# 20V P-CHANNEL ENHANCEMENT MODE MOSFET
# POWERDI®

NEW PRODUCT

## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(ON)}$ Max | $I_D$ Max $T_C$ = +25°C |
|---|---|---|
| -20V | 6.7mΩ @ $V_{GS}$ = -4.5V | -40A |
| | 9.0mΩ @ $V_{GS}$ = -2.5V | -40A |

## 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

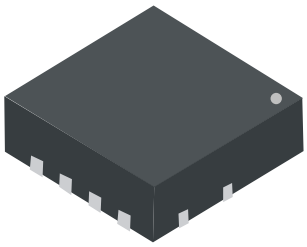
## Features

- 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
- **ESD HBM Protected up to 1KV**
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

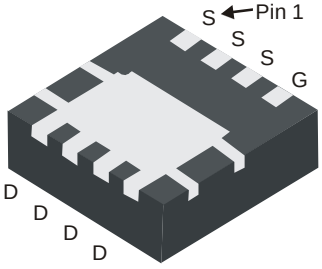
## Mechanical Data

- 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)

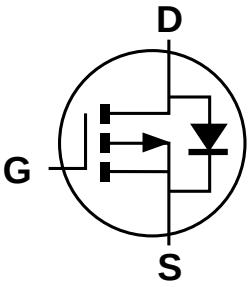
POWERDI3333-8



Top View




Bottom View



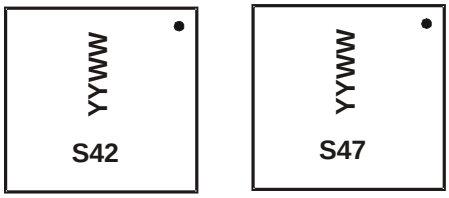

Equivalent Circuit

## Ordering Information (Note 4)

| Part Number | Case | Packaging |
|---|---|---|
| DMP26M7UFG-7 | POWERDI3333-8 | 2000/Tape & Reel |
| DMP26M7UFG-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 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




S42 or S47= Product Type Marking Code
YYWW = Date Code Marking
YY = Last Digit of Year (ex: 14 = 2014)
WW = Week Code (01 to 53)


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## Maximum Ratings (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | | | Symbol | Value | Unit |
|---|---|---|---|---|---|
| Drain-Source Voltage | | | $V_{DSS}$ | -20 | V |
| Gate-Source Voltage | | | $V_{GSS}$ | ±10 | V |
| Continuous Drain Current (Note 5) $V_{GS}$ = -4.5V | Steady State | $T_A$ = +25°C<br>$T_A$ = +70°C<br>$T_C$ = +25°C | $I_D$ | -18.0<br>-14.5<br>-40 | A |
| Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%) | | | $I_{DM}$ | -80 | A |
| Maximum Continuous Body Diode Forward Current (Note 5) | | | $I_S$ | -2.2 | A |
| Avalanche Current (Note 7) L=0.1mH | | | $I_{AS}$ | -23 | A |
| Avalanche Energy (Note 7) L=0.1mH | | | $E_{AS}$ | 28 | mJ |

## Thermal Characteristics (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Total Power Dissipation (Note 5) | $T_A$ = +25°C | $P_D$ | 2.3 | W |
| | $T_C$ = +25°C | | 41 | |
| Thermal Resistance, Junction to Ambient | (Note 5) | $R_{\theta JA}$ | 56 | °C/W |
| | (Note 6) | | 124 | |
| Thermal Resistance, Junction to Case | | $R_{\theta JC}$ | 6.8 | |
| Operating and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to +150 | °C |

