30V N-CHANNEL ENHANCEMENT MODE MOSFET WITH SCHOTTKY DIODE
PowerDI3333-8

Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)}$	Package	I_D T_A = +25°C
30V	10mΩ @ V_{GS} = 10V	PowerDI®3333-8	12A
	15mΩ @ V_{GS} = 4.5V		9.5A

Description

This 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

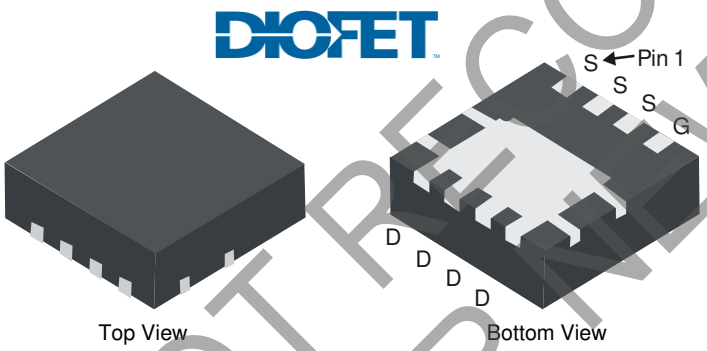
- Backlighting
- Power Management Functions
- DC-DC Converters

Features

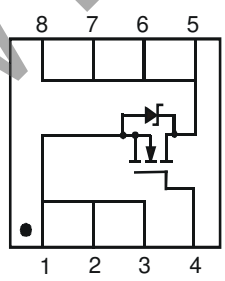
- DIOFET utilizes a unique patented process to monolithically integrate a MOSFET and a Schottky in a single die to deliver:
  - Low $R_{DS(ON)}$ – minimize conduction losses
  - Low V_{SD} – reducing the losses due to body diode conduction
  - Low Q_{rr} – lower Q_{rr} of the integrated Schottky reduces body diode switching losses
  - Low gate capacitance (Q_g/Q_{gs}) ratio – reduces risk of shoot-through or cross conduction currents at high frequencies
- 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**

Mechanical Data

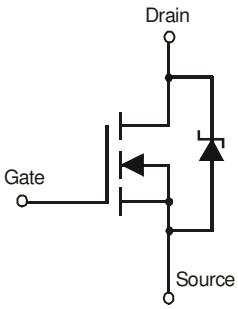
- Case: PowerDI3333-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections Indicator: See diagram
- Terminals: Finish – Matte Tin annealed over Copper leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.072 grams (approximate)



Top View | Bottom View



Top View
Pin Configuration



Internal Schematic

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Ordering Information (Note 4)

Part Number	Case	Packaging
DMG7702SFG-7	PowerDI3333-8	2000/Tape & Reel
DMG7702SFG-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 https://www.diodes.com/design/support/packaging/diodes-packaging/.

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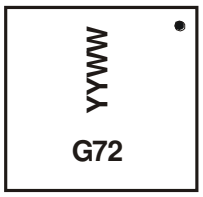
Marking Information



G72 = Product Type Marking Code
YYWW = Date Code Marking
YY = Last Two Digits of Year (ex: 11 = 2011)
WW = Week Code (01 to 53)

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

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V_{DSS}	30	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	12 9.5	A
	t<10s	T_A = +25°C T_A = +70°C	I_D	16.0 12.7	A
Continuous Drain Current (Note 6) V_{GS} = 4.5V	Steady State	T_A = +25°C T_A = +70°C	I_D	9.5 7.5	A
	t<10s	T_A = +25°C T_A = +70°C	I_D	13.0 10.3	A
Pulsed Drain Current (10µs pulse, duty cycle = 1%)			I_{DM}	90	A
Maximum Continuous Body Diode Forward Current (Note 6)			I_S	3.5	A
Avalanche Current (Note 7) L = 0.1mH			I_{AR}	17	A
Repetitive Avalanche Energy (Note 7) L = 0.1mH			E_{AR}	43	mJ

