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October 2011

FDS8858CZ

Dual N & P-Channel PowerTrench® MOSFET

N-Channel: 30V, 8.6A, 17.0m Ω P-Channel: -30V, -7.3A, 20.5m Ω

Features

Q1: N-Channel

- Max $r_{DS(on)} = 17m\Omega$ at $V_{GS} = 10V$, $I_D = 8.6A$
- Max $r_{DS(on)} = 20m\Omega$ at $V_{GS} = 4.5V$, $I_D = 7.3A$

Q2: P-Channel

- Max $r_{DS(on)} = 20.5 \text{m}\Omega$ at $V_{GS} = -10 \text{V}$, $I_D = -7.3 \text{A}$
- Max $r_{DS(on)} = 34.5 \text{m}\Omega$ at $V_{GS} = -4.5 \text{V}$, $I_D = -5.6 \text{A}$
- High power and handing capability in a widely used surface mount package
- Fast switching speed



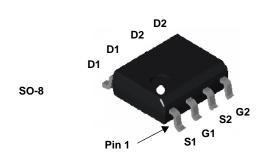
General Description

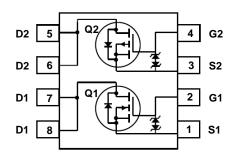
These dual N and P-Channel enhancement mode power MOSFETs are produced using Fairchild Semiconductor's advanced PowerTrench process that has been especially tailored to minimize on-state resistance and yet maintain superior switching performance.

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

Applications

- Inverter
- Synchronous Buck





MOSFET Maximum Ratings T_A = 25°C unless otherwise noted

Symbol	Parameter		Q1	Q2	Units	
V _{DS}	Drain to Source Voltage			30	-30	V
V _{GS}	Gate to Source Voltage			±20	±25	V
1	Drain Current - Continuous	T _A = 25°C		8.6	-7.3	۸
ID	- Pulsed			20	-20	A
E _{AS}	Single Pulse Avalanche Energy		(Note 3)	50	11	mJ
	Power Dissipation for Dual Operation			2	.0	
P_{D}	Power Dissipation for Single Operation	$T_A = 25$ °C	(Note 1a)	1	.6	W
		T _A = 25°C	(Note 1c)	0.9		1
T _J , T _{STG}	Operating and Storage Junction Temperature Range -55 to				+150	°C

Thermal Characteristics

	$R_{\theta JC}$	Thermal Resistance, Junction to Case	(Note 1)	40	°C/W
Ī	Raia	Thermal Resistance, Junction to Ambient	(Note 1a)	78	C/VV

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDS8858CZ	FDS8858CZ	SO-8	13"	12mm	2500 units

Electrical Characteristics $T_J = 25^{\circ}C$ unless otherwise noted

Symbol	Parameter	Test Conditions	Туре	Min	Тур	Max	Units
Off Chara	acteristics						
BV _{DSS}	Drain to Source Breakdown Voltage	$I_D = 250 \mu A, V_{GS} = 0 V$ $I_D = -250 \mu A, V_{GS} = 0 V$	Q1 Q2	30 -30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250μA, referenced to 25°C I_D = -250μA, referenced to 25°C	Q1 Q2		22 -22		mV/°C
I _{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 24V, V_{GS} = 0V$ $V_{DS} = -24V, V_{GS} = 0V$	Q1 Q2			1 -1	μА
I _{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 20V, V_{DS} = 0V$ $V_{GS} = \pm 25V, V_{DS} = 0V$	Q1 Q2			±10 ±10	μА

On Characteristics

V _{GS(th)}	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu A$ $V_{GS} = V_{DS}, I_D = -250\mu A$	Q1 Q2	1 -1	1.6 -2.1	3 -3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250 μ A, referenced to 25°C I_D = -250 μ A, referenced to 25°C	Q1 Q2		-5.4 6.0		mV/°C
	Statio Drain to Source On Begintance	$V_{GS} = 10V, I_D = 8.6A$ $V_{GS} = 4.5V, I_D = 7.3A$ $V_{GS} = 10V, I_D = 8.6A, T_J = 125^{\circ}C$	Q1		12.4 15.2 17.7	17.0 20.0 24.3	m0
r _{DS(on)}	r _{DS(on)} Static Drain to Source On Resistance	$V_{GS} = -10V$, $I_D = -7.3A$ $V_{GS} = -4.5V$, $I_D = -5.6A$ $V_{GS} = -10V$, $I_D = -7.3A$, $T_J = 125$ °C	Q2		17.1 26.5 24.0	20.5 34.5 28.8	mΩ
g _{FS}	Forward Transconductance	$V_{DS} = 5V, I_{D} = 8.6A$ $V_{DS} = -5V, I_{D} = -7.3A$	Q1 Q2		27 21		S

