

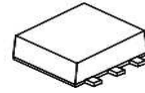
## WIDE BAND LOW NOISE AMPLIFIER GaAs MMIC

### ■ GENERAL DESCRIPTION

The NJG1140KA1 is a wide band low noise amplifier GaAs MMIC designed for terrestrial and satellite applications.

The NJG1140KA1 features wideband operation from 50MHz to 2150MHz, high linearity and high ESD tolerance. The NJG1140KA1 requires only four external components. The NJG1140KA1 is available in a small, lead-free, halogen-free, 1.6mm x 1.6mm x 0.55 mm, 6-pin FLP6-A1 package.

### ■ PACKAGE OUTLINE



NJG1140KA1

### ■ APPLICATIONS

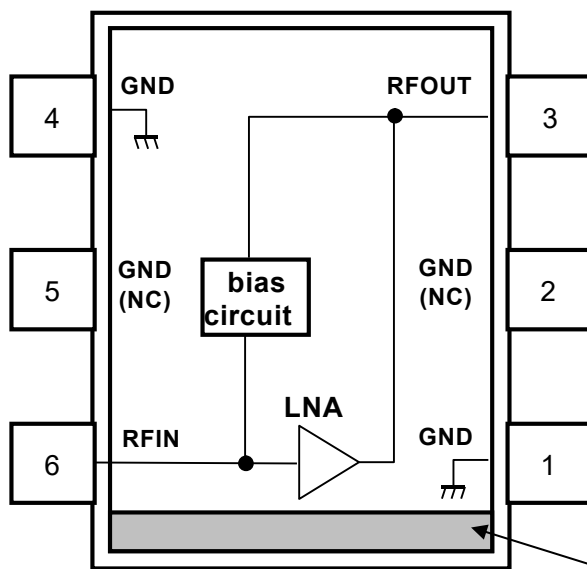
Terrestrial and Satellite applications  
 Set-top Box, Digital TV, CATV, BS/CS applications  
 LTE Router, Modem and Base Station applications

### ■ FEATURES

- Wide operating frequency range      50MHz~2150MHz
- Operation voltage                        3.3V typ. (+2.5V~+4.0V)
- Current consumption                      10mA typ. @  $V_{DD}=3.3V$
- Gain    9.0dB typ. @  $V_{DD}=3.3V$
- High  $P_{-1dB(IN)}$                             +7.0dBm @  $V_{DD}=3.3V$
- High Input IP3                              +9.0dBm @  $V_{DD}=3.3V$
- High ESD tolerance                        On-chip ESD protection circuit
- External components count              4 pcs. (capacitors 3pcs, inductor 1pc)
- Small package                              FLP6-A1 (package size: 1.6mm x 1.6mm x 0.55mm typ.)
- Lead -free and halogen-free

### ■ PIN CONFIGURATION

(TOP VIEW)



Pin Connection

1. GND
2. GND(NC)
3. RFOUT
4. GND
5. GND(NC)
6. RFIN

1Pin INDEX

NOTE: The information on this datasheet is subject to change without notice

# NJG1140KA1

## ■ ABSOLUTE MAXIMUM RATINGS

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

PARAMETER	SYMBOL	CONDITIONS	RATINGS	UNITS
Supply voltage	$V_{DD}$		5.0	V
Input power	$P_{IN}$	$V_{DD}=3.3\text{V}$	+15	dBm
Power dissipation	$P_D$	4-layer FR4 PCB with through-hole (74.2mmx74.2mm), $T_j=150^{\circ}\text{C}$	580	mW
Operating temperature	$T_{opr}$		-40~+85	$^{\circ}\text{C}$
Storage temperature	$T_{stg}$		-55~+150	$^{\circ}\text{C}$

## ■ ELECTRICAL CHARACTERISTICS (DC)

GENERAL CONDITIONS:  $V_{DD}=3.3\text{V}$ ,  $T_a=+25^{\circ}\text{C}$ ,  $Z_s=Z_l=50\Omega$

PARAMETERS	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Supply voltage	$V_{DD}$		2.5	3.3	4.0	V
Supply current	$I_{DD}$		-	10	14	mA

## ■ ELECTRICAL CHARACTERISTICS (RF)

GENERAL CONDITIONS:  $V_{DD}=3.3\text{V}$ ,  $f_{RF}=50\sim 2150\text{MHz}$ ,  $T_a=+25^{\circ}\text{C}$ ,  $Z_s=Z_l=50\Omega$  with application circuit

PARAMETERS	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Operating frequency	Freq		50	-	2150	MHz
Small signal gain	Gain	Exclude PCB and connector losses*1	7.0	9.0	12.0	dB
Noise figure	NF	Exclude PCB and connector losses*2	-	2.5	3.0	dB
Input power at 1dB gain compression point	$P_{-1\text{dB(IN)}}$		+2.0	+7.0	-	dBm
Input 3rd order intercept point	IIP3	$f_1=f_{RF}$ , $f_2=f_{RF}+100\text{kHz}$ , $P_{in}=-20\text{dBm}$	+5.0	+9.0	-	dBm
Isolation	ISO	S12	-	-16.0	-	dB
RF IN VSWR	VSWRi		-	1.5	3.3	
RF OUT VSWR	VSWRo		-	1.5	3.3	

