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# DMNH6035SPDW

**60V 175°C N-CHANNEL ENHANCEMENT MODE MOSFET**
**PowerDI5060-8**

## Product Summary

| $BV_{DSS}$ | $R_{DS(ON)}$ max | $I_D$ max $T_C$ = +25°C |
|---|---|---|
| 60V | 35mΩ @ $V_{GS}$ = 10V | 33A |
| | 44mΩ @ $V_{GS}$ = 4.5V | 29A |

## Description and Applications

This MOSFET is designed to minimize the on-state resistance ($R_{DS(ON)}$) yet maintain superior switching performance, making it ideal for high efficiency power management applications.

- Backlighting
- Power Management Functions
- DC-DC Converters

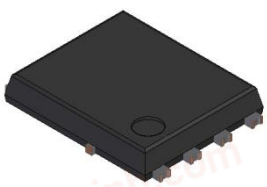
## Features and Benefits

- Rated to +175°C – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switch (UIS) Test in Production
- Low $R_{DS(ON)}$ – Minimizes On State Losses
- Low Input Capacitance
- Wettable Flank for Improved Optical Inspections
- **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/**
- **An Automotive-Compliant Part is Available Under Separate Datasheet (DMNH6035SPDWQ)**

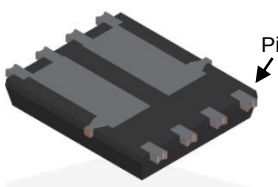
## Mechanical Data

- 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
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.097 grams (Approximate)

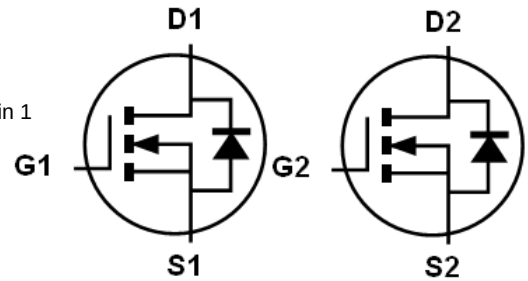
PowerDI5060-8 (SWP) (Type R)



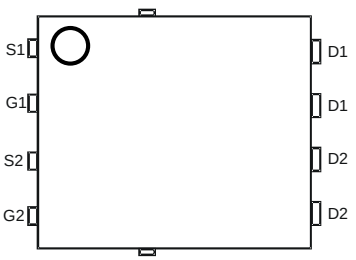
Top View




Bottom View




Equivalent Circuit




Top View
Pin Configuration

## Ordering Information (Note 4)

| Part Number | Case | Packaging |
|---|---|---|
| DMNH6035SPDW-13 | PowerDI5060-8 (SWP) (Type R) | 2500 / 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/.

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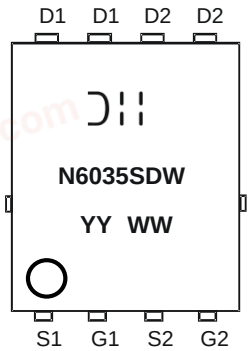
## Marking Information




= Manufacturer's Marking
N6035SDW = Product Type Marking Code
YYWW = Date Code Marking
YY = Year (ex: 20 = 2020)
WW = Week (01 to 53)

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

| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DSS}$ | 60 | V |
| Gate-Source Voltage | | $V_{GSS}$ | ±20 | V |
| Continuous Drain Current, $V_{GS}$ = 10V (Note 6) | $T_C$ = +25°C<br>$T_C$ = +100°C | $I_D$ | 33<br>21 | A |
| Maximum Body Diode Forward Current (Note 6) | | $I_S$ | 33 | A |
| Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%) | | $I_{DM}$ | 132 | A |
| Pulsed Source Current (10µs Pulse, Duty Cycle = 1%) | | $I_{SM}$ | 132 | A |
| Avalanche Current, L = 1mH | | $I_{AS}$ | 21.4 | A |
| Avalanche Energy, L = 1mH | | $E_{AS}$ | 230 | mJ |

## Thermal Characteristics

| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Thermal Resistance, Junction to Ambient (Note 5) | | $R_{\theta JA}$ | 62 | °C/W |
| Total Power Dissipation | $T_A$ = +25°C | $P_D$ | 2.4 | W |
| Thermal Resistance, Junction to Case (Note 6) | | $R_{\theta JC}$ | 2.2 | °C/W |
| Total Power Dissipation | $T_C$ = +25°C | $P_D$ | 68 | W |
| Operating and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to +175 | °C |

