

## GPS LOW NOISE AMPLIFIER GaAs MMIC

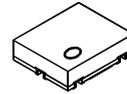
### ■ GENERAL DESCRIPTION

This IC is a Low noise amplifier GaAs MMIC designed for GPS. This amplifier provides low noise figure, high gain and high IP3 operated by single low positive power supply.

This amplifier can be tuned to wide frequency point (1.5GHz~2.4GHz).

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

### ■ PACKAGE OUTLINE

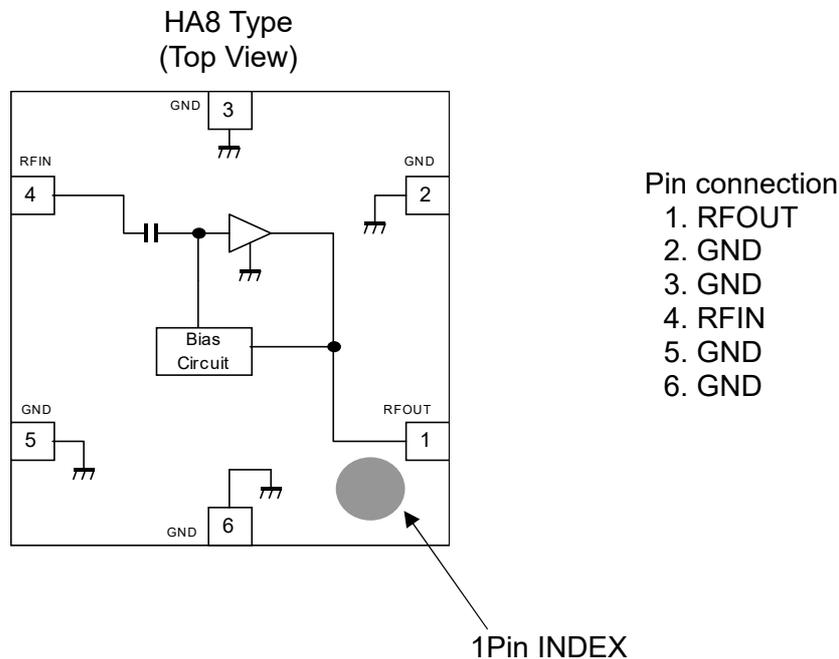


NJG1117HA8

### ■ FEATURES

- |   |  |
|---|--|
| ● Low voltage operation                     | +2.7V typ.                             |
| ● Low current consumption                   | 3.0mA typ.                             |
| ● High small signal gain                    | 19.5dB typ. @ f=1.575GHz               |
| ● Low noise figure                          | 0.7dB typ. @ f=1.575GHz                |
| ● Input power at 1dB gain compression point | -16.5 dBm typ. @f=1.575GHz             |
| ● High input IP3                            | -2.0dBm typ. @f=1.575GHz+1.5751GHz     |
| ● Ultra-small & ultra-thin package          | USB6-A8 (Package size: 1.0x1.2x0.38mm) |

### ■ PIN CONFIGURATION



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

## ■ ABSOLUTE MAXIMUM RATINGS

$T_a=+25^{\circ}\text{C}$ ,  $Z_s=Z_l=50\ \text{ohm}$

PARAMETER	SYMBOL	CONDITIONS	RATINGS	UNITS
Drain Voltage	$V_{DD}$		5.0	V
Input power	$P_{in}$	$V_{DD}=2.7\text{V}$	+15	dBm
Power dissipation	$P_D$	On PCB board, $T_{jmax}=150^{\circ}\text{C}$	150	mW
Operating temperature	$T_{opr}$		-40~+85	$^{\circ}\text{C}$
Storage temperature	$T_{stg}$		-55~+150	$^{\circ}\text{C}$

## ■ ELECTRICAL CHARACTERISTICS

GENERAL CONDITIONS:  $V_{DD}=2.7\text{V}$ ,  $f_{RF}=1575\text{MHz}$ ,  $T_a=+25^{\circ}\text{C}$ ,  $Z_s=Z_l=50\ \text{ohm}$ , with application circuit.

PARAMETERS	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Operating Frequency	freq		1.57	1.575	1.58	GHz
Operating voltage	$V_{DD}$		2.5	2.7	3.6	V
Operating current1	$I_{DD}$	RF OFF	-	3.0	4.0	mA
Small signal gain	Gain		17.5	19.5	22.0	dB
Noise figure	NF	Exclude PCB & connector losses (IN: 0.05dB)	-	0.7	1.0	dB
Input power at 1dB gain compression point	$P_{-1dB(IN)}$		-19.0	-16.5	-	dBm
Input 3rd order intercept point	IIP3	$f_1=f_{RF}$ , $f_2=f_{RF}+100\text{kHz}$ , $P_{in}=-34\text{dBm}$	-8.0	-2.0	-	dBm
RF IN VSWR	VSWR <sub>i</sub>		-	2.0	2.5	
RF OUT VSWR	VSWR <sub>o</sub>		-	1.5	2.0	

