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# FDD390N15ALZ

## N-Channel PowerTrench® MOSFET

150 V, 26 A, 42 mΩ

### Features

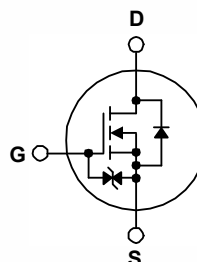
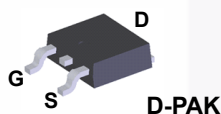
- $R_{DS(on)} = 33.4 \text{ m}\Omega$  (Typ.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 26 \text{ A}$
- $R_{DS(on)} = 42.2 \text{ m}\Omega$  (Typ.) @  $V_{GS} = 4.5 \text{ V}$ ,  $I_D = 20 \text{ A}$
- Fast Switching Speed
- Low Gate Charge,  $Q_G = 17.6 \text{ nC}$  (Typ.)
- High Performance Trench Technology 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 Appliances
- LED TV
- Synchronous Rectification
- Uninterruptible Power Supplies
- Micro Solar Inverter



### MOSFET Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted.

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

### Thermal Characteristics

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

## 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 $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
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### Off Characteristics

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250\ \mu\text{A}$ , $V_{GS} = 0\ \text{V}$	150	-	-	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$	-	0.15	-	$\text{V}/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 120\ \text{V}$ , $V_{GS} = 0\ \text{V}$ $V_{DS} = 120\ \text{V}$ , $T_C = 125^\circ\text{C}$	-	-	1 500	$\mu\text{A}$
$I_{GSS}$	Gate to Body Leakage Current	$V_{GS} = \pm 20\ \text{V}$ , $V_{DS} = 0\ \text{V}$	-	-	$\pm 10$	$\mu\text{A}$

### On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = 250\ \mu\text{A}$	1.4	-	2.8	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\ \text{V}$ , $I_D = 26\ \text{A}$ $V_{GS} = 4.5\ \text{V}$ , $I_D = 20\ \text{A}$	-	33.4 42.2	42 64	$\text{m}\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 10\ \text{V}$ , $I_D = 26\ \text{A}$	-	50	-	S

### Dynamic Characteristics

C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 75 V, V <sub>GS</sub> = 0 V, f = 1 MHz		-	1323	1760	pF
C <sub>oss</sub>	Output Capacitance			-	93	120	pF
C <sub>rss</sub>	Reverse Transfer Capacitance			-	4	6	pF
C <sub>oss(er)</sub>	Energy Related Output Capacitance	V <sub>DS</sub> = 75 V, V <sub>GS</sub> = 0 V		-	165	-	pF
Q <sub>g(tot)</sub>	Total Gate Charge at 10V	V <sub>GS</sub> = 10 V	V <sub>DS</sub> = 75 V, I <sub>D</sub> = 26 A	-	17.6	39	nC
Q <sub>g(tot)</sub>	Total Gate Charge at 5V	V <sub>GS</sub> = 4.5 V		-	8.1	10.5	nC
Q <sub>gs</sub>	Gate to Source Gate Charge			-	4.7	-	nC
Q <sub>gd</sub>	Gate to Drain “Miller” Charge		(Note 4)	-	2.3	-	nC
ESR	Equivalent Series Resistance (G-S)	f = 1 MHz		-	1.48	-	Ω

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 75\ \text{V}$ , $I_D = 26\ \text{A}$ , $V_{GS} = 10\ \text{V}$ , $R_G = 4.7\ \Omega$	-	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	(Note 4)	-	3.2	16.4	ns

### Drain-Source Diode Characteristics

I <sub>S</sub>	Maximum Continuous Drain to Source Diode Forward Current		-	-	26	A
I <sub>SM</sub>	Maximum Pulsed Drain to Source Diode Forward Current		-	-	104	A
V <sub>SD</sub>	Drain to Source Diode Forward Voltage	V <sub>GS</sub> = 0 V, I <sub>SD</sub> = 26 A	-	-	1.25	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> = 0 V, I <sub>SD</sub> = 26 A, dI <sub>F</sub> /dt = 100 A/μs	-	70	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge		-	169	-	nC

#### Notes:

1. Repetitive rating; pulse-width limited by maximum junction temperature.
2.  $L = 3\ \text{mH}$ ,  $I_{AS} = 6.75\ \text{A}$ , starting  $T_J = 25^\circ\text{C}$ .
3.  $I_{SD} \leq 26\ \text{A}$ ,  $di/dt \leq 200\ \text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , starting  $T_J = 25^\circ\text{C}$ .
4. Essentially independent of operating temperature typical characteristics.

