60V N-CHANNEL ENHANCEMENT MODE MOSFET
POWERDI

Product Summary

BV_{DSS}	$R_{DS(ON)}$ Max	I_D Max T_C = +25°C
60V	50mΩ @ V_{GS} = 10V	18A
	63mΩ @ V_{GS} = 4.5V	16A

Features and Benefits

- 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
- **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**

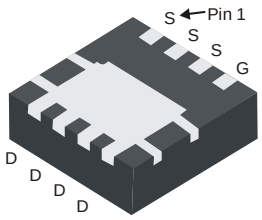
Description and Applications

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.

- Backlighting
- Power Management Functions
- DC-DC Converters

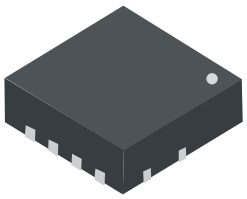
Mechanical Data

- 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
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.03 grams (Approximate)

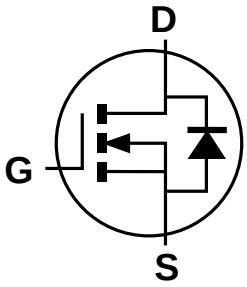


Bottom View

PowerDI3333-8



Top View



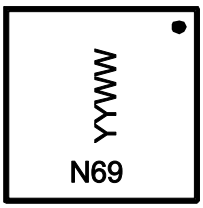
Equivalent Circuit

Ordering Information (Note 4)

Part Number	Case	Packaging
DMN6069SFG-7	PowerDI3333-8	2,000/Tape & Reel
DMN6069SFG-13	PowerDI3333-8	3,000/Tape & Reel

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
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



N69 = Product Type Marking Code
YYWW = Date Code Marking
YY = Last Two Digits of Year (ex: 16 = 2016)
WW = Week Code (01 to 53)

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

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V_{DSS}	60	V
Gate-Source Voltage			V_{GSS}	±20	V
Continuous Drain Current (Note 6) V_{GS} = 10V	Steady State	T_A = +25°C T_A = +70°C	I_D	5.6 4.5	A
	Steady State	T_C = +25°C T_C = +70°C	I_D	18 14.5	A
Pulsed Drain Current (380µs Pulse, Duty Cycle = 1%)			I_{DM}	25	A
Maximum Continuous Body Diode Forward Current (Note 6)			I_S	2.5	A
Avalanche Current (Note 7) L = 0.1mH			I_{AS}	12	A
Avalanche Energy (Note 7) L = 0.1mH			E_{AS}	7.2	mJ

Thermal Characteristics

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)		P_D	0.93	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	134	°C/W
	t<10s		82	
Total Power Dissipation (Note 6)		P_D	2.4	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	53	°C/W
	t<10s		33	
Thermal Resistance, Junction to Case		$R_{\theta JC}$	5	
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 8)						
Drain-Source Breakdown Voltage	BV_{DSS}	60	—	—	V	V_{GS} = 0V, I_D = 250µA
Zero Gate Voltage Drain Current T_J = +25°C	I_{DSS}	—	—	1	µA	V_{DS} = 60V, V_{GS} = 0V
Zero Gate Voltage Drain Current T_J = +150°C (Note 9)	I_{DSS}	—	—	100	µA	V_{DS} = 60V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	$V_{GS(TH)}$	1	—	3	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	39	50	mΩ	V_{GS} = 10V, I_D = 4.5A
		—	47	63		V_{GS} = 4.5V, I_D = 3A
Diode Forward Voltage	V_{SD}	—	—	1.1	V	V_{GS} = 0V, I_S = 2.5A
On State Drain Current (Note 9)	$I_{D(ON)}$	20	—	—	A	V_{DS} ≧5V, V_{GS} = 10V
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C_{ISS}	—	740	1,480	pF	V_{DS} = 30V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{OSS}	—	40	80	pF	
Reverse Transfer Capacitance	C_{RSS}	—	28	55	pF	
Gate Resistance	R_G	—	2.2	4	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (V_{GS} = 4.5V)	Q_G	—	6.4	12	nC	V_{DS} = 30V, I_D = 12A
Total Gate Charge (V_{GS} = 10V)	Q_G	—	14	25	nC	
Gate-Source Charge	Q_{GS}	—	2.8	5.5	nC	
Gate-Drain Charge	Q_{GD}	—	2.3	5	nC	
Turn-On Delay Time	$t_{D(ON)}$	—	3.6	10	ns	V_{DS} = 30V, I_D = 12A V_{GS} = 10V, R_G = 6.0Ω
Turn-On Rise Time	t_R	—	5.0	10	ns	
Turn-Off Delay Time	$t_{D(OFF)}$	—	12	24	ns	
Turn-Off Fall Time	t_F	—	3.3	10	ns	
Body Diode Reverse Recovery Time	t_{RR}	—	11	22	ns	I_F = 4.5A, di/dt = 100A/µs
Body Diode Reverse Recovery Charge	Q_{RR}	—	5.1	10	nC	

