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# FDMC86240

## N-Channel Shielded Gate PowerTrench<sup>®</sup> MOSFET

150 V, 16 A, 51 mΩ

### Features

- Shielded Gate MOSFET Technology
- Max  $r_{DS(on)}$  = 51 mΩ at  $V_{GS} = 10$  V,  $I_D = 4.6$  A
- Max  $r_{DS(on)}$  = 70 mΩ at  $V_{GS} = 6$  V,  $I_D = 3.9$  A
- Low Profile - 1 mm max in Power 33
- 100% UIL Tested
- RoHS Compliant

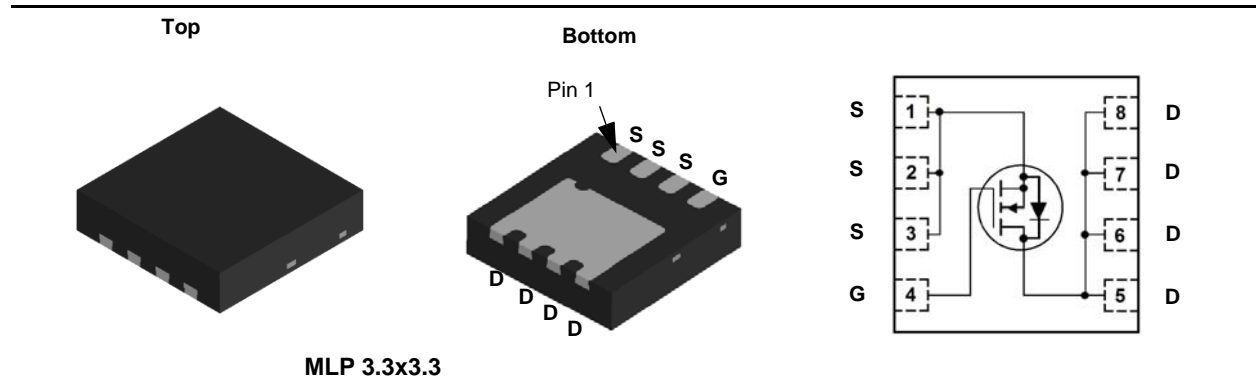


### General Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench<sup>®</sup> 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	Conditions	Rated Value	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	16	A
		-Continuous $T_A = 25$ °C (Note 1a)	4.6	
		-Pulsed	20	
$E_{AS}$	Single Pulse Avalanche Energy	(Note 3)	34	mJ
$P_D$	Power Dissipation	$T_C = 25$ °C	40	W
		$T_A = 25$ °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		3.1	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	53	

### Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMC86240	FDMC86240	Power 33	13 "	12 mm	3000 units

FDMC86240 N-Channel Shielded Gate PowerTrench<sup>®</sup> MOSFET

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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### Off Characteristics

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250\ \mu\text{A}$ , $V_{GS} = 0\ \text{V}$	150			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , referenced to $25\text{ }^\circ\text{C}$		101		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 120\ \text{V}$ , $V_{GS} = 0\ \text{V}$			1	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 20\ \text{V}$ , $V_{DS} = 0\ \text{V}$			$\pm 100$	nA

### On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = 250\ \mu\text{A}$	2.0	2.9	4.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , referenced to $25\text{ }^\circ\text{C}$		-9		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\ \text{V}$ , $I_D = 4.6\ \text{A}$		44.7	51	m $\Omega$
		$V_{GS} = 6\ \text{V}$ , $I_D = 3.9\ \text{A}$		51.4	70	
		$V_{GS} = 10\ \text{V}$ , $I_D = 4.6\ \text{A}$ , $T_J = 125\text{ }^\circ\text{C}$		84.5	97	
$g_{FS}$	Forward Transconductance	$V_{DS} = 10\ \text{V}$ , $I_D = 4.6\ \text{A}$		15		S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 75\ \text{V}$ , $V_{GS} = 0\ \text{V}$ , $f = 1\ \text{MHz}$		680	905	pF
$C_{oss}$	Output Capacitance			79	105	pF
$C_{rss}$	Reverse Transfer Capacitance			4.3	10	pF
$R_g$	Gate Resistance			0.5		$\Omega$

