



YOUSHANG SEMICONDUCTOR

**设计研发新型功率器件**

**各类小信号开关**

**中低压及高压大电流等场效应管**

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企业微信二维码



企业QQ二维码

## Product Summary

| BV <sub>DSS</sub> | R <sub>DS(ON)</sub> Max       | I <sub>D</sub> Max<br>T <sub>c</sub> = +25°C |
|-------------------|-------------------------------|--|
| 40V               | 7.5mΩ @ V <sub>GS</sub> = 10V | 49.1A  |

## Features and Benefits

- Excellent Q<sub>GD</sub> × R<sub>DS(ON)</sub> Product (FOM)
- Low R<sub>DS(ON)</sub> – Ensures On-State Losses are Minimized
- 100% Unclamped Inductive Switching, Test in Production – Ensures More Reliable and Robust End Application
- Wettable Flank for Improved Optical Inspection

## Description and Applications

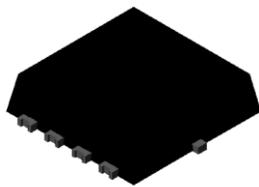
This new generation MOSFET is designed to minimize the on-state resistance (R<sub>DS(ON)</sub>) yet maintain superior switching performance, making it ideal for high-efficiency power-management applications.

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

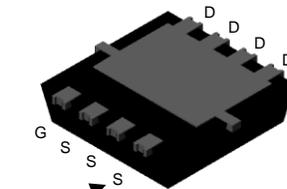
## Mechanical Data

- 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 Finish - Matte Tin Annealed over Copper Leadframe; Solderable per MIL-STD-202, Method 208 Ⓔ3
- Weight: 0.025 grams (Approximate)

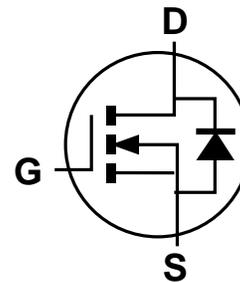
PowerDI3333-8/SWP (Type UX)



Top View



Bottom View



Equivalent Circuit

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

| Characteristic  | Symbol           | Value                  | Unit |   |
|---|------------------|------------------------|------|---|
| 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        | I <sub>D</sub>   | T <sub>C</sub> = +25°C | 49.1 | A |
|   |                  | T <sub>C</sub> = +70°C | 39.2 |   |
| Continuous Drain Current (Note 5), V <sub>GS</sub> = 10V        | I <sub>D</sub>   | T <sub>A</sub> = +25°C | 15.4 | A |
|   |                  | T <sub>A</sub> = +70°C | 12.3 |   |
| Pulsed Drain Current (10μs Pulse, Duty Cycle = 1%)              | I <sub>DM</sub>  | 196                    | A    |   |
| Maximum Continuous Body Diode Forward Current (Note 6)          | I <sub>S</sub>   | 30.8                   | A    |   |
| Pulsed Body Diode Forward Current (10μs Pulse, Duty Cycle = 1%) | I <sub>SM</sub>  | 196                    | A    |   |
| Avalanche Current, L = 0.1mH                                    | I <sub>AS</sub>  | 24.7                   | A    |   |
| Avalanche Energy, L = 0.1mH                                     | E <sub>AS</sub>  | 30.5                   | mJ   |   |

