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November 2013

## FDMC86244

# N-Channel Shielded Gate PowerTrench® MOSFET 150 V, 9.4 A, 134 m $\Omega$

#### **Features**

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

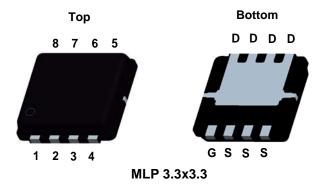


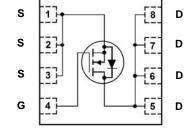
#### **General Description**

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





### MOSFET Maximum Ratings T<sub>A</sub> = 25 °C unless otherwise noted

Symbol	Parameter			Ratings	Units
V <sub>DS</sub>	Drain to Source Voltage			150	V
$V_{GS}$	Gate to Source Voltage			±20	V
	Drain Current -Continuous	T <sub>C</sub> = 25°C		9.4	
I <sub>D</sub>	-Continuous	T <sub>A</sub> = 25°C	(Note 1a)	2.8	Α
	-Pulsed			12	
E <sub>AS</sub>	Single Pulse Avalanche Energy		(Note 3)	12	mJ
D	Power Dissipation	T <sub>C</sub> = 25°C		26	W
$P_{D}$	Power Dissipation	T <sub>A</sub> = 25°C	(Note 1a)	2.3	VV
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Junction Temperat	ure 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	C/VV

#### **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<sub>J</sub> = 25 °C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Тур	Max	Units
Off Chara	cteristics					
BV <sub>DSS</sub>	Drain to Source Breakdown Voltage	$I_D = 250 \mu A, V_{GS} = 0 V$	150			V
$\frac{\Delta BV_{DSS}}{\Delta T_{J}}$	Breakdown Voltage Temperature Coefficient	$I_D$ = 250 $\mu$ A, referenced to 25 °C		106		mV/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 120 V, V <sub>GS</sub> = 0 V			1	μΑ
I <sub>GSS</sub>	Gate to Source Leakage Current	$V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$			±100	nA

#### On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250 \mu A$	2	2.6	4	V
$\Delta V_{GS(th)}$ $\Delta T_J$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250 \mu A$ , referenced to 25 °C		-9		mV/°C
r <sub>DS(on)</sub>		$V_{GS} = 10 \text{ V}, I_D = 2.8 \text{ A}$		105	134	
	Static Drain to Source On Resistance	$V_{GS} = 6 \text{ V}, I_D = 2.4 \text{ A}$		120	186	mΩ
		$V_{GS} = 10 \text{ V}, I_D = 2.8 \text{ A}, T_J = 125 \text{ °C}$		199	254	
9 <sub>FS</sub>	Forward Transconductance	$V_{DD} = 10 \text{ V}, I_D = 2.8 \text{ A}$		8		S

#### **Dynamic Characteristics**

C <sub>iss</sub>	Input Capacitance	V 75 V V 6 V	257	345	pF
C <sub>oss</sub>	Output Capacitance	$V_{DS} = 75 \text{ V}, V_{GS} = 0 \text{ V},$ f = 1 MHz	32	45	pF
C <sub>rss</sub>	Reverse Transfer Capacitance	1 - 1 1411 12	1.8	5	pF

#### **Switching Characteristics**

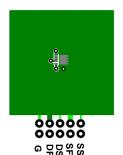
t <sub>d(on)</sub>	Turn-On Delay Time		5.3	11	ns
t <sub>r</sub>	Rise Time	$V_{DD} = 75 \text{ V}, I_D = 2.8 \text{ A},$	1.5	10	ns
t <sub>d(off)</sub>	Turn-Off Delay Time	$V_{GS} = 10 \text{ V}, R_{GEN} = 6 \Omega$	9.9	20	ns
t <sub>f</sub>	Fall Time		2.3	10	ns
$Q_{g(TOT)}$	Total Gate Charge	V <sub>GS</sub> = 0 V to 10 V	4.2	5.9	nC
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0 \text{ V to 5 V}$ $V_{DD} = 75 \text{ V},$ $I_{D} = 2.8 \text{ A}$	2.4	3.4	
$Q_{gs}$	Total Gate Charge	1 <sub>D</sub> = 2.6 A	1.1		nC
$Q_{gd}$	Gate to Drain "Miller" Charge		1.0		nC

