

# MOSFET – N-Channel, UltraFET Trench

**200 V, 9.5 A, 200 mΩ**

## FDMC2610

### General Description

This N-Channel MOSFET is a rugged gate version of onsemi's advanced POWER trench<sup>®</sup> process. It has been optimized for power management applications.

### Features

- Max  $R_{DS(on)}$  = 200 mΩ at  $V_{GS} = 10\text{ V}$ ,  $I_D = 2.2\text{ A}$
- Max  $R_{DS(on)}$  = 215 mΩ at  $V_{GS} = 6\text{ V}$ ,  $I_D = 1.5\text{ A}$
- Low Profile – 1 mm Max in a Power 33
- Pb-Free, Halide Free and RoHS Compliant

### Applications

- DC-DC Conversion

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

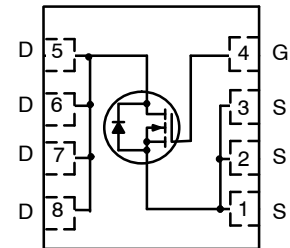
| Symbol         | Parameter  | Value                              | Unit |   |
|----------------|--|------------------------------------|------|---|
| $V_{DS}$       | Drain to Source Voltage                          | 200                                | V    |   |
| $V_{GS}$       | Gate to Source Voltage                           | ±20                                | V    |   |
| $I_D$          | Drain Current:                                   |                                    | A    |   |
|                | Continuous (Silicon limited)                     | $T_C = 25^\circ\text{C}$<br>9.5    |      |   |
|                | Continuous (Note 1a)                             | $T_A = 25^\circ\text{C}$<br>2.2    |      |   |
|                | Pulsed   | 15                                 |      |   |
| $E_{AS}$       | Single Pulse Avalanche Energy (Note 3)           | 6                                  | mJ   |   |
| $P_D$          | Power Dissipation:                               | $T_C = 25^\circ\text{C}$           | 42   | W |
|                |  | $T_A = 25^\circ\text{C}$ (Note 1a) | 2.1  |   |
| $T_J, T_{STG}$ | 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.

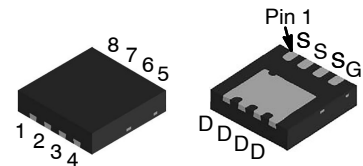
### THERMAL CHARACTERISTICS

| Symbol          | Parameter   | Value | Unit |
|-----------------|---|-------|------|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case              | 3     | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Note 1a) | 60    |      |

| $V_{DS}$ | $R_{DS(on)}$ MAX | $I_D$ MAX |
|----------|------------------|-----------|
| 200 V    | 200 mΩ @ 10 V    | 9.5 A     |
|          | 215 mΩ @ 6 V     |           |



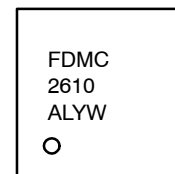
N-CHANNEL MOSFET



Top Bottom

WDFN8 3.3 x 3.3, 0.65P  
CASE 511DH

### MARKING DIAGRAM



FDMC2610 = Specific Device Code  
A = Assembly Site  
L = Wafer Lot Number  
YW = Assembly Start Week

### ORDERING INFORMATION

| Device   | Package                      | Shipping <sup>†</sup> |
|----------|------------------------------|-----------------------|
| FDMC2610 | WDFN8 (Pb-Free, Halide Free) | 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 Specification Brochure, [BRD8011/D](#).

