# 100V N-CHANNEL ENHANCEMENT MODE MOSFET
# PowerDI5060-8

## Product Summary

| $BV_{DSS}$ | $R_{DS(ON)}$ Max | $I_D$ Max $T_C$ = +25°C |
|---|---|---|
| 100V | 14.5mΩ @ $V_{GS}$ = 10V | 53A |
| | 19.5mΩ @ $V_{GS}$ = 6V | 47A |

## 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 controls
- DC-DC converters
- Power managements

## Features

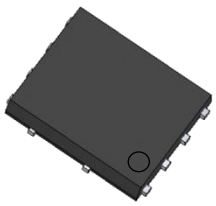
- 100% Unclamped Inductive Switching (UIS) Test in Production—Ensures More Reliable and Robust End Application
- Thermally Efficient Package—Cooler Running Applications
- High Conversion Efficiency
- Low $R_{DS(ON)}$—Minimizes On-State Losses
- Low Input Capacitance
- Fast Switching Speed
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e.: parts qualified to AEC-Q100/101/104/200, 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/**

## Mechanical Data

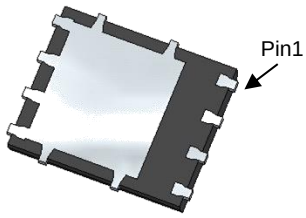
- Package: PowerDI®5060-8
- Package Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections Indicator: See Diagram
- Terminals: Finish—Matte Tin Annealed over Copper Leadframe. Solderable per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

Site 1:

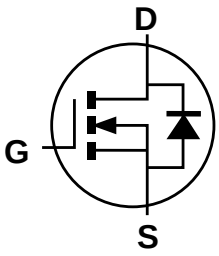
PowerDI5060-8



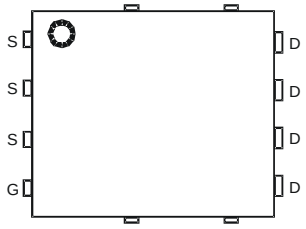
Top View




Bottom View



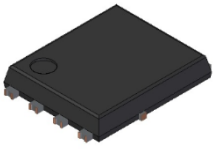

Internal Schematic



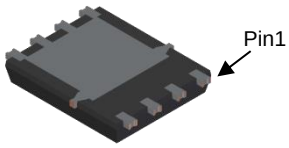

Top View
Pin Configuration

Site 2:

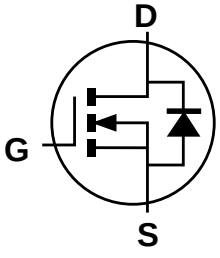
PowerDI5060-8/SWP (Type UX)



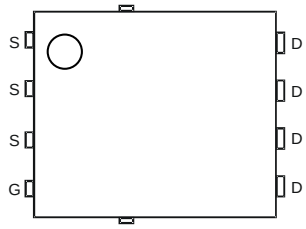
Top View




Bottom View




Internal Schematic




Top View
Pin Configuration

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.


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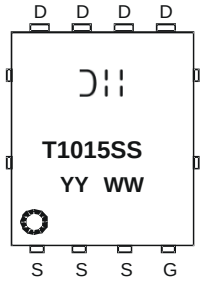
## Ordering Information (Note 4)

| Part Number | Package | Packing | |
|---|---|---|---|
| | | Qty. | Carrier |
| DMT10H015SPS-13 | PowerDI5060-8 | 2,500 | Tape & Reel |
| DMT10H015SPS-13 | PowerDI5060-8/SWP (Type UX) | 2,500 | Tape & Reel |

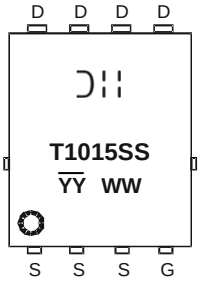
Note: 4. For packaging details, go to our website at https://www.diodes.com/design/support/packaging/diodes-packaging/.

