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FAIRCHILD SEMICONDUCTOR®

October 2003

FDP7030BL/FDB7030BL

N-Channel Logic Level PowerTrench® MOSFET

General Description

This N-Channel Logic Level MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers.

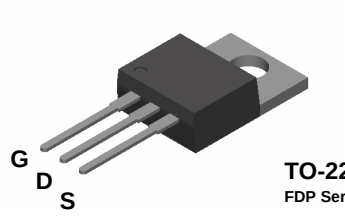
These MOSFETs feature faster switching and lower gate charge than other MOSFETs with comparable $R_{DS(ON)}$ specifications.

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.

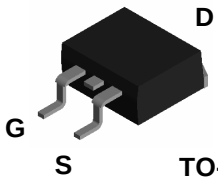
It has been optimized for low gate charge, low $R_{DS(ON)}$ and fast switching speed.

Features

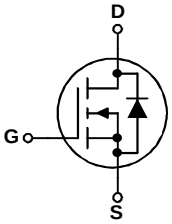
- 60 A, 30 V $R_{DS(ON)}$ = 9 mΩ @ V_{GS} = 10 V
  $R_{DS(ON)}$ = 12 mΩ @ V_{GS} = 4.5 V
- Critical DC electrical parameters specified at elevated temperature
- High performance trench technology for extremely low $R_{DS(ON)}$
- 175°C maximum junction temperature rating



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		± 20	V
I_D	Drain Current – Continuous	(Note 1)	60	A
	– Pulsed	(Note 1)	180	
P_D	Total Power Dissipation @ T_C = 25°C		60	W
	Derate above 25°C		0.4	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	2.5	°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
FDB7030BL	FDB7030BL	13''	24mm	800 units
FDP7030BL	FDP7030BL	Tube	n/a	45

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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 = 60 A			73	mJ
I_{AR}	Maximum Drain-Source Avalanche Current				60	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		22		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 24 V, V_{GS} = 0 V			1	µA
I_{GSS}	Gate–Body Leakage	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	1	1.9	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = 250 µA, Referenced to 25°C		–5		mV/°C
$R_{DS(on)}$	Static Drain–Source On–Resistance	V_{GS} = 10 V, I_D = 30 A V_{GS} = 4.5 V, I_D = 25 A V_{GS}= 10 V, I_D = 30 A, T_J=125°C		6.8 8.5 10.1	9 12 18	mΩ
$I_{D(on)}$	On–State Drain Current	V_{GS} = 10 V, V_{DS} = 10 V	30			A
g_{FS}	Forward Transconductance	V_{DS} = 10V, I_D = 30 A		85		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 15 V, V_{GS} = 0 V, f = 1.0 MHz		1760		pF
C_{oss}	Output Capacitance			440		pF
C_{rss}	Reverse Transfer Capacitance			185		pF
R_G	Gate Resistance	V_{GS} = 15 mV, f = 1.0 MHz		1.2		Ω
Switching Characteristics (Note 2)						
$t_{d(on)}$	Turn–On Delay Time	V_{DD} = 15V, I_D = 1 A, V_{GS} = 10 V, R_{GEN} = 6 Ω		12	22	ns
t_r	Turn–On Rise Time			12	22	ns
$t_{d(off)}$	Turn–Off Delay Time			30	48	ns
t_f	Turn–Off Fall Time			19	33	ns
Q_g	Total Gate Charge	V_{DS} = 15 V, I_D = 30 A, V_{GS} = 5 V		17	24	nC
Q_{gs}	Gate–Source Charge			5.4		nC
Q_{gd}	Gate–Drain Charge			6.4		nC
Drain–Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain–Source Diode Forward Current				60	A
V_{SD}	Drain–Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 30 A (Note 1)		0.92	1.3	V
t_{rr}	Diode Reverse Recovery Time	I_F = 30 A, d_{iF}/d_t = 100 A/µs			30	nS
Q_{rr}	Diode Reverse Recovery Charge				20	nC

Notes:

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

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Typical Characteristics

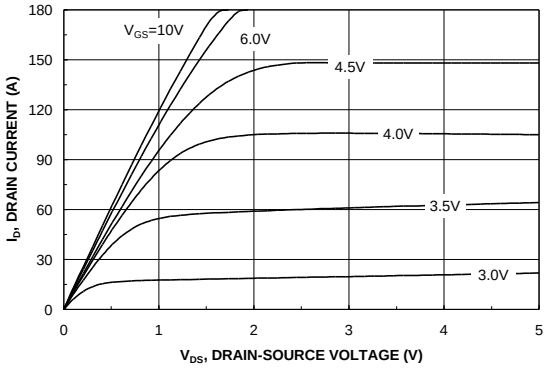


Figure 1. On-Region Characteristics.

