# 30V +175°C N-CHANNEL ENHANCEMENT MODE MOSFET
## PowerDI

## Product Summary

| $BV_{DSS}$ | $R_{DS(ON)}$ | $I_D$ $T_C$ = +25°C |
|---|---|---|
| 30V | 1.6mΩ @ $V_{GS}$ = 10V | 240A |

## 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 power management and load switch.

## Features

- Thermally Efficient Package – Cooler Running Applications
- <1.1mm Package Profile – Ideal for Thin Applications
- 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)**
- **Qualified to AEC-Q101 Standards for High Reliability**

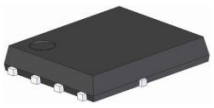
## Applications

- DC-DC Converters
- Load Switch

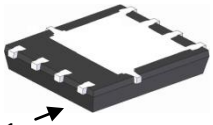
## Mechanical Data

- Case: PowerDI5060-8 (Type K)
- 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)

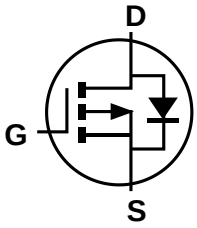
PowerDI5060-8 (Type K)



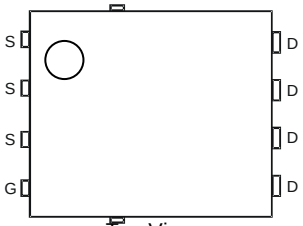
Top View




Bottom View




Internal Schematic




Top View
Pin Configuration

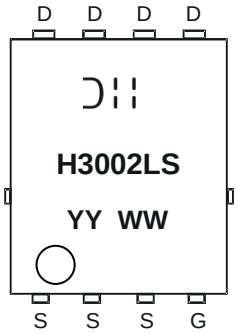
## Ordering Information (Note 4)

| Part Number | Case | Packaging |
|---|---|---|
| DMTH3002LPS-13 | PowerDI5060-8 (Type K) | 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

PowerDI5060-8 (Type K)




= Manufacturer's Marking
H3002LS = Product Type Marking Code
YYWW = Date Code Marking
YY = Last Two Digits of Year (ex: 17 = 2017)
WW = Week Code (01 to 53)

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

| Characteristic | | | Symbol | Value | Unit |
|---|---|---|---|---|---|
| Drain-Source Voltage | | | $V_{DSS}$ | 30 | V |
| Gate-Source Voltage | | | $V_{GSS}$ | ±16 | V |
| Continuous Drain Current, $V_{GS}$ = 10V (Note 7) | Steady State | $T_C$ = +25°C<br>$T_C$ = +100°C | $I_D$ | 240<br>240 | A |
| Maximum Continuous Body Diode Forward Current (Note 7) | | | $I_S$ | 100 | A |
| Pulsed Drain Current (380µs Pulse, Duty Cycle = 1%) | | | $I_{DM}$ | 400 | A |
| Pulsed Continuous Body Diode Forward Current (380µs Pulse, Duty Cycle = 1%) | | | $I_{SM}$ | 400 | A |
| Avalanche Current, L=3mH (Note 8) | | | $I_{AS}$ | 15 | A |
| Avalanche Energy, L=3mH (Note 8) | | | $E_{AS}$ | 700 | mJ |

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

| Characteristic | | Symbol | Value | Units |
|---|---|---|---|---|
| Total Power Dissipation (Note 5) | $T_A$ = +25°C | $P_D$ | 1.2 | W |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady State | $R_{\theta JA}$ | 103 | °C/W |
| Total Power Dissipation (Note 6) | $T_A$ = +25°C | $P_D$ | 2.5 | W |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady State | $R_{\theta JA}$ | 51 | °C/W |
| Total Power Dissipation (Note 7) | $T_C$ = +25°C | $P_D$ | 136 | W |
| Thermal Resistance, Junction to Case (Note 7) | | $R_{\theta JC}$ | 1.1 | °C/W |
| Operating and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to +175 | °C |