## Thermal Characteristics

| Characteristic                                   | Symbol                            | Value                  | Unit |   |
|--|-----------------------------------|------------------------|------|---|
| Total Power Dissipation (Note 5)                 | P <sub>D</sub>                    | T <sub>A</sub> = +25°C | 2.67 | W |
| Thermal Resistance, Junction to Ambient (Note 5) |                                   | R <sub>θJA</sub>       | 46.5 |   |
| Total Power Dissipation (Note 6)                 | P <sub>D</sub>                    | T <sub>C</sub> = +25°C | 27.1 | W |
| Thermal Resistance, Junction to Case (Note 6)    |                                   | R <sub>θJC</sub>       | 4.61 |   |
| 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 7)</b>     |                     |     |      |      |      |  |
| 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         | I <sub>DSS</sub>    | —   | —    | 1    | μA   | V <sub>DS</sub> = 32V, 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> | 2   | 2.5  | 4    | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                                 |
| Static Drain-Source On-Resistance       | R <sub>DS(ON)</sub> | —   | 5.9  | 7.5  | mΩ   | V <sub>GS</sub> = 10V, I <sub>D</sub> = 20A  |
| Diode Forward Voltage                   | V <sub>SD</sub>     | —   | 0.88 | 1.2  | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = 20A   |
| <b>DYNAMIC CHARACTERISTICS (Note 8)</b> |                     |     |      |      |      |  |
| Input Capacitance                       | C <sub>iss</sub>    | —   | 897  | —    | pF   | V <sub>DS</sub> = 20V, V <sub>GS</sub> = 0V,<br>f = 1MHz                                   |
| Output Capacitance                      | C <sub>oss</sub>    | —   | 530  | —    |      |  |
| Reverse Transfer Capacitance            | C <sub>rss</sub>    | —   | 12.4 | —    |      |  |
| Gate Resistance                         | R <sub>g</sub>      | —   | 2.07 | —    | Ω    | V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz                                       |
| Total Gate Charge                       | Q <sub>g</sub>      | —   | 12.1 | —    | nC   | V <sub>DS</sub> = 20V, I <sub>D</sub> = 20A, V <sub>GS</sub> = 10V                         |
| Gate-Source Charge                      | Q <sub>gs</sub>     | —   | 2.0  | —    |      |  |
| Gate-Drain Charge                       | Q <sub>gd</sub>     | —   | 1.9  | —    |      |  |
| Turn-On Delay Time                      | t <sub>D(ON)</sub>  | —   | 5.36 | —    | ns   | V <sub>DD</sub> = 20V, V <sub>GS</sub> = 10V,<br>R <sub>G</sub> = 3Ω, I <sub>D</sub> = 20A |
| Turn-On Rise Time                       | t <sub>r</sub>      | —   | 4.54 | —    |      |  |
| Turn-Off Delay Time                     | t <sub>D(OFF)</sub> | —   | 12.1 | —    |      |  |
| Turn-Off Fall Time                      | t <sub>f</sub>      | —   | 5.59 | —    |      |  |
| Body Diode Reverse Recovery Time        | t <sub>RR</sub>     | —   | 39.1 | —    | ns   | I <sub>F</sub> = 20A, di/dt = 100A/μs  |
| Body Diode Reverse Recovery Charge      | Q <sub>RR</sub>     | —   | 53.3 | —    | nC   |  |

