

# MOSFET – N-Channel, POWERTRENCH<sup>®</sup>, GreenBridge<sup>™</sup> Series of High-Efficiency Bridge Rectifiers

100 V, 6 A, 110 mΩ

## FDMQ8403

### General Description

This quad MOSFET solution provides ten-fold improvement in power dissipation over diode bridge.

### Features

- Max  $r_{DS(on)}$  = 110 mΩ at  $V_{GS}$  = 10 V,  $I_D$  = 3 A
- Max  $r_{DS(on)}$  = 175 mΩ at  $V_{GS}$  = 6 V,  $I_D$  = 2.4 A
- Substantial Efficiency Benefit in PD Solutions
- This Device is Pb-Free, Halid Free and is RoHS Compliant

### Applications

- High-Efficiency Bridge Rectifiers

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

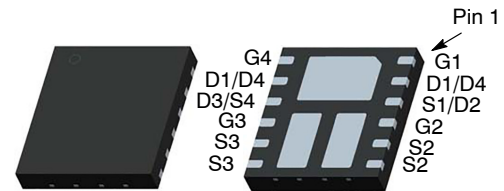
| Symbol         | Rating                                           | Value       | Unit |
|----------------|--------------------------------------------------|-------------|------|
| $V_{DS}$       | Drain to Source Voltage                          | 100         | V    |
| $V_{GS}$       | Gate to Source Voltage                           | ±20         | V    |
| $I_D$          | Drain Current                                    |             | A    |
|                | – Continuous (Package Limited) $T_C$ = 25°C      | 6           |      |
|                | – Continuous (Silicon Limited) $T_C$ = 25°C      | 9           |      |
|                | – Continuous (Note 1a.) $T_A$ = 25°C             | 3.1         |      |
|                | – Pulsed                                         | 12          |      |
| $P_D$          | Power Dissipation $T_C$ = 25°C                   | 17          | W    |
|                | Power Dissipation (Note 1a.) $T_A$ = 25°C        | 1.9         |      |
| $T_J, T_{STG}$ | 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

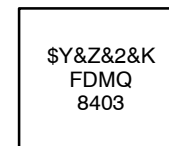
| Symbol          | Rating                                             | Value | Unit |
|-----------------|----------------------------------------------------|-------|------|
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Note 1a.) | 65    | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Note 1b.) | 135   |      |

| $V_{DSS}$ | $R_{DS(ON)}$ MAX | $I_D$ MAX |
|-----------|------------------|-----------|
| 100 V     | 110 Ω @ 10 V     | 6 A       |



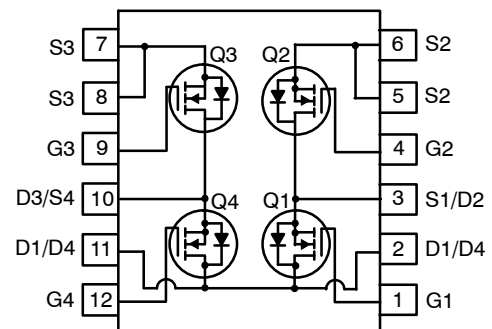
WDFN12 5 x 4.5, 0.8P  
(MLP 4.5 x 5)  
CASE 511CR

### MARKING DIAGRAM



FDMQ8403 = Specific Device Code  
\$Y = onsemi Logo  
&Z = Assembly plant code  
&2 = Date Code format (Year and Week)  
&K = Lot Run Traceability Code

