

UHF BAND LOW NOISE AMPLIFIER GaAs MMIC

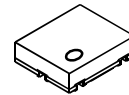
■GENERAL DESCRIPTION

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

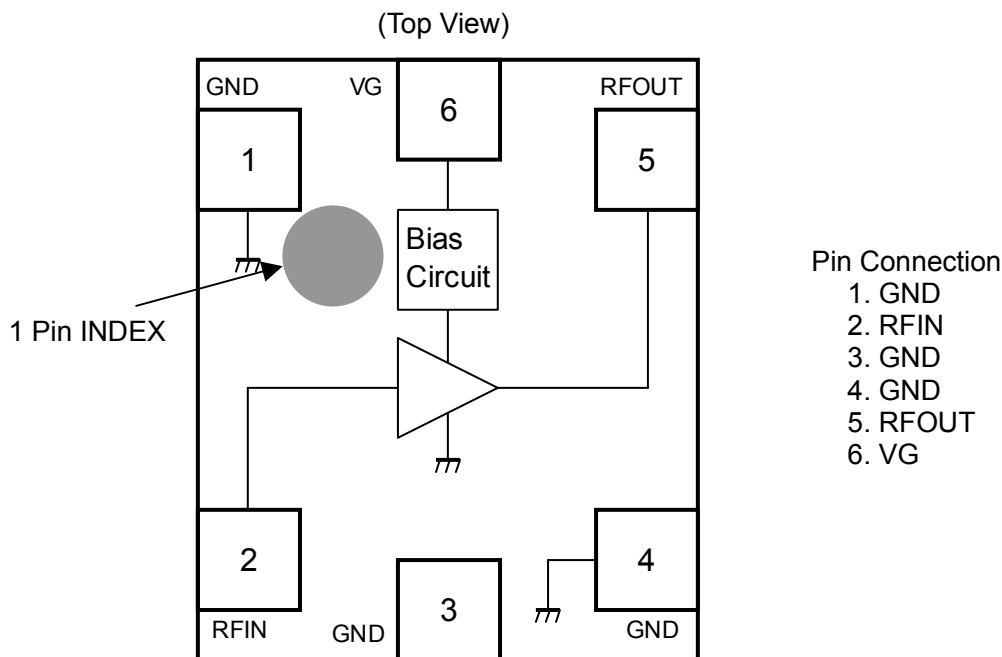
Mobile TV and Digital TV applications

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



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

NJG1131HA8

■ 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}	VDD terminal	5	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 1 (DC)

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

PARAMETERS	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Operating Frequency	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	$f_1=f_{RF}$, $f_2=f_{RF}+100\text{kHz}$, $P_{in}=-28\text{dBm}$	+2.0	+5.0	-	dBm
RF IN VSWR	VSWR _i		-	2.6	3.0	
RF OUT VSWR	VSWR _o		-	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.

