ON Semiconductor®

FDB0690N1507L

N-Channel PowerTrench® MOSFET

150 V, 115 A, 6.9 mΩ

Features

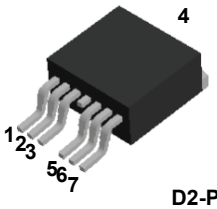
- Max $r_{DS(on)}$ = 6.9 mΩ at V_{GS} = 10 V, I_D = 17 A
- Fast Switching Speed
- Low Gate Charge
- High Performance Trench Technology for Extremely Low $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

General Description

This N-Channel MOSFET is produced using ON Semiconductor's advance PowerTrench® process that has been especially tailored to minimize the on-state resistance while maintaining superior ruggedness and switching performance for industrial applications.

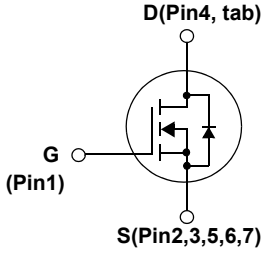
Applications

- Industrial Motor Drive
- Industrial Power Supply
- Industrial Automation
- Battery Operated tools
- Battery Protection
- Solar Inverters
- UPS and Energy Inverters
- Energy Storage
- Load Switch



1. Gate
2. Source/Kelvin Sense
3. Source/Kelvin Sense
4. Drain
5. Source
6. Source
7. Source

D2-PAK
(TO263)



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

Symbol	Parameter			Ratings	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	(Note 5)	115	A
	-Continuous	T_C = 100°C	(Note 5)	81	
	-Pulsed		(Note 4)	636	
E_{AS}	Single Pulse Avalanche Energy		(Note 3)	633	mJ
P_D	Power Dissipation	T_C = 25°C		250	W
	Power Dissipation	T_A = 25°C	(Note 1a)	3.8	
T_J, T_{STG}	Operating and Storage Junction Temperature Range			-55 to +175	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	(Note 1)	0.6	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	40	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDB0690N1507L	FDB0690N1507L	D2-PAK-7L	330 mm	24 mm	800 units

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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	150			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25 °C		106		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 120 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 (Note 2)						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	2	3.3	4	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25 °C		-13		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 17 A		5.4	6.9	mΩ
		V_{GS} = 10 V, I_D = 17 A, T_J= 150°C		12.9	16.5	
g_{FS}	Forward Transconductance	V_{DS} = 10 V, I_D = 17 A		60		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 75 V, V_{GS} = 0 V, f = 1 MHz		6265	8775	pF
C_{oss}	Output Capacitance			502	705	pF
C_{rss}	Reverse Transfer Capacitance			25	40	pF
R_g	Gate Resistance			2.5		Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 75 V, I_D = 17 A, V_{GS} = 10 V, R_{GEN} = 6 Ω		35	56	ns
t_r	Rise Time			30	48	ns
$t_{d(off)}$	Turn-Off Delay Time			53	85	ns
t_f	Fall Time			14	25	ns
Q_g	Total Gate Charge	V_{DD} = 75 V, I_D = 17 A, V_{GS} = 10 V		82	115	nC
Q_{gs}	Gate to Source Gate Charge			29		nC
Q_{gd}	Gate to Drain “Miller” Charge			15		nC
Drain-Source Diode Characteristics						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	115	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	636	A
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 17 A (Note 2)		0.8	1.2	V
t_{rr}	Reverse Recovery Time	I_F = 17 A, di/dt = 100 A/μs		106	170	ns
Q_{rr}	Reverse Recovery Charge			226	362	nC

Notes:

1. $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.

   a) 40 °C/W when mounted on a 1 in^2 pad of 2 oz copper.
   b) 62.5 °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 633 mJ is based on starting T_J = 25 °C, L = 0.3 mH, I_{AS} = 65 A, V_{DD} = 135 V, V_{GS} = 10 V. 100% test at L = 0.1 mH, I_{AS} = 94 A.

