

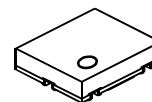
900MHz Band LNA GaAs MMIC

■ GENERAL DESCRIPTION

The NJG1138HA8 is a low noise amplifier designed for UMTS and LTE low band applications. The NJG1138HA8 has two gain state which are high gain mode and low gain mode. The NJG1138HA8 features high gain, low noise figure and high IP3.

An Ultra-small and thin USB6-A8 package is adopted.

■ PACKAGE OUTLINE



NJG1138HA8

■ APPLICATIONS

UMTS and LTE Low band applications

Mobile phone, Data card, modem and others mobile device applications

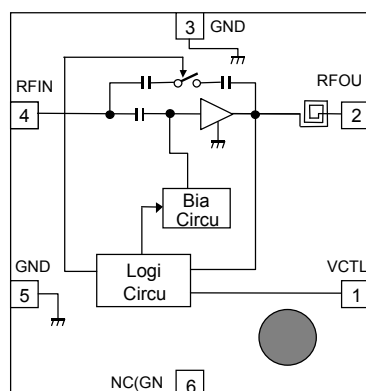
700MHz Band application*

*Note: Please check the Application Note for 700MHz Band

■ FEATURES

- Low operating voltage +2.8V typ.
- Low control voltage +1.8V typ.
- Low current consumption 2.3mA typ. @V_{CTL}=1.8V
10μA typ. @V_{CTL}=0V
- High gain 16.0dB typ. @V_{CTL}=1.8V, f_{RF}=942.5MHz
- Low noise figure 1.4dB typ. @V_{CTL}=1.8V, f_{RF}=942.5MHz
- Input power at 1dB gain compression point -8.5dBm typ. @V_{CTL}=1.8V, f_{RF}=942.5MHz
+16.0dBm typ. @V_{CTL}=0V, f_{RF}=942.5MHz
- High input IP3 0dBm typ. @V_{CTL}=1.8V, f_{RF}=942.5MHz
+14dBm typ. @V_{CTL}=0V, f_{RF}=942.5MHz
- Small package size USB6-A8 (Package size: 1.0mmx1.2mmx0.38mm typ.)
- Lead-free and halogen-free

■ PIN CONFIGURATION



Pin Connection

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

■ TRUTH TABLE

“H”=V_{CTL}(H), “L”=V_{CTL}(L)

VCTL	LNA Mode
H	High Gain Mode
L	Low Gain Mode

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

NJG1138HA8

■ ABSOLUTE MAXIMUM RATINGS

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

PARAMETERS	SYMBOL	CONDITIONS	RATINGS	UNITS
Supply voltage	V_{DD}		5.0	V
Control voltage	V_{CTL}		5.0	V
Input power	P_{IN}		+15	dBm
Power dissipation	P_D	on PCB board, $T_{jmax}=150^{\circ}\text{C}$	150	mW
Operating temperature	T_{opr}		-40~+85	$^{\circ}\text{C}$
Storage temperature	T_{stg}		-55~+150	$^{\circ}\text{C}$

■ ELECTRICAL CHARACTERISTICS 1 (DC)

(General Conditions: $V_{DD}=2.8\text{V}$, $T_a=+25^{\circ}\text{C}$)

PARAMETERS	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Operating voltage	V_{DD}		2.5	2.8	3.6	V
Control voltage (High)	$V_{CTL(H)}$	VCTL terminal	1.36	1.8	3.6	V
Control voltage (Low)	$V_{CTL(L)}$	VCTL terminal	0	0	0.3	V
Operating current1 (High Gain Mode)	I_{DD1}	RF OFF, $V_{CTL}=1.8\text{V}$	-	2.3	4.0	mA
Operating current2 (Low Gain Mode)	I_{DD2}	RFOFF, $V_{CTL}=0\text{V}$	-	10	45	μA
Control current	I_{CTL}	RF OFF, $V_{CTL}=1.8\text{V}$	-	5.5	8.5	μA

■ ELECTRICAL CHARACTERISTICS 2 (High Gain Mode)

(General Conditions: $V_{DD}=2.8V$, $V_{CTL}=1.8V$, $f_{RF}=942.5MHz$, $Z_s=Z_l=50\ \Omega$, $T_a=+25^{\circ}C$, with application circuit)

PARAMETERS	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Small signal gain 1	Gain1	Exclude PCB and connector losses (input: 0.07dB, output: 0.07dB)	14.5	16.0	17.5	dB
Noise figure 1	NF1	Exclude PCB and connector losses (input:0.07dB)	-	1.4	1.7	dB
Input power at 1dB gain compression point 1	$P_{-1dB(IN)1}$		-16.0	-8.5	-	dBm
3rd order Input Intercept Point 1	IIP3_1	$f1=f_{RF}$, $f2=f_{RF}+100kHz$, $P_{in}=-30dBm$	-7.0	0	-	dBm
RF IN VSWR 1	$VSWR_i1$		-	1.8	2.3	-
RF OUT VSWR 1	$VSWR_o1$		-	2.2	2.7	-

■ ELECTRICAL CHARACTERISTICS 3 (Low Gain Mode)

(General Conditions: $V_{DD}=2.8V$, $V_{CTL}=0V$, $f_{RF}=942.5MHz$, $Z_s=Z_l=50\ \Omega$, $T_a=+25^{\circ}C$, with application circuit)

PARAMETERS	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Small signal gain 2	Gain2	Exclude PCB and connector losses (input: 0.07dB, output: 0.07dB)	-4.5	-3.0	-2.0	dB
Noise figure 2	NF2	Exclude PCB and connector losses (input:0.07dB)	-	3.0	6.0	dB
Input power at 1dB gain compression point 1	$P_{-1dB(IN)2}$		+4.5	+16.0	-	dBm
3rd order Input Intercept Point 2	IIP3_2	$f1=f_{RF}$, $f2=f_{RF}+100kHz$, $P_{in}=-20dBm$	+2.0	+14.0	-	dBm
RF IN VSWR 2	$VSWR_i2$		-	1.4	2.0	-
RF OUT VSWR 2	$VSWR_o2$		-	1.6	2.2	-

