

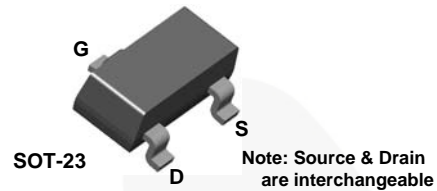


January 2015

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

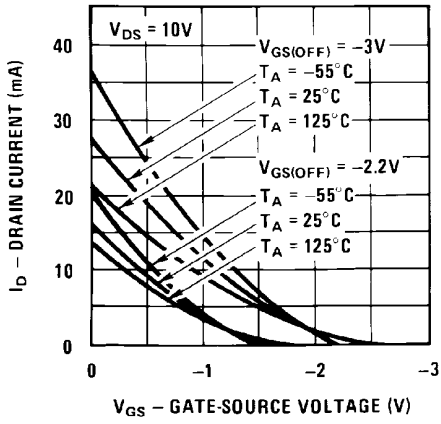


Figure 1. Transfer Characteristics

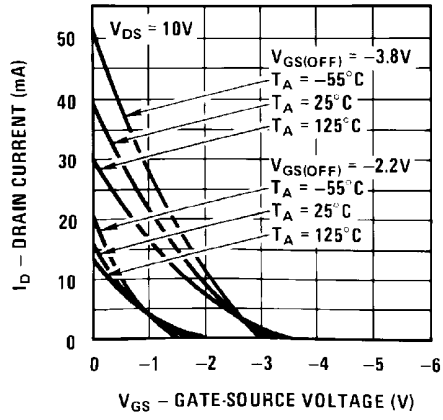


Figure 2. Transfer Characteristics

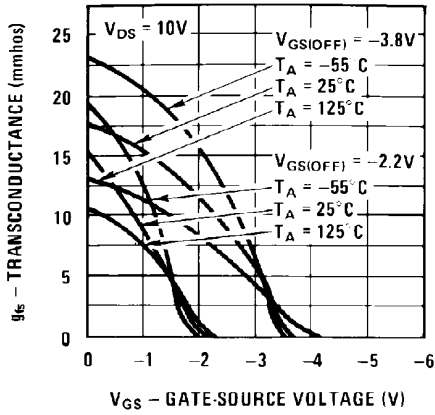


Figure 3. Transfer Characteristics

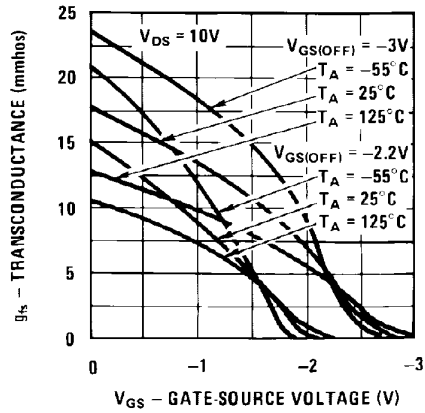


Figure 4. Transfer Characteristics

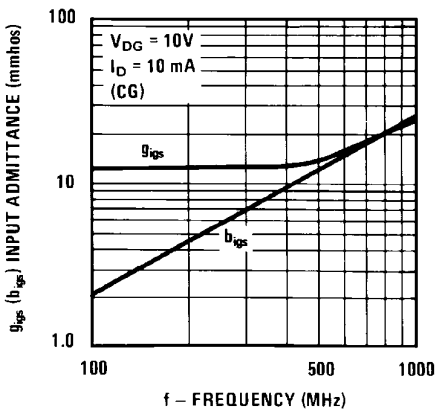


Figure 5. Input Admittance

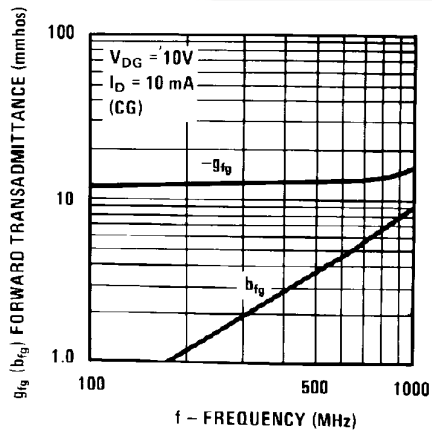


Figure 6. Forward Transadmittance

Typical Performance Characteristics (Continued)

