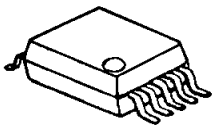
1.5/1.9GHz BAND FRONT-END GaAs MMIC

■GENERAL DESCRIPTION

NJG1705V is a front-end GaAs MMIC including a LNA, local amplifier and a Mixer, designed mainly for 1.5 and 1.9GHz band cellular phone.

NJG1705V exhibits low noise of 16dB at 1.5GHz and 2.1dB at 1.9GHz at low total current consumption of 9.5mA.

■PACKAGE OUTLINE



NJG1705V

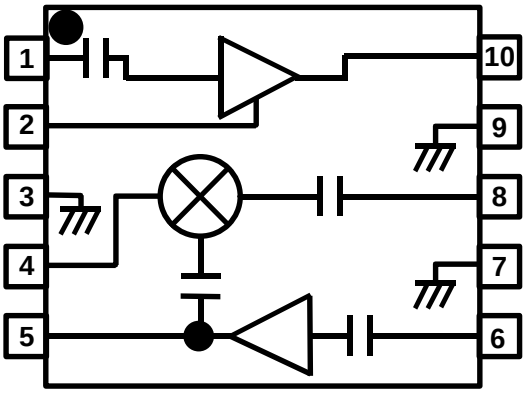
■FEATURES

●Low voltage operation	+2.7V typ.
●Low current consumption	9.5mA typ.
●High conversion gain	23.5dB typ. @f_{RF}=1489MHz, P_{RF}=-50dBm, f_{LO}=1619MHz, P_{LO}=-10dBm
	20.5dB typ. @f_{RF}=1900MHz, P_{RF}=-50dBm, f_{LO}=1660MHz, P_{LO}=-10dBm
●Low noise figure	1.6dB typ. @f_{RF}=1489MHz, f_{LO}=1619MHz, P_{LO}=-10dBm, f_{IF}=130MHz
	2.2dB typ. @f_{RF}=1900MHz, f_{LO}=1660MHz, P_{LO}=-10dBm, f_{IF}=240MHz
●High IIP3	-15.5dBm typ. @f_{RF}=1489.0+1489.1MHzf_{LO}=1619MHz, P_{LO}=-10dBm
	-10dBm typ. @f_{RF}=1900.0+1900.1MHzf_{LO}=1660MHz, P_{LO}=-10dBm
●Package	SSOP10

■PIN CONFIGURATION

V Type

(Top View)



Pin Connection

1.LNAIN
2.LNACAP
3.GND
4.IFOUT
5.VLO
6.LOIN
7.GND
8.MIXIN
9.GND
10.LNAOUT

■ABSOLUTE MAXIMUM RATINGS

(T_a=+25°C, Z_s=Z_l=50Ω)

PARAMETER	SYMBOL	CONDITIONS	RATINGS	UNITS
LNA Voltage	V_{LNA}		5.0	V
MIXER Voltage	V_{MIX}		5.0	V
Local Amplifier Voltage	V_{LO}		5.0	V
InputPower1	P_{LNAIN}	V_{LNA}=V_{MIX}=V_{LO}=2.7V	+15	dBm
InputPower2	P_{LOIN}	V_{LNA}=V_{MIX}=V_{LO}=2.7V	+10	dBm
Power Dissipation	P_D		320	mW
Operating Temperature	T_{opr}		-40~+85	°C
Storage Temperature	T_{stg}		-55~+125	°C

■ELECTRICAL CHARACTERISTICS 1 (1.5GHz band)

COMMON CONDITIONS: T_a=+25°C, V_{LNA}=V_{MIX}=V_{LO}=2.7V, f_{RF}=1489MHz, f_{LO}=1619MHz,f_{IF}=130MHz, P_{RF}=-50dBm, P_{LO}=-10dBm, Z_s=Z_l=50Ω, Application Circuit, 1.5GHz band, f_{LO}=1619MHz

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Operating Frequency	freq		1470	1489	1520	MHz
LNA Voltage	V_{LNA}		2.5	2.7	4.5	V
MIXER Voltage	V_{MIX}		2.5	2.7	4.5	V
Local Amplifier Voltage	V_{LO}		2.5	2.7	4.5	V
LNA current	I_{LNA}	RF, LO=OFF	-	3.5	5.0	mA
MIXER current	I_{MIX}	RF, LO=OFF	-	5.0	6.6	mA
Local Amplifier current	I_{LO}	RF, LO=OFF	-	1.0	2.0	mA
Total current	I_{AL}	RF, LO=OFF	-	9.5	13.6	mA
Conversion Gain	Gc		21.0	23.5	-	dB
Gain Flatness	G_{flat}	f_{RF}=1470-1520MHz	-	1.0	1.5	dB
Noise Figure	NF		-	1.6	1.9	dB
1dB Gain Compression Output Power	P-1dB		-4.0	-2.0	-	dBm
Input 3'rd Intercept Point	IIP3	f_{RF}=1489.0+1489.1MHz	-18.0	-15.5	-	dBm
Image Suppression Level	IMR		-	-11.0	-8.0	dBc
RF IN VSWR	$VSWR_i$		-	2.0	3.0	

■ELECTRICAL CHARACTERISTICS (1.5GHz band LNA)

COMMON CONDITIONS: T_a=+25°C, V_{LNA}=2.7V, V_{MIX}=V_{LO}=0V, f_{RF}=1489MHz, Z_s=Z_l=50Ω, f_{LO}=1619MHz, Application Circuit, 1.5GHz band, f_{LO}=1619MHz

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Small Signal Gain	Gain		-	15.0	-	dB
Noise Figure	NF		-	1.2	-	dB
Input 3'rd Intercept Point	IIP3	f_{RF}=1489.0+1489.1MHz	-	-4.0	-	dBm
RF IN VSWR	VSWRi		-	2.0	-	
RF OUT VSWR	VSWRo		-	2.0	-	

■ELECTRICAL CHARACTERISTICS (1.5GHz band MIXER)

COMMON CONDITIONS: T_a=+25°C, V_{LNA}=0V, V_{MIX}=V_{LO}=2.7V, f_{RF}=1489MHz, f_{LO}=1619MHz, P_{RF}=-30dBm, P_{LO}=-10dBm, Z_s=Z_l=50Ω, Application Circuit, 1.5GHz band, f_{LO}=1619MHz

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Conversion Gain	G_c		-	8.0	-	dB
Noise Figure	NF		-	8.0	-	dB
Input 3'rd Intercept Point	IIP3	f_{RF}=1489.0+1489.1MHz	-	-1.0	-	dBm

■ELECTRICAL CHARACTERISTICS 2 (1.9GHz band)

COMMON CONDITIONS: T_a=+25°C, V_{LNA}=V_{MIX}=V_{LO}=2.7V, f_{RF}=1900MHz, f_{LO}=1660MHz, f_{IF}=240MHz, P_{RF}=-50dBm, P_{LO}=-10dBm, Z_s=Z_l=50Ω, Application Circuit, 1.9GHz band, f_{LO}=1660MHz

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Operating Frequency	freq		1890	1900	1920	MHz
LNA Voltage	V_{LNA}		2.5	2.7	4.5	V
MIXER Voltage	V_{MIX}		2.5	2.7	4.5	V
Local Amplifier Voltage	V_{LO}		2.5	2.7	4.5	V
LNA Current *1	I_{LNA}	RF, LO=OFF	-	3.5	5.0	mA
MIXER Current *2	I_{MIX}	RF, LO=OFF	-	5.0	6.6	mA
Local Amplifier Current *3	I_{LO}	RF, LO=OFF	-	1.0	2.0	mA
Total Current	I_{AL}	RF, LO=OFF	-	9.5	13.6	mA
Conversion Gain	Gc		18.5	20.5	-	dB
Gain Flatness	G_{flat}	f_{RF}=1890-1920MHz	-	1.3	1.8	dB
Noise Figure	NF		-	2.2	2.5	dB
1dB Gain Output Compression Output Power	P-1dB		-3.0	-1.0	-	dBm
Input 3’rd Intercept Point	IIP3	f_{RF}=1900.0+1900.1MHz	-14.0	-10.0	-	dBm
Image Suppression Level	IMR		-	-6.5	-4.5	dBc
RF IN VSWR	$VSWR_I$		-	2.0	3.0	

■ELECTRICAL CHARACTERISTICS (1.9GHz band LNA)

COMMON CONDITIONS: T_a=+25°C, V_{LNA}=2.7V, V_{MIX}=V_{LO}=0V, f_{RF}=1900MHz, Z_s=Z_l=50Ω,
Application Circuit, 1.9GHz band, f_{LO}=1660MHz

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Small signal Gain	Gain		-	13.0	-	dB
Noise Figure	NF		-	1.4	-	dB
Input 3'rd Intercept Point	IIP3	f_{RF}=1900.0+1900.1MHz	-	-3.0	-	dBm
RF IN VSWR	VSWRi		-	2.0	-	
RF OUT VSWR	VSWRo		-	2.0	-	

■ELECTRICAL CHARACTERISTICS (1.9GHz band MIXER)

COMMON CONDITIONS: T_a=+25°C, V_{LNA}=0V, V_{MIX}=V_{LO}=2.7V, f_{RF}=1900MHz, f_{LO}=1660MHz,
P_{RF}=-30dBm, P_{LO}=-10dBm, Zs=Zl=50Ω, f_{LO}=1660MHz,
Application Circuit, 1.9GHz band, f_{LO}=1660MHz

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Conversion Gain	G_c		-	8.0	-	dB
Noise Figure	NF		-	8.0	-	dB
Input 3'rd Intercept Point	IIP3	f_{RF}=1900.0+1900.1MHz	-	4.0	-	dBm

■TERMINAL INFORMATION

No.	SYMBOL	DESCRIPTIONS
1	LNAIN	RF input terminal of LNA. The RF signal is input through external matching circuit.
2	LNACAP	Terminal for the bypass capacitor of LNA. The bypass capacitor C1 shown in application circuit, should be connected to this terminal as close as possible.
3	GND	Ground terminal(0V)
4	IFOUT	IF signal output terminal. The IF signal is output though external matching circuit's connected to this terminal. Please connect inductance L8 and power supply as application circuit since it is also the terminal of Mixer power supply.
5	VLO	Power supply terminal for local amplifier. Please connect R1 and L10 to this terminal shown in the application circuit as close as possible.
6	LOIN	Local signal input terminal of local amplifier. The local signal is terminal to local amplifier through external matching circuit.
7	GND	Ground terminal(0V)
8	MIXIN	RF signal input terminal of Mixer. The RF signal from LNA is sent to Mixer through matching circuit.
9	GND	Ground terminal(0V)
10	LNAOUT	Signal output terminal of LNA. The RF signal from LNA is output through external matching circuit connected to this terminal. Please connect inductance L4 and power supply shown in application circuit, since it is also the terminal of LNA power supply.