Notes: 5. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate; measured with 1 channel active.
6. Thermal resistance from junction to solder point (on the exposed drain pin); measured with 1 channel active.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## Electrical Characteristics N-Channel (@$T_C$ = +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, $I_D$ = 250µA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | — | — | 1 | µA | $V_{DS}$ = 60V, $V_{GS}$ = 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 | $R_{DS(ON)}$ | — | 24 | 35 | mΩ | $V_{GS}$ = 10V, $I_D$ = 15A |
| | | — | 33 | 44 | | $V_{GS}$ = 4.5V, $I_D$ = 10A |
| Diode Forward Voltage | $V_{SD}$ | — | 0.75 | 1.2 | V | $V_{GS}$ = 0V, $I_S$ = 2.6A |
| **DYNAMIC CHARACTERISTICS (Note 8)** | | | | | | |
| Input Capacitance | $C_{iss}$ | — | 879 | — | pF | $V_{DS}$ = 25V, $V_{GS}$ = 0V, f = 1.0MHz |
| Output Capacitance | $C_{oss}$ | — | 227 | — | | |
| Reverse Transfer Capacitance | $C_{rss}$ | — | 17 | — | | |
| Gate Resistance | $R_G$ | — | 2.4 | — | Ω | $V_{DS}$ = 0V, $V_{GS}$ = 0V, f = 1.0MHz |
| Total Gate Charge ($V_{GS}$ = 6V) | $Q_g$ | — | 10 | — | nC | $V_{DS}$ = 30V, $I_D$ = 20A |
| Total Gate Charge ($V_{GS}$ = 10V) | $Q_g$ | — | 16 | — | | |
| Gate-Source Charge | $Q_{gs}$ | — | 2 | — | | |
| Gate-Drain Charge | $Q_{gd}$ | — | 4.9 | — | | |
| Turn-On Delay Time | $t_{D(ON)}$ | — | 3.8 | — | ns | $V_{DD}$ = 30V, $V_{GS}$ = 10V, $R_G$ = 4.7Ω, $I_D$ = 20A |
| Turn-On Rise Time | $t_R$ | — | 7.7 | — | | |
| Turn-Off Delay Time | $t_{D(OFF)}$ | — | 19.5 | — | | |
| Turn-Off Fall Time | $t_F$ | — | 5.8 | — | | |
| Body Diode Reverse Recovery Time | $t_{RR}$ | — | 28 | — | ns | $I_F$ = 20A, di/dt = 100A/µs |
| Body Diode Reverse Recovery Charge | $Q_{RR}$ | — | 28 | — | nC | $I_F$ = 20A, di/dt = 100A/µs |

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


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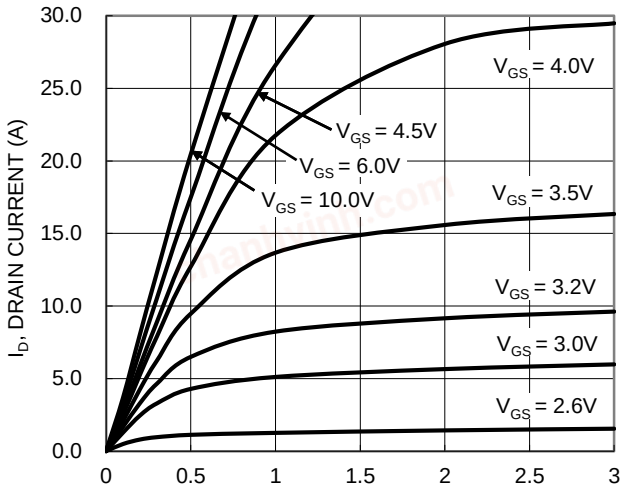


