

### Product Summary

| $V_{(BR)DSS}$ | $R_{DS(ON)}$ max        | $I_D$ max<br>$T_A = +25^\circ C$ |
|---------------|-------------------------|----------------------------------|
| -60V          | 50mΩ @ $V_{GS} = -10V$  | -4.8A                            |
|               | 70mΩ @ $V_{GS} = -4.5V$ | -4.1A                            |

### 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
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

### Description and Applications

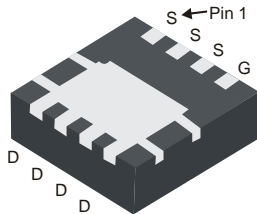
This MOSFET has been designed to minimize the on-state resistance ( $R_{DS(ON)}$ ) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

- Backlighting
- Power Management Functions
- DC-DC Converters

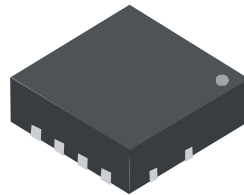
### Mechanical Data

- Case: POWERDI®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)

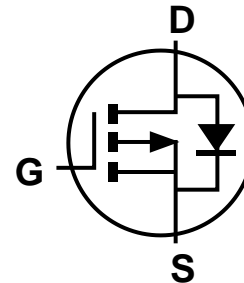
POWERDI®3333-8



Bottom View



Top View



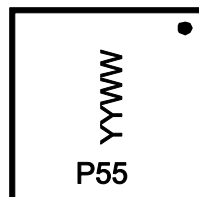
Equivalent Circuit

### Ordering Information (Note 4)

| Part Number   | Case           | Packaging        |
|---------------|----------------|------------------|
| DMP6050SFG-7  | POWERDI®3333-8 | 2000/Tape & Reel |
| DMP6050SFG-13 | POWERDI®3333-8 | 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



