

## Product Summary

$BV_{DSS}$	$R_{DS(ON)}$ Max	$I_D$ Max $T_C = +25^\circ C$
60V	50m $\Omega$ @ $V_{GS} = 10V$	18A
	63m $\Omega$ @ $V_{GS} = 4.5V$	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
- 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)**

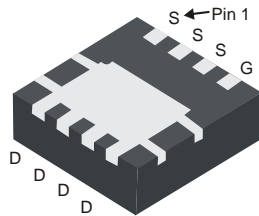
## Description and Applications

This MOSFET is designed to 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

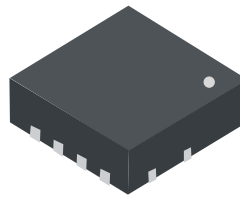
## Mechanical Data

- Case: 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  $\text{e3}$
- Weight: 0.03 grams (Approximate)

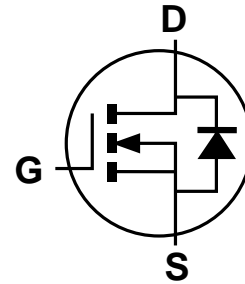


Bottom View

PowerDI3333-8



Top View



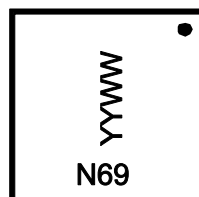
Equivalent Circuit

## Ordering Information (Note 5)

Part Number	Case	Packaging
DMN6069SFGQ-7	PowerDI3333-8	2,000/Tape & Reel
DMN6069SFGQ-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. Refer to [http://www.diodes.com/product\\_compliance\\_definitions.html](http://www.diodes.com/product_compliance_definitions.html).
  5. 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** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			$V_{DSS}$	60	V
Gate-Source Voltage			$V_{GSS}$	$\pm 20$	V
Continuous Drain Current (Note 7) $V_{GS} = 10\text{V}$	Steady State	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	$I_D$	5.6 4.5	A
	Steady State	$T_C = +25^\circ\text{C}$ $T_C = +70^\circ\text{C}$	$I_D$	18 14.5	A
Pulsed Drain Current (380 $\mu\text{s}$ Pulse, Duty Cycle = 1%)			$I_{DM}$	25	A
Maximum Continuous Body Diode Forward Current (Note 7)			$I_S$	2.5	A
Avalanche Current (Note 8) $L = 0.1\text{mH}$			$I_{AS}$	12	A
Repetitive Avalanche Energy (Note 8) $L = 0.1\text{mH}$			$E_{AS}$	7.2	mJ