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 1-inch square copper plate.
7. I_{AS} and E_{AS} ratings are based on low frequency and duty cycles to keep T_J = +25°C.
8. Short duration pulse test used to minimize self-heating effect.
9. Guaranteed by design. Not subject to product testing.

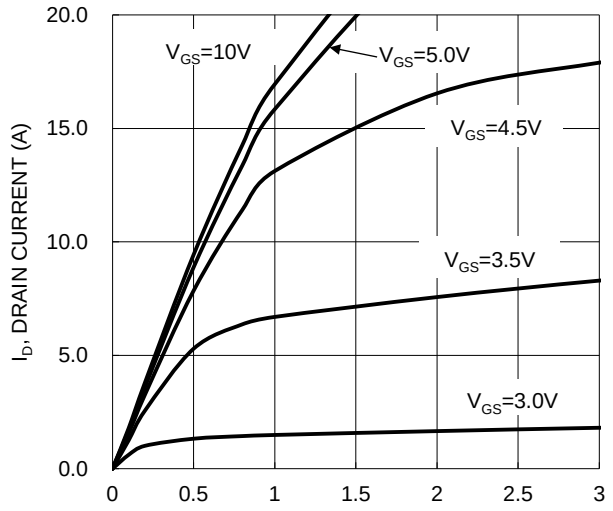


Figure 1. Typical Output Characteristic

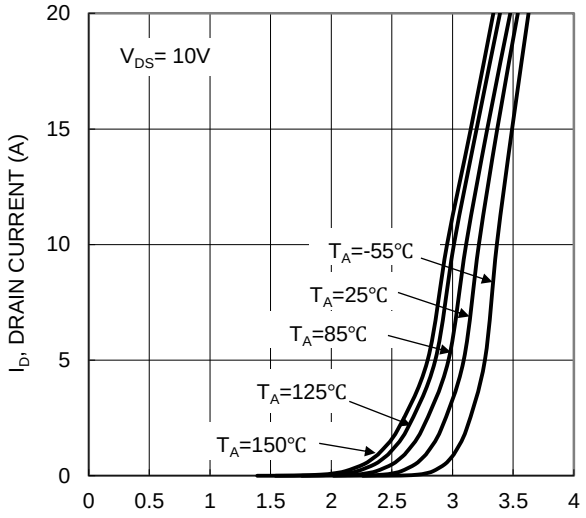


