**60V N-CHANNEL ENHANCEMENT MODE MOSFET**
**POWERDI®**

NEW PRODUCT

## Product Summary

| $BV_{DSS}$ | $R_{DS(ON)}$ | $I_D$ $T_C$ = +25°C (Note 9) |
|---|---|---|
| 60V | 8mΩ @ $V_{GS}$ = 10V | 80A |
| | 12mΩ @ $V_{GS}$ = 4.5V | 79A |

## Description and Applications

This new generation N-Channel Enhancement Mode MOSFET is 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

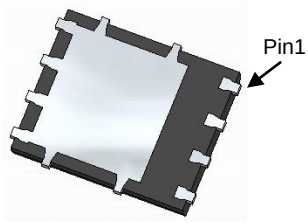
- Thermally Efficient Package-Cooler Running Applications
- High Conversion Efficiency
- Low $R_{DS(ON)}$ – Minimizes On State Losses
- Low Input Capacitance
- Fast Switching Speed
- <1.1mm Package Profile – Ideal for Thin Applications
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

## Mechanical Data

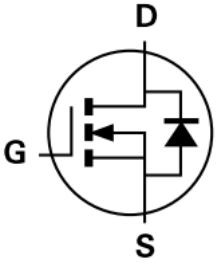
- Case: POWERDI®5060-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Finish - Matte Tin Annealed over Copper Leadframe; Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.097 grams (Approximate)

POWERDI®5060-8

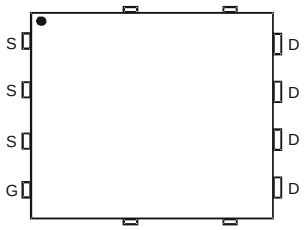
Top View




Bottom View




Internal Schematic



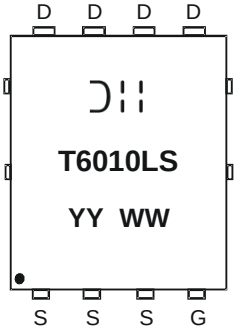

Top View
Pin Configuration

## Ordering Information (Note 4)

| Part Number | Case | Packaging |
|---|---|---|
| DMT6010LPS-13 | POWERDI®5060-8 | 2,500 / Tape & Reel |

Notes:
1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. All applicable RoHS exemptions applied.
2. See 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
T6010LS = Product Type Marking Code
YYWW = Date Code Marking
YY = Last Two Digits of Year (ex: 14 = 2014)
WW = Week Code (01 to 53)

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## Maximum Ratings (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DSS}$ | 60 | V |
| Gate-Source Voltage | | $V_{GSS}$ | ±20 | V |
| Continuous Drain Current (Note 5) | $T_A$ = +25°C<br>$T_A$ = +70°C | $I_D$ | 13.5<br>11 | A |
| Continuous Drain Current (Note 6) | $T_C$ = +25°C (Note 9)<br>$T_C$ = +70°C | $I_D$ | 80<br>77 | A |
| Maximum Continuous Body Diode Forward Current (Note 6) | | $I_S$ | 80 | A |
| Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%) | | $I_{DM}$ | 80 | A |
| Avalanche Current, L=0.1mH | | $I_{AS}$ | 20 | A |
| Avalanche Energy, L=0.1mH | | $E_{AS}$ | 20 | mJ |

## Thermal Characteristics

| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Total Power Dissipation (Note 5) | $T_A$ = +25°C | $P_D$ | 2.2 | W |
| Thermal Resistance, Junction to Ambient (Note 5) | | $R_{\theta JA}$ | 57 | °C/W |
| Total Power Dissipation (Note 6) | $T_C$ = +25°C | $P_D$ | 113 | W |
| Thermal Resistance, Junction to Case (Note 6) | | $R_{\theta JC}$ | 1.1 | °C/W |
| Operating and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to +150 | °C |