**Thermal Characteristics**

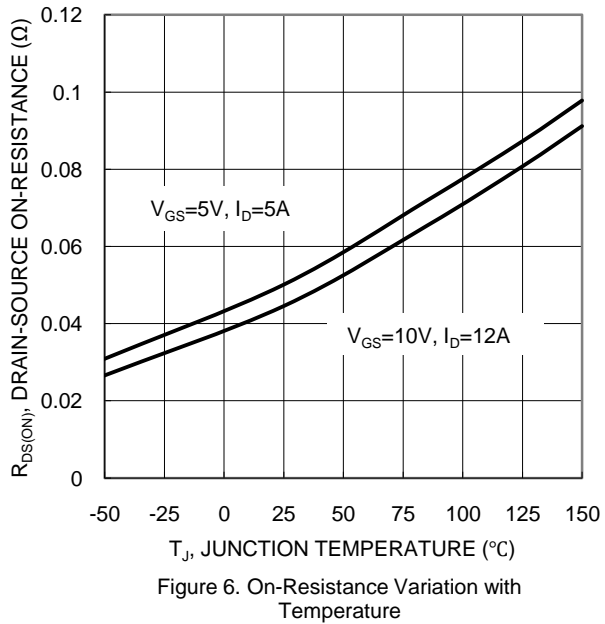
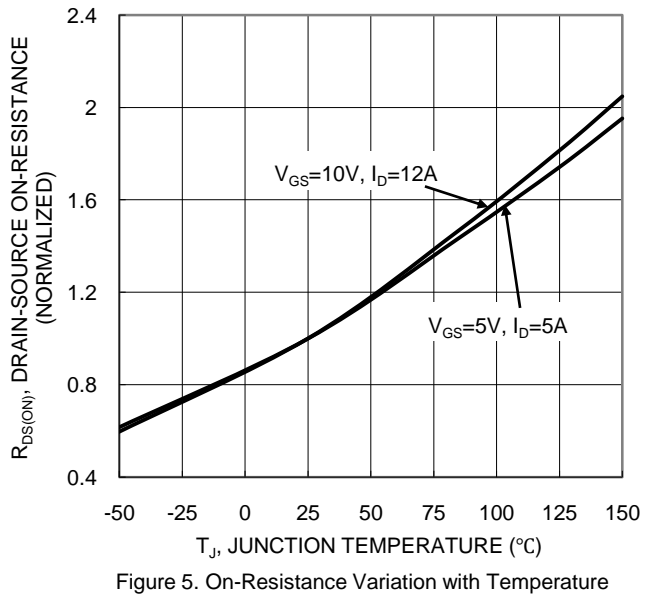
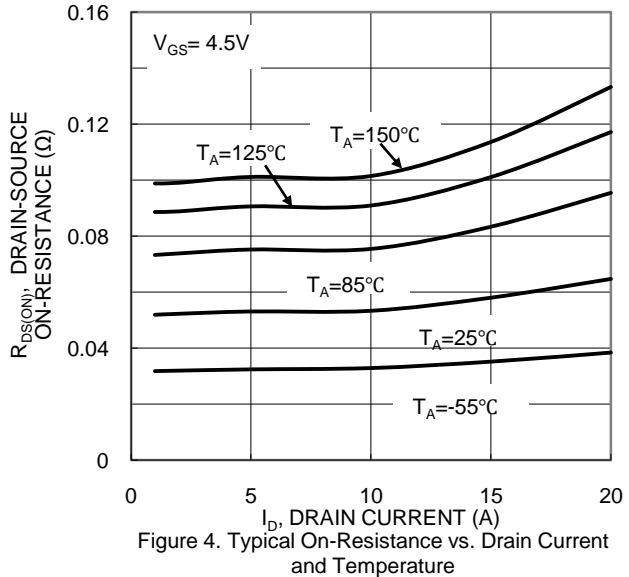
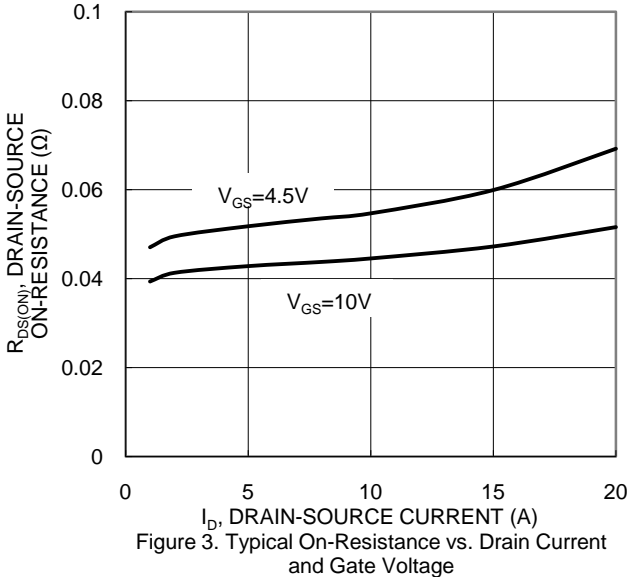
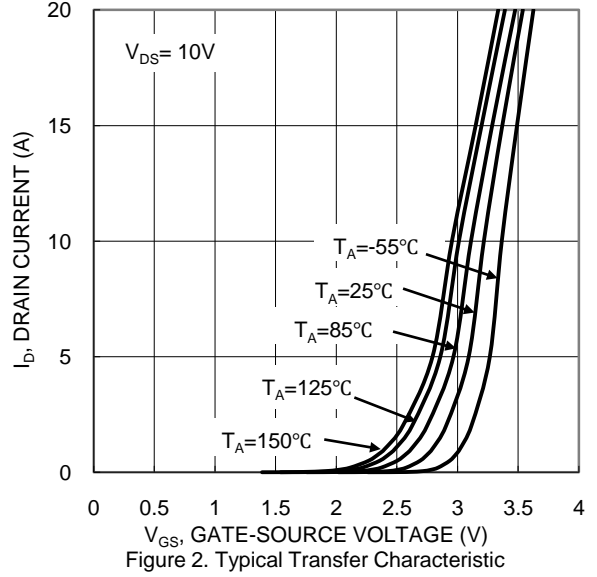
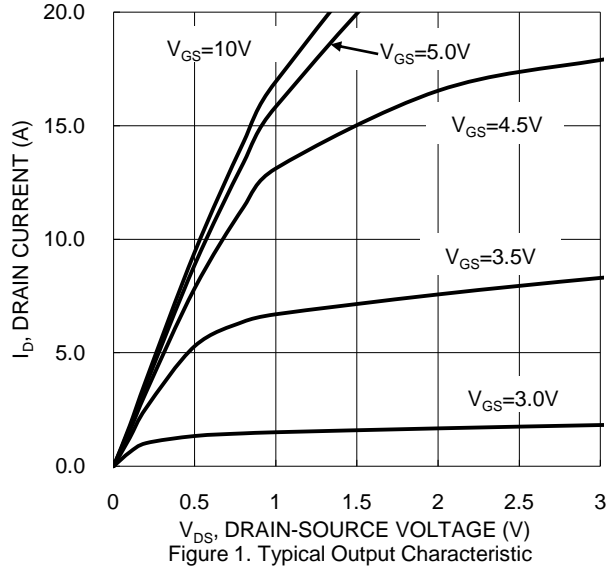
Characteristic			Symbol	Value	Unit
Total Power Dissipation (Note 6)			$P_D$	0.93	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State		$R_{\theta JA}$	134	$^\circ\text{C/W}$
	$t < 10\text{s}$			82	
Total Power Dissipation (Note 7)			$P_D$	2.4	W
Thermal Resistance, Junction to Ambient (Note 7)	Steady State		$R_{\theta JA}$	53	$^\circ\text{C/W}$
	$t < 10\text{s}$			33	
Thermal Resistance, Junction to Case			$R_{\theta JC}$	5	$^\circ\text{C}$
Operating and Storage Temperature Range			$T_J, T_{STG}$	-55 to +150	$^\circ\text{C}$

