

# MOSFET – N-Channel, Shielded Gate, POWER trench®

150 V, 25 A, 34 mΩ

## FDMC86260

### General Description

This N-Channel MOSFET is produced using onsemi's advanced POWER trench process that incorporates Shielded Gate technology. This process has been optimized for the on-state resistance and yet maintain superior switching performance.

### Features

- Shielded Gate MOSFET Technology
- Max  $R_{DS(on)}$  = 34 mΩ at  $V_{GS}$  = 10 V,  $I_D$  = 5.4 A
- Max  $R_{DS(on)}$  = 44 mΩ at  $V_{GS}$  = 6 V,  $I_D$  = 4.8 A
- High Performance Technology for Extremely Low  $R_{DS(on)}$
- 100% UIL Tested
- Pb-Free, Halide Free and RoHS Compliant

### Applications

- DC-DC Conversion

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

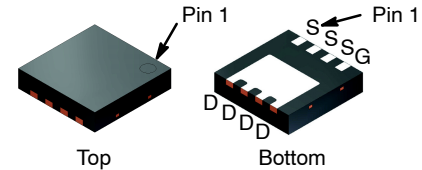
| Symbol         | Parameter                                                                                                                                          | Value                  | Unit |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|------|
| $V_{DS}$       | Drain to Source Voltage                                                                                                                            | 150                    | V    |
| $V_{GS}$       | Gate to Source Voltage                                                                                                                             | ±20                    | V    |
| $I_D$          | Drain Current:<br>Continuous, $T_C$ = 25°C (Note 5)<br>Continuous, $T_C$ = 100°C (Note 5)<br>Continuous, $T_A$ = 25°C (Note 1a)<br>Pulsed (Note 4) | 25<br>16<br>5.4<br>135 | A    |
| $E_{AS}$       | Single Pulse Avalanche Energy (Note 3)                                                                                                             | 121                    | mJ   |
| $P_D$          | Power Dissipation:<br>$T_C$ = 25°C<br>$T_A$ = 25°C (Note 1a)                                                                                       | 54<br>2.3              | 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.

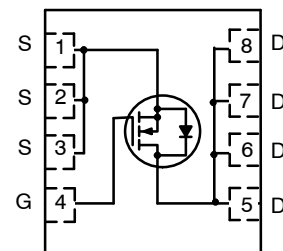
### THERMAL CHARACTERISTICS ( $T_A$ = 25°C unless otherwise noted.)

| Symbol          | Parameter                                         | Value | Unit |
|-----------------|---------------------------------------------------|-------|------|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case (Note 1)     | 2.3   | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Note 1a) | 53    | °C/W |

| $V_{DS}$ | $R_{DS(on)}$ MAX | $I_D$ MAX |
|----------|------------------|-----------|
| 150 V    | 34 mΩ @ 10 V     | 25 A      |
|          | 44 mΩ @ 6 V      |           |

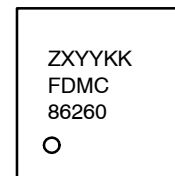


WDFN8 3.3 × 3.3, 0.65P  
CASE 483AW



N-CHANNEL MOSFET

### MARKING DIAGRAM



Z = Assembly Plant Code  
 XYY = 3-Digit Date Code Format  
 KK = 2-Alphanumeric Lot Run Traceability Code  
 FDMC86260 = Specific Device Code

### ORDERING INFORMATION

| Device    | Package                            | Shipping†             |
|-----------|------------------------------------|-----------------------|
| FDMC86260 | 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).

