

W-CDMA Triple LNA GaAs MMIC

GENERAL DESCRIPTION

NJG1123PB5 is a Triple band LNA IC designed for W-CDMA / UMTS cellular phone of 2.1GHz, 1.7GHz and 800MHz band.

This IC has the function which bypasses LNA, and high gain mode or low gain mode can be chosen.

High IIP3 and a low noise are achieved at the High gain mode.

And low current consumption can be achieved at the low gain mode because LNA enters the state of the standby.

An ultra small and ultra thin package of FFP16-B5 is adopted.

PACKAGE OUTLINE

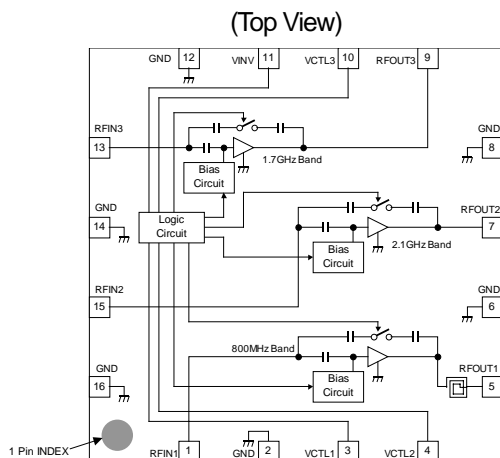


NJG1123PB5

FEATURES

- Low voltage operation +2.85V
 - Low CTL voltage operation +1.85V
 - Low current consumption 2.2mA typ. @High Gain Mode
0uA typ. @Low Gain Mode
 - Small package FFP16-B5 (Package size: 2.0 x 2.0 x 0.65mm typ)
- [High gain mode]
- High gain 17.0dB typ. @ $f_{RF}=2140\text{MHz}$, 1860MHz
16.0dB typ. @ $f_{RF}=885\text{MHz}$
1.65dB typ. @ $f_{RF}=2140\text{MHz}$
1.5dB typ. @ $f_{RF}=885\text{MHz}$, 1860MHz
0dBm typ. @ $f_{RF}=2140.0+2140.1\text{MHz}$, $P_{in}=-30\text{dBm}$
-1dBm typ. @ $f_{RF}=885.0+885.1\text{MHz}$, $P_{in}=-30\text{dBm}$
+1dBm typ. @ $f_{RF}=1860.0+1860.1\text{MHz}$, $P_{in}=-30\text{dBm}$
- [Low gain mode]
- Gain -8.0dB typ. @ $f_{RF}=2140\text{MHz}$
-6.5dB typ. @ $f_{RF}=885\text{MHz}$
-9.0dB typ. @ $f_{RF}=1860\text{MHz}$
+18dBm typ. @ $f_{RF}=2140.0+2140.1\text{MHz}$, $P_{in}=-16\text{dBm}$
+13dBm typ. @ $f_{RF}=885.0+885.1\text{MHz}$, $P_{in}=-20\text{dBm}$
+18.5dBm typ. @ $f_{RF}=1860.0+1860.1\text{MHz}$, $P_{in}=-16\text{dBm}$

PIN CONFIGURATION



Pin Connection

- | | |
|---------------------|----------------------|
| 1. RFIN1 (800MHz) | 9. RFOUT3 (1.7GHz) |
| 2. GND | 10. VCTL3 (Gain Sel) |
| 3. VCTL1 (Band Sel) | 11. VINV |
| 4. VCTL2 (Band Sel) | 12. GND |
| 5. RFOUT1 (800MHz) | 13. RFIN3 (1.7GHz) |
| 6. GND | 14. GND |
| 7. RFOUT2 (2.1GHz) | 15. RFIN2 (2.1GHz) |
| 8. GND | 16. GND |

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

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■ABSOLUTE MAXIMUM RATINGS

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

PARAMETERS	SYMBOL	CONDITIONS	RATINGS	UNITS
Operating voltage	V_{DD}		5.0	V
Inverter supply voltage	V_{INV}		5.0	V
Control voltage	V_{CTL}	$V_{CTL1, 2, 3}$	5.0	V
Input power	P_{in}	$V_{DD}=2.7\text{V}$	+15	dBm
Power dissipation	P_D	At on PCB Board	300	mW
Operating temperature	T_{opr}		-40~+85	$^{\circ}\text{C}$
Storage temperature	T_{stg}		-55~+125	$^{\circ}\text{C}$

■ELECTRICAL CHARACTERISTICS 1 (DC)

$V_{DD}=V_{INV}=2.85\text{V}$, $T_a=+25^{\circ}\text{C}$, $Z_s=Z_f=50\ \text{ohm}$

PARAMETERS	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Operating voltage	V_{DD}		2.5	2.85	3.6	V
Inverter supply voltage	V_{INV}		2.5	2.85	3.6	V
Control voltage1 (High)	$V_{CTL1(H)}$		1.52	1.85	$V_{INV}+0.3$	V
Control voltage1 (Low)	$V_{CTL1(L)}$		0	0	0.3	V
Control voltage 2 (High)	$V_{CTL2(H)}$		1.52	1.85	$V_{INV}+0.3$	V
Control voltage 2 (Low)	$V_{CTL2(L)}$		0	0	0.3	V
Control voltage 3 (High)	$V_{CTL3(H)}$		1.52	1.85	$V_{INV}+0.3$	V
Control voltage 3 (Low)	$V_{CTL3(L)}$		0	0	0.3	V
Operating current2 2.1GHz[High gain mode]	I_{DD1}	$V_{CTL1}=0\text{V}$, $V_{CTL2}=0\text{V}$, $V_{CTL3}=1.85\text{V}$, RF OFF	-	2.2	2.95	mA
Operating current1 800MHz[High gain mode]	I_{DD2}	$V_{CTL1}=1.85\text{V}$, $V_{CTL2}=0\text{V}$, $V_{CTL3}=1.85\text{V}$, RF OFF	-	2.2	2.95	mA
Operating current1 1.7GHz[High gain mode]	I_{DD3}	$V_{CTL1}=0\text{V}$, $V_{CTL2}=1.85\text{V}$, $V_{CTL3}=1.85\text{V}$, RF OFF	-	2.2	2.95	mA
Operating current 3 800M/2.1GHz[Low gain mode]	I_{DD4}	$V_{CTL3}=0\text{V}$, RF OFF	-	0	5	μA
Inverter current1	I_{INV1}	$V_{CTL3}=1.85\text{V}$	-	80	130	μA
Inverter current2	I_{INV2}	$V_{CTL3}=0\text{V}$	-	45	80	μA
Control current 1	I_{CTL1}	$V_{CTL1}=1.85\text{V}$	-	3	10	μA
Control current 2	I_{CTL2}	$V_{CTL2}=1.85\text{V}$	-	3	10	μA
Control current 3	I_{CTL3}	$V_{CTL3}=1.85\text{V}$	-	3	10	μA

■ ELECTRICAL CHARACTERISTICS 2 (2.1GHz band High Gain mode)

$V_{DD}=V_{INV}=2.85V$, $V_{CTL1}=0V$, $V_{CTL2}=0V$, $V_{CTL3}=1.85V$, $f_{RF}=2140MHz$, $T_a=+25^{\circ}C$, $Z_s=Z_f=50\Omega$, TEST CIRCUIT

PARAMETERS	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Small signal gain1	Gain1	Exclude PCB & connector losses (IN: 0.09dB, OUT: 0.36dB)	15.5	17.0	19.0	dB
Noise figure1	NF1	Exclude PCB & connector losses (IN: 0.09dB)	-	1.65	1.85	dB
Pin at 1dB gain compression point1	P-1dB(1)		-16.0	-12.5	-	dBm
Input 3rd order intercept point1	IIP3_1	$f_1=f_{RF}$, $f_2=f_{RF}+100kHz$, Pin=-30dBm	-5.0	0	-	dBm
RF Input VSWR1	VSWRi1		-	1.7	2.2	
RF Output VSWR1	VSWRo1		-	1.8	2.5	

■ ELECTRICAL CHARACTERISTICS 3 (2.1GHz band Low Gain mode)

$V_{DD}=V_{INV}=2.85V$, $V_{CTL1}=0V$, $V_{CTL2}=0V$, $V_{CTL3}=0V$, $f_{RF}=2140MHz$, $T_a=+25^{\circ}C$, $Z_s=Z_f=50\Omega$, TEST CIRCUIT

PARAMETERS	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Small signal gain2	Gain2	Exclude PCB & connector losses (IN: 0.09dB, OUT: 0.36dB)	-11.0	-8.0	-6.0	dB
Noise figure2	NF2	Exclude PCB & connector losses (IN: 0.09dB)	-	8.5	11.5	dB
Pin at 1dB gain compression point2	P-1dB(2)		+5.0	+12.5	-	dBm
Input 3rd order intercept point2	IIP3_2	$f_1=f_{RF}$, $f_2=f_{RF}+100kHz$, Pin=-16dBm	0.0	+18.0	-	dBm
RF Input VSWR2	VSWRi2		-	2.0	2.4	
RF Output VSWR2	VSWRo2		-	1.5	2.1	

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■ELECTRICAL CHARACTERISTICS 4 (800MHz band High Gain mode)

$V_{DD}=V_{INV}=2.85V$, $V_{CTL1}=1.85V$, $V_{CTL2}=0V$, $V_{CTL3}=1.85V$, $f_{RF}=885MHz$, $T_a=+25^{\circ}C$, $Z_s=Z_f=50\Omega$, TEST CIRCUIT

PARAMETERS	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Small signal gain3	Gain3	Exclude PCB & connector losses (IN: 0.06dB, OUT: 0.16dB)	15.0	16.0	18.5	dB
Noise figure3	NF3	Exclude PCB & connector losses (IN: 0.06dB)	-	1.5	1.7	dB
Pin at 1dB gain compression point3	P-1dB(3)		-16.0	-9.0	-	dBm
Input 3rd order intercept point3	IIP3_3	$f_1=f_{RF}$, $f_2=f_{RF}+100kHz$, Pin=30dBm	-8.0	-1.0	-	dBm
RF Input VSWR3	VSWR _{i3}		-	1.5	2.0	
RF Output VSWR3	VSWR _{o3}		-	1.5	2.1	

■ELECTRICAL CHARACTERISTICS 5 (800MHz band Low Gain mode)

$V_{DD}=V_{INV}=2.85V$, $V_{CTL1}=1.85V$, $V_{CTL2}=0V$, $V_{CTL3}=0V$, $f_{RF}=885MHz$, $T_a=+25^{\circ}C$, $Z_s=Z_f=50\Omega$, TEST CIRCUIT

PARAMETERS	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Small signal gain4	Gain4	Exclude PCB & connector losses (IN: 0.06dB, OUT: 0.16dB)	-8.5	-6.5	-4.5	dB
Noise figure4	NF4	Exclude PCB & connector losses (IN: 0.06dB)	-	6.5	9.5	dB
Pin at 1dB gain compression point4	P-1dB(4)		+3.5	+11.0	-	dBm
Input 3rd order intercept point4	IIP3_4	$F_1=f_{RF}$, $f_2=f_{RF}+100kHz$, Pin=-20dBm	0	+13.0	-	dBm
RF Input VSWR4	VSWR _{i4}		-	2.0	2.5	
RF Output VSWR4	VSWR _{o4}		-	1.9	2.2	

■ ELECTRICAL CHARACTERISTICS 4 (1.7GHz band High Gain mode)

$V_{DD}=V_{INV}=2.85V, V_{CTL1}=0V, V_{CTL2}=1.85V, V_{CTL3}=1.85V, f_{RF}=1860MHz, T_a=+25^{\circ}C, Z_s=Z_f=50\Omega, TEST\ CIRCUIT$

PARAMETERS	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Small signal gain5	Gain5	Exclude PCB & connector losses (IN: 0.10dB, OUT: 0.31dB)	15.6	17.0	19.0	dB
Noise figure5	NF5	Exclude PCB & connector losses (IN: 0.10dB,)	-	1.5	1.75	dB
Pin at 1dB gain compression point5	P _{-1dB(5)}		-16.0	-11.5	-	dBm
Input 3rd order intercept point5	IIP3_5	f1=f _{RF} , f2=f _{RF} +100kHz, Pin=-30dBm	-5.0	+1.0	-	dBm
RF Input VSWR5	VSWR _{i,5}		-	1.9	2.4	
RF Output VSWR5	VSWR _{o,5}		-	1.9	2.3	

■ ELECTRICAL CHARACTERISTICS 5 (1.7GHz band Low Gain mode)

$V_{DD}=V_{INV}=2.85V, V_{CTL1}=0V, V_{CTL2}=1.85V, V_{CTL3}=0V, f_{RF}=1860MHz, T_a=+25^{\circ}C, Z_s=Z_f=50\Omega, TEST\ CIRCUIT$

PARAMETERS	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Small signal gain6	Gain6	Exclude PCB & connector losses (IN: 0.10dB, OUT: 0.31dB)	-11.5	-9.0	-7.0	dB
Noise figure6	NF6	Exclude PCB & connector losses (IN: 0.10dB,)	-	9.0	12.0	dB
Pin at 1dB gain compression point6	P _{-1dB(6)}		+4.0	+12.5	-	dBm
Input 3rd order intercept point6	IIP3_6	f1=f _{RF} , f2=f _{RF} +100kHz, Pin=-16dBm	0	+18.5	-	dBm
RF Input VSWR6	VSWR _{i,6}		-	1.7	2.3	
RF Output VSWR6	VSWR _{o,6}		-	1.6	2.3	

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■TERMINAL INFORMATION

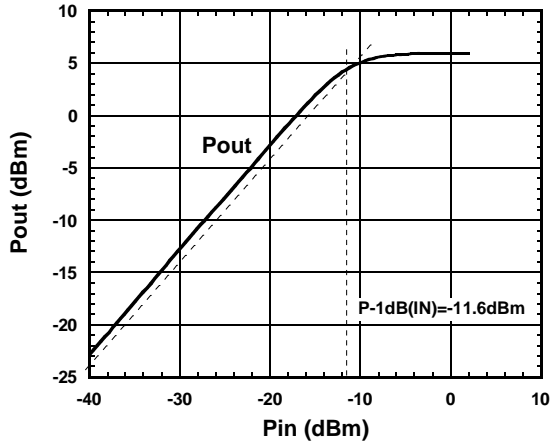
No.	SYMBOL	DESCRIPTION
1	RFIN1	RF input terminal of 800MHz band. The RF signal is input through external matching circuit connected to this terminal. The DC blocking capacitor is not required.
2	GND	Ground terminal. (0V)
3	VCTL1	Control voltage supply terminal. The frequency band (2Ghz / 800MHz / 1.7GHz) selects by 2bit control signal. (Please refer to truth table.)
4	VCTL2	
5	RFOUT1	Output terminal of 800MHz band. This terminal is also the power supply terminal of the LNA, please use inductor (L3) to connect power supply.
6	GND	Ground terminal. (0V)
7	RFOUT2	Output terminal of 2.1GHz band. This terminal is also the power supply terminal of the LNA, please use inductor (L6) to connect power supply.
8	GND	Ground terminal. (0V)
9	RFOUT3	Output terminal of 1.7GHz band. This terminal is also the power supply terminal of the LNA, please use inductor (L10) to connect power supply.
10	VCTL3	Control voltage supply terminal. The high level voltage of this terminal selects High Gain Mode. The low level voltage of this terminal selects Low Gain Mode.
11	VINV	Inverter voltage supplies terminal.
12	GND	Ground terminal. (0V)
13	RFIN3	RF input terminal of 1.7GHz band. The RF signal is input through external matching circuit connected to this terminal. The DC blocking capacitor is not required.
14	GND	Ground terminal. (0V)
15	RFIN2	RF input terminal of 2.1GHz band. The RF signal is input through external matching circuit connected to this terminal. The DC blocking capacitor is not required.
16	GND	Ground terminal. (0V)

CAUTION

- 1) Ground terminal (No.2, 6, 8, 12, 14, 16) should be connected to the ground plane as low inductance as possible.

■ ELECTRICAL CHARACTERISTICS (2.1GHz band High Gain Mode)

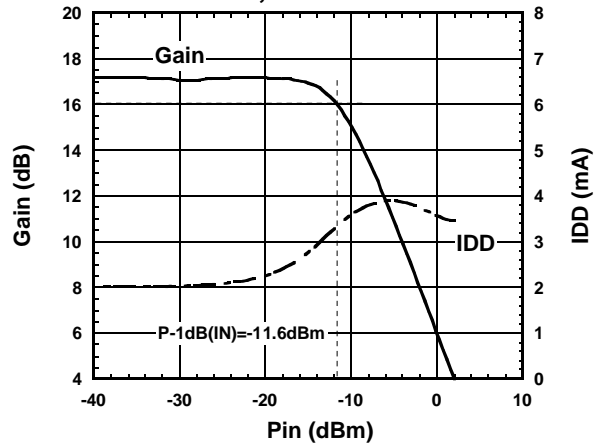
**NJG1123PB5 (2.1GHz) @High Gain
Pout vs. Pin**



Condition

$T_a=+25^{\circ}\text{C}$,
 $f=2140\text{MHz}$,
 $V_{DD}=V_{INV}=2.7\text{V}$,
 $V_{CTL1}=0\text{V}$, $V_{CTL2}=0\text{V}$, $V_{CTL3}=1.85\text{V}$

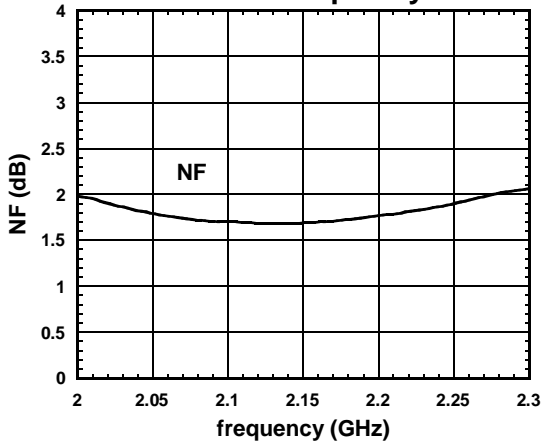
**NJG1123PB5 (2.1GHz) @High Gain
Gain, IDD vs. Pin**



Condition

$T_a=+25^{\circ}\text{C}$,
 $f=2140\text{MHz}$,
 $V_{DD}=V_{INV}=2.7\text{V}$,
 $V_{CTL1}=0\text{V}$, $V_{CTL2}=0\text{V}$, $V_{CTL3}=1.85\text{V}$

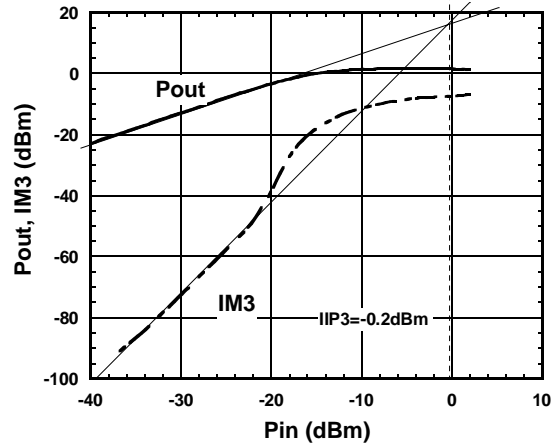
**NJG1123PB5 (2.1GHz) @High Gain
NF vs. frequency**



Condition

$T_a=+25^{\circ}\text{C}$,
 $f=2\sim 2.3\text{GHz}$,
 $V_{DD}=V_{INV}=2.7\text{V}$,
 $V_{CTL1}=0\text{V}$, $V_{CTL2}=0\text{V}$, $V_{CTL3}=1.85\text{V}$

**NJG1123PB5 (2.1GHz) @High Gain
Pout, IM3 vs. Pin**



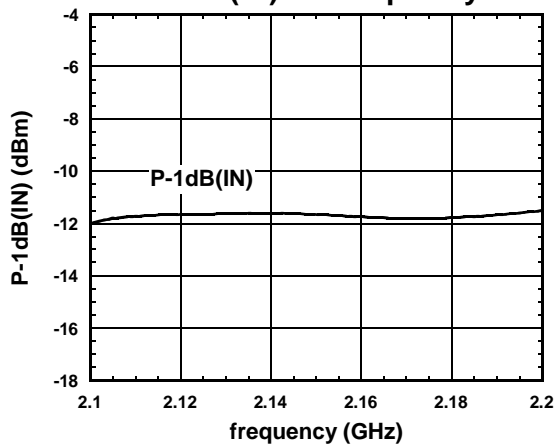
Condition

$T_a=+25^{\circ}\text{C}$,
 $f_1=2140\text{MHz}$, $f_2=f_1+100\text{kHz}$,
 $V_{DD}=V_{INV}=2.7\text{V}$,
 $V_{CTL1}=0\text{V}$, $V_{CTL2}=0\text{V}$, $V_{CTL3}=1.85\text{V}$

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■ ELECTRICAL CHARACTERISTICS (2.1GHz band High Gain Mode)

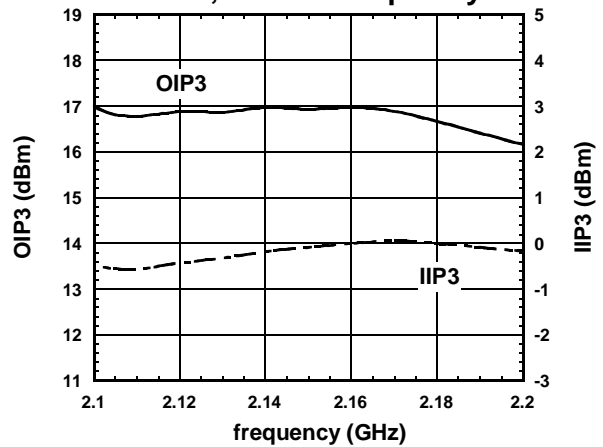
NJG1123PB5 (2.1GHz) @High Gain
P-1dB(IN) vs. frequency



Condition

$T_a = +25^\circ\text{C}$,
 $f = 2.1 \sim 2.2\text{GHz}$,
 $V_{DD} = V_{INV} = 2.7\text{V}$,
 $V_{CTL1} = 0\text{V}$, $V_{CTL2} = 0\text{V}$, $V_{CTL3} = 1.85\text{V}$

NJG1123PB5 (2.1GHz) @High Gain
OIP3, IIP3 vs. frequency

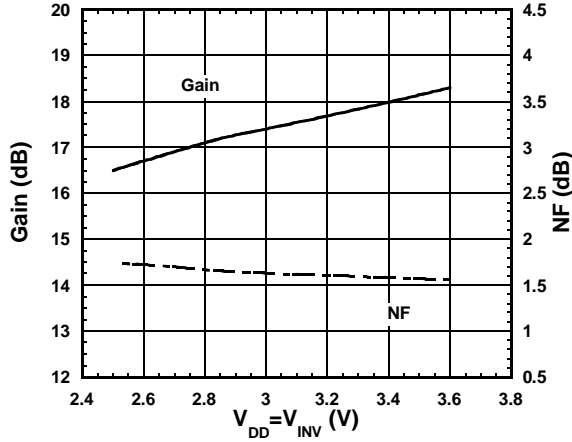


Condition

$T_a = +25^\circ\text{C}$,
 $f_1 = 2.1 \sim 2.2\text{GHz}$, $f_2 = f_1 + 100\text{kHz}$,
 $P_{in} = -30\text{dBm}$,
 $V_{DD} = V_{INV} = 2.7\text{V}$,
 $V_{CTL1} = 0\text{V}$, $V_{CTL2} = 0\text{V}$, $V_{CTL3} = 1.85\text{V}$

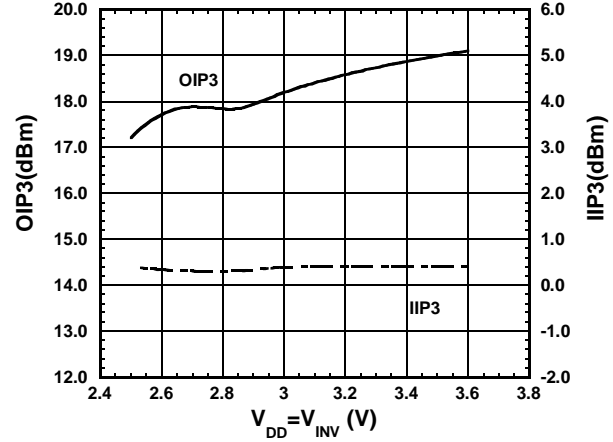
■ ELECTRICAL CHARACTERISTICS (2.1GHz band High Gain Mode)

