FAIRCHILD SEMICONDUCTOR™

October 2001

FDS9435A

30V P-Channel PowerTrench® MOSFET

General Description

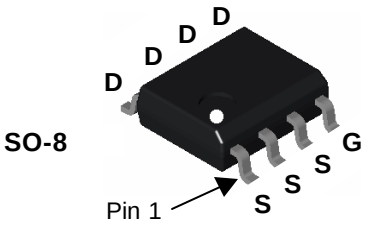
This P-Channel MOSFET is a rugged gate version of Fairchild Semiconductor's advanced PowerTrench process. It has been optimized for power management applications requiring a wide range of gave drive voltage ratings (4.5V – 25V).

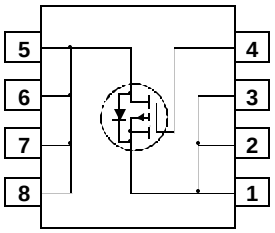
Applications

- Power management
- Load switch
- Battery protection

Features

- –5.3 A, –30 V $R_{DS(ON)}$ = 50 mΩ @ V_{GS} = –10 V
  $R_{DS(ON)}$ = 80 mΩ @ V_{GS} = –4.5 V
- Low gate charge
- Fast switching speed
- High performance trench technology for extremely low $R_{DS(ON)}$
- High power and current handling capability





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		±25	V
I_D	Drain Current – Continuous	(Note 1a)	–5.3	A
	– Pulsed		–50	
P_D	Power Dissipation for Single Operation	(Note 1a)	2.5	W
		(Note 1b)	1.2	
		(Note 1c)	1	
T_J, T_{STG}	Operating and Storage Junction Temperature Range		–55 to +175	°C

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1a)	50	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1c)	125	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	(Note 1)	25	°C/W

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
FDS9435A	FDS9435A	13"	12mm	2500 units

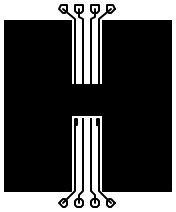
Electrical Characteristics

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		–23		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = –24 V, V_{GS} = 0 V			–1	µA
I_{GSSF}	Gate–Body Leakage, Forward	V_{GS} = 25 V, V_{DS} = 0 V			100	nA
I_{GSSR}	Gate–Body Leakage, Reverse	V_{GS} = –25 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	–1.7	–3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = –250 µA, Referenced to 25°C		4.5		mV/°C
$R_{DS(on)}$	Static Drain–Source On–Resistance	V_{GS} = –10 V, I_D = –5.3 A V_{GS} = –4.5 V, I_D = –4 A V_{GS}= –10 V, I_D = –5.3 A, T_J=125°C		42 65 57	50 80 77	mΩ
$I_{D(on)}$	On–State Drain Current	V_{GS} = –10 V, V_{DS} = –5 V	–25			A
g_{FS}	Forward Transconductance	V_{DS} = –5 V, I_D = –5.3 A		10		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = –15 V, V_{GS} = 0 V, f = 1.0 MHz		528		pF
C_{oss}	Output Capacitance			132		pF
C_{rss}	Reverse Transfer Capacitance			70		pF
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		7	14	ns
t_r	Turn–On Rise Time			13	24	ns
$t_{d(off)}$	Turn–Off Delay Time			14	25	ns
t_f	Turn–Off Fall Time			9	17	ns
Q_g	Total Gate Charge	V_{DS} = –15 V, I_D = –4 A, V_{GS} = –10 V		10	14	nC
Q_{gs}	Gate–Source Charge			2.2		nC
Q_{gd}	Gate–Drain Charge			2		nC
Drain–Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain–Source Diode Forward Current				–2.1	A
V_{SD}	Drain–Source Diode Forward Voltage	V_{GS} = 0 V, I_S = –2.1 A (Note 2)		–0.8	–1.2	V

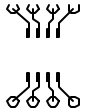
Notes:

1. $R_{\theta JA}$ 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) 50°C/W when mounted on a 1in² pad of 2 oz copper

b) 105°C/W when mounted on a .04 in² pad of 2 oz copper



c) 125°C/W when mounted on a minimum pad.

