

**60V N-CHANNEL ENHANCEMENT MODE MOSFET
POWERDI®**

Product Summary

BV _{DSS}	R _{DS(ON)} Max	I _D Max T _C = +25°C
60V	50mΩ @ V _{GS} = 10V	18A
	63mΩ @ 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**

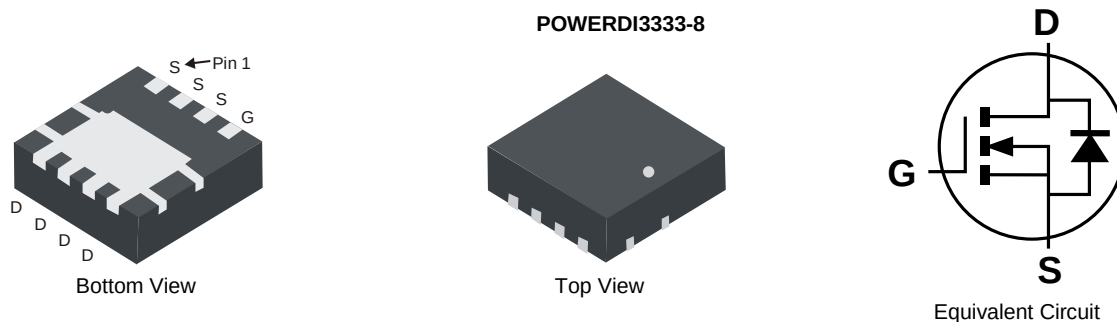
Description and Applications

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®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: 0.03 grams (Approximate)

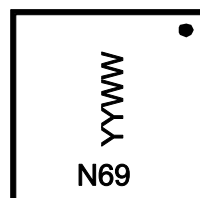


Ordering Information (Note 4)

Part Number	Case	Packaging
DMN6069SFG-7	POWERDI3333-8	2,000/Tape & Reel
DMN6069SFG-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 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



N69 = Product Type Marking Code
YYWW = Date Code Marking
YY = Last Two Digits of Year (ex: 15 = 2015)
WW = Week Code (01 to 53)

Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V _{DSS}	60	V
Gate-Source Voltage			V _{GSS}	±20	V
Continuous Drain Current (Note 6) V _{GS} = 10V	Steady State	T _A = +25°C T _A = +70°C	I _D	5.6 4.5	A
	Steady State	T _C = +25°C T _C = +70°C	I _D	18 14.5	A
Pulsed Drain Current (380µs Pulse, Duty Cycle = 1%)			I _{DM}	25	A
Maximum Continuous Body Diode Forward Current (Note 6)			I _S	2.5	A
Avalanche Current (Note 7) L = 0.1mH			I _{AS}	12	A
Repetitive Avalanche Energy (Note 7) L = 0.1mH			E _{AS}	7.2	mJ

Thermal Characteristics

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)		P _D	0.93	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	R _{θJA}	134	°C/W
	t < 10s		82	
Total Power Dissipation (Note 6)		P _D	2.4	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	R _{θJA}	53	°C/W
	t < 10s		33	
Thermal Resistance, Junction to Case		R _{θJC}	5	
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.
 7. I_{AS} and E_{AS} ratings are based on low frequency and duty cycles to keep T_J = +25°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}	60	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
Zero Gate Voltage Drain Current $T_J = +25^\circ\text{C}$	I_{DSS}	—	—	1	μA	$V_{DS} = 60V, V_{GS} = 0V$
Zero Gate Voltage Drain Current $T_J = +150^\circ\text{C}$ (Note 9)	I_{DSS}	—	—	100	μA	$V_{DS} = 60V, V_{GS} = 0V$
Gate-Source Leakage	I_{GSS}	—	—	± 100	nA	$V_{GS} = \pm 20V, V_{DS} = 0V$
ON CHARACTERISTICS (Note 8)						
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 Ω	$V_{GS} = 10V, I_D = 4.5A$
		—	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 9)	$I_{D(ON)}$	20	—	—	A	$V_{DS} \geq 5V, V_{GS} = 10V$
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C_{ISS}	—	740	1,480	pF	$V_{DS} = 30V, V_{GS} = 0V,$ $f = 1.0MHz$
Output Capacitance	C_{OSS}	—	40	80	pF	
Reverse Transfer Capacitance	C_{RSS}	—	28	55	pF	
Gate Resistance	R_g	—	2.2	4	Ω	$V_{DS} = 0V, V_{GS} = 0V, f = 1MHz$
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: 8. Short duration pulse test used to minimize self-heating effect.
9. Guaranteed by design. Not subject to product testing.

