

## Product Summary

| BV <sub>DSS</sub> | R <sub>DS(ON)</sub> Max        | I <sub>D</sub> Max<br>T <sub>A</sub> = +25°C |
|-------------------|--------------------------------|----------------------------------------------|
| -30V              | 13mΩ @ V <sub>GS</sub> = -10V  | -9.8A                                        |
|                   | 25mΩ @ V <sub>GS</sub> = -4.5V | -7.0A                                        |

## Description

This MOSFET is designed to minimize the on-state resistance (R<sub>DS(ON)</sub>) and yet maintain superior switching performance, making it ideal for high-efficiency power management applications.

## Applications

- Backlighting
- Power Management Functions
- DC-DC Converters

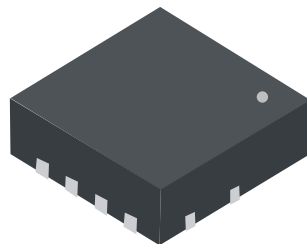
## Features and Benefits

- Low R<sub>DS(ON)</sub> – 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)**

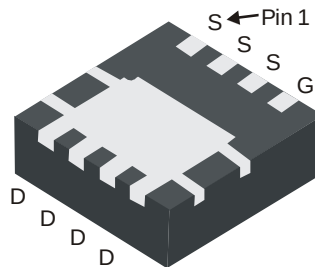
## Mechanical Data

- Case: PowerDI<sup>®</sup> 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 
- Weight: 0.0174 grams (Approximate)

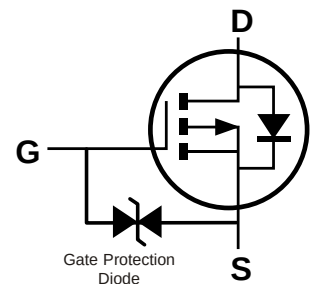
PowerDI3333-8



Top View



Bottom View



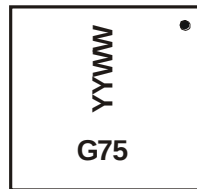
Equivalent Circuit

## 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) & 2015/863/EU (RoHS 3) compliant.
  2. See <https://www.diodes.com/quality/lead-free/> 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. Refer to <https://www.diodes.com/quality/>.
  5. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

## Marking Information



G75 = Product Marking Code  
 YYWW = Date Code Marking  
 YY = Last Two Digits of Year (ex: 18 for 2018)  
 WW = Week Code (01 to 53)

## Maximum Ratings (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic                                           |              |                                                  | Symbol           | Value          | Unit |
|----------------------------------------------------------|--------------|--------------------------------------------------|------------------|----------------|------|
| Drain-Source Voltage                                     |              |                                                  | V <sub>DSS</sub> | -30            | V    |
| Gate-Source Voltage                                      |              |                                                  | V <sub>GSS</sub> | ±25            | V    |
| Continuous Drain Current (Note 7) V <sub>GS</sub> = -10V | Steady State | T <sub>A</sub> = +25°C<br>T <sub>A</sub> = +70°C | I <sub>D</sub>   | -9.8<br>-7.7   | A    |
|                                                          | t < 10s      | T <sub>A</sub> = +25°C<br>T <sub>A</sub> = +70°C | I <sub>D</sub>   | -13.5<br>-10.8 | A    |
| Maximum Continuous Body Diode Forward Current (Note 6)   |              |                                                  | I <sub>S</sub>   | -3.0           | A    |
| Pulsed Drain Current (10μs Pulse, Duty Cycle = 1%)       |              |                                                  | I <sub>DM</sub>  | -80            | A    |
| Avalanche Current (Notes 8 & 9)                          |              |                                                  | I <sub>AR</sub>  | -14            | A    |
| Repetitive Avalanche Energy (Notes 8 & 9) L = 1mH        |              |                                                  | E <sub>AR</sub>  | 104            | mJ   |