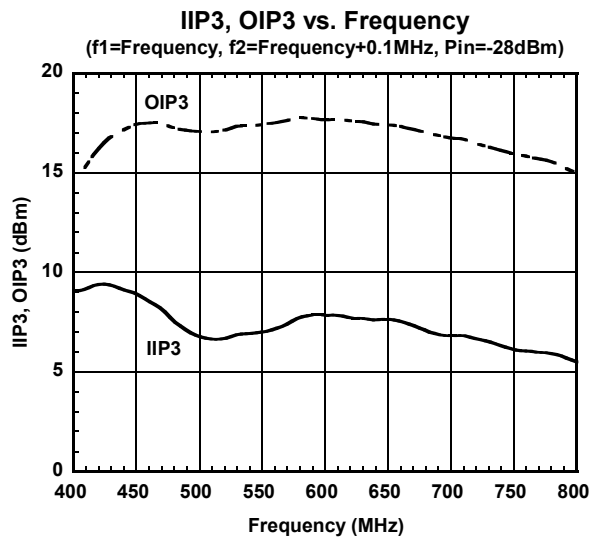
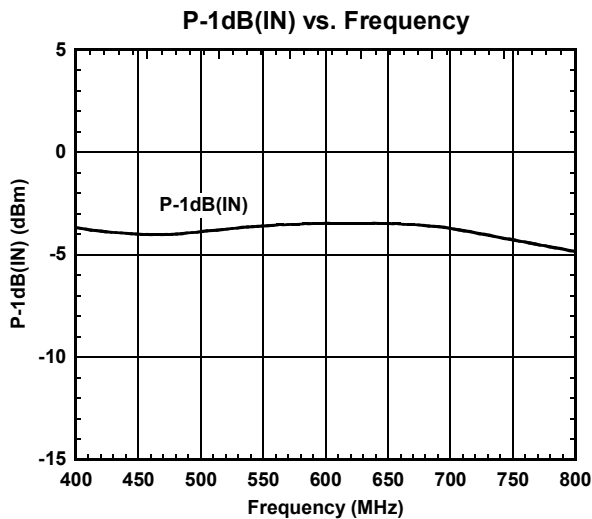
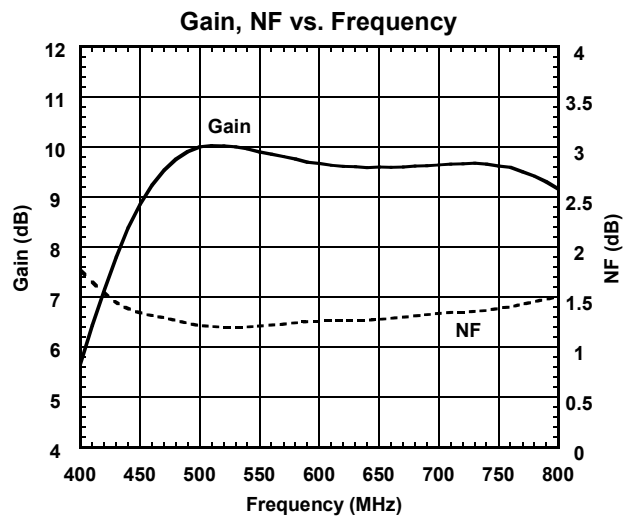
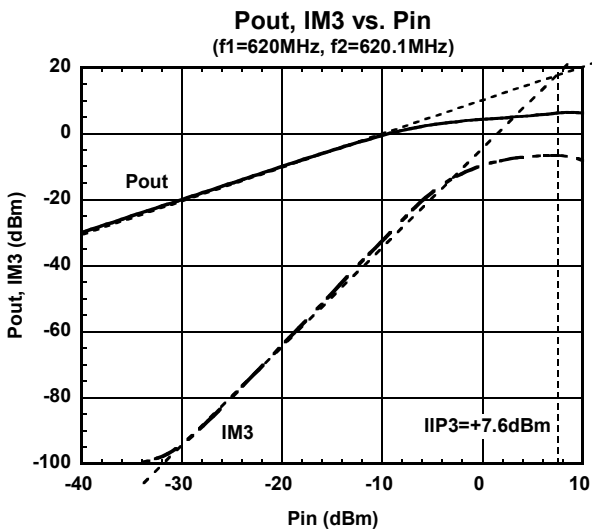
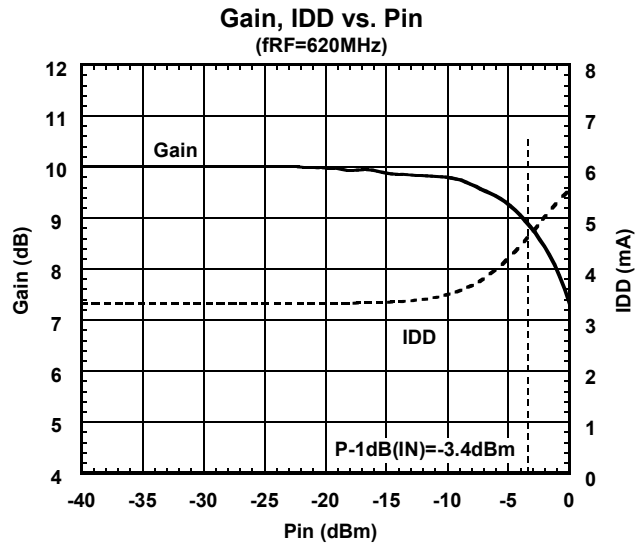
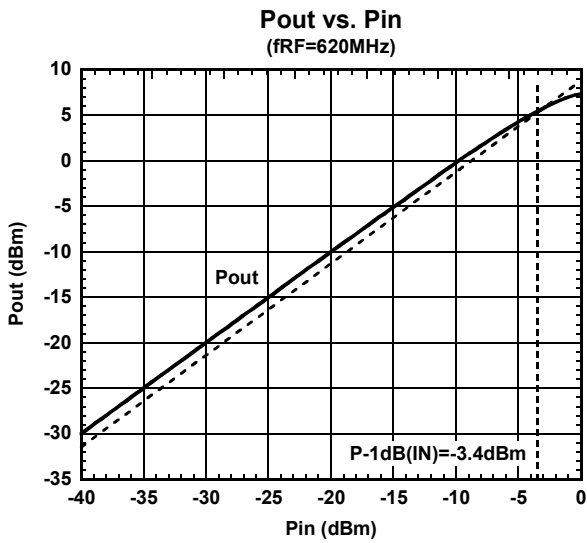
CAUTION

