

# JFET - VHF/UHF Amplifier Transistor

## N-Channel

### MMBFJ309L, MMBFJ310L, SMMBFJ309L, SMMBFJ310L

#### Features

- Drain and Source are Interchangeable
- S Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

#### MAXIMUM RATINGS

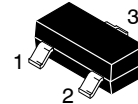
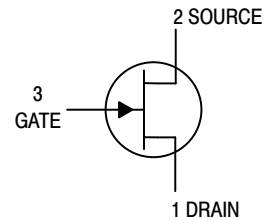
| Rating               | Symbol   | Value | Unit |
|----------------------|----------|-------|------|
| Drain-Source Voltage | $V_{DS}$ | 25    | Vdc  |
| Gate-Source Voltage  | $V_{GS}$ | 25    | Vdc  |
| Gate Current         | $I_G$    | 10    | mA   |

#### THERMAL CHARACTERISTICS

| Characteristic                                                                                               | Symbol          | Max         | Unit                       |
|--------------------------------------------------------------------------------------------------------------|-----------------|-------------|----------------------------|
| Total Device Dissipation FR-5 Board,<br>(Note 1) $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$           | 225<br>1.8  | mW<br>mW/ $^\circ\text{C}$ |
| Thermal Resistance, Junction-to-Ambient                                                                      | $R_{\theta JA}$ | 556         | $^\circ\text{C/W}$         |
| Junction and Storage Temperature                                                                             | $T_J, T_{stg}$  | -55 to +150 | $^\circ\text{C}$           |

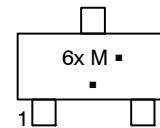
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. FR-5 = 1.0 x 0.75 x 0.062 in.



SOT-23 (TO-236)  
CASE 318  
STYLE 10

#### MARKING DIAGRAM



6x = Device Code

x = U for MMBFJ309L, SMMBFJ309L

x = T for MMBFJ310L, SMMBFJ310L

M = Date Code\*

▪ = Pb-Free Package

(Note: Microdot may be in either location)

\*Date Code orientation and/or overbar may vary depending upon manufacturing location.

#### ORDERING INFORMATION

| Device                         | Package             | Shipping†               |
|--------------------------------|---------------------|-------------------------|
| MMBFJ309LT1G,<br>SMMBFJ309LT1G | SOT-23<br>(Pb-Free) | 3,000 / Tape &<br>Reel  |
| MMBFJ310LT1G,<br>SMMBFJ310LT1G | SOT-23<br>(Pb-Free) | 3,000 / Tape &<br>Reel  |
| SMMBFJ310LT3G                  | SOT-23<br>(Pb-Free) | 10,000 / Tape &<br>Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

# MMBFJ309L, MMBFJ310L, SMMBFJ309L, SMMBFJ310L

## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------|--------|-----|-----|-----|------|
|----------------|--------|-----|-----|-----|------|

### OFF CHARACTERISTICS

|                                                                                                                   |               |              |        |              |                         |
|-------------------------------------------------------------------------------------------------------------------|---------------|--------------|--------|--------------|-------------------------|
| Gate-Source Breakdown Voltage<br>( $I_G = -1.0 \mu\text{Adc}$ , $V_{DS} = 0$ )                                    | $V_{(BR)GSS}$ | -25          | -      | -            | Vdc                     |
| Gate Reverse Current ( $V_{GS} = -15 \text{ Vdc}$ )<br>( $V_{GS} = -15 \text{ Vdc}$ , $T_A = 125^\circ\text{C}$ ) | $I_{GSS}$     | -            | -      | -1.0<br>-1.0 | nAdc<br>$\mu\text{Adc}$ |
| Gate Source Cutoff Voltage<br>( $V_{DS} = 10 \text{ Vdc}$ , $I_D = 1.0 \text{ nAdc}$ )                            | $V_{GS(off)}$ | -1.0<br>-2.0 | -<br>- | -4.0<br>-6.5 | Vdc                     |

