

## Product Summary

| BV <sub>DSS</sub> | R <sub>DS(ON)</sub> Max        | I <sub>D</sub> Max<br>T <sub>A</sub> = +25°C<br>(Note 6) |
|-------------------|--------------------------------|--|
| -40V              | 25mΩ @ V <sub>GS</sub> = -10V  | -7.2A  |
|                   | 45mΩ @ V <sub>GS</sub> = -4.5V | -5.4A  |

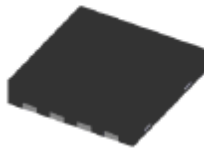
## Description

This MOSFET has been designed to minimize the on-state resistance and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

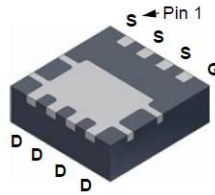
## Applications

- Motor Control
- Backlighting
- DC-DC Converters
- Printer Equipment

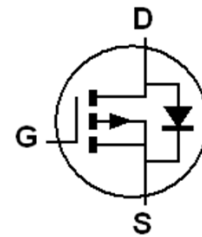
PowerDI3333-8



Top View



Bottom View



Device Symbol

## Features

- Low R<sub>DS(ON)</sub> – Minimizes Conduction Losses
- Fast Switching Speed – Minimizes Switching Losses
- **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**
- **An Automotive-Compliant Part is Available Under Separate Datasheet ([DMP4025SFGQ](#))**

## Mechanical Data

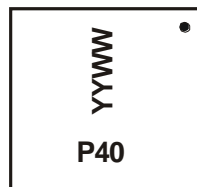
- Case: PowerDI<sup>®</sup> 3333-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals Connections: See Diagram Below
- Terminals: Finish - Matte Tin Annealed over Copper Lead Frame. Solderable per MIL-STD-202, Method 208
- Weight: 0.0172 grams (Approximate)

## Ordering Information (Note 4)

| Part Number   | Marking | Reel Size (inches) | Tape Width (mm) | Quantity per Reel |
|---------------|---------|--------------------|-----------------|-------------------|
| DMP4025SFG-7  | P40     | 7                  | 8               | 2,000             |
| DMP4025SFG-13 | P40     | 13                 | 8               | 3,000             |

- 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. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

## Marking Information



P40 = Product Marking Code  
 YYWW = Date Code Marking  
 YY = Year (ex: 18 = 2018)  
 WW = Week (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>                | -40   | V    |
| Gate-Source Voltage                              | V <sub>GSS</sub>                | ±20   |      |
| Continuous Drain Current, V <sub>GS</sub> = -10V | (Note 6)                        | -7.2  | A    |
|  | T <sub>A</sub> = +70°C (Note 6) | -5.77 |      |
|  | (Note 5)                        | -4.65 |      |
| Maximum Body Diode Forward Current               | I <sub>S</sub>                  | -7.2  |      |
| Pulsed Drain Current                             | I <sub>DM</sub>                 | -80   |      |
| Pulsed Source Current                            | I <sub>SM</sub>                 | -80   |      |

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

| Characteristic                          | Symbol                            | Value       | Unit |
|---|-----------------------------------|-------------|------|
| Power Dissipation                       | P <sub>D</sub>                    | 0.81        | W    |
| Linear Derating Factor                  |                                   | 1.95        |      |
| Thermal Resistance, Junction to Ambient | R <sub>θJA</sub>                  | 155         | °C/W |
|   |                                   | 64          |      |
| Operating and Storage Temperature Range | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C   |

- Notes:
5. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
  6. For a device surface mounted on 25mm x 25mm FR-4 PCB with 2oz copper, in still air conditions.
  7. Same as note (6), except the device is pulsed with D= 0.02 and pulse width 300µs.

