



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 _{DSS} | R _{DS(ON)} Max | I _D Max T _C = +25°C |
|-------------------|---------------------------------|--|
| 60V | 9.5mΩ @ V _{GS} = 10V | 45.4A |
| | 13.3mΩ @ V _{GS} = 4.5V | 38.4A |

Features

- Rated to +175°C—Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching (UIS) Test in Production—Ensures More Reliable and Robust End Application
- Low On-Resistance
- Small Form Factor Thermally Efficient Package Enables Higher Density End Products
- Wettable Flank for Improved Optical Inspection

Description and Applications

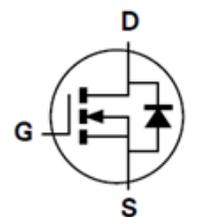
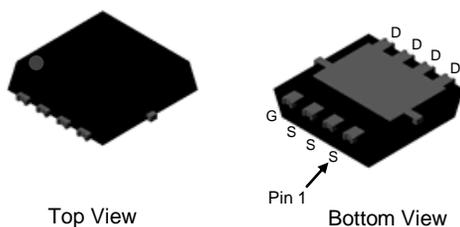
This MOSFET is designed to meet the stringent requirements of automotive applications. It is qualified to AEC-Q101, supported by a PPAP and is ideal for use in:

- 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
- Weight: 0.072 grams (Approximate) 

PowerDI3333-8 (SWP) (Type UX)



Equivalent Circuit

Maximum Ratings (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

| Characteristic | Symbol | Value | Unit |
|---|----------------------------|----------|------|
| Drain-Source Voltage | V_{DSS} | 60 | V |
| Gate-Source Voltage | V_{GSS} | ± 16 | V |
| Continuous Drain Current (Note 6) $V_{GS} = 10\text{V}$ | $T_C = +25^\circ\text{C}$ | 45.4 | A |
| | $T_C = +100^\circ\text{C}$ | 32.1 | A |
| | $T_A = +25^\circ\text{C}$ | 15.9 | A |
| | $T_A = +100^\circ\text{C}$ | 11.2 | A |
| Pulsed Drain Current (10 μs Pulse, Duty Cycle = 1%) | I_{DM} | 180 | A |
| Maximum Continuous Body Diode Forward Current (Note 6) | I_S | 45 | A |
| Pulsed Body Diode Forward Current (10 μs Pulse, Duty Cycle = 1%) | I_{SM} | 180 | A |
| Avalanche Current, $L = 0.1\text{mH}$ | I_{AS} | 30 | A |
| Avalanche Energy, $L = 0.1\text{mH}$ | E_{AS} | 45 | mJ |

Thermal Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

| Characteristic | Symbol | Value | Unit |
|--|-----------------|-------------|--------------------|
| Total Power Dissipation (Note 6) | P_D | 3.6 | W |
| Thermal Resistance, Junction to Ambient (Note 6) | $R_{\theta JA}$ | 41.7 | $^\circ\text{C/W}$ |
| Total Power Dissipation (Note 7) | P_D | 29.4 | W |
| Thermal Resistance, Junction to Case (Note 7) | $R_{\theta JC}$ | 5.1 | $^\circ\text{C/W}$ |
| Operating and Storage Temperature Range | T_J, T_{STG} | -55 to +175 | $^\circ\text{C}$ |