## Electrical Characteristics (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS (Note 7)** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | 60 | - | - | V | $V_{GS}$ = 0V, $I_D$ = 1mA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | - | - | 1 | µA | $V_{DS}$ = 48V, $V_{GS}$ = 0V |
| Gate-Source Leakage | $I_{GSS}$ | - | - | ±100 | nA | $V_{GS}$ = ±20V, $V_{DS}$ = 0V |
| **ON CHARACTERISTICS (Note 7)** | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | 1 | - | 3 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250µA |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | - | 6 | 8 | mΩ | $V_{GS}$ = 10V, $I_D$ = 20A |
| | | - | 8 | 12 | | $V_{GS}$ = 4.5V, $I_D$ = 20A |
| Diode Forward Voltage | $V_{SD}$ | - | 0.9 | 1.2 | V | $V_{GS}$ = 0V, $I_S$ = 20A |
| **DYNAMIC CHARACTERISTICS (Note 8)** | | | | | | |
| Input Capacitance | $C_{iss}$ | - | 2090 | - | pF | $V_{DS}$ = 30V, $V_{GS}$ = 0V, f = 1MHz |
| Output Capacitance | $C_{oss}$ | - | 746 | - | | |
| Reverse Transfer Capacitance | $C_{rss}$ | - | 38.5 | - | | |
| Gate Resistance | $R_g$ | - | 0.59 | - | Ω | $V_{DS}$ = 0V, $V_{GS}$ = 0V, f = 1MHz |
| Total Gate Charge ($V_{GS}$ = 4.5V) | $Q_g$ | - | 19.3 | - | nC | $V_{DS}$ = 30V, $I_D$ = 20A |
| Total Gate Charge ($V_{GS}$ = 10V) | $Q_g$ | - | 41.3 | - | | |
| Gate-Source Charge | $Q_{gs}$ | - | 6.0 | - | | |
| Gate-Drain Charge | $Q_{gd}$ | - | 8.8 | - | | |
| Turn-On Delay Time | $t_{D(ON)}$ | - | 5.7 | - | ns | $V_{DD}$ = 30V, $V_{GS}$ = 10V, $I_D$ = 20A, $R_G$ = 3Ω |
| Turn-On Rise Time | $t_R$ | - | 4.3 | - | | |
| Turn-Off Delay Time | $t_{D(OFF)}$ | - | 23.4 | - | | |
| Turn-Off Fall Time | $t_F$ | - | 9.7 | - | | |
| Body Diode Reverse Recovery Time | $t_{RR}$ | - | 35.4 | - | ns | $I_F$ = 20A, di/dt = 100A/µs |
| Body Diode Reverse Recovery Charge | $Q_{RR}$ | - | 38.2 | - | nC | |

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

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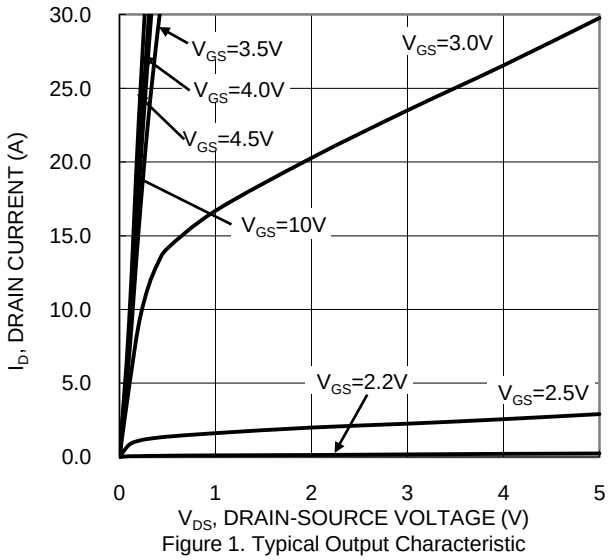


