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ON Semiconductor®

FDMC86184

N-Channel Shielded Gate PowerTrench® MOSFET

100 V, 57 A, 8.5 mΩ

Features

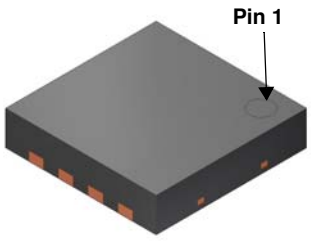
- Shielded Gate MOSFET Technology
- Max $r_{DS(on)}$ = 8.5 mΩ at V_{GS} = 10 V, I_D =21 A
- Max $r_{DS(on)}$ = 24.8 mΩ at V_{GS} = 6 V, I_D = 10 A
- 50% Lower Qrr than Other MOSFET Suppliers
- Lowers Switching Noise/EMI
- MSL1 Robust Package Design
- 100% UIL Tested
- RoHS Compliant

General Description

This N-Channel MV MOSFET is produced using ON Semiconductor's advanced PowerTrench® process that incorporates Shielded Gate technology. This process has been optimized to minimize on-state resistance and yet maintain superior switching performance with best in class soft body diode.

Applications

- Primary DC-DC MOSFET
- Synchronous Rectifier in DC-DC and AC-DC
- Motor Drive
- Solar



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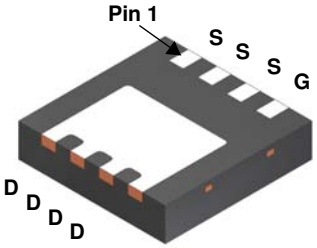

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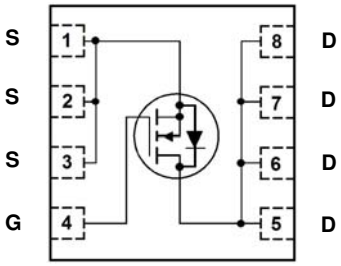


MOSFET Maximum Ratings T_A = 25 °C unless otherwise noted.

Symbol	Parameter			Ratings	Units
V_{DS}	Drain to Source Voltage			100	V
V_{GS}	Gate to Source Voltage			±20	V
I_D	Drain Current -Continuous	T_C = 25 °C	(Note 5)	57	A
	-Continuous	T_C = 100 °C	(Note 5)	36	
	-Continuous	T_A = 25 °C	(Note 1a)	12	
	-Pulsed		(Note 4)	266	
E_{AS}	Single Pulse Avalanche Energy		(Note 3)	121	mJ
P_D	Power Dissipation	T_C = 25 °C		54	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		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
FDMC86184	FDMC86184	Power 33	13 ”	12 mm	3000 units

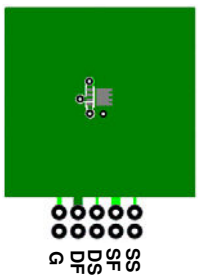
Semiconductor Components Industries, LLC, 2016
June, 2017, Rev. 1.1

