# MOSFET – N-Channel, POWERTRENCH®, DUAL COOL® 88

## 150 V, 99 A, 6.5 mΩ

# FDMT800150DC

| $V_{DS}$ | $r_{DS(on)}$ MAX | $I_D$ MAX |
|---|---|---|
| 150 V | 6.5 mΩ @ 10 V | 99 A |
| | 8.4 mΩ @ 6 V | |

### General Description

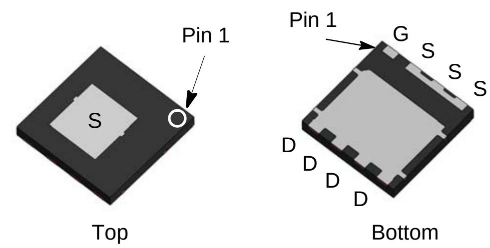
This N−Channel MOSFET is produced using **onsemi**'s advanced POWERTRENCH process. Advancements in both silicon and DUAL COOL package technologies have been combined to offer the lowest $r_{DS(on)}$ while maintaining excellent switching performance by extremely low Junction−to−Ambient thermal resistance.

### Features

- Max $r_{DS(on)}$ = 6.5 mΩ at $V_{GS}$ = 10 V, $I_D$ = 15 A
- Max $r_{DS(on)}$ = 8.4 mΩ at $V_{GS}$ = 8 V, $I_D$ = 13 A
- Advanced Package and Silicon Combination for Low $r_{DS(on)}$ and High Efficiency
- Next Generation Enhanced Body Diode Technology, Engineered for Soft Recovery
- Low Profile 8x8 mm MLP Package
- MSL1 Robust Package Design
- 100% UIL Tested
- This Device is Pb−Free, Halide Free and RoHS Compliant

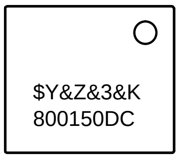
### Applications

- OringFET / Load Switching
- Synchronous Rectification
- DC−DC Conversion



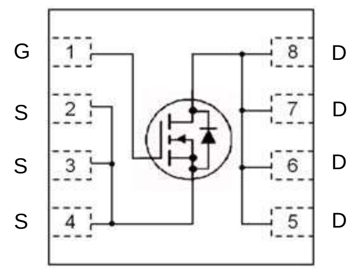

**PQFN8 8X8, 2P**
**(Dual Cool 88)**
**CASE 483AQ**

### MARKING DIAGRAM




800150DC = Device Code
$Y = Company Logo
&Z = Assembly Plant Code
&3 = Date Code
&K = Traceability Code

### ELECTRICAL CONNECTION




**N-Channel MOSFET**

### ORDERING INFORMATION

See detailed ordering, marking and shipping information on page 7 of this data sheet.

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

| Symbol | Parameter | | | | Rating | Unit |
|---|---|---|---|---|---|---|
| $V_{DS}$ | Drain to Source Voltage | | | | 150 | V |
| $V_{GS}$ | Gate to Source Voltage | | | | ±20 | V |
| $I_D$ | Drain Current | − Continuous | $T_C$ = 25°C | (Note 5) | 99 | A |
| | | − Continuous | $T_C$ = 100°C | (Note 5) | 62 | |
| | | − Continuous | $T_A$ = 25°C | (Note 1a) | 15 | |
| | | − Pulsed | | (Note 4) | 561 | |
| $E_{AS}$ | Single Pulse Avalanche Energy | | | (Note 3) | 1093 | mJ |
| $P_D$ | Power Dissipation | | $T_C$ = 25°C | | 156 | W |
| | Power Dissipation | | $T_A$ = 25°C | (Note 1a) | 3.2 | |
| $T_J$, $T_{STG}$ | 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 | | Ratings | Unit |
|---|---|---|---|---|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case | (Top Source) | 1.6 | °C/W |
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case | (Bottom Drain) | 0.8 | |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | (Note 1a) | 38 | |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | (Note 1b) | 81 | |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | (Note 1i) | 15 | |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | (Note 1j) | 21 | |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | (Note 1k) | 9 | |

