

**20V P-CHANNEL ENHANCEMENT MODE MOSFET  
 POWERDI®**
**Product Summary**

| $V_{(BR)DSS}$ | $R_{DS(ON)}$ max                | $I_D$ max<br>$T_A = +25^\circ\text{C}$ |
|---------------|---------------------------------|----------------------------------------|
| -20V          | 8mΩ @ $V_{GS} = -4.5\text{V}$   | -14A                                   |
|               | 9.8mΩ @ $V_{GS} = -2.5\text{V}$ | -10A                                   |
|               | 13mΩ @ $V_{GS} = -1.8\text{V}$  | -9.3A                                  |
|               | 17mΩ @ $V_{GS} = -1.5\text{V}$  | -8.3A                                  |

**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**

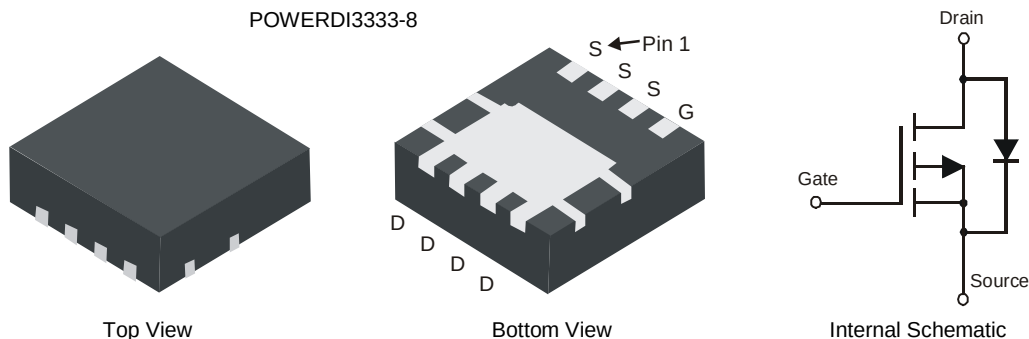
- Load Switch
- Power Management Functions

**Features**

- 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**

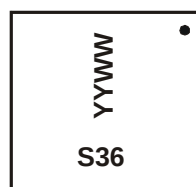
**Mechanical Data**

- Case: POWERDI3333-8
- 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: 0.008 grams (approximate)


**Ordering Information (Note 4)**

| Part Number   | Case          | Packaging        |
|---------------|---------------|------------------|
| DMP2008UFG-7  | POWERDI3333-8 | 2000/Tape & Reel |
| DMP2008UFG-13 | POWERDI3333-8 | 3000/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. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

**Marking Information**


S36 = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Last digit of year (ex: 11 = 2011)  
 WW = Week code (01 ~ 53)

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

| Characteristic                                            |              |                        | Symbol           | Value | Units |
|-----------------------------------------------------------|--------------|------------------------|------------------|-------|-------|
| Drain-Source Voltage                                      |              |                        | V <sub>DSS</sub> | -20   | V     |
| Gate-Source Voltage (Note 5)                              |              |                        | V <sub>GSS</sub> | ±8    | V     |
| Continuous Drain Current (Note 6) V <sub>GS</sub> = -4.5V | Steady State | T <sub>A</sub> = +25°C | I <sub>D</sub>   | -14   | A     |
|                                                           |              | T <sub>A</sub> = +70°C |                  | -11   |       |
|                                                           |              | T <sub>C</sub> = +25°C |                  | -54   |       |
| Pulsed Drain Current (10μs pulse, duty cycle = 1%)        |              |                        | I <sub>DM</sub>  | -80   | A     |
| Maximum Continuous Body Diode Forward Current (Note 6)    |              |                        | I <sub>S</sub>   | -2.2  | A     |
| Avalanche Current (Note 8)                                |              |                        | I <sub>AS</sub>  | -15   | A     |
| Avalanche Energy (Note 8)                                 |              |                        | E <sub>AS</sub>  | -113  | mJ    |