Dynamic Characteristics

C _{iss}	Input Capacitance	Q1 V _{DS} = 15V, V _{GS} = 0V, f = 1MHZ	Q1 Q2	905 1675	1205 2230	pF
C _{oss}	Output Capacitance	Q2	Q1 Q2	180 290	240 390	pF
C _{rss}	Reverse Transfer Capacitance	$V_{DS} = -15V, V_{GS} = 0V, f = 1MHZ$	Q1 Q2	110 260	165 390	pF
R _g	Gate Resistance	f = 1MHz	Q1 Q2	1.3 4.4		Ω

Switching Characteristics

t _{d(on)}	Turn-On Delay Time	Q1	Q1 Q2	7 9	14 18	ns
t _r	Rise Time	$V_{DD} = 15V, I_{D} = 8.6A,$ $V_{GS} = 10V, R_{GEN} = 6\Omega$	Q1 Q2	3 10	10 20	ns
t _{d(off)}	Turn-Off Delay Time	Q2 V _{DD} = -15V, I _D = -7.3A,	Q1 Q2	19 33	35 53	ns
t _f	Fall Time	$V_{GS} = -10V, R_{GEN} = 6\Omega$	Q1 Q2	3 16	10 29	ns
Q _{g(TOT)}	Total Gate Charge	Q1	Q1 Q2	17 33	24 46	nC
Q_{gs}	Gate to Source Charge	$V_{GS} = 10V$, $V_{DD} = 15V$, $I_{D} = 8.6A$ $Q2$ $V_{GS} = -10V$, $V_{DD} = -15V$, $I_{D} = -7.3A$	Q1 Q2	2.7 6.1		nC
Q_{gd}	Gate to Drain "Miller" Charge		Q1 Q2	3.4 8.5		nC

Units

Max

Electrical Characteristics $T_J = 25^{\circ}C$ unless otherwise noted

Parameter

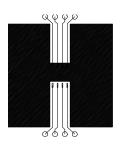
Drain-Source Diode Characteristics								
V _{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0V, I_S = 8.6A$ $V_{GS} = 0V, I_S = -7.3A$	(Note 2) (Note 2)	Q1 Q2		0.8 0.9	1.2 -1.2	V
t _{rr}	Reverse Recovery Time	Q1 I _F = 8.6A, di/dt = 100A/s		Q1 Q2		25 28	38 42	ns
Q _{rr}	Reverse Recovery Charge	Q_2 $I_F = -7.3A$, di/dt = 100A/s		Q1 Q2		19 22	29 33	nC

Test Conditions

Notes:

Symbol

1. R_{0JA} 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



ωψ φ ρο b) 125°C/W when mounted on a 0.02 in² pad of 2 oz copper



C) 135°C/W when mounted on a minimun pad

Min

Тур

Type



Scale 1:1 on letter size paper

- 2. Pulse Test: Pulse Width < 300 $\mu s,$ Duty cycle < 2.0%.
- 3. Starting $T_J = 25^{\circ}C$, N-ch: L = 1mH, $I_{AS} = 10A$, $V_{DD} = 27V$, $V_{GS} = 10V$; P-ch: L = 1mH, $I_{AS} = -4.7A$, $V_{DD} = -27V$, $V_{GS} = -10V$.

