

## Product Summary

| BV <sub>DSS</sub> | R <sub>DS(ON)</sub> Max        | I <sub>D</sub> Max<br>T <sub>c</sub> = +25°C |
|-------------------|--------------------------------|--|
| 60V               | 1.6mΩ @ V <sub>GS</sub> = 10V  | 225A   |
|                   | 2.8mΩ @ V <sub>GS</sub> = 4.5V | 180A   |

## 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:

- Engine Management Systems
- Body Control Electronics
- DC-DC Converters

## 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 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)**
- **The DMTH61M8LPSQ 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<sup>®</sup>5060-8
- 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
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 (e3)
- Weight: 0.097 grams (Approximate)

PowerDI5060-8 (Type K)

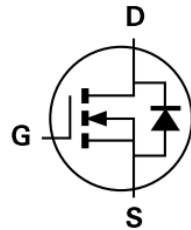


Top View

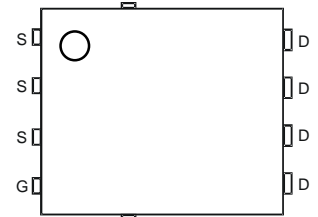


Pin1

Bottom View



Internal Schematic



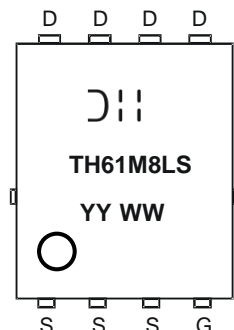
Top View  
Pin Configuration

## Ordering Information (Note 4)

| Part Number     | Case                   | Packaging          |
|-----------------|------------------------|--------------------|
| DMTH61M8LPSQ-13 | PowerDI5060-8 (Type K) | 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



D;| = Manufacturer's Marking  
 TH61M8LS = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Year (ex: 20 = 2020)  
 WW = Week (01 to 53)

**Maximum Ratings** (@T<sub>C</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, V <sub>GS</sub> = 10V (Note 6)        | I <sub>D</sub>   | T <sub>C</sub> = +25°C  | 225  |
|   |                  | T <sub>C</sub> = +100°C | 160  |
| Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)              | I <sub>DM</sub>  | 900                     | A    |
| Maximum Continuous Body Diode Forward Current (Note 6)          | I <sub>S</sub>   | 225                     | A    |
| Pulsed Body Diode Forward Current (10µs Pulse, Duty Cycle = 1%) | I <sub>SM</sub>  | 900                     | A    |
| Avalanche Current, L = 1mH                                      | I <sub>AS</sub>  | 34.8                    | A    |
| Avalanche Energy, L = 1mH                                       | E <sub>AS</sub>  | 605                     | mJ   |

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

| Characteristic                                   | Symbol                            | Value       | Unit |
|--|-----------------------------------|-------------|------|
| Total Power Dissipation (Note 5)                 | P <sub>D</sub>                    | 3.2         | W    |
| Thermal Resistance, Junction to Ambient (Note 5) | R <sub>θJA</sub>                  | 46          | °C/W |
| Total Power Dissipation (Note 6)                 | P <sub>D</sub>                    | 187.5       | W    |
| Thermal Resistance, Junction to Case (Note 6)    | R <sub>θJC</sub>                  | 0.8         | °C/W |
| Operating and Storage Temperature Range          | T <sub>J</sub> , T <sub>STG</sub> | -55 to +175 | °C   |

