

# FDMC86340

## N-Channel Shielded Gate Power Trench® MOSFET 80 V, 48 A, 6.5 mΩ

### Features

- Shielded Gate MOSFET Technology
- Max  $r_{DS(on)}$  = 6.5 mΩ at  $V_{GS} = 10$  V,  $I_D = 14$  A
- Max  $r_{DS(on)}$  = 8.5 mΩ at  $V_{GS} = 8$  V,  $I_D = 12$  A
- High performance technology for extremely low  $r_{DS(on)}$
- Termination is Lead-free
- RoHS Compliant

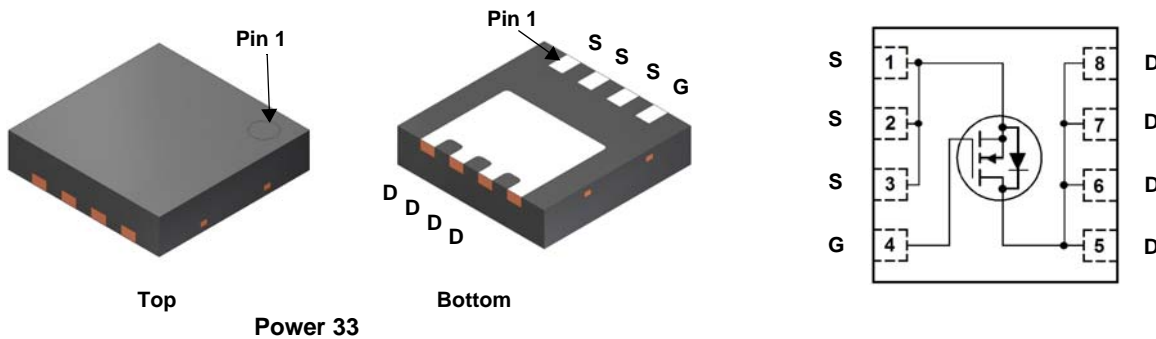


### General Description

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 $T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Ratings	Units
$V_{DS}$	Drain to Source Voltage	80	V
$V_{GS}$	Gate to Source Voltage	$\pm 20$	V
$I_D$	Drain Current -Continuous	$T_C = 25^\circ\text{C}$	48
	-Continuous	$T_A = 25^\circ\text{C}$ (Note 1a)	14
	-Pulsed	(Note 4)	200
$E_{AS}$	Single Pulse Avalanche Energy	(Note 3)	216
$P_D$	Power Dissipation	$T_C = 25^\circ\text{C}$	54
	Power Dissipation	$T_A = 25^\circ\text{C}$ (Note 1a)	2.3
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$

### Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	(Note 1)	2.3	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	53	

### Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMC86340	FDMC86340	Power33	13 "	12 mm	3000 units

## 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	$I_D = 250\text{ }\mu\text{A}$ , $V_{GS} = 0\text{ V}$	80			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$ , referenced to $25\text{ }^\circ\text{C}$		46		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 64\text{ V}$ , $V_{GS} = 0\text{ V}$			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	$V_{GS} = V_{DS}$ , $I_D = 250\text{ }\mu\text{A}$	2.0	3.4	4.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$ , referenced to $25\text{ }^\circ\text{C}$		-10		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}$ , $I_D = 14\text{ A}$		5.0	6.5	m $\Omega$
		$V_{GS} = 8\text{ V}$ , $I_D = 12\text{ A}$		6.0	8.5	
		$V_{GS} = 10\text{ V}$ , $I_D = 14\text{ A}$ , $T_J = 125\text{ }^\circ\text{C}$		8.5	11	
$g_{FS}$	Forward Transconductance	$V_{DD} = 10\text{ V}$ , $I_D = 14\text{ A}$		36		S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 40\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1\text{ MHz}$		2775	3885	pF
$C_{oss}$	Output Capacitance			468	655	pF
$C_{riss}$	Reverse Transfer Capacitance			15	25	pF
$R_g$	Gate Resistance		0.1	0.7	2.1	$\Omega$

