

### Product Summary

| BV <sub>DSS</sub> | R <sub>DS(ON)</sub> Max        | I <sub>D</sub> Max<br>T <sub>c</sub> = +25°C |
|-------------------|--------------------------------|--|
| -60V              | 60mΩ @ V <sub>GS</sub> = -10V  | -20.6A                                       |
|                   | 80mΩ @ V <sub>GS</sub> = -4.5V | -18.5A                                       |

### Features and Benefits

- Rated to +175°C—Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switch (UIS) Test in Production
- Low R<sub>DS(ON)</sub>—Ensures Minimal On-State Losses
- Wettable Flank for Improved Optical Inspection
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. “Green” Device (Note 3)**
- **The DMPH6051SFVWQ 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/>

### Description and Applications

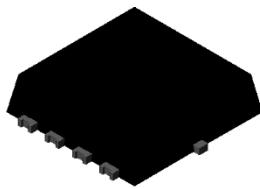
This MOSFET is designed to meet the stringent requirements of automotive applications. It is qualified to AEC-Q101, supported by a PPAP, and is ideal for use in:

- Motor controls
- Power-management functions
- DC-DC converters

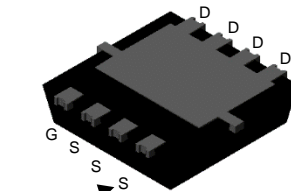
### Mechanical Data

- Package: PowerDI<sup>®</sup>3333-8
- Package 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: 0.072 grams (Approximate)

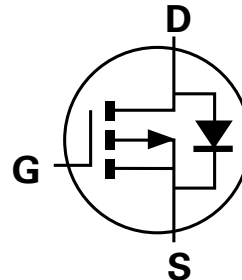
PowerDI3333-8/SWP (Type UX)



Top View



Bottom View



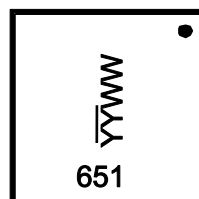
Equivalent Circuit

### Ordering Information (Note 4)

| Part Number      | Package                     | Packing |             |
|------------------|-----------------------------|---------|-------------|
|                  |                             | Qty.    | Carrier     |
| DMPH6051SFVWQ-7  | PowerDI3333-8/SWP (Type UX) | 2000    | Tape & Reel |
| DMPH6051SFVWQ-13 | PowerDI3333-8/SWP (Type UX) | 3000    | 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



651 = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Last Two Digits of Year (ex: 24 = 2024)  
 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> | -60                     | V     |
| Gate-Source Voltage                                      | V <sub>GSS</sub> | ±20                     | V     |
| Continuous Drain Current (Note 5) V <sub>GS</sub> = -10V | I <sub>D</sub>   | T <sub>C</sub> = +25°C  | -20.6 |
|  |                  | T <sub>C</sub> = +100°C | -14.6 |
| Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)       | I <sub>DM</sub>  | -83                     | A     |
| Maximum Continuous Body Diode Forward Current (Note 5)   | I <sub>S</sub>   | -20.6                   | A     |
| Pulsed Source Current (10µs Pulse, Duty Cycle = 1%)      | I <sub>SM</sub>  | -83                     | A     |
| Avalanche Current, L = 0.1mH                             | I <sub>AS</sub>  | -27                     | A     |
| Avalanche Energy, L = 0.1mH                              | E <sub>AS</sub>  | 36                      | mJ    |

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

| Characteristic                                   | Symbol                            | Value       | Unit |
|--|-----------------------------------|-------------|------|
| Total Power Dissipation (Note 6)                 | P <sub>D</sub>                    | 3.2         | W    |
| Thermal Resistance, Junction to Ambient (Note 6) | R <sub>θJA</sub>                  | 47          | °C/W |
| Total Power Dissipation (Note 5)                 | P <sub>D</sub>                    | 51          | W    |
| Thermal Resistance, Junction to Case (Note 5)    | R <sub>θJC</sub>                  | 2.9         | °C/W |
| Operating and Storage Temperature Range          | T <sub>J</sub> , T <sub>STG</sub> | -55 to +175 | °C   |

