

# 800MHz BAND MIXER GaAs MMIC

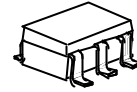
## ■GENERAL DESCRIPTION

NJG1551F is a mixer GaAs MMIC featured low distortion, high conversion gain and low noise figure.

NJG1551F includes a mixer and a local amplifier, and ideally suitable for 800MHz band digital mobile phone handsets.

The very small MTP package is adopted.

## ■PACKAGE OUTLINE

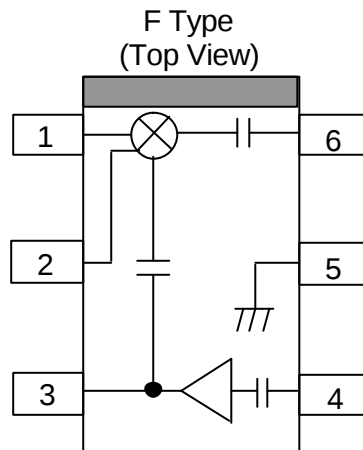


NJG1551F

## ■FEATURES

- Low voltage operation +2.7V
- High conversion gain 13dB typ. @ $f_{RF}=820\text{MHz}$ ,  $P_{LO}=-10\text{dBm}$ ,  $P_{RF}=-30\text{dBm}$
- High IP3 OIP3=12dBm typ. @ $f_{RF1}=820.0\text{MHz}$ ,  $f_{RF2}=820.1\text{MHz}$   
 $P_{LO}=-10\text{dBm}$ ,  $P_{RF}=-30\text{dBm}$   
 IIP3=-1dBm typ. @ $f_{RF1}=820.0\text{MHz}$ ,  $f_{RF2}=820.1\text{MHz}$   
 $P_{LO}=-10\text{dBm}$ ,  $P_{RF}=-30\text{dBm}$
- Low noise figure 5dB typ. @ $f_{RF}=820\text{MHz}$ ,  $P_{LO}=-10\text{dBm}$
- Package MTP6 (Mount Size: 2.8x2.9x1.2mm)

## ■PIN CONFIGURATION



### Pin Connection

1. IFOUT
2. BPC
3. VLO
4. LOIN
5. GND
6. RFIN

NOTE :The portion above shows orientation mark printed on the package surface.

# NJG1551F

## ■ABSOLUTE MAXIMUM RATINGS

( $T_a=25^{\circ}\text{C}$ ,  $Z_s=Z_l=50\Omega$ )

| PARAMETERS                     | SYMBOL            | CONDITIONS                                                 | RATINGS  | UNITS              |
|--------------------------------|-------------------|------------------------------------------------------------|----------|--------------------|
| Mixer Supply Voltage           | $V_{\text{MIX}}$  |                                                            | 5        | V                  |
| Local Amplifier Supply Voltage | $V_{\text{LO}}$   |                                                            | 5        | V                  |
| Mixer RF Input Power           | $P_{\text{RFIN}}$ | $V_{\text{MIX}}=2.7\text{V}$ , $V_{\text{LO}}=2.7\text{V}$ | 10       | dBm                |
| Mixer LO Input Power           | $P_{\text{LOIN}}$ | $V_{\text{MIX}}=2.7\text{V}$ , $V_{\text{LO}}=2.7\text{V}$ | 10       | dBm                |
| Power Dissipation              | $P_D$             |                                                            | 150      | mW                 |
| Operating Temp.                | $T_{\text{opr}}$  |                                                            | -30~+85  | $^{\circ}\text{C}$ |
| Storage Temp.                  | $T_{\text{stg}}$  |                                                            | -40~+150 | $^{\circ}\text{C}$ |

## ■RECOMMENDED OPERATING RANGE

| PARAMETER                      | SYMBOL           | MIN | TYP | MAX | UNITS |
|--------------------------------|------------------|-----|-----|-----|-------|
| Mixer Supply Voltage           | $V_{\text{MIX}}$ | 2.5 | 2.7 | 4.5 | V     |
| Local Amplifier Supply Voltage | $V_{\text{LO}}$  | 2.5 | 2.7 | 4.5 | V     |

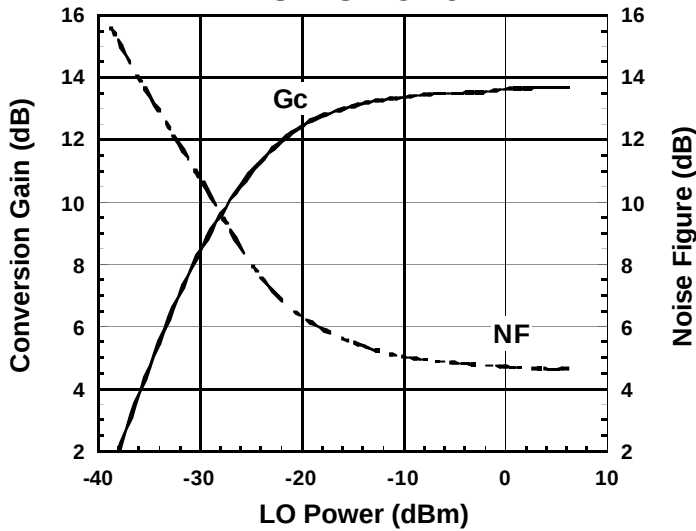
## ■ELECTRICAL CHARACTERISTICS

( $T_a=25^{\circ}\text{C}$ ,  $V_{\text{MIX}}=2.7\text{V}$ ,  $V_{\text{LO}}=2.7\text{V}$ ,  $f_{\text{IF}}=130\text{MHz}$ ,  $P_{\text{LO}}=-10\text{dBm}$ )

