

## LOW NOISE AMPLIFIER GaAs MMIC

### ■GENERAL DESCRIPTION

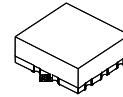
NJG1107HB3 is a Low Noise Amplifier GaAs MMIC designed for GPS. This amplifier provides low noise figure, high gain and high IP3 operated by single low positive power supply.

This amplifier includes internal self-bias circuit and input DC blocking capacitor.

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

An ultra small and ultra thin package of USB8-B3 is adopted.

### ■PACKAGE OUTLINE

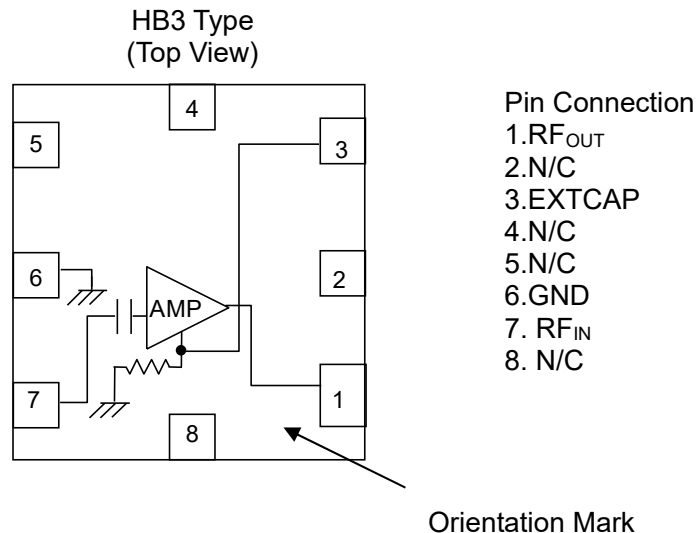


NJG1107HB3

### ■FEATURES

- Low voltage operation +2.7V typ.
- Low current consumption 2.5mA typ.
- High small signal gain 17dB typ. @f=1.575GHz
- Low noise figure 1.1dB typ. @f=1.575GHz
- High Input IP3 -4.0dBm typ. @f=1.575+1.5751GHz
- Ultra small & ultra thin package USB8-B3 (Package size: 1.5x1.5x0.75mm)

### ■PIN CONFIGURATION



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

## ■ABSOLUTE MAXIMUM RATINGS

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

PARAMETER	SYMBOL	CONDITIONS	RATINGS	UNIT
Drain Voltage	$V_{DD}$		6.0	V
Input Power	$P_{in}$	$V_{DD}=2.7\text{V}$	+15	dBm
Power Dissipation	$P_D$	At on PCB board	135	mW
Operating Temp.	$T_{opr}$		-40~+85	$^{\circ}\text{C}$
Storage Temp.	$T_{stg}$		-55~+150	$^{\circ}\text{C}$

## ■ELECTRICAL CHARACTERISTICS

( $V_{DD}=2.7\text{V}$ ,  $f=1.575\text{GHz}$ ,  $T_a=+25^{\circ}\text{C}$ ,  $Z_s=Z_l=50\text{ohm}$ , TEST CIRCUIT)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Frequency	freq1		1.57	1.575	1.58	GHz
Drain Voltage	$V_{DD}$		2.5	2.7	5.5	V
Operating Current	$I_{DD}$	RF OFF	-	2.5	3.2	mA
Small Signal Gain	Gain		15.0	17.0	-	dB
Noise Figure	NF		-	1.1	1.3	dB
Pin at 1dB Gain Compression point	$P_{-1dB}$		-20.0	-16.0	-	dBm
Input 3rd Order Intercept Point	IIP3	$f=1.575+1.5751\text{GHz}$ $RFin=-35\text{dBm}$	-6.0	-4.0	-	dBm
RF Input Port VSWR	$VSWR_i$		-	1.6	2.0	
RF Output Port VSWR	$VSWR_o$			1.6	2.0	