Figure 1. Typical Output Characteristic

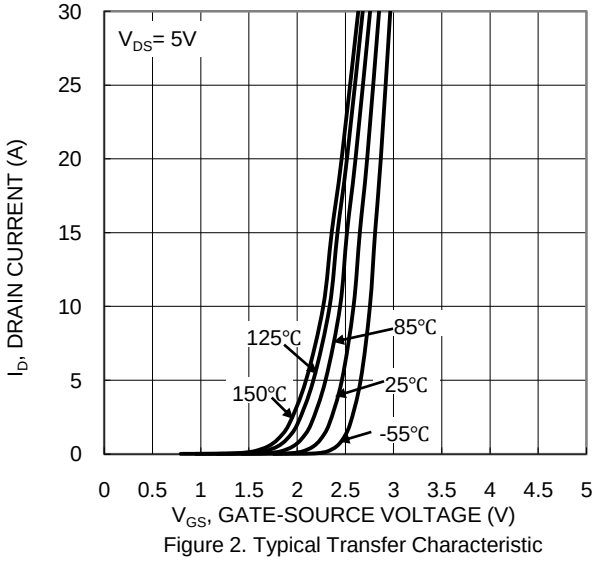


Figure 2. Typical Transfer Characteristic

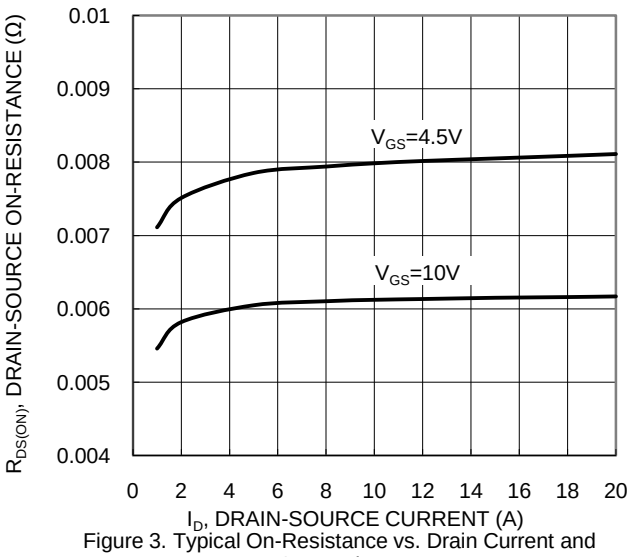


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

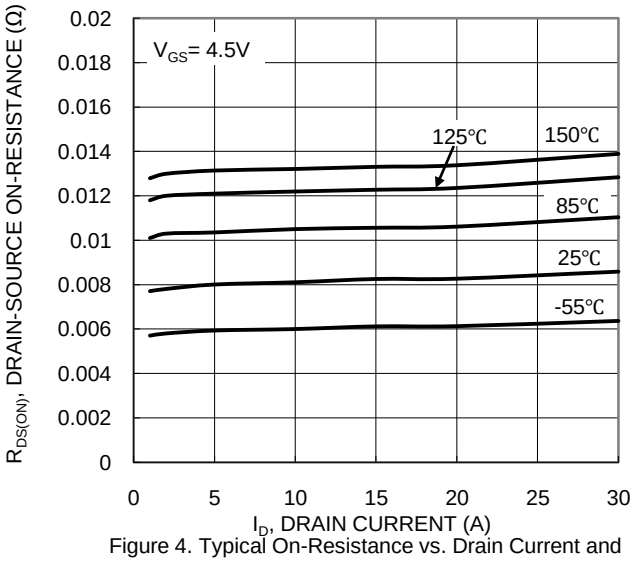


Figure 4. Typical On-Resistance vs. Drain Current and Temperature

