# 60V N-CHANNEL ENHANCEMENT MODE MOSFET
# POWERDI

## Product Summary

| $BV_{DSS}$ | $R_{DS(ON)}$ Max | $I_D$ $T_C$ = +25°C (Note 9) |
|---|---|---|
| 60V | 4.5mΩ @ $V_{GS}$ = 10V | 100A |
| | 6.5mΩ @ $V_{GS}$ = 4.5V | 100A |

## Features

- 100% Unclamped Inductive Switching – ensures more reliable and robust end application
- Low $R_{DS(ON)}$ – Minimizes Power Losses
- Low $Q_G$ – Minimizes Switching Losses
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

## Description and Applications

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.

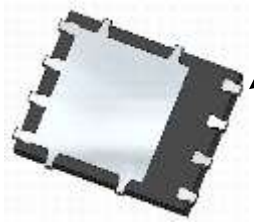
- High Frequency Switching
- Sync. Rectification
- DC-DC Converters

## Mechanical Data

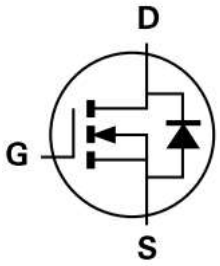
- Case: PowerDI®5060-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Finish – Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.097 grams (Approximate)

PowerDI5060-8

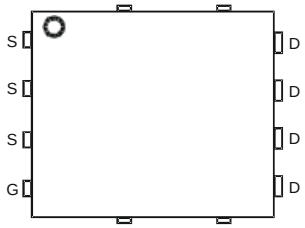
Top View




Bottom View




Internal Schematic



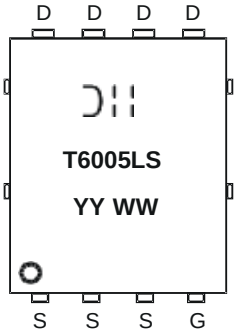

Top View
Pin Configuration

## Ordering Information (Note 4)

| Part Number | Case | Packaging |
|---|---|---|
| DMT6005LPS-13 | PowerDI5060-8 | 2,500/Tape & Reel |

Notes:
1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. All applicable RoHS exemptions applied.
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




DH = Manufacturer's Marking
T6005LS = Product Type Marking Code
YYWW = Date Code Marking
YY = Year (ex: 17 = 2017)
WW = Week (01 to 53)

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

| Characteristic | | Symbol | Value | Units |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DSS}$ | 60 | V |
| Gate-Source Voltage | | $V_{GSS}$ | ±20 | V |
| Continuous Drain Current (Note 5) | $T_A$ = +25°C<br>$T_A$ = +70°C | $I_D$ | 17.9<br>14.3 | A |
| Continuous Drain Current (Note 6) | $T_C$ = +25°C (Note 9)<br>$T_C$ = +100°C | $I_D$ | 100<br>90 | A |
| Maximum Continuous Body Diode Forward Current (Note 6) | | $I_S$ | 100 | A |
| Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%) | | $I_{DM}$ | 160 | A |
| Avalanche Current, L=1mH | | $I_{AS}$ | 14.8 | A |
| Avalanche Energy, L=1mH | | $E_{AS}$ | 98 | mJ |