## Thermal Characteristics

| Characteristic                                   |                        | Symbol                            | Value       | Unit |
|--------------------------------------------------|------------------------|-----------------------------------|-------------|------|
| Total Power Dissipation (Note 6)                 | T <sub>A</sub> = +25°C | P <sub>D</sub>                    | 0.94        | W    |
|                                                  | T <sub>A</sub> = +70°C |                                   | 0.6         |      |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady State           | R <sub>θJA</sub>                  | 137         | °C/W |
|                                                  | t < 10s                |                                   | 82          | °C/W |
| Total Power Dissipation (Note 7)                 | T <sub>A</sub> = +25°C | P <sub>D</sub>                    | 2.2         | W    |
|                                                  | T <sub>A</sub> = +70°C |                                   | 1.3         |      |
| Thermal Resistance, Junction to Ambient (Note 7) | Steady State           | R <sub>θJA</sub>                  | 60          | °C/W |
|                                                  | t < 10s                |                                   | 36          | °C/W |
| Thermal Resistance, Junction to Case (Note 7)    |                        | R <sub>θJC</sub>                  | 3.0         | °C/W |
| Operating and Storage Temperature Range          |                        | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C   |

- Notes:
6. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
  7. Device mounted on FR-4 substrate PC board, 2oz copper, with 1-inch square copper plate.
  8. I<sub>AR</sub> and E<sub>AR</sub> ratings are based on low frequency and duty cycles to keep T<sub>J</sub> = +25°C.

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

| Characteristic                              | Symbol              | Min  | Typ   | Max   | Unit | Test Condition                                                                                 |
|---------------------------------------------|---------------------|------|-------|-------|------|------------------------------------------------------------------------------------------------|
| OFF CHARACTERISTICS (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                                                   |
| ON CHARACTERISTICS (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                                                   |
| DYNAMIC CHARACTERISTICS (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   |                                                                                                |
| BODY DIODE CHARACTERISTICS                  |                     |      |       |       |      |                                                                                                |
| 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.

