20V P-CHANNEL ENHANCEMENT MODE MOSFET
PowerDI3333-8

Product Summary

BV_{DSS}	$R_{DS(ON)}$ max	I_D max T_C = +25°C
-20V	4.0mΩ @ V_{GS} = -4.5V	-89A
	6.5mΩ @ V_{GS} = -2.5V	-70A

Description

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

Applications

- Load Switch
- Power Management Functions

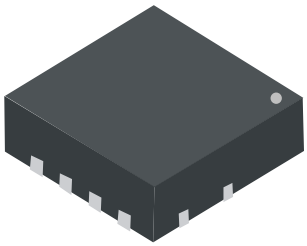
Features

- Low $R_{DS(ON)}$ – ensures on state losses are minimized
- Small form factor, thermally efficient package enables higher density end products (PowerDI®)
- Occupies just 33% of the board area occupied by SO-8 enabling smaller end product
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

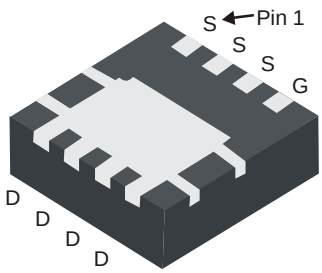
Mechanical Data

- Case: PowerDI3333-8
- 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
- Terminal Finish — Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.072 grams (Approximate)

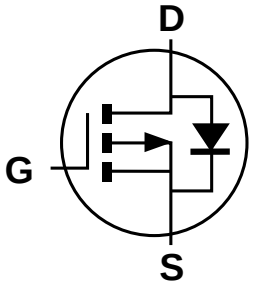
PowerDI3333-8



Top View



Bottom View



Equivalent Circuit

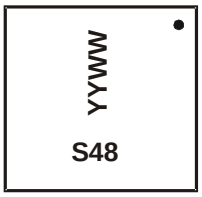
Ordering Information (Note 4)

Part Number	Case	Packaging
DMP2005UFG-7	PowerDI3333-8	2,000/Tape & Reel
DMP2005UFG-13	PowerDI3333-8	3,000/Tape & Reel

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

PowerDI3333-8



S48 = Product Type Marking Code
YYWW = Date Code Marking
YY = Last Two Digits of Year (ex: 16 = 2016)
WW = Week Code (01 to 53)

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

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V_{DSS}	-20	V
Gate-Source Voltage			V_{GSS}	±10	V
Continuous Drain Current V_{GS} = -4.5V (Note 7)	Steady State	T_C = +25°C T_C = +70°C	I_D	-89 -70	A
Continuous Drain Current V_{GS} = -4.5V (Note 6)	Steady State	T_A = +25°C T_A = +70°C	I_D	-19 -15	A
Pulsed Drain Current (380µs pulse, duty cycle = 1%)			I_{DM}	-100	A
Maximum Continuous Body Diode Forward Current (Note 6)			I_S	-2.5	A
Avalanche Current (Note 8) L = 0.1mH			I_{AS}	-27	A
Avalanche Energy (Note 8) L = 0.1mH			E_{AS}	35	mJ