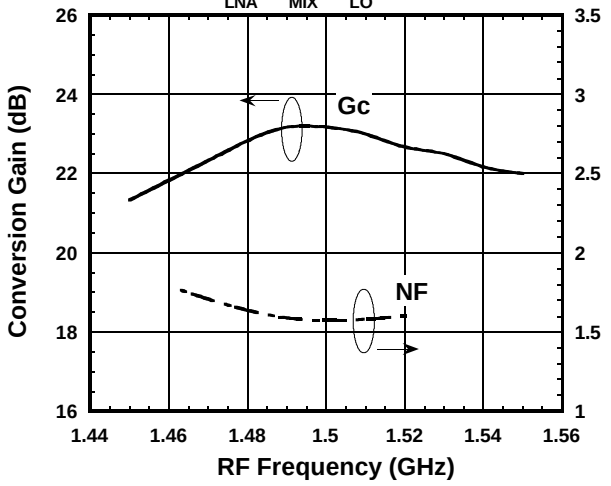
CAUTION

1) Ground terminal (No.3, 7, 9) should be connected to the ground plane as short as possible.

■**TYPICAL CHARACTERISTICS** (LNA+MIXER 1.5GHz band f_{LO}=1619MHz)

Conversion Gain , Noise Figure vs. RF Frequency

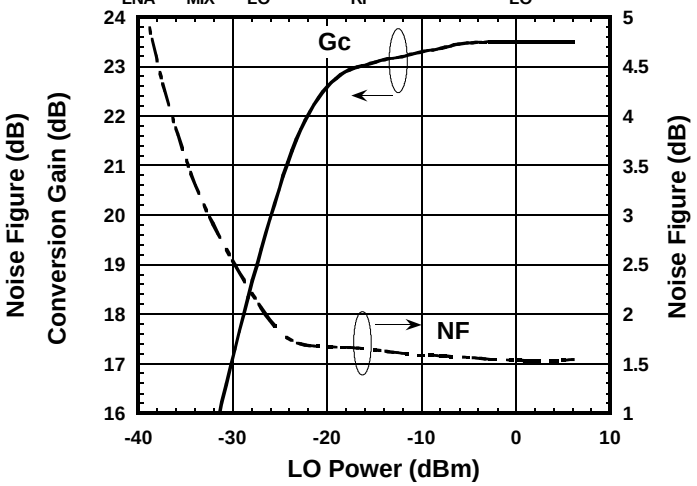
(V_{LNA}=V_{MIX}=V_{LO}=2.7V)



Condition
f_{IF}=130MHz
P_{RF}=-50dBm
P_{LO}=-10dBm
V_{LNA}=V_{MIX}=V_{LO}=2.7V
Upper LOCAL

Conversion Gain , Noise Figure vs. LO Power

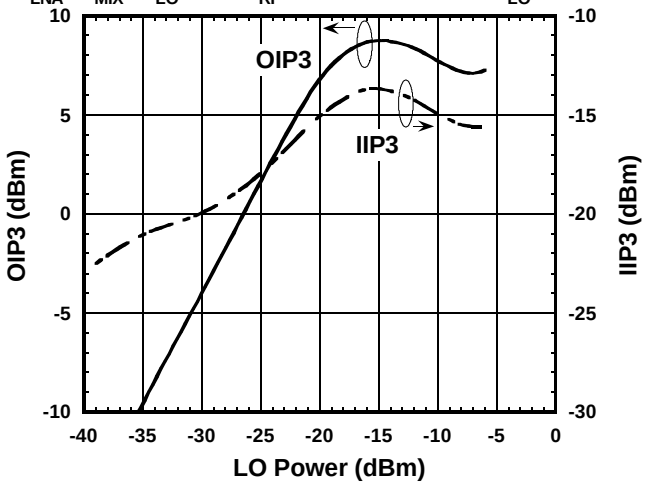
(V_{LNA}=V_{MIX}=V_{LO}=2.7V,f_{RF}=1489MHz,f_{LO}=1619MHz)



Condition
f_{IF}=130MHz
f_{RF}=1489MHz,P_{RF}=-50dBm
f_{LO}=1619MHz
V_{LNA}=V_{MIX}=V_{LO}=2.7V

Output-IP3 , Input-IP3 vs. LO Power

(V_{LNA}=V_{MIX}=V_{LO}=2.7V,f_{RF}=1469+1489.1MHz,f_{LO}=1619MHz)



Condition
f_{IF}=130MHz
f_{RF1}=1489.0MHz,P_{RF}=-35dBm
f_{RF2}=1489.1MHz
f_{LO}=1619MHz
V_{LNA}=V_{MIX}=V_{LO}=2.7V

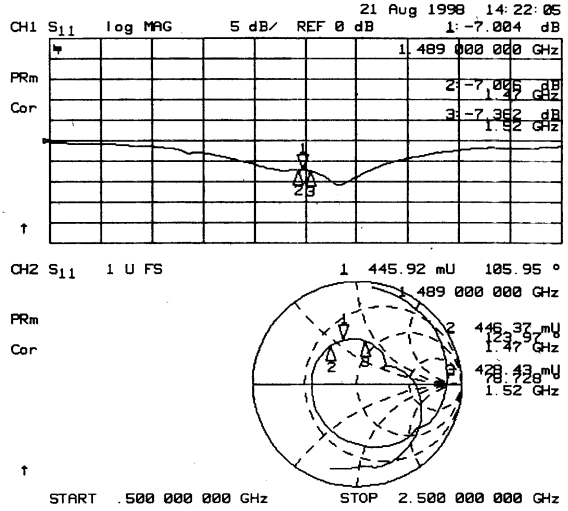
$$OIP3=\frac{3IF-IM3}{2}$$

$$IIP3=\frac{3IF-IM3}{2}-G_c$$

@P_{RF}=-35dBm

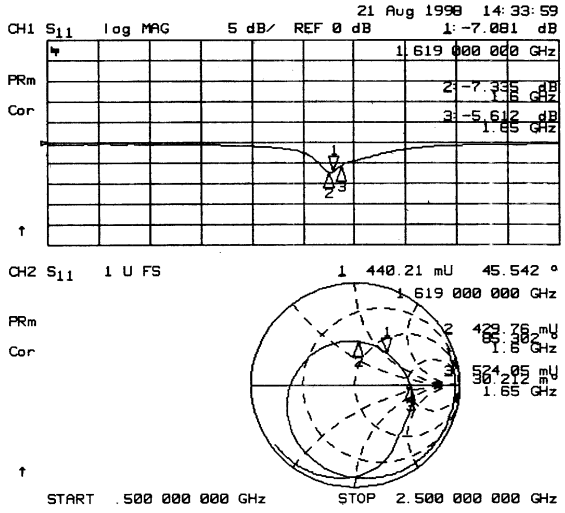
■TYPICAL CHARACTERISTICS (LNA+MIXER 1.5GHz band f_{LO}=1619MHz)

RF IN IMPEDANCE



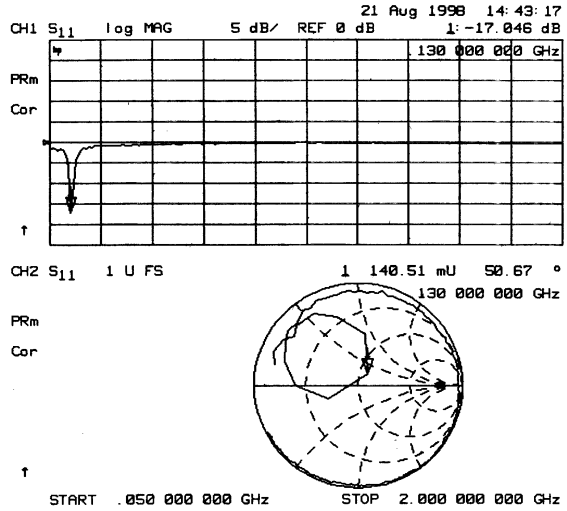
Condition
V_{LNA}=2.7V
V_{MIX}=V_{LO}=2.7V

LOCAL IN IMPEDANCE



Condition
V_{LNA}=2.7V
V_{MIX}=V_{LO}=2.7V

IF OUT IMPEDANCE

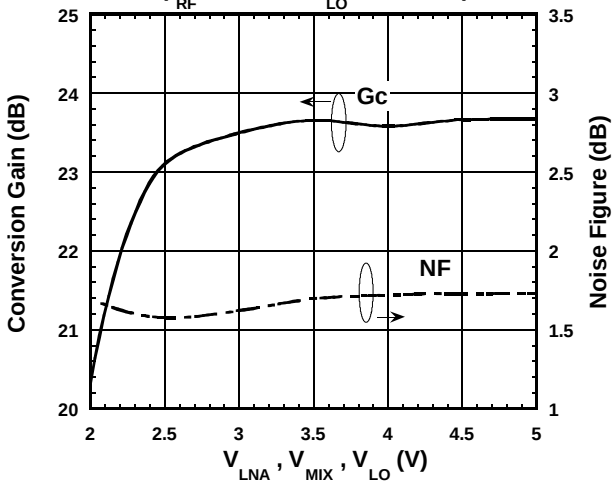


Condition
V_{LNA}=2.7V
V_{MIX}=V_{LO}=2.7V

■**TYPICAL CHARACTERISTICS** (LNA+MIXER 1.5GHz band f_{LO}=1619MHz)

Conversion Gain , Noise Figure vs. V_{LNA} , V_{MIX} , V_{LO}

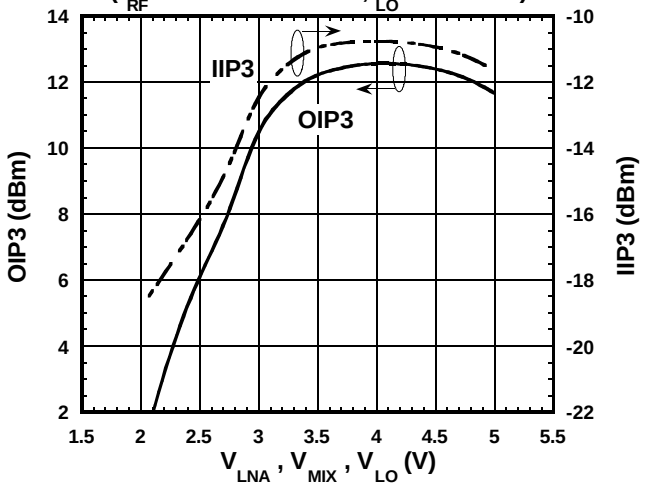
(f_{RF}=1489MHz,f_{LO}=1619MHz)



Condition
f_{IF}=130MHz
f_{RF}=1489MHz, P_{RF}=-50dBm
f_{LO}=1619MHz, P_{LO}=-10dBm

Output-IP3 , Input-IP3 vs. V_{LNA} , V_{MIX} , V_{LO}

(f_{RF}=1489+1489.1MHz,f_{LO}=1619MHz)