Thermal Characteristics

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	T_A = +25°C	P_D	0.89	W
	T_A = +70°C		0.55	
Thermal Resistance, Junction to Ambient (Note 5)	Steady state	$R_{\theta JA}$	145	°C/W
	t<10s		74	
Total Power Dissipation (Note 6)	T_A = +25°C	P_D	2.2	W
	T_A = +70°C		1.3	
Thermal Resistance, Junction to Ambient (Note 6)	Steady state	$R_{\theta JA}$	58	°C/W
	t<10s		31	
Thermal Resistance, Junction to Case (Note 6)		$R_{\theta JC}$	11	
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

Notes: 5. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
6. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
7. I_{AR} and E_{AR} ratings are based on low frequency and duty cycles to keep T_J = +25°C

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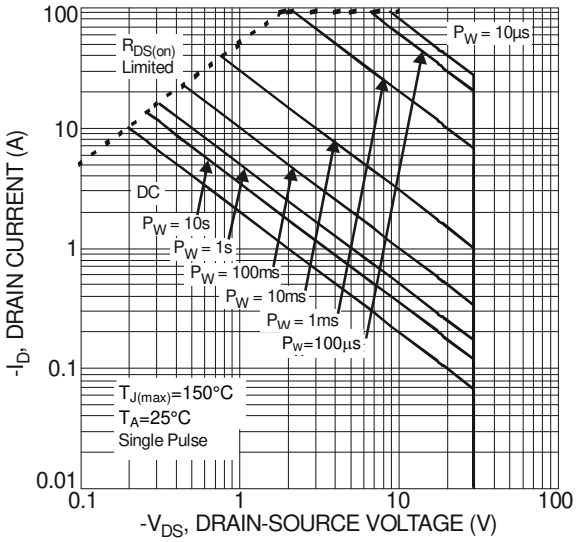