# FDMC86260

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

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

### OFF CHARACTERISTICS

|                                     |                                           |                                                |     |     |      |       |
|-------------------------------------|-------------------------------------------|------------------------------------------------|-----|-----|------|-------|
| BV <sub>DSS</sub>                   | Drain to Source Breakdown Voltage         | I <sub>D</sub> = 250 μA, V <sub>GS</sub> = 0 V | 150 | –   | –    | V     |
| ΔBV <sub>DSS</sub> /ΔT <sub>J</sub> | Breakdown Voltage Temperature Coefficient | I <sub>D</sub> = 250 μA, referenced to 25°C    | –   | 110 | –    | mV/°C |
| I <sub>DSS</sub>                    | Zero Gate Voltage Drain Current           | V <sub>DS</sub> = 120 V, V <sub>GS</sub> = 0 V | –   | –   | 1    | μA    |
| 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 | 2.7 | 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  | –  | mV/°C |
| R <sub>DS(on)</sub>                   | Static Drain to Source On Resistance                     | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 5.4 A                         | – | 27  | 34 | mΩ    |
|                                       |                                                          | V <sub>GS</sub> = 6 V, I <sub>D</sub> = 4.8 A                          | – | 31  | 44 |       |
|                                       |                                                          | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 5.4 A, T <sub>J</sub> = 125°C | – | 55  | 69 |       |
| g <sub>FS</sub>                       | Forward Transconductance                                 | V <sub>DD</sub> = 10 V, I <sub>D</sub> = 5.4 A                         | – | 19  | –  | S     |

### DYNAMIC CHARACTERISTICS

|                  |                              |                                                          |     |      |      |    |
|------------------|------------------------------|----------------------------------------------------------|-----|------|------|----|
| C <sub>iss</sub> | Input Capacitance            | V <sub>DS</sub> = 75 V, V <sub>GS</sub> = 0 V, f = 1 MHz | –   | 1000 | 1330 | pF |
| C <sub>oss</sub> | Output Capacitance           |                                                          | –   | 105  | 140  | pF |
| C <sub>rss</sub> | Reverse Transfer Capacitance |                                                          | –   | 4.8  | 10   | pF |
| R <sub>g</sub>   | Gate Resistance              |                                                          | 0.1 | 0.6  | 1.8  | Ω  |

### SWITCHING CHARACTERISTICS

|                     |                               |                                                                                                |   |     |    |    |
|---------------------|-------------------------------|------------------------------------------------------------------------------------------------|---|-----|----|----|
| t <sub>d(on)</sub>  | Turn-On Delay Time            | V <sub>DD</sub> = 75 V, I <sub>D</sub> = 5.4 A, V <sub>GS</sub> = 10 V, R <sub>GEN</sub> = 6 Ω | – | 9.5 | 19 | ns |
| t <sub>r</sub>      | Rise Time                     |                                                                                                | – | 2   | 10 | ns |
| t <sub>d(off)</sub> | Turn-Off Delay Time           |                                                                                                | – | 17  | 30 | ns |
| t <sub>f</sub>      | Fall Time                     |                                                                                                | – | 3.3 | 10 | ns |
| Q <sub>g(TOT)</sub> | Total Gate Charge             | V <sub>GS</sub> = 0 V to 10 V, V <sub>DD</sub> = 75 V, I <sub>D</sub> = 5.4 A                  | – | 15  | 21 | nC |
|                     |                               | V <sub>GS</sub> = 0 V to 6 V, V <sub>DD</sub> = 75 V, I <sub>D</sub> = 5.4 A                   | – | 9.7 | 14 | nC |
| Q <sub>gs</sub>     | Gate to Source Charge         | V <sub>DD</sub> = 75 V, I <sub>D</sub> = 5.4 A                                                 | – | 4.0 | –  | nC |
| Q <sub>gd</sub>     | Gate to Drain “Miller” Charge | V <sub>DD</sub> = 75 V, I <sub>D</sub> = 5.4 A                                                 | – | 3.1 | –  | nC |

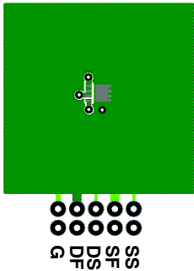
**ELECTRICAL CHARACTERISTICS** ( $T_J = 25^\circ\text{C}$  unless otherwise noted) (continued)

| Symbol                                    | Parameter                             | Test Condition                                         | Min | Typ  | Max | Unit |
|-------------------------------------------|---------------------------------------|--------------------------------------------------------|-----|------|-----|------|
| <b>DRAIN-SOURCE DIODE CHARACTERISTICS</b> |                                       |                                                        |     |      |     |      |
| $V_{SD}$                                  | Source to Drain Diode Forward Voltage | $V_{GS} = 0\text{ V}, I_S = 5.4\text{ A}$ (Note 2)     | –   | 0.77 | 1.3 | V    |
|                                           |                                       | $V_{GS} = 0\text{ V}, I_S = 1.9\text{ A}$ (Note 2)     | –   | 0.72 | 1.2 |      |
| $t_{rr}$                                  | Reverse Recovery Time                 | $I_F = 5.4\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$ | –   | 64   | 102 | ns   |
| $Q_{rr}$                                  | Reverse Recovery Charge               |                                                        | –   | 85   | 137 | 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:**

