



# 40V 175°C DUAL N-CHANNEL ENHANCEMENT MODE MOSFET PowerDI

## **Product Summary**

BV <sub>DSS</sub>	R <sub>DS(ON)</sub> Max	I <sub>D</sub> Max T <sub>C</sub> = +25°C (Note 10)
40V	$8.6 m\Omega @ V_{GS} = 10V$	45A

## **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:

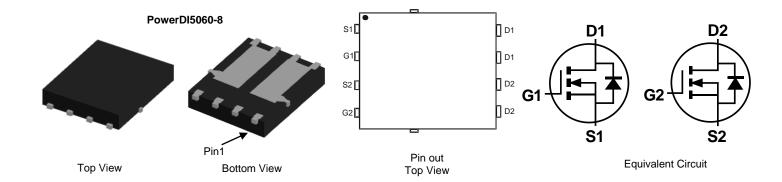
- Backlighting
- Power Management Functions
- DC-DC Converters

#### **Features and Benefits**

- Rated to +175°C Ideal for High Ambient Temperature Environments
- High Conversion Efficiency
- Low R<sub>DS(ON)</sub> 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)

#### **Mechanical Data**

- Case: PowerDI<sup>®</sup>5060-8
- Case Material: Molded Plastic, "Green" Molding Compound.
   UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish Matte Tin Annealed over Copper Leadframe.
   Solderable per MIL-STD-202, Method 208 (2)
- Weight: 0.097 grams (Approximate)



## Ordering Information (Note 5)

Part Number	Case	Packaging		
DMTH4007SPDQ-13	PowerDI5060-8	2,500/Tape & Reel		

Notes:

- 1. 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.
- 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. Please refer to http://www.diodes.com/product\_compliance\_definitions.html.
- 5. For packaging details, go to our website at http://www.diodes.com/products/packages.html.



## **Marking Information**



);; = Manufacturer's Marking
H4007SD = Product Type Marking Code
YYWW = Date Code Marking
YY = Year (ex: 15 = 2015)
WW = Week (01 - 53)

## Maximum Ratings (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Units	
Drain-Source Voltage	V <sub>DSS</sub>	40	V	
Gate-Source Voltage	V <sub>GSS</sub>	±20	V	
Continuous Drain Current (Note 7)	T <sub>C</sub> = +25°C (Note 10)	I <sub>D</sub>	45	А
	$T_{C} = +100^{\circ}C$		38.1	
Continuous Drain Current (Note 6)	$T_A = +25$ °C $T_A = +70$ °C	I <sub>D</sub>	14.2 11.9	А
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)	I <sub>DM</sub>	90	А	
Maximum Continuous Body Diode Forward Current (Note 7)	Is	34	A	
Avalanche Current, L = 0.1mH	I <sub>AS</sub>	20	A	
Avalanche Energy, L = 0.1mH	E <sub>AS</sub>	20	mJ	

### **Thermal Characteristics**

Characteristic	Symbol	Value	Unit	
Total Power Dissipation (Note 6) $T_A = +25^{\circ}C$		P <sub>D</sub>	2.6	W
Thermal Resistance, Junction to Ambient (Note 6)	$R_{\theta JA}$	57	°C/W	
Total Power Dissipation (Note 7) $T_C = +25^{\circ}C$		P <sub>D</sub>	37.5	W
Thermal Resistance, Junction to Case (Note 7)	$R_{\theta JC}$	4	°C/W	
Operating and Storage Temperature Range	$T_{J_i}T_{STG}$	-55 to +175	°C	

Notes: 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).

