January 2000

FAIRCHILD SEMICONDUCTOR™

FDP7045L/FDB7045L

N-Channel Logic Level PowerTrench® MOSFET

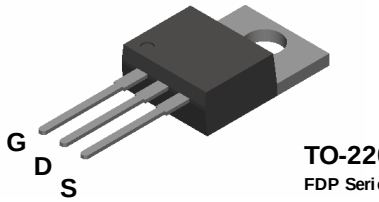
General Description

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.

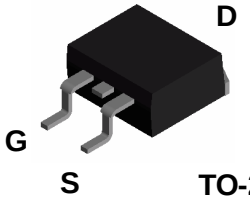
These MOSFETs feature faster switching and lower gate charge than other MOSFETs with comparable $R_{DS(on)}$ specifications resulting in DC/DC power supply designs with higher overall efficiency.

Features

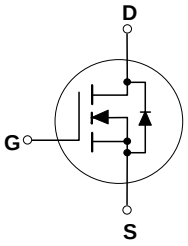
- 100 A, 30 V. $R_{DS(ON)}$ = 0.0045 Ω @ V_{GS} = 10 V
  $R_{DS(ON)}$ = 0.006 Ω @ V_{GS} = 4.5 V.
- Critical DC electrical parameters specified at elevated temperature.
- Rugged internal source-drain diode can eliminate the need for an external Zener diode transient suppressor.
- High performance PowerTrench 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_C = 25°C unless otherwise noted

Symbol	Parameter	FDP7045L	FDB7045L	Units
V_{DSS}	Drain-Source Voltage	30		V
V_{GSS}	Gate-Source Voltage	±20		V
I_D	Maximum Drain Current - Continuous (Note 1)	100		A
		75		
	- Pulsed (Note 1)	300		
P_D	Total Power Dissipation @ T_C = 25°C	125		W
	Derate above 25°C	0.85		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	1.2		°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62.5		°C/W

Package Outlines and Ordering Information

Device Marking	Device	Reel Size	Tape Width	Quantity
FDB7045L	FDB7045L	13''	24mm	800
FDP7045L	FDP7045L	Tube	N/A	45

Electrical Characteristics

T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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_{GSSF}	Gate-Body Leakage Current, Forward	V_{GS} = 20 V, V_{DS} = 0 V			100	nA
I_{GSSR}	Gate-Body Leakage Current, 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	1	1.5	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 = 50 A, V_{GS} = 10 V, I_D = 50 A, T_J=125◦C V_{GS} = 4.5 V,I_D = 40 A		0.0039 0.0056 0.0048	0.0045 0.0070 0.0060	Ω
$I_{D(on)}$	On-State Drain Current	V_{GS} = 10 V, V_{DS} = 10 V	50			A
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 50 A		120		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 15 V, V_{GS} = 0 V, f = 1.0 MHz		5400		pF
C_{oss}	Output Capacitance			1170		pF
C_{rss}	Reverse Transfer Capacitance			530		pF
Switching Characteristics (Note 2)						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 15 V, I_D = 50 A, V_{GS} = 10 V		14	30	ns
t_r	Turn-On Rise Time			114	160	ns
$t_{d(off)}$	Turn-Off Delay Time			105	150	ns
t_f	Turn-Off Fall Time			115	160	ns
Q_g	Total Gate Charge	V_{DS} = 15 V, I_D = 50 A, V_{GS} = 5 V		50	70	nC
Q_{gs}	Gate-Source Charge			16		nC
Q_{gd}	Gate-Drain Charge			16		nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current (Note 2)				75	A
V_{SD}	Drain-Source Diode Forward Voltage	V = 0 V, I = 50 A (Note 2)		0.95	1.2	V

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 ≤ 300 μs, Duty Cycle ≤ 2.0%

Typical Characteristics

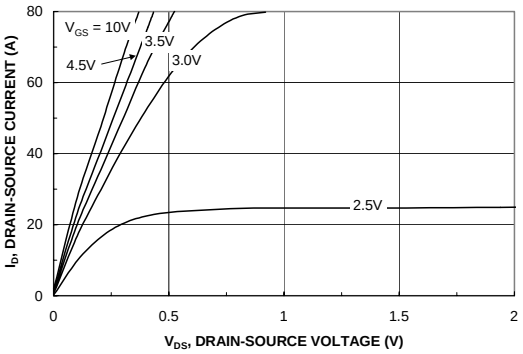


Figure 1. On-Region Characteristics.