**ELECTRICAL CHARACTERISTICS** ($T_J$ = 25°C unless otherwise noted)

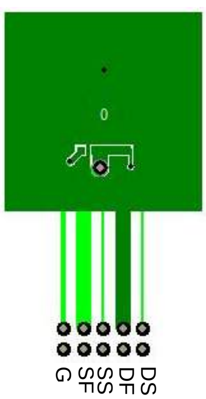
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| $BV_{DSS}$ | Drain to Source Breakdown Voltage | $I_D$ = 250 μA, $V_{GS}$ = 0 V | 150 | – | – | V |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D$ = 250 μA, referenced to 25°C | – | 110 | – | mV/°C |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = 120 V, $V_{GS}$ = 0 V | – | – | 1 | μA |
| $I_{GSS}$ | Gate to Source Leakage Current | $V_{GS}$ = ±20 V, $V_{DS}$ = 0 V | – | – | 100 | nA |
| **ON CHARACTERISTICS** | | | | | | |
| $V_{GS(th)}$ | Gate to Source Threshold Voltage | $V_{GS}$ = $V_{DS}$, $I_D$ = 250 μA | 2.0 | 3.0 | 4.0 | V |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate to Source Threshold Voltage Temperature Coefficient | $I_D$ = 250 μA, referenced to 25°C | – | −12 | – | mV/°C |
| $r_{DS(on)}$ | Static Drain to Source On Resistance | $V_{GS}$ = 10 V, $I_D$ = 15 A | – | 5.4 | 6.5 | mΩ |
| | | $V_{GS}$ = 6 V, $I_D$ = 13 A | – | 6.6 | 8.4 | |
| | | $V_{GS}$ = 10 V, $I_D$ = 15 A, $T_J$ = 125°C | – | 11 | 13 | |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$ = 5 V, $I_D$ = 15 A | – | 48 | – | S |
| **DYNAMIC CHARACTERISTICS** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$ = 75 V, $V_{GS}$ = 0 V, f = 1 MHz | – | 5860 | 8205 | pF |
| $C_{oss}$ | Output Capacitance | | – | 520 | 730 | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | – | 17 | 30 | pF |
| $R_g$ | Gate Resistance | | 0.1 | 1.4 | 3.5 | Ω |
| **SWITCHING CHARACTERISTICS** | | | | | | |
| $td_{(on)}$ | Turn−On Delay Time | $V_{DD}$ = 75 V, $I_D$ = 15 A, $V_{GS}$ = 10 V, $R_{GEN}$ = 6 Ω | – | 31 | 50 | ns |
| $t_r$ | Rise Time | | – | 16 | 29 | ns |
| $t_{d(off)}$ | Turn−Off Delay Time | | – | 41 | 66 | ns |
| $t_f$ | Fall Time | | – | 9.3 | 19 | ns |
| $Q_{g(TOT)}$ | Total Gate Charge | $V_{GS}$ = 0 V to 10 V, $V_{DD}$ = 75 V, $I_D$ = 15 A | – | 77 | 108 | nC |
| | | $V_{GS}$ = 0 V to 6 V, $V_{DD}$ = 75 V, $I_D$ = 15 A | – | 49 | 69 | |
| $Q_{gs}$ | Gate to Source Charge | $V_{DD}$ = 75 V, $I_D$ = 15 A | – | 25 | – | nC |
| $Q_{gd}$ | Gate to Drain “Miller” Charge | | – | 14 | – | nC |
| **DRAIN−SOURCE DIODE CHARACTERISTICS** | | | | | | |
| $V_{SD}$ | Source to Drain Diode Forward Voltage | $V_{GS}$ = 0 V, $I_S$ = 2.9 A (Note 2) | – | 0.7 | 1.1 | V |
| | | $V_{GS}$ = 0 V, $I_S$ = 15 A (Note 2) | – | 0.8 | 1.2 | |
| $t_{rr}$ | Reverse Recovery Time | $I_F$ = 15 A, di/dt = 100 A/μs | – | 103 | 165 | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | – | 233 | 373 | 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.

