

## Product Summary

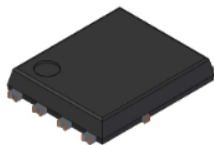
| BV <sub>DSS</sub> | R <sub>DS(ON)</sub> Max         | I <sub>D</sub> Max<br>T <sub>c</sub> = +25°C |
|-------------------|---------------------------------|----------------------------------------------|
| 40V               | 14.5mΩ @ V <sub>GS</sub> = 10V  | 43.5A                                        |
|                   | 25.0mΩ @ V <sub>GS</sub> = 4.5V | 34.5A                                        |

## Description and Applications

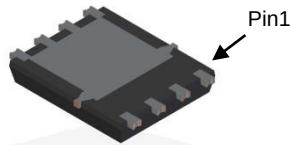
This MOSFET is designed to meet the stringent requirements of automotive applications. It is qualified to AEC-Q101, supported by a PPAP and is ideal for use in:

- High Frequency Switching
- Sync Rectification
- DC-DC Converters

PowerDI5060-8 (SWP) (Type UX)



Top View



Bottom View

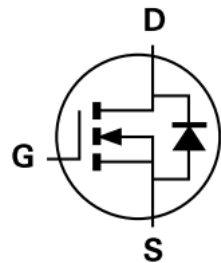
## Features

- 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
- High Conversion Efficiency
- Low R<sub>DS(ON)</sub> — Minimizes Power Losses
- Wettable Flank for Improved Optical Inspection
- Fast Switching Speed
- Low Input Capacitance
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **The DMTH4014LPSWQ is suitable for automotive applications requiring specific change control; this part is AEC-Q101 qualified, PPAP capable, and manufactured in IATF 16949 certified facilities.**

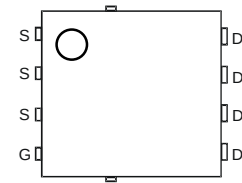
<https://www.diodes.com/quality/product-definitions/>

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



Internal Schematic



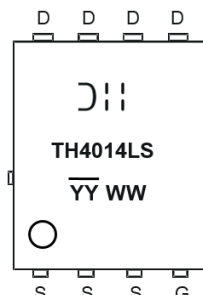
Top View  
Pin Configuration

## Ordering Information (Note 4)

| Part Number      | Case                          | Packaging        |
|------------------|-------------------------------|------------------|
| DMTH4014LPSWQ-13 | PowerDI5060-8 (SWP) (Type UX) | 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/>.

## Marking Information



JII = Manufacturer's Marking  
 TH4014LS = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Year (ex: 21 = 2021)  
 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> | 40                      | V    |
| Gate-Source Voltage                                             | V <sub>GSS</sub> | ±20                     | V    |
| Continuous Drain Current (Note 6)                               | I <sub>D</sub>   | T <sub>C</sub> = +25°C  | A    |
|                                                                 |                  | T <sub>C</sub> = +100°C |      |
| Maximum Continuous Body Diode Forward Current (Note 6)          | I <sub>S</sub>   | 43.5                    | A    |
| Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)              | I <sub>DM</sub>  | 170                     | A    |
| Pulsed Body Diode Forward Current (10µs Pulse, Duty Cycle = 1%) | I <sub>SM</sub>  | 170                     | A    |
| Avalanche Current, L=0.1mH                                      | I <sub>AS</sub>  | 19.8                    | A    |
| Avalanche Energy, L=0.1mH                                       | E <sub>AS</sub>  | 19.6                    | mJ   |

**Thermal Characteristics**

| Characteristic                                   | Symbol                            | Value       | Unit |
|--------------------------------------------------|-----------------------------------|-------------|------|
| Total Power Dissipation (Note 5)                 | P <sub>D</sub>                    | 4           | W    |
| Thermal Resistance, Junction to Ambient (Note 5) | R <sub>θJA</sub>                  | 38          | °C/W |
| Total Power Dissipation (Note 6)                 | P <sub>D</sub>                    | 46.9        | W    |
| Thermal Resistance, Junction to Case (Note 6)    | R <sub>θJC</sub>                  | 3.2         | °C/W |
| Operating and Storage Temperature Range          | T <sub>J</sub> , T <sub>STG</sub> | -55 to +175 | °C   |

