

## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(ON)}$ Max                       | $I_D$ Max<br>$T_A = +25^\circ\text{C}$ |
|---------------|--|--|
| -30V          | 13m $\Omega$ @ $V_{GS} = -10\text{V}$  | -9.8A                                  |
|               | 25m $\Omega$ @ $V_{GS} = -4.5\text{V}$ | -7.0A                                  |

## Description

This MOSFET is designed to minimize the on-state resistance ( $R_{DS(ON)}$ ) and yet maintain superior switching performance, making it ideal for high-efficiency power management applications.

## Applications

- Backlighting
- Power Management Functions
- DC-DC Converters

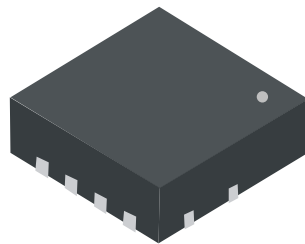
## Features and Benefits

- Low  $R_{DS(ON)}$  – Ensures On-State Losses Are Minimized
- Small form factor thermally efficient package enables higher density end products
- Occupies just 33% of the board area occupied by SO-8 enabling smaller end product
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP Capable (Note 4)**

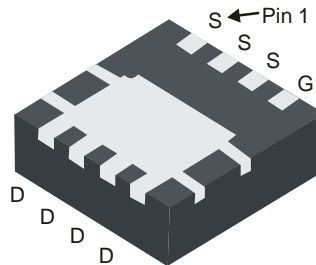
## Mechanical Data

- Case: POWERDI®3333-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections Indicator: See Diagram
- Terminals: Finish — Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 (E3)
- Weight: 0.0174 grams (Approximate)

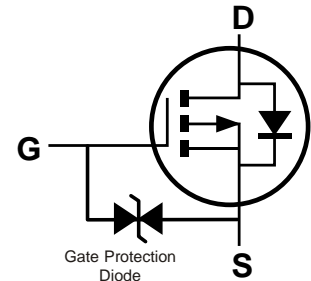
### POWERDI3333-8



Top View



Bottom View



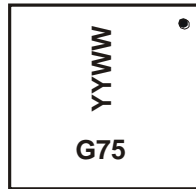
Equivalent Circuit

## Ordering Information (Note 5)

| Part Number    | Case          | Packaging         |
|----------------|---------------|-------------------|
| DMG7401SFGQ-7  | POWERDI3333-8 | 2,000/Tape & Reel |
| DMG7401SFGQ-13 | POWERDI3333-8 | 3,000/Tape & Reel |

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  2. See [http://www.diodes.com/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
  3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
  4. Automotive products are AEC-Q101 qualified and are PPAP capable. Automotive, AEC-Q101 and standard products are electrically and thermally the same, except where specified. For more information, please refer to [http://www.diodes.com/quality/product\\_compliance\\_definitions/](http://www.diodes.com/quality/product_compliance_definitions/).
  5. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

## Marking Information



G75 = Product Marking Code  
 YYWW = Date Code Marking  
 YY = Last Digit of Year (ex: 10 for 2010)  
 WW = Week Code (01 – 53)

## Maximum Ratings (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

| Characteristic   | Symbol    | Value                     | Units |   |
|--|-----------|---------------------------|-------|---|
| Drain-Source Voltage   | $V_{DSS}$ | -30                       | V     |   |
| Gate-Source Voltage  | $V_{GSS}$ | $\pm 25$                  | V     |   |
| Continuous Drain Current (Note 7) $V_{GS} = -10\text{V}$       | $I_D$     | $T_A = +25^\circ\text{C}$ | -9.8  | A |
|  |           | $T_A = +70^\circ\text{C}$ | -7.7  | A |
|  | $I_D$     | $T_A = +25^\circ\text{C}$ | -13.5 | A |
|  |           | $T_A = +70^\circ\text{C}$ | -10.8 | A |
| Maximum Continuous Body Diode Forward Current (Note 6)         | $I_S$     | -3.0                      | A     |   |
| Pulsed Drain Current (10 $\mu\text{s}$ pulse, duty cycle = 1%) | $I_{DM}$  | -80                       | A     |   |
| Avalanche Current (Notes 8 & 9)                                | $I_{AR}$  | 14                        | A     |   |
| Repetitive Avalanche Energy (Notes 8 & 9) $L = 1\text{mH}$     | $E_{AR}$  | 104                       | mJ    |   |

