

November 2013

FDPF15N65

N-Channel UniFETTM MOSFET 650 V, 15 A, 440 m Ω

Features

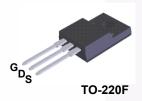
- $R_{DS(on)}$ = 360 m Ω (Typ.) @ V_{GS} = 10 V, I_D = 7.5 A
- Low Gate Charge (Typ. 48.5 nC)
- Low C_{rss} (Typ. 23.6 pF)
- · 100% Avalanche Tested

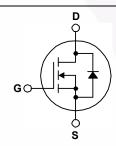
Applications

- · LCD/LED/PDP TV and Monitor
- Uninterruptible 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. 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.





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

Symbol		Parameter	FDPF15N65	Unit
V_{DSS}	Drain-Source Voltage	3	650	V
I _D	Drain Current - Continuous (T _C = 25°C) - Continuous (T _C = 100°C)		15* 9.5*	A A
I _{DM}	Drain Current	- Pulsed (Note 1)	60*	А
V _{GSS}	Gate-Source voltage		± 30	V
E _{AS}	Single Pulsed Avalanche Energy (Note 2)		637	mJ
I _{AR}	Avalanche Current (Note		15	А
E _{AR}	Repetitive Avalanche Energy (Note 1)		25.0	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)		4.5	V/ns
P _D	Power Dissipation	(T _C = 25°C) - Derate Above 25°C	38.5 0.3	W/°C
T _{J,} T _{STG}	Operating and Storag	ge Temperature Range	-55 to +150	°C
T _L	Maximum Lead Temp	perature for Soldering, 1/8" from Case for 5 Seconds	300	°C

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

Thermal Characteristics

Symbol	Parameter	FDPF15N65	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	3.3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	62.5	C/VV

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDPF15N65	FDPF15N65	TO-220F	Tube	N/A	N/A	50 units

$\textbf{Electrical Characteristics} \quad \textbf{T}_{C} = 25^{\circ} \text{C unless otherwise noted}.$

Symbol	Parameter	Conditions	Min.	Тур.	Max.	Unit
Off Charac	teristics					
BV _{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}, T_J = 25^{\circ}\text{C}$				V
ΔBV _{DSS} / ΔT _J	Breakdown Voltage Temperature Coefficient	I _D = 250 μA, Referenced to 25°C		0.65		V/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 650 V, V _{GS} = 0 V V _{DS} = 520 V, T _C = 125°C			1 10	μA μA
I _{GSSF}	Gate-Body Leakage Current, Forward	V _{GS} = 30 V, V _{DS} = 0 V			100	nA
I _{GSSR}	Gate-Body Leakage Current, Reverse	V _{GS} = -30 V, V _{DS} = 0 V			-100	nA
On Charac	teristics					
V _{GS(th)}	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_{D} = 250 \mu\text{A}$	3.0		5.0	V
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} = 10 V, I _D = 7.5 A		0.36	0.44	Ω
9 _{FS}	Forward Transconductance	V _{DS} = 40 V, I _D = 7.5 A		19.2		S
Dynamic C	Characteristics					
C _{iss}	Input Capacitance	V _{DS} = 25 V, V _{GS} = 0 V, f = 1 MHz		2380	3095	pF
C _{oss}	Output Capacitance		\	295	385	pF
C _{rss}	Reverse Transfer Capacitance			23.6	35.5	pF
Switching	Characteristics					
t _{d(on)}	Turn-On Delay Time	V _{DD} = 325 V, I _D = 15 A,		65	140	ns
t _r	Turn-On Rise Time	V_{GS} = 10 V, R_{G} = 21.7 Ω		125	260	ns
t _{d(off)}	Turn-Off Delay Time			105	220	ns
t _f	Turn-Off Fall Time	(Note 4)		65	140	ns
Qg	Total Gate Charge	V _{DS} = 520 V, I _D = 15 A, V _{GS} = 10 V		48.5	63.0	nC
Q_{gs}	Gate-Source Charge		/	14.0		nC
Q _{gd}	Gate-Drain Charge	(Note 4)		21.2		nC
Drain-Soul	rce Diode Characteristics and Maximur	n Ratings				
I _S	Maximum Continuous Drain-Source Dio	de Forward Current			15*	Α
I _{SM}	Maximum Pulsed Drain-Source Diode F	orward Current			60	Α
V_{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0 V, I _S = 15 A			1.4	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _S = 15 A,		496		ns
Q _{rr}	Reverse Recovery Charge	dl _F /dt =100 A/μs		5.69		μС

