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FAIRCHILD SEMICONDUCTOR™

November 2001

FDP2670/FDB2670

200V N-Channel PowerTrench® MOSFET

General Description

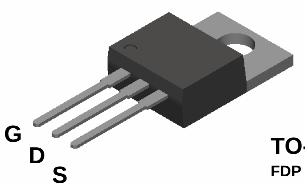
This N-Channel MOSFET has been designed specifically for switching on the primary side in the isolated DC/DC converter application. Any application requiring a 200V MOSFETs with low on-resistance and fast switching will benefit.

These MOSFETs feature faster switching and lower gate charge than other MOSFETs with comparable $RDS_{(ON)}$ specifications.

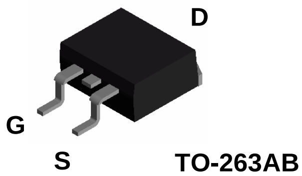
The result is a MOSFET that is easy and safer to drive (even at very high frequencies), and DC/DC power supply designs with higher overall efficiency.

Features

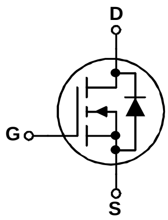
- 19 A, 200 V. $R_{DS(ON)}$ = 130 mΩ @ V_{GS} = 10 V
- Low gate charge (27 nC typical)
- Fast switching speed
- High performance trench technology for extremely low $R_{DS(ON)}$
- High power and current handling capability



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		200	V
V_{GSS}	Gate-Source Voltage		± 20	V
I_D	Drain Current – Continuous	(Note 1)	19	A
	– Pulsed	(Note 1)	40	A
P_D	Total Power Dissipation @ T_C = 25°C		93	W
	Derate above 25°C		0.63	W/°C
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	3.2	V/ns
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
FDB2670	FDB2670	13''	24mm	800 units
FDP2670	FDP2670	Tube	n/a	45 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} = 100 V, I_D = 10 A			375	mJ
I_{AR}	Maximum Drain-Source Avalanche Current				10	A
Off Characteristics						
BV_{DSS}	Drain–Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 μA	200			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C		241		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 160 V, V_{GS} = 0 V			1	μA
I_{GSSF}	Gate–Body Leakage, Forward	V_{GS} = 20 V, V_{DS} = 0 V			100	nA
I_{GSSR}	Gate–Body Leakage, Reverse	V_{GS} = –20 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	2	4	4.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C		–9		mV/°C
$R_{DS(on)}$	Static Drain–Source On–Resistance	V_{GS} = 10 V, I_D = 10 A V_{GS} = 10V, I_D = 10 A, T_J = 125°C		98 205	130 285	mΩ
$I_{D(on)}$	On–State Drain Current	V_{GS} = 10 V, V_{DS} = 10 V	20			A
g_{FS}	Forward Transconductance	V_{DS} = 10 V, I_D = 10 A		24		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 100 V, V_{GS} = 0 V, f = 1.0 MHz		1320		pF
C_{oss}	Output Capacitance			71		pF
C_{rss}	Reverse Transfer Capacitance			24		pF
Switching Characteristics (Note 2)						
$t_{d(on)}$	Turn–On Delay Time	V_{DD} = 100 V, I_D = 1 A, V_{GS} = 10 V, R_{GEN} = 6 Ω		14	25	ns
t_r	Turn–On Rise Time			5	10	ns
$t_{d(off)}$	Turn–Off Delay Time			26	41	ns
t_f	Turn–Off Fall Time			23	37	ns
Q_g	Total Gate Charge	V_{DS} = 100 V, I_D = 10 A, V_{GS} = 10 V		27	38	nC
Q_{gs}	Gate–Source Charge			7		nC
Q_{gd}	Gate–Drain Charge			10		nC
Drain–Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain–Source Diode Forward Current				19	A
V_{SD}	Drain–Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 10 A (Note 2)		0.8	1.3	V

Notes:

1. Calculated continuous current based on maximum allowable junction temperature.

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

3. $I_{SD} \le 3A$, di/dt ≤ 100A/μs, $V_{DD} \le BV_{DSS}$, Starting T_J = 25°C

Typical Characteristics

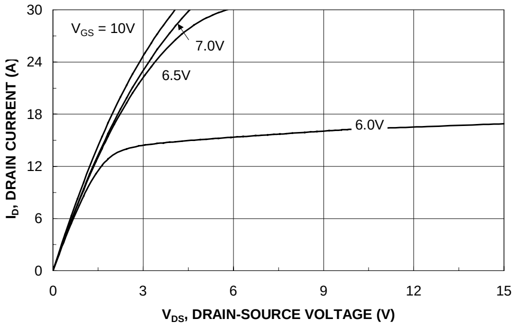


Figure 1. On-Region Characteristics.

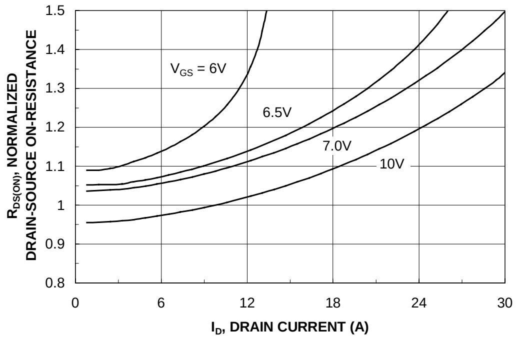


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

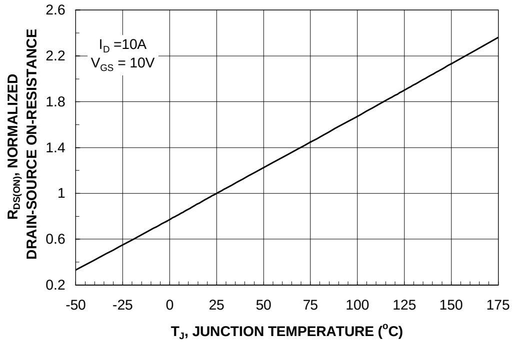


Figure 3. On-Resistance Variation with Temperature.

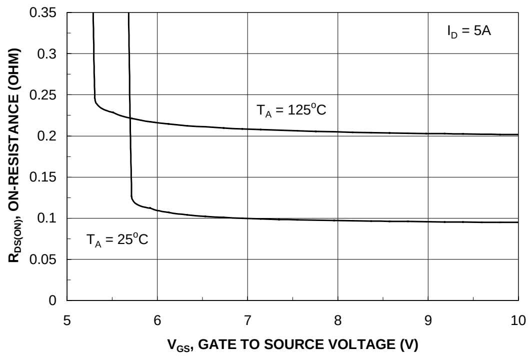


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

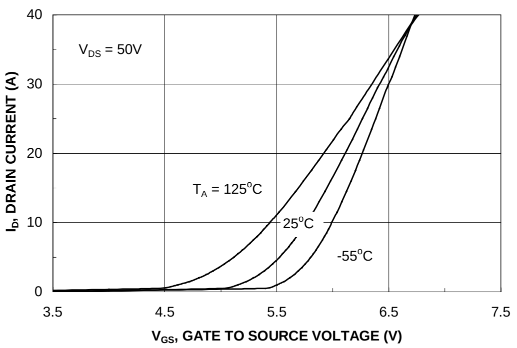


Figure 5. Transfer Characteristics.

