

## W-LAN/WiMAX Application

### 4. 2.5-2.7GHz BAND APPLICATION

#### 4-1 SUMMARY

The characteristics of 2.7GHz band have evaluated as follows. The evaluation circuit structure and measured data are reviewed.

#### 4-2-1 MEASURED DATA1 (DC)

General conditions:  $V_{DD}=V_{INV}=2.85V$ ,  $T_a=+25^{\circ}C$ ,  $Z_s=Z_l=50\Omega$

Parameter	Symbol	Conditions	Measurement data	Unit
Operating Voltage	$V_{DD}$		2.85	V
Inverter Voltage	$V_{INV}$		2.85	V
Control Voltage (High)	$V_{CTL(H)}$		1.85	V
Control Voltage (Low)	$V_{CTL(L)}$		0	V
Operating current	$I_{DD1}$	RF OFF, $V_{CTL}=1.85V$	2.63	mA
Operating current	$I_{DD2}$	RF OFF, $V_{CTL}=0V$	0.03	$\mu A$
Inverter current	$I_{INV1}$	RF OFF, $V_{CTL}=1.85V$	98.1	$\mu A$
Inverter current	$I_{INV2}$	RF OFF, $V_{CTL}=0V$	18.1	$\mu A$
Control current	$I_{CTL}$	RF OFF, $V_{CTL}=1.85V$	4.5	$\mu A$

## 4-2-2 MEASURED DATA2 (LNA HIGH GAIN MODE)

General conditions:  $V_{DD}=V_{INV}=2.7V$ ,  $V_{CTL}=1.85V$ ,  $f_{RF}=2585MHz$ ,  $T_a=+25^{\circ}C$ ,  $Z_s=Z_l=50\Omega$   
with application circuit

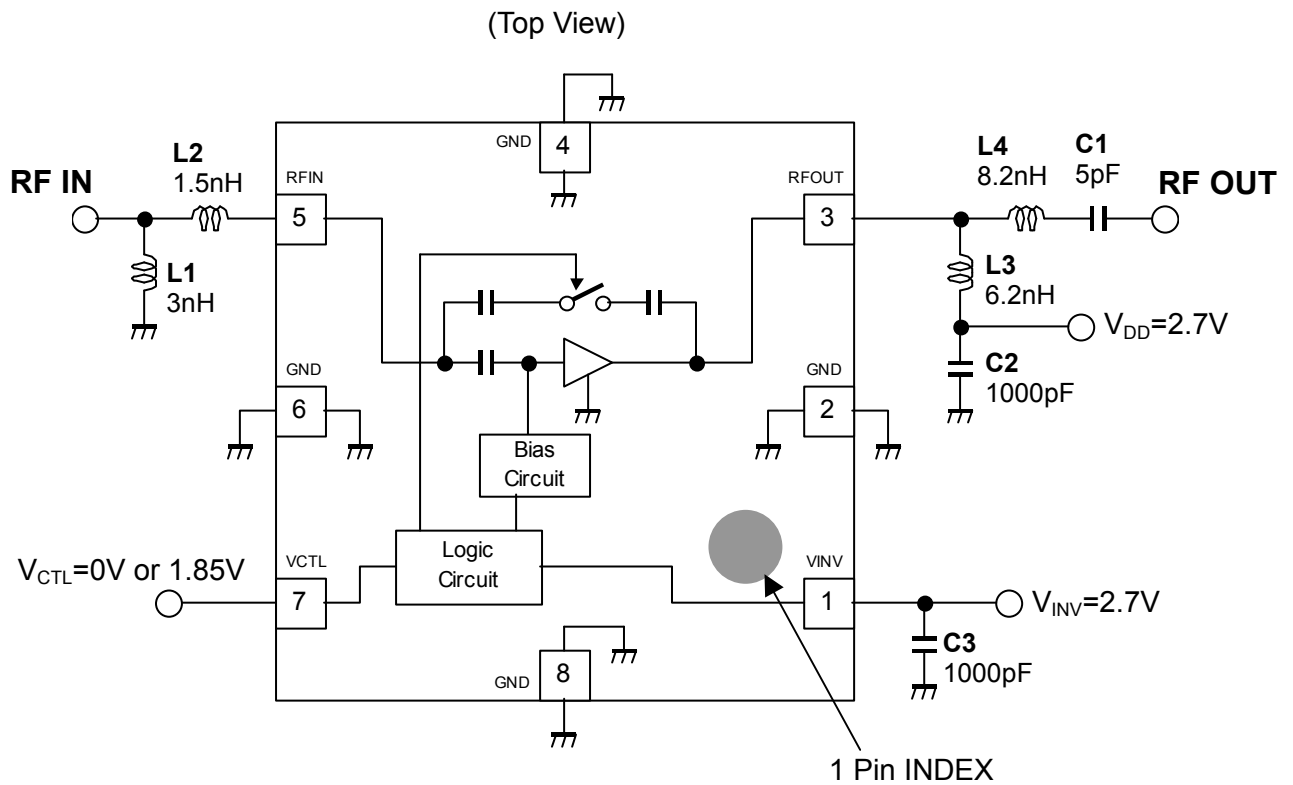
Parameter	Symbol	Conditions	Measurement data	Unit
Operating current	$I_{DD}$	RF OFF	2.47	mA
Small signal gain	Gain		15.3	dB
Noise figure	NF	Exclude PCB/Connector losses (0.11dB)	1.65	dB
Pin at 1dB compression point	P-1dB(IN)		-9.7	dBm
Input 3rd order intercept point	IIP3	$f1=f_{RF}$ , $f2=f_{RF}+100kHz$ , Pin=-32dBm	+2.4	dBm
RF Input port VSWR	VSWR <sub>i</sub>		1.95	
RF Output port VSWR	VSWR <sub>o</sub>		1.53	

