

## Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)}$ Max	$I_D$ Max $T_A = +25^\circ C$
60V	13m $\Omega$ @ $V_{GS} = 10V$	10.3A
	18m $\Omega$ @ $V_{GS} = 4.5V$	8.8A

## Description

This MOSFET has been designed to minimize the on-state resistance ( $R_{DS(ON)}$ ) yet maintain superior switching performance, which makes it ideal for high-efficiency power management applications.

## Applications

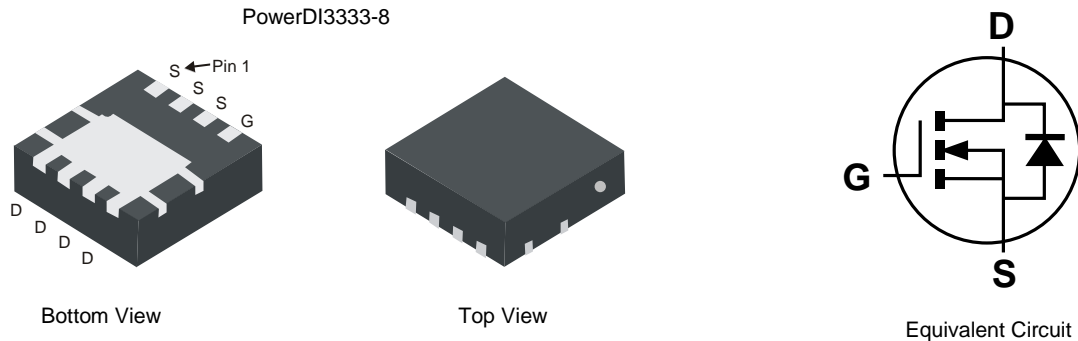
- Backlighting
- Power Management Functions
- DC-DC Converters

## 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 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**

## Mechanical Data

- Case: PowerDI<sup>®</sup>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 <sup>(3)</sup>
- Weight: 0.072 grams (Approximate)

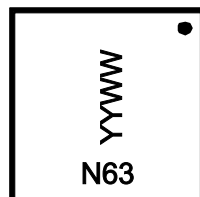


## Ordering Information (Note 4)

Part Number	Case	Packaging
DMN6013LFG-7	PowerDI3333-8	2000/Tape & Reel
DMN6013LFG-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. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

## Marking Information



N63= Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Last digit of year (ex: 18 = 2018)  
 WW = Week code (01 ~ 53)

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

Characteristic	Symbol	Value	Units
Drain-Source Voltage	V <sub>DSS</sub>	60	V
Gate-Source Voltage	V <sub>GSS</sub>	±20	V
Continuous Drain Current (Note 6) V <sub>GS</sub> = 10V	T <sub>A</sub> = +25°C	10.3	A
	T <sub>A</sub> = +70°C	8.3	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)	T <sub>C</sub> = +25°C	45	A
	T <sub>C</sub> = +100°C	28	A
Maximum Continuous Body Diode Forward Current (Note 6)	I <sub>S</sub>	3	A
Avalanche Current, L = 0.1mH	I <sub>AS</sub>	33.3	A
Avalanche Energy, L = 0.1mH	E <sub>AS</sub>	56.8	mJ

