX |
|---------------|-----------------|-----------|
| 20 V | 0.37 V @ 500 mA | 2 A |



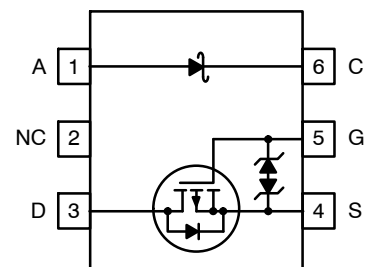
WDFN6 2x2, 0.65P
MicroFET
CASE 511DA

MARKING DIAGRAM



&Z = Assembly Plant Code
&2 = 2-Digit Date Code
&K = 2-Digits Lot Run Traceability Code
P29 = Device Code

PIN CONNECTIONS



ORDERING INFORMATION

See detailed ordering and shipping information on page 6 of this data sheet.

FDFMA2P029Z, FDFMA2P029Z-F106

MOSFET MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

| Symbol | Parameter | | Ratings | Unit |
|-----------------------------------|--|----------------------|-------------|------|
| V _{DS} | Drain to Source Voltage | | −20 | V |
| V _{GS} | Gate to Source Voltage | | ±12 | V |
| I _D | Drain Current | Continuous (Note 2a) | −3.1 | A |
| | | Pulsed | −6 | |
| P _D | Power Dissipation | (Note 2a) | 1.4 | W |
| | | (Note 2b) | 0.7 | |
| T _J , T _{STG} | Operating and Storage Junction Temperature Range | | −55 to +150 | °C |
| V _{RRM} | Schottky Repetitive Peak Reverse Voltage | | 20 | V |
| I _O | Schottky Average Forward Current | | 2 | A |

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.

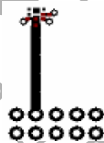
THERMAL CHARACTERISTICS

| Symbol | Parameter | Ratings | Unit |
|------------------|---|---------|------|
| R _{θJA} | Thermal Resistance, Junction to Ambient (Note 2a) | 86 | °C/W |
| R _{θJA} | Thermal Resistance, Junction to Ambient (Note 2b) | 173 | |
| R _{θJA} | Thermal Resistance, Junction to Ambient (Note 2c) | 86 | |
| R _{θJA} | Thermal Resistance, Junction to Ambient (Note 2d) | 140 | |

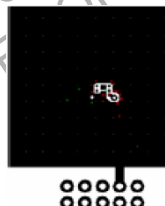
2. R_{θJA} is determined with the device mounted on a 1 in² oz. copper pad on a 1.5 x 1.5 in. board of FR-4 material. R_{θJC} is guaranteed by design while R_{θJA} is determined by the user's board design.
- MOSFET R_{θJA} = 86°C/W when mounted on a 1 in² pad of 2 oz copper, 1.5" x 1.5" x 0.062" thick PCB.
 - MOSFET R_{θJA} = 173°C/W when mounted on a minimum pad of 2 oz copper.
 - Schottky R_{θJA} = 86°C/W when mounted on a 1 in² pad of 2 oz copper, 1.5" x 1.5" x 0.062" thick PCB.
 - Schottky R_{θJA} = 140°C/W when mounted on a minimum pad of 2 oz copper.



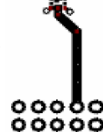
a. 86°C/W when mounted on a 1 in² pad of 2 oz copper.



b. 173°C/W when mounted on a minimum pad of 2 oz copper.



c. 86°C/W when mounted on a 1 in² pad of 2 oz copper.



d. 140°C/W when mounted on a minimum pad of 2 oz copper.

FDFMA2P029Z, FDFMA2P029Z-F106

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Unit |
|--------|-----------|-----------------|-----|-----|-----|------|
|--------|-----------|-----------------|-----|-----|-----|------|

OFF CHARACTERISTICS

| | | | | | | |
|--------------------------------------|---|---|-----|-----|-----|-------|
| BV _{DSS} | Drain to Source Breakdown Voltage | I _D = -250 μA, V _{GS} = 0 V | -20 | - | - | V |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | I _D = -250 μA, referenced to 25°C | - | -12 | - | mV/°C |
| I _{DSS} | Zero Gate Voltage Drain Current | V _{DS} = -16 V, V _{GS} = 0 V | - | - | -1 | μA |
| I _{GSS} | Gate to Source Leakage Current | V _{GS} = ±12 V, V _{DS} = 0 V | - | - | ±10 | μA |