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

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** (Note 9) | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | 30 | — | — | V | $V_{GS}$ = 0V, $I_D$ = 250µA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | — | — | 1 | µA | $V_{DS}$ = 24V, $V_{GS}$ = 0V |
| Gate-Source Leakage | $I_{GSS}$ | — | — | ±100 | nA | $V_{GS}$ = ±16V, $V_{DS}$ = 0V |
| **ON CHARACTERISTICS** (Note 9) | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | 1 | — | 2 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 1mA |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | — | 1.25 | 1.6 | mΩ | $V_{GS}$ = 10V, $I_D$ = 25A |
| | | — | 2 | 2.5 | | $V_{GS}$ = 4.5V, $I_D$ = 25A |
| Diode Forward Voltage | $V_{SD}$ | — | 0.8 | 1.1 | V | $V_{GS}$ = 0V, $I_S$ = 25A |
| **DYNAMIC CHARACTERISTICS** (Note 10) | | | | | | |
| Input Capacitance | $C_{ISS}$ | — | 5,000 | — | pF | $V_{DS}$ = 15V, $V_{GS}$ = 0V, f = 1MHz |
| Output Capacitance | $C_{OSS}$ | — | 2,660 | — | | |
| Reverse Transfer Capacitance | $C_{RSS}$ | — | 300 | — | | |
| Gate Resistance | $R_G$ | — | 0.75 | — | Ω | $V_{DS}$ = 0V, $V_{GS}$ = 0V, f = 1MHz |
| Total Gate Charge ($V_{GS}$ = 4.5V) | $Q_G$ | — | 37 | — | nC | $V_{DS}$ = 15V, $I_D$ = 25A |
| Total Gate Charge ($V_{GS}$ = 10V) | $Q_G$ | — | 77 | — | | |
| Gate-Source Charge | $Q_{GS}$ | — | 10 | — | | |
| Gate-Drain Charge | $Q_{GD}$ | — | 14 | — | | |
| Turn-On Delay Time | $t_{D(ON)}$ | — | 21 | — | ns | $V_{DD}$ = 15V, $V_{GS}$ = 4.5V, $I_D$ = 25A, $R_G$ = 4.7Ω |
| Turn-On Rise Time | $t_R$ | — | 45 | — | | |
| Turn-Off Delay Time | $t_{D(OFF)}$ | — | 32 | — | | |
| Turn-Off Fall Time | $t_F$ | — | 26 | — | | |
| Body Diode Reverse Recovery Time | $t_{RR}$ | — | 44 | — | ns | $I_S$ = 15A, di/dt = 100A/µs |
| Body Diode Reverse Recovery Charge | $Q_{RR}$ | — | 52 | — | nC | |

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 1-inch square copper plate.
7. Thermal resistance from junction to soldering point (on the exposed drain pad).
8. $I_{AS}$ and $E_{AS}$ rating are based on low frequency and duty cycles to keep $T_J$ = +25°C.
9. Short duration pulse test used to minimize self-heating effect.
10. Guaranteed by design. Not subject to product testing.


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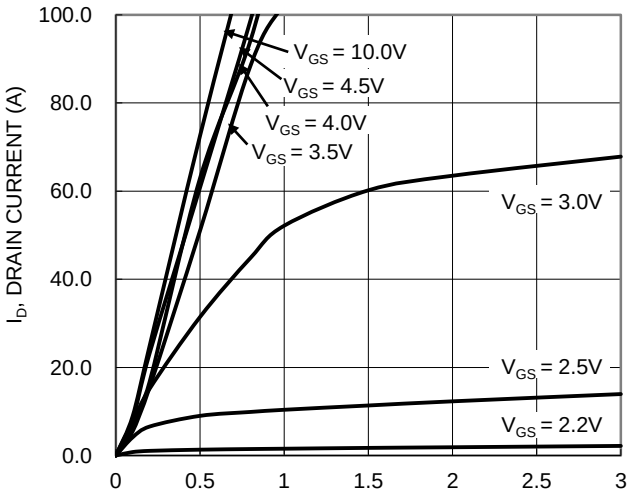



