

Product Summary

| $V_{(BR)DSS}$ | $R_{DS(ON)}$ Max | I_D Max $T_C = +25^\circ\text{C}$ |
|---------------|---------------------------------------|--|
| 60V | 25m Ω @ $V_{GS} = 10\text{V}$ | 32A |
| | 40m Ω @ $V_{GS} = 4.5\text{V}$ | 25A |

Features and Benefits

- Rated to +175°C – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching – Ensures More Reliable and Robust End Application
- High Conversion Efficiency
- Low $R_{DS(ON)}$ – Minimizes On-State Losses
- Low Input Capacitance
- Fast Switching Speed
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- Halogen and Antimony Free. "Green" Device (Note 3)**
- Qualified to AEC-Q101 Standards for High Reliability**
- PPAP Capable (Note 4)**

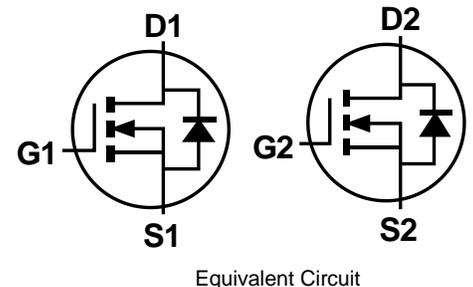
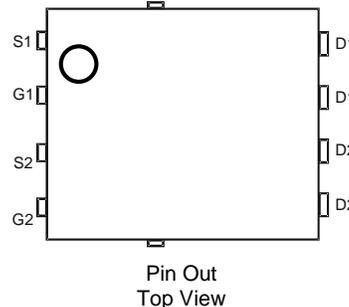
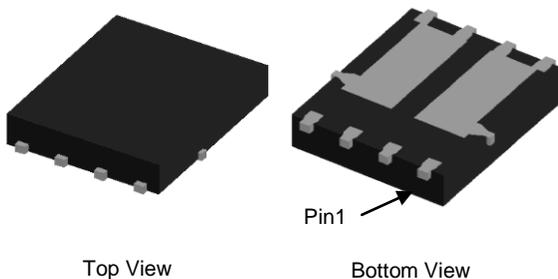
Description and Applications

This MOSFET is designed to meet the stringent requirements of Automotive applications. It is qualified to AEC-Q101, supported by a PPAP and is ideal for use in:

- Backlighting
- Power Management Functions
- DC-DC Converters

Mechanical Data

- Case: PowerDI[®]5060-8 (Type C)
- 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@3
- Weight: 0.097 grams (Approximate)

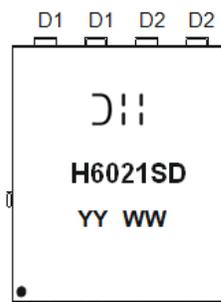


Ordering Information (Note 5)

| Part Number | Case | Packaging |
|-----------------|------------------------|-------------------|
| DMNH6021SPDQ-13 | PowerDI5060-8 (Type C) | 2,500/Tape & Reel |

- Notes:
- No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
 - 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.
 - Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
 - Automotive products are AEC-Q101 qualified and are PPAP capable. Please refer to http://www.diodes.com/quality/product_compliance_definitions/.
 - For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

Marking Information



$\text{D} \text{ } \text{H}6021\text{SD}$ = Manufacturer's Marking
 $\text{H}6021\text{SD}$ = Product Type Marking Code
 YYWW = Date Code Marking
 YY = Year (ex: 16 = 2016)
 WW = Week (01 - 53)

