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FDS9934C

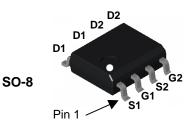
Complementary

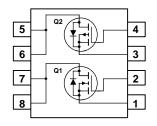
These dual N- and P-Channel enhancement mode power field effect transistors are produced using Fairchild Semiconductor's advanced PowerTrench process that has been especially tailored to minimize on-state ressitance and yet maintain superior switching performance.

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

Features

- Q1: 6.5 A, 20 V. $R_{DS(ON)}$ = 30 m Ω @ V_{GS} = 4.5 V $R_{DS(ON)}$ = 43 m Ω @ V_{GS} = 2.5 V.
- Q2: -5 A, -20 V, $R_{DS(ON)} = 55$ m Ω @ $V_{GS} = -4.5$ V $R_{DS(ON)} = 90$ m Ω @ $V_{GS} = -2.5$ V





Absolute Maximum Ratings T_A=25°C unless otherwise noted

Symbol	Parameter		Ratings		Units	
			Q1	Q2		
V _{DSS}	Drain-Source Voltage		20	-20	V	
V _{GSS}	Gate-Source Voltage		±10	±12	V	
I _D	Drain Current - Continuous	(Note 1a)	6.5	- 5	Α	
	– Pulsed		20	-30	1	
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 +150			°C		

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1a)	78	°C/W
R _{eJC}	Thermal Resistance, Junction-to-Case	(Note 1)	40	°C/W

Package Marking and Ordering Information

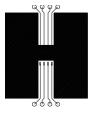
Device Marking	Device	Reel Size	Tape width	Quantity
FDS9934C	FDS9934C	13"	12mm	2500 units

Symbol	Parameter	Test Conditions	Type	Min	Тур	Max	Units
Off Chai	racteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, \qquad I_{D} = 250 \mu\text{A}$ $V_{GS} = 0 \text{ V}, \qquad I_{D} = -250 \mu\text{A}$	Q1 Q2	20 –20			V
ΔBV _{DSS} ΔT _J	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C I_D = -250 μA, Referenced to 25°C	Q1 Q2		14 –14		mV/°C
I _{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 16V$, $V_{GS} = 0 V$	Q1 Q2			1 –1	μА
I _{GSS}	Gate-Body Leakage	$\begin{split} &V_{DS} = -16 V, &V_{GS} = 0 \ V \\ &V_{GS} = \ \pm 8 \ V, &V_{DS} = 0 \ V \\ &V_{GS} = \pm 12 \ V, &V_{DS} = 0 \ V \end{split}$	Q1 Q2			±100 ±100	nA
V _{GS(th)}	Gate Threshold Voltage	$V_{DS} = V_{GS}, \qquad I_{D} = 250 \ \mu A$	Q1	0.6	1	1.5	V
ΔV _{GS(th)} 2 T, _J	Gate Threshold Voltage Temperature Coefficient	$V_{DS} = V_{GS}$, $I_D = 250 \mu A$ $I_D = 250 uA$, Referenced to 25°C $I_D = 250 uA$, Referenced to 25°C	Q2 Q1 Q2	-0.6	-0.9 -3 3	-1.2	mV/°C
R _{DS(on)}	Static Drain-Source On-Resistance	$V_{GS} = 4.5 \text{ V}, I_D = 6.5 \text{ A}$ $V_{GS} = 2.5 \text{ V}, I_D = 5.4 \text{ A}$ $V_{GS} = 4.5 \text{ V}, I_D = 6.5 \text{A}, T_J = 125 ^{\circ}\text{C}$	Q1		25 35 35	30 43 50	mΩ
		$\begin{split} &V_{GS} = -4.5 \text{ V}, & I_D = -3.2 \text{ A} \\ &V_{GS} = -2.5 \text{ V}, & I_D = -1.0 \text{ A} \\ &V_{GS} = -4.5 \text{ V}, I_D = -3.2 \text{ A}, T_J = 125^{\circ}\text{C} \end{split}$	Q2		43 64 55	55 90 76	mΩ
$I_{D(on)}$	On-State Drain Current	$V_{GS} = 4.5V, V_{DS} = 5 V$ $V_{GS} = -4.5 V, V_{DS} = -5 V$	Q1 Q2	15 –16			Α
g FS	Forward Transcoductance	$V_{DS} = -5 \text{ V}, \qquad I_D = 6.5 \text{ A} $ $V_{DS} = 5 \text{ V}, \qquad I_D = -5.5 \text{ A}$	Q1 Q2		22 14		S S
Dynami	c Characteristics						
C _{iss}	Input Capacitance	Q1 $V_{DS} = 10V$, $V_{GS} = 0 V$,	Q1 Q2		650 955		pF
C _{oss}	Output Capacitance	f = 1.0 MHz Q2	Q1 Q2		150 215		pF
C _{rss}	Reverse Transfer Capacitance	$V_{DS} = -10 \text{ V}, V_{GS} = 0 \text{ V},$ f = 1.0 MHz	Q1 Q2		85 115		pF
R _G	Gate Resistance	$V_{GS} = 15 \text{ mV}, f = 1.0 \text{ MHz}$	Q1 Q2		1.4 4.9		Ω

