

# MOSFET - POWERTRENCH<sup>®</sup>, N-Channel

80 V, 110 A, 2.4 mΩ

## FDB86363-F085

### Features

- Typical  $R_{DS(on)} = 2.0 \text{ m}\Omega$  at  $V_{GS} = 10 \text{ V}$ ,  $I_D = 80 \text{ A}$
- Typical  $Q_{g(tot)} = 131 \text{ nC}$  at  $V_{GS} = 10 \text{ V}$ ,  $I_D = 80 \text{ A}$
- UIS Capability
- AEC-Q101 Qualified and PPAP Capable
- This Device is Pb-Free, Halide Free and is RoHS Compliant

### Applications

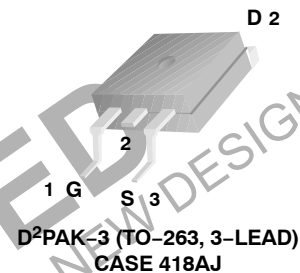
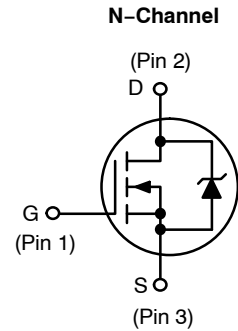
- Automotive Engine Control
- Power Train Management
- Solenoid and Motor Drivers
- Integrated Starter/Alternator
- Primary Switch for 12 V Systems

### MOSFET MAXIMUM RATINGS ( $T_J = 25^\circ\text{C}$ , Unless otherwise noted)

| Symbol          | Parameter                                                                                    | Ratings         | Unit                      |
|-----------------|----------------------------------------------------------------------------------------------|-----------------|---------------------------|
| $V_{DSS}$       | Drain-to-Source Voltage                                                                      | 80              | V                         |
| $V_{GS}$        | Gate-to-Source Voltage                                                                       | $\pm 20$        | V                         |
| $I_D$           | Drain Current – Continuous<br>( $V_{GS} = 10 \text{ V}$ , $T_C = 25^\circ\text{C}$ (Note 1)) | 110             | A                         |
|                 | Pulsed, $T_C = 25^\circ\text{C}$                                                             | See Figure 4    |                           |
| $E_{AS}$        | Single Pulse Avalanche Energy<br>(Note 2)                                                    | 512             | mJ                        |
| $P_D$           | Power Dissipation                                                                            | 300             | W                         |
|                 | Derate Above $25^\circ\text{C}$                                                              | 2.0             | W/ $^\circ\text{C}$       |
| $T_J, T_{STG}$  | Operating and Storage Temperature                                                            | $-55$ to $+175$ | $^\circ\text{C}$          |
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case                                                         | 0.5             | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Maximum Thermal Resistance,<br>Junction to Ambient (Note 3)                                  | 43              | $^\circ\text{C}/\text{W}$ |

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.

1. Current is limited by bondwire configuration.
2. Starting  $T_J = 25^\circ\text{C}$ ,  $L = 0.25 \text{ mH}$ ,  $I_{AS} = 64 \text{ A}$ ,  $V_{DD} = 80 \text{ V}$  during inductor charging and  $V_{DD} = 0 \text{ V}$  during time in avalanche.
3.  $R_{\theta JA}$  is the sum of the junction-to-case and case-to-ambient thermal resistance, where the case thermal reference is defined as the solder mounting surface of the drain pins.  $R_{\theta JC}$  is guaranteed by design, while  $R_{\theta JA}$  is determined by the board design. The maximum rating presented here is based on mounting on a 1 in<sup>2</sup> pad of 2 oz copper.



