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FDMC86570L

N-Channel Shielded Gate PowerTrench[®] MOSFET

60 V, 84 A, 4.3 mΩ

Features

- Shielded Gate MOSFET Technology
- Max $r_{DS(on)}$ = 4.3 mΩ at $V_{GS} = 10$ V, $I_D = 18$ A
- Max $r_{DS(on)}$ = 6.5 mΩ at $V_{GS} = 4.5$ V, $I_D = 15$ A
- High performance technology for extremely low $r_{DS(on)}$
- Termination is Lead-free
- RoHS Compliant

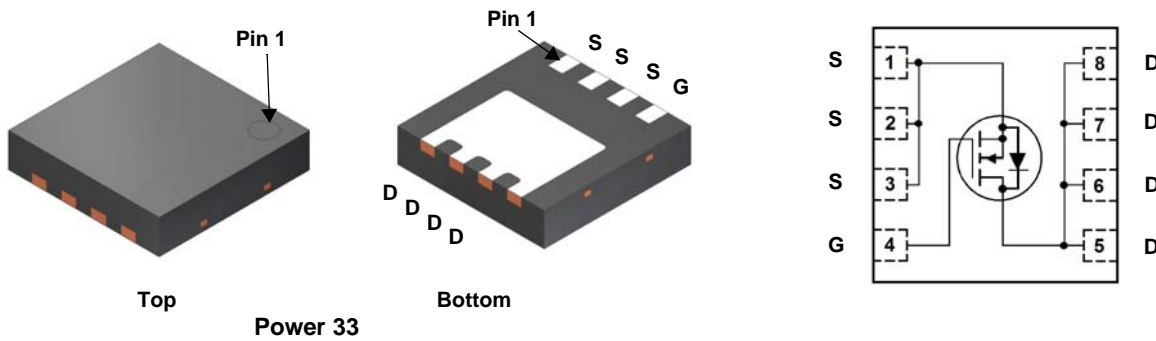


General Description

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 $T_A = 25$ °C unless otherwise noted.

Symbol	Parameter	Rated	Units
V_{DS}	Drain to Source Voltage	60	V
V_{GS}	Gate to Source Voltage	±20	V
I_D	Drain Current -Continuous	$T_C = 25$ °C (Note 5)	84
	-Continuous	$T_C = 100$ °C (Note 5)	53
	-Continuous	$T_A = 25$ °C (Note 1a)	18
	-Pulsed	(Note 4)	416
E_{AS}	Single Pulse Avalanche Energy	(Note 3)	253
P_D	Power Dissipation	$T_C = 25$ °C	54
	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	(Note 1)	2.3	°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
FDMC86570L	FDMC86570L	Power33	13 "	12 mm	3000 units

FDMC86570L N-Channel Shielded Gate PowerTrench[®] 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	$I_D = 250\text{ }\mu\text{A}$, $V_{GS} = 0\text{ V}$	60			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$, referenced to $25\text{ }^\circ\text{C}$		30		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 48\text{ V}$, $V_{GS} = 0\text{ V}$			1	μA
I_{GSS}	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	$V_{GS} = V_{DS}$, $I_D = 250\text{ }\mu\text{A}$	1.0	1.8	3.0	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 $25\text{ }^\circ\text{C}$		-7		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}$, $I_D = 18\text{ A}$		3.1	4.3	m Ω
		$V_{GS} = 4.5\text{ V}$, $I_D = 15\text{ A}$		4.7	6.5	
		$V_{GS} = 10\text{ V}$, $I_D = 18\text{ A}$, $T_J = 125\text{ }^\circ\text{C}$		5.0	6.9	
g_{FS}	Forward Transconductance	$V_{DD} = 5\text{ V}$, $I_D = 18\text{ A}$		75		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 30\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$		4790	6705	pF
C_{oss}	Output Capacitance			821	1150	pF
C_{rss}	Reverse Transfer Capacitance			19	30	pF
R_g	Gate Resistance		0.1	0.9	2.7	Ω

