

DUAL N-CANNEL ENHANCEMENT MODE MOSFET POWERDI®
Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)}$ max	I_D max $T_A = +25^\circ\text{C}$
20V	10.8mΩ @ $V_{GS} = 4.5\text{V}$	10.7A
	14.5mΩ @ $V_{GS} = 2.5\text{V}$	9.3A
	17.0mΩ @ $V_{GS} = 1.8\text{V}$	8.6A

Description

This new generation MOSFET has been 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

- Power Management Functions
- Load Switch

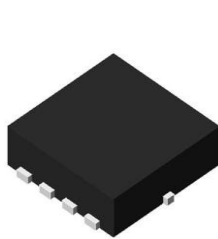
Features

- Low On-Resistance
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- Complementary Pair MOSFET
- **ESD Protected Up to 2kV**
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

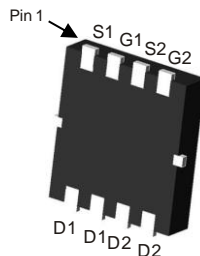
Mechanical Data

- 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
- Terminals: Finish — Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 **e3**
- Weight: 0.0065 grams (Approximate)

POWERDI®3333-8



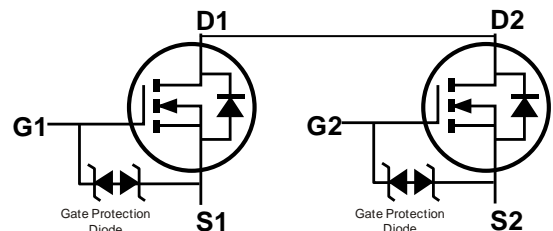
Top View



Bottom View



ESD PROTECTED

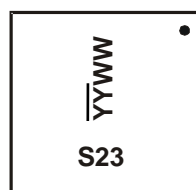


Internal Schematic

Ordering Information (Note 4)

Part Number	Case	Packaging
DMN2022UNS-7	POWERDI®3333-8	2000/Tape & Reel
DMN2022UNS-13	POWERDI®3333-8	3000/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> 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


S23 = Product Type Marking Code
 YYWW = Date Code Marking
 YY = Last Digit 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}	20	V
Gate-Source Voltage	V _{GSS}	±10	V
Continuous Drain Current (Note 6) V _{GS} = 10V	I _D	T _A = +25°C	10.7
		T _A = +70°C	8.6
Maximum Body Diode Forward Current (Note 6)	I _S	T _A = +25°C	2
		T _A = +70°C	2
Pulsed Drain Current (10µs pulse, Duty cycle = 1%)	I _{DM}	60	A
Avalanche Current (Note 7) L = 0.1mH	I _{AS}	17.1	A
Avalanche Energy (Note 7) L = 0.1mH	E _{AS}	14.7	mJ

Thermal Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Units
Total Power Dissipation (Note 5)	P _D	1.2	W
Thermal Resistance, Junction to Ambient (Note 5)	R _{θJA}	Steady State	107
		t < 10s	64
Total Power Dissipation (Note 6)	P _D	1.9	W
Thermal Resistance, Junction to Ambient (Note 6)	R _{θJA}	Steady State	67
		t < 10s	40
Operating and Storage Temperature Range	T _J , T _{STG}	-55 to +150	°C

Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 8)						
Drain-Source Breakdown Voltage	BV _{DSS}	20	—	—	V	V _{GS} = 0V, I _D = 250µA
Zero Gate Voltage Drain Current T _J = +25°C	I _{DSS}	—	—	1	µA	V _{DS} = 20V, V _{GS} = 0V
Gate-Source Leakage	I _{GSS}	—	—	±10	µA	V _{GS} = ±10V, V _{DS} = 0V
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	V _{GS(TH)}	0.4	—	1	V	V _{DS} = V _{GS} , I _D = 250µA
Static Drain-Source On-Resistance	R _{DS(ON)}	—	9.0	10.8	mΩ	V _{GS} = 4.5V, I _D = 4A
		—	9.2	11.2		V _{GS} = 4.0V, I _D = 4A
		—	9.8	13.0		V _{GS} = 3.1V, I _D = 4A
		—	10.5	14.5		V _{GS} = 2.5V, I _D = 4A
		—	13.9	17.0		V _{GS} = 1.8V, I _D = 4A
		—	—	—		—
Diode Forward Voltage	V _{SD}	—	0.7	1.1	V	V _{GS} = 0V, I _S = 5A
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C _{iss}	—	1870	—	pF	V _{DS} = 10V, V _{GS} = 0V, f = 1.0MHz
Output Capacitance	C _{oss}	—	320	—	pF	
Reverse Transfer Capacitance	C _{rss}	—	160	—	pF	
Gate Resistance	R _g	—	96	—	Ω	V _{DS} = 0V, V _{GS} = 0V, f = 1MHz
Total Gate Charge	Q _g	—	20.3	—	nC	V _{GS} = 4.5V, V _{DS} = 10V, I _D = 6.5A
Gate-Source Charge	Q _{gs}	—	2.8	—	nC	
Gate-Drain Charge	Q _{gd}	—	3.6	—	nC	
Turn-On Delay Time	t _{D(ON)}	—	62	—	ns	V _{GS} = 4.5V, V _{DS} = 10V, R _G = 6Ω, R _L = 1.0Ω
Turn-On Rise Time	t _r	—	101	—	ns	
Turn-Off Delay Time	t _{D(OFF)}	—	596	—	ns	
Turn-Off Fall Time	t _f	—	224	—	ns	
Reverse Recovery Time	t _{RR}	—	150	—	ns	
Reverse Recovery Charge	Q _{RR}	—	135	—	nC	I _F = 4A, di/dt = 100A/µs

- Notes:
- Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.
 - Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate.
 - I_{AS} and E_{AS} rating are based on low frequency and duty cycles to keep T_J = +25°C.
 - Short duration pulse test used to minimize self-heating effect.
 - Guaranteed by design. Not subject to production testing.