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

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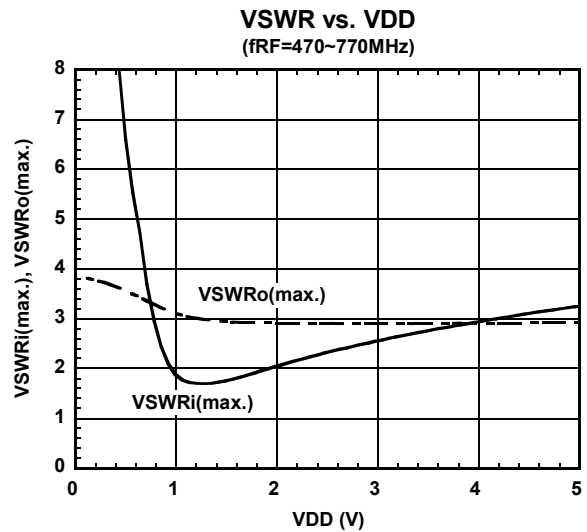
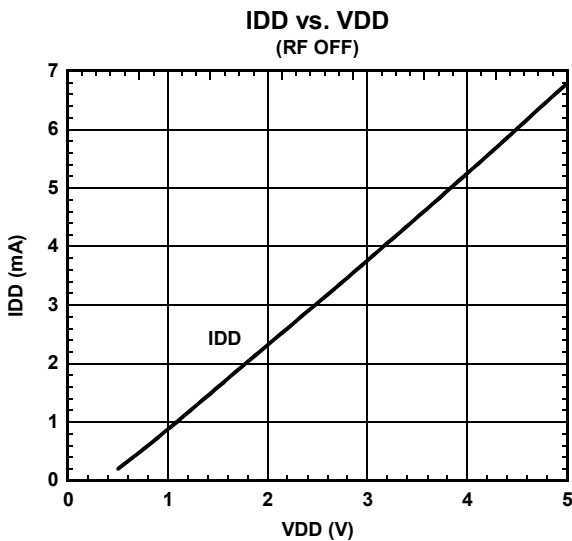
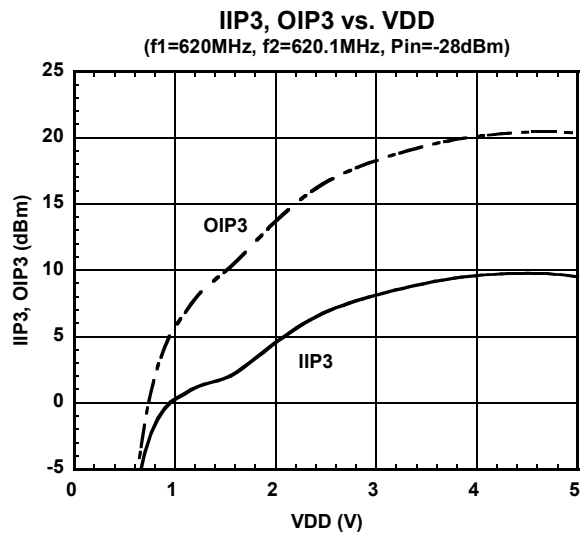
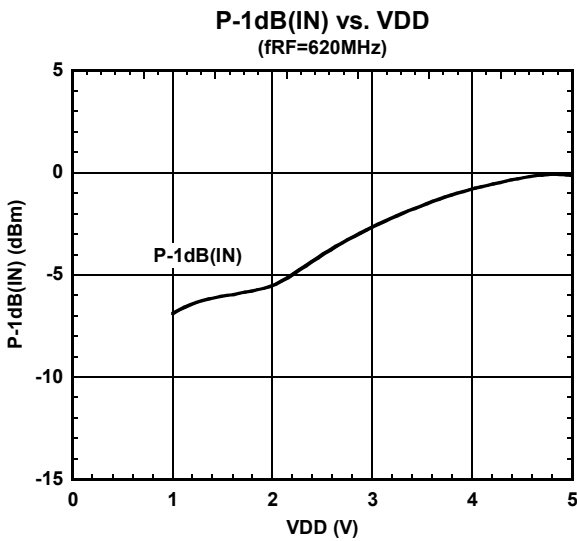
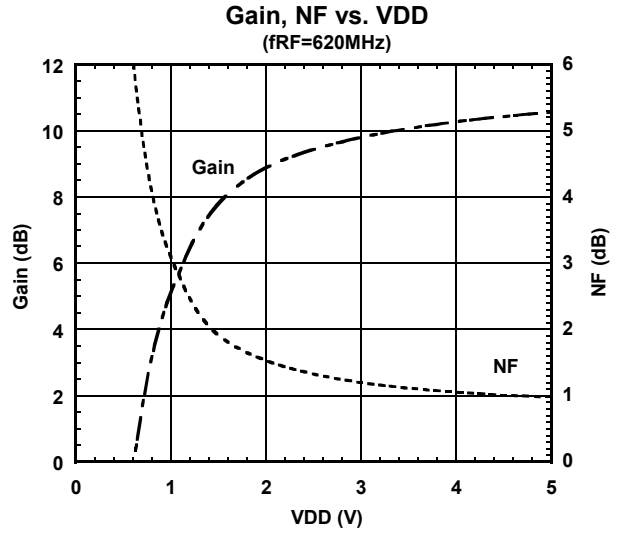
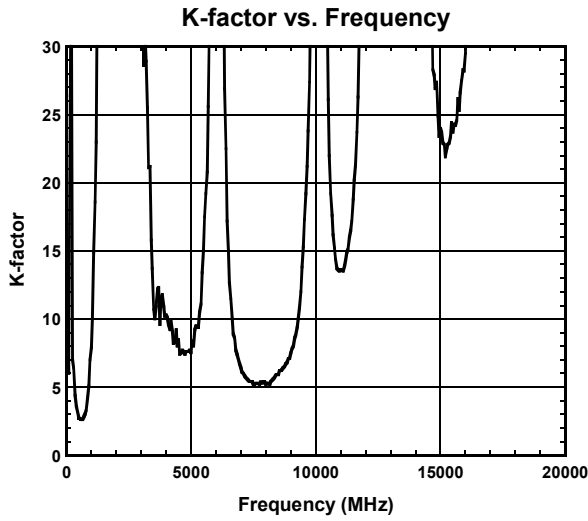
■ ELECTRICAL CHARACTERISTICS