Figure 1. Typical Output Characteristic

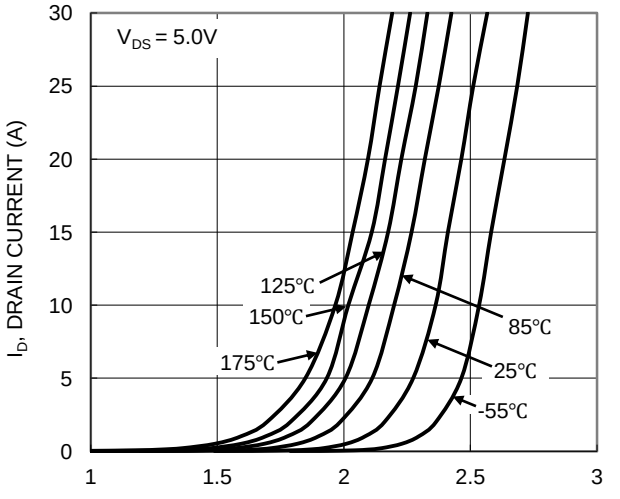



Figure 2. Typical Transfer Characteristic

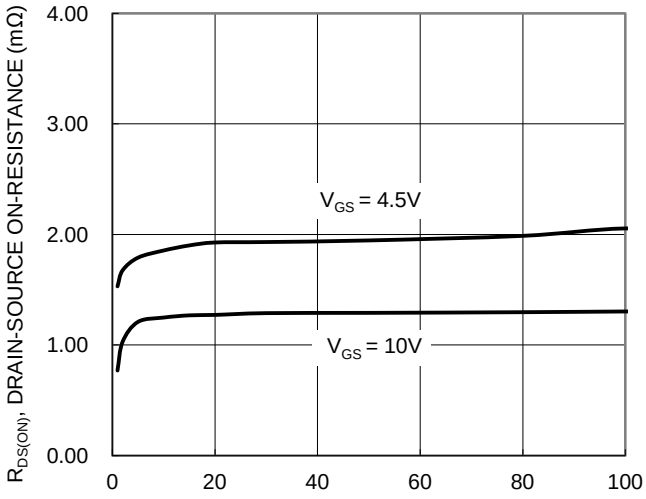



Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

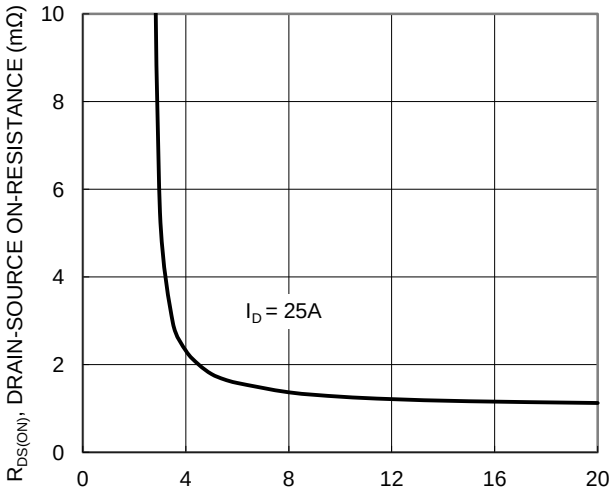



Figure 4. Typical Transfer Characteristic

