

# MOSFET - N-Channel, Shielded Gate, POWERTRENCH®

100 V, 24 mΩ, 22 A

## FDMC86102LZ

### Description

This N-Channel logic Level MOSFETs are produced using onsemi's advanced POWERTRENCH process that incorporates Shielded Gate technology. This process has been optimized for the on-state resistance and yet maintain superior switching performance. G-S zener has been added to enhance ESD voltage level.

### Features

- Shielded Gate MOSFET Technology
- Max  $R_{DS(on)}$  = 24 mΩ at  $V_{GS} = 10$  V,  $I_D = 6.5$  A
- Max  $R_{DS(on)}$  = 35 mΩ at  $V_{GS} = 4.5$  V,  $I_D = 5.5$  A
- HBM ESD Protection Level > 6 kV Typical (Note 4)
- 100% UIL Tested
- RoHS Compliant

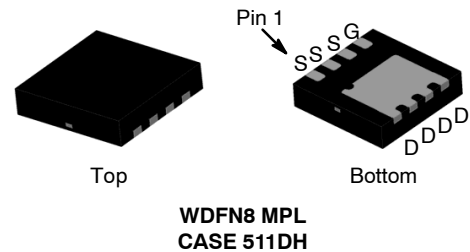
### Applications

- DC-DC Switching

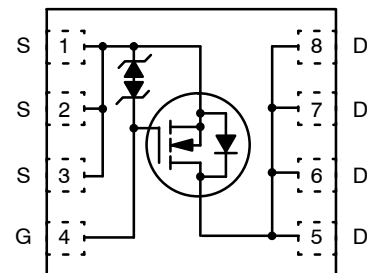
### MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ unless otherwise specified)

| Symbol         | Parameter                                               | Ratings     | Unit             |
|----------------|---------------------------------------------------------|-------------|------------------|
| $V_{DS}$       | Drain-to-Source Voltage                                 | 100         | V                |
| $V_{GS}$       | Gate-to-Source Voltage                                  | $\pm 20$    | V                |
| $I_D$          | Drain Current<br>– Continuous $T_C = 25^\circ\text{C}$  | 22          | A                |
|                | – Continuous $T_A = 25^\circ\text{C}$<br>(Note 1a)      | 7           |                  |
|                | – Pulsed                                                | 30          |                  |
| $E_{AS}$       | Single Pulse Avalanche Energy (Note 3)                  | 84          | mJ               |
| $P_D$          | Power Dissipation $T_C = 25^\circ\text{C}$              | 41          | W                |
|                | Power Dissipation $T_A = 25^\circ\text{C}$<br>(Note 1a) | 2.3         |                  |
| $T_J, T_{STG}$ | Operating and Storage Junction Temperature Range        | -55 to +150 | $^\circ\text{C}$ |

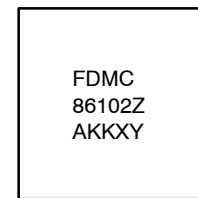
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.



### N-Channel



### MARKING DIAGRAM



FDMC86102Z = Specific Device Code  
A = Assembly Plant Code  
KK = Lot Run Traceability Code  
XY = Numeric Date Code

### ORDERING INFORMATION

| Device      | Package                            | Shipping†             |
|-------------|------------------------------------|-----------------------|
| FDMC86102LZ | WDFN8<br>(Pb-Free,<br>Halide Free) | 3000 /<br>Tape & Reel |

†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](http://BRD8011/D).