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

| Characteristic                             | Symbol              | Min | Typ   | Max  | Unit | Test Condition  |
|--|---------------------|-----|-------|------|------|---|
| <b>OFF CHARACTERISTICS (Note 7)</b>        |                     |     |       |      |      |   |
| Drain-Source Breakdown Voltage             | BV <sub>DSS</sub>   | 60  | —     | —    | V    | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250µA  |
| Zero Gate Voltage Drain Current            | I <sub>DSS</sub>    | —   | —     | 1    | µA   | V <sub>DS</sub> = 48V, 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 (Note 7)</b>         |                     |     |       |      |      |   |
| 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> | —   | 1.2   | 1.6  | mΩ   | V <sub>GS</sub> = 10V, I <sub>D</sub> = 30A   |
|  |                     | —   | 1.9   | 2.8  |      | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 20A  |
| Diode Forward Voltage                      | V <sub>SD</sub>     | —   | 0.7   | 1.2  | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = 20A  |
| <b>DYNAMIC CHARACTERISTICS (Note 8)</b>    |                     |     |       |      |      |   |
| Input Capacitance                          | C <sub>iss</sub>    | —   | 8320  | —    | pF   | V <sub>DS</sub> = 30V, V <sub>GS</sub> = 0V, f = 1MHz                                   |
| Output Capacitance                         | C <sub>oss</sub>    | —   | 2298  | —    |      |   |
| Reverse Transfer Capacitance               | C <sub>rss</sub>    | —   | 157   | —    |      |   |
| Gate Resistance                            | R <sub>g</sub>      | —   | 3     | —    | 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>      | —   | 53.3  | —    | nC   | V <sub>DS</sub> = 30V, I <sub>D</sub> = 30A   |
| Total Gate Charge (V <sub>GS</sub> = 10V)  | Q <sub>g</sub>      | —   | 115.5 | —    |      |   |
| Gate-Source Charge                         | Q <sub>gs</sub>     | —   | 27.8  | —    |      |   |
| Gate-Drain Charge                          | Q <sub>gd</sub>     | —   | 16.5  | —    |      |   |
| Turn-On Delay Time                         | t <sub>D(ON)</sub>  | —   | 10.3  | —    | ns   | V <sub>DD</sub> = 30V, V <sub>GS</sub> = 10V, I <sub>D</sub> = 30A, R <sub>g</sub> = 3Ω |
| Turn-On Rise Time                          | t <sub>R</sub>      | —   | 23.9  | —    |      |   |
| Turn-Off Delay Time                        | t <sub>D(OFF)</sub> | —   | 108.3 | —    |      |   |
| Turn-Off Fall Time                         | t <sub>F</sub>      | —   | 51.7  | —    |      |   |
| Body Diode Reverse Recovery Time           | t <sub>RR</sub>     | —   | 64    | —    | ns   | I <sub>F</sub> = 30A, di/dt = 100A/µs   |
| Body Diode Reverse Recovery Charge         | Q <sub>RR</sub>     | —   | 124   | —    | 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.