## Thermal Characteristics

| Characteristic                                   | Symbol          | Value                     | Units              |                    |
|--|-----------------|---------------------------|--------------------|--------------------|
| Total Power Dissipation (Note 6)                 | $P_D$           | $T_A = +25^\circ\text{C}$ | 0.94               | W                  |
|  |                 | $T_A = +70^\circ\text{C}$ | 0.6                |                    |
| Thermal Resistance, Junction to Ambient (Note 6) | $R_{\theta JA}$ | Steady State              | 137                | $^\circ\text{C/W}$ |
|  |                 | $t < 10\text{s}$          | 82                 | $^\circ\text{C/W}$ |
| Total Power Dissipation (Note 7)                 | $P_D$           | $T_A = +25^\circ\text{C}$ | 2.2                | W                  |
|  |                 | $T_A = +70^\circ\text{C}$ | 1.3                |                    |
| Thermal Resistance, Junction to Ambient (Note 7) | $R_{\theta JA}$ | Steady State              | 60                 | $^\circ\text{C/W}$ |
|  |                 | $t < 10\text{s}$          | 36                 | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction to Case (Note 7)    | $R_{\theta JC}$ | 3.0                       | $^\circ\text{C/W}$ |                    |
| Operating and Storage Temperature Range          | $T_J, T_{STG}$  | -55 to +150               | $^\circ\text{C}$   |                    |

- Notes:
- Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
  - Device mounted on FR-4 substrate PC board, 2oz copper, with 1-inch square copper plate.
  - $I_{AR}$  and  $E_{AR}$  rating are based on low frequency and duty cycles to keep  $T_J = +25^\circ\text{C}$ .

**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic                             | Symbol              | Min  | Typ   | Max   | Unit | Test Condition  |
|--|---------------------|------|-------|-------|------|---|
| <b>OFF CHARACTERISTICS</b> (Note 9)        |                     |      |       |       |      |   |
| Drain-Source Breakdown Voltage             | BV <sub>DSS</sub>   | -30  | —     | —     | V    | V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA   |
| Zero Gate Voltage Drain Current            | I <sub>DSS</sub>    | —    | —     | -1    | μA   | V <sub>DS</sub> = -30V, V <sub>GS</sub> = 0V  |
| Gate-Source Leakage                        | I <sub>GSS</sub>    | —    | —     | ±10   | μA   | V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V  |
| <b>ON CHARACTERISTICS</b> (Note 9)         |                     |      |       |       |      |   |
| Gate Threshold Voltage                     | V <sub>GS(th)</sub> | -1.7 | —     | -3.0  | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA                                     |
| Static Drain-Source On-Resistance          | R <sub>DS(on)</sub> | —    | 9     | 11    | mΩ   | V <sub>GS</sub> = -20V, I <sub>D</sub> = -12A   |
|  |                     | —    | 10    | 13    |      | V <sub>GS</sub> = -10V, I <sub>D</sub> = -9A  |
|  |                     | —    | 17    | 25    |      | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -5A   |
| Forward Transfer Admittance                | Y <sub>fs</sub>     | —    | 21    | —     | S    | V <sub>DS</sub> = -5V, I <sub>D</sub> = -10A  |
| <b>DYNAMIC CHARACTERISTICS</b> (Note 10)   |                     |      |       |       |      |   |
| Input Capacitance                          | C <sub>iSS</sub>    | —    | 2,246 | 2,987 | pF   | V <sub>DS</sub> = -15V, V <sub>GS</sub> = 0V,<br>f = 1.0MHz                                     |
| Output Capacitance                         | C <sub>oss</sub>    | —    | 352   | 468   | pF   |   |
| Reverse Transfer Capacitance               | C <sub>rSS</sub>    | —    | 294   | 391   | pF   |   |
| Gate resistance                            | R <sub>g</sub>      | —    | 5.1   | 10    | Ω    | V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1.0MHz  |
| Total Gate Charge (V <sub>GS</sub> = 4.5V) | Q <sub>g</sub>      | —    | 20.5  | 30    | nC   | V <sub>DS</sub> = -15V, I <sub>D</sub> = -12A   |
| Total Gate Charge (V <sub>GS</sub> = 10V)  | Q <sub>g</sub>      | —    | 41    | 58    | nC   |   |
| Gate-Source Charge                         | Q <sub>gs</sub>     | —    | 7.6   | —     | nC   |   |
| Gate-Drain Charge                          | Q <sub>gd</sub>     | —    | 8.0   | —     | nC   |   |
| Turn-On Delay Time                         | t <sub>D(on)</sub>  | —    | 11.3  | 23    | nS   | V <sub>DD</sub> = -15V, V <sub>GS</sub> = -10V,<br>R <sub>L</sub> = 1.25Ω, R <sub>G</sub> = 3Ω, |
| Turn-On Rise Time                          | t <sub>r</sub>      | —    | 15.4  | 31    | nS   |   |
| Turn-Off Delay Time                        | t <sub>D(off)</sub> | —    | 38.0  | 61    | nS   |   |
| Turn-Off Fall Time                         | t <sub>f</sub>      | —    | 22.0  | 38    | nS   |   |
| <b>BODY DIODE CHARACTERISTICS</b>          |                     |      |       |       |      |   |
| Diode Forward Voltage                      | V <sub>SD</sub>     | —    | -0.7  | -1.0  | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = -1A  |
| Reverse Recovery Time (Note 10)            | t <sub>rr</sub>     | —    | 20    | 31    | nS   | I <sub>S</sub> = -9.5A, di/dt = 100A/μs   |
| Reverse Recovery Charge (Note 10)          | Q <sub>rr</sub>     | —    | 9.5   | 18    | nC   |   |

