FAIRCHILD

July 2013

FDMS3006SDC N-Channel Dual CoolTM PowerTrench[®] SyncFETTM 30 V, 90 A, 1.9 m Ω

Features

- Dual CoolTM Top Side Cooling PQFN package
- Max r_{DS(on)} = 1.9 mΩ at V_{GS} = 10 V, I_D = 30 A
- Max r_{DS(on)} = 2.7 mΩ at V_{GS} = 4.5 V, I_D = 26 A
- High performance technology for extremely low r_{DS(on)}
- SyncFET Schottky Body Diode
- RoHS Compliant

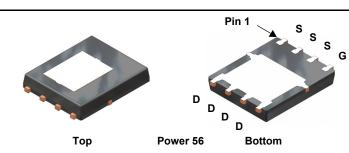


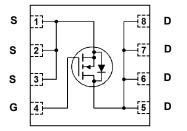
General Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench[®] process. Advancements in both silicon and Dual CoolTM 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





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		90		
	-Continuous (Silicon limited)	T _C = 25 °C		179	Α	
	-Continuous	T _A = 25 °C	(Note 1a)	34	— A	
	-Pulsed	ed		200		
E _{AS}	Single Pulse Avalanche Energy		(Note 3)	144	mJ	
dv/dt	Peak Diode Recovery dv/dt		(Note 5)	1.8	V/ns	
P _D	Power Dissipation	T _C = 25 °C		89	14/	
	Power Dissipation	T _A = 25 °C	(Note 1a)	3.3	W	
T _J , T _{STG}	Operating and Storage Junction Temperature R	ange		-55 to +150	°C	

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	(Top Source)	2.7	
$R_{ extsf{ heta}JC}$	Thermal Resistance, Junction to Case	(Bottom Drain)	1.4	
$R_{ extsf{ heta}JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	38	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1b)	81	°C/W
$R_{\theta JA}$	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
3006S	FDMS3006SDC	Dual Cool TM Power 56	13"	12 mm	3000 units

Symbol	Parameter	Test Conditions	Min	Тур	Max	Units
Off Chara	cteristics					
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		16		mV/°C
IDSS	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 Chara	cteristics					
V _{GS(th)}	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 1 \text{ mA}$	1.2	1.8	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_{el}}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 10$ mA, referenced to 25 °C		-5		mV/°C
0		V _{GS} = 10 V, I _D = 30 A		1.3	1.9	
r _{DS(on)}	Static Drain to Source On Resistance	$V_{GS} = 4.5 \text{ V}, \text{ I}_{D} = 26 \text{ A}$		1.9	2.7	mΩ
()		V _{GS} = 10 V, I _D = 30 A, T _J = 125 °C		1.8	2.7	
9 _{FS}	Forward Transconductance	V _{DS} = 5 V, I _D = 30 A		176		S
Dynamic C _{iss}	Characteristics			4430	5895	pF
C _{oss}	Output Capacitance	V _{DS} = 15 V, V _{GS} = 0 V,		1615	2150	pF
C _{rss}	Reverse Transfer Capacitance	_f = 1 MHz		106	160	pF
R _a	Gate Resistance			0.8		Ω
Switching t _{d(on)}	Characteristics Turn-On Delay Time			16	29	ns
t _r	Rise Time	V _{DD} = 15 V, I _D = 30 A,		6.3	13	ns
t _{d(off)}	Turn-Off Delay Time	V_{GS} = 10 V, R_{GEN} = 6 Ω		40	64	ns
t _f	Fall Time	1		4.1	10	ns
Q _g	Total Gate Charge	V _{GS} = 0 V to 10 V		61	85	nC
Q _g	Total Gate Charge	V_{GS} = 0 V to 4.5 V V_{DD} = 15 V,		28	40	nC
Q _{gs}	Gate to Source Gate Charge	I _D = 30 A		12		nC
Q _{gd}	Gate to Drain "Miller" Charge	1		7		nC
Drain-Sou	urce Diode Characteristics					
V _{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0 V, I_S = 2 A$ (Note 2)		0.4	0.8	v
บง		$V_{GS} = 0 V, I_S = 30 A$ (Note 2)		0.8	1.2	<u> </u>
t _{rr}	Reverse Recovery Time	I _E = 30 A, di/dt = 300 A/μs		38	61	ns
Q _{rr}	Reverse Recovery Charge	$-1_{\rm F} = 30$ A, u/ul = 300 A/µs		56	90	nC

Thermal Characteristics

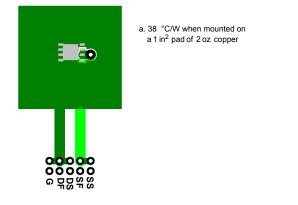
$R_{ ext{ heta}JC}$	Thermal Resistance, Junction to Case	(Top Source)	2.7	
$R_{\theta JC}$	Thermal Resistance, Junction to Case	(Bottom Drain)	1.4	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	38	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1b)	81	
$R_{\theta JA}$	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/M
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1f)	19	°C/W
$R_{ ext{ heta}JA}$	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 1I)	13	