Electrical Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|--|--------------|-----|------|-----------|---------------|---|
| OFF CHARACTERISTICS (Note 8) | | | | | | |
| Drain-Source Breakdown Voltage | BV_{DSS} | 60 | — | — | V | $V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$ |
| Zero Gate Voltage Drain Current | I_{DSS} | — | — | 1 | μA | $V_{DS} = 48\text{V}, V_{GS} = 0\text{V}$ |
| Gate-Source Leakage | I_{GSS} | — | — | ± 100 | nA | $V_{GS} = \pm 16\text{V}, V_{DS} = 0\text{V}$ |
| ON CHARACTERISTICS (Note 8) | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | 1 | — | 3 | V | $V_{DS} = V_{GS}, I_D = 250\mu\text{A}$ |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | — | 7.7 | 9.5 | m Ω | $V_{GS} = 10\text{V}, I_D = 13.5\text{A}$ |
| | | — | 9.5 | 13.3 | | $V_{GS} = 4.5\text{V}, I_D = 11.5\text{A}$ |
| Diode Forward Voltage | V_{SD} | — | 0.8 | 1.2 | V | $V_{GS} = 0\text{V}, I_S = 13.5\text{A}$ |
| DYNAMIC CHARACTERISTICS (Note 9) | | | | | | |
| Input Capacitance | C_{iss} | — | 1925 | — | pF | $V_{DS} = 30\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$ |
| Output Capacitance | C_{oss} | — | 438 | — | pF | |
| Reverse Transfer Capacitance | C_{rss} | — | 41 | — | pF | |
| Gate Resistance | R_g | — | 1.7 | — | Ω | $V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$ |
| Total Gate Charge ($V_{GS} = 10\text{V}$) | Q_g | — | 33.5 | — | nC | $V_{DS} = 30\text{V}, I_D = 13.5\text{A}$ |
| Total Gate Charge ($V_{GS} = 4.5\text{V}$) | Q_g | — | 15.6 | — | nC | |
| Gate-Source Charge | Q_{gs} | — | 4.7 | — | nC | |
| Gate-Drain Charge | Q_{gd} | — | 5.3 | — | nC | |
| Turn-On Delay Time | $t_{D(ON)}$ | — | 4.5 | — | ns | $V_{DD} = 30\text{V}, V_{GS} = 10\text{V}, R_G = 6\Omega, I_D = 13.5\text{A}$ |
| Turn-On Rise Time | t_R | — | 8.6 | — | ns | |
| Turn-Off Delay Time | $t_{D(OFF)}$ | — | 35.9 | — | ns | |
| Turn-Off Fall Time | t_F | — | 15.7 | — | ns | |
| Body Diode Reverse Recovery Time | t_{RR} | — | 18.2 | — | ns | $I_F = 13.5\text{A}, di/dt = 400\text{A}/\mu\text{s}$ |
| Body Diode Reverse Recovery Charge | Q_{RR} | — | 33.1 | — | nC | |

- Notes:
- Device mounted on FR-4 substrate PCB, 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 product testing.