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

| Characteristic                             | Symbol              | Min | Typ  | Max  | Unit | Test Condition                                                                            |
|--------------------------------------------|---------------------|-----|------|------|------|-------------------------------------------------------------------------------------------|
| <b>OFF CHARACTERISTICS</b> (Note 7)        |                     |     |      |      |      |                                                                                           |
| Drain-Source Breakdown Voltage             | BV <sub>DSS</sub>   | 40  | —    | —    | V    | V <sub>GS</sub> = 0V, I <sub>D</sub> = 1mA                                                |
| Zero Gate Voltage Drain Current            | I <sub>DSS</sub>    | —   | —    | 1    | µA   | V <sub>DS</sub> = 32V, V <sub>GS</sub> = 0V                                               |
| Gate-Source Leakage                        | I <sub>GSS</sub>    | —   | —    | ±100 | nA   | V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V                                              |
| <b>ON CHARACTERISTICS</b> (Note 7)         |                     |     |      |      |      |                                                                                           |
| Gate Threshold Voltage                     | V <sub>GS(TH)</sub> | 1   | —    | 3    | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250µA                                |
| Static Drain-Source On-Resistance          | R <sub>DS(ON)</sub> | —   | 10.8 | 14.5 | mΩ   | V <sub>GS</sub> = 10V, I <sub>D</sub> = 20A                                               |
|                                            |                     | —   | 17.0 | 25.0 |      | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 10A                                              |
| 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</b> (Note 8)    |                     |     |      |      |      |                                                                                           |
| Input Capacitance                          | C <sub>iss</sub>    | —   | 750  | —    | pF   | V <sub>DS</sub> = 20V, V <sub>GS</sub> = 0V, f = 1MHz                                     |
| Output Capacitance                         | C <sub>oss</sub>    | —   | 225  | —    |      |                                                                                           |
| Reverse Transfer Capacitance               | C <sub>rss</sub>    | —   | 21   | —    |      |                                                                                           |
| Gate Resistance                            | R <sub>g</sub>      | —   | 1.1  | —    | Ω    | V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz                                      |
| Total Gate Charge (V <sub>GS</sub> = 4.5V) | Q <sub>g</sub>      | —   | 5.7  | —    | nC   | V <sub>DD</sub> = 20V, I <sub>D</sub> = 20A                                               |
| Total Gate Charge (V <sub>GS</sub> = 10V)  | Q <sub>g</sub>      | —   | 11.2 | —    |      |                                                                                           |
| Gate-Source Charge                         | Q <sub>gs</sub>     | —   | 2.0  | —    |      |                                                                                           |
| Gate-Drain Charge                          | Q <sub>gd</sub>     | —   | 2.2  | —    |      |                                                                                           |
| Turn-On Delay Time                         | t <sub>D(ON)</sub>  | —   | 3.5  | —    | ns   | V <sub>GS</sub> = 10V, V <sub>DD</sub> = 20V, R <sub>g</sub> = 1.6Ω, I <sub>D</sub> = 20A |
| Turn-On Rise Time                          | t <sub>r</sub>      | —   | 4.6  | —    |      |                                                                                           |
| Turn-Off Delay Time                        | t <sub>D(OFF)</sub> | —   | 12.4 | —    |      |                                                                                           |
| Turn-Off Fall Time                         | t <sub>f</sub>      | —   | 4.9  | —    |      |                                                                                           |
| Body Diode Reverse Recovery Time           | t <sub>RR</sub>     | —   | 11.3 | —    | ns   | I <sub>F</sub> = 15A, di/dt = 400A/µs                                                     |
| Body Diode Reverse Recovery Charge         | Q <sub>RR</sub>     | —   | 9.5  | —    | nC   |                                                                                           |

- Notes:
- Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate.
  - Thermal resistance from junction to soldering point (on the exposed drain pad).
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to product testing.

