

MOSFET – Single, P-Channel, POWERTRENCH®

-12 V, -10 A, 16 mΩ

FDMA905P

General Description

This device is designed specifically for battery charge or load switching in cellular handset and other ultraportable applications. It features a MOSFET with low on-state resistance.

The MicroFET™ 2x2 package offers exceptional thermal performance for its physical size and is well suited to linear mode applications.

Features

- Max $r_{DS(on)}$ = 16 mΩ at $V_{GS} = -4.5$ V, $I_D = -10$ A
- Max $r_{DS(on)}$ = 21 mΩ at $V_{GS} = -2.5$ V, $I_D = -8.9$ A
- Max $r_{DS(on)}$ = 82 mΩ at $V_{GS} = -1.8$ V, $I_D = -4.5$ A
- Low Profile – 0.8 mm Maximum in the New Package MicroFET 2x2 mm
- ESD Protection Level: HBM > 800 V, CDM > 2 kV, MM > 100 V
- Free from Halogenated Compounds and Antimony Oxides
- This Device is Pb-Free, Halide Free and is RoHS Compliant

MOSFET MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$, unless otherwise noted)

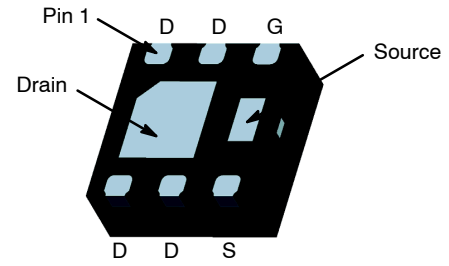
| Symbol | Parameter | Ratings | Unit |
|----------------|---|-------------|------|
| V_{DS} | Drain to Source Voltage | -12 | V |
| V_{GS} | Gate to Source Voltage | ±8 | V |
| I_D | Drain Current – Continuous (Note 1a) – Pulsed | -10 -40 | A |
| P_D | Power Dissipation (Note 1a) (Note 1b) | 2.4 0.9 | W |
| T_J, T_{STG} | Operating and Storage Junction Temperature Range | -55 to +150 | °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 CHARACTERISTICS ($T_A = 25^\circ\text{C}$, unless otherwise noted)

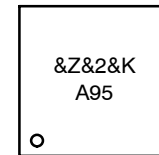
| Symbol | Parameter | Ratings | Unit |
|-----------------|--|---------|------|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case | 6.9 | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Note 1a) | 52 | |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Note 1b) | 145 | |

| V_{DS} | $r_{DS(on)}$ MAX | I_D MAX |
|----------|------------------|-----------|
| -12 V | 16 mΩ @ -4.5 V | -10 A |
| | 21 mΩ @ -2.5 V | |
| | 82 mΩ @ -1.8 V | |



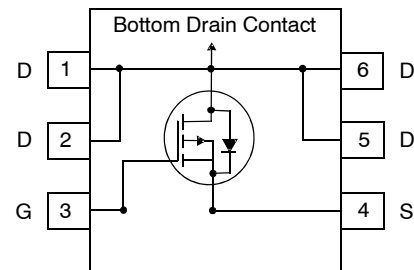
Bottom
WDFN6 2x2, 0.65P
(MicroFET 2x2)
CASE 511CZ

MARKING DIAGRAM



&Z = Assembly Plant Code
&2 = 2-Digit Date Code
&K = 2-Digits Lot Run Traceability Code
A95 = Specific Device Code

PIN ASSIGNMENT



ORDERING INFORMATION

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

FDMA905P

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

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

OFF CHARACTERISTICS

| | | | | | | |
|--------------------------------------|---|---|-----|------|-----------|----------------------------|
| BV_{DSS} | Drain to Source Breakdown Voltage | $I_D = -250 \mu\text{A}, V_{GS} = 0 \text{ V}$ | -12 | - | - | V |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D = -250 \mu\text{A}$, referenced to 25°C | - | -4.3 | - | $\text{mV}/^\circ\text{C}$ |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = -9.6 \text{ V}, V_{GS} = 0 \text{ V}$ | - | - | -1 | μA |
| I_{GSS} | Gate to Source Leakage Current | $V_{GS} = \pm 8 \text{ V}, V_{DS} = 0 \text{ V}$ | - | - | ± 100 | nA |