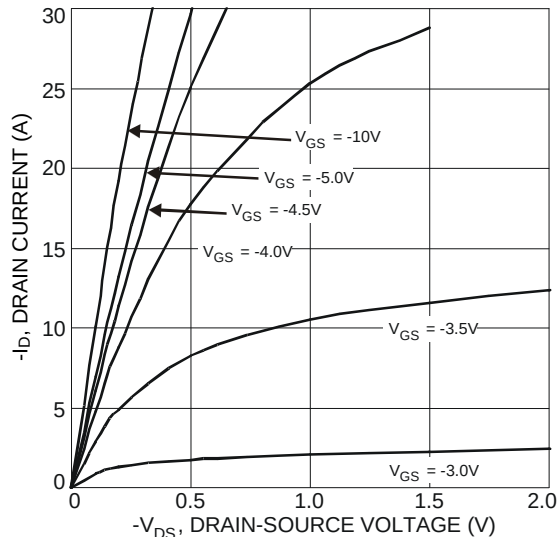


Fig. 1 Typical Output Characteristics

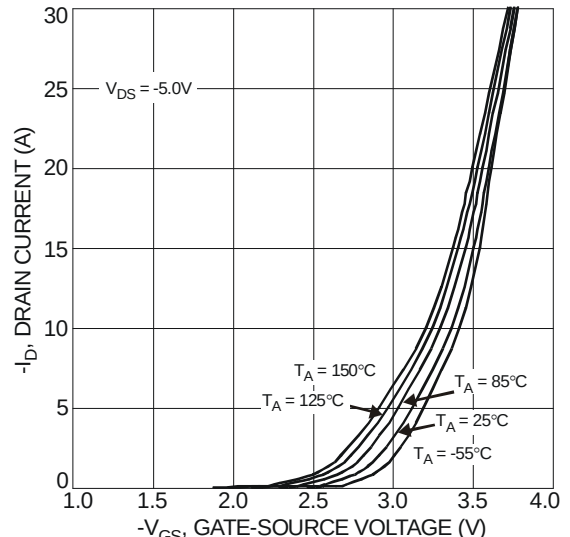


Fig. 2 Typical Transfer Characteristics

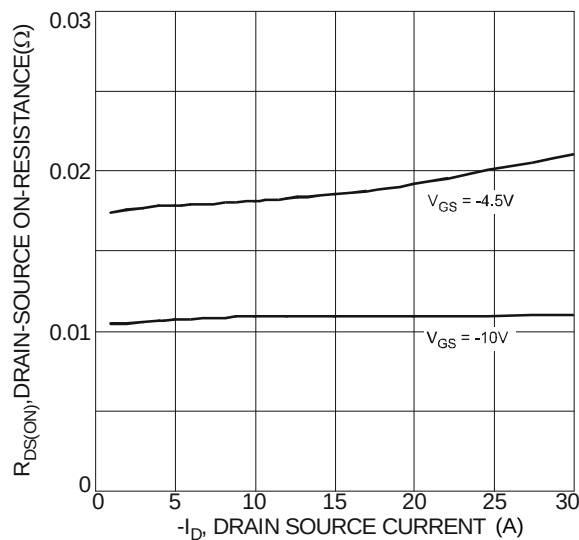


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

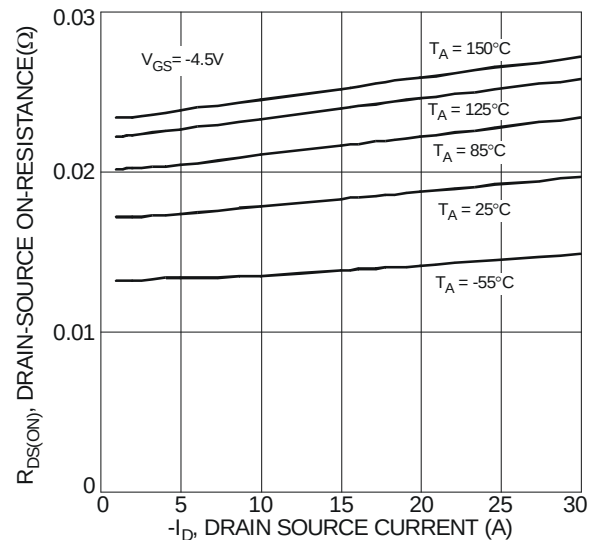


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

