

## Product Summary

| BV <sub>DSS</sub> | R <sub>DS(ON)</sub> Max        | I <sub>D</sub> Max<br>T <sub>A</sub> = +25°C |
|-------------------|--------------------------------|--|
| -40V              | 13mΩ @ V <sub>GS</sub> = -10V  | -10.3A                                       |
|                   | 18mΩ @ V <sub>GS</sub> = -4.5V | -8.8A  |

## 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:

- Reverse-polarity protections
- Power-management functions
- DC-DC converters

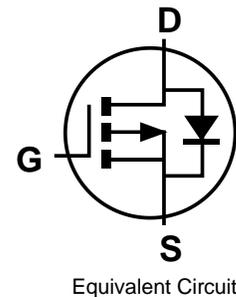
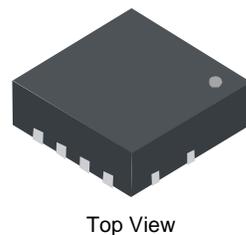
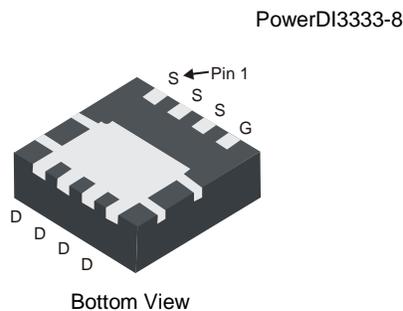
## Features and Benefits

- Low R<sub>DS(ON)</sub> – Ensures On-State Losses are Minimized
- Small Form Factor Thermally Efficient Package Enables Higher Density End Products
- Occupies 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)**
- **The DMP4013LFGQ 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

- 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
- Weight: 0.034 grams (Approximate)



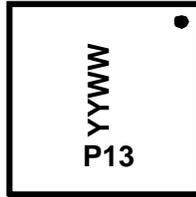
## Ordering Information (Note 4)

| Part Number    | Package       | Packing |             |
|----------------|---------------|---------|-------------|
|                |               | Qty.    | Carrier     |
| DMP4013LFGQ-7  | PowerDI3333-8 | 2000    | Tape & Reel |
| DMP4013LFGQ-13 | PowerDI3333-8 | 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/>.

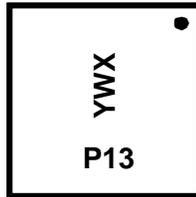
## Marking Information

Site 1



P13 = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Last Two Digits of Year (ex: 23 = 2023)  
 WW = Week Code (01 to 53)

Site2



P13 = Product Type Marking Code  
 YWX = Date Code Marking  
 Y = Year (ex: 3 = 2023)  
 W = Week (ex: a = Week 27; z Represents Week 52 and 53)  
 X = Internal Code (ex: U = Monday)

## Maximum Ratings (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic   |              |  | Symbol           | Value         | Units |
|--|--------------|--|------------------|---------------|-------|
| Drain-Source Voltage                                     |              |  | V <sub>DSS</sub> | -40           | 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>   | -10.3<br>-8.3 | A     |
|  | t < 10s      | T <sub>A</sub> = +25°C<br>T <sub>A</sub> = +70°C | I <sub>D</sub>   | -13.7<br>-11  | A     |
| Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)       |              |  | I <sub>DM</sub>  | -80           | A     |
| Maximum Continuous Body Diode Forward Current (Note 6)   |              |  | I <sub>S</sub>   | -10.3         | A     |
| Avalanche Current, L = 0.1mH                             |              |  | I <sub>AS</sub>  | -34           | A     |
| Avalanche Energy, L = 0.1mH                              |              |  | E <sub>AS</sub>  | 58            | mJ    |