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

| Characteristic                                |                        | Symbol                            | Value       | Units |
|-----------------------------------------------|------------------------|-----------------------------------|-------------|-------|
| Total Power Dissipation (Note 6)              | T <sub>A</sub> = +25°C | P <sub>D</sub>                    | 2.4         | W     |
|                                               | T <sub>C</sub> = +25°C |                                   | 41          |       |
| Thermal Resistance, Junction to Ambient       | (Note 5)               | R <sub>θJA</sub>                  | 52          | °C/W  |
|                                               | (Note 6)               |                                   | 137         |       |
| Thermal Resistance, Junction to Case (Note 6) |                        | R <sub>θJC</sub>                  | 3.0         |       |
| Operating and Storage Temperature Range       |                        | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C    |

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

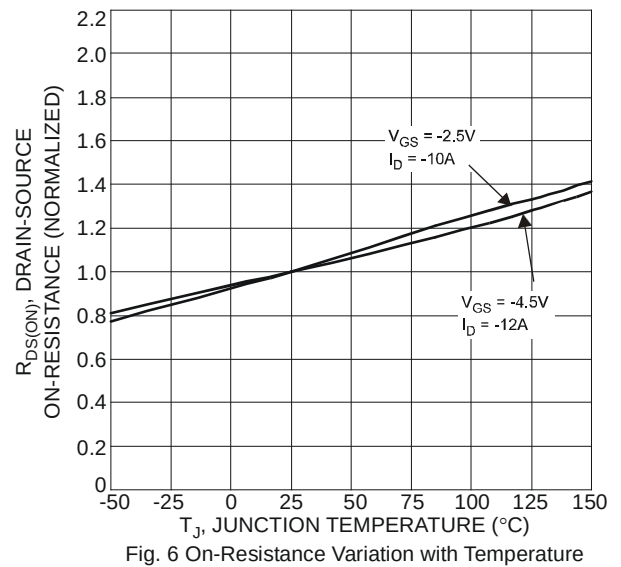
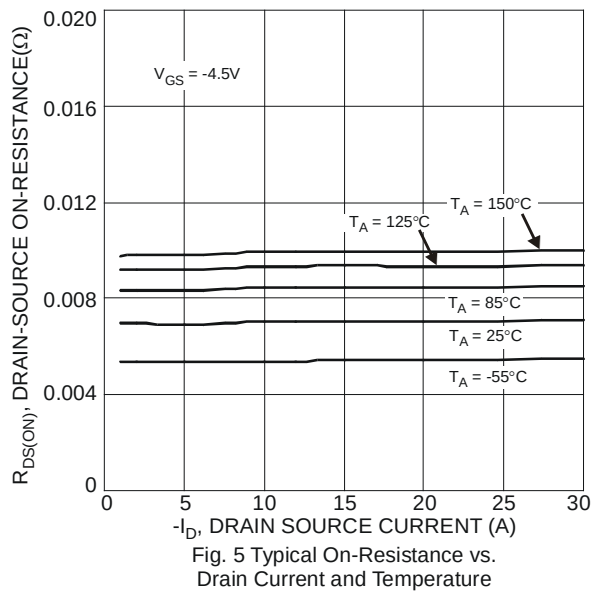
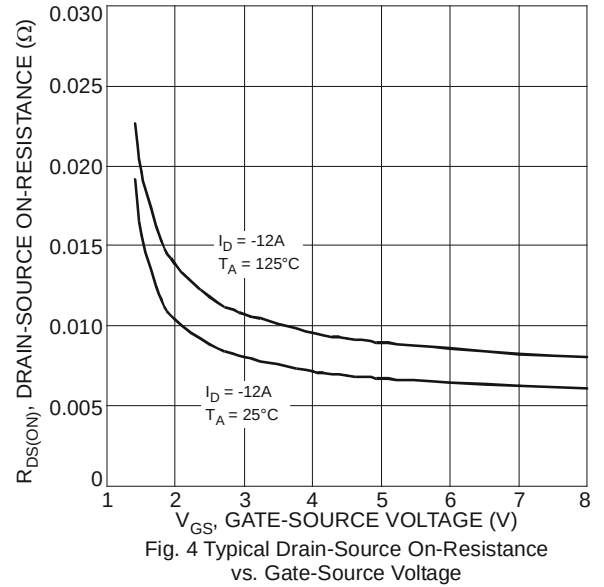
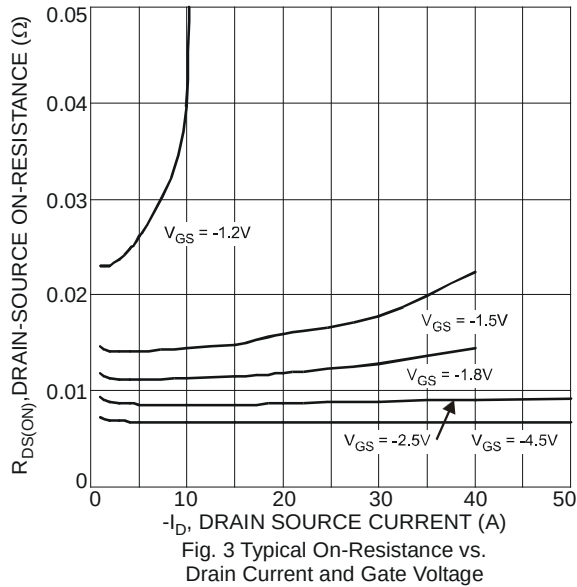
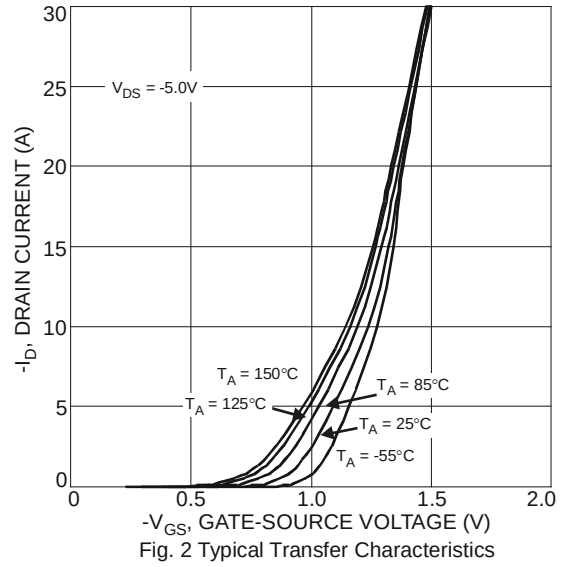
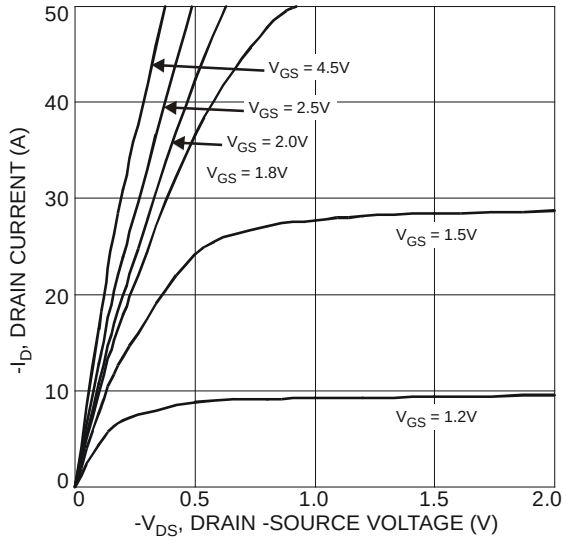
| Characteristic                              | Symbol              | Min  | Typ  | Max  | Unit | Test Condition                                                                                 |
|---------------------------------------------|---------------------|------|------|------|------|------------------------------------------------------------------------------------------------|
| OFF CHARACTERISTICS (Note 9)                |                     |      |      |      |      |                                                                                                |
| Drain-Source Breakdown Voltage              | BV <sub>DSS</sub>   | -20  | —    | —    | 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> = -16V, V <sub>GS</sub> = 0V                                                   |
| Gate-Source Leakage                         | I <sub>GSS</sub>    | —    | —    | ±100 | nA   | V <sub>GS</sub> = ±8V, V <sub>DS</sub> = 0V                                                    |