### PIN CONFIGURATION

| Position    | Designation |
|-------------|-------------|
| Pin 1       | Gate        |
| Pin 2 / Tab | Drain       |
| Pin 3       | Source      |

### MARKING DIAGRAM



$\$Y$  = onsemi Logo  
 $\&Z$  = Assembly Plant Code  
 $\&3$  = Numeric Date Code  
 $\&K$  = Lot Code  
 FDB86363 = Specific Device Code

### ORDERING INFORMATION

See detailed ordering and shipping information on page 6 of this data sheet.

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

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Units |
|--------|-----------|-----------------|------|------|------|-------|
|--------|-----------|-----------------|------|------|------|-------|

**OFF CHARACTERISTICS**

|            |                                   |                                                                                       |    |   |           |               |
|------------|-----------------------------------|---------------------------------------------------------------------------------------|----|---|-----------|---------------|
| $B_{VDSS}$ | Drain-to-Source Breakdown Voltage | $I_D = 250\ \mu\text{A}$ , $V_{GS} = 0\ \text{V}$                                     | 80 | – | –         | V             |
| $I_{DSS}$  | Drain-to-Source Leakage Current   | $V_{DS} = 80\ \text{V}$ , $V_{GS} = 0\ \text{V}$ , $T_J = 25^\circ\text{C}$           | –  | – | 1         | $\mu\text{A}$ |
|            |                                   | $V_{DS} = 80\ \text{V}$ , $V_{GS} = 0\ \text{V}$ , $T_J = 175^\circ\text{C}$ (Note 4) | –  | – | 1         | mA            |
| $I_{GSS}$  | Gate-to-Source Leakage Current    | $V_{GS} = \pm 20\ \text{V}$                                                           | –  | – | $\pm 100$ | nA            |

**ON CHARACTERISTICS**

|              |                                  |                                                                                     |     |     |     |            |
|--------------|----------------------------------|-------------------------------------------------------------------------------------|-----|-----|-----|------------|
| $V_{GS(th)}$ | Gate to Source Threshold Voltage | $V_{GS} = V_{DS}$ , $I_D = 250\ \mu\text{A}$                                        | 2.0 | 3.0 | 4.0 | V          |
| $R_{DS(on)}$ | Drain-to-Source On-Resistance    | $I_D = 80\ \text{A}$ , $V_{GS} = 10\ \text{V}$ , $T_J = 25^\circ\text{C}$           | –   | 2.0 | 2.4 | m $\Omega$ |
|              |                                  | $I_D = 80\ \text{A}$ , $V_{GS} = 10\ \text{V}$ , $T_J = 175^\circ\text{C}$ (Note 4) | –   | 3.8 | 4.3 |            |

**DYNAMIC CHARACTERISTICS**

|              |                               |                                                                        |                                                |   |       |     |          |
|--------------|-------------------------------|------------------------------------------------------------------------|------------------------------------------------|---|-------|-----|----------|
| $C_{iss}$    | Input Capacitance             | $V_{DS} = 25\ \text{V}$ , $V_{GS} = 0\ \text{V}$ , $f = 1\ \text{MHz}$ |                                                | – | 10000 | –   | pF       |
| $C_{oss}$    | Output Capacitance            |                                                                        |                                                | – | 1400  | –   | pF       |
| $C_{rss}$    | Reverse Transfer Capacitance  |                                                                        |                                                | – | 95    | –   | pF       |
| $R_g$        | Gate Resistance               | $f = 1\ \text{MHz}$                                                    |                                                | – | 3.3   | –   | $\Omega$ |
| $Q_{g(TOT)}$ | Total Gate Charge             | $V_{GS} = 0\ \text{V}$ to $10\ \text{V}$                               | $V_{DD} = 64\ \text{V}$ , $I_D = 80\ \text{A}$ | – | 131   | 150 | nC       |
| $Q_{g(th)}$  | Threshold Gate Charge         | $V_{GS} = 0\ \text{V}$ to $2\ \text{V}$                                |                                                | – | 18    | 21  | nC       |
| $Q_{gs}$     | Gate-to-Source Gate Charge    |                                                                        |                                                | – | 47    | –   | nC       |
| $Q_{gd}$     | Gate-to-Drain "Miller" Charge |                                                                        |                                                | – | 24    | –   | nC       |

