

# FDPF680N10T

## N-Channel PowerTrench® MOSFET

100 V, 12 A, 68 mΩ

### Features

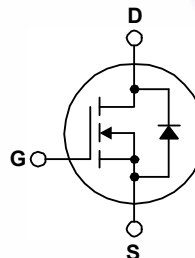
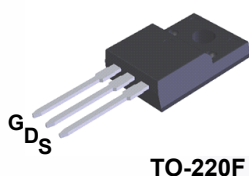
- $R_{DS(on)} = 54 \text{ m}\Omega$  (Typ.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 6 \text{ A}$
- Fast Switching Speed
- Low Gate Charge
- High Performance Trench Technology for Extremely Low  $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

### Description

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

### Applications

- Consumer Appliances
- LCD/LED/PDP TV
- Synchronous Rectification
- Uninterruptible Power Supply
- Micro Solar Inverter



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

Symbol	Parameter	FDPF680N10T	Unit
$V_{DSS}$	Drain to Source Voltage	100	V
$V_{GSS}$	Gate to Source Voltage	$\pm 20$	V
$I_D$	Drain Current	- Continuous ( $T_C = 25^\circ\text{C}$ )	A
		- Continuous ( $T_C = 100^\circ\text{C}$ )	
$I_{DM}$	Drain Current	- Pulsed (Note 1)	A
$E_{AS}$	Single Pulsed Avalanche Energy	(Note 2)	mJ
$dv/dt$	Peak Diode Recovery $dv/dt$	(Note 3)	V/ns
$P_D$	Power Dissipation	( $T_C = 25^\circ\text{C}$ )	W
		- Derate Above $25^\circ\text{C}$	$W/^\circ\text{C}$
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$
$T_L$	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds	300	$^\circ\text{C}$

### Thermal Characteristics

Symbol	Parameter	FDPF680N10T	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	5.2	$^\circ\text{C/W}$
$R_{\theta JA}$	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
FDPF680N10T	FDPF680N10T	TO-220F	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 $25^\circ\text{C}$	-	0.1	-	$V/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 100\ \text{V}$ , $V_{GS} = 0\ \text{V}$	-	-	1	$\mu\text{A}$
		$V_{DS} = 100\ \text{V}$ , $V_{GS} = 0\ \text{V}$ , $T_C = 150^\circ\text{C}$	-	-	500	
$I_{GSS}$	Gate to Body Leakage Current	$V_{GS} = \pm 20\ \text{V}$ , $V_{DS} = 0\ \text{V}$	-	-	$\pm 100$	nA

### On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = 250\ \mu\text{A}$	2.5	3.5	4.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\ \text{V}$ , $I_D = 6\ \text{A}$	-	54	68	$\text{m}\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 10\ \text{V}$ , $I_D = 12\ \text{A}$	-	26	-	S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 50\ \text{V}$ , $V_{GS} = 0\ \text{V}$ , $f = 1\ \text{MHz}$	-	750	1000	pF
$C_{oss}$	Output Capacitance		-	60	80	pF
$C_{rss}$	Reverse Transfer Capacitance		-	25	40	pF
$Q_{g(tot)}$	Total Gate Charge	$V_{DS} = 80\ \text{V}$ , $I_D = 12\ \text{A}$ , $V_{GS} = 10\ \text{V}$	-	13	17	nC
$Q_{gs}$	Gate to Source Gate Charge		-	4	-	nC
$Q_{gd}$	Gate to Drain "Miller" Charge		-	4	-	nC

(Note 4)

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 50\ \text{V}$ , $I_D = 12\ \text{A}$ , $V_{GS} = 10\ \text{V}$ , $R_G = 10\ \Omega$	-	13	36	ns
$t_r$	Turn-On Rise Time		-	19	48	ns
$t_{d(off)}$	Turn-Off Delay Time		-	18	46	ns
$t_f$	Turn-Off Fall Time		-	6	22	ns

(Note 4)

### Drain-Source Diode Characteristics

I <sub>S</sub>	Maximum Continuous Drain to Source Diode Forward Current	-	-	12	A	
I <sub>SM</sub>	Maximum Pulsed Drain to Source Diode Forward Current	-	-	48	A	
V <sub>SD</sub>	Drain to Source Diode Forward Voltage	V <sub>GS</sub> = 0 V, I <sub>SD</sub> = 12 A	-	-	1.3	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> = 0 V, I <sub>SD</sub> = 12 A, dI <sub>F</sub> /dt = 100 A/μs	-	29	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge		-	35	-	nC

#### Notes:

1. Repetitive rating; pulse-width limited by maximum junction temperature.
2.  $L = 0.7\ \text{mH}$ ,  $I_{AS} = 12\ \text{A}$ ,  $V_{DD} = 50\ \text{V}$ ,  $R_G = 25\ \Omega$ , starting  $T_J = 25^\circ\text{C}$ .
3.  $I_{SD} \leq 12\ \text{A}$ ,  $di/dt \leq 200\ \text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , starting  $T_J = 25^\circ\text{C}$ .
4. Essentially independent of operating temperature typical characteristics.

