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FAIRCHILD SEMICONDUCTOR®

October 2011

FDS8858CZ

Dual N & P-Channel PowerTrench® MOSFET
N-Channel: 30V, 8.6A, 17.0mΩ P-Channel: -30V, -7.3A, 20.5mΩ

Features

Q1: N-Channel

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

Q2: P-Channel

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

General Description

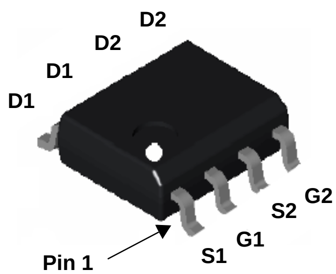
These dual N and P-Channel enhancement mode power MOSFETs are produced using Fairchild Semiconductor's advanced PowerTrench process that has been especially tailored to minimize on-state resistance and yet maintain superior switching performance.

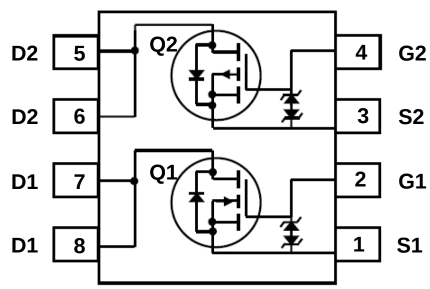
These devices are well suited for low voltage and battery powered applications where low in-line power loss and fast switching are required.

Applications

- Inverter
- Synchronous Buck

SO-8





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
I_D	Drain Current - Continuous T_A = 25°C	8.6	-7.3	A
	- Pulsed	20	-20	
E_{AS}	Single Pulse Avalanche Energy (Note 3)	50	11	mJ
P_D	Power Dissipation for Dual Operation	2.0		W
	Power Dissipation for Single Operation T_A = 25°C (Note 1a)	1.6		
	T_A = 25°C (Note 1c)	0.9		
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
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	78	

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°C unless otherwise noted

Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units

Off Characteristics

Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250μA, V_{GS} = 0V I_D = -250μA, V_{GS} = 0V	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	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20V, V_{DS} = 0V V_{GS} = ±25V, V_{DS} = 0V	Q1 Q2			±10 ±10	μA

On Characteristics

Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250μA V_{GS} = V_{DS}, I_D = -250μA	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 = 250μA, referenced to 25°C I_D = -250μA, referenced to 25°C	Q1 Q2		-5.4 6.0		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	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°C	Q1		12.4 15.2 17.7	17.0 20.0 24.3	mΩ
		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	
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

Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
C_{iss}	Input Capacitance	Q1 V_{DS} = 15V, V_{GS} = 0V, f = 1MHZ Q2 V_{DS} = -15V, V_{GS} = 0V, f = 1MHZ	Q1 Q2		905 1675	1205 2230	pF
C_{oss}	Output Capacitance		Q1 Q2		180 290	240 390	pF
C_{rss}	Reverse Transfer Capacitance		Q1 Q2		110 260	165 390	pF
R_g	Gate Resistance	f = 1MHz	Q1 Q2		1.3 4.4		Ω

Switching Characteristics

Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
$t_{d(on)}$	Turn-On Delay Time	Q1 V_{DD} = 15V, I_D = 8.6A, V_{GS} = 10V, R_{GEN} = 6Ω Q2 V_{DD} = -15V, I_D = -7.3A, V_{GS} = -10V, R_{GEN} = 6Ω	Q1 Q2		7 9	14 18	ns
t_r	Rise Time		Q1 Q2		3 10	10 20	ns
$t_{d(off)}$	Turn-Off Delay Time		Q1 Q2		19 33	35 53	ns
t_f	Fall Time		Q1 Q2		3 16	10 29	ns
$Q_{g(TOT)}$	Total Gate Charge	Q1 V_{GS} = 10V, V_{DD} = 15V, I_D = 8.6A Q2 V_{GS} = -10V, V_{DD} = -15V, I_D = -7.3A	Q1 Q2		17 33	24 46	nC
Q_{gs}	Gate to Source Charge		Q1 Q2		2.7 6.1		nC
Q_{gd}	Gate to Drain “Miller” Charge		Q1 Q2		3.4 8.5		nC