**SWITCHING CHARACTERISTICS**

|              |                |                                                                                                  |   |     |     |    |
|--------------|----------------|--------------------------------------------------------------------------------------------------|---|-----|-----|----|
| $t_{on}$     | Turn-On Time   | $V_{DD} = 40\ \text{V}$ , $I_D = 80\ \text{A}$ , $V_{GS} = 10\ \text{V}$ , $R_{GEN} = 6\ \Omega$ | – | –   | 231 | ns |
| $t_{d(on)}$  | Turn-On Delay  |                                                                                                  | – | 38  | –   | ns |
| $t_r$        | Rise Time      |                                                                                                  | – | 129 | –   | ns |
| $t_{d(off)}$ | Turn-Off Delay |                                                                                                  | – | 64  | –   | ns |
| $t_f$        | Fall Time      |                                                                                                  | – | 40  | –   | ns |
| $t_{off}$    | Turn-Off Time  |                                                                                                  | – | –   | 135 | ns |

**DRAIN-SOURCE DIODE CHARACTERISTICS**

|          |                               |                                                                                                       |   |     |             |    |
|----------|-------------------------------|-------------------------------------------------------------------------------------------------------|---|-----|-------------|----|
| $V_{SD}$ | Source-to-Drain Diode Voltage | $V_{GS} = 0\ \text{V}$ , $I_{SD} = 80\ \text{A}$<br>$V_{GS} = 0\ \text{V}$ , $I_{SD} = 40\ \text{A}$  | – | –   | 1.25<br>1.2 | V  |
| $t_{rr}$ | Reverse-Recovery Time         | $I_F = 80\ \text{A}$ , $\Delta I_{SD}/\Delta t = 100\ \text{A}/\mu\text{s}$ , $V_{DD} = 64\ \text{V}$ | – | 88  | 101         | ns |
| $Q_{rr}$ | Reverse-Recovery Charge       |                                                                                                       | – | 129 | 157         | 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.

4. The maximum value is specified by design at  $T_J = 175^\circ\text{C}$ . Product is not tested to this condition in production.