# Typical Performance Characteristics

Figure 1. On-Region Characteristics

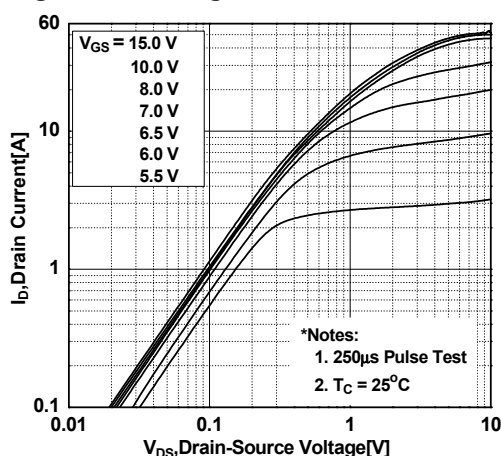


Figure 2. Transfer Characteristics

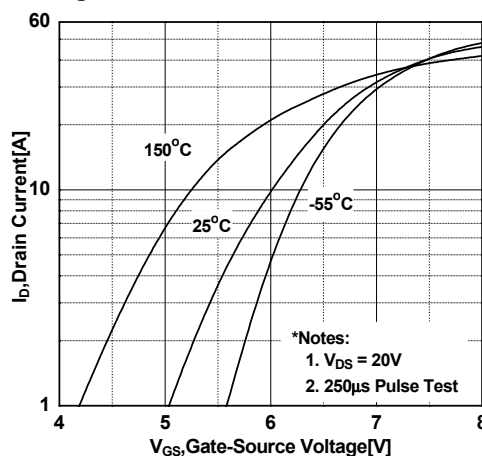


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

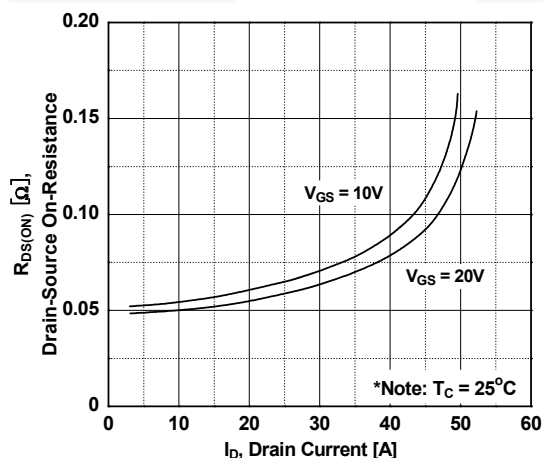


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

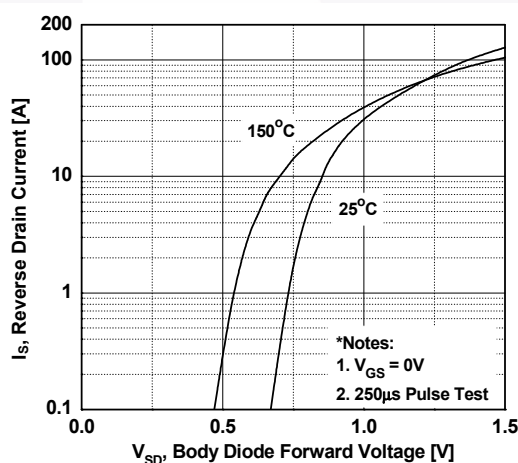


Figure 5. Capacitance Characteristics

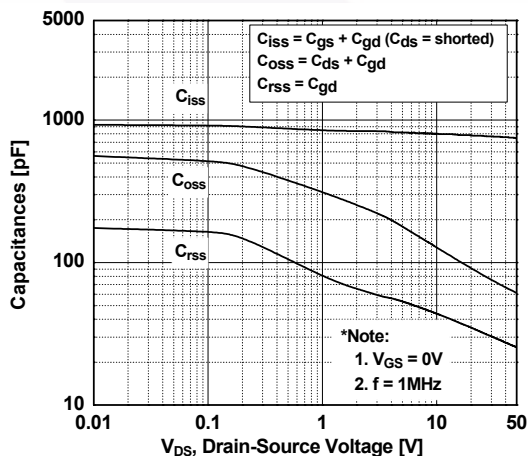
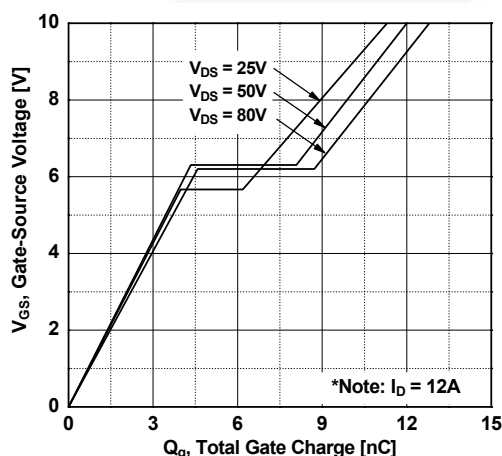