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



■ ELECTRICAL CHARACTERISTICS

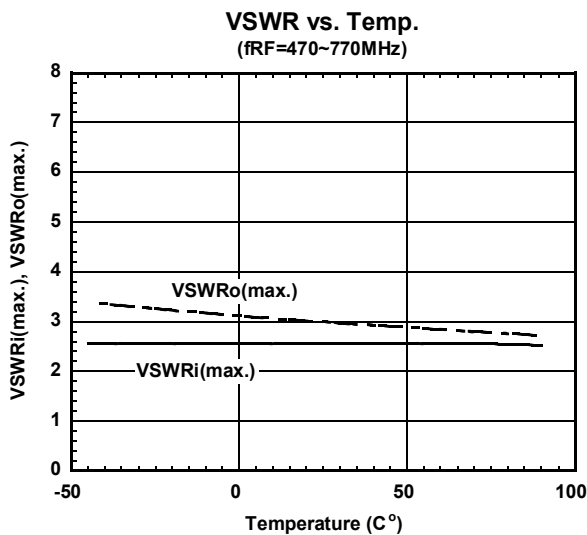
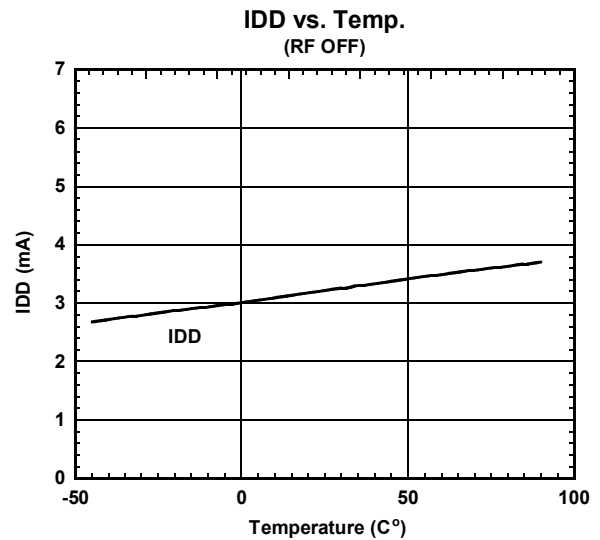
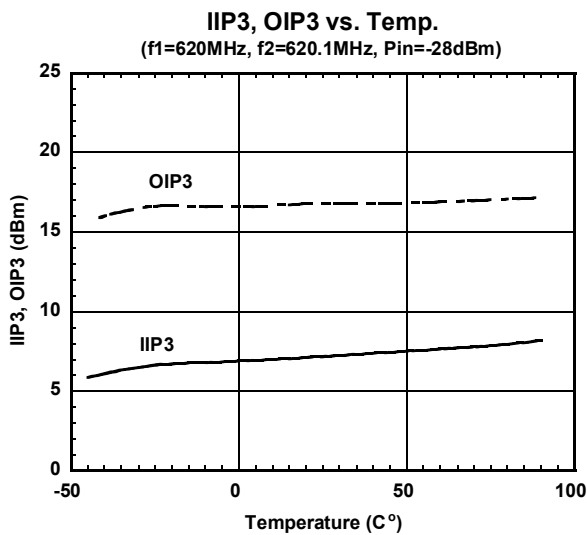
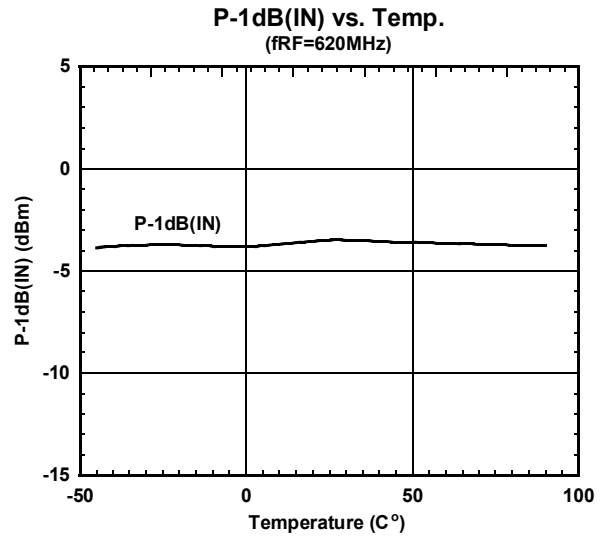
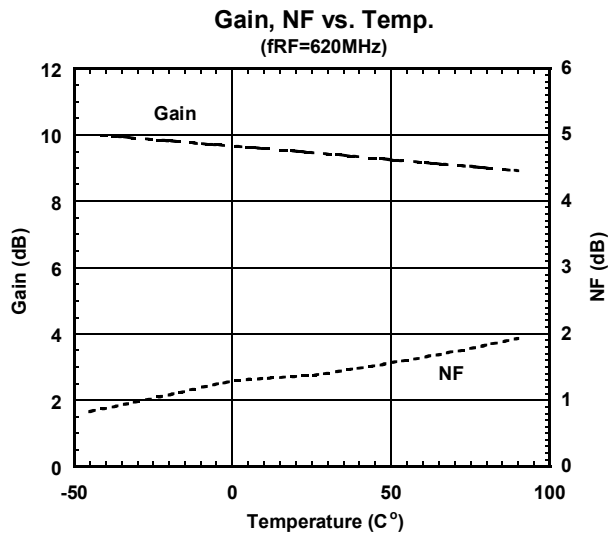
(Conditions: $T_a=+25^\circ\text{C}$, $V_{DD}=2.7\text{V}$, $Z_s=Z_l=50\ \Omega$, with application circuit.)



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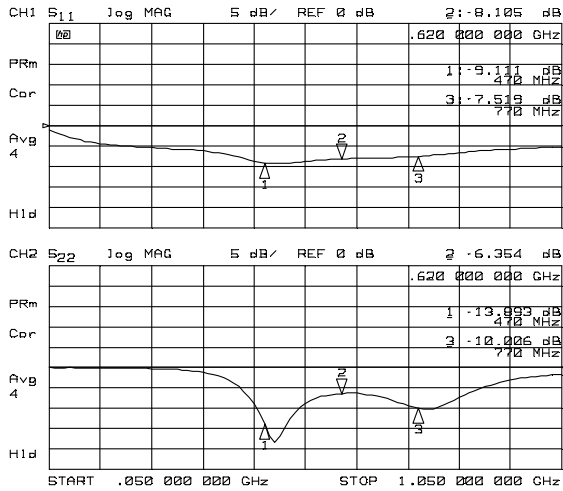
■ ELECTRICAL CHARACTERISTICS