# FDMC86102LZ

## THERMAL CHARACTERISTICS

| Symbol          | Parameter                                         | Ratings | Unit                        |
|-----------------|---------------------------------------------------|---------|-----------------------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case              | 3       | $^{\circ}\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient (Note 1a) | 53      |                             |

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

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

### OFF CHARACTERISTICS

|                                      |                                           |                                                               |     |    |          |                              |
|--------------------------------------|-------------------------------------------|---------------------------------------------------------------|-----|----|----------|------------------------------|
| $BV_{DSS}$                           | Drain-to-Source Breakdown Voltage         | $I_D = 250\ \mu\text{A}$ , $V_{GS} = 0\ \text{V}$             | 100 | –  | –        | V                            |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D = 250\ \mu\text{A}$ , referenced to $25^{\circ}\text{C}$ | –   | 71 | –        | $\text{mV}/^{\circ}\text{C}$ |
| $I_{DSS}$                            | Zero Gate Voltage Drain Current           | $V_{DS} = 80\ \text{V}$ , $V_{GS} = 0\ \text{V}$              | –   | –  | 1        | $\mu\text{A}$                |
| $I_{GSS}$                            | Gate-to-Source Leakage Current            | $V_{GS} = \pm 20\ \text{V}$ , $V_{DS} = 0\ \text{V}$          | –   | –  | $\pm 10$ | $\mu\text{A}$                |

### ON CHARACTERISTICS

|                                        |                                                          |                                                                               |     |     |     |                              |
|----------------------------------------|----------------------------------------------------------|-------------------------------------------------------------------------------|-----|-----|-----|------------------------------|
| $V_{GS(th)}$                           | Gate-to-Source Threshold Voltage                         | $V_{GS} = V_{DS}$ , $I_D = 250\ \mu\text{A}$                                  | 1.0 | 1.6 | 2.2 | V                            |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate-to-Source Threshold Voltage Temperature Coefficient | $I_D = 250\ \mu\text{A}$ , referenced to $25^{\circ}\text{C}$                 | –   | –6  | –   | $\text{mV}/^{\circ}\text{C}$ |
| $R_{DS(on)}$                           | Static Drain-to-Source On Resistance                     | $V_{GS} = 10\ \text{V}$ , $I_D = 6.5\ \text{A}$                               | –   | 19  | 24  | $\text{m}\Omega$             |
|                                        |                                                          | $V_{GS} = 4.5\ \text{V}$ , $I_D = 5.5\ \text{A}$                              | –   | 25  | 35  |                              |
|                                        |                                                          | $V_{GS} = 10\ \text{V}$ , $I_D = 6.5\ \text{A}$ , $T_J = 125^{\circ}\text{C}$ | –   | 31  | 40  |                              |
| $g_{FS}$                               | Forward Transconductance                                 | $V_{DS} = 5\ \text{V}$ , $I_D = 6.5\ \text{A}$                                | –   | 24  | –   | S                            |

### DYNAMIC CHARACTERISTICS

|           |                              |                                                                        |   |     |      |          |
|-----------|------------------------------|------------------------------------------------------------------------|---|-----|------|----------|
| $C_{iss}$ | Input Capacitance            | $V_{DS} = 50\ \text{V}$ , $V_{GS} = 0\ \text{V}$ , $f = 1\ \text{MHz}$ | – | 969 | 1290 | pF       |
| $C_{oss}$ | Output Capacitance           |                                                                        | – | 181 | 240  | pF       |
| $C_{rss}$ | Reverse Transfer Capacitance |                                                                        | – | 9   | 15   | pF       |
| $R_g$     | Gate Resistance              |                                                                        | – | 0.4 | –    | $\Omega$ |

### SWITCHING CHARACTERISTICS

|              |                               |                                                                                                   |   |      |    |    |
|--------------|-------------------------------|---------------------------------------------------------------------------------------------------|---|------|----|----|
| $t_{d(on)}$  | Turn-On Delay Time            | $V_{DD} = 50\ \text{V}$ , $I_D = 6.5\ \text{A}$ , $V_{GS} = 10\ \text{V}$ , $R_{GEN} = 6\ \Omega$ | – | 7.1  | 15 | ns |
| $t_r$        | Rise Time                     |                                                                                                   | – | 2.3  | 10 |    |
| $t_{d(off)}$ | Turn-Off Delay Time           |                                                                                                   | – | 19   | 35 |    |
| $t_f$        | Fall Time                     |                                                                                                   | – | 2.5  | 10 |    |
| $Q_{g(tot)}$ | Total Gate Charge             | $V_{GS} = 0\ \text{V}$ to $10\ \text{V}$ , $V_{DD} = 50\ \text{V}$ , $I_D = 6.5\ \text{A}$        | – | 15.3 | 22 | nC |
| $Q_{g(tot)}$ | Total Gate Charge             | $V_{GS} = 0\ \text{V}$ to $4.5\ \text{V}$ , $V_{DD} = 50\ \text{V}$ , $I_D = 6.5\ \text{A}$       | – | 7.6  | 11 |    |
| $Q_{gs}$     | Gate-to-Source Charge         | $V_{DD} = 50\ \text{V}$ , $I_D = 6.5\ \text{A}$                                                   | – | 2.4  | –  |    |
| $Q_{gd}$     | Gate-to-Drain "Miller" Charge | $V_{DD} = 50\ \text{V}$ , $I_D = 6.5\ \text{A}$                                                   | – | 2.5  | –  |    |