Publication Order Number:
FDMC86184/D

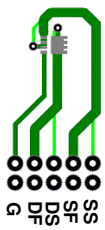
Electrical Characteristics T_J = 25 °C unless otherwise noted.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V	100			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25 °C		59		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 80 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						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 110 μA	2.0	3.1	4.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 110 μA, referenced to 25 °C		-9		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 21 A		6.4	8.5	mΩ
		V_{GS} = 6 V, I_D = 10 A		11	24.8	
		V_{GS} = 10 V, I_D = 21 A, T_J = 125 °C		11	18	
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 21 A		49		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 50 V, V_{GS} = 0 V, f = 1 MHz		1490	2090	pF
C_{oss}	Output Capacitance			906	1270	pF
C_{rss}	Reverse Transfer Capacitance			13	25	pF
R_g	Gate Resistance		0.1	0.4	1.2	Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 50 V, I_D = 21 A, V_{GS} = 10 V, R_{GEN} = 6 Ω		12	22	ns
t_r	Rise Time			4	10	ns
$t_{d(off)}$	Turn-Off Delay Time			17	31	ns
t_f	Fall Time			4	10	ns
Q_g	Total Gate Charge	V_{GS} = 0 V to 10 V; V_{DD} = 50 V, I_D = 21 A		21	30	nC
Q_g	Total Gate Charge	V_{GS} = 0 V to 6 V; V_{DD} = 50 V, I_D = 21 A		14	20	nC
Q_{gs}	Gate to Source Charge	V_{DD} = 50 V, I_D = 21 A		6.5		nC
Q_{gd}	Gate to Drain “Miller” Charge	V_{DD} = 50 V, I_D = 21 A		4.6		nC
Q_{oss}	Output Charge	V_{DD} = 50 V, V_{GS} = 0 V		61		nC
Drain-Source Diode Characteristics						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 2.1 A (Note 2)		0.7	1.2	V
		V_{GS} = 0 V, I_S = 21 A (Note 2)		0.8	1.3	
t_{rr}	Reverse Recovery Time	I_F = 10 A, di/dt = 300 A/μs		27	44	ns
Q_{rr}	Reverse Recovery Charge			46	74	nC
t_{rr}	Reverse Recovery Time	I_F = 10 A, di/dt = 1000 A/μs		21	34	ns
Q_{rr}	Reverse Recovery Charge			96	154	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. $R_{\theta CA}$ 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. E_{AS} of 121 mJ is based on starting T_J = 25 °C; N-ch: L = 3 mH, I_{AS} = 9 A, V_{DD} = 100 V, V_{GS} =10 V. 100% test at L = 0.3 mH, I_{AS} = 21 A.
4. Pulsed Id please refer to Fig 11 SOA graph for more details.
5. 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 °C unless otherwise noted.

