

Product Summary

BV_{DSS}	$R_{DS(ON)}$ Max	I_D Max $T_A = +25^\circ C$
-40V	13m Ω @ $V_{GS} = -10V$	-10.3A
	18m Ω @ $V_{GS} = -4.5V$	-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 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

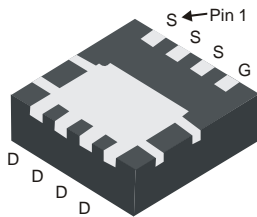
This MOSFET is designed to meet the stringent requirements of Automotive applications. It is qualified to AEC-Q101, supported by a PPAP and is ideal for use in:

- Reverse Polarity Protection
- Power Management Functions
- DC-DC Converters

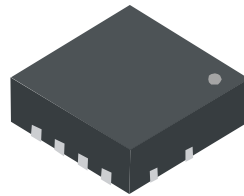
Mechanical Data

- 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)

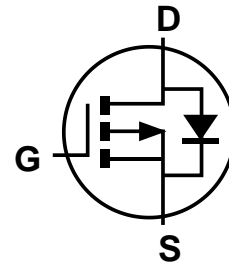
PowerDI3333-8



Bottom View



Top View



Equivalent Circuit

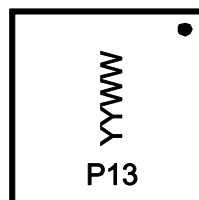
Ordering Information (Note 5)

Part Number	Case	Packaging
DMP4013LFGQ-7	PowerDI3333-8	2,000/Tape & Reel
DMP4013LFGQ-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 http://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

PowerDI3333-8



P13= 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 (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V_{DSS}	-40	V
Gate-Source Voltage			V_{GSS}	± 20	V
Continuous Drain Current (Note 7) $V_{GS} = -10\text{V}$	Steady State	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	I_D	-10.3 -8.3	A
	$t < 10\text{s}$	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	I_D	-13.7 -11	A
Pulsed Drain Current (10 μs Pulse, Duty Cycle = 1%)			I_{DM}	-80	A
Maximum Continuous Body Diode Forward Current (Note 7)			I_S	-2.6	A
Avalanche Current, $L = 0.1\text{mH}$			I_{AS}	-34	A
Avalanche Energy, $L = 0.1\text{mH}$			E_{AS}	58	mJ

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

Characteristic			Symbol	Value	Units
Total Power Dissipation (Note 6)			P_D	1	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State		$R_{\theta JA}$	123	$^\circ\text{C/W}$
	$t < 10\text{s}$			69	
Total Power Dissipation (Note 7)			P_D	2.1	W
Thermal Resistance, Junction to Ambient (Note 7)	Steady State		$R_{\theta JA}$	60	$^\circ\text{C/W}$
	$t < 10\text{s}$			34	
Thermal Resistance, Junction to Case (Note 7)			$R_{\theta JC}$	3.3	
Operating and Storage Temperature Range			T_J, T_{STG}	-55 to +150	$^\circ\text{C}$