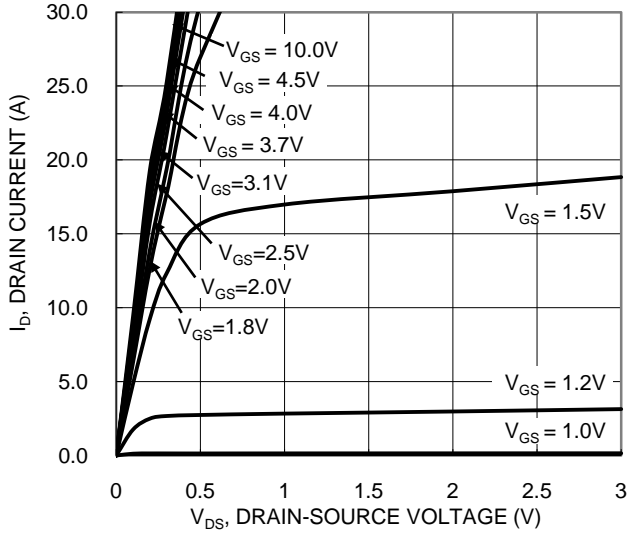


Figure 1. Typical Output Characteristic

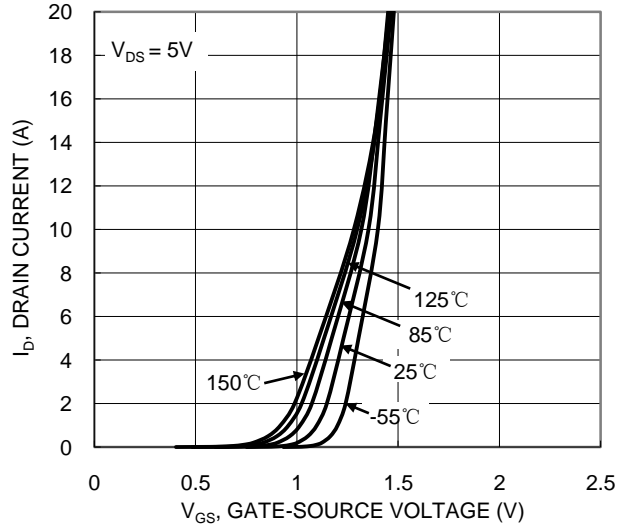


Figure 2. Typical Transfer Characteristic

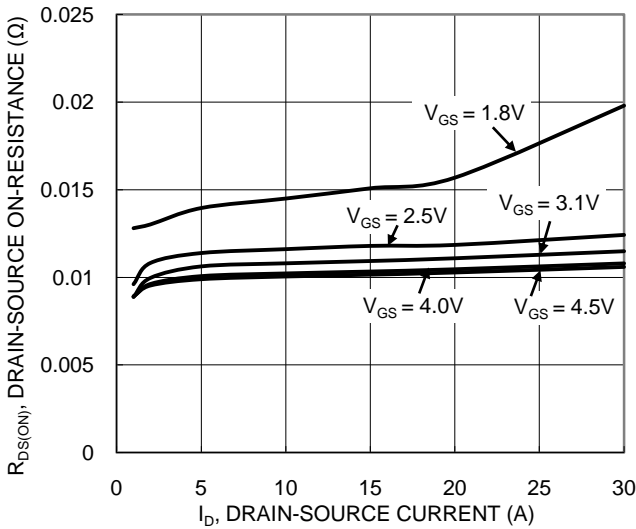


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

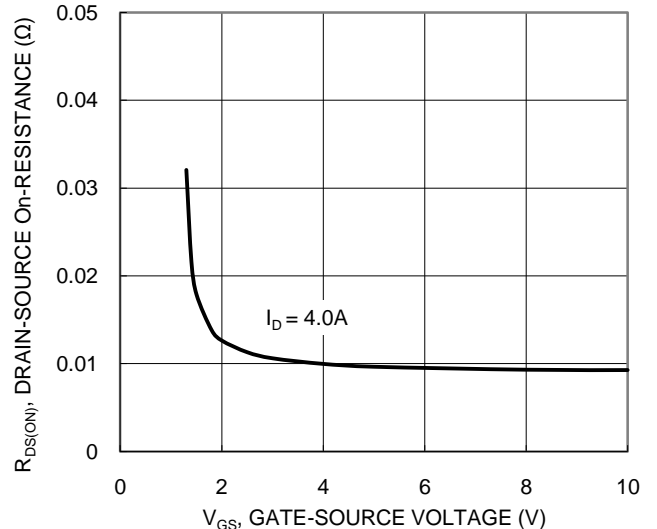


Figure 4. Typical Transfer Characteristic

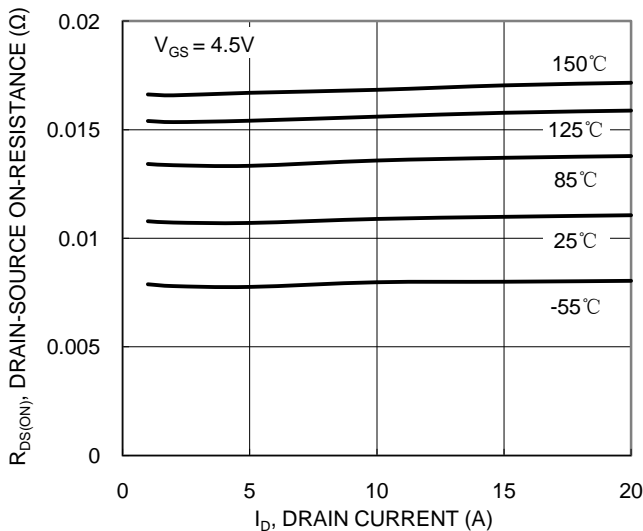


Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

