FAIRCHILD SEMICONDUCTOR TM

April 2001

FDP6676/FDB6676

30V N-Channel Logic Level PowerTrench® MOSFET

General Description

This N-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for "low side" synchronous rectifier operation, providing an extremely low $R_{DS(ON)}$.

Applications

- Synchronous rectifier
- DC/DC converter

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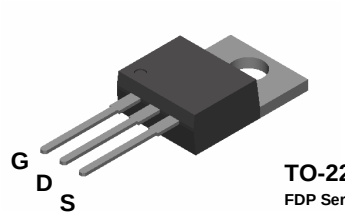
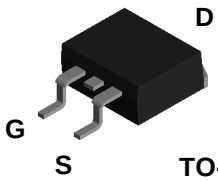
Features

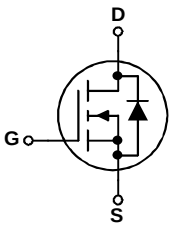
- 42 A, 30 V. $R_{DS(ON)}$ = 6.0 mΩ @ V_{GS} = 10 V
  $R_{DS(ON)}$ = 7.5 mΩ @ V_{GS} = 4.5 V
- Critical DC electrical parameters specified at elevated temperature
- High performance trench technology for extremely low $R_{DS(ON)}$
- 175°C maximum junction temperature rating



TO-220
FDP Series



TO-263AB
FDB Series



Absolute Maximum Ratings

T_A=25°C unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{DSS}	Drain-Source Voltage		30	V
V_{GSS}	Gate-Source Voltage		± 16	V
I_D	Drain Current – Continuous	(Note 1)	84	A
	– Pulsed	(Note 1)	240	
P_D	Total Power Dissipation @ T_C = 25°C		93	W
	Derate above 25°C		0.48	W°C
T_J, T_{STG}	Operating and Storage Junction Temperature Range		-65 to +175	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	1.6	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62.5	°C/W

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
FDP6676	FDP6676	Tube	n/a	45
FDB6676	FDB6676	13"	24mm	800 units

Electrical Characteristics

T_A = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Drain-Source Avalanche Ratings (Note 1)						
W_{DSS}	Single Pulse Drain-Source Avalanche Energy	V_{DD} = 15 V, I_D = 20 A			370	mJ
I_{AR}	Maximum Drain-Source Avalanche Current				20	A
Off Characteristics						
BV_{DSS}	Drain–Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 µA	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 µA, Referenced to 25°C		24		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 24 V, V_{GS} = 0 V			1	µA
I_{GSSF}	Gate–Body Leakage, Forward	V_{GS} = 16 V, V_{DS} = 0 V			100	nA
I_{GSSR}	Gate–Body Leakage, Reverse	V_{GS} = –16 V, V_{DS} = 0 V			–100	nA
On Characteristics (Note 2)						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 µA	1	1.5	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = 250 µA, Referenced to 25°C		–4.5		mV/°C
$R_{DS(on)}$	Static Drain–Source On–Resistance	V_{GS} = 10 V, I_D = 42 A V_{GS} = 4.5 V, I_D = 39 A V_{GS}=10V, I_D = 42 A, T_J=125°C		4.3 4.9 7.0	6 7.5 11	mΩ
$I_{D(on)}$	On–State Drain Current	V_{GS} = 10 V, V_{DS} = 5 V	60			A
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 42 A		141		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 15 V, V_{GS} = 0 V, f = 1.0 MHz		5324		pF
C_{oss}	Output Capacitance			841		pF
C_{rss}	Reverse Transfer Capacitance			384		pF
Switching Characteristics (Note 2)						
$t_{d(on)}$	Turn–On Delay Time	V_{DD} = 15 V, I_D = 1 A, V_{GS} = 10 V, R_{GEN} = 6 Ω		15	27	ns
t_r	Turn–On Rise Time			10	20	ns
$t_{d(off)}$	Turn–Off Delay Time			93	149	ns
t_f	Turn–Off Fall Time			37	59	ns
Q_g	Total Gate Charge	V_{DS} = 15 V, I_D = 42 A, V_{GS} = 5 V		43	60	nC
Q_{gs}	Gate–Source Charge			13		nC
Q_{gd}	Gate–Drain Charge			11		nC
Drain–Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain–Source Diode Forward Current				84	A
V_{SD}	Drain–Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 42 A		0.9	1.3	V