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

Characteristic	Symbol	Value	Units
Total Power Dissipation (Note 5)	P <sub>D</sub>	1	W
Thermal Resistance, Junction to Ambient (Note 5)	R <sub>θJA</sub>	Steady state	123
		t < 10s	69
Total Power Dissipation (Note 6)	P <sub>D</sub>	2.1	W
Thermal Resistance, Junction to Ambient (Note 6)	R <sub>θJA</sub>	Steady state	60
		t < 10s	34
Total Power Dissipation (Note 6)	P <sub>D</sub>	40	W
Thermal Resistance, Junction to Case (Note 6)	R <sub>θJC</sub>	3.2	°C/W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 7)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	60	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250µA
Zero Gate Voltage Drain Current, T <sub>J</sub> = +25°C	I <sub>DSS</sub>	—	—	1	µA	V <sub>DS</sub> = 60V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±100	nA	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 7)</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	1	1.8	3	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250µA
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	—	9.3	13	mΩ	V <sub>GS</sub> = 10V, I <sub>D</sub> = 10A
		—	12.3	18		V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 8A
Diode Forward Voltage	V <sub>SD</sub>	—	0.7	1.2	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = 1.7A
<b>DYNAMIC CHARACTERISTICS (Note 8)</b>						
Input Capacitance	C <sub>iSS</sub>	—	2577	—	pF	V <sub>DS</sub> = 30V, V <sub>GS</sub> = 0V, f = 1MHz
Output Capacitance	C <sub>oss</sub>	—	162	—	pF	
Reverse Transfer Capacitance	C <sub>rSS</sub>	—	132	—	pF	
Gate Resistance	R <sub>g</sub>	—	0.9	—	Ω	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz
Total Gate Charge (V <sub>GS</sub> = 4.5V)	Q <sub>g</sub>	—	26.6	—	nC	V <sub>DS</sub> = 30V, I <sub>D</sub> = 10A
Total Gate Charge (V <sub>GS</sub> = 10V)	Q <sub>g</sub>	—	55.4	—	nC	
Gate-Source Charge	Q <sub>gs</sub>	—	9.3	—	nC	
Gate-Drain Charge	Q <sub>gd</sub>	—	12.6	—	nC	
Turn-On Delay Time	t <sub>D(on)</sub>	—	6.2	—	ns	V <sub>GS</sub> = 10V, V <sub>DS</sub> = 30V, R <sub>G</sub> = 3Ω, I <sub>D</sub> = 10A
Turn-On Rise Time	t <sub>r</sub>	—	9.9	—	ns	
Turn-Off Delay Time	t <sub>D(off)</sub>	—	27.6	—	ns	
Turn-Off Fall Time	t <sub>f</sub>	—	11.7	—	ns	
Body Diode Reverse Recovery Time	t <sub>rr</sub>	—	9.4	—	nS	I <sub>F</sub> = 10A, di/dt = 100A/µs
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>	—	18.6	—	nC	

- Notes:
- Device mounted on FR-4 PCB, with minimum recommended pad layout, single sided.
  - Device mounted on FR-4 substrate PCB, 2oz copper, with thermal bias to bottom layer 1inch square copper plate
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to product testing.

