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July 2015

FDMS3008SDC

N-Channel Dual Cool™ 56 PowerTrench® SyncFET™
### 30 V, 65 A, 2.6 mΩ

Features

- Dual Cool™ Top Side Cooling PQFN package
- Max $r_{DS(on)}$ = 2.6 mΩ at V_{GS} = 10 V, I_D = 28 A
- Max $r_{DS(on)}$ = 3.3 mΩ at V_{GS} = 4.5 V, I_D = 22 A
- High performance technology for extremely low $r_{DS(on)}$
- SyncFET Schottky Body Diode
- RoHS Compliant

General Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® process. Advancements in both silicon and Dual Cool™ package technologies have been combined to offer the lowest $r_{DS(on)}$ while maintaining excellent switching performance by extremely low Junction-to-Ambient thermal resistance. This device has the added benefit of an efficient monolithic Schottky body diode.

Applications

- Synchronous Rectifier for DC/DC Converters
- Telecom Secondary Side Rectification
- High End Server/Workstation Vcore Low Side

Top   **Dual Cool™ 56**   **Bottom**
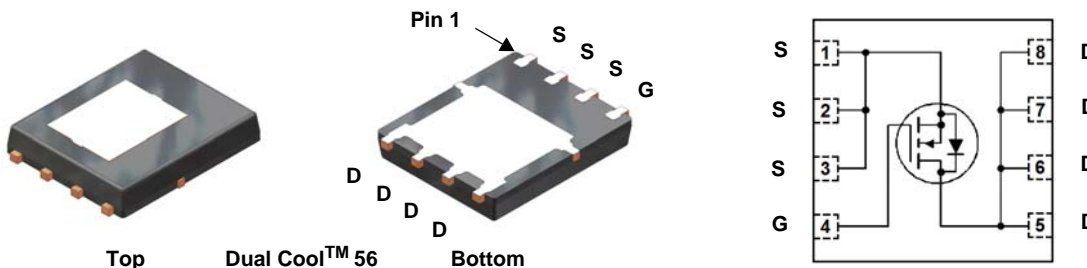
MOSFET Maximum Ratings T_A = 25°C unless otherwise noted

Symbol	Parameter			Ratings	Units
V_{DS}	Drain to Source Voltage			30	V
V_{GS}	Gate to Source Voltage		(Note 4)	±20	V
I_D	Drain Current -Continuous (Package limited)	T_C = 25 °C		65	A
	-Continuous (Silicon limited)	T_C = 25 °C		140	
	-Continuous	T_A = 25 °C	(Note 1a)	29	
	-Pulsed			200	
E_{AS}	Single Pulse Avalanche Energy		(Note 3)	112	mJ
dv/dt	Peak Diode Recovery dv/dt		(Note 5)	2.3	V/ns
P_D	Power Dissipation	T_C = 25 °C		78	W
	Power Dissipation	T_A = 25 °C	(Note 1a)	3.3	
T_J, T_{STG}	Operating and Storage Junction Temperature Range			-55 to +150	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	(Top Source)		3.5	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction to Case	(Bottom Drain)		1.6	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)		38	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1b)		81	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1i)		16	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1j)		23	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1k)		11	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
3008S	FDMS3008SDC	Dual Cool™ 56	13"	12 mm	3000 units

Electrical Characteristics $T_J = 25°C$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units

Off Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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		13		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, Forward	$V_{GS} = 20$ V, $V_{DS} = 0$ V			100	nA

On Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 1$ mA	1.2	1.9	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		-5		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10$ V, $I_D = 28$ A		1.8	2.6	mΩ
		$V_{GS} = 4.5$ V, $I_D = 22$ A		2.7	3.3	
		$V_{GS} = 10$ V, $I_D = 28$ A, $T_J = 125°C$		2.4	3.6	
g_{FS}	Forward Transconductance	$V_{DS} = 5$ V, $I_D = 28$ A		144		S

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
C_{iss}	Input Capacitance	$V_{DS} = 15$ V, $V_{GS} = 0$ V, $f = 1MHz$		3400	4520	pF
C_{oss}	Output Capacitance			1115	1485	pF
C_{rss}	Reverse Transfer Capacitance			80	120	pF
R_g	Gate Resistance			0.7		Ω