Notes:

1. Pulse Test: Pulse Width < 300µs, Duty Cycle < 2.0%

2. TO-220 package is supplied in tube / rail @ 45 pieces per rail.

3. Calculated continuous current based on maximum allowable junction temperature. Actual maximum continuous current limited by package constraints to 75A

Typical Characteristics

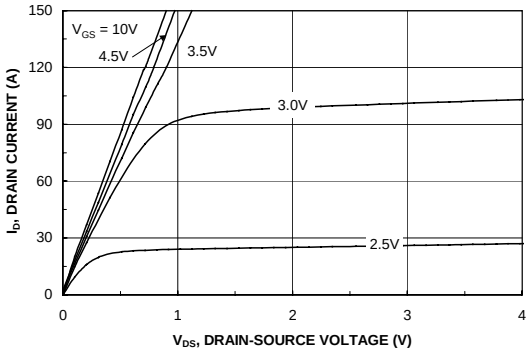


Figure 1. On-Region Characteristics.

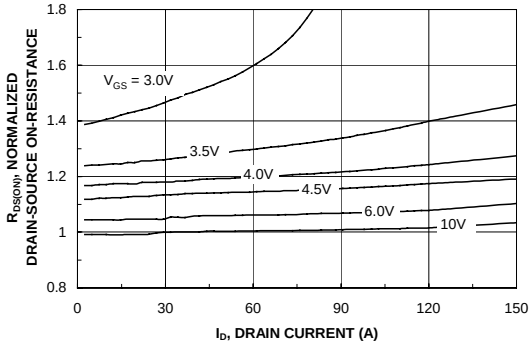


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

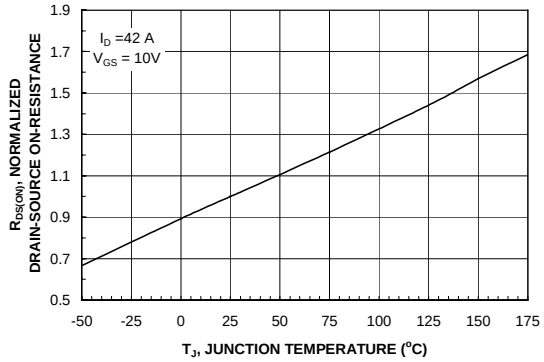


Figure 3. On-Resistance Variation with Temperature.

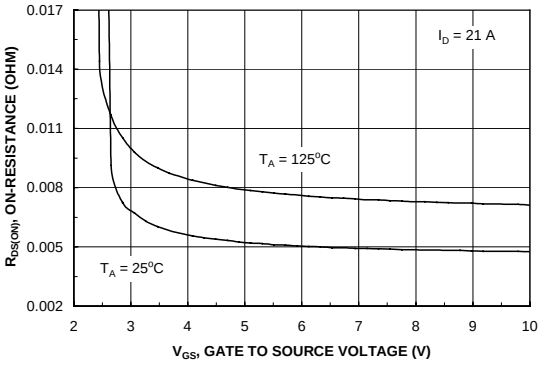


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

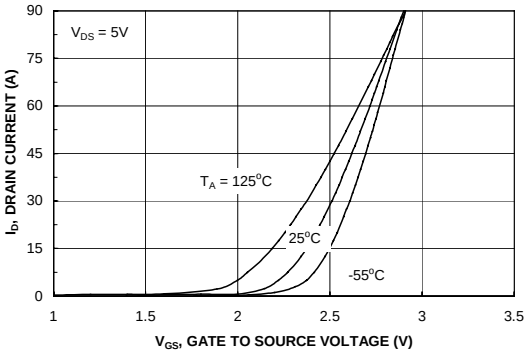


Figure 5. Transfer Characteristics.