NJG1138HA8

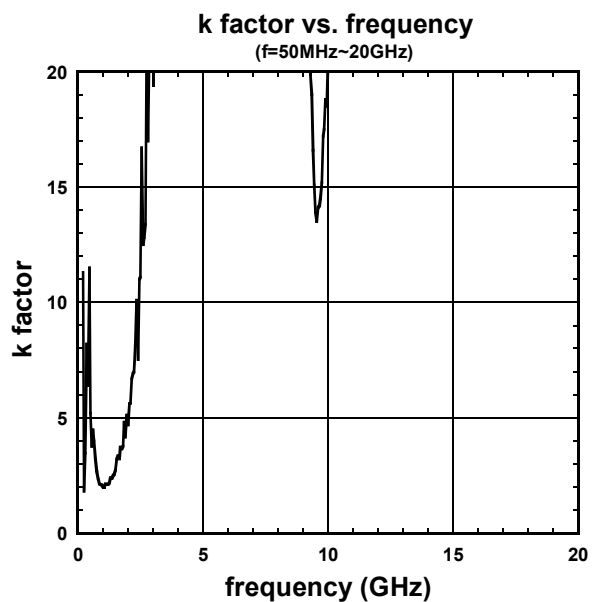
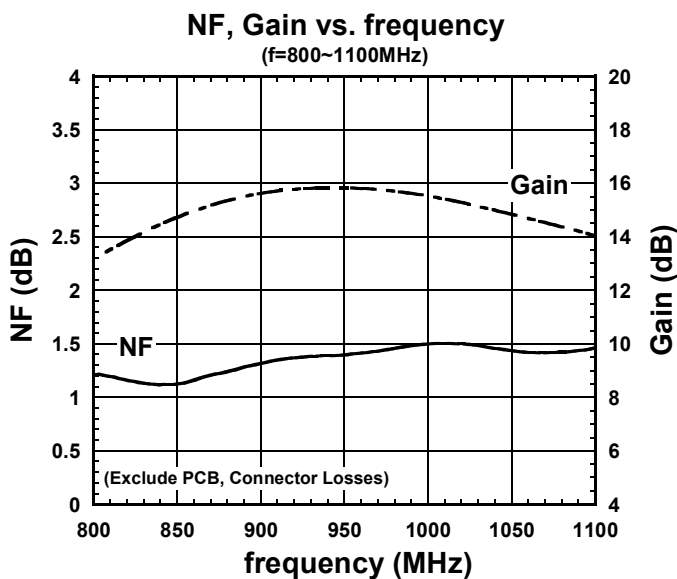
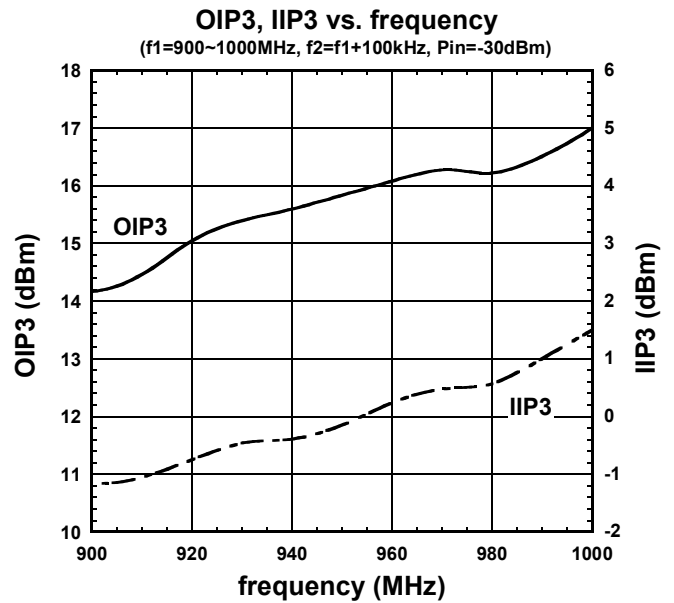
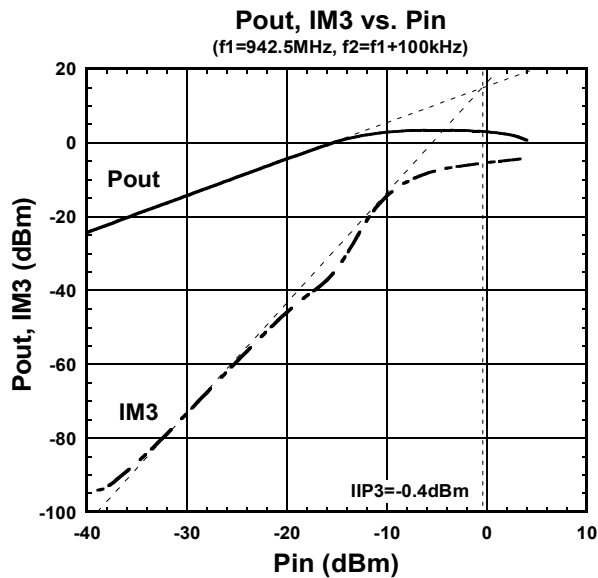
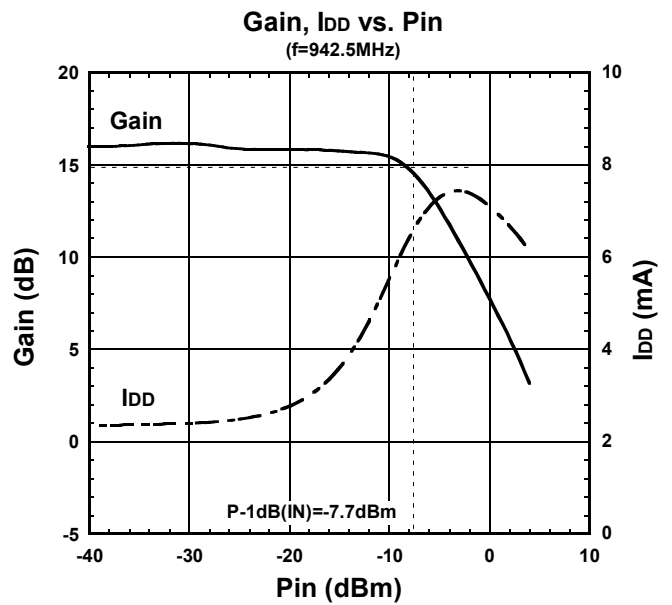
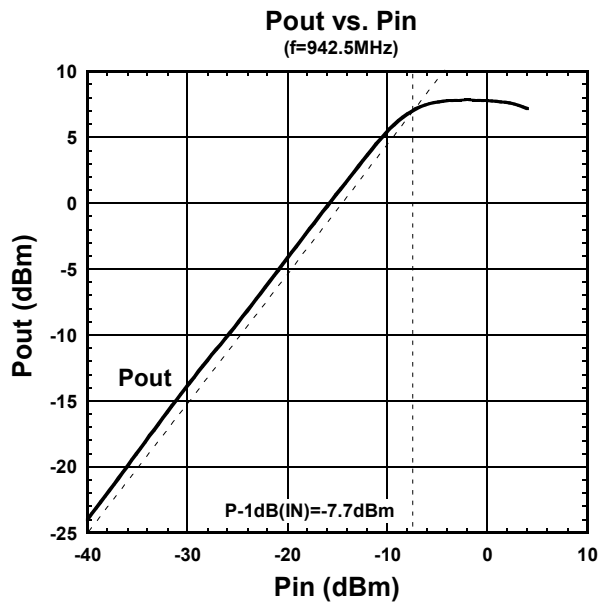
■ TERMINAL INFORMATION

No.	SYMBOL	DESCRIPTION
1	VCTL	Gain control port. Inputting a logic-high, the LNA turn at high gain mode. Inputting a logic-low, the LNA turn at low gain mode.
2	RFOUT	RF output terminal. Requires an external matching components. This terminal should be connected a DC blocking capacitor C1.
3	GND	Ground terminal. Connect to the PCB ground plane.
4	RFIN	RF input terminal. Requires an external matching components.
5	GND	Ground terminal. Connect to the PCB ground plane.
6	NC (GND)	No connected terminal. This terminal is not connected with internal circuit. Connect to the PCB ground plane.

Notes: Ground terminal (No.3 and 5) and NC terminal (No.6) should be connected with the PCB ground for good RF performance.

■ ELECTRICAL CHARACTERISTICS (High Gain Mode)

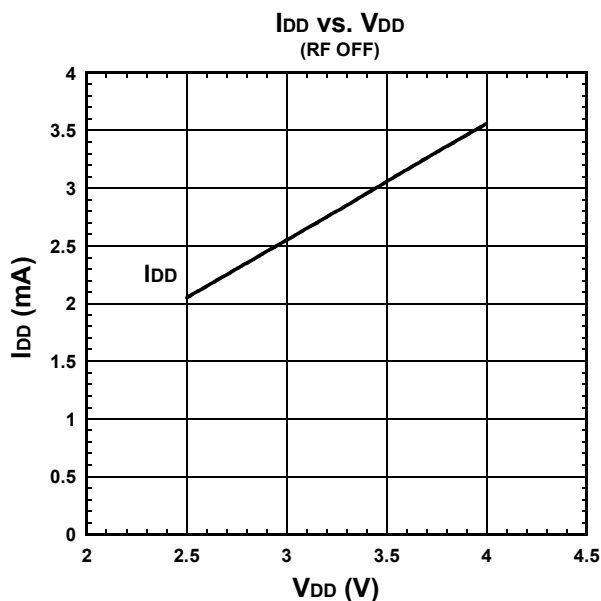
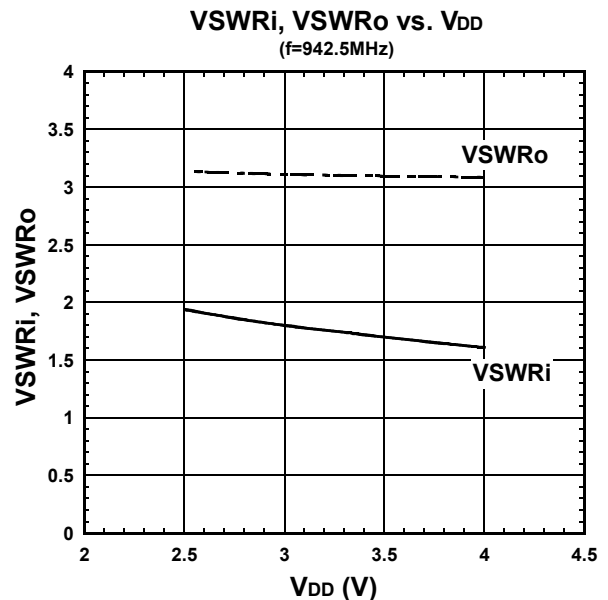
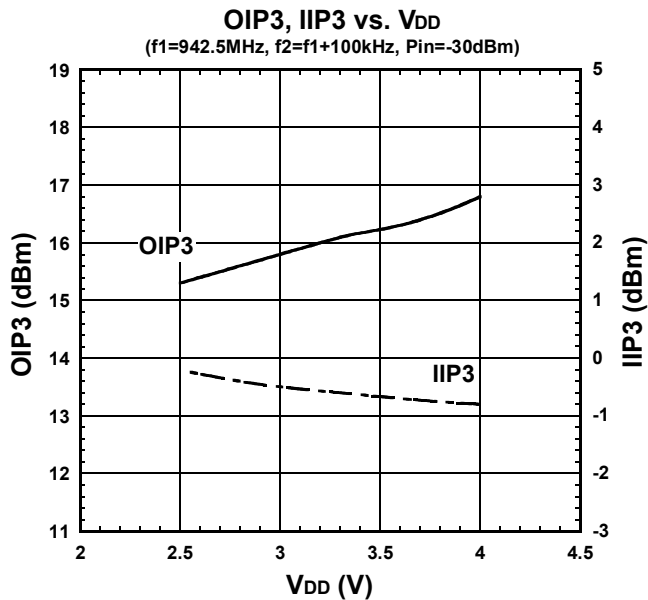
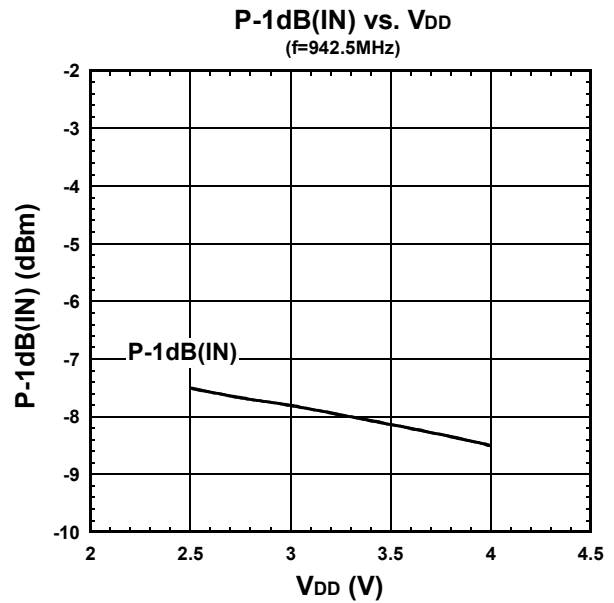
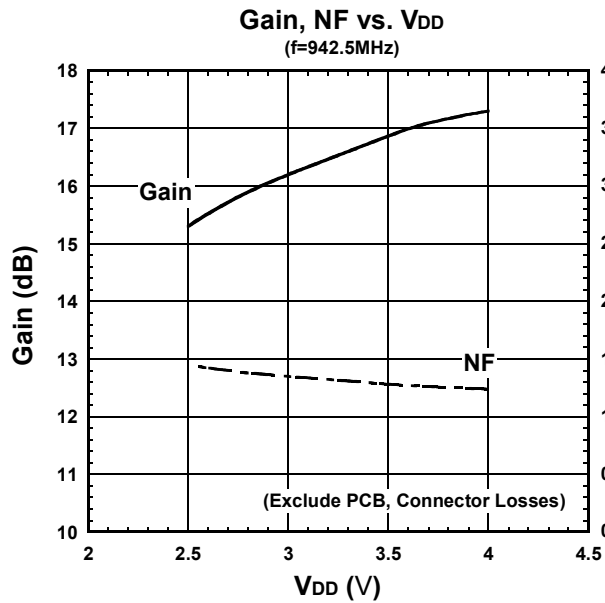
(General Conditions: $V_{DD}=2.8V$, $V_{CTL}=1.8V$, $f_{RF}=942.5MHz$, $Z_S=Z_L=50\Omega$, $T_a=+25^\circ C$, with application circuit)



