

Product Summary

| BV _{DSS} | R _{DS(ON)} Max | I _D Max T _C = +25°C |
|-------------------|-------------------------------|----------------------------------------------|
| 60V | 50mΩ @ V _{GS} = 10V | 24A |
| | 65mΩ @ V _{GS} = 4.5V | 21A |

Description and Applications

This MOSFET is 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.

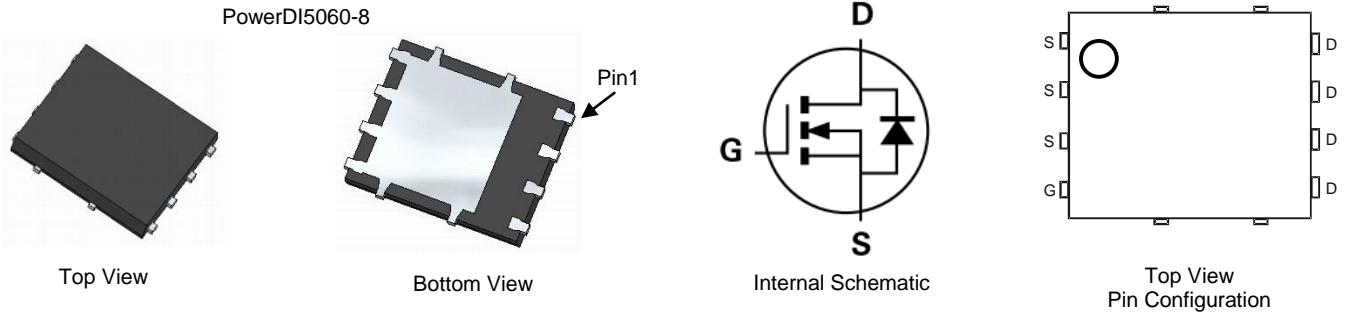
- Engine Management Systems
- Body Control Electronics
- DC-DC Converters

Features and Benefits

- Rated to +175°C – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching – Ensures More Reliable and Robust End Application
- Low R_{DS(ON)} – Minimizes Power Losses
- Low Q_g – Minimizes Switching Losses
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **An Automotive-Compliant Part is Available Under Separate Datasheet ([DMNH6042SPSQ](#))**

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 Indicator: See Diagram
- Terminals: Finish — Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 (E3)
- Weight: 0.097 grams (Approximate)

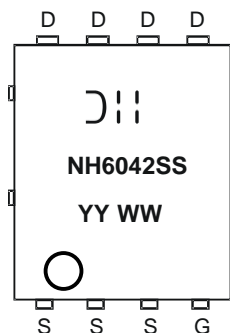


Ordering Information (Note 4)

| Part Number | Case | Packaging |
|----------------|---------------|------------------|
| DMNH6042SPS-13 | PowerDI5060-8 | 2500/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
 NH6042SS = Product Type Marking Code
 YYWW = Date Code Marking
 YY = Year (ex: 16 = 2016)
 WW = Week (01 to 53)

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 7) V _{GS} = 10V | Steady State | T _C = +25°C | 24 |
| | | T _C = +100°C | 17 |
| Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%) | I _{DM} | 35 | A |
| Maximum Continuous Body Diode Forward Current (Note 7) | I _S | 24 | A |
| Avalanche Current (Note 8) L = 10mH | I _{AS} | 3.5 | A |
| Avalanche Energy (Note 8) L = 10mH | E _{AS} | 65 | mJ |

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

| Characteristic | Symbol | Value | Unit |
|--------------------------------------------------|-----------------------------------|-------------|------|
| Total Power Dissipation (Note 5) | P _D | 1.5 | W |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady state | | 98 |
| | | t < 10s | 54 |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady state | | 51 |
| | | t < 10s | 26 |
| Thermal Resistance, Junction to Case (Note 7) | R _{θJC} | 3.5 | °C/W |
| Operating and Storage Temperature Range | T _J , T _{STG} | -55 to +175 | °C |