## Electrical Characteristics (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS (Note 8)** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | -20 | — | — | V | $V_{GS}$ = 0V, $I_D$ = -250µA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | — | — | -1 | µA | $V_{DS}$ = -16V, $V_{GS}$ = 0V |
| Gate-Source Leakage | $I_{GSS}$ | — | — | ±100 | nA | $V_{GS}$ = ±8V, $V_{DS}$ = 0V |
| **ON CHARACTERISTICS (Note 8)** | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | -0.4 | — | -1.0 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = -250µA |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | — | 4.2 | 6.7 | mΩ | $V_{GS}$ = -4.5V, $I_D$ = -15A |
| | | — | 5.4 | 9.0 | | $V_{GS}$ = -2.5V, $I_D$ = -10A |
| | | — | 7 | — | | $V_{GS}$ = -1.8V, $I_D$ = -1A |
| Diode Forward Voltage | $V_{SD}$ | — | -0.7 | -1.2 | V | $V_{GS}$ = 0V, $I_S$ = -10A |
| **DYNAMIC CHARACTERISTICS (Note 9)** | | | | | | |
| Input Capacitance | $C_{iss}$ | — | 5940 | — | pF | $V_{DS}$ = -10V, $V_{GS}$ = 0V<br>f = 1.0MHz |
| Output Capacitance | $C_{oss}$ | — | 835 | — | | |
| Reverse Transfer Capacitance | $C_{rss}$ | — | 728 | — | | |
| Gate Resistance | $R_G$ | — | 3.0 | — | Ω | $V_{DS}$ = 0V, $V_{GS}$ = 0V, f = 1.0MHz |
| Total Gate Charge ($V_{GS}$ = -4.5V) | $Q_g$ | — | 75 | — | nC | $V_{DD}$ = -10V, $I_D$ = -20A |
| Total Gate Charge ($V_{GS}$ = -10V) | $Q_g$ | — | 156 | — | | |
| Gate-Source Charge | $Q_{gs}$ | — | 8.8 | — | | |
| Gate-Drain Charge | $Q_{gd}$ | — | 22 | — | | |
| Turn-On Delay Time | $t_{D(ON)}$ | — | 10.7 | — | ns | $V_{GS}$ = -4.5V, $V_{DD}$ = -10V,<br>$R_G$ = 1Ω, $I_D$ = -10A |
| Turn-On Rise Time | $t_R$ | — | 23 | — | | |
| Turn-Off Delay Time | $t_{D(OFF)}$ | — | 121 | — | | |
| Turn-Off Fall Time | $t_F$ | — | 109 | — | | |
| Reverse Recovery Time | $t_{RR}$ | — | 60 | — | ns | $I_F$ = -10A, di/dt = 100A/µs |
| Reverse Recovery Charge | $Q_{RR}$ | — | 47 | — | nC | $I_F$ = -10A, di/dt = 100A/µs |

Notes:
5. $R_{\theta JA}$ is determined with the device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate. $R_{\theta JC}$ is guaranteed by design while $R_{\theta JA}$ is determined by the user's board design.
6. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
7. .UIS in production with L =0.1mH, $T_J$ = +25°C
8. Short duration pulse test used to minimize self-heating effect.
9. Guaranteed by design. Not subject to product testing.


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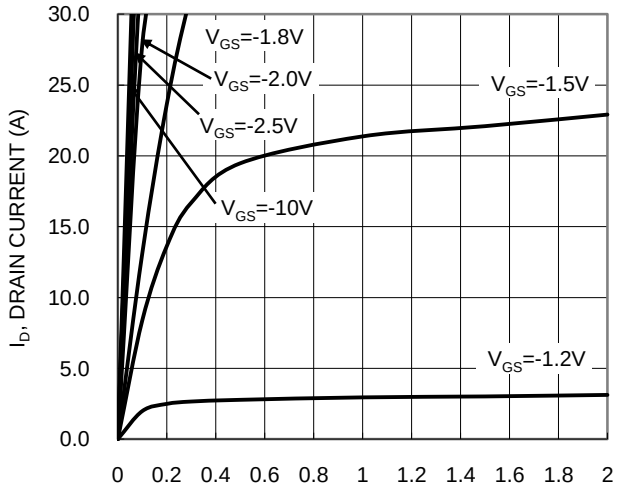


