



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

Product Summary

| V _{(BR)DSS} | R _{DS(ON)} Max | I _D Max T _C = +25°C |
|----------------------|-------------------------------|--|
| 60V | $25m\Omega @ V_{GS} = 10V$ | 32A |
| | 40mΩ @ V _{GS} = 4.5V | 25A |

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

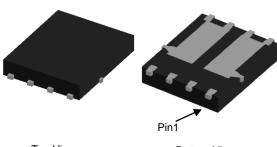
- Backlighting
- Power Management Functions
- DC-DC Converters

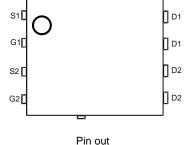
Features and Benefits

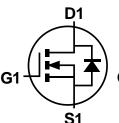
- Rated to +175°C Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching Ensures More Reliable and Robust End Application
- High Conversion Efficiency
- Low R_{DS(ON)} Minimizes On-State Losses
- Low Input Capacitance
- Fast Switching Speed
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)
- Halogen and Antimony Free. "Green" Device (Note 3)
- Qualified to AEC-Q101 Standards for High Reliability
- An Automotive-Complaint Part is Available Under Separate Datasheet (<u>DMNH6021SPDQ</u>)

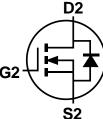
Mechanical Data

- 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)









Top View Bottom View

Top View Equivalent Circuit

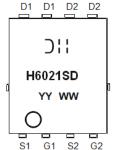
Ordering Information (Note 4)

| Part Number | Case | Packaging | |
|----------------|------------------------|-------------------|--|
| DMNH6021SPD-13 | PowerDI5060-8 (Type C) | 2,500/Tape & Reel | |

Notes:

- 1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
- 2. Halogen and Antimony free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
- 3. 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
- 4. For packaging details, go to our website at http://www.diodes.com/products/packages.html.

Marking Information



);; = Manufacturer's Marking H6021SD = Product Type Marking Code YYWW = Date Code Marking YY = Year (ex: 16 = 2016) WW = Week (01 - 53)



Maximum Ratings (@ $T_A = +25^{\circ}C$, 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 6) $V_{GS} = 10V$ $T_A = +25^{\circ}C$ $T_A = +70^{\circ}C$ | | I _D | 8.2 6.5 | А |
| Continuous Drain Current (Note 7) $V_{GS} = 10V$ $T_C = +25^{\circ}C$ $T_C = +100^{\circ}C$ | | I _D | 32 22 | А |
| Pulsed Drain Current (380µs Pulse, Duty Cycle = 1%) | I _{DM} | 80 | Α | |
| Maximum Continuous Body Diode Forward Current (Note 7) | I _S | 32 | Α | |
| Avalanche Current, L = 0.1mH (Note 8) | I _{AS} | 35 | Α | |
| Avalanche Energy, L = 0.1mH (Note 8) | E _{AS} | 64 | mJ | |

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

| Characteristic | Symbol | Value | Units | |
|--|--------------|-----------------------------------|-------------|------|
| Total Power Dissipation (Note 5) | | P _D | 1.5 | W |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady State | R _{θJA} | 99 | °C/W |
| Thermal Resistance, Junction to Ambient (Note 5) | t<10s | | 53 | |
| Total Power Dissipation (Note 6) | | P _D | 2.8 | W |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady State | D | 54 | °C/W |
| Thermal Resistance, Junction to Ambient (Note 6) | t<10s | $R_{\theta JA}$ | 27 | |
| Thermal Resistance, Junction to Case (Note 7) | | $R_{	heta JC}$ | 2.2 | °C/W |
| Operating and Storage Temperature Range | | T _J , T _{STG} | -55 to +175 | °C |