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

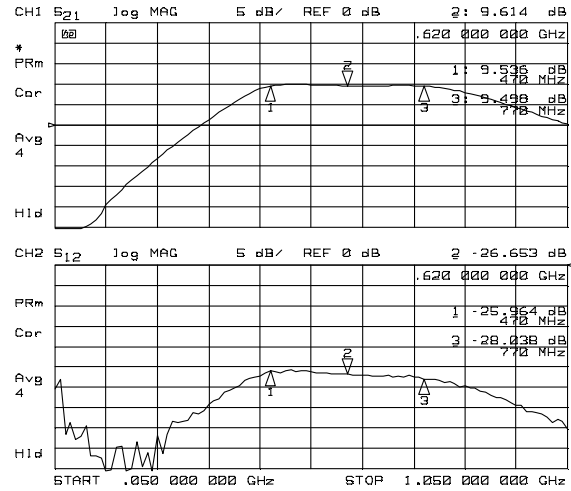


ELECTRICAL CHARACTERISTICS

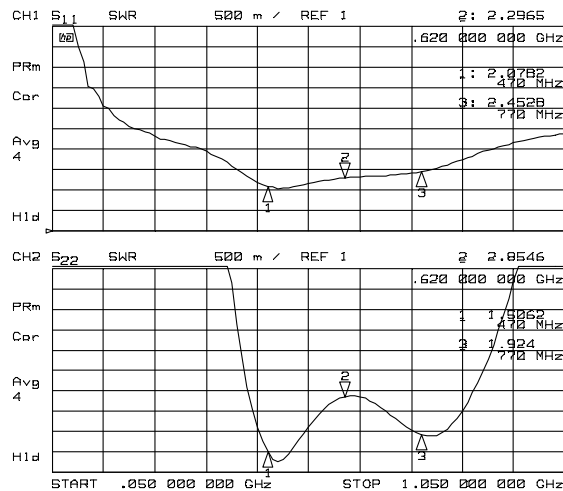
(Conditions: $T_a=+25^\circ\text{C}$, $V_{DD}=2.7\text{V}$, $Z_s=Z_l=50\ \text{ohm}$, with application circuit.)