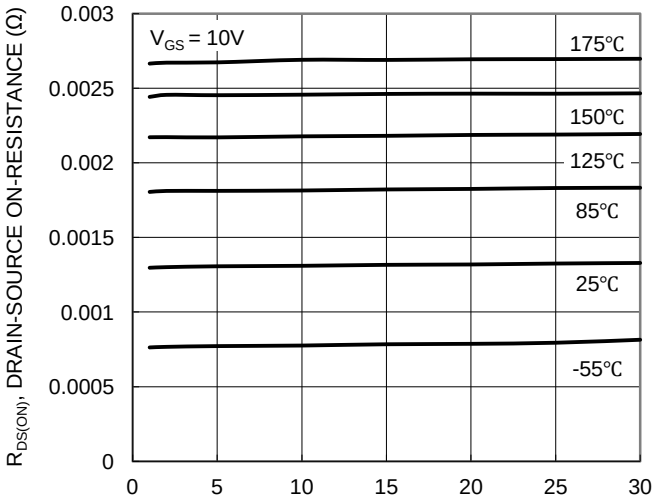



Figure 5. Typical On-Resistance vs. Drain Current and Temperature

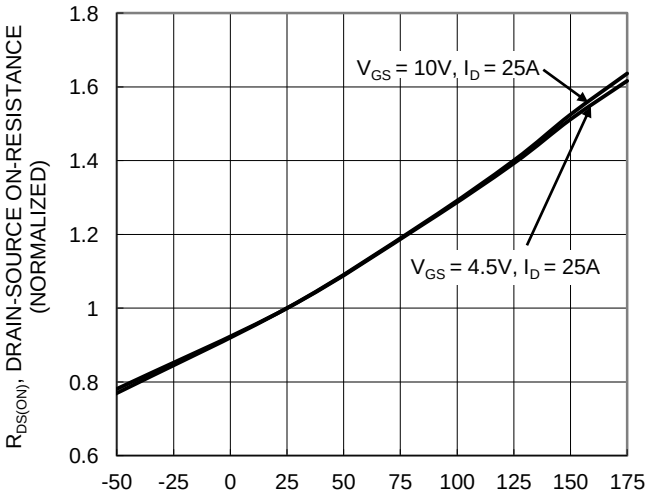



Figure 6. On-Resistance Variation with Temperature


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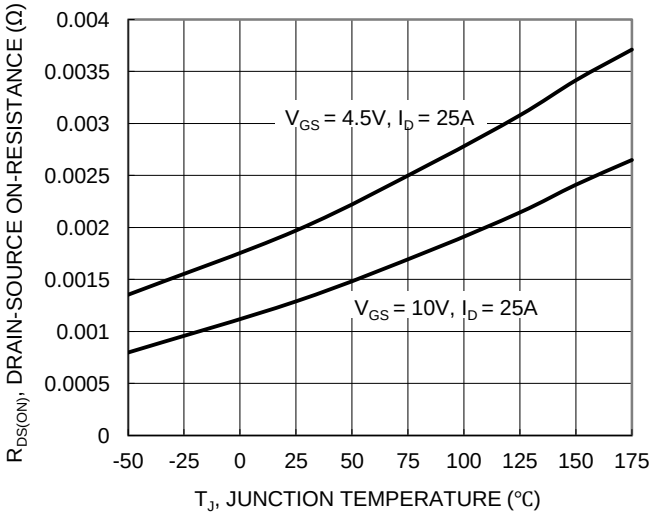



