March 1998

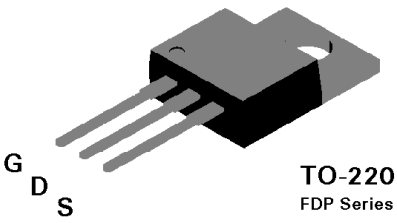
FDP4030L / FDB4030L
N-Channel Logic Level Enhancement Mode Field Effect Transistor

General Description

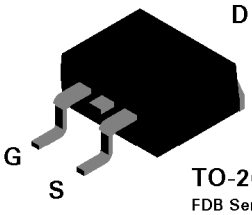
These N-Channel enhancement mode power field effect transistors are produced using Fairchild's proprietary, high cell density, DMOS technology. This very high density process has been especially tailored to minimize on-state resistance and provide superior switching performance. These devices are particularly suited for low voltage applications such as DC/DC converters and other battery powered circuits where fast switching, low in-line power loss, and resistance to transients are needed.

Features

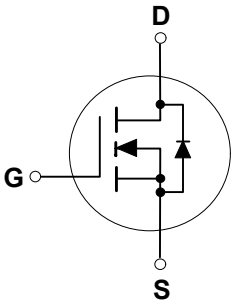
- 20 A, 30 V. $R_{DS(ON)}$ = 0.035 Ω @ V_{GS}=10 V
  $R_{DS(ON)}$ = 0.055 Ω @ V_{GS}=4.5V.
- Critical DC electrical parameters specified at elevated temperature.
- Rugged internal source-drain diode can eliminate the need for an external Zener diode transient suppressor.
- High density cell design for 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	FDP4030L	FDB4030L	Units
V_{DSS}	Drain-Source Voltage	30		V
V_{GSS}	Gate-Source Voltage	±20		V
I_D	Drain Current - Continuous (Note 1)	20		A
	- Pulsed (Note 1)	60		
P_D	Total Power Dissipation @ T_C = 25°C	37.5		W
	Derate above 25°C	0.25		W/°C
T_J,T_{STG}	Operating and Storage Temperature Range	-65 to 175		°C
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	275		°C
THERMAL CHARACTERISTICS				
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	4		°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62.5		°C/W

Electrical Characteristics (T_C = 25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
DRAIN-SOURCE AVALANCHE RATINGS (Note 1)						
OFF CHARACTERISTICS						
W_{DSS}	Single Pulse Drain-Source Avalanche Energy	V_{DD} = 15 V, I_D = 7 A			50	mJ
I_{AR}	Maximum Drain-Source Avalanche Current				7	A
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 µA	30			V
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	I_D = 250 µA, Referenced to 25°C		33		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 24 V, V_{GS} = 0 V			10	µA
		T_J = 125°C			1	mA
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 1)						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 µA	1	1.6	2	V
$\Delta V_{GS(th)}/\Delta T_J$	Gate Threshold Voltage Temp. Coefficient	I_D = 250 µA, Referenced to 25°C		-4.1		mV/°C
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS} = 10 V, I_D = 10 A		0.025	0.035	Ω
		T_J = 125°C		0.048	0.06	
		V_{GS} = 10 V, I_D = 4.5 A		0.046	0.055	
$I_{D(on)}$	On-State Drain Current	V_{GS} = 10 V, V_{DS} = 10 V	30			A
g_{FS}	Forward Transconductance	V_{DS} = 10 V, I_D = 10 A		11		S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input Capacitance	V_{DS} = 15 V, V_{GS} = 0 V, f = 1.0 MHz		365		pF
C_{oss}	Output Capacitance			210		pF
C_{rss}	Reverse Transfer Capacitance			70		pF
SWITCHING CHARACTERISTICS (Note 1)						
$t_{D(on)}$	Turn - On Delay Time	V_{DD} = 15 V, I_D = 10 A, V_{GS} = 10 V, R_{GEN} = 10 Ω		8	15	nS
t_r	Turn - On Rise Time			8	15	nS
$t_{D(off)}$	Turn - Off Delay Time			20	40	nS
t_f	Turn - Off Fall Time			10	20	nS
Q_g	Total Gate Charge	V_{DS} = 24 V, I_D = 10 A, V_{GS} = 10 V		13	18	nC
Q_{gs}	Gate-Source Charge			2		nC
Q_{gd}	Gate-Drain Charge			4		nC
DRAIN-SOURCE DIODE CHARACTERISTICS						
I_S	Maximum Continuos Drain-Source Diode Forward Current				20	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current				60	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 10 A (Note 1)		1.12	1.3	V
		T_J = 125°C		1.08	1.2	