NJG1123PB5 (2.1GHz) @High Gain
Gain, NF vs. V_{DD} , V_{INV}



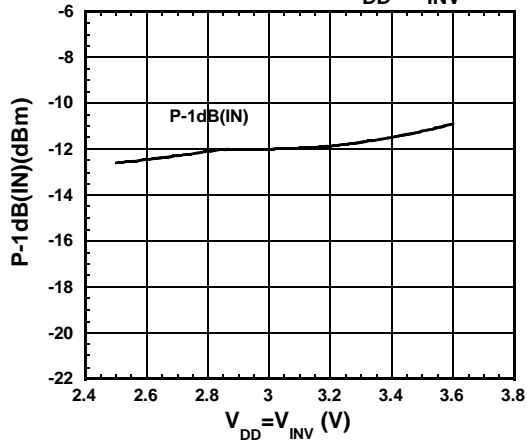
Condition
 $T_a = +25^\circ\text{C}$,
 $f = 2140\text{MHz}$,
 $V_{CTL1} = 0\text{V}$, $V_{CTL2} = 0\text{V}$, $V_{CTL3} = 1.85\text{V}$

NJG1123PB5 (2.1GHz) @High Gain
OIP3, IIP3 vs. V_{DD} , V_{INV}



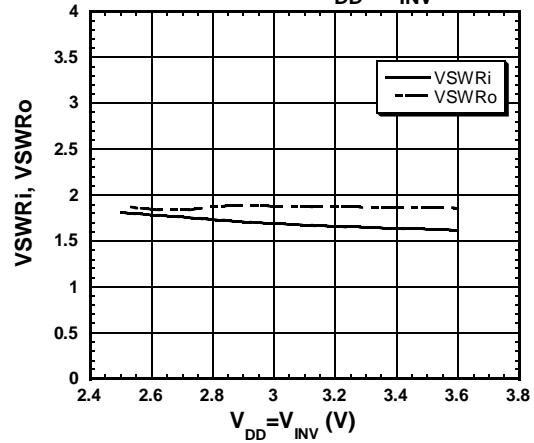
Condition
 $T_a = +25^\circ\text{C}$,
 $f_1 = 2140\text{MHz}$, $f_2 = f_1 + 2140.1\text{Hz}$,
 $P_{in} = -30\text{dBm}$,
 $V_{CTL1} = 0\text{V}$, $V_{CTL2} = 0\text{V}$, $V_{CTL3} = 1.85\text{V}$

NJG1123PB5 (2.1GHz) @High Gain
P-1dB(IN) vs. V_{DD} , V_{INV}



Condition
 $T_a = +25^\circ\text{C}$,
 $f = 2140\text{MHz}$,
 $V_{CTL1} = 0\text{V}$, $V_{CTL2} = 0\text{V}$, $V_{CTL3} = 1.85\text{V}$

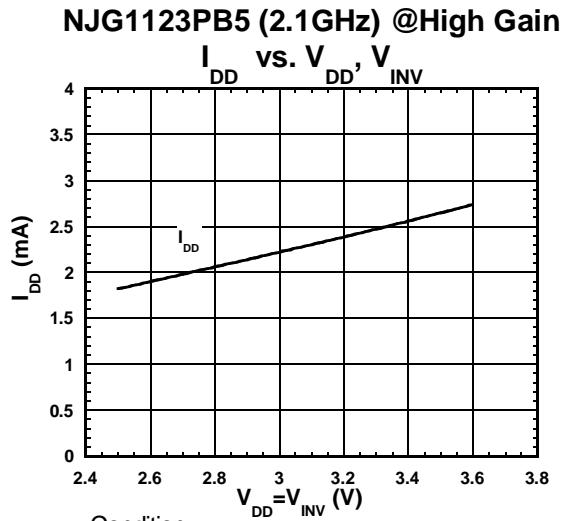
NJG1123PB5 (2.1GHz) @High Gain
VSWR vs. V_{DD} , V_{INV}



Condition
 $T_a = +25^\circ\text{C}$,
 $f = 2140\text{MHz}$,
 $V_{CTL1} = 0\text{V}$, $V_{CTL2} = 0\text{V}$, $V_{CTL3} = 1.85\text{V}$

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■ ELECTRICAL CHARACTERISTICS (2.1GHz band High Gain Mode)



Condition

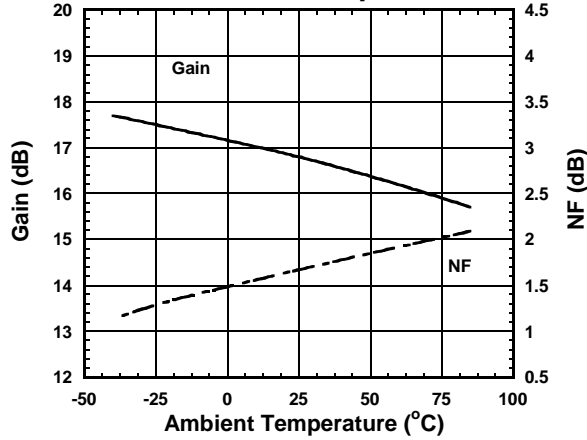
$T_a = +25^\circ\text{C}$,

RF=OFF,

$V_{CTL1} = 0\text{V}$, $V_{CTL2} = 0\text{V}$, $V_{CTL3} = 1.85\text{V}$

■ ELECTRICAL CHARACTERISTICS (2.1GHz band High Gain Mode)

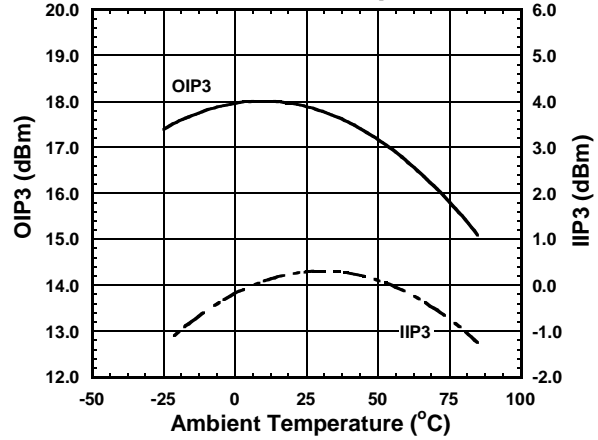
NJG1123PB5 (2.1GHz) @High Gain Gain, NF vs. Temperature



Condition

$f=2140\text{MHz}$,
 $V_{DD}=V_{INV}=2.7\text{V}$,
 $V_{CTL1}=0\text{V}$, $V_{CTL2}=0\text{V}$, $V_{CTL3}=1.85\text{V}$

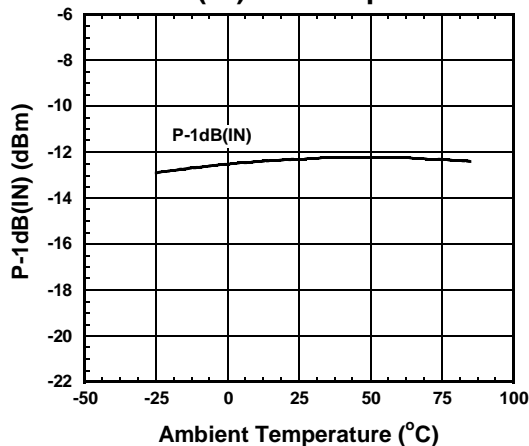
NJG1123PB5 (2.1GHz) @High Gain OIP3, IIP3 vs. Temperature



Condition

$f1=2140\text{MHz}$, $f2=f1+2140.1\text{Hz}$,
 $\text{Pin}=-30\text{dBm}$,
 $V_{DD}=V_{INV}=2.7\text{V}$
 $V_{CTL1}=0\text{V}$, $V_{CTL2}=0\text{V}$, $V_{CTL3}=1.85\text{V}$

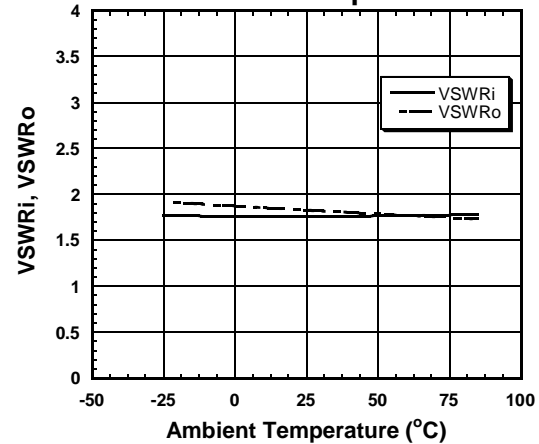
NJG1123PB5 (2.1GHz) @High Gain P-1dB(IN) vs. Temperature



Condition

$f=2140\text{MHz}$,
 $V_{DD}=V_{INV}=2.7\text{V}$
 $V_{CTL1}=0\text{V}$, $V_{CTL2}=0\text{V}$, $V_{CTL3}=1.85\text{V}$

NJG1123PB5 (2.1GHz) @High Gain VSWR vs. Temperature

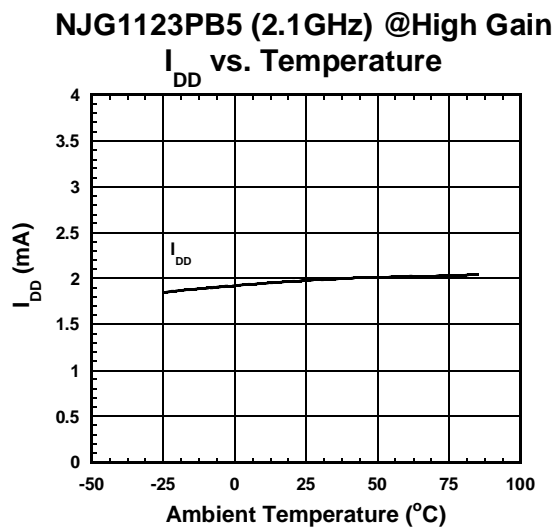


Condition

$f=2140\text{MHz}$,
 $V_{DD}=V_{INV}=2.7\text{V}$
 $V_{CTL1}=0\text{V}$, $V_{CTL2}=0\text{V}$, $V_{CTL3}=1.85\text{V}$

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■ ELECTRICAL CHARACTERISTICS (2.1GHz band High Gain Mode)



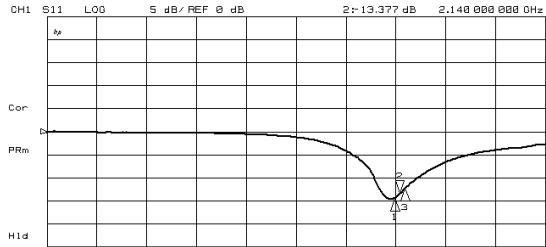
Condition

RF=OFF,

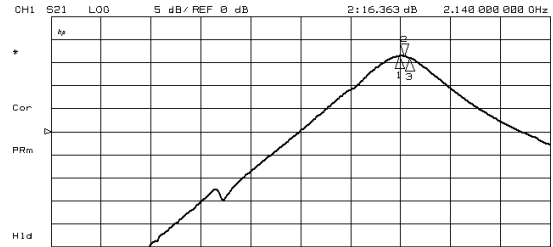
$V_{DD} = V_{INV} = 2.7V$

$V_{CTL1} = 0V, V_{CTL2} = 0V, V_{CTL3} = 1.85V$

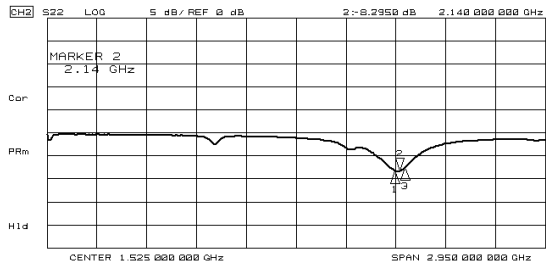
ELECTRICAL CHARACTERISTICS (2.1GHz band High Gain Mode)



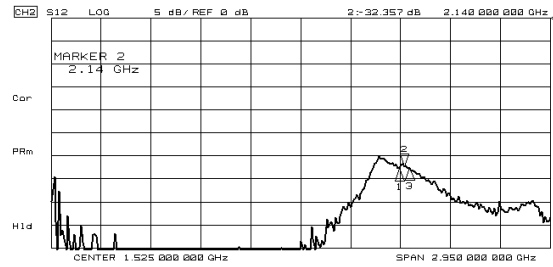
CH1 Markers
 1:-14.376 dB
 2.11000 GHz
 3:-12.345 dB
 2.17000 GHz



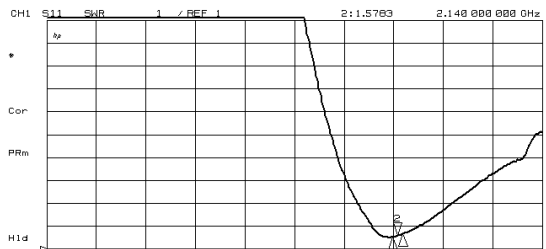
CH1 Markers
 1:16.414 dB
 2.11000 GHz
 3:16.834 dB
 2.17000 GHz



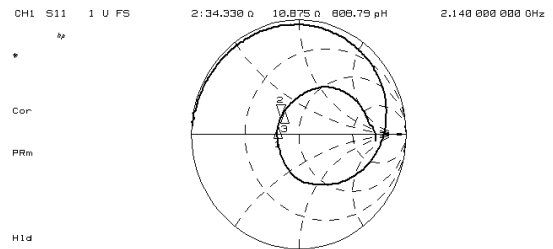
CH2 Markers
 1:-8.240 dB
 2.11000 GHz
 3:-7.6270 dB
 2.17000 GHz



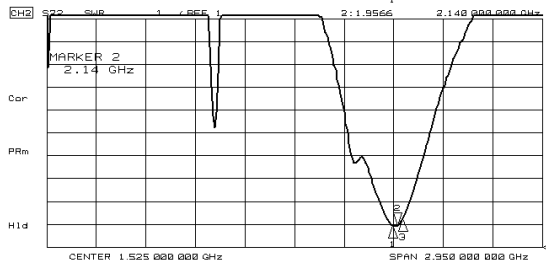
CH2 Markers
 1:32.600 dB
 2.11000 GHz
 3:32.513 dB
 2.17000 GHz



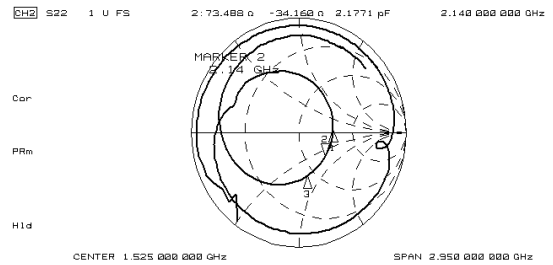
CH1 Markers
 1:1.5204
 2.11000 GHz
 3:1.6577
 2.17000 GHz



CH1 Markers
 1:33.500 0
 5.1270 0
 2.11000 GHz
 3:35.617 0
 16.953 0
 2.17000 GHz



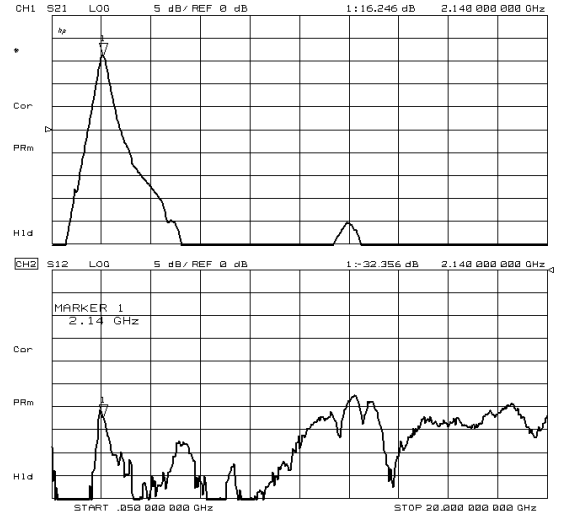
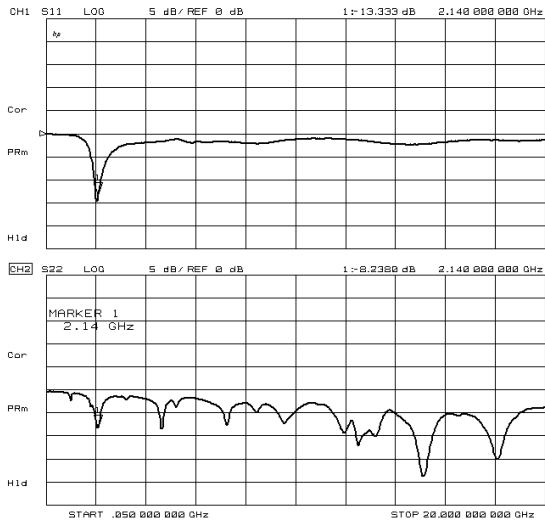
CH2 Markers
 1:1.9461
 2.11000 GHz
 3:2.2549
 2.17000 GHz



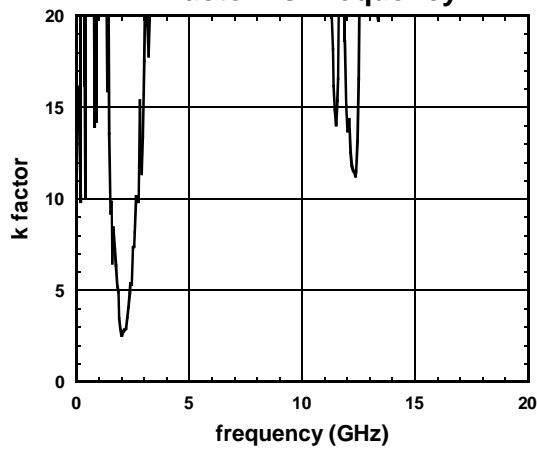
CH2 Markers
 1:96.709 0
 6.0430 0
 2.11000 GHz
 3:43.191 0
 -35.232 0
 2.17000 GHz

NJG1123PB5

■ ELECTRICAL CHARACTERISTICS (2.1GHz band High Gain Mode)

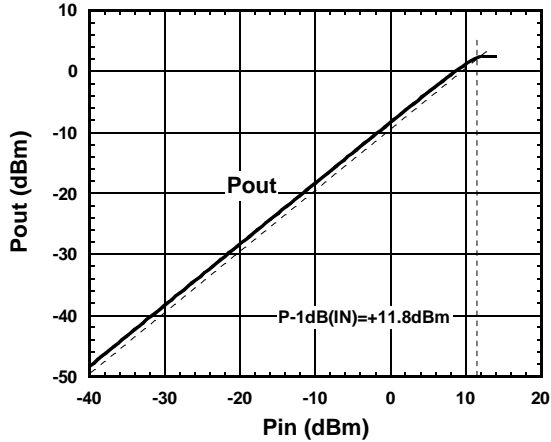


NJG1123PB5 (2.1GHz) @High Gain k factor vs. frequency



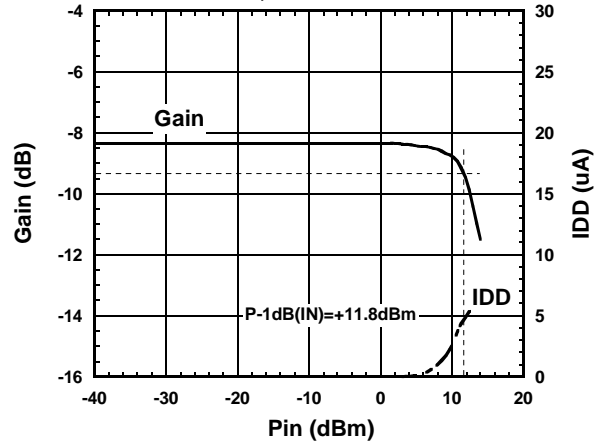
■ ELECTRICAL CHARACTERISTICS (2.1GHz band Low Gain Mode)

**NJG1123PB5 (2.1GHz) @Low Gain
Pout vs. Pin**



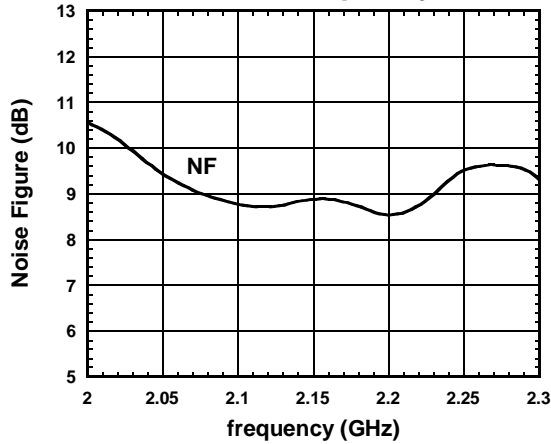
Condition
 $T_a = +25^\circ\text{C}$,
 $f = 2140\text{MHz}$,
 $V_{DD} = V_{INV} = 2.7\text{V}$,
 $V_{CTL1} = 0\text{V}$, $V_{CTL2} = 0\text{V}$, $V_{CTL3} = 0\text{V}$

**NJG1123PB5 (2.1GHz) @Low Gain
Gain, IDD vs. Pin**



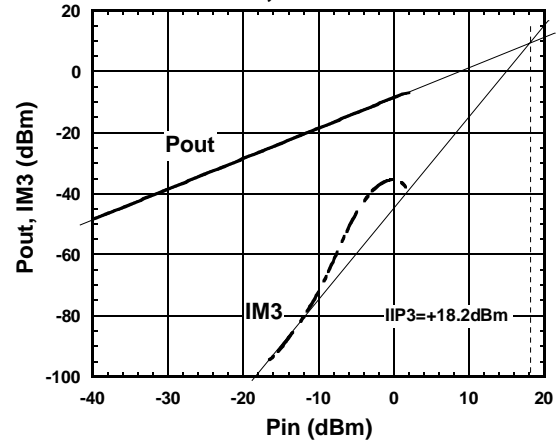
Condition
 $T_a = +25^\circ\text{C}$,
 $f = 2140\text{MHz}$,
 $V_{DD} = V_{INV} = 2.7\text{V}$,
 $V_{CTL1} = 0\text{V}$, $V_{CTL2} = 0\text{V}$, $V_{CTL3} = 0\text{V}$

**NJG1123PB5 (2.1GHz) @Low Gain
NF vs. frequency**



Condition
 $T_a = +25^\circ\text{C}$,
 $f = 2 \sim 2.3\text{GHz}$,
 $V_{DD} = V_{INV} = 2.7\text{V}$,
 $V_{CTL1} = 0\text{V}$, $V_{CTL2} = 0\text{V}$, $V_{CTL3} = 0\text{V}$

**NJG1123PB5 (2.1GHz) @Low Gain
Pout, IM3 vs. Pin**

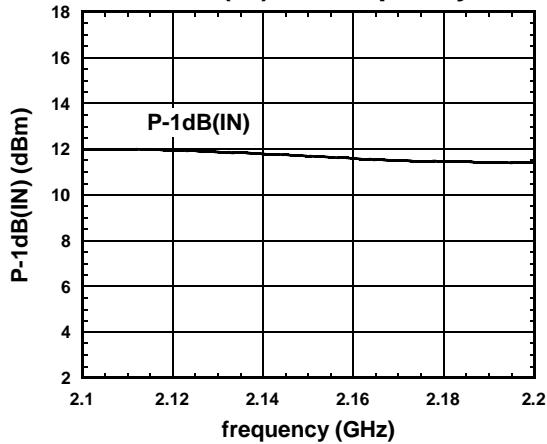


Condition
 $T_a = +25^\circ\text{C}$,
 $f = 2 \sim 2.3\text{GHz}$,
 $V_{DD} = V_{INV} = 2.7\text{V}$,
 $V_{CTL1} = 0\text{V}$, $V_{CTL2} = 0\text{V}$, $V_{CTL3} = 0\text{V}$

NJG1123PB5

■ ELECTRICAL CHARACTERISTICS (2.1GHz band Low Gain Mode)

