# 100V 175°C N-CHANNEL ENHANCEMENT MODE MOSFET
## PowerDI

## Product Summary

| $BV_{DSS}$ | $R_{DS(ON)}$ Max | $I_D$ $T_C$ = +25°C |
|---|---|---|
| 100V | 16mΩ @ $V_{GS}$ = 10V | 44A |
| | 18mΩ @ $V_{GS}$ = 6V | 41A |

## Features

- Rated to +175°C – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching – Ensures More Reliable and Robust End Application
- High Conversion Efficiency
- Low $R_{DS(ON)}$ – Minimizes On-State Losses
- Low Input Capacitance
- Fast Switching Speed
- **Lead-Free Finish; 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 refer to the related automotive grade (Q-suffix) part. A listing can be found at https://www.diodes.com/products/automotive/automotive-products/.**
- **This part is qualified to JEDEC standards (as references in AEC-Q) for High Reliability. https://www.diodes.com/quality/product-definitions/**

## Description

This new generation N-Channel Enhancement Mode MOSFET is designed to minimize $R_{DS(ON)}$, yet maintain superior switching performance. This device is ideal for use in Notebook battery power management and load switch.

## Applications

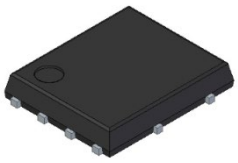
- Motor Control
- DC-DC Converters
- Power Management

## Mechanical Data

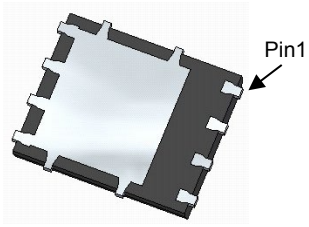
- Case: PowerDI®5060-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections Indicator: See Diagram
- Terminals: Finish – Matte Tin Annealed over Copper Lead-Frame. Solderable per MIL-STD-202,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

Site 1:

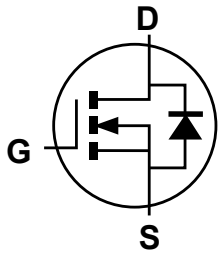
PowerDI5060-8



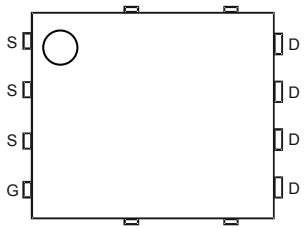
Top View




Bottom View



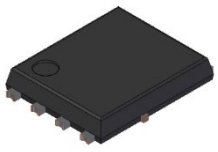

Internal Schematic



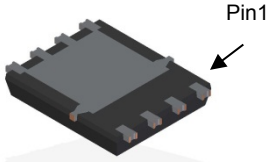

Top View
Pin Configuration

Site 2:

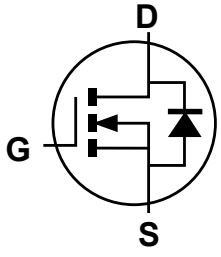
PowerDI5060-8 (SWP) (Type UX)



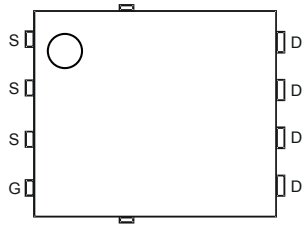
Top View




Bottom View




Internal Schematic




Top View
Pin Configuration

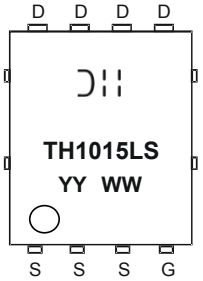
*PowerDI is a registered trademark of Diodes Incorporated.*

## Ordering Information (Note 4)

| Part Number | Case | Packaging |
|---|---|---|
| DMTH10H015LPS-13 | PowerDI5060-8 | 2,500/Tape & Reel |

Notes:
1. EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant. All applicable RoHS exemptions applied.
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




= Manufacturer's Marking
TH1015LS = Product Type Marking Code
YYWW = Date Code Marking
YY = Last Digit of Year (ex: 20 = 2020)
WW = Week Code (01 to 53)

