

**30V N-CHANNEL ENHANCEMENT MODE MOSFET WITH SCHOTTKY DIODE
POWERDI[®]**
Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)}$	Package	I_D $T_A = +25^\circ C$
30V	10m Ω @ $V_{GS} = 10V$	POWERDI 3333-8	12A
	15m Ω @ $V_{GS} = 4.5V$		9.5A

Description

This MOSFET is designed to minimize on-state resistance ($R_{DS(on)}$) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

Applications

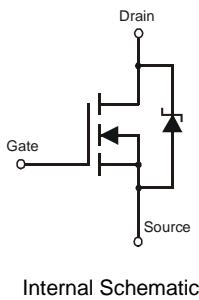
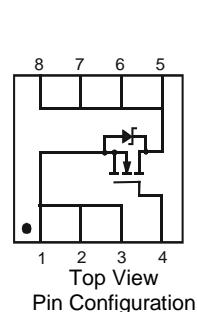
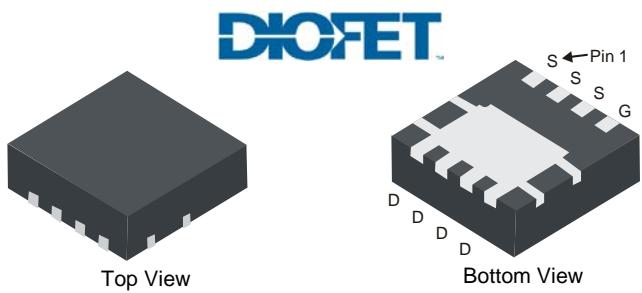
- Backlighting
- Power Management Functions
- DC-DC Converters

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
- 100% UIS (Avalanche) rated
- 100% 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: 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)

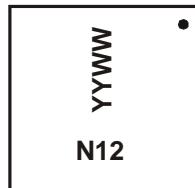

Ordering Information (Note 4)

Part Number	Case	Packaging
DMS3012SFG-7	POWERDI3333-8	2000/Tape & Reel
DMS3012SFG-13	POWERDI3333-8	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



N12 = Product Type Marking Code
 YYWW = Date Code Marking
 YY = Last digit of year (ex: 11 = 2011)
 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}	30	V
Gate-Source Voltage			V_{GSS}	± 20	V
Continuous Drain Current (Note 6) $V_{GS} = 10\text{V}$	Steady State	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	I_D	12 9.5	A
	$t < 10\text{s}$	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	I_D	16.0 12.7	A
Continuous Drain Current (Note 6) $V_{GS} = 4.5\text{V}$	Steady State	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	I_D	9.5 7.5	A
	$t < 10\text{s}$	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	I_D	13.0 10.3	A
Pulsed Drain Current (10 μs 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) $L = 0.1\text{mH}$			I_{AS}	17	A
Avalanche Energy (Note 7) $L = 0.1\text{mH}$			E_{AS}	43	mJ

Thermal Characteristics

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

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_{AS} and E_{AS} rating are based on low frequency and duty cycles to keep $T_J = +25^\circ\text{C}$.