## ■ TERMINAL INFORMATION

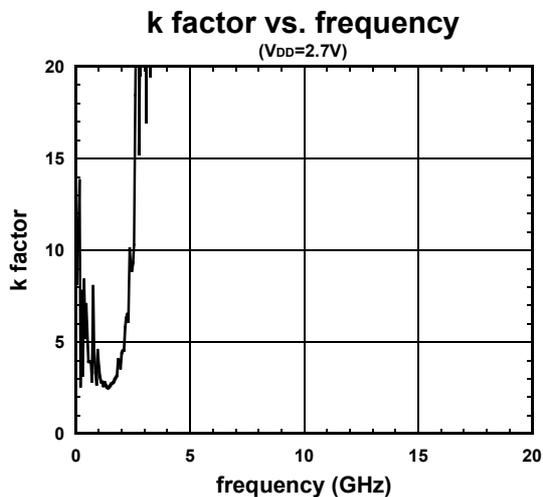
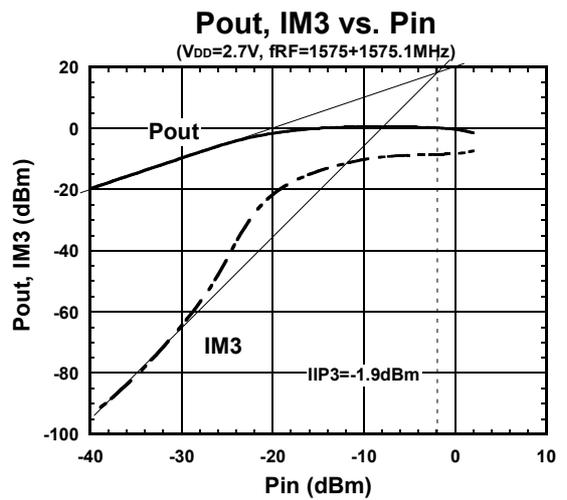
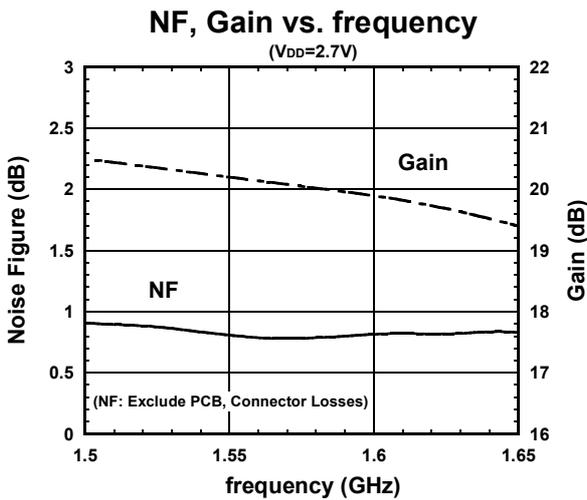
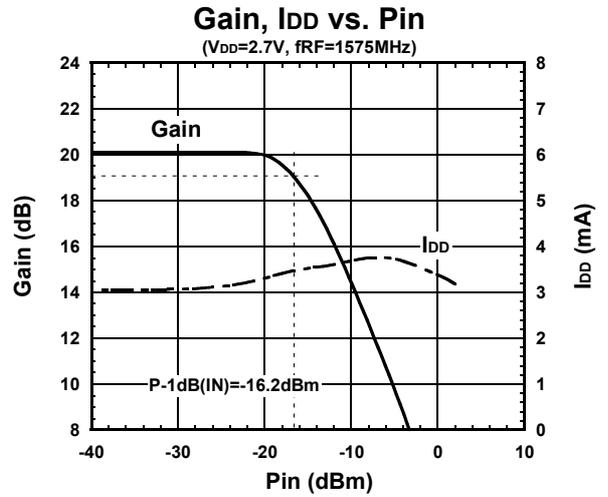
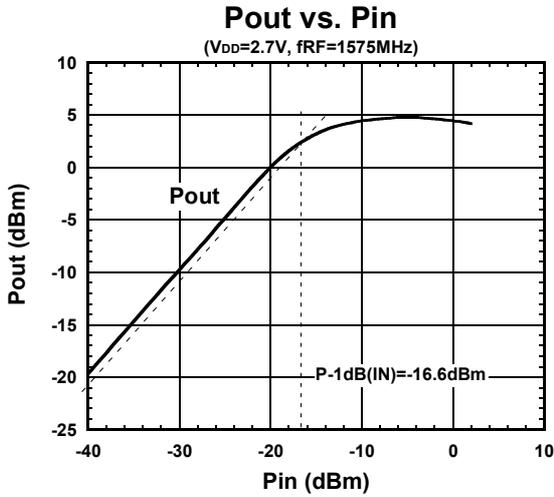
No.	SYMBOL	DESCRIPTION
1	RFOUT	RF Output and voltage supply pin. An external output matching circuit and a bypass capacitor are required. L3 is a RF choke inductor. These elements are used as output matching circuit.
2	GND	Ground terminal. (0V)
3	GND	Ground terminal. (0V)
4	RFIN	RF input pin. A DC blocking capacitor is not required. An external input matching circuit is required.
5	GND	Ground terminal. (0V)
6	GND	Ground terminal. (0V)

### CAUTION

1) Ground terminal (2, 3, 5, 6) should be connected with the ground plane as low inductance as possible.

