



### N-CHANNEL ENHANCEMENT MODE MOSFET PowerDI3333-8 (Type UX)

## **Product Summary**

BV <sub>DSS</sub>	R <sub>DS(ON)</sub> Max	I <sub>D</sub> Max T <sub>C</sub> = +25°C
24V	5.0mΩ @ V <sub>GS</sub> = 10V	70A
	6.5mΩ @ V <sub>GS</sub> = 4.5V	60A
	10.0mΩ @ V <sub>GS</sub> = 2.5V	45A

## **Description and Applications**

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

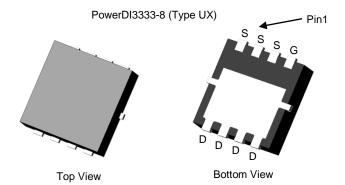
- Backlighting
- Power Management Functions
- DC-DC Converters

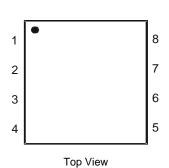
# **Features and Benefits**

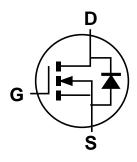
- Low R<sub>DS(ON)</sub> ensures on state losses are minimized
- Small form factor thermally efficient package enables higher density end products
- Occupies just 33% of the board area occupied by SO-8 enabling smaller end product
- 100% Unclamped Inductive Switch (UIS) Test in Production
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)
- Halogen and Antimony Free. "Green" Device (Note 3)

#### **Mechanical Data**

- Case: PowerDI<sup>®</sup>3333-8 (Type UX)
- 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: 0.072 grams (Approximate)







**Equivalent Circuit** 

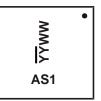
## **Ordering Information** (Note 4)

Part Number	Case	Packaging		
DMT2004UFV-7	PowerDI3333-8 (Type UX)	2,000/Tape & Reel		
DMT2004UFV-13	PowerDI3333-8 (Type UX)	3,000/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. For packaging details, go to our website at https://www.diodes.com/design/support/packaging/diodes-packaging/.

# **Marking Information**



AS1 = Product Type Marking Code
YYWW = Date Code Marking
YY = Last Two Digits of Year (ex: 18 = 2018)
WW = Week Code (01 to 53)

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

Characteristic	Symbol	Value	Unit		
Drain-Source Voltage	$V_{DSS}$	24	V		
Gate-Source Voltage	$V_{GSS}$	±12	V		
Continuous Drain Current (Note 7) $V_{GS} = 10V$ Steady $T_C = +25^{\circ}C$ State $T_C = +70^{\circ}C$			I <sub>D</sub>	70 55	А
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)	I <sub>DM</sub>	90	А		
Continuous Source-Drain Diode Current (Note 6)	Is	2.5	А		
Avalanche Current (Note 8) L = 0.1mH			I <sub>AS</sub>	26	Α
Avalanche Energy (Note 8) L = 0.1mH			Eas	36	mJ

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

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	$T_A = +25^{\circ}C$	$P_{D}$	1.2	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{ hetaJA}$	106	°C/W
Total Power Dissipation (Note 6)	$T_A = +25^{\circ}C$	$P_{D}$	2.3	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{ hetaJA}$	54	°C/W
Thermal Resistance, Junction to Case (Note 7)		$R_{ heta JC}$	3.5	°C/W
Operating and Storage Temperature Range		T <sub>J,</sub> T <sub>STG</sub>	-55 to +150	°C

