

Product Summary

| BV _{DSS} | R _{DS(ON)} Max | I _D T _C = +25°C |
|-------------------|---------------------------------|--|
| 60V | 10mΩ @ V _{GS} = 10V | 89.5A |
| | 13.5mΩ @ V _{GS} = 4.5V | 77A |

Description

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

Applications

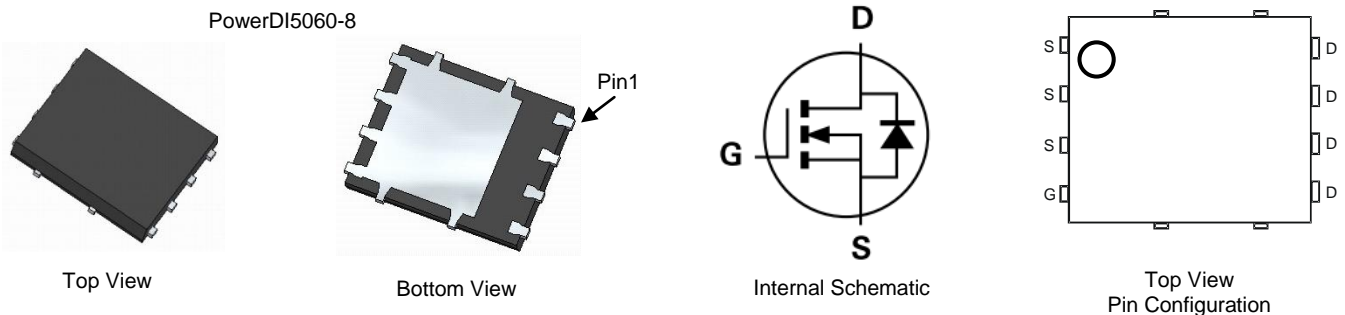
- High Frequency Switching
- Sync. Rectification
- DCDC Converters

Features

- 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**

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)

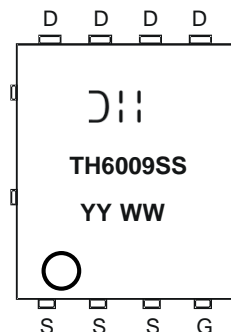


Ordering Information (Note 4)

| Part Number | Case | Packaging |
|----------------|---------------|-------------------|
| DMTH6009SPS-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



DII = Manufacturer's Marking
 TH6009SS = Product Type Marking Code
 YYWW = Date Code Marking
 YY = Year (ex: 18 = 2018)
 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 5) | I _D | T _A = +25°C T _A = +100°C | 12.9 9.1 | A |
| Continuous Drain Current (Note 6) | | T _C = +25°C T _C = +100°C | 89.5 63.3 | A |
| Maximum Continuous Body Diode Forward Current (Note 6) | I _S | 80 | A | |
| Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%) | I _{DM} | 350 | A | |
| Pulsed Body Diode Forward Current (10µs Pulse, Duty Cycle = 1%) | I _{SM} | 350 | A | |
| Avalanche Current, L = 0.1mH | I _{AS} | 20.3 | A | |
| Avalanche Energy, L = 0.1mH | E _{AS} | 20.6 | mJ | |