ON CHARACTERISTICS

| | | | | | | |
|--|--|---|------|------|------|-------|
| V _{GS(th)} | Gate to Source Threshold Voltage | V _{GS} = V _{DS} , I _D = -250 μA | -0.6 | -1.0 | -1.5 | V |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate to Source Threshold Voltage Temperature Coefficient | I _D = -250 μA, referenced to 25°C | - | 4 | - | mV/°C |
| r _{DS(on)} | Static Drain to Source On-Resistance | V _{GS} = -4.5 V, I _D = -3.1 A | - | 60 | 95 | mΩ |
| | | V _{GS} = -2.5 V, I _D = -2.5 A | - | 88 | 141 | |
| | | V _{GS} = -4.5 V, I _D = -3.1 A, T _J = 125°C | - | 87 | 140 | |
| g _{FS} | Forward Transconductance | V _{DS} = -10 V, I _D = -3.1 A | - | -11 | - | S |

DYNAMIC CHARACTERISTICS

| | | | | | | |
|------------------|------------------------------|---|---|-----|-----|----|
| C _{iss} | Input Capacitance | V _{DS} = -10 V, V _{GS} = 0 V, f = 1 MHz | - | 540 | 720 | pF |
| C _{oss} | Output Capacitance | | - | 120 | 160 | pF |
| C _{rss} | Reverse Transfer Capacitance | | - | 100 | 150 | pF |

SWITCHING CHARACTERISTICS

| | | | | | | |
|---------------------|-------------------------------|--|---|-----|----|----|
| t _{d(on)} | Turn-On Delay Time | V _{DD} = -10 V, I _D = -1 A V _{GS} = -4.5 V, R _{GEN} = 6 Ω | - | 13 | 24 | ns |
| t _r | Rise Time | | - | 11 | 20 | ns |
| t _{d(off)} | Turn-Off Delay Time | | - | 37 | 59 | ns |
| t _f | Fall Time | | - | 36 | 58 | ns |
| Q _{g(TOT)} | Total Gate Charge | V _{DD} = -10 V, I _D = -3.1 A V _{GS} = -4.5 V | - | 7 | 10 | nC |
| Q _{gs} | Gate to Source Gate Charge | | - | 1.1 | - | nC |
| Q _{gd} | Gate to Drain "Miller" Charge | | - | 2.4 | - | nC |

DRAIN-SOURCE DIODE CHARACTERISTICS

| | | | | | | |
|-----------------|---|---|---|------|------|----|
| I _S | Maximum Continuous Drain-Source Diode Forward Current | | – | – | –1.1 | A |
| V _{SD} | Source to Drain Diode Forward Voltage | V _{GS} = 0 V, I _S = –1.1 A (Note 3) | – | –0.8 | –1.2 | V |
| t _{rr} | Reverse Recovery Time | I _F = –3.1 A, di/dt = 100 A/μs | – | 25 | – | ns |
| Q _{rr} | Reverse Recovery Charge | | – | 9 | – | nC |

SCHOTTKY DIODE CHARACTERISTICS

| | | | | | | | |
|----------------|-----------------|-------------------------|------------------------|----|------|-------|----|
| V _R | Reverse Voltage | I _R = 1 mA | T _J = 25°C | 20 | - | - | V |
| I _R | Reverse Leakage | V _R = 20 V | T _J = 25°C | - | 30 | 300 | μA |
| | | | T _J = 125°C | - | 10 | 45 | mA |
| V _F | Forward Voltage | I _F = 500 mA | T _J = 25°C | - | 0.32 | 0.37 | V |
| | | | T _J = 125°C | - | 0.21 | 0.26 | |
| | | I _F = 1 A | T _J = 25°C | - | 0.37 | 0.435 | |
| | | | T _J = 125°C | - | 0.28 | 0.33 | |

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.

3. Pulse Test: Pulse Width < 300 μs, Duty Cycle < 2.0%

TYPICAL CHARACTERISTICS

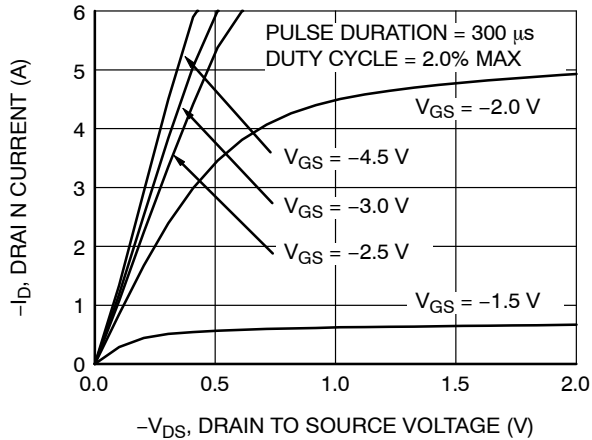
(T_J = 25°C unless otherwise noted)