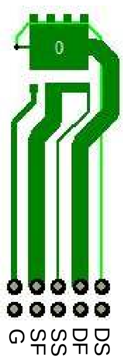
### THERMAL CHARACTERISTICS

| Symbol | Parameter | | Ratings | Unit |
|---|---|---|---|---|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case | (Top Source) | 1.6 | °C/W |
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case | (Bottom Drain) | 0.8 | |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | (Note 1a) | 38 | |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | (Note 1b) | 81 | |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | (Note 1c) | 26 | |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | (Note 1d) | 34 | |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | (Note 1e) | 14 | |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | (Note 1f) | 16 | |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | (Note 1g) | 26 | |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | (Note 1h) | 60 | |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | (Note 1i) | 15 | |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | (Note 1j) | 21 | |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | (Note 1k) | 9 | |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | (Note 1l) | 11 | |

NOTES:
1. $R_{\theta JA}$ is determined with the device mounted on a FR−4 board using a specified pad of 2 oz copper as shown below. $R_{\theta CA}$ is determined by the user's board design.



a) 38°C/W when mounted on a 1 in$^2$ pad of 2 oz copper.



b) 81°C/W when mounted on a minimum pad of 2 oz copper.

c) Still air, 20.9 x 10.4 x 12.7 mm Aluminum Heat Sink, 1 in$^2$ pad of 2 oz copper
d) Still air, 20.9 x 10.4 x 12.7 mm Aluminum Heat Sink, minimum pad of 2 oz copper
e) Still air, 45.2 x 41.4 x 11.7 mm Aavid Thermalloy Part # 10−L41B−11 Heat Sink, 1 in$^2$ pad of 2 oz copper
f) Still air, 45.2 x 41.4 x 11.7 mm Aavid Thermalloy Part # 10−L41B−11 Heat Sink, minimum pad of 2 oz copper
g) 200FPM Airflow, No Heat Sink, 1 in$^2$ pad of 2 oz copper
h) 200FPM Airflow, No Heat Sink, minimum pad of 2 oz copper
i) 200FPM Airflow, 20.9 x 10.4 x 12.7 mm Aluminum Heat Sink, 1 in$^2$ pad of 2 oz copper
j) 200FPM Airflow, 20.9 x 10.4 x 12.7 mm Aluminum Heat Sink, minimum pad of 2 oz copper
k) 200FPM Airflow, 45.2 x 41.4 x 11.7 mm Aavid Thermalloy Part # 10−L41B−11 Heat Sink, 1 in$^2$ pad of 2 oz copper
l) 200FPM Airflow, 45.2 x 41.4 x 11.7 mm Aavid Thermalloy Part # 10−L41B−11 Heat Sink, minimum pad of 2 oz copper

2. Pulse Test: Pulse Width < 300 μs, Duty cycle < 2.0%.
3. $E_{AS}$ of 1093 mJ is based on starting $T_J$ = 25°C; N−ch: L = 3 mH, $I_{AS}$ = 27 A, $V_{DD}$ = 150 V, $V_{GS}$ = 10 V. 100% test at L = 0.1 mH, $I_{AS}$ = 86 A.
4. Pulsed Id please refer to Figure 11 SOA graph for more details.
5. 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°C unless otherwise noted)