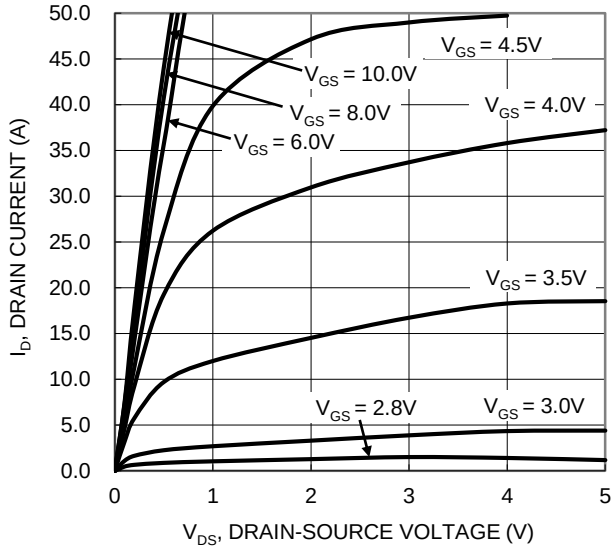


Figure 1. Typical Output Characteristic

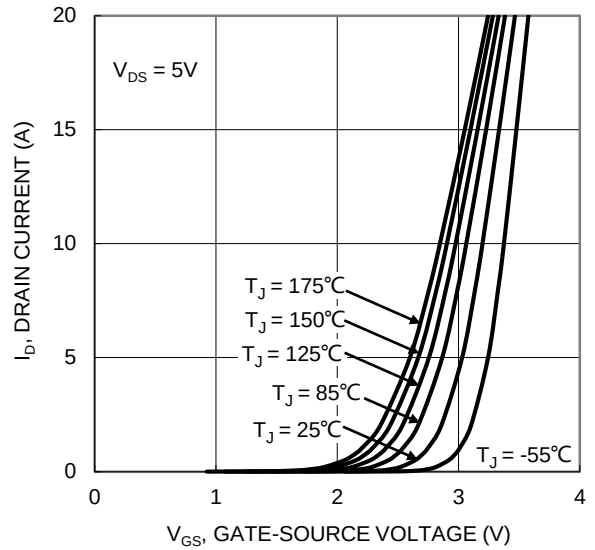


Figure 2. Typical Transfer Characteristic

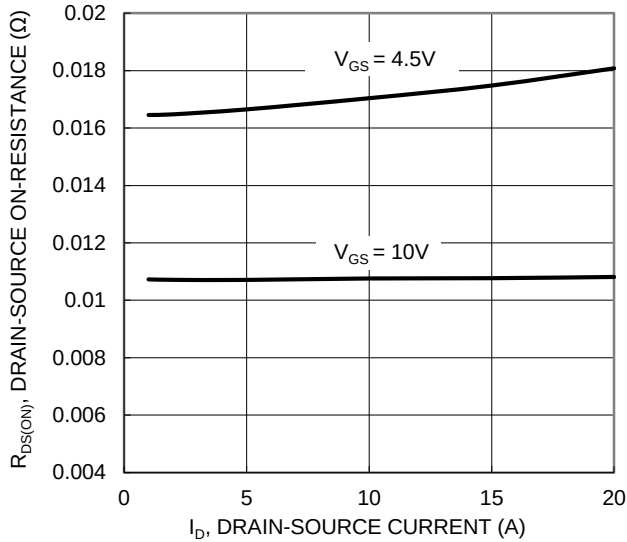


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