\*1: Input and output PCB, connector losses: 0.016dB(at 50MHz), 0.254dB(at 2150MHz)

\*2: Input PCB, connector losses: 0.008dB(at 50MHz), 0.127dB(at 2150MHz)

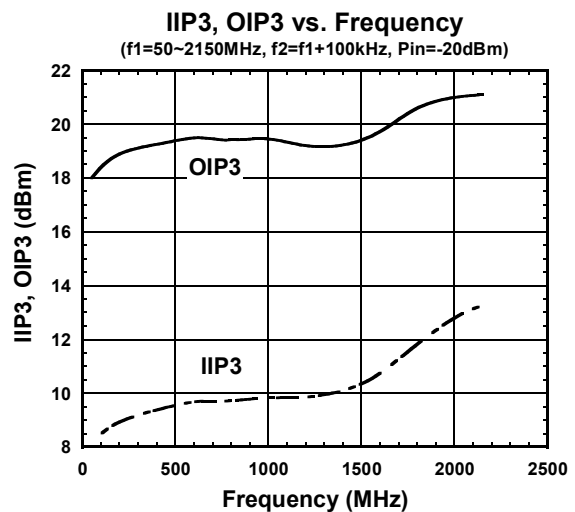
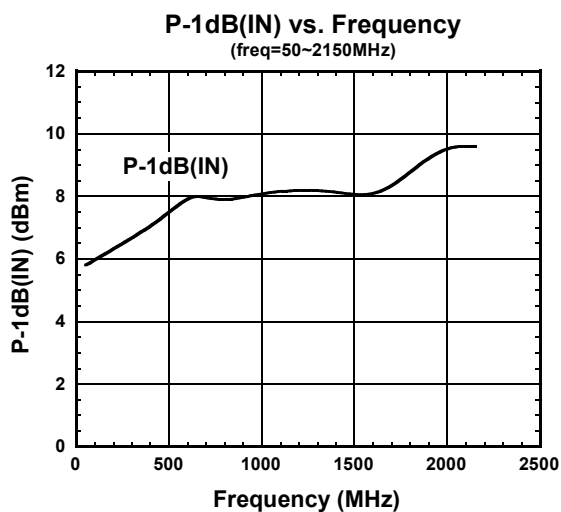
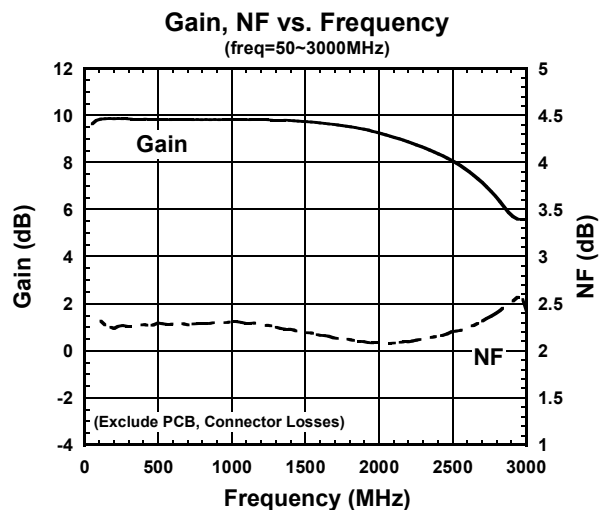
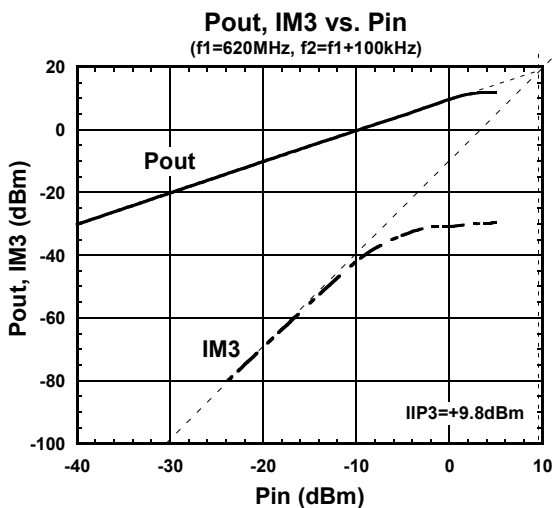
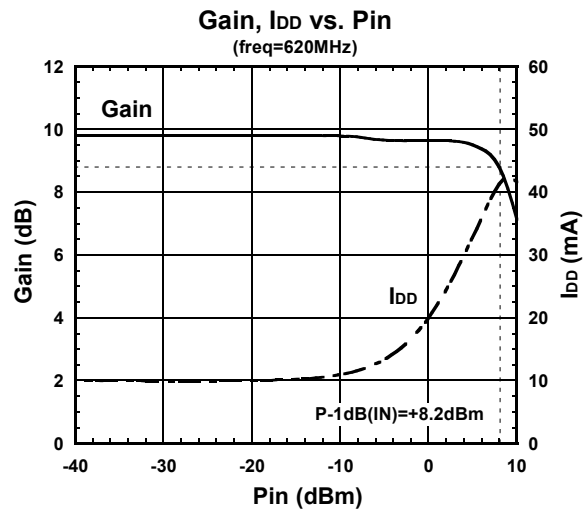
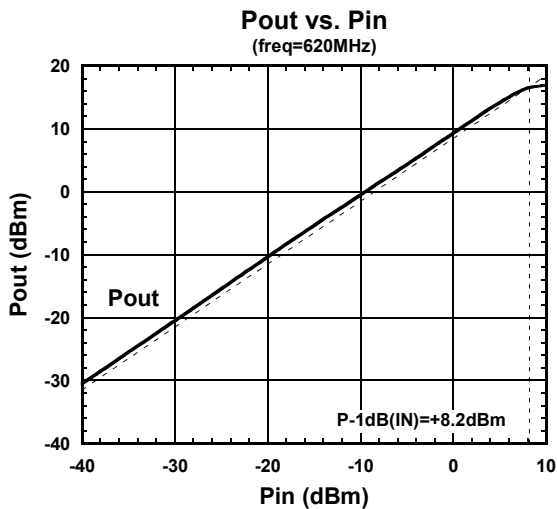
## ■ TERMINAL INFORMATION

