

## Product Summary

| $BV_{DSS}$ | $R_{DS(ON)}$ Max                | $I_D$ Max<br>$T_C = +25^\circ C$ |
|------------|---------------------------------|----------------------------------|
| 30V        | 5.0m $\Omega$ @ $V_{GS} = 10V$  | 60A                              |
|            | 7.4m $\Omega$ @ $V_{GS} = 4.5V$ | 50A                              |

## Description and Applications

This MOSFET is designed to meet the stringent requirements of automotive applications. It is qualified to AEC-Q101, supported by a PPAP and is ideal for use in:

- Backlighting
- Power Management Functions
- DC-DC Converters

## Features and Benefits

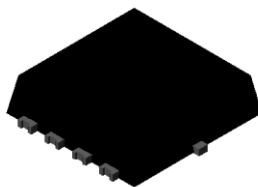
- Low  $R_{DS(ON)}$  – ensures on state losses are minimized
- Small form factor thermally efficient package enables higher density end products
- Occupies just 33% of the board area occupied by SO-8 enabling smaller end product
- 100% Unclamped Inductive Switching (UIS) Test in Production – Ensures More Reliable and Robust End Application
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **The DMN3009LFVWQ is suitable for automotive applications requiring specific change control; this part is AEC-Q101 qualified, PPAP capable, and manufactured in IATF 16949 certified facilities.**

<https://www.diodes.com/quality/product-definitions/>

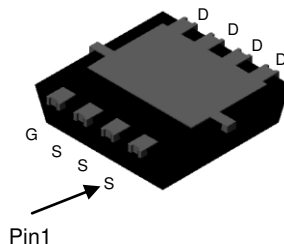
## Mechanical Data

- 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 @3
- Weight: 0.072 grams (Approximate)

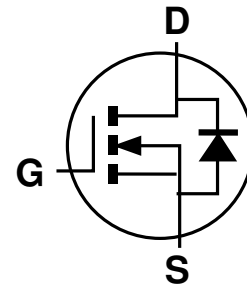
PowerDI3333-8 (SWP) (Type UX)



Top View



Bottom View



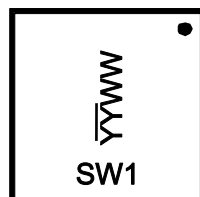
Equivalent Circuit

## Ordering Information (Note 4)

| Part Number     | Case                          | Packaging         |
|-----------------|-------------------------------|-------------------|
| DMN3009LFVWQ-7  | PowerDI3333-8 (SWP) (Type UX) | 2,000/Tape & Reel |
| DMN3009LFVWQ-13 | PowerDI3333-8 (SWP) (Type UX) | 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. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

## Marking Information



SW1 = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Last Two Digits of Year (ex: 19 = 2019)  
 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> | ±20                    | V    |
| Continuous Drain Current (Note 7) V <sub>GS</sub> = 10V         | I <sub>D</sub>   | T <sub>C</sub> = +25°C | 60   |
|   |                  | T <sub>C</sub> = +70°C | 48   |
| Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)              | I <sub>DM</sub>  | 90                     | A    |
| Maximum Continuous Body Diode Forward Current (Note 7)          | I <sub>S</sub>   | 60                     | A    |
| Pulsed Body Diode Forward Current (10µs Pulse, Duty Cycle = 1%) | I <sub>SM</sub>  | 90                     | A    |
| Avalanche Current, L = 0.1mH (Note 8)                           | I <sub>AS</sub>  | 33                     | A    |
| Avalanche Energy, L = 0.1mH (Note 8)                            | E <sub>AS</sub>  | 58                     | mJ   |