## 4-2-3 MEASURED DATA3 (LNA LOW GAIN MODE)

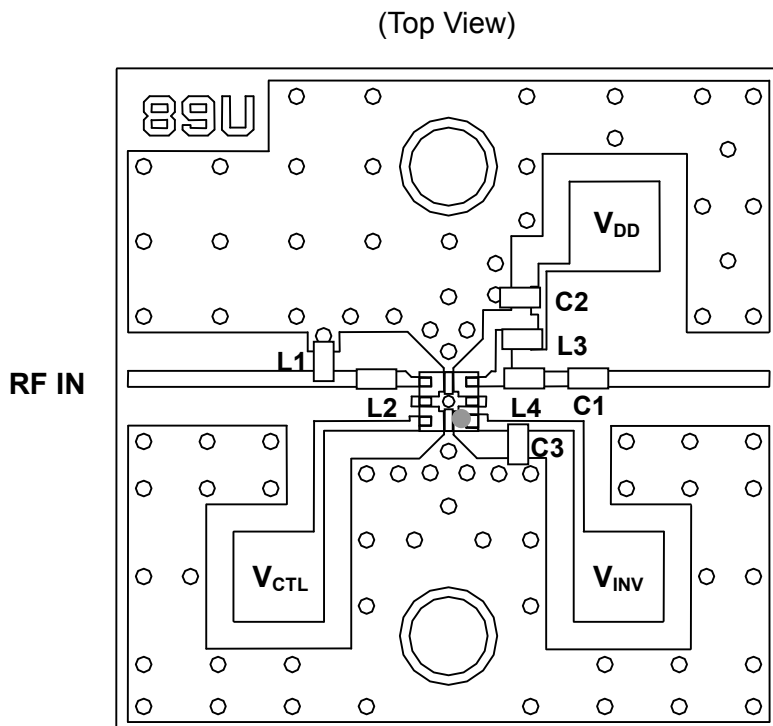
General conditions:  $V_{DD}=V_{INV}=2.7V$ ,  $V_{CTL}=0V$ ,  $f_{RF}=2585MHz$ ,  $T_a=+25^{\circ}C$ ,  $Z_s=Z_l=50\Omega$   
with application circuit

Parameter	Symbol	Conditions	Measurement data	Unit
Small signal gain	Gain		-7.0	dB
Noise figure	NF	Exclude PCB/Connector losses (0.11dB)	7.0	dB
Pin at 1dB compression point	P-1dB(IN)		+11.0	dBm
Input 3rd order intercept point	IIP3	$f1=f_{RF}$ , $f2=f_{RF}+100kHz$ , Pin=-16dBm	+14.8	dBm
RF Input port VSWR	VSWR <sub>i</sub>		1.12	
RF Output port VSWR	VSWR <sub>o</sub>		1.38	

## 4-3 APPLICATION CIRCUIT



## 4-4 PCB DESIGN



### Parts List

Parts ID	Comment
L1~L4	TAIYO-YUDEN (HK1005 Series)
C1~C3	MURATA (GRM15 Series)

PCB (FR-4):

$t=0.2\text{mm}$

MICROSTRIP LINE WIDTH

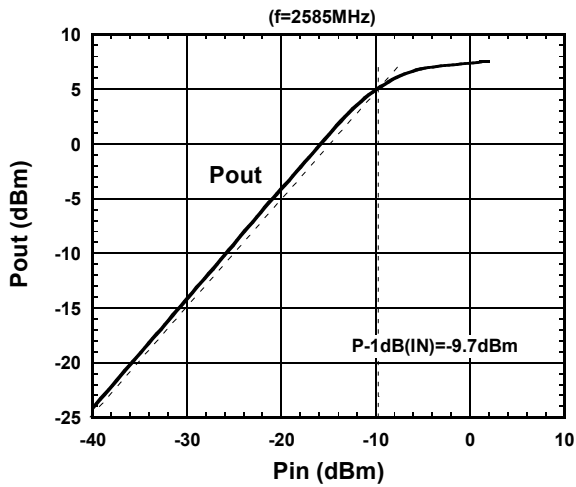
$=0.4\text{mm}$  ( $Z_0=50\Omega$ )