Figure 2. Typical Transfer Characteristic

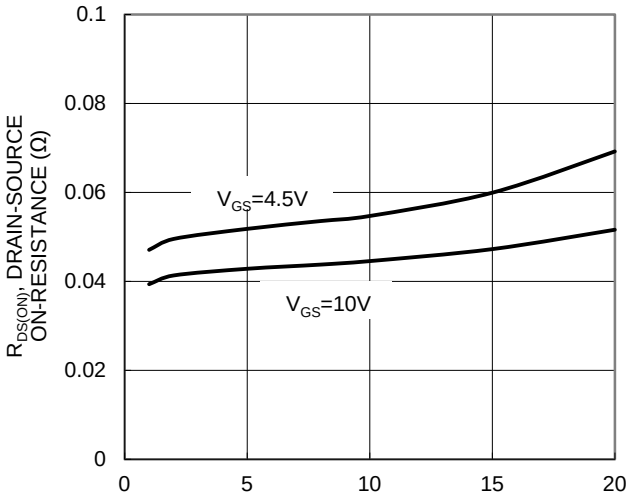


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

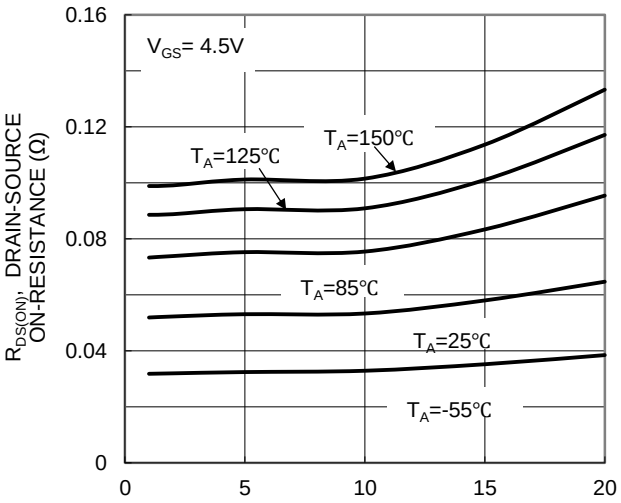


Figure 4. Typical On-Resistance vs. Drain Current and Temperature

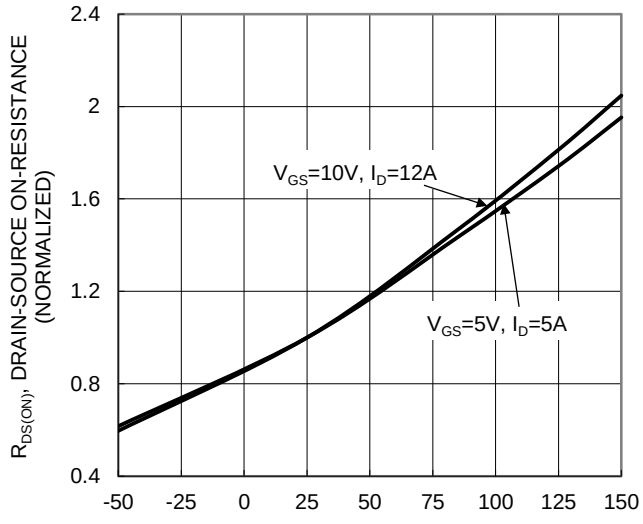


Figure 5. On-Resistance Variation with Temperature

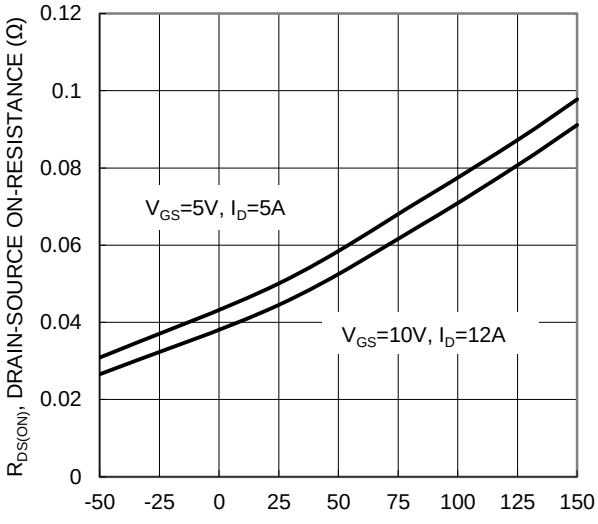