P55= Product Type Marking Code  
YYWW = Date Code Marking  
YY = Last Digit of Year (ex: 14 = 2014)  
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 6) V <sub>GS</sub> = -10V | Steady State | T <sub>A</sub> = +25°C<br>T <sub>A</sub> = +70°C | I <sub>D</sub>   | -4.8<br>-3.9 | A    |
|  | t < 10s      | T <sub>A</sub> = +25°C<br>T <sub>A</sub> = +70°C | I <sub>D</sub>   | -6.0<br>-4.8 | A    |
| Pulsed Drain Current (10µs pulse, duty cycle = 1%)       |              |  | I <sub>DM</sub>  | -32          | A    |
| Maximum Continuous Body Diode Forward Current (Note 6)   |              |  | I <sub>S</sub>   | -2.8         | A    |
| Avalanche Current (Note 7) L = 0.1mH                     |              |  | I <sub>AS</sub>  | -24.8        | A    |
| Repetitive Avalanche Energy (Note 7) L = 0.1mH           |              |  | E <sub>AS</sub>  | 30.8         | 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>                    | 1.1         | W    |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady state |  | R <sub>θJA</sub>                  | 118         | °C/W |
|  | t < 10s      |  |                                   | 78          |      |
| Total Power Dissipation (Note 6)                 |              |  | P <sub>D</sub>                    | 1.8         | W    |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady state |  | R <sub>θJA</sub>                  | 71          | °C/W |
|  | t < 10s      |  |                                   | 46          |      |
| Thermal Resistance, Junction to Case (Note 6)    |              |  | R <sub>θJC</sub>                  | 6.7         |      |
| 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 8)</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 T <sub>J</sub> = +25°C | 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 8)</b>                     |                     |      |      |      |      |  |
| Gate Threshold Voltage                                 | V <sub>GS(TH)</sub> | -1.0 | —    | -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> | —    | 36   | 50   | mΩ   | V <sub>GS</sub> = -10V, I <sub>D</sub> = -5A   |
|  |                     | —    | 47   | 70   |      | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -4A  |
| 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 9)</b>                |                     |      |      |      |      |  |
| Input Capacitance                                      | C <sub>iss</sub>    | —    | 1293 | —    | pF   | V <sub>DS</sub> = -30V, V <sub>GS</sub> = 0V,<br>f = 1.0MHz                                  |
| Output Capacitance                                     | C <sub>oss</sub>    | —    | 86.3 | —    | pF   |  |
| Reverse Transfer Capacitance                           | C <sub>rss</sub>    | —    | 64.7 | —    | pF   |  |
| Gate Resistance  | R <sub>g</sub>      | —    | 12   | —    | 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>      | —    | 11.9 | —    | nC   | V <sub>DS</sub> = -30V, I <sub>D</sub> = -5A   |
| Total Gate Charge (V <sub>GS</sub> = -10V)             | Q <sub>g</sub>      | —    | 24   | —    | nC   |  |
| Gate-Source Charge                                     | Q <sub>gs</sub>     | —    | 3.6  | —    | nC   |  |
| Gate-Drain Charge                                      | Q <sub>gd</sub>     | —    | 5.7  | —    | nC   |  |
| Turn-On Delay Time                                     | t <sub>D(ON)</sub>  | —    | 4.3  | —    | ns   | V <sub>GS</sub> = -10V, V <sub>DS</sub> = -30V,<br>R <sub>G</sub> = 3Ω, I <sub>D</sub> = -5A |
| Turn-On Rise Time                                      | t <sub>R</sub>      | —    | 6.3  | —    | ns   |  |
| Turn-Off Delay Time                                    | t <sub>D(OFF)</sub> | —    | 46.7 | —    | ns   |  |
| Turn-Off Fall Time                                     | t <sub>F</sub>      | —    | 25.3 | —    | ns   |  |
| Body Diode Reverse Recovery Time                       | t <sub>RR</sub>     | —    | 13.6 | —    | ns   | I <sub>F</sub> = -5A, di/dt = 100A/µs  |
| Body Diode Reverse Recovery Charge                     | Q <sub>RR</sub>     | —    | 7.4  | —    | nC   | I <sub>F</sub> = -5A, di/dt = 100A/µs  |

- 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.
  - I<sub>AS</sub> and E<sub>AS</sub> rating 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.