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

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)	T_A = +25°C	P_D	1.0	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	128	°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	$R_{\theta JA}$	57	°C/W
Total Power Dissipation (Note 7)	T_C = +25°C	P_D	48	W
Thermal Resistance, Junction to Case (Note 7)		$R_{\theta JC}$	2.6	°C/W
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°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	I_{DSS}	—	—	-1	µA	V_{DS} = -16V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±8V, V_{DS} = 0V
ON CHARACTERISTICS (Note 9)						
Gate Threshold Voltage	$V_{GS(TH)}$	-0.3	-0.7	-0.9	V	V_{DS} = V_{GS}, I_D = -250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	3.5	4.0	mΩ	V_{GS} = -4.5V, I_D = -15A
		—	5.4	6.5		V_{GS} = -2.5V, I_D = -10A
		—	8.0	14		V_{GS} = -1.8V, I_D = -1A
Diode Forward Voltage	V_{SD}	—	-0.7	-1.2	V	V_{GS} = 0V, I_S = -10A
DYNAMIC CHARACTERISTICS (Note 10)						
Input Capacitance	C_{iss}	—	4,670	—	pF	V_{DS} = -10V, V_{GS} = 0V f = 1.0MHz
Output Capacitance	C_{oss}	—	650	—		
Reverse Transfer Capacitance	C_{rss}	—	550	—		
Gate Resistance	R_G	—	3.5	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1.0MHz
Total Gate Charge (V_{GS} = -4.5V)	Q_g	—	55	—	nC	V_{DD} = -10V, I_D = -20A
Total Gate Charge (V_{GS} = -10V)	Q_g	—	125	—		
Gate-Source Charge	Q_{gs}	—	7.8	—		
Gate-Drain Charge	Q_{gd}	—	16.5	—		
Turn-On Delay Time	$t_{D(ON)}$	—	9.5	—	ns	V_{GS} = -4.5V, V_{DD} = -10V, R_G = 1Ω, R_G = 1Ω, I_D = -10A
Turn-On Rise Time	t_R	—	10.5	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	115	—		
Turn-Off Fall Time	t_F	—	85	—		
Reverse Recovery Time	t_{RR}	—	25	—	ns	I_F = -10A, di/dt = 100A/µs
Reverse Recovery Charge	Q_{RR}	—	14	—	nC	I_F = -10A, di/dt = 100A/µs

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} rating are based on low frequency and duty cycles to keep T_J = +25°C.
9. Short duration pulse test used to minimize self-heating effect.
10. Guaranteed by design. Not subject to product testing.

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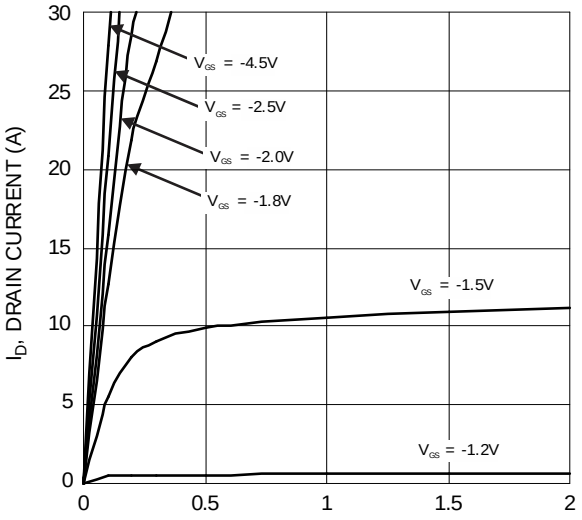