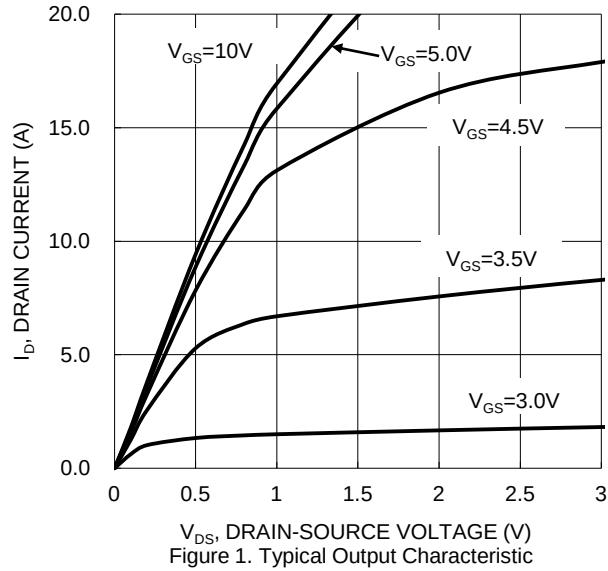


Figure 1. Typical Output Characteristic

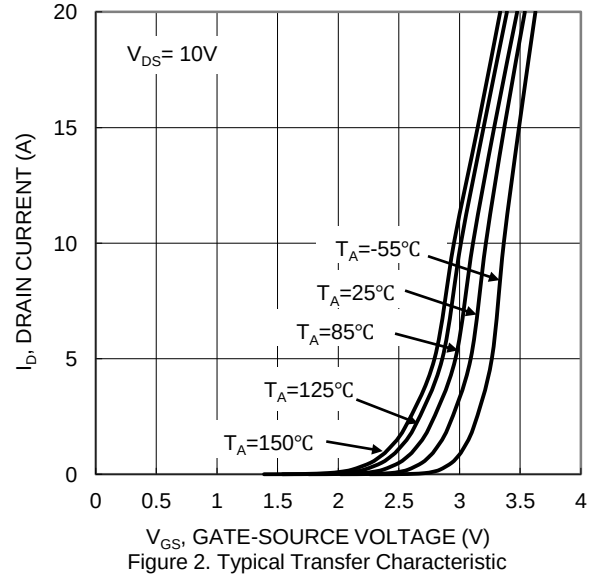


Figure 2. Typical Transfer Characteristic

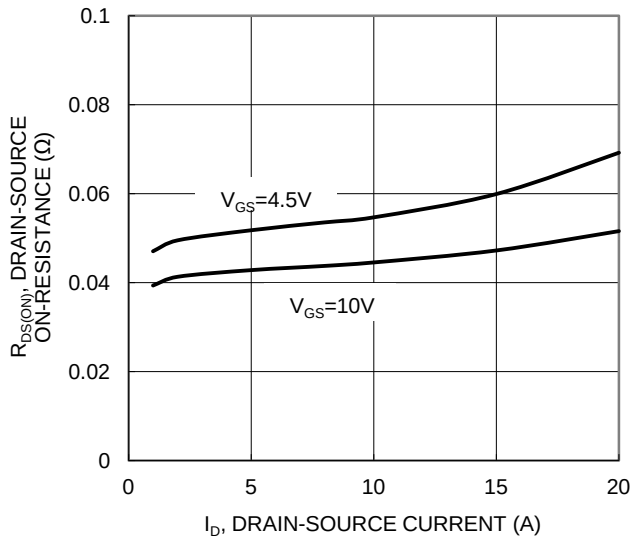


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

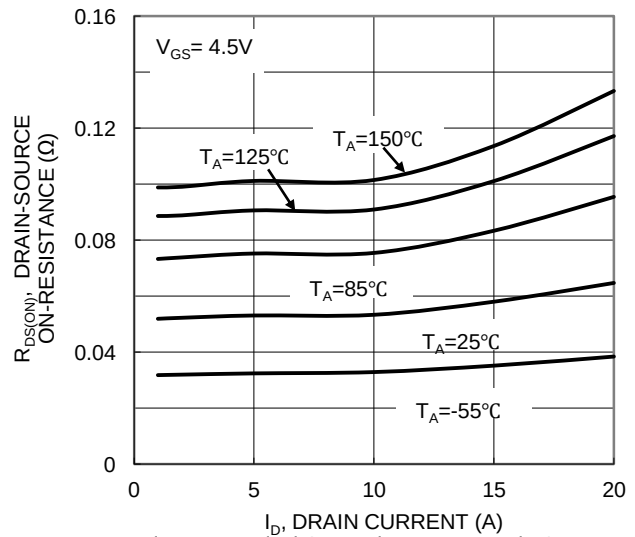


Figure 4. Typical On-Resistance vs. Drain Current and Temperature

