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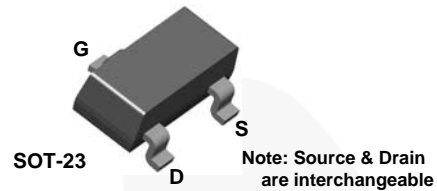


January 2015

# 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<sup>(1), (2)</sup>

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  $150^\circ\text{C}$ .
2. These are steady-state limits. Fairchild Semiconductor should be consulted on applications involving pulsed or low-duty-cycle operations.

## Thermal Characteristics<sup>(3)</sup>

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 $25^\circ\text{C}$	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  $6\text{cm}^2$ .

## Electrical Characteristics

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit	
<b>Off Characteristics</b>							
$V_{(BR)GSS}$	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	$\mu\text{A}$	
$V_{GS(off)}$	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	
<b>On Characteristics</b>							
$I_{DSS}$	Zero-Gate Voltage Drain Current <sup>(4)</sup>	$V_{DS} = 10 \text{ V}$ , $V_{GS} = 0$	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	
<b>Small Signal Characteristics</b>							
$Re_{(yis)}$	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	$\mu\text{mhos}$
			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	$\mu\text{mhos}$	
$g_{fg}$	Common-Gate Forward Conductance	$V_{DS} = 10 \text{ V}$ , $I_D = 10 \text{ mA}$ , $f = 1.0 \text{ kHz}$	MMBFJ309		13000		$\mu\text{mhos}$
			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		$\mu\text{mhos}$
			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

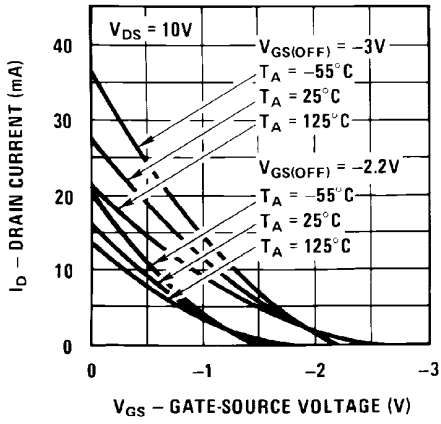


Figure 1. Transfer Characteristics

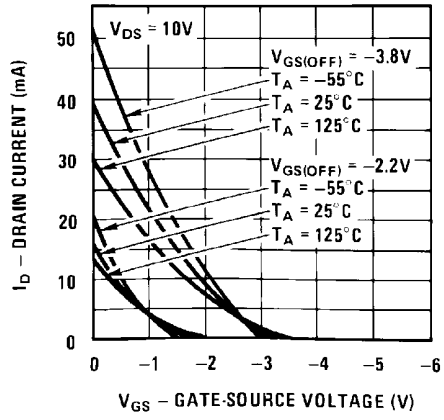


Figure 2. Transfer Characteristics

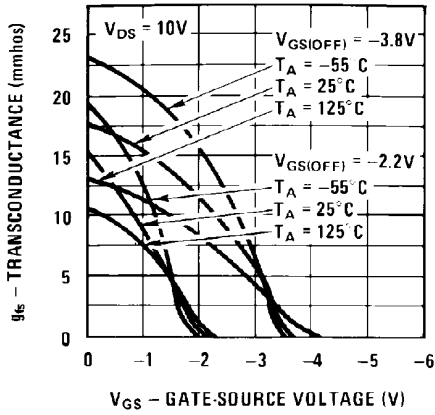


Figure 3. Transfer Characteristics

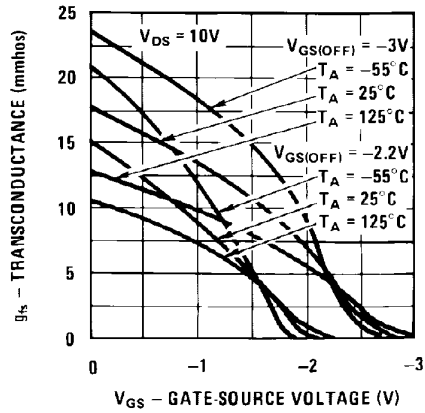


Figure 4. Transfer Characteristics

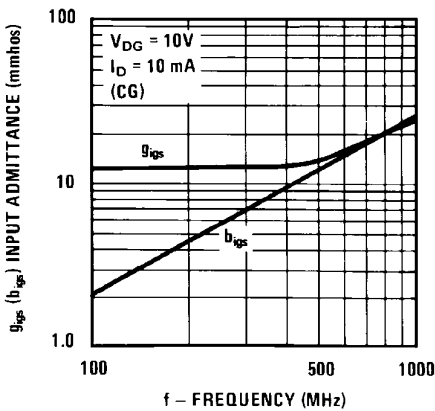


Figure 5. Input Admittance

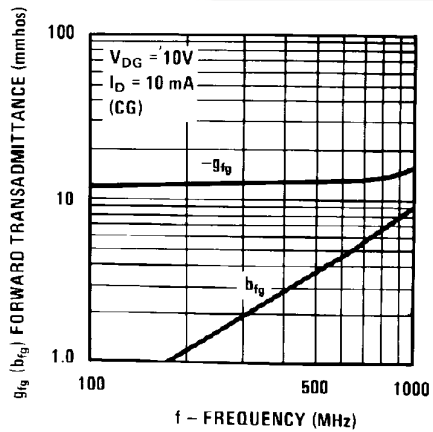


Figure 6. Forward Transadmittance

Typical Performance Characteristics (Continued)