Typical Characteristics (Q1 N-Channel)T_J = 25°C unless otherwise noted

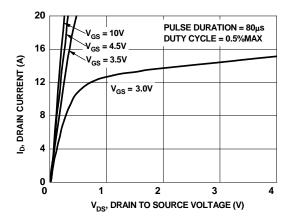


Figure 1. On-Region Characteristics

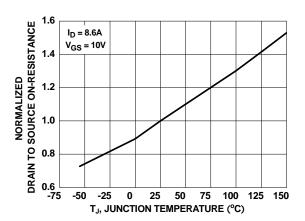


Figure 3. Normalized On-Resistance vs Junction Temperature

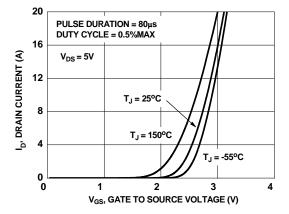


Figure 5. Transfer Characteristics

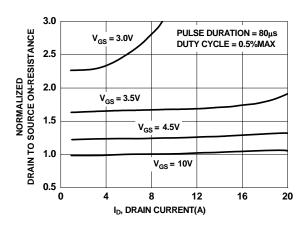


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

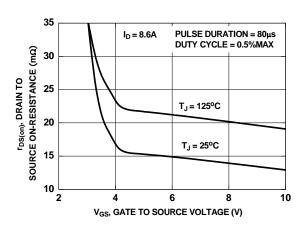


Figure 4. On-Resistance vs Gate to Source Voltage

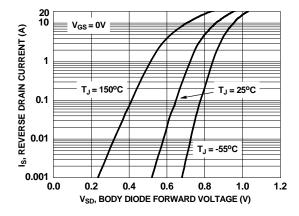


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics (Q1 N-Channel)T_J = 25°C unless otherwise noted

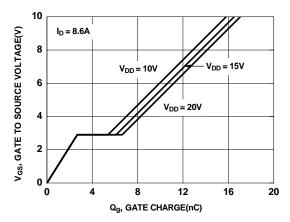
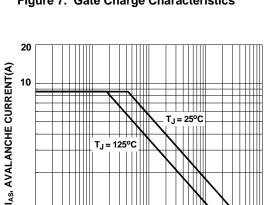


Figure 7. Gate Charge Characteristics



10

100

Figure 9. Unclamped Inductive Switching Capability

t_{AV}, TIME IN AVALANCHE(ms)

