FAIRCHILD SEMICONDUCTOR™

January 2001

Si9934DY

Dual P-Channel 2.5V Specified PowerTrench® MOSFET

General Description

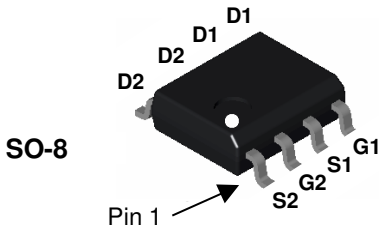
This P-Channel 2.5V specified MOSFET is a rugged gate version of Fairchild Semiconductor's advanced PowerTrench process. It has been optimized for power management applications with a wide range of gate drive voltage (2.5V – 12V).

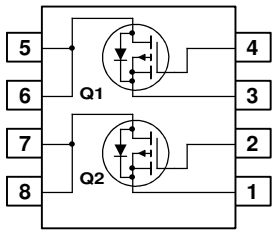
Applications

- Load switch
- Motor drive
- DC/DC conversion
- Power management

Features

- –5 A, –20 V, $R_{DS(ON)}$ = 50 mΩ @ V_{GS} = –4.5 V
  $R_{DS(ON)}$ = 74 mΩ @ V_{GS} = –2.5 V
- Extended V_{GSS} range (±12V) for battery applications
- Low gate charge
- 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		–20	V
V_{GSS}	Gate-Source Voltage		±12	V
I_D	Drain Current – Continuous	(Note 1a)	–5	A
	– Pulsed		–30	
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 +175	°C

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1a)	78	°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
9934	Si9934DY	13"	12mm	2500 units

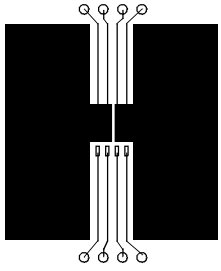
Electrical Characteristics

T_A = 25°C unless otherwise noted

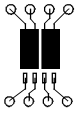
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain–Source Breakdown Voltage	V_{GS} = 0 V, I_D = –250 µA	–20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = –250 µA, Referenced to 25°C		–16		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = –16 V, V_{GS} = 0 V			–1	µA
I_{GSSF}	Gate–Body Leakage, Forward	V_{GS} = –12 V, V_{DS} = 0 V			–100	nA
I_{GSSR}	Gate–Body Leakage, Reverse	V_{GS} = 12 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	–0.6	–1.0	–1.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = –250 µA, Referenced to 25°C		3		mV/°C
$R_{DS(on)}$	Static Drain–Source On–Resistance	V_{GS} = –4.5 V, I_D = –5 A V_{GS} = –2.5 V, I_D = –3 A V_{GS} = –4.5 V, I_D = –5, T_J=125°C		36 56 49	50 74 80	mΩ
$I_{D(on)}$	On–State Drain Current	V_{GS} = –4.5 V, V_{DS} = –5 V	–15			A
g_{FS}	Forward Transconductance	V_{DS} = –5 V, I_D = –5 A		13		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = –10 V, V_{GS} = 0 V, f = 1.0 MHz		1015		pF
C_{oss}	Output Capacitance			446		pF
C_{rss}	Reverse Transfer Capacitance			118		pF
Switching Characteristics (Note 2)						
$t_{d(on)}$	Turn–On Delay Time	V_{DD} = –5 V, I_D = –1 A, V_{GS} = –4.5 V, R_{GEN} = 6 Ω		11	20	ns
t_r	Turn–On Rise Time			18	32	ns
$t_{d(off)}$	Turn–Off Delay Time			34	55	ns
t_f	Turn–Off Fall Time			34	55	ns
Q_g	Total Gate Charge	V_{DS} = –5 V, I_D = –5 A, V_{GS} = –4.5 V		9.7	16	nC
Q_{gs}	Gate–Source Charge			2.2		nC
Q_{gd}	Gate–Drain Charge			2.4		nC
Drain–Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain–Source Diode Forward Current				–1.3	A
V_{SD}	Drain–Source Diode Forward Voltage	V_{GS} = 0 V, I_S = –1.3 A (Note 2)		–0.7	–1.2	V

Notes:

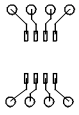
1. $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



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



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



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

Scale 1 : 1 on letter size paper

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

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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.
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