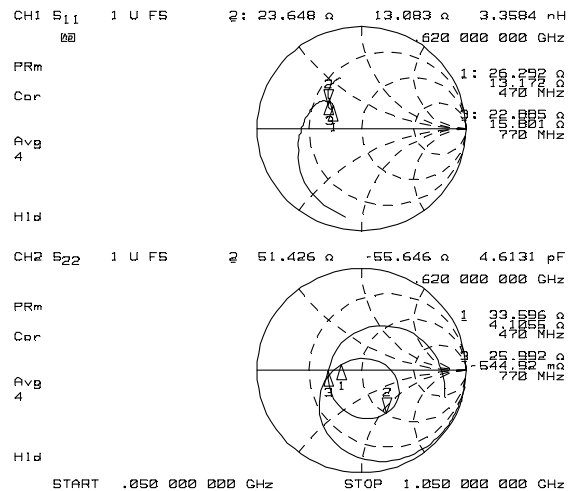
S11, S22



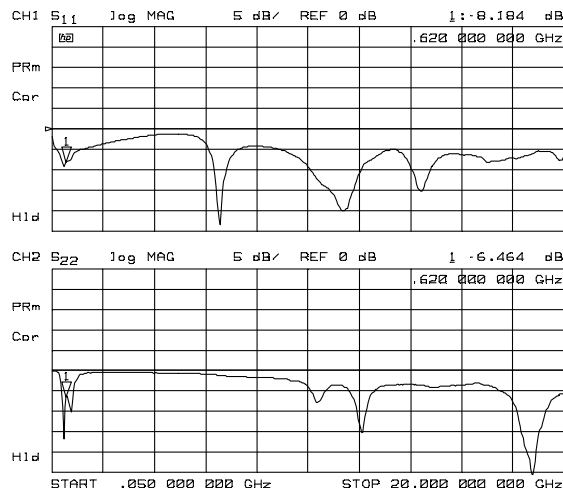
S21, S12



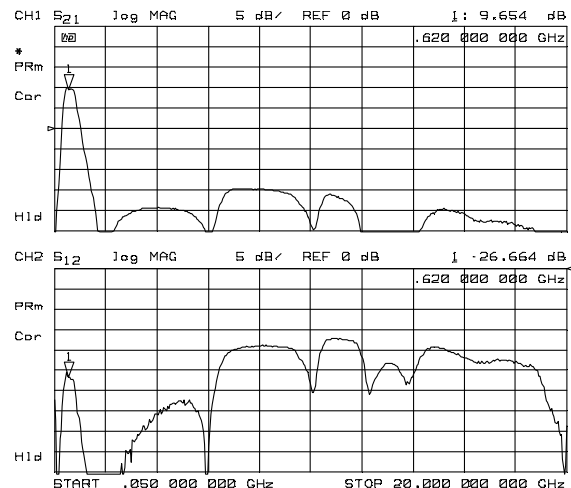