# FDMC86102LZ

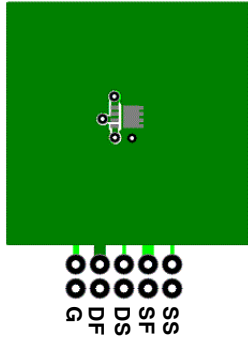
## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise noted)

| Symbol                                    | Parameter                             | Test Conditions                                        | Min | Typ  | Max | Unit |
|-------------------------------------------|---------------------------------------|--------------------------------------------------------|-----|------|-----|------|
| <b>DRAIN-SOURCE DIODE CHARACTERISTICS</b> |                                       |                                                        |     |      |     |      |
| V <sub>SD</sub>                           | Source-to-Drain Diode Forward Voltage | V <sub>GS</sub> = 0 V, I <sub>S</sub> = 6.5 A (Note 2) | –   | 0.80 | 1.3 | V    |
|                                           |                                       | V <sub>GS</sub> = 0 V, I <sub>S</sub> = 2 A (Note 2)   | –   | 0.72 | 1.2 | V    |
| t <sub>rr</sub>                           | Reverse Recovery Time                 | I <sub>F</sub> = 6.5 A, di/dt = 100 A/μs               | –   | 37   | 59  | ns   |
| Q <sub>rr</sub>                           | Reverse Recovery Charge               |                                                        | –   | 27   | 43  | 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:

1. R<sub>θJA</sub> is determined with the device mounted on a 1 in<sup>2</sup> pad 2 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) 53°C/W when mounted on a 1 in<sup>2</sup> pad of 2 oz copper



b) 125°C/W when mounted on a minimum pad of 2 oz copper

2. Pulse Test: Pulse Width < 300 μs, Duty cycle < 2.0%.
3. Starting T<sub>J</sub> = 25°C; N-ch: L = 1 mH, I<sub>AS</sub> = 13 A, V<sub>DD</sub> = 90 V, V<sub>GS</sub> = 10 V.
4. The diode connected between gate and source serves only as protection against ESD. No gate overvoltage rating is implied.