## TYPICAL CHARACTERISTICS

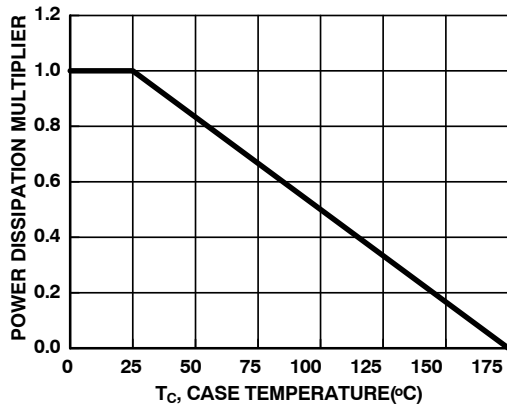


Figure 1. Normalized Power Dissipation vs. Case Temperature

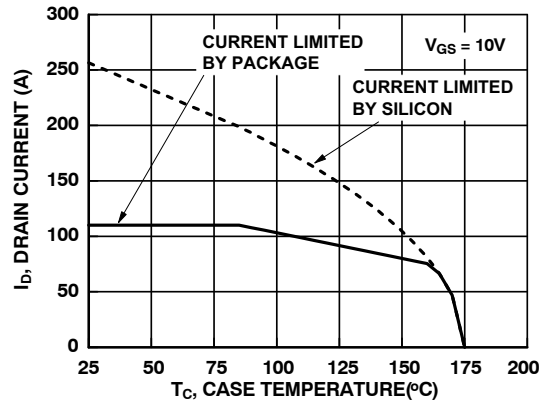


Figure 2. Maximum Continuous Drain Current vs. Case Temperature

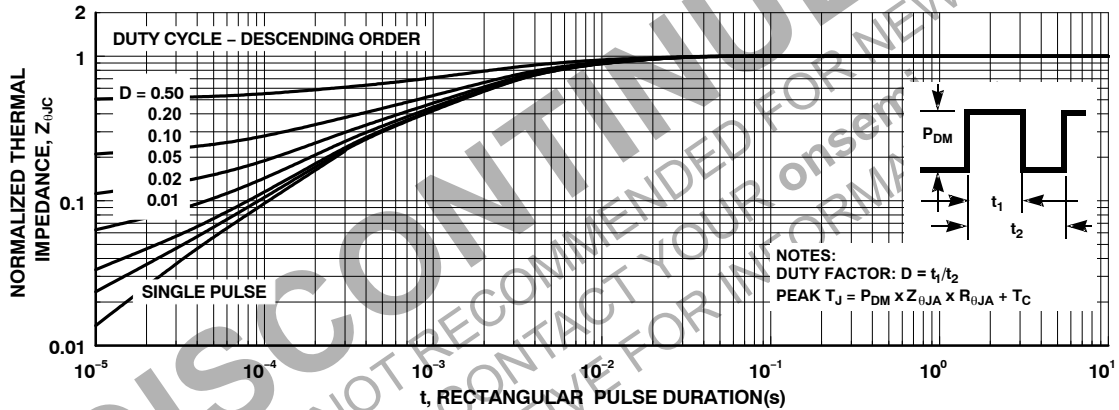