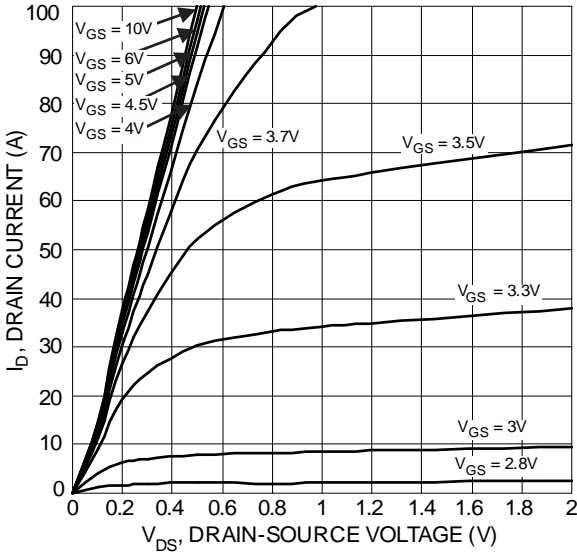


Figure 1 Typical Output Characteristic

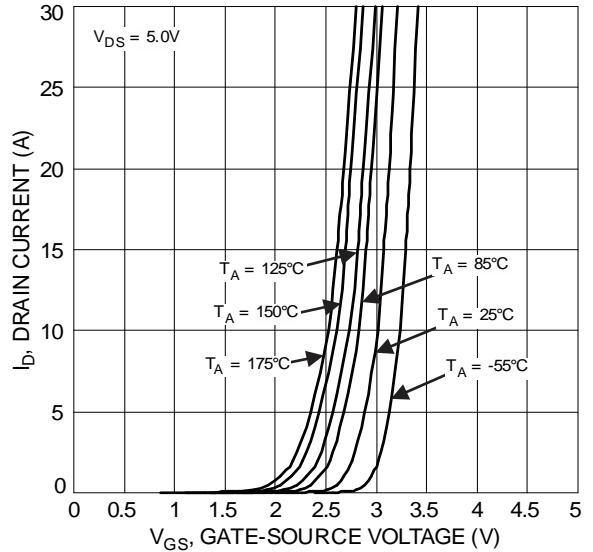


Figure 2 Typical Transfer Characteristics

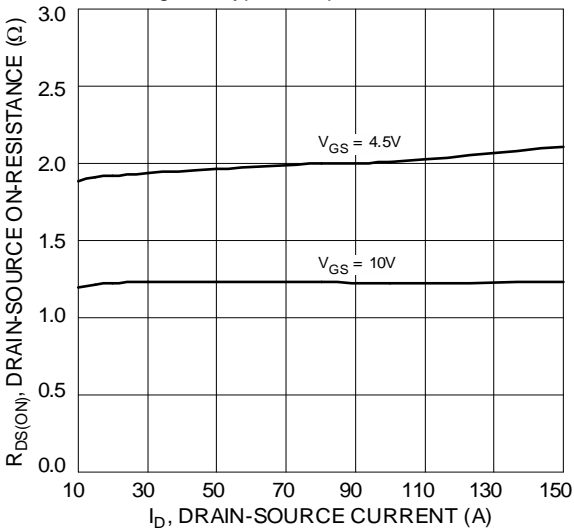


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

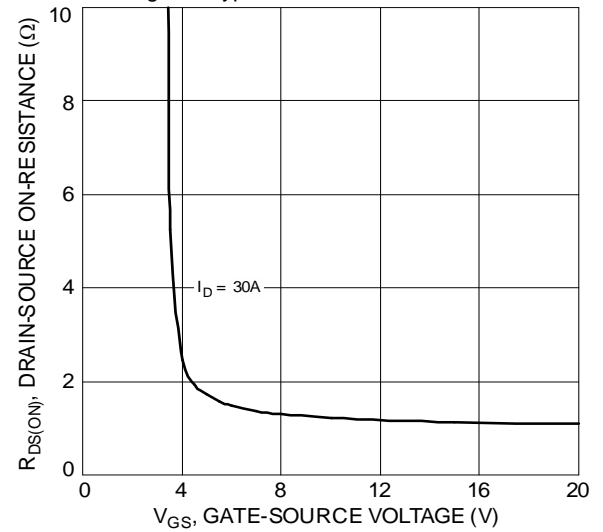


Figure 4 Typical Drain-Source On-Resistance vs. Gate-Source Voltage