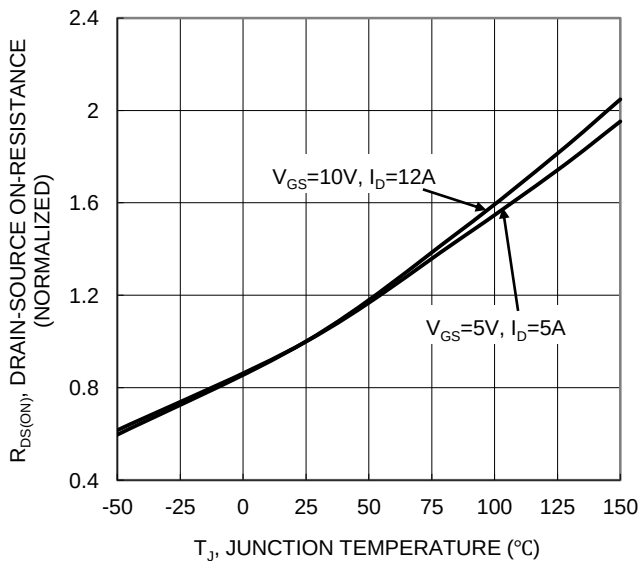


Figure 5. On-Resistance Variation with Temperature

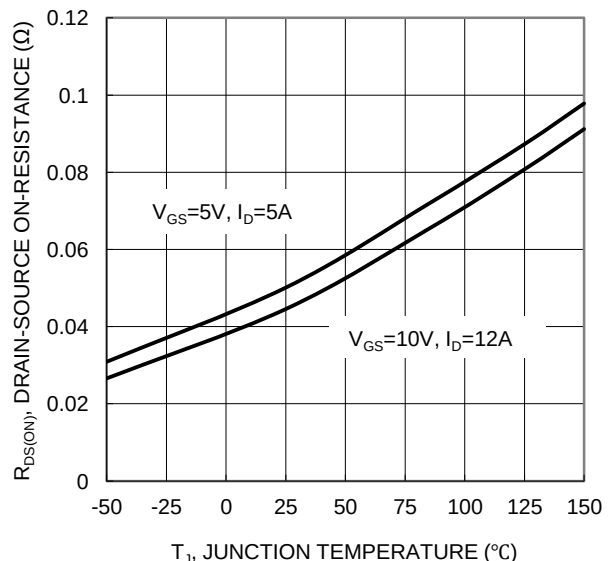


Figure 6. On-Resistance Variation with Temperature

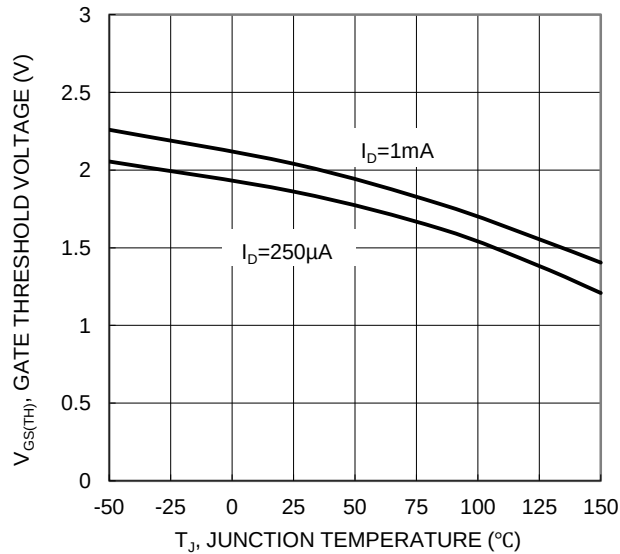


Figure 7. Gate Threshold Variation vs. Junction Temperature

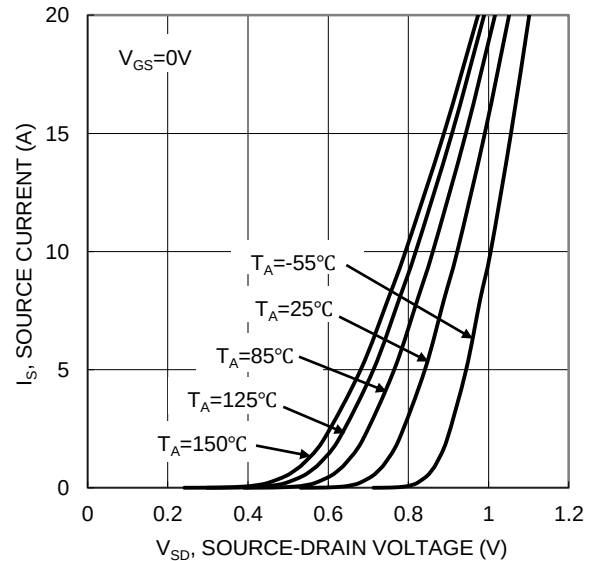