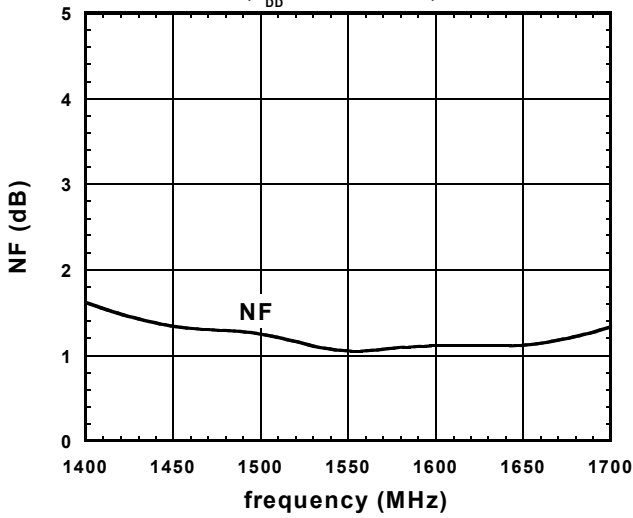
## ■PIN CONFIGURATION

Pin	Function	Description
1	Rfout	RF output and voltage supply pin. External matching circuits and a bypass capacitor is required. L3 is a RF choke inductor and C1 is a DC blocking capacitor. These elements are used as output matching circuit. C2 is a bypass capacitor.
2,4,5,8	N/C	Neutral terminal. Should be connected to the ground.
3	EXTCAP	An external bypass capacitor is required.
6	GND	Ground pin. To keep good RF grounding performance, please use multiple via holes to connect with ground plane and this pin.
7	Rfin	RF input pin. A DC blocking capacitor is not required. An external matching circuit is required.

## TYPICAL CHARACTERISTICS

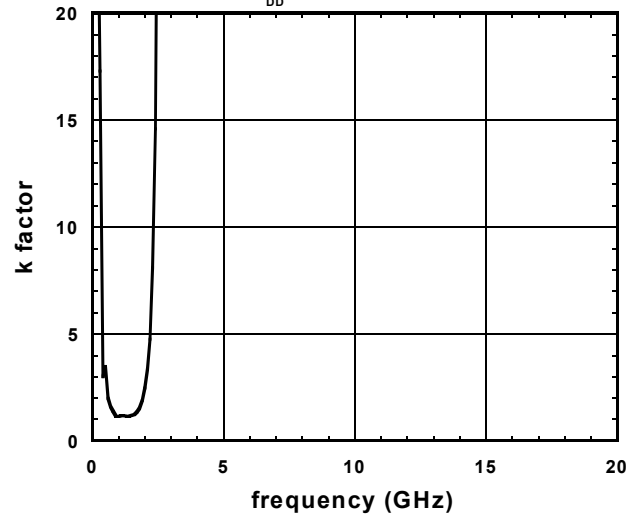
### NF vs. frequency

( $V_{DD}=2.7V, T_a=25^\circ C$ )



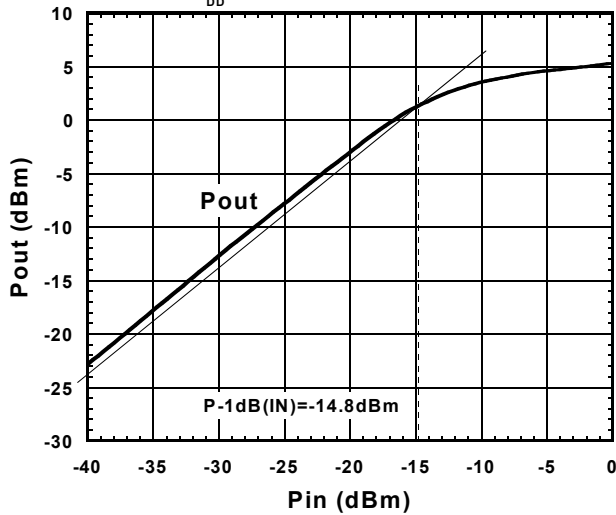
### k factor vs. frequency

( $V_{DD}=2.7V, T_a=25^\circ C$ )



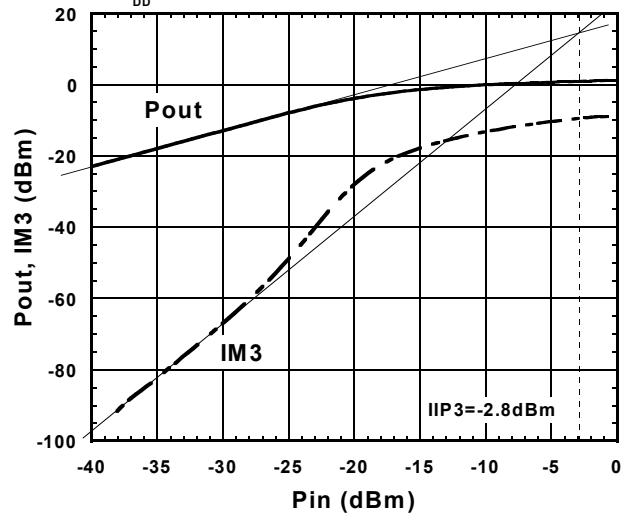
### Pout vs. Pin

( $V_{DD}=2.7V, f=1575MHz, T_a=25^\circ C$ )



