

# Si9945DY\*

## 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.

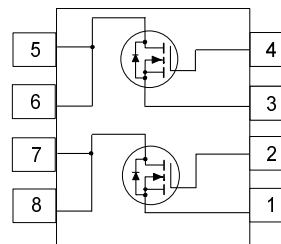
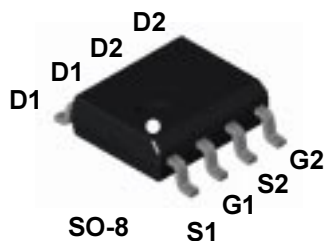
These devices are well suited for low voltage and battery powered applications where low in-line power loss and fast switching are required.

### Features

- 3.3 A, 60 V.  $R_{DS(ON)} = 0.100 \Omega @ V_{GS} = 10 V$   
 $R_{DS(ON)} = 0.200 \Omega @ V_{GS} = 4.5 V$
- Low gate charge.
- Fast switching speed.
- High power and current handling capability.

### Applications

- Battery switch
- Load switch
- Motor controls



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

Symbol	Parameter	Ratings	Units
V <sub>DSS</sub>	Drain-Source Voltage	60	V
V <sub>GSS</sub>	Gate-Source Voltage	±20	V
I <sub>D</sub>	Drain Current - Continuous (Note 1a)	3.3	A
	- Pulsed	10	
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
9945	SI9945DY	13"	12mm	2500 units

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

## Electrical Characteristics T<sub>A</sub> = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
<b>Off Characteristics</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	60			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> = 250 μA, Referenced to 25°C		60		mV/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 48 V, V <sub>GS</sub> = 0 V V <sub>DS</sub> = 48 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 55°C			1 25	μA
I <sub>GSSF</sub>	Gate-Body Leakage Current, Forward	V <sub>GS</sub> = 20 V, V <sub>DS</sub> = 0 V			100	nA
I <sub>GSSR</sub>	Gate-Body Leakage Current, Reverse	V <sub>GS</sub> = -20 V, V <sub>DS</sub> = 0 V			-100	nA

### On Characteristics (Note 2)

V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	1			V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I <sub>D</sub> = 250 μA, Referenced to 25°C		-4.5		mV/°C
R <sub>DS(on)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 3.3 A V <sub>GS</sub> = 10 V, I <sub>D</sub> = 3.3 A, T <sub>J</sub> = 125°C V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 2.5 A		0.076 0.124 0.103	0.100 0.180 0.200	Ω
I <sub>D(on)</sub>	On-State Drain Current	V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 5 V	10			A
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 3.3 A		5.3		S

### Dynamic Characteristics

C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V, f = 1.0 MHz		345		pF
C <sub>oss</sub>	Output Capacitance			110		pF
C <sub>riss</sub>	Reverse Transfer Capacitance			25		pF

### Switching Characteristics (Note 2)

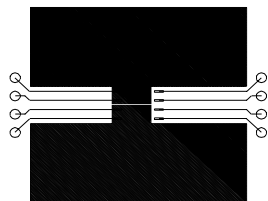
t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> = 30 V, I <sub>D</sub> = 1 A, R <sub>L</sub> = 30 Ω V <sub>GS</sub> = 10 V, R <sub>GEN</sub> = 6 Ω		5	25	ns
t <sub>r</sub>	Turn-On Rise Time			7.5	30	ns
t <sub>d(off)</sub>	Turn-Off Delay Time			20	50	ns
t <sub>f</sub>	Turn-Off Fall Time			7	40	ns
t <sub>rr</sub>	Drain-Source Reverse Recovery Time	I <sub>F</sub> = 1.7 A, di/dt = 100A/μs			100	nS
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> = 30 V, I <sub>D</sub> = 3.3 A, V <sub>GS</sub> = 10 V		13	30	nC
Q <sub>gs</sub>	Gate-Source Charge			1.7		nC
Q <sub>gd</sub>	Gate-Drain Charge			3.2		nC

### Drain-Source Diode Characteristics and Maximum Ratings

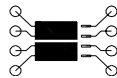
I <sub>S</sub>	Maximum Continuous Drain-Source Diode Forward Current			1.7		A
V <sub>SD</sub>	Drain-Source Diode Forward Voltage	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 1.7 A <small>(Note 2)</small>		0.8	1.2	V

#### Notes:

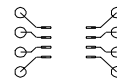
- R<sub>θJA</sub> is the sum of the junction-to-case and case-to-ambient resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. R<sub>θJC</sub> is guaranteed by design while R<sub>θJA</sub> is determined by the user's board design.



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



b) 125° C/W when mounted on a 0.02 in<sup>2</sup> pad of 2 oz. copper.



c) 135° C/W when mounted on a 0.003 in<sup>2</sup> pad of 2 oz. copper.

Scale 1 : 1 on letter size paper

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

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