



April 1998

FDP603AL / FDB603AL

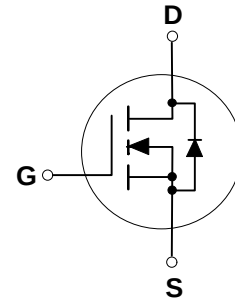
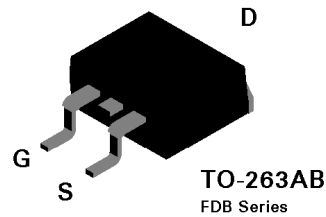
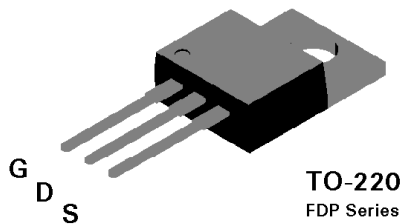
N-Channel Logic Level Enhancement Mode Field Effect Transistor

General Description

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

Features

- 33 A, 30 V. $R_{DS(ON)} = 0.022 \Omega @ V_{GS}=10 \text{ V}$
 $R_{DS(ON)} = 0.036 \Omega @ V_{GS}=4.5 \text{ V}$.
- 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 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	FDP603AL	FDB603AL	Units
V _{DSS}	Drain-Source Voltage	30		V
V _{GSS}	Gate-Source Voltage - Continuous	±20		V
I _D	Drain Current - Continuous	33		A

THERMAL CHARACTERISTICS

$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	3	$^\circ\text{C/W}$
$R_{\theta JA}$	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)						
W_{DSS}	Single Pulse Drain-Source Avalanche Energy	$V_{DD} = 15\text{ V}$, $I_D = 12\text{ A}$			100	mJ
I_{AR}	Maximum Drain-Source Avalanche Current				12	A
OFF CHARACTERISTICS						
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 $25\text{ }^\circ\text{C}$		32		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 24\text{ V}$, $V_{GS} = 0\text{ V}$			10	μA
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	1.8	3	V
$\Delta V_{GS(th)}/\Delta T_J$	Gate Threshold Voltage Temp.Coefficient	$I_D = 250\text{ }\mu\text{A}$, Referenced to $25\text{ }^\circ\text{C}$		-4.5		mV/ $^\circ\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}$, $I_D = 25\text{ A}$		0.018	0.022	Ω
		$T_J = 125\text{ }^\circ\text{C}$		0.026	0.035	
		$V_{GS} = 4.5\text{ V}$, $I_D = 10\text{ A}$		0.03	0.036	
$I_{D(on)}$	On-State Drain Current	$V_{GS} = 10\text{ V}$, $V_{DS} = 10\text{ V}$	60			A
$I_{D(on)}$	On-State Drain Current	$V_{GS} = 4.5\text{ V}$, $V_{DS} = 10\text{ V}$	15			A
g_{FS}	Forward Transconductance	$V_{DS} = 10\text{ V}$, $I_D = 25\text{ A}$		24		S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input Capacitance	$V_{DS} = 15\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1.0\text{ MHz}$		670		pF
C_{oss}	Output Capacitance			345		pF
C_{rss}	Reverse Transfer Capacitance			95		pF
SWITCHING CHARACTERISTICS (Note 1)						
$t_{D(on)}$	Turn - On Delay Time	$V_{DD} = 15\text{ V}$, $I_D = 25\text{ A}$ $V_{GS} = 10\text{ V}$, $R_{GEN} = 24\text{ }\Omega$		8	16	nS
t_r	Turn - On Rise Time			102	140	nS
$t_{D(off)}$	Turn - Off Delay Time			20	36	nS
t_f	Turn - Off Fall Time			80	115	nS
Q_{gi}	Total Gate Charge	$V_{DS} = 10\text{ V}$ $I_D = 25\text{ A}$, $V_{GS} = 10\text{ V}$		19	26	nC
Q_{gis}	Gate-Source Charge			3.5		nC
Q_{gfd}	Gate-Drain Charge			5.5		nC
DRAIN-SOURCE DIODE CHARACTERISTICS						
I_S	Maximum Continuous Drain-Source Diode Forward Current				25	A
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}$, $I_S = 25\text{ A}$ (Note 1)		1	1.3	V
		$T_J = 125^\circ\text{C}$		0.85	1.1	

Note

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

Typical Electrical Characteristics

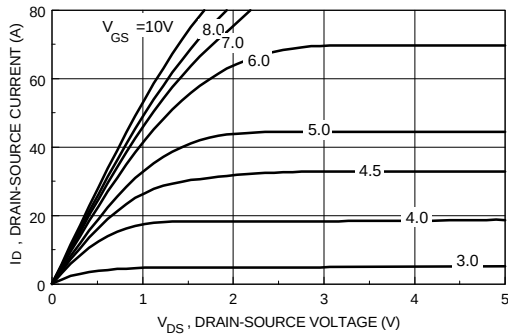


Figure 1. On-Region Characteristics.

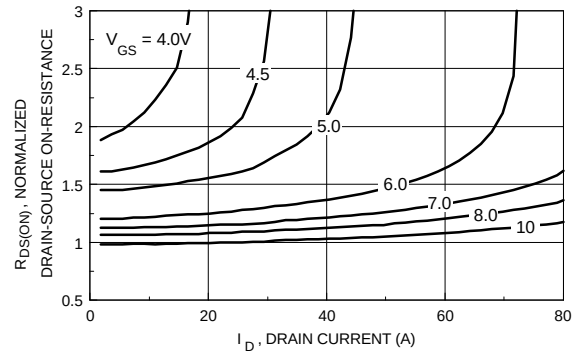


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

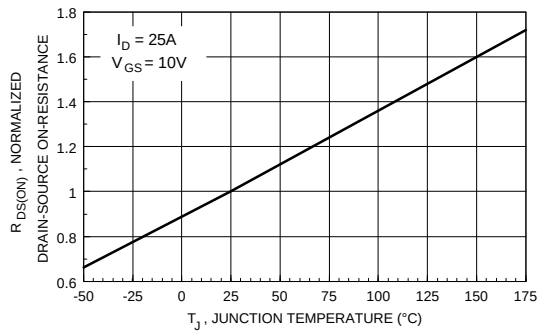


Figure 3. On-Resistance Variation with Temperature.

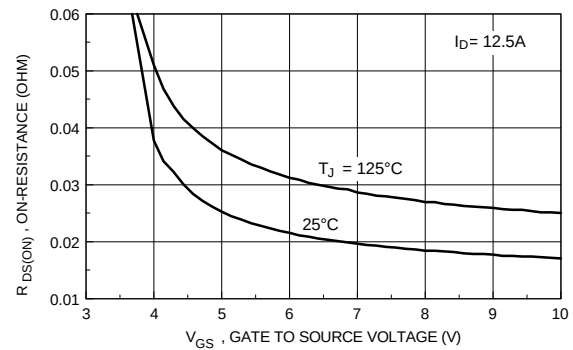


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

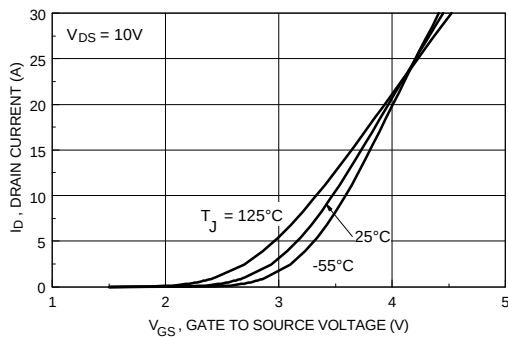


Figure 5. Transfer Characteristics.

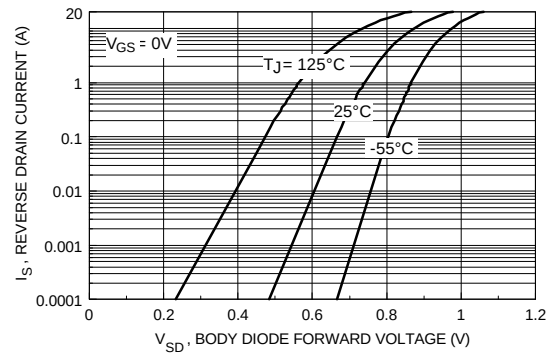


Figure 6 . Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Electrical Characteristics (continued)

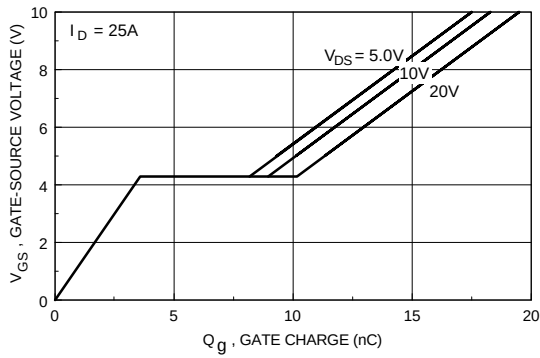


Figure 7. Gate Charge Characteristics.

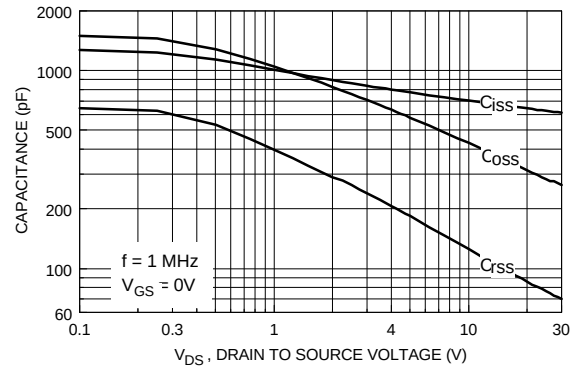


Figure 8. Capacitance Characteristics.

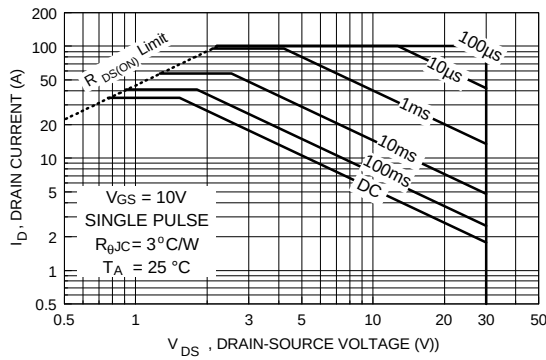


Figure 9. Maximum Safe Operating Area.

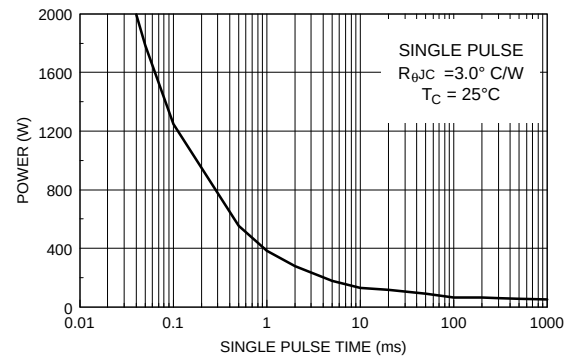


Figure 10. Single Pulse Maximum Power Dissipation.

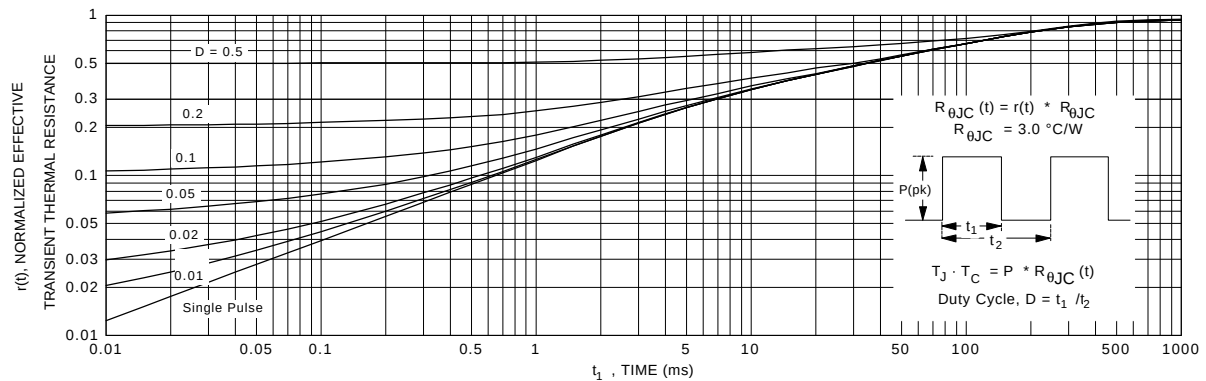


Figure 11. Transient Thermal Response Curve.