

## Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)} \text{ max}$	$I_D \text{ max}$ $T_A = +25^\circ\text{C} (t < 10\text{s})$
20V	4.6m $\Omega$ @ $V_{GS} = 4.5\text{V}$	24.1A
	8.7m $\Omega$ @ $V_{GS} = 2.5\text{V}$	17.5A

## 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

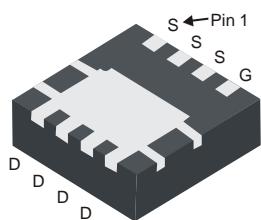
## Features and Benefits

- 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
- 100% UIS &  $R_g$  tested
- **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

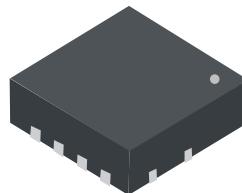
## Mechanical Data

- Case: POWERDI®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 
- Weight: 0.072 grams (Approximate)

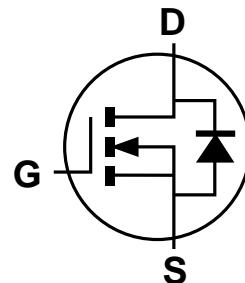
POWERDI3333-8



Bottom View



Top View



Equivalent Circuit

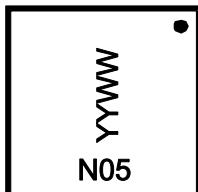
## Ordering Information (Note 4)

Part Number	Case	Packaging
DMN2005UFG-7	POWERDI3333-8	2,000/Tape & Reel
DMN2005UFG-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. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

## Marking Information



N05= Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Last Digit of Year (ex: 13 = 2013)  
 WW = Week Code (01 ~ 53)

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

Characteristic			Symbol	Value	Units
Drain-Source Voltage			$V_{DSS}$	20	V
Gate-Source Voltage			$V_{GSS}$	$\pm 12$	V
Continuous Drain Current (Note 6) $V_{GS} = 4.5\text{V}$	Steady State	$T_C = +25^\circ\text{C}$ $T_C = +70^\circ\text{C}$	$I_D$	18.1 14.5	A
	$t < 10\text{s}$	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	$I_D$	24.1 19.3	A
Pulsed Drain Current (10 $\mu\text{s}$ pulse, duty cycle = 1%)			$I_{DM}$	58.3	A
Maximum Continuous Body Diode Forward Current (Note 6)			$I_S$	2.6	A
Avalanche Current, $L = 0.2\text{mH}$			$I_{AS}$	23.9	A
Repetitive Avalanche Energy, $L = 0.2\text{mH}$			$E_{AS}$	58.4	mJ

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

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)		$T_A = +25^\circ\text{C}$	$P_D$	1.05 W
Thermal Resistance, Junction to Ambient (Note 5)	Steady state	$R_{\theta JA}$	120	°C/W
	$t < 10\text{s}$		67	
Total Power Dissipation (Note 6)		$T_A = +25^\circ\text{C}$	$P_D$	2.27 W
Thermal Resistance, Junction to Ambient (Note 6)	Steady state	$R_{\theta JA}$	55	°C/W
	$t < 10\text{s}$		31	
Thermal Resistance, Junction to Case (Note 6)		$R_{\theta JC}$	6.1	
Operating and Storage Temperature Range		$T_J, T_{STG}$	-55 to +150	°C

Notes: 5. Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.  
6. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate.