Fig. 1 SOA, Safe Operation Area

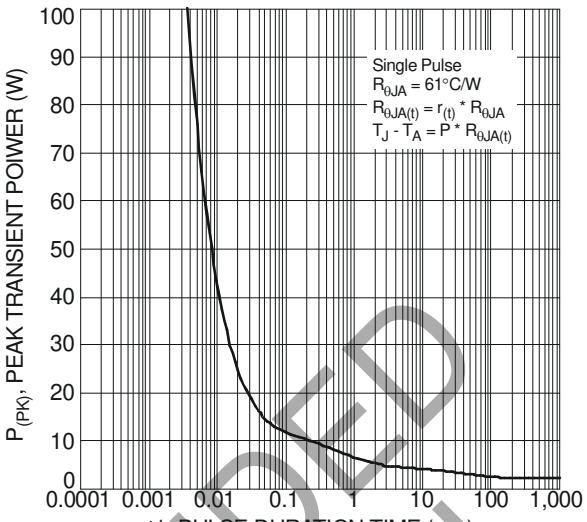

Fig. 2 Single Pulse Maximum Power Dissipation

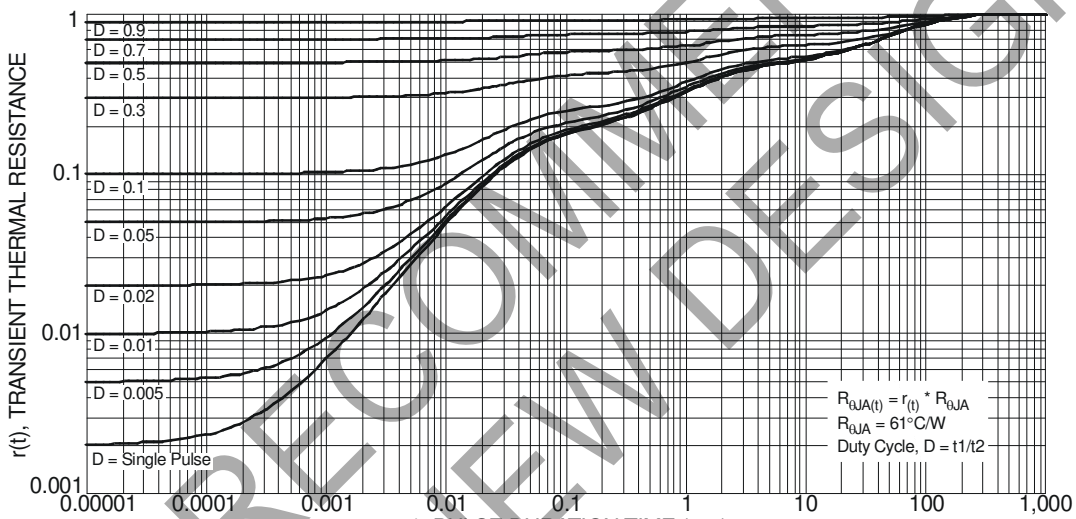

Fig. 3 Transient Thermal Resistance

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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}	30	-	-	V	V_{GS} = 0V, I_D = 250µA
Zero Gate Voltage Drain Current	I_{DSS}	-	-	100	µA	V_{DS} = 30V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	-	-	±100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	$V_{GS(th)}$	1.0	1.5	2.5	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance	$R_{DS\ (ON)}$	-	7.3	10	mΩ	V_{GS} = 10V, I_D = 13.5A
		-	10	15		V_{GS} = 4.5V, I_D = 11A
Forward Transfer Admittance	$\|Y_{fs}\|$	-	22	-	S	V_{DS} = 5V, I_D = 10.0A
Diode Forward Voltage	V_{SD}	-	0.45	0.55	V	V_{GS} = 0V, I_S = 1A
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C_{iss}	-	1296	4310	pF	V_{DS} = 15V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{oss}	-	415	-	pF	
Reverse Transfer Capacitance	C_{rss}	-	204	-	pF	
Gate Resistance	R_g	0.26	1.6	2.7	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge V_{GS} = 4.5V	Q_g	-	14.7	-	nC	V_{DS} = 15V, V_{GS} = 10V, I_D = 13.5A
Total Gate Charge V_{GS} = 10V	Q_g	-	31.6	-	nC	
Gate-Source Charge	Q_{gs}	-	3.5	-	nC	
Gate-Drain Charge	Q_{gd}	-	5.0	-	nC	
Turn-On Delay Time	$t_{D(on)}$	-	15.8	-	ns	V_{GS} = 10V, V_{DS} = 15V, R_G = 3Ω, I_D = 8.8A
Turn-On Rise Time	t_r	-	27.8	-	ns	
Turn-Off Delay Time	$t_{D(off)}$	-	29.7	-	ns	
Turn-Off Fall Time	t_f	-	13.6	-	ns	
Reverse Recovery Time	t_{rr}	-	13.1	-	ns	I_F = 13.5A, di/dt = 100A/µs
Reverse Recovery Charge	Q_{rr}	-	4.3	-	nC	I_F = 13.5A, di/dt = 100A/µs

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

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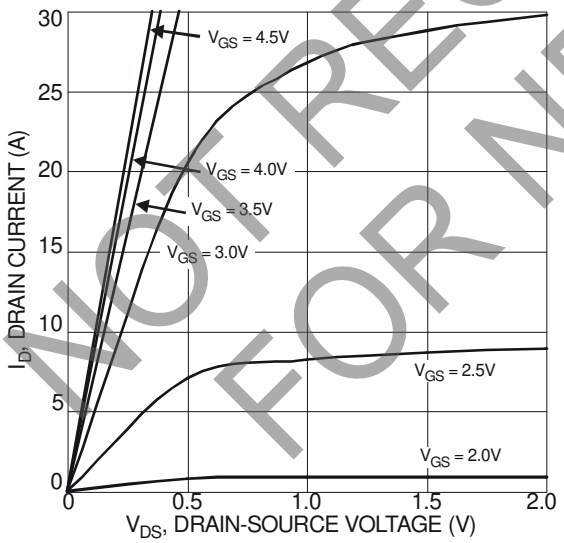