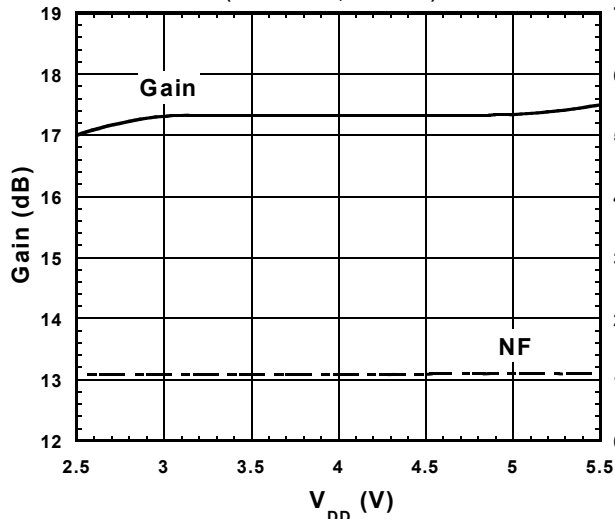
### Pout, IM3 vs. Pin

( $V_{DD}=2.7V, f_1=1575MHz, f_2=f_1+100kHz, T_a=25^\circ C$ )



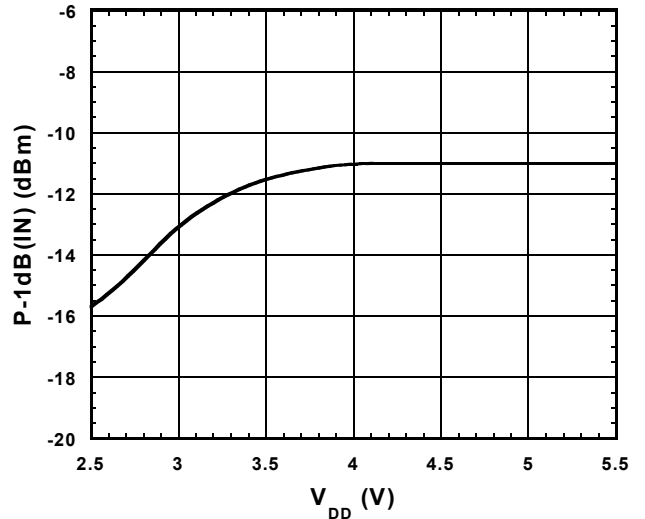
### Gain, NF vs. $V_{DD}$

( $f=1575MHz, T_a=25^\circ C$ )



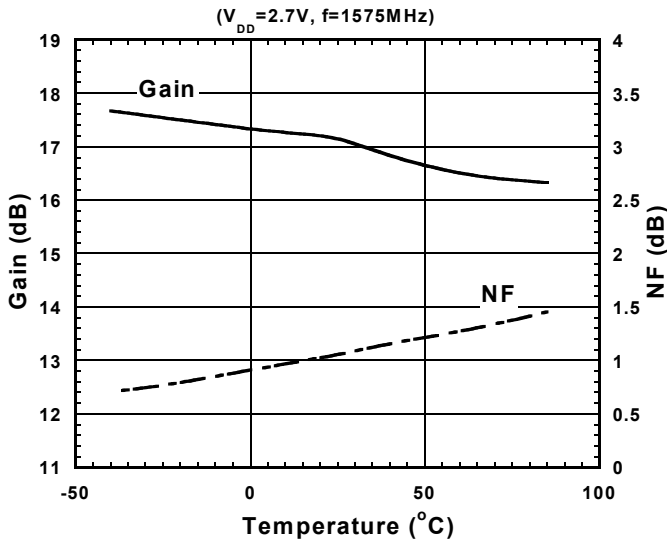
### P-1dB(IN) vs. $V_{DD}$

( $f=1575MHz, T_a=25^\circ C$ )

