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FQP27P06
P-Channel QFET® MOSFET
- 60 V, - 27 A, 70 mΩ

Description
This P-Channel enhancement mode power MOSFET is produced using Fairchild Semiconductor®’s proprietary planar stripe and DMOS technology. This advanced MOSFET technology has been especially tailored to reduce on-state resistance, and to provide superior switching performance and high avalanche energy strength. These devices are suitable for switched mode power supplies, audio amplifier, DC motor control, and variable switching power applications.

Features
- 27 A, - 60 V, \( R_{DS(on)} = 70 \, \text{mΩ} \) (Max.) @ \( V_{GS} = -10 \, \text{V} \), \( I_D = -13.5 \, \text{A} \)
- Low Gate Charge (Typ. 33 nC)
- Low Crss (Typ. 120 pF)
- 100% Avalanche Tested
- 175°C Maximum Junction Temperature Rating

Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>FQP27P06 Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V_{DSS} )</td>
<td>Drain-Source Voltage</td>
<td>-60 V</td>
</tr>
<tr>
<td>( I_D )</td>
<td>Drain Current</td>
<td>-27 A</td>
</tr>
<tr>
<td></td>
<td>- Continuous (( T_C = 25^\circ \text{C} ))</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Continuous (( T_C = 100^\circ \text{C} ))</td>
<td>-19.1 A</td>
</tr>
<tr>
<td>( I_{DM} )</td>
<td>Drain Current - Pulsed</td>
<td>-108 A</td>
</tr>
<tr>
<td>( V_{GSS} )</td>
<td>Gate-Source Voltage</td>
<td>±25 V</td>
</tr>
<tr>
<td>( E_{AS} )</td>
<td>Single Pulsed Avalanche Energy (Note 2)</td>
<td>560 mJ</td>
</tr>
<tr>
<td>( I_{AR} )</td>
<td>Avalanche Current (Note 1)</td>
<td>-27 A</td>
</tr>
<tr>
<td>( E_{AR} )</td>
<td>Repetitive Avalanche Energy (Note 1)</td>
<td>12 mJ</td>
</tr>
<tr>
<td>( dV/dt )</td>
<td>Peak Diode Recovery ( dV/dt ) (Note 3)</td>
<td>-7.0 V/ns</td>
</tr>
<tr>
<td>( P_D )</td>
<td>Power Dissipation (( T_C = 25^\circ \text{C} ))</td>
<td>120 W</td>
</tr>
<tr>
<td></td>
<td>- Derate above 25°C</td>
<td>0.8 W/°C</td>
</tr>
<tr>
<td>( T_J, T_{STG} )</td>
<td>Operating and Storage Temperature Range</td>
<td>-55 to +175 °C</td>
</tr>
<tr>
<td>( T_L )</td>
<td>Maximum lead temperature for soldering purposes, 1/8\” from case for 5 seconds</td>
<td>300 °C</td>
</tr>
</tbody>
</table>

Thermal Characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>FQP27P06 Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>( R_{JUC} )</td>
<td>Thermal Resistance, Junction-to-Case, Max.</td>
<td>1.25 °C/W</td>
</tr>
<tr>
<td>( R_{JCS} )</td>
<td>Thermal Resistance, Case-to-Sink, Typ.</td>
<td>0.5 °C/W</td>
</tr>
<tr>
<td>( R_{JUA} )</td>
<td>Thermal Resistance, Junction-to-Ambient, Max.</td>
<td>62.5 °C/W</td>
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### Electrical Characteristics

TC = 25°C unless otherwise noted

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
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<tr>
<td>BVDSS</td>
<td>Drain-Source Breakdown Voltage</td>
</tr>
<tr>
<td>ΔBVDD / ΔTJ</td>
<td>Breakdown Voltage Temperature Coefficient</td>
</tr>
<tr>
<td>IDSS</td>
<td>Zero Gate Voltage Drain Current</td>
</tr>
<tr>
<td>ISDF</td>
<td>Gate-Body Leakage Current, Forward</td>
</tr>
<tr>
<td>ISDR</td>
<td>Gate-Body Leakage Current, Reverse</td>
</tr>
<tr>
<td>VGS(th)</td>
<td>Gate Threshold Voltage</td>
</tr>
<tr>
<td>RDS(on)</td>
<td>Static Drain-Source On-Resistance</td>
</tr>
<tr>
<td>gFS</td>
<td>Forward Transconductance</td>
</tr>
<tr>
<td>Ciss</td>
<td>Input Capacitance</td>
</tr>
<tr>
<td>Coss</td>
<td>Output Capacitance</td>
</tr>
<tr>
<td>Crss</td>
<td>Reverse Transfer Capacitance</td>
</tr>
<tr>
<td>tD(on)</td>
<td>Turn-On Delay Time</td>
</tr>
<tr>
<td>tR</td>
<td>Turn-On Rise Time</td>
</tr>
<tr>
<td>tD(off)</td>
<td>Turn-Off Delay Time</td>
</tr>
<tr>
<td>tf</td>
<td>Turn-Off Fall Time</td>
</tr>
<tr>
<td>Qg</td>
<td>Total Gate Charge</td>
</tr>
<tr>
<td>Qgs</td>
<td>Gate-Source Charge</td>
</tr>
<tr>
<td>Qgd</td>
<td>Gate-Drain Charge</td>
</tr>
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</table>

### Off Characteristics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>BVDSS</td>
<td>VGS = 0 V, ID = -250 μA</td>
<td>-60</td>
<td>--</td>
<td>--</td>
<td>V</td>
</tr>
<tr>
<td>ΔBVDD / ΔTJ</td>
<td>ID = -250 μA, Referenced to 25°C</td>
<td>--</td>
<td>-0.06</td>
<td>--</td>
<td>V/°C</td>
</tr>
<tr>
<td>IDSS</td>
<td>VDS = -60 V, VGS = 0 V</td>
<td>--</td>
<td>--</td>
<td>-1</td>
<td>μA</td>
</tr>
<tr>
<td>ISDF</td>
<td>VGS = -25 V, VDS = 0 V</td>
<td>--</td>
<td>--</td>
<td>-100</td>
<td>nA</td>
</tr>
<tr>
<td>ISDR</td>
<td>VGS = 25 V, VDS = 0 V</td>
<td>--</td>
<td>--</td>
<td>100</td>
<td>nA</td>
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</table>

### On Characteristics

<table>
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<tr>
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<th>Test Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>VGS(th)</td>
<td>VDS = VGS, ID = -250 μA</td>
<td>-2.0</td>
<td>--</td>
<td>-4.0</td>
<td>V</td>
</tr>
<tr>
<td>RDS(on)</td>
<td>VGS = -10 V, ID = -13.5 A</td>
<td>0.055</td>
<td>0.07</td>
<td>Ω</td>
<td></td>
</tr>
<tr>
<td>gFS</td>
<td>VDS = -30 V, ID = -13.5 A</td>
<td>12.4</td>
<td>--</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>Ciss</td>
<td>VDS = -25 V, VGS = 0 V, f = 1.0 MHz</td>
<td>--</td>
<td>1100</td>
<td>1400</td>
<td>pF</td>
</tr>
<tr>
<td>Coss</td>
<td>--</td>
<td>510</td>
<td>660</td>
<td>pF</td>
<td></td>
</tr>
<tr>
<td>Crss</td>
<td>--</td>
<td>120</td>
<td>155</td>
<td>pF</td>
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### Dynamic Characteristics

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<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ciss</td>
<td>VDS = -25 V, VGS = 0 V, f = 1.0 MHz</td>
<td>--</td>
<td>1100</td>
<td>1400</td>
<td>pF</td>
</tr>
<tr>
<td>gFS</td>
<td>VDS = -30 V, ID = -13.5 A, Rg = 25 Ω</td>
<td>--</td>
<td>18</td>
<td>45</td>
<td>ns</td>
</tr>
<tr>
<td>tD(on)</td>
<td>VDD = -30 V, ID = -13.5 A, Rg = 25 Ω</td>
<td>18</td>
<td>45</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>tR</td>
<td>--</td>
<td>185</td>
<td>380</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>tD(off)</td>
<td>VGS = -10 V, ID = -27 A, VDD = -48 V</td>
<td>30</td>
<td>70</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>tf</td>
<td>--</td>
<td>90</td>
<td>190</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Qg</td>
<td>VDS = -48 V, ID = -27 A, VGS = -10 V</td>
<td>33</td>
<td>43</td>
<td>nC</td>
<td></td>
</tr>
<tr>
<td>Qgs</td>
<td>--</td>
<td>6.8</td>
<td>--</td>
<td>nC</td>
<td></td>
</tr>
<tr>
<td>Qgd</td>
<td>--</td>
<td>18</td>
<td>--</td>
<td>nC</td>
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</tr>
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</table>

### Switching Characteristics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>IS</td>
<td>Maximum Continuous Drain-Source Diode Forward Current</td>
<td>--</td>
<td>--</td>
<td>-27</td>
<td>A</td>
</tr>
<tr>
<td>ISM</td>
<td>Maximum Pulsed Drain-Source Diode Forward Current</td>
<td>--</td>
<td>--</td>
<td>-108</td>
<td>A</td>
</tr>
<tr>
<td>VSD</td>
<td>Drain-Source Diode Forward Voltage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IR</td>
<td>Reverse Recovery Time</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>QF</td>
<td>Reverse Recovery Charge</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Drain-Source Diode Characteristics and Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>IS</td>
<td>VGS = 0 V, IS = -27 A</td>
<td>--</td>
<td>--</td>
<td>-27</td>
<td>A</td>
</tr>
<tr>
<td>ISM</td>
<td>VGS = 0 V, IS = -108 A</td>
<td>--</td>
<td>--</td>
<td>-27</td>
<td>A</td>
</tr>
<tr>
<td>VSD</td>
<td>VGS = 0 V, IS = -27 A</td>
<td>--</td>
<td>--</td>
<td>-4.0</td>
<td>V</td>
</tr>
<tr>
<td>IR</td>
<td>VGS = 0 V, IS = -105 A</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>ns</td>
</tr>
<tr>
<td>QF</td>
<td>dIc / dt = 100 A/μs</td>
<td>0.41</td>
<td>--</td>
<td>μC</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. L = 0.9mH, ISD = -27A, VSD = -25V, RG = 25 Ω, Starting TJ = 25°C
3. Isd = -27A, Dist = 300Watts, VSD = BVDS, Starting TJ = 25°C
4. Essentially independent of operating temperature

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Typical Characteristics

Figure 1. On-Region Characteristics

Figure 2. Transfer Characteristics

Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

Figure 5. Capacitance Characteristics

Figure 6. Gate Charge Characteristics
Typical Characteristics (Continued)

- **Figure 7. Breakdown Voltage Variation vs. Temperature**
  - $-V_{DS,ON}$ (Normalized) Drain-Source Breakdown Voltage
  - $T_J$ Junction Temperature [°C]

- **Figure 8. On-Resistance Variation vs. Temperature**
  - $R_{DS(ON)}$ (Normalized) Drain-Source On-Resistance
  - $T_J$ Junction Temperature [°C]

- **Figure 9. Maximum Safe Operating Area**
  - $-V_{DS}$ Drain-Source Voltage [V]
  - $-I_D$ Drain Current [A]

- **Figure 10. Maximum Drain Current vs. Case Temperature**
  - $T_C$, Case Temperature [°C]
  - $-I_D$, Drain Current [A]

- **Figure 11. Transient Thermal Response Curve**
  - $Z_{TH}$, Thermal Response
  - $t_1$, Square Wave Pulse Duration [sec]
Peak Diode Recovery dv/dt Test Circuit & Waveforms

- DUT
- V_{DS}
- I_{SD}
- Driver
- Compliment of DUT (N-Channel)
- V_{DD}
- R_G

- V_{GS} • dv/dt controlled by R_G
- I_{SD} controlled by pulse period

\[ D = \frac{\text{Gate Pulse Width}}{\text{Gate Pulse Period}} \]

\[ 10V \]

- \( I_{SD} \) (DUT)
- Body Diode Reverse Current
- \( I_{RM} \), Body Diode Forward Current

\[ V_{DS} \] (DUT)
- Body Diode Forward Voltage Drop
- Body Diode Recovery dv/dt

\[ V_{DD} \]

\[ V_{SD} \]
Package Dimensions

TO-220

NOTES: UNLESS OTHERWISE SPECIFIED,
A) REFERENCE JEDEC TO-220, ISSUE K,
VARIATION AB, DATED APRIL, 2002.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSIONING AND TOLERANCING PER
ANSI Y14.5M-1973
D) LOCATION OF THE PIN HOLE MAY VARY
(LOWER LEFT CORNER, LOWER CENTER
AND CENTER OF THE PACKAGE)
E) DOES NOT COMPLY JEDEC STANDARD VALUE,
F) "A1" DIMENSIONS REPRESENT LIKE BELOW:
SINGLE GAUGE = 0.51 - 0.61
DUAL GAUGE = 1.14 - 1.40
G) DRAWING FILE NAME: TO220B03REV6

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FQP27P06 Rev.C0
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- AX-CAP™
- BitSIC™
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- CorePLUS™
- CorePOWER™
- CROSSVOLT™
- CTL™
- Current Transfer Logic™
- DEUXPEED™
- Dual Cool™
- EcoSPARK™
- EfficientMax™
- ESBC™
- FastCore™
- FETBench™
- FPF™
- F-FPS™
- FRFET®
- Global Power Resource™
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- Green FPS™
- Green FPS™ e-Series™
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- GTO™
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- MicroPak™
- MillerDrive™
- MotionMax™
- mWSaver™
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- Programmable Active Droop™
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- QS™
- Quiet Series™
- RapidConfigure™
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- SuperFET®
- SuperSOT™-3
- SuperSOT™-6
- SuperSOT™-8
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- SyncFET™
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- TMS900®
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- TRADING®
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- TinyPWM™
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- CrossVOLT™
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- TinyLogic®
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- TinyPower™
- TinyPWM™
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- µSerDes™
- 2Cool™
- Ultra FRFET™
- UniFET™
- VCX™
- VisualMax™
- VoltagePlus™
- X3™

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As used here in:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.

2. A critical component in any component of a life support device or system is a component whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

ANTI-COUNTERFEITING POLICY

Fairchild Semiconductor Corporation’s Anti-Counterfeiting Policy. Fairchild’s Anti-Counterfeiting Policy is also stated on our external website, www.Fairchildsemi.com, under Sales Support.

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufacturers of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed application, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from Fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild’s quality standards for handling and storage and provide access to Fairchild’s full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address and warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

PRODUCT STATUS DEFINITIONS

<table>
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<tr>
<th>Datasheet Status</th>
<th>Definition</th>
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<tr>
<td>Advance Information</td>
<td>Formative / In Design</td>
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<tr>
<td>Preliminary</td>
<td>First Production</td>
</tr>
<tr>
<td>No Identification Needed</td>
<td>Full Production</td>
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<td>Obsolete</td>
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Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.

Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.

Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.

Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

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