UHF BAND LOW NOISE AMPLIFIER GaAs MMIC

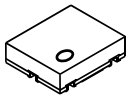
■GENERAL DESCRIPTION

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



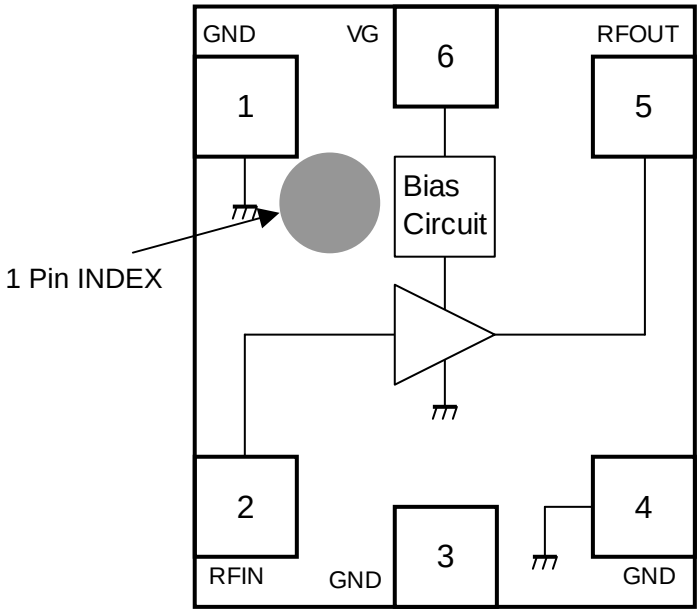
NJG1131HA8

■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**

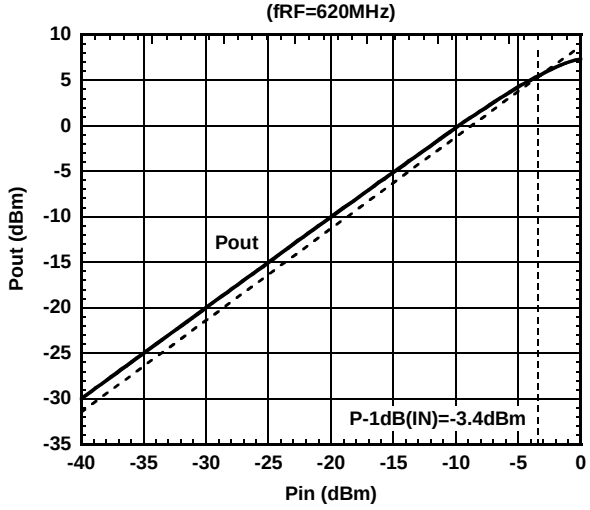
No.	SYMBOL	DESCRIPTION
1	GND	Ground terminal.
2	RFIN	RF input terminal. This terminal requires the DC-blocking capacitor and the DC-feed Inductor as shown in the application circuit.
3	GND	Ground terminal.
4	GND	Ground terminal.
5	RFOUT	RF output terminal. This terminal requires the external matching 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.

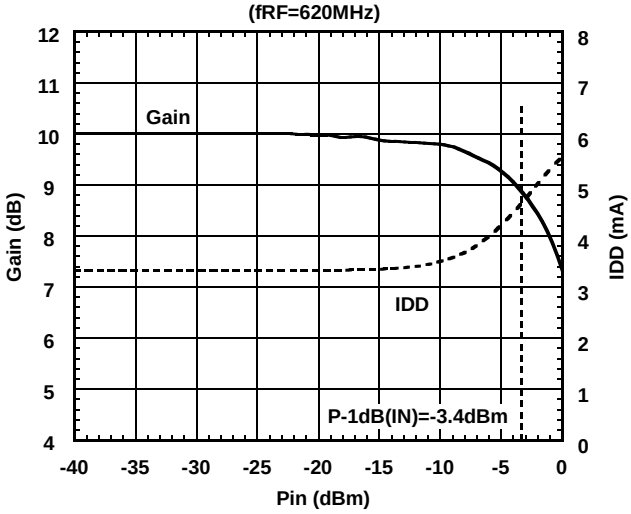
■ ELECTRICAL CHARACTERISTICS

(Conditions: T_a=+25°C, VDD=2.7V, Z_s=Z_l=50 ohm, with application circuit.)