ON CHARACTERISTICS

| | | | | | | |
|--|--|---|------|------|------|----------------------------|
| $V_{GS(th)}$ | Gate to Source Threshold Voltage | $V_{GS} = V_{DS}, I_D = -250 \mu\text{A}$ | -0.4 | -0.7 | -1.0 | V |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate to Source Threshold Voltage Temperature Coefficient | $I_D = -250 \mu\text{A}$, referenced to 25°C | - | 2.6 | - | $\text{mV}/^\circ\text{C}$ |
| $r_{DS(on)}$ | Static Drain to Source On Resistance | $V_{GS} = -4.5 \text{ V}, I_D = -10 \text{ A}$ | - | 14 | 16 | m Ω |
| | | $V_{GS} = -2.5 \text{ V}, I_D = -8.9 \text{ A}$ | - | 17 | 21 | |
| | | $V_{GS} = -1.8 \text{ V}, I_D = -4.5 \text{ A}$ | - | 21 | 82 | |
| | | $V_{GS} = -4.5 \text{ V}, I_D = -10 \text{ A}, T_J = 125^\circ\text{C}$ | - | 16 | 21 | |
| g_{FS} | Forward Transconductance | $V_{DD} = -5 \text{ V}, I_D = -10 \text{ A}$ | - | 50 | - | S |

DYNAMIC CHARACTERISTICS

| | | | | | | |
|-----------|------------------------------|--|---|------|------|----|
| C_{iss} | Input Capacitance | $V_{DS} = -6 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$ | - | 2559 | 3405 | pF |
| C_{oss} | Output Capacitance | | - | 490 | 735 | pF |
| C_{rss} | Reverse Transfer Capacitance | | - | 437 | 655 | pF |

SWITCHING CHARACTERISTICS

| | | | | | | |
|--------------|-------------------------------|---|---|-----|-----|----|
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD} = -6 \text{ V}, I_D = -10 \text{ A}, V_{GS} = -4.5 \text{ V}, R_{GEN} = 6 \Omega$ | - | 11 | 20 | ns |
| t_r | Rise Time | | - | 11 | 20 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | - | 120 | 192 | ns |
| t_f | Fall Time | | - | 59 | 94 | ns |
| Q_g | Total Gate Charge | $V_{DD} = -6 \text{ V}, I_D = -10 \text{ A}, V_{GS} = -4.5 \text{ V}$ | - | 21 | 29 | nC |
| Q_{gs} | Gate to Source Charge | | - | 3.5 | - | nC |
| Q_{gd} | Gate to Drain "Miller" Charge | | - | 4.2 | - | nC |

DRAIN-SOURCE CHARACTERISTICS

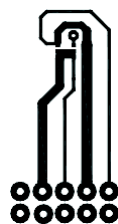
| | | | | | | |
|----------|---------------------------------------|--|---|------|------|----|
| V_{SD} | Source to Drain Diode Forward Voltage | $V_{GS} = 0 \text{ V}, I_S = -2 \text{ A}$ (Note 2) | - | -0.6 | -1.2 | V |
| | | $V_{GS} = 0 \text{ V}, I_S = -10 \text{ A}$ (Note 2) | - | -0.8 | -1.2 | |
| t_{rr} | Reverse Recovery Time | $I_F = -10 \text{ A}, di/dt = 100 \text{ A}/\mu\text{s}$ | - | 21 | 34 | ns |
| Q_{rr} | Reverse Recovery Charge | | - | 6.1 | 12 | nC |

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.

- $R_{\theta JA}$ is determined with the device mounted on a 1 in² pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta JA}$ is determined by the user's board design.



a. $52^\circ\text{C}/\text{W}$ when mounted on a 1 in² pad of 2 oz copper



b. $145^\circ\text{C}/\text{W}$ when mounted on a minimum pad of 2 oz copper

- Pulse Test: Pulse Width < 300 μs , Duty cycle < 2.0%.