Figure 3. Normalized Maximum Transient Thermal Impedance

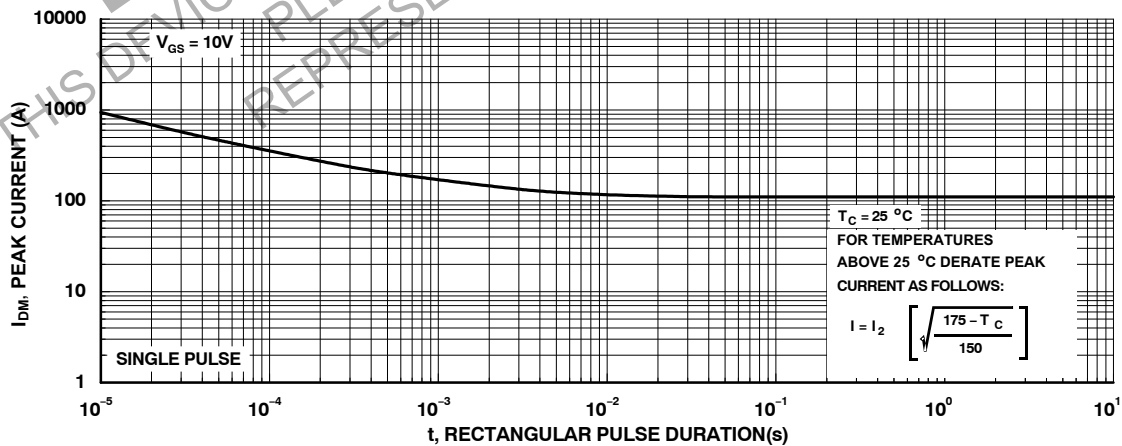


Figure 4. Peak Current Capability

## TYPICAL CHARACTERISTICS

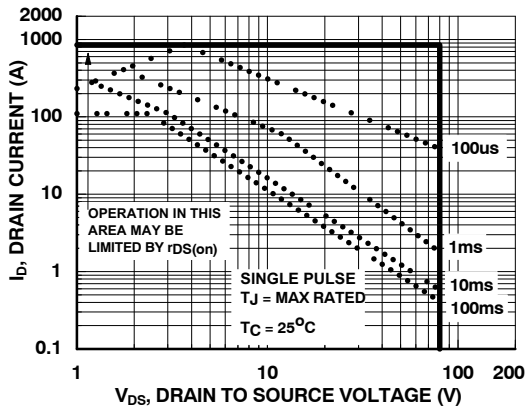
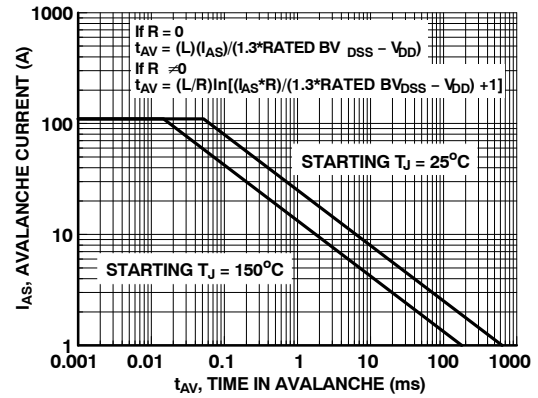