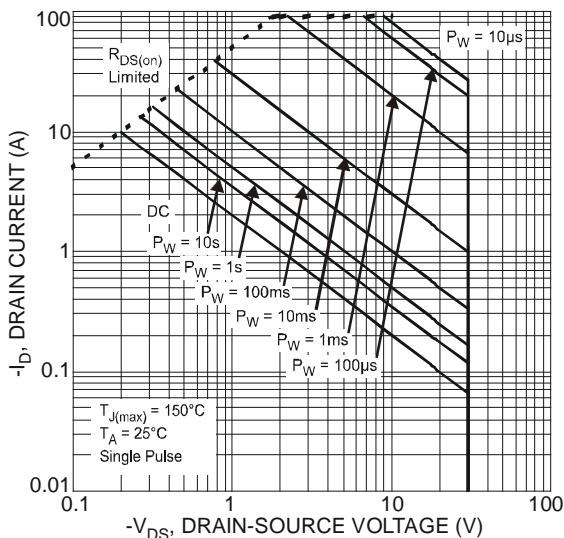


Fig. 1 SOA, Safe Operation Area

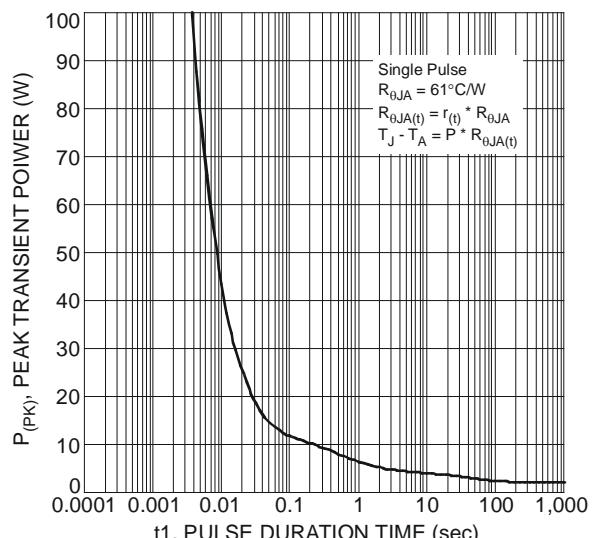


Fig. 2 Single Pulse Maximum Power Dissipation

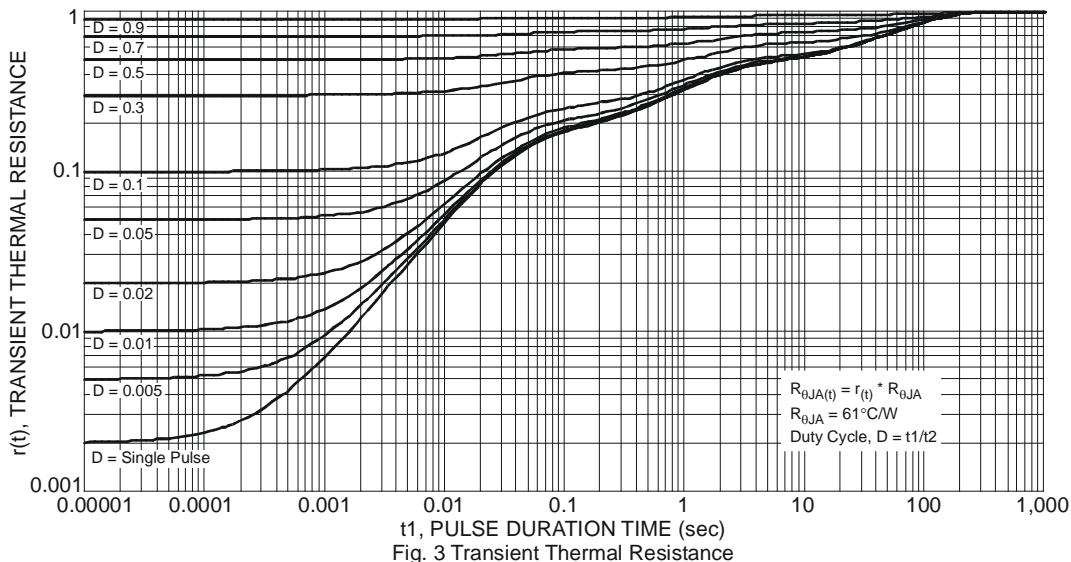


Fig. 3 Transient Thermal Resistance

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}	30	—	—	V	$\text{V}_{\text{GS}} = 0\text{V}$, $\text{I}_D = 250\mu\text{A}$
Zero Gate Voltage Drain Current	I_{DSS}	—	—	100	μA	$\text{V}_{\text{DS}} = 30\text{V}$, $\text{V}_{\text{GS}} = 0\text{V}$
Gate-Source Leakage	I_{GSS}	—	—	± 100	nA	$\text{V}_{\text{GS}} = \pm 20\text{V}$, $\text{V}_{\text{DS}} = 0\text{V}$
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	$\text{V}_{\text{GS(th)}}$	1.0	1.5	2.5	V	$\text{V}_{\text{DS}} = \text{V}_{\text{GS}}$, $\text{I}_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$\text{R}_{\text{DS (ON)}}$	—	7.3	10	$\text{m}\Omega$	$\text{V}_{\text{GS}} = 10\text{V}$, $\text{I}_D = 13.5\text{A}$
—	—	—	10	15	$\text{m}\Omega$	$\text{V}_{\text{GS}} = 4.5\text{V}$, $\text{I}_D = 11\text{A}$
Forward Transfer Admittance	$ \text{Y}_{\text{fs}} $	—	30	—	S	$\text{V}_{\text{DS}} = 5\text{V}$, $\text{I}_D = 10.0\text{A}$
Diode Forward Voltage	V_{SD}	—	0.45	0.55	V	$\text{V}_{\text{GS}} = 0\text{V}$, $\text{I}_S = 1\text{A}$