## Marking Information

PowerDI5060-8




PowerDI5060-8/SWP (Type UX)




= Manufacturer's Marking
T1015SS = Product Type Marking Code
YYWW or $\overline{\text{YY}}$WW = Date Code Marking
YY or $\overline{\text{YY}}$ = Last Two Digits of Year (ex: 23 = 2023)
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 6) $V_{GS}$ = 10V | Steady State | $T_C$ = +25°C<br>$T_C$ = +70°C | $I_D$ | 53<br>43 | A |
| Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%) | | | $I_{DM}$ | 120 | A |
| Maximum Continuous Body Diode Forward Current (Note 6) | | | $I_S$ | 53 | A |
| Avalanche Current (Note 7), L = 3mH | | | $I_{AS}$ | 7.5 | A |
| Avalanche Energy (Note 7), L = 3mH | | | $E_{AS}$ | 85 | mJ |
| Avalanche Current, L = 0.1mH | | | $I_{AS}$ | 15.8 | A |
| Avalanche Energy, L = 0.1mH | | | $E_{AS}$ | 12.5 | mJ |

## Thermal Characteristics

| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Total Power Dissipation (Note 5) | $T_A$ = +25°C | $P_D$ | 2.3 | W |
| Thermal Resistance, Junction to Ambient (Note 5) | | $R_{\theta JA}$ | 55 | °C/W |
| Total Power Dissipation (Note 6) | $T_C$ = +25°C | $P_D$ | 78 | W |
| Thermal Resistance, Junction to Case (Note 6) | | $R_{\theta JC}$ | 1.6 | °C/W |
| Operating and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to +150 | °C |

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. Guaranteed by design. Not subject to product testing.


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

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** (Note 8) | | | | | | |
| 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 8) | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | 2 | — | 4 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | — | 11.3 | 14.5 | mΩ | $V_{GS}$ = 10V, $I_D$ = 20A |
| | | — | 14.7 | 19.5 | | $V_{GS}$ = 6V, $I_D$ = 20A |
| Diode Forward Voltage | $V_{SD}$ | — | 0.9 | 1.3 | V | $V_{GS}$ = 0V, $I_S$ = 20A |
| **DYNAMIC CHARACTERISTICS** (Note 7) | | | | | | |
| Input Capacitance | $C_{iss}$ | — | 2343 | — | pF | $V_{DS}$ = 50V, $V_{GS}$ = 0V<br>f = 1MHz |
| Output Capacitance | $C_{oss}$ | — | 487 | — | | |
| Reverse Transfer Capacitance | $C_{rss}$ | — | 26 | — | | |
| Gate Resistance | $R_g$ | — | 0.69 | — | Ω | $V_{DS}$ = 0V, $V_{GS}$ = 0V, f = 1MHz |
| Total Gate Charge | $Q_g$ | — | 30.1 | — | nC | $V_{DD}$ = 50V, $I_D$ = 10A,<br>$V_{GS}$ = 10V |
| Gate-Source Charge | $Q_{gs}$ | — | 7.5 | — | | |
| Gate-Drain Charge | $Q_{gd}$ | — | 6.5 | — | | |
| Turn-On Delay Time | $t_{D(ON)}$ | — | 9.8 | — | ns | $V_{DD}$ = 50V, $V_{GS}$ = 10V,<br>$I_D$ = 10A, $R_g$ = 6Ω |
| Turn-On Rise Time | $t_R$ | — | 7.8 | — | | |
| Turn-Off Delay Time | $t_{D(OFF)}$ | — | 22.5 | — | | |
| Turn-Off Fall Time | $t_F$ | — | 9.6 | — | | |
| Reverse Recovery Time | $t_{RR}$ | — | 43.1 | — | ns | $I_F$ = 10A, di/dt = 100A/μs |
| Reverse Recovery Charge | $Q_{RR}$ | — | 65.1 | — | nC | |

Notes: 7. Guaranteed by design. Not subject to product testing.
8. Short duration pulse test used to minimize self-heating effect.


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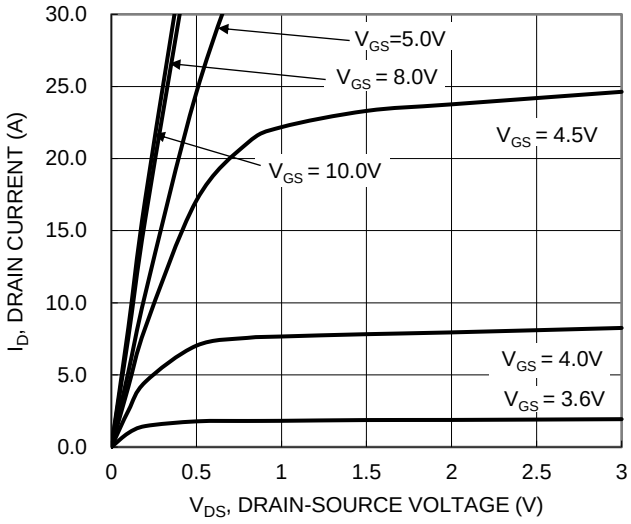



