20V N-CHANNEL ENHANCEMENT MODE MOSFET
PowerDI3333-8

Product Summary

BV_{DSS}	$R_{DS(ON)}$ Max	I_D Max T_C = +25°C (Note 10)
20V	4.6mΩ @ V_{GS} = 4.5V	50A
	8.7mΩ @ V_{GS} = 2.5V	36A

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 33% of the Board Area Occupied by SO-8 Enabling Smaller End Product
- 100% Unclamped Inductive Switching, Test in Production—Ensures More Reliable And Robust End Application
- **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)**

Description and Applications

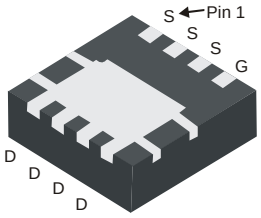
This MOSFET is designed to meet the stringent requirements of automotive applications. It is qualified to AEC-Q101, supported by a PPAP, and is ideal for use in:

- Motor Control
- Load Switch
- DC-DC Converters

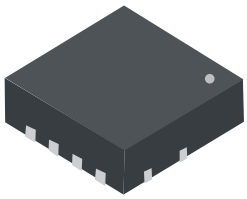
Mechanical Data

- Case: PowerDI®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 e3
- Weight: 0.072 grams (Approximate)

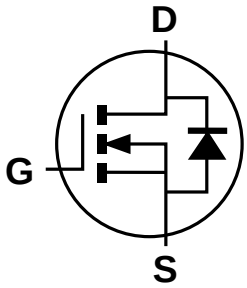
PowerDI3333-8



Bottom View



Top View



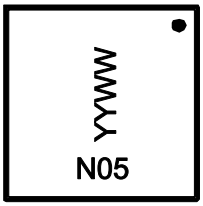
Equivalent Circuit

Ordering Information (Note 5)

Part Number	Case	Packaging
DMN2005UFGQ-7	PowerDI3333-8	2000/Tape & Reel
DMN2005UFGQ-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



N05= Product Type Marking Code
YYWW = Date Code Marking
YY = Last Two Digits of Year (ex: 19 = 2019)
WW = Week Code (01 to 53)

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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 (Notes 7&10) V_{GS} = 4.5V	Steady State	T_C = +25°C T_C = +70°C	I_D	50 40	A
		T_A = +25°C T_A = +70°C	I_D	18 14	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)			I_{DM}	130	A
Maximum Continuous Body Diode Forward Current (Note 7)			I_S	2.6	A
Avalanche Current , L = 0.2mH			I_{AS}	23.9	A
Repetitive Avalanche Energy, L = 0.2mH			E_{AS}	58.4	mJ

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

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 6)	T_A = +25°C	P_D	1.05	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\Theta JA}$	120	°C/W
Total Power Dissipation (Note 7)	T_A = +25°C	P_D	2.27	W
Thermal Resistance, Junction to Ambient (Note 7)	Steady State	$R_{\Theta JA}$	55	°C/W
Thermal Resistance, Junction to Case (Note 7)		$R_{\Theta JC}$	6.1	
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

Notes: 6. Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.
7. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate.

