FAIRCHILD SEMICONDUCTOR®

March 2004

FDP7045L/FDB7045L

N-Channel Logic Level PowerTrench® MOSFET

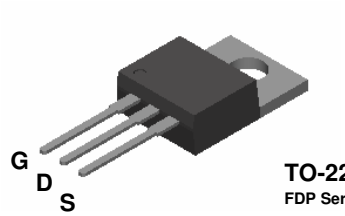
General Description

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.

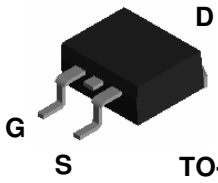
These MOSFETs feature faster switching and lower gate charge than other MOSFETs with comparable $R_{DS(ON)}$ specifications resulting in DC/DC power supply designs with higher overall efficiency.

Features

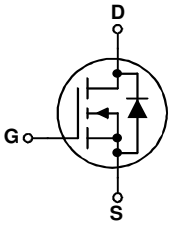
- 100 A, 30 V $R_{DS(ON)}$ = 4.5 mΩ @ V_{GS} = 10 V
  $R_{DS(ON)}$ = 6.0 mΩ @ V_{GS} = 4.5 V
- Critical DC electrical parameters specified at elevated temperature
- High performance trench technology for extremely low $R_{DS(ON)}$
- 175°C maximum junction temperature rating



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)	100	A
			75	
	– Pulsed	(Note 1)	300	
P_D	Total Power Dissipation @ T_C = 25°C		107	W
	Derate above 25°C		0.7	W/°C
T_J, T_{STG}	Operating and Storage Junction Temperature Range		–55 to +175	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	1.4	°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
FDB7045L	FDB7045L	13''	24mm	800 units
FDP7045L	FDP7045L	Tube	n/a	45

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 = 75 A			330	mJ
I_{AR}	Maximum Drain-Source Avalanche Current				75	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		25		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	1.8	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C		–6		mV/°C
$R_{DS(on)}$	Static Drain–Source On–Resistance	V_{GS} = 10 V, I_D = 50 A V_{GS} = 4.5 V, I_D = 40 A V_{GS}= 10 V, I_D = 50 A, T_J=125°C		3.5 4.0 5.5	4.5 6.0 7.0	mΩ
$I_{D(on)}$	On–State Drain Current	V_{GS} = 10 V, V_{DS} = 10 V	50			A
g_{FS}	Forward Transconductance	V_{DS} = 5V, I_D = 50 A		165		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 15 V, V_{GS} = 0 V, f = 1.0 MHz		4357		pF
C_{oss}	Output Capacitance			1092		pF
C_{rss}	Reverse Transfer Capacitance			399		pF
R_G	Gate Resistance	V_{GS} = 15 mV, f = 1.0 MHz		1.4		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		16	29	ns
t_r	Turn–On Rise Time			13	24	ns
$t_{d(off)}$	Turn–Off Delay Time			74	119	ns
t_f	Turn–Off Fall Time			41	66	ns
Q_g	Total Gate Charge	V_{DS} = 15 V, I_D = 50 A, V_{GS} = 5 V		41	58	nC
Q_{gs}	Gate–Source Charge			12		nC
Q_{gd}	Gate–Drain Charge			14		nC
Drain–Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain–Source Diode Forward Current				75	A
V_{SD}	Drain–Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 50 A (Note 1)		0.91	1.2	V
t_{rr}	Diode Reverse Recovery Time	I_F = 50 A, d_{iF}/d_t = 100 A/μs		48		nS
Q_{rr}	Diode Reverse Recovery Charge			42		nC

Notes:

1. Calculated continuous current based on maximum allowable junction temperature. Actual maximum continuous current limited by package constraints to 75A.
2. Pulse Test: Pulse Width < 300μs, Duty Cycle < 2.0%

Typical Characteristics

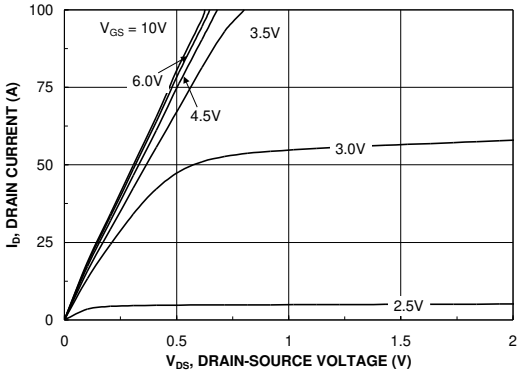


Figure 1. On-Region Characteristics.