- 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.  $I_{AS}$  and  $E_{AS}$  ratings are based on low frequency and duty cycles to keep  $T_J = +25^\circ\text{C}$ .

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b> (Note 9)						
Drain-Source Breakdown Voltage	$BV_{DSS}$	60	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
Zero Gate Voltage Drain Current $T_J = +25^\circ\text{C}$	$I_{DSS}$	—	—	1	$\mu A$	$V_{DS} = 60V, V_{GS} = 0V$
Zero Gate Voltage Drain Current $T_J = +150^\circ\text{C}$	$I_{DSS}$	—	—	100	$\mu A$	$V_{DS} = 60V, V_{GS} = 0V$
Gate-Source Leakage	$I_{GSS}$	—	—	$\pm 100$	nA	$V_{GS} = \pm 20V, V_{DS} = 0V$
<b>ON CHARACTERISTICS</b> (Note 9)						
Gate Threshold Voltage	$V_{GS(TH)}$	1	—	3	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	39	50	m $\Omega$	$V_{GS} = 10V, I_D = 4.5A$
		—	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 10)	$I_{D(ON)}$	20	—	—	A	$V_{DS} \geq 5V, V_{GS} = 10V$
<b>DYNAMIC CHARACTERISTICS</b> (Note 10)						
Input Capacitance	$C_{iss}$	—	740	1,480	pF	$V_{DS} = 30V, V_{GS} = 0V,$ $f = 1.0\text{MHz}$
Output Capacitance	$C_{oss}$	—	40	80	pF	
Reverse Transfer Capacitance	$C_{rss}$	—	28	55	pF	
Gate Resistance	$R_g$	—	2.2	4	$\Omega$	$V_{DS} = 0V, V_{GS} = 0V, f = 1\text{MHz}$
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	$V_{DS} = 30V, I_D = 12A$ $V_{GS} = 10V, R_G = 6.0\Omega$
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	$I_F = 4.5A, di/dt = 100A/\mu s$
Body Diode Reverse Recovery Charge	$Q_{RR}$	—	5.1	10	nC	

