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November 2013

## **FDP65N06**

# N-Channel UniFET<sup>TM</sup> MOSFET 60 V, 65 A, 16 m $\Omega$

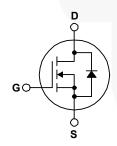
#### **Features**

- $R_{DS(on)}$  = 13 m $\Omega$  (Typ.) @  $V_{GS}$  = 10 V,  $I_D$  = 32.5 A
- Low Gate Charge (typical 33 nC)
- Low Crss (typical 35 pF)
- · Fast Switching
- · Improved dv/dt Capability

## **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. 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<sub>C</sub> = 25°C unless otherwise noted.

Symbol	Parameter		FDP65N06	Units	
V <sub>DSS</sub>	Drain-Source Voltage		60	V	
I <sub>D</sub>	Drain Current - Continuous (T <sub>C</sub> = 25°C)		65	А	
	- Continuous (T <sub>C</sub> = 100°C)		41	А	
I <sub>DM</sub>	Drain Current - Pulsed	(Note 1)	260	А	
V <sub>GSS</sub>	Gate-Source Voltage		± 20	V	
E <sub>AS</sub>	Single Pulsed Avalanche Energy	(Note 2)	430	mJ	
I <sub>AR</sub>	Avalanche Current	(Note 1)	65	А	
E <sub>AR</sub>	Repetitive Avalanche Energy	(Note 1)	13.5	mJ	
dv/dt	Peak Diode Recovery dv/dt (Note 3)		4.5	V/ns	
P <sub>D</sub>	Power Dissipation (T <sub>C</sub> = 25°C)		135	W	
	- Derate above 25°C		1.08	W/°C	
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Temperature Range		-55 to +150	°C	
T <sub>L</sub>	Maximum Lead Temperature for Soldering, 1/8 from Case for 5 Seconds		300	°C	

### **Thermal Characteristics**

Symbol	Parameter	FDP65N06	Units	
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	0.92	°C/W	
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	62.5	°C/W	

## **Package Marking and Ordering Information**

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDP65N06	FDP65N06	TO-220	Tube N/A		50 units

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

Symbol	Parameter Test Conditions		Min	Тур	Max	Units
Off Charac	teristics					
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	60	-	-	V
$\Delta BV_{DSS}$ / $\Delta T_{J}$	Breakdown Voltage Temperature Coefficient	$I_D$ = 250 μA, Referenced to 25°C	-	0.5	-	V/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 60 V, V <sub>GS</sub> = 0 V	-	-	1	μΑ
		$V_{DS} = 48 \text{ V}, T_{C} = 125^{\circ}\text{C}$	-	-	10	μА
I <sub>GSSF</sub>	Gate-Body Leakage Current, Forward	$V_{GS} = 20 \text{ V}, V_{DS} = 0 \text{ V}$	-	-	100	nA
I <sub>GSSR</sub>	Gate-Body Leakage Current, Reverse	$V_{GS} = -20 \text{ V}, V_{DS} = 0 \text{ V}$	-	-	-100	nA
On Charact	eristics					
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_{D} = 250 \mu A$	2.0	-	4.0	V
R <sub>DS(on)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 32.5 A	-	0.013	0.016	Ω
g <sub>FS</sub>	Forward Transconductance	$V_{DS} = 40 \text{ V}, I_D = 32.5 \text{ A}$	-	39	-	S
Dynamic Cl	naracteristics					
C <sub>iss</sub>	Input Capacitance	$V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V},$	-	1670	2170	pF
C <sub>oss</sub>	Output Capacitance	f = 1.0 MHz	-	464	600	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		- \	35	52	pF
Switching C	Characteristics					
t <sub>d(on)</sub>	Turn-On Delay Time	$V_{DD} = 30 \text{ V}, I_{D} = 65\text{A},$	-	24	58	ns
t <sub>r</sub>	Turn-On Rise Time	$R_G = 25 \Omega$	-	94	200	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		-	98	210	ns
t <sub>f</sub>	Turn-Off Fall Time	- (Note 4)	-/	52	114	ns
Qg	Total Gate Charge	$V_{DS} = 48 \text{ V}, I_{D} = 65\text{A},$	-	33	43	nC
Q <sub>gs</sub>	Gate-Source Charge	V <sub>GS</sub> = 10 V	/-	10	-	nC
$Q_{gd}$	Gate-Drain Charge	(Note 4)	-	11	-	nC
Drain-Source	ce Diode Characteristics and Maximum Ratings				7	
I <sub>S</sub> Maximum Continuous Drain-Source Diode Forward Current			-	-	65	Α
I <sub>SM</sub>	Maximum Pulsed Drain-Source Diode Forward Current		-	-	260	Α
V <sub>SD</sub>	Drain-Source Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_{S} = 65 \text{ A}$	-	-	1.4	V
t <sub>rr</sub>	Reverse Recovery Time	$V_{GS} = 0 \text{ V}, I_{S} = 65 \text{ A},$	- 49	62	//	ns
Q <sub>rr</sub>	Reverse Recovery Charge	$dI_{F}/dt = 100 A/\mu s$	-	132		nC