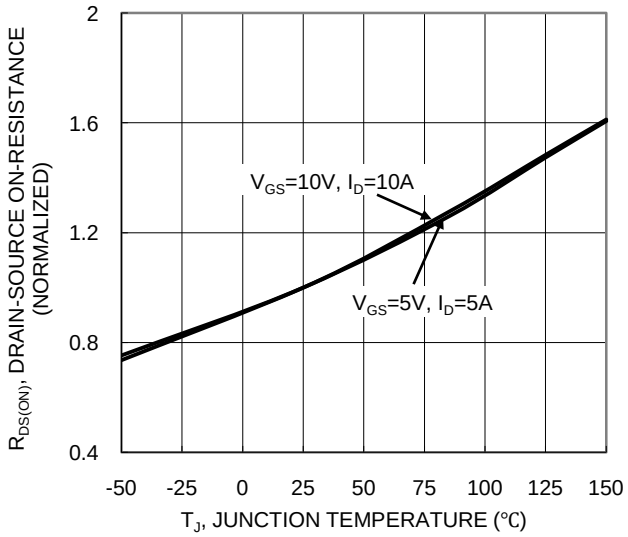


Figure 5. On-Resistance Variation with Temperature

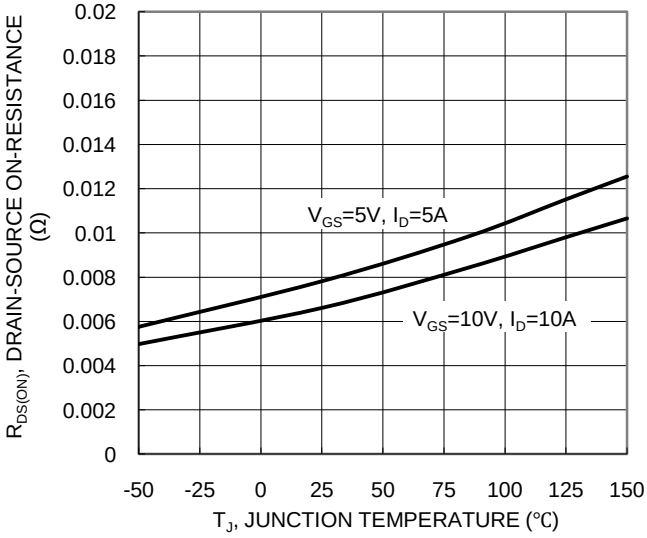


Figure 6. On-Resistance Variation with Temperature

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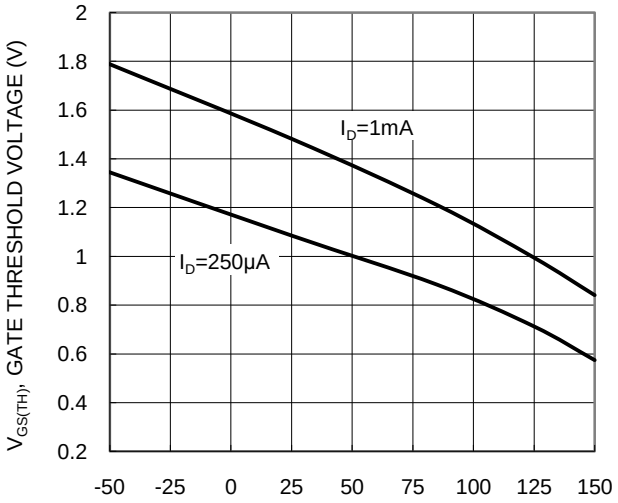