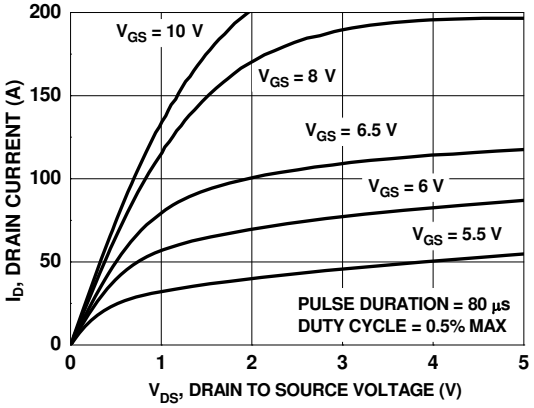


Figure 1. On-Region Characteristics

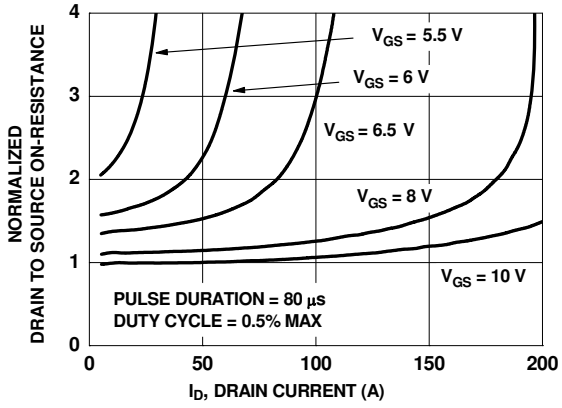


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

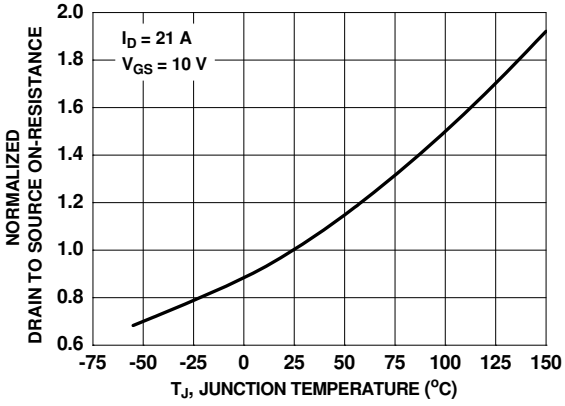


Figure 3. Normalized On- Resistance vs. Junction Temperature

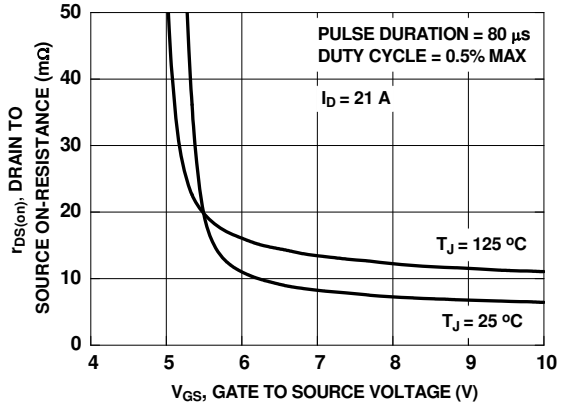


Figure 4. On-Resistance vs. Gate to Source Voltage

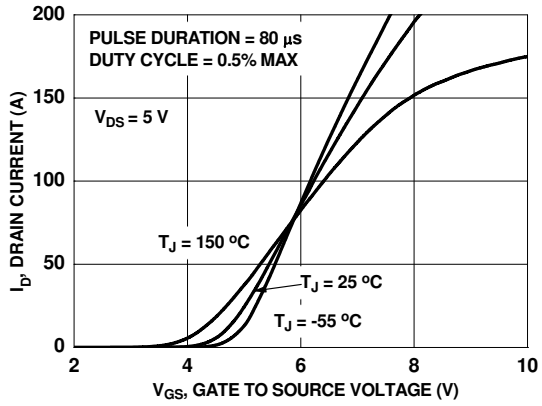


Figure 5. Transfer Characteristics

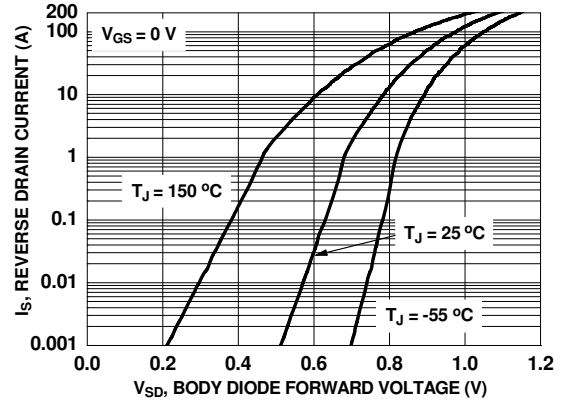


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

Typical Characteristics T_J = 25 °C unless otherwise noted.