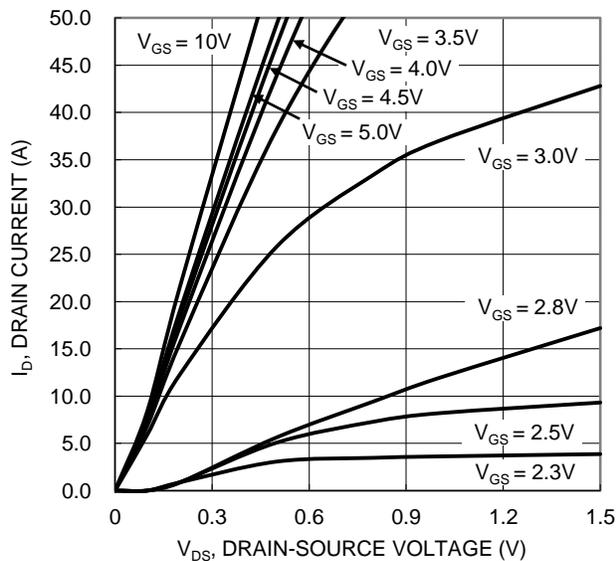


Figure 1. Typical Output Characteristic

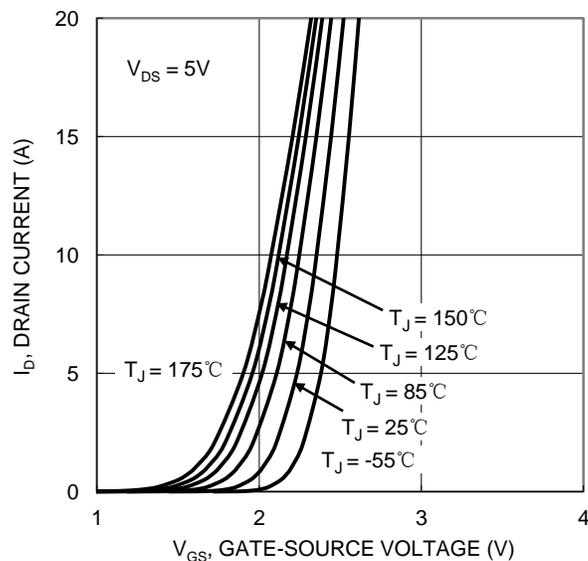


Figure 2. Typical Transfer Characteristic

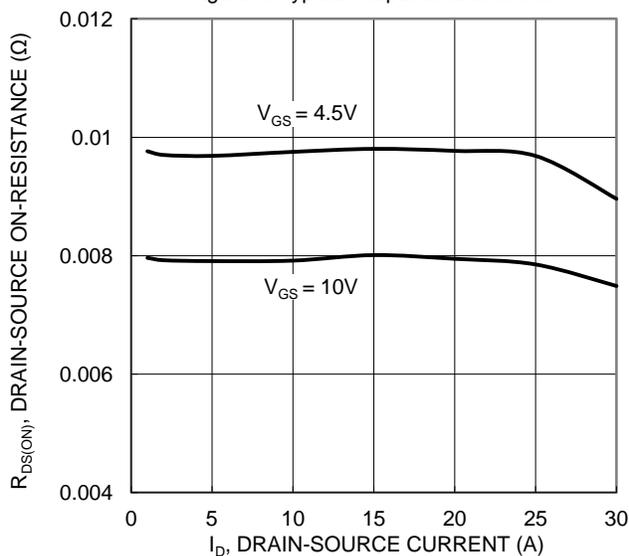


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

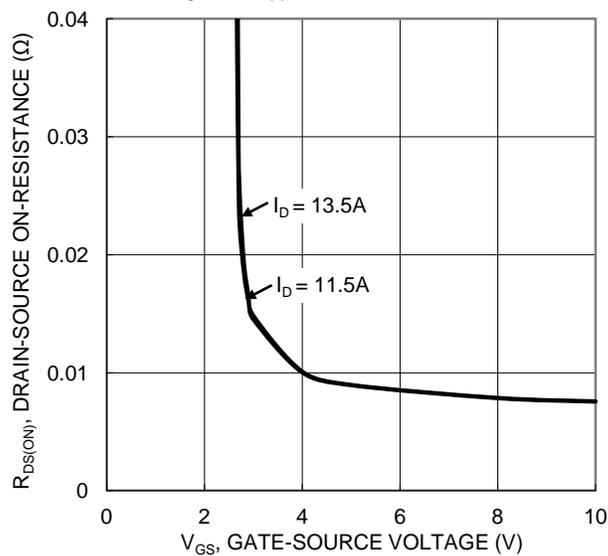


Figure 4. Typical Transfer Characteristic

