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FQPF30N06L

N-Channel QFET® MOSFET

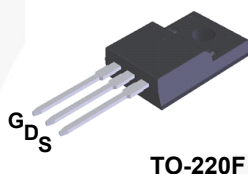
60 V, 22.5 A, 35 mΩ

Description

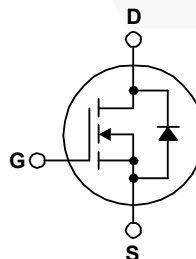
This N-Channel enhancement mode power MOSFET is produced using Fairchild Semiconductor's proprietary planar stripe and DMOS technology. This advanced MOSFET technology has been especially tailored to reduce on-state resistance, and to provide superior switching performance and high avalanche energy strength.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

Features

- 22.5 A, 60 V, $R_{DS(on)} = 35 \text{ m}\Omega$ (Max.) @ $V_{GS}=10 \text{ V}$, $I_D = 11.3 \text{ A}$
- Low Gate Charge (Typ. 15 nC)
- Low C_{rss} (Typ. 50 pF)
- 100% Avalanche Tested
- 175°C Maximum Junction Temperature Rating



TO-220F



Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted.

| Symbol | Parameter | FQPF30N06L | Unit |
|----------------|--|-------------|---------------------|
| V_{DSS} | Drain-Source Voltage | 60 | V |
| I_D | Drain Current - Continuous ($T_C = 25^\circ\text{C}$) | 22.5 | A |
| | - Continuous ($T_C = 100^\circ\text{C}$) | 15.9 | A |
| I_{DM} | Drain Current - Pulsed (Note 1) | 90 | A |
| V_{GSS} | Gate-Source Voltage | ± 20 | V |
| E_{AS} | Single Pulsed Avalanche Energy (Note 2) | 350 | mJ |
| I_{AR} | Avalanche Current (Note 1) | 22.5 | A |
| E_{AR} | Repetitive Avalanche Energy (Note 1) | 3.8 | mJ |
| dv/dt | Peak Diode Recovery dv/dt (Note 3) | 7.0 | V/ns |
| P_D | Power Dissipation ($T_C = 25^\circ\text{C}$) | 38 | W |
| | - Derate above 25°C | 0.25 | W/ $^\circ\text{C}$ |
| T_J, T_{STG} | Operating and Storage Junction Temperature Range | -55 to +175 | $^\circ\text{C}$ |
| T_L | Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds | 300 | $^\circ\text{C}$ |

Thermal Characteristics

| Symbol | Parameter | FQPF30N06L | Unit |
|-----------------|---|------------|---------------------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case, Max. | 3.9 | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient, Max. | 62.5 | $^\circ\text{C}/\text{W}$ |

Package Marking and Ordering Information

| Part Number | Top Mark | Package | Packing Method | Reel Size | Tape Width | Quantity |
|-------------|------------|---------|----------------|-----------|------------|----------|
| FQPF30N06L | FQPF30N06L | 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 | 60 | -- | -- | V |
| ΔBV _{DSS} / ΔT _J | Breakdown Voltage Temperature Coefficient | I _D = 250 μA, Referenced to 25°C | -- | 0.06 | -- | V/°C |
| I _{DSS} | Zero Gate Voltage Drain Current | V _{DS} = 60 V, V _{GS} = 0 V | -- | -- | 1 | μA |
| | | V _{DS} = 48 V, T _C = 150°C | -- | -- | 10 | μA |
| I _{GSSF} | Gate-Body Leakage Current, Forward | V _{GS} = 20 V, V _{DS} = 0 V | -- | -- | 100 | nA |
| I _{GSSR} | Gate-Body Leakage Current, Reverse | V _{GS} = -20 V, V _{DS} = 0 V | -- | -- | -100 | nA |

On Characteristics

| | | | | | | |
|---------------------|-----------------------------------|---|-----|-------|-------|---|
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} = V _{GS} , I _D = 250 μA | 1.0 | -- | 2.5 | V |
| R _{DS(on)} | Static Drain-Source On-Resistance | V _{GS} = 10 V, I _D = 11.3 A | -- | 0.027 | 0.035 | Ω |
| | | V _{GS} = 5 V, I _D = 11.3 A | -- | 0.035 | 0.045 | Ω |
| g _{FS} | Forward Transconductance | V _{DS} = 25 V, I _D = 11.3 A | -- | 22 | -- | S |

Dynamic Characteristics

| | | | | | | |
|------------------|------------------------------|---|----|-----|------|----|
| C _{iss} | Input Capacitance | V _{DS} = 25 V, V _{GS} = 0 V, f = 1.0 MHz | -- | 800 | 1040 | pF |
| C _{oss} | Output Capacitance | | -- | 270 | 350 | pF |
| C _{rss} | Reverse Transfer Capacitance | | -- | 50 | 65 | pF |

Switching Characteristics

| | | | | | | |
|---------------------|---------------------|---|----|-----|-----|----|
| t _{d(on)} | Turn-On Delay Time | V _{DD} = 30 V, I _D = 16 A, R _G = 25 Ω (Note 4) | -- | 15 | 40 | ns |
| t _r | Turn-On Rise Time | | -- | 210 | 430 | ns |
| t _{d(off)} | Turn-Off Delay Time | | -- | 60 | 130 | ns |
| t _f | Turn-Off Fall Time | | -- | 110 | 230 | ns |
| Q _g | Total Gate Charge | V _{DS} = 48 V, I _D = 32 A, V _{GS} = 5 V (Note 4) | -- | 15 | 20 | nC |
| Q _{gs} | Gate-Source Charge | | -- | 3.5 | -- | nC |
| Q _{gd} | Gate-Drain Charge | | -- | 8.5 | -- | nC |

Drain-Source Diode Characteristics and Maximum Ratings

| | | | | | | |
|-----------------|---|--|----|------|-----|----|
| I _S | Maximum Continuous Drain-Source Diode Forward Current | -- | -- | 22.5 | A | |
| I _{SM} | Maximum Pulsed Drain-Source Diode Forward Current | -- | -- | 90 | A | |
| V _{SD} | Drain-Source Diode Forward Voltage | V _{GS} = 0 V, I _S = 22.5 A | -- | -- | 1.5 | V |
| t _{rr} | Reverse Recovery Time | V _{GS} = 0 V, I _S = 32 A, | -- | 60 | -- | ns |
| Q _{rr} | Reverse Recovery Charge | dI _F / dt = 100 A/μs | -- | 90 | -- | nC |

Notes:

1. Repetitive rating : pulse-width limited by maximum junction temperature.
2. L = 810 μH, I_{AS} = 22.5 A, V_{DD} = 25 V, R_G = 25 Ω, starting T_J = 25°C.
3. I_{SD} ≤ 32 A, di/dt ≤ 300 A/μs, V_{DD} ≤ BV_{DSS}, starting T_J = 25°C.
4. Essentially independent of operating temperature.

Typical Characteristics

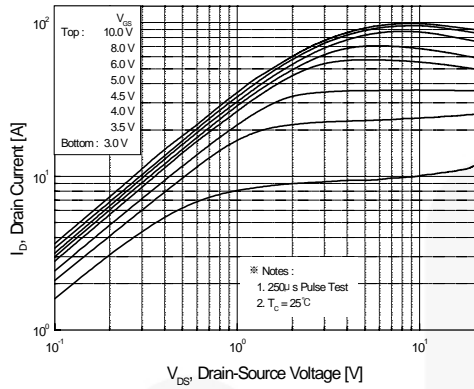


Figure 1. On-Region Characteristics

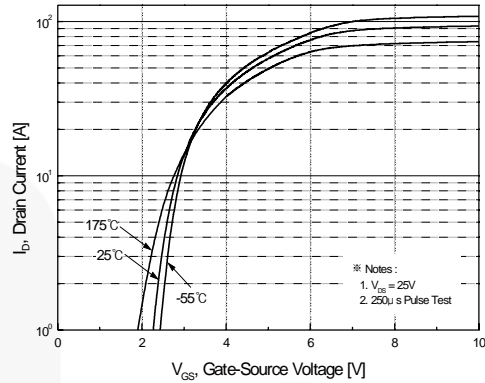


Figure 2. Transfer Characteristics

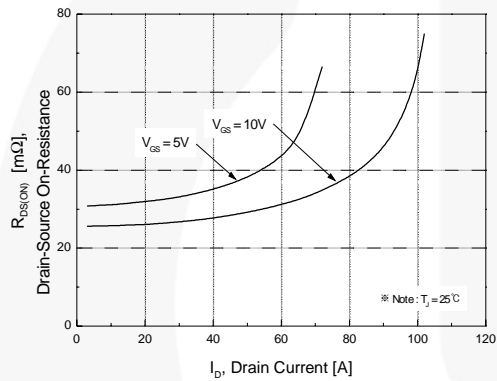


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

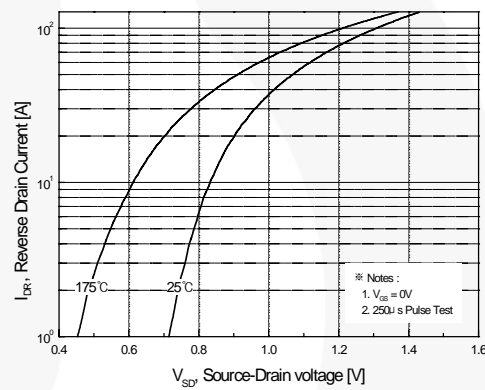


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

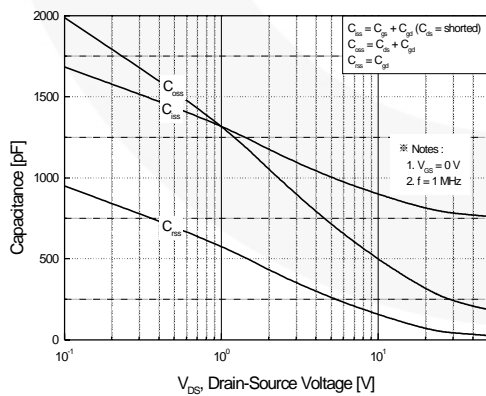


Figure 5. Capacitance Characteristics

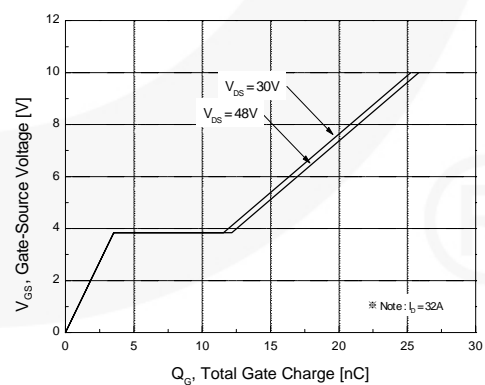


Figure 6. Gate Charge Characteristics

Typical Characteristics (continued)

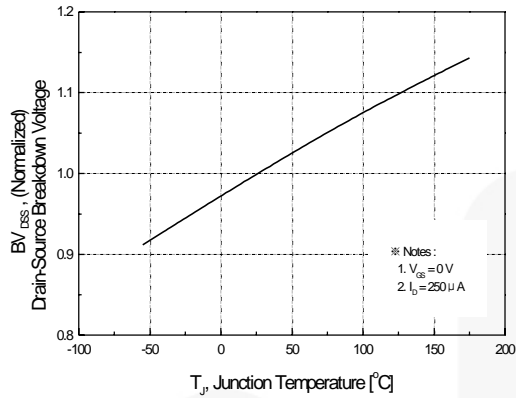


Figure 7. Breakdown Voltage Variation vs. Temperature

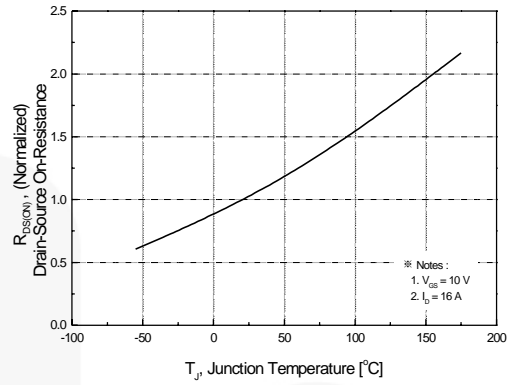


Figure 8. On-Resistance Variation vs. Temperature

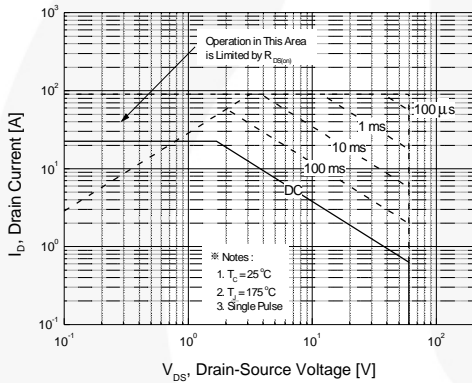


Figure 9. Maximum Safe Operating Area

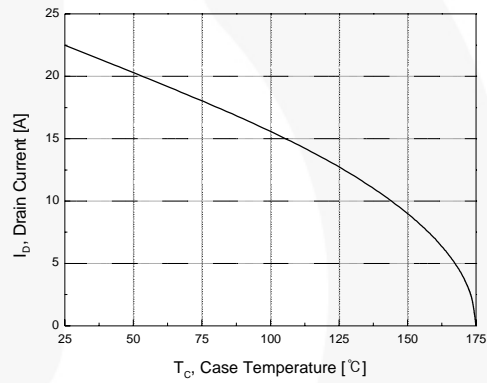


Figure 10. Maximum Drain Current vs. Case Temperature

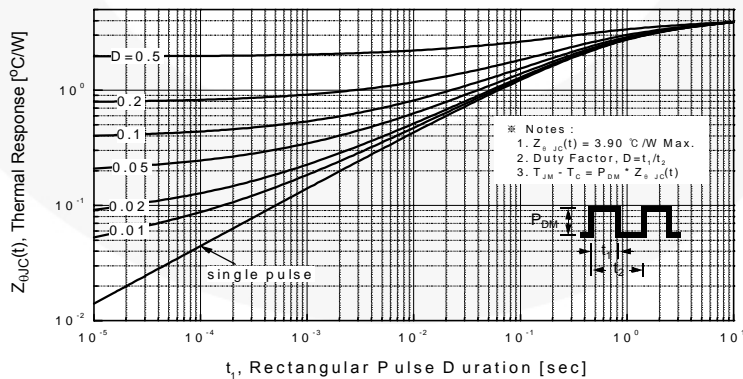


Figure 11. Transient Thermal Response Curve

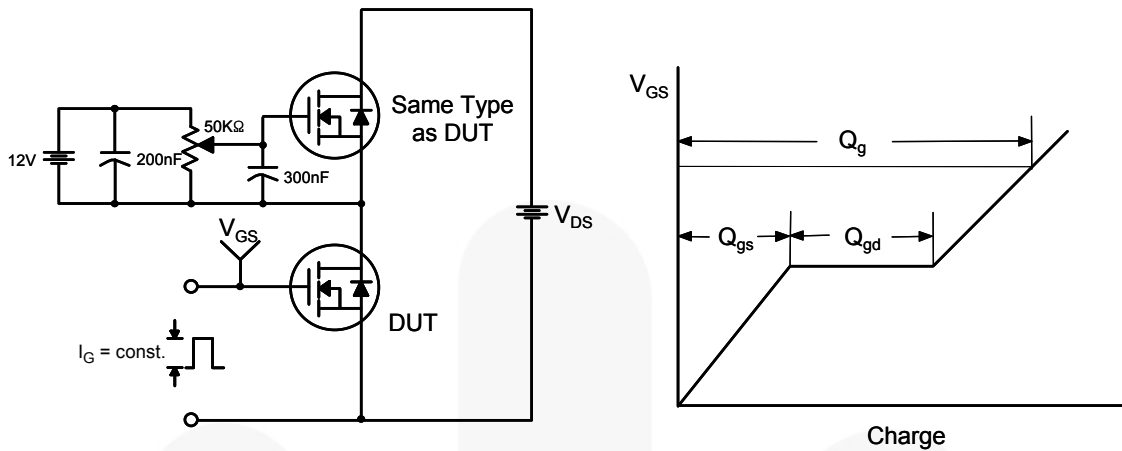


Figure 12. Gate Charge Test Circuit & Waveform

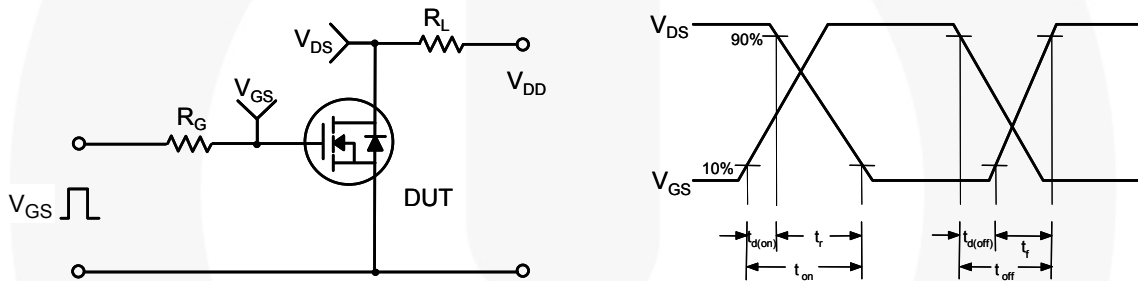


Figure 13. Resistive Switching Test Circuit & Waveforms



Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms



Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions

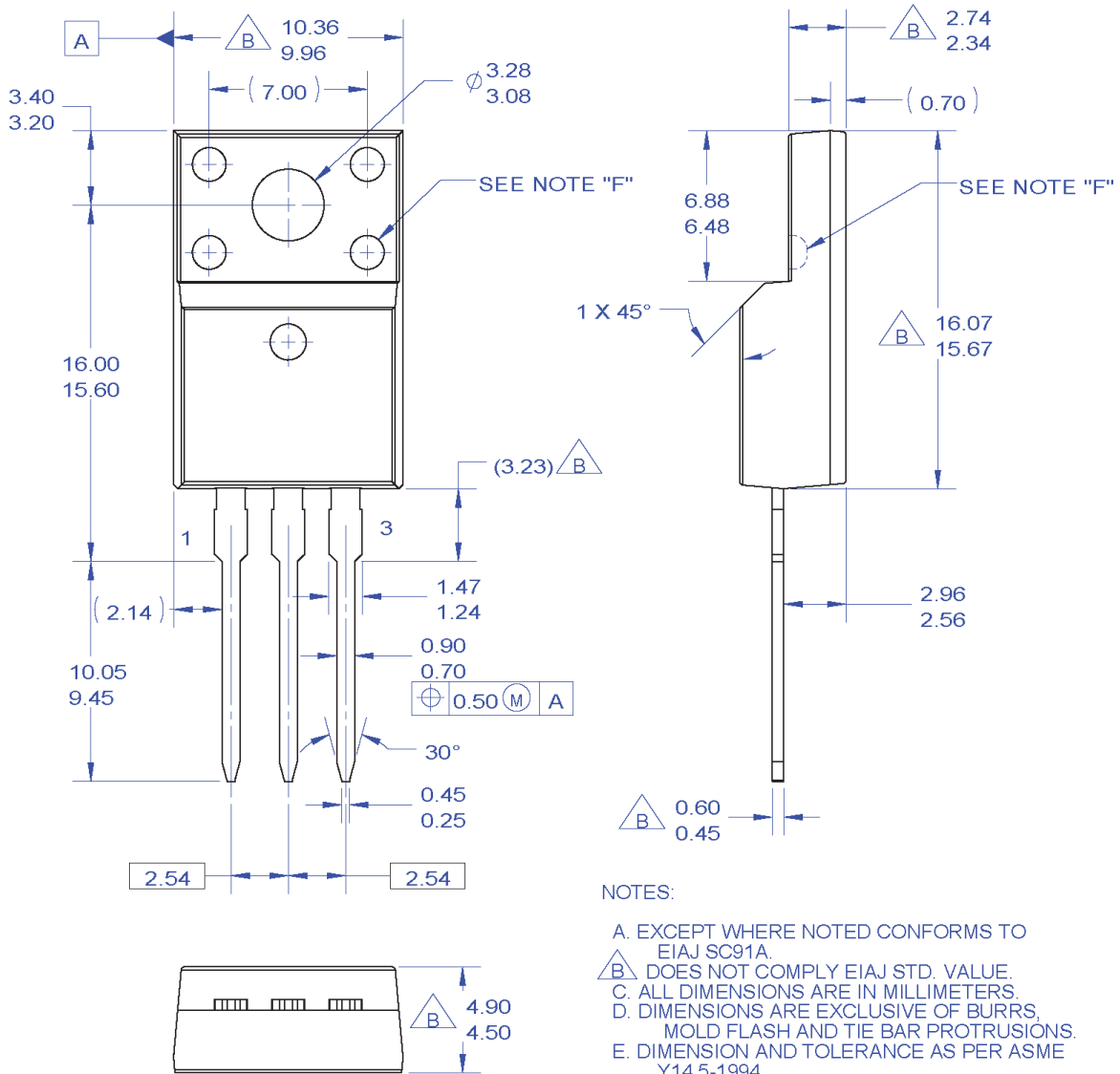


Figure 16. TO220, Molded, 3-Lead, Full Pack, EIAJ SC91, Straight Lead

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