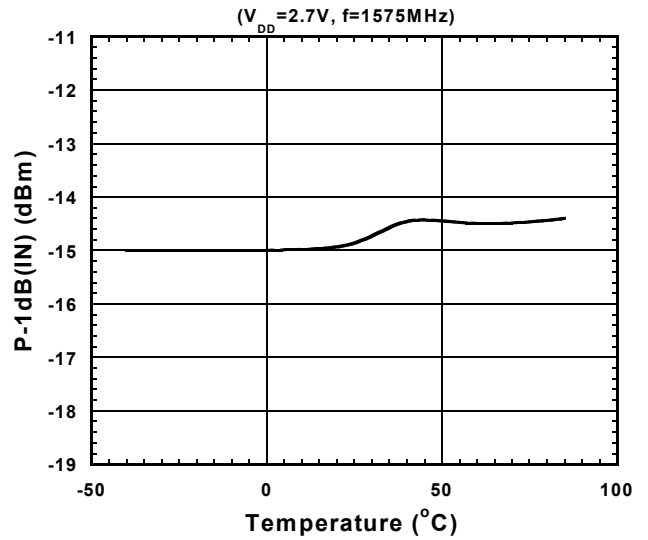


## TYPICAL CHARACTERISTICS

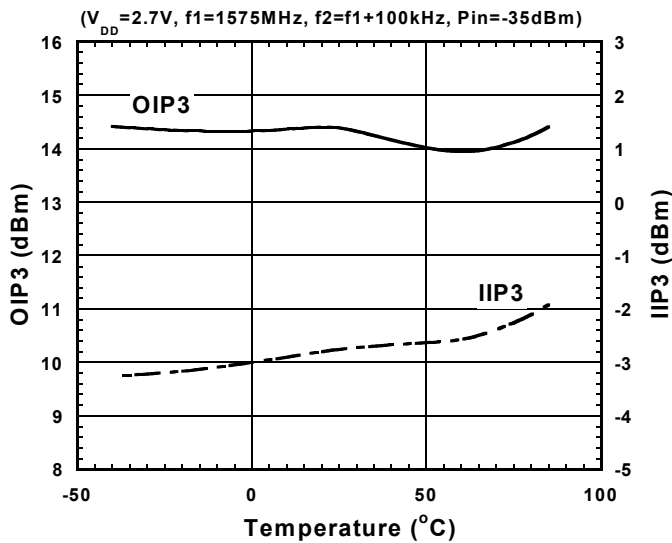
### Gain, NF vs. Temperature



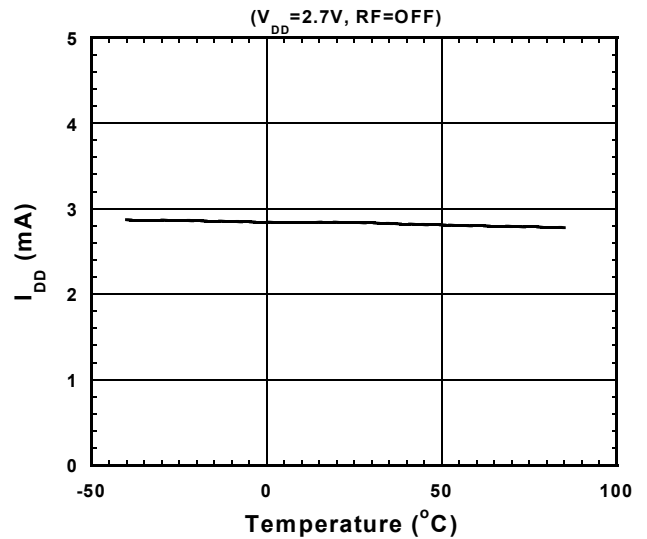
### P-1dB(IN) vs. Temperature



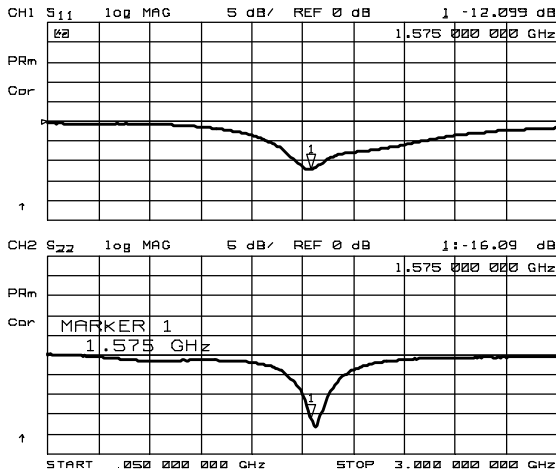