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

| Characteristic | Symbol | Value | Units |
|---|------------------|-------------------------|-------|
| Drain-Source Voltage | V _{DSS} | 60 | V |
| Gate-Source Voltage | V _{GSS} | ±20 | V |
| Continuous Drain Current (Note 7) V _{GS} = 10V | I _D | T _A = +25°C | 8.2 |
| | | T _A = +70°C | 6.5 |
| Continuous Drain Current (Note 8) V _{GS} = 10V | I _D | T _C = +25°C | 32 |
| | | T _C = +100°C | 22 |
| Pulsed Drain Current (380µs Pulse, Duty Cycle = 1%) | I _{DM} | 80 | A |
| Maximum Continuous Body Diode Forward Current (Note 8) | I _S | 32 | A |
| Avalanche Current, L = 0.1mH (Note 9) | I _{AS} | 35 | A |
| Avalanche Energy, L = 0.1mH (Note 9) | E _{AS} | 64 | mJ |

Thermal Characteristics

| Characteristic | Symbol | Value | Units |
|--|-----------------------------------|--------------|-------|
| Total Power Dissipation (Note 6) | P _D | 1.5 | W |
| Thermal Resistance, Junction to Ambient (Note 6) | R _{θJA} | Steady State | 99 |
| | | t < 10s | 53 |
| Total Power Dissipation (Note 7) | P _D | 2.8 | W |
| Thermal Resistance, Junction to Ambient (Note 7) | R _{θJA} | Steady State | 54 |
| | | t < 10s | 27 |
| Thermal Resistance, Junction to Case (Note 8) | R _{θJC} | 2.2 | °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 10) | | | | | | |
| 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 10) | | | | | | |
| Gate Threshold Voltage | V _{GS(TH)} | 1 | — | 3 | V | V _{DS} = V _{GS} , I _D = 250µA |
| Static Drain-Source On-Resistance | R _{DS(ON)} | — | 15 | 25 | mΩ | V _{GS} = 10V, I _D = 15A |
| | | — | 21 | 40 | | V _{GS} = 4.5V, I _D = 12A |
| Diode Forward Voltage | V _{SD} | — | 0.75 | 1.2 | V | V _{GS} = 0V, I _S = 2.6A |
| DYNAMIC CHARACTERISTICS (Note 11) | | | | | | |
| Input Capacitance | C _{ISS} | — | 1,143 | — | pF | V _{DS} = 25V, V _{GS} = 0V, f = 1MHz |
| Output Capacitance | C _{OSS} | — | 168 | — | pF | |
| Reverse Transfer Capacitance | C _{RSS} | — | 69 | — | pF | |
| Gate Resistance | R _G | — | 2.1 | — | Ω | V _{DS} = 0V, V _{GS} = 0V, f = 1MHz |
| Total Gate Charge (V _{GS} = 10V) | Q _G | — | 20.1 | — | nC | V _{DS} = 30V, I _D = 20A, |
| Total Gate Charge (V _{GS} = 6V) | Q _G | — | 12 | — | nC | |
| Gate-Source Charge | Q _{GS} | — | 4.3 | — | nC | |
| Gate-Drain Charge | Q _{GD} | — | 5.5 | — | nC | |
| Turn-On Delay Time | t _{D(ON)} | — | 4.4 | — | ns | V _{DD} = 30V, V _{GS} = 10V, R _G = 4.7Ω, I _D = 20A |
| Turn-On Rise Time | t _R | — | 6.0 | — | ns | |
| Turn-Off Delay Time | t _{D(OFF)} | — | 14.2 | — | ns | |
| Turn-Off Fall Time | t _F | — | 5.4 | — | ns | |
| Body Diode Reverse Recovery Time | t _{RR} | — | 21.2 | — | ns | IF = 20A, di/dt = 100A/µs |
| Body Diode Reverse Recovery Charge | Q _{RR} | — | 15.2 | — | nC | |

- 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 1-inch square copper plate.
 - Thermal resistance from junction to soldering point (on the exposed drain pad).
 - I_{AS} and E_{AS} rating 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.

