FDP16N50U / FDPF16N50UT

N-Channel UniFET™ Ultra FRFET™ MOSFET

500 V, 15 A, 480 mΩ

Features

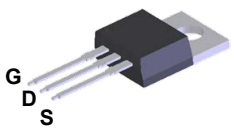
- $R_{DS(on)}$ = 370 mΩ (Typ.) @ V_{GS} = 10 V, I_D = 7.5 A
- Low Gate Charge (Typ. 32 nC)
- Low C_{rss} (Typ. 20 pF)
- 100% Avalanche Tested
- Improved dv/dt Capability
- RoHS Compliant

Applications

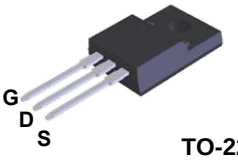
- LCD/LED/PDP TV
- Lighting
- Uninterruptible Power Supply

Description

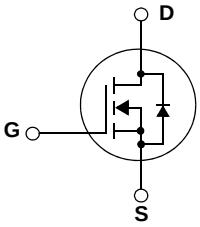
UniFET™ MOSFET is Fairchild Semiconductor®'s high voltage MOSFET family based on planar stripe and DMOS technology. This MOSFET is tailored to reduce on-state resistance, and to provide better switching performance and higher avalanche energy strength. UniFET Ultra FRFET™ MOSFET has much superior body diode reverse recovery performance. Its t_{rr} is less than 50nsec and the reverse dv/dt immunity is 20V/nsec while normal planar MOSFETs have over 200nsec and 4.5V/nsec respectively. Therefore UniFET Ultra FRFET MOSFET can remove additional component and improve system reliability in certain applications that require performance improvement of the MOSFET's body diode. 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.



TO-220



TO-220F



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

Symbol	Parameter		FDP16N50U	FDPF16N50UT	Unit
V_{DSS}	Drain to Source Voltage		500		V
V_{GSS}	Gate to Source Voltage		±30		V
I_D	Drain Current	-Continuous (T_C = 25°C)	15	15*	A
		-Continuous (T_C = 100°C)	9	9*	
I_{DM}	Drain Current	- Pulsed (Note 1)	60	60*	A
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	610		mJ
I_{AR}	Avalanche Current	(Note 1)	15		A
E_{AR}	Repetitive Avalanche Energy	(Note 1)	20		mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	20		V/ns
P_D	Power Dissipation	(T_C = 25°C)	200	38.5	W
		- Derate above 25°C	1.59	0.3	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +150		°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	FDP16N50U	FDPF16N50UT	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.63	3.3	°C/W
$R_{\theta CS}$	Thermal Resistance, Junction to Ambient, Typ.	0.5	-	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	62.5	62.5	

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

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDP16N50U	FDP16N50U	TO-220	-	-	50
FDPF16N50UT	FDPF16N50UT	TO-220F	-	-	50

Electrical Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250μA, V_{GS} = 0V, $T_J = 25^oC$	500	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250μA, Referenced to 25^oC	-	0.5	-	$V/^oC$
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 500V, V_{GS} = 0V	-	-	25	μA
		V_{DS} = 400V, $T_C = 125^oC$	-	-	250	
I_{GSS}	Gate to Body Leakage Current	V_{GS} = ±30V, V_{DS} = 0V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}$, I_D = 250μA	3.0	-	5.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10V, I_D = 7.5A	-	0.37	0.48	Ω
g_{FS}	Forward Transconductance	V_{DS} = 40V, I_D = 7.5A (Note 4)	-	23	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25V, V_{GS} = 0V, f = 1MHz	-	1495	1945	pF
C_{oss}	Output Capacitance		-	235	310	pF
C_{rss}	Reverse Transfer Capacitance		-	20	30	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	V_{DS} = 400V, I_D = 15A, V_{GS} = 10V (Note 4, 5)	-	32	45	nC
Q_{gs}	Gate to Source Gate Charge		-	8.5	-	nC
Q_{gd}	Gate to Drain “Miller” Charge		-	14	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 250V, I_D = 15A, R_G = 25Ω (Note 4, 5)	-	40	90	ns
t_r	Turn-On Rise Time		-	150	310	ns
$t_{d(off)}$	Turn-Off Delay Time		-	65	140	ns
t_f	Turn-Off Fall Time		-	80	170	ns
Drain-Source Diode Characteristics						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	15	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	60	A
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS} = 0V, I_{SD} = 15A	-	-	1.6	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0V, I_{SD} = 15A, dI_F/dt = 100A/μs (Note 4)	-	65	-	ns
Q_{rr}	Reverse Recovery Charge		-	0.1	-	μC