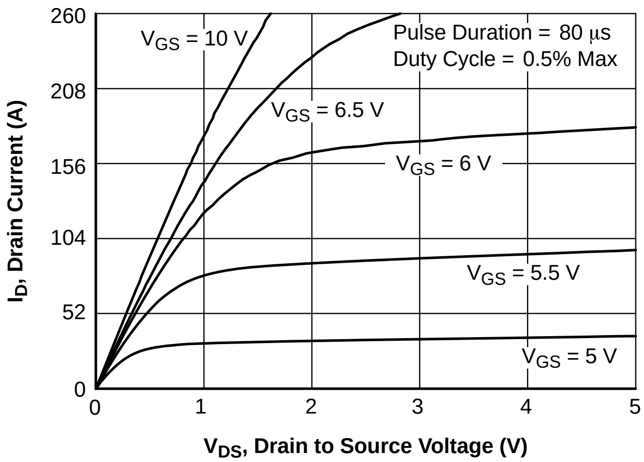



**Figure 1. On−Region Characteristics**

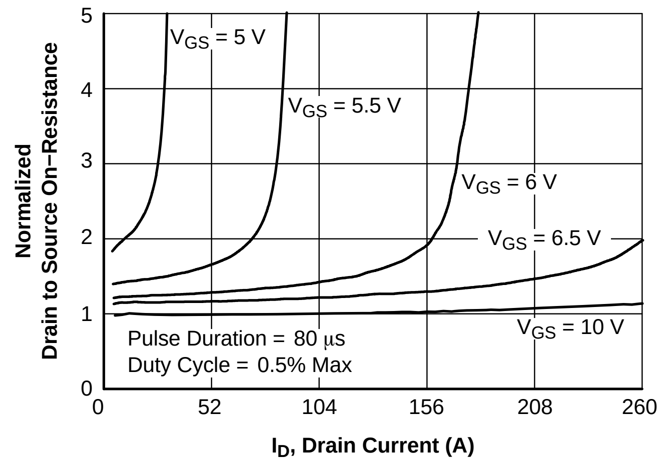



**Figure 2. Normalized On−Resistance vs. Drain Current and Gate Voltage**

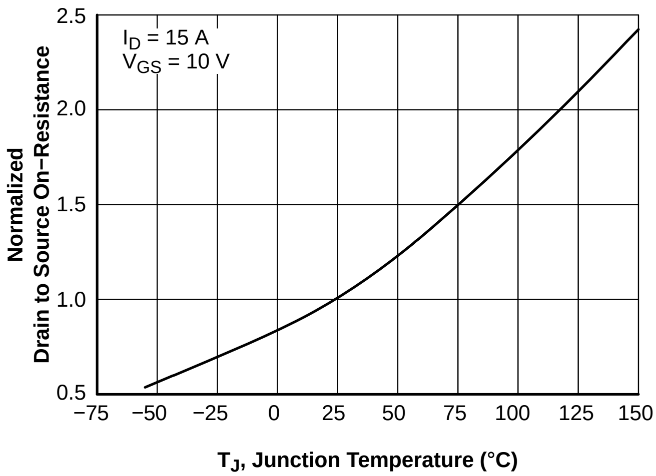



**Figure 3. Normalized On−Resistance vs. Junction Temperature**

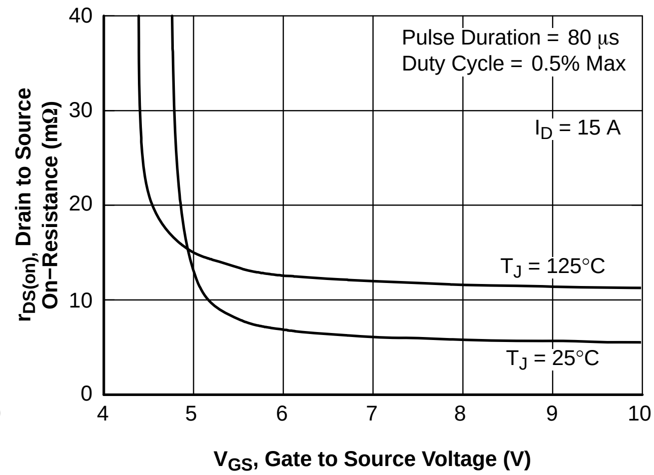



**Figure 4. On−Resistance vs. Gate to Source Voltage**

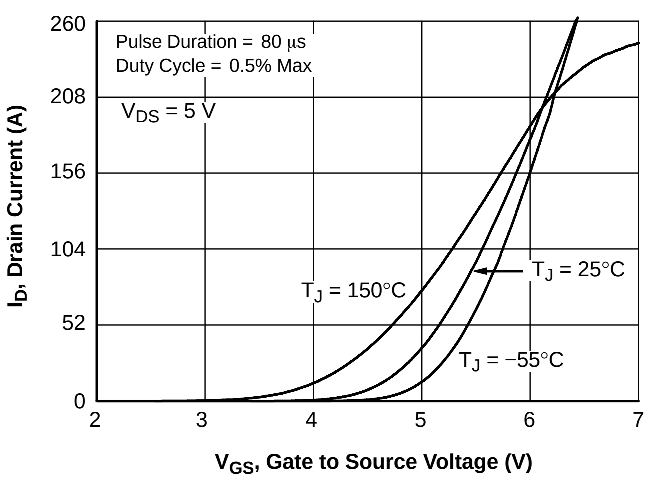



