

# Si9926DY

## Dual N-Channel 2.5V Specified PowerTrench® MOSFET

### General Description

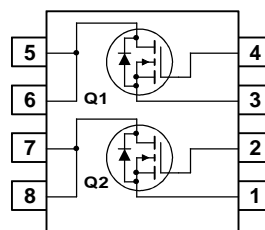
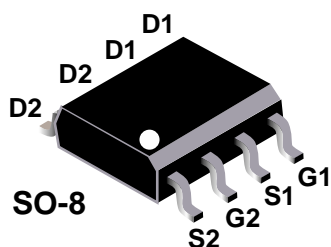
These N-Channel 2.5V specified MOSFETs use Fairchild Semiconductor's advanced PowerTrench process. It has been optimized for power management applications with a wide range of gate drive voltage (2.5V – 10V).

### Applications

- Battery protection
- Load switch
- Power management

### Features

- 6.5 A, 20 V.  $R_{DS(ON)} = 0.030 \Omega @ V_{GS} = 4.5 V$   
 $R_{DS(ON)} = 0.043 \Omega @ V_{GS} = 2.5 V$ .
- Optimized for use in battery protection circuits
- $\pm 10 V_{GSS}$  allows for wide operating voltage range
- Low gate charge



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

Symbol	Parameter	Ratings	Units
V <sub>DSS</sub>	Drain-Source Voltage	20	V
V <sub>GSS</sub>	Gate-Source Voltage	±10	V
I <sub>D</sub>	Drain Current – Continuous (Note 1a)	6.5	A
	– Pulsed	20	
P <sub>D</sub>	Power Dissipation for Dual Operation	2	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 (Note 1a)	78	°C/W
R <sub>θJC</sub>	Thermal Resistance, Junction-to-Case (Note 1)	40	°C/W

### Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
9926	Si9926DY	13"	12mm	2500 units

**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	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$		14		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 16\text{ V}, V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
$I_{GSSF}$	Gate–Body Leakage, Forward	$V_{GS} = 8\text{ V}, V_{DS} = 0\text{ V}$			100	nA
$I_{GSSR}$	Gate–Body Leakage, Reverse	$V_{GS} = -8\text{ V}, V_{DS} = 0\text{ V}$			-100	nA

**On Characteristics (Note 2)**

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	0.5	1	1.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$		-3		mV/ $^\circ\text{C}$
$R_{DS(on)}$	Static Drain–Source On–Resistance	$V_{GS} = 4.5\text{ V}, I_D = 6.5\text{ A}$ $V_{GS} = 2.5\text{ V}, I_D = 5.4\text{ A}$ $V_{GS} = 4.5\text{ V}, I_D = 6.5\text{ A}, T_J = 125^\circ\text{C}$		0.025 0.036 0.035	0.030 0.043 0.050	$\Omega$
$I_{D(on)}$	On–State Drain Current	$V_{GS} = 4.5\text{ V}, V_{DS} = 5\text{ V}$	15			A
$g_{FS}$	Forward Transconductance	$V_{DS} = 5\text{ V}, I_D = 3\text{ A}$		11		S

**Dynamic Characteristics**

$C_{iss}$	Input Capacitance	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}$		700		pF
$C_{oss}$	Output Capacitance	$f = 1.0\text{ MHz}$		175		pF
$C_{riss}$	Reverse Transfer Capacitance			85		pF

**Switching Characteristics (Note 2)**

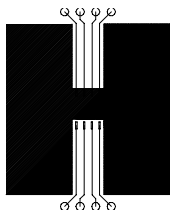
$t_{d(on)}$	Turn–On Delay Time	$V_{DD} = 10\text{ V}, I_D = 1\text{ A}$		8	16	ns
$t_r$	Turn–On Rise Time	$V_{GS} = 4.5\text{ V}, R_{GEN} = 6\ \Omega$		10	18	ns
$t_{d(off)}$	Turn–Off Delay Time			18	29	ns
$t_f$	Turn–Off Fall Time			5	10	ns
$Q_g$	Total Gate Charge	$V_{DS} = 10\text{ V}, I_D = 3\text{ A}$		7	10	nC
$Q_{gs}$	Gate–Source Charge	$V_{GS} = 4.5\text{ V}$		1.2		nC
$Q_{gd}$	Gate–Drain Charge			1.9		nC

**Drain–Source Diode Characteristics and Maximum Ratings**

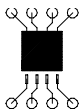
$I_S$	Maximum Continuous Drain–Source Diode Forward Current				1.3	A
$V_{SD}$	Drain–Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 1.3\text{ A}$ (Note 2)		0.65	1.2	V

**Notes:**

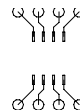
1.  $R_{\theta JA}$  is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta CA}$  is determined by the user's board design.