PCB SIZE= $17.0\text{mm} \times 17.0\text{mm}$

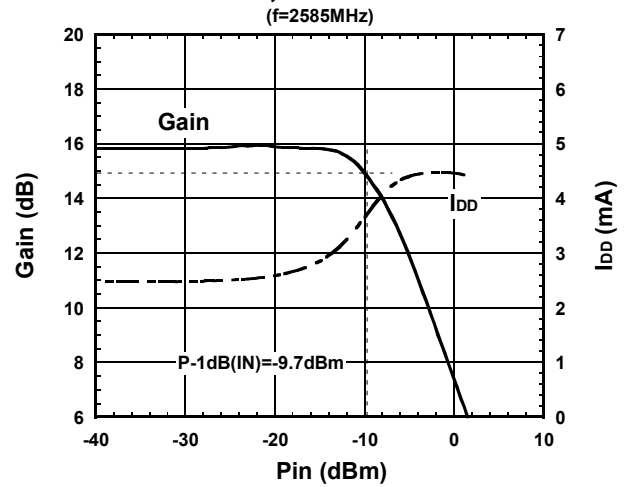
## 4-5-1 TYPICAL CHARACTERISTICS (LNA HIGH GAIN MODE)

Condition:  $T_a=+25^{\circ}\text{C}$ ,  $V_{DD}=V_{INV}=2.7\text{V}$ ,  $V_{CTL}=1.85\text{V}$ ,  $Z_s=Z_l=50\Omega$

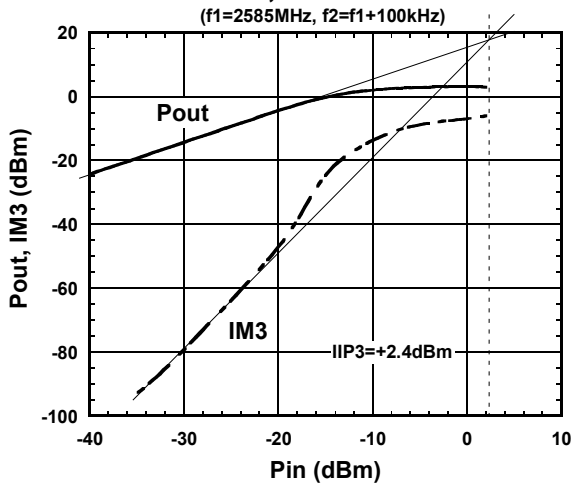
**NJG1126HB6 @High Gain**  
**Pout vs. Pin**



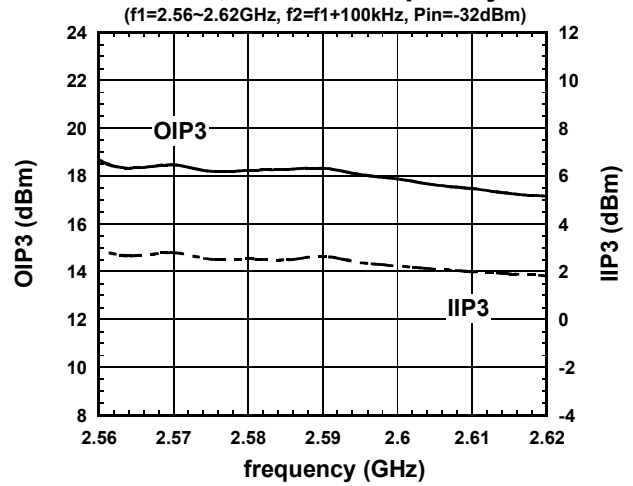
**NJG1126HB6 @High Gain**  
**Gain, I<sub>DD</sub> vs. Pin**



**NJG1126HB6 @High Gain**  
**Pout, IM3 vs. Pin**



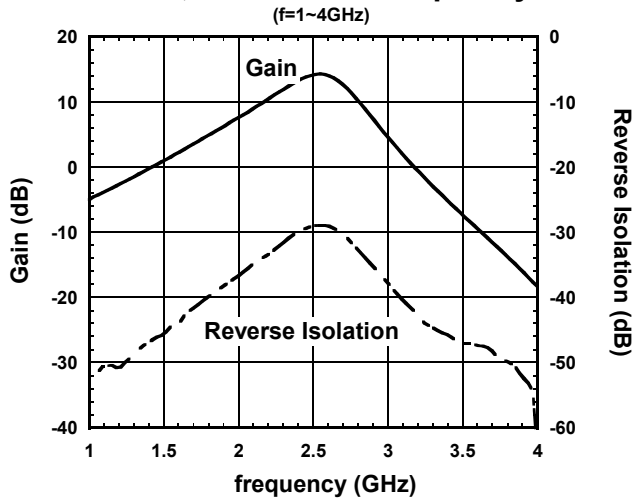
**NJG1126HB6 @High Gain**  
**OIP3, IIP3 vs. frequency**