Scale 1 : 1 on letter size paper

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

Typical Characteristics

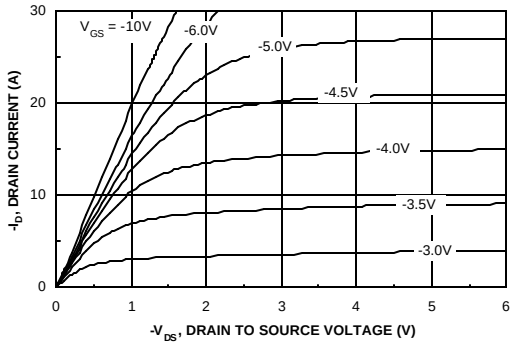


Figure 1. On-Region Characteristics.

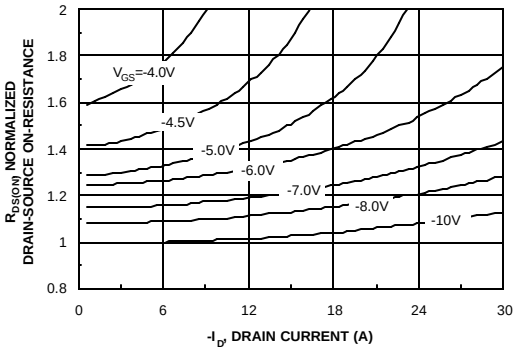


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

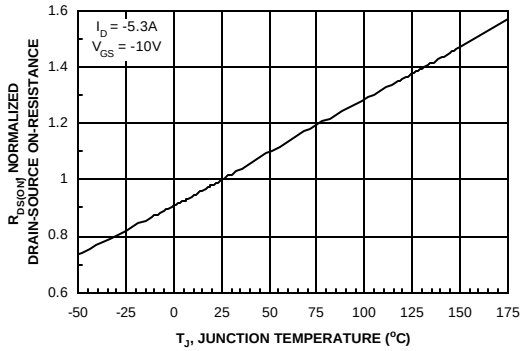


Figure 3. On-Resistance Variation with Temperature.

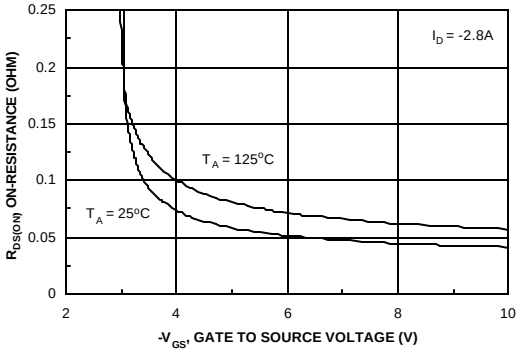


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

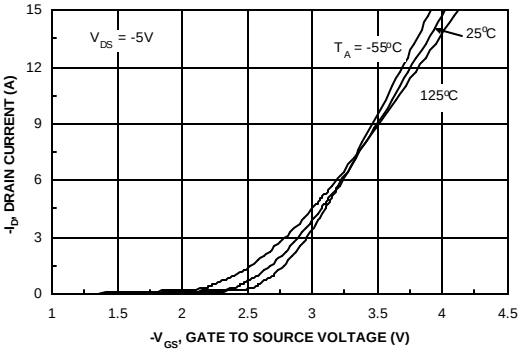


Figure 5. Transfer Characteristics.

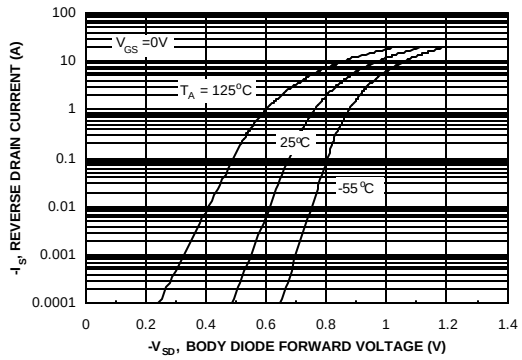


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics

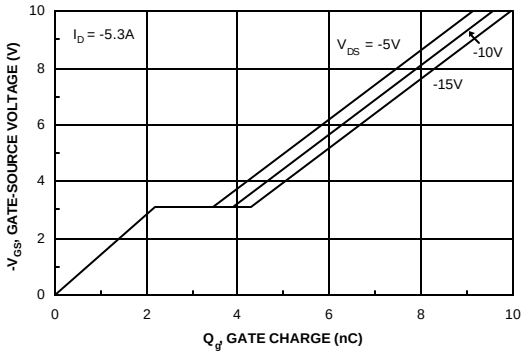


Figure 7. Gate Charge Characteristics.

