# UHF BAND LOW NOISE AMPLIFIER GaAs MMIC

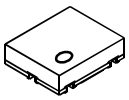
## ■GENERAL DESCRIPTION

NJG1131HA8 is a low noise amplifier GaAs MMIC designed for mobile digital TV application (470~770 MHz).

This IC features good gain flatness, and low gain characteristic in out-of-band. This IC achieves low current consumption, low noise figure and low distortion. Also, this IC is integrated the ESD protection circuit.

An ultra-small and ultra-thin package of USB6-A8 is adopted.

## ■PACKAGE OUTLINE



NJG1131HA8

## ■APPLICATIONS

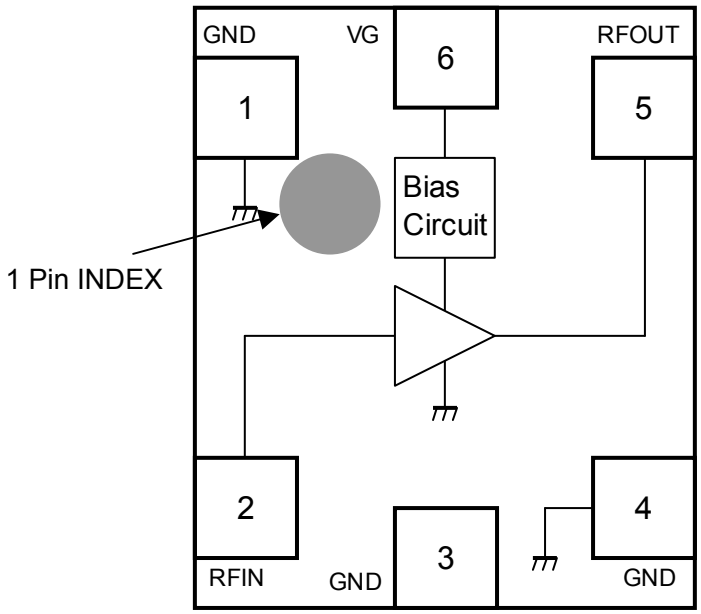
Wide band application from 470MHz to 770MHz
Mobile TV and Digital TV applications
Mobile phone and tablet PC applications

## ■FEATURES

| | |
|---|---|
| ● Wide operating frequency range | 470~770MHz |
| ● Low voltage operation | +2.7V typ. |
| ● Low current consumption | 3.4mA typ. |
| ● Gain | 10.0dB typ. |
| ● Low noise figure | 1.4dB typ. |
| ● High P-1dB(IN) | -5.0dBm typ. |
| ● High Input IP3 | +5.0dBm typ. |
| ● Ultra-small & ultra-thin package | USB6-A8 (Package size: 1mm x 1.2mm x 0.38mm typ.) |

## ■PIN CONFIGURATION

(Top View)




Pin Connection
1. GND
2. RFIN
3. GND
4. GND
5. RFOUT
6. VG

Note: Specifications and description listed in this catalog are subject to change without notice.

## ■ ABSOLUTE MAXIMUM RATINGS

$T_a$=+25°C, $Z_s$=$Z_l$=50 ohm

| PARAMETER | SYMBOL | CONDITIONS | RATINGS | UNITS |
|---|---|---|---|---|
| Drain Voltage | $V_{DD}$ | VDD terminal | 5 | V |
| Input power | $P_{IN}$ | $V_{DD}$=2.7V | +15 | dBm |
| Power dissipation | $P_D$ | On PCB board, Tjmax=150°C | 150 | mW |
| Operating temperature | $T_{opr}$ | | -40~+85 | °C |
| Storage temperature | $T_{stg}$ | | -55~+150 | °C |

## ■ ELECTRICAL CHARACTERISTICS 1 (DC)

General conditions: $V_{DD}$=2.7V, $T_a$=+25°C, $Z_s$=$Z_l$=50 ohm, with application circuit.

| PARAMETERS | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| Operating voltage | $V_{DD}$ | | 2.3 | 2.7 | 3.6 | V |
| Operating Current | $I_{DD}$ | RF OFF | - | 3.4 | 5.0 | mA |

## ■ ELECTRICAL CHARACTERISTICS 2 (RF)

General conditions: $V_{DD}$= 2.7V, $f_{RF}$=470~770MHz, $T_a$=+25°C, $Z_s$=$Z_l$=50 ohm, with application circuit.

| PARAMETERS | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| Operating Frequency | $f_{RF}$ | | 470 | 620 | 770 | MHz |
| Small signal gain | Gain | | 8.0 | 10.0 | 12.0 | dB |
| Gain flatness | $G_{flat}$ | | - | 1.1 | 1.4 | dB |
| Noise figure | NF | Exclude PCB & connector losses (0.05dB) | - | 1.4 | 1.8 | dB |
| Input power at 1dB gain compression point | $P_{-1dB(IN)}$ | | -8.0 | -5.0 | - | dBm |
| Input 3rd order intercept point | IIP3 | f1=$f_{RF}$, f2=$f_{RF}$+100kHz, Pin=-28dBm | +2.0 | +5.0 | - | dBm |
| RF IN VSWR | VSWRi | | - | 2.6 | 3.0 | |
| RF OUT VSWR | VSWRo | | - | 2.9 | 3.3 | |