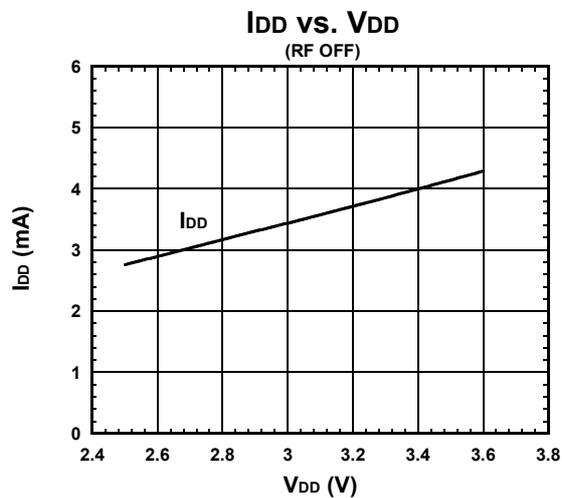
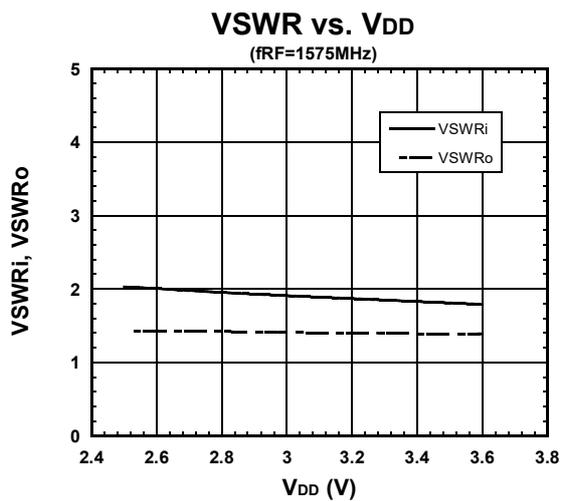
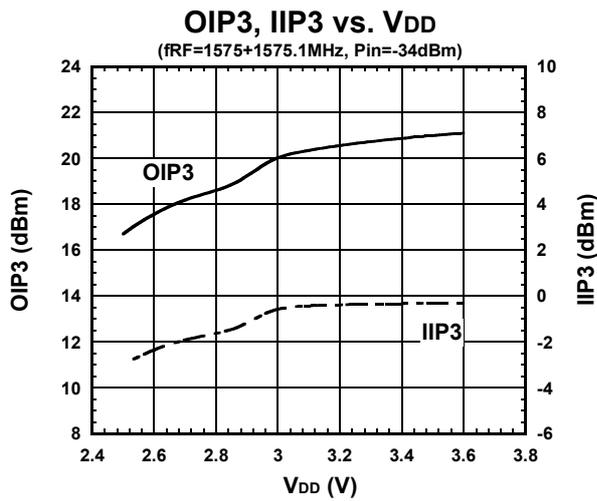
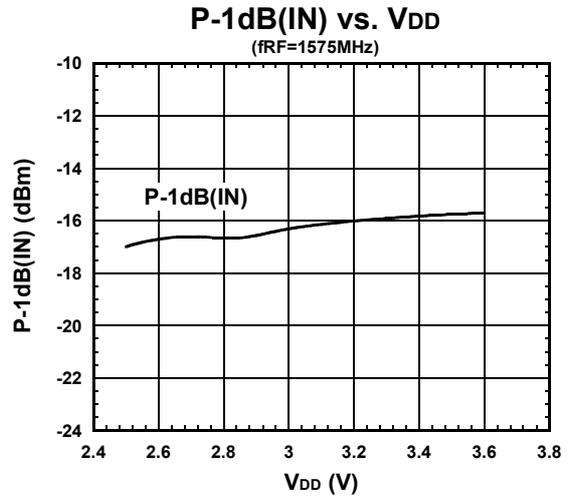
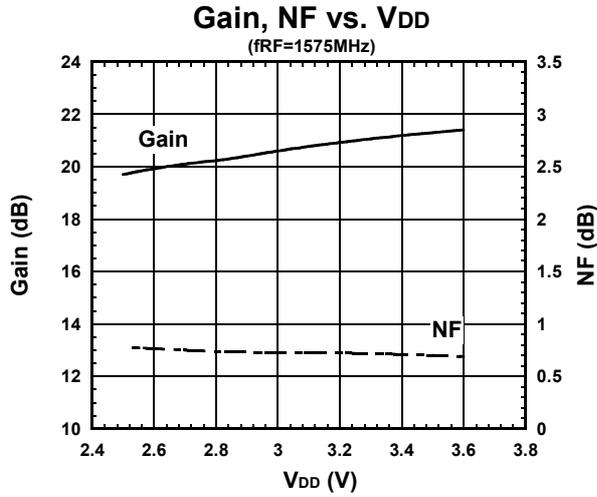
## ELECTRICAL CHARACTERISTICS

(Conditions:  $T_a=+25^{\circ}\text{C}$ ,  $V_{DD}=2.7\text{V}$ ,  $Z_s=Z_l=50\ \text{ohm}$ , with application circuit.)



