FAIRCHILD SEMICONDUCTOR®

November 2013

FDMC86244

N-Channel Shielded Gate PowerTrench® MOSFET

150 V, 9.4 A, 134 mΩ

Features

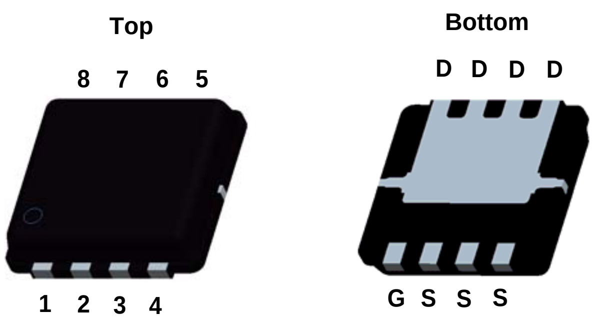
- Shielded Gate MOSFET Technology
- Max $r_{DS(on)}$ = 134 mΩ at V_{GS} = 10 V, I_D = 2.8 A
- Max $r_{DS(on)}$ = 186 mΩ at V_{GS} = 6 V, I_D = 2.4 A
- Low Profile - 1 mm max in Power 33
- 100% UIL Tested
- RoHS Compliant

General Description

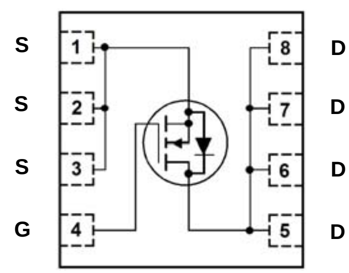
This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® process that incorporates Shielded Gate technology. This process has been optimized for the on-state resistance and yet maintain superior switching performance.

Application

- DC - DC Conversion



MLP 3.3x3.3



MOSFET Maximum Ratings T_A = 25 °C unless otherwise noted

Symbol	Parameter	Ratings	Units
V_{DS}	Drain to Source Voltage	150	V
V_{GS}	Gate to Source Voltage	±20	V
I_D	Drain Current -Continuous T_C = 25°C	9.4	A
	-Continuous T_A = 25°C (Note 1a)	2.8	
	-Pulsed	12	
E_{AS}	Single Pulse Avalanche Energy (Note 3)	12	mJ
P_D	Power Dissipation T_C = 25°C	26	W
	Power Dissipation T_A = 25°C (Note 1a)	2.3	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to + 150	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	4.7	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	125	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMC86244	FDMC86244	Power 33	13''	12 mm	3000 units

Electrical Characteristics T_J = 25 °C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units

Off Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V	150			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25 °C		106		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 120 V, V_{GS} = 0 V			1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20 V, V_{DS} = 0 V			±100	nA

On Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	2	2.6	4	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25 °C		-9		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 2.8 A		105	134	mΩ
		V_{GS} = 6 V, I_D = 2.4 A		120	186	
		V_{GS} = 10 V, I_D = 2.8 A, T_J = 125 °C		199	254	
g_{FS}	Forward Transconductance	V_{DD} = 10 V, I_D = 2.8 A		8		S

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
C_{iss}	Input Capacitance	V_{DS} = 75 V, V_{GS} = 0 V, f = 1 MHz		257	345	pF
C_{oss}	Output Capacitance			32	45	pF
C_{rss}	Reverse Transfer Capacitance			1.8	5	pF

Switching Characteristics

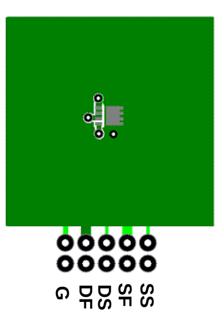
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 75 V, I_D = 2.8 A, V_{GS} = 10 V, R_{GEN} = 6 Ω		5.3	11	ns
t_r	Rise Time			1.5	10	ns
$t_{d(off)}$	Turn-Off Delay Time			9.9	20	ns
t_f	Fall Time			2.3	10	ns
$Q_{g(TOT)}$	Total Gate Charge	V_{GS} = 0 V to 10 V; V_{DD} = 75 V, I_D = 2.8 A		4.2	5.9	nC
$Q_{g(TOT)}$	Total Gate Charge	V_{GS} = 0 V to 5 V		2.4	3.4	
Q_{gs}	Total Gate Charge			1.1		nC
Q_{gd}	Gate to Drain "Miller" Charge			1.0		nC

