20V N-CHANNEL ENHANCEMENT MODE MOSFET
PowerDI3333-8

Product Summary

BV_{DSS}	$R_{DS(ON)}$ Max	I_D Max T_C = +25°C
20V	2.0mΩ @ V_{GS} = 4.5V	27A
	2.6mΩ @ V_{GS} = 2.5V	23A

Description

This MOSFET is designed to minimize the on-state resistance ($R_{DS(ON)}$) yet maintain superior switching performance, making it ideal for high-efficiency power management applications.

Applications

- Backlighting
- Power management functions
- DC-DC converters

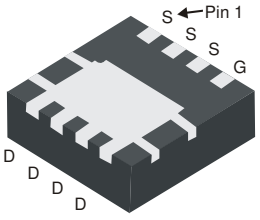
Features and Benefits

- Low $R_{DS(ON)}$ – 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 Switching (UIS) Test in Production – Ensures More Reliable and Robust End Application**
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/104/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please contact us or your local Diodes representative.**
  https://www.diodes.com/quality/product-definitions/

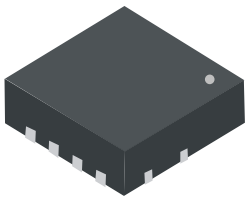
Mechanical Data

- Package: PowerDI®3333-8
- Package 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
- Terminal Finish — Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.072 grams (Approximate)

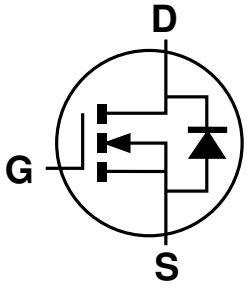
PowerDI3333-8



Bottom View



Top View



Equivalent Circuit

Ordering Information (Note 4)

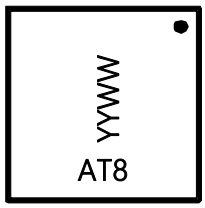
Part Number	Package	Packing	
		Qty.	Carrier
DMN22M5UFG-7	PowerDI3333-8	2,000	Tape & Reel
DMN22M5UFG-13	PowerDI3333-8	3,000	Tape & Reel

Notes:
1. EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant. All applicable RoHS exemptions applied.
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

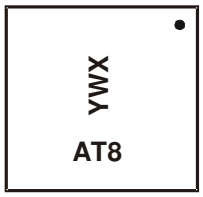
Site 1

PowerDI3333-8



AT8= Product Type Marking Code
YYWW = Date Code Marking
YY = Last Two Digits of Year (ex: 22 = 2022)
WW = Week Code (01 to 53)

PowerDI3333-8



AT8 = Product Type Marking Code
YWX = Date Code Marking
Y = Year (ex: 2 = 2022)
W = Week (ex: a = Week 27; z Represents Week 52 and 53)
X = Internal Code (ex: U = Monday)

Date Code Key

Year	2018	…	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Code	8	…	2	3	4	5	6	7	8	9	0	1

Week	1-26	27-52	53
Code	A-Z	a-z	z

Internal Code	Sun	Mon	Tue	Wed	Thu	Fri	Sat
Code	T	U	V	W	X	Y	Z

Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V_{DSS}	20	V
Gate-Source Voltage			V_{GSS}	±12	V
Continuous Drain Current (Note 6) V_{GS} = 4.5V	Steady State	T_A = +25°C	I_D	24	A
		T_A = +70°C		19	
Continuous Drain Current (Note 7) V_{GS} = 4.5V	Steady State	T_C = +25°C	I_D	27	A
		T_C = +70°C		22	
Maximum Continuous Body Diode Forward Current (Note 6)			I_S	3	A
Pulsed Drain Current (380µs Pulse, Duty Cycle = 1%)			I_{DM}	500	A
Pulsed Body Diode Forward Current (380µs Pulse, Duty Cycle = 1%)			I_{SM}	500	A
Avalanche Current, L = 0.2mH (Note 8)			I_{AS}	30	A
Repetitive Avalanche Energy, L = 0.2mH (Note 8)			E_{AS}	175	mJ

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

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	T_A = +25°C	P_D	0.6	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	127	°C/W
Total Power Dissipation (Note 6)	T_A = +25°C	P_D	2.2	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	56	°C/W
Thermal Resistance, Junction to Case (Note 7)		$R_{\theta JC}$	1.7	°C/W
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

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_{AS} and E_{AS} ratings are based on low frequency and duty cycles to keep T_J = +25°C.

