

FQP12N20L

200V LOGIC N-Channel MOSFET

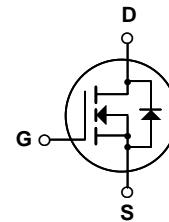
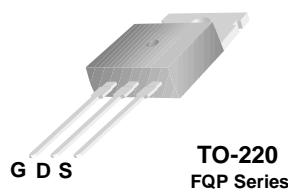
General Description

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 minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency switching DC/DC converters, switch mode power supply, motor control.

Features

- 11.6A, 200V, $R_{DS(on)} = 0.28\Omega$ @ $V_{GS} = 10$ V
- Low gate charge (typical 16 nC)
- Low C_{rss} (typical 17 pF)
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability
- Low level gate drive requirement allowing direct operation from logic drivers



Absolute Maximum Ratings

$T_C = 25^\circ\text{C}$ unless otherwise noted

| Symbol | Parameter | FQP12N20L | Units |
|----------------|--|-------------|---------------------|
| V_{DSS} | Drain-Source Voltage | 200 | V |
| I_D | Drain Current - Continuous ($T_C = 25^\circ\text{C}$) | 11.6 | A |
| | - Continuous ($T_C = 100^\circ\text{C}$) | 7.35 | A |
| I_{DM} | Drain Current - Pulsed | (Note 1) | A |
| V_{GSS} | Gate-Source Voltage | ± 20 | V |
| E_{AS} | Single Pulsed Avalanche Energy | (Note 2) | mJ |
| I_{AR} | Avalanche Current | (Note 1) | A |
| E_{AR} | Repetitive Avalanche Energy | (Note 1) | mJ |
| dv/dt | Peak Diode Recovery dv/dt | (Note 3) | V/ns |
| P_D | Power Dissipation ($T_C = 25^\circ\text{C}$) | 90 | W |
| | - Derate above 25°C | 0.72 | W/ $^\circ\text{C}$ |
| T_J, T_{STG} | Operating and Storage Temperature Range | -55 to +150 | $^\circ\text{C}$ |
| T_L | Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds | 300 | $^\circ\text{C}$ |

Thermal Characteristics

| Symbol | Parameter | Typ | Max | Units |
|-----------------|---|-----|------|---------------------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case | -- | 1.39 | $^\circ\text{C}/\text{W}$ |
| $R_{\theta CS}$ | Thermal Resistance, Case-to-Sink | 0.5 | -- | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | -- | 62.5 | $^\circ\text{C}/\text{W}$ |

Electrical Characteristics

$T_C = 25^\circ\text{C}$ unless otherwise noted

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|--|---|--|-----|------|------|---------------------------|
| Off Characteristics | | | | | | |
| BV_{DSS} | Drain-Source Breakdown Voltage | $V_{\text{GS}} = 0 \text{ V}, I_D = 250 \mu\text{A}$ | 200 | -- | -- | V |
| $\Delta \text{BV}_{\text{DSS}} / \Delta T_J$ | Breakdown Voltage Temperature Coefficient | $I_D = 250 \mu\text{A}$, Referenced to 25°C | -- | 0.14 | -- | $\text{V}/^\circ\text{C}$ |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{\text{DS}} = 200 \text{ V}, V_{\text{GS}} = 0 \text{ V}$ | -- | -- | 1 | μA |
| | | $V_{\text{DS}} = 160 \text{ V}, T_C = 125^\circ\text{C}$ | -- | -- | 10 | μA |
| I_{GSSF} | Gate-Body Leakage Current, Forward | $V_{\text{GS}} = 20 \text{ V}, V_{\text{DS}} = 0 \text{ V}$ | -- | -- | 100 | nA |
| I_{GSSR} | Gate-Body Leakage Current, Reverse | $V_{\text{GS}} = -20 \text{ V}, V_{\text{DS}} = 0 \text{ V}$ | -- | -- | -100 | nA |

On Characteristics

| | | | | | | |
|---------------------|-----------------------------------|---|-----|--------------|--------------|----------|
| $V_{\text{GS(th)}}$ | Gate Threshold Voltage | $V_{\text{DS}} = V_{\text{GS}}, I_D = 250 \mu\text{A}$ | 1.0 | -- | 2.0 | V |
| $R_{\text{DS(on)}}$ | Static Drain-Source On-Resistance | $V_{\text{GS}} = 10 \text{ V}, I_D = 5.8 \text{ A}$ $V_{\text{GS}} = 5 \text{ V}, I_D = 5.8 \text{ A}$ | -- | 0.22 0.25 | 0.28 0.32 | Ω |
| g_{FS} | Forward Transconductance | $V_{\text{DS}} = 30 \text{ V}, I_D = 5.8 \text{ A}$ (Note 4) | -- | 12.7 | -- | S |

Dynamic Characteristics

| | | | | | | |
|------------------|------------------------------|--|----|-----|------|----|
| C_{iss} | Input Capacitance | $V_{\text{DS}} = 25 \text{ V}, V_{\text{GS}} = 0 \text{ V}, f = 1.0 \text{ MHz}$ | -- | 830 | 1080 | pF |
| C_{oss} | Output Capacitance | | -- | 120 | 155 | pF |
| C_{rss} | Reverse Transfer Capacitance | | -- | 17 | 22 | pF |

Switching Characteristics

| | | | | | | |
|---------------------|---------------------|---|----|-----|-----|----|
| $t_{\text{d(on)}}$ | Turn-On Delay Time | $V_{\text{DD}} = 100 \text{ V}, I_D = 11.6 \text{ A}, R_G = 25 \Omega$ (Note 4, 5) | -- | 15 | 40 | ns |
| t_r | Turn-On Rise Time | | -- | 190 | 390 | ns |
| $t_{\text{d(off)}}$ | Turn-Off Delay Time | | -- | 60 | 130 | ns |
| t_f | Turn-Off Fall Time | | -- | 120 | 250 | ns |
| Q_g | Total Gate Charge | $V_{\text{DS}} = 160 \text{ V}, I_D = 11.6 \text{ A}, V_{\text{GS}} = 5 \text{ V}$ (Note 4, 5) | -- | 16 | 21 | nC |
| Q_{gs} | Gate-Source Charge | | -- | 2.8 | -- | nC |
| Q_{gd} | Gate-Drain Charge | | -- | 7.6 | -- | nC |

Drain-Source Diode Characteristics and Maximum Ratings

| | | | | | | |
|-----------------|---|--|----|------|-----|---------------|
| I_S | Maximum Continuous Drain-Source Diode Forward Current | -- | -- | 11.6 | A | |
| I_{SM} | Maximum Pulsed Drain-Source Diode Forward Current | -- | -- | 46.4 | A | |
| V_{SD} | Drain-Source Diode Forward Voltage | $V_{\text{GS}} = 0 \text{ V}, I_S = 11.6 \text{ A}$ | -- | -- | 1.5 | V |
| t_{rr} | Reverse Recovery Time | $V_{\text{GS}} = 0 \text{ V}, I_S = 11.6 \text{ A}, dI_F / dt = 100 \text{ A}/\mu\text{s}$ (Note 4) | -- | 128 | -- | ns |
| Q_{rr} | Reverse Recovery Charge | | -- | 0.56 | -- | μC |

Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. L = 2.3mH, $I_{AS} = 11.6\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25 \Omega$, Starting $T_J = 25^\circ\text{C}$
3. $I_{SD} \leq 11.6\text{A}$, $dI/dt \leq 300\text{A}/\mu\text{s}$, $V_{DD} \leq \text{BV}_{\text{DSS}}$, Starting $T_J = 25^\circ\text{C}$
4. Pulse Test : Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$
5. Essentially independent of operating temperature

Typical Characteristics

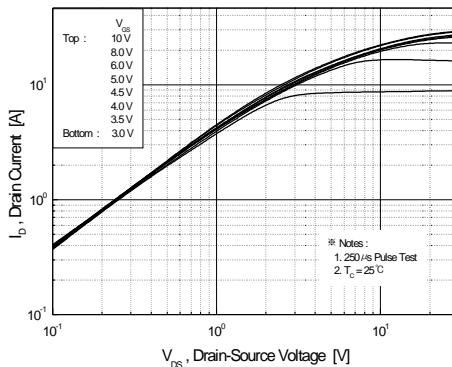


Figure 1. On-Region Characteristics

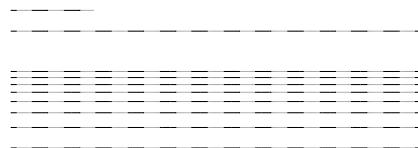


Figure 2. Transfer Characteristics

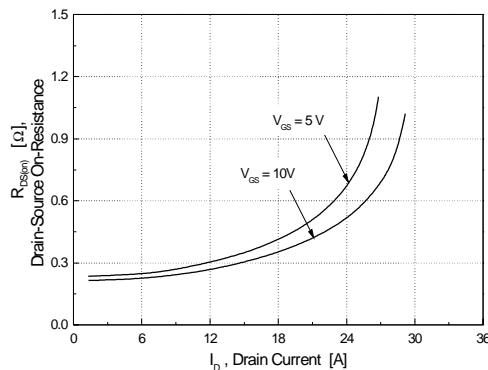


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

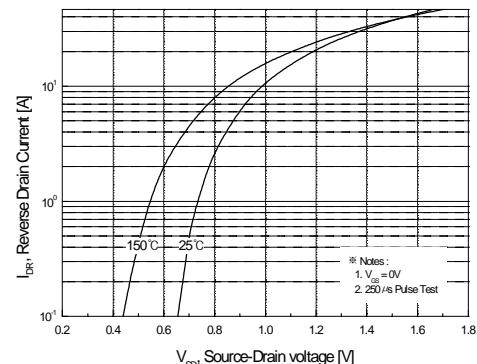


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

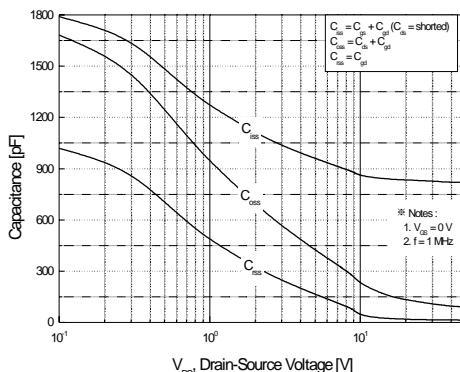


Figure 5. Capacitance Characteristics

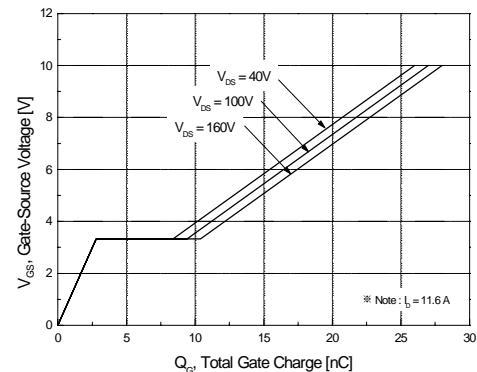


Figure 6. Gate Charge Characteristics