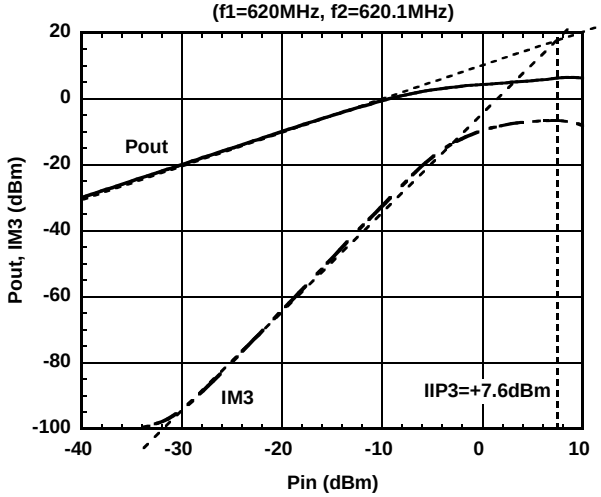
Pout vs. Pin
(fRF=620MHz)



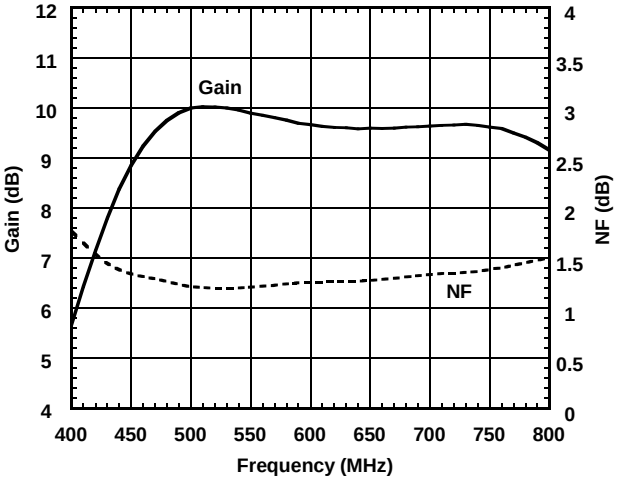
Gain, IDD vs. Pin
(fRF=620MHz)



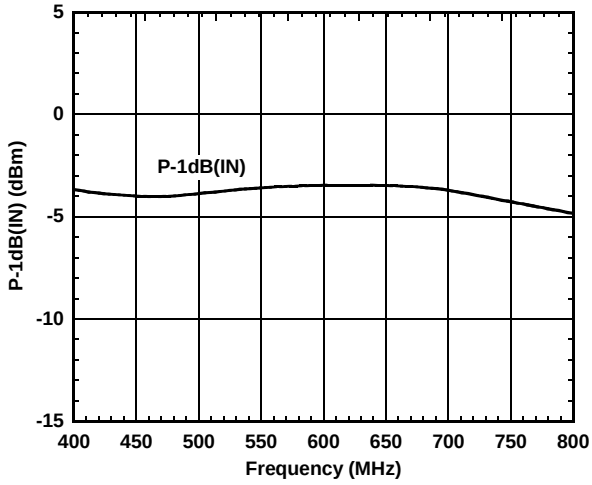
Pout, IM3 vs. Pin
(f1=620MHz, f2=620.1MHz)



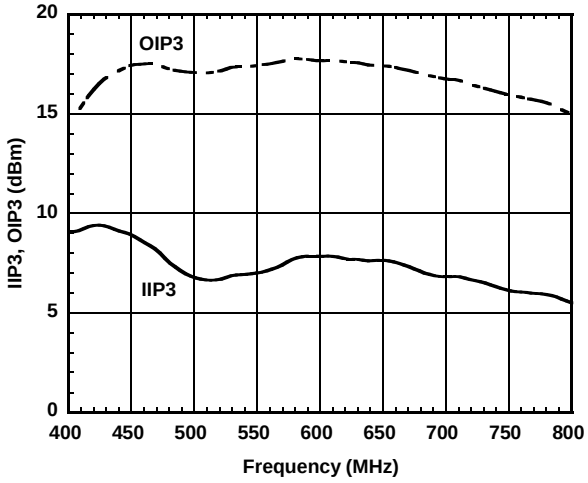
Gain, NF vs. Frequency



P-1dB(IN) vs. Frequency



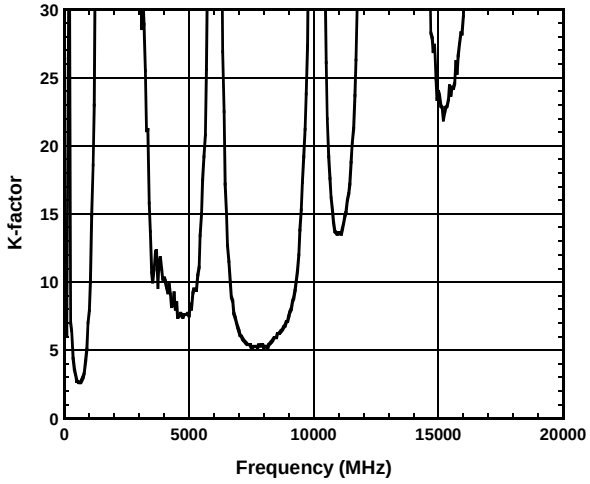
IIP3, OIP3 vs. Frequency
(f1=Frequency, f2=Frequency+0.1MHz, Pin=-28dBm)



