

## Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)}$ Max	$I_D$ Max $T_A = +25^\circ\text{C}$
-30V	13m $\Omega$ @ $V_{GS} = -10\text{V}$	-9.8A
	25m $\Omega$ @ $V_{GS} = -4.5\text{V}$	-7.0A

## 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

- Backlighting
- Power Management Functions
- DC-DC Converters

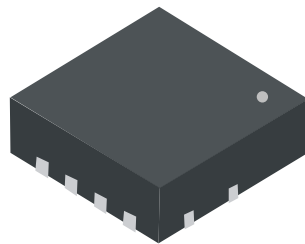
## Features and Benefits

- 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)**

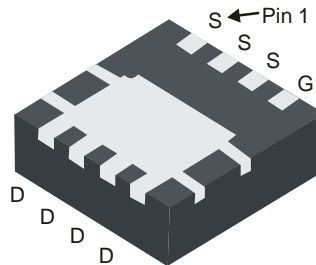
## Mechanical Data

- 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: 0.0174 grams (Approximate)

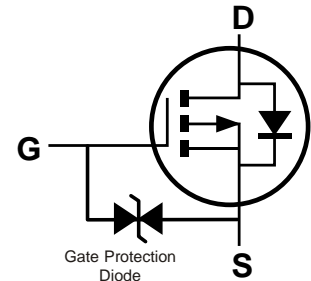
### POWERDI3333-8



Top View



Bottom View



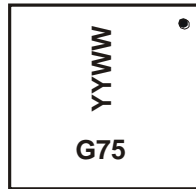
Equivalent Circuit

## Ordering Information (Note 5)

Part Number	Case	Packaging
DMG7401SFGQ-7	POWERDI3333-8	2,000/Tape & Reel
DMG7401SFGQ-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](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. Automotive products are AEC-Q101 qualified and are PPAP capable. Automotive, AEC-Q101 and standard products are electrically and thermally the same, except where specified. For more information, please refer to [http://www.diodes.com/quality/product\\_compliance\\_definitions/](http://www.diodes.com/quality/product_compliance_definitions/).
  5. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

## Marking Information



G75 = Product Marking Code  
 YYWW = Date Code Marking  
 YY = Last Digit of Year (ex: 10 for 2010)  
 WW = Week Code (01 – 53)

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

Characteristic	Symbol	Value	Units	
Drain-Source Voltage	$V_{DSS}$	-30	V	
Gate-Source Voltage	$V_{GSS}$	$\pm 25$	V	
Continuous Drain Current (Note 7) $V_{GS} = -10\text{V}$	$I_D$	$T_A = +25^\circ\text{C}$	-9.8	A
		$T_A = +70^\circ\text{C}$	-7.7	A
	$I_D$	$T_A = +25^\circ\text{C}$	-13.5	A
		$T_A = +70^\circ\text{C}$	-10.8	A
Maximum Continuous Body Diode Forward Current (Note 6)	$I_S$	-3.0	A	
Pulsed Drain Current (10 $\mu\text{s}$ pulse, duty cycle = 1%)	$I_{DM}$	-80	A	
Avalanche Current (Notes 8 & 9)	$I_{AR}$	14	A	
Repetitive Avalanche Energy (Notes 8 & 9) $L = 1\text{mH}$	$E_{AR}$	104	mJ	

## Thermal Characteristics

Characteristic	Symbol	Value	Units	
Total Power Dissipation (Note 6)	$P_D$	$T_A = +25^\circ\text{C}$	0.94	W
		$T_A = +70^\circ\text{C}$	0.6	
Thermal Resistance, Junction to Ambient (Note 6)	$R_{\theta JA}$	Steady State	137	$^\circ\text{C/W}$
		$t < 10\text{s}$	82	$^\circ\text{C/W}$
Total Power Dissipation (Note 7)	$P_D$	$T_A = +25^\circ\text{C}$	2.2	W
		$T_A = +70^\circ\text{C}$	1.3	
Thermal Resistance, Junction to Ambient (Note 7)	$R_{\theta JA}$	Steady State	60	$^\circ\text{C/W}$
		$t < 10\text{s}$	36	$^\circ\text{C/W}$
Thermal Resistance, Junction to Case (Note 7)	$R_{\theta JC}$	3.0	$^\circ\text{C/W}$	
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150	$^\circ\text{C}$	

- Notes:
6. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
  7. Device mounted on FR-4 substrate PC board, 2oz copper, with 1-inch square copper plate.
  8.  $I_{AR}$  and  $E_{AR}$  rating are based on low frequency and duty cycles to keep  $T_J = +25^\circ\text{C}$ .