Figure 1. Typical Output Characteristic

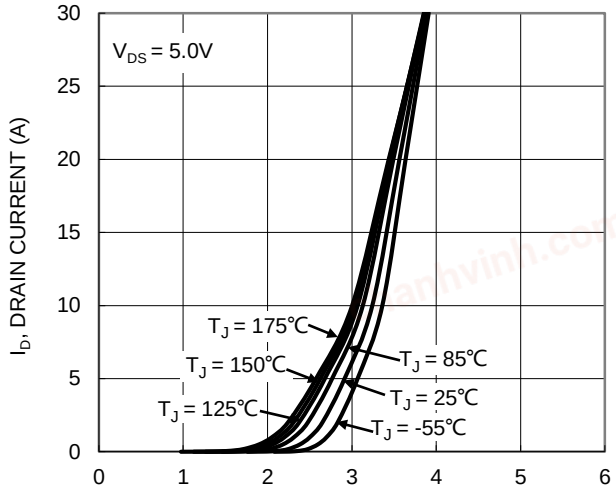


Figure 2. Typical Transfer Characteristic

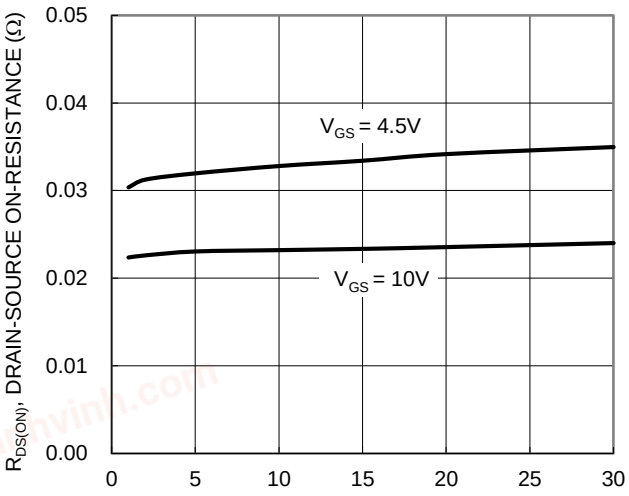


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

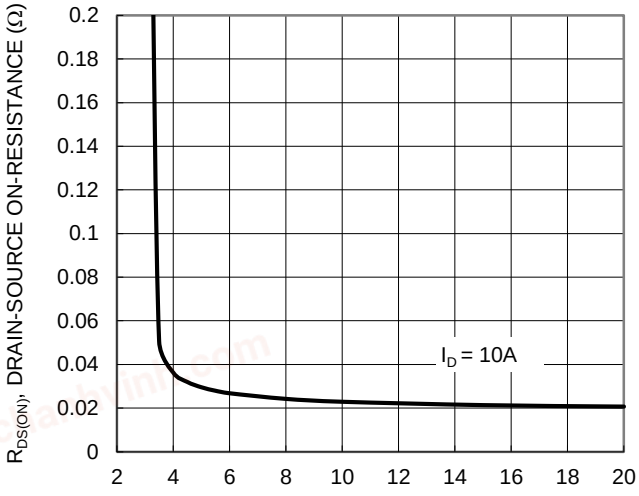


Figure 4. Typical Transfer Characteristic

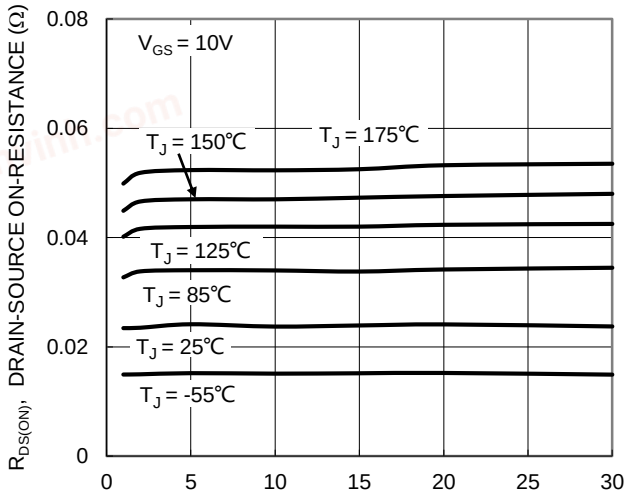


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

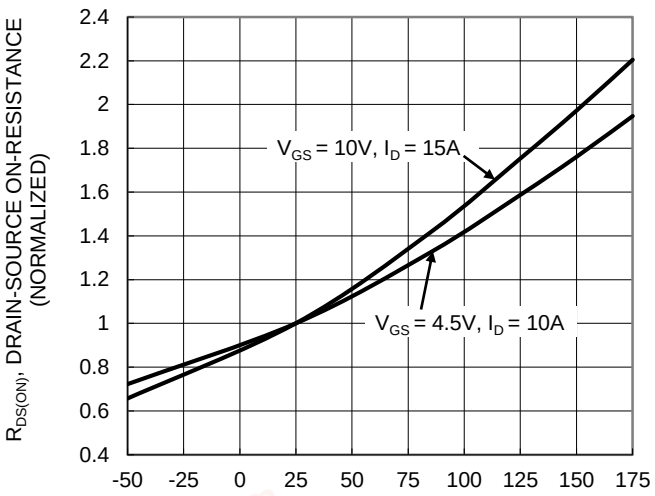


Figure 6. On-Resistance Variation with Temperature


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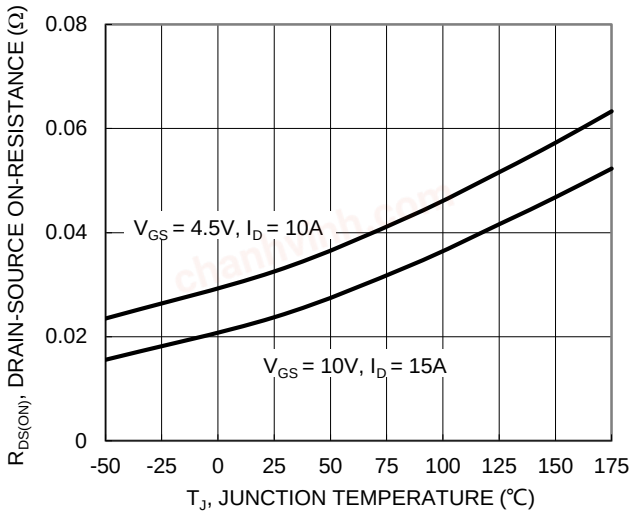