- $R_{\theta JA}$  is determined with the device mounted on a 1 in<sup>2</sup> 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  $R_{\theta CA}$  is determined by the user's board design.



a)  $53^\circ\text{C}/\text{W}$  when mounted on a 1 in<sup>2</sup> pad of 2 oz copper.



b)  $125^\circ\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper.

- Pulse Test: Pulse Width < 300  $\mu\text{s}$ , Duty cycle < 2.0%.
- $E_{AS}$  of 121 mJ is based on starting  $T_J = 25^\circ\text{C}$ ,  $L = 3\text{ mH}$ ,  $I_{AS} = 9\text{ A}$ ,  $V_{DD} = 150\text{ V}$ ,  $V_{GS} = 10\text{ V}$ . 100% test at  $L = 0.1\text{ mH}$ ,  $I_{AS} = 22\text{ A}$ .
- Pulsed  $I_d$  please refer to Figure 11 SOA graph for more details.
- Computed continuous current limited to Max Junction Temperature only, actual continuous current will be limited by thermal & electro-mechanical application board design.

# TYPICAL CHARACTERISTICS

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

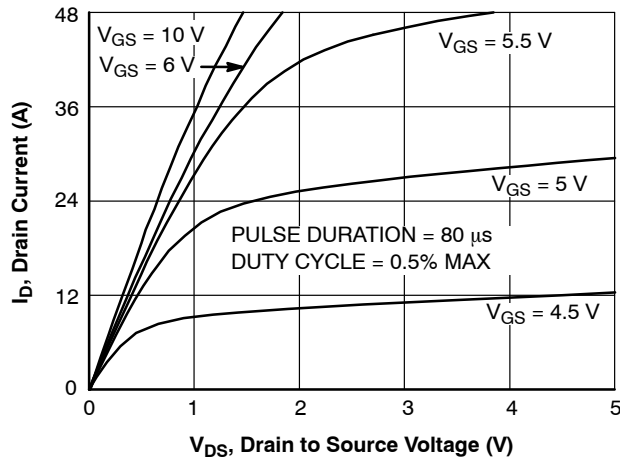


Figure 1. On-Region Characteristics

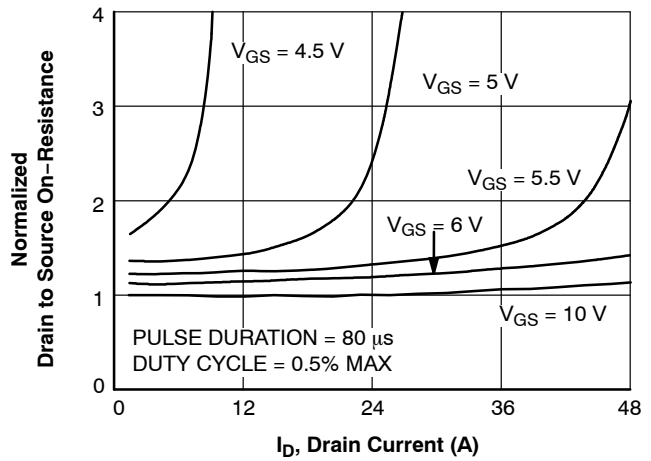


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

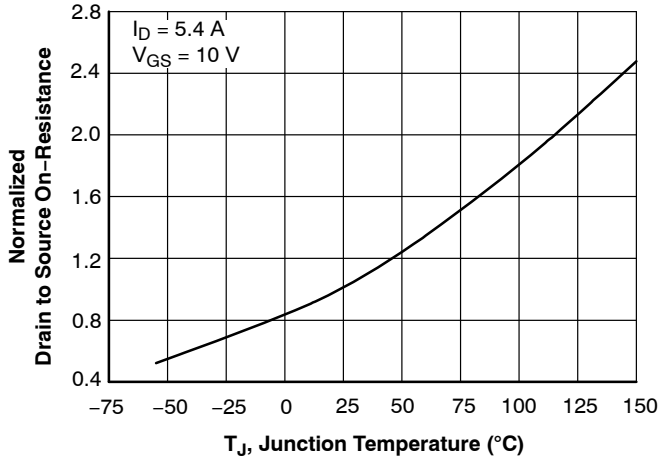


Figure 3. Normalized On-Resistance vs. Junction Temperature

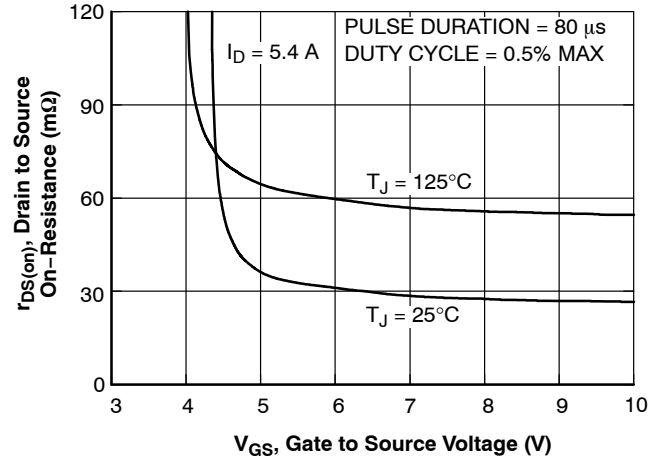


Figure 4. On-Resistance vs. Gate to Source Voltage

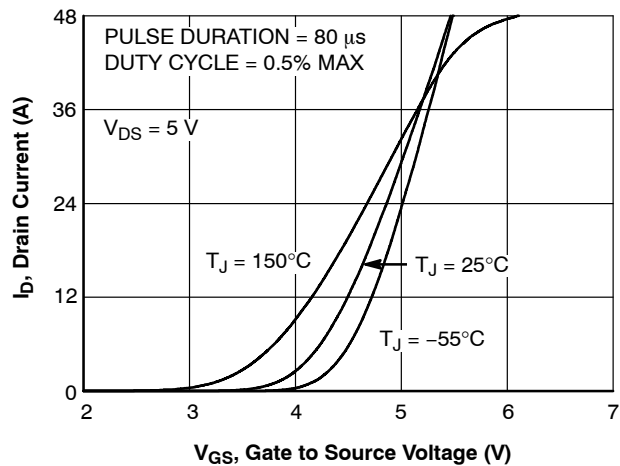


Figure 5. Transfer Characteristics

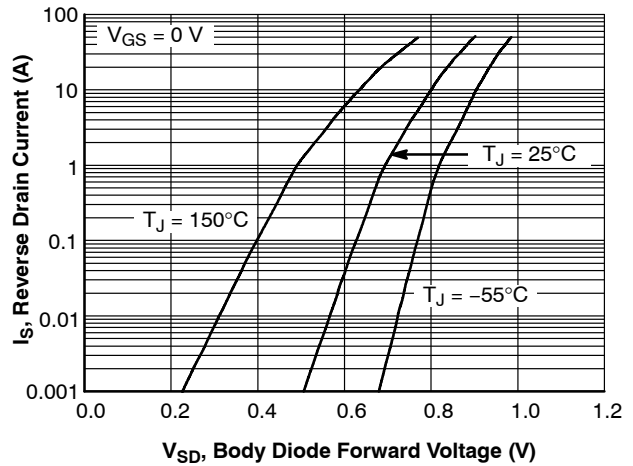


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

TYPICAL CHARACTERISTICS (continued)