Notes:

^{1.} Repetitive rating: pulse-width limited by maximum junction temperature.

^{2.} L = 5.23 mH, I $_{AS}$ = 15 A, V $_{DD}$ = 50 V, R $_{G}$ = 25 Ω , starting T $_{J}$ = 25°C.

^{3.} I_{SD} \leq 15 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

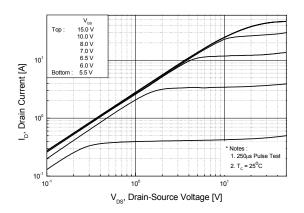


Figure 3. On-Resistance Variation vs.
Drain Current and Gate Voltage

Figure 2. Transfer Characteristics

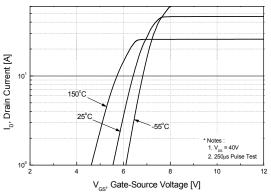


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperatue

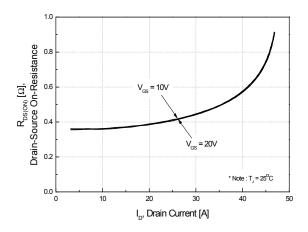
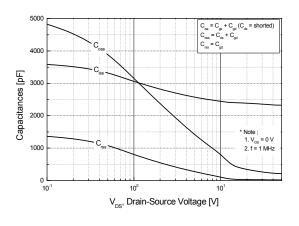


Figure 5. Capacitance Characteristics



Notes:

10°

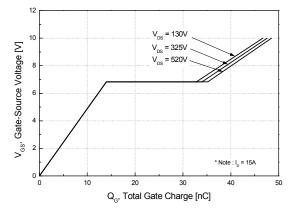
10°

25°C

-Notes:
1. V_{ss} = 0V
2. 250µs Pulse Test

V_{Sp}, Source-Drain voltage [V]

Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

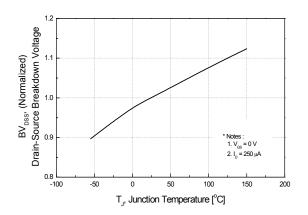


Figure 8. On-Resistance Variation vs. Temperature

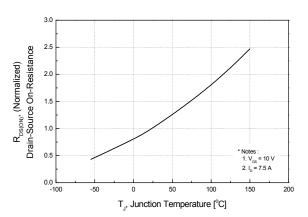
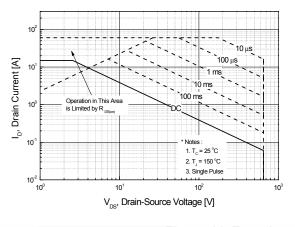


Figure 9. Safe Operating Area

Figure 10. Maximum Drain Current vs. Case Temperature



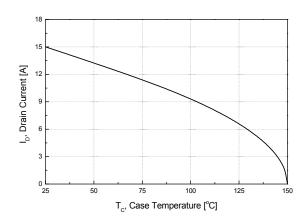
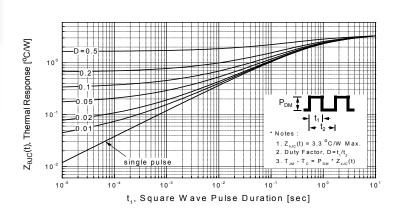