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 8)						
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}	—	—	10	µA	V_{DS} = 20V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±12V, V_{DS} = 0V
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	$V_{GS(TH)}$	0.4	0.7	1.2	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	4	4.6	mΩ	V_{GS} = 4.5V, I_D = 13.5A
		—	4.9	8.7		V_{GS} = 2.5V, I_D = 13.5A
Diode Forward Voltage	V_{SD}	—	0.8	1.1	V	V_{GS} = 0V, I_S = 27A
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C_{iss}	—	6,495	—	pF	V_{DS} = 10V, V_{GS} = 0V, f = 1MHz
Output Capacitance	C_{oss}	—	546	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	477	—	pF	
Gate Resistance	R_g	—	0.7	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (V_{GS} = 4.5V)	Q_g	—	68.8	—	nC	V_{DS} = 16V, I_D = 27A
Total Gate Charge (V_{GS} = 10V)	Q_g	—	164	—	nC	
Gate-Source Charge	Q_{gs}	—	10.4	—	nC	
Gate-Drain Charge	Q_{gd}	—	17.4	—	nC	
Turn-On Delay Time	$t_{D(ON)}$	—	12.4	—	ns	V_{GS} = 5V, V_{DS} = 10V, R_G = 4.7Ω, I_D = 13.5A
Turn-On Rise Time	t_R	—	25.7	—	ns	
Turn-Off Delay Time	$t_{D(OFF)}$	—	114	—	ns	
Turn-Off Fall Time	t_F	—	38	—	ns	
Body Diode Reverse Recovery Time	t_{RR}	—	16.1	—	ns	I_F = 13.5A, di/dt = 100A/µs
Body Diode Reverse Recovery Charge	Q_{RR}	—	8.5	—	nC	I_F = 13.5A, di/dt = 100A/µs

Notes: 8. Short duration pulse test used to minimize self-heating effect.
9. Guaranteed by design. Not subject to product testing.
10. Limited by package.

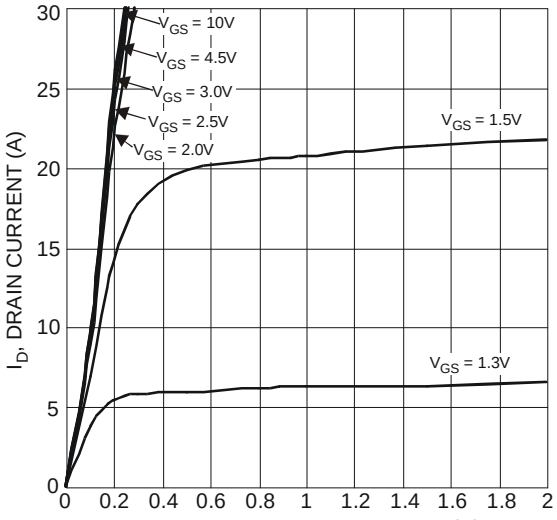


Figure 1 Typical Output Characteristics

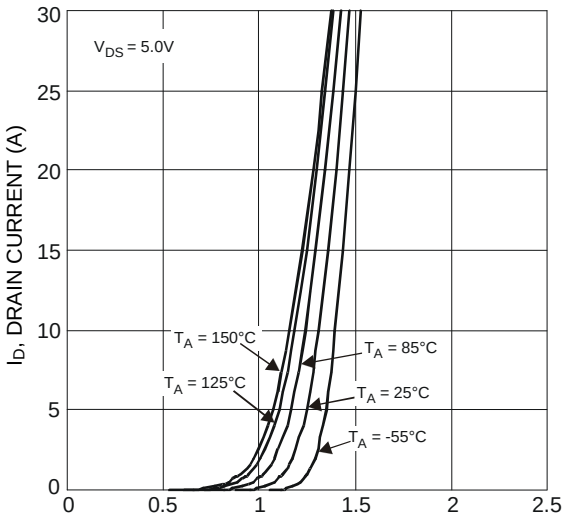


Figure 2 Typical Transfer Characteristics

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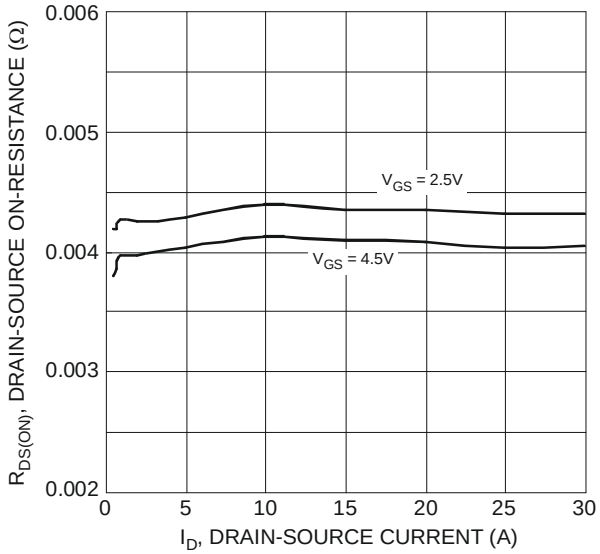