## Thermal Characteristics

| Characteristic | | Symbol | Value | Units |
|---|---|---|---|---|
| Total Power Dissipation (Note 5) | $T_A$ = +25°C | $P_D$ | 2.6 | W |
| Thermal Resistance, Junction to Ambient (Note 5) | | $R_{\theta JA}$ | 47 | °C/W |
| Total Power Dissipation (Note 6) | $T_C$ = +25°C | $P_D$ | 125 | W |
| Thermal Resistance, Junction to Case (Note 6) | | $R_{\theta JC}$ | 1 | °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 7) | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | 60 | — | — | V | $V_{GS}$ = 0V, $I_D$ = 1mA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | — | — | 1 | µA | $V_{DS}$ = 48V, $V_{GS}$ = 0V |
| Gate-Source Leakage | $I_{GSS}$ | — | — | ±100 | nA | $V_{GS}$ = ±20V, $V_{DS}$ = 0V |
| **ON CHARACTERISTICS** (Note 7) | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | 1 | — | 3 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250µA |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | — | 3.5 | 4.5 | mΩ | $V_{GS}$ = 10V, $I_D$ = 50A |
| | | — | 5 | 6.5 | | $V_{GS}$ = 4.5V, $I_D$ = 12.5A |
| Diode Forward Voltage | $V_{SD}$ | — | 0.9 | — | V | $V_{GS}$ = 0V, $I_S$ = 50A |
| **DYNAMIC CHARACTERISTICS** (Note 8) | | | | | | |
| Input Capacitance | $C_{ISS}$ | — | 2,962 | — | pF | $V_{DS}$ = 30V, $V_{GS}$ = 0V, f = 1MHz |
| Output Capacitance | $C_{OSS}$ | — | 965.2 | — | | |
| Reverse Transfer Capacitance | $C_{RSS}$ | — | 59.8 | — | | |
| Gate Resistance | $R_G$ | — | 0.66 | — | Ω | $V_{DS}$ = 0V, $V_{GS}$ = 0V, f = 1MHz |
| Total Gate Charge ($V_{GS}$ = 10V) | $Q_G$ | — | 47.1 | — | nC | $V_{DD}$ = 30V, $I_D$ = 50A |
| Total Gate Charge ($V_{GS}$ = 4.5V) | $Q_G$ | — | 23.1 | — | | |
| Gate-Source Charge | $Q_{GS}$ | — | 10.2 | — | | |
| Gate-Drain Charge | $Q_{GD}$ | — | 12.5 | — | | |
| Turn-On Delay Time | $t_{D(ON)}$ | — | 8.3 | — | ns | $V_{DD}$ = 30V, $V_{GS}$ = 10V, $I_D$ = 30A, $R_G$ = 3.3Ω |
| Turn-On Rise Time | $t_R$ | — | 9.4 | — | | |
| Turn-Off Delay Time | $t_{D(OFF)}$ | — | 22 | — | | |
| Turn-Off Fall Time | $t_F$ | — | 8.9 | — | | |
| Body Diode Reverse Recovery Time | $t_{RR}$ | — | 40.4 | — | ns | $I_F$ = 30A, di/dt = 100A/µs |
| Body Diode Reverse Recovery Charge | $Q_{RR}$ | — | 49.7 | — | nC | |