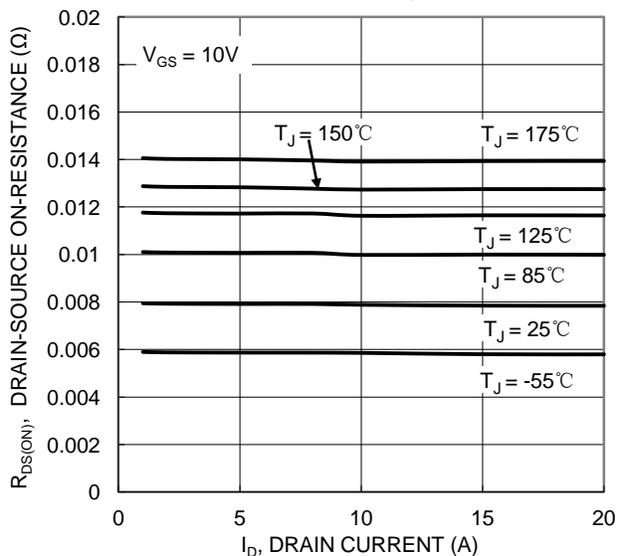


Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

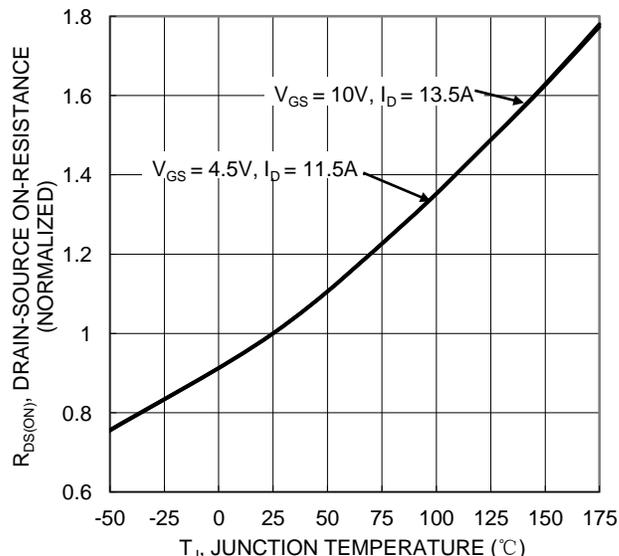


Figure 6. On-Resistance Variation with Junction Temperature

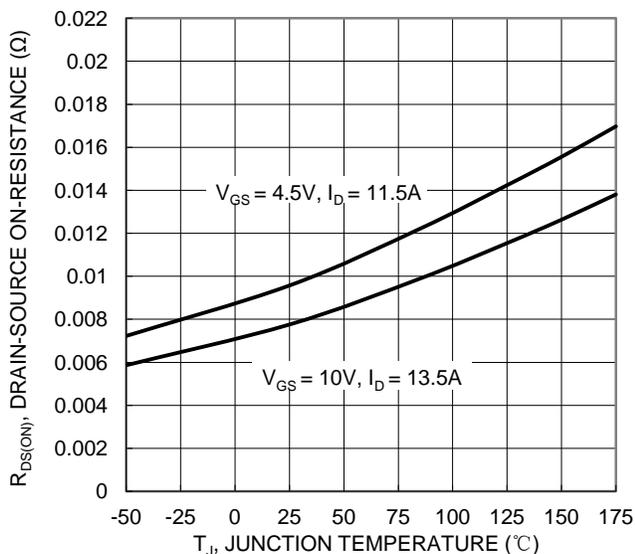


Figure 7. On-Resistance Variation with Junction Temperature

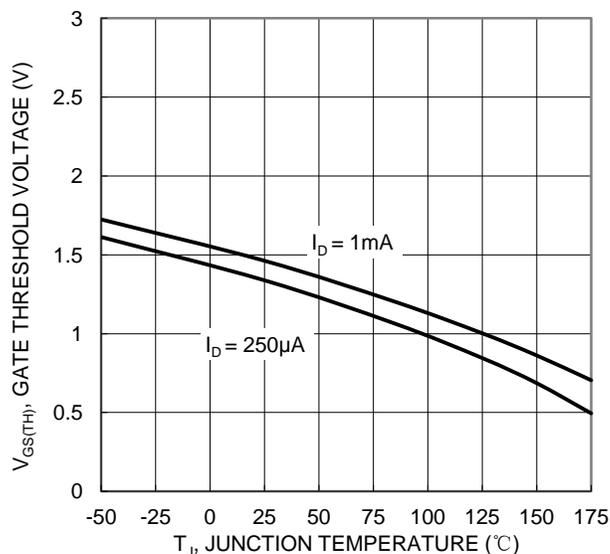


