# FQP10N60C / FQPF10N60C

## N-Channel QFET® MOSFET

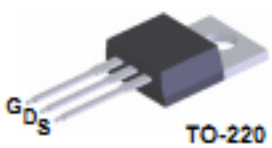
### 600 V, 9.5 A, 730 mΩ

## Description

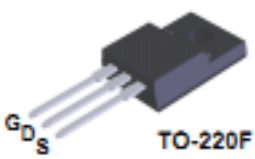
These N-Channel enhancement mode power field effect transistors are produced using Fairchild's proprietary, planar stripe, DMOS technology. This advanced technology has been especially tailored to mini-mize on-state resistance, provide superior switching perfor-mance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high effi-ciency switched mode power supplies, active power factor correction, electronic lamp ballasts based on half bridge topology.

## Features

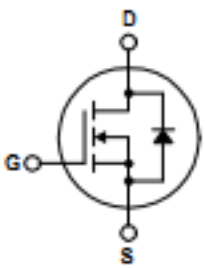
- 9.5 A, 600 V, $R_{DS(on)}$ = 730 mΩ (Max.) @ $V_{GS}$ = 10 V, $I_D$ = 4.75 A
- Low Gate Charge (Typ. 44 nC)
- Low Crss (Typ. 18 pF)
- 100% Avalanche Tested




TO-220




TO-220F




## Absolute Maximum Ratings $T_C$ = 25°C unless otherwise noted.

| Symbol | Parameter | | FQP10N60C | FQPF10N60C | Unit |
|---|---|---|---|---|---|
| $V_{DSS}$ | Drain-Source Voltage | | 600 | | V |
| $I_D$ | Drain Current • Continuous ($T_C$ = 25°C) | | 9.5 | 9.5 * | A |
| | • Continuous ($T_C$ = 100°C) | | 5.7 | 5.7 * | A |
| $I_{DM}$ | Drain Current • Pulsed | (Note 1) | 38 | 38 * | A |
| $V_{GSS}$ | Gate-Source Voltage | | ± 30 | | V |
| $E_{AS}$ | Single Pulsed Avalanche Energy | (Note 2) | 700 | | mJ |
| $I_{AR}$ | Avalanche Current | (Note 1) | 9.5 | | A |
| $E_{AR}$ | Repetitive Avalanche Energy | (Note 1) | 15.8 | | mJ |
| dv/dt | Peak Diode Recovery dv/dt | (Note 3) | 4.5 | | V/ns |
| $P_D$ | Power Dissipation ($T_C$ = 25°C) | | 156 | 50 | W |
| | • Derate above 25°C | | 1.25 | 0.4 | W/°C |
| $T_J$, $T_{STG}$ | Operating and Storage Temperature Range | | -55 to +150 | | °C |
| $T_L$ | Maximum lead temperature for soldering, 1/8" from case for 5 seconds | | 300 | | °C |

* Drain current limited by maximum junction temperature.

## Thermal Characteristics

| Symbol | Parameter | FQP10N60C | FQPF10N60C | Unit |
|---|---|---|---|---|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case, Max. | 0.8 | 2.5 | °C/W |
| $R_{\theta CS}$ | Thermal Resistance, Case-to-Sink, Typ. | 0.5 | -- | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient, Max. | 62.5 | 62.5 | °C/W |

## Package Marking and Ordering Information

| Part Number | Top Mark | Package | Packing Method | Reel Size | Tape Width | Quantity |
|---|---|---|---|---|---|---|
| FQP10N60C | FQP10N60C | TO-220 | Tube | N/A | N/A | 50 units |
| FQPF10N60C | FQPF10N60C | TO-220F | Tube | N/A | N/A | 50 units |
| FQPF10N60CT | FQPF10N60CT | TO-220F | Tube | N/A | N/A | 50 units |
| FQPF10N60C_F105 | FQPF10N60C | TO-220F | Tube | N/A | N/A | 50 units |

## Electrical Characteristics $T_C$ = 25°C unless otherwise noted.

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$ = 0 V, $I_D$ = 250 μA | 600 | -- | -- | V |
| $\Delta BV_{DSS}$ / $\Delta T_J$ | Breakdown Voltage Temperature Coefficient | $I_D$ = 250 μA, Referenced to 25°C | -- | 0.7 | -- | V/°C |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = 600 V, $V_{GS}$ = 0 V | -- | -- | 1 | μA |
| | | $V_{DS}$ = 480 V, $T_C$ = 125°C | -- | -- | 10 | μA |
| $I_{GSSF}$ | Gate-Body Leakage Current, Forward | $V_{GS}$ = 30 V, $V_{DS}$ = 0 V | -- | -- | 100 | nA |
| $I_{GSSR}$ | Gate-Body Leakage Current, Reverse | $V_{GS}$ = -30 V, $V_{DS}$ = 0 V | -- | -- | -100 | nA |
| **On Characteristics** | | | | | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = 250 μA | 2.0 | -- | 4.0 | V |
| $R_{DS(on)}$ | Static Drain-Source On-Resistance | $V_{GS}$ = 10 V, $I_D$ = 4.75 A | -- | 0.6 | 0.73 | Ω |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$ = 40 V, $I_D$ = 4.75 A | -- | 8.0 | -- | S |
| **Dynamic Characteristics** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$ = 25 V, $V_{GS}$ = 0 V, f = 1.0 MHz | -- | 1570 | 2040 | pF |
| $C_{oss}$ | Output Capacitance | | -- | 168 | 215 | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | -- | 18 | 24 | pF |
| **Switching Characteristics** | | | | | | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD}$ = 300 V, $I_D$ = 9.5A, $R_G$ = 25 Ω | -- | 23 | 55 | ns |
| $t_r$ | Turn-On Rise Time | | -- | 69 | 150 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | -- | 144 | 300 | ns |
| $t_f$ | Turn-Off Fall Time | (Note 4) | -- | 77 | 165 | ns |
| $Q_g$ | Total Gate Charge | $V_{DS}$ = 480 V, $I_D$ = 9.5A, $V_{GS}$ = 10 V | -- | 44 | 57 | nC |
| $Q_{gs}$ | Gate-Source Charge | | -- | 6.7 | -- | nC |
| $Q_{gd}$ | Gate-Drain Charge | (Note 4) | -- | 18.5 | -- | nC |
| **Drain-Source Diode Characteristics and Maximum Ratings** | | | | | | |
| $I_S$ | Maximum Continuous Drain-Source Diode Forward Current | | -- | -- | 9.5 | A |
| $I_{SM}$ | Maximum Pulsed Drain-Source Diode Forward Current | | -- | -- | 38 | A |
| $V_{SD}$ | Drain-Source Diode Forward Voltage | $V_{GS}$ = 0 V, $I_S$ = 9.5 A | -- | -- | 1.4 | V |
| $t_{rr}$ | Reverse Recovery Time | $V_{GS}$ = 0 V, $I_S$ = 9.5 A, $dI_F$ / dt = 100 A/μs | -- | 420 | -- | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | -- | 4.2 | -- | μC |

NOTES:

1. Repetitive rating: pulse-width limited by maximum junction temperature.
2. L = 14.2 mH, $I_{AS}$ = 9.5 A, $V_{DD}$ = 50 V, $R_G$ = 25 Ω, starting $T_J$ = 25°C.
3. $I_{SD}$ ≤ 9.5 A, di/dt ≤ 200 A/μs, $V_{DD}$ ≤ $BV_{DSS}$, starting $T_J$ = 25°C.
4. Essentially independent of operating temperature typical characteristics.