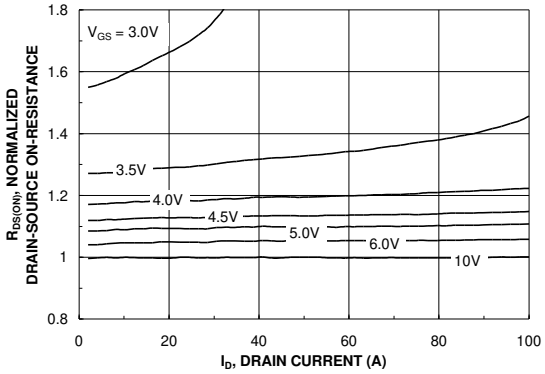


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

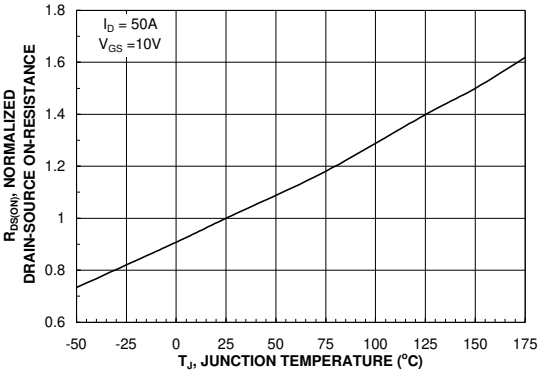


Figure 3. On-Resistance Variation with Temperature.

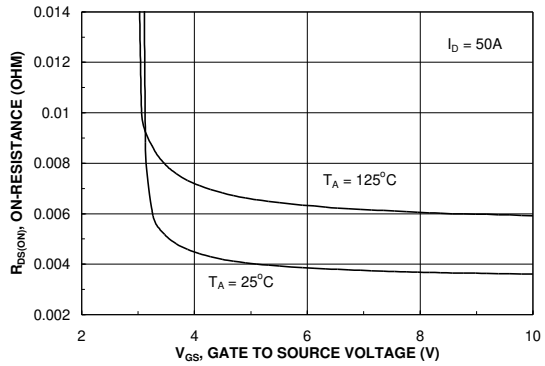


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

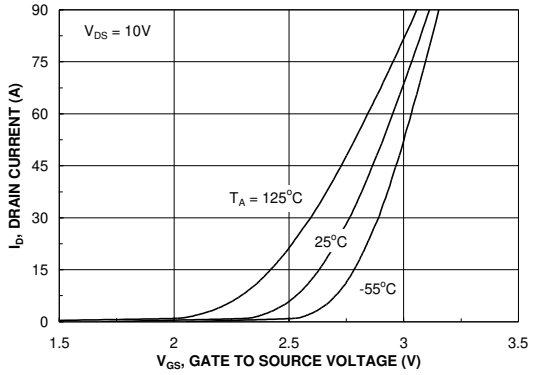


Figure 5. Transfer Characteristics.

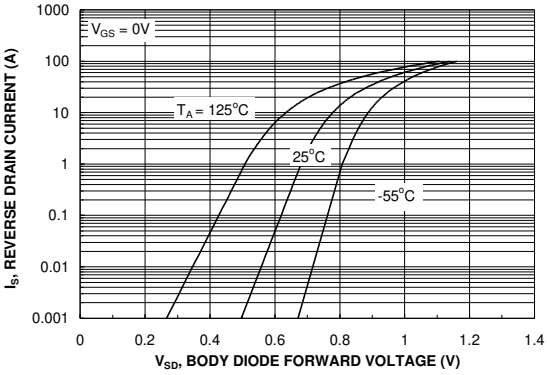


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics

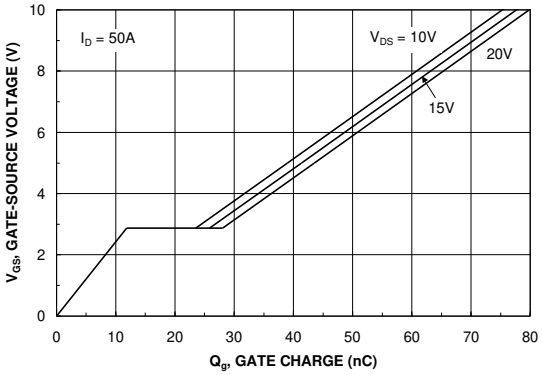


Figure 7. Gate Charge Characteristics.