Figure 7. On-Resistance Variation with Temperature

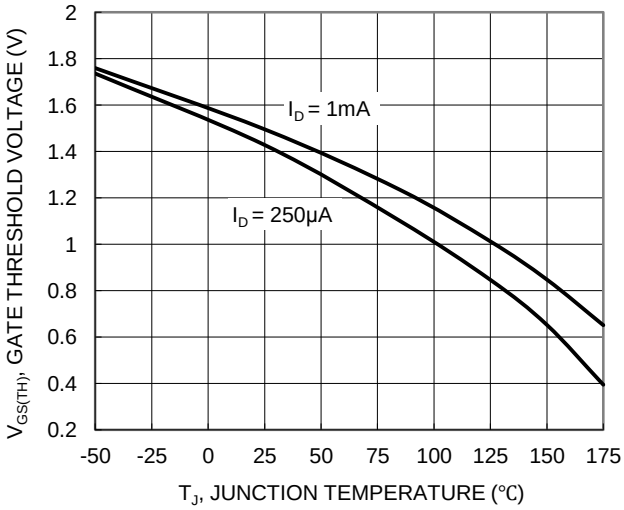



Figure 8. Gate Threshold Variation vs. JunctionTemperature

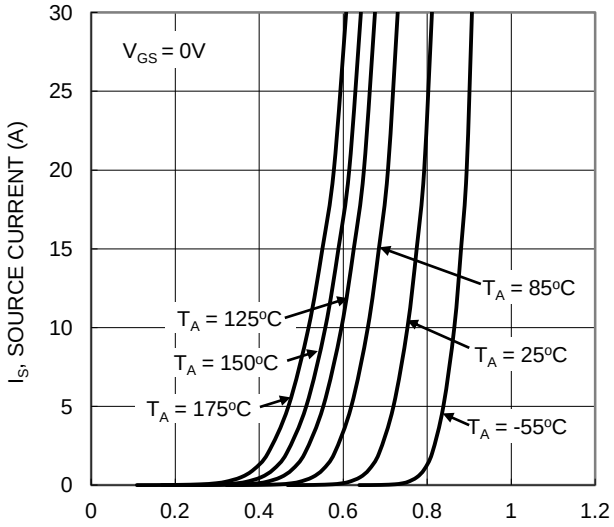



Figure 9. Diode Forward Voltage vs. Current

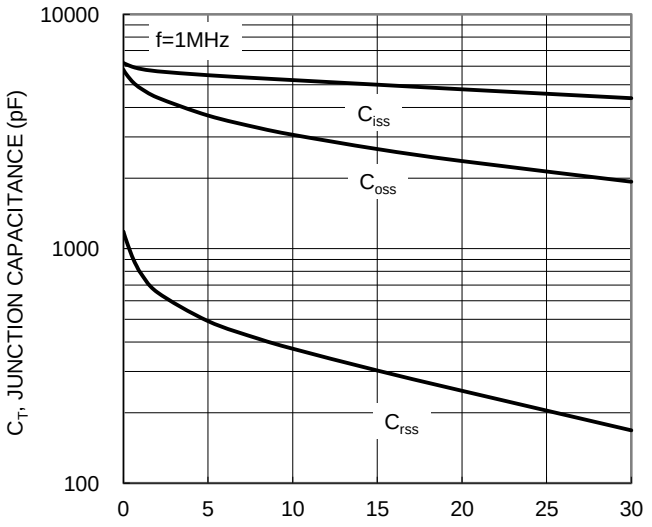