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

| Characteristic                                   | Symbol                            | Value            | Unit |
|--|-----------------------------------|------------------|------|
| Total Power Dissipation (Note 5)                 | P <sub>D</sub>                    | 1.0              | W    |
| Thermal Resistance, Junction to Ambient (Note 5) | R <sub>θJA</sub>                  | Steady State     | 126  |
| Total Power Dissipation (Note 6)                 |                                   | P <sub>D</sub>   | 2.0  |
| Thermal Resistance, Junction to Ambient (Note 6) | R <sub>θJA</sub>                  | Steady State     | 62   |
| Thermal Resistance, Junction to Case (Note 7)    |                                   | R <sub>θJC</sub> | 4.6  |
| 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   |
|--|---------------------|-----|-------|------|------|--|
| <b>OFF CHARACTERISTICS (Note 9)</b>        |                     |     |       |      |      |  |
| 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> = 24V, V <sub>GS</sub> = 0V  |
| Gate-Source Leakage                        | I <sub>GSS</sub>    | —   | —     | ±100 | nA   | V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V   |
| <b>ON CHARACTERISTICS (Note 9)</b>         |                     |     |       |      |      |  |
| Gate Threshold Voltage                     | V <sub>GS(TH)</sub> | 1   | —     | 2.5  | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250µA                                   |
| Static Drain-Source On-Resistance          | R <sub>DS(ON)</sub> | —   | 3.5   | 5.0  | mΩ   | V <sub>GS</sub> = 10V, I <sub>D</sub> = 30A  |
|  |                     | —   | 4.9   | 7.4  |      | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 15A   |
| Diode Forward Voltage                      | V <sub>SD</sub>     | —   | 0.7   | 1.2  | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = 1A  |
| <b>DYNAMIC CHARACTERISTICS (Note 10)</b>   |                     |     |       |      |      |  |
| Input Capacitance                          | C <sub>iss</sub>    | —   | 2,000 | —    | pF   | V <sub>DS</sub> = 15V, V <sub>GS</sub> = 0V,<br>f = 1MHz                                     |
| Output Capacitance                         | C <sub>oss</sub>    | —   | 315   | —    | pF   |  |
| Reverse Transfer Capacitance               | C <sub>rss</sub>    | —   | 247   | —    | pF   |  |
| Gate Resistance                            | R <sub>g</sub>      | —   | 2.2   | —    | Ω    | V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz   |
| Total Gate Charge (V <sub>GS</sub> = 4.5V) | Q <sub>g</sub>      | —   | 20    | —    | nC   | V <sub>DS</sub> = 15V, I <sub>D</sub> = 15A  |
| Total Gate Charge (V <sub>GS</sub> = 10V)  | Q <sub>g</sub>      | —   | 42    | —    | nC   |  |
| Gate-Source Charge                         | Q <sub>gs</sub>     | —   | 4.7   | —    | nC   |  |
| Gate-Drain Charge                          | Q <sub>gd</sub>     | —   | 7.4   | —    | nC   |  |
| Turn-On Delay Time                         | t <sub>D(ON)</sub>  | —   | 3.9   | —    | ns   | V <sub>DD</sub> = 15V, V <sub>GS</sub> = 10V,<br>R <sub>G</sub> = 3.3Ω, I <sub>D</sub> = 15A |
| Turn-On Rise Time                          | t <sub>R</sub>      | —   | 4.1   | —    | ns   |  |
| Turn-Off Delay Time                        | t <sub>D(OFF)</sub> | —   | 31    | —    | ns   |  |
| Turn-Off Fall Time                         | t <sub>F</sub>      | —   | 15    | —    | ns   |  |
| Body Diode Reverse Recovery Time           | t <sub>RR</sub>     | —   | 15    | —    | ns   | I <sub>F</sub> = 15A, di/dt = 100A/µs  |
| Body Diode Reverse Recovery Charge         | Q <sub>RR</sub>     | —   | 6.0   | —    | nC   |  |

- Notes:
- Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.
  - Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1-inch square copper plate.
  - Thermal resistance from junction to soldering point (on the exposed drain pad).
  - I<sub>AS</sub> and E<sub>AS</sub> ratings are based on low frequency and duty cycles to keep T<sub>J</sub> = +25°C.
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to product testing.