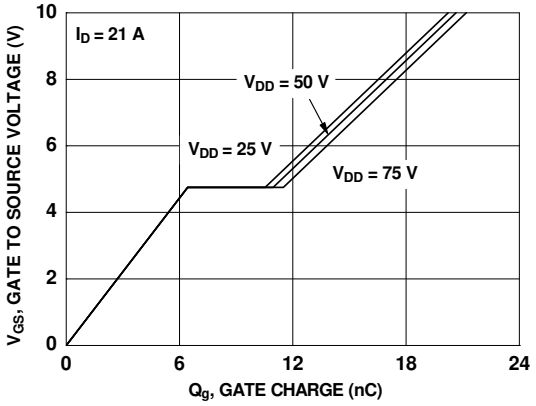


Figure 7. Gate Charge Characteristics

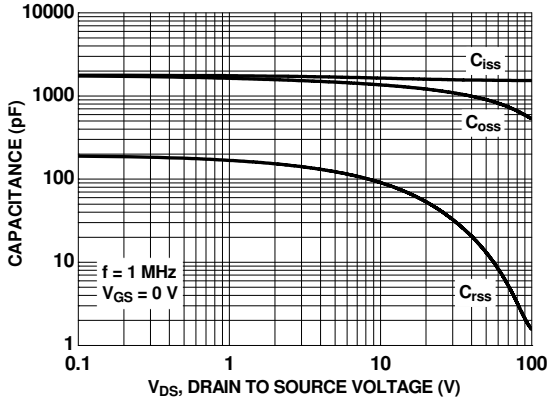


Figure 8. Capacitance vs. Drain to Source Voltage

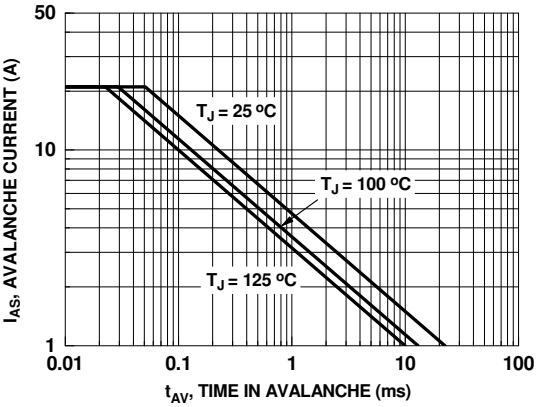


Figure 9. Unclamped Inductive Switching Capability

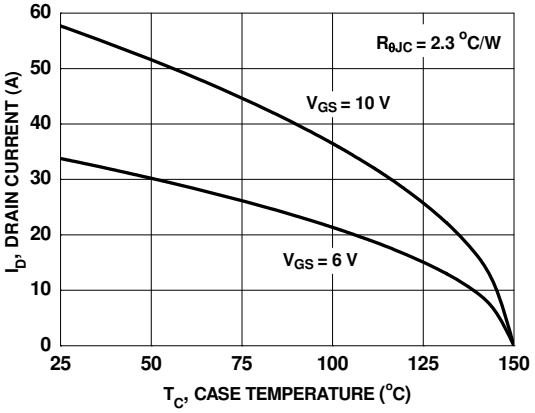


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

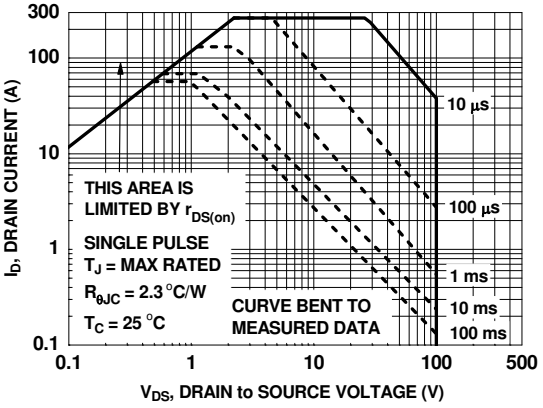


Figure 11. Forward Bias Safe Operating Area

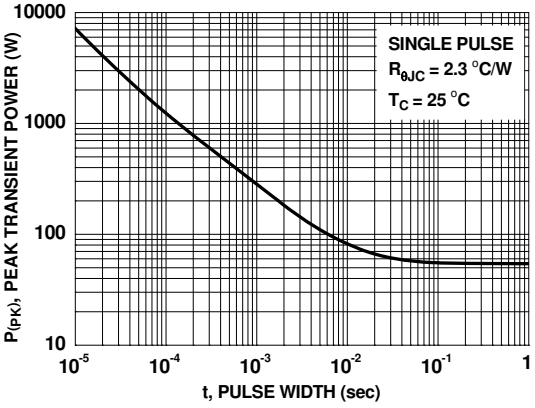


Figure 12. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25 °C unless otherwise noted.