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

| Characteristic                                   |              |  | Symbol                            | Value       | Units |
|--|--------------|--|-----------------------------------|-------------|-------|
| Total Power Dissipation (Note 5)                 |              |  | P <sub>D</sub>                    | 1           | W     |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady State |  | R <sub>θJA</sub>                  | 123         | °C/W  |
|  | t < 10s      |  |                                   | 69          |       |
| Total Power Dissipation (Note 6)                 |              |  | P <sub>D</sub>                    | 2.1         | W     |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady State |  | R <sub>θJA</sub>                  | 60          | °C/W  |
|  | t < 10s      |  |                                   | 34          |       |
| Thermal Resistance, Junction to Case (Note 6)    |              |  | R <sub>θJC</sub>                  | 3.3         |       |
| Operating and Storage Temperature Range          |              |  | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C    |

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.

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

| Characteristic   | Symbol              | Min | Typ  | Max  | Unit | Test Condition   |
|--|---------------------|-----|------|------|------|--|
| <b>OFF CHARACTERISTICS</b> (Note 7)                    |                     |     |      |      |      |  |
| Drain-Source Breakdown Voltage                         | BV <sub>DSS</sub>   | -40 | —    | —    | 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> = -40V, 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</b> (Note 7)                     |                     |     |      |      |      |  |
| 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> | —   | 9.4  | 13   | mΩ   | V <sub>GS</sub> = -10V, I <sub>D</sub> = -10A  |
|  |                     | —   | 12.3 | 18   |      | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -8A  |
| 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</b> (Note 8)                |                     |     |      |      |      |  |
| Input Capacitance                                      | C <sub>ISS</sub>    | —   | 3426 | —    | pF   | V <sub>DS</sub> = -20V, V <sub>GS</sub> = 0V,<br>f = 1MHz                                      |
| Output Capacitance                                     | C <sub>OSS</sub>    | —   | 283  | —    | pF   |  |
| Reverse Transfer Capacitance                           | C <sub>RSS</sub>    | —   | 235  | —    | pF   |  |
| Gate Resistance  | R <sub>g</sub>      | —   | 4.7  | —    | 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>      | —   | 32.5 | —    | nC   | V <sub>DS</sub> = -20V, I <sub>D</sub> = -10A  |
| Total Gate Charge (V <sub>GS</sub> = -10V)             | Q <sub>g</sub>      | —   | 68.6 | —    | nC   |  |
| Gate-Source Charge                                     | Q <sub>gs</sub>     | —   | 8.2  | —    | nC   |  |
| Gate-Drain Charge                                      | Q <sub>gd</sub>     | —   | 9.9  | —    | nC   |  |
| Turn-On Delay Time                                     | t <sub>D(ON)</sub>  | —   | 5.3  | —    | ns   | V <sub>DD</sub> = -20V, V <sub>GEN</sub> = -10V,<br>R <sub>G</sub> = 3Ω, I <sub>D</sub> = -10A |
| Turn-On Rise Time                                      | t <sub>r</sub>      | —   | 20   | —    | ns   |  |
| Turn-Off Delay Time                                    | t <sub>D(OFF)</sub> | —   | 126  | —    | ns   |  |
| Turn-Off Fall Time                                     | t <sub>f</sub>      | —   | 83   | —    | ns   |  |
| Body Diode Reverse-Recovery Time                       | t <sub>RR</sub>     | —   | 19.5 | —    | ns   | I <sub>F</sub> = -10A, di/dt = 100A/μs   |
| Body Diode Reverse-Recovery Charge                     | Q <sub>RR</sub>     | —   | 9.8  | —    | nC   |  |

Notes: 7. Short duration pulse test used to minimize self-heating effect.  
8. Guaranteed by design. Not subject to product testing.

