FDP090N10

N-Channel PowerTrench® MOSFET

100V, 75A, 9mΩ

Features

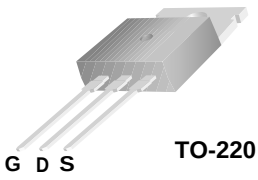
- $R_{DS(on)}$ = 7.2mΩ (Typ.) @ V_{GS} = 10V, I_D = 75A
- Fast switching speed
- Low gate charge
- High performance trench technology for extremely low $R_{DS(on)}$
- High power and current handling capability
- RoHS compliant

Application

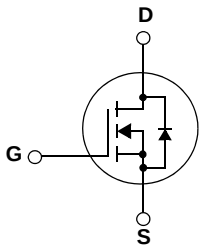
- DC to DC convertors / Synchronous Rectification

General Description

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



TO-220



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

Symbol	Parameter			Ratings	Units
V_{DSS}	Drain to Source Voltage			100	V
V_{GSS}	Gate to Source Voltage			±20	V
I_D	Drain Current	-Continuous (T_C = 85°C)		75	A
I_{DM}	Drain Current	- Pulsed	(Note 1)	300	A
E_{AS}	Single Pulsed Avalanche Energy		(Note 2)	309	mJ
I_{AR}	Avalance Current		(Note 1)	75	A
E_{AR}	Repetitive Avalanche Energy		(Note 1)	20.8	mJ
dv/dt	Peak Diode Recovery dv/dt		(Note 3)	5.6	V/ns
P_D	Power Dissipation	(T_C = 25°C)		208	W
		- Derate above 25°C		1.39	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range			-55 to +175	°C
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds			300	°C

*Drain current limited by maximum junction temperature

Thermal Characteristics

Symbol	Parameter	Ratings	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.72	°C/W
$R_{\theta CS}$	Thermal Resistance, Case to Sink Typ.	0.5	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	62.5	

Package Marking and Ordering Information $T_C = 25^oC$ unless otherwise noted

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDP090N10	FDP090N10	TO-220	-	-	50

Electrical Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250\mu A$, $V_{GS} = 0V$, $T_C = 25^oC$	100	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu A$, Referenced to 25^oC	-	0.1	-	$V/^oC$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 100V$, $V_{GS} = 0V$	-	-	1	μA
		$V_{DS} = 100V$, $V_{GS} = 0V$, $T_C = 150^oC$	-	-	500	
I_{GSS}	Gate to Body Leakage Current	$V_{GS} = \pm 20V$, $V_{DS} = 0V$	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 250\mu A$	2.5	3.5	4.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10V$, $I_D = 75A$	-	7.2	9	mΩ
g_{FS}	Forward Transconductance	$V_{DS} = 10V$, $I_D = 37.5A$ (Note 4)	-	100	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS} = 25V$, $V_{GS} = 0V$ f = 1MHz	-	6185	8225	pF
C_{oss}	Output Capacitance		-	585	775	pF
C_{rss}	Reverse Transfer Capacitance		-	235	355	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 50V$, $I_D = 75A$ $V_{GS} = 10V$, $R_{GEN} = 25\Omega$ (Note 4, 5)	-	107	224	ns
t_r	Turn-On Rise Time		-	322	655	ns
$t_{d(off)}$	Turn-Off Delay Time		-	166	342	ns
t_f	Turn-Off Fall Time		-	149	309	ns
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 50V$, $I_D = 75A$ $V_{GS} = 10V$ (Note 4, 5)	-	89	116	nC
Q_{gs}	Gate to Source Gate Charge		-	37	-	nC
Q_{gd}	Gate to Drain "Miller" Charge		-	22	-	nC
Drain-Source Diode Characteristics						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	75	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	300	A
V_{SD}	Drain to Source Diode Forward Voltage	$V_{GS} = 0V$, $I_{SD} = 75A$	-	-	1.25	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0V$, $I_{SD} = 75A$ $dI_F/dt = 100A/\mu s$ (Note 4)	-	73	-	ns
Q_{rr}	Reverse Recovery Charge		-	166	-	nC

Notes:
1: Repetitive Rating: Pulse width limited by maximum junction temperature
2: L = 0.11mH, $I_{AS} = 75A$, $V_{DD} = 50V$, $R_G = 25\Omega$, Starting $T_J = 25°C$
3: $I_{SD} \leq 75A$, $di/dt \leq 200A/\mu s$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25°C$
4: Pulse Test: Pulse width ≤ 300μs, Duty Cycle ≤ 2%
5: Essentially Independent of Operating Temperature Typical Characteristics

