



175°C 60V DUAL P-CHANNEL ENHANCEMENT MODE MOSFET POWERDI

Product Summary

BV _{DSS}	RDS(ON) Max	I _D T _C = +25°C
601/	$48mΩ @ V_{GS} = -10V$	-26A
-60V	$60m\Omega$ @ $V_{GS} = -4.5V$	-23A

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:

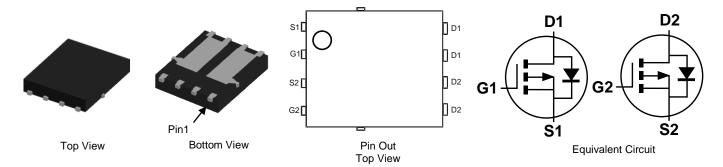
- Engine Management Systems
- Body Control Electronics
- DC-DC Converters

Features

- Rated to +175°C ideal for high ambient temperature environments
- 100% Unclamped Inductive Switching ensures more reliable and robust end application
- Low R_{DS(ON)} minimises power losses
- Low Qg minimises switching losses
- 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: PowerDI5060-8 (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)



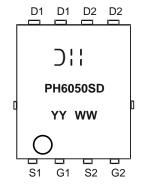
Ordering Information (Note 5)

Part Number	Case	Packaging
DMPH6050SPDQ-13	PowerDI5060-8 (Type C)	2500 / 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. 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 PH6050SD = Product Type Marking Code YYWW = Date Code Marking YY = Year (ex: 16 = 2016) WW = Week (01 to 53)



Maximum Ratings (@ $T_A = +25^{\circ}C$, 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	Steady State	$T_A = +25^{\circ}C$ $T_A = +100^{\circ}C$	I _D	-6.3 -4.4	А
Continuous Drain Current (Note 8) V _{GS} = -10V	I _D	-26 -18	А		
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)			I _{DM}	-40	Α
Maximum Continuous Body Diode Forward Current (Note 7)			Is	-2.0	Α
Avalanche Current (Note 9) L = 0.1mH			I _{AS}	-21	А
Avalanche Energy (Note 9) L = 0.1mH			E _{AS}	30	mJ

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

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 6)	$T_A = +25$ °C	P _D	1.5	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady state	D.	100	°C/W
Thermal Resistance, Junction to Ambient (Note 6)	t<10s	$R_{\theta JA}$	53	
Total Power Dissipation (Note 7)	$T_A = +25$ °C	P _D	2.8	W
Thermal Resistance, Junction to Ambient (Note 7)	Steady state	D	52	°C/W
Thermal Resistance, Junction to Ambient (Note 1)	t<10s	$R_{\theta JA}$	27	
Thermal Resistance, Junction to Case (Note 8)		$R_{\theta JC}$	2.9	
Operating and Storage Temperature Range		T _{J,} T _{STG}	-55 to +175	°C

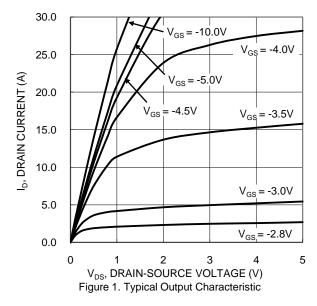
Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

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)}	-1.0	_	-3.0	V	$V_{DS} = V_{GS}, I_{D} = -250 \mu A$	
Static Drain-Source On-Resistance	D		36	48	mΩ	$V_{GS} = -10V, I_D = -5A$	
Static Dialit-Source Off-Resistance	R _{DS(ON)}		44	60	11122	$V_{GS} = -4.5V, I_D = -4A$	
Diode Forward Voltage	V _{SD}	_	-0.7	-1.2	V	$V_{GS} = 0V$, $I_{S} = -1A$	
DYNAMIC CHARACTERISTICS (Note 11)							
Input Capacitance	C _{iss}	_	1525	_	pF), oo, , , o, ,	
Output Capacitance	Coss	_	90	_	pF	$V_{DS} = -30V, V_{GS} = 0V,$ -f = 1.0MHz	
Reverse Transfer Capacitance	C _{rss}	_	70	_	pF	1 = 1.0IVII 12	
Gate Resistance	Rg	_	16	_	Ω	$V_{DS} = 0V$, $V_{GS} = 0V$, $f = 1MHz$	
Total Gate Charge (V _{GS} = -4.5V)	Q_{g}	_	14.5	_	nC		
Total Gate Charge (V _{GS} = -10V)	Q_g	_	30.6	_	nC	V 20V I 5A	
Gate-Source Charge	Q_{gs}	_	4.9	_	nC	$V_{DS} = -30V, I_{D} = -5A$	
Gate-Drain Charge	Q_{gd}	_	5.2	_	nC		
Turn-On Delay Time	t _{D(ON)}	_	5.3	_	ns		
Turn-On Rise Time	t _R	_	15.4	_	ns	$V_{GS} = -10V, V_{DS} = -30V,$	
Turn-Off Delay Time	t _{D(OFF)}	_	79.2		ns	$R_G = 3\Omega$, $I_D = -5A$	
Turn-Off Fall Time	t _F	_	45.3	_	ns	1	
Body Diode Reverse Recovery Time	t _{RR}	_	15.2	_	ns	I _F = -5A, di/dt = -100A/μs	
Body Diode Reverse Recovery Charge	Q _{RR}	_	9.3	_	nC	$I_F = -5A$, di/dt = -100A/ μ s	

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.