Switching Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 15$ V, $I_D = 28$ A, $V_{GS} = 10$ V, $R_{GEN} = 6$ Ω		15	27	ns
t_r	Rise Time			4.7	10	ns
$t_{d(off)}$	Turn-Off Delay Time			33	53	ns
t_f	Fall Time			3	10	ns
Q_g	Total Gate Charge	$V_{GS} = 0$ V to 10 V		46	64	nC
Q_g	Total Gate Charge	$V_{GS} = 0$ V to 4.5 V, $V_{DD} = 15$ V, $I_D = 28$ A		21	29	nC
Q_{gs}	Gate to Source Charge			9.6		nC
Q_{gd}	Gate to Drain "Miller" Charge			4.3		nC

Drain-Source Diode Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
V_{SD}	Source-Drain Diode Forward Voltage	$V_{GS} = 0$ V, $I_S = 2$ A (Note 2)		0.4	0.8	V
		$V_{GS} = 0$ V, $I_S = 28$ A (Note 2)		0.8	1.2	
t_{rr}	Reverse Recovery Time	$I_F = 28$ A, di/dt = 300 A/μs		32	51	ns
Q_{rr}	Reverse Recovery Charge			39	62	nC

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	(Top Source)	3.5	
$R_{\theta JC}$	Thermal Resistance, Junction to Case	(Bottom Drain)	1.6	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	38	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1b)	81	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1c)	27	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1d)	34	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1e)	16	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1f)	19	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1g)	26	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1h)	61	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1i)	16	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1j)	23	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1k)	11	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1l)	13	

NOTES:

1. $R_{\theta JA}$ is determined with the device mounted on a FR-4 board using a specified pad of 2 oz copper as shown below. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.
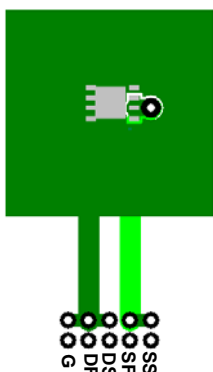
a. 38 °C/W when mounted on a 1 in^2 pad of 2 oz copper

b. 81 °C/W when mounted on a minimum pad of 2 oz copper

c. Still air, 20.9x10.4x12.7mm Aluminum Heat Sink, 1 in^2 pad of 2 oz copper

d. Still air, 20.9x10.4x12.7mm Aluminum Heat Sink, minimum pad of 2 oz copper

e. Still air, 45.2x41.4x11.7mm Aavid Thermalloy Part # 10-L41B-11 Heat Sink, 1 in^2 pad of 2 oz copper

f. Still air, 45.2x41.4x11.7mm Aavid Thermalloy Part # 10-L41B-11 Heat Sink, minimum pad of 2 oz copper

g. 200FPM Airflow, No Heat Sink,1 in^2 pad of 2 oz copper

h. 200FPM Airflow, No Heat Sink, minimum pad of 2 oz copper

i. 200FPM Airflow, 20.9x10.4x12.7mm Aluminum Heat Sink, 1 in^2 pad of 2 oz copper

j. 200FPM Airflow, 20.9x10.4x12.7mm Aluminum Heat Sink, minimum pad of 2 oz copper

k. 200FPM Airflow, 45.2x41.4x11.7mm Aavid Thermalloy Part # 10-L41B-11 Heat Sink, 1 in^2 pad of 2 oz copper

l. 200FPM Airflow, 45.2x41.4x11.7mm Aavid Thermalloy Part # 10-L41B-11 Heat Sink, minimum pad of 2 oz copper
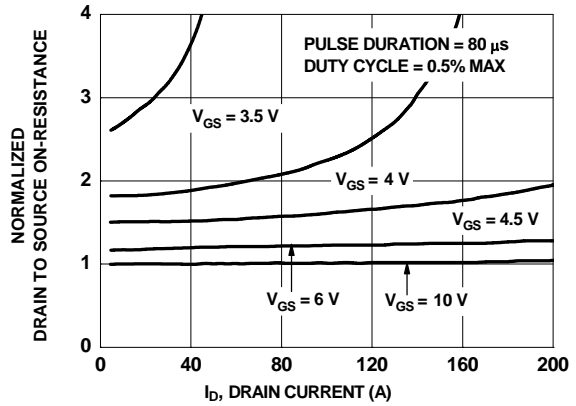
2. Pulse Test: Pulse Width < 300 μs, Duty cycle < 2.0%.

