

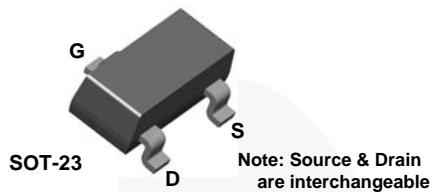


January 2015

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	°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	mW/°C
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	357	°C/W

Note:

3. Device mounted on FR-4 PCB 36mm × 18mm × 1.5mm; mounting pad for the collector lead minimum 6cm².

Electrical Characteristics

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit	
Off Characteristics							
$V_{(\text{BR})\text{GSS}}$	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	
$V_{GS(\text{off})}$	Gate-Source Cut-Off Voltage	$V_{DS} = 10 \text{ V}$, $I_D = 1.0 \text{ nA}$	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							
$R_{e(yis)}$	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			
$R_{e(yos)}$	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	
$R_{e(yfs)}$	Common-Source Forward Transconductance	$V_{DS} = 10 \text{ V}$, $I_D = 10 \text{ mA}$, $f = 100 \text{ MHz}$		12		mmhos	
$R_{e(yig)}$	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

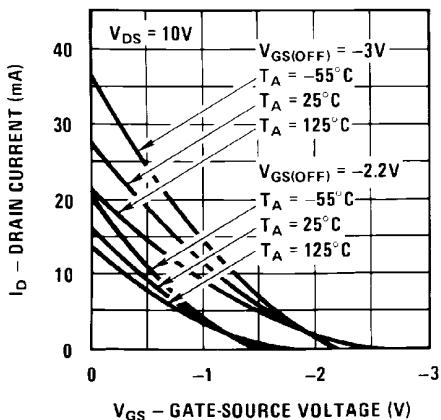


Figure 1. Transfer Characteristics

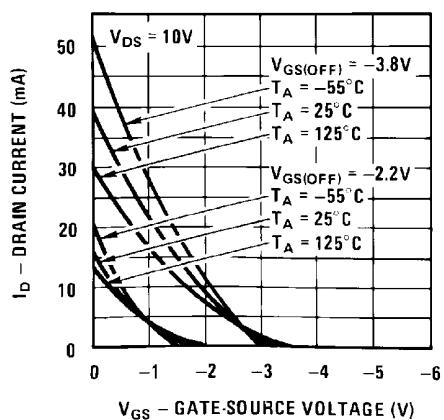


Figure 2. Transfer Characteristics

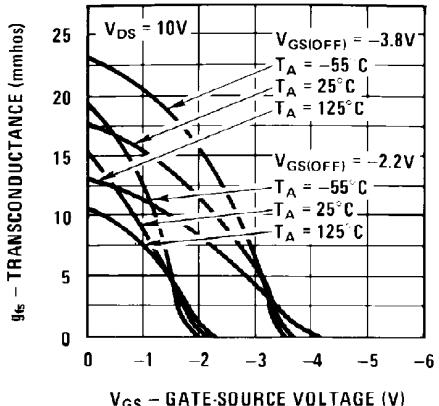


Figure 3. Transfer Characteristics

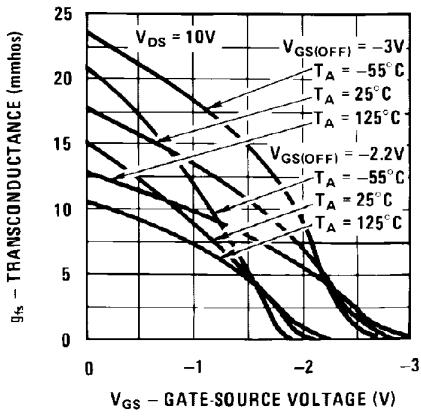


Figure 4. Transfer Characteristics

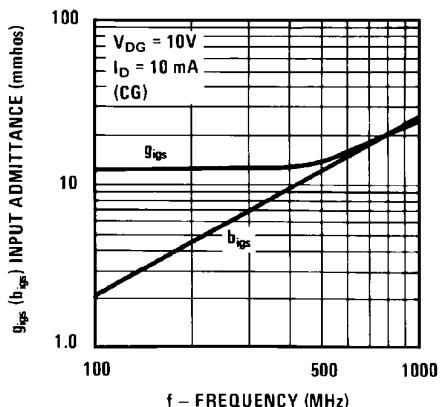


Figure 5. Input Admittance

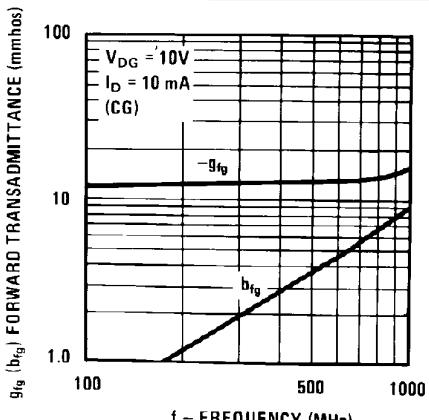


Figure 6. Forward Transadmittance

Typical Performance Characteristics (Continued)

