

60V 175°C DUAL N-CHANNEL ENHANCEMENT MODE MOSFET PowerDI5060-8

Product Summary

| BV _{DSS} | R _{DS(ON)} Max | I _D Max T _C = +25°C |
|-------------------|---|--|
| 60V | 25mΩ @ V _{GS} = 10V | 32A |
| 000 | $40 \text{m}\Omega$ @ $V_{GS} = 4.5 \text{V}$ | 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
- Wettable Flank for Improved Optical Inspection
- 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:

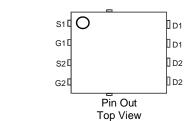
- Backlighting
- Power Management Functions
- DC-DC Converters

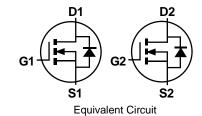
Mechanical Data

- Case: PowerDI[®]5060-8
- Case Material: Molded Plastic, "Green" Molding Compound.
 UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 3 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 | |
|------------------|------------------------------|------------------|--|
| DMNH6021SPDWQ-13 | PowerDI5060-8 (SWP) (Type R) | 2500/Tape & Reel | |

Notes:

- 1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
- 2. See http://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. Automotive products are AEC-Q101 qualified and are PPAP capable. Refer to https://www.diodes.com/quality/.
- 5. For packaging details, go to our website at https://www.diodes.com/design/support/packaging/diodes-packaging/.

Marking Information



Oll = Manufacturer's Marking
NH6021DW = Product Type Marking Code
YYWW = Date Code Marking
YY = Year (ex: 19 = 2019)
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 | $T_A = +25$ °C $T_A = +70$ °C | I _D | 8.2 6.5 | А |
| Continuous Drain Current (Note 8) $V_{GS} = 10V$ $T_C = +25^{\circ}C$ $T_C = +100^{\circ}C$ | | I _D | 32 22 | А |
| Pulsed Drain Current (380µs Pulse, Duty Cycle = 1%) | I _{DM} | 80 | А | |
| Maximum Continuous Body Diode Forward Current (Note 7) | | Is | 32 | А |
| Avalanche Current, L = 0.1mH (Note 9) | I _{AS} | 35 | Α | |
| Avalanche Energy, L = 0.1mH (Note 9) | E _{AS} | 64 | mJ | |

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

| Characteristic | | Symbol | Value | Unit |
|--|-------|----------------------------------|-------------|------|
| Total Power Dissipation (Note 6) | | P _D | 1.5 | W |
| Thermal Resistance, Junction to Ambient (Note 6) | | D | 99 | °C/W |
| Themai Resistance, sunction to Ambient (Note 0) | t<10s | R _{OJA} | 53 | C/VV |
| Total Power Dissipation (Note 7) | | P_{D} | 2.8 | W |
| Thermal Resistance, Junction to Ambient (Note 7) | | D | 54 | °C/W |
| Themal Resistance, sunction to Ambient (Note 1) | t<10s | $R_{\Theta JA}$ | 27 | C/VV |
| Thermal Resistance, Junction to Case (Note 8) | | R _{OJC} | 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.)