**Figure 5. Transfer Characteristics**

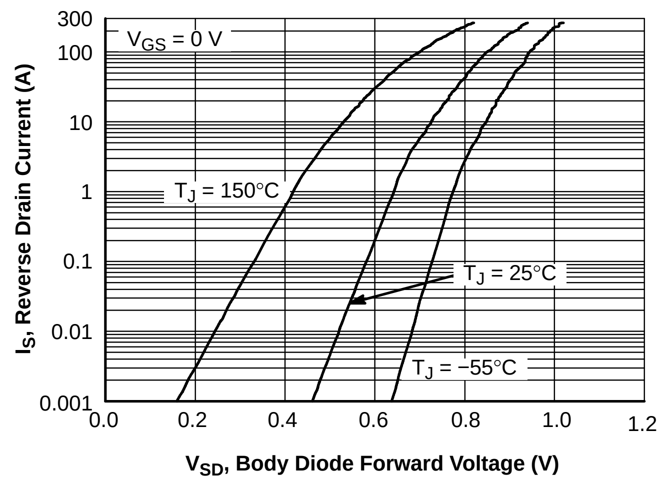



**Figure 6. Source to Drain Diode Forward Voltage vs. Source Current**

**TYPICAL CHARACTERISTICS** ($T_J$ = 25°C unless otherwise noted) (continued)

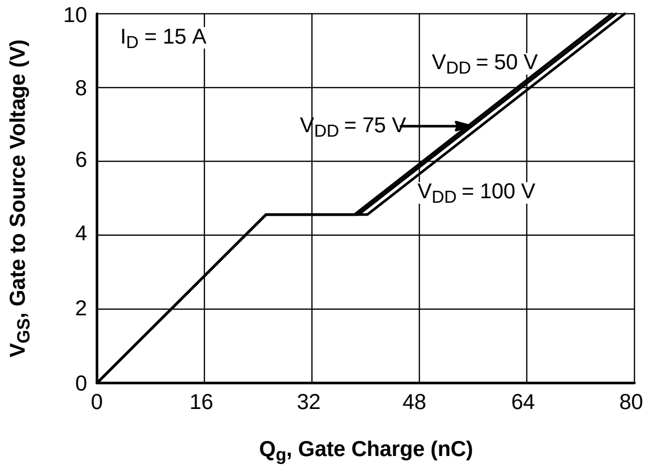



**Figure 7. Gate Charge Characteristics**

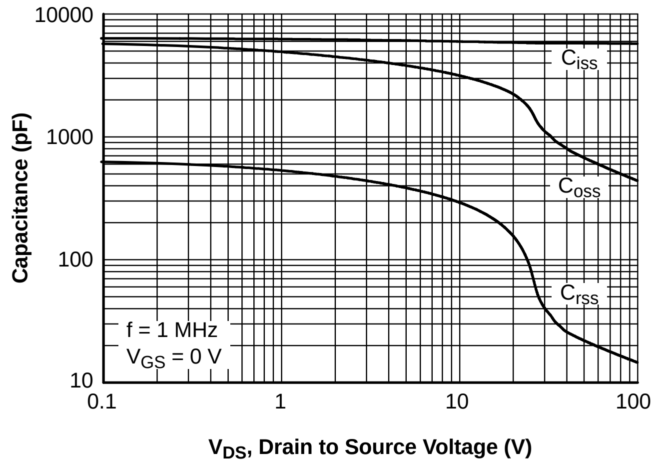



**Figure 8. Capacitance vs. Drain to Source Voltage**

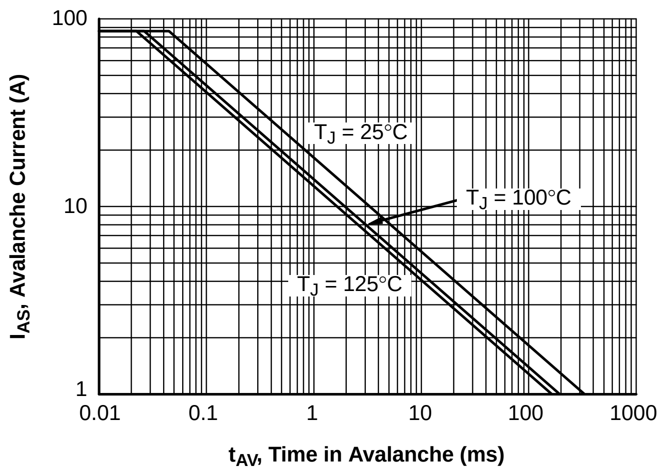