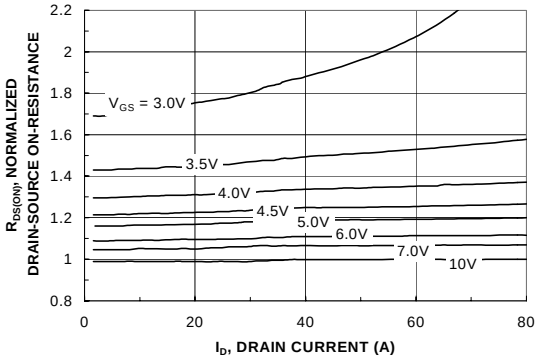


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

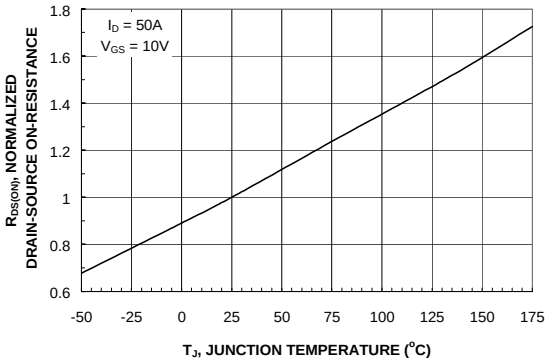


Figure 3. On-Resistance Variation with Temperature.

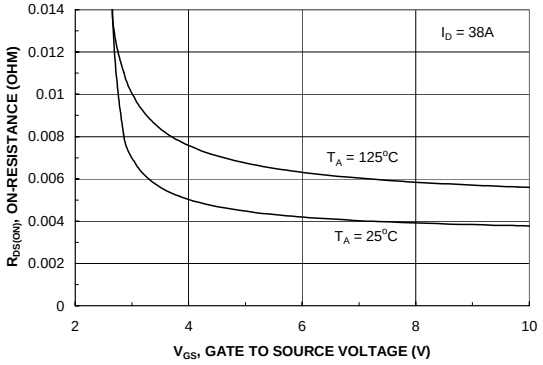


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

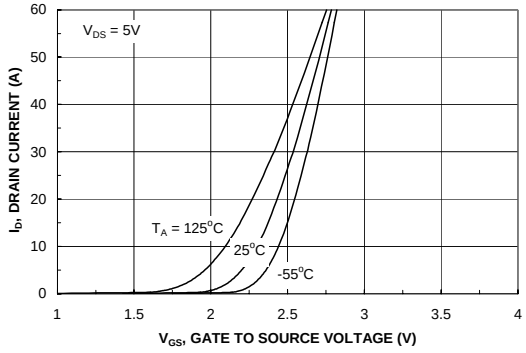


Figure 5. Transfer Characteristics.

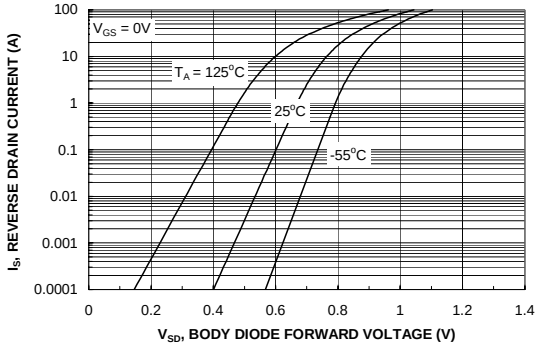


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics (continued)