### PIN CONNECTION



### ORDERING INFORMATION

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

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

| Symbol                               | Parameter                                 | Test Condition                                                    | Min | Typ | Max       | Unit                 |
|--------------------------------------|-------------------------------------------|-------------------------------------------------------------------|-----|-----|-----------|----------------------|
| <b>OFF CHARACTERISTICS</b>           |                                           |                                                                   |     |     |           |                      |
| $BV_{DSS}$                           | Drain to Source Breakdown Voltage         | $V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$               | 100 | –   | –         | V                    |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D = 250\text{ }\mu\text{A}$ , Referenced to $25^\circ\text{C}$ | –   | 72  | –         | mV/ $^\circ\text{C}$ |
| $I_{DSS}$                            | Zero Gate Voltage Drain Current           | $V_{GS} = 0\text{ V}, V_{DS} = 80\text{ V}$                       | –   | –   | 1         | nA                   |
| $I_{GSS}$                            | Gate to Source Leakage Current            | $V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$                   | –   | –   | $\pm 100$ | $\mu\text{A}$        |

**OFF CHARACTERISTICS**

|                                        |                                           |                                                                   |   |     |     |                      |
|----------------------------------------|-------------------------------------------|-------------------------------------------------------------------|---|-----|-----|----------------------|
| $V_{GS(th)}$                           | Drain to Source Breakdown Voltage         | $V_{GS} = V_{DS}, I_D = 250\text{ }\mu\text{A}$                   | 2 | 2.8 | 4   | V                    |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D = 250\text{ }\mu\text{A}$ , Referenced to $25^\circ\text{C}$ | – | –8  | –   | mV/ $^\circ\text{C}$ |
| $r_{DS(on)}$                           | Static Drain to Source On Resistance      | $V_{GS} = 10\text{ V}, I_D = 3\text{ A}$                          | – | 85  | 110 | m $\Omega$           |
|                                        |                                           | $V_{GS} = 6\text{ V}, I_D = 2.4\text{ A}$                         | – | 115 | 175 |                      |
|                                        |                                           | $V_{GS} = 10\text{ V}, I_D = 3\text{ A}, T_J = 125^\circ\text{C}$ | – | 147 | 191 |                      |
| $g_{FS}$                               | Forward Transconductance                  | $V_{DS} = 10\text{ V}, I_D = 3\text{ A}$                          | – | 6   | –   | S                    |

**DYNAMIC CHARACTERISTICS**

|           |                              |                                                               |   |     |     |    |
|-----------|------------------------------|---------------------------------------------------------------|---|-----|-----|----|
| $C_{iss}$ | Input Capacitance            | $V_{DS} = 50\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$ | – | 162 | 215 | pF |
| $C_{oss}$ | Output Capacitance           |                                                               | – | 43  | 60  | pF |
| $C_{rss}$ | Reverse Transfer Capacitance |                                                               | – | 2.6 | 5   | pF |

**DYNAMIC CHARACTERISTICS**

|                     |                               |                                                                                                 |                                                 |   |     |    |    |
|---------------------|-------------------------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------|---|-----|----|----|
| t <sub>d(on)</sub>  | Turn-On Delay Time            | V <sub>DD</sub> = 50 V, I <sub>D</sub> = 3 A,<br>V <sub>GS</sub> = 10 V, R <sub>GEN</sub> = 6 Ω |                                                 | – | 4.1 | 10 | ns |
| t <sub>r</sub>      | Rise Time                     |                                                                                                 |                                                 | – | 1.2 | 10 | ns |
| t <sub>d(off)</sub> | Turn-Off Delay Time           |                                                                                                 |                                                 | – | 7.2 | 15 | ns |
| t <sub>f</sub>      | Fall Time                     |                                                                                                 |                                                 | – | 1.8 | 10 | ns |
| Q <sub>g</sub>      | Total Gate Charge             | V <sub>GS</sub> = 0 V to 10 V                                                                   | V <sub>DD</sub> = 50 V,<br>I <sub>D</sub> = 3 A | – | 3   | 5  | nC |
| Q <sub>g</sub>      | Total Gate Charge             | V <sub>GS</sub> = 0 V to 5 V                                                                    |                                                 | – | 1.7 | 3  | nC |
| Q <sub>gs</sub>     | Gate to Source Charge         | V <sub>DD</sub> = 50 V,<br>I <sub>D</sub> = 3 A                                                 |                                                 | – | 0.9 | –  | nC |
| Q <sub>gd</sub>     | Gate to Drain “Miller” Charge |                                                                                                 |                                                 | – | 0.8 | –  | nC |