Figure 1. On Region Characteristics

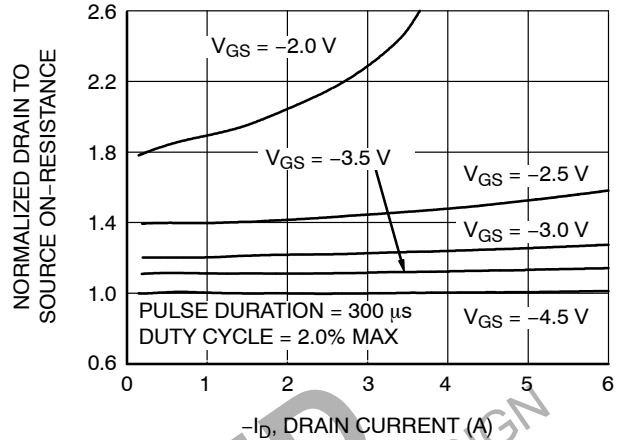


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

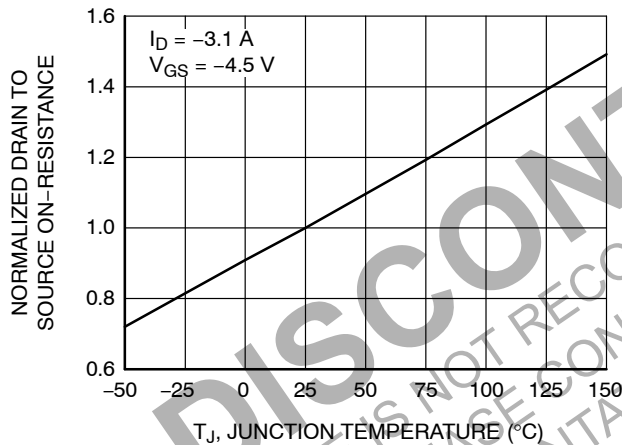


Figure 3. Normalized On-Resistance vs. Junction Temperature

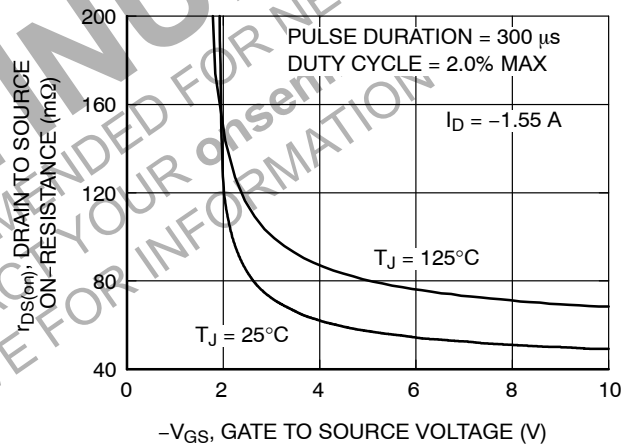


Figure 4. On-Resistance vs. Gate to Source Voltage

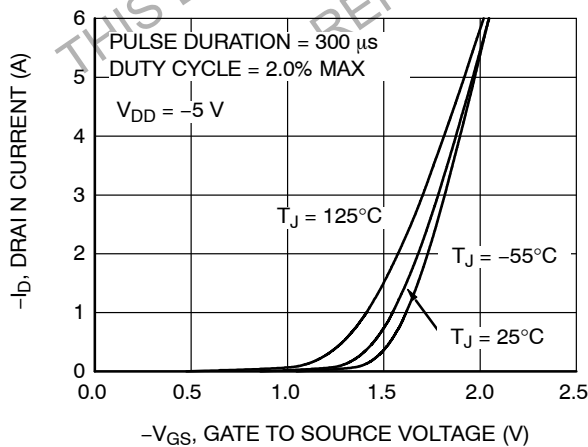


Figure 5. Transfer Characteristics

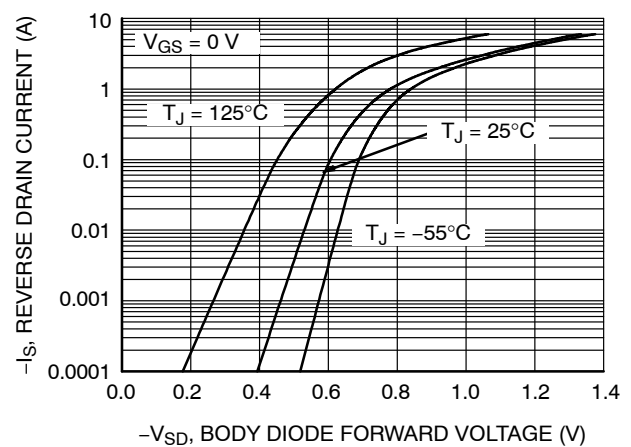


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

TYPICAL CHARACTERISTICS

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