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}	-40	—	—	V	$V_{GS} = 0\text{V}, I_D = -250\mu\text{A}$
Zero Gate Voltage Drain Current $T_J = +25^\circ\text{C}$	I_{DSS}	—	—	-1	μA	$V_{DS} = -40\text{V}, V_{GS} = 0\text{V}$
Gate-Source Leakage	I_{GSS}	—	—	± 100	nA	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	$V_{GS(TH)}$	-1	—	-3	V	$V_{DS} = V_{GS}, I_D = -250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	9.4	13	m Ω	$V_{GS} = -10\text{V}, I_D = -10\text{A}$
		—	12.3	18		$V_{GS} = -4.5\text{V}, I_D = -8\text{A}$
Diode Forward Voltage	V_{SD}	—	-0.7	-1.2	V	$V_{GS} = 0\text{V}, I_S = -1\text{A}$
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C_{iss}	—	3,426	—	pF	$V_{DS} = -20\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$
Output Capacitance	C_{oss}	—	283	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	235	—	pF	
Gate Resistance	R_g	—	4.7	—	Ω	$V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$
Total Gate Charge ($V_{GS} = -4.5\text{V}$)	Q_g	—	32.5	—	nC	$V_{DS} = -20\text{V}, I_D = -10\text{A}$
Total Gate Charge ($V_{GS} = -10\text{V}$)	Q_g	—	68.6	—	nC	
Gate-Source Charge	Q_{gs}	—	8.2	—	nC	
Gate-Drain Charge	Q_{gd}	—	9.9	—	nC	
Turn-On Delay Time	$t_{D(ON)}$	—	5.3	—	ns	$V_{DD} = -20\text{V}, V_{GEN} = -10\text{V}, R_G = 3\Omega, I_D = -10\text{A}$
Turn-On Rise Time	t_R	—	20	—	ns	
Turn-Off Delay Time	$t_{D(OFF)}$	—	126	—	ns	
Turn-Off Fall Time	t_F	—	83	—	ns	
Body Diode Reverse Recovery Time	t_{RR}	—	19.5	—	ns	$I_F = -10\text{A}, di/dt = 100\text{A}/\mu\text{s}$
Body Diode Reverse Recovery Charge	Q_{RR}	—	9.8	—	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 1 inch square copper plate.
8. Short duration pulse test used to minimize self-heating effect.
9. Guaranteed by design. Not subject to product testing.

