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FDS4435A

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FAIRCHILD SEMICONDUCTOR™

October 2001

FDS4435A

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P-Channel Logic Level PowerTrench® MOSFET

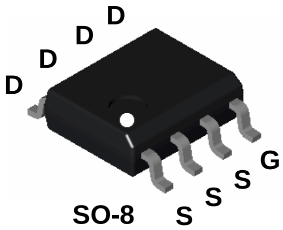
General Description

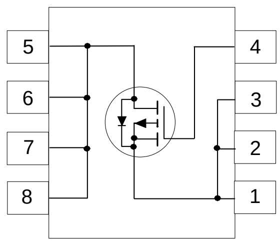
This P-Channel Logic Level MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench process that has been especially tailored to minimize the on-state resistance and yet maintain low gate charge for superior switching performance.

These devices are well suited for notebook computer applications: load switching and power management, battery charging circuits, and DC/DC conversion.

Features

- -9 A, -30 V. $R_{DS(ON)}$ = 0.017 Ω @ V_{GS} = -10 V
  $R_{DS(ON)}$ = 0.025 Ω @ V_{GS} = -4.5 V
- Low gate charge (21nC typical).
- 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		± 20	V
I_D	Drain Current - Continuous	(Note 1a)	-9	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 +150	°C

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1a)	50	°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
FDS4435A	FDS4435A	13''	12mm	2500 units

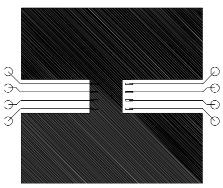
Electrical Characteristics

T_A = 25°C unless otherwise noted

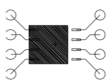
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = -250 µA	-30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = -250 µA,Referenced to 25°C		-26		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = -24 V, V_{GS} = 0			-1	µA
		T_J = 125°C			-10	
I_{GSSF}	Gate-Body Leakage Current, Forward	V_{GS} = 20 V, V_{DS} = 0 V			100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	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	-1.7	-2	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = -250 µA,Referenced to 25°C		4.2		mV/°C
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = -10 V, I_D = -9 A		0.015	0.017	Ω
		T_J = 125°C		0.021	0.030	
		V_{GS} = -4.5 V, I_D = -7 A		0.023	0.025	
$I_{D(on)}$	On-State Drain Current	V_{GS} = -10 V, V_{DS} = -5 V	-40			A
g_{FS}	Forward Transconductance	V_{DS} = -10 V, I_D = -9 A		25		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = -15 V, V_{GS} = 0 V f = 1.0 MHz		2010		pF
C_{oss}	Output Capacitance			590		pF
C_{rss}	Reverse Transfer Capacitance			260		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		12	22	ns
t_r	Turn-On Rise Time			15	27	ns
$t_{d(off)}$	Turn-Off Delay Time			100	140	ns
t_f	Turn-Off Fall Time			55	80	ns
Q_g	Total Gate Charge	V_{DS} = -15 V, I_D = -9 A V_{GS} = -5 V,		21	30	nC
Q_{gs}	Gate-Source Charge			6		nC
Q_{gd}	Gate-Drain Charge			8		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)		0.75	-1.2	V
t_{rr}	Source-Drain Reverse Recovery Time	I_F = -10 A, dI_F/dt = 100 A/µS		36	80	ns

Notes:

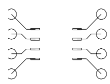
1: $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a) 50° C/W when mounted on a 1 in² pad of 2 oz. copper.



b) 105° C/W when mounted on a 0.04 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 ≤ 300 µs, Duty Cycle ≤ 2.0%