Figure 7. Gate Threshold Variation vs. junction Temperature

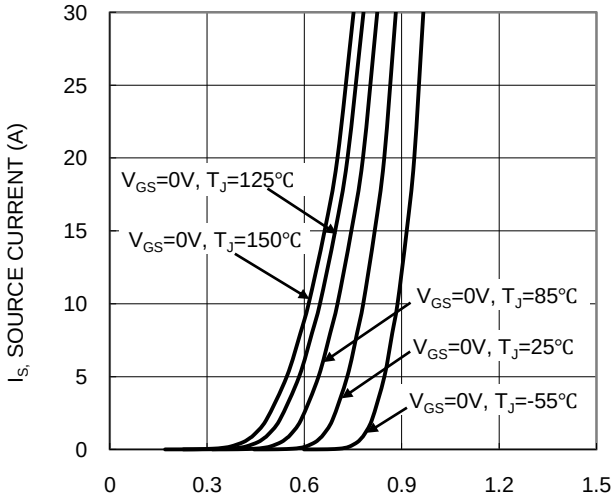


Figure 8. Diode Forward Voltage vs. Current

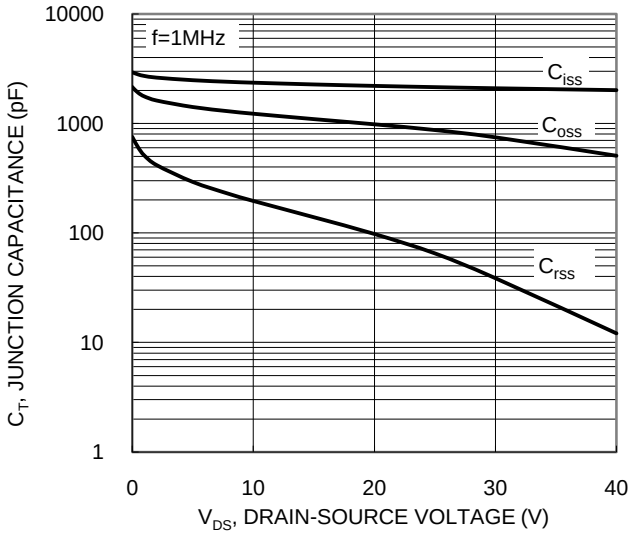


Figure 9. Typical Junction Capacitance

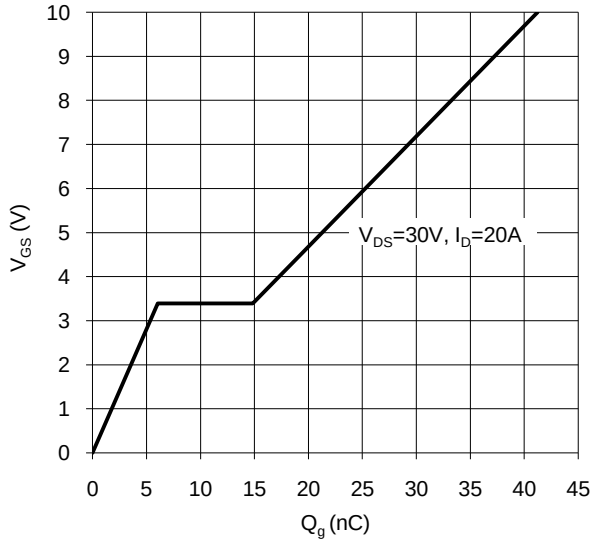


Figure 10. Gate Charge

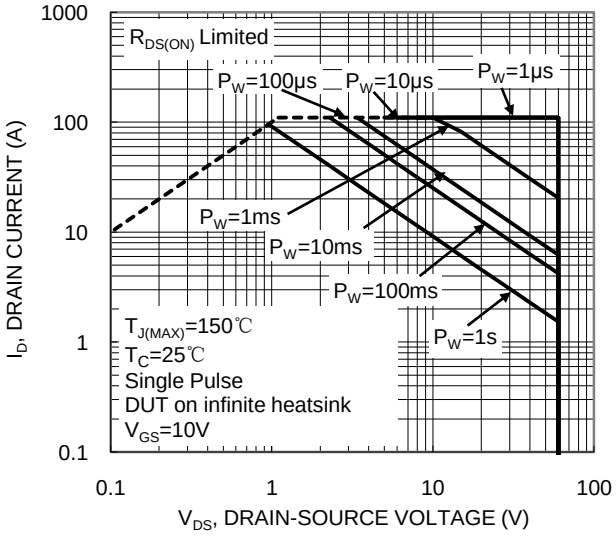


Figure 11. SOA, Safe Operation Area

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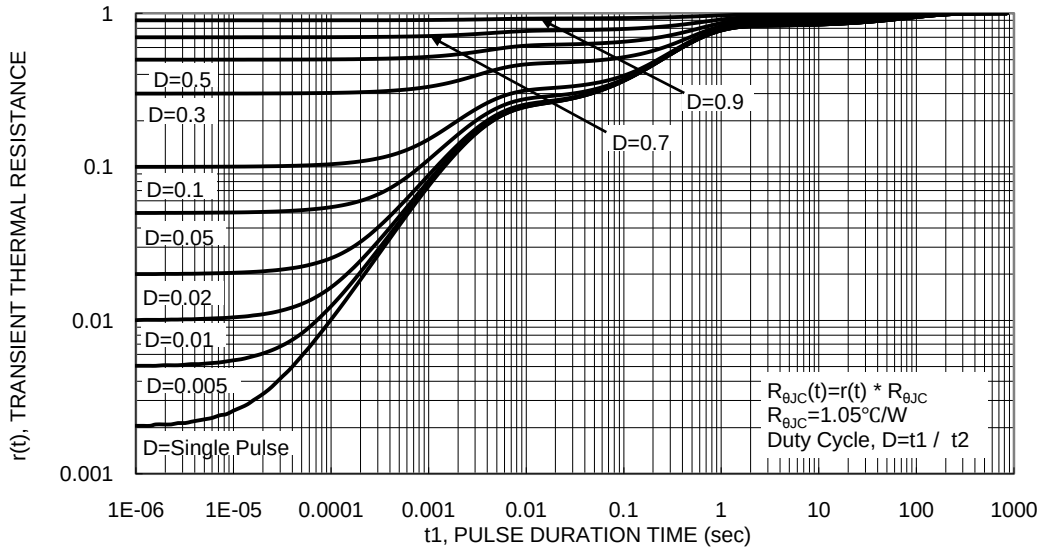


Figure 12. Transient Thermal Resistance