Figure 8. Diode Forward Voltage vs. Current

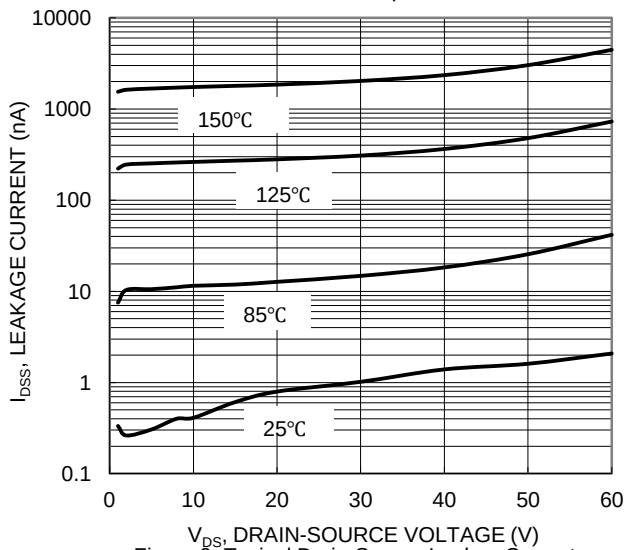


Figure 9. Typical Drain-Source Leakage Current vs. Voltage

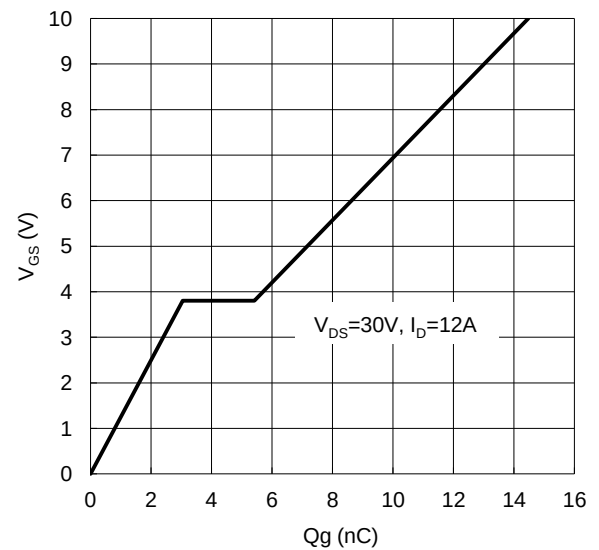


Figure 10. Gate Charge

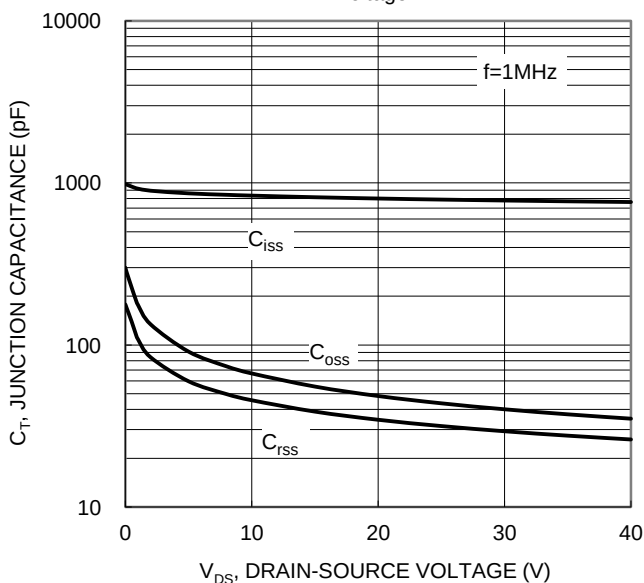


Figure 11. Typical Junction Capacitance

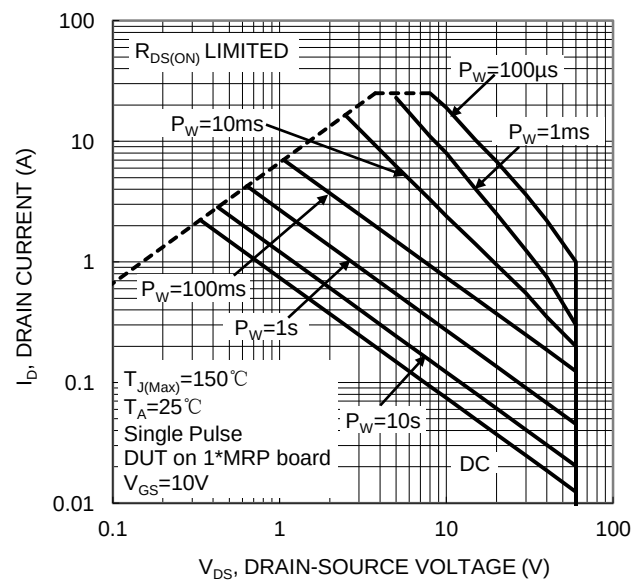