No.	SYMBOL	DESCRIPTION
1	GND	Ground terminal. Connect to the PCB ground plane.
2	NC (GND)	No connected terminal. This terminal is not connected with internal circuit. Connect to the PCB ground plane.
3	RFOUT	RF output terminal. Requires a DC blocking capacitor C2 and DC feed inductor L1.
4	GND	Ground terminal. Connect to the PCB ground plane.
5	NC (GND)	No connected terminal. This terminal is not connected with internal circuit. Connect to the PCB ground plane.
6	RFIN	RF input terminal. Requires a DC blocking capacitor C1.

# NJG1140KA1

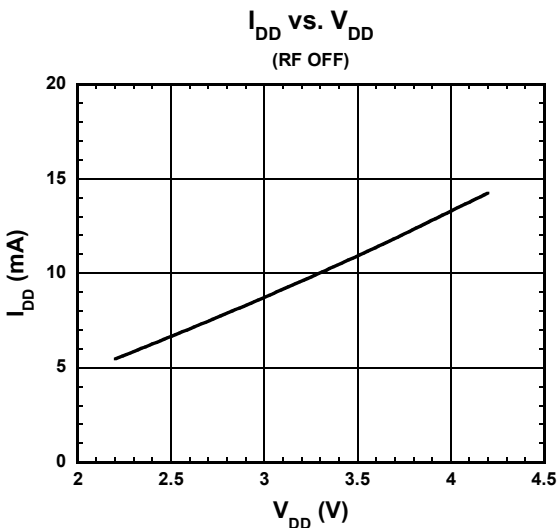
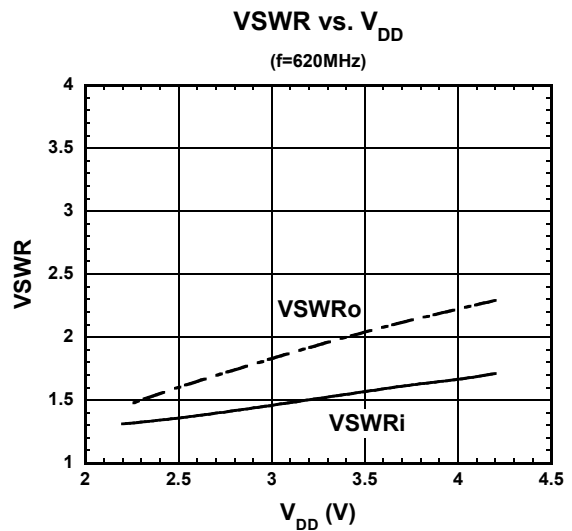
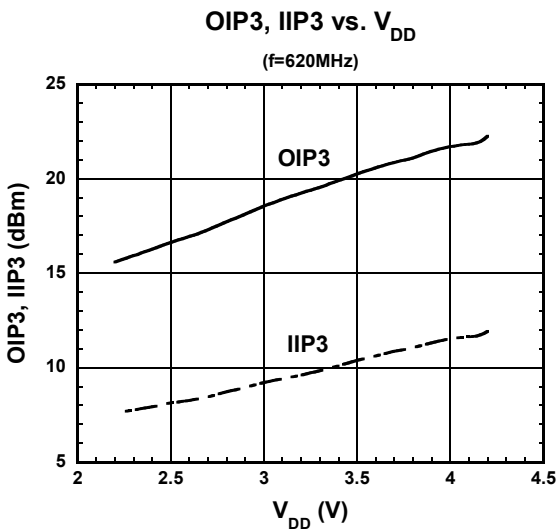
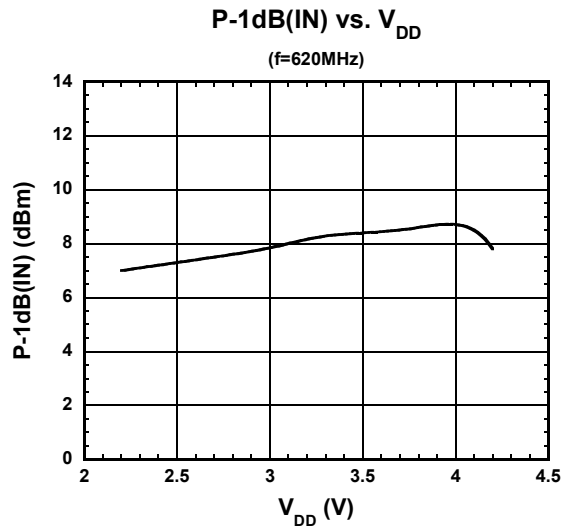
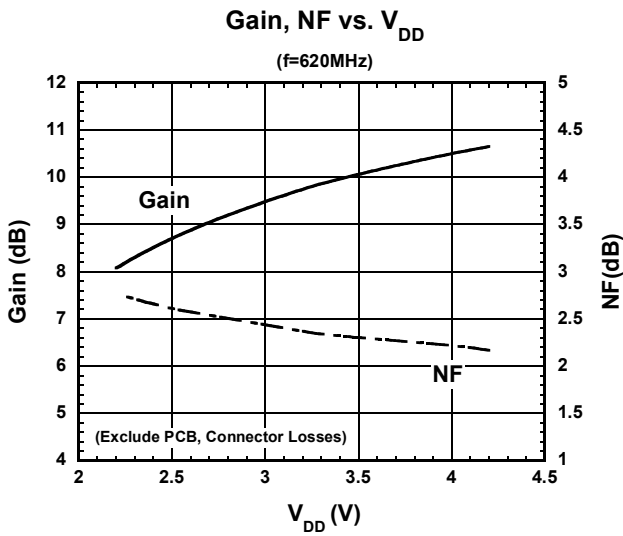
## TYPICAL CHARACTERISTICS

