

## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(ON) max}$               | $I_D$<br>$T_A = +25^\circ C$ |
|---------------|--------------------------------|------------------------------|
| 30V           | 12m $\Omega$ @ $V_{GS} = 10V$  | 10.8A                        |
|               | 16m $\Omega$ @ $V_{GS} = 4.5V$ | 9.5A                         |

## Description and Applications

This new generation MOSFET has been designed to minimize the on-state resistance ( $R_{DS(ON)}$ ) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

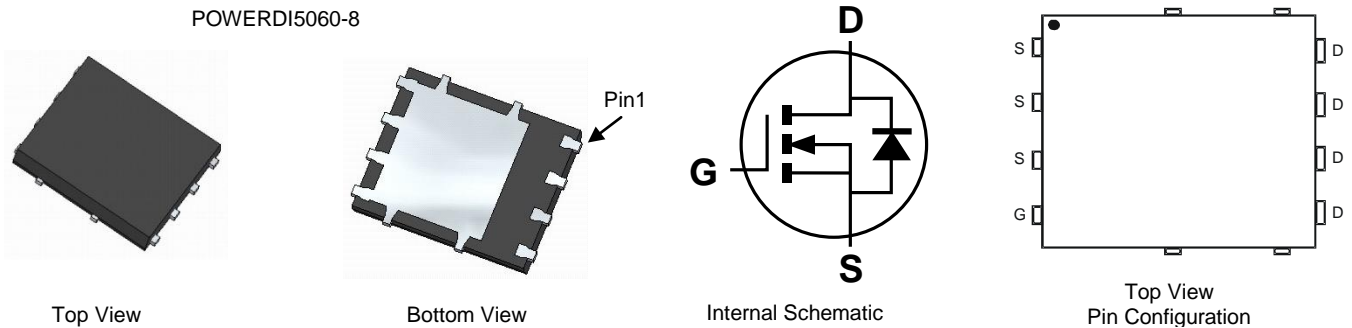
- DC-DC Converters
- Power Management Functions
- Analog Switch

## Features and Benefits

- Low On-Resistance
- Low Input Capacitance
- Fast Switching Speed
- <1.1mm Package Profile – Ideal for Thin Applications
- **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
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208
- Weight: 0.097 grams (Approximate)

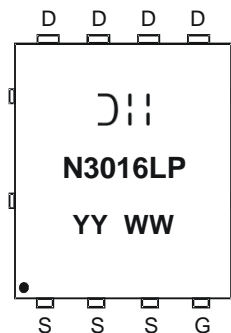


## Ordering Information (Note 4)

| Part Number   | Case          | Packaging          |
|---------------|---------------|--------------------|
| DMN3016LPS-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



= Manufacturer's Marking  
 N3016LP = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Last Digit of Year (ex: 14 = 2014)  
 WW = Week Code (01 to 53)

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

| Characteristic   |              | Symbol   | Value        | Units |
|--|--------------|--|--------------|-------|
| 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<br>T <sub>A</sub> = +70°C | 10.8<br>8.5  | A     |
|  | t < 10s      | T <sub>A</sub> = +25°C<br>T <sub>A</sub> = +70°C | 15.5<br>12.3 | A     |
| Continuous Drain Current (Note 6) V <sub>GS</sub> = 4.5V | Steady State | T <sub>A</sub> = +25°C<br>T <sub>A</sub> = +70°C | 9.5<br>7.5   | A     |
|  | t < 10s      | T <sub>A</sub> = +25°C<br>T <sub>A</sub> = +70°C | 13.5<br>10.8 | A     |
| Pulsed Drain Current (10µs pulse, duty cycle = 1%)       |              | I <sub>DM</sub>                                  | 70           | A     |
| Avalanche Current (Note 7) L = 0.1mH                     |              | I <sub>AS</sub>                                  | 22           | A     |
| Avalanche Energy (Note 7) L = 0.1mH                      |              | E <sub>AS</sub>                                  | 24           | mJ    |