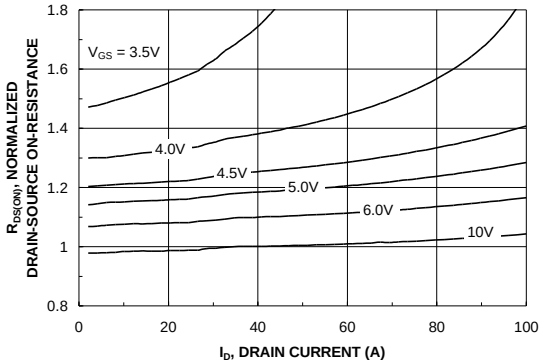


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

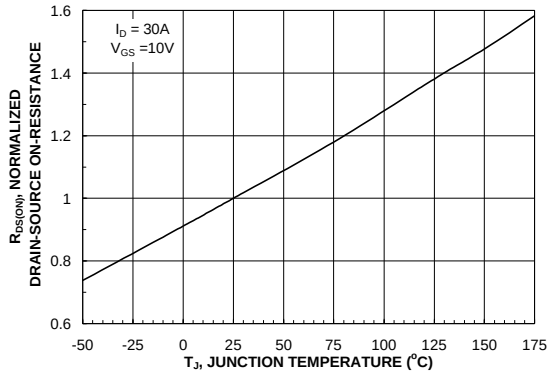


Figure 3. On-Resistance Variation with Temperature.

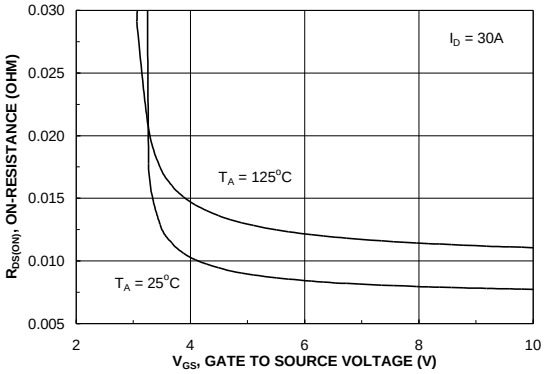


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

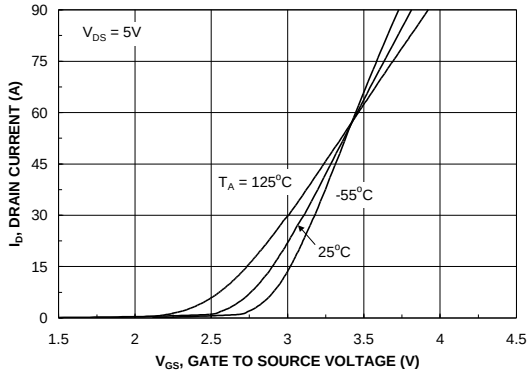


Figure 5. Transfer Characteristics.

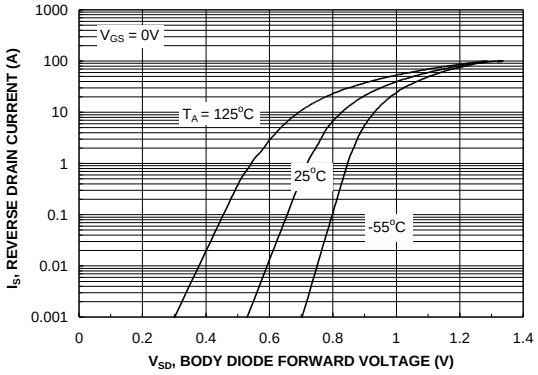


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

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Typical Characteristics

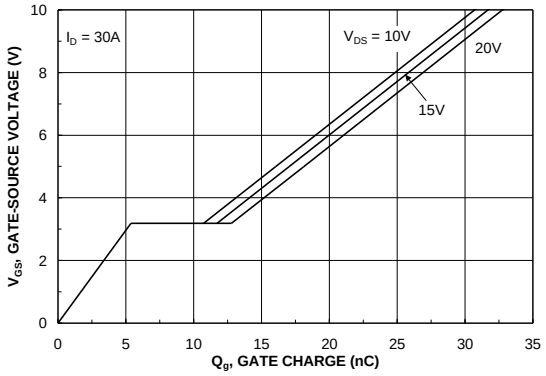


Figure 7. Gate Charge Characteristics.