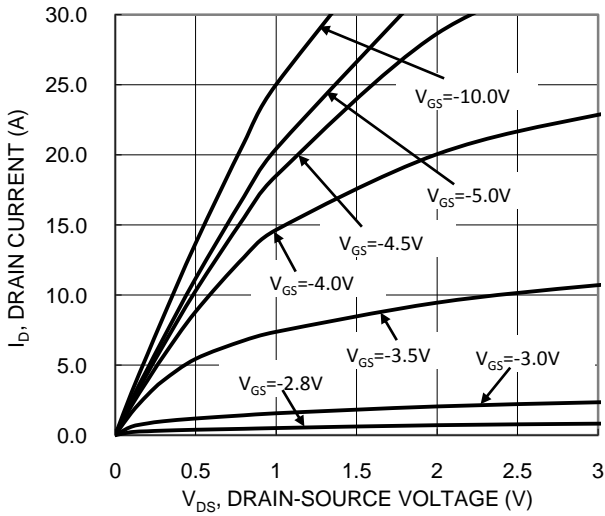


Figure 1 Typical Output Characteristic

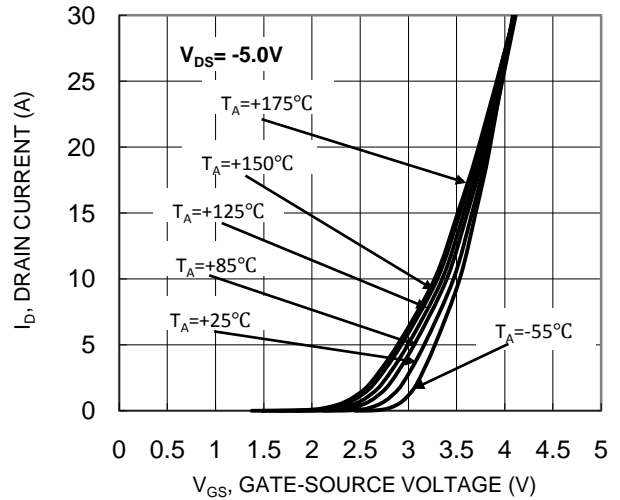


Figure 2 Typical Transfer Characteristic

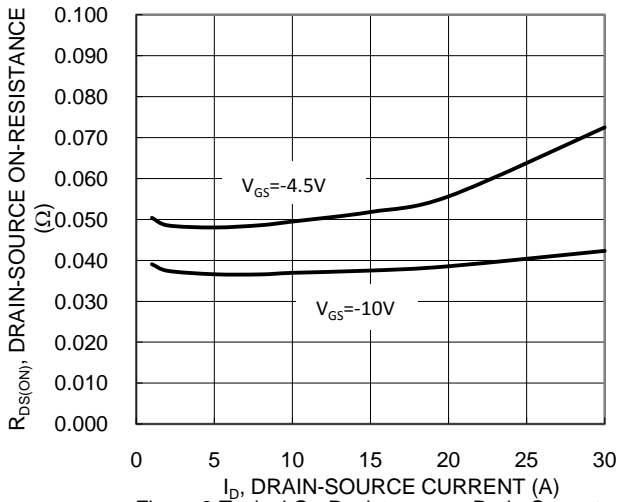


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

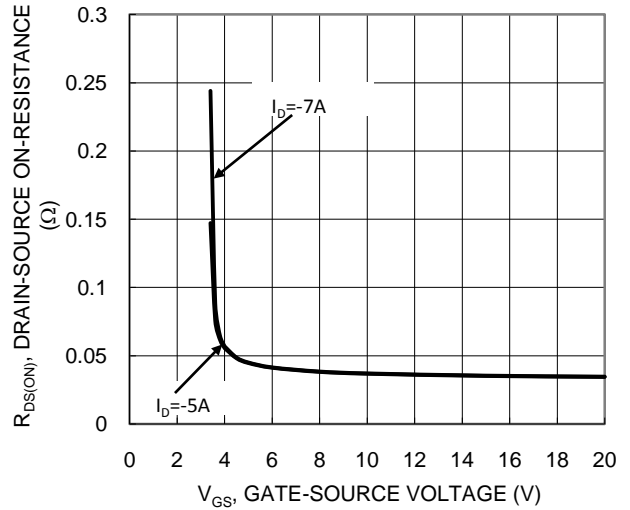


Figure 4 Typical Transfer Characteristic

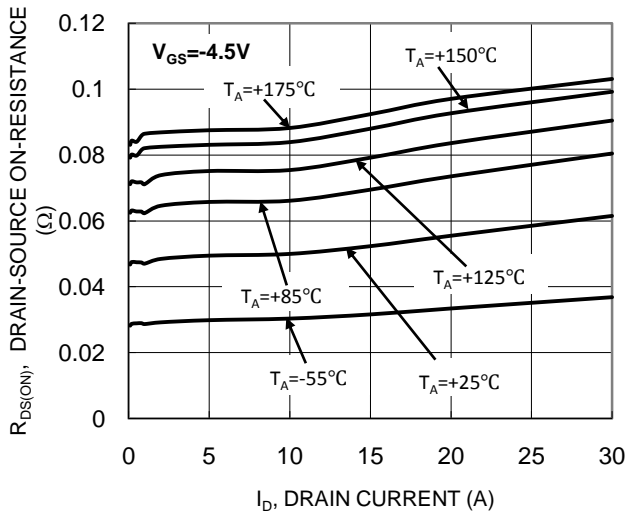