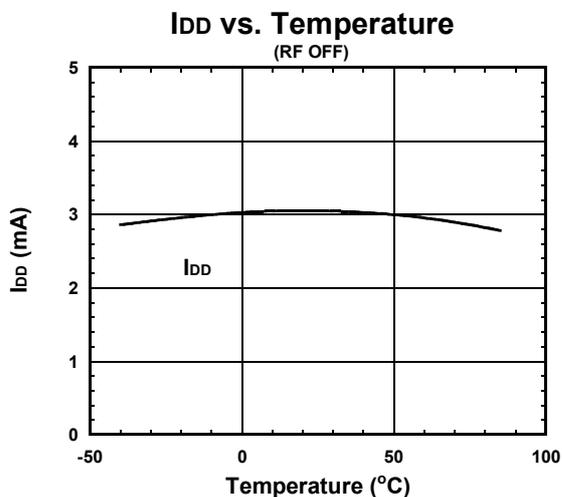
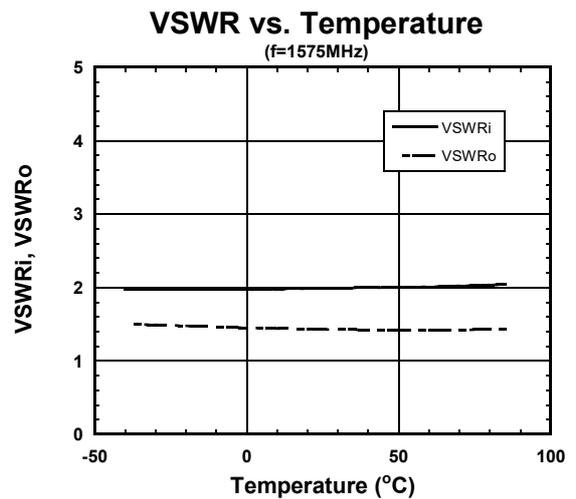
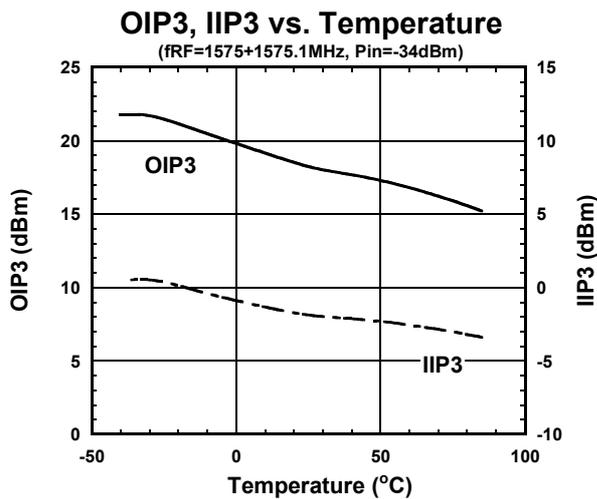
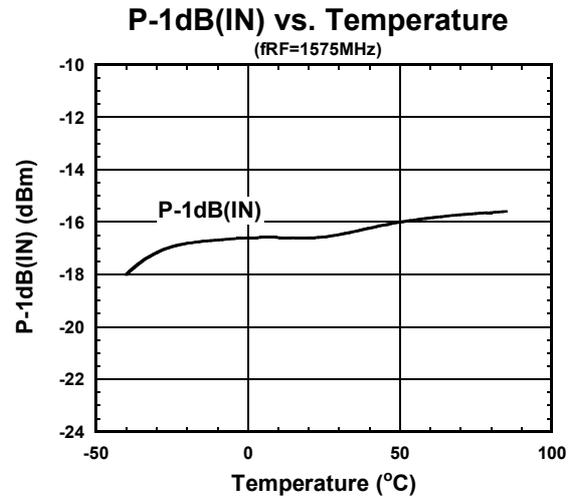
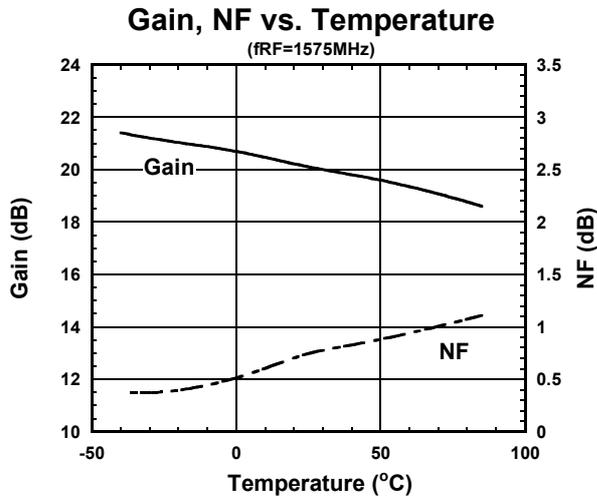
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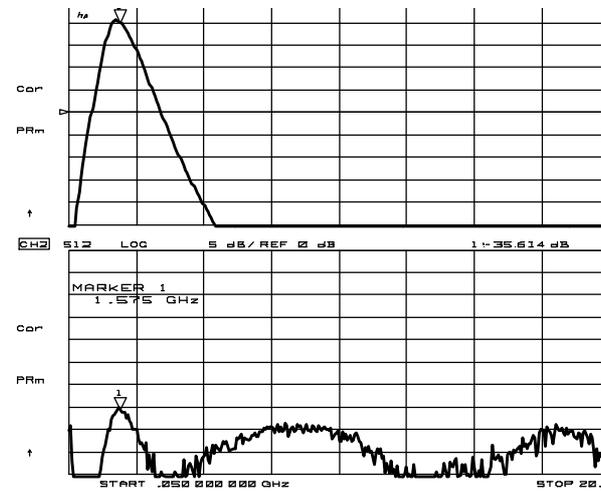
