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November 2013

FDP18N20F / FDPF18N20FT N-Channel UniFETTM FRFET[®] MOSFET 200 V, 18 A, 140 m Ω

Features

- $R_{DS(on)}$ = 120 $m\Omega$ (Typ.) @ V_{GS} = 10 V, I_D = 9 A
- Low Gate Charge (Typ. 20 nC)
- Low C_{rss} (Typ. 24 pF)
- · 100% Avalanche Tested
- · RoHS Compliant

Applications

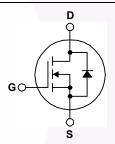
- · LCD/LED TV
- · Consumer Appliances
- Lighting
- · Uninterruptible Power Supply
- · AC-DC Power Supply

Description

UniFETTM MOSFET is Fairchild Semiconductor's high voltage MOSFET family based on planar stripe and DMOS technology. This MOSFET is tailored to reduce on-state resistance, and to provide better switching performance and higher avalanche energy strength. The body diode's reverse recovery performance of UniFET FRFET® MOSFET has been enhanced by lifetime control. Its t_{rr} is less than 100nsec and the reverse dv/dt immunity is 15V/ns while normal planar MOSFETs have over 200nsec and 4.5V/nsec respectively. Therefore, it can remove additional component and improve system reliability in certain applications in which the performance of MOSFET's body diode is significant. This device family is suitable for switching power converter applications such as power factor correction (PFC), flat panel display (FPD) TV power, ATX and electronic lamp ballasts.







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

Symbol		Parameter		FDP18N20F	FDPF18N20FT	Unit	
V _{DSS}	Drain to Source Voltage		2	V			
V _{GSS}	Gate to Source Voltage			±	30	V	
	Drain Current	- Continuous (T _C = 25°C)		18	18*	Α	
ID	Diamounem	- Continuous (T _C = 100°C)		10.8	10.8*	A	
I _{DM}	Drain Current	- Pulsed	(Note 1)	72	72*	Α	
E _{AS}	Single Pulsed Avalanche Ene	rgy	(Note 2)	3	24	mJ	
I _{AR}	Avalanche Current (N		(Note 1)	18		Α	
E _{AR}	Repetitive Avalanche Energy		(Note 1)	10		mJ	
dv/dt	Peak Diode Recovery dv/dt		(Note 3)	3) 4.5		V/ns	
D	Dower Dissipation	(T _C = 25°C)		100	41	W	
P_{D}	Power Dissipation	- Derate Above 25°C		0.83	0.33	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			3	00	٥С	

^{*}Drain current limited by maximum junction temperature.

Thermal Characteristics

Symbol	Parameter	FDP18N20F	FDPF18N20FT	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	1.2	3.0	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	62.5	62.5	0/80

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDP18N20F	FDP18N20F	TO-220	Tube	N/A	N/A	50 units
FDPF18N20FT	FDPF18N20FT	TO-220F	Tube	N/A	N/A	50 units

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

Symbol	Parameter	lest Conditions	Min.	ıyp.	Max.	Unit
Off Charae	cteristics					
BV _{DSS}	Drain to Source Breakdown Voltage	$I_D = 250 \mu A, V_{GS} = 0 V, T_J = 25^{\circ} C$	200	-	-	V
ΔBV _{DSS} / ΔT _J	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C	-	0.2	-	V/°C
Inno	Zero Gate Voltage Drain Current	$V_{DS} = 200 \text{ V}, V_{GS} = 0 \text{ V}$	-	-	10	μА
IDSS	Zero Gate Voltage Brain Guirent	$V_{DS} = 160 \text{ V}, T_C = 125^{\circ}\text{C}$	-	-	100	μΑ
I _{GSS}	Gate to Body Leakage Current	$V_{GS} = \pm 30 \text{ V}, V_{DS} = 0 \text{ V}$	-	-	±100	nA

