

FDS7064SN3

30V N-Channel PowerTrench® SyncFET™

General Description

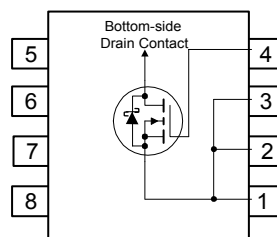
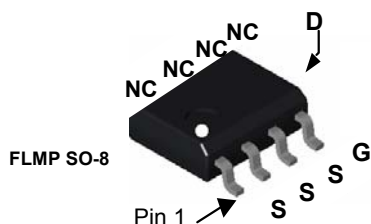
The FDS7064SN3 is designed to improve the efficiency of Buck Regulators. Used as the Synchronous rectifier, (Low side MOSFET), losses can be reduced, not only in this device, but also in the Control switch, (High side MOSFET). After the low side MOSFET turns off, reverse recovery current in the body diode is dissipated in the High Side device. A Discrete Schottky diode in parallel with the Low Side MOSFET can lower the reverse recovery current, but parasitic PCB and Package Inductance reduce the effectiveness of the Schottky. SyncFET™ technology reduces this inductance to a minimum by providing a monolithic solution (MOSFET and Schottky in the same die), resulting in optimum performance.

Applications

- Synchronous Rectifier

• Features

- 16 A, 30 V $R_{DS(ON)} = 8.0 \text{ m}\Omega @ V_{GS} = 10 \text{ V}$
 $R_{DS(ON)} = 9.5 \text{ m}\Omega @ V_{GS} = 4.5 \text{ V}$
- High performance trench technology for extremely low $R_{DS(ON)}$
- No inductance between MOSFET and Schottky
- 40% reduction in Body Diode Forward Voltage
- Optimized to reduce losses in Synchronous Buck Regulators
- FLMP SO-8 package for enhanced thermal performance.



Absolute Maximum Ratings T_A=25°C unless otherwise noted

Symbol	Parameter	Ratings	Units
V _{DSS}	Drain-Source Voltage	30	V
V _{GSS}	Gate-Source Voltage	±16	V
I _D	Drain Current – Continuous (Note 1a)	16	A
	– Pulsed	60	
P _D	Power Dissipation for Single Operation (Note 1a) (Note 1b)	3.13	W
		1.5	
T _J , T _{STG}	Operating and Storage Junction Temperature Range	–55 to +150	°C

Thermal Characteristics

R _{θJA}	Thermal Resistance, Junction-to-Ambient (Note 1a)	40	°C/W
R _{θJC}	Thermal Resistance, Junction-to-Case (Note 1)	0.5	°C/W

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
FDS7064SN3	FDS7064SN3	13"	12mm	2500 units

Electrical Characteristics

$T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
--------	-----------	-----------------	-----	-----	-----	-------

Off Characteristics

BV_{DSS}	Drain–Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 10\text{ mA}$, Referenced to 25°C		26		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 24\text{ V}, V_{GS} = 0\text{ V}$			500	μA
I_{GSS}	Gate–Body Leakage	$V_{GS} = \pm 16\text{ V}, V_{DS} = 0\text{ V}$			± 100	nA

On Characteristics (Note 2)

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 1\text{ mA}$	1	1.4	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_D = 10\text{ mA}$, Referenced to 25°C		-2		mV/ $^\circ\text{C}$
$R_{DS(on)}$	Static Drain–Source On–Resistance	$V_{GS} = 10\text{ V}, I_D = 16\text{ A}$ $V_{GS} = 4.5\text{ V}, I_D = 14\text{ A}$ $V_{GS} = 10\text{ V}, I_D = 16\text{ A}, T_J = 125^\circ\text{C}$		6.5 7.5 9.1	8.0 9.5 11.5	m Ω
g_{FS}	Forward Transconductance	$V_{DS} = 10\text{ V}, I_D = 16\text{ A}$		70		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$		2800		pF
C_{oss}	Output Capacitance			530		pF
C_{rss}	Reverse Transfer Capacitance			190		pF
R_G	Gate Resistance	$V_{GS} = 15\text{ mV}, f = 1.0\text{ MHz}$		1.4		Ω

Switching Characteristics (Note 2)