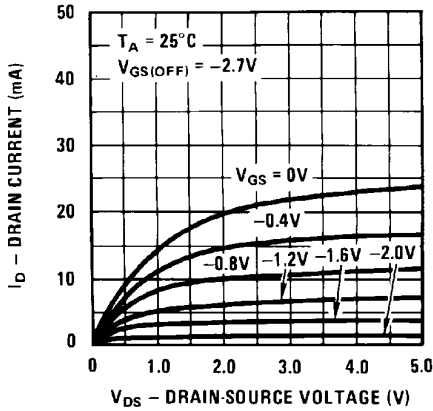


Figure 7. Common Drain-Source

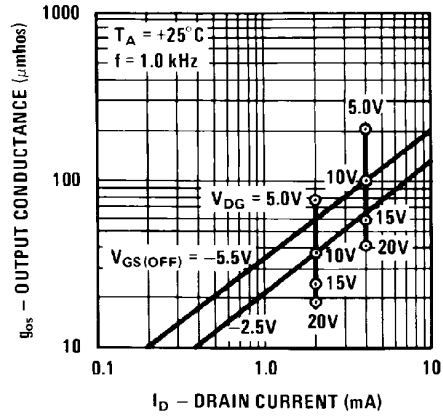


Figure 8. Output Conductance vs. Drain Current

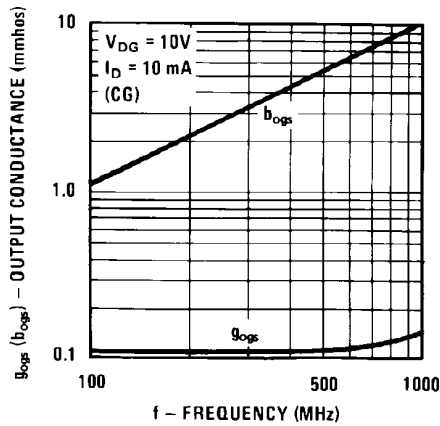


Figure 9. Output Admittance

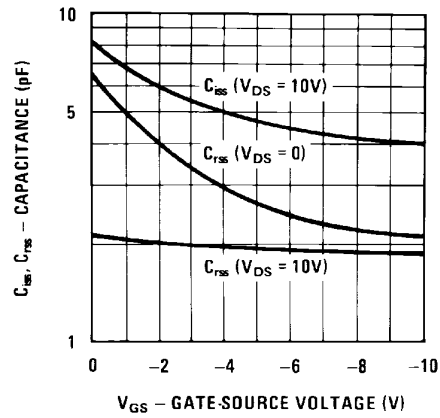


Figure 10. Capacitance vs. Voltage

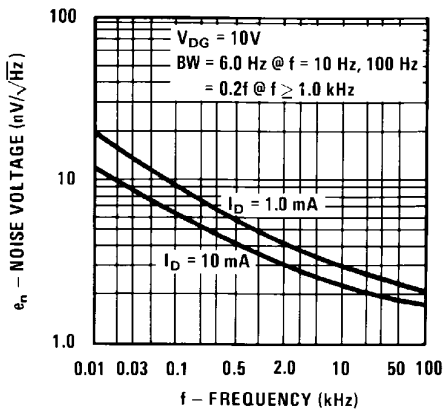


Figure 11. Noise Voltage vs. Frequency

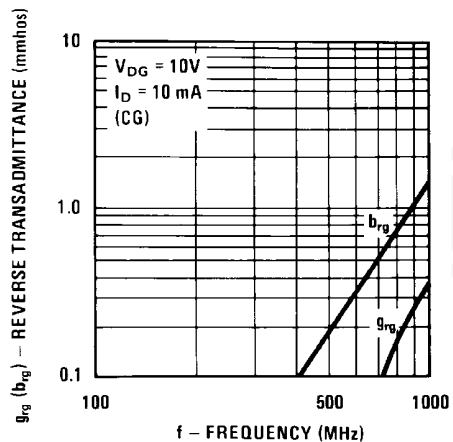


Figure 12. Reverse Transmittance

Typical Performance Characteristics (Continued)