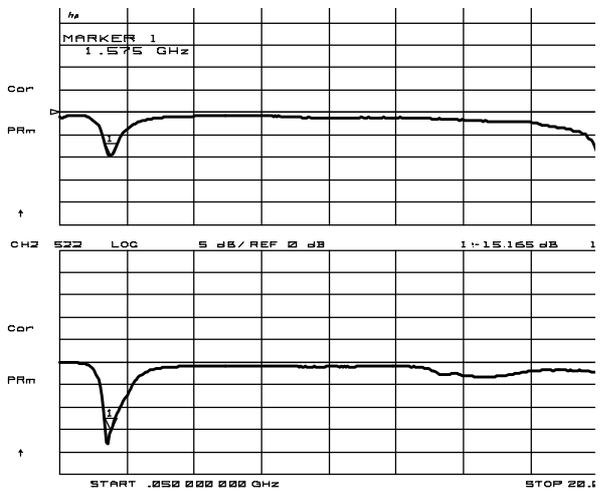
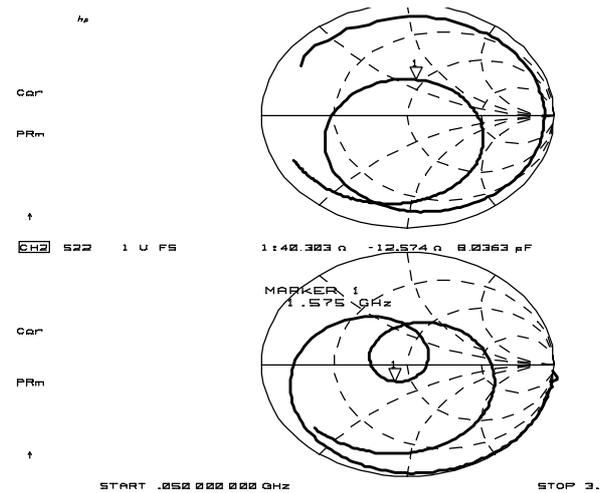
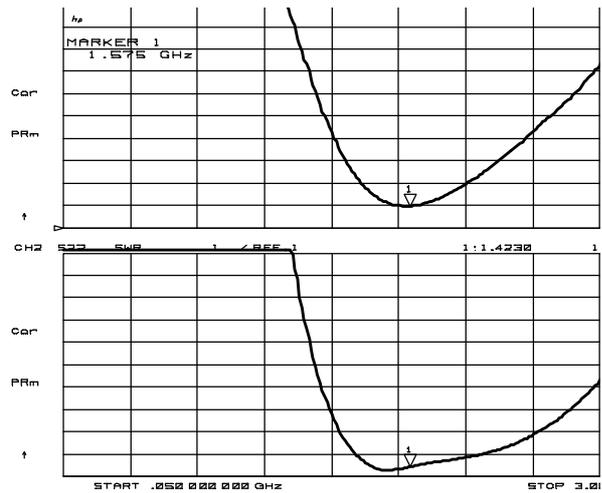
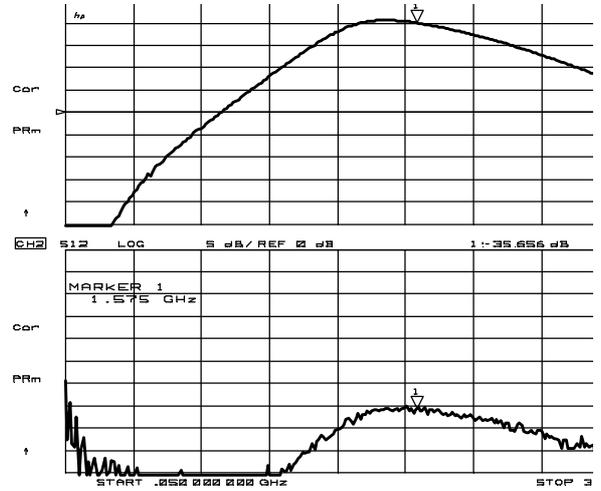
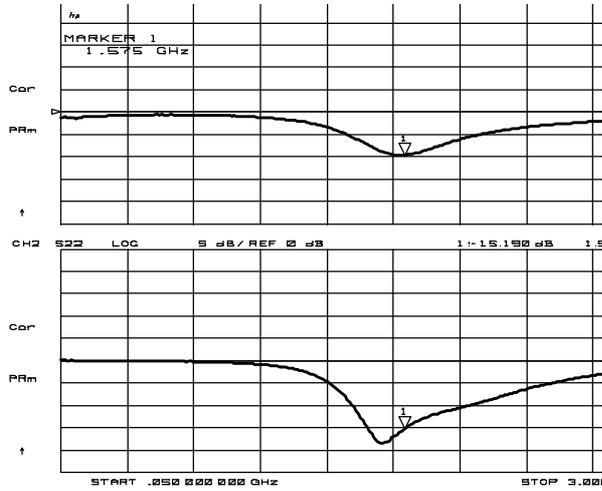
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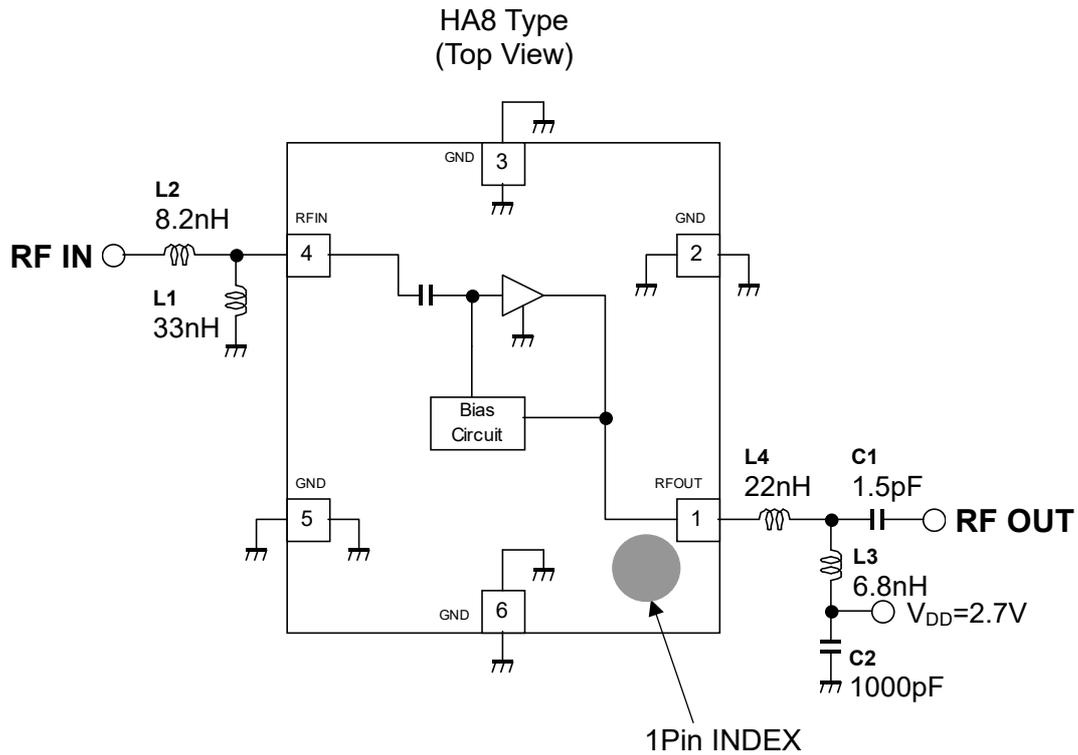