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

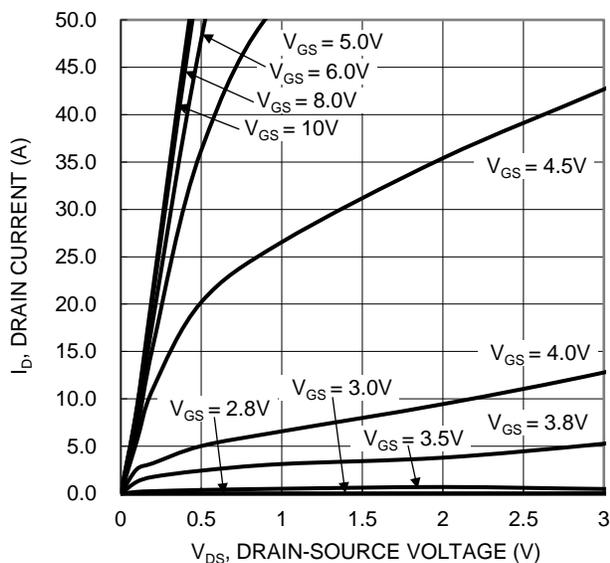


Figure 1. Typical Output Characteristic

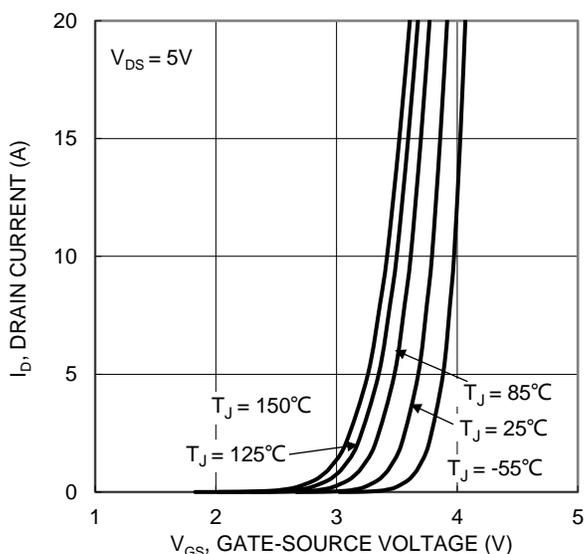


Figure 2. Typical Transfer Characteristic

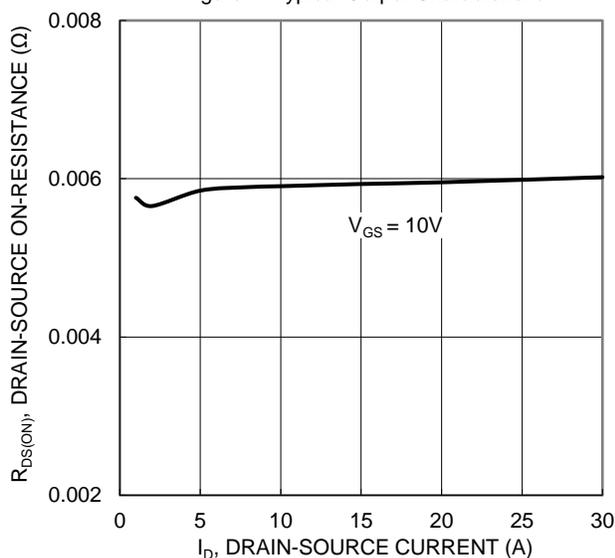


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

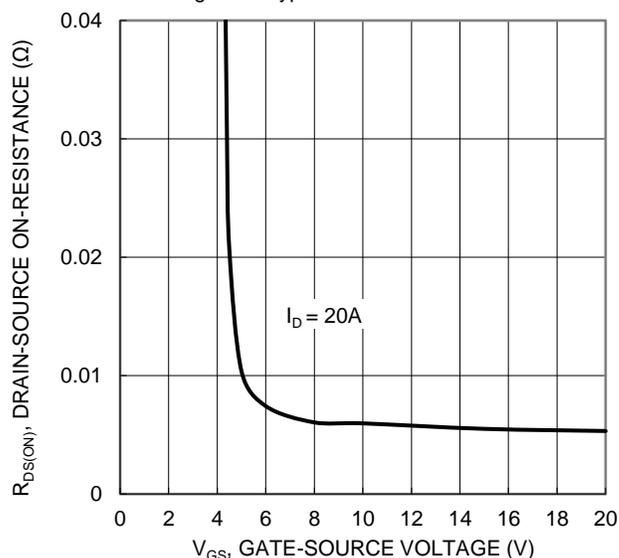


Figure 4. Typical Transfer Characteristic

