60V N-CHANNEL ENHANCEMENT MODE MOSFET
PowerDI3333-8

Product Summary

BV_{DSS}	$R_{DS(ON)}$ max	I_D max T_A = +25°C
60V	13mΩ @ V_{GS} = 10V	10.3A
	18mΩ @ V_{GS} = 4.5V	8.8A

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
- **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

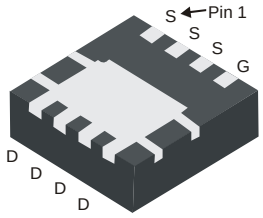
This MOSFET is designed to meet the stringent requirements of Automotive applications. It is qualified to AEC-Q101, supported by a PPAP and is ideal for use in:

- Motor Control
- DC to DC Converters
- Reverse Polarity Protection

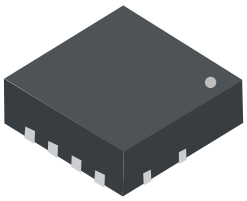
Mechanical Data

- 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)

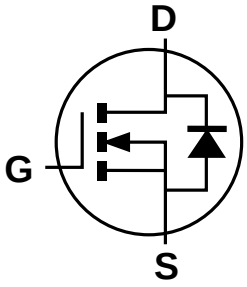
PowerDI3333-8



Bottom View



Top View



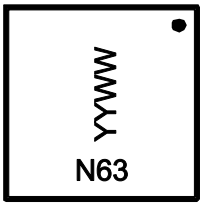
Equivalent Circuit

Ordering Information (Note 5)

Part Number	Case	Packaging
DMN6013LFGQ-7	PowerDI3333-8	2,000/Tape & Reel
DMN6013LFGQ-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) & 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



N63 = Product Type Marking Code
YYWW = Date Code Marking
YY = Last Two Digits of Year (ex: 18 = 2018)
WW = Week Code (01 to 53)

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

Characteristic		Symbol	Value	Unit
Drain-Source Voltage		V_{DSS}	60	V
Gate-Source Voltage		V_{GSS}	±20	V
Continuous Drain Current (Note 7) V_{GS} = 10V	T_A = +25°C T_A = +70°C	I_D	10.3 8.3	A
	T_C = +25°C T_C = +100°C	I_D	45 28	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)		I_{DM}	58.3	A
Maximum Continuous Body Diode Forward Current (Note 7)		I_S	3	A
Avalanche Current, L = 0.1mH		I_{AS}	33.3	A
Avalanche Energy, L = 0.1mH		E_{AS}	56.8	mJ

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

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 6)		P_D	1	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	123	°C/W
	t < 10s		69	
Total Power Dissipation (Note 7)		P_D	2.1	W
Thermal Resistance, Junction to Ambient (Note 7)	Steady State	$R_{\theta JA}$	60	°C/W
	t < 10s		34	
Total Power Dissipation (Note 7)		P_D	40	W
Thermal Resistance, Junction to Case (Note 7)		$R_{\theta JC}$	3.2	°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 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
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	$V_{GS(TH)}$	1	1.8	3	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	9.3	13	mΩ	V_{GS} = 10V, I_D = 10A
		—	12.3	18		V_{GS} = 4.5V, I_D = 8A
Diode Forward Voltage	V_{SD}	—	0.7	1.2	V	V_{GS} = 0V, I_S = 1.7A
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C_{iss}	—	2577	—	pF	V_{DS} = 30V, V_{GS} = 0V, f = 1MHz
Output Capacitance	C_{oss}	—	162	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	132	—	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	—	26.6	—	nC	V_{DS} = 30V, I_D = 10A
Total Gate Charge (V_{GS} = 10V)	Q_g	—	55.4	—	nC	
Gate-Source Charge	Q_{gs}	—	9.3	—	nC	
Gate-Drain Charge	Q_{gd}	—	12.6	—	nC	
Turn-On Delay Time	$t_{D(ON)}$	—	6.2	—	ns	V_{GS} = 10V, V_{DS} = 30V, R_G = 3Ω, I_D = 10A
Turn-On Rise Time	t_R	—	9.9	—	ns	
Turn-Off Delay Time	$t_{D(OFF)}$	—	27.6	—	ns	
Turn-Off Fall Time	t_F	—	11.7	—	ns	
Body Diode Reverse Recovery Time	t_{RR}	—	9.4	—	ns	I_F = 10A, di/dt = 100A/µs
Body Diode Reverse Recovery Charge	Q_{RR}	—	18.6	—	nC	