**DRAIN-SOURCE DIODE CHARACTERISTICS**

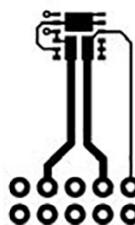
|          |                                       |                                                      |   |      |     |    |
|----------|---------------------------------------|------------------------------------------------------|---|------|-----|----|
| $V_{SD}$ | Source to Drain Diode Forward Voltage | $V_{GS} = 0\text{ V}, I_S = 3\text{ A}$ (Note 2)     | – | 0.86 | 1.3 | V  |
| $t_{rr}$ | Reverse Recovery Time                 | $I_F = 3\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$ | – | 33   | 53  | ns |
| $Q_{rr}$ | Reverse Recovery Charge               |                                                      | – | 23   | 37  | 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  $1\text{ in}^2$  pad 2 oz copper pad on a  $1.5 \times 1.5\text{ in.}$  board of FR-4 material.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta CA}$  is determined by the user's board design.



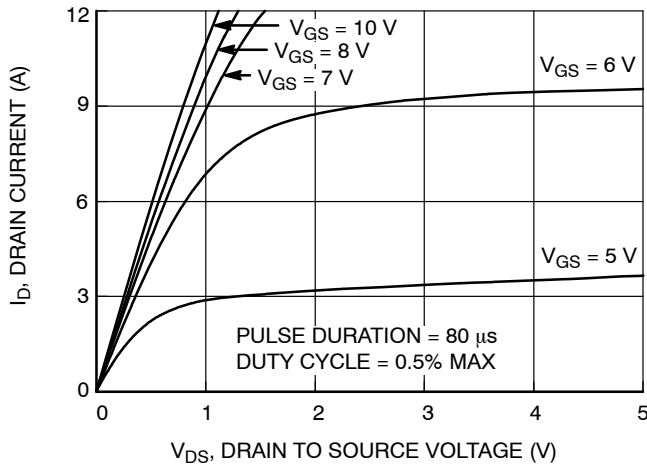
a.  $65^\circ\text{C/W}$  when mounted on a  $1\text{ in}^2$  pad of 2 oz copper, the board designed Q1 + Q3 or Q2 + Q4.



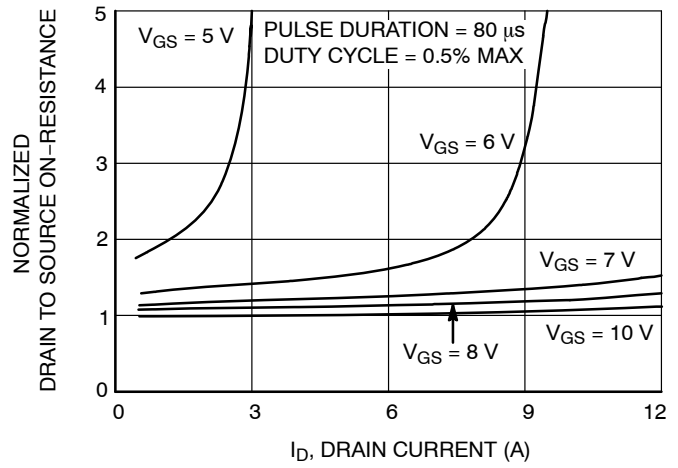
b.  $135^\circ\text{C/W}$  when mounted on a minimum pad of 2 oz copper, the board designed Q1 + Q3 or Q2 + Q4.

- Pulse Test: Pulse Width  $< 300\text{ }\mu\text{s}$ , Duty cycle  $< 2.0\%$ .