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

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|--------------------------------------------------------|---------------------|-----|------|------|------|----------------------------------------------------------------------------------------|
| OFF CHARACTERISTICS (Note 9) | | | | | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | 60 | — | — | V | V _{GS} = 0V, I _D = 250µA |
| Zero Gate Voltage Drain Current T _J = +25°C | I _{DSS} | — | — | 1 | µA | V _{DS} = 60V, V _{GS} = 0V |
| Gate-Source Leakage | I _{GSS} | — | — | ±100 | nA | V _{GS} = ±20V, V _{DS} = 0V |
| ON CHARACTERISTICS (Note 9) | | | | | | |
| Gate Threshold Voltage | V _{GS(TH)} | 1.0 | — | 3.0 | V | V _{DS} = V _{GS} , I _D = 250µA |
| Static Drain-Source On-Resistance | R _{DS(ON)} | — | 34 | 50 | mΩ | V _{GS} = 10V, I _D = 5.1A |
| | | — | 45 | 65 | | V _{GS} = 4.5V, I _D = 4.4A |
| Diode Forward Voltage | V _{SD} | — | 0.8 | 1.2 | V | V _{GS} = 0V, I _S = 2.6A |
| DYNAMIC CHARACTERISTICS (Note 10) | | | | | | |
| Input Capacitance | C _{iss} | — | 584 | — | pF | V _{DS} = 25V, V _{GS} = 0V, f = 1.0MHz |
| Output Capacitance | C _{oss} | — | 83 | — | pF | |
| Reverse Transfer Capacitance | C _{riss} | — | 24 | — | pF | |
| Gate Resistance | R _g | — | 3.8 | — | Ω | V _{DS} = 0V, V _{GS} = 0V, f = 1MHz |
| Total Gate Charge (V _{GS} = 4.5V) | Q _g | — | 4.2 | — | nC | V _{DS} = 44V, I _D = 5.2A |
| Total Gate Charge (V _{GS} = 10V) | Q _g | — | 8.8 | — | nC | |
| Gate-Source Charge | Q _{gs} | — | 1.8 | — | nC | |
| Gate-Drain Charge | Q _{gd} | — | 1.8 | — | nC | |
| Turn-On Delay Time | t _{D(ON)} | — | 3.4 | — | ns | |
| Turn-On Rise Time | t _r | — | 1.9 | — | ns | V _{GS} = 10V, V _{DS} = 30V, R _G = 6Ω, I _D = 1A |
| Turn-Off Delay Time | t _{D(OFF)} | — | 10.1 | — | ns | |
| Turn-Off Fall Time | t _f | — | 4.5 | — | ns | |
| Body Diode Reverse Recovery Time | t _{RR} | — | 12.9 | — | ns | I _F = 2.6A, di/dt = 100A/µs |
| Body Diode Reverse Recovery Charge | Q _{RR} | — | 5.4 | — | nC | I _F = 2.6A, di/dt = 100A/µs |

- Notes:
- Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.
 - 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).
 - I_{AS} and E_{AS} ratings are based on low frequency and duty cycles to keep T_J = +25°C.
 - Short duration pulse test used to minimize self-heating effect.
 - Guaranteed by design. Not subject to product testing.

