



September 1999

Si9410DY

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.

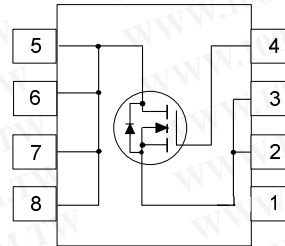
This device is well suited for low voltage and battery powered applications where low in-line power loss and fast switching are required.

Features

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

Applications

- Battery switch
- Load switch
- Motor controls



Absolute Maximum Ratings $T_A = 25^\circ\text{C}$ 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) (Note 1b) (Note 1c)	2.5	W
		1.2	
		1	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$

Thermal Characteristics

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

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

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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Off Characteristics

BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$, Referenced to 25°C		31		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 24\text{ V}, V_{GS} = 0\text{ V}$ $V_{DS} = 24\text{ V}, V_{GS} = 0\text{ V}, T_J = 55^\circ\text{C}$			2 25	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	$V_{GS} = 20\text{ V}, V_{DS} = 0\text{ V}$			100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	$V_{GS} = -20\text{ V}, V_{DS} = 0\text{ V}$			-100	nA

On Characteristics (Note 2)

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	1			V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_D = -250\text{ }\mu\text{A}$, Referenced to 25°C		-4.4		mV/ $^\circ\text{C}$
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 7\text{ A}$ $V_{GS} = 5\text{ V}, I_D = 4\text{ A}$ $V_{GS} = 4.5\text{ V}, I_D = 3.5\text{ A}$		0.024 0.034 0.037	0.030 0.040 0.050	Ω
$I_{D(on)}$	On-State Drain Current	$V_{GS} = 10\text{ V}, V_{DS} = 5\text{ V}$	30			A
g_{FS}	Forward Transconductance	$V_{DS} = 15\text{ V}, I_D = 7\text{ A}$		18		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$		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	$V_{DD} = 25\text{ V}, I_D = 1\text{ A}, R_L = 25\text{ }\Omega$ $V_{GS} = 10\text{ V}, R_{GEN} = 6\text{ }\Omega$		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	$I_F = 2\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		60		nS
Q_g	Total Gate Charge	$V_{DS} = 15\text{ V}, I_D = 2\text{ A},$ $V_{GS} = 10\text{ V}$		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

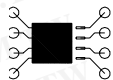
I_S	Maximum Continuous Drain-Source Diode Forward Current				2.0	A
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 2\text{ A}$ (Note 2)		0.7	1.1	V

Notes:

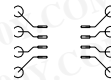
- 1: $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



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



b) 105° C/W when mounted on a 0.04 in^2 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 $\leq 300\text{ }\mu\text{s}$, Duty Cycle $\leq 2.0\%$

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