| PARAMETERS                      | SYMBOL           | CONDITIONS                                                                                     | MIN | TYP  | MAX | UNITS |
|---------------------------------|------------------|------------------------------------------------------------------------------------------------|-----|------|-----|-------|
| Mixer Current                   | $I_{\text{MIX}}$ | $P_{\text{RF}}=\text{OFF}$ , $P_{\text{LO}}=\text{OFF}$                                        | -   | 5.0  | 7.0 | mA    |
| Local Amplifier Current         | $I_{\text{LO}}$  | $P_{\text{RF}}=\text{OFF}$ , $P_{\text{LO}}=\text{OFF}$                                        | -   | 2.0  | 3.2 | mA    |
| Conversion Gain                 | $G_C$            | $f_{\text{RF}}=820\text{MHz}$ , $P_{\text{RF}}=-30\text{dBm}$<br>$f_{\text{LO}}=690\text{MHz}$ | 9.5 | 13.0 | -   | dB    |
| Input 3rd Order Intercept Point | IIP3             | $f_{\text{RF}}=820.0\text{MHz}+820.1\text{MHz}$<br>$f_{\text{LO}}=690\text{MHz}$               | -   | -1.0 | -   | dBm   |
| Noise Figure                    | NF               | $f_{\text{RF}}=820\text{MHz}$<br>$f_{\text{LO}}=690\text{MHz}$                                 | -   | 5.0  | 6.0 | dB    |

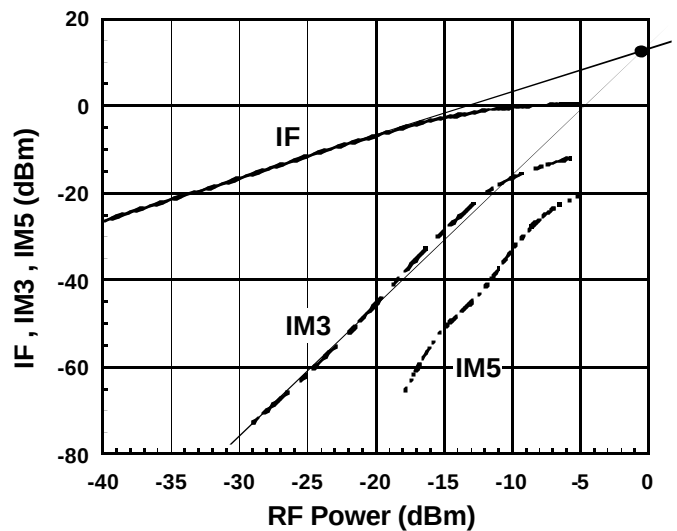
## TYPICAL CHARACTERISTICS (Application 1, $f_{LO}=690\text{MHz}$ )

### Conversion Gain , Noise Figure vs. LO Power



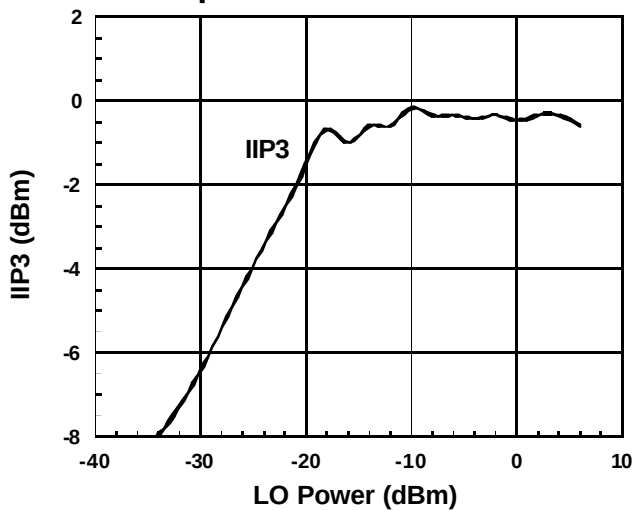
Condition  
 $f_{IF}=130\text{MHz}$   
 $f_{RF}=820\text{MHz}$ ,  $P_{RF}=-30\text{dBm}$   
 $f_{LO}=690\text{MHz}$   
 $V_{MIX}=V_{LO}=2.7\text{V}$

### IF , IM3 , IM5 vs. RF Power



Condition  
 $f_{IF}=130\text{MHz}$   
 $f_{RF1}=820.0\text{MHz}$   
 $f_{RF2}=820.1\text{MHz}$   
 $f_{LO}=690\text{MHz}$ ,  $P_{LO}=-10\text{dBm}$   
 $V_{MIX}=V_{LO}=2.7\text{V}$