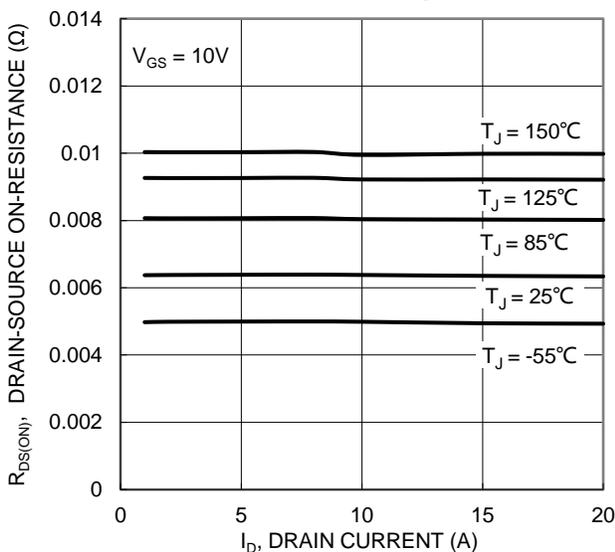


Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

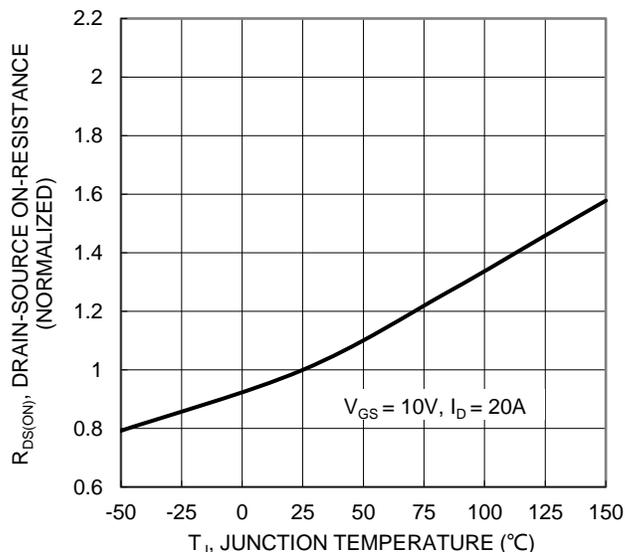


Figure 6. On-Resistance Variation with Junction Temperature

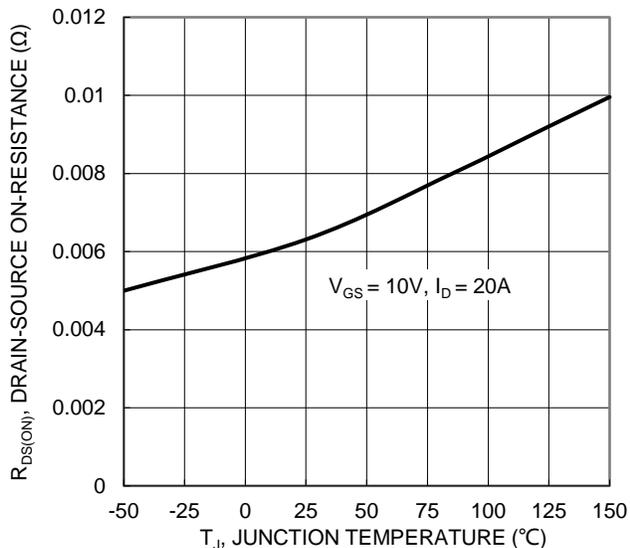


Figure 7. On-Resistance Variation with Junction Temperature

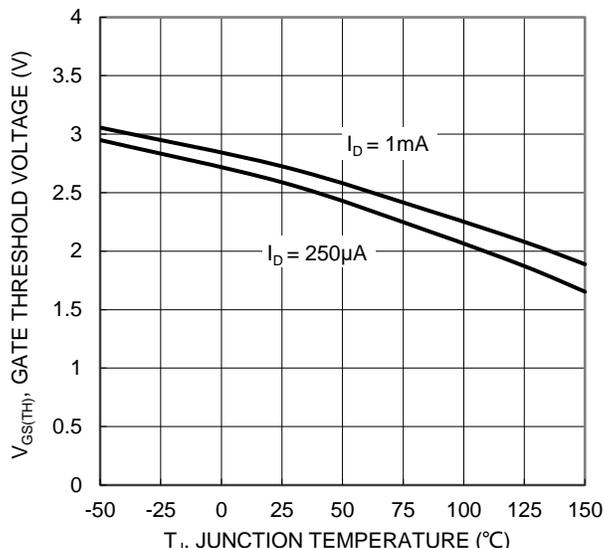


