

Product Summary

| BV _{DSS} | R _{DS(ON)} Max | I _D T _C = +25°C |
|-------------------|-------------------------------|--|
| 40V | 2.5mΩ @ V _{GS} = 10V | 90A |
| | 4mΩ @ V _{GS} = 4.5V | 90A |

Description and Applications

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.

- Engine management systems
- Body control electronics
- DC-DC converters

Features

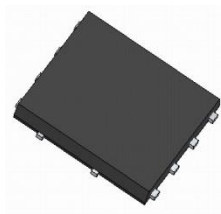
- 100% Unclamped Inductive Switching – ensures more reliable and robust end application
- Low R_{DS(ON)} – minimizes power losses
- Low Q_g – minimizes switching losses
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e.: parts qualified to AEC-Q100/101/104/200, 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

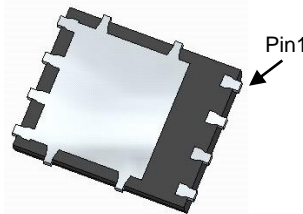
- Package: PowerDI[®]5060-8
- Package Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Finish - Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 [Ⓢ]
- Weight: 0.097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

Site 1:

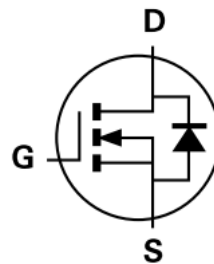
PowerDI5060-8



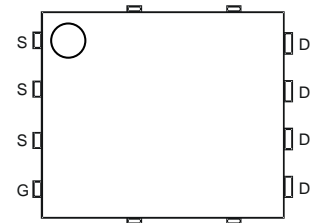
Top View



Bottom View



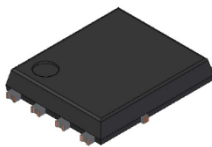
Internal Schematic



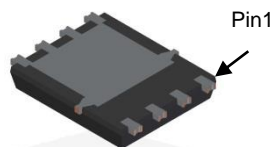
Top View
Pin Configuration

Site 2:

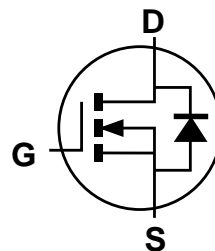
PowerDI5060-8/SWP (Type UX)



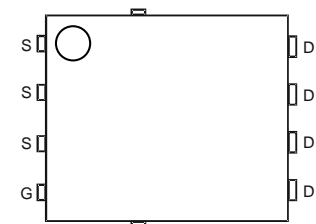
Top View



Bottom View



Internal Schematic



Top View
Pin Configuration

Notes:

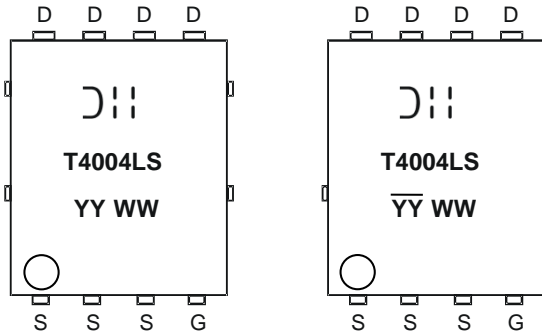
1. EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant. All applicable RoHS exemptions applied.
2. See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

Ordering Information (Note 4)

| Part Number | Package | Packing | |
|---------------|-----------------------------|---------|-------------|
| | | Qty. | Carrier |
| DMT4004LPS-13 | PowerDI5060-8 | 2500 | Tape & Reel |
| DMT4004LPS-13 | PowerDI5060-8/SWP (Type UX) | 2500 | Tape & Reel |

Note: 4. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

Marking Information



D;:: = Manufacturer's Marking
 T4004LS = Product Type Marking Code
 YYWW = Date Code Marking
 YY or YY = Year (ex: 23 = 2023)
 WW = Week (01 to 53)

