FAIRCHILD SEMICONDUCTOR™

September 1999

Si4532DY*

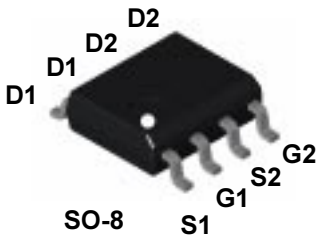
Dual N- and P-Channel Enhancement Mode Field Effect Transistor

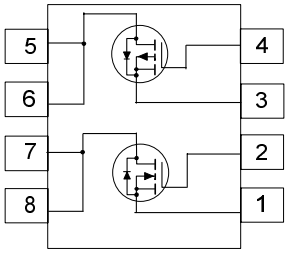
General Description

These dual N- and P-Channel enhancement mode power field effect transistors are produced using Fairchild's propretary, high cell density, DMOS technology. This very high density process is especially tailored to minimize on-state resistance and provide superior switching performance. These devices are particularly suited for low voltage applications such as notebook computer power management and other battery powered circuits where fast switching, low in-line power loss, and resistance to transients are needed.

Features

- N-Channel 3.9A, 30V. $R_{DS(ON)}$ = 0.065Ω @V_{GS} = 10V
  $R_{DS(ON)}$ = 0.095Ω @V_{GS} = 4.5V.
- P-Channel -3.5A,-30V. $R_{DS(ON)}$= 0.085Ω @V_{GS} = -10V
  $R_{DS(ON)}$= 0.190 Ω @V_{GS} = -4.5V.
- High density cell design for extremely low $R_{DS(ON)}$.
- High power and current handling capability in a widely used surface mount package.
- Dual (N & P-Channel) MOSFET in surface mount package.





Absolute Maximum Ratings T_A = 25°C unless otherwise noted

Symbol	Parameter		N-Channel	P-Channel	Units
V_{DSS}	Drain-Source Voltage		30	-30	V
V_{GSS}	Gate-Source Voltage		20	-20	V
I_D	Drain Current - Continuous	(Note 1a)	3.9	-3.5	A
	- Pulsed		20	-20	
P_D	Power Dissipation for Dual Operation		2		W
	Power Dissipation for Single Operation	(Note 1a)	1.6		
		(Note 1b)	1		
		(Note 1c)	0.9		
T_J, T_{STG}	Operating and Storage Junction Temperature Range		-55 to +150		°C

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62.5	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case (Note 1)	40	°C/W

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape Width	Quantity
4532	Si4532DY	13”	12mm	2500 units

* Die and manufacturing source subject to change without prior notification.

Electrical Characteristics

T_A = 25°C unless otherwise noted

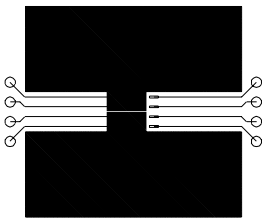
Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
Off Characteristics							
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 μA	N-Ch	30			V
		V_{GS} = 0 V, I_D = -250 μA	P-Ch	-30			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 24 V, V_{GS} = 0 V	N-Ch			1	μA
		V_{DS} = -24 V, V_{GS} = 0 V	P-Ch			-1	μA
I_{GSSF}	Gate-Body Leakage, Forward	V_{GS} = 20 V, V_{DS} = 0 V	All			100	nA
I_{GSSR}	Gate-Body Leakage, Reverse	V_{GS} = -20 V, V_{DS} = 0 V	All			-100	nA
On Characteristics (Note 2)							
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 μA	N-Ch	1		3	V
		V_{DS} = V_{GS}, I_D = -250 μA	P-Ch	-1		-3	V
$R_{DS(on)}$	Static Drain-Source On Resistance	V_{GS} = 10 V, I_D = 3.9 A	N-Ch		0.053	0.065	Ω
		V_{GS} = 4.5 V, I_D = 3.1 A			0.081	0.095	
		V_{GS} = -10 V, I_D = -2.5 A	P-Ch		0.06	0.085	
		V_{GS} = -4.5 V, I_D = -1.8 A			0.095	0.19	
$I_{D(on)}$	On-State Drain Current	V_{GS} = 10 V, V_{DS} = 5 V	N-Ch	15			A
		V_{GS} = -10 V, V_{DS} = -5 V	P-Ch	-15			
g_{FS}	Forward Transconductance	V_{DS} = 15 V, I_D = 3.9 A	N-Ch		7		S
		V_{DS} = -15 V, I_D = -2.5 A	P-Ch		5		
Dynamic Characteristics							
C_{iss}	Input Capacitance	V_{DS} = 10 V, V_{GS} = 0 V, f = 1.0 MHz	N-Ch		235		pF
			P-Ch		420		
C_{oss}	Input Capacitance	V_{DS} = -10 V, V_{GS} = 0 V, f = 1.0 MHz	N-Ch		150		pF
			P-Ch		140		
C_{rss}	Reverse Transfer Capacitance		N-Ch		49		pF
			P-Ch		60		