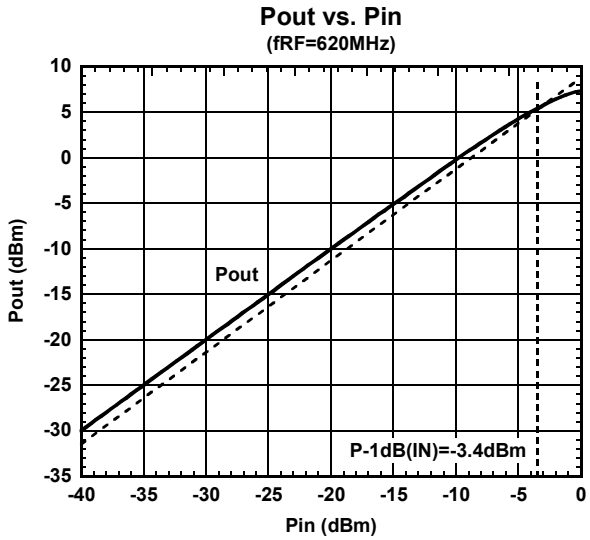
■TERMINAL INFORMATION

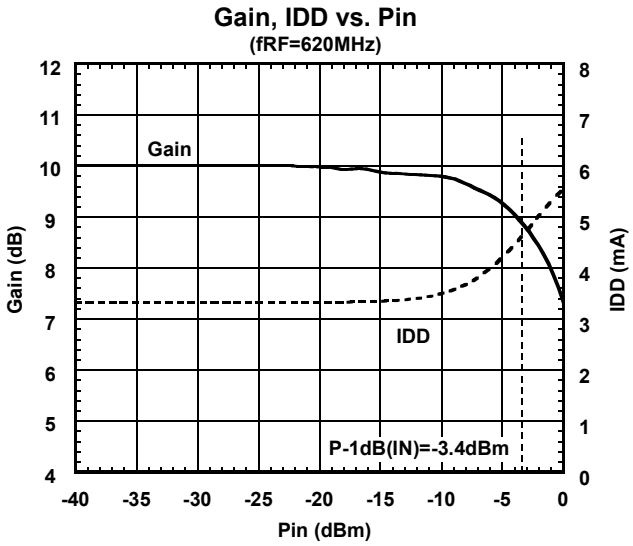
| No. | SYMBOL | DESCRIPTION |
|---|---|---|
| 1 | GND | Ground terminal. |
| 2 | RFIN | RF input terminal. This terminal requires the DC-blocking capacitor and the DC-feed Inductor as shown in the application circuit. |
| 3 | GND | Ground terminal. |
| 4 | GND | Ground terminal. |
| 5 | RFOUT | RF output terminal. This terminal requires the external matching circuit as shown in the application circuit. |
| 6 | VG | Power supply pin of the bias circuit. Please supply the voltage as same as the LNA voltage. |

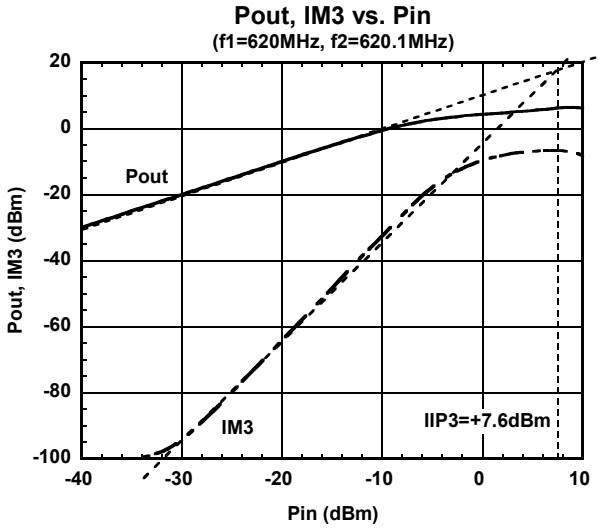
CAUTION
1) Ground terminals (1pin, 3pin and 4pin) should be connected with the ground plane close as possible.