Typical Performance Characteristics

Figure 1. On-Region Characteristics

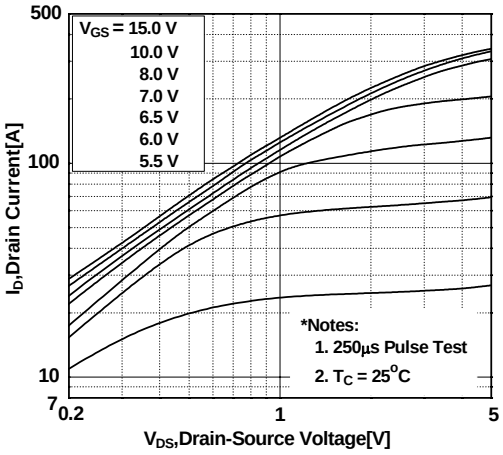


Figure 2. Transfer Characteristics

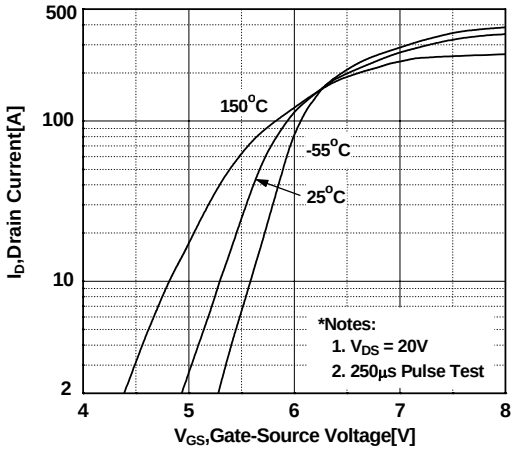


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

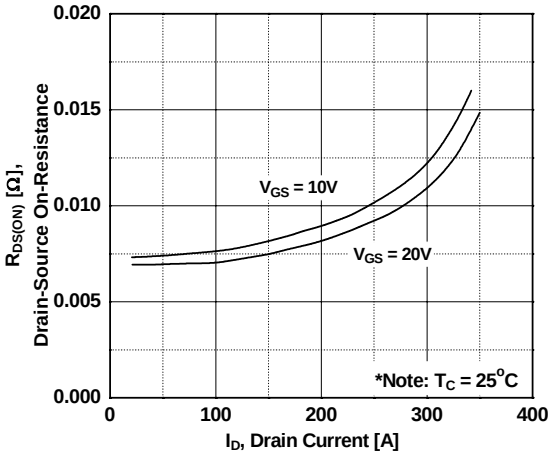


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

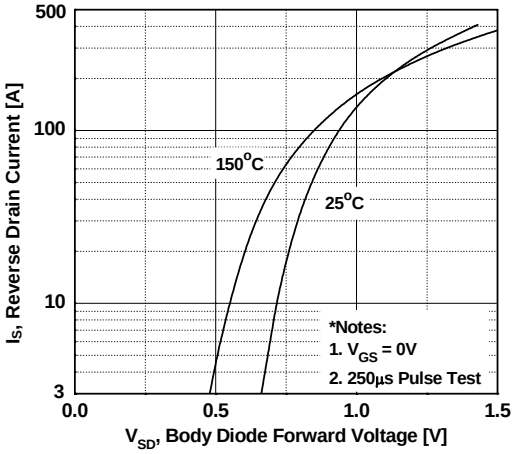


Figure 5. Capacitance Characteristics

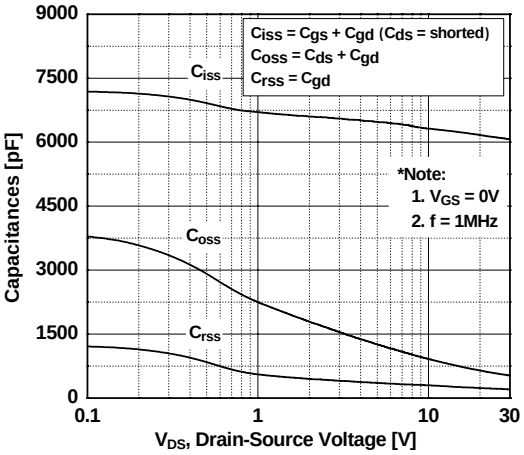


Figure 6. Gate Charge Characteristics