**Figure 9. Unclamped Inductive Switching Capability**

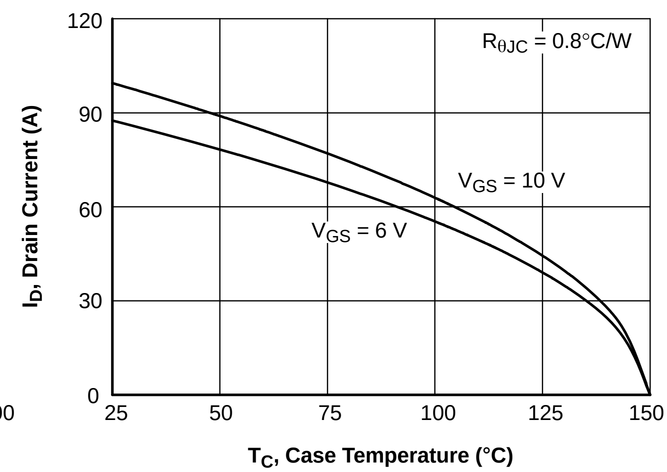



**Figure 10. Maximum Continuous Drain Current vs. Case Temperature**

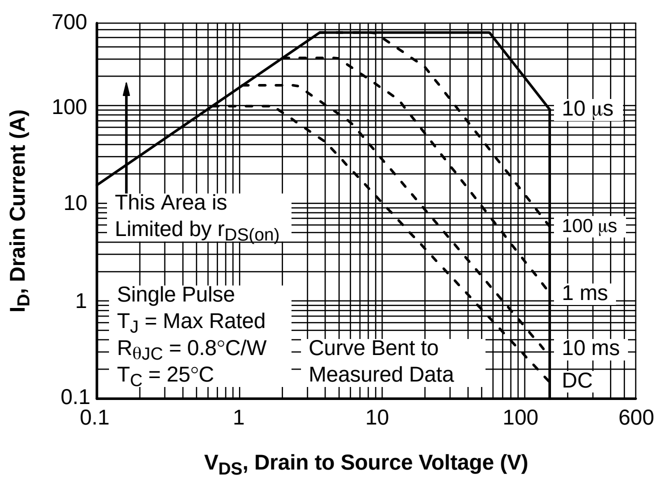



**Figure 11. Forward Bias Safe Operating Area**

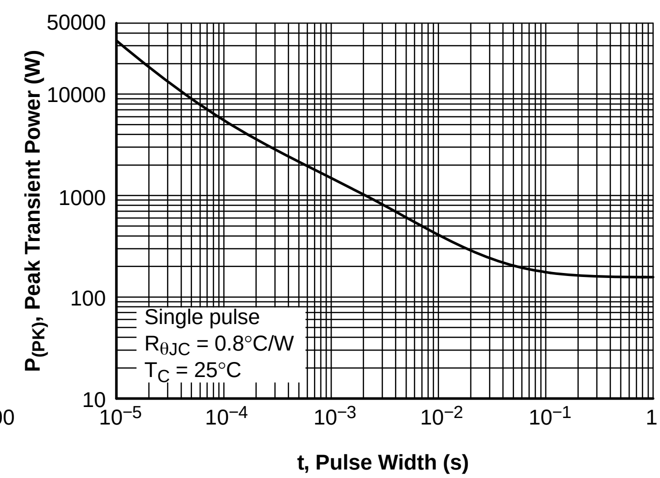



**Figure 12. Single Pulse Maximum Power Dissipation**

## TYPICAL CHARACTERISTICS ($T_J$ = 25°C unless otherwise noted) (continued)

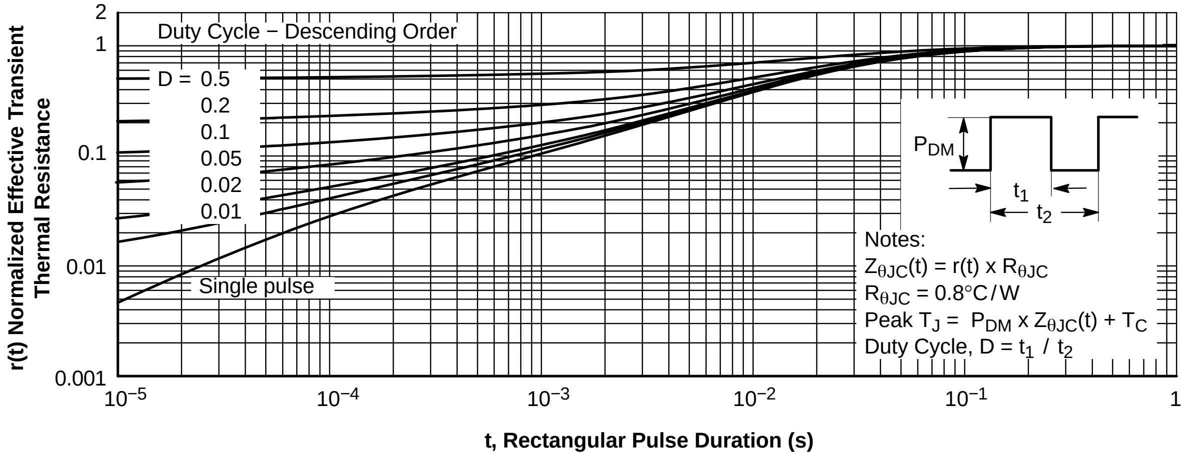