Fig. 4 Typical Output Characteristic

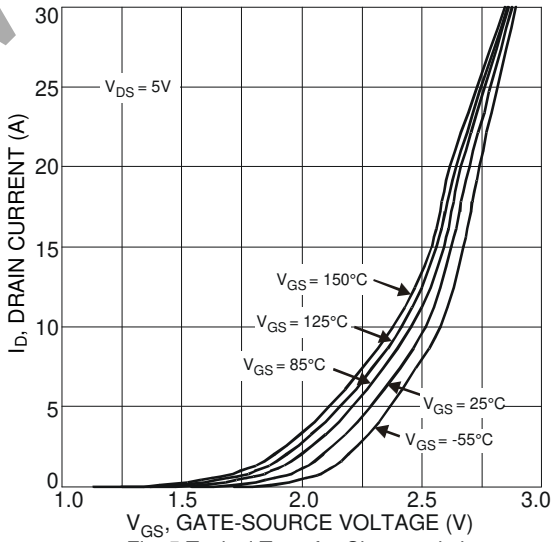

Fig. 5 Typical Transfer Characteristic

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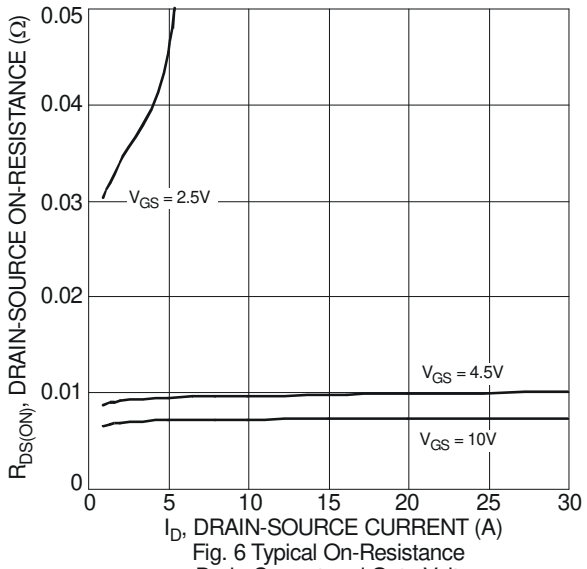

