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Lead-free Green

# DMP2040UND

## DUAL P-CHANNEL ENHANCEMENT MODE MOSFET

## Product Summary

| $BV_{DSS}$ | $R_{DS(ON)}$ Max | $I_D$ $T_A$ = +25°C |
|---|---|---|
| -20V | 36mΩ @ $V_{GS}$ = -4.5V | -5.3A |
| | 60mΩ @ $V_{GS}$ = -2.5V | -3.9A |

## Description

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

## Applications

- Backlighting
- Power Management Functions
- DC-DC Converters

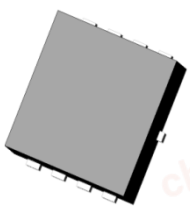
## Features

- Dual P-Channel MOSFET
- Low On-Resistance
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please contact us or your local Diodes representative.**
  **https://www.diodes.com/quality/product-definitions/**

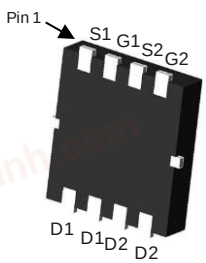
## Mechanical Data

- 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
- Terminals Connections Indicator: See Diagram
- Terminals: Finish - Matte Tin Annealed over Copper Lead Frame. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.072 grams (Approximate)

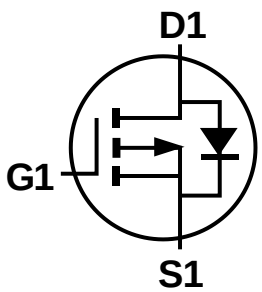
POWERDI3333-8 (Type UXB)



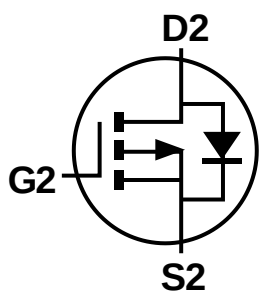
Top View




Bottom View




P-Channel MOSFET



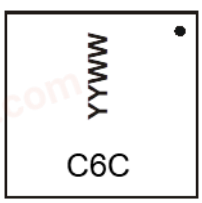

P-Channel MOSFET

## Ordering Information (Note 4)

| Part Number | Case | Packaging |
|---|---|---|
| DMP2040UND-7 | POWERDI3333-8 (Type UXB) | 2000/Tape & Reel |
| DMP2040UND-13 | POWERDI3333-8 (Type UXB) | 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




C6C = Product Type Marking Code
YYWW = Date Code Marking
YY = Last Two Digits of Year (ex: 20 for 2020)
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 | | | $V_{GSS}$ | ±12 | V |
| Continuous Drain Current (Note 6) $V_{GS}$ = -4.5V | Steady State | $T_A$ = +25°C<br>$T_A$ = +70°C | $I_D$ | -5.3<br>-4.2 | A |
| Continuous Drain Current (Note 7) $V_{GS}$ = -4.5V | Steady State | $T_C$ = +25°C<br>$T_C$ = +70°C | $I_D$ | -13.6<br>-10.9 | A |
| Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%) | | | $I_{DM}$ | -25 | A |
| Continuous Source-Drain Diode Current (Note 6) | | | $I_S$ | -1.9 | A |
| Avalanche Current (Note 8) L = 0.1mH | | | $I_{AS}$ | -19 | A |
| Avalanche Energy (Note 8) L = 0.1mH | | | $E_{AS}$ | 18 | mJ |

