

## Product Summary

| $BV_{DSS}$ | $R_{DS(ON)}$ Max              | $I_D$ Max<br>$T_C = +25^\circ C$ |
|------------|-------------------------------|----------------------------------|
| 150V       | 19m $\Omega$ @ $V_{GS} = 10V$ | 61A                              |
|            | 22m $\Omega$ @ $V_{GS} = 8V$  | 40A                              |

## 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

## Features

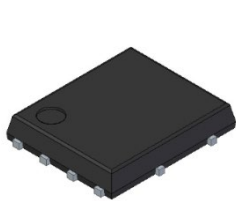
- Rated to +175°C – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching (UIS) Test in Production – Ensures More Reliable and Robust End Application
- Thermally Efficient Package-Cooler Running Applications
- High Conversion Efficiency
- Low  $R_{DS(ON)}$  – Minimizes On-State Losses
- Low Input Capacitance
- Fast Switching Speed
- <1.1mm Package Profile – Ideal for Thin Applications (PowerDI®)
- **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 [contact us](https://www.diodes.com/quality/product-definitions/) or your local Diodes representative.**

## Mechanical Data

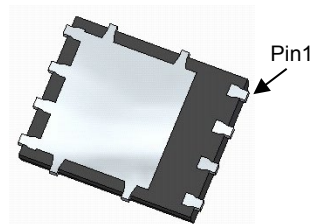
- Case: PowerDI5060-8
- Case Material: Molded Plastic, “Green” Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram Below
- Terminal Finish - Matte Tin Annealed over Copper Lead-Frame. Solderable per MIL-STD-202, Method 208 (e3)
- Weight: 0.097 grams (Approximate)

Site 1:

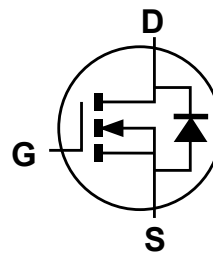
PowerDI5060-8



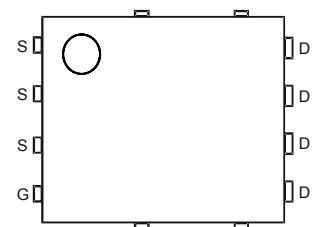
Top View



Bottom View



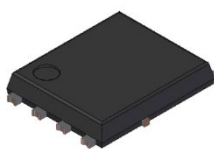
Internal Schematic



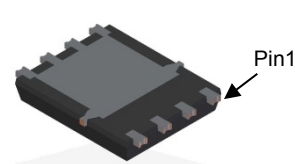
Top View  
Pin Configuration

Site 2:

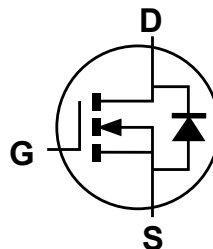
PowerDI5060-8 (SWP) (Type UX)



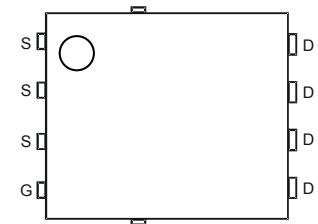
Top View



Bottom View



Internal Schematic



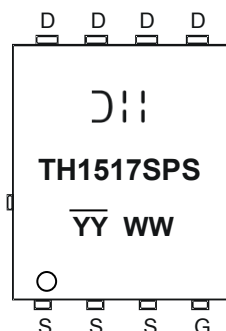
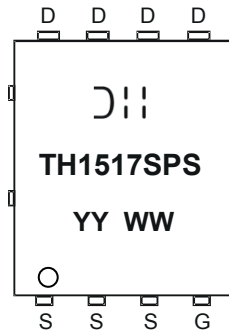
Top View  
Pin Configuration

## Ordering Information (Note 4)

| Part Number      | Case          | Packaging           |
|------------------|---------------|---------------------|
| DMTH15H017SPS-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  
 TH1517SPS = Product Type Marking Code  
 YYWW or YYWW = Date Code Marking  
 YY or YY = Last Two Digits of Year (ex: 20 = 2020)  
 WW = Week Code (01 to 53)