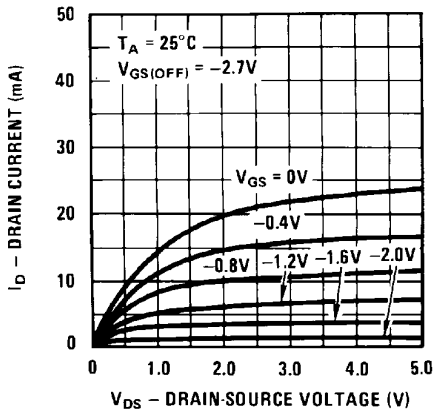


Figure 7. Common Drain-Source

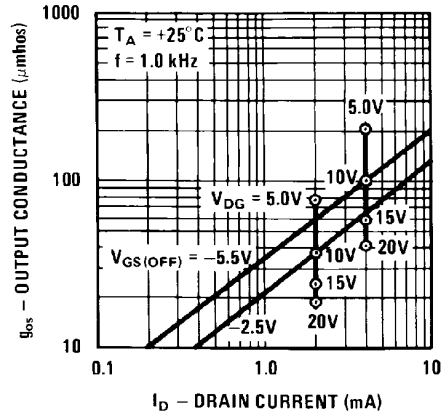


Figure 8. Output Conductance vs. Drain Current

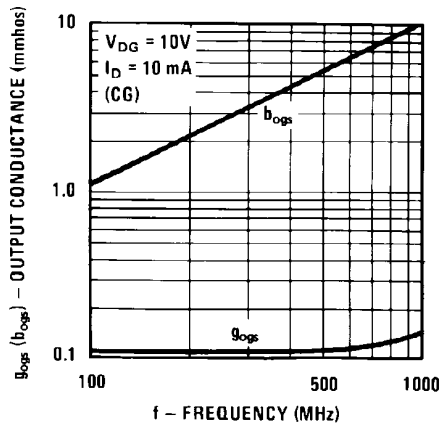


Figure 9. Output Admittance

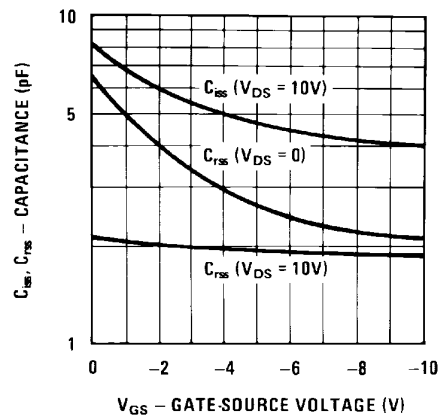


Figure 10. Capacitance vs. Voltage

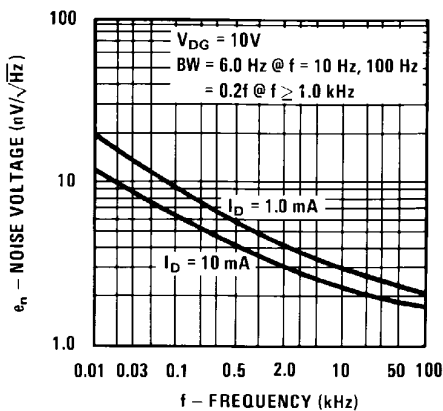


Figure 11. Noise Voltage vs. Frequency

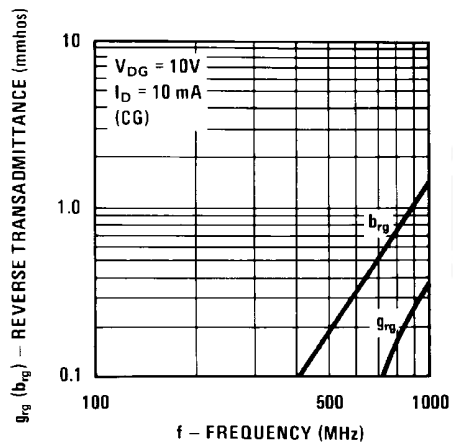


Figure 12. Reverse Transadmittance

Typical Performance Characteristics (Continued)

