

Product Summary

| BV _{DSS} | R _{DS(ON)} | I _D T _C = +25°C |
|-------------------|--------------------------------|--|
| 20V | 4.6mΩ @ V _{GS} = 4.5V | 100A |
| | 8.7mΩ @ V _{GS} = 2.5V | 80A |

Description

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

Applications

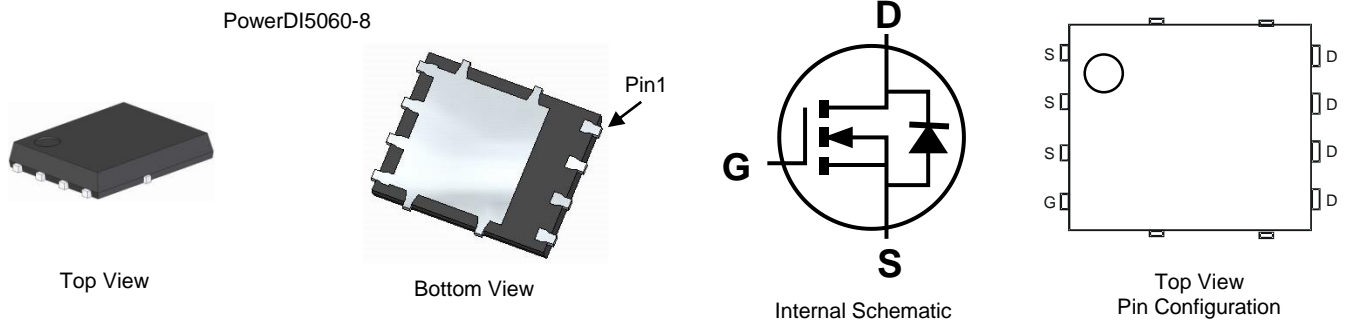
- Motor Control
- DC-DC Converters
- Power Management

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)**
- **For automotive applications requiring specific change control (i.e.: parts qualified to AEC-Q100/101/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please refer to the related automotive grade (Q-suffix) part. A listing can be found at <https://www.diodes.com/products/automotive/automotive-products/>.**
- **This part is qualified to JEDEC standards (as references in AEC-Q) for High Reliability. <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 208③
- Terminal Connections: See Diagram Below
- Weight: 0.097 grams (Approximate)

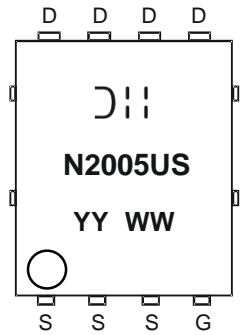


Ordering Information (Note 4)

| Part Number | Case | Packaging |
|---------------|---------------|---------------------|
| DMN2005UPS-13 | PowerDI5060-8 | 2,500 / 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



= Manufacturer's Marking
 N2005US = Product Type Marking Code
 YYWW = Date Code Marking
 YY = Last Two Digits of Year (ex: 20 = 2020)
 WW = Week Code (01 to 53)

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

| Characteristic | | | Symbol | Value | Unit |
|--|--------------|------------------------|------------------|-------|------|
| Drain-Source Voltage | | | V _{DSS} | 20 | V |
| Gate-Source Voltage | | | V _{GSS} | ±12 | V |
| Continuous Drain Current (Note 6) V _{GS} = 10V | Steady State | T _A = +25°C | I _D | 20 | A |
| | | T _A = +70°C | | 15 | |
| Continuous Drain Current (Note 6) V _{GS} = 10V | Steady State | T _C = +25°C | I _D | 100 | A |
| | | T _C = +70°C | | 88 | |
| Pulsed Drain Current (380µs Pulse, Duty Cycle = 1%) | | | I _{DM} | 150 | A |
| Maximum Continuous Body Diode Forward Current (Mounted on Infinite Heatsink) | | | I _S | 150 | A |
| Avalanche Current (Note 7) L=0.2mH | | | I _{AS} | 36 | A |
| Avalanche Energy (Note 7) L=0.2mH | | | E _{AS} | 133 | mJ |