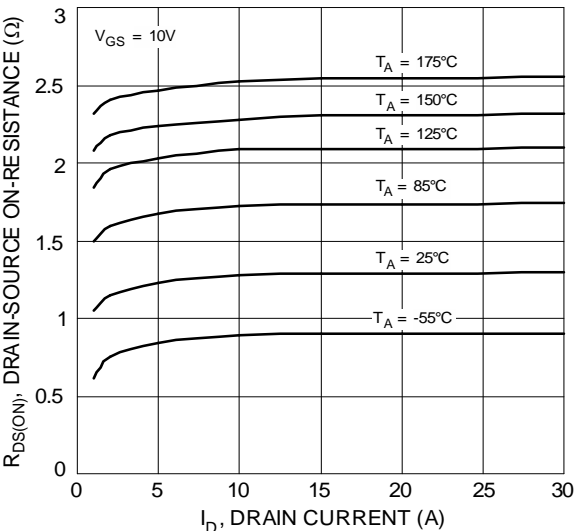


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

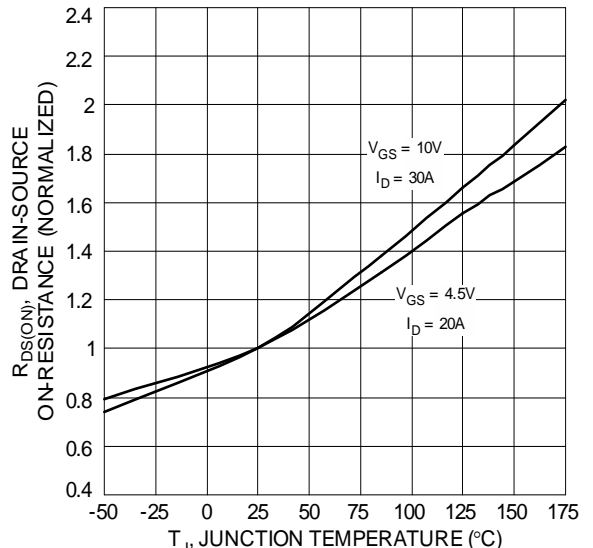


Figure 6 On-Resistance Variation with Temperature

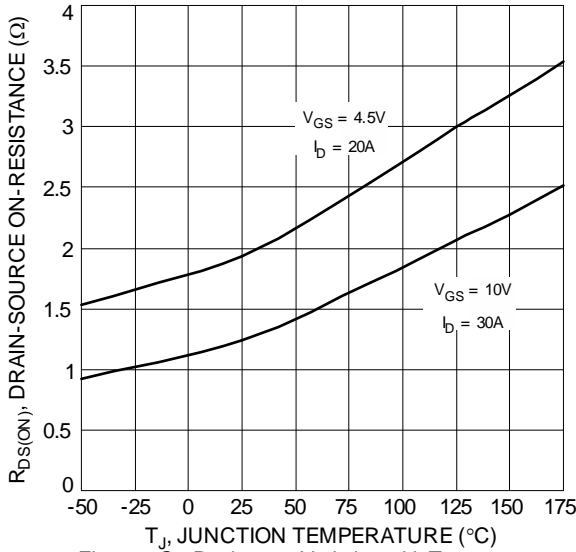


Figure 7 On-Resistance Variation with Temperature

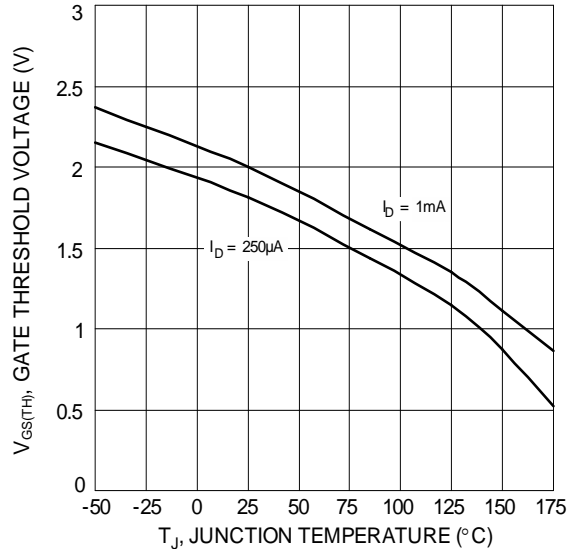