## Typical Performance Characteristics

Figure 1. On-Region Characteristics

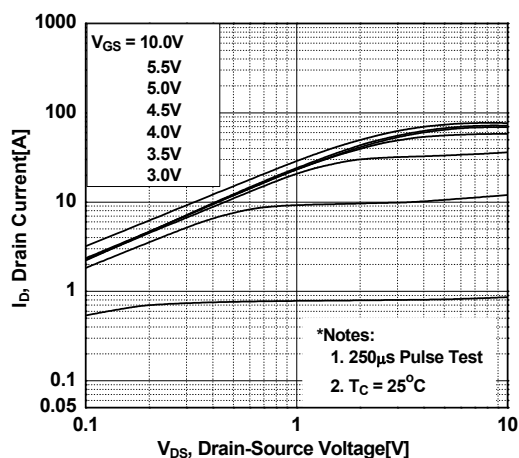


Figure 2. Transfer Characteristics

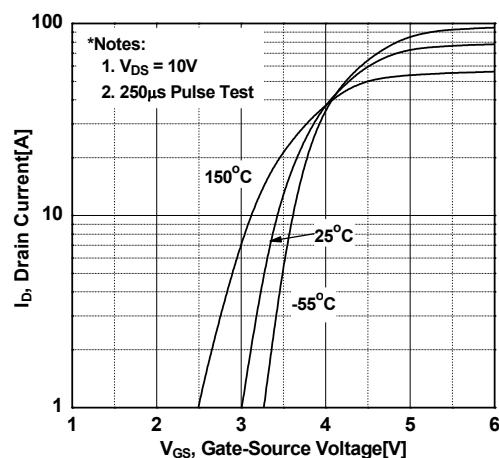


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

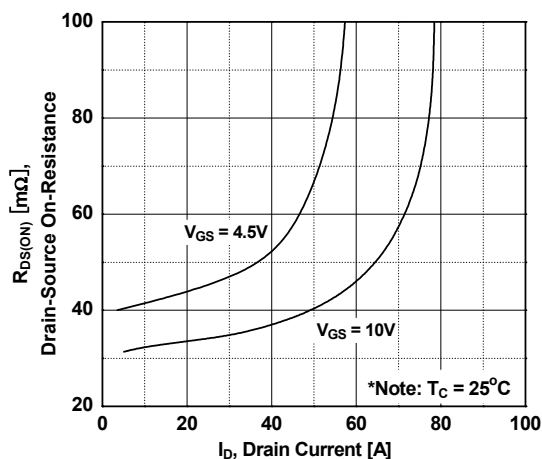


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

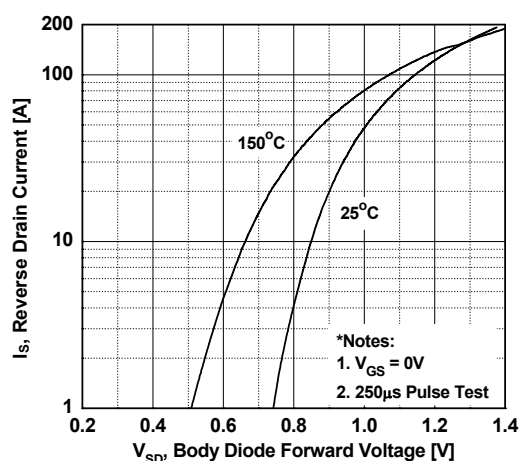