Notes: 9. Short duration pulse test used to minimize self-heating effect.  
10. Guaranteed by design. Not subject to product testing.

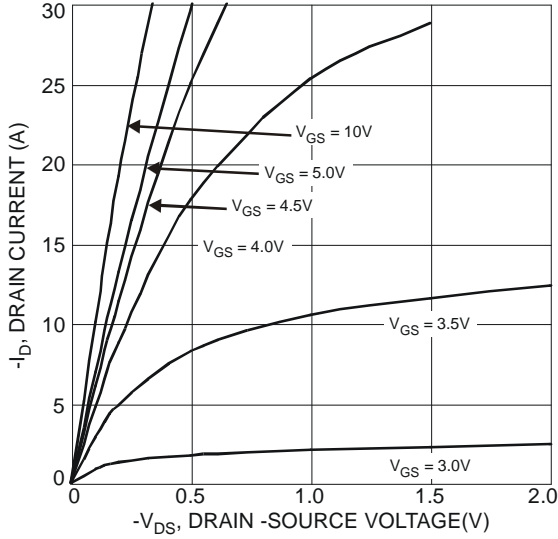


Fig. 1 Typical Output Characteristics

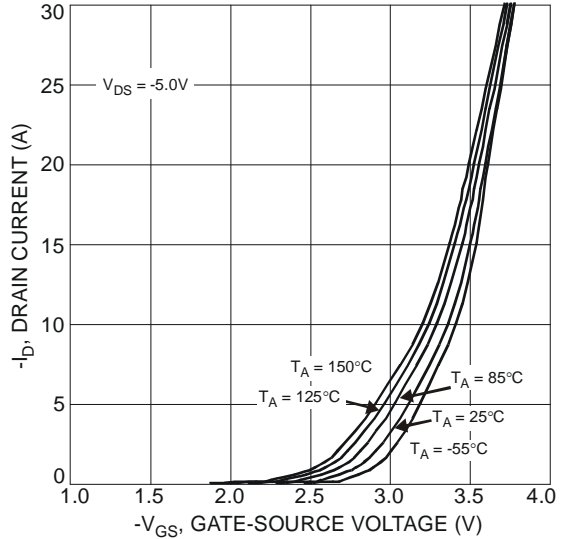


Fig. 2 Typical Transfer Characteristics