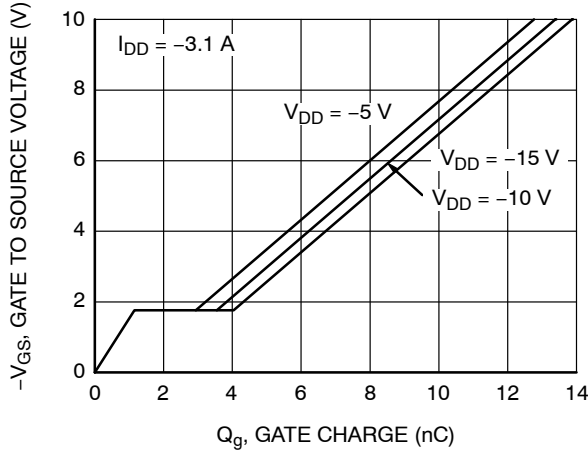


Figure 7. Gate Charge Characteristics

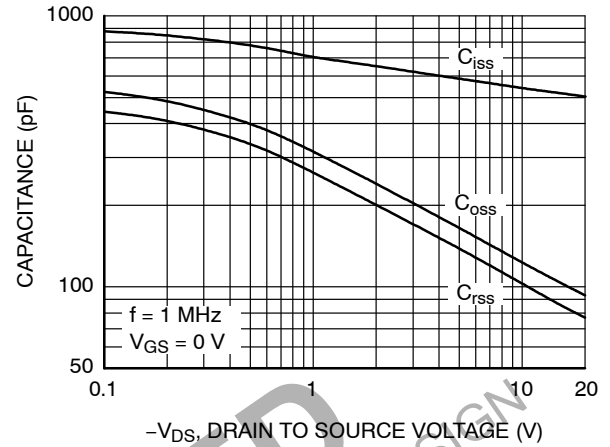


Figure 8. Capacitance Characteristics

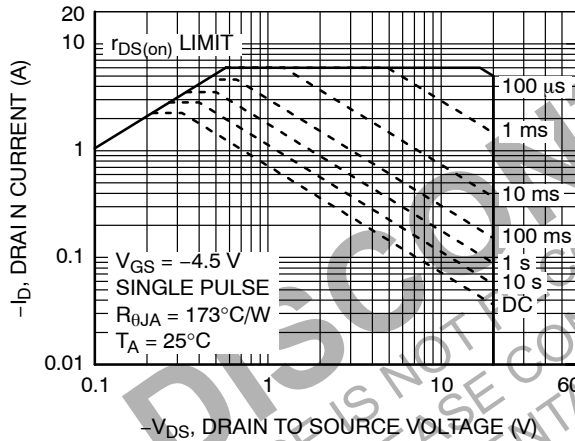


Figure 9. Forward Bias Safe Operating Area

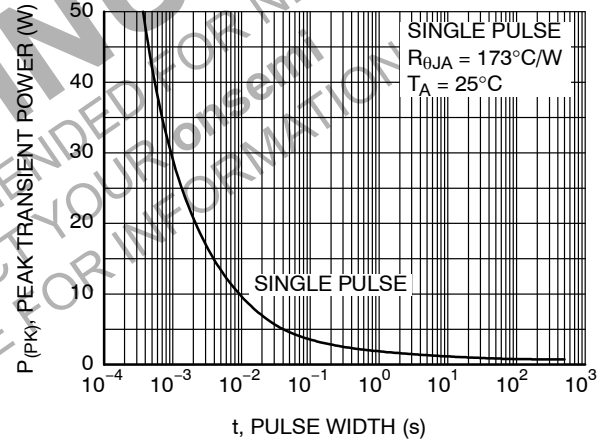


Figure 10. Single Pulse Maximum Power Dissipation

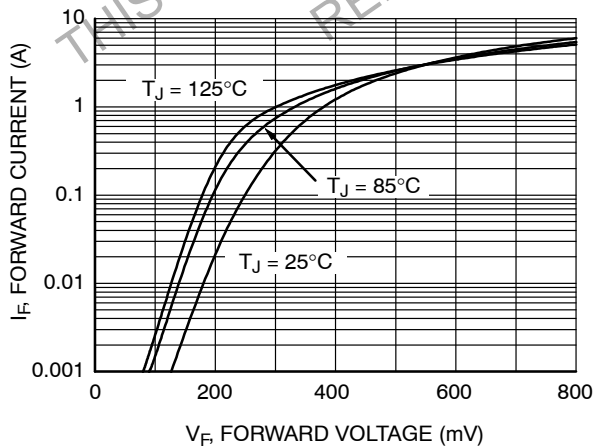


Figure 11. Schottky Diode Forward Voltage

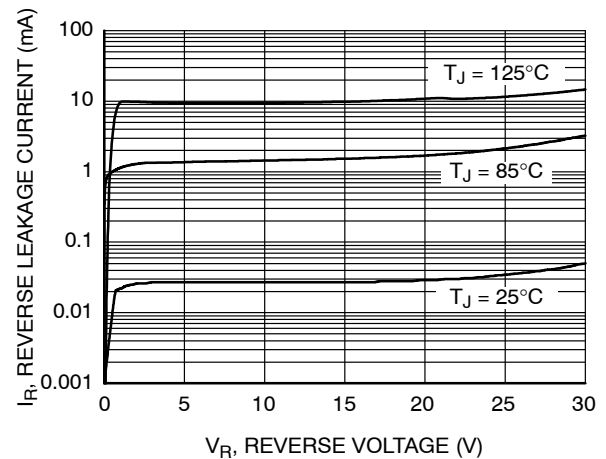


Figure 12. Schottky Diode Reverse Current

TYPICAL CHARACTERISTICS