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

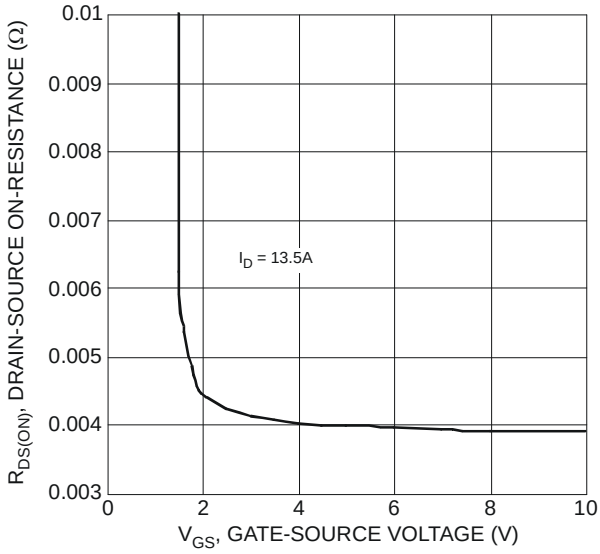


Figure 4 Typical Transfer Characteristic

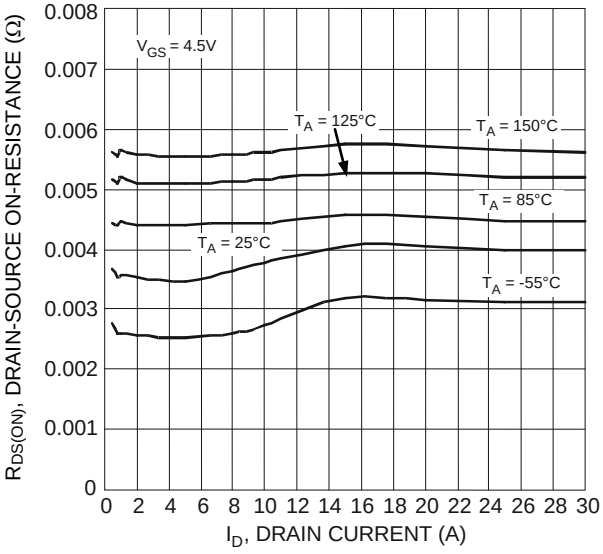


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

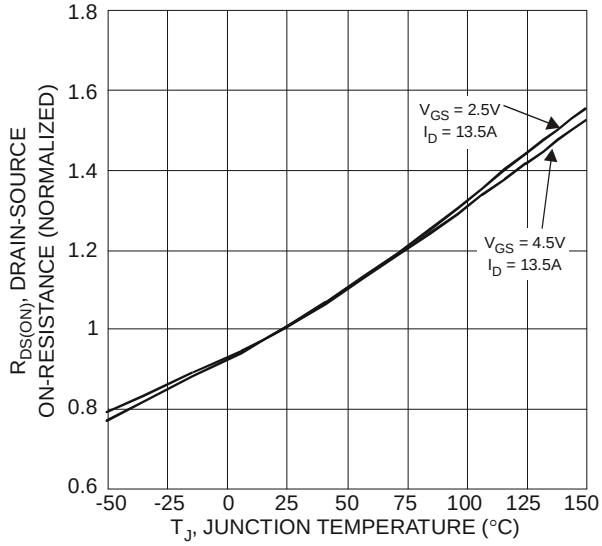


Figure 6 On-Resistance Variation with Temperature

