

## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(ON)}$                    | $I_D$<br>$T_C = +25^\circ C$ |
|---------------|---------------------------------|------------------------------|
| -30V          | 9m $\Omega$ @ $V_{GS} = -10V$   | -45A                         |
|               | 12m $\Omega$ @ $V_{GS} = -4.5V$ | -35A                         |

## Description and Applications

This new generation 30V P-Channel Enhancement Mode MOSFET has been designed to minimize  $R_{DS(ON)}$  and yet maintain superior switching performance. This device is ideal for use in Notebook battery power management and loadswitch.

- Notebook Battery Power Management
- DC-DC Converters
- Loadswitch

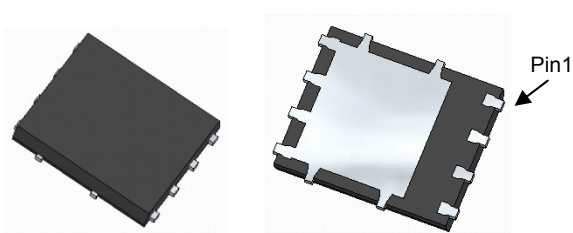
## Features and Benefits

- 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
- ESD HBM Protected up to 1kV
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

## Mechanical Data

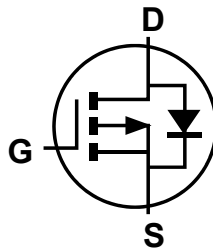
- Case: POWERDI5060-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram Below
- Weight: 0.097 grams (approximate)

POWERDI5060-8

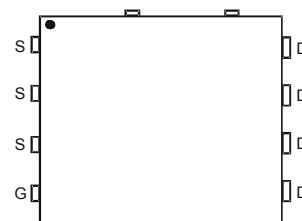


Top View

Bottom View



Internal Schematic



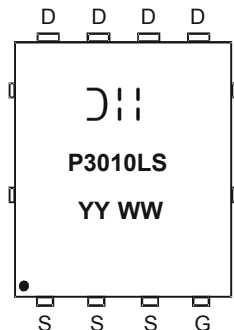
Top View  
Pin Configuration

## Ordering Information (Note 4)

| Part Number   | Case          | Packaging          |
|---------------|---------------|--------------------|
| DMP3012LPS-13 | POWERDI5060-8 | 2500 / Tape & Reel |

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant
  2. See [http://www.diodes.com/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) 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 <http://www.diodes.com/products/packages.html>.

## Marking Information



D:: = Manufacturer's Marking  
 P3012LS = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Year (ex: 13 = 2013)  
 WW = Week (01 - 53)

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

| Characteristic                                            |              |                        | Symbol           | Value | Unit |
|-----------------------------------------------------------|--------------|------------------------|------------------|-------|------|
| Drain-Source Voltage                                      |              |                        | V <sub>DSS</sub> | -30   | V    |
| Gate-Source Voltage                                       |              |                        | V <sub>GSS</sub> | ±20   | V    |
| Continuous Drain Current (Note 6) V <sub>GS</sub> = -10V  | Steady State | T <sub>A</sub> = +25°C | I <sub>D</sub>   | 13.2  | A    |
|                                                           |              | T <sub>A</sub> = +70°C |                  | 10.5  |      |
| Continuous Drain Current (Note 6) V <sub>GS</sub> = -4.5V | Steady State | T <sub>A</sub> = +25°C | I <sub>D</sub>   | 11.4  | A    |
|                                                           |              | T <sub>A</sub> = +70°C |                  | 9.1   |      |
| Pulsed Drain Current (Notes 6)                            |              |                        | I <sub>DM</sub>  | -100  | A    |
| Avalanche Current (Notes 7) L = 1mH                       |              |                        | I <sub>AR</sub>  | -24   | A    |
| Avalanche Energy (Notes 7) L = 1mH                        |              |                        | E <sub>AR</sub>  | 292   | mJ   |