Figure 1 Typical Output Characteristics

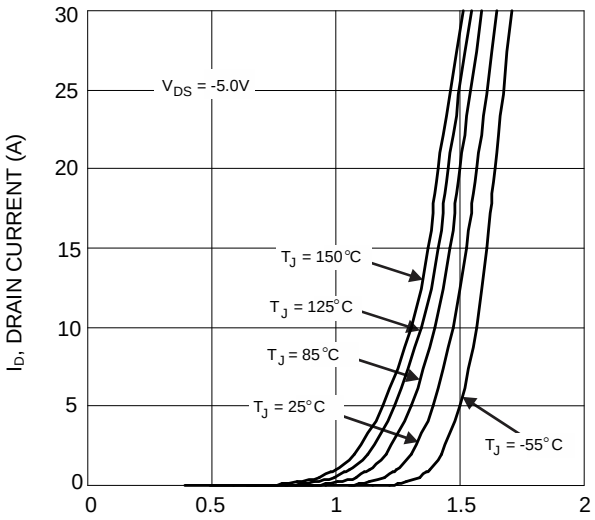


Figure 2 Typical Transfer Characteristics

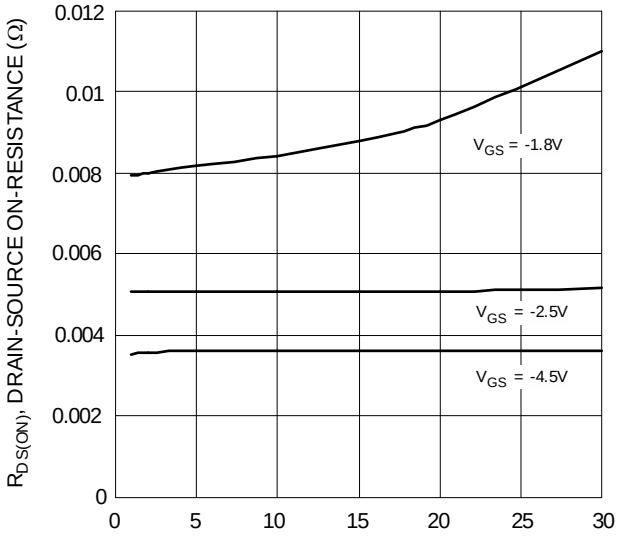


Figure 3 Typical On-Resistance vs.
Drain Current and Gate Voltage

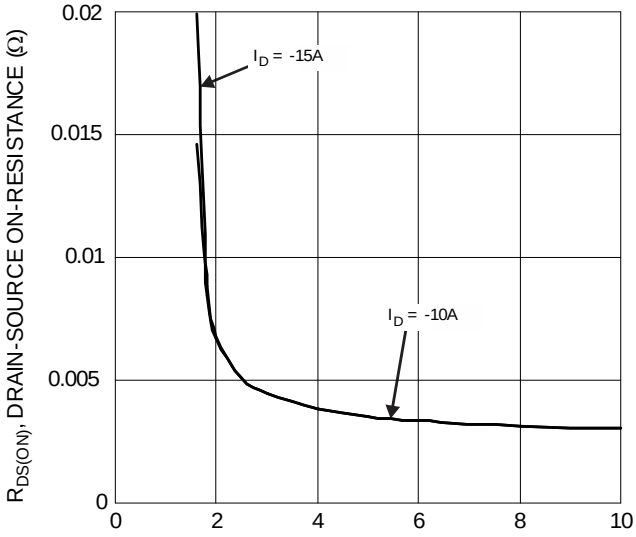


Figure 4 Typical Drain-Source On-Resistance
