



April 2001

FDP6676/FDB6676

30V N-Channel Logic Level PowerTrench[®] MOSFET

General Description

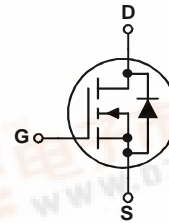
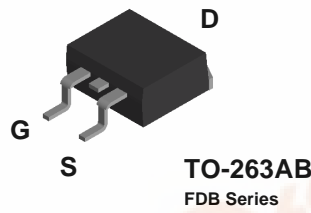
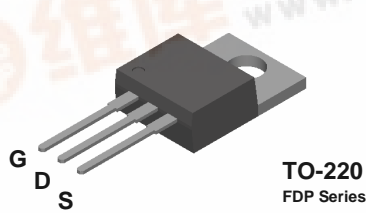
This N-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for "low side" synchronous rectifier operation, providing an extremely low $R_{DS(ON)}$.

Applications

- Synchronous rectifier
- DC/DC converter

Features

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



Absolute Maximum Ratings T_A=25°C unless otherwise noted

Symbol	Parameter	Rated	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 @ $T_C = 25^\circ\text{C}$	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 $T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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Drain-Source Avalanche Ratings (Note 1)

W_{DSS}	Single Pulse Drain-Source Avalanche Energy	$V_{DD} = 15\text{ V}, I_D = 20\text{ A}$			370	mJ
I_{AR}	Maximum Drain-Source Avalanche Current				20	A

Off Characteristics

BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$, Referenced to 25°C		24		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 24\text{ V}, V_{GS} = 0\text{ V}$			1	μA
I_{GSSF}	Gate-Body Leakage, Forward	$V_{GS} = 16\text{ V}, V_{DS} = 0\text{ V}$			100	nA
I_{GSSR}	Gate-Body Leakage, Reverse	$V_{GS} = -16\text{ V}, V_{DS} = 0\text{ V}$			-100	nA

On Characteristics (Note 2)

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1	1.5	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$, Referenced to 25°C		-4.5		mV/ $^\circ\text{C}$
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 42\text{ A}$ $V_{GS} = 4.5\text{ V}, I_D = 39\text{ A}$ $V_{GS} = 10\text{ V}, I_D = 42\text{ A}, T_J = 125^\circ\text{C}$		4.3 4.9 7.0	6 7.5 11	m Ω
$I_{D(on)}$	On-State Drain Current	$V_{GS} = 10\text{ V}, V_{DS} = 5\text{ V}$	60			A
g_{FS}	Forward Transconductance	$V_{DS} = 5\text{ V}, I_D = 42\text{ A}$		141		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V},$		5324		pF
C_{oss}	Output Capacitance	$f = 1.0\text{ MHz}$		841		pF
C_{riss}	Reverse Transfer Capacitance			384		pF

Switching Characteristics (Note 2)

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 15\text{ V}, I_D = 1\text{ A},$		15	27	ns
t_r	Turn-On Rise Time	$V_{GS} = 10\text{ V}, R_{GEN} = 6\text{ }\Omega$		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	$V_{DS} = 15\text{ V}, I_D = 42\text{ A},$		43	60	nC
Q_{gs}	Gate-Source Charge	$V_{GS} = 5\text{ V}$		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	$V_{GS} = 0\text{ V}, I_S = 42\text{ A}$		0.9	1.3	V

Notes:

1. Pulse Test: Pulse Width < 300 μs , 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

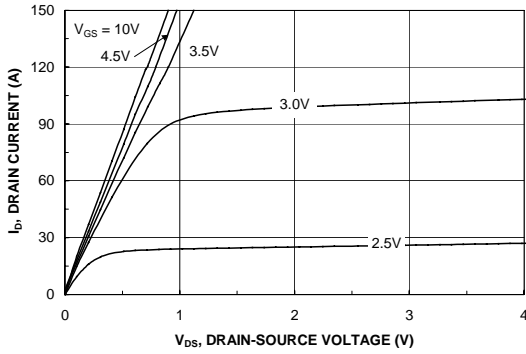


Figure 1. On-Region Characteristics.