# TYPICAL CHARACTERISTICS

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

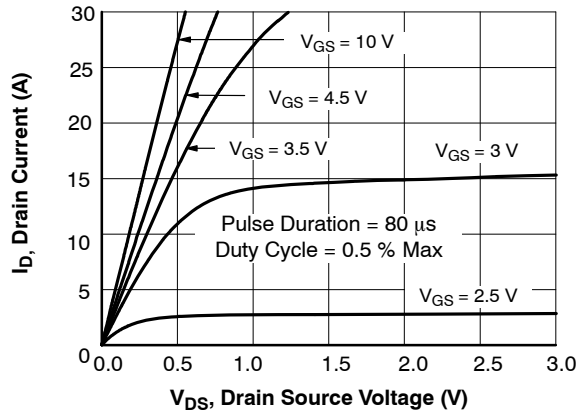


Figure 1. On-Region Characteristics

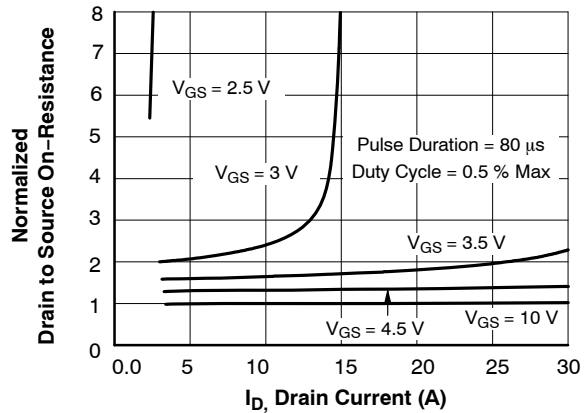


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

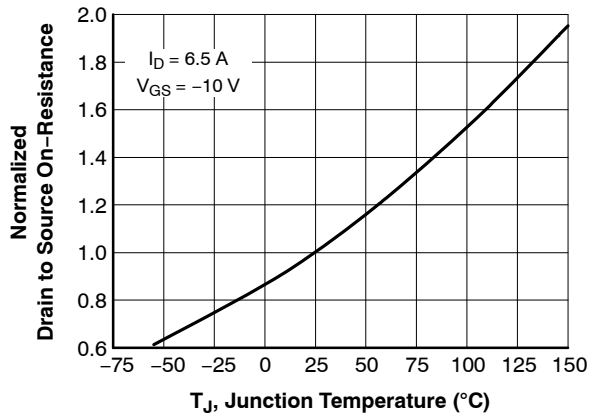


Figure 3. Normalized On-Resistance vs. Junction Temperature

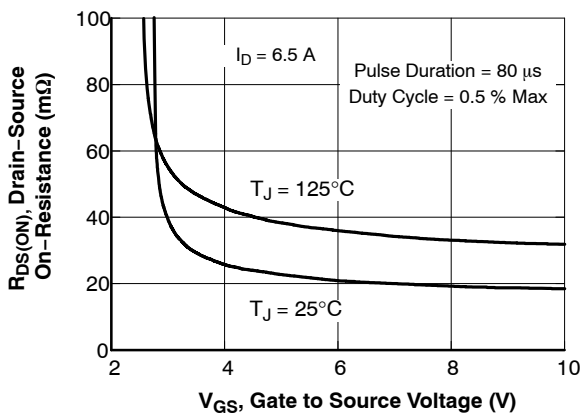


Figure 4. On-Resistance vs. Gate-to-Source Voltage

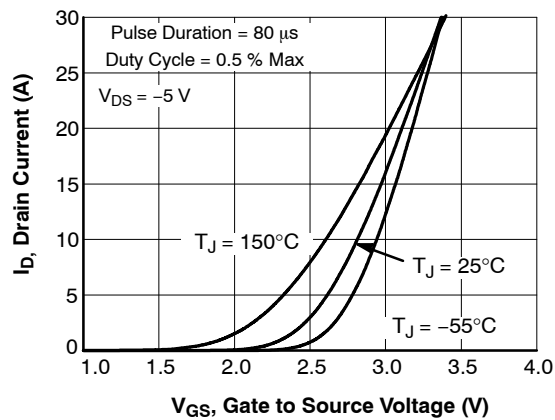


Figure 5. Transfer Characteristics

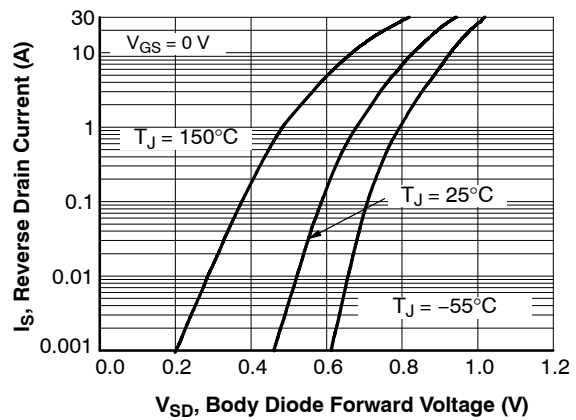


Figure 6. Source-to-Drain Diode Forward Voltage vs. Source Current

TYPICAL CHARACTERISTICS (continued)