Figure 8 Gate Threshold Variation vs. Junction Temperature

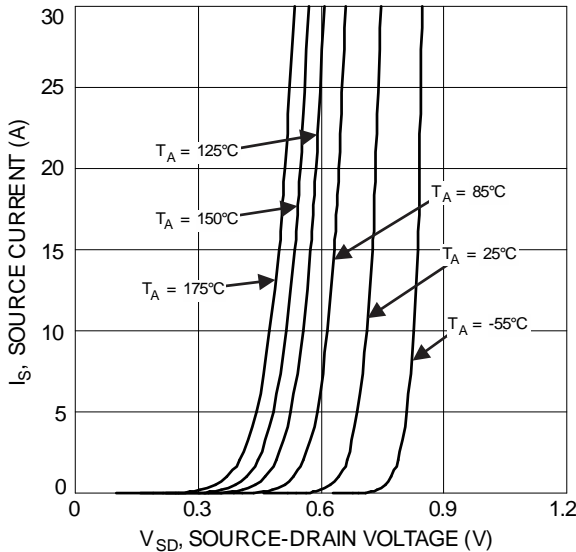


Figure 9 Diode Forward Voltage vs. Current

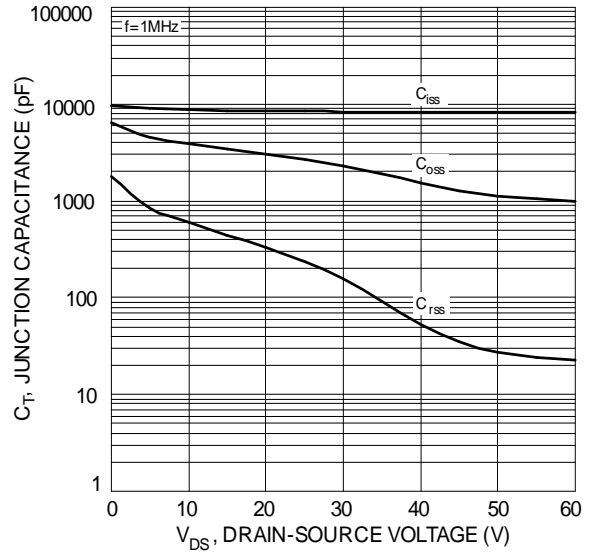


Figure 10 Typical Junction Capacitance

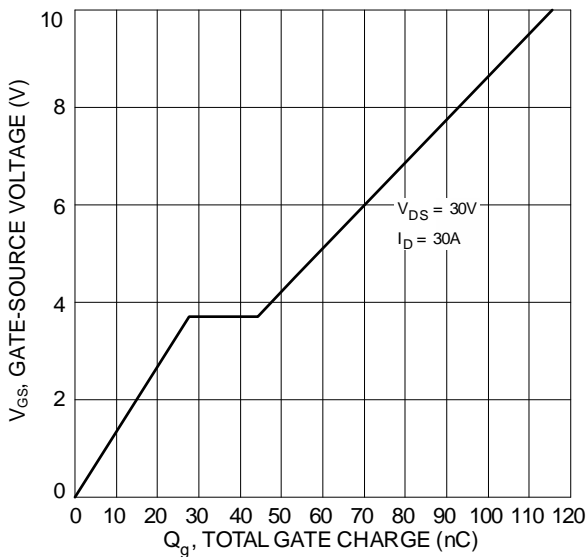


Figure 11 Gate Charge

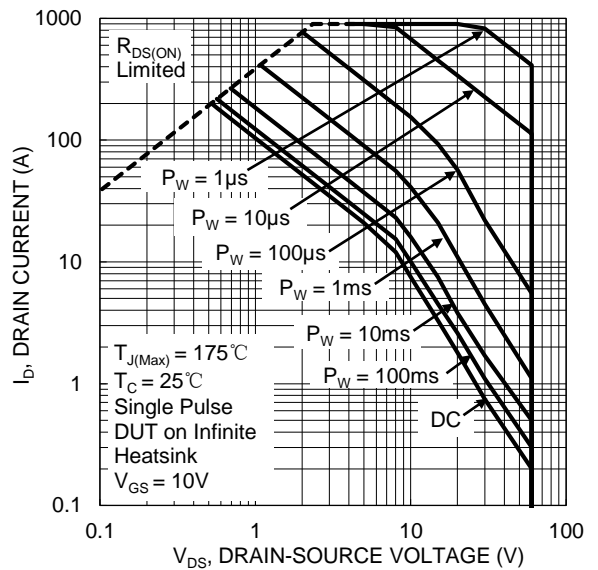
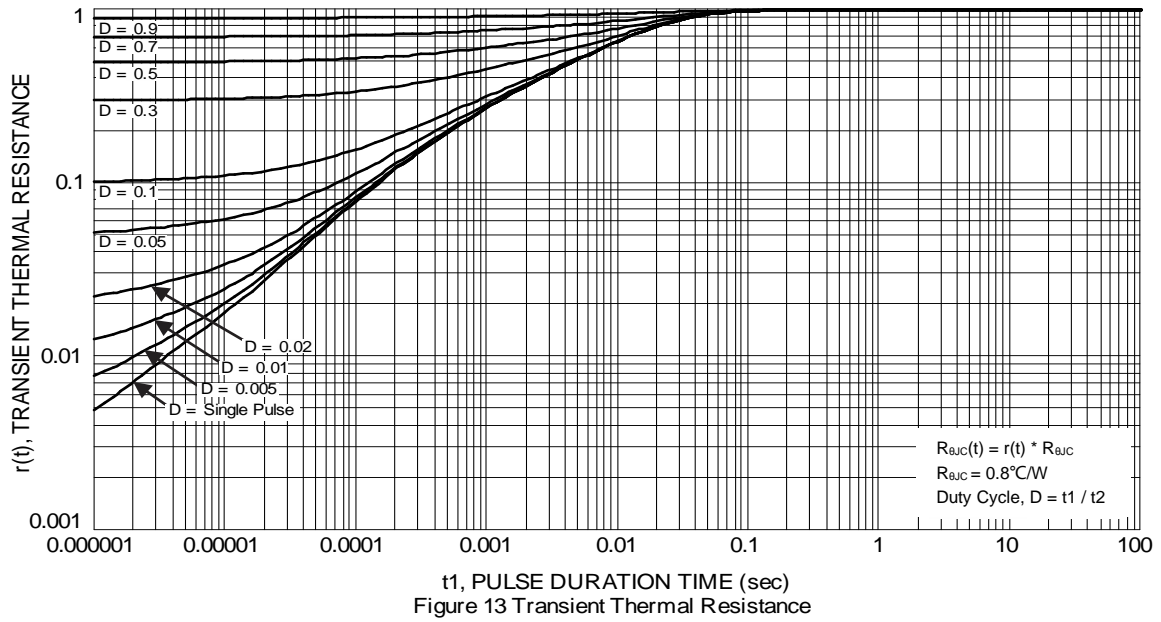