**Thermal Characteristics**

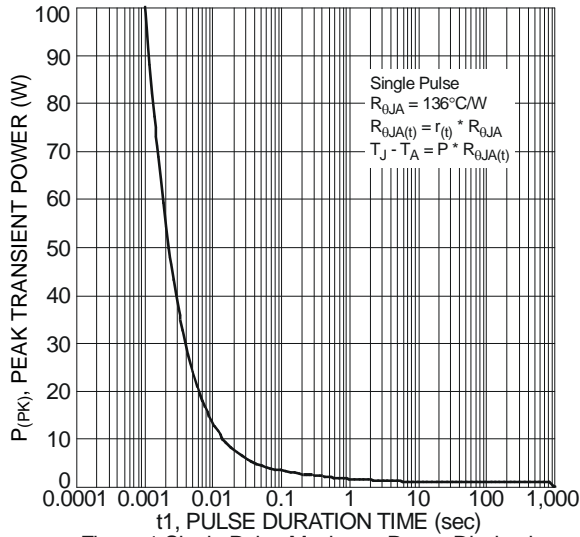


Figure 1 Single Pulse Maximum Power Dissipation

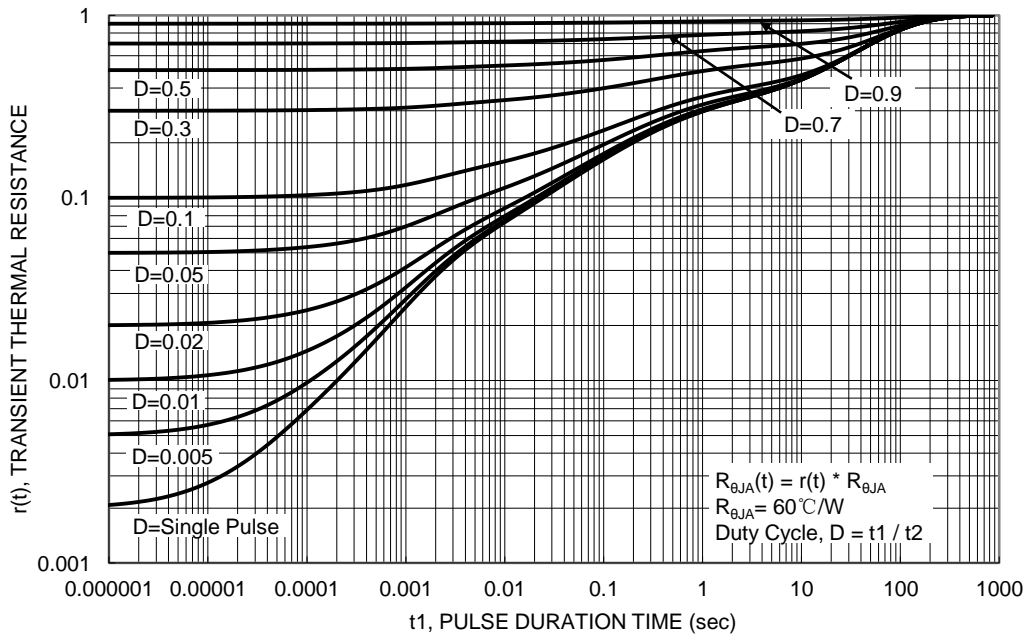


Figure 2. Transient Thermal Resistance

**Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

| Characteristic                             | Symbol       | Min  | Typ  | Max       | Unit          | Test Condition  |
|--|--------------|------|------|-----------|---------------|---|
| <b>OFF CHARACTERISTICS</b>                 |              |      |      |           |               |   |
| Drain-Source Breakdown Voltage             | $BV_{DSS}$   | -40  | —    | —         | V             | $I_D = -250\mu\text{A}$ , $V_{GS} = 0\text{V}$                        |
| Zero Gate Voltage Drain Current            | $I_{DSS}$    | —    | —    | -1.0      | $\mu\text{A}$ | $V_{DS} = -40\text{V}$ , $V_{GS} = 0\text{V}$                         |
| Gate-Source Leakage                        | $I_{GSS}$    | —    | —    | $\pm 100$ | nA            | $V_{GS} = \pm 20\text{V}$ , $V_{DS} = 0\text{V}$                      |
| <b>ON CHARACTERISTICS</b>                  |              |      |      |           |               |   |
| Gate Threshold Voltage                     | $V_{GS(TH)}$ | -0.8 | -1.3 | -1.8      | V             | $I_D = -250\mu\text{A}$ , $V_{DS} = V_{GS}$                           |
| Static Drain-Source On-Resistance (Note 8) | $R_{DS(ON)}$ | —    | 18   | 25        | m $\Omega$    | $V_{GS} = -10\text{V}$ , $I_D = -3\text{A}$                           |
|  |              |      | 30   | 45        |               | $V_{GS} = -4.5\text{V}$ , $I_D = -3\text{A}$                          |
| Forward Transconductance (Notes 8 & 9)     | $g_{fs}$     | —    | 16.6 | —         | S             | $V_{DS} = -5\text{V}$ , $I_D = -3\text{A}$                            |
| Diode Forward Voltage (Note 8)             | $V_{SD}$     | —    | -0.7 | -1.0      | V             | $I_S = -1\text{A}$ , $V_{GS} = 0\text{V}$                             |