Thermal Characteristics

| Characteristic | Symbol | Value | Unit |
|--|-----------------------------------|-------------|------|
| Total Power Dissipation (Note 5) | P _D | 2.8 | W |
| Thermal Resistance, Junction to Ambient (Note 5) | R _{θJA} | 53 | °C/W |
| Total Power Dissipation (Note 6) | P _D | 136 | W |
| Thermal Resistance, Junction to Case (Note 6) | R _{θJC} | 1.1 | °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 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)} | 1.2 | — | 2.8 | V | V _{DS} = V _{GS} , I _D = 250µA |
| Static Drain-Source On-Resistance | R _{DS(ON)} | — | 7.6 | 10 | mΩ | V _{GS} = 10V, I _D = 20A |
| | | — | 10.7 | 13.5 | | V _{GS} = 4.5V, I _D = 15A |
| Diode Forward Voltage | V _{SD} | — | 0.9 | 1.2 | V | V _{GS} = 0V, I _S = 20A |
| DYNAMIC CHARACTERISTICS (Note 8) | | | | | | |
| Input Capacitance | C _{iSS} | — | 1572 | — | pF | V _{DS} = 30V, V _{GS} = 0V, f = 1MHz |
| Output Capacitance | C _{oss} | — | 490 | — | | |
| Reverse Transfer Capacitance | C _{rSS} | — | 50 | — | | |
| Gate Resistance | R _G | — | 1.6 | — | Ω | V _{DS} = 0V, V _{GS} = 0V, f = 1MHz |
| Total Gate Charge (V _{GS} = 10V) | Q _G | — | 29.3 | — | nC | V _{DS} = 30V, I _D = 13.5A |
| Total Gate Charge (V _{GS} = 4.5V) | Q _G | — | 13.9 | — | | |
| Gate-Source Charge | Q _{GS} | — | 4.3 | — | | |
| Gate-Drain Charge | Q _{GD} | — | 5.9 | — | | |
| Turn-On Delay Time | t _{D(ON)} | — | 5.4 | — | ns | V _{DD} = 30V, V _{GS} = 10V, R _G = 6Ω, I _D = 13.5A |
| Turn-On Rise Time | t _R | — | 9.8 | — | | |
| Turn-Off Delay Time | t _{D(OFF)} | — | 28.1 | — | | |
| Turn-Off Fall Time | t _F | — | 16.3 | — | | |
| Body Diode Reverse Recovery Time | t _{RR} | — | 17.2 | — | ns | I _F = 13.5A, di/dt = 400A/µs |
| Body Diode Reverse Recovery Charge | Q _{RR} | — | 25.1 | — | nC | |