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

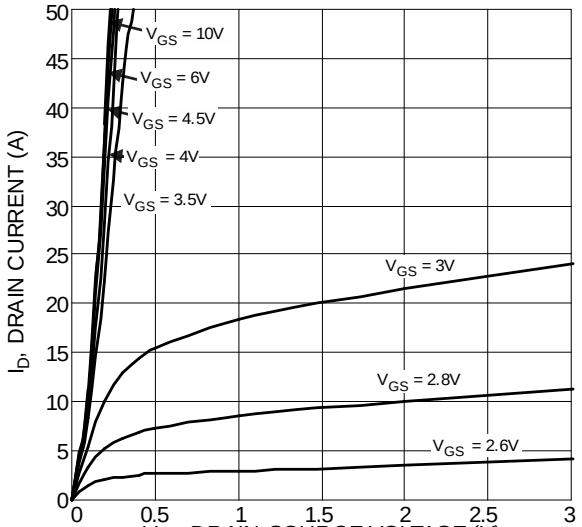



Figure 1 Typical Output Characteristic

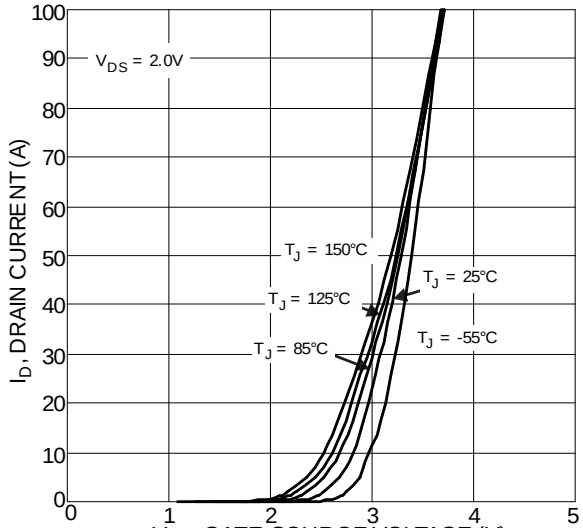



Figure 2 Typical Transfer Characteristics

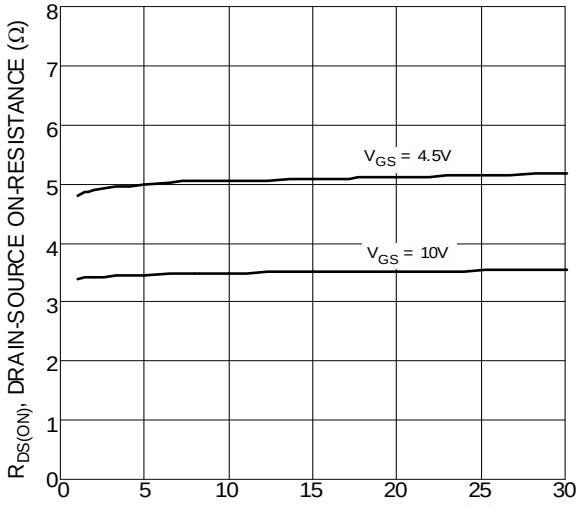



Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

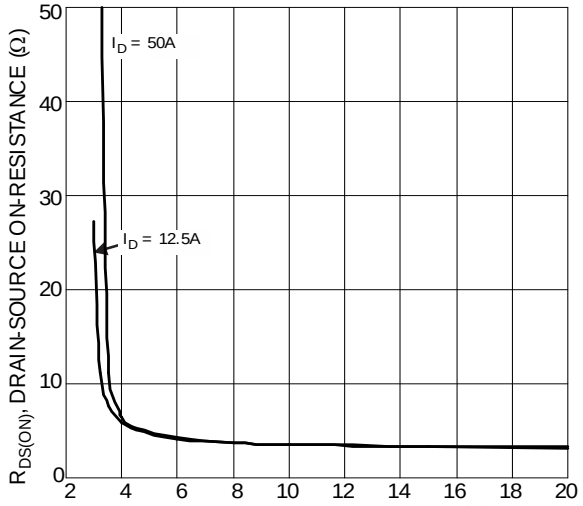



Figure 4 Typical Drain-Source On-Resistance vs. Gate-Source Voltage