**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b> (Note 9)						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	-30	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	-1	μA	V <sub>DS</sub> = -30V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±10	μA	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS</b> (Note 9)						
Gate Threshold Voltage	V <sub>GS(th)</sub>	-1.7	—	-3.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA
Static Drain-Source On-Resistance	R <sub>DS(on)</sub>	—	9	11	mΩ	V <sub>GS</sub> = -20V, I <sub>D</sub> = -12A
		—	10	13		V <sub>GS</sub> = -10V, I <sub>D</sub> = -9A
		—	17	25		V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -5A
Forward Transfer Admittance	Y <sub>fs</sub>	—	21	—	S	V <sub>DS</sub> = -5V, I <sub>D</sub> = -10A
<b>DYNAMIC CHARACTERISTICS</b> (Note 10)						
Input Capacitance	C <sub>iSS</sub>	—	2,246	2,987	pF	V <sub>DS</sub> = -15V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	—	352	468	pF	
Reverse Transfer Capacitance	C <sub>rSS</sub>	—	294	391	pF	
Gate resistance	R <sub>g</sub>	—	5.1	10	Ω	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1.0MHz
Total Gate Charge (V <sub>GS</sub> = 4.5V)	Q <sub>g</sub>	—	20.5	30	nC	V <sub>DS</sub> = -15V, I <sub>D</sub> = -12A
Total Gate Charge (V <sub>GS</sub> = 10V)	Q <sub>g</sub>	—	41	58	nC	
Gate-Source Charge	Q <sub>gs</sub>	—	7.6	—	nC	
Gate-Drain Charge	Q <sub>gd</sub>	—	8.0	—	nC	
Turn-On Delay Time	t <sub>D(on)</sub>	—	11.3	23	nS	V <sub>DD</sub> = -15V, V <sub>GS</sub> = -10V, R <sub>L</sub> = 1.25Ω, R <sub>G</sub> = 3Ω,
Turn-On Rise Time	t <sub>r</sub>	—	15.4	31	nS	
Turn-Off Delay Time	t <sub>D(off)</sub>	—	38.0	61	nS	
Turn-Off Fall Time	t <sub>f</sub>	—	22.0	38	nS	
<b>BODY DIODE CHARACTERISTICS</b>						
Diode Forward Voltage	V <sub>SD</sub>	—	-0.7	-1.0	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = -1A
Reverse Recovery Time (Note 10)	t <sub>rr</sub>	—	20	31	nS	I <sub>S</sub> = -9.5A, dI/dt = 100A/μs
Reverse Recovery Charge (Note 10)	Q <sub>rr</sub>	—	9.5	18	nC	