GENERAL CONDITIONS :  $V_{DD}=3.3V$ ,  $T_a=+25^{\circ}C$ ,  $Z_s=Z_L=50\Omega$



## ■ TYPICAL CHARACTERISTICS

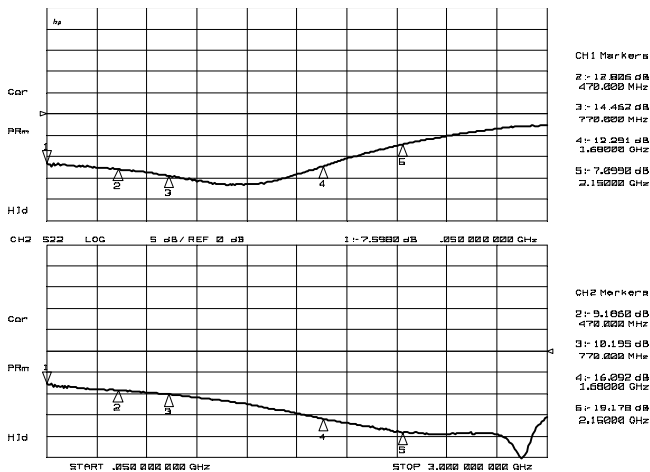
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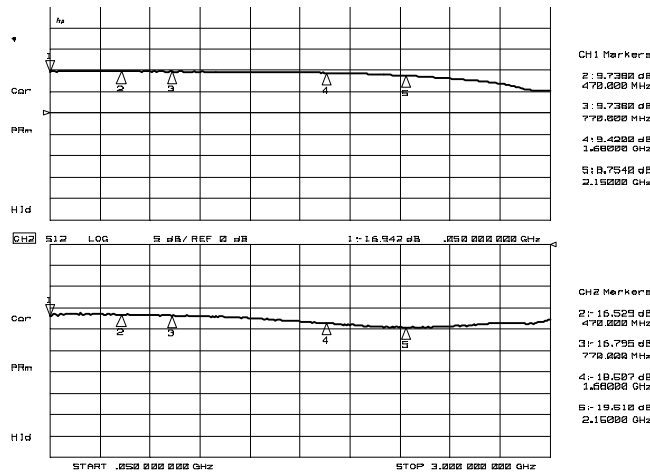
# NJG1140KA1

## TYPICAL CHARACTERISTICS

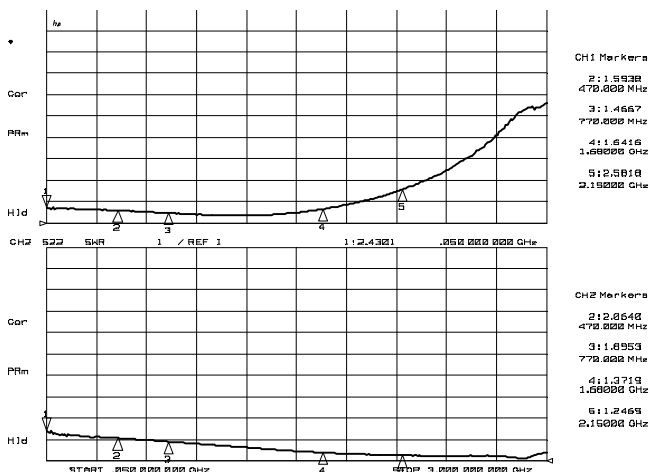
GENERAL CONDITIONS :  $V_{DD}=3.3V$ ,  $T_a=+25^{\circ}C$ ,  $Z_s=Z_l=50\text{ohm}$