3. E_{AS} of 112 mJ is based on starting T_J = 25 °C, L = 1 mH, I_{AS} = 15 A, V_{DD} = 27 V, V_{GS} = 10 V. 100% test at L = 0.1 mH, I_{AS} = 33.4 A.
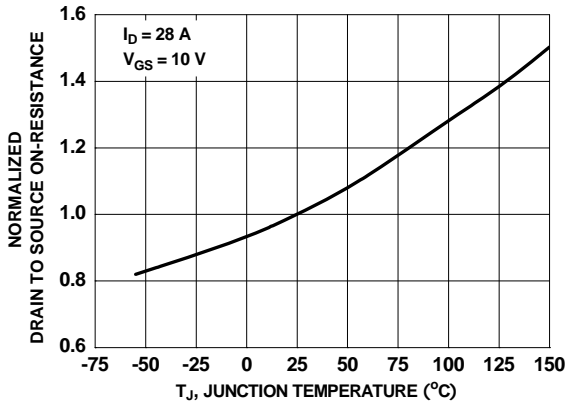
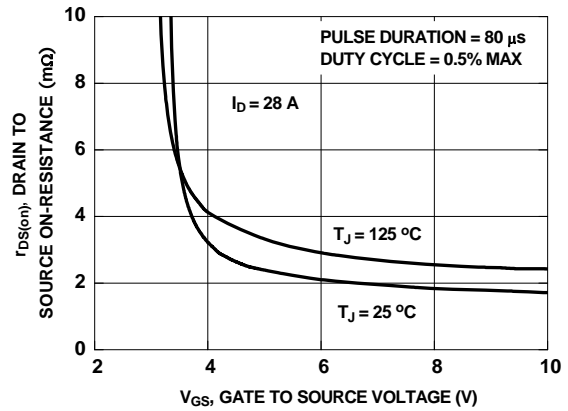**Typical Characteristics** T_J = 25°C unless otherwise noted
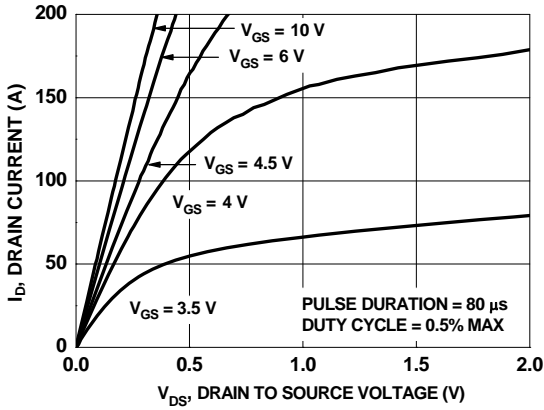
Figure 1. On Region Characteristics
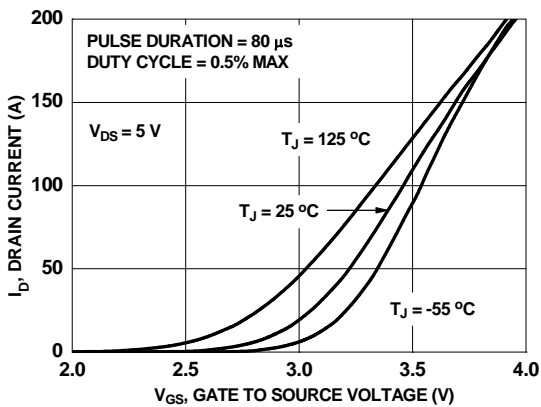

Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage
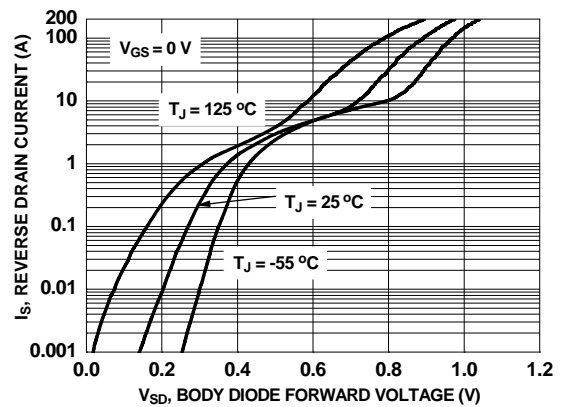

Figure 3. Normalized On Resistance vs Junction Temperature

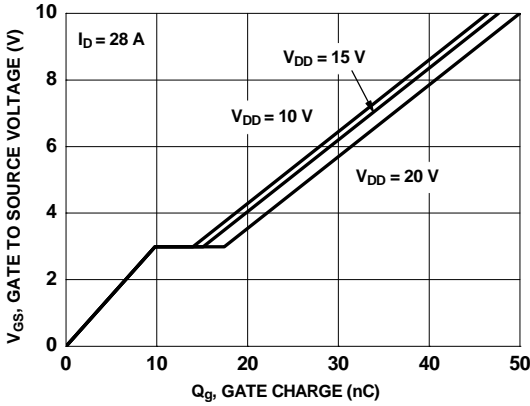**Figure 4. On-Resistance vs Gate to Source Voltage**
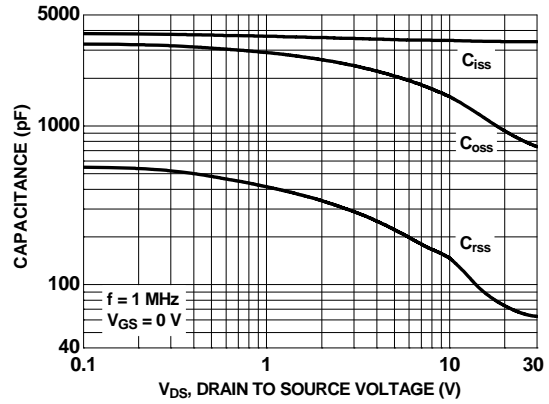

Figure 5. Transfer Characteristics

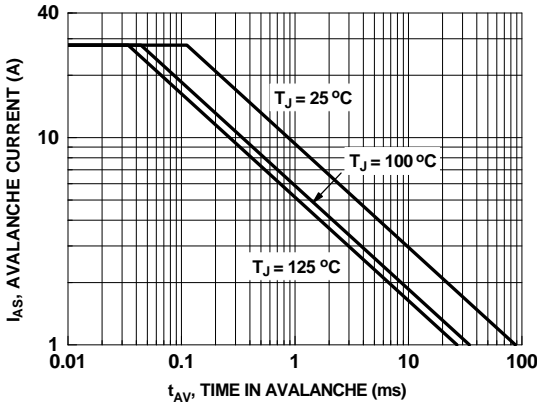**Figure 6. Source to Drain Diode Forward Voltage vs Source Current**
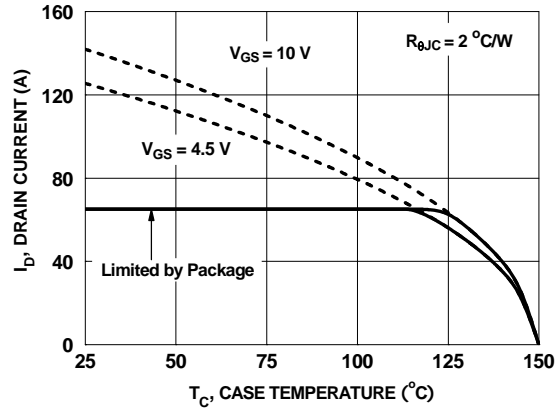
Typical Characteristics T_J = 25°C unless otherwise noted

