N-CHANNEL ENHANCEMENT MODE MOSFET WITH SCHOTTKY DIODE
POWERDI®

Product Summary

$V_{(BR)DSS}$	$R_{DS(on)\ max}$	I_D $T_A = 25°C$
30V	13mΩ @ V_{GS} = 10V	10.2A
	16mΩ @ V_{GS} = 4.5V	9.3A

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

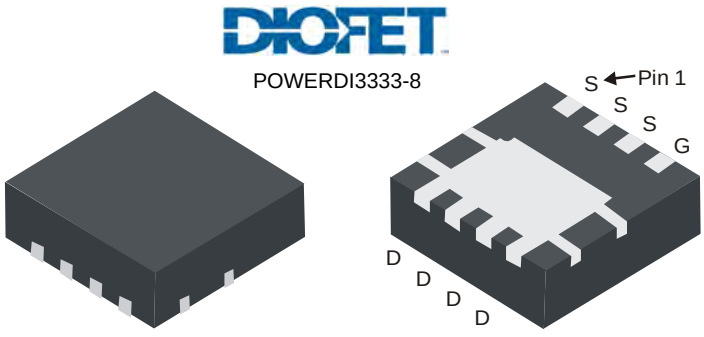
- DC-DC Converters
- Power management functions
- Analog Switch

Features and Benefits

- 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
  - Avalanche rugged – I_{AR} and E_{AR} rated
- 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
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

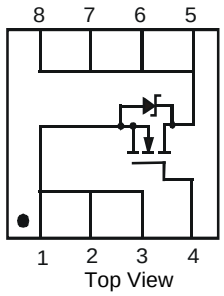
Mechanical Data

- 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: See Diagram
- Terminals: Finish — Matte Tin annealed over Copper leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.072 grams (approximate)

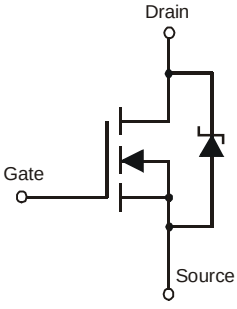


Top View

Bottom View



Top View
Pin Configuration



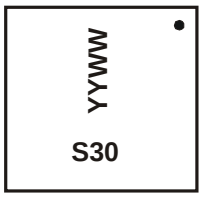
Internal Schematic

Ordering Information (Note 4)

Part Number	Case	Packaging
DMS3016SFG-7	POWERDI3333-8	2,000/Tape & Reel
DMS3016SFG-13	POWERDI3333-8	3,000/Tape & Reel

Notes:
1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. All applicable RoHS exemptions applied.
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.

Marking Information



S30 = Product Type Marking Code
YYWW = Date Code Marking
YY = Last digit of year (ex: 09 = 2009)
WW = Week code (01 ~ 53)

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

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V_{DSS}	30	V
Gate-Source Voltage			V_{GSS}	±12	V
Continuous Drain Current (Note 5) V_{GS} = 10V	Steady State	T_A = +25°C T_A = +70°C	I_D	7.0 5.5	A
Continuous Drain Current (Note 5) V_{GS} = 4.5V	Steady State	T_A = +25°C T_A = +70°C	I_D	6.4 5.1	A
Continuous Drain Current (Note 6) V_{GS} = 10V	Steady State	T_A = +25°C T_A = +70°C	I_D	10.2 8.1	A
Continuous Drain Current (Note 6) V_{GS} = 4.5V	Steady State	T_A = +25°C T_A = +70°C	I_D	9.3 7.4	A
Pulsed Drain Current (10us pulse, duty cycle=1%)			I_{DM}	80	A
Avalanche Current (Note 7)			I_{AR}	13	A
Repetitive Avalanche Energy (Note 7) L = 0.3mH			E_{AR}	24	mJ

