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November 2015

# FDPF190N15A N-Channel PowerTrench<sup>®</sup> MOSFET 150 V, 27.4 A, 19 mΩ

## Features

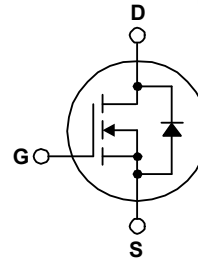
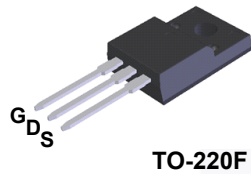
- $R_{DS(on)} = 14.7\text{ m}\Omega$  (Typ.) @  $V_{GS} = 10\text{ V}$ ,  $I_D = 27.4\text{ A}$
- Low Gate Charge,  $Q_G = 31\text{ nC}$  (Typ.)
- Low  $C_{rss}$  (Typ. 56 pF)
- Fast Switching Speed
- Improved dv/dt Capability
- RoHS Compliant

## Description

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

## Applications

- Consumer Appliances
- LED TV
- Synchronous Rectification for ATX / Sever / Telecom PSU
- Uninterruptible Power Supply
- Micro Solar Inverter



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

Symbol	Parameter	FDPF190N15A	Unit
$V_{DSS}$	Drain to Source Voltage	150	V
$V_{GSS}$	Gate to Source Voltage	- DC	$\pm 20$
		- AC (f > 1 Hz)	$\pm 30$
$I_D$	Drain Current	- Continuous ( $T_C = 25^\circ\text{C}$ )	27.4
		- Continuous ( $T_C = 100^\circ\text{C}$ )	17.4
$I_{DM}$	Drain Current	- Pulsed (Note 1)	110
$E_{AS}$	Single Pulsed Avalanche Energy	(Note 2)	261
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	6.0
$P_D$	Power Dissipation	( $T_C = 25^\circ\text{C}$ )	33
		- Derate Above $25^\circ\text{C}$	0.26
$T_J, T_{STG}$	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	FDPF190N15A	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	3.3	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	62.5	

FDPF190N15A — N-Channel PowerTrench<sup>®</sup> MOSFET

## Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDPF190N15A	FDPF190N15A	TO-220F	Tube	N/A	N/A	50 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 $25^\circ\text{C}$	-	0.14	-	$\text{V}/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 120 \text{ V}, V_{GS} = 0 \text{ V}$	-	-	1	$\mu\text{A}$
		$V_{DS} = 120 \text{ V}, T_C = 150^\circ\text{C}$	-	-	500	
$I_{GSS}$	Gate to Body Leakage Current	$V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$	-	-	$\pm 100$	nA

### On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250 \mu\text{A}$	2.0	-	4.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10 \text{ V}, I_D = 27.4 \text{ A}$	-	14.7	19.0	$\text{m}\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 10 \text{ V}, I_D = 27.4 \text{ A}$	-	64	-	S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	-	2020	2685	pF
$C_{oss}$	Output Capacitance		-	700	930	pF
$C_{rSS}$	Reverse Transfer Capacitance		-	56	85	pF
$C_{oss(er)}$	Energy Related Output Capacitance	$V_{DS} = 75 \text{ V}, V_{GS} = 0 \text{ V}$	-	252	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 120 \text{ V}, I_D = 27.4 \text{ A}, V_{GS} = 10 \text{ V}$	-	30	39	nC
$Q_{gs}$	Gate to Source Gate Charge		-	8.8	-	nC
$Q_{gd}$	Gate to Drain "Miller" Charge		(Note 4)	-	7.3	-
ESR	Equivalent Series Resistance (G-S)	$f = 1 \text{ MHz}$	-	1.5	-	$\Omega$

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 75 \text{ V}, I_D = 27.4 \text{ A}, V_{GS} = 10 \text{ V}, R_G = 4.7 \Omega$	-	18	46	ns
$t_r$	Turn-On Rise Time		-	16	42	ns
$t_{d(off)}$	Turn-Off Delay Time		-	32	74	ns
$t_f$	Turn-Off Fall Time		(Note 4)	-	8	26