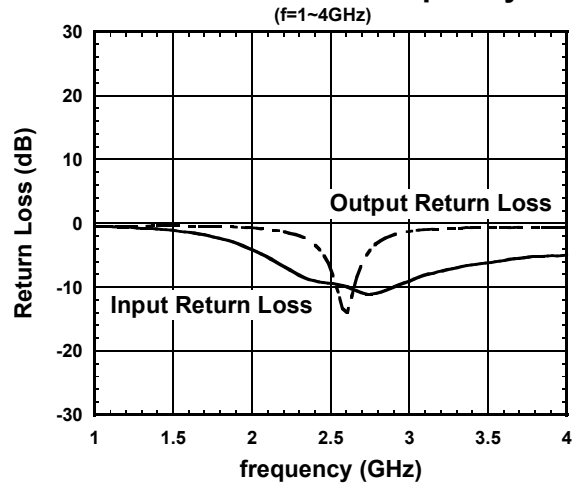
## 4-5-2 TYPICAL CHARACTERISTICS (LNA HIGH GAIN MODE)

Condition:  $T_a=+25^{\circ}\text{C}$ ,  $V_{DD}=V_{INV}=2.7\text{V}$ ,  $V_{CTL}=1.85\text{V}$ ,  $Z_s=Z_l=50\Omega$

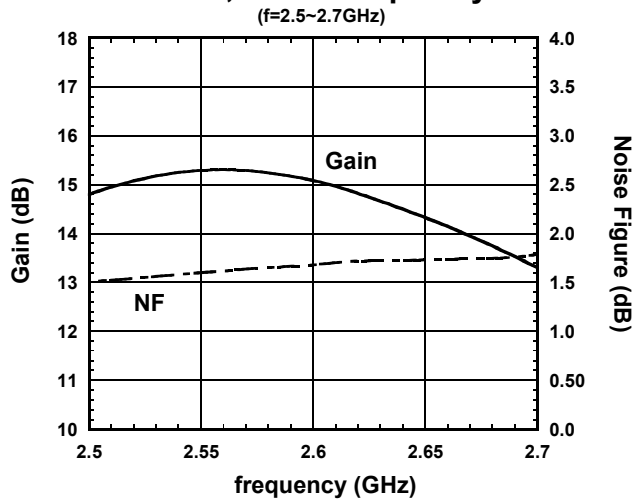
**NJG1126HB6 @High Gain**  
Gain, Isolation vs. frequency