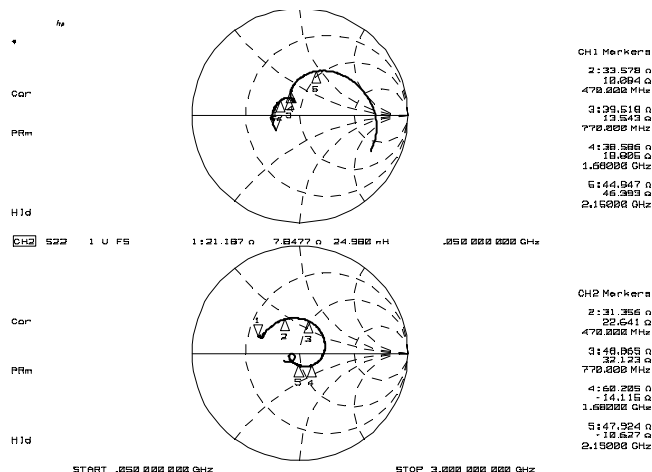
S11, S22



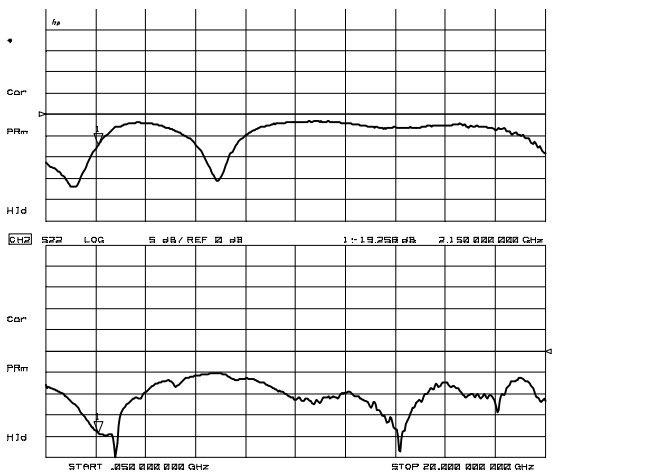
S21, S12



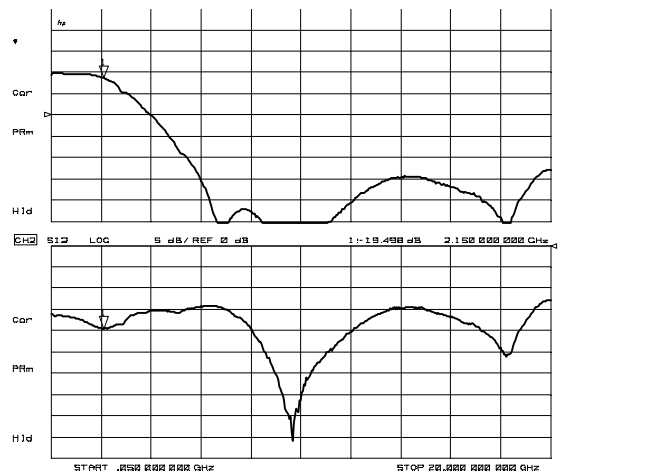
VSWR



Zin, Zout



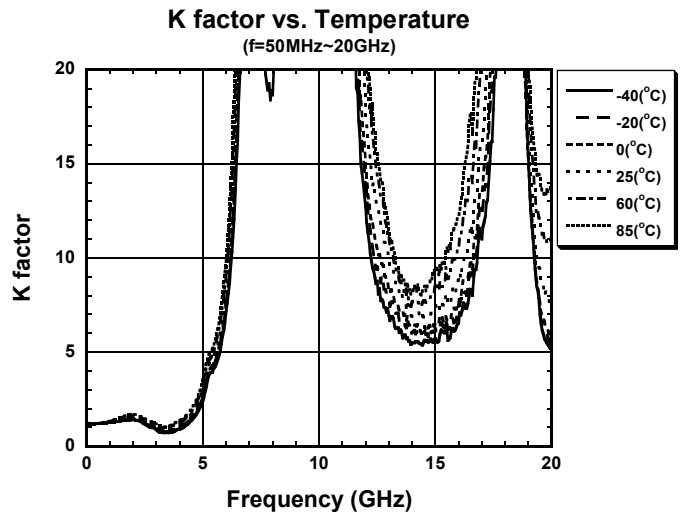
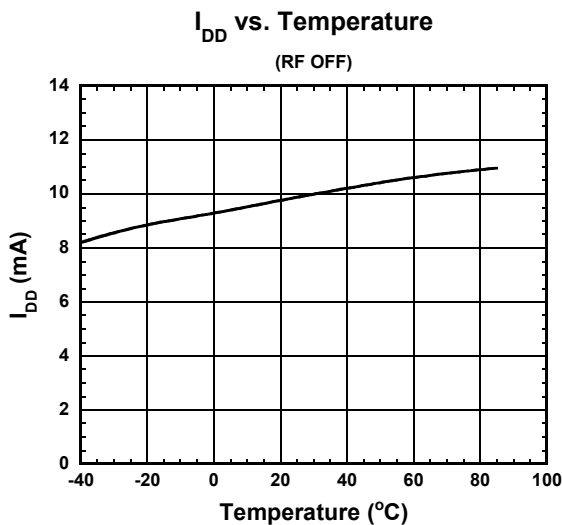