**Thermal Characteristics**

| Characteristic                                                            | Symbol                            | Value       | Unit |
|---------------------------------------------------------------------------|-----------------------------------|-------------|------|
| Power Dissipation (Note 5)                                                | P <sub>D</sub>                    | 1.29        | W    |
| Thermal Resistance, Junction to Ambient @ T <sub>A</sub> = +25°C (Note 5) | R <sub>θJA</sub>                  | 97          | °C/W |
| Power Dissipation (Note 6)                                                | P <sub>D</sub>                    | 2.36        | W    |
| Thermal Resistance, Junction to Ambient @ T <sub>A</sub> = +25°C (Note 6) | R <sub>θJA</sub>                  | 53          | °C/W |
| Thermal Resistance, Junction to Case @ T <sub>C</sub> = +25°C (Notes 6)   | R <sub>θJC</sub>                  | 4.0         | °C/W |
| Operating and Storage Temperature Range                                   | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C   |

**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>   | -30  | —     | —    | V    | V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA                                                 |
| Zero Gate Voltage Drain Current             | I <sub>DSS</sub>    | —    | —     | -1.0 | μA   | V <sub>DS</sub> = -30V, 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 8)</b>          |                     |      |       |      |      |                                                                                               |
| Gate Threshold Voltage                      | V <sub>GS(th)</sub> | -1.1 | -1.6  | -2.1 | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA                                   |
| Static Drain-Source On-Resistance           | R <sub>DS(on)</sub> | —    | 7.5   | 9.0  | mΩ   | V <sub>GS</sub> = -10V, I <sub>D</sub> = -10A                                                 |
|                                             |                     | —    | 8.5   | 12.0 |      | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -10A                                                |
| Forward Transfer Admittance                 | Y <sub>fs</sub>     | —    | 30    | —    | S    | V <sub>DS</sub> = -15V, I <sub>D</sub> = -10A                                                 |
| Diode Forward Voltage                       | V <sub>SD</sub>     | —    | -0.65 | -1.0 | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = -1A                                                    |
| <b>DYNAMIC CHARACTERISTICS (Note 9)</b>     |                     |      |       |      |      |                                                                                               |
| Input Capacitance                           | C <sub>iss</sub>    | —    | 6807  | —    | pF   | V <sub>DS</sub> = 15V, V <sub>GS</sub> = 0V,<br>f = 1.0MHz                                    |
| Output Capacitance                          | C <sub>oss</sub>    | —    | 988   | —    | pF   |                                                                                               |
| Reverse Transfer Capacitance                | C <sub>rss</sub>    | —    | 647   | —    | pF   |                                                                                               |
| Gate Resistance                             | R <sub>g</sub>      | —    | 6.2   | —    | Ω    | V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz                                          |
| Total Gate Charge (V <sub>GS</sub> = -10V)  | Q <sub>g</sub>      | —    | 139   | —    | nC   | V <sub>DS</sub> = -15V, I <sub>D</sub> = -10A                                                 |
| Total Gate Charge (V <sub>GS</sub> = -4.5V) | Q <sub>g</sub>      | —    | 66    | —    | nC   |                                                                                               |
| Gate-Source Charge                          | Q <sub>gs</sub>     | —    | 19    | —    | nC   |                                                                                               |
| Gate-Drain Charge                           | Q <sub>gd</sub>     | —    | 21    | —    | nC   |                                                                                               |
| Turn-On Delay Time                          | t <sub>D(on)</sub>  | —    | 8.9   | —    | ns   | V <sub>DS</sub> = -15V, V <sub>GEN</sub> = -10V,<br>R <sub>G</sub> = 6Ω, I <sub>D</sub> = -1A |
| Turn-On Rise Time                           | t <sub>r</sub>      | —    | 10.5  | —    | ns   |                                                                                               |
| Turn-Off Delay Time                         | t <sub>D(off)</sub> | —    | 254   | —    | ns   |                                                                                               |
| Turn-Off Fall Time                          | t <sub>f</sub>      | —    | 95    | —    | ns   |                                                                                               |

- Notes:
- Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
  - Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
  - I<sub>AS</sub> and E<sub>AS</sub> rating are based on low frequency and duty cycles to keep T<sub>J</sub> = 25°C
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to product testing.