Figure 1. Typical Output Characteristic

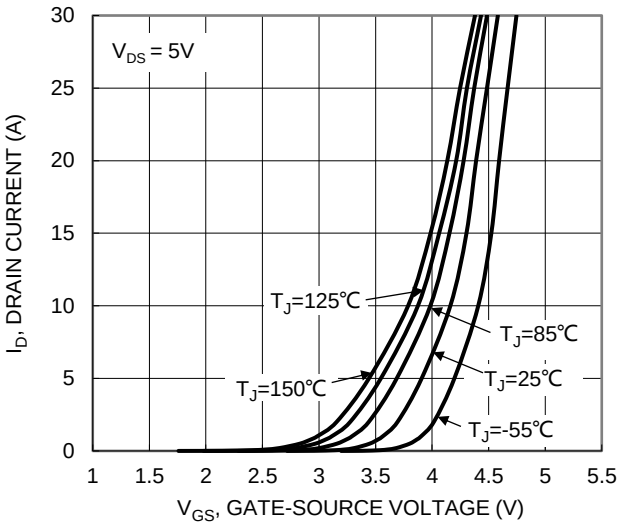



Figure 2. Typical Transfer Characteristic

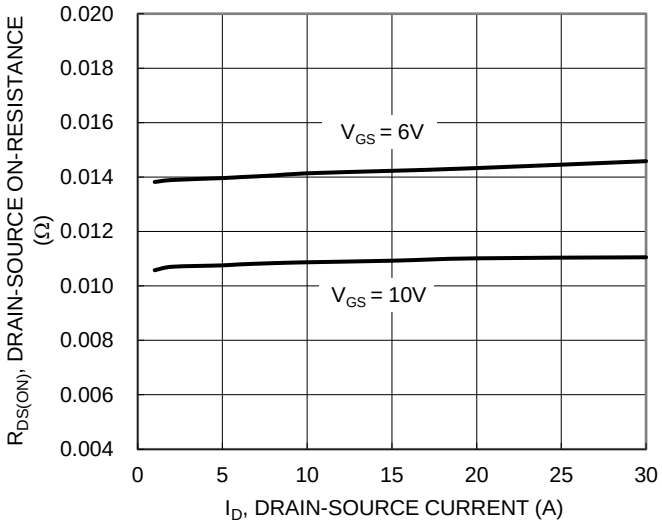



Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

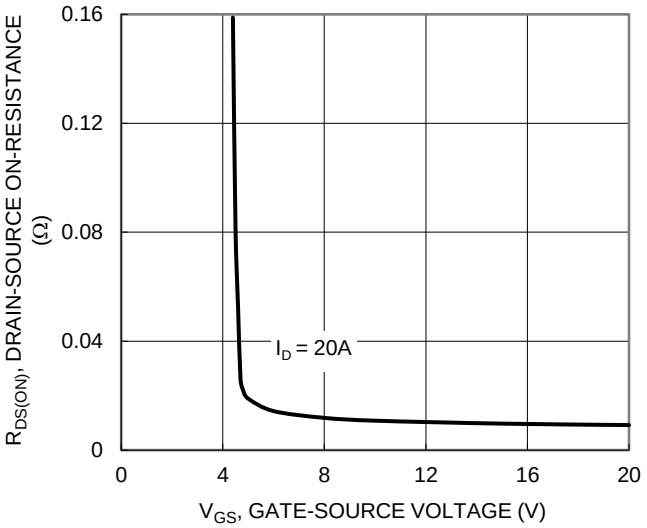



Figure 4. Typical Transfer Characteristic