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 9)						
Drain-Source Breakdown Voltage	BV_{DSS}	20	—	—	V	V_{GS} = 0V, I_D = 250μA
Zero Gate Voltage Drain Current T_J = +25°C	I_{DSS}	—	—	1	μA	V_{DS} = 16V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±12V, V_{DS} = 0V
ON CHARACTERISTICS (Note 9)						
Gate Threshold Voltage	$V_{GS(TH)}$	0.5	—	1.3	V	V_{DS} = V_{GS}, I_D = 250μA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	1.5	2.0	mΩ	V_{GS} = 4.5V, I_D = 13.5A
		—	2.0	2.6		V_{GS} = 2.5V, I_D = 13.5A
Diode Forward Voltage	V_{SD}	—	—	1.2	V	V_{GS} = 0V, I_S = 2A
DYNAMIC CHARACTERISTICS (Note 10)						
Input Capacitance	C_{iss}	—	3926	—	pF	V_{DS} = 10V, V_{GS} = 0V, f = 1MHz
Output Capacitance	C_{oss}	—	710	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	538	—	pF	
Gate Resistance	R_g	—	0.9	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (V_{GS} = 4.5V)	Q_g	—	53	—	nC	V_{DS} = 16V, I_D = 27A
Total Gate Charge (V_{GS} = 10V)	Q_g	—	99	—	nC	
Gate-Source Charge	Q_{gs}	—	3.7	—	nC	
Gate-Drain Charge	Q_{gd}	—	24.4	—	nC	
Turn-On Delay Time	$t_{D(ON)}$	—	8.1	—	ns	V_{GS} = 5V, V_{DS} = 10V, R_g = 4.7Ω, I_D = 13.5A
Turn-On Rise Time	t_R	—	22.5	—	ns	
Turn-Off Delay Time	$t_{D(OFF)}$	—	72.1	—	ns	
Turn-Off Fall Time	t_F	—	44.5	—	ns	
Body Diode Reverse Recovery Time	t_{RR}	—	23.3	—	ns	I_F = 13.5A, di/dt = 100A/μs
Body Diode Reverse Recovery Charge	Q_{RR}	—	11.5	—	nC	I_F = 13.5A, di/dt = 100A/μs

Notes: 9. Short duration pulse test used to minimize self-heating effect.
10. Guaranteed by design. Not subject to product testing.