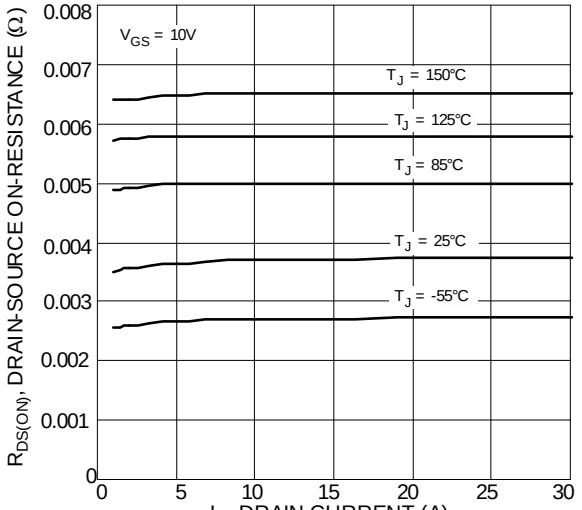



Figure 5 Typical On-Resistance vs. Drain Current and Temperature

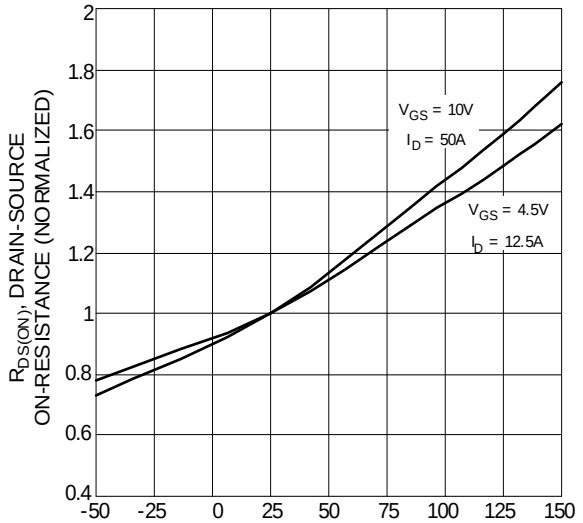



Figure 6 On-Resistance Variation with Temperature

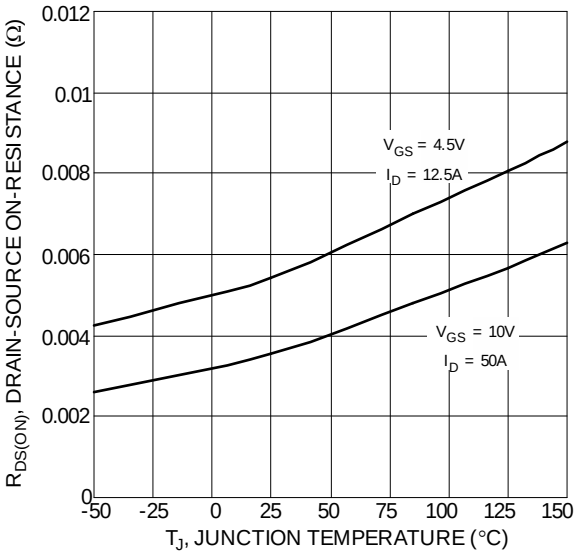



Figure 7 On-Resistance Variation with Temperature

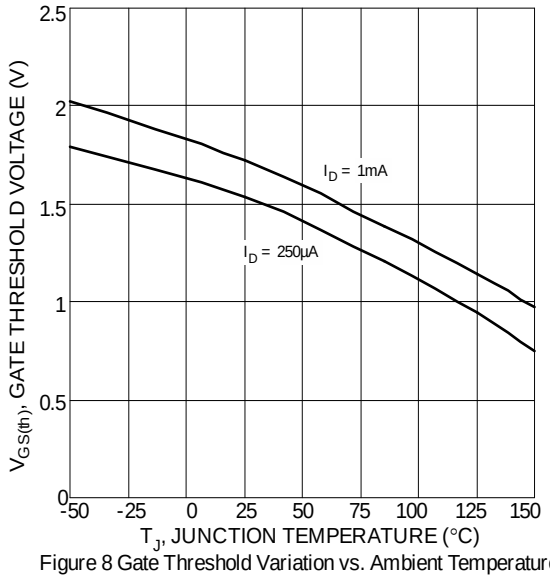



Figure 8 Gate Threshold Variation vs. Ambient Temperature