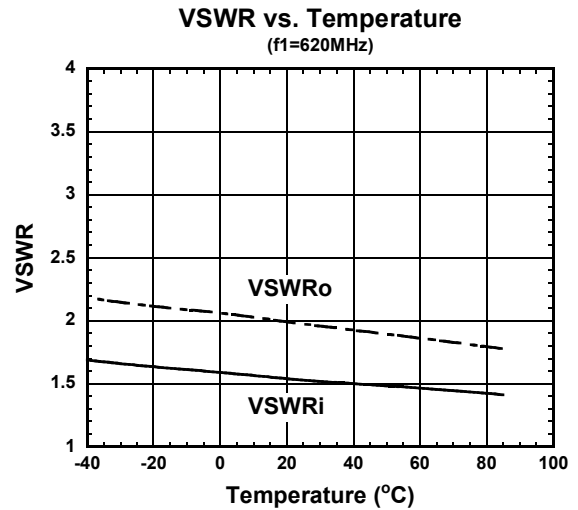
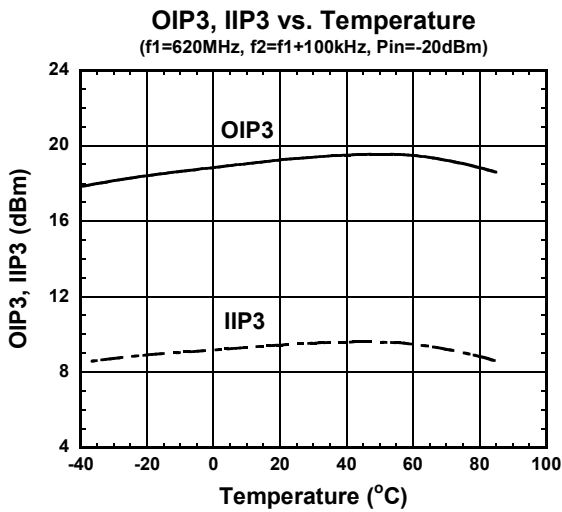
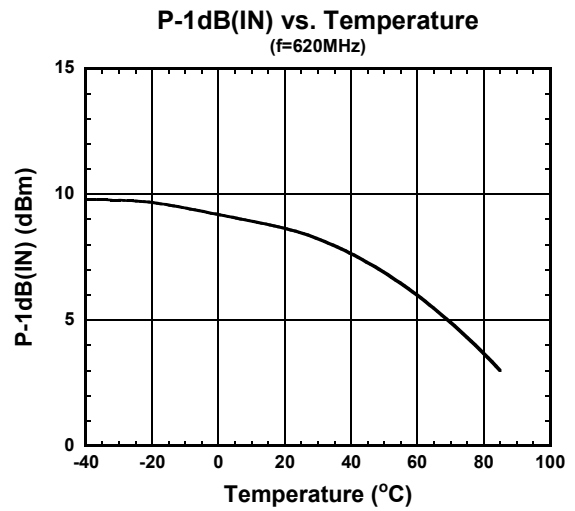
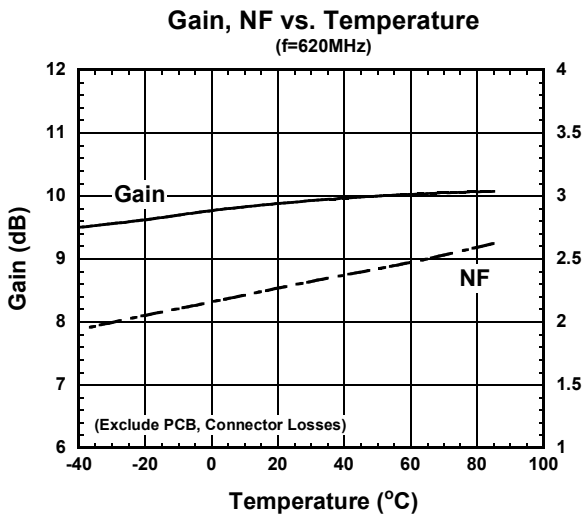
S11, S22 (f=50MHz~20GHz)



S21, S12 (f=50MHz~20GHz)

