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ON Semiconductor®

FDMS2D4N03S

N-Channel PowerTrench® SyncFET™
30 V, 163 A, 1.8 mΩ

Features

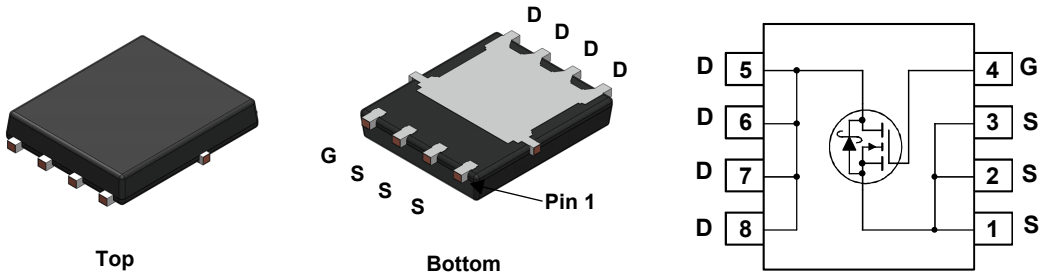
- Max $r_{DS(on)}$ = 1.8 mΩ at V_{GS} = 10 V, I_D = 28 A
- Max $r_{DS(on)}$ = 2.34 mΩ at V_{GS} = 4.5 V, I_D = 26 A
- High Performance Technology for Extremely Low $r_{DS(on)}$
- SyncFET™ Schottky Body Diode
- 100% UIL Tested
- RoHS Compliant

General Description

The FDMS2D4N03S has been designed to minimize losses in power conversion application. Advancements in both silicon and package technologies have been combined to offer the lowest $r_{DS(on)}$ while maintaining excellent switching performance. This device has the added benefit of an efficient monolithic schottky body diode.

Applications

- Synchronous Rectifier for DC/DC Converters
- Notebook Vcore/ GPU Low Side Switch
- Networking Point of Load Low Side Switch
- Telecom Secondary Side Rectification



Top Bottom

Power 56

MOSFET Maximum Ratings T_A = 25 °C unless otherwise noted.

Symbol	Parameter			Ratings	Units
V_{DS}	Drain to Source Voltage			30	V
V_{GS}	Gate to Source Voltage			±16	V
I_D	Drain Current -Continuous	T_C = 25 °C	(Note 5)	163	A
	-Continuous	T_C = 100 °C	(Note 5)	103	
	-Continuous	T_A = 25 °C	(Note 1a)	28	
	-Pulsed		(Note 4)	694	
E_{AS}	Single Pulse Avalanche Energy		(Note 3)	175	mJ
P_D	Power Dissipation	T_C = 25 °C		74	W
	Power Dissipation	T_A = 25 °C	(Note 1a)	2.5	
T_J, T_{STG}	Operating and Storage Junction Temperature Range			-55 to +150	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	1.7	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	50	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMS2D4N03S	FDMS2D4N03S	Power 56	13 ”	12 mm	3000 units

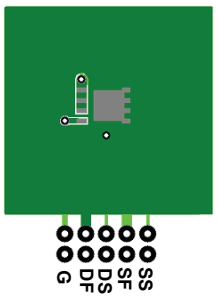
Semiconductor Components Industries, LLC, 2017
Jul, 2017, Rev. 1.1