VSWR



Zin, Zout



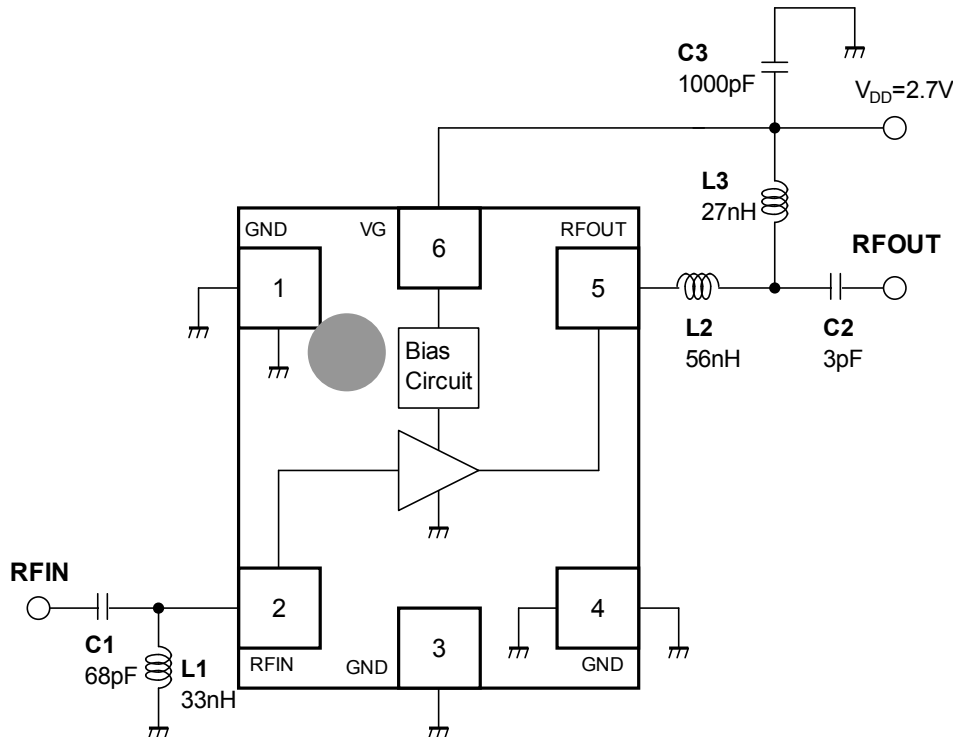
S11, S22 (~20GHz)



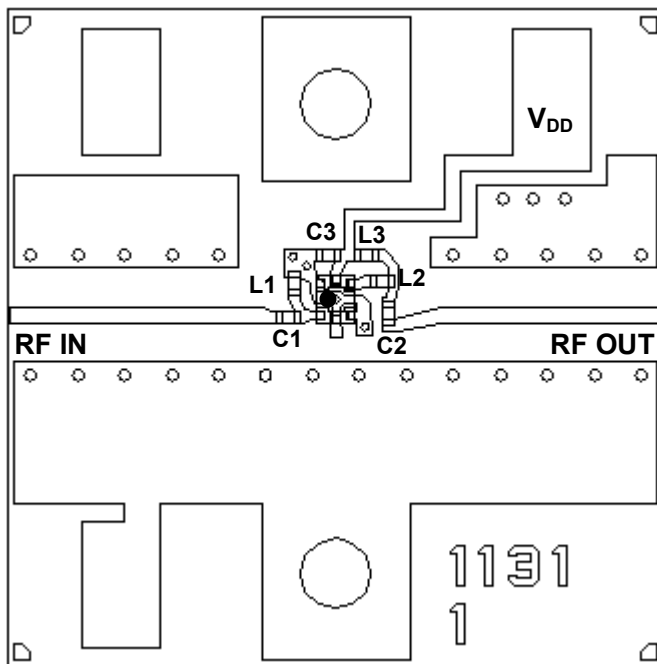
S21, S12 (~20GHz)