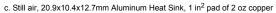
NOTES:

1. R_{0.JA} is determined with the device mounted on a FR-4 board using a specified pad of 2 oz copper as shown below. R_{0.JC} is guaranteed by design while R_{0CA} is determined by the user's board design.

b. 81 °C/W when mounted on

a minimum pad of 2 oz copper



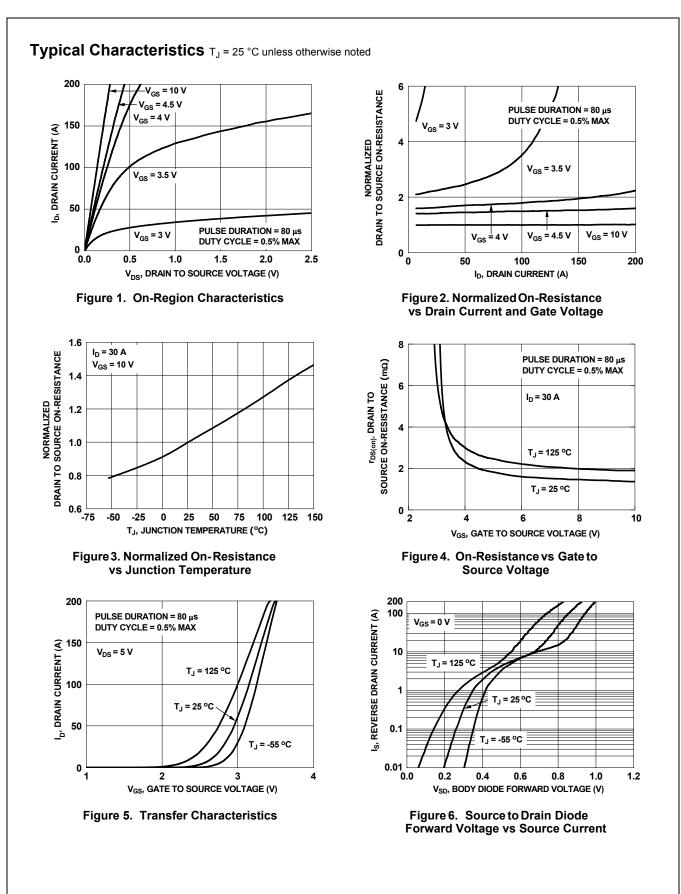


- d. Still air, 20.9x10.4x12.7mm Aluminum Heat Sink, minimum pad of 2 oz copper
- e. Still air, 45.2x41.4x11.7mm Aavid Thermalloy Part # 10-L41B-11 Heat Sink, 1 in² pad of 2 oz copper
- f. Still air, 45.2x41.4x11.7mm Aavid Thermalloy Part # 10-L41B-11 Heat Sink, minimum pad of 2 oz copper
- g. 200FPM Airflow, No Heat Sink,1 in² 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 in² pad of 2 oz copper
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- I. 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 μ s, Duty cycle < 2.0%.

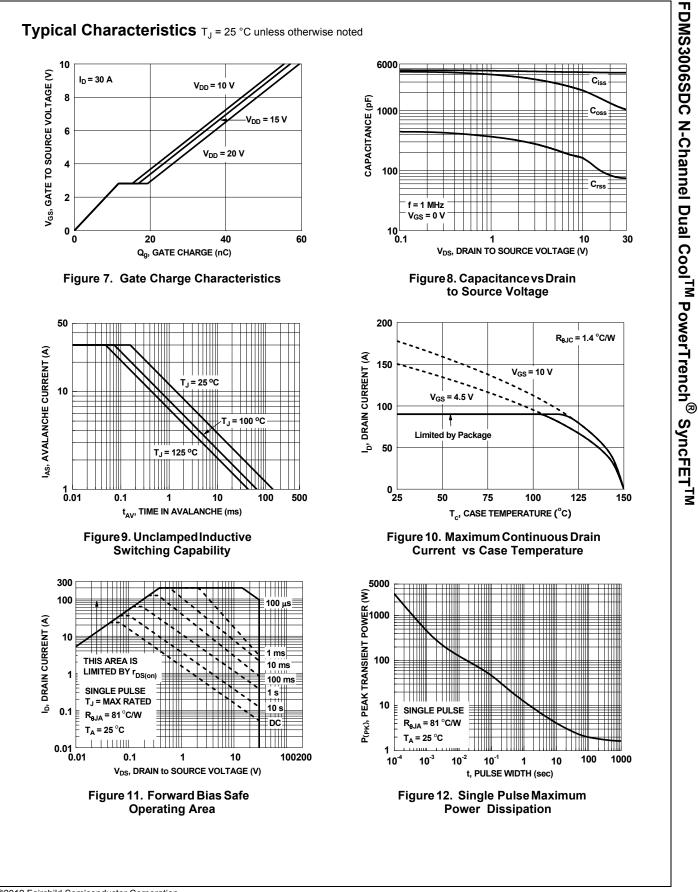
3. E_{AS} of 144 mJ is based on starting T_J = 25 °C, L = 1 mH, I_{AS} = 17 A, V_{DD} = 27 V, V_{GS} = 10 V. 100% test at L = 0.1 mH, I_{AS} = 39.2 A.