Publication Order Number:
FDMS2D4N03S

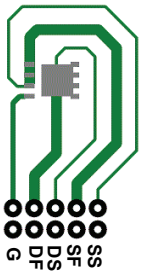
Electrical Characteristics T_J = 25 °C unless otherwise noted.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 1 mA, V_{GS} = 0 V	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 10 mA, referenced to 25 °C		18		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 24 V, V_{GS} = 0 V			500	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±16 V, V_{DS} = 0 V			±100	nA
On Characteristics						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 1 mA	1.0	1.6	3.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 10 mA, referenced to 25 °C		-4		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 28 A		1.4	1.8	mΩ
		V_{GS} = 4.5 V, I_D = 26 A		1.7	2.34	
		V_{GS} = 10 V, I_D = 28 A, T_J = 125 °C		2.0	2.8	
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 28 A		200		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 15 V, V_{GS} = 0 V, f = 1 MHz		4670	6540	pF
C_{oss}	Output Capacitance			1395	1955	pF
C_{rss}	Reverse Transfer Capacitance			63	120	pF
R_g	Gate Resistance		0.1	0.5	1.5	Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 15 V, I_D = 28 A, V_{GS} = 10 V, R_{GEN} = 6 Ω		15	28	ns
t_r	Rise Time			4	10	ns
$t_{d(off)}$	Turn-Off Delay Time			38	61	ns
t_f	Fall Time			3	10	ns
Q_g	Total Gate Charge	V_{GS} = 0 V to 10 V; V_{DD} = 15 V, I_D = 28 A		63	88	nC
Q_g	Total Gate Charge	V_{GS} = 0 V to 4.5 V; V_{DD} = 15 V, I_D = 28 A		28	40	nC
Q_{gs}	Gate to Source Charge	V_{DD} = 15 V, I_D = 28 A		9.8		nC
Q_{gd}	Gate to Drain “Miller” Charge	V_{DD} = 15 V, I_D = 28 A		4.9		nC
Drain-Source Diode Characteristics						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 2.1 A (Note 2)		0.65	1.2	V
		V_{GS} = 0 V, I_S = 28 A (Note 2)		0.78	1.3	
t_{rr}	Reverse Recovery Time	I_F = 28 A, di/dt = 300 A/μs		37	59	ns
Q_{rr}	Reverse Recovery Charge			51	81	nC

Notes:
1. $R_{\theta JA}$ is determined with the device mounted on a 1 in^2 pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. $R_{\theta CA}$ is determined by the user's board design.



50 °C/W when mounted on a 1 in^2 pad of 2 oz copper



125 °C/W when mounted on a minimum pad of 2 oz copper.

2. Pulse Test: Pulse Width < 300 μs, Duty cycle < 2.0%.
3. E_{AS} of 175 mJ is based on starting T_J = 25 °C; N-ch: L = 3 mH, I_{AS} = 10.8 A, V_{DD} = 30 V, V_{GS} =10 V. 100% test at L = 0.1 mH, I_{AS} = 33 A.
4. Pulsed Id please refer to Fig 11 SOA graph for more details.
5. Computed continuous current limited to Max Junction Temperature only, actual continuous current will be limited by thermal & electro-mechanical application board design.

Typical Characteristics T_J = 25 °C unless otherwise noted.

