



# 20V P-CHANNEL ENHANCEMENT MODE MOSFET POWERDI®

#### **Product Summary**

V <sub>(BR)DSS</sub>	R <sub>DS(ON)</sub> Max	I <sub>D</sub> Max T <sub>C</sub> = +25°C	
-20V	$9.5 \text{m}\Omega$ @ $V_{GS} = -4.5 \text{V}$	-42A	
-20 V	12.5m $\Omega$ @ V <sub>GS</sub> = -2.5V	-42A	

#### **Description**

This MOSFET is designed to minimize the on-state resistance (R<sub>DS(ON)</sub>), yet maintain superior switching performance, making it ideal for high efficiency power management applications.

#### **Applications**

- Load Switch
- Power Management Functions

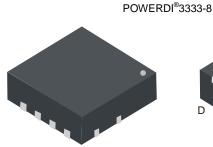
#### **Features**

- Low R<sub>DS(ON)</sub> Ensures On State Losses Are Minimized
- Small Form Factor Thermally Efficient Package Enables Higher Density End Products
- Occupies Just 33% of The Board Area Occupied by SO-8 Enabling Smaller End Product
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)
- Halogen and Antimony Free. "Green" Device (Note 3)

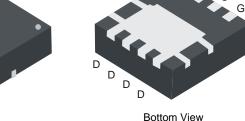
#### **Mechanical Data**

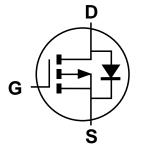
Pin 1

- Case: POWERDI<sup>®</sup>3333-8
- 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 <sup>3</sup>
- Weight: 0.008 grams (Approximate)



Top View





Equivalent Circuit

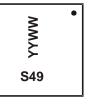
### **Ordering Information** (Note 4)

h-		
Part Number	Case	Packaging
DMP2010UFG-7	POWERDI®3333-8	2000/Tape & Reel
DMP2010UFG-13	POWERDI®3333-8	3000/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**



S49 = Product Type Marking Code YYWW = Date Code Marking YY = Last Two Digits of Year (ex: 15 = 2015) WW = Week Code (01 to 53)



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

Characteristic		Symbol	Value	Unit
Drain-Source Voltage	$V_{DSS}$	-20	V	
Gate-Source Voltage	V <sub>GSS</sub>	±10	V	
Continuous Drain Current, V <sub>GS</sub> = -4.5V (Note 6)	I <sub>D</sub>	-12.7 -42	А	
Maximum Continuous Body Diode Forward Current (Note 6)	Is	-3	Α	
Pulsed Drain Current (380µs Pulse, Duty Cycle = 1%)	I <sub>DM</sub>	-80	Α	
Avalanche Current, L=0.1mH (Note 7)	I <sub>AS</sub>	-35	Α	
Avalanche Energy, L=0.1mH (Note 7)	E <sub>AS</sub>	64	mJ	

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

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)		$P_D$	0.9	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{ hetaJA}$	136	°C/W
Total Power Dissipation (Note 6)		$P_{D}$	2.3	W
Thermal Resistance, Junction to Ambient (Note 6)	$R_{ hetaJA}$	54	°C/W	
Thermal Resistance, Junction to Case (Note 6)	$R_{ heta JC}$	4	C/VV	
Operating and Storage Temperature Range		$T_{J_i}T_{STG}$	-55 to +150	°C

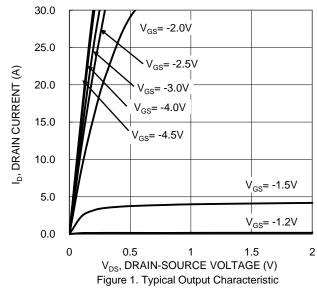
#### Electrical Characteristics (@TA = +25°C, unless otherwise specified.)