NJG1138HA8

■ ELECTRICAL CHARACTERISTICS (High Gain Mode)

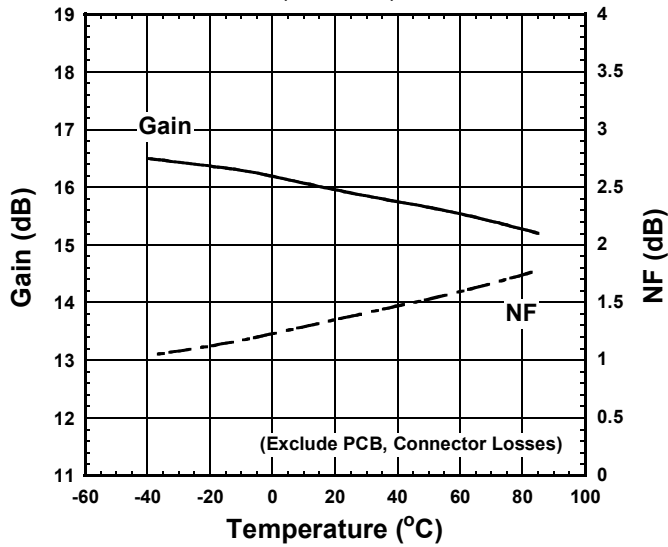
(General Conditions: $V_{DD}=2.8V$, $V_{CTL}=1.8V$, $f_{RF}=942.5MHz$, $Z_S=Z_L=50\ \Omega$, $T_a=+25^{\circ}C$, with application circuit)



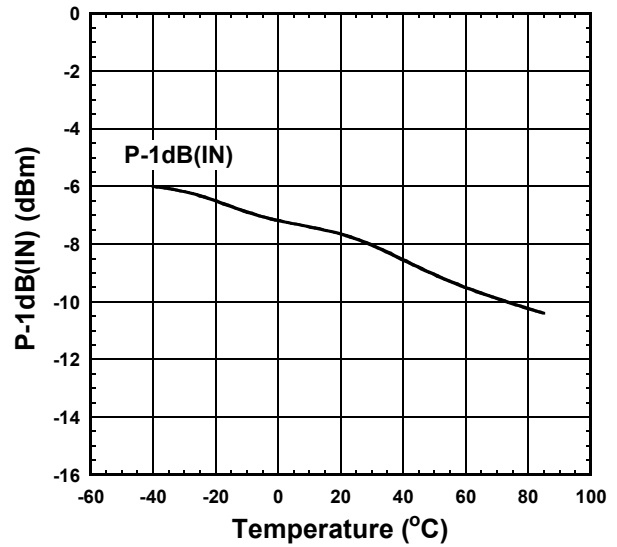
■ ELECTRICAL CHARACTERISTICS (High Gain Mode)

(General Conditions: $V_{DD}=2.8V$, $V_{CTL}=1.8V$, $f_{RF}=942.5MHz$, $Z_S=Z_L=50\Omega$, with application circuit)

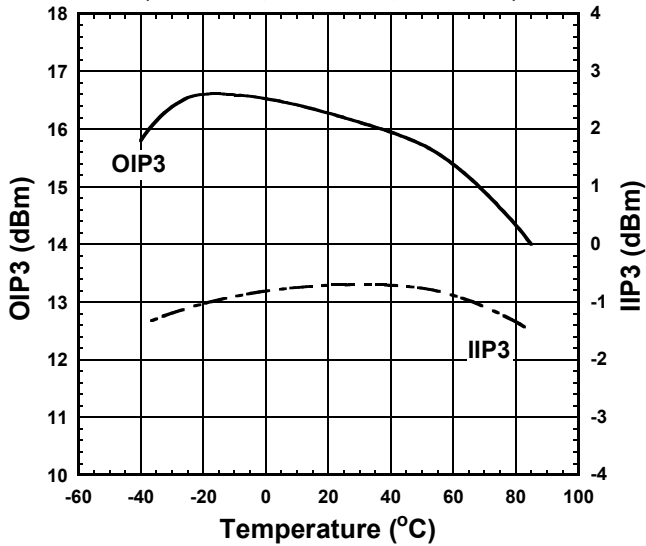
Gain, NF vs. Temperature
($f=942.5MHz$)



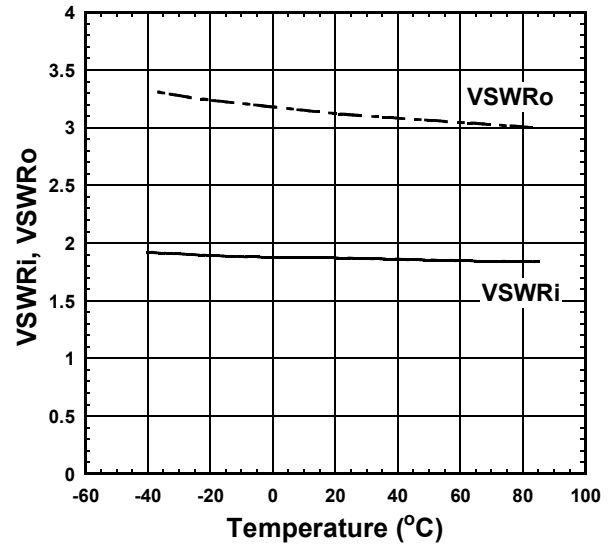
P-1dB(IN) vs. Temperature
($f=942.5MHz$)