### Input-IP3 vs. LO Power

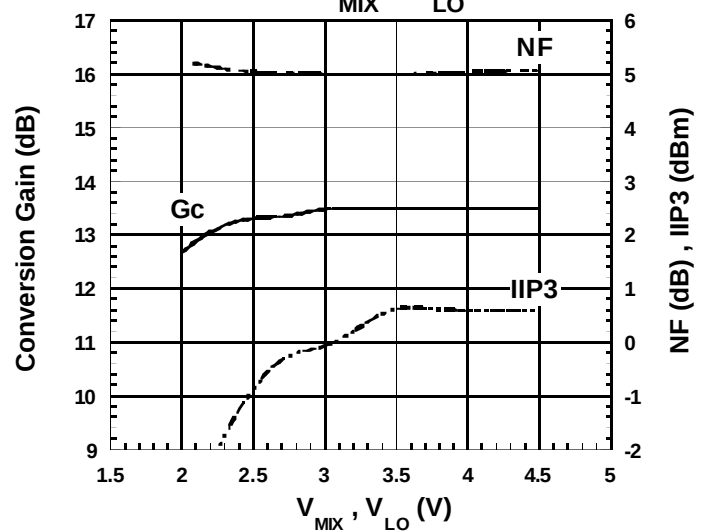


Condition  
 $f_{IF}=130\text{MHz}$   
 $f_{RF1}=820.0\text{MHz}$ ,  $P_{RF}=-30\text{dBm}$   
 $f_{RF2}=820.1\text{MHz}$   
 $f_{LO}=690\text{MHz}$   
 $V_{MIX}=V_{LO}=2.7\text{V}$

$$IIP3 = \frac{3IF - IM3}{2} - G_c$$

@ $P_{RF}=-27\text{dBm}$

### Conversion Gain , Noise Figure , Input-IP3 vs. $V_{MIX}$ , $V_{LO}$



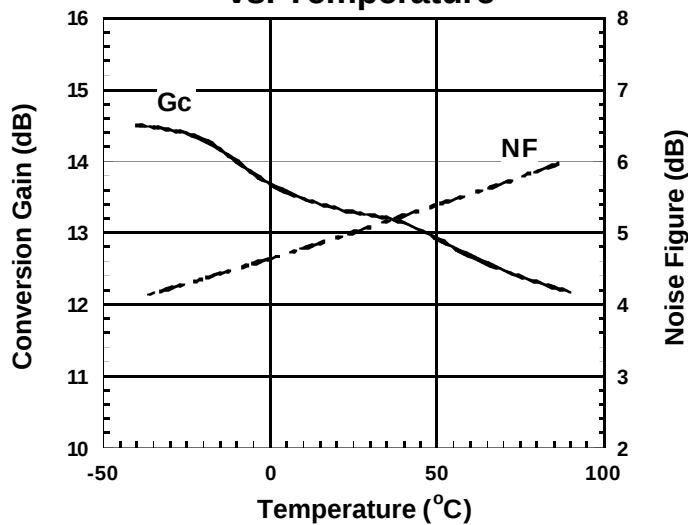
Condition  
 $f_{IF}=130\text{MHz}$   
 $f_{RF1}=820.0\text{MHz}$ ,  $P_{RF}=-30\text{dBm}$   
 $f_{RF2}=820.1\text{MHz}$   
 $f_{LO}=690\text{MHz}$ ,  $P_{LO}=-10\text{dBm}$