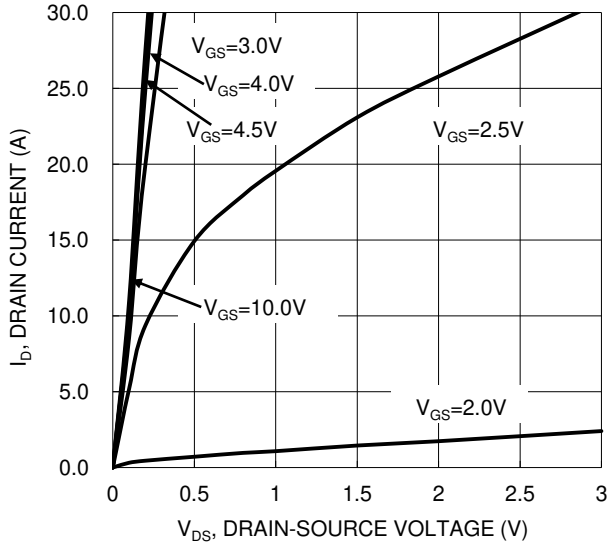


Figure 1. Typical Output Characteristic

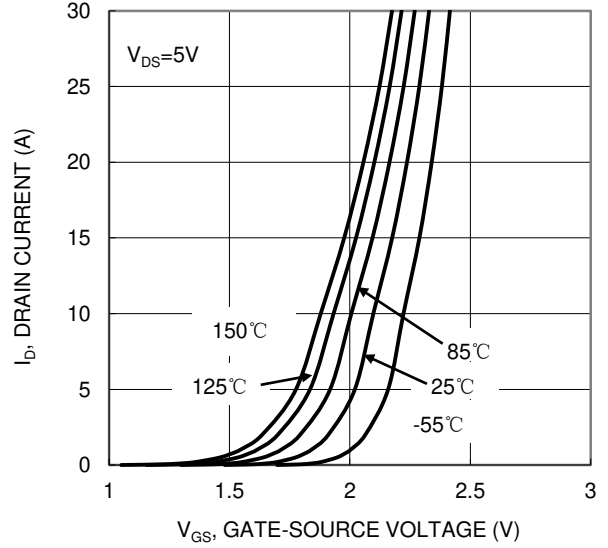


Figure 2. Typical Transfer Characteristic

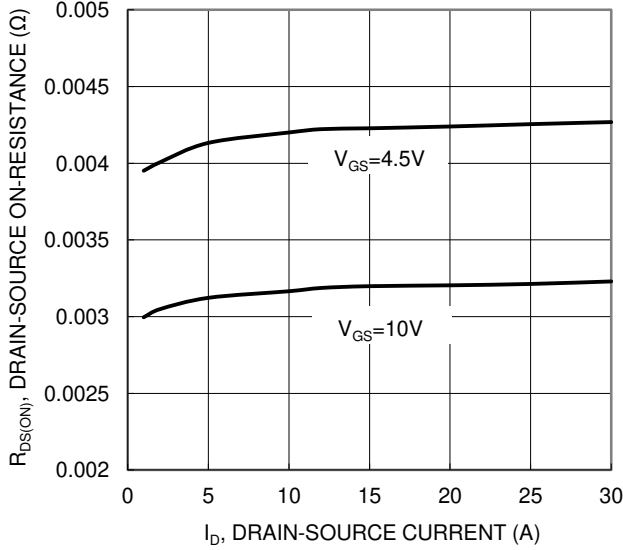


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