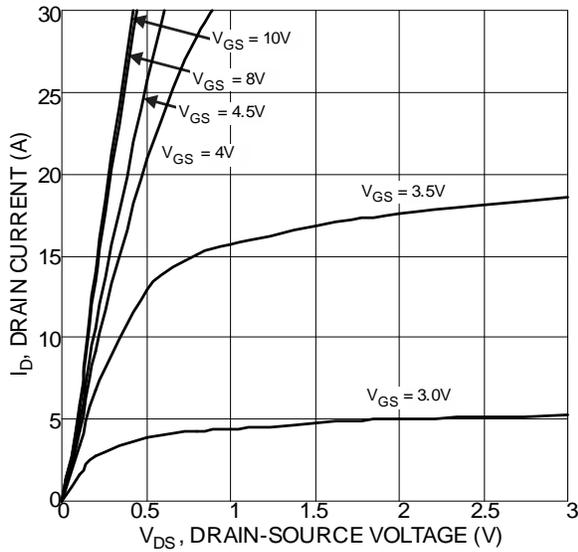


Figure 1 Typical Output Characteristic

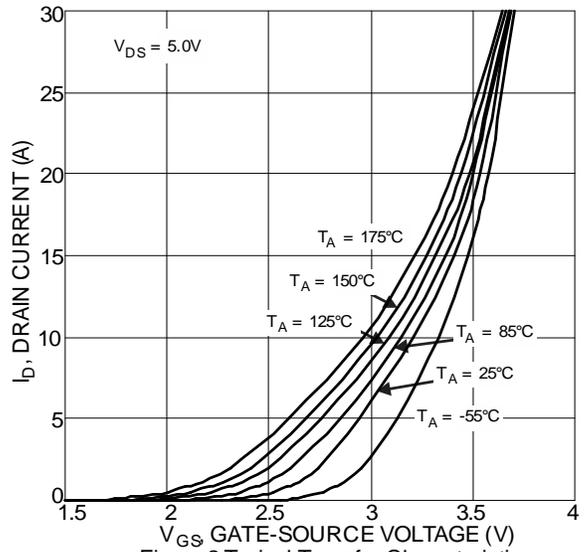


Figure 2 Typical Transfer Characteristics

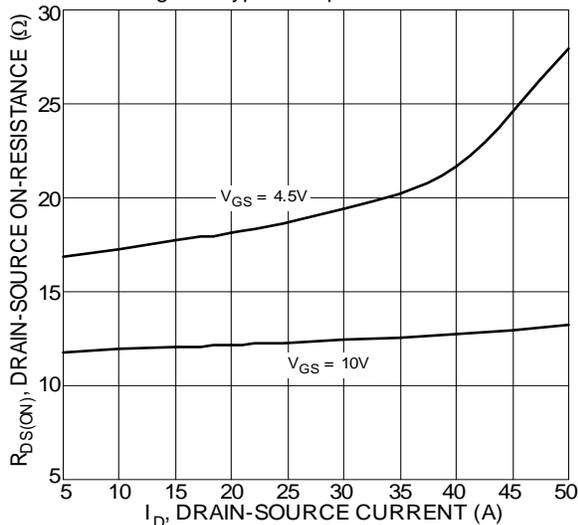


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

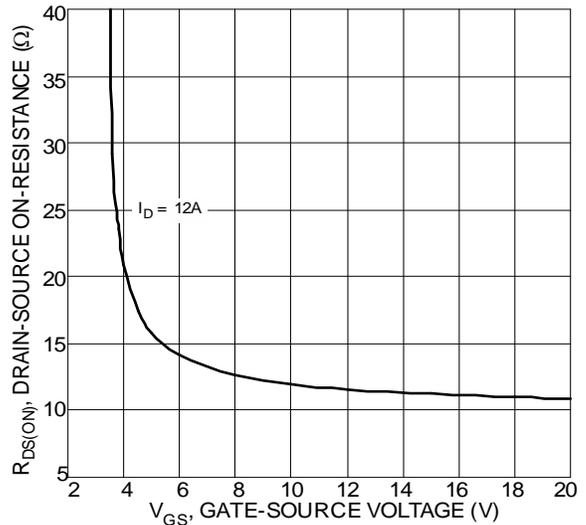