Figure 6. On-Resistance Variation with Temperature

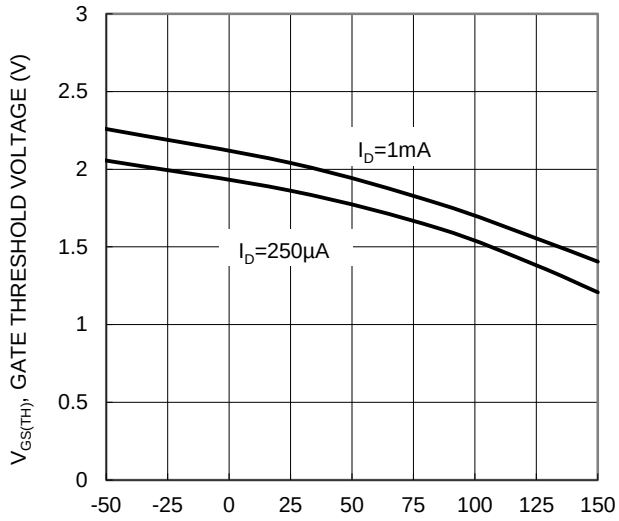


Figure 7. Gate Threshold Variation vs. JunctionTemperature

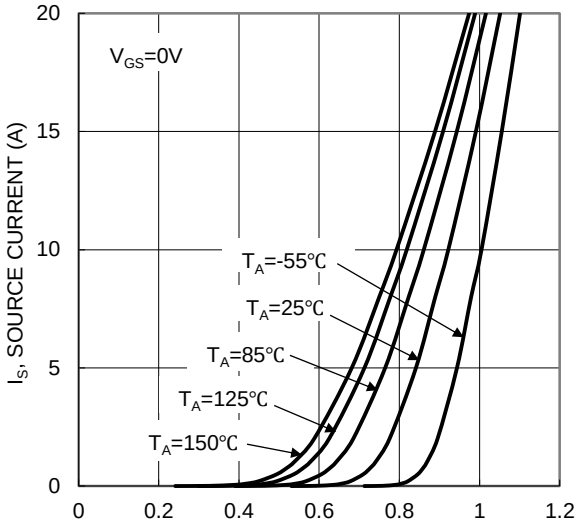


Figure 8. Diode Forward Voltage vs. Current

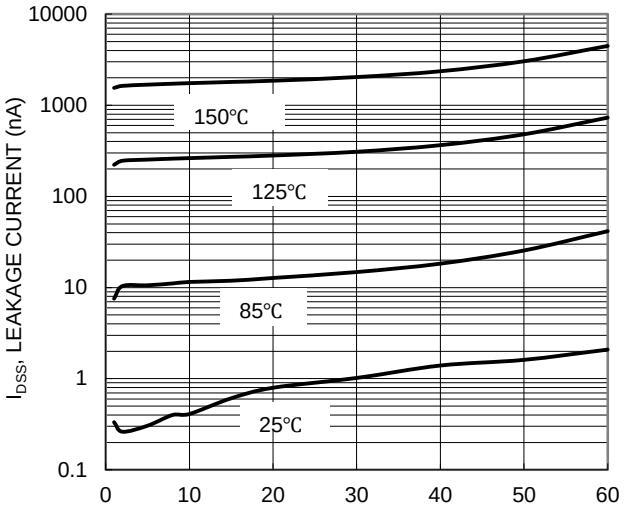


Figure 9. Typical Drain-Source Leakge Current vs. Voltage

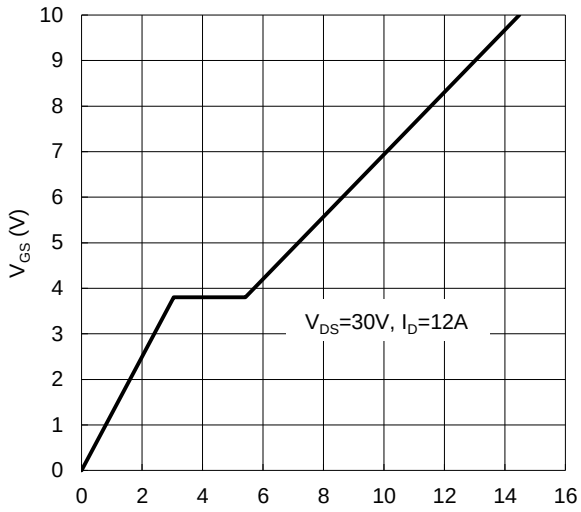


Figure 10. Gate Charge