NJG1123PB5 (2.1GHz) @Low Gain
P-1dB(IN) vs. frequency



Condition

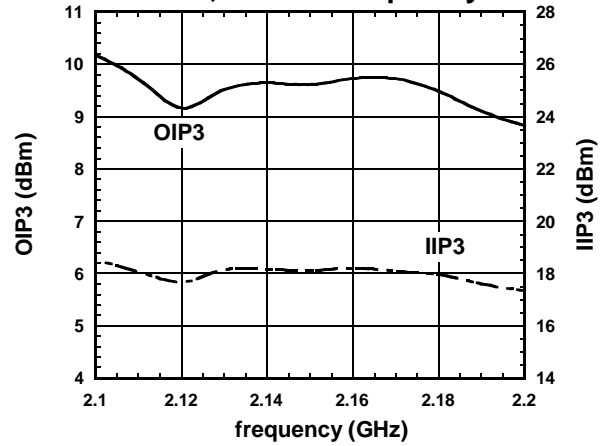
$T_a = +25^\circ\text{C}$,

$f = 2.1 \sim 2.2\text{GHz}$,

$V_{DD} = V_{INV} = 2.7\text{V}$,

$V_{CTL1} = 0\text{V}$, $V_{CTL2} = 0\text{V}$, $V_{CTL3} = 0\text{V}$

NJG1123PB5 (2.1GHz) @Low Gain
OIP3, IIP3 vs. frequency



Condition

$T_a = +25^\circ\text{C}$,

$f_1 = 2.1 \sim 2.2\text{GHz}$, $f_2 = f_1 + 100\text{kHz}$,

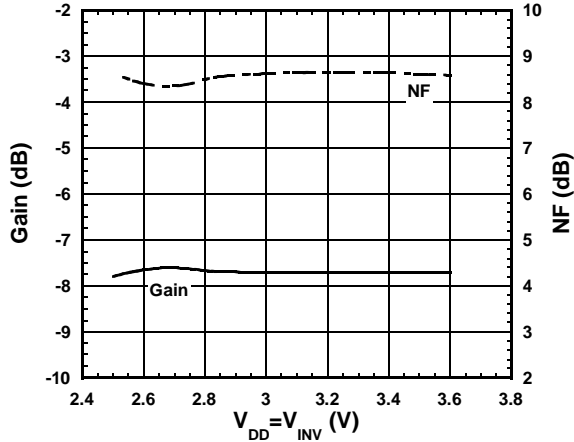
$P_{in} = -16\text{dBm}$,

$V_{DD} = V_{INV} = 2.7\text{V}$,

$V_{CTL1} = 0\text{V}$, $V_{CTL2} = 0\text{V}$, $V_{CTL3} = 0\text{V}$

■ ELECTRICAL CHARACTERISTICS (2.1GHz band Low Gain Mode)

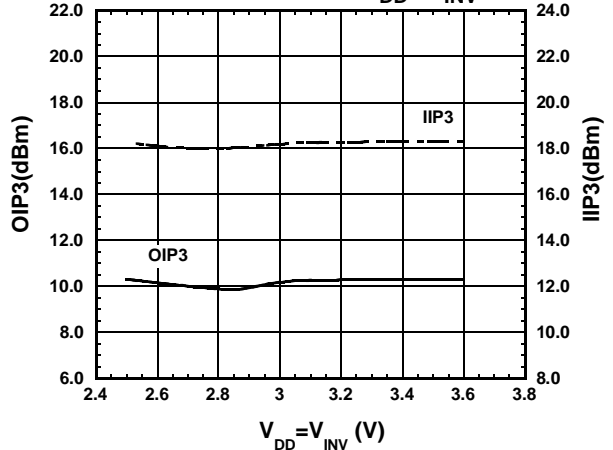
NJG1123PB5 (2.1GHz) @Low Gain
Gain, NF vs. V_{DD} , V_{INV}



Condition

$T_a = +25^\circ\text{C}$,
 $f = 2140\text{MHz}$,
 $V_{CTL1} = 0\text{V}$, $V_{CTL2} = 0\text{V}$, $V_{CTL3} = 0\text{V}$

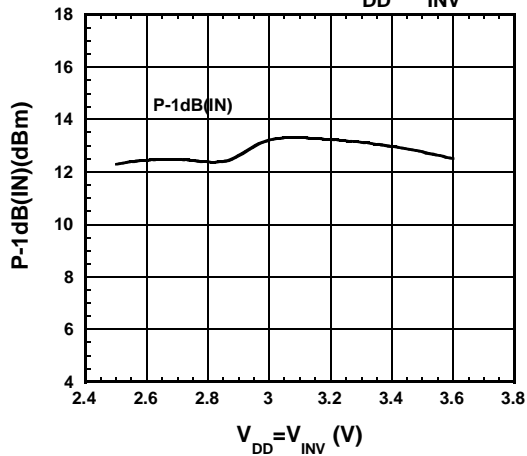
NJG1123PB5 (2.1GHz) @Low Gain
OIP3, IIP3 vs. V_{DD} , V_{INV}



Condition

$T_a = +25^\circ\text{C}$,
 $f_1 = 2140\text{MHz}$, $f_2 = f_1 + 2140.1\text{MHz}$,
 $P_{in} = -16\text{dBm}$,
 $V_{CTL1} = 0\text{V}$, $V_{CTL2} = 0\text{V}$, $V_{CTL3} = 0\text{V}$

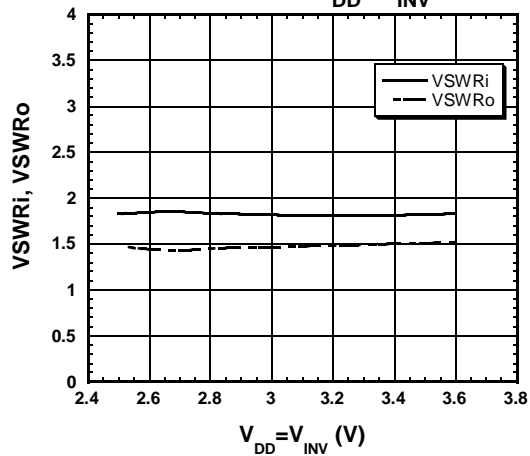
NJG1123PB5 (2.1GHz) @Low Gain
P-1dB(IN) vs. V_{DD} , V_{INV}



Condition

$T_a = +25^\circ\text{C}$,
 $f = 2140\text{MHz}$,
 $V_{CTL1} = 0\text{V}$, $V_{CTL2} = 0\text{V}$, $V_{CTL3} = 0\text{V}$

NJG1123PB5 (2.1GHz) @Low Gain
VSWR vs. V_{DD} , V_{INV}



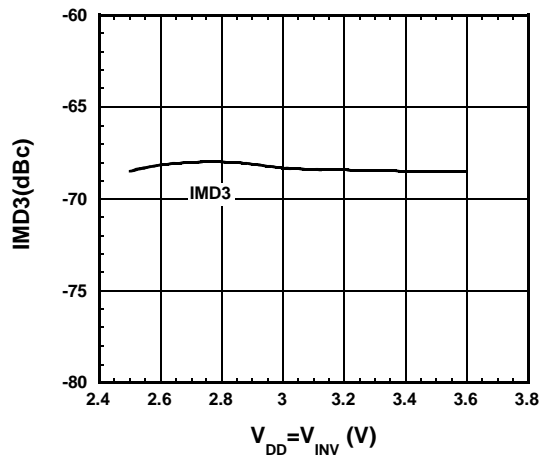
Condition

$T_a = +25^\circ\text{C}$,
 $f = 2140\text{MHz}$,
 $V_{CTL1} = 0\text{V}$, $V_{CTL2} = 0\text{V}$, $V_{CTL3} = 0\text{V}$

NJG1123PB5

■ ELECTRICAL CHARACTERISTICS (2.1GHz band Low Gain Mode)

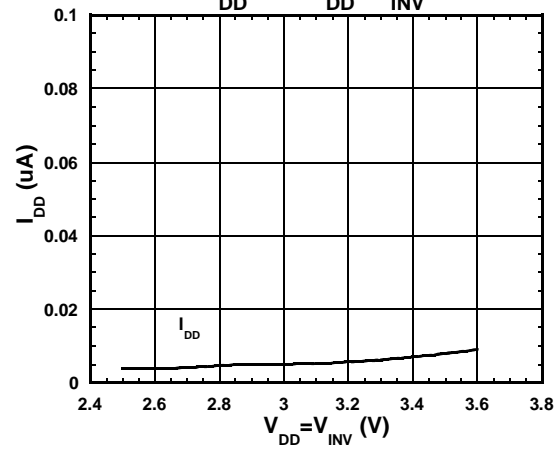
NJG1123PB5 (2.1GHz) @Low Gain
IMD3 vs. V_{DD} , V_{INV}



Condition

$T_a = +25^\circ\text{C}$,
 $f_1 = 2140\text{MHz}$, $f_2 = f_1 + 2140.1\text{MHz}$,
 $P_{in} = -16\text{dBm}$,
 $V_{CTL1} = 0\text{V}$, $V_{CTL2} = 0\text{V}$, $V_{CTL3} = 0\text{V}$

NJG1123PB5 (2.1GHz) @Low Gain
 I_{DD} vs. V_{DD} , V_{INV}

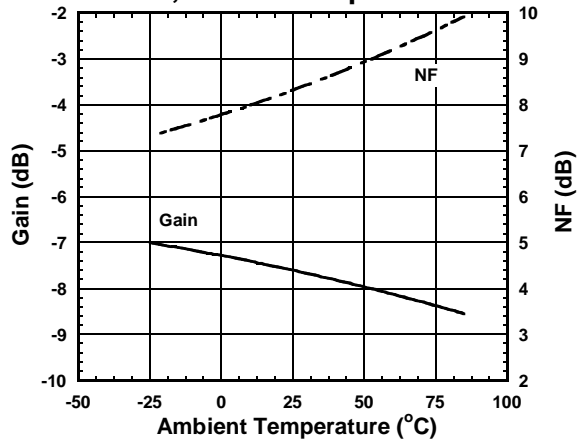


Condition

$T_a = +25^\circ\text{C}$,
RF=OFF,
 $V_{CTL1} = 0\text{V}$, $V_{CTL2} = 0\text{V}$, $V_{CTL3} = 0\text{V}$

■ ELECTRICAL CHARACTERISTICS (2.1GHz band Low Gain Mode)

**NJG1123PB5 (2.1GHz) @Low Gain
Gain, NF vs. Temperature**



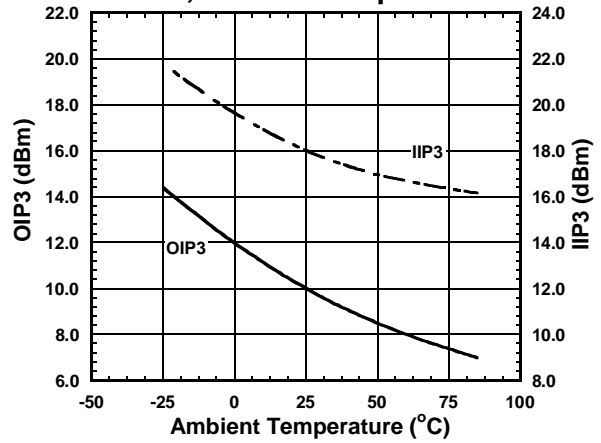
Condition

$$f=2140\text{MHz,}$$

$$V_{DD}=V_{INV}=2.7\text{V,}$$

$$V_{CTL1}=0\text{V, } V_{CTL2}=0\text{V, } V_{CTL3}=0\text{V}$$

**NJG1123PB5 (2.1GHz) @Low Gain
OIP3, IIP3 vs. Temperature**



Condition

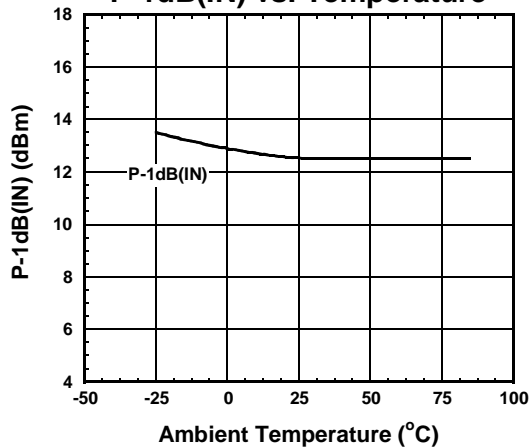
$$f1=2140\text{MHz, } f2=f1+2140.1\text{Hz,}$$

$$\text{Pin}=-16\text{dBm,}$$

$$V_{DD}=V_{INV}=2.7\text{V}$$

$$V_{CTL1}=0\text{V, } V_{CTL2}=0\text{V, } V_{CTL3}=0\text{V}$$

**NJG1123PB5 (2.1GHz) @Low Gain
P-1dB(IN) vs. Temperature**



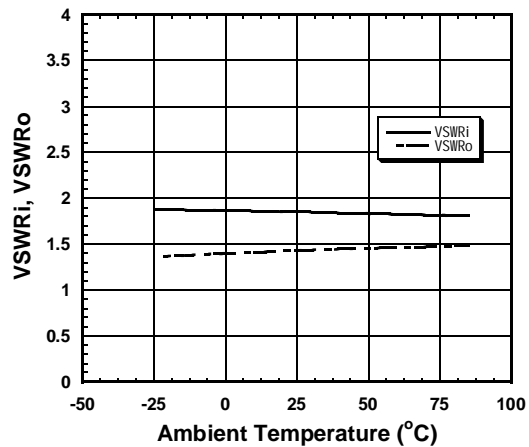
Condition

$$f=2140\text{MHz,}$$

$$V_{DD}=V_{INV}=2.7\text{V}$$

$$V_{CTL1}=0\text{V, } V_{CTL2}=0\text{V, } V_{CTL3}=0\text{V}$$

**NJG1123PB5 (2.1GHz) @Low Gain
VSWR vs. Temperature**



Condition

$$f=2140\text{MHz,}$$

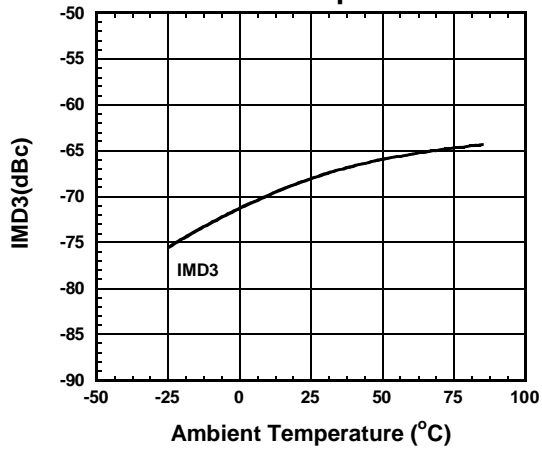
$$V_{DD}=V_{INV}=2.7\text{V}$$

$$V_{CTL1}=0\text{V, } V_{CTL2}=0\text{V, } V_{CTL3}=0\text{V}$$

NJG1123PB5

■ ELECTRICAL CHARACTERISTICS (2.1GHz band Low Gain Mode)

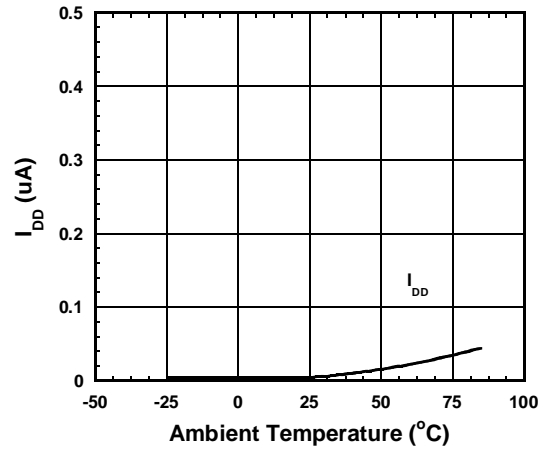
NJG1123PB5 (2.1GHz) @Low Gain
IMD3 vs. Temperature



Condition

$f_1=2140\text{MHz}$, $f_2=f_1+2140.1\text{Hz}$,
 $P_{in}=-16\text{dBm}$,
 $V_{DD}=V_{INV}=2.7\text{V}$
 $V_{CTL1}=0\text{V}$, $V_{CTL2}=0\text{V}$, $V_{CTL3}=0\text{V}$

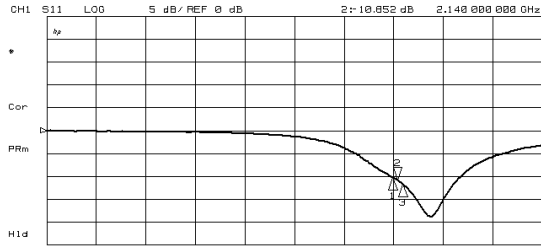
NJG1123PB5 (2.1GHz) @Low Gain
 I_{DD} vs. Temperature



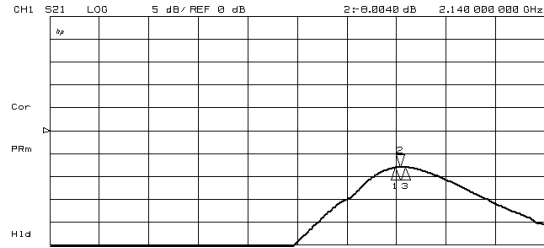
Condition

RF=OFF,
 $V_{DD}=V_{INV}=2.7\text{V}$
 $V_{CTL1}=0\text{V}$, $V_{CTL2}=0\text{V}$, $V_{CTL3}=0\text{V}$

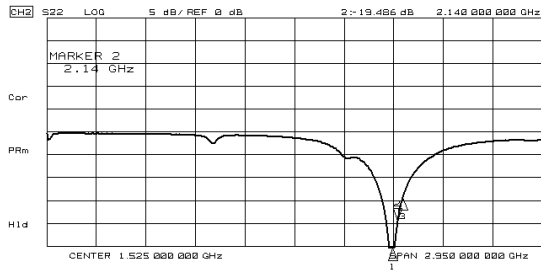
ELECTRICAL CHARACTERISTICS (2.1GHz band Low Gain Mode)



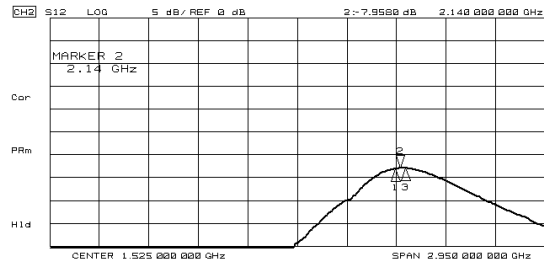
CH1 Markers
 1:-10.191 dB
 2.11000 GHz
 3:-11.615 dB
 2.17000 GHz



CH1 Markers
 1:-6.0900 dB
 2.11000 GHz
 3:-6.0270 dB
 2.17000 GHz



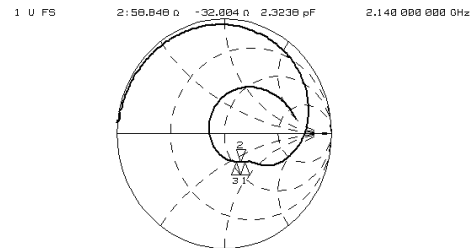
CH2 Markers
 1:-32.524 dB
 2.11000 GHz
 3:-14.482 dB
 2.17000 GHz



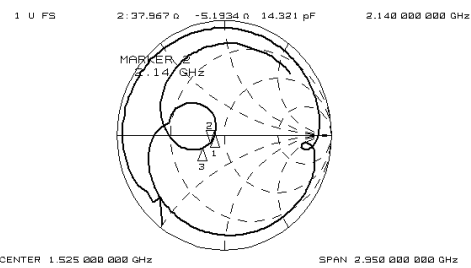
CH2 Markers
 1:-6.0850 dB
 2.11000 GHz
 3:-6.0280 dB
 2.17000 GHz



CH1 Markers
 1:1.0150
 2.11000 GHz
 3:1.7501
 2.17000 GHz

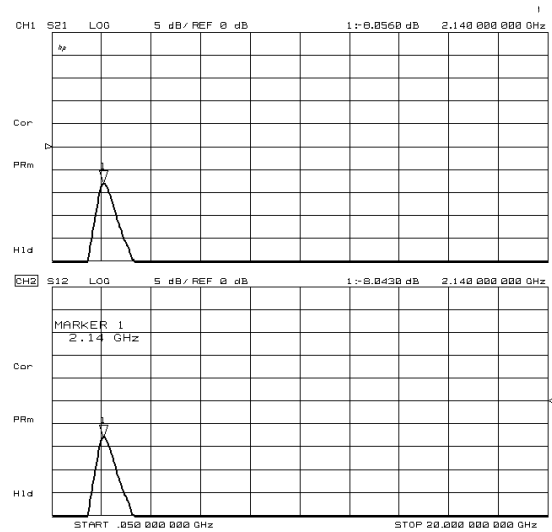
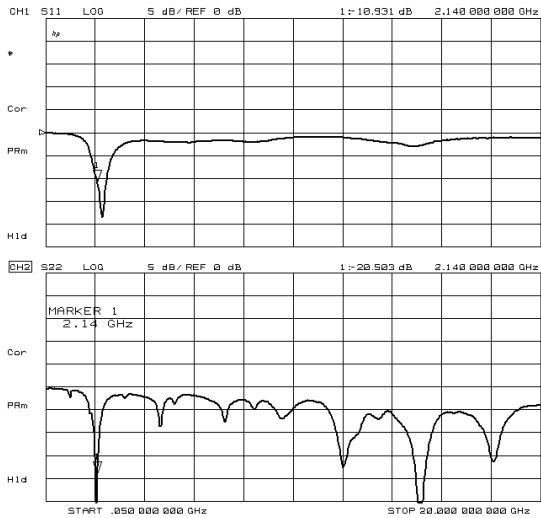


CH2 Markers
 1:1.1909
 2.11000 GHz
 3:1.6042
 2.17000 GHz

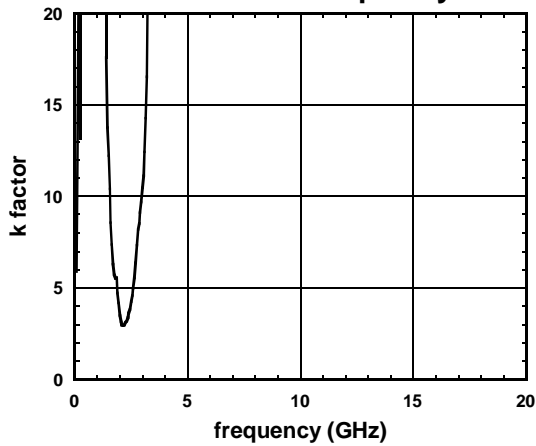


NJG1123PB5

■ ELECTRICAL CHARACTERISTICS (2.1GHz band Low Gain Mode)

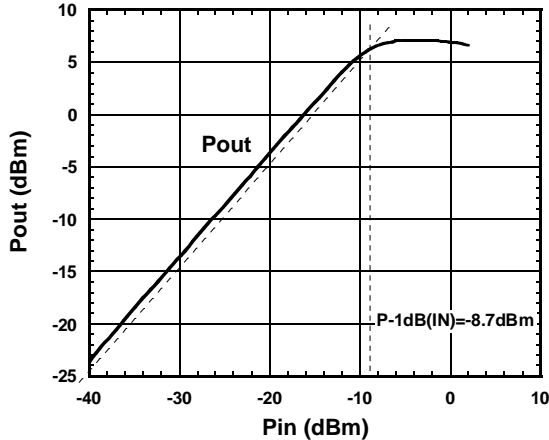


NJG1123PB5 (2.1GHz) @Low Gain
k factor vs. frequency



■ ELECTRICAL CHARACTERISTICS (800MHz band High Gain Mode)

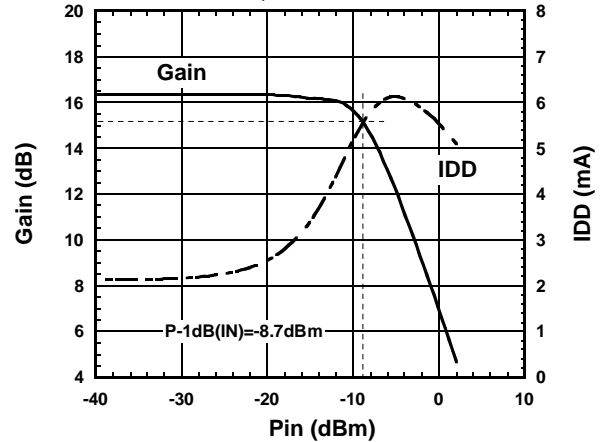
**NJG1123PB5 (800MHz) @High Gain
Pout vs. Pin**



Condition

$T_a = +25^\circ\text{C}$,
 $f = 885\text{MHz}$,
 $V_{DD} = V_{INV} = 2.7\text{V}$,
 $V_{CTL1} = 1.85\text{V}$, $V_{CTL2} = 0\text{V}$, $V_{CTL3} = 1.85\text{V}$

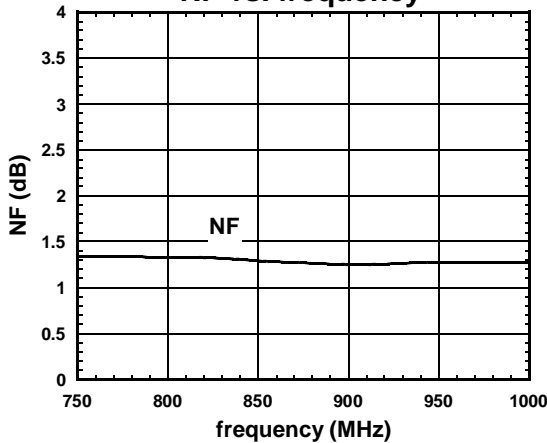
**NJG1123PB5 (800MHz) @High Gain
Gain, IDD vs. Pin**