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

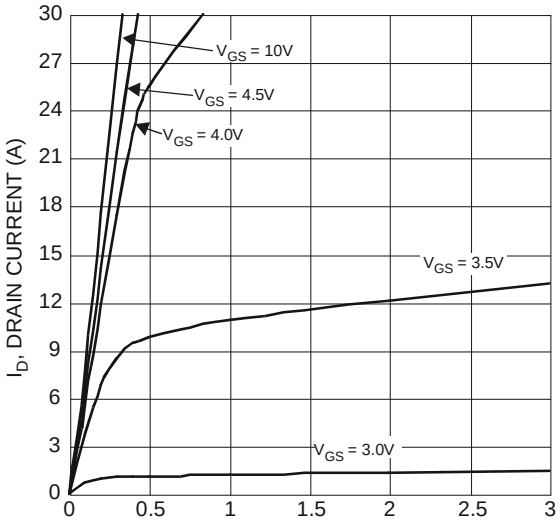


Figure 1 Typical Output Characteristics

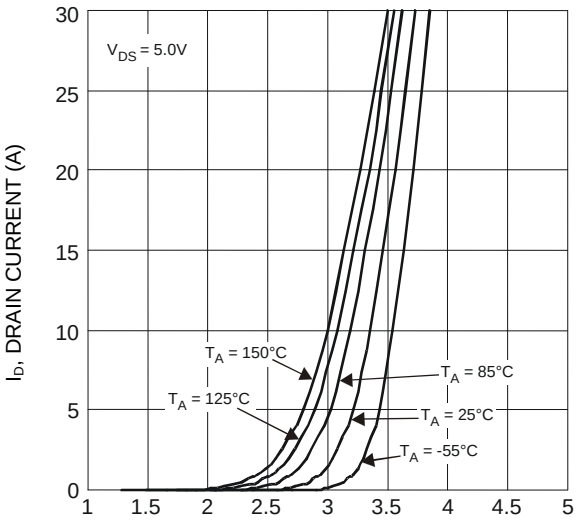


Figure 2 Typical Transfer Characteristics

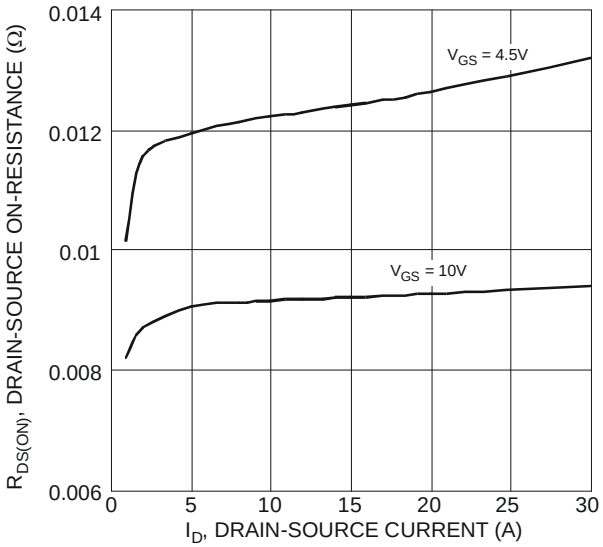


Figure 3 Typical On-Resistance vs.
Drain Current and Gate Voltage

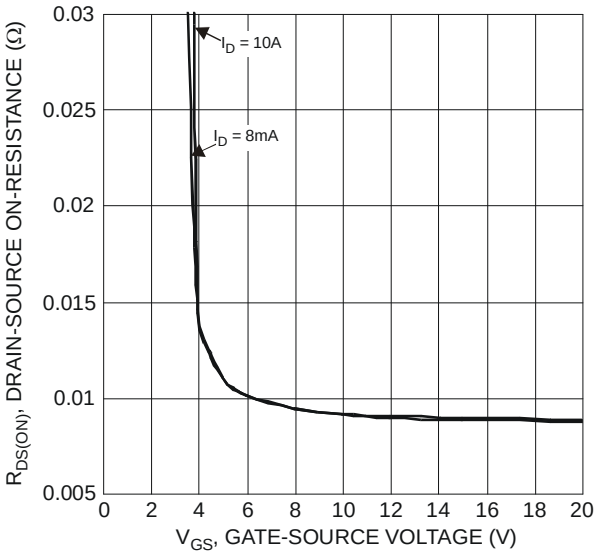


Figure 4 Typical Drain-Source On-Resistance
vs. Gate-Source Voltage