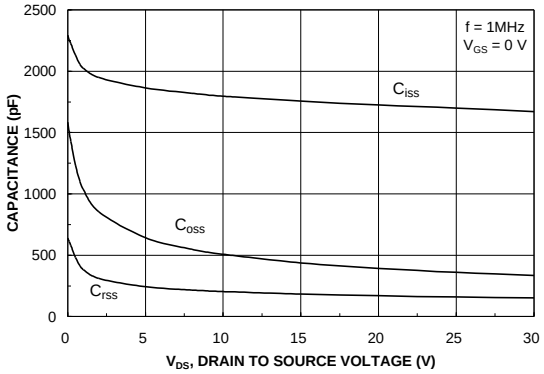


Figure 8. Capacitance Characteristics.

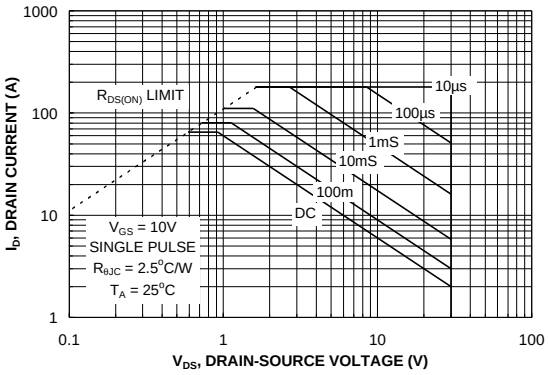


Figure 9. Maximum Safe Operating Area.

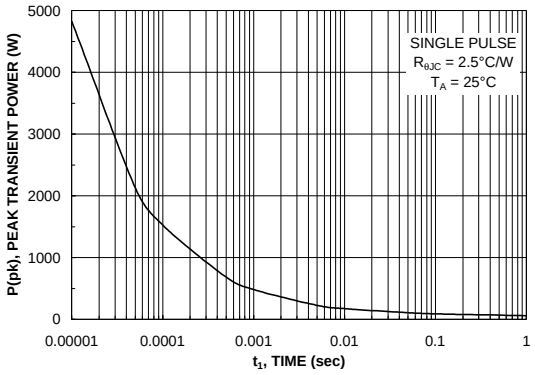


Figure 10. Single Pulse Maximum Power Dissipation.

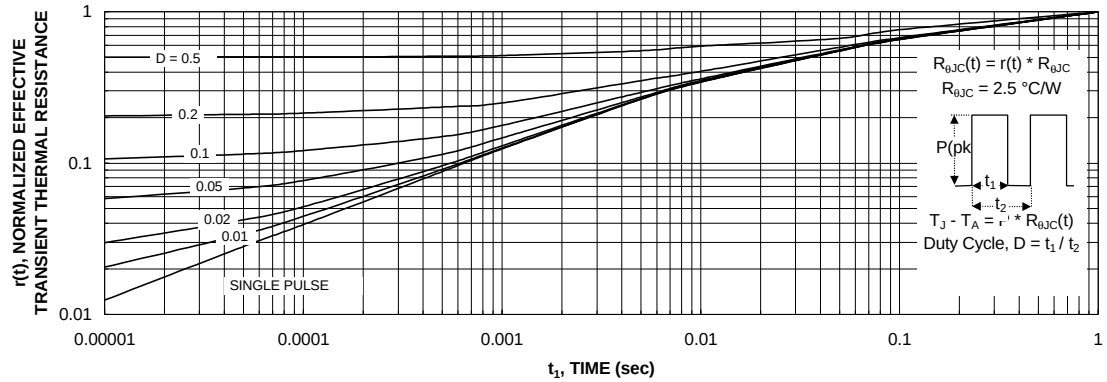


Figure 11. Transient Thermal Response Curve.

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