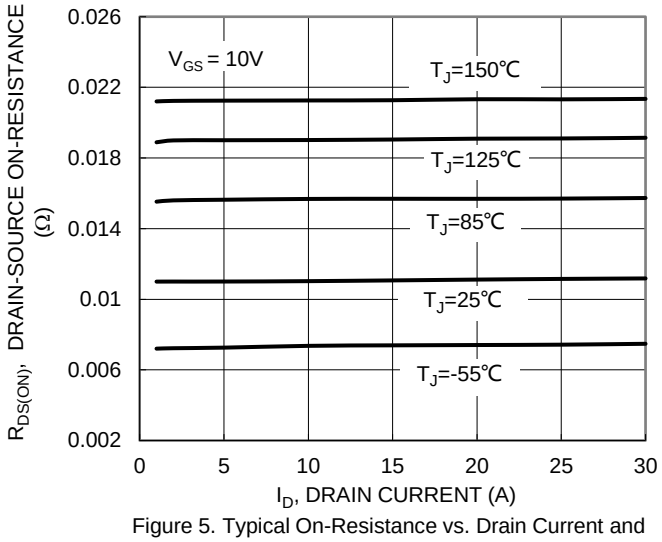



Figure 5. Typical On-Resistance vs. Drain Current and Temperature

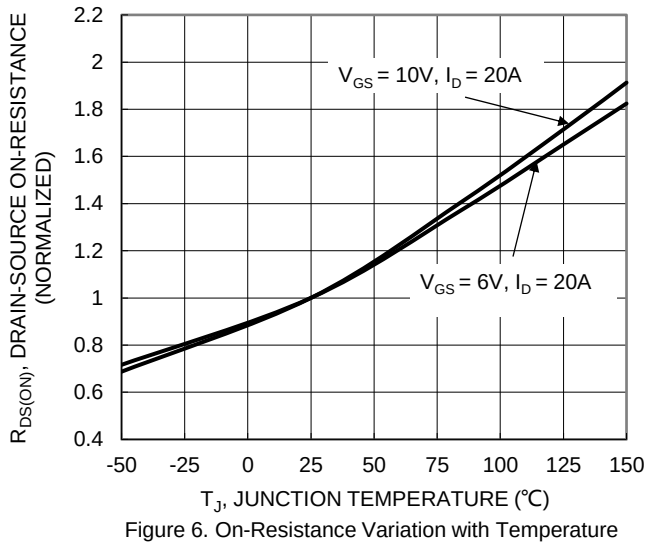



Figure 6. On-Resistance Variation with Temperature


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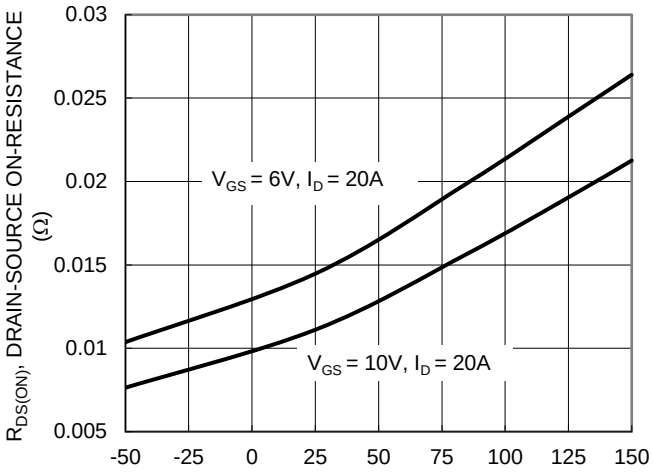