Figure 7. On-Resistance Variation with Temperature

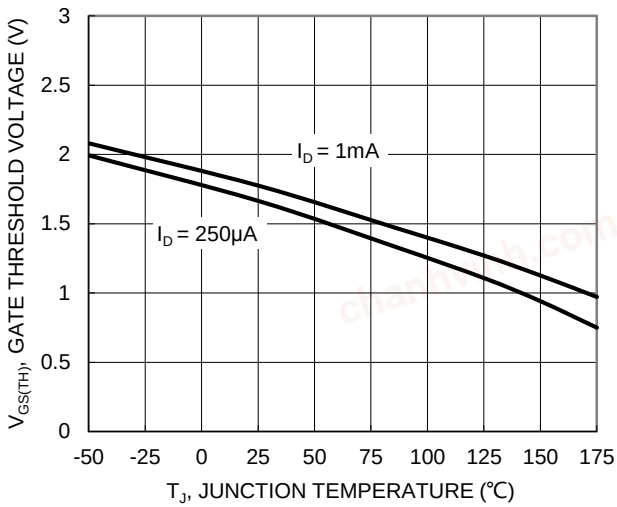


Figure 8. Gate Threshold Variation vs. Junction Temperature

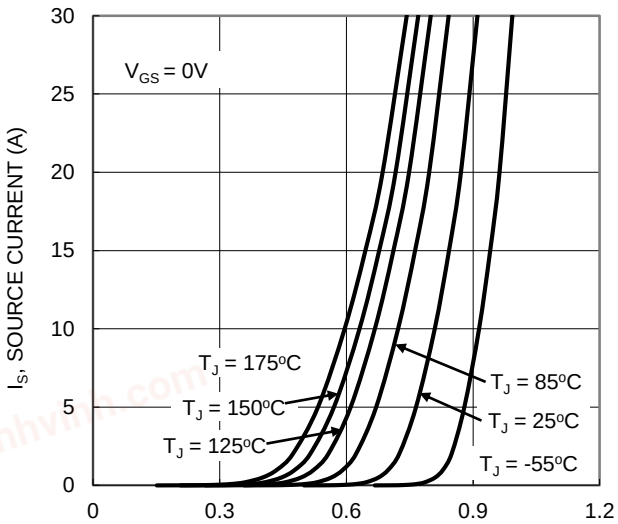


Figure 9. Diode Forward Voltage vs. Current

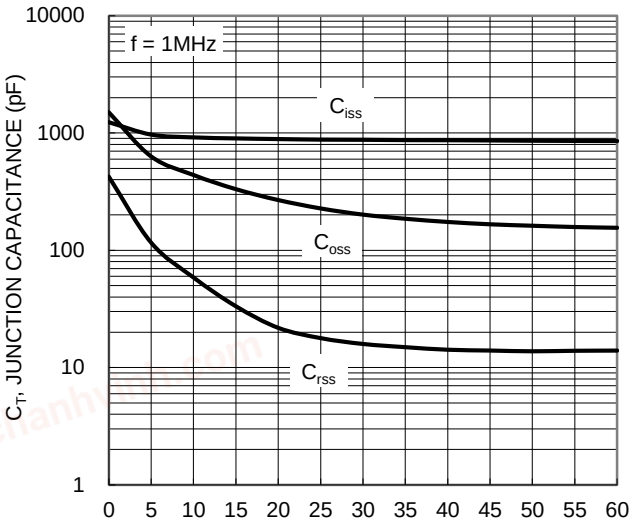