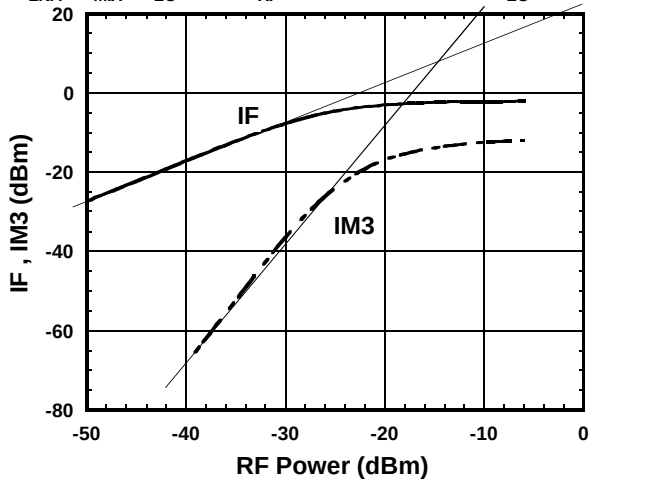
Condition
f_{IF}=130MHz
f_{RF1}=1489.0MHz, P_{RF}=-35dBm
f_{RF2}=1489.1MHz
f_{LO}=1619MHz, P_{LO}=-10dBm

$$OIP3=\frac{3IF\text{-}IM3}{2}$$

$$IIP3=\frac{3IF\text{-}IM3}{2}-G_c \quad @P_{RF}=-35dBm$$

IF , IM3 vs. RF Power

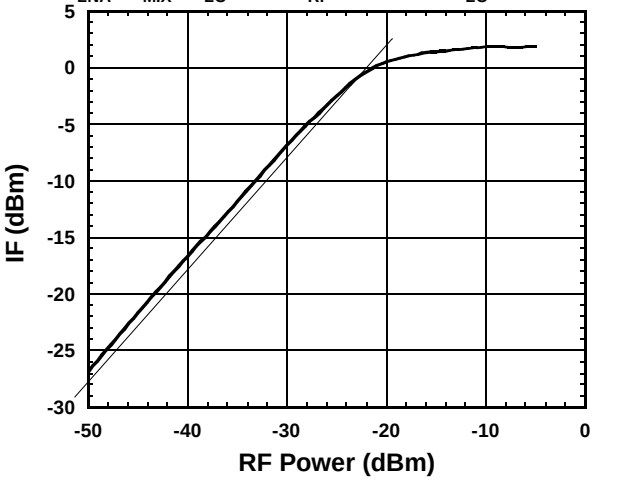
(V_{LNA}=V_{MIX}=V_{LO}=2.7V,f_{RF}=1489+1489.1MHz,f_{LO}=1619MHz)



Condition
f_{IF}=130MHz
f_{RF1}=1489.0MHz
f_{RF2}=1489.1MHz
f_{LO}=1619MHz, P_{LO}=-10dBm
V_{LNA}=V_{MIX}=V_{LO}=2.7V

IF vs. RF Power

(V_{LNA}=V_{MIX}=V_{LO}=2.7V,f_{RF}=1489MHz,f_{LO}=1619MHz)

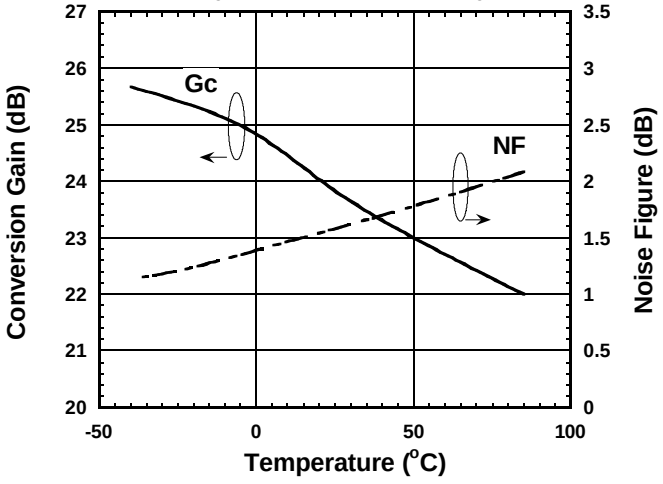


Condition
f_{IF}=130MHz
f_{RF}=1489MHz
f_{LO}=1619MHz, P_{LO}=-10dBm
V_{LNA}=V_{MIX}=V_{LO}=2.7V

■**TYPICAL CHARACTERISTICS** (LNA+MIXER 1.5GHz band f_{LO}=1619MHz)

Conversion Gain , Noise Figure vs. Temperature

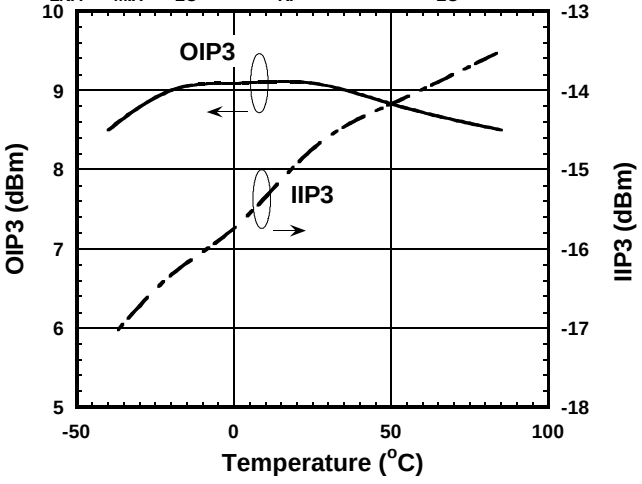
(V_{LNA}=V_{MIX}=V_{LO}=2.7V,f_{RF}=1489MHz,f_{LO}=1619MHz)



Condition
f_{IF}=130MHz
f_{RF}=1489MHz, P_{RF}=-50dBm
f_{LO}=1619MHz, P_{LO}=-10dBm
V_{LNA}=V_{MIX}=V_{LO}=2.7V

Output-IP3 , Input-IP3 vs. Temperature

(V_{LNA}=V_{MIX}=V_{LO}=2.7V,f_{RF}=1489MHz,f_{LO}=1619MHz)



Condition
f_{IF}=130MHz
f_{RF1}=1489.0MHz, P_{RF}=-35dBm
f_{RF2}=1489.1MHz
f_{LO}=1619MHz
V_{LNA}=V_{MIX}=V_{LO}=2.7V

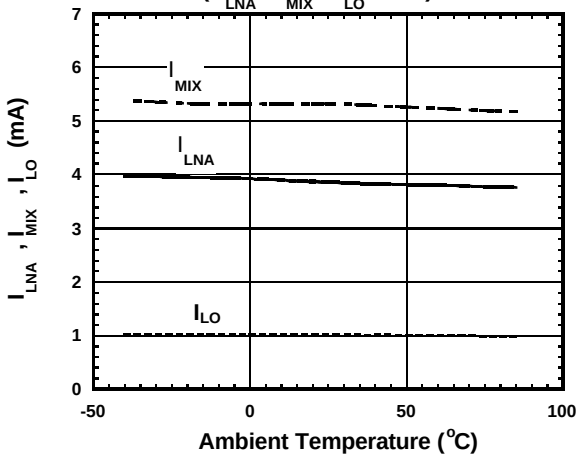
$$OIP3=\frac{3IF\text{-}IM3}{2}$$

$$IIP3=\frac{3IF\text{-}IM3}{2}-G_c$$

@P_{RF}=-35dBm

I_{LNA} , I_{MIX} , I_{LO} vs. Ambient Temperature

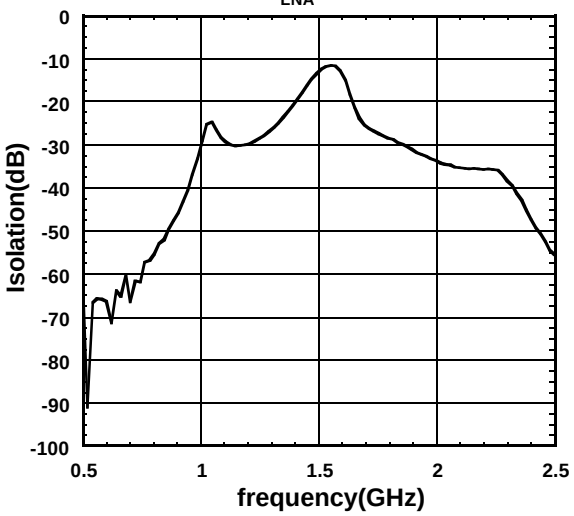
(V_{LNA}=V_{MIX}=V_{LO}=2.7V)



Condition
P_{RF}=OFF
P_{LO}=OFF
V_{LNA}=V_{MIX}=V_{LO}=2.7V

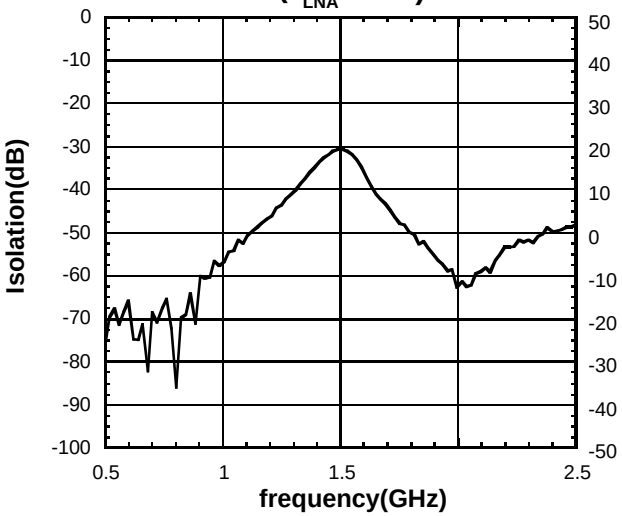
■**TYPICAL CHARACTERISTICS** (LNA+MIXER 1.5GHz band f_{LO}=1619MHz)

RF IN-LOCAL IN Isolation
(V_{LNA}=2.7V)



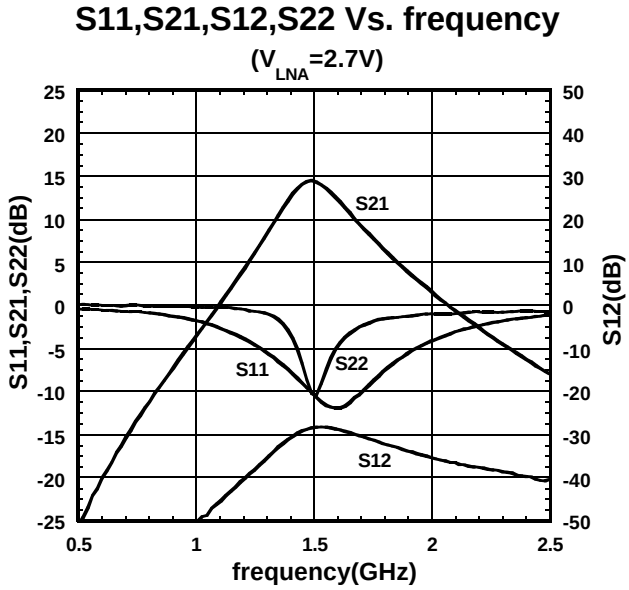
Condition
V_{LNA}=2.7V
V_{MIX}=V_{LO}=2.7V
Port1: RF IN
Port2: LOCAL IN