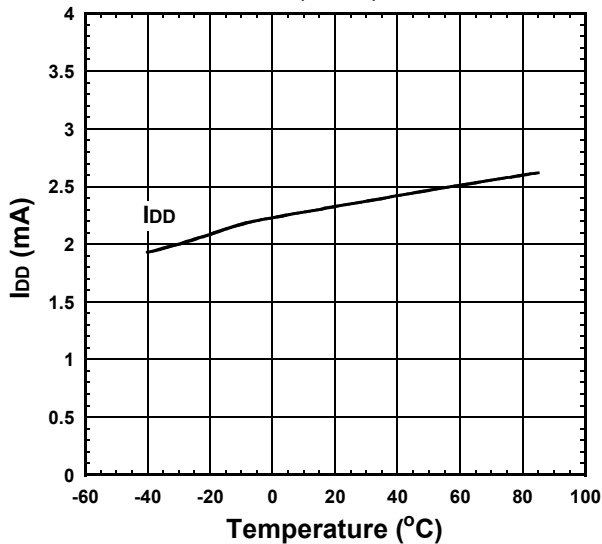
OIP3, IIP3 vs. Temperature
($f_1=942.5MHz$, $f_2=f_1+100kHz$, $P_{in}=-30dBm$)



VSWRi, VSWRo vs. Temperature
($f=942.5MHz$)



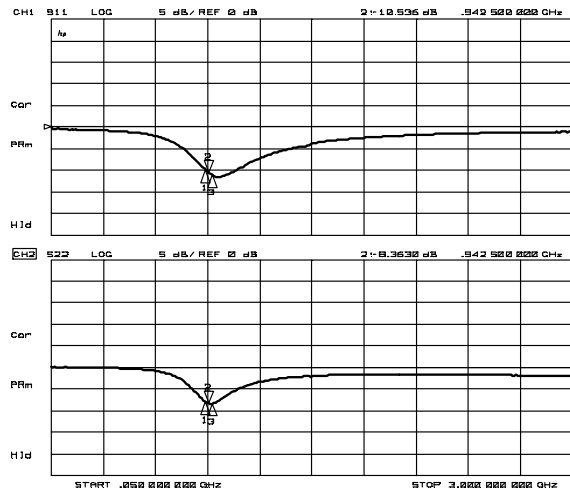
I_{DD} vs. Temperature
(RF OFF)



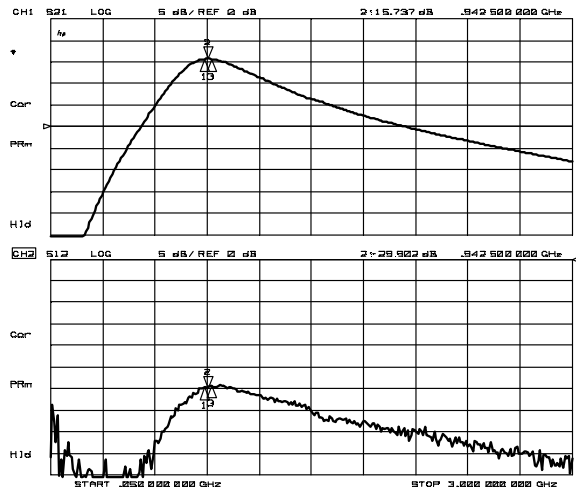
NJG1138HA8

ELECTRICAL CHARACTERISTICS (High Gain Mode)

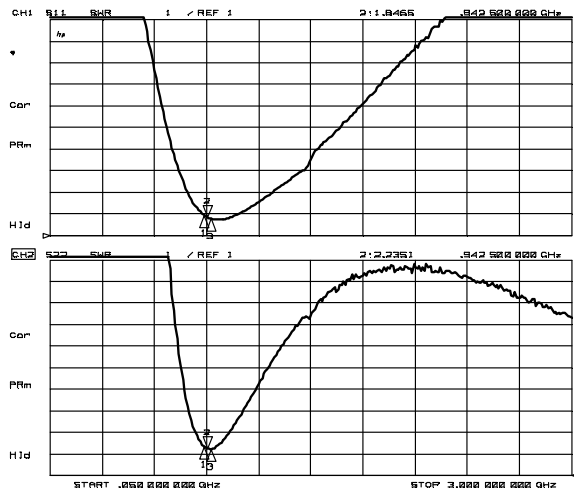
(General Conditions: $V_{DD}=2.8V$, $V_{CTL}=1.8V$, $f_{RF}=942.5MHz$, $Z_s=Z_L=50\Omega$, $T_a=+25^\circ C$, with application circuit)