Figure 8. Gate Threshold Variation vs. Junction Temperature

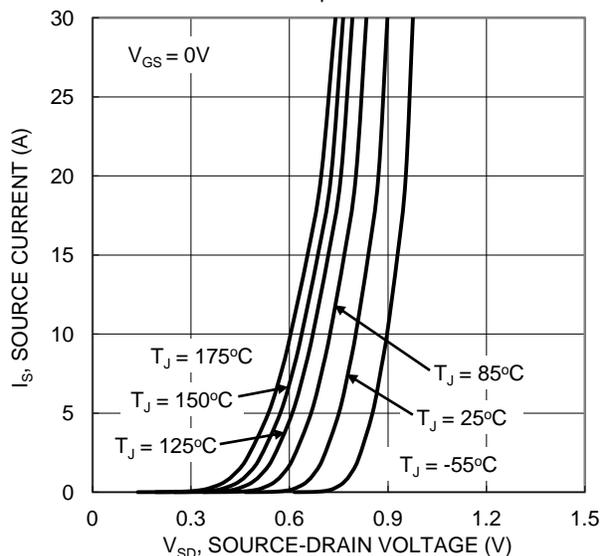


Figure 9. Diode Forward Voltage vs. Current

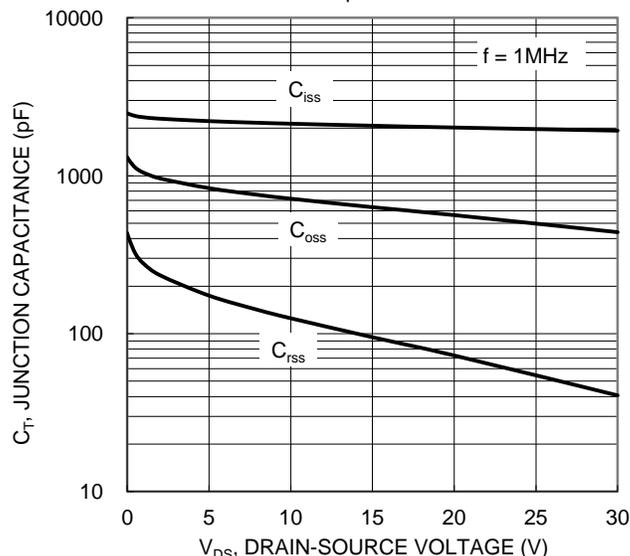


Figure 10. Typical Junction Capacitance

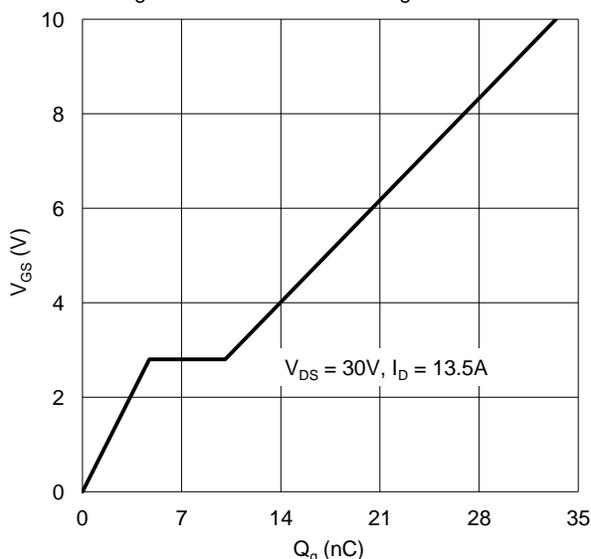


Figure 11. Gate Charge

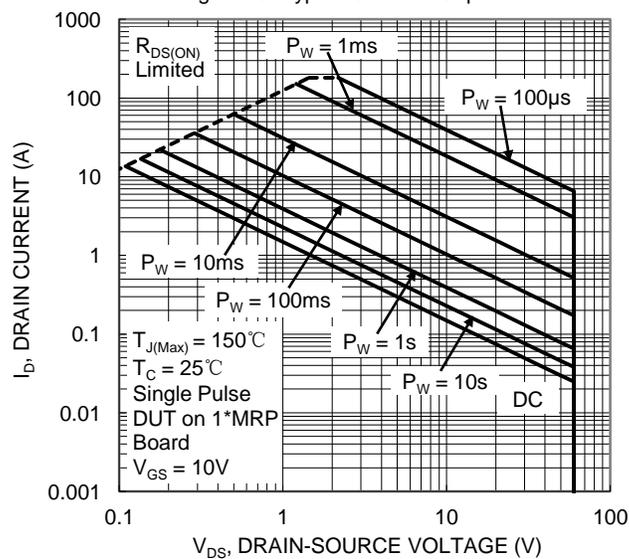


