FAIRCHILD SEMICONDUCTOR™

June 1999

Si9953DY*

Dual P-Channel Enhancement Mode MOSFET

General Description

These P-Channel Enhancement Mode MOSFETs are produced using Fairchild Semiconductor's advance process that has been especially tailored to minimize on-state resistance and yet maintain superior switching performance.

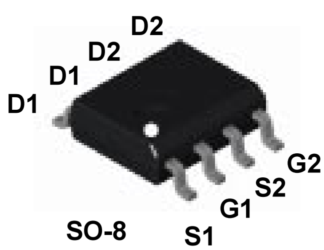
These devices are well suited for low voltage and battery powered applications where low in-line power loss and fast switching are required.

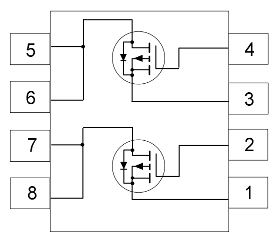
Features

- -2.3 A, -20 V. $R_{DS(on)}$ = 0.250 Ω @ V_{GS} = -10 V
  $R_{DS(on)}$ = 0.400 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





Absolute Maximum Ratings

T_A=25°C unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{DSS}	Drain-Source Voltage		-20	V
V_{GSS}	Gate-Source Voltage		±20	V
I_D	Drain Current - Continuous	(Note 1a)	-2.3	A
	- Pulsed		-10	
P_D	Power Dissipation for Dual Operation		2.0	W
	Power Dissipation for Single Operation	(Note 1a)	1.6	
		(Note 1b)	1.0	
		(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
9953	Si9953DY	13''	12mm	2500 units

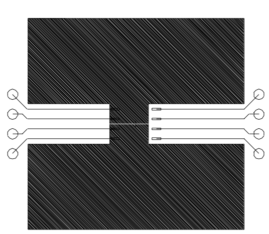
* Die and manufacturing source subject to change without prior notification.

Electrical Characteristics
T_A = 25°C unless otherwise noted

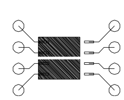
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = -250 μA	-20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = -250 μA,Referenced to 25°C		-16		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = -16 V, V_{GS} = 0 V V_{DS} = -16 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	-1.0			V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = -250 μA,Referenced to 25°C		3.5		mV/°C
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = -10 V, I_D = -1 A V_{GS} = -10 V, I_D = -1 A,T_J=125°C V_{GS} = -4.5 V, I_D = -0.5 A		0.11 0.15 0.24	0.25 0.30 0.40	Ω
$I_{D(on)}$	On-State Drain Current	V_{GS} = -10 V, V_{DS} = -5 V V_{GS} = -4.5 V, V_{DS} = -5 V	-10 -1.5			A
g_{FS}	Forward Transconductance	V_{DS} = -15 V, I_D = -2.3 A		4		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = -10 V, V_{GS} = 0 V, f = 1.0 MHz		350		pF
C_{oss}	Output Capacitance			260		pF
C_{rss}	Reverse Transfer Capacitance			100		pF
Switching Characteristics (Note 2)						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = -10 V, I_D = -1 A, R_L = 10 Ω V_{GS} = -10 V, R_{GEN} = 6 Ω		9	40	ns
t_r	Turn-On Rise Time			21	40	ns
$t_{d(off)}$	Turn-Off Delay Time			21	90	ns
t_f	Turn-Off Fall Time			8	50	ns
t_{rr}	Drain-Source Reverse Recovery Time	I_F= -1.7 A, di/dt = 100A/μs			100	nS
Q_g	Total Gate Charge	V_{DS} = -10 V, I_D = -2.3 A, V_{GS} = -10 V		10	25	nC
Q_{gs}	Gate-Source Charge			1.6		nC
Q_{gd}	Gate-Drain Charge			3.4		nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current				-1.7	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = -1.7 A (Note 2)		-0.8	-1.2	V

Notes:

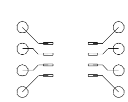
1. $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a) 78° C/W when mounted on a 0.5 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 pad of 2 oz. copper.

Scale 1 : 1 on letter size paper

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

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