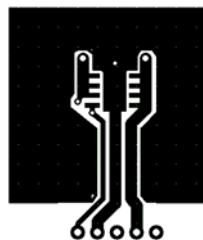
$t_{d(on)}$	Turn–On Delay Time	$V_{DD} = 15\text{ V}, I_D = 1\text{ A},$ $V_{GS} = 10\text{ V}, R_{GEN} = 6\ \Omega$		11	20	ns
t_r	Turn–On Rise Time			20	22	ns
$t_{d(off)}$	Turn–Off Delay Time			50	80	ns
t_f	Turn–Off Fall Time			18	33	ns
Q_g	Total Gate Charge	$V_{DS} = 15\text{ V}, I_D = 16\text{ A},$ $V_{GS} = 5.0\text{ V}$		25	35	nC
Q_{gs}	Gate–Source Charge			6		nC
Q_{gd}	Gate–Drain Charge			6		nC

Drain–Source Diode Characteristics and Maximum Ratings

I_S	Maximum Continuous Drain–Source Schottky Diode Forward Current			4.3		A
V_{SD}	Drain–Source Schottky Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 4.3\text{ A}$ (Note 2)		0.4	0.7	V
t_{RR}	Reverse Recovery Time	$I_F = 16\text{ A}$ $diF/dt = 300\text{ A/us}$		22		ns
Q_{RR}	Reverse Recovery Charge			20		nC

Notes:

- $R_{\theta JA}$ 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. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



- a) 40°C/W when mounted on a 1 in^2 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

- Pulse Test: Pulse Width < $300\ \mu\text{s}$, Duty Cycle < 2.0%

Typical Characteristics

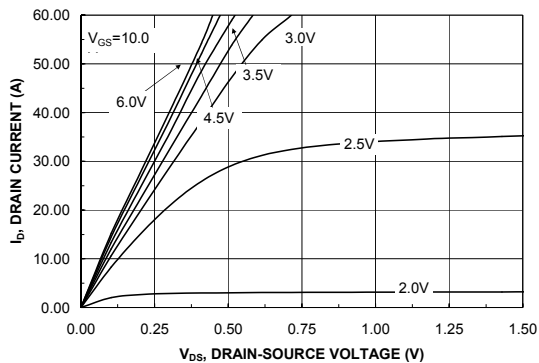


Figure 1. On-Region Characteristics.

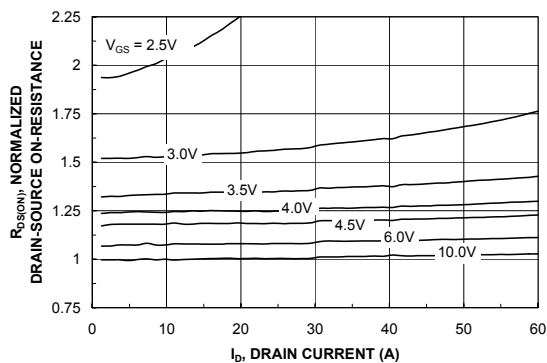


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

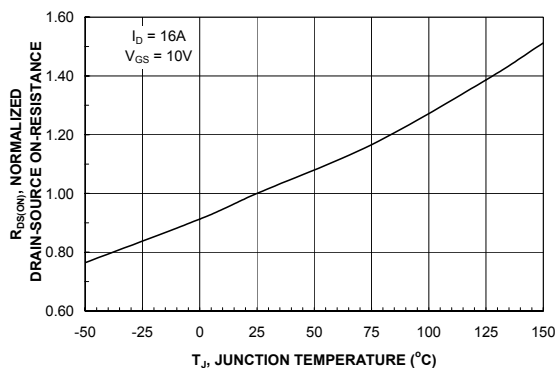


Figure 3. On-Resistance Variation with Temperature.