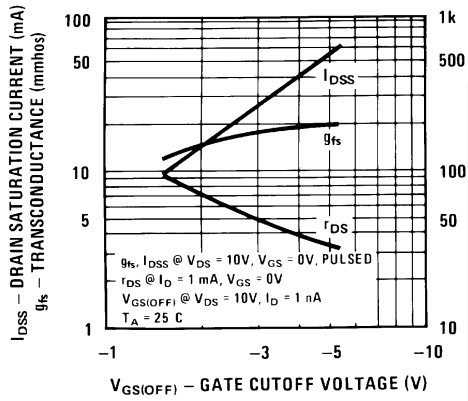


Figure 13. Parameter Interactions

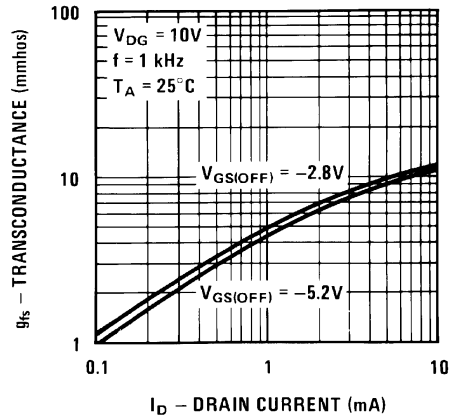


Figure 14. Transconductance vs. Drain Current

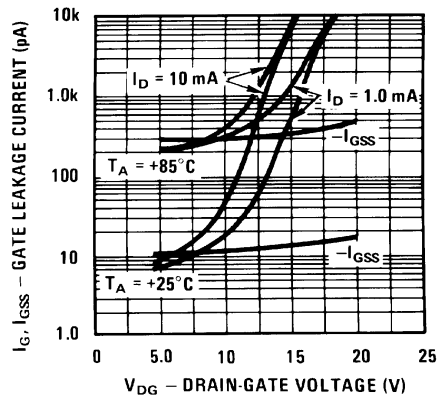


Figure 15. Leakage Current vs. Voltage

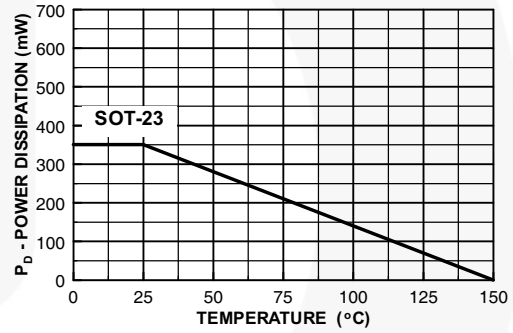
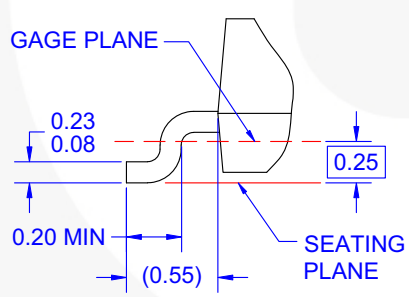


Figure 16. Power Dissipation vs. Ambient Temperature

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



TRADEMARKS

The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

AccuPower™
 AttitudeEngine™
 Awinda®
 AX-CAP®
 BitSiC™
 Build it Now™
 CorePLUS™
 CorePOWER™
 CROSSVOLT™
 CTL™
 Current Transfer Logic™
 DEUXPEED®
 Dual Cool™
 EcoSPARK®
 EfficientMax™
 ESBC™

 Fairchild®
 Fairchild Semiconductor®
 FACT Quiet Series™
 FACT®
 FAST®
 FastvCore™
 FETBench™
 FPS™

F-PFS™
 FRFET®
 Global Power ResourceSM
 GreenBridge™
 Green FPS™
 Green FPS™ e-Series™
 Gmax™
 GTO™
 IntelliMAX™
 ISOPLANAR™
 Making Small Speakers Sound Louder and Better™
 MegaBuck™
 MICROCOUPLER™
 MicroFET™
 MicroPak™
 MicroPak2™
 MillerDrive™
 MotionMax™
 MotionGrid®
 MTi®
 MTx®
 MVN®
 mWSaver®
 OptoHiT™
 OPTOLOGIC®

OPTOPLANAR®

 PowerTrench®
 PowerXS™
 Programmable Active Droop™
 QFET®
 QS™
 Quiet Series™
 RapidConfigure™

 Saving our world, 1mW/W/kW at a time™
 SignalWise™
 SmartMax™
 SMART START™
 Solutions for Your Success™
 SPM®
 STEALTH™
 SuperFET®
 SuperSOT™-3
 SuperSOT™-6
 SuperSOT™-8
 SupreMOS®
 SyncFET™
 Sync-Lock™

 SYSTEM GENERAL®
 TinyBoost®
 TinyBuck®
 TinyCalc™
 TinyLogic®
 TINYOPTO™
 TinyPower™
 TinyPWM™
 TinyWire™
 TranSiC™
 TriFault Detect™
 TRUECURRENT®
 μSerDes™

 UHC®
 Ultra FRFET™
 UniFET™
 VCX™
 VisualMax™
 VoltagePlus™
 XS™
 Xsens™
 仙童™

* Trademarks of System General Corporation, used under license by Fairchild Semiconductor.

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. TO OBTAIN THE LATEST, MOST UP-TO-DATE DATASHEET AND PRODUCT INFORMATION, VISIT OUR WEBSITE AT [HTTP://WWW.FAIRCHILDSEMI.COM](http://www.fairchildsemi.com). FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.

As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
2. A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

ANTI-COUNTERFEITING POLICY

Fairchild Semiconductor Corporation's Anti-Counterfeiting Policy. Fairchild's Anti-Counterfeiting Policy is also stated on our external website, www.fairchildsemi.com, under Sales Support.

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufacturers of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed applications, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from Fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handling and storage and provide access to Fairchild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address any warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

Rev. I73