# FDMC2610

## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise noted)

| Symbol                              | Parameter                                 | Test Condition   | Min | Typ | Max  | Unit  |
|-------------------------------------|---|--|-----|-----|------|-------|
| <b>OFF CHARACTERISTICS</b>          |   |  |     |     |      |       |
| BV <sub>DSS</sub>                   | Drain to Source Breakdown Voltage         | I <sub>D</sub> = 250 μA, V <sub>GS</sub> = 0 V                         | 200 | –   | –    | V     |
| ΔBV <sub>DSS</sub> /ΔT <sub>J</sub> | Breakdown Voltage Temperature Coefficient | I <sub>D</sub> = 250 μA, referenced to 25°C                            | –   | 199 | –    | mV/°C |
| I <sub>DSS</sub>                    | Zero Gate Voltage Drain Current           | V <sub>DS</sub> = 160 V, V <sub>GS</sub> = 0 V                         | –   | –   | 1    | μA    |
|                                     |   | V <sub>DS</sub> = 160 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125°C | –   | –   | 100  |       |
| I <sub>GSS</sub>                    | Gate to Source Leakage Current            | V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0 V                         | –   | –   | ±100 | nA    |

## ON CHARACTERISTICS

|                                       |  |  |   |      |     |       |
|---------------------------------------|--|--|---|------|-----|-------|
| V <sub>GS(th)</sub>                   | Gate to Source Threshold Voltage                         | V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 250 μA            | 2 | 3.2  | 4   | V     |
| ΔV <sub>GS(th)</sub> /ΔT <sub>J</sub> | Gate to Source Threshold Voltage Temperature Coefficient | I <sub>D</sub> = 250 μA, referenced to 25°C                            | – | –9.9 | –   | mV/°C |
| R <sub>DS(on)</sub>                   | Drain to Source On Resistance                            | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 2.2 A                         | – | 175  | 200 | mΩ    |
|                                       |  | V <sub>GS</sub> = 6 V, I <sub>D</sub> = 1.5 A,                         | – | 188  | 215 |       |
|                                       |  | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 2.2 A, T <sub>J</sub> = 125°C | – | 347  | 397 |       |
| g <sub>FS</sub>                       | Forward Transconductance                                 | V <sub>DS</sub> = 5 V, I <sub>D</sub> = 2.2 A                          | – | 7    | –   | S     |

## DYNAMIC CHARACTERISTICS

|                  |                              |   |   |     |     |    |
|------------------|------------------------------|---|---|-----|-----|----|
| C <sub>iss</sub> | Input Capacitance            | V <sub>DS</sub> = 100 V, V <sub>GS</sub> = 0 V, f = 1 MHz | – | 720 | 960 | pF |
| C <sub>oss</sub> | Output Capacitance           |   | – | 41  | 55  | pF |
| C <sub>rss</sub> | Reverse Transfer Capacitance |   | – | 12  | 20  | pF |
| R <sub>g</sub>   | Gate Resistance              | f = 1 MHz   | – | 0.7 | –   | Ω  |

## SWITCHING CHARACTERISTICS

|                     |                               |   |   |      |    |    |
|---------------------|-------------------------------|---|---|------|----|----|
| t <sub>d(on)</sub>  | Turn-On Delay Time            | V <sub>DD</sub> = 100 V, I <sub>D</sub> = 2.2 A,<br>V <sub>GS</sub> = 10 V, R <sub>GEN</sub> = 24 Ω | – | 17   | 31 | ns |
| t <sub>r</sub>      | Rise Time                     |   | – | 13   | 24 | ns |
| t <sub>d(off)</sub> | Turn-Off Delay Time           |   | – | 29   | 47 | ns |
| t <sub>f</sub>      | Fall Time                     |   | – | 16   | 29 | ns |
| Q <sub>g(TOT)</sub> | Total Gate Charge at 10 V     | V <sub>GS</sub> = 0 V to 10 V, V <sub>DD</sub> = 100 V,<br>I <sub>D</sub> = 2.2 A                   | – | 12.3 | 18 | nC |
| Q <sub>gs</sub>     | Gate to Source Gate Charge    | V <sub>DD</sub> = 100 V, I <sub>D</sub> = 2.2 A   | – | 3    | –  | nC |
| Q <sub>gd</sub>     | Gate to Drain “Miller” Charge | V <sub>DD</sub> = 100 V, I <sub>D</sub> = 2.2 A   | – | 3.6  | –  | nC |

