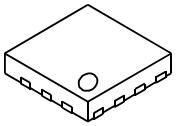
UMTS Triple Band LNA GaAs MMIC

■GENERAL DISCRIPTION

NJG1133MD7 is a triple band LNA IC designed for UMTS and LTE.
This IC has a LNA pass-through function to select high gain mode or suitable low gain mode. The LNA of 1.7GHz band can be used to 1.5GHz band by changing application circuit.
An ultra-small and ultra-thin package of EQFN14-D7 is adopted.

■PACKAGE OUTLINE



NJG1133MD7

■APPLICATIONS

2.1GHz, 1.7GHz and 800MHz triple band of standard condition application
Any dual High-band and single Low-band combination for LTE and UMTS applications, like Band1,2 and 5,Band1,3 and 5,Band1,2 and 8

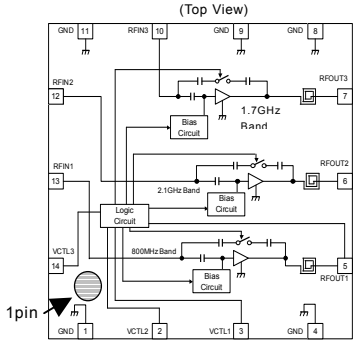
Note: For except of standard condition applications please refer to Application Note

■FEATURES

●Low operation voltage	+2.8V typ.	
●Low control voltage	+1.8V typ.	
●Low current consumption	2.3mA typ.	@High Gain Mode
	48μA typ.	@Low Gain Mode
●Small and thin package	EQFN14-D7 (Package size: 1.6 x 1.6 x 0.397mm typ.)	
[High Gain Mode]		
●High gain	16.0dB typ.	@f_{RF}=2140MHz, 885MHz, 1860MHz, 1495MHz
●Low noise figure	1.35dB typ.	@f_{RF}=2140MHz, 1860MHz
	1.40dB typ.	@f_{RF}=885MHz
	1.55dB typ.	@f_{RF}=1495MHz
●High input IP3	+0.5dBm typ.	@f_{RF}=2140.0+2140.1MHz, Pin=-30dBm
	-2.0dBm typ.	@f_{RF}=885.0+885.1MHz, Pin=-30dBm
	0dBm typ.	@f_{RF}=1860.0+1860.1MHz, Pin=-30dBm
	0dBm typ.	@f_{RF}=1495.0+1495.1MHz, Pin=-30dBm
[Low Gain Mode]		
●Gain	-3.5dB typ.	@f_{RF}=2140MHz
	-3.0dB typ.	@f_{RF}=885MHz, 1495MHz
	-4.0dB typ.	@f_{RF}=1860MHz
●High input IP3	+12dBm typ.	@f_{RF}=2140.0+2140.1MHz, Pin=-16dBm
	+12dBm typ.	@f_{RF}=885.0+885.1MHz, Pin=-20dBm
	+15dBm typ.	@f_{RF}=1860.0+1860.1MHz, Pin=-16dBm
	+15dBm typ.	@f_{RF}=1495.0+1495.1MHz, Pin=-16dBm

■PIN CONFIGURATION

(Top View)



Pin Connection

1. GND	8. GND
2. VCTL2	9. GND
3. VCTL1	10. RFIN3 (1.7G/1.5GHz)
4. GND	11. GND
5. RFOUT1 (800MHz)	12. RFIN2 (2.1GHz)
6. RFOUT2 (2.1GHz)	13. RFIN1 (800MHz)
7. RFOUT3 (1.7G/1.5GHz)	14. VCTL3

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

■ABSOLUTE MAXIMUM RATINGS

T_a=+25°C, Z_s=Z_l=50Ω

PARAMETERS	SYMBOL	CONDITIONS	RATINGS	UNITS
Operating voltage	V_{DD}		5.0	V
Control voltage	V_{CTL}	VCTL1,2,3 terminal	5.0	V
Input power	P_{in}		+15	dBm
Power dissipation	P_D	4-layer FR4 PCB with through-hole (74.2x74.2mm), T_j=150°C	1300	mW
Operating temperature	T_{opr}		-40~+85	°C
Storage temperature	T_{stg}		-55~+150	°C

■ELECTRICAL CHARACTERISTICS 1 (DC CHARACTERISTICS)

General conditions: V_{DD}=2.8V, T_a=+25°C, Z_s=Z_l=50Ω, with application circuit

PARAMETERS	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Operating voltage	V_{DD}		2.7	2.8	3.6	V
Control voltage1 (High)	V_{CTL}1(H)		1.36	1.8	3.6	V
Control voltage1 (Low)	V_{CTL}1(L)		0	0	0.3	V
Control voltage 2 (High)	V_{CTL}2(H)		1.36	1.8	3.6	V
Control voltage 2 (Low)	V_{CTL}2(L)		0	0	0.3	V
Control voltage 3 (High)	V_{CTL}3(H)		1.36	1.8	3.6	V
Control voltage 3 (Low)	V_{CTL}3(L)		0	0	0.3	V
Operating current 1 2.1GHz Band High Gain mode	I_{DD}1	V_{CTL}1=0V, V_{CTL}2=0V, V_{CTL}3=1.8V, RF OFF	-	2.3	3.1	mA
Operating current 2 800MHz Band high Gain mode	I_{DD}2	V_{CTL}1=1.8V, V_{CTL}2=0V, V_{CTL}3=1.8V, RF OFF	-	2.3	3.1	mA
Operating current 3 1.7GHz Band High Gain mode	I_{DD}3	V_{CTL}1=0V, V_{CTL}2=1.8V, V_{CTL}3=1.8V, RF OFF	-	2.3	3.1	mA
Operating current 4 1.5GHz Band High Gain mode	I_{DD}4	V_{CTL}1=1.8V, V_{CTL}2=1.8V, V_{CTL}3=1.8V, RF OFF	-	2.3	3.1	mA
Operating current 5	I_{DD}5	V_{CTL}3=0V, RF OFF	-	48	85	μA
Control current 1	I_{CTL}1	V_{CTL}1=1.8V	-	5.5	8.5	μA
Control current 2	I_{CTL}2	V_{CTL}2=1.8V	-	5.5	8.5	μA
Control current 3	I_{CTL}3	V_{CTL}3=1.8V	-	5.5	8.5	μA

■**ELECTRICAL CHARACTERISTICS 2 (2.1GHz Band High Gain Mode)**

General conditions: V_{DD}=2.7V, V_{CTL}1=0V, V_{CTL}2=0V, V_{CTL}3=1.8V, fRF=2140MHz, T_a=+25°C, Z_s=Z_l=50Ω, with application circuit

PARAMETERS	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Small signal gain 1	Gain1	Exclude PCB & connector losses (IN: 0.09dB, OUT: 0.36dB)	14.5	16.0	17.5	dB
Noise figure 1	NF1	Exclude PCB & connector losses (IN: 0.09dB)	-	1.35	1.5	dB
Input Power at 1dB gain compression point 1	P-1dB(IN)_1		-15.0	-11.5	-	dBm
Input 3rd order intercept point 1	IIP3_1	f1=fRF, f2=fRF+100kHz, Pin=-30dBm	-9.0	+0.5	-	dBm
RF Input VSWR 1	VSWRi1		-	1.5	2.0	
RF Output VSWR 1	VSWRo1		-	2.0	2.5	

■**ELECTRICAL CHARACTERISTICS 3 (2.1GHz Band Low Gain Mode)**

General conditions: V_{DD}=2.7V, V_{CTL}1=0V, V_{CTL}2=0V, V_{CTL}3=0V, fRF=2140MHz, T_a=+25°C, Z_s=Z_l=50Ω, with application circuit

PARAMETERS	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Small signal gain 2	Gain2	Exclude PCB & connector losses (IN: 0.09dB, OUT: 0.36dB)	-5.0	-3.5	-2.0	dB
Noise figure 2	NF2	Exclude PCB & connector losses (IN: 0.09dB)	-	3.5	6.0	dB
Input Power at 1dB gain compression point 2	P-1dB(IN)_2		+5.0	+14.0	-	dBm
Input 3rd order intercept point 2	IIP3_2	f1=fRF, f2=fRF+100kHz, Pin=-16dBm	0	+12.0	-	dBm
RF Input VSWR 2	VSWRi2		-	1.6	2.0	
RF Output VSWR 2	VSWRo2		-	1.9	2.3	

■**ELECTRICAL CHARACTERISTICS 4 (800MHz Band High Gain Mode)**

General conditions: V_{DD}=2.7V, V_{CTL}1=1.8V, V_{CTL}2=0V, V_{CTL}3=1.8V, fRF=885MHz, T_a=+25°C, Z_s=Z_l=50Ω, with application circuit

PARAMETERS	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Small signal gain 3	Gain3	Exclude PCB & connector losses (IN: 0.06dB, OUT: 0.16dB)	14.3	16.0	17.3	dB
Noise figure 3	NF3	Exclude PCB & connector losses (IN: 0.06dB)	-	1.40	1.65	dB
Input Power at 1dB gain compression point 3	P-1dB(IN)_3		-16.0	-9.5	-	dBm
Input 3rd order intercept point 3	IIP3_3	f1=fRF, f2=fRF+100kHz, Pin=-30dBm	-10.0	-2.0	-	dBm
RF Input VSWR 3	VSWRi3		-	1.8	2.3	
RF Output VSWR 3	VSWRo3		-	2.2	2.7	

■**ELECTRICAL CHARACTERISTICS 5 (800MHz Band Low Gain Mode)**

General conditions: V_{DD}=2.7V, V_{CTL}1=1.8V, V_{CTL}2=0V, V_{CTL}3=0V, fRF=885MHz, T_a=+25°C, Z_s=Z_l=50Ω, with application circuit

PARAMETERS	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Small signal gain 4	Gain4	Exclude PCB & connector losses (IN: 0.06dB, OUT: 0.16dB)	-4.5	-3.0	-2.0	dB
Noise figure 4	NF4	Exclude PCB & connector losses (IN: 0.06dB)	-	3.0	6.0	dB
Input Power at 1dB gain compression point 4	P-1dB(IN)4		+4.5	+17.0	-	dBm
Input 3rd order intercept point 4	IIP3_4	f1=fRF, f2=fRF+100kHz, Pin=-20dBm	+2.0	+12.0	-	dBm
RF Input VSWR 4	VSWRi4		-	1.4	2.1	
RF Output VSWR 4	VSWRo4		-	1.8	2.2	

■**ELECTRICAL CHARACTERISTICS 6 (1.7GHz Band High Gain Mode)**

General conditions: V_{DD}=2.7V, V_{CTL}1=0V, V_{CTL}2=1.8V, V_{CTL}3=1.8V, fRF=1860MHz, T_a=+25°C, Z_s=Z_l=50Ω, with application circuit

PARAMETERS	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Small signal gain 5	Gain5	Exclude PCB & connector losses (IN: 0.10dB, OUT: 0.31dB)	14.5	16.0	17.5	dB
Noise figure 5	NF5	Exclude PCB & connector losses (IN: 0.10dB)	-	1.35	1.6	dB
Input Power at 1dB gain compression point 5	P-1dB(IN)_5		-16.0	-8.0	-	dBm
Input 3rd order intercept point 5	IIP3_5	f1=fRF, f2=fRF+100kHz, Pin=-30dBm	-9.0	0	-	dBm
RF Input VSWR 5	VSWRi5		-	2.1	2.6	
RF Output VSWR 5	VSWRo5		-	1.8	2.2	

■**ELECTRICAL CHARACTERISTICS 7 (1.7GHz Band Low Gain Mode)**

General conditions: V_{DD}=2.7V, V_{CTL}1=0V, V_{CTL}2=1.8V, V_{CTL}3=0V, fRF=1860MHz, T_a=+25°C, Z_s=Z_l=50Ω, with application circuit

PARAMETERS	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Small signal gain 6	Gain6	Exclude PCB & connector losses (IN: 0.10dB, OUT: 0.31dB)	-5.5	-4.0	-2.0	dB
Noise figure 6	NF6	Exclude PCB & connector losses (IN: 0.10dB)	-	4.0	6.5	dB
Input Power at 1dB gain compression point 6	P-1dB(IN)_6		+4.0	+16.0	-	dBm
Input 3rd order intercept point 6	IIP3_6	f1=fRF, f2=fRF+100kHz, Pin=-16dBm	0	+15.0	-	dBm
RF Input VSWR 6	VSWRi6		-	1.7	2.2	
RF Output VSWR 6	VSWRo6		-	2.4	2.7	

■**ELECTRICAL CHARACTERISTICS 8 (1.5GHz Band High Gain Mode)**

General conditions: V_{DD}=2.7V, V_{CTL}1=1.8V, V_{CTL}2=1.8V, V_{CTL}3=1.8V, fRF=1495MHz, T_a=+25°C, Z_s=Z_l=50Ω, with application circuit

