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FAIRCHILD SEMICONDUCTOR®

January 2014

FDD390N15ALZ

N-Channel PowerTrench® MOSFET

150 V, 26 A, 42 mΩ

Features

- $R_{DS(on)}$ = 33.4 mΩ (Typ.) @ V_{GS} = 10 V, I_D = 26 A
- $R_{DS(on)}$ = 42.2 mΩ (Typ.) @ V_{GS} = 4.5 V, I_D = 20 A
- Fast Switching Speed
- Low Gate Charge, Q_G = 17.6 nC (Typ.)
- High Performance Trench Technology for Extremely Low $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® process that has been tailored to minimize the on-state resistance while maintaining superior switching performance.

Applications

- Consumer Applicances
- LED TV
- Synchronous Rectification
- Uninterruptible Power Supplies
- Micro Solar Inverter

D-PAK

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

Symbol	Parameter			FDD390N15ALZ	Unit
V_{DSS}	Drain to Source Voltage			150	V
V_{GSS}	Gate to Source Voltage			±20	V
I_D	Drain Current	- Continuous (T_C = 25°C)		26	A
		- Continuous (T_C = 100°C)		17	
I_{DM}	Drain Current	- Pulsed	(Note 1)	104	A
E_{AS}	Single Pulsed Avalanche Energy		(Note 2)	96	mJ
dv/dt	Peak Diode Recovery dv/dt		(Note 3)	13	V/ns
P_D	Power Dissipation	(T_C = 25°C)		63	W
		- Derate Above 25°C		0.5	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range			-55 to +150	°C
T_L	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds			300	°C

Thermal Characteristics

Symbol	Parameter	FDD390N15ALZ	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	2.0	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	87	

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Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDD390N15ALZ	FDD390N15ALZ	DPAK	Tape and Reel	330 mm	16 mm	2500 units

Electrical Characteristics T_C = 25°C unless otherwise noted.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V	150	-	-	V
ΔBV_{DSS} / ΔT_J	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C	-	0.15	-	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 120 V, V_{GS} = 0 V	-	-	1	μA
		V_{DS} = 120 V, T_C = 125°C	-	-	500	
I_{GSS}	Gate to Body Leakage Current	V_{GS} = ±20 V, V_{DS} = 0 V	-	-	±10	μA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	1.4	-	2.8	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 26 A	-	33.4	42	mΩ
		V_{GS} = 4.5 V, I_D = 20 A	-	42.2	64	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 10 V, I_D = 26 A	-	50	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 75 V, V_{GS} = 0 V, f = 1 MHz	-	1323	1760	pF
C_{oss}	Output Capacitance		-	93	120	pF
C_{rss}	Reverse Transfer Capacitance		-	4	6	pF
$C_{oss(er)}$	Energy Related Output Capacitance	V_{DS} = 75 V, V_{GS} = 0 V	-	165	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	V_{GS} = 10 V; V_{DS} = 75 V, I_D = 26 A	-	17.6	39	nC
$Q_{g(tot)}$	Total Gate Charge at 5V	V_{GS} = 4.5 V	-	8.1	10.5	nC
Q_{gs}	Gate to Source Gate Charge	(Note 4)	-	4.7	-	nC
Q_{gd}	Gate to Drain “Miller” Charge		-	2.3	-	nC
ESR	Equivalent Series Resistance (G-S)	f = 1 MHz	-	1.48	-	Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 75 V, I_D = 26 A, V_{GS} = 10 V, R_G = 4. 7Ω (Note 4)	-	12.8	35.6	ns
t_r	Turn-On Rise Time		-	9.3	28.6	ns
$t_{d(off)}$	Turn-Off Delay Time		-	26.9	63.8	ns
t_f	Turn-Off Fall Time		-	3.2	16.4	ns
Drain-Source Diode Characteristics						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	26	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	104	A
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS} = 0 V, I_{SD} = 26 A	-	-	1.25	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_{SD} = 26 A, dI_F/dt = 100 A/μs	-	70	-	ns
Q_{rr}	Reverse Recovery Charge		-	169	-	nC

Notes:

1. Repetitive rating: pulse-width limited by maximum junction temperature.
2. L = 3 mH, I_{AS} = 6.75 A, starting T_J = 25°C.
3. I_{SD} ≤ 26 A, di/dt ≤ 200 A/μs, V_{DD} ≤ BV_{DSS}, starting T_J = 25°C.
4. Essentially independent of operating temperature typical characteristics.

Typical Performance Characteristics

Figure 1. On-Region Characteristics

Figure 2. Transfer Characteristics

Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

Figure 5. Capacitance Characteristics

Figure 6. Gate Charge Characteristics

Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

Figure 8. On-Resistance Variation vs. Temperature

Figure 9. Maximum Safe Operating Area

Figure 10. Maximum Drain Current vs. Case Temperature

Figure 11. Eoss vs. Drain to Source Voltage

Figure 12. Unclamped Inductive Switching Capability

Typical Performance Characteristics (Continued)

Figure 13. Transient Thermal Response Curve

Figure 14. Gate Charge Test Circuit & Waveform

Figure 15. Resistive Switching Test Circuit & Waveforms

Figure 16. Unclamped Inductive Switching Test Circuit & Waveforms

Figure 17. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions

Figure 18. TO252 (D-PAK), Molded, 3-Lead, Option AA&AB

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