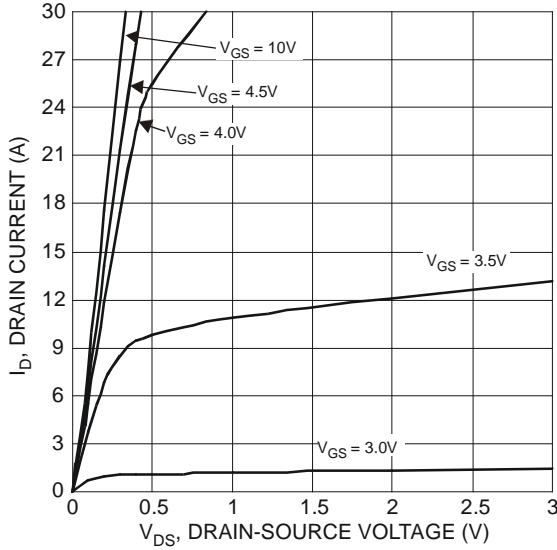


Figure 1 Typical Output Characteristics

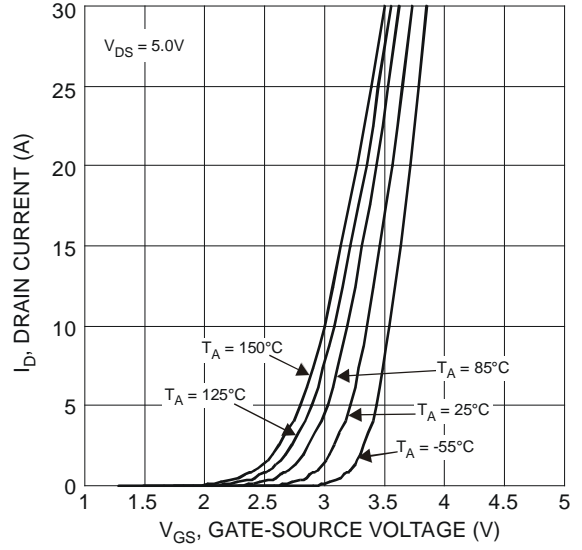


Figure 2 Typical Transfer Characteristics

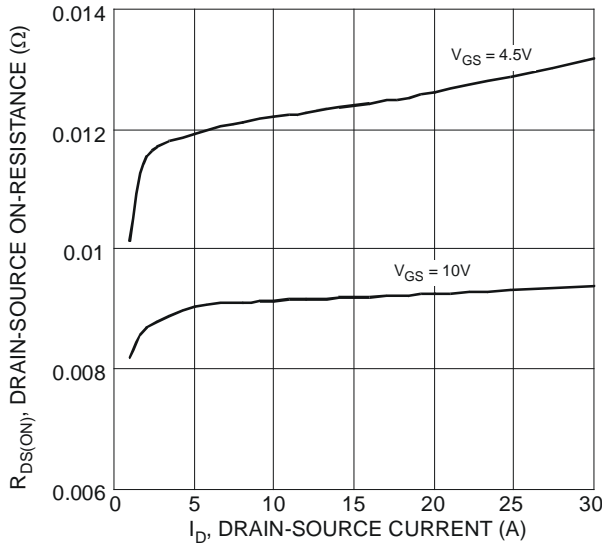


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

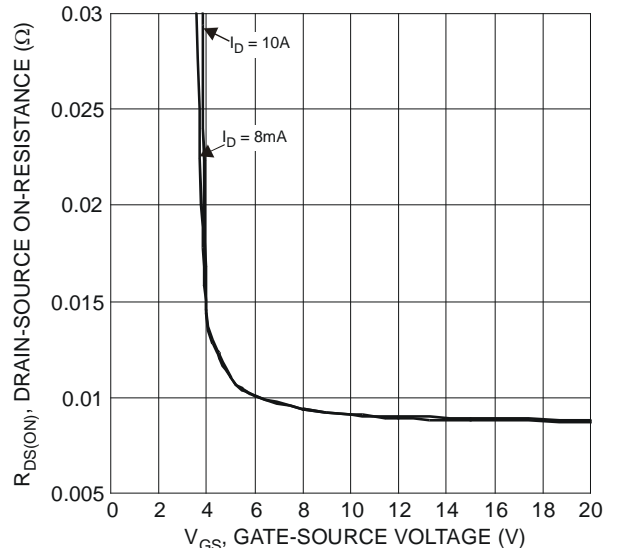


Figure 4 Typical Drain-Source On-Resistance vs. Gate-Source Voltage