Switching Characteristics

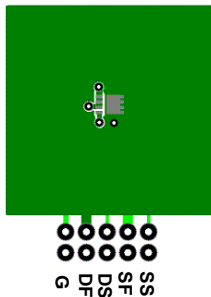
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 30\text{ V}$, $I_D = 18\text{ A}$, $V_{GS} = 10\text{ V}$, $R_{GEN} = 6\text{ }\Omega$		19	34	ns	
t_r	Rise Time			6.2	12	ns	
$t_{d(off)}$	Turn-Off Delay Time			38	61	ns	
t_f	Fall Time			3.9	10	ns	
$Q_{g(TOT)}$	Total Gate Charge		$V_{GS} = 0\text{ V to }10\text{ V}$		63	88	nC
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0\text{ V to }4.5\text{ V}$	$V_{DD} = 30\text{ V}$, $I_D = 18\text{ A}$		29	41	nC
Q_{gs}	Gate to Source Charge				14		nC
Q_{gd}	Gate to Drain "Miller" Charge				6.3		nC

Drain-Source Diode Characteristics

V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}$, $I_S = 18\text{ A}$ (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	$I_F = 18\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$		43	69	ns
Q_{rr}	Reverse Recovery Charge			26	42	nC

Notes:

- $R_{\theta JA}$ is determined with the device mounted on a 1 in² pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. $R_{\theta CA}$ is determined by the user's board design.



a. 53 $^\circ\text{C}/\text{W}$ when mounted on a 1 in² pad of 2 oz copper



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

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

- E_{AS} of 253 mJ is based on starting $T_J = 25\text{ }^\circ\text{C}$, $L = 3\text{ mH}$, $I_{AS} = 13\text{ A}$, $V_{DD} = 60\text{ V}$, $V_{GS} = 10\text{ V}$. 100% test at $L = 0.1\text{ mH}$, $I_{AS} = 43\text{ A}$.

- Pulsed I_D please refer to Fig 11 SOA graph for more details.

- Computed continuous current limited to Max Junction Temperature only, actual continuous current will be limited by thermal & electro-mechanical application board design.