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

| Characteristic                                   |              | Symbol                            | Value       | Units |
|--|--------------|-----------------------------------|-------------|-------|
| Total Power Dissipation (Note 5)                 |              | P <sub>D</sub>                    | 1.18        | W     |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady State | R <sub>θJA</sub>                  | 109         | °C/W  |
|  | t < 10s      |                                   | 49          | °C/W  |
| Total Power Dissipation (Note 6)                 |              | P <sub>D</sub>                    | 2.75        | W     |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady State | R <sub>θJA</sub>                  | 46          | °C/W  |
|  | t < 10s      |                                   | 24          | °C/W  |
| Thermal Resistance, Junction to Case (Note 6)    |              | R <sub>θJC</sub>                  | 4.5         | °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    | 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> | 1.4 | -    | 2.0  | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250µA                                   |
| Static Drain-Source On-Resistance          | R <sub>DS(ON)</sub> | -   | 8.5  | 12   | mΩ   | V <sub>GS</sub> = 10V, I <sub>D</sub> = 20A  |
|  |                     | -   | 10.5 | 16   |      | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 20A   |
| Diode Forward Voltage                      | V <sub>SD</sub>     | -   | 0.7  | 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>    | -   | 1415 | -    | pF   | V <sub>DS</sub> = 15V, V <sub>GS</sub> = 0V,<br>f = 1.0MHz                                   |
| Output Capacitance                         | C <sub>oss</sub>    | -   | 119  | -    | pF   |  |
| Reverse Transfer Capacitance               | C <sub>rss</sub>    | -   | 82   | -    | pF   |  |
| Gate Resistance                            | R <sub>g</sub>      | -   | 3.0  | -    | Ω    | V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1.0MHz                                       |
| Total Gate Charge (V <sub>GS</sub> = 4.5V) | Q <sub>g</sub>      | -   | 11.3 | -    | nC   | V <sub>DS</sub> = 15V, I <sub>D</sub> = 12A  |
| Total Gate Charge (V <sub>GS</sub> = 10V)  | Q <sub>g</sub>      | -   | 25.1 | -    | nC   |  |
| Gate-Source Charge                         | Q <sub>gs</sub>     | -   | 3.5  | -    | nC   |  |
| Gate-Drain Charge                          | Q <sub>gd</sub>     | -   | 3.6  | -    | nC   |  |
| Turn-On Delay Time                         | t <sub>D(ON)</sub>  | -   | 4.8  | -    | ns   | V <sub>DD</sub> = 15V, V <sub>GS</sub> = 10V,<br>R <sub>L</sub> = 1.25Ω, R <sub>G</sub> = 3Ω |
| Turn-On Rise Time                          | t <sub>R</sub>      | -   | 16.5 | -    | ns   |  |
| Turn-Off Delay Time                        | t <sub>D(OFF)</sub> | -   | 26.1 | -    | ns   |  |
| Turn-Off Fall Time                         | t <sub>F</sub>      | -   | 5.6  | -    | ns   |  |
| Reverse Recovery Time                      | t <sub>RR</sub>     | -   | 12.3 | -    | ns   | I <sub>F</sub> = 12A, di/dt = 500A/µs  |
| Reverse Recovery Charge                    | Q <sub>rr</sub>     | -   | 10.4 | -    | nC   |  |

- 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.