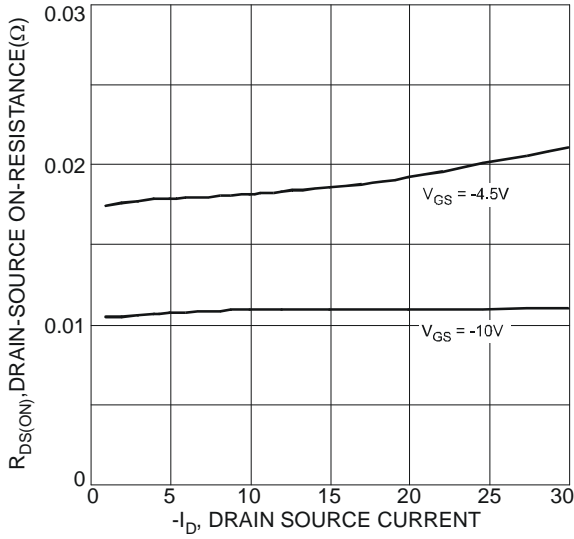


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

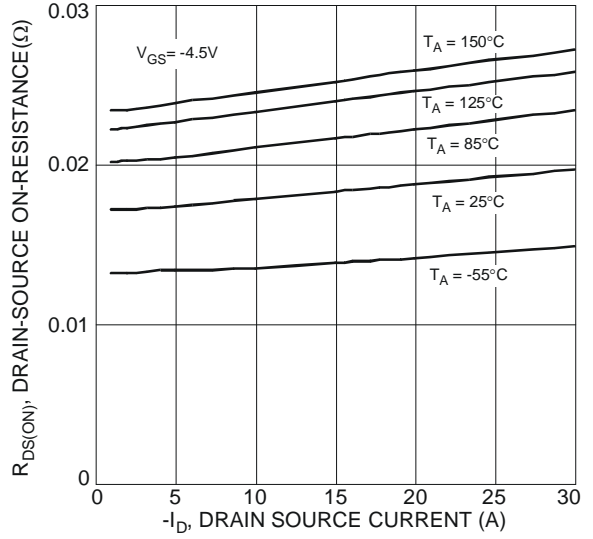


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

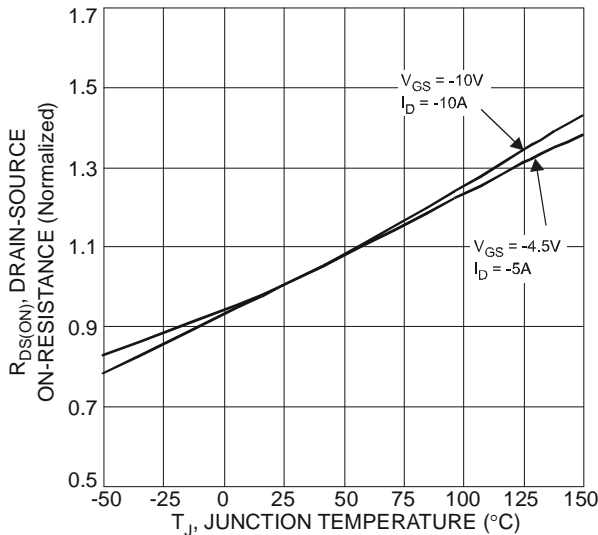


Fig. 5 On-Resistance Variation with Temperature

