FAIRCHILD SEMICONDUCTOR®

May 2011

FDMS7606

Dual N-Channel PowerTrench® MOSFET

Q1: 30 V, 12 A, 11.4 mΩ Q2: 30 V, 22 A, 11.6 mΩ

Features

Q1: N-Channel

- Max $r_{DS(on)}$ = 11.4 mΩ at V_{GS} = 10 V, I_D = 11.5 A
- Max $r_{DS(on)}$ = 15.7 mΩ at V_{GS} = 4.5 V, I_D = 10 A

Q2: N-Channel

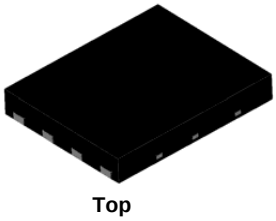
- Max $r_{DS(on)}$ = 11.6 mΩ at V_{GS} = 10 V, I_D = 12 A
- Max $r_{DS(on)}$ = 17.2 mΩ at V_{GS} = 4.5 V, I_D = 9.5 A
- RoHS Compliant

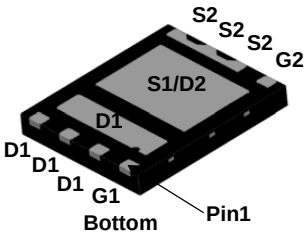
General Description

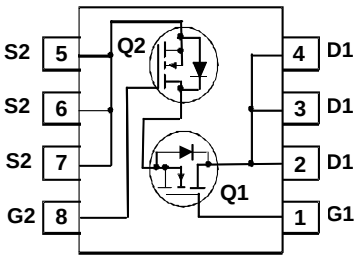
This device includes two specialized N-Channel MOSFETs in a dual MLP package. The switch node has been internally connected to enable easy placement and routing of synchronous buck converters. The control MOSFET (Q1) and synchronous MOSFET (Q2) have been designed to provide optimal power efficiency.

Applications

- Computing
- Communications
- General Purpose Point of Load
- Notebook Charger







Power 56

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	(Note 3)	±20	±20	V
I_D	Drain Current -Continuous (Package limited)	T_C = 25 °C	12	22	A
	-Continuous (Silicon limited)	T_C = 25 °C	41	39	
	-Continuous	T_A = 25 °C	11.5[1a]	12[1b]	
	-Pulsed		50	60	
E_{AS}	Single Pulse Avalanche Energy	(Note 4)	25	33	mJ
P_D	Power Dissipation for Single Operation	T_A = 25°C	2.2[1a]	2.5[1b]	W
	Power Dissipation for Single Operation	T_A = 25°C	1.0[1c]	1.0[1d]	
T_J, T_{STG}	Operating and Storage Junction Temperature Range		-55 to +150		°C

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	57[1a]	50[1b]	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	125[1c]	120[1d]	
$R_{\theta JC}$	Thermal Resistance, Junction to Case	4.6	4.7	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMS7606	FDMS7606	Power 56	13 ”	12 mm	3000 units

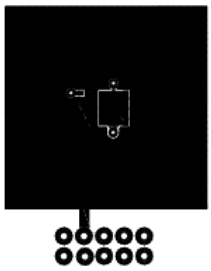
Electrical Characteristics T_J = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
Off Characteristics							
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V	Q1 Q2	30 30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25°C	Q1 Q2		16 20		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 24 V, V_{GS} = 0 V	Q1 Q2			1 1	μA
I_{GSS}	Gate to Source Leakage Curent	V_{GS} = 20 V, V_{DS} = 0 V V_{GS} = ±20 V, V_{DS} = 0 V	Q1 Q2			100 ±100	nA
On Characteristics							
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	Q1 Q2	1.0 1.0	2.1 1.9	3.0 3.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25°C	Q1 Q2		-6 -5.5		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 11.5 A V_{GS} = 4.5 V, I_D = 10 A V_{GS} = 10 V, I_D = 11.5 A, T_J = 125°C	Q1		9.2 12.6 11.8	11.4 15.7 14.7	mΩ
		V_{GS} = 10 V, I_D = 12 A V_{GS} = 4.5 V, I= 9.5 A V_{GS} = 10 V, I_D = 12 A, T_J = 125°C	Q2		9.7 12.8 12.3	11.6 17.2 15.4	
g_{FS}	Forward Transconductance	V_{DD} = 5 V, I_D = 11.5 A V_{DD} = 5 V, I_D = 12 A	Q1 Q2		53 47		S
Dynamic Characteristics							
C_{iss}	Input Capacitance	Q1: V_{DS} = 15 V, V_{GS} = 0 V, f = 1 MHZ	Q1 Q2		1050 947	1400 1260	pF
C_{oss}	Output Capacitance	Q2: V_{DS} = 15 V, V_{GS} = 0 V, f = 1 MHZ	Q1 Q2		295 191	395 255	pF
C_{rss}	Reverse Transfer Capacitance		Q1 Q2		32 131	50 200	pF
R_g	Gate Resistance		Q1 Q2	0.2 0.2	1.6 1.0	4.0 2.5	Ω
Switching Characteristics							
$t_{d(on)}$	Turn-On Delay Time	Q1 V_{DD} = 15 V, I_D = 11.5 A, R_{GEN} = 6 Ω	Q1 Q2		7 6	14 12	ns
t_r	Rise Time		Q1 Q2		3 3	10 10	ns
$t_{d(off)}$	Turn-Off Delay Time	Q2 V_{DD} = 15 V, I_D = 12 A, R_{GEN} = 6 Ω	Q1 Q2		18 19	33 34	ns
t_f	Fall Time		Q1 Q2		3 3	10 10	ns
$Q_{g(TOT)}$	Total Gate Charge	V_{GS} = 0V to 10 V; Q1 V_{DD} = 15 V, I_D = 11.5 A	Q1 Q2		16 19	22 27	nC
$Q_{g(TOT)}$	Total Gate Charge	V_{GS} = 0V to 5 V; Q1 V_{DD} = 15 V, I_D = 11.5 A	Q1 Q2		8 10	11 15	nC
Q_{gs}	Gate to Source Charge	Q2 V_{DD} = 15 V, I_D = 12 A	Q1 Q2		3.2 2.6		nC
Q_{gd}	Gate to Drain “Miller” Charge		Q1 Q2		2.0 4.2		nC

