

#### N-CHANNEL ENHANCEMENT MODE MOSFET PowerDI3333-8

#### **Product Summary**

BV <sub>DSS</sub>	R <sub>DS(ON)</sub> max	I <sub>D</sub> max T <sub>A</sub> = +25°C		
400)/	122mΩ @ $V_{GS} = 10V$	2.9A		
100V	$133m\Omega @ V_{GS} = 4.5V$	2.7A		

### **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:

PowerDI3333-8

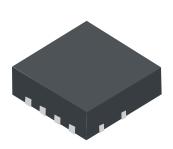
- Motor Control
- Power Management Functions
- DC-DC Converters

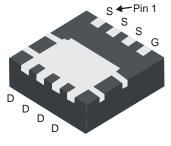
#### **Features**

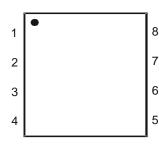
- 100% Unclamped Inductive Switching, Test in Production Ensures more reliable and robust end application
- Low R<sub>DS(ON)</sub> Ensures on state losses are minimized
- Small form factor thermally efficient package enables higher density end products
- Occupies just 33% of the board area occupied by SO-8 enabling smaller end product
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)
- Halogen and Antimony Free. "Green" Device (Note 3)
- Qualified to AEC-Q101 Standards for High Reliability
- PPAP Capable (Note 4)

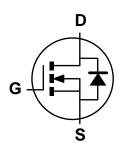
#### **Mechanical Data**

- 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
- Terminals: Finish Matte Tin Annealed over Copper Leadframe.
   Solderable per MIL-STD-202, Method 208@3
- Weight: 0.03 grams (Approximate)









Top View

**Bottom View** 

Top View

**Equivalent Circuit** 

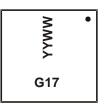
#### Ordering Information (Note 5)

Part Number	Case	Packaging
DMN10H170SFGQ-7	PowerDI3333-8	2000/Tape & Reel
DMN10H170SFGQ-13	PowerDI3333-8	3000/Tape & Reel

Notes:

- 1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
- 2. See https://www.diodes.com/quality/lead-free/ 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 https://www.diodes.com/quality/.
- 5. For packaging details, go to our website at https://www.diodes.com/design/support/packaging/diodes-packaging/.

### **Marking Information**



G17 = Product Marking Code YYWW = Date Code Marking YY = Last Two Digits of Year (ex: 19 for 2019) WW = Week Code (01 to 53)



## 

Characteristic	Symbol	Value	Unit		
Drain-Source Voltage			V <sub>DSS</sub>	100	V
Gate-Source Voltage			V <sub>GSS</sub>	±20	V
Continuous Drain Current (Note 7) V <sub>GS</sub> = 10V	Steady State	$T_A = +25^{\circ}C$ $T_A = +70^{\circ}C$ $T_C = +25^{\circ}C$	ID	2.9 2.4 8.5	А
	t<10s	$T_A = +25$ °C $T_A = +70$ °C	I <sub>D</sub>	3.7 3.0	А
Maximum Continuous Body Diode Forward Currer	Is	3.0	Α		
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1	I <sub>DM</sub>	16	А		
Avalanche Current (Note 8)	I <sub>AS</sub>	5.3	А		
Avalanche Energy (Note 8)	E <sub>AS</sub>	20	mJ		

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

Characteristic	Symbol	Value	Unit		
Total Power Dissipation (Note 6)	$T_A = +25^{\circ}C$	D	0.94	W	
Total Fower Dissipation (Note 6)	$T_A = +70^{\circ}C$	$P_{D}$	0.6		
Thormal Posistance, Junction to Ambient (Note 6)	Steady State	D	137	°C/W	
Thermal Resistance, Junction to Ambient (Note 6)	t<10s	$R_{\theta JA}$	82	°C/W	
Total Power Dissipation (Note 7)	$T_A = +25^{\circ}C$	Б	2.0	W	
Total Power Dissipation (Note 7)	$T_A = +70^{\circ}C$	$P_{D}$	1.3	VV	
Thermal Resistance, Junction to Ambient (Note 7)	Steady State	D	60	°C/W	
Thermal Resistance, Junction to Ambient (Note 7)	t<10s	$R_{\theta JA}$	36	°C/W	
Thermal Resistance, Junction to Case (Note 7)	R <sub>0</sub> JC	7.0	°C/W		
Operating and Storage Temperature Range		$T_{J_i}T_{STG}$	-55 to +150	°C	

