FAIRCHILD
SEMICONDUCTOR®

February 2009

FDN361BN

## 30V N-Channel, Logic Level, PowerTrench® MOSFET

General Description

These N-Channel Logic Level MOSFETs are produced using Fairchild Semiconductor's advanced PowerTrench process that has been especially tailored to minimize the on-state resistance and yet maintain superior switching performance.

These devices are particularly suited for low voltage applications in notebook computers, portable phones, PCMCIA cards, and other battery powered circuits where fast switching, and low in-line power loss are needed in a very small outline surface mount package.

Features

- 1.4 A, 30 V. $R_{DS(ON)}$ = 110 mΩ @ V_{GS} = 10 V
  $R_{DS(ON)}$ = 160 mΩ @ V_{GS} = 4.5 V

- Low gate charge

- Industry standard outline SOT-23 surface mount package using proprietary SuperSOT™-3 design for superior thermal and electrical capabilities

- High performance trench technology for extremely low $R_{DS(ON)}$

D
S
G

SuperSOT™-3

D

G   S
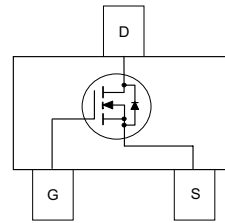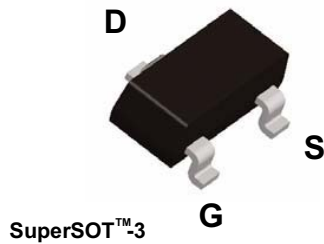
Absolute Maximum Ratings T_A=25°C unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{DSS}	Drain-Source Voltage		30	V
V_{GSS}	Gate-Source Voltage		± 20	V
I_D	Drain Current – Continuous	(Note 1a)	1.4	A
	– Pulsed		10	
P_D	Power Dissipation for Single Operation	(Note 1a)	0.5	W
		(Note 1b)	0.46	
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)	250	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	(Note 1)	75	

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
361B	FDN361BN	7"	8mm	3000 units

©2009 Fairchild Semiconductor Corporation
FDN361BN Rev A1(W)

www.fairchildsemi.com

Electrical Characteristics

T_A = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain–Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 μA	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C		26		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 24 V, V_{GS} = 0 V			1	μA
		V_{DS} = 24 V, V_{GS} = 0 V, T_J = 55°C			10	μA
I_{GSS}	Gate–Body Leakage	V_{GS} = ±20 V, V_{DS} = 0 V			±100	nA
On Characteristics (Note 2)						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 μA	1	2.1	3	V
$R_{DS(on)}$	Static Drain–Source On–Resistance	V_{GS} = 10 V, I_D = 1.4 A		92	110	mΩ
		V_{GS} = 4.5 V, I_D = 1.2 A		120	160	
		V_{GS} = 10 V, I_D = 1.4 A, T_J = 125°C		114	150	
$I_{D(on)}$	On–State Drain Current	V_{GS} = 4.5 V, V_{DS} = 5 V	3.5			A
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 1.4 A		4		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 15 V, V_{GS} = 0 V, f = 1.0 MHz		145	193	pF
C_{oss}	Output Capacitance			35	47	pF
C_{rss}	Reverse Transfer Capacitance			15	23	pF
R_G	Gate Resistance	V_{GS} = 15 mV, f = 1.0 MHz		1.6		Ω
Switching Characteristics (Note 2)						
$t_{d(on)}$	Turn–On Delay Time	V_{DD} = 15 V, I_D = 1 A, V_{GS} = 10 V, R_{GEN} = 6 Ω		3	6	ns
t_r	Turn–On Rise Time			8	16	ns
$t_{d(off)}$	Turn–Off Delay Time			16	29	ns
t_f	Turn–Off Fall Time			2	4	ns
Q_g	Total Gate Charge	V_{DS} = 15 V, I_D = 1.4 A, V_{GS} = 4.5 V		1.3	1.8	nC
Q_{gs}	Gate–Source Charge			0.5		nC
Q_{gd}	Gate–Drain Charge			0.5		nC
Drain–Source Diode Characteristics						
V_{SD}	Drain–Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 0.42 A (Note 2)		0.8	1.2	V
t_{rr}	Diode Reverse Recovery Time	I_F = 1.4 A, d_{iF}/d_t = 100 A/μs		11	22	nS
Q_{rr}	Diode Reverse Recovery Charge			4		nC

Notes:

1. $R_{θJA}$ 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. $R_{θJC}$ is guaranteed by design while $R_{θCA}$ is determined by the user's board design.

     a) 250°C/W when mounted on a 0.02 in² pad of 2 oz. copper.

     b) 270°C/W when mounted on a minimum pad.