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

| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Total Power Dissipation (Note 5) | $T_A$ = +25°C | $P_D$ | 0.9 | W |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady State | $R_{\theta JA}$ | 148 | °C/W |
| Total Power Dissipation (Note 6) | $T_A$ = +25°C | $P_D$ | 1.4 | W |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady State | $R_{\theta JA}$ | 88 | °C/W |
| Thermal Resistance, Junction to Case (Note 7) | Steady State | $R_{\theta JC}$ | 13.2 | °C/W |
| 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 9)** | | | | | | |
| 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 | $V_{GS}$ = ±12V, $V_{DS}$ = 0V |
| **ON CHARACTERISTICS (Note 9)** | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | -0.6 | — | -1.5 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = -250µA |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | — | 28 | 36 | mΩ | $V_{GS}$ = -4.5V, $I_D$ = -8.9A |
| | | — | 38 | 60 | | $V_{GS}$ = -2.5V, $I_D$ = -6.9A |
| Diode Forward Voltage | $V_{SD}$ | — | -0.7 | -1.2 | V | $V_{GS}$ = 0V, $I_S$ = -2.9A |
| **DYNAMIC CHARACTERISTICS (Note 10)** | | | | | | |
| Input Capacitance | $C_{iss}$ | — | 834 | — | pF | $V_{DS}$ = -10V, $V_{GS}$ = 0V, f = 1.0MHz |
| Output Capacitance | $C_{oss}$ | — | 133 | — | | |
| Reverse Transfer Capacitance | $C_{rss}$ | — | 105 | — | | |
| Gate Resistance | $R_g$ | — | 4.9 | — | Ω | $V_{DS}$ = 0V, $V_{GS}$ = 0V, f = 1.0MHz |
| Total Gate Charge ($V_{GS}$ = -4.5V) | $Q_g$ | — | 9.6 | — | nC | $V_{DS}$ = -6V, $I_D$ = -8.9A |
| Total Gate Charge ($V_{GS}$ = -10V) | $Q_g$ | — | 20 | — | | |
| Gate-Source Charge | $Q_{gs}$ | — | 1.1 | — | | |
| Gate-Drain Charge | $Q_{gd}$ | — | 2.6 | — | | |
| Turn-On Delay Time | $t_{D(ON)}$ | — | 14.6 | — | ns | $V_{DD}$ = -6V, $R_L$ = 6Ω<br>$V_{GS}$ = -4.5V, $R_g$ = 6Ω, $I_D$ = -1A |
| Turn-On Rise Time | $t_R$ | — | 5.5 | — | | |
| Turn-Off Delay Time | $t_{D(OFF)}$ | — | 38.7 | — | | |
| Turn-Off Fall Time | $t_F$ | — | 18.3 | — | | |
| Body Diode Reverse Recovery Time | $t_{RR}$ | — | 9.8 | — | ns | $I_F$ = -8.9A, di/dt = -100A/µs |
| Body Diode Reverse Recovery Charge | $Q_{RR}$ | — | 2.7 | — | nC | $I_F$ = -8.9A, di/dt = -100A/µs |

Notes:
5. Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.
6. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate.
7. Thermal resistance from junction to soldering point (on the exposed drain pad).
8. $I_{AS}$ and $E_{AS}$ ratings are based on low frequency and duty cycles to keep $T_J$ = +25°C.
9. Short duration pulse test used to minimize self-heating effect.
10. Guaranteed by design. Not subject to product testing.


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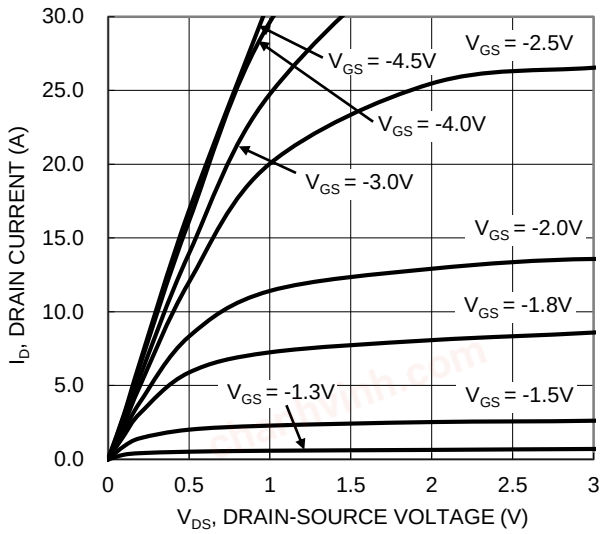



