

Product Summary

BV_{DSS}	$R_{DS(ON)}$ Max	I_D Max $T_C = +25^\circ\text{C}$ (Note 10)
20V	4.6m Ω @ $V_{GS} = 4.5\text{V}$	50A
	8.7m Ω @ $V_{GS} = 2.5\text{V}$	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

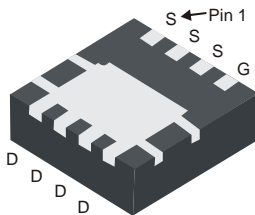
This MOSFET is designed to meet the stringent requirements of automotive applications. It is qualified to AEC-Q101, supported by a PPAP, and is ideal for use in:

- Motor Control
- Load Switch
- DC-DC Converters

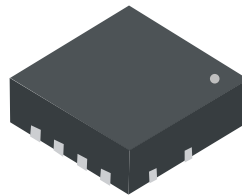
Mechanical Data

- 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 (3)
- Weight: 0.072 grams (Approximate)

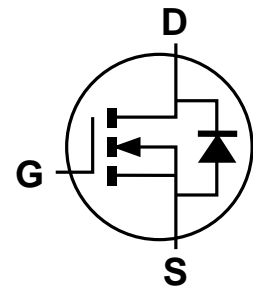
PowerDI3333-8



Bottom View



Top View



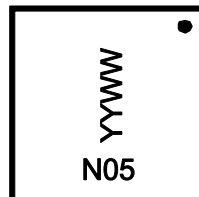
Equivalent Circuit

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)

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	50	A
		T _C = +70°C	40	A
		T _A = +25°C	18	A
		T _A = +70°C	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.)

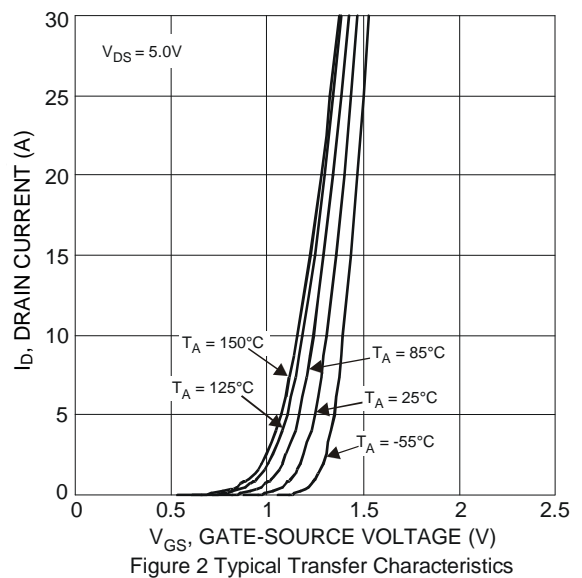
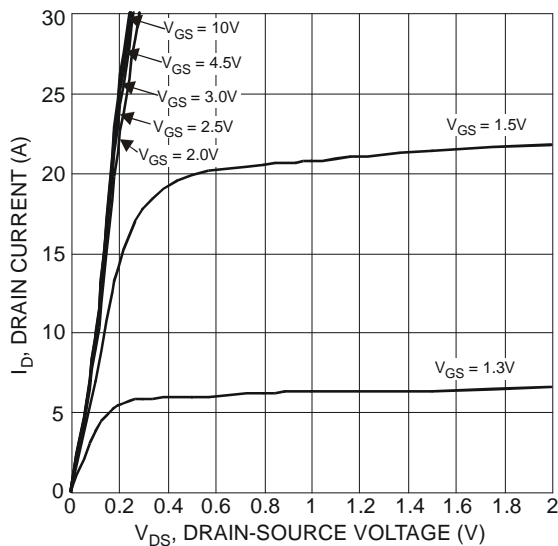
Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 6)	T _A = +25°C	P _D	1.05	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	R _{θJA}	120	°C/W
Total Power Dissipation (Note 7)	T _A = +25°C	P _D	2.27	W
Thermal Resistance, Junction to Ambient (Note 7)	Steady State	R _{θJA}	55	°C/W
Thermal Resistance, Junction to Case (Note 7)		R _{θJC}	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.