| ON CHARACTERISTICS (Note 9)                 |                     |      |      |      |      |                                                                                                |
| Gate Threshold Voltage                      | V <sub>GS(th)</sub> | -0.4 | —    | -1.0 | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA                                    |
| Static Drain-Source On-Resistance           | R <sub>DS(ON)</sub> | —    | —    | 8    | mΩ   | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -12A                                                 |
|                                             |                     | —    | —    | 9.8  |      | V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -10A                                                 |
|                                             |                     | —    | —    | 13   |      | V <sub>GS</sub> = -1.8V, I <sub>D</sub> = -9.3A                                                |
|                                             |                     | —    | —    | 17   |      | V <sub>GS</sub> = -1.5V, I <sub>D</sub> = -8.3A                                                |
|                                             |                     | —    | —    | —    |      | V <sub>GS</sub> = -1.5V, I <sub>D</sub> = -8.3A                                                |
| Forward Transfer Admittance                 | Y <sub>fs</sub>     | —    | 42   | —    | S    | V <sub>DS</sub> = -5V, I <sub>D</sub> = -12A                                                   |
| DYNAMIC CHARACTERISTICS (Note 10)           |                     |      |      |      |      |                                                                                                |
| Input Capacitance                           | C <sub>iss</sub>    | —    | 6909 | —    | pF   | V <sub>DS</sub> = -10V, V <sub>GS</sub> = 0V<br>f = 1.0MHz                                     |
| Output Capacitance                          | C <sub>oss</sub>    | —    | 635  | —    |      |                                                                                                |
| Reverse Transfer Capacitance                | C <sub>rss</sub>    | —    | 563  | —    |      |                                                                                                |
| Gate Resistance                             | R <sub>G</sub>      | —    | 2.5  | —    | 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>      | —    | 72   | —    | nC   | V <sub>DD</sub> = -10V, I <sub>D</sub> = -12A                                                  |