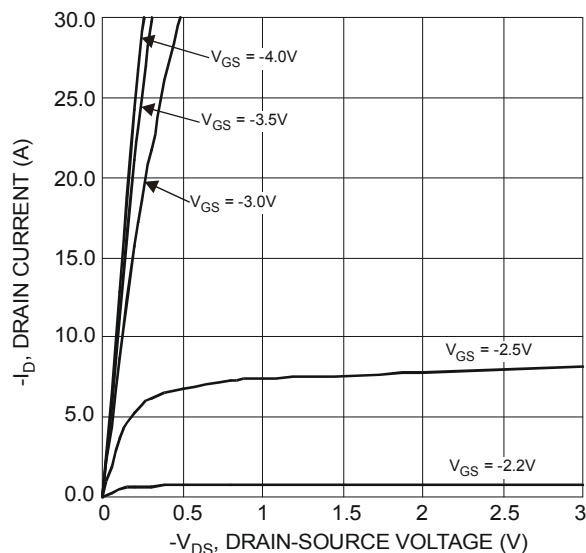


Figure 1 Typical Output Characteristics

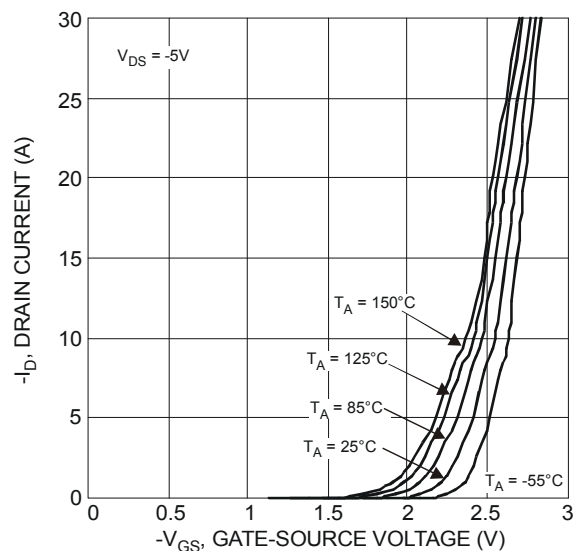


Figure 2 Typical Transfer Characteristics

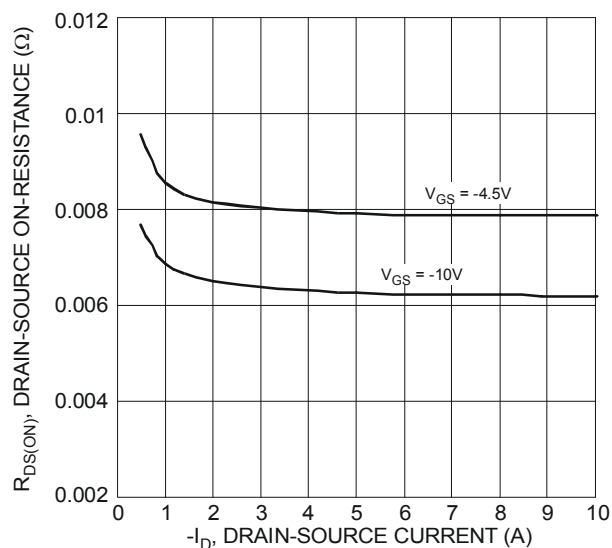


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

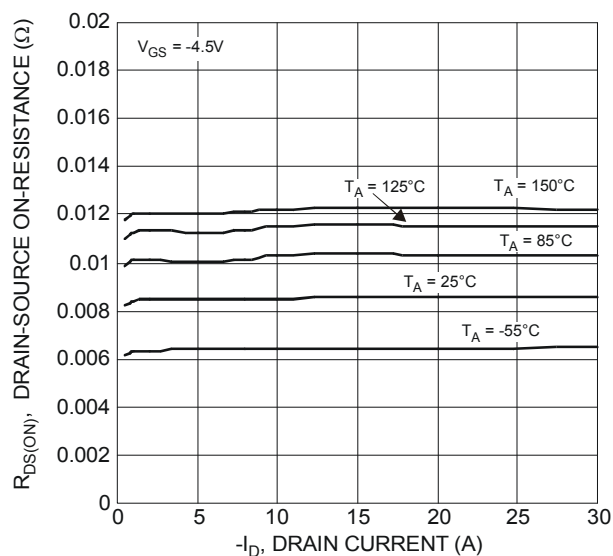


Figure 4 Typical On-Resistance vs. Drain Current and Temperature