Condition

$T_a = +25^\circ\text{C}$,
 $f = 885\text{MHz}$,
 $V_{DD} = V_{INV} = 2.7\text{V}$,
 $V_{CTL1} = 1.85\text{V}$, $V_{CTL2} = 0\text{V}$, $V_{CTL3} = 1.85\text{V}$

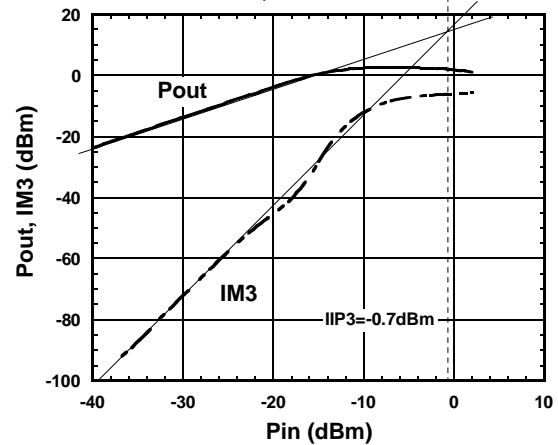
**NJG1123PB5 (800MHz) @High Gain
NF vs. frequency**



Condition

$T_a = +25^\circ\text{C}$,
 $f = 750\text{M} \sim 1\text{GHz}$,
 $V_{DD} = V_{INV} = 2.7\text{V}$,
 $V_{CTL1} = 1.85\text{V}$, $V_{CTL2} = 0\text{V}$, $V_{CTL3} = 1.85\text{V}$

**NJG1123PB5 (800MHz) @High Gain
Pout, IM3 vs. Pin**



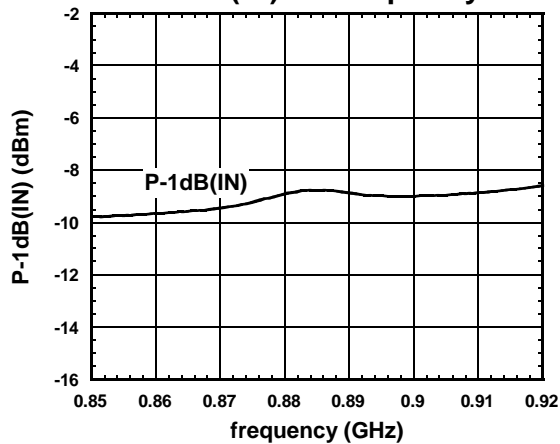
Condition

$T_a = +25^\circ\text{C}$,
 $f_1 = 885\text{MHz}$, $f_2 = f_1 + 100\text{kHz}$,
 $V_{DD} = V_{INV} = 2.7\text{V}$,
 $V_{CTL1} = 1.85\text{V}$, $V_{CTL2} = 0\text{V}$, $V_{CTL3} = 1.85\text{V}$

NJG1123PB5

■ ELECTRICAL CHARACTERISTICS (800MHz band High Gain Mode)

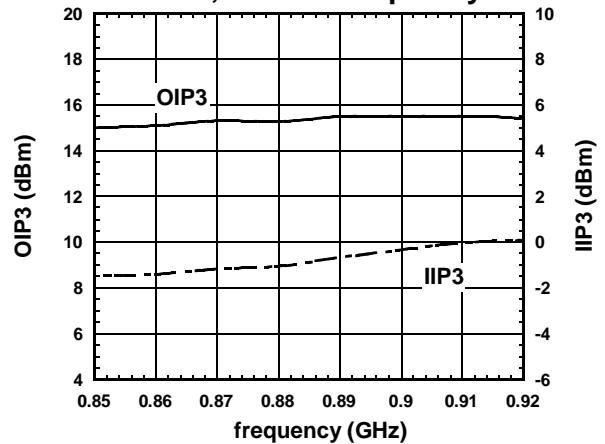
NJG1123PB5 (800MHz) @High Gain
P-1dB(IN) vs. frequency



Condition

$T_a = +25^\circ\text{C}$,
 $f = 850\text{--}920\text{MHz}$,
 $V_{DD} = V_{INV} = 2.7\text{V}$,
 $V_{CTL1} = 1.85\text{V}$, $V_{CTL2} = 0\text{V}$, $V_{CTL3} = 1.85\text{V}$

NJG1123PB5 (800MHz) @High Gain
OIP3, IIP3 vs. frequency

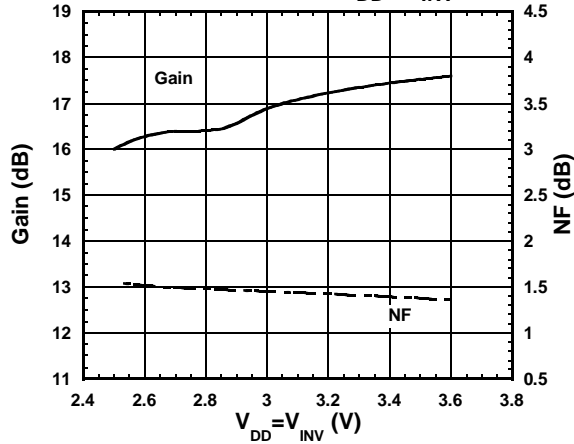


Condition

$T_a = +25^\circ\text{C}$,
 $f_1 = 850\text{--}920\text{MHz}$, $f_2 = f_1 + 100\text{kHz}$,
 $\text{Pin} = -30\text{dBm}$,
 $V_{DD} = V_{INV} = 2.7\text{V}$,
 $V_{CTL1} = 1.85\text{V}$, $V_{CTL2} = 0\text{V}$, $V_{CTL3} = 1.85\text{V}$

■ ELECTRICAL CHARACTERISTICS (800MHz band High Gain Mode)

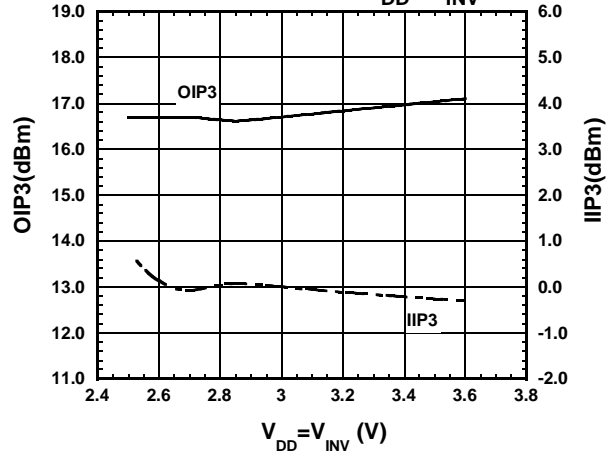
NJG1123PB5 (800MHz) @High Gain
Gain, NF vs. V_{DD} , V_{INV}



Condition

T_a=+25°C,
f=885MHz,
V_{CTL1}=1.85V, V_{CTL2}=0V, V_{CTL3}=1.85V

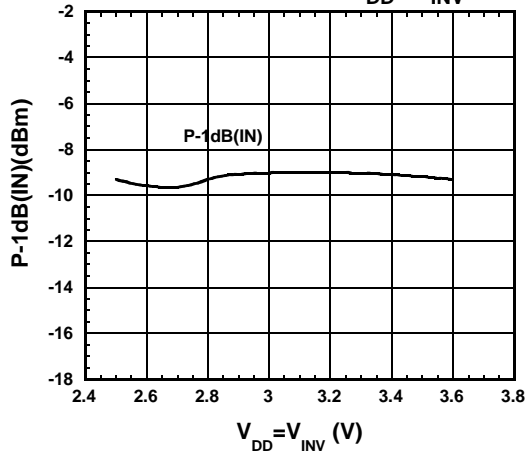
NJG1123PB5 (800MHz) @High Gain
OIP3, IIP3 vs. V_{DD} , V_{INV}



Condition

T_a=+25°C,
f₁=885MHz, f₂=f₁+100kHz,
Pin=-30dBm,
V_{CTL1}=1.85V, V_{CTL2}=0V, V_{CTL3}=1.85V

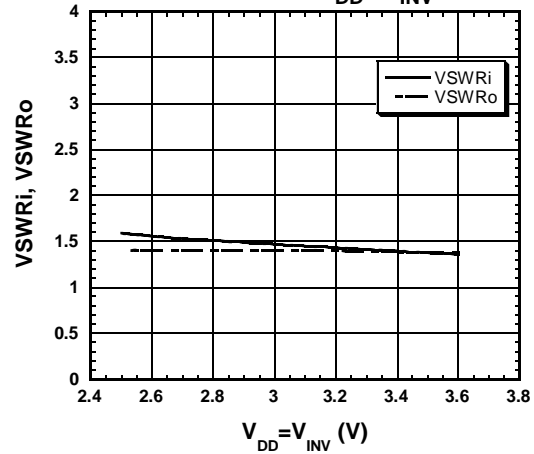
NJG1123PB5 (800MHz) @High Gain
P-1dB(IN) vs. V_{DD} , V_{INV}



Condition

T_a=+25°C,
f=885MHz,
V_{CTL1}=1.85V, V_{CTL2}=0V, V_{CTL3}=1.85V

NJG1123PB5 (800MHz) @High Gain
VSWRi, VSWRo vs. V_{DD} , V_{INV}

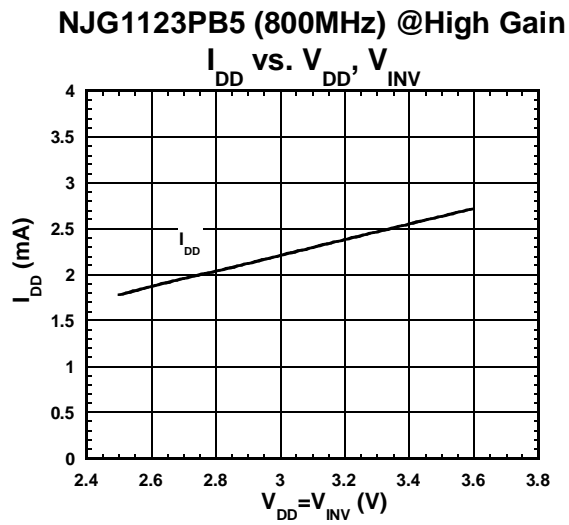


Condition

T_a=+25°C,
f=885MHz,
V_{CTL1}=1.85V, V_{CTL2}=0V, V_{CTL3}=1.85V

NJG1123PB5

■ ELECTRICAL CHARACTERISTICS (800MHz band High Gain Mode)



Condition

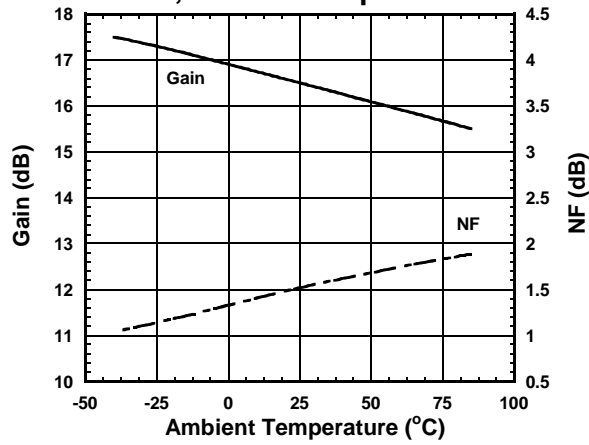
$T_a = +25^\circ\text{C}$,

RF=OFF

$V_{CTL1} = 1.85\text{V}$, $V_{CTL2} = 0\text{V}$, $V_{CTL3} = 1.85\text{V}$

■ ELECTRICAL CHARACTERISTICS (800MHz band High Gain Mode)

**NJG1123PB5 (800MHz) @High Gain
Gain, NF vs. Temperature**



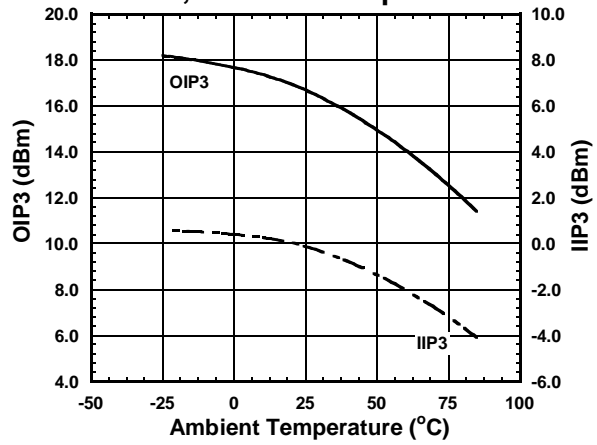
Condition

$f=885\text{MHz}$,

$V_{DD}=V_{INV}=2.7\text{V}$,

$V_{CTL1}=1.85\text{V}$, $V_{CTL2}=0\text{V}$, $V_{CTL3}=1.85\text{V}$

**NJG1123PB5 (800MHz) @High Gain
OIP3, IIP3 vs. Temperature**



Condition

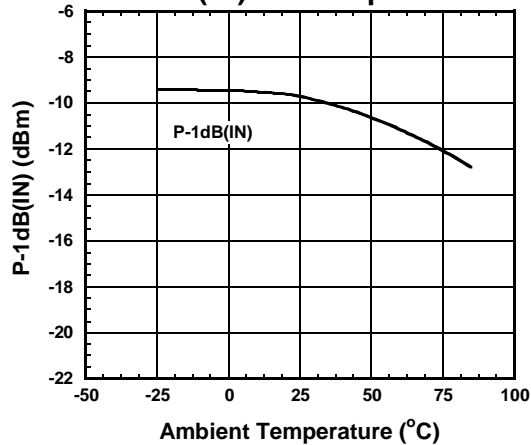
$f1=885\text{MHz}$, $f2=f1+100\text{kHz}$,

$P_{in}=-30\text{dBm}$,

$V_{DD}=V_{INV}=2.7\text{V}$,

$V_{CTL1}=1.85\text{V}$, $V_{CTL2}=0\text{V}$, $V_{CTL3}=1.85\text{V}$

**NJG1123PB5 (800MHz) @High Gain
P-1dB(IN) vs. Temperature**



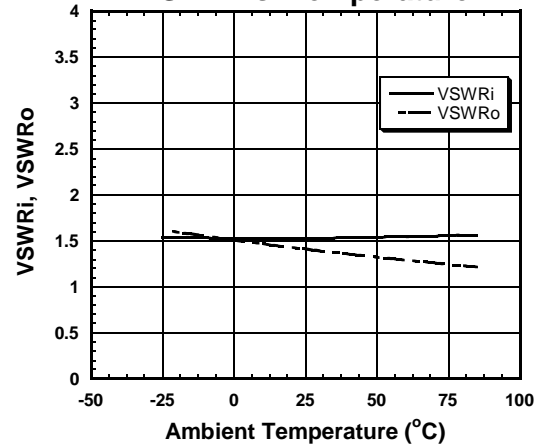
Condition

$f=885\text{MHz}$,

$V_{DD}=V_{INV}=2.7\text{V}$,

$V_{CTL1}=1.85\text{V}$, $V_{CTL2}=0\text{V}$, $V_{CTL3}=1.85\text{V}$

**NJG1123PB5 (800MHz) @High Gain
VSWR vs. Temperature**



Condition

$f=885\text{MHz}$,

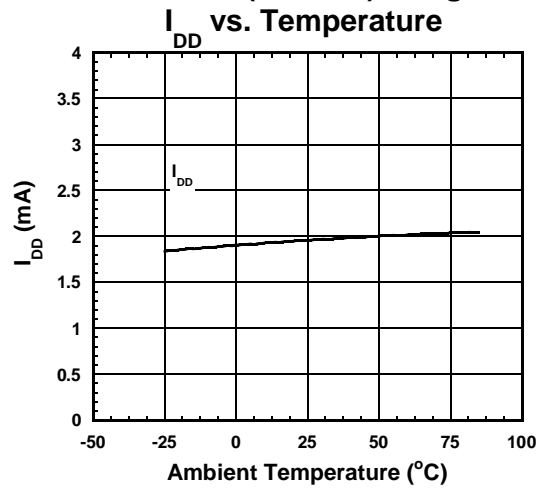
$V_{DD}=V_{INV}=2.7\text{V}$,

$V_{CTL1}=1.85\text{V}$, $V_{CTL2}=0\text{V}$, $V_{CTL3}=1.85\text{V}$

NJG1123PB5

■ ELECTRICAL CHARACTERISTICS (800MHz band High Gain Mode)

NJG1123PB5 (800MHz) @High Gain



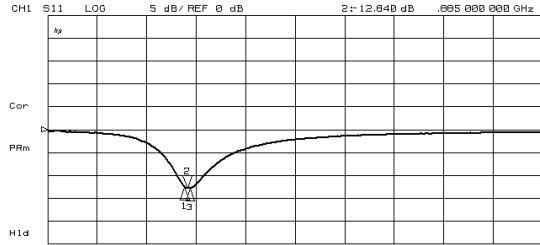
Condition

RF=OFF

$V_{DD} = V_{INV} = 2.7V$,

$V_{CTL1} = 1.85V$, $V_{CTL2} = 0V$, $V_{CTL3} = 1.85V$

ELECTRICAL CHARACTERISTICS (800MHz band High Gain Mode)



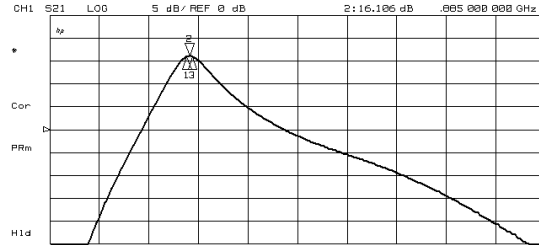
CH1 Markers

1:-12.554 dB

869.000 MHz

3:-12.845 dB

900.000 MHz



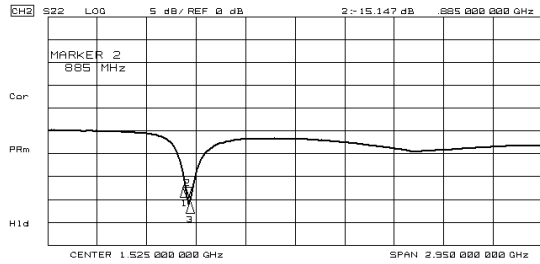
CH1 Markers

1:16.014 dB

869.000 MHz

3:16.974 dB

900.000 MHz



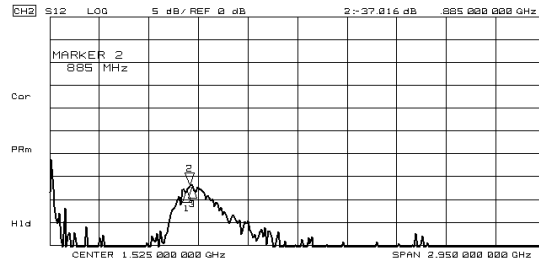
CH2 Markers

1:-11.703 dB

869.000 MHz

3:-15.208 dB

900.000 MHz



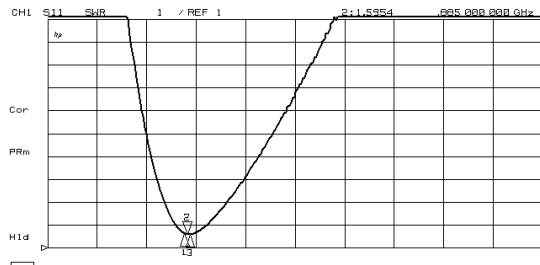
CH2 Markers

1:-37.872 dB

869.000 MHz

3:-36.836 dB

900.000 MHz



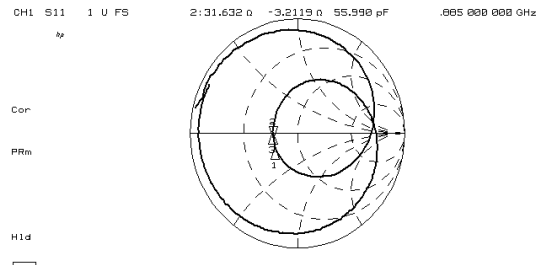
CH1 Markers

1:1.6300

869.000 MHz

3:1.6002

900.000 MHz



CH1 Markers

1:32.041 n

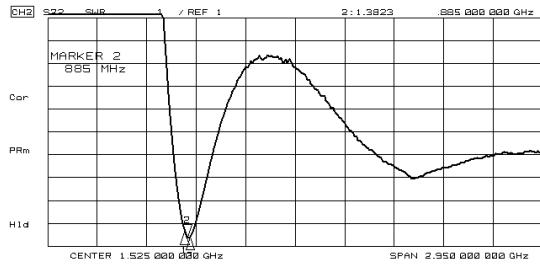
+8.1367 n

869.000 MHz

3:31.272 n

1.1689 n

900.000 MHz



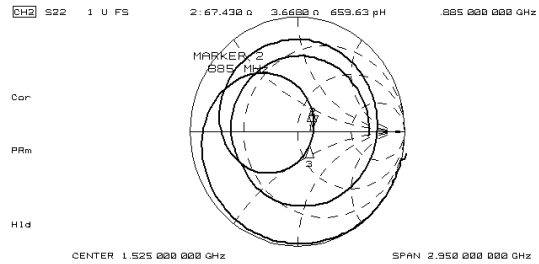
CH2 Markers

1:1.6329

869.000 MHz

3:1.4032

900.000 MHz



CH2 Markers

1:59.527 n

25.037 n

869.000 MHz

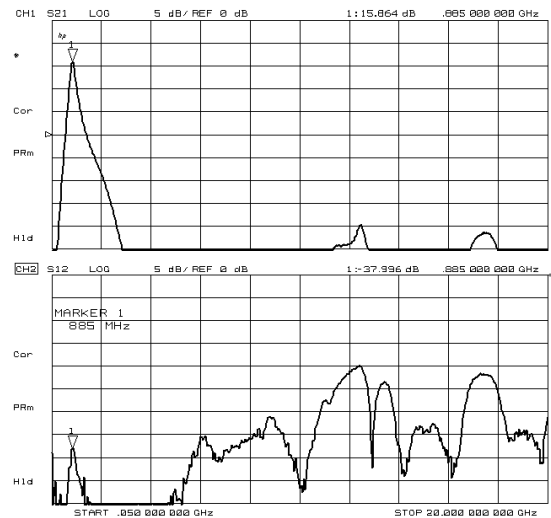
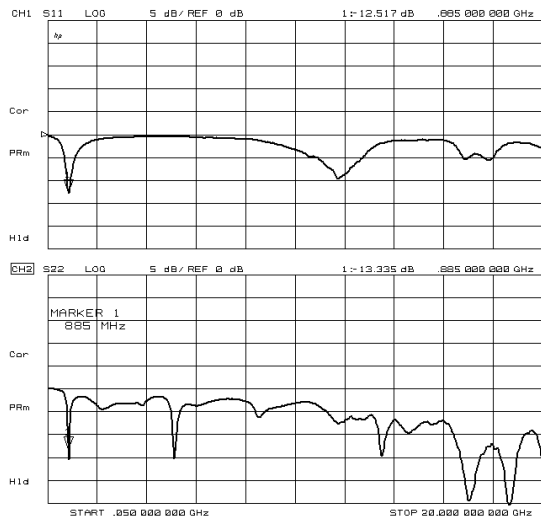
2:60.000 n

-15.320 n

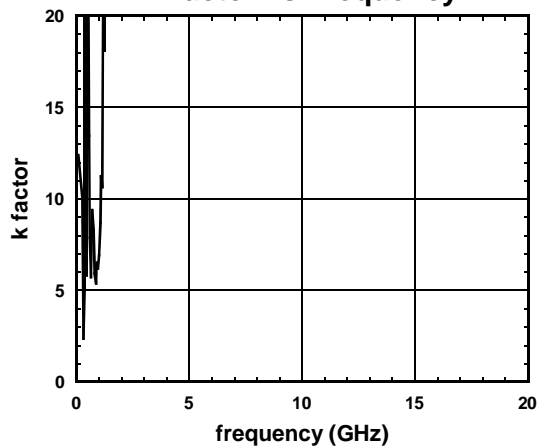
900.000 MHz

NJG1123PB5

■ ELECTRICAL CHARACTERISTICS (800MHz band High Gain Mode)