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



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



c)  $135^\circ\text{W}$  when mounted on a minimum pad.

Scale 1 : 1 on letter size paper

2. Pulse Test: Pulse Width <  $300\ \mu\text{s}$ , Duty Cycle < 2.0%

Typical Characteristics

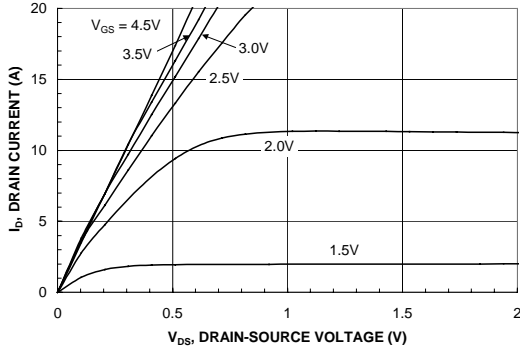


Figure 1. On-Region Characteristics.

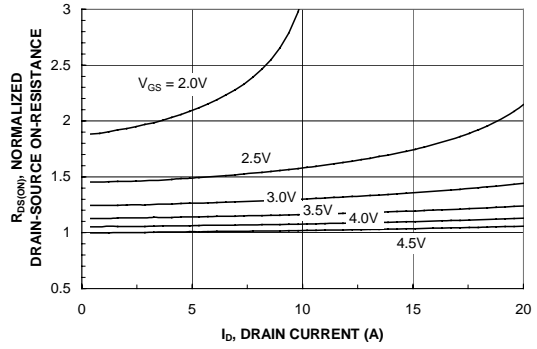


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

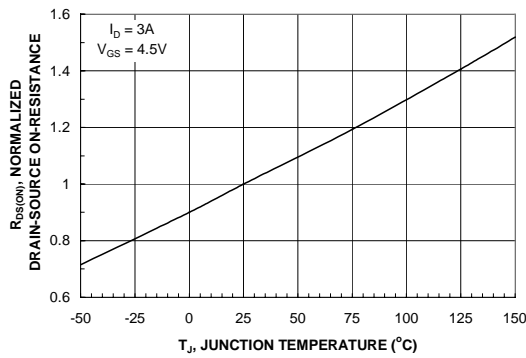


Figure 3. On-Resistance Variation with Temperature.

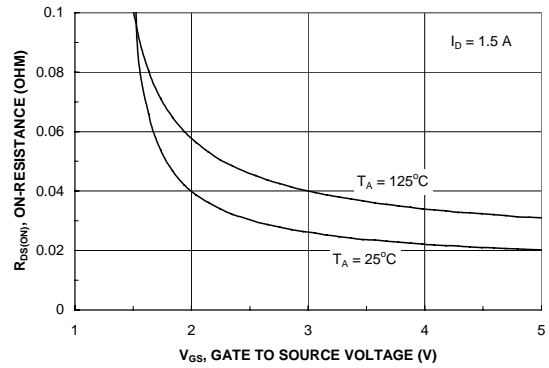


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

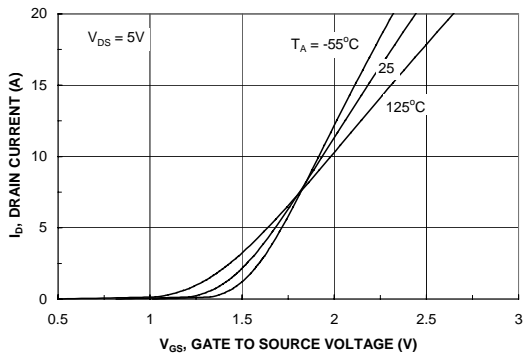


Figure 5. Transfer Characteristics.