RF OUT-MIXER IN Isolation
(V_{LNA}=2.7V)

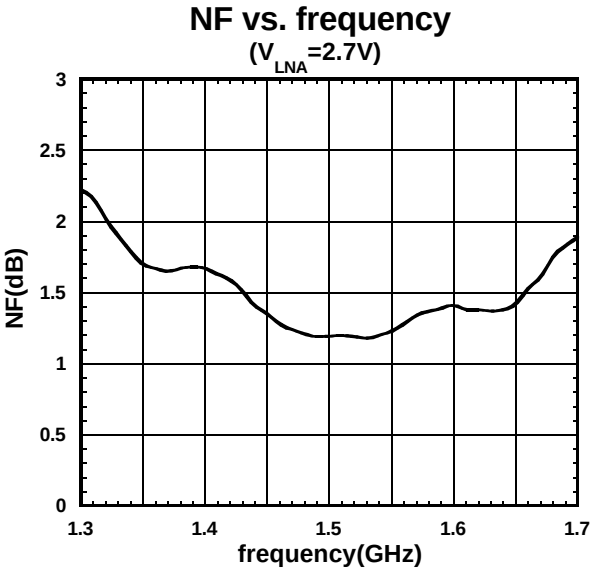


Condition
V_{LNA}=2.7V
V_{MIX}=V_{LO}=2.7V
Port1: RF OUT
Port2: MIXER IN

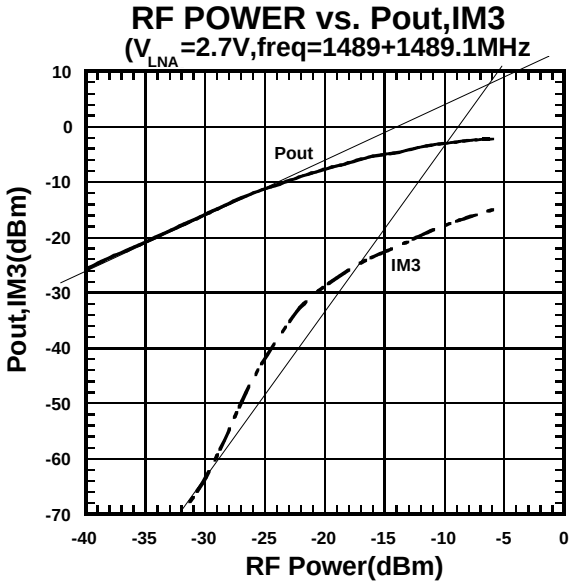
■**TYPICAL CHARACTERISTICS** (LNA 1.5GHz band f_{LO}=1619MHz)



Condition
V_{LNA}=2.7V
V_{MIX}=V_{LO}=0V



Condition
V_{LNA}=2.7V
V_{MIX}=V_{LO}=0V

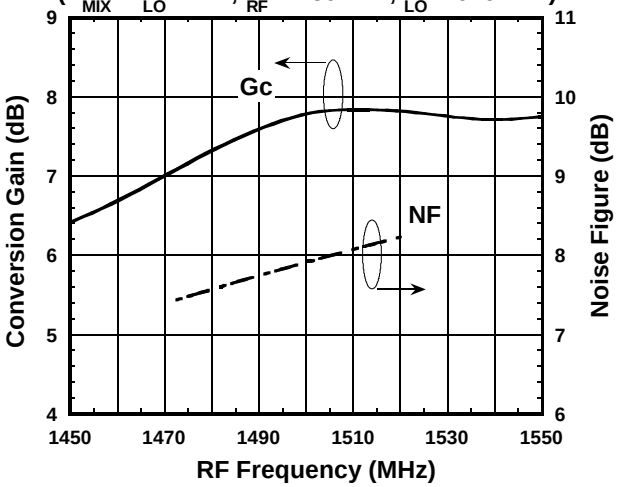


Condition
f_{RF}=1489.0+1489.1MHz
V_{LNA}=2.7V
V_{MIX}=V_{LO}=0V

■**TYPICAL CHARACTERISTICS** (MIXER 1.5GHz band f_{LO}=1619MHz)

Conversion Gain , Noise Figure vs. RF Frequency

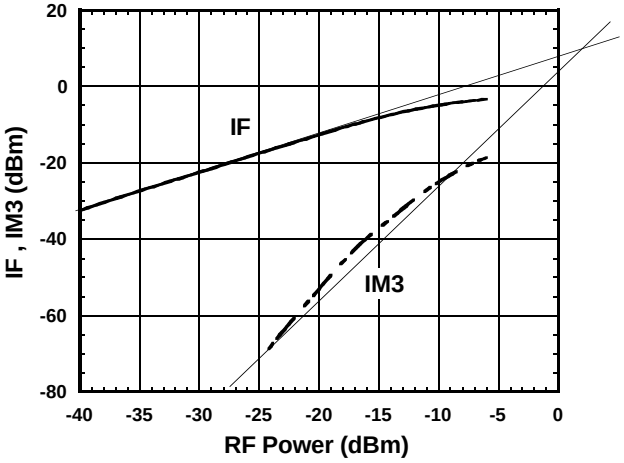
(V_{MIX}=V_{LO}=2.7V,f_{RF}=1489MHz,f_{LO}=1619MHz)



Condition
f_{IF}=130MHz
P_{RF}=-30dBm
P_{LO}=-10dBm
V_{LNA}=0V
V_{MIX}=V_{LO}=2.7V
Upper LOCAL

IF , IM3 vs. RF Power

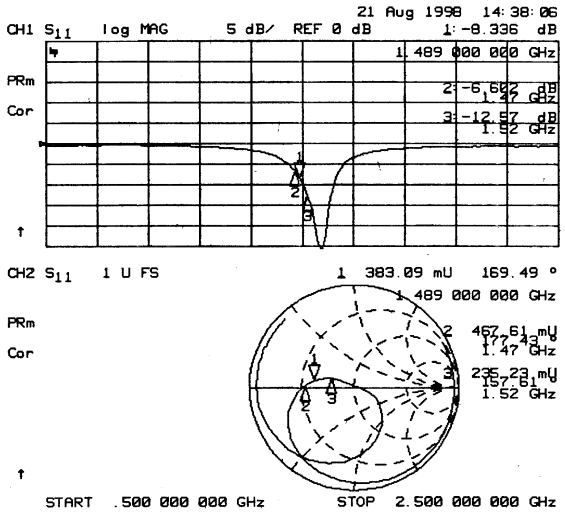
(V_{MIX}=V_{LO}=2.7V,f_{RF}=1489+1489.1MHz,f_{LO}=1619MHz)



Condition
f_{IF}=130MHz
f_{RF}=1489MHz,P_{RF}=-30dBm
f_{LO}=1619MHz
V_{LNA}=0V
V_{MIX}=V_{LO}=2.7V

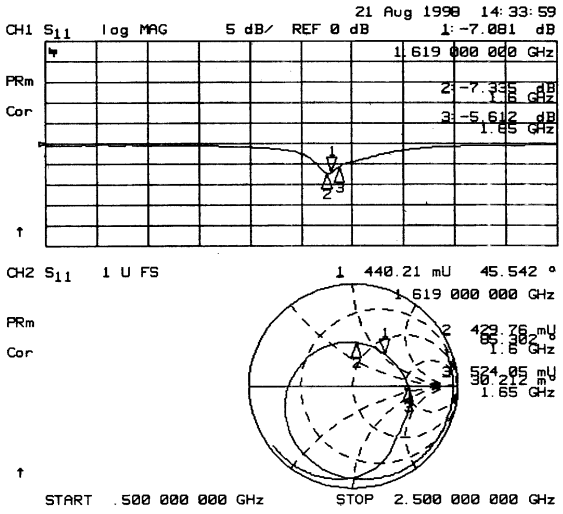
■TYPICAL CHARACTERISTICS (MIXER 1.5GHz band f_{LO}=1619MHz)

MIXER IN IMPEDANCE



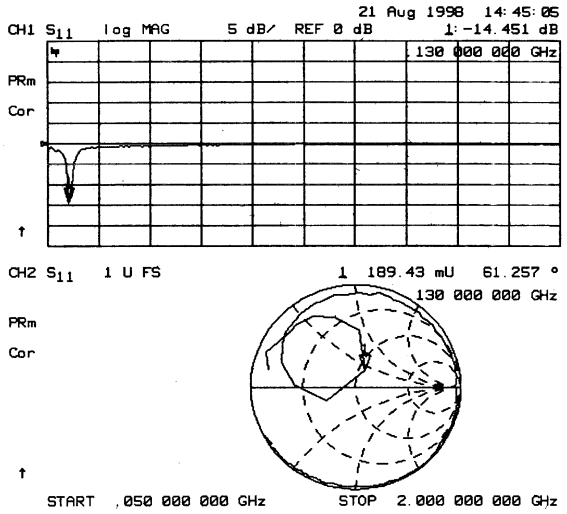
Condition
V_{LNA}=0V
V_{MIX}=V_{LO}=2.7V

LOCAL IN IMPEDANCE



Condition
V_{LNA}=0V
V_{MIX}=V_{LO}=2.7V

IF OUT IMPEDANCE

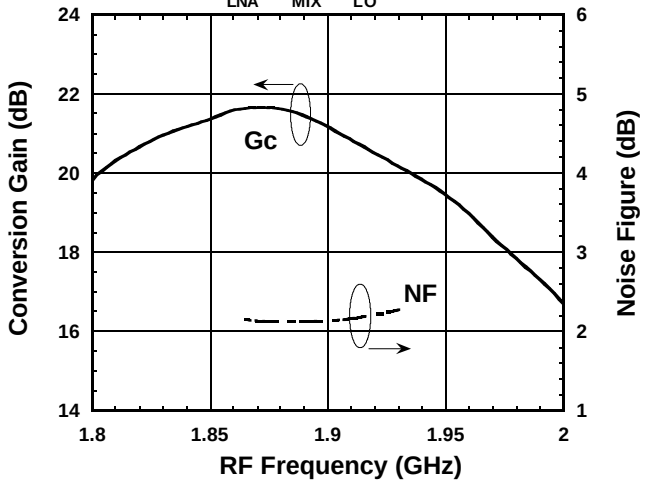


Condition
V_{LNA}=0V
V_{MIX}=V_{LO}=2.7V

■**TYPICAL CHARACTERISTICS** (LNA+MIXER 1.9GHz band f_{LO}=1660MHz)