Figure 4 Typical Drain-Source On-Resistance vs. Gate-Source Voltage

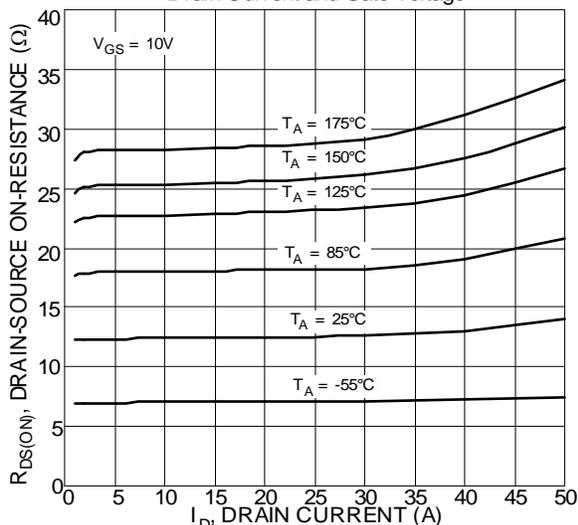


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

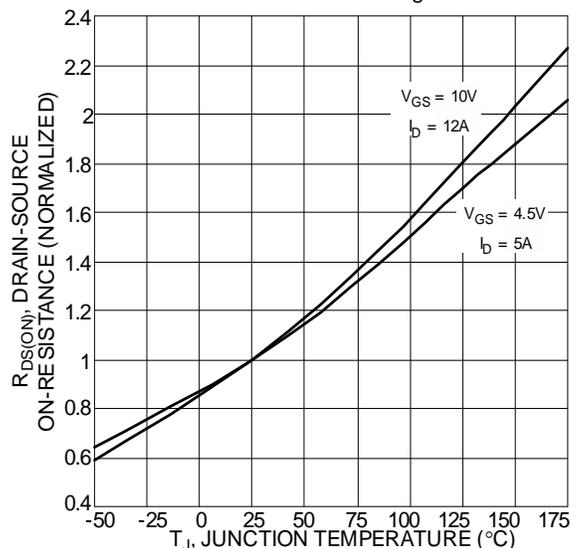


Figure 6 On-Resistance Variation with Temperature