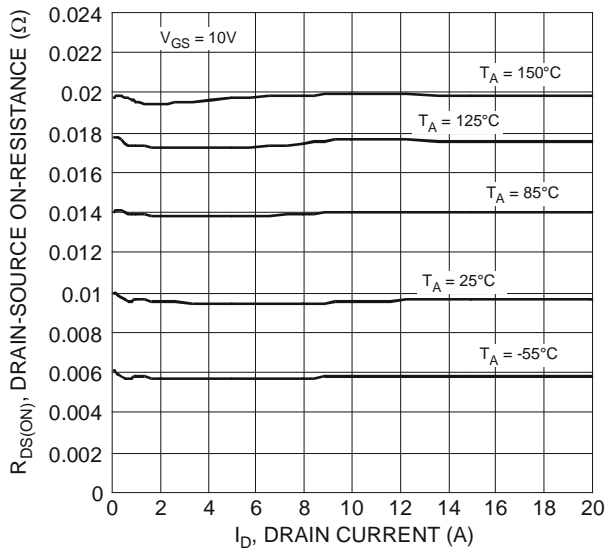


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

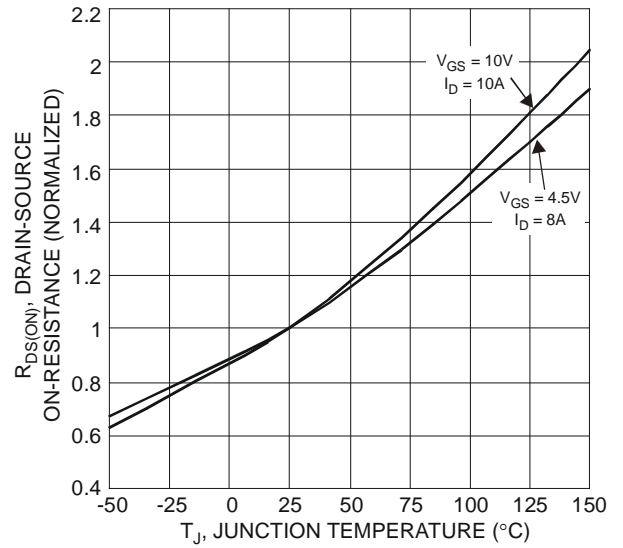


Figure 6 On-Resistance Variation with Temperature

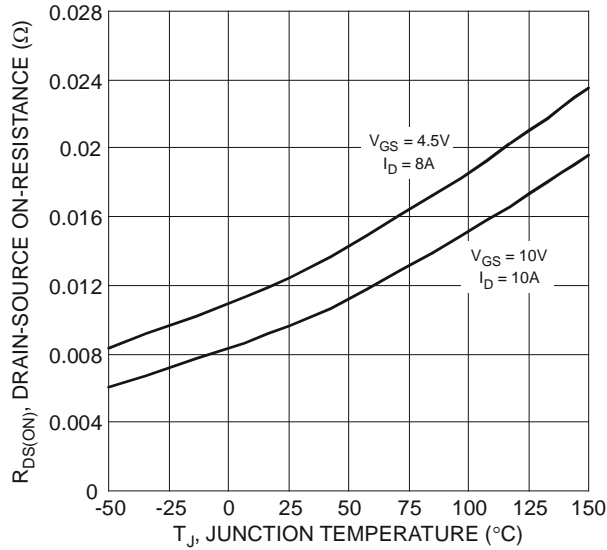


Figure 7 On-Resistance Variation with Temperature

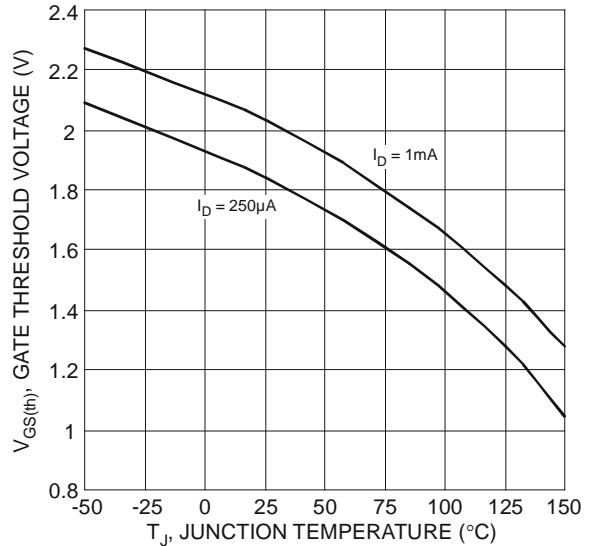