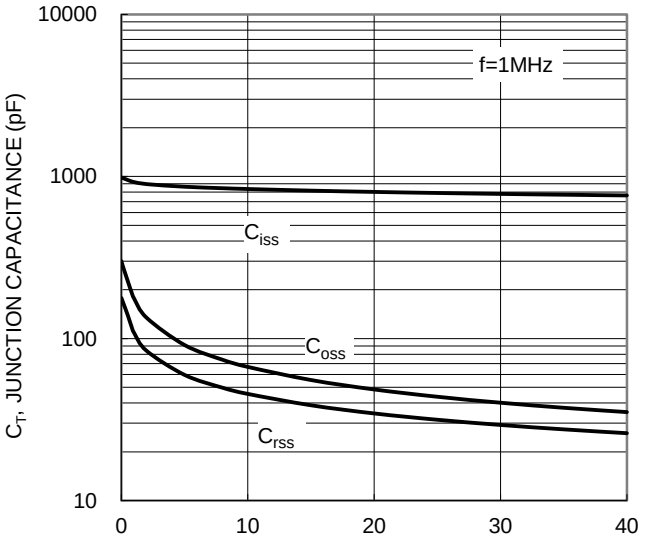


Figure 11. Typical Junction Capacitance

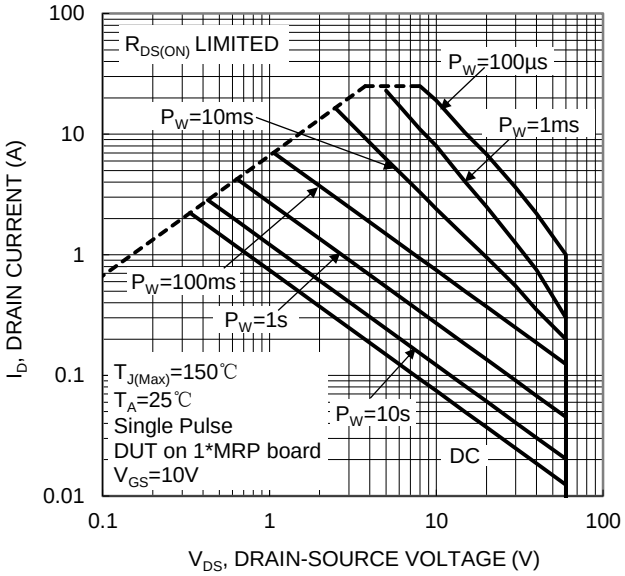


Figure 12. SOA, Safe Operation Area

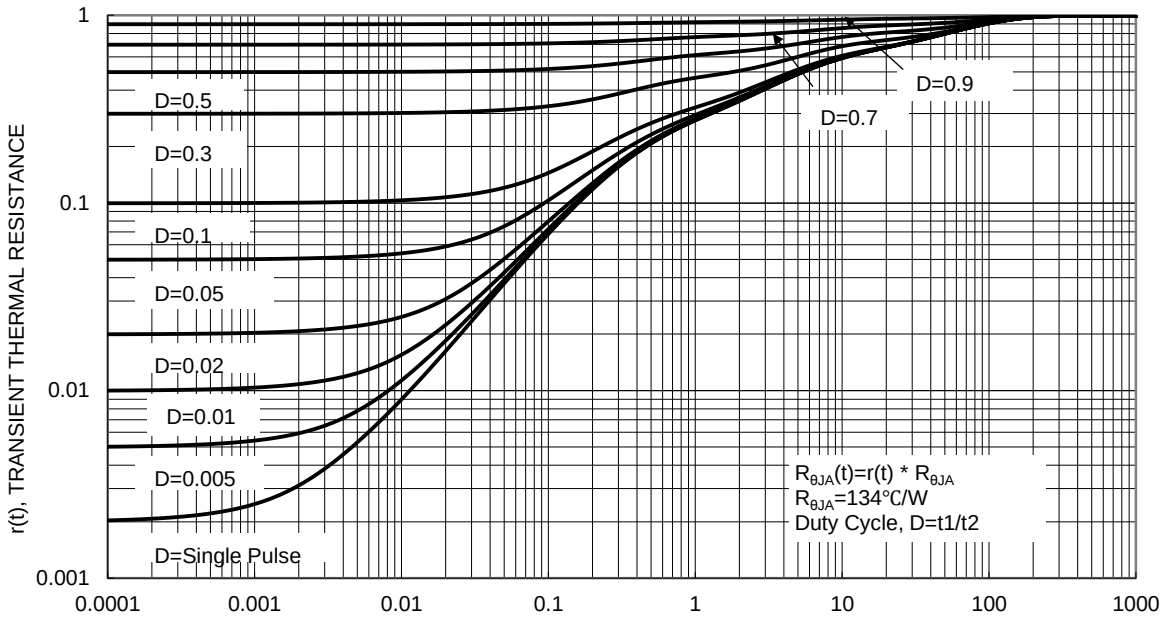
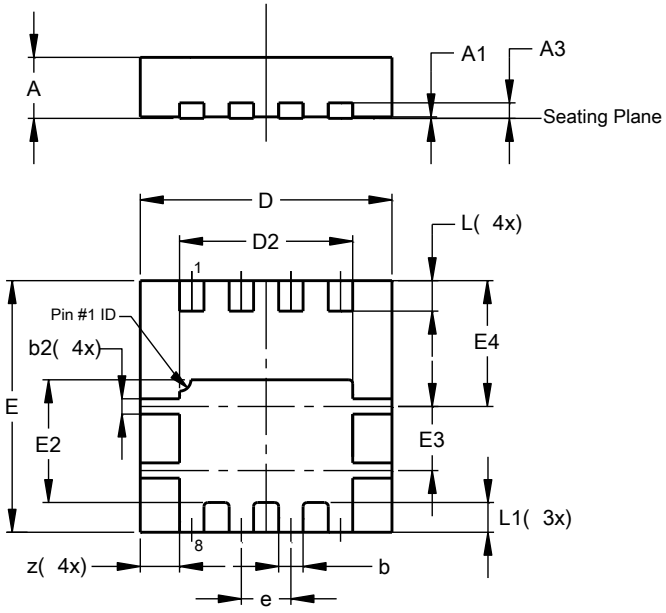


Figure 13. Transient Thermal Resistance

Package Outline Dimensions

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

PowerDI3333-8

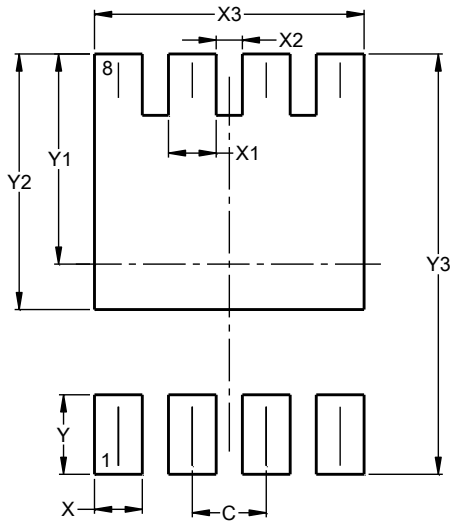


PowerDI3333-8			
Dim	**Min**	**Max**	**Typ**
A	0.75	0.85	0.80
A1	0.00	0.05	0.02
A3	–	–	0.203
b	0.27	0.37	0.32
b2	0.15	0.25	0.20
D	3.25	3.35	3.30
D2	2.22	2.32	2.27
E	3.25	3.35	3.30
E2	1.56	1.66	1.61
E3	0.79	0.89	0.84
E4	1.60	1.70	1.65
e	–	–	0.65
L	0.35	0.45	0.40
L1	–	–	0.39
z	–	–	0.515
All Dimensions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

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