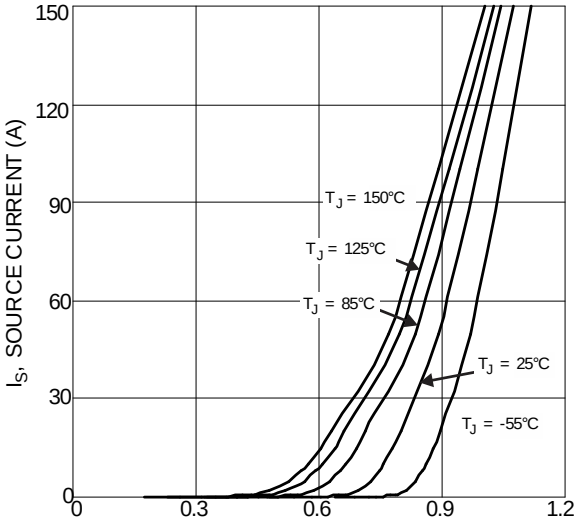



Figure 9 Diode Forward Voltage vs. Current

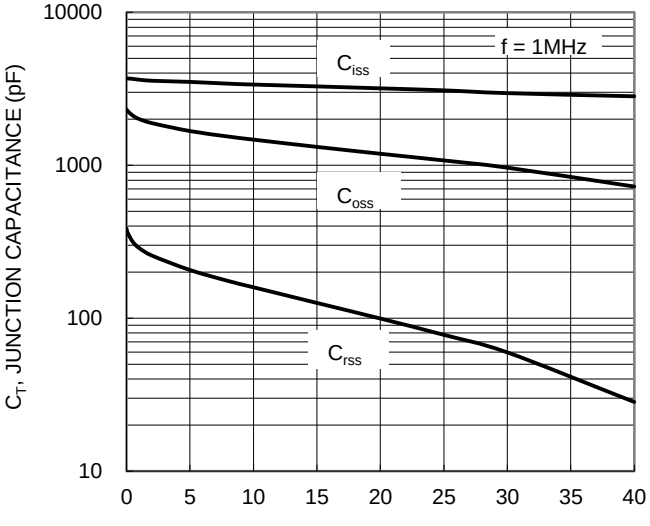



Figure 10. Typical Junction Capacitance

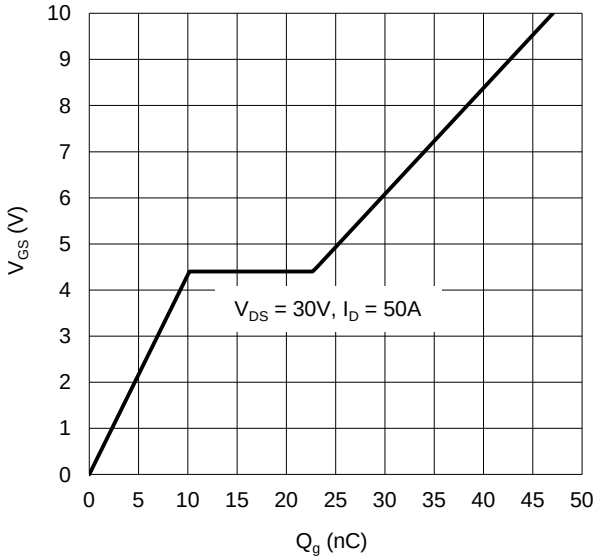



Figure 11. Gate Charge

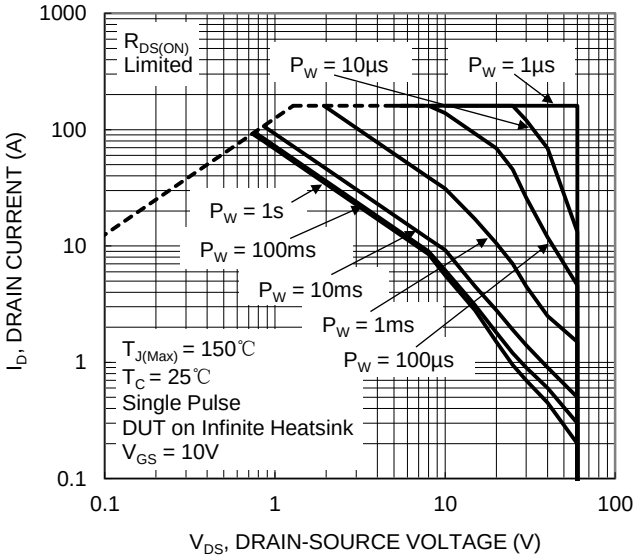



Figure 12. SOA, Safe Operation Area

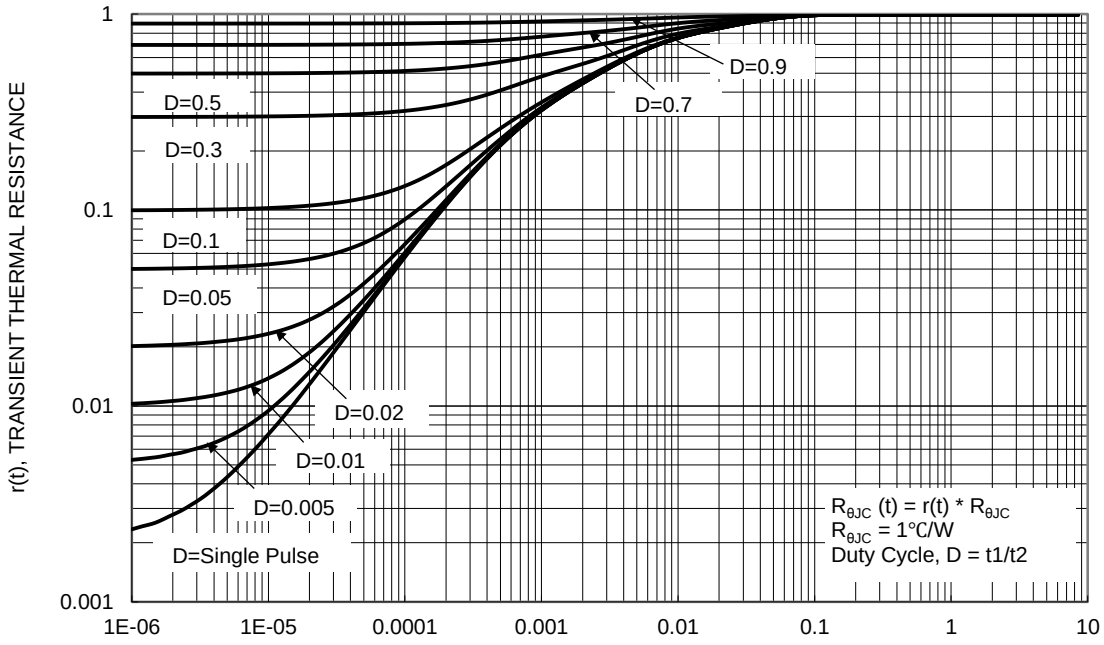
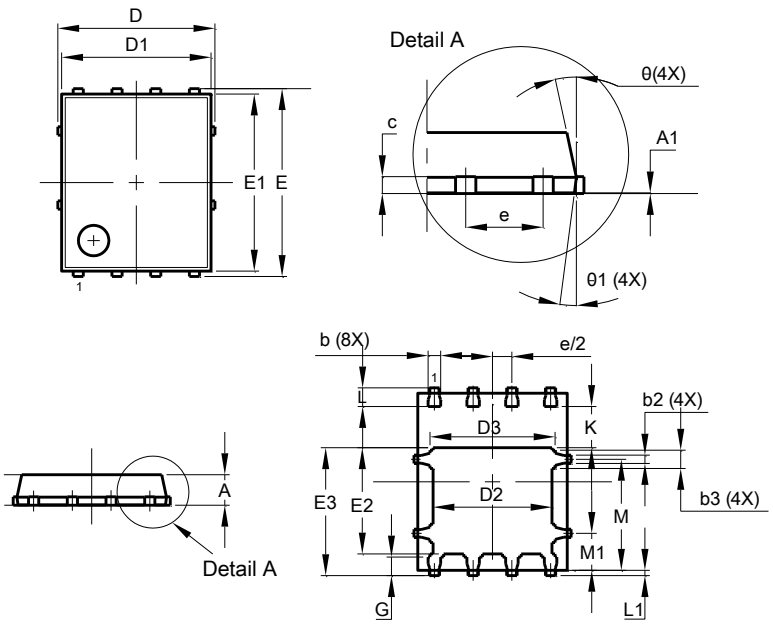