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

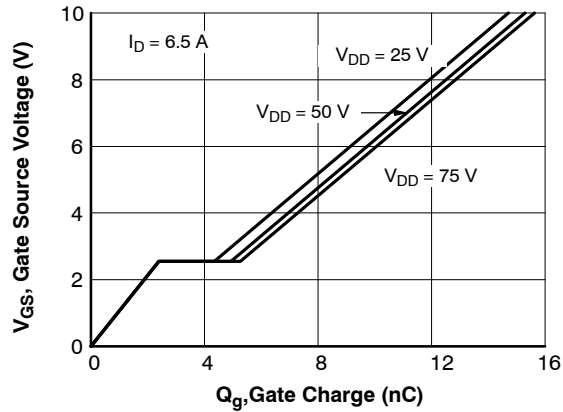


Figure 7. Gate Charge Characteristics

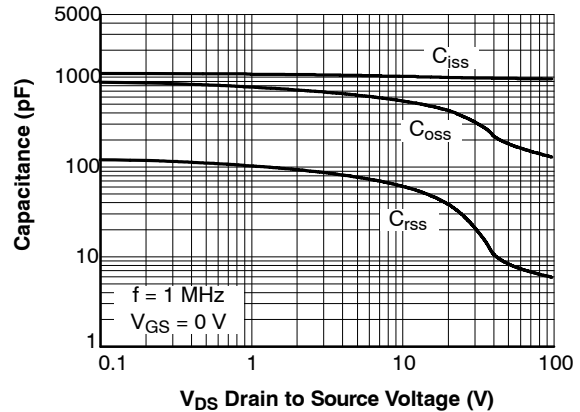


Figure 8. Capacitance vs Drain-to-Source Voltage

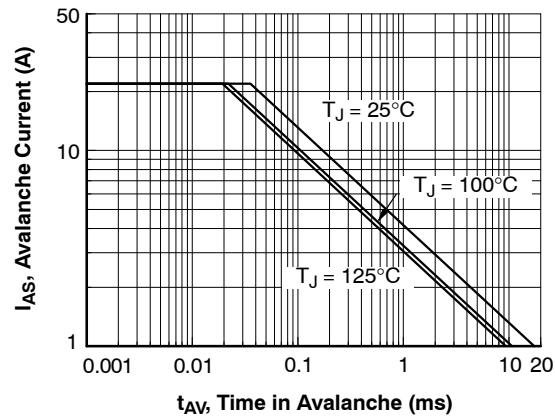


Figure 9. Unclamped Inductive Switching Capability

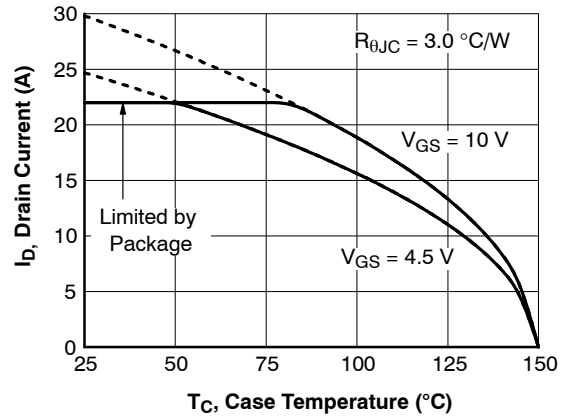


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

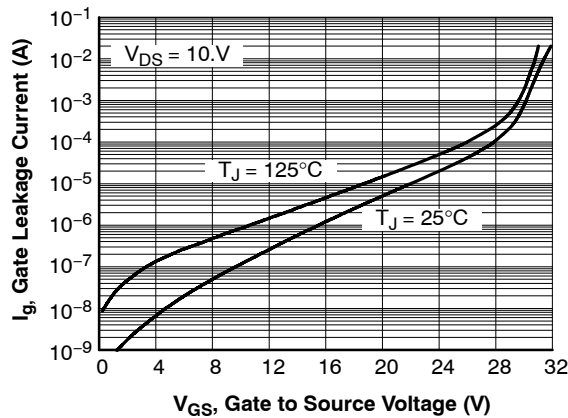


Figure 11. Gate Leakage Current vs. Gate-to-Source Voltage

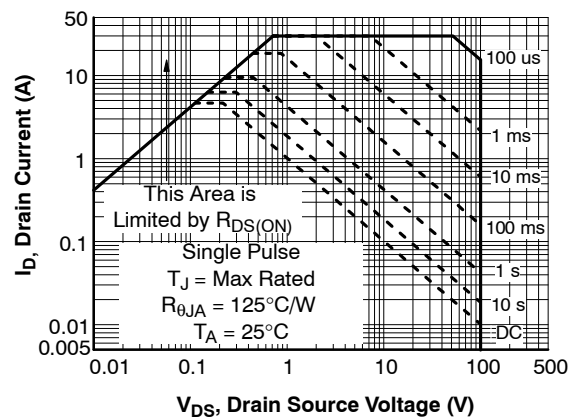


Figure 12. Forward Bias Safe Operating Area

TYPICAL CHARACTERISTICS (continued)