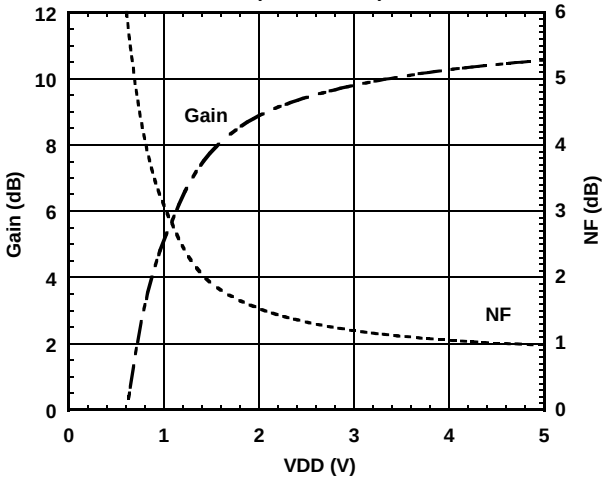
■ ELECTRICAL CHARACTERISTICS

(Conditions: T_a=+25°C, VDD=2.7V, Z_s=Z_l=50 ohm, with application circuit.)

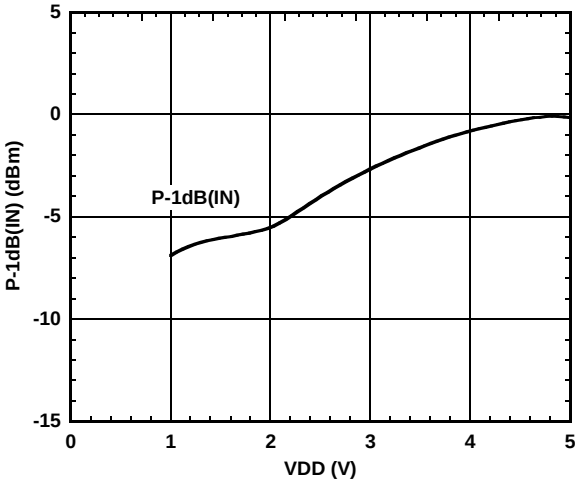
K-factor vs. Frequency



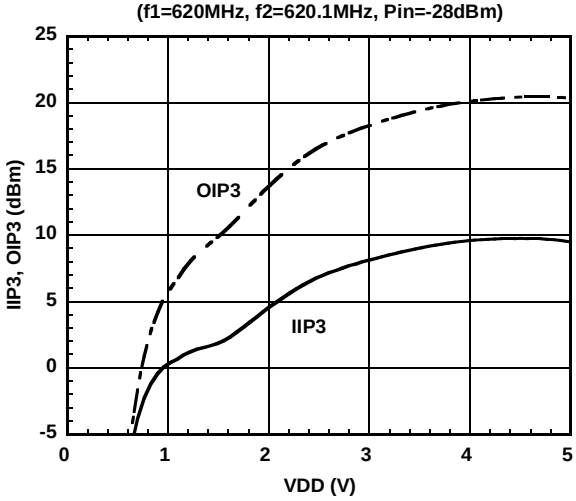
Gain, NF vs. VDD
(fRF=620MHz)



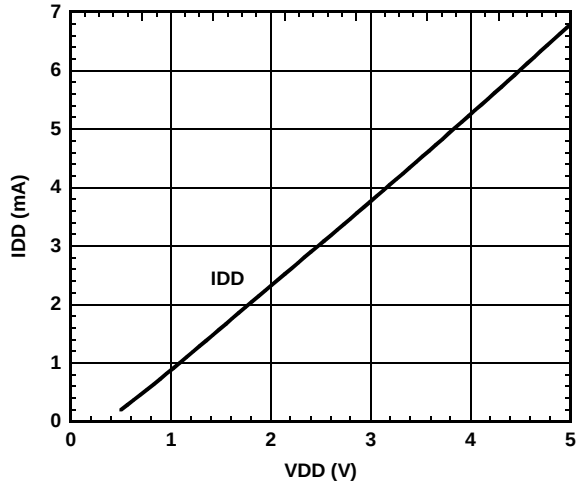
P-1dB(IN) vs. VDD
(fRF=620MHz)