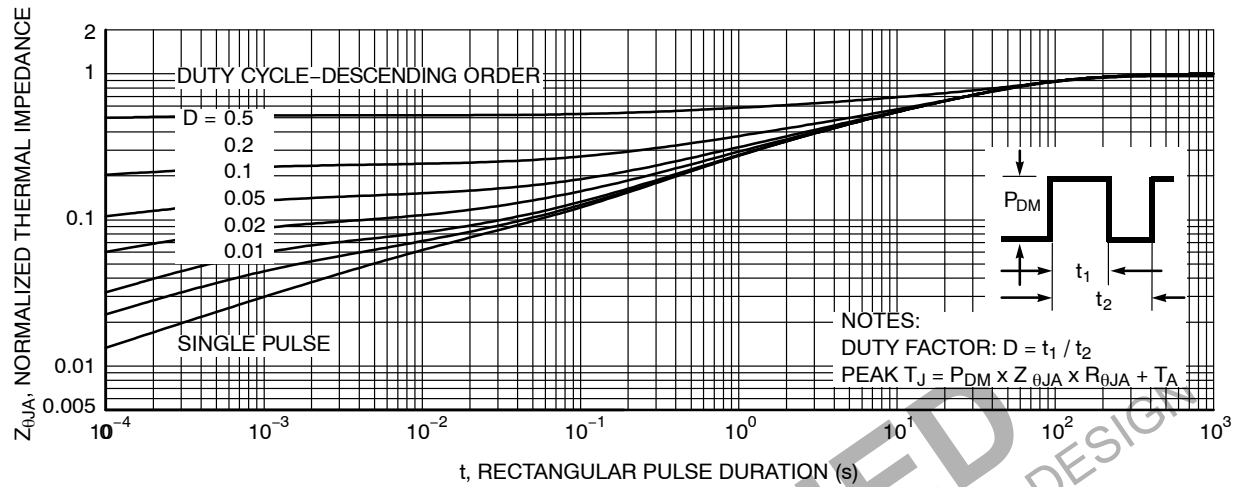
(T_J = 25°C unless otherwise noted) (continued)

Figure 13. Transient Thermal Response Curve

PACKAGE MARKING AND ORDERING INFORMATION

| Device | Device Marking | Package Type | Reel Size | Tape Width | Shipping [†] |
|------------------|----------------|---|-----------|------------|-----------------------|
| FDFMA2P029Z | P29 | WDFN6 2x2, 0.65P MicroFET (Pb-Free) | 7" | 8 mm | 3000 / Tape & Reel |
| FDFMA2P029Z-F106 | P29 | WDFN6 2x2, 0.65P MicroFET (Pb-Free) | 7" | 8 mm | 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.