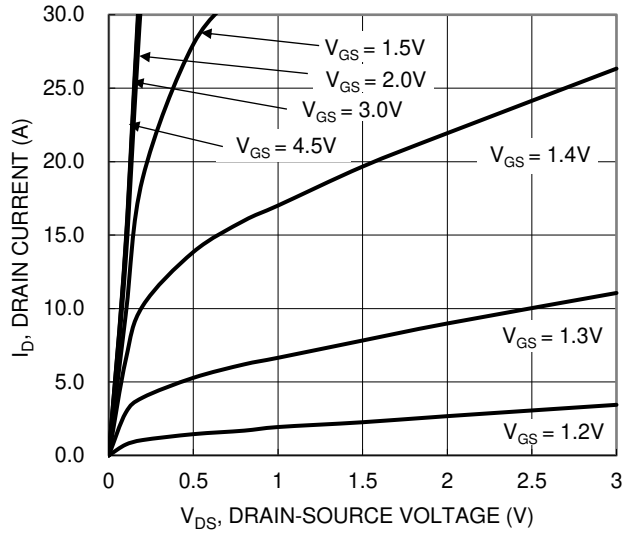


Figure 1. Typical Output Characteristic

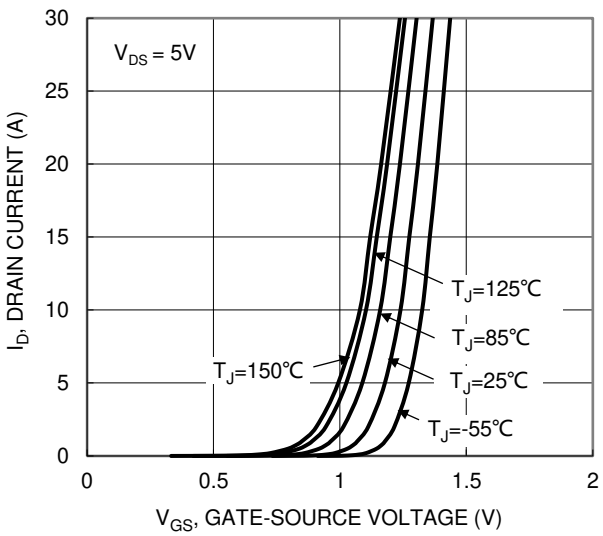


Figure 2. Typical Transfer Characteristic

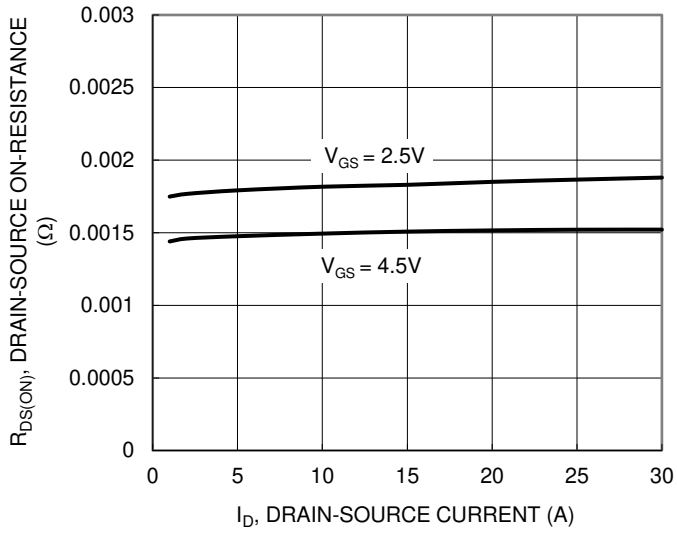


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

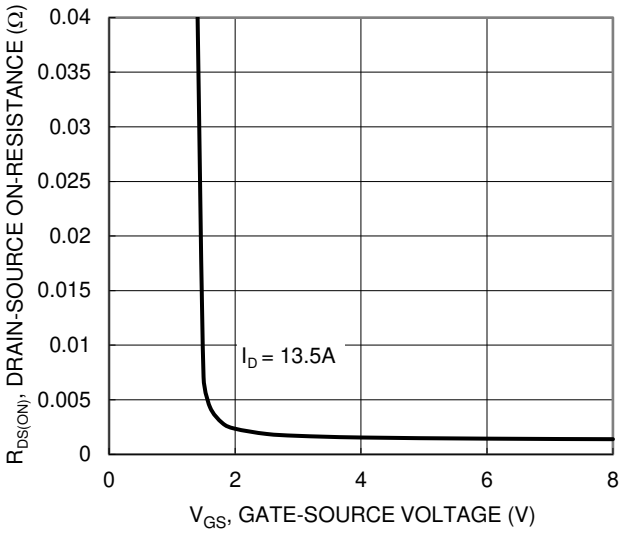


Figure 4. Typical Transfer Characteristic

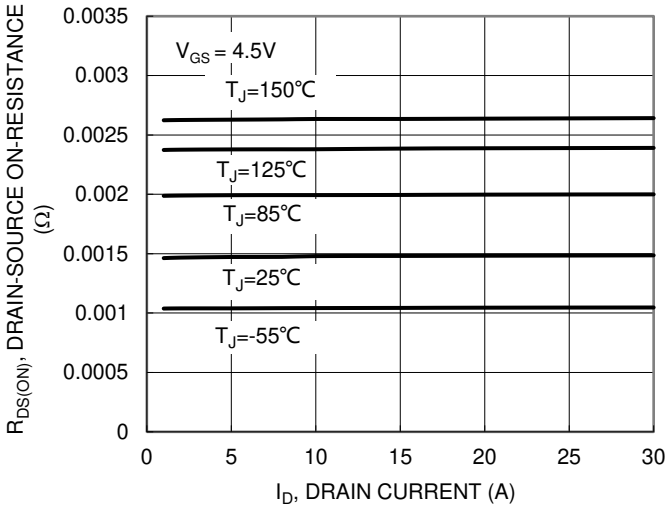


Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

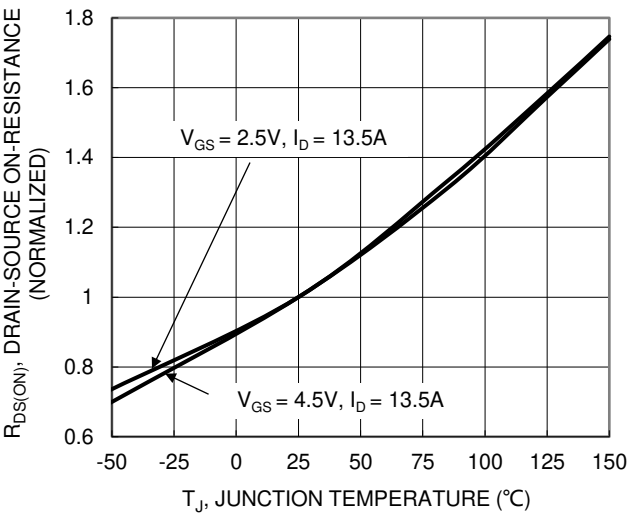