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 7)</b>						
Drain-Source Breakdown Voltage	$\text{BV}_{\text{DSS}}$	20	—	—	V	$\text{V}_{\text{GS}} = 0\text{V}$ , $\text{I}_D = 250\mu\text{A}$
Zero Gate Voltage Drain Current $T_J = +25^\circ\text{C}$	$\text{I}_{\text{DSS}}$	—	—	10	$\mu\text{A}$	$\text{V}_{\text{DS}} = 20\text{V}$ , $\text{V}_{\text{GS}} = 0\text{V}$
Gate-Source Leakage	$\text{I}_{\text{GSS}}$	—	—	$\pm 100$	nA	$\text{V}_{\text{GS}} = \pm 12\text{V}$ , $\text{V}_{\text{DS}} = 0\text{V}$
<b>ON CHARACTERISTICS (Note 7)</b>						
Gate Threshold Voltage	$\text{V}_{\text{GS}(\text{th})}$	0.4	0.7	1.2	V	$\text{V}_{\text{DS}} = \text{V}_{\text{GS}}$ , $\text{I}_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$\text{R}_{\text{DS}(\text{ON})}$	—	4	4.6	$\text{m}\Omega$	$\text{V}_{\text{GS}} = 4.5\text{V}$ , $\text{I}_D = 13.5\text{A}$
		—	4.9	8.7		$\text{V}_{\text{GS}} = 2.5\text{V}$ , $\text{I}_D = 13.5\text{A}$
Diode Forward Voltage	$\text{V}_{\text{SD}}$	—	0.8	1.1	V	$\text{V}_{\text{GS}} = 0\text{V}$ , $\text{I}_S = 27\text{A}$
<b>DYNAMIC CHARACTERISTICS (Note 8)</b>						
Input Capacitance	$\text{C}_{\text{iss}}$	—	6,495	—	pF	$\text{V}_{\text{DS}} = 10\text{V}$ , $\text{V}_{\text{GS}} = 0\text{V}$ , $f = 1\text{MHz}$
Output Capacitance	$\text{C}_{\text{oss}}$	—	546	—	pF	
Reverse Transfer Capacitance	$\text{C}_{\text{rss}}$	—	477	—	pF	
Gate Resistance	$\text{R}_g$	—	0.7	—	$\Omega$	$\text{V}_{\text{DS}} = 0\text{V}$ , $\text{V}_{\text{GS}} = 0\text{V}$ , $f = 1\text{MHz}$
Total Gate Charge ( $\text{V}_{\text{GS}} = 4.5\text{V}$ )	$\text{Q}_g$	—	68.8	—	nC	$\text{V}_{\text{DS}} = 16\text{V}$ , $\text{I}_D = 27\text{A}$
Total Gate Charge ( $\text{V}_{\text{GS}} = 10\text{V}$ )	$\text{Q}_g$	—	164	—	nC	
Gate-Source Charge	$\text{Q}_{\text{gs}}$	—	10.4	—	nC	
Gate-Drain Charge	$\text{Q}_{\text{gd}}$	—	17.4	—	nC	
Turn-On Delay Time	$\text{t}_{\text{D}(\text{on})}$	—	12.4	—	ns	$\text{V}_{\text{GS}} = 5\text{V}$ , $\text{V}_{\text{DS}} = 10\text{V}$ , $\text{R}_g = 4.7\Omega$ , $\text{I}_D = 13.5\text{A}$
Turn-On Rise Time	$\text{t}_r$	—	25.7	—	ns	
Turn-Off Delay Time	$\text{t}_{\text{D}(\text{off})}$	—	114	—	ns	
Turn-Off Fall Time	$\text{t}_f$	—	38	—	ns	
Body Diode Reverse Recovery Time	$\text{t}_{\text{rr}}$	—	16.1	—	ns	$\text{I}_F = 13.5\text{A}$ , $\text{di}/\text{dt} = 100\text{A}/\mu\text{s}$
Body Diode Reverse Recovery Charge	$\text{Q}_{\text{rr}}$	—	8.5	—	nC	$\text{I}_F = 13.5\text{A}$ , $\text{di}/\text{dt} = 100\text{A}/\mu\text{s}$

