

# FDPF320N06L

## N-Channel PowerTrench® MOSFET

60V, 21A, 25mΩ

### Features

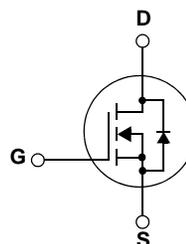
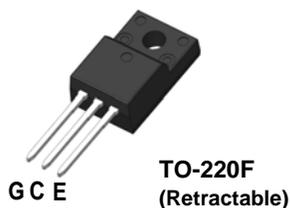
- $R_{DS(on)} = 20m\Omega$  (Typ.)@  $V_{GS} = 10V, I_D = 21A$
- $R_{DS(on)} = 23m\Omega$  (Typ.)@  $V_{GS} = 5V, I_D = 17A$
- Low Gate Charge (Typ. 23.2nC)
- Low  $C_{rss}$  (Typ. 64pF)
- Fast Switching
- 100% Avalanche Tested
- Improved dv/dt Capability
- RoHS Compliant

### Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advance PowerTrench process that has been especially tailored to minimize the on-state resistance and yet maintain superior switching performance.

### Application

- DC to DC converters / Synchronous Rectification



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

Symbol	Parameter	FDPF320N06L	Units
$V_{DSS}$	Drain to Source Voltage	60	V
$V_{GSS}$	Gate to Source Voltage	$\pm 20$	V
$I_D$	Drain Current	- Continuous ( $T_C = 25^\circ\text{C}$ )	21
		- Continuous ( $T_C = 100^\circ\text{C}$ )	15
$I_{DM}$	Drain Current	- Pulsed (Note 1)	84
$E_{AS}$	Single Pulsed Avalanche Energy	(Note 2)	66
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	6.0
$P_D$	Power Dissipation	( $T_C = 25^\circ\text{C}$ )	26
		- Derate above $25^\circ\text{C}$	0.17
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +175	$^\circ\text{C}$
$T_L$	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds	300	$^\circ\text{C}$

\*Drain current limited by maximum junction temperature

### Thermal Characteristics

Symbol	Parameter	FDPF320N06L	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case	5.8	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	62.5	

## Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDPF320N06L	FDPF320N06L	TO-220F	-	-	50

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

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

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	60	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$ , Referenced to $25^\circ\text{C}$	-	0.04	-	$\text{V}/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 48\text{V}, V_{GS} = 0\text{V}$ $V_{DS} = 48\text{V}, T_C = 150^\circ\text{C}$	-	-	1 500	$\mu\text{A}$
$I_{GSS}$	Gate to Body Leakage Current	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$	-	-	$\pm 100$	$\mu\text{A}$

### On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	1.0	-	2.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{V}, I_D = 21\text{A}$ $V_{GS} = 5\text{V}, I_D = 17\text{A}$	-	20 23	25 38	$\text{m}\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 10\text{V}, I_D = 21\text{A}$ (Note 4)	-	34	-	S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{V}, V_{GS} = 0\text{V}$ $f = 1\text{MHz}$	-	1105	1470	pF
$C_{oss}$	Output Capacitance		-	115	150	pF
$C_{riss}$	Reverse Transfer Capacitance		-	64	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{GS} = 10\text{V}$	-	23.2	30.2	nC
$Q_{g(tot)}$	Total Gate Charge at 5V	$V_{GS} = 5\text{V}$	-	12.7	16.5	nC
$Q_{gs}$	Gate to Source Gate Charge	$V_{DS} = 48\text{V}$ $I_D = 21\text{A}$	-	3.4	-	nC
$Q_{gd}$	Gate to Drain "Miller" Charge		-	6.3	-	nC

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 30\text{V}, I_D = 21\text{A}$ $V_{GS} = 5\text{V}, R_{GEN} = 4.7\Omega$	-	16	42	ns
$t_r$	Turn-On Rise Time		-	34	78	ns
$t_{d(off)}$	Turn-Off Delay Time		-	27	64	ns
$t_f$	Turn-Off Fall Time		(Note 4, 5)	-	8	26
ESR	Equivalent Series Resistance (G-S)		-	2	-	$\Omega$