PARAMETERS	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Small signal gain 7	Gain7	Exclude PCB & connector losses (IN: 0.09dB, OUT: 0.30dB)	14.5	16.0	18.0	dB
Noise figure 7	NF7	Exclude PCB & connector losses (IN: 0.09dB)	-	1.55	1.75	dB
Input Power at 1dB gain compression point 7	P-1dB(IN)_7		-16.0	-9.0	-	dBm
Input 3rd order intercept point 7	IIP3_7	f1=fRF, f2=fRF+100kHz, Pin=-30dBm	-6.0	0	-	dBm
RF Input VSWR 7	VSWRi7		-	2.5	2.8	
RF Output VSWR 7	VSWRo7		-	1.8	2.4	

■**ELECTRICAL CHARACTERISTICS 9 (1.5GHz Band Low Gain Mode)**

General conditions: V_{DD}=2.7V, V_{CTL}1=1.8V, V_{CTL}2=1.8V, V_{CTL}3=0V, fRF=1495MHz, T_a=+25°C, Z_s=Z_l=50Ω, with application circuit

PARAMETERS	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Small signal gain 8	Gain8	Exclude PCB & connector losses (IN: 0.09dB, OUT: 0.30dB)	-5.0	-3.0	-2.0	dB
Noise figure 8	NF8	Exclude PCB & connector losses (IN: 0.09dB)	-	3.0	6.0	dB
Input Power at 1dB gain compression point 8	P-1dB(IN)_8		+4.0	+16.0	-	dBm
Input 3rd order intercept point 8	IIP3_8	f1=fRF, f2=fRF+100kHz, Pin=-16dBm	0	+15.0	-	dBm
RF Input VSWR 8	VSWRi8		-	1.5	2.1	
RF Output VSWR 8	VSWRo8		-	1.8	2.3	

■**ELECTRICAL CHARACTERISTICS 10**

General conditions: V_{DD}=2.7V, T_a=+25°C, Z_s=Z_l=50Ω, with application circuit

PARAMETERS	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Gain dynamic range 1 (2.1GHz Band)	GDR_1	(Gain@High Gain mode) - (Gain@Low Gain mode), f=2140MHz V_{CTL}1=0V, V_{CTL}2=0V, V_{CTL}3=0 or 1.8V	17.5	19.5	21.0	dB
Gain dynamic range 2 (800MHz Band)	GDR_2	(Gain@High Gain mode) - (Gain@Low Gain mode), f=885MHz V_{CTL}1=1.8V, V_{CTL}2=0V, V_{CTL}3=0 or 1.8V	17.5	19.0	20.5	dB
Gain dynamic range 3 (1.7GHz Band)	GDR_3	(Gain@High Gain mode) - (Gain@Low Gain mode), f=1860MHz V_{CTL}1=0V, V_{CTL}2=1.8V, V_{CTL}3=0 or 1.8V	18.0	20.0	21.5	dB
Gain dynamic range 4 (1.5GHz Band)	GDR_4	(Gain@High Gain mode) - (Gain@Low Gain mode), f=1495MHz V_{CTL}1=1.8V, V_{CTL}2=1.8V, V_{CTL}3=0 or 1.8V	17.5	19.5	21.0	dB

■ **TRUTH TABLE**

Control voltage			Operating state					
$V_{CTL}1$ (Band Sel1)	$V_{CTL}2$ (Band Sel2)	$V_{CTL}3$ (Gain Sel1)	2.1GHz Band		800MHz Band		1.7GHz(or 1.5GHz) 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	OFF	ON	OFF	ON	OFF	ON
H	H	H	OFF	OFF	OFF	OFF	ON	OFF

"L"=0 ~ 0.30V, "H"=1.36 ~ 1.9 V

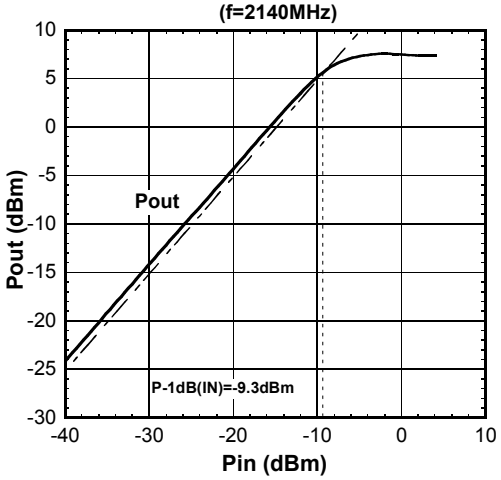
■**TERMINAL INFORMATION**

No.	SYMBOL	DESCRIPTION
1	GND	GND terminal (0V)
2	VCTL2	Control voltage supply terminal. The frequency band (2GHz / 800MHz / 1.7GHz or 1.5GHz) is selected by 2bit control signal. (Please refer to truth table.)
3	VCTL1	
4	GND	GND terminal (0V)
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	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.
7	RFOUT3	Output terminal of 1.7GHz(or 1.5GHz) band. This terminal is also the power supply terminal of the LNA, please use inductor (L9) to connect power supply.
8	GND	GND terminal (0V)
9	GND	GND terminal (0V)
10	RFIN3	RF input terminal of 1.7GHz(or 1.5GHz) band. The RF signal is input through external matching circuit connected to this terminal. The DC blocking capacitor is not required.
11	GND	GND terminal (0V)
12	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.
13	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.
14	VCTL3	Control voltage supply terminal. High gain mode or low gain mode is selected by applying this terminal.

Notes: Ground terminal (No.1, 4, 8, 9, 11) should be connected with the ground plane as short as possible.

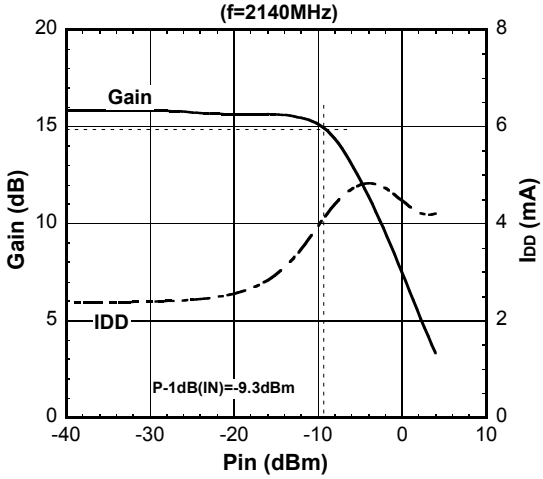
■**ELECTRICAL CHARACTERISTICS** (2.1GHz band High Gain mode)

2.1GHz @High Gain
Pout vs. Pin
(f=2140MHz)



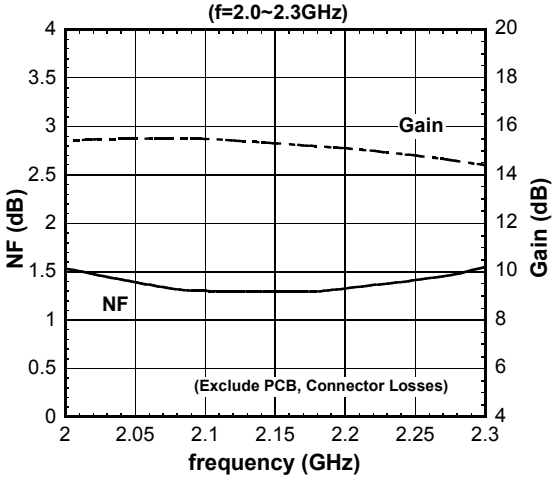
Condition
Ta=+25℃,
V_{DD} =2.7V,
V_{CTL}1=0V, V_{CTL}2=0V, V_{CTL}3=1.8V

2.1GHz @High Gain
Gain, IDD vs. Pin
(f=2140MHz)



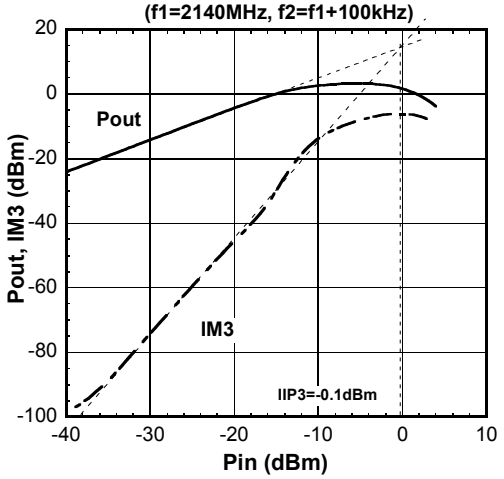
Condition
Ta=+25℃,
V_{DD}= 2.7V,
V_{CTL}1=0V, V_{CTL}2=0V, V_{CTL}3=1.8V

2.1GHz @High Gain
NF, Gain vs. frequency
(f=2.0~2.3GHz)



Condition
Ta=+25℃,
V_{DD}= 2.7V,
V_{CTL}1=0V, V_{CTL}2=0V, V_{CTL}3=1.85

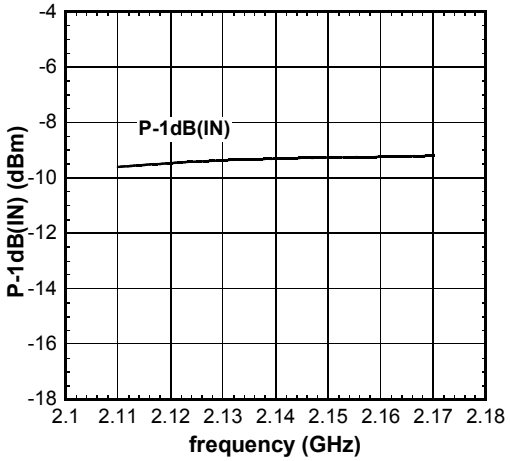
2.1GHz @High Gain
Pout, IM3 vs. Pin
(f1=2140MHz, f2=f1+100kHz)



Condition
Ta=+25℃,
V_{DD}= 2.7V,
V_{CTL}1=0V, V_{CTL}2=0V, V_{CTL}3=1.8V

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

2.1GHz @High Gain
P-1dB(IN) vs. frequency
(f=2.11~2.17GHz)



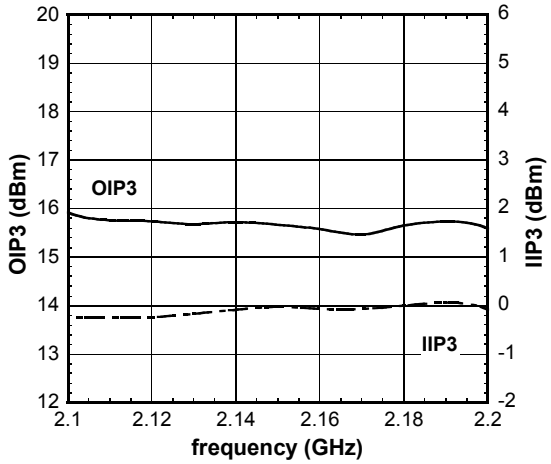
Condition

Ta=+25℃,

V_{DD}= 2.7V,

V_{CTL}1=0V, V_{CTL}2=0V, V_{CTL}3=1.8V

2.1GHz @High Gain
OIP3, IIP3 vs. frequency
(f1=2.1~2.2GHz, f2=f1+100kHz, Pin=-30dBm)



Condition

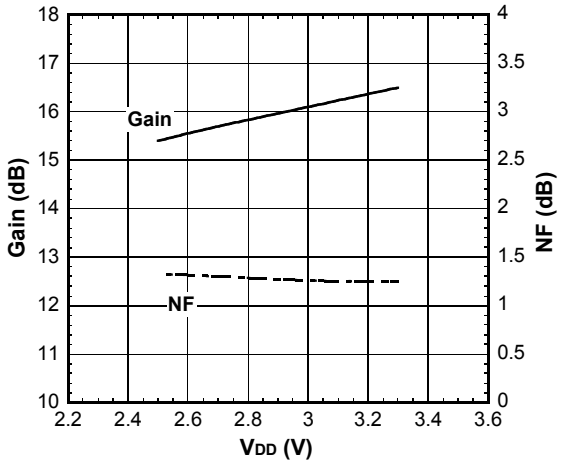
Ta=+25℃,

V_{DD}= 2.7V,

V_{CTL}1=0V, V_{CTL}2=0V, V_{CTL}3=1.8V

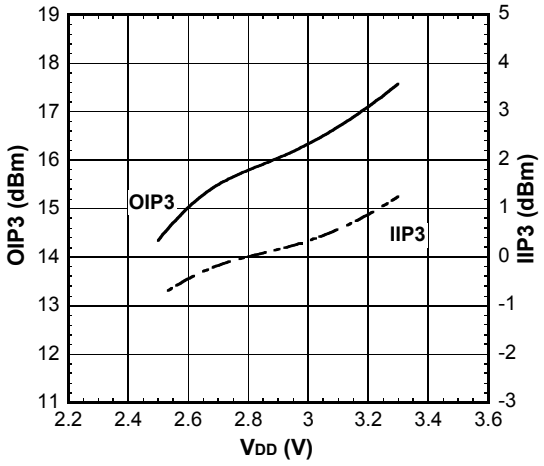
■**ELECTRICAL CHARACTERISTICS** (2.1GHz band High Gain mode)