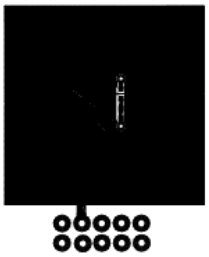
Electrical Characteristics T_J = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
Drain-Source Diode Characteristics							
V_{SD}	Source-Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 2 A (Note 2)	Q1		0.76	1.2	V
		V_{GS} = 0 V, I_S = 11.5 A (Note 2)	Q1		0.87	1.2	
		V_{GS} = 0 V, I_S = 2 A (Note 2)	Q2		0.75	1.2	
		V_{GS} = 0 V, I_S = 12 A (Note 2)	Q2		0.85	1.2	
t_{rr}	Reverse Recovery Time	Q1 I_F = 11.5 A, di/dt = 100 A/s	Q1		22	35	ns
			Q2		18	33	
Q_{rr}	Reverse Recovery Charge	Q2 I_F = 12 A, di/dt = 100 A/s	Q1		7	13	nC
			Q2		6	12	

Notes:
1.$R_{\theta JA}$ is determined with the device mounted on a 1 in^2 pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.

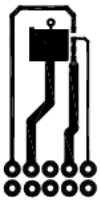


a. 57 °C/W when mounted on a 1 in^2 pad of 2 oz copper



b. 50 °C/W when mounted on a 1 in^2 pad of 2 oz copper

c. 125 °C/W when mounted on a minimum pad of 2 oz copper



d. 120 °C/W when mounted on a minimum pad of 2 oz copper

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

3. As an N-ch device, the negative Vgs rating is for low duty cycle pulse occurrence only. No continuous rating is implied

4. Q1: E_{AS} of 25 mJ is based on starting T_J = 25 °C, L = 0.3 mH, I_{AS} = 13 A, V_{DD} = 27 V, V_{GS} = 10 V.

Q2: E_{AS} of 33 mJ is based on starting T_J = 25 °C, L = 0.3 mH, I_{AS} = 15 A, V_{DD} = 27 V, V_{GS} = 10 V.