Electrical Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 8)						
Drain-Source Breakdown Voltage	BV_{DSS}	20	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
Zero Gate Voltage Drain Current $T_J = +25^\circ\text{C}$	I_{DSS}	—	—	10	μA	$V_{DS} = 20V, V_{GS} = 0V$
Gate-Source Leakage	I_{GSS}	—	—	± 100	nA	$V_{GS} = \pm 12V, V_{DS} = 0V$
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	$V_{GS(TH)}$	0.4	0.7	1.2	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	4	4.6	m Ω	$V_{GS} = 4.5V, I_D = 13.5A$
		—	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	$V_{DS} = 10V, V_{GS} = 0V,$ $f = 1\text{MHz}$
Output Capacitance	C_{oss}	—	546	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	477	—	pF	
Gate Resistance	R_g	—	0.7	—	Ω	$V_{DS} = 0V, V_{GS} = 0V, f = 1\text{MHz}$
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	$V_{GS} = 5V, V_{DS} = 10V,$ $R_G = 4.7\Omega, I_D = 13.5A$
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	$I_F = 13.5A, di/dt = 100A/\mu s$
Body Diode Reverse Recovery Charge	Q_{RR}	—	8.5	—	nC	$I_F = 13.5A, di/dt = 100A/\mu s$

- 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.