#### NOTES

<sup>1.</sup> Repetitive Rating: Pulse width limited by maximum junction temperature.

<sup>2.</sup> L = 47  $\mu$ H, I<sub>AS</sub> = 65 A, V<sub>DD</sub> = 50 V, R<sub>G</sub> = 25  $\Omega$ , Starting T<sub>J</sub> = 25°C.

 $<sup>3.~</sup>I_{SD} \leq 65~A,~di/dt \leq 200~A/\mu s,~V_{DD} \leq BV_{DSS,} Starting~~T_{J} = 25^{\circ}C.$ 

<sup>4.</sup> Essentially independent of operating temperature.

## **Typical Performance Characteristics**

Figure 1. On-Region Characteristics

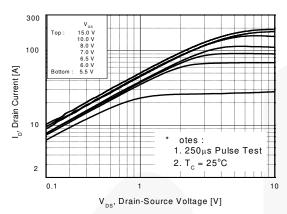


Figure 3. On-Resistance Variation vs.

Drain Current and Gate Voltage

Figure 2. Transfer Characteristics

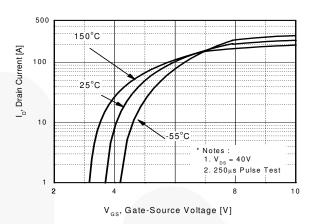
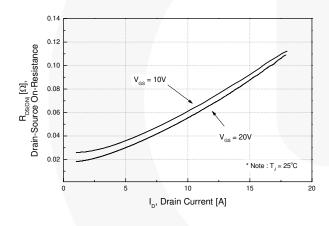


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperatue



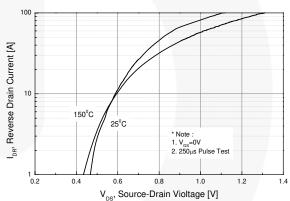
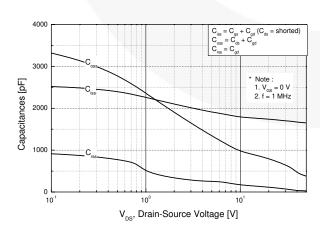
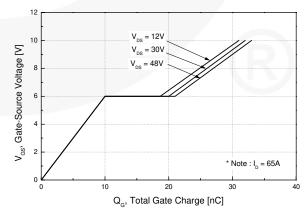


Figure 5. Capacitance Characteristics



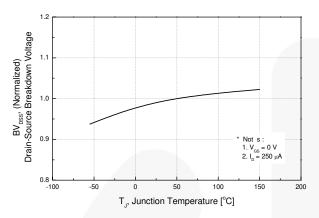
**Figure 6. Gate Charge Characteristics** 



## **Typical Performance Characteristics** (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

Figure 8. On-Resistance Variation vs. Temperature



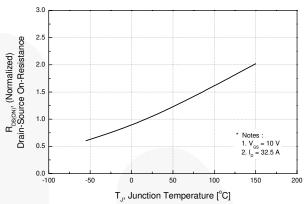
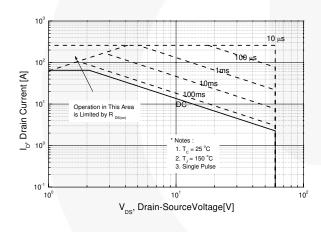