| Total Gate Charge (V <sub>GS</sub> = -2.5V) | Q <sub>g</sub>      | —    | 40   | —    |      |                                                                                                |
| Gate-Source Charge                          | Q <sub>gs</sub>     | —    | 8.6  | —    |      |                                                                                                |
| Gate-Drain Charge                           | Q <sub>gd</sub>     | —    | 14.5 | —    |      |                                                                                                |
| Turn-On Delay Time                          | t <sub>D(on)</sub>  | —    | 22   | —    | ns   | V <sub>GS</sub> = -4.5V, V <sub>DD</sub> = -10V,<br>R <sub>G</sub> = 6Ω, I <sub>D</sub> = -12A |
| Turn-On Rise Time                           | t <sub>r</sub>      | —    | 33   | —    |      |                                                                                                |
| Turn-Off Delay Time                         | t <sub>D(off)</sub> | —    | 291  | —    |      |                                                                                                |
| Turn-Off Fall Time                          | t <sub>f</sub>      | —    | 124  | —    |      |                                                                                                |
| BODY DIODE CHARACTERISTICS                  |                     |      |      |      |      |                                                                                                |
| Diode Forward Voltage                       | V <sub>SD</sub>     | —    | -0.7 | —    | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = -12A                                                    |
|                                             |                     | —    | -0.7 | —    | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = -2A                                                     |
| Reverse Recovery Time (Note 10)             | t <sub>rr</sub>     | —    | 25   | —    | ns   | I <sub>F</sub> = -12A, di/dt = 100A/μs                                                         |
| Reverse Recovery Charge (Note 10)           | Q <sub>rr</sub>     | —    | 15   | —    | nC   | I <sub>F</sub> = -12A, di/dt = 100A/μs                                                         |