| <b>DYNAMIC CHARACTERISTICS (Note 9)</b>    |              |      |      |           |               |   |
| Input Capacitance                          | $C_{iss}$    | —    | 1643 | —         | pF            | $V_{DS} = -20\text{V}$ , $V_{GS} = 0\text{V}$<br>$f = 1\text{MHz}$    |
| Output Capacitance                         | $C_{oss}$    | —    | 179  | —         |               |   |
| Reverse Transfer Capacitance               | $C_{rss}$    | —    | 128  | —         |               |   |
| Gate Resistance                            | $R_g$        | —    | 6.43 | —         | $\Omega$      | $V_{DS} = 0\text{V}$ , $V_{GS} = 0\text{V}$ , $f = 1\text{MHz}$       |
| Total Gate Charge (Note 10)                | $Q_g$        | —    | 14.0 | —         | nC            | $V_{DS} = -20\text{V}$<br>$I_D = -3\text{A}$                          |
| Total Gate Charge (Note 10)                | $Q_g$        | —    | 33.7 | —         |               |   |
| Gate-Source Charge (Note 10)               | $Q_{gs}$     | —    | 5.5  | —         |               |   |
| Gate-Drain Charge (Note 10)                | $Q_{gd}$     | —    | 7.3  | —         |               |   |
| Turn-On Delay Time (Note 10)               | $t_{D(ON)}$  | —    | 6.9  | —         | ns            | $V_{DD} = -20\text{V}$ , $V_{GS} = -10\text{V}$<br>$I_D = -3\text{A}$ |
| Turn-On Rise Time (Note 10)                | $t_R$        | —    | 14.7 | —         |               |   |
| Turn-Off Delay Time (Note 10)              | $t_{D(OFF)}$ | —    | 53.7 | —         |               |   |
| Turn-Off Fall Time (Note 10)               | $t_F$        | —    | 30.9 | —         |               |   |

- Notes:
8. Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ ; duty cycle  $\leq 2\%$ .
  9. For design aid only, not subject to production testing.
  10. Switching characteristics are independent of operating junction temperatures.