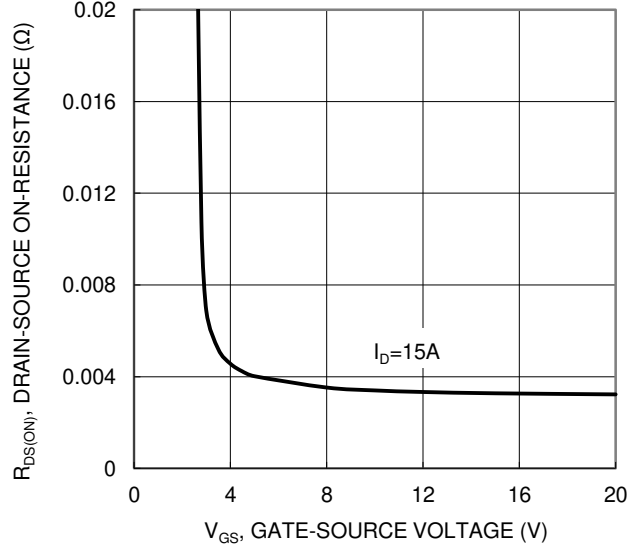


Figure 4. Typical Transfer Characteristic

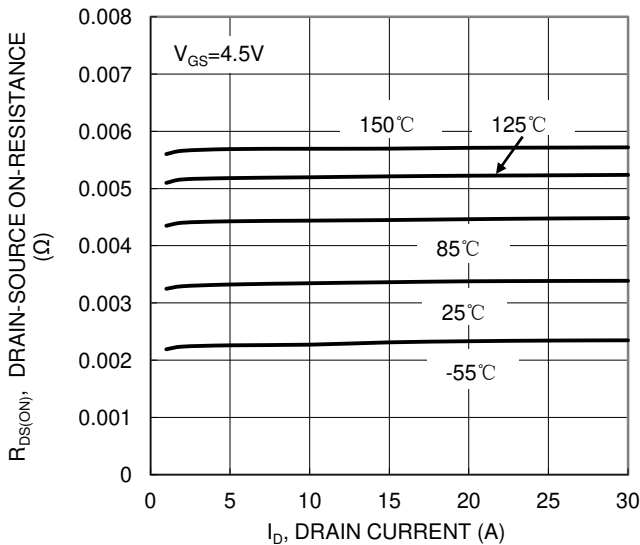


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

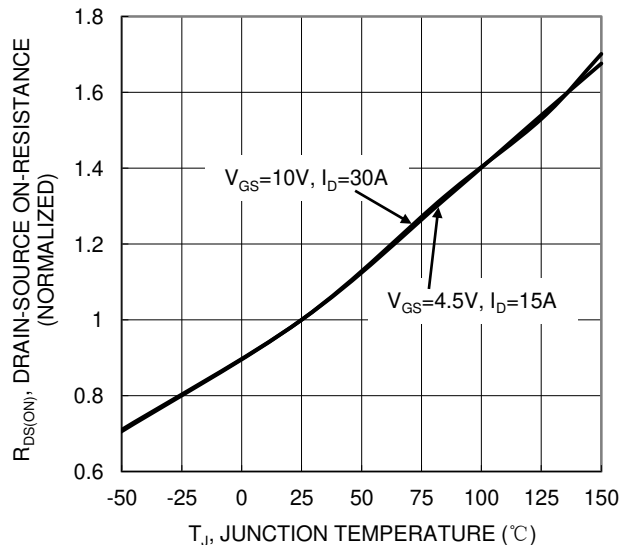


Figure 6. On-Resistance Variation with Temperature

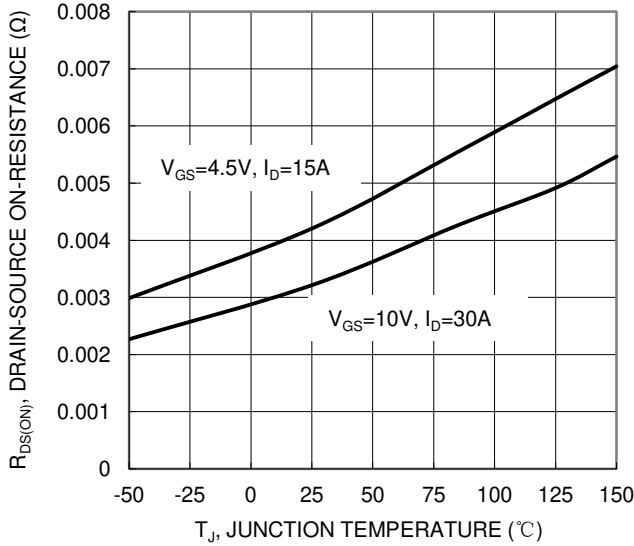