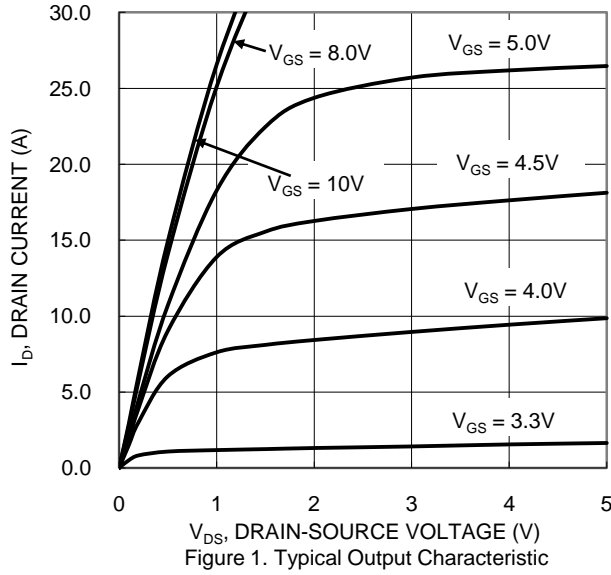


Figure 1. Typical Output Characteristic

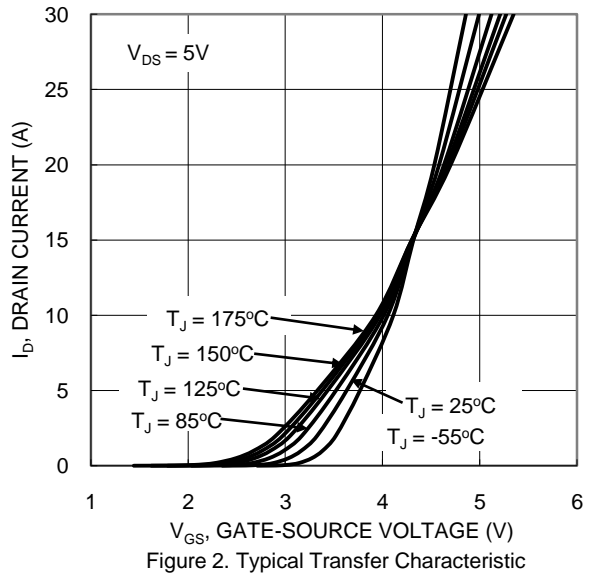


Figure 2. Typical Transfer Characteristic

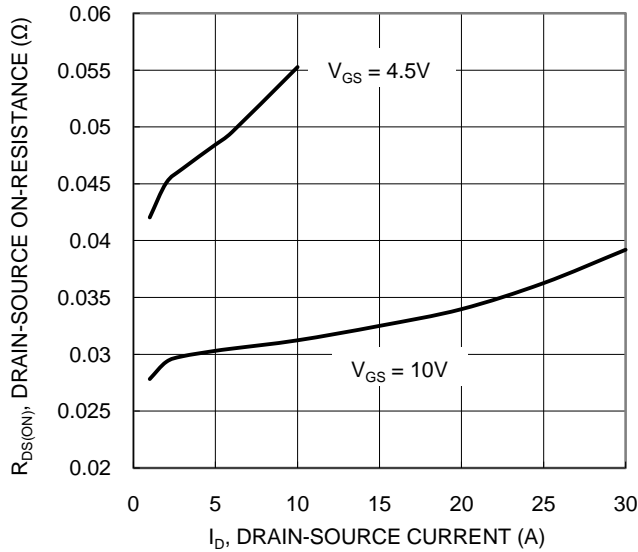


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

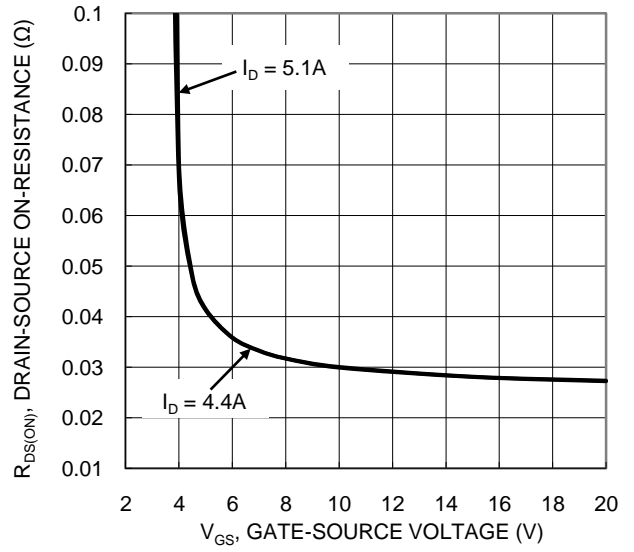


Figure 4. Typical Transfer Characteristic