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

| Characteristic | | | Symbol | Value | Unit |
|---|---|---|---|---|---|
| Drain-Source Voltage | | | $V_{DSS}$ | 100 | V |
| Gate-Source Voltage | | | $V_{GSS}$ | ±20 | V |
| Continuous Drain Current (Note 5) $V_{GS}$ = 10V | Steady State | $T_A$ = +25°C<br>$T_A$ = +70°C | $I_D$ | 11<br>8 | A |
| | Steady State | $T_C$ = +25°C<br>$T_C$ = +100°C | $I_D$ | 44<br>28 | A |
| Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%) | | | $I_{DM}$ | 120 | A |
| Maximum Continuous Body Diode Forward Current (Note 5) | | | $I_S$ | 1.5 | A |
| Avalanche Current (Note 7) L=3mH | | | $I_{AS}$ | 7.5 | A |
| Avalanche Energy (Note 7) L=3mH | | | $E_{AS}$ | 85 | mJ |

## Thermal Characteristics

| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Total Power Dissipation (Note 5) | $T_A$ = +25°C | $P_D$ | 2.8 | W |
| Thermal Resistance, Junction to Ambient (Note 5) | | $R_{\theta JA}$ | 52 | °C/W |
| Total Power Dissipation | $T_C$ = +25°C | $P_D$ | 46 | W |
| Thermal Resistance, Junction to Case | | $R_{\theta JC}$ | 2.7 | °C/W |
| Operating and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to +175 | °C |

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

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** (Note 6) | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | 100 | — | — | V | $V_{GS}$ = 0V, $I_D$ = 1mA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | — | — | 1 | μA | $V_{DS}$ = 80V, $V_{GS}$ = 0V |
| Gate-Source Leakage | $I_{GSS}$ | — | — | ±100 | nA | $V_{GS}$ = ±20V, $V_{DS}$ = 0V |
| **ON CHARACTERISTICS** (Note 6) | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | 1.4 | 2 | 3 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | — | 11 | 16 | mΩ | $V_{GS}$ = 10V, $I_D$ = 20A |
| | | — | 13.5 | 18 | | $V_{GS}$ = 6V, $I_D$ = 20A |
| | | — | 18.4 | 25 | | $V_{GS}$ = 4.5V, $I_D$ = 5A |
| Diode Forward Voltage | $V_{SD}$ | — | 0.9 | 1.3 | V | $V_{GS}$ = 0V, $I_S$ = 20A |
| **DYNAMIC CHARACTERISTICS** (Note 7) | | | | | | |
| Input Capacitance | $C_{ISS}$ | — | 1,871 | — | pF | $V_{DS}$ = 50V, $V_{GS}$ = 0V<br>f = 1MHz |
| Output Capacitance | $C_{OSS}$ | — | 261 | — | | |
| Reverse Transfer Capacitance | $C_{RSS}$ | — | 7 | — | | |
| Gate Resistance | $R_G$ | — | 0.75 | — | Ω | $V_{DS}$ = 0V, $V_{GS}$ = 0V, f = 1MHz |
| Total Gate Charge | $Q_G$ | — | 33.3 | — | nC | $V_{DD}$ = 50V, $I_D$ = 10A,<br>$V_{GS}$ = 10V |
| Gate-Source Charge | $Q_{GS}$ | — | 6.9 | — | | |
| Gate-Drain Charge | $Q_{GD}$ | — | 5.1 | — | | |
| Turn-On Delay Time | $t_{D(ON)}$ | — | 6.5 | — | ns | $V_{DD}$ = 50V, $V_{GS}$ = 10V,<br>$I_D$ = 10A, $R_G$ = 6Ω |
| Turn-On Rise Time | $t_R$ | — | 7 | — | | |
| Turn-Off Delay Time | $t_{D(OFF)}$ | — | 19.7 | — | | |
| Turn-Off Fall Time | $t_F$ | — | 8.1 | — | | |
| Reverse Recovery Time | $t_{RR}$ | — | 37.9 | — | ns | $I_F$ = 10A, di/dt = 100A/μs |
| Reverse Recovery Charge | $Q_{RR}$ | — | 51.9 | — | nC | |

Notes: 5. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate.
6. Short duration pulse test used to minimize self-heating effect.
7. Guaranteed by design. Not subject to product testing.