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

Characteristic		Symbol	Value	Units
Total Power Dissipation	(Note 5) (Note 6)	P_D	0.98 2.08	W
Thermal Resistance, Junction to Ambient	(Note 5) (Note 6)	$R_{\theta JA}$	127 60	°C/W
Thermal Resistance, Junction to Case	(Note 6)	$R_{\theta JC}$	3.42	°C/W
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 vias to bottom layer 1inch square copper plate
7 .I_{AR} and E_{AR} rating are based on low frequency and duty cycles to keep T_J = +25°C

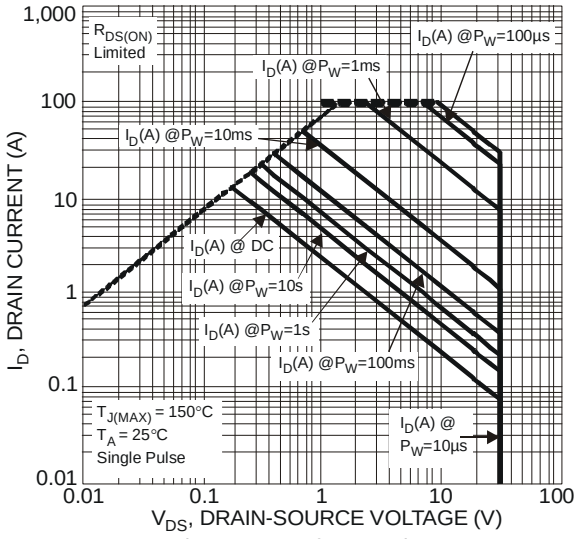


Fig. 1 SOA, Safe Operation Area

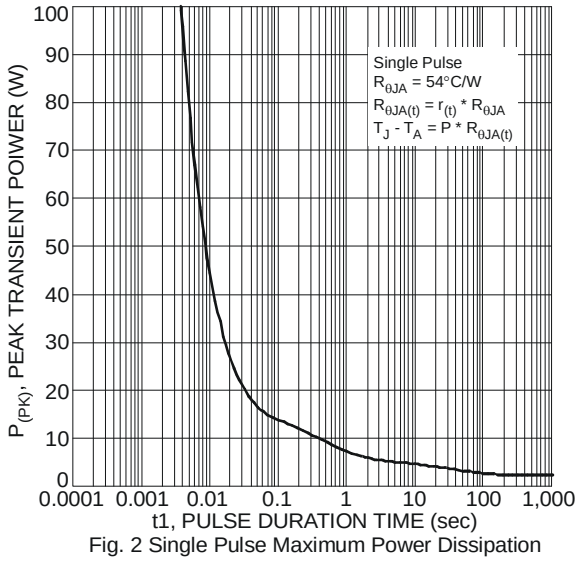


Fig. 2 Single Pulse Maximum Power Dissipation

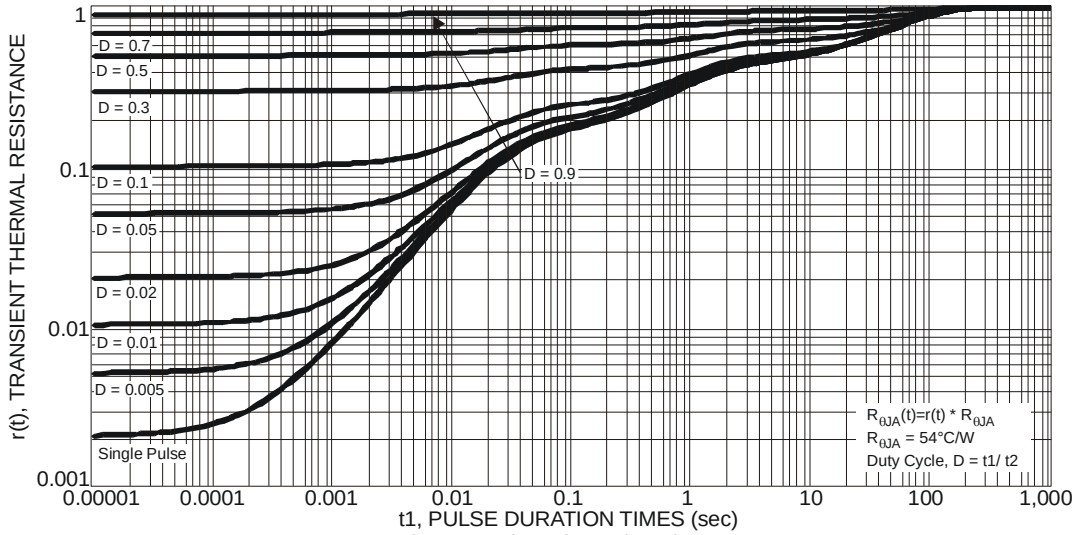


Fig. 3 Transient Thermal Resistance

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 = 1mA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	100	μA	V_{DS} = 30V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±12V, V_{DS} = 0V