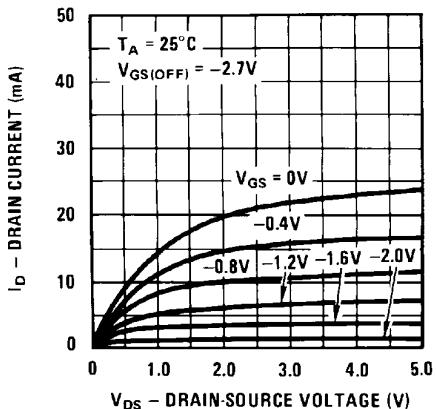


Figure 7. Common Drain-Source

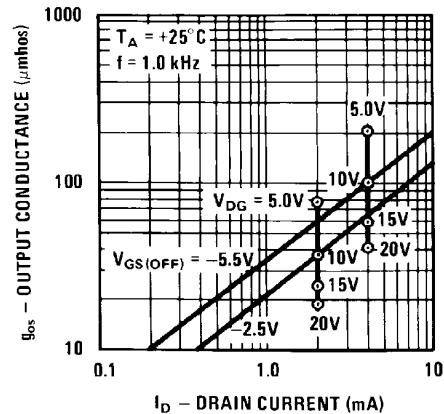


Figure 8. Output Conductance vs. Drain Current

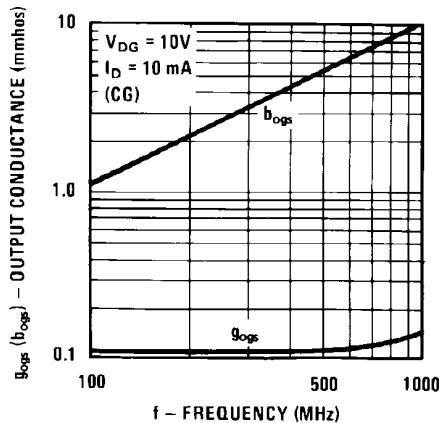


Figure 9. Output Admittance

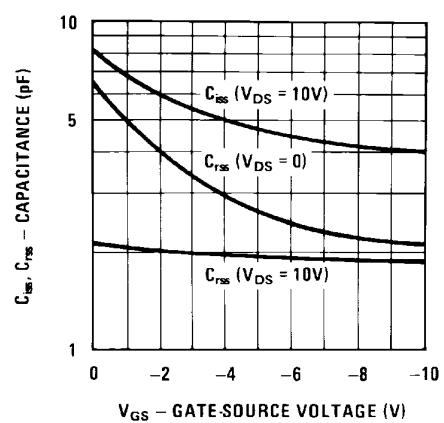


Figure 10. Capacitance vs. Voltage

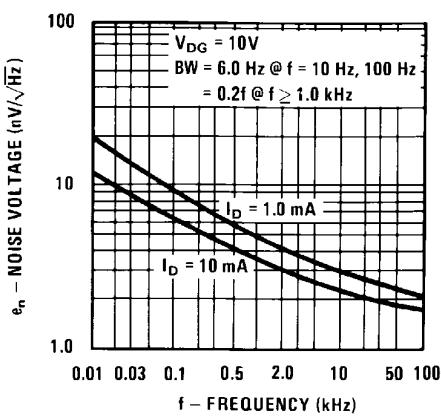


Figure 11. Noise Voltage vs. Frequency

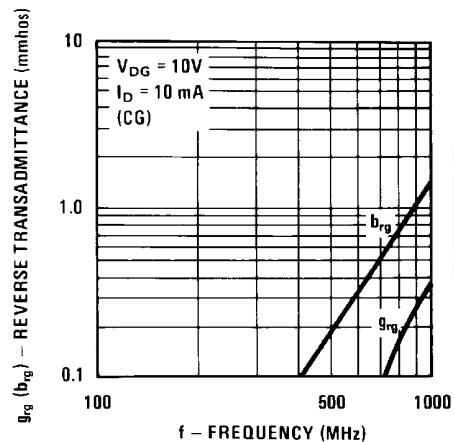


Figure 12. Reverse Transadmittance

Typical Performance Characteristics (Continued)