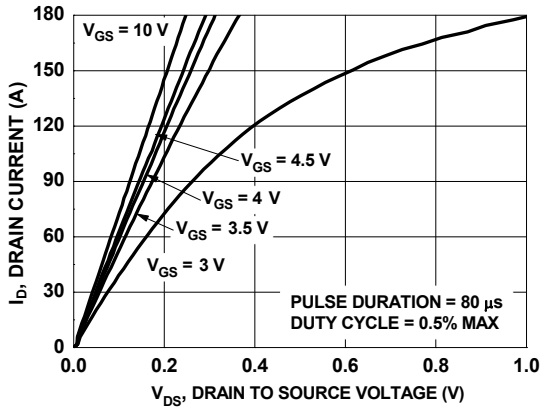


Figure 1. On Region Characteristics

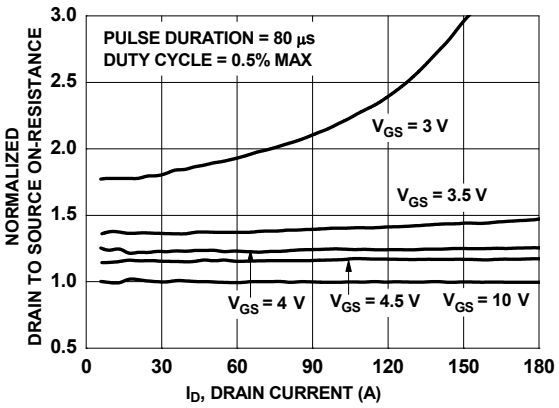


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

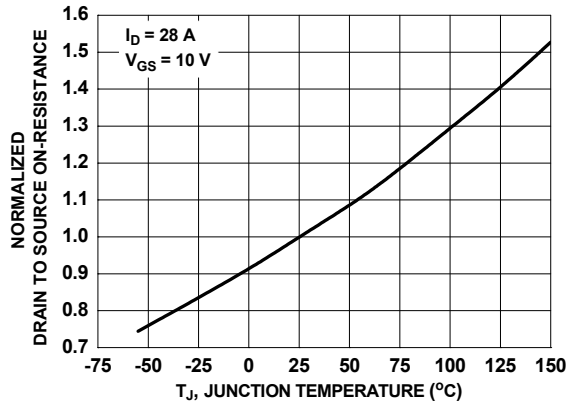


Figure 3. Normalized On Resistance vs. Junction Temperature

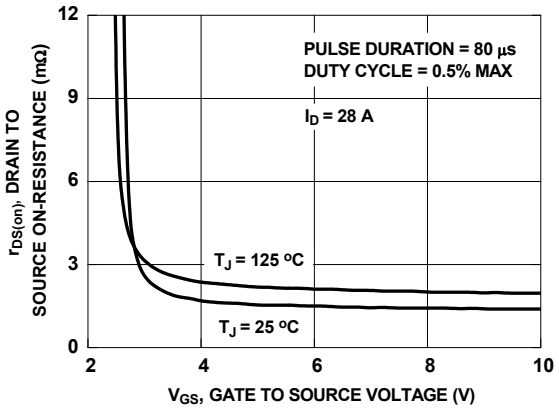


Figure 4. On-Resistance vs. Gate to Source Voltage

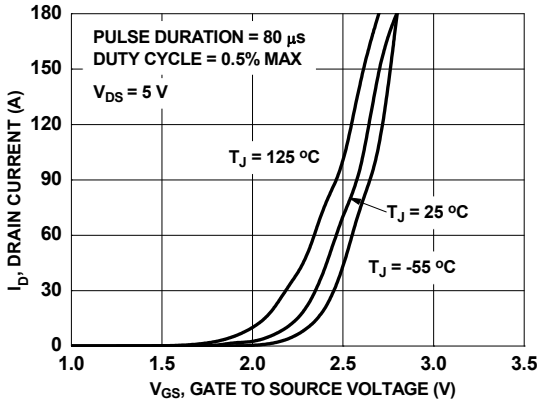


Figure 5. Transfer Characteristics

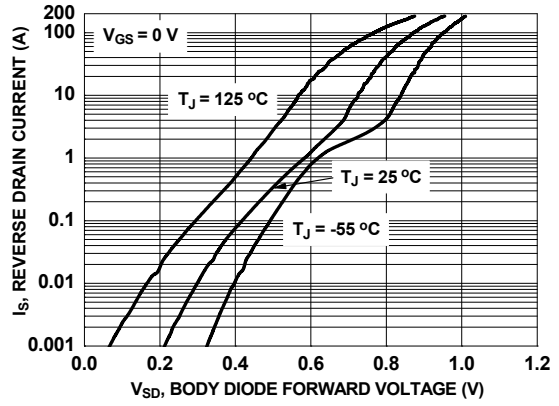


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

Typical Characteristics T_J = 25 °C unless otherwise noted.