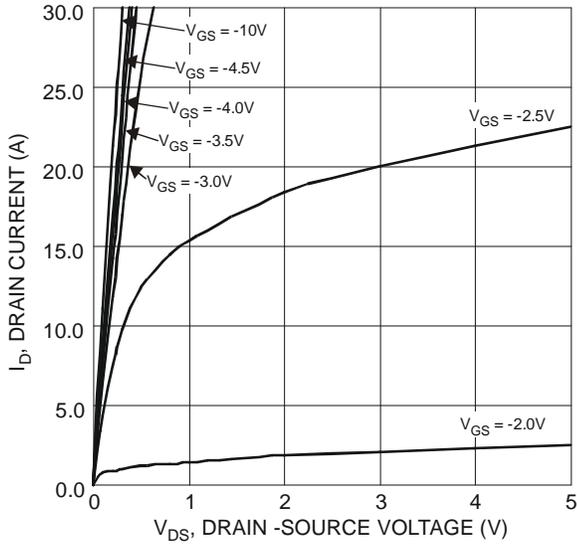


Figure 1 Typical Output Characteristics

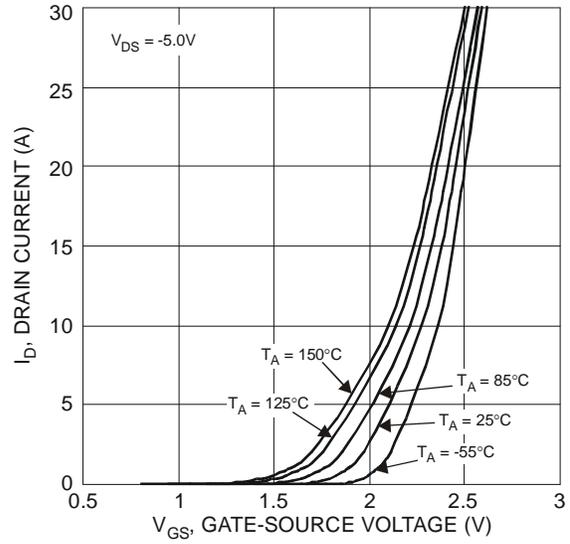


Figure 2 Typical Transfer Characteristics

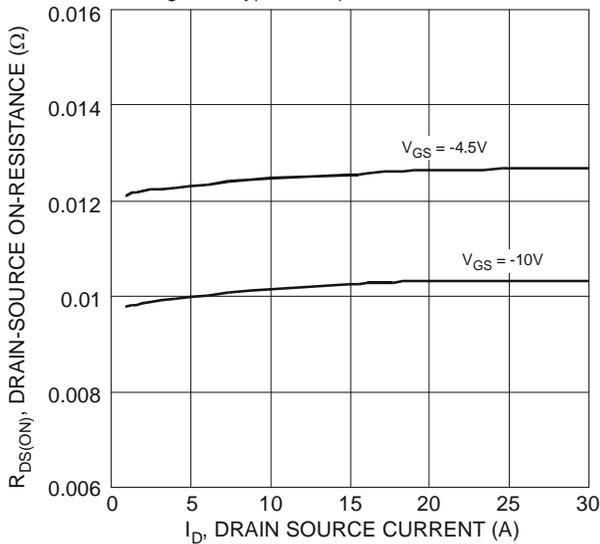


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