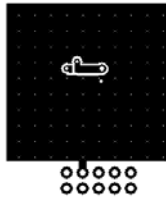
## DRAIN-SOURCE DIODE CHARACTERISTICS

|                 |                                       |  |   |     |     |    |
|-----------------|---------------------------------------|--|---|-----|-----|----|
| V <sub>SD</sub> | Source to Drain Diode Forward Voltage | V <sub>GS</sub> = 0 V, I <sub>S</sub> = 2.2 A (Note 2) | – | 0.8 | 1.2 | V  |
| t <sub>rr</sub> | Reverse Recovery Time                 | I <sub>F</sub> = 2.2 A, di/dt = 100 A/μs               | – | 69  | 104 | ns |
| Q <sub>rr</sub> | Reverse Recovery Charge               |  | – | 114 | 171 | 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.

### NOTES:

- R<sub>θJA</sub> is determined with the device mounted on a 1 in<sup>2</sup> oz copper pad on a 1.5 × 1.5 in. board of FR-4 material. R<sub>θJC</sub> is guaranteed by design while R<sub>θCA</sub> is determined by the user's board design.



- a) 60°C/W when mounted on a 1 in<sup>2</sup> pad of 2 oz copper.



- b) 135°C/W when mounted on a minimum pad of 2 oz copper.

- Pulse Test: Pulse Width < 300 μs, Duty cycle < 2.0%.
- Starting T<sub>J</sub> = 25°C; N-ch: L = 3 mH, I<sub>AS</sub> = 2 A, V<sub>DD</sub> = 200 V, V<sub>GS</sub> = 10 V.