### OIP3, IIP3 vs. Temperature



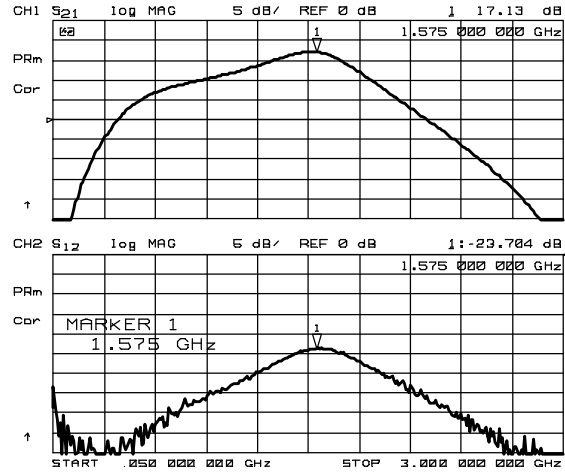
### $I_{DD}$ vs. Temperature



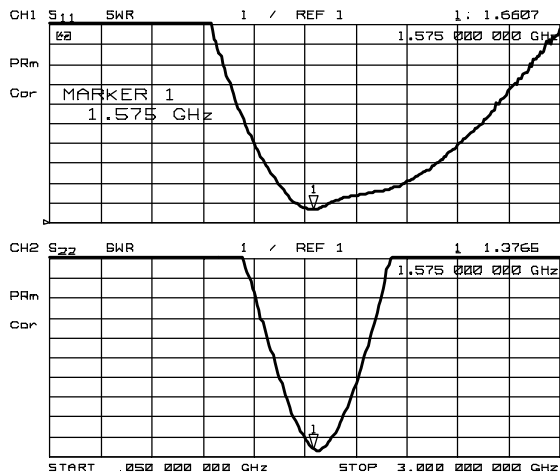
## TYPICAL CHARACTERISTICS



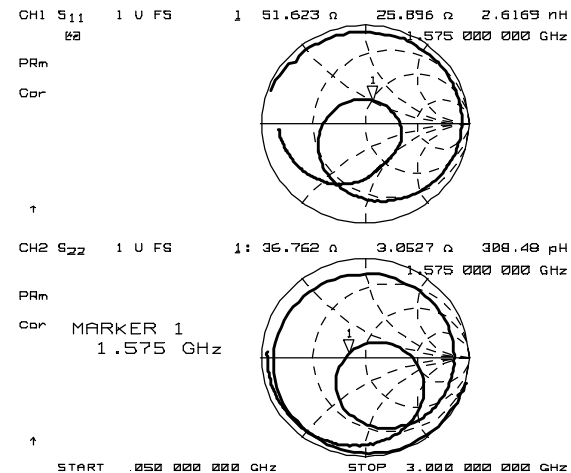