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DMN3016LPS

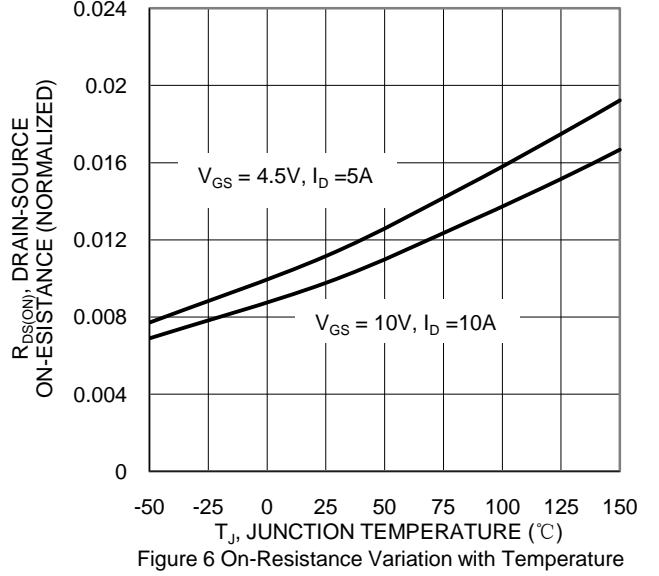
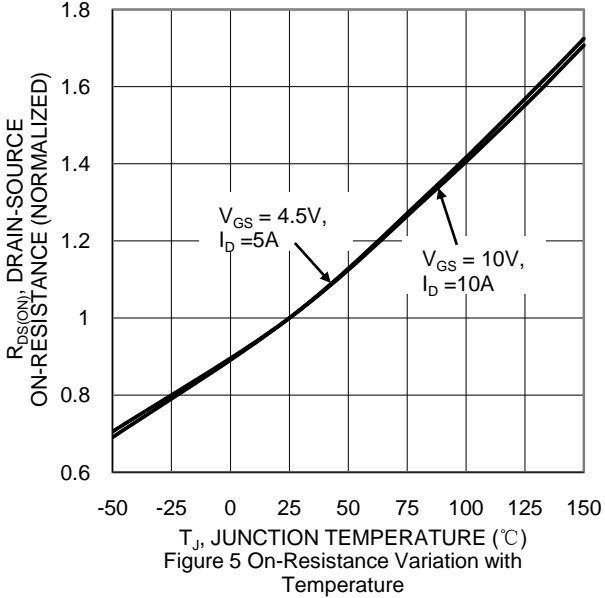
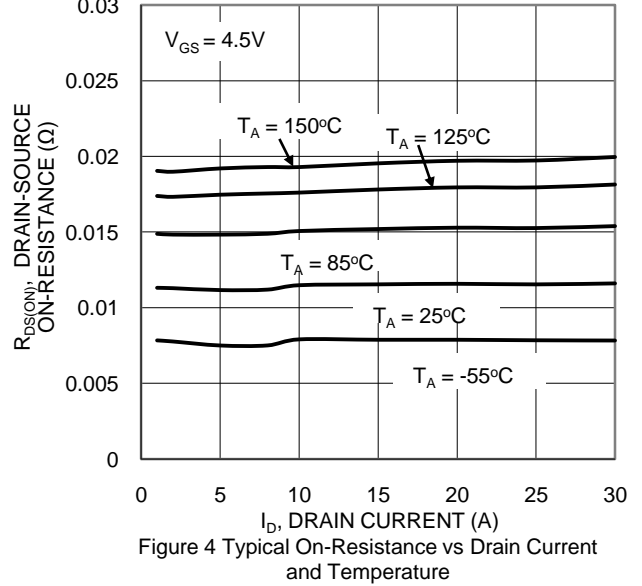
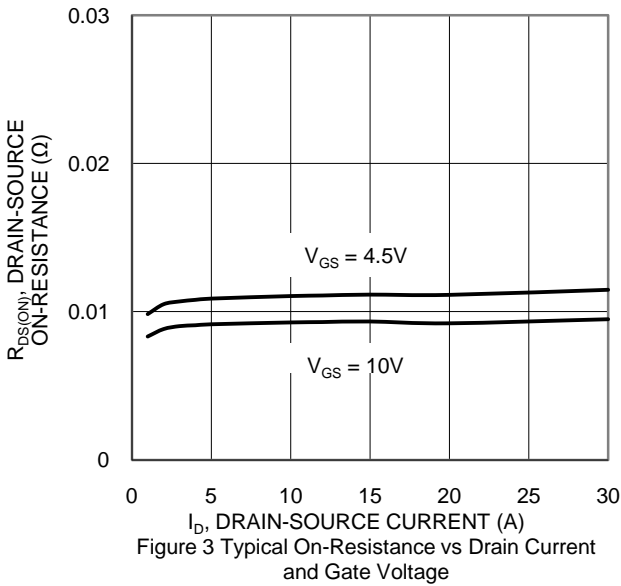
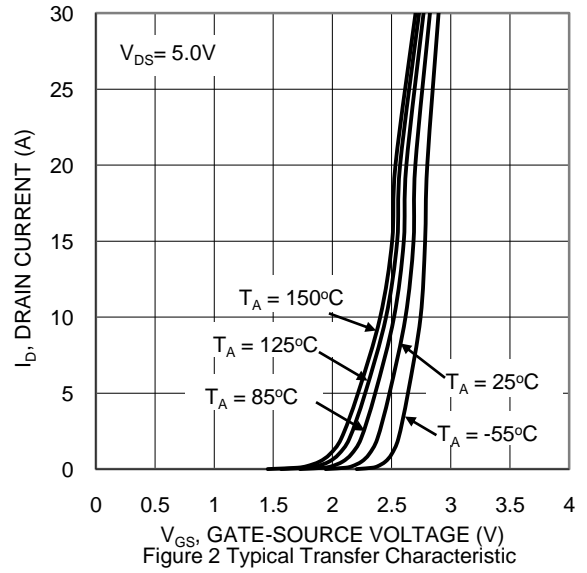
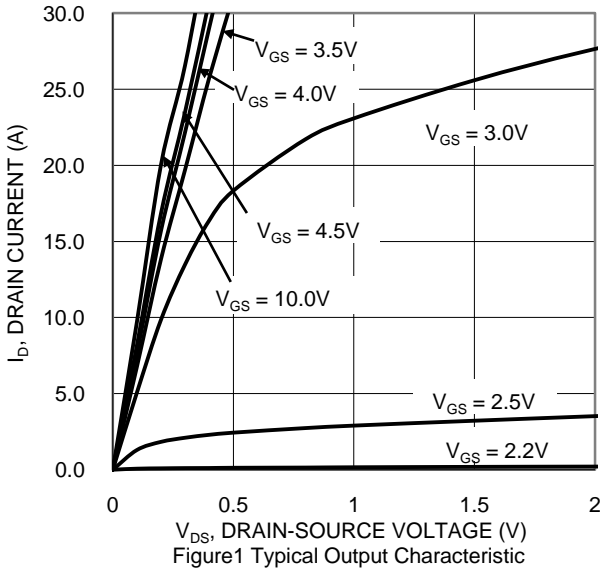
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February 2015