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

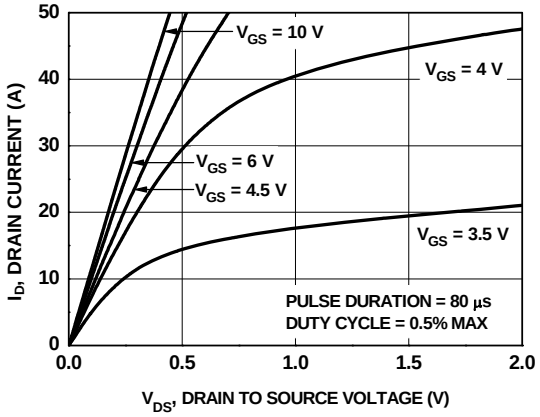


Figure 1. On Region Characteristics

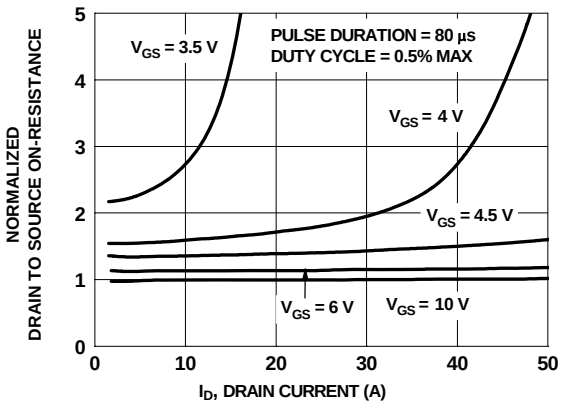


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

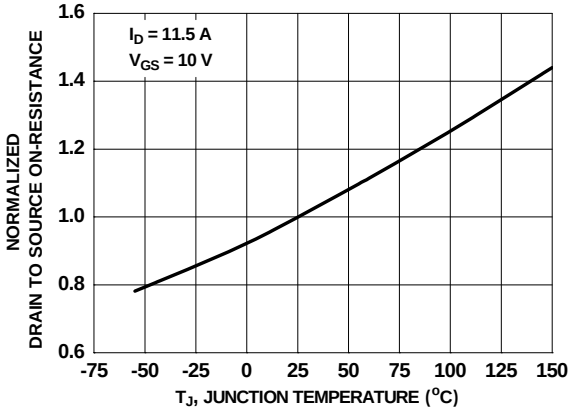


Figure 3. Normalized On Resistance vs Junction Temperature

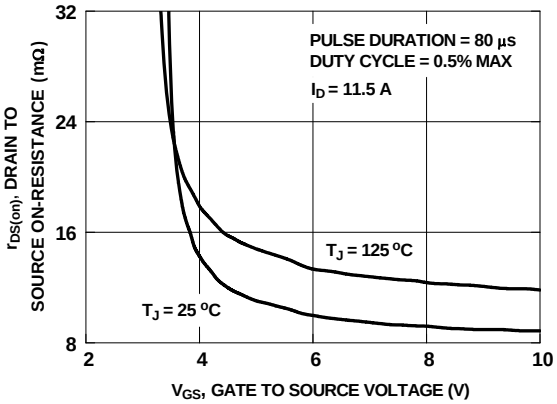


Figure 4. On-Resistance vs Gate to Source Voltage

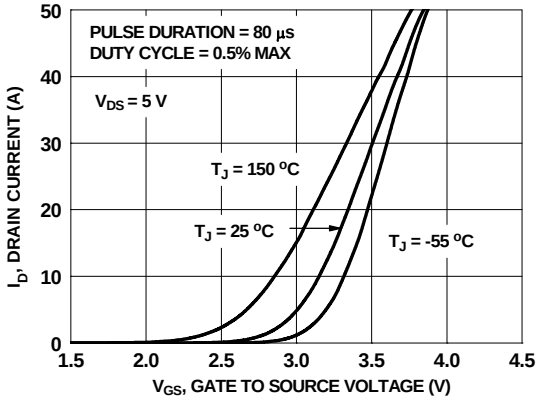


Figure 5. Transfer Characteristics

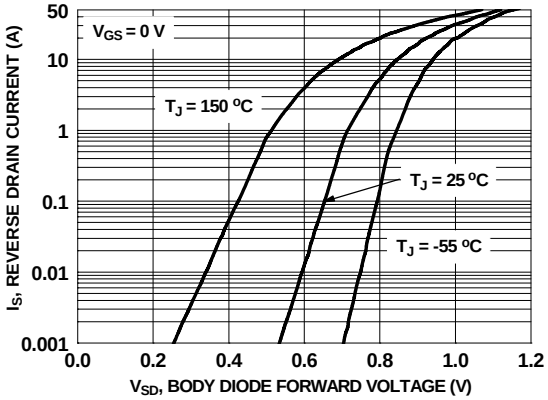