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Symbol Parameter		Test Conditions	Туре	Min	Тур	Max	Units
Switchir	ng Characteristics (Note	2)					
t _{d(on)}	Turn-On Delay Time	Q1 V _{DD} = 10 V, I _D = 1 A,	Q1 Q2		8 16	16 29	ns
·r	Turn-On Rise Time	$V_{GS} = 4.5V$, $R_{GEN} = 6\Omega$	Q1 Q2		9	17 18	ns
d(off)	Turn-Off Delay Time	Q2 Vpp = -6V.	Q1 Q2		15 25	26 41	ns
f	Turn-Off Fall Time	$V_{GS} = -4.5V$, $R_{GEN} = 6\Omega$	Q1 Q2		4 9	9	ns
Q_g	Total Gate Charge	Q1 V _{DS} = 10 V, I _D = 3 A, V _{GS} = 4.5V	Q1 Q2		6.2 8.7	9	nC
Q _{gs}	Gate-Source Charge	1 v v v v v v v v v v v v v v v v v v v	Q1 Q2		1.2 2.1		nC
Q _{gd}	Gate-Drain Charge	Q2 $V_{DS} = -6 \text{ V}, I_{D} = -3.2 \text{ A}, V_{GS} = -4.5 \text{ V}$	Q1 Q2		1.7 2.1		nC
Drain-S	ource Diode Character	istics and Maximum Ratings	5				•
I _S	Maximum Continuous Drain-Source Diode Forward Current		Q1 Q2			1.3 -1.3	Α
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_S = 1.3 \text{ A} \text{(Note 2)}$ $V_{GS} = 0 \text{ V}, I_S = -2.0 \text{ A} \text{(Note 2)}$	Q1 Q2		0.73 -0.8	1.2 -1.2	V
rr	Diode Reverse Recovery Time	Q1 $I_F = 6.5 \text{ A}, d_{iF}/d_t = 100 \text{ A/}\mu\text{s}$	Q1 Q2		15 20		nS
Q _{rr}	Diode Reverse Recovery Charge	Q2 $I_F = -3.2 \text{ A}, d_{iF}/d_t = 100 \text{ A/µs}$	Q1 Q2		5 7		nC

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 0.5 in² pad of 2 oz copper



b) 125°C/W when mounted on a .02 in² 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%

Typical Characteristics: Q1 (N-Channel)

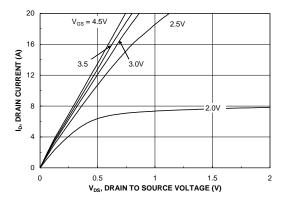


Figure 1. On-Region Characteristics.

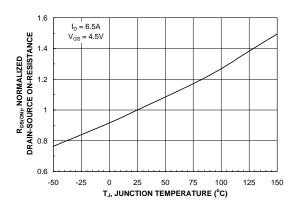


Figure 3. On-Resistance Variation with Temperature.

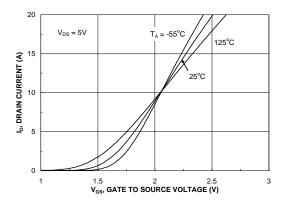


Figure 5. Transfer Characteristics.