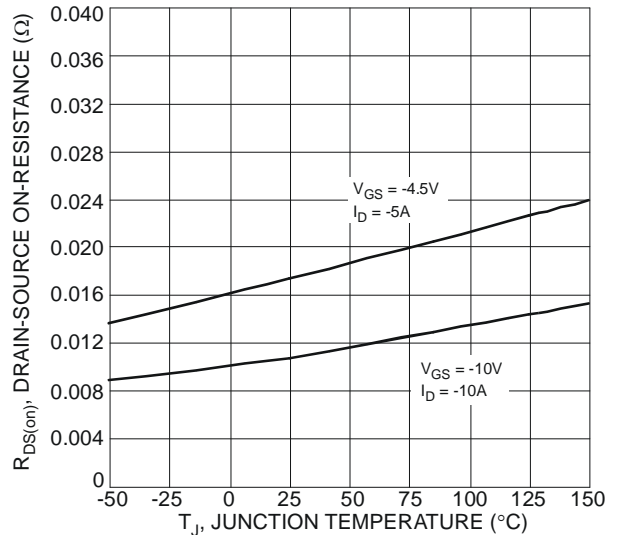


Fig. 6 On-Resistance Variation with Temperature

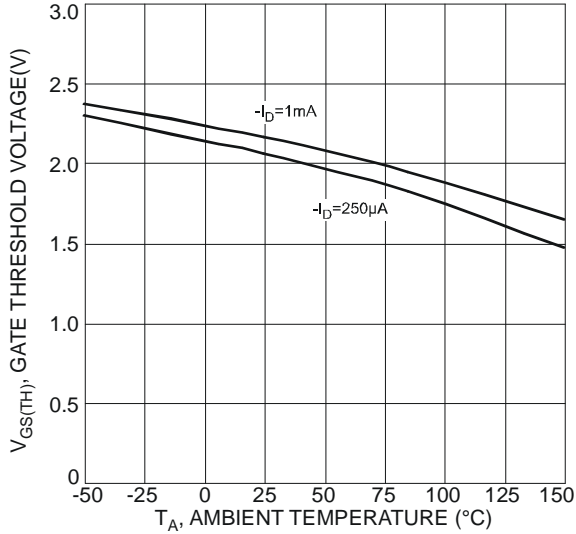


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

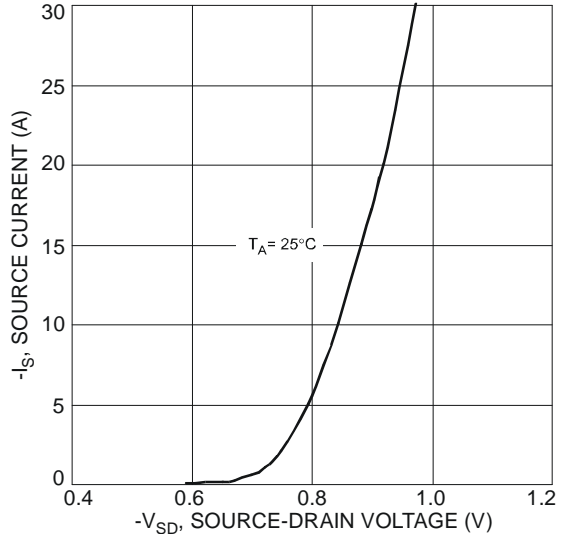


Fig. 8 Diode Forward Voltage vs. Current

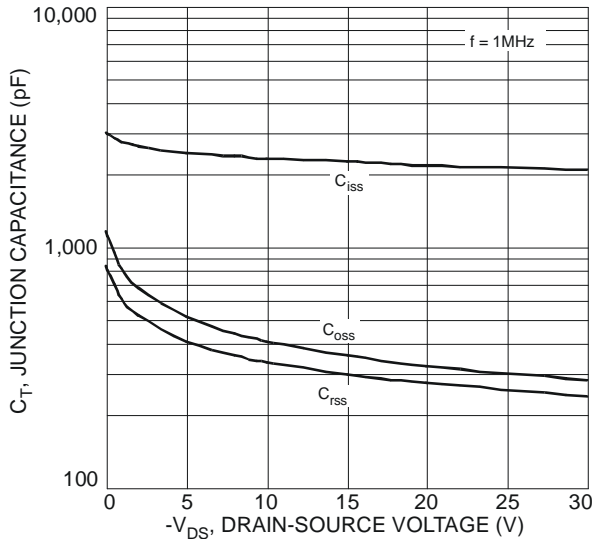