Figure 11. Transient Thermal Response Curve



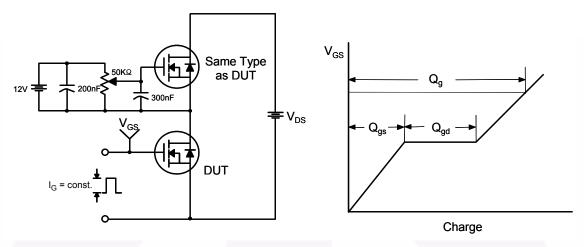


Figure 12. Gate Charge Test Circuit & Waveform

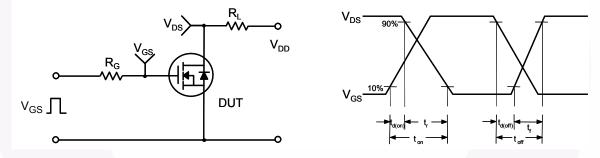


Figure 13. Resistive Switching Test Circuit & Waveforms

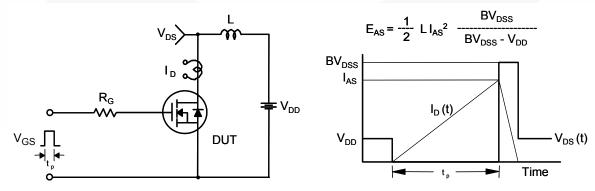


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

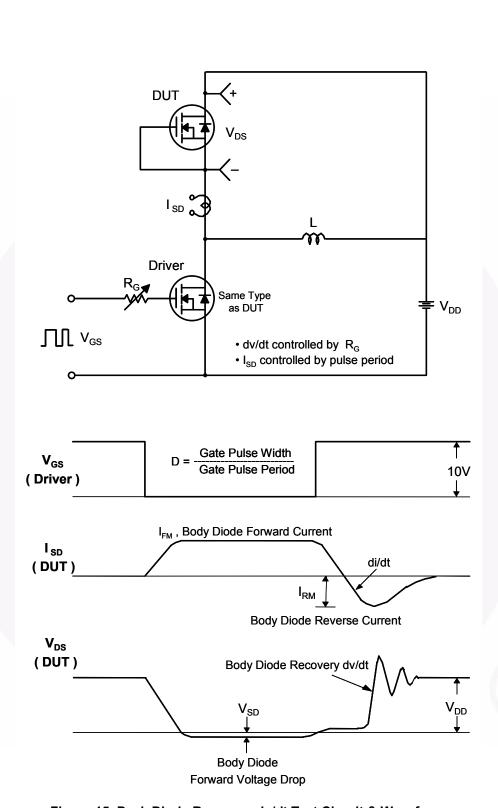


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions

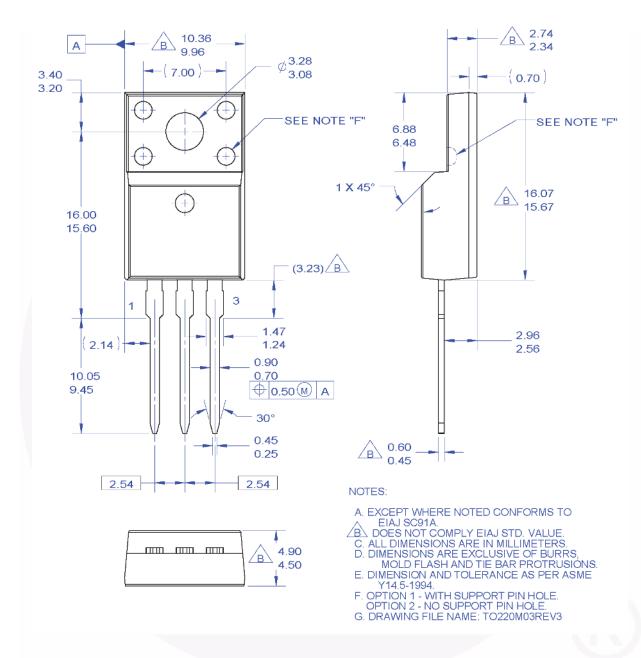


Figure 16. TO220, Molded, 3-Lead, Full Pack, EIAJ SC91, Straight Lead

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