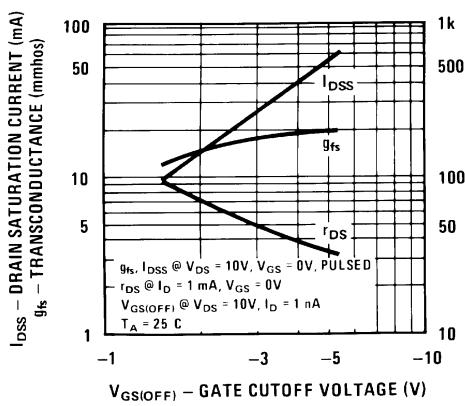


Figure 13. Parameter Interactions

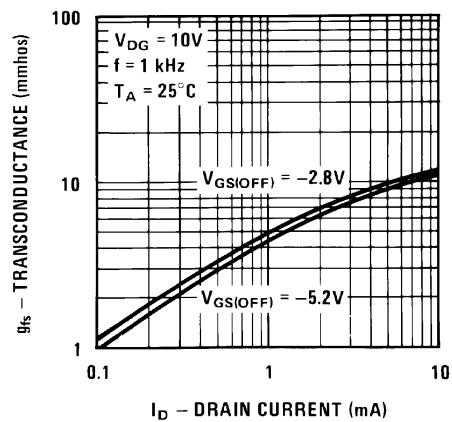


Figure 14. Transconductance vs. Drain Current

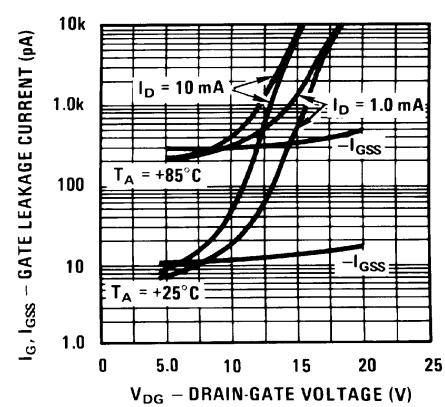


Figure 15. Leakage Current vs. Voltage