Figure 13. Transient Thermal Resistance

## Package Outline Dimensions

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

**PowerDI5060-8**

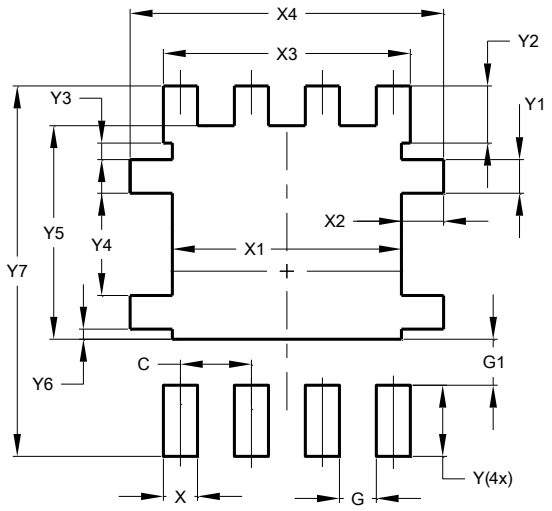



| PowerDI5060-8 | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 0.90 | 1.10 | 1.00 |
| **A1** | 0.00 | 0.05 | – |
| **b** | 0.33 | 0.51 | 0.41 |
| **b2** | 0.200 | 0.350 | 0.273 |
| **b3** | 0.40 | 0.80 | 0.60 |
| **c** | 0.230 | 0.330 | 0.277 |
| **D** | 5.15 BSC | | |
| **D1** | 4.70 | 5.10 | 4.90 |
| **D2** | 3.70 | 4.10 | 3.90 |
| **D3** | 3.90 | 4.30 | 4.10 |
| **E** | 6.15 BSC | | |
| **E1** | 5.60 | 6.00 | 5.80 |
| **E2** | 3.28 | 3.68 | 3.48 |
| **E3** | 3.99 | 4.39 | 4.19 |
| **e** | 1.27 BSC | | |
| **G** | 0.51 | 0.71 | 0.61 |
| **K** | 0.51 | – | – |
| **L** | 0.51 | 0.71 | 0.61 |
| **L1** | 0.100 | 0.200 | 0.175 |
| **M** | 3.235 | 4.035 | 3.635 |
| **M1** | 1.00 | 1.40 | 1.21 |
| **Θ** | 10° | 12° | 11° |
| **Θ1** | 6° | 8° | 7° |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout

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

**PowerDI5060-8**




| Dimensions | Value (in mm) |
|---|---|
| **C** | 1.270 |
| **G** | 0.660 |
| **G1** | 0.820 |
| **X** | 0.610 |
| **X1** | 4.100 |
| **X2** | 0.755 |
| **X3** | 4.420 |
| **X4** | 5.610 |
| **Y** | 1.270 |
| **Y1** | 0.600 |
| **Y2** | 1.020 |
| **Y3** | 0.295 |
| **Y4** | 1.825 |
| **Y5** | 3.810 |
| **Y6** | 0.180 |
| **Y7** | 6.610 |

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