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

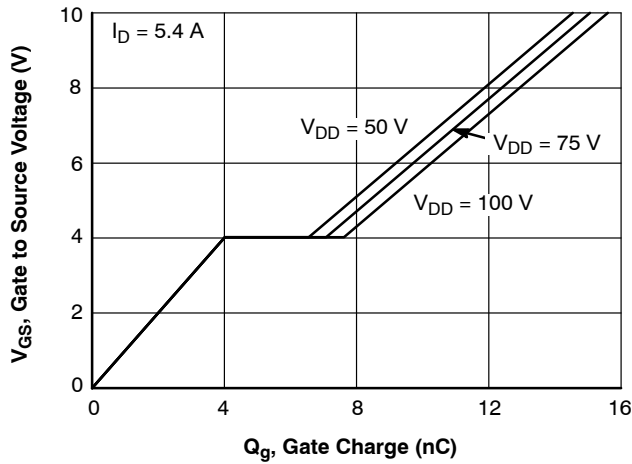


Figure 7. Gate Charge Characteristics

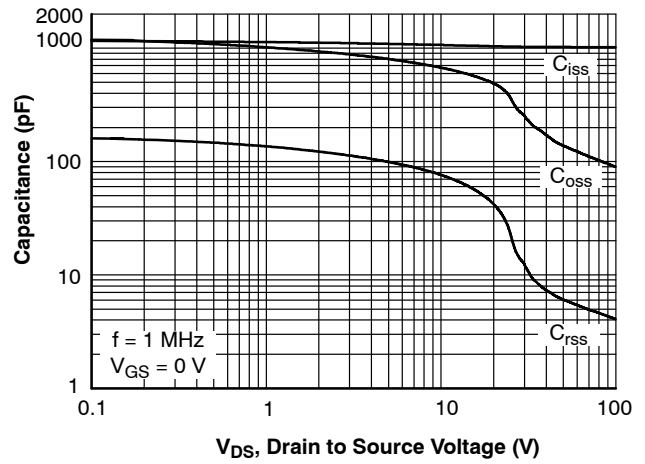


Figure 8. Capacitance vs. Drain to Source Voltage

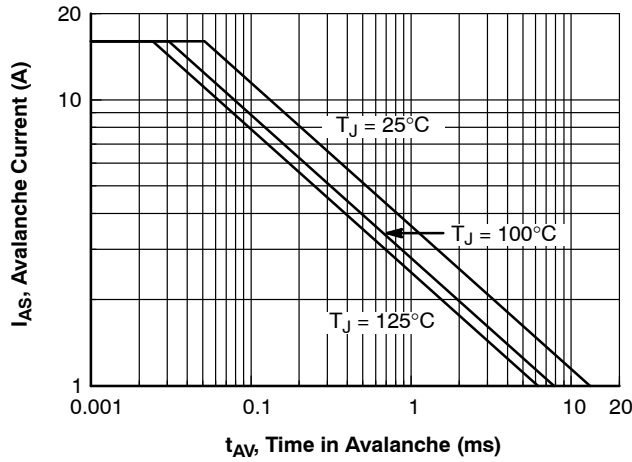


Figure 9. Unclamped Inductive Switching Capability

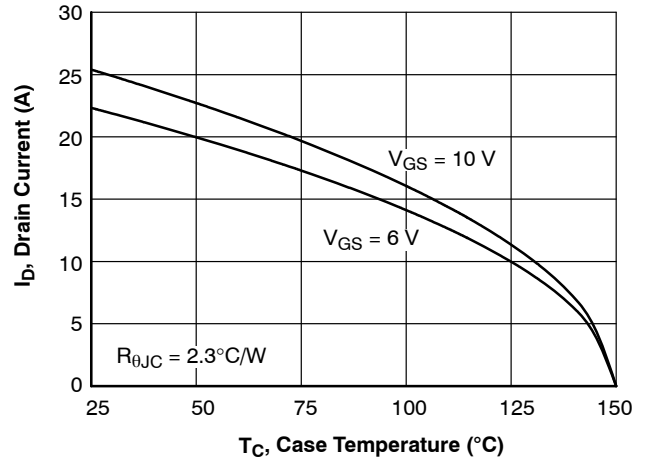


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

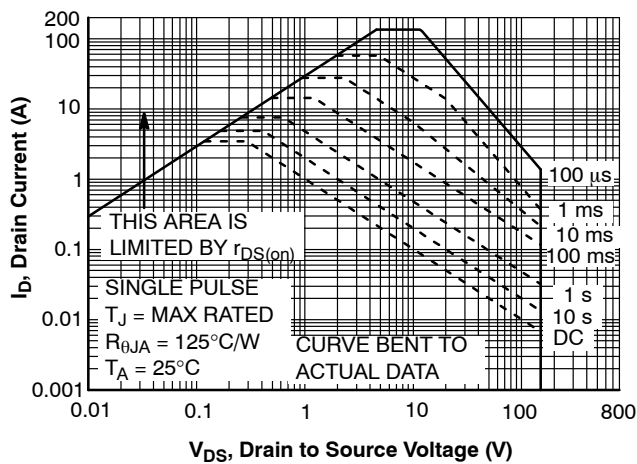