#### **Drain-Source Diode Characteristics**

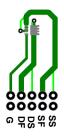
$V_{SD}$	Source to Drain Dioge Forward Voltage	$V_{GS} = 0 \text{ V}, I_{S} = 2.8 \text{ A}$	(Note 2)	0.81	1.3	\/
		$V_{GS} = 0 \text{ V}, I_{S} = 2 \text{ A}$	(Note 2)	0.79	1.2	V
t <sub>rr</sub>	Reverse Recovery Time	-I <sub>F</sub> = 2.8 A, di/dt = 100 A/μs		48	76	ns
Q <sub>rr</sub>	Reverse Recovery Charge			38	61	nC

#### NOTES

1. R<sub>0JA</sub> is determined with the device mounted on a 1 in<sup>2</sup> pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. R<sub>0JC</sub> is guaranteed by design while R<sub>0CA</sub> is determined by the user's board design.



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



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

<sup>2.</sup> Pulse Test: Pulse Width < 300  $\mu\text{s},$  Duty cycle < 2.0%.

<sup>3.</sup> 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<sub>J</sub> = 25 °C unless otherwise noted

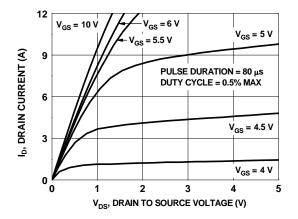


Figure 1. On Region Characteristics

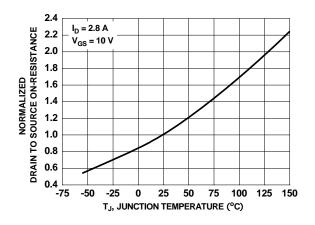


Figure 3. Normalized On Resistance vs Junction Temperature

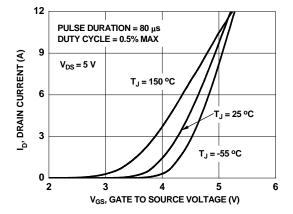


Figure 5. Transfer Characteristics

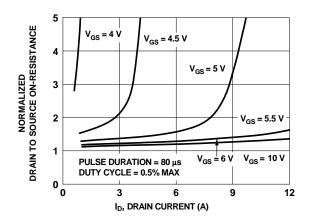


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

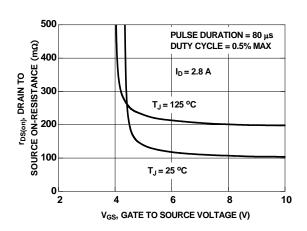


Figure 4. On-Resistance vs Gate to Source Voltage

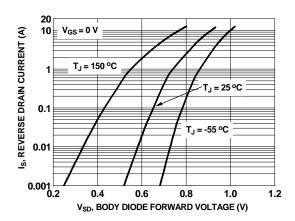