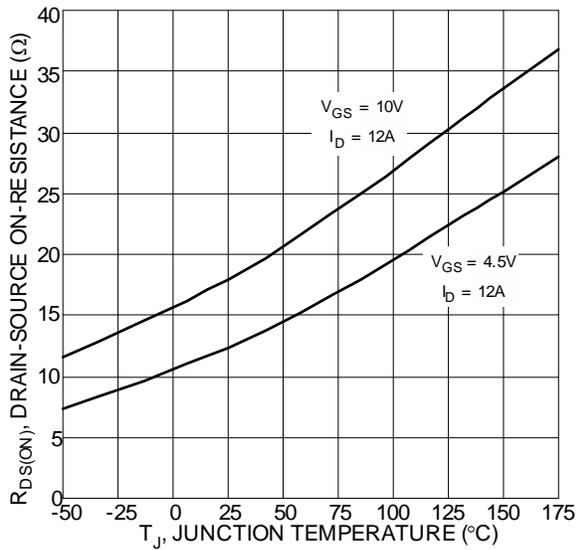


Figure 7 On-Resistance Variation with Temperature

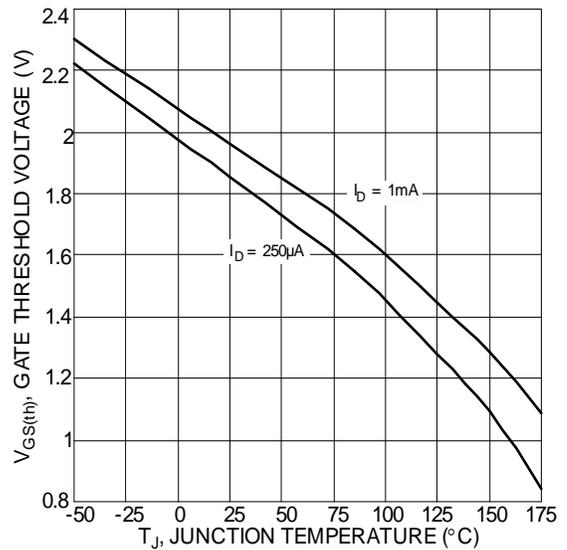


Figure 8 Gate Threshold Variation vs. Ambient Temperature

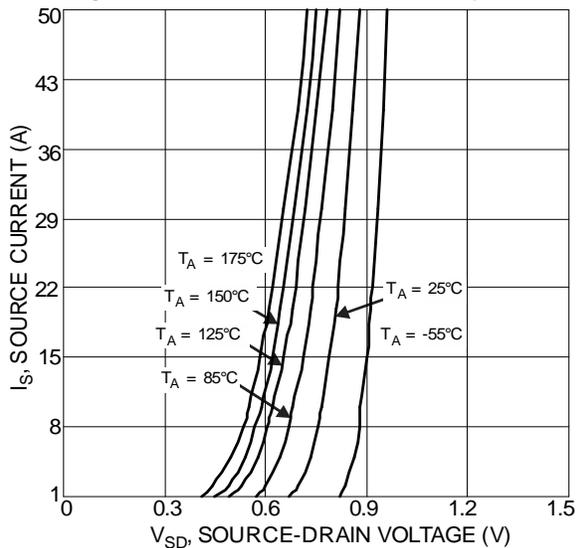


Figure 9 Diode Forward Voltage vs. Current