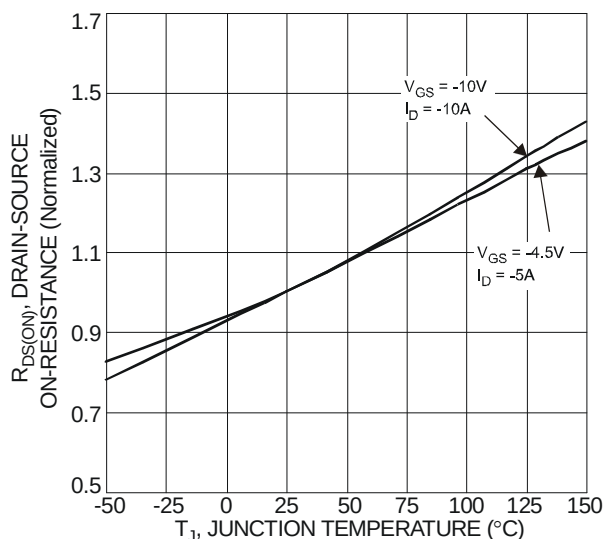


Fig. 5 On-Resistance Variation with Temperature

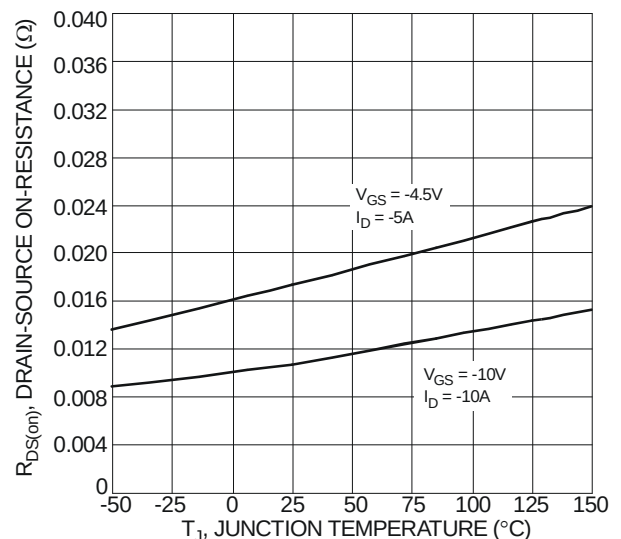


Fig. 6 On-Resistance Variation with Temperature

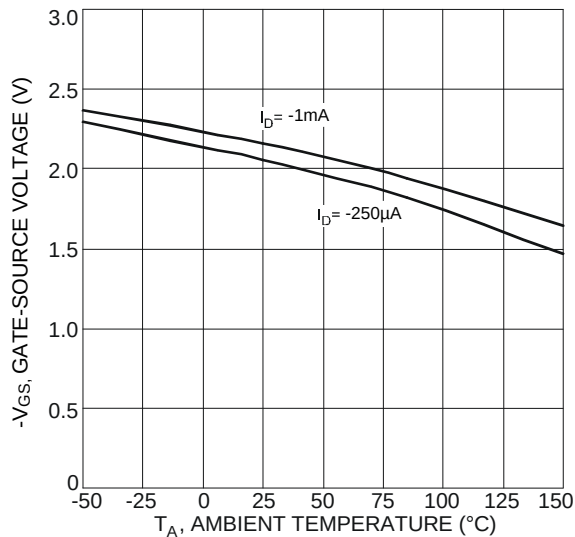


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

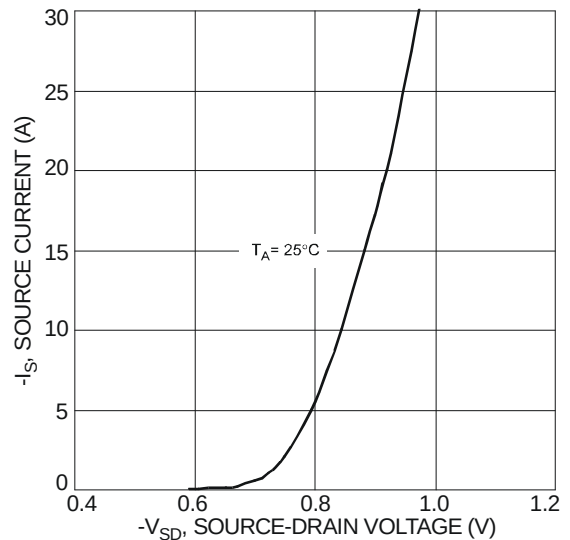


Fig. 8 Diode Forward Voltage vs. Current