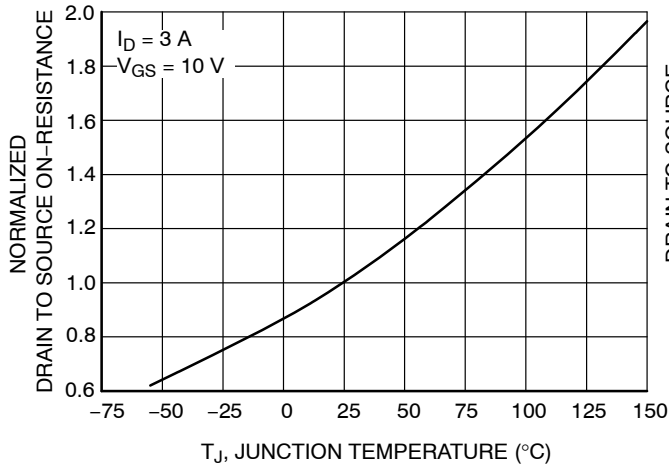
**TYPICAL CHARACTERISTICS** ( $T_J = 25^\circ\text{C}$  unless otherwise noted.)



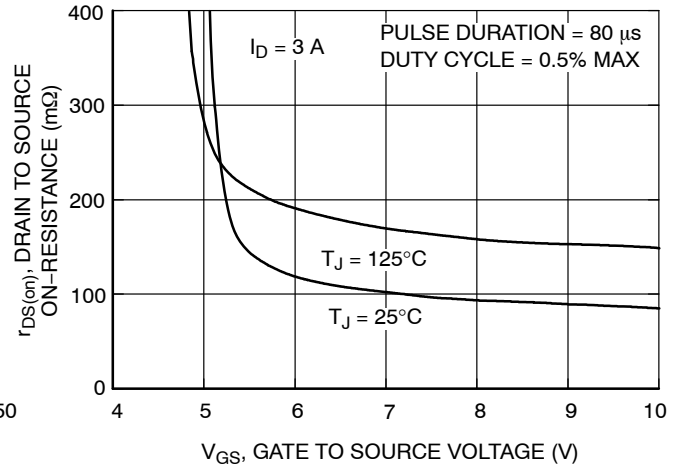
**Figure 1. On Region Characteristics**



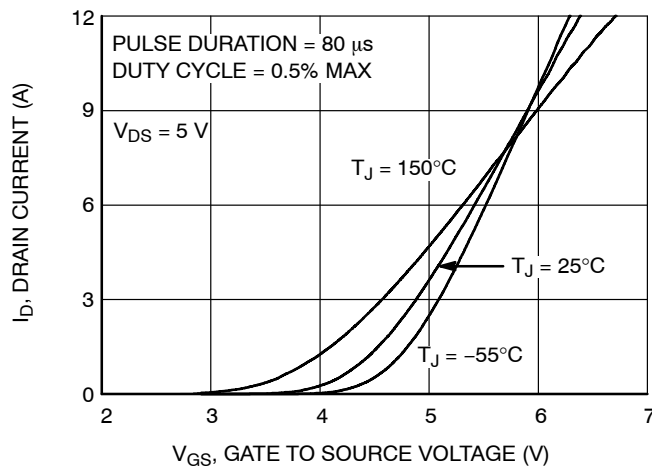
**Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage**



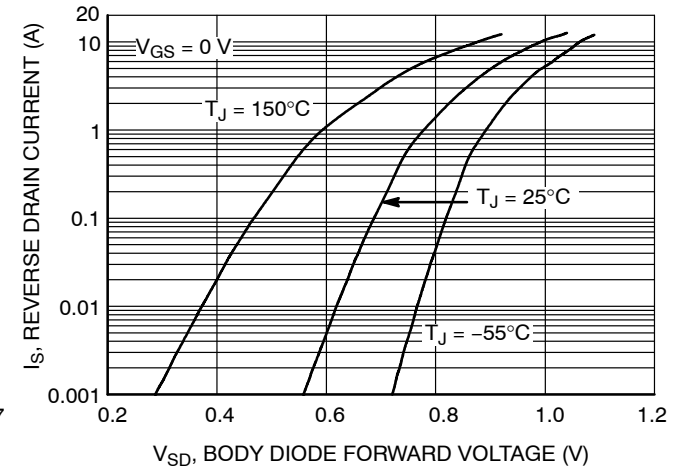
**Figure 3. Normalized On Resistance vs. Junction Temperature**