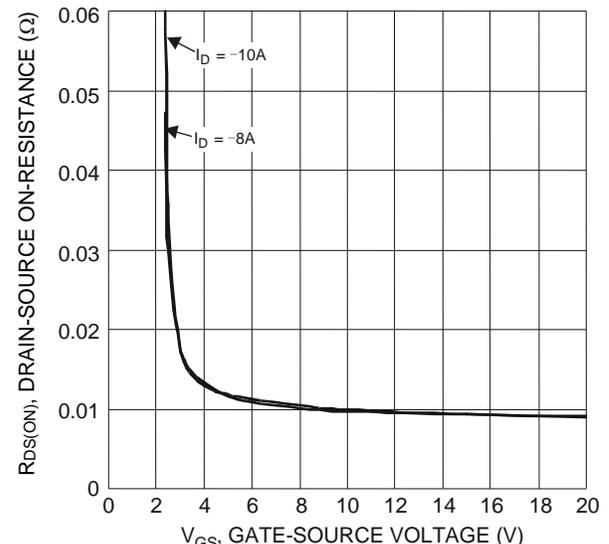


Figure 4 Typical Transfer Characteristics

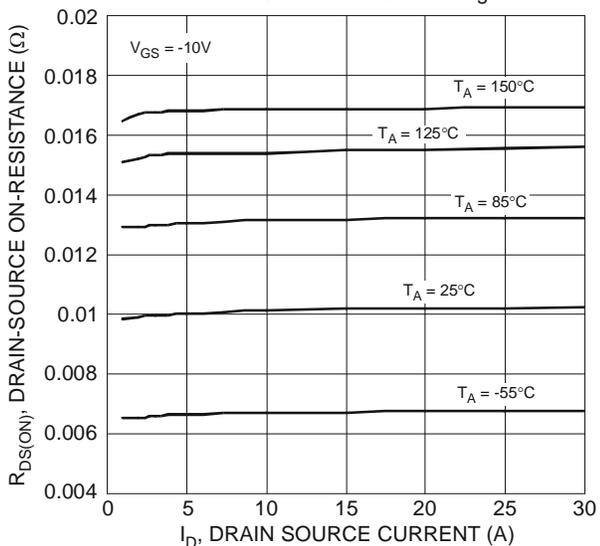


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

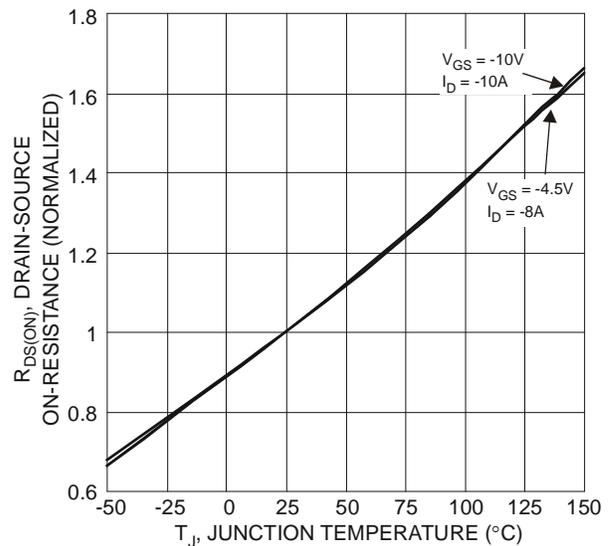


Figure 6 On-Resistance Variation with Temperature

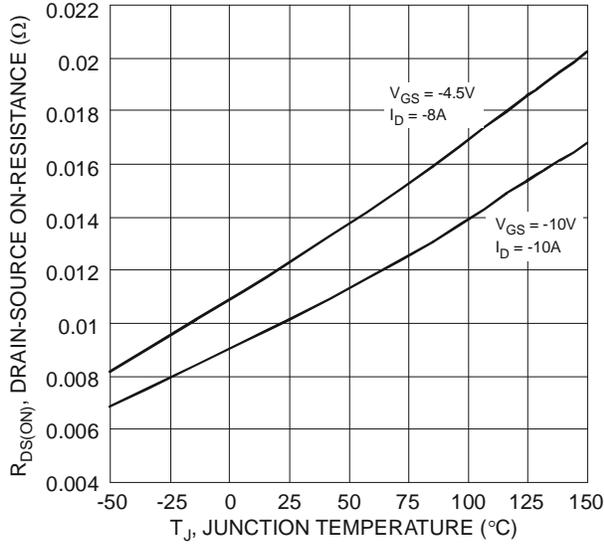