Figure 1. Typical Output Characteristic

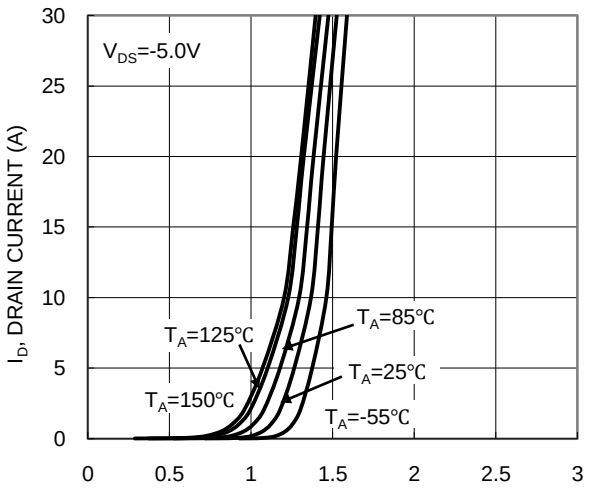


Figure 2. Typical Transfer Characteristic

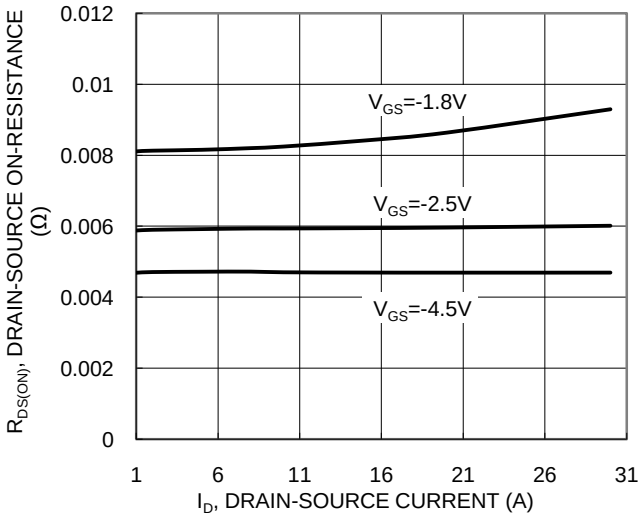


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

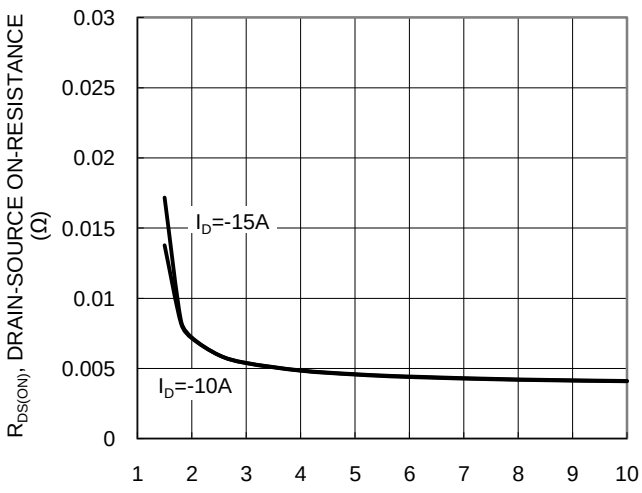


Figure 4. Typical Transfer Characteristic