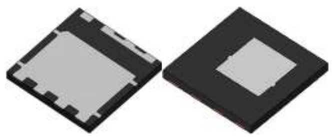



**Figure 13. Junction−to−Case Transient Thermal Response Curve**

### PACKAGE MARKING AND ORDERING INFORMATION

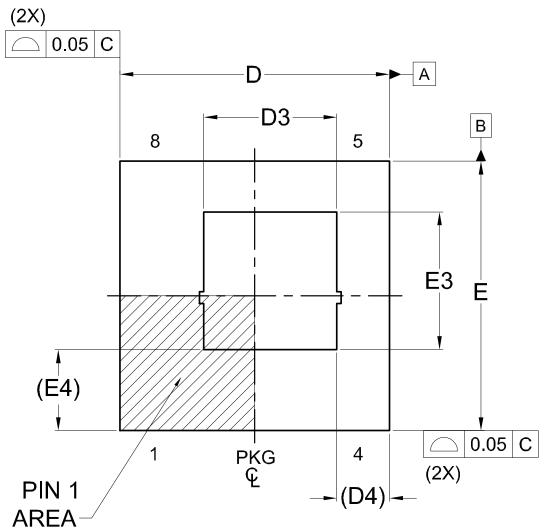
| Device Marking | Device | Package | Reel Size | Tape Width | Shipping† |
|---|---|---|---|---|---|
| 800150DC | FDMT800150DC | PQFN8 8X8, 2P, DUAL COOL 88 | | 13.3 mm | 3000 / Tape & Reel |

†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.