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C_{iss}	—	1296	4310	pF	$\text{V}_{\text{DS}} = 15\text{V}$, $\text{V}_{\text{GS}} = 0\text{V}$, $f = 1.0\text{MHz}$
Output Capacitance	C_{oss}	—	415	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	204	—	pF	
Gate Resistance	R_{g}	0.26	1.6	2.6	Ω	$\text{V}_{\text{DS}} = 0\text{V}$, $\text{V}_{\text{GS}} = 0\text{V}$, $f = 1\text{MHz}$
Total Gate Charge $\text{V}_{\text{GS}} = 4.5\text{V}$	Q_{g}	—	14.7	—	nC	$\text{V}_{\text{DS}} = 15\text{V}$, $\text{V}_{\text{GS}} = 10\text{V}$, $\text{I}_D = 13.5\text{A}$
Total Gate Charge $\text{V}_{\text{GS}} = 10\text{V}$	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	$\text{t}_{\text{D(on)}}$	—	15.8	—	ns	$\text{V}_{\text{GS}} = 10\text{V}$, $\text{V}_{\text{DS}} = 15\text{V}$, $\text{R}_{\text{g}} = 3\Omega$, $\text{I}_D = 8.8\text{A}$
Turn-On Rise Time	t_{r}	—	27.8	—	ns	
Turn-Off Delay Time	$\text{t}_{\text{D(off)}}$	—	29.7	—	ns	
Turn-Off Fall Time	t_{f}	—	13.6	—	ns	
Reverse Recovery Time	t_{rr}	—	13.1	—	ns	$\text{I}_F = 13.5\text{A}$, $\text{di/dt} = 100\text{A}/\mu\text{s}$
Reverse Recovery Charge	Q_{rr}	—	4.3	—	nC	$\text{I}_F = 13.5\text{A}$, $\text{di/dt} = 100\text{A}/\mu\text{s}$

Notes: 8. Short duration pulse test used to minimize self-heating effect.