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

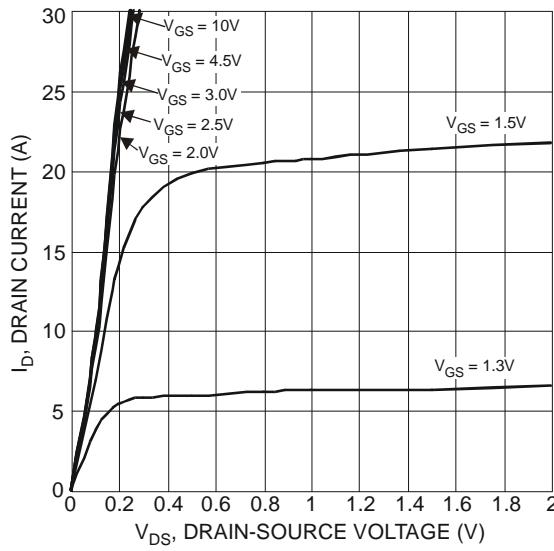


Figure 1 Typical Output Characteristics

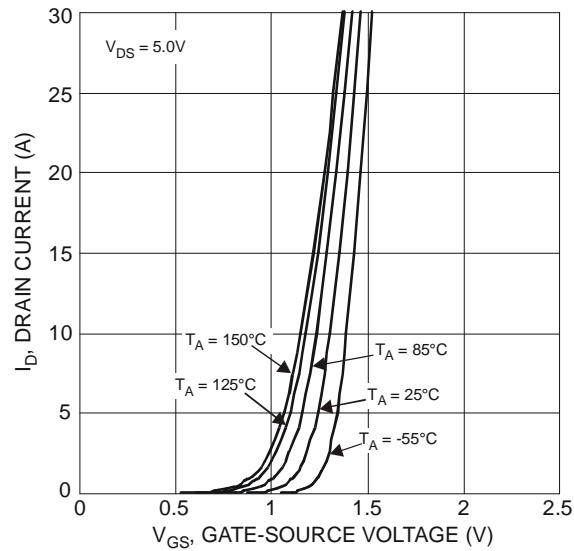
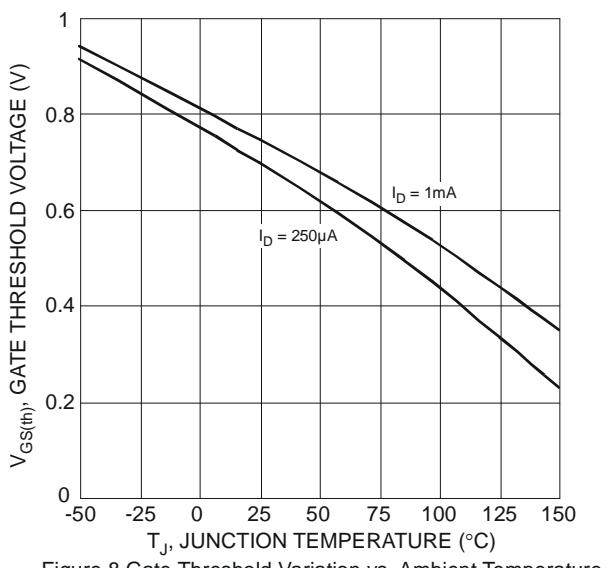