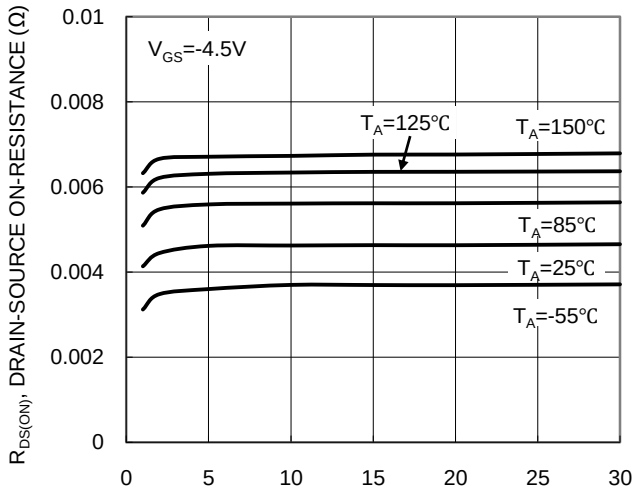


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

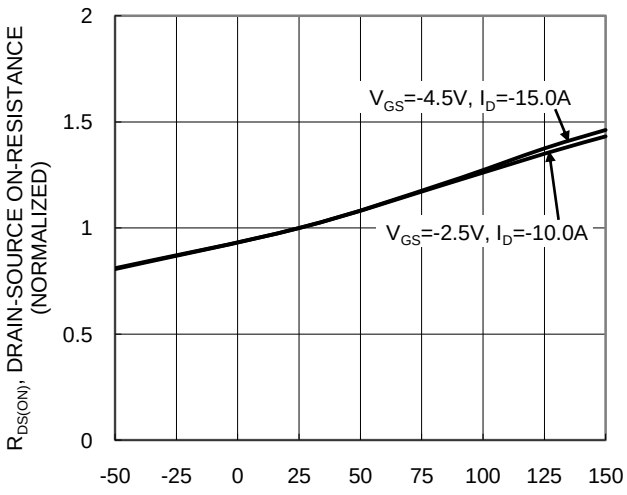


Figure 6. On-Resistance Variation with Temperature


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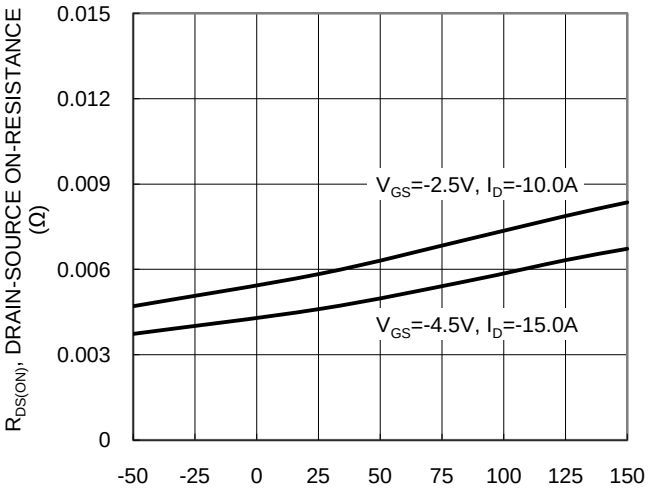