Figure 12. SOA, Safe Operation Area

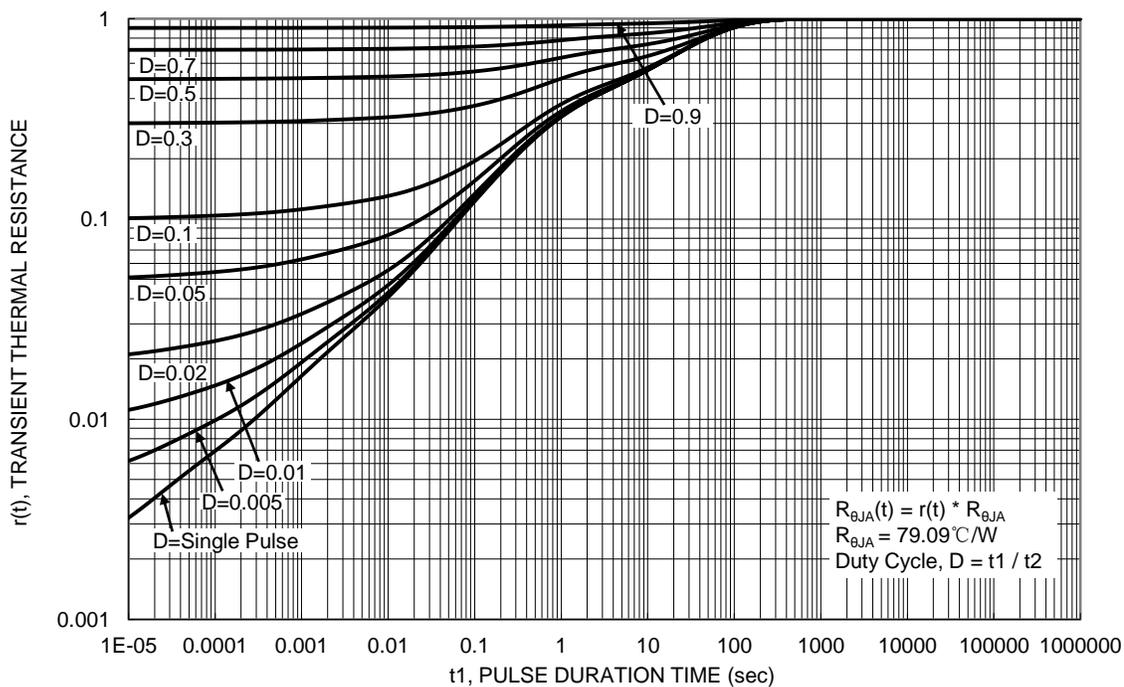
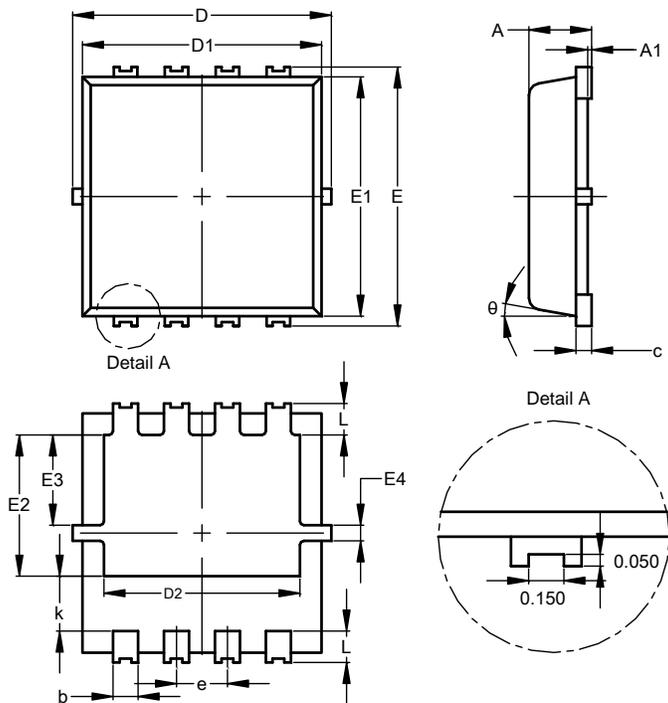


Figure 13. Transient Thermal Resistance

Package Outline Dimensions

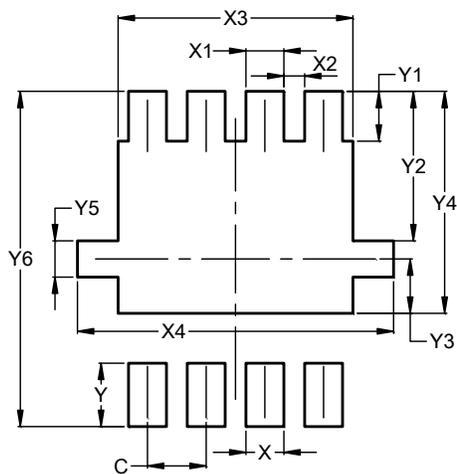
PowerDI3333-8 (SWP) (Type UX)



| 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 |