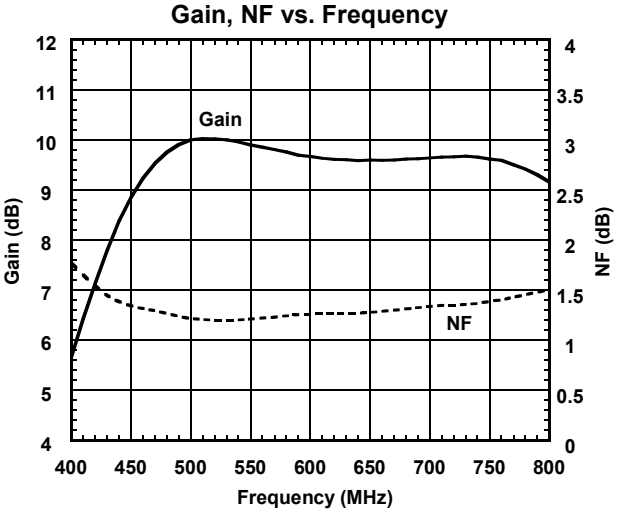
## ■ ELECTRICAL CHARACTERISTICS

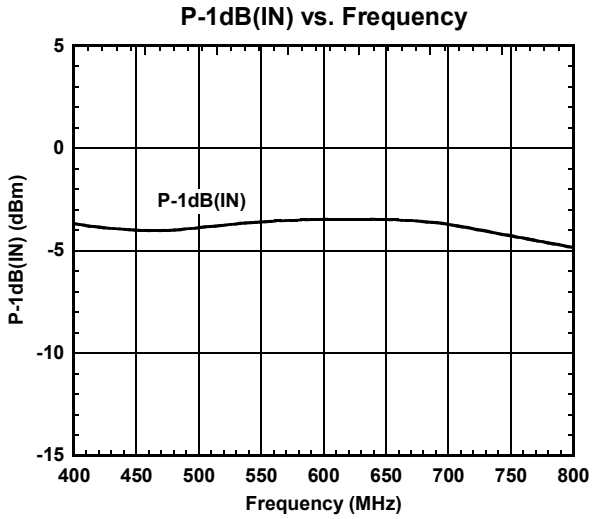
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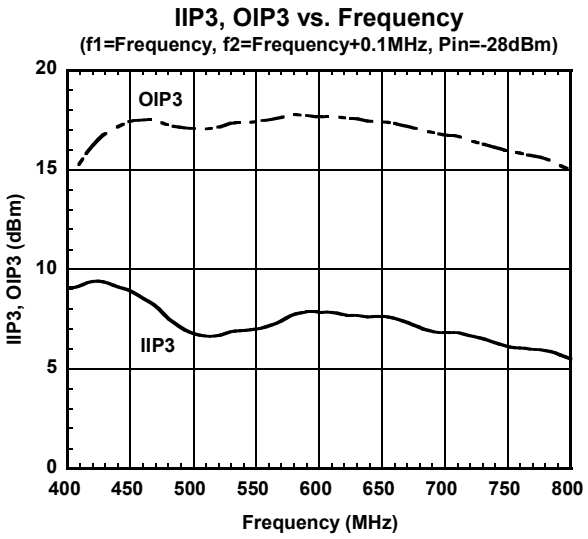