Figure 7. On-Resistance Variation with Temperature

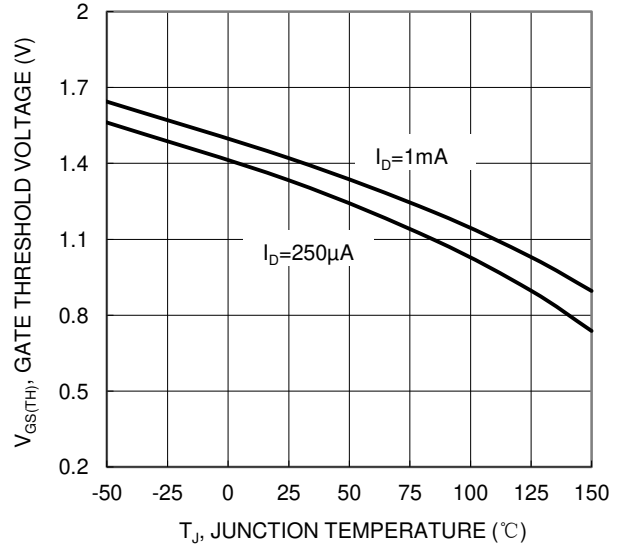


Figure 8. Gate Threshold Variation vs. Junction Temperature

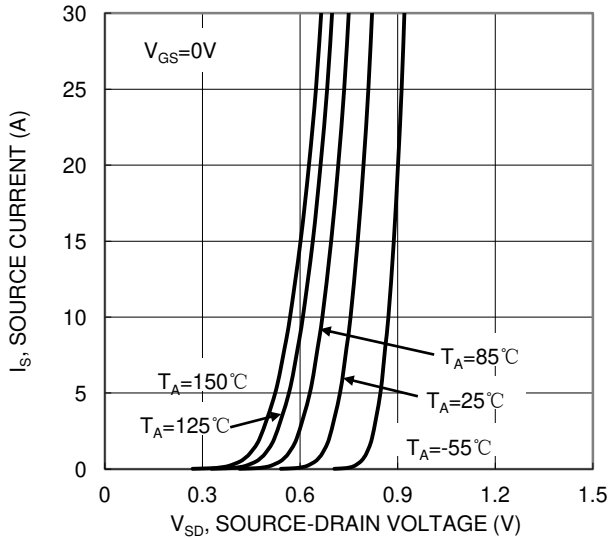


Figure 9. Diode Forward Voltage vs. Current

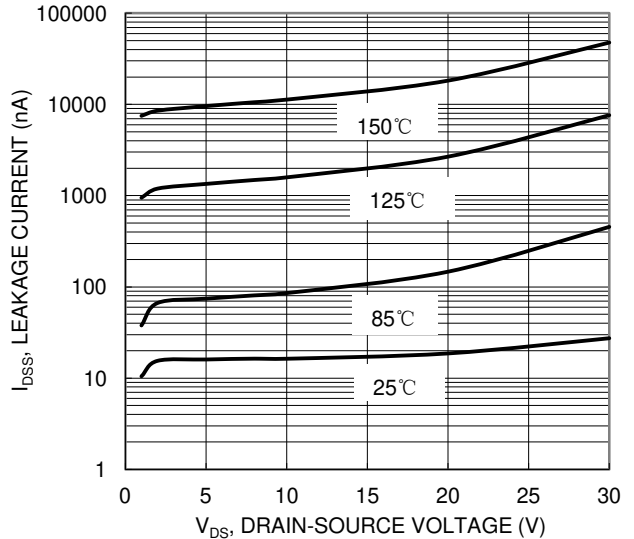