Figure 7. Gate Charge Characteristics

Figure 8. Capacitance vs Drain to Source Voltage

Figure 9. Unclamped Inductive Switching Capability

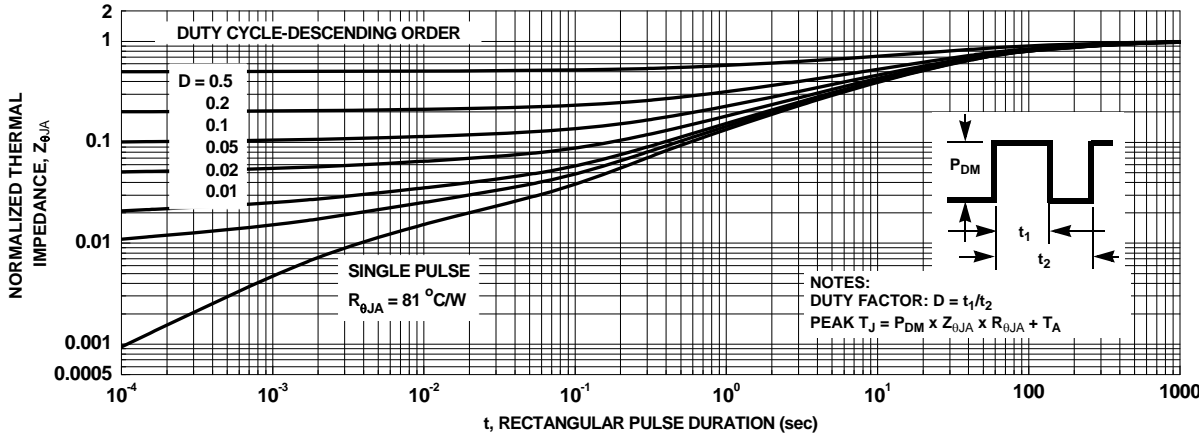**Figure 10. Maximum Continuous Drain Current vs Case Temperature**
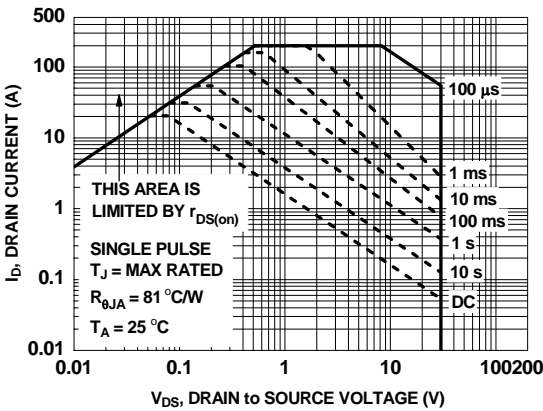
Figure 11. Forward Bias Safe Operating Area
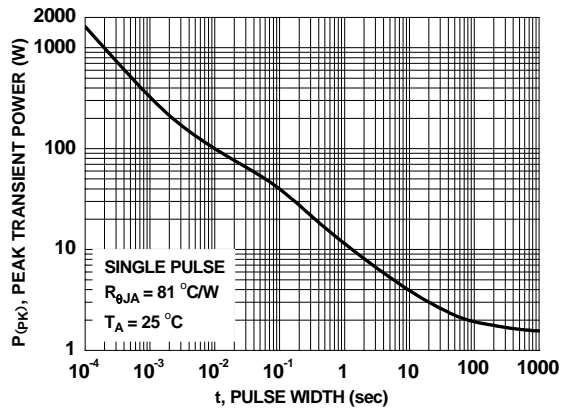
Figure 12. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25°C unless otherwise noted

DUTY CYCLE-DESCENDING ORDER

D = 0.5
0.2
0.1
0.05
0.02
0.01

NORMALIZED THERMAL IMPEDANCE, $Z_{\theta JA}$

SINGLE PULSE

$R_{\theta JA}$ = 81 °C/W

P_{DM}

t_1

t_2

NOTES:
DUTY FACTOR: D = t_1/t_2
PEAK T_J = P_{DM} x $Z_{\theta JA}$ x $R_{\theta JA}$ + T_A

t, RECTANGULAR PULSE DURATION (sec)

Figure 13. Junction-to-Ambient 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 FDMS3008SDC.