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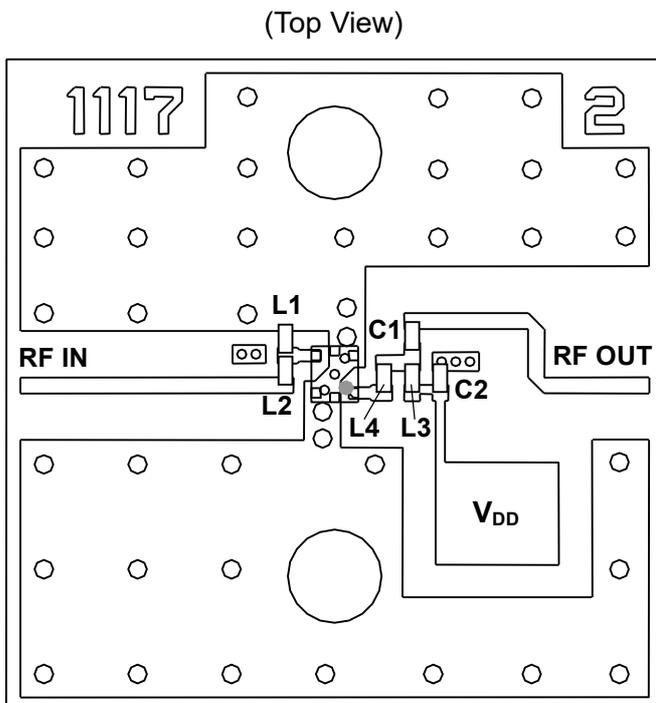
(Conditions:  $T_a=+25^{\circ}\text{C}$ ,  $V_{DD}=2.7\text{V}$ ,  $Z_s=Z_l=50\text{ ohm}$ , with application circuit.)