Figure 7. On-Resistance Variation with Temperature

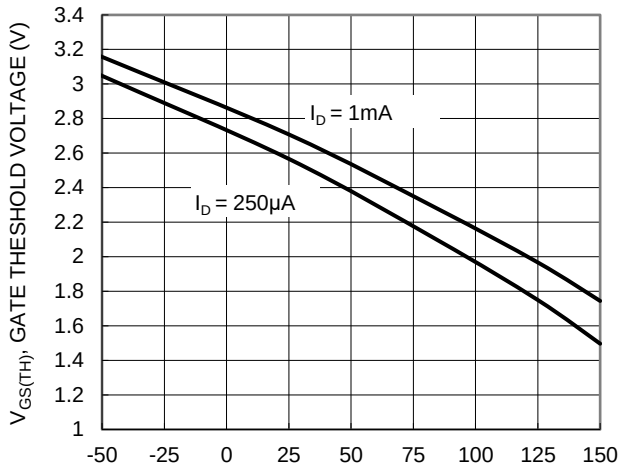



Figure 8. Gate Theshold Variation vs. Junction Temperature

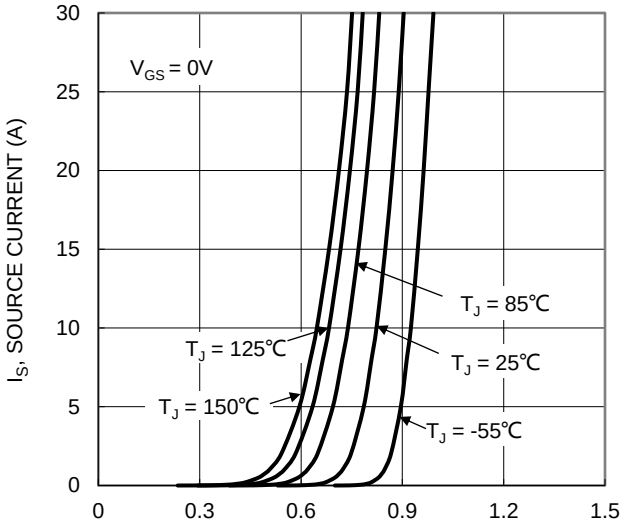



Figure 9. Diode Forward Voltage vs. Current

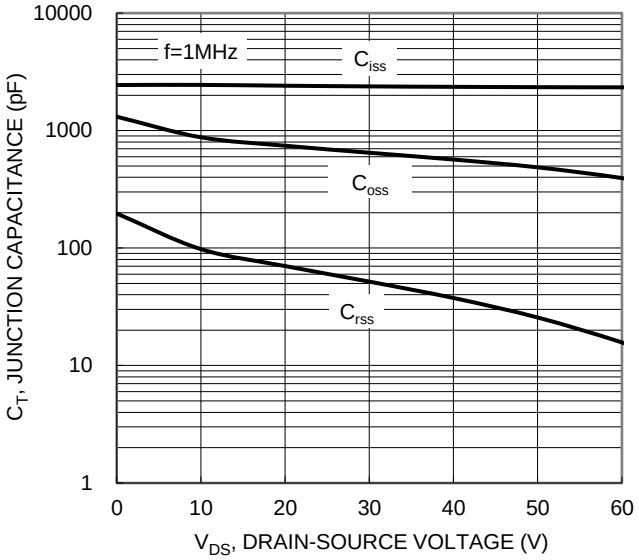



Figure 10. Typical Junction Capacitance

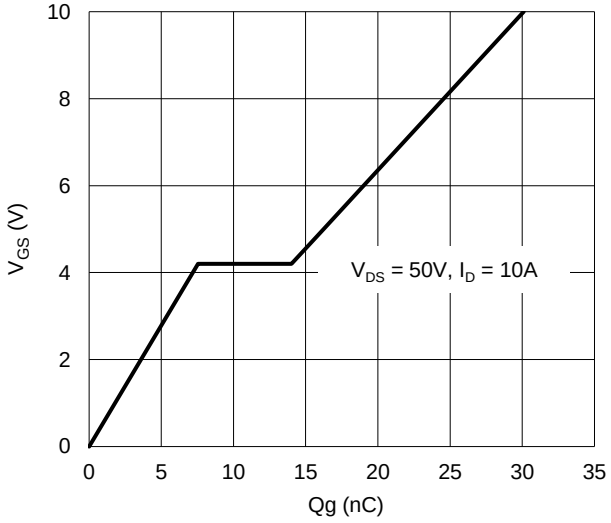



Figure 11. Gate Charge