### ON CHARACTERISTICS

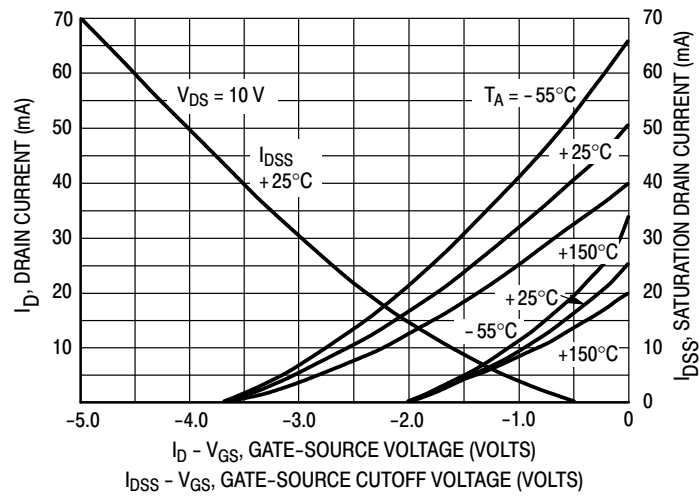
|                                                                                 |             |          |        |          |      |
|---------------------------------------------------------------------------------|-------------|----------|--------|----------|------|
| Zero-Gate-Voltage Drain Current<br>( $V_{DS} = 10 \text{ Vdc}$ , $V_{GS} = 0$ ) | $I_{DSS}$   | 12<br>24 | -<br>- | 30<br>60 | mAdc |
| Gate-Source Forward Voltage<br>( $I_G = 1.0 \text{ mAdc}$ , $V_{DS} = 0$ )      | $V_{GS(f)}$ | -        | -      | 1.0      | Vdc  |

### SMALL-SIGNAL CHARACTERISTICS

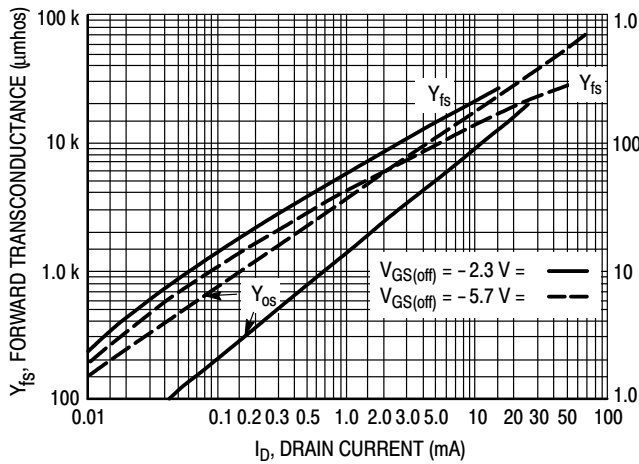
|                                                                                                                                |             |     |    |     |                              |
|--------------------------------------------------------------------------------------------------------------------------------|-------------|-----|----|-----|------------------------------|
| Forward Transfer Admittance<br>( $V_{DS} = 10 \text{ Vdc}$ , $I_D = 10 \text{ mAdc}$ , $f = 1.0 \text{ kHz}$ )                 | $ Y_{fs} $  | 8.0 | -  | 18  | mmhos                        |
| Output Admittance<br>( $V_{DS} = 10 \text{ Vdc}$ , $I_D = 10 \text{ mAdc}$ , $f = 1.0 \text{ kHz}$ )                           | $ Y_{os} $  | -   | -  | 250 | $\mu\text{mhos}$             |
| Input Capacitance<br>( $V_{GS} = -10 \text{ Vdc}$ , $V_{DS} = 0 \text{ Vdc}$ , $f = 1.0 \text{ MHz}$ )                         | $C_{iss}$   | -   | -  | 5.0 | pF                           |
| Reverse Transfer Capacitance<br>( $V_{GS} = -10 \text{ Vdc}$ , $V_{DS} = 0 \text{ Vdc}$ , $f = 1.0 \text{ MHz}$ )              | $C_{rss}$   | -   | -  | 2.5 | pF                           |
| Equivalent Short-Circuit Input Noise Voltage<br>( $V_{DS} = 10 \text{ Vdc}$ , $I_D = 10 \text{ mAdc}$ , $f = 100 \text{ Hz}$ ) | $\bar{e}_n$ | -   | 10 | -   | $\text{nV}/\sqrt{\text{Hz}}$ |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