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

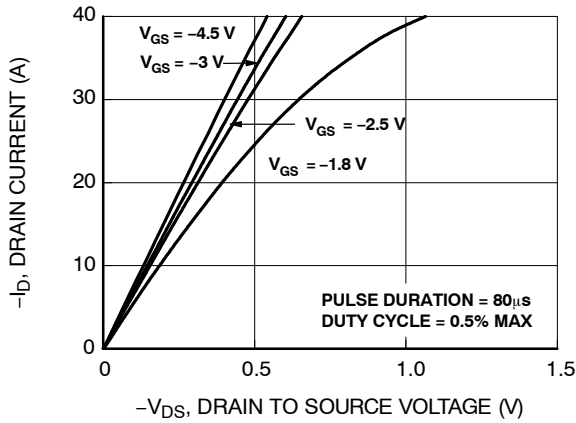


Figure 1. On-Region Characteristics

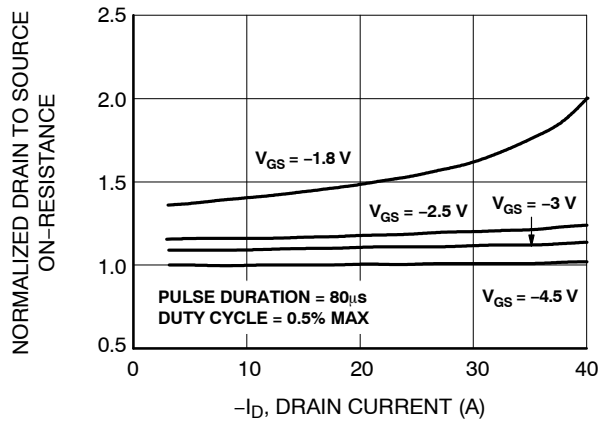


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

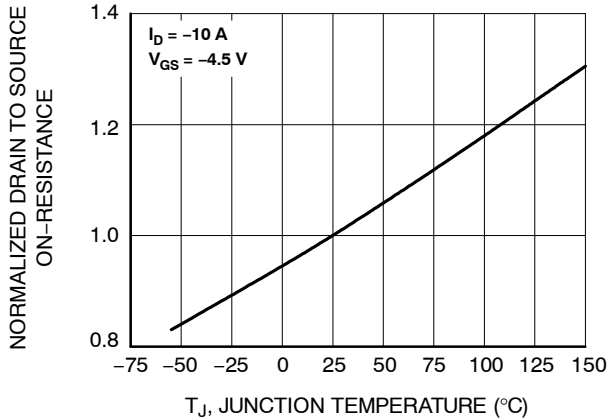


Figure 3. Normalized On Resistance vs. Junction Temperature

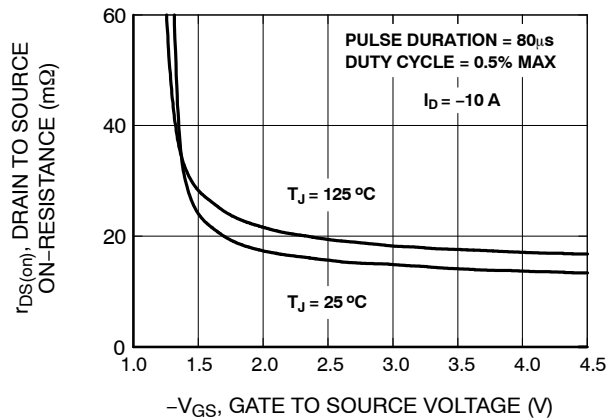


Figure 4. On-Resistance vs. Gate to Source Voltage

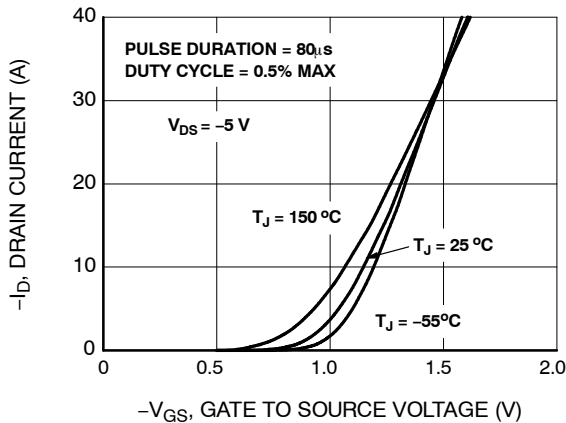