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

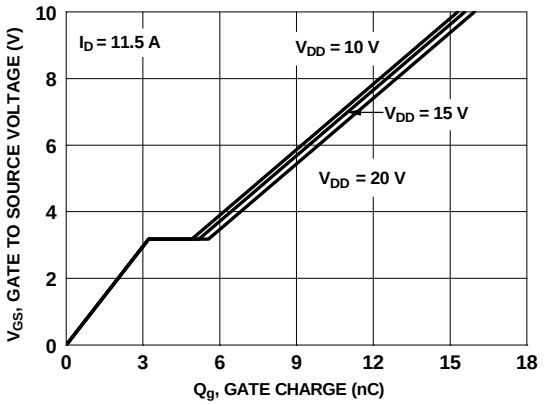


Figure 7. Gate Charge Characteristics

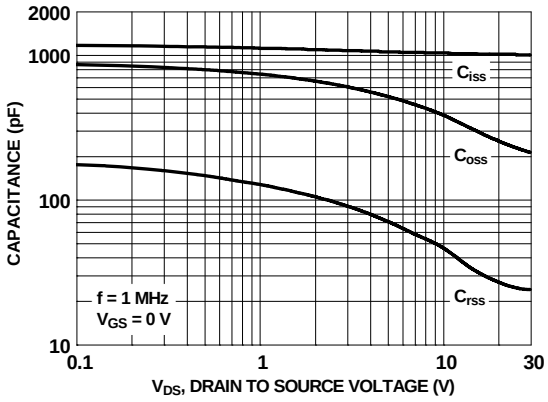


Figure 8. Capacitance vs Drain to Source Voltage

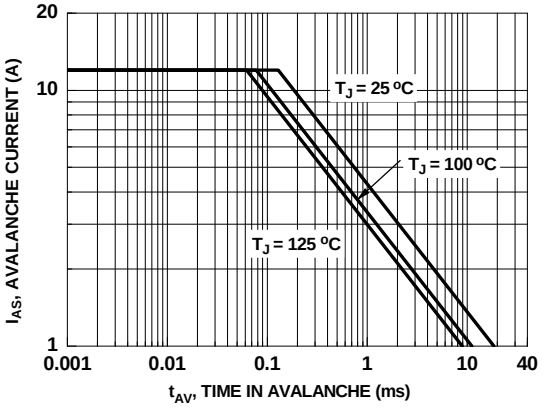


Figure 9. Unclamped Inductive Switching Capability

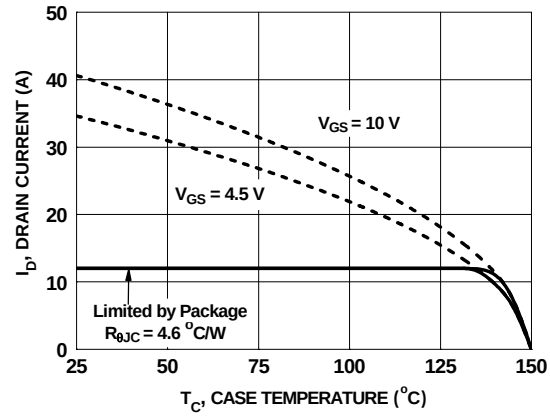


Figure 10. Maximum Continuous Drain Current vs Case Temperature

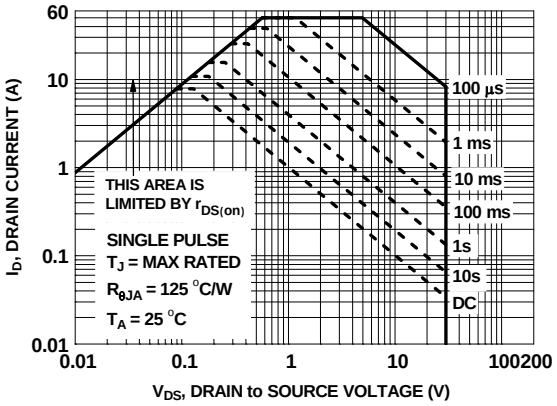


Figure 11. Forward Bias Safe Operating Area

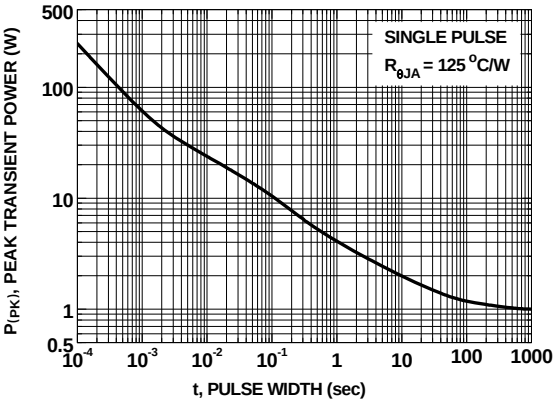