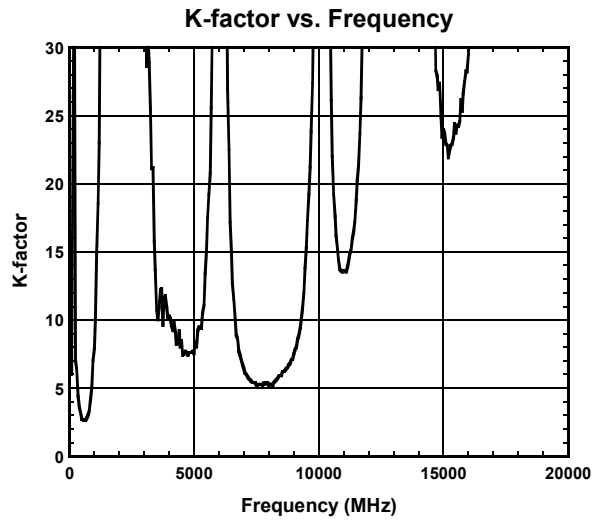



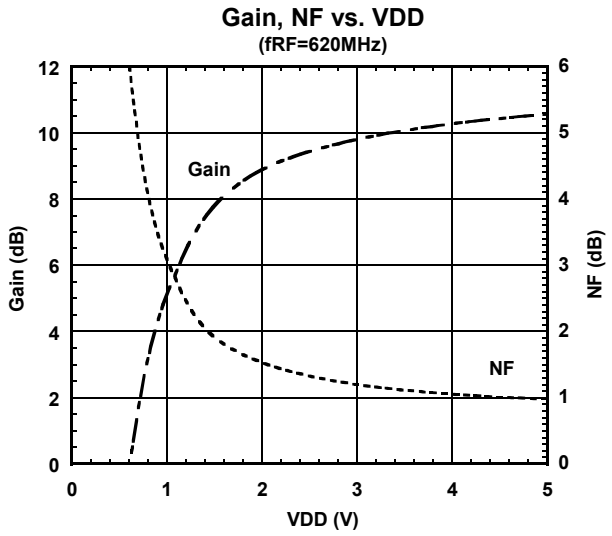



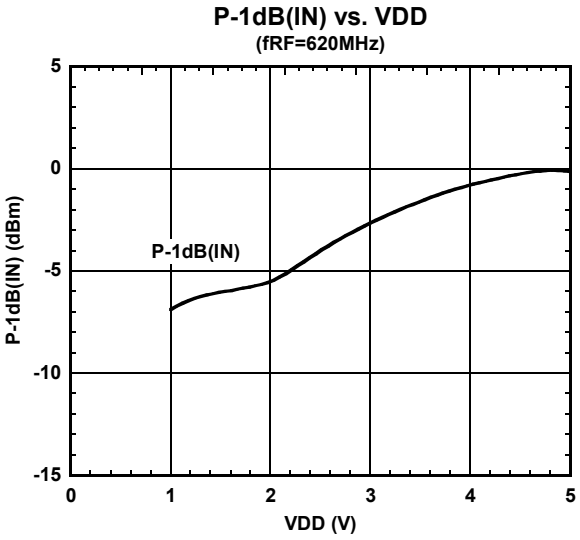



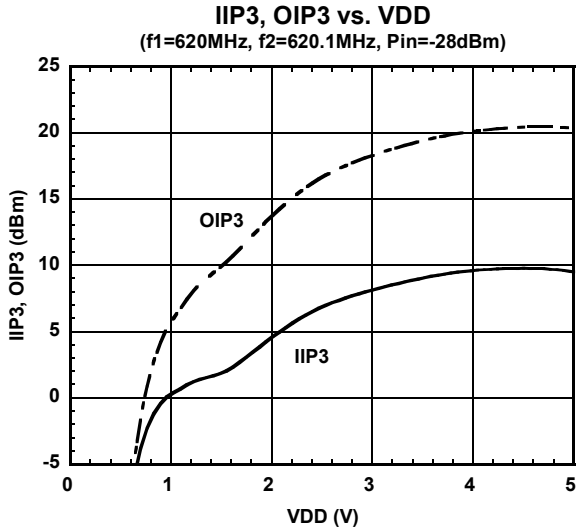
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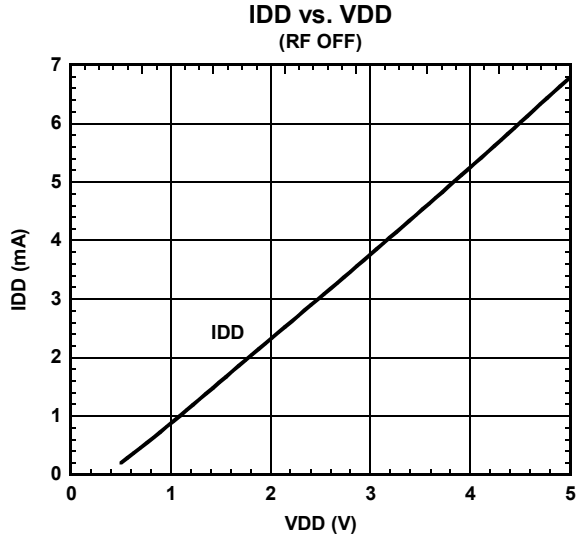
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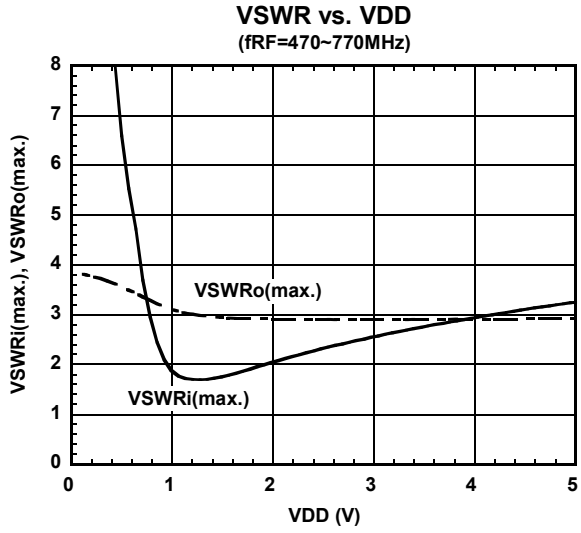


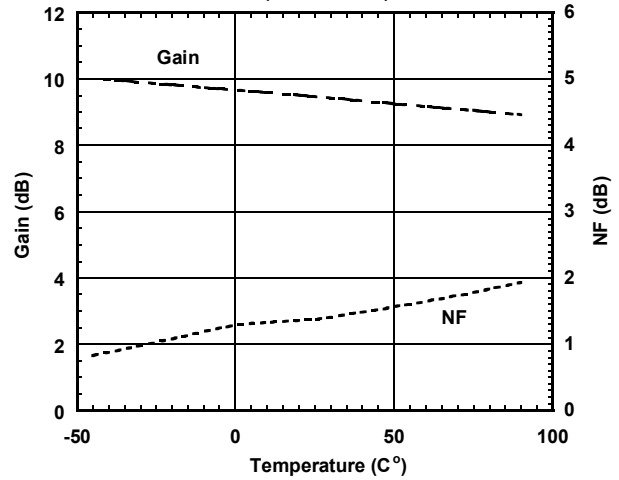



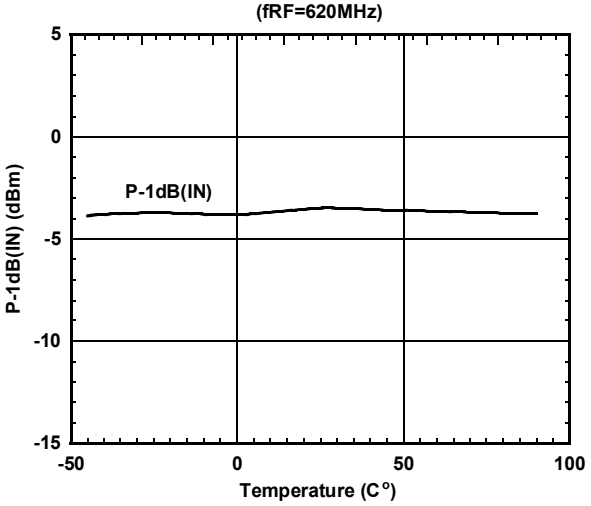
## ■ ELECTRICAL CHARACTERISTICS

(Conditions: VDD=2.7V, $Z_s$=$Z_l$=50 ohm, with application circuit.)