TYPICAL CHARACTERISTICS

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

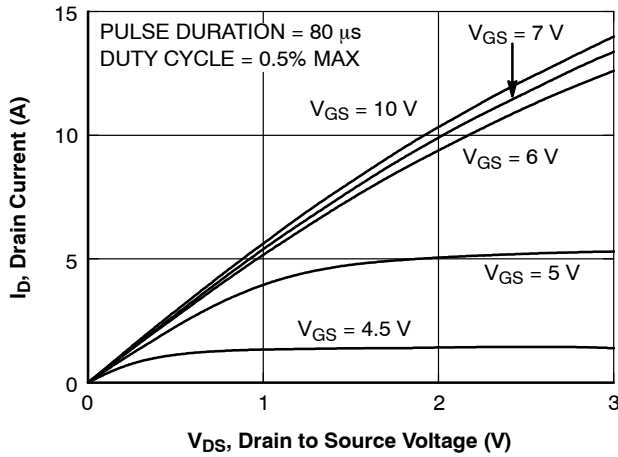


Figure 1. On-Region Characteristics

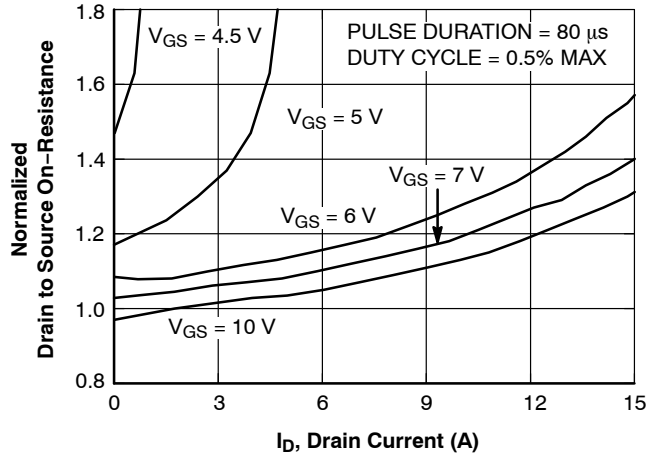


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

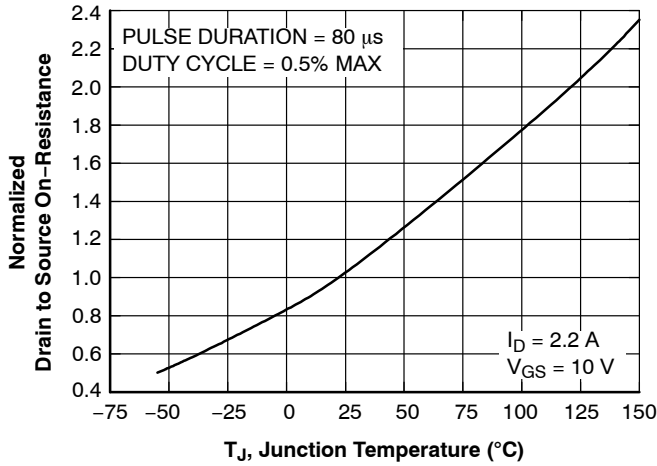


Figure 3. Normalized On-Resistance vs. Junction Temperature

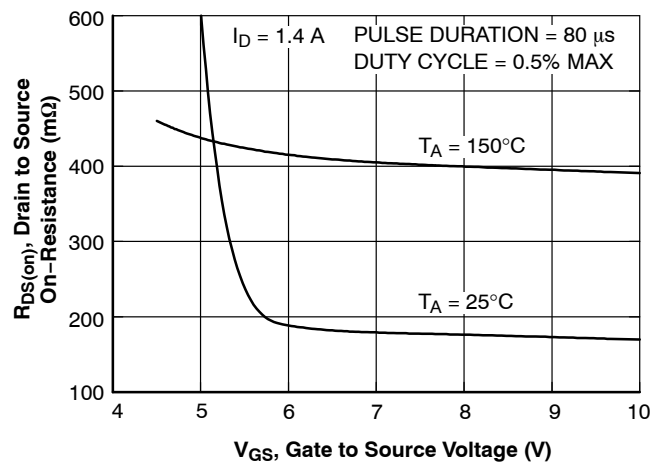


Figure 4. On-Resistance vs. Gate to Source Voltage