2.1GHz @High Gain
Gain, NF vs. V_{DD}



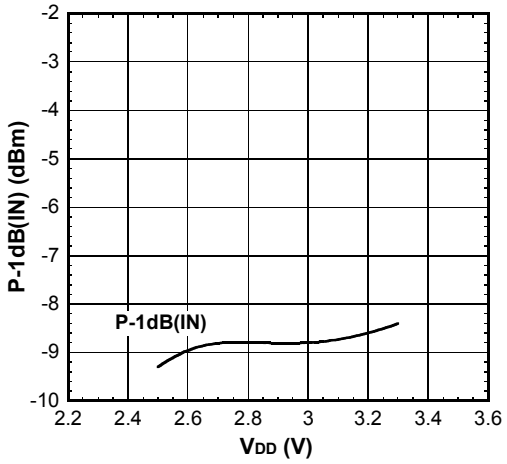
Condition
Ta=+25℃,
f=2140MHz,
$V_{CTL}1$=0V, $V_{CTL}2$=0V, $V_{CTL}3$=1.8V

2.1GHz @High Gain
OIP3, IIP3 vs. V_{DD}



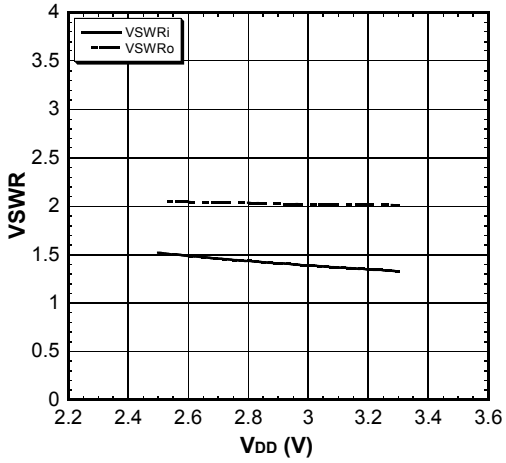
Condition
Ta=+25℃,
f1=2140MHz, f2=f1+100kHz,
Pin=-30dBm,
$V_{CTL}1$=0V, $V_{CTL}2$=0V, $V_{CTL}3$=1.8V

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



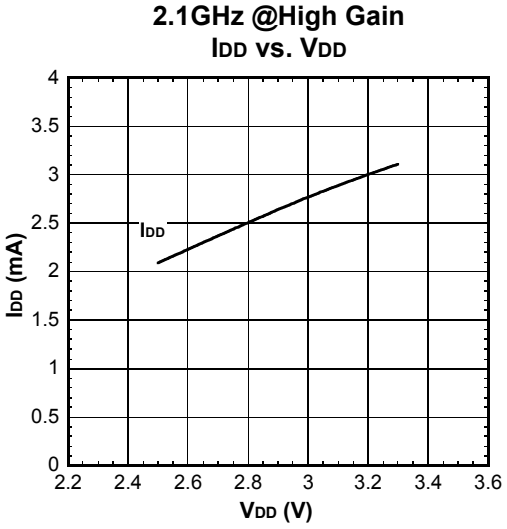
Condition
Ta=+25℃,
f=2140MHz,
$V_{CTL}1$=0V, $V_{CTL}2$=0V, $V_{CTL}3$=1.8V

2.1GHz @High Gain
VSWR vs. V_{DD}



Condition
Ta=+25℃,
f=2140MHz,
$V_{CTL}1$=0V, $V_{CTL}2$=0V, $V_{CTL}3$=1.8V

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



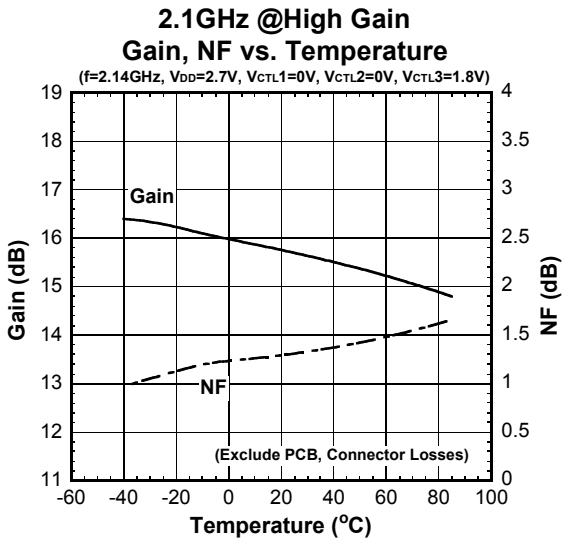
Condition

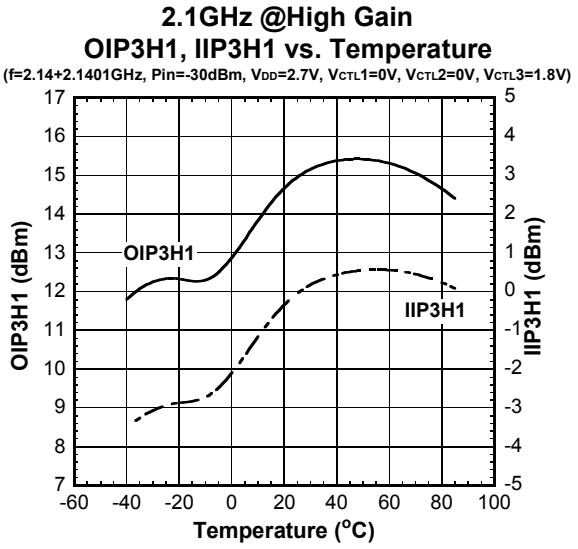
Ta=+25℃,

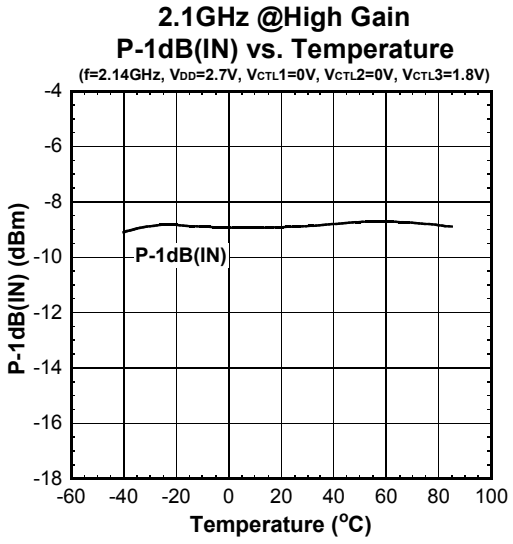
RF=OFF,

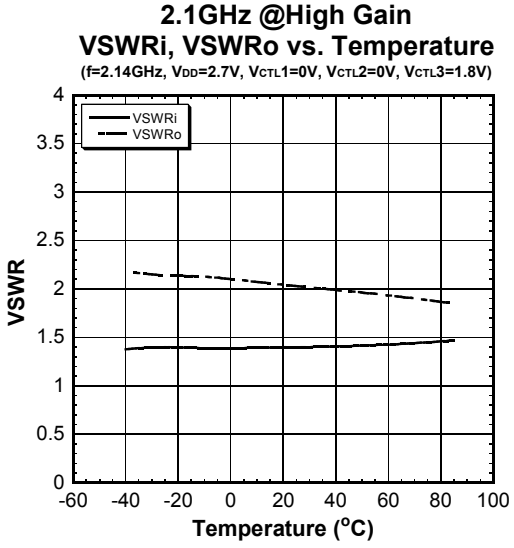
$V_{CTL}1$=0V, $V_{CTL}2$=0V, $V_{CTL}3$=1.8V

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

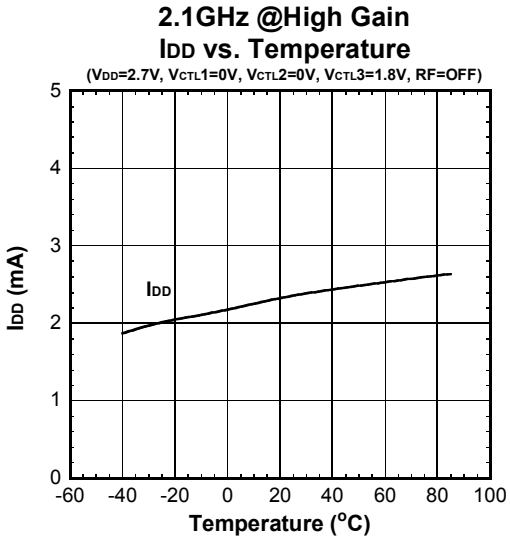






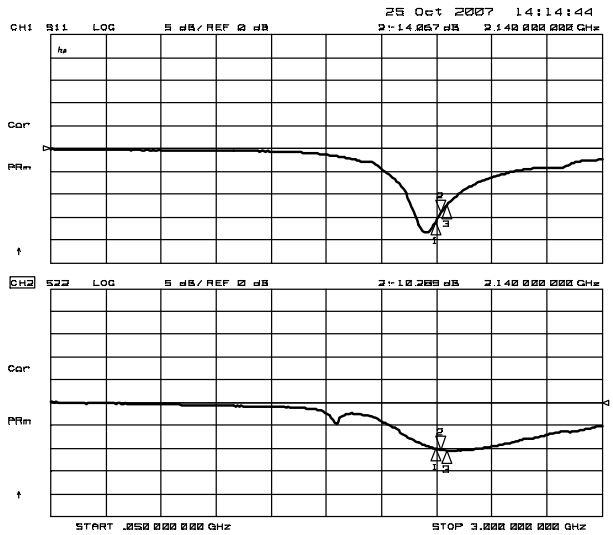


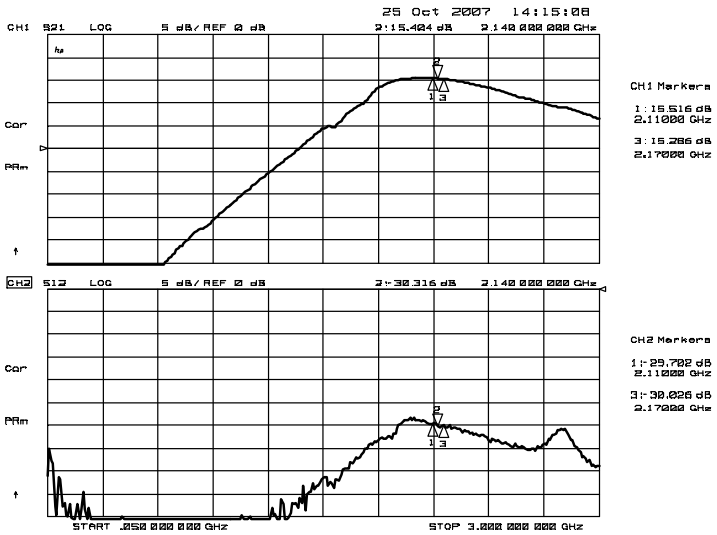
■**ELECTRICAL CHARACTERISTICS** (2.1GHz band High Gain mode)