Conversion Gain , Noise Figure vs. RF Frequency

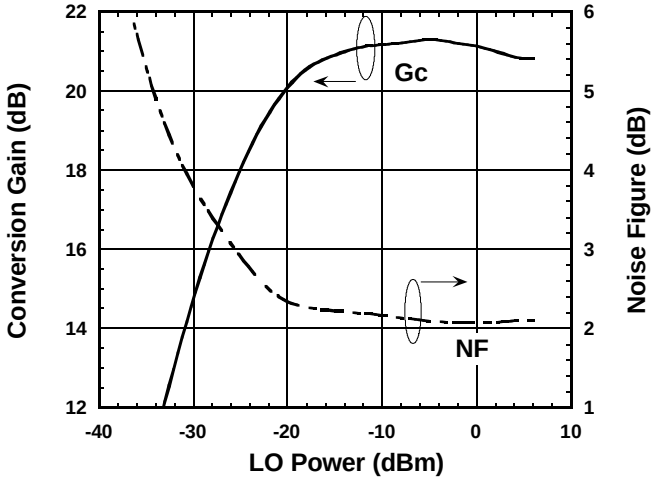
(V_{LNA}=V_{MIX}=V_{LO}=2.7V)



Condition
f_{IF}=240MHz
P_{RF}=-50dBm
P_{LO}=-10dBm
V_{LNA}=V_{MIX}=V_{LO}=2.7V
Lower LOCAL

Conversion Gain , Noise Figure vs. LO Power

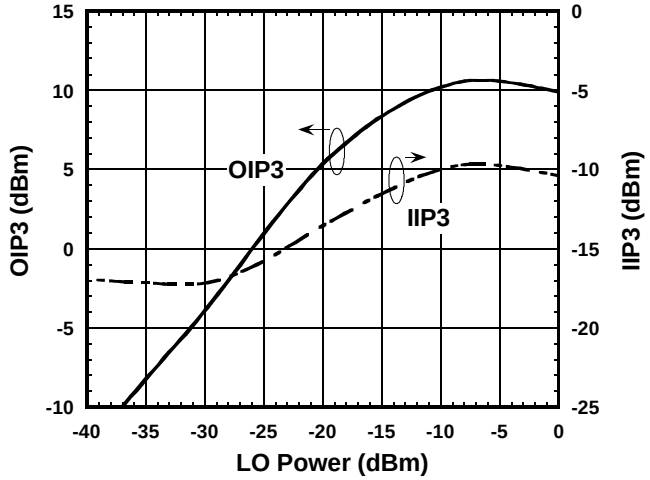
(V_{LNA}=V_{MIX}=V_{LO}=2.7V,f_{RF}=1900MHz,f_{LO}=1660MHz)



Condition
f_{IF}=240MHz
f_{RF}=1900MHz,P_{RF}=-50dBm
f_{LO}=1660MHz
V_{LNA}=V_{MIX}=V_{LO}=2.7V

Output-IP3 , Input-IP3 vs. LO Power

(V_{LNA}=V_{MIX}=VLO=2.7V,f_{RF}=1900+1900.1MHz,f_{LO}=1660MHz)



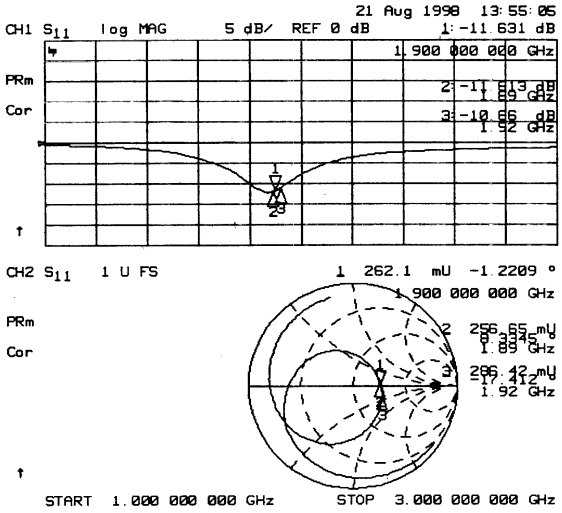
Condition
f_{IF}=240MHz
f_{RF1}=1900.0MHz, P_{RF}=-35dBm
f_{RF2}=1900.1MHz
f_{LO}=1660MHz
V_{LNA}=V_{MIX}=V_{LO}=2.7V

$$OIP3=\frac{3IF\text{-}IM3}{2}$$

$$IIP3=\frac{3IF\text{-}IM3}{2}-G_c$$
@P_{RF}=-35dBm

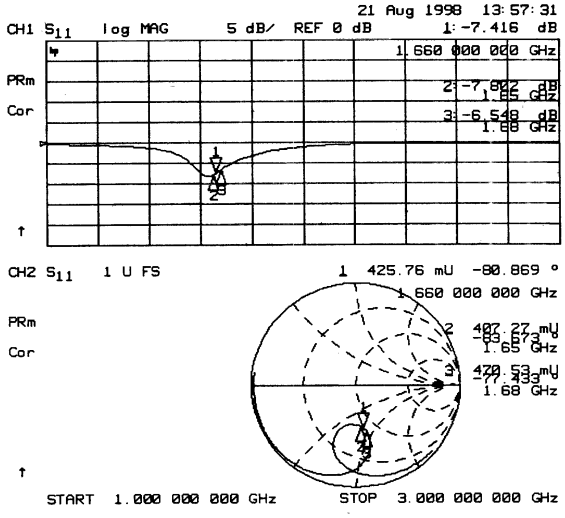
■TYPICAL CHARACTERISTICS (LNA+MIXER 1.9GHz band f_{LO}=1660MHz)

RF IN IMPEDANCE



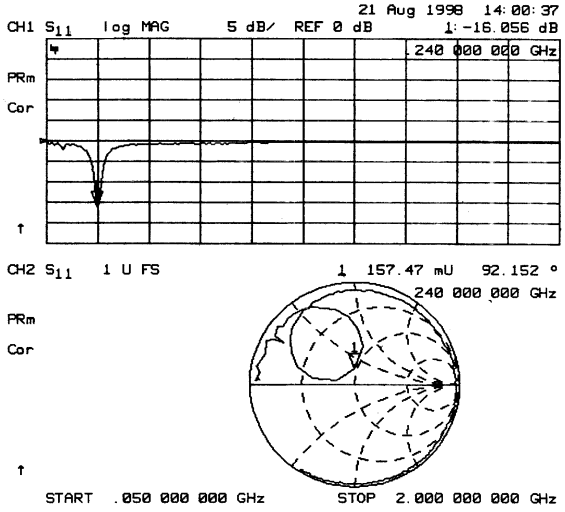
Condition
V_{LNA}=2.7V
V_{MIX}=V_{LO}=2.7V

LOCAL IN IMPEDANCE



Condition
V_{LNA}=2.7V
V_{MIX}=V_{LO}=2.7V

IF OUT IMPEDANCE

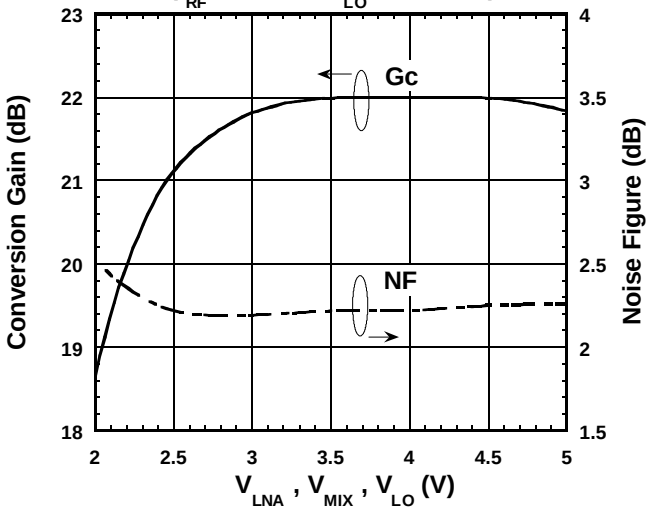


Condition
V_{LNA}=2.7V
V_{MIX}=V_{LO}=2.7V

■**TYPICAL CHARACTERISTICS** (LNA+MIXER 1.9GHz band f_{LO}=1660MHz)

Conversion Gain , Noise Figure vs. V_{LNA} , V_{MIX} , V_{LO}

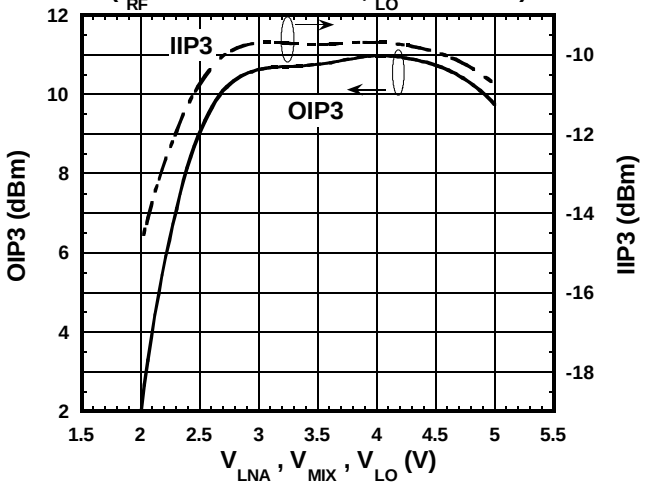
(f_{RF}=1900MHz,f_{LO}=1660MHz)



Condition
f_{IF}=240MHz
f_{RF}=1900MHz, P_{RF}=-50dBm
f_{LO}=1660MHz, P_{LO}=-10dBm

Output-IP3 , Input-IP3 vs. V_{LNA} , V_{MIX} , V_{LO}

(f_{RF}=1900+1900.1MHz,f_{LO}=1660MHz)



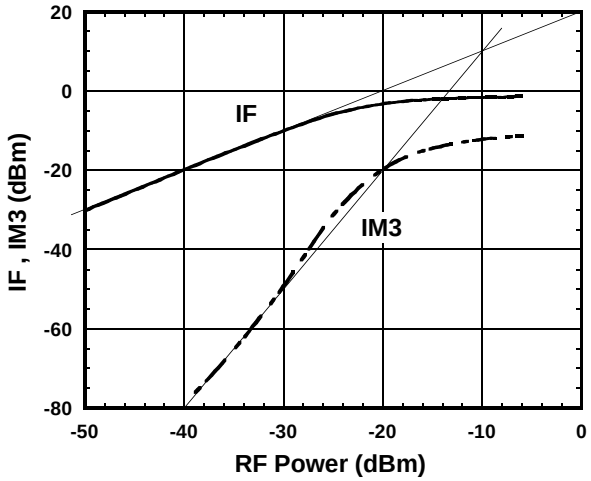
Condition
f_{IF}=240MHz
f_{RF1}=1900.0MHz, P_{RF}=-35dBm
f_{RF2}=1900.1MHz
f_{LO}=1660MHz, P_{LO}=-10dBm

$$OIP3=\frac{3IF-IM3}{2}$$

$$IIP3=\frac{3IF-IM3}{2}-G_c$$
@P_{RF}=-35dBm

IF , IM3 vs. RF Power

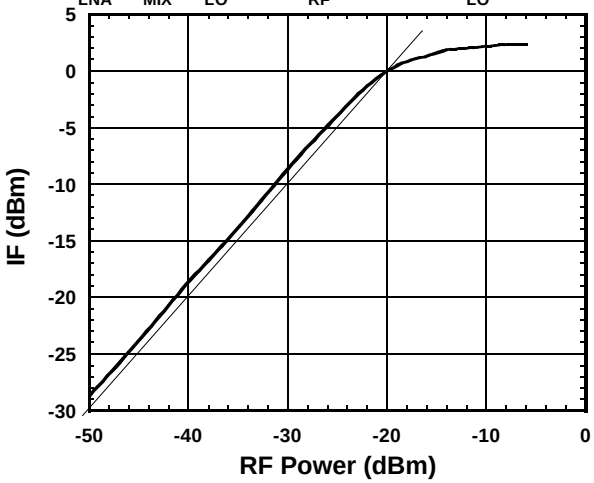
(V_{LNA}=V_{MIX}=V_{LO}=2.7V,f_{RF}=1900+1900.1MHz,f_{LO}=1660MHz)