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



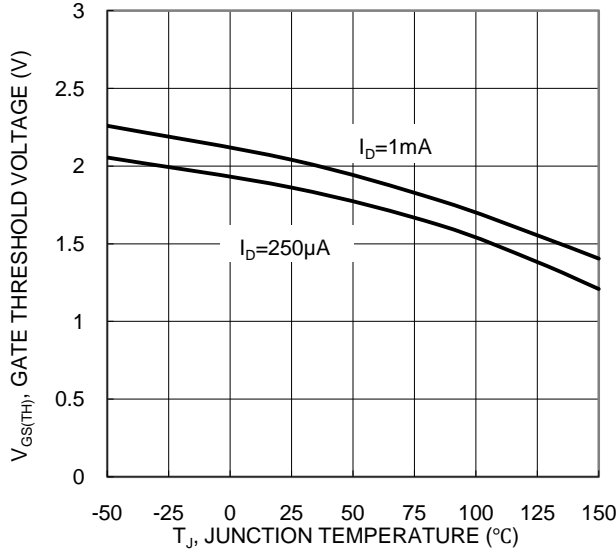


Figure 7. Gate Threshold Variation vs. Junction Temperature

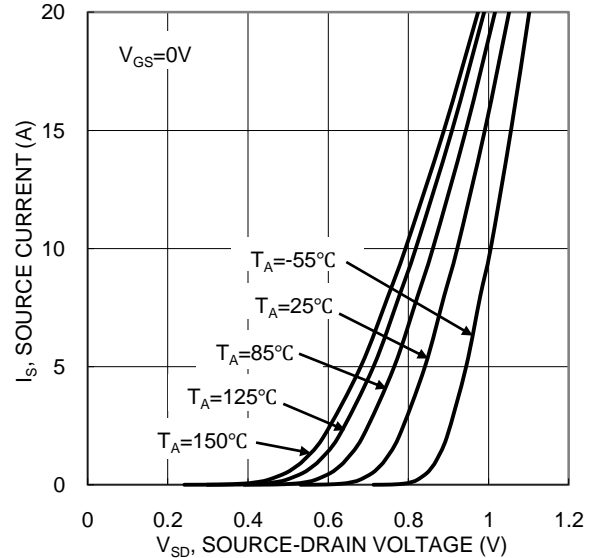


Figure 8. Diode Forward Voltage vs. Current

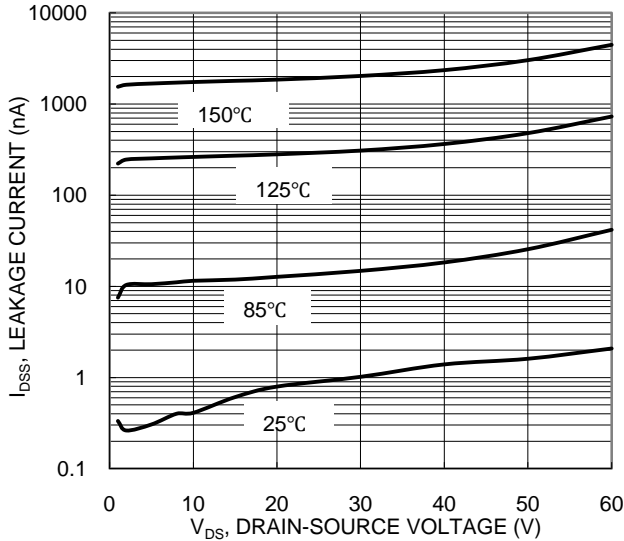