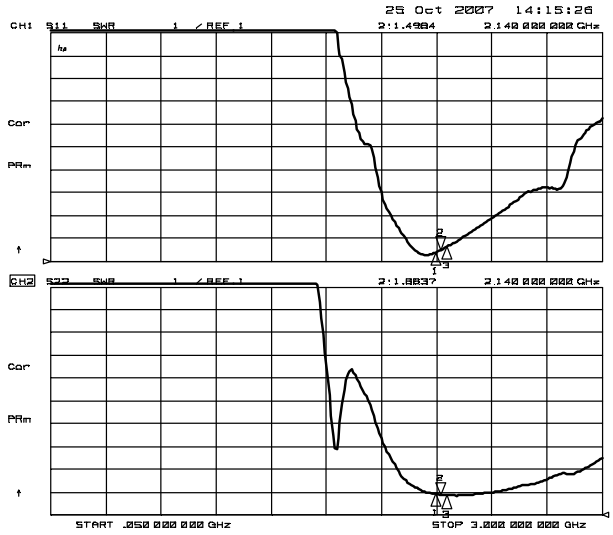


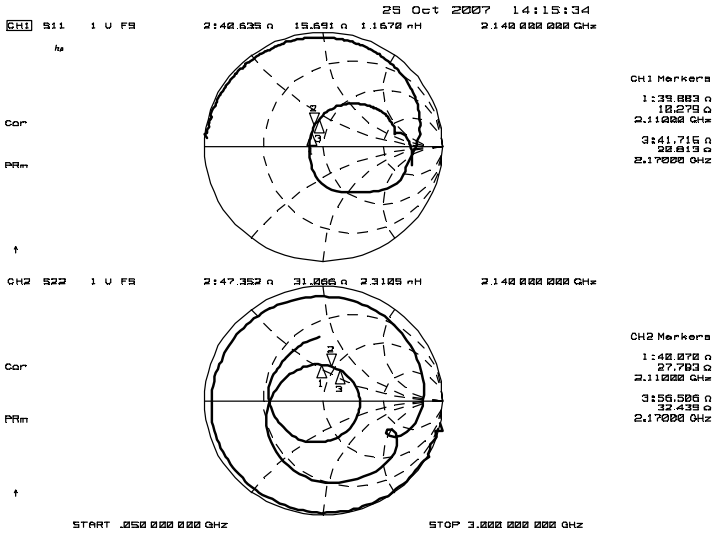
■ELECTRICAL CHARACTERISTICS (2.1GHz band High Gain mode)

Condition : Ta=+25°C, V_{DD}=2.7V, V_{CTL}1=0V, V_{CTL}2=0V, V_{CTL}3=1.8V



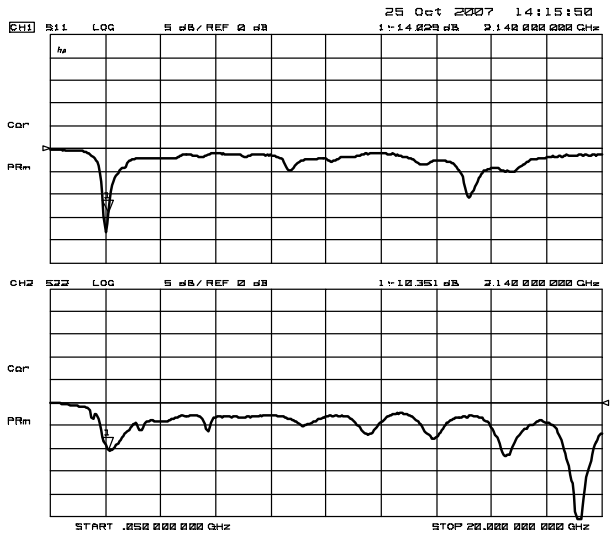


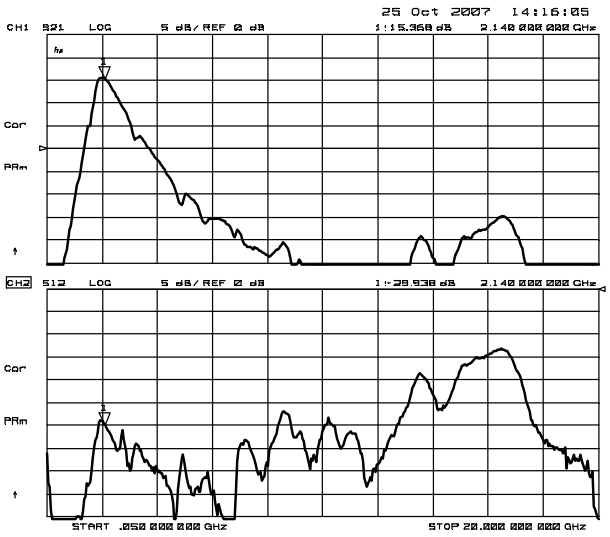


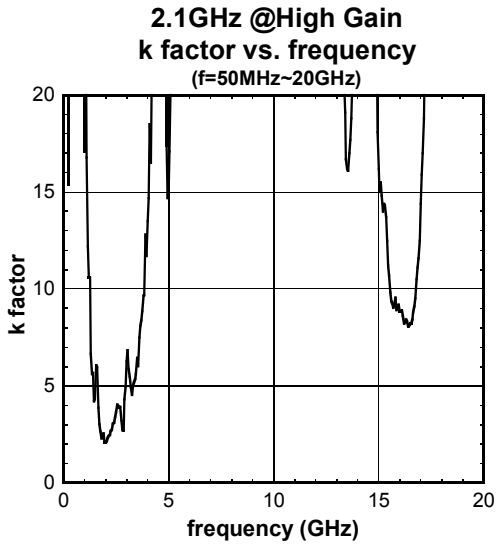


■**ELECTRICAL CHARACTERISTICS** (2.1GHz band High Gain mode)

Condition : Ta=+25℃, V_{DD}= 2.7V, V_{CTL}1=0V, V_{CTL}2=0V, V_{CTL}3=1.8V

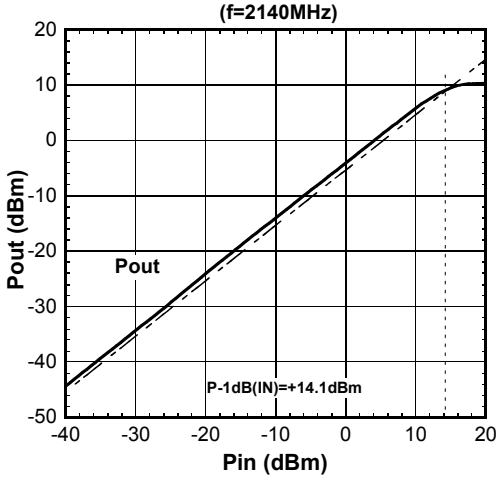






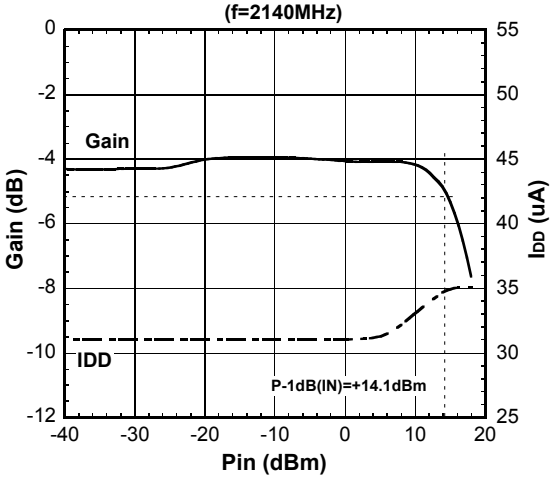
■**ELECTRICAL CHARACTERISTICS** (2.1GHz band Low Gain mode)

2.1GHz @Low Gain
Pout vs. Pin
(f=2140MHz)



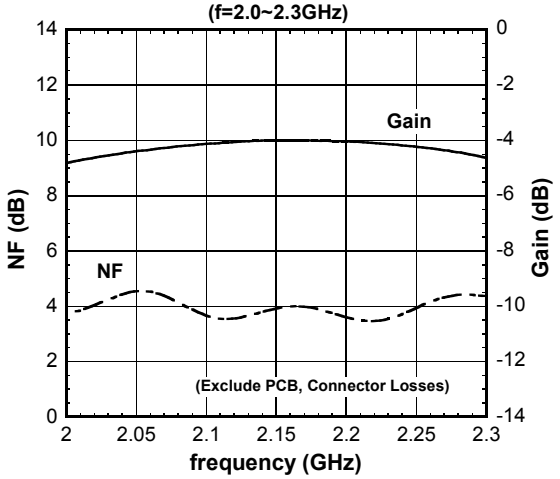
Condition
Ta=+25℃,
V_{DD}= 2.7V,
V_{CTL}1=0V, V_{CTL}2=0V, V_{CTL}3=0V

2.1GHz @Low Gain
Gain, IDD vs. Pin
(f=2140MHz)



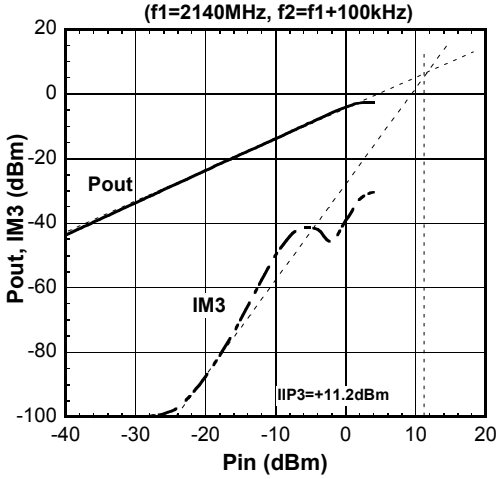
Condition
Ta=+25℃,
V_{DD}= 2.7V,
V_{CTL}1=0V, V_{CTL}2=0V, V_{CTL}3=0V

2.1GHz @Low Gain
NF, Gain vs. frequency
(f=2.0~2.3GHz)



Condition
Ta=+25℃,
V_{DD}=2.7V,
V_{CTL}1=0V, V_{CTL}2=0V, V_{CTL}3=0V

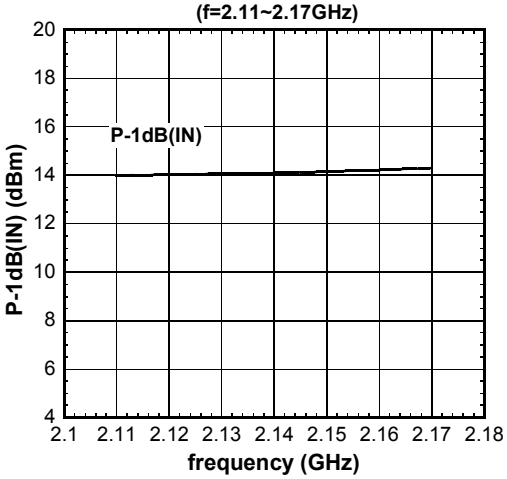
2.1GHz @Low Gain
Pout, IM3 vs. Pin
(f1=2140MHz, f2=f1+100kHz)



Condition
Ta=+25℃,
V_{DD}= 2.7V,
V_{CTL}1=0V, V_{CTL}2=0V, V_{CTL}3=0V

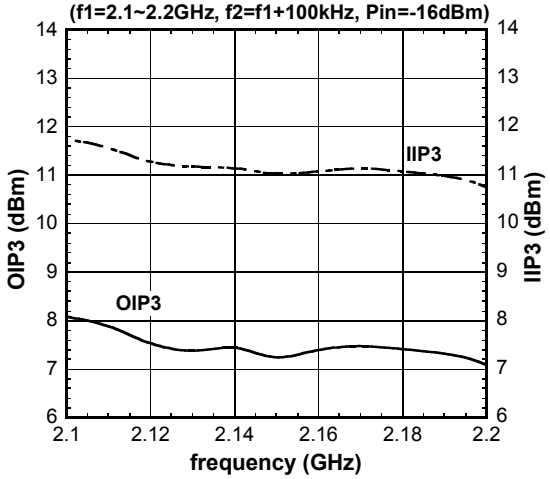
■**ELECTRICAL CHARACTERISTICS** (2.1GHz band Low Gain mode)

2.1GHz @Low Gain
P-1dB(IN) vs. frequency
(f=2.11~2.17GHz)



Condition
Ta=+25°C,
V_{DD}= 2.7V,
V_{CTL}1=0V, V_{CTL}2=0V, V_{CTL}3=0V

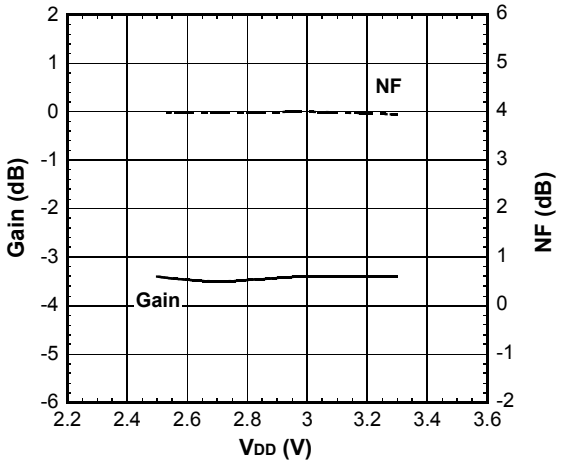
2.1GHz @Low Gain
OIP3, IIP3 vs. frequency
(f1=2.1~2.2GHz, f2=f1+100kHz, Pin=-16dBm)