0.1

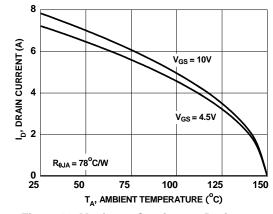


Figure 11. Maximum Continuous Drain Current vs Ambient Temperature

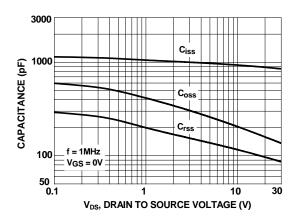


Figure 8. Capacitance vs Drain to Source Voltage

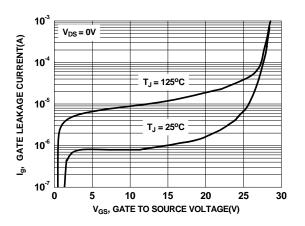


Figure 10. Gate Leakage Current vs Gate to Source Voltage

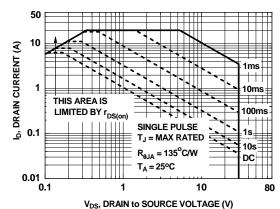


Figure 12. Forward Bias Safe Operating Area

0.01

Typical Characteristics (Q1 N-Channel)T_J = 25°C unless otherwise noted

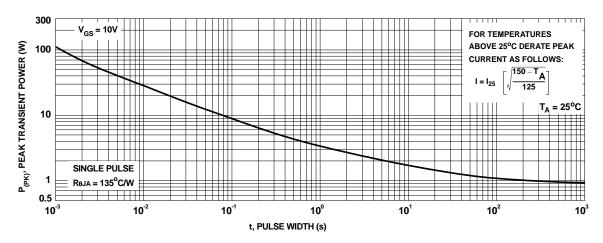


Figure 13. Single Pulse Maximum Power Dissipation

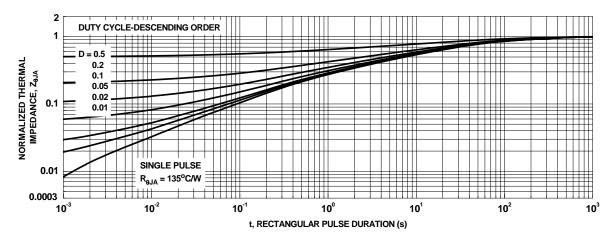


Figure 14. Transient Thermal Response Curve

Typical Characteristics (Q2 P-Channel)T_J = 25°C unless otherwise noted

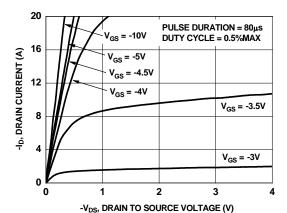


Figure 15. On- Region Characteristics

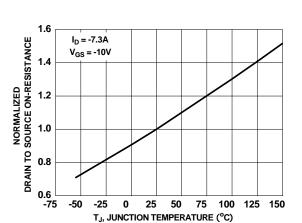


Figure 17. Normalized On- Resistance vs Junction Temperature

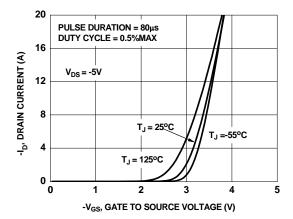


Figure 19. Transfer Characteristics

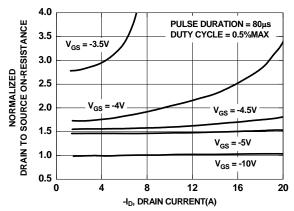


Figure 16. Normalized on-Resistance vs Drain Current and Gate Voltage

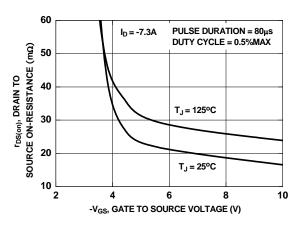


Figure 18. On-Resistance vs Gate to Source Voltage

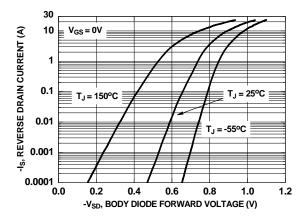


Figure 20. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics(Q2 P-Channel)T_J = 25°C unless otherwise noted

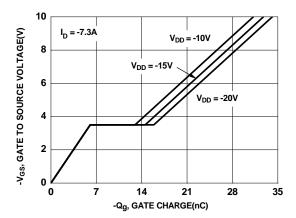


Figure 21. Gate Charge Characteristics

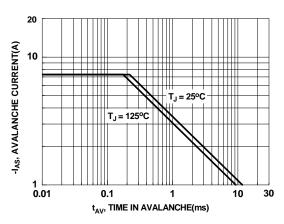


Figure 23. Unclamped Inductive Switching Capability

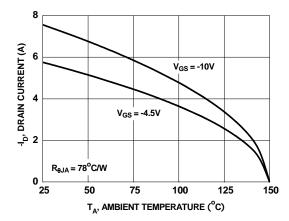


Figure 25. Maximum Continuous Drain Current vs Ambient Temperature

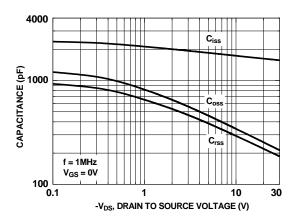


Figure 22. Capacitance vs Drain to Source Voltage

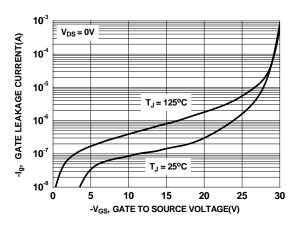


Figure 24. Gate Leakage Current vs Gate to Source Voltage

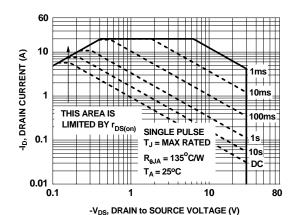


Figure 26. Forward Bias Safe Operating Area

Typical Characteristics(Q2 P-Channel) T_J = 25°C unless otherwise noted

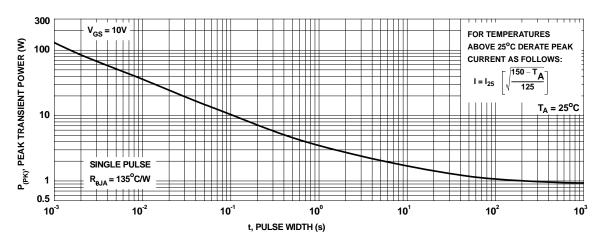


Figure 27. Single Pulse Maximum Power Dissipation

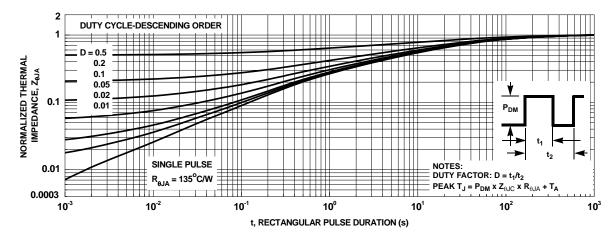


Figure 28. Transient Thermal Response Curve





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Наши контакты:

Телефон: +7 812 627 14 35

Электронная почта: sales@st-electron.ru

Адрес: 198099, Санкт-Петербург,

Промышленная ул, дом № 19, литера Н,

помещение 100-Н Офис 331