

# FDP6676/FDB6676

## 30V N-Channel Logic Level PowerTrench® MOSFET

### General Description

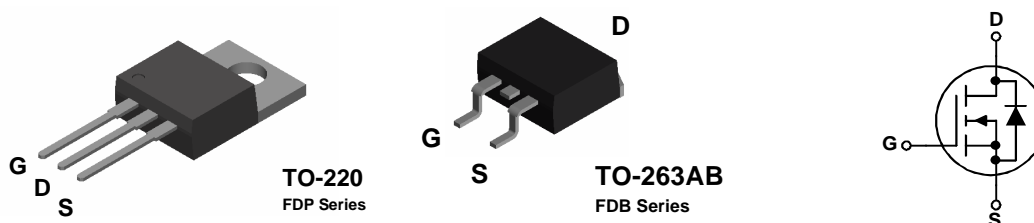
This N-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for "low side" synchronous rectifier operation, providing an extremely low  $R_{DS(ON)}$ .

### 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<sub>A</sub>=25°C unless otherwise noted

Symbol	Parameter	Ratings	Units
$V_{DSS}$	Drain-Source Voltage	30	V
$V_{GSS}$	Gate-Source Voltage	$\pm 16$	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 $25^\circ\text{C}$	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
--------	-----------	-----------------	-----	-----	-----	-------

### 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	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$		24		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 24\text{ V}, V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
$I_{GSSF}$	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	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	1	1.5	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$		-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 $\Omega$
$I_{D(on)}$	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	$V_{GS} = 10\text{ V}, R_{GEN} = 6\ \Omega$		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 $\mu\text{s}$ , 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

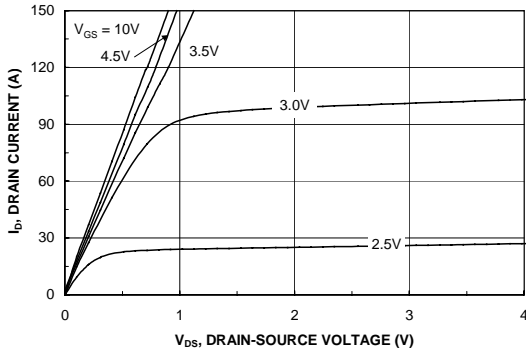


Figure 1. On-Region Characteristics.

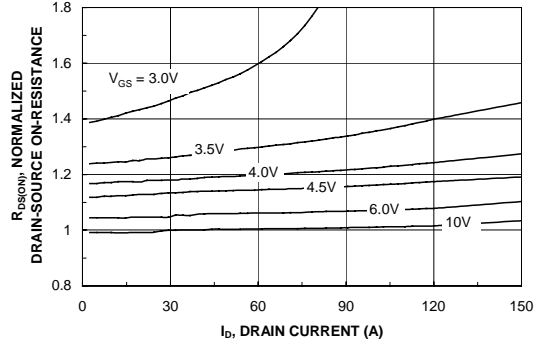


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

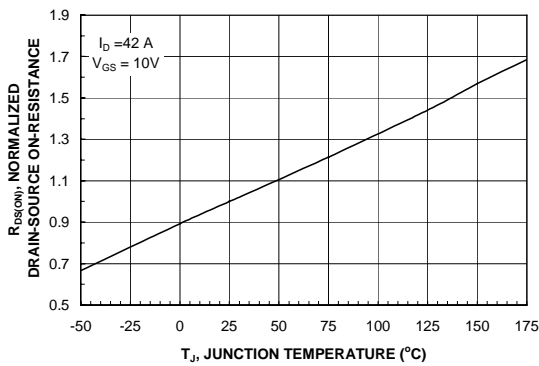


Figure 3. On-Resistance Variation with Temperature.