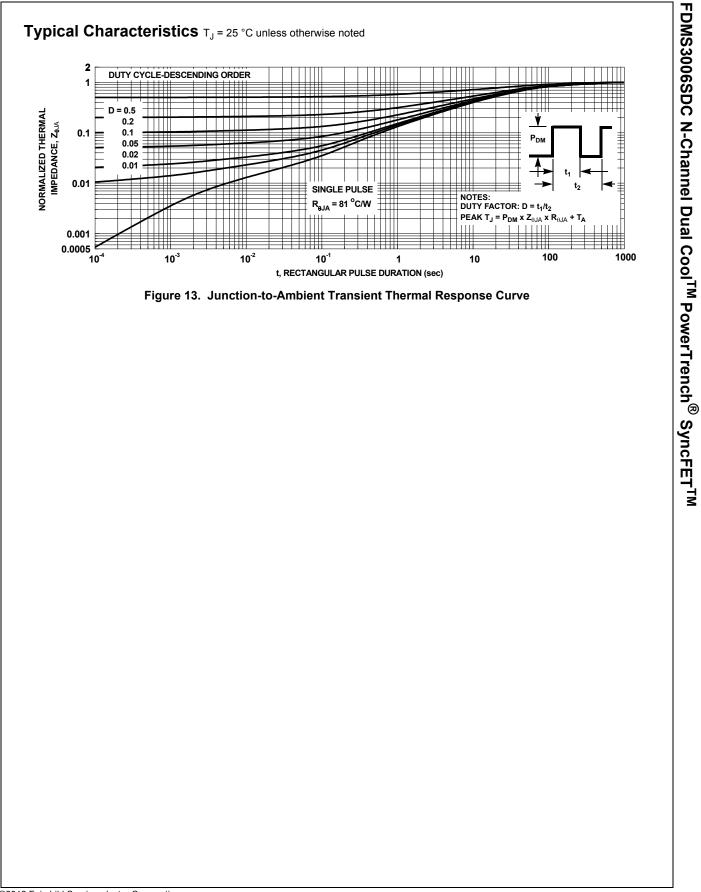
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Typical Characteristics (continued)

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 FDMS3006SDC.

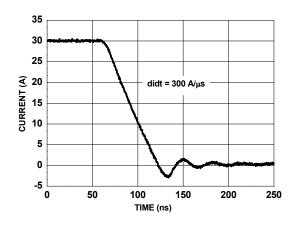
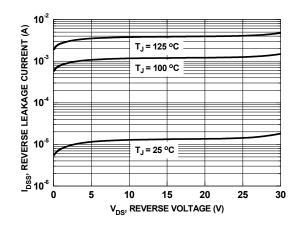
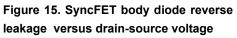
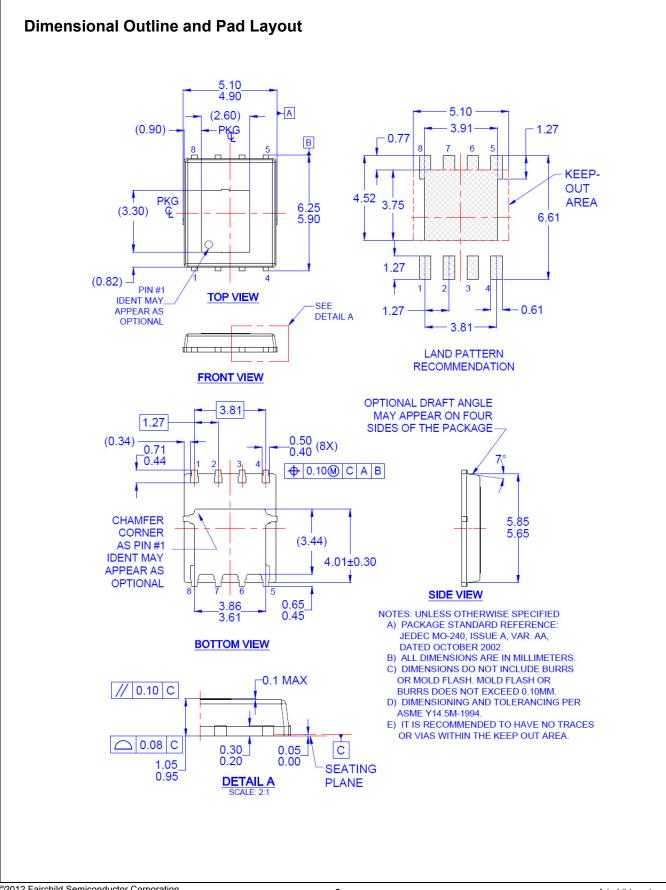


Figure 14. FDMS3006SDC SyncFET body diode reverse recovery characteristic

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







FDMS3006SDC N-Channel Dual CoolTM PowerTrench[®] SyncFETTM



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