Figure 5. Transfer Characteristics

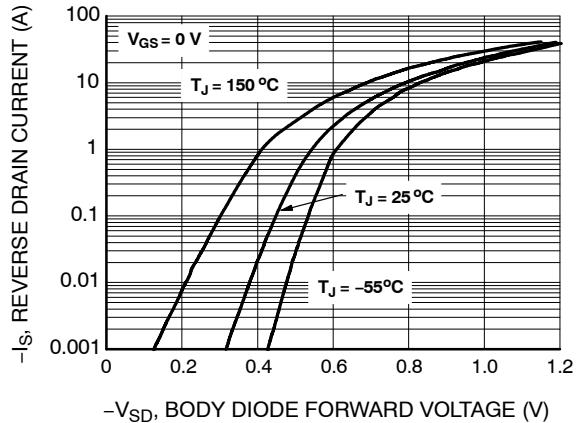


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

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

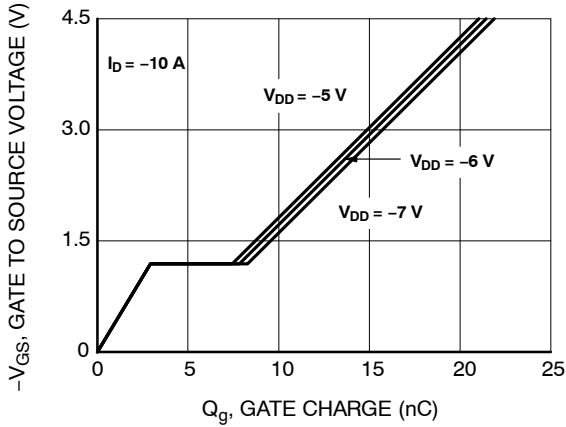


Figure 7. Gate Charge Characteristics

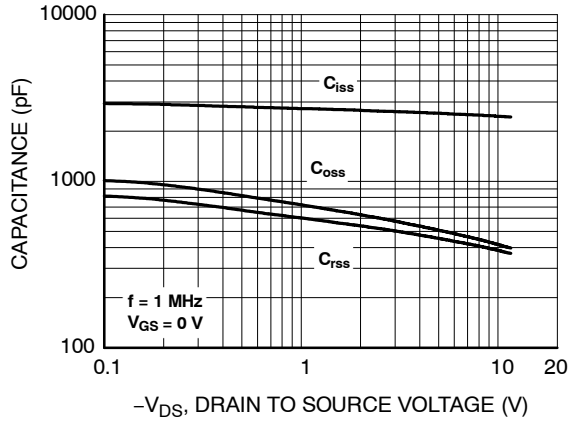


Figure 8. Capacitance vs. Drain to Source Voltage

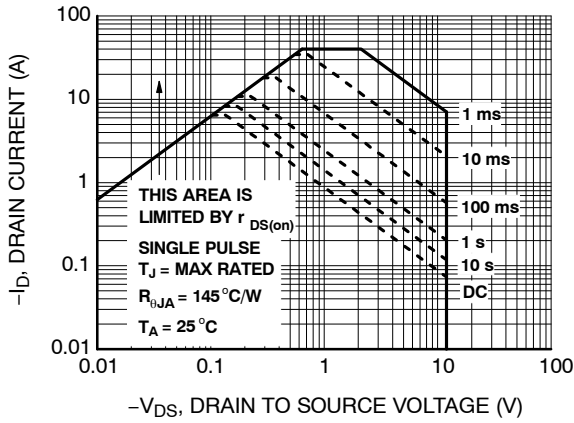


Figure 9. Forward Bias Safe Operating Area