$$IIP3 = \frac{3IF - IM3}{2} - G_c$$

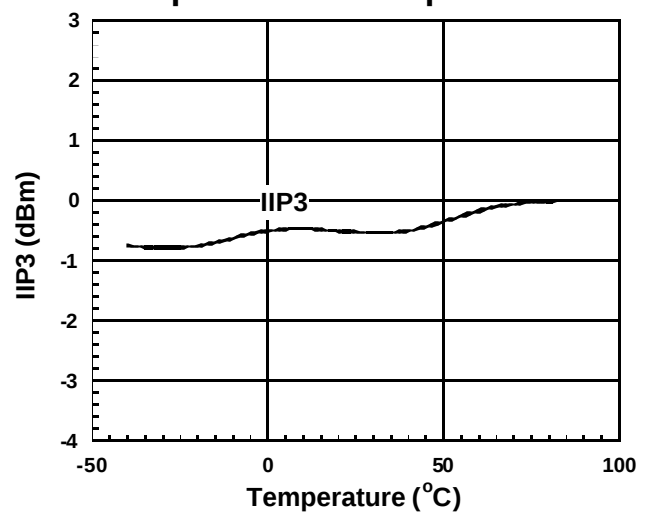
@ $P_{RF}=-27\text{dBm}$

## TYPICAL CHARACTERISTICS (Continued)

### Conversion Gain , Noise Figure vs. Temperature



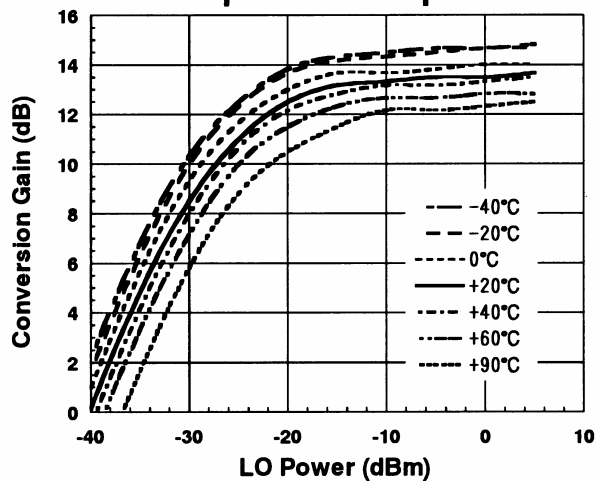
### Input-IP3 vs. Temperature



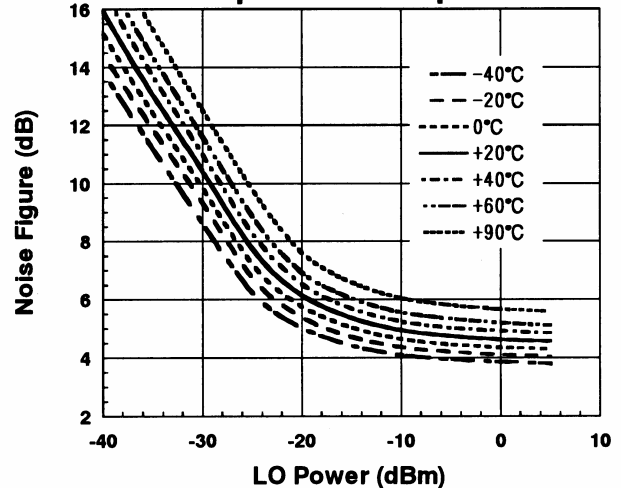
$$IIP3 = \frac{3f_{IF} - IM3}{2} - G_c$$

@  $P_{RF} = -27\text{dBm}$

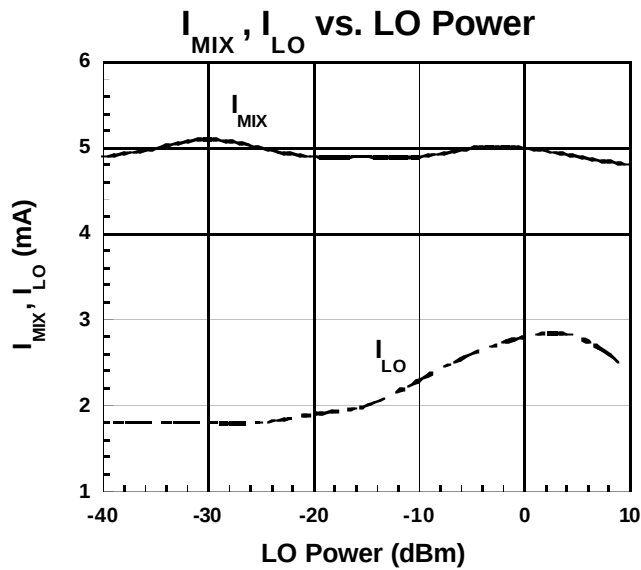
### Conversion Gain vs. LO Power Temperature Response



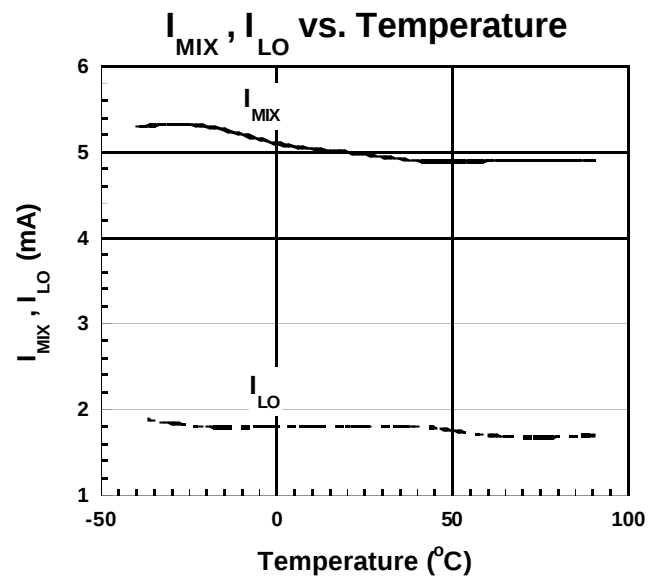
### Noise Figure vs. LO Power Temperature Response



## TYPICAL CHARACTERISTICS (Continued)

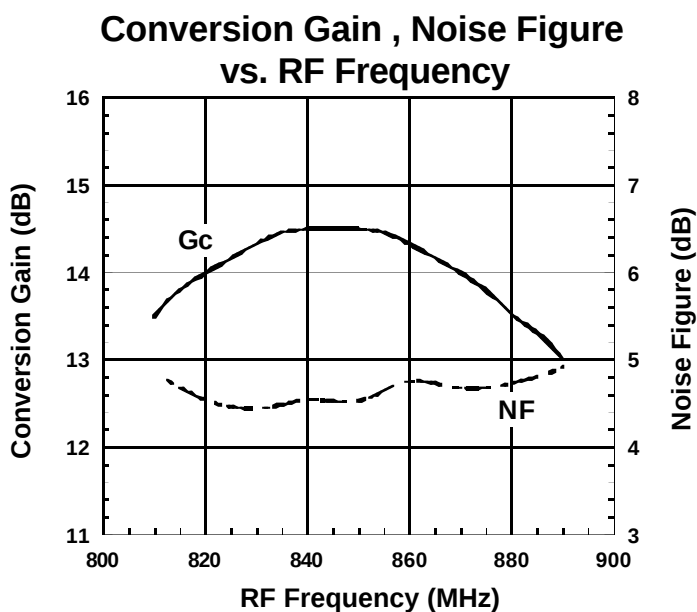


Condition  
 $f_{RF}=820\text{MHz}$ ,  $P_{RF}=-30\text{dBm}$   
 $f_{LO}=690\text{MHz}$   
 $V_{MIX}=V_{LO}=2.7\text{V}$