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

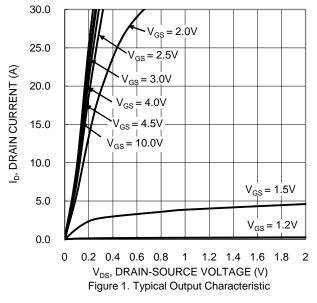
Characteristic	Symbol	Min	Тур	Max	Unit	Test Condition	
OFF CHARACTERISTICS (Note 9)							
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	24	_	_	V	$V_{GS} = 0V, I_D = 250\mu A$	
Zero Gate Voltage Drain Current (T <sub>J</sub> = +25°C)	I <sub>DSS</sub>	_	_	1	μΑ	V <sub>DS</sub> = 20V, V <sub>GS</sub> = 0V	
Gate-Source Leakage	I <sub>GSS</sub>	_	_	±100	nA	$V_{GS} = \pm 10V, V_{DS} = 0V$	
ON CHARACTERISTICS (Note 9)							
Gate Threshold Voltage	V <sub>GS(TH)</sub>	0.55	_	1.45	V	$V_{DS} = V_{GS}, I_D = 250 \mu A$	
		_	3.8	5.0	mΩ	$V_{GS} = 10V, I_D = 12A$	
Static Drain-Source On-Resistance	RDS(ON)	_	4.6	6.5		$V_{GS} = 4.5V, I_D = 12A$	
		_	6.8	10.0		$V_{GS} = 2.5V, I_D = 12A$	
Diode Forward Voltage	V <sub>SD</sub>	_	0.65	1.0	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = 2A	
DYNAMIC CHARACTERISTICS (Note 10)							
Input Capacitance	C <sub>iss</sub>	_	1683	_		451/1/ 01/	
Output Capacitance	Coss	_	581	_	pF	$V_{DS} = 15V, V_{GS} = 0V,$ f = 1.0MHz	
Reverse Transfer Capacitance	C <sub>rss</sub>	_	559	_		I = 1.0IVINZ	
Gate Resistance	R <sub>G</sub>	_	1.6	_	Ω	$V_{DS} = 0V, V_{GS} = 0V, f = 1.0MHz$	
Total Gate Charge (V <sub>GS</sub> = 4.5V)	Qg	_	29.6	_			
Total Gate Charge (V <sub>GS</sub> = 10V)	Qq	_	53.7	_	1		
Gate-Source Charge	$Q_{gs}$	_	4.2	_	nC	$V_{DD} = 15V, I_{D} = 9A$	
Gate-Drain Charge	Q <sub>qd</sub>	_	13.4	_			
Turn-On Delay Time	t <sub>D(ON)</sub>	_	3.9	_			
Turn-On Rise Time	t <sub>R</sub>	_	9.6	_	$V_{DD} = 15V, V_{GS} = 10V,$		
Turn-Off Delay Time	t <sub>D(OFF)</sub>	_	30.8	_	ns	$R_G = 3\Omega$ , $I_D = 9A$	
Turn-Off Fall Time	t <sub>F</sub>	_	38.6	_			
Reverse Recovery Time	t <sub>RR</sub>	_	11.2	_	ns		
Reverse Recovery Charge	Q <sub>RR</sub>	_	22.9	_	nC	$I_F = 1.5A$ , di/dt = 100A/ $\mu$ s	

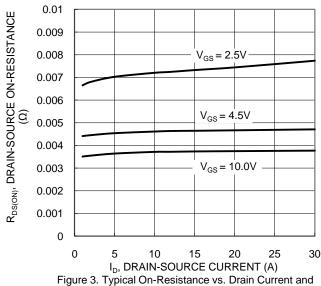
Notes:

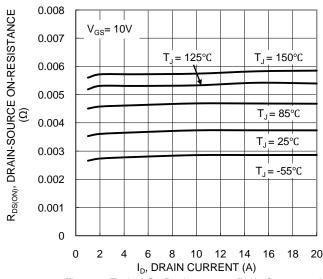
- 5. Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.
  6. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate.
  7. Thermal resistance from junction to soldering point (on the exposed drain pad).
  8. I<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.
  9. Short duration pulse test used to minimize self-heating effect.
  10. Guaranteed by design. Not subject to product testing.