vs. Gate-Source Voltage

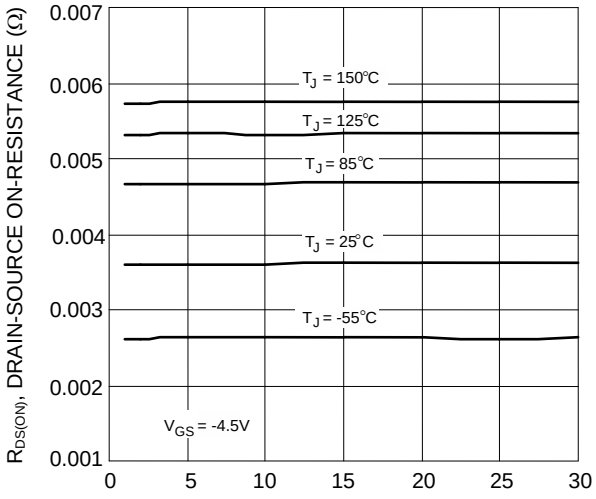


Figure 5 Typical On-Resistance vs.
Drain Current and Temperature

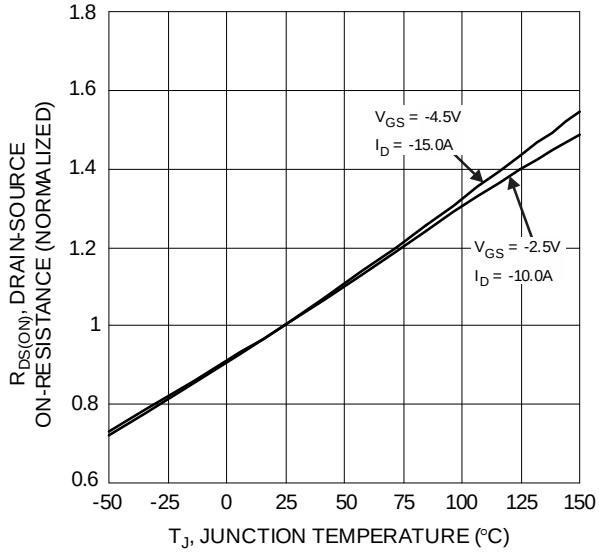


Figure 6 On-Resistance Variation with Temperature

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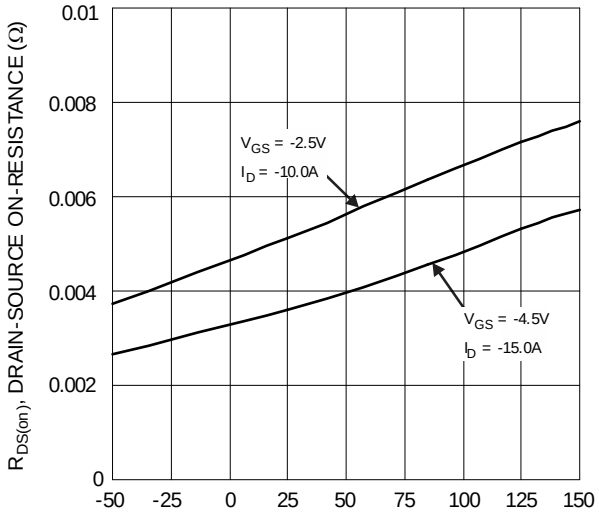


