

# FDS9435A

## 30V P-Channel PowerTrench<sup>®</sup> MOSFET

### General Description

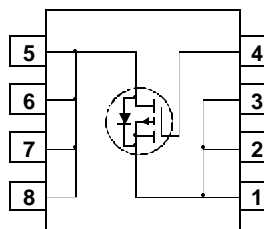
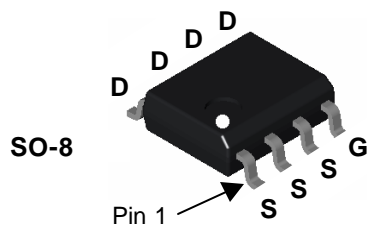
This P-Channel MOSFET is a rugged gate version of Fairchild Semiconductor's advanced PowerTrench process. It has been optimized for power management applications requiring a wide range of gate drive voltage ratings (4.5V – 25V).

### Applications

- Power management
- Load switch
- Battery protection

### Features

- -5.3 A, -30 V  $R_{DS(ON)} = 50\text{ m}\Omega$  @  $V_{GS} = -10\text{ V}$   
 $R_{DS(ON)} = 80\text{ m}\Omega$  @  $V_{GS} = -4.5\text{ V}$
- 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 $T_A=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Rated	Units
$V_{DSS}$	Drain-Source Voltage	-30	V
$V_{GSS}$	Gate-Source Voltage	$\pm 25$	V
$I_b$	Drain Current – Continuous (Note 1a) – Pulsed	-5.3	A
		-50	
$P_b$	Power Dissipation for Single Operation (Note 1a) (Note 1b) (Note 1c)	2.5	W
		1.2	
		1	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +175	$^\circ\text{C}$

### Thermal Characteristics

Symbol	Parameter	Rated	Units
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1a)	50	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1c)	125	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case (Note 1)	25	$^\circ\text{C/W}$

### Package Marking and Ordering Information

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

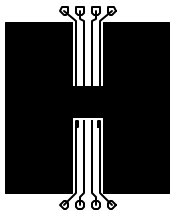
## Electrical Characteristics

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

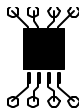
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
<b>Off Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_b = -250\ \mu\text{A}$	-30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_b = -250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$		-23		mV/°C
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = -24\text{ V}, V_{GS} = 0\text{ V}$			-1	$\mu\text{A}$
$I_{GSSF}$	Gate-Body Leakage, Forward	$V_{GS} = 25\text{ V}, V_{DS} = 0\text{ V}$			100	nA
$I_{GSSR}$	Gate-Body Leakage, Reverse	$V_{GS} = -25\text{ V}, V_{DS} = 0\text{ V}$			-100	nA
<b>On Characteristics (Note 2)</b>						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_b = -250\ \mu\text{A}$	-1	-1.7	-3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_b = -250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$		4.5		mV/°C
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = -10\text{ V}, I_b = -5.3\text{ A}$ $V_{GS} = -4.5\text{ V}, I_b = -4\text{ A}$ $V_{GS} = -10\text{ V}, I_b = -5.3\text{ A}, T_J = 125^\circ\text{C}$		42 65 57	50 80 77	m $\Omega$
$I_{D(on)}$	On-State Drain Current	$V_{GS} = -10\text{ V}, V_{DS} = -5\text{ V}$	-25			A
$g_{FS}$	Forward Transconductance	$V_{DS} = -5\text{ V}, I_b = -5.3\text{ A}$		10		S
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{DS} = -15\text{ V}, V_{GS} = 0\text{ V},$		528		pF
$C_{oss}$	Output Capacitance	$f = 1.0\text{ MHz}$		132		pF
$C_{rss}$	Reverse Transfer Capacitance			70		pF
<b>Switching Characteristics (Note 2)</b>						
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -15\text{ V}, I_b = -1\text{ A},$		7	14	ns
$t_r$	Turn-On Rise Time	$V_{GS} = -10\text{ V}, R_{GEN} = 6\ \Omega$		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	$V_{DS} = -15\text{ V}, I_b = -4\text{ A},$		10	14	nC
$Q_{gs}$	Gate-Source Charge	$V_{GS} = -10\text{ V}$		2.2		nC
$Q_{gd}$	Gate-Drain Charge			2		nC
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
$I_S$	Maximum Continuous Drain-Source Diode Forward Current				-2.1	A
$V_{SD}$	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = -2.1\text{ A}$ (Note 2)		-0.8	-1.2	V

**Notes:**

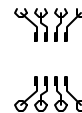
- $R_{\theta JA}$  is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta CA}$  is determined by the user's board design.



a)  $50^\circ\text{C/W}$  when mounted on a  $1\text{ in}^2$  pad of 2 oz copper



b)  $105^\circ\text{C/W}$  when mounted on a  $.04\text{ in}^2$  pad of 2 oz copper



c)  $125^\circ\text{C/W}$  when mounted on a minimum pad.