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

| Characteristic | Symbol | Value | Unit |
|--|------------------|---------------------------------|------|
| Drain-Source Voltage | V _{DSS} | 40 | V |
| Gate-Source Voltage | V _{GSS} | ±20 | V |
| Continuous Drain Current (Note 5) | I _D | T _A = +25°C | 26 |
| | | T _A = +70°C | 21 |
| Continuous Drain Current (Note 6) | I _D | T _C = +25°C | 90 |
| | | T _C = +70°C (Note 8) | 90 |
| Maximum Continuous Body Diode Forward Current (Note 6) | I _S | 70 | A |
| Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%) | I _{DM} | 100 | A |
| Avalanche Current, L=0.2mH | I _{AS} | 33.3 | A |
| Avalanche Energy, L=0.2mH | E _{AS} | 110 | mJ |

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

| Characteristic | Symbol | Value | Unit |
|--|-----------------------------------|-------------|------|
| Total Power Dissipation (Note 5) | P _D | 2.6 | W |
| Thermal Resistance, Junction to Ambient (Note 5) | R _{θJA} | 47 | °C/W |
| Total Power Dissipation (Note 6) | P _D | 138 | W |
| Thermal Resistance, Junction to Case (Note 6) | R _{θJC} | 0.9 | °C/W |
| Operating and Storage Temperature Range | T _J , T _{STG} | -55 to +150 | °C |

- Notes:
- Device mounted with exposed drain pad on 25mm by 25mm 2oz copper on a single-sided 1.6mm FR-4 PCB; device is measured under still air conditions whilst operating in a steady state.
 - 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 production testing.

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} | 40 | — | — | V | V _{GS} = 0V, I _D = 1mA |
| Zero Gate Voltage Drain Current | I _{DSS} | — | — | 1 | μA | V _{DS} = 32V, 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)} | — | — | 2.5 | mΩ | V _{GS} = 10V, I _D = 50A |
| | | — | — | 4 | | V _{GS} = 4.5V, I _D = 50A |
| Diode Forward Voltage | V _{SD} | — | 0.9 | 1.2 | V | V _{GS} = 0V, I _S = 50A |
| DYNAMIC CHARACTERISTICS (Note 8) | | | | | | |
| Input Capacitance | C _{iss} | — | 4508 | — | pF | V _{DS} = 20V, V _{GS} = 0V, f = 1MHz |
| Output Capacitance | C _{oss} | — | 1648 | — | | |
| Reverse Transfer Capacitance | C _{rss} | — | 104 | — | | |
| Gate resistance | R _g | — | 0.7 | — | Ω | V _{DS} = 0V, V _{GS} = 0V, f = 1MHz |
| Total Gate Charge (V _{GS} = 4.5V) | Q _g | — | 34.6 | — | nC | V _{DD} = 20V, I _D = 30A |
| Total Gate Charge (V _{GS} = 10V) | Q _g | — | 82.2 | — | | |
| Gate-Source Charge | Q _{gs} | — | 9.9 | — | | |
| Gate-Drain Charge | Q _{gd} | — | 11.2 | — | | |
| Turn-On Delay Time | t _{D(ON)} | — | 5.9 | — | ns | V _{DD} = 20V, V _{GS} = 10V, I _D = 30A, R _G = 1.6Ω |
| Turn-On Rise Time | t _R | — | 13.3 | — | | |
| Turn-Off Delay Time | t _{D(OFF)} | — | 25.9 | — | | |
| Turn-Off Fall Time | t _F | — | 7.9 | — | | |
| Body Diode Reverse Recovery Time | t _{RR} | — | 48.4 | — | ns | I _F = 50A, di/dt = 100A/μs |
| Body Diode Reverse Recovery Charge | Q _{RR} | — | 72.4 | — | nC | |

Notes: 7. Short duration pulse test used to minimize self-heating effect.
8. Guaranteed by design. Not subject to production testing.