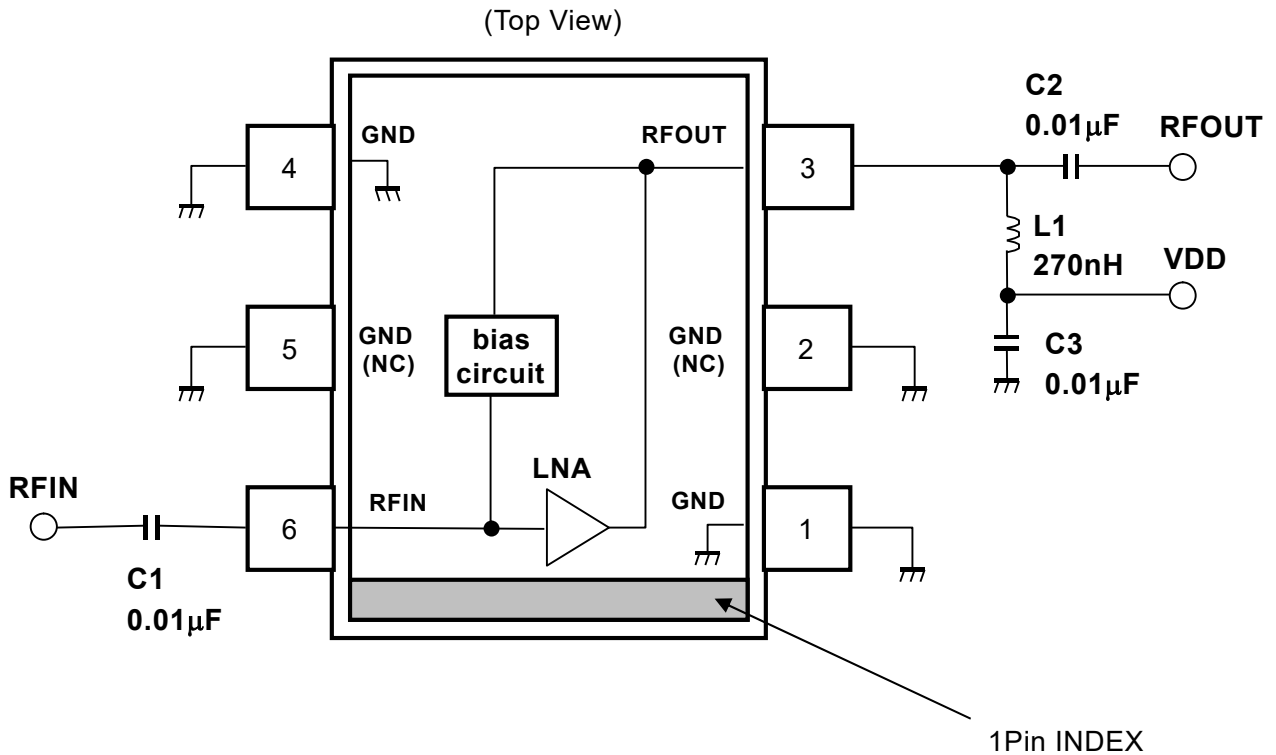
## ■ TYPICAL CHARACTERISTICS

GENERAL CONDITIONS :  $V_{DD}=3.3V$ ,  $Z_s=Z_l=50\text{ohm}$

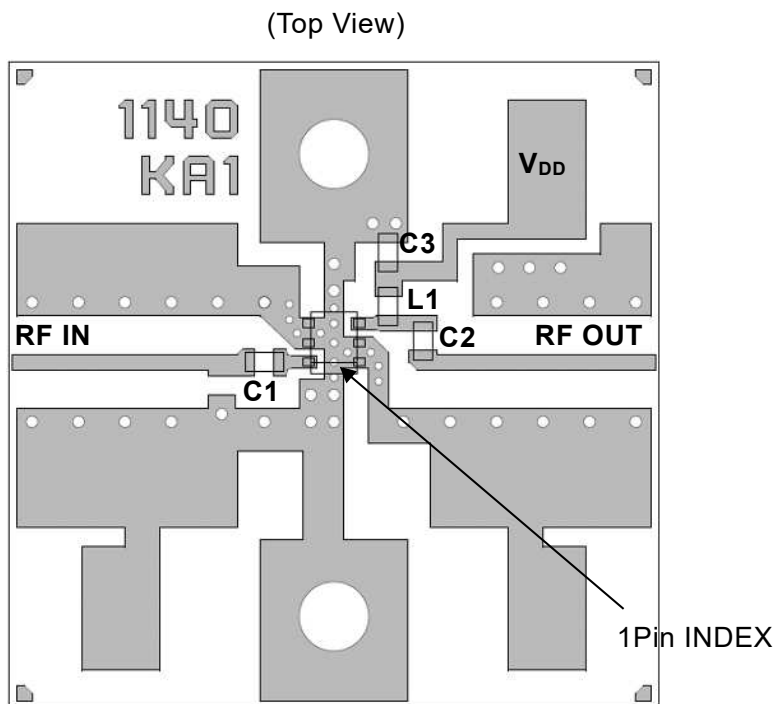


# NJG1140KA1

## APPLICATION CIRCUIT



## TEST PCB LAYOUT



### Parts list

Parts ID	Comments
L1	TAIYO YUDEN HK1005 Series
C1~C3	MURATA MFG GRM15 Series

### PCB (FR-4):

t=0.2mm

MICROSTRIP LINE WIDTH

=0.40mm ( $Z_0=50\Omega$ )