4. Pulsed Id please refer to Figure “Forward Bias Safe Operating Area” 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.

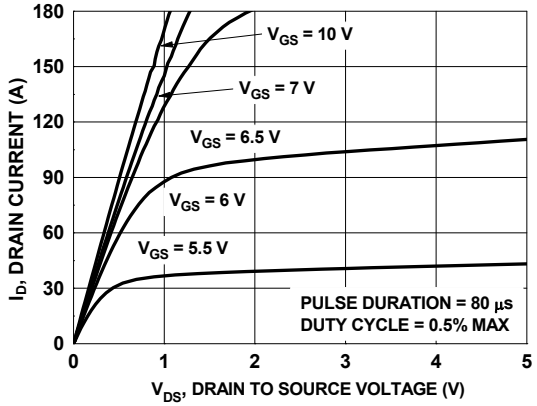


Figure 1. On Region Characteristics

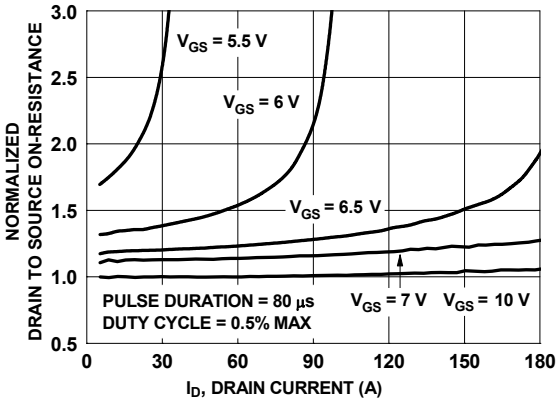


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

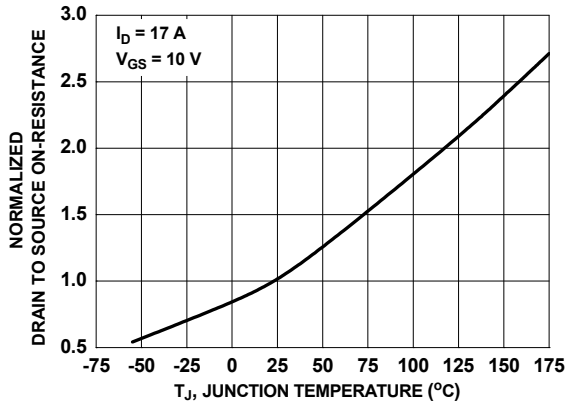


Figure 3. Normalized On Resistance vs. Junction Temperature

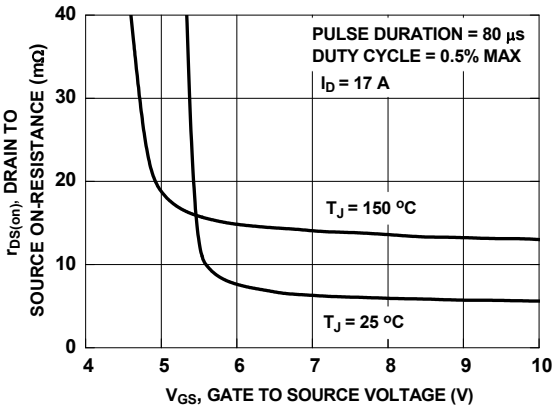


Figure 4. On-Resistance vs. Gate to Source Voltage

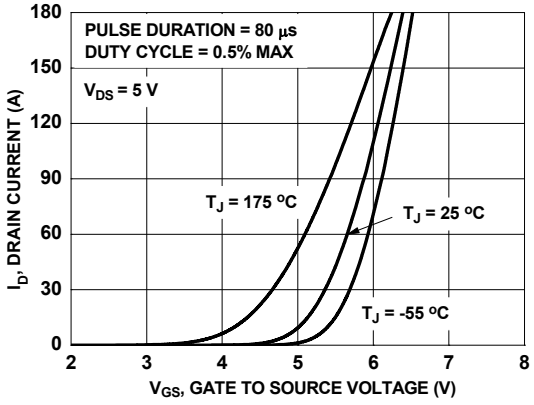


Figure 5. Transfer Characteristics

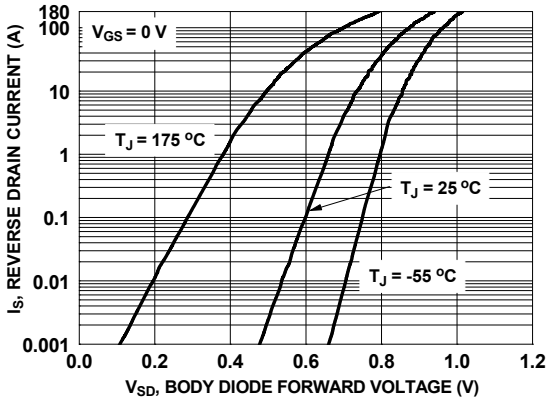


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

Typical Characteristics T_J = 25 °C unless otherwise noted.