**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)

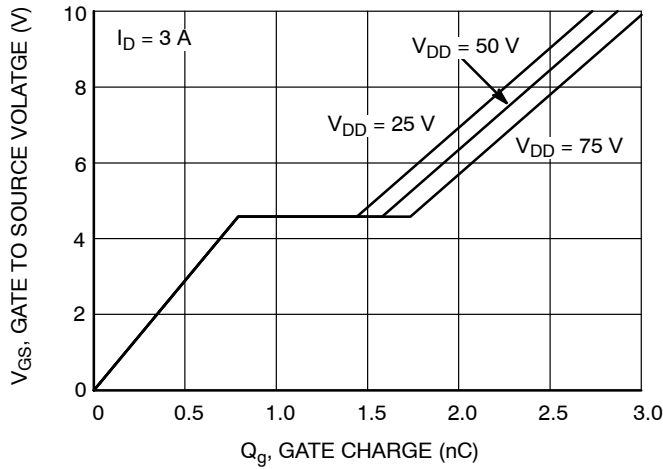


Figure 7. Gate Charge Characteristics

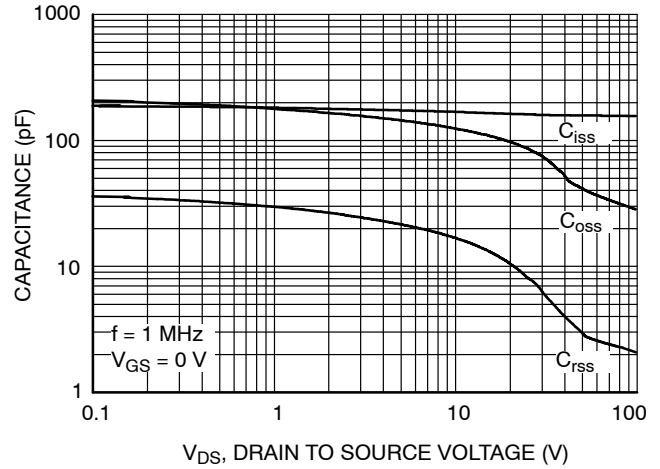


Figure 8. Capacitance vs. Drain to Source Voltage

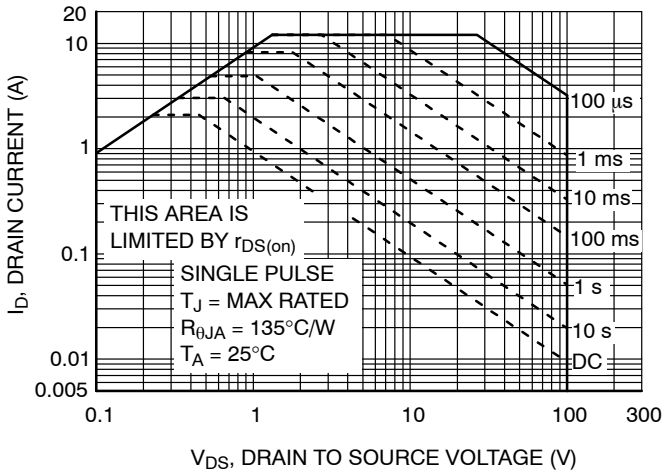


Figure 9. Forward Bias Safe Operating Area

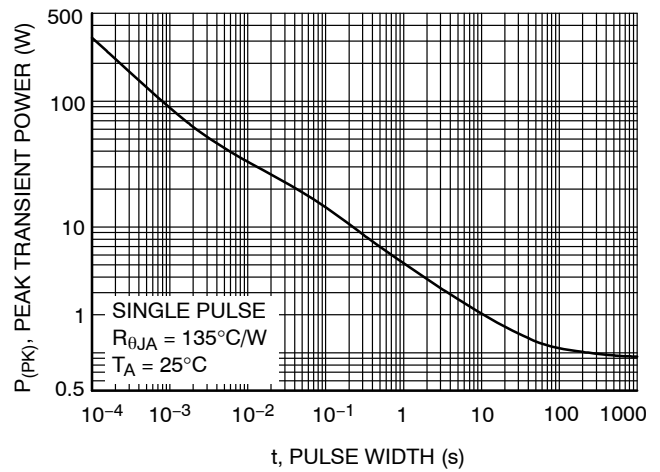


Figure 10. Single Pulse Maximum Power Dissipation

