

Product Summary

| BV_{DSS} | $R_{DS(ON)}$ | I_D $T_C = +25^\circ C$ |
|------------|---------------------------------|------------------------------|
| -60V | 50m Ω @ $V_{GS} = -10V$ | -26A |
| | 70m Ω @ $V_{GS} = -4.5V$ | -22A |

Description and Applications

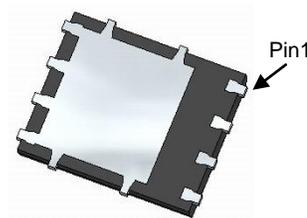
This new generation 60V P-Channel Enhancement Mode MOSFET is designed to minimize $R_{DS(ON)}$ and yet maintain superior switching performance. This device is ideal for use in Notebook battery power management and loadswitch.

- Notebook Battery Power Management
- DC-DC Converters
- Loadswitch

PowerDI5060-8



Top View



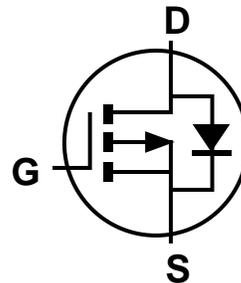
Bottom View

Features and Benefits

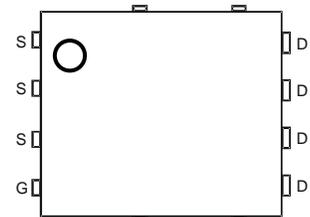
- Thermally Efficient Package-Cooler Running Applications
- High Conversion Efficiency
- Low $R_{DS(ON)}$ – Minimizes On State Losses
- Low Input Capacitance
- Fast Switching Speed
- <1.1mm Package Profile – Ideal for Thin Applications
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen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

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)



Internal Schematic

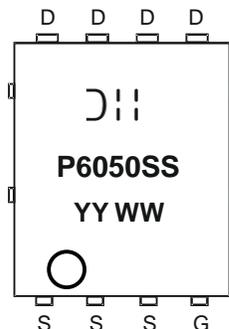

 Top View
 Pin Configuration

Ordering Information (Note 4)

| Part Number | Case | Packaging |
|---------------|---------------|--------------------|
| DMP6050SPS-13 | PowerDI5060-8 | 2500 / 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
 P6050SS = Product Type Marking Code
 YYWW = Date Code Marking
 YY = Last Two Digits of Year (ex: 18 = 2018)
 WW = Week Code (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 6) V _{GS} = -10V | I _D | T _A = +25°C | -5.7 | A |
| | | T _A = +70°C | -4.5 | A |
| Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%) | I _{DM} | -45 | A | |
| Maximum Continuous Body Diode Forward Current (Note 6) | I _S | -2.4 | A | |
| Pulsed Body Diode Forward Current (10µs Pulse, Duty Cycle = 1%) | I _{SM} | -45 | A | |
| Avalanche Current (Note 8) L = 0.1mH | I _{AS} | -25 | A | |
| Repetitive Avalanche Energy (Note 8) L = 0.1mH | E _{AS} | 32 | mJ | |

