FAIRCHILD SEMICONDUCTOR TM

April 2001
PRELIMINARY

FDP6021P/FDB6021P

20V P-Channel 1.8V Specified PowerTrench® MOSFET

General Description

This P-Channel power MOSFET uses Fairchild's low voltage PowerTrench process. It has been optimized for power management applications.

Applications

- Battery management
- Load switch
- Voltage regulator

Features

- –28 A, –20 V. $R_{DS(ON)}$ = 30 mΩ @ V_{GS} = 4.5 V
  $R_{DS(ON)}$ = 40 mΩ @ V_{GS} = 2.5 V
  $R_{DS(ON)}$ = 65 mΩ @ V_{GS} = 1.8 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

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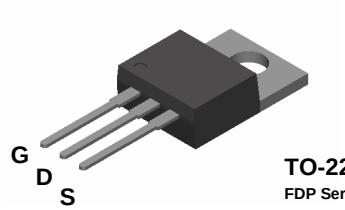
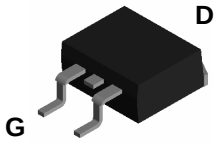
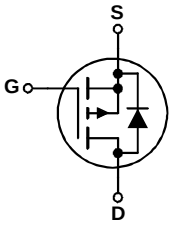


TO-220
FDP Series



TO-263AB
FDB Series



Absolute Maximum Ratings

T_A=25°C unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{DSS}	Drain-Source Voltage		–20	V
V_{GSS}	Gate-Source Voltage		± 8	V
I_D	Drain Current – Continuous	(Note 1)	–28	A
	– Pulsed	(Note 1)	–80	
P_D	Total Power Dissipation @ T_C = 25°C		37	W
	Derate above 25°C		0.25	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	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
FDP6021P	FDP6021P	Tube	n/a	45
FDB6021P	FDB6021P	13"	24mm	800 units

Electrical Characteristics

T_A = 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	–20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = –250 µA,Referenced to 25°C		–16		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = –16 V, V_{GS} = 0 V			–1	µA
I_{GSSF}	Gate–Body Leakage, Forward	V_{GS} = 8 V, V_{DS} = 0 V			100	nA
I_{GSSR}	Gate–Body Leakage, Reverse	V_{GS} = –8 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	–0.4	–0.7	–1.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = –250 µA,Referenced to 25°C		3		mV/°C
$R_{DS(on)}$	Static Drain–Source On–Resistance	V_{GS} = –4.5 V, I_D = –14 A V_{GS} = –2.5 V, I_D = –12 A V_{GS} = –1.8 V, I_D = –10 A V_{GS}= –4.5V, I_D = –14 A, T_J=125°C		24 31 50 30	30 40 65 42	mΩ
$I_{D(on)}$	On–State Drain Current	V_{GS} = –4.5 V, V_{DS} = –5 V	–40			A
g_{FS}	Forward Transconductance	V_{DS} = –5 V, I_D = –14 A		33		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = –10 V, V_{GS} = 0 V, f = 1.0 MHz		1890		pF
C_{oss}	Output Capacitance			302		pF
C_{rss}	Reverse Transfer Capacitance			124		pF
Switching Characteristics (Note 2)						
$t_{d(on)}$	Turn–On Delay Time	V_{DD} = –10 V, I_D = –1 A, V_{GS} = –4.5 V, R_{GEN} = 6 Ω		13	23	ns
t_r	Turn–On Rise Time			10	20	ns
$t_{d(off)}$	Turn–Off Delay Time			80	128	ns
t_f	Turn–Off Fall Time			50	80	ns
Q_g	Total Gate Charge	V_{DS} = –10 V, I_D = –14 A, V_{GS} = –4.5 V		20	28	nC
Q_{gs}	Gate–Source Charge			4		nC
Q_{gd}	Gate–Drain Charge			7		nC
Drain–Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain–Source Diode Forward Current				–28	A
V_{SD}	Drain–Source Diode Forward Voltage	V_{GS} = 0 V, I_S = –14 A		–0.9	–1.3	V

Notes:

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

2. TO-220 package is supplied in tube / rail @ 45 pieces per rail.

3. Calculated continuous current based on maximum allowable junction temperature. Actual maximum continuous current limited by package constraints to 75A

Typical Characteristics

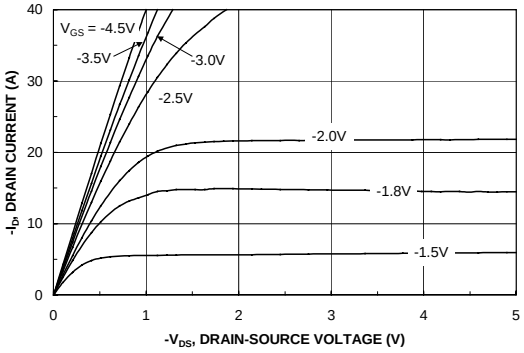


Figure 1. On-Region Characteristics.

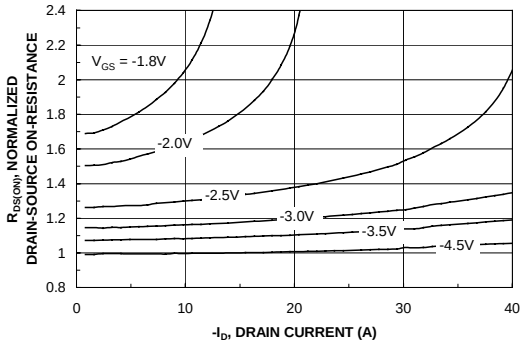


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

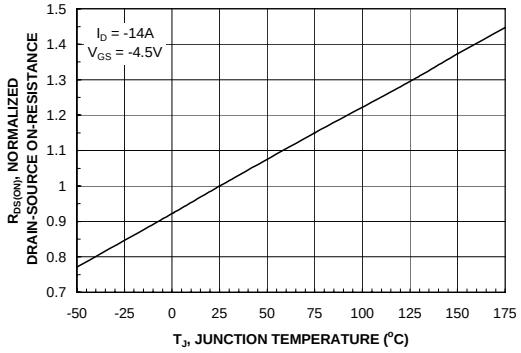


Figure 3. On-Resistance Variation withTemperature.

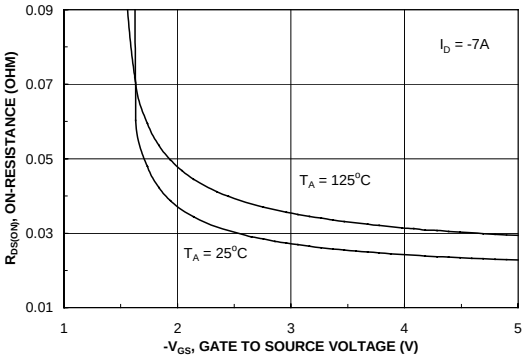


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

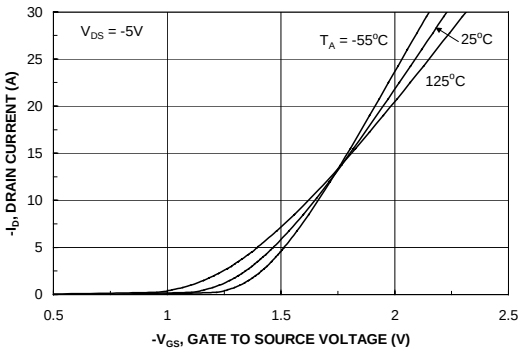


Figure 5. Transfer Characteristics.

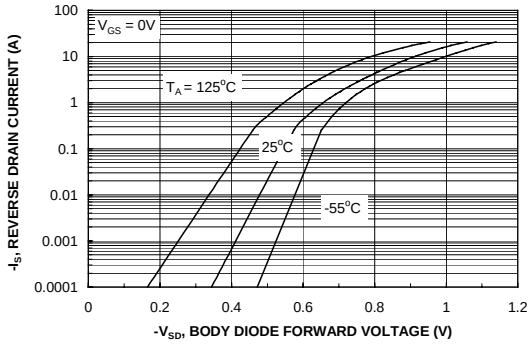


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics

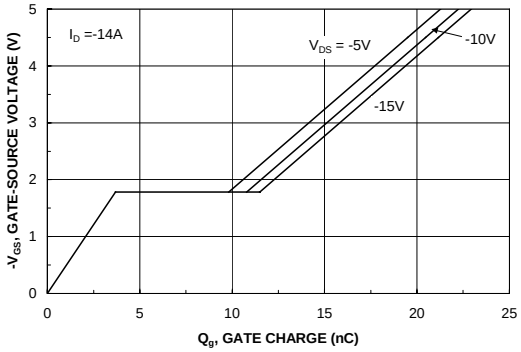


Figure 7. Gate Charge Characteristics.

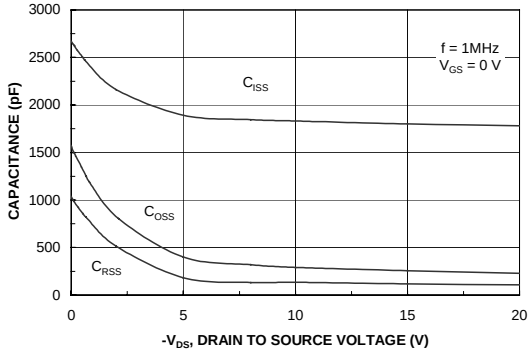


Figure 8. Capacitance Characteristics.

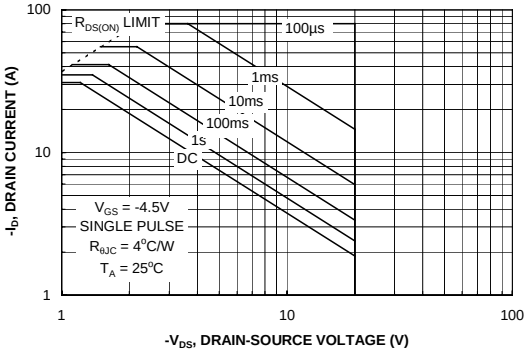


Figure 9. Maximum Safe Operating Area.

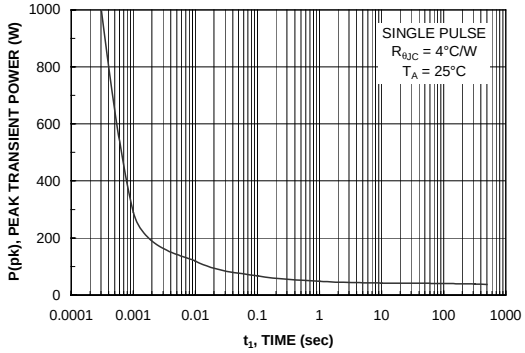


Figure 10. Single Pulse Maximum Power Dissipation.

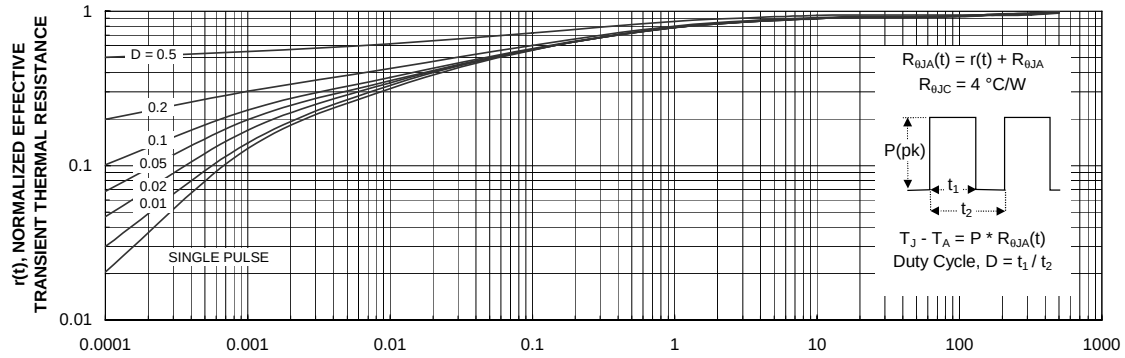


Figure 11. Transient Thermal Response Curve.

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