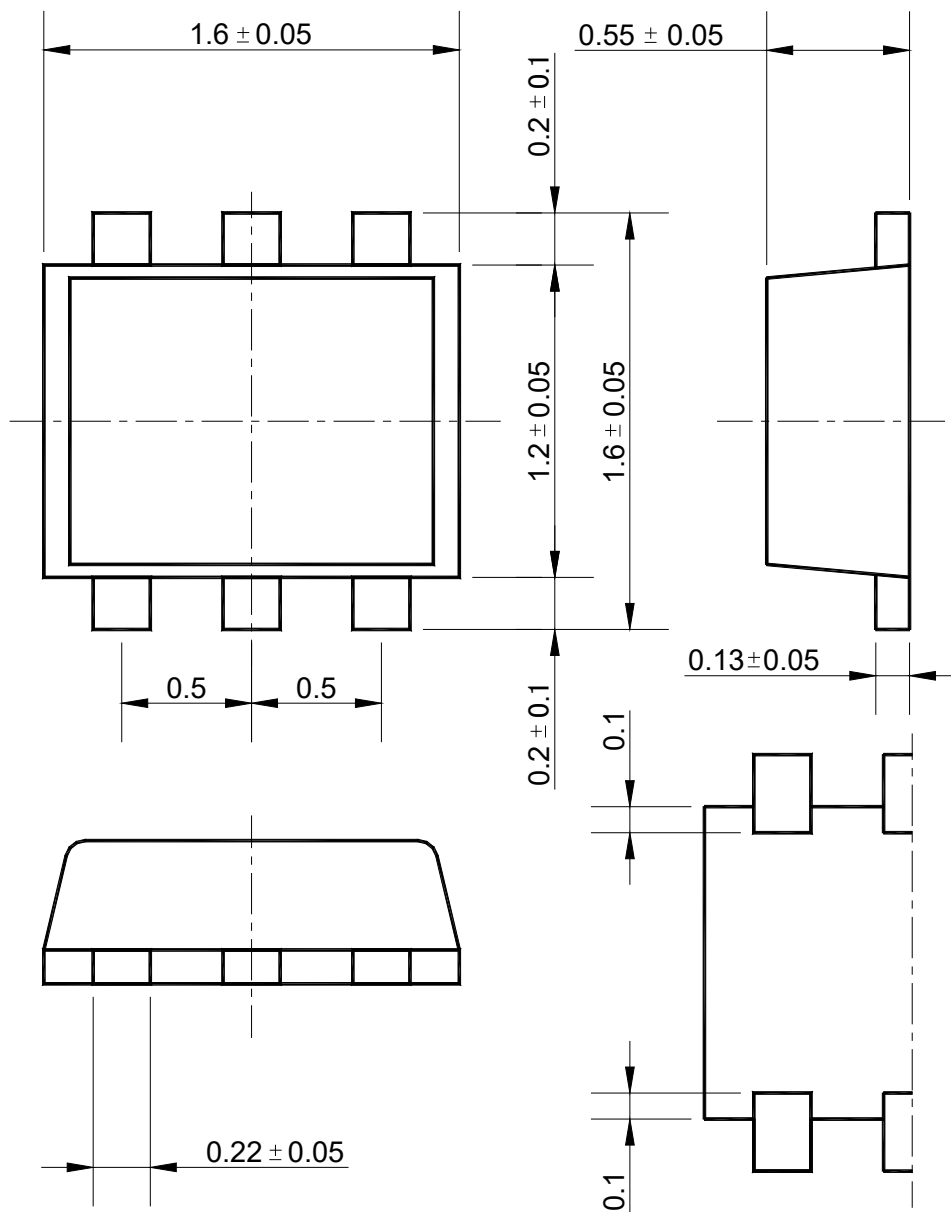
PCB SIZE=16.8mm x 16.8mm

### CAUTION

In order not to couple with terminal RFIN and RFOUT, please layout ground pattern under the IC.



## ■ PACKAGE OUTLINE (FLP6-A1)



Unit: mm

### 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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  - Power Generator Control Equipment (nuclear, steam, hydraulic, etc.)
  - Life Maintenance Medical Equipment
  - Fire Alarms / Intruder Detectors
  - Vehicle Control Equipment (automotive, airplane, railroad, ship, etc.)
  - Various Safety Devices
  - Traffic control system
  - Combustion equipment

In case your company desires to use this product for any applications other than general electronic equipment mentioned above, make sure to contact our company in advance. Note that the important requirements mentioned in this section are not applicable to cases where operation requirements such as application conditions are confirmed by our company in writing after consultation with your company.

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.
7. The products have been designed and tested to function within controlled environmental conditions. Do not use products under conditions that deviate from methods or applications specified in this datasheet. Failure to employ the products in the proper applications can lead to deterioration, destruction or failure of the products. We shall not be responsible for any bodily injury, fires or accident, property damage or any consequential damages resulting from misuse or misapplication of the products.
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.
10. The X-ray exposure can influence functions and characteristics of the products. Confirm the product functions and characteristics in the evaluation stage.
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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