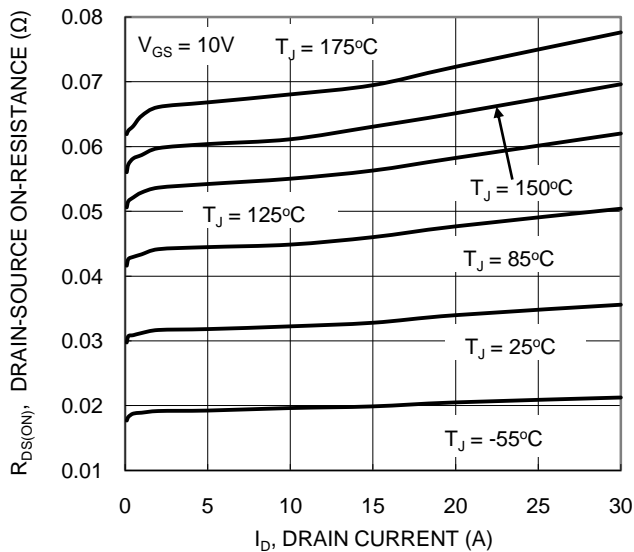


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

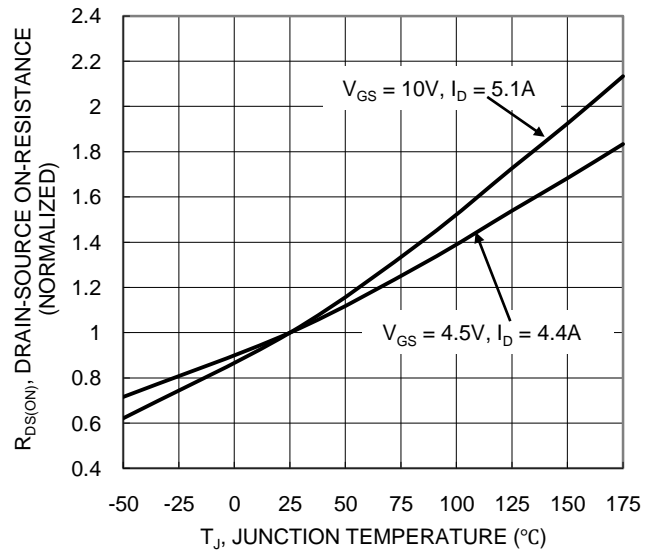


Figure 6. On-Resistance Variation with Temperature

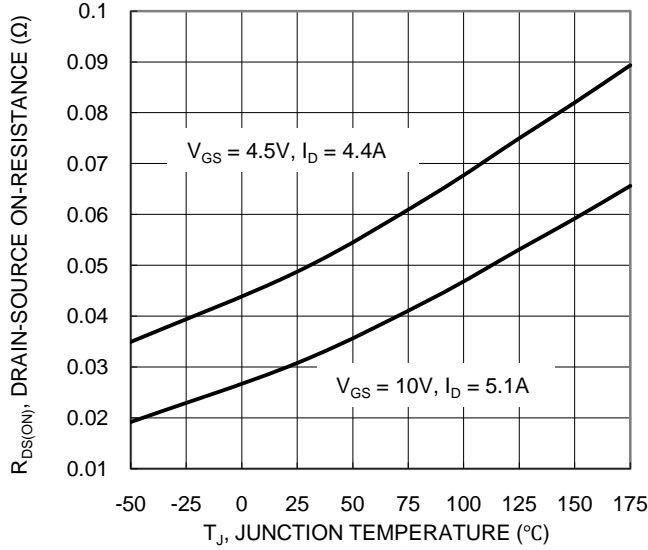


Figure 7. On-Resistance Variation with Temperature

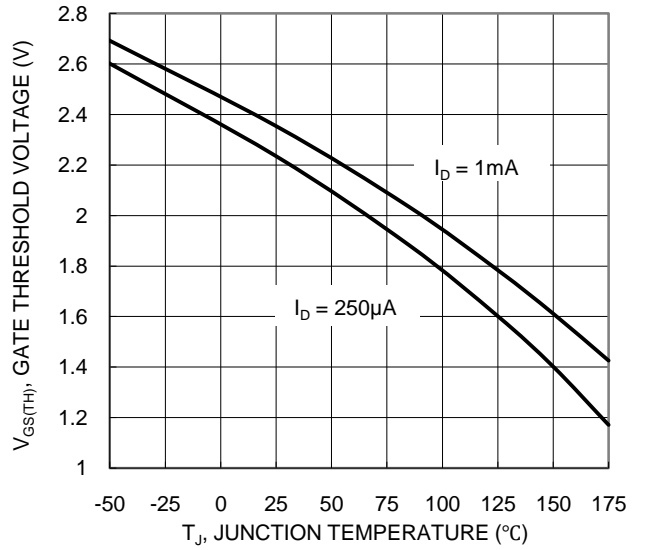


Figure 8. Gate Threshold Variation vs. Junction Temperature