Figure 7 On-Resistance Variation with Temperature

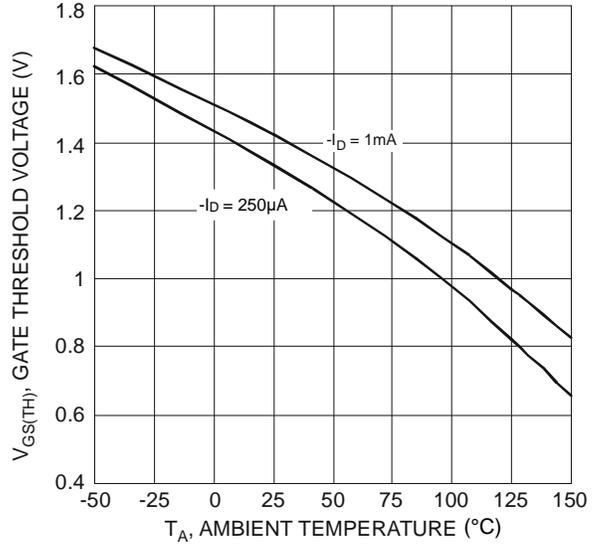


Figure 8 Gate Threshold Variation vs. Ambient Temperature

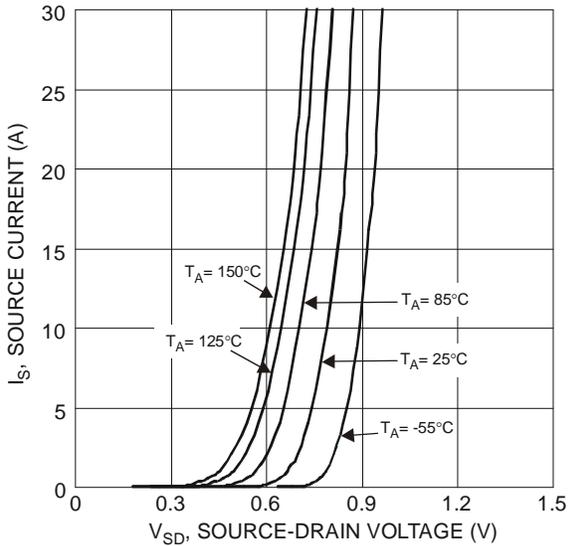


Figure 9 Diode Forward Voltage vs. Current

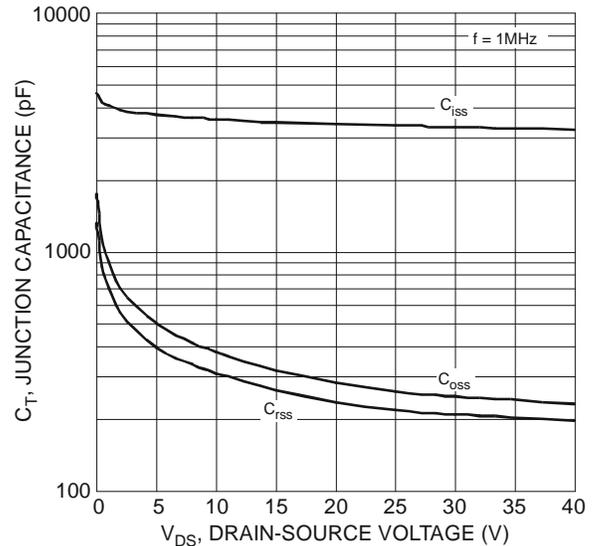