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

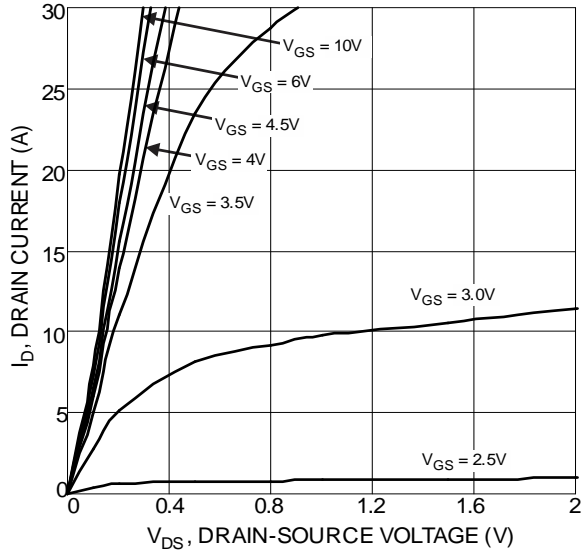


Figure 1 Typical Output Characteristic

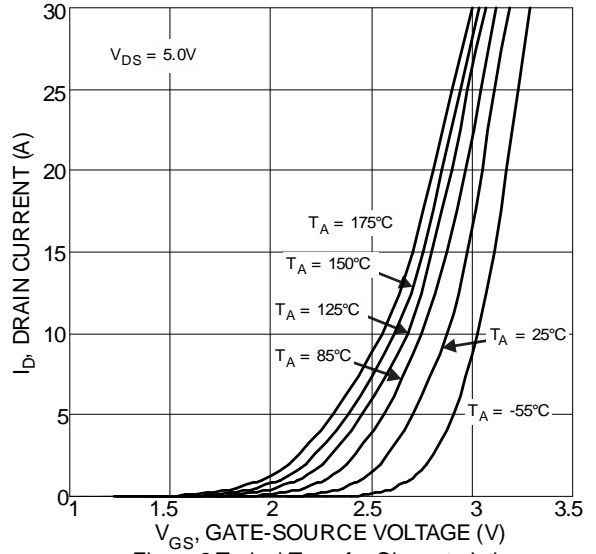


Figure 2 Typical Transfer Characteristics

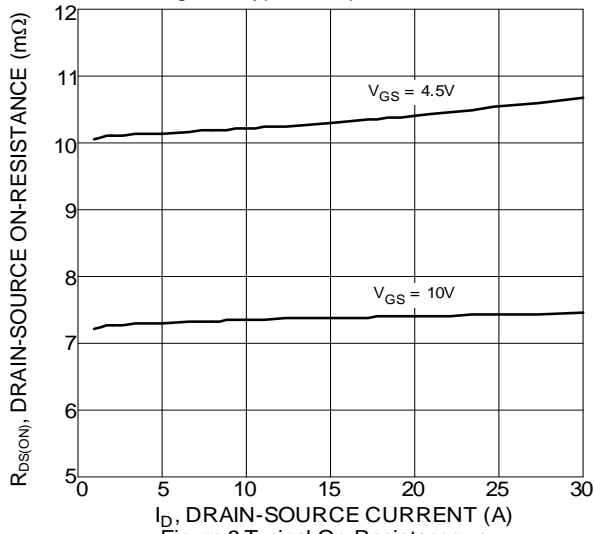


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

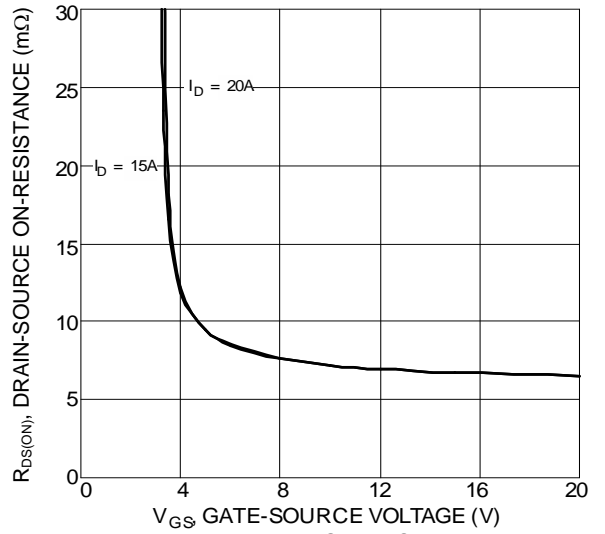


Figure 4 Typical Drain-Source On-Resistance vs. Gate-Source Voltage

