Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor’s system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.
**FQT5P10**

**P-Channel QFET® MOSFET**

-100 V, -1.0 A, 1.05 Ω

**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**

- -1.0 A, -100 V, RDS(on) = 1.05 Ω (Max.) @VGS = -10 V, ID = -0.5 A
- Low Gate Charge (Typ. 6.3 nC)
- Low Crss (Typ. 18 pF)
- 100% Avalanche Tested

**Absolute Maximum Ratings** \( T_C = 25°C \) unless otherwise noted

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>FQT5P10</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>V_DSS</td>
<td>Drain-Source Voltage</td>
<td>-100</td>
<td>V</td>
</tr>
<tr>
<td>I_D</td>
<td>Drain Current</td>
<td>- Continuous ( T_C = 25°C )</td>
<td>-1.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Continuous ( T_C = 70°C )</td>
<td>-0.8</td>
</tr>
<tr>
<td>I_DCM</td>
<td>Drain Current</td>
<td>- Pulsed (Note 1)</td>
<td>-4.0</td>
</tr>
<tr>
<td>V_GSS</td>
<td>Gate-Source Voltage</td>
<td>( \pm 30 )</td>
<td>V</td>
</tr>
<tr>
<td>E_AVS</td>
<td>Single Pulsed Avalanche Energy</td>
<td>(Note 2)</td>
<td>55</td>
</tr>
<tr>
<td>I_AR</td>
<td>Avalanche Current</td>
<td>(Note 1)</td>
<td>-1.0</td>
</tr>
<tr>
<td>E_AR</td>
<td>Repetitive Avalanche Energy</td>
<td>(Note 1)</td>
<td>0.2</td>
</tr>
<tr>
<td>dv/dt</td>
<td>Peak Diode Recovery dv/dt</td>
<td>(Note 3)</td>
<td>-6.0</td>
</tr>
<tr>
<td>P_D</td>
<td>Power Dissipation ( T_C = 25°C )</td>
<td>2.0</td>
<td>W</td>
</tr>
<tr>
<td></td>
<td>- Derate above 25°C</td>
<td>0.016</td>
<td>W/°C</td>
</tr>
<tr>
<td>T_J, T_STG</td>
<td>Operating and Storage Temperature Range</td>
<td>-55 to +150</td>
<td>°C</td>
</tr>
<tr>
<td>T_L</td>
<td>Maximum lead temperature for soldering purposes, 1/8&quot; from case for 5 seconds</td>
<td>300</td>
<td>°C</td>
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**Thermal Characteristics**

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<thead>
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<th>Parameter</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>R_NJA</td>
<td>Thermal Resistance, Junction-to-Ambient *</td>
<td>--</td>
<td>62.5</td>
<td>°C/W</td>
</tr>
</tbody>
</table>

* When mounted on the minimum pad size recommended (PCB Mount)
### Electrical Characteristics

Symbol | Parameter | Test Conditions | Min | Typ | Max | Unit
--- | --- | --- | --- | --- | --- | ---

#### Off Characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>BV_DSS</td>
<td>Drain-Source Breakdown Voltage</td>
<td>$V_{GS} = 0 , \text{V}, , I_D = -250 , \mu\text{A}$</td>
<td>-100</td>
<td>--</td>
<td>--</td>
<td>V</td>
</tr>
<tr>
<td>$\Delta B_{VDS} / \Delta T_J$</td>
<td>Breakdown Voltage Temperature Coefficient</td>
<td>$I_D = -250 , \mu\text{A}$, Referenced to 25°C</td>
<td>--</td>
<td>-0.1</td>
<td>--</td>
<td>V/°C</td>
</tr>
<tr>
<td>$I_{DSS}$</td>
<td>Zero Gate Voltage Drain Current</td>
<td>$V_{DS} = -100 , \text{V}, , V_{GS} = 0 , \text{V}$</td>
<td>--</td>
<td>--</td>
<td>-1</td>
<td>μA</td>
</tr>
<tr>
<td>$I_{GSSF}$</td>
<td>Gate-Body Leakage Current, Forward</td>
<td>$V_{GS} = -30 , \text{V}, , V_{DS} = 0 , \text{V}$</td>
<td>--</td>
<td>--</td>
<td>-100</td>
<td>nA</td>
</tr>
<tr>
<td>$I_{GSSR}$</td>
<td>Gate-Body Leakage Current, Reverse</td>
<td>$V_{GS} = 30 , \text{V}, , V_{DS} = 0 , \text{V}$</td>
<td>--</td>
<td>--</td>
<td>100</td>
<td>nA</td>
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</table>

#### On Characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{GS(on)}$</td>
<td>Gate Threshold Voltage</td>
<td>$V_{DS} = V_{GS}, , I_D = -250 , \mu\text{A}$</td>
<td>-2.0</td>
<td>--</td>
<td>-4.0</td>
<td>V</td>
</tr>
<tr>
<td>$R_{DS(on)}$</td>
<td>Static Drain-Source On-Resistance</td>
<td>$V_{GS} = -10 , \text{V}, , I_D = -0.5 , \text{A}$</td>
<td>--</td>
<td>0.82</td>
<td>1.05</td>
<td>Ω</td>
</tr>
<tr>
<td>$g_{FS}$</td>
<td>Forward Transconductance</td>
<td>$V_{DS} = -40 , \text{V}, , I_D = -0.5 , \text{A}$</td>
<td>(Note 4)</td>
<td>1.4</td>
<td>--</td>
<td>S</td>
</tr>
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</table>