Figure 8. Gate Threshold Variation vs. Junction Temperature

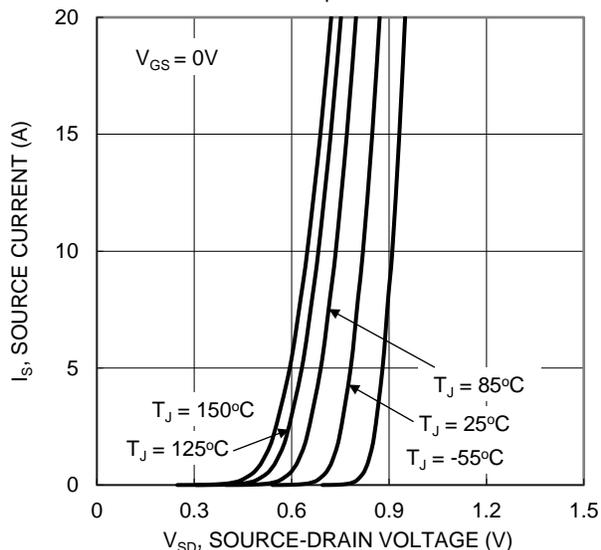


Figure 9. Diode Forward Voltage vs. Current

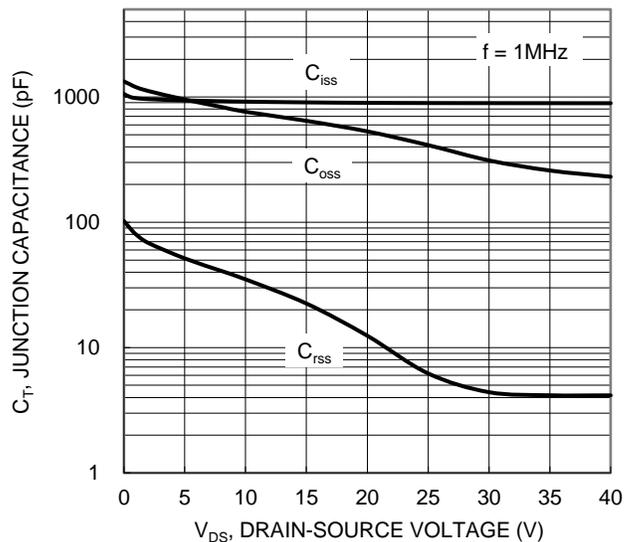


Figure 10. Typical Junction Capacitance

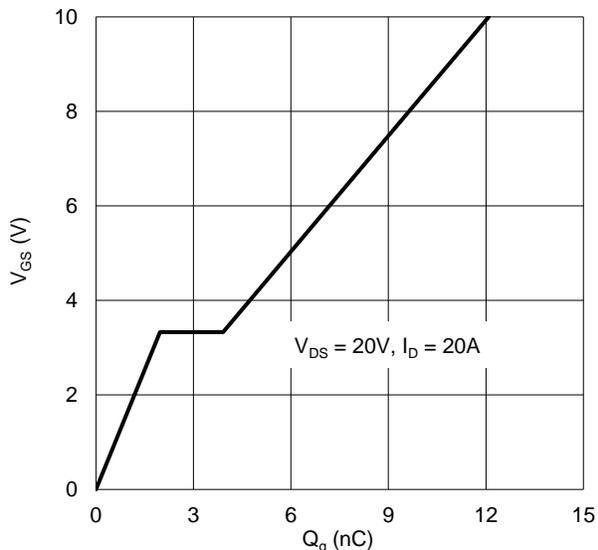


Figure 11. Gate Charge

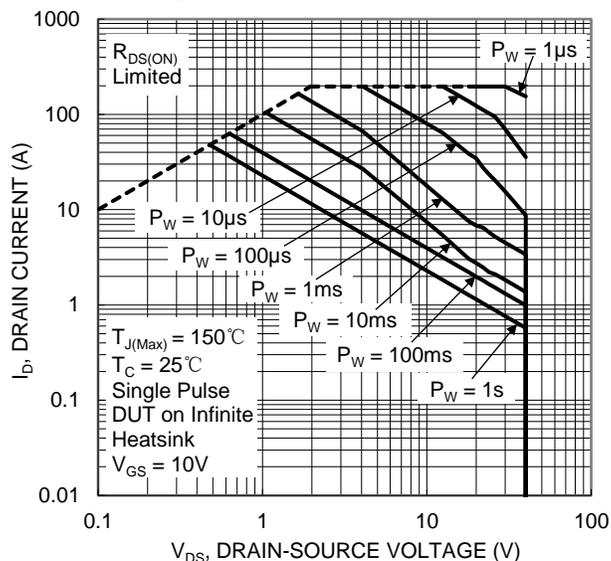


Figure 12. SOA, Safe Operation Area

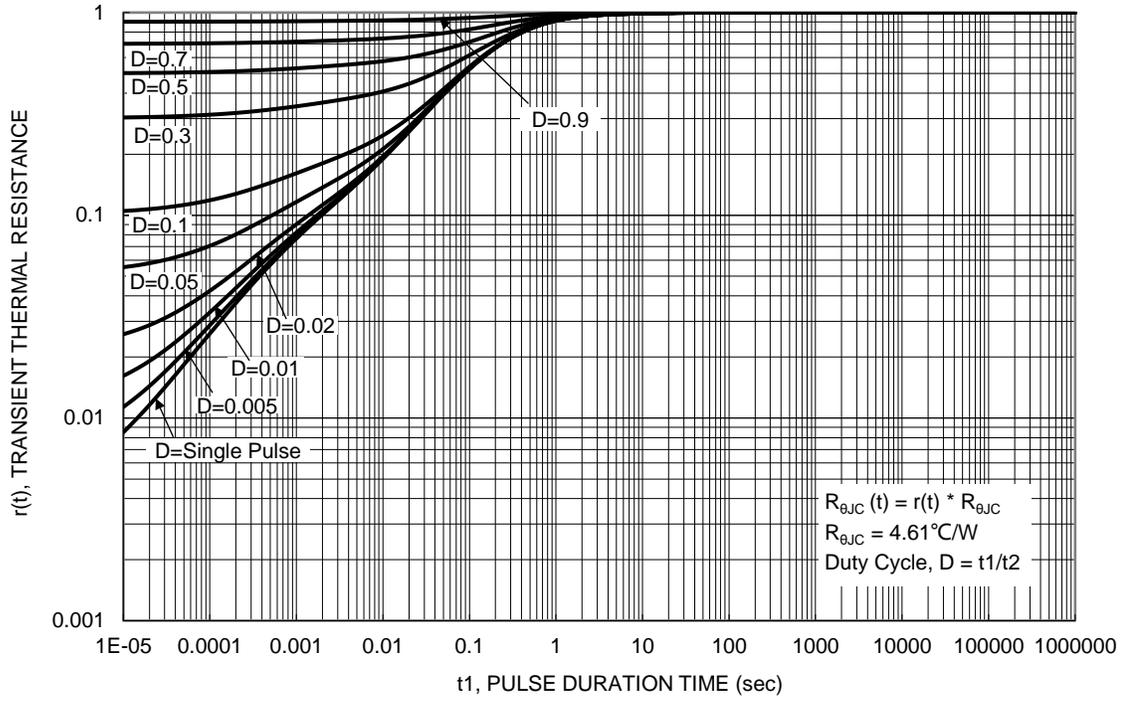