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

| Characteristic                              | Symbol              | Min | Typ  | Max  | Unit | Test Condition  |
|---|---------------------|-----|------|------|------|---|
| <b>OFF CHARACTERISTICS (Note 7)</b>         |                     |     |      |      |      |   |
| Drain-Source Breakdown Voltage              | BV <sub>DSS</sub>   | -60 | —    | —    | 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> = -60V, 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 7)</b>          |                     |     |      |      |      |   |
| Gate Threshold Voltage                      | V <sub>GS(TH)</sub> | -1  | —    | -3   | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250µA                                 |
| Static Drain-Source On-Resistance           | R <sub>DS(ON)</sub> | —   | 48   | 60   | mΩ   | V <sub>GS</sub> = -10V, I <sub>D</sub> = -7A  |
|   |                     | —   | 62   | 80   |      | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -7A   |
| Diode Forward Voltage                       | V <sub>SD</sub>     | —   | -0.8 | -1.2 | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = -1A  |
| <b>DYNAMIC CHARACTERISTICS (Note 8)</b>     |                     |     |      |      |      |   |
| Input Capacitance                           | C <sub>iss</sub>    | —   | 2087 | —    | pF   | V <sub>DS</sub> = -30V, V <sub>GS</sub> = 0V<br>f = 1MHz                                    |
| Output Capacitance                          | C <sub>oss</sub>    | —   | 94   | —    | pF   |   |
| Reverse Transfer Capacitance                | C <sub>rss</sub>    | —   | 78   | —    | pF   |   |
| Gate Resistance                             | R <sub>g</sub>      | —   | 3.5  | —    | 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>      | —   | 17   | —    | nC   | V <sub>DS</sub> = -30V, I <sub>D</sub> = -5A  |
| Total Gate Charge (V <sub>GS</sub> = -10V)  | Q <sub>g</sub>      | —   | 36   | —    | nC   |   |
| Gate-Source Charge                          | Q <sub>gs</sub>     | —   | 3.7  | —    | nC   |   |
| Gate-Drain Charge                           | Q <sub>gd</sub>     | —   | 5.6  | —    | nC   |   |
| Turn-On Delay Time                          | t <sub>D(ON)</sub>  | —   | 6.5  | —    | ns   | V <sub>DD</sub> = -30V, V <sub>GS</sub> = -10V<br>R <sub>g</sub> = 3Ω, I <sub>D</sub> = -5A |
| Turn-On Rise Time                           | t <sub>r</sub>      | —   | 19   | —    | ns   |   |
| Turn-Off Delay Time                         | t <sub>D(OFF)</sub> | —   | 40   | —    | ns   |   |
| Turn-Off Fall Time                          | t <sub>f</sub>      | —   | 24   | —    | ns   |   |
| Body Diode Reverse-Recovery Time            | t <sub>RR</sub>     | —   | 23   | —    | ns   | I <sub>F</sub> = -5A, di/dt = 100A/µs   |
| Body Diode Reverse-Recovery Charge          | Q <sub>RR</sub>     | —   | 21   | —    | nC   |   |

- Notes:
5. Thermal resistance from junction to soldering point (on the exposed drain pad).
  6. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate.
  7. Short duration pulse test used to minimize self-heating effect.
  8. Guaranteed by design. Not subject to product testing.