Figure 5. Capacitance Characteristics

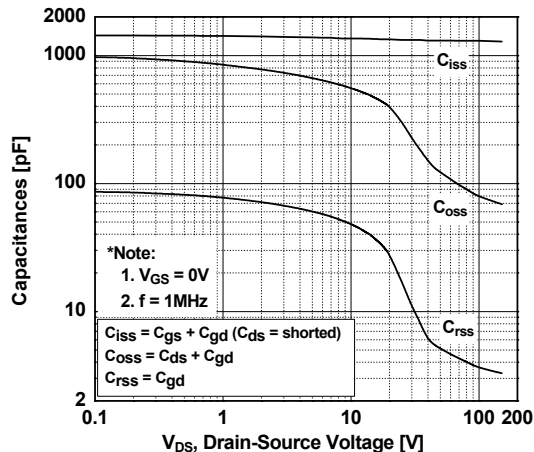
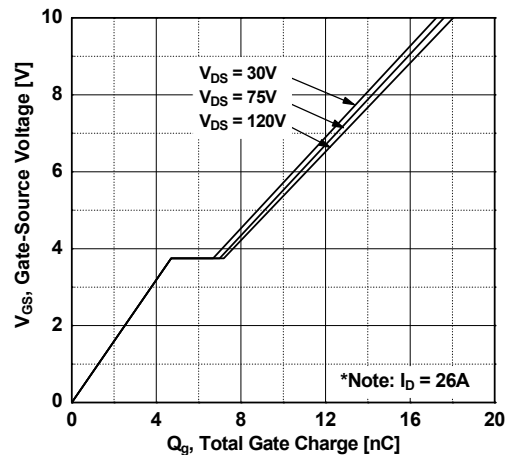
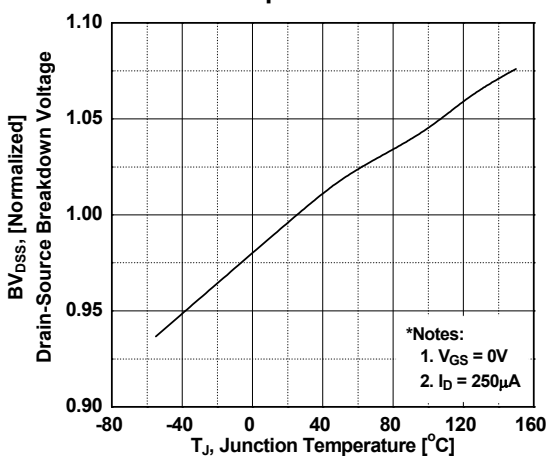


Figure 6. Gate Charge Characteristics

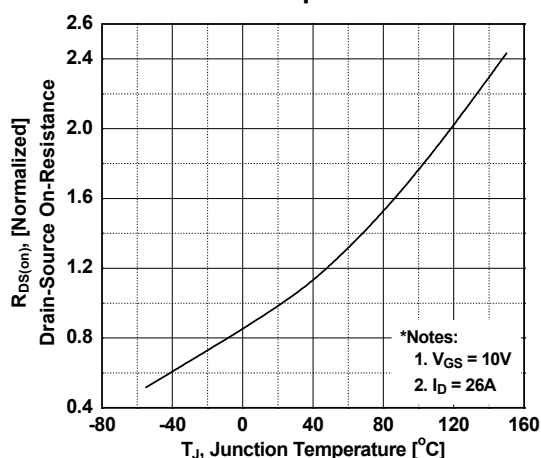


# Typical Performance Characteristics (Continued)

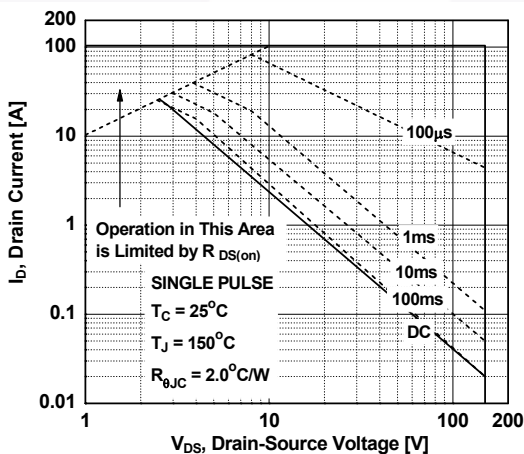
**Figure 7. Breakdown Voltage Variation vs. Temperature**