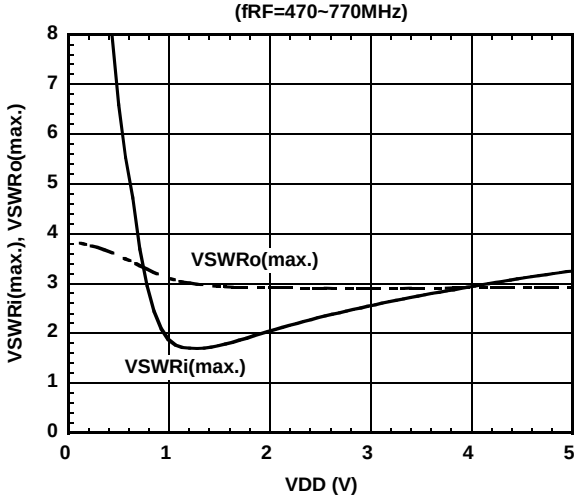
IIP3, OIP3 vs. VDD
(f1=620MHz, f2=620.1MHz, Pin=-28dBm)



IDD vs. VDD
(RF OFF)



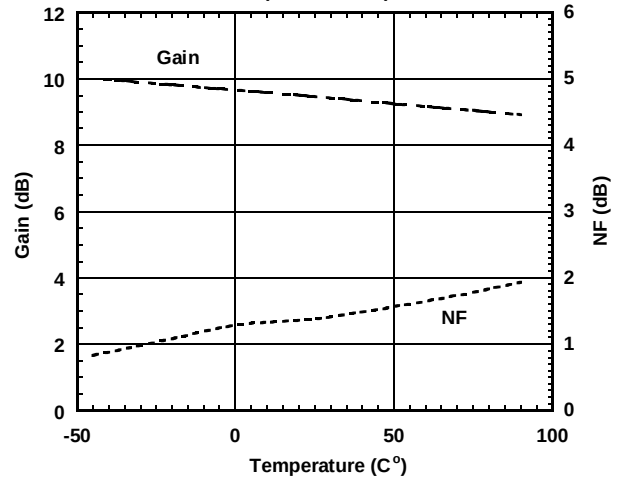
VSWR vs. VDD
(fRF=470~770MHz)



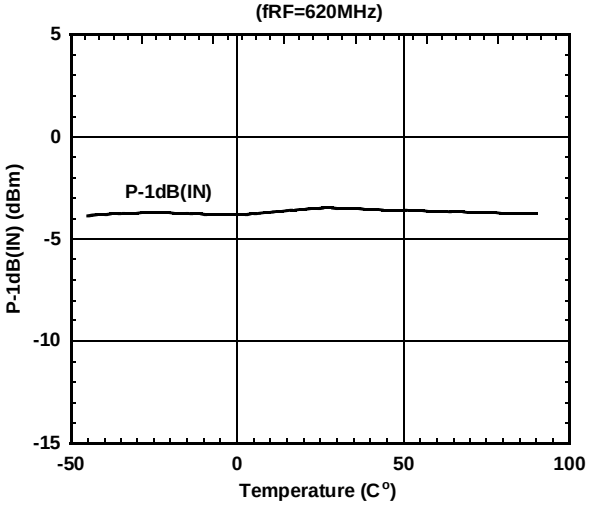
■ ELECTRICAL CHARACTERISTICS

(Conditions: VDD=2.7V, Z_S=Z_I=50 ohm, with application circuit.)

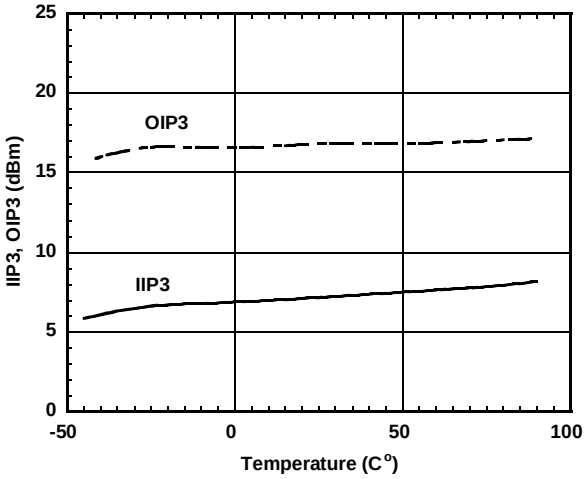
Gain, NF vs. Temp.
(fRF=620MHz)