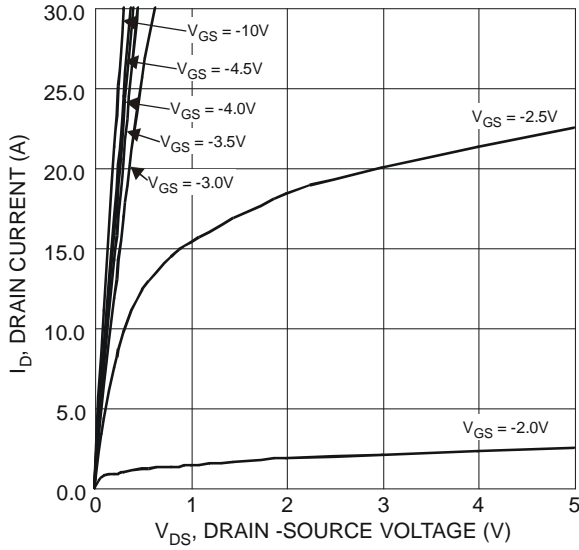


Figure 1 Typical Output Characteristics

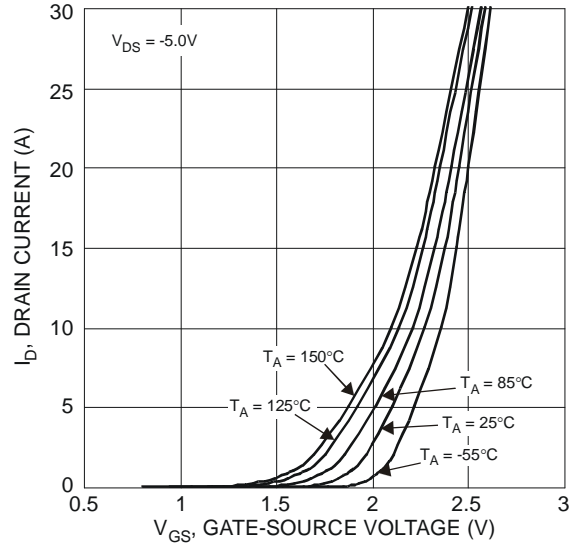


Figure 2 Typical Transfer Characteristics

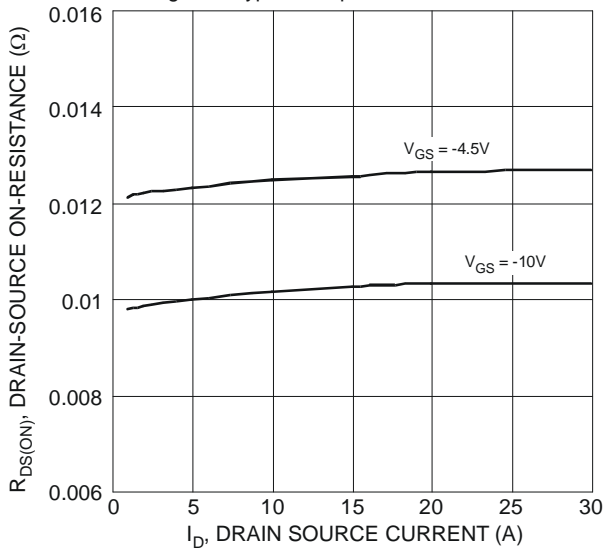


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

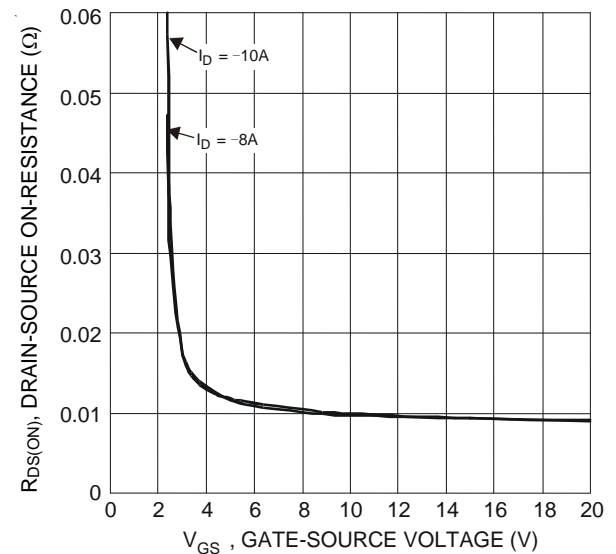


Figure 4 Typical Transfer Characteristics