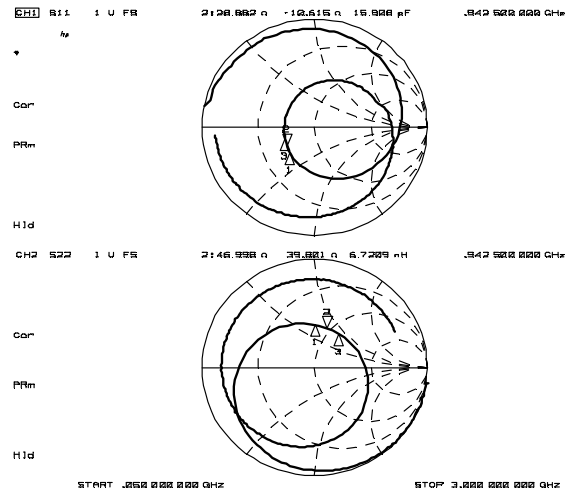
S11, S22



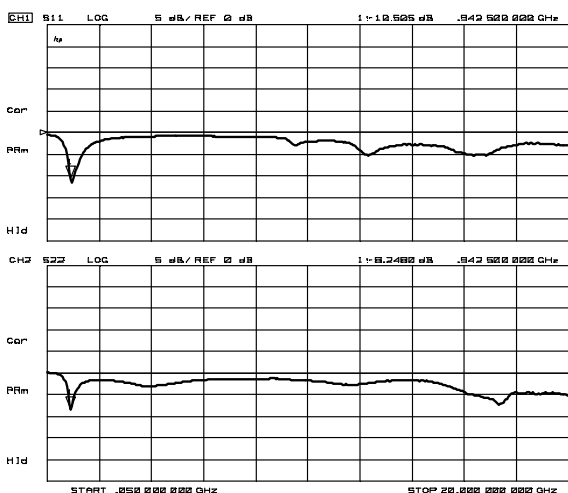
S21, S12



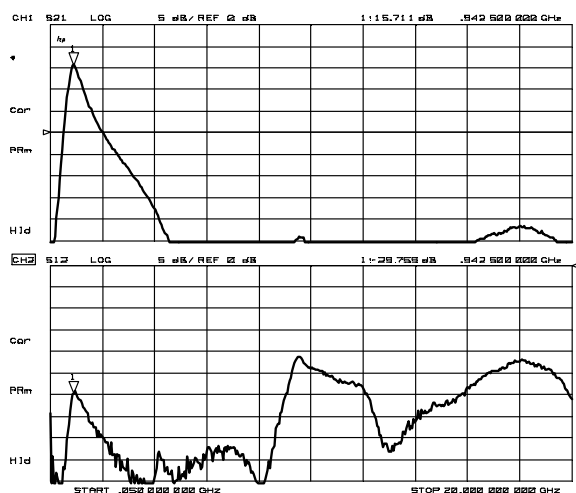
VSWR



Zin, Zout



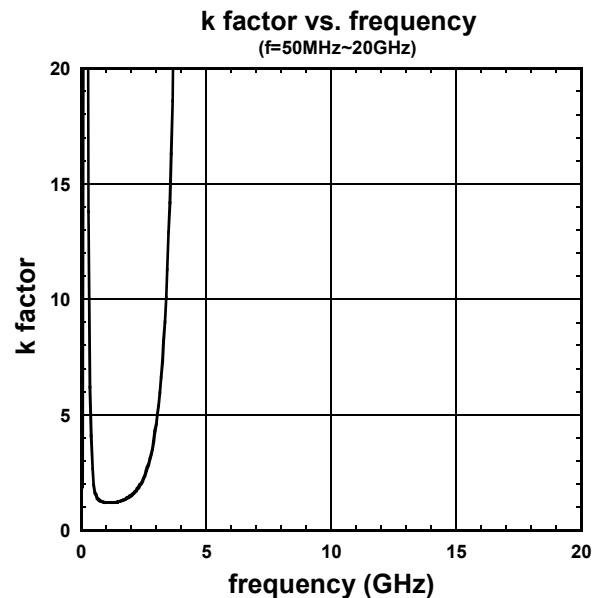
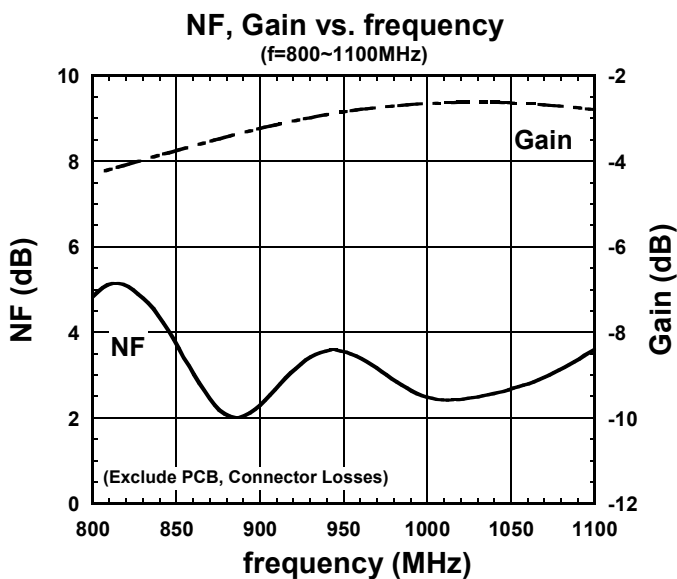
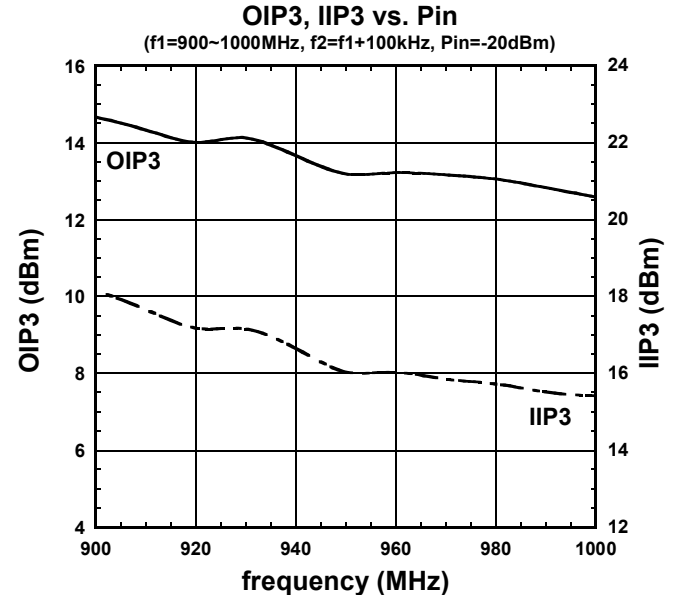
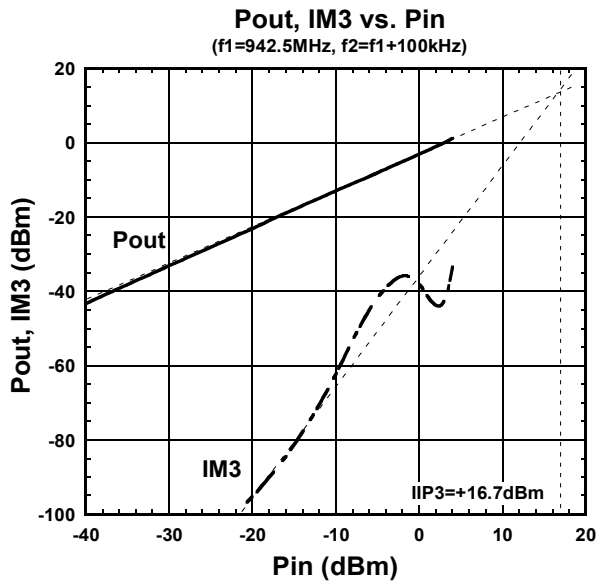
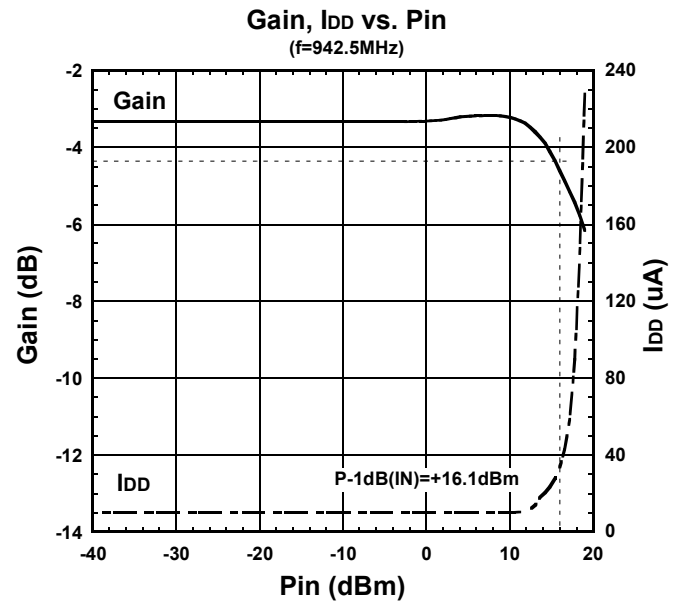
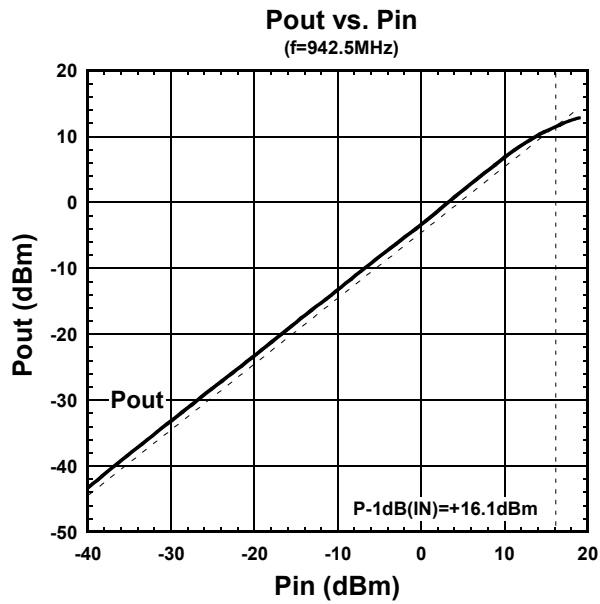
S11, S22
(f=50MHz~20GHz)



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

ELECTRICAL CHARACTERISTICS (Low Gain Mode)