Scale 1 : 1 on letter size paper

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

## Typical Characteristics

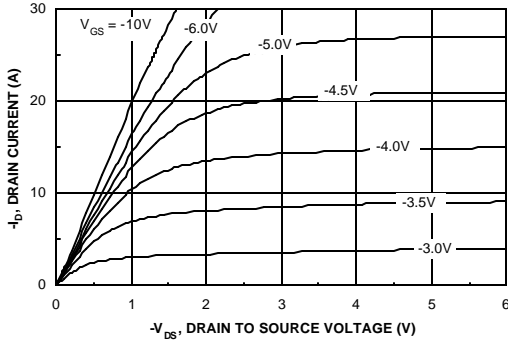


Figure 1. On-Region Characteristics.

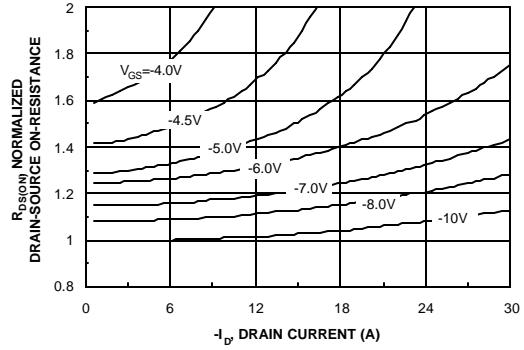


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

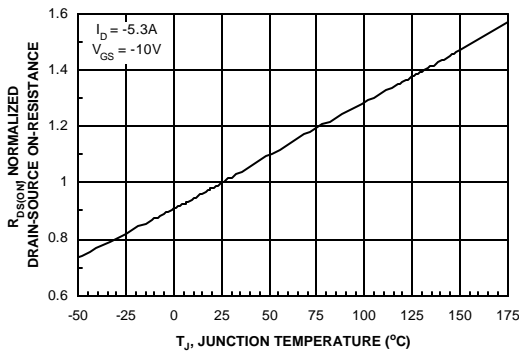


Figure 3. On-Resistance Variation with Temperature.

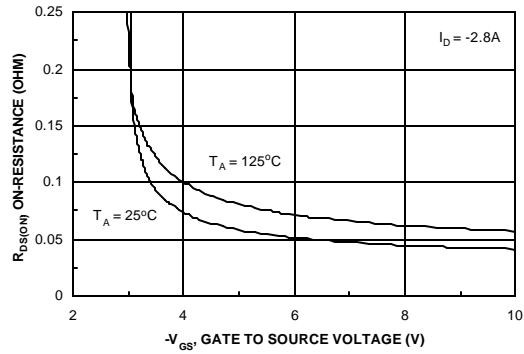


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

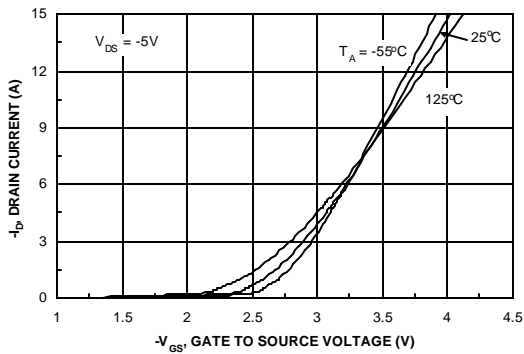


Figure 5. Transfer Characteristics.

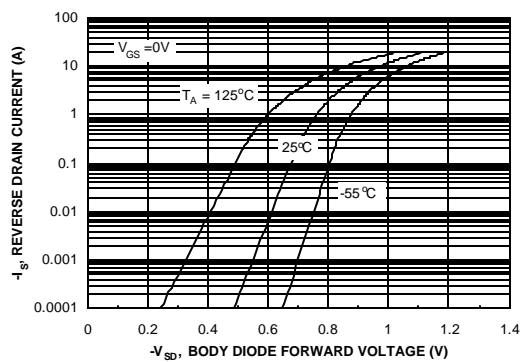


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics

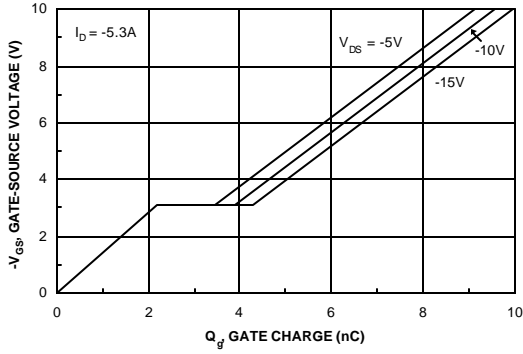


Figure 7. Gate Charge Characteristics.