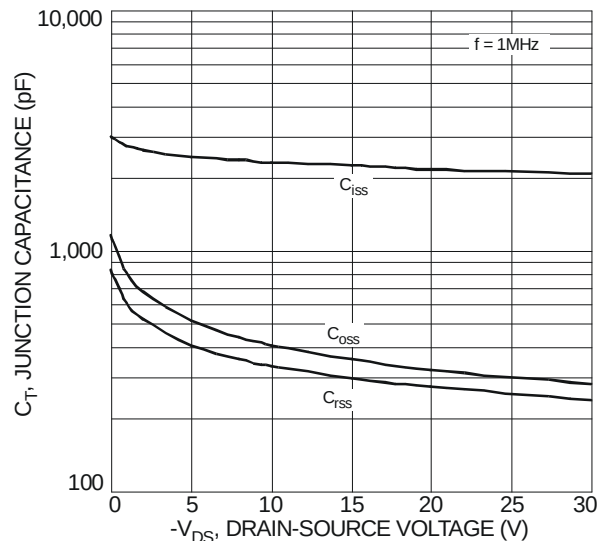


Fig. 9 Typical Junction Capacitance

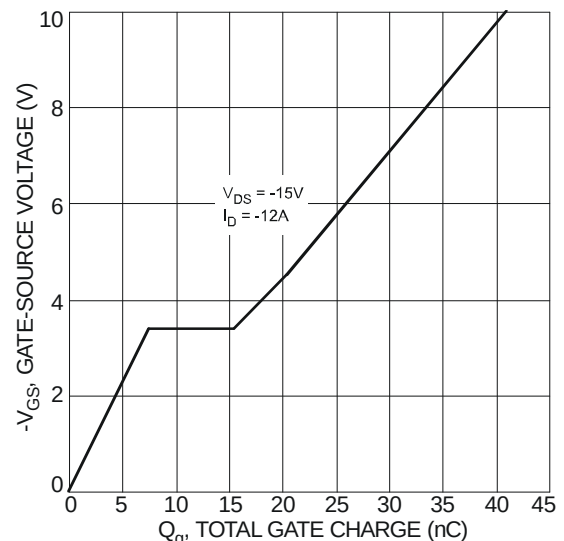


Fig. 10 Gate-Charge Characteristics

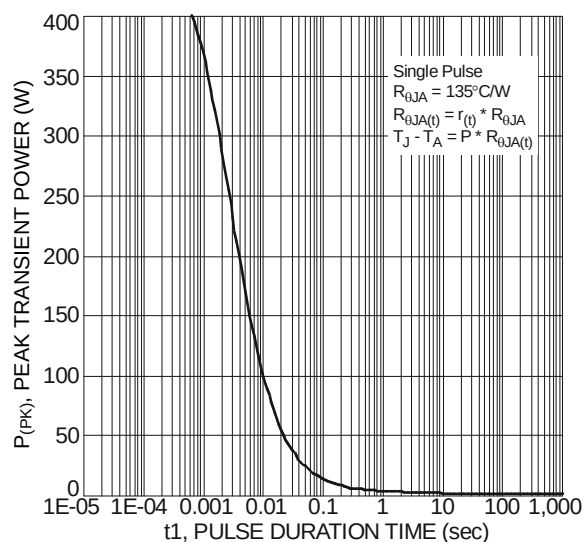


Fig. 11 Single Pulse Maximum Power Dissipation

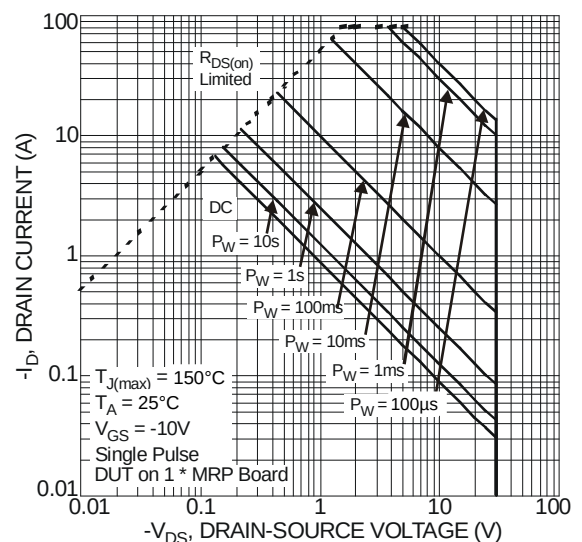
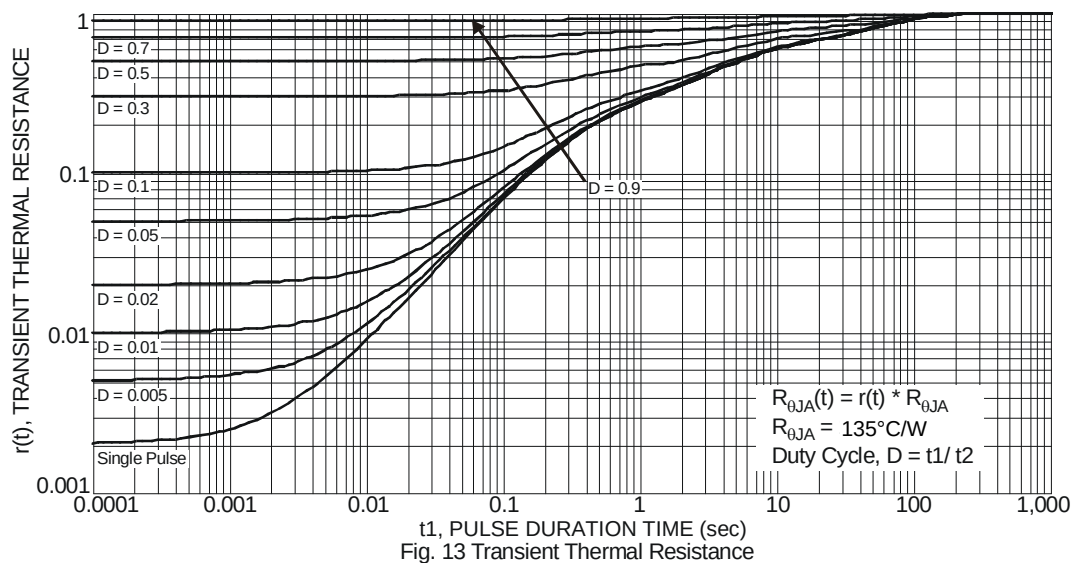