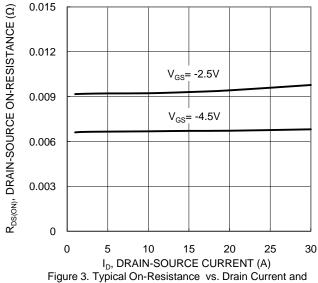
Characteristic	Symbol	Min	Тур	Max	Unit	Test Condition	
OFF CHARACTERISTICS (Note 8)							
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	-20	_	_	V	$V_{GS} = 0V$ , $I_D = -1mA$	
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	_	_	-1	μA	V <sub>DS</sub> = -16V, V <sub>GS</sub> = 0V	
Gate-Source Leakage	I <sub>GSS</sub>	_	_	±100	nA	$V_{GS} = \pm 8V, V_{DS} = 0V$	
ON CHARACTERISTICS (Note 8)				l .	l.		
Gate Threshold Voltage	V <sub>GS(TH)</sub>	-0.4	_	-1.2	V	$V_{DS} = V_{GS}, I_{D} = -250 \mu A$	
Static Drain-Source On-Resistance				9.5	mΩ	V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -3.6A	
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	_	_	12.5		$V_{GS} = -2.5V, I_D = -3.6A$	
Diode Forward Voltage	$V_{SD}$		-0.7	-1.2	V	$V_{GS} = 0V, I_{S} = -10A$	
DYNAMIC CHARACTERISTICS (Note 9)							
Input Capacitance	C <sub>iss</sub>	-	3350	_		V <sub>DS</sub> = -10V, V <sub>GS</sub> = 0V f = 1.0MHz	
Output Capacitance	Coss	_	527	_	pF		
Reverse Transfer Capacitance	Crss	1	460	_			
Gate Resistance	$R_G$	l	10.7	_	Ω	$V_{DS} = 0V, V_{GS} = 0V, f = 1.0MHz$	
Total Gate Charge (V <sub>GS</sub> = -4.5V)	Qg	I	50	_			
Total Gate Charge (V <sub>GS</sub> = -10V)	$Q_{g}$	I	103	_	nC	V <sub>DS</sub> = -10V. I <sub>D</sub> = -3.6A	
Gate-Source Charge	$Q_{gs}$		6.0	_	IIC	V <sub>DS</sub> = -10V, I <sub>D</sub> = -3.0A	
Gate-Drain Charge	$Q_{gd}$	_	14.4	_			
Turn-On Delay Time	t <sub>D(ON)</sub>	-	9.7	_			
Turn-On Rise Time	t <sub>R</sub>	-	30	_		$V_{DD} = -10V, V_{GS} = -4.5V,$	
Turn-Off Delay Time	t <sub>D(OFF)</sub>		235	_	ns	$R_{GEN} = 4.7\Omega$ , $I_D = -3.6A$	
Turn-Off Fall Time	t <sub>F</sub>		110	_			
Reverse Recovery Time	t <sub>RR</sub>		64	_	ns		
Reverse Recovery Charge	$Q_{RR}$	_	60	_	nC	$I_F = -3.6A$ , di/dt = 100A/ $\mu$ s	

- 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. I<sub>AS</sub> and E<sub>AS</sub> ratings are based on low frequency and duty cycles to keep T<sub>J</sub> = +25°C.
  8. Short duration pulse test used to minimize self-heating effect.
  9. Guaranteed by design. Not subject to product testing.



## DMP2010UFG





Gate Voltage

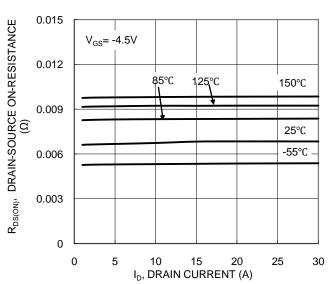
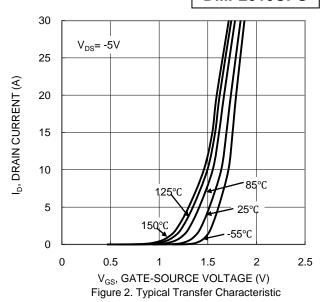
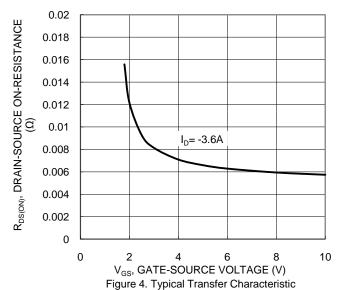


Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature





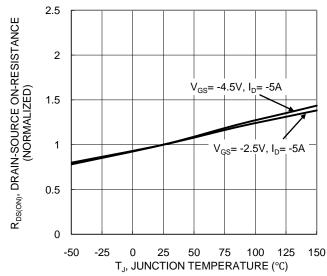
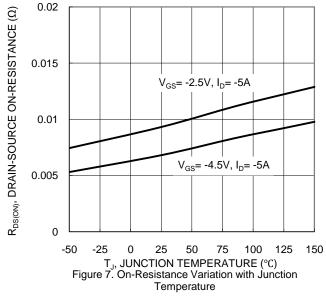
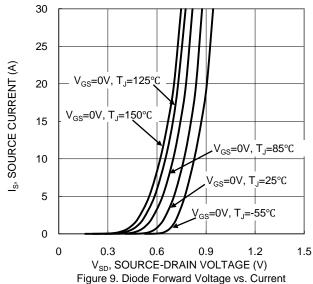
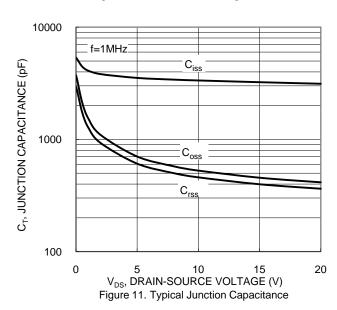


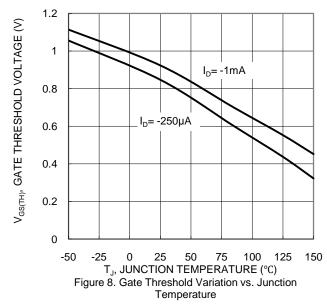
Figure 6. On-Resistance Variation with Junction Temperature

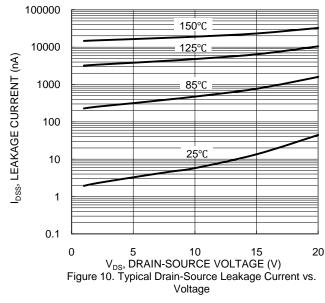


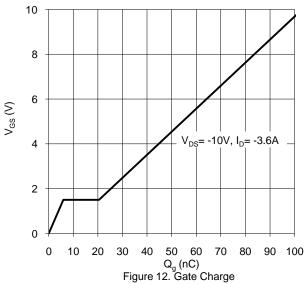




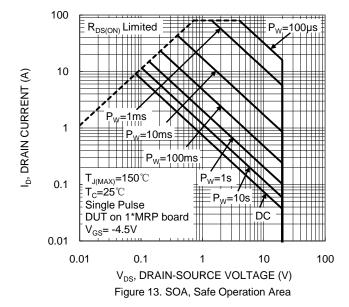












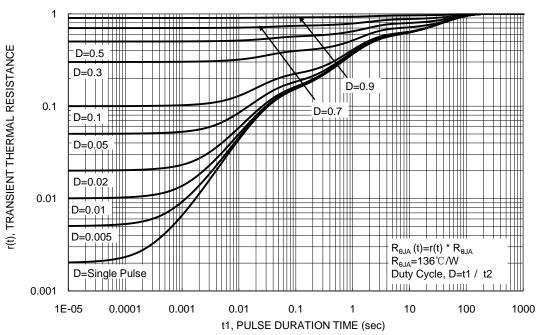
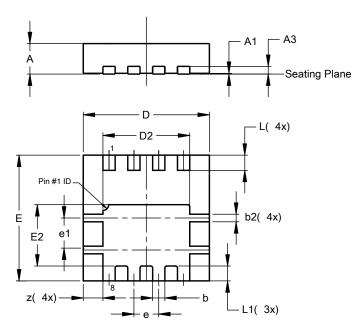


Figure 14. Transient Thermal Resistance



### **Package Outline Dimensions**

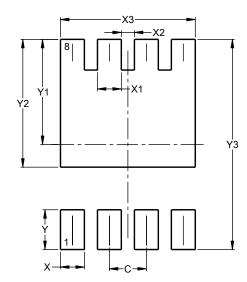
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for the latest version.



POWERDI®3333-8						
Dim	Min	Max	Тур			
Α	0.75	0.85	0.80			
A1	0.00	0.05	0.02			
А3	_	_	0.203			
b	0.27	0.37	0.32			
b2	_	_	0.20			
D	3.25	3.35	3.30			
D2	2.22	2.32	2.27			
Е	3.25	3.35	3.30			
E2	1.56	1.66	1.61			
е	_	-	0.65			
e1	0.79	0.89	0.84			
L	0.35	0.45	0.40			
L1	_	_	0.39			
Z	_	_	0.515			
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	0.650		
Х	0.420		
X1	0.420		
X2	0.230		
Х3	2.370		
Υ	0.700		
Y1	1.850		
Y2	2.250		
Y3	3.700		



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