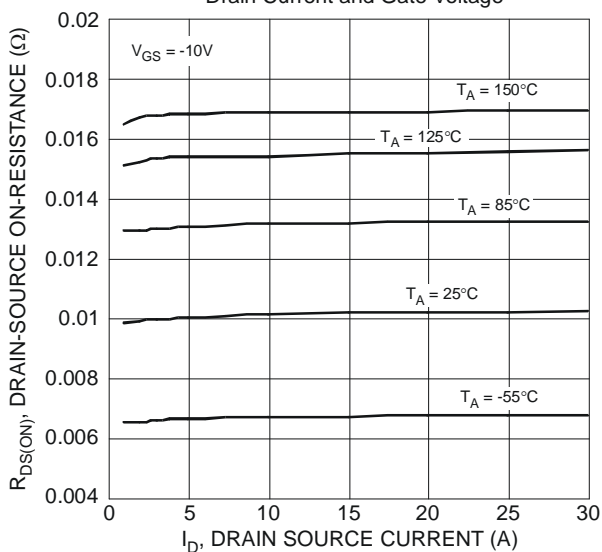


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

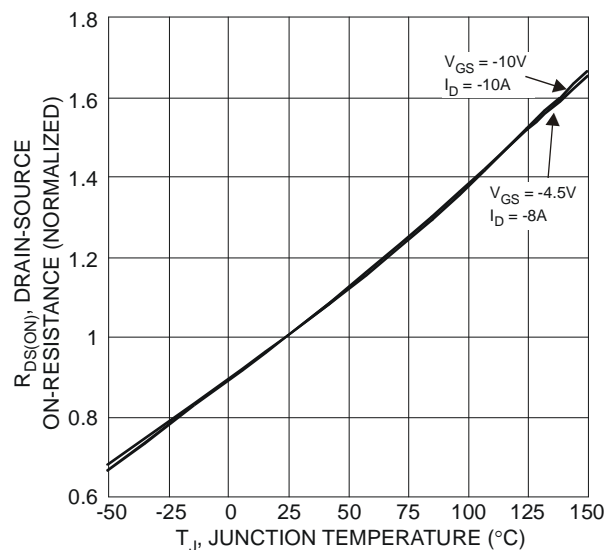


Figure 6 On-Resistance Variation with Temperature

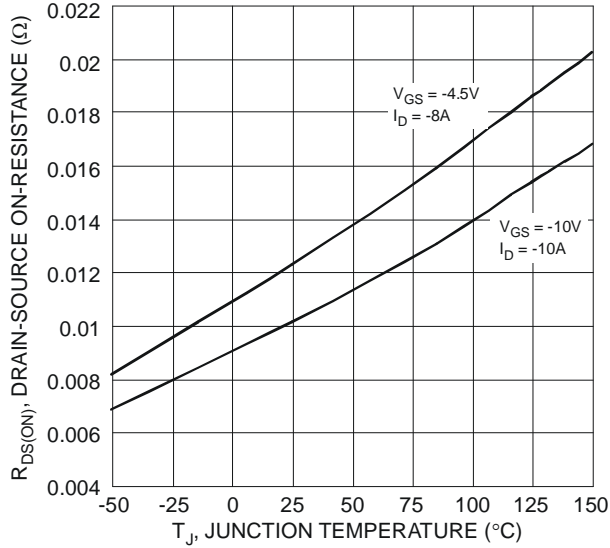


Figure 7 On-Resistance Variation with Temperature

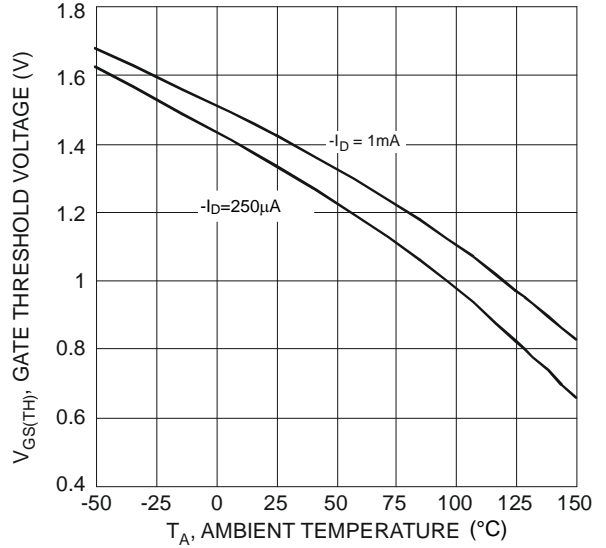


Figure 8 Gate Threshold Variation vs. Ambient Temperature