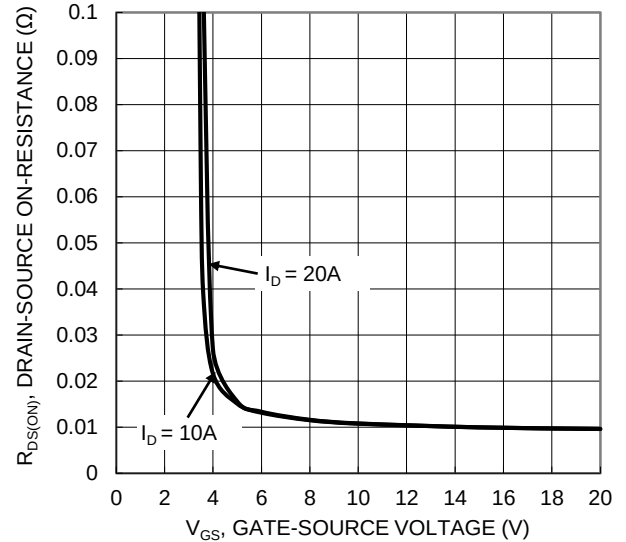


Figure 4. Typical Transfer Characteristic

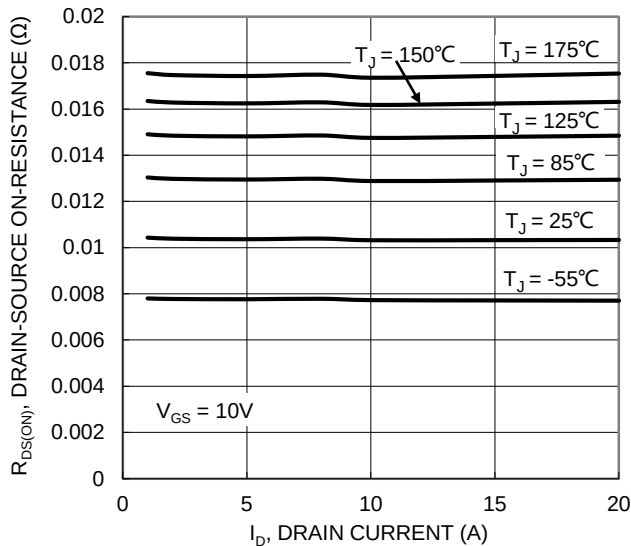


Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

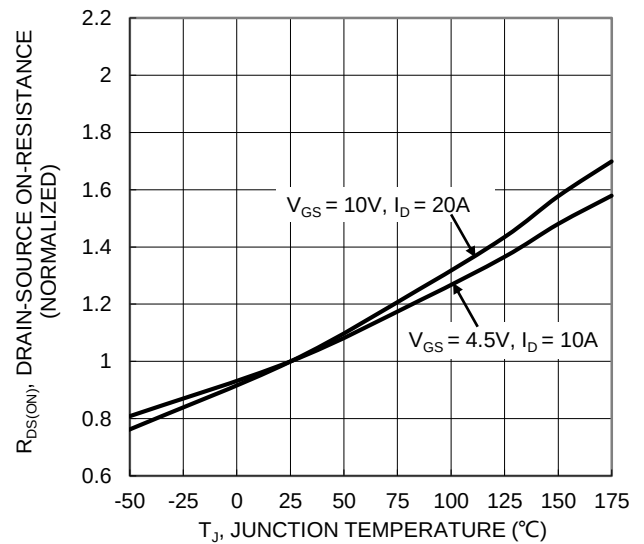