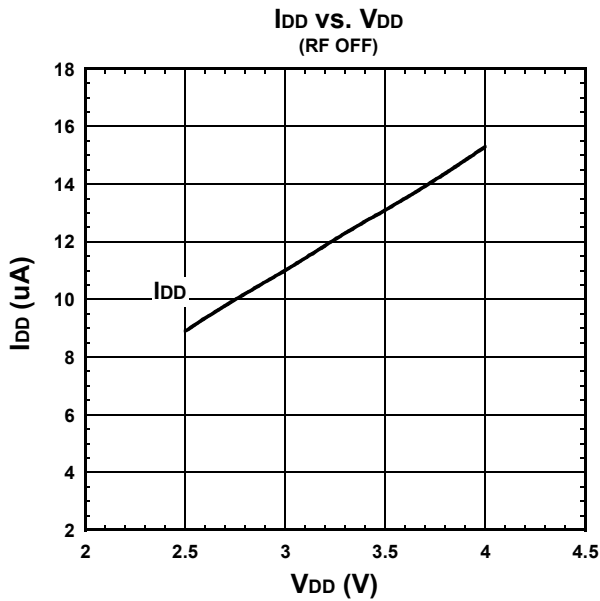
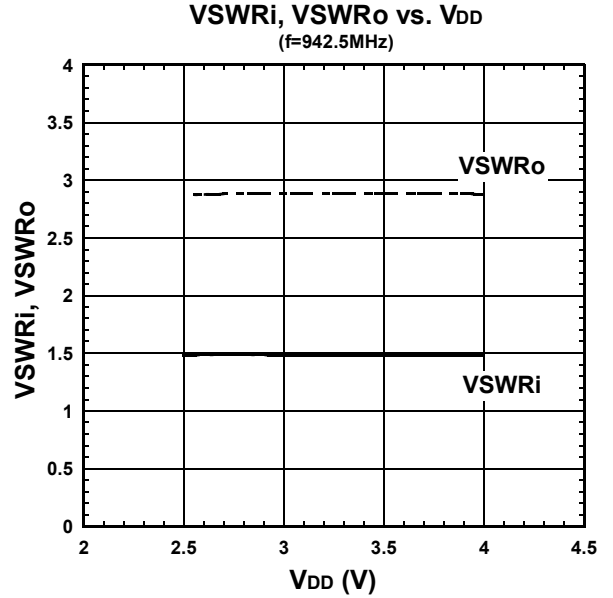
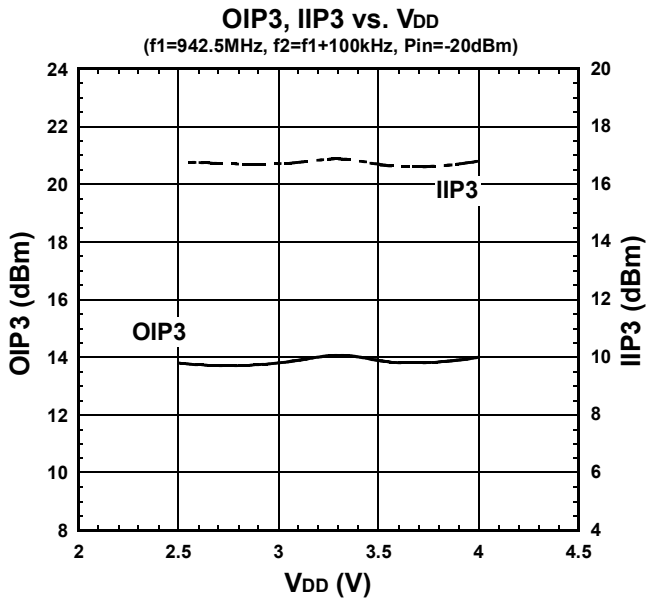
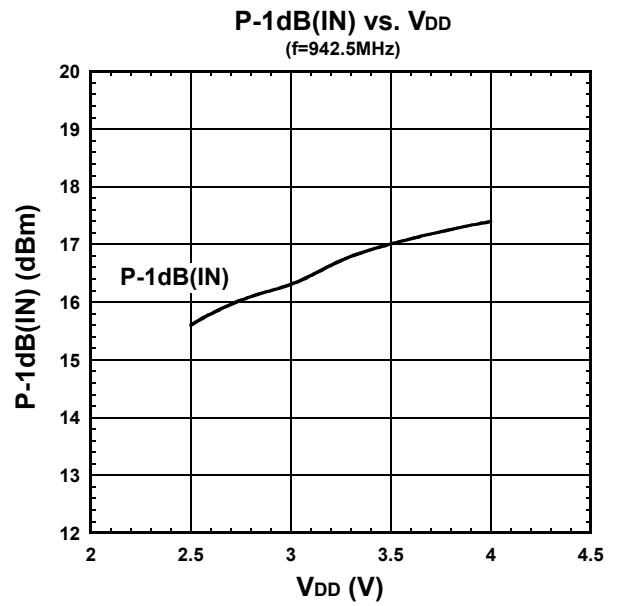
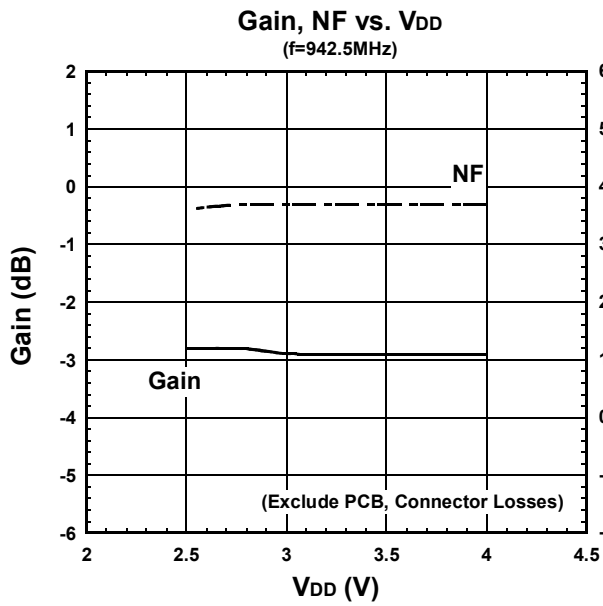
(General Conditions: $V_{DD}=2.8V$, $V_{CTL}=0V$, $f_{RF}=942.5MHz$, $Z_s=Z_l=50\ \Omega$, $T_a=+25^{\circ}C$, with application circuit)



NJG1138HA8

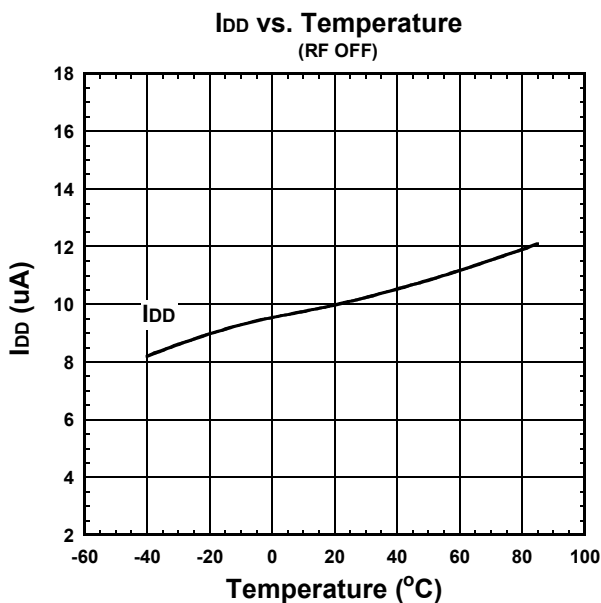
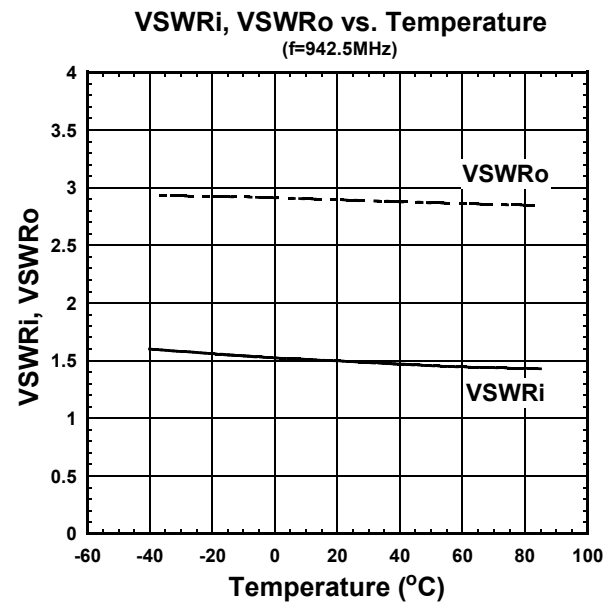
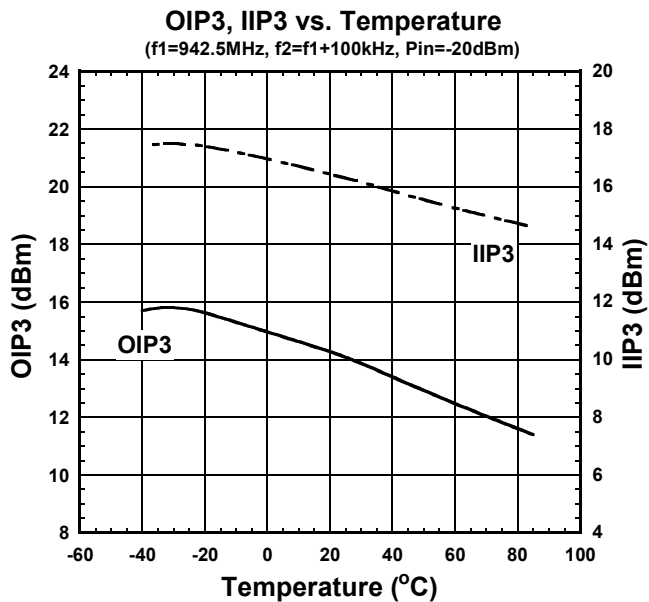
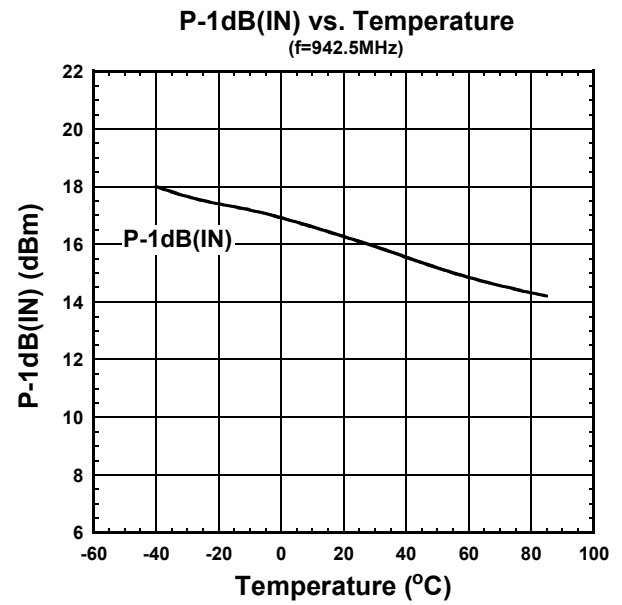
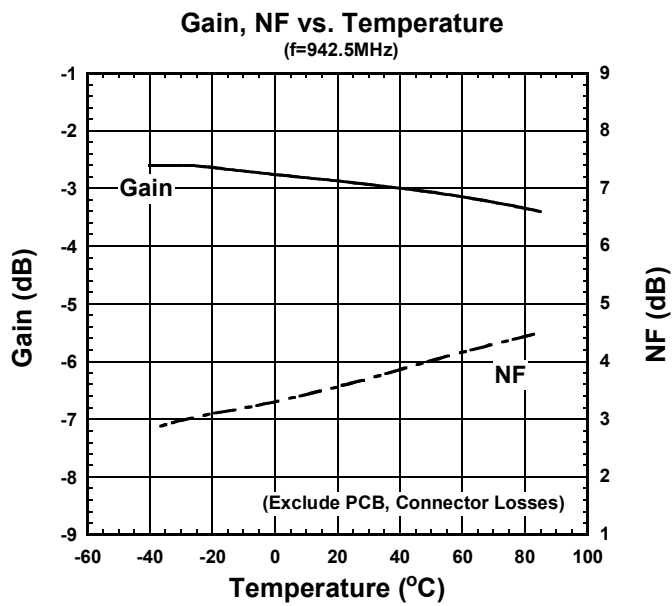
■ ELECTRICAL CHARACTERISTICS (Low Gain Mode)