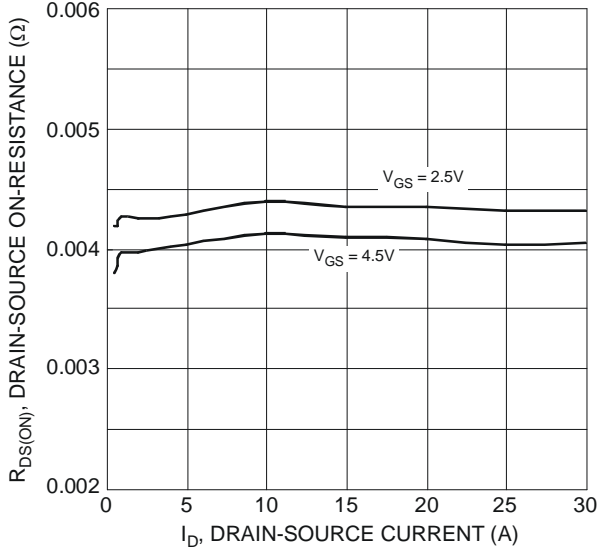


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

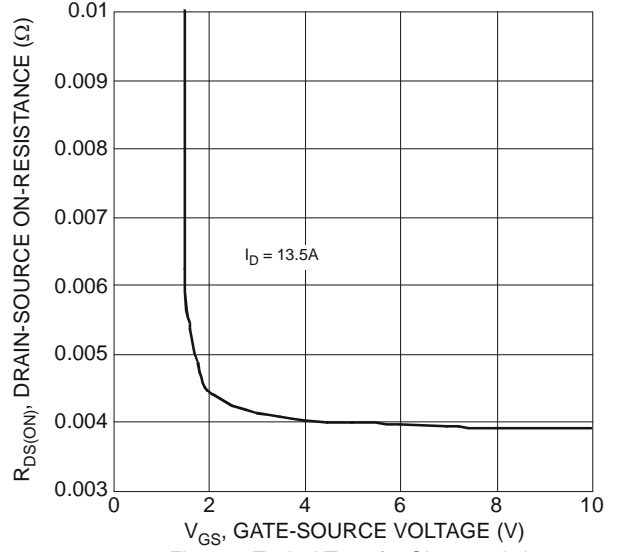


Figure 4 Typical Transfer Characteristic

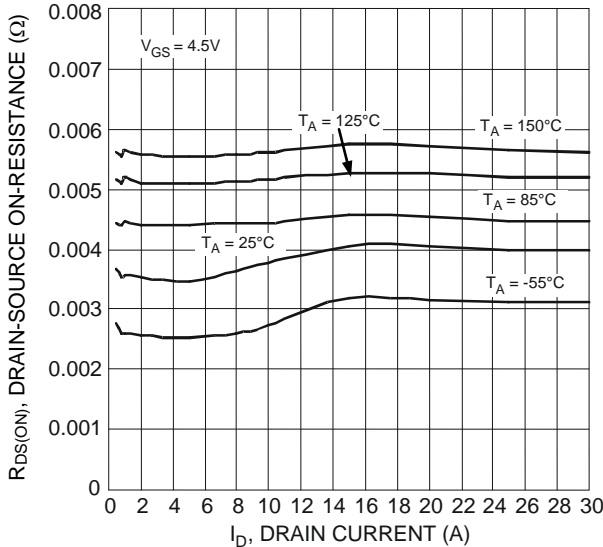


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

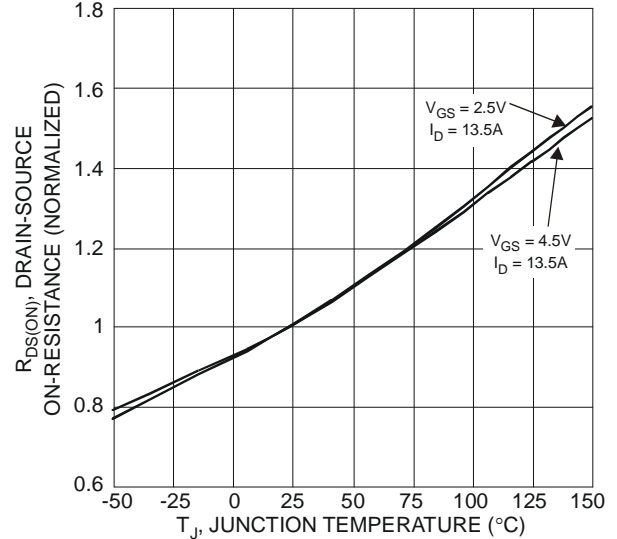


Figure 6 On-Resistance Variation with Temperature

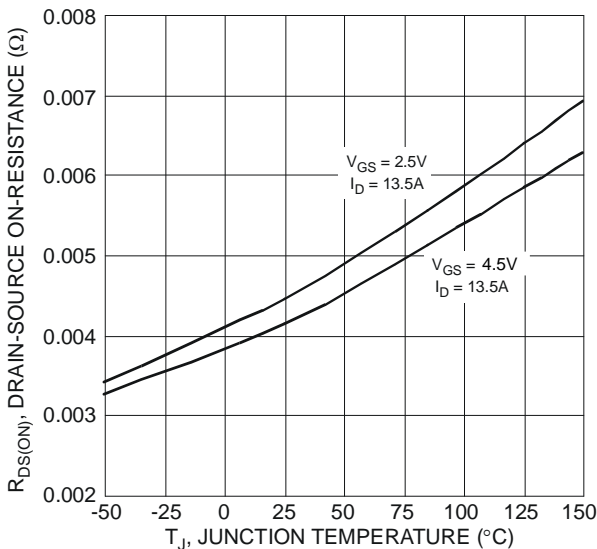


Figure 7 On-Resistance Variation with Temperature

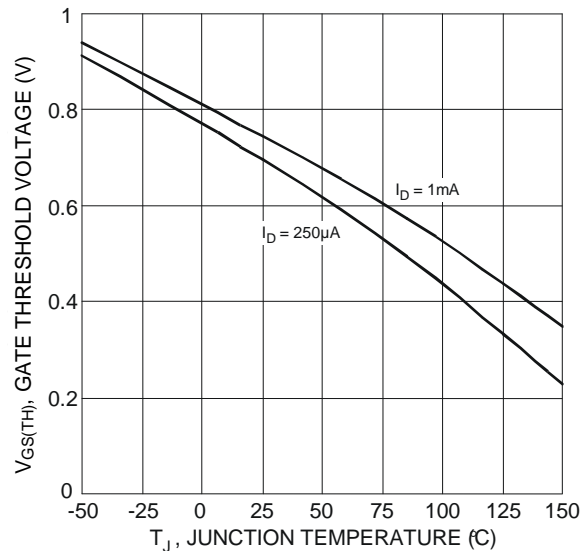