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	$V_{GS(th)}$	1.0	—	2.2	V	V_{DS} = V_{GS}, I_D = 250μA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	10	13	mΩ	V_{GS} = 10V, I_D = 11.2A
		—	12	16		V_{GS} = 4.5V, I_D = 10.A
Forward Transfer Admittance	$\|Y_{fs}\|$	—	25	—	S	V_{DS} = 5V, I_D = 11.2A
Diode Forward Voltage	V_{SD}	—	0.37	0.6	V	V_{GS} = 0V, I_S = 1A
Maximum Body-Diode + Schottky Continuous Current	I_S	—	—	5	A	
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C_{iss}	—	1886	—	pF	V_{DS} = 15V, V_{GS} = 0V f = 1.0MHz
Output Capacitance	C_{oss}	—	372	—		
Reverse Transfer Capacitance	C_{rss}	—	128	—		
Gate Resistance	R_G	—	2.0	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1.0MHz
Total Gate Charge (V_{GS} = 4.5V)	Q_g	—	19.5	—	nC	V_{DS} = 15V, V_{GS} = 10V I_D = 11.2A
Total Gate Charge (V_{GS} = 10V)	Q_g	—	44.6	—		
Gate-Source Charge	Q_{gs}	—	4.8	—		
Gate-Drain Charge	Q_{gd}	—	4.6	—		
Turn-On Delay Time	$t_{D(on)}$	—	5.8	—	ns	V_{GS} = 10V, V_{DD} = 15V, R_G = 3Ω, R_L = 1.2Ω
Turn-On Rise Time	t_r	—	23.7	—		
Turn-Off Delay Time	$t_{D(off)}$	—	35.4	—		
Turn-Off Fall Time	t_f	—	7.7	—		