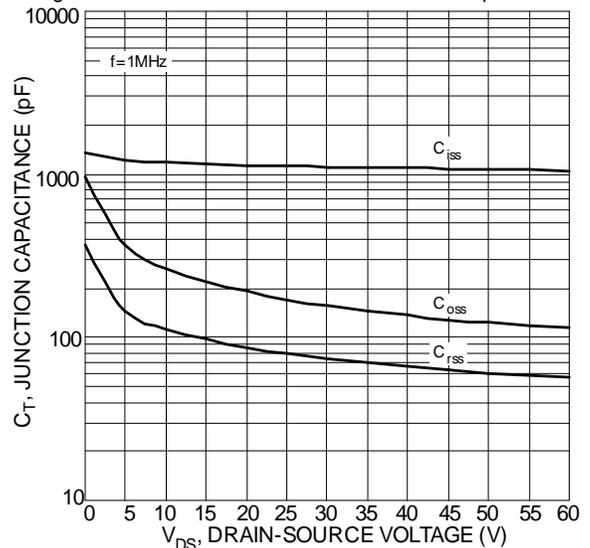


Figure 10 Typical Junction Capacitance

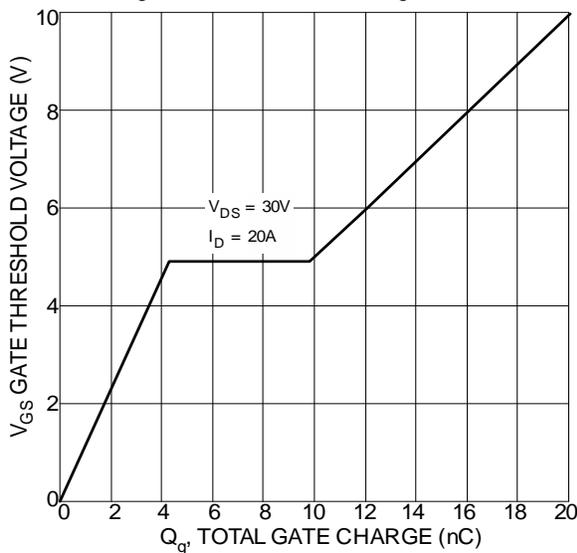


Figure 11 Gate Charge

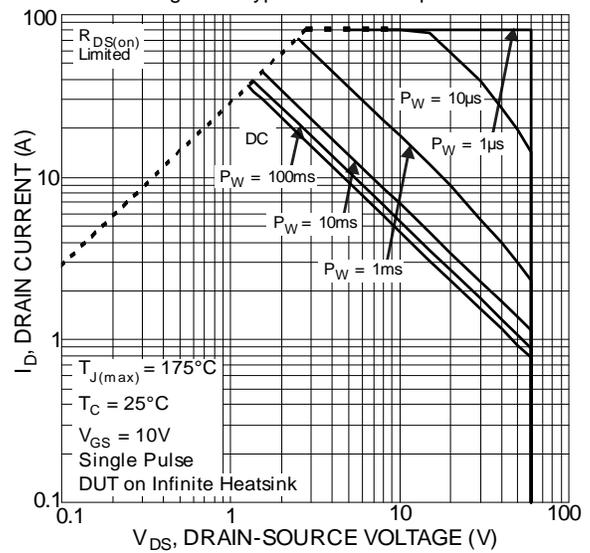


Figure 12 SOA, Safe Operation Area

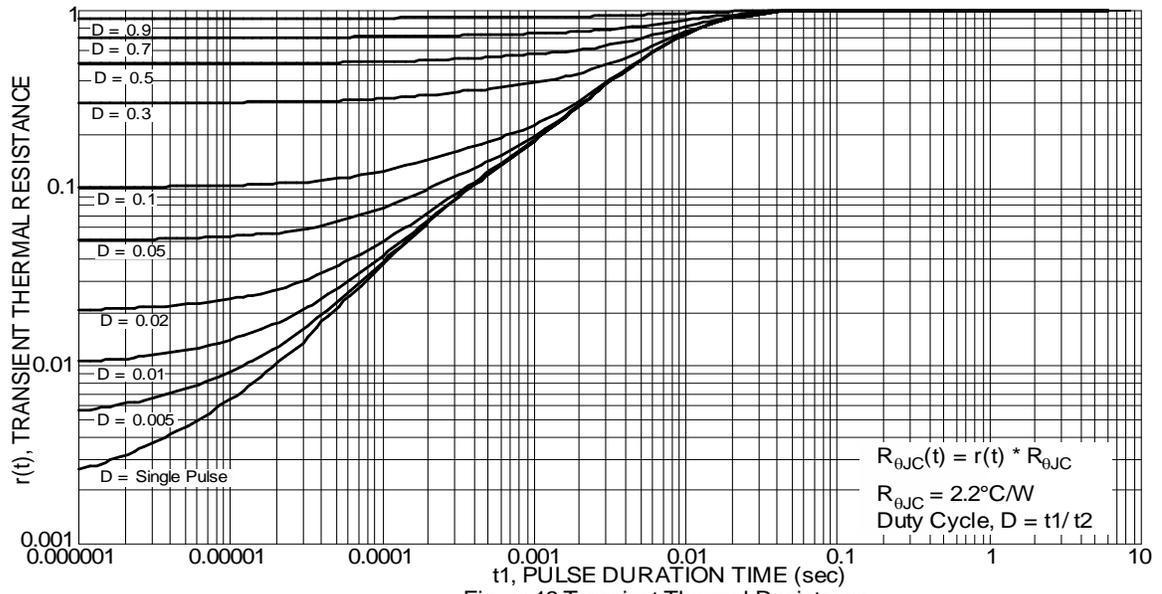
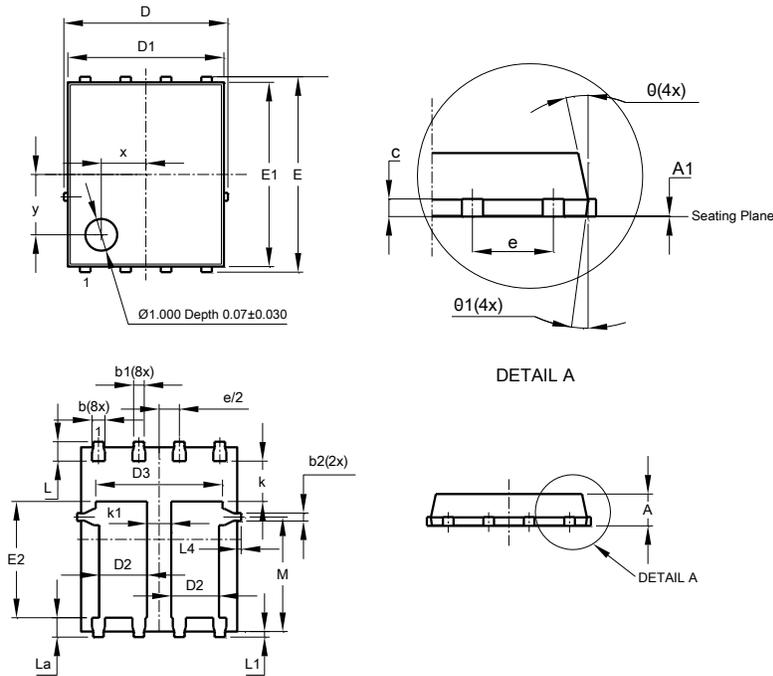