Figure 6. Gate Charge Characteristics



# Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

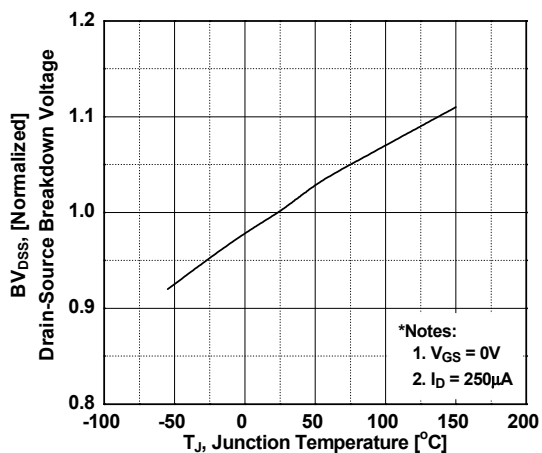


Figure 8. On-Resistance Variation vs. Temperature

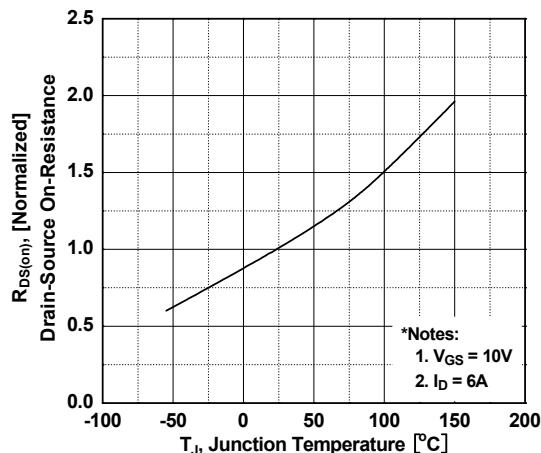


Figure 9. Maximum Safe Operating Area

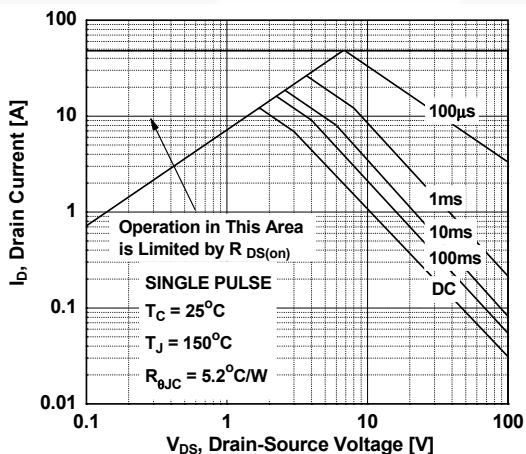


Figure 10. Maximum Drain Current vs. Case Temperature

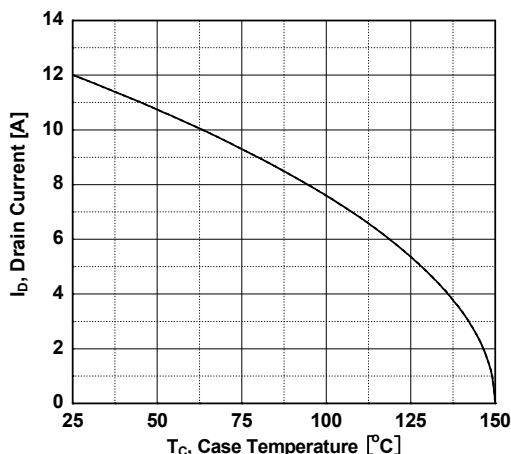


Figure 11. Transient Thermal Response Curve

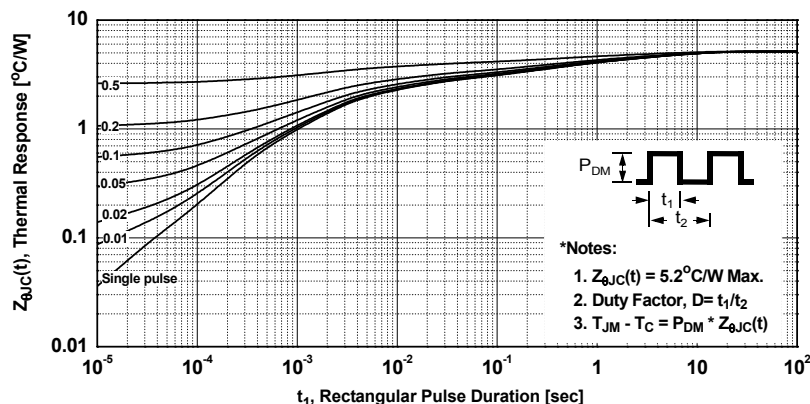




Figure 12. Gate Charge Test Circuit & Waveform



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





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