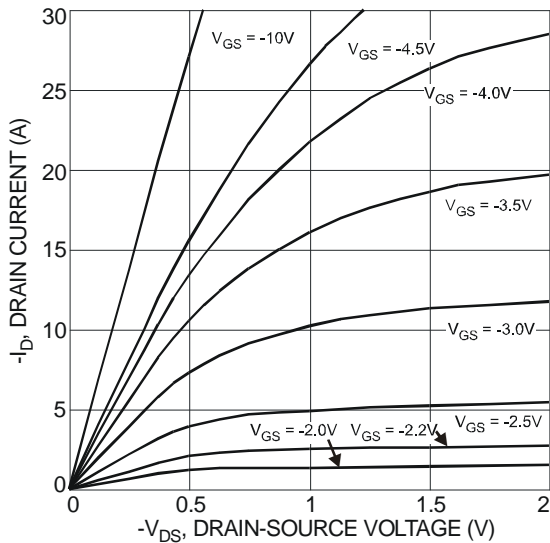
**Typical Characteristics**


Figure 3 Typical Output Characteristic

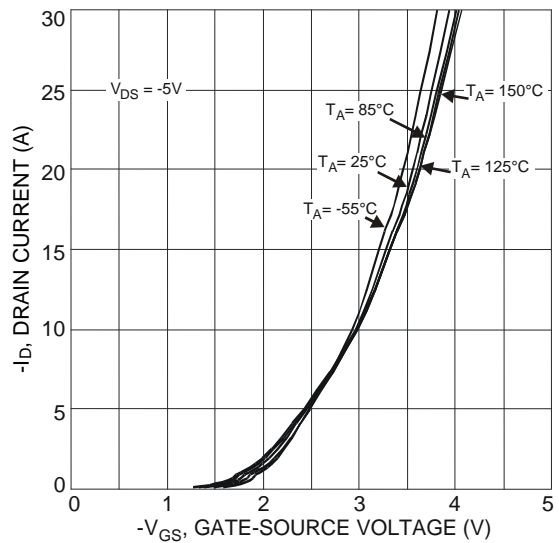


Figure 4 Typical Transfer Characteristic

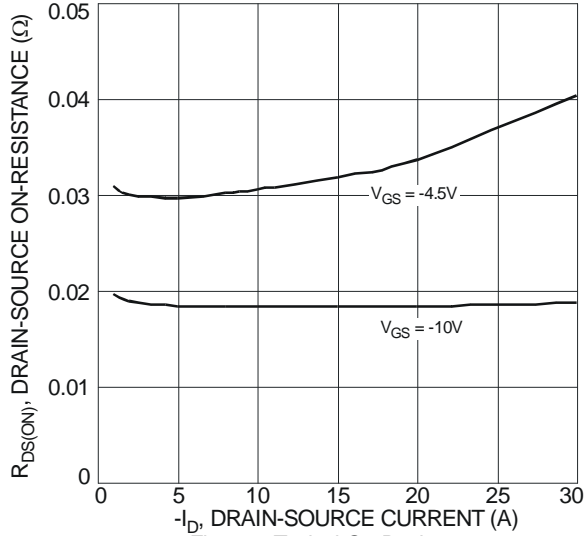


Figure 5 Typical On-Resistance vs. Drain Current and Gate Voltage

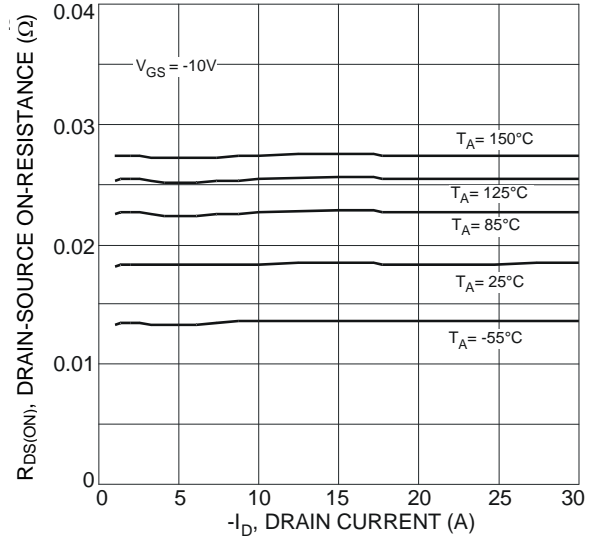


Figure 6 Typical On-Resistance vs. Drain Current and Temperature