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

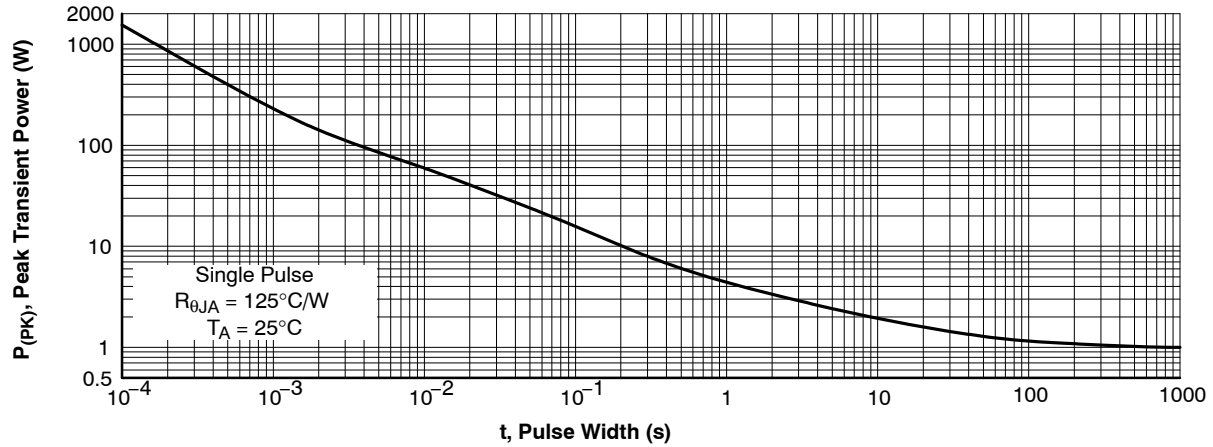


Figure 13. Single Pulse Maximum Power Dissipation

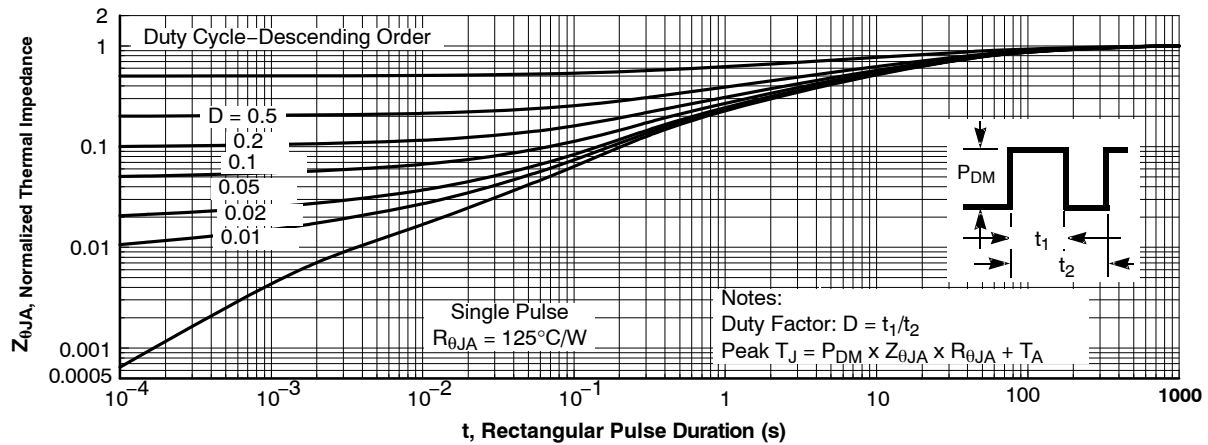
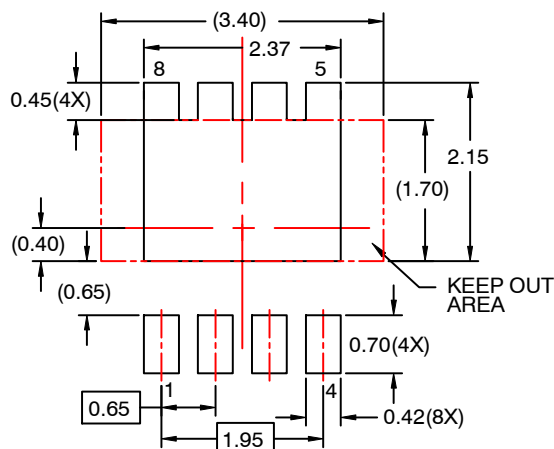
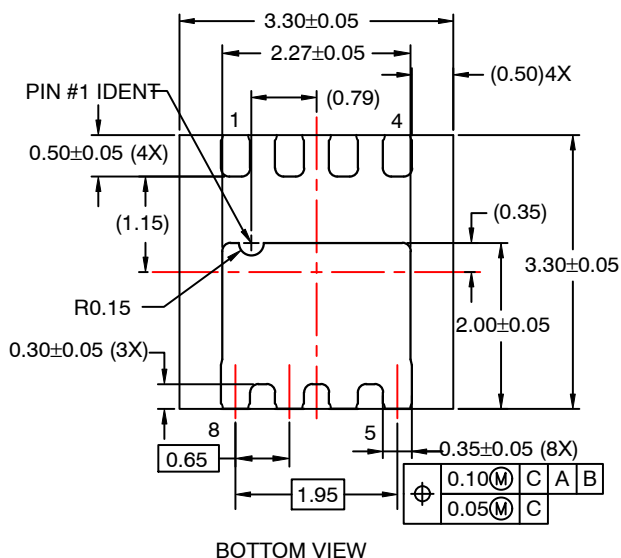
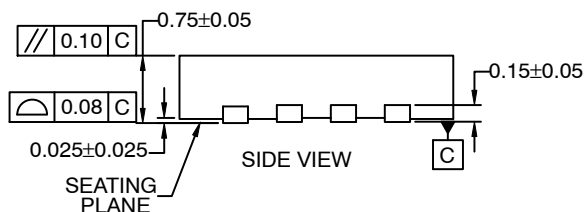
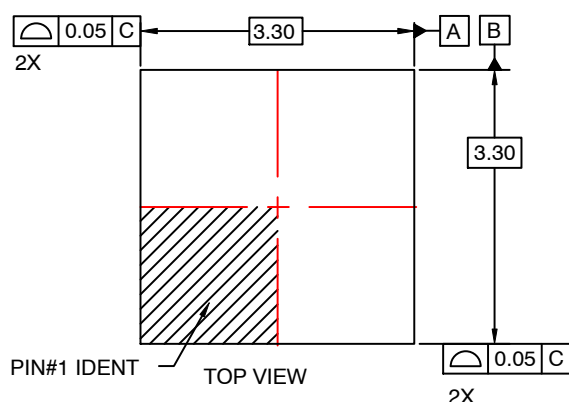


Figure 14. Junction-to-Ambient Transient Thermal Response

**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.

|                         |                             |                                                                                                                                                                                  |
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