Figure 10. Typical Junction Capacitance

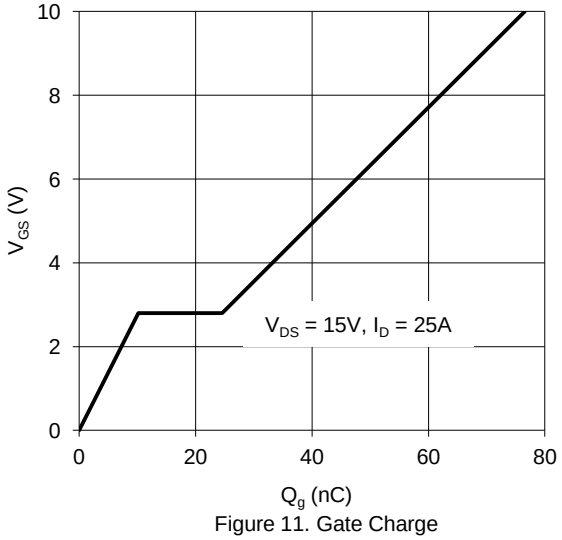



Figure 11. Gate Charge

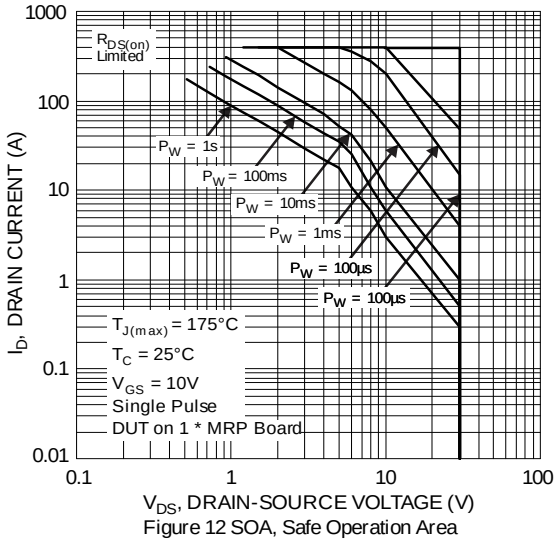



Figure 12 SOA, Safe Operation Area


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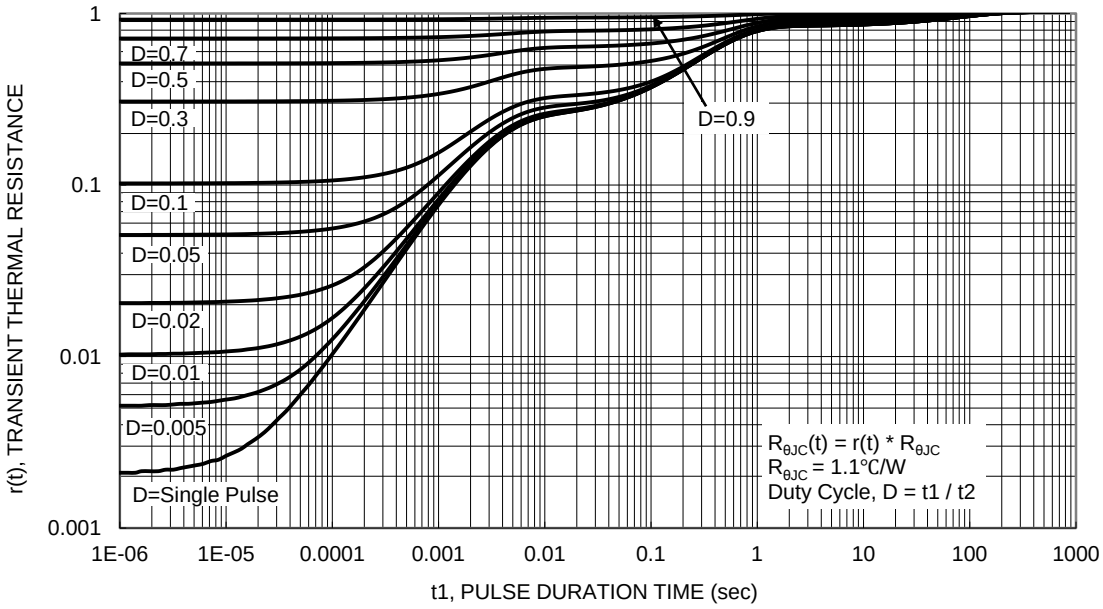