Condition
Ta=+25°C,
V_{DD}= 2.7V,
V_{CTL}1=0V, V_{CTL}2=0V, V_{CTL}3=0V

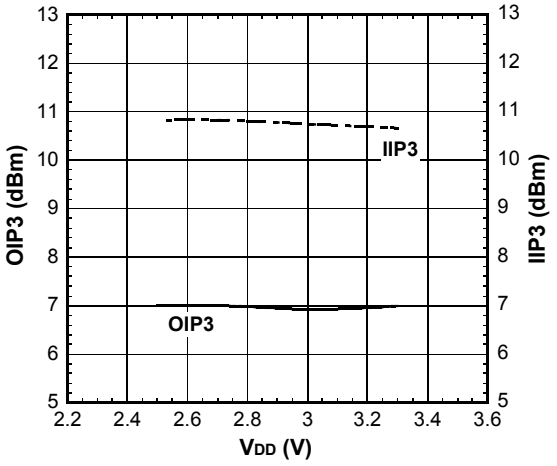
■**ELECTRICAL CHARACTERISTICS** (2.1GHz band Low Gain mode)

2.1GHz @Low Gain
Gain, NF vs. V_{DD}



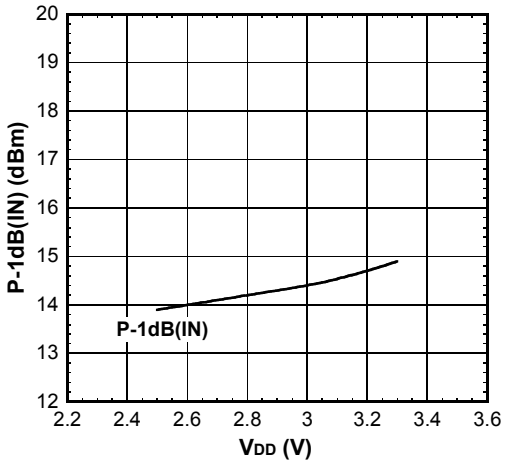
Condition
Ta=+25℃,
f=2140MHz,
$V_{CTL}1$=0V, $V_{CTL}2$=0V, $V_{CTL}3$=0V

2.1GHz @Low Gain
OIP3, IIP3 vs. V_{DD}



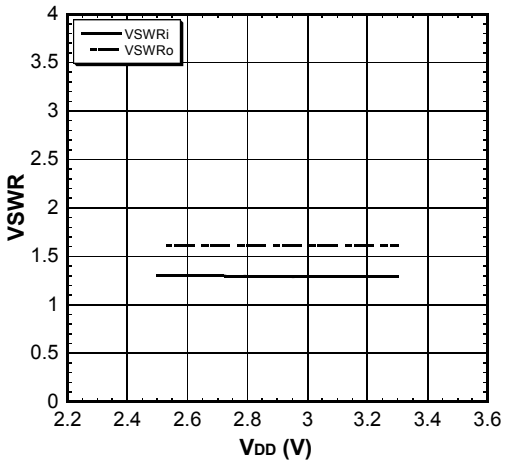
Condition
Ta=+25℃,
f1=2140MHz, f2=f1+100kHz,
Pin=-16dBm,
$V_{CTL}1$=0V, $V_{CTL}2$=0V, $V_{CTL}3$=0V

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



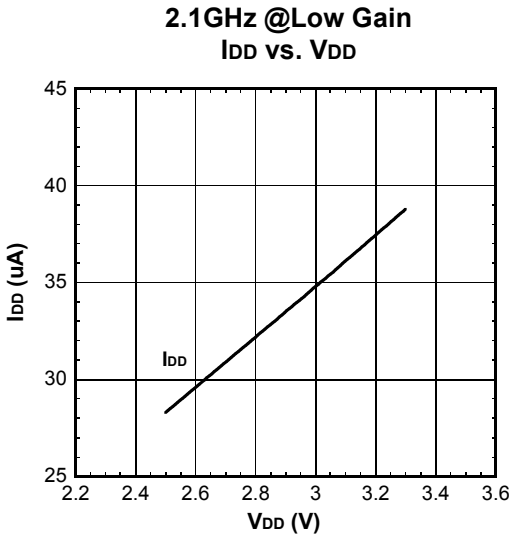
Condition
Ta=+25℃,
f=2140MHz,
$V_{CTL}1$=0V, $V_{CTL}2$=0V, $V_{CTL}3$=0V

2.1GHz @Low Gain
VSWR vs. V_{DD}



Condition
Ta=+25℃,
f=2140MHz,
$V_{CTL}1$=0V, $V_{CTL}2$=0V, $V_{CTL}3$=0V

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



Condition

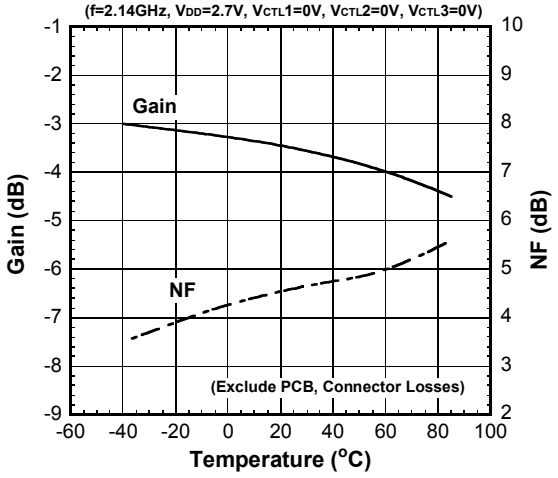
Ta=+25℃,

RF=OFF,

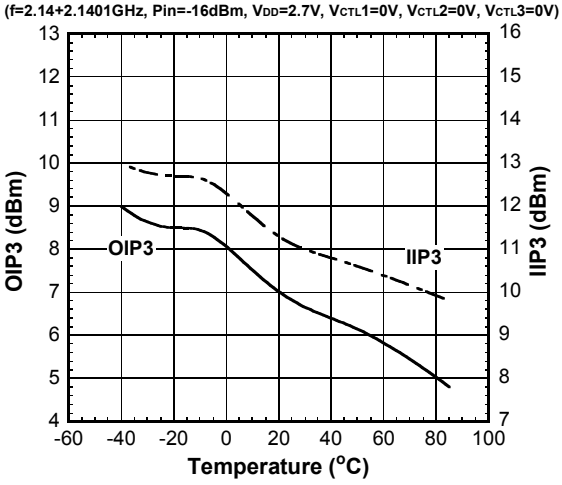
$V_{CTL}1$=0V, $V_{CTL}2$=0V, $V_{CTL}3$=0V

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

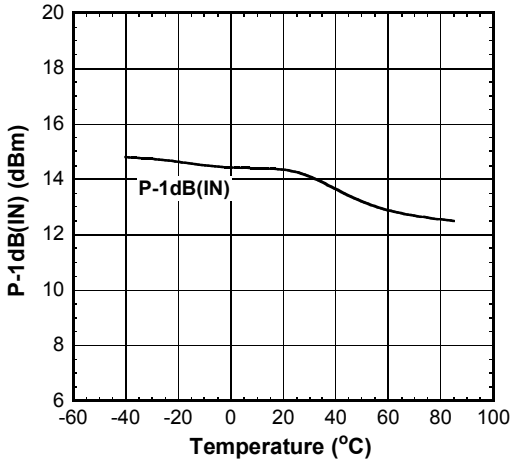
2.1GHz @Low Gain
Gain, NF vs. Temperature
(f=2.14GHz, V_{DD}=2.7V, V_{CTL}1=0V, V_{CTL}2=0V, V_{CTL}3=0V)



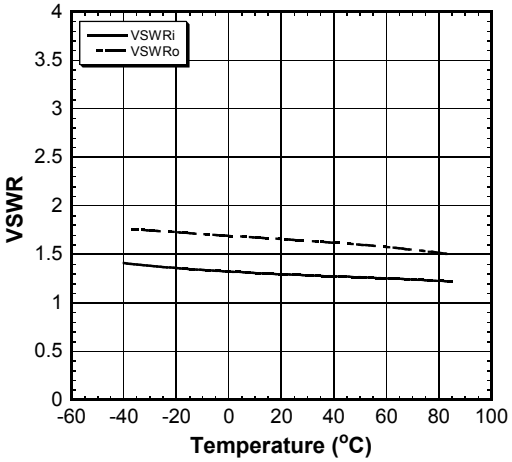
2.1GHz @Low Gain
OIP3, IIP3 vs. Temperature
(f=2.14+2.1401GHz, Pin=-16dBm, V_{DD}=2.7V, V_{CTL}1=0V, V_{CTL}2=0V, V_{CTL}3=0V)



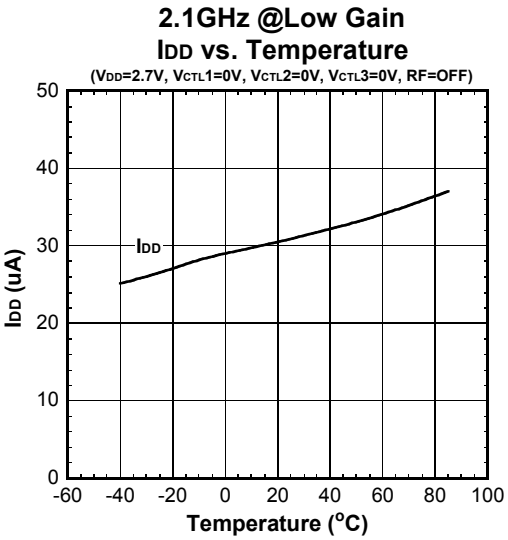
2.1GHz @Low Gain
P-1dB(IN) vs. Temperature
(f=2.14GHz, V_{DD}=2.7V, V_{CTL}1=0V, V_{CTL}2=0V, V_{CTL}3=0V)



2.1GHz @Low Gain
VSWRi, VSWRo vs. Temperature
(f=2.14GHz, V_{DD}=2.7V, V_{CTL}1=0V, V_{CTL}2=0V, V_{CTL}3=0V)

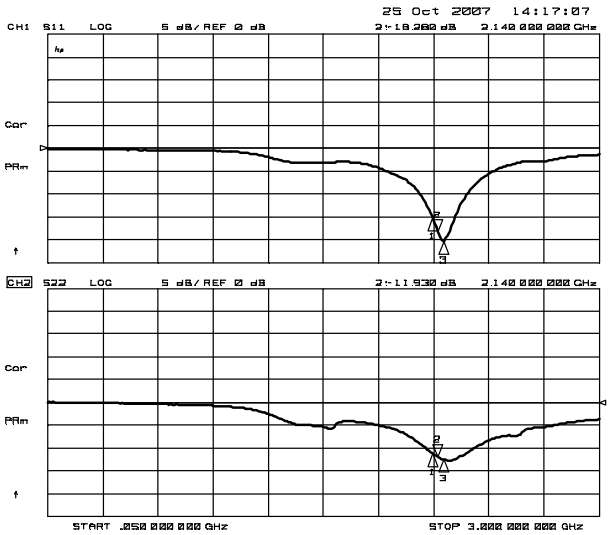


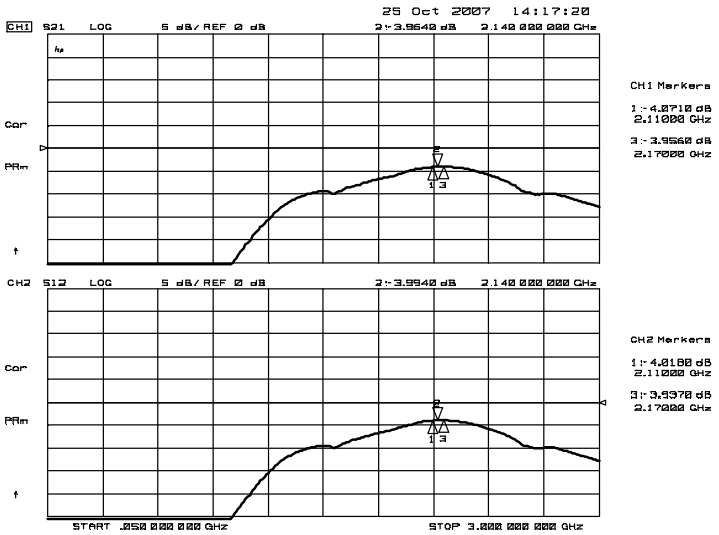
■**ELECTRICAL CHARACTERISTICS** (2.1GHz band Low Gain mode)