Thermal Characteristics

| Characteristic | | Symbol | Value | Unit |
|--|--------------|-----------------------------------|-------------|------|
| Total Power Dissipation (Note 5) | | P _D | 1.5 | W |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady state | R _{θJA} | 98 | °C/W |
| | t < 10s | | 83 | |
| Total Power Dissipation (Note 6) | | P _D | 2.5 | W |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady state | R _{θJA} | 51 | °C/W |
| | t < 10s | | 43 | |
| Thermal Resistance, Junction to Case | | R _{θJC} | 1.5 | °C |
| Operating and Storage Temperature Range | | T _J , T _{STG} | -55 to +150 | °C |

- Notes:
5. Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.
 6. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate.
 7. I_{AS} and E_{AS} ratings are based on low frequency and duty cycles to keep T_J = +25°C.

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

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|--|---------------------|-----|------|------|------|---|
| OFF CHARACTERISTICS (Note 8) | | | | | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | 20 | — | — | V | V _{GS} = 0V, I _D = 250μA |
| Zero Gate Voltage Drain Current T _J = +25°C | I _{DSS} | — | — | 1 | μA | V _{DS} = 20V, V _{GS} = 0V |
| Gate-Source Leakage | I _{GSS} | — | — | ±100 | nA | V _{GS} = ±12V, V _{DS} = 0V |
| ON CHARACTERISTICS (Note 8) | | | | | | |
| Gate Threshold Voltage | V _{GS(TH)} | 0.4 | 0.7 | 1.2 | V | V _{DS} = V _{GS} , I _D = 250μA |
| Static Drain-Source On-Resistance | R _{DS(ON)} | — | — | 4.6 | mΩ | V _{GS} = 4.5V, I _D = 13.5A |
| | | — | — | 8.7 | | V _{GS} = 2.5V, I _D = 13.5A |
| Diode Forward Voltage | V _{SD} | — | 0.8 | 1.1 | V | V _{GS} = 0V, I _S = 27A |
| DYNAMIC CHARACTERISTICS (Note 9) | | | | | | |
| Input Capacitance | C _{iss} | — | 5337 | — | pF | V _{DS} = 10V, V _{GS} = 0V, f = 1MHz |
| Output Capacitance | C _{oss} | — | 560 | — | pF | |
| Reverse Transfer Capacitance | C _{rss} | — | 505 | — | pF | |
| Gate Resistance | R _g | — | 0.7 | — | Ω | V _{DS} = 0V, V _{GS} = 0V, f = 1MHz |
| Total Gate Charge (V _{GS} = 4.5V) | Q _g | — | 60 | — | nC | V _{DS} = 16V, I _D = 27A |
| Total Gate Charge (V _{GS} = 10V) | Q _g | — | 142 | — | nC | |
| Gate-Source Charge | Q _{gs} | — | 7 | — | nC | |
| Gate-Drain Charge | Q _{gd} | — | 11 | — | nC | |
| Turn-On Delay Time | t _{D(ON)} | — | 12.4 | — | ns | V _{GS} = 5V, V _{DS} = 10V, R _G = 4.7Ω, I _D = 13.5A |
| Turn-On Rise Time | t _r | — | 29.8 | — | ns | |
| Turn-Off Delay Time | t _{D(OFF)} | — | 117 | — | ns | |
| Turn-Off Fall Time | t _f | — | 52 | — | ns | |
| Body Diode Reverse Recovery Time | t _{RR} | — | 17.8 | — | ns | I _F = 13.5A, di/dt = 100A/μs |
| Body Diode Reverse Recovery Charge | Q _{RR} | — | 8.6 | — | nC | I _F = 13.5A, di/dt = 100A/μs |

Notes: 8. Short duration pulse test used to minimize self-heating effect.
9. Guaranteed by design. Not subject to product testing.

