FAIRCHILD SEMICONDUCTOR™

September 1999

Si9410DY*

Single N-Channel Enhancement Mode MOSFET

General Description

This N-Channel Enhancement Mode MOSFET is produced using Fairchild Semiconductor's advance process that has been especially tailored to minimize on-state resistance and yet maintain superior switching performance.

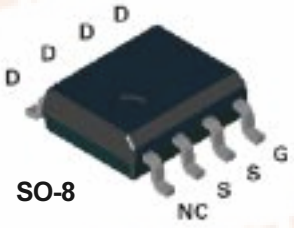
This device is well suited for low voltage and battery powered applications where low in-line power loss and fast switching are required.

Features

- 7.0 A, 30 V. $R_{DS(ON)}$ = 0.030 Ω @ V_{GS} = 10 V
  $R_{DS(ON)}$ = 0.050 Ω @ V_{GS} = 4.5 V
- Low gate charge.
- Fast switching speed.
- High power and current handling capability.

Applications

- Battery switch
- Load switch
- Motor controls



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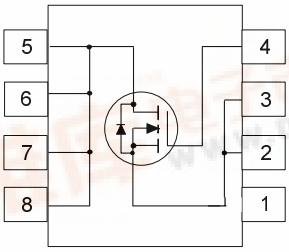


Absolute Maximum Ratings T_A = 25°C unless otherwise noted

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)	7.0	A
	- Pulsed		30	
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 Outlines and Ordering Information

Device Marking	Device	Reel Size	Tape Width	Quantity
9410	SI9410DY	13"	12mm	2500 units

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

Electrical Characteristics

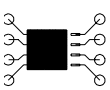
T_A = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	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		31		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 24 V, V_{GS} = 0 V V_{DS} = 24 V, V_{GS} = 0 V, T_J = 55°C			2 25	μA
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			V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = -250 μA, Referenced to 25°C		-4.4		mV/°C
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = 10 V, I_D = 7 A V_{GS} = 5 V, I_D = 4 A V_{GS} = 4.5 V, I_D = 3.5 A		0.024 0.034 0.037	0.030 0.040 0.050	Ω
$I_{D(on)}$	On-State Drain Current	V_{GS} = 10 V, V_{DS} = 5 V	30			A
g_{FS}	Forward Transconductance	V_{DS} = 15 V, I_D = 7 A		18		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 15 V, V_{GS} = 0 V, f = 1.0 MHz		650		pF
C_{oss}	Output Capacitance			345		pF
C_{rss}	Reverse Transfer Capacitance			95		pF
Switching Characteristics (Note 2)						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 25 V, I_D = 1 A, R_L = 25 Ω V_{GS} = 10 V, R_{GEN} = 6 Ω		8	30	ns
t_r	Turn-On Rise Time			14	60	ns
$t_{d(off)}$	Turn-Off Delay Time			23	150	ns
t_f	Turn-Off Fall Time			9	140	ns
t_{rr}	Drain-Source Reverse Recovery Time	I_F = 2 A, di/dt = 100A/μs		60		nS
Q_g	Total Gate Charge	V_{DS} = 15 V, I_D = 2 A, V_{GS} = 10 V		19	50	nC
Q_{gs}	Gate-Source Charge			3.2		nC
Q_{gd}	Gate-Drain Charge			4.3		nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current				2.0	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 2 A (Note 2)		0.7	1.1	V

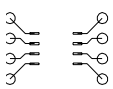
Notes:

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) 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 on a minimum mounting pad.

Scale 1 : 1 on letter size paper

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

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