Condition  
 $P_{RF}=\text{OFF}$   
 $P_{LO}=\text{OFF}$   
 $V_{MIX}=V_{LO}=2.7\text{V}$

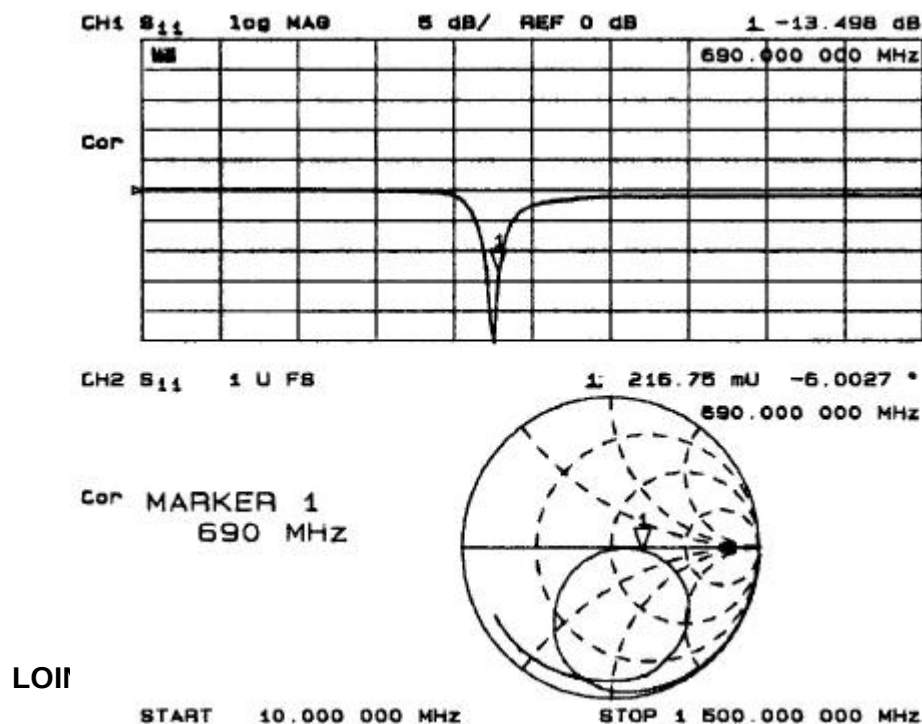
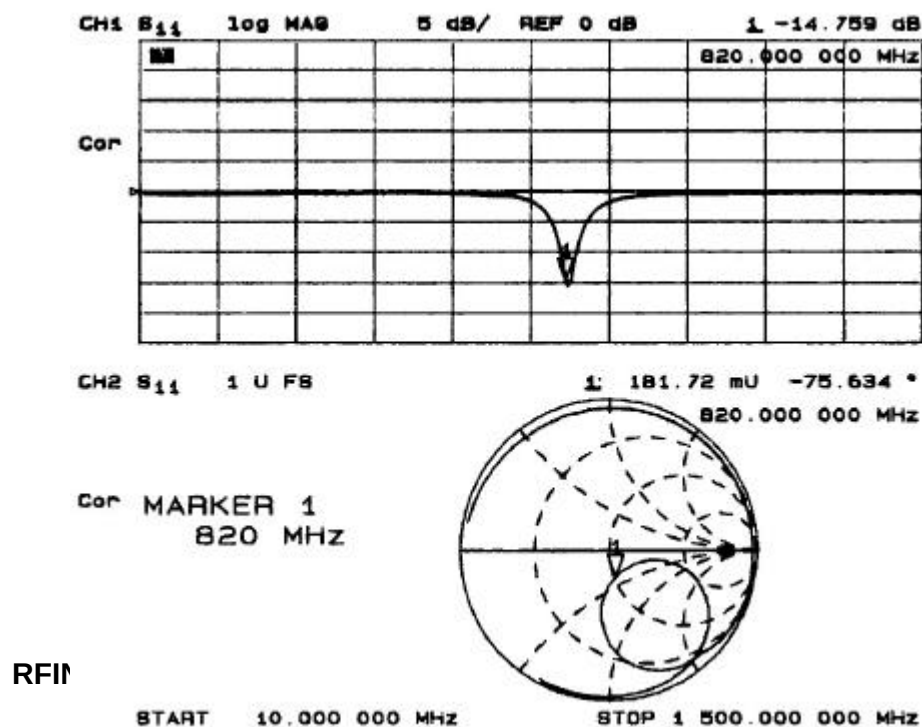
## TYPICAL CHARACTERISTICS (Application 1, $f_{LO}=720\text{MHz}$ )