Scale 1 : 1 on letter size paper

2. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%

FDN361BN Rev A1(W)   www.fairchildsemi.com
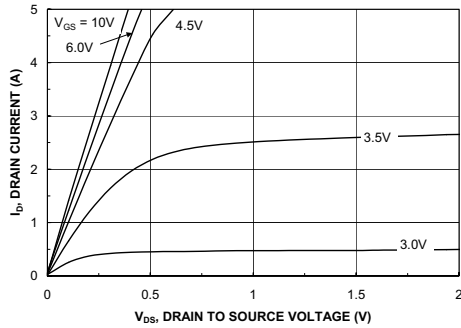
Typical Characteristics
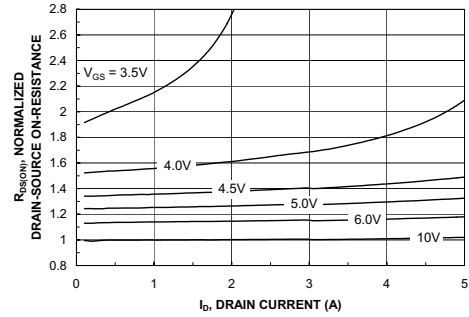

Figure 1. On-Region Characteristics.

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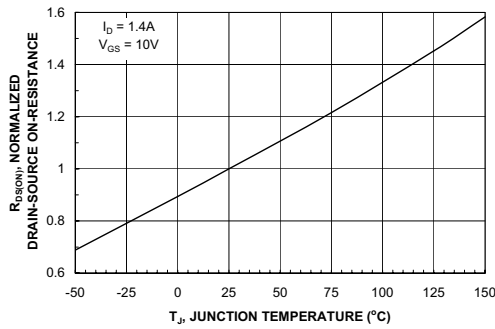Drain Current and Gate Voltage.

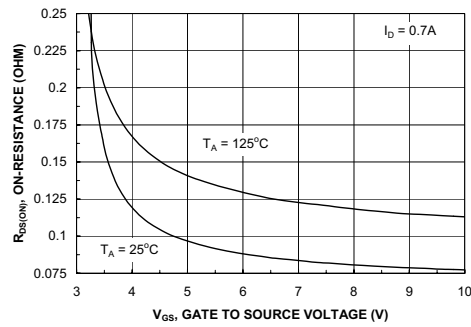Figure 3. On-Resistance Variation with
Temperature.

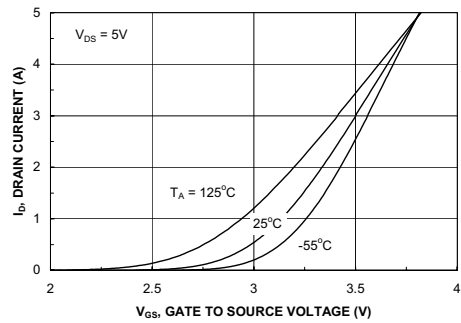Figure 4. On-Resistance Variation with
Gate-to-Source Voltage.

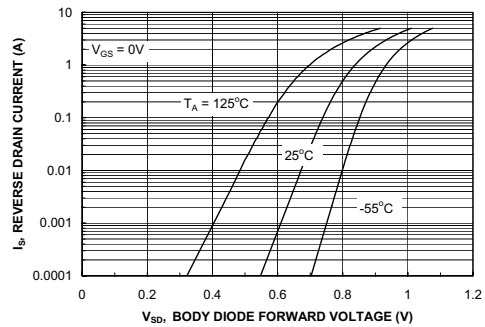Figure 5. Transfer Characteristics.

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

FDN361BN 30V N-Channel, Logic Level, PowerTrench® MOSFET

FDN361BN Rev A1(W)

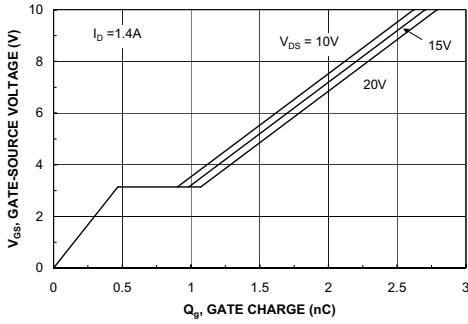www.fairchildsemi.com

Typical Characteristics

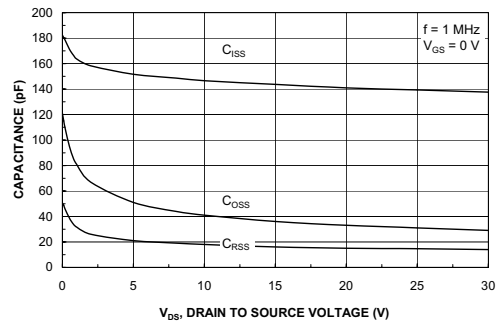Figure 7. Gate Charge Characteristics.
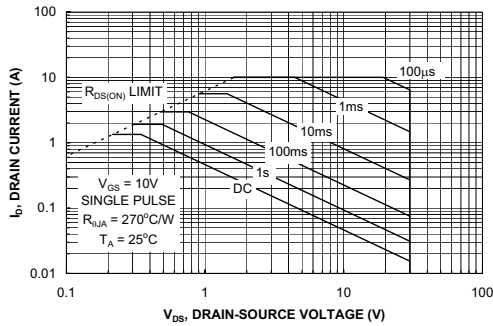