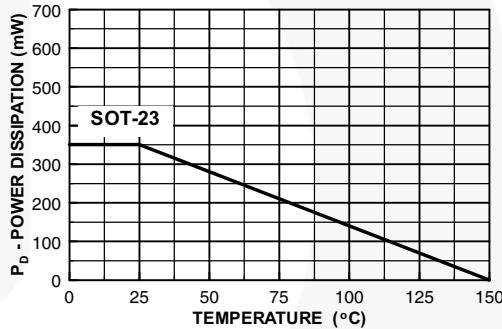


Figure 16. Power Dissipation vs. Ambient Temperature

Physical Dimensions

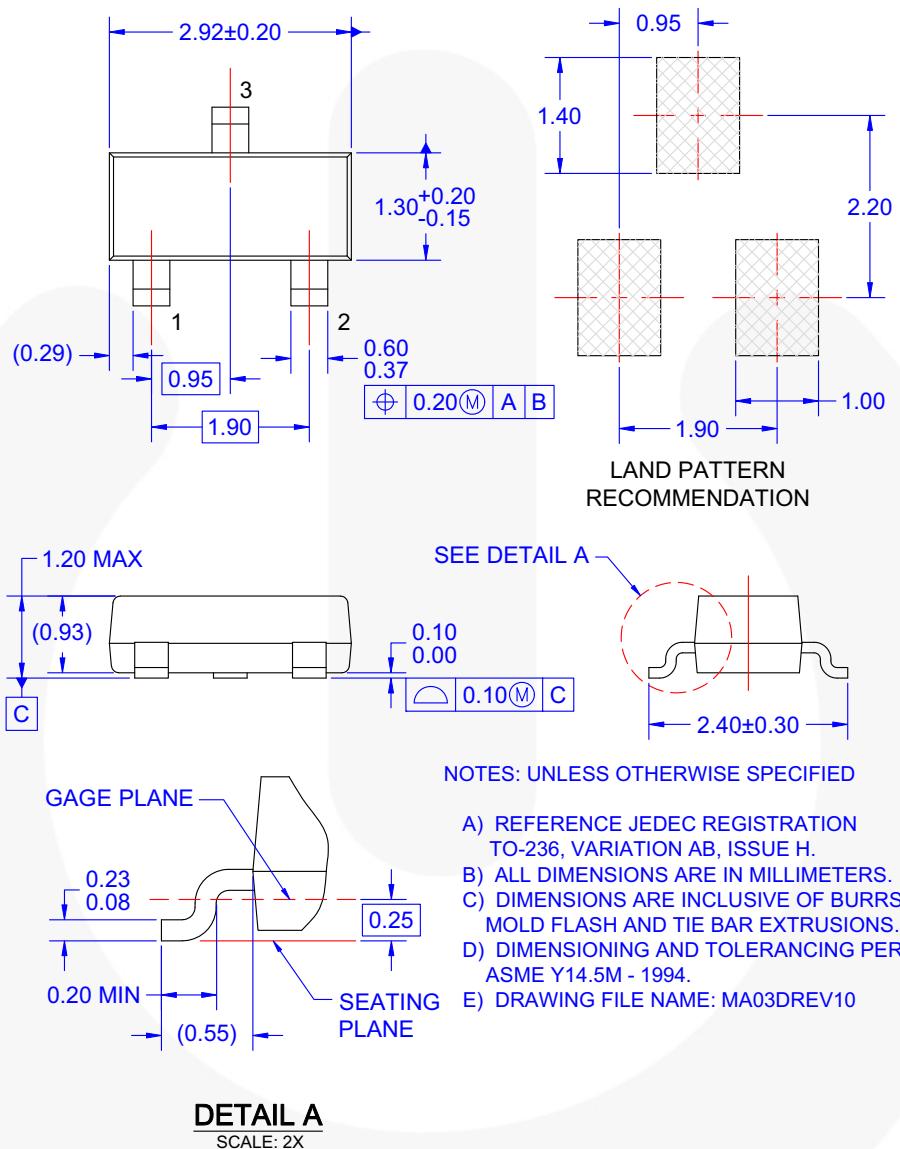


Figure 17. 3-LEAD, SOT23, JEDEC TO-236, LOW PROFILE



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