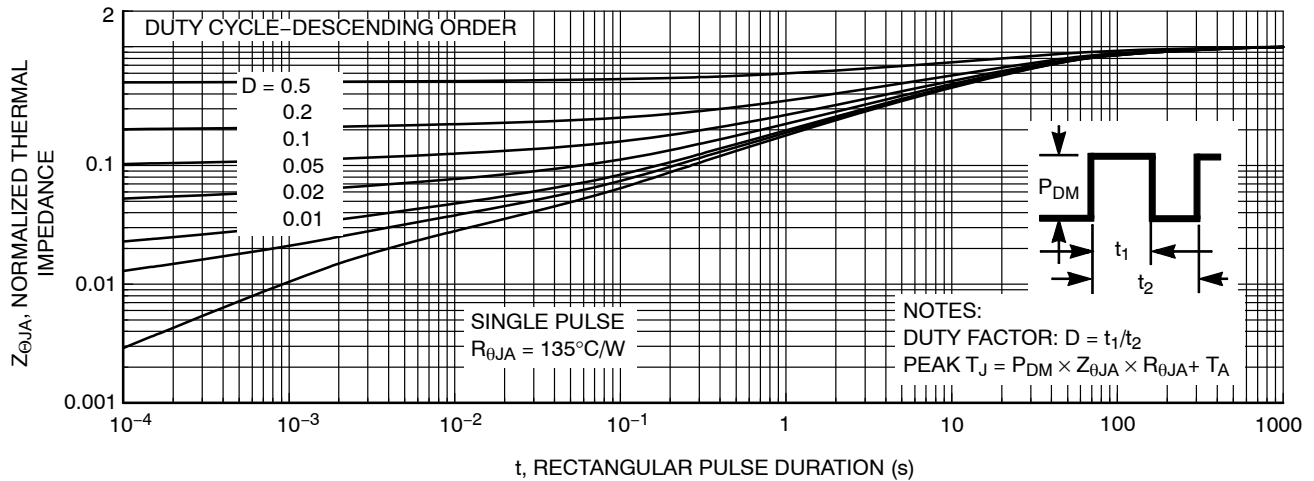


Figure 11. Junction-to-Ambient Transient Thermal Response Curve

## FDMQ8403

### ORDERING INFORMATION

| Device Marking | Device   | Package             | Reel Size | Tape Width | Shipping <sup>†</sup> |
|----------------|----------|---------------------|-----------|------------|-----------------------|
| FDMQ8403       | FDMQ8403 | WDFN12<br>(Pb-Free) | 13"       | 12 mm      | 3000 / Tape & Reel    |