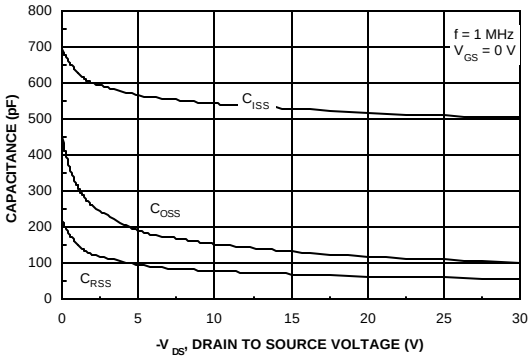


Figure 8. Capacitance Characteristics.

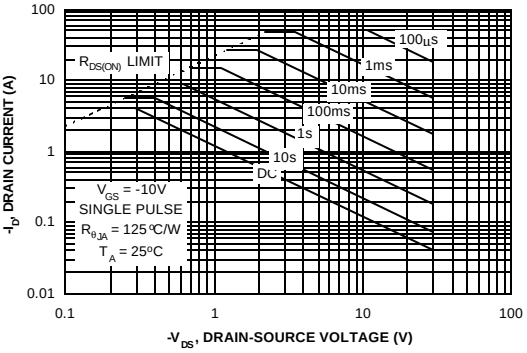


Figure 9. Maximum Safe Operating Area.

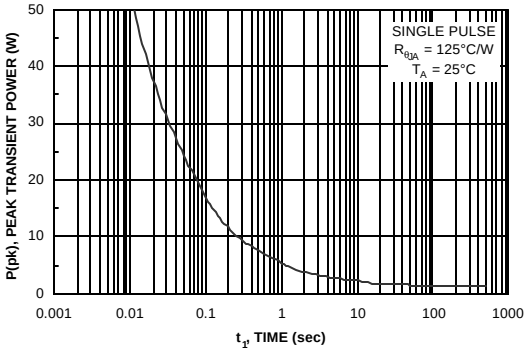


Figure 10. Single Pulse Maximum Power Dissipation.

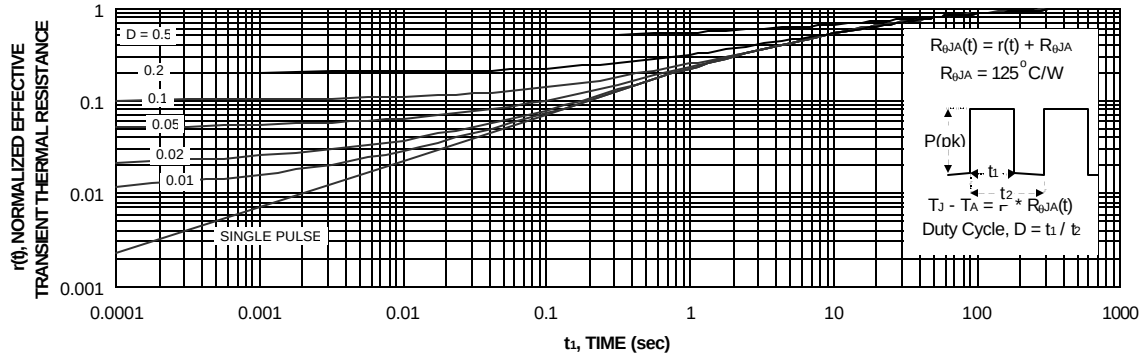


Figure 11. Transient Thermal Response Curve.

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

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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.

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- Fast switching speed
- High density cell design for extremely low $R_{DS(ON)}$.
- High power and current handling capability

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Applications

- Power management
- Load switch
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Product status/pricing/packaging BUY

Product	Product status	Pb-free Status	Pricing*	Package type	Leads	Packing method	Package Marking Convention**
FDS9435A	Full Production	Full Production	$0.393	SO-8	8	TAPE REEL	Line 1: **$Y** (Fairchild logo) &**Z** (Asm. Plant Code) &**2** (2-Digit Date Code) &**T** (Die Trace Code) Line 2: FDS Line 3: 9435A

* Fairchild 1,000 piece Budgetary Pricing
** A sample button will appear if the part is available through Fairchild's on-line samples program. If there is no sample button, please contact a Fairchild distributor to obtain samples

Indicates product with Pb-free second-level interconnect. For more information click here.

Package marking information for product FDS9435A is available. Click here for more information .

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Models

Package & leads	Condition	Temperature range	Software version	Revision date
PSPICE				
SO-8-8	Electrical	25°C to 125°C	Orcad 9.1	Oct 2, 2003

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Qualification Support

Click on a product for detailed qualification data

Product
FDS9435A

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