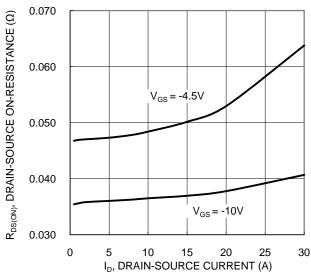


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

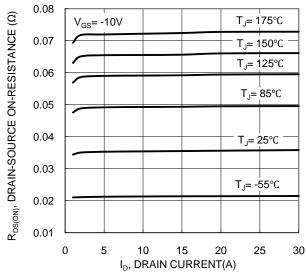


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

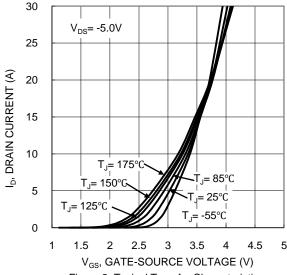
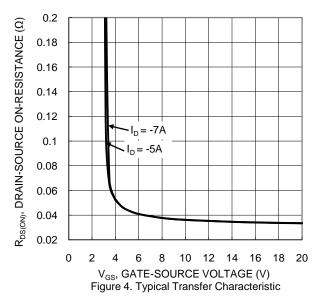


Figure 2. Typical Transfer Characteristic



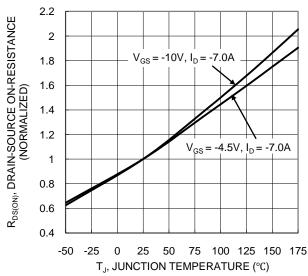


Figure 6. On-Resistance Variation with Temperature



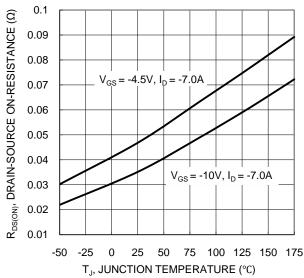
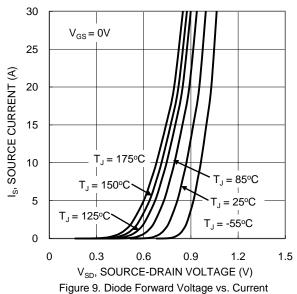
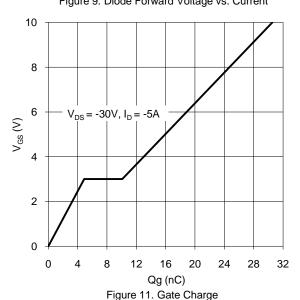


Figure 7. On-Resistance Variation with Temperature





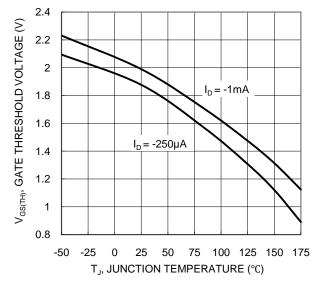
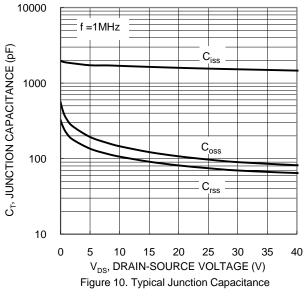
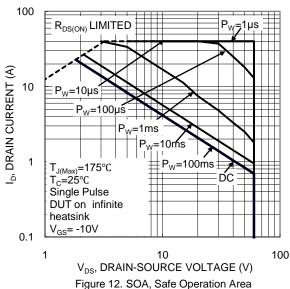


Figure 8. Gate Threshold Variation vs Temperature







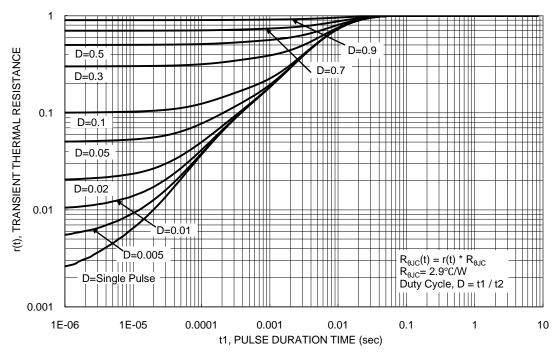


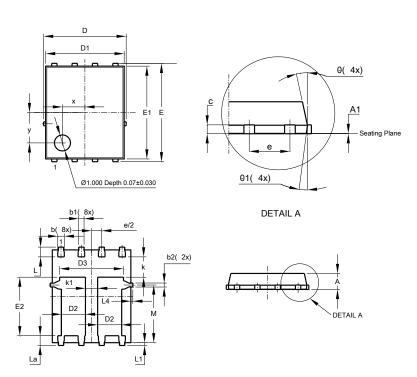
Figure 13. Transient Thermal Resistance



Package Outline Dimensions

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

PowerDI5060-8 (Type C)

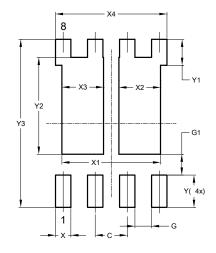


PowerDI5060-8 (Type C)				
Dim	Min	Тур		
Α	0.90	1.10	1.00	
A 1	0	0.05	0.02	
b	0.33	0.51	0.41	
b1	0.300	0.366	0.333	
b2	0.20	0.35	0.25	
С	0.23	0.33	0.277	
D	5	.15 BS0	2	
D1	4.85	4.95	4.90	
D2	1.40	1.60	1.50	
D3	-	-	3.98	
Е	6	.15 BS0	2	
E1	5.75	5.85	5.80	
E2	3.56	3.76	3.66	
е	1	.27BS0		
k	-	-	1.27	
k1	0.56	-	-	
L	0.51	0.71	0.61	
La	0.51	0.71	0.61	
L1	0.05	0.20	0.175	
L4	-			
M	3.50	3.71	3.605	
х	-	-		
у	-	-	1.900	
θ	10° 12°		11°	
θ1	6° 8° 7°		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				
פווטופווזטוווט	(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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