### Switching Characteristics

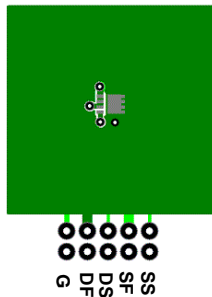
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 75\ \text{V}$ , $I_D = 4.6\ \text{A}$ , $V_{GS} = 10\ \text{V}$ , $R_{GEN} = 6\ \Omega$		8.2	17	ns
$t_r$	Rise Time			1.7	10	ns
$t_{d(off)}$	Turn-Off Delay Time			14	26	ns
$t_f$	Fall Time			3.1	10	ns
$Q_{g(TOT)}$	Total Gate Charge		$V_{GS} = 0\ \text{V}$ to $10\ \text{V}$		11	15
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0\ \text{V}$ to $5\ \text{V}$	$V_{DD} = 75\ \text{V}$ , $I_D = 4.6\ \text{A}$	6	9	nC
$Q_{gs}$	Total Gate Charge			2.8		nC
$Q_{gd}$	Gate to Drain "Miller" Charge			2.3		nC

### Drain-Source Diode Characteristics

$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\ \text{V}$ , $I_S = 4.6\ \text{A}$ (Note 2)		0.79	1.3	V
		$V_{GS} = 0\ \text{V}$ , $I_S = 2\ \text{A}$ (Note 2)		0.75	1.2	
$t_{rr}$	Reverse Recovery Time	$I_F = 4.6\ \text{A}$ , $di/dt = 100\ \text{A}/\mu\text{s}$		58	93	ns
$Q_{rr}$	Reverse Recovery Charge			63	102	nC

#### NOTES:

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



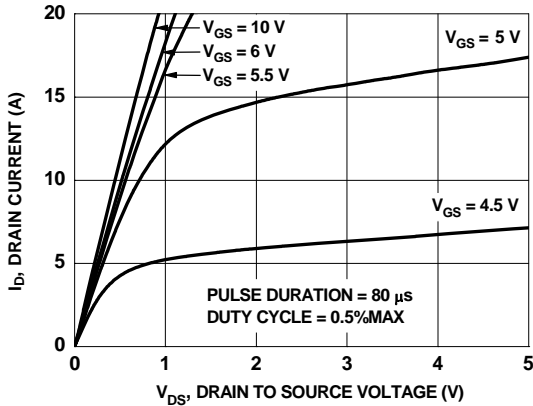
53  $^\circ\text{C}/\text{W}$  when mounted on a  $1\ \text{in}^2$  pad of 2 oz copper



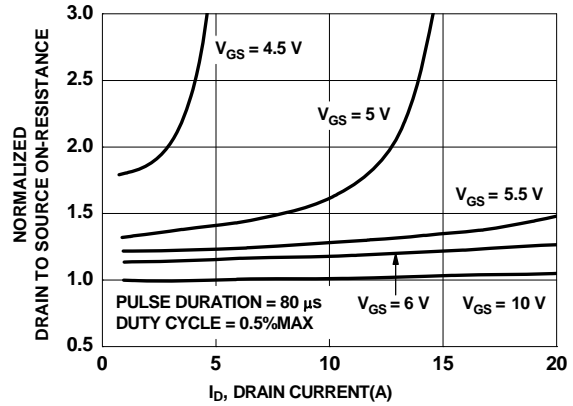
125  $^\circ\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper

- Pulse Test: Pulse Width < 300  $\mu\text{s}$ , Duty cycle < 2.0%.
- Starting  $T_J = 25\text{ }^\circ\text{C}$ ; N-ch:  $L = 3\ \text{mH}$ ,  $I_{AS} = 4.8\ \text{A}$ ,  $V_{DD} = 150\ \text{V}$ ,  $V_{GS} = 10\ \text{V}$ .

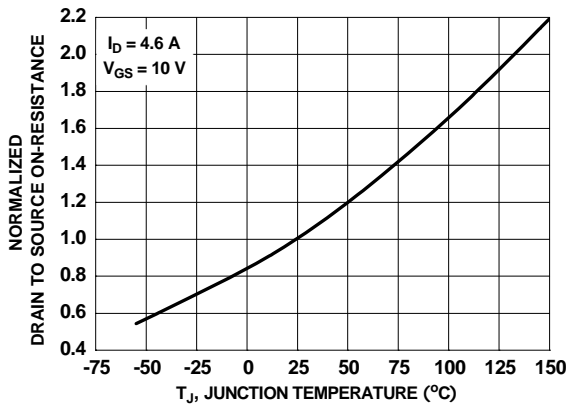
**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted



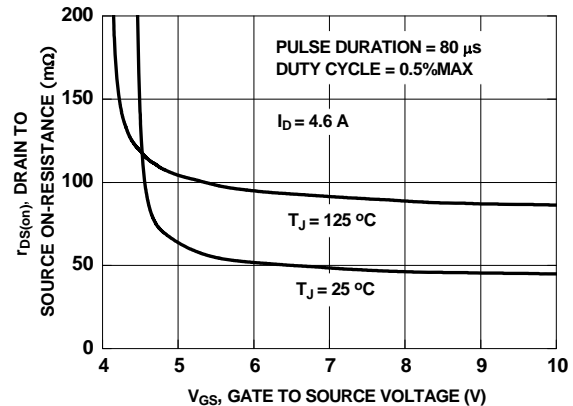
**Figure 1. On-Region Characteristics**



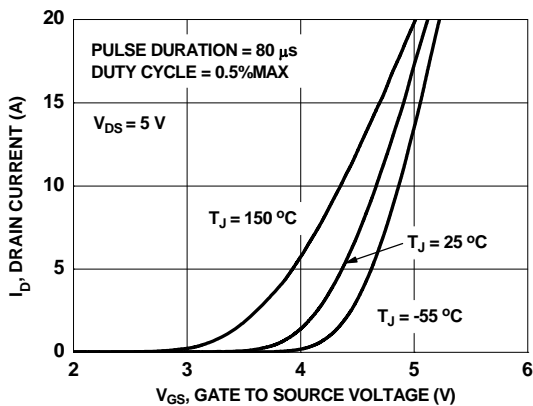
**Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage**



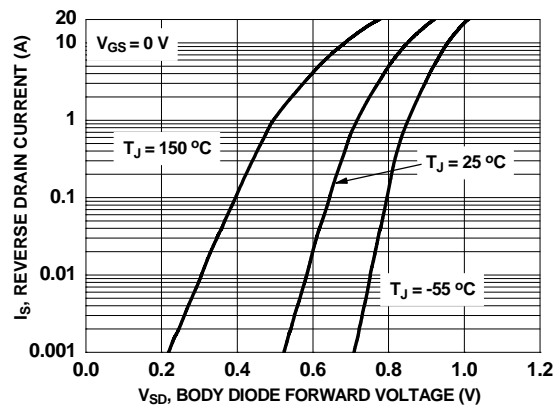
**Figure 3. Normalized On-Resistance vs. Junction Temperature**



**Figure 4. On-Resistance vs. Gate to Source Voltage**

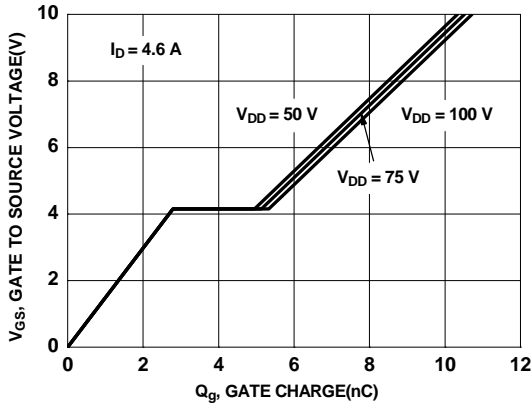


**Figure 5. Transfer Characteristics**

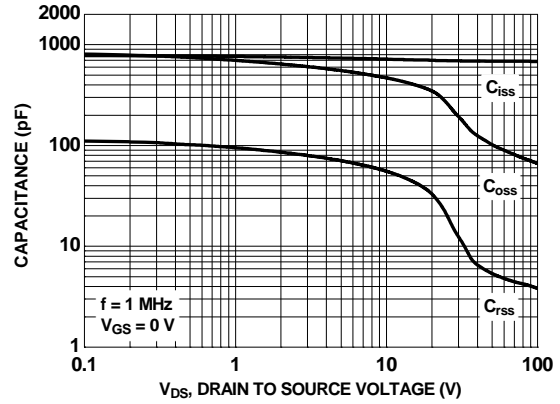


**Figure 6. Source to Drain Diode Forward Voltage vs. Source Current**

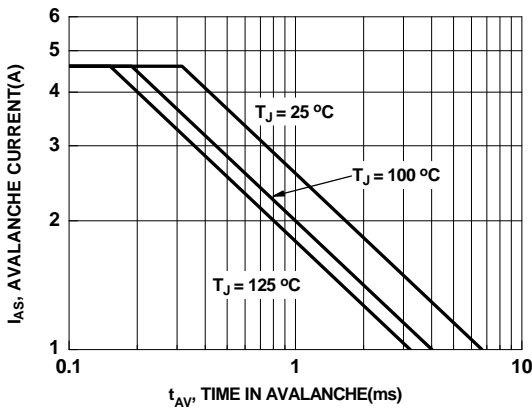
**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted



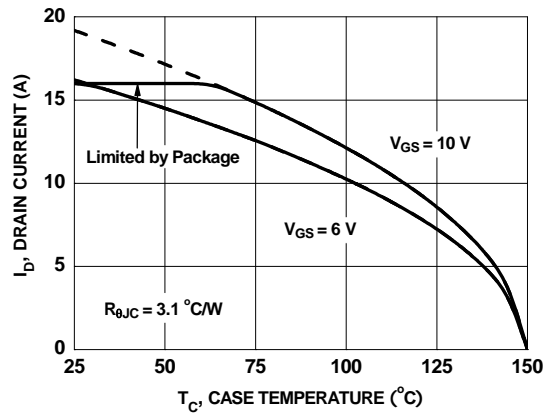
**Figure 7. Gate Charge Characteristics**



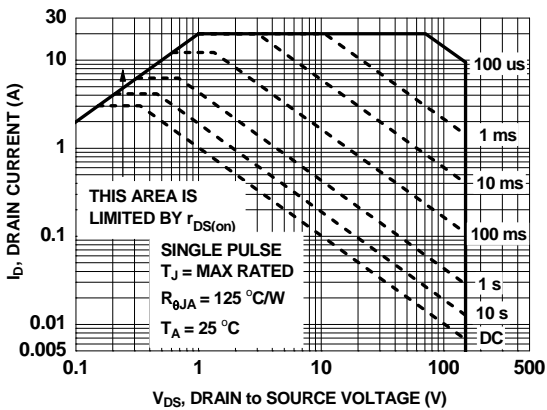
**Figure 8. Capacitance vs. Drain to Source Voltage**



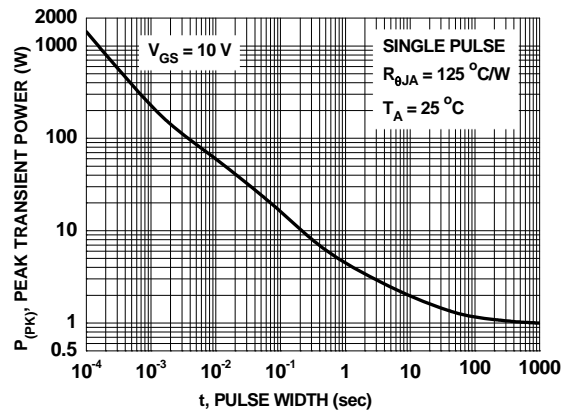
**Figure 9. Unclamped Inductive Switching Capability**



**Figure 10. Maximum Continuous Drain Current vs. Case Temperature**

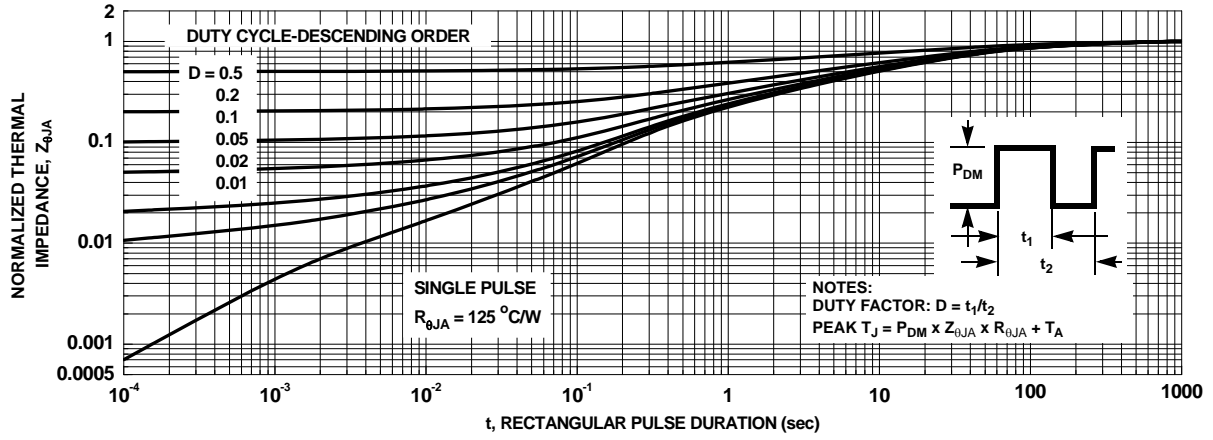


**Figure 11. Forward Bias Safe Operating Area**



**Figure 12. Single Pulse Maximum Power Dissipation**

**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted




**Figure 13. Transient Thermal Response Curve**





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