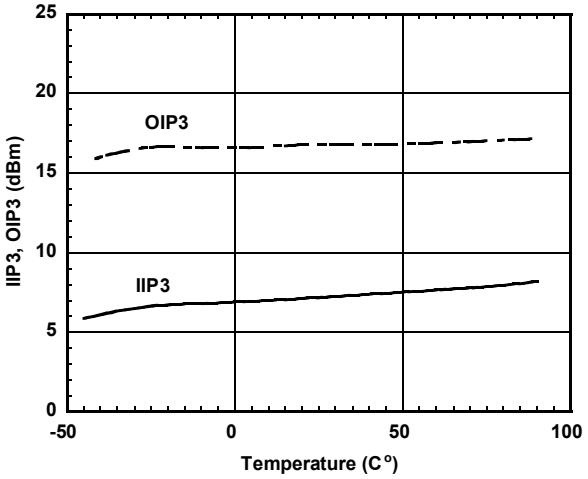
**Gain, NF vs. Temp.**
(fRF=620MHz)



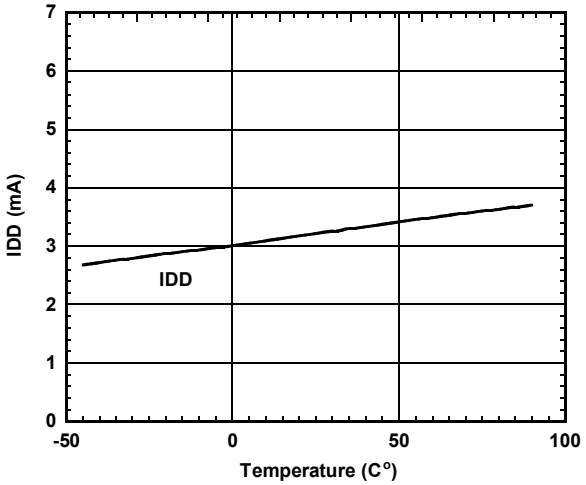

**P-1dB(IN) vs. Temp.**
(fRF=620MHz)



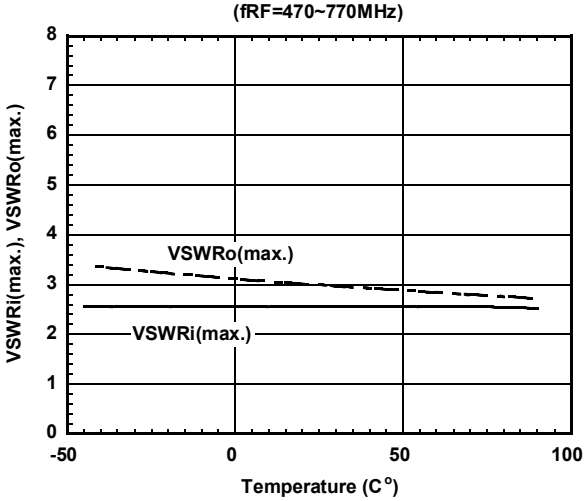

**IIP3, OIP3 vs. Temp.**
(f1=620MHz, f2=620.1MHz, Pin=-28dBm)




**IDD vs. Temp.**
(RF OFF)

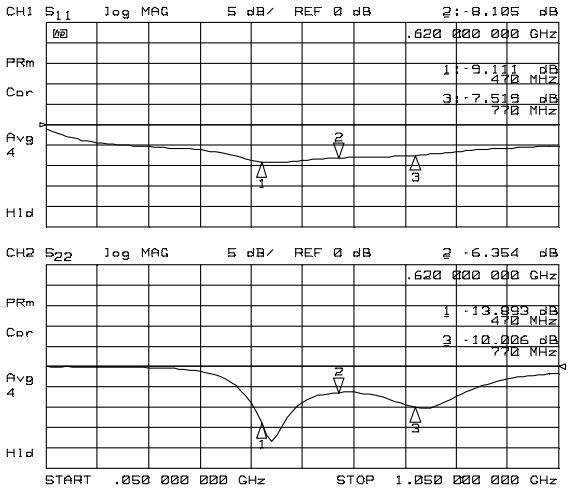



**VSWR vs. Temp.**
(fRF=470~770MHz)

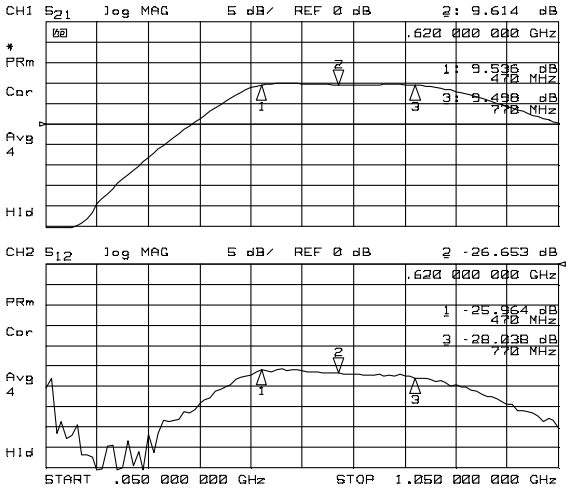


## ■ ELECTRICAL CHARACTERISTICS

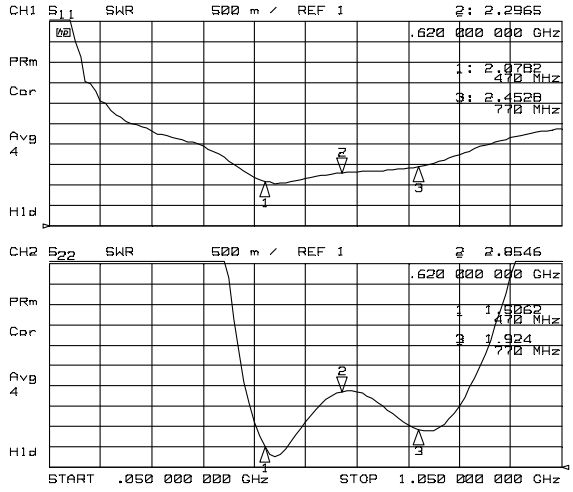
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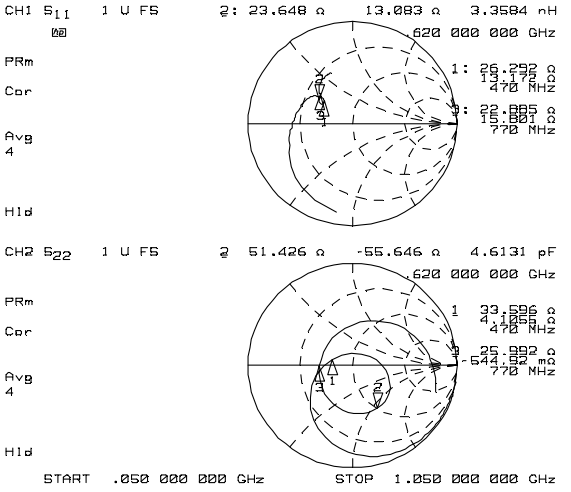