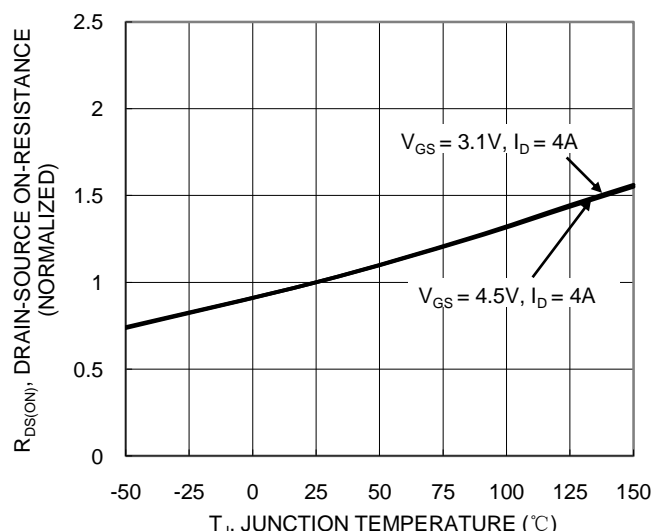


Figure 6. On-Resistance Variation with Junction Temperature

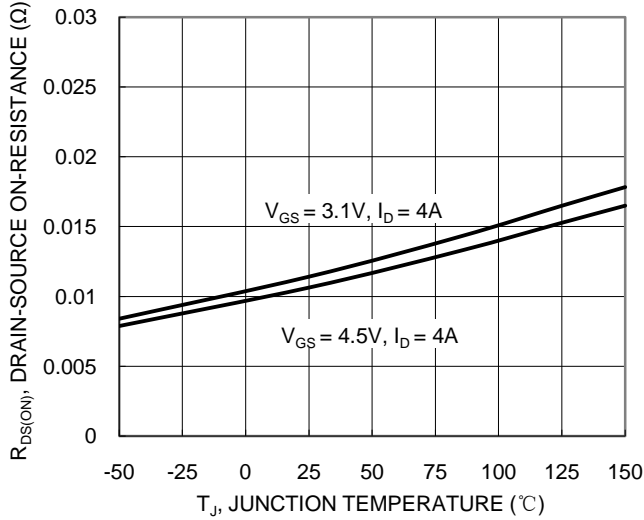


Figure 7. On-Resistance Variation with Junction Temperature

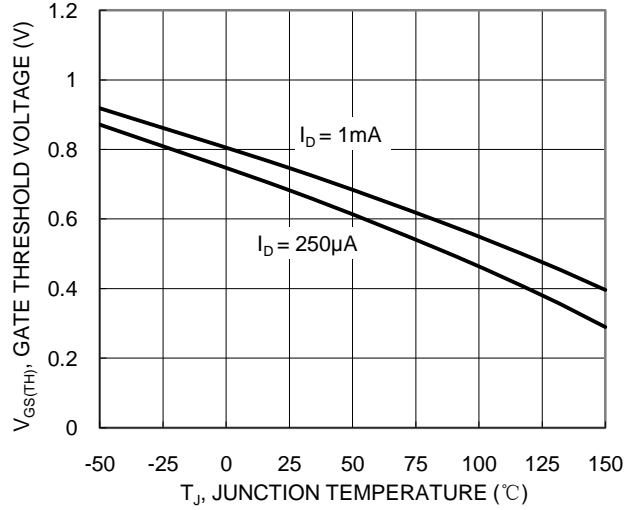


Figure 8. Gate Threshold Variation vs. Junction Temperature

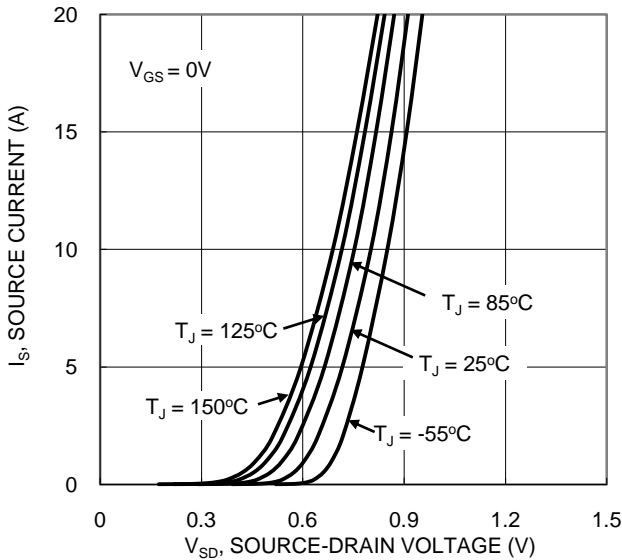


Figure 9. Diode Forward Voltage vs. Current

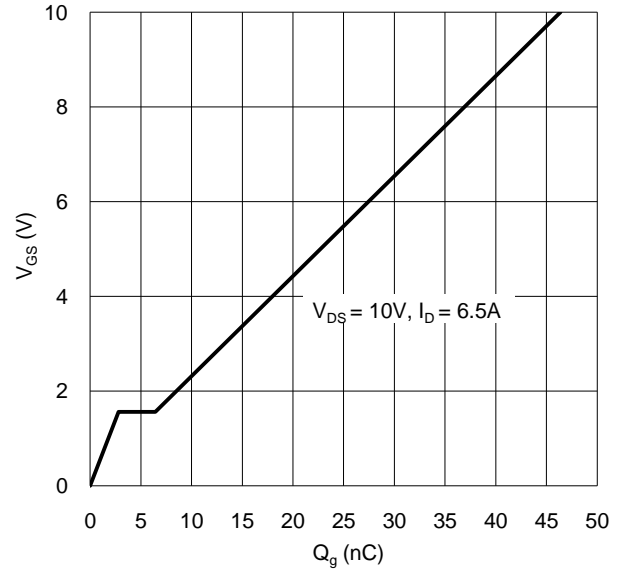