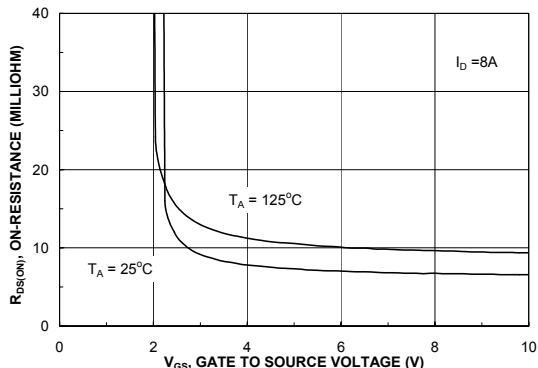


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

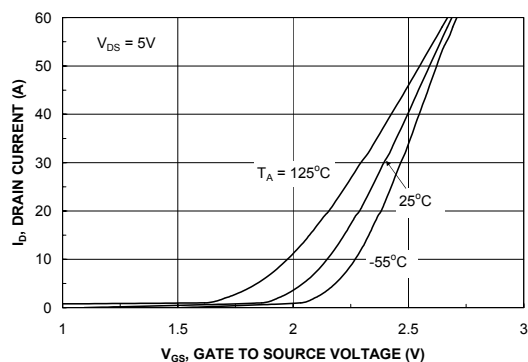


Figure 5. Transfer Characteristics.

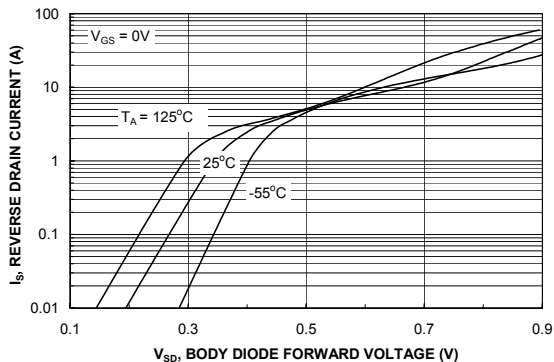


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics

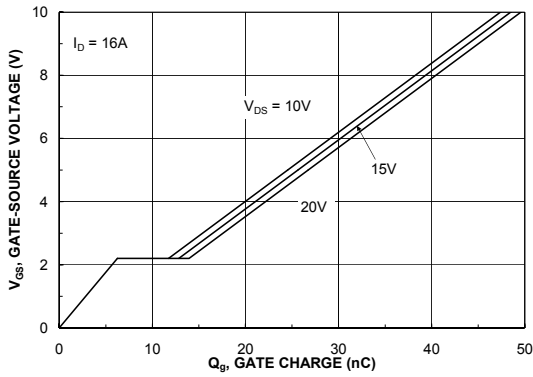


Figure 7. Gate Charge Characteristics.

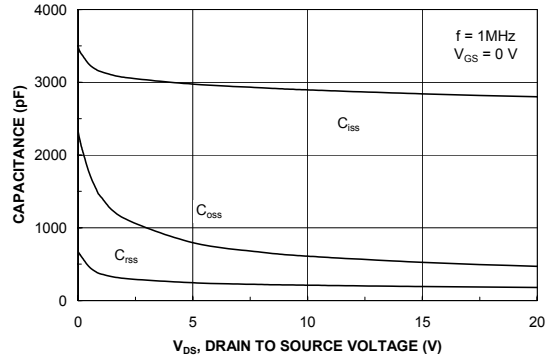


Figure 8. Capacitance Characteristics.

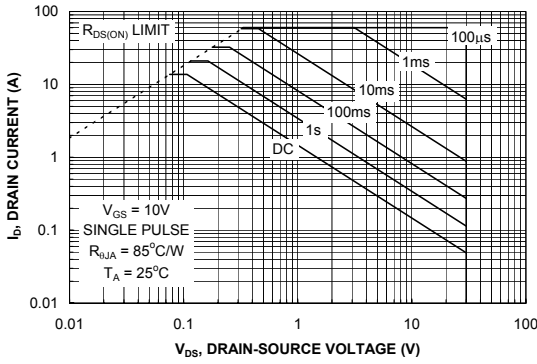


Figure 9. Maximum Safe Operating Area.