Figure 7 On-Resistance Variation with Temperature

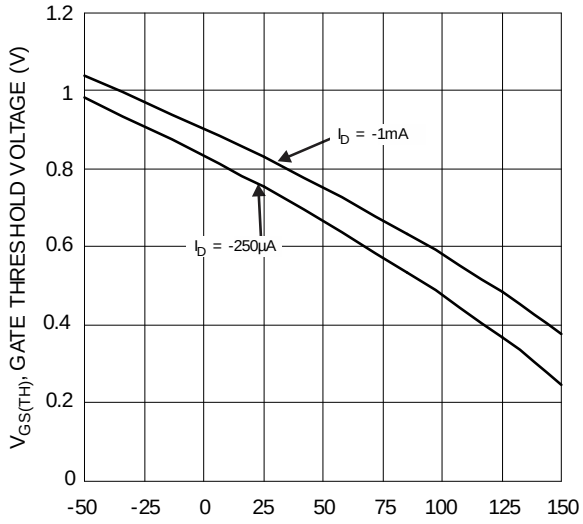


Figure 8 Gate Threshold Variation vs. Junction Temperature

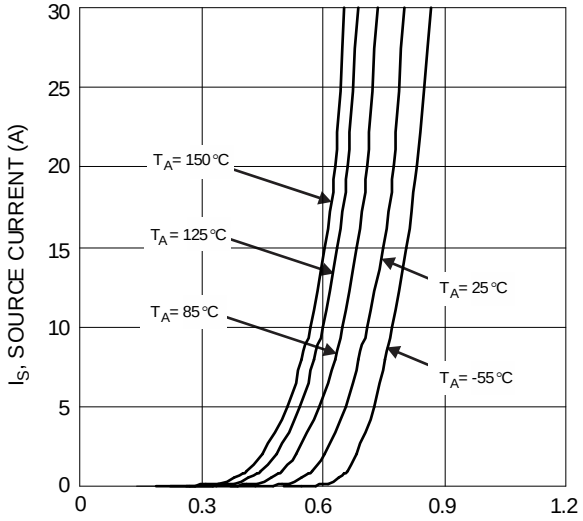


Figure 9 Diode Forward Voltage vs. Current

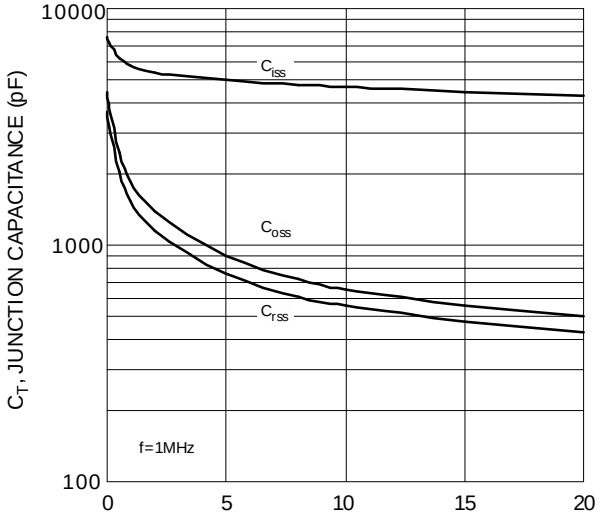


Figure 10 Typical Junction Capacitance

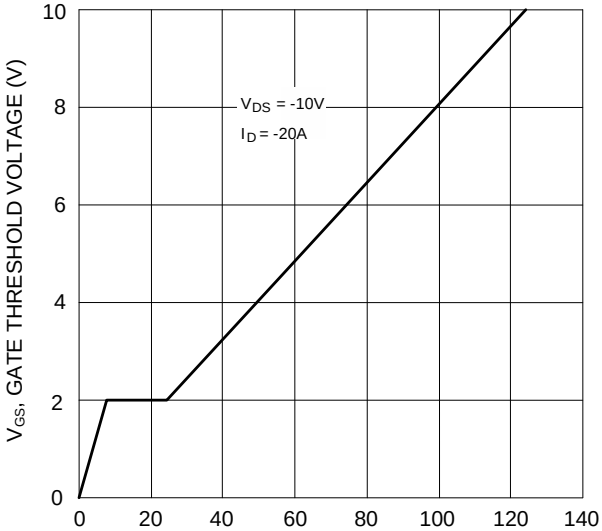


Figure 11 Gate Charge

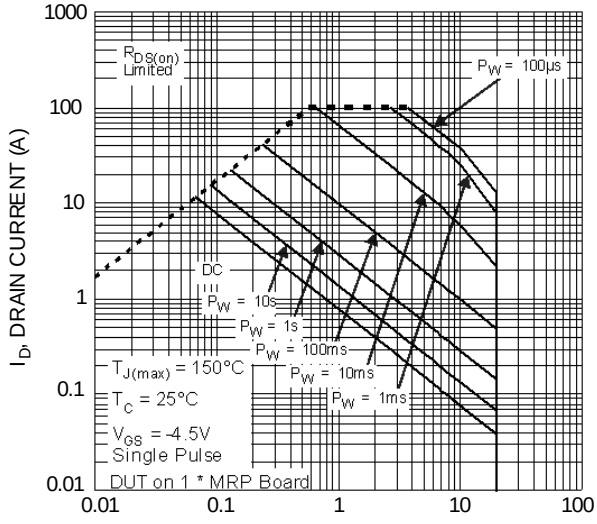


Figure 12 SOA, Safe Operation Area

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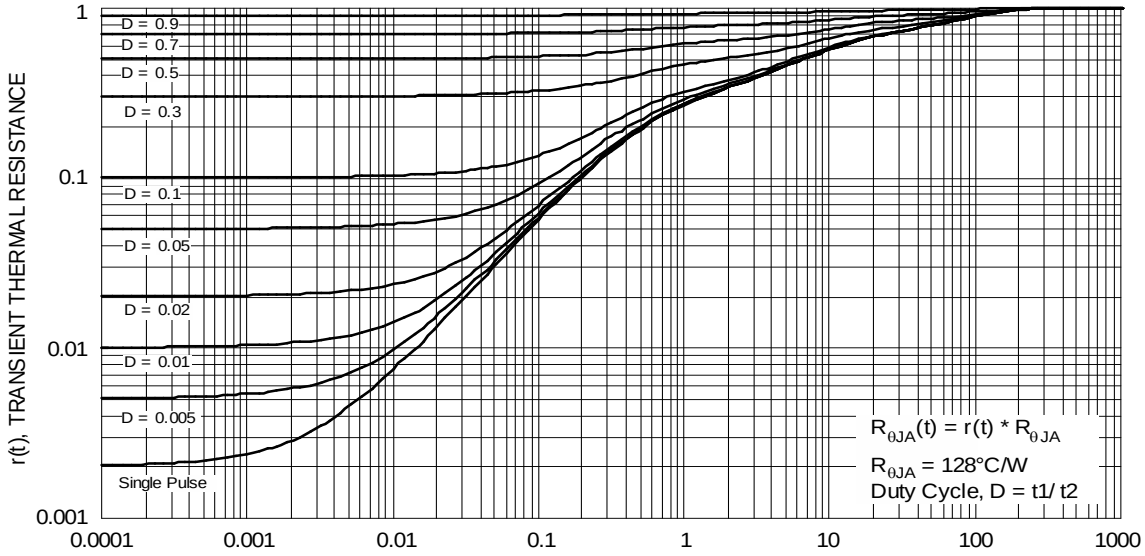


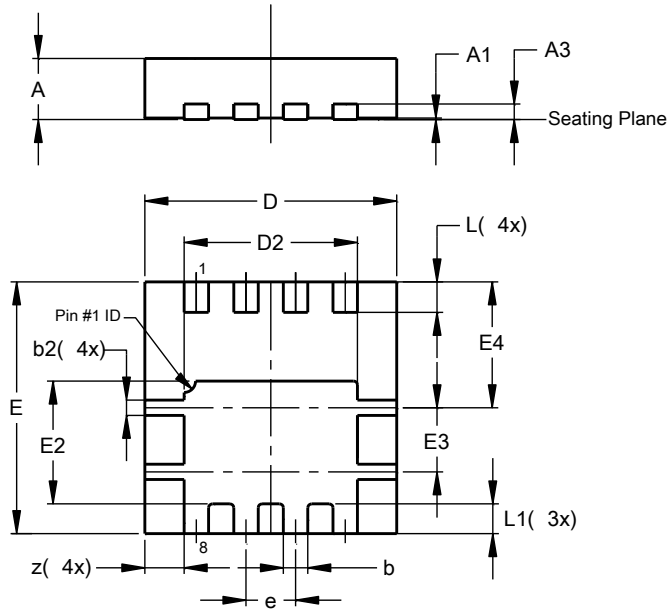
