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FDP036N10A

N-Channel PowerTrench® MOSFET

100 V, 214 A, 3.6 mΩ



Features

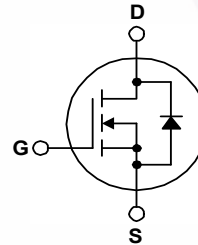
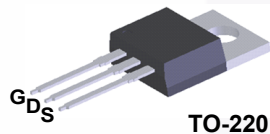
- $R_{DS(on)} = 3.2 \text{ m}\Omega$ (Typ.) @ $V_{GS} = 10 \text{ V}$, $I_D = 75 \text{ A}$
- Fast Switching Speed
- Low Gate Charge, $Q_G = 89 \text{ nC}$ (Typ.)
- High Performance Trench Technology for Extremely Low $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's 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
- Micro Solar Inverter



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

Symbol	Parameter	FDP036N10A	Unit
V_{DSS}	Drain to Source Voltage	100	V
V_{GSS}	Gate to Source Voltage	± 20	V
I_D	Drain Current	- Continuous ($T_C = 25^\circ\text{C}$, Silicon Limited)	214*
		- Continuous ($T_C = 100^\circ\text{C}$, Silicon Limited)	151*
		- Continuous ($T_C = 25^\circ\text{C}$, Package Limited)	120
I_{DM}	Drain Current	- Pulsed (Note 1)	856
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	658
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	6.0
P_D	Power Dissipation	($T_C = 25^\circ\text{C}$)	333
		- Derate Above 25°C	2.22
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +175	$^\circ\text{C}$
T_L	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds	300	$^\circ\text{C}$

*Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 120A.

Thermal Characteristics

Symbol	Parameter	FDP036N10A	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.45	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	62.5	

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDP036N10A	FDP036N10A	TO-220	Tube	N/A	N/A	50 units

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
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Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250 \mu\text{A}$, $V_{GS} = 0 \text{ V}$, $T_C = 25^\circ\text{C}$	100	-	-	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$, Referenced to 25°C	-	0.03	-	$\text{V}/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 80 \text{ V}$, $V_{GS} = 0 \text{ V}$ $V_{DS} = 80 \text{ V}$, $T_C = 150^\circ\text{C}$	-	-	1 500	μA
I_{GSS}	Gate to Body Leakage Current	$V_{GS} = \pm 20 \text{ V}$, $V_{DS} = 0 \text{ V}$	-	-	± 100	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 250 \mu\text{A}$	2.0	3.0	4.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10 \text{ V}$, $I_D = 75 \text{ A}$	-	3.2	3.6	m Ω
g_{FS}	Forward Transconductance	$V_{DS} = 10 \text{ V}$, $I_D = 75 \text{ A}$	-	167	-	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 25 \text{ V}$, $V_{GS} = 0 \text{ V}$, $f = 1 \text{ MHz}$	-	5485	7295	pF
C_{oss}	Output Capacitance		-	2430	3230	pF
C_{riss}	Reverse Transfer Capacitance		-	210	315	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 80 \text{ V}$, $I_D = 75 \text{ A}$, $V_{GS} = 10 \text{ V}$	-	89	116	nC
Q_{gs}	Gate to Source Gate Charge		-	24	-	nC
Q_{gs2}	Gate Charge Threshold to Plateau		-	8	-	nC
Q_{gd}	Gate to Drain "Miller" Charge		(Note 4)	-	25	-
ESR	Equivalent Series Resistance (G-S)	$f = 1 \text{ MHz}$	-	1.2	-	Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 50 \text{ V}$, $I_D = 75 \text{ A}$, $V_{GS} = 10 \text{ V}$, $R_G = 4.7 \Omega$	-	22	54	ns
t_r	Turn-On Rise Time		-	54	118	ns
$t_{d(off)}$	Turn-Off Delay Time		-	37	84	ns
t_f	Turn-Off Fall Time		(Note 4)	-	11	32

