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November 2013

# FDP150N10

# N-Channel PowerTrench<sup>®</sup> MOSFET 100 V, 57 A, 15 m $\Omega$

#### **Features**

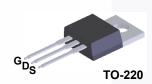
- $R_{DS(on)}$  = 12 m $\Omega$  (Typ.) @  $V_{GS}$  = 10 V,  $I_D$  = 49 A
- · Fast Switching Speed
- · Low Gate Charge
- High Performance Trench Technology for Extremely Low  $R_{DS(on)}$
- · High Power and Current Handling Capability
- · RoHS Compliant

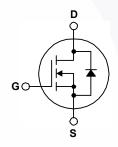
## **Description**

This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® process that has been tailored to minimize the on-state resistance while maintaining superior switching performance.

### **Applications**

- · Synchronous Rectification for ATX / Server / Telecom PSU
- · Battery Protection Circuit
- · Motor Drives and Uninterruptible Power Supplies
- · Micor Solar Inverter





# **MOSFET Maximum Ratings** $T_C = 25^{\circ}C$ unless otherwise noted.

Symbol		Parameter		FDP150N10	Unit		
$V_{DSS}$	Drain to Source Voltage	Drain to Source Voltage			V		
$V_{GSS}$	Gate to Source Voltage			±20	V		
	- Continuous (T <sub>C</sub> = 25°C)			57	Α		
ID	Drain Current	Drain Current  - Continuous (T <sub>C</sub> = 100°C)		- Continuous (T <sub>C</sub> = 100°C)		40	Α
I <sub>DM</sub>	Drain Current	- Pulsed	- Pulsed (Note 1)		Α		
E <sub>AS</sub>	Single Pulsed Avalanche Energy (Note 2)			132	mJ		
dv/dt	Peak Diode Recovery dv	Peak Diode Recovery dv/dt (Note 3)		7.5	V/ns		
D	Power Dissipation	(T <sub>C</sub> = 25°C)		110	W		
$P_{D}$	Power Dissipation	- Derate Above 25°C		0.88	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 Tempera	ature for Soldering, 1/8" from Case fo	or 5 Seconds	300	°C		

#### **Thermal Characteristics**

Symbol	Parameter FDP150N10			
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	1.13	°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
FDP150N10	FDP150N10	TO-220	Tube	N/A	N/A	50 units

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

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
Off Charac	eteristics					
BV <sub>DSS</sub>	Drain to Source Breakdown Voltage	$I_D = 250 \mu A, V_{GS} = 0 V, T_C = 25^{\circ} C$	100	-	-	V
ΔBV <sub>DSS</sub> / ΔT <sub>J</sub>	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> = 250 μA, Referenced to 25°C	-	0.1	-	V/°C
1	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 100 V, V <sub>GS</sub> = 0 V	-	-	1	μА
IDSS	Zero Gate Voltage Drain Guirent	$V_{DS} = 100 \text{ V}, V_{GS} = 0 \text{ V}, T_{C} = 150^{\circ}\text{C}$	-	-	500	μΑ
$I_{GSS}$	Gate to Body Leakage Current	$V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$		-	±100	nA

#### **On Characteristics**

V <sub>GS(th)</sub>	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_{D} = 250 \mu\text{A}$	2.5	-	4.5	V
R <sub>DS(on)</sub>	Static Drain to Source On Resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 49 A	-	12	15	mΩ
9 <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = 20 V, I <sub>D</sub> = 49 A	-	156	-	S

#### **Dynamic Characteristics**

C <sub>iss</sub>	Input Capacitance	V - 25 V V - 0 V	-	3580	4760	pF
Coss	Output Capacitance	V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V, f = 1 MHz	-	340	450	pF
C <sub>rss</sub>	Reverse Transfer Capacitance	1 11112	1	140	210	pF