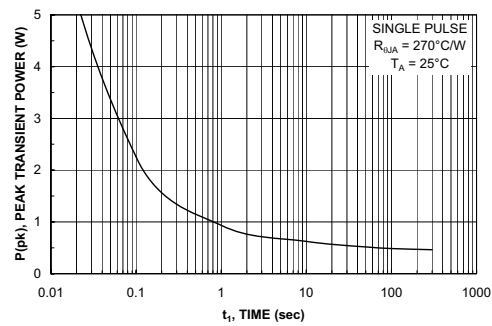Figure 8. Capacitance Characteristics.

Figure 9. Maximum Safe Operating Area.
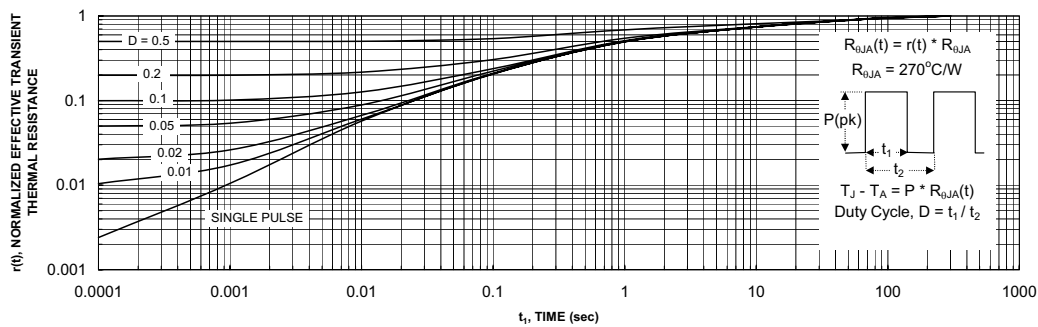

Figure 10. Single Pulse Maximum Power Dissipation.

Figure 11. Transient Thermal Response Curve.
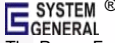
Thermal characterization performed using the conditions described in Note 1b.
Transient thermal response will change depending on the circuit board design.

![FAIRCHILD SEMICONDUCTOR®]

TRADEMARKS

The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

Build it Now™	FRFET®	Programmable Active Droop™	the p⏻wer franchise
CorePLUS™	Global Power Resource℠	QFET®	TinyBoost™
CorePOWER™	Green FPS™	QS™	TinyBuck™
CROSSVOLT™	Green FPS™ e-Series™	Quiet Series™	TinyLogic®
CTL™	GTO™	RapidConfigure™	TINYOPTO™
Current Transfer Logic™	IntelliMAX™		TinyPower™
EcoSPARK®	ISOPLANAR™	◯ ™	TinyPWM™
EfficentMax™	MegaBuck™	Saving our world, 1mW /W /kW at a time™	TinyWire™
EZSWITCH™ *	MICROCOUPLER™	SmartMax™	TriFault Detect™
E² ™	MicroFET™	SMART START™	µSerDes™
F®	MicroPak™	SPM®	
Fairchild®	MillerDrive™	STEALTH™	µ SerDes™
Fairchild Semiconductor®	MotionMax™	SuperFET™	UHC®
FACT Quiet Series™	Motion-SPM™	SuperSOT™-3	Ultra FRFET™
FACT®	OPTOLOGIC®	SuperSOT™-6	UniFET™
FAST®	OPTOPLANAR®	SuperSOT™-8	VCX™
FastvCore™	®	SupreMOS™	VisualMax™
FlashWriter® *	⏻	SyncFET™	XS™
FPS™	PDP SPM™		
F-PFS™	Power-SPM™	⬙ SYSTEM GENERAL ®	
	PowerTrench®	The Power Franchise®	
	PowerXS™		

* EZSWITCH™ and FlashWriter® are trademarks of System General Corporation, used under license by Fairchild Semiconductor.

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. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

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, and (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 a significant injury of the user.

2. A critical component in 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.

ANTI-COUNTERFEITING POLICY
Fairchild Semiconductor Corporation's Anti-Counterfeiting Policy. Farichild's Anti-Counterfeiting Policy is also stated on our external website, www.fairchildsemi.com, under Sales Support.

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufactures of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed application, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Farichild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handing and storage and provide access to Farichild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address and warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Farichild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

PRODUCT STATUS DEFINITIONS
Definition of Terms

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

Rev. I38