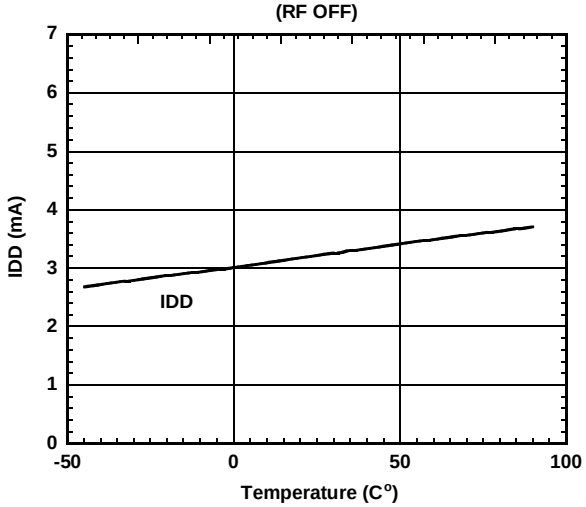
P-1dB(IN) vs. Temp.
(fRF=620MHz)



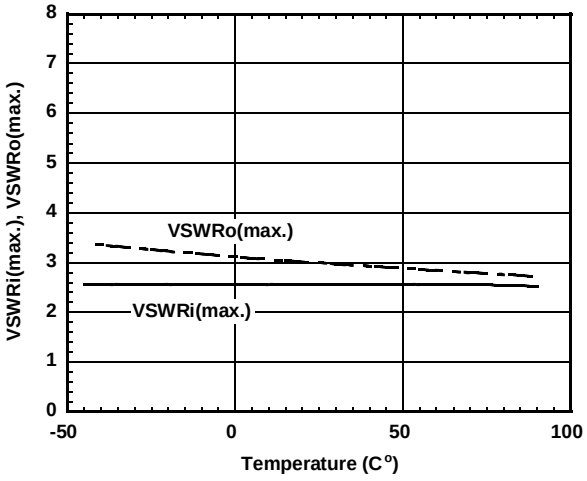
IIP3, OIP3 vs. Temp.
(f1=620MHz, f2=620.1MHz, Pin=-28dBm)



IDD vs. Temp.
(RF OFF)

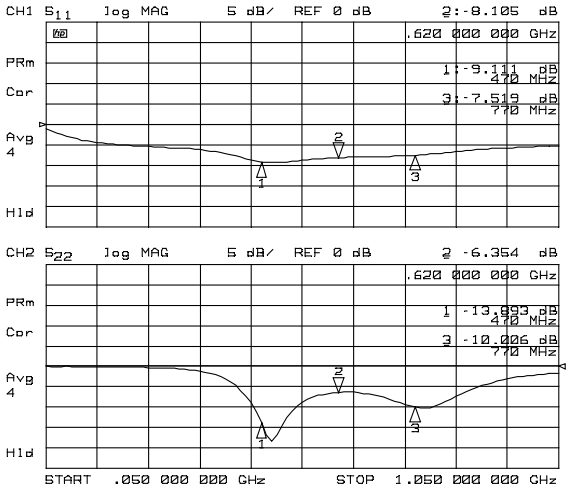


VSWR vs. Temp.
(fRF=470~770MHz)

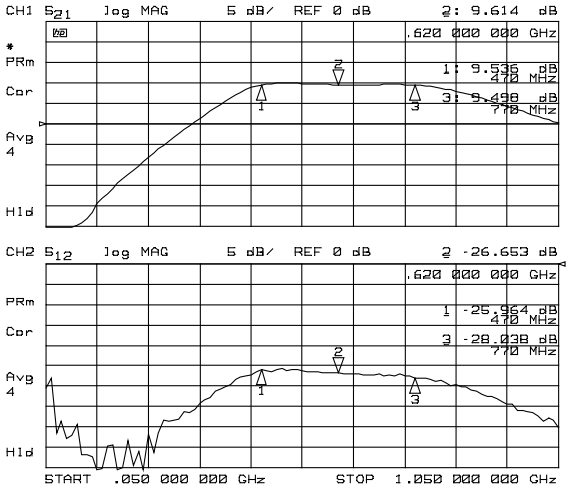


■ ELECTRICAL CHARACTERISTICS

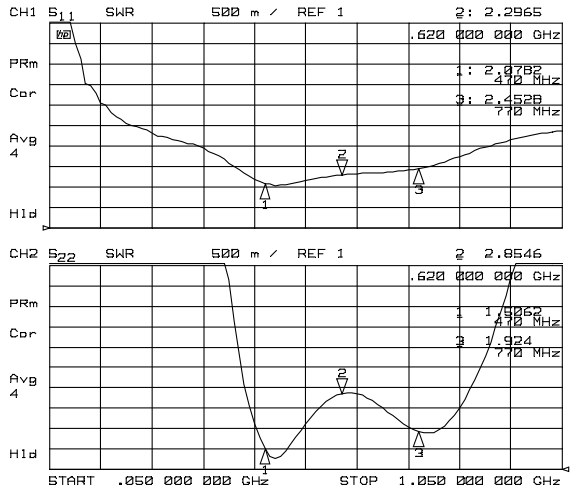
(Conditions: T_a=+25°C, VDD=2.7V, Z_s=Z_l=50 ohm, with application circuit.)