POWERTRENCH is registered trademark of Semiconductor Components Industries, LLC dba "onsemi" or its affiliates and/or subsidiaries in the United States and/or other countries.

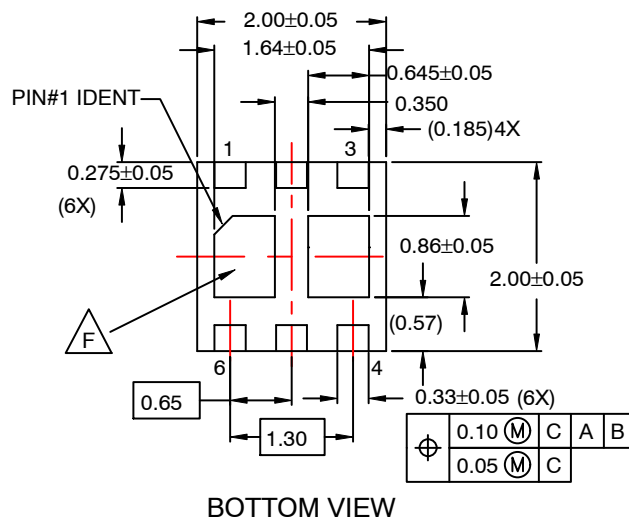
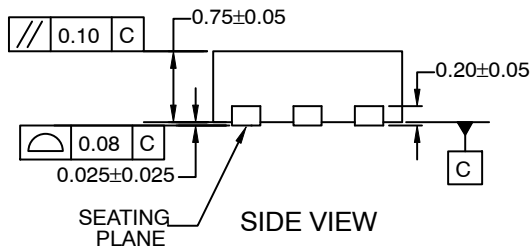
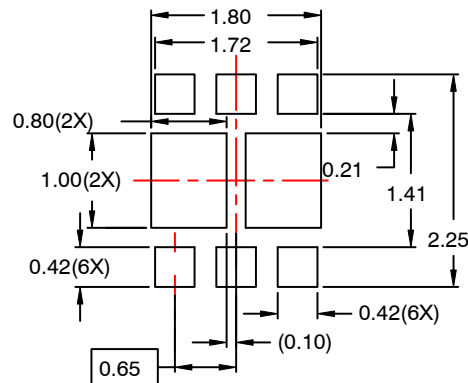
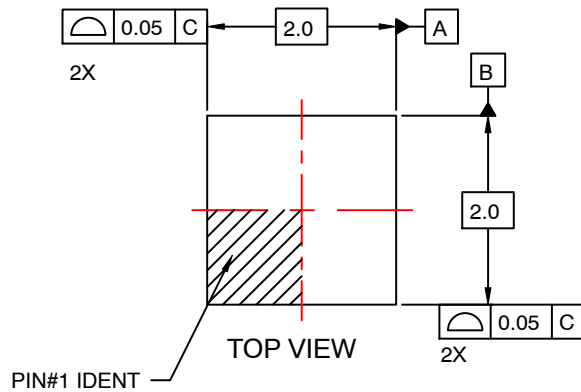
MicroFET is trademark of Semiconductor Components Industries, LLC dba "onsemi" or its affiliates and/or subsidiaries in the United States and/or other countries.

WDFN6 2x2, 0.65P

CASE 511DA

ISSUE O

DATE 31 JUL 2016




NOTES:

- CONFORM TO JEDEC REGISTRATIONS MO-229, VARIATION VCCC, EXCEPT WHERE NOTED.
- DIMENSIONS ARE IN MILLIMETERS.
- DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.
- LAND PATTERN RECOMMENDATION IS EXISTING INDUSTRY LAND PATTERN.

F. NON-JEDEC DUAL DAP

| | | |
|------------------|------------------|--|
| DOCUMENT NUMBER: | 98AON13615G | Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. |
| DESCRIPTION: | WDFN6 2X2, 0.65P | PAGE 1 OF 1 |

ON Semiconductor and  are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor 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. ON Semiconductor does not convey any license under its patent rights nor the rights of others.

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.

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:

Technical Library: www.onsemi.com/design/resources/technical-documentation
onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support

For additional information, please contact your local Sales Representative at
www.onsemi.com/support/sales