

# FDB6021P

## 20V P-Channel 1.8V Specified PowerTrench® MOSFET

### General Description

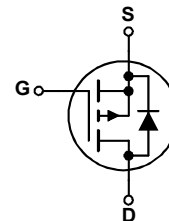
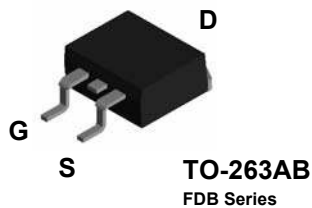
This P-Channel power MOSFET uses Fairchild's low voltage PowerTrench process. It has been optimized for power management applications.

### Applications

- Battery management
- Load switch
- Voltage regulator

### Features

- -28 A, -20 V.  $R_{DS(ON)} = 30\text{ m}\Omega @ V_{GS} = 4.5\text{ V}$   
 $R_{DS(ON)} = 40\text{ m}\Omega @ V_{GS} = 2.5\text{ V}$   
 $R_{DS(ON)} = 65\text{ m}\Omega @ V_{GS} = 1.8\text{ V}$
- Critical DC electrical parameters specified at elevated temperature
- High performance trench technology for extremely low  $R_{DS(ON)}$
- 175°C maximum junction temperature rating



### Absolute Maximum Ratings T<sub>A</sub>=25°C unless otherwise noted

Symbol	Parameter	Ratings	Units
V <sub>DSS</sub>	Drain-Source Voltage	-20	V
V <sub>GSS</sub>	Gate-Source Voltage	± 8	V
I <sub>D</sub>	Drain Current – Continuous (Note 1)	-28	A
	– Pulsed (Note 1)	-80	
P <sub>D</sub>	Total Power Dissipation @ T <sub>C</sub> = 25°C	37	W
	Derate above 25°C	0.25	W°C
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Junction Temperature Range	-65 to +175	°C

### Thermal Characteristics

R <sub>θJC</sub>	Thermal Resistance, Junction-to-Case	4	°C/W
R <sub>θJA</sub>	Thermal Resistance, Junction-to-Ambient	62.5	°C/W

### Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
FDB6021P	FDB6021P	13"	24mm	800 units

### Electrical Characteristics

$T_A = 25^\circ\text{C}$  unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
<b>Off Characteristics</b>						
$BV_{DSS}$	Drain–Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = -250\ \mu\text{A}$	-20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = -250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$		-16		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = -16\text{ V}, V_{GS} = 0\text{ V}$			-1	$\mu\text{A}$
$I_{GSSF}$	Gate–Body Leakage, Forward	$V_{GS} = 8\text{ V}, V_{DS} = 0\text{ V}$			100	nA
$I_{GSSR}$	Gate–Body Leakage, Reverse	$V_{GS} = -8\text{ V}, V_{DS} = 0\text{ V}$			-100	nA
<b>On Characteristics (Note 2)</b>						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = -250\ \mu\text{A}$	-0.4	-0.7	-1.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_D = -250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$		3		mV/ $^\circ\text{C}$
$R_{DS(on)}$	Static Drain–Source On–Resistance	$V_{GS} = -4.5\text{ V}, I_D = -14\text{ A}$ $V_{GS} = -2.5\text{ V}, I_D = -12\text{ A}$ $V_{GS} = -1.8\text{ V}, I_D = -10\text{ A}$ $V_{GS} = -4.5\text{ V}, I_D = -14\text{ A}, T_J = 125^\circ\text{C}$		24 31 50 30	30 40 65 42	m $\Omega$
$I_{D(on)}$	On–State Drain Current	$V_{GS} = -4.5\text{ V}, V_{DS} = -5\text{ V}$	-40			A
$g_{FS}$	Forward Transconductance	$V_{DS} = -5\text{ V}, I_D = -14\text{ A}$		33		S
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$		1890		pF
$C_{oss}$	Output Capacitance			302		pF
$C_{rss}$	Reverse Transfer Capacitance			124		pF
<b>Switching Characteristics (Note 2)</b>						
$t_{d(on)}$	Turn–On Delay Time	$V_{DD} = -10\text{ V}, I_D = -1\text{ A},$ $V_{GS} = -4.5\text{ V}, R_{GEN} = 6\ \Omega$		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	$V_{DS} = -10\text{ V}, I_D = -14\text{ A},$ $V_{GS} = -4.5\text{ V}$		20	28	nC
$Q_{gs}$	Gate–Source Charge			4		nC
$Q_{gd}$	Gate–Drain Charge			7		nC
<b>Drain–Source Diode Characteristics and Maximum Ratings</b>						
$I_S$	Maximum Continuous Drain–Source Diode Forward Current				-28	A
$V_{SD}$	Drain–Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = -14\text{ A}$		-0.9	-1.3	V

**Notes:**

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

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

### Typical Characteristics

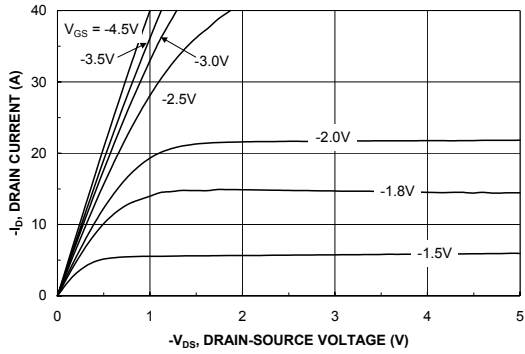


Figure 1. On-Region Characteristics.

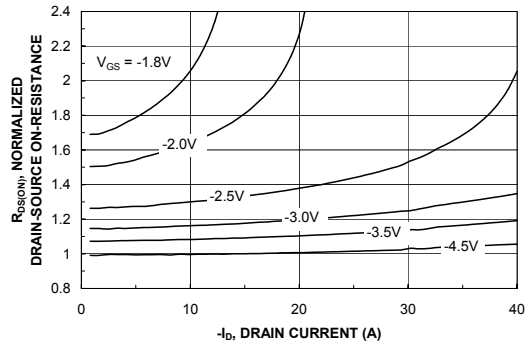


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

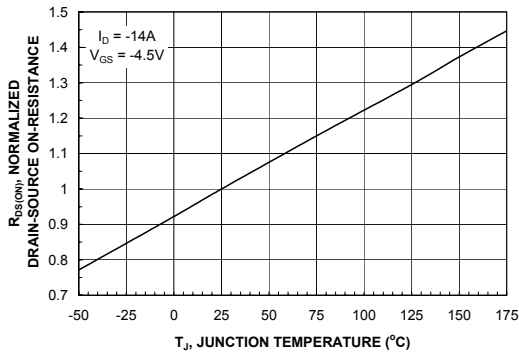


Figure 3. On-Resistance Variation with Temperature.

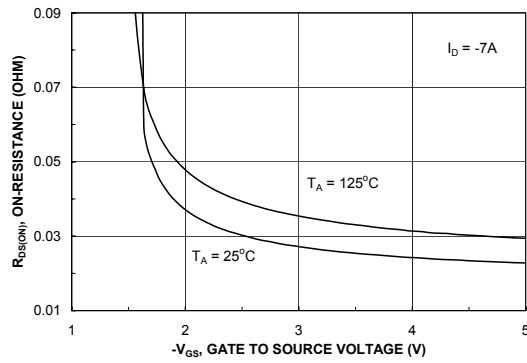


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

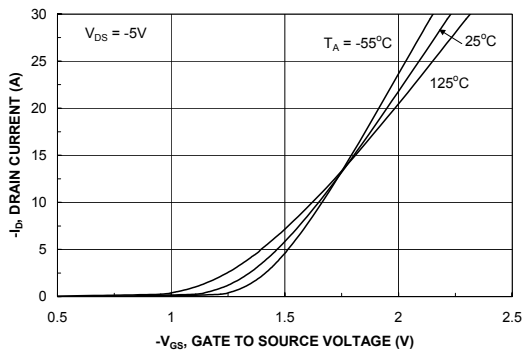


Figure 5. Transfer Characteristics.

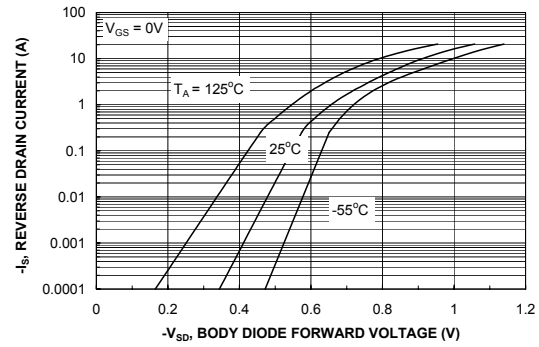


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

## Typical Characteristics

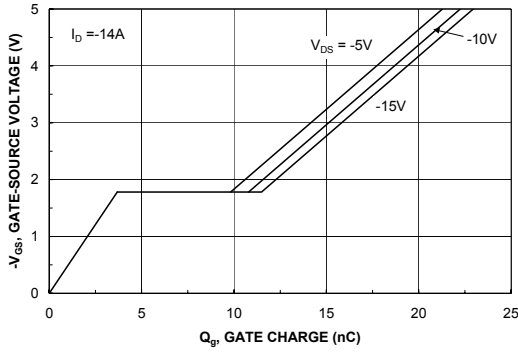


Figure 7. Gate Charge Characteristics.

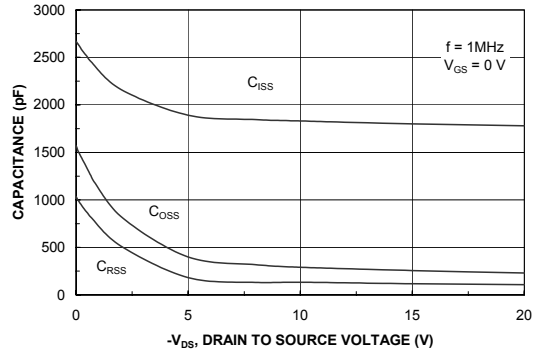


Figure 8. Capacitance Characteristics.

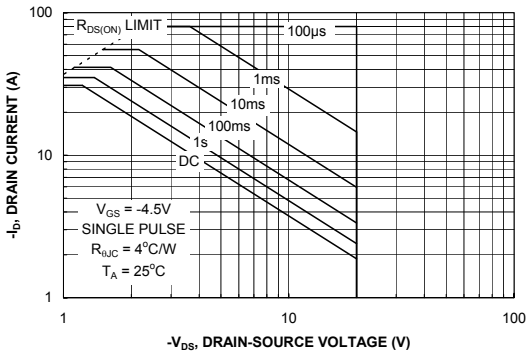


Figure 9. Maximum Safe Operating Area.

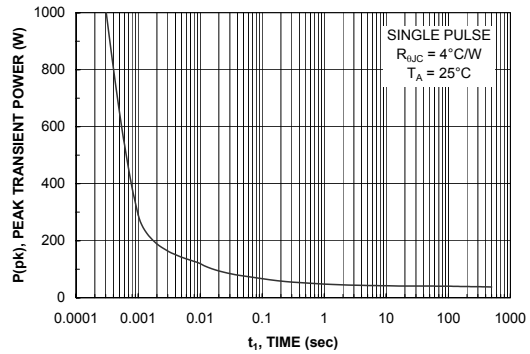


Figure 10. Single Pulse Maximum Power Dissipation.

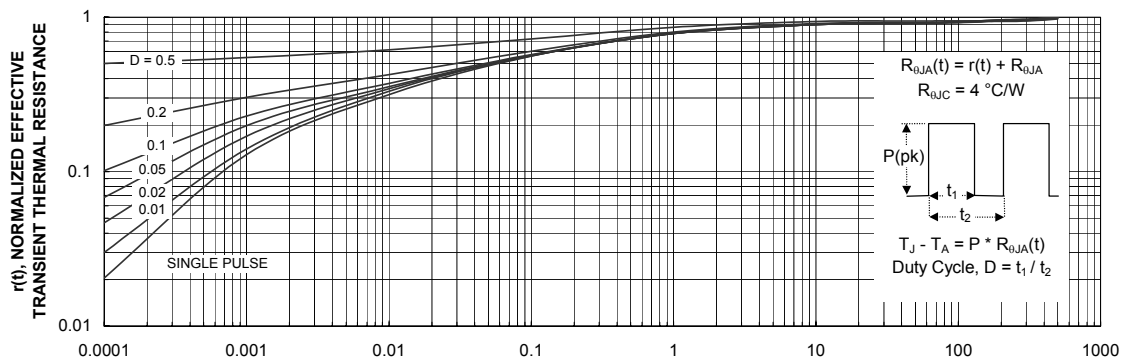


Figure 11. Transient Thermal Response Curve.

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EnSigna™	ImpliedDisconnect™	OCXPro™	SILENT SWITCHER®	UltraFET®
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