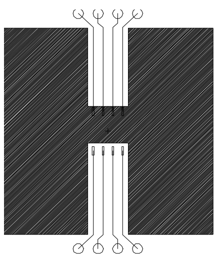
Electrical Characteristics T_J = 25°C unless otherwise noted

Drain-Source Diode Characteristics

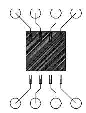
Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0V, I_S = 8.6A (Note 2) V_{GS} = 0V, I_S = -7.3A (Note 2)	Q1 Q2		0.8 0.9	1.2 -1.2	V
t_{rr}	Reverse Recovery Time	Q1 I_F = 8.6A, di/dt = 100A/s	Q1 Q2		25 28	38 42	ns
Q_{rr}	Reverse Recovery Charge	Q2 I_F = -7.3A, di/dt = 100A/s	Q1 Q2		19 22	29 33	nC

Notes:

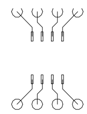
1. $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a) 78°C/W when mounted on a 0.5 in^2 pad of 2 oz copper



b) 125°C/W when mounted on a 0.02 in^2 pad of 2 oz copper



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

Scale 1 : 1 on letter size paper

2. Pulse Test: Pulse Width < 300μs, Duty cycle < 2.0%.

3. Starting T_J = 25°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

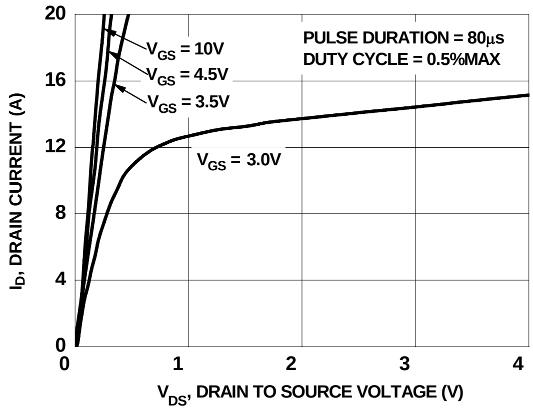


Figure 1. On- Region Characteristics

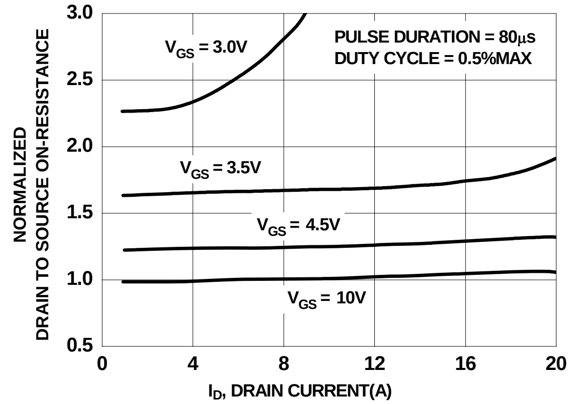


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

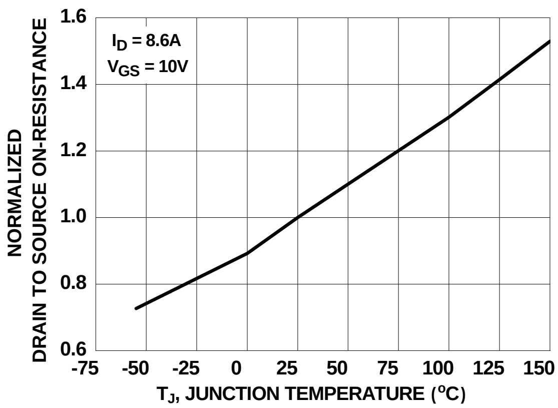


Figure 3. Normalized On-Resistance vs Junction Temperature