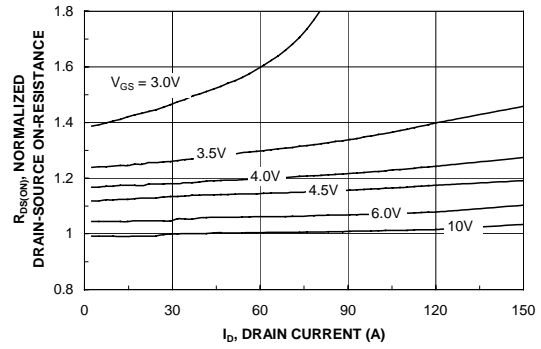


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

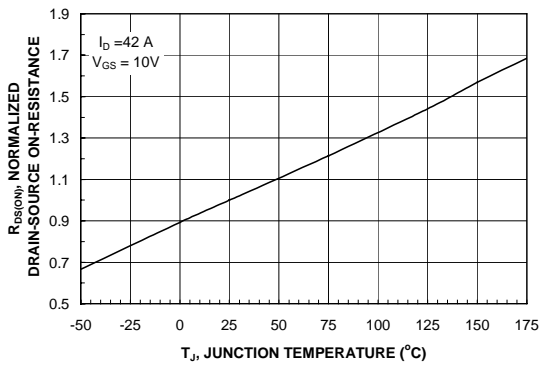


Figure 3. On-Resistance Variation with Temperature.

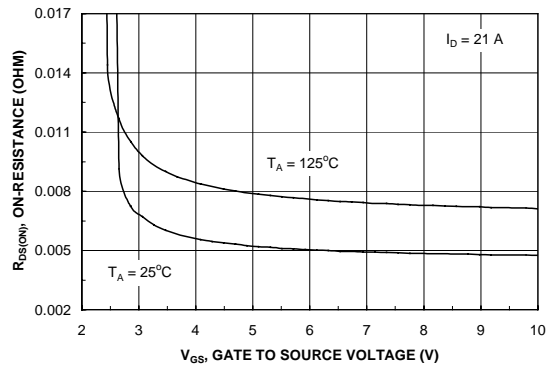


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

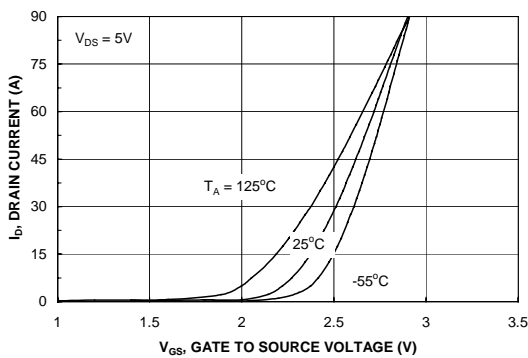


Figure 5. Transfer Characteristics.

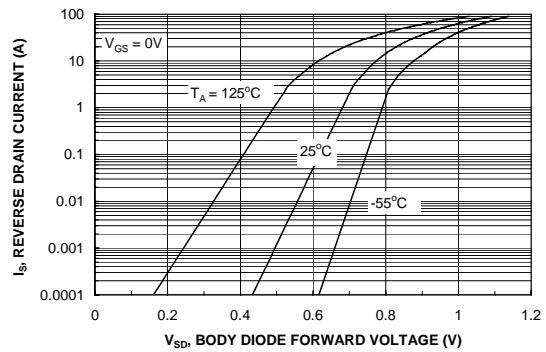


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics

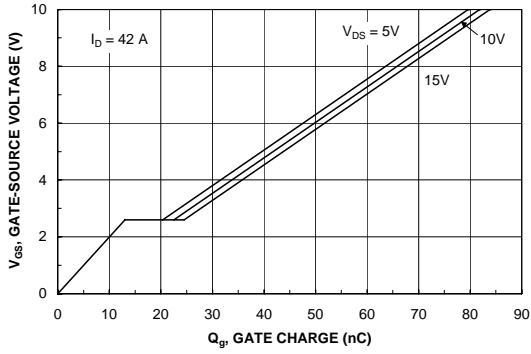


Figure 7. Gate Charge Characteristics.

