

# Si9936DY\*

## Dual N-Channel Enhancement Mode MOSFET

### General Description

These N-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.

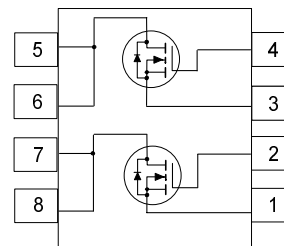
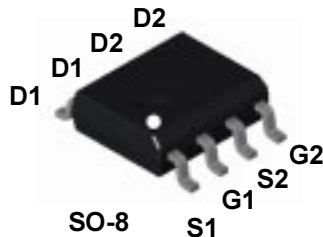
These devices are well suited for low voltage and battery powered applications where low in-line power loss and fast switching are required.

### Features

- 5.0 A, 30 V.  $R_{DS(ON)} = 0.050 \Omega @ V_{GS} = 10 \text{ V}$   
 $R_{DS(ON)} = 0.080 \Omega @ V_{GS} = 4.5 \text{ V}$
- Low gate charge.
- Fast switching speed.
- High power and current handling capability.

### Applications

- Battery switch
- Load switch
- Motor controls



### Absolute Maximum Ratings T<sub>A</sub> = 25°C unless otherwise noted

Symbol	Parameter	Ratings	Units
V <sub>DSS</sub>	Drain-Source Voltage	30	V
V <sub>GSS</sub>	Gate-Source Voltage	±20	V
I <sub>D</sub>	Drain Current - Continuous (Note 1a) - Pulsed	5.0	A
		40	
P <sub>D</sub>	Power Dissipation for Single Operation	2.0	W
	Power Dissipation for Single Operation (Note 1a)	1.6	
	(Note 1b)	1	
	(Note 1c)	0.9	
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Junction Temperature Range	-55 to +150	°C

### Thermal Characteristics

R <sub>θJA</sub>	Thermal Resistance, Junction-to-Ambient	62.5	°C/W
R <sub>θJC</sub>	Thermal Resistance, Junction-to-Case (Note 1)	40	°C/W

### Package Outlines and Ordering Information

Device Marking	Device	Reel Size	Tape Width	Quantity
9936	SI9936DY	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
<b>Off Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$		70		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 20	$\mu\text{A}$
$I_{GSSF}$	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	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	1			V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$		-4.5		mV/ $^\circ\text{C}$
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 5\text{ A}$ $V_{GS} = 10\text{ V}, I_D = 5\text{ A}, T_J = 125^\circ\text{C}$ $V_{GS} = 4.5\text{ V}, I_D = 3.9\text{ A}$		0.044 0.066 0.066	0.050 0.100 0.080	$\Omega$
$I_{D(on)}$	On-State Drain Current	$V_{GS} = 10\text{ V}, V_{DS} = 5\text{ V}$	40			A
$g_{FS}$	Forward Transconductance	$V_{DS} = 15\text{ V}, I_D = 5\text{ A}$		8		S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$		525		pF
$C_{oss}$	Output Capacitance			315		pF
$C_{rss}$	Reverse Transfer Capacitance			185		pF

### Switching Characteristics (Note 2)

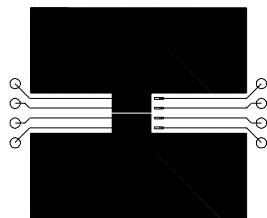
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 15\text{ V}, I_D = 1\text{ A}, R_L = 15\ \Omega$ $V_{GS} = 10\text{ V}, R_{GEN} = 6\ \Omega$		12	30	ns
$t_r$	Turn-On Rise Time			10	25	ns
$t_{d(off)}$	Turn-Off Delay Time			25	50	ns
$t_f$	Turn-Off Fall Time			10	50	ns
$t_{rr}$	Drain-Source Reverse Recovery Time	$I_F = 5\text{ A}, di/dt = 100\text{A}/\mu\text{s}$			160	nS
$Q_g$	Total Gate Charge	$V_{DS} = 15\text{ V}, I_D = 5\text{ A},$ $V_{GS} = 10\text{ V}$		17	35	nC
$Q_{gs}$	Gate-Source Charge			1.5		nC
$Q_{gd}$	Gate-Drain Charge			3.7		nC

### Drain-Source Diode Characteristics and Maximum Ratings

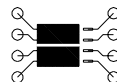
$I_S$	Maximum Continuous Drain-Source Diode Forward Current			1.7	A	
$V_{SD}$	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 1.7\text{ A}$ (Note 2)		0.78	1.2	V

**Notes:**

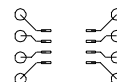
- $R_{\theta JA}$  is the sum of the junction-to-case and case-to-ambient resistance where the case thermal reference is defined as the solder mounting surface of the drain pins.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta JA}$  is determined by the user's board design.



a)  $78^\circ\text{C/W}$  when mounted on a  $0.5\text{ in}^2$  pad of 2 oz. copper.



b)  $125^\circ\text{C/W}$  when mounted on a  $0.02\text{ in}^2$  pad of 2 oz. copper.



c)  $135^\circ\text{C/W}$  when mounted on a  $0.003\text{ in}^2$  pad of 2 oz. copper.

Scale 1 : 1 on letter size paper

- Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$

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