Electrical Characteristics (continued)

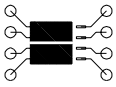
Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
Switching Characteristics (Note 2)							
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 10 V, I_D = 1 A, V_{GS} = 10 V, R_{GEN} = 6 Ω	N-Ch		7	13	ns
			P-Ch		9	18	
t_r	Turn-On Rise Time		N-Ch		18	29	ns
			P-Ch		8	16	
$t_{d(off)}$	Turn-Off Delay Time	V_{DD} = -10 V, I_D = -2.5 A, V_{GS} = -10 V, R_{GEN} = 6 Ω	N-Ch		15	27	ns
			P-Ch		18	29	
t_f	Turn-Off Fall Time		N-Ch		0.8	8	ns
			P-Ch		6	12	
t_{rr}	Drain-Source Reverse Recovery Time	I_F = 1.7 A, di/dt = 100A/μs	N-Ch			80	nS
		I_F = -1.7 A, di/dt = 100A/μs	P-Ch			80	
Q_g	Total Gate Charge	V_{DS} = 10 V, I_D = 3.9 A, V_{GS} = 10 V	N-Ch		3.7	15	nC
			P-Ch		5	15	
Q_{gs}	Gate-Source Charge	V_{DS} = -10 V, I_D = -2.5 A, V_{GS} = -10 V	N-Ch		0.9		nC
			P-Ch		1.7		
Q_{gd}	Gate-Drain Charge		N-Ch		1.9		nC
			P-Ch		1.8		
Drain-Source Diode Characteristics and Maximum Ratings							
I_S	Maximum Continuous Drain-Source Diode Forward Current		N-Ch			1.7	A
			P-Ch			-1.7	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 1.7 A (Note 2)	N-Ch		0.75	1.2	V
		V_{GS} = 0 V, I_S = -1.7 A (Note 2)	P-Ch		-0.75	-1.2	V

Notes:

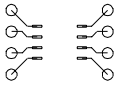
1. $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a) 78° C/W when mounted on a 0.05 in² pad of 2 oz. copper.



b) 125° C/W when mounted on a 0.02 in² pad of 2 oz. copper.



c) 135° C/W when mounted on a minimum mounting pad.

Scale 1 : 1 on letter size paper

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

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™
Bottomless™
CoolFET™
CROSSVOLT™
DOME™
E²CMOS™
EnSigna™
FACT™
FACT Quiet Series™
FAST®
FASTr™
GlobalOptoisolator™
GTO™
HiSeC™
ISOPLANAR™
MICROWIRE™
OPTOLOGIC™
OPTOPLANAR™
PACMAN™
POP™
PowerTrench®
QFET™
QS™
QT Optoelectronics™
Quiet Series™
SILENT SWITCHER®
SMART START™
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
SyncFET™
TinyLogic™
UHC™
VCX™

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.