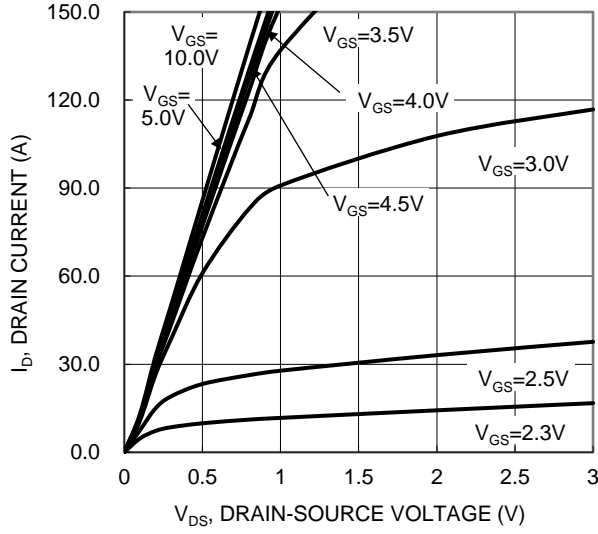


Figure 1. Typical Output Characteristic

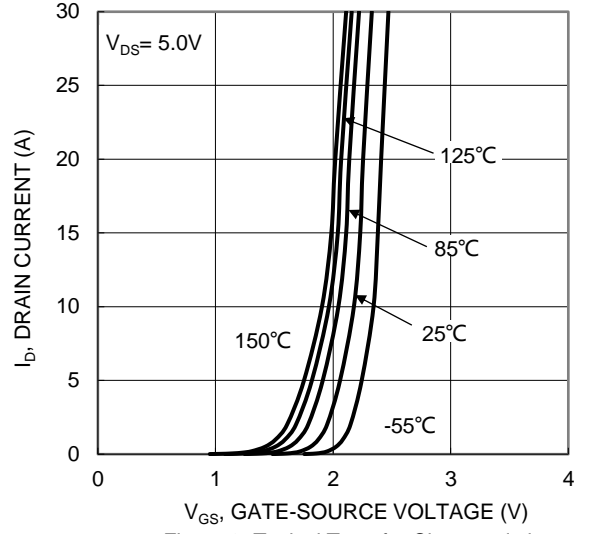


Figure 2. Typical Transfer Characteristic

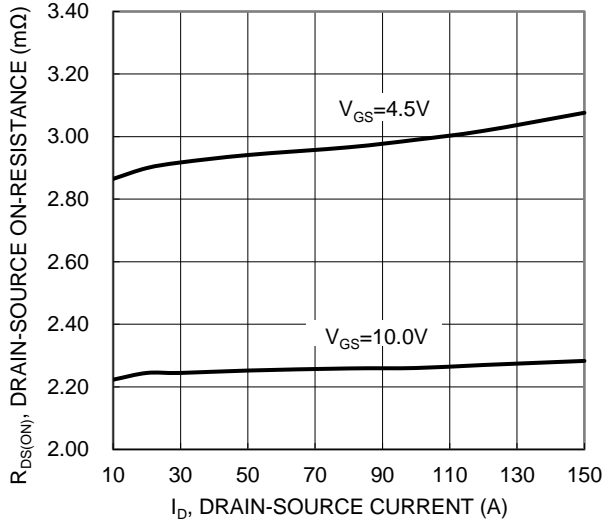


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

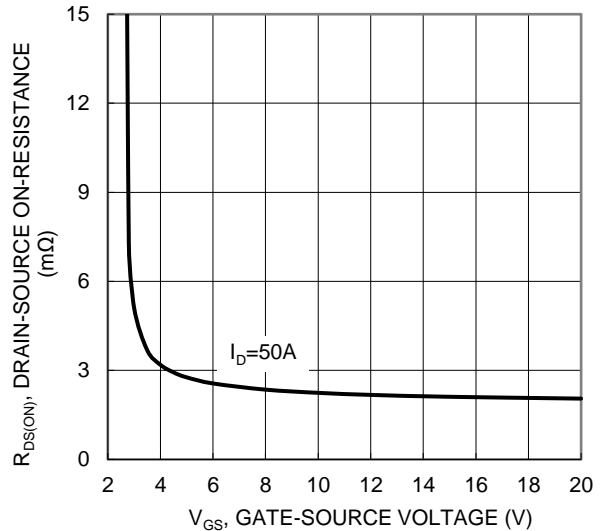