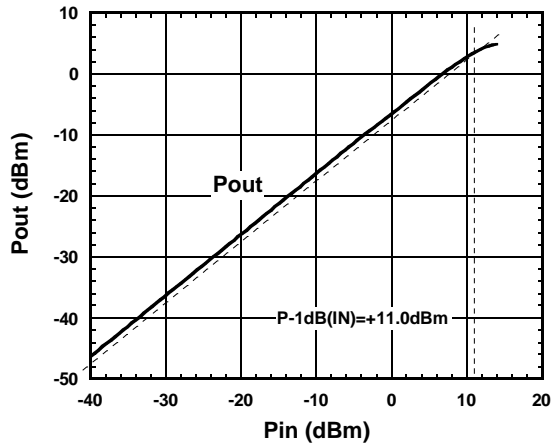


**NJG1123PB5 (800MHz) @High Gain
k factor vs. frequency**



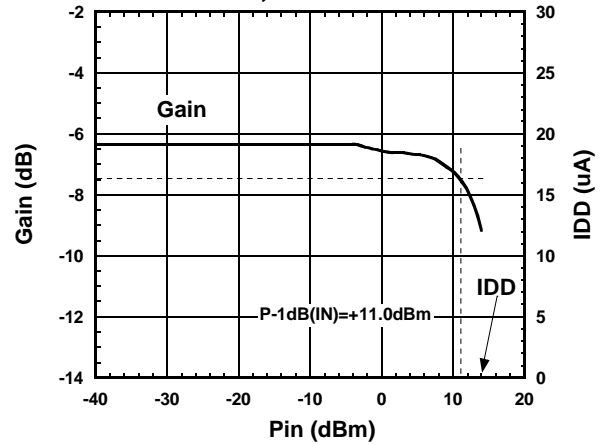
■ ELECTRICAL CHARACTERISTICS (800MHz band Low Gain Mode)

**NJG1123PB5 (800MHz) @Low Gain
Pout vs. Pin**



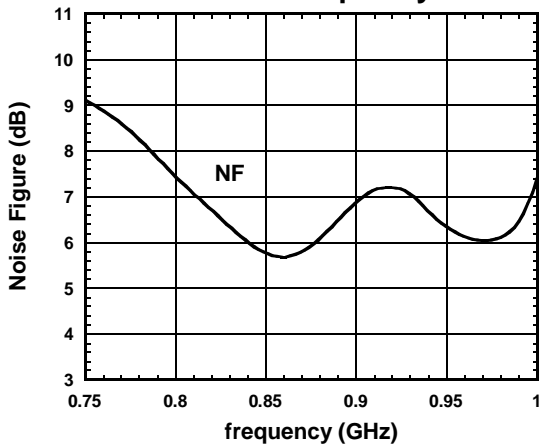
Condition
 $T_a = +25^\circ\text{C}$,
 $f = 885\text{MHz}$,
 $V_{DD} = V_{INV} = 2.7\text{V}$,
 $V_{CTL1} = 1.85\text{V}$, $V_{CTL2} = 0\text{V}$, $V_{CTL3} = 0\text{V}$

**NJG1123PB5 (800MHz) @Low Gain
Gain, IDD vs. Pin**



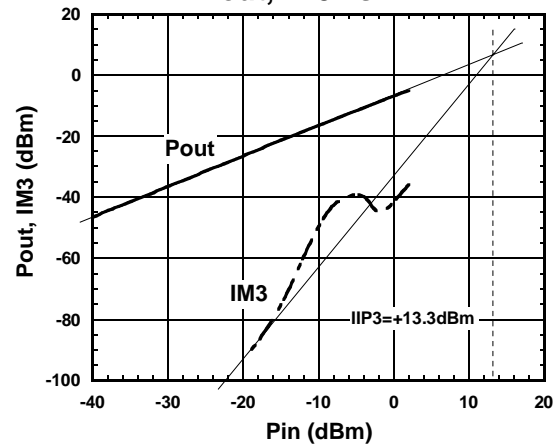
Condition
 $T_a = +25^\circ\text{C}$,
 $f = 885\text{MHz}$,
 $V_{DD} = V_{INV} = 2.7\text{V}$,
 $V_{CTL1} = 1.85\text{V}$, $V_{CTL2} = 0\text{V}$, $V_{CTL3} = 0\text{V}$

**NJG1123PB5 (800MHz) @Low Gain
NF vs. frequency**



Condition
 $T_a = +25^\circ\text{C}$,
 $f = 750\sim 1\text{GHz}$,
 $V_{DD} = V_{INV} = 2.7\text{V}$,
 $V_{CTL1} = 1.85\text{V}$, $V_{CTL2} = 0\text{V}$, $V_{CTL3} = 0\text{V}$

**NJG1123PB5 (800MHz) @Low Gain
Pout, IM3 vs. Pin**

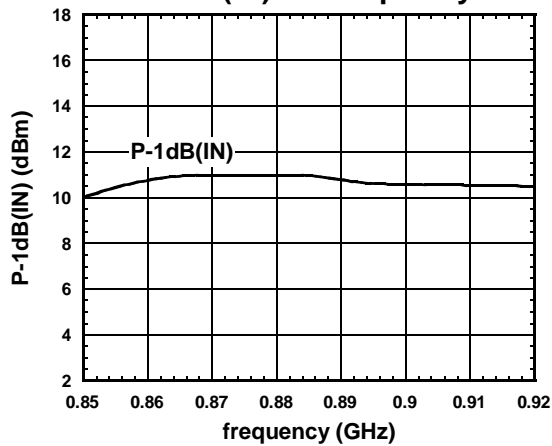


Condition
 $T_a = +25^\circ\text{C}$,
 $f_1 = 885\text{MHz}$, $f_2 = f_1 + 100\text{kHz}$,
 $V_{DD} = V_{INV} = 2.7\text{V}$,
 $V_{CTL1} = 1.85\text{V}$, $V_{CTL2} = 0\text{V}$, $V_{CTL3} = 0\text{V}$

NJG1123PB5

■ ELECTRICAL CHARACTERISTICS (800MHz band Low Gain Mode)

NJG1123PB5 (800MHz) @Low Gain
P-1dB(IN) vs. frequency



Condition

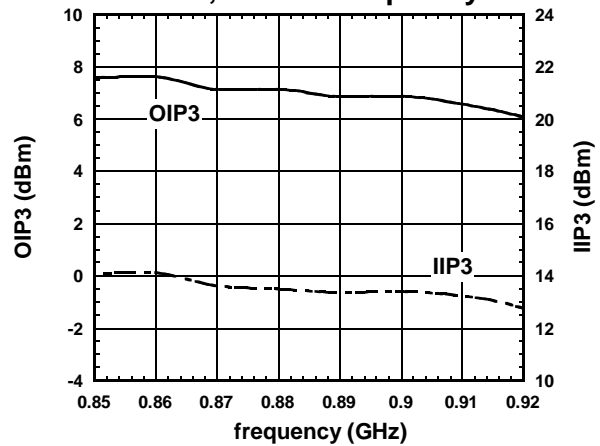
$T_a = +25^\circ\text{C}$,

$f = 850 \sim 920\text{MHz}$,

$V_{DD} = V_{INV} = 2.7\text{V}$,

$V_{CTL1} = 1.85\text{V}$, $V_{CTL2} = 0\text{V}$, $V_{CTL3} = 0\text{V}$

NJG1123PB5 (800MHz) @Low Gain
OIP3, IIP3 vs. frequency



Condition

$T_a = +25^\circ\text{C}$

$f_1 = 850 \sim 920\text{MHz}$, $f_2 = f_1 + 100\text{kHz}$,

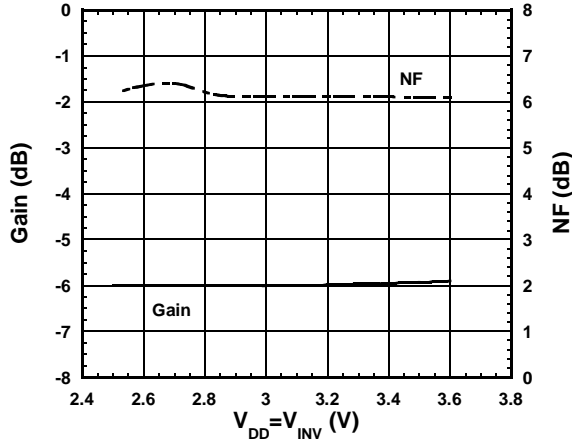
$P_{in} = -20\text{dBm}$,

$V_{DD} = V_{INV} = 2.7\text{V}$,

$V_{CTL1} = 1.85\text{V}$, $V_{CTL2} = 0\text{V}$, $V_{CTL3} = 0\text{V}$

ELECTRICAL CHARACTERISTICS (800MHz band Low Gain Mode)

NJG1123PB5 (800MHz) @Low Gain
Gain, NF vs. V_{DD} , V_{INV}



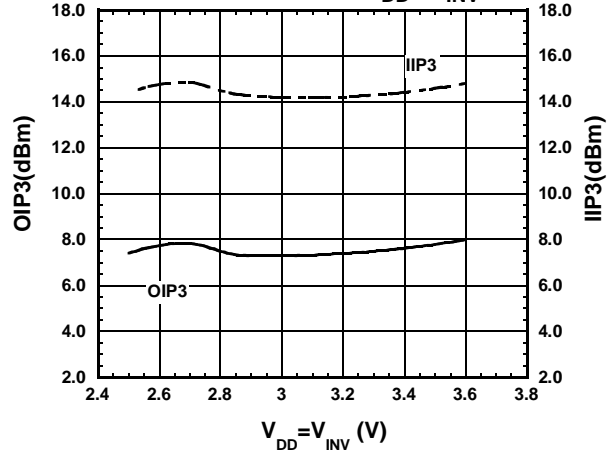
Condition

$T_a = +25^\circ\text{C}$,

$f = 885\text{MHz}$,

$V_{CTL1} = 1.85\text{V}$, $V_{CTL2} = 0\text{V}$, $V_{CTL3} = 0\text{V}$

NJG1123PB5 (800MHz) @Low Gain
OIP3, IIP3 vs. V_{DD} , V_{INV}



Condition

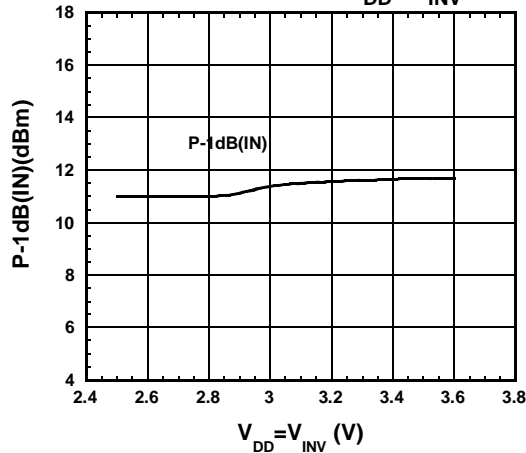
$T_a = +25^\circ\text{C}$,

$f_1 = 885\text{MHz}$, $f_2 = f_1 + 100\text{kHz}$,

$P_{in} = -20\text{dBm}$,

$V_{CTL1} = 1.85\text{V}$, $V_{CTL2} = 0\text{V}$, $V_{CTL3} = 0\text{V}$

NJG1123PB5 (800MHz) @Low Gain
P-1dB(IN) vs. V_{DD} , V_{INV}



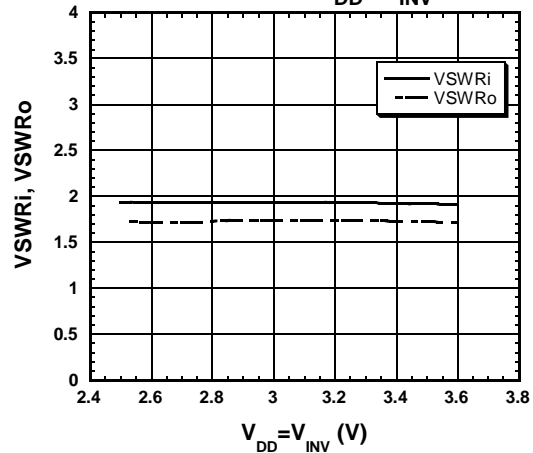
Condition

$T_a = +25^\circ\text{C}$,

$f = 885\text{MHz}$,

$V_{CTL1} = 1.85\text{V}$, $V_{CTL2} = 0\text{V}$, $V_{CTL3} = 0\text{V}$

NJG1123PB5 (800MHz) @Low Gain
VSWR vs. V_{DD} , V_{INV}



Condition

$T_a = +25^\circ\text{C}$,

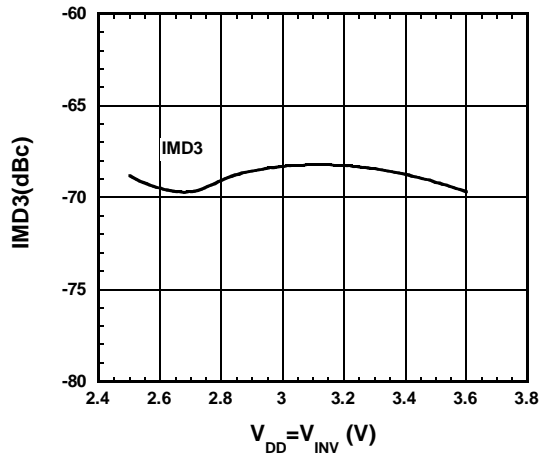
$f = 885\text{MHz}$,

$V_{CTL1} = 1.85\text{V}$, $V_{CTL2} = 0\text{V}$, $V_{CTL3} = 0\text{V}$

NJG1123PB5

■ ELECTRICAL CHARACTERISTICS (800MHz band Low Gain Mode)

NJG1123PB5 (800MHz) @Low Gain
IMD3 vs. V_{DD} , V_{INV}



Condition

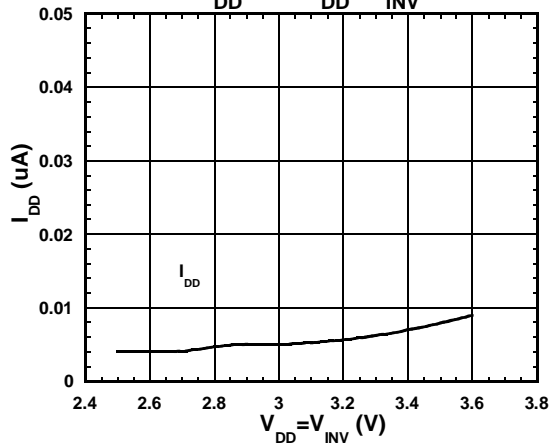
$T_a = +25^\circ\text{C}$,

$f_1 = 885\text{MHz}$, $f_2 = f_1 + 100\text{kHz}$,

$P_{in} = -20\text{dBm}$,

$V_{CTL1} = 1.85\text{V}$, $V_{CTL2} = 0\text{V}$, $V_{CTL3} = 0\text{V}$

NJG1123PB5 (800MHz) @Low Gain
 I_{DD} vs. V_{DD} , V_{INV}



Condition

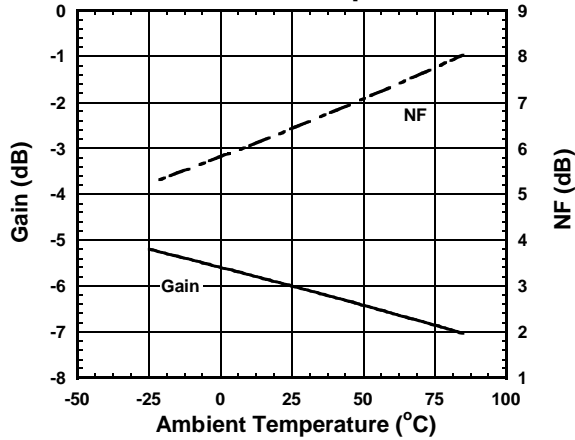
$T_a = +25^\circ\text{C}$,

RF=OFF

$V_{CTL1} = 1.85\text{V}$, $V_{CTL2} = 0\text{V}$, $V_{CTL3} = 0\text{V}$

■ ELECTRICAL CHARACTERISTICS (800MHz band Low Gain Mode)

**NJG1123PB5 (800MHz) @Low Gain
Gain, NF vs. Temperature**



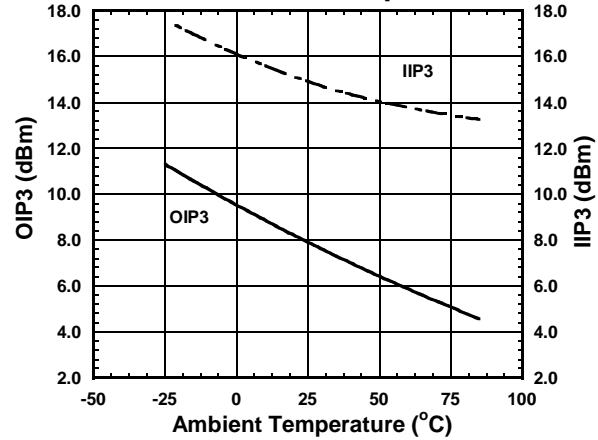
Condition

$f=885\text{MHz}$,

$V_{DD}=V_{INV}=2.7\text{V}$,

$V_{CTL1}=1.85\text{V}$, $V_{CTL2}=0\text{V}$, $V_{CTL3}=0\text{V}$

**NJG1123PB5 (800MHz) @Low Gain
OIP3, IIP3 vs. Temperature**



Condition

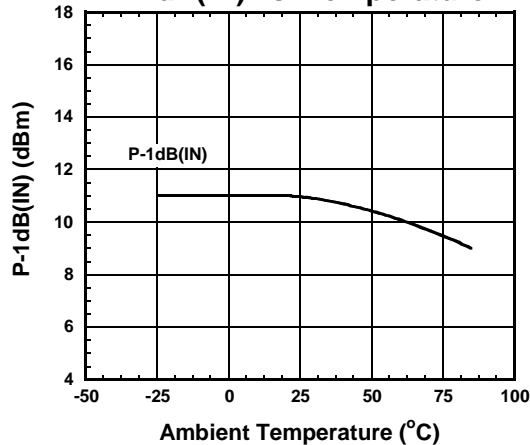
$f1=885\text{MHz}$, $f2=f1+100\text{kHz}$,

$P_{in}=-20\text{dBm}$,

$V_{DD}=V_{INV}=2.7\text{V}$,

$V_{CTL1}=1.85\text{V}$, $V_{CTL2}=0\text{V}$, $V_{CTL3}=0\text{V}$

**NJG1123PB5 (800MHz) @Low Gain
P-1dB(IN) vs. Temperature**



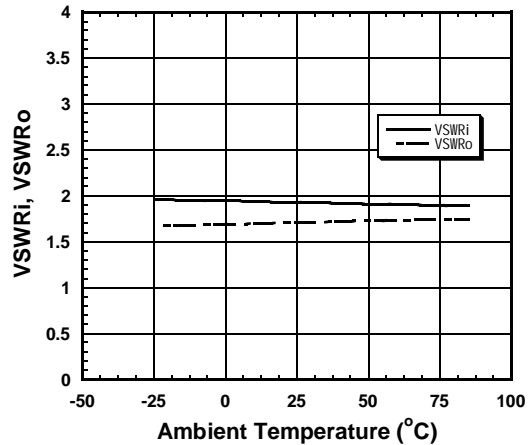
Condition

$f=885\text{MHz}$,

$V_{DD}=V_{INV}=2.7\text{V}$,

$V_{CTL1}=1.85\text{V}$, $V_{CTL2}=0\text{V}$, $V_{CTL3}=0\text{V}$

**NJG1123PB5 (800MHz) @Low Gain
VSWRi, VSWRo vs. Temperature**



Condition

$f=885\text{MHz}$,

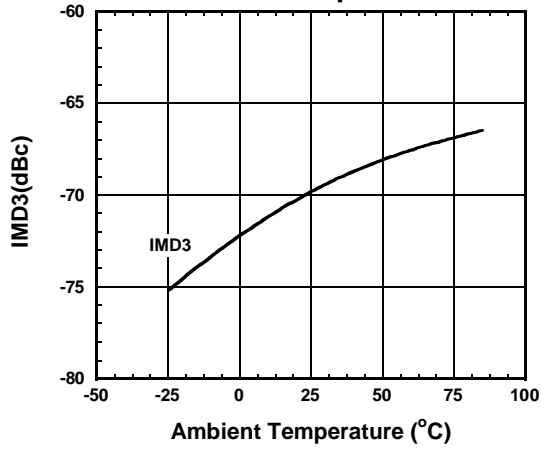
$V_{DD}=V_{INV}=2.7\text{V}$,

$V_{CTL1}=1.85\text{V}$, $V_{CTL2}=0\text{V}$, $V_{CTL3}=0\text{V}$

NJG1123PB5

■ ELECTRICAL CHARACTERISTICS (800MHz band Low Gain Mode)

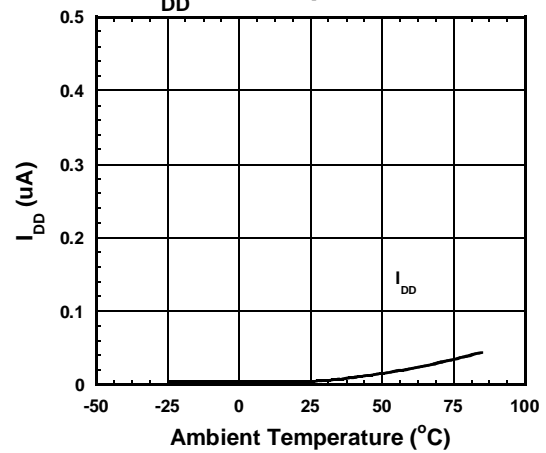
NJG1123PB5 (800MHz) @Low Gain
IMD3 vs. Temperature



Condition

$f_1=885\text{MHz}$, $f_2=f_1+100\text{kHz}$,
 $P_{in}=-20\text{dBm}$,
 $V_{DD}=V_{INV}=2.7\text{V}$,
 $V_{CTL1}=1.85\text{V}$, $V_{CTL2}=0\text{V}$, $V_{CTL3}=0\text{V}$

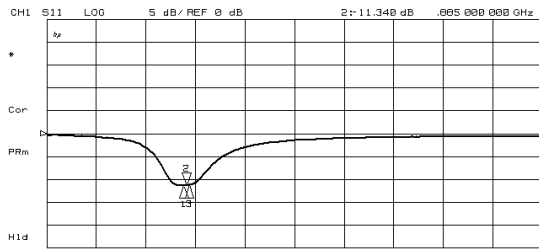
NJG1123PB5 (800MHz) @Low Gain
 I_{DD} vs. Temperature



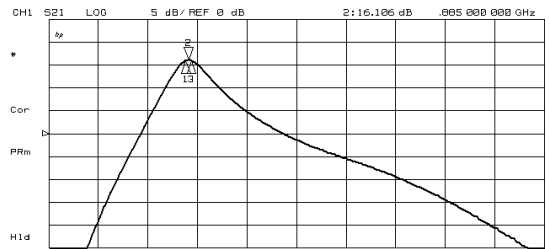
Condition

RF=OFF
 $V_{DD}=V_{INV}=2.7\text{V}$,
 $V_{CTL1}=1.85\text{V}$, $V_{CTL2}=0\text{V}$, $V_{CTL3}=0\text{V}$

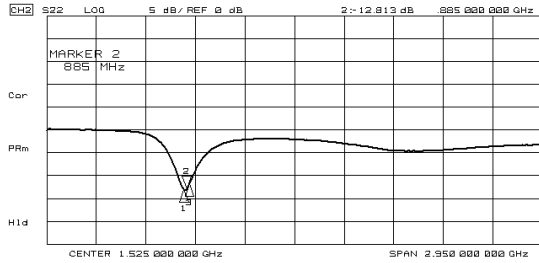
ELECTRICAL CHARACTERISTICS (800MHz band Low Gain Mode)



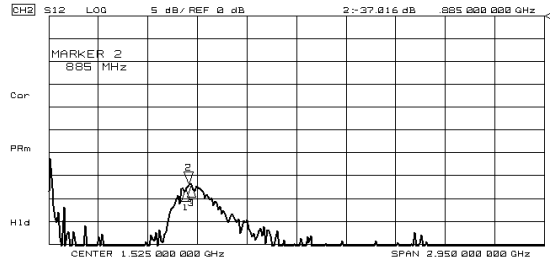
CH1 Markers
 1: -11.353 dB
 865.000 MHz
 3: -11.209 dB
 900.000 MHz



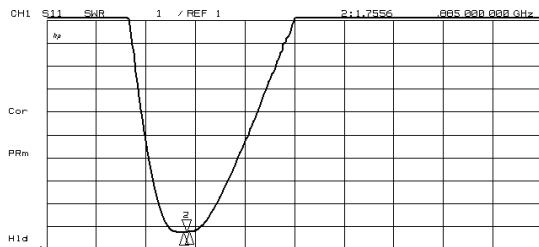
CH1 Markers
 1: 16.014 dB
 865.000 MHz
 3: 15.974 dB
 900.000 MHz



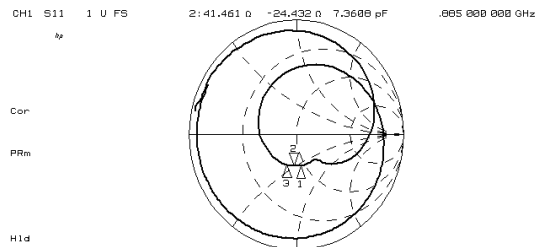
CH2 Markers
 1: -13.123 dB
 869.000 MHz
 3: -11.863 dB
 900.000 MHz