### **Switching Characteristics**

$t_{d(on)}$	Turn-On Delay Time			-	47	104	ns
t <sub>r</sub>	Turn-On Rise Time	$V_{DD} = 50 \text{ V}, I_{D} = 49 \text{ A},$		-	164	338	ns
t <sub>d(off)</sub>	Turn-Off Delay Time	$V_{GS} = 10 \text{ V}, R_{G} = 25 \Omega$		-	86	182	ns
t <sub>f</sub>	Turn-Off Fall Time		(Note 4)	-	83	176	ns
Q <sub>g(tot)</sub>	Total Gate Charge at 10V	V <sub>DS</sub> = 80 V, I <sub>D</sub> = 49 A,		-	53	69	nC
Q <sub>gs</sub>	Gate to Source Gate Charge	V <sub>GS</sub> = 10 V		-	19	-	nC
$Q_{gd}$	Gate to Drain "Miller" Charge		(Note 4)	- /	15	-	nC

#### **Drain-Source Diode Characteristics**

I <sub>S</sub>	Maximum Continuous Drain to Source Diode Forward Current			-	57	Α
I <sub>SM</sub>	Maximum Pulsed Drain to Source Diode Forward Current		-	-	228	Α
$V_{SD}$	Drain to Source Diode Forward Voltage	V <sub>GS</sub> = 0 V, I <sub>SD</sub> = 49 A	-	-	1.3	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> = 0 V, I <sub>SD</sub> = 49 A,	-	41	-	ns
$Q_{rr}$	Reverse Recovery Charge	$dI_F/dt = 100 A/\mu s$	-	70	-	nC

- 1: Repetitive rating: pulse width limited by maximum junction temperature.
- 2: L = 0.11 mH,  $I_{AS}$  = 49 A,  $V_{DD}$  = 50 V,  $R_{G}$  = 25  $\Omega$ , starting  $T_{J}$  = 25°C. 3:  $I_{SD}$  ≤ 49 A, di/dt ≤ 200 A/ $\mu$ s,  $V_{DD}$  ≤ BV $_{DSS}$ , starting  $T_{J}$  = 25°C.
- 4: Essentially independent of operating temperature typical characteristics.

# **Typical Performance Characteristics**

Figure 1. On-Region Characteristics

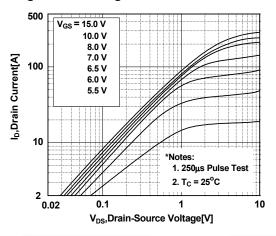


Figure 3. On-Resistance Variation vs.

Drain Current and Gate Voltage

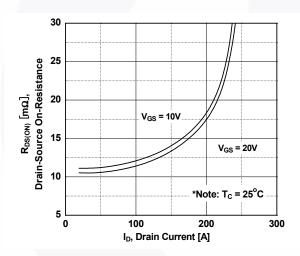


Figure 5. Capacitance Characteristics

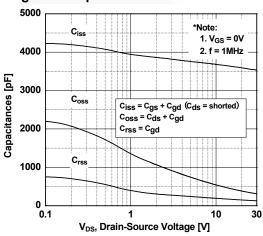


Figure 2. Transfer Characteristics

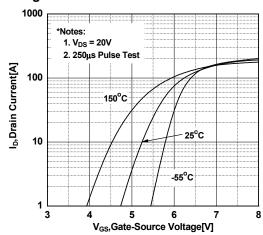


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

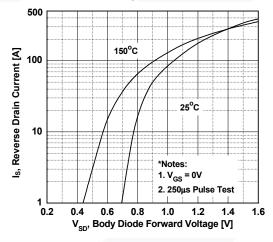
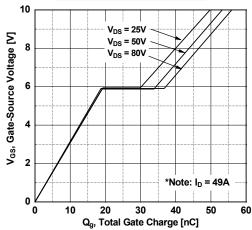