#### Dynamic Characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$C_{iss}$</td>
<td>Input Capacitance</td>
<td>$V_{DS} = -25 , \text{V}, , V_{GS} = 0 , \text{V}, , f = 1.0 , \text{MHz}$</td>
<td>--</td>
<td>190</td>
<td>250</td>
<td>pF</td>
</tr>
<tr>
<td>$C_{oss}$</td>
<td>Output Capacitance</td>
<td>--</td>
<td>70</td>
<td>90</td>
<td>pF</td>
<td></td>
</tr>
<tr>
<td>$C_{rss}$</td>
<td>Reverse Transfer Capacitance</td>
<td>--</td>
<td>18</td>
<td>25</td>
<td>pF</td>
<td></td>
</tr>
</tbody>
</table>

#### Switching Characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$t_{on}$</td>
<td>Turn-On Delay Time</td>
<td>$V_{DS} = -50 , \text{V}, , I_D = -4.5 , \text{A}$, $R_G = 25 , \Omega$</td>
<td>--</td>
<td>9</td>
<td>30</td>
<td>ns</td>
</tr>
<tr>
<td>$t_r$</td>
<td>Turn-On Rise Time</td>
<td>--</td>
<td>70</td>
<td>150</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>$t_{off}$</td>
<td>Turn-Off Delay Time</td>
<td>--</td>
<td>12</td>
<td>35</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>$t_f$</td>
<td>Turn-Off Fall Time</td>
<td>--</td>
<td>30</td>
<td>70</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>$Q_g$</td>
<td>Total Gate Charge</td>
<td>$V_{DS} = -80 , \text{V}, , I_D = -4.5 , \text{A}$, $V_{GS} = -10 , \text{V}$</td>
<td>(Note 4, 5)</td>
<td>6.3</td>
<td>8.2</td>
<td>nC</td>
</tr>
<tr>
<td>$Q_{gs}$</td>
<td>Gate-Source Charge</td>
<td>--</td>
<td>1.7</td>
<td>--</td>
<td>nC</td>
<td></td>
</tr>
<tr>
<td>$Q_{gd}$</td>
<td>Gate-Drain Charge</td>
<td>--</td>
<td>3.0</td>
<td>--</td>
<td>nC</td>
<td></td>
</tr>
</tbody>
</table>

#### Drain-Source Diode Characteristics and Maximum Ratings

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$I_S$</td>
<td>Maximum Continuous Drain-Source Diode Forward Current</td>
<td>--</td>
<td>--</td>
<td>-1.0</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>$I_{SM}$</td>
<td>Maximum Pulsed Drain-Source Diode Forward Current</td>
<td>--</td>
<td>--</td>
<td>-4.0</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>$V_{SD}$</td>
<td>Drain-Source Diode Forward Voltage</td>
<td>$V_{GS} = 0 , \text{V}, , I_S = -1.0 , \text{A}$</td>
<td>--</td>
<td>--</td>
<td>-4.0</td>
<td>V</td>
</tr>
<tr>
<td>$t_{rr}$</td>
<td>Reverse Recovery Time</td>
<td>$V_{GS} = 0 , \text{V}, , I_S = -4.5 , \text{A}$, $dI_F / dt = 100 , \text{A/µs}$</td>
<td>(Note 4)</td>
<td>85</td>
<td>--</td>
<td>ns</td>
</tr>
<tr>
<td>$Q_{rr}$</td>
<td>Reverse Recovery Charge</td>
<td>--</td>
<td>0.27</td>
<td>--</td>
<td>µC</td>
<td></td>
</tr>
</tbody>
</table>

#### Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. $L = 83\, \text{mH}, \, I_{AS} = -1.0\, \text{A}, \, V_{DD} = -25\, \text{V}, \, R_G = 25\, \Omega, \, \text{Starting} \, \, T_J = 25\, ^\circ\text{C}$
3. $I_{DG} \leq 4.5\, \text{A}, \, d\dot{I} / dt \leq 300\, \text{A/µs}, \, V_{DD} \leq BV_{DSS}, \, \text{Starting} \, \, T_J = 25\, ^\circ\text{C}$
4. Pulse Test : Pulse width $\leq 300\, \text{µs}, \, \text{Duty cycle} \leq 2\%$
5. Essentially independent of operating temperature
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

Figure 8. On-Resistance Variation vs. Temperature

Figure 9. Maximum Safe Operating Area

Figure 10. Maximum Drain Current vs. Case Temperature

Figure 11. Transient Thermal Response Curve
Peak Diode Recovery $dv/dt$ Test Circuit & Waveforms

- **DUT**
- **VDS**
- **Driver**
- **RG**
- Compliment of DUT (N-Channel)

- $V_{GS}$
- $V_{DD}$
- $I_{SD}$
- $L$

- $V_{DD}$
- $I_{FM}$, Body Diode Forward Current
- $I_{RM}$, Body Diode Reverse Current
- $V_{DS}$
- $V_{DD}$

- $V_{GS}$ (Driver)
- $D = $ Gate Pulse Width
- $10V$
- $10V$

- $I_{SD}$ (DUT)
- $V_{DS}$ (DUT)
- $V_{SD}$
- $V_{DD}$
- $dv/dt$
- $di/dt$

- **Body Diode**
- **Forward Voltage Drop**
- **Reverse Current**
- **Recovery dv/dt**

- $dv/dt$ controlled by $R_G$
- $I_{SD}$ controlled by pulse period

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Sync-Lock™
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<th>Product Status</th>
<th>Definition</th>
</tr>
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<tbody>
<tr>
<td>Advance Information</td>
<td>Formative / In Design</td>
<td>Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.</td>
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<tr>
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<td>First Production</td>
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