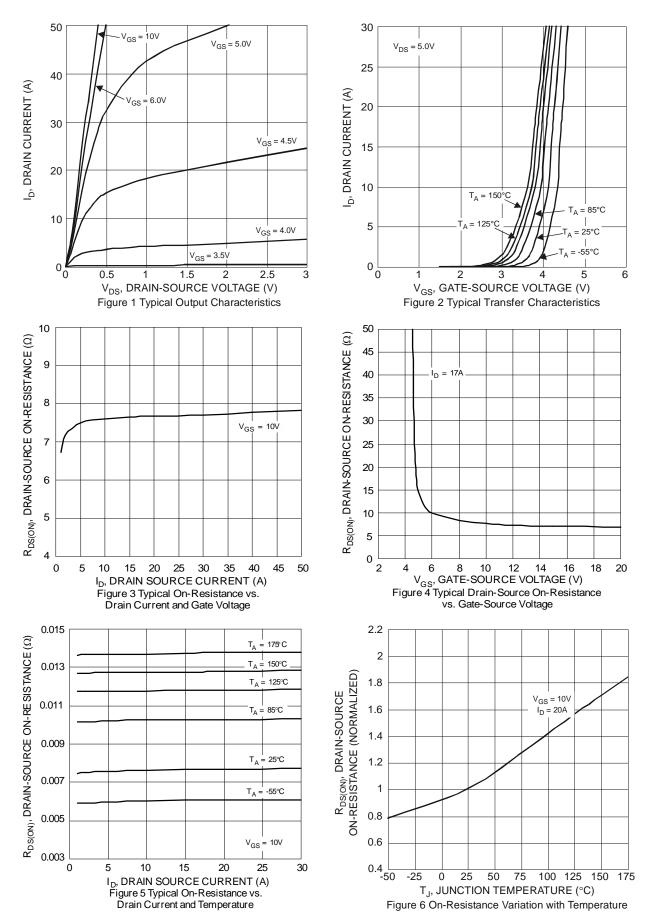


## **Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

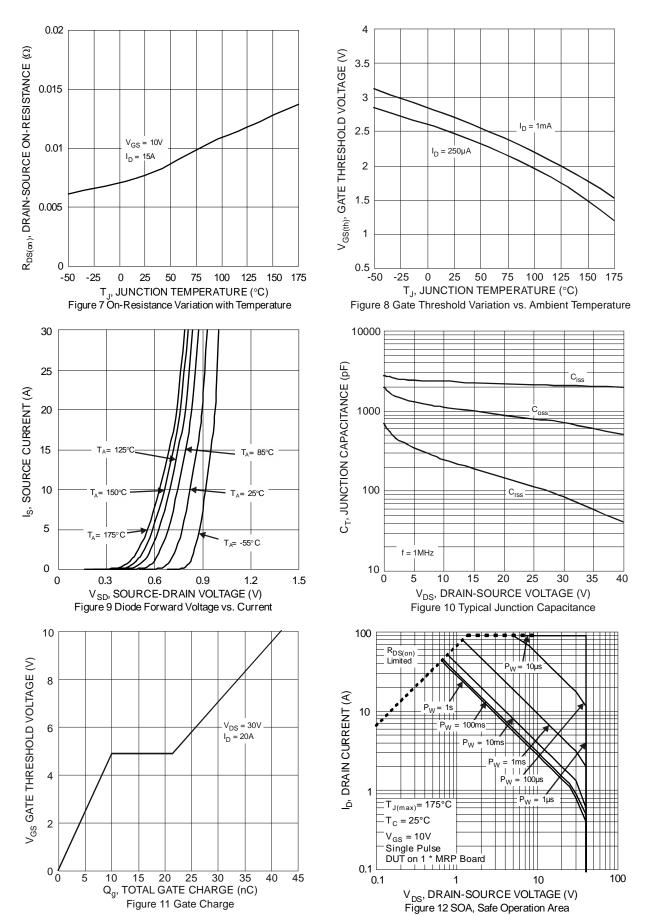
Characteristic	Symbol	Min	Тур	Max	Unit	Test Condition	
OFF CHARACTERISTICS (Note 8)							
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	40	_	_	V	$V_{GS} = 0V$ , $I_D = 1mA$	
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	1	_	1	μΑ	$V_{DS} = 32V$ , $V_{GS} = 0V$	
Gate-Source Leakage	I <sub>GSS</sub>	1	_	±100	nA	$V_{GS} = \pm 20V, V_{DS} = 0V$	
ON CHARACTERISTICS (Note 8)							
Gate Threshold Voltage	V <sub>GS(TH)</sub>	2	_	4	V	$V_{DS} = V_{GS}$ , $I_D = 250\mu A$	
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	1	7.5	8.6	mΩ	$V_{GS} = 10V, I_D = 17A$	
Diode Forward Voltage	$V_{SD}$	1	0.85	1	V	$V_{GS} = 0V, I_{S} = 17A$	
DYNAMIC CHARACTERISTICS (Note 9)							
Input Capacitance	C <sub>ISS</sub>	1	2,026	_	pF	$V_{DS} = 30V, V_{GS} = 0V,$ f = 1MHz	
Output Capacitance	Coss	l	702	1	рF		
Reverse Transfer Capacitance	C <sub>RSS</sub>	l	84.8	1	рF		
Gate Resistance	R <sub>G</sub>	_	0.46	_	Ω	$V_{DS} = 0V$ , $V_{GS} = 0V$ , $f = 1MHz$	
Total Gate Charge	$Q_{G}$	1	41.9	_	nC		
Gate-Source Charge	Q <sub>GS</sub>	_	10	_	nC	$V_{DS} = 30V, I_{D} = 20A, V_{GS} = 10V$	
Gate-Drain Charge	$Q_{GD}$	_	11.5	_	nC		
Turn-On Delay Time	t <sub>D(ON)</sub>	_	7	_	ns		
Turn-On Rise Time	t <sub>R</sub>	_	11.5	_	ns	$V_{DD} = 30V, V_{GS} = 10V,$ $I_{D} = 20A, R_{G} = 3\Omega$	
Turn-Off Delay Time	t <sub>D(OFF)</sub>	_	15.6	_	ns		
Turn-Off Fall Time	t <sub>F</sub>	_	8.8	_	ns		
Body Diode Reverse Recovery Time	t <sub>RR</sub>	_	29.9	_	ns	I_ 200 di/dt 1000/up	
Body Diode Reverse Recovery Charge	Q <sub>RR</sub>	1	23		nC	-I <sub>F</sub> = 20A, di/dt = 100A/μs	