Drain-Source Diode Characteristics

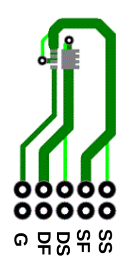
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 2.8 A (Note 2)		0.81	1.3	V
		V_{GS} = 0 V, I_S = 2 A (Note 2)		0.79	1.2	
t_{rr}	Reverse Recovery Time	I_F = 2.8 A, di/dt = 100 A/μs		48	76	ns
Q_{rr}	Reverse Recovery Charge			38	61	nC

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. 53 °C/W when mounted on a 1 in^2 pad of 2 oz copper



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

2. Pulse Test: Pulse Width < 300 μs, Duty cycle < 2.0%.
3. Starting T_J = 25 °C; N-ch: L = 1.0 mH, I_{AS} = 5.0 A, V_{DD} = 135 V, V_{GS} = 10 V.

Typical Characteristics T_J = 25 °C unless otherwise noted

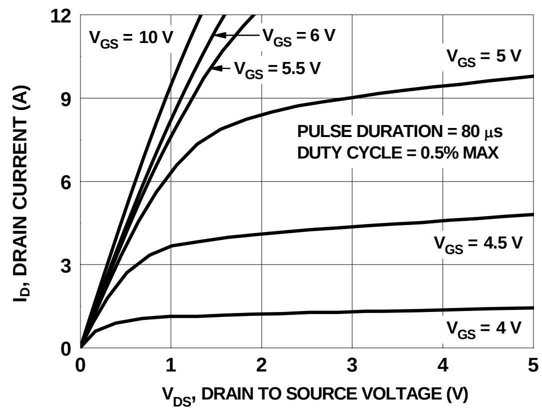


Figure 1. On Region Characteristics

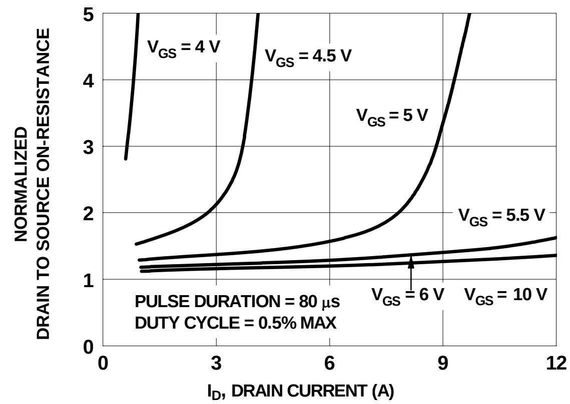


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

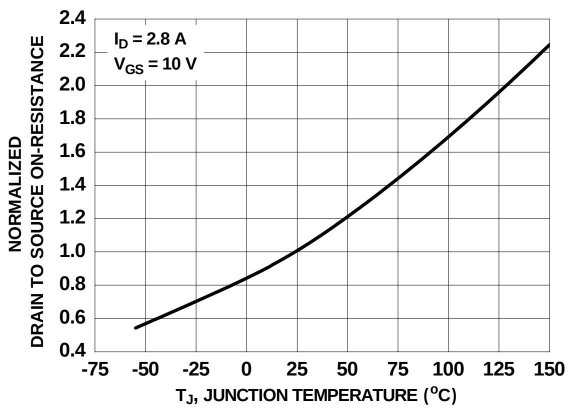


Figure 3. Normalized On Resistance vs Junction Temperature

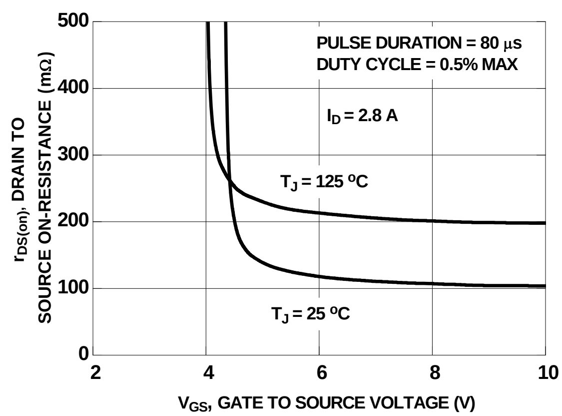


Figure 4. On-Resistance vs Gate to Source Voltage

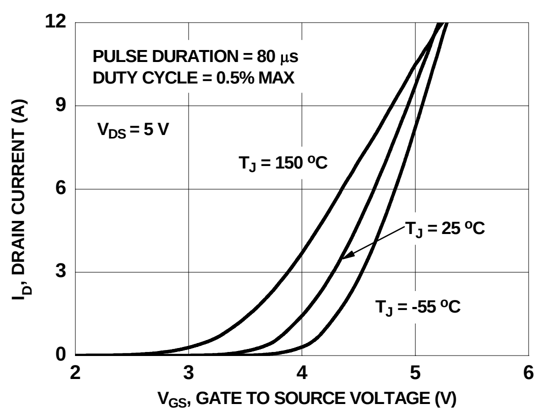


Figure 5. Transfer Characteristics

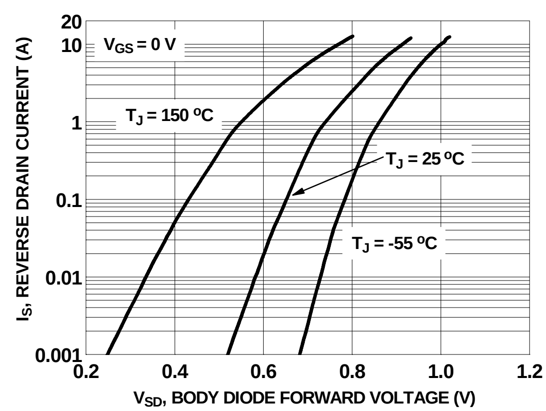


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics T_J = 25 °C unless otherwise noted

