

FDS2170N7

200V N-Channel PowerTrench® MOSFET

General Description

This N-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for "low side" synchronous rectifier operation, providing an extremely low $R_{\text{DS(ON)}}$ in a small package.

Applications

· Synchronous rectifier

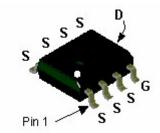
FLMP

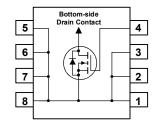
SO-8

• DC/DC converter

Features

- 3.0 A, 200 V. $R_{DS(ON)}$ = 128 m Ω @ V_{GS} = 10 V
- High performance trench technology for extremely low $R_{\mbox{\scriptsize DS}(\mbox{\scriptsize ON})}$
- High power and current handling capability
- Fast switching, low gate charge (26nC typical)
- FLMP SO-8 package: Enhanced thermal performance in industry-standard package size





Absolute Maximum Ratings T_A=25°C unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{DSS}	Drain-Source Voltage		200	V
V_{GSS}	Gate-Source Voltage		± 20	V
I _D	Drain Current - Continuous	(Note 1a)	3.0	Α
	– Pulsed		20	
P _D	Power Dissipation for Single Operation	(Note 1a)	3.0	W
		(Note 1b)	1.8	
T _J , T _{STG}	Operating and Storage Junction Temperature Range		-55 to +150	°C

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1a)	40	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	(Note 1)	0.5	

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
FDS2170N7	FDS2170N7	13"	12mm	2500 units

Symbol	Parameter	Test Conditions	Min	Тур	Max	Units
Drain-So	urce Avalanche Ratings		ı	II.	ı	l.
W _{DSS}	Drain-Source Avalanche Energy	Single Pulse, V _{DD} = 200 V, I _D =10 A			400	mJ
I _{AR}	Drain-Source Avalanche Current				10	Α
Off Char	acteristics					
BV _{DSS}	Drain–Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, \qquad I_{D} = 250 \mu\text{A}$	200	1	1	V
ΔBV _{DSS} ΔT _J	Breakdown Voltage Temperature Coefficient	I _D = 250 μA, Referenced to 25°C		231		mV/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 160 V, V _{GS} = 0 V			1	μА
I _{GSSF}	Gate-Body Leakage, Forward	V _{GS} = 20 V, V _{DS} = 0 V			100	nA
I _{GSSR}	Gate-Body Leakage, Reverse	V _{GS} = -20 V, V _{DS} = 0 V			-100	nA
On Char	acteristics (Note 2)			•	•	
V _{GS(th)}	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_{D} = 250 \mu A$	2	4	4.5	V
$\Delta V_{GS(th)} \over \Delta T_J$	Gate Threshold Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C		-10		mV/°C
R _{DS(on)}	Static Drain–Source On–Resistance	V_{GS} = 10 V, I_{D} = 3.0 A V_{GS} = 10 V, I_{D} = 3.0 A, T_{J} = 125°C		107 213	128 268	mΩ
g FS	Forward Transconductance	$V_{DS} = 10 \text{ V}, \qquad I_{D} = 3.0 \text{ A}$		15		S
Dynamic	: Characteristics					
C _{iss}	Input Capacitance	V _{DS} = 100 V, V _{GS} = 0 V,		1292		pF
C _{oss}	Output Capacitance	f = 1.0 MHz		72		pF
C _{rss}	Reverse Transfer Capacitance			24		pF
R_G	Gate Resistance	V _{GS} = 15 mV, f = 1.0 MHz		1.5		Ω
Switchin	g Characteristics (Note 2)					
t _{d(on)}	Turn-On Delay Time	V _{DD} = 100 V, I _D = 1 A,		12	22	ns
t _r	Turn-On Rise Time	V_{GS} = 10 V, R_{GEN} = 6 Ω		5	10	ns
$t_{d(off)}$	Turn-Off Delay Time			30	48	ns
t _f	Turn-Off Fall Time			23	36	ns
Q _g	Total Gate Charge	$V_{DS} = 100 \text{ V}, I_{D} = 3.0 \text{ A},$		26	36	nC
Q _{gs}	Gate-Source Charge	V _{GS} = 10 V		7		nC
Q_{gd}	Gate-Drain Charge	1		10		nC
	ource Diode Characteristics	and Maximum Ratings				
Is	Maximum Continuous Drain-Source				2.5	Α
V _{SD}	Drain–Source Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_S = 2.5 \text{ A} \text{(Note 2)}$		0.76	1.2	V
t _{rr}	Diode Reverse Recovery Time	I _F = 3.0A		95		nS
Q _{rr}	Diode Reverse Recovery Charge	$d_{iF}/d_t = 100 \text{ A/}\mu\text{s}$ (Note 2)		552	1	nC

 R_{0JA} is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. R_{0JC} is guaranteed by design while R_{0CA} is determined by the user's board design.