**NJG1126HB6 @High Gain**  
Return Loss vs. frequency

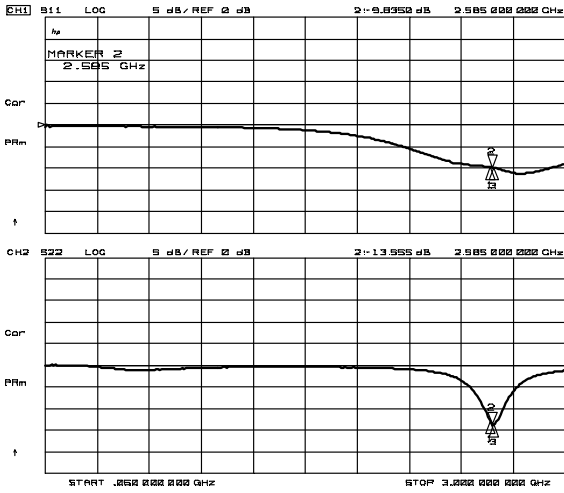


**NJG1126HB6 @High Gain**  
Gain, NF vs. frequency

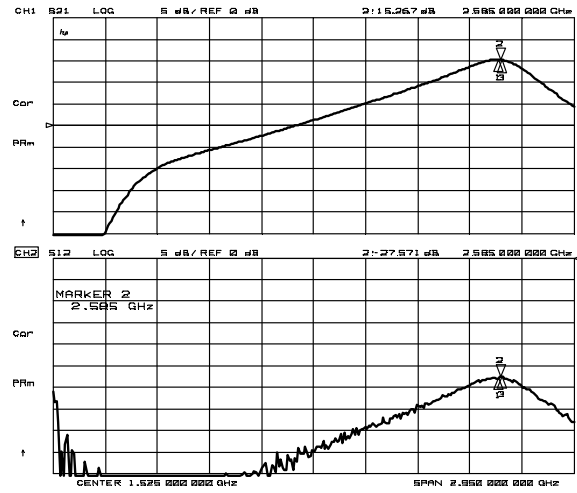


## 4-5-3 TYPICAL CHARACTERISTICS (LNA HIGH GAIN MODE)

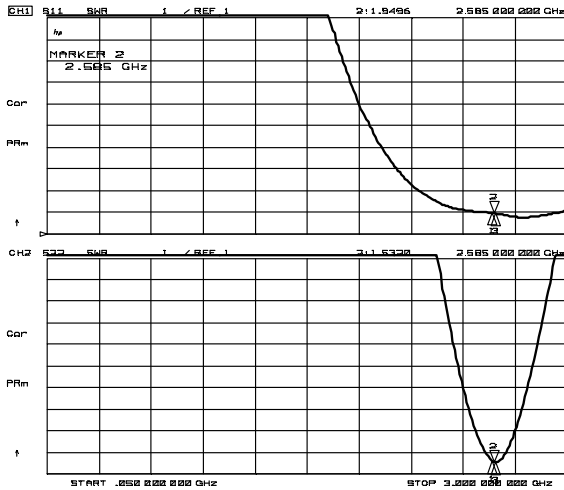
Condition:  $T_a=+25^{\circ}\text{C}$ ,  $V_{DD}=V_{INV}=2.7\text{V}$ ,  $V_{CTL}=1.85\text{V}$ ,  $Z_s=Z_l=50\Omega$



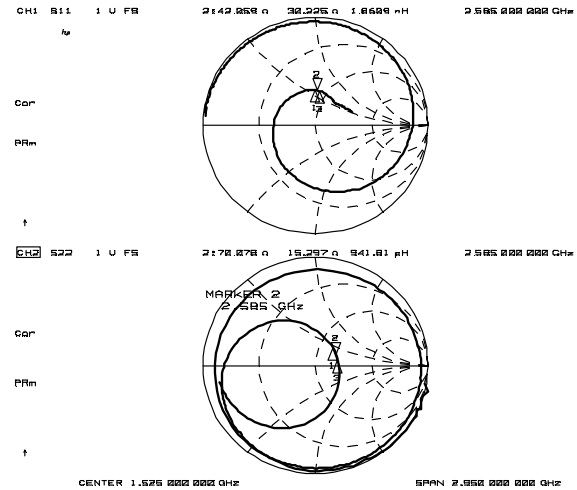
S11, S22



S21, S12



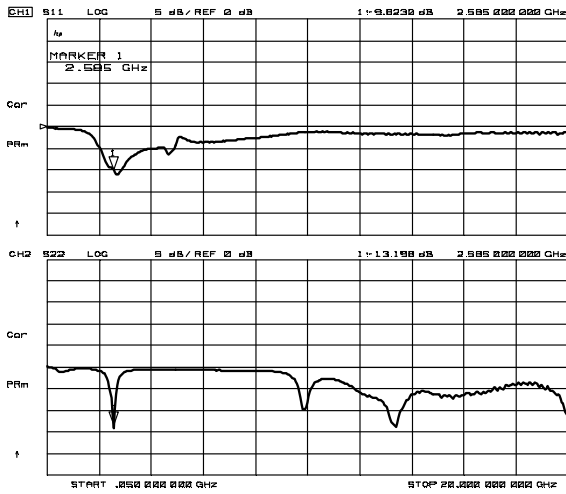
VSWR



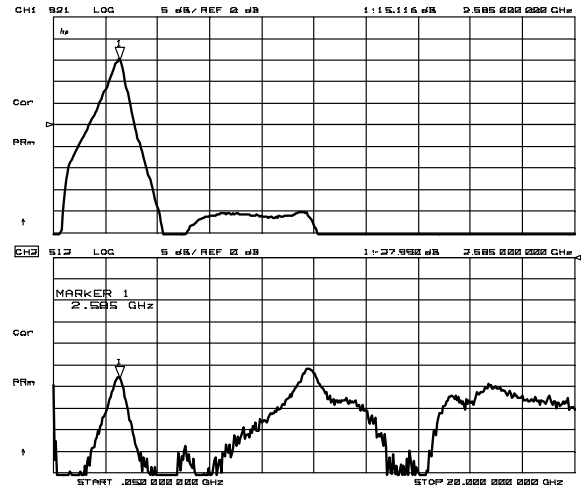
Zin, Zout

## 4-5-4 TYPICAL CHARACTERISTICS (LNA HIGH GAIN MODE)

Condition:  $T_a = +25^\circ\text{C}$ ,  $V_{DD} = V_{INV} = 2.7\text{V}$ ,  $V_{CTL} = 1.85\text{V}$ ,  $Z_s = Z_l = 50\Omega$



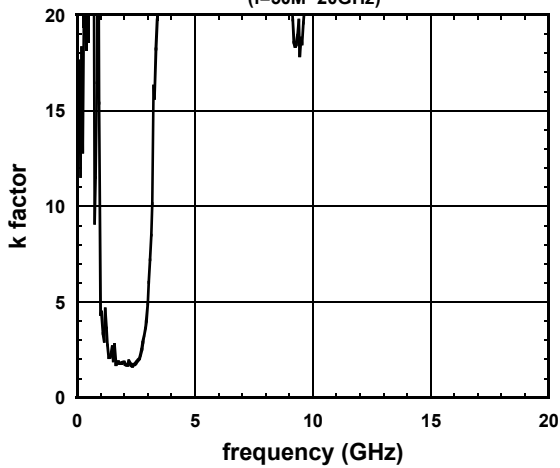
S11, S22 (f=50MHz ~ 20GHz)