### Drain-Source Diode Characteristics

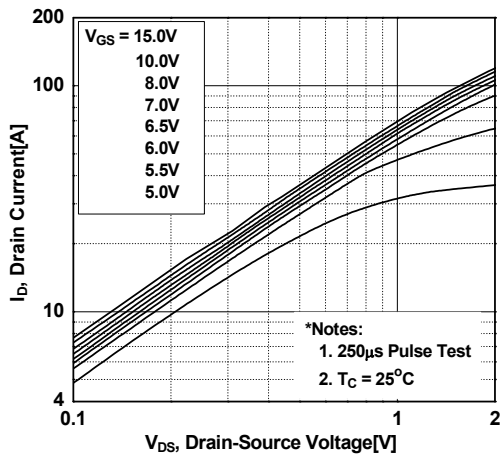
$I_S$	Maximum Continuous Drain to Source Diode Forward Current	-	-	27.4	A	
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current	-	-	110	A	
$V_{SD}$	Drain to Source Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_{SD} = 27.4 \text{ A}$	-	-	1.3	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0 \text{ V}, I_{SD} = 27.4 \text{ A}$	-	76	-	ns
$Q_{rr}$	Reverse Recovery Charge	$di/dt = 100 \text{ A}/\mu\text{s}, V_{DD} = 120 \text{ V}$	-	0.18	-	$\mu\text{C}$

#### Notes:

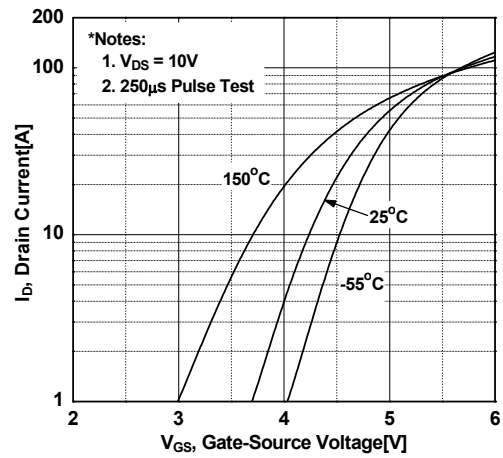
1. Repetitive rating: pulse-width limited by maximum junction temperature.
2.  $L = 0.33 \text{ mH}, I_{AS} = 29 \text{ A}, R_G = 25 \Omega$ , starting  $T_J = 25^\circ\text{C}$ .
3.  $I_{SD} \leq 27.4 \text{ A}, di/dt \leq 200 \text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$ , starting  $T_J = 25^\circ\text{C}$ .
4. Essentially independent of operating temperature typical characteristics.