Figure 1.Typical Output Characteristic

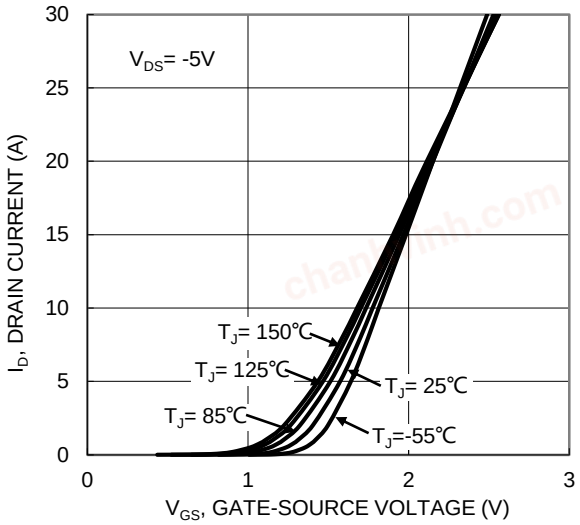



Figure 2. Typical Transfer Characteristic

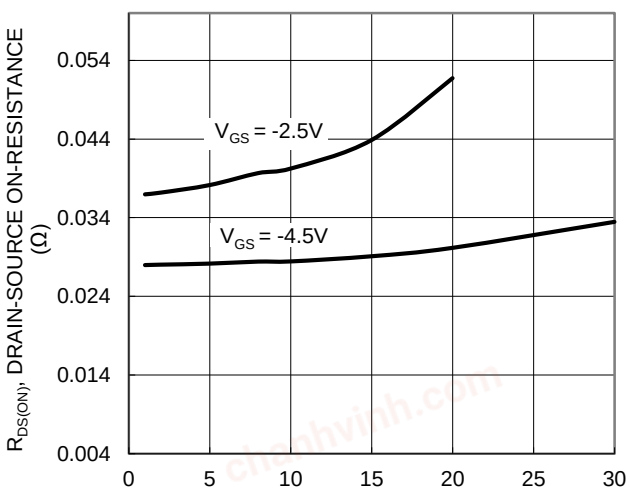



Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

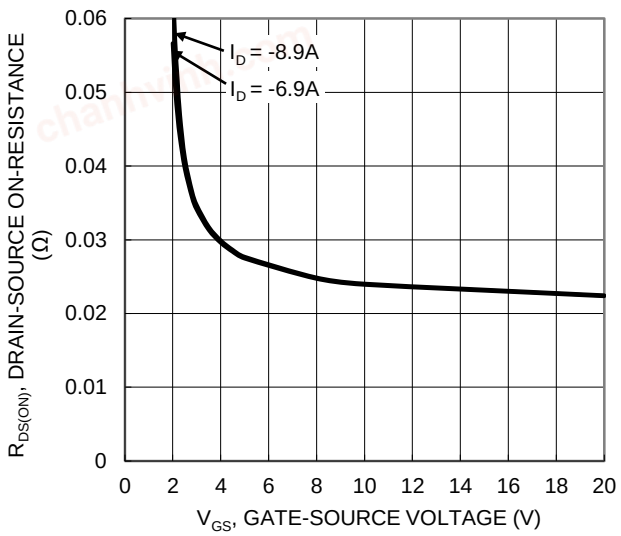



Figure 4. Typical Transfer Characteristic