S11, S22



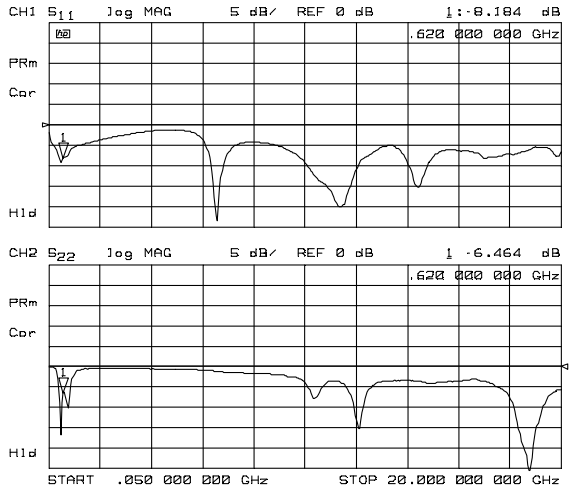

S21, S12



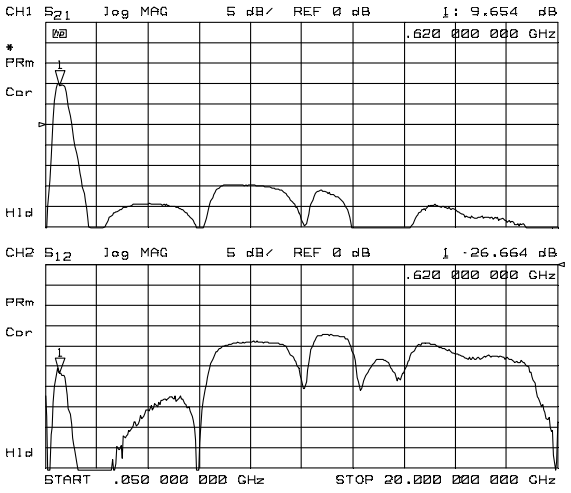

VSWR




Zin, Zout

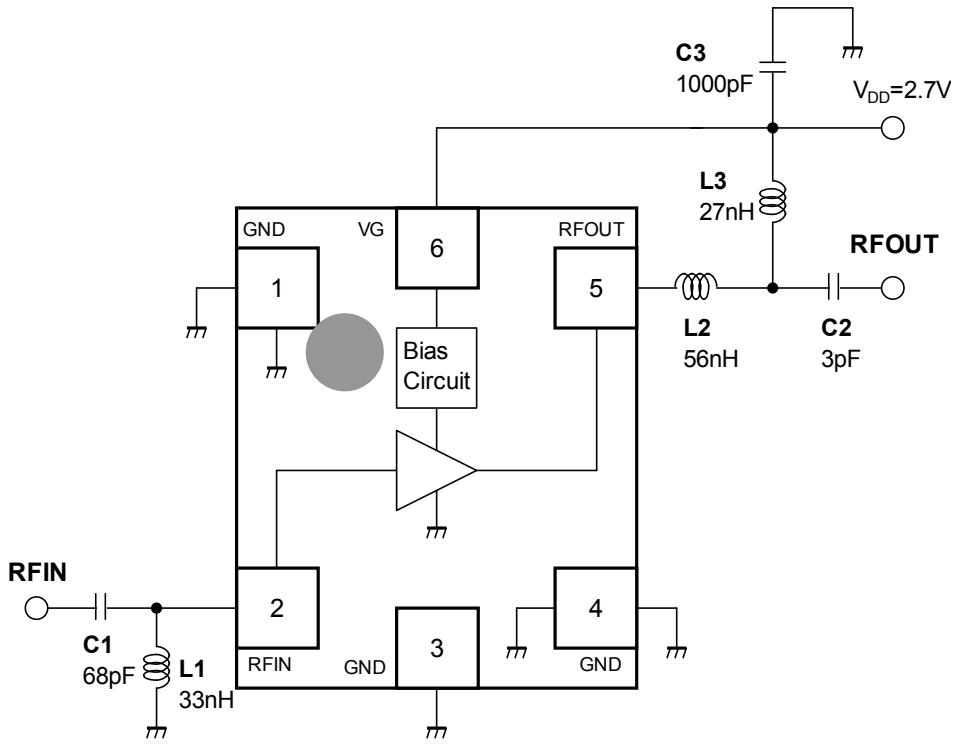



S11, S22 (~20GHz)

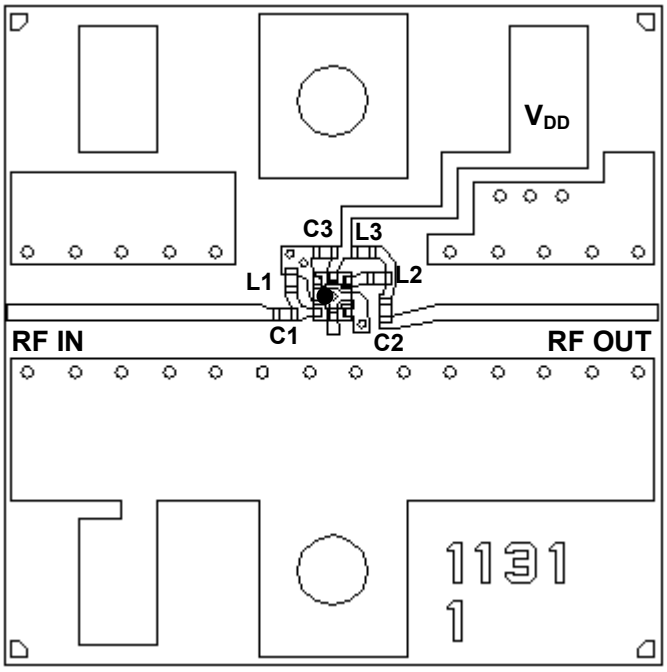



S21, S12 (~20GHz)

## ■ TEST CIRCUIT




## ■ TEST PCB LAYOUT




Parts List

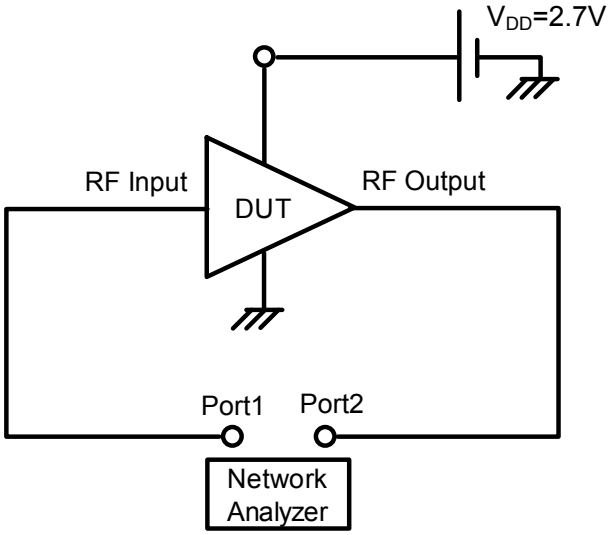
| Parts ID | Notes |
|---|---|
| L1~L3 | MURATA (LQP03T series) |
| C1~C3 | MURATA (GRM03 series) |

PCB (FR-4):
t=0.2mm