- Notes:
- AEC-Q101 V<sub>GS</sub> maximum is ±6.4V.
  - R<sub>θJA</sub> is determined with the device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate. R<sub>θJC</sub> is guaranteed by design while R<sub>θJA</sub> is determined by the user's board design.
  - Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
  - UIS in production with L = 1mH, T<sub>J</sub> = +25°C.
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to product testing.

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DMP2008UFG

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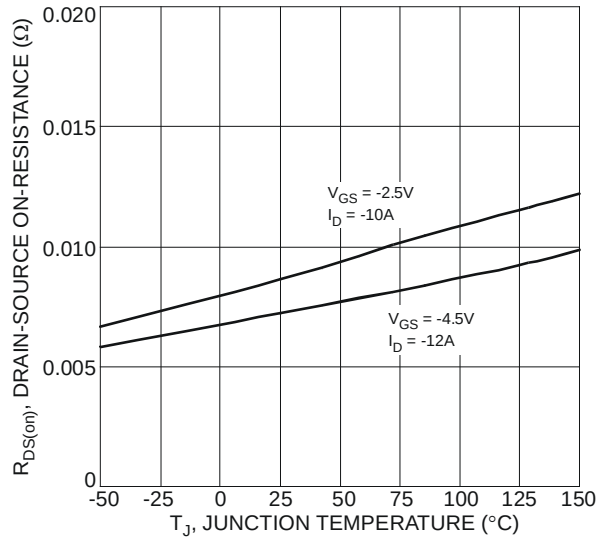