Figure 10 Typical Junction Capacitance

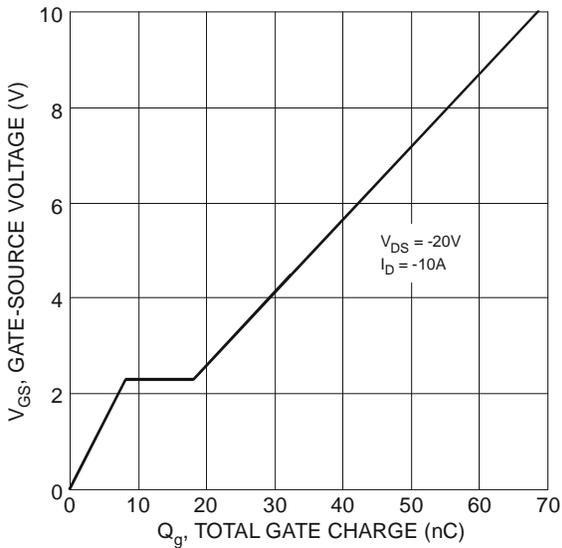


Figure 11 Gate-Charge Characteristics

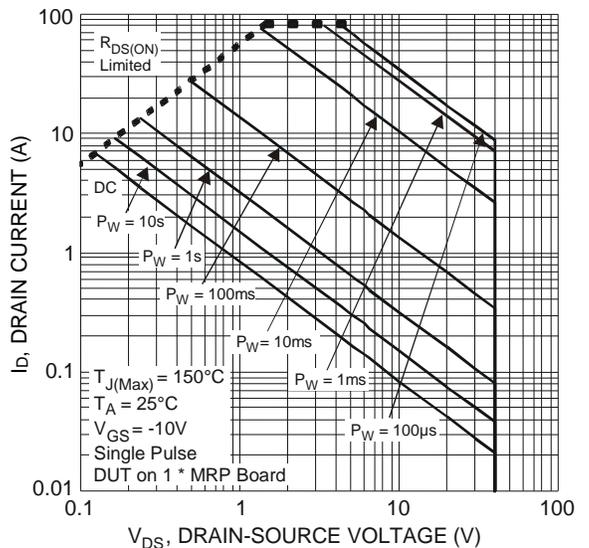


Figure 12 SOA, Safe Operation Area

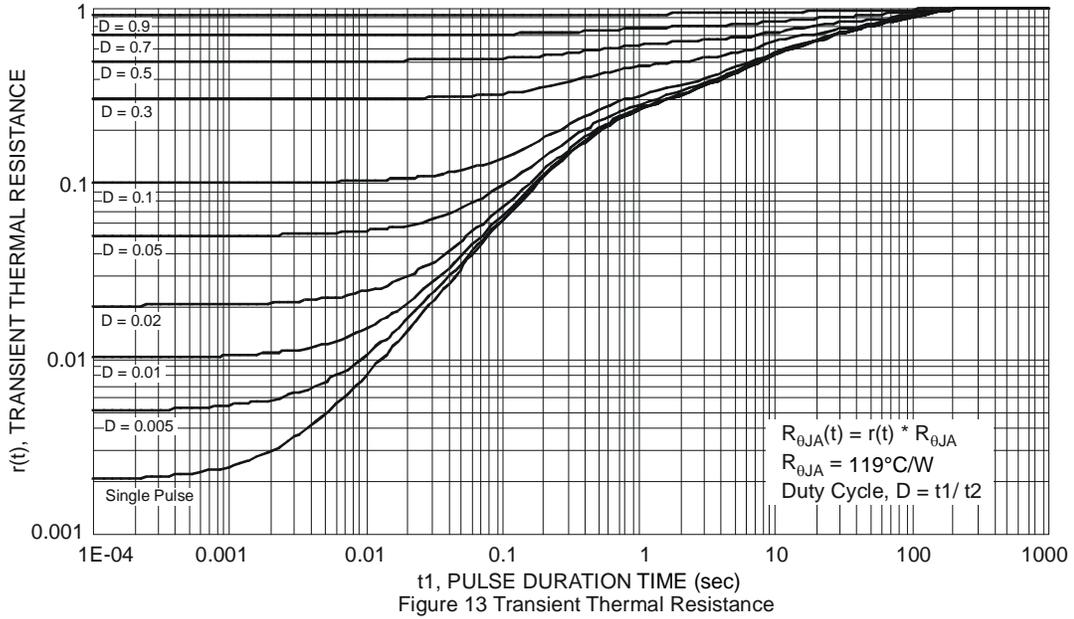
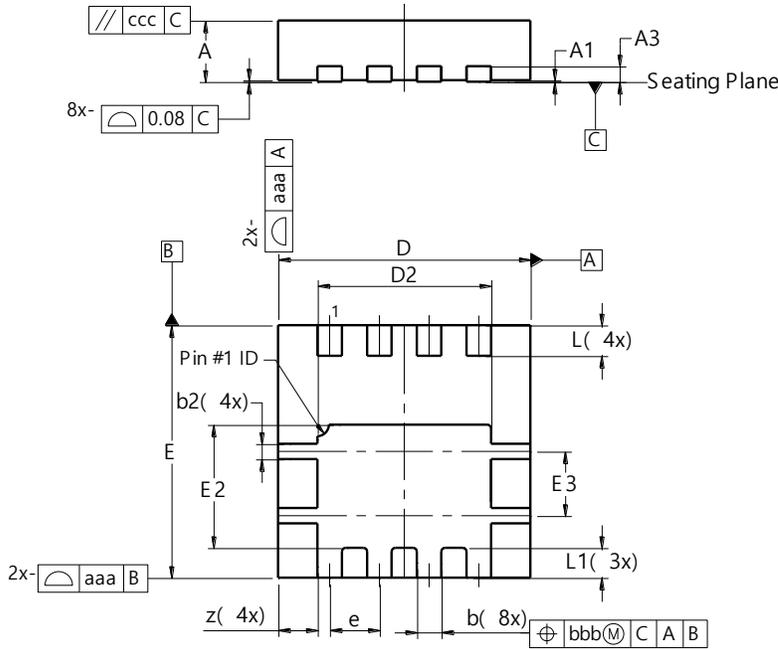