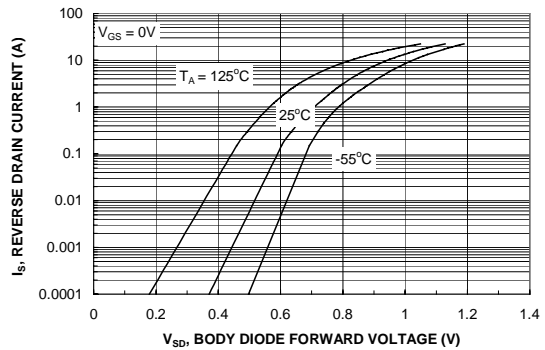
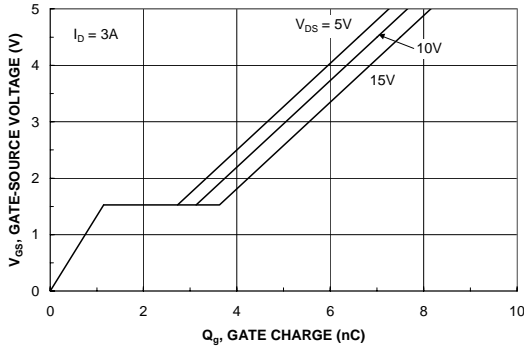
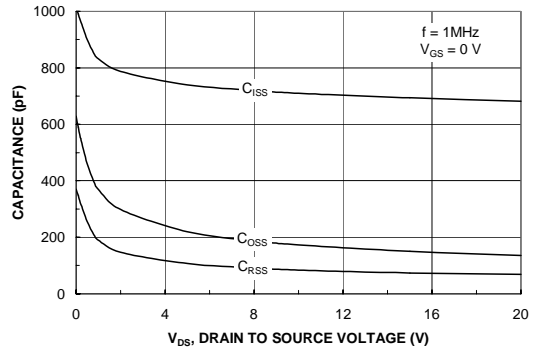


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

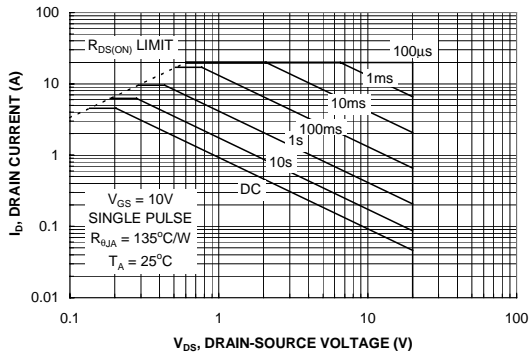
## Typical Characteristics



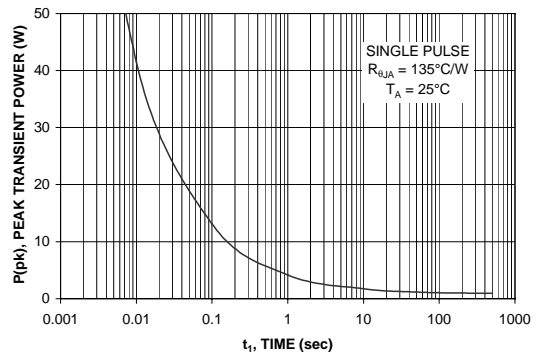
**Figure 7. Gate Charge Characteristics.**



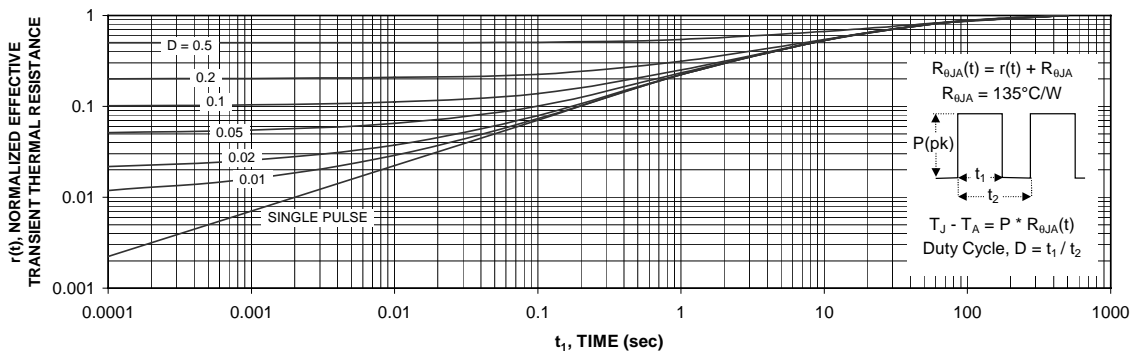
**Figure 8. Capacitance Characteristics.**



**Figure 9. Maximum Safe Operating Area.**



**Figure 10. Single Pulse Maximum Power Dissipation.**



**Figure 11. Transient Thermal Response Curve.**

Thermal characterization performed using the conditions described in Note 1c.  
Transient thermal response will change depending on the circuit board design.

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