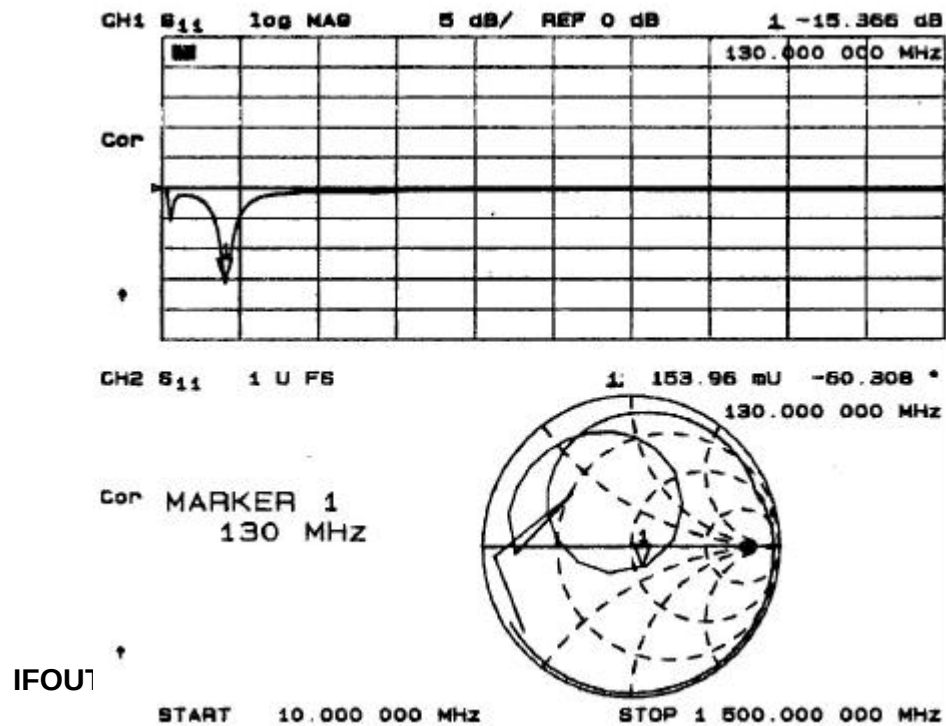
Condition  
 $f_{IF}=130\text{MHz}$   
 $P_{RF}=-30\text{dBm}$   
 $P_{LO}=-10\text{dBm}$   
 $V_{MIX}=V_{LO}=2.7\text{V}$   
 Lower LOCAL

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## ■TYPICAL CHARACTERISTICS (Application 1, $f_{LO}=690\text{MHz}$ )



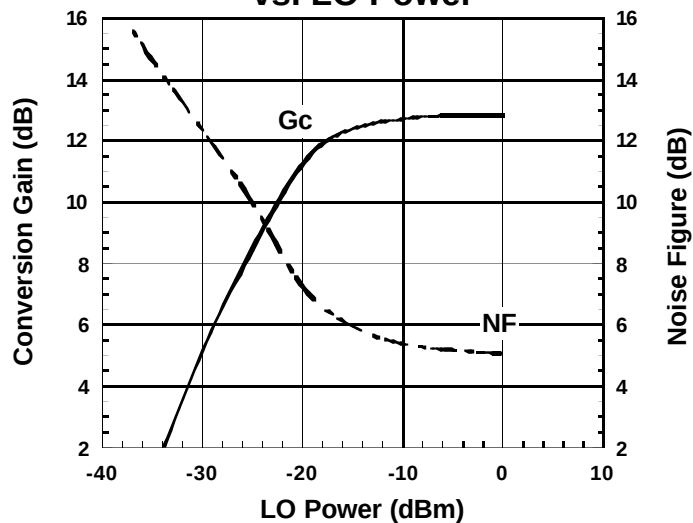
## TYPICAL CHARACTERISTICS (Continued)



# NJG1551F

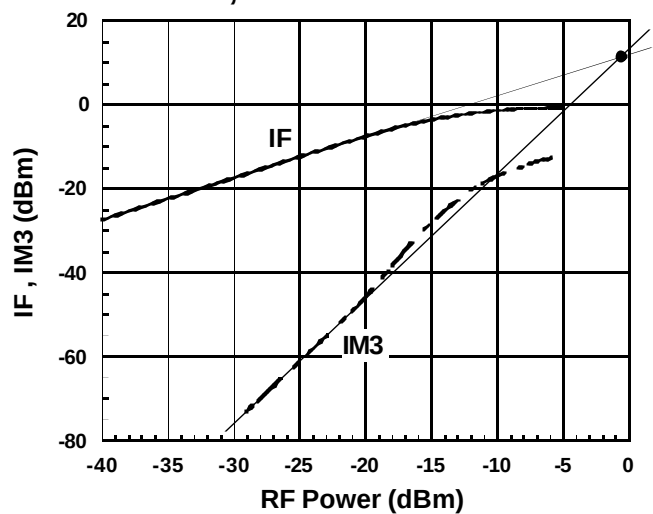
## ■TYPICAL CHARACTERISTICS (Application 2, $f_{LO}=796.12\text{MHz}$ )

Conversion Gain , Noise Figure  
vs. LO Power



Condition  
 $f_{IF}=85.38\text{MHz}$   
 $f_{RF}=881.5\text{MHz}$ ,  $P_{RF}=-30\text{dBm}$   
 $f_{LO}=796.12\text{MHz}$   
 $V_{MIX}=V_{LO}=2.7\text{V}$