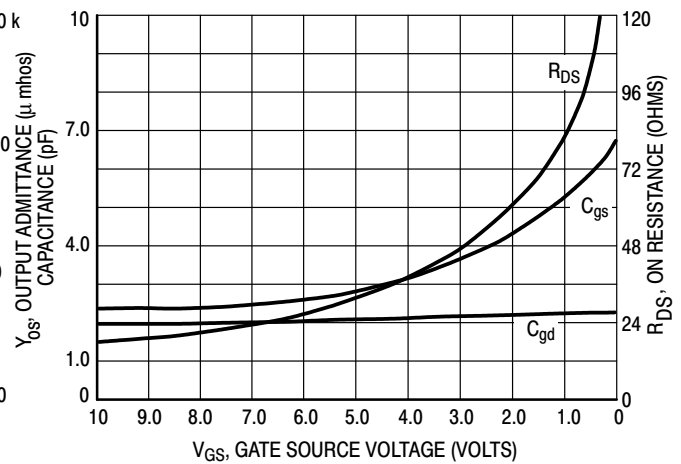




**Figure 1. Drain Current and Transfer Characteristics versus Gate-Source Voltage**

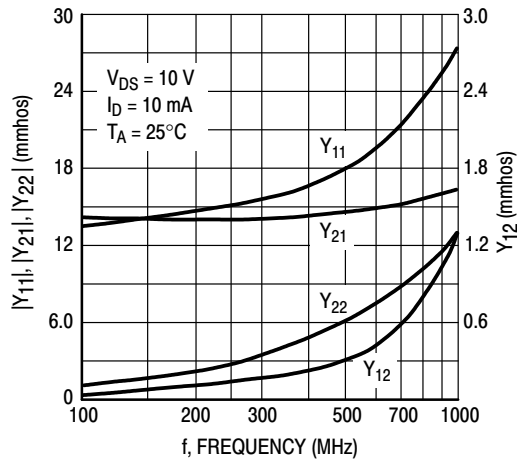


**Figure 2. Common-Source Output Admittance and Forward Transconductance versus Drain Current**

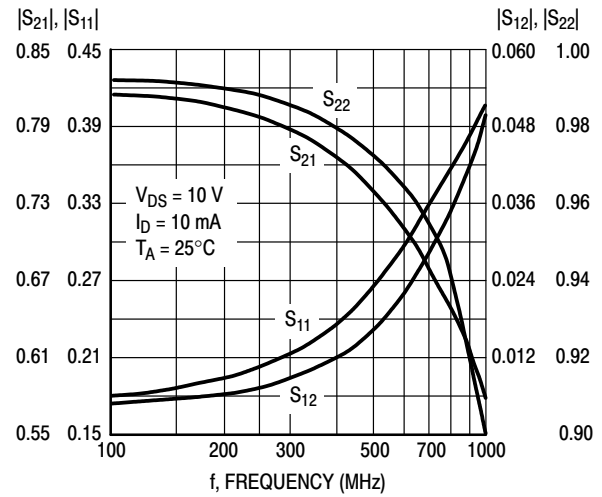


**Figure 3. On Resistance and Junction Capacitance versus Gate-Source Voltage**

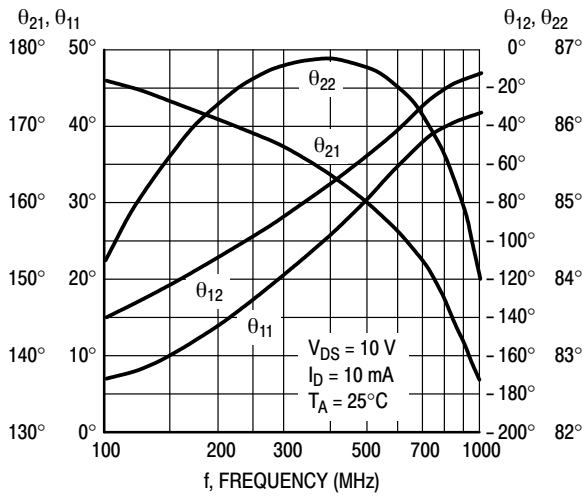
# MMBFJ309L, MMBFJ310L, SMMBFJ309L, SMMBFJ310L



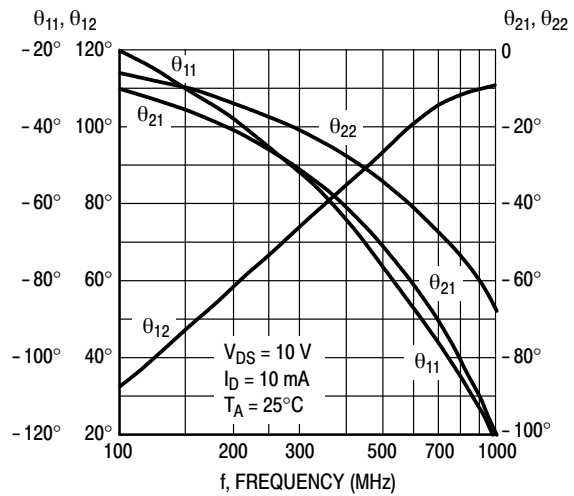
**Figure 4. Common-Gate Y Parameter Magnitude versus Frequency**



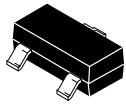
**Figure 5. Common-Gate S Parameter Magnitude versus Frequency**



**Figure 6. Common-Gate Y Parameter Phase-Angle versus Frequency**



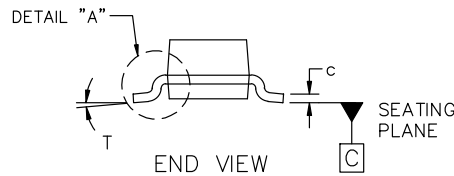