Figure 4. Typical Transfer Characteristic

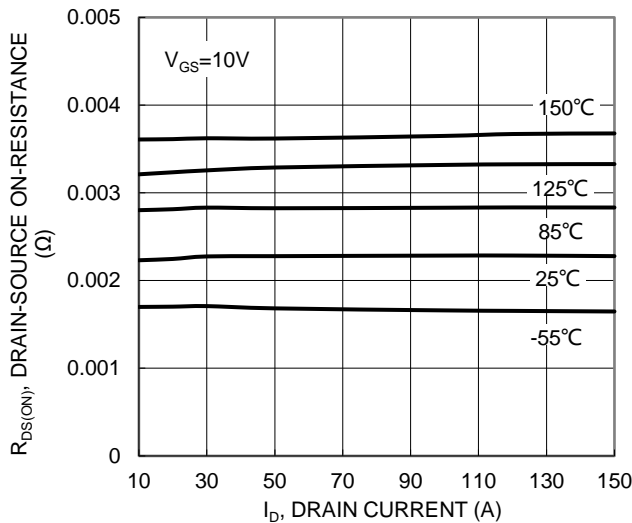


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

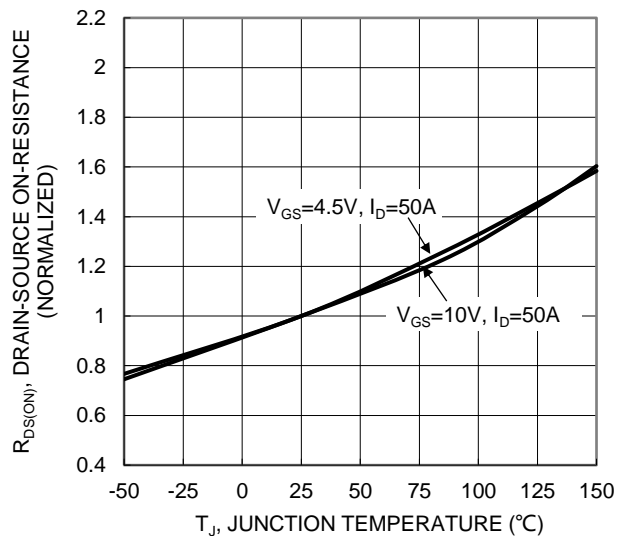


Figure 6. On-Resistance Variation with Temperature

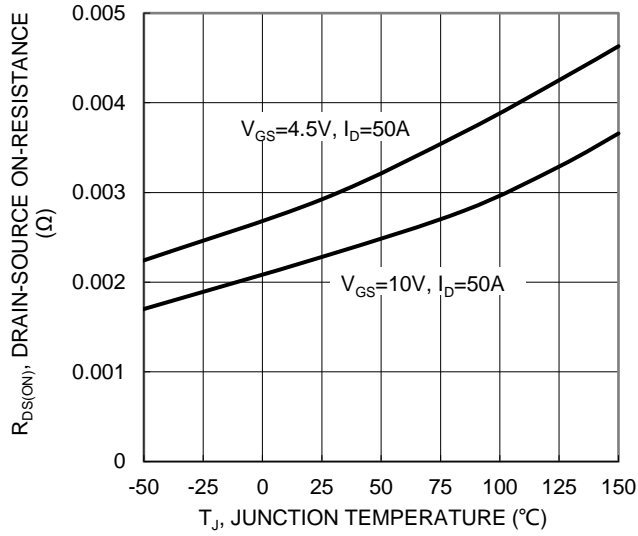