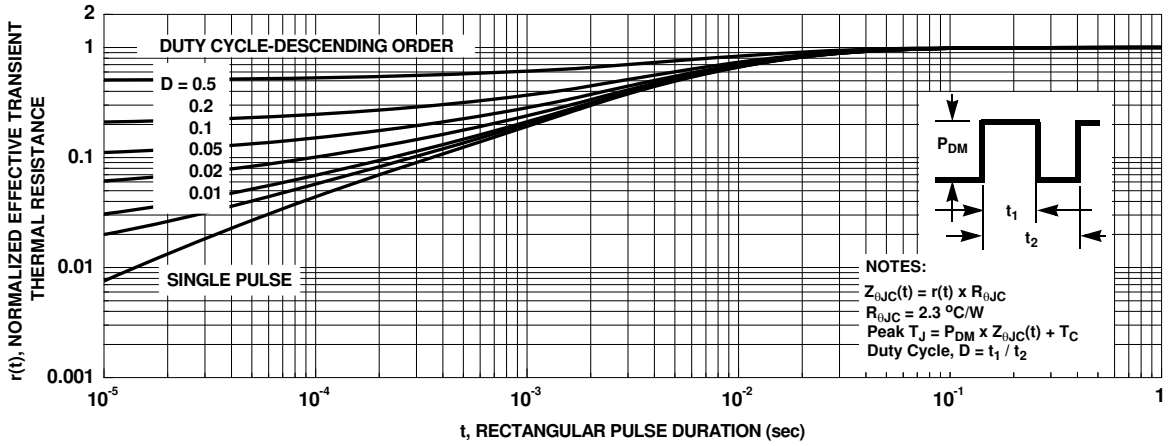
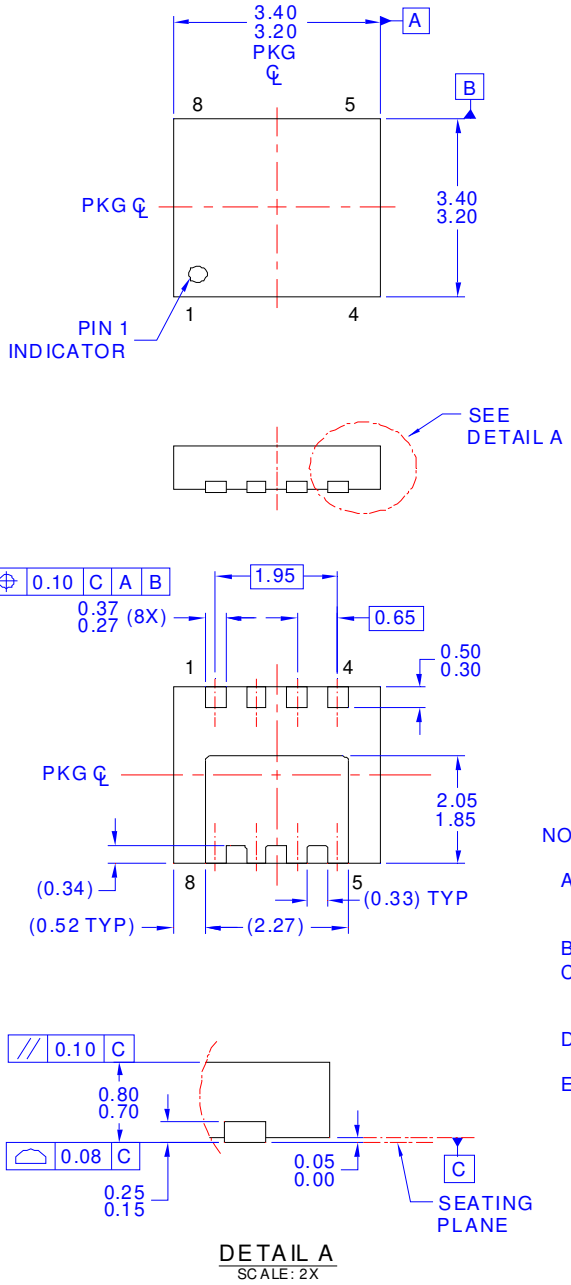
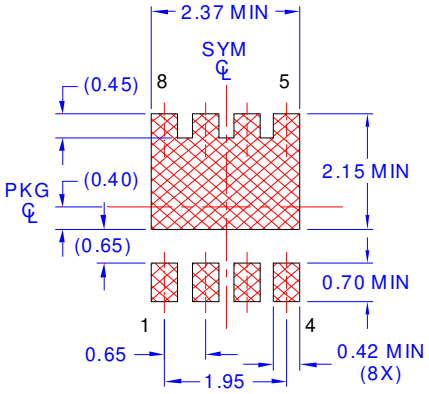


Figure 13. Junction-to-Case Transient Thermal Response Curve

Dimensional Outline and Pad Layout



DETAIL A
SCALE: 2X



LAND PATTERN
RECOMMENDATION

NOTES: UNLESS OTHERWISE SPECIFIED

A) PACKAGE STANDARD REFERENCE: JEDEC MO-240, ISSUE A, VAR. BA, DATED OCTOBER 2002.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH. MOLD FLASH OR BURRS DOES NOT EXCEED 0.10MM.
D) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
E) DRAWING FILE NAME: PQFN08HREV1