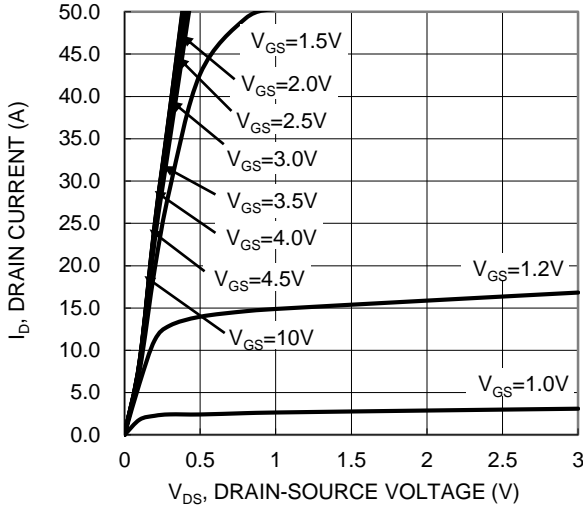


Figure 1. Typical Output Characteristic

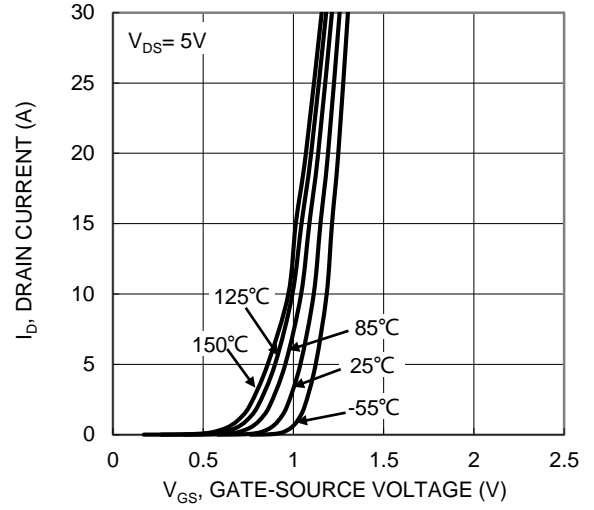


Figure 2. Typical Transfer Characteristic

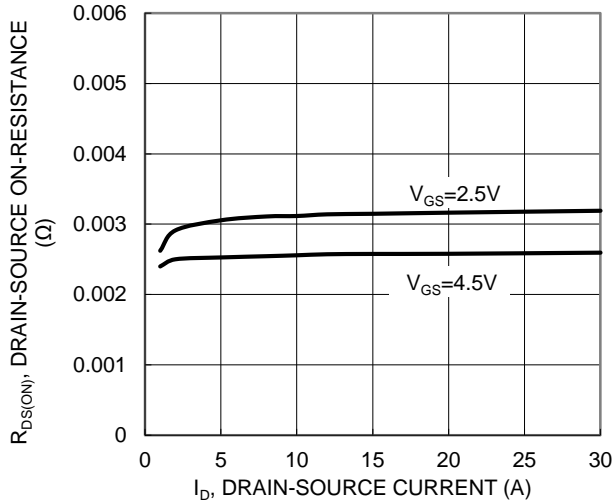


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

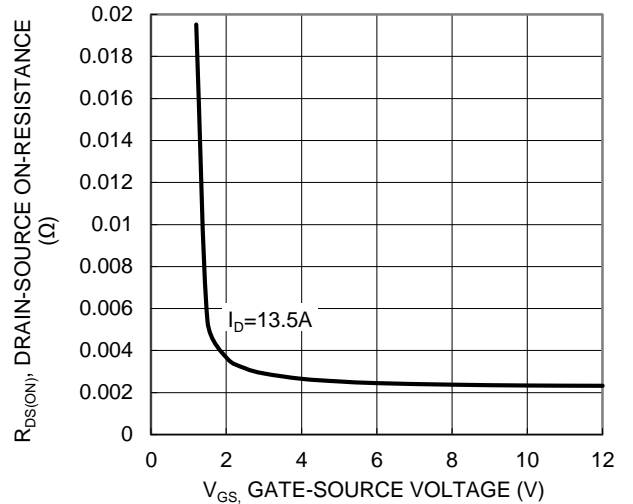


Figure 4. Typical Transfer Characteristic

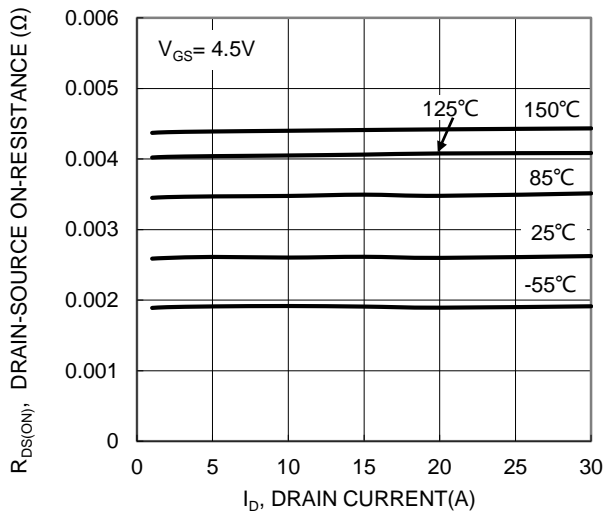


Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

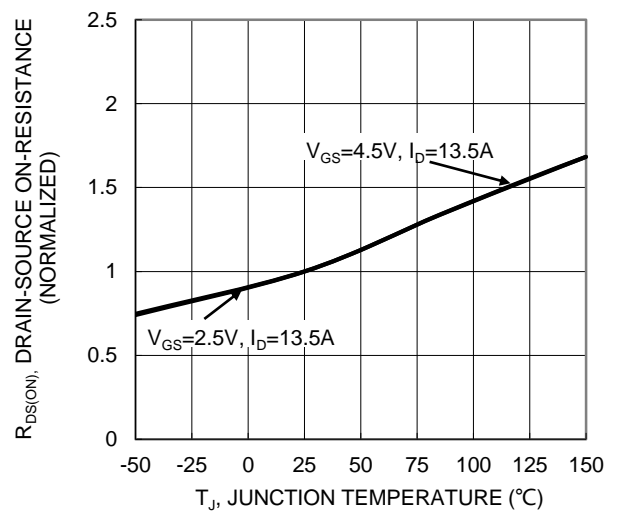


Figure 6. On-Resistance Variation with Junction Temperature

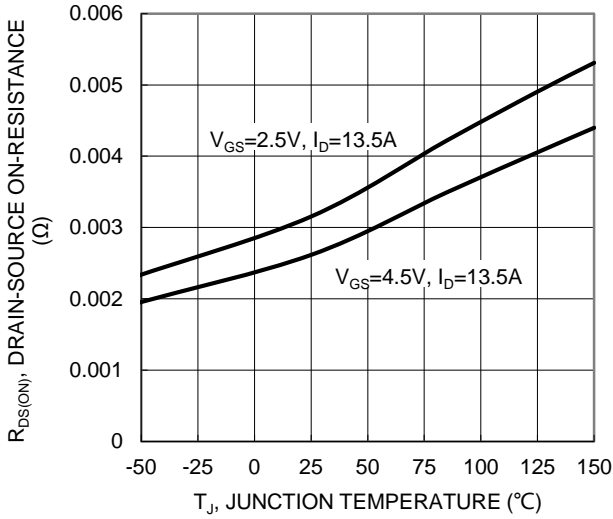


Figure 7. On-Resistance Variation with Junction Temperature

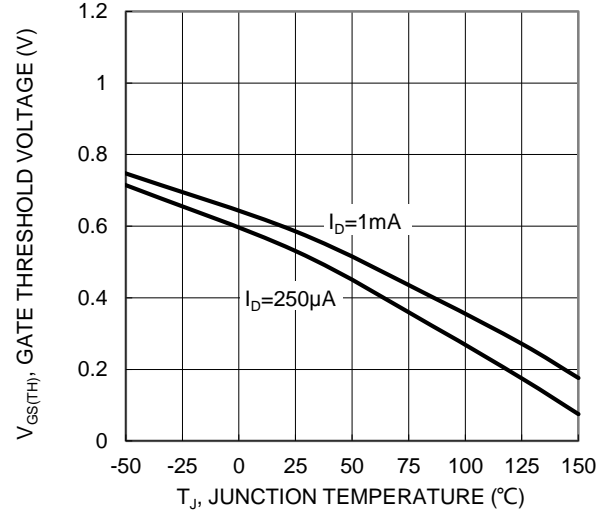


Figure 8. Gate Threshold Variation vs. Junction Temperature

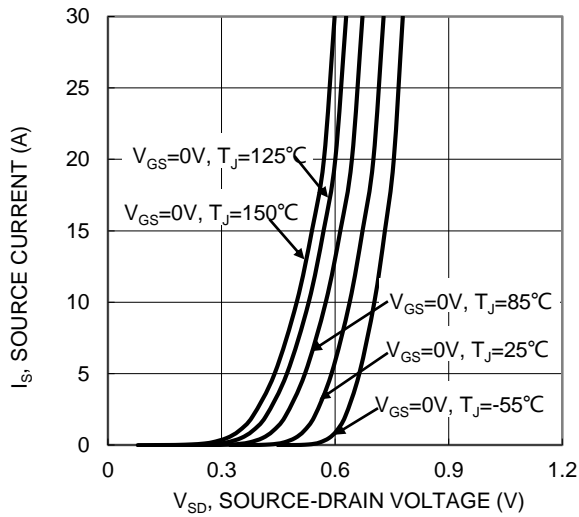


Figure 9. Diode Forward Voltage vs. Current