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

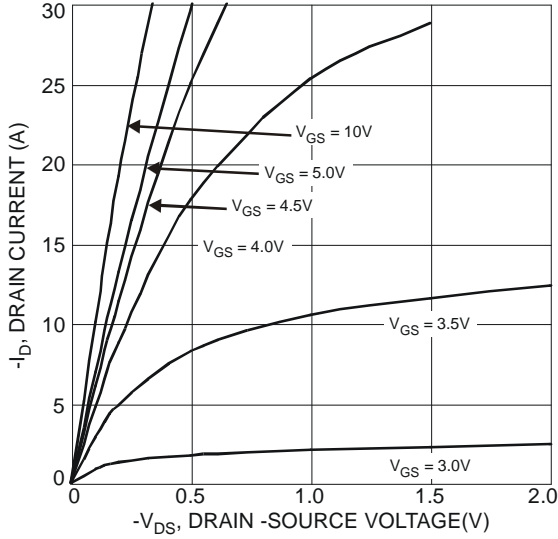


Fig. 1 Typical Output Characteristics

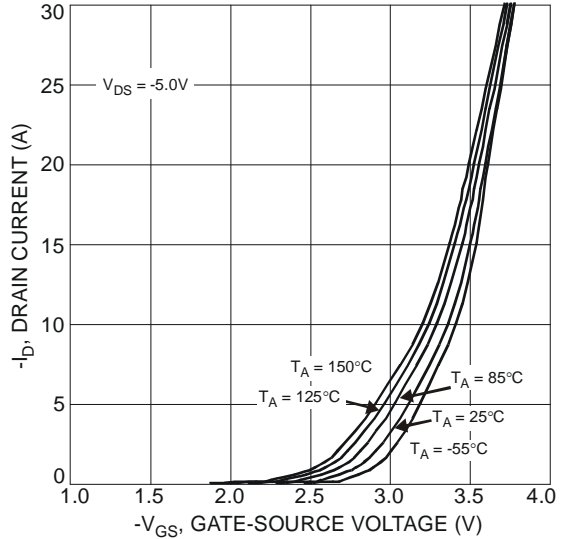


Fig. 2 Typical Transfer Characteristics

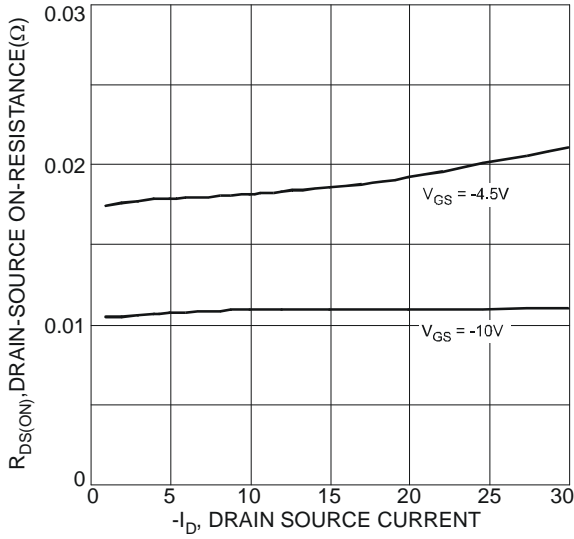


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

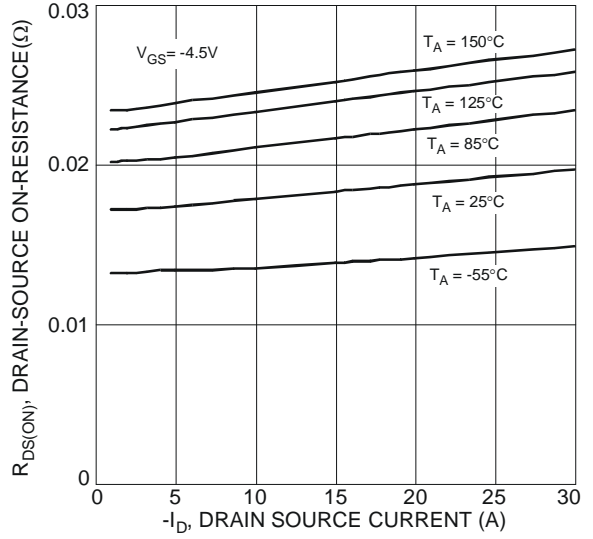