## APPLICATION CIRCUIT



## TEST PCB LAYOUT

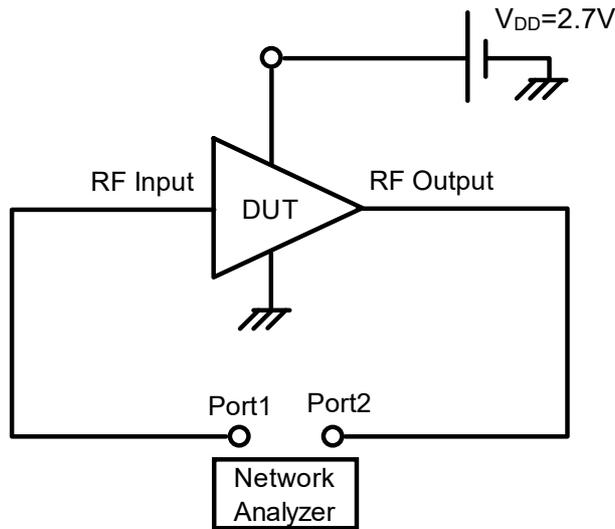


### Parts list

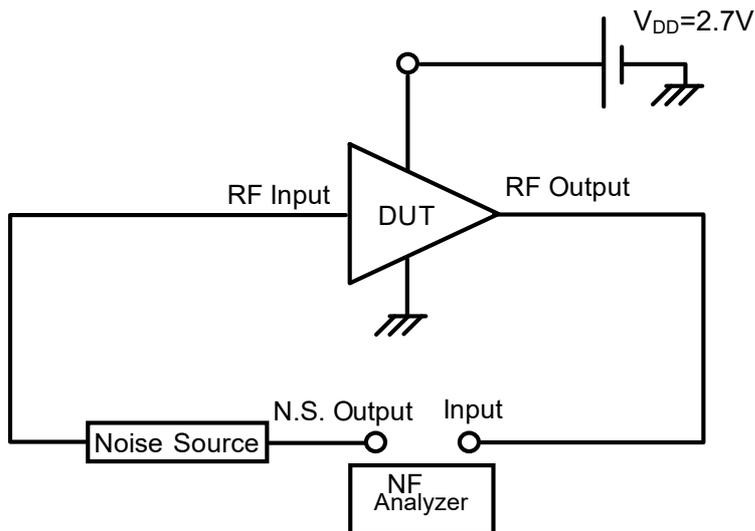
Parts ID	Comment
L1 ~ L3	MURATA (LQP03T Series)
L4	TDK (MLK0603 Series)
C1 ~ C2	MURATA (GRM03 Series)

PCB (FR-4):  
 t=0.2mm  
 MICROSTRIP LINE WIDTH  
 =0.34mm ( $Z_0=50\text{ ohm}$ )  
 PCB SIZE=14.0mm x 14.0mm