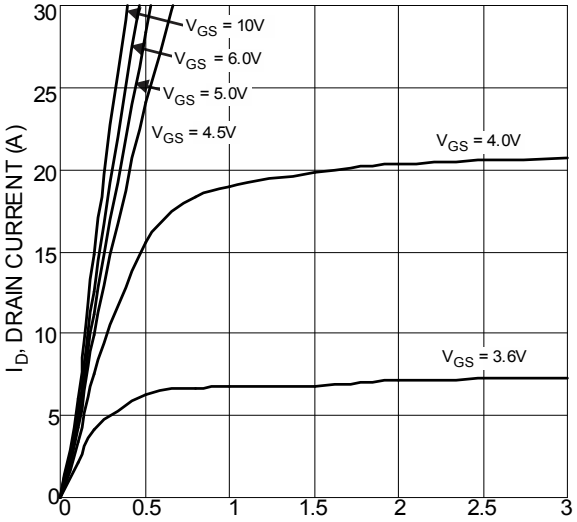


Figure 1 Typical Output Characteristic

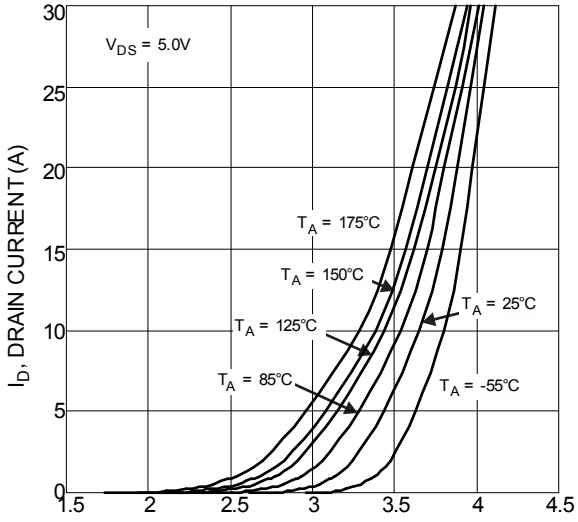


Figure 2 Typical Transfer Characteristics

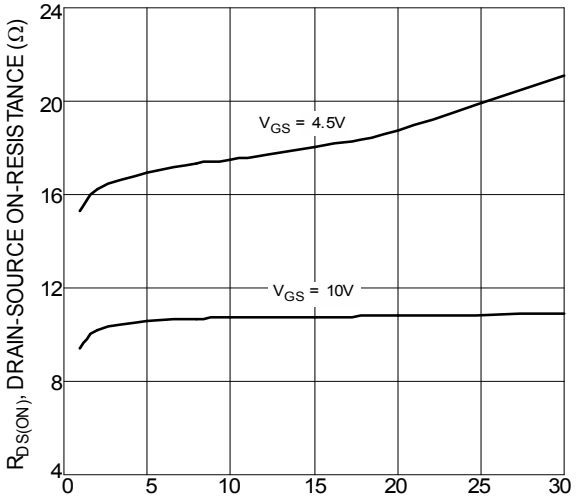


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

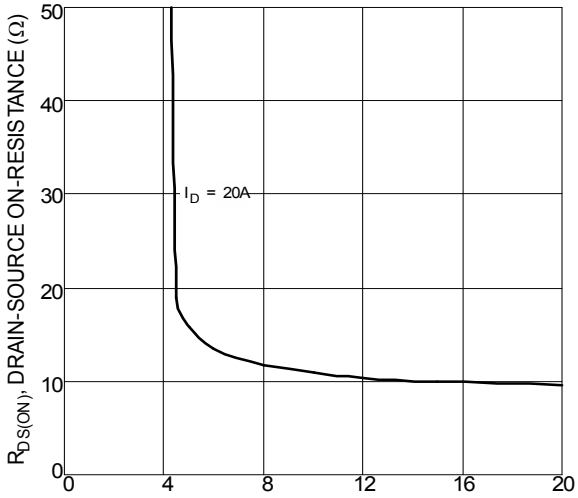