## Maximum Ratings (@ T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic  |              |                         | Symbol           | Value | Unit |
|---|--------------|-------------------------|------------------|-------|------|
| Drain-Source Voltage                                    |              |                         | V <sub>DSS</sub> | 150   | V    |
| Gate-Source Voltage                                     |              |                         | V <sub>GSS</sub> | ±20   | V    |
| Continuous Drain Current V <sub>GS</sub> = 10V (Note 6) | Steady State | T <sub>A</sub> = +25°C  | I <sub>D</sub>   | 11    | A    |
|   |              | T <sub>A</sub> = +100°C |                  | 7     |      |
| Continuous Drain Current V <sub>GS</sub> = 10V (Note 7) | Steady       | T <sub>C</sub> = +25°C  | I <sub>D</sub>   | 61    | A    |
|   | State        | T <sub>C</sub> = +100°C |                  | 40    |      |
| Pulsed Drain Current (10μs Pulse, Duty Cycle = 1%)      |              |                         | I <sub>DM</sub>  | 250   | A    |
| Maximum Continuous Body Diode Forward Current           |              |                         | I <sub>S</sub>   | 61    | A    |
| Pulsed Body Diode Current (10μs Pulse, Duty Cycle = 1%) |              |                         | I <sub>SM</sub>  | 250   | A    |
| Avalanche Current (Note 8), L = 3mH                     |              |                         | I <sub>AS</sub>  | 14.4  | A    |
| Avalanche Energy (Note 8), L = 3mH                      |              |                         | E <sub>AS</sub>  | 311   | mJ   |

## Thermal Characteristics

| Characteristic                                   |                        | Symbol                            | Value       | Unit |
|--|------------------------|-----------------------------------|-------------|------|
| Total Power Dissipation (Note 5)                 | T <sub>A</sub> = +25°C | P <sub>D</sub>                    | 1.5         | W    |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady State           | R <sub>θJA</sub>                  | 97          | °C/W |
| Total Power Dissipation (Note 6)                 | T <sub>A</sub> = +25°C | P <sub>D</sub>                    | 3.2         | W    |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady State           | R <sub>θJA</sub>                  | 47          | °C/W |
| Total Power Dissipation (Note 7)                 | T <sub>C</sub> = +25°C | P <sub>D</sub>                    | 107         | W    |
| Thermal Resistance, Junction to Case (Note 7)    |                        | R <sub>θJC</sub>                  | 1.4         | °C/W |
| Operating and Storage Temperature Range          |                        | T <sub>J</sub> , T <sub>STG</sub> | -55 to +175 | °C   |

- 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 1inch square copper plate.
  7. Thermal resistance from junction to soldering point (on the exposed drain pad).
  8. I<sub>AS</sub> and E<sub>AS</sub> ratings are based on low frequency and duty cycles to keep T<sub>J</sub> = +25°C.