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

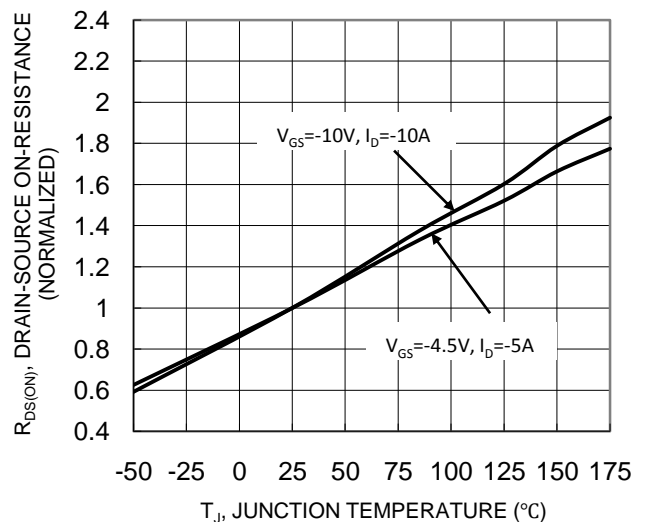


Figure 6 On-Resistance Variation with Temperature

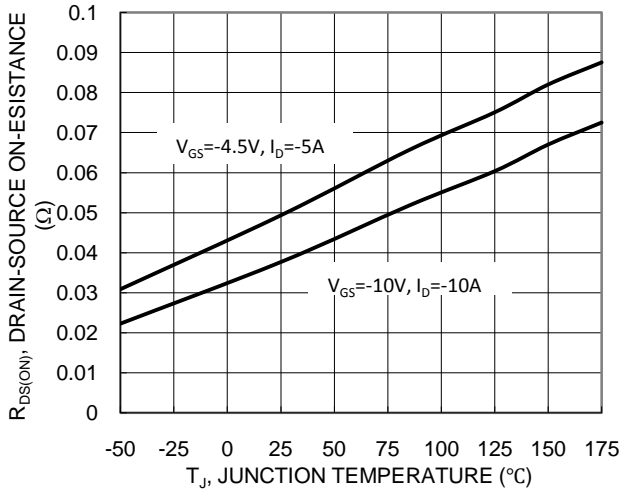


Figure 7 On-Resistance Variation with Temperature

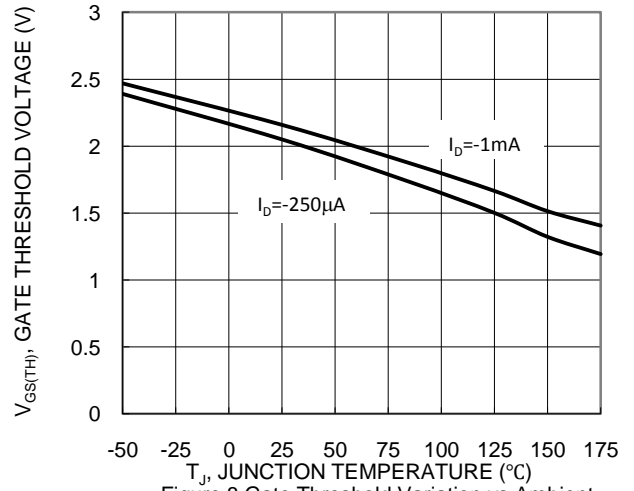


Figure 8 Gate Threshold Variation vs Ambient Temperature

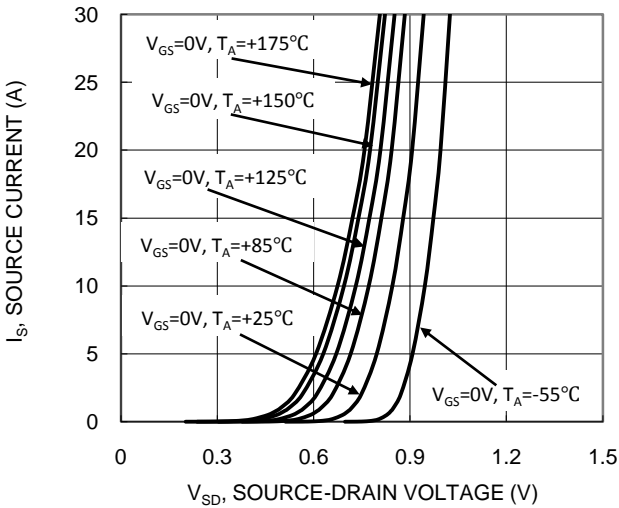