Figure 4 Typical Drain-Source On-Resistance vs. Gate-Source Voltage

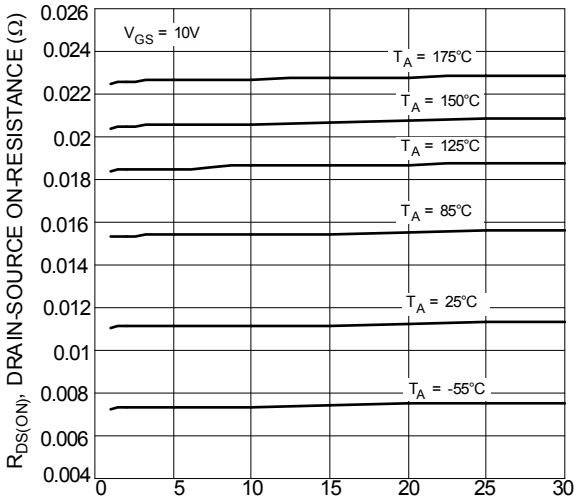


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

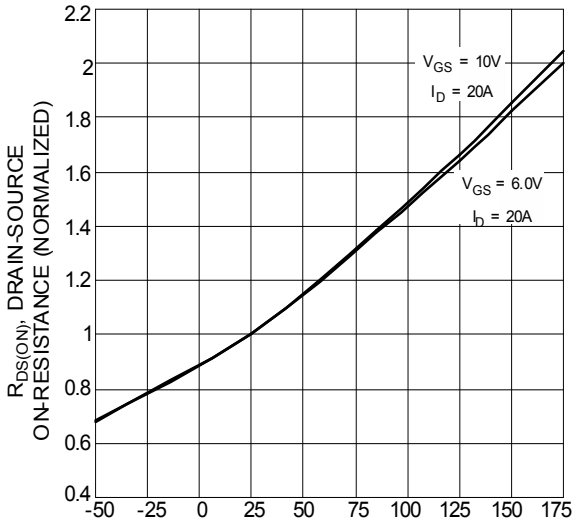


Figure 6 On-Resistance Variation with Temperature

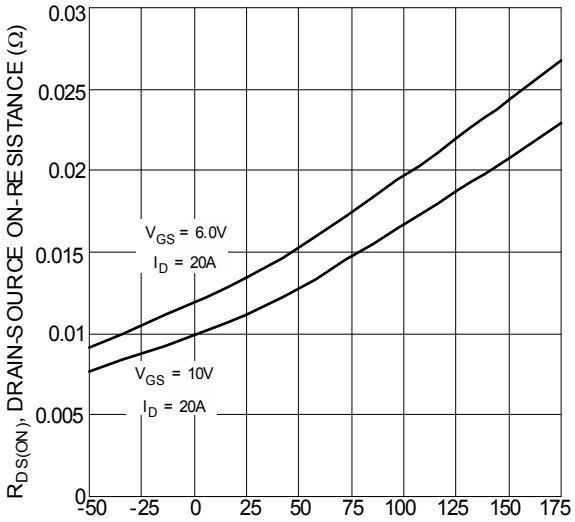



Figure 7 On-Resistance Variation with Temperature