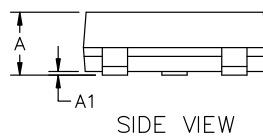
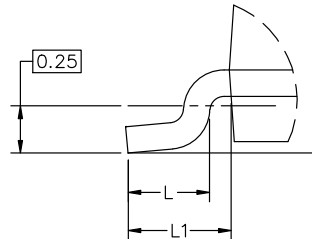
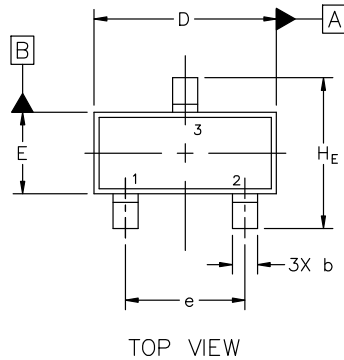
**Figure 7. S Parameter Phase-Angle versus Frequency**



SCALE 4:1

**SOT-23 (TO-236) 2.90x1.30x1.00 1.90P**  
CASE 318  
ISSUE AU

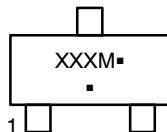
DATE 14 AUG 2024



| MILLIMETERS |      |      |      |
|-------------|------|------|------|
| DIM         | MIN  | NOM  | MAX  |
| A           | 0.89 | 1.00 | 1.11 |
| A1          | 0.01 | 0.06 | 0.10 |
| b           | 0.37 | 0.44 | 0.50 |
| c           | 0.08 | 0.14 | 0.20 |
| D           | 2.80 | 2.90 | 3.04 |
| E           | 1.20 | 1.30 | 1.40 |
| e           | 1.78 | 1.90 | 2.04 |
| L           | 0.30 | 0.43 | 0.55 |
| L1          | 0.35 | 0.54 | 0.69 |
| HE          | 2.10 | 2.40 | 2.64 |
| T           | 0°   | ---  | 10°  |

