

FQI27N25

N-Channel QFET® MOSFET

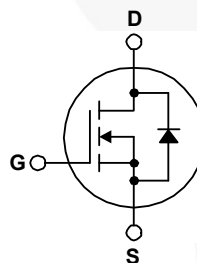
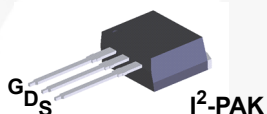
250 V, 25.5 A, 110 mΩ

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, active power factor correction (PFC), and electronic lamp ballasts.

Features

- 25.5 A, 250 V, $R_{DS(on)} = 110 \text{ m}\Omega$ (Max.) @ $V_{GS} = 10 \text{ V}$, $I_D = 12.75 \text{ A}$
- Low Gate Charge (Typ. 50 nC)
- Low Crss (Typ. 45 pF)
- 100% Avalanche Tested



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

| Symbol | Parameter | FQI27N25TU | Unit |
|----------------|---|-------------|---------------------|
| V_{DSS} | Drain-Source Voltage | 250 | V |
| I_D | Drain Current - Continuous ($T_C = 25^\circ\text{C}$) - Continuous ($T_C = 100^\circ\text{C}$) | 25.5 | A |
| | | 16.2 | A |
| I_{DM} | Drain Current - Pulsed (Note 1) | 102 | A |
| V_{GSS} | Gate-Source Voltage | ± 30 | V |
| E_{AS} | Single Pulsed Avalanche Energy (Note 2) | 600 | mJ |
| I_{AR} | Avalanche Current (Note 1) | 25.5 | A |
| E_{AR} | Repetitive Avalanche Energy (Note 1) | 18 | mJ |
| dv/dt | Peak Diode Recovery dv/dt (Note 3) | 5.5 | V/ns |
| P_D | Power Dissipation ($T_A = 25^\circ\text{C}$) * | 3.13 | W |
| | Power Dissipation ($T_C = 25^\circ\text{C}$) | 180 | W |
| | - Derate above 25°C | 1.43 | 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, 1/8" from Case for 5 Seconds. | 300 | $^\circ\text{C}$ |

Thermal Characteristics

| Symbol | Parameter | FQI27N25TU | Unit |
|-----------------|---|------------|---------------------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case, Max. | 0.7 | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Minimum Pad of 2-oz Copper), Max. | 62.5 | |
| | Thermal Resistance, Junction to Ambient (*1 in ² Pad of 2-oz Copper), Max. | 40 | |

Package Marking and Ordering Information

| Part Number | Top Mark | Package | Packing Method | Reel Size | Tape Width | Quantity |
|-------------|----------|---------------------|----------------|-----------|------------|----------|
| FQI27N25TU | FQI27N25 | I ² -PAK | Tube | N/A | N/A | 50 units |

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

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

Off Characteristics

| | | | | | | |
|------------------------------|---|---|-----|------|------|---------------------|
| BV_{DSS} | Drain-Source Breakdown Voltage | $V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$ | 250 | -- | -- | V |
| $\Delta BV_{DSS} / \Delta T$ | Breakdown Voltage Temperature Coefficient | $I_D = 250\ \mu\text{A}$, Referenced to 25°C | -- | 0.29 | -- | V/ $^\circ\text{C}$ |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = 250\text{ V}, V_{GS} = 0\text{ V}$ | -- | -- | 1 | μA |
| | | $V_{DS} = 200\text{ V}, T_C = 125^\circ\text{C}$ | -- | -- | 10 | μA |
| I_{GSSF} | Gate-Body Leakage Current, Forward | $V_{GS} = 30\text{ V}, V_{DS} = 0\text{ V}$ | -- | -- | 100 | nA |
| I_{GSSR} | Gate-Body Leakage Current, Reverse | $V_{GS} = -30\text{ V}, V_{DS} = 0\text{ V}$ | -- | -- | -100 | nA |

On Characteristics

| | | | | | | |
|--------------|-----------------------------------|--|-----|-------|------|----------|
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$ | 3.0 | -- | 5.0 | V |
| $R_{DS(on)}$ | Static Drain-Source On-Resistance | $V_{GS} = 10\text{ V}, I_D = 12.75\text{ A}$ | -- | 0.083 | 0.11 | Ω |
| g_{FS} | Forward Transconductance | $V_{DS} = 50\text{ V}, I_D = 12.75\text{ A}$ | -- | 24 | -- | S |

Dynamic Characteristics

| | | | | | | |
|------------|------------------------------|--|----|------|------|----|
| C_{iss} | Input Capacitance | $V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$ | -- | 1900 | 2450 | pF |
| C_{oss} | Output Capacitance | | -- | 360 | 470 | pF |
| C_{riss} | Reverse Transfer Capacitance | | -- | 45 | 60 | pF |

Switching Characteristics

| | | | | | | |
|--------------|---------------------|---|----------|------|-----|-----|
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD} = 125\text{ V}, I_D = 27\text{ A},$ $R_G = 25\ \Omega$ | -- | 32 | 75 | ns |
| t_r | Turn-On Rise Time | | -- | 270 | 550 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | -- | 80 | 170 | ns |
| t_f | Turn-Off Fall Time | | (Note 4) | -- | 120 | 250 |
| Q_g | Total Gate Charge | $V_{DS} = 200\text{ V}, I_D = 27\text{ A},$ $V_{GS} = 10\text{ V}$ | -- | 50 | 65 | nC |
| Q_{gs} | Gate-Source Charge | | -- | 12.5 | -- | nC |
| Q_{gd} | Gate-Drain Charge | | (Note 4) | -- | 26 | -- |

Drain-Source Diode Characteristics and Maximum Ratings

| | | | | | | |
|----------|---|--|----|------|-----|---------------|
| I_S | Maximum Continuous Drain-Source Diode Forward Current | -- | -- | 25.5 | A | |
| I_{SM} | Maximum Pulsed Drain-Source Diode Forward Current | -- | -- | 102 | A | |
| V_{SD} | Drain-Source Diode Forward Voltage | $V_{GS} = 0\text{ V}, I_S = 25.5\text{ A}$ | -- | -- | 1.5 | V |
| t_{rr} | Reverse Recovery Time | $V_{GS} = 0\text{ V}, I_S = 27\text{ A},$ | -- | 220 | -- | ns |
| Q_{rr} | Reverse Recovery Charge | $di_F / dt = 100\text{ A}/\mu\text{s}$ | -- | 1.8 | -- | μC |

Notes:

1. Repetitive rating : pulse-width limited by maximum junction temperature.
2. $L = 1.5\text{ mH}, I_{AS} = 25.5\text{ A}, V_{DD} = 50\text{ V}, R_G = 25\ \Omega$, starting $T_J = 25^\circ\text{C}$.
3. $I_{SD} \leq -27\text{ A}, di/dt \leq 300\text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$, starting $T_J = 25^\circ\text{C}$.
4. Essentially independent of operating temperature.

Typical Characteristics

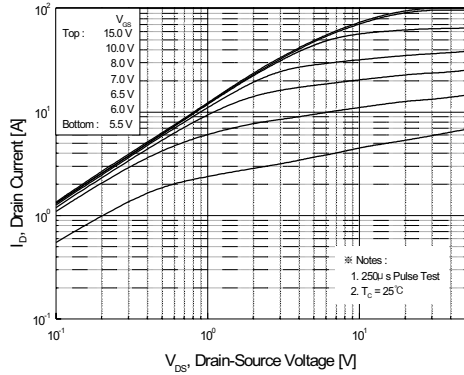


Figure 1. On-Region Characteristics

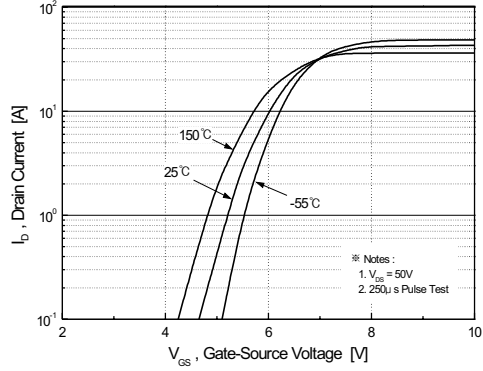


Figure 2. Transfer Characteristics

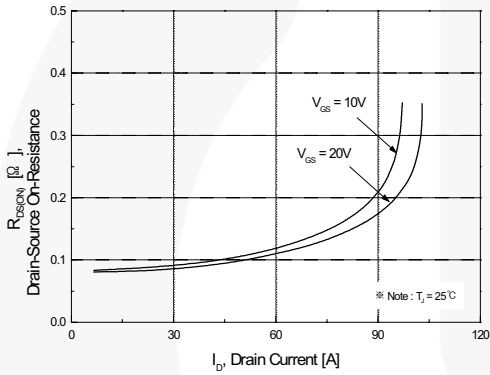


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

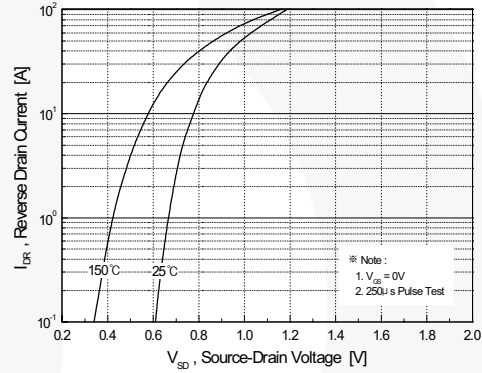


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

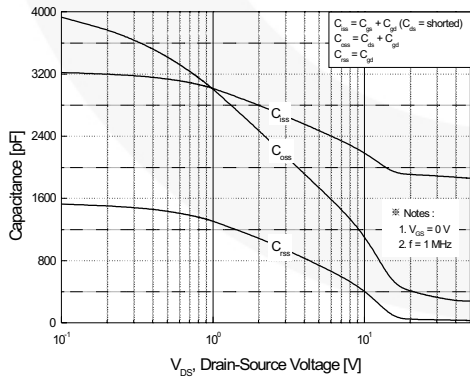


Figure 5. Capacitance Characteristics

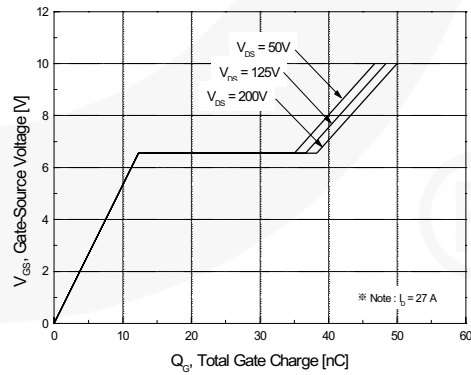


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

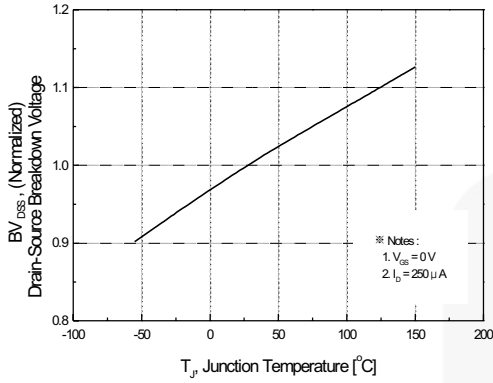


Figure 7. Breakdown Voltage Variation vs. Temperature

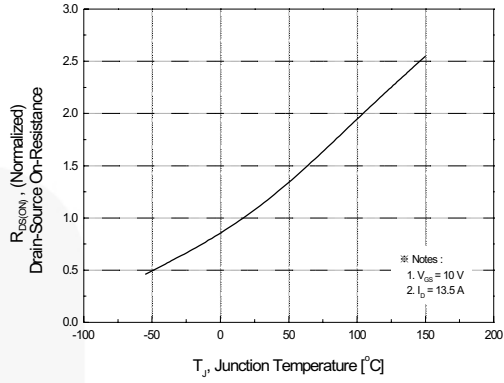


Figure 8. On-Resistance Variation vs. Temperature

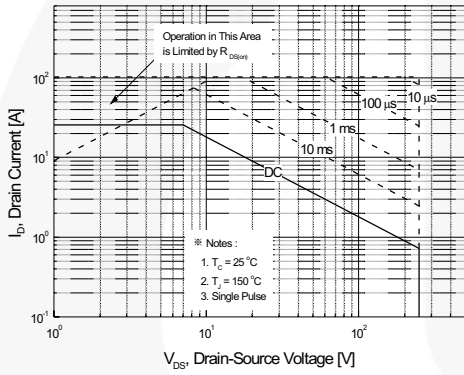


Figure 9. Maximum Safe Operating Area

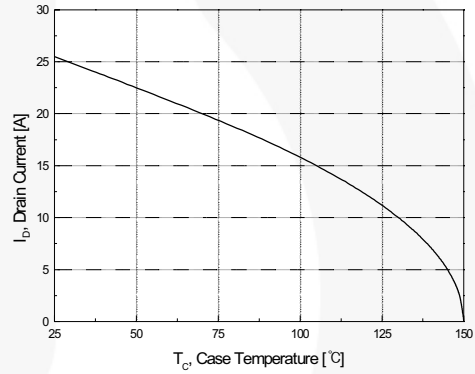


Figure 10. Maximum Drain Current vs. Case Temperature

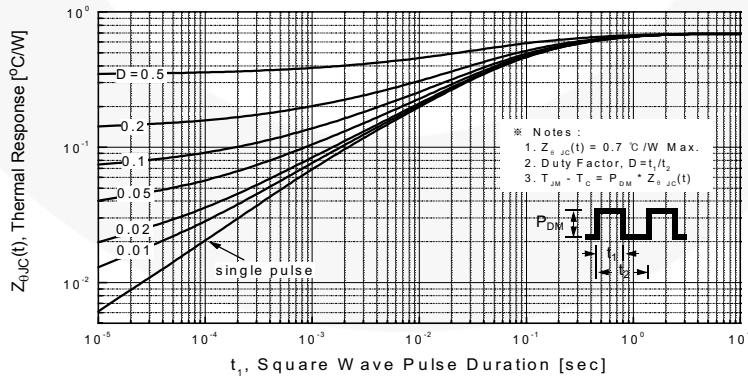


Figure 11. Transient Thermal Response Curve



Figure 12. Gate Charge Test Circuit & Waveform



Figure 13. Resistive Switching Test Circuit & Waveforms

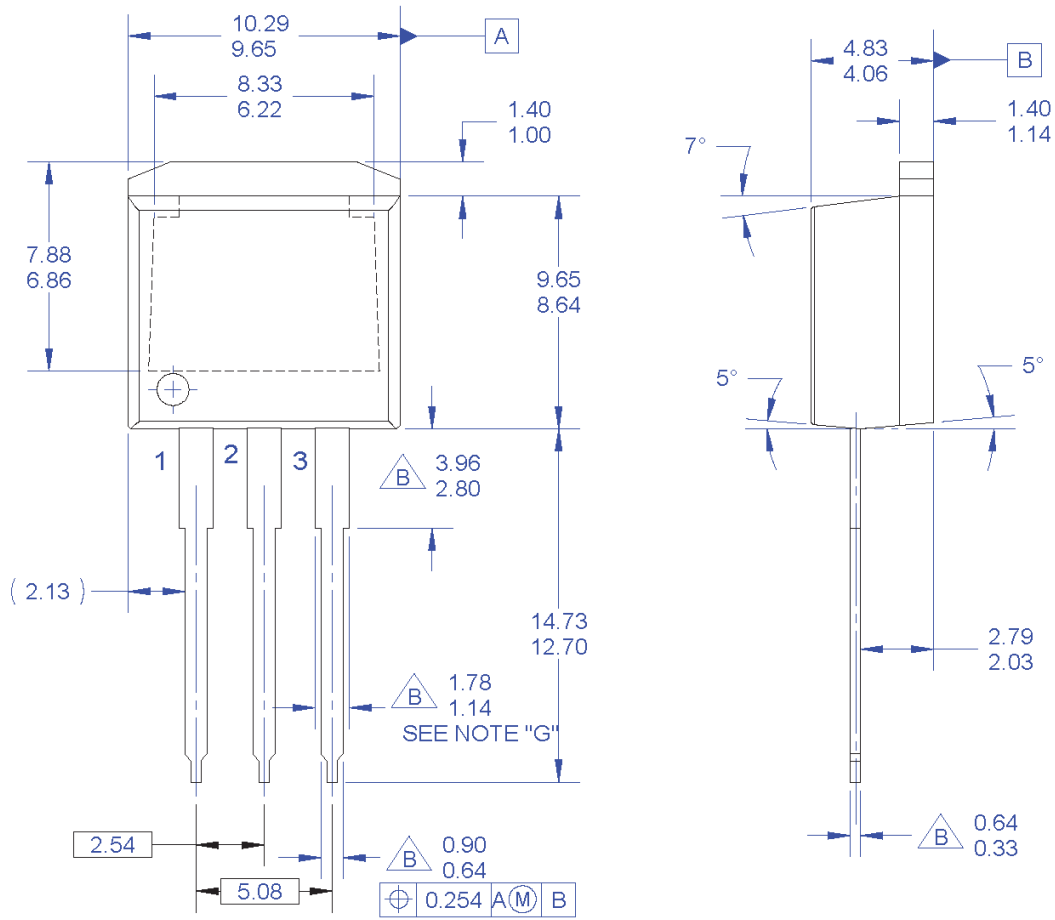


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms



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

Mechanical Dimensions



NOTES:

- A. EXCEPT WHERE NOTED CONFORMS TO TO262 JEDEC VARIATION AA.
- B. DOES NOT COMPLY JEDEC STD. VALUE.
- C. ALL DIMENSIONS ARE IN MILLIMETERS.
- D. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.
- E. DIMENSION AND TOLERANCE AS PER ANSI Y14.5-1994.
- F. LOCATION OF PIN HOLE MAY VARY (LOWER LEFT CORNER, LOWER CENTER AND CENTER OF PACKAGE)
- G. MAXIMUM WIDTH FOR F102 DEVICE = 1.35 MAX.
- H. DRAWING FILE NAME: TO262A03REV5

Figure 16. TO262 (I²PAK), Molded, 3-Lead, Jedec Variation AA

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Rev. I66