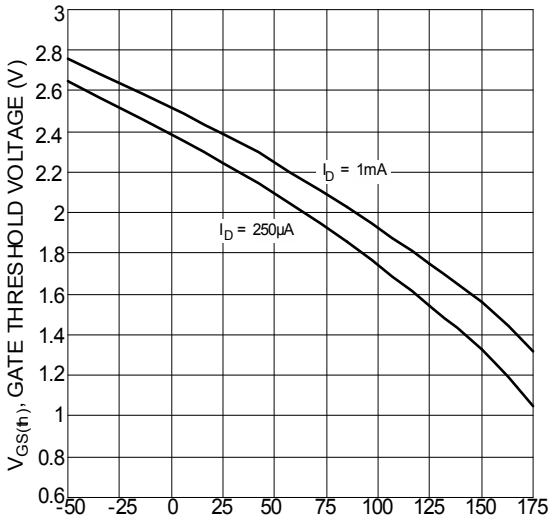



Figure 8 Gate Threshold Variation vs. Ambient Temperature

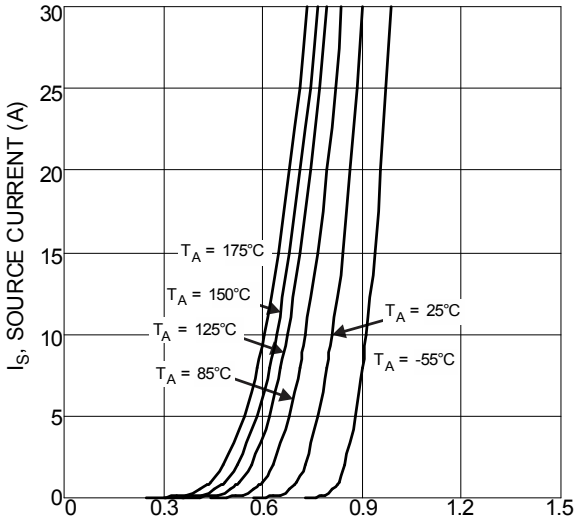



Figure 9 Diode Forward Voltage vs. Current

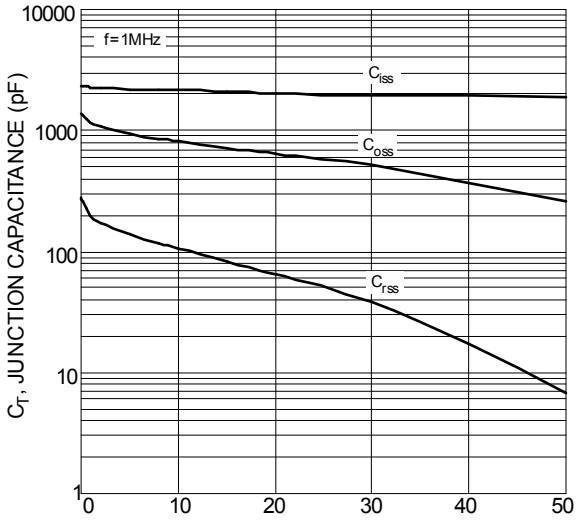



Figure 10 Typical Junction Capacitance

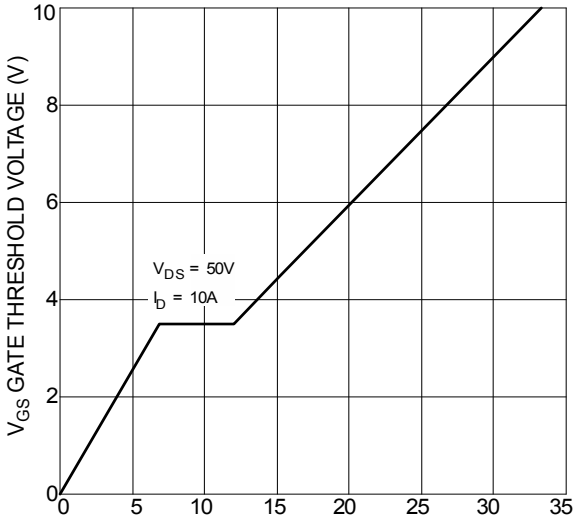