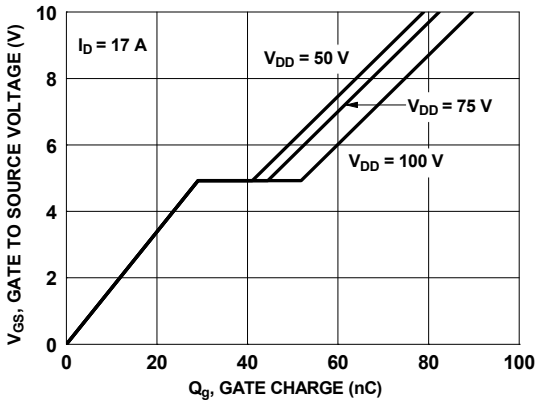


Figure 7. Gate Charge Characteristics

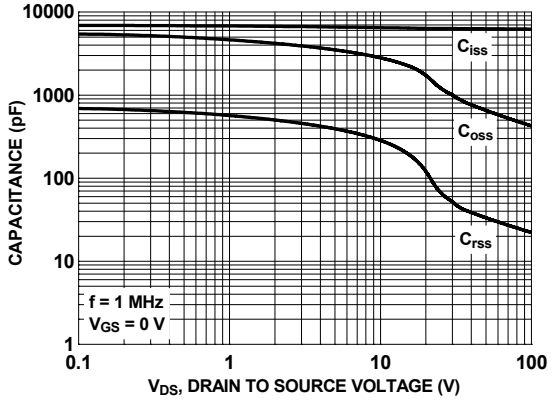


Figure 8. Capacitance vs. Drain to Source Voltage

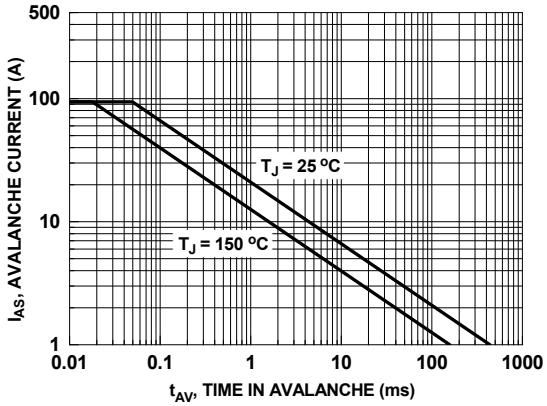


Figure 9. Unclamped Inductive Switching Capability

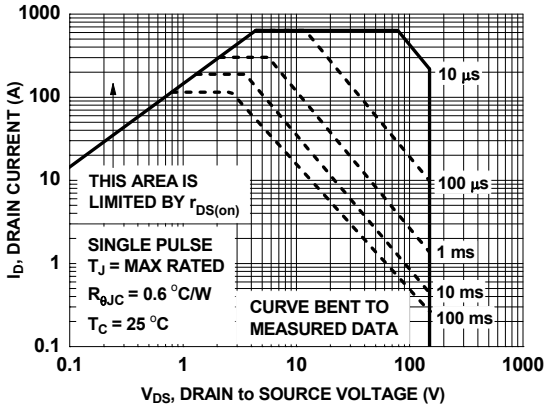