Figure 10. Typical Drain-Source Leakage Current vs. Voltage

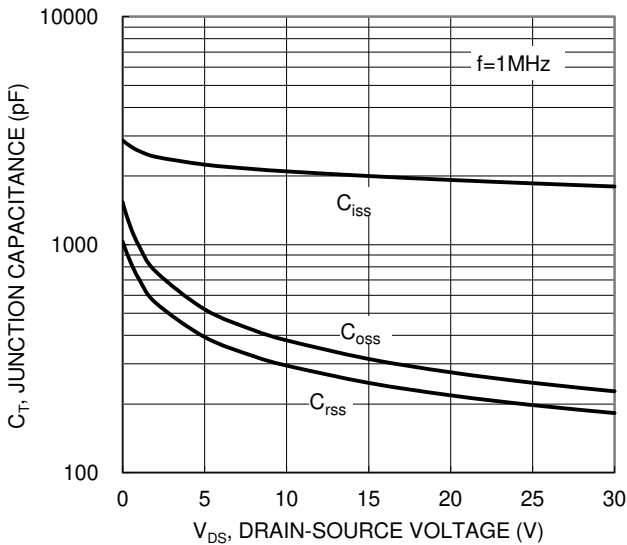


Figure 11. Typical Junction Capacitance

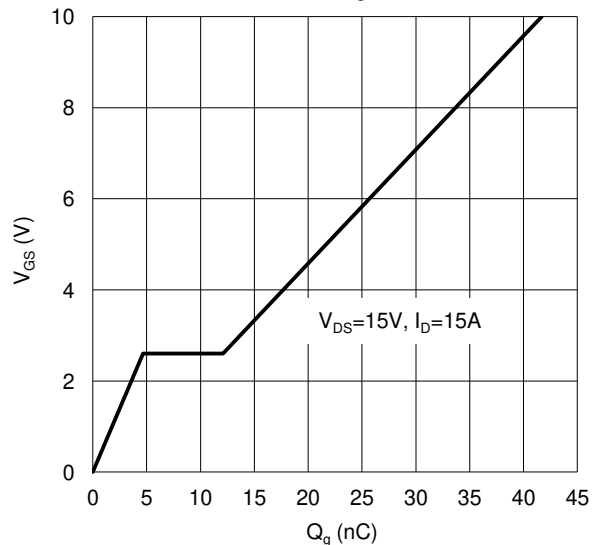
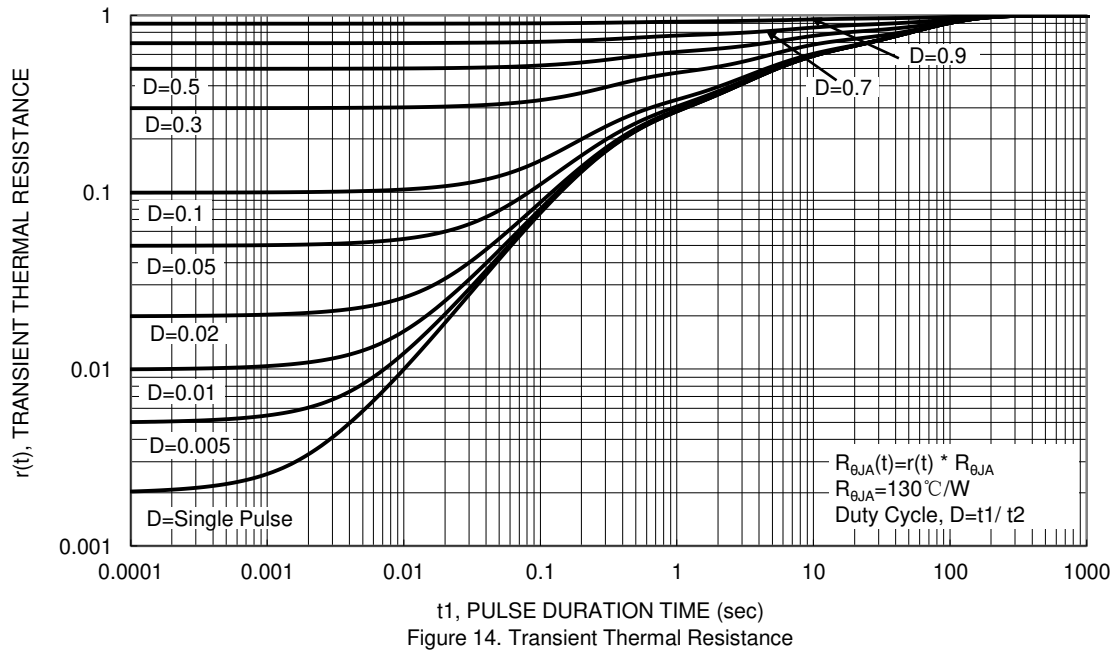
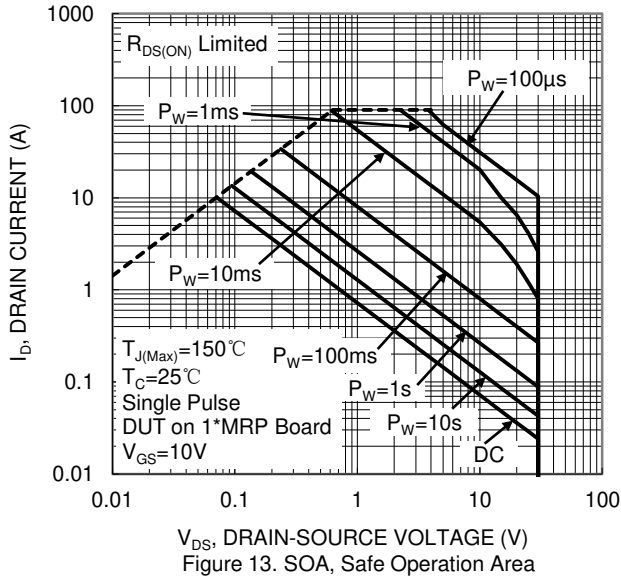