Fig. 6 Typical On-Resistance
vs. Drain Current and Gate Voltage

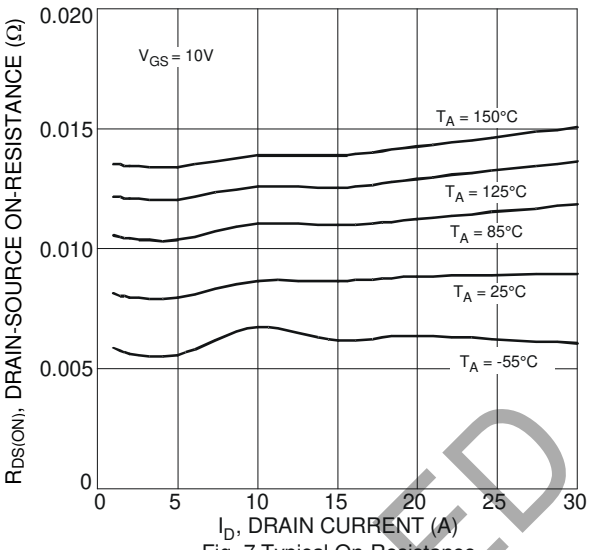

Fig. 7 Typical On-Resistance
vs. Drain Current and Temperature

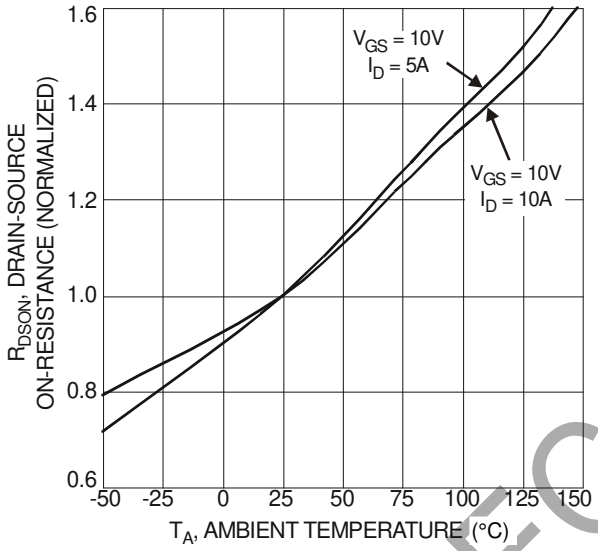

Fig. 8 On-Resistance Variation with Temperature

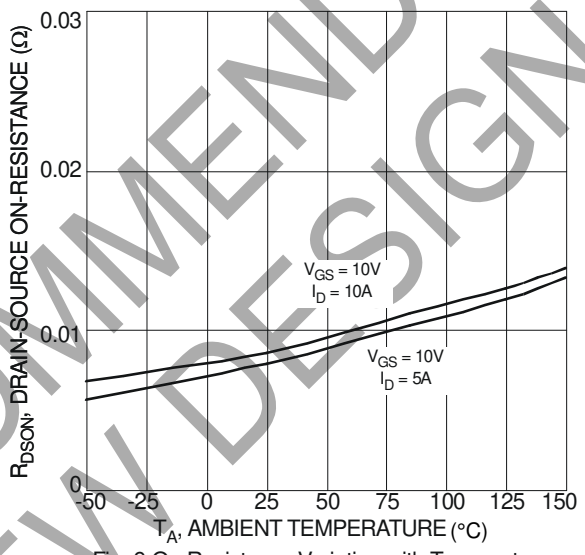

Fig. 9 On-Resistance Variation with Temperature

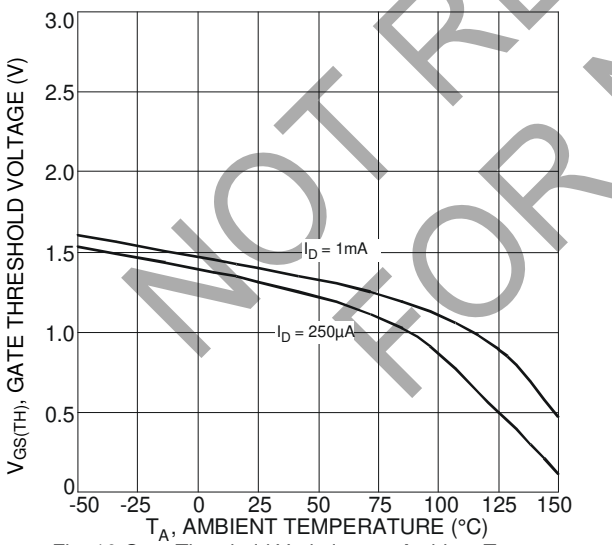

Fig. 10 Gate Threshold Variation vs. Ambient Temperature

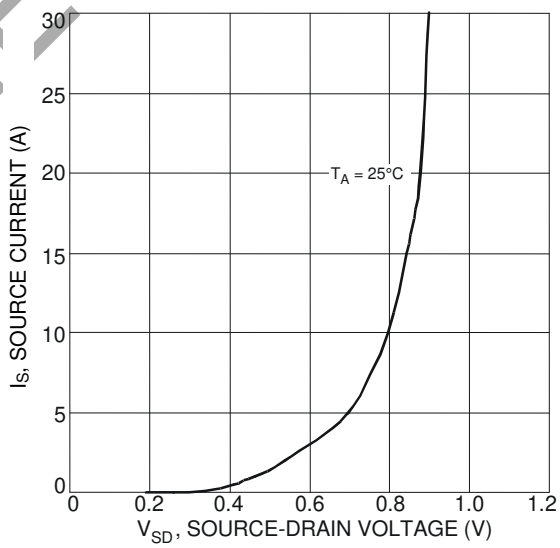

Fig. 11 Diode Forward Voltage vs. Current

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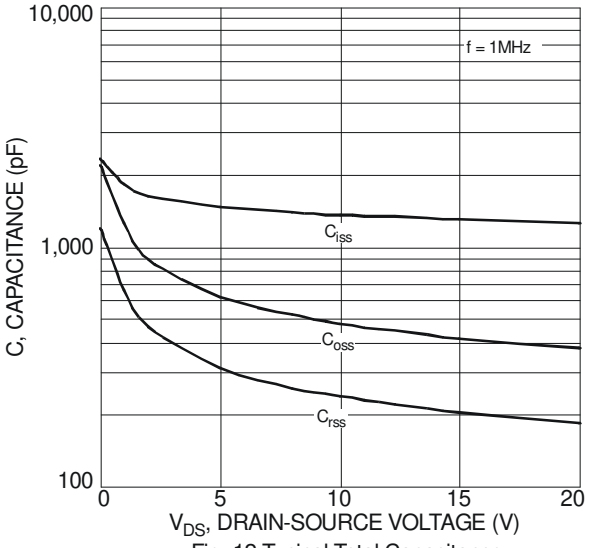