Figure 7. On-Resistance Variation with Temperature

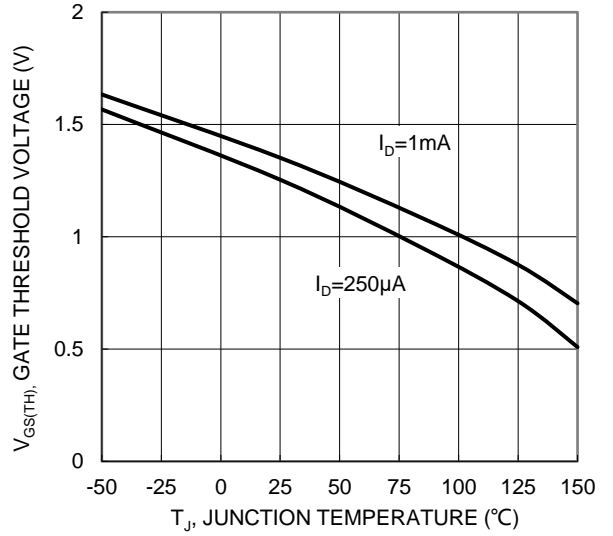


Figure 8. Gate Threshold Variation vs. Temperature

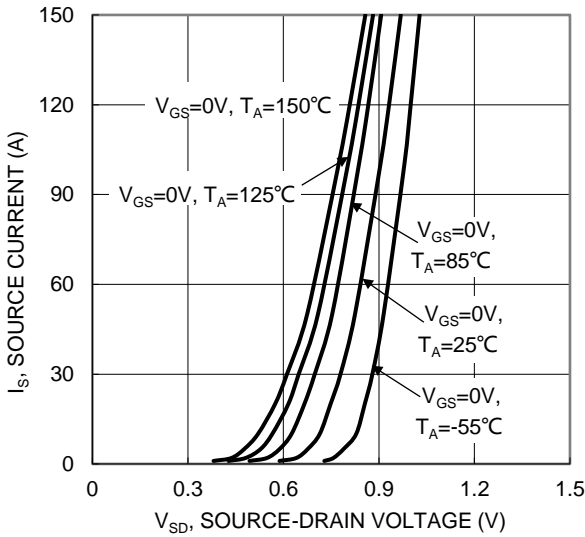


Figure 9. Diode Forward Voltage vs. Current

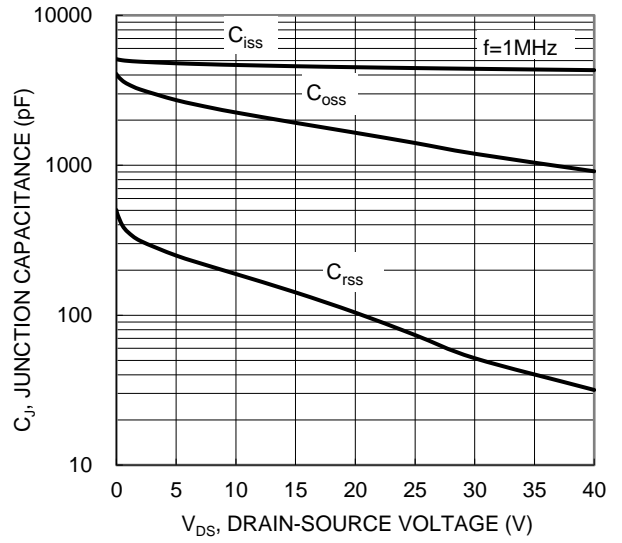