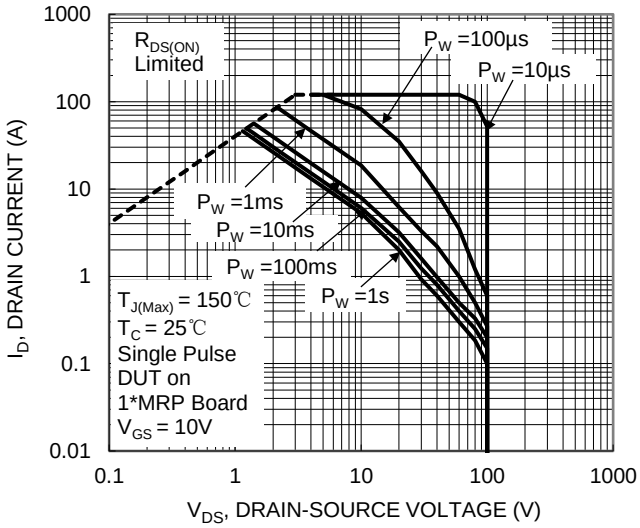



Figure 12. SOA, Safe Operation Area


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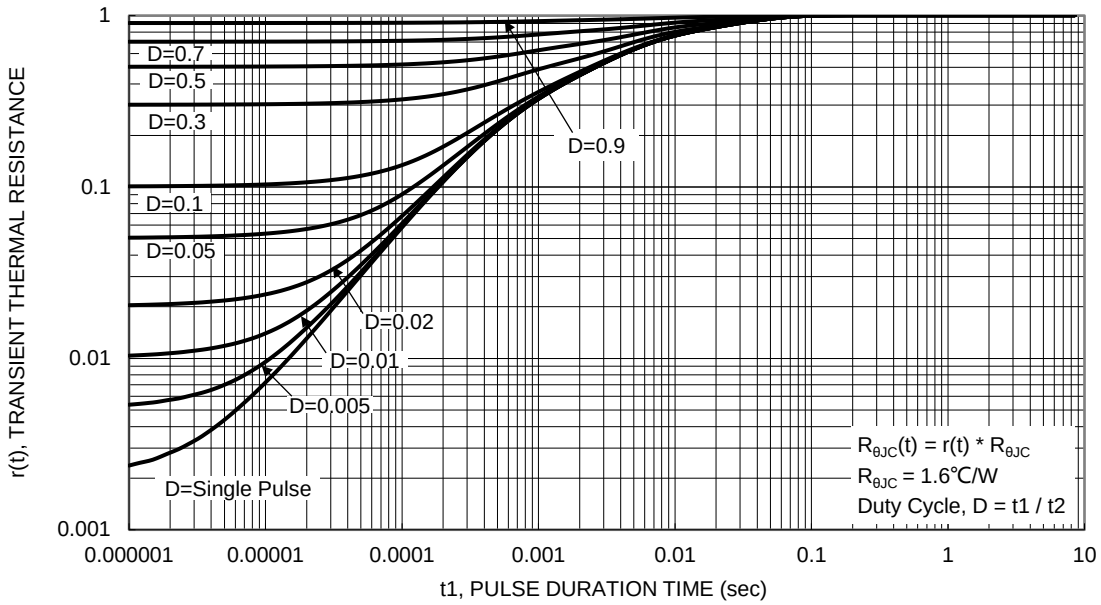



Figure 13. Transient Thermal Resistance

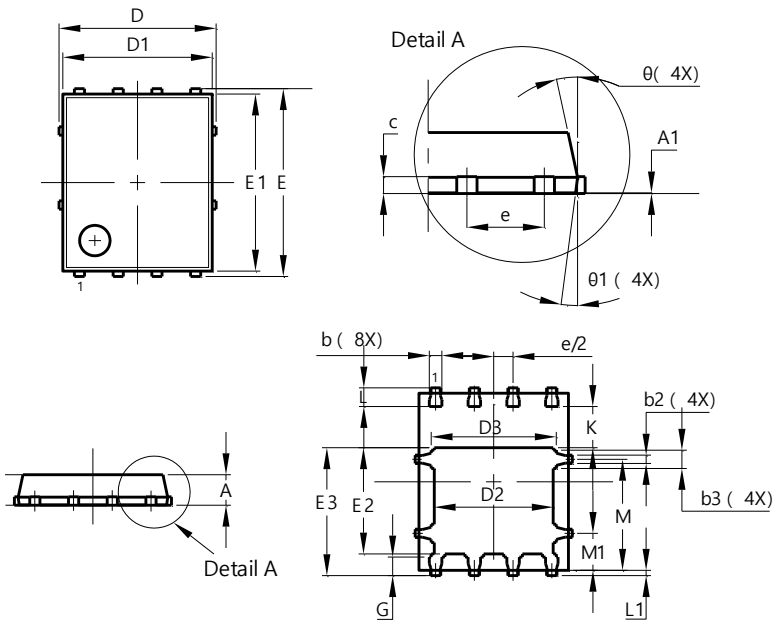

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## Package Outline Dimensions

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

Site 1:

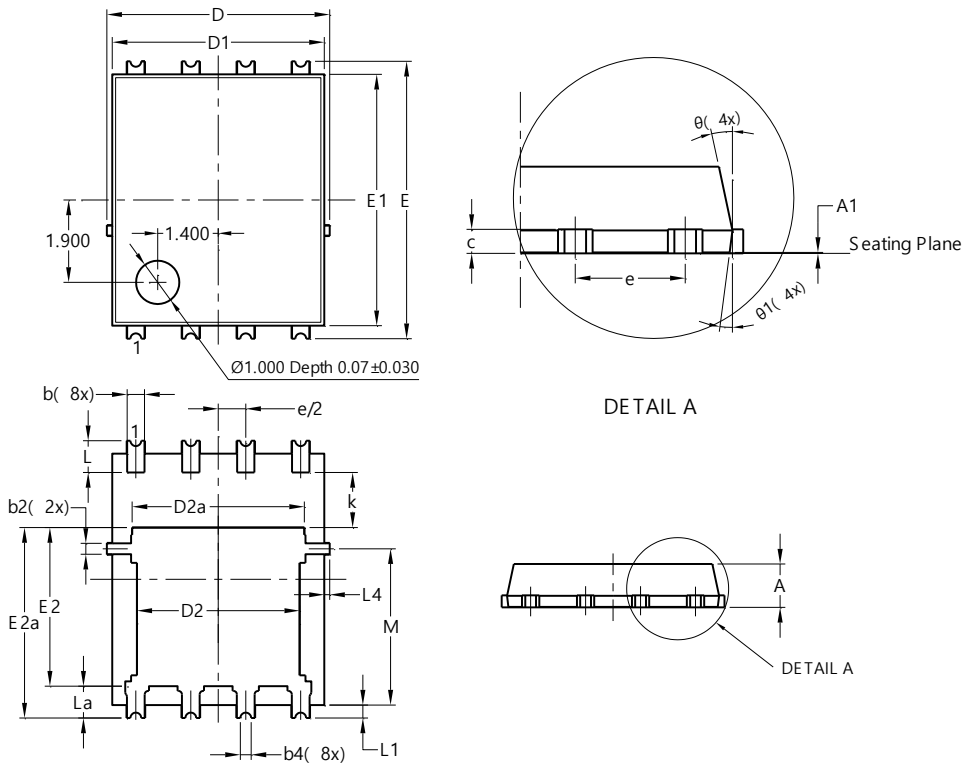
**PowerDI5060-8**




| 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** | | | |

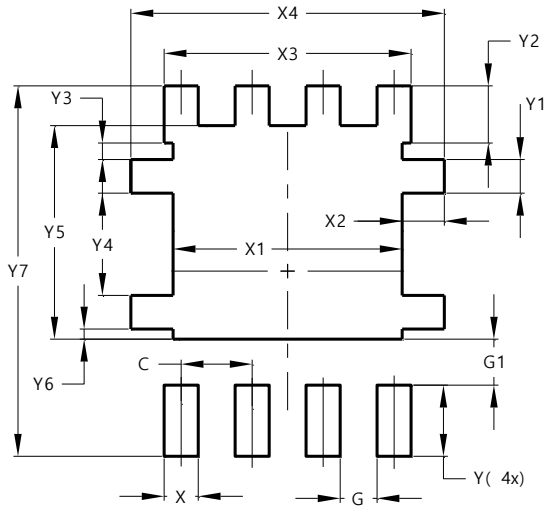

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## Suggested Pad Layout

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Site 1:

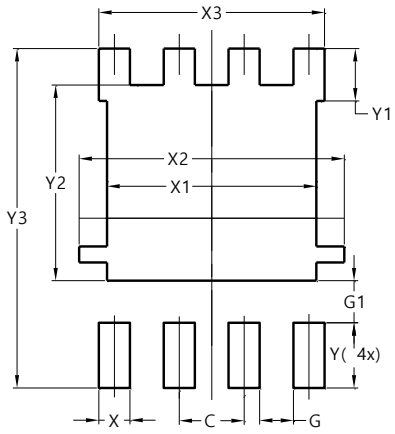
**PowerDI5060-8**




| 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 |
| G | 0.660 |
| G1 | 0.820 |
| X | 0.610 |
| X1 | 4.100 |
| X2 | 5.190 |
| X3 | 4.420 |
| Y | 1.270 |
| Y1 | 1.020 |
| Y2 | 3.810 |
| Y3 | 6.610 |


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