Figure 12. Single Pulse Maximum Power Dissipation

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

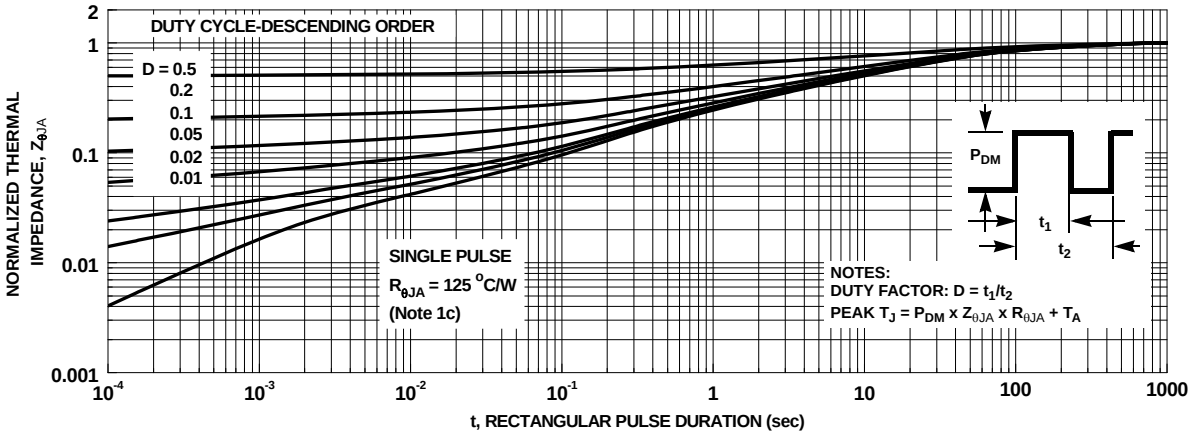


Figure 13. Junction-to-Ambient Transient Thermal Response Curve

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

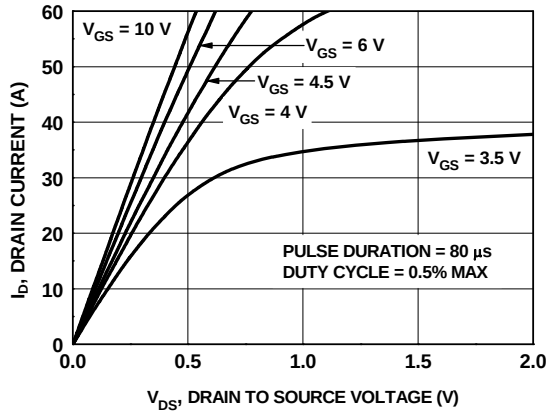


Figure 14. On-Region Characteristics

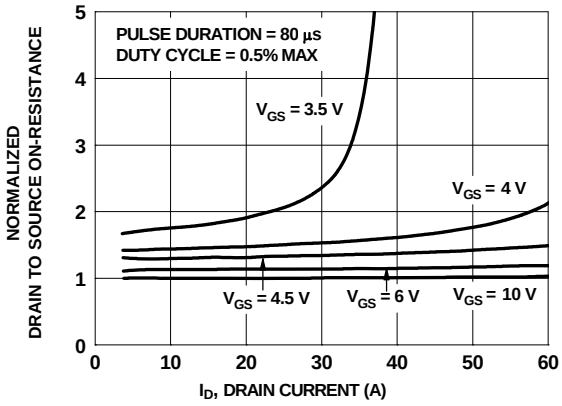


Figure 15. Normalized on-Resistance vs Drain Current and Gate Voltage

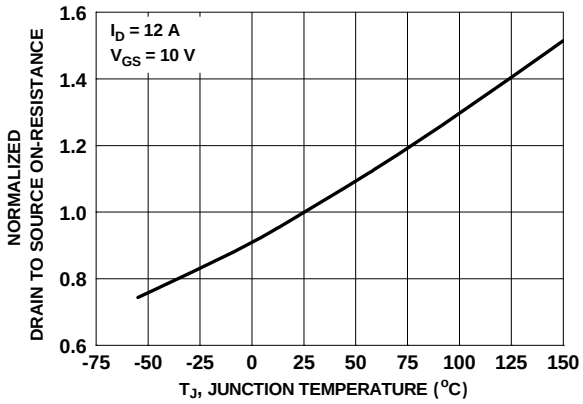


Figure 16. Normalized On-Resistance vs Junction Temperature