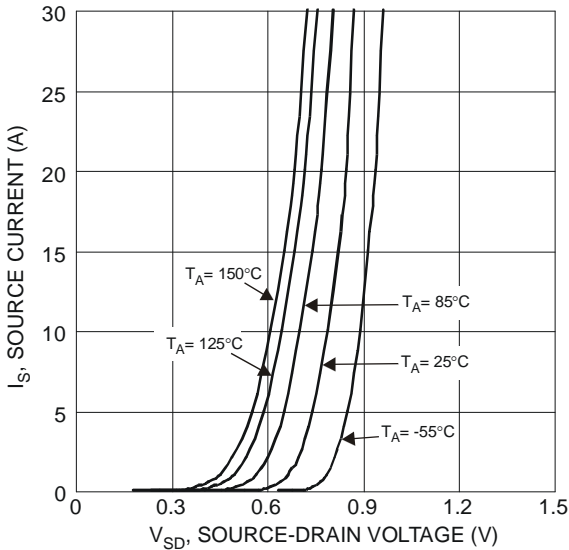


Figure 9 Diode Forward Voltage vs. Current

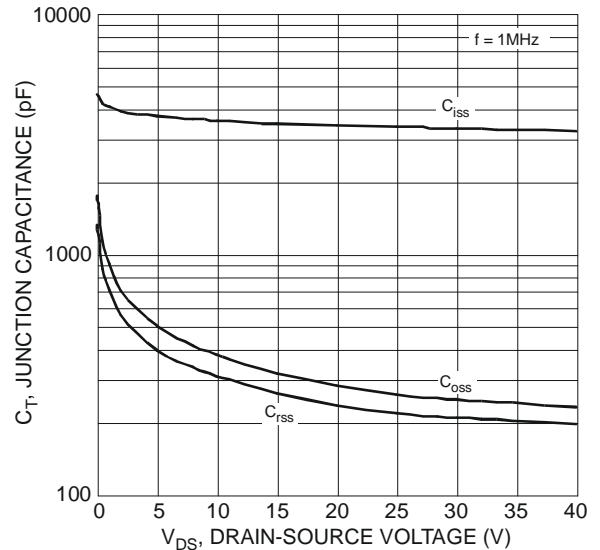


Figure 10 Typical Junction Capacitance

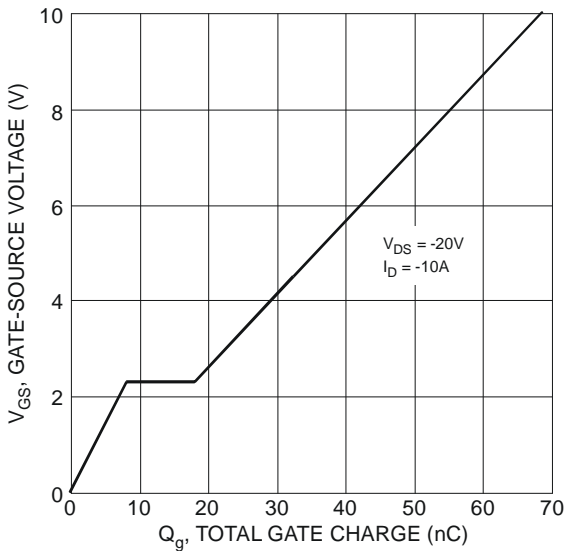


Figure 11 Gate-Charge Characteristics

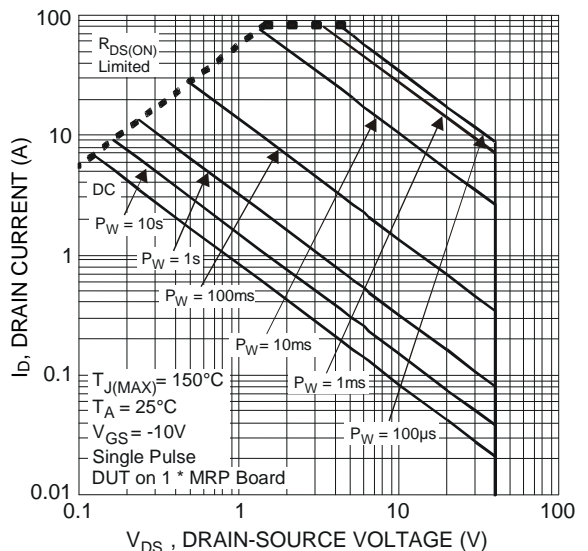
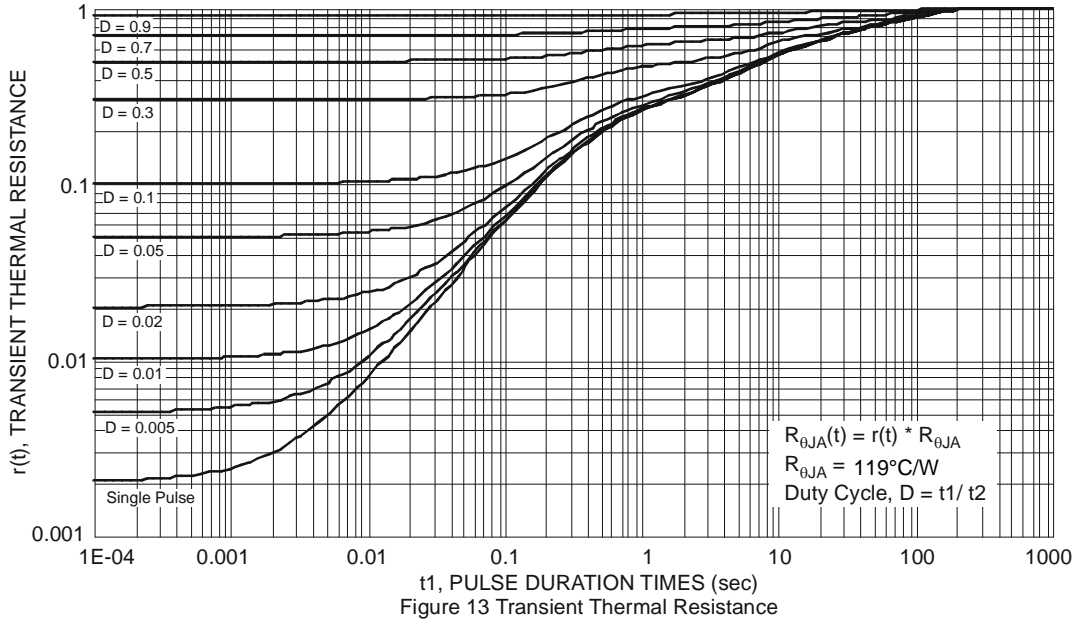