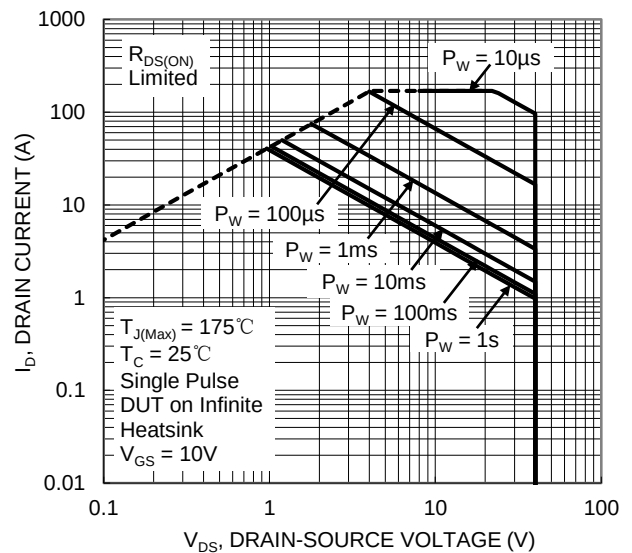
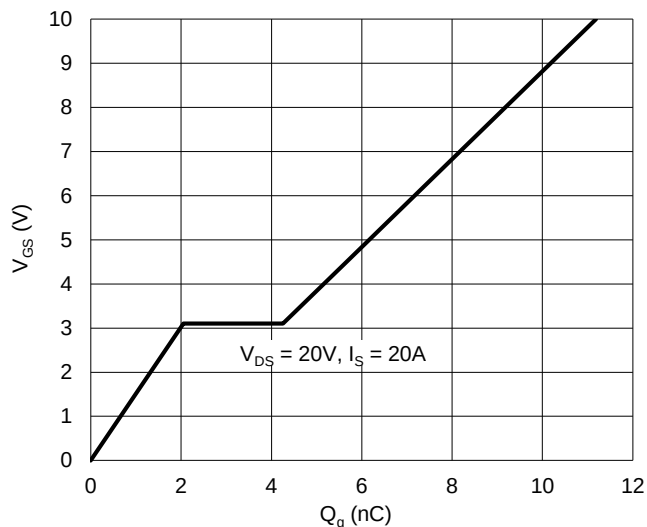
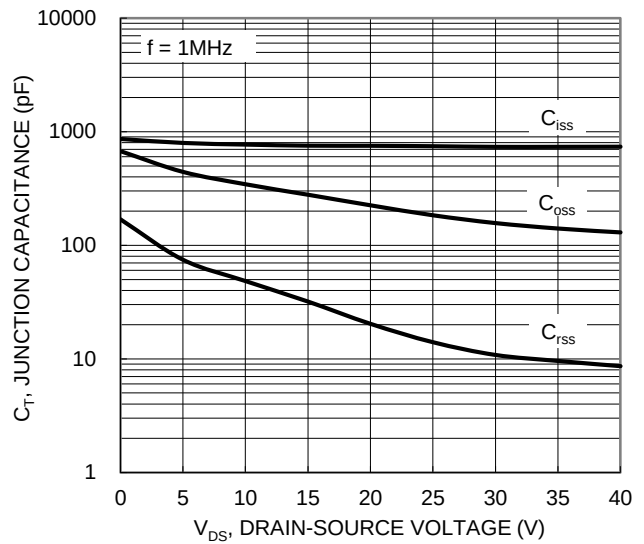
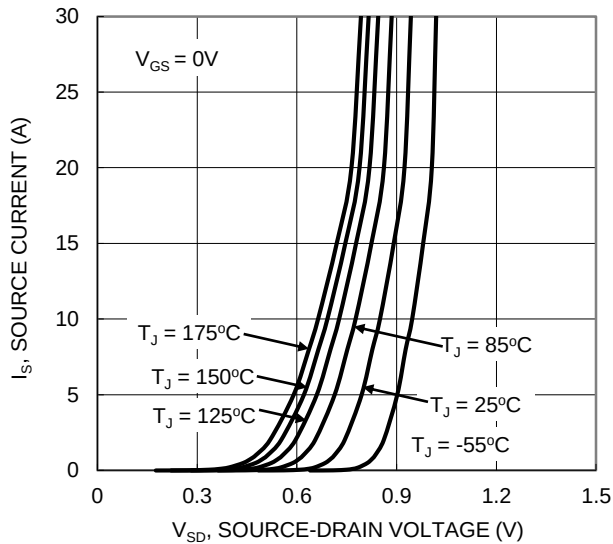
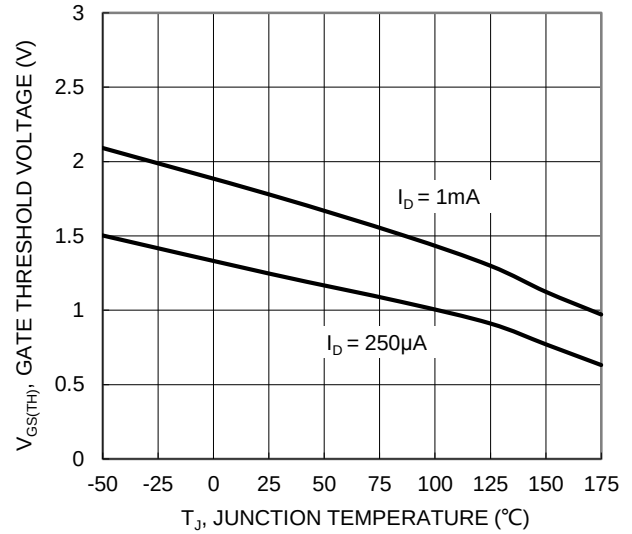
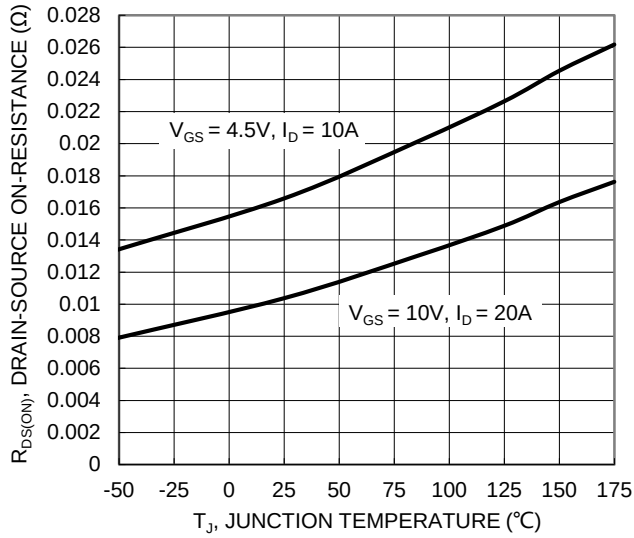