9. Guaranteed by design. Not subject to product testing.

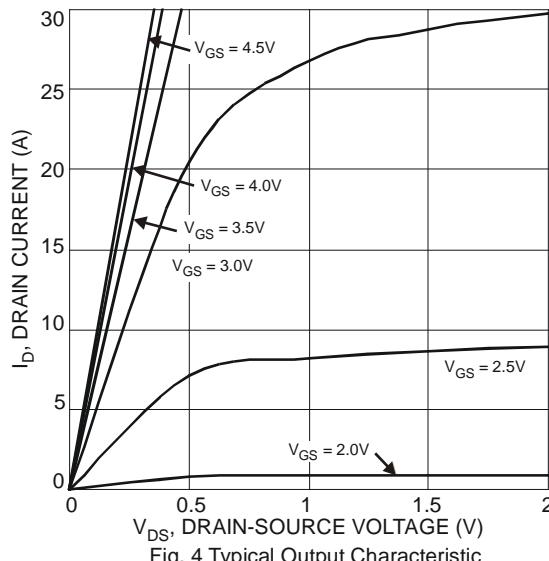


Fig. 4 Typical Output Characteristic

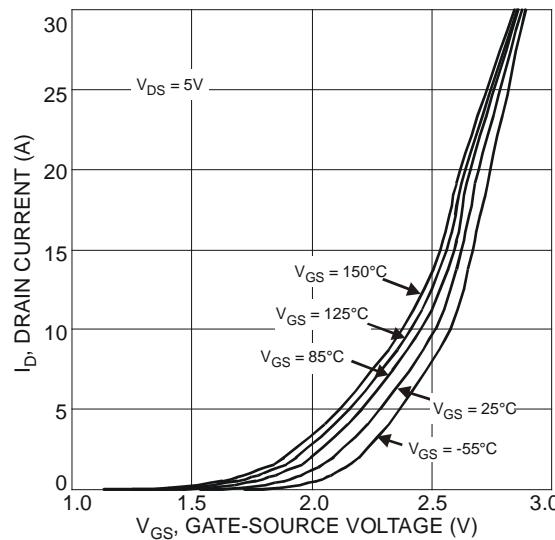


Fig. 5 Typical Transfer Characteristic

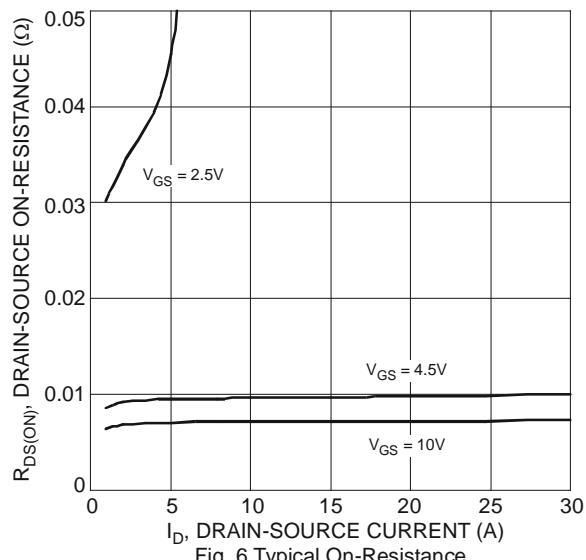


Fig. 6 Typical On-Resistance
vs. Drain Current and Gate Voltage

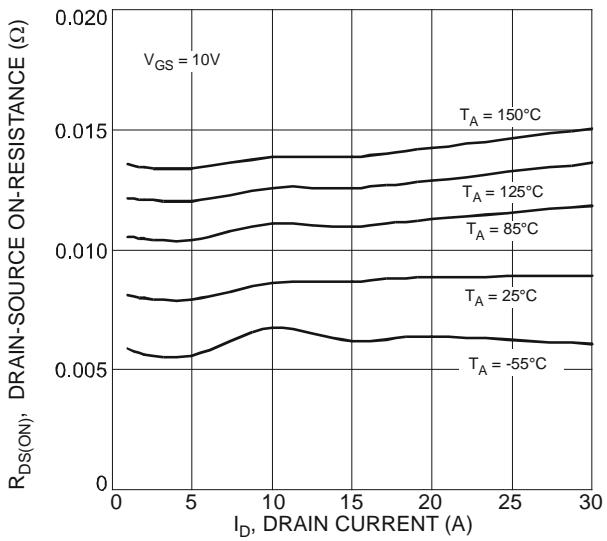


Fig. 7 Typical On-Resistance
vs. Drain Current and Temperature

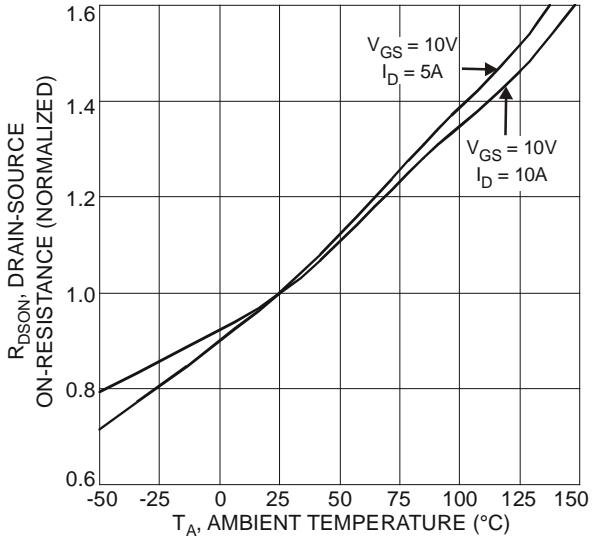


Fig. 8 On-Resistance Variation with Temperature