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

### NJG1126HB6 @High Gain k factor vs. frequency

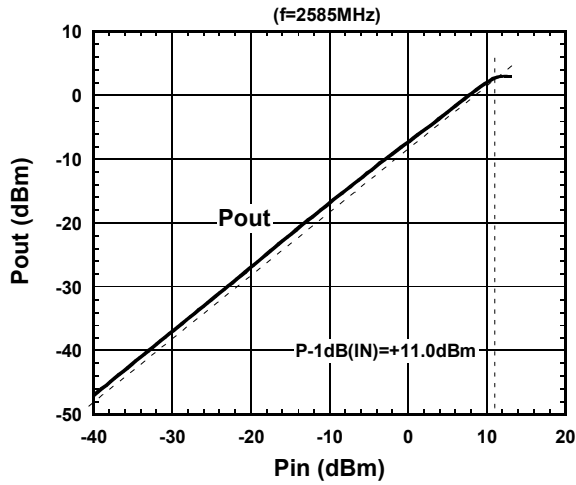
(f=50M~20GHz)



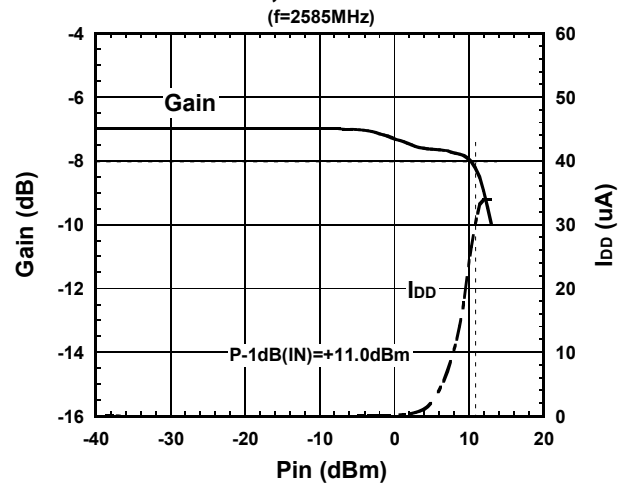
## 4-5-5 TYPICAL CHARACTERISTICS (LNA LOW GAIN MODE)

Condition:  $T_a=+25^\circ\text{C}$ ,  $V_{DD}=V_{INV}=2.7\text{V}$ ,  $V_{CTL}=0\text{V}$ ,  $Z_s=Z_l=50\Omega$

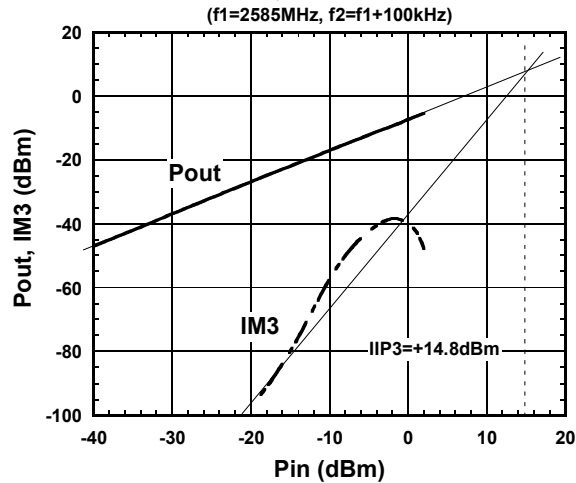
**NJG1126HB6 @Low Gain**  
**Pout vs. Pin**



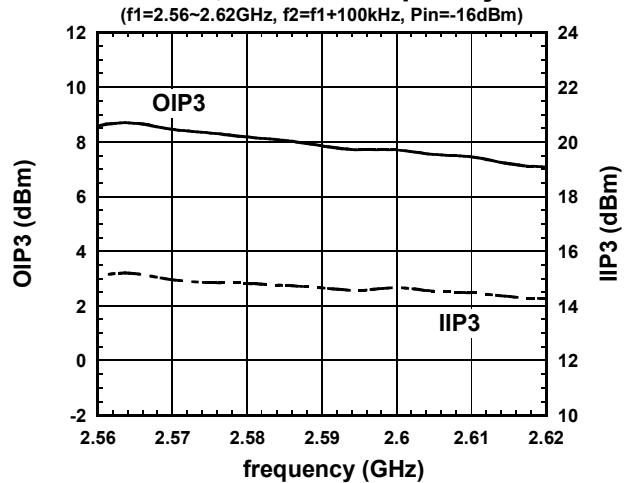
**NJG1126HB6 @Low Gain**  
**Gain, IDD vs. Pin**