Notes:
1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. L = 5.5mH, I_{AS} = 15A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C
3. $I_{SD} \leq$ 16A, di/dt ≤ 200A/μs, $V_{DD} \leq BV_{DSS}$, 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

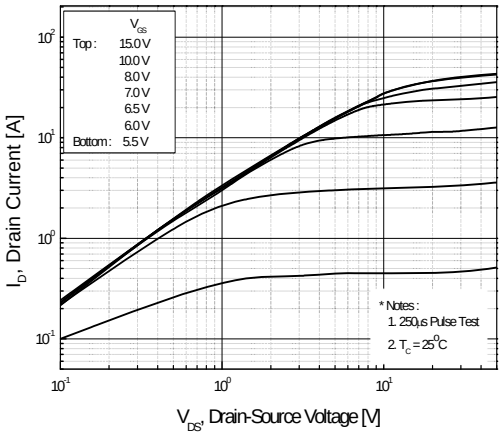


Figure 2. Transfer Characteristics

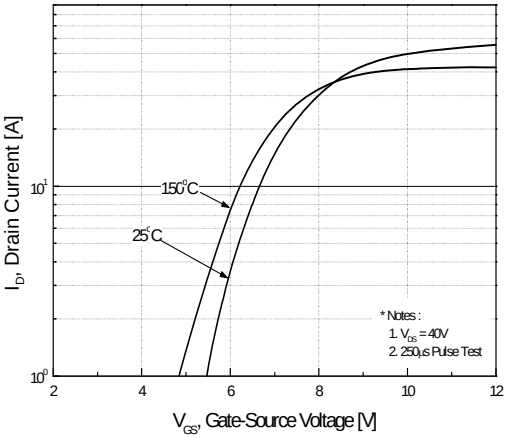


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

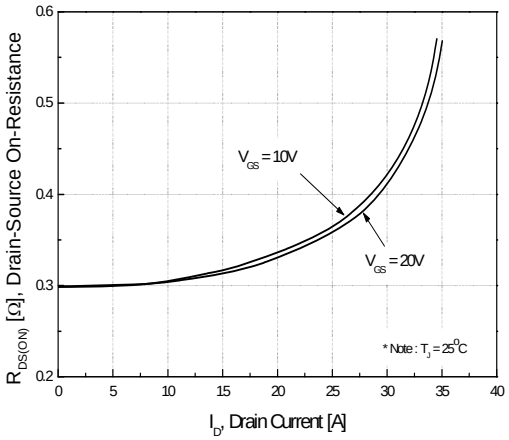


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

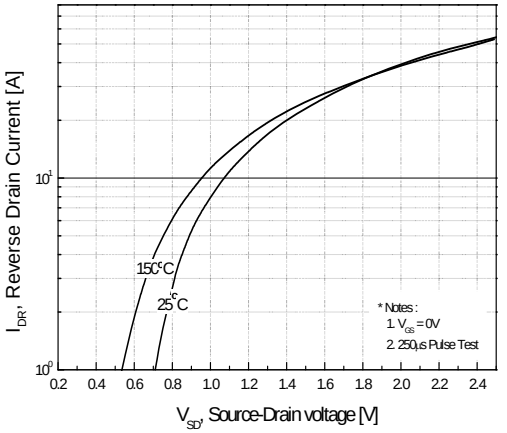


Figure 5. Capacitance Characteristics

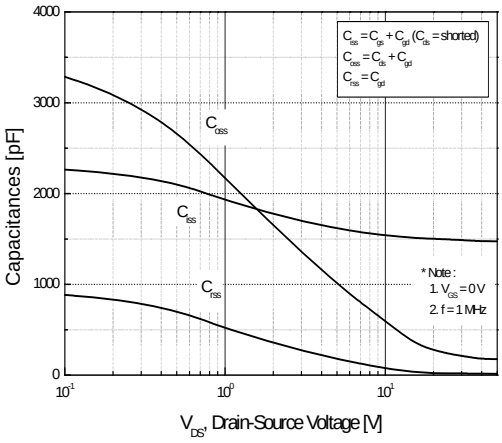


Figure 6. Gate Charge Characteristics