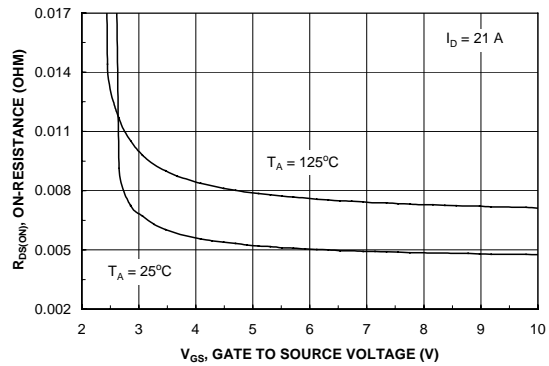


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

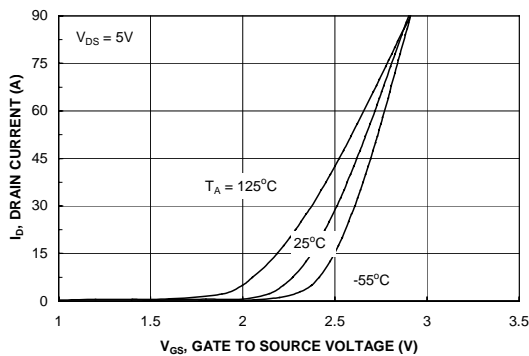


Figure 5. Transfer Characteristics.

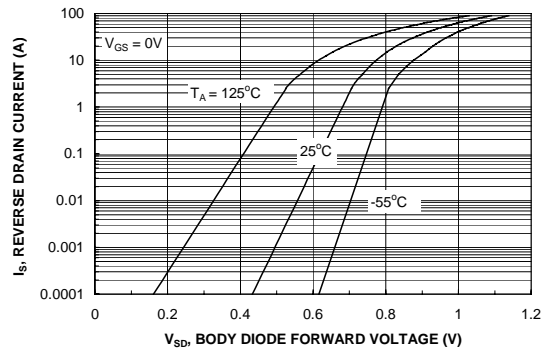


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

## Typical Characteristics

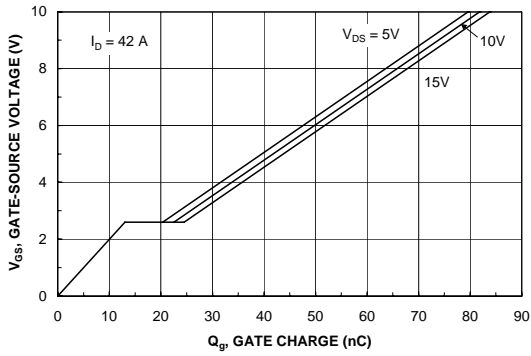


Figure 7. Gate Charge Characteristics.

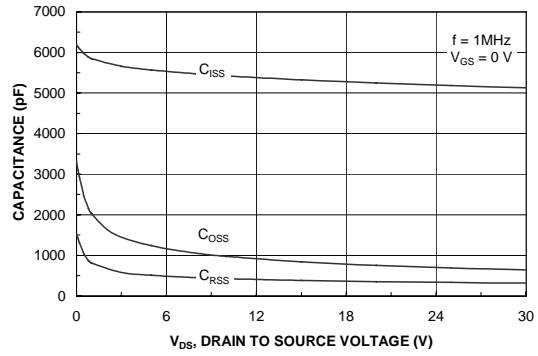


Figure 8. Capacitance Characteristics.

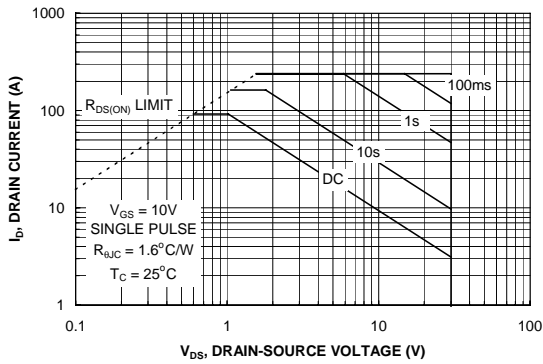


Figure 9. Maximum Safe Operating Area.