### Switching Characteristics

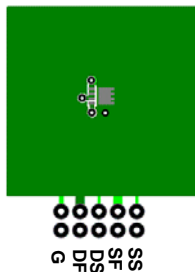
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 40\text{ V}$ , $I_D = 14\text{ A}$ , $V_{GS} = 10\text{ V}$ , $R_{GEN} = 6\text{ }\Omega$		20	32	ns	
$t_r$	Rise Time			7.9	16	ns	
$t_{d(off)}$	Turn-Off Delay Time			23	37	ns	
$t_f$	Fall Time			5.1	10	ns	
$Q_{g(TOT)}$	Total Gate Charge		$V_{GS} = 0\text{ V to } 10\text{ V}$		38	53	nC
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0\text{ V to } 8\text{ V}$	$V_{DD} = 40\text{ V}$ , $I_D = 14\text{ A}$		31	44	nC
$Q_{gs}$	Gate to Source Charge				14		nC
$Q_{gd}$	Gate to Drain "Miller" Charge				8.0		nC
$Q_{oss}$	Output Charge	$V_{DD} = 40\text{ V}$ , $V_{GS} = 0\text{ V}$		42		nC	

### Drain-Source Diode Characteristics

$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}$ , $I_S = 14\text{ A}$ (Note 2)		0.8	1.3	V
		$V_{GS} = 0\text{ V}$ , $I_S = 1.9\text{ A}$ (Note 2)		0.7	1.2	V
$t_{rr}$	Reverse Recovery Time	$I_F = 14\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$		41	66	ns
$Q_{rr}$	Reverse Recovery Charge			25	40	nC

#### Notes:

- $R_{\theta JA}$  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.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta CA}$  is determined by the user's board design.



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



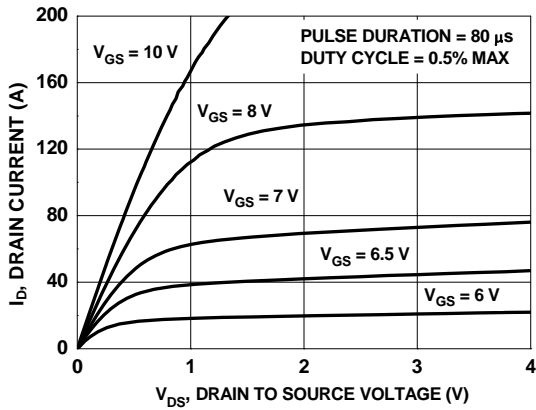
b. 125  $^\circ\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper

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

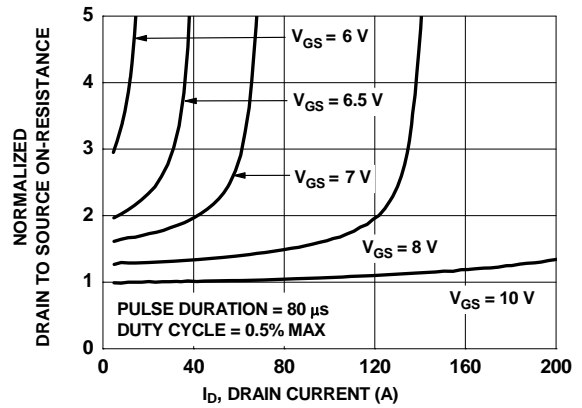
3.  $E_{AS}$  of 216 mJ is based on starting  $T_J = 25\text{ }^\circ\text{C}$ ,  $L = 3\text{ mH}$ ,  $I_{AS} = 12\text{ A}$ ,  $V_{DD} = 80\text{ V}$ ,  $V_{GS} = 10\text{ V}$ . 100% test at  $L = 0.1\text{ mH}$ ,  $I_{AS} = 37\text{ A}$ .

4. Pulsed  $I_d$  limited by junction temperature,  $t_d \leq 100\text{ }\mu\text{s}$ , please refer to SOA curve for more details.

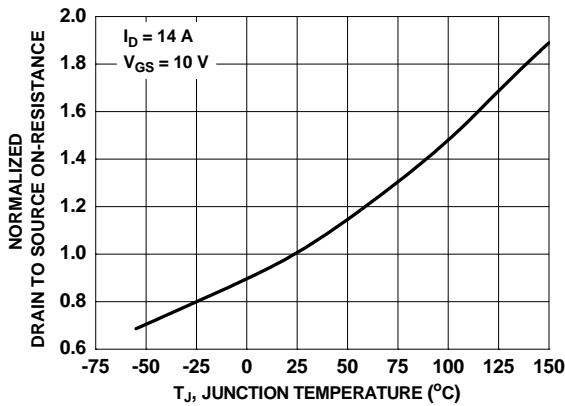
**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted



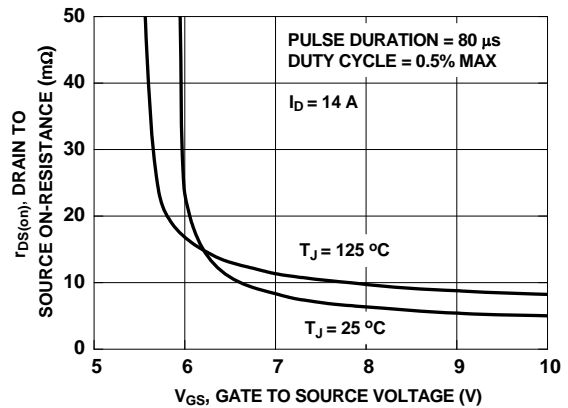
**Figure 1. On-Region Characteristics**



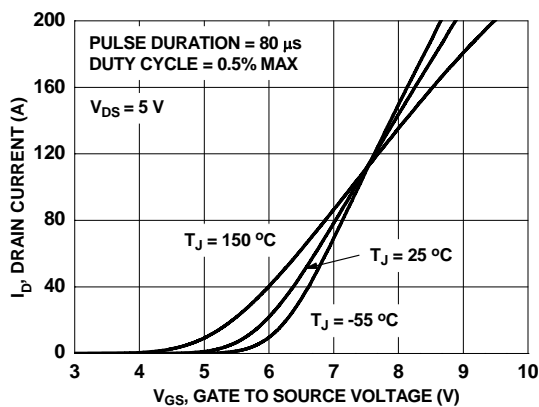
**Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage**



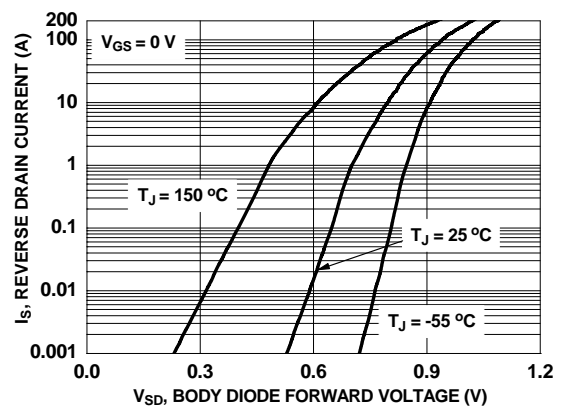
**Figure 3. Normalized On-Resistance vs Junction Temperature**



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

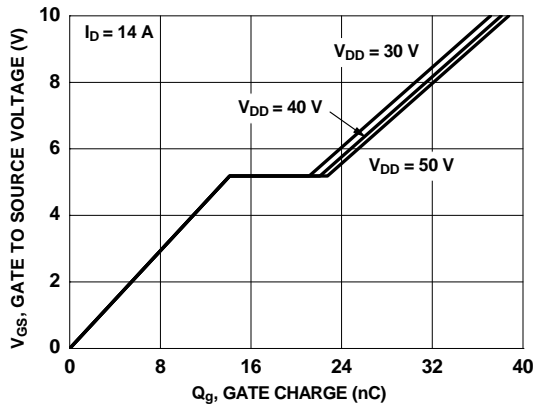


**Figure 5. Transfer Characteristics**

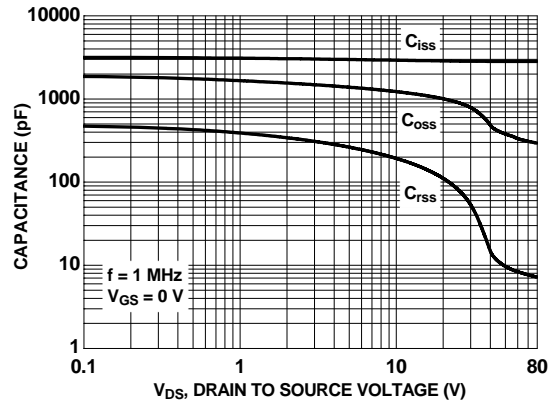


**Figure 6. Source to Drain Diode Forward Voltage vs Source Current**

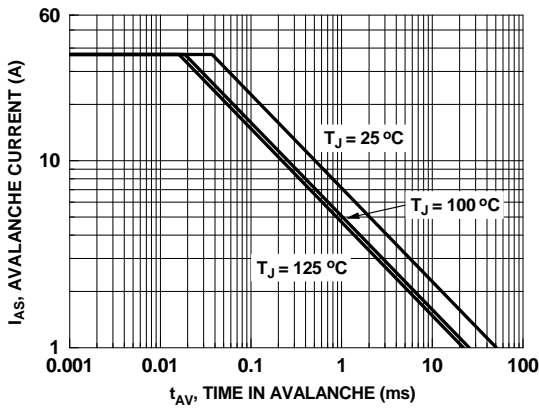
**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted



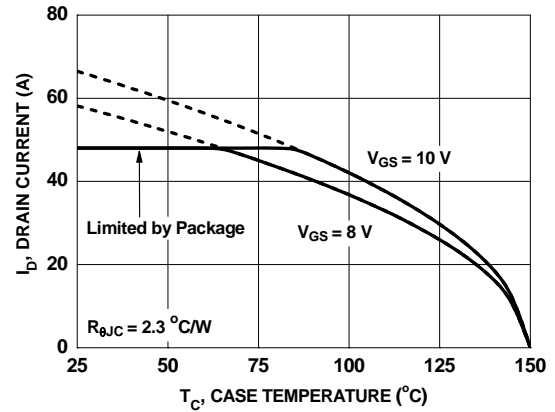
**Figure 7. Gate Charge Characteristics**



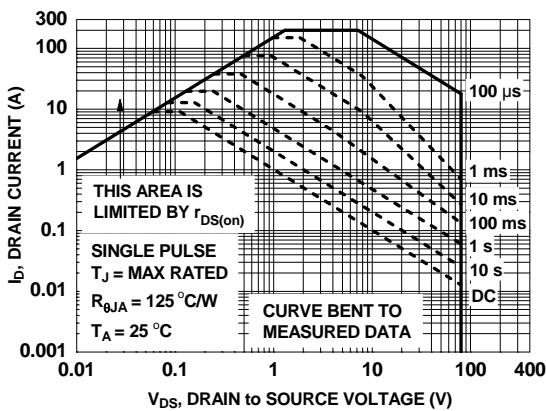
**Figure 8. Capacitance vs Drain to Source Voltage**



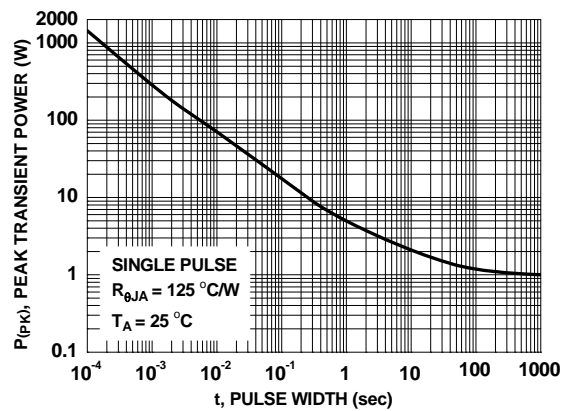
**Figure 9. Unclamped Inductive Switching Capability**



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

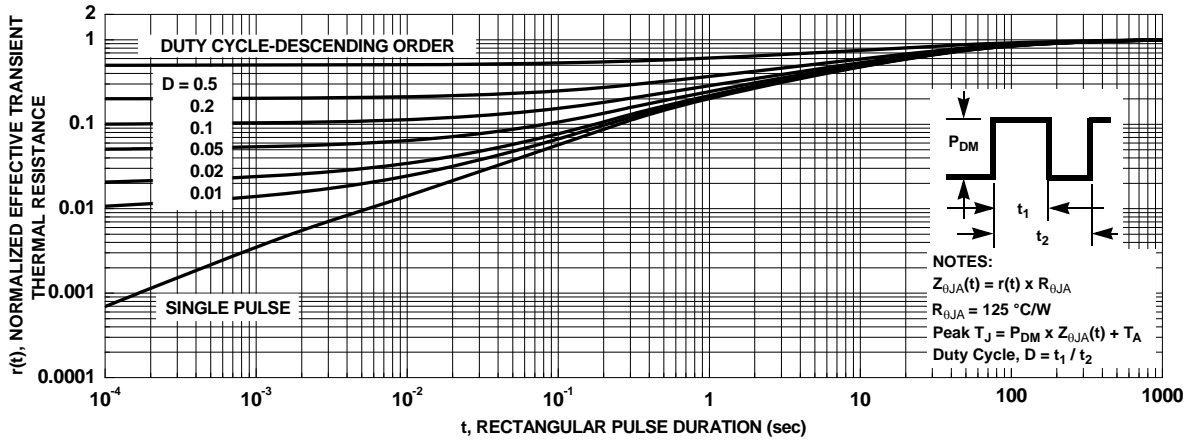


**Figure 11. Forward Bias Safe Operating Area**



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

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



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





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Rev. I73

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