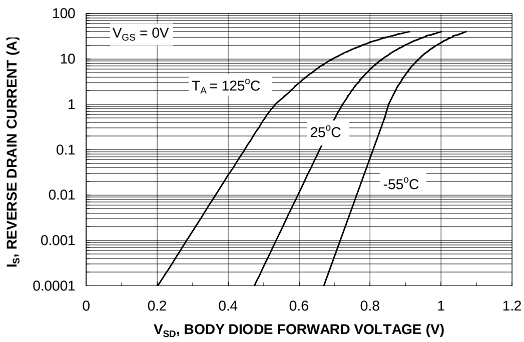


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics

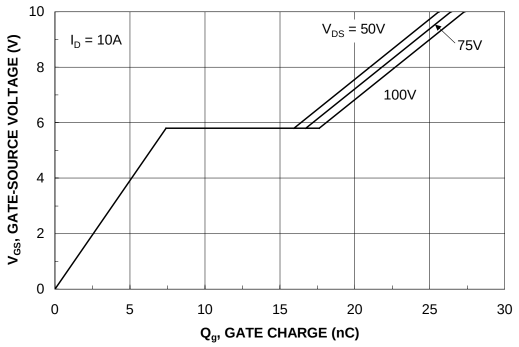


Figure 7. Gate Charge Characteristics.

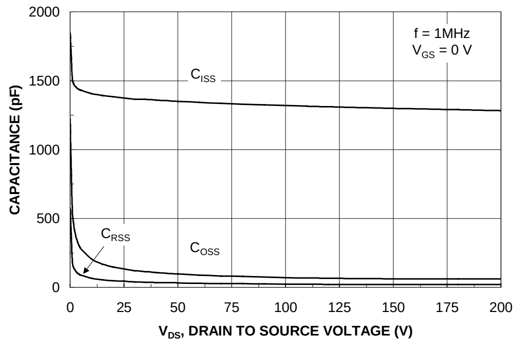


Figure 8. Capacitance Characteristics.

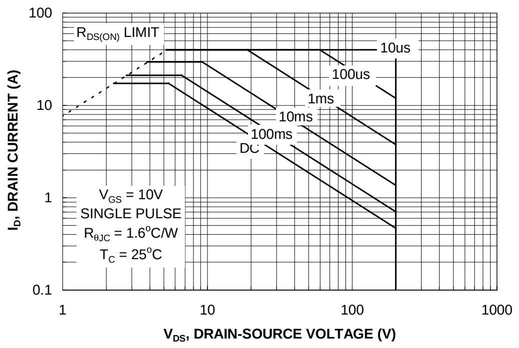


Figure 9. Maximum Safe Operating Area.

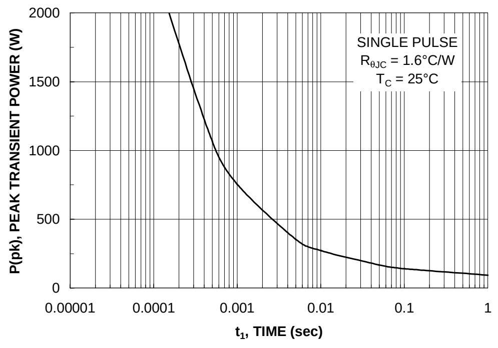


Figure 10. Single Pulse Maximum Power Dissipation.

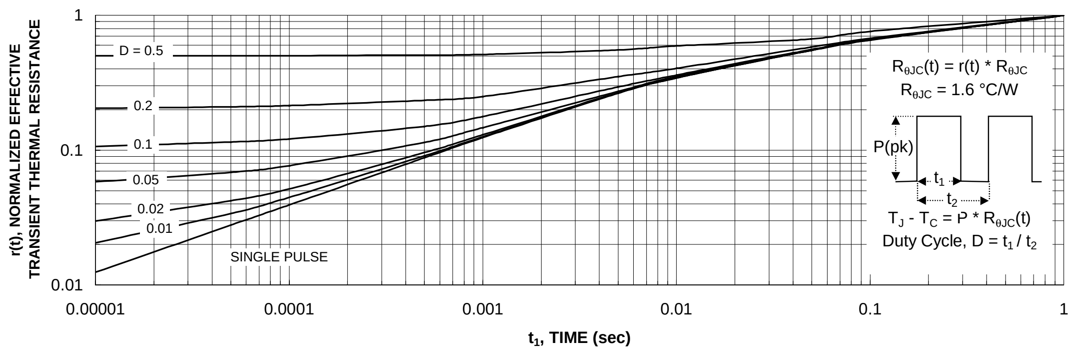


Figure 11. Transient Thermal Response Curve.

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

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