**Electrical Characteristics** (@  $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

| Characteristic                           | Symbol       | Min | Typ  | Max       | Unit       | Test Condition  |
|--|--------------|-----|------|-----------|------------|---|
| <b>OFF CHARACTERISTICS</b> (Note 9)      |              |     |      |           |            |   |
| Drain-Source Breakdown Voltage           | $BV_{DSS}$   | 150 | —    | —         | V          | $V_{GS} = 0V, I_D = 10mA$                                   |
| Zero Gate Voltage Drain Current          | $I_{DSS}$    | —   | —    | 1         | $\mu A$    | $V_{DS} = 120V, V_{GS} = 0V$                                |
| Gate-Source Leakage                      | $I_{GSS}$    | —   | —    | $\pm 100$ | nA         | $V_{GS} = \pm 20V, V_{DS} = 0V$                             |
| <b>ON CHARACTERISTICS</b> (Note 9)       |              |     |      |           |            |   |
| Gate Threshold Voltage                   | $V_{GS(TH)}$ | 2   | —    | 4         | V          | $V_{DS} = V_{GS}, I_D = 250\mu A$                           |
| Static Drain-Source On-Resistance        | $R_{DS(ON)}$ | —   | 14   | 19        | m $\Omega$ | $V_{GS} = 10V, I_D = 20A$                                   |
|  |              | —   | 16   | 22        |            | $V_{GS} = 8V, I_D = 15A$                                    |
| Diode Forward Voltage                    | $V_{SD}$     | —   | 0.8  | 1.2       | V          | $V_{GS} = 0V, I_S = 20A$                                    |
| <b>DYNAMIC CHARACTERISTICS</b> (Note 10) |              |     |      |           |            |   |
| Input Capacitance                        | $C_{iss}$    | —   | 2344 | —         | pF         | $V_{DS} = 75V, V_{GS} = 0V$<br>$f = 1MHz$                   |
| Output Capacitance                       | $C_{oss}$    | —   | 213  | —         |            |   |
| Reverse Transfer Capacitance             | $C_{rss}$    | —   | 6.9  | —         |            |   |
| Gate Resistance                          | $R_g$        | —   | 1.8  | —         | $\Omega$   | $V_{DS} = 0V, V_{GS} = 0V, f = 1MHz$                        |
| Total Gate Charge                        | $Q_g$        | —   | 34   | —         | nC         | $V_{DD} = 75V, I_D = 20A,$<br>$V_{GS} = 10V$                |
| Gate-Source Charge                       | $Q_{gs}$     | —   | 12   | —         |            |   |
| Gate-Drain Charge                        | $Q_{gd}$     | —   | 9    | —         |            |   |
| Turn-On Delay Time                       | $t_{D(ON)}$  | —   | 13.2 | —         | ns         | $V_{DD} = 75V, V_{GS} = 10V,$<br>$I_D = 20A, R_g = 6\Omega$ |
| Turn-On Rise Time                        | $t_R$        | —   | 22.4 | —         |            |   |
| Turn-Off Delay Time                      | $t_{D(OFF)}$ | —   | 26.3 | —         |            |   |
| Turn-Off Fall Time                       | $t_F$        | —   | 16.1 | —         |            |   |
| Reverse Recovery Time                    | $t_{RR}$     | —   | 69   | —         | ns         | $I_F = 20A, di/dt = 100A/\mu s$                             |
| Reverse Recovery Charge                  | $Q_{RR}$     | —   | 196  | —         | nC         |   |

Notes: 9. Short duration pulse test used to minimize self-heating effect.  
10. Guaranteed by design. Not subject to product testing.