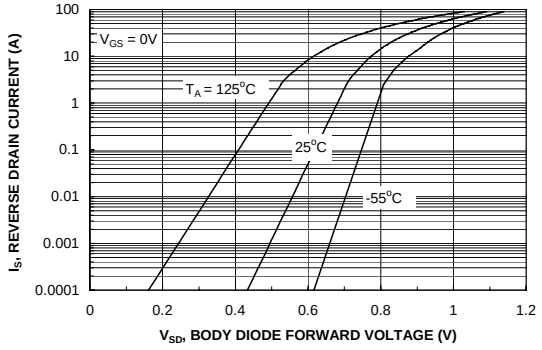


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics

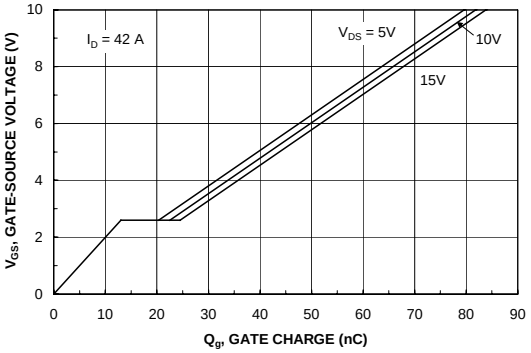


Figure 7. Gate Charge Characteristics.

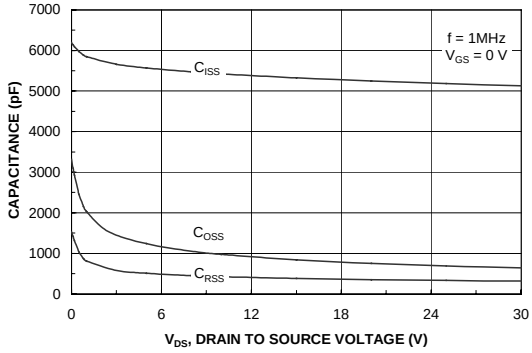


Figure 8. Capacitance Characteristics.

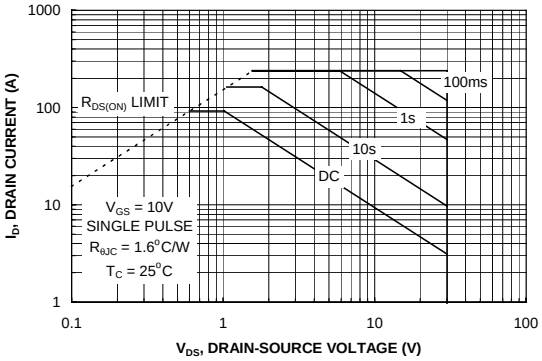


Figure 9. Maximum Safe Operating Area.

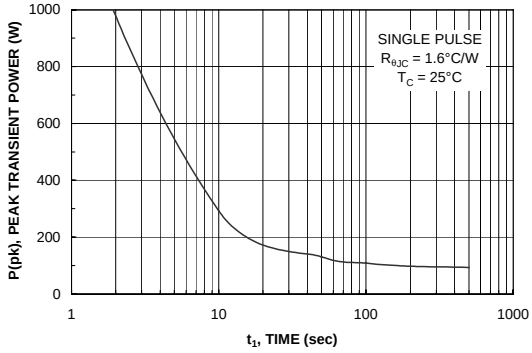


Figure 10. Single Pulse Maximum Power Dissipation.

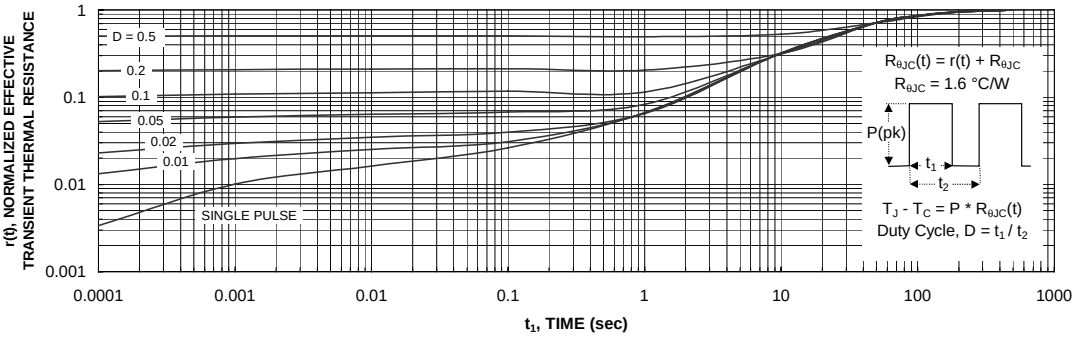


Figure 11. Transient Thermal Response Curve.

Thermal characterization performed using the conditions described in Note 1c.
Transient thermal response will change depending on the circuit board design.

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