Condition
f_{IF}=240MHz
f_{RF1}=1900.0MHz
f_{RF2}=1900.1MHz
f_{LO}=1660MHz, P_{LO}=-10dBm
V_{LNA}=V_{MIX}=V_{LO}=2.7V

IF vs. RF Power

(V_{LNA}=V_{MIX}=V_{LO}=2.7V,f_{RF}=1900MHz,f_{LO}=1660MHz)

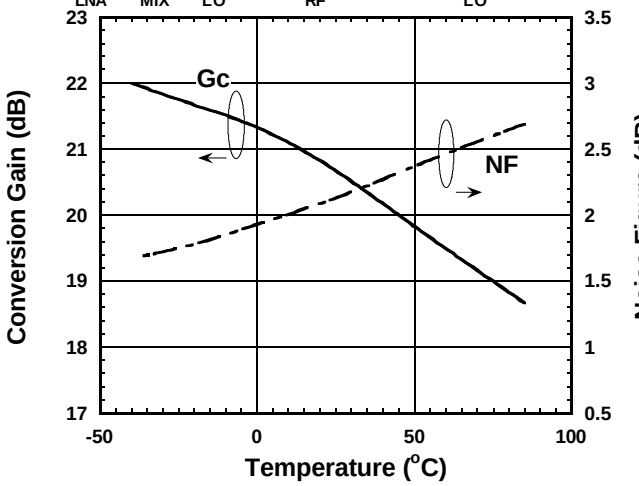


Condition
f_{IF}=240MHz
f_{RF}=1900MHz
f_{LO}=1660MHz, P_{LO}=-10dBm
V_{LNA}=V_{MIX}=V_{LO}=2.7V

■**TYPICAL CHARACTERISTICS** (LNA+MIXER 1.9GHz band f_{LO}=1660MHz)

Conversion Gain , Noise Figure vs. Temperature

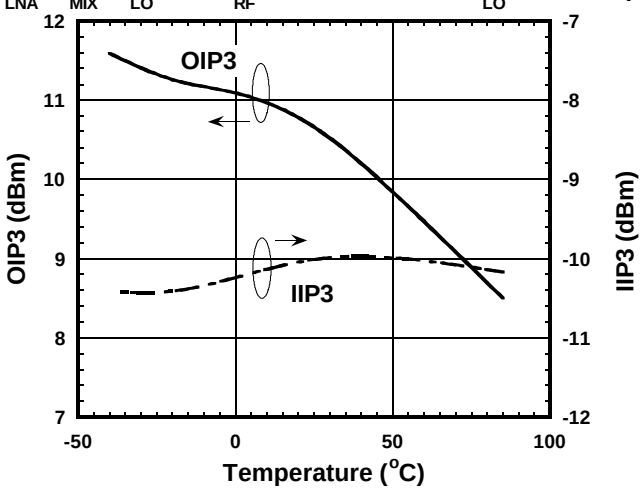
(V_{LNA}=V_{MIX}=V_{LO}=2.7V,f_{RF}=1900MHz,f_{LO}=1660MHz)



Condition
f_{IF}=240MHz
f_{RF}=1900MHz, P_{RF}=-50dBm
f_{LO}=1900MHz, P_{LO}=-10dBm
V_{LNA}=V_{MIX}=V_{LO}=2.7V

Output-IP3 , Input-IP3 vs. Temperature

(V_{LNA}=V_{MIX}=V_{LO}=2.7V,f_{RF}=1900+1900.1MHz,f_{LO}=1660MHz)



Condition
f_{IF}=240MHz
f_{RF1}=1900.0MHz, P_{RF}=-35dBm
f_{RF2}=1900.1MHz
f_{LO}=1660MHz
V_{LNA}=V_{MIX}=V_{LO}=2.7V

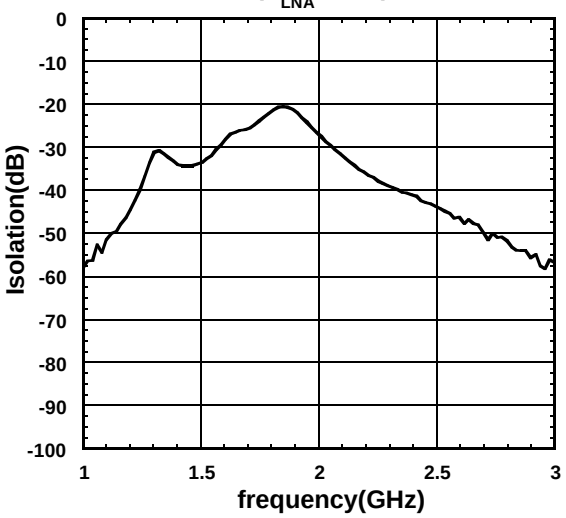
$$OIP3=\frac{3IF\text{-}IM3}{2}$$

$$IIP3=\frac{3IF\text{-}IM3}{2}-G_c$$

@P_{RF}=-35dBm

RF IN-LOCAL IN Isolation

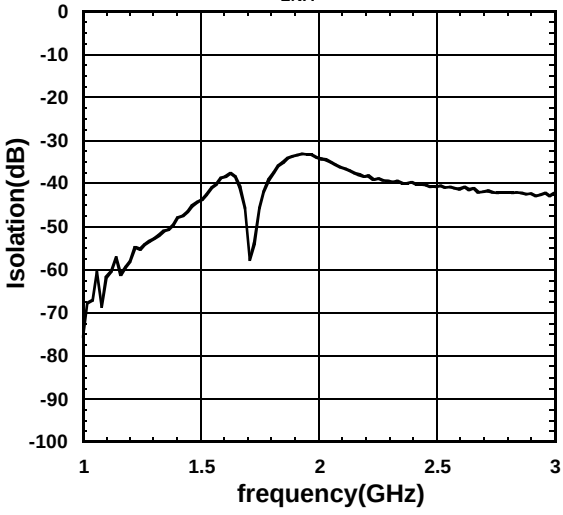
(V_{LNA}=2.7V)



Condition
V_{LNA}=2.7V
V_{MIX}=V_{LO}=2.7V
Port1:RF IN
Port2:LOCAL IN

RF OUT-MIXER IN Isolation

(V_{LNA}=2.7V)

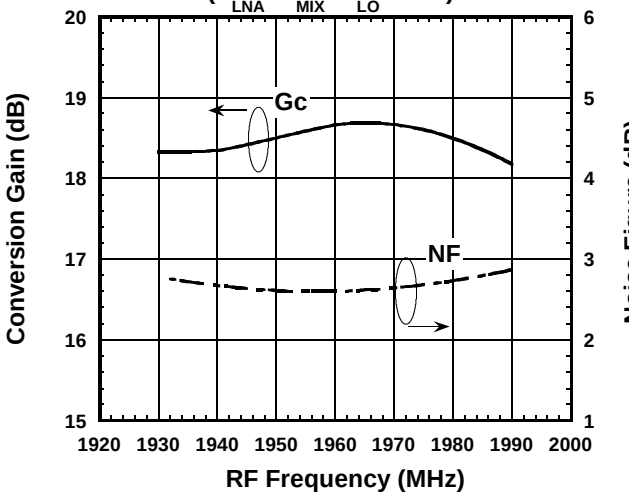


Condition
V_{LNA}=2.7V
V_{MIX}=V_{LO}=2.7V
Port1:RF OUT
Port2:MIXER IN

■**TYPICAL CHARACTERISTICS** (LNA+MIXER 1.9GHz band f_{LO}=2095.2MHz)

Conversion Gain , Noise Figure vs. RF Frequency

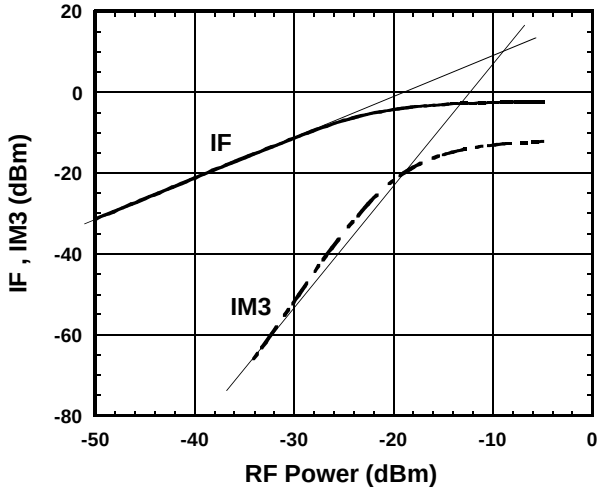
(V_{LNA}=V_{MIX}=V_{LO}=3.0V)



Condition
f_{IF}=135.2MHz
P_{RF}=-50dBm
P_{LO}=-8dBm
V_{LNA}=V_{MIX}=V_{LO}=3.0V
Upper LOCAL

IF , IM3 vs. RF Power

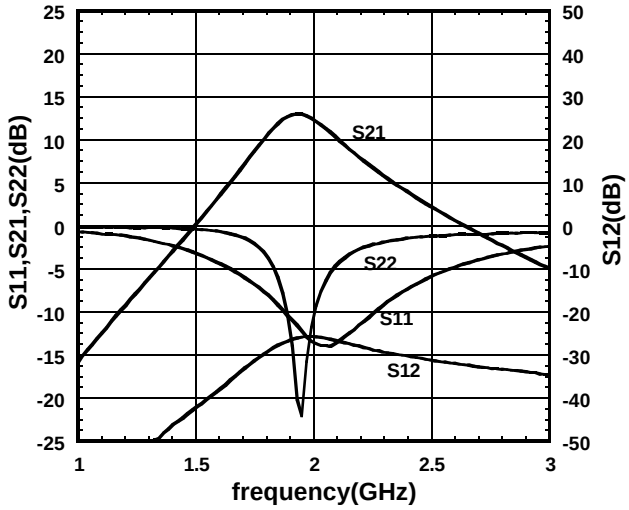
(V_{LNA}=V_{MIX}=V_{LO}=3.0V,f_{RF}=1960+1960.1MHz,f_{LO}=2095.2MHz)