Figure 10. Typical Junction Capacitance

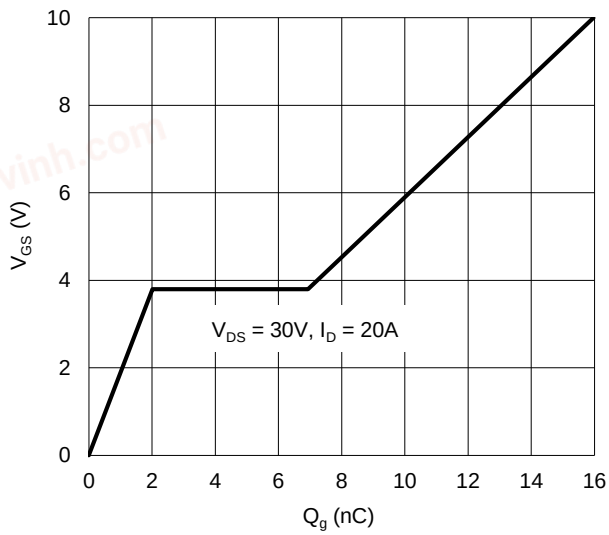


Figure 11. Gate Charge

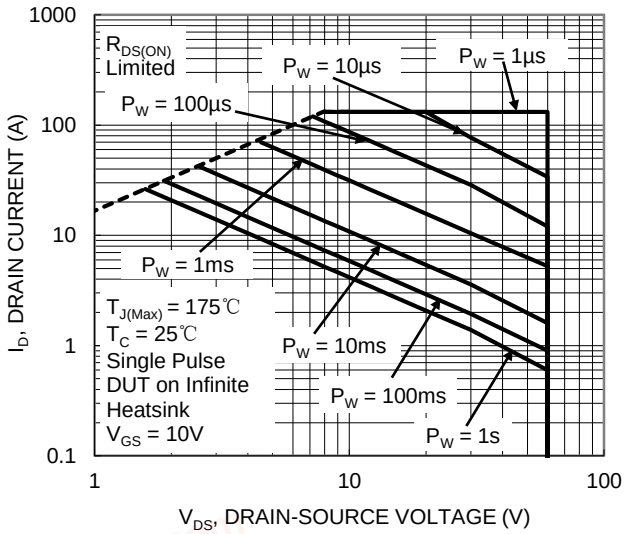


Figure 12. SOA, Safe Operation Area


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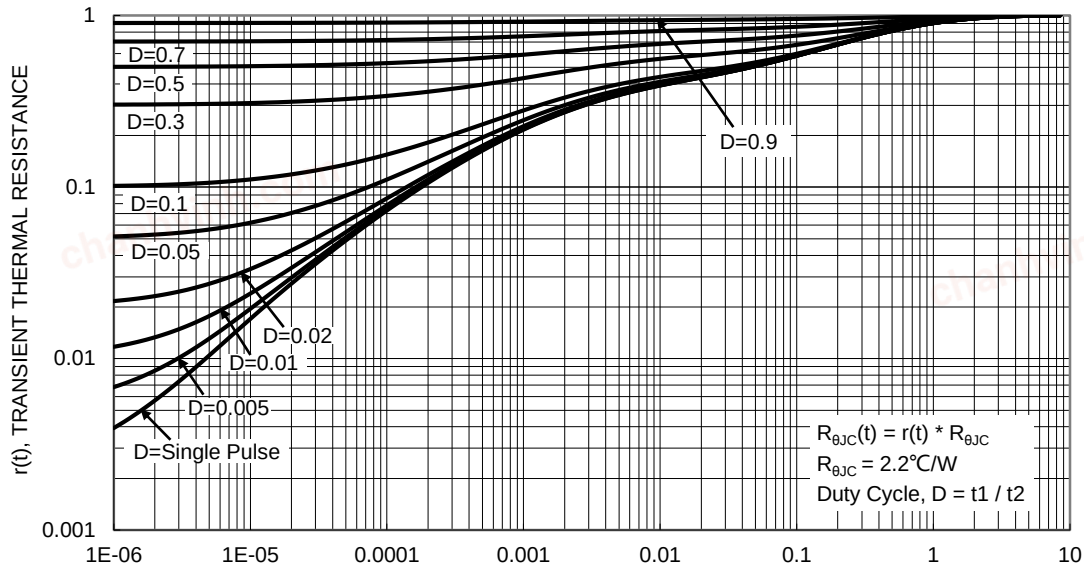