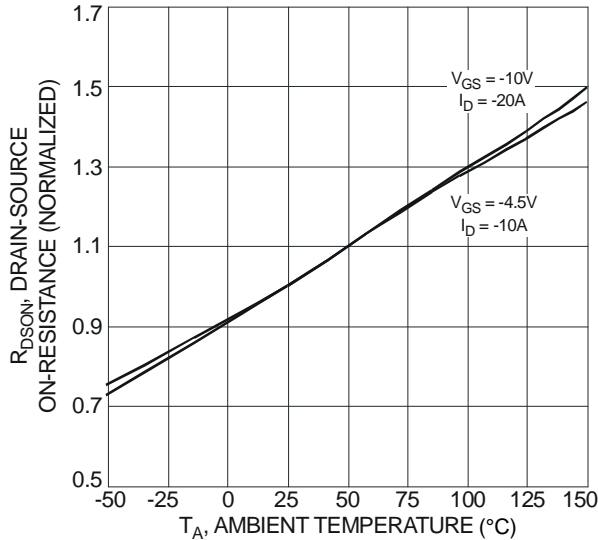


Figure 7 On-Resistance Variation with Temperature

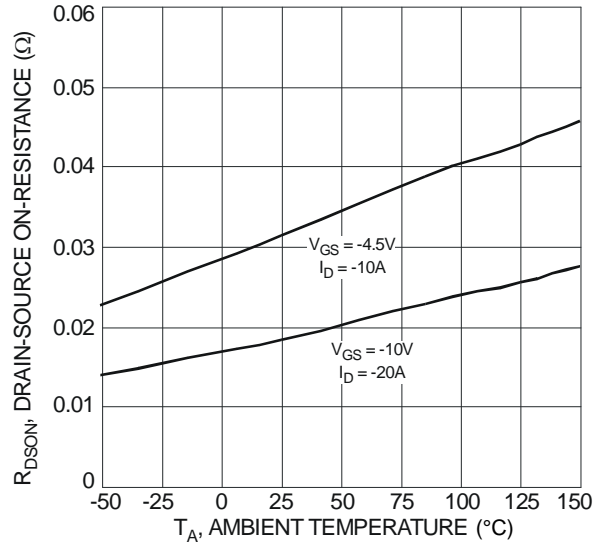


Figure 8 On-Resistance Variation with Temperature

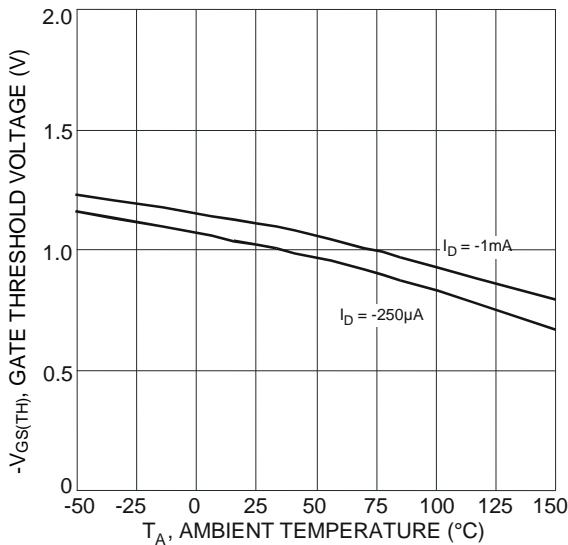


Figure 9 Gate Threshold Variation vs. Ambient Temperature

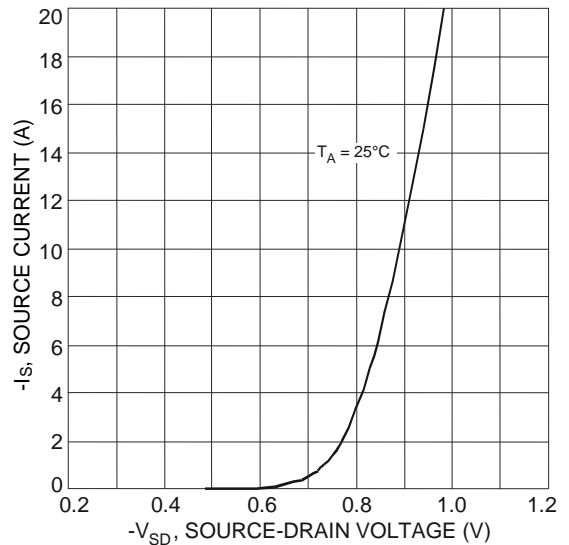


Figure 10 Diode Forward Voltage vs. Current

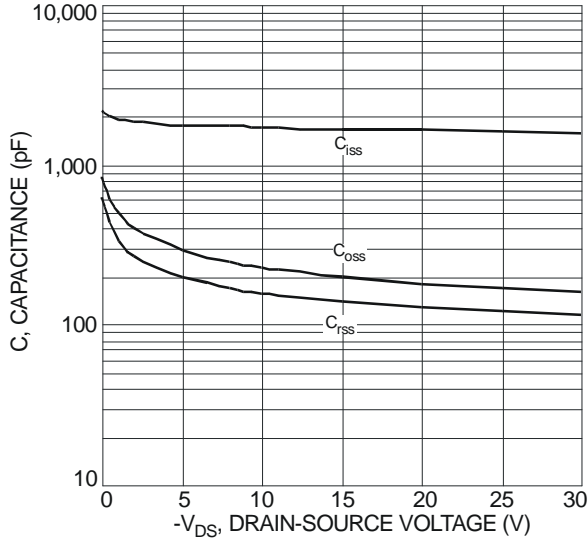


Figure 11 Typical Total Capacitance