**NJG1126HB6 @Low Gain**  
**Pout, IM3 vs. Pin**



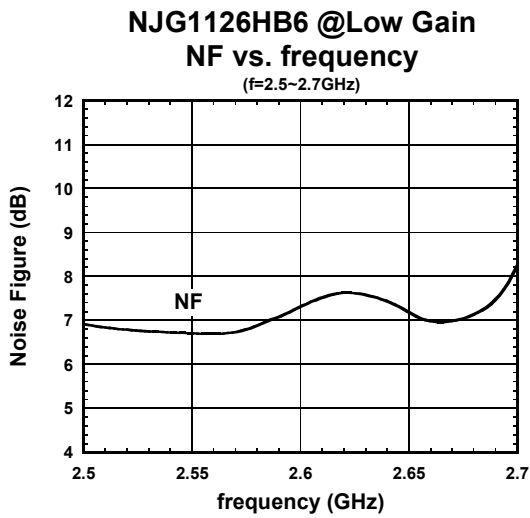
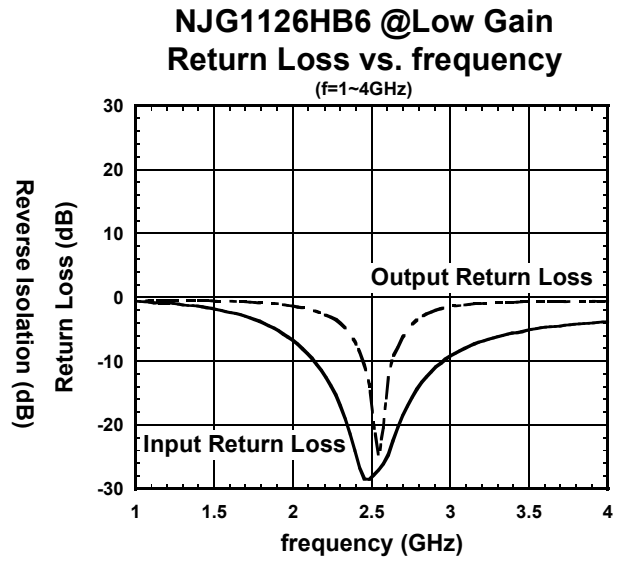
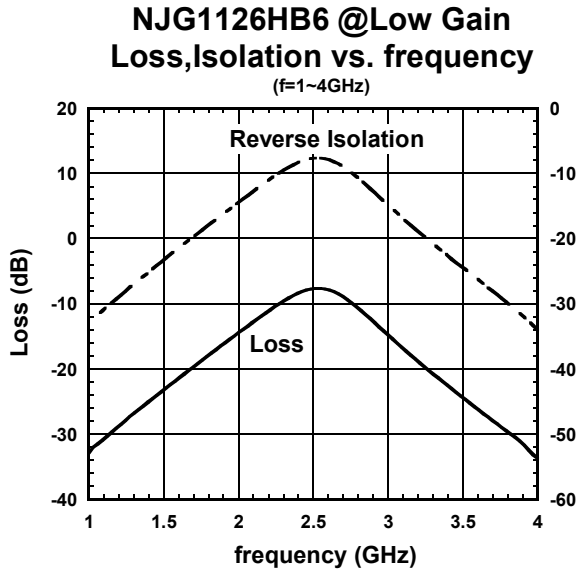
**NJG1126HB6 @Low Gain**  
**OIP3, IIP3 vs. frequency**





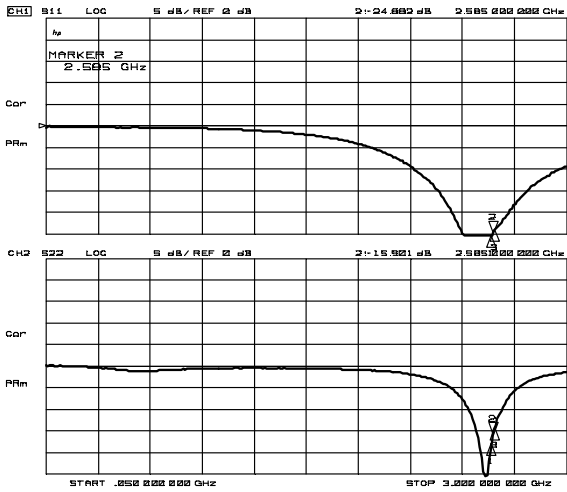
## 4-5-6 TYPICAL CHARACTERISTICS (LNA LOW GAIN MODE)

Condition:  $T_a=+25^{\circ}\text{C}$ ,  $V_{DD}=V_{INV}=2.7\text{V}$ ,  $V_{CTL}=0\text{V}$ ,  $Z_s=Z_l=50\Omega$