Figure 6. On-Resistance Variation with Junction Temperature

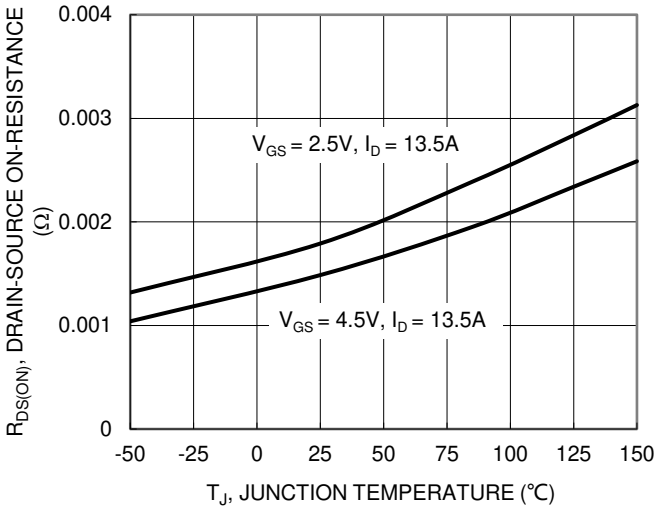


Figure 7. On-Resistance Variation with Junction Temperature

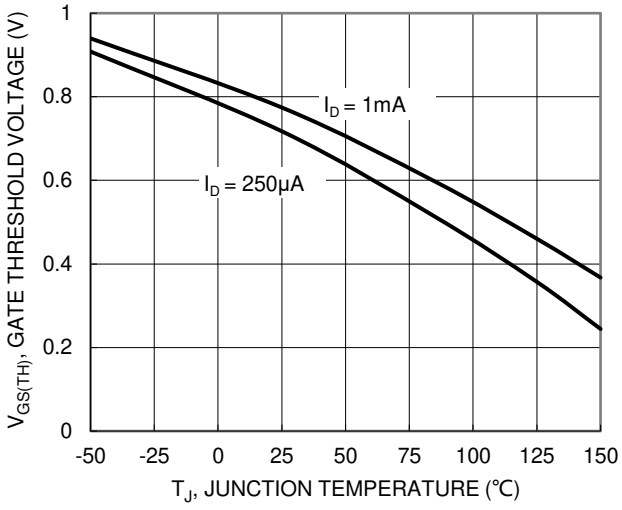


Figure 8. Gate Threshold Variation vs. Junction Temperature

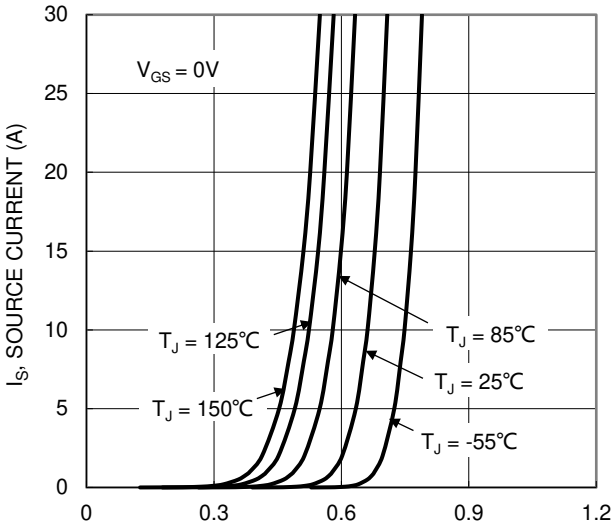


Figure 9. Diode Forward Voltage vs. Current

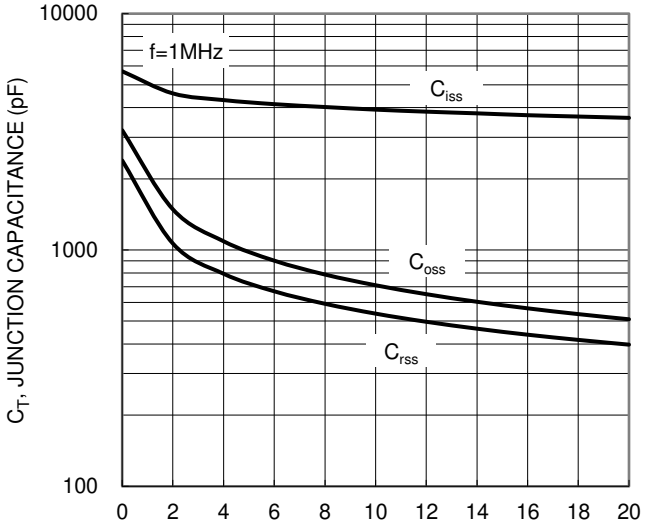


Figure 10. Typical Junction Capacitance

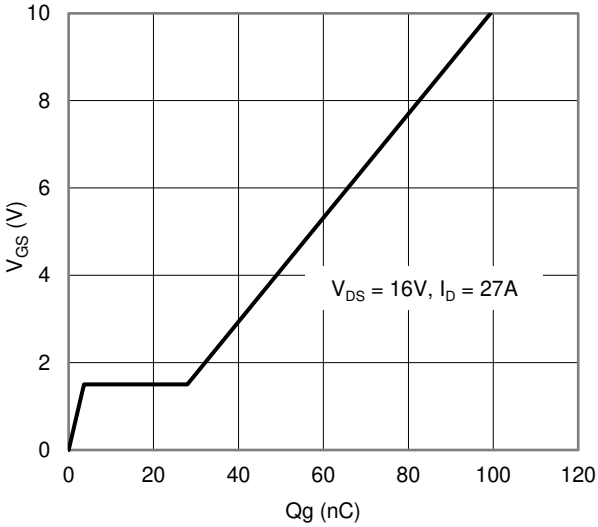