### Drain-Source Diode Characteristics

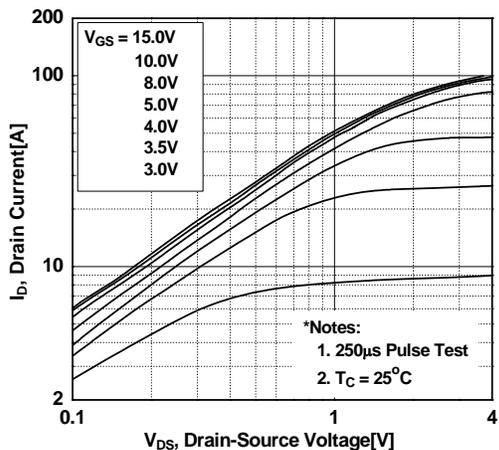
$I_S$	Maximum Continuous Drain to Source Diode Forward Current	-	-	21	A	
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current	-	-	84	A	
$V_{SD}$	Drain to Source Diode Forward Voltage	$V_{GS} = 0\text{V}, I_{SD} = 21\text{A}$	-	-	1.3	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0\text{V}, I_{SD} = 21\text{A}, V_{DD} = 48\text{V}$	-	27	-	ns
$Q_{rr}$	Reverse Recovery Charge	$di_F/dt = 100\text{A}/\mu\text{s}$ (Note 4)	-	23	-	nC

#### Notes:

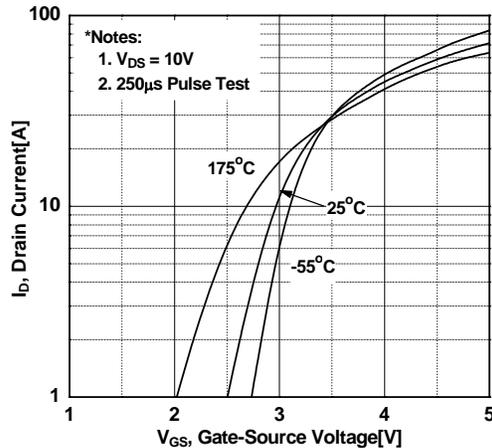
1. Repetitive Rating: Pulse width limited by maximum junction temperature
2.  $L = 1\text{mH}, I_{AS} = 11.5\text{A}, R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq 21\text{A}, di/dt \leq 200\text{A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$
4. Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Dual Cycle  $\leq 2\%$
5. Essentially Independent of Operating Temperature Typical Characteristics

## Typical Performance Characteristics

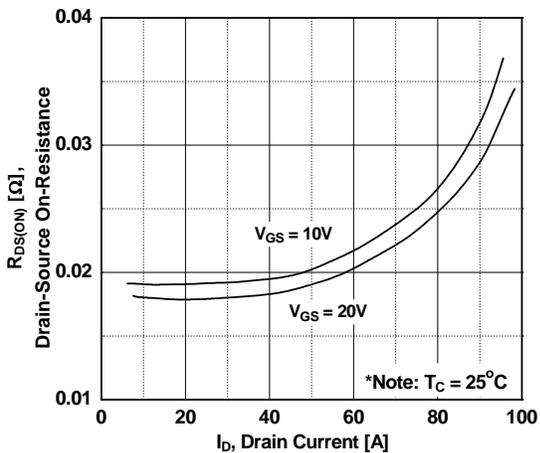
**Figure 1. On-Region Characteristics**



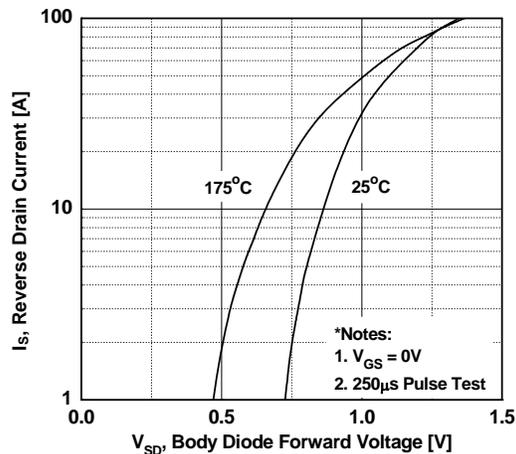
**Figure 2. Transfer Characteristics**



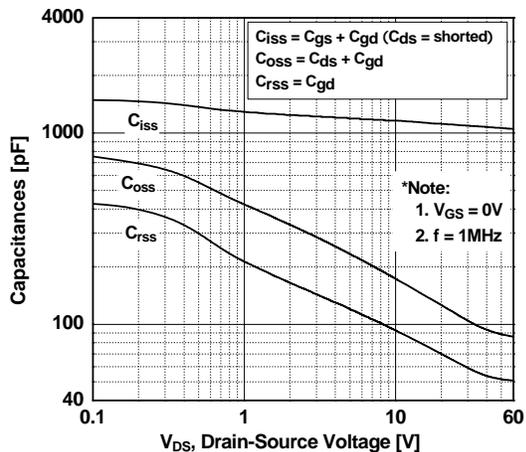
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



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



**Figure 5. Capacitance Characteristics**



**Figure 6. Gate Charge Characteristics**