Figure 9 Diode Forward Voltage vs. Current

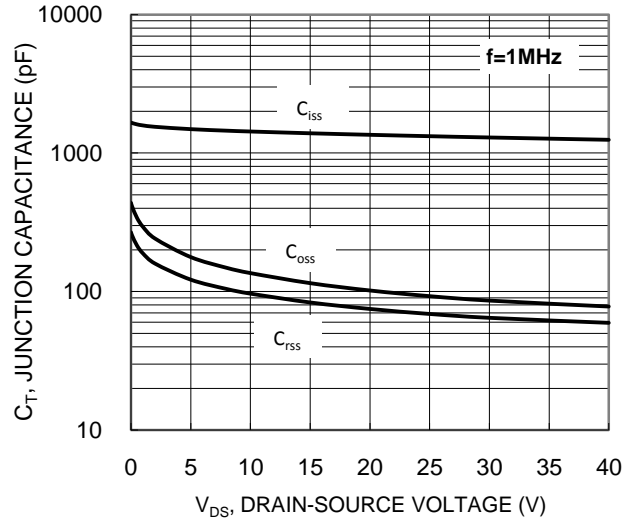


Figure 10 Typical Junction Capacitance

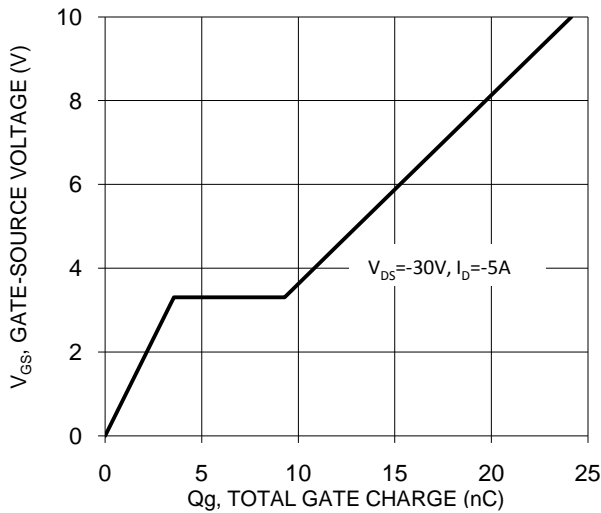


Figure 11 Gate Charge

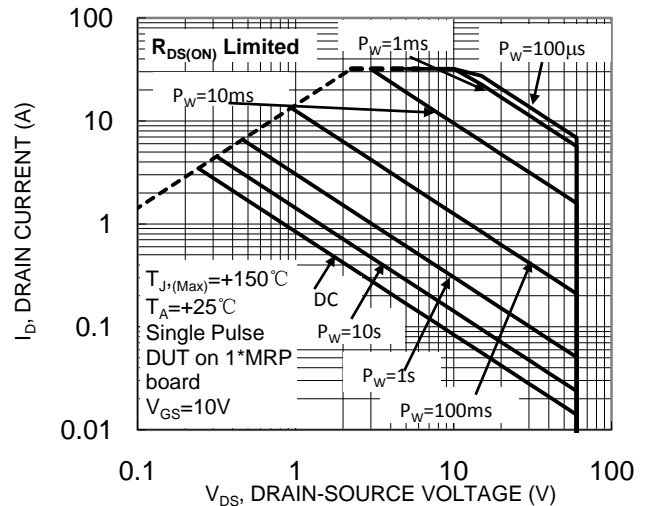


Figure 12 SOA, Safe Operation Area

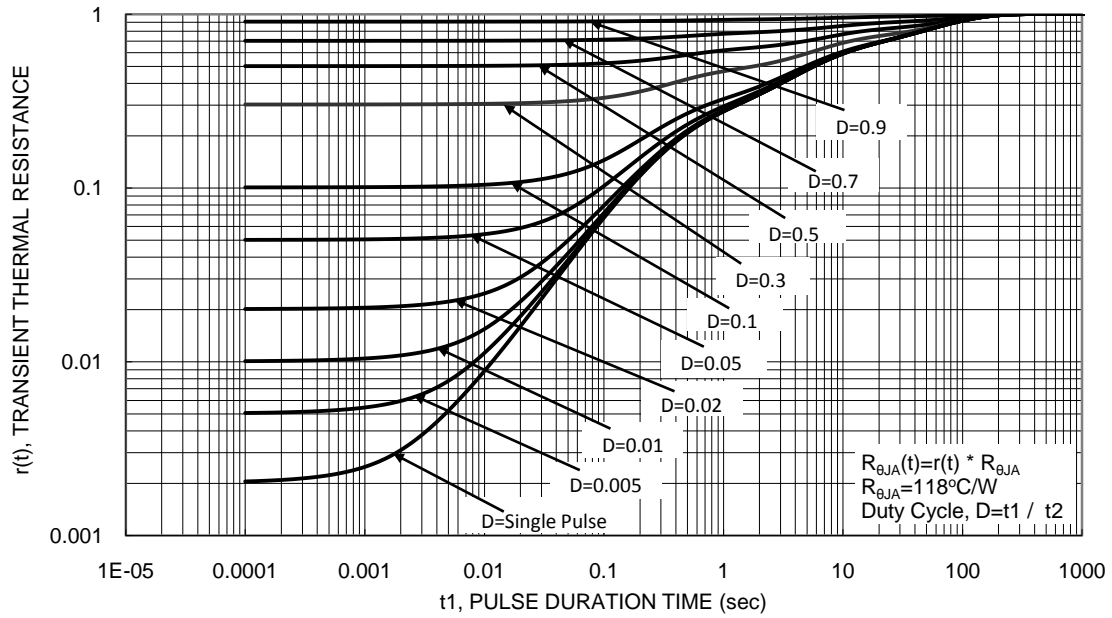
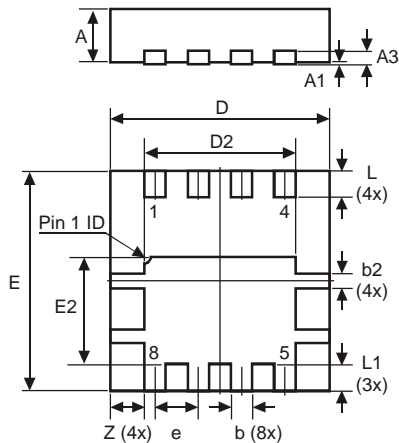


Figure 13 Transient Thermal Resistance

**Package Outline Dimensions**

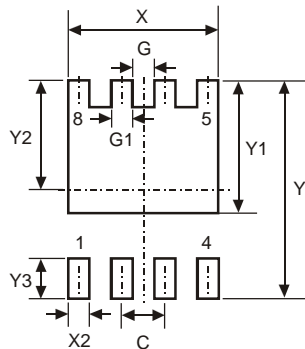
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



| POWERDI <sup>®</sup> 3333-8 |      |      |       |
|-----------------------------|------|------|-------|
| 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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