Figure 9. Maximum Safe Operating Area

Figure 10. Maximum Drain Current vs. Case Temperature



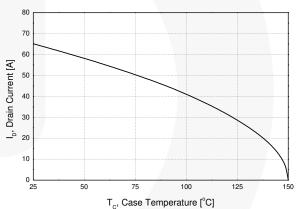


Figure 11. Transient Thermal Response Curve

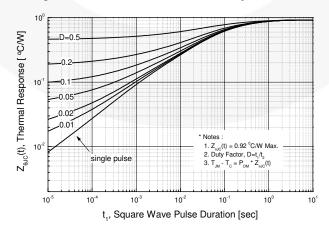


Figure 12. Gate Charge Test Circuit & Waveform

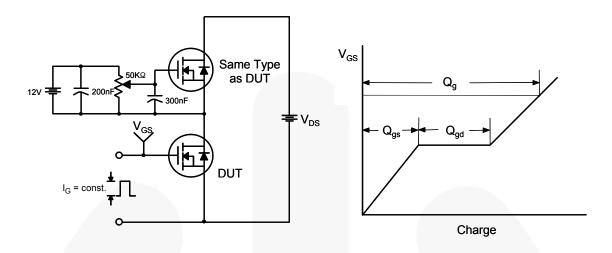


Figure 13. Resistive Switching Test Circuit & Waveforms

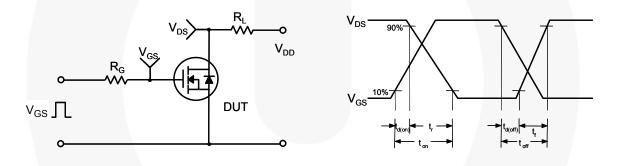
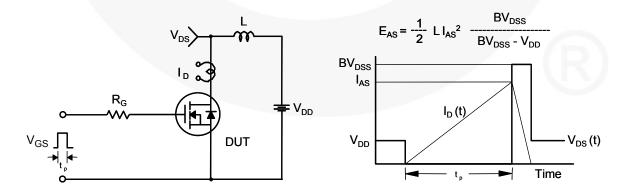


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms



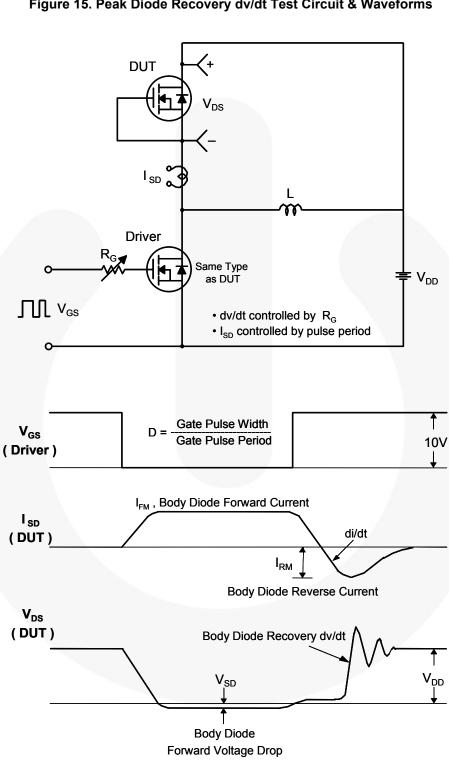


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

### **Mechanical Dimensions**

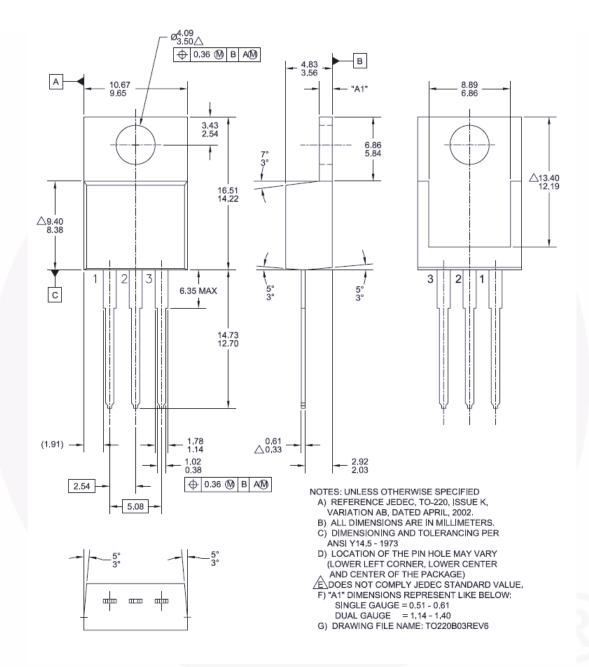


Figure 16. TO-220, Molded, 3-Lead, Jedec Variation AB

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