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

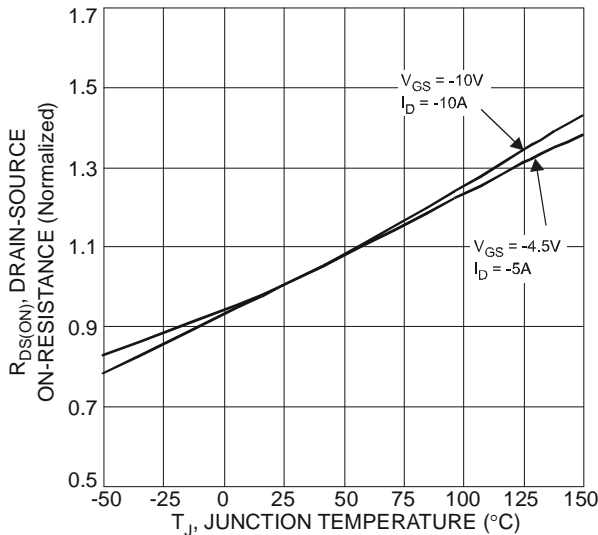


Fig. 5 On-Resistance Variation with Temperature

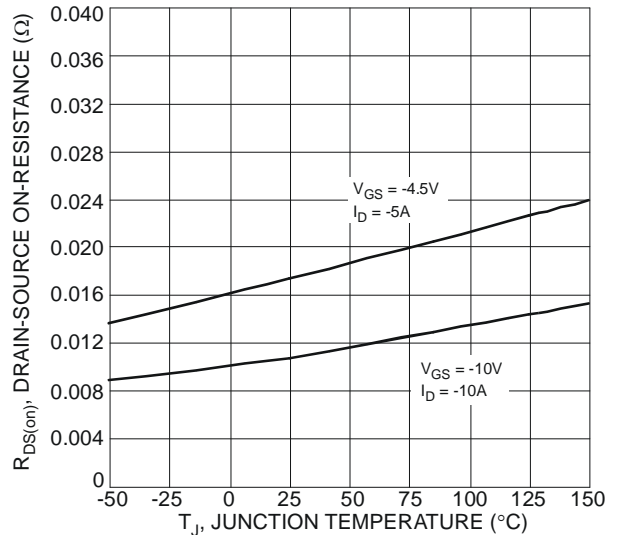


Fig. 6 On-Resistance Variation with Temperature

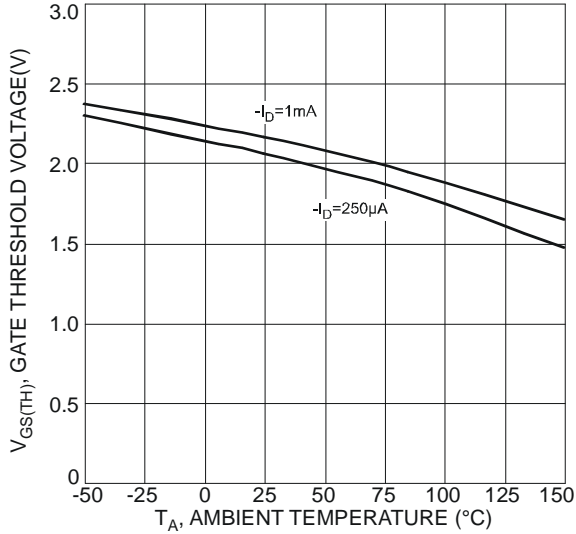


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

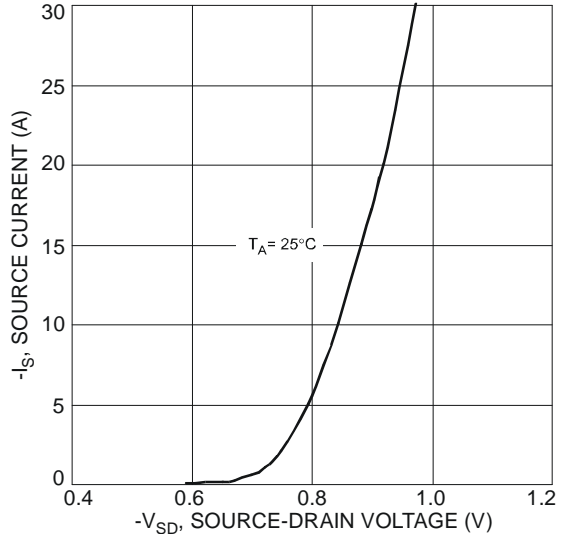