Thermal Characteristics

| Characteristic | Symbol | Value | Unit |
|---|-----------------------------------|-------------|------|
| Power Dissipation (Note 5) | P _D | 1.3 | W |
| Thermal Resistance, Junction to Ambient @ T _A = +25°C (Note 5) | R _{θJA} | 95 | °C/W |
| Power Dissipation (Note 6) | P _D | 2.4 | W |
| Thermal Resistance, Junction to Ambient @ T _A = +25°C (Note 6) | R _{θJA} | 52 | °C/W |
| Thermal Resistance, Junction to Case @ T _C = +25°C (Note 7) | R _{θJC} | 2.4 | °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 9) | | | | | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | -60 | — | — | V | V _{GS} = 0V, I _D = -250µA |
| Zero Gate Voltage Drain Current | 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 _{DSON} | — | 43 | 50 | mΩ | V _{GS} = -10V, I _D = -5A |
| | | — | 53 | 70 | | V _{GS} = -4.5V, I _D = -4A |
| Diode Forward Voltage | V _{SD} | — | -0.7 | -1.2 | V | V _{GS} = 0V, I _S = -1A |
| DYNAMIC CHARACTERISTICS (Note 10) | | | | | | |
| Input Capacitance | C _{ISS} | — | 2163 | — | pF | V _{DS} = -30V, V _{GS} = 0V, f = 1.0MHz |
| Output Capacitance | C _{OSS} | — | 88 | — | pF | |
| Reverse Transfer Capacitance | C _{RSS} | — | 58 | — | pF | |
| Gate Resistance | R _g | — | 13 | — | Ω | V _{DS} = 0V, V _{GS} = 0V, f = 1MHz |
| Total Gate Charge (V _{GS} = -10V) | Q _g | — | 30 | — | nC | V _{DS} = -30V, I _D = -5A |
| Total Gate Charge (V _{GS} = -4.5V) | Q _g | — | 14 | — | nC | |
| Gate-Source Charge | Q _{gs} | — | 5 | — | nC | |
| Gate-Drain Charge | Q _{gd} | — | 4.6 | — | nC | |
| Turn-On Delay Time | t _{D(ON)} | — | 4.7 | — | ns | V _{GS} = -10V, V _{DS} = -30V, R _G = 3Ω, I _D = -5A |
| Turn-On Rise Time | t _r | — | 2.7 | — | ns | |
| Turn-Off Delay Time | t _{D(OFF)} | — | 73 | — | ns | |
| Turn-Off Fall Time | t _f | — | 25 | — | ns | |
| Body Diode Reverse Recovery Time | t _{RR} | — | 18 | — | ns | I _F = -5A, di/dt = 100A/µs |
| Body Diode Reverse Recovery Charge | Q _{RR} | — | 12 | — | nC | I _F = -5A, di/dt = 100A/µs |

- Notes:
5. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
 6. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
 7. Thermal resistance from junction to soldering point (on the exposed drain pad).
 8. I_{AS} and E_{AS} ratings are based on low frequency and duty cycles to keep T_J = +25°C.
 9. Short duration pulse test used to minimize self-heating effect.
 10. Guaranteed by design. Not subject to product testing.