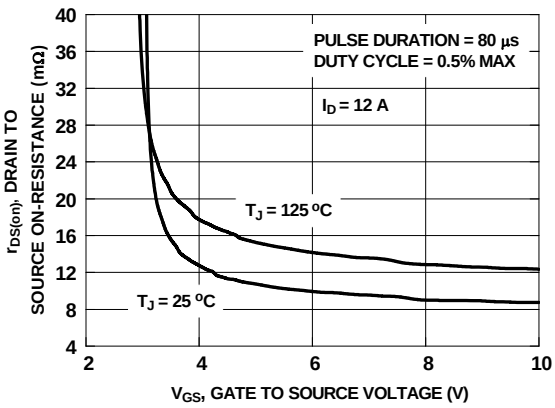


Figure 17. On-Resistance vs Gate to Source Voltage

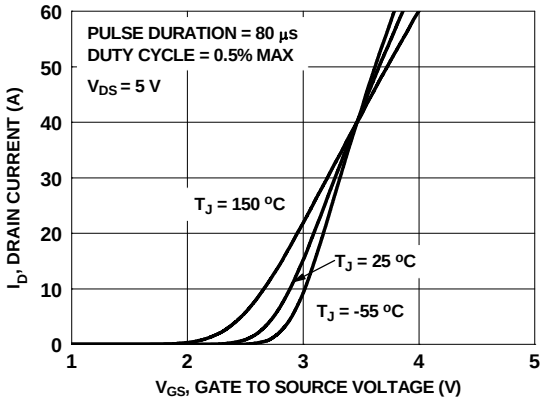


Figure 18. Transfer Characteristics

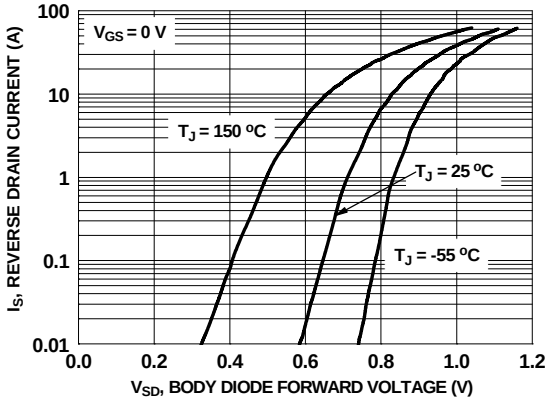


Figure 19. Source to Drain Diode Forward Voltage vs Source Current

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

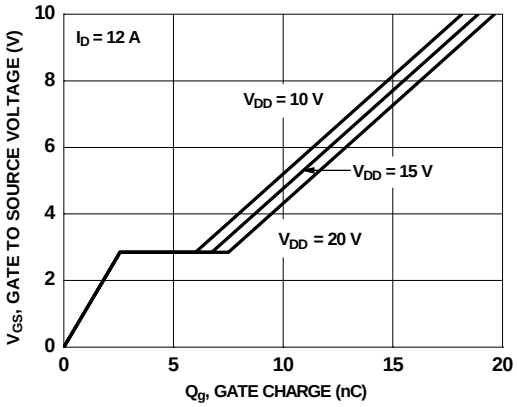


Figure 20. Gate Charge Characteristics

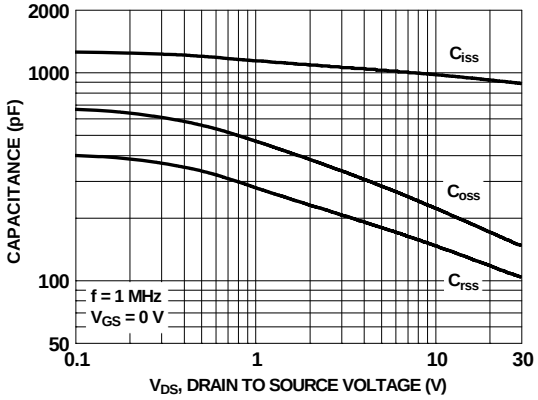


Figure 21. Capacitance vs Drain to Source Voltage

