

#### P-CHANNEL ENHANCEMENT MODE MOSFET POWERDI® 5060-8

#### **Product Summary**

V <sub>(BR)DSS</sub>	R <sub>DS(ON)</sub>	I <sub>D</sub> T <sub>C</sub> = +25°C	
-30V	$9m\Omega$ @ $V_{GS}$ = -10 $V$	-45A	
	$12m\Omega$ @ $V_{GS} = -4.5V$	-35A	

# **Description and Applications**

This new generation 30V P-Channel Enhancement Mode MOSFET has been designed to minimize  $R_{\text{DS(ON)}}$  and yet maintain superior switching performance. This device is ideal for use in Notebook battery power management and loadswitch.

- Notebook Battery Power Management
- DC-DC Converters
- Loadswitch

### **Features and Benefits**

- Thermally Efficient Package-Cooler Running Applications
- High Conversion Efficiency
- Low <sub>RDS(ON)</sub> Minimizes On State Losses
- Low Input Capacitance
- Fast Switching Speed
- <1.1mm Package Profile Ideal for Thin Applications</li>
- ESD HBM Protected up to 1kV
- 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

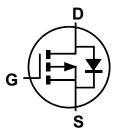
#### **Mechanical Data**

- Case: POWERDI5060-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram Below
- Weight: 0.097 grams (approximate)

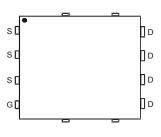


Top View

**Bottom View** 



Internal Schematic



Top View Pin Configuration

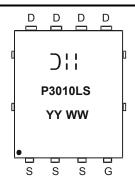
# Ordering Information (Note 4)

1	Part Number	Case	Packaging
	DMP3012LPS-13	POWERDI5060-8	2500 / Tape & Reel

Notes:

- 1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant
- 2. 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. For packaging details, go to our website at http://www.diodes.com/products/packages.html.

# **Marking Information**



);; = Manufacturer's Marking
P3012LS = Product Type Marking Code
YYWW = Date Code Marking
YY = Year (ex: 13 = 2013)
WW = Week (01 - 53)



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

Characteristic			Symbol	Value	Unit
Drain-Source Voltage	V <sub>DSS</sub>	-30	V		
Gate-Source Voltage			$V_{GSS}$	±20	V
Continuous Drain Current (Note 6) V <sub>GS</sub> = -10V	Steady State	$T_A = +25^{\circ}C$ $T_A = +70^{\circ}C$	I <sub>D</sub>	13.2 10.5	А
Continuous Drain Current (Note 6) V <sub>GS</sub> = -4.5V	I <sub>D</sub>	11.4 9.1	А		
Pulsed Drain Current (Notes 6)	I <sub>DM</sub>	-100	Α		
Avalanche Current (Notes 7) L = 1mH			I <sub>AR</sub>	-24	Α
Avalanche Energy (Notes 7) L = 1mH			E <sub>AR</sub>	292	mJ

#### **Thermal Characteristics**

Characteristic	Symbol	Value	Unit
Power Dissipation (Note 5)	P <sub>D</sub>	1.29	W
Thermal Resistance, Junction to Ambient @ T <sub>A</sub> = +25°C (Note 5)	$R_{\theta JA}$	97	°C/W
Power Dissipation (Note 6)	P <sub>D</sub>	2.36	W
Thermal Resistance, Junction to Ambient @ T <sub>A</sub> = +25°C (Note 6)	$R_{ heta JA}$	53	°C/W
Thermal Resistance, Junction to Case @ T <sub>C</sub> = +25°C (Notes 6)	$R_{ heta JC}$	4.0	°C/W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