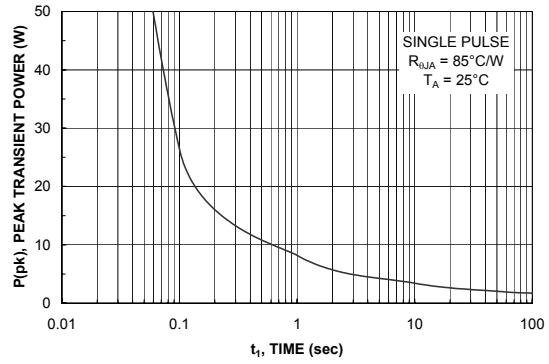


Figure 10. Single Pulse Maximum Power Dissipation.

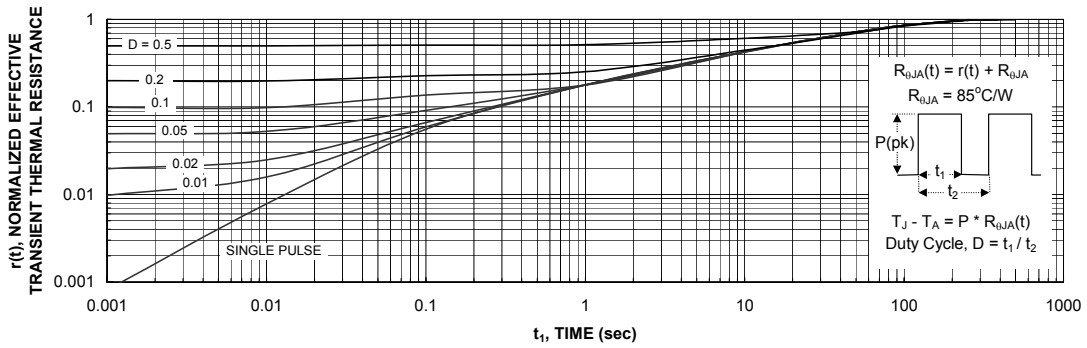


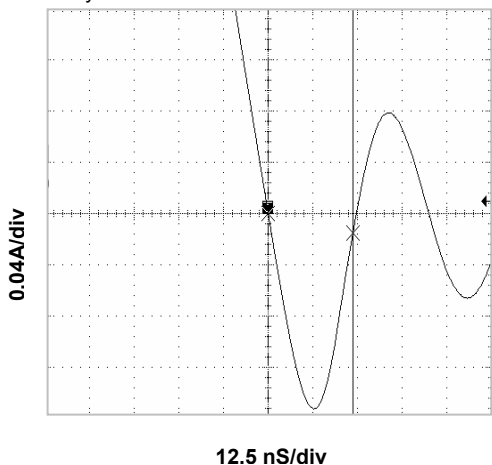
Figure 11. Transient Thermal Response Curve.

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

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 12 shows the reverse recovery characteristic of the FDS7064SN3.