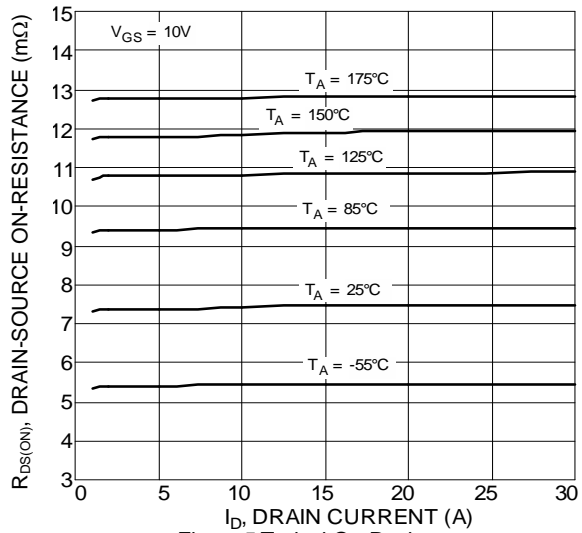


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

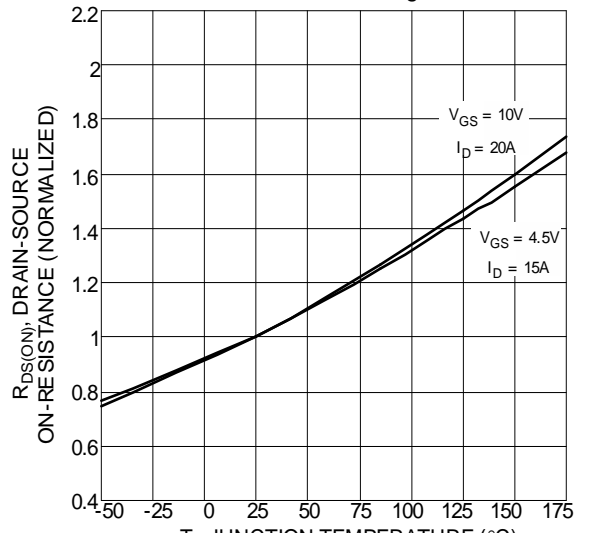


Figure 6 On-Resistance Variation with Temperature

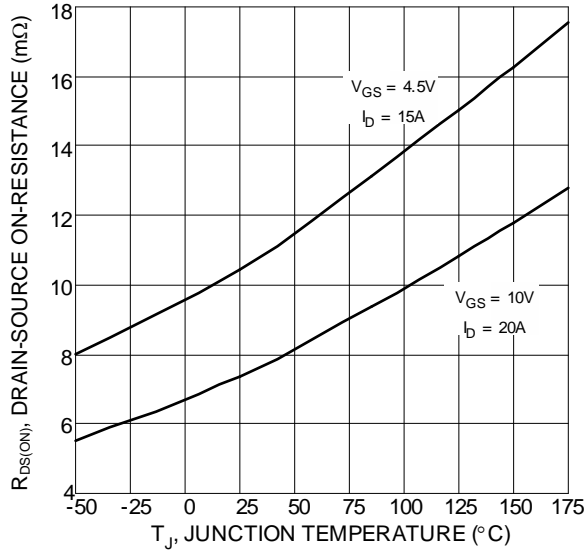


Figure 7 On-Resistance Variation with Temperature

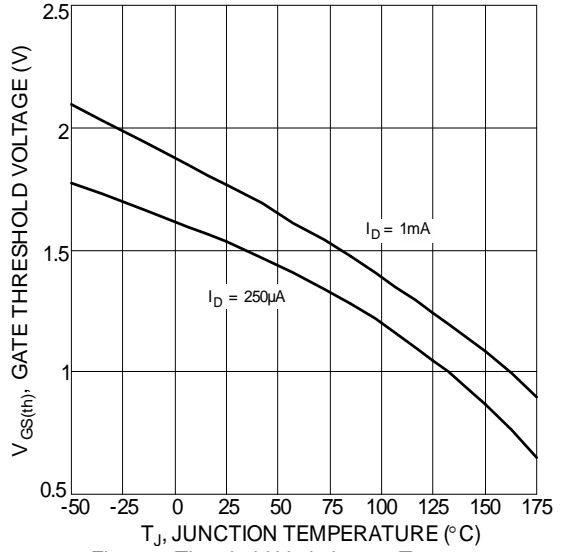


Figure 8 Threshold Variation vs. Temperature

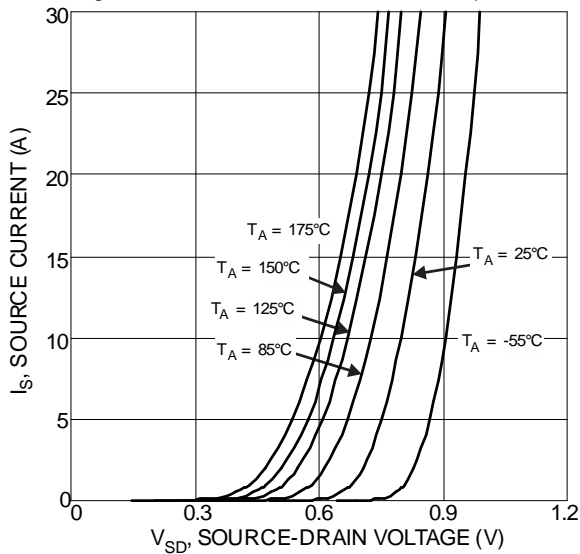