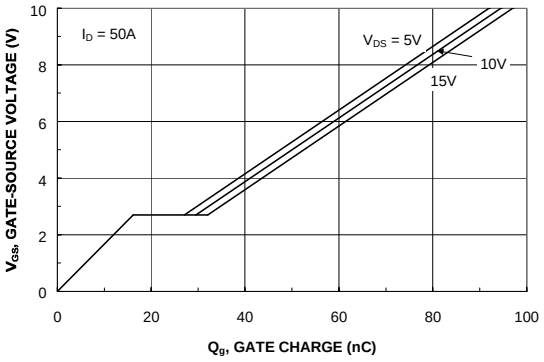


Figure 7. Gate-Charge Characteristics.

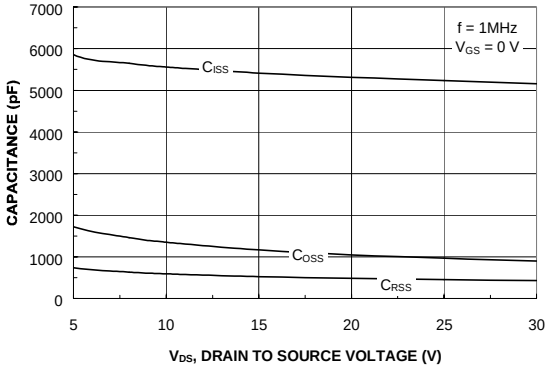


Figure 8. Capacitance Characteristics.

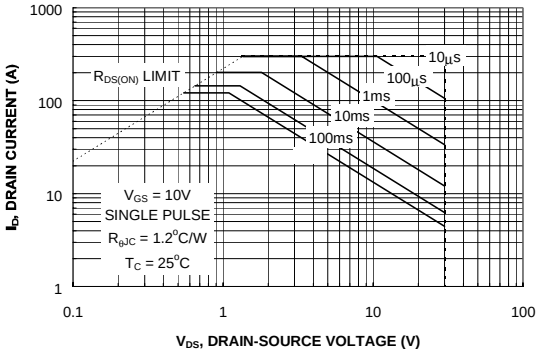


Figure 9. Maximum Safe Operating Area.

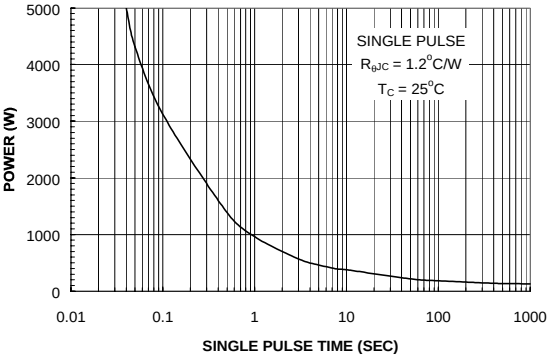


Figure 10. Single Pulse Maximum Power Dissipation.

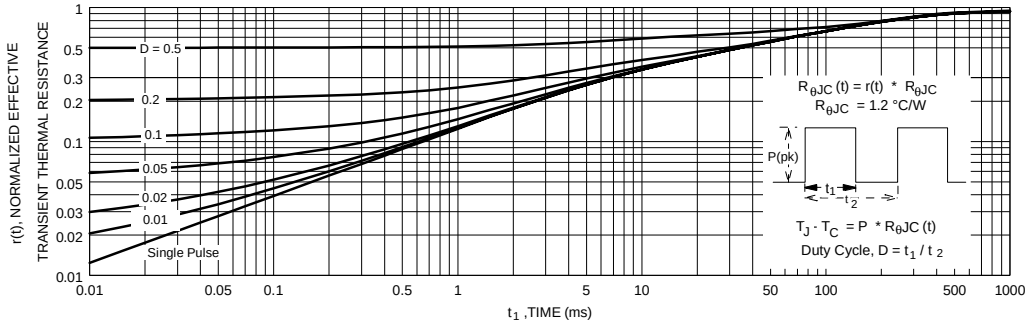


Figure 11. Transient Thermal Response Curve.

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

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