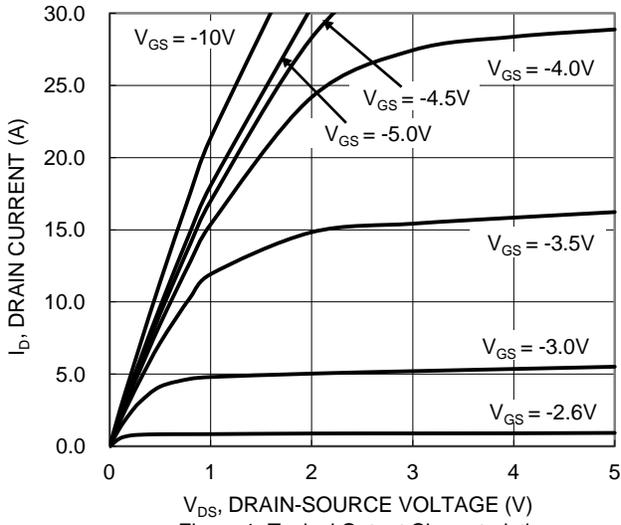


Figure 1. Typical Output Characteristic

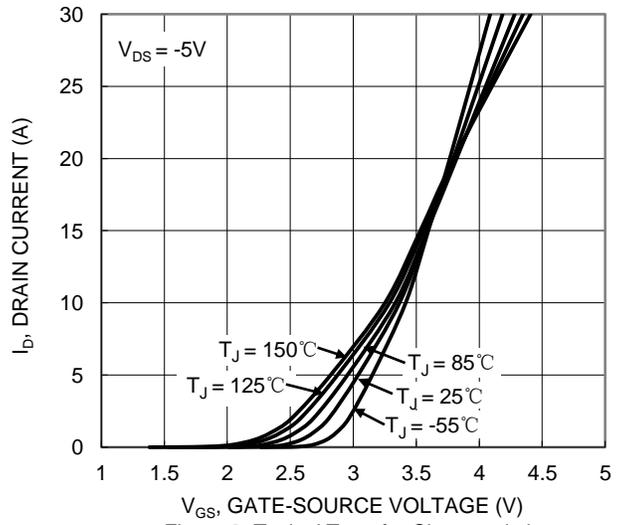


Figure 2. Typical Transfer Characteristic

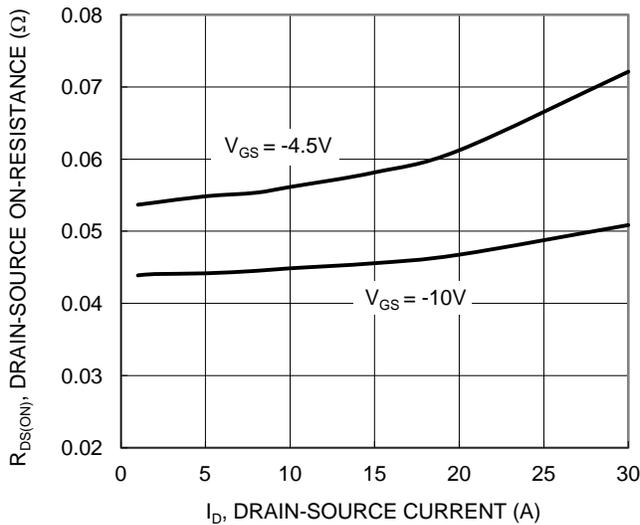


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

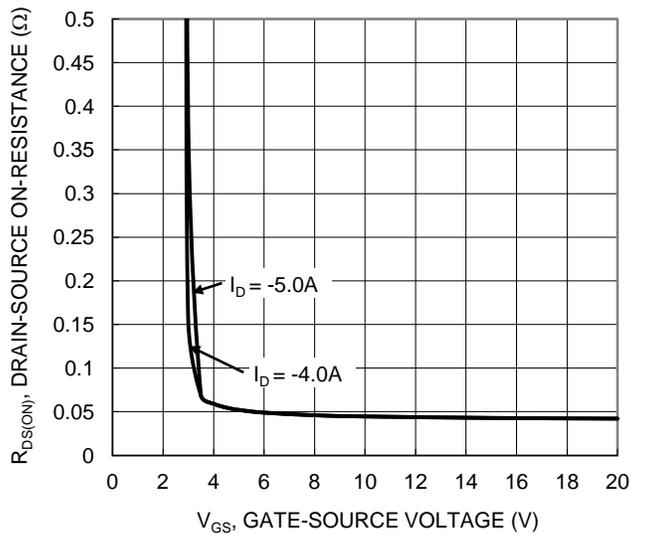


Figure 4. Typical Transfer Characteristic

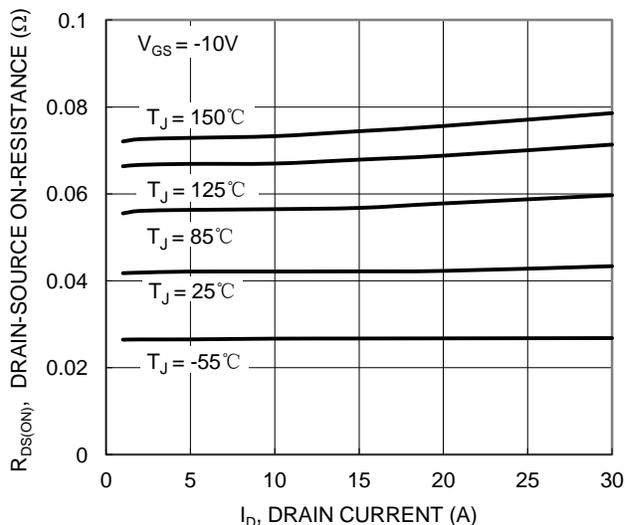


Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