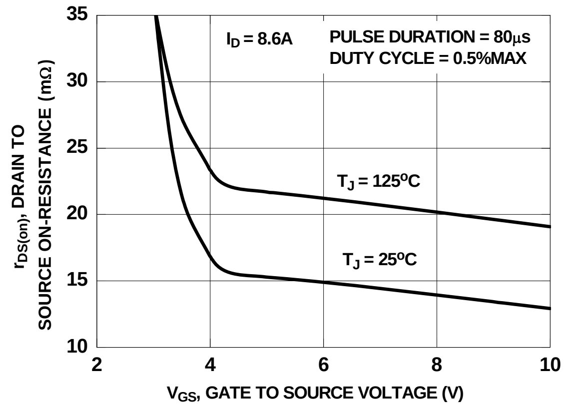


Figure 4. On-Resistance vs Gate to Source Voltage

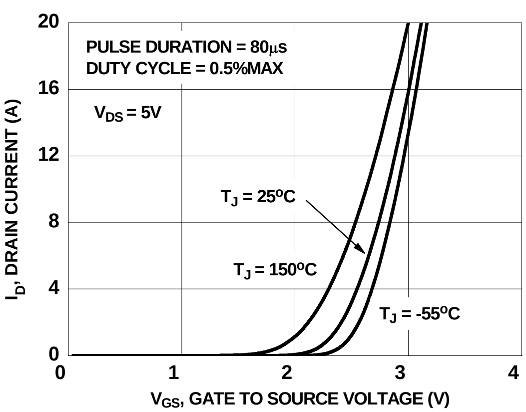


Figure 5. Transfer Characteristics

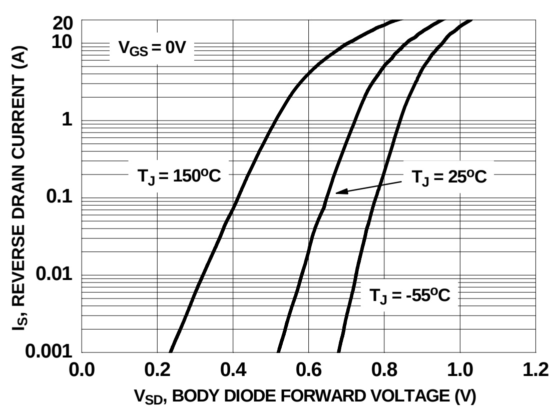


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

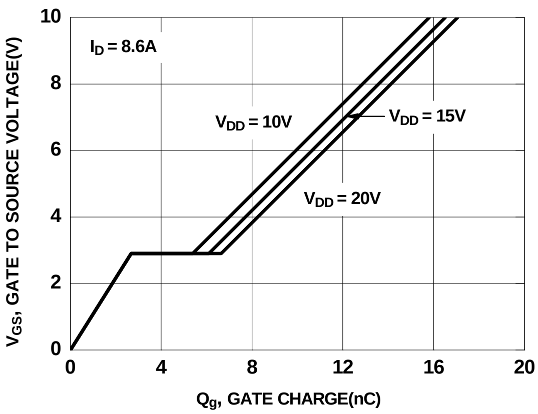

Figure 7. Gate Charge Characteristics

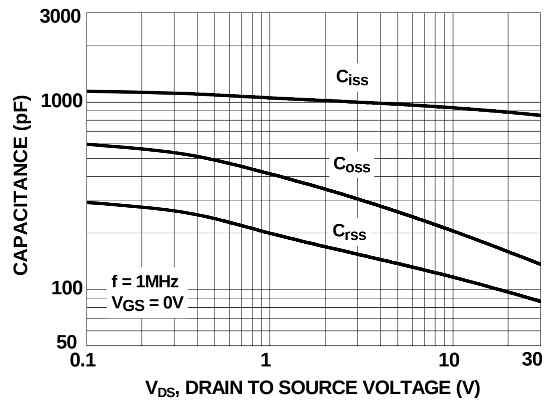

Figure 8. Capacitance vs Drain to Source Voltage

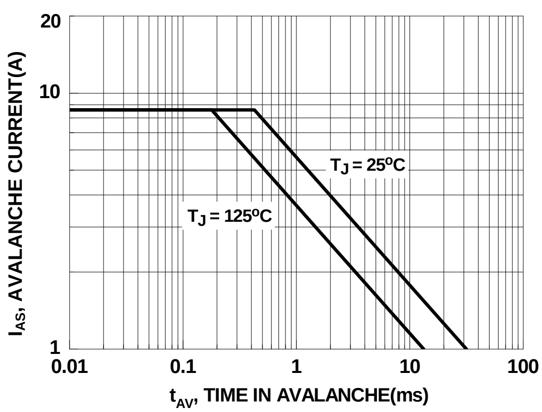

Figure 9. Unclamped Inductive Switching Capability

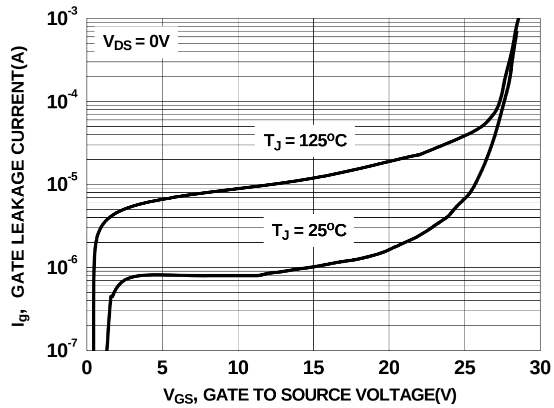

Figure 10. Gate Leakage Current vs Gate to Source Voltage