Figure 9 Diode Forward Voltage vs. Current

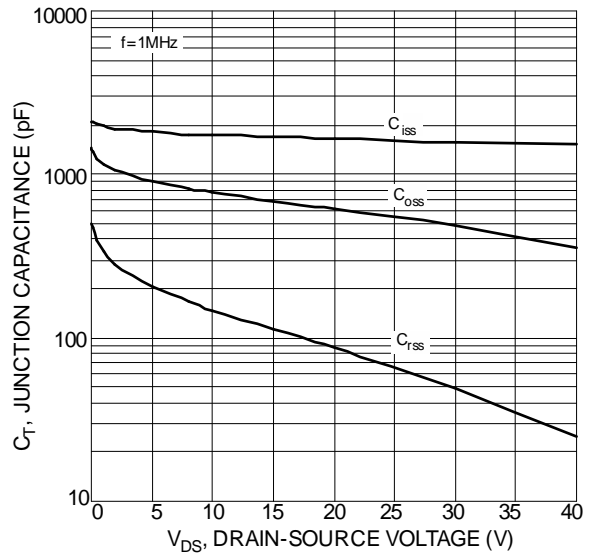


Figure 10 Typical Junction Capacitance

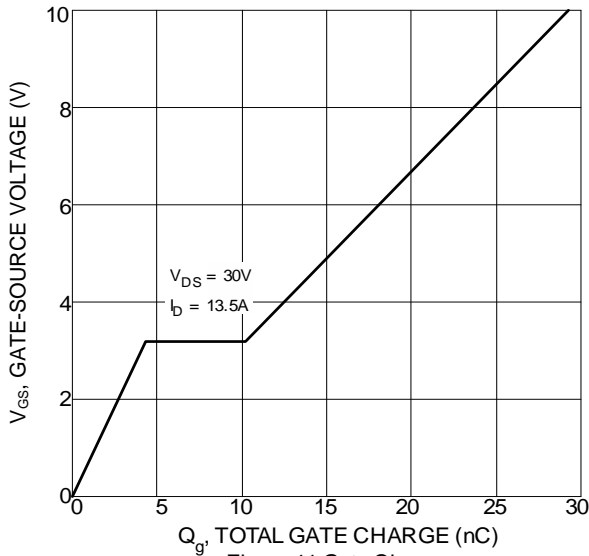


Figure 11 Gate Charge

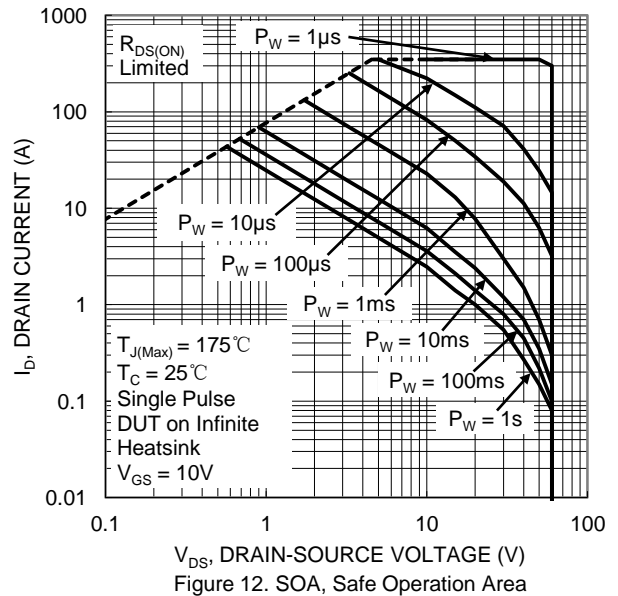


Figure 12. SOA, Safe Operation Area

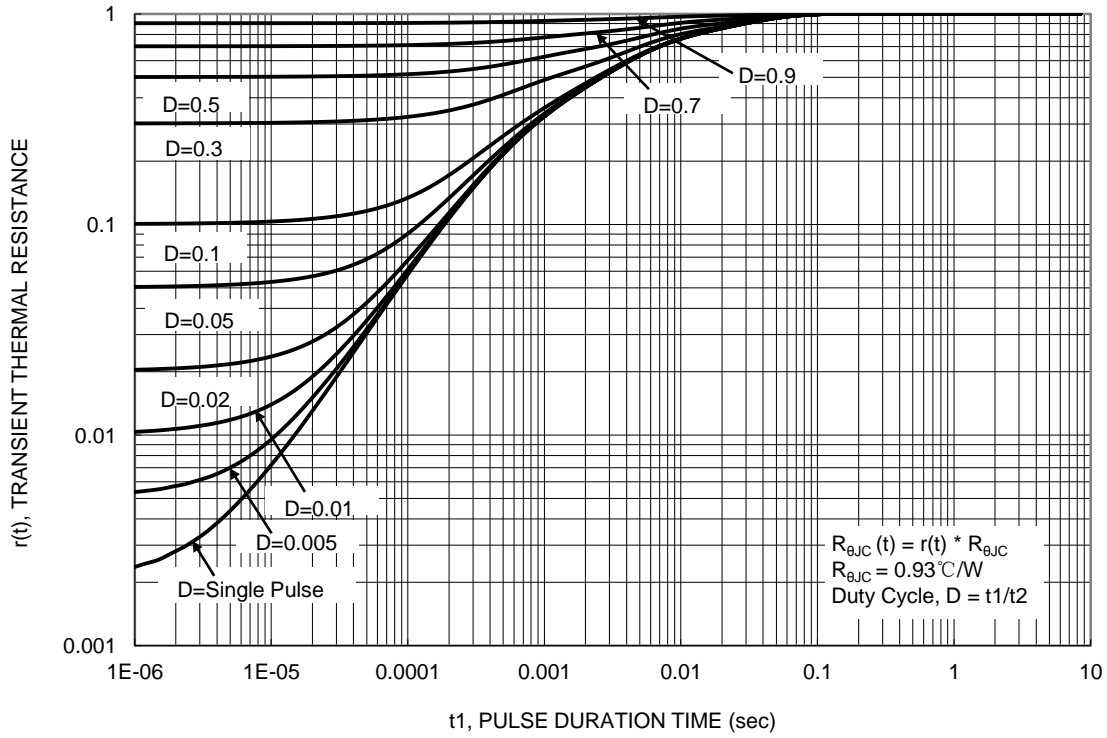
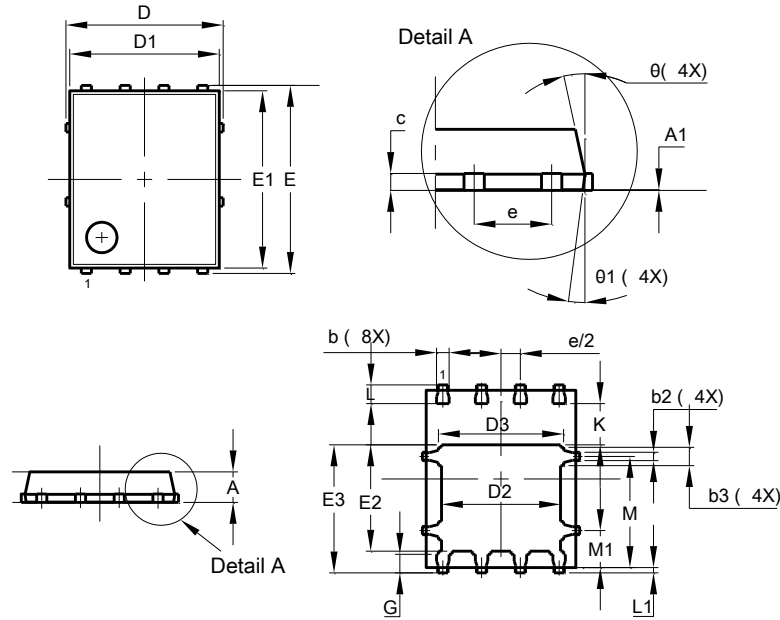


Figure 13. Transient Thermal Resistance

Package Outline Dimensions

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