Figure 10. Forward Bias Safe Operating Area

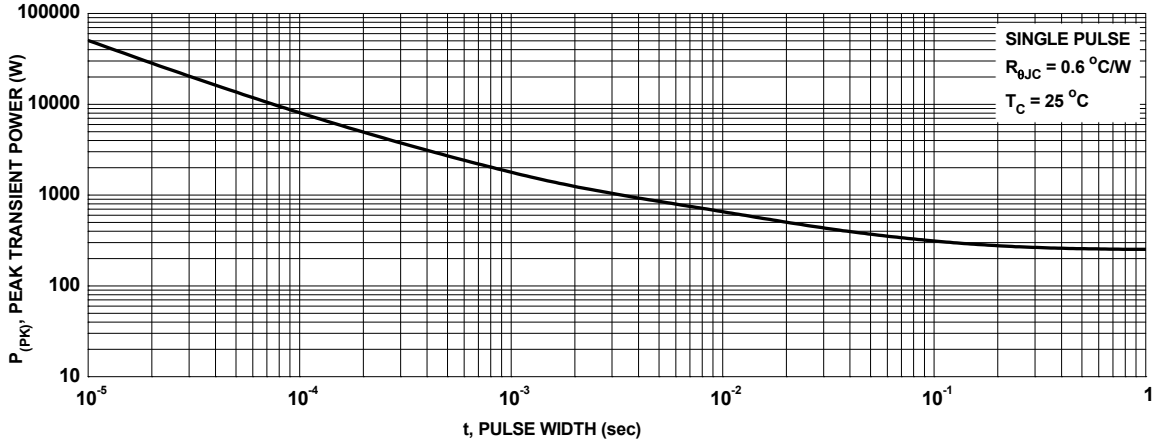


Figure 11. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25 °C unless otherwise noted.

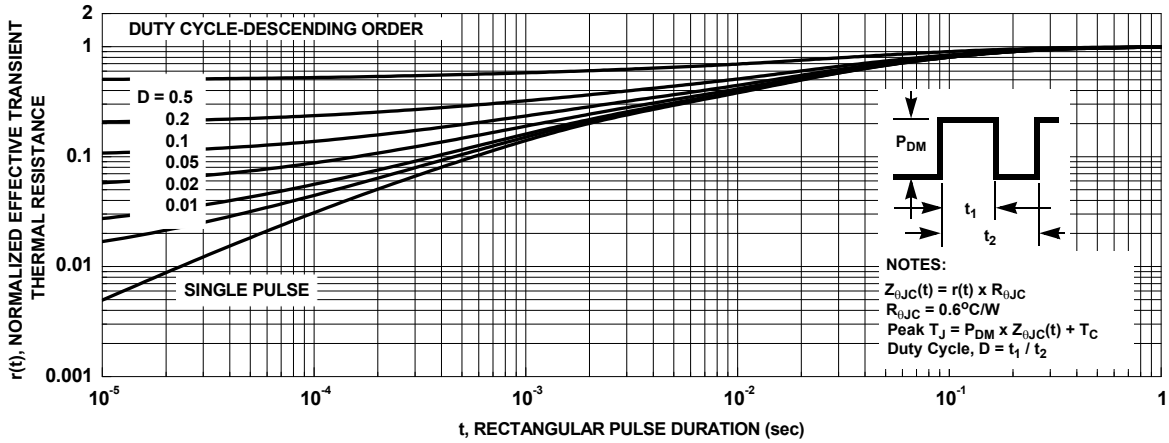


Figure 12. Junction-to-Case Transient Thermal Response Curve

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