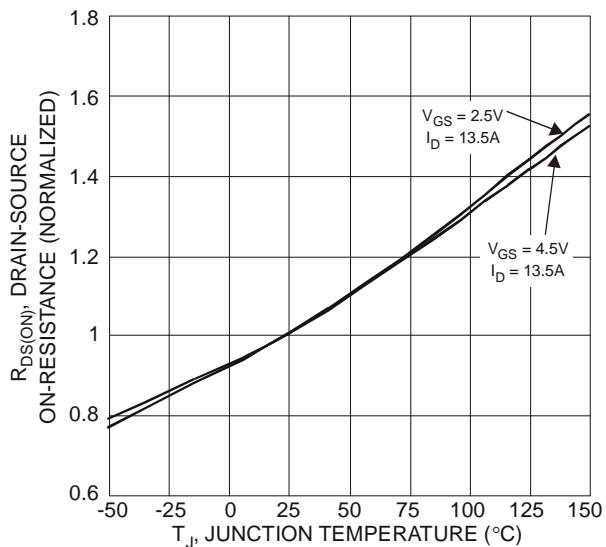
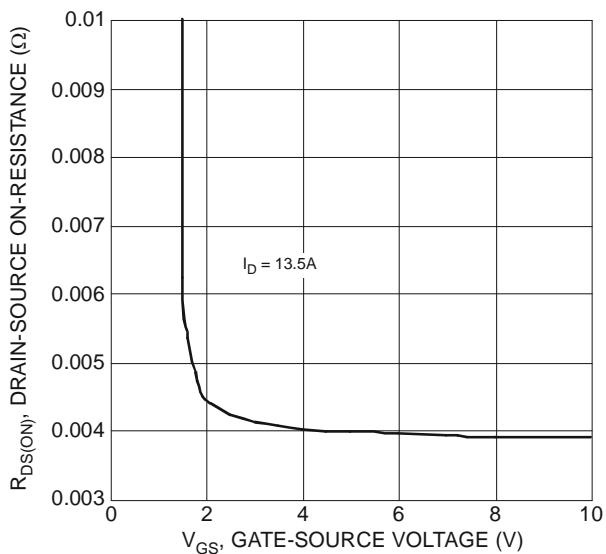
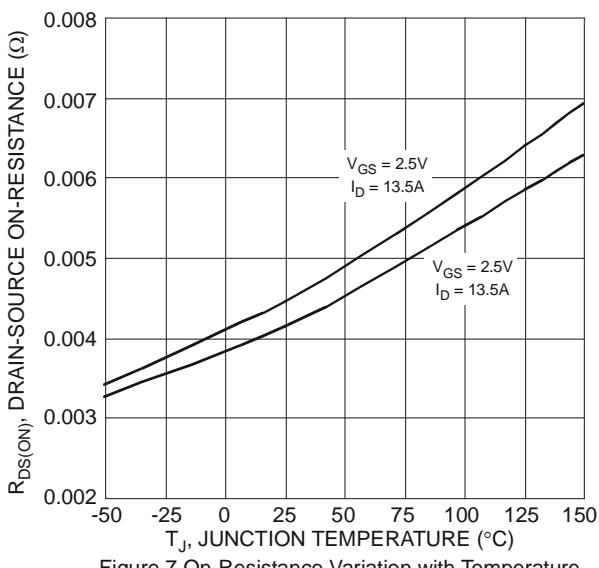
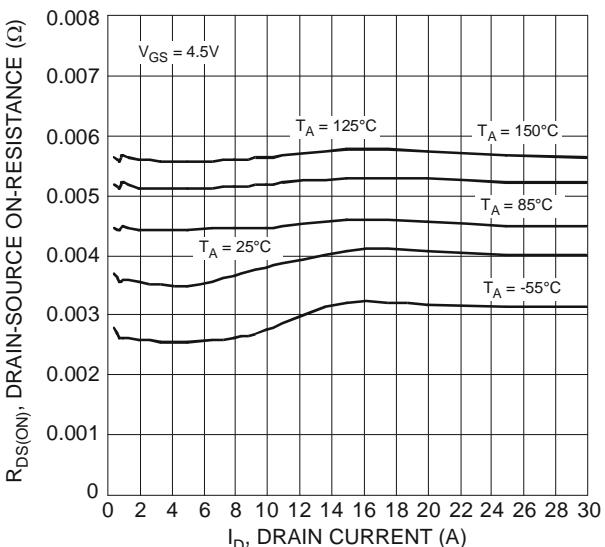
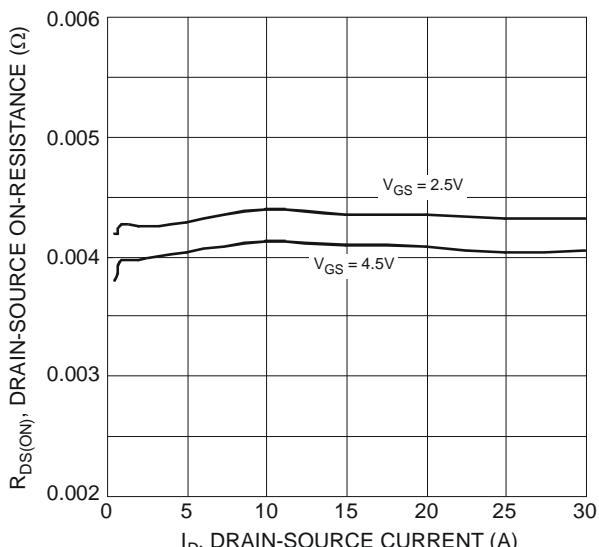


