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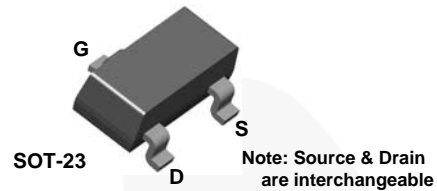


January 2015

MMBFJ309 / MMBFJ310 N-Channel RF Amplifier

Description

This device is designed for VHF/UHF amplifier, oscillator and mixer applications. As a common gate amplifier, 16 dB at 100 MHz and 12 dB at 450 MHz can be realized. Sourced from process 92. Source & Drain are interchangeable.



Ordering Information

| Part Number | Top Mark | Package | Packing Method |
|-------------|----------|-----------|----------------|
| MMBFJ309 | 6U | SOT-23 3L | Tape and Reel |
| MMBFJ310 | 6T | SOT-23 3L | Tape and Reel |

Absolute Maximum Ratings^{(1), (2)}

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only. Values are at $T_A = 25^\circ\text{C}$ unless otherwise noted.

| Symbol | Parameter | Value | Unit |
|----------------|--------------------------------------------------|------------|------------------|
| V_{DG} | Drain-Gate Voltage | 25 | V |
| V_{GS} | Gate-Source Voltage | -25 | V |
| I_{GF} | Forward Gate Current | 10 | mA |
| T_J, T_{STG} | Operating and Storage Junction Temperature Range | -55 to 150 | $^\circ\text{C}$ |

Notes:

1. These ratings are based on a maximum junction temperature of 150°C .
2. These are steady-state limits. Fairchild Semiconductor should be consulted on applications involving pulsed or low-duty-cycle operations.

Thermal Characteristics⁽³⁾

Values are at $T_A = 25^\circ\text{C}$ unless otherwise noted.

| Symbol | Parameter | Max. | Unit |
|-----------------|-----------------------------------------|------|----------------------------|
| P_D | Total Device Dissipation | 350 | mW |
| | Derate Above 25°C | 2.8 | $\text{mW}/^\circ\text{C}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | 357 | $^\circ\text{C}/\text{W}$ |

Note:

3. Device mounted on FR-4 PCB $36\text{mm} \times 18\text{mm} \times 1.5\text{mm}$; mounting pad for the collector lead minimum 6cm^2 .