S11,S22



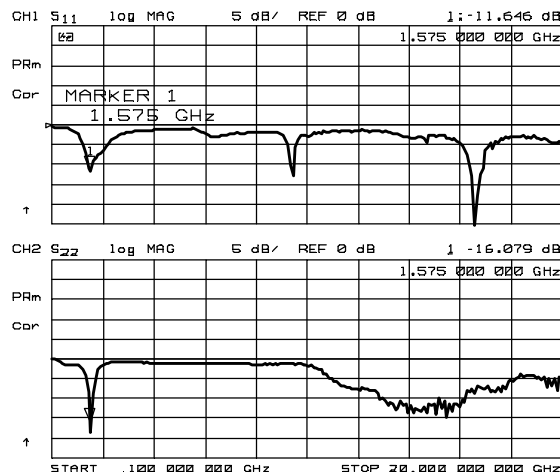
S21,S12



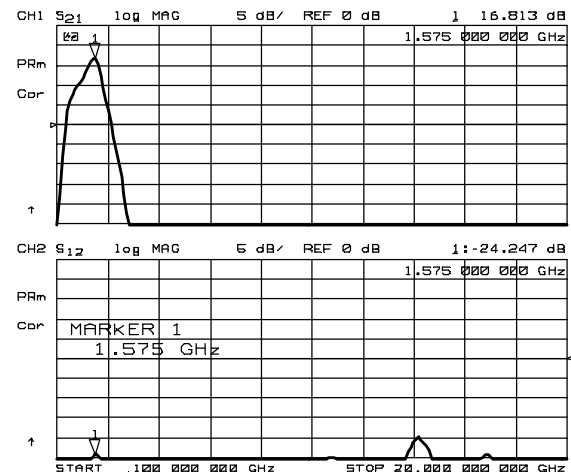
VSWR



Zin, Zout

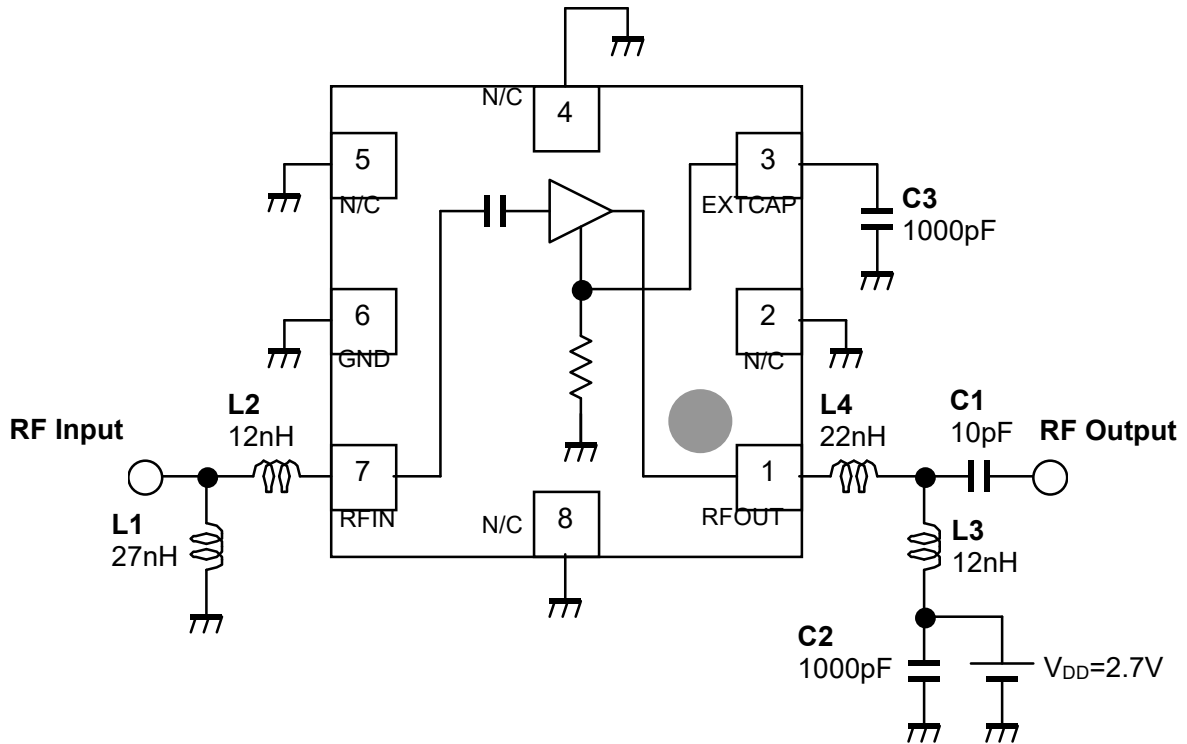


S11, S22(~20GHz)



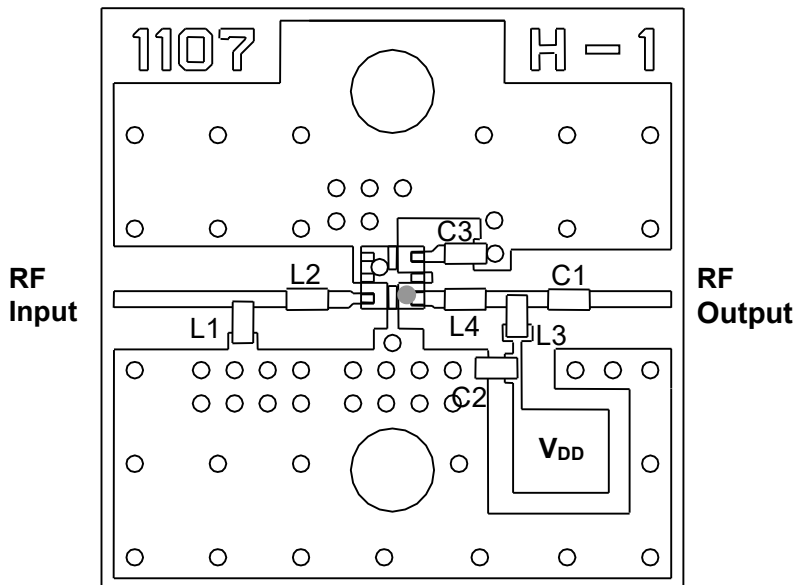
S21, S12(~20GHz)