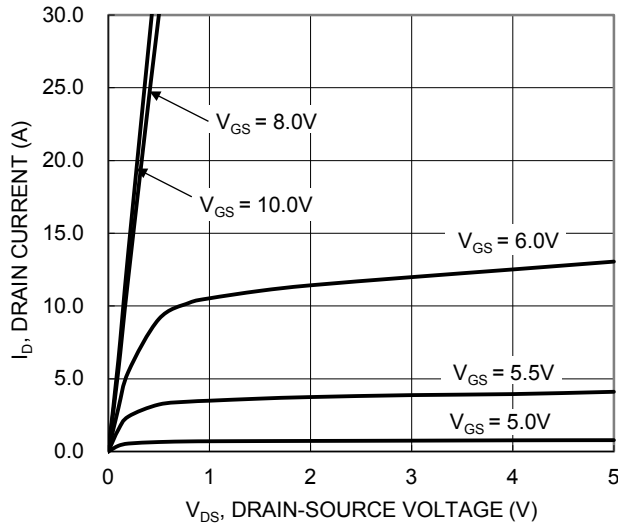


Figure 1. Typical Output Characteristic

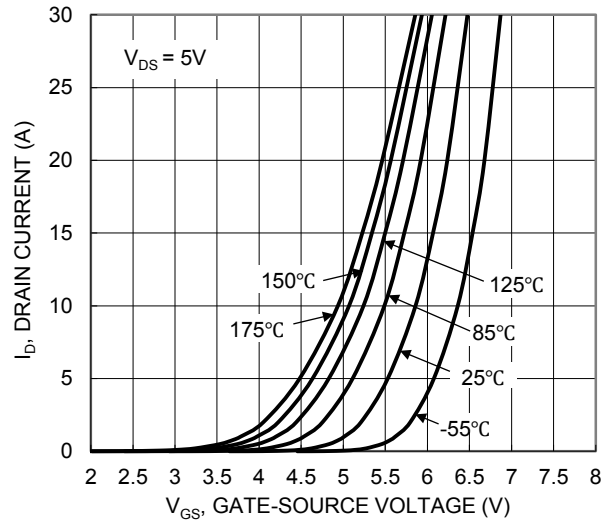


Figure 2. Typical Transfer Characteristic

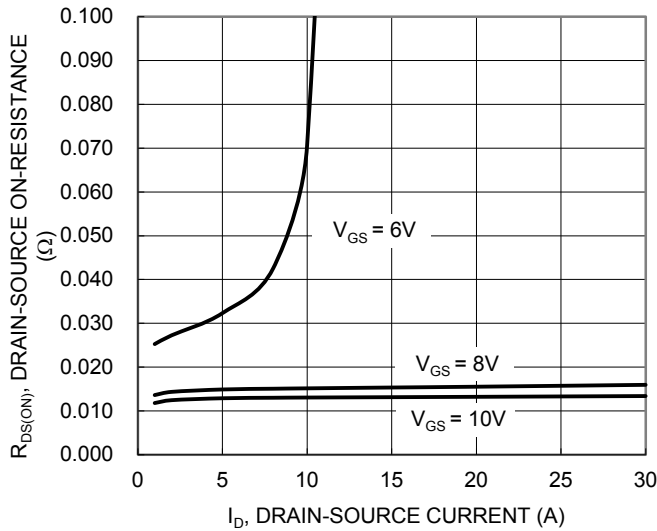


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

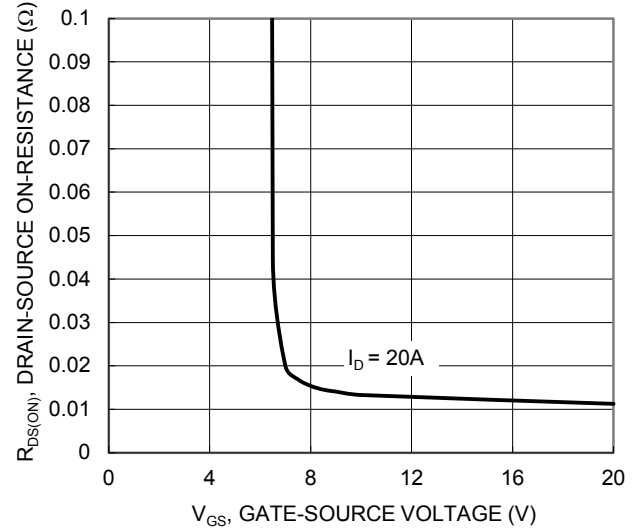