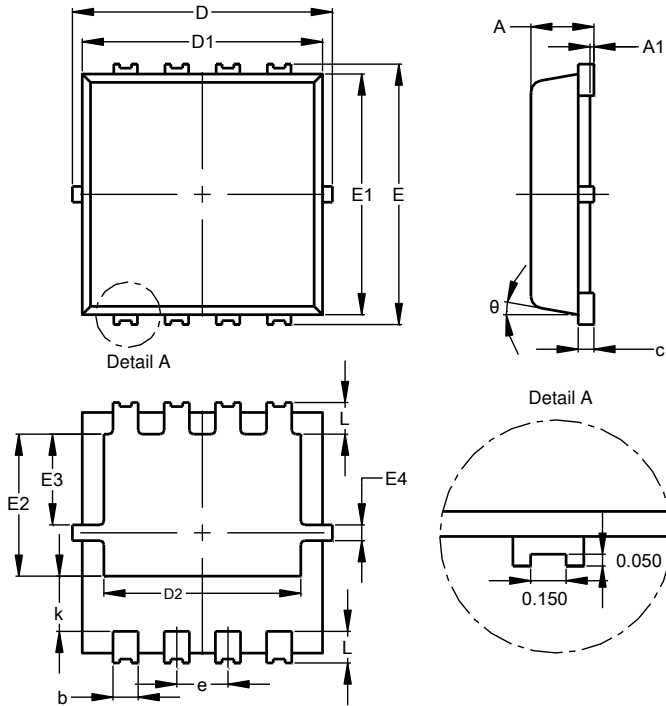
Figure 12. Gate Charge



**Package Outline Dimensions**

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

**PowerDI3333-8 (SWP) (Type UX)**

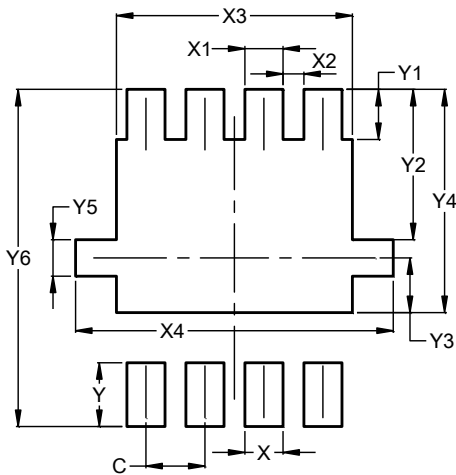


| PowerDI3333-8 (SWP)<br>(Type UX) |      |      |      |
|----------------------------------|------|------|------|
| Dim                              | Min  | Max  | Typ  |
| A                                | 0.75 | 0.85 | 0.80 |
| A1                               | 0.00 | 0.05 | --   |
| b                                | 0.25 | 0.40 | 0.32 |
| c                                | 0.10 | 0.25 | 0.15 |
| D                                | 3.20 | 3.40 | 3.30 |
| D1                               | 2.95 | 3.15 | 3.05 |
| D2                               | 2.30 | 2.70 | 2.50 |
| E                                | 3.20 | 3.40 | 3.30 |
| E1                               | 2.95 | 3.15 | 3.05 |
| E2                               | 1.60 | 2.00 | 1.80 |
| E3                               | 0.95 | 1.35 | 1.15 |
| E4                               | 0.10 | 0.30 | 0.20 |
| e                                | --   | --   | 0.65 |
| k                                | 0.50 | 0.90 | 0.70 |
| L                                | 0.30 | 0.50 | 0.40 |
| θ                                | 0°   | 12°  | 10°  |
| <b>All Dimensions in mm</b>      |      |      |      |

**Suggested Pad Layout**

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

**PowerDI3333-8 (SWP) (Type UX)**



| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 0.650         |
| X          | 0.420         |
| X1         | 0.420         |
| X2         | 0.230         |
| X3         | 2.600         |
| X4         | 3.500         |
| Y          | 0.700         |
| Y1         | 0.550         |
| Y2         | 1.650         |
| Y3         | 0.600         |
| Y4         | 2.450         |
| Y5         | 0.400         |
| Y6         | 3.700         |

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