Figure 11. Forward Bias Safe Operating Area

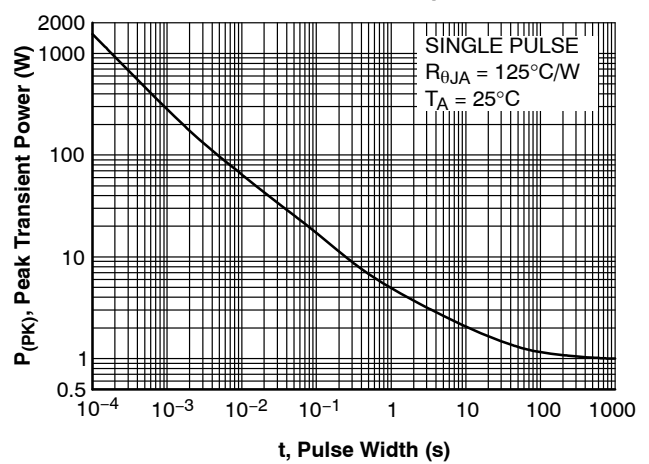


Figure 12. Single Pulse Maximum Power Dissipation

TYPICAL CHARACTERISTICS (continued)

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

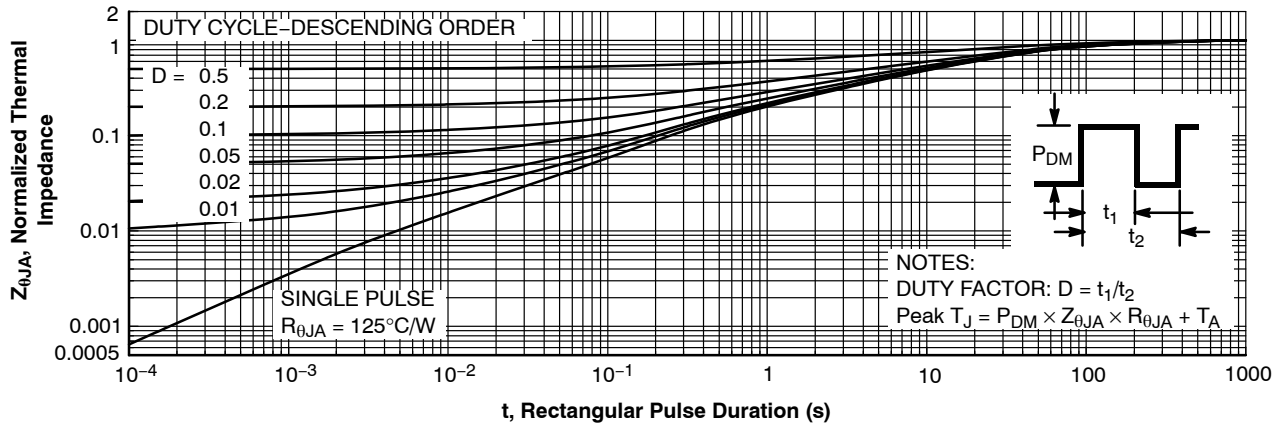
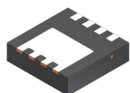
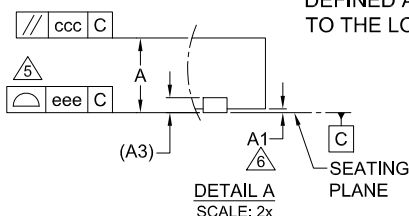
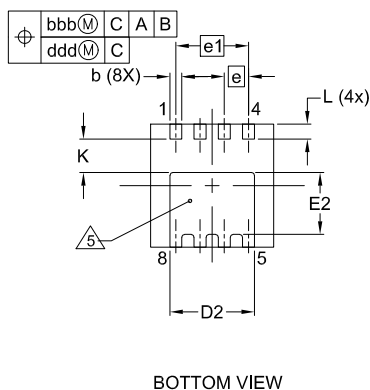
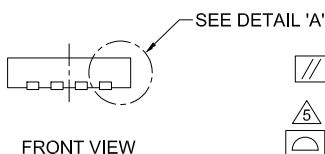
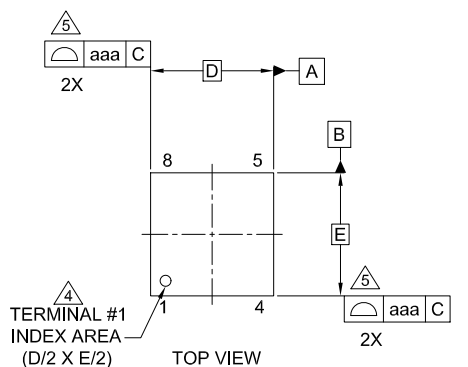