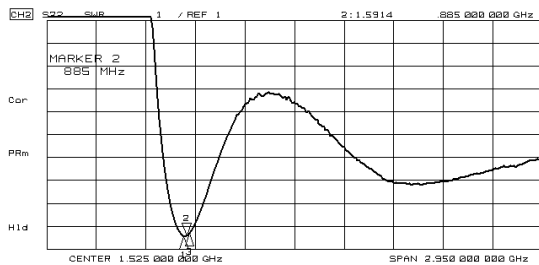
CH2 Markers
 1: -37.872 dB
 869.000 MHz
 3: -36.936 dB
 900.000 MHz



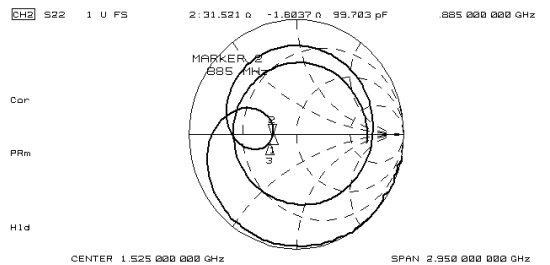
CH1 Markers
 1: 1.7450
 865.000 MHz
 3: 1.7630
 900.000 MHz



CH1 Markers
 1: 46.980 Ω
 -27.143 Ω
 869.000 MHz
 3: 36.865 Ω
 -20.889 Ω
 900.000 MHz



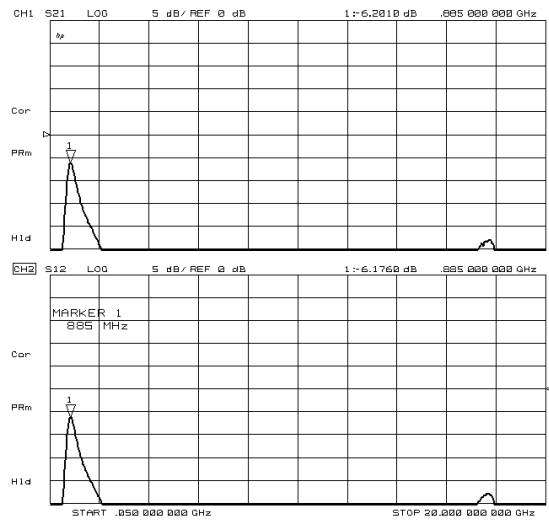
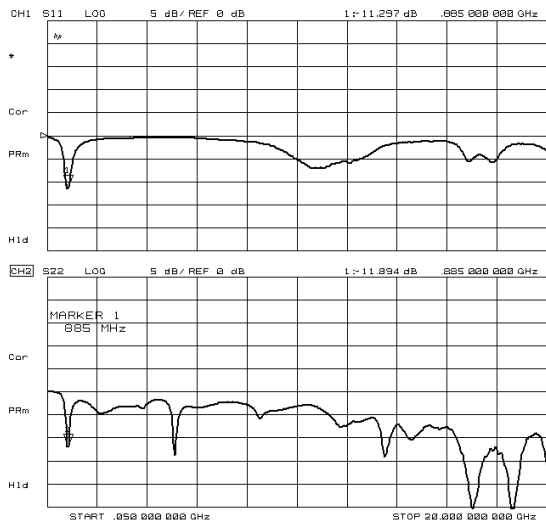
CH2 Markers
 1: 1.5539
 869.000 MHz
 3: 1.6917
 900.000 MHz



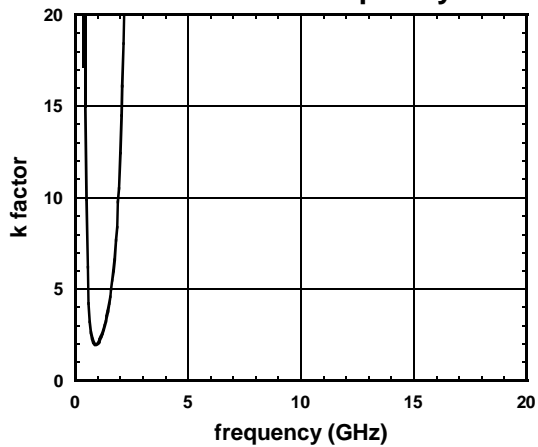
CH2 Markers
 1: 32.256 Ω
 1.7070 Ω
 869.000 MHz
 3: 29.899 Ω
 -4.2477 Ω
 900.000 MHz

NJG1123PB5

ELECTRICAL CHARACTERISTICS (800MHz band Low Gain Mode)

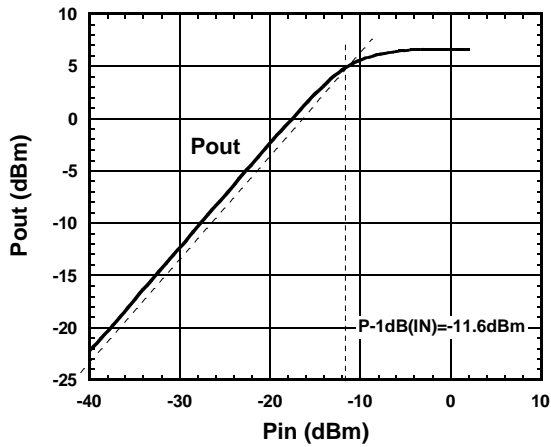


NJG1123PB5 (800MHz) @Low Gain k factor vs. frequency



ELECTRICAL CHARACTERISTICS (1.7GHz band High Gain Mode)

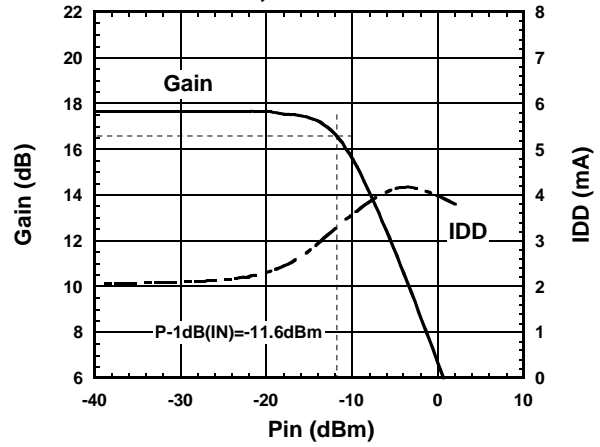
**NJG1123PB5 (1.7GHz) @High Gain
Pout vs. Pin**



Condition

$T_a=+25^{\circ}\text{C}$,
 $f=1860\text{MHz}$,
 $V_{DD}=V_{INV}=2.7\text{V}$,
 $V_{CTL1}=0\text{V}$, $V_{CTL2}=1.85\text{V}$, $V_{CTL3}=1.85\text{V}$

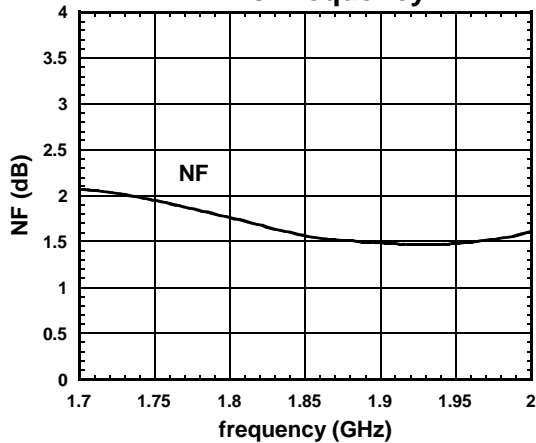
**NJG1123PB5 (1.7GHz) @High Gain
Gain, IDD vs. Pin**



Condition

$T_a=+25^{\circ}\text{C}$,
 $f=1860\text{MHz}$,
 $V_{DD}=V_{INV}=2.7\text{V}$,
 $V_{CTL1}=0\text{V}$, $V_{CTL2}=1.85\text{V}$, $V_{CTL3}=1.85\text{V}$

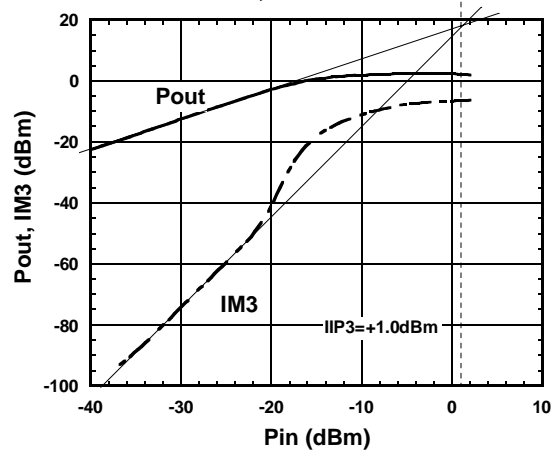
**NJG1123PB5 (1.7GHz) @High Gain
NF vs. frequency**



Condition

$T_a=+25^{\circ}\text{C}$,
 $f=1.7\sim 2\text{GHz}$,
 $V_{DD}=V_{INV}=2.7\text{V}$,
 $V_{CTL1}=0\text{V}$, $V_{CTL2}=1.85\text{V}$, $V_{CTL3}=1.85\text{V}$

**NJG1123PB5 (1.7GHz) @High Gain
Pout, IM3 vs. Pin**



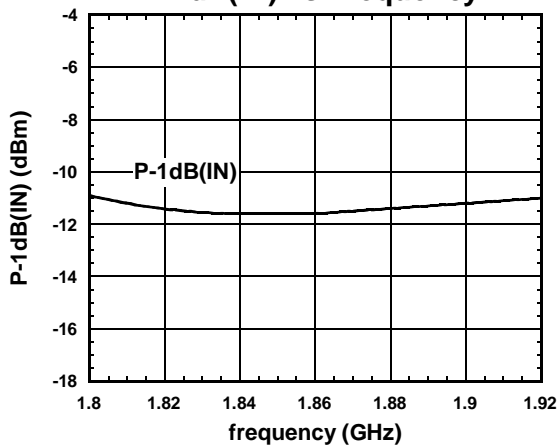
Condition

$T_a=+25^{\circ}\text{C}$,
 $f1=1860\text{MHz}$, $f2=f1+100\text{kHz}$,
 $V_{DD}=V_{INV}=2.7\text{V}$,
 $V_{CTL1}=0\text{V}$, $V_{CTL2}=1.85\text{V}$, $V_{CTL3}=1.85\text{V}$

NJG1123PB5

■ ELECTRICAL CHARACTERISTICS (1.7GHz band High Gain Mode)

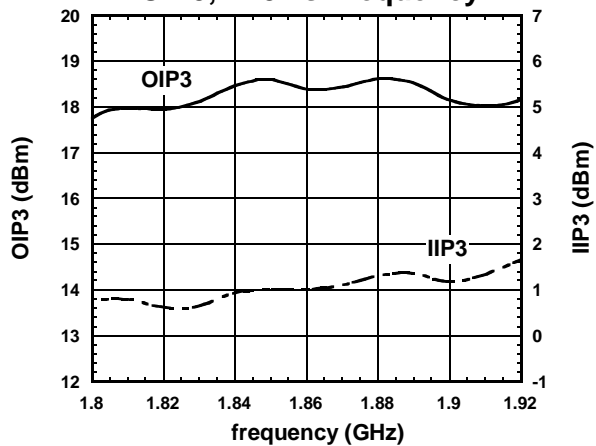
NJG1123PB5 (1.7GHz) @High Gain
P-1dB(IN) vs. frequency



Condition

$T_a = +25^\circ\text{C}$,
 $f = 1.8 \sim 1.92\text{GHz}$,
 $V_{DD} = V_{INV} = 2.7\text{V}$,
 $V_{CTL1} = 0\text{V}$, $V_{CTL2} = 1.85\text{V}$, $V_{CTL3} = 1.85\text{V}$

NJG1123PB5 (1.7GHz) @High Gain
OIP3, IIP3 vs. frequency

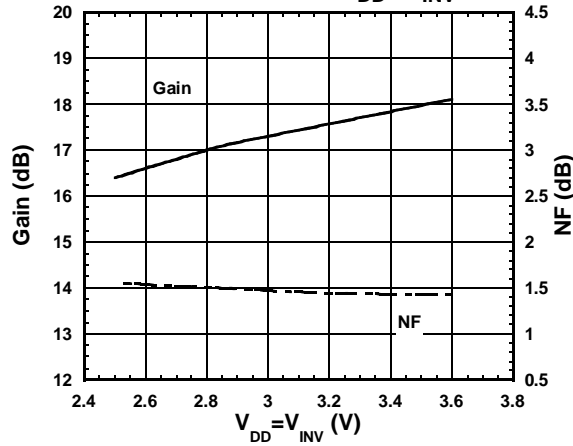


Condition

$T_a = +25^\circ\text{C}$,
 $f_1 = 1.8 \sim 1.92\text{GHz}$, $f_2 = f_1 + 100\text{kHz}$,
 $P_{in} = -30\text{dBm}$,
 $V_{DD} = V_{INV} = 2.7\text{V}$,
 $V_{CTL1} = 0\text{V}$, $V_{CTL2} = 1.85\text{V}$, $V_{CTL3} = 1.85\text{V}$

ELECTRICAL CHARACTERISTICS (1.7GHz band High Gain Mode)

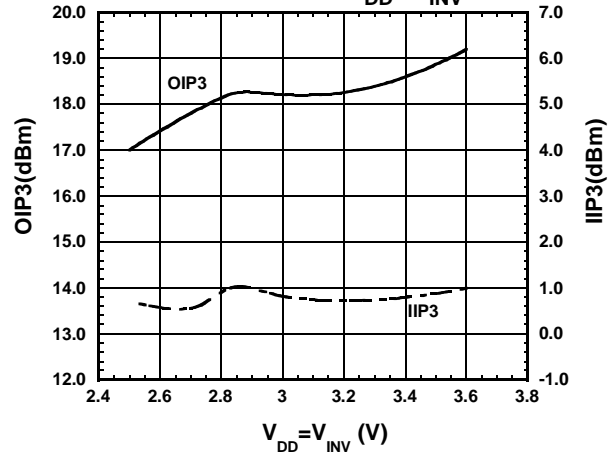
NJG1123PB5 (1.7GHz) @High Gain
Gain, NF vs. V_{DD} , V_{INV}



Condition

$T_a = +25^\circ\text{C}$,
 $f = 1860\text{MHz}$,
 $V_{CTL1} = 0\text{V}$, $V_{CTL2} = 1.85\text{V}$, $V_{CTL3} = 1.85\text{V}$

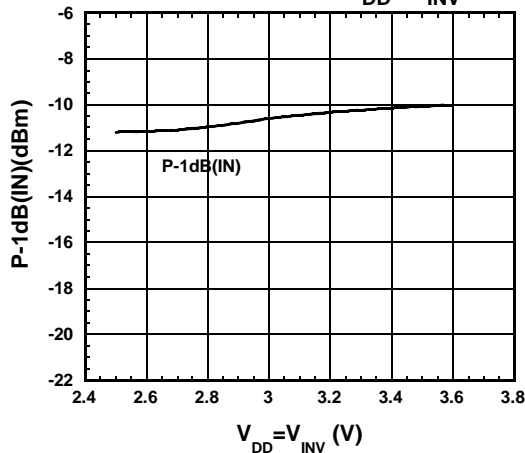
NJG1123PB5 (1.7GHz) @High Gain
OIP3, IIP3 vs. V_{DD} , V_{INV}



Condition

$T_a = +25^\circ\text{C}$,
 $f_1 = 1860\text{MHz}$, $f_2 = f_1 + 100\text{kHz}$,
 $P_{in} = -30\text{dBm}$,
 $V_{CTL1} = 0\text{V}$, $V_{CTL2} = 1.85\text{V}$, $V_{CTL3} = 1.85\text{V}$

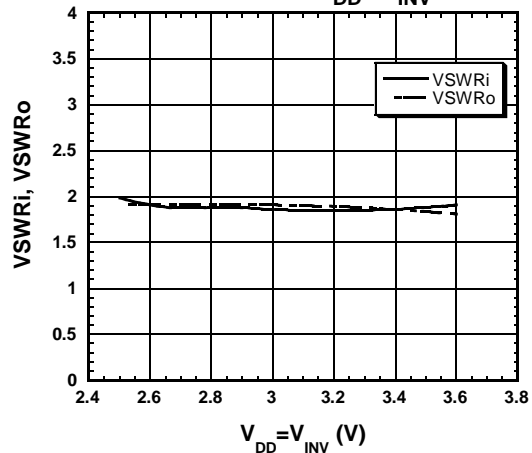
NJG1123PB5 (1.7GHz) @High Gain
P-1dB(IN) vs. V_{DD} , V_{INV}



Condition

$T_a = +25^\circ\text{C}$,
 $f = 1860\text{MHz}$,
 $V_{CTL1} = 0\text{V}$, $V_{CTL2} = 1.85\text{V}$, $V_{CTL3} = 1.85\text{V}$

NJG1123PB5 (1.7GHz) @High Gain
VSWRi, VSWRo vs. V_{DD} , V_{INV}

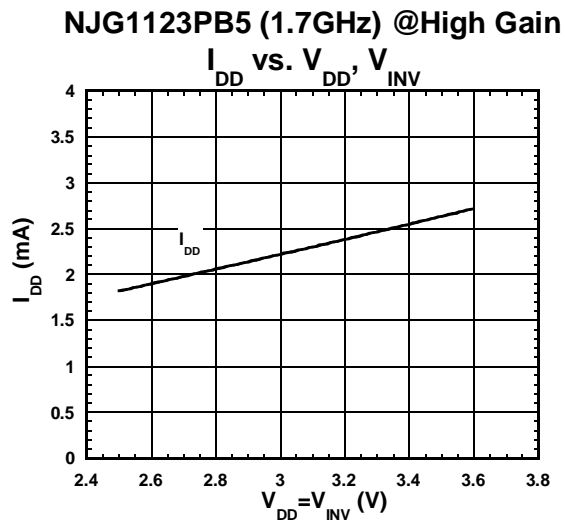


Condition

$T_a = +25^\circ\text{C}$,
 $f = 1860\text{MHz}$,
 $V_{CTL1} = 0\text{V}$, $V_{CTL2} = 1.85\text{V}$, $V_{CTL3} = 1.85\text{V}$

NJG1123PB5

■ ELECTRICAL CHARACTERISTICS (1.7GHz band High Gain Mode)



Condition

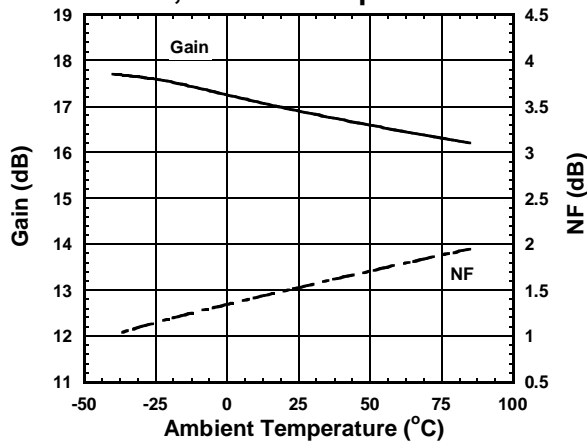
$T_a = +25^\circ\text{C}$,

RF=OFF

$V_{CTL1} = 0\text{V}$, $V_{CTL2} = 1.85\text{V}$, $V_{CTL3} = 1.85\text{V}$

ELECTRICAL CHARACTERISTICS (1.7GHz band High Gain Mode)

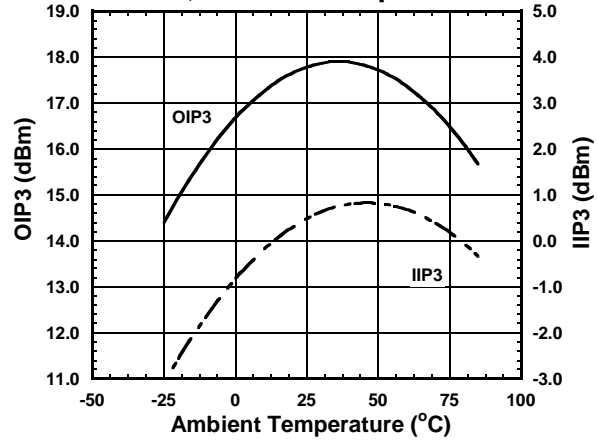
**NJG1123PB5 (1.7GHz) @High Gain
Gain, NF vs. Temperature**



Condition

f=1860MHz,
 $V_{DD} = V_{INV} = 2.7V$,
 $V_{CTL1} = 0V$, $V_{CTL2} = 1.85V$, $V_{CTL3} = 1.85V$

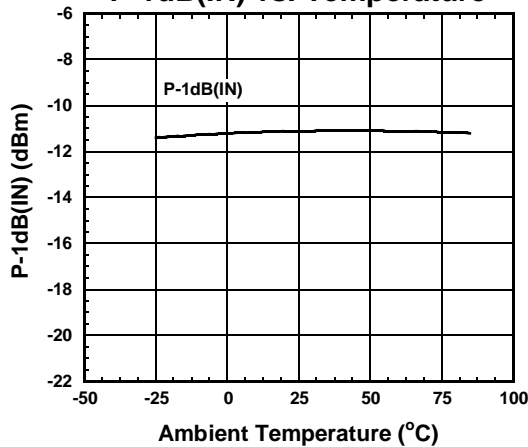
**NJG1123PB5 (1.7GHz) @High Gain
OIP3, IIP3 vs. Temperature**



Condition

f1=1860MHz, f2=f1+100kHz,
 $P_{in} = -30dBm$,
 $V_{DD} = V_{INV} = 2.7V$,
 $V_{CTL1} = 0V$, $V_{CTL2} = 1.85V$, $V_{CTL3} = 1.85V$

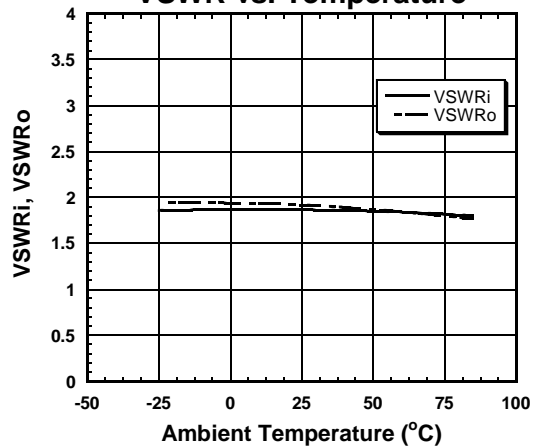
**NJG1123PB5 (1.7GHz) @High Gain
P-1dB(IN) vs. Temperature**



Condition

f=1860MHz,
 $V_{DD} = V_{INV} = 2.7V$,
 $V_{CTL1} = 0V$, $V_{CTL2} = 1.85V$, $V_{CTL3} = 1.85V$

**NJG1123PB5 (1.7GHz) @High Gain
VSWRi, VSWRo vs. Temperature**



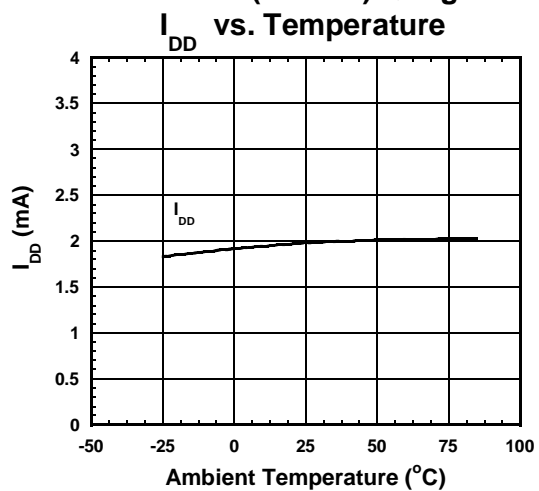
Condition

f=1860MHz,
 $V_{DD} = V_{INV} = 2.7V$,
 $V_{CTL1} = 0V$, $V_{CTL2} = 1.85V$, $V_{CTL3} = 1.85V$

NJG1123PB5

■ ELECTRICAL CHARACTERISTICS (1.7GHz band High Gain Mode)