Fig. 7 On-Resistance Variation with Temperature

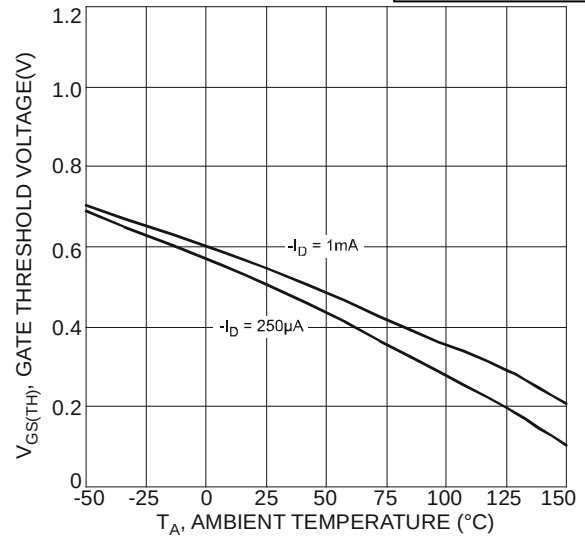


Fig. 8 Gate Threshold Variation vs. Ambient Temperature

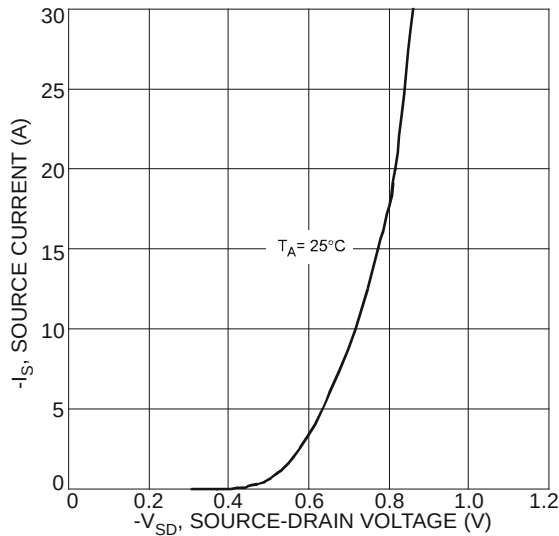


Fig. 9 Diode Forward Voltage vs. Current

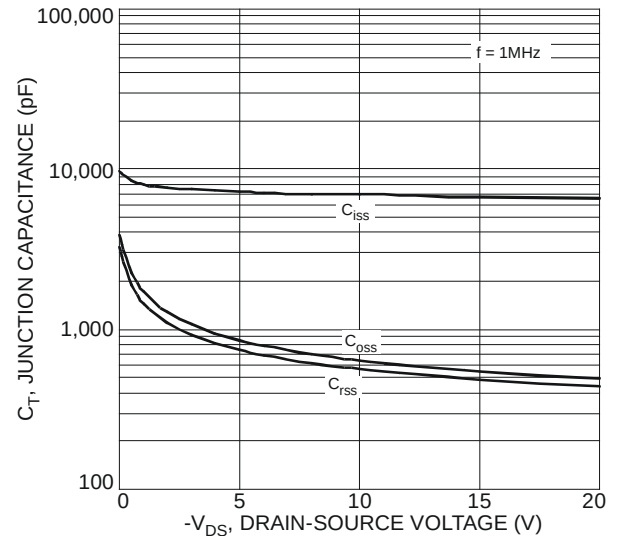


Fig. 10 Typical Junction Capacitance

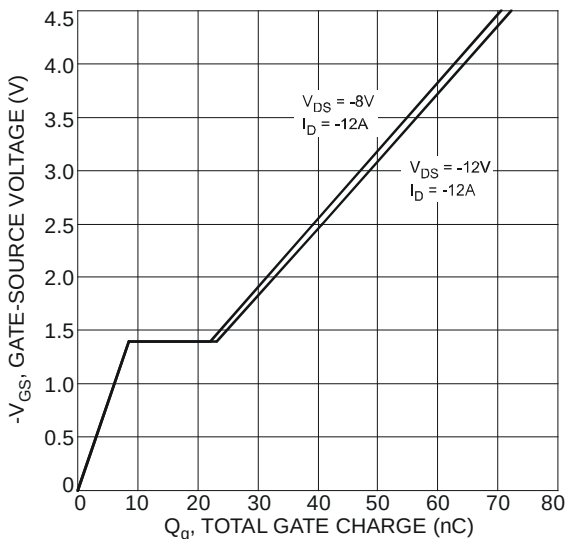


Fig. 11 Gate-Charge Characteristics

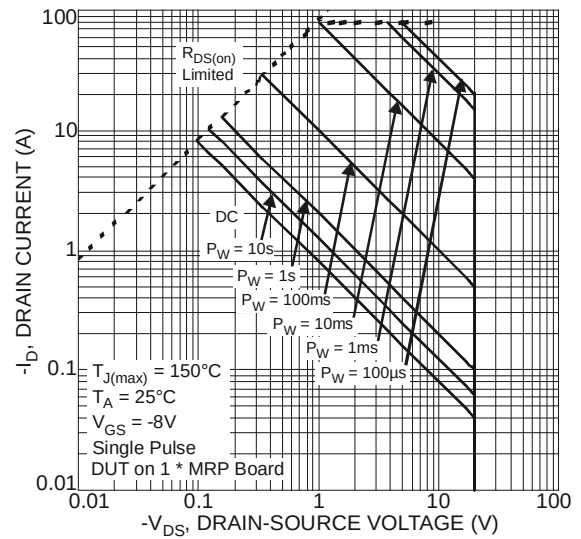
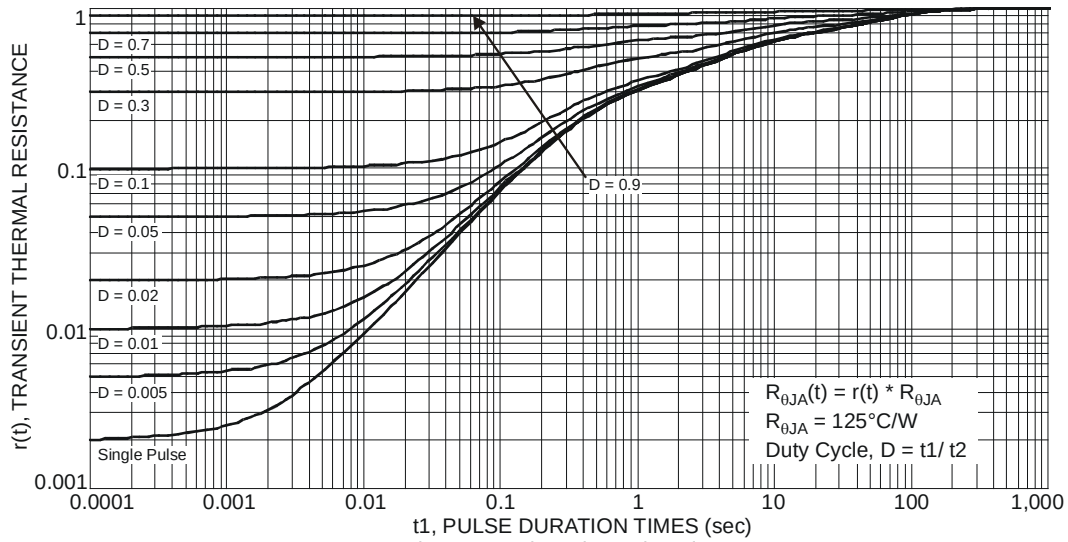
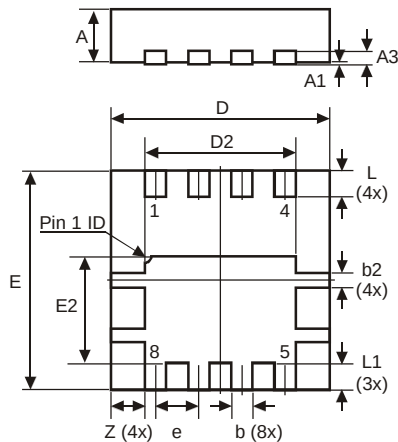


Fig. 12 SOA, Safe Operation Area



## Package Outline Dimensions

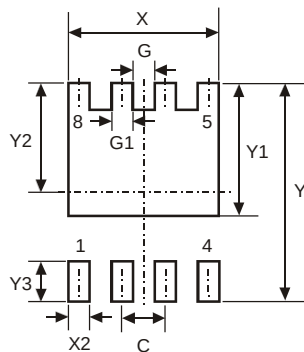
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



| POWERDI3333-8        |      |      |       |
|----------------------|------|------|-------|
| Dim                  | Min  | Max  | Typ   |
| D                    | 3.25 | 3.35 | 3.30  |
| E                    | 3.25 | 3.35 | 3.30  |
| D2                   | 2.22 | 2.32 | 2.27  |
| E2                   | 1.56 | 1.66 | 1.61  |
| A                    | 0.75 | 0.85 | 0.80  |
| A1                   | 0    | 0.05 | 0.02  |
| A3                   | —    | —    | 0.203 |
| b                    | 0.27 | 0.37 | 0.32  |
| b2                   | —    | —    | 0.20  |
| L                    | 0.35 | 0.45 | 0.40  |
| L1                   | —    | —    | 0.39  |
| e                    | —    | —    | 0.65  |
| Z                    | —    | —    | 0.515 |
| All Dimensions in mm |      |      |       |

## Suggested Pad Layout

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



| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 0.650         |
| G          | 0.230         |
| G1         | 0.420         |
| Y          | 3.700         |
| Y1         | 2.250         |
| Y2         | 1.850         |
| Y3         | 0.700         |
| X          | 2.370         |
| X2         | 0.420         |

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### Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: [info@moschip.ru](mailto:info@moschip.ru)

Skype отдела продаж:

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