(General Conditions: $V_{DD}=2.8V$, $V_{CTL}=0V$, $f_{RF}=942.5MHz$, $Z_s=Z_l=50\ \Omega$, $T_a=+25^{\circ}C$, with application circuit)



■ ELECTRICAL CHARACTERISTICS (Low Gain Mode)

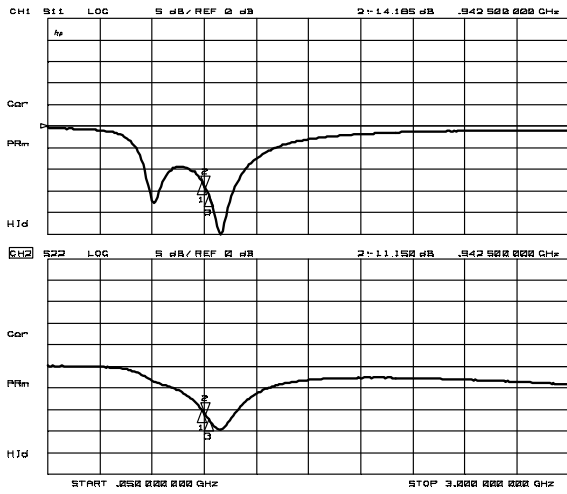
(General Conditions: $V_{DD}=2.8V$, $V_{CTL}=0V$, $f_{RF}=942.5MHz$, $Z_s=Z_l=50\ \Omega$, with application circuit)



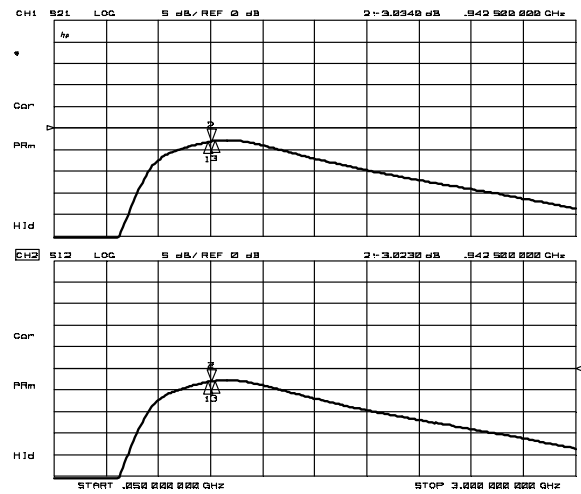
NJG1138HA8

ELECTRICAL CHARACTERISTICS (Low Gain Mode)

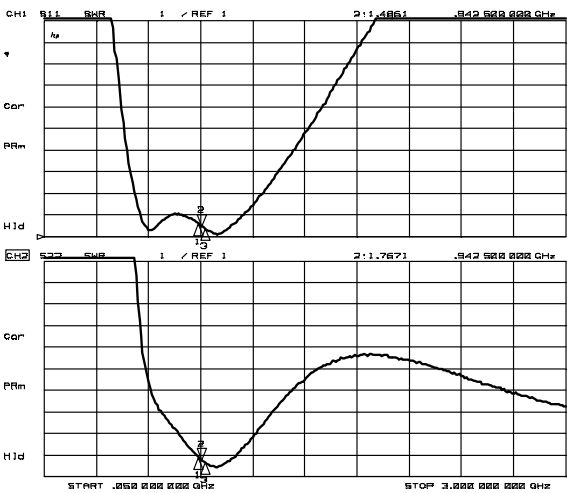
(General Conditions: $V_{DD}=2.8V$, $V_{CTL}=0V$, $f_{RF}=942.5MHz$, $Z_s=Z_l=50\ \Omega$, $T_a=+25^{\circ}C$, with application circuit)