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

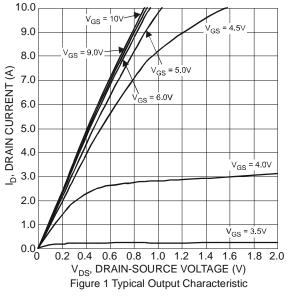
Characteristic	Symbol	Min	Тур	Max	Unit	Test Condition	
OFF CHARACTERISTICS (Note 9)							
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	100	_	_	V	$V_{GS} = 0V, I_D = 250\mu A$	
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	_	_	1.0	μΑ	V <sub>DS</sub> = 100V, V <sub>GS</sub> = 0V	
Gate-Source Leakage	I <sub>GSS</sub>	_	_	±100	nA	$V_{GS} = \pm 20V, V_{DS} = 0V$	
ON CHARACTERISTICS (Note 9)	•						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	1.0	-	3.0	V	$V_{DS} = V_{GS}, I_{D} = 250 \mu A$	
Static Drain-Source On-Resistance		I	99	122	mΩ	$V_{GS} = 10V, I_D = 3.3A$	
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	_	104	133	11122	$V_{GS} = 4.5V, I_D = 3.0A$	
Forward Transfer Admittance	Y <sub>fs</sub>	_	4.4	_	S	$V_{DS} = 10V, I_D = 3.3A$	
Diode Forward Voltage	V <sub>SD</sub>		0.7	1.0	V	$V_{GS} = 0V, I_S = 3.3A$	
DYNAMIC CHARACTERISTICS (Note 10)	•						
Input Capacitance	Ciss	_	870.7	_	pF	.,	
Output Capacitance	Coss	-	40.8	_	pF	$V_{DS} = 25V, V_{GS} = 0V,$ f = 1.0MHz	
Reverse Transfer Capacitance	Crss	-	24.6	_	pF		
Gate Resistance	Rq	-	1.1	_	Ω	$V_{DS} = 0V, V_{GS} = 0V, f = 1.0MHz$	
Total Gate Charge (V <sub>GS</sub> = 4.5V)	Qq	_	7.0	_	nC		
Total Gate Charge (V <sub>GS</sub> = 10V)	Qg	_	14.9	_	nC	., 50,4,1, 2,24	
Gate-Source Charge	Q <sub>gs</sub>	-	3.3	_	nC	$V_{DS} = 50V, I_D = 3.3A$	
Gate-Drain Charge	Q <sub>qd</sub>	-	3.0	_	nC	1	
Turn-On Delay Time	t <sub>D(ON)</sub>		4.4	_	ns		
Turn-On Rise Time	t <sub>R</sub>		2.3	_	ns	$V_{DD} = 50V, V_{GEN} = 10V,$ $R_{GEN} = 6.0\Omega, I_D = 3.3A$	
Turn-Off Delay Time	t <sub>D(OFF)</sub>		13.9	_	ns		
Turn-Off Fall Time	t <sub>F</sub>		3.4	_	ns		
Reverse Recovery Time	t <sub>RR</sub>		22.4	_	ns	1 000 11/1/1 1000/	
Reverse Recovery Charge	$Q_{RR}$		19.7		nC	I <sub>S</sub> = 3.3A, dl/dt = 100A/μs	

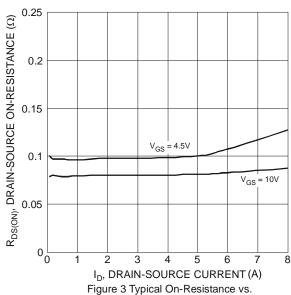
Notes:

- 6. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
- 7. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
- 8. UIS in production with L = 1.43mH,  $T_J = +25$ °C.
- Short duration pulse test used to minimize self-heating effect.
   Guaranteed by design. Not subject to product testing.









Drain Current and Gate Voltage

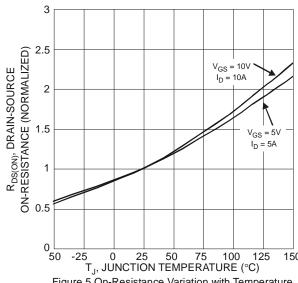
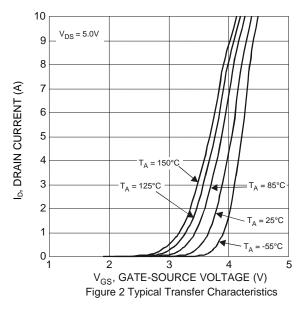
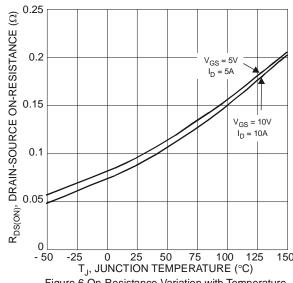