Figure 11. Gate Charge

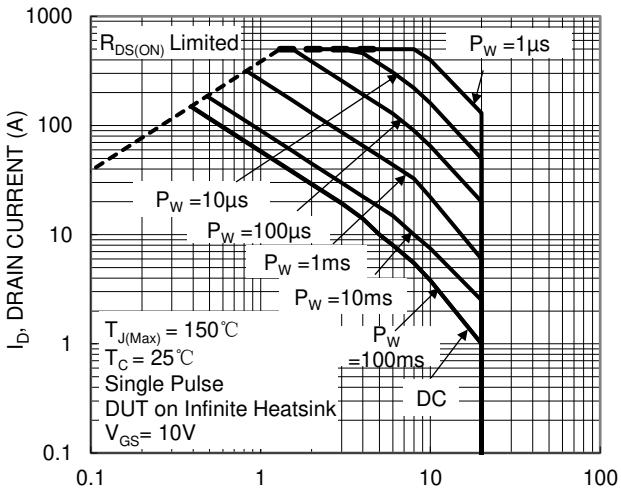


Figure 12. SOA, Safe Operation Area

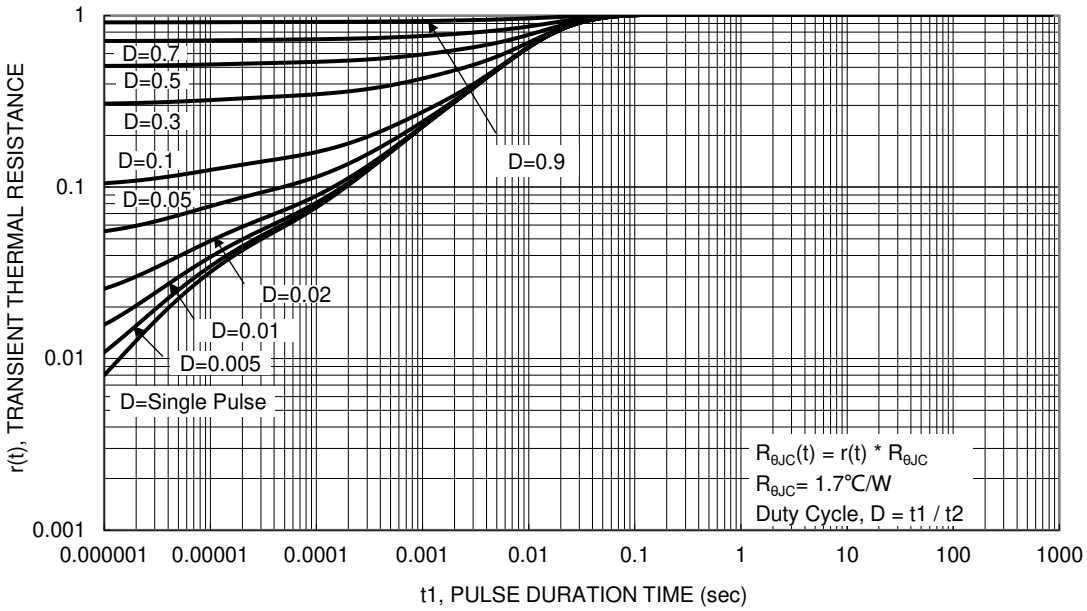
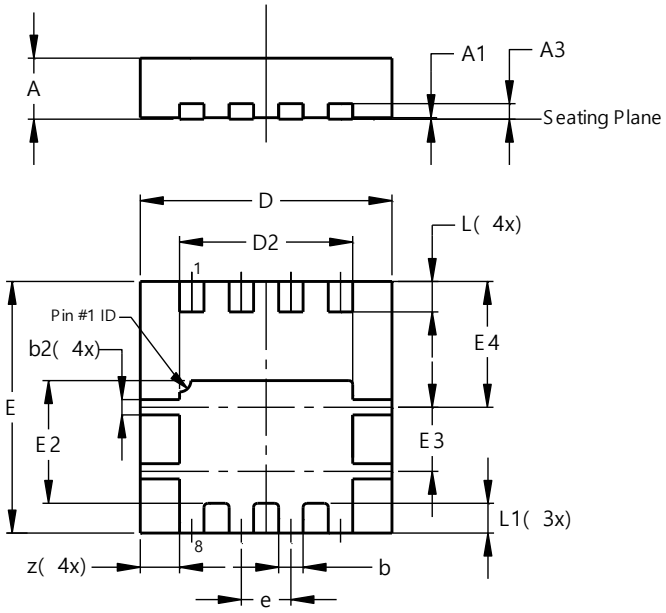


Figure 13. Transient Thermal Resistance

Package Outline Dimensions

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

PowerDI3333-8

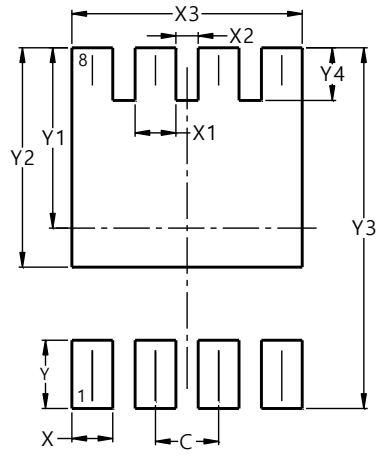


PowerDI3333-8			
Dim	**Min**	**Max**	**Typ**
A	0.75	0.85	0.80
A1	0.00	0.05	0.02
A3	–	–	0.203
b	0.27	0.37	0.32
b2	0.15	0.25	0.20
D	3.25	3.35	3.30
D2	2.22	2.32	2.27
E	3.25	3.35	3.30
E2	1.56	1.66	1.61
E3	0.79	0.89	0.84
E4	1.60	1.70	1.65
e	–	–	0.65
L	0.35	0.45	0.40
L1	–	–	0.39
z	–	–	0.515
All Dimensions in mm			

Suggested Pad Layout

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

PowerDI3333-8



Dimensions	Value (in mm)
C	0.650
X	0.420
X1	0.420
X2	0.230
X3	2.370
Y	0.700
Y1	1.850
Y2	2.250
Y3	3.700
Y4	0.540

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