Figure 5. Forward Bias Safe Operating Area



NOTE: Refer to ON Semiconductor Application Notes AN7514 and AN7515

Figure 6. Unclamped Inductive Switching Capability

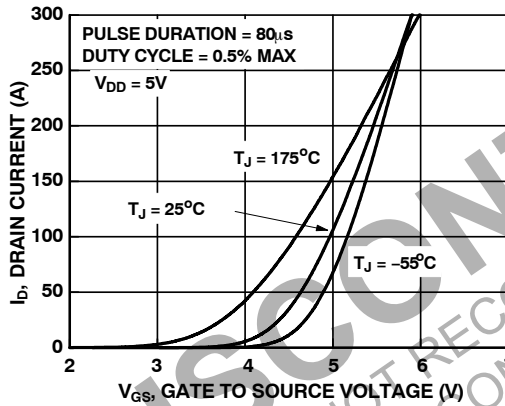


Figure 7. Transfer Characteristics

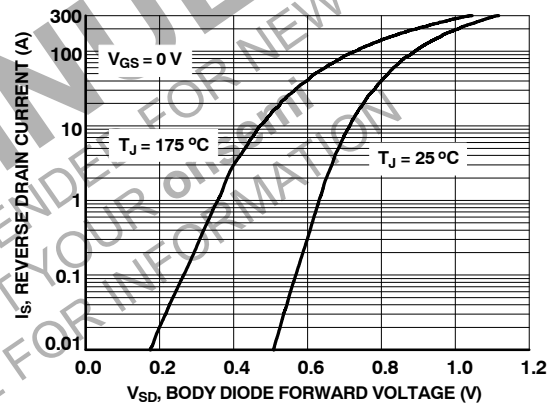


Figure 8. Forward Diode Characteristics

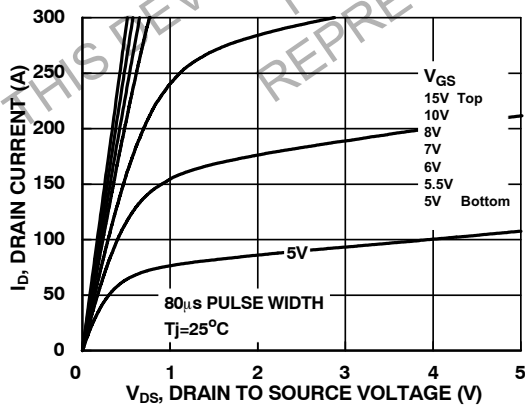


Figure 9. Saturation Characteristics

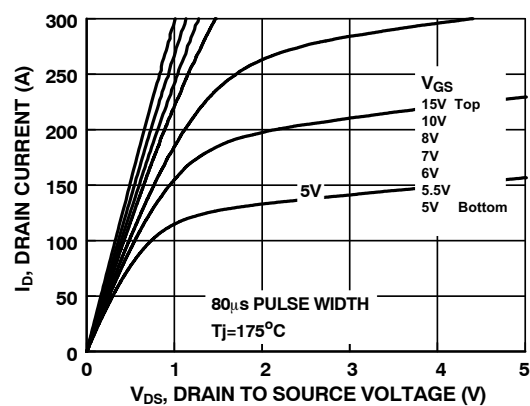


Figure 10. Saturation Characteristics

## TYPICAL CHARACTERISTICS

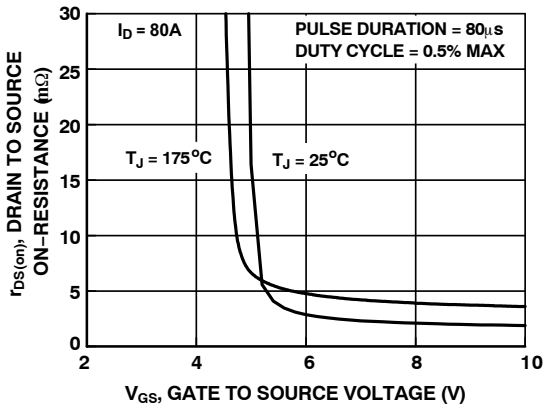
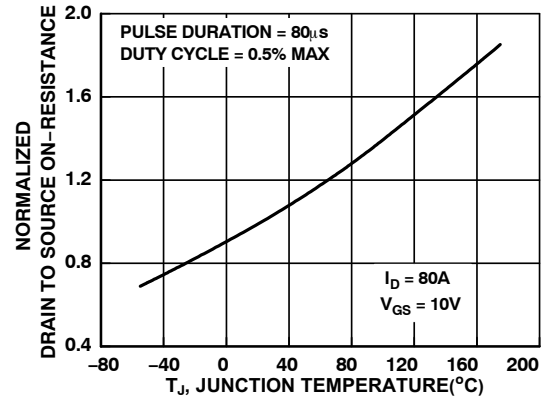
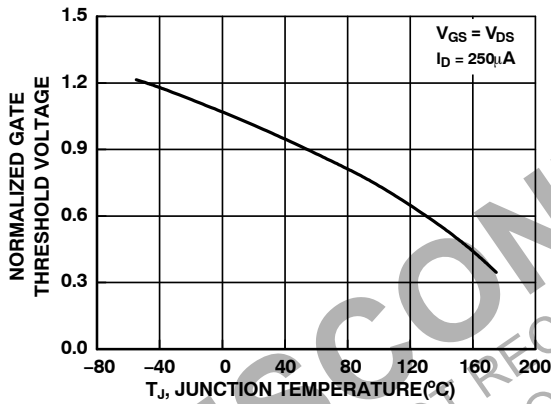
Figure 11.  $R_{DS(on)}$  vs. Gate VoltageFigure 12. Normalized  $R_{DS(on)}$  vs. Junction Temperature