Figure 10. Typical Junction Capacitance

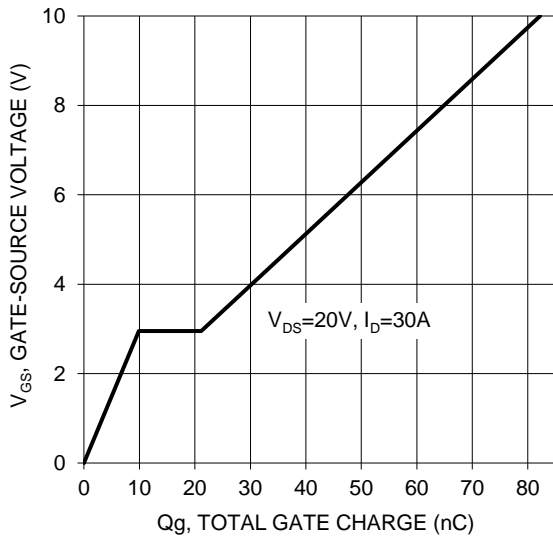


Figure 11. Gate Charge

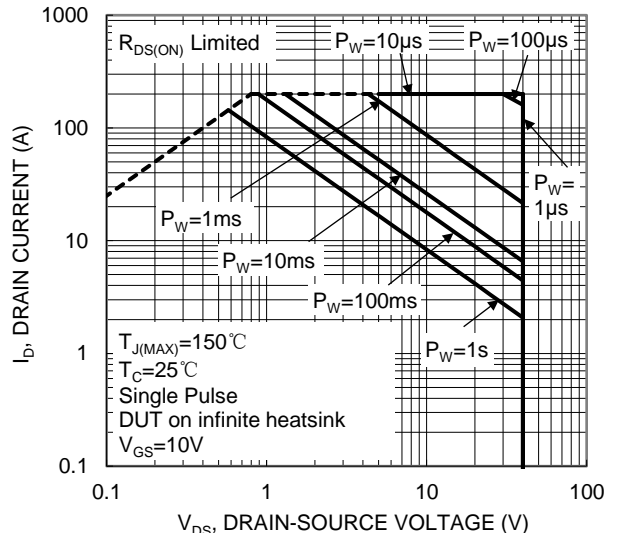


Figure 12. SOA, Safe Operation Area

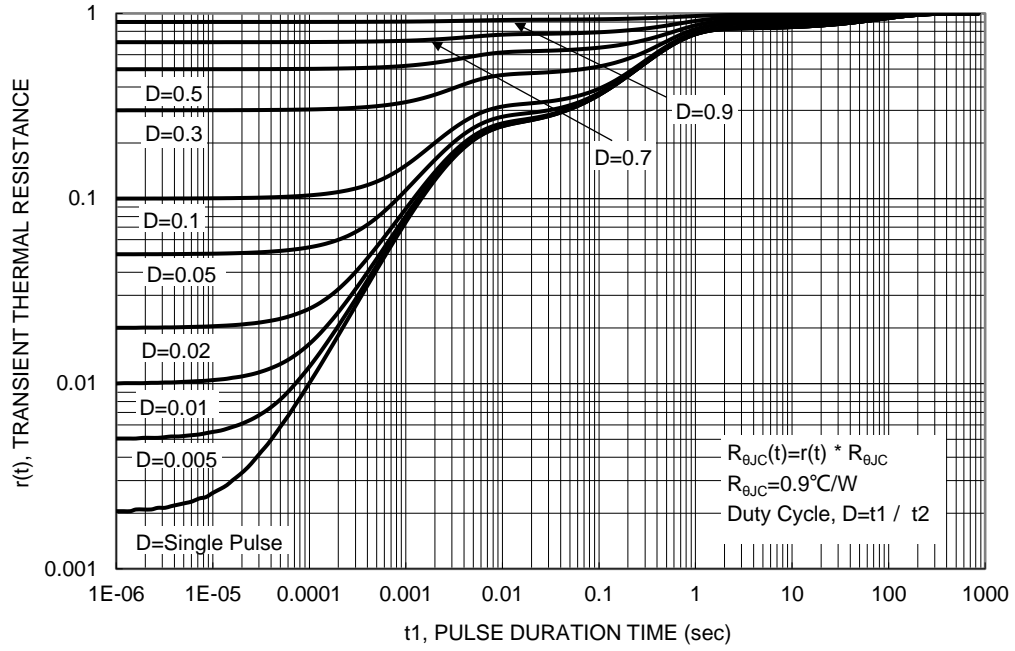


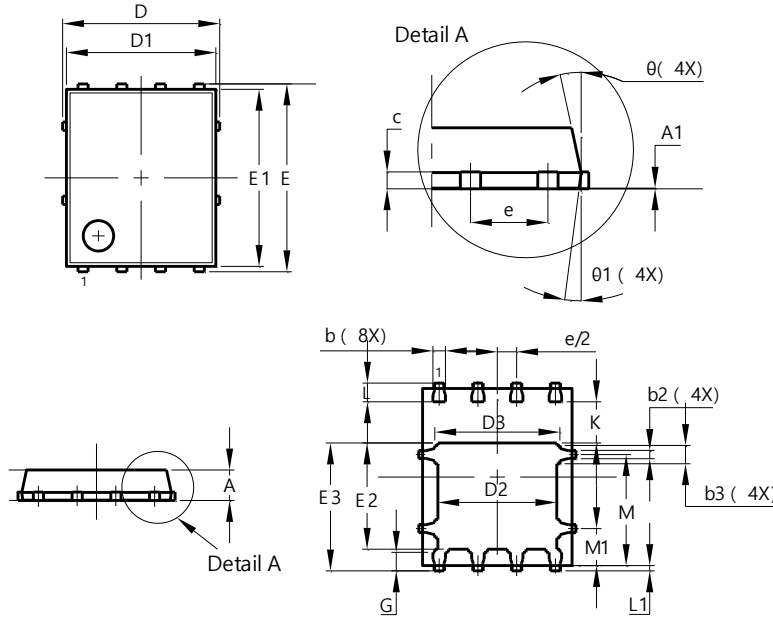
Figure 13. Transient Thermal Resistance