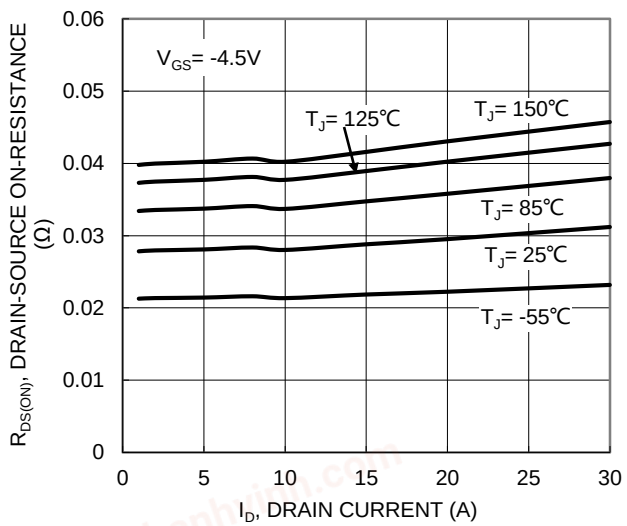



Figure 5. Typical On-Resistance vs. Drain Current and Temperature

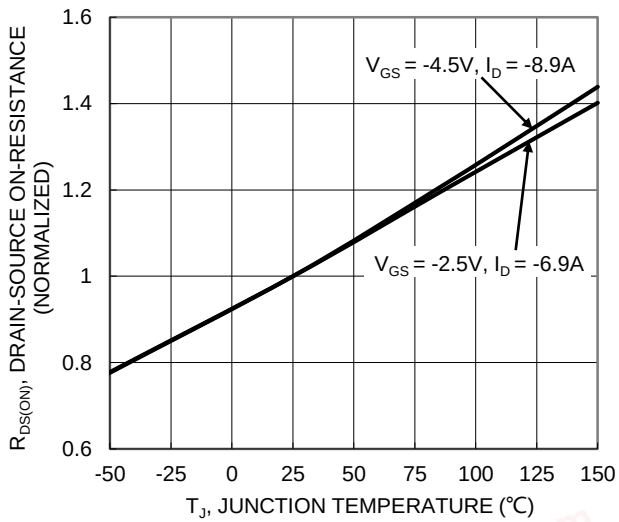



Figure 6. On-Resistance Variation with Temperature


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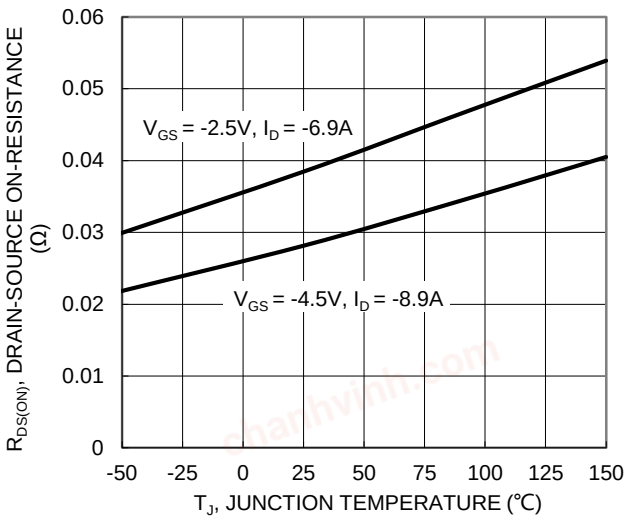