Figure 9. Typical Drain-Source Leakage Current vs. Voltage

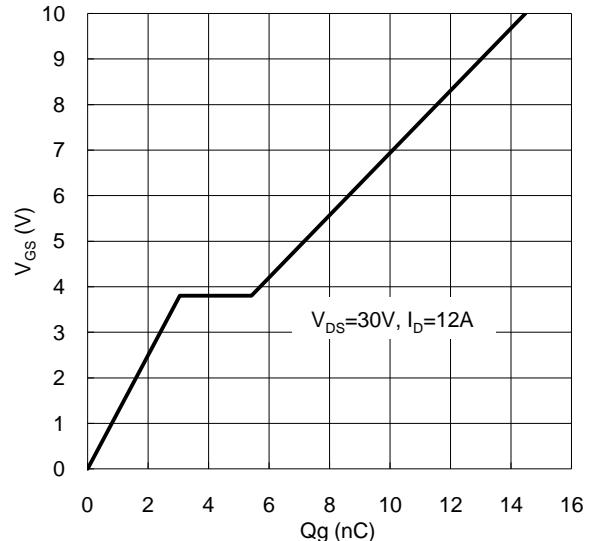


Figure 10. Gate Charge

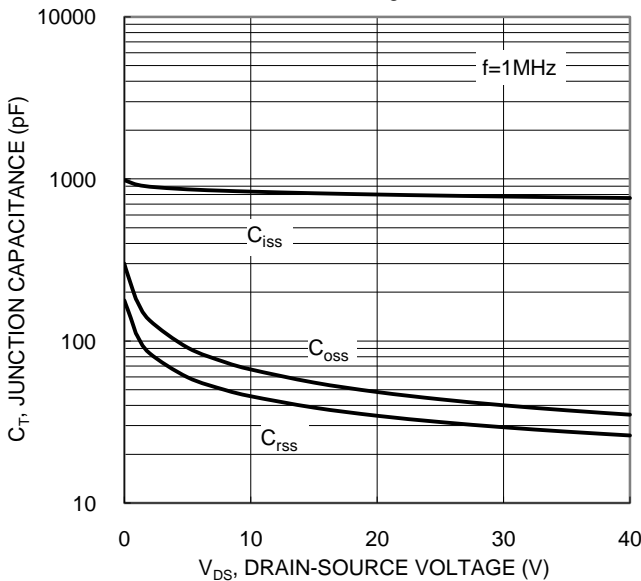


Figure 11. Typical Junction Capacitance

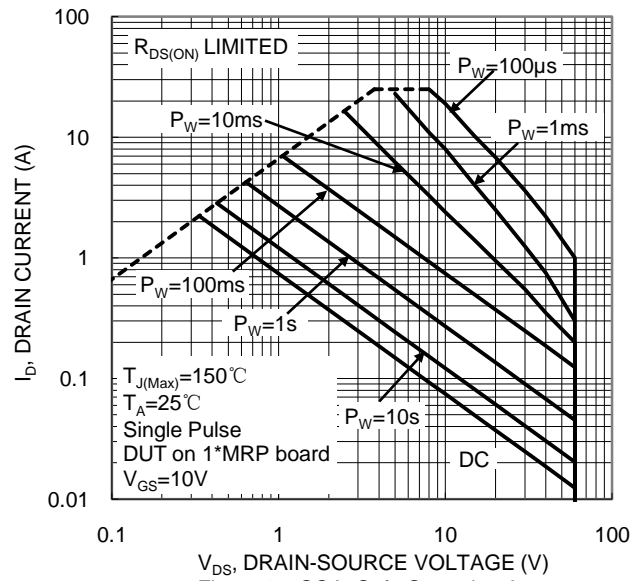
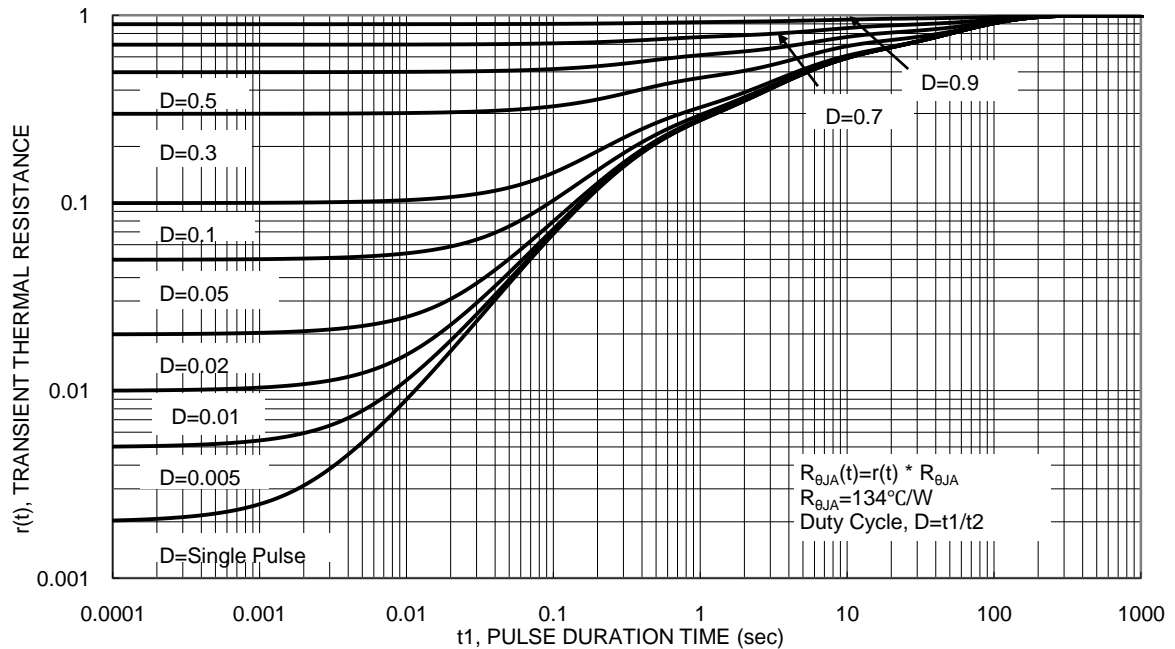