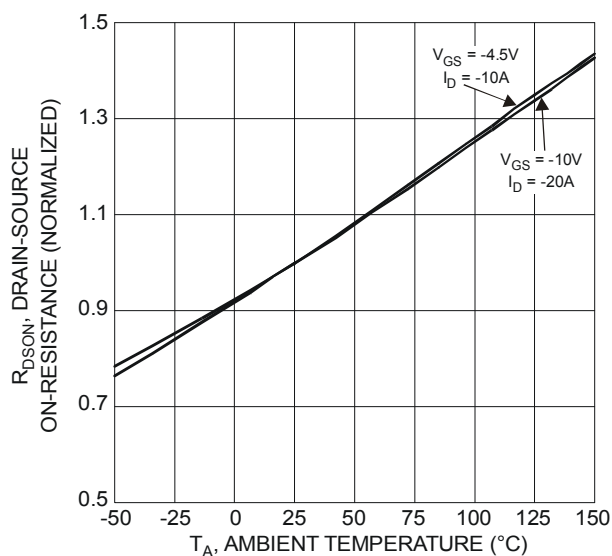


Figure 5 On-Resistance Variation with Temperature

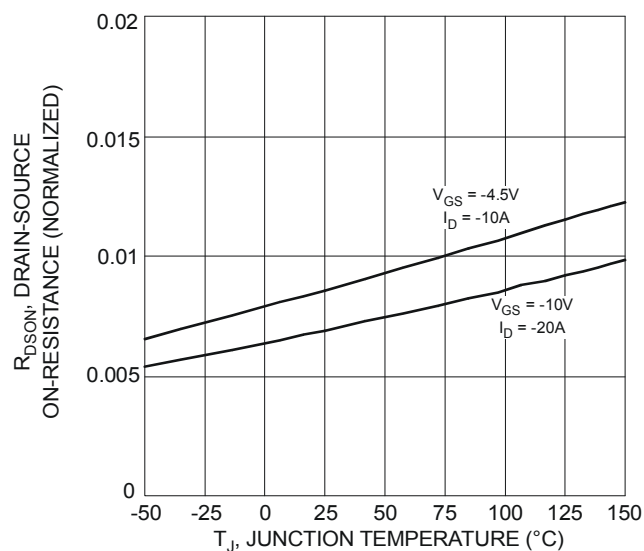


Figure 6 On-Resistance Variation with Temperature

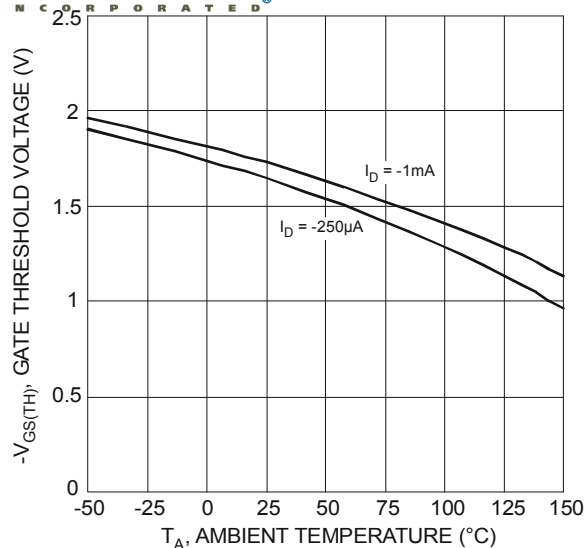


Figure 7 Gate Threshold Variation vs. Ambient Temperature

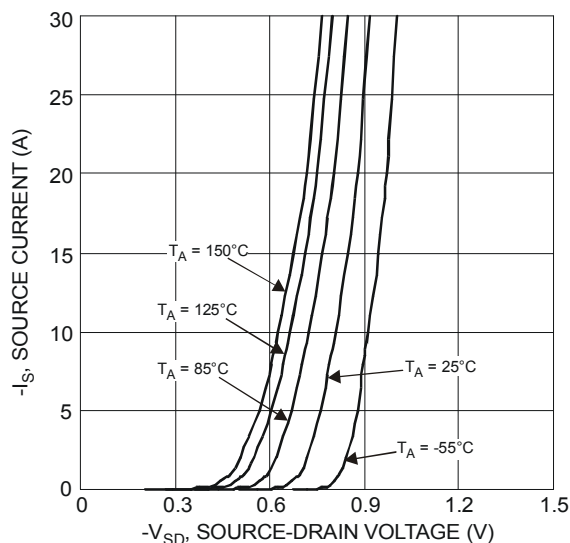


Figure 8 Diode Forward Voltage vs. Current

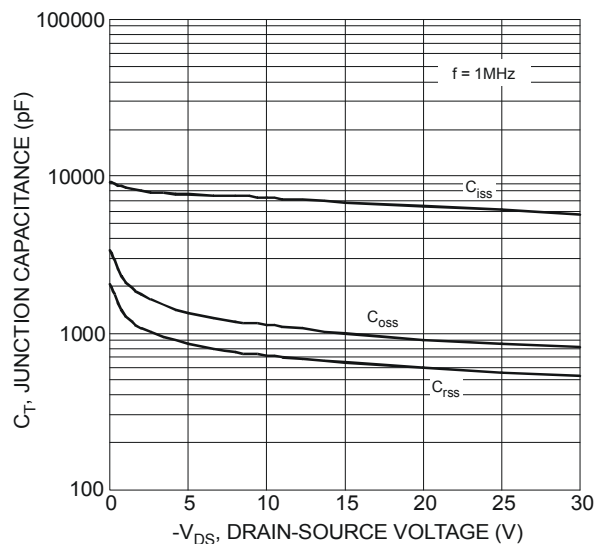