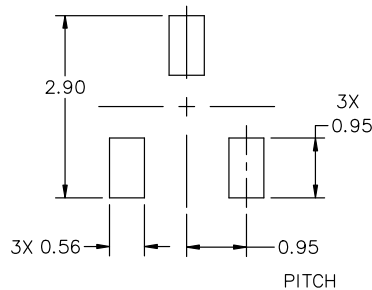
## NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSIONS: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

**GENERIC MARKING DIAGRAM\***


XXX = Specific Device Code  
M = Date Code  
▪ = Pb-Free Package

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.



\* For additional information on our Pb-Free strategy and soldering details, please download the onsemi Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

**STYLES ON PAGE 2**

|                         |                                             |                                                                                                                                                                                  |
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**CASE 318**  
**ISSUE AU**

DATE 14 AUG 2024

|                                                         |                                                       |                                                             |                                                             |                                                             |                                                             |
|---------------------------------------------------------|-------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------|
| STYLE 1 THRU 5:<br>CANCELLED                            | STYLE 6:<br>PIN 1. BASE<br>2. EMITTER<br>3. COLLECTOR | STYLE 7:<br>PIN 1. EMITTER<br>2. BASE<br>3. COLLECTOR       | STYLE 8:<br>PIN 1. ANODE<br>2. NO CONNECTION<br>3. CATHODE  |                                                             |                                                             |
| STYLE 9:<br>PIN 1. ANODE<br>2. ANODE<br>3. CATHODE      | STYLE 10:<br>PIN 1. DRAIN<br>2. SOURCE<br>3. GATE     | STYLE 11:<br>PIN 1. ANODE<br>2. CATHODE<br>3. CATHODE-ANODE | STYLE 12:<br>PIN 1. CATHODE<br>2. CATHODE<br>3. ANODE       | STYLE 13:<br>PIN 1. SOURCE<br>2. DRAIN<br>3. GATE           | STYLE 14:<br>PIN 1. CATHODE<br>2. GATE<br>3. ANODE          |
| STYLE 15:<br>PIN 1. GATE<br>2. CATHODE<br>3. ANODE      | STYLE 16:<br>PIN 1. ANODE<br>2. CATHODE<br>3. CATHODE | STYLE 17:<br>PIN 1. NO CONNECTION<br>2. ANODE<br>3. CATHODE | STYLE 18:<br>PIN 1. NO CONNECTION<br>2. CATHODE<br>3. ANODE | STYLE 19:<br>PIN 1. CATHODE<br>2. ANODE<br>3. CATHODE-ANODE | STYLE 20:<br>PIN 1. CATHODE<br>2. ANODE<br>3. GATE          |
| STYLE 21:<br>PIN 1. GATE<br>2. SOURCE<br>3. DRAIN       | STYLE 22:<br>PIN 1. RETURN<br>2. OUTPUT<br>3. INPUT   | STYLE 23:<br>PIN 1. ANODE<br>2. ANODE<br>3. CATHODE         | STYLE 24:<br>PIN 1. GATE<br>2. DRAIN<br>3. SOURCE           | STYLE 25:<br>PIN 1. ANODE<br>2. CATHODE<br>3. GATE          | STYLE 26:<br>PIN 1. CATHODE<br>2. ANODE<br>3. NO CONNECTION |
| STYLE 27:<br>PIN 1. CATHODE<br>2. CATHODE<br>3. CATHODE | STYLE 28:<br>PIN 1. ANODE<br>2. ANODE<br>3. ANODE     |                                                             |                                                             |                                                             |                                                             |

|                  |                                      |                                                                                                                                                                                     |
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