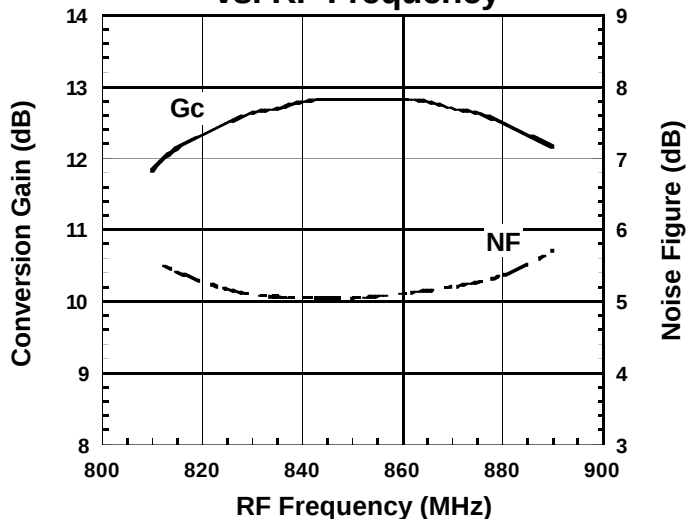
IF , IM3 vs. RF Power



Condition  
 $f_{IF}=85.38\text{MHz}$   
 $f_{RF1}=881.5\text{MHz}$   
 $f_{RF2}=881.6\text{MHz}$   
 $f_{LO}=796.12\text{MHz}$ ,  $P_{LO}=-10\text{dBm}$   
 $V_{MIX}=V_{LO}=2.7\text{V}$

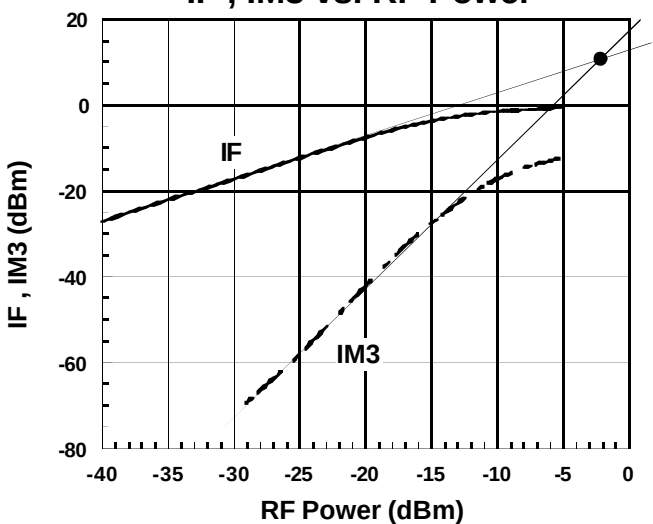
## ■TYPICAL CHARACTERISTICS (Application 2, $f_{LO}=980\text{MHz}$ )

Conversion Gain , Noise Figure  
vs. RF Frequency



Condition  
 $f_{IF}=130\text{MHz}$   
 $P_{RF}=-30\text{dBm}$   
 $P_{LO}=-10\text{dBm}$   
 $V_{MIX}=V_{LO}=2.7\text{V}$

IF , IM3 vs. RF Power



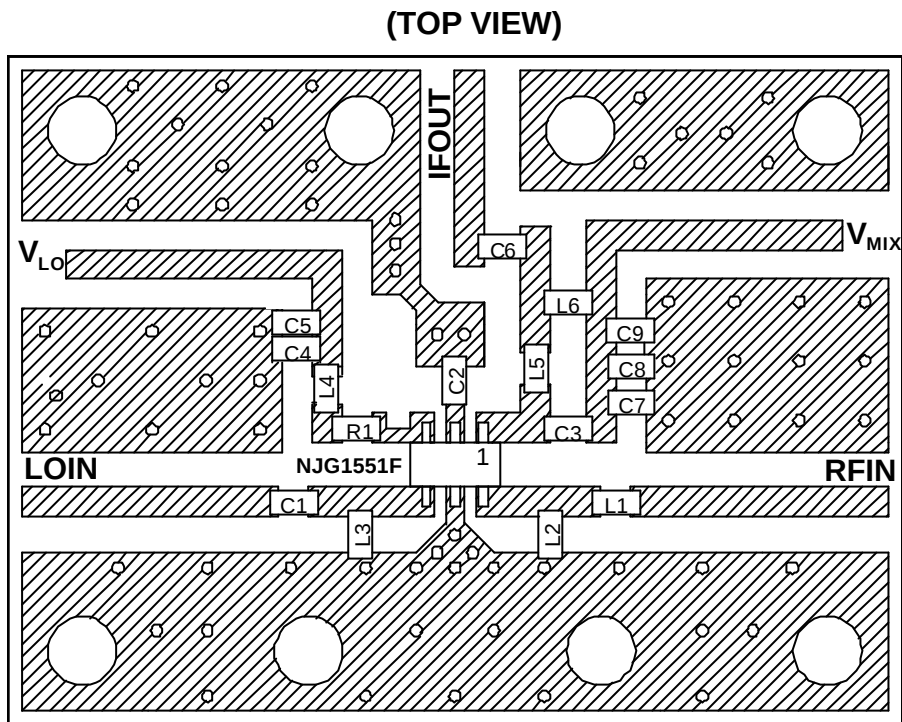
Condition  
 $f_{IF}=130\text{MHz}$   
 $f_{RF1}=850.0\text{MHz}$   
 $f_{RF2}=850.1\text{MHz}$   
 $f_{LO}=980\text{MHz}$ ,  $P_{LO}=-10\text{dBm}$   
 $V_{MIX}=V_{LO}=2.7\text{V}$