Figure 13. Normalized Gate Threshold Voltage vs. Temperature

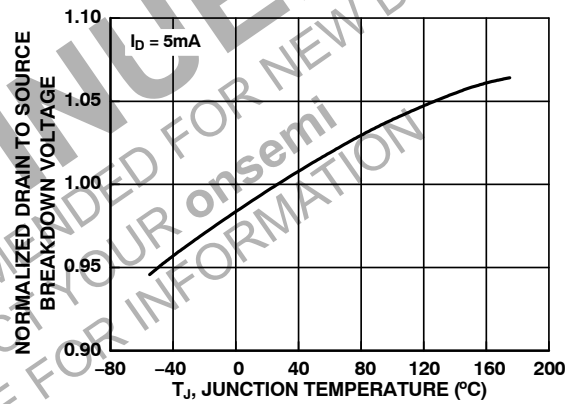


Figure 14. Normalized Drain to Source Breakdown Voltage vs. Junction Temperature

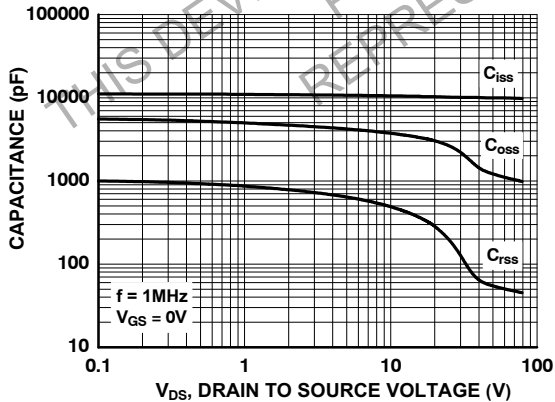


Figure 15. Capacitance vs. Drain to Source Voltage

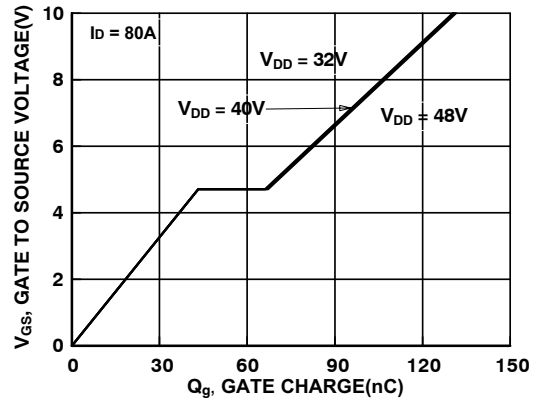


Figure 16. Gate Charge vs. Gate to Source Voltage

## FDB86363–F085

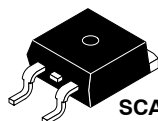
### PACKAGE MARKING AND ORDERING INFORMATION

| Device Marking | Device        | Package                                 | Shipping <sup>†</sup>   |
|----------------|---------------|-----------------------------------------|-------------------------|
| FDB86363       | FDB86363–F085 | D2PAK (TO–263)<br>(Pb–Free/Halide Free) | 800 units / 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

**DISCONTINUED**  
THIS DEVICE IS NOT RECOMMENDED FOR NEW DESIGN  
PLEASE CONTACT YOUR **onsemi**  
REPRESENTATIVE FOR INFORMATION

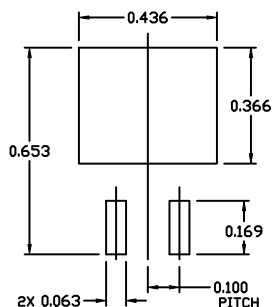
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SCALE 1:1

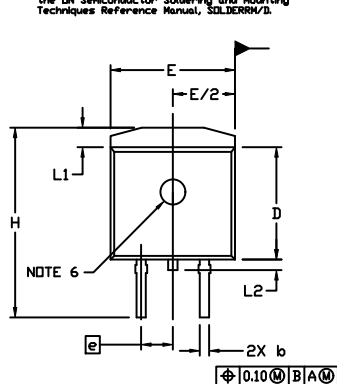
**D<sup>2</sup>PAK-3 (TO-263, 3-LEAD)**  
CASE 418AJ  
ISSUE F