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

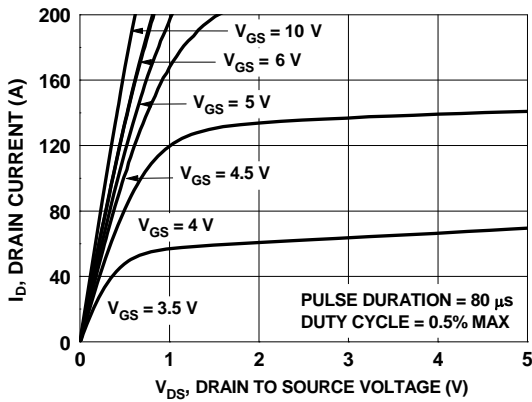


Figure 1. On-Region Characteristics

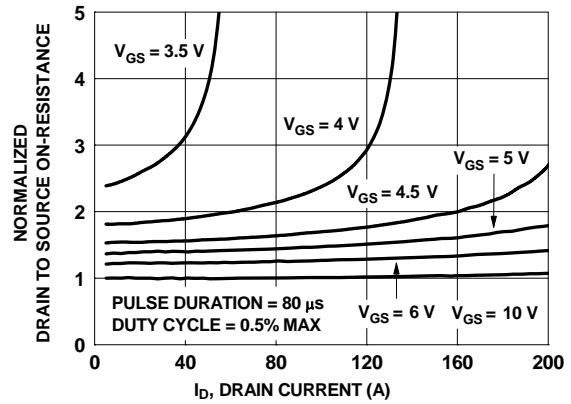


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

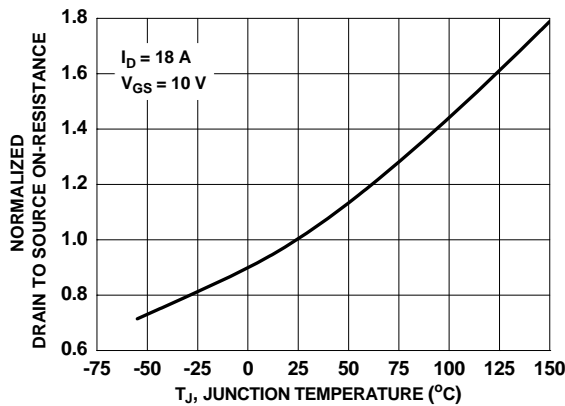


Figure 3. Normalized On-Resistance vs. Junction Temperature

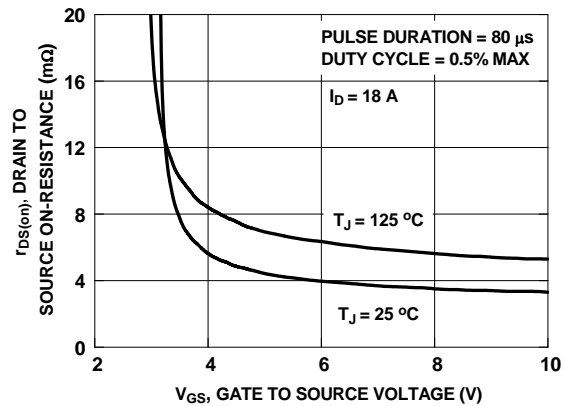


Figure 4. On-Resistance vs. Gate to Source Voltage

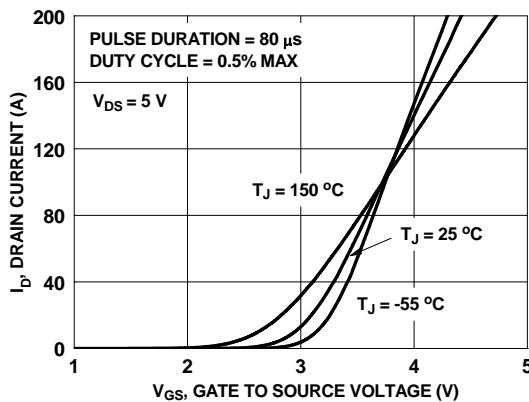


Figure 5. Transfer Characteristics

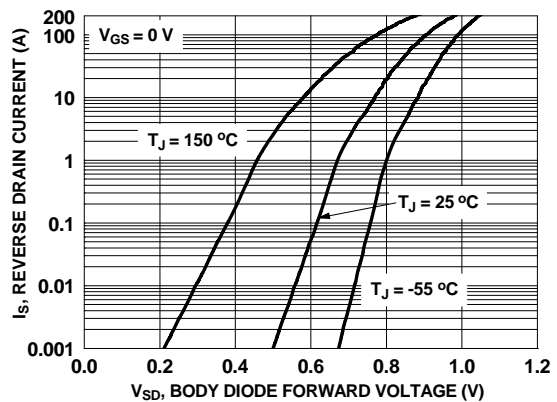