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

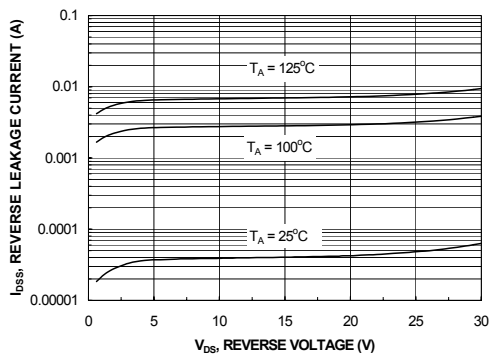
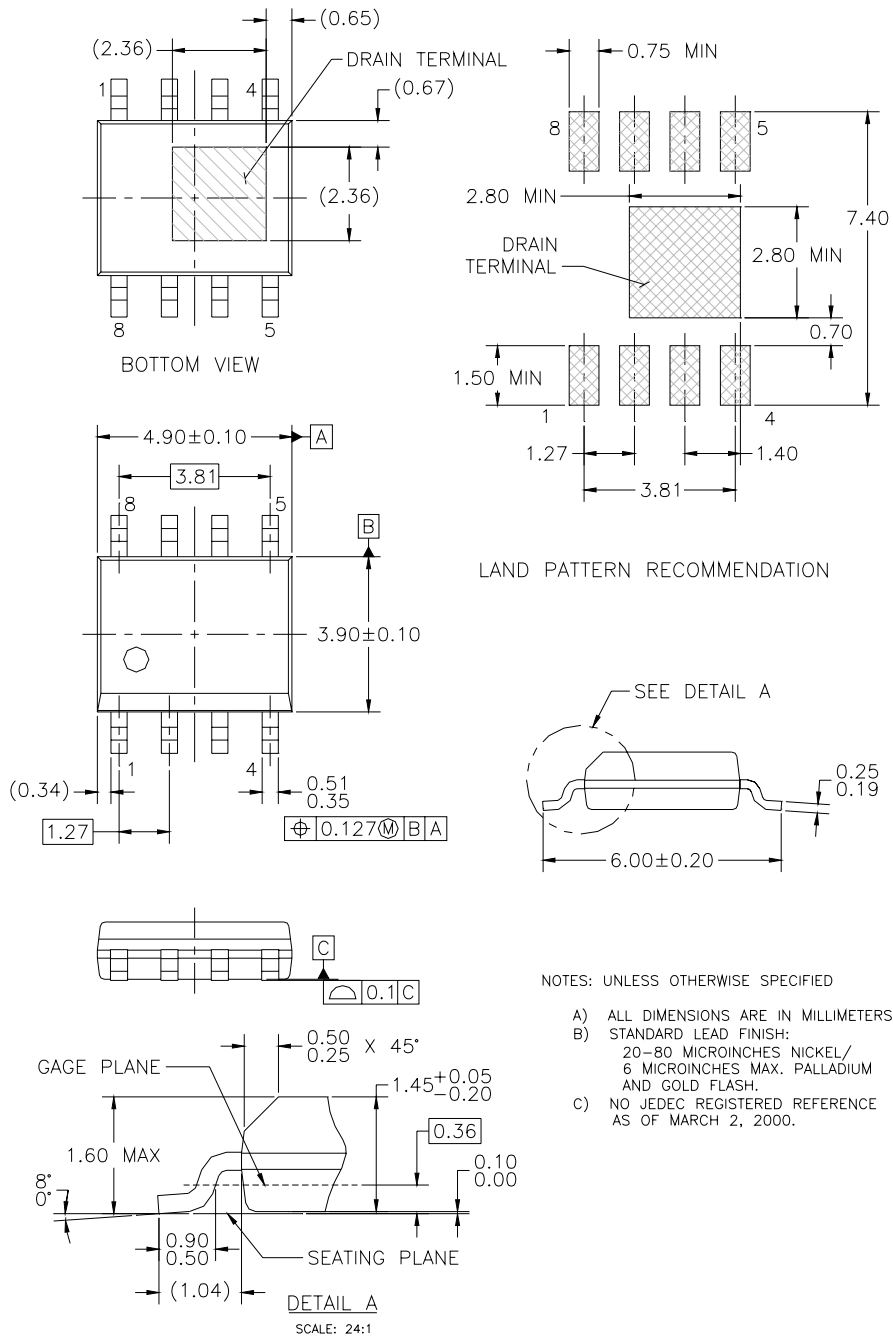


Figure 13. SyncFET body diode reverse leakage versus drain-source voltage and temperature

Dimensional Outline and Pad Layout



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.

ACEx™	FACT Quiet Series™	ISOPLANAR™	POP™	Stealth™
ActiveArray™	FAST®	LittleFET™	Power247™	SuperFET™
Bottomless™	FASTr™	MICROCOUPLER™	PowerSaver™	SuperSOT™-3
CoolFET™	FPST™	MicroFET™	PowerTrench®	SuperSOT™-6
CROSSVOLT™	FRFET™	MicroPak™	QFET®	SuperSOT™-8
DOMET™	GlobalOptoisolator™	MICROWIRE™	QS™	SyncFET™
EcoSPARK™	GTO™	MSX™	QT Optoelectronics™	TinyLogic®
E ² CMOS™	HiSeC™	MSXPro™	Quiet Series™	TINYOPTO™
EnSigna™	µC™	OCX™	RapidConfigure™	TruTranslation™
FACT™	ImpliedDisconnect™	OCXPro™	RapidConnect™	UHC™
Across the board. Around the world.™	OPTOLOGIC®	SILENT SWITCHER®	SMART START™	UltraFET®
The Power Franchise™	OPTOPLANAR™	SPM™		VCX™
Programmable Active Droop™	PACMAN™			

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

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 user.
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.