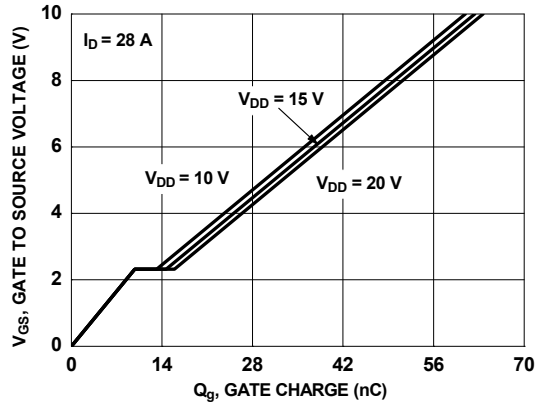


Figure 7. Gate Charge Characteristics

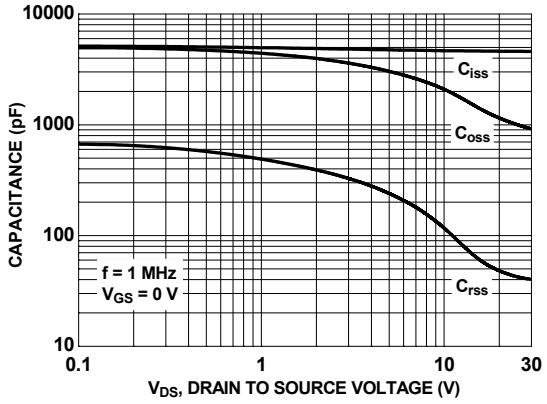


Figure 8. Capacitance vs. Drain to Source Voltage

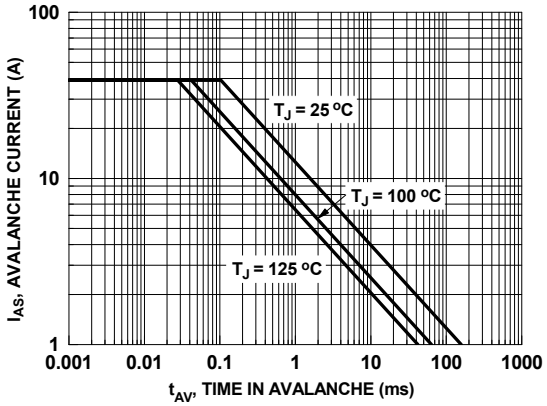


Figure 9. Unclamped Inductive Switching Capability

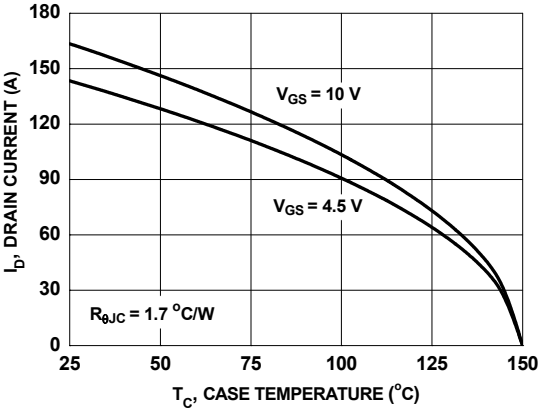


Figure 10. Maximum Continuous Drain Current vs Case Temperature

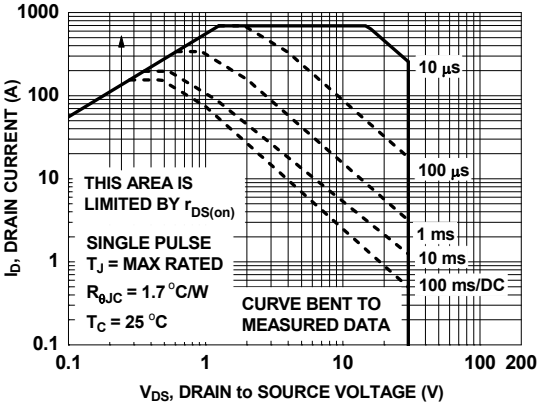


Figure 11. Forward Bias Safe Operating Area

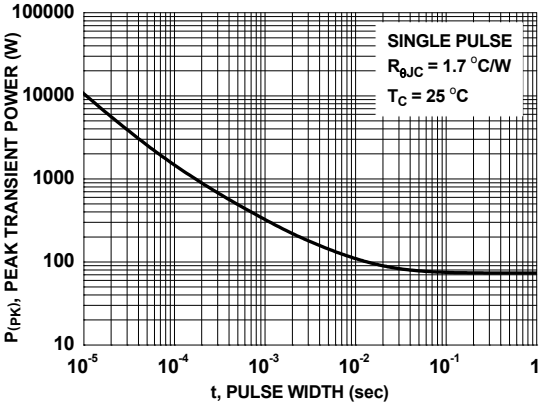


Figure 12. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25 °C unless otherwise noted.