Figure 8 Gate Threshold Variation vs. Ambient Temperature

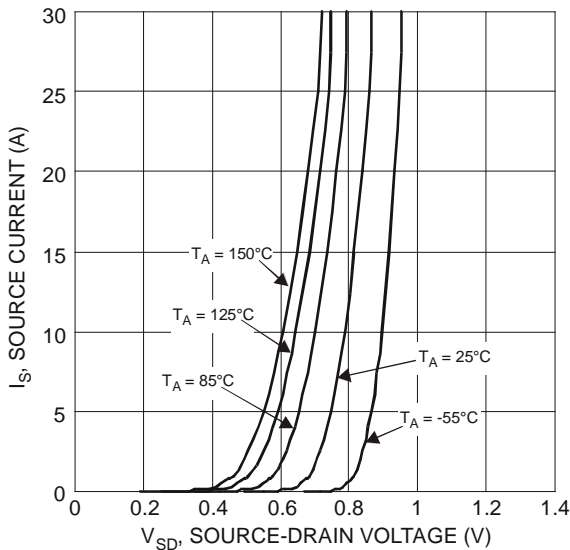


Figure 9 Diode Forward Voltage vs. Current

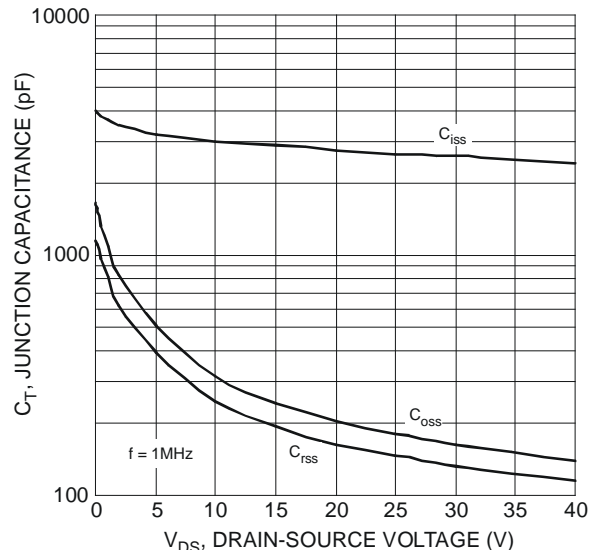


Figure 10 Typical Junction Capacitance

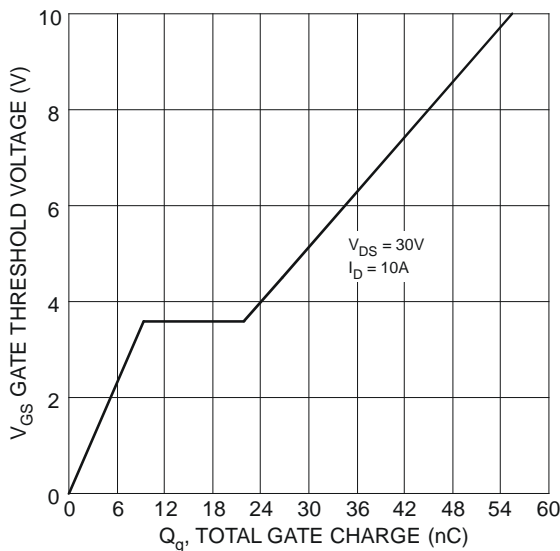


Figure 11 Gate Charge

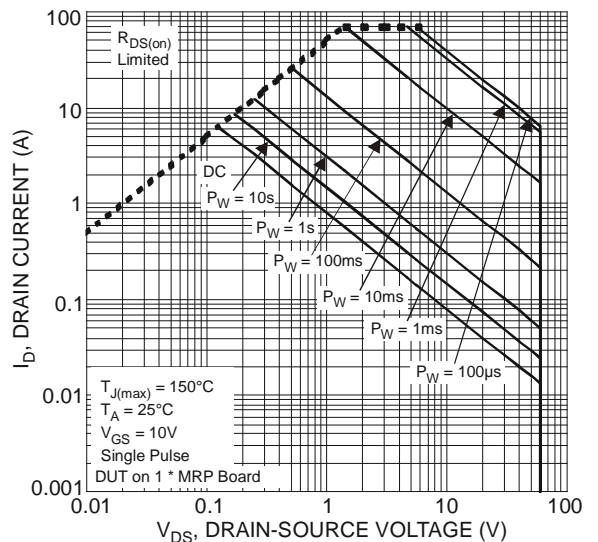
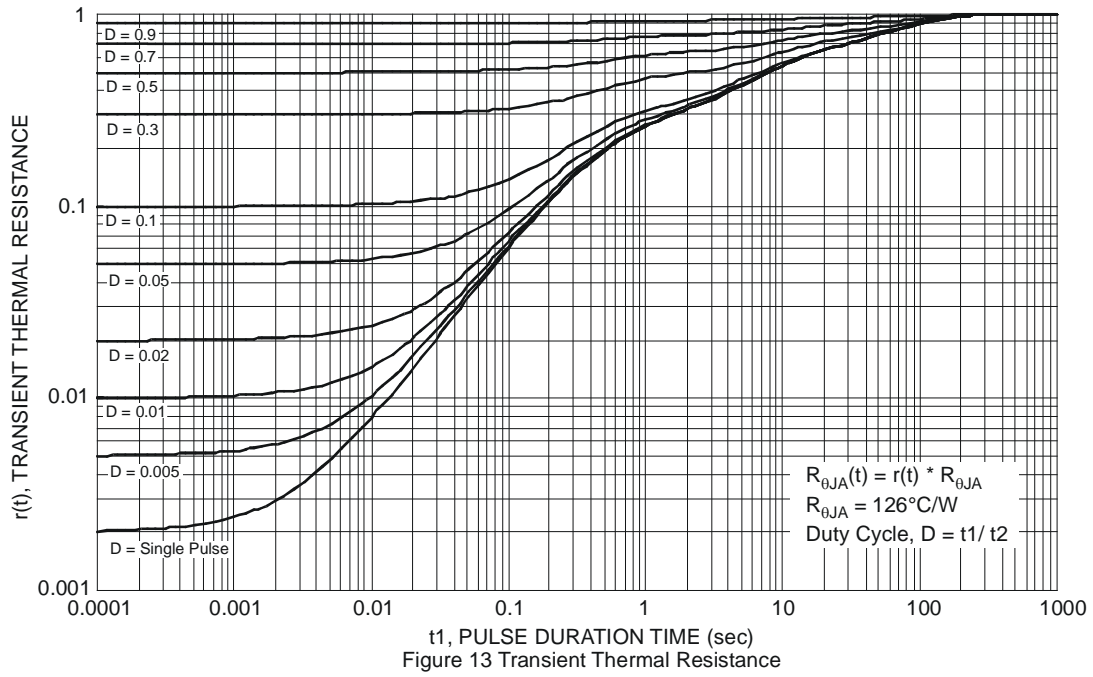