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

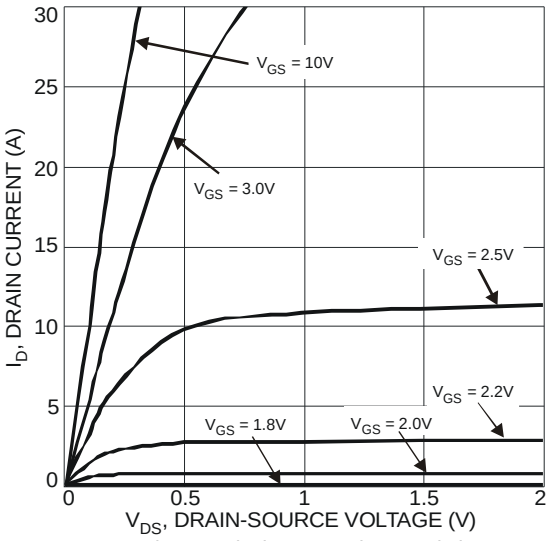


Fig. 4 Typical Output Characteristics

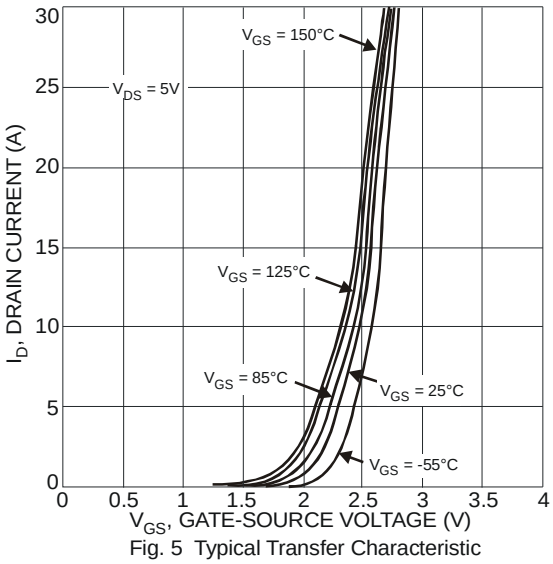


Fig. 5 Typical Transfer Characteristic

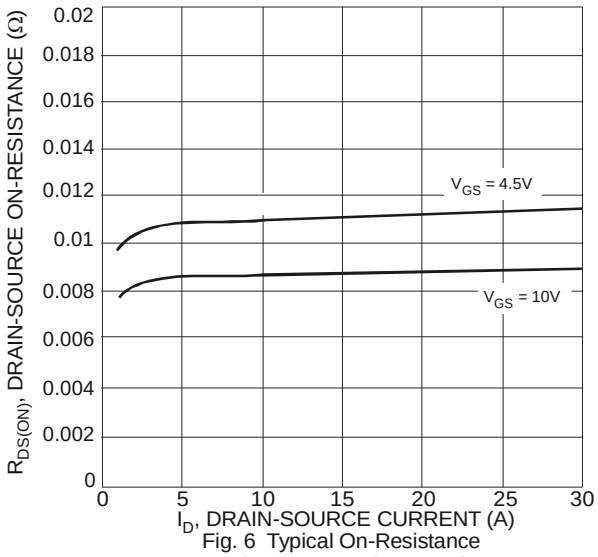


Fig. 6 Typical On-Resistance
vs. Drain Current and Gate Voltage

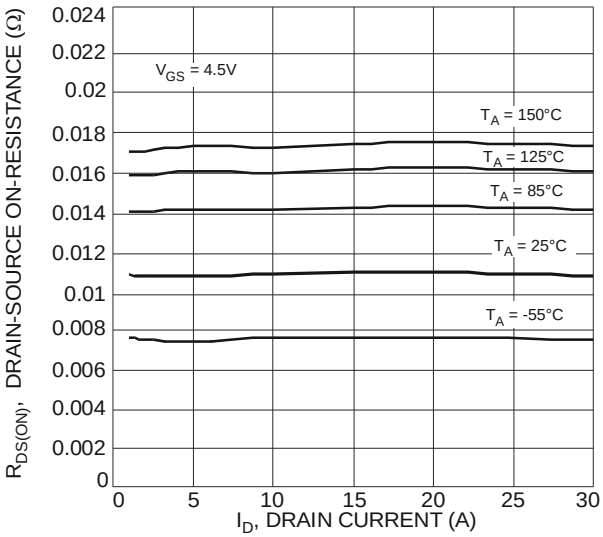


Fig. 7 Typical On-Resistance
vs. Drain Current and Temperature

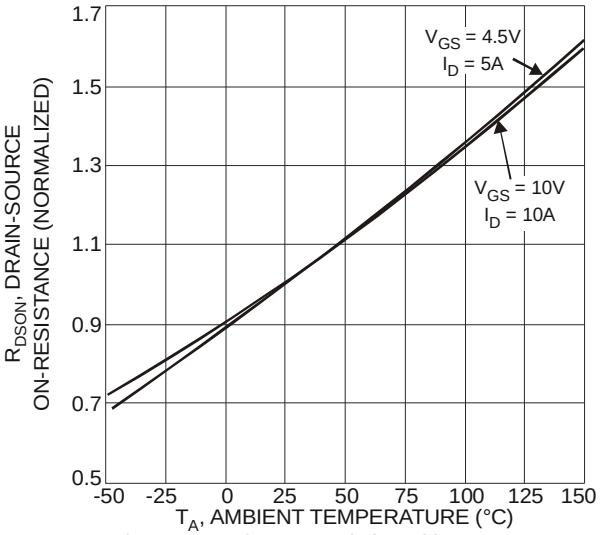