Drain-Source Diode Characteristics

I_S	Maximum Continuous Drain to Source Diode Forward Current	-	-	214	A	
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current	-	-	856	A	
V_{SD}	Drain to Source Diode Forward Voltage	$V_{GS} = 0 \text{ V}$, $I_{SD} = 75 \text{ A}$	-	-	1.25	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0 \text{ V}$, $I_{SD} = 75 \text{ A}$, $di/dt = 100 \text{ A}/\mu\text{s}$	-	72	93.6	ns
Q_{rr}	Reverse Recovery Charge		-	129	-	nC

Notes:

1. Repetitive rating: pulse-width limited by maximum junction temperature.
2. Starting $T_J = 25^\circ\text{C}$, $L = 1 \text{ mH}$, $I_{AS} = 36.3 \text{ A}$.
3. $I_{SD} \leq 75 \text{ A}$, $di/dt \leq 200 \text{ A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, starting $T_J = 25^\circ\text{C}$.
4. Essentially independent of operating temperature typical characteristics.

Typical Performance Characteristics

Figure 1. On-Region Characteristics

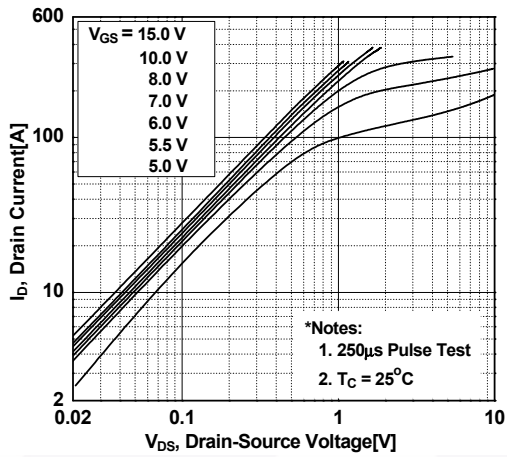


Figure 2. Transfer Characteristics

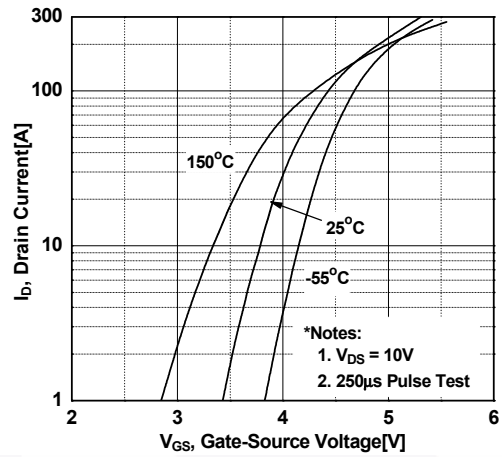


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

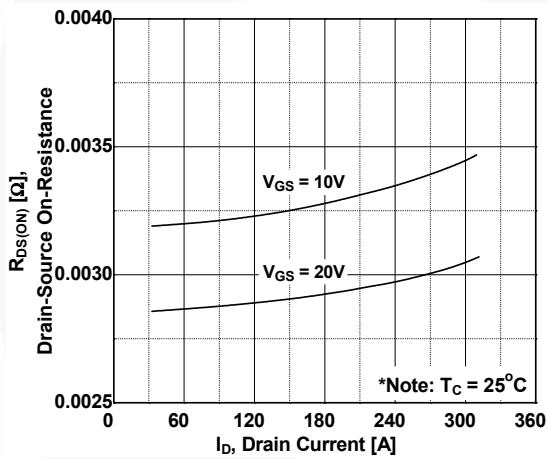


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

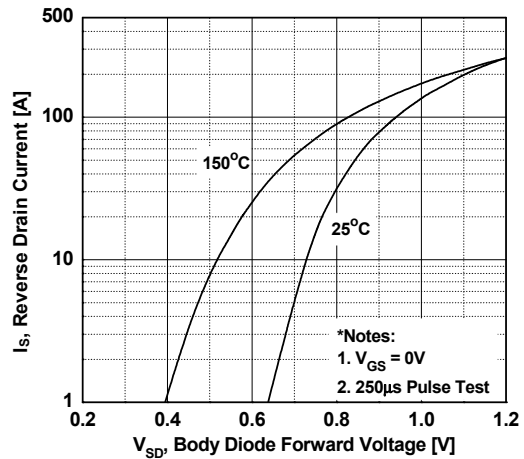


Figure 5. Capacitance Characteristics

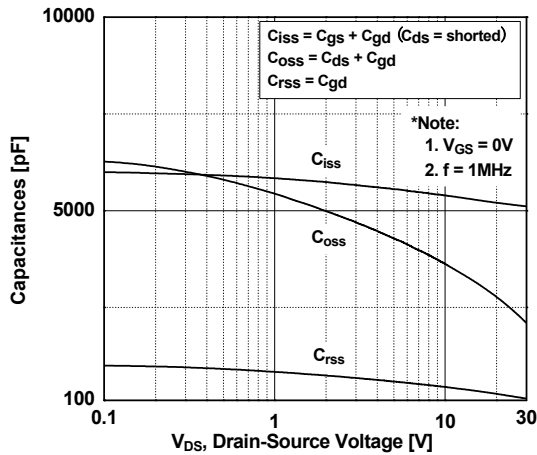
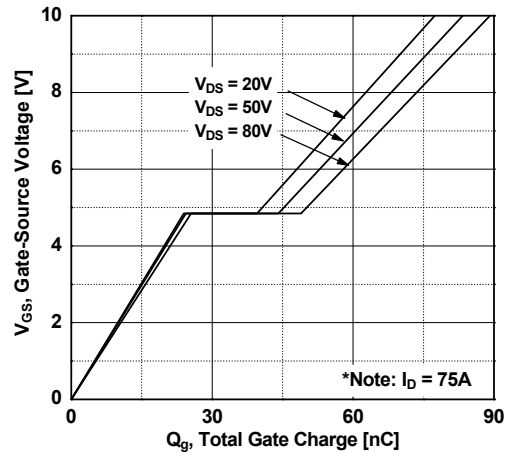