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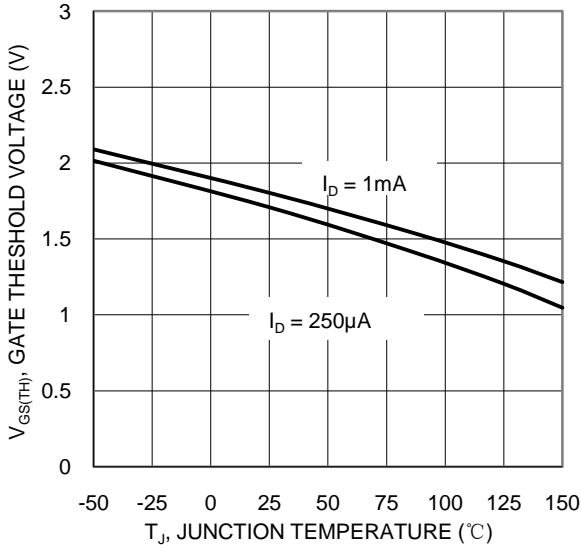


Figure 7 Gate Threshold Variation vs Junction Temperature

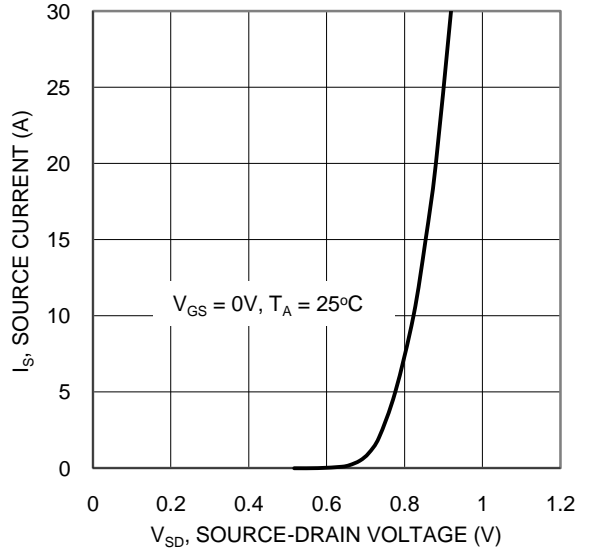


Figure 8 Diode Forward Voltage vs Current