Fig. 8 On-Resistance Variation with Temperature

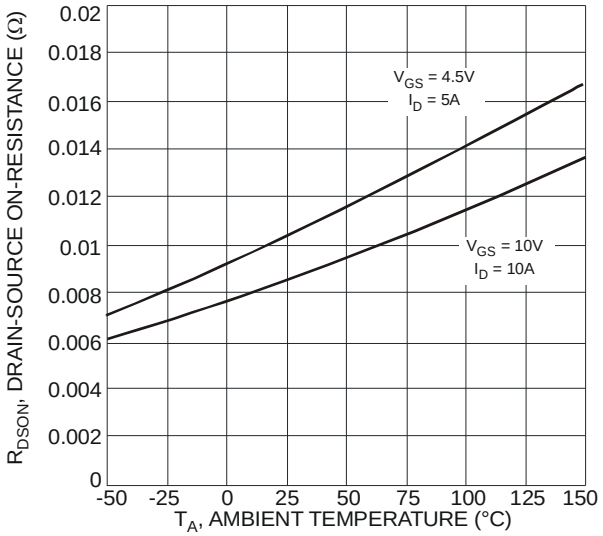


Fig. 9 On-Resistance Variation with Temperature

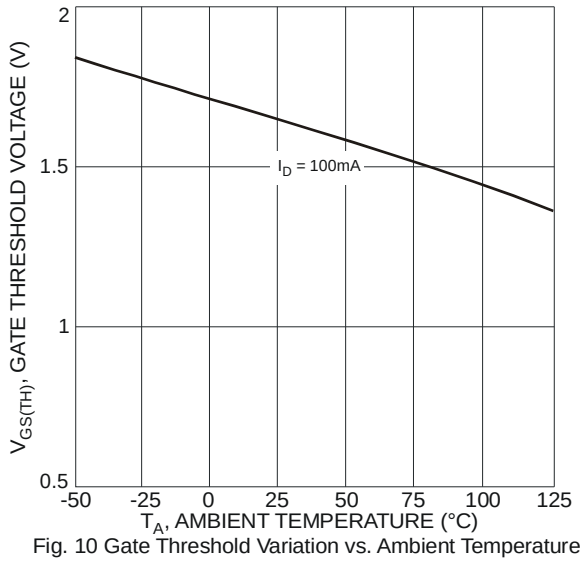


Fig. 10 Gate Threshold Variation vs. Ambient Temperature

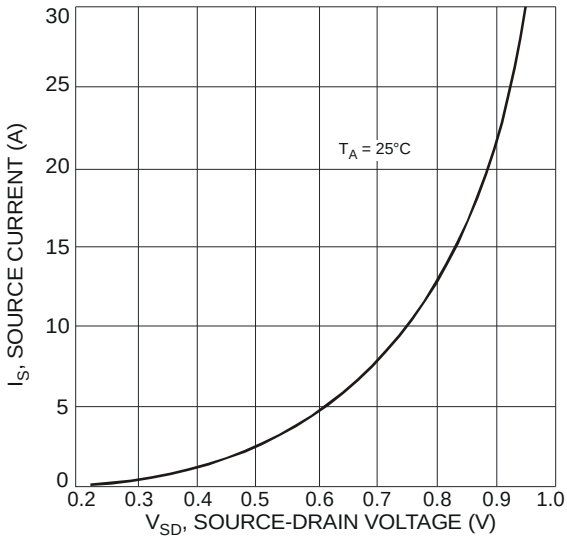


Fig. 11 Diode Forward Voltage vs. Current

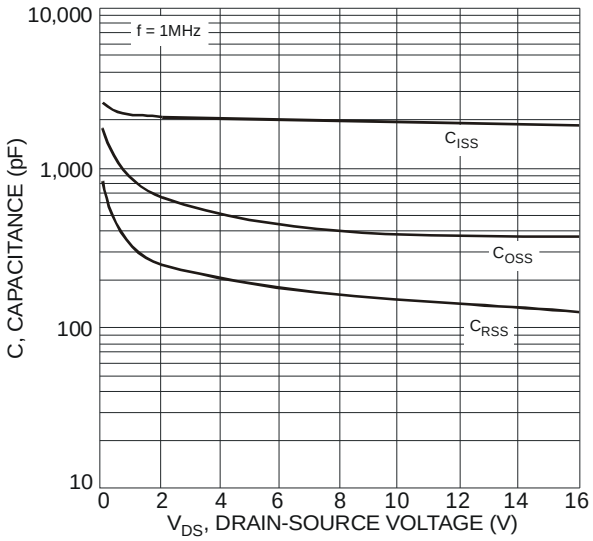


Fig. 12 Typical Total Capacitance

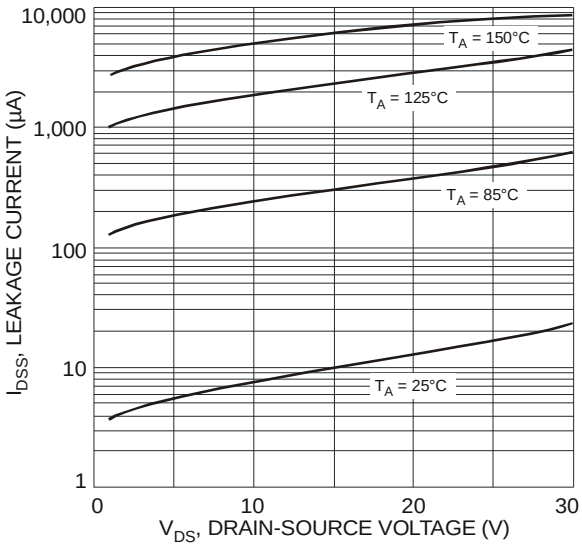


Fig. 13 Typical Drain-Source Leakage Current vs. Voltage