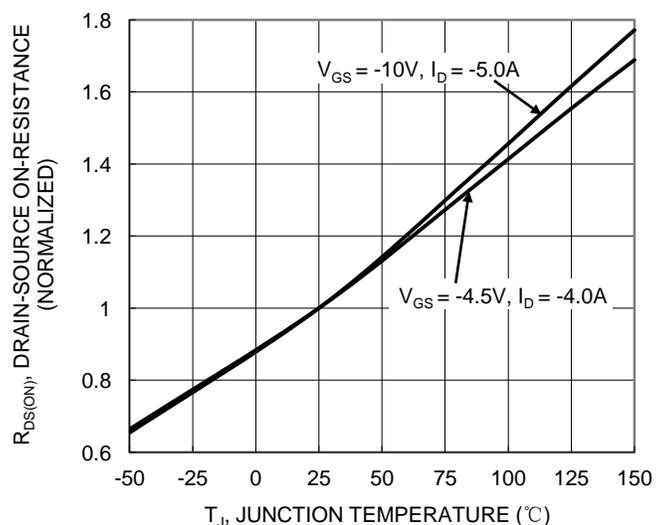


Figure 6. On-Resistance Variation with Junction Temperature

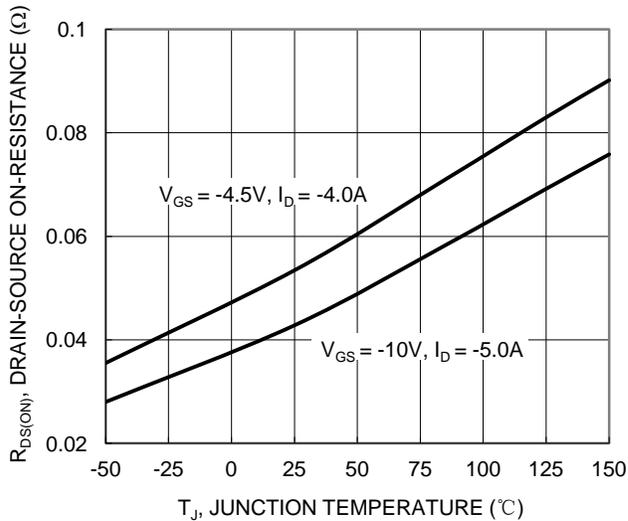


Figure 7. On-Resistance Variation with Junction Temperature

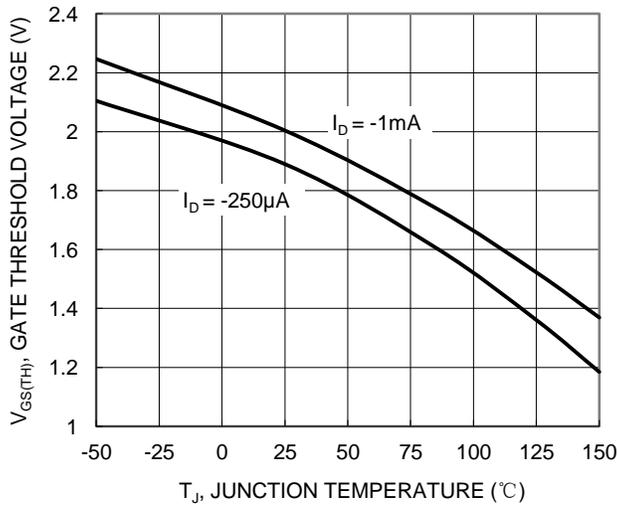


Figure 8. Gate Threshold Variation vs. Junction Temperature

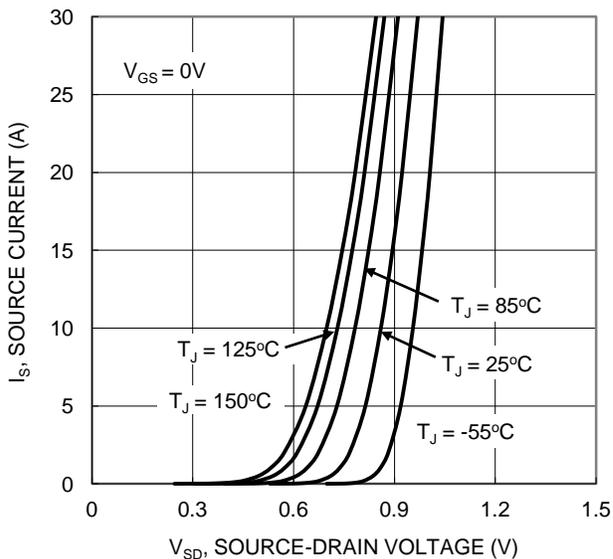


Figure 9. Diode Forward Voltage vs. Current