MICROSTRIP LINE
WIDTH=0.4mm ($Z_0$=50 ohm)
PCB SIZE=16.8mmx16.8mm

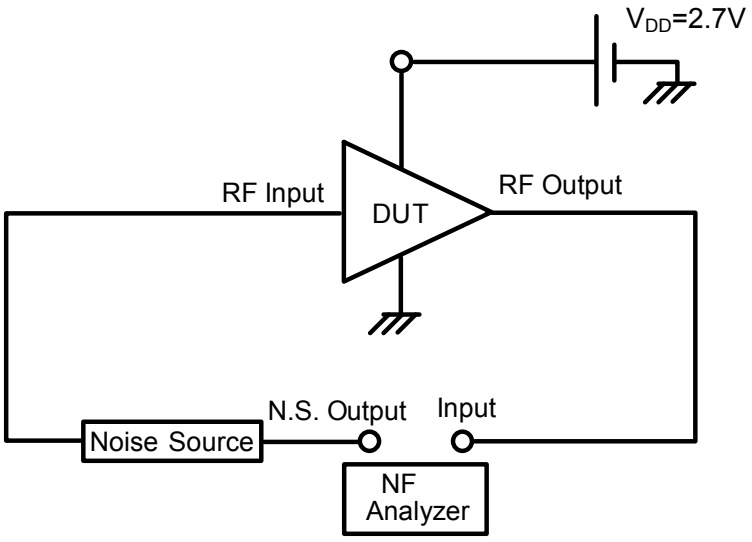
**PRECAUTIONS**

[1] C1 is a DC-Blocking capacitor, and L1 is a DC-feed inductor.
[2] L2, L3, and C2 formed the output matching circuit.
[3] C3 is a bypass capacitor.
[4] Ground terminals (1pin, 3pin and 4pin) should be connected with ground plane as close as possible in order to limit ground path induction.
[5] All external parts are placed as close as possible to the IC.