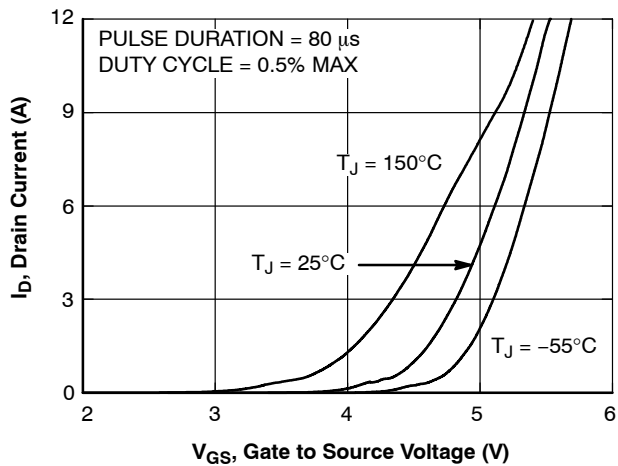


Figure 5. Transfer Characteristics

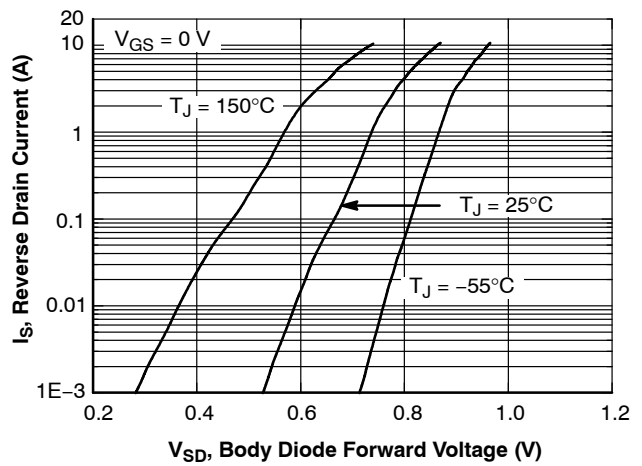


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

# FDMC2610

## TYPICAL CHARACTERISTICS (continued)

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

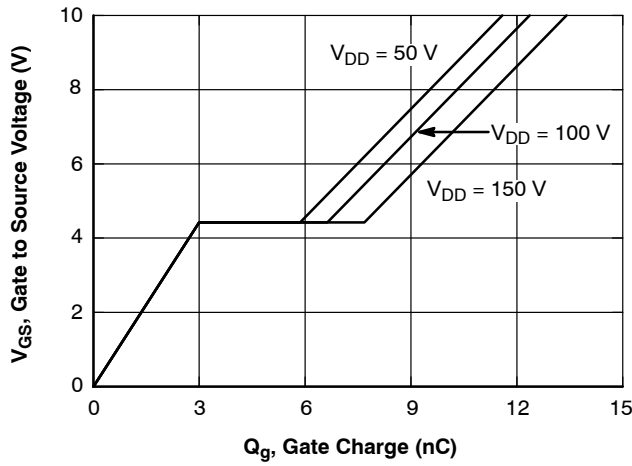


Figure 7. Gate Charge Characteristics

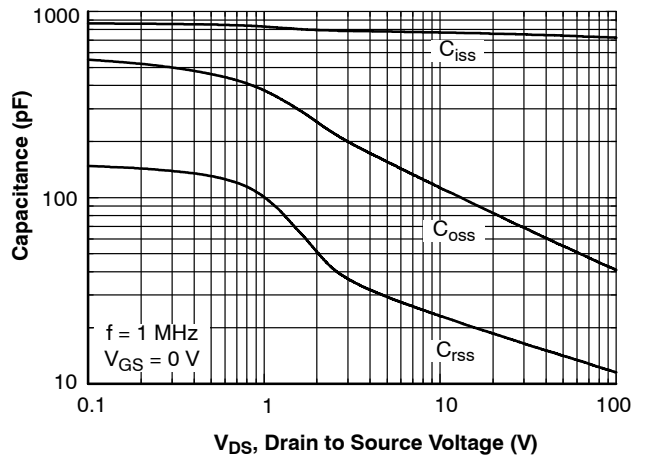


Figure 8. Capacitance vs. Drain to Source Voltage