Package Outline Dimensions

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

Site 1:

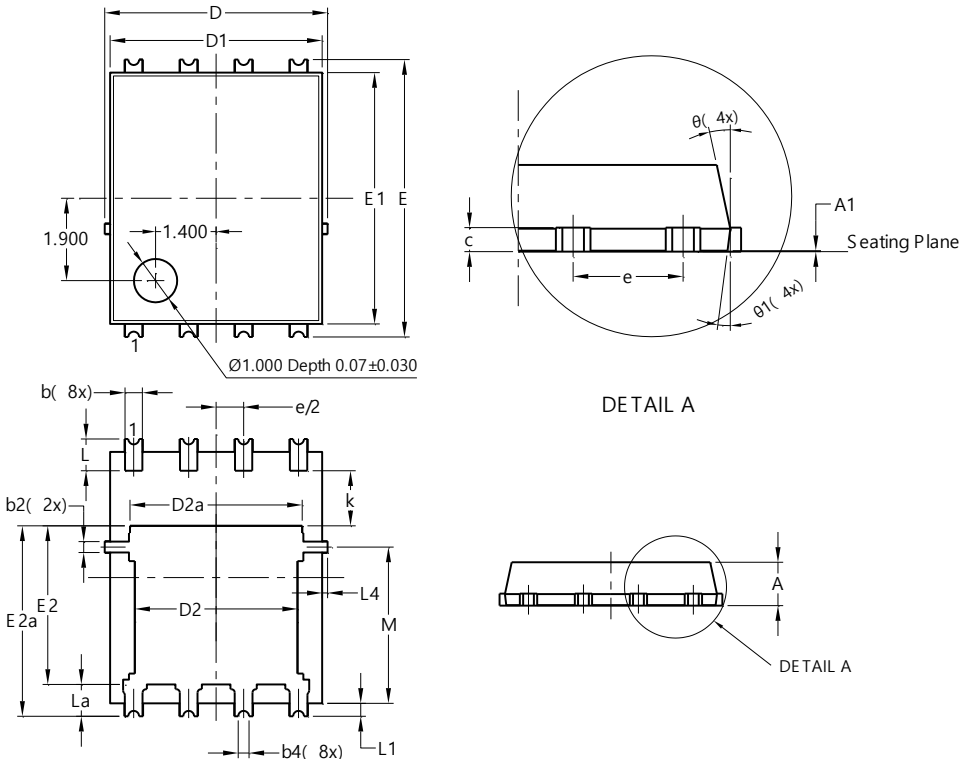
PowerDI5060-8



| 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 |
| theta | 10° | 12° | 11° |
| theta1 | 6° | 8° | 7° |
| All Dimensions in mm | | | |