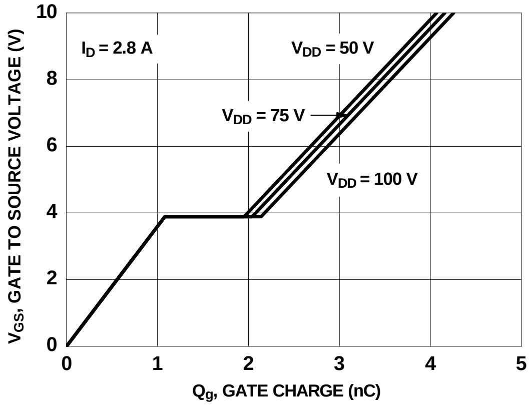


Figure 7. Gate Charge Characteristics

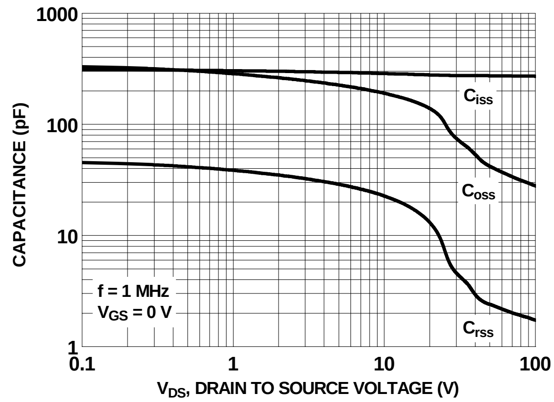


Figure 8. Capacitance vs Drain to Source Voltage

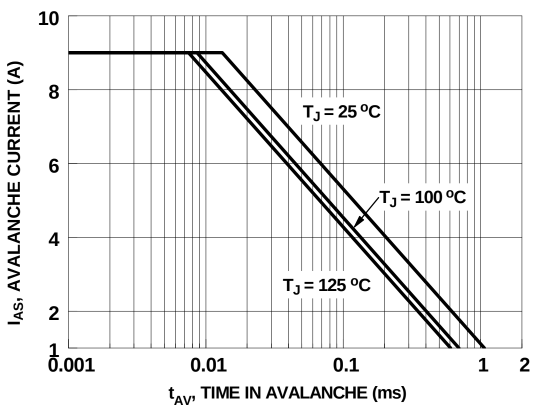


Figure 9. Unclamped Inductive Switching Capability

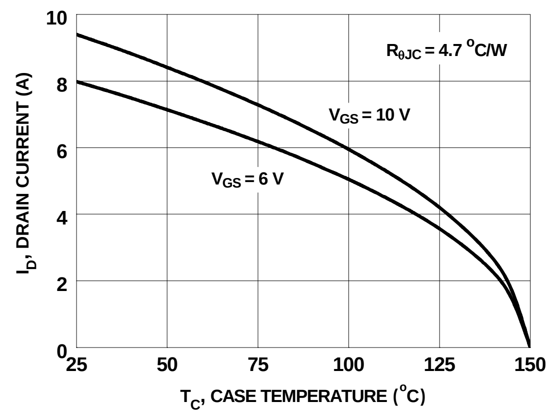


Figure 10. Maximum Continuous Drain Current vs Case Temperature