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

Typical Electrical Characteristics

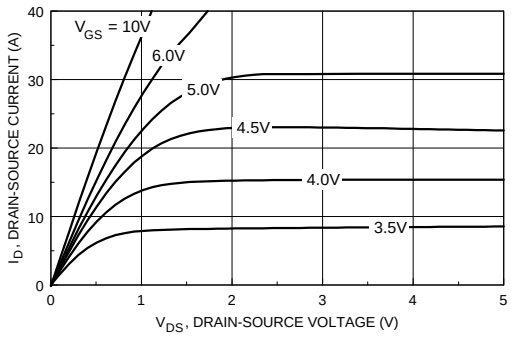


Figure 1. On-Region Characteristics.

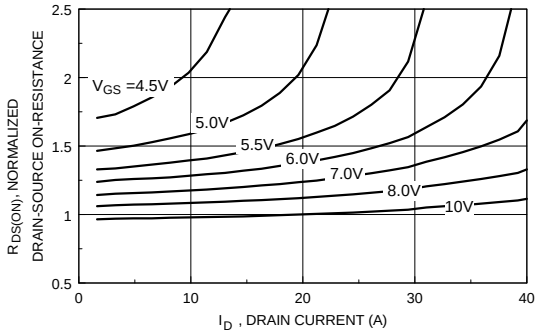


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

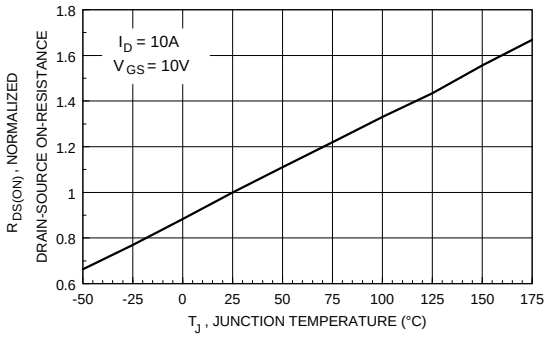


Figure 3. On-Resistance Variation with Temperature.

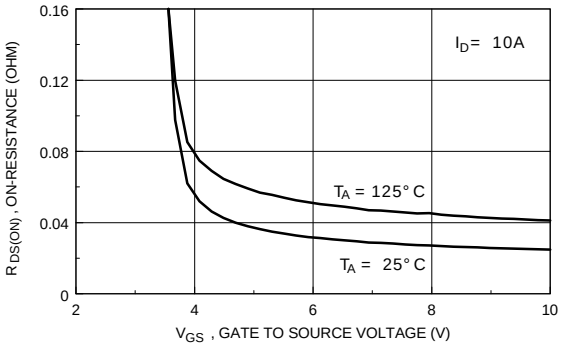


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

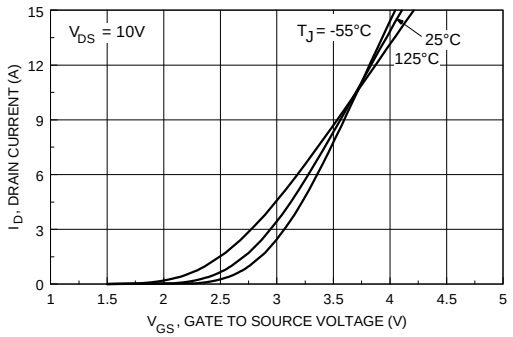


Figure 5. Transfer Characteristics.

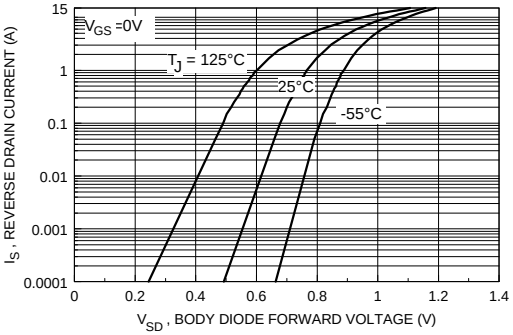


Figure 6 . Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Electrical Characteristics (continued)

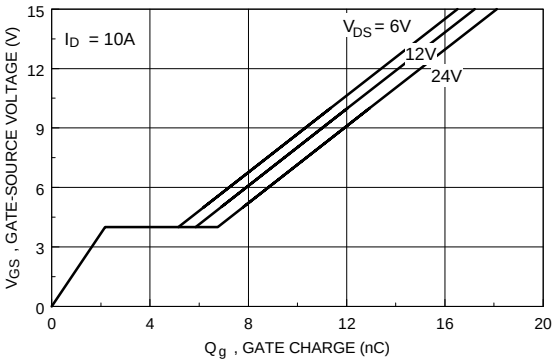


Figure 7. Gate Charge Characteristics.

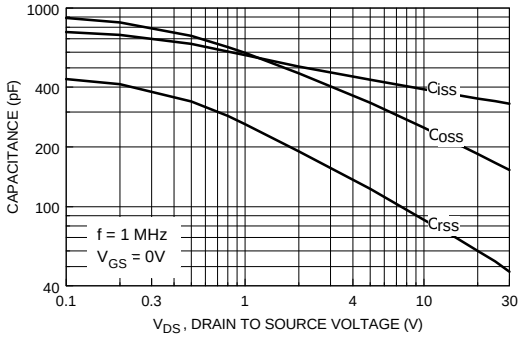


Figure 8. Capacitance Characteristics.

EFFECTIVE

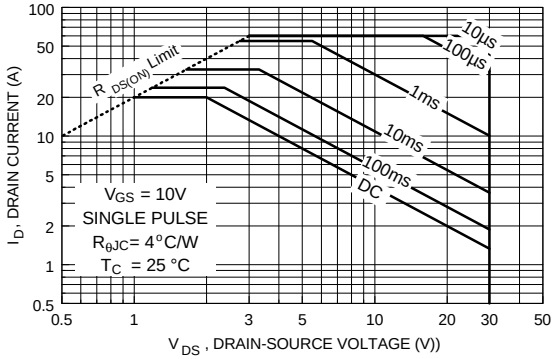


Figure 9. Maximum Safe Operating Area.

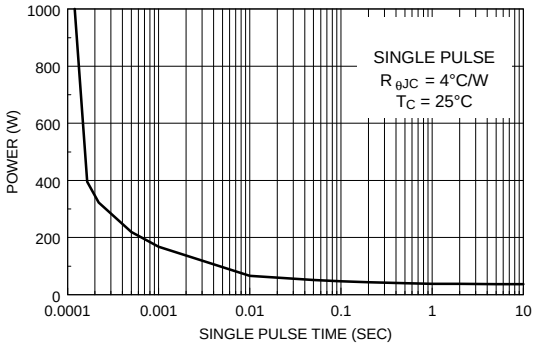


Figure 10. Single Pulse Maximum Power Dissipation.

NORMALIZED

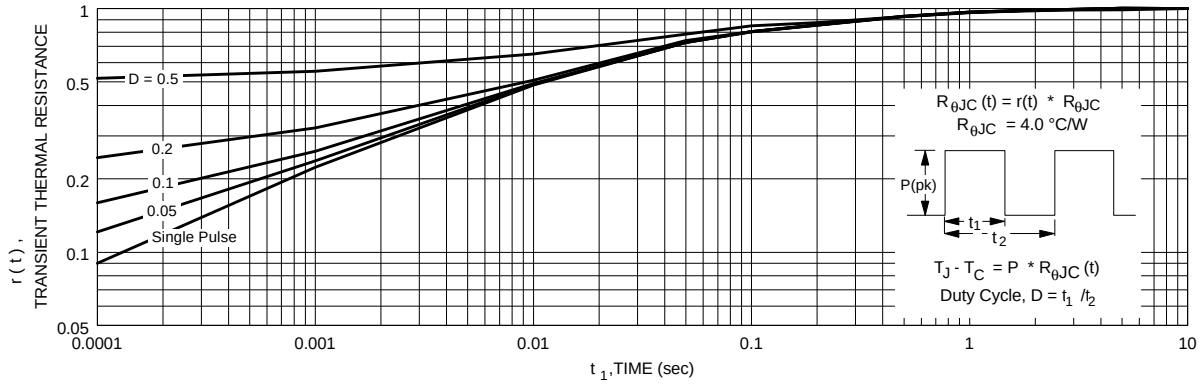


Figure 11. Transient Thermal Response Curve.

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