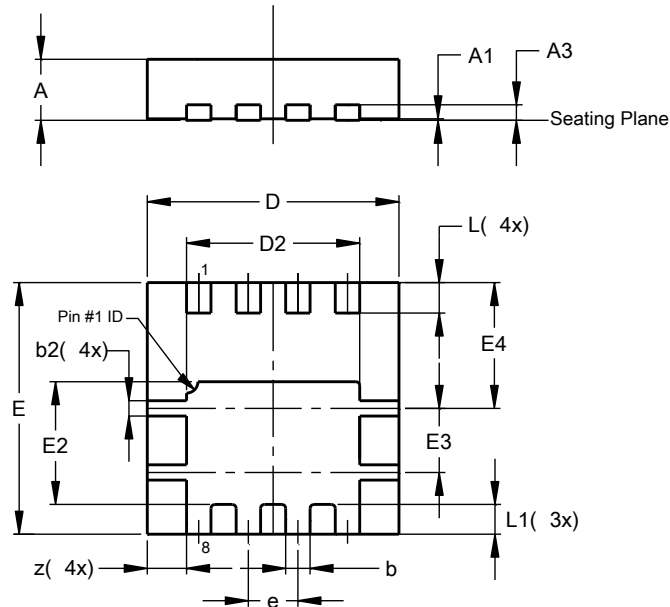
Fig. 12 SOA, Safe Operation Area



## Package Outline Dimensions

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

### PowerDI3333-8

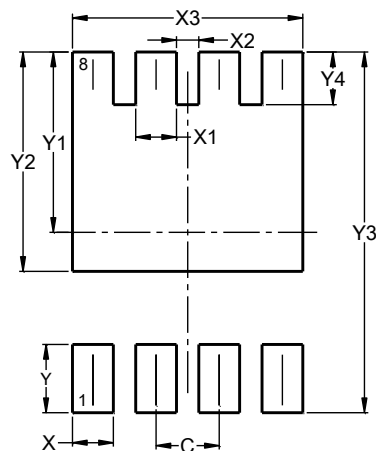


| PowerDI3333-8        |      |      |       |
|----------------------|------|------|-------|
| Dim                  | Min  | Max  | Typ   |
| A                    | 0.75 | 0.85 | 0.80  |
| A1                   | 0.00 | 0.05 | 0.02  |
| A3                   | —    | —    | 0.203 |
| b                    | 0.27 | 0.37 | 0.32  |
| b2                   | 0.15 | 0.25 | 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  |
| E3                   | 0.79 | 0.89 | 0.84  |
| E4                   | 1.60 | 1.70 | 1.65  |
| e                    | —    | —    | 0.65  |
| L                    | 0.35 | 0.45 | 0.40  |
| L1                   | —    | —    | 0.39  |
| z                    | —    | —    | 0.515 |
| All Dimensions in mm |      |      |       |

## Suggested Pad Layout

Please see <http://www.diodes.com/package-outlines.html> 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         |
| Y4         | 0.540         |

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