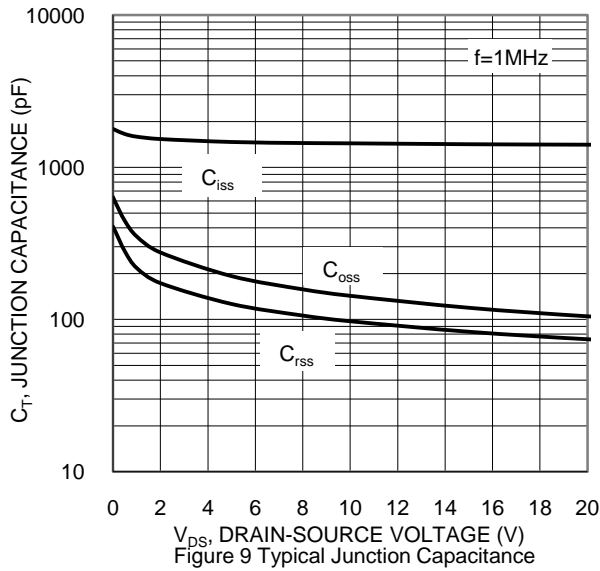


Figure 9 Typical Junction Capacitance

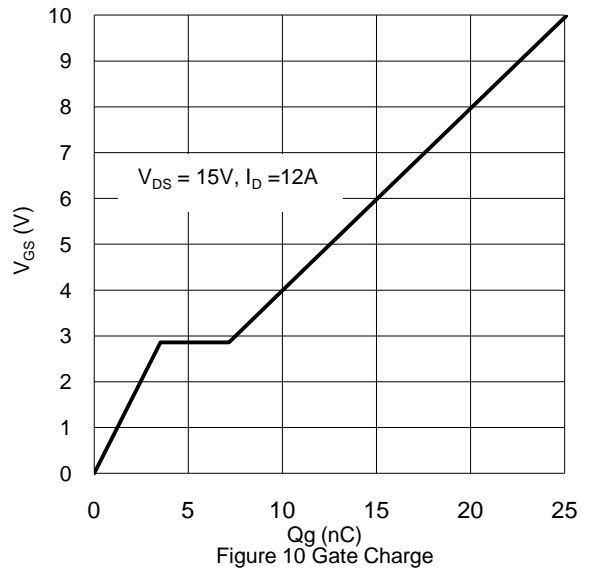


Figure 10 Gate Charge

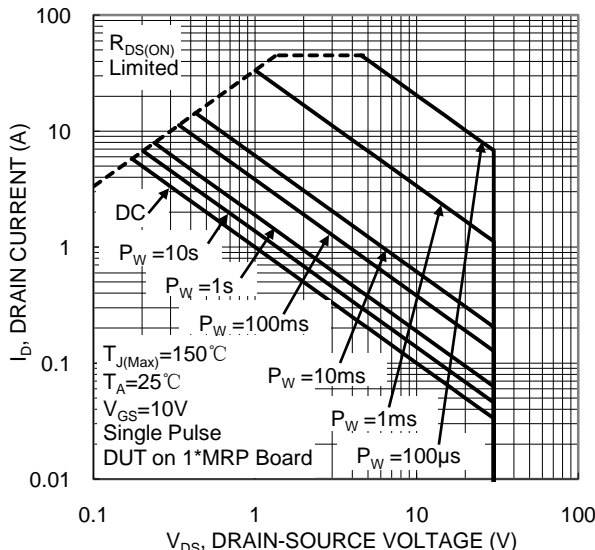
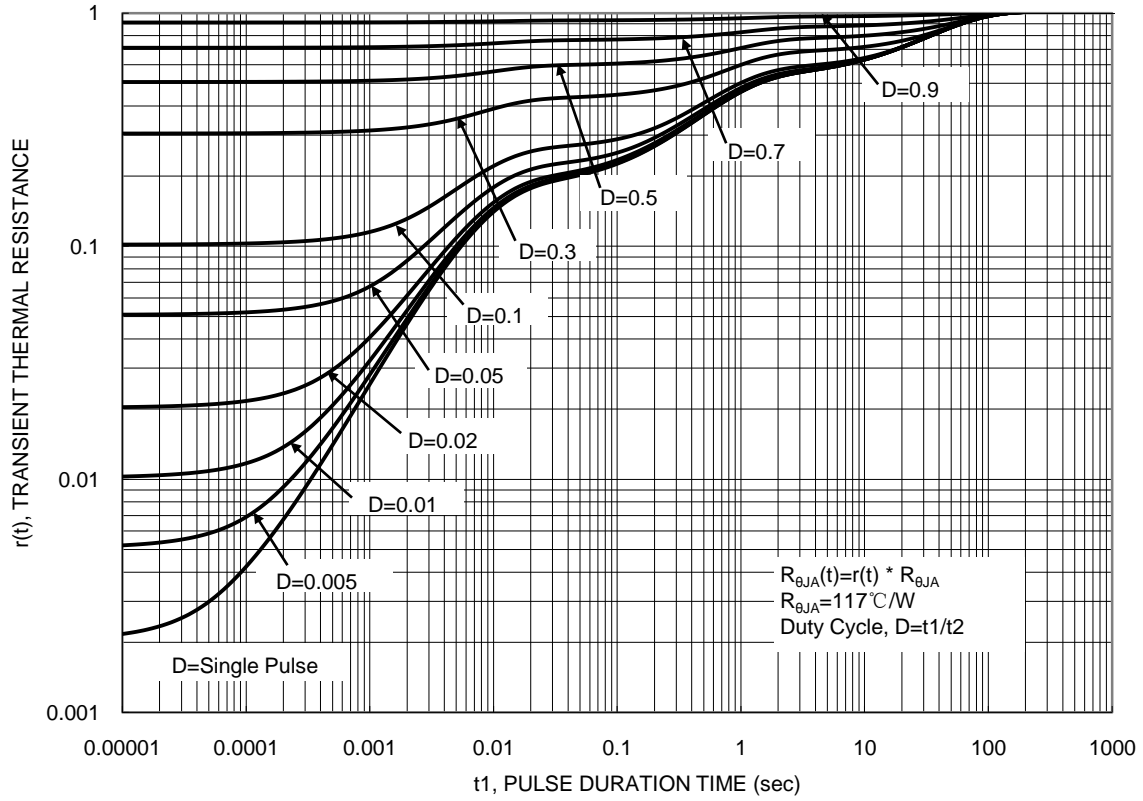