Figure 13 Transient Thermal Resistance

**Package Outline Dimensions**

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

**PowerDI3333-8**

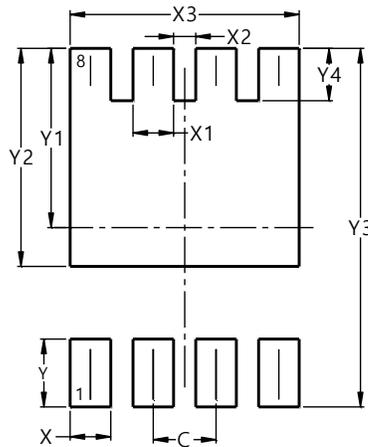


| PowerDI3333-8        |      |      |       |
|----------------------|------|------|-------|
| Dim                  | Min  | Max  | Typ   |
| A                    | 0.75 | 0.85 | 0.80  |
| A1                   | 0.00 | 0.05 | 0.02  |
| A3                   | -    | -    | 0.203 |
| b                    | 0.27 | 0.37 | 0.32  |
| b2                   | -    | -    | 0.20  |
| D                    | 3.25 | 3.35 | 3.30  |
| D2                   | 2.22 | 2.32 | 2.27  |
| E                    | 3.25 | 3.35 | 3.30  |
| E2                   | 1.56 | 1.66 | 1.61  |
| E3                   | 0.79 | 0.89 | 0.84  |
| e                    | -    | -    | 0.65  |
| L                    | 0.35 | 0.45 | 0.40  |
| L1                   | -    | -    | 0.39  |
| z                    | -    | -    | 0.515 |
| aaa                  | 0.25 |      |       |
| bbb                  | 0.10 |      |       |
| ccc                  | 0.10 |      |       |
| All Dimensions in mm |      |      |       |

**Suggested Pad Layout**

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

**PowerDI3333-8**



| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 0.650         |
| X          | 0.420         |
| X1         | 0.420         |
| X2         | 0.230         |
| X3         | 2.370         |
| Y          | 0.700         |
| Y1         | 1.850         |
| Y2         | 2.250         |
| Y3         | 3.700         |
| Y4         | 0.540         |

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