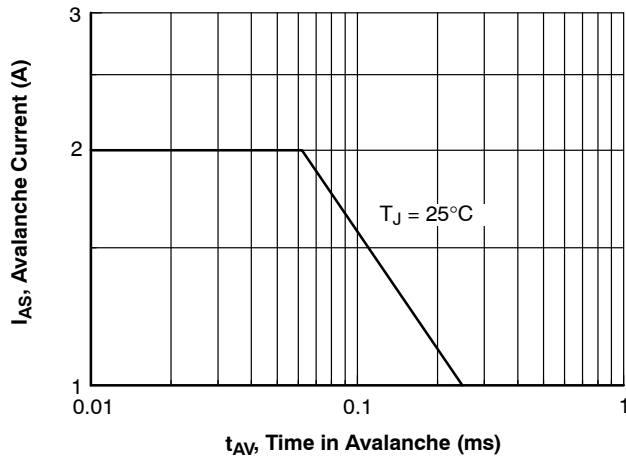


Figure 9. Unclamped Inductive Switching Capability

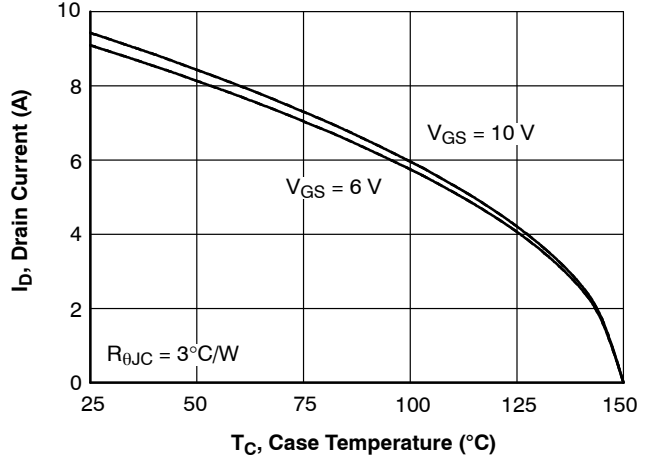


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

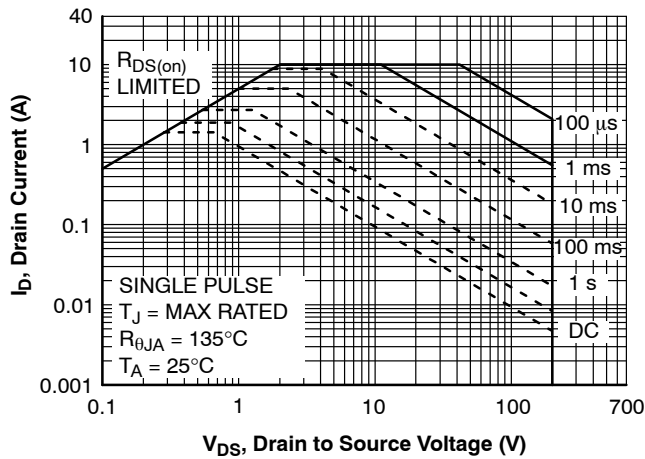


Figure 11. Forward Bias Safe Operating Area

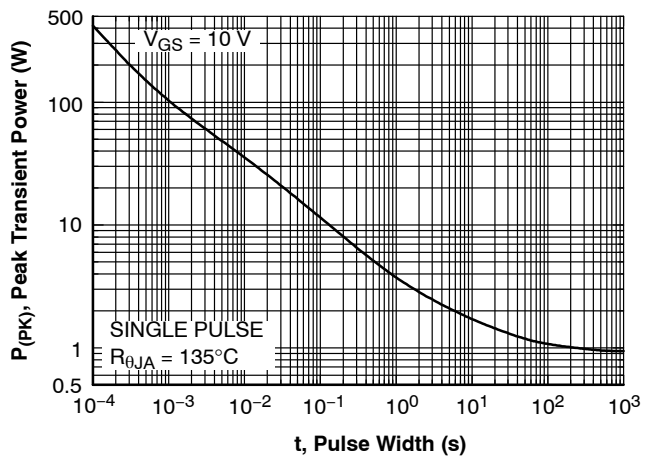


Figure 12. Single Pulse Maximum Power Dissipation

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## TYPICAL CHARACTERISTICS (continued)