Figure 10. Gate Charge

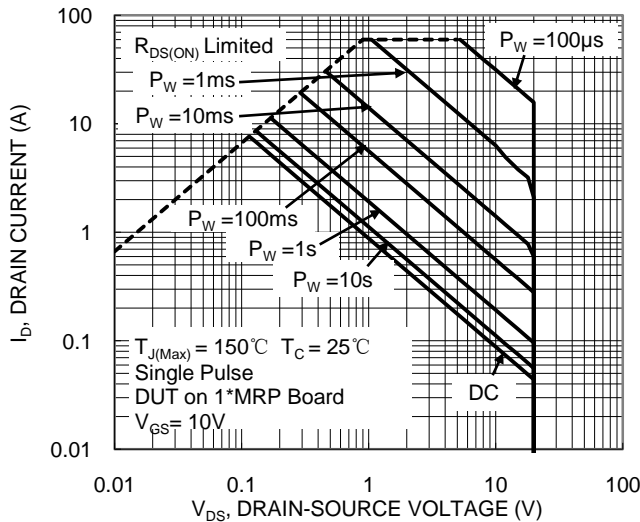


Figure 11. SOA, Safe Operation Area

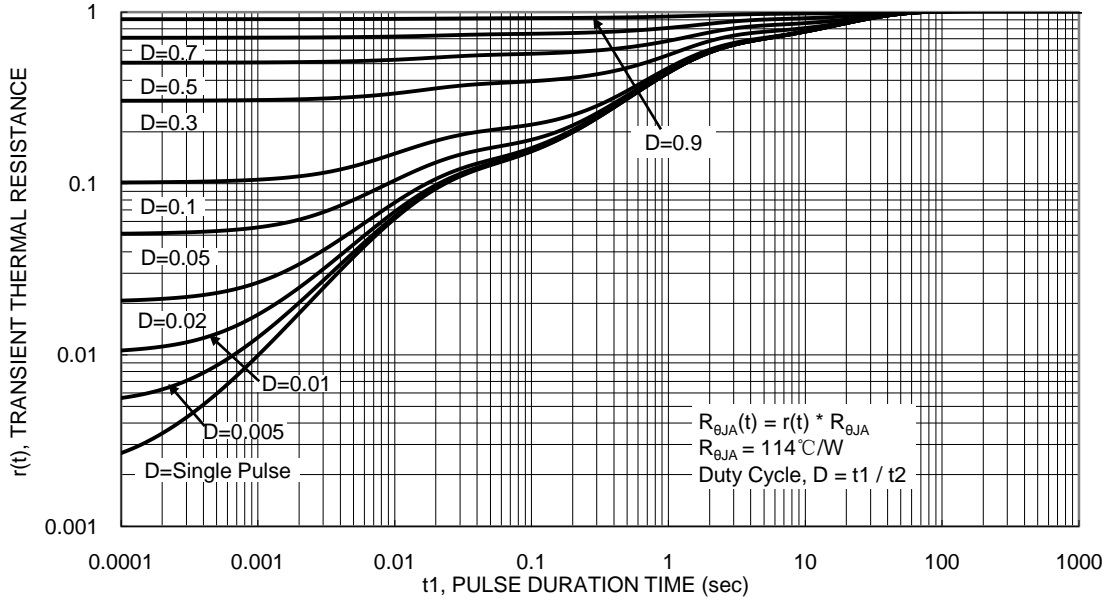
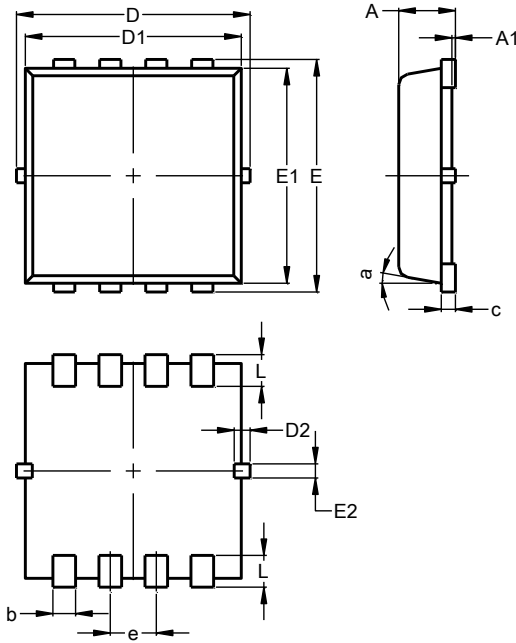


Figure 12. Transient Thermal Resistance

Package Outline Dimensions

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

POWERDI[®]3333-8 (Type UXB)



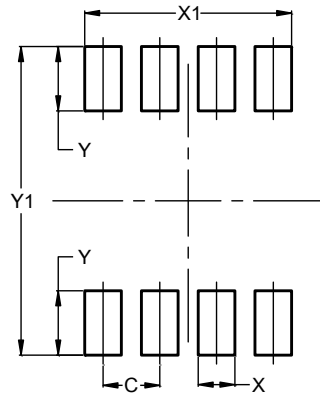
POWERDI [®] 3333-8 (Type UXB)			
Dim	Min	Max	Typ
A	0.75	0.85	0.80
A1	0.00	0.05	--
b	0.25	0.40	0.32
c	0.10	0.25	0.15
D	3.20	3.40	3.30
D1	2.95	3.15	3.05
D2	0.10	0.35	0.23
E	3.20	3.40	3.30
E1	2.95	3.15	3.05
E2	0.10	0.30	0.20
e	--	--	0.65
L	0.35	0.55	0.45
a	0°	12°	10°
All Dimensions in mm			

NEW PRODUCT

Suggested Pad Layout

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

POWERDI[®]3333-8 (Type UXB)



Dimensions	Value (in mm)
C	0.650
X	0.420
X1	2.370
Y	0.730
Y1	3.500

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