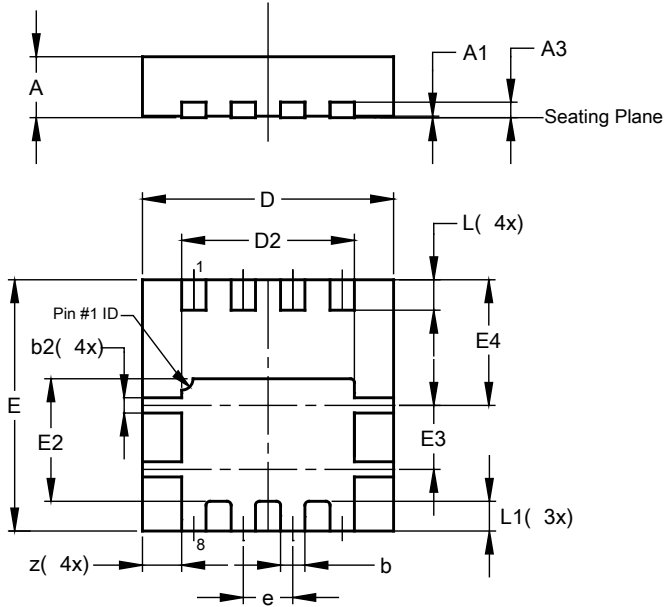
Figure 12 SOA, Safe Operation Area



**Package Outline Dimensions**

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

**PowerDI3333-8**

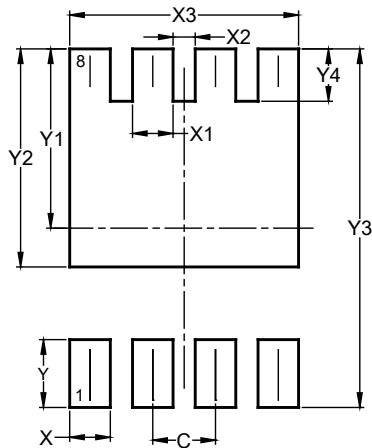


PowerDI3333-8			
Dim	Min	Max	Typ
A	0.75	0.85	0.80
A1	0.00	0.05	0.02
A3	—	—	0.203
b	0.27	0.37	0.32
b2	0.15	0.25	0.20
D	3.25	3.35	3.30
D2	2.22	2.32	2.27
E	3.25	3.35	3.30
E2	1.56	1.66	1.61
E3	0.79	0.89	0.84
E4	1.60	1.70	1.65
e	—	—	0.65
L	0.35	0.45	0.40
L1	—	—	0.39
z	—	—	0.515
<b>All Dimensions in mm</b>			

**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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