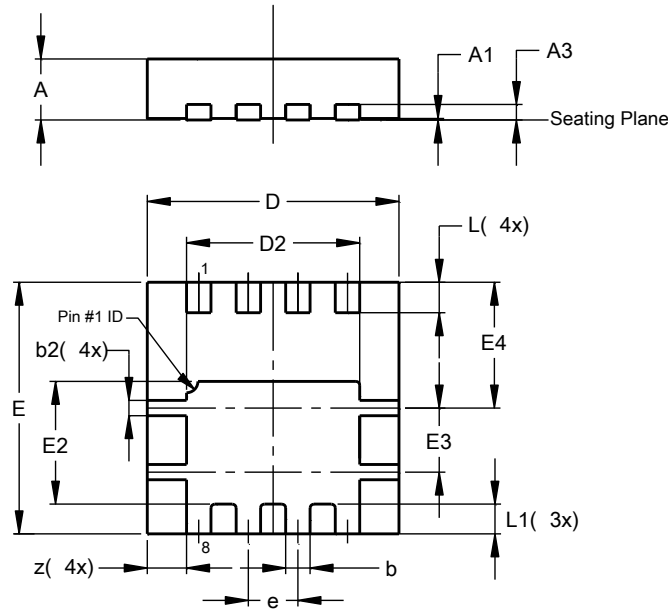
Figure 12. SOA, Safe Operation Area



**Package Outline Dimensions**

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

**PowerDI3333-8**

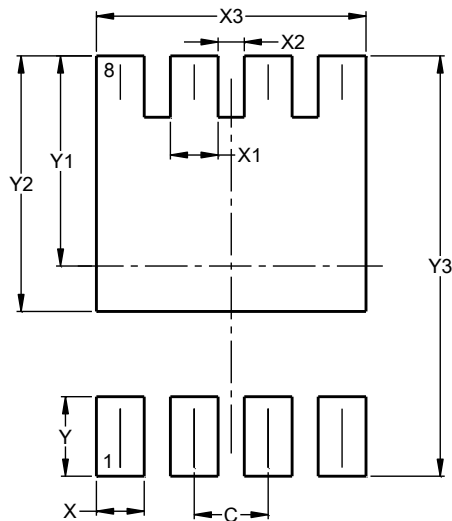


PowerDI3333-8			
Dim	Min	Max	Typ
A	0.75	0.85	0.80
A1	0.00	0.05	0.02
A3	-	-	0.203
b	0.27	0.37	0.32
b2	0.15	0.25	0.20
D	3.25	3.35	3.30
D2	2.22	2.32	2.27
E	3.25	3.35	3.30
E2	1.56	1.66	1.61
E3	0.79	0.89	0.84
E4	1.60	1.70	1.65
e	-	-	0.65
L	0.35	0.45	0.40
L1	-	-	0.39
z	-	-	0.515
All Dimensions in mm			

**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

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