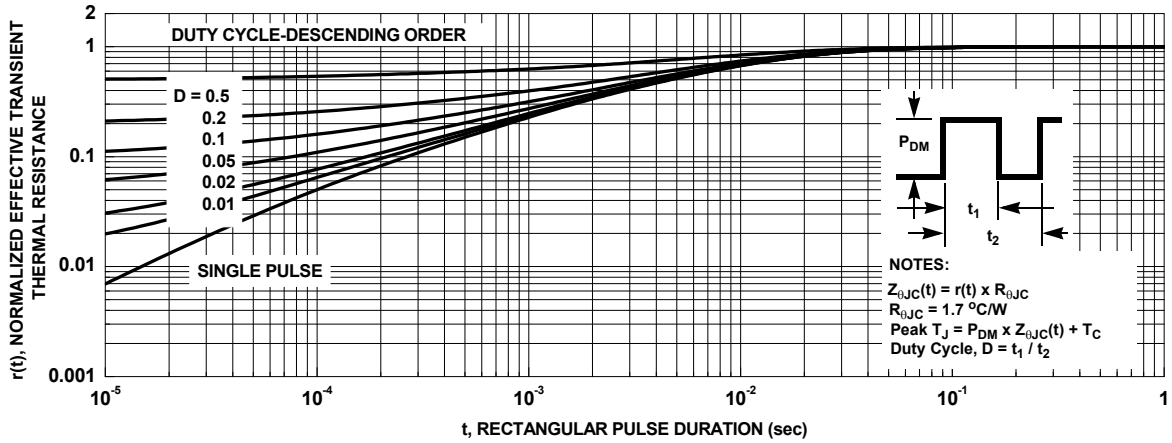


Figure 13. Junction-to-Case Transient Thermal Response Curve

Typical Characteristics (continued)

SyncFET™ Schottky body diode Characteristics

Fairchild's SyncFET™ process embeds a Schottky diode in parallel with PowerTrench MOSFET. This diode exhibits similar characteristics to a discrete external Schottky diode in parallel with a MOSFET. Figure 14 shows the reverse recovery characteristic of the FDMS2D4N03S.

Schottky barrier diodes exhibit significant leakage at high temperature and high reverse voltage. This will increase the power in the device.