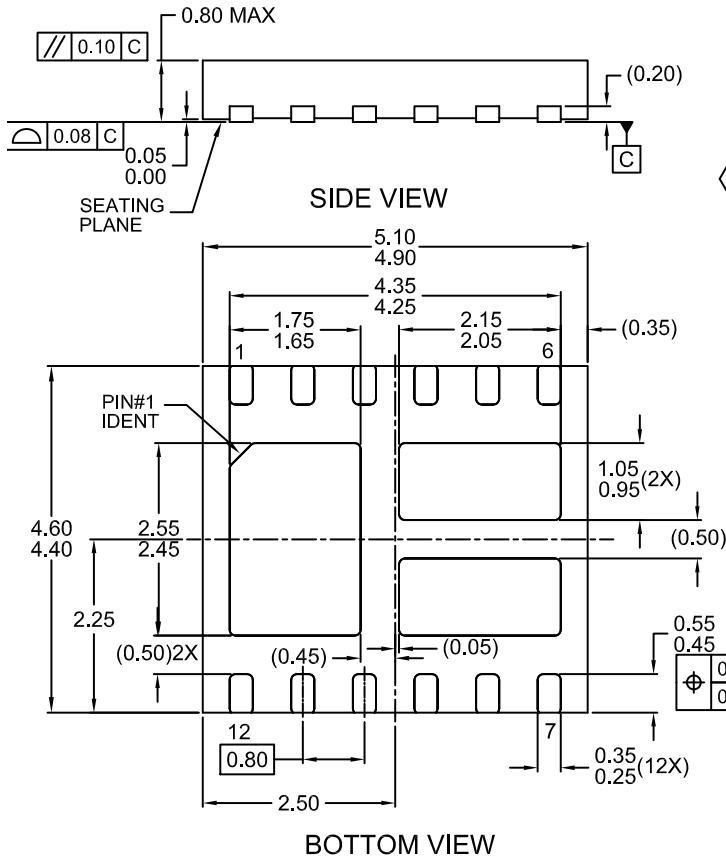
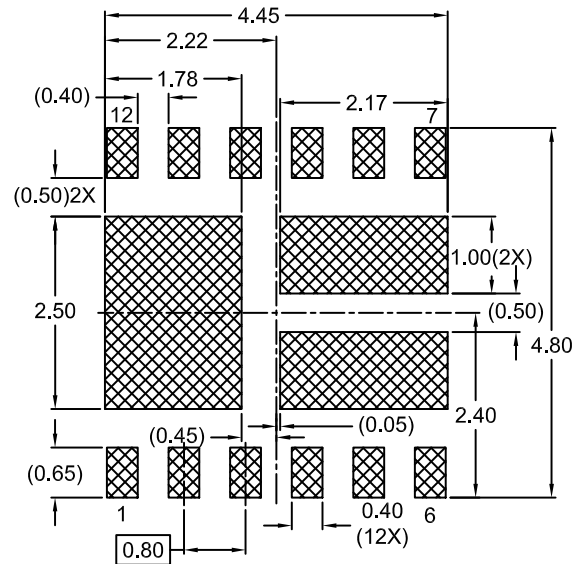
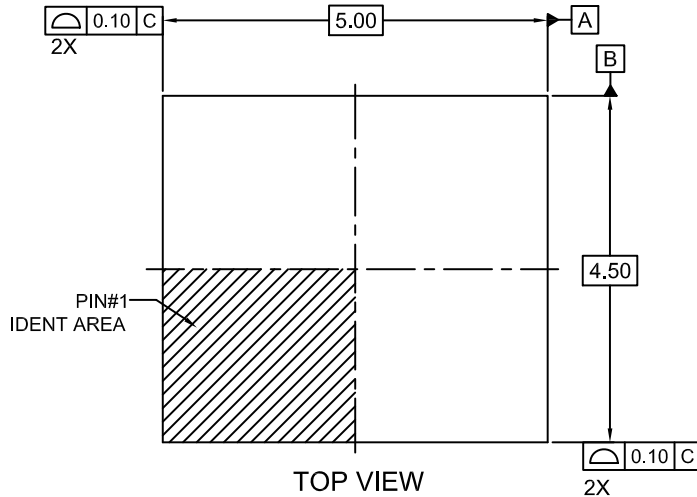
<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, [BRD8011/D](#).

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**WDFN12 5x4.5, 0.8P**  
**CASE 511CR**  
**ISSUE A**

DATE 21 MAR 2017



**NOTES:**

- A. THIS MKT. DWG. DOES NOT FULLY CONFORM TO JEDEC MO-229 REGISTRATION
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.

|                         |                           |                                                                                                                                                                                     |
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