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

## **Typical Characteristics** $T_J = 25$ °C unless otherwise noted

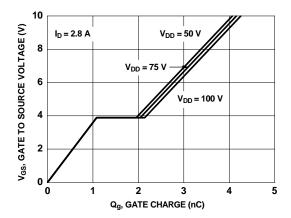


Figure 7. Gate Charge Characteristics

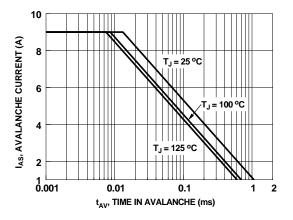


Figure 9. Unclamped Inductive Switching Capability

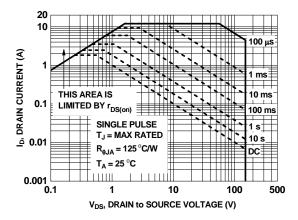


Figure 11. Forward Bias Safe Operating Area

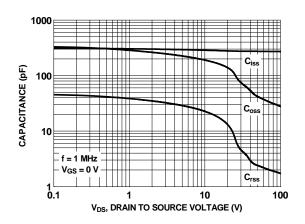


Figure 8. Capacitance vs Drain to Source Voltage

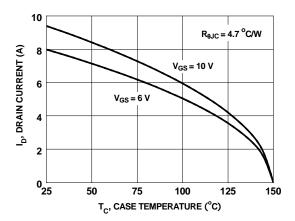


Figure 10. Maximum Continuous Drain Current vs Case Temperature

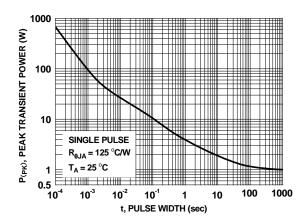


Figure 12. Single Pulse Maximum Power Dissipation

## **Typical Characteristics** $T_J = 25$ °C unless otherwise noted

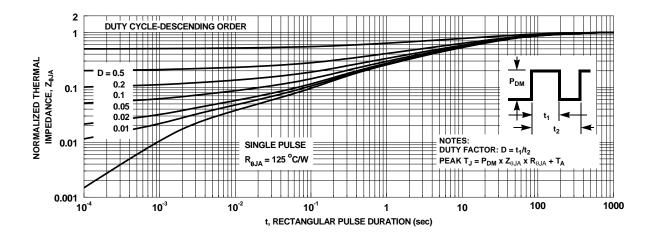
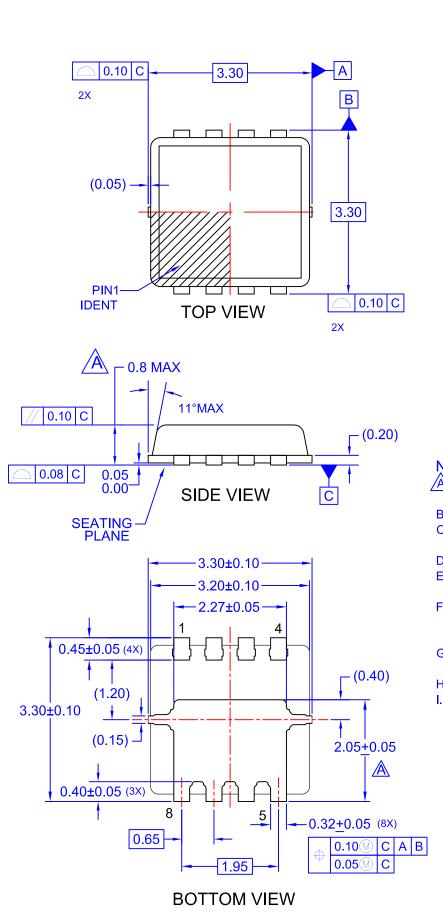
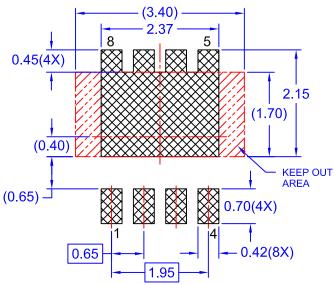


Figure 13. Junction-to-Ambient Transient Thermal Response Curve





#### RECOMMENDED LAND PATTERN

#### **NOTES:**

- A EXCEPT AS NOTED, PACKAGE CONFORMS TO JEDEC REGISTRATION MO-240 VARIATION BA.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.
- D. SEATING PLANE IS DEFINED BY TERMINAL TIPS ONLY
- E. BODY DIMENSIONS DO NOT INCLUDE MOLD FLASH PROTRUSIONS NOR GATE BURRS.
- 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-MLP08Trev4.
- GENERAL RADII FOR ALL CORNERS SHALL BE 0.20MM MAX.



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