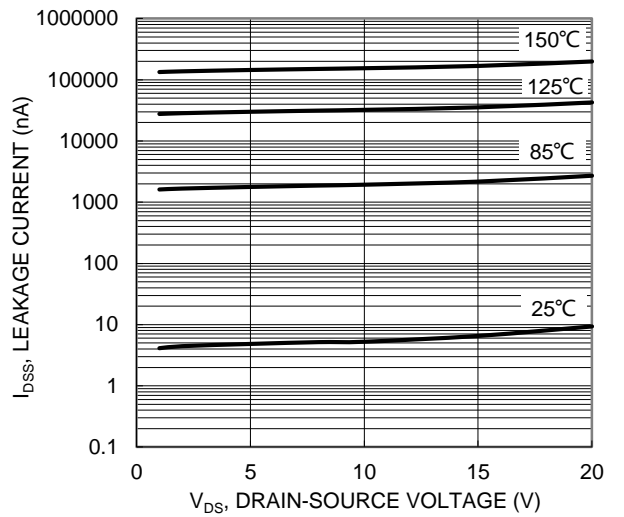


Figure 10. Typical Drain-Source Leakage Current vs. Voltage

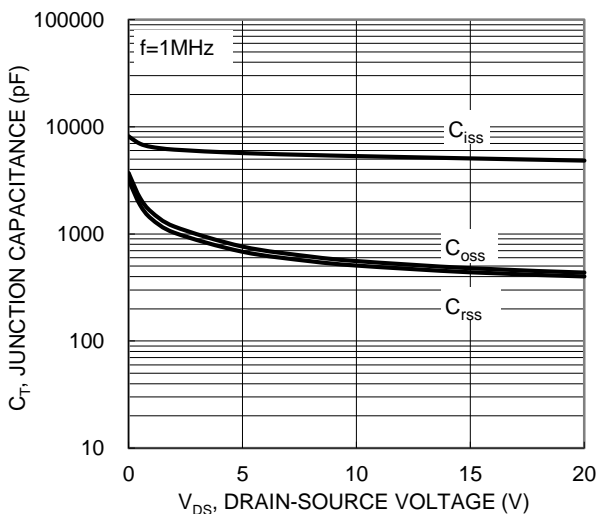


Figure 11. Typical Junction Capacitance

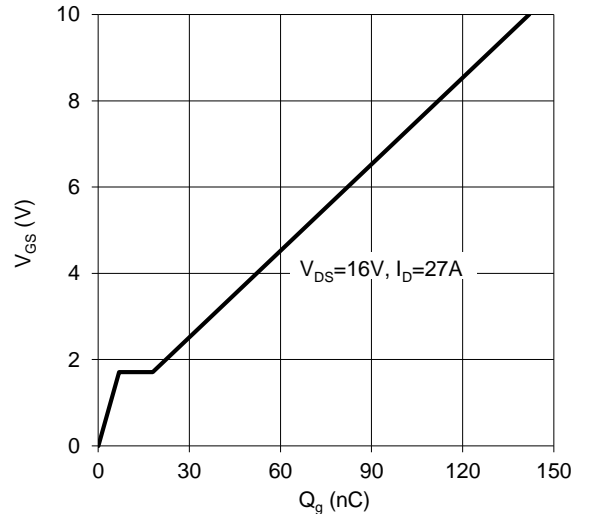


Figure 12. Gate Charge

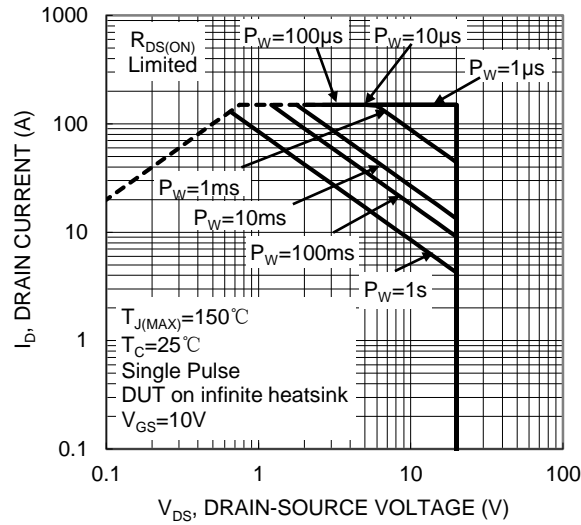


Figure 13. SOA, Safe Operation Area

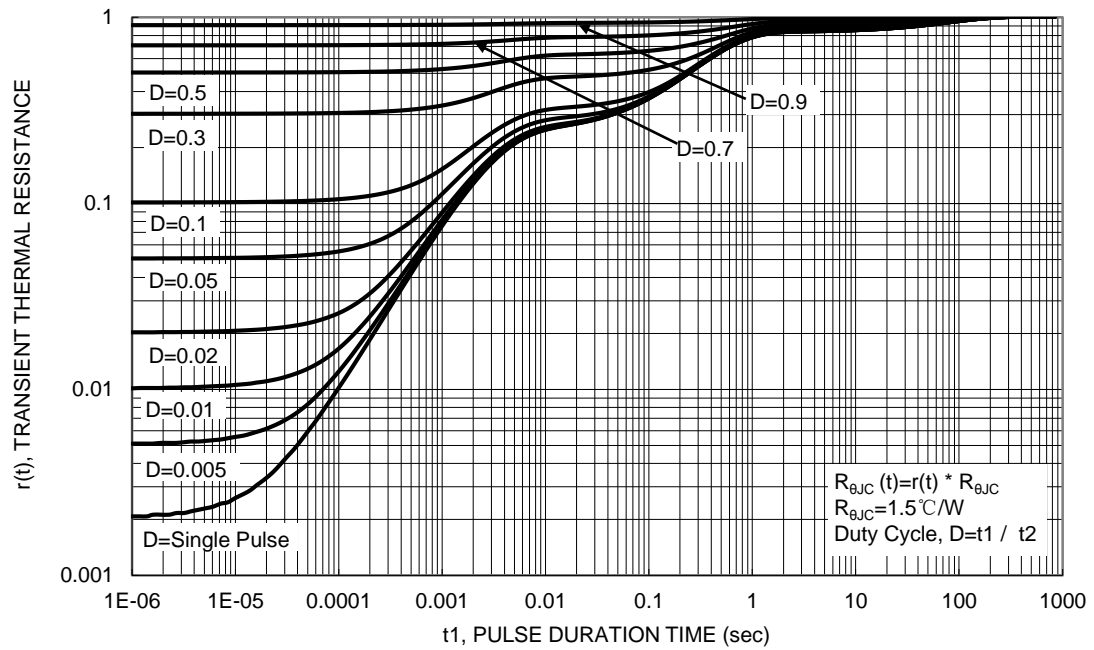