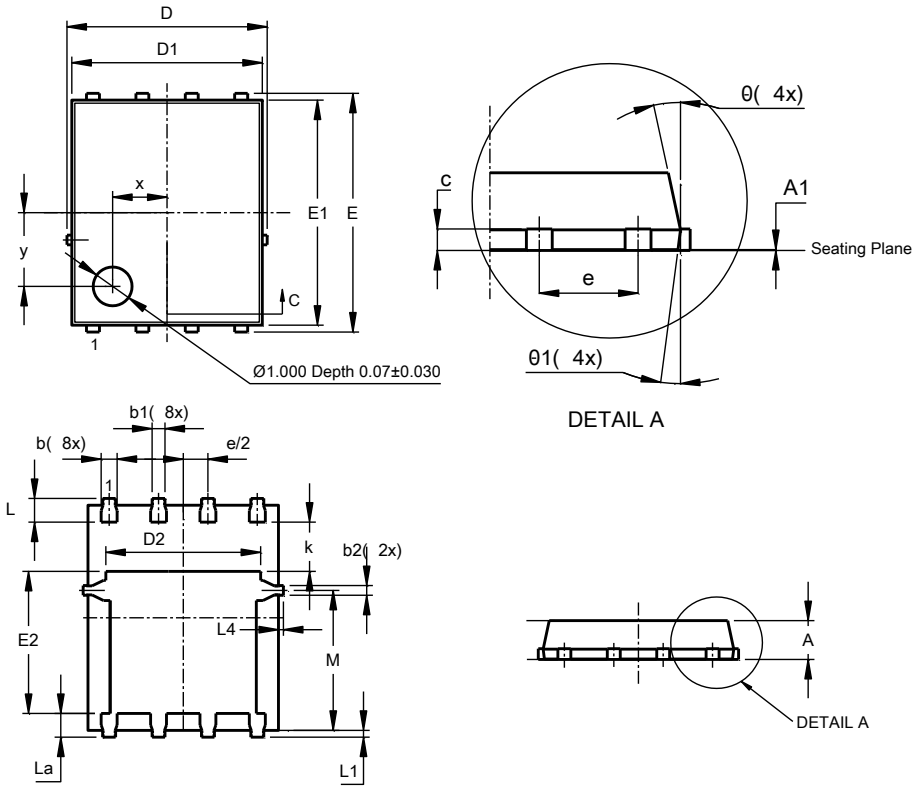

Figure 13. Transient Thermal Resistance


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## Package Outline Dimensions

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**PowerDI5060-8 (Type K)**

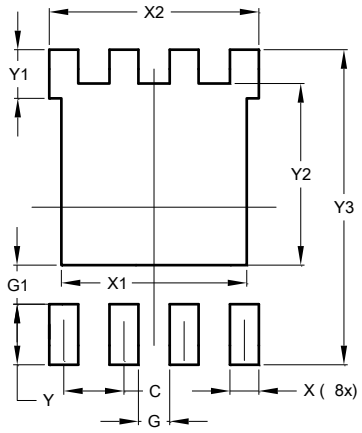



| PowerDI5060-8 (Type K) | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 0.90 | 1.10 | 1.00 |
| **A1** | 0 | 0.05 | 0.02 |
| **b** | 0.33 | 0.51 | 0.41 |
| **b1** | 0.300 | 0.366 | 0.333 |
| **b2** | 0.20 | 0.35 | 0.25 |
| **c** | 0.23 | 0.33 | 0.277 |
| **D** | 5.15 BSC | | |
| **D1** | 4.85 | 4.95 | 4.90 |
| **D2** | - | - | 3.98 |
| **E** | 6.15 BSC | | |
| **E1** | 5.75 | 5.85 | 5.80 |
| **E2** | 3.56 | 3.725 | 3.66 |
| **E** | 1.27BSC | | |
| **k** | - | - | 1.27 |
| **L** | 0.51 | 0.71 | 0.61 |
| **La** | 0.51 | 0.675 | 0.61 |
| **L1** | 0.05 | 0.20 | 0.175 |
| **L4** | - | - | 0.125 |
| **M** | 3.50 | 3.71 | 3.605 |
| **x** | - | - | 1.400 |
| **y** | - | - | 1.900 |
| **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 (Type K)**




| Dimensions | Value (in mm) |
|---|---|
| **C** | 1.270 |
| **G** | 0.660 |
| **G1** | 0.820 |
| **X** | 0.610 |
| **X1** | 3.910 |
| **X2** | 4.420 |
| **Y** | 1.270 |
| **Y1** | 1.020 |
| **Y2** | 3.810 |
| **Y3** | 6.610 |


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