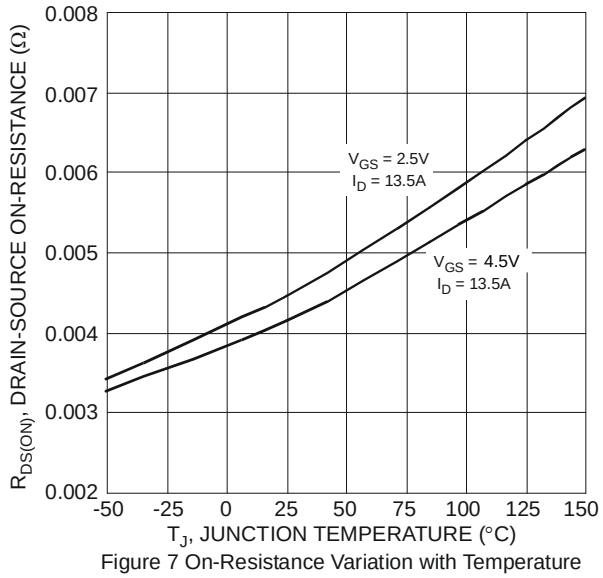


Figure 7 On-Resistance Variation with Temperature

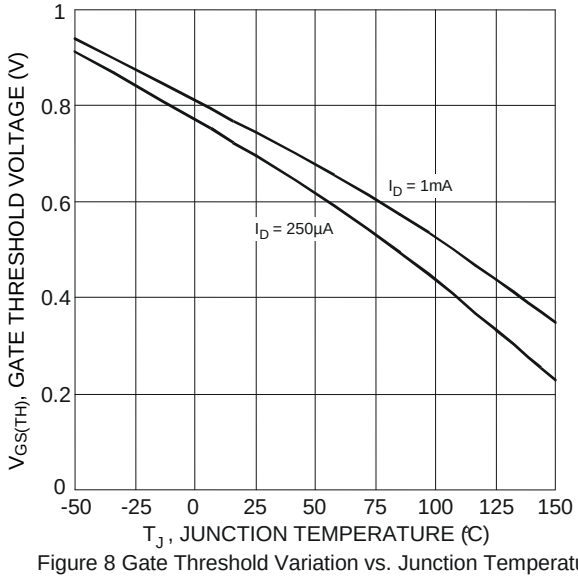


Figure 8 Gate Threshold Variation vs. Junction Temperature

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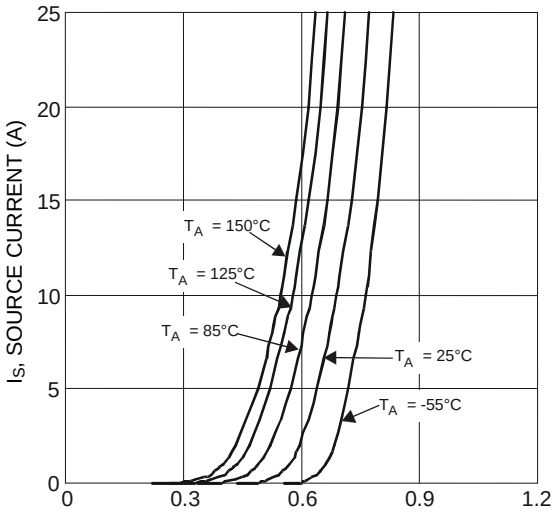