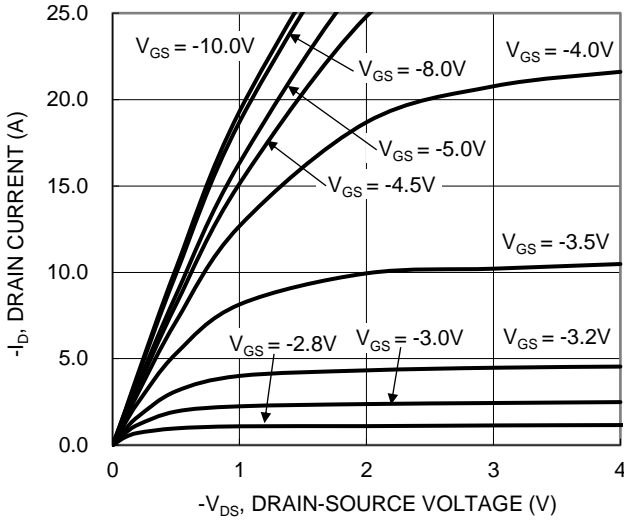


Figure 1. Typical Output Characteristic

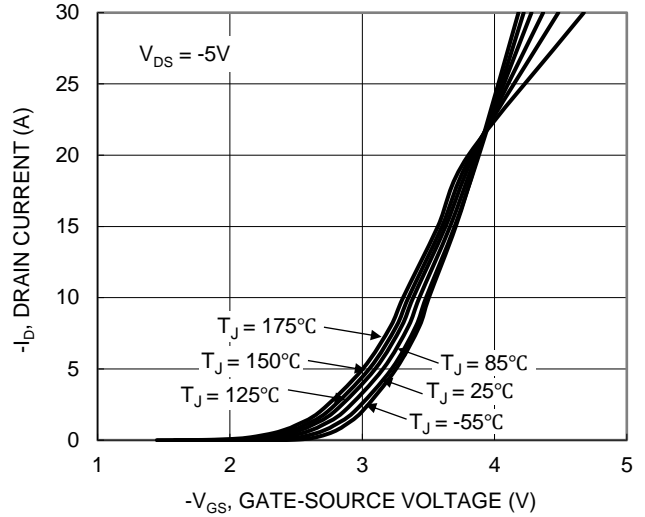


Figure 2. Typical Transfer Characteristic

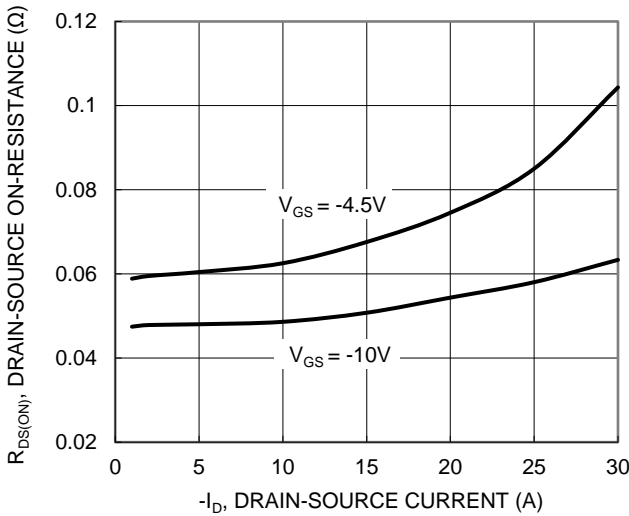


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

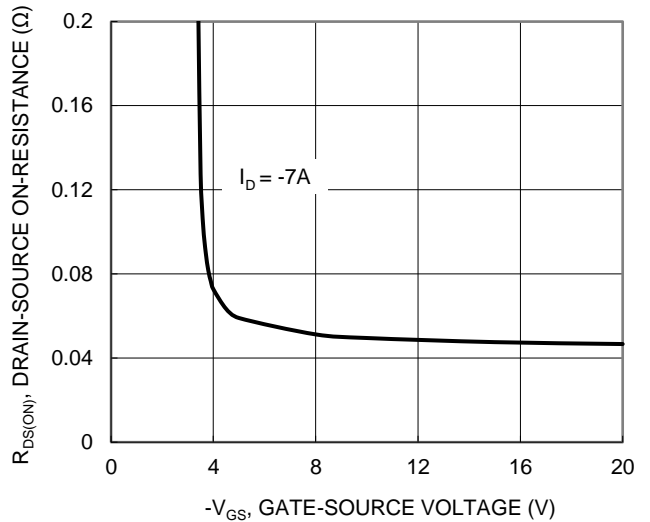


Figure 4. Typical Transfer Characteristic

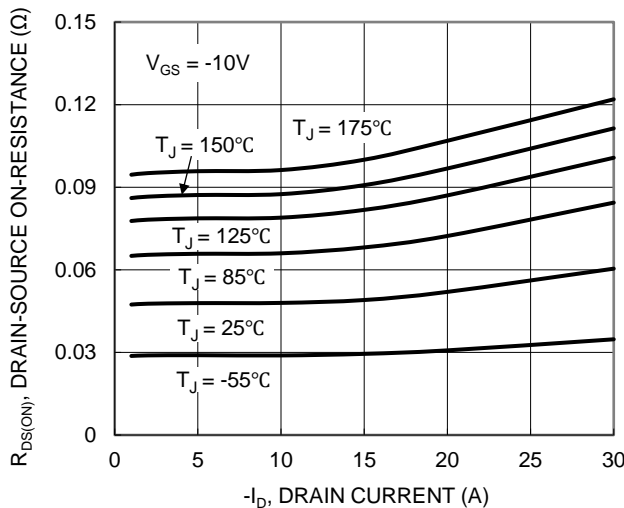


Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