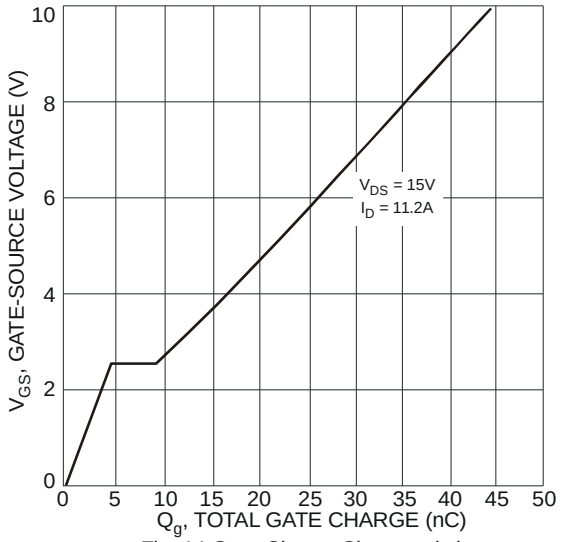
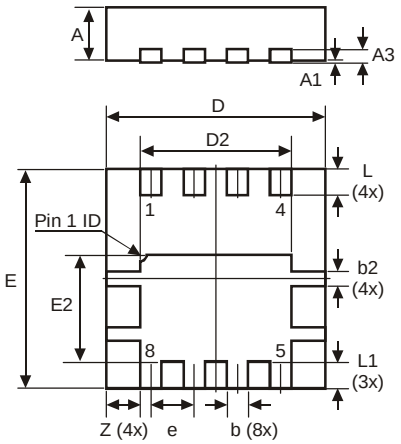


Fig. 14 Gate-Charge Characteristics

Package Outline Dimensions

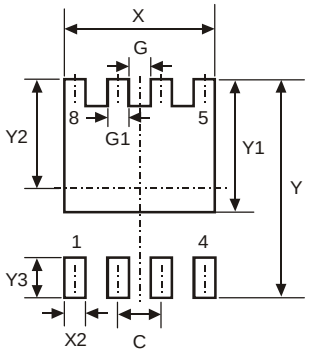
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.



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 AP02001 at http://www.diodes.com/datasheets/ap02001.pdf 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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