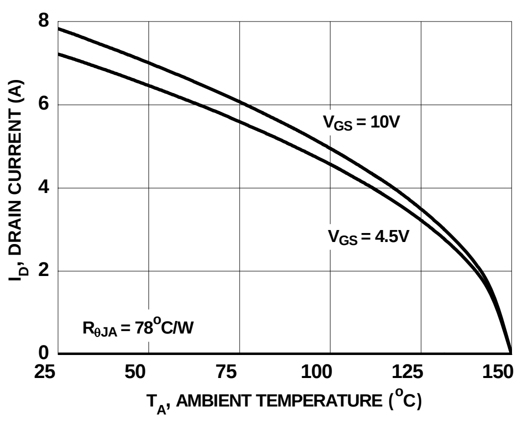

Figure 11. Maximum Continuous Drain Current vs Ambient Temperature

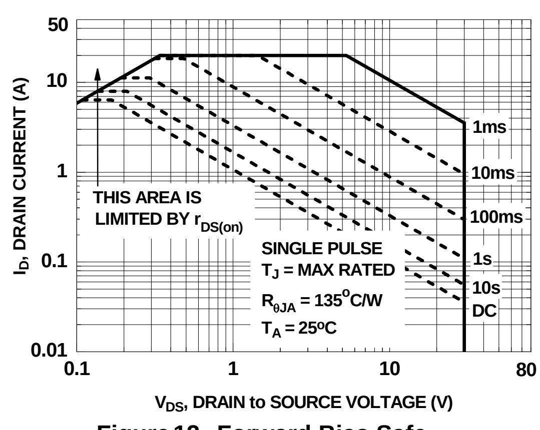

Figure 12. Forward Bias Safe Operating Area

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

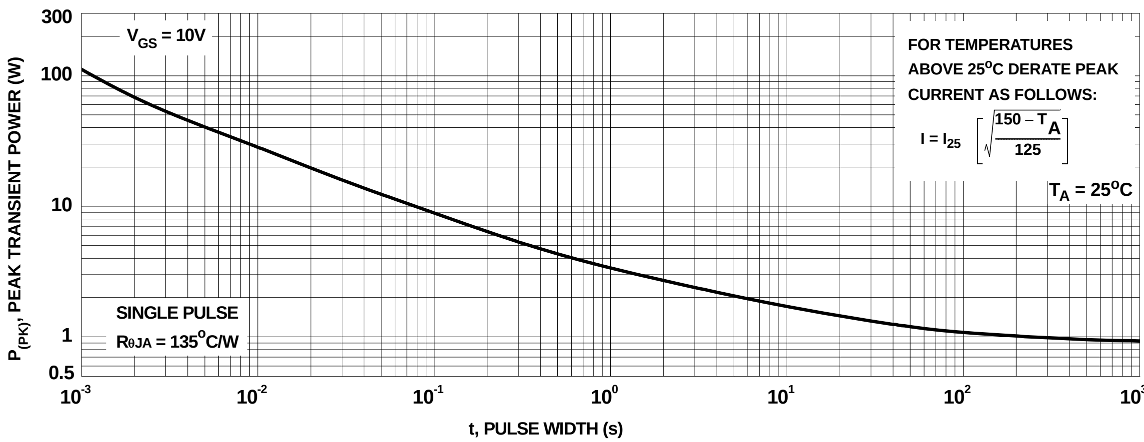

Figure 13. Single Pulse Maximum Power Dissipation

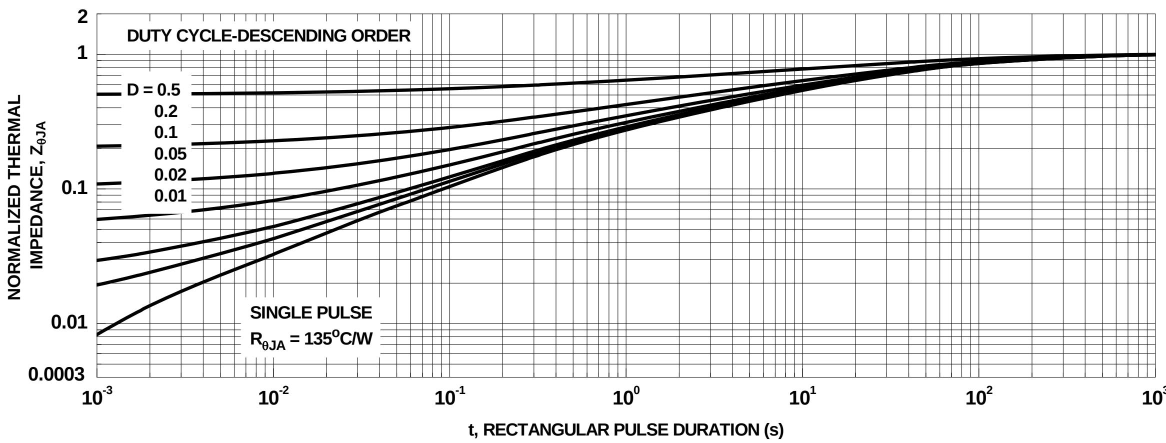

Figure 14. Transient Thermal Response Curve

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

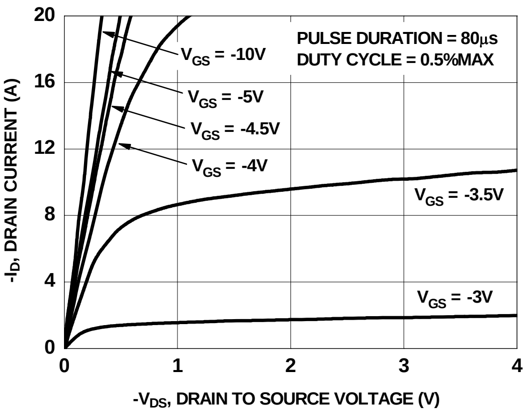

Figure 15. On- Region Characteristics