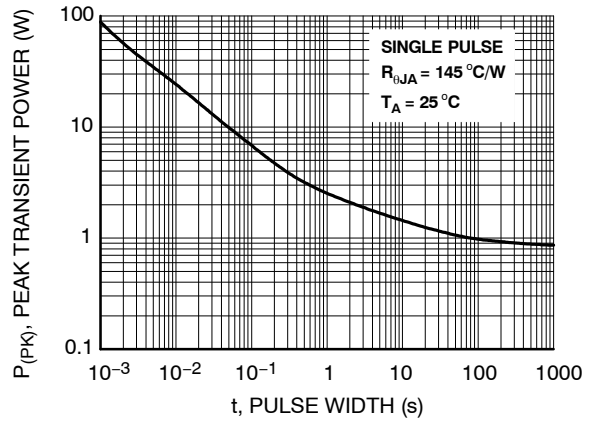


Figure 10. Single Pulse Maximum Power Dissipation

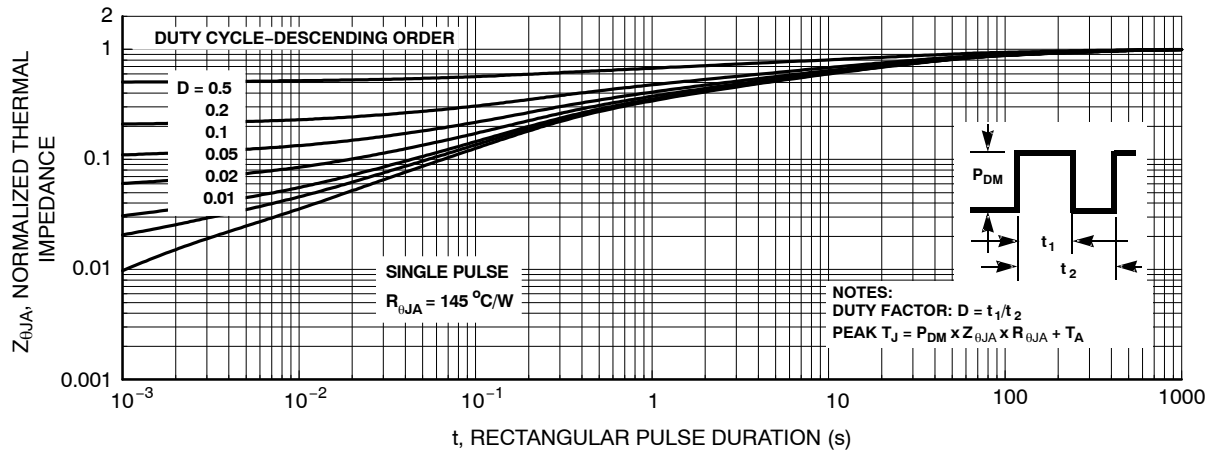


Figure 11. Junction-to-Ambient Transient Thermal Response Curve

FDMA905P

PACKAGE MARKING AND ORDERING INFORMATION

| Device | Device Marking | Package | Shipping [†] |
|----------|----------------|--|-----------------------|
| FDMA905P | A95 | WDFN6 2x2, 0.65P (MicroFET 2x2) (Pb-Free, Halide 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.