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics

Figure 7. Breakdown Voltage Variation vs. Temperature

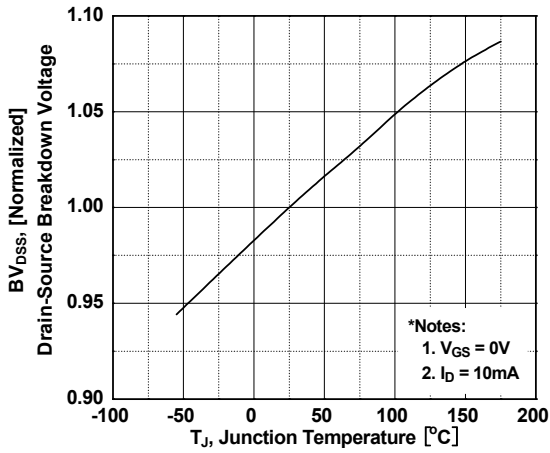


Figure 8. On-Resistance Variation vs. Temperature

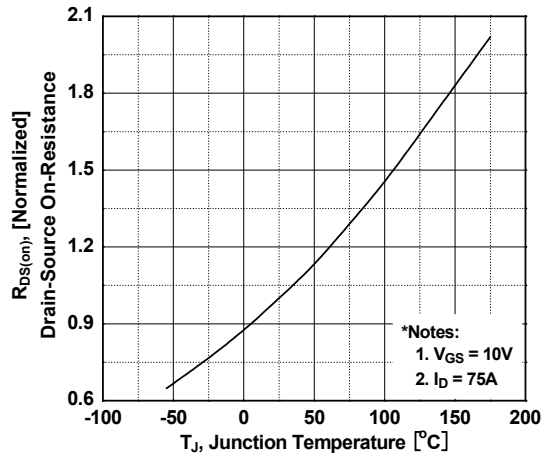


Figure 9. Maximum Safe Operating Area

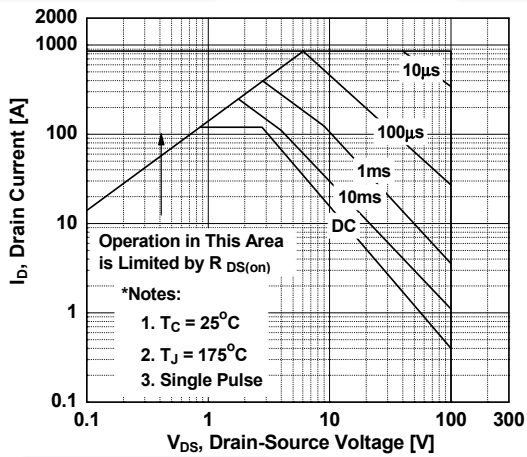


Figure 10. Maximum Drain Current vs. Case Temperature

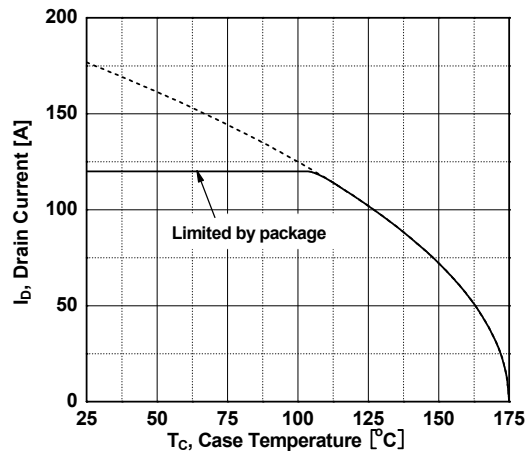
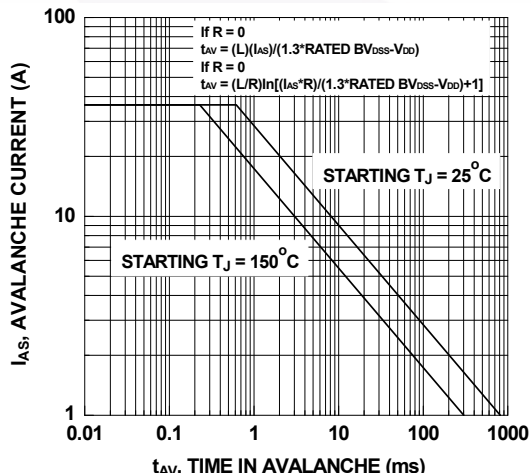


Figure 11. Unclamped Inductive Switching Capability



Typical Performance Characteristics

Figure 12. Transient Thermal Response Curve

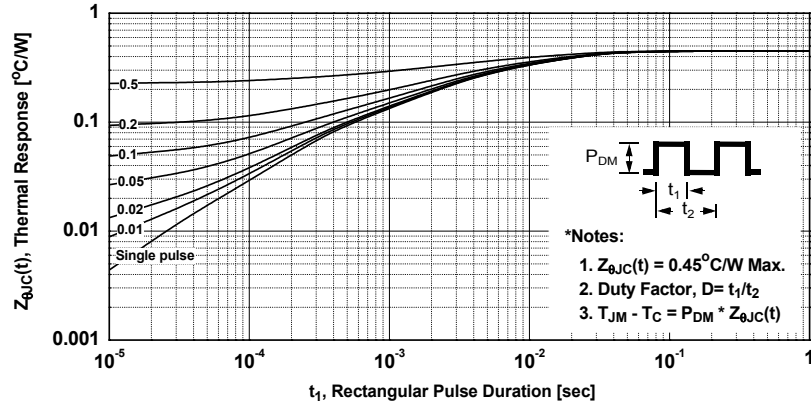




Figure 13. Gate Charge Test Circuit & Waveform



Figure 14. Resistive Switching Test Circuit & Waveforms



Figure 15. Unclamped Inductive Switching Test Circuit & Waveforms



Figure 16. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions



Figure 17. TO-220, Molded, 3-Lead, Jedec Variation AB

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