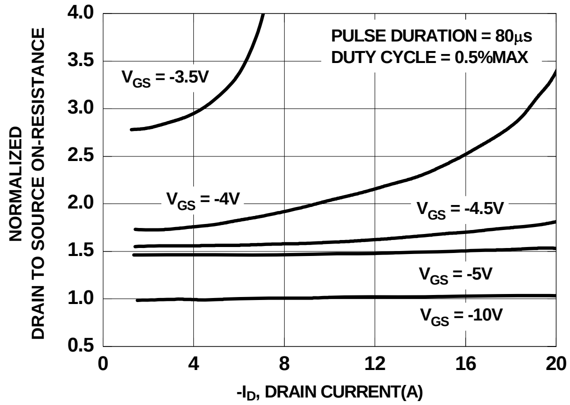

Figure 16. Normalized on-Resistance vs Drain Current and Gate Voltage

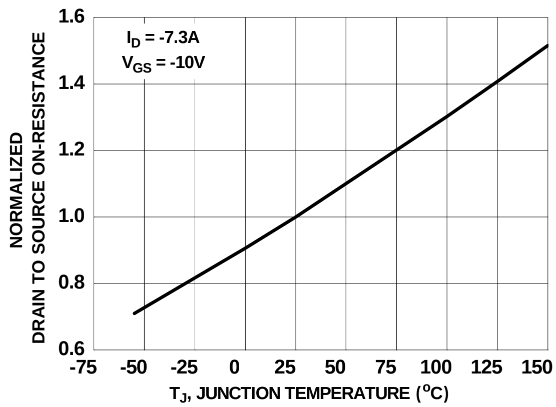

Figure 17. Normalized On- Resistance vs Junction Temperature

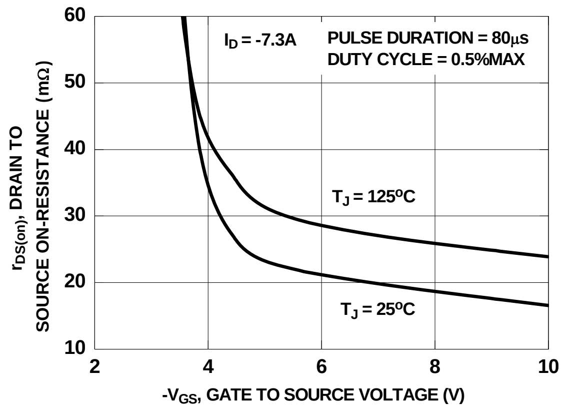

Figure 18. On-Resistance vs Gate to Source Voltage

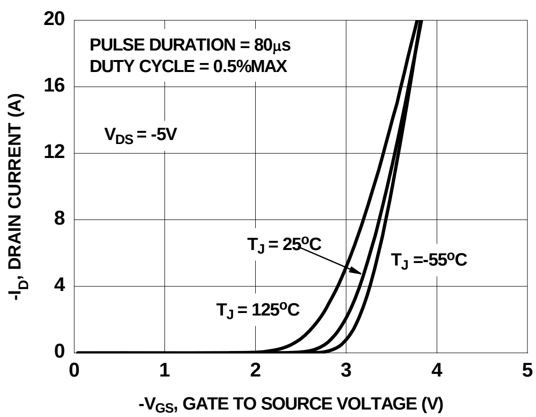

Figure 19. Transfer Characteristics

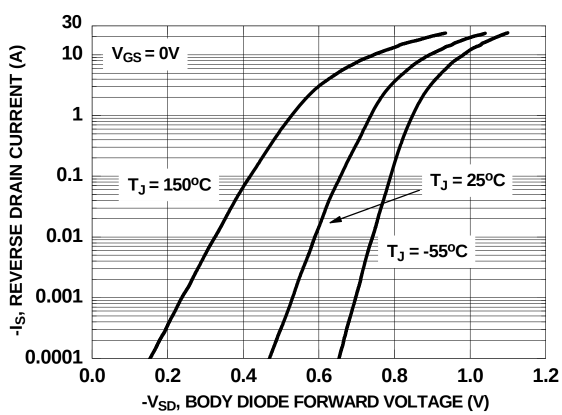

Figure 20. Source to Drain Diode Forward Voltage vs Source Current

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

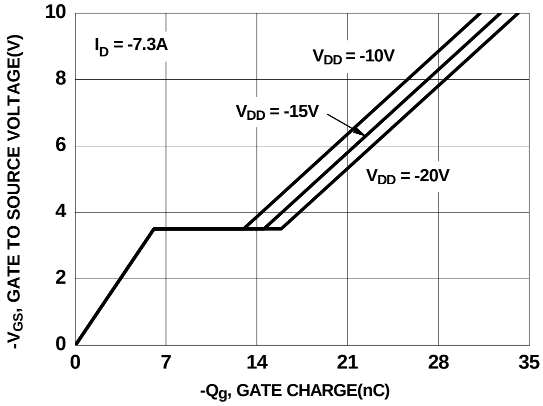

Figure 21. Gate Charge Characteristics