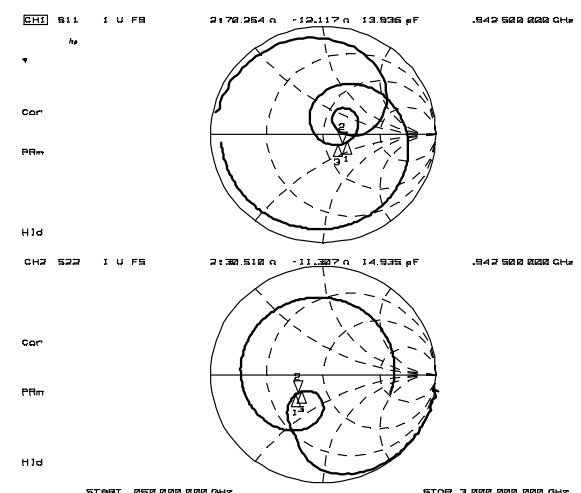
S11, S22



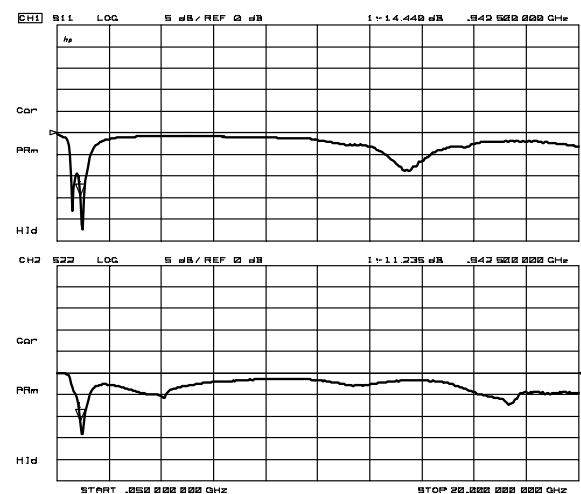
S21, S12



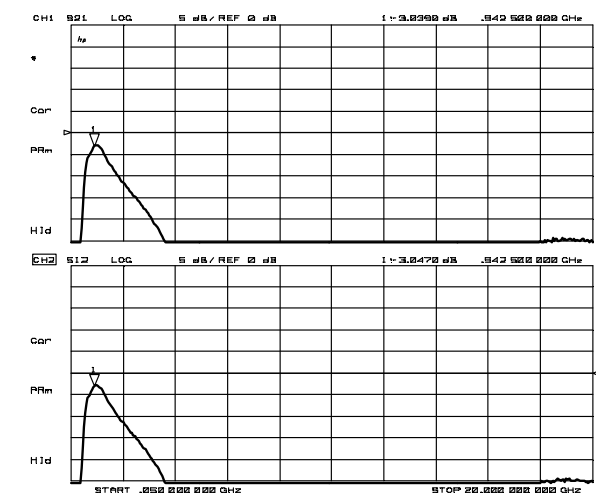
VSWR



Zin, Zout

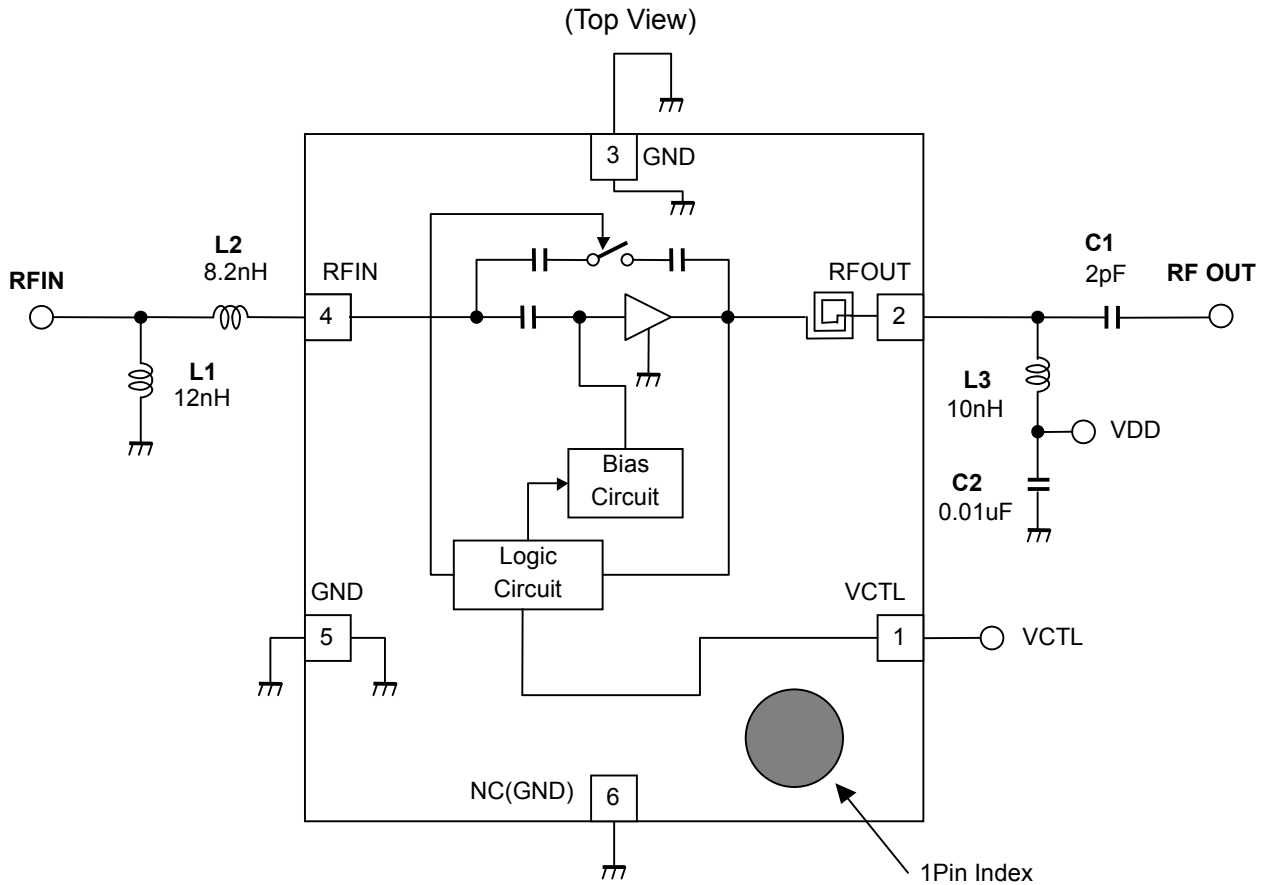


S11, S22
(f=50MHz~20GHz)

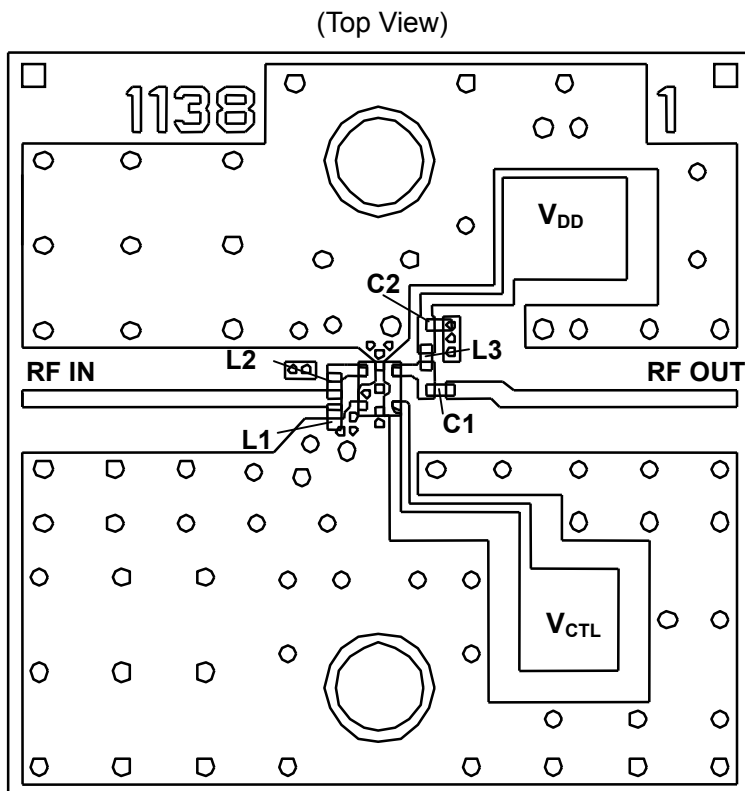


S21, S12
(f=50MHz~20GHz)

APPLICATION CIRCUIT



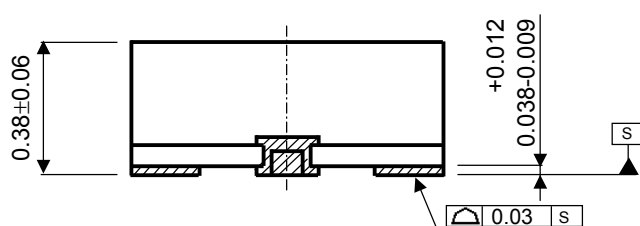
TEST PCB LAYOUT



Parts ID	Comments
L1, L2	Murata LQP03T Series
L3	TDK MLK0603 Series
C1, C2	Murata GRM03 Series

PCB (FR-4):
 t=0.2mm
 MICROSTRIP LINE WIDTH
 =0.4mm ($Z_0=50\text{ohm}$)
 PCB SIZE=17.0mm x 17.0mm

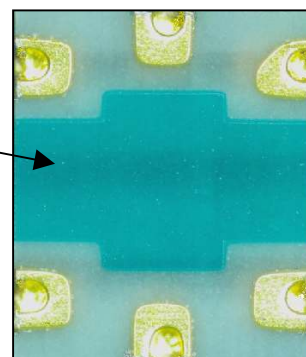
■ PACKAGE OUTLINE (USB6-A8)



Technical drawing of a mechanical part with dimensions and tolerances. The part is a square plate with a central cross-shaped hole. The overall dimensions are 1.0±0.05 (width) and 1.2±0.05 (height). The central hole has a width of 0.6 and a height of 0.4. The four corners of the plate are chamfered with a radius of R0.05. The four corners of the central hole are also chamfered with a radius of R0.05. The part is divided into four quadrants by the central hole. The dimensions and tolerances for the quadrants are as follows:

- Top-left quadrant: 0.2 (MIN0.15) width, 0.2±0.04 height, 0.1±0.05 distance from the central hole.
- Top-right quadrant: 0.2±0.04 width, 0.2±0.04 height, 0.1±0.05 distance from the central hole.
- Bottom-left quadrant: 0.2±0.04 width, 0.2±0.04 height, 0.1±0.05 distance from the central hole.
- Bottom-right quadrant: 0.2±0.04 width, 0.2±0.04 height, 0.1±0.05 distance from the central hole.

The part is labeled with 1, 2, 3, and 4 in the corners, and 5, 6, 7, and 8 in the center. The part is also labeled with 0.2 (MIN0.15), 0.2±0.04, 0.1±0.05, 0.2±0.04, 0.2±0.07, 1.0±0.05, 1.2±0.05, 0.8, 0.4, 0.6, 0.2, 0.1, R0.05, and C0.1.



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

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[NJR:](#)

[NJG1138HA8](#) [NJG1138HA8-TE1](#)



**Стандарт
Электрон
Связь**

Мы молодая и активно развивающаяся компания в области поставок электронных компонентов. Мы поставляем электронные компоненты отечественного и импортного производства напрямую от производителей и с крупнейших складов мира.

Благодаря сотрудничеству с мировыми поставщиками мы осуществляем комплексные и плановые поставки широчайшего спектра электронных компонентов.

Собственная эффективная логистика и склад в обеспечивает надежную поставку продукции в точно указанные сроки по всей России.

Мы осуществляем техническую поддержку нашим клиентам и предпродажную проверку качества продукции. На все поставляемые продукты мы предоставляем гарантию .

Осуществляем поставки продукции под контролем ВП МО РФ на предприятия военно-промышленного комплекса России , а также работаем в рамках 275 ФЗ с открытием отдельных счетов в уполномоченном банке. Система менеджмента качества компании соответствует требованиям ГОСТ ISO 9001.

Минимальные сроки поставки, гибкие цены, неограниченный ассортимент и индивидуальный подход к клиентам являются основой для выстраивания долгосрочного и эффективного сотрудничества с предприятиями радиоэлектронной промышленности, предприятиями ВПК и научно-исследовательскими институтами России.

С нами вы становитесь еще успешнее!

Наши контакты:

Телефон: +7 812 627 14 35

Электронная почта: sales@st-electron.ru

Адрес: 198099, Санкт-Петербург,
Промышленная ул, дом № 19, литера Н,
помещение 100-Н Офис 331