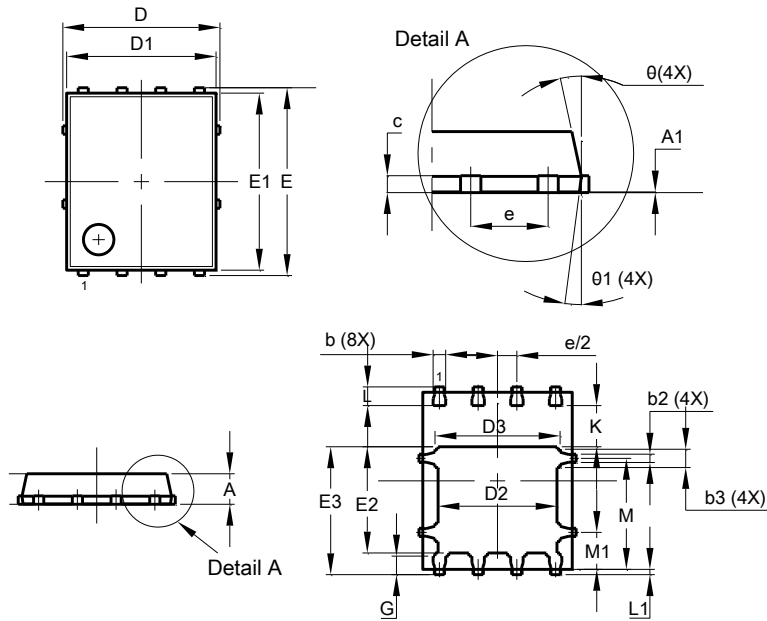


Figure 14. Transient Thermal Resistance

Package Outline Dimensions

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

PowerDI5060-8

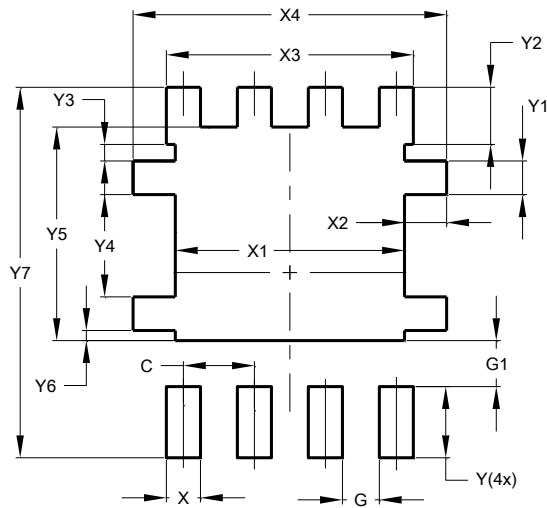


| PowerDI5060-8 | | | |
|----------------------|----------|-------|-------|
| Dim | Min | Max | Typ |
| A | 0.90 | 1.10 | 1.00 |
| A1 | 0.00 | 0.05 | - |
| b | 0.33 | 0.51 | 0.41 |
| b2 | 0.200 | 0.350 | 0.273 |
| b3 | 0.40 | 0.80 | 0.60 |
| c | 0.230 | 0.330 | 0.277 |
| D | 5.15 BSC | | |
| D1 | 4.70 | 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 | 0.100 | 0.200 | 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 <http://www.diodes.com/package-outlines.html> for the latest version.

PowerDI5060-8



| 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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