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

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

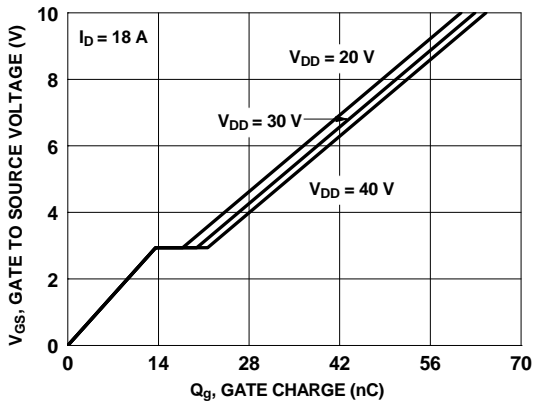


Figure 7. Gate Charge Characteristics

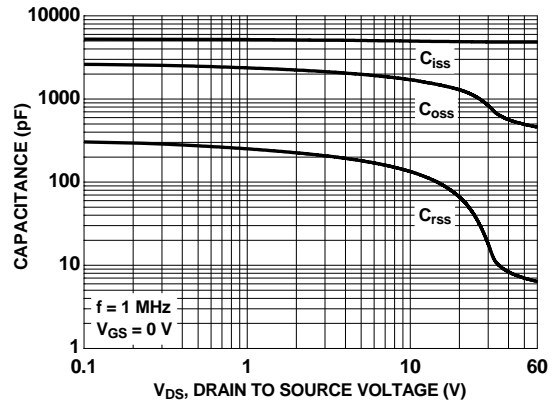


Figure 8. Capacitance vs. Drain to Source Voltage

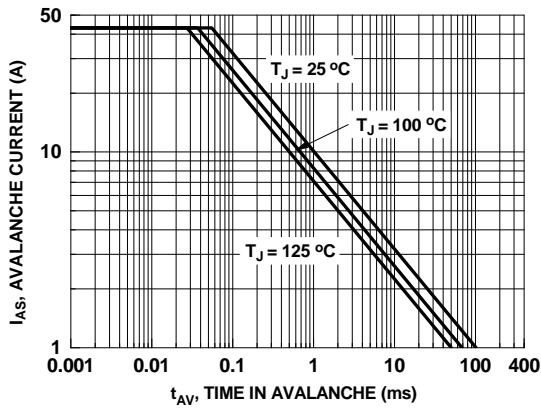


Figure 9. Unclamped Inductive Switching Capability

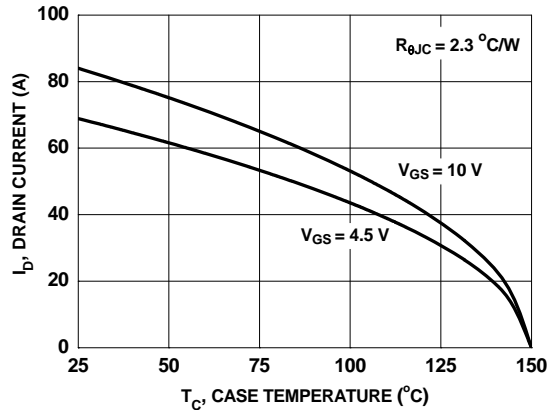


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

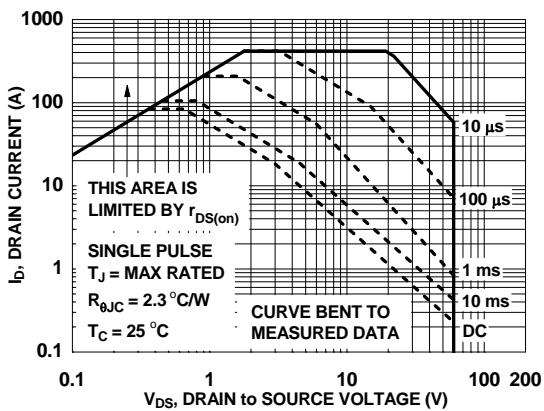