On Characteristics

V _{GS(th)}	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_{D} = 250 \mu\text{A}$	3.0	-	5.0	V
R _{DS(on)}	Static Drain to Source On Resistance	$V_{GS} = 10 \text{ V}, I_D = 9 \text{ A}$	-	0.12	0.14	Ω
9 _{FS}	Forward Transconductance	V _{DS} = 20 V, I _D = 9 A	ı	13.6	ı	S

Dynamic Characteristics

C _{iss}	Input Capacitance	V 05.V V 0.V	-	885	1180	pF
C _{oss}	Output Capacitance	V _{DS} = 25 V, V _{GS} = 0 V, f = 1 MHz	-\	200	270	pF
C _{rss}	Reverse Transfer Capacitance			24	35	pF
Q _{g(tot)}	Total Gate Charge at 10V	V _{DS} = 160 V, I _D = 18 A,	-	20	26	nC
Q _{gs}	Gate to Source Gate Charge	V _{GS} = 10 V	-	5	-	nC
Q _{gd}	Gate to Drain "Miller" Charge	(Note 4)	-	9	-	nC

Switching Characteristics

t _{d(on)}	Turn-On Delay Time		-	16	40	ns
t _r		$V_{DD} = 100 \text{ V}, I_D = 18 \text{ A},$	-	50	110	ns
t _{d(off)}	Turn-Off Delay Time	V_{GS} = 10 V, R_G = 25 Ω	-	50	110	ns
t _f	Turn-Off Fall Time	(Note 4)	-	40	90	ns

Drain-Source Diode Characteristics

I _S	Maximum Continuous Drain to Source Diode Forward Current		-	-	18	Α
I _{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	72	Α
V_{SD}	Drain to Source Diode Forward Voltage	V _{GS} = 0 V, I _{SD} = 18 A	-	-	1.5	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _{SD} = 18 A,	-	80	-	ns
Q _{rr}	Reverse Recovery Charge	$dI_F/dt = 100 A/\mu s$	-	240	-	nC

Notes

- 1. Repetitive rating: pulse-width limited by maximum junction temperature.
- 2. L = 2 mH, I $_{AS}$ = 18 A, V $_{DD}$ = 50 V, R_{G} = 2 $5\Omega,$ starting T $_{J}$ = 25°C.
- 3. I_{SD} \leq 18 A, di/dt \leq 200 A/ μ s, V_{DD} \leq BV_{DSS}, starting T_J = 25°C.
- 4. Essentially independent of operating temperature typical characteristics.

Typical Performance Characteristics

Figure 1. On-Region Characteristics

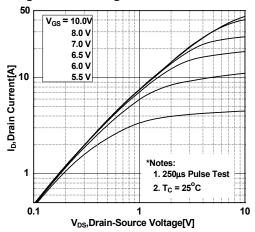


Figure 3. On-Resistance Variation vs.

Drain Current and Gate Voltage

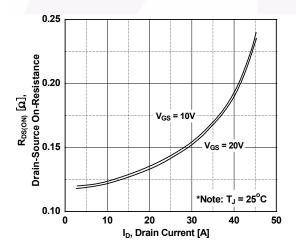


Figure 5. Capacitance Characteristics

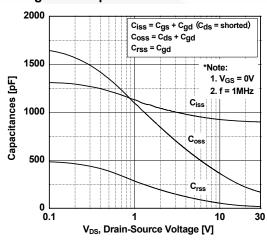


Figure 2. Transfer Characteristics

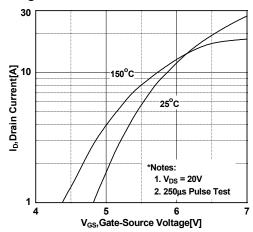


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

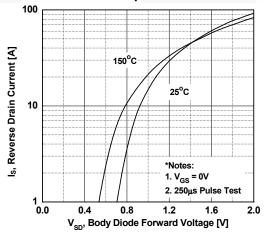
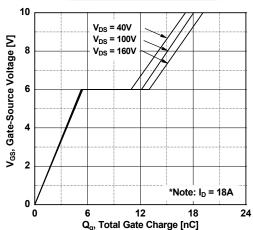


