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# FQB27N25TM\_F085/FQI27N25TU\_F085

## N-Channel MOSFET

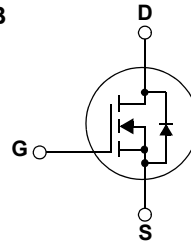
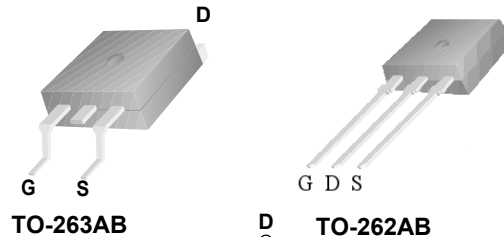
250 V, 25.5 A, 131 mΩ

### Features

- Typ  $R_{DS(on)}$  = 108mΩ at  $V_{GS}$  = 10V,  $I_D$  = 25.5A
- Typ  $Q_{g(tot)}$  = 45nC at  $V_{GS}$  = 10V,  $I_D$  = 27A
- UIS Capability
- RoHS Compliant
- Qualified to AEC Q101

### Applications

- Automotive Engine Control
- Powertrain Management
- Solenoid and Motor Drivers
- Electronic Steering
- Integrated Starter/Alternator
- Distributed Power Architectures and VRM
- Primary Switch for 12V Systems



For current package drawing, please refer to the Fairchild website at [www.fairchildsemi.com/packaging](http://www.fairchildsemi.com/packaging)

### MOSFET Maximum Ratings $T_J = 25^\circ\text{C}$ unless otherwise noted

| Symbol          | Parameter  | Rated                    | Units                     |
|-----------------|--|--------------------------|---------------------------|
| $V_{DSS}$       | Drain to Source Voltage                                  | 250                      | V                         |
| $V_{GS}$        | Gate to Source Voltage                                   | ±30                      | V                         |
| $I_D$           | Drain Current - Continuous ( $V_{GS}=10$ ) (Note 1)      | $T_C = 25^\circ\text{C}$ | 25.5                      |
|                 | Pulsed Drain Current                                     | $T_C = 25^\circ\text{C}$ | See Figure 4              |
| $E_{AS}$        | Single Pulse Avalanche Energy (Note 2)                   | 972                      | mJ                        |
| $P_D$           | Power Dissipation  | 417                      | W                         |
|                 | Derate above $25^\circ\text{C}$                          | 3.3                      | W/ $^\circ\text{C}$       |
| $T_J, T_{STG}$  | Operating and Storage Temperature                        | -55 to + 150             | $^\circ\text{C}$          |
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case                     | 0.3                      | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Maximum Thermal Resistance, Junction to Ambient (Note 3) | 43                       | $^\circ\text{C}/\text{W}$ |

### Package Marking and Ordering Information

| Device Marking | Device          | Package  | Reel Size | Tape Width | Quantity  |
|----------------|-----------------|----------|-----------|------------|-----------|
| FQB27N25TM     | FQB27N25TM_F085 | TO-263AB | 330mm     | 24mm       | 800 units |
| FQI27N25TU     | FQI27N25TU_F085 | TO-262AB | Tube      | N/A        | 50 units  |

#### Notes:

- 1: Current is limited by bondwire configuration.
- 2: Starting  $T_J = 25^\circ\text{C}$ ,  $L = 4.67\text{mH}$ ,  $I_{AS} = 20.4\text{A}$ ,  $V_{DD} = 100\text{V}$  during inductor charging and  $V_{DD} = 0\text{V}$  during time in avalanche.
- 3:  $R_{\theta JA}$  is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta JA}$  is determined by the user's board design. The maximum rating presented here is based on mounting on a 1 in<sup>2</sup> pad of 2oz copper.

FQB27N25TM\_F085/FQI27N25TU\_F085 N-Channel MOSFET

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

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

**Off Characteristics**

|               |                                   |   |     |   |           |               |
|---------------|-----------------------------------|---|-----|---|-----------|---------------|
| $B_{V_{DSS}}$ | Drain to Source Breakdown Voltage | $I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$                    | 250 | - | -         | V             |
| $I_{DSS}$     | Drain to Source Leakage Current   | $V_{DS} = 250\text{V}, T_J = 25^\circ\text{C}$                | -   | - | 1         | $\mu\text{A}$ |
|               |                                   | $V_{GS} = 0\text{V}, T_J = 150^\circ\text{C}(\text{Note } 4)$ | -   | - | 250       | $\mu\text{A}$ |
| $I_{GSS}$     | Gate to Source Leakage Current    | $V_{GS} = \pm 30\text{V}$                                     | -   | - | $\pm 100$ | nA            |

**On Characteristics**

|              |                                  |  |     |     |     |                  |
|--------------|----------------------------------|--|-----|-----|-----|------------------|
| $V_{GS(th)}$ | Gate to Source Threshold Voltage | $V_{GS} = V_{DS}, I_D = 250\mu\text{A}$                        | 3.0 | 4.1 | 5.0 | V                |
| $R_{DS(on)}$ | Drain to Source On Resistance    | $I_D = 25.5\text{A}, T_J = 25^\circ\text{C}$                   | -   | 108 | 131 | $\text{m}\Omega$ |
|              |                                  | $V_{GS} = 10\text{V}, T_J = 150^\circ\text{C}(\text{Note } 4)$ | -   | 265 | 310 | $\text{m}\Omega$ |

**Dynamic Characteristics**

|              |                               |  |   |      |    |          |
|--------------|-------------------------------|--|---|------|----|----------|
| $C_{iss}$    | Input Capacitance             | $V_{DS} = 25\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$ | - | 1800 | -  | pF       |
| $C_{oss}$    | Output Capacitance            |  | - | 350  | -  | pF       |
| $C_{rss}$    | Reverse Transfer Capacitance  |  | - | 45   | -  | pF       |
| $R_g$        | Gate Resistance               | $f = 1\text{MHz}$  | - | 0.82 | -  | $\Omega$ |
| $Q_{g(ToT)}$ | Total Gate Charge at 10V      | $V_{GS} = 0 \text{ to } 10\text{V}$                        | - | 45   | 49 | nC       |
| $Q_{g(th)}$  | Threshold Gate Charge         | $V_{GS} = 0 \text{ to } 2\text{V}$                         |   |      |    |          |
| $Q_{gs}$     | Gate to Source Gate Charge    | $V_{DD} = 125\text{V}, I_D = 27\text{A}$                   | - | 12   | -  | nC       |
| $Q_{gd}$     | Gate to Drain "Miller" Charge |  | - | 23   | -  | nC       |

**Switching Characteristics**

|              |                |   |   |     |     |    |
|--------------|----------------|---|---|-----|-----|----|
| $t_{on}$     | Turn-On Time   | $V_{DD} = 125\text{V}, I_D = 27\text{A}, V_{GS} = 10\text{V}, R_{GEN} = 25\Omega$ | - | -   | 196 | ns |
| $t_{d(on)}$  | Turn-On Delay  |   | - | 36  | -   | ns |
| $t_r$        | Rise Time      |   | - | 122 | -   | ns |
| $t_{d(off)}$ | Turn-Off Delay |   | - | 81  | -   | ns |
| $t_f$        | Fall Time      |   | - | 60  | -   | ns |
| $t_{off}$    | Turn-Off Time  |   | - | -   | 164 | ns |

**Drain-Source Diode Characteristics**

|          |                               |  |   |     |      |    |
|----------|-------------------------------|--|---|-----|------|----|
| $V_{SD}$ | Source to Drain Diode Voltage | $I_{SD} = 25.5\text{A}, V_{GS} = 0\text{V}$              | - | -   | 1.5  | V  |
|          |                               | $I_{SD} = 12.75\text{A}, V_{GS} = 0\text{V}$             | - | -   | 1.25 | V  |
| $t_{rr}$ | Reverse--Recovery Time        | $I_F = 27\text{A}, dI_{SD}/dt = 100\text{A}/\mu\text{s}$ | - | 205 | 238  | ns |
| $Q_{rr}$ | Reverse--Recovery Charge      | $V_{DD} = 200\text{V}$                                   | - | 1.8 | 2.3  | nC |

**Notes:**

4: The maximum value is specified by design at  $T_J = 150^\circ\text{C}$ . Product is not tested to this condition in production.

### Typical Characteristics

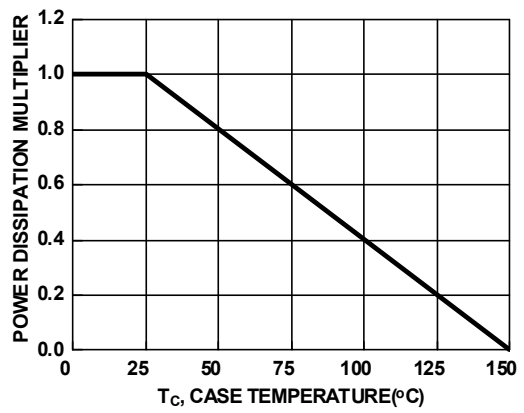


Figure 1. Normalized Power Dissipation vs. Case Temperature

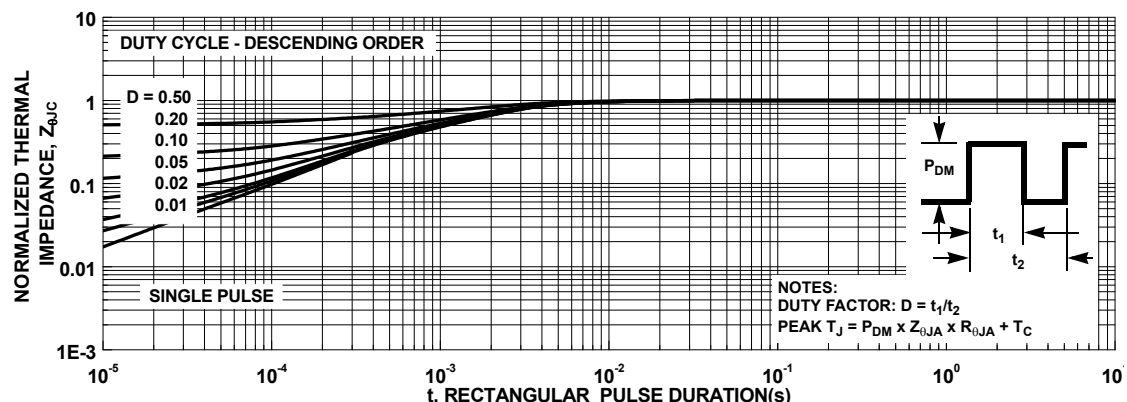


Figure 2. Normalized Maximum Transient Thermal Impedance

## Typical Characteristics

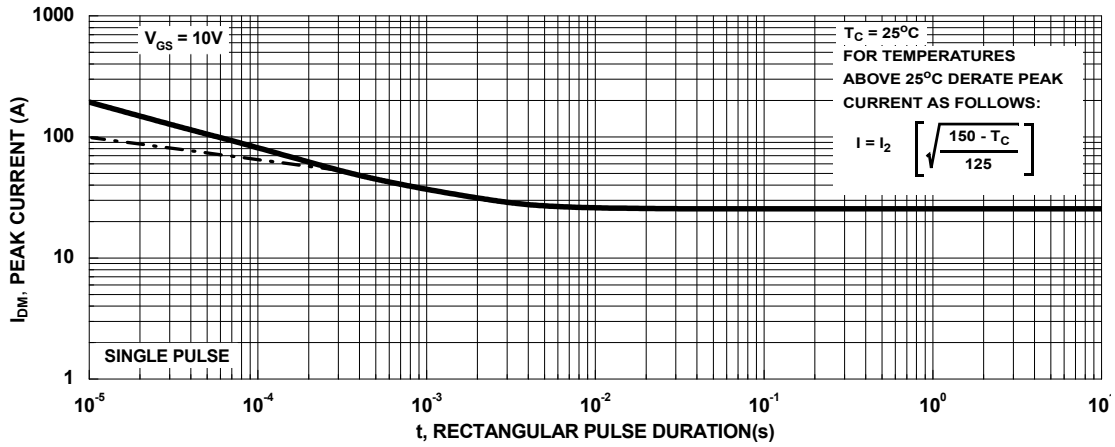


Figure 3. Peak Current Capability

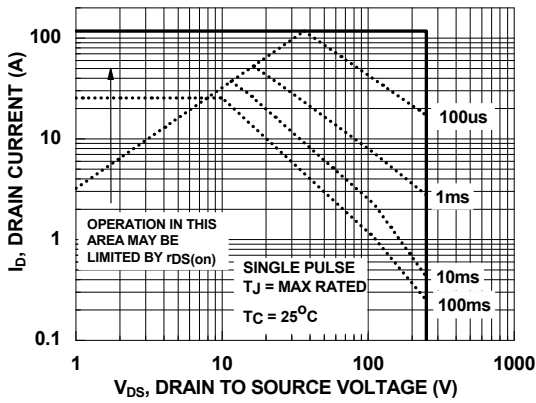
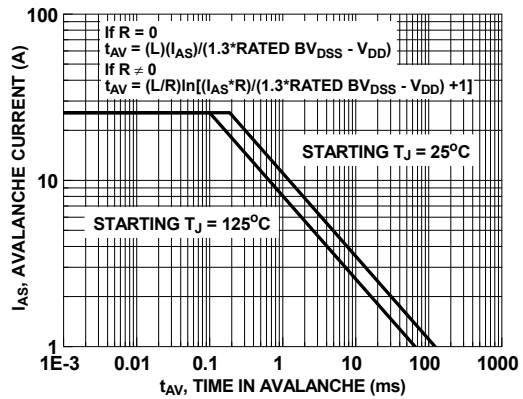


Figure 4. Forward Bias Safe Operating Area



NOTE: Refer to Fairchild Application Notes AN7514 and AN7515

Figure 5. Unclamped Inductive Switching Capability

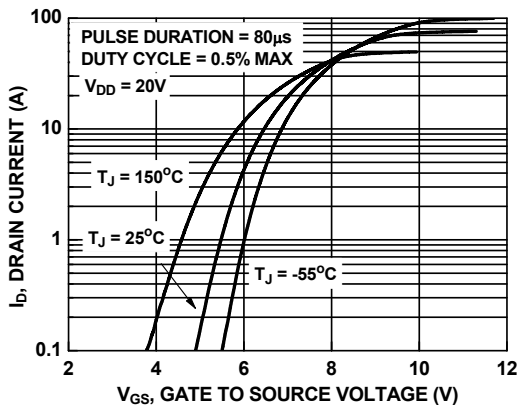


Figure 6. Transfer Characteristics

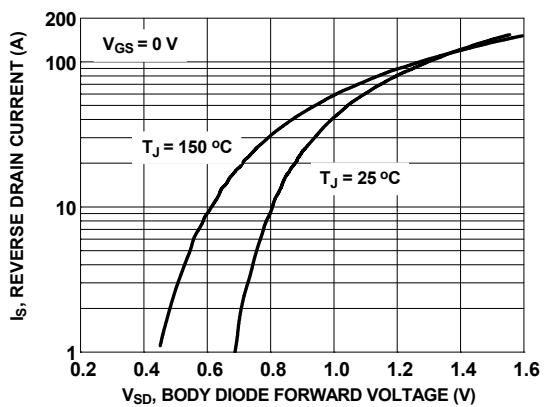


Figure 7. Forward Diode Characteristics

## Typical Characteristics

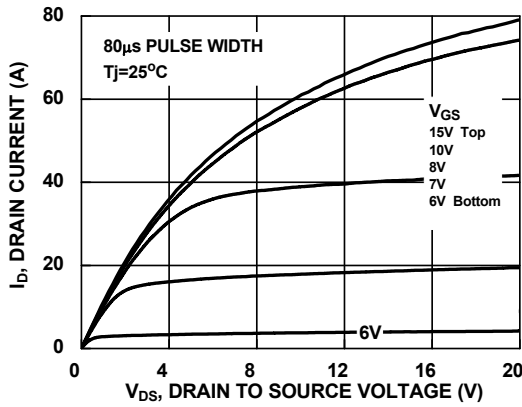


Figure 8. Saturation Characteristics

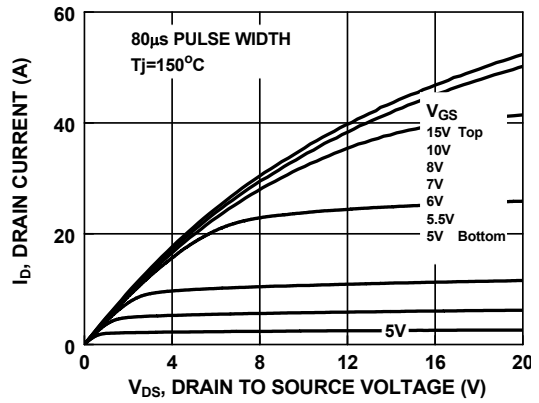


Figure 9. Saturation Characteristics

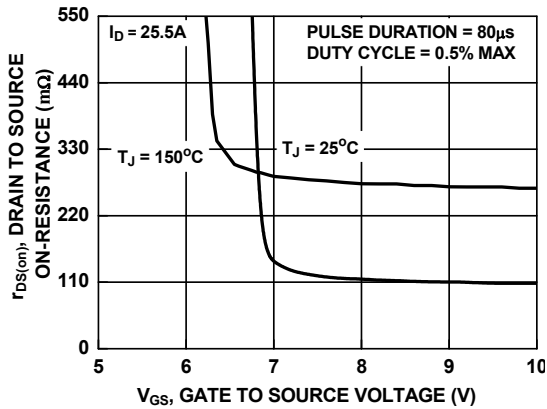


Figure 10.  $R_{DS(on)}$  vs. Gate Voltage

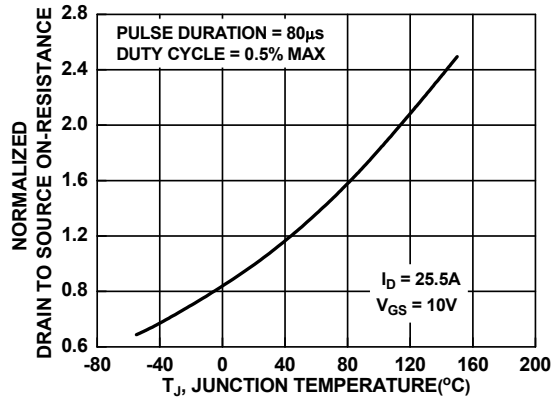


Figure 11. Normalized  $R_{DS(on)}$  vs. Junction Temperature

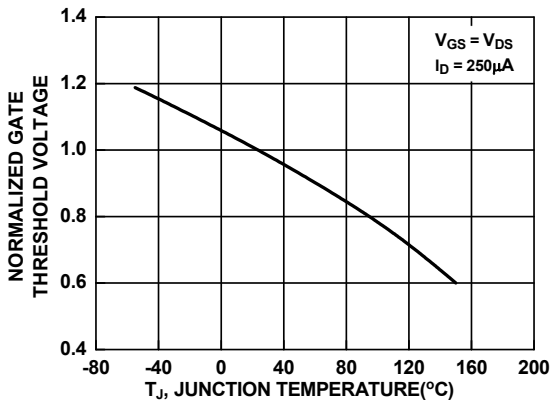


Figure 12. Normalized Gate Threshold Voltage vs. Temperature

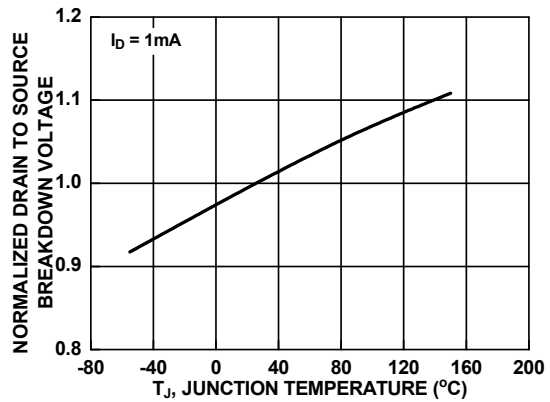


Figure 13. Normalized Drain to Source Breakdown Voltage vs. Junction Temperature

### Typical Characteristics

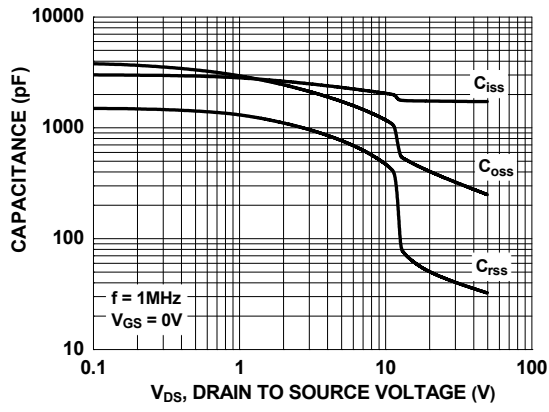


Figure 14. Capacitance vs. Drain to Source Voltage

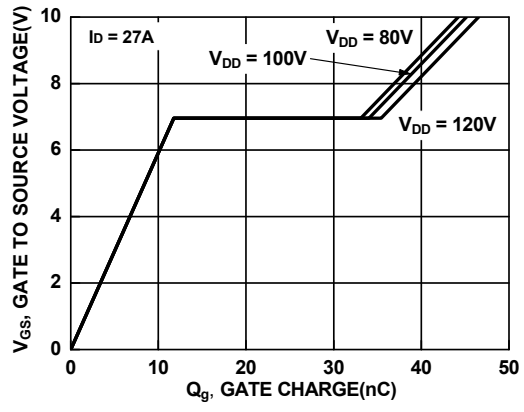







Figure 15. Gate Charge vs. Gate to Source Voltage



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