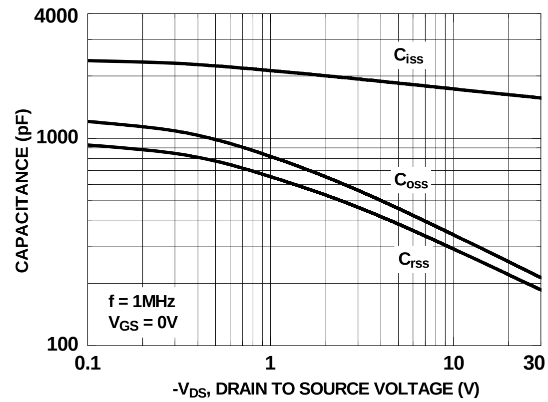

Figure 22. Capacitance vs Drain to Source Voltage

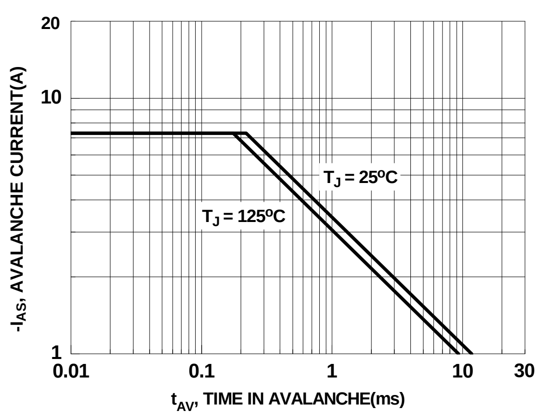

Figure 23. Unclamped Inductive Switching Capability

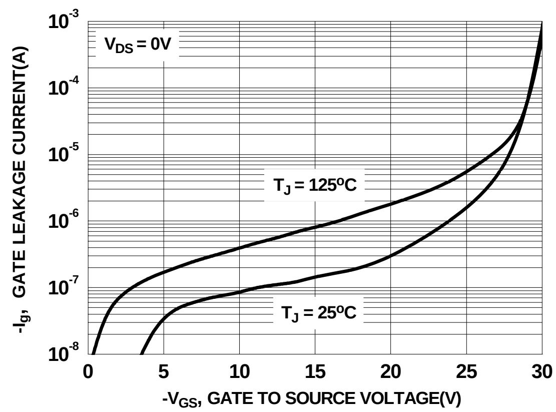

Figure 24. Gate Leakage Current vs Gate to Source Voltage

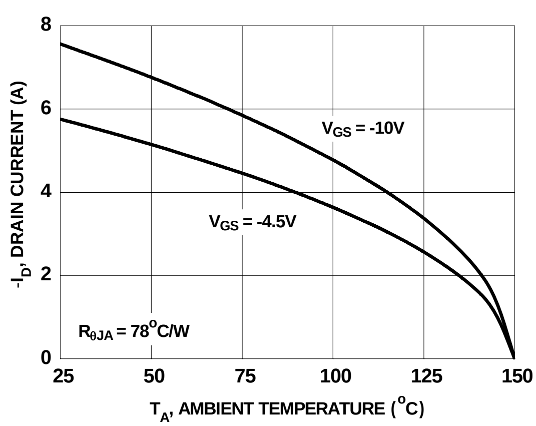

Figure 25. Maximum Continuous Drain Current vs Ambient Temperature

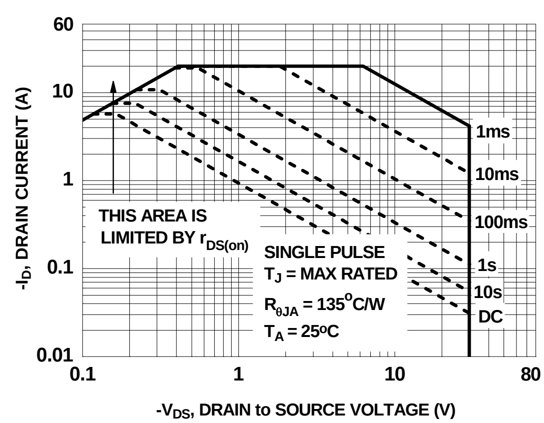

Figure 26. Forward Bias Safe Operating Area

Typical Characteristics(Q2 P-Channel) $T_J = 25^oC$ unless otherwise noted

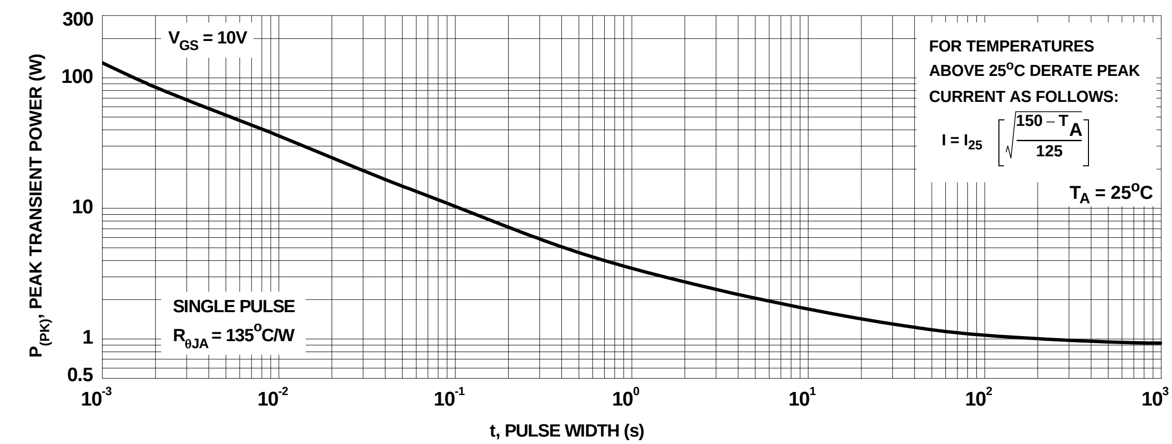