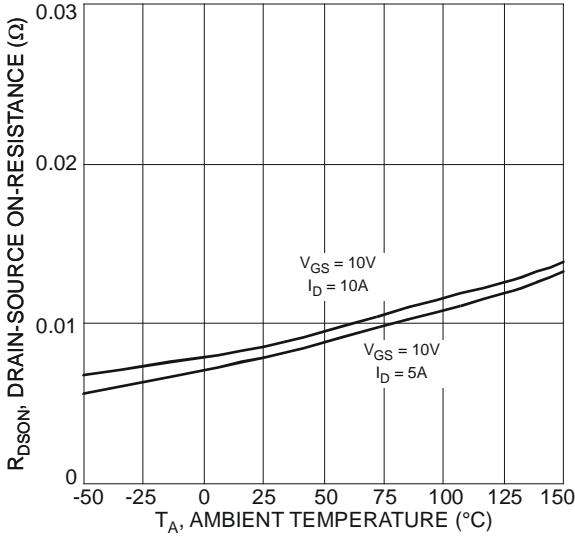


Fig. 9 On-Resistance Variation with Temperature

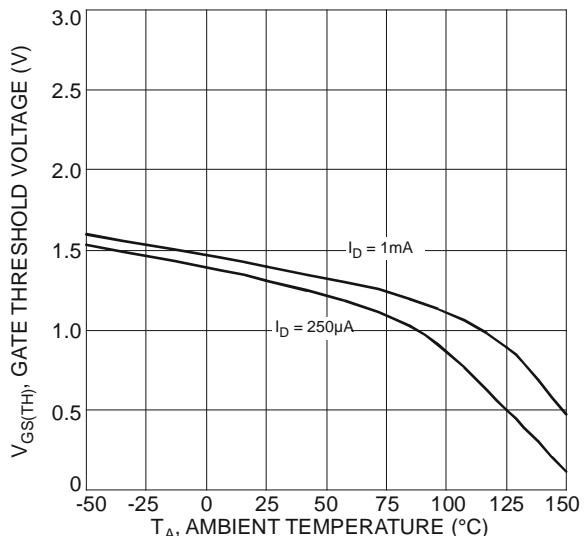


Fig. 10 Gate Threshold Variation vs. Ambient Temperature

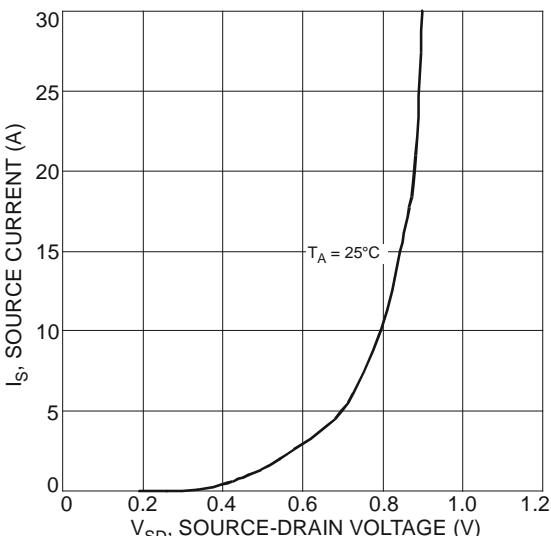


Fig. 11 Diode Forward Voltage vs. Current

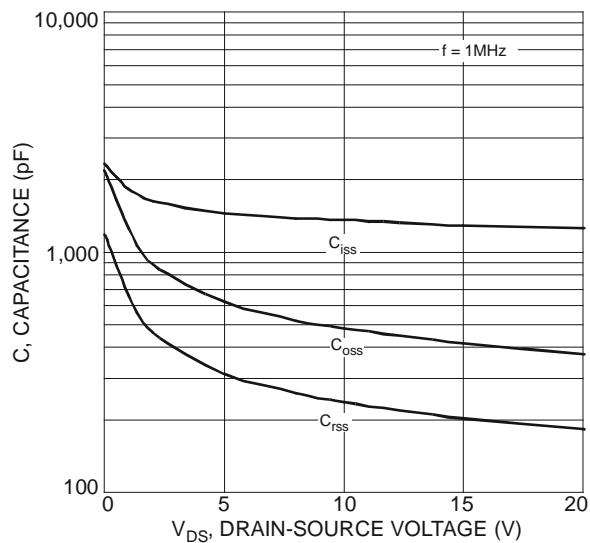


Fig. 12 Typical Total Capacitance

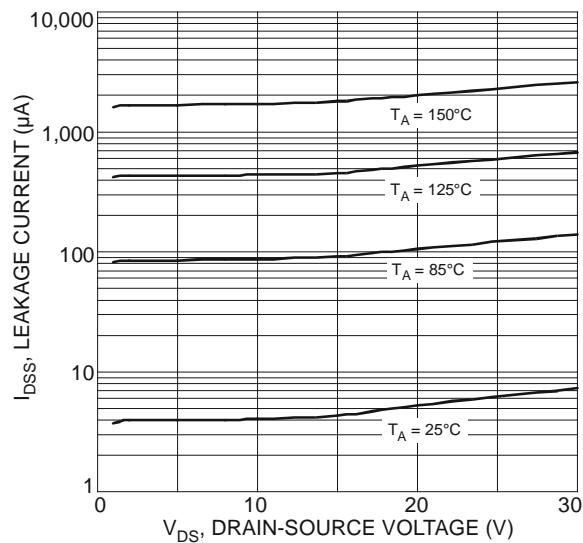


Fig. 13 Typical Leakage Current vs. Drain-Source Voltage

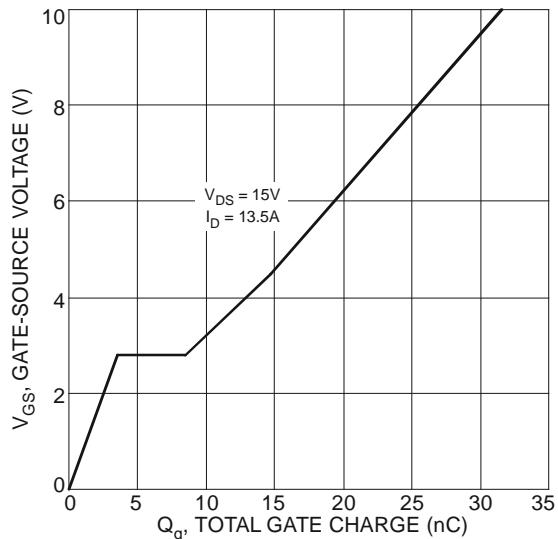
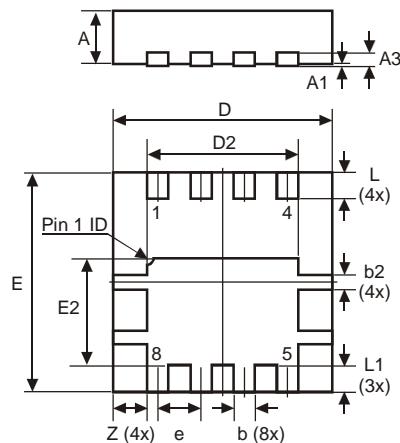


Fig. 14 Gate-Source Voltage vs. Total Gate Charge

Package Outline Dimensions

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

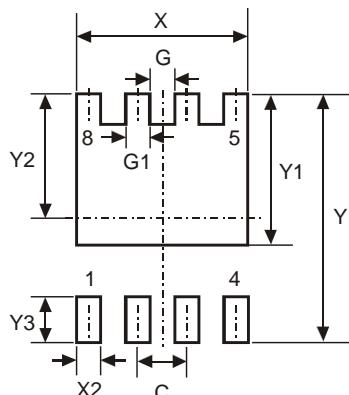


POWERDI3333-8			
Dim	Min	Max	Typ
D	3.25	3.35	3.30
E	3.25	3.35	3.30
D2	2.22	2.32	2.27
E2	1.56	1.66	1.61
A	0.75	0.85	0.80
A1	0	0.05	0.02
A3	—	—	0.203
b	0.27	0.37	0.32
b2	—	—	0.20
L	0.35	0.45	0.40
L1	—	—	0.39
e	—	—	0.65
Z	—	—	0.515

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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