Figure 7. On-Resistance Variation with Temperature

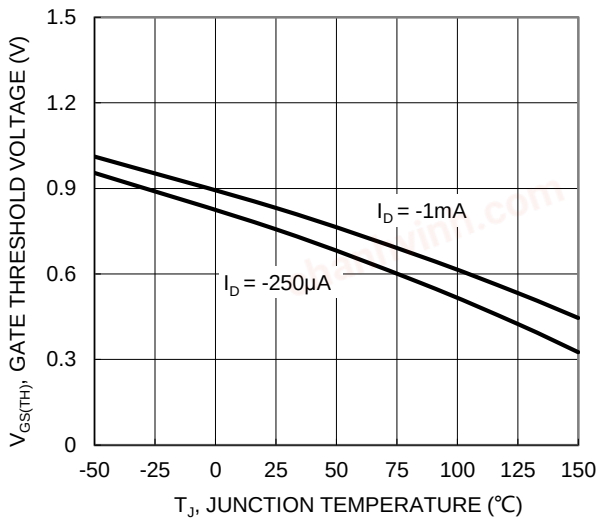



Figure 8. Gate Threshold Variation vs. JunctionTemperature

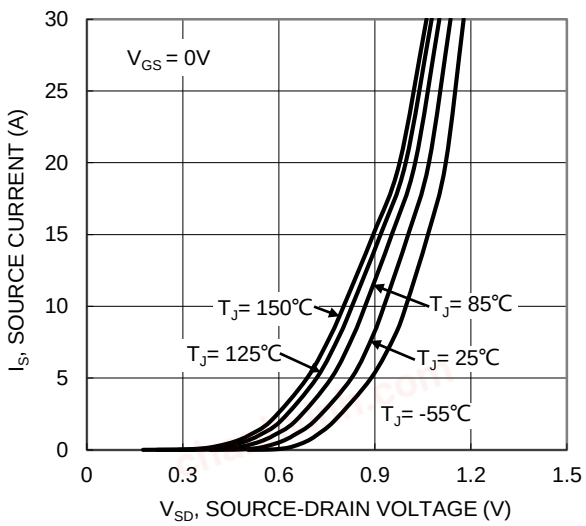



Figure 9. Diode Forward Voltage vs. Current

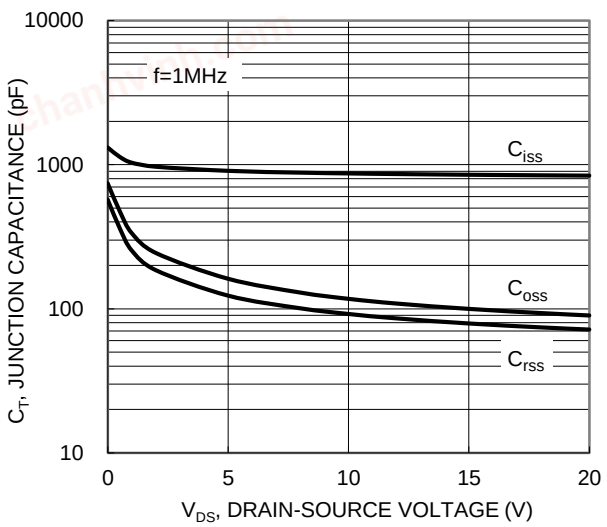



Figure 10. Typical Junction Capacitance

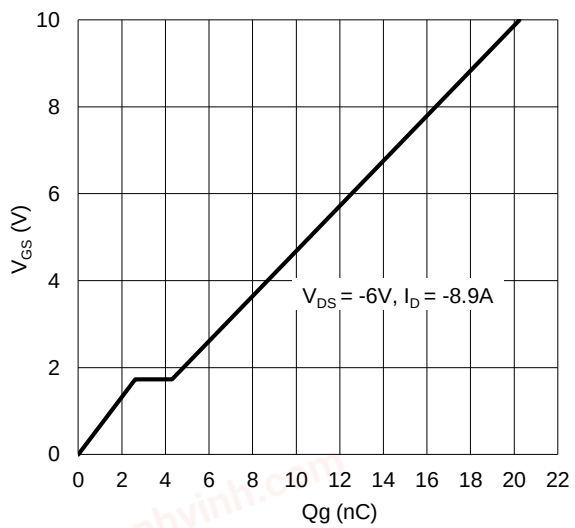



Figure 11. Gate Charge

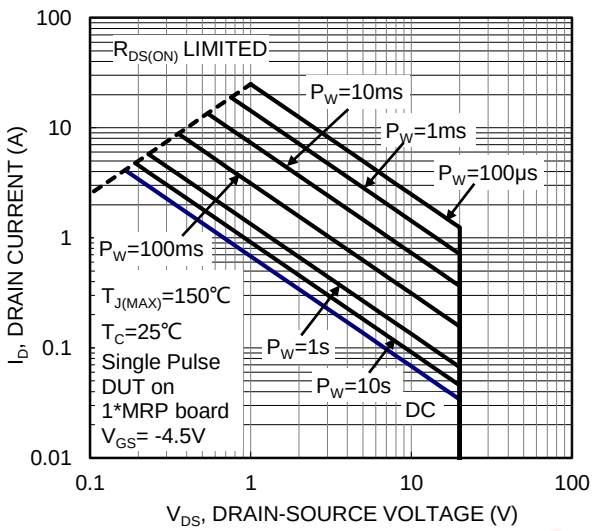



Figure 12. SOA, Safe Operation Area


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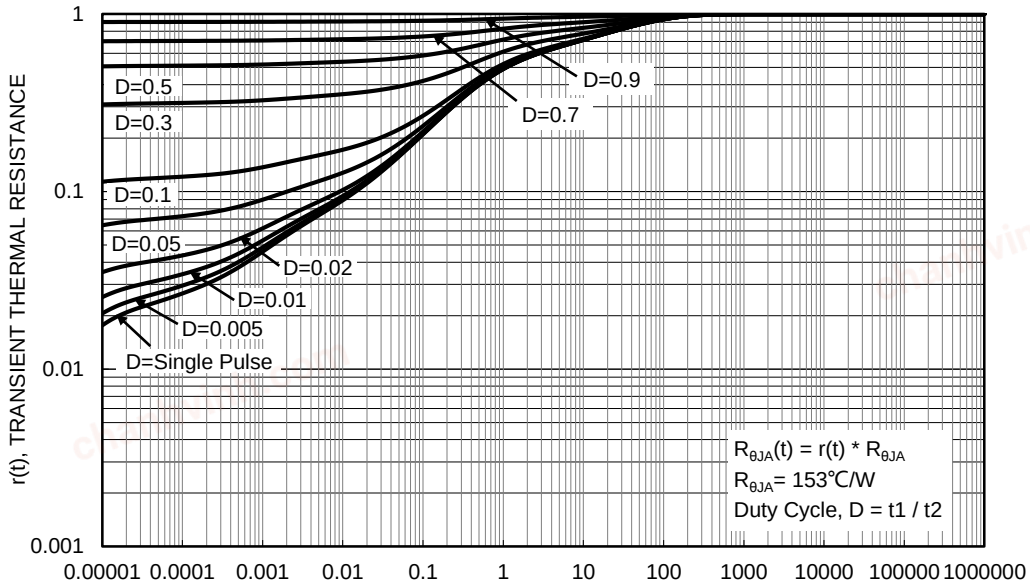



Figure 13. Transient Thermal Resistance


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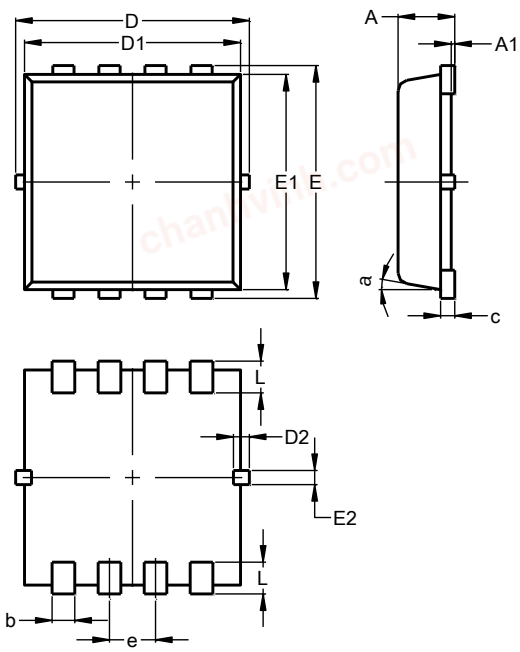
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## Package Outline Dimensions

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