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

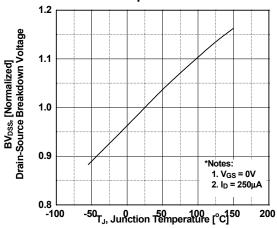


Figure 8-2. Maximum Safe Operating Area

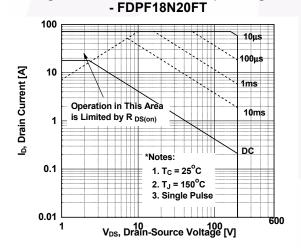


Figure 8-1. Maximum Safe Operating Area - FDP18N20F

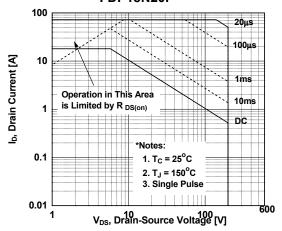


Figure 9. Maximum Drain Current vs. Case Temperature

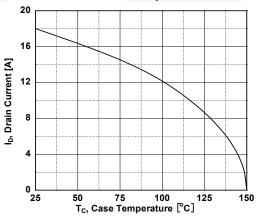


Figure 10-1. Transient Thermal Response Curve - FDP18N20F

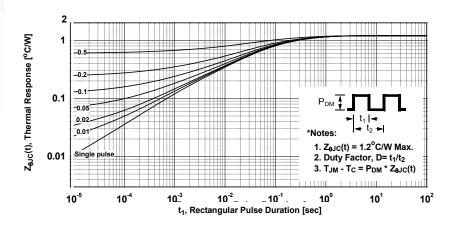
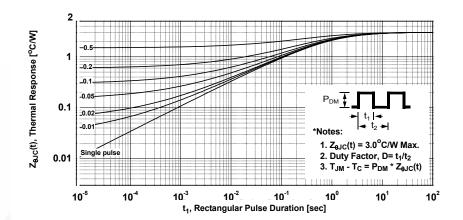