Figure 27. Single Pulse Maximum Power Dissipation

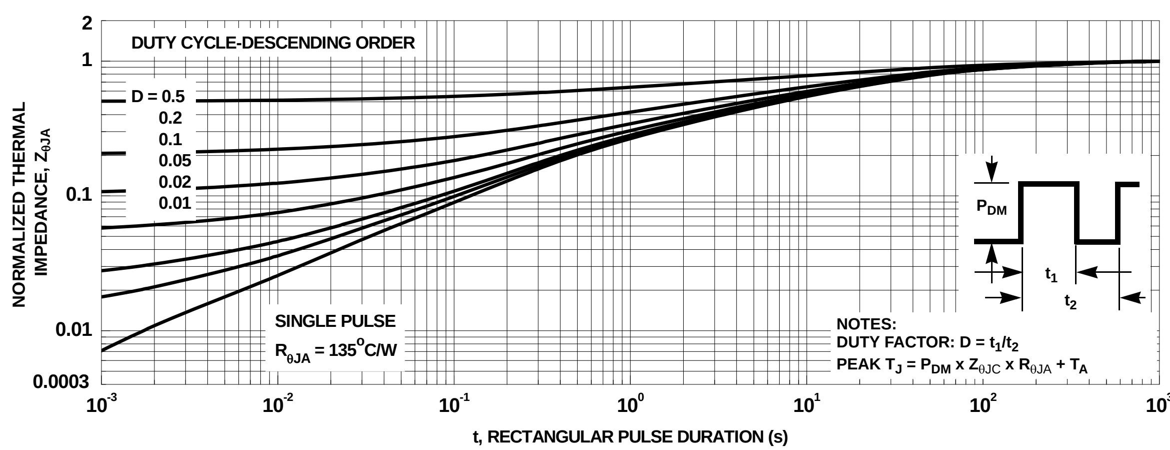

Figure 28. Transient Thermal Response Curve

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2. A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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Definition of Terms

Datasheet Identification	Product Status	Definition
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Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
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Rev. I58

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