Figure 13. Transient Thermal Resistance

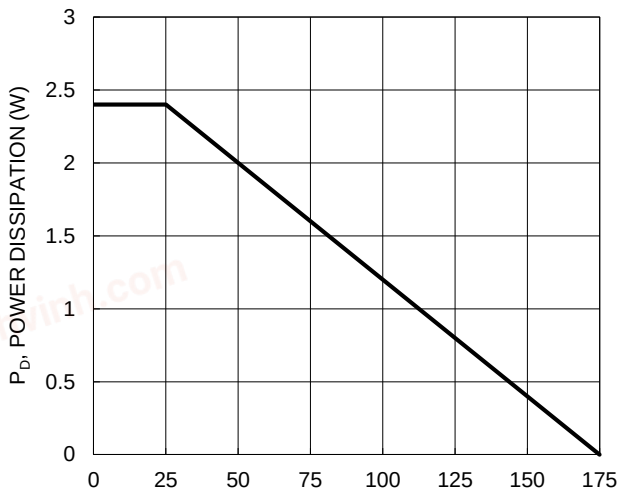


Figure 14. DC Power Derating

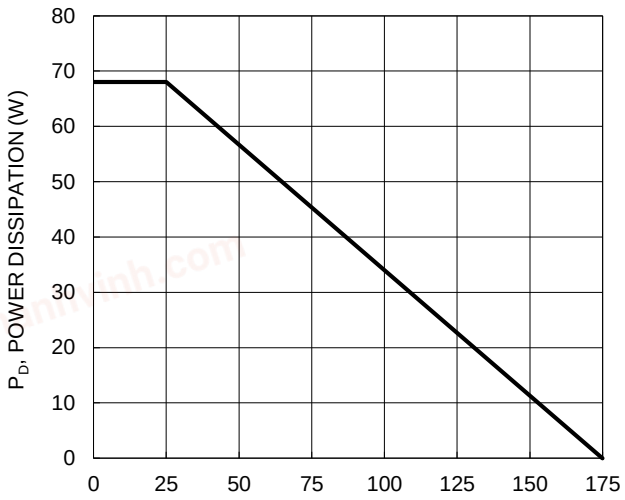


Figure 15. DC Power Derating

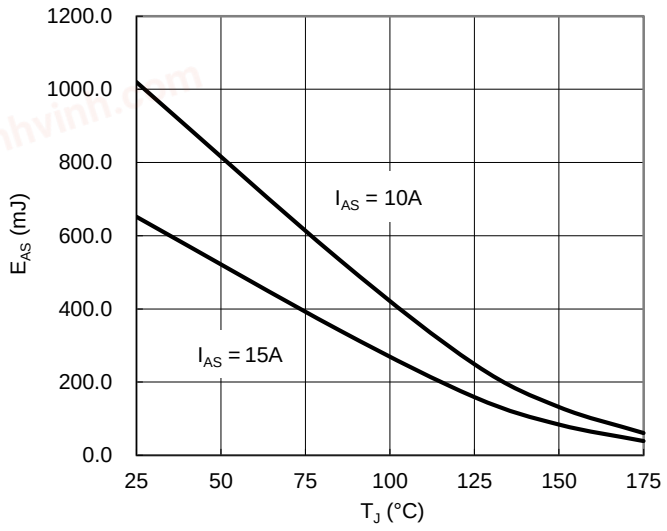


Figure 16. $E_{AS}$ vs. $T_J$


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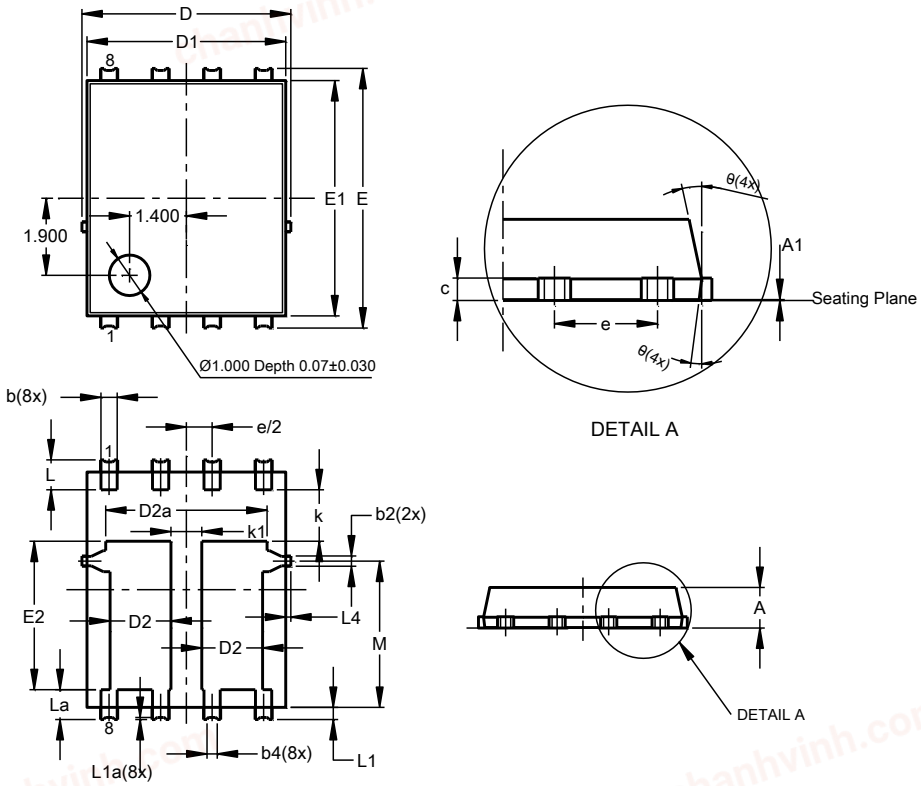
## Package Outline Dimensions

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

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

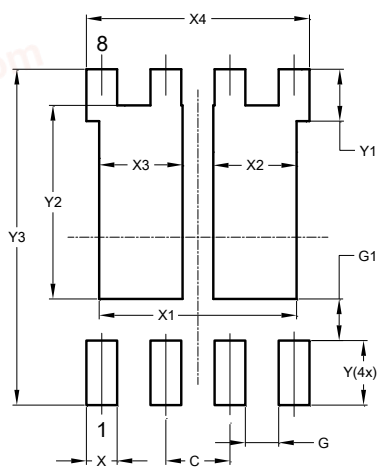



| PowerDI5060-8 (SWP) (Type R) | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 0.90 | 1.10 | 1.00 |
| **A1** | 0 | 0.05 | -- |
| **b** | 0.30 | 0.50 | 0.41 |
| **b2** | 0.20 | 0.35 | 0.25 |
| **b4** | 0.25REF | | |
| **c** | 0.230 | 0.330 | 0.277 |
| **D** | 5.15 BSC | | |
| **D1** | 4.70 | 5.10 | 4.90 |
| **D2** | 1.40 | 1.60 | 1.50 |
| **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 |
| **e** | 1.27BSC | | |
| **k** | 1.05 | -- | -- |
| **k1** | 0.56 | -- | -- |
| **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.

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




| Dimensions | Value (in mm) |
|---|---|
| **C** | 1.270 |
| **G** | 0.660 |
| **G1** | 0.820 |
| **X** | 0.610 |
| **X1** | 3.910 |
| **X2** | 1.650 |
| **X3** | 1.650 |
| **X4** | 4.420 |
| **Y** | 1.270 |
| **Y1** | 1.020 |
| **Y2** | 3.810 |
| **Y3** | 6.610 |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