Fig. 9 Typical Junction Capacitance

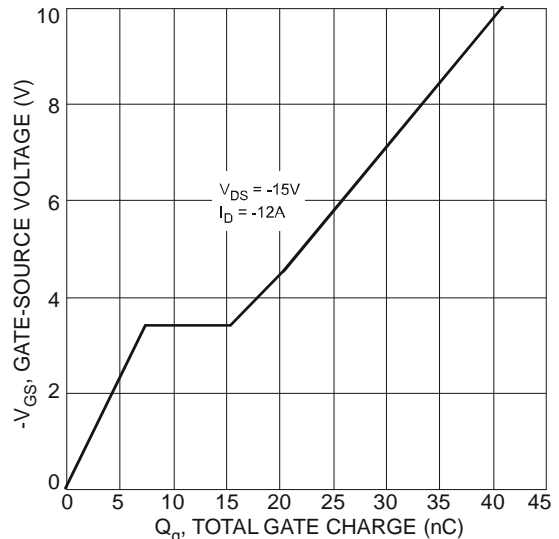


Fig. 10 Gate-Charge Characteristics

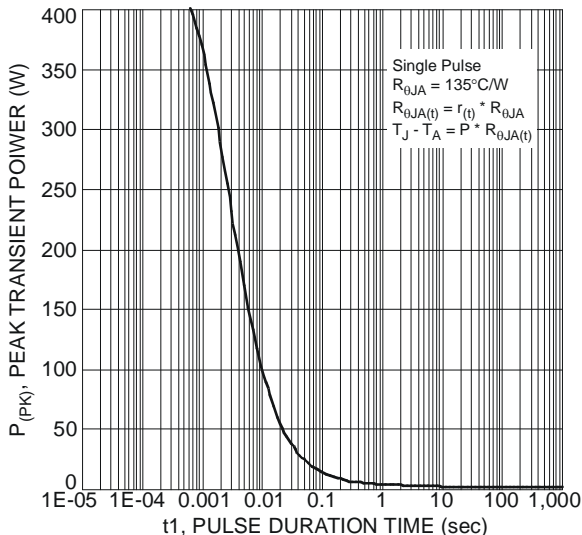


Fig. 11 Single Pulse Maximum Power Dissipation

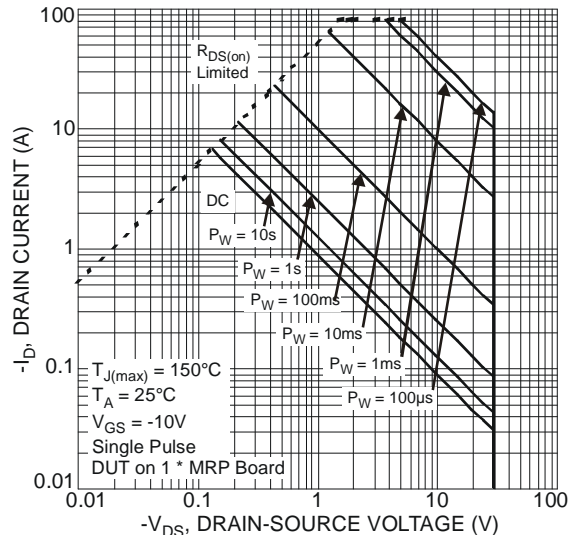
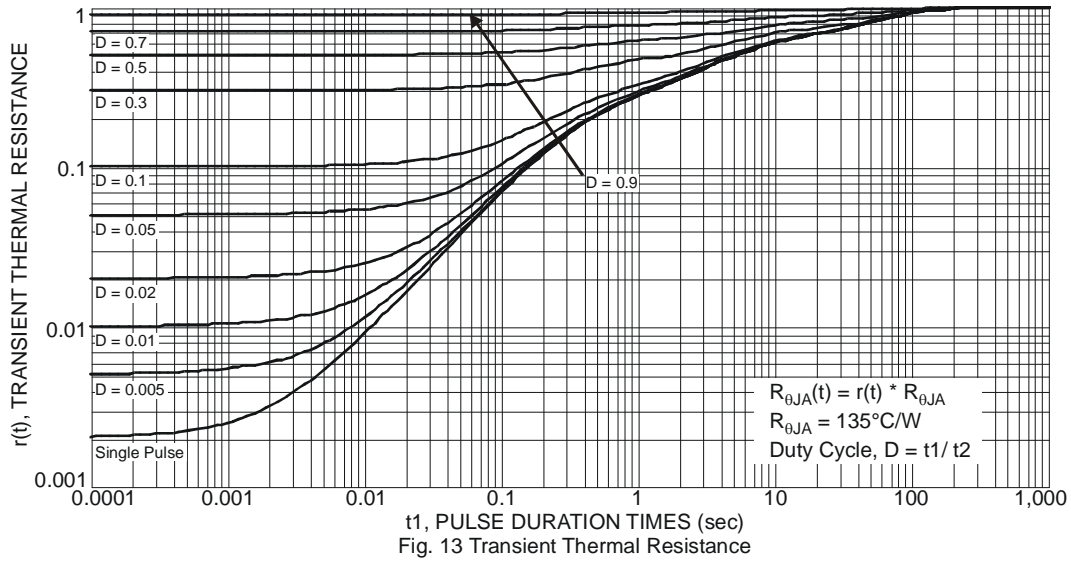