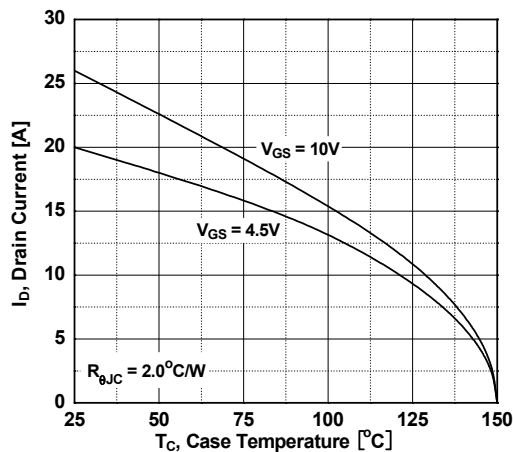
**Figure 8. On-Resistance Variation vs. Temperature**



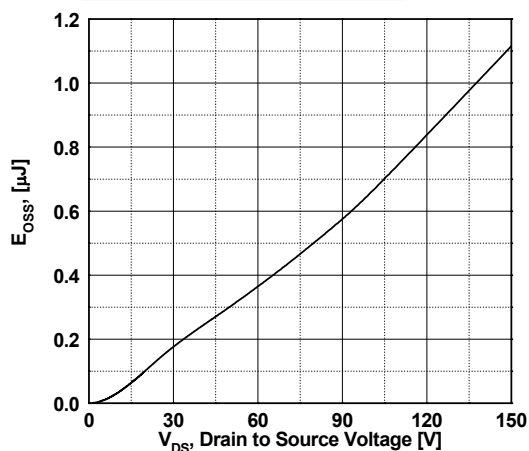
**Figure 9. Maximum Safe Operating Area**



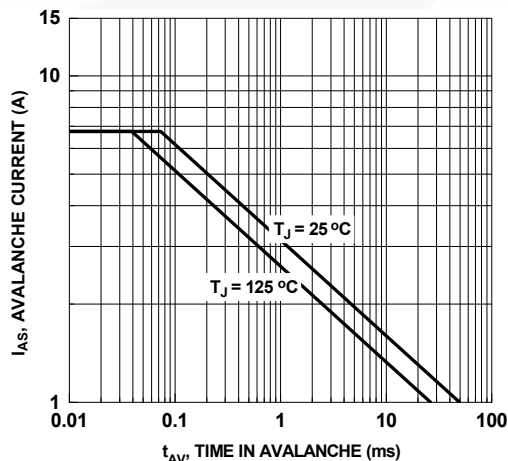
**Figure 10. Maximum Drain Current vs. Case Temperature**