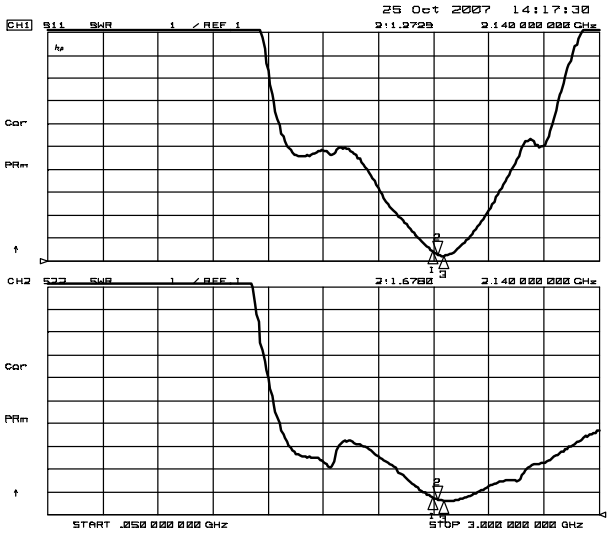


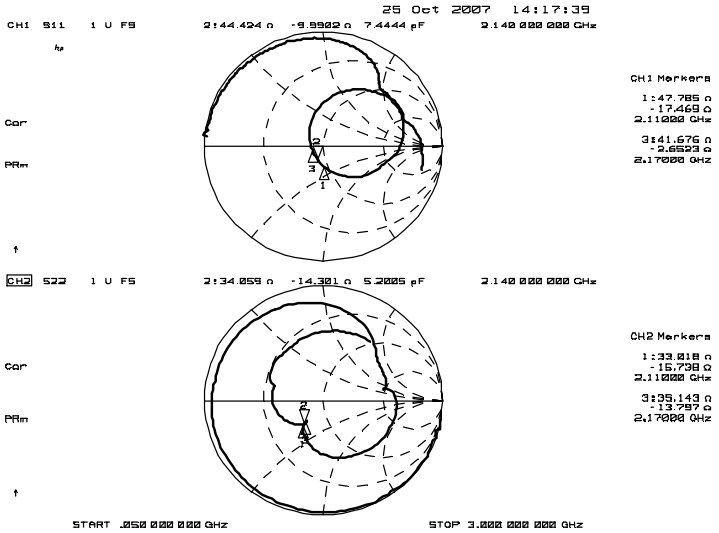
■ELECTRICAL CHARACTERISTICS (2.1GHz band Low Gain mode)

Condition : Ta=+25℃, V_{DD}=2.7V, V_{CTL}1=0V, V_{CTL}2=0V, V_{CTL}3=0V



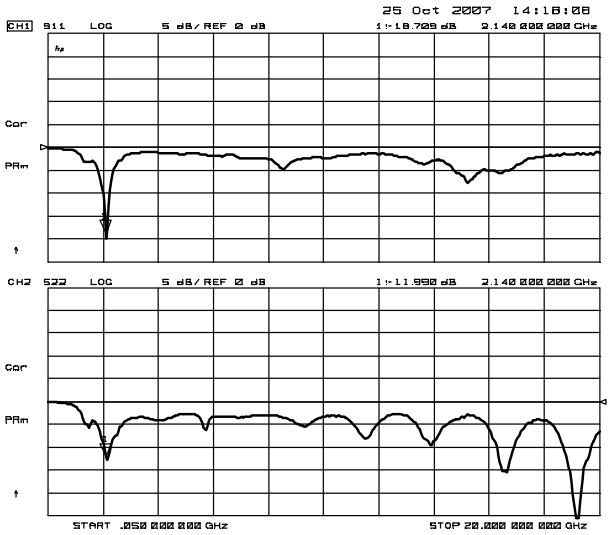


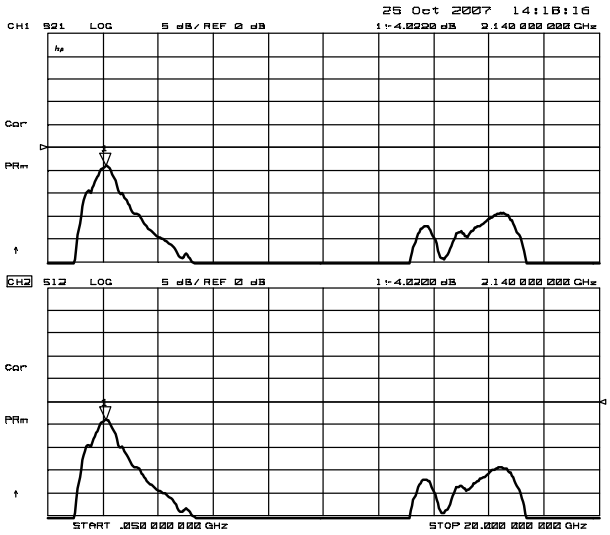


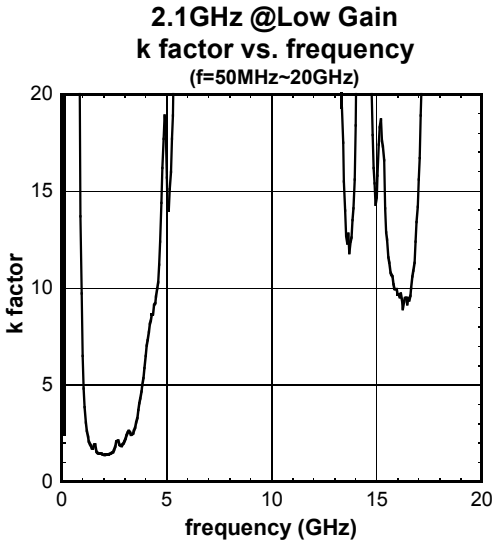


■**ELECTRICAL CHARACTERISTICS** (2.1GHz band Low Gain mode)

Condition : Ta=+25℃, V_{DD}= 2.7V, V_{CTL}1=0V, V_{CTL}2=0V, V_{CTL}3=0V

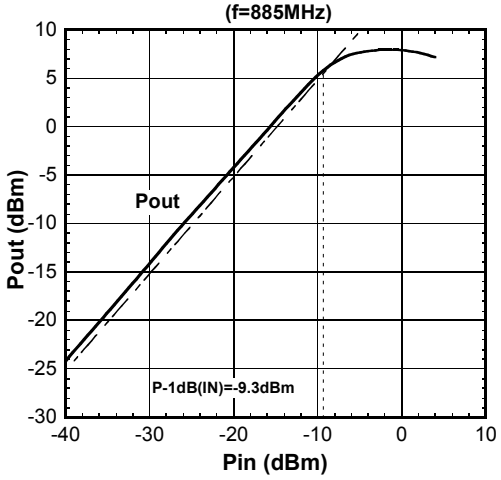






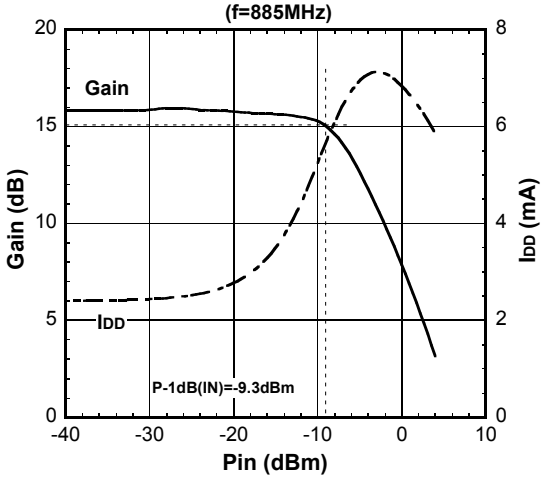
■**ELECTRICAL CHARACTERISTICS** (800MHz band High Gain mode)

800MHz @High Gain
Pout vs. Pin
(f=885MHz)



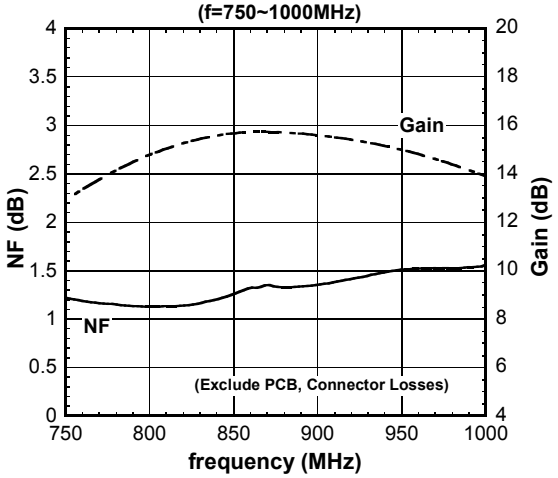
Condition
Ta=+25℃,
V_{DD}= 2.7V,
V_{CTL}1=1.8V, V_{CTL}2=0V, V_{CTL}3=1.8V

800MHz @High Gain
Gain, IDD vs. Pin
(f=885MHz)



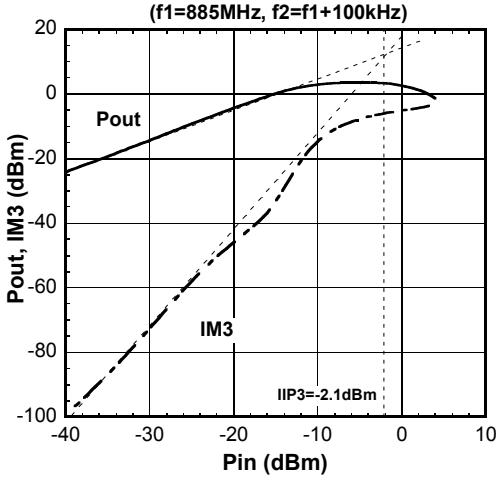
Condition
Ta=+25℃,
V_{DD}= 2.7V,
V_{CTL}1=1.8V, V_{CTL}2=0V, V_{CTL}3=1.8V

800MHz @High Gain
NF, Gain vs. frequency
(f=750~1000MHz)



Condition
Ta=+25℃,
V_{DD}= 2.7V,
V_{CTL}1=1.8V, V_{CTL}2=0V, V_{CTL}3=1.8V

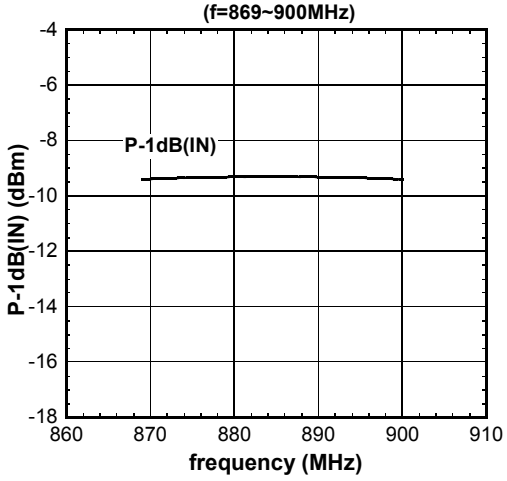
800MHz @High Gain
Pout, IM3 vs. Pin
(f1=885MHz, f2=f1+100kHz)



Condition
Ta=+25℃,
V_{DD}= 2.7V,
V_{CTL}1=1.8V, V_{CTL}2=0V, V_{CTL}3=1.8V

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

800MHz @High Gain
P-1dB(IN) vs. frequency
(f=869~900MHz)



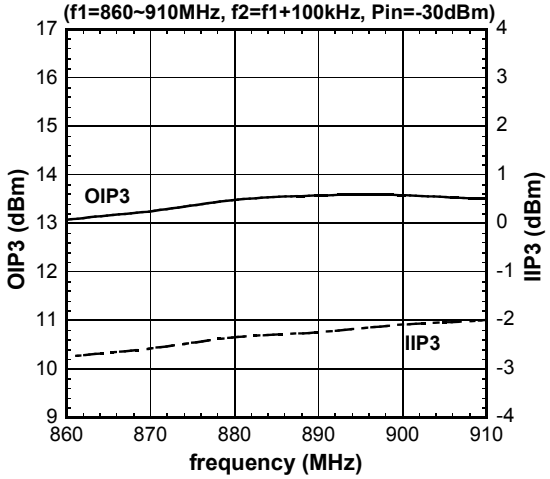
Condition

Ta=+25℃,

V_{DD}= 2.7V,

V_{CTL}1=1.8V, V_{CTL}2=0V, V_{CTL}3=1.8V

800MHz @High Gain
OIP3, IIP3 vs. frequency
(f1=860~910MHz, f2=f1+100kHz, Pin=-30dBm)