**POWERDI3333-8**
**(Type UXB)**

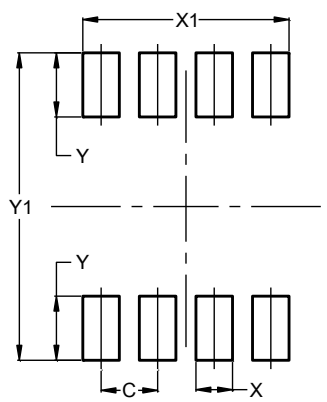



| POWERDI3333-8 (Type UXB) | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 0.75 | 0.85 | 0.80 |
| **A1** | 0.00 | 0.05 | -- |
| **b** | 0.25 | 0.40 | 0.32 |
| **c** | 0.10 | 0.25 | 0.15 |
| **D** | 3.20 | 3.40 | 3.30 |
| **D1** | 2.95 | 3.15 | 3.05 |
| **D2** | 0.10 | 0.35 | 0.23 |
| **E** | 3.20 | 3.40 | 3.30 |
| **E1** | 2.95 | 3.15 | 3.05 |
| **E2** | 0.10 | 0.30 | 0.20 |
| **e** | – | – | 0.65 |
| **L** | 0.35 | 0.55 | 0.45 |
| **a** | 0° | 12° | 10° |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout

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

**POWERDI3333-8**
**(Type UXB)**




| Dimensions | Value (in mm) |
|---|---|
| **C** | 0.650 |
| **X** | 0.420 |
| **X1** | 2.370 |
| **Y** | 0.730 |
| **Y1** | 3.500 |


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