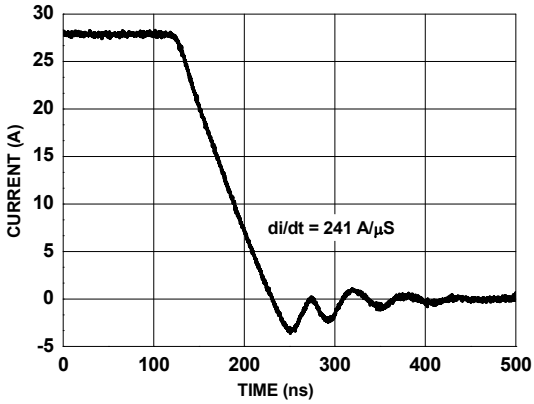


Figure 14. FDMS2D4N03S SyncFET™ Body Diode Reverse Recovery Characteristic

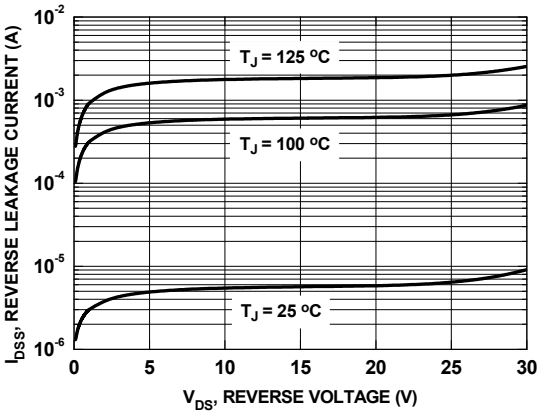
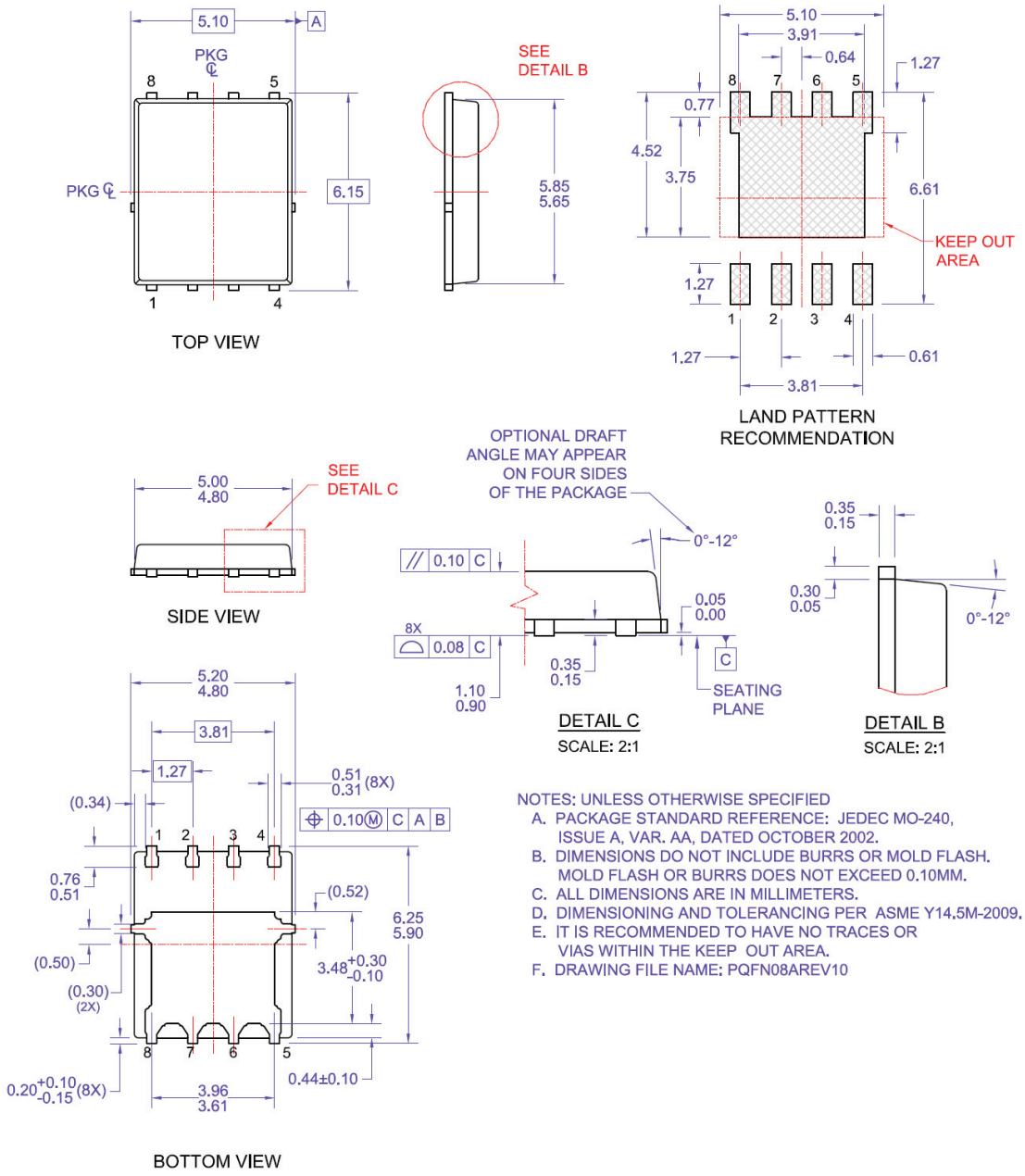


Figure 15. SyncFET™ Body Diode Reverse Leakage vs. Drain-Source Voltage

Dimensional Outline and Pad Layout



NOTES: UNLESS OTHERWISE SPECIFIED

A. PACKAGE STANDARD REFERENCE: JEDEC MO-240, ISSUE A, VAR. AA, DATED OCTOBER 2002.
B. DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH. MOLD FLASH OR BURRS DOES NOT EXCEED 0.10MM.
C. ALL DIMENSIONS ARE IN MILLIMETERS.
D. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-2009.
E. IT IS RECOMMENDED TO HAVE NO TRACES OR VIAS WITHIN THE KEEP OUT AREA.
F. DRAWING FILE NAME: PQFN08AREV10

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