Figure 13 Transient Thermal Resistance

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Package Outline Dimensions

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

PowerDI3333-8

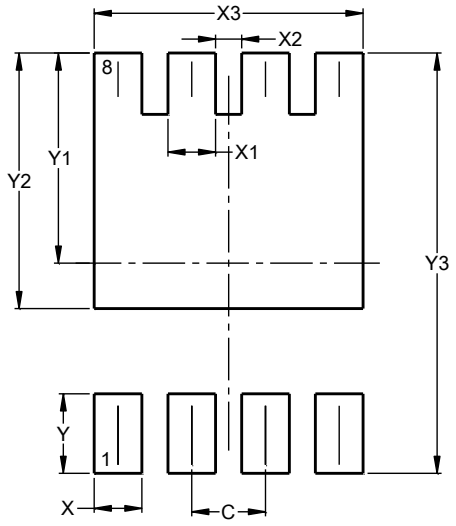


PowerDI3333-8			
Dim	**Min**	**Max**	**Typ**
A	0.75	0.85	0.80
A1	0.00	0.05	0.02
A3	–	–	0.203
b	0.27	0.37	0.32
b2	0.15	0.25	0.20
D	3.25	3.35	3.30
D2	2.22	2.32	2.27
E	3.25	3.35	3.30
E2	1.56	1.66	1.61
E3	0.79	0.89	0.84
E4	1.60	1.70	1.65
e	–	–	0.65
L	0.35	0.45	0.40
L1	–	–	0.39
z	–	–	0.515
All Dimensions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

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