Figure 10-2. Transient Thermal Response Curve - FDPF18N20FT



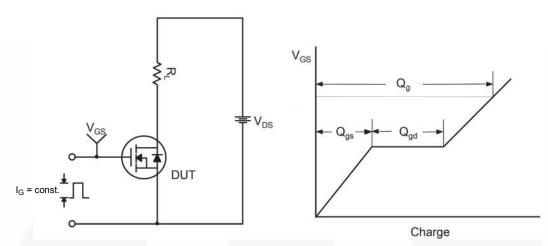


Figure 11. Gate Charge Test Circuit & Waveform

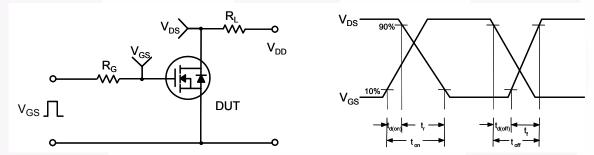


Figure 12. Resistive Switching Test Circuit & Waveforms

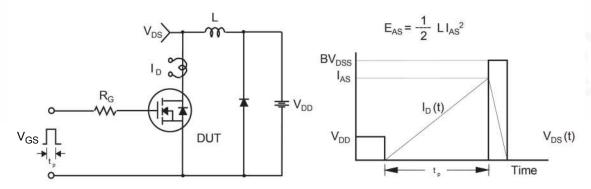


Figure 13. Unclamped Inductive Switching Test Circuit & Waveforms

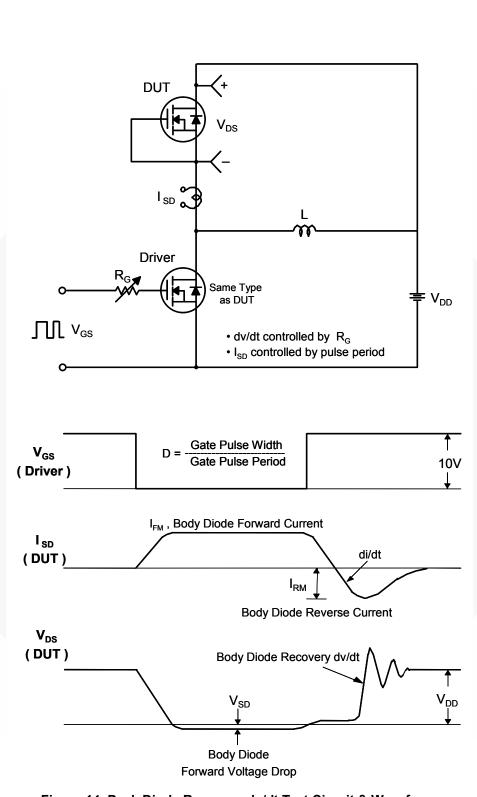


Figure 14. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions

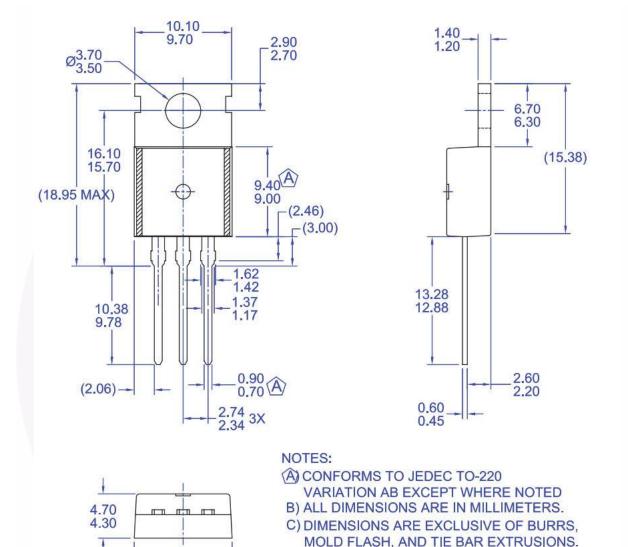


Figure 15. TO220, Molded, 3-Lead, Jedec Variation AB

D) DRAWING FILE/REVISION: MKT-TO220Y03REV1

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Mechanical Dimensions

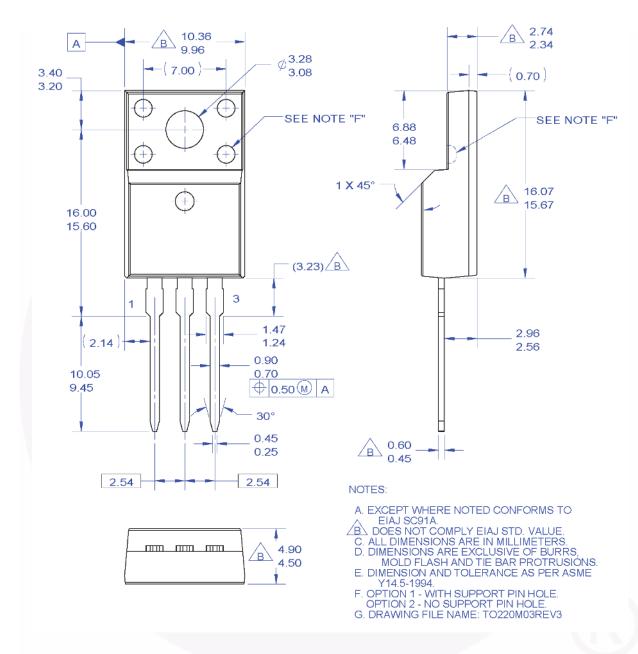


Figure 16. TO220, Molded, 3-Lead, Full Pack, EIAJ SC91, Straight Lead

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