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

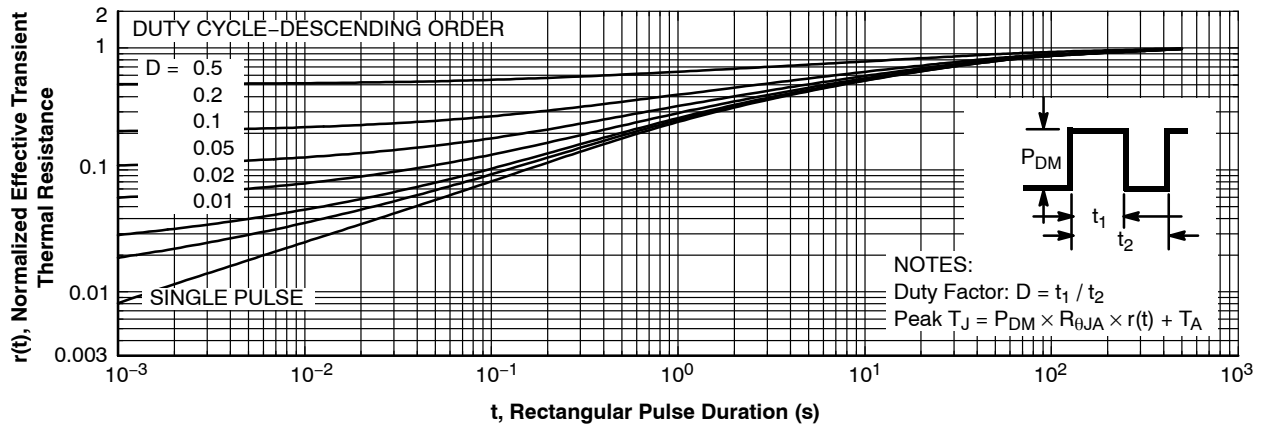
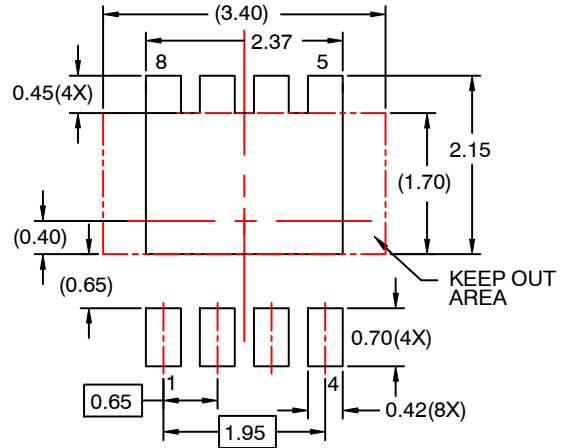
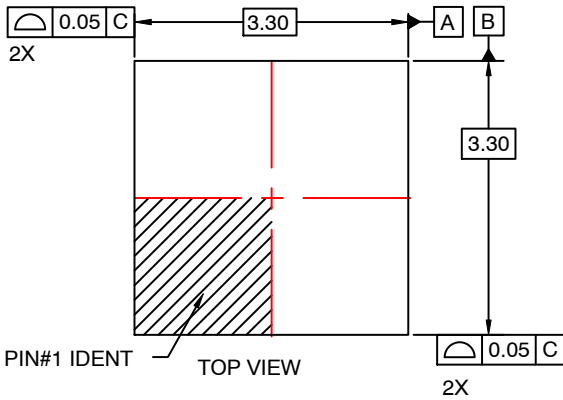


Figure 13. Transient Thermal Response Curve

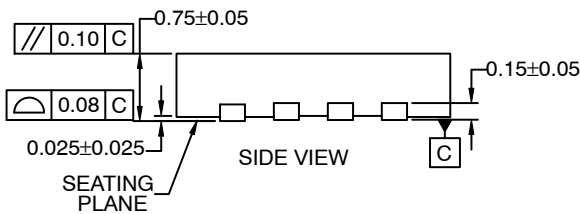
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**WDFN8 3.3x3.3, 0.65P**  
CASE 511DH  
ISSUE O

DATE 31 JUL 2016

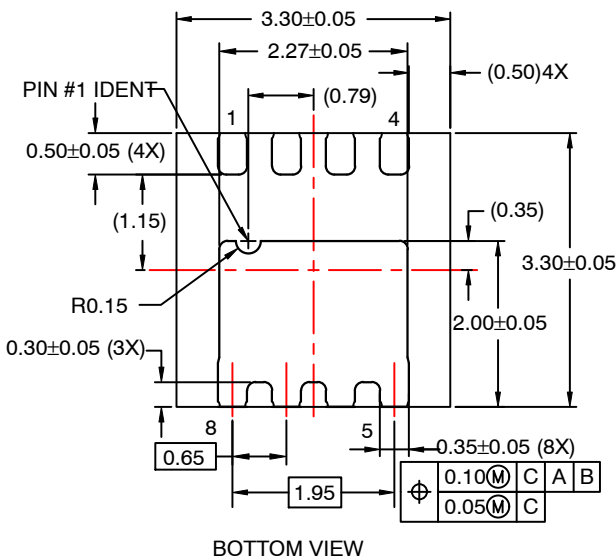


RECOMMENDED LAND PATTERN



NOTES:

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



BOTTOM VIEW

|                         |                             |  |
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