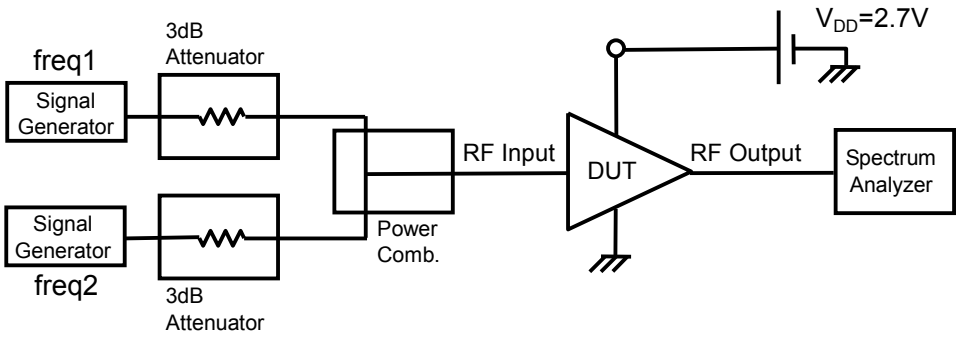
■ **MEASUREMENT BLOCK DIAGRAM**




S parameter Measurement Block Diagram

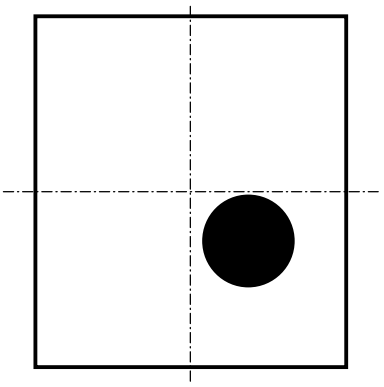


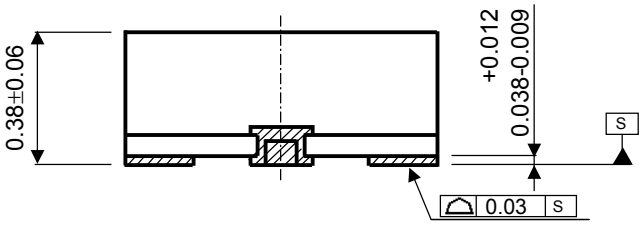

Noise Figure Measurement Block Diagram



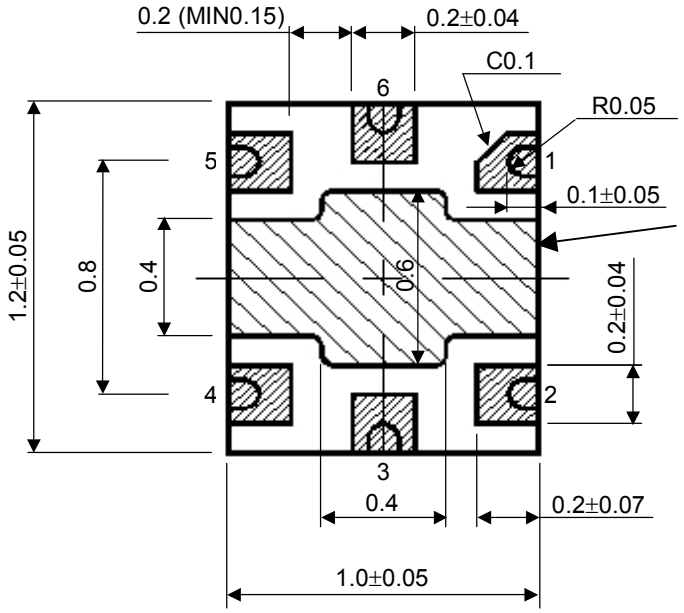

IF and IM3 Measurement Block Diagram for IIP3

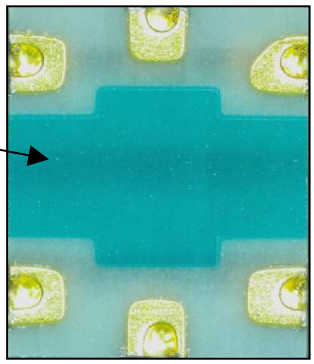
## ■PACKAGE OUTLINE (USB6-A8)






| | |
|---|---|
| TERMINAL TREAT | :Au |
| Substrate | :FR5 |
| Molding material | :Epoxy resin |
| UNIT | :mm |
| WEIGHT | :1.1mg |



**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.

# Mouser Electronics

Authorized Distributor

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NJR:

NJG1131HA8

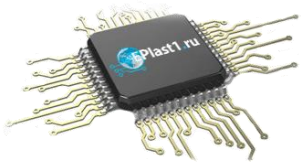
Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.




**Как с нами связаться**

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**Факс:** 8 (812) 320-02-42
**Электронная почта:** org@eplast1.ru
**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.