# Electrical Characteristics (@TA = +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>	-30	1		V	$V_{GS} = 0V, I_D = -250\mu A$	
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	_	_	-1.0	μA	V <sub>DS</sub> = -30V, V <sub>GS</sub> = 0V	
Gate-Source Leakage	$I_{GSS}$	_	_	±100	nA	$V_{GS} = \pm 20V, V_{DS} = 0V$	
ON CHARACTERISTICS (Note 8)							
Gate Threshold Voltage	V <sub>GS(th)</sub>	-1.1	-1.6	-2.1	<b>V</b>	$V_{DS} = V_{GS}, I_{D} = -250 \mu A$	
Static Drain-Source On-Resistance	Pro (OV)	1	7.5	9.0	mΩ	$V_{GS} = -10V, I_D = -10A$	
Static Drain-Source On-Nesistance	R <sub>DS (ON)</sub>	l	8.5	12.0	11152	$V_{GS} = -4.5V, I_D = -10A$	
Forward Transfer Admittance	Y <sub>fs</sub>	l	30		S	$V_{DS} = -15V, I_{D} = -10A$	
Diode Forward Voltage	$V_{SD}$	_	-0.65	-1.0	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = -1A	
DYNAMIC CHARACTERISTICS (Note 9)							
Input Capacitance	C <sub>iss</sub>	-	6807	_	pF	457777 077	
Output Capacitance	Coss	-	988	_	pF	$V_{DS} = 15V, V_{GS} = 0V,$ f = 1.0MHz	
Reverse Transfer Capacitance	Crss	_	647	_	pF	1 - 1.000112	
Gate Resistance	$R_g$	_	6.2	_	Ω	$V_{DS} = 0V$ , $V_{GS} = 0V$ , $f = 1MHz$	
Total Gate Charge (V <sub>GS</sub> = -10V)	$Q_g$	_	139	_	nC		
Total Gate Charge (V <sub>GS</sub> = -4.5V)	$Q_g$	_	66	_	nC	\/ = 15\/  - = 10A	
Gate-Source Charge	Qgs	_	19	_	nC	V <sub>DS</sub> = -15V, I <sub>D</sub> = -10A	
Gate-Drain Charge	$Q_{gd}$	_	21	_	nC		
Turn-On Delay Time	$t_{D(on)}$	_	8.9	_	ns		
Turn-On Rise Time	t <sub>r</sub>		10.5	_	ns	$V_{DS}$ = -15V, $V_{GEN}$ = -10V, $R_{G}$ = 6 $\Omega$ , $I_{D}$ = -1A	
Turn-Off Delay Time	t <sub>D(off)</sub>		254	_	ns		
Turn-Off Fall Time	t <sub>f</sub>	_	95	_	ns		

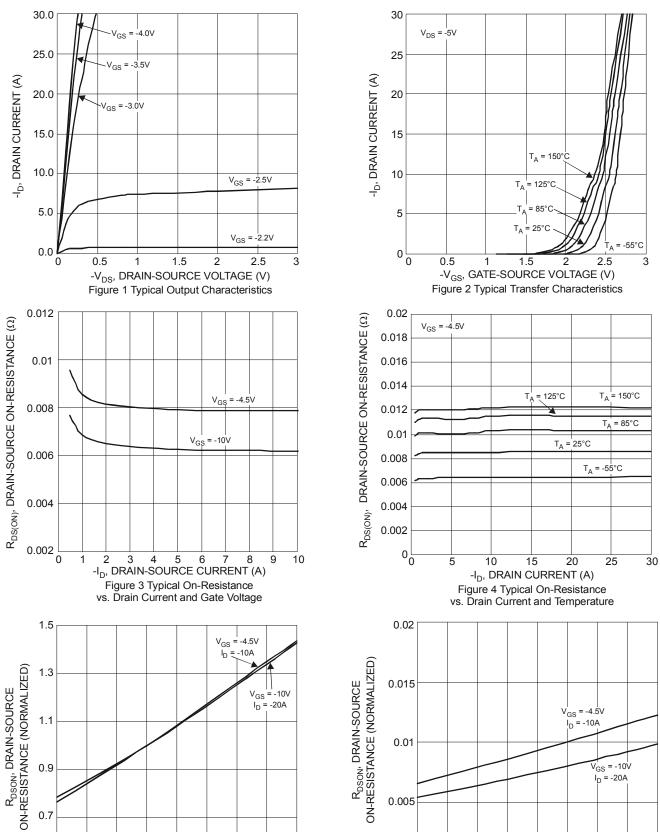
Notes: 5. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.

6. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.

7. Ias and Eas rating are based on low frequency and duty cycles to keep  $T_J = 25^{\circ}$ C 8. Short duration pulse test used to minimize self-heating effect.