Figure 7. On-Resistance Variation with Temperature

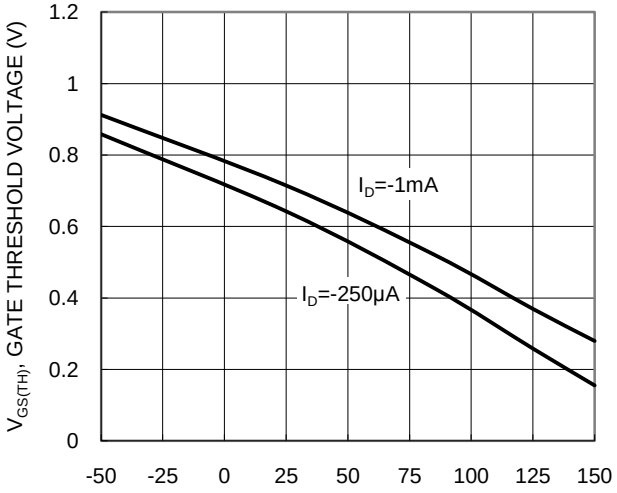



Figure 8. Gate Threshold Variation vs. Junction Temperature

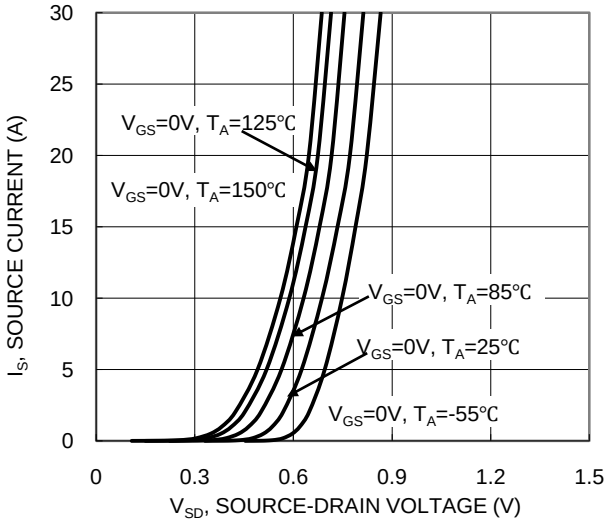



Figure 9. Diode Forward Voltage vs. Current

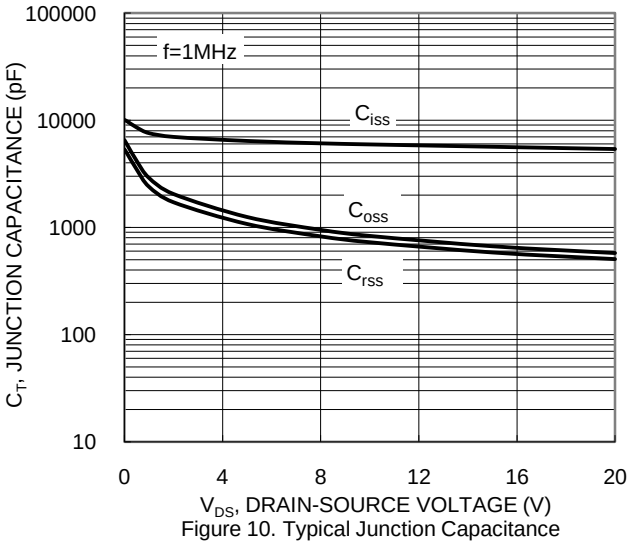



Figure 10. Typical Junction Capacitance

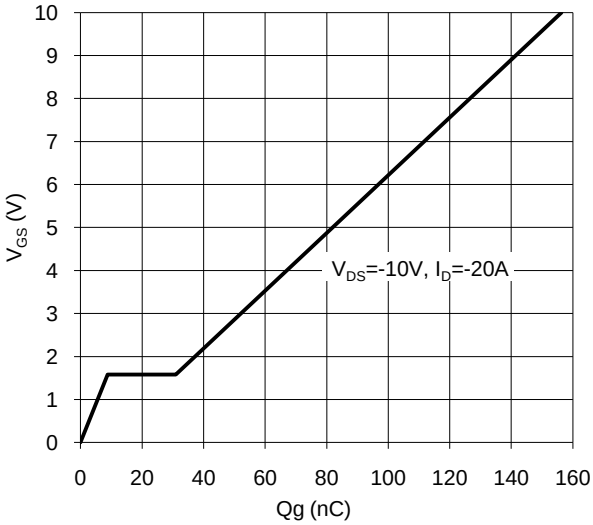



Figure 11. Gate Charge

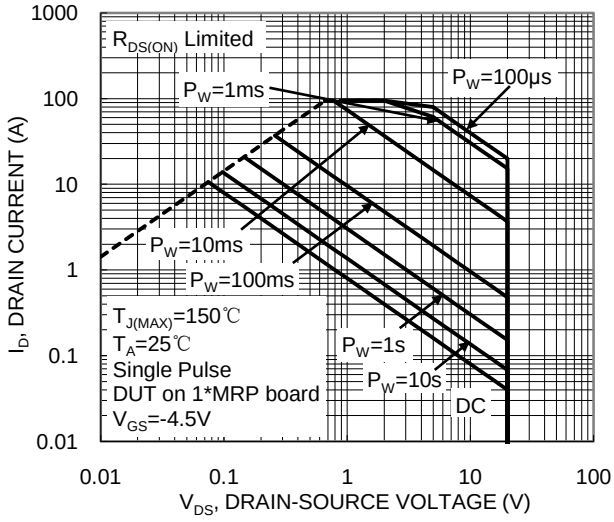



Figure 12. SOA, Safe Operation Area


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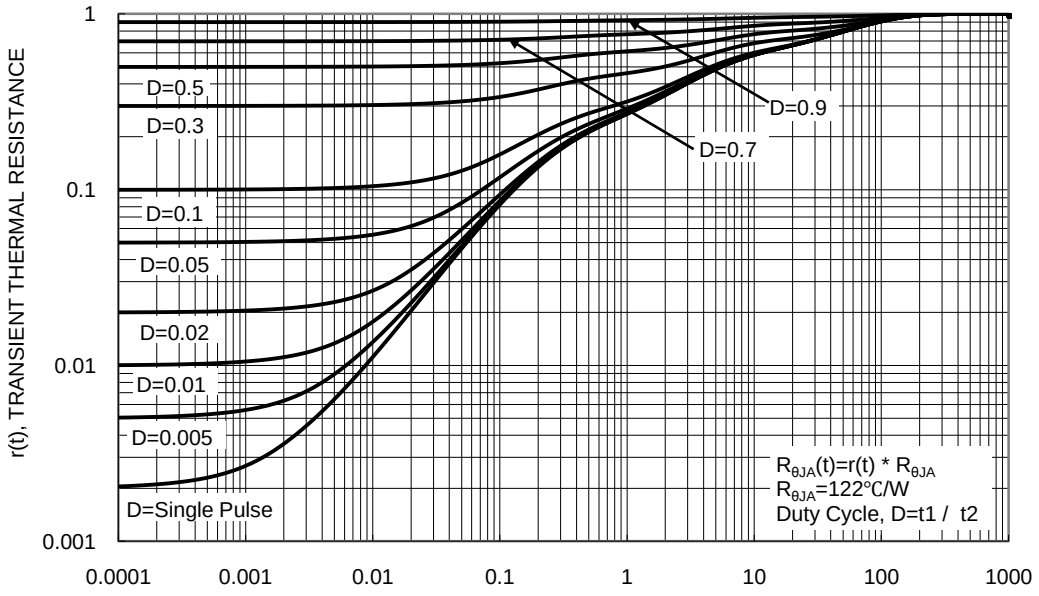
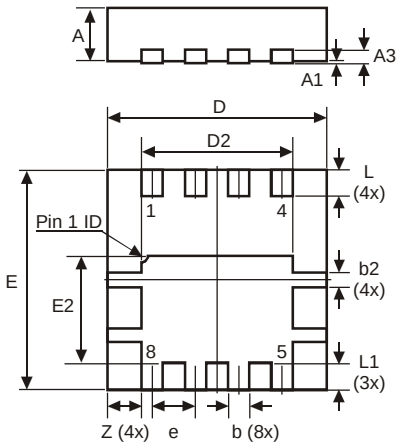



Figure 13. Transient Thermal Resistance

## Package Outline Dimensions

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



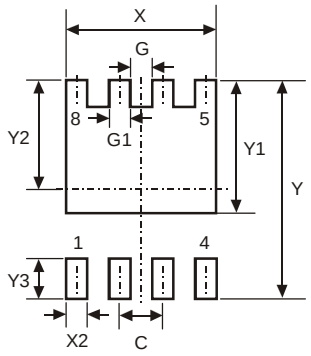

| POWERDI3333-8 | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **D** | 3.25 | 3.35 | 3.30 |
| **E** | 3.25 | 3.35 | 3.30 |
| **D2** | 2.22 | 2.32 | 2.27 |
| **E2** | 1.56 | 1.66 | 1.61 |
| **A** | 0.75 | 0.85 | 0.80 |
| **A1** | 0 | 0.05 | 0.02 |
| **A3** | – | – | 0.203 |
| **b** | 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** | | | |


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## 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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