Figure 9 Diode Forward Voltage vs. Current

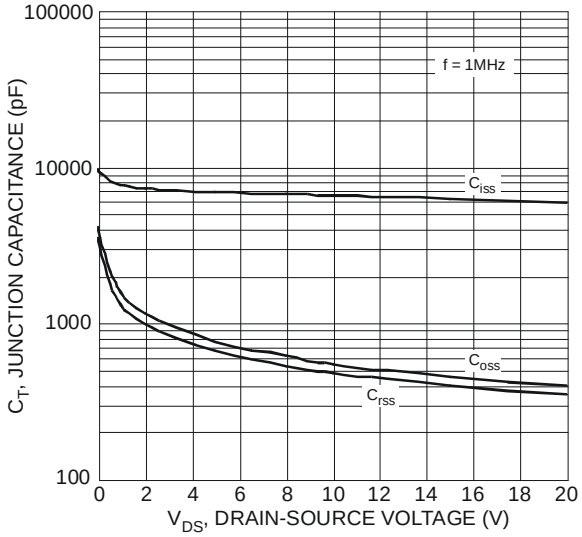


Figure 10 Typical Junction Capacitance

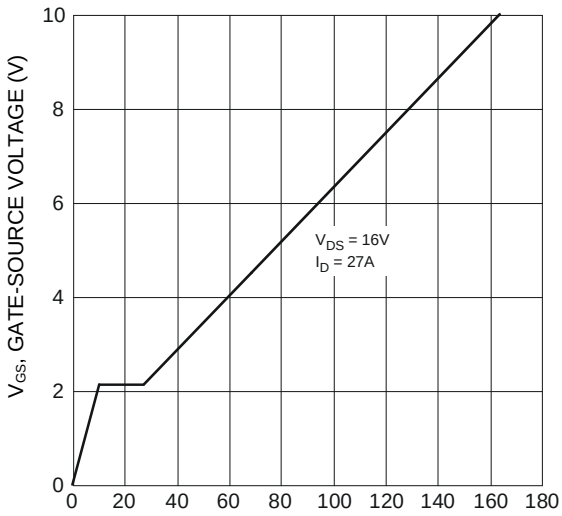


Figure 11 Gate Charge

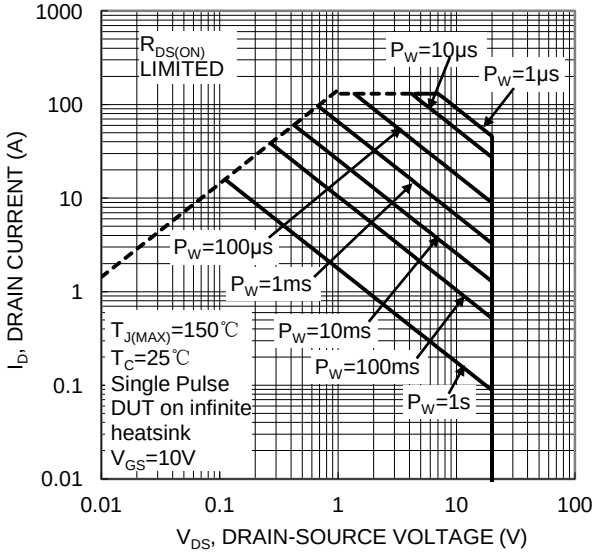


Figure 12. SOA, Safe Operation Area

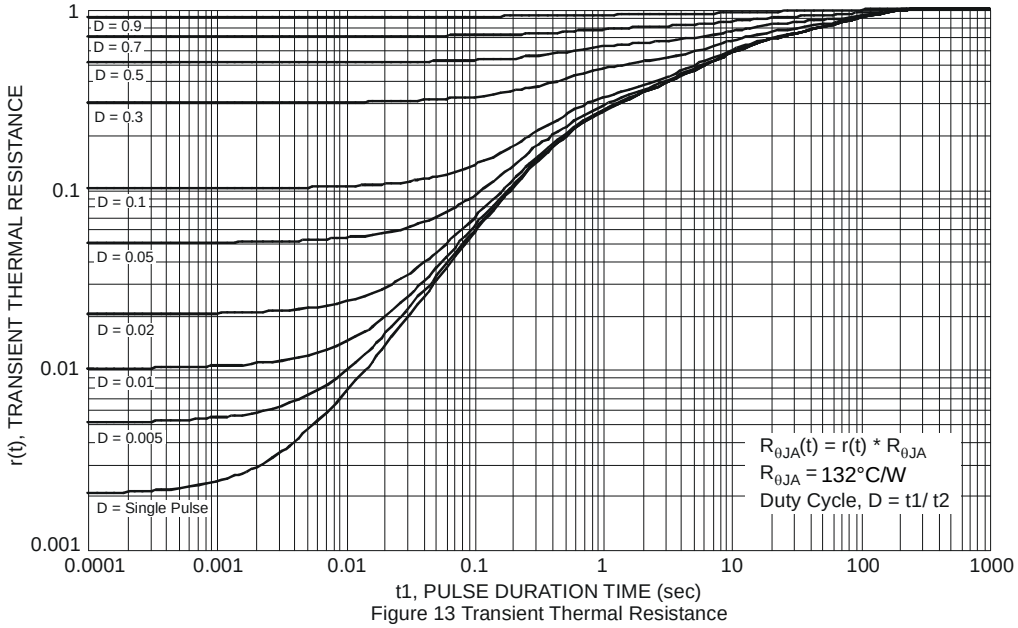


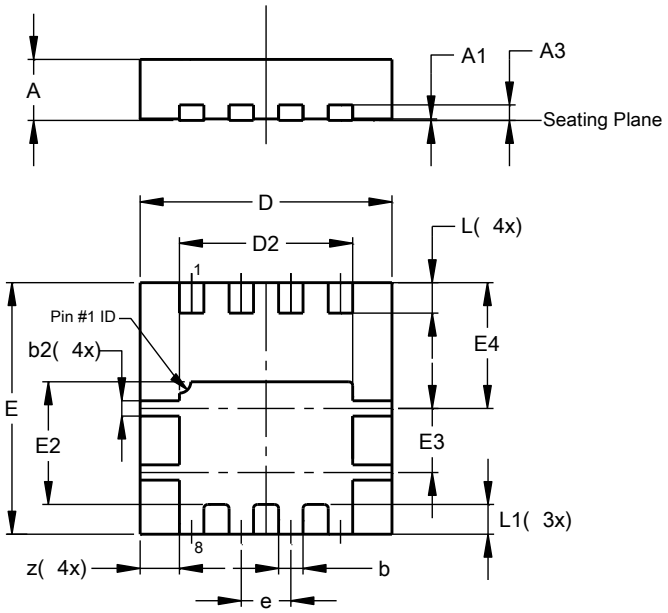
Figure 13 Transient Thermal Resistance

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Package Outline Dimensions

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

PowerDI3333-8

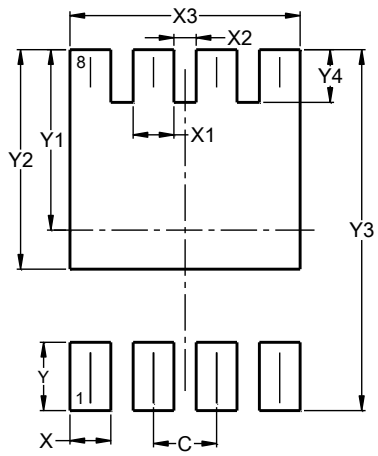


PowerDI3333-8			
Dim	**Min**	**Max**	**Typ**
A	0.75	0.85	0.80
A1	0.00	0.05	0.02
A3	–	–	0.203
b	0.27	0.37	0.32
b2	0.15	0.25	0.20
D	3.25	3.35	3.30
D2	2.22	2.32	2.27
E	3.25	3.35	3.30
E2	1.56	1.66	1.61
E3	0.79	0.89	0.84
E4	1.60	1.70	1.65
e	–	–	0.65
L	0.35	0.45	0.40
L1	–	–	0.39
z	–	–	0.515
All Dimensions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