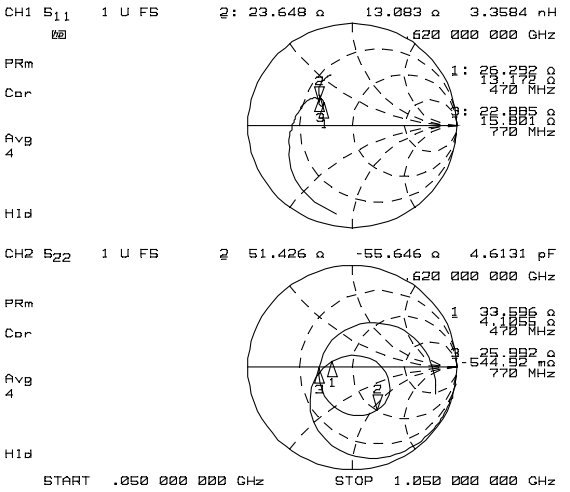
S11, S22



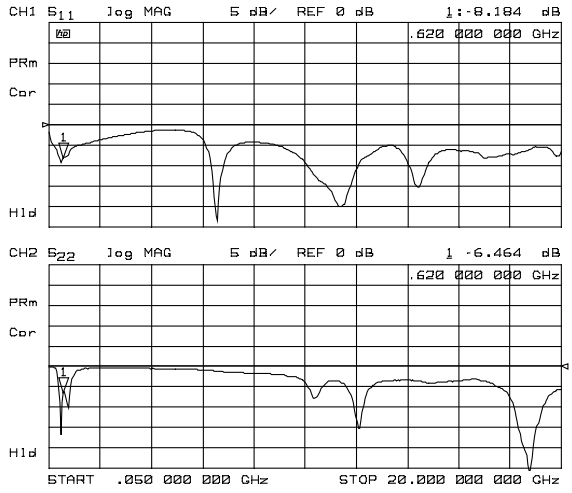
S21, S12



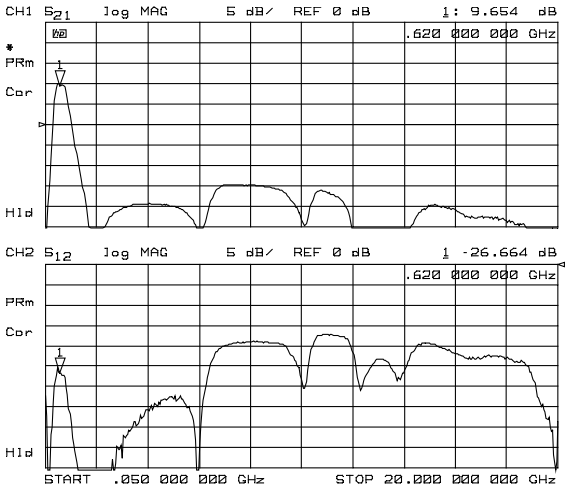
VSWR



Zin, Zout

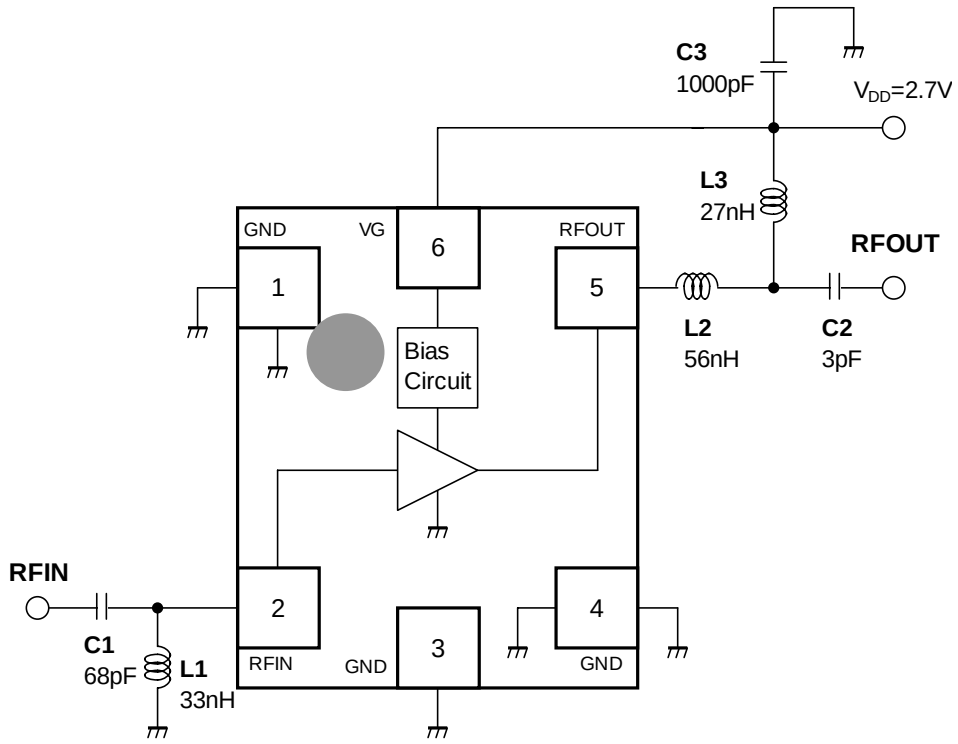


S11, S22 (~20GHz)

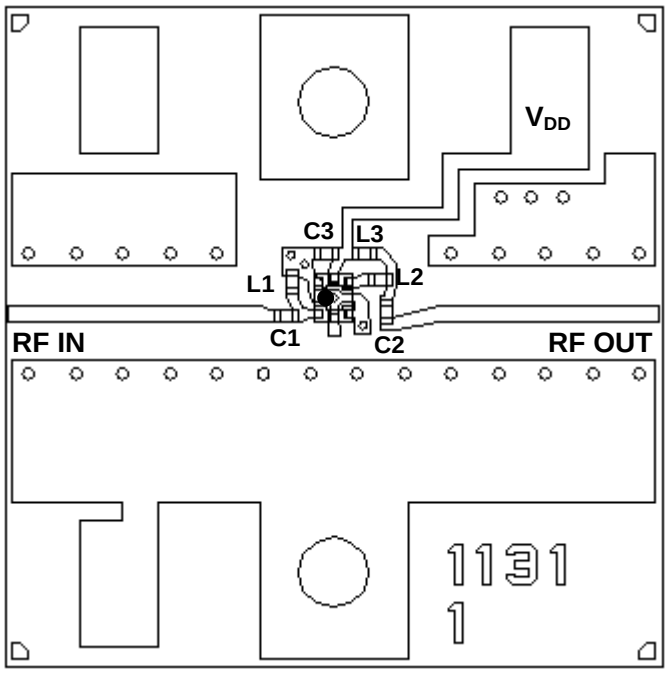


S21, S12 (~20GHz)

■ TEST CIRCUIT