Figure 11. Forward Bias Safe Operating Area

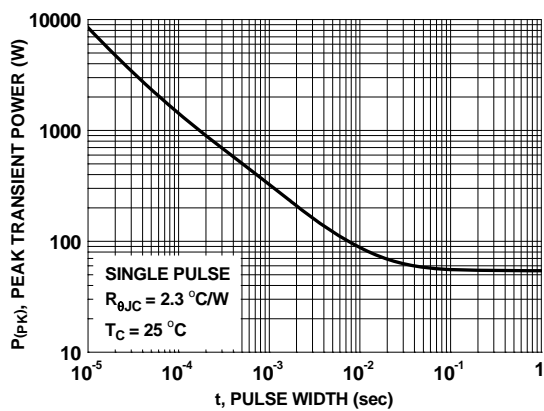


Figure 12. Single Pulse Maximum Power Dissipation

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

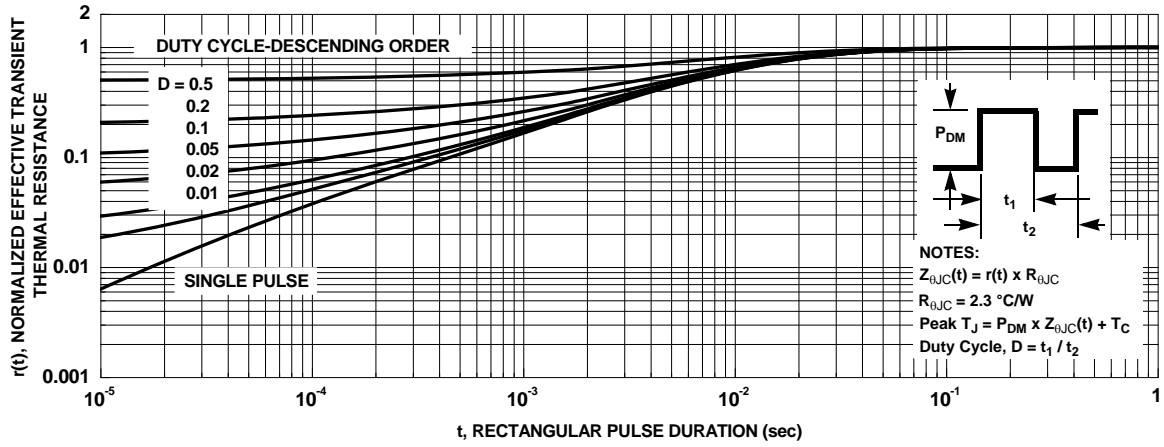
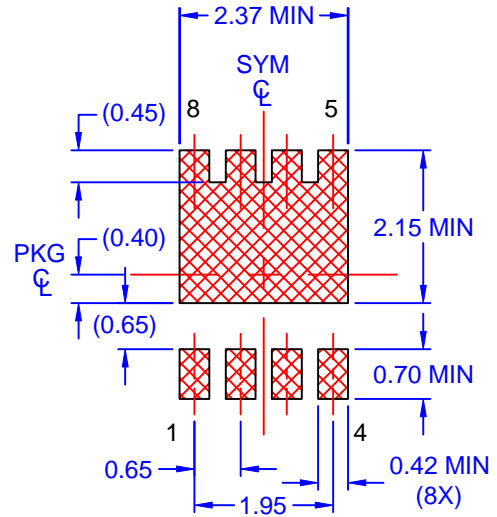
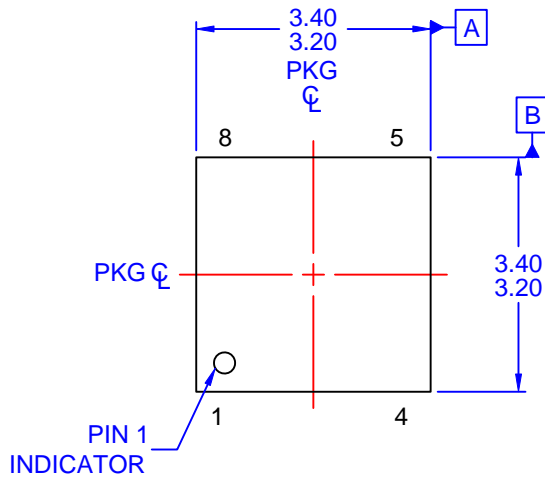
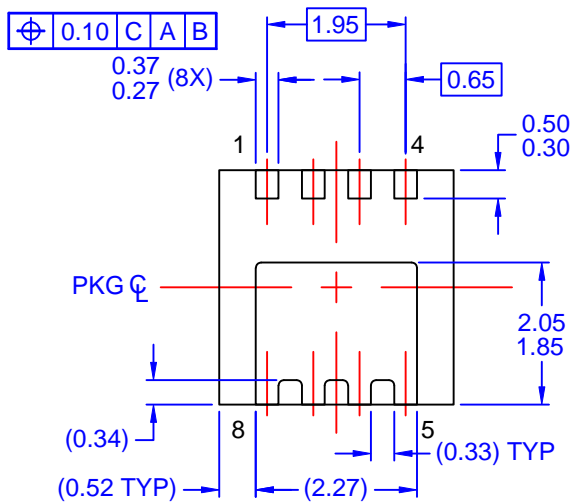
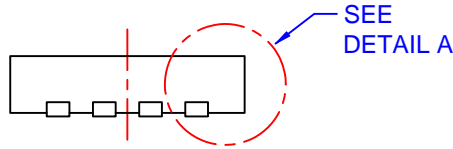


Figure 13. Junction-to-Case Transient Thermal Response Curve

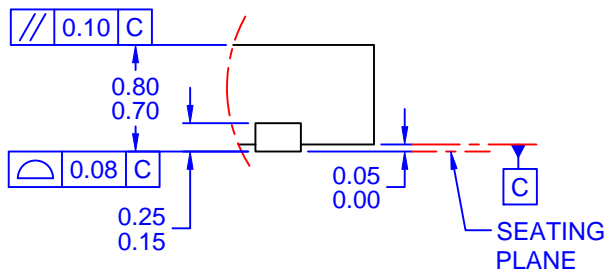


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