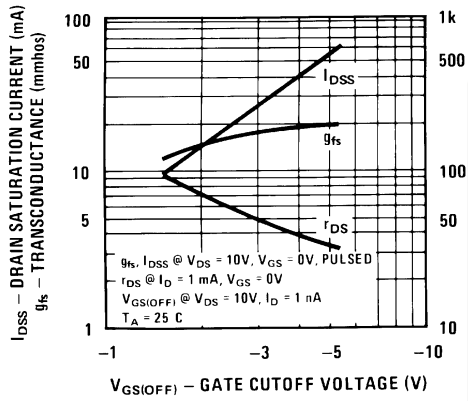


Figure 13. Parameter Interactions

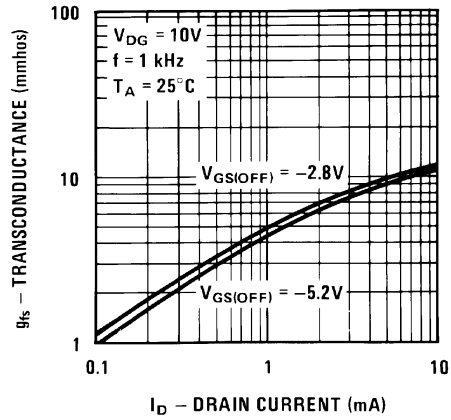


Figure 14. Transconductance vs. Drain Current

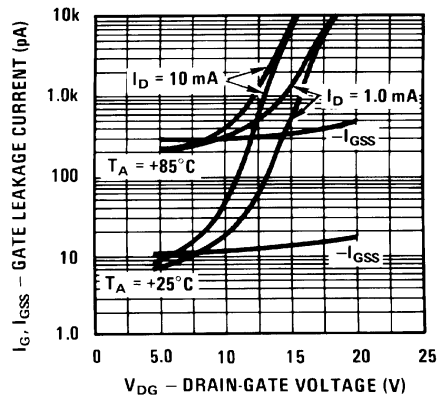


Figure 15. Leakage Current vs. Voltage

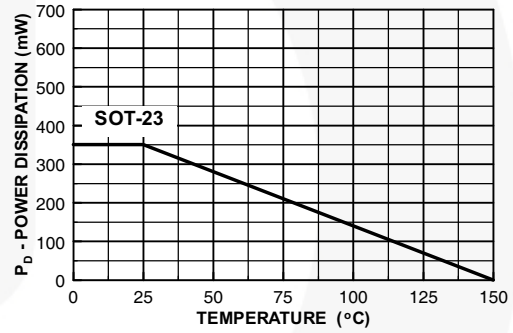
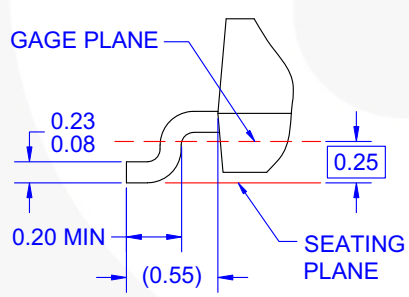
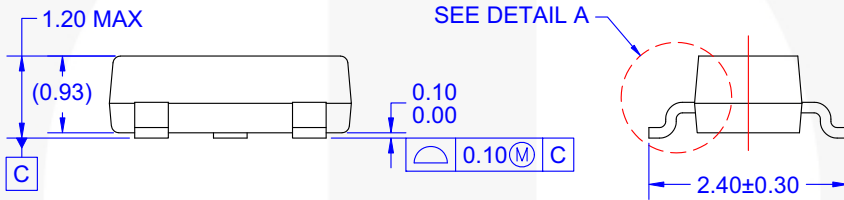
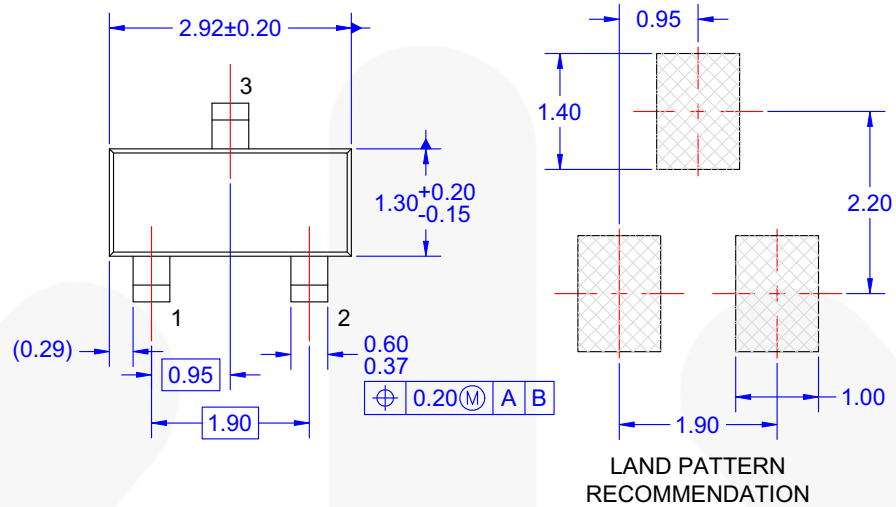


Figure 16. Power Dissipation vs. Ambient Temperature

Physical Dimensions



- NOTES: UNLESS OTHERWISE SPECIFIED
- A) REFERENCE JEDEC REGISTRATION TO-236, VARIATION AB, ISSUE H.
  - 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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