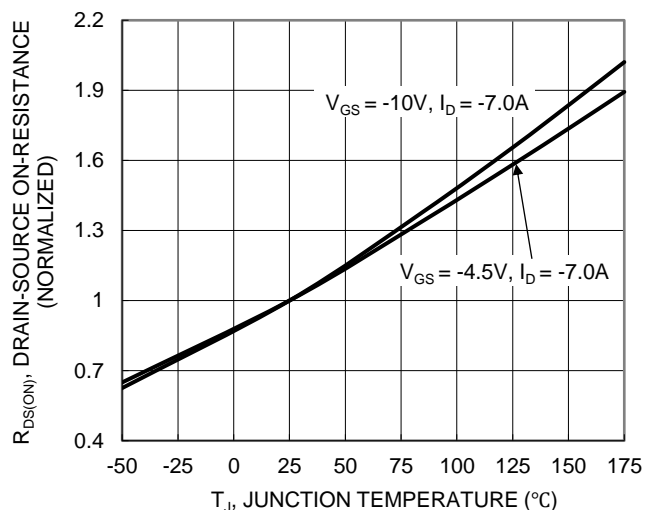


Figure 6. On-Resistance Variation with Junction Temperature

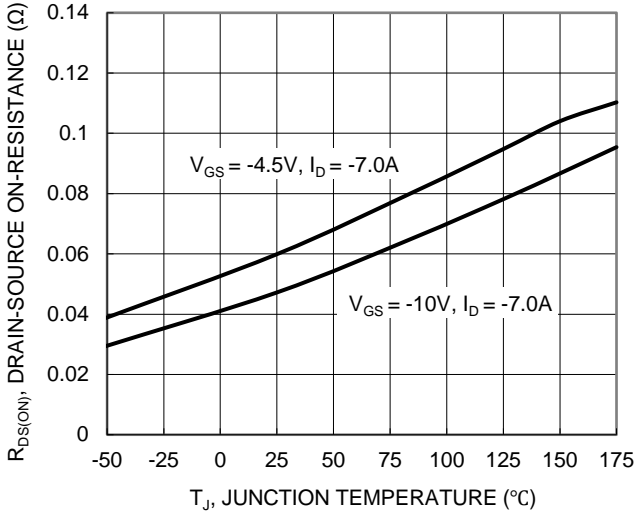


Figure 7. On-Resistance Variation with Junction Temperature

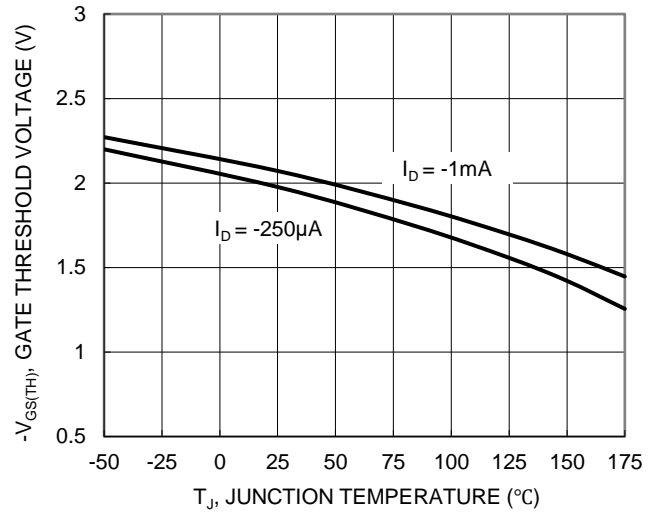


Figure 8. Gate Threshold Variation vs. Junction Temperature

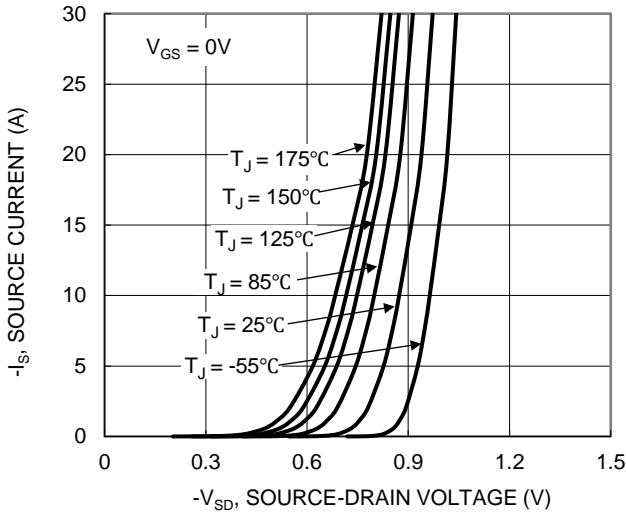


Figure 9. Diode Forward Voltage vs. Current

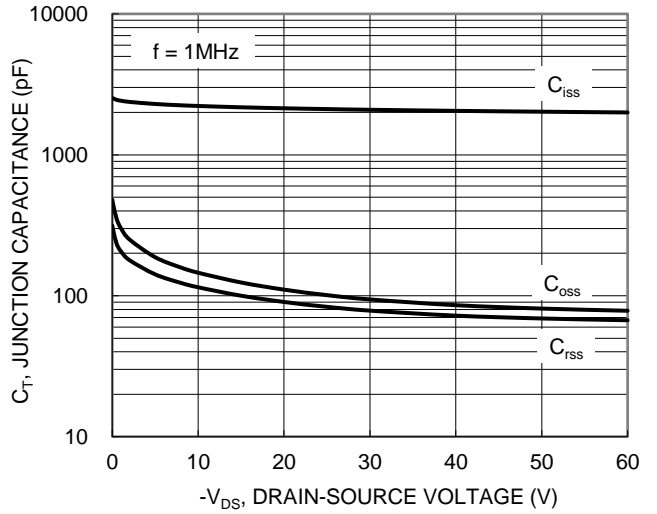