## TEST CIRCUIT



## RECOMMENDED PCB DESIGN

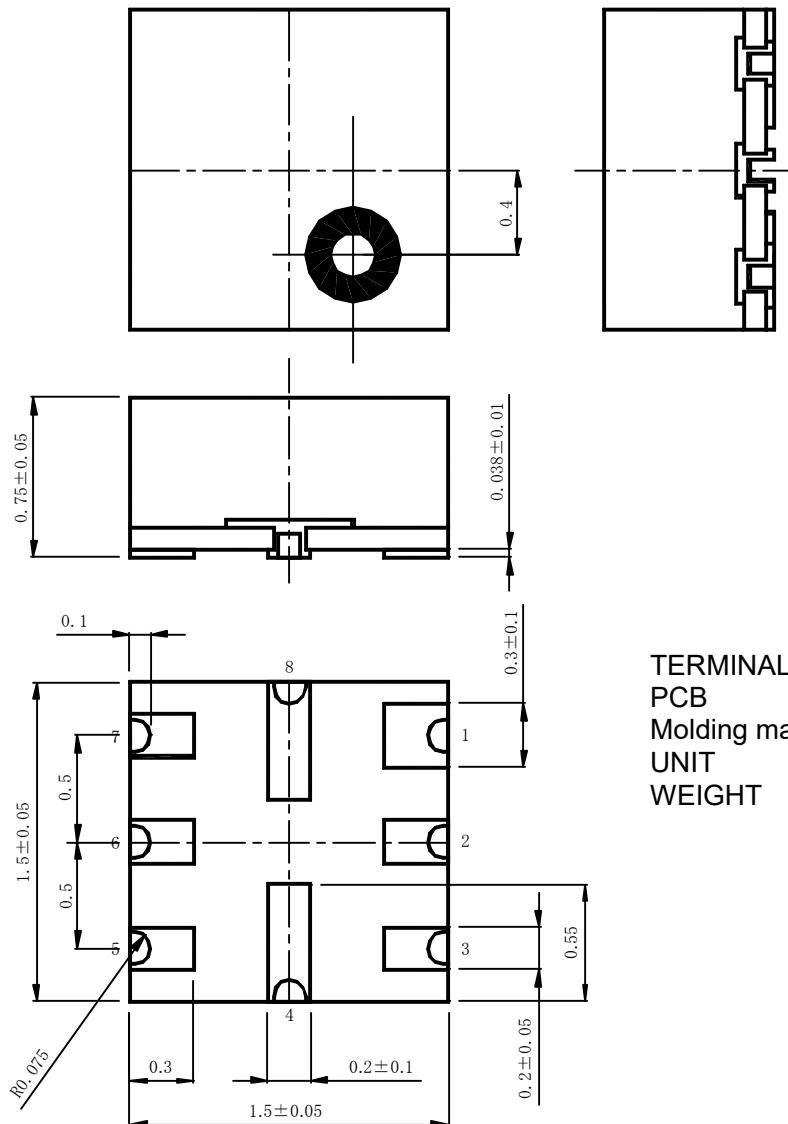
(Top View)



Parts ID	Comment
L1, L3, L4	TDK (MLK1005)
L2	TDK (MLG1005)
C1~C3	MURATA (GRP15)

PCB (FR-4):  
 t=0.2mm  
 MICROSTRIP LINE WIDTH  
 =0.4mm ( $Z_0=50\text{ohm}$ )  
 PCB SIZE=14.0mmX14.0mm

## PACKAGE OUTLINE (USB8-B3)



TERMINAL TREAT	:Au
PCB	:FR5
Molding material	:Epoxy resin
UNIT	:mm
WEIGHT	:4mg

### 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.

### [CAUTION]

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



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  - 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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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.
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