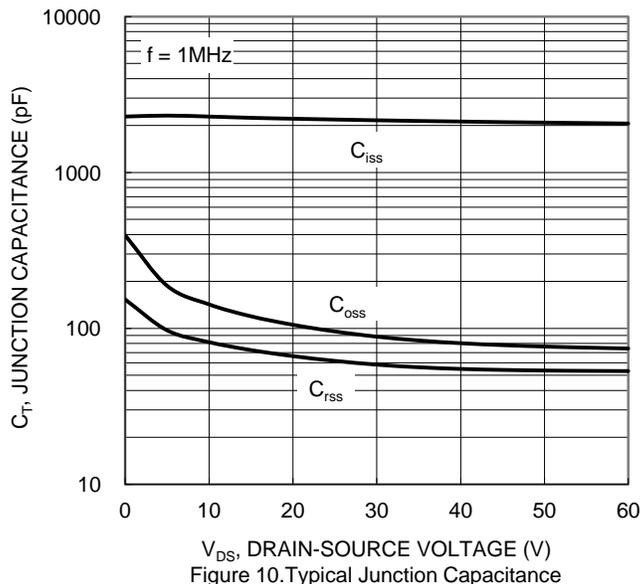


Figure 10. Typical Junction Capacitance

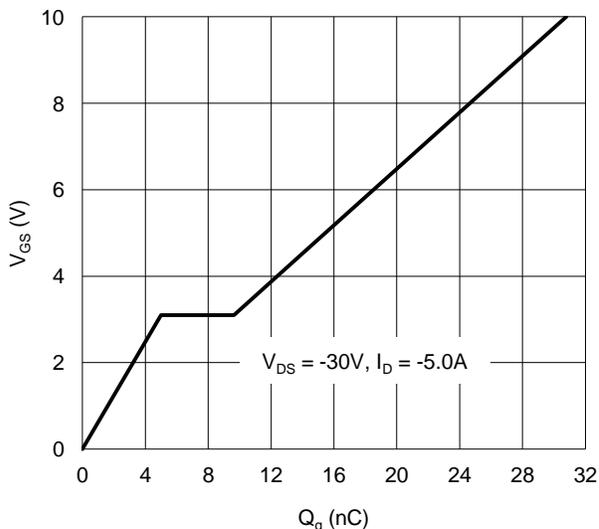


Figure 11. Gate Charge

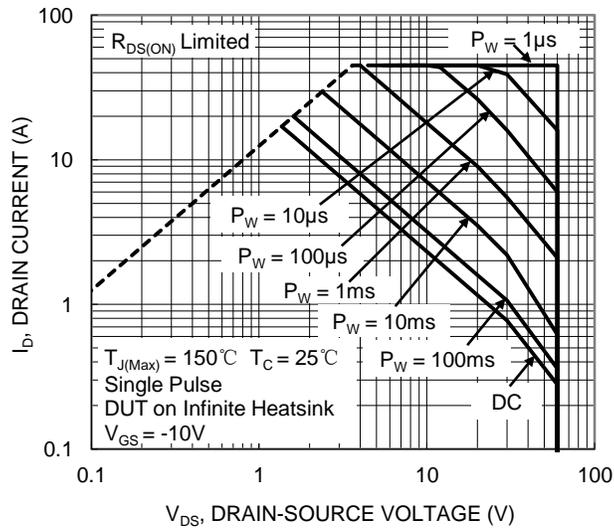


Figure 12. SOA, Safe Operation Area

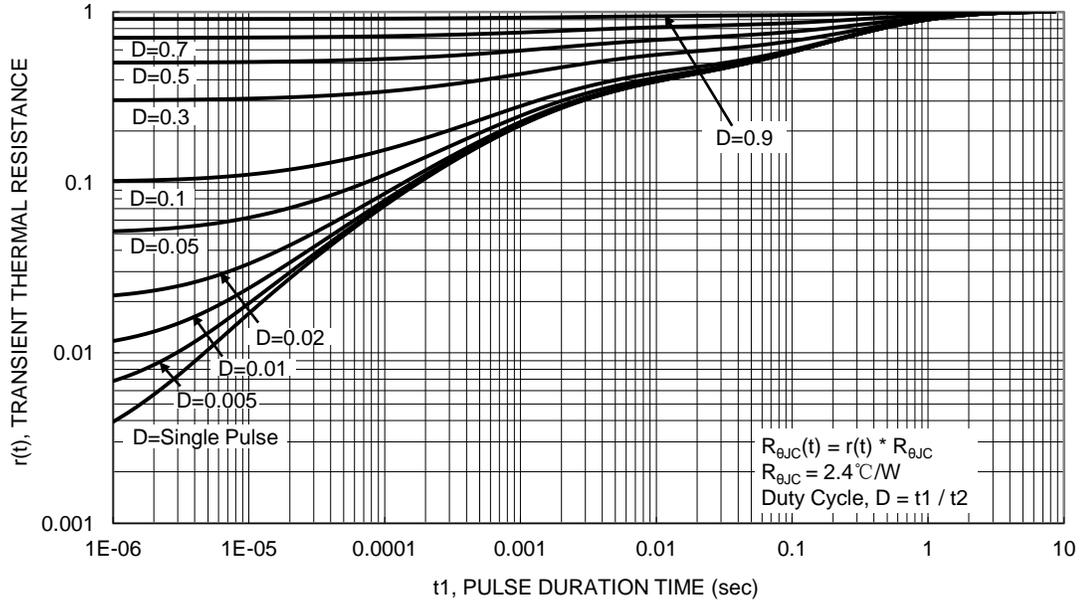
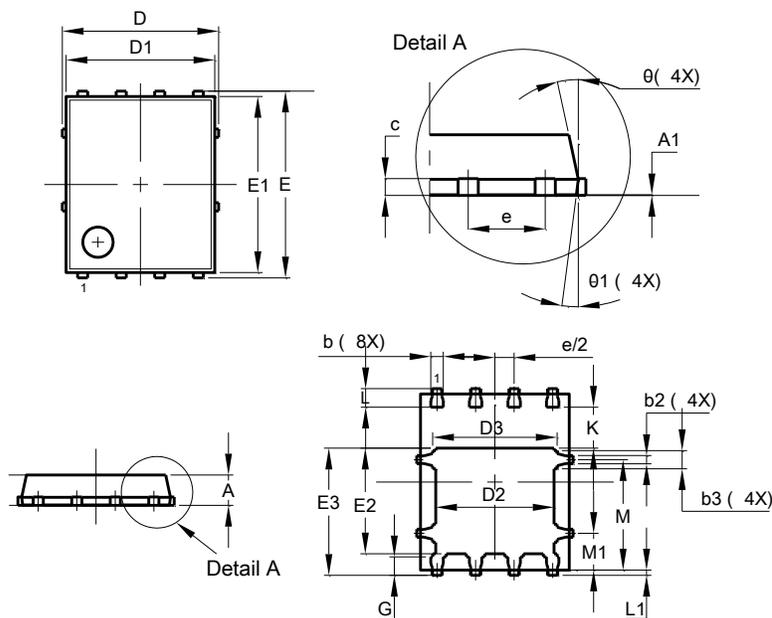


Figure 13. Transient Thermal Resistance

Package Outline Dimensions

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