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## RECOMMENDED PCB DESIGN

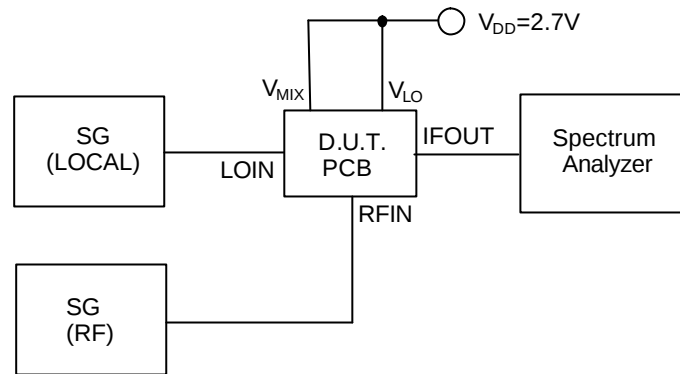


(SIZE: 22.5mmx30mm)

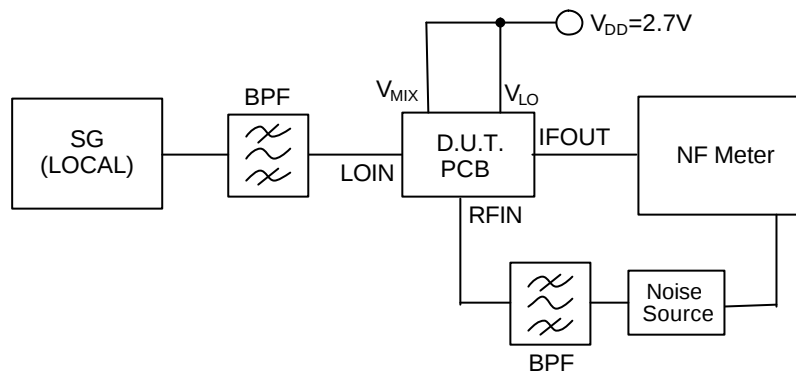
## PRECAUTIONS

- [1] Please locate L4 and R1 close to VLO terminal (3).
- [2] Distance from L1 and RFIN terminal (6) is 3.5mm.
- [3] Distance from C1 and LOIN terminal (4) is 3.5mm.
- [4] Please locate C2 close to BPC terminal (2).
- [5] Please locate C7, C8 and C9 close to C3, L6.
- [6] Please locate C4, C5 close to L4.

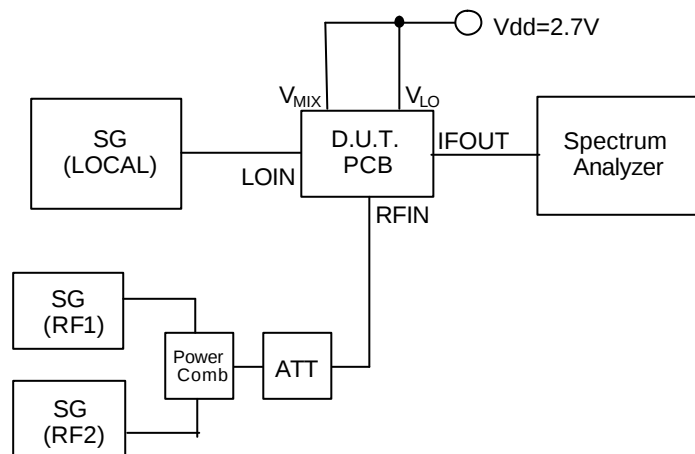
## MEASURING BLOCK DIAGRAM



Conversion Gain Measurement Block Diagram

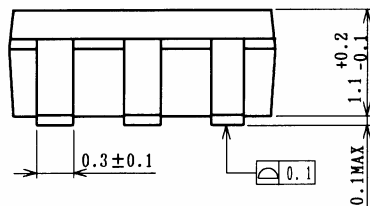
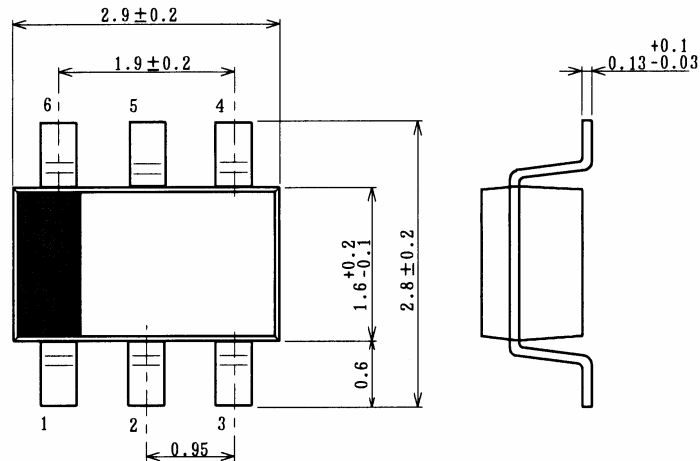


Noise Figure Measurement Block Diagram



IF, IM3, IM5 Measurement Block Diagram

## ■PACKAGE OUTLINE (MTP6)



Lead material : Copper  
 Lead surface finish : Solder plating  
 Molding material : Epoxy resin  
 UNIT : mm  
 Weight : 14mg

### Cautions on using this product

This product contains Gallium-Arsenide (GaAs) which is a harmful material.

- Do NOT eat or put into mouth.
- Do NOT dispose in fire or break up this product.
- Do NOT chemically make gas or powder with this product.
- To waste this product, please obey the relating law of your country.

This product may be damaged with electric static discharge (ESD) or spike voltage. Please handle with care to avoid these damages.

### [CAUTION]

The specifications on this databook are only given for information, without any guarantee as regards either mistakes or omissions. The application circuits in this databook are described only to show representative usages of the product and not intended for the guarantee or permission of any right including the industrial rights.