Site 2:

PowerDI5060-8/SWP (Type UX)



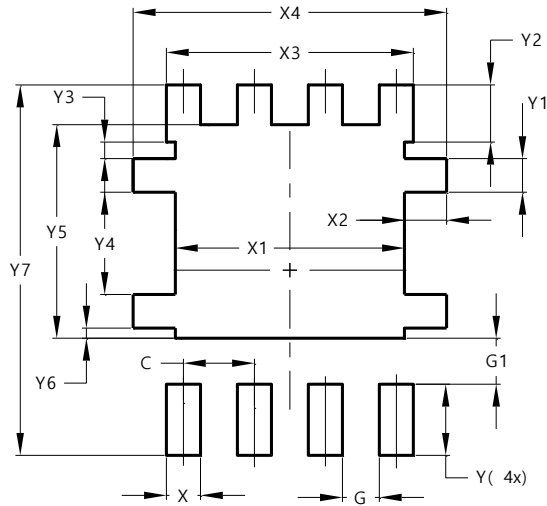
| PowerDI5060-8/SWP (Type UX) | | | |
|-----------------------------|----------|-------|-------|
| Dim | Min | Max | Typ |
| A | 0.90 | 1.10 | 1.00 |
| A1 | 0 | 0.05 | -- |
| b | 0.30 | 0.50 | 0.41 |
| b2 | 0.20 | 0.35 | 0.25 |
| b4 | 0.25REF | | |
| c | 0.230 | 0.330 | 0.277 |
| D | 5.15 BSC | | |
| D1 | 4.70 | 5.10 | 4.90 |
| D2 | 3.56 | 3.96 | 3.76 |
| D2a | 3.78 | 4.18 | 3.98 |
| E | 6.40 BSC | | |
| E1 | 5.60 | 6.00 | 5.80 |
| E2 | 3.46 | 3.86 | 3.66 |
| E2a | 4.195 | 4.595 | 4.395 |
| e | 1.27BSC | | |
| k | 1.05 | -- | -- |
| L | 0.635 | 0.835 | 0.735 |
| La | 0.635 | 0.835 | 0.735 |
| L1 | 0.200 | 0.400 | 0.300 |
| L1a | 0.050REF | | |
| L4 | 0.025 | 0.225 | 0.125 |
| M | 3.205 | 4.005 | 3.605 |
| theta | 10° | 12° | 11° |
| theta1 | 6° | 8° | 7° |
| All Dimensions in mm | | | |

Suggested Pad Layout

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

Site 1:

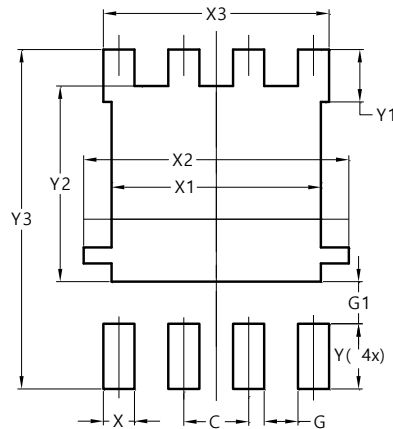
PowerDI5060-8



| 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 |

Site 2:

PowerDI5060-8/SWP (Type UX)



| Dimensions | Value (in mm) |
|------------|---------------|
| C | 1.270 |
| G | 0.660 |
| G1 | 0.820 |
| X | 0.610 |
| X1 | 4.100 |
| X2 | 5.190 |
| X3 | 4.420 |
| Y | 1.270 |
| Y1 | 1.020 |
| Y2 | 3.810 |
| Y3 | 6.610 |

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