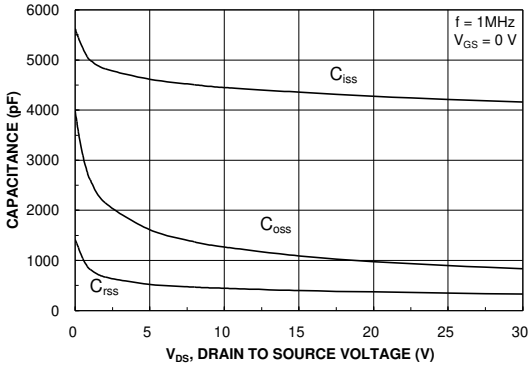


Figure 8. Capacitance Characteristics.

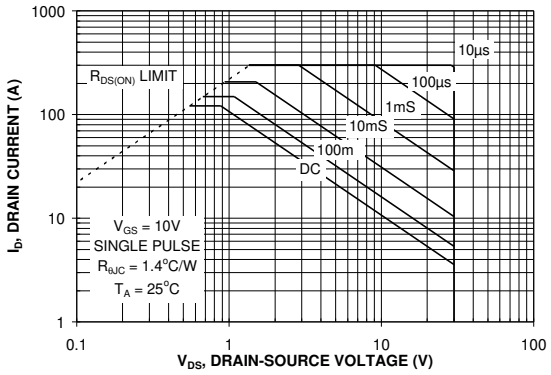


Figure 9. Maximum Safe Operating Area.

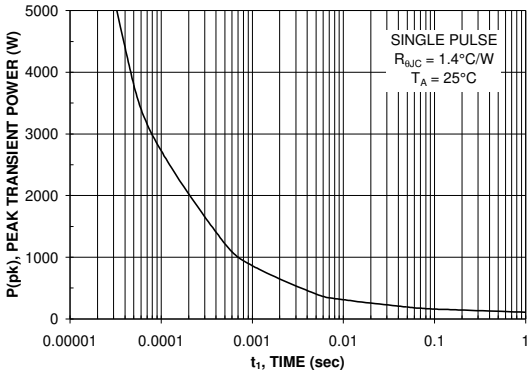


Figure 10. Single Pulse Maximum Power Dissipation.

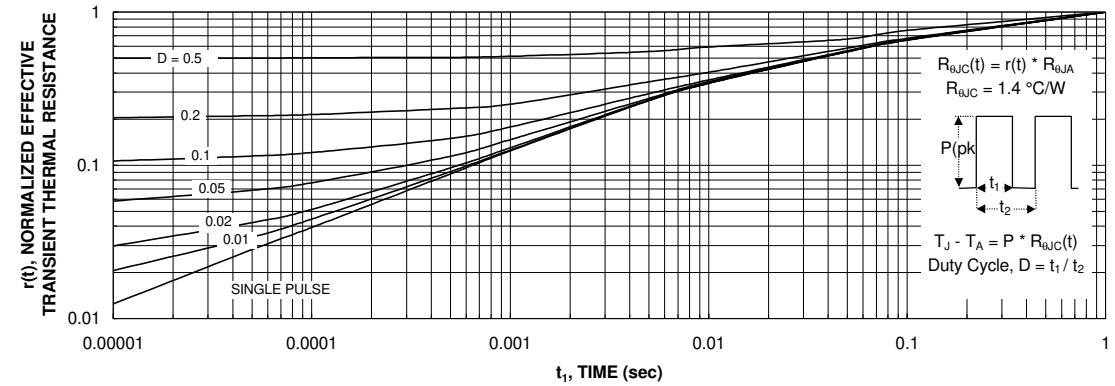


Figure 11. Transient Thermal Response Curve.

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