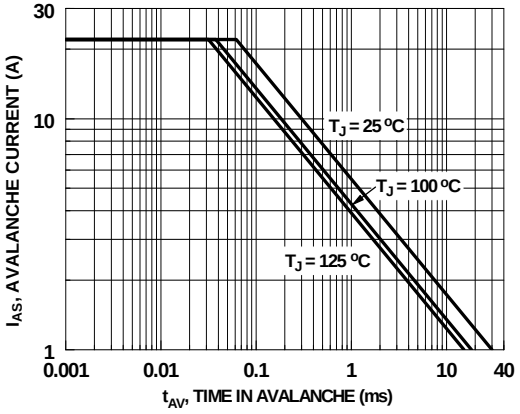


Figure 22. Unclamped Inductive Switching Capability

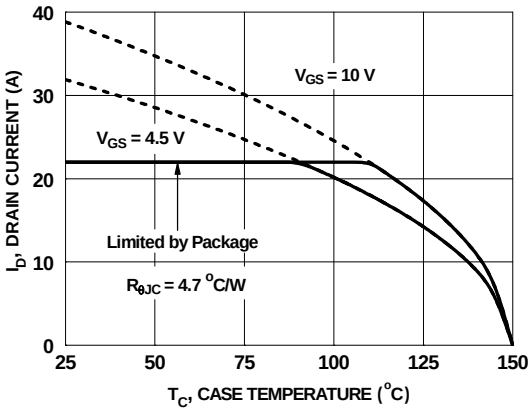


Figure 23. Maximum Continuous Drain Current vs Case Temperature

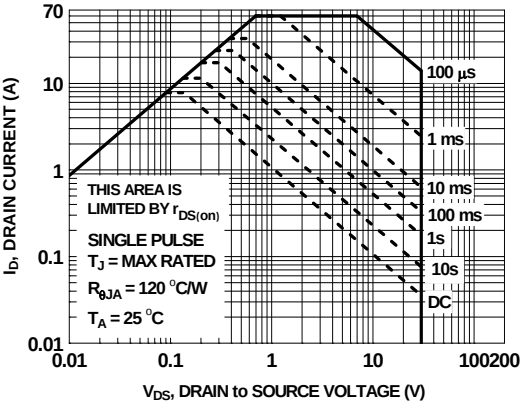


Figure 24. Forward Bias Safe Operating Area

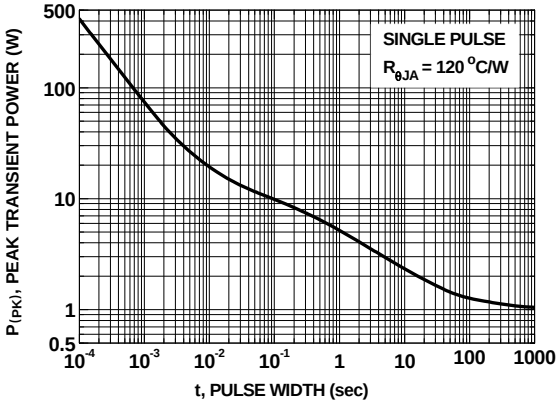


Figure 25. Single Pulse Maximum Power Dissipation

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

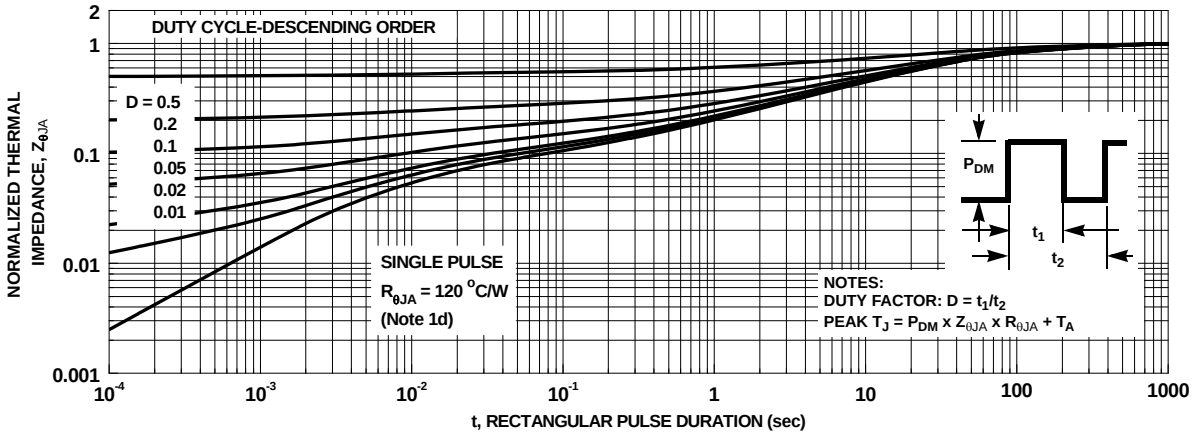
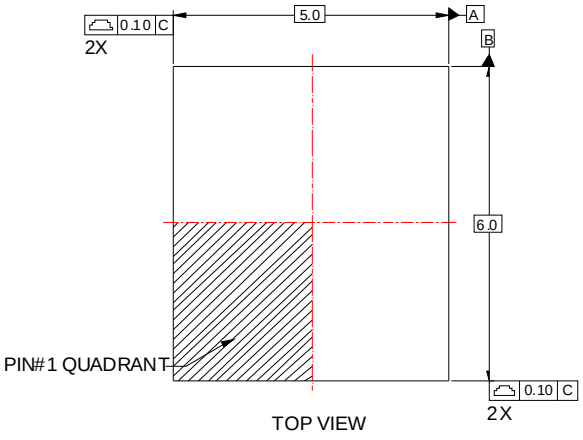
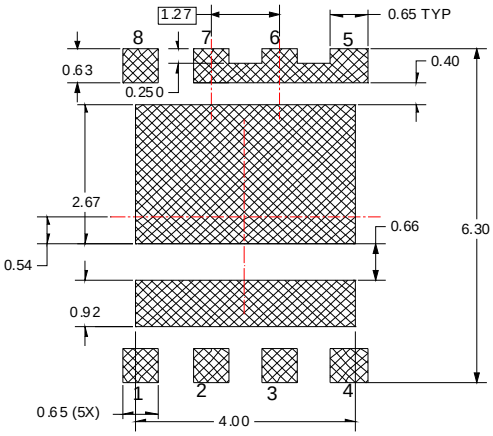