## Typical Performance Characteristics

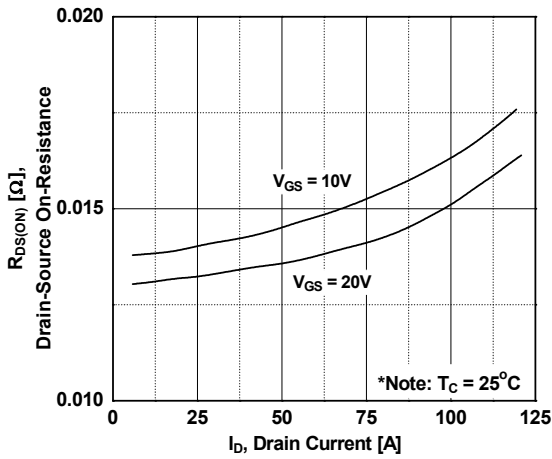
**Figure 1. On-Region Characteristics**



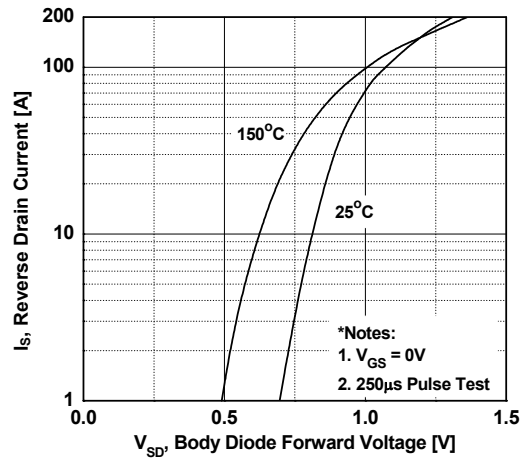
**Figure 2. Transfer Characteristics**



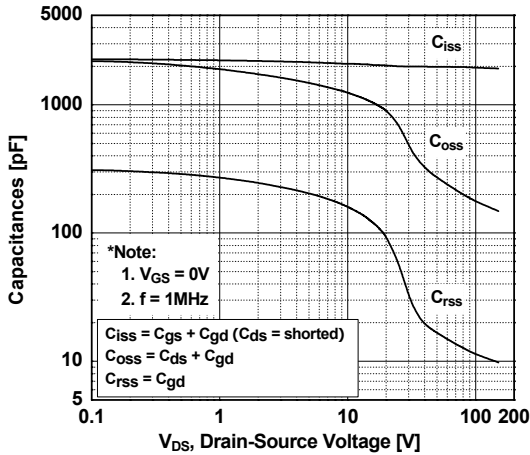
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



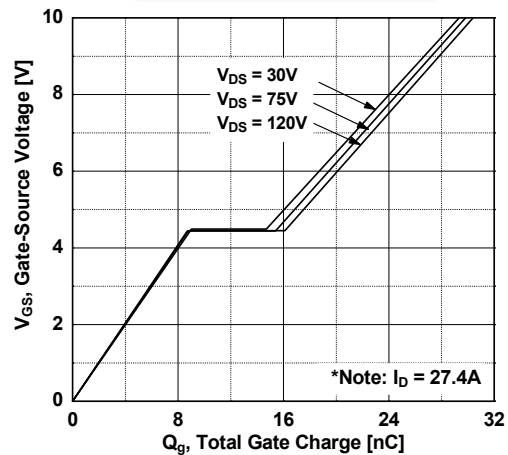
**Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature**