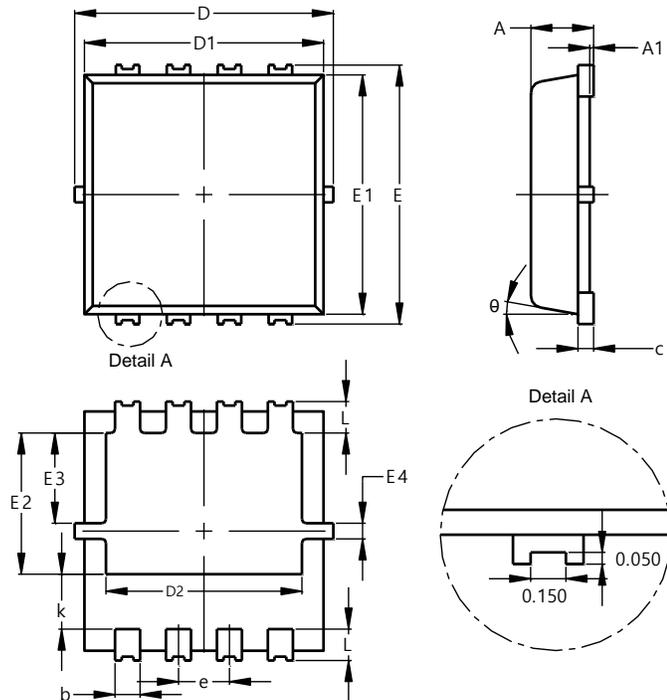


Figure 13. Transient Thermal Resistance

**Package Outline Dimensions**

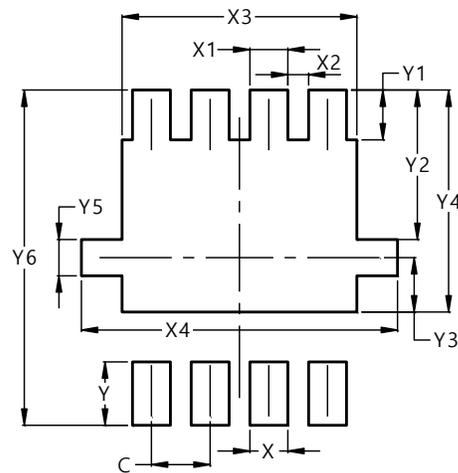
**PowerDI3333-8/SWP (Type UX)**



| 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°  |
| All Dimensions in mm        |      |      |      |

**Suggested Pad Layout**

**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         |