9. Guaranteed by design. Not subject to product testing.





T<sub>A</sub>, AMBIENT TEMPERATURE (°C) Figure 5 On-Resistance Variation with Temperature

75

100

25

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0.005

-50

-25

25

50

T<sub>.I</sub>, JUNCTION TEMPERATURE (°C)

Figure 6 On-Resistance Variation with Temperature

75

125

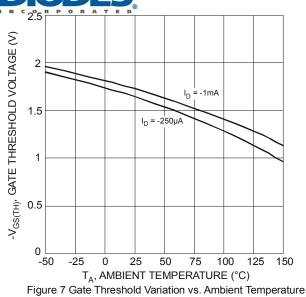
I<sub>D</sub> = -20A

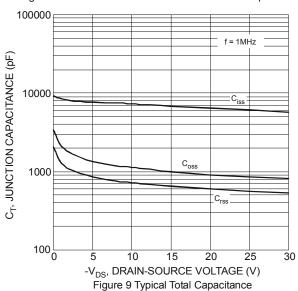
100

0.7

0.5

-50





30 25 -I<sub>S</sub>, SOURCE CURRENT (A) 20 15 10 T<sub>A</sub> = 25°C  $T_A = 85^{\circ}C$ 5 Γ<sub>A</sub> = -55<sup>6</sup>C 0 0 0.6 0.9 1.2 1.5 -V<sub>SD</sub>, SOURCE-DRAIN VOLTAGE (V) Figure 8 Diode Forward Voltage vs. Current

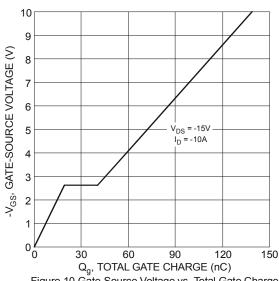
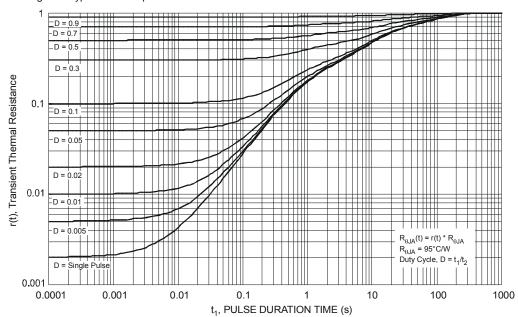


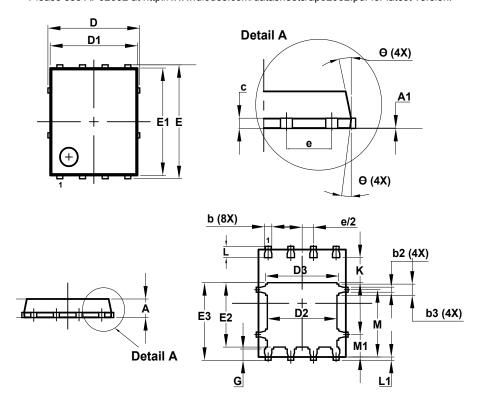
Figure 10 Gate-Source Voltage vs. Total Gate Charge





# **Package Outline Dimensions**

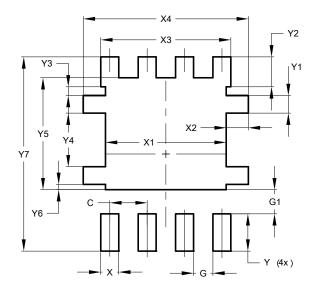
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.



POWERDI5060-8					
Dim	Min	Max	Тур		
Α	0.90	1.10	1.00		
<b>A</b> 1	0.00	0.05	1		
b	0.33	0.51	0.41		
b2	0.200	0.350	0.273		
b3	0.40	0.80	0.60		
С	0.230	0.330	0.277		
D	5	.15 BS	2		
D1	4.70	5.10	4.90		
D2	3.70	4.10	3.90		
D3	3.90	4.30	4.10		
Е	6	.15 BS0	$\Box$		
E1	5.60	6.00	5.80		
E2	3.28	3.68	3.48		
E3	3.99	4.39	4.19		
е	1	.27 BS0	$\Box$		
G	0.51	0.71	0.61		
K	0.51	-	-		
L	0.51	0.71	0.61		
L1	0.10	0.20	0.175		
М	3.235	4.035	3.635		
М1	1.00	1.40	1.21		
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.



Dimensions	Value (in mm)			
С	1.270			
G	0.660			
G1	0.820			
X	0.610			
X1	4.100			
X2	0.755			
Х3	4.420			
X4	5.610			
Υ	1.270			
Y1	0.600			
Y2	1.020			
Y3	0.295			
Y4	1.825			
Y5	3.810			
Y6	0.180			
Y7	6.610			



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