Figure 26. Junction-to-Ambient Transient Thermal Response Curve

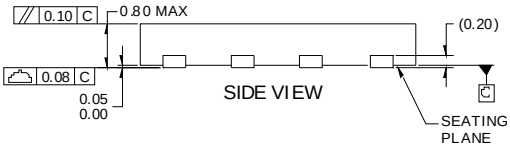
Dimensional Outline and Pad Layout

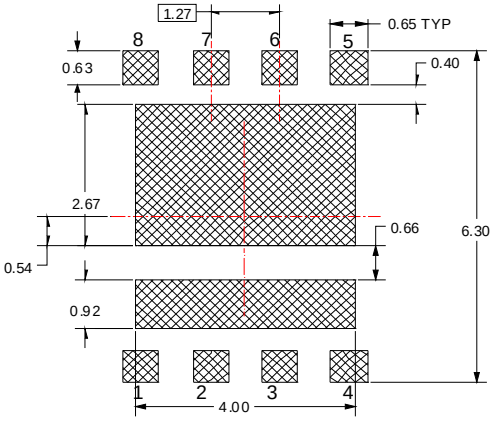


TOP VIEW

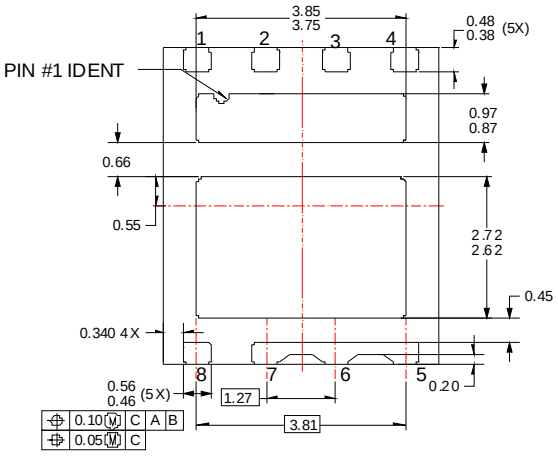


RECOMMENDED LAND PATTERN
(OPTION 1 - FUSED LEADS 5,6,7)





RECOMMENDED LAND PATTERN
(OPTION 2 - ISOLATED LEADS)



BOTTOM VIEW

NOTES:

A. DOES NOT FULLY CONFORM TO JEDEC REGISTRATION, MO-229.

B. DIMENSIONS ARE IN MILLIMETERS.

C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994

D. LAND PATTERN RECOMMENDATION IS BASED ON FSC DESIGN ONLY

FAIRCHILD SEMICONDUCTOR®

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CorePOWER™
CROSSVOLT™
CTL™
Current Transfer Logic™
DEUXPEED®
Dual Cool™
EcoSPARK®
EfficentMax™
ESBC™
Fairchild®
Fairchild Semiconductor®
FACT Quiet Series™
FACT®
FAST®
FastvCore™
FETBench™
FlashWriter®*
FPS™
F-PFS™
FRFET®
Global Power Resource^{SM}
Green FPS™
Green FPS™ e-Series™
G*max*™
GTO™
IntelliMAX™
ISOPLANAR™
MegaBuck™
MICROCOUPLER™
MicroFET™
MicroPak™
MicroPak2™
MillerDrive™
MotionMax™
Motion-SPM™
mWSaver™
OptiHiT™
OPTOLOGIC®
OPTOPLANAR®
PDP SPM™
Power-SPM™
PowerTrench®
PowerXS™
Programmable Active Droop™
QFET®
QS™
Quiet Series™
RapidConfigure™
Saving our world, 1mW/W/kW at a time™
SignalWise™
SmartMax™
SMART START™
SPM®
STEALTH™
SuperFET®
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
SupreMOS®
SyncFET™
Sync-Lock™
SYSTEM GENERAL®*
The Power Franchise®
The Right Technology for Your Success™
the power franchise®
TinyBoost™
TinyBuck™
TinyCalc™
TinyLogic®
TINYOPTO™
TinyPower™
TinyPWM™
TinyWire™
TranSiC®
TriFault Detect™
TRUECURRENT®*
μSerDes™
UHC®
Ultra FRFET™
UniFET™
VCX™
VisualMax™
XS™

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Definition of Terms

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