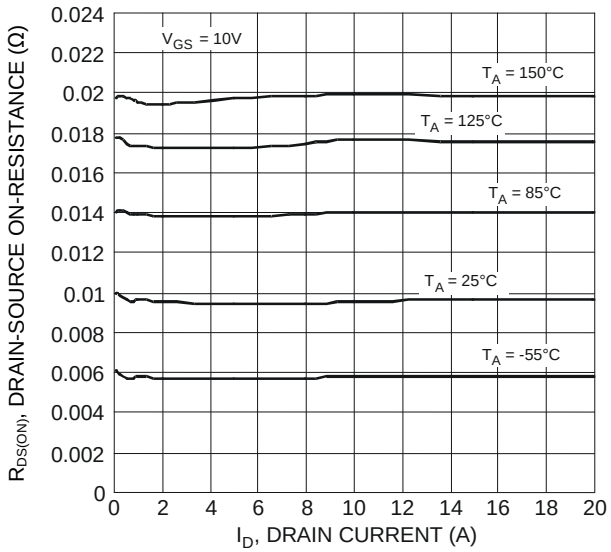


Figure 5 Typical On-Resistance vs.
Drain Current and Temperature

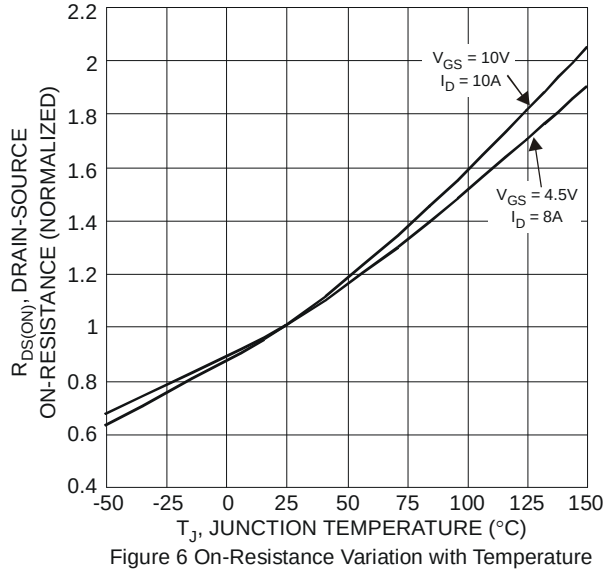


Figure 6 On-Resistance Variation with Temperature

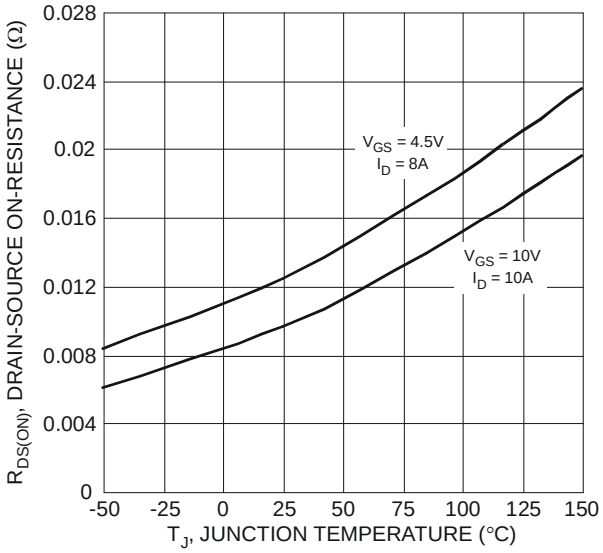


Figure 7 On-Resistance Variation with Temperature

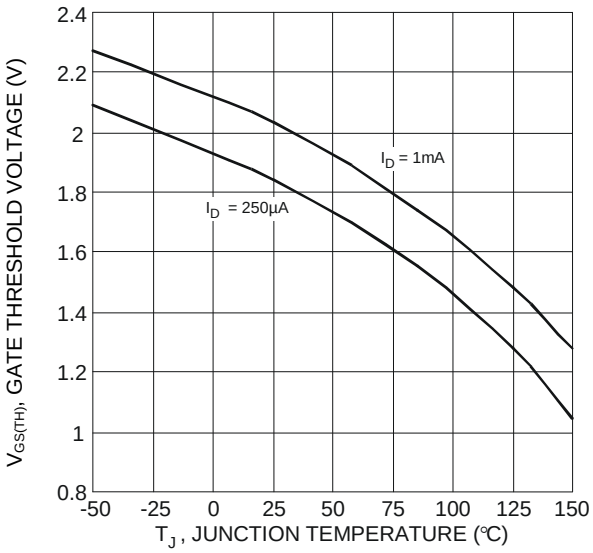


Figure 8 Gate Threshold Variation vs. Junction Temperature

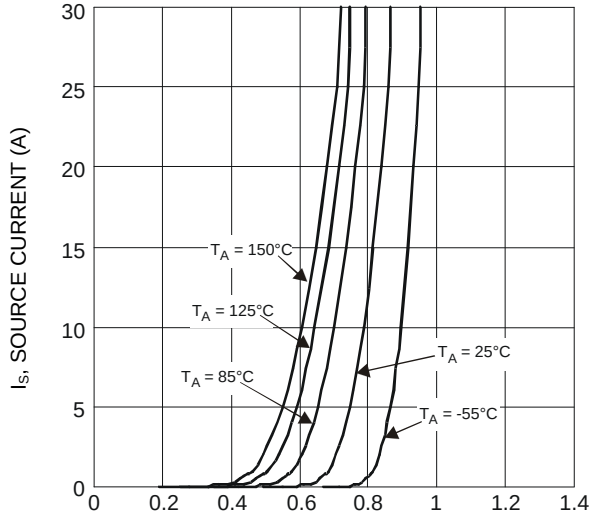


