



March 1998

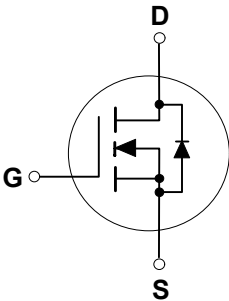
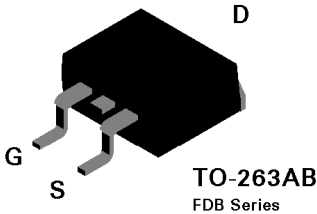
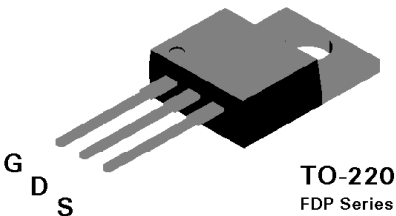
FDP4030L / FDB4030L
N-Channel Logic Level Enhancement Mode Field Effect Transistor

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. $R_{DS(ON)} = 0.035 \Omega @ V_{GS}=10 V$
 $R_{DS(ON)} = 0.055 \Omega @ V_{GS}=4.5V$.
- 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.



Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ 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	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62.5	$^\circ\text{C/W}$

Electrical Characteristics ($T_c = 25^\circ\text{C}$ 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	$V_{DD} = 15\text{ V}$, $I_D = 7\text{ A}$			50	mJ
I_{AR}	Maximum Drain-Source Avalanche Current				7	A
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$	30			V
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	$I_D = 250\text{ }\mu\text{A}$, Referenced to 25°C		33		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 24\text{ V}$, $V_{GS} = 0\text{ V}$			10	μA
		$T_J = 125^\circ\text{C}$			1	mA
I_{GSSF}	Gate - Body Leakage, Forward	$V_{GS} = 20\text{ V}$, $V_{DS} = 0\text{ V}$			100	nA
I_{GSSR}	Gate - Body Leakage, Reverse	$V_{GS} = -20\text{ V}$, $V_{DS} = 0\text{ V}$			-100	nA
ON CHARACTERISTICS (Note 1)						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	1	1.6	2	V
$\Delta V_{GS(th)}/\Delta T_J$	Gate Threshold Voltage Temp. Coefficient	$I_D = 250\text{ }\mu\text{A}$, Referenced to 25°C		-4.1		mV/ $^\circ\text{C}$
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}$, $I_D = 10\text{ A}$		0.025	0.035	Ω
		$T_J = 125^\circ\text{C}$		0.048	0.06	
		$V_{GS} = 10\text{ V}$, $I_D = 4.5\text{ A}$		0.046	0.055	
$I_{D(on)}$	On-State Drain Current	$V_{GS} = 10\text{ V}$, $V_{DS} = 10\text{ V}$	30			A
g_{FS}	Forward Transconductance	$V_{DS} = 10\text{ V}$, $I_D = 10\text{ A}$		11		S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input Capacitance	$V_{DS} = 15\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1.0\text{ MHz}$		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	$V_{DD} = 15\text{ V}$, $I_D = 10\text{ A}$, $V_{GS} = 10\text{ V}$, $R_{GEN} = 10\text{ }\Omega$		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	$V_{DS} = 24\text{ V}$ $I_D = 10\text{ A}$, $V_{GS} = 10\text{ V}$		13	18	nC
Q_{gs}	Gate-Source Charge			2		nC
Q_{gd}	Gate-Drain Charge			4		nC
DRAIN-SOURCE DIODE CHARACTERISTICS						
I_S	Maximum Continuous 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	$V_{GS} = 0\text{ V}$, $I_S = 10\text{ A}$ (Note 1)		1.12	1.3	V
		$T_J = 125^\circ\text{C}$		1.08	1.2	

Note:

1. Pulse Test: Pulse Width $\leq 300\text{ }\mu\text{s}$, Duty Cycle $\leq 2.0\%$.

Typical Electrical Characteristics

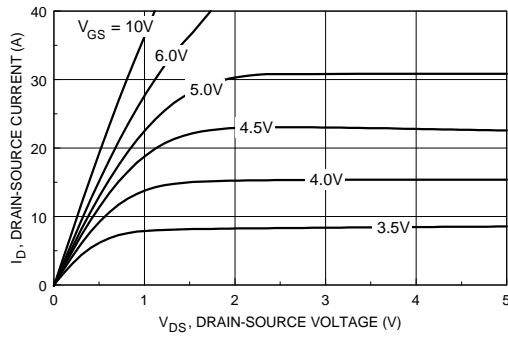


Figure 1. On-Region Characteristics.