Typical Characteristics

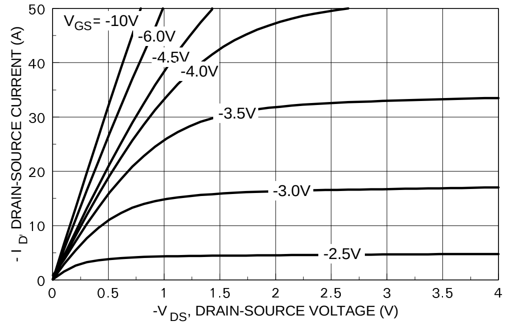


Figure 1. On-Region Characteristics

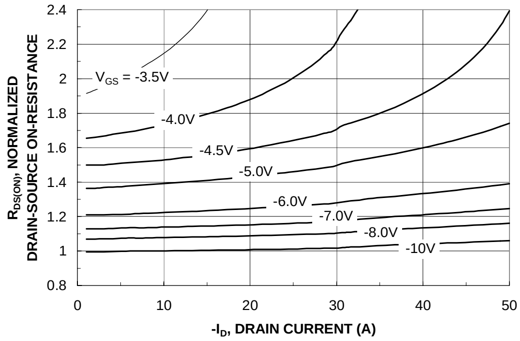


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage

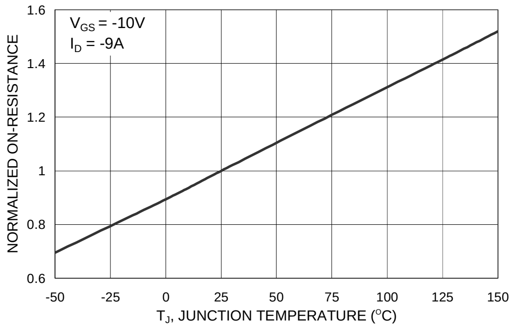


Figure 3. On-Resistance Variation with Temperature

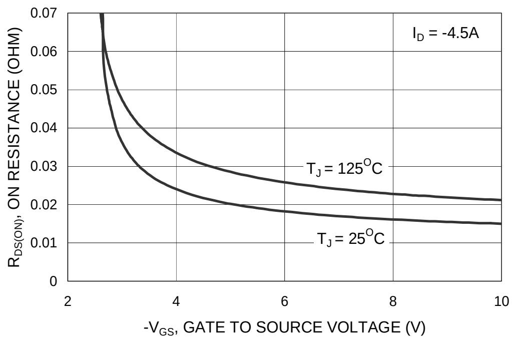


Figure 4. On-Resistance Variation with Gate-to-Source Voltage

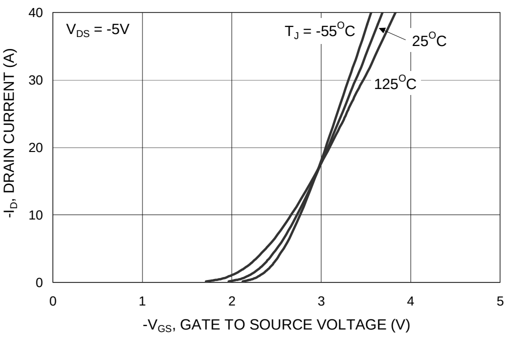


Figure 5. Transfer Characteristics

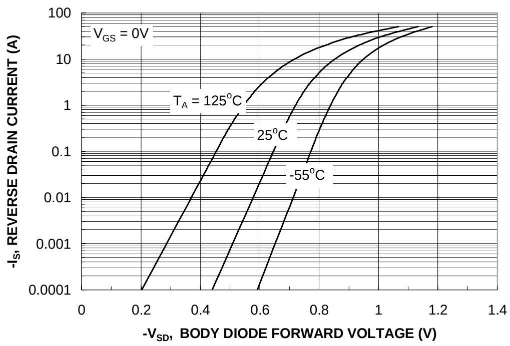


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature

Typical Characteristics (continued)

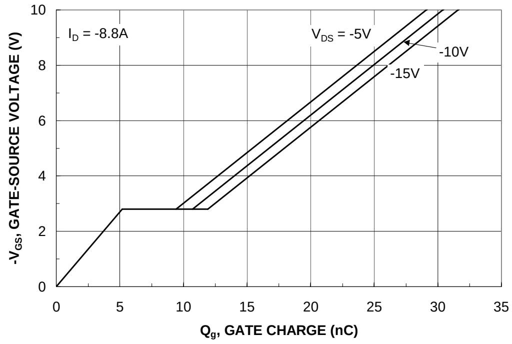


Figure 7. Gate-Charge Characteristics

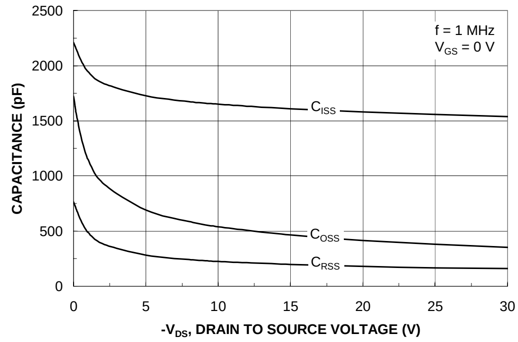


Figure 8. Capacitance Characteristics

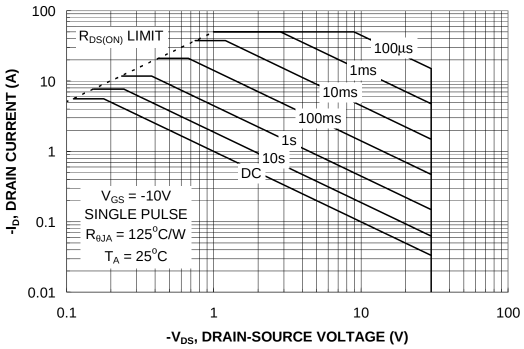


Figure 9. Maximum Safe Operating Area

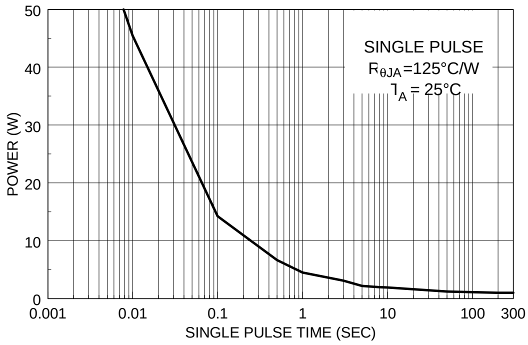


Figure 10. Single Pulse Maximum Power Dissipation

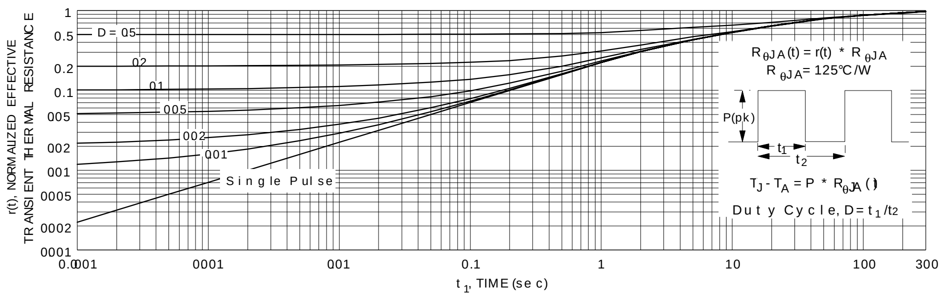


Figure 11. Transient Thermal Response Curve.

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

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