NJG1123PB5 (1.7GHz) @High Gain



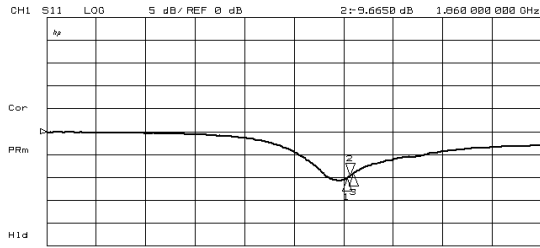
Condition

RF=OFF

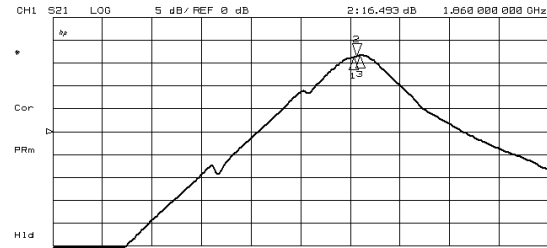
$V_{DD} = V_{INV} = 2.7V$,

$V_{CTL1} = 0V$, $V_{CTL2} = 1.85V$, $V_{CTL3} = 1.85V$

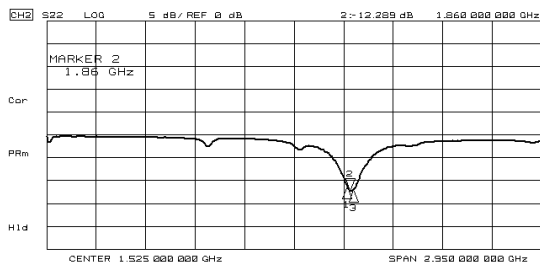
ELECTRICAL CHARACTERISTICS (1.7GHz band High Gain Mode)



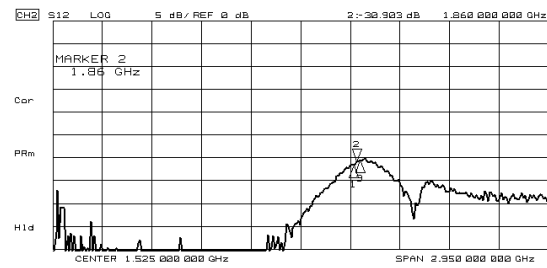
CH1 Markers
 1:-10.183 dB
 1.84000 GHz
 3:-9.8950 dB
 1.86000 GHz



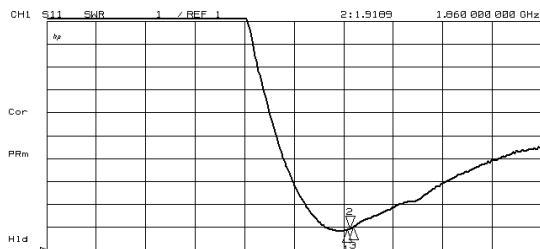
CH1 Markers
 1:16.275 dB
 1.84000 GHz
 3:16.690 dB
 1.86000 GHz



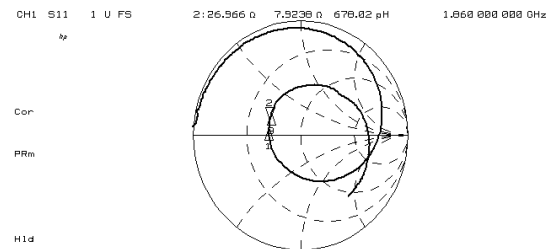
CH2 Markers
 1:-11.214 dB
 1.84000 GHz
 3:-11.925 dB
 1.86000 GHz



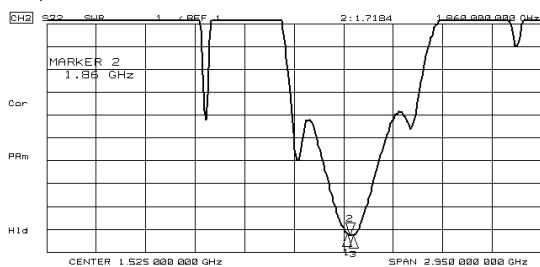
CH2 Markers
 1:-31.656 dB
 1.84000 GHz
 3:-30.430 dB
 1.86000 GHz



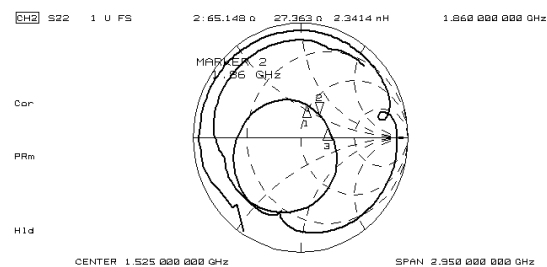
CH1 Markers
 1:1.8721
 1.84000 GHz
 3:2.8193
 1.86000 GHz



CH1 Markers
 1:26.932 0
 3:12.212 0



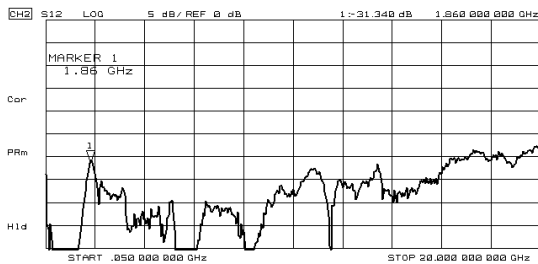
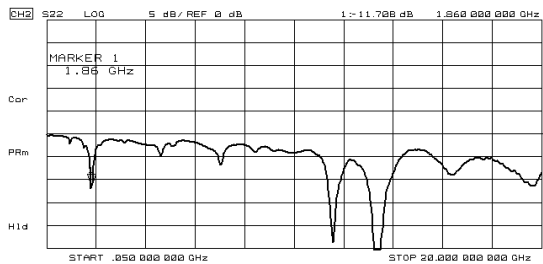
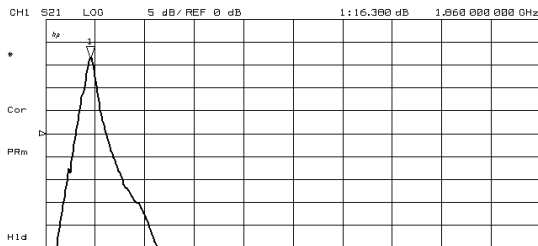
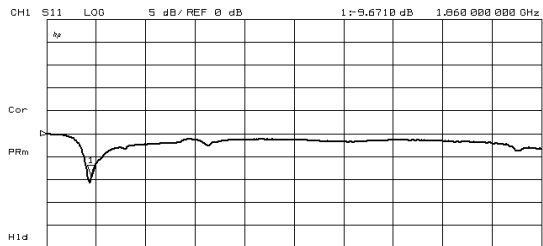
CH2 Markers
 1:1.8196
 1.84000 GHz
 3:1.7278
 1.86000 GHz



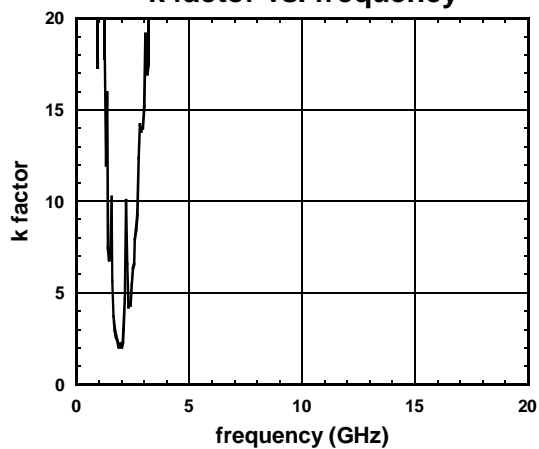
CH2 Markers
 1:47.223 0
 3:29.395 0

NJG1123PB5

ELECTRICAL CHARACTERISTICS (1.7GHz band High Gain Mode)

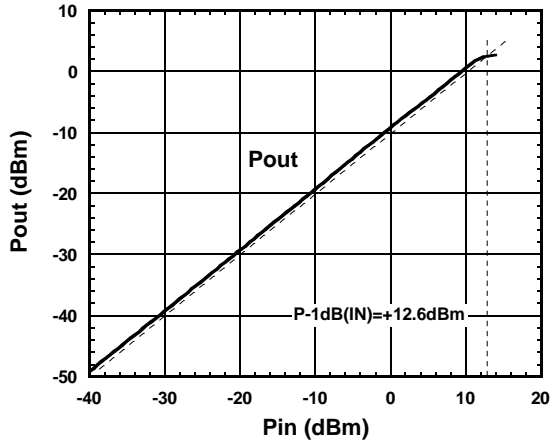


NJG1123PB5 (1.7GHz) @High Gain k factor vs. frequency



ELECTRICAL CHARACTERISTICS (1.7GHz band Low gain Mode)

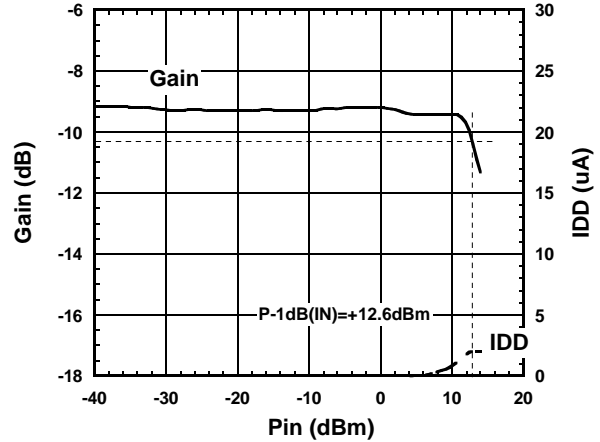
**NJG1123PB5 (1.7GHz) @Low Gain
Pout vs. Pin**



Condition

$T_a = +25^\circ\text{C}$,
 $f = 1860\text{MHz}$,
 $V_{DD} = V_{INV} = 2.7\text{V}$,
 $V_{CTL1} = 0\text{V}$, $V_{CTL2} = 1.85\text{V}$, $V_{CTL3} = 0\text{V}$

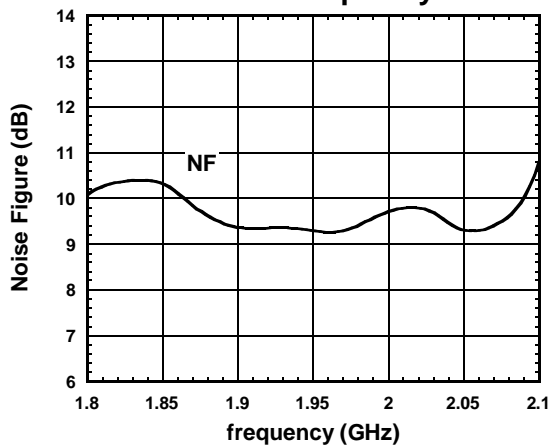
**NJG1123PB5 (1.7GHz) @Low Gain
Gain, IDD vs. Pin**



Condition

$T_a = +25^\circ\text{C}$,
 $f = 1860\text{MHz}$,
 $V_{DD} = V_{INV} = 2.7\text{V}$,
 $V_{CTL1} = 0\text{V}$, $V_{CTL2} = 1.85\text{V}$, $V_{CTL3} = 0\text{V}$

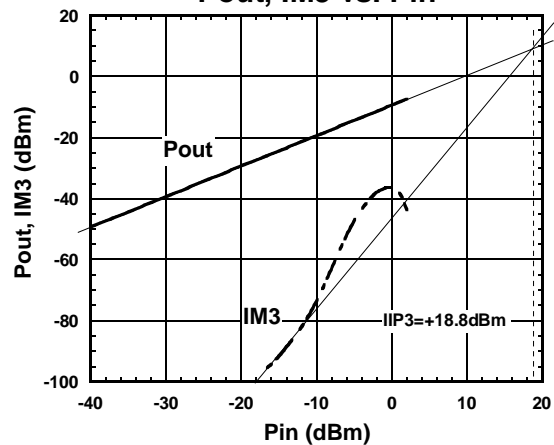
**NJG1123PB5 (1.7GHz) @Low Gain
NF vs. frequency**



Condition

$T_a = +25^\circ\text{C}$,
 $f = 1.8\text{--}2.1\text{GHz}$,
 $V_{DD} = V_{INV} = 2.7\text{V}$,
 $V_{CTL1} = 0\text{V}$, $V_{CTL2} = 1.85\text{V}$, $V_{CTL3} = 0\text{V}$

**NJG1123PB5 (1.7GHz) @Low Gain
Pout, IM3 vs. Pin**



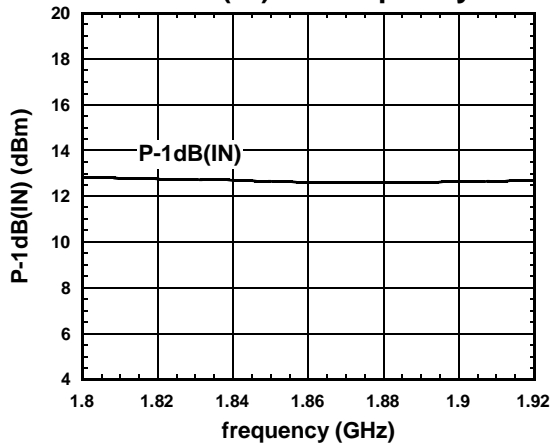
Condition

$T_a = +25^\circ\text{C}$,
 $f_1 = 1860\text{MHz}$, $f_2 = f_1 + 100\text{kHz}$,
 $V_{DD} = V_{INV} = 2.7\text{V}$,
 $V_{CTL1} = 0\text{V}$, $V_{CTL2} = 1.85\text{V}$, $V_{CTL3} = 0\text{V}$

NJG1123PB5

■ ELECTRICAL CHARACTERISTICS (1.7GHz band Low gain Mode)

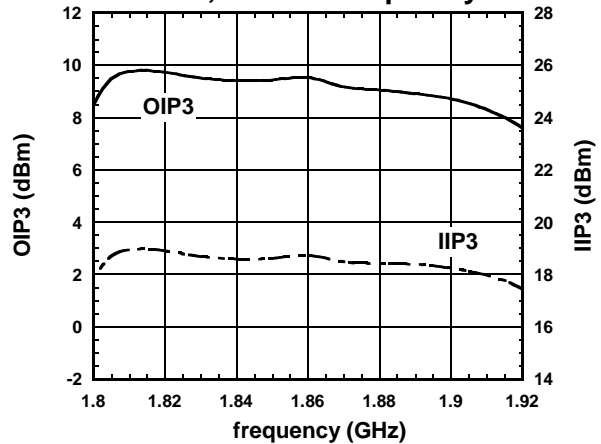
NJG1123PB5 (1.7GHz) @Low Gain
P-1dB(IN) vs. frequency



Condition

$T_a = +25^\circ\text{C}$,
 $f = 1.8 \sim 1.92\text{GHz}$,
 $V_{DD} = V_{INV} = 2.7\text{V}$,
 $V_{CTL1} = 0\text{V}$, $V_{CTL2} = 1.85\text{V}$, $V_{CTL3} = 0\text{V}$

NJG1123PB5 (1.7GHz) @Low Gain
OIP3, IIP3 vs. frequency

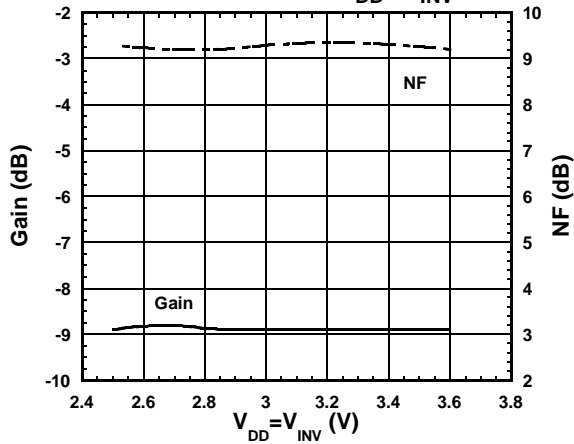


Condition

$T_a = +25^\circ\text{C}$,
 $f_1 = 1.8 \sim 1.92\text{GHz}$, $f_2 = f_1 + 100\text{kHz}$,
 $\text{Pin} = -16\text{dBm}$,
 $V_{DD} = V_{INV} = 2.7\text{V}$,
 $V_{CTL1} = 0\text{V}$, $V_{CTL2} = 1.85\text{V}$, $V_{CTL3} = 0\text{V}$

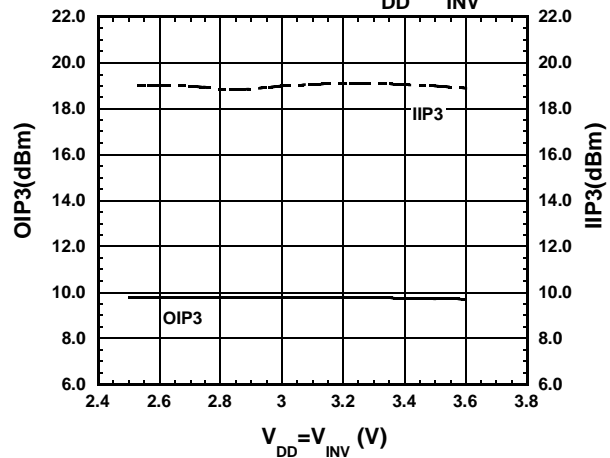
■ ELECTRICAL CHARACTERISTICS (1.7GHz band Low gain Mode)

NJG1123PB5 (1.7GHz) @Low Gain
Gain, NF vs. V_{DD} , V_{INV}



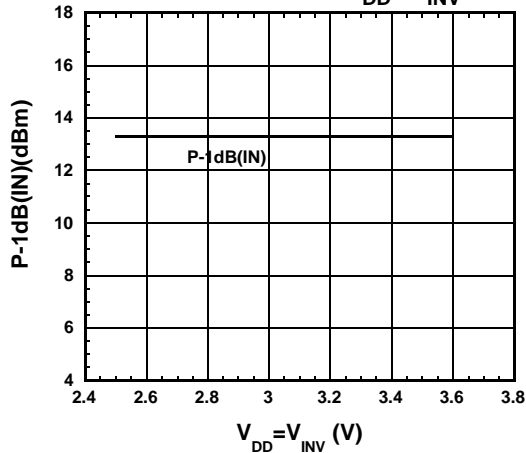
Condition
 $T_a = +25^\circ\text{C}$,
 $f = 1860\text{MHz}$,
 $V_{CTL1} = 0\text{V}$, $V_{CTL2} = 1.85\text{V}$, $V_{CTL3} = 0\text{V}$

NJG1123PB5 (1.7GHz) @Low Gain
OIP3, IIP3 vs. V_{DD} , V_{INV}



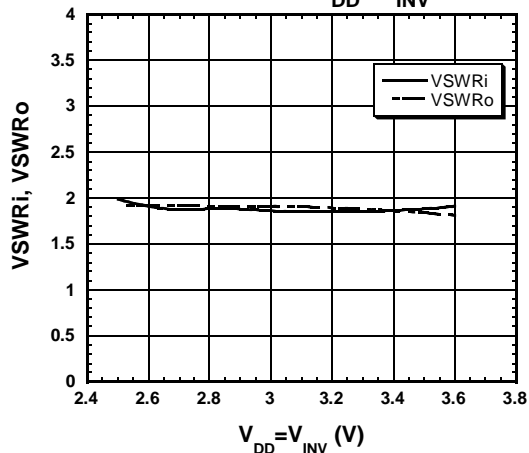
Condition
 $T_a = +25^\circ\text{C}$,
 $f_1 = 1860\text{MHz}$, $f_2 = f_1 + 100\text{kHz}$,
 $P_{in} = -16\text{dBm}$,
 $V_{CTL1} = 0\text{V}$, $V_{CTL2} = 1.85\text{V}$, $V_{CTL3} = 0\text{V}$

NJG1123PB5 (1.7GHz) @Low Gain
P-1dB(IN) vs. V_{DD} , V_{INV}



Condition
 $T_a = +25^\circ\text{C}$,
 $f = 1860\text{MHz}$,
 $V_{CTL1} = 0\text{V}$, $V_{CTL2} = 1.85\text{V}$, $V_{CTL3} = 0\text{V}$

NJG1123PB5 (1.7GHz) @Low Gain
VSWR vs. V_{DD} , V_{INV}

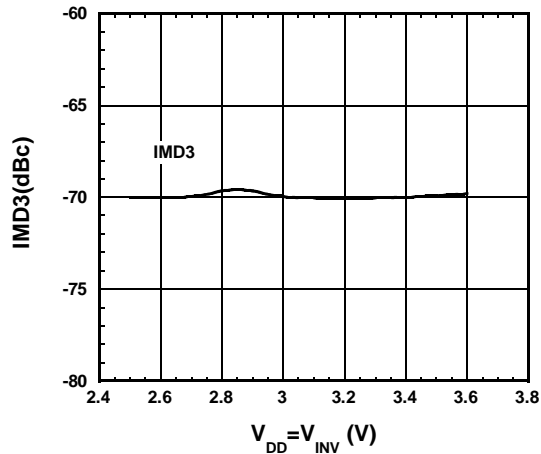


Condition
 $T_a = +25^\circ\text{C}$,
 $f = 1860\text{MHz}$,
 $V_{CTL1} = 0\text{V}$, $V_{CTL2} = 1.85\text{V}$, $V_{CTL3} = 0\text{V}$

NJG1123PB5

■ ELECTRICAL CHARACTERISTICS (1.7GHz band Low gain Mode)

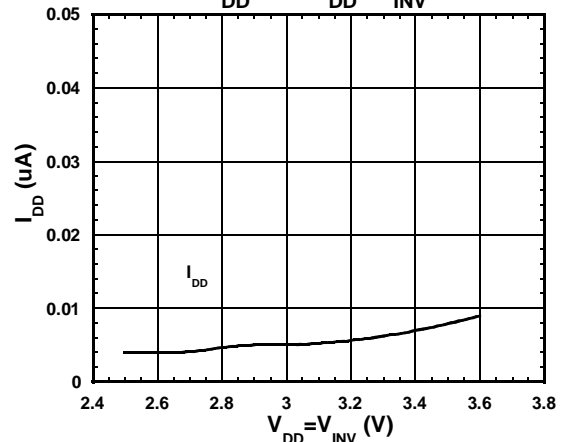
NJG1123PB5 (1.7GHz) @Low Gain
IMD3 vs. V_{DD} , V_{INV}



Condition

$T_a = +25^\circ\text{C}$,
 $f_1 = 1860\text{MHz}$, $f_2 = f_1 + 100\text{kHz}$,
 $P_{in} = -16\text{dBm}$,
 $V_{CTL1} = 0\text{V}$, $V_{CTL2} = 1.85\text{V}$, $V_{CTL3} = 0\text{V}$

NJG1123PB5 (1.7GHz) @Low Gain
 I_{DD} vs. V_{DD} , V_{INV}

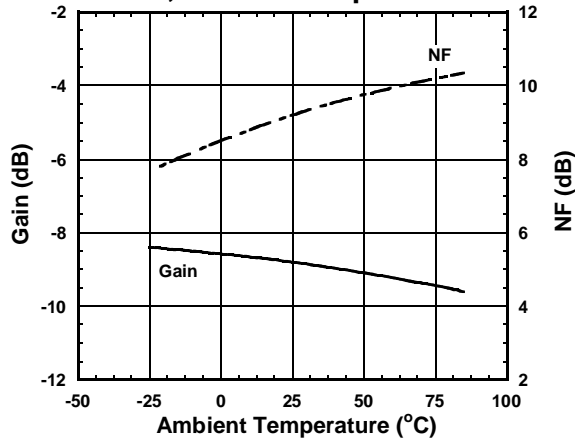


Condition

$T_a = +25^\circ\text{C}$,
RF=OFF,
 $V_{CTL1} = 0\text{V}$, $V_{CTL2} = 1.85\text{V}$, $V_{CTL3} = 0\text{V}$

■ ELECTRICAL CHARACTERISTICS (1.7GHz band Low gain Mode)

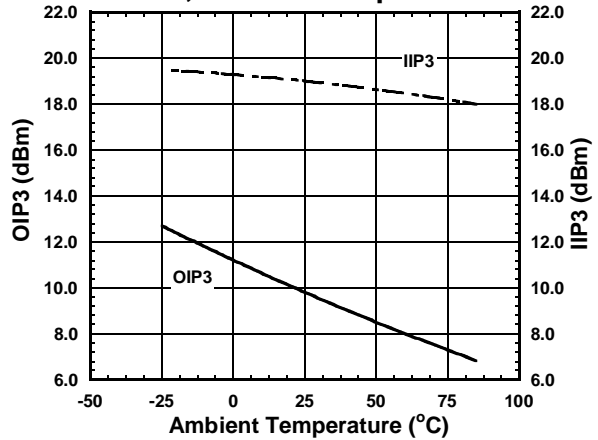
**NJG1123PB5 (1.7GHz) @Low Gain
Gain, NF vs. Temperature**



Condition

f=1860MHz,
 $V_{DD} = V_{INV} = 2.7V$,
 $V_{CTL1} = 0V$, $V_{CTL2} = 1.85V$, $V_{CTL3} = 0V$

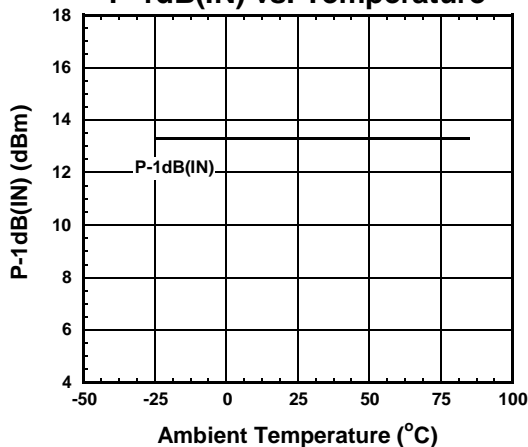
**NJG1123PB5 (1.7GHz) @Low Gain
OIP3, IIP3 vs. Temperature**