Figure 12. SOA, Safe Operation Area

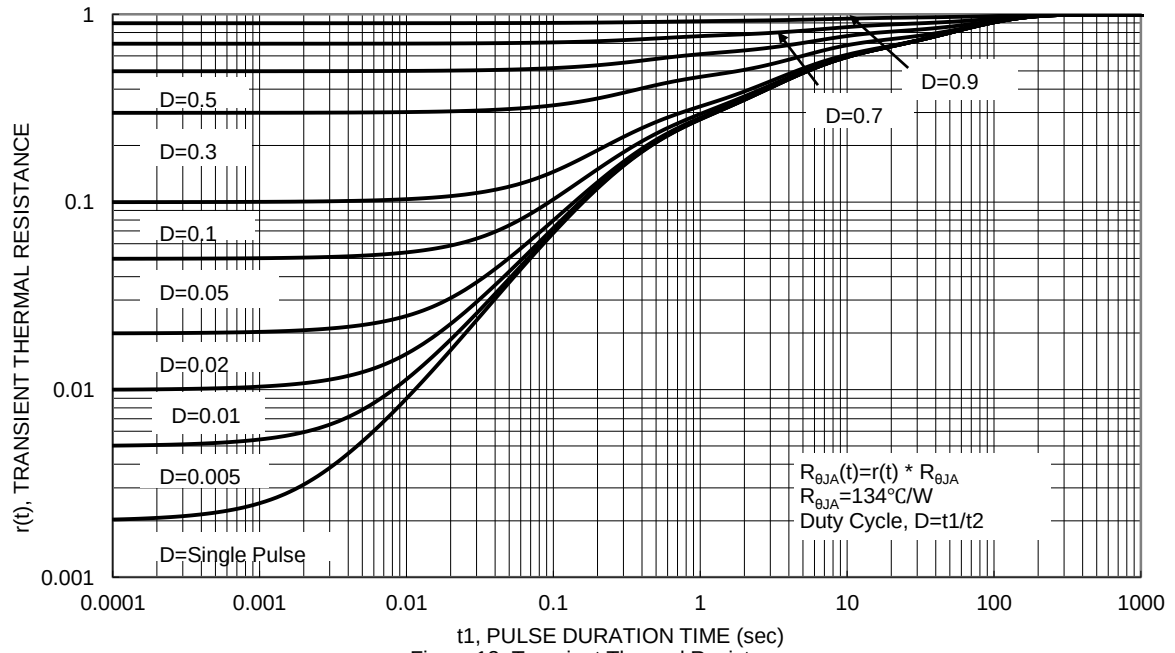
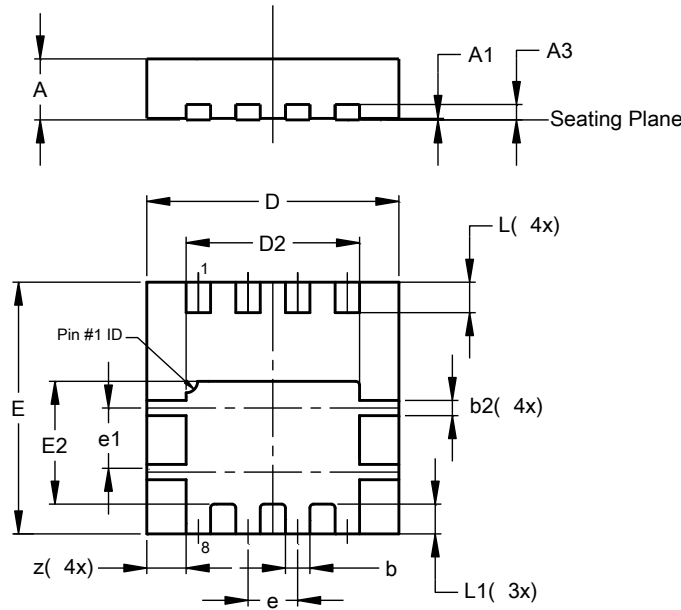


Figure 13. Transient Thermal Resistance

Package Outline Dimensions

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

POWERDI3333-8

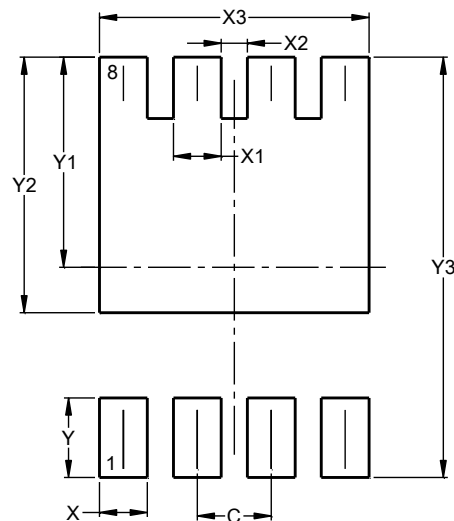


POWERDI3333-8			
Dim	Min	Max	Typ
A	0.75	0.85	0.80
A1	0.00	0.05	0.02
A3	—	—	0.203
b	0.27	0.37	0.32
b2	—	—	0.20
D	3.25	3.35	3.30
D2	2.22	2.32	2.27
E	3.25	3.35	3.30
E2	1.56	1.66	1.61
e	—	—	0.65
e1	0.79	0.89	0.84
L	0.35	0.45	0.40
L1	—	—	0.39
z	—	—	0.515
All Dimensions in mm			

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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