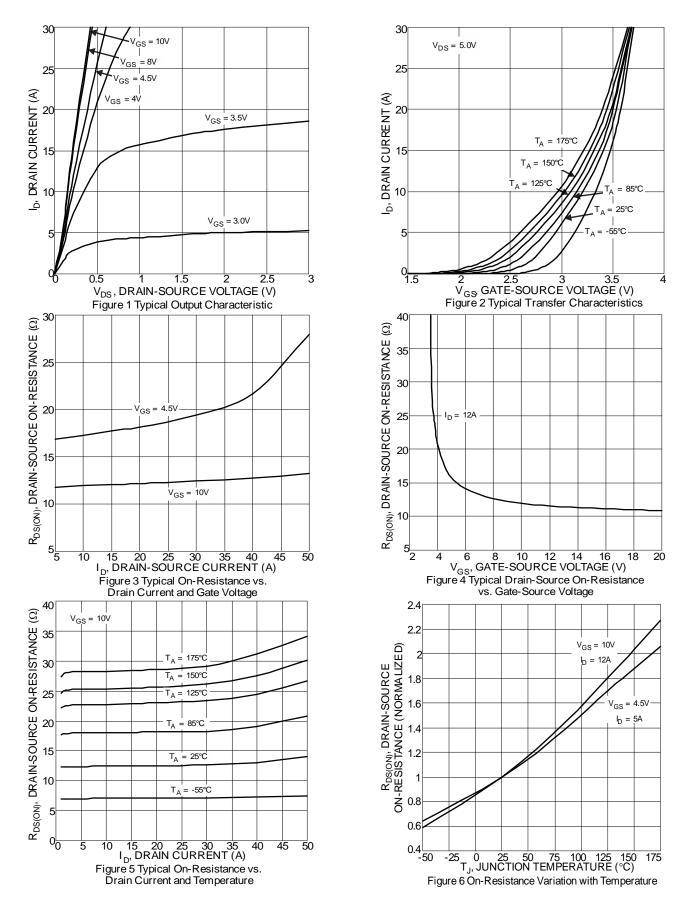
Electrical Characteristics (@ $T_A = \pm 25$ °C, unless otherwise specified.)

| Characteristic | Symbol | Min | Тур | Max | Unit | Test Condition | |
|--|---------------------|-----|-------|------|------|--|--|
| OFF CHARACTERISTICS (Note 9) | | | | | | | |
| Drain-Source Breakdown Voltage | | 60 | _ | _ | V | $V_{GS} = 0V, I_D = 250\mu A$ | |
| Zero Gate Voltage Drain Current T _J = +25°C | I _{DSS} | _ | _ | 1 | μΑ | V _{DS} = 60V, V _{GS} = 0V | |
| Gate-Source Leakage | | _ | _ | ±100 | nA | $V_{GS} = \pm 20V, V_{DS} = 0V$ | |
| ON CHARACTERISTICS (Note 9) | | | • | • | • | • | |
| Gate Threshold Voltage | V _{GS(TH)} | 1 | _ | 3 | V | $V_{DS} = V_{GS}$, $I_D = 250\mu A$ | |
| Static Drain-Source On-Resistance | Б | _ | 15 | 25 | 0 | V _{GS} = 10V, I _D = 15A | |
| Static Drain-Source On-Resistance | R _{DS(ON)} | _ | 21 | 40 | mΩ | 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 10) | | | | | • | • | |
| Input Capacitance | C _{ISS} | _ | 1,143 | _ | pF | V 051/ 1/ 01/ | |
| Output Capacitance | Coss | _ | 168 | _ | pF | $V_{DS} = 25V, V_{GS} = 0V,$ - f = 1MHz | |
| Reverse Transfer Capacitance | C _{RSS} | _ | 69 | _ | pF | 1 = 1101112 | |
| Gate Resistance | Rg | _ | 2.1 | _ | Ω | $V_{DS} = 0V$, $V_{GS} = 0V$, $f = 1MHz$ | |
| Total Gate Charge (V _{GS} = 10V) | Q_G | _ | 20.1 | _ | nC | | |
| Total Gate Charge (V _{GS} = 6V) | Q _G | _ | 12 | _ | nC | 1.,, | |
| 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 | $V_{DD} = 30V, V_{GS} = 10V,$ $R_G = 4.7\Omega, , I_D = 20A$ | |
| 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 | 1= "/"/ | |
| Body Diode Reverse Recovery Charge | Q _{RR} | _ | 15.2 | _ | nC | | |