Condition

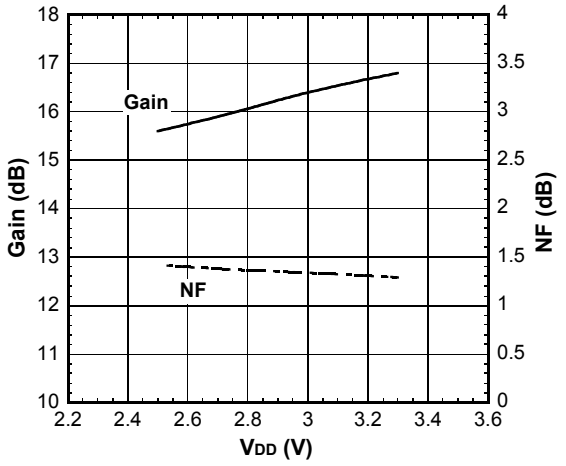
Ta=+25℃,

V_{DD}= 2.7V,

V_{CTL}1=1.8V, V_{CTL}2=0V, V_{CTL}3=1.8V

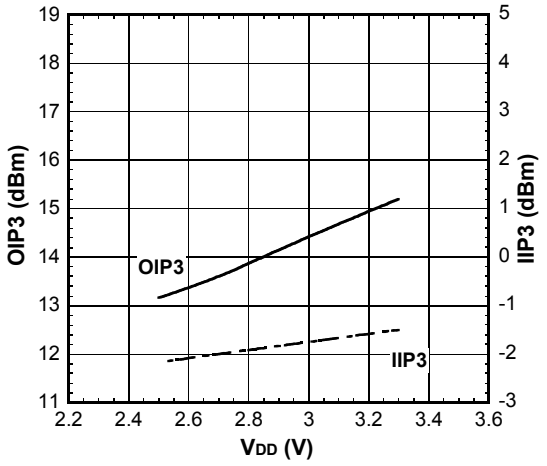
■**ELECTRICAL CHARACTERISTICS** (800MHz band High Gain mode)

800MHz @High Gain
Gain, NF vs. V_{DD}



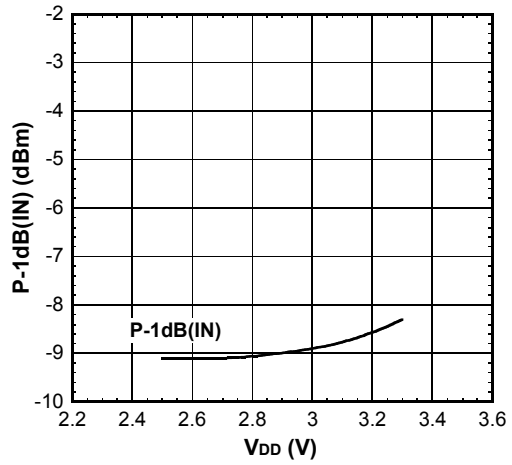
Condition
Ta=+25℃,
f=885MHz,
$V_{CTL}1$=1.8V, $V_{CTL}2$=0V, $V_{CTL}3$=1.8V

800MHz @High Gain
OIP3, IIP3 vs. V_{DD}



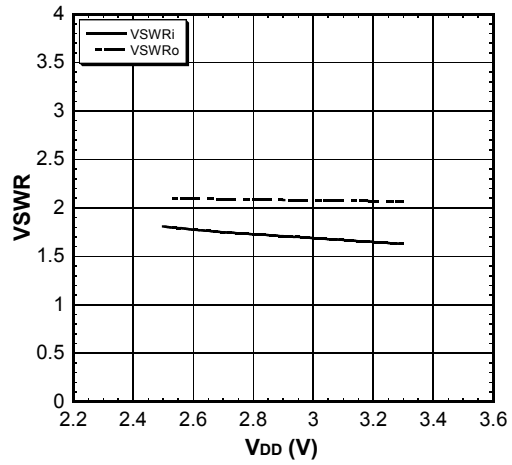
Condition
Ta=+25℃,
f1=885MHz, f2=f1+100kHz,
Pin=-30dBm,
$V_{CTL}1$=1.8V, $V_{CTL}2$=0V, $V_{CTL}3$=1.8V

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



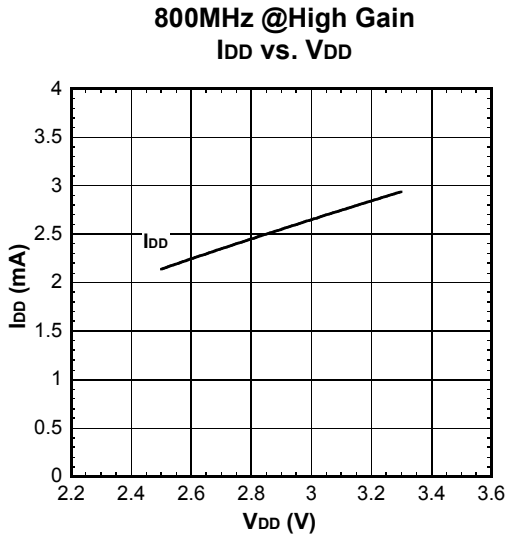
Condition
Ta=+25℃,
f=885MHz,
$V_{CTL}1$=1.8V, $V_{CTL}2$=0V, $V_{CTL}3$=1.8V

800MHz @High Gain
VSWR vs. V_{DD}



Condition
Ta=+25℃,
f=885MHz,
$V_{CTL}1$=1.8V, $V_{CTL}2$=0V, $V_{CTL}3$=1.8V

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



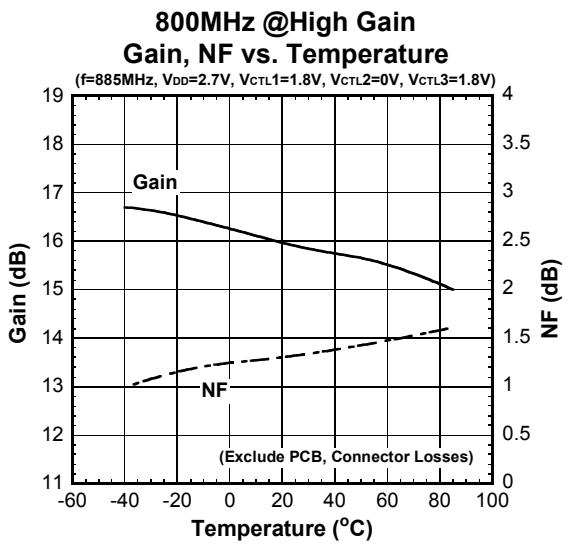
Condition

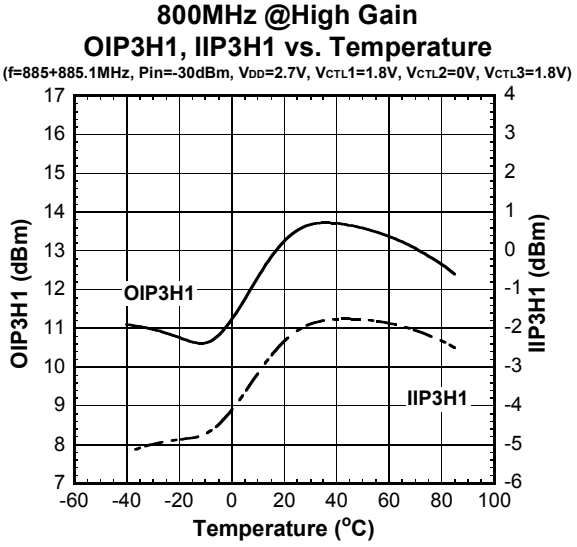
Ta=+25°C,

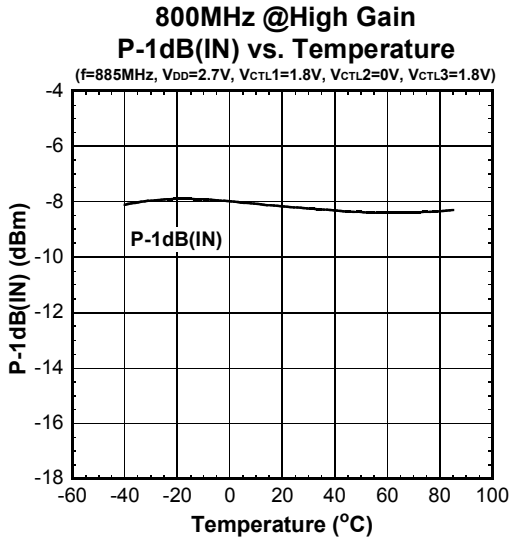
RF=OFF

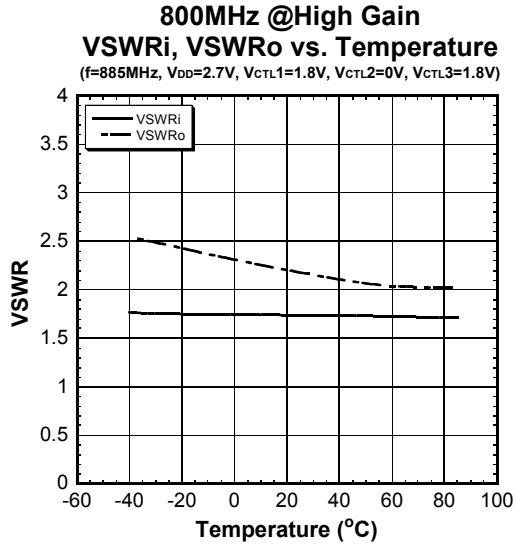
$V_{CTL}1$=1.8V, $V_{CTL}2$=0V, $V_{CTL}3$=1.8V

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

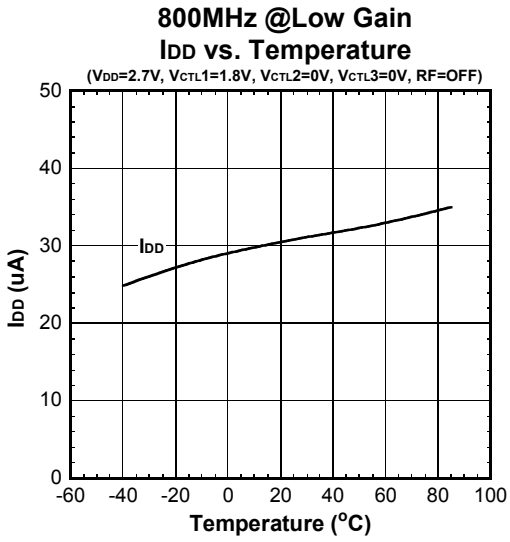






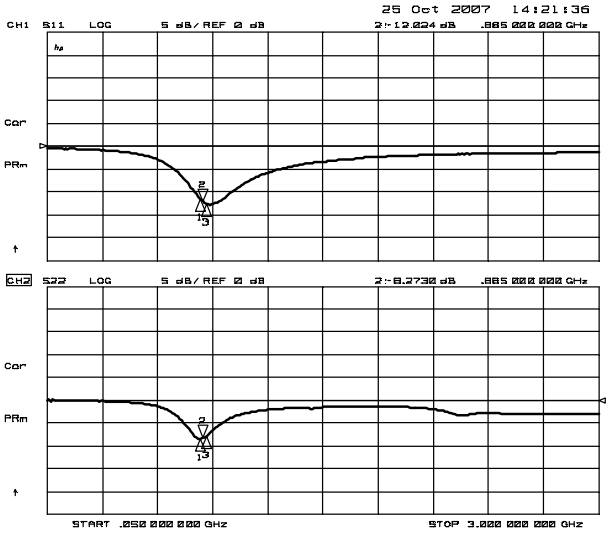


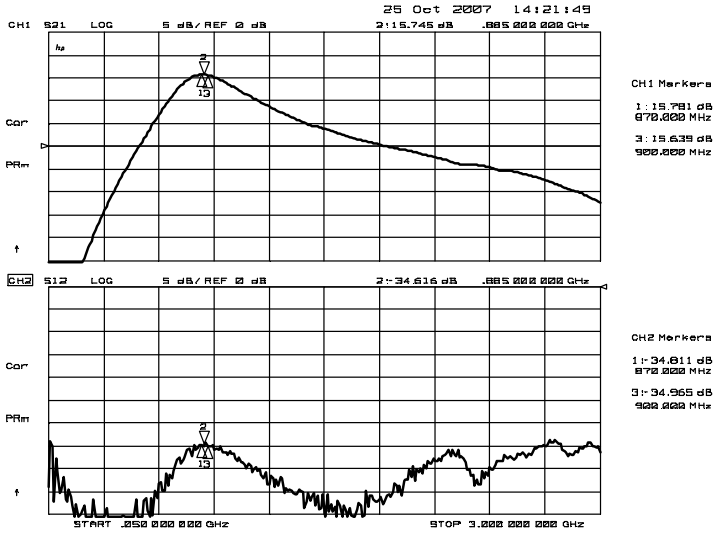
■**ELECTRICAL CHARACTERISTICS** (800MHz band High Gain mode)