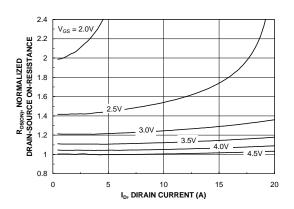


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

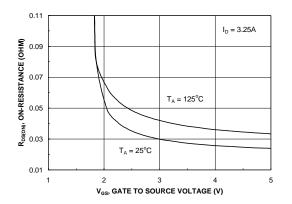


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

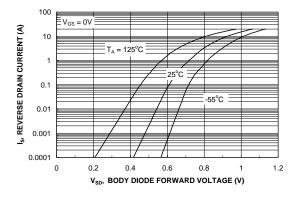


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics: Q1 (N-Channel)

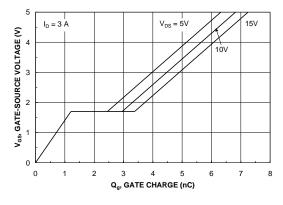
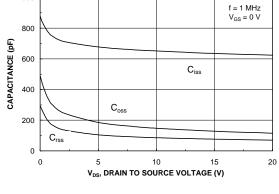


Figure 7. Gate Charge Characteristics.



1000

Figure 8. Capacitance Characteristics.

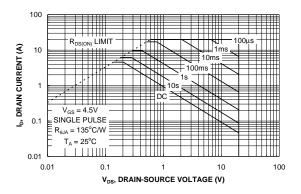


Figure 9. Maximum Safe Operating Area.

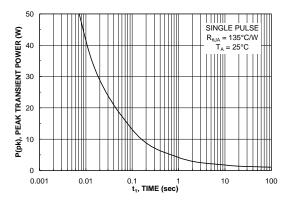


Figure 10. Single Pulse Maximum Power Dissipation.

Typical Characteristics: Q2 (P-Channel)

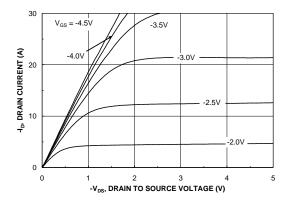


Figure 11. On-Region Characteristics.

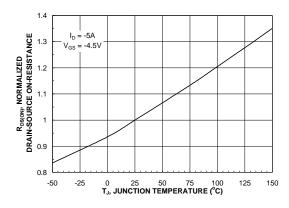


Figure 13. On-Resistance Variation with Temperature.

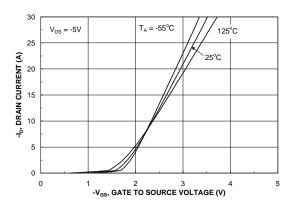


Figure 15. Transfer Characteristics.

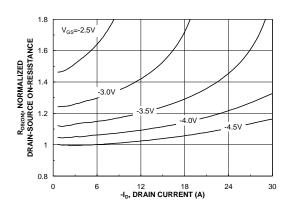


Figure 12. On-Resistance Variation with Drain Current and Gate Voltage.

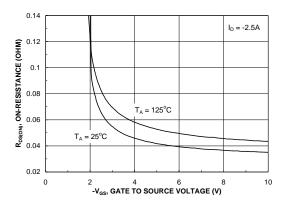


Figure 14. On-Resistance Variation with Gate-to-Source Voltage.

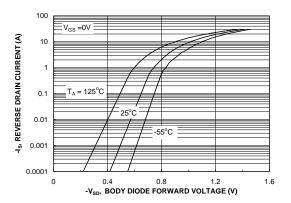
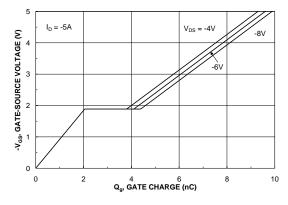


Figure 16. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics: Q2 (P-Channel)



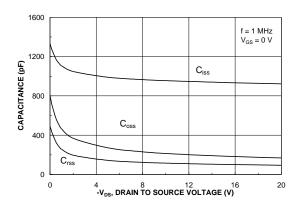
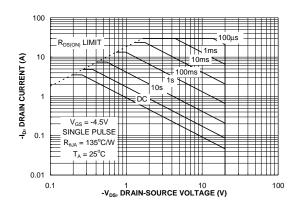


Figure 17. Gate Charge Characteristics.





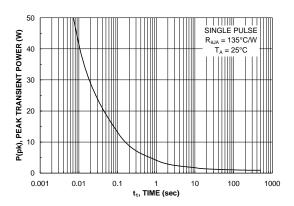


Figure 19. Maximum Safe Operating Area.



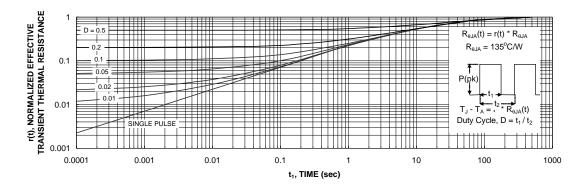


Figure 21. Transient Thermal Response Curve.

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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