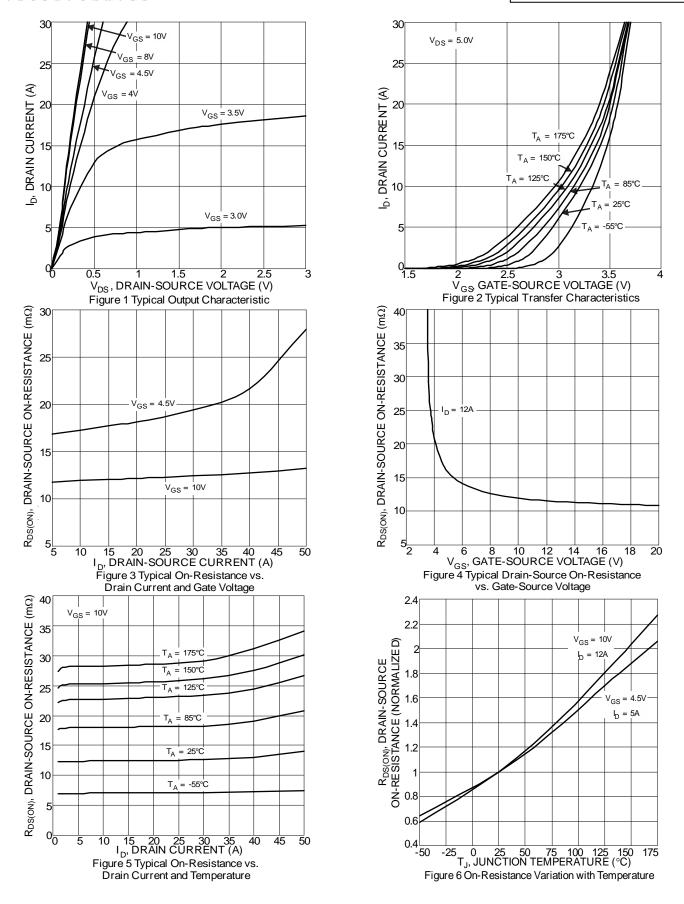
| Characteristic | Symbol | Min | Тур | Max | Unit | Test Condition | |
|--|---------------------|-----|-------|------|-------|--|--|
| OFF CHARACTERISTICS (Note 10) | | | | | • | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | 60 | _ | _ | V | $V_{GS} = 0V, I_D = 250\mu A$ | |
| Zero Gate Voltage Drain Current T _J = +25°C | I _{DSS} | _ | _ | 1 | μA | $V_{DS} = 60V, V_{GS} = 0V$ | |
| Gate-Source Leakage | I _{GSS} | _ | _ | ±100 | nA | $V_{GS} = \pm 20V, V_{DS} = 0V$ | |
| ON CHARACTERISTICS (Note 10) | | | | | | | |
| Gate Threshold Voltage | V _{GS(TH)} | 1 | _ | 3 | V | $V_{DS} = V_{GS}$, $I_D = 250\mu A$ | |
| Static Drain-Source On-Resistance | | _ | 15 | 25 | mΩ | $V_{GS} = 10V, I_D = 15A$ | |
| Static Dialii-Source Oil-Resistance | R _{DS(ON)} | _ | 21 | 40 | 11122 | 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 | 1,143 | _ | pF | V 25V V 2V | |
| Output Capacitance | Coss | _ | 168 | _ | pF | $V_{DS} = 25V, V_{GS} = 0V,$ f = 1MHz | |
| Reverse Transfer Capacitance | C _{rss} | _ | 69 | _ | pF | -T = TIMHZ | |
| Gate Resistance | Rg | _ | 2.5 | _ | Ω | $V_{DS} = 0V$, $V_{GS} = 0V$, $f = 1MHz$ | |
| Total Gate Charge (V _{GS} = 10V) | Qg | _ | 20.1 | _ | nC | | |
| Total Gate Charge (V _{GS} = 6V) | | _ | 12 | _ | nC | 7, 20,4, 20,4 | |
| Gate-Source Charge | Q _{gs} | _ | 4.3 | _ | nC | $V_{DS} = 30V, I_D = 20A,$ | |
| Gate-Drain Charge | Q _{gd} | _ | 5.5 | _ | nC | 1 | |
| Turn-On Delay Time | t _{D(ON)} | | 4.4 | _ | ns | | |
| Turn-On Rise Time | t _R | - | 6.0 | _ | ns | $V_{DD} = 30V, V_{GS} = 10V,$ | |
| Turn-Off Delay Time | t _{D(OFF)} | - | 14.2 | _ | ns | $R_{g} = 4.7\Omega, I_{D} = 20A$ | |
| Turn-Off Fall Time | t _F | | 5.4 | _ | ns | | |
| Body Diode Reverse Recovery Time | t _{RR} | _ | 21.2 | _ | ns | 1 200 4:/44 4000///- | |
| Body Diode Reverse Recovery Charge | Q_{RR} | 1 | 15.2 | _ | nC | - I _F =20A, di/dt=100A/μs | |

Notes:

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

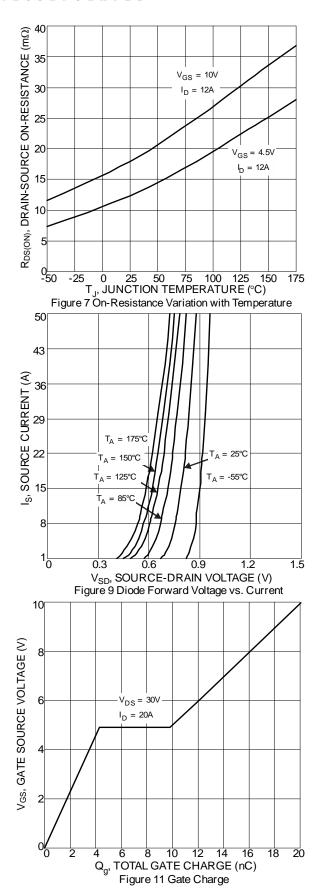












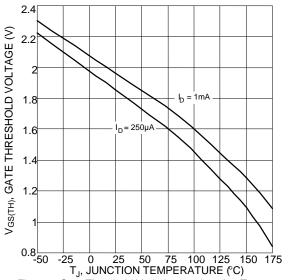
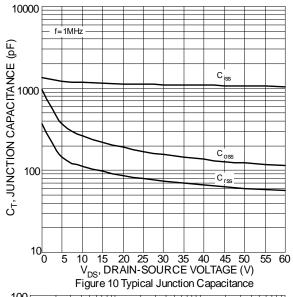
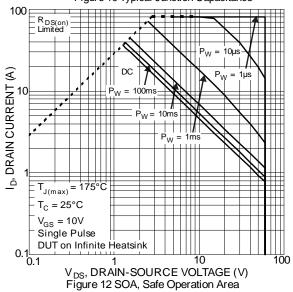


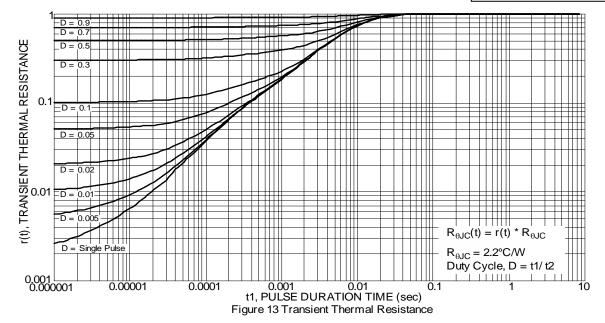
Figure 8 Gate Threshold Variation vs. Junction Temperature









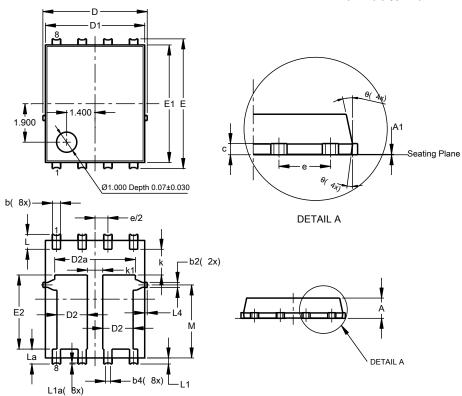




Package Outline Dimensions

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

PowerDI5060-8 (SWP) (Type R)

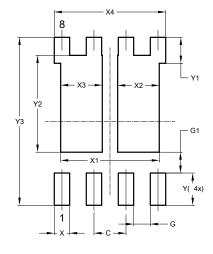


| PowerDI5060-8 (SWP) | | | | | | |
|----------------------|-----------|---------|-------|--|--|--|
| (Type R) | | | | | | |
| Dim | Min Max | | Тур | | | |
| Α | 0.90 | 1.10 | 1.00 | | | |
| A1 | 0 | 0.05 | - | | | |
| b | 0.30 | 0.50 | 0.41 | | | |
| b2 | 0.20 | 0.35 | 0.25 | | | |
| b4 | |).25REF | = | | | |
| С | 0.230 | 0.330 | 0.277 | | | |
| D | 5 | .15 BS0 |) | | | |
| D1 | 4.70 | 5.10 | 4.90 | | | |
| D2 | 1.40 | 1.60 | 1.50 | | | |
| D2a | 3.78 4.18 | | 3.98 | | | |
| Е | 6 | .40 BS0 | 2 | | | |
| E1 | 5.60 | 6.00 | 5.80 | | | |
| E2 | 3.46 | 3.86 | 3.66 | | | |
| е | 1 | .27BSC |) | | | |
| k | 1.05 | | - | | | |
| k1 | 0.56 | | | | | |
| 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 | | | |
| 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 (SWP) (Type R)



| Dimensions | Value (in mm) | | |
|------------|------------------|--|--|
| С | 1.270 | | |
| G | 0.660 | | |
| G1 | 0.820 | | |
| X | 0.610 | | |
| X1 | 3.910 | | |
| X2 | 1.650 | | |
| Х3 | 1.650 | | |
| X4 | 4.420 | | |
| Y | 1.270 | | |
| Y1 | 1.020 | | |
| Y2 | 3.810 | | |
| Y3 | 6.610 | | |



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