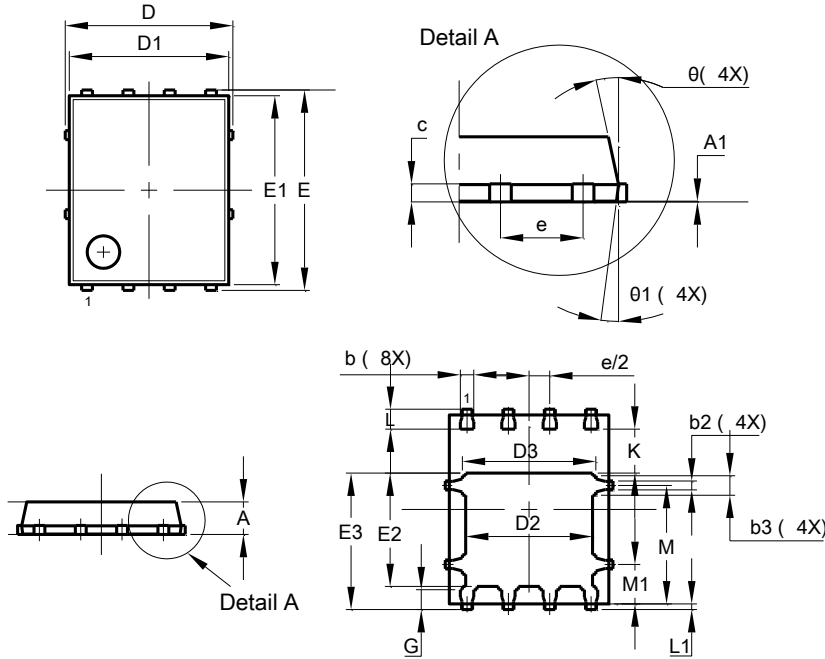
Figure 11 SOA, Safe Operation Area



**Package Outline Dimensions**

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

(1) Package Type: POWERDI<sup>®</sup>5060-8

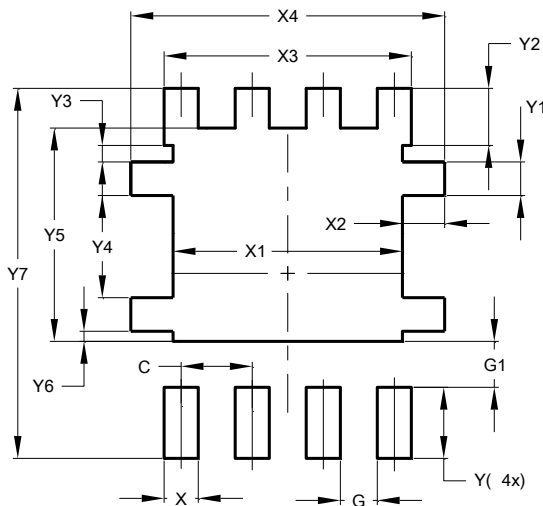


| POWERDI <sup>®</sup> 5060-8 |          |       |       |
|-----------------------------|----------|-------|-------|
| Dim                         | Min      | Max   | Typ   |
| A                           | 0.90     | 1.10  | 1.00  |
| A1                          | 0.00     | 0.05  |       |
| b                           | 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  |
| $\theta$                    | 10°      | 12°   | 11°   |
| $\theta1$                   | 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.

(1) Package Type: POWERDI<sup>®</sup>5060-8



| 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         |

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