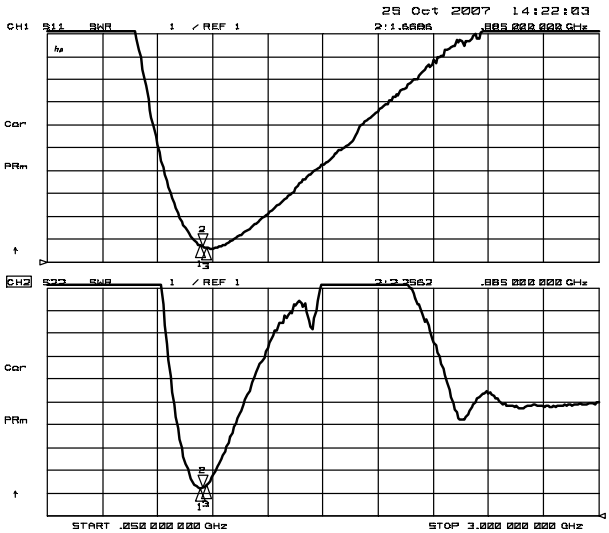


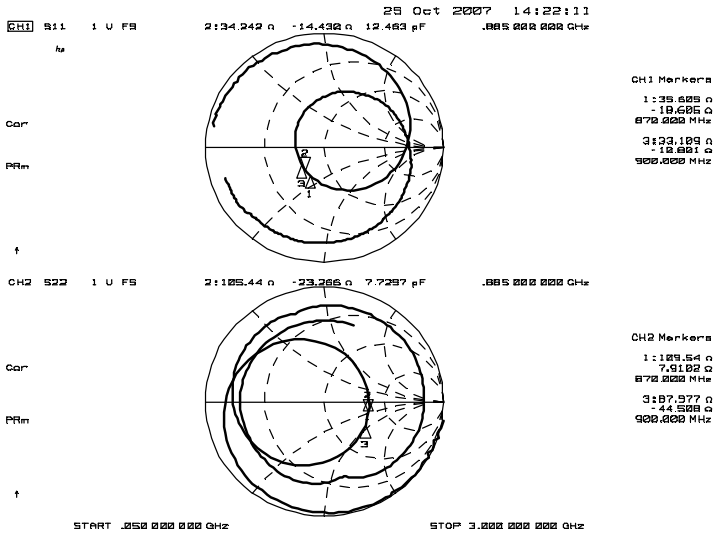
■ELECTRICAL CHARACTERISTICS (800MHz band High Gain mode)

Condition : Ta=+25°C, V_{DD}= 2.7V, V_{CTL}1=1.8V, V_{CTL}2=0V, V_{CTL}3=1.8V



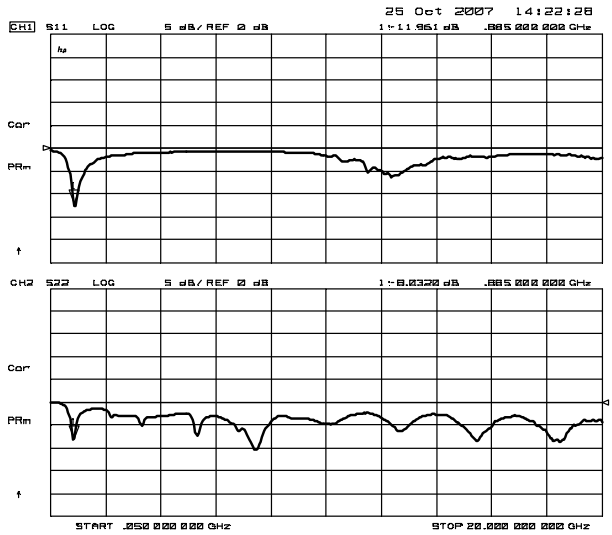


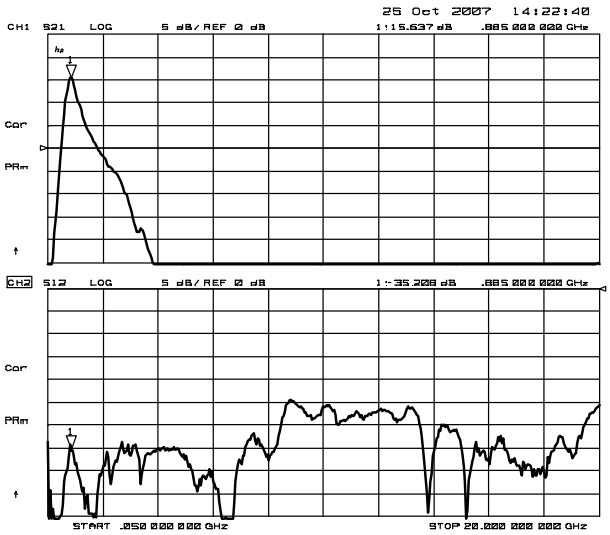


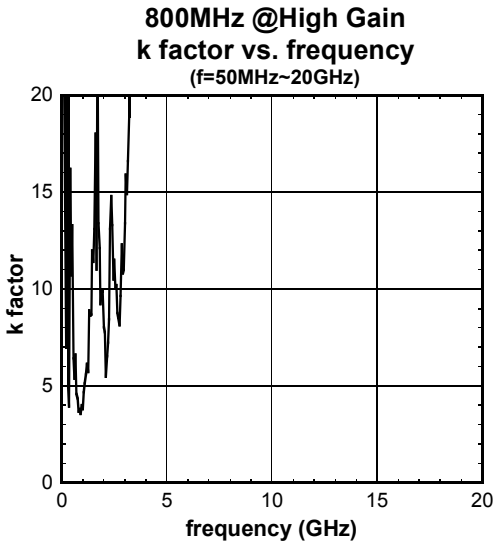


■**ELECTRICAL CHARACTERISTICS** (800MHz band High Gain mode)

Condition : Ta=+25℃, V_{DD}= 2.7V, V_{CTL}1=1.8V, V_{CTL}2=0V, V_{CTL}3=1.8V

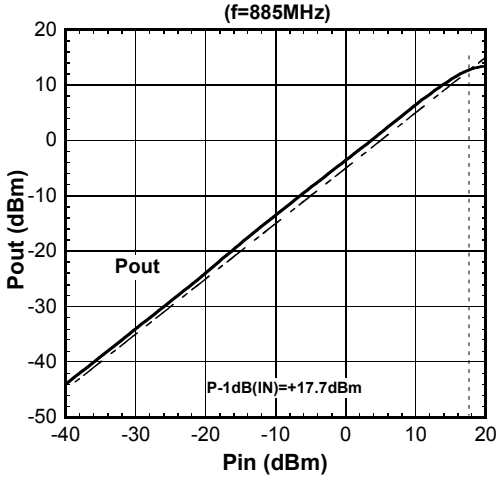






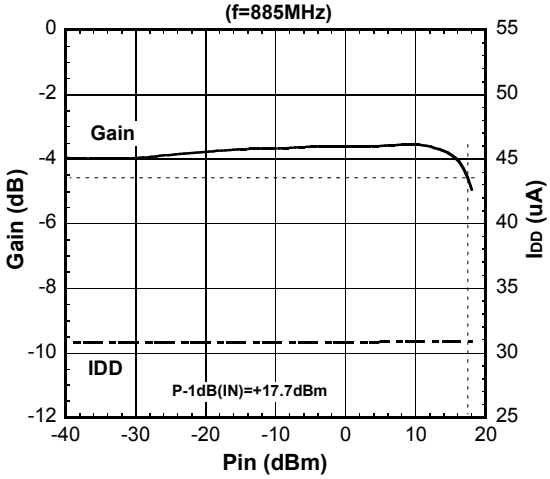
■**ELECTRICAL CHARACTERISTICS** (800MHz band Low Gain mode)

800MHz @Low Gain
Pout vs. Pin
(f=885MHz)



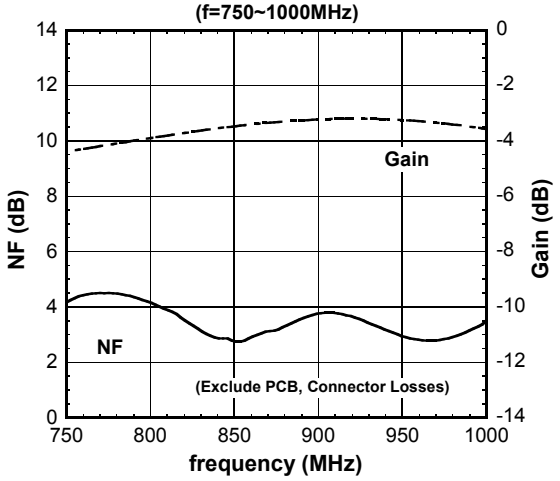
Condition
Ta=+25℃,
V_{DD}= 2.7V,
V_{CTL}1=1.8V, V_{CTL}2=0V, V_{CTL}3=0V

800MHz @Low Gain
Gain, IDD vs. Pin
(f=885MHz)



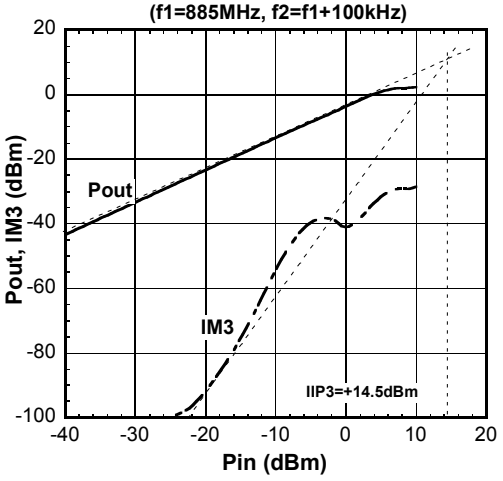
Condition
Ta=+25℃,
V_{DD}= 2.7V,
V_{CTL}1=1.8V, V_{CTL}2=0V, V_{CTL}3=0V

800MHz @Low Gain
NF, Gain vs. frequency
(f=750~1000MHz)



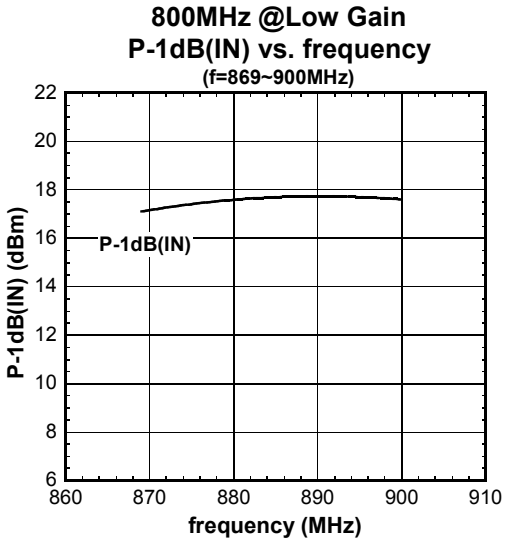
Condition
Ta=+25℃,
V_{DD}= 2.7V,
V_{CTL}1=1.8V, V_{CTL}2=0V, V_{CTL}3=0V

800MHz @Low Gain
Pout, IM3 vs. Pin
(f1=885MHz, f2=f1+100kHz)



Condition
Ta=+25℃,
V_{DD}= 2.7V,
V_{CTL}1=1.8V, V_{CTL}2=0V, V_{CTL}3=0V

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

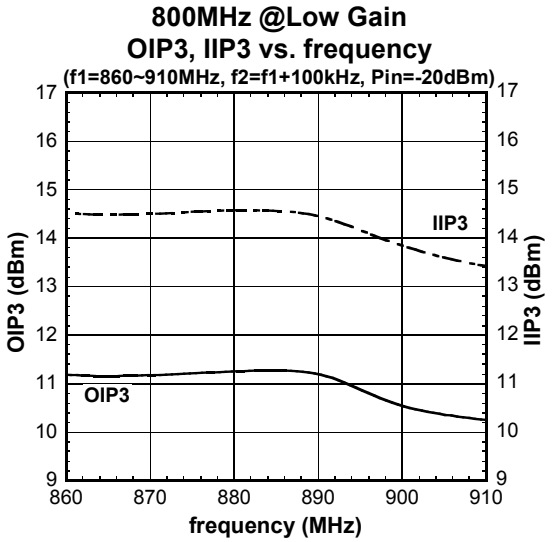


Condition

Ta=+25℃,

V_{DD}= 2.7V,

V_{CTL}1=1.8V, V_{CTL}2=0V, V_{CTL}3=0V



Condition

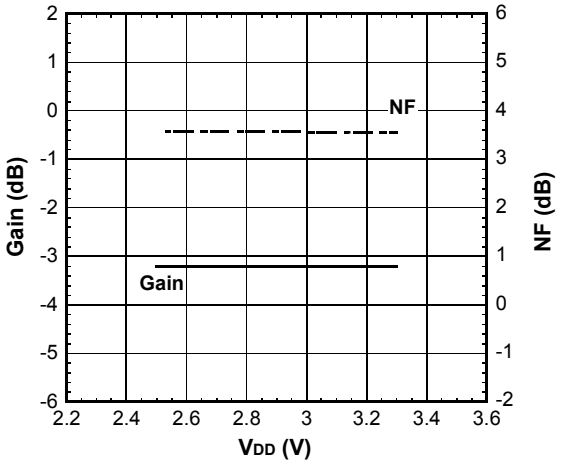
Ta=+25℃,

V_{DD}= 2.7V,