Figure 6. Gate Charge Characteristics



# **Typical Performance Characteristics** (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

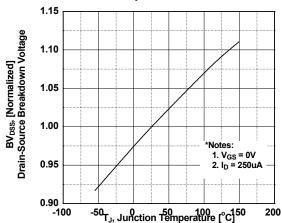


Figure 8. On-Resistance Variation vs. Temperature

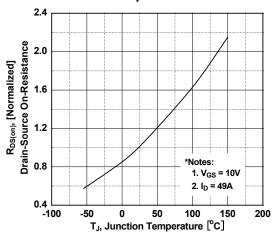


Figure 9. Maximum Safe Operating Area

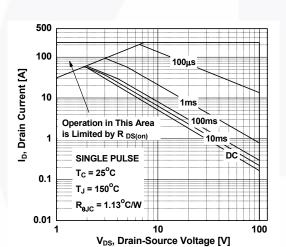


Figure 10. Maximum Drain Current vs. Case Temperature

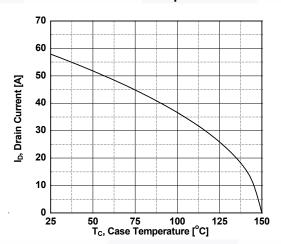
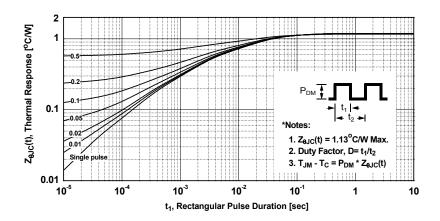


Figure 11. Transient Thermal Response Curve



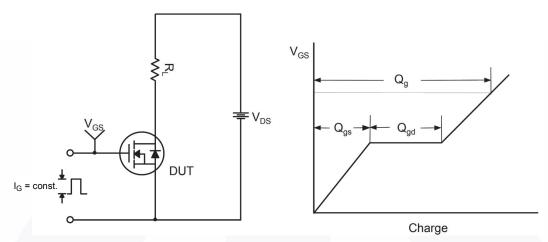


Figure 12. Gate Charge Test Circuit & Waveform



Figure 13. Resistive Switching Test Circuit & Waveforms



Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

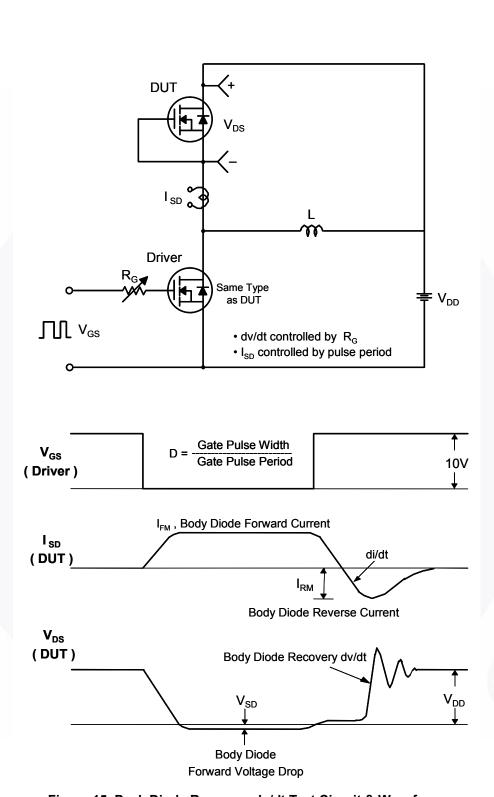


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

#### **Mechanical Dimensions**

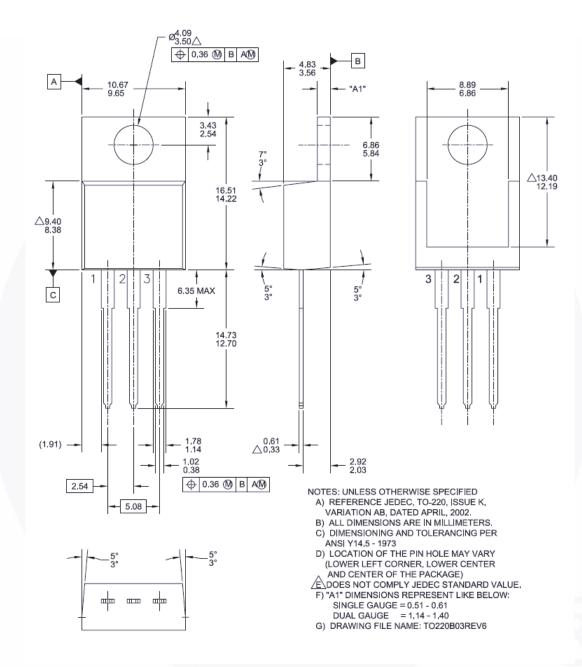


Figure 16. TO-220, Molded, 3-Lead, Jedec Variation AB

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