a) 40°C/W when mounted on a 1in² pad of 2 oz copper



b) 85°C/W when mounted on a minimum pad of 2 oz copper

Scale 1:1 on letter size paper

2. Pulse Test: Pulse Width < 300 μ s, Duty Cycle < 2.0%

Dimensional Outline and Pad Layout -(0.65)(3.68)DRAIN TERMINAL -0.75 MIN (0.67)(2.36)DRAIN 2.80 MIN TERMINAL 7.40 8 5 0.70 BOTTOM VIEW 1.50 MIN 4 4.90±0.10-1.27 1.40 3.81 - 3.81 В -4.10 MIN-LAND PATTERN RECOMMENDATION 3.90±0.10 SEE DETAIL A 0.51 (0.34) -**⊕** 0.127**M** B A 6.00±0.20-NOTES: UNLESS OTHERWISE SPECIFIED △ 0.1 C A) ALL DIMENSIONS ARE IN MILLIMETERS. STANDARD LEAD FINISH: 20-80 MICROINCHES NICKEL/ 6 MICROINCHES MAX. PALLADIUM AND GOLD FLASH. C) NO JEDEC REGISTERED REFERENCE AS OF MARCH 2, 2000. -0.50 X 45° GAGE PLANE 0.36 1.60 MAX _0.10 _0.00 0.90 SEATING PLANE - (1.04) |- <u>DETAIL</u> A SCALE: 24:1

Typical Characteristics

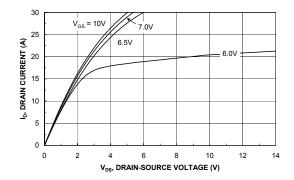


Figure 1. On-Region Characteristics.

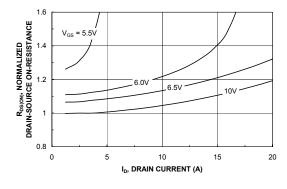


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

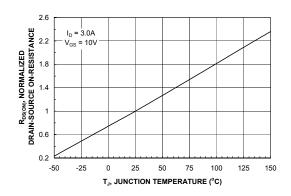


Figure 3. On-Resistance Variation with Temperature.

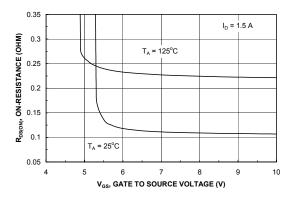


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

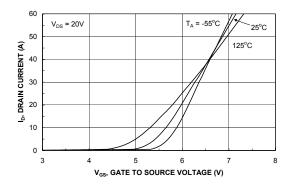


Figure 5. Transfer Characteristics.

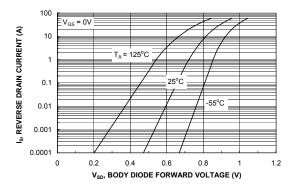
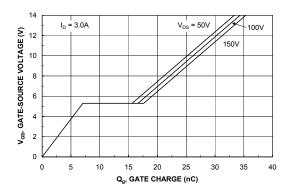


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics



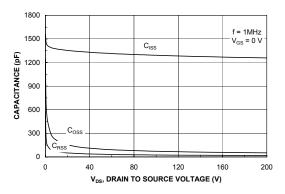


Figure 7. Gate Charge Characteristics.

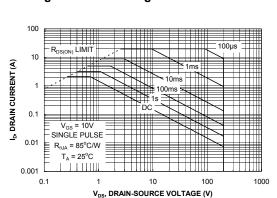


Figure 8. Capacitance Characteristics.

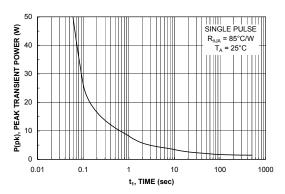


Figure 9. Maximum Safe Operating Area.



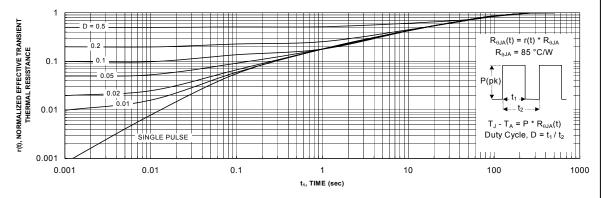


Figure 11. Transient Thermal Response Curve.

Thermal characterization performed using the conditions described in Note 1b. Transient thermal response will change depending on the circuit board design.

TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

FACT Quiet Series™ LittleFET™ ACEx™ Power247™ SuperSOT™-3 MICROCOUPLER™ PowerTrench® ActiveArray™ SuperSOT™-6 FAST® Bottomless™ MicroFET™ **OFET®** SuperSOT™-8 FASTr™ CoolFET™ QSTM $\mathsf{FRFET}^\mathsf{TM}$ MicroPak™ SyncFET™ CROSSVOLT™ MICROWIRE™ QT Optoelectronics™ TinyLogic[®] GlobalOptoisolator™ DOME™ GTO™ Quiet Series™ TINYOPTO™ MSX™ TruTranslation™ EcoSPARK™ RapidConfigure™ HiSeC™ MSXPro™ E²CMOSTM I2CTM OCX^{TM} RapidConnect™ UHC™ EnSigna™ SILENT SWITCHER® UltraFET® ImpliedDisconnect[™] OCXPro[™] FACT™ VCX^{TM} OPTOLOGIC® SMART START™ ISOPLANAR™ SPM™ Across the board. Around the world. $^{\text{TM}}$ OPTOPLANAR $^{\text{TM}}$ Stealth™ PACMAN™ The Power Franchise™ РОР™ SuperFET™

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS. NOR THE RIGHTS OF OTHERS.

LIFE SUPPORT POLICY

Programmable Active Droop™

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

- 1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the
- 2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition		
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.		
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.		
No Identification Needed Full Production		This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.		
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.		