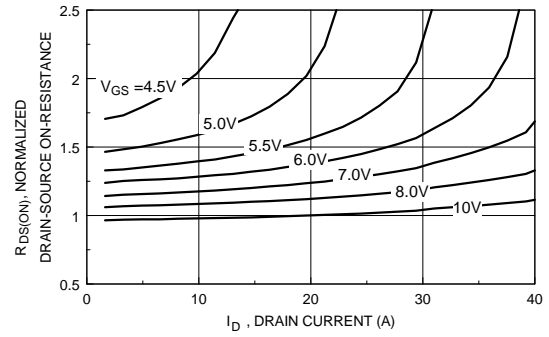


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

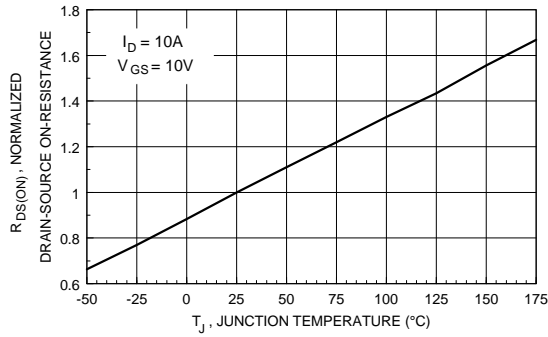


Figure 3. On-Resistance Variation with Temperature.

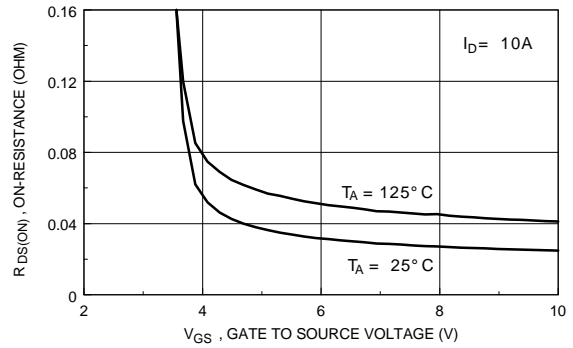


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

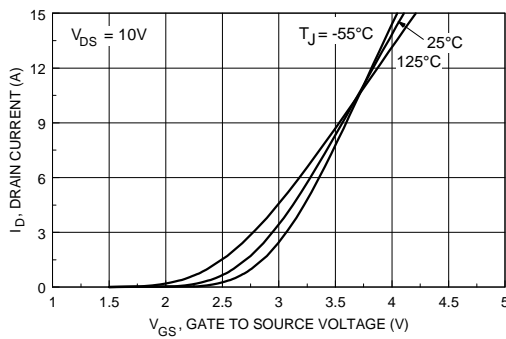


Figure 5. Transfer Characteristics.

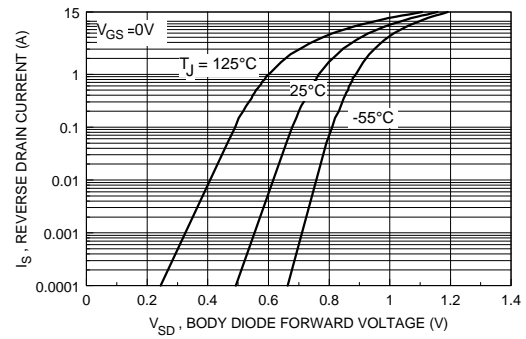


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Electrical Characteristics (continued)

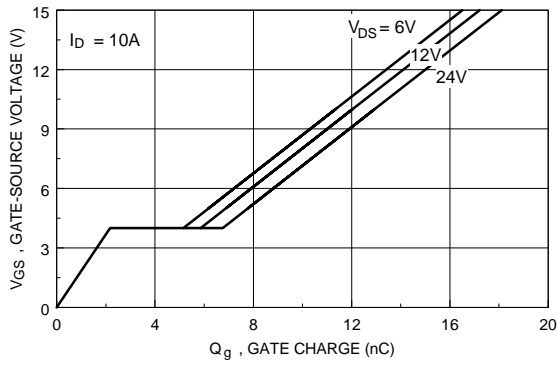


Figure 7. Gate Charge Characteristics.

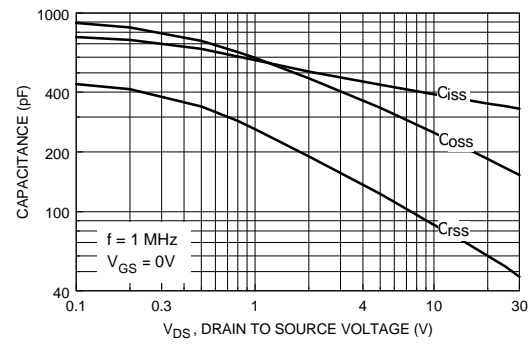


Figure 8. Capacitance Characteristics.

EFFECTIVE

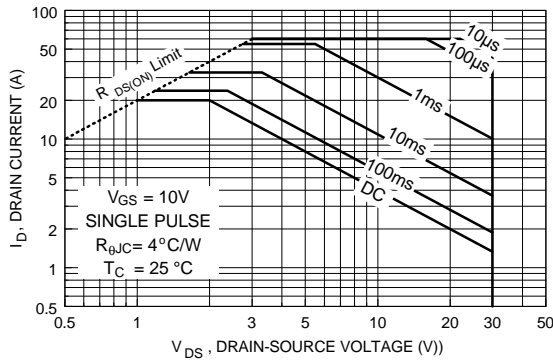


Figure 9. Maximum Safe Operating Area.

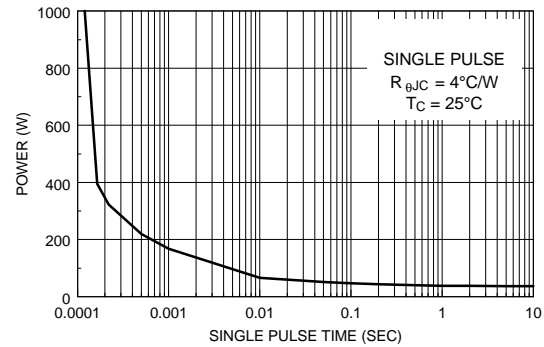


Figure 10. Single Pulse Maximum Power Dissipation.

NORMALIZED

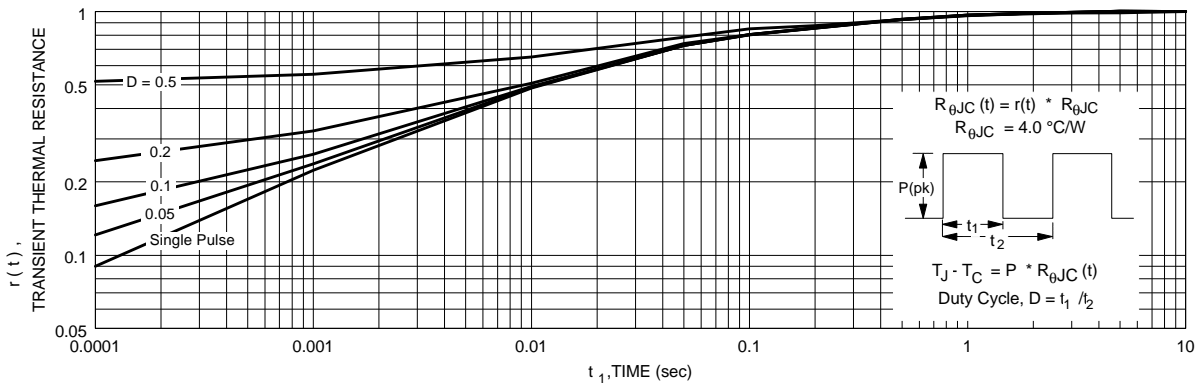


Figure 11. Transient Thermal Response Curve.

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