Figure 4. Typical Transfer Characteristic

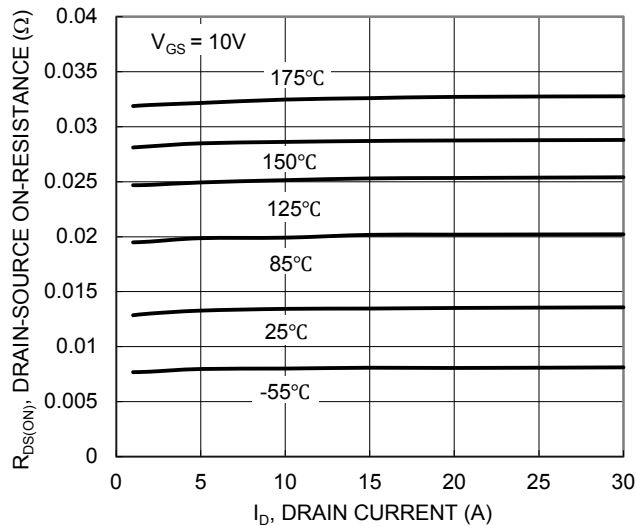


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

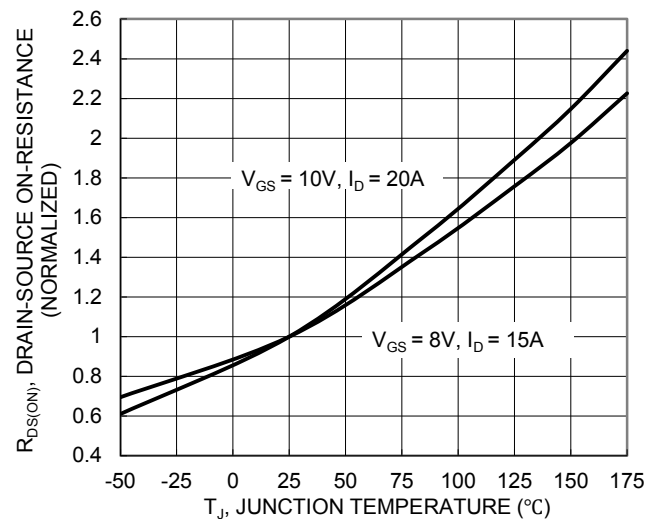


Figure 6. On-Resistance Variation with Temperature

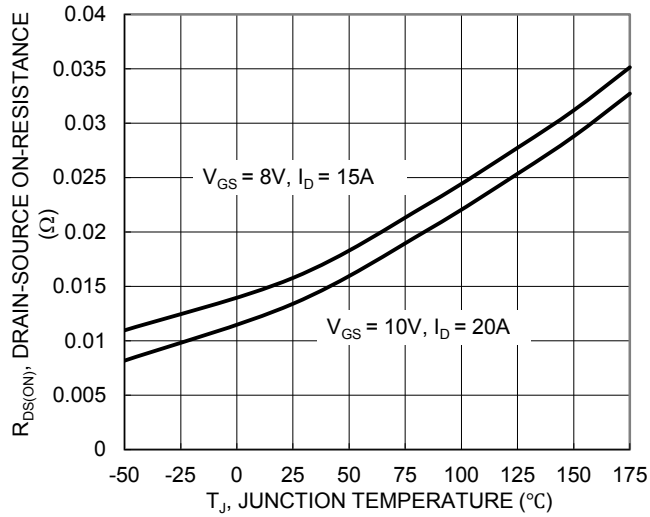


Figure 7. On-Resistance Variation with Temperature

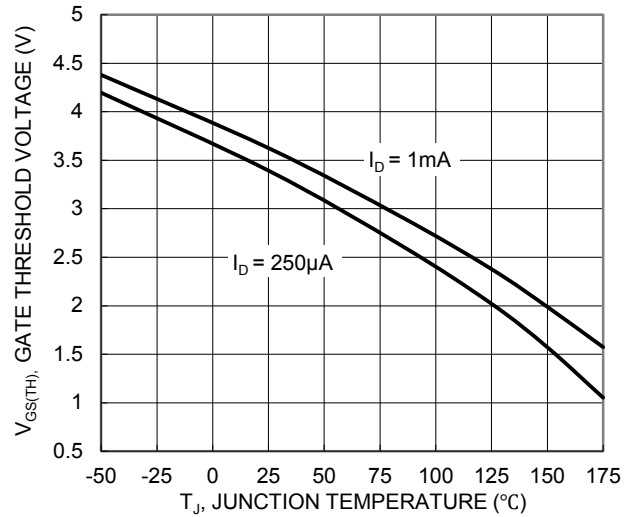


Figure 8. Gate Threshold Variation vs. Junction Temperature

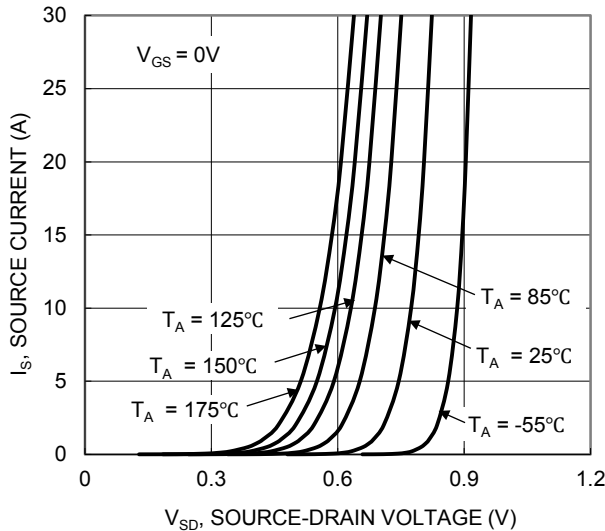


Figure 9. Diode Forward Voltage vs. Current

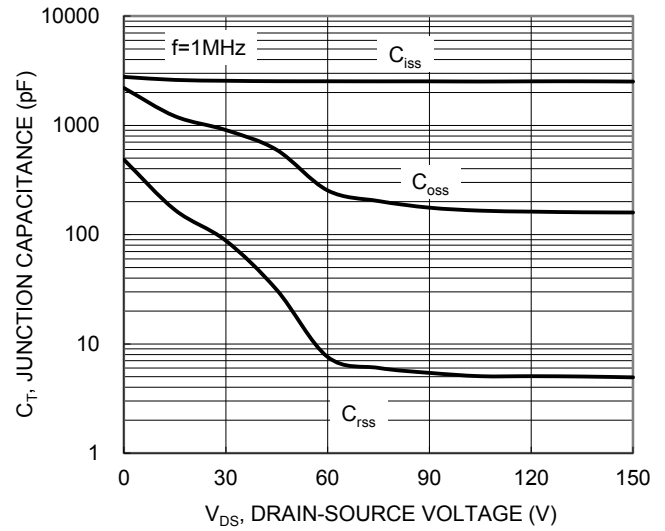


Figure 10. Typical Junction Capacitance

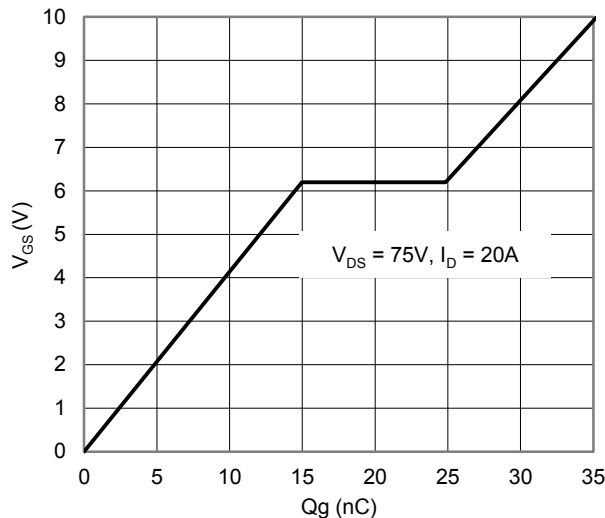


Figure 11. Gate Charge

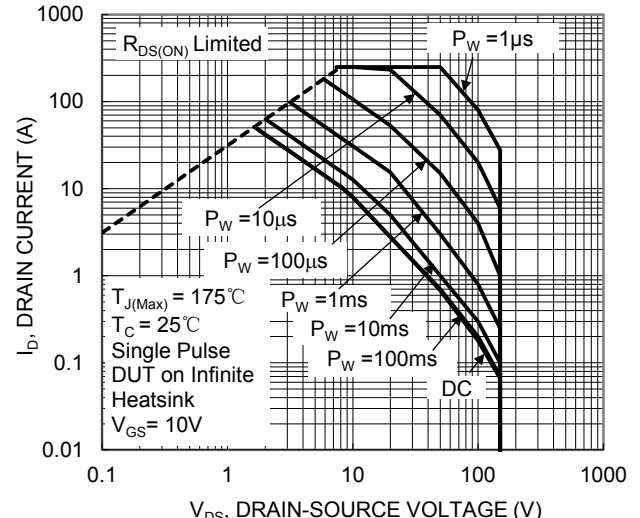


Figure 12. SOA, Safe Operation Area

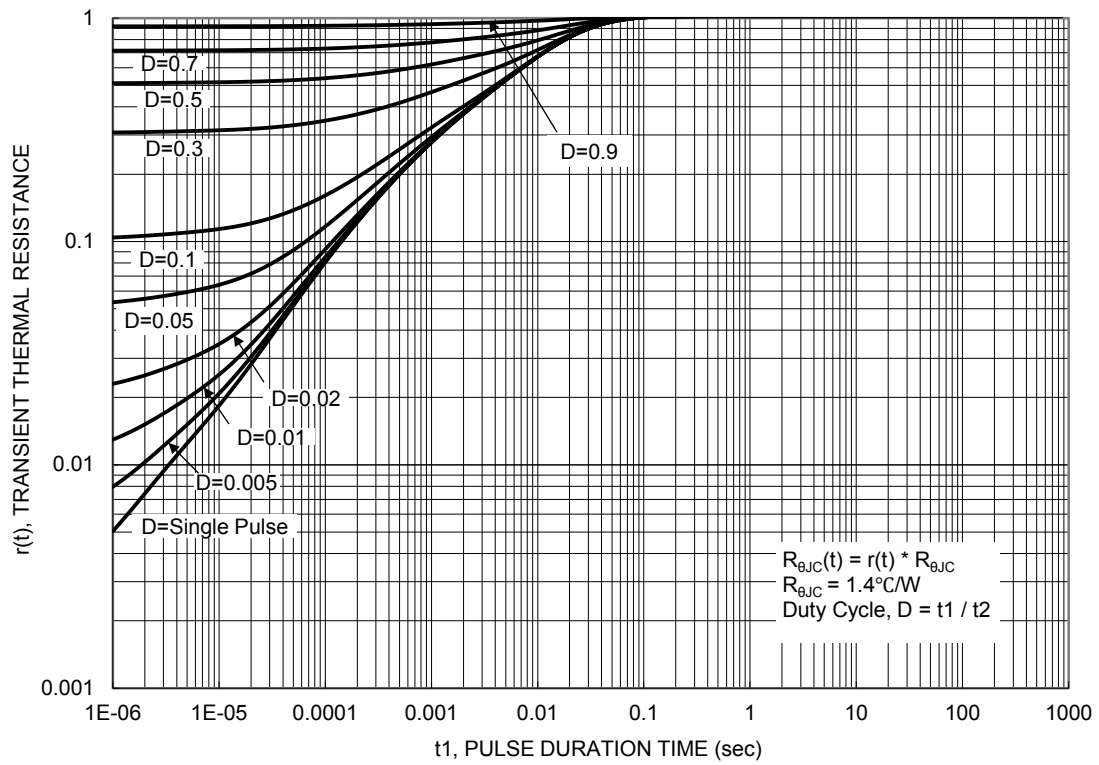


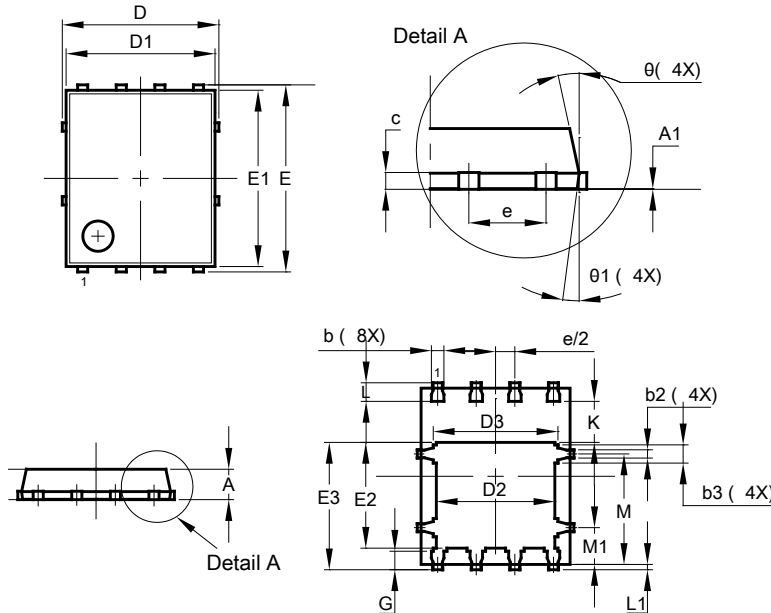
Figure 13. Transient Thermal Resistance

## Package Outline Dimensions

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

Site 1:

**PowerDI5060-8**

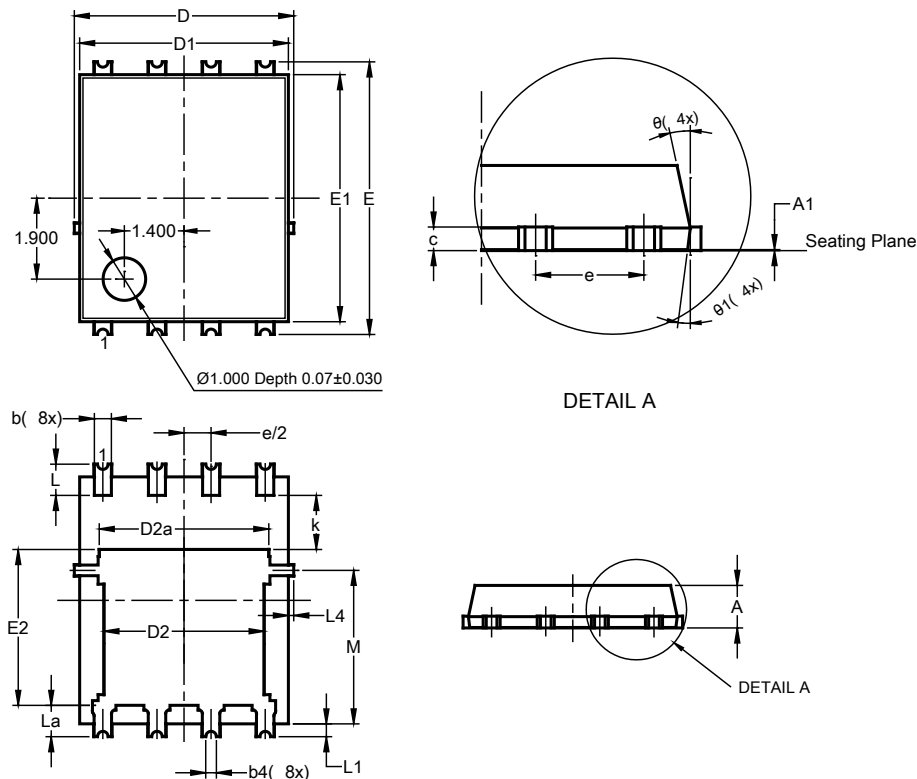


| PowerDI5060-8 |          |       |       |
|---------------|----------|-------|-------|
| Dim           | Min      | Max   | Typ   |
| A             | 0.90     | 1.10  | 1.00  |
| A1            | 0.00     | 0.05  | —     |
| b             | 0.33     | 0.51  | 0.41  |
| b2            | 0.200    | 0.350 | 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°    |

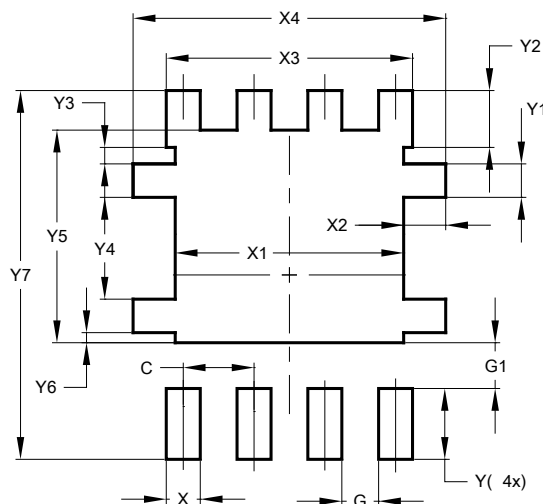
All Dimensions in mm

## Suggested Pad Layout

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

Site 1:

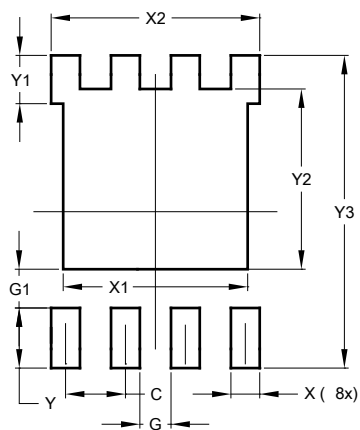
**PowerDI5060-8**



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



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