Fig. 12 Typical Total Capacitance

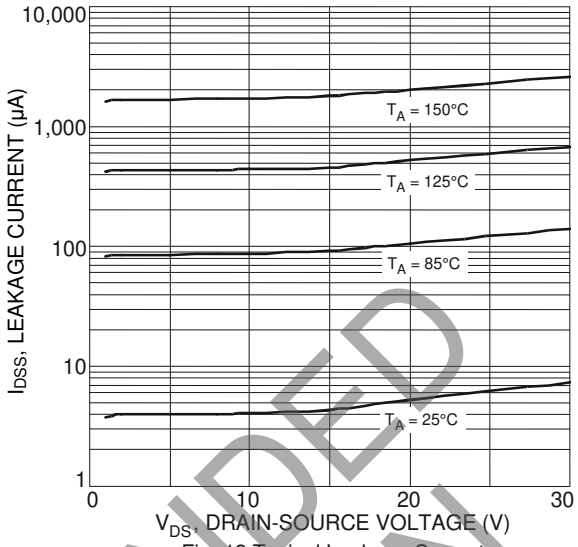

Fig. 13 Typical Leakage Current vs. Drain-Source Voltage

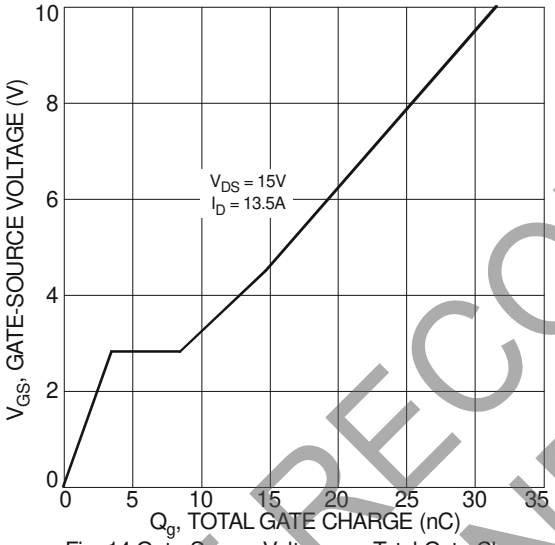

Fig. 14 Gate-Source Voltage vs. Total Gate Charge

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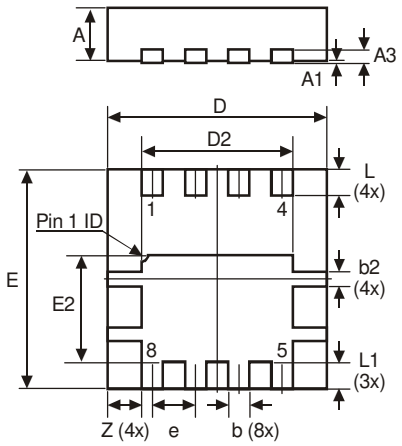
Package Outline Dimensions

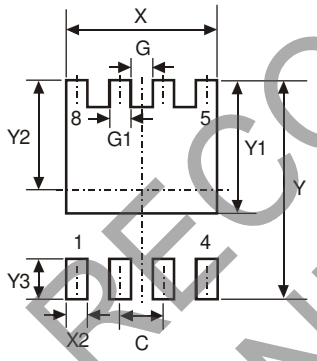
Please see http://www.diodes.com/package-outlines.html for the latest version.



PowerDI3333-8			
Dim	Min	Max	Typ
D	3.25	3.35	3.30
E	3.25	3.35	3.30
D2	2.22	2.32	2.27
E2	1.56	1.66	1.61
A	0.75	0.85	0.80
A1	0	0.05	0.02
A3	–	–	0.203
b	0.27	0.37	0.32
b2	–	–	0.20
L	0.35	0.45	0.40
L1	–	–	0.39
e	–	–	0.65
Z			0.515
All Dimensions in mm			

Suggested Pad Layout

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



Dimensions	Value (in mm)
C	0.650
G	0.230
G1	0.420
Y	3.700
Y1	2.250
Y2	1.850
Y3	0.700
X	2.370
X2	0.420

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