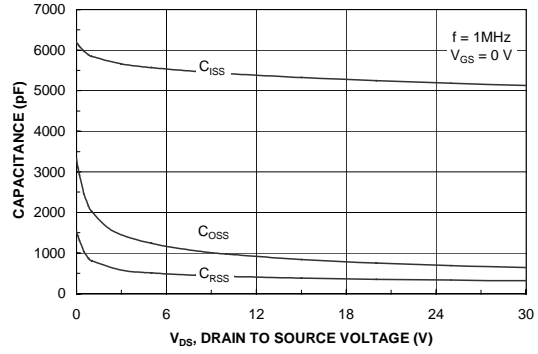


Figure 8. Capacitance Characteristics.

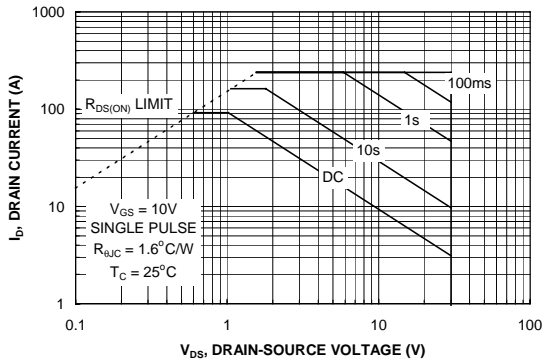


Figure 9. Maximum Safe Operating Area.

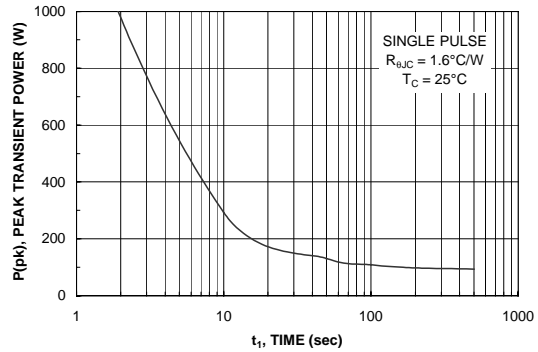


Figure 10. Single Pulse Maximum Power Dissipation.

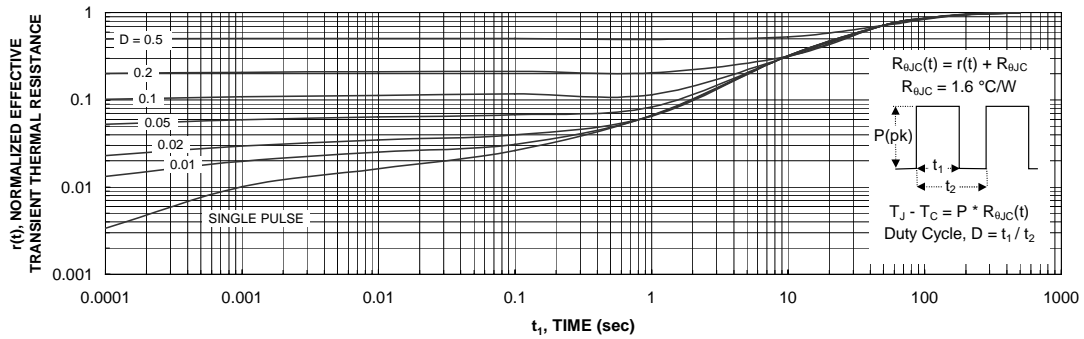


Figure 11. Transient Thermal Response Curve.

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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