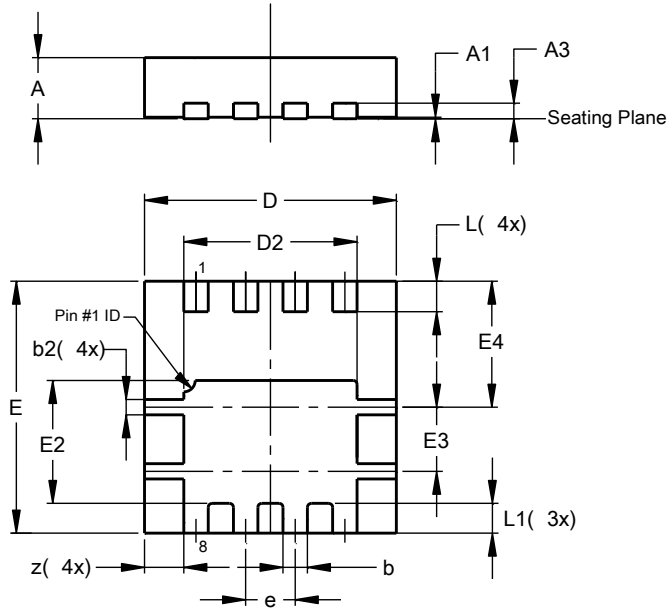
Figure 12 SOA, Safe Operation Area



Package Outline Dimensions

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

PowerDI3333-8

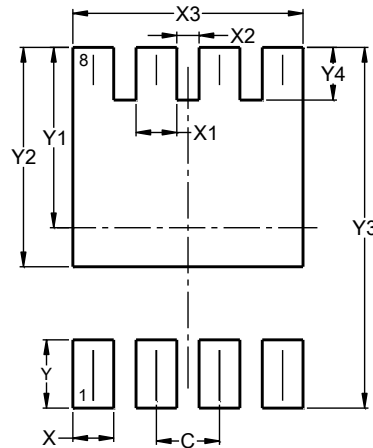


PowerDI3333-8			
Dim	Min	Max	Typ
A	0.75	0.85	0.80
A1	0.00	0.05	0.02
A3	-	-	0.203
b	0.27	0.37	0.32
b2	0.15	0.25	0.20
D	3.25	3.35	3.30
D2	2.22	2.32	2.27
E	3.25	3.35	3.30
E2	1.56	1.66	1.61
E3	0.79	0.89	0.84
E4	1.60	1.70	1.65
e	-	-	0.65
L	0.35	0.45	0.40
L1	-	-	0.39
z	-	-	0.515
All Dimensions in mm			

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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