DATE 11 MAR 2021



**RECOMMENDED  
MOUNTING FOOTPRINT**

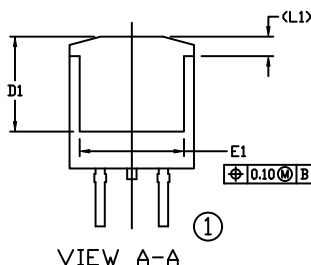
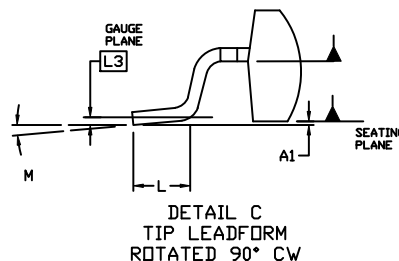
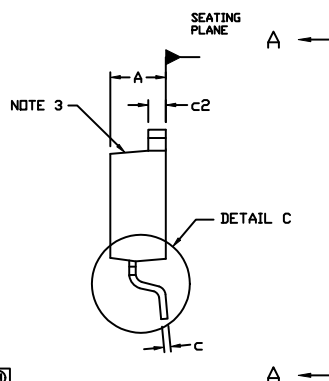
For additional information on our Pb-free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



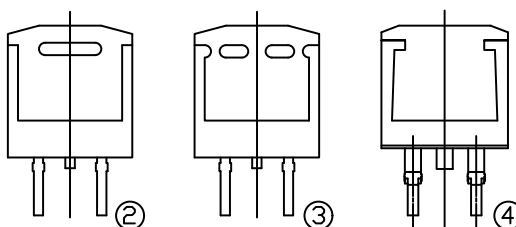
**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: INCHES
3. CHAMFER OPTIONAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.005 PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY AT DATUM H.
5. THERMAL PAD CONTOUR IS OPTIONAL WITHIN DIMENSIONS E, L1, D1, AND E1.
6. OPTIONAL MOLD FEATURE.
7. ①, ② ... OPTIONAL CONSTRUCTION FEATURE CALL OUTS.

| DIM | INCHES    |       | MILLIMETERS |       |
|-----|-----------|-------|-------------|-------|
|     | MIN.      | MAX.  | MIN.        | MAX.  |
| A   | 0.160     | 0.190 | 4.06        | 4.83  |
| A1  | 0.000     | 0.010 | 0.00        | 0.25  |
| b   | 0.020     | 0.039 | 0.51        | 0.99  |
| c   | 0.012     | 0.029 | 0.30        | 0.74  |
| c2  | 0.045     | 0.065 | 1.14        | 1.65  |
| D   | 0.330     | 0.380 | 8.38        | 9.65  |
| D1  | 0.260     | ---   | 6.60        | ---   |
| E   | 0.380     | 0.420 | 9.65        | 10.67 |
| E1  | 0.245     | ---   | 6.22        | ---   |
| e   | 0.100 BSC | ---   | 2.54 BSC    | ---   |
| H   | 0.575     | 0.625 | 14.60       | 15.88 |
| L   | 0.070     | 0.110 | 1.78        | 2.79  |
| L1  | ---       | 0.066 | ---         | 1.68  |
| L2  | ---       | 0.070 | ---         | 1.78  |
| L3  | 0.010 BSC | ---   | 0.25 BSC    | ---   |
| M   | 0°        | 8°    | 0°          | 8°    |

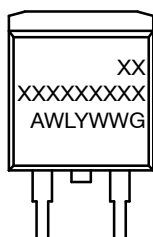


VIEW A-A

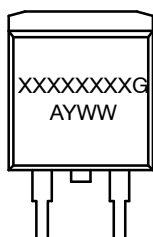


VIEW A-A  
OPTIONAL CONSTRUCTIONS

**GENERIC MARKING DIAGRAMS\***



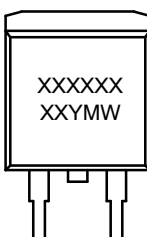
IC



Standard



Rectifier



SSG

XXXXXX = Specific Device Code  
A = Assembly Location  
WL = Wafer Lot  
Y = Year  
WW = Work Week  
W = Week Code (SSG)  
M = Month Code (SSG)  
G = Pb-Free Package  
AKA = Polarity Indicator

\*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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| <b>DESCRIPTION:</b>     | <b>D<sup>2</sup>PAK-3 (TO-263, 3-LEAD)</b> | <b>PAGE 1 OF 1</b>                                                                                                                                                               |

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