Figure 9 Diode Forward Voltage vs. Current

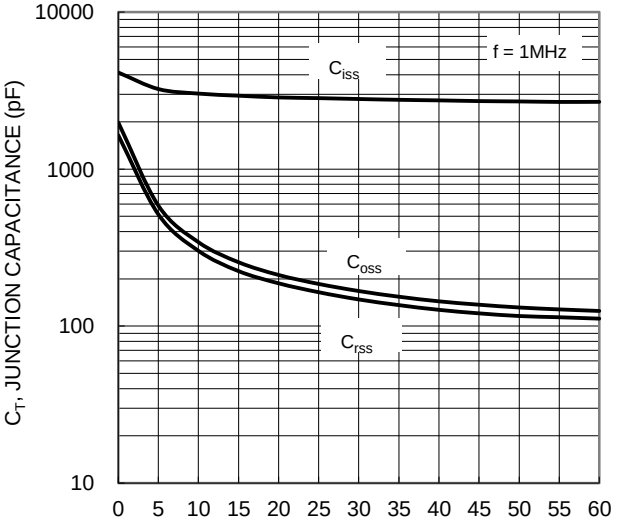


Figure 10 Typical Junction Capacitance

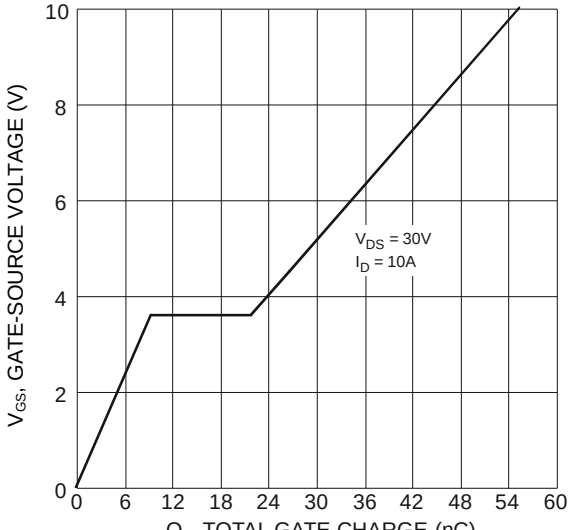


Figure 11 Gate Charge

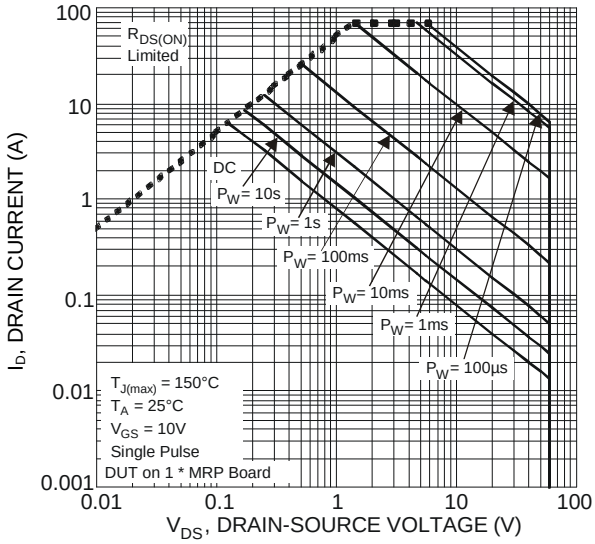


Figure 12 SOA, Safe Operation Area

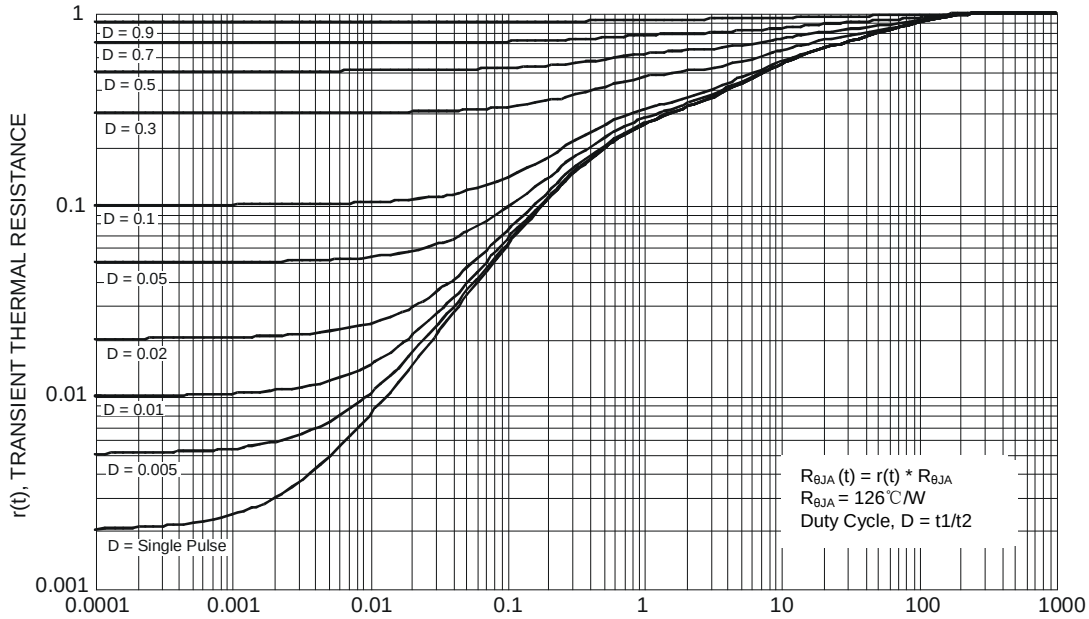
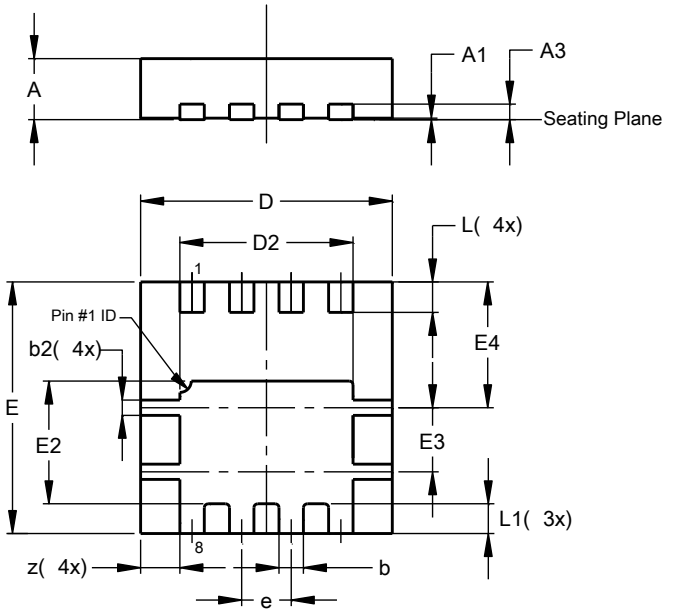


Figure 13 Transient Thermal Resistance

Package Outline Dimensions

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

PowerDI3333-8

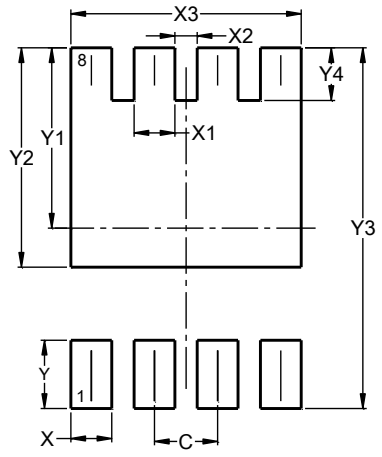


PowerDI3333-8			
Dim	**Min**	**Max**	**Typ**
A	0.75	0.85	0.80
A1	0.00	0.05	0.02
A3	–	–	0.203
b	0.27	0.37	0.32
b2	0.15	0.25	0.20
D	3.25	3.35	3.30
D2	2.22	2.32	2.27
E	3.25	3.35	3.30
E2	1.56	1.66	1.61
E3	0.79	0.89	0.84
E4	1.60	1.70	1.65
e	–	–	0.65
L	0.35	0.45	0.40
L1	–	–	0.39
z	–	–	0.515
All Dimensions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