**Figure 5. Capacitance Characteristics**

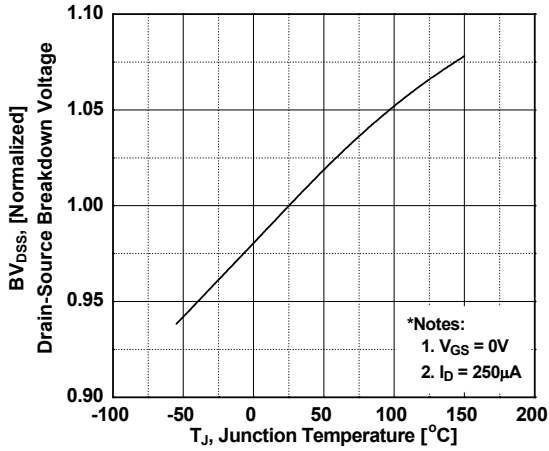


**Figure 6. Gate Charge Characteristics**

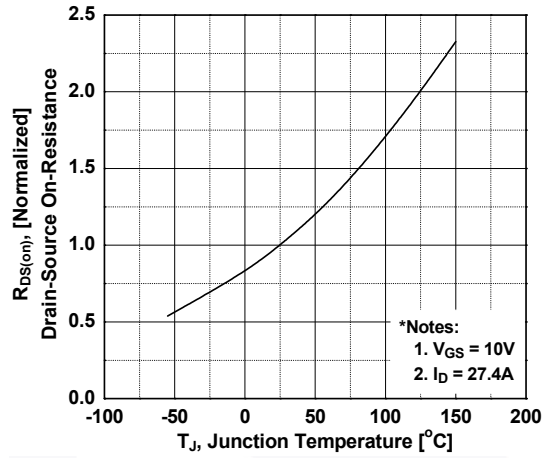


**Typical Performance Characteristics** (Continued)

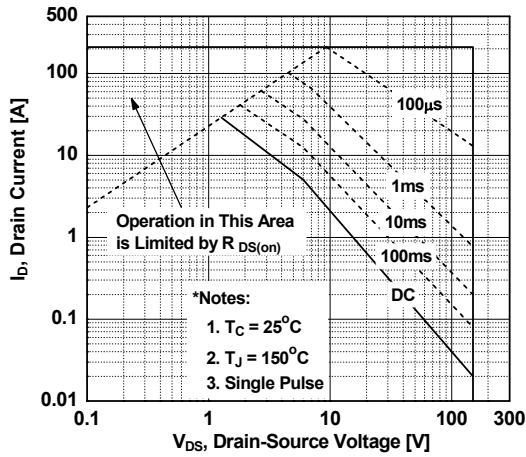
**Figure 7. Breakdown Voltage Variation vs. Temperature**



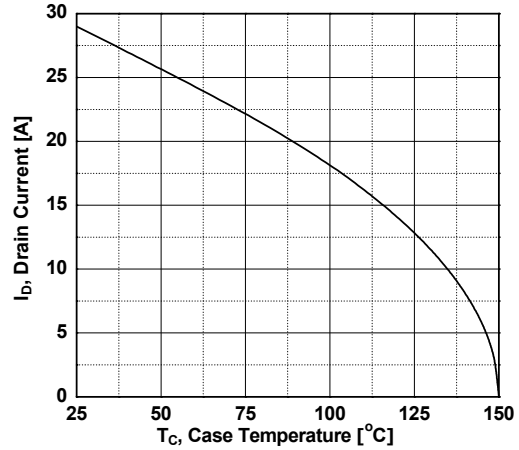
**Figure 8. On-Resistance Variation vs. Temperature**



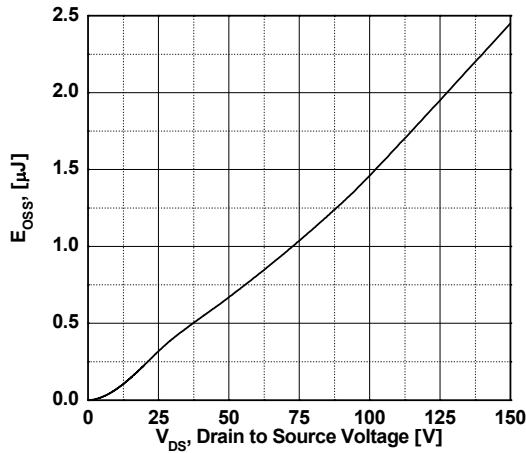
**Figure 9. Maximum Safe Operating Area**



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

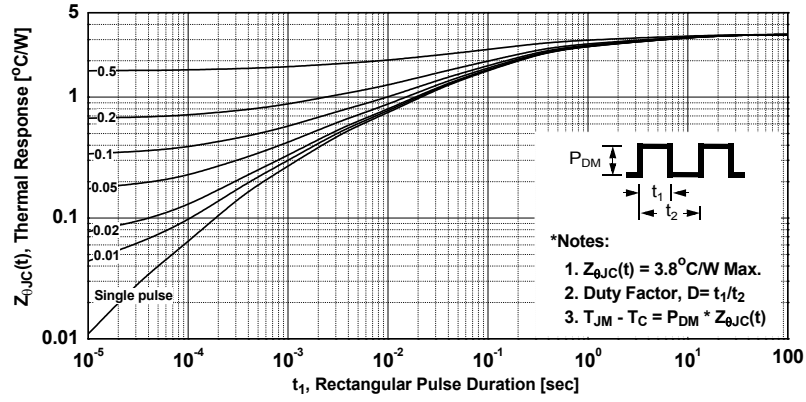


**Figure 11. E<sub>oss</sub> vs. Drain to Source Voltage**



Typical Performance Characteristics (Continued)

Figure 12. Transient Thermal Response Curve





**Figure 13. Gate Charge Test Circuit & Waveform**



**Figure 14. Resistive Switching Test Circuit & Waveforms**



**Figure 15. Unclamped Inductive Switching Test Circuit & Waveforms**



Figure 16. Peak Diode Recovery  $dv/dt$  Test Circuit & Waveforms





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