■ TEST PCB LAYOUT



Parts List

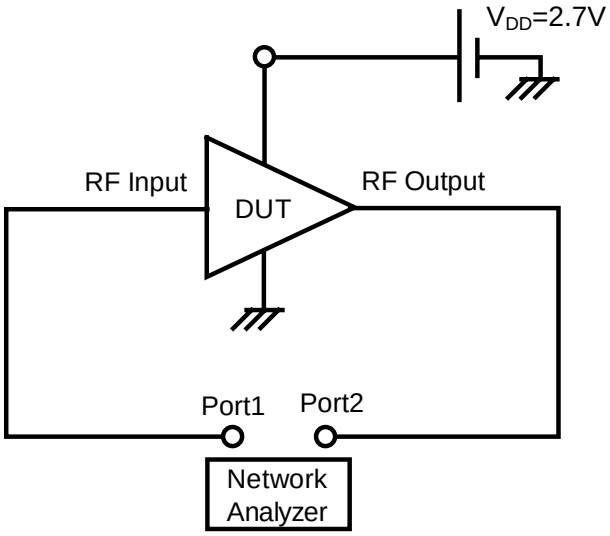
Parts ID	Notes
L1~L3	MURATA (LQP03T series)
C1~C3	MURATA (GRM03 series)

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

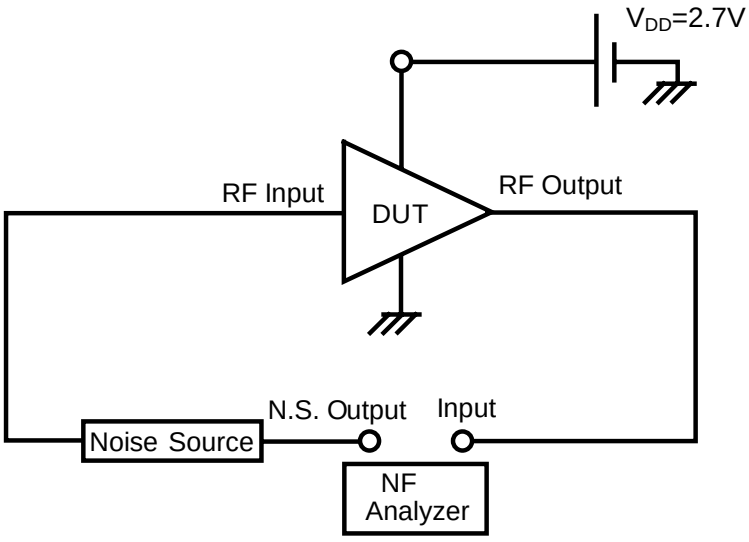
PRECAUTIONS

[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.

