

## **FQP10N60C / FQPF10N60C** N-Channel QFET<sup>®</sup> MOSFET

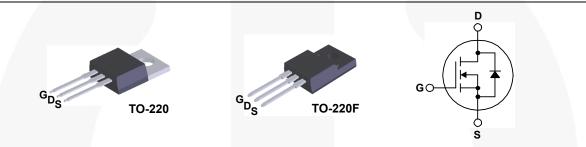
600 V, 9.5 A, 730 mΩ

## 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 m $\Omega$  (Max.) @ V<sub>GS</sub> = 10 V, I<sub>D</sub> = 4.75 A
- Low Gate Charge (Typ. 44 nC)
- Low Crss (Typ. 18 pF)
- 100% Avalanche Tested



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

| Symbol  | Parameter  |          | FQP10N60C   | FQPF10N60C | Unit |
|---|--|----------|-------------|------------|------|
| V <sub>DSS</sub>  | Drain-Source Voltage   |          | 600         |            | V    |
| I <sub>D</sub> Drain Current - Continuous (T <sub>C</sub> = |  | 25°C)    | 9.5         | 9.5 *      | А    |
|   | - Continuous (T <sub>C</sub> =                                       | = 100°C) | 5.7         | 5.7 *      | А    |
| I <sub>DM</sub>   | Drain Current - Pulsed   | (Note 1) | 38          | 38 *       | А    |
| V <sub>GSS</sub>  | Gate-Source Voltage  |          | ± 30        |            | V    |
| E <sub>AS</sub>   | Single Pulsed Avalanche Energy                                       | (Note 2) | 700         |            | mJ   |
| I <sub>AR</sub>   | Avalanche Current  | (Note 1) | 9.5         |            | А    |
| E <sub>AR</sub>   | Repetitive Avalanche Energy  | (Note 1) | 15.6        |            | mJ   |
| dv/dt   | Peak Diode Recovery dv/dt (Note 3)                                   |          | 4.5         |            | V/ns |
| P <sub>D</sub>  | Power Dissipation ( $T_C = 25^{\circ}C$ )                            |          | 156         | 50         | W    |
| - Derate above 25°C   |  | °C       | 1.25        | 0.4        | W/°C |
| T <sub>J</sub> , T <sub>STG</sub>                           | Operating and Storage Temperature Range                              |          | -55 to +150 |            | °C   |
| Τ <sub>L</sub>  | 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 |
|---------------------|---|-----------|------------|------|
| $R_{	ext{	heta}JC}$ | 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 |
| $R_{\thetaJA}$      | Thermal Resistance, Junction-to-Ambient, Max. | 62.5      | 62.5       | °C/W |

| FQP10N60C FQP10N60C TC   FQPF10N60C FQPF10N60C TO   FQPF10N60CT FQPF10N60CT TO |                                      | Top Mark Pac   |   | kage  | Packing Method                  | Reel     | Size | Tape Wi  | dth  | Quantity |  |
|--|--------------------------------------|--|---|---|---------------------------------|----------|------|----------|------|----------|--|
|  |                                      | -  | TO-   | 220   | Tube                            | N//      | 4    | N/A      |      | 50 units |  |
|  |                                      | FQPF10N60C   | TO-2  | -220F Tube                                      |                                 | N//      | N/A  |          |      | 50 units |  |
|  |                                      | -  | 0-220F Tube N/A                                 |   |                                 | N/A      |      | 50 units |      |          |  |
| FQPF10N60  |                                      | FQPF10N60C   |   | 220F  | Tube                            | N//      | 4    | N/A      |      | 50 units |  |
| Symbol   | Chara                                | Cteristics T <sub>C</sub> = 25 <sup>4</sup><br>Parameter | °C unless o                                     | otherwise                                       | Test Condition                  | ns       | Min  | Тур      | Мах  | Unit     |  |
| •  |                                      |  | -   |   |                                 |          |      |          | max  |          |  |
| Off Characte   |                                      | urao Brookdown Voltag                                    |   | \/ -  | - 0 ) ( 1 - 250 4               |          | 600  |          |      | V        |  |
| BV <sub>DSS</sub>  |                                      | urce Breakdown Voltag                                    | _   | $V_{GS} = 0 V, I_D = 250 \mu A$                 |                                 | 000      | -    |          | V/°C |          |  |
| ΔΒV <sub>DSS</sub><br>/ΔTJ   | Coefficie                            | wn Voltage Temperature<br>nt                             | ;   | $I_D$ = 250 µA, Referenced to 25°C              |                                 | -        | 0.7  |          |      |          |  |
| I <sub>DSS</sub>   | Zero Gate Voltage Drain Current      |  | t   | $V_{DS}$ = 600 V, $V_{GS}$ = 0 V                |                                 |          |      | 1        | μA   |          |  |
|  |                                      |  |   | V <sub>DS</sub> = 480 V, T <sub>C</sub> = 125°C |                                 |          |      |          | 10   | μA       |  |
| I <sub>GSSF</sub>  | Gate-Boo                             | dy Leakage Current, Fo                                   | rward   | $V_{GS}$ = 30 V, $V_{DS}$ = 0 V                 |                                 |          |      | 100      | nA   |          |  |
| I <sub>GSSR</sub>  | Gate-Body Leakage Current, Reverse   |  | verse   | $V_{GS} = -30 \text{ V}, V_{DS} = 0 \text{ V}$  |                                 |          |      | -100     | nA   |          |  |
| On Character   | istics                               |  |   |   |                                 |          |      |          |      |          |  |
| V <sub>GS(th)</sub>  | Gate Thr                             | e Threshold Voltage                                      |   | $V_{DS} = V_{GS}, I_D = 250 \ \mu A$            |                                 | 2.0      |      | 4.0      | V    |          |  |
| R <sub>DS(on)</sub>  | Static Drain-Source<br>On-Resistance |  |   | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 4.75 A |                                 |          | 0.6  | 0.73     | Ω    |          |  |
| 9 <sub>FS</sub>  | Forward                              | rward Transconductance                                   |   | V <sub>DS</sub> = 40 V, I <sub>D</sub> = 4.75 A |                                 |          | 8.0  |          | S    |          |  |
| Dynamic Cha  | racteristi                           | cs   |   |   |                                 |          |      |          |      |          |  |
| C <sub>iss</sub>   |                                      |  |   | V <sub>DS</sub> =                               | = 25 V, V <sub>GS</sub> = 0 V,  |          |      | 1570     | 2040 | pF       |  |
| C <sub>oss</sub>   |                                      | apacitance   | _   | f = 1.0 MHz                                     |                                 |          | 166  | 215      | pF   |          |  |
| C <sub>rss</sub>   | Reverse                              | Transfer Capacitance                                     |   |   |                                 |          | 18   | 24       | pF   |          |  |
| Switching Ch   | aracterist                           | ics  |   |   |                                 |          |      |          |      |          |  |
| t <sub>d(on)</sub>   | 1                                    | Delay Time   | V <sub>DD</sub> = 300 V, I <sub>D</sub> = 9.5A, |   |                                 |          | 23   | 55       | ns   |          |  |
| t <sub>r</sub>   |                                      | Rise Time  |   | $R_{G} = 25 \Omega$                             |                                 | -        | 69   | 150      | ns   |          |  |
| t <sub>d(off)</sub>  | Turn-Off                             | Delay Time   |   | 1   |                                 |          |      | 144      | 300  | ns       |  |
| t <sub>f</sub>   |                                      | Fall Time  |   | (Note 4)  |                                 | (Note 4) |      | 77       | 165  | ns       |  |
| Q <sub>g</sub>   | Total Gat                            | e Charge   |   | V <sub>DS</sub> =                               | = 480 V, I <sub>D</sub> = 9.5A, |          |      | 44       | 57   | nC       |  |
| Q <sub>gs</sub>  | Gate-Sou                             | urce Charge  |   | $V_{GS} = 10 V$ (Note 4)                        |                                 |          | 6.7  |          | nC   |          |  |
| Q <sub>gd</sub>  | Gate-Dra                             | in Charge  |   |   |                                 |          | 18.5 |          | nC   |          |  |
| Drain-Source   | Diode Ch                             | aracteristics and Max                                    | imum F  | Ratings   |                                 |          |      | 1        |      | 6        |  |
| I <sub>S</sub>   |                                      | n Continuous Drain-Sou                                   |   | •   |                                 |          |      |          | 9.5  | A        |  |
| I <sub>SM</sub>  | Maximun                              | n Pulsed Drain-Source                                    | Diode F   | orward Current                                  |                                 | -        |      | 38       | А    |          |  |
| V <sub>SD</sub>  | Drain-So                             | urce Diode Forward Vo                                    | Itage   | V <sub>GS</sub> =                               | = 0 V, I <sub>S</sub> = 9.5 A   |          |      |          | 1.4  | V        |  |
| t <sub>rr</sub>  | Reverse                              | Recovery Time  |   | V <sub>GS</sub> =                               | = 0 V, I <sub>S</sub> = 9.5 A,  |          |      | 420      |      | ns       |  |
| Q <sub>rr</sub>  |                                      | Recovery Charge  |   | $dI_{\rm F}$ / dt = 100 A/µs                    |                                 |          | 4.2  |          | μC   |          |  |

1. Repetitive rating: pulse-width limited by maximum junction temperature.

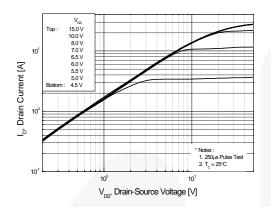
2. L = 14.2 mH, I<sub>AS</sub> = 9.5 A, V<sub>DD</sub> = 50 V, R<sub>G</sub> = 25  $\Omega$ , starting T<sub>J</sub> = 25°C.

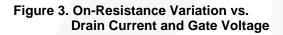
3.  $I_{SD} \leq$  9.5 A, di/dt  $\leq$  200 A/µs,  $V_{DD} \leq BV_{DSS},$  starting  $T_J$  = 25°C.

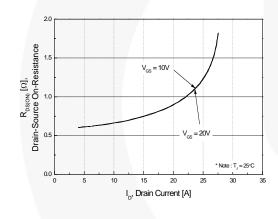
4. Essentially independent of operating temperature typical characteristics.

## **Typical Performance Characteristics**

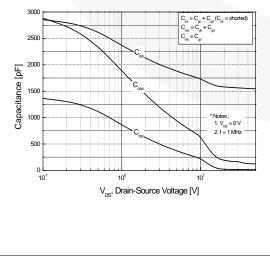




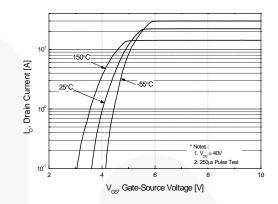


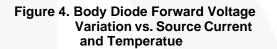


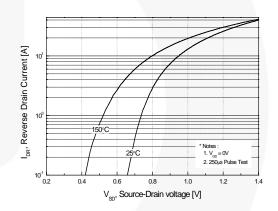




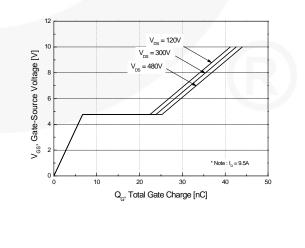


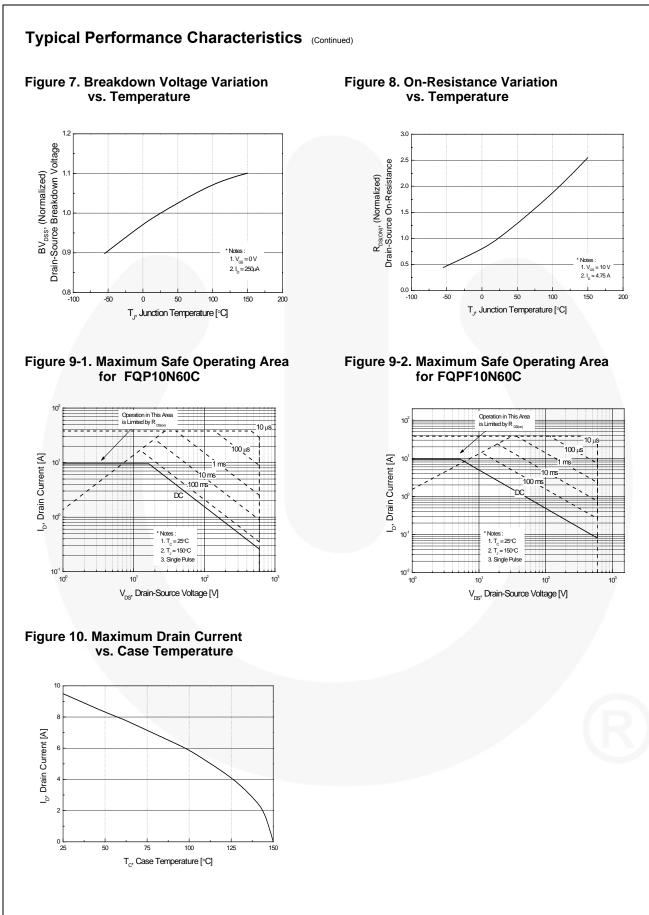








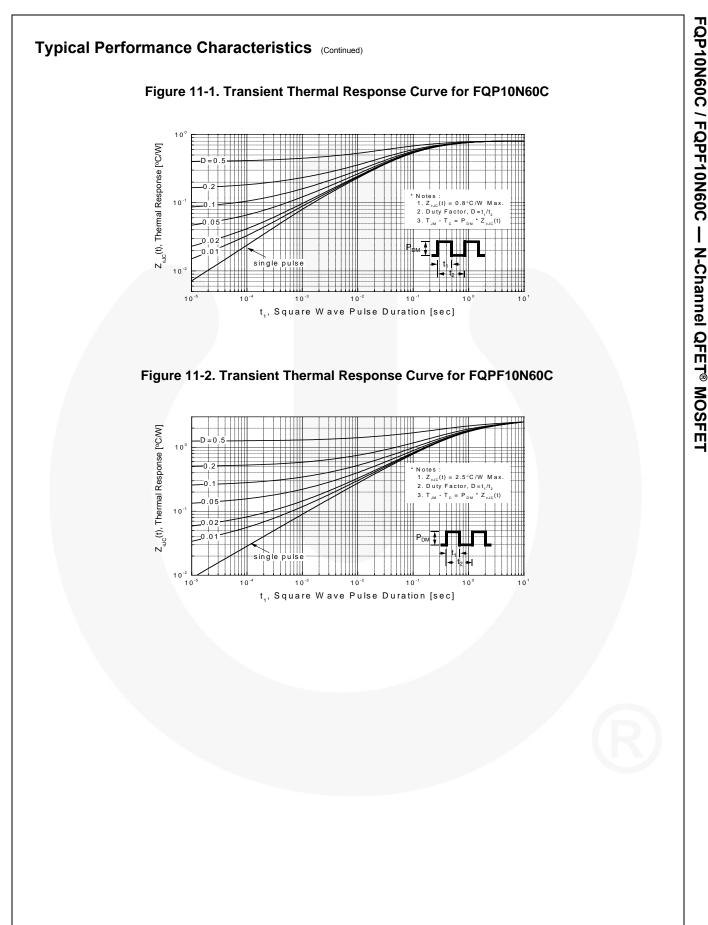


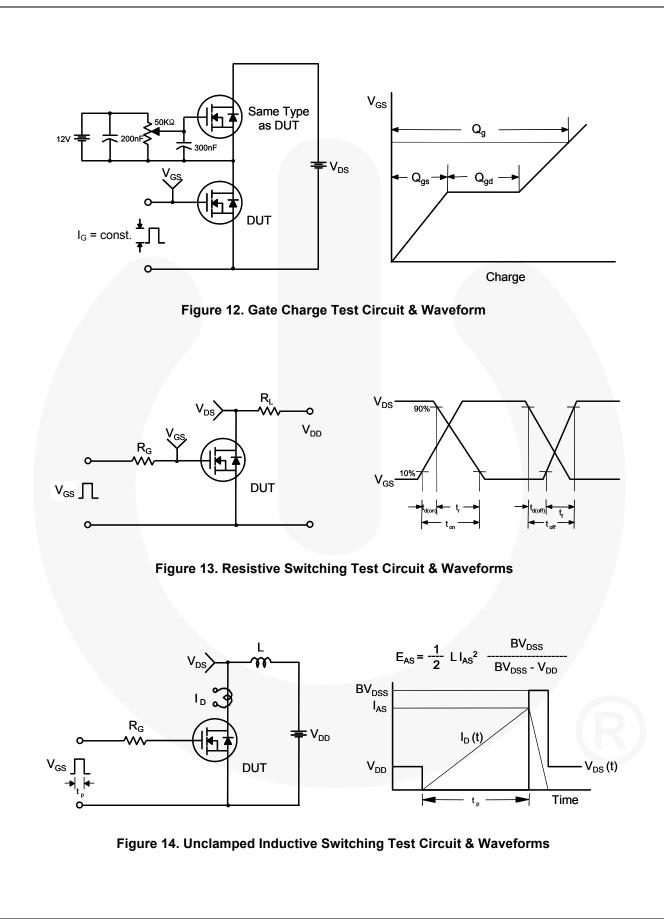


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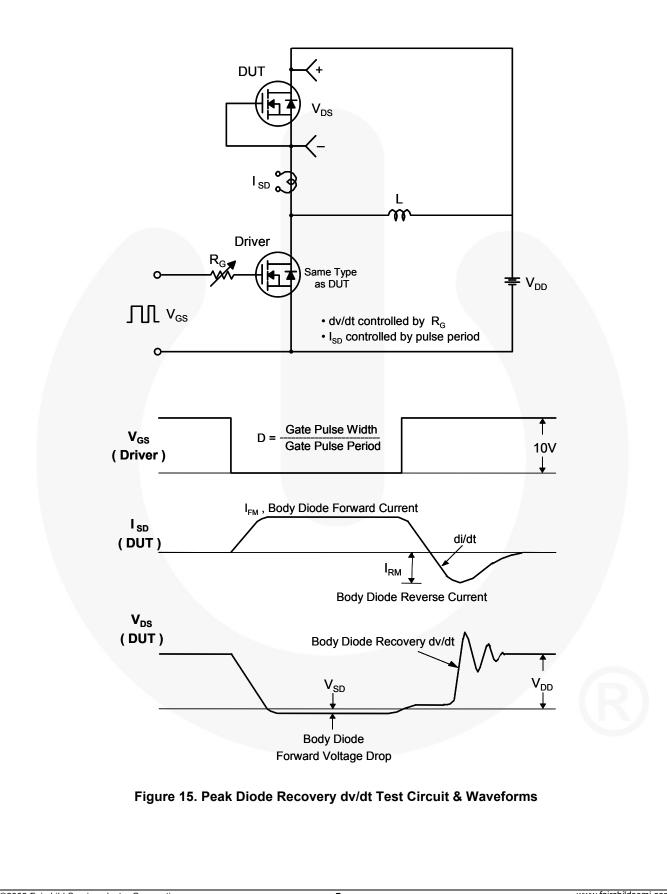
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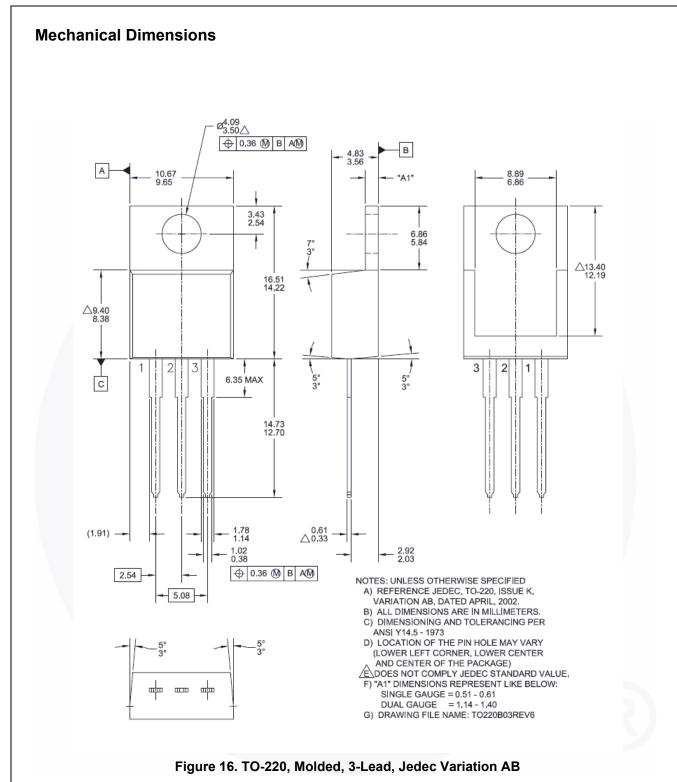




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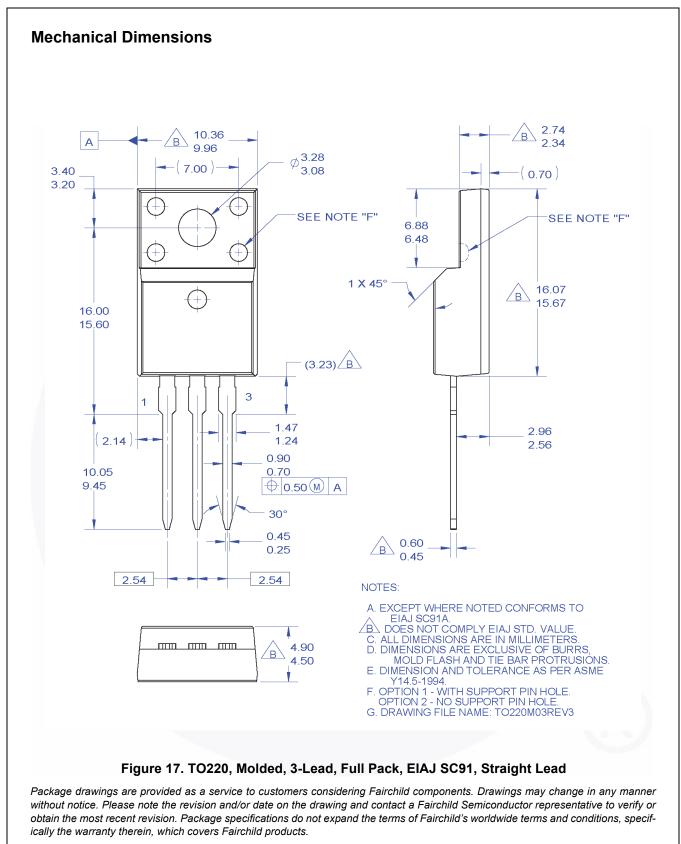


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