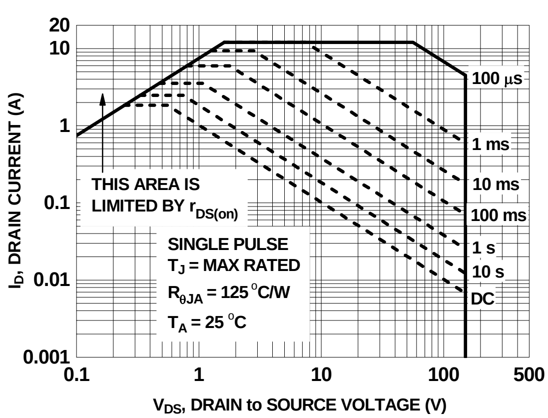


Figure 11. Forward Bias Safe Operating Area

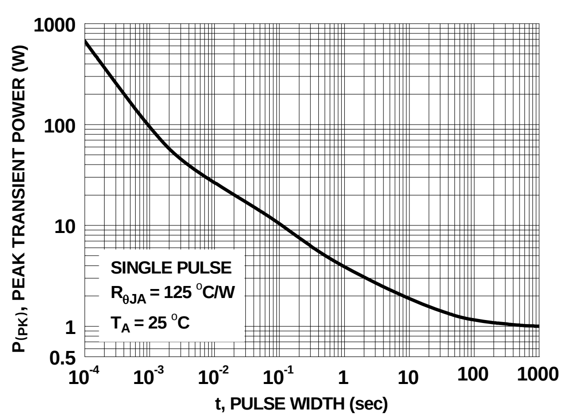


Figure 12. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25 °C unless otherwise noted

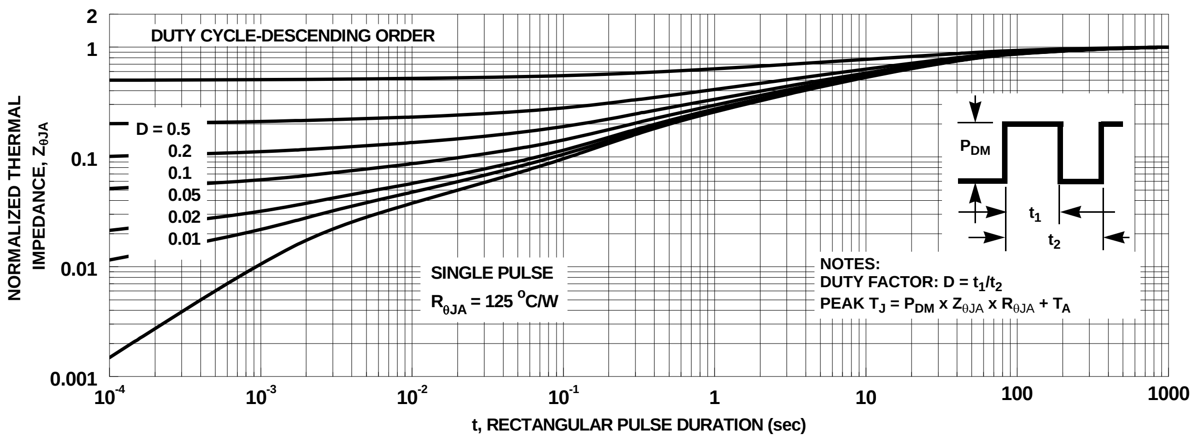
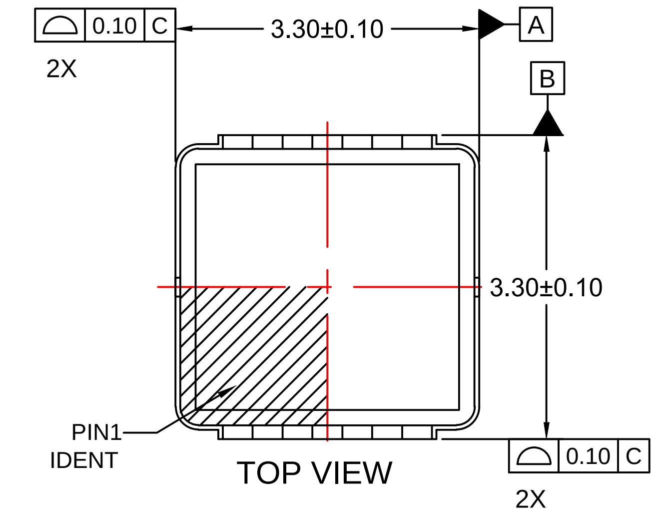
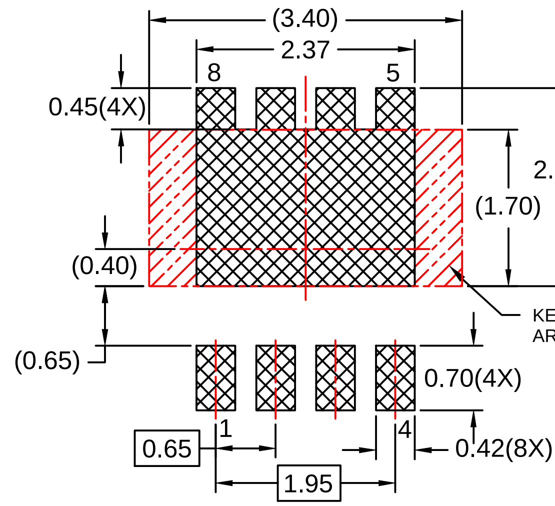
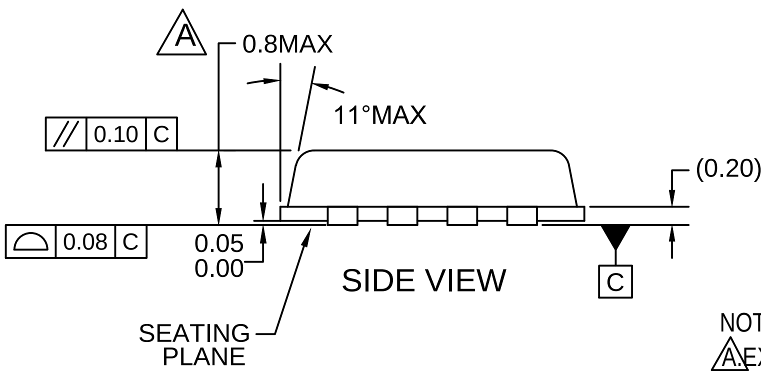