Figure 5 On-Resistance Variation with Temperature



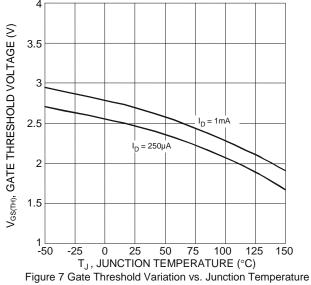
0.24 R<sub>DS(ON)</sub>, DRAIN-SOURCE ON-RESISTANCE (Ω) V<sub>GS</sub> = 10V 0.22 0.20 T<sub>A</sub> = 150°C 0.18  $T_A = 125^{\circ}C$ 0.16 0.14 T<sub>A</sub> = 85°C 0.12 0.10 0.08  $T_A = 25^{\circ}C$ 0.06 0.04  $T_A = -55$ °C 0.02 0.00 0 3 5 8 I<sub>D</sub>, DRAIN CURRENT (A) Figure 4 Typical On-Resistance vs.

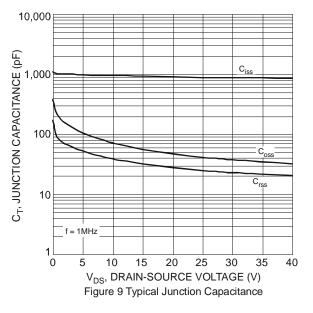


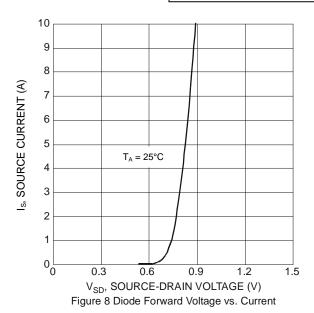
Drain Current and Temperature

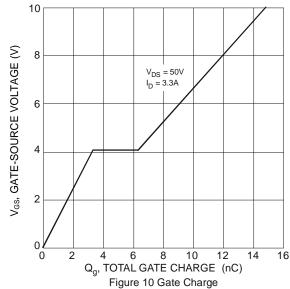
Figure 6 On-Resistance Variation with Temperature











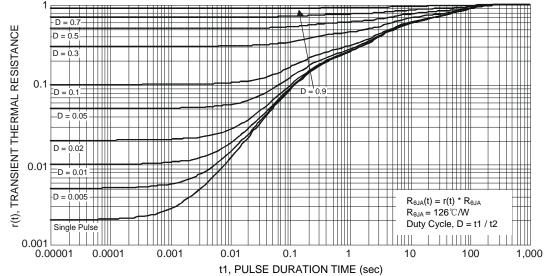


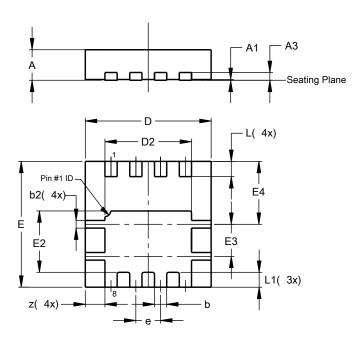
Figure 11 Transient Thermal Resistance



### **Package Outline Dimensions**

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

#### PowerDI3333-8

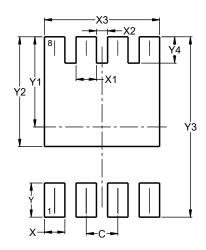


PowerDI3333-8						
Dim	Min	Max	Тур			
Α	0.75	0.85	0.80			
<b>A</b> 1	0.00	0.05	0.02			
A3	_	_	0.203			
b	0.27	0.37	0.32			
b2	0.15	0.25	0.20			
D	3.25	3.35	3.30			
D2	2.22	2.32	2.27			
Е	3.25	3.35	3.30			
E2	1.56	1.66	1.61			
E3	0.79	0.89	0.84			
E4	1.60	1.70	1.65			
е	_	_	0.65			
L	0.35	0.45	0.40			
L1	_	_	0.39			
Z	_	_	0.515			
All Dimensions in mm						

### **Suggested Pad Layout**

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

#### PowerDI3333-8



Dimensions	Value (in mm)		
С	0.650		
X	0.420		
X1	0.420		
X2	0.230		
Х3	2.370		
Υ	0.700		
Y1	1.850		
Y2	2.250		
Y3	3.700		
Y4	0.540		



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многоканальный

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