Fig. 8 Diode Forward Voltage vs. Current

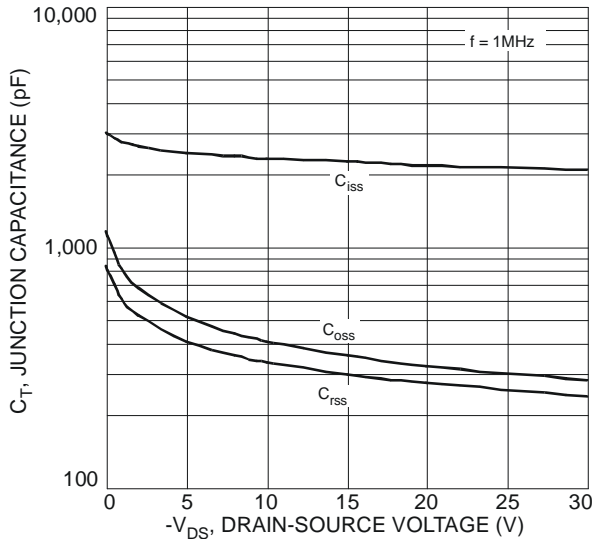


Fig. 9 Typical Junction Capacitance

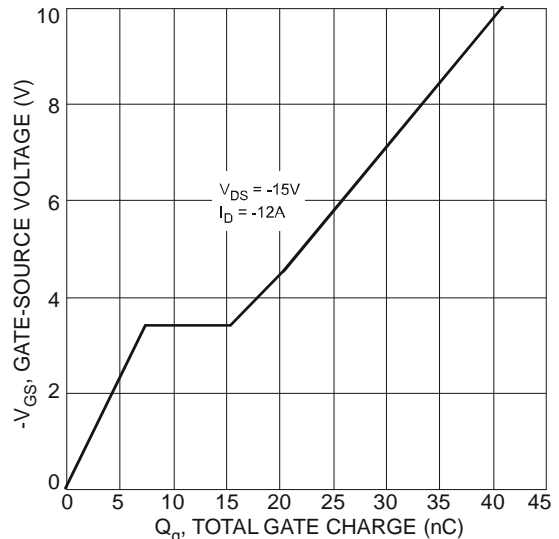


Fig. 10 Gate-Charge Characteristics

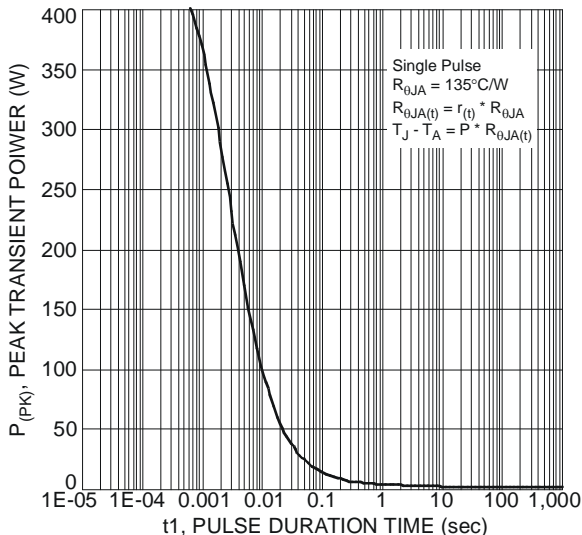


Fig. 11 Single Pulse Maximum Power Dissipation

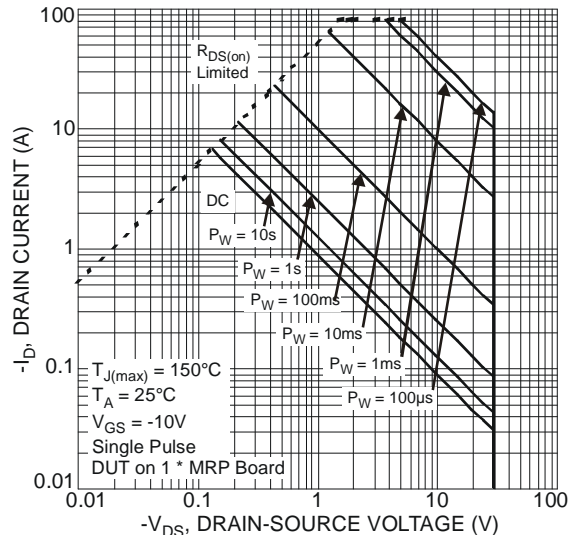
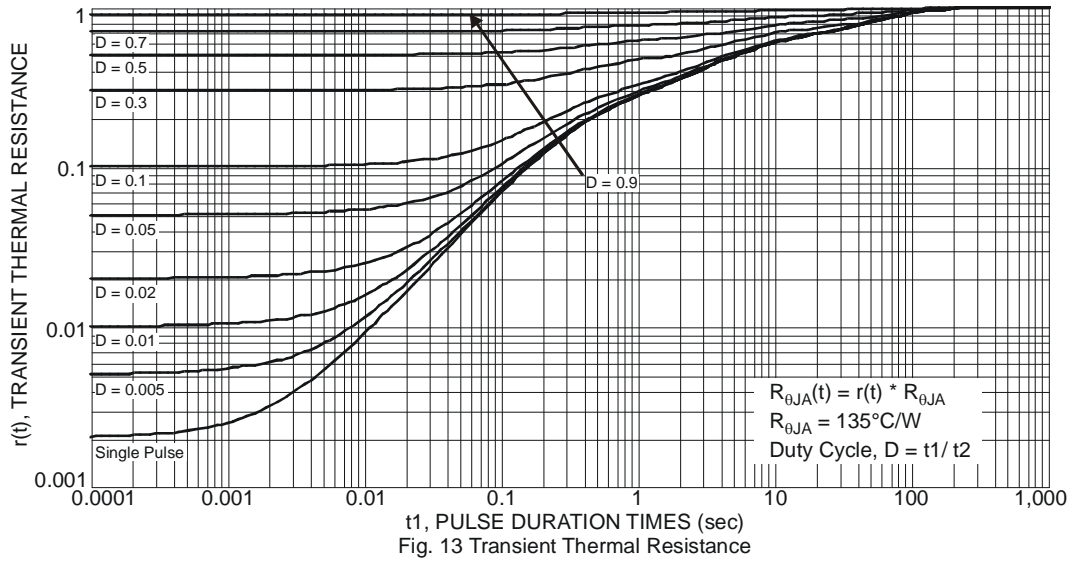