Condition
f_{IF}=135.2MHz
f_{RF1}=1960.0MHz
f_{RF2}=1960.1MHz
f_{LO}=2095.2MHz,P_{LO}=-8dBm
V_{LNA}=V_{MIX}=V_{LO}=3.0V

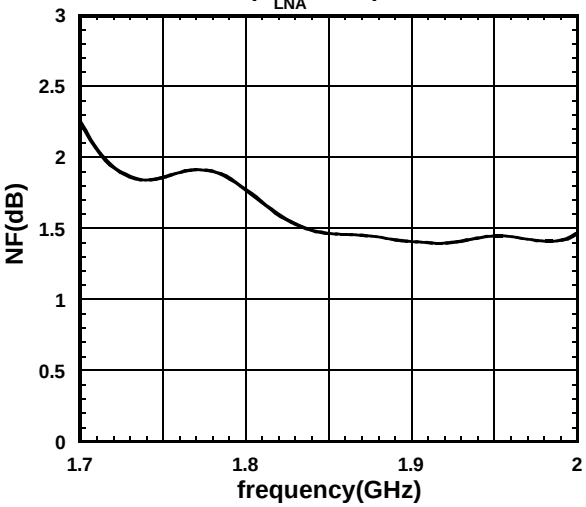
■**TYPICAL CHARACTERISTICS** (LNA 1.9GHz band f_{LO}=1660MHz)

S11,S21,S12,S22 Vs. frequency
(V_{LNA}=2.7V)



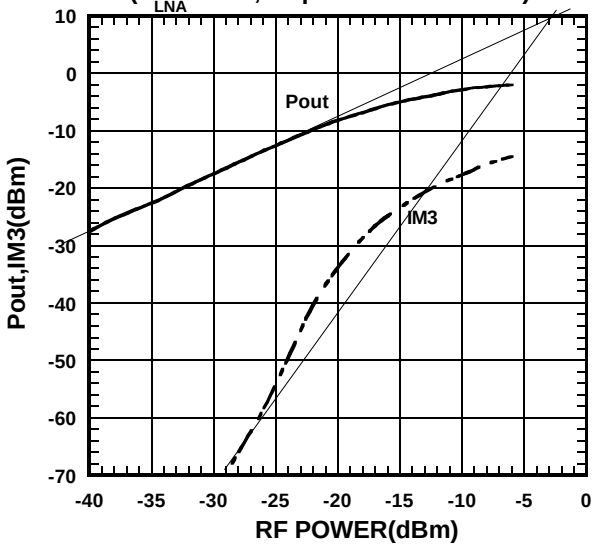
Condition
V_{LNA}=2.7V
V_{MIX}=V_{LO}=0V

NF vs. frequency
(V_{LNA}=2.7V)



Condition
V_{LNA}=2.7V
V_{MIX}=V_{LO}=0V

RF POWER vs. Pout,IM3
(V_{LNA}=2.7V,freq=1900+1900.1MHz)

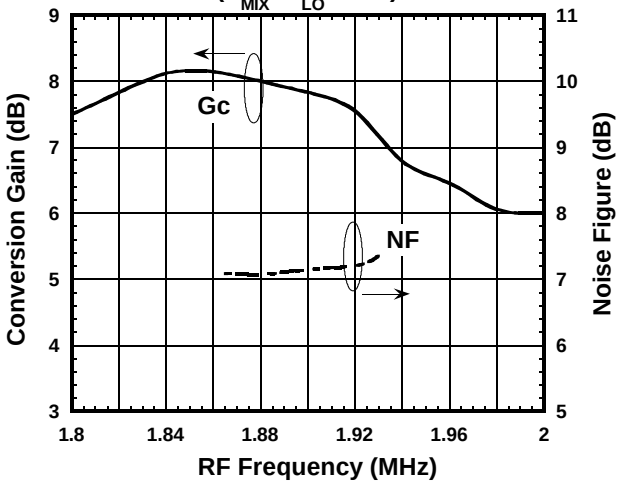


Condition
f_{RF}=1900.0+1900.1MHz
V_{LNA}=2.7V
V_{MIX}=V_{LO}=0V

■**TYPICAL CHARACTERISTICS** (MIXER 1.9GHz band f_{LO}=1660MHz)

Conversion Gain , Noise Figure vs. RF Frequency

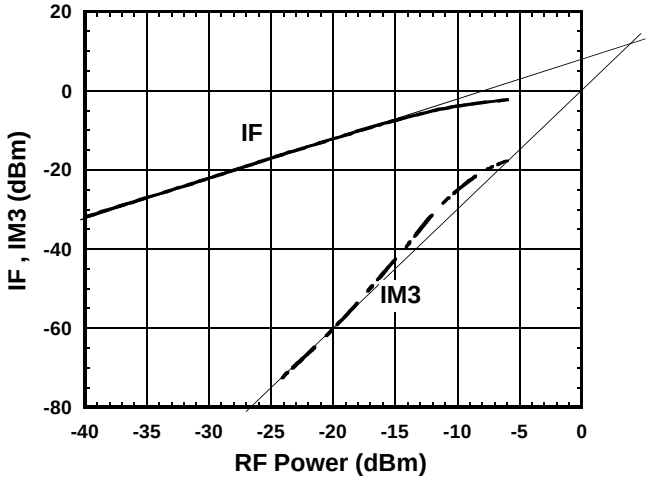
(V_{MIX}=V_{LO}=2.7V)



Condition
f_{IF}=240MHz
P_{RF}=-30dBm
P_{LO}=-10dBm
V_{LNA}=0V
V_{MIX}=V_{LO}=2.7V
Lower LOCAL

IF , IM3 vs. RF Power

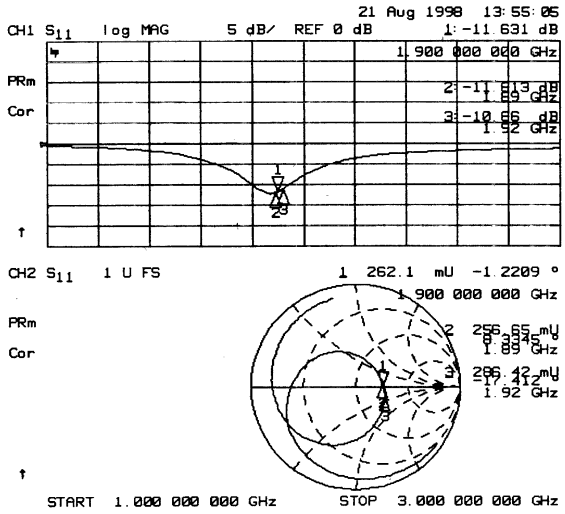
(V_{MIX}=V_{LO}=2.7V,f_{RF}=1900+1900.1MHz,f_{LO}=1660MHz)



Condition
f_{IF}=240MHz
f_{RF}=1900MHz,P_{RF}=-30dBm
f_{LO}=1660MHz
V_{LNA}=0V
V_{MIX}=V_{LO}=2.7V

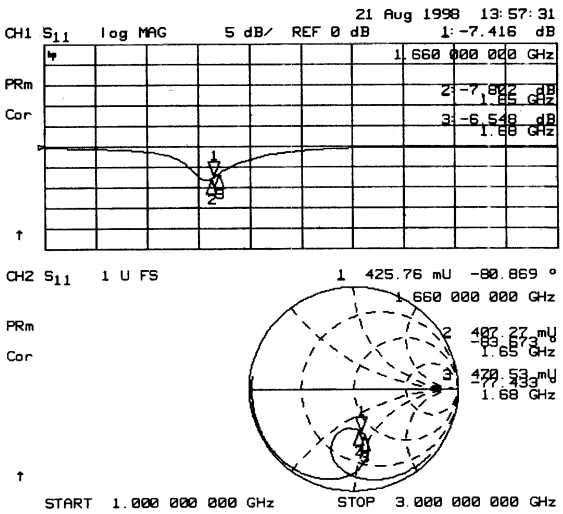
■TYPICAL CHARACTERISTICS (MIXER 1.9GHz band f_{LO}=1660MHz)

MIXER IN IMPEDANCE



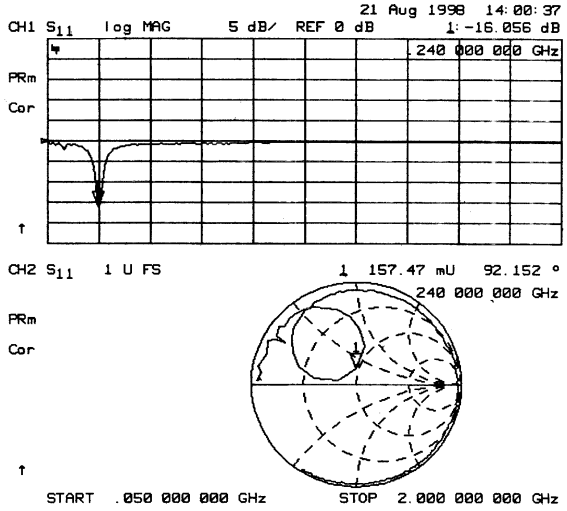
Condition
V_{LNA}=0V
V_{MIX}=V_{LO}=2.7V

LOCAL IN IMPEDANCE



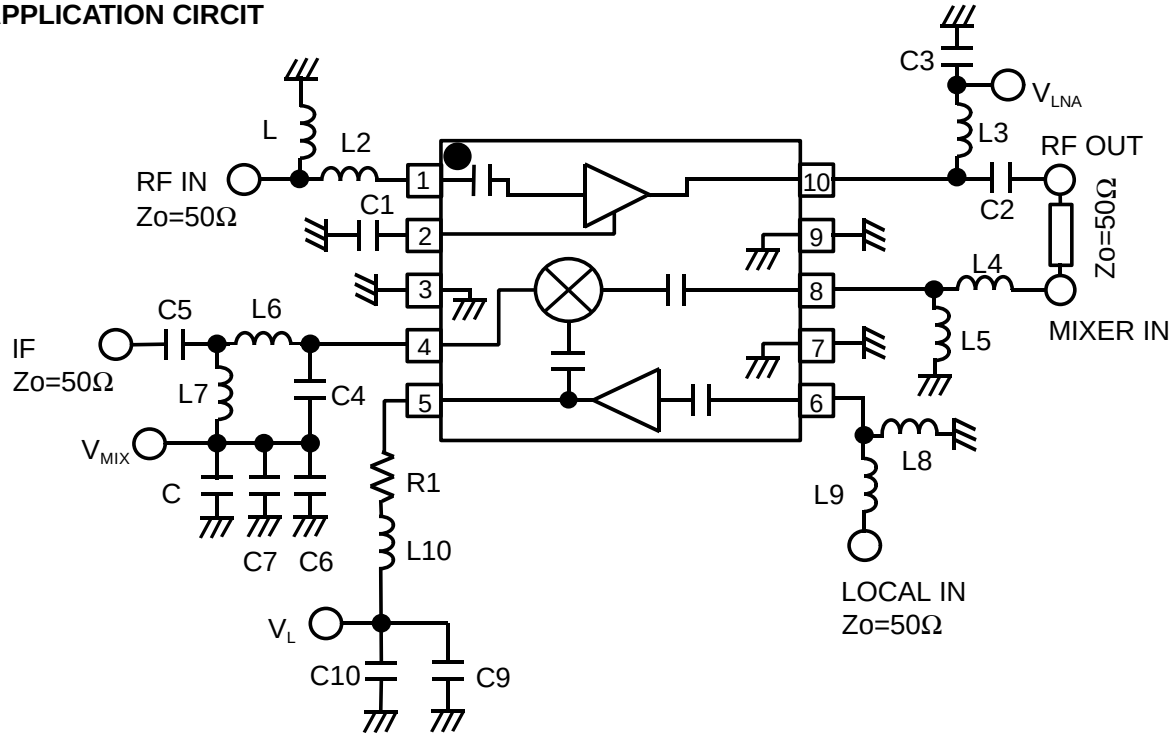
Condition
V_{LNA}=0V
V_{MIX}=V_{LO}=2.7V