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MECHANICAL CASE OUTLINE

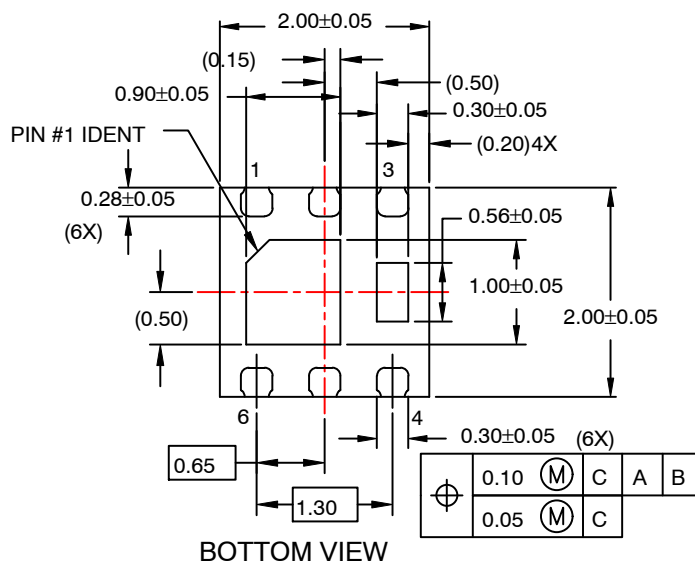
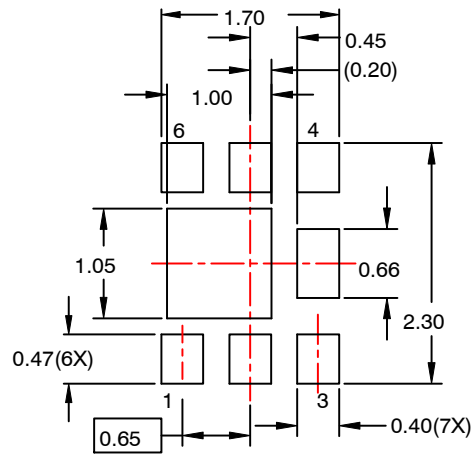
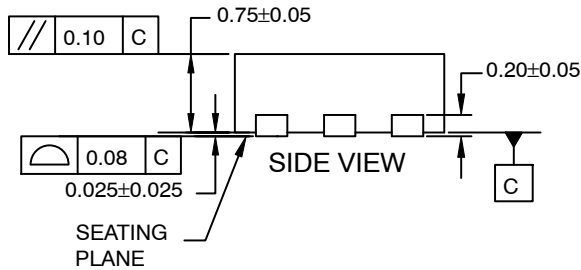
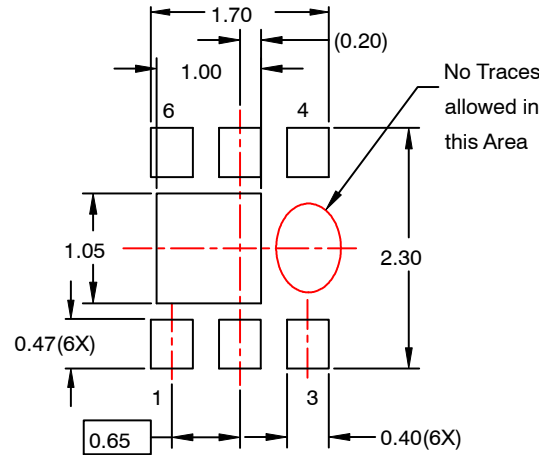
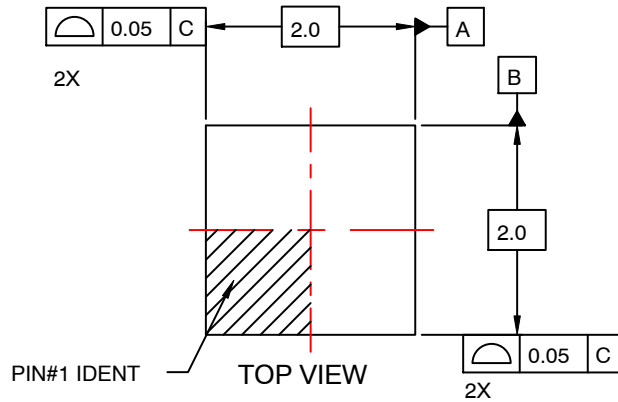
PACKAGE DIMENSIONS

ON Semiconductor®



WDFN6 2x2, 0.65P
CASE 511CZ
ISSUE O

DATE 31 JUL 2016



NOTES:

- A. PACKAGE DOES NOT FULLY CONFORM TO JEDEC MO-229 REGISTRATION
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.
- D. LAND PATTERN RECOMMENDATION IS EXISTING INDUSTRY LAND PATTERN.

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