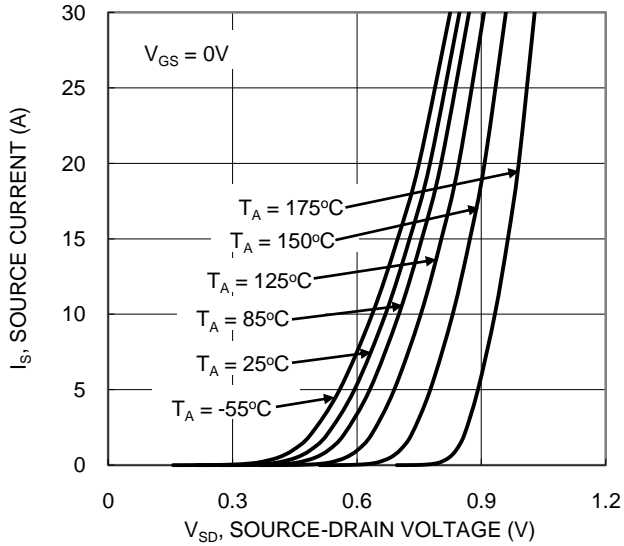


Figure 9. Diode Forward Voltage vs. Current

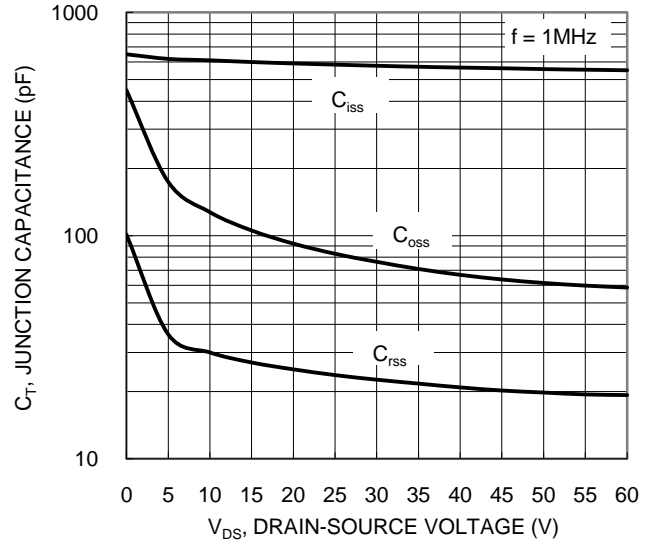


Figure 10. Typical Junction Capacitance

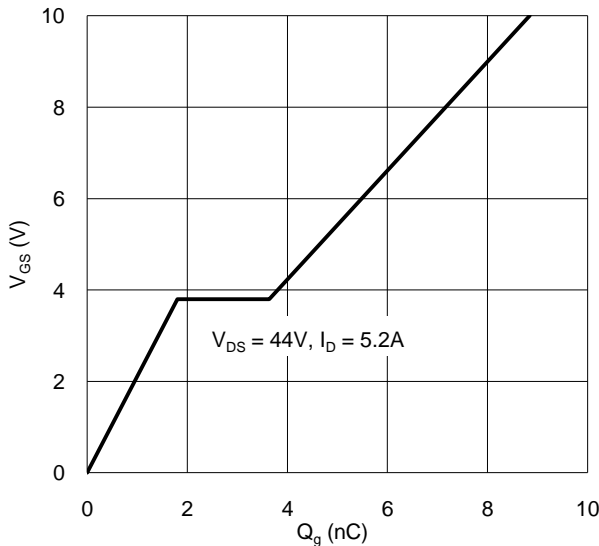


Figure 11. Gate Charge

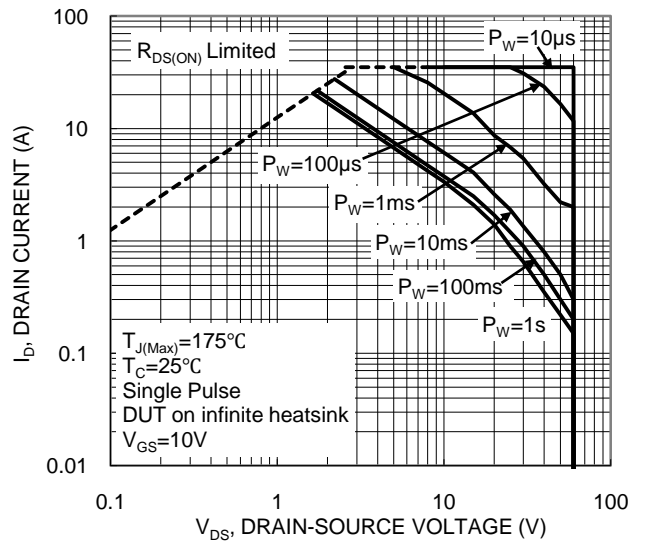


Figure 12. SOA, Safe Operation Area

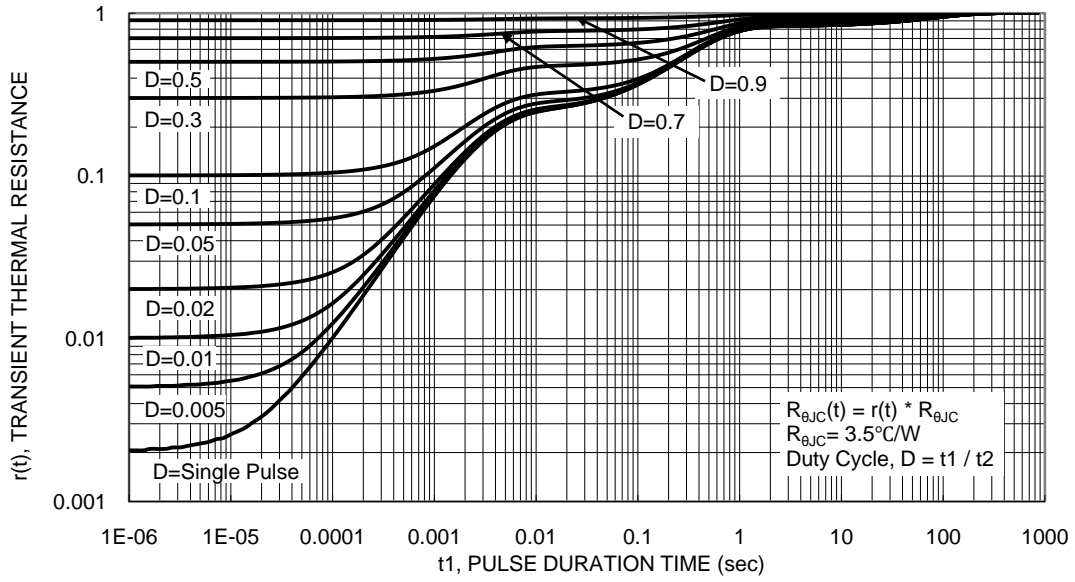