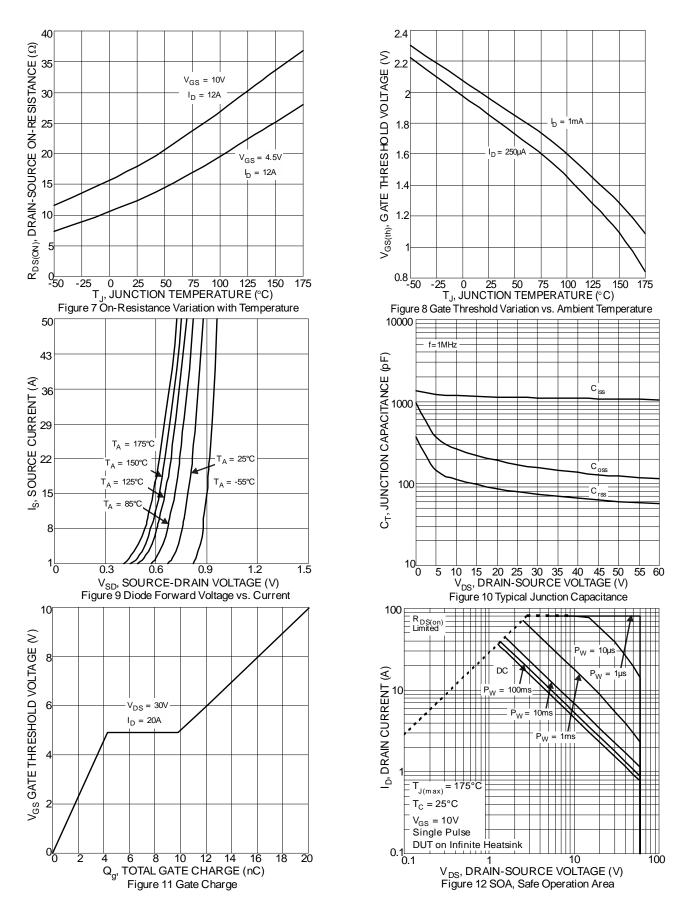
Notes: 5. Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.

- 6. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate.
- 7. Thermal resistance from junction to soldering point (on the exposed drain pad).
- 8. IAS and EAS rating 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.





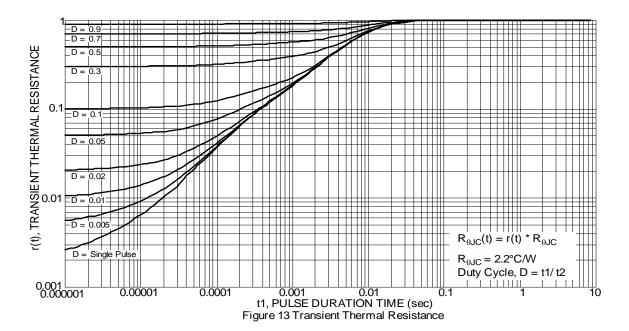




June 2016

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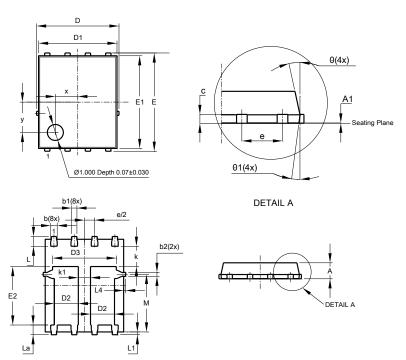




Package Outline Dimensions

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

PowerDI5060-8 (Type C)

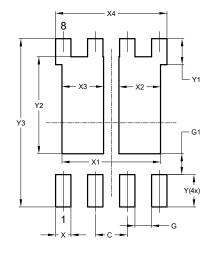


| PowerDI5060-8 (Type C) | | | | |
|------------------------|-------|--------|-------|--|
| Dim | Min | Тур | | |
| Α | 0.90 | 1.10 | 1.00 | |
| A1 | 0 | 0.05 | 0.02 | |
| b | 0.33 | 0.51 | 0.41 | |
| b1 | 0.300 | 0.366 | 0.333 | |
| b2 | 0.20 | 0.35 | 0.25 | |
| С | 0.23 | 0.33 | 0.277 | |
| D | 5 | .15 BS | 2 | |
| D1 | 4.85 | 4.95 | 4.90 | |
| D2 | 1.40 | 1.60 | 1.50 | |
| D3 | • | - | 3.98 | |
| Е | 6 | .15 BS | 2 | |
| E1 | 5.75 | 5.85 | 5.80 | |
| E2 | 3.56 | 3.76 | 3.66 | |
| е | 1 | .27BS0 | | |
| 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 | |
| М | 3.50 | 3.71 | 3.605 | |
| х | - | - | 1.400 | |
| у | - | - | 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) | | |
|------------|------------------|--|--|
| 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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Офис по работе с юридическими лицами:

105318, г. Москва, ул. Щербаковская д. 3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:

moschip.ru moschip.ru_6 moschip.ru 4 moschip.ru 9