Figure 9 Typical Total Capacitance

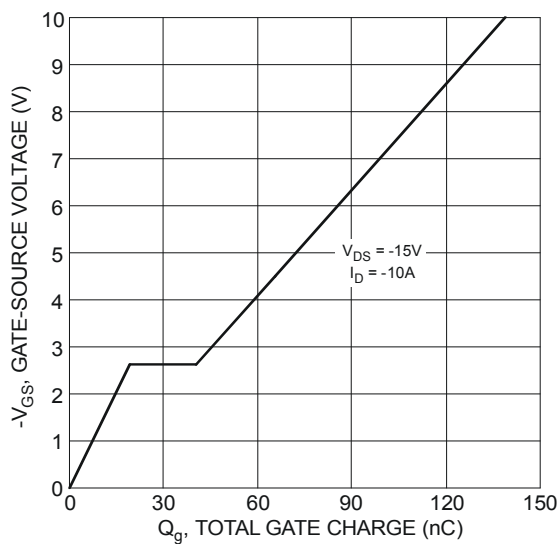


Figure 10 Gate-Source Voltage vs. Total Gate Charge

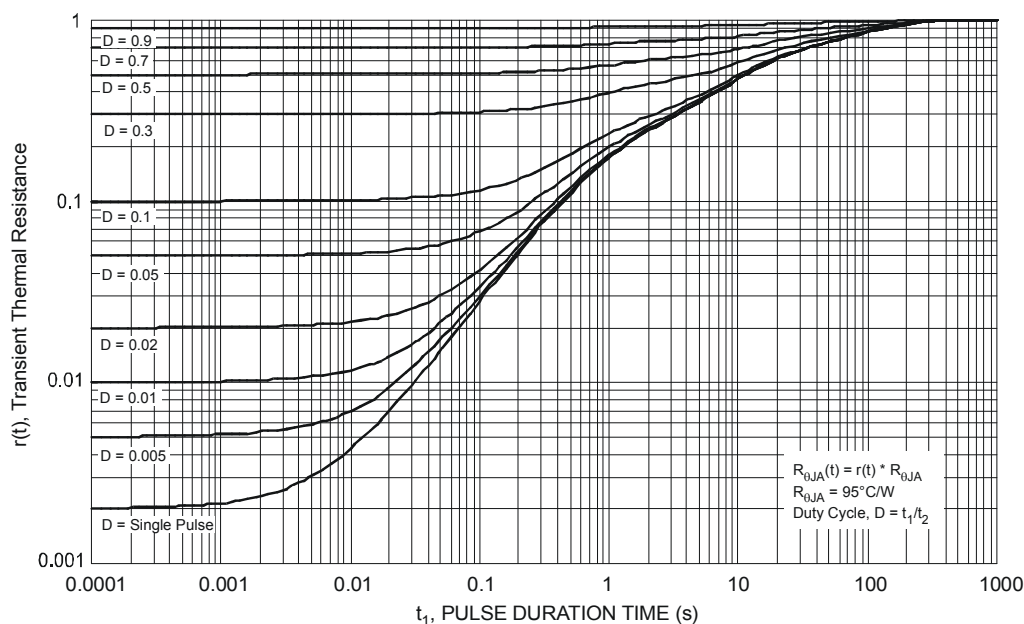
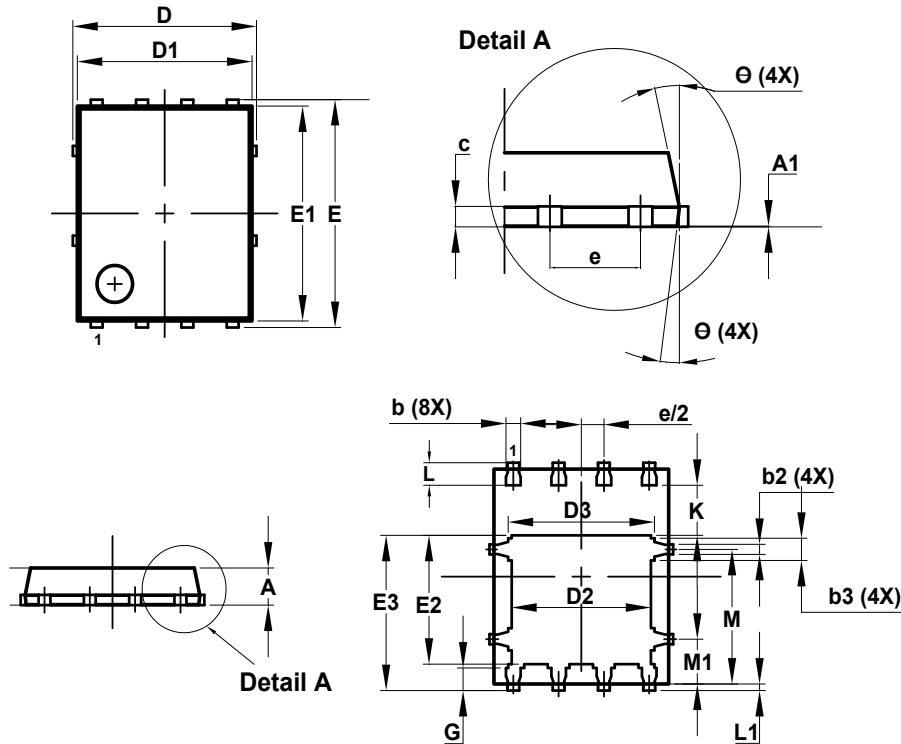


Figure 11 Transient Thermal Response

## Package Outline Dimensions

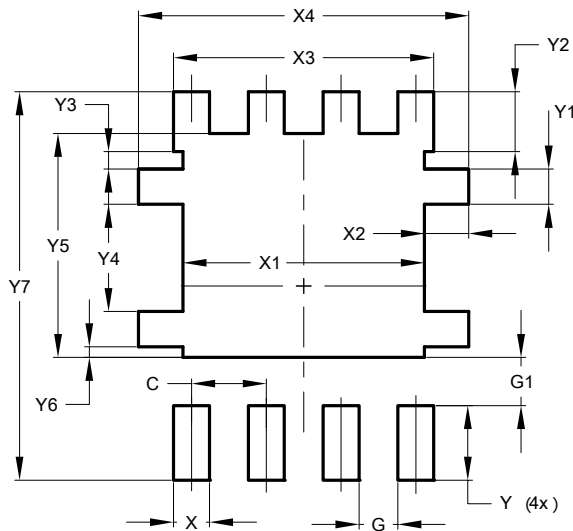
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



| 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                   | 0.10     | 0.20  | 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 |          |       |       |

## Suggested Pad Layout

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.



| 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         |

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