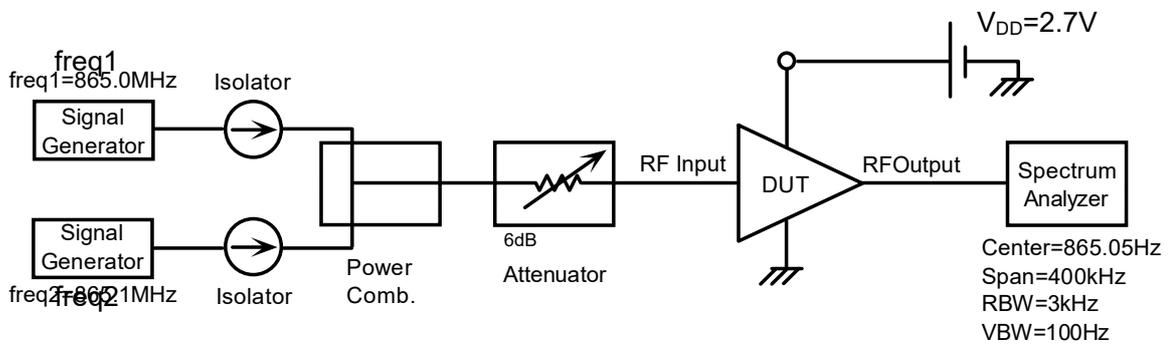
## MEASUREMENT BLOCK DIAGRAM



S parameter Measurement Block Diagram

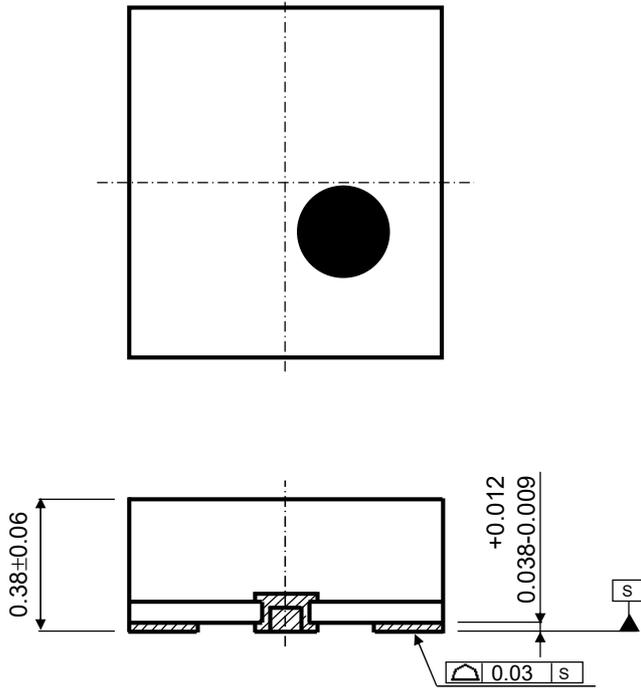


Noise Figure Measurement Block Diagram



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

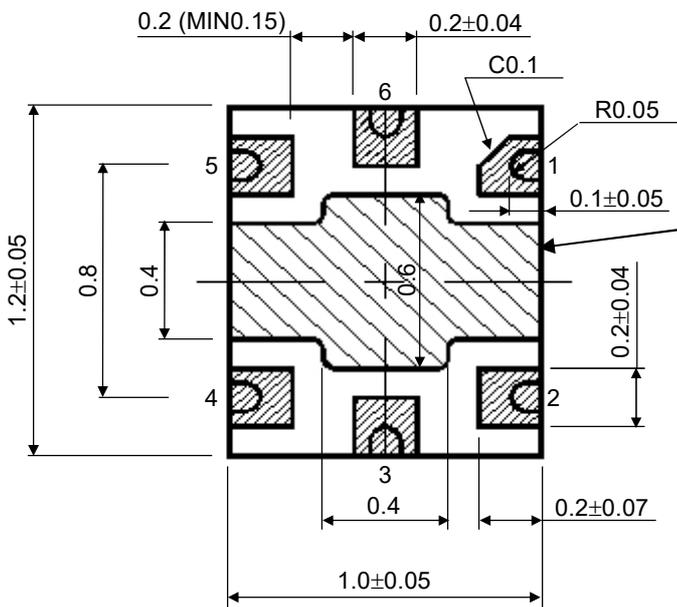
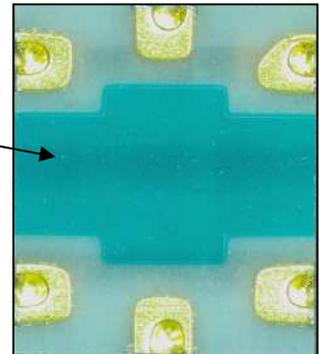


Photo resist coating



### 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.

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  - Combustion equipment

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6. We are making our continuous effort to improve the quality and reliability of our products, but semiconductor products are likely to fail with certain probability. In order to prevent any injury to persons or damages to property resulting from such failure, customers should be careful enough to incorporate safety measures in their design, such as redundancy feature, fire containment feature and fail-safe feature. We do not assume any liability or responsibility for any loss or damage arising from misuse or inappropriate use of the products.
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8. **Quality Warranty**
  - 8-1. **Quality Warranty Period**

In the case of a product purchased through an authorized distributor or directly from us, the warranty period for this product shall be one (1) year after delivery to your company. For defective products that occurred during this period, we will take the quality warranty measures described in section 8-2. However, if there is an agreement on the warranty period in the basic transaction agreement, quality assurance agreement, delivery specifications, etc., it shall be followed.
  - 8-2. **Quality Warranty Remedies**

When it has been proved defective due to manufacturing factors as a result of defect analysis by us, we will either deliver a substitute for the defective product or refund the purchase price of the defective product.

Note that such delivery or refund is sole and exclusive remedies to your company for the defective product.
  - 8-3. **Remedies after Quality Warranty Period**

With respect to any defect of this product found after the quality warranty period, the defect will be analyzed by us. On the basis of the defect analysis results, the scope and amounts of damage shall be determined by mutual agreement of both parties. Then we will deal with upper limit in Section 8-2. This provision is not intended to limit any legal rights of your company.
9. Anti-radiation design is not implemented in the products described in this document.
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11. WLCSP products should be used in light shielded environments. The light exposure can influence functions and characteristics of the products under operation or storage.
12. Warning for handling Gallium and Arsenic (GaAs) products (Applying to GaAs MMIC, Photo Reflector). These products use Gallium (Ga) and Arsenic (As) which are specified as poisonous chemicals by law. For the prevention of a hazard, do not burn, destroy, or process chemically to make them as gas or power. When the product is disposed of, please follow the related regulation and do not mix this with general industrial waste or household waste.
13. Please contact our sales representatives should you have any questions or comments concerning the products or the technical information.



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