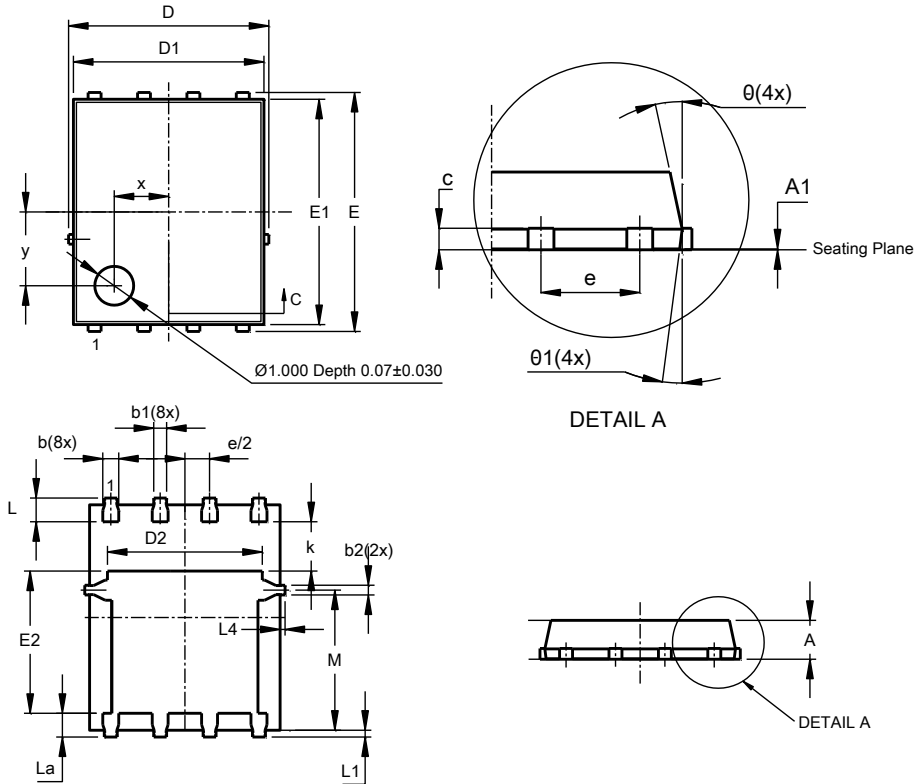
Figure 12. SOA, Safe Operation Area



## Package Outline Dimensions

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

### PowerDI5060-8 (Type K)

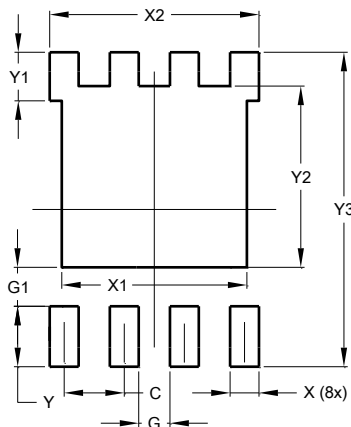


| PowerDI5060-8<br>(Type K) |          |       |       |
|---------------------------|----------|-------|-------|
| Dim                       | Min      | Max   | Typ   |
| A                         | 0.90     | 1.10  | 1.00  |
| A1                        | 0        | 0.05  | 0.02  |
| b                         | 0.33     | 0.51  | 0.41  |
| b1                        | 0.300    | 0.366 | 0.333 |
| b2                        | 0.20     | 0.35  | 0.25  |
| c                         | 0.23     | 0.33  | 0.277 |
| D                         | 5.15 BSC |       |       |
| D1                        | 4.85     | 4.95  | 4.90  |
| D2                        | -        | -     | 3.98  |
| E                         | 6.15 BSC |       |       |
| E1                        | 5.75     | 5.85  | 5.80  |
| E2                        | 3.56     | 3.725 | 3.66  |
| e                         | 1.27BSC  |       |       |
| k                         | -        | -     | 1.27  |
| L                         | 0.51     | 0.71  | 0.61  |
| La                        | 0.51     | 0.675 | 0.61  |
| L1                        | 0.05     | 0.20  | 0.175 |
| L4                        | -        | -     | 0.125 |
| M                         | 3.50     | 3.71  | 3.605 |
| x                         | -        | -     | 1.400 |
| y                         | -        | -     | 1.900 |
| 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 (Type K)



| Dimensions | Value<br>(in mm) |
|------------|------------------|
| C          | 1.270            |
| G          | 0.660            |
| G1         | 0.820            |
| X          | 0.610            |
| X1         | 3.910            |
| X2         | 4.420            |
| Y          | 1.270            |
| Y1         | 1.020            |
| Y2         | 3.810            |
| Y3         | 6.610            |

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