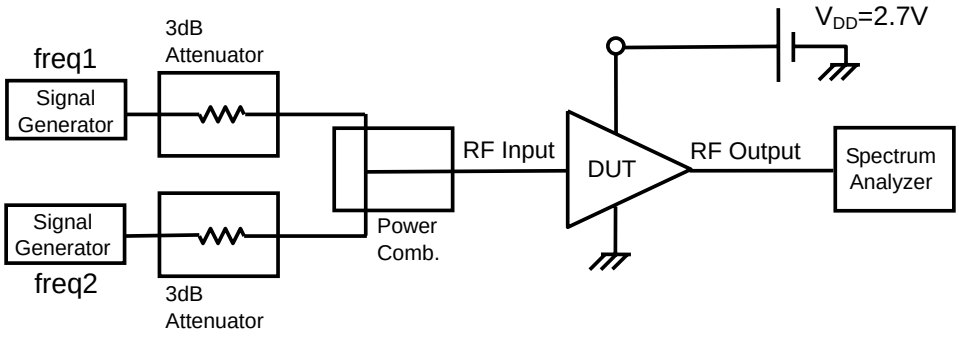
■ MEASUREMENT BLOCK DIAGRAM



S parameter Measurement Block Diagram

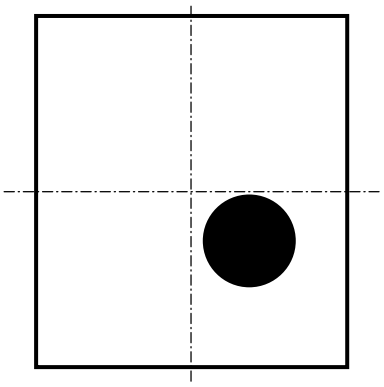


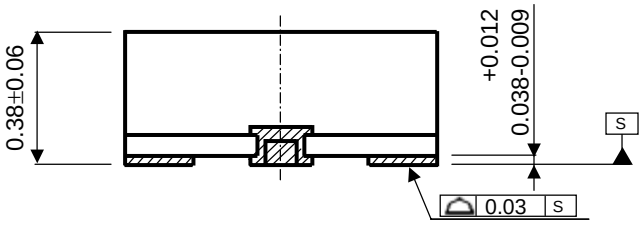
Noise Figure Measurement Block Diagram



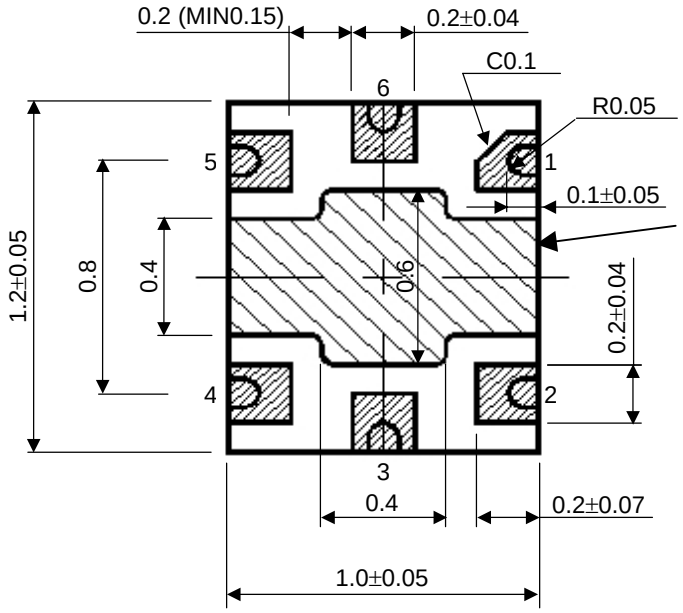
IF and IM3 Measurement Block Diagram for IIP3

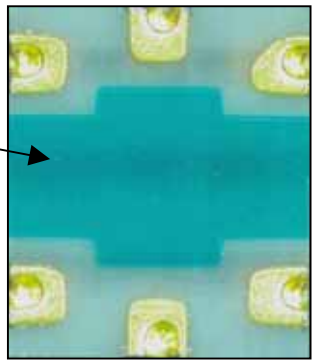
■PACKAGE OUTLINE (USB6-A8)





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.