Figure 13 Transient Thermal Resistance

Package Outline Dimensions

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

PowerDI5060-8 (Type C)

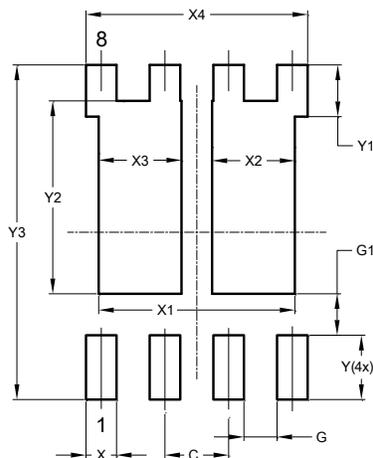


| PowerDI5060-8 (Type C) | | | |
|------------------------|----------|-------|-------|
| Dim | Min | Max | Typ |
| A | 0.90 | 1.10 | 1.00 |
| A1 | 0 | 0.05 | 0.02 |
| b | 0.33 | 0.51 | 0.41 |
| b1 | 0.300 | 0.366 | 0.333 |
| b2 | 0.20 | 0.35 | 0.25 |
| c | 0.23 | 0.33 | 0.277 |
| D | 5.15 BSC | | |
| D1 | 4.85 | 4.95 | 4.90 |
| D2 | 1.40 | 1.60 | 1.50 |
| D3 | - | - | 3.98 |
| E | 6.15 BSC | | |
| E1 | 5.75 | 5.85 | 5.80 |
| E2 | 3.56 | 3.76 | 3.66 |
| e | 1.27BSC | | |
| k | - | - | 1.27 |
| k1 | 0.56 | - | - |
| L | 0.51 | 0.71 | 0.61 |
| La | 0.51 | 0.71 | 0.61 |
| L1 | 0.05 | 0.20 | 0.175 |
| L4 | - | - | 0.125 |
| M | 3.50 | 3.71 | 3.605 |
| x | - | - | 1.400 |
| y | - | - | 1.900 |
| 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 (Type C)



| Dimensions | Value (in mm) |
|------------|---------------|
| C | 1.270 |
| G | 0.660 |
| G1 | 0.820 |
| X | 0.610 |
| X1 | 3.910 |
| X2 | 1.650 |
| X3 | 1.650 |
| X4 | 4.420 |
| Y | 1.270 |
| Y1 | 1.020 |
| Y2 | 3.810 |
| Y3 | 6.610 |

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