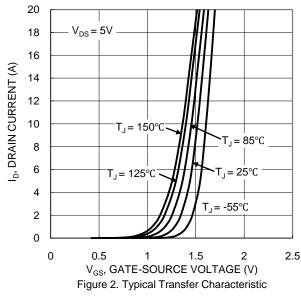


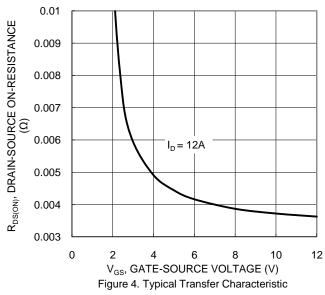




Gate Voltage

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





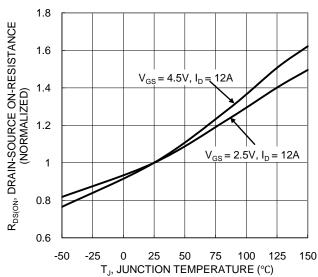


Figure 6. On-Resistance Variation with Temperature



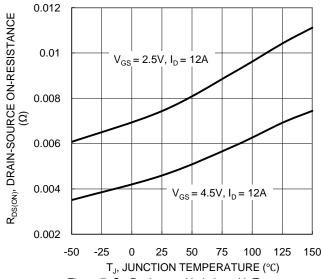
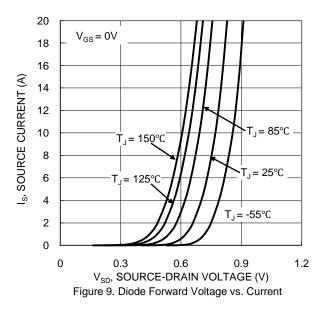
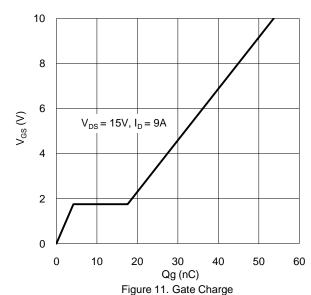


Figure 7. On-Resistance Variation with Temperature





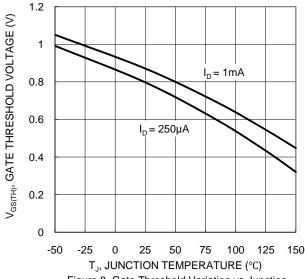
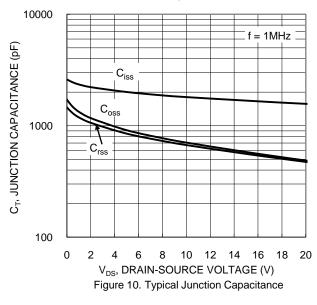
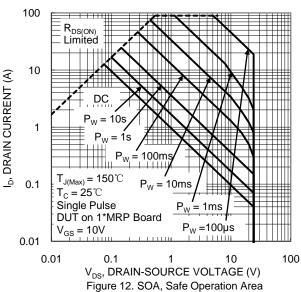


Figure 8. Gate Threshold Variation vs. Junction Temperature







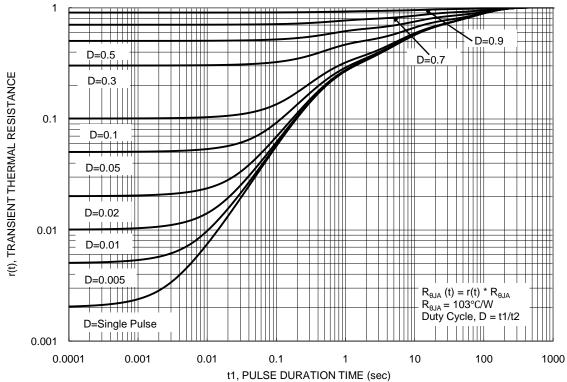


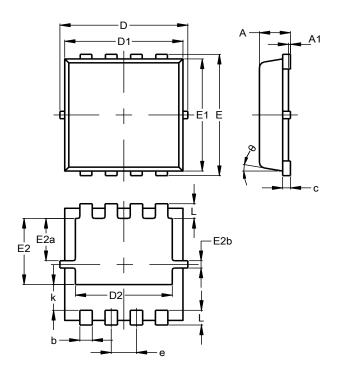
Figure 13. Transient Thermal Resistance



# **Package Outline Dimensions**

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

### PowerDI3333-8 (Type UX)

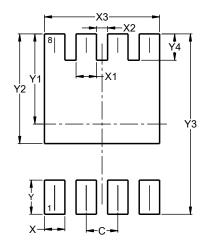


PowerDl3333-8 (Type UX)						
Dim	Dim Min Max Typ					
Α	0.75	0.85	0.80			
A1	0.00	0.05	0.00			
b	0.00	0.40	0.32			
C	0.23	0.40	0.32			
D	3.20	3.40	3.30			
D1	2.95	3.15	3.05			
D2	2.30	2.70	2.50			
E	3.20	3.40	3.30			
<u>–</u> E1	2.95	3.15	3.05			
E2	1.60	2.00	1.80			
E2a	0.95	1.35	1.15			
E2b	0.10	0.30	0.20			
е	0.65 BSC					
k	0.50	0.90	0.70			
┙	0.30	0.50	0.40			
θ	0°	12°	10°			
All Dimensions in mm						

# **Suggested Pad Layout**

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

### PowerDI3333-8 (Type UX)



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			
Y4	0.540			



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