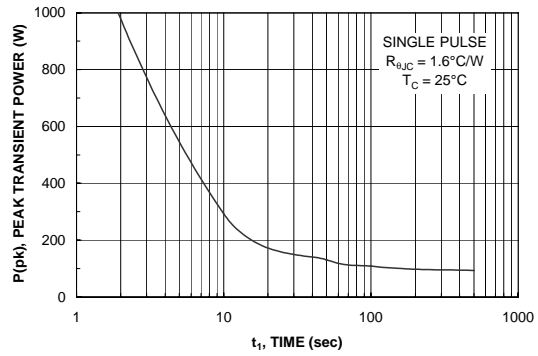


Figure 10. Single Pulse Maximum Power Dissipation.

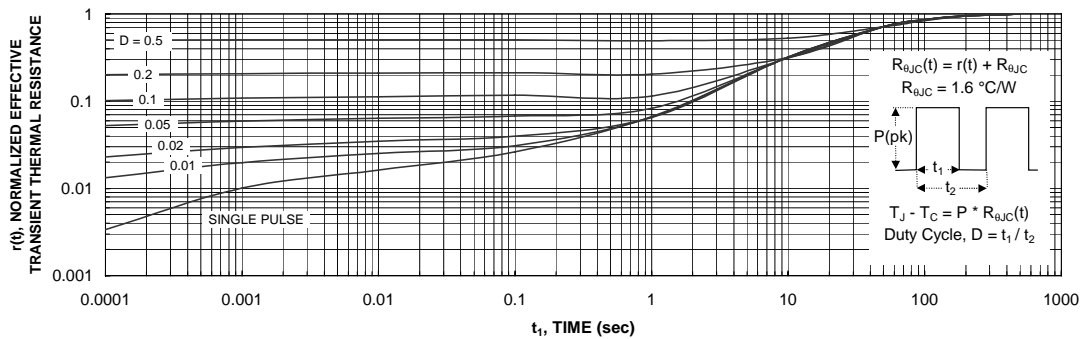


Figure 11. Transient Thermal Response Curve.

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

## TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACE <sub>x</sub> <sup>TM</sup>	FAST <sup>®</sup>	PACMAN <sup>TM</sup>	SuperSOT <sup>TM</sup> -3
Bottomless <sup>TM</sup>	FAST <sub>r</sub> <sup>TM</sup>	POP <sup>TM</sup>	SuperSOT <sup>TM</sup> -6
CoolFET <sup>TM</sup>	GlobalOptoisolator <sup>TM</sup>	PowerTrench <sup>®</sup>	SuperSOT <sup>TM</sup> -8
CROSSVOLT <sup>TM</sup>	GTO <sup>TM</sup>	QFET <sup>TM</sup>	SyncFET <sup>TM</sup>
DenseTrench <sup>TM</sup>	HiSeC <sup>TM</sup>	QS <sup>TM</sup>	TinyLogic <sup>TM</sup>
DOMET <sup>TM</sup>	ISOPLANAR <sup>TM</sup>	QT Optoelectronics <sup>TM</sup>	UHC <sup>TM</sup>
EcoSPARK <sup>TM</sup>	LittleFET <sup>TM</sup>	Quiet Series <sup>TM</sup>	UltraFET <sup>®</sup>
E <sup>2</sup> CMOS <sup>TM</sup>	MicroFET <sup>TM</sup>	SILENT SWITCHER <sup>®</sup>	VCX <sup>TM</sup>
EnSigna <sup>TM</sup>	MICROWIRE <sup>TM</sup>	SMART START <sup>TM</sup>	
FACT <sup>TM</sup>	OPTOLOGIC <sup>TM</sup>	Star* Power <sup>TM</sup>	
FACT Quiet Series <sup>TM</sup>	OPTOPLANAR <sup>TM</sup>	Stealth <sup>TM</sup>	

## DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

## LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

## PRODUCT STATUS DEFINITIONS

### Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.