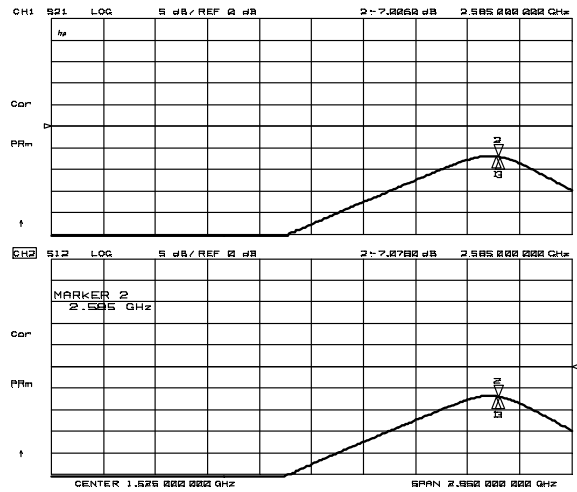


## 4-5-7 TYPICAL CHARACTERISTICS (LNA LOW GAIN MODE)

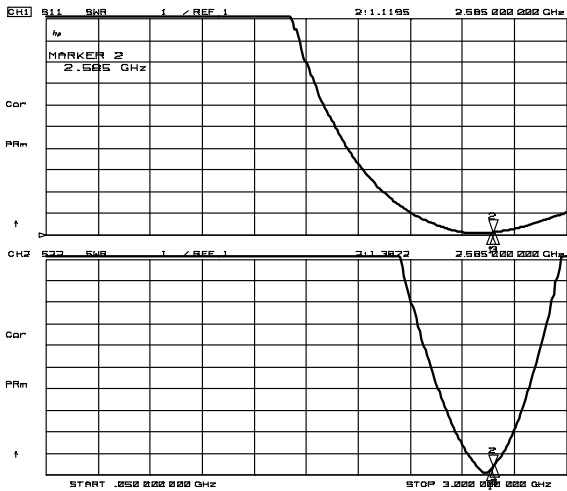
Condition:  $T_a = +25^\circ\text{C}$ ,  $V_{DD} = V_{INV} = 2.7\text{V}$ ,  $V_{CTL} = 0\text{V}$ ,  $Z_s = Z_l = 50\Omega$



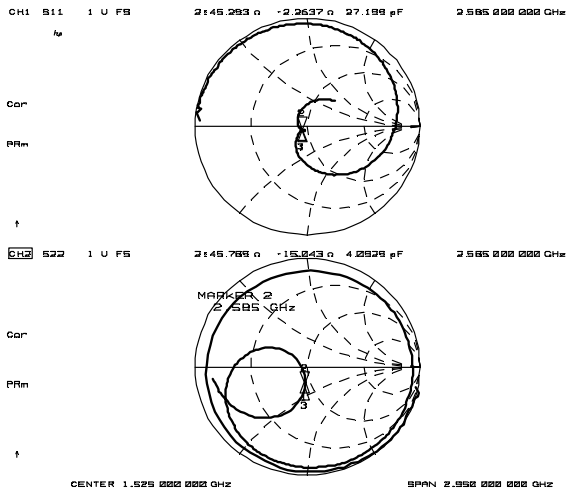
S11, S22



S21, S12



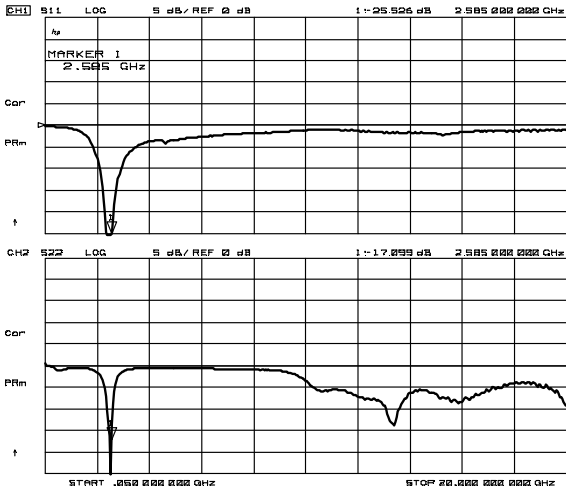
VSWR



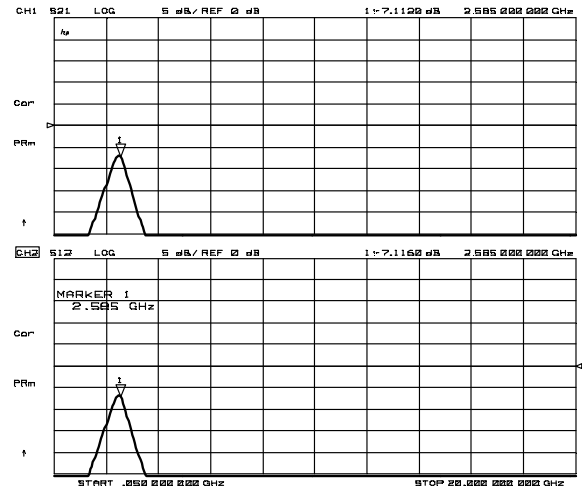
Zin, Zout

## 4-5-8 TYPICAL CHARACTERISTICS (LNA LOW GAIN MODE)

Condition:  $T_a=+25^{\circ}\text{C}$ ,  $V_{DD}=V_{INV}=2.7\text{V}$ ,  $V_{CTL}=0\text{V}$ ,  $Z_s=Z_l=50\Omega$



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



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

### NJG1126HB6 @Low Gain k factor vs. frequency

(f=50M~20GHz)