Figure 13. Junction-to-Ambient Transient Thermal Response Curve

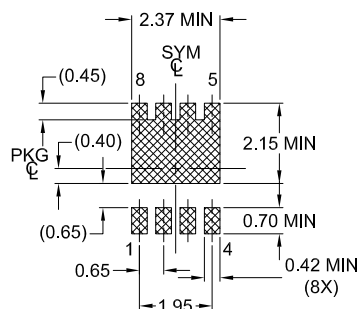


WDFN8 3.30x3.30x0.75, 0.65P  
CASE 483AW  
ISSUE B

DATE 22 MAR 2024



LAND PATTERN  
RECOMMENDATION



NOTES:

1. DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5-2018.
2. ALL DIMENSIONS ARE IN MILLIMETERS.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.
4. THE TERMINAL #1 IDENTIFIER AND TERMINAL NUMBERING CONVENTION SHALL CONFORM TO JEP95 SEC. 3 SPP-12. DETAILS OF TERMINAL #1 IDENTIFIER ARE OPTIONAL, BUT MUST BE LOCATED WITHIN THE ZONE INDICATED. THE TERMINAL #1 IDENTIFIER MAY BE EITHER A MOLD, EMBEDDED METAL OR MARKED FEATURE.
5. COPLANARITY APPLIES TO THE EXPOSED PADS AS WELL AS THE TERMINALS.
6. SEATING PLANE IS DEFINED BY THE TERMINALS. 'A1' IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.

| DIM | MILLIMETERS |      |      |
|-----|-------------|------|------|
|     | MIN         | NOM  | MAX  |
| A   | 0.70        | 0.75 | 0.80 |
| A1  | --          | --   | 0.05 |
| A3  | 0.20 REF    |      |      |
| b   | 0.27        | 0.32 | 0.37 |
| D   | 3.30 BSC    |      |      |
| D2  | 2.17        | 2.27 | 2.37 |
| E   | 3.30 BSC    |      |      |
| E2  | 1.56        | 1.66 | 1.76 |
| e   | 0.65 BSC    |      |      |
| e1  | 1.95 BSC    |      |      |
| K   | 0.90        | --   | --   |
| L   | 0.30        | 0.40 | 0.50 |
| aaa | 0.10        |      |      |
| bbb | 0.10        |      |      |
| ccc | 0.10        |      |      |
| ddd | 0.05        |      |      |
| eee | 0.05        |      |      |

\*FOR ADDITIONAL INFORMATION ON OUR PB-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

GENERIC  
MARKING DIAGRAM\*



XXXX = Specific Device Code  
A = Assembly Location  
Y = Year  
WW = Work Week

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

|                  |                             |                                                                                                                                                                                  |
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