Figure 8 Gate Threshold Variation vs. Junction Temperature

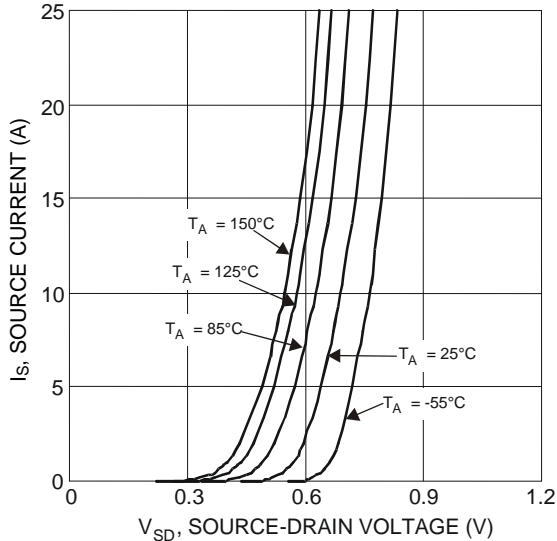


Figure 9 Diode Forward Voltage vs. Current

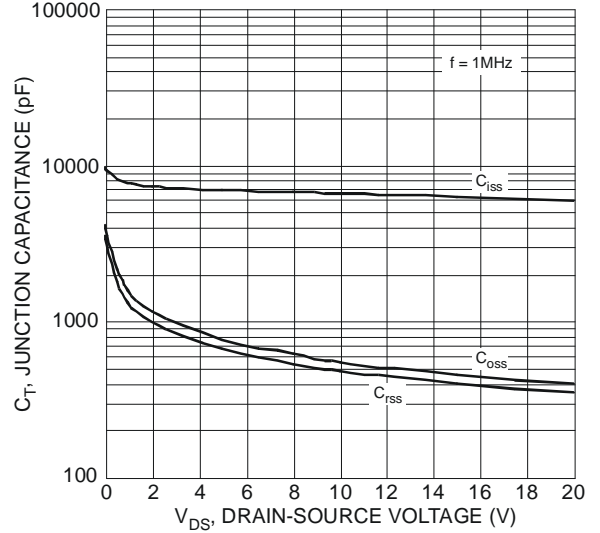


Figure 10 Typical Junction Capacitance

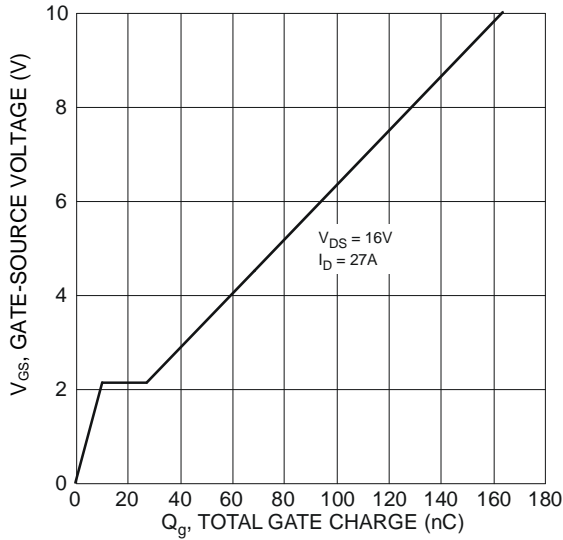


Figure 11 Gate Charge

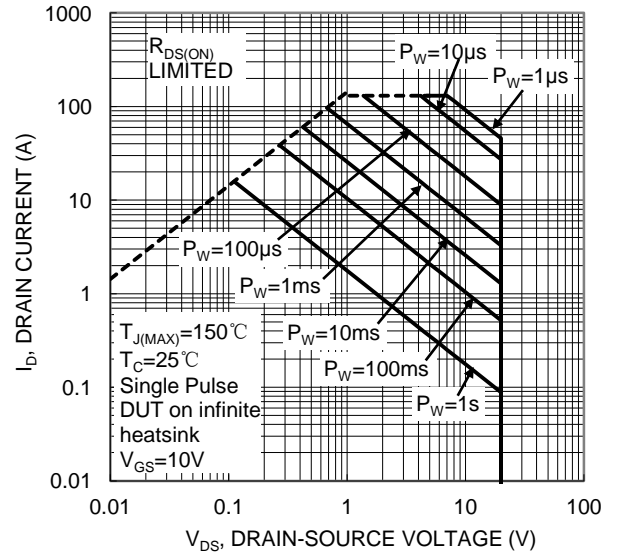


Figure 12. SOA, Safe Operation Area

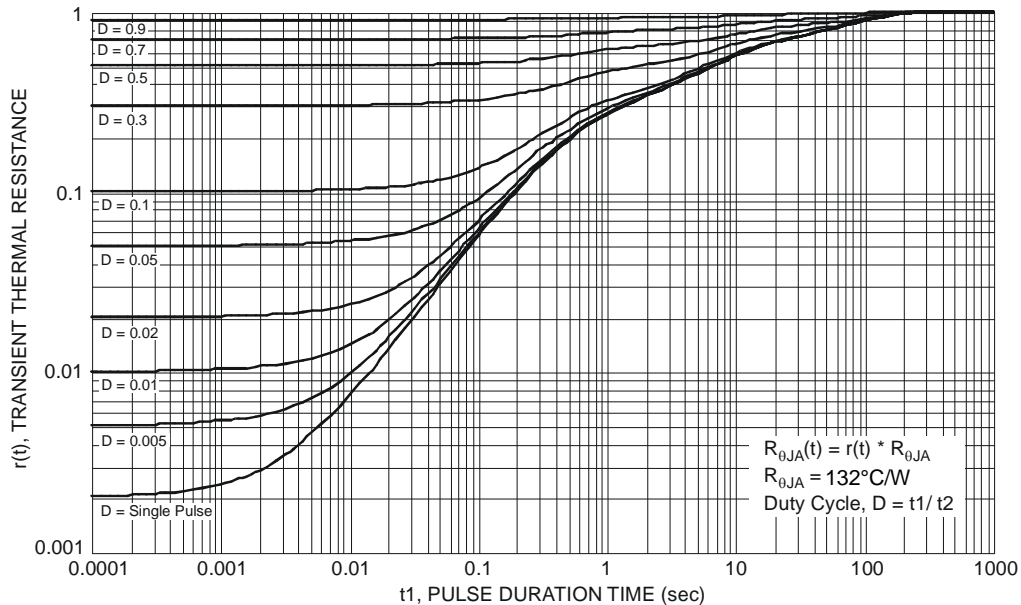
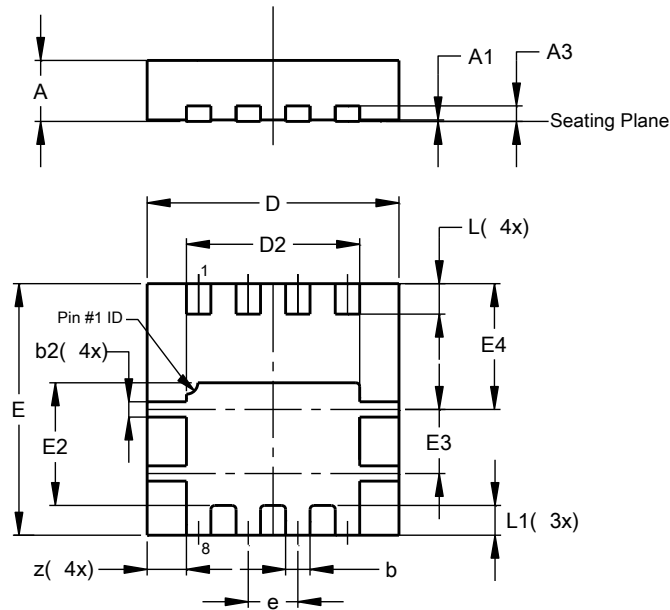


Figure 13 Transient Thermal Resistance

Package Outline Dimensions

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

PowerDI3333-8

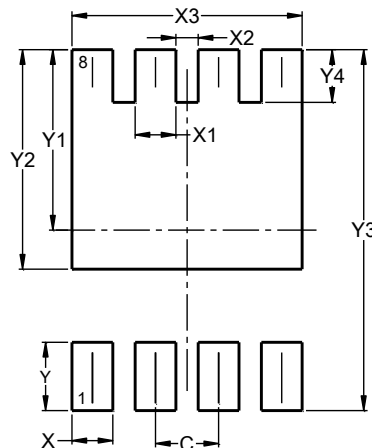


PowerDI3333-8			
Dim	Min	Max	Typ
A	0.75	0.85	0.80
A1	0.00	0.05	0.02
A3	-	-	0.203
b	0.27	0.37	0.32
b2	0.15	0.25	0.20
D	3.25	3.35	3.30
D2	2.22	2.32	2.27
E	3.25	3.35	3.30
E2	1.56	1.66	1.61
E3	0.79	0.89	0.84
E4	1.60	1.70	1.65
e	-	-	0.65
L	0.35	0.45	0.40
L1	-	-	0.39
z	-	-	0.515
All Dimensions in mm			

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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