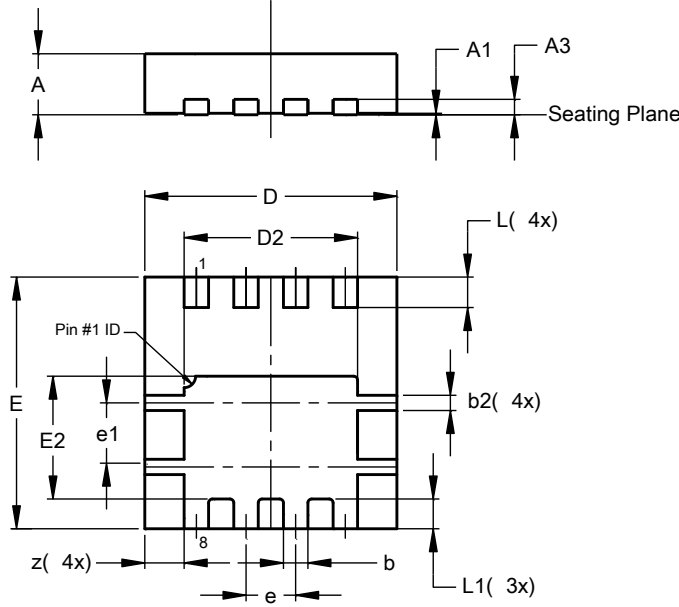
Fig. 12 SOA, Safe Operation Area



**Package Outline Dimensions**

Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.

**POWERDI3333-8**

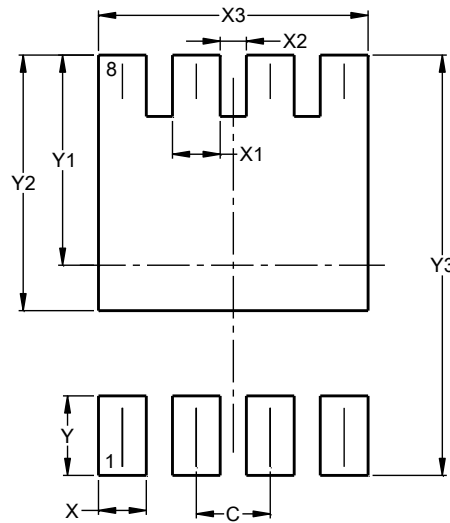


| POWERDI3333-8               |      |      |       |
|-----------------------------|------|------|-------|
| Dim                         | Min  | Max  | Typ   |
| A                           | 0.75 | 0.85 | 0.80  |
| A1                          | 0.00 | 0.05 | 0.02  |
| A3                          | -    | -    | 0.203 |
| b                           | 0.27 | 0.37 | 0.32  |
| b2                          | -    | -    | 0.20  |
| D                           | 3.25 | 3.35 | 3.30  |
| D2                          | 2.22 | 2.32 | 2.27  |
| E                           | 3.25 | 3.35 | 3.30  |
| E2                          | 1.56 | 1.66 | 1.61  |
| e                           | -    | -    | 0.65  |
| e1                          | 0.79 | 0.89 | 0.84  |
| L                           | 0.35 | 0.45 | 0.40  |
| L1                          | -    | -    | 0.39  |
| z                           | -    | -    | 0.515 |
| <b>All Dimensions in mm</b> |      |      |       |

**Suggested Pad Layout**

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.

**POWERDI3333-8**



| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 0.650         |
| X          | 0.420         |
| X1         | 0.420         |
| X2         | 0.230         |
| X3         | 2.370         |
| Y          | 0.700         |
| Y1         | 1.850         |
| Y2         | 2.250         |
| Y3         | 3.700         |

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