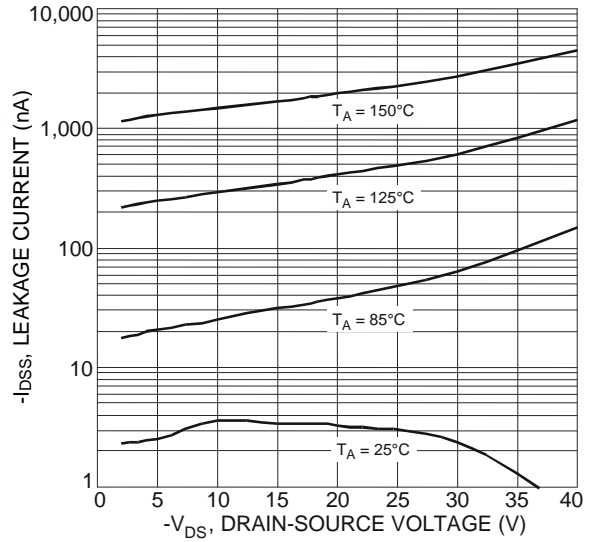


Figure 12 Typical Leakage Current vs. Drain-Source Voltage

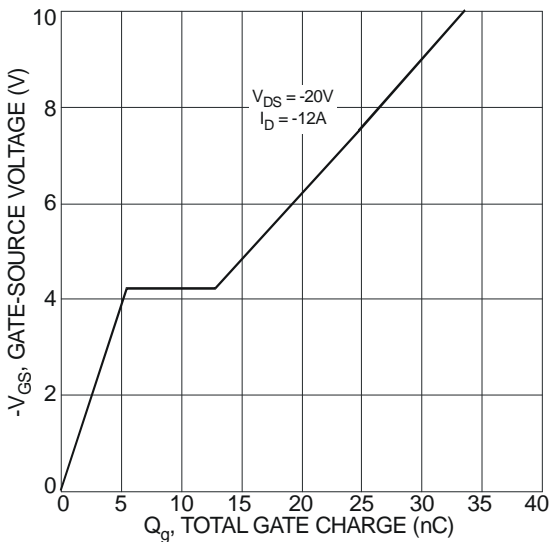


Figure 13 Gate-Charge Characteristics

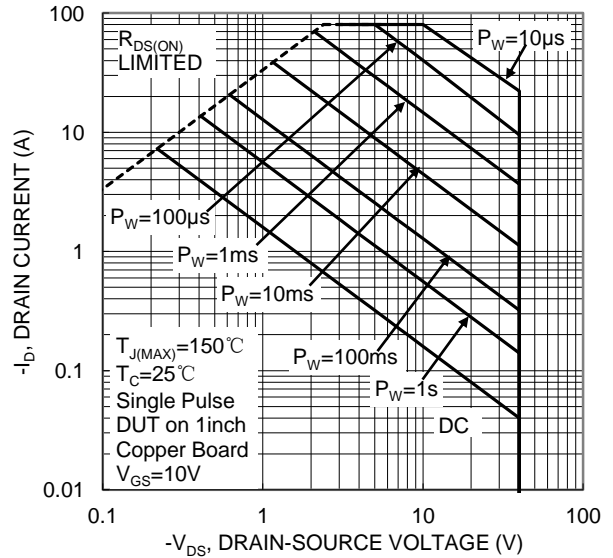
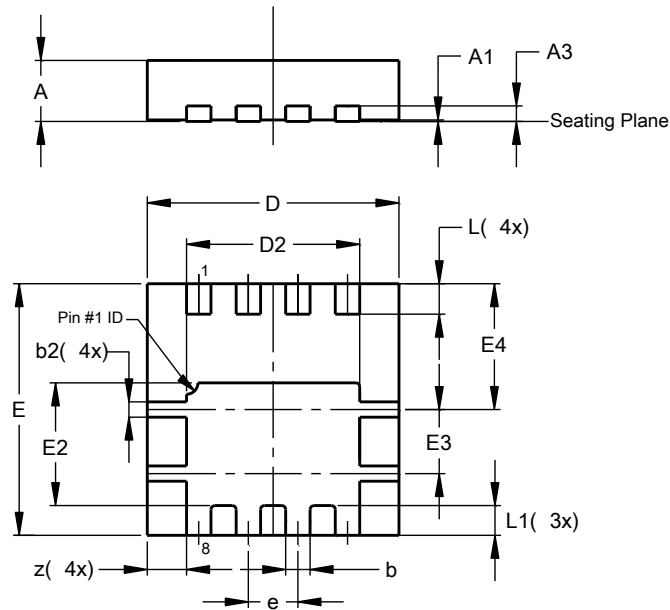


Figure 14. SOA, Safe Operation Area

**Package Outline Dimensions**

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

**PowerDI3333-8**

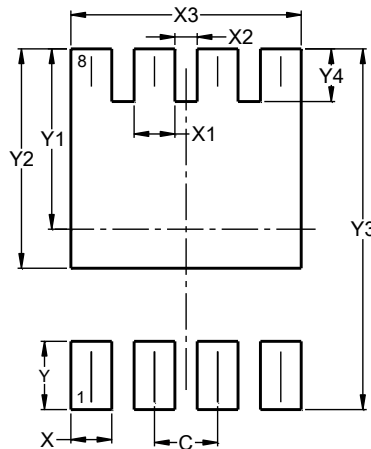


| PowerDI3333-8        |      |      |       |
|----------------------|------|------|-------|
| Dim                  | Min  | Max  | Typ   |
| A                    | 0.75 | 0.85 | 0.80  |
| A1                   | 0.00 | 0.05 | 0.02  |
| A3                   | -    | -    | 0.203 |
| b                    | 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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