NJG1131HA8

TEST CIRCUIT



TEST PCB LAYOUT



Parts List

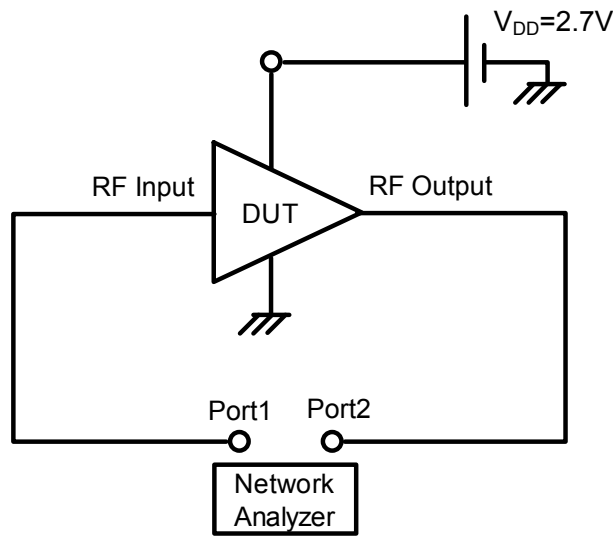
Parts ID	Notes
L1~L3	MURATA (LQP03T series)
C1~C3	MURATA (GRM03 series)

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

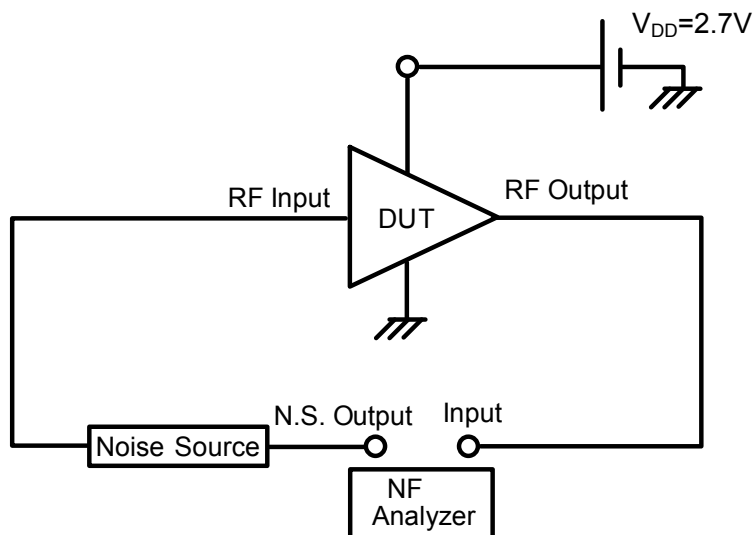
PRECAUTIONS

- [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.

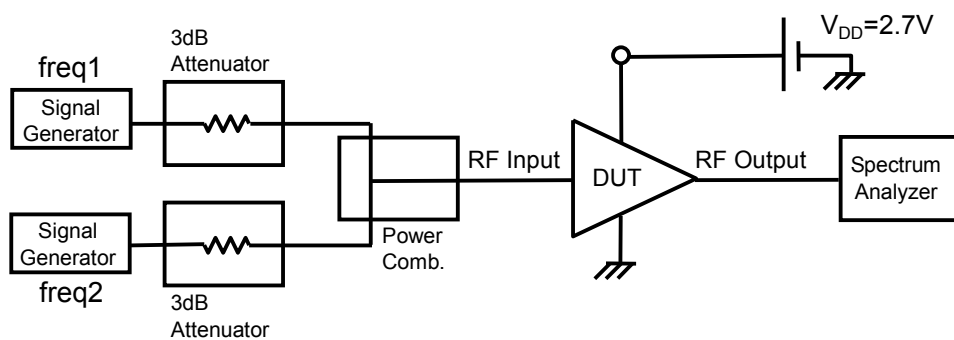
MEASUREMENT BLOCK DIAGRAM



S parameter Measurement Block Diagram



Noise Figure Measurement Block Diagram



IF and IM3 Measurement Block Diagram for IIP3