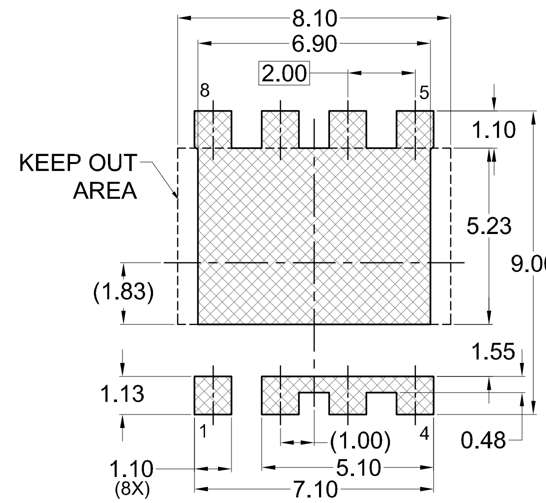


**PQFN8 8X8, 2P**
CASE 483AQ
ISSUE B

DATE 24 OCT 2022

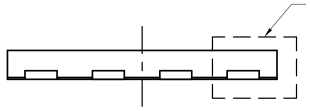



TOP VIEW

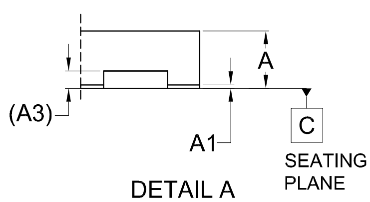



LAND PATTERN RECOMMENDATION

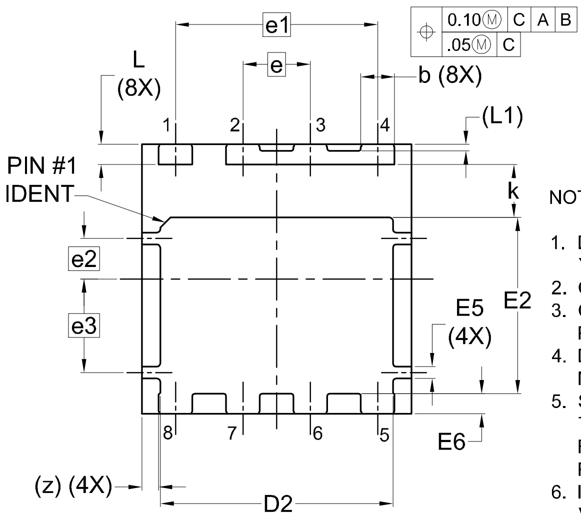
*FOR ADDITIONAL INFORMATION ON OUR PB-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.




FRONT VIEW




DETAIL A
SCALE: 2X




BOTTOM VIEW

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. COPLANARITY APPLIES TO THE EXPOSED PADS AS WELL AS THE TERMINALS.
4. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
5. 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.
6. IT IS RECOMMENDED TO HAVE NO TRACES OR VIAS WITHIN THE KEEP OUT AREA.

| DIM | MILLIMETERS | | |
|---|---|---|---|
| | MIN. | NOM. | MAX. |
| A | 0.75 | 0.85 | 0.95 |
| A1 | 0.00 | - | 0.05 |
| A3 | 0.25 REF | | |
| b | 0.90 | 1.00 | 1.10 |
| D | 7.90 | 8.00 | 8.10 |
| D2 | 6.80 | 6.90 | 7.00 |
| D3 | 3.68 | 3.86 | 4.03 |
| D4 | 1.56 REF | | |
| E | 7.90 | 8.00 | 8.10 |
| E2 | 5.13 | 5.23 | 5.33 |
| E3 | 3.99 | 4.09 | 4.19 |
| E4 | 2.41 REF | | |
| E5 | 0.35 REF | | |
| E6 | 0.60 REF | | |
| e | 2.00 BSC | | |
| e1 | 6.00 BSC | | |
| e2 | 1.20 BSC | | |
| e3 | 2.78 BSC | | |
| k | 1.48 | 1.58 | 1.68 |
| L | 0.50 | 0.60 | 0.70 |
| L1 | 0.20 REF | | |
| z | 0.50 REF | | |

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|---|---|---|
| DESCRIPTION: | PQFN8 8X8, 2P | PAGE 1 OF 1 |

## ADDITIONAL INFORMATION

**TECHNICAL PUBLICATIONS**:
**Technical Library:** www.onsemi.com/design/resources/technical−documentation
**onsemi Website:** www.onsemi.com

**ONLINE SUPPORT:** www.onsemi.com/support
**For additional information, please contact your local Sales Representative at** www.onsemi.com/support/sales