Schottky barrier diodes exhibit significant leakage at high temperature and high reverse voltage. This will increase the power in the device.
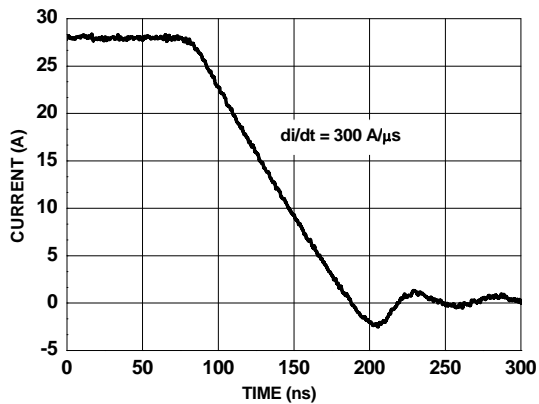
Figure 14. FDMS3008SDC SyncFET body diode reverse recovery characteristic
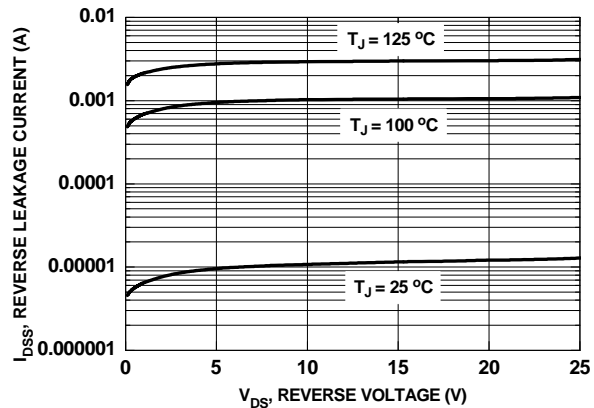
Figure 15. SyncFET body diode reverses leakage versus drain-source voltage

TOP VIEW

(2X)
⌒ .1 C

(2X)
⌒ .1 C

A
4.90
A

(2.60)
(0.90)

B

8   5

A

(3.30)
(2.08)
(0.82)

5.80

1   4

(1.05)

OPTIONAL PIN 1
INDICATOR

TOP VIEW

FRONT VIEW

SEE
DETAIL A

FRONT VIEW

LAND PATTERN RECOMMENDATION

5.10
3.91
1.27

0.77

8 7 6 5

KEEP-
OUT
AREA

2.54

2.04

1.22

2.67

1.27

1 2 3 4

1.27

0.61

3.81

**LAND PATTERN
RECOMMENDATION**

BOTTOM VIEW

A 5.00
   4.80

A 0.41 (8X)
   0.31

1.27

3.81

(0.34)

0.50 (8X)
0.40

⊕ 0.10Ⓜ C A B

OPTIONAL DRAFT ANGLE
MAY APPEAR ON FOUR
SIDES OF THE PACKAGE

7°

1 2   3 4

A 0.71 (4X)
   0.44

A (1.40)

(1.02)
(0.50)

0.35   0.40
0.25   0.30

5.85 A
5.50

CHAMFER
CORNER
AS PIN #1
IDENT MAY
APPEAR AS
OPTIONAL

3.58
3.38

(0.20)
(8X)

8 7 6   5

3.86
3.61

0.65 (4X)
0.45

BOTTOM VIEW

SIDE VIEW

DETAIL A

∥ 0.10 C

0.1 MAX

⌒ 0.08 C

0.30
0.20

0.05
0.00

C

1.05
0.95

SEATING
PLANE

DETAIL A
SCALE: 2:1

NOTES:

A) PACKAGE IS NOT FULLY COMPLIANT
   TO JEDEC MO-240, VARIATION AA.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSIONS DO NOT INCLUDE BURRS
   OR MOLD FLASH. MOLD FLASH OR
   BURRS DOES NOT EXCEED 0.10MM.
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: PQFN08DREV4

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