Figure 10. Typical Junction Capacitance

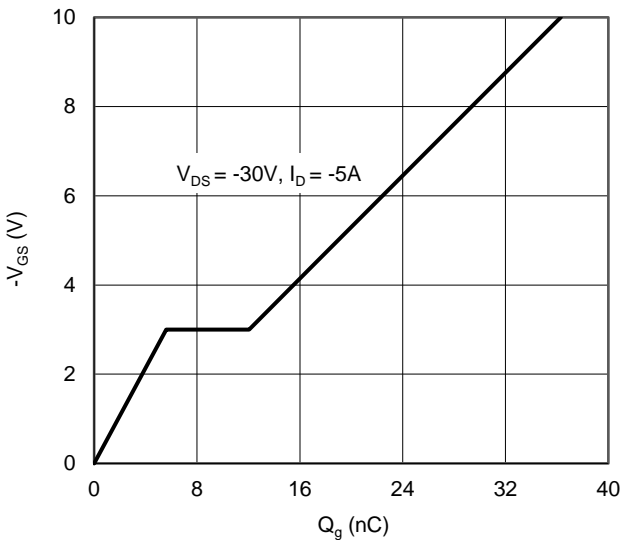


Figure 11. Gate Charge

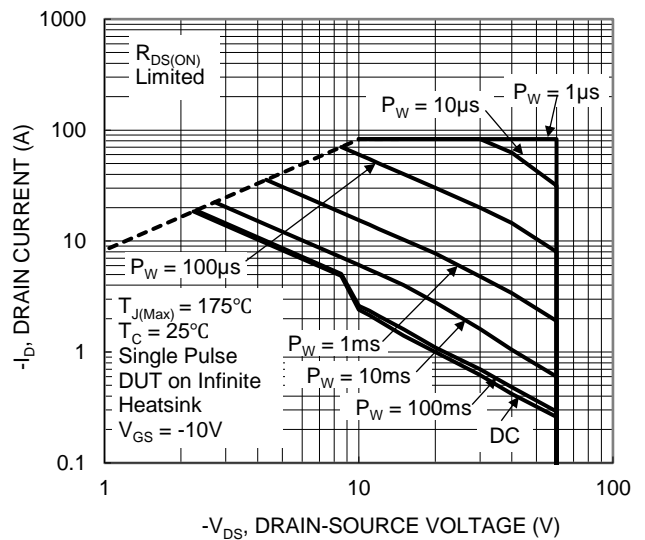


Figure 12. SOA, Safe Operation Area

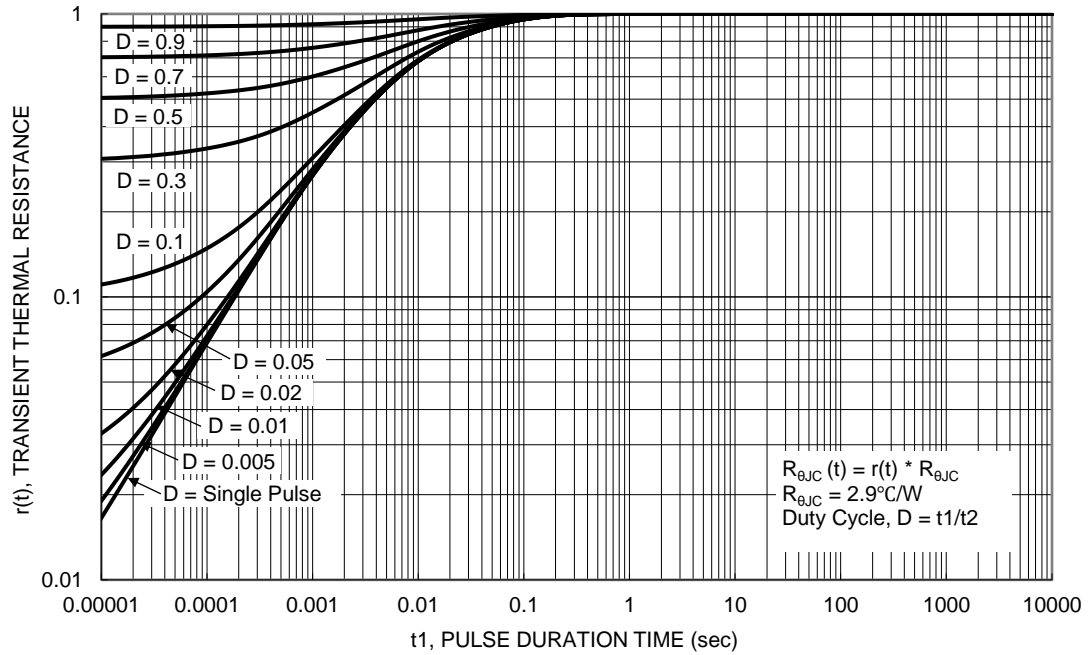
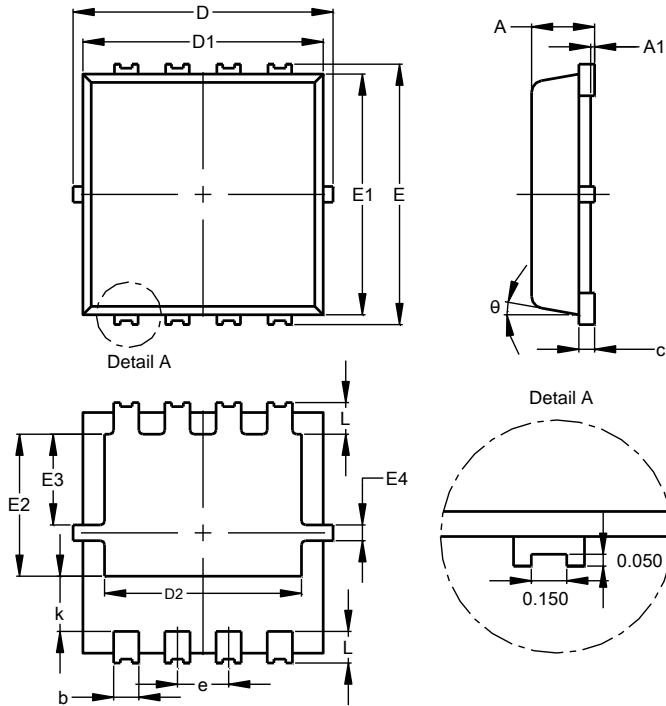


Figure 13. Transient Thermal Resistance

**Package Outline Dimensions**

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

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

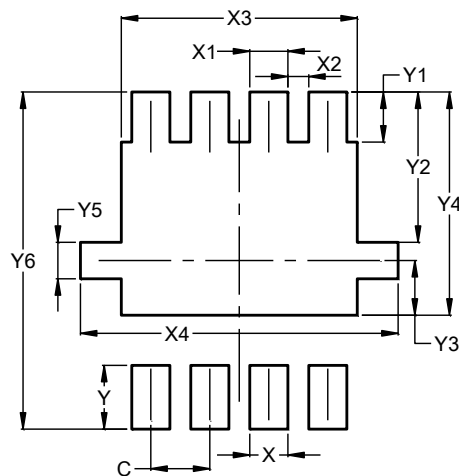


| PowerDI3333-8/SWP (Type UX) |      |      |      |
|-----------------------------|------|------|------|
| Dim                         | Min  | Max  | Typ  |
| A                           | 0.75 | 0.85 | 0.80 |
| A1                          | 0.00 | 0.05 | --   |
| b                           | 0.25 | 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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