Condition

f1=1860MHz, f2=f1+100kHz,
 $P_{in} = -16dBm$,
 $V_{DD} = V_{INV} = 2.7V$,
 $V_{CTL1} = 0V$, $V_{CTL2} = 1.85V$, $V_{CTL3} = 0V$

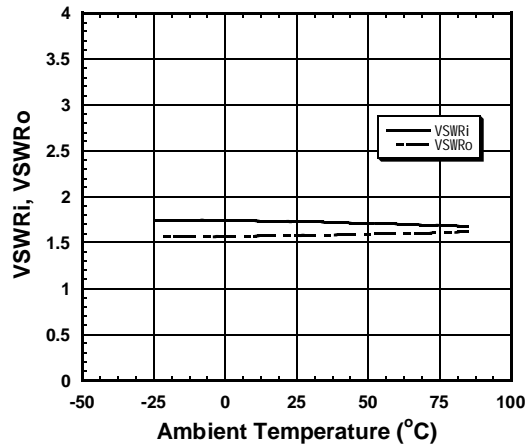
**NJG1123PB5 (1.7GHz) @Low Gain
P-1dB(IN) vs. Temperature**



Condition

f=1860MHz,
 $V_{DD} = V_{INV} = 2.7V$,
 $V_{CTL1} = 0V$, $V_{CTL2} = 1.85V$, $V_{CTL3} = 0V$

**NJG1123PB5 (1.7GHz) @Low Gain
VSWR vs. Temperature**



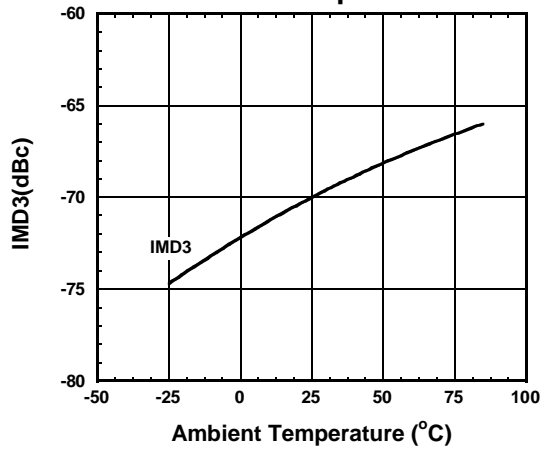
Condition

f=1860MHz,
 $V_{DD} = V_{INV} = 2.7V$,
 $V_{CTL1} = 0V$, $V_{CTL2} = 1.85V$, $V_{CTL3} = 0V$

NJG1123PB5

■ ELECTRICAL CHARACTERISTICS (1.7GHz band Low gain Mode)

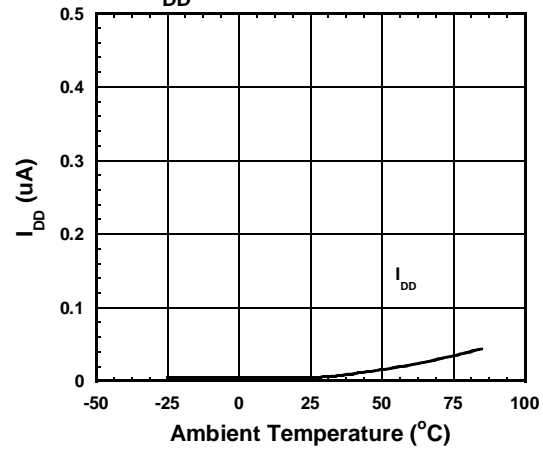
NJG1123PB5 (1.7GHz) @Low Gain
IMD3 vs. Temperature



Condition

$f_1=1860\text{MHz}$, $f_2=f_1+100\text{kHz}$,
 $P_{in}=-16\text{dBm}$,
 $V_{DD}=V_{INV}=2.7\text{V}$,
 $V_{CTL1}=0\text{V}$, $V_{CTL2}=1.85\text{V}$, $V_{CTL3}=0\text{V}$

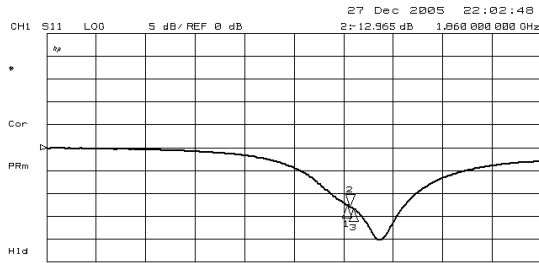
NJG1123PB5 (1.7GHz) @Low Gain
 I_{DD} vs. Temperature



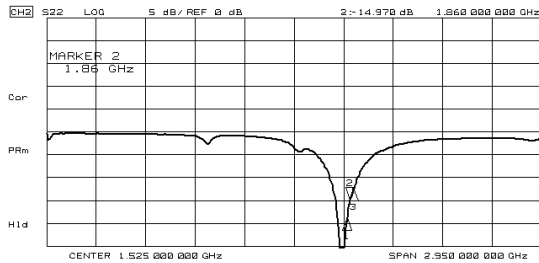
Condition

$RF=OFF$
 $V_{DD}=V_{INV}=2.7\text{V}$,
 $V_{CTL1}=0\text{V}$, $V_{CTL2}=1.85\text{V}$, $V_{CTL3}=0\text{V}$

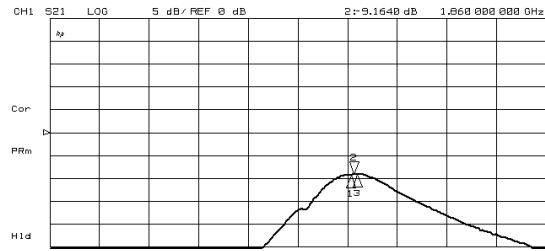
ELECTRICAL CHARACTERISTICS (1.7GHz band Low gain Mode)



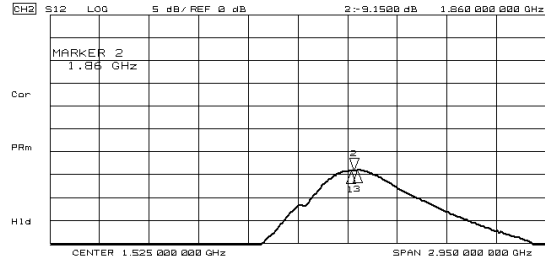
CH1 Markers
 1:-12.541 dB
 1.84000 GHz
 3:-13.378 dB
 1.89000 GHz



CH2 Markers
 1:-18.761 dB
 1.84000 GHz
 3:-12.373 dB
 1.89000 GHz



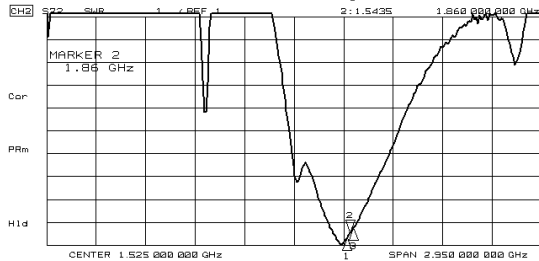
CH1 Markers
 1:-9.2410 dB
 1.84000 GHz
 3:-9.1290 dB
 1.89000 GHz



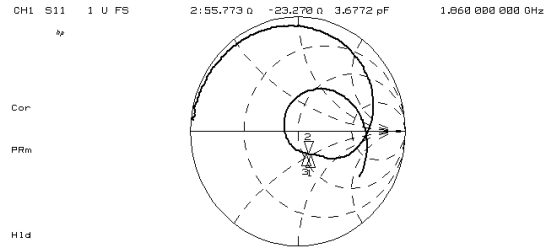
CH2 Markers
 1:-9.2130 dB
 1.84000 GHz
 3:-9.0930 dB
 1.89000 GHz



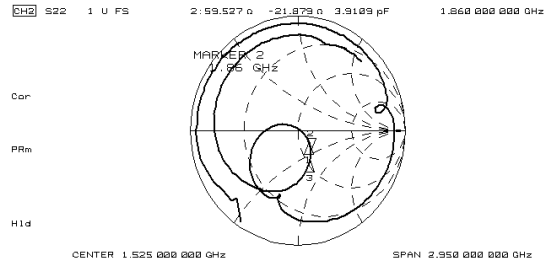
CH1 Markers
 1:1.6175
 1.84000 GHz
 3:1.5245
 1.89000 GHz



CH2 Markers
 1:1.3225
 1.84000 GHz
 3:1.7667
 1.89000 GHz



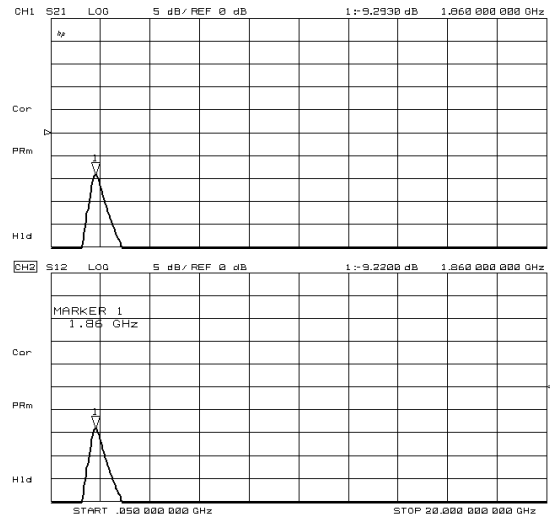
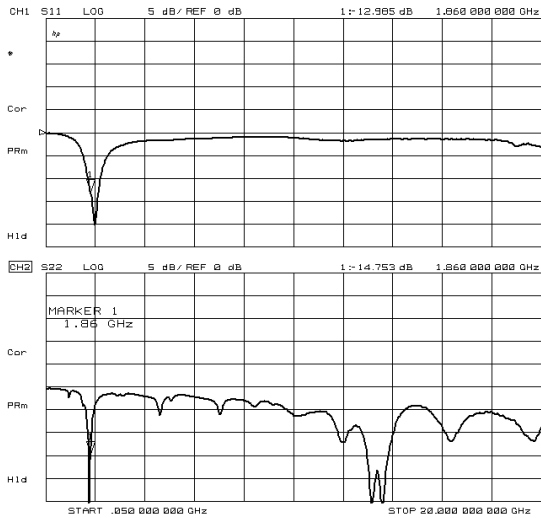
CH1 Markers
 1:57.030 n
 -24.900 n
 1.84000 GHz
 3:53.707 n
 -21.701 n
 1.89000 GHz



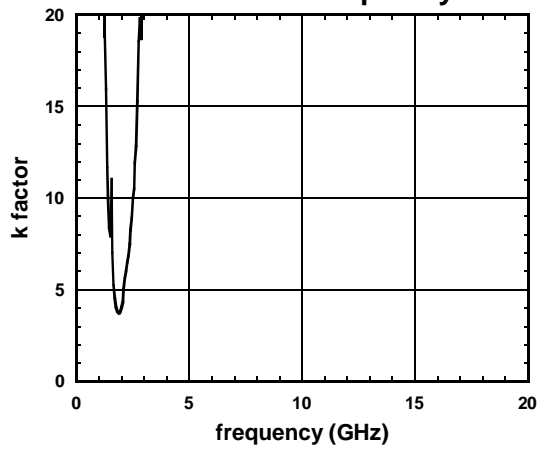
CH2 Markers
 1:60.059 n
 -11.643 n
 1.84000 GHz
 3:54.400 n
 -23.773 n
 1.89000 GHz

NJG1123PB5

ELECTRICAL CHARACTERISTICS (1.7GHz band Low gain Mode)



**NJG1123PB5 (1.7GHz) @Low Gain
k factor vs. frequency**



■ TRUTH TABLE

Control voltage			Operating state					
V _{CTL1} (Band Sel1)	V _{CTL2} (Band Sel2)	V _{CTL3} (Gain Sel1)	2.1GHz Band		800MHz Band		1.7GHz Band	
			LNA	Bypass	LNA	Bypass	LNA	Bypass
L	L	L	OFF	ON	OFF	ON	OFF	ON
L	L	H	ON	OFF	OFF	OFF	OFF	OFF
H	L	L	OFF	ON	OFF	ON	OFF	ON
H	L	H	OFF	OFF	ON	OFF	OFF	OFF
L	H	L	OFF	ON	OFF	ON	OFF	ON
L	H	H	OFF	OFF	OFF	OFF	ON	OFF
H	H	L	Don't Care					
H	H	H						

“L”=0 ~ 0.45V, “H”=1.52 ~ V_{INV}+0.3 V

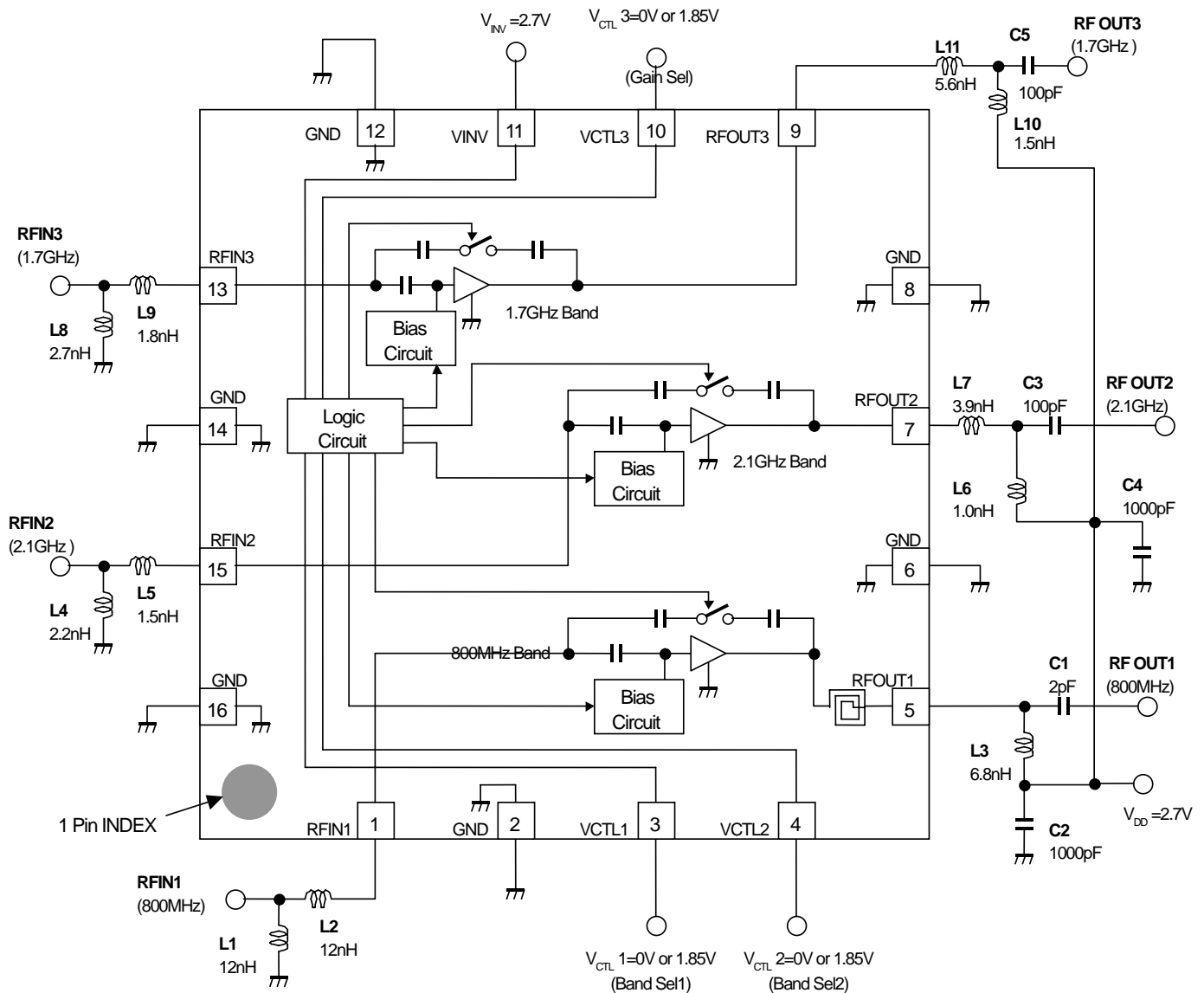
Note:

- 1) V_{CTL3}=“L” (All bypass circuits: ON state)
- 2) V_{CTL1}=V_{CTL2}=V_{CTL3}=“H” (800MHz and 1.7GHz band LNA: ON state)

NJG1123PB5

APPLICATION CIRCUIT

(Top View)



PARTS LIST

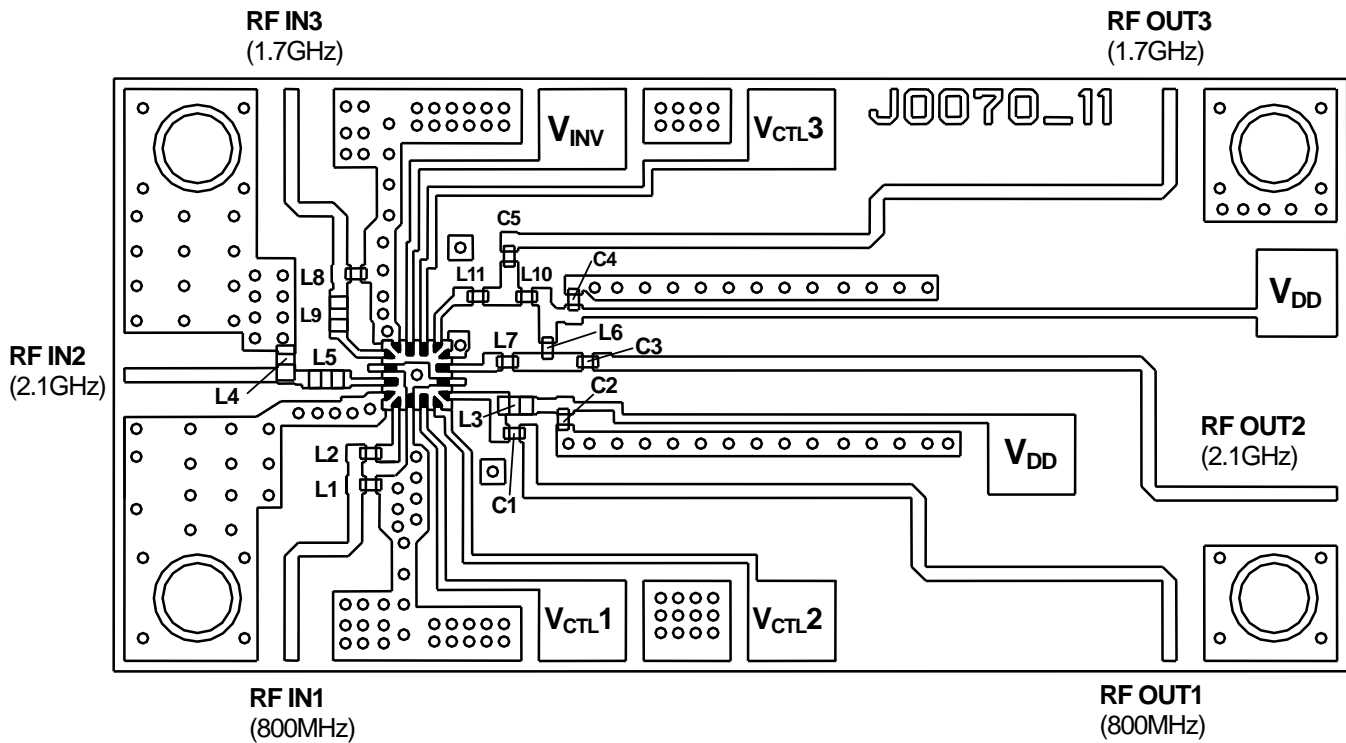
Parts ID	Comment
L1, L2, L6, L7, L8, L10, L11	TDK (MLG0603)
L3, L4, L5, L9	TAIYO-YUDEN (HK1005)
C1 ~ C5	MURATA (GRM03)

PRECAUTIONS

- 1) Please locate C2 close to L3.
- 2) Please locate C4 close to L6, L10.
- 3) Ground terminal should be connected to the ground plane as low inductance as possible.
- 4) Please use an appropriate inductor for L3, L4, L5, L9 to improve Gain.

TEST PCB LAYOUT

(Top View)



PCB (FR-4):

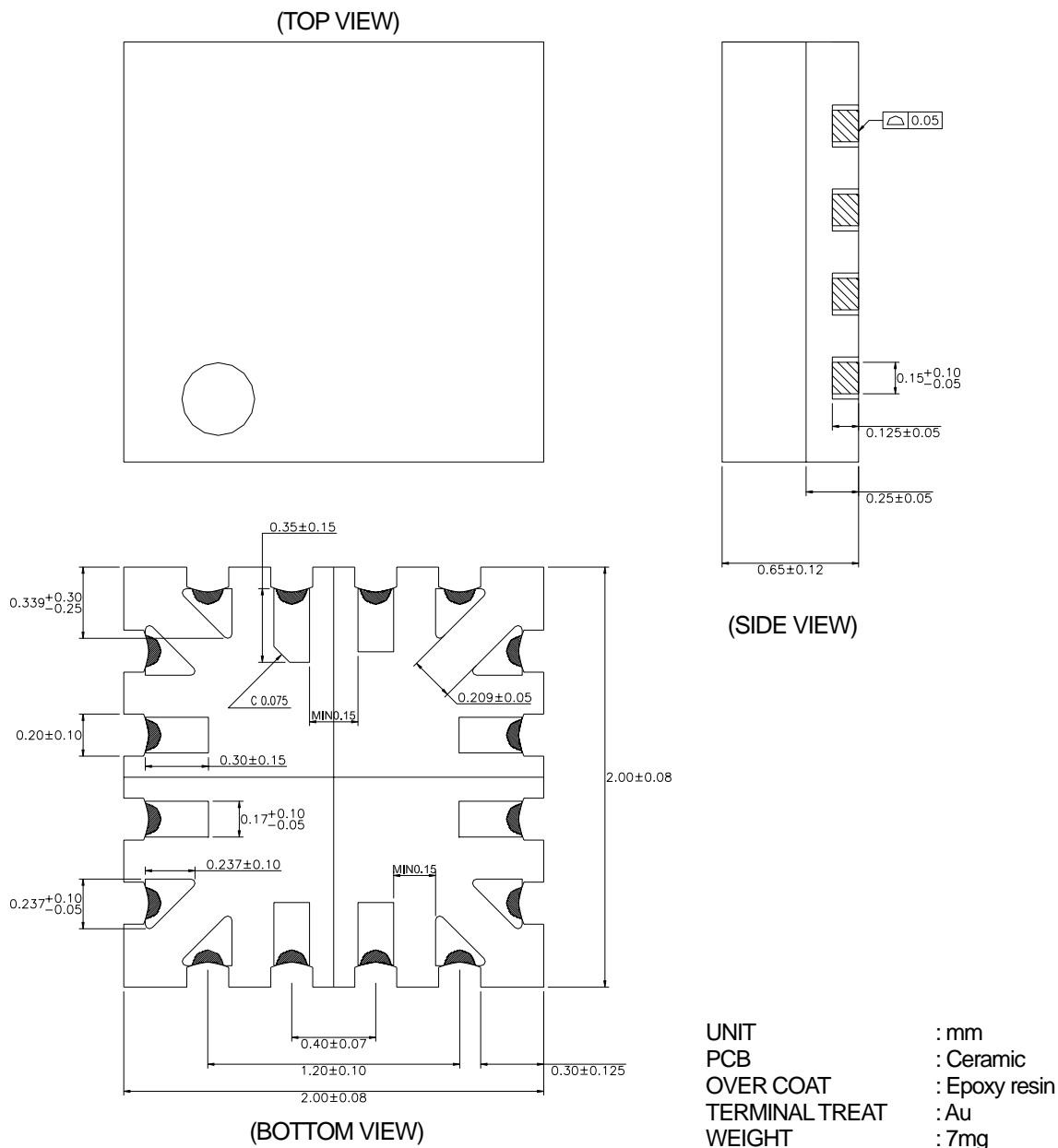
$t=0.2\text{mm}$

MICROSTRIP LINE WIDTH=0.4mm ($Z_0=50\Omega$)

PCB SIZE=35.4mmx17.0mm

NJG1123PB5

PACKAGE OUTLINE (FFP16-B5)



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]

The specifications on this databook are only given for information, without any guarantee as regards either mistakes or omissions. The application circuits in this databook are described only to show representative usages of the product and not intended for the guarantee or permission of any right including the industrial rights.

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