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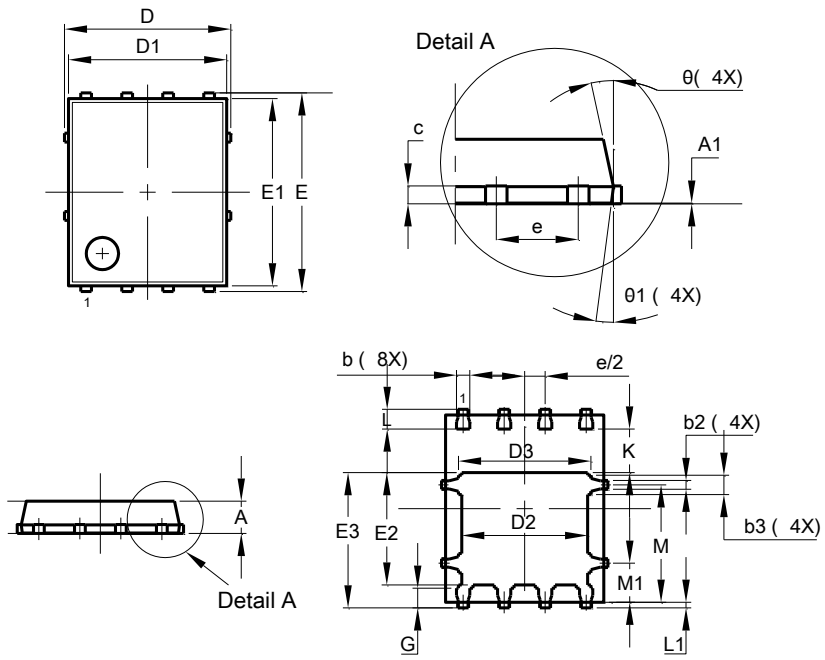
## Package Outline Dimensions

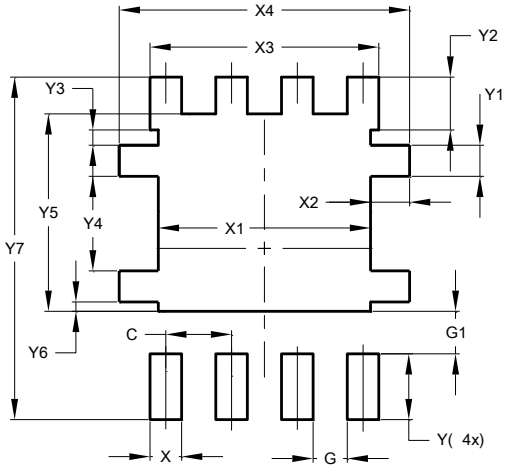
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for the latest version.




| POWERDI®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 |
| **θ** | 10º | 12º | 11º |
| **θ1** | 6º | 8º | 7º |
| **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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