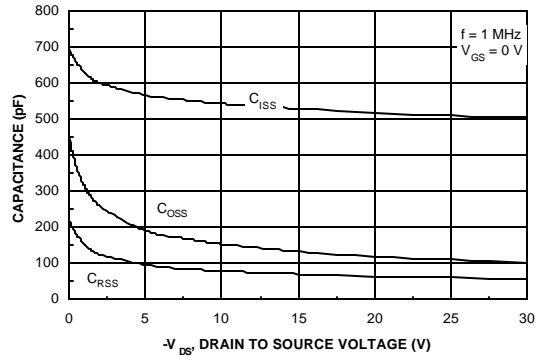


Figure 8. Capacitance Characteristics.

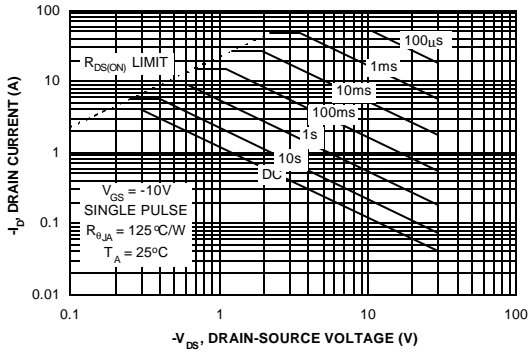


Figure 9. Maximum Safe Operating Area.

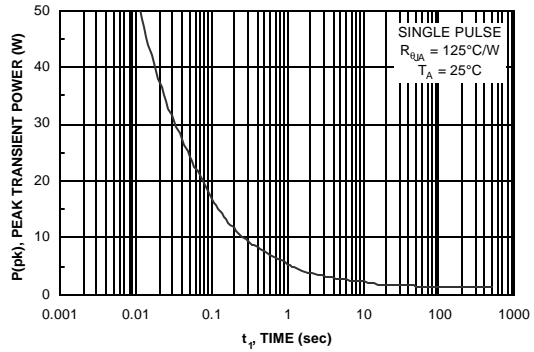


Figure 10. Single Pulse Maximum Power Dissipation.

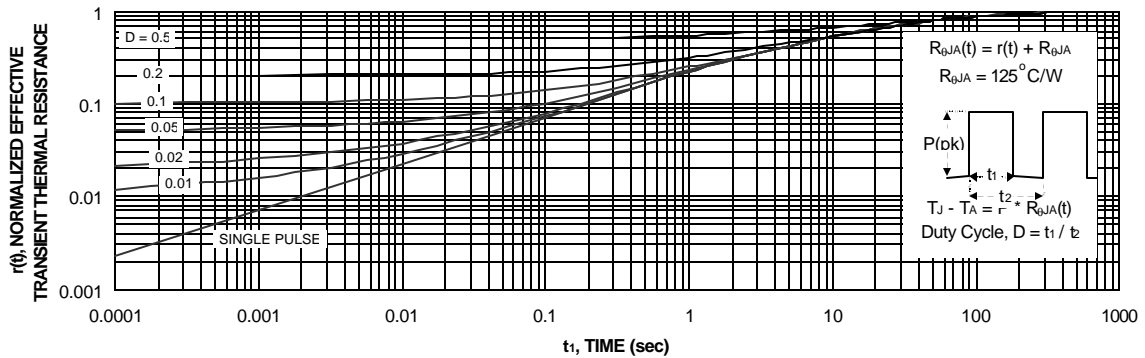


Figure 11. Transient Thermal Response Curve.

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

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### 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.
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## FDS9435A

30V P-Channel PowerTrench MOSFET

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### General description

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### Applications

- Power management
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BUY

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Product status/pricing/packageing

**BUY**

Product	Product status	Pb-free Status	Pricing*	Package type	Leads	Packing method	Package Marking Convention**
FDS9435A	Full Production	 Full Production	\$0.393	<a href="#">SO-8</a>	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
<b>PSPICE</b>				
SO-8-8	<a href="#">Electrical</a>	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
<a href="#">FDS9435A</a>

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