Short duration pulse test used to minimize self-heating effect.
 Guaranteed by design. Not subject to product testing.
 Package limited.

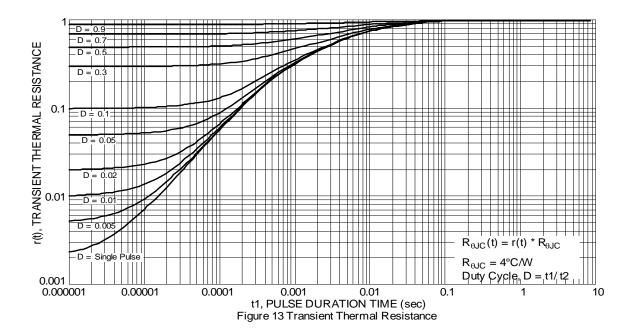










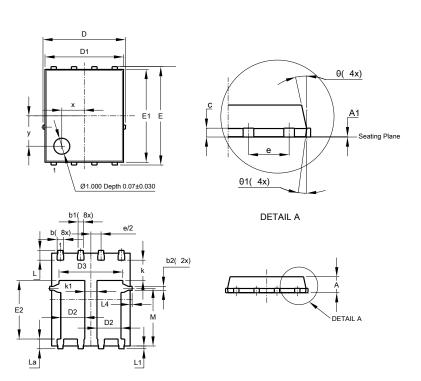




## **Package Outline Dimensions**

Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for the latest version.

## PowerDI5060-8 (Type C)

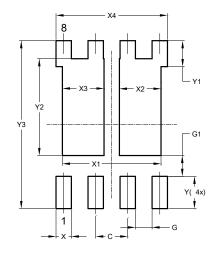


PowerDI5060-8 (Type C)					
Dim	Min	Тур			
Α	0.90	1.10	1.00		
A1	0	0.05	0.02		
b	0.33	0.51	0.41		
b1	0.300	0.366	0.333		
b2	0.20	0.35	0.25		
С	0.23	0.33	0.277		
D	5	.15 BS0	2		
D1	4.85	4.95	4.90		
D2	1.40	1.60	1.50		
D3	1				
Е	6.15 BSC				
E1	5.75	5.85	5.80		
E2	3.56	3.76	3.66		
е	1.27BSC				
k	1	-	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	1	-	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 AP02001 at http://www.diodes.com/datasheets/ap02001.pdf for the latest version.

#### PowerDI5060-8 (Type C)



Dimensions	Value				
	(in mm)				
С	1.270				
G	0.660				
G1	0.820				
Χ	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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