Figure 13. Junction-to-Ambient Transient Thermal Response Curve

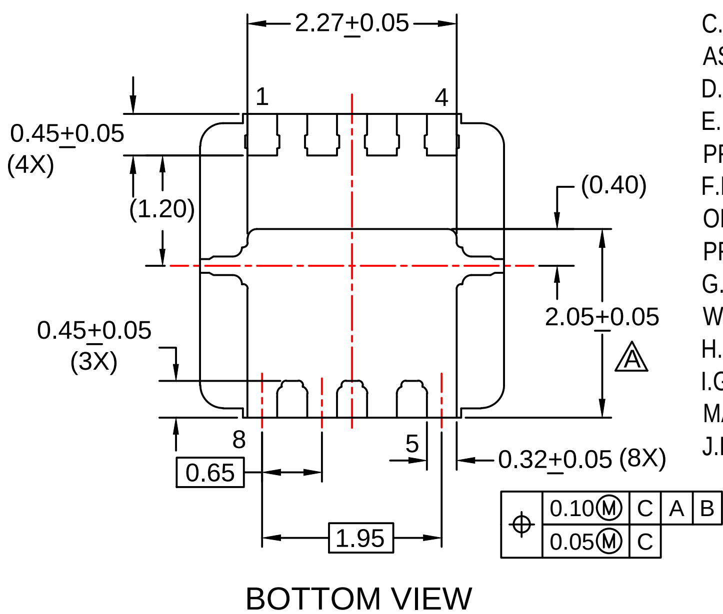
Dimensional Outline and Pad Layout







RECOMMENDED LAND PATTERN



NOTES:

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C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M,1994.
D. SEATING PLANE IS DEFINED BY TERMINAL TIPS ONLY
E. BODY DIMENSIONS DO NOT INCLUDE MOLD FLASH PROTRUSIONS NOR GATEBURRS.
F. FLANGE DIMENSIONS INCLUDE INTERTERMINAL FLASH OR PROTRUSION. INTERTERMINAL FLASH OR PROTRUSION SHALL NOT EXCEED 0.25MM PER SIDE.
G. IT IS RECOMMENDED TO HAVE NO TRACES OR VIA WITHIN THE KEEP OUT AREA.
H. DRAWING FILENAME: MKT-MLP08Trev3.
I. GENERAL RADII FOR ALL CORNERS SHALL BE 0.20MM MAX.
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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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