IF OUT IMPEDANCE



Condition
V_{LNA}=0V
V_{MIX}=V_{LO}=2.7V

■APPLICATION CIRCIT

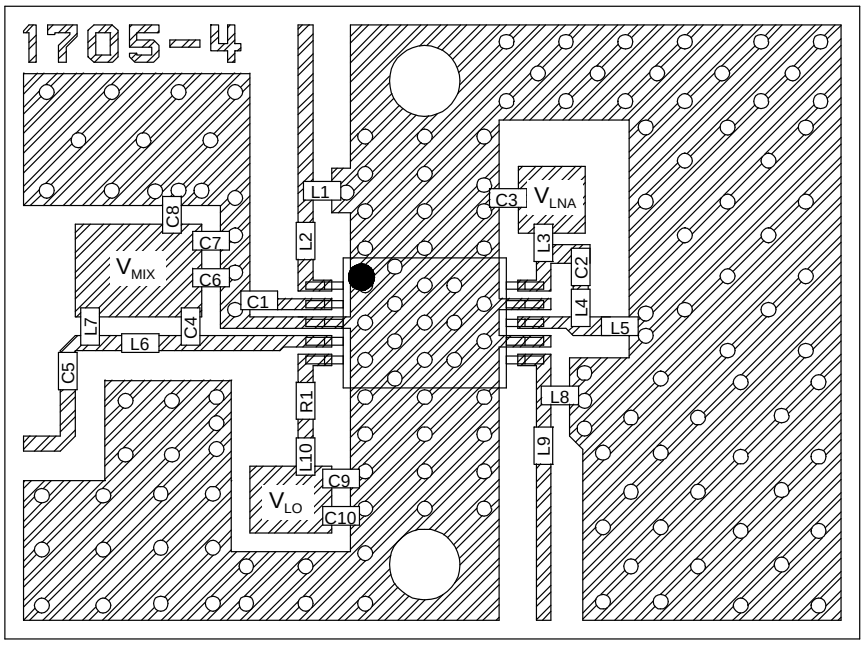


PARTS LIST

PART ID	1.5GHz band	1.9GHz band		COMMENT
	Upper LOCAL	Lower LOCAL	Upper LOCAL	
	f_{LO}=1619MHz f_{IF}=130MHz	f_{LO}=1660MHz f_{IF}=240MHz	f_{LO}=2095.2MHz f_{IF}=135.2MHz	
L1	10nH	4.7nH	4.7nH	TAIYO-YUDEN (HK1005)
L2	10nH	4.7nH	4.7nH	TAIYO-YUDEN (HK1005)
L3	8.2nH	4.7nH	4.7nH	TAIYO-YUDEN (HK1005)
L4	12nH	4.7nH	4.7nH	TAIYO-YUDEN (HK1005)
L5	8.2nH	4.7nH	3.9nH	TAIYO-YUDEN (HK1005)
L6	82nH	47nH	82nH	TAIYO-YUDEN (HK1005)
L7	33nH	18nH	33nH	TAIYO-YUDEN (HK1005)
L8	15nH	12nH	8.2nH	TAIYO-YUDEN (HK1005)
L9	15nH	18nH	10nH	TAIYO-YUDEN (HK1005)
L10	6.8nH	6.8nH	3.9nH	TAIYO-YUDEN (HK1005)
C1	30pF	30pF	30pF	MURATA(GRM36)
C2	0.5nH	0.5pF	0.5pF	MURATA(GRM36)
C3	1000pF	1000pF	1000pF	MURATA(GRM36)
C4	11pF	5pF	11pF	MURATA(GRM36)
C5	1000pF	1000pF	1000pF	MURATA(GRM36)
C6	10pF	10pF	10pF	MURATA(GRM36)
C7	100pF	100pF	100pF	MURATA(GRM36)
C8	1000pF	1000pF	1000pF	MURATA(GRM36)
C9	1000pF	1000pF	1000pF	MURATA(GRM36)
C10	100pF	100pF	100pF	MURATA(GRM36)
R1	10Ω	10Ω	10Ω	TAMA Electronics (CRG16G)

■RECOMMENDED PCB DESIGN

LNAIN (Top View)



IFOUT

LOIN

PCB (FR-4): t=0.2mm
STRIP LINE WIDTH
=0.4mm (Z_0=50Ω)
PCB SIZE
=23.0x17.0mm

Caution on using devices.

[1] Please place R1 close to the VLO terminal (5th pin), and L10 to R1.

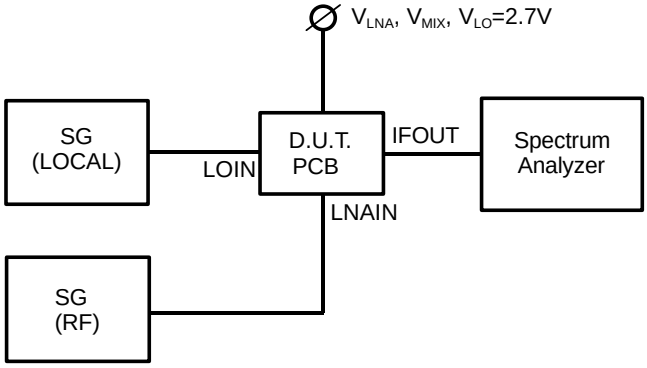
[2] Please place C1 close to the LNACAP terminal (2nd pin).

[3] Please place C3 close to L3.

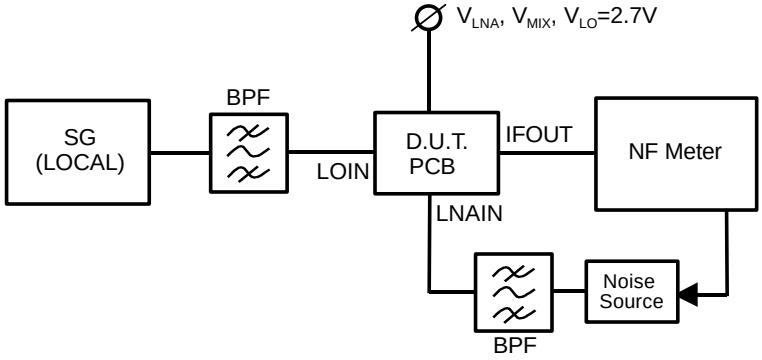
[4] Please place C3 close to C6, C7, and C8

[5] Please place L10 close to C9, C10.

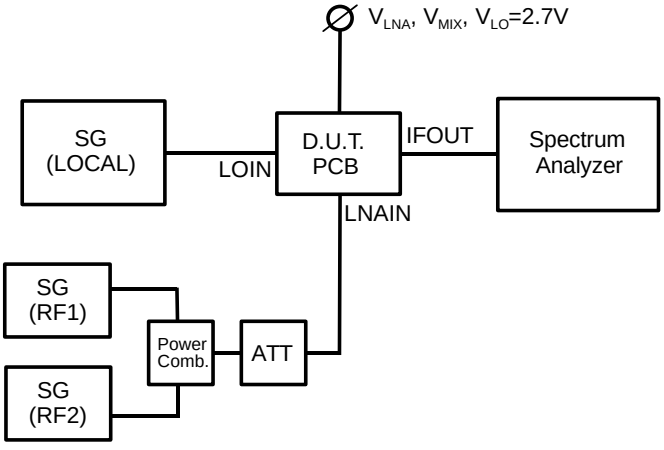
■MEASURING BLOCK DISGRSM



Conversion Gain Measurement Block Diagram

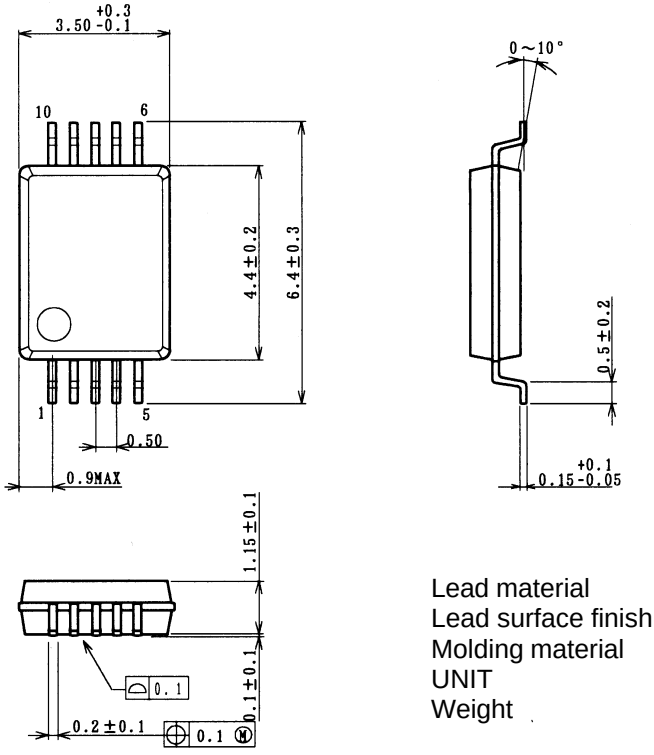


Noise Figure Measurement Block Diagram



IF, IM3, IM5 Measurement Block Diagram

■PACKAGE OUTLINE (SSOP10)



Lead material	: Copper
Lead surface finish	: Solder plating
Molding material	: Epoxy resin
UNIT	: mm
Weight	: 41mg

Cautions on using this product

This product contains Gallium-Arsenide (GaAs) which is a harmful material.

- Do NOT eat or put into mouth.
- Do NOT dispose in fire or break up this product.
- Do NOT chemically make gas or powder with this product.
- To waste this product, please obey the relating law of your country.

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