Figure 11 Gate Charge

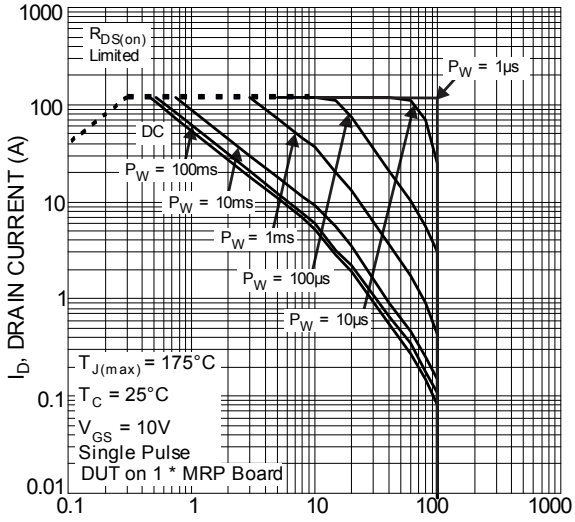



Figure 12 SOA, Safe Operation Area

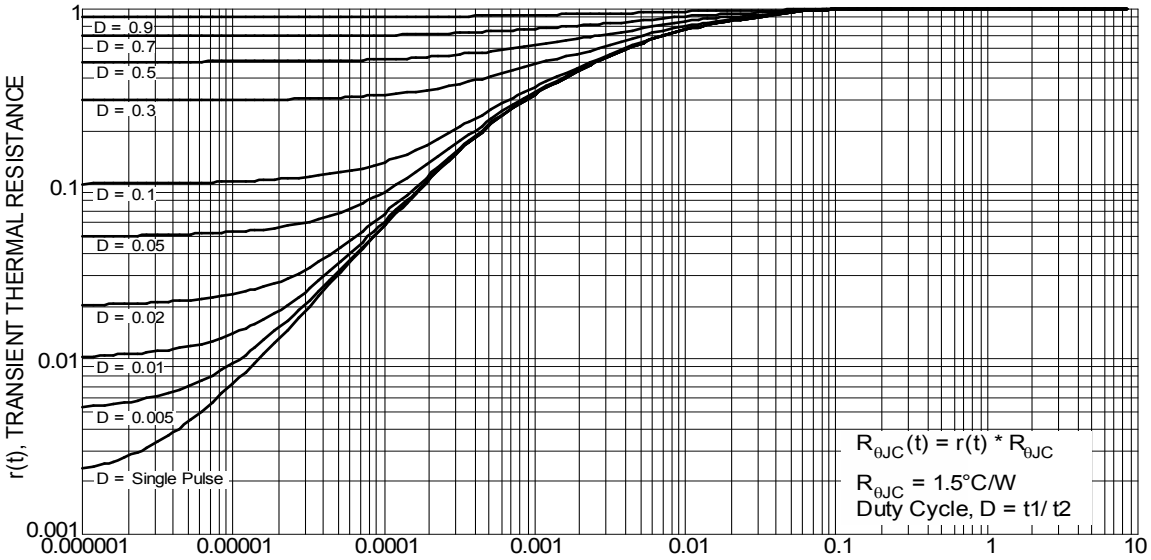


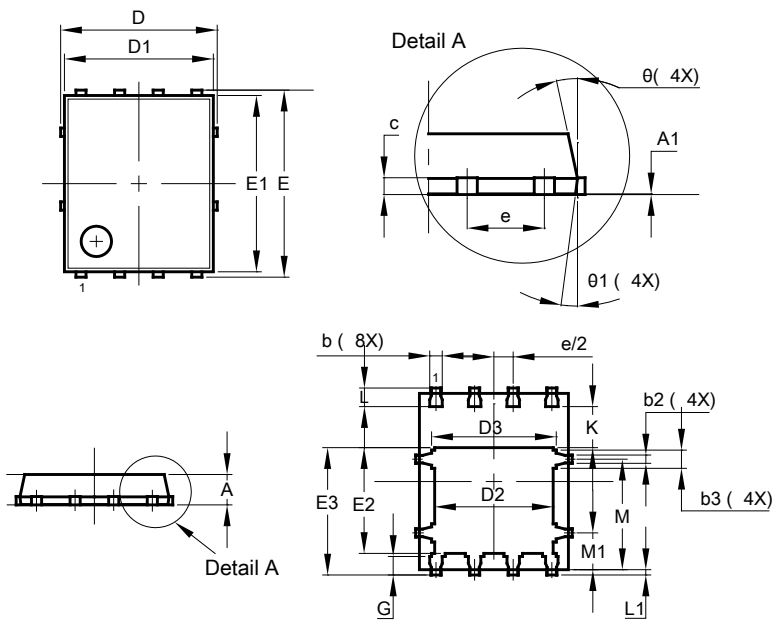

Figure 13 Transient Thermal Resistance

## Package Outline Dimensions

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

Site 1:

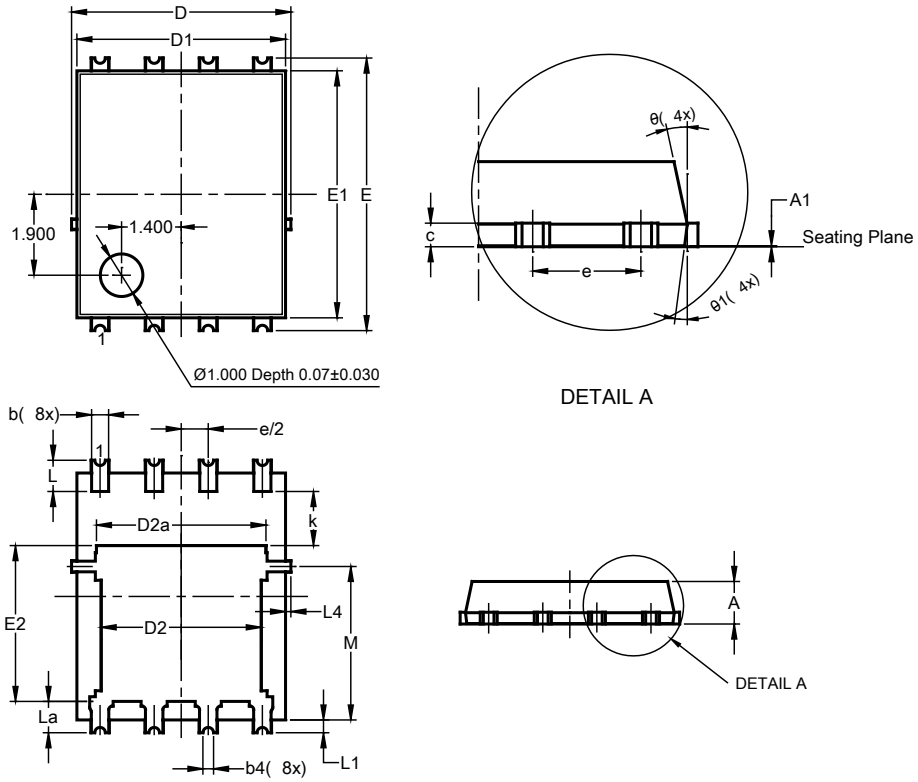
**PowerDI5060-8**




| 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** | | | |

Site 2:

**PowerDI5060-8 (SWP) (Type UX)**



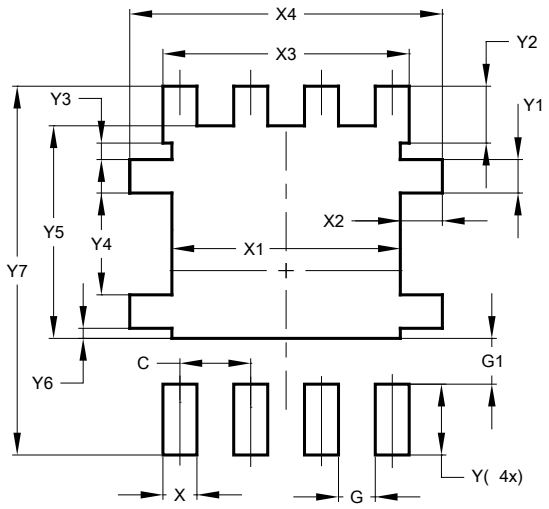

| PowerDI5060-8 (SWP) (Type UX) | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 0.90 | 1.10 | 1.00 |
| **A1** | 0 | 0.05 | -- |
| **b** | 0.30 | 0.50 | 0.41 |
| **b2** | 0.20 | 0.35 | 0.25 |
| **b4** | 0.25REF | | |
| **c** | 0.230 | 0.330 | 0.277 |
| **D** | 5.15 BSC | | |
| **D1** | 4.70 | 5.10 | 4.90 |
| **D2** | 3.56 | 3.96 | 3.76 |
| **D2a** | 3.78 | 4.18 | 3.98 |
| **E** | 6.40 BSC | | |
| **E1** | 5.60 | 6.00 | 5.80 |
| **E2** | 3.46 | 3.86 | 3.66 |
| **E2a** | 4.195 | 4.595 | 4.395 |
| **e** | 1.27BSC | | |
| **k** | 1.05 | -- | -- |
| **L** | 0.635 | 0.835 | 0.735 |
| **La** | 0.635 | 0.835 | 0.735 |
| **L1** | 0.200 | 0.400 | 0.300 |
| **L1a** | 0.050REF | | |
| **L4** | 0.025 | 0.225 | 0.125 |
| **M** | 3.205 | 4.005 | 3.605 |
| **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.

Site 1:

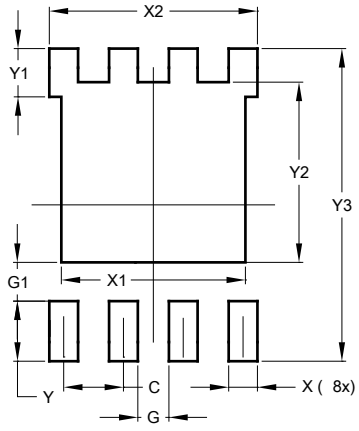
**PowerDI5060-8**




| 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 |

Site 2:

**PowerDI5060-8 (SWP) (Type UX)**




| Dimensions | Value (in mm) |
|---|---|
| C | 1.270 |
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| X1 | 4.100 |
| X2 | 4.420 |
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| Y2 | 3.810 |
| Y3 | 6.610 |

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