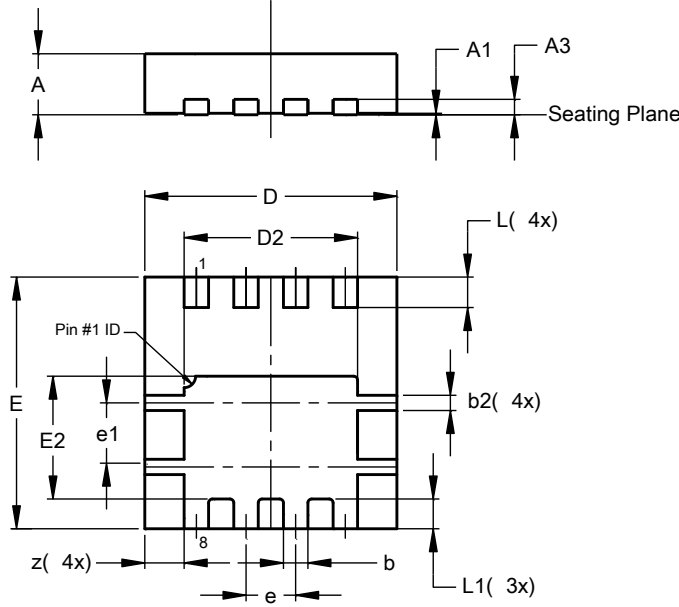
Fig. 12 SOA, Safe Operation Area



**Package Outline Dimensions**

Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.

**POWERDI3333-8**

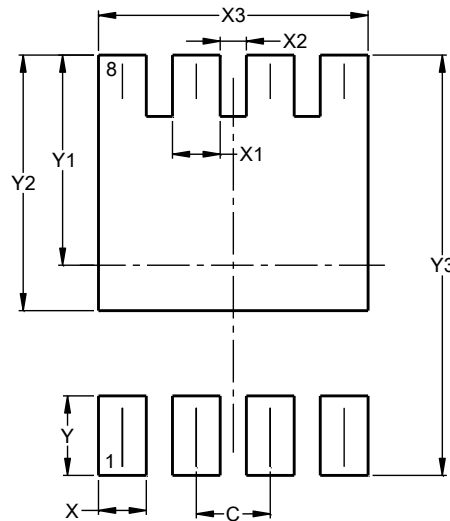


POWERDI3333-8			
Dim	Min	Max	Typ
A	0.75	0.85	0.80
A1	0.00	0.05	0.02
A3	-	-	0.203
b	0.27	0.37	0.32
b2	-	-	0.20
D	3.25	3.35	3.30
D2	2.22	2.32	2.27
E	3.25	3.35	3.30
E2	1.56	1.66	1.61
e	-	-	0.65
e1	0.79	0.89	0.84
L	0.35	0.45	0.40
L1	-	-	0.39
z	-	-	0.515
<b>All Dimensions in mm</b>			

**Suggested Pad Layout**

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> 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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