Figure 2 Typical Transfer Characteristics



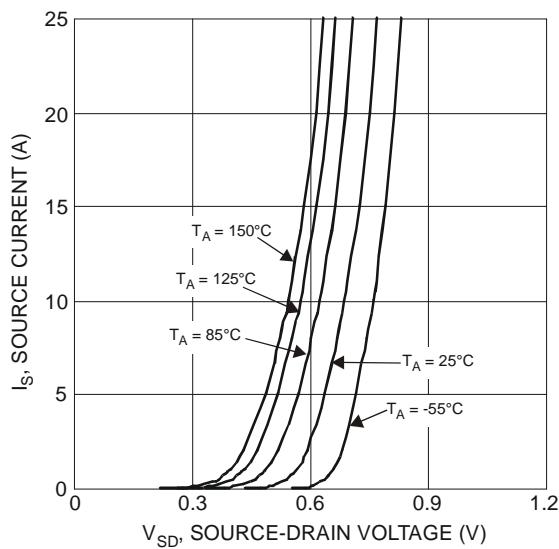


Figure 9 Diode Forward Voltage vs. Current

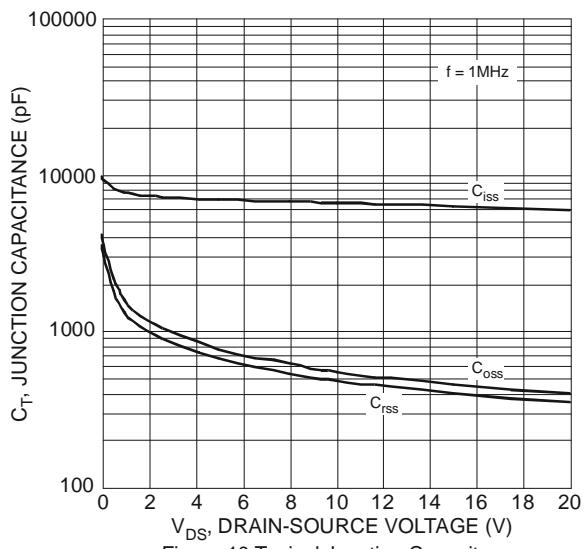


Figure 10 Typical Junction Capacitance

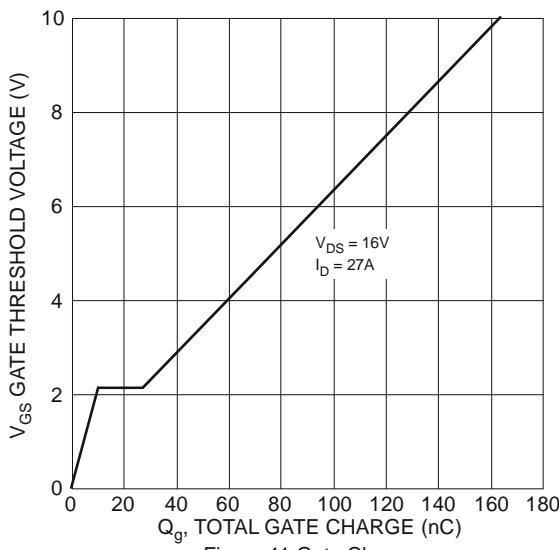


Figure 11 Gate Charge

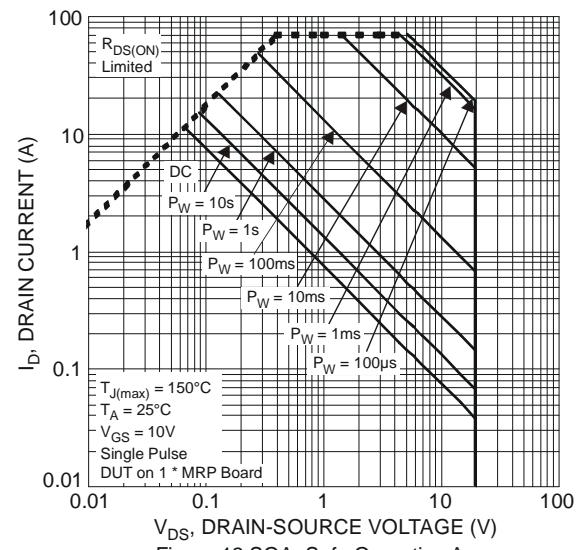


Figure 12 SOA, Safe Operation Area

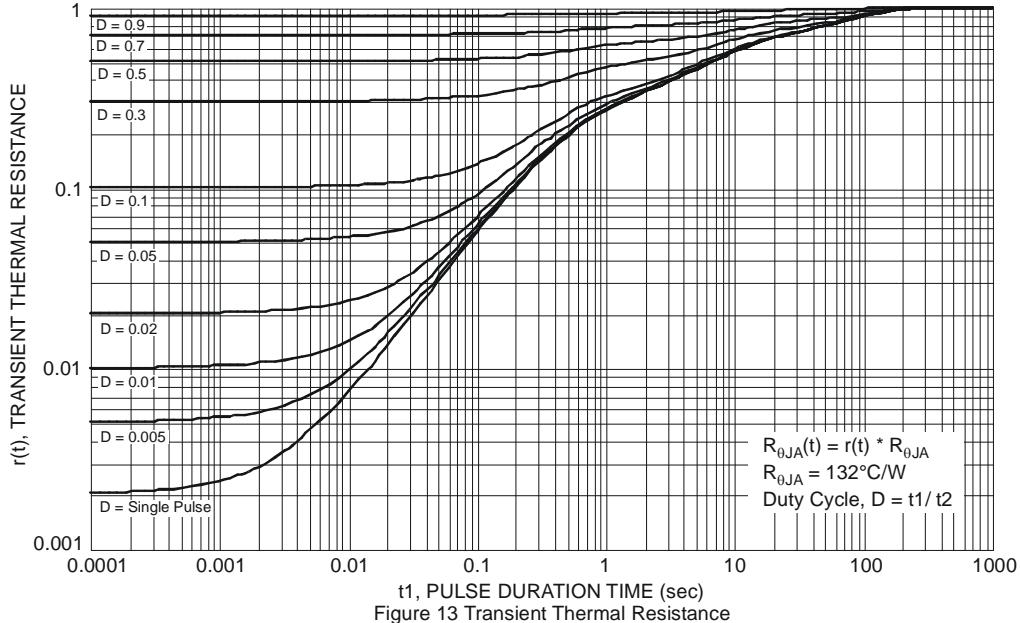
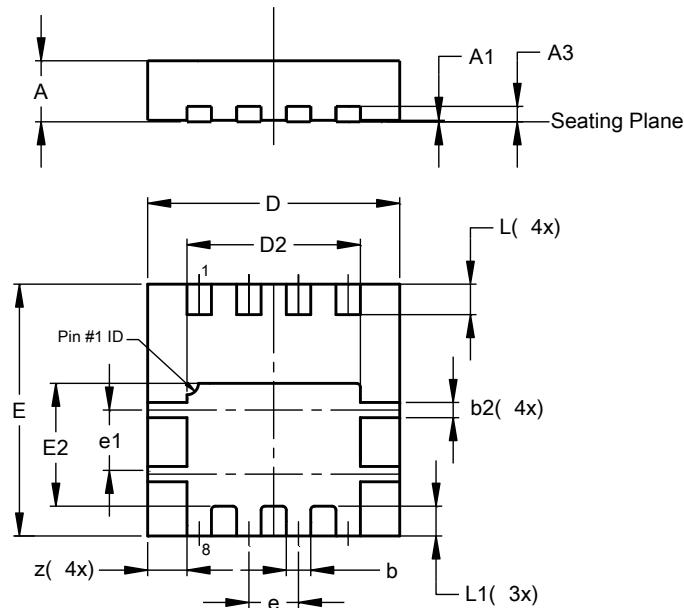


Figure 13 Transient Thermal Resistance

## Package Outline Dimensions

Please see AP02001 at [http://www.diodes.com/\\_files/datasheets/ap02001.pdf](http://www.diodes.com/_files/datasheets/ap02001.pdf) for the latest version.

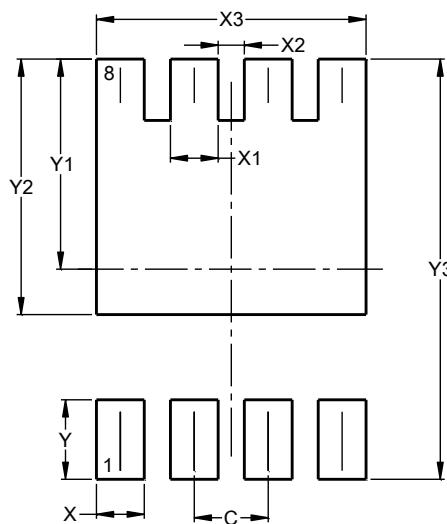


POWERDI®3333-8			
Dim	Min	Max	Typ
<b>A</b>	0.75	0.85	0.80
<b>A1</b>	0.00	0.05	0.02
<b>A3</b>	—	—	0.203
<b>b</b>	0.27	0.37	0.32
<b>b2</b>	—	—	0.20
<b>D</b>	3.25	3.35	3.30
<b>D2</b>	2.22	2.32	2.27
<b>E</b>	3.25	3.35	3.30
<b>E2</b>	1.56	1.66	1.61
<b>e</b>	—	—	0.65
<b>e1</b>	0.79	0.89	0.84
<b>L</b>	0.35	0.45	0.40
<b>L1</b>	—	—	0.39
<b>z</b>	—	—	0.515

All Dimensions in mm

## Suggested Pad Layout

Please see AP02001 at [http://www.diodes.com/\\_files/datasheets/ap02001.pdf](http://www.diodes.com/_files/datasheets/ap02001.pdf) for the latest version.



Dimensions	Value (in mm)
<b>C</b>	0.650
<b>X</b>	0.420
<b>X1</b>	0.420
<b>X2</b>	0.230
<b>X3</b>	2.370
<b>Y</b>	0.700
<b>Y1</b>	1.850
<b>Y2</b>	2.250
<b>Y3</b>	3.700

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