PowerDI5060-8

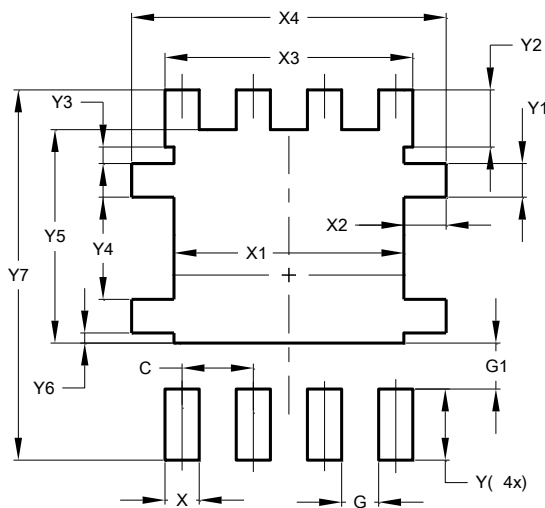


| PowerDI5060-8 | | | |
|----------------------|----------|-------|-------|
| Dim | Min | Max | Typ |
| A | 0.90 | 1.10 | 1.00 |
| A1 | 0.00 | 0.05 | - |
| b | 0.33 | 0.51 | 0.41 |
| b2 | 0.200 | 0.350 | 0.273 |
| b3 | 0.40 | 0.80 | 0.60 |
| c | 0.230 | 0.330 | 0.277 |
| D | 5.15 BSC | | |
| D1 | 4.70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