PowerDI5060-8

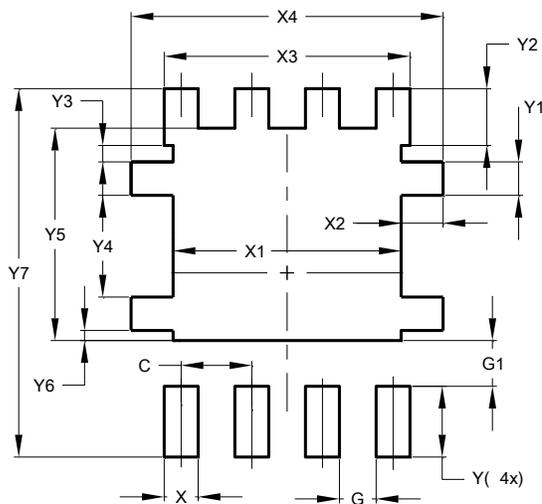


| PowerDI5060-8 | | | |
|----------------------|----------|-------|-------|
| Dim | Min | Max | Typ |
| A | 0.90 | 1.10 | 1.00 |
| A1 | 0.00 | 0.05 | - |
| b | 0.33 | 0.51 | 0.41 |
| b2 | 0.200 | 0.350 | 0.273 |
| b3 | 0.40 | 0.80 | 0.60 |
| c | 0.230 | 0.330 | 0.277 |
| D | 5.15 BSC | | |
| D1 | 4.70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