Figure 6. On-Resistance Variation with Junction Temperature



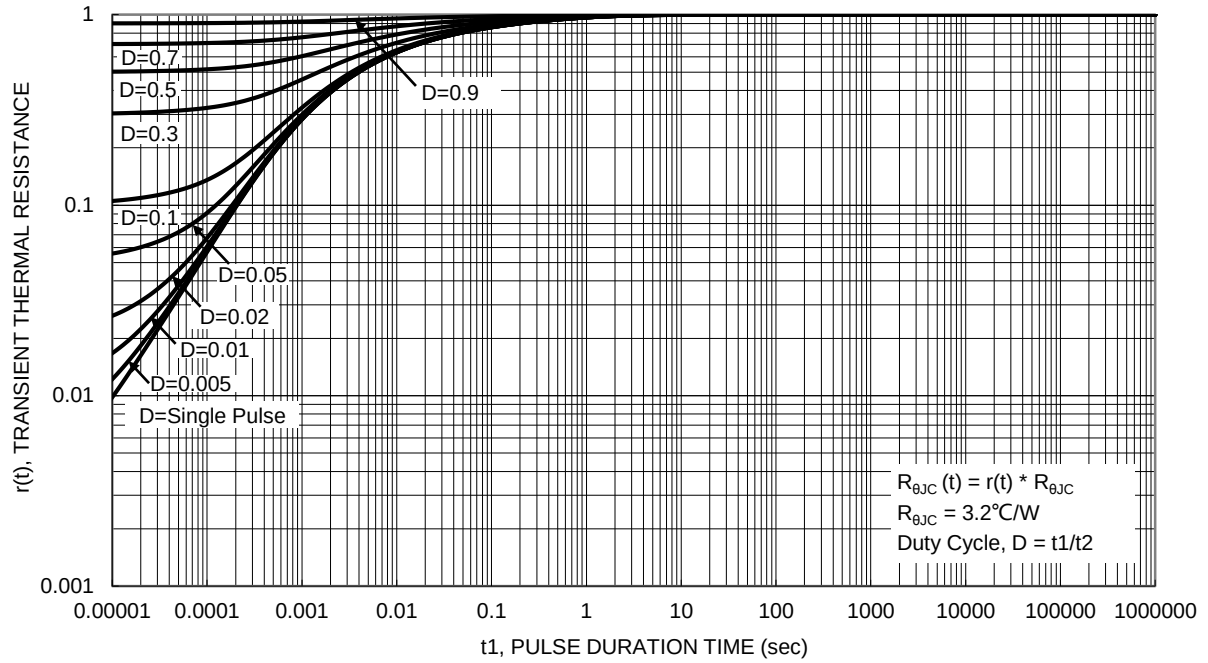
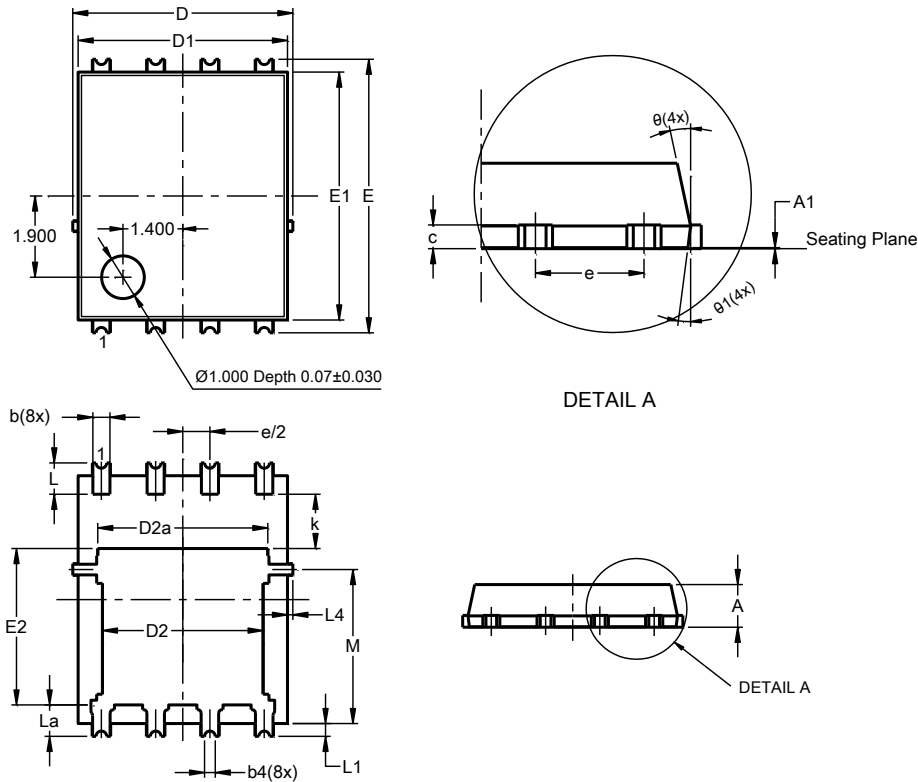


Figure 13. Transient Thermal Resistance

## Package Outline Dimensions

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

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

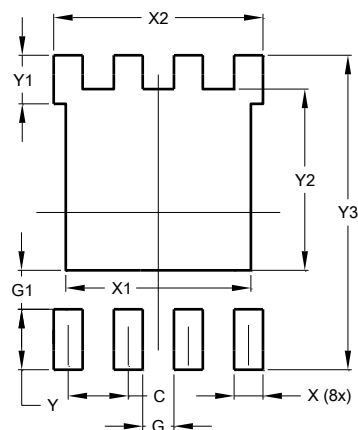


| PowerDI5060-8 (SWP)<br>(Type UX) |          |       |       |
|----------------------------------|----------|-------|-------|
| Dim                              | Min      | Max   | Typ   |
| A                                | 0.90     | 1.10  | 1.00  |
| A1                               | 0        | 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<br>(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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