**Figure 11. E\_oss vs. Drain to Source Voltage**

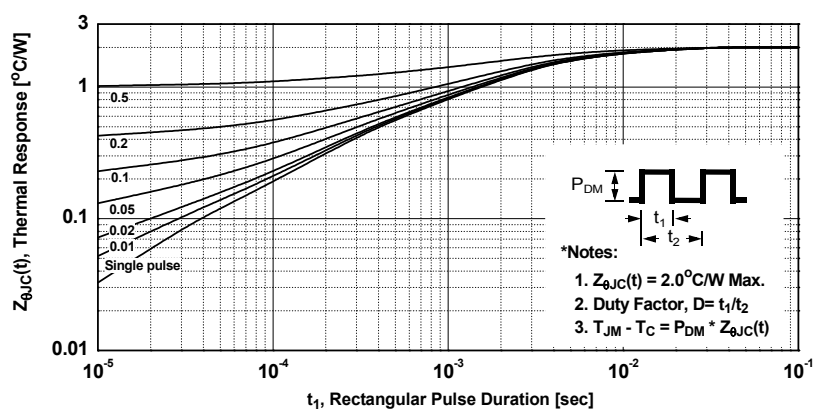


**Figure 12. Unclamped Inductive Switching Capability**



# Typical Performance Characteristics (Continued)

Figure 13. Transient Thermal Response Curve





**Figure 14. Gate Charge Test Circuit & Waveform**



**Figure 15. Resistive Switching Test Circuit & Waveforms**



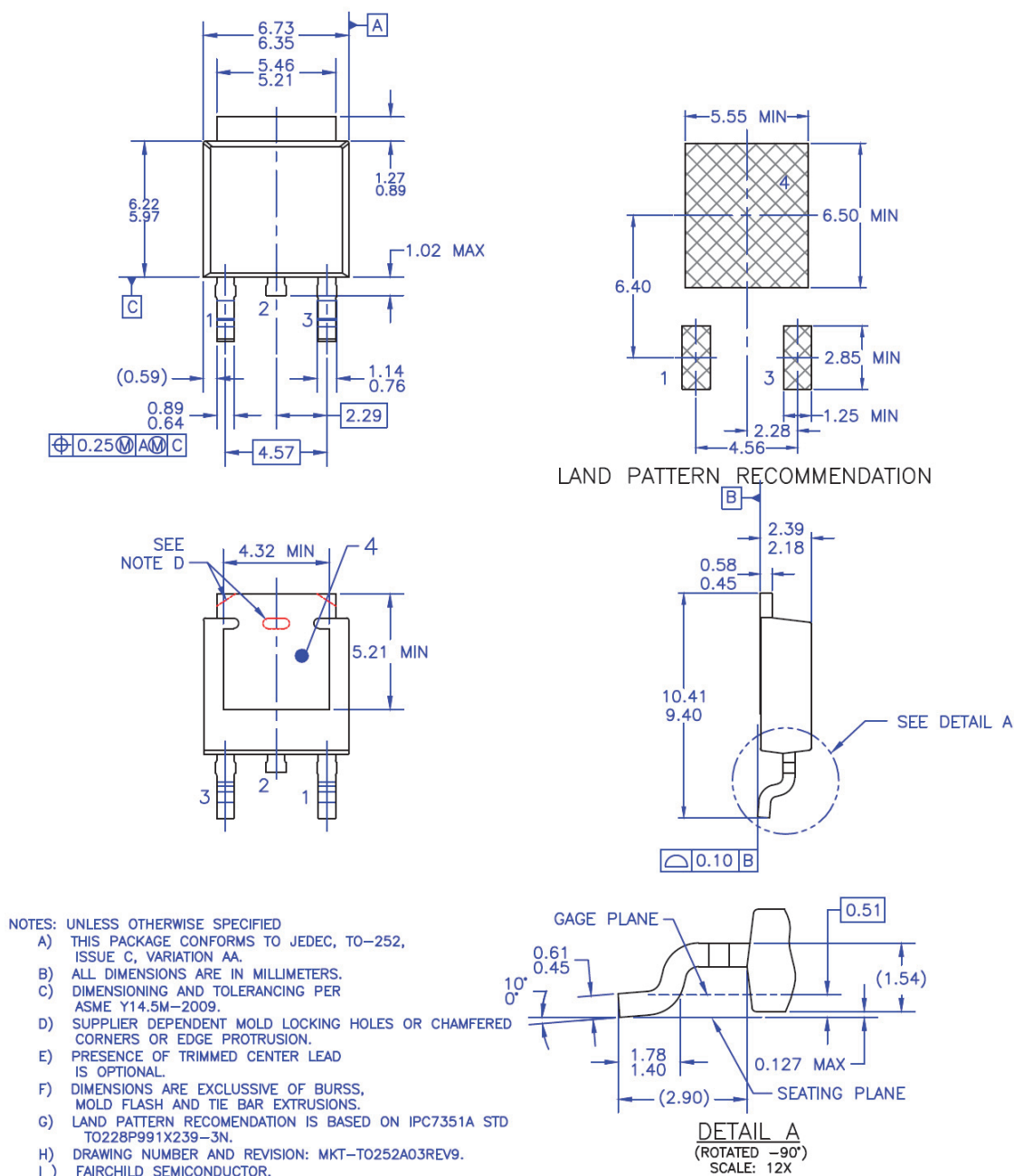
**Figure 16. Unclamped Inductive Switching Test Circuit & Waveforms**



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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