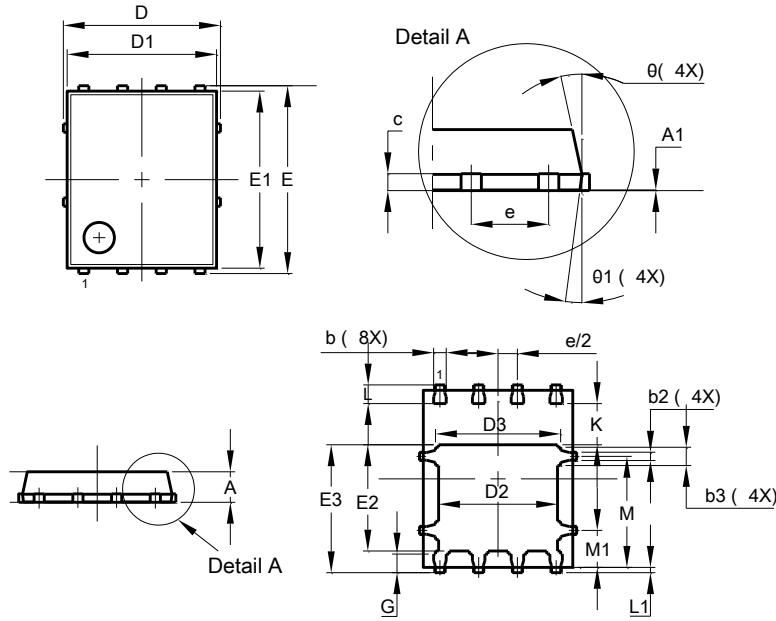


Figure 13. Transient Thermal Resistance

Package Outline Dimensions

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

PowerDI5060-8

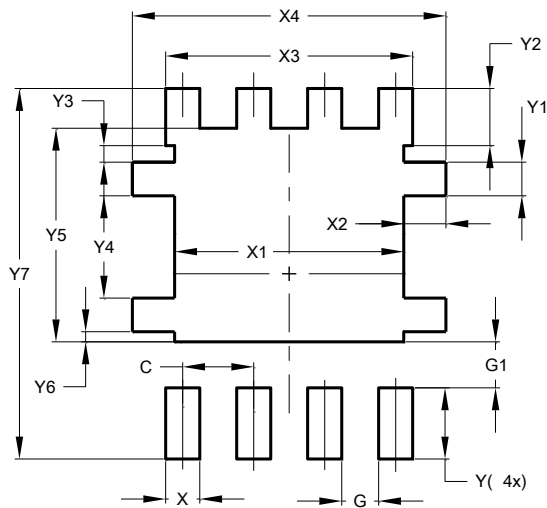


| PowerDI5060-8 | | | |
|----------------------|----------|-------|-------|
| Dim | Min | Max | Typ |
| A | 0.90 | 1.10 | 1.00 |
| A1 | 0.00 | 0.05 | — |
| b | 0.33 | 0.51 | 0.41 |
| b2 | 0.200 | 0.350 | 0.273 |
| b3 | 0.40 | 0.80 | 0.60 |
| c | 0.230 | 0.330 | 0.277 |
| D | 5.15 BSC | | |
| D1 | 4.70 | 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° |
| $\theta 1$ | 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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