

## Product Summary

| BV <sub>DSS</sub> | R <sub>DS(ON)</sub> Max       | I <sub>D</sub><br>T <sub>C</sub> = +25°C<br>(Note 5) |
|-------------------|-------------------------------|--|
| 60V               | 3.1mΩ @ V <sub>GS</sub> = 10V | 100A   |

## 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
- Low R<sub>DS(ON)</sub> – Minimizes Power Losses
- Low Q<sub>G</sub> – Minimizes Switching Losses
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. “Green” Device (Note 3)**
- **The DMTH6004SPSWQ is suitable for automotive applications requiring specific change control; this part is AEC-Q101 qualified, PPAP capable, and manufactured in IATF 16949 certified facilities.**

<https://www.diodes.com/quality/product-definitions/>

## Description and Applications

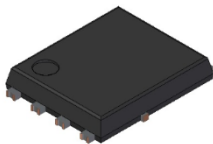
This MOSFET is designed to meet the stringent requirements of automotive applications. It is qualified to AEC-Q101, supported by a PPAP and is ideal for use in:

- DC motor controls
- Synchronous rectification
- DC-DC converters

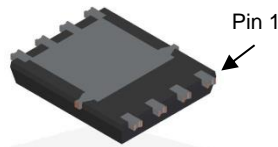
## Mechanical Data

- Package: PowerDI<sup>®</sup>5060-8
- Package 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)

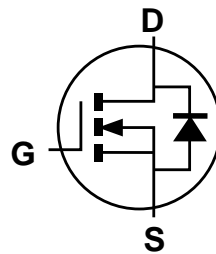
PowerDI5060-8/SWP (Type UX)



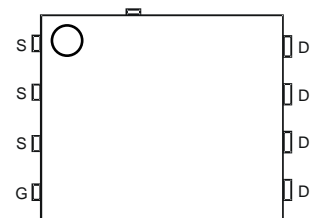
Top View



Bottom View



Internal Schematic



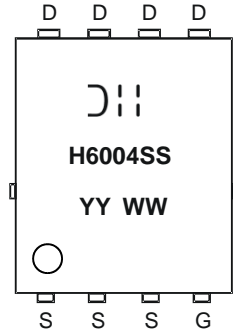
Top View  
Pin Configuration

## Ordering Information (Note 4)

| Part Number      | Package                     | Packing |             |
|------------------|-----------------------------|---------|-------------|
|                  |                             | Qty.    | Carrier     |
| DMTH6004SPSWQ-13 | PowerDI5060-8/SWP (Type UX) | 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/>.
  5. Package limited.

## Marking Information



⤴⤵ = Manufacturer's Marking  
 H6004SS = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Year (ex: 23 = 2023)  
 WW = Week (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> | 60                             | V    |
| Gate-Source Voltage   |              | V <sub>GSS</sub> | ±20                            | V    |
| Continuous Drain Current (Note 6)                               | Steady State | I <sub>D</sub>   | T <sub>A</sub> = +25°C<br>25   | A    |
|   |              |                  | T <sub>A</sub> = +70°C<br>21   |      |
| Continuous Drain Current (Notes 5 & 7)                          |              | I <sub>D</sub>   | T <sub>C</sub> = +25°C<br>100  | A    |
|   |              |                  | T <sub>C</sub> = +100°C<br>100 |      |
| Maximum Continuous Body Diode Forward Current (Notes 5 & 7)     |              | I <sub>S</sub>   | 100                            | A    |
| Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)              |              | I <sub>DM</sub>  | 400                            | A    |
| Pulsed Body Diode Forward Current (10µs Pulse, Duty Cycle = 1%) |              | I <sub>SM</sub>  | 400                            | A    |
| Avalanche Current, L = 0.2mH                                    |              | I <sub>AS</sub>  | 45                             | A    |
| Avalanche Energy, L = 0.2mH                                     |              | E <sub>AS</sub>  | 200                            | mJ   |

## Thermal Characteristics

| Characteristic                                   |                        | Symbol                            | Value       | Unit |
|--|------------------------|-----------------------------------|-------------|------|
| 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>                    | 167         | W    |
| Thermal Resistance, Junction to Case (Note 7)    |                        | R <sub>θJC</sub>                  | 0.9         | °C/W |
| Operating and Storage Temperature Range          |                        | T <sub>J</sub> , T <sub>STG</sub> | -55 to +175 | °C   |

Notes: 5. Package limited.  
 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).

**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic                          | Symbol              | Min              | Typ   | Max  | Unit | Test Condition  |  |
|---|---------------------|------------------|-------|------|------|---|--|
| <b>OFF CHARACTERISTICS (Note 8)</b>     |                     |                  |       |      |      |   |  |
| Drain-Source Breakdown Voltage          | BV <sub>DSS</sub>   | 60               | —     | —    | V    | V <sub>GS</sub> = 0V, I <sub>D</sub> = 1mA  |  |
| Zero Gate Voltage Drain Current         | —<br>(Note 9)       | I <sub>DSS</sub> | —     | —    | 1    | μA  | V <sub>DS</sub> = 48V, V <sub>GS</sub> = 0V                          |
|   |                     |                  | —     | —    | 100  | μA  | V <sub>DS</sub> = 48V, V <sub>GS</sub> = 0V, T <sub>J</sub> = +125°C |
| Gate-Source Leakage                     | I <sub>GSS</sub>    | —                | —     | ±100 | nA   | V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V  |  |
| <b>ON CHARACTERISTICS (Note 8)</b>      |                     |                  |       |      |      |   |  |
| Gate Threshold Voltage                  | V <sub>GS(TH)</sub> | 2                | —     | 4    | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                                  |  |
| Static Drain-Source On-Resistance       | R <sub>DS(ON)</sub> | —                | 2.5   | 3.1  | mΩ   | V <sub>GS</sub> = 10V, I <sub>D</sub> = 50A   |  |
| Diode Forward Voltage                   | V <sub>SD</sub>     | —                | 0.9   | 1.2  | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = 20A  |  |
| <b>DYNAMIC CHARACTERISTICS (Note 9)</b> |                     |                  |       |      |      |   |  |
| Input Capacitance                       | C <sub>iss</sub>    | —                | 4556  | —    | pF   | V <sub>DS</sub> = 30V, V <sub>GS</sub> = 0V<br>f = 1MHz                                     |  |
| Output Capacitance                      | C <sub>oss</sub>    | —                | 1383  | —    |      |   |  |
| Reverse Transfer Capacitance            | C <sub>rss</sub>    | —                | 105.2 | —    |      |   |  |
| Gate Resistance                         | R <sub>g</sub>      | 0.1              | 0.66  | 1.9  | Ω    | V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz  |  |
| Total Gate Charge                       | Q <sub>g</sub>      | —                | 95.4  | —    | nC   | V <sub>DD</sub> = 30V, I <sub>D</sub> = 90A<br>V <sub>GS</sub> = 10V                        |  |
| Gate-Source Charge                      | Q <sub>gs</sub>     | —                | 21.6  | —    |      |   |  |
| Gate-Drain Charge                       | Q <sub>gd</sub>     | —                | 20.4  | —    |      |   |  |
| Turn-On Delay Time                      | t <sub>D(ON)</sub>  | —                | 13.2  | —    | ns   | V <sub>DD</sub> = 30V, V <sub>GS</sub> = 10V<br>I <sub>D</sub> = 90A, R <sub>g</sub> = 3.5Ω |  |
| Turn-On Rise Time                       | t <sub>r</sub>      | —                | 11.7  | —    |      |   |  |
| Turn-Off Delay Time                     | t <sub>D(OFF)</sub> | —                | 31    | —    |      |   |  |
| Turn-Off Fall Time                      | t <sub>f</sub>      | —                | 12    | —    |      |   |  |
| Body Diode Reverse Recovery Time        | t <sub>RR</sub>     | —                | 50.5  | —    | ns   | I <sub>F</sub> = 50A, di/dt = 100A/μs   |  |
| Body Diode Reverse Recovery Charge      | Q <sub>RR</sub>     | —                | 80.8  | —    | nC   |   |  |

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

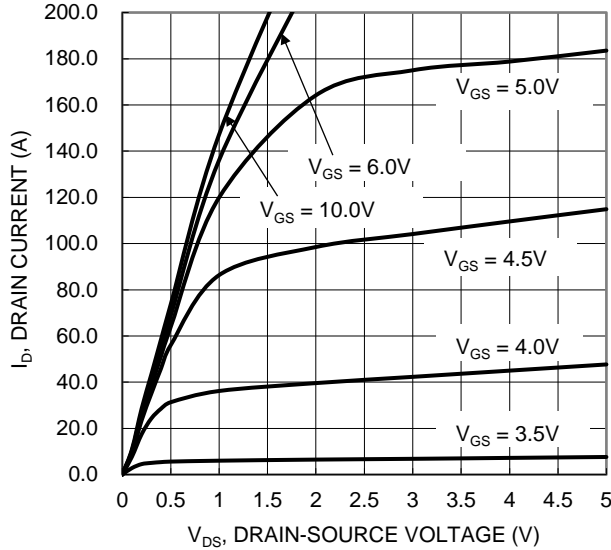


Figure 1. Typical Output Characteristic

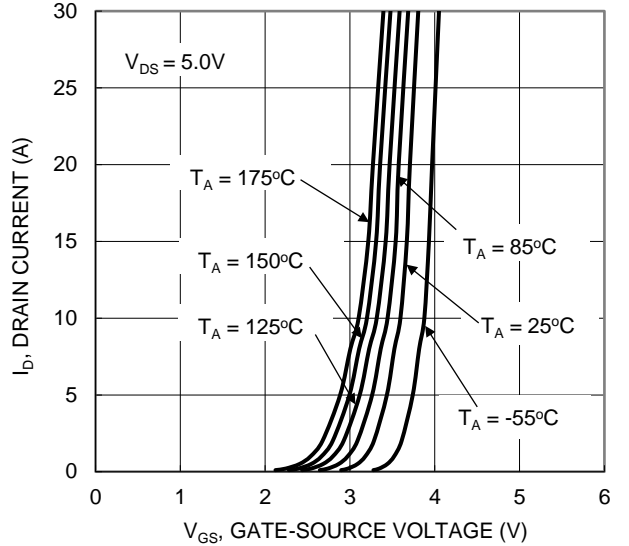


Figure 2. Typical Transfer Characteristic

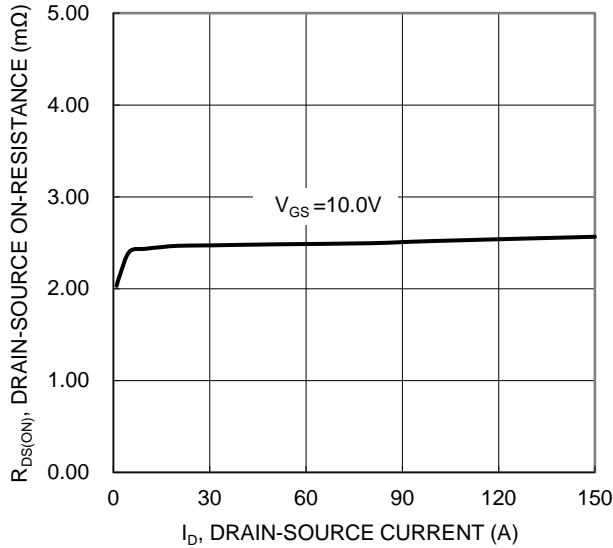


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

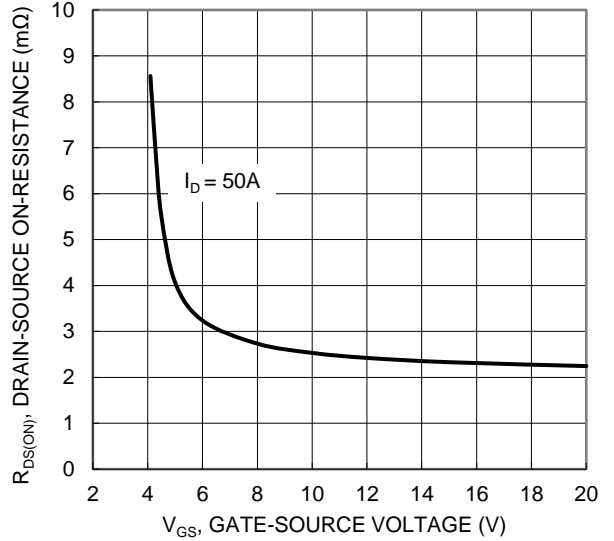


Figure 4. Typical Transfer Characteristic

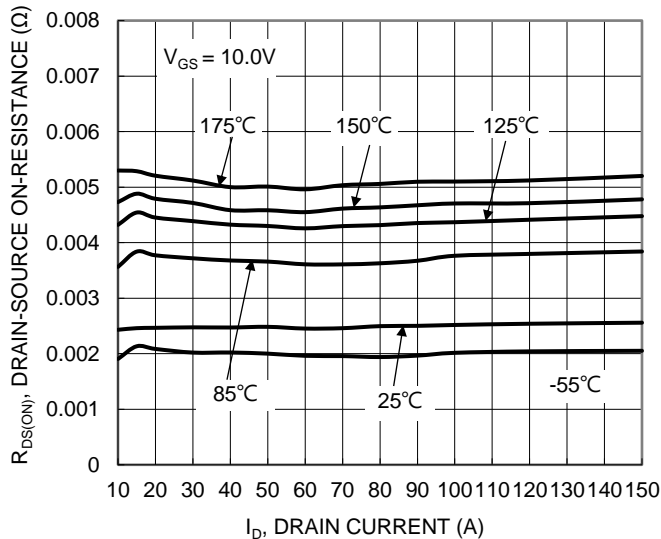


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

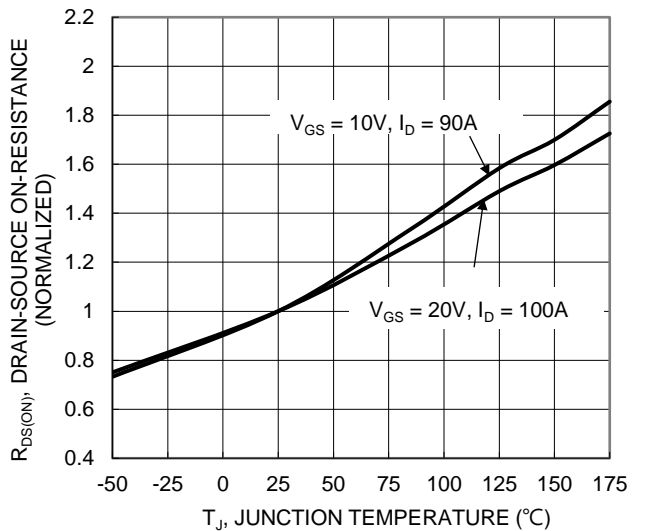


Figure 6. On-Resistance Variation with Temperature

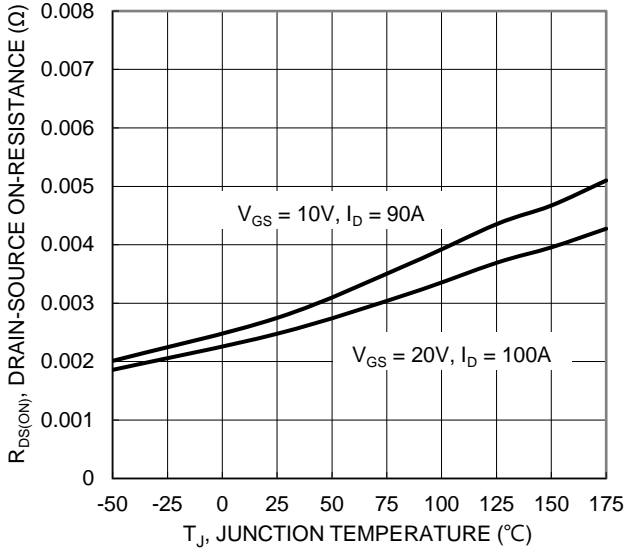


Figure 7. On-Resistance Variation with Temperature

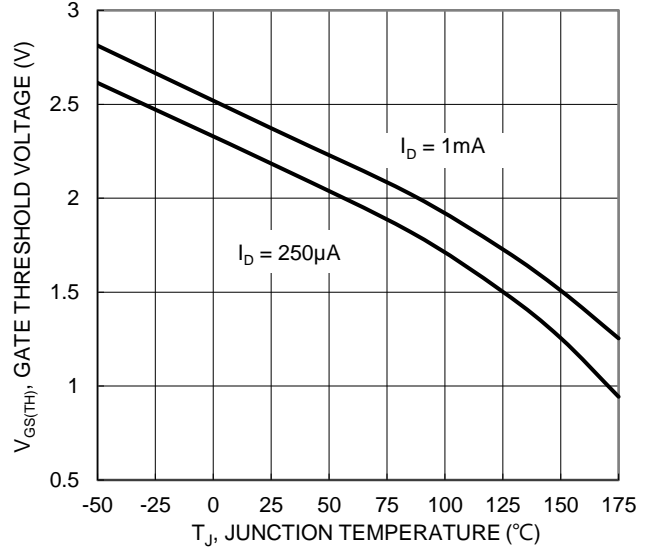


Figure 8. Gate Threshold Variation vs. Temperature

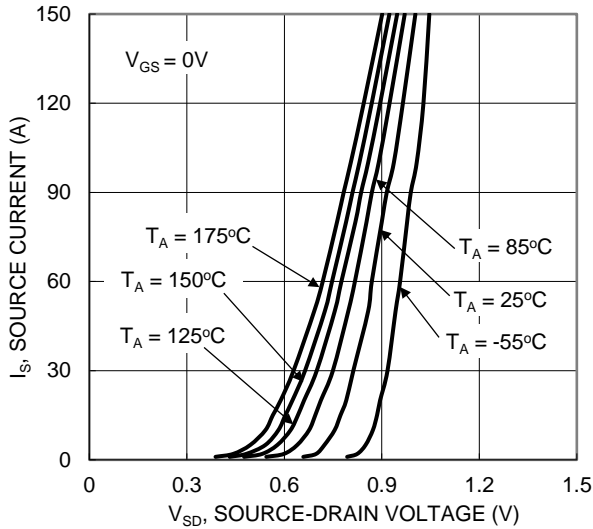


Figure 9. Diode Forward Voltage vs. Current

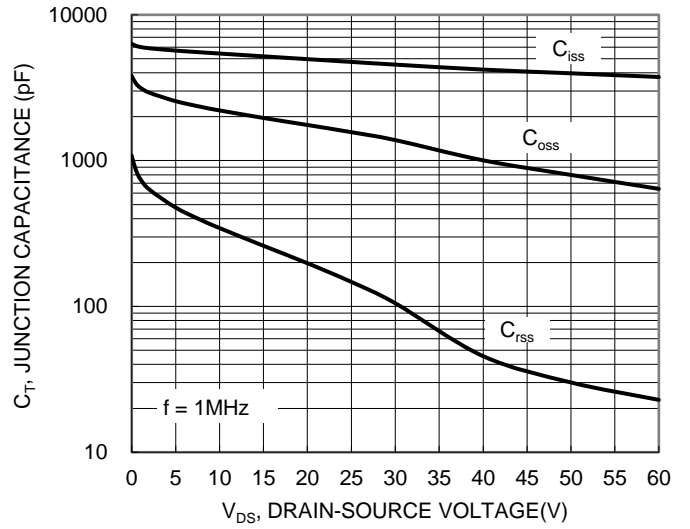


Figure 10. Typical Junction Capacitance

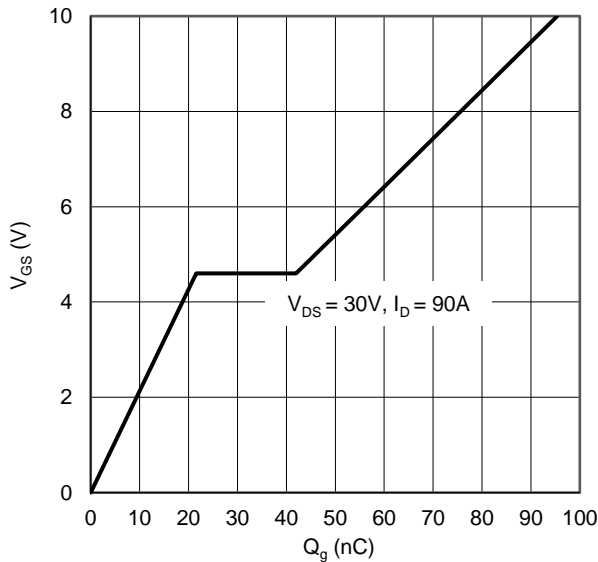


Figure 11. Gate Charge

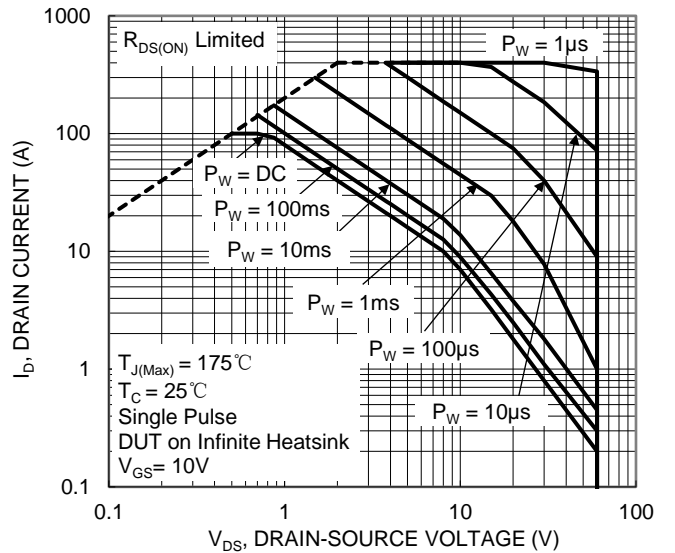


Figure 12. SOA, Safe Operation Area

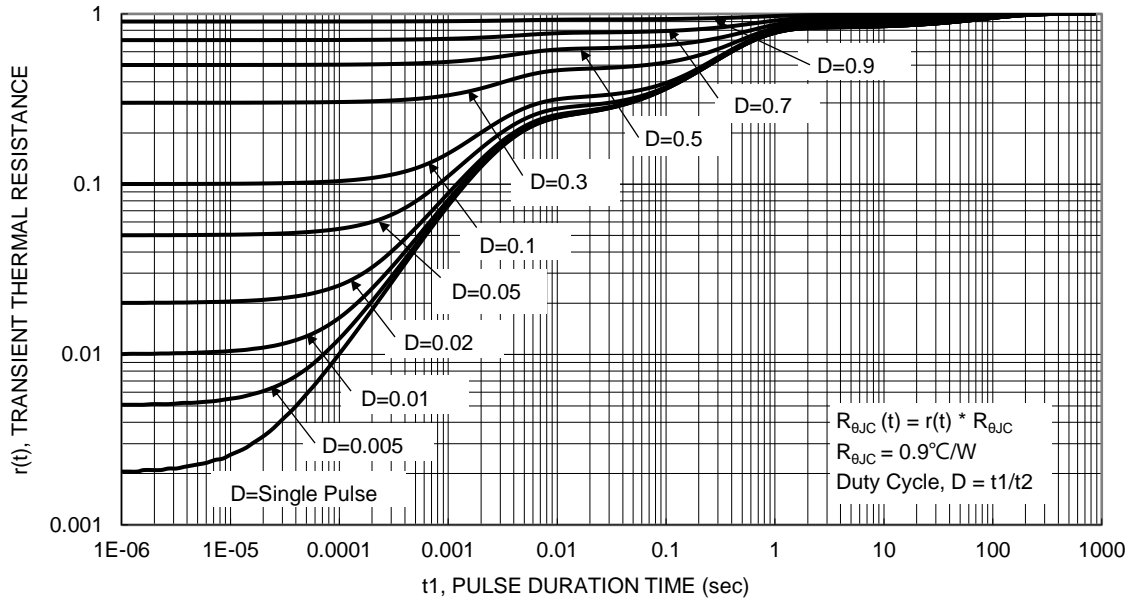
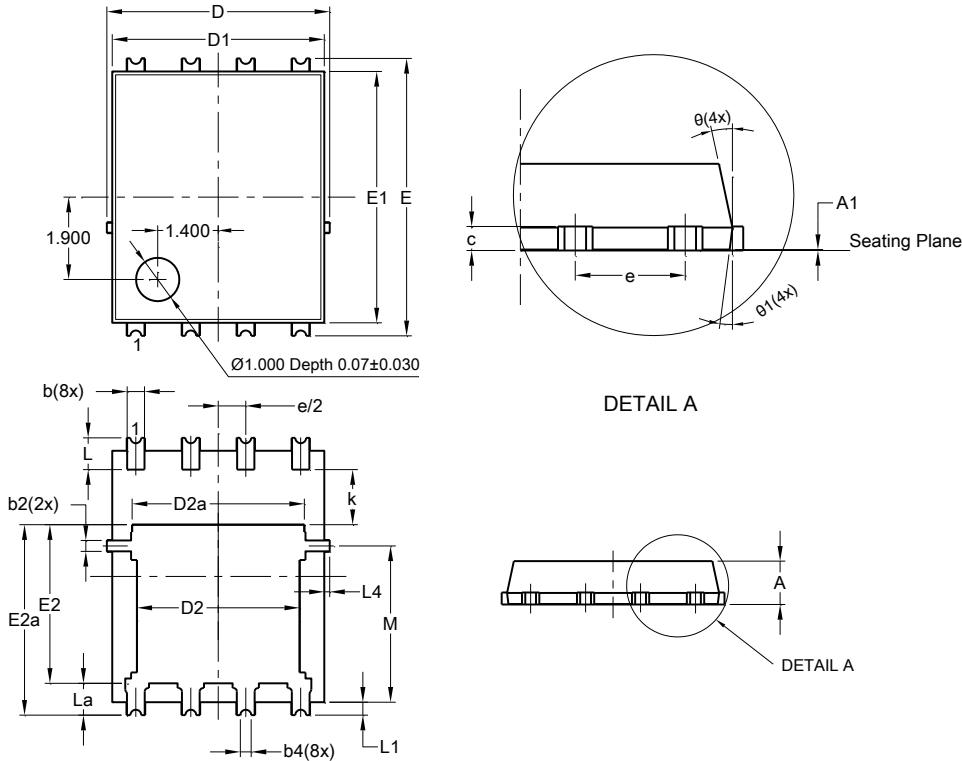


Figure 13. Transient Thermal Resistance

## Package Outline Dimensions

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

PowerDI5060-8/SWP (Type UX)

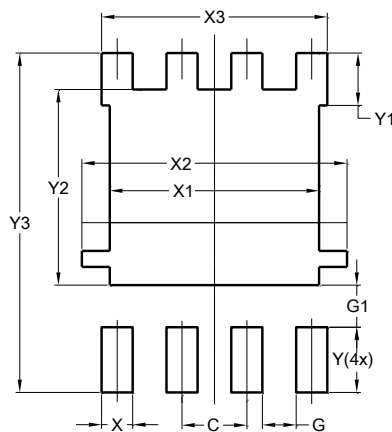


| PowerDI5060-8/SWP (Type UX) |          |       |       |
|-----------------------------|----------|-------|-------|
| Dim                         | Min      | Max   | Typ   |
| A                           | 0.90     | 1.10  | 1.00  |
| A1                          | 0        | 0.05  | --    |
| b                           | 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.

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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