Electrical Characteristics

Values are at $T_A = 25^\circ\text{C}$ unless otherwise noted.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit | |
|-------------------------------------|------------------------------------------------|----------------------------------------------------------------------------|----------|-------|-------|------------------------------|------------------|
| Off Characteristics | | | | | | | |
| $V_{(BR)GSS}$ | Gate-Source Breakdown Voltage | $I_G = -1.0 \mu\text{A}$, $V_{DS} = 0$ | -25 | | | V | |
| I_{GSS} | Gate Reverse Current | $V_{GS} = -15 \text{ V}$, $V_{DS} = 0$ | | | -1.0 | nA | |
| | | $V_{GS} = -15 \text{ V}$, $V_{DS} = 0$, $T_A = 125^\circ\text{C}$ | | | -1.0 | μA | |
| $V_{GS(off)}$ | Gate-Source Cut-Off Voltage | $V_{DS} = 10 \text{ V}$, $I_D = 1.0 \text{ mA}$ | MMBFJ309 | -1.0 | | -4.0 | V |
| | | | MMBFJ310 | -2.0 | | -6.5 | |
| On Characteristics | | | | | | | |
| I_{DSS} | Zero-Gate Voltage Drain Current ⁽⁴⁾ | $V_{DS} = 10 \text{ V}$, $V_{GS} = 0$ | MMBFJ309 | 12 | | 30 | mA |
| | | | MMBFJ310 | 24 | | 60 | |
| $V_{GS(f)}$ | Gate-Source Forward Voltage | $V_{DS} = 0$, $I_G = 1.0 \text{ mA}$ | | | 1.0 | V | |
| Small Signal Characteristics | | | | | | | |
| $Re_{(yis)}$ | Common-Source Input Conductance | $V_{DS} = 10 \text{ V}$, $I_D = 10 \text{ mA}$, $f = 100 \text{ MHz}$ | MMBFJ309 | | 0.7 | | mmhos |
| | | | MMBFJ310 | | 0.5 | | |
| $Re_{(yos)}$ | Common-Source Output Conductance | $V_{DS} = 10 \text{ V}$, $I_D = 10 \text{ mA}$, $f = 100 \text{ MHz}$ | | 0.25 | | mmhos | |
| G_{pg} | Common-Gate Power Gain | $V_{DS} = 10 \text{ V}$, $I_D = 10 \text{ mA}$, $f = 100 \text{ MHz}$ | | 16 | | dB | |
| $Re_{(yfs)}$ | Common-Source Forward Transconductance | $V_{DS} = 10 \text{ V}$, $I_D = 10 \text{ mA}$, $f = 100 \text{ MHz}$ | | 12 | | mmhos | |
| $Re_{(yig)}$ | Common-Gate Input Conductance | $V_{DS} = 10 \text{ V}$, $I_D = 10 \text{ mA}$, $f = 100 \text{ MHz}$ | | 12 | | mmhos | |
| g_{fs} | Common-Source Forward Transconductance | $V_{DS} = 10 \text{ V}$, $I_D = 10 \text{ mA}$, $f = 1.0 \text{ kHz}$ | MMBFJ309 | 10000 | | 20000 | μmhos |
| | | | MMBFJ310 | 8000 | | 18000 | |
| g_{oss} | Common-Source Output Conductance | $V_{DS} = 10 \text{ V}$, $I_D = 10 \text{ mA}$, $f = 1.0 \text{ kHz}$ | | | 150 | μmhos | |
| g_{fg} | Common-Gate Forward Conductance | $V_{DS} = 10 \text{ V}$, $I_D = 10 \text{ mA}$, $f = 1.0 \text{ kHz}$ | MMBFJ309 | | 13000 | | μmhos |
| | | | MMBFJ310 | | 12000 | | |
| g_{og} | Common-Gate Output Conductance | $V_{DS} = 10 \text{ V}$, $I_D = 10 \text{ mA}$, $f = 1.0 \text{ kHz}$ | MMBFJ309 | | 100 | | μmhos |
| | | | MMBFJ310 | | 150 | | |
| C_{dg} | Drain-Gate Capacitance | $V_{DS} = 0$, $V_{GS} = -10 \text{ V}$, $f = 1.0 \text{ MHz}$ | | 2.0 | 2.5 | pF | |
| C_{sg} | Source-Gate Capacitance | $V_{DS} = 0$, $V_{GS} = -10 \text{ V}$, $f = 1.0 \text{ MHz}$ | | 4.1 | 5.0 | pF | |
| NF | Noise Figure | $V_{DS} = 10 \text{ V}$, $I_D = 10 \text{ mA}$, $f = 450 \text{ MHz}$ | | 3.0 | | dB | |
| e_n | Equivalent Short-Circuit Input Noise Voltage | $V_{DS} = 10 \text{ V}$, $I_D = 10 \text{ mA}$, $f = 100 \text{ Hz}$ | | 6.0 | | $\text{nV}/\sqrt{\text{Hz}}$ | |

Note:

4. Pulse test: pulse width $\leq 300 \mu\text{s}$, duty cycle $\leq 2.0\%$

Typical Performance Characteristics

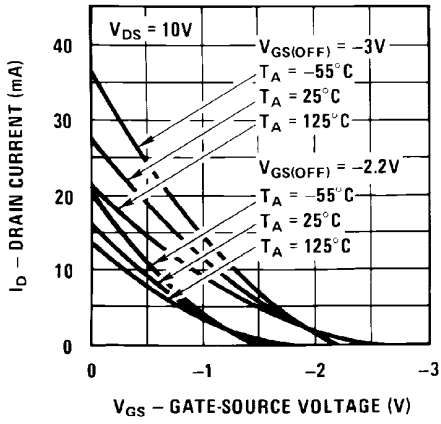


Figure 1. Transfer Characteristics

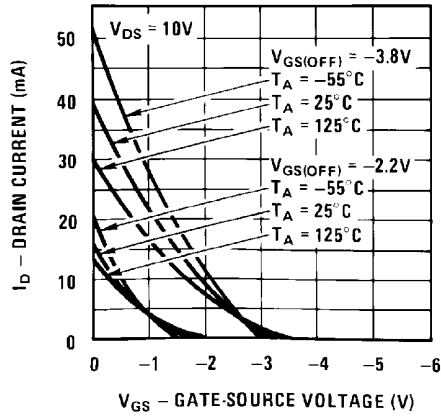


Figure 2. Transfer Characteristics

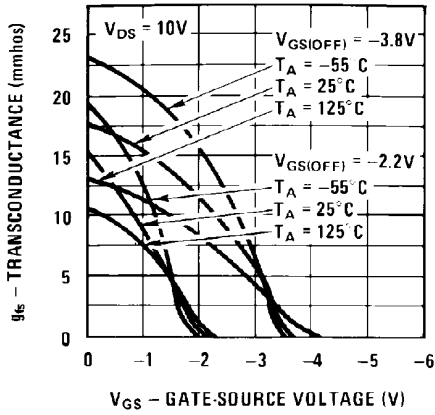


Figure 3. Transfer Characteristics

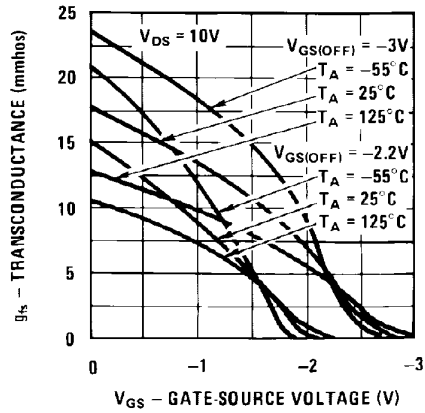


Figure 4. Transfer Characteristics

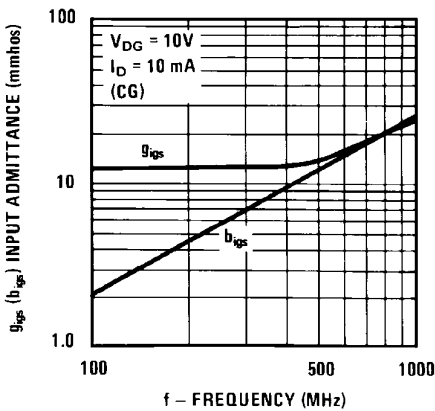


Figure 5. Input Admittance

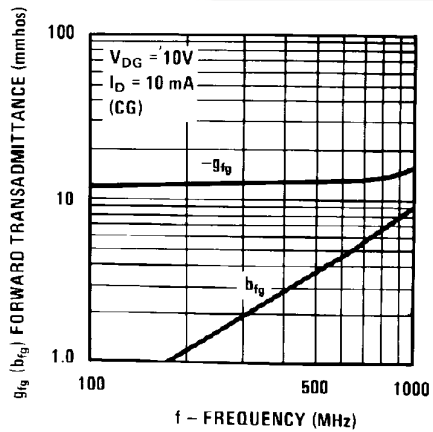


Figure 6. Forward Transadmittance

Typical Performance Characteristics (Continued)

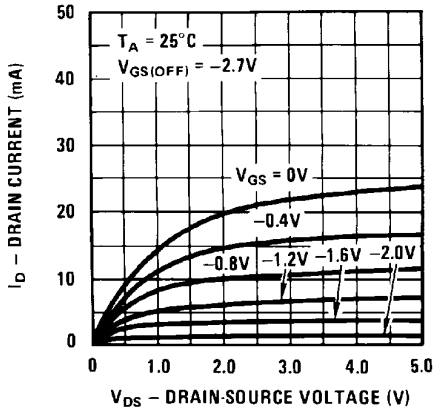


Figure 7. Common Drain-Source

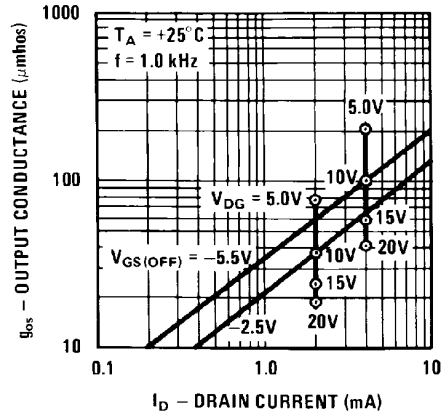


Figure 8. Output Conductance vs. Drain Current

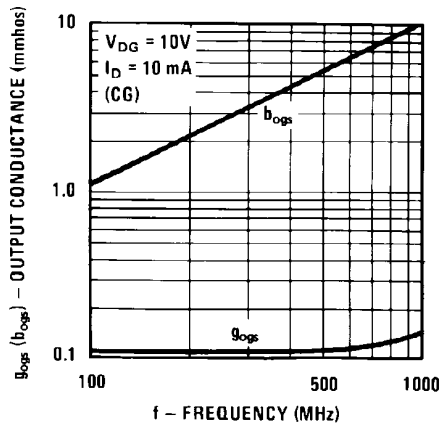


Figure 9. Output Admittance

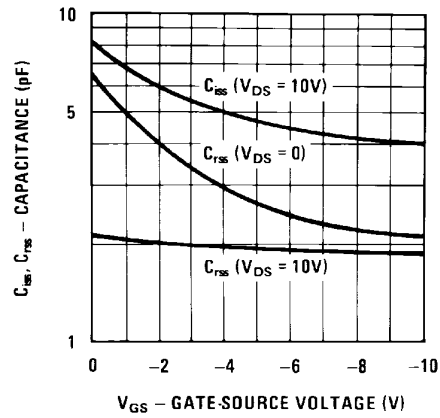


Figure 10. Capacitance vs. Voltage

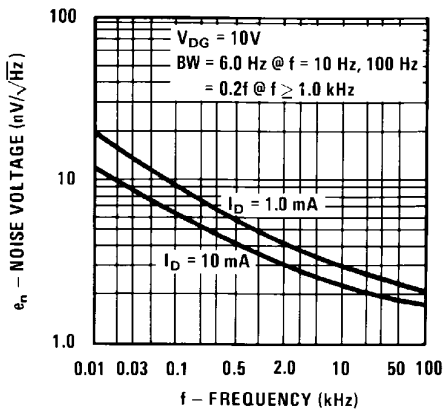


Figure 11. Noise Voltage vs. Frequency

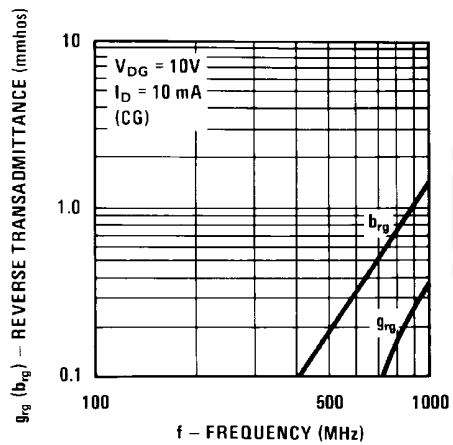


Figure 12. Reverse Transadmittance

Typical Performance Characteristics (Continued)

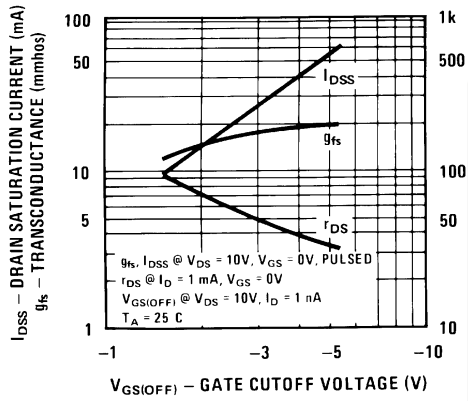


Figure 13. Parameter Interactions

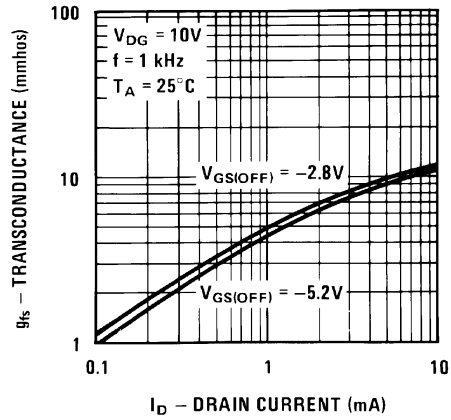


Figure 14. Transconductance vs. Drain Current

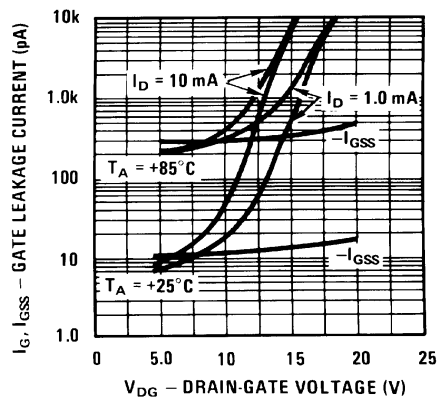


Figure 15. Leakage Current vs. Voltage

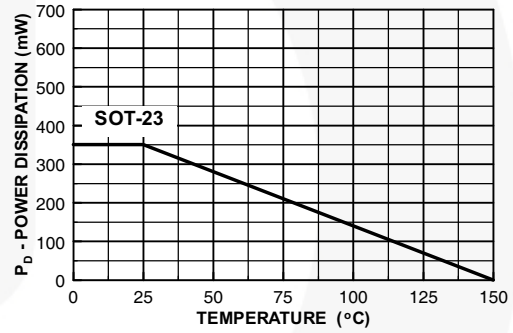
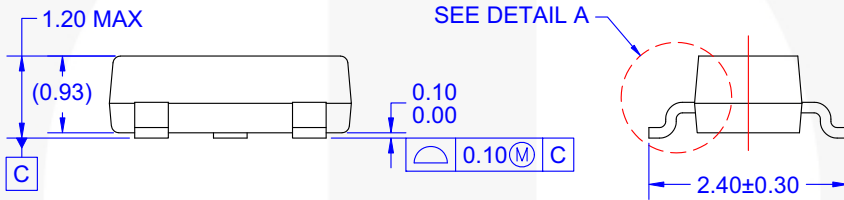
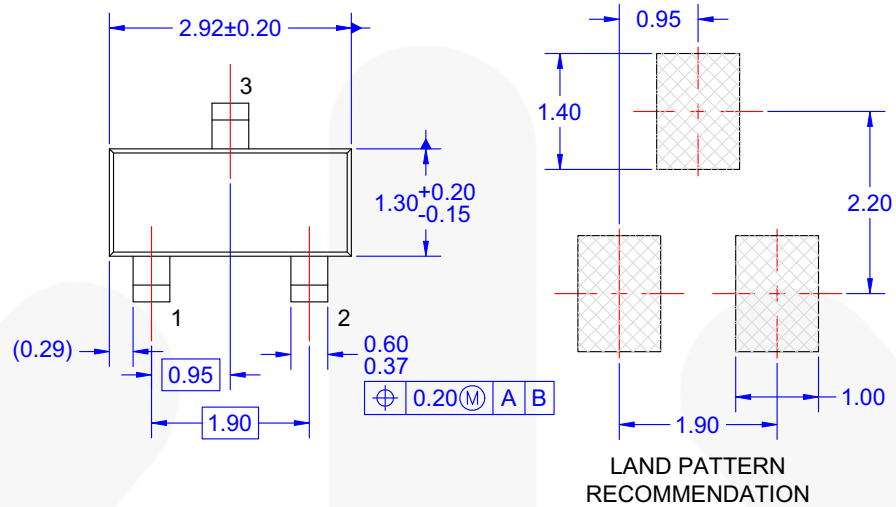


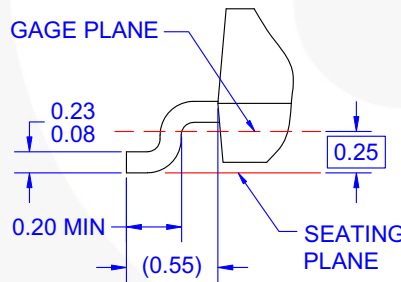
Figure 16. Power Dissipation vs. Ambient Temperature

Physical Dimensions



NOTES: UNLESS OTHERWISE SPECIFIED

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- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS ARE INCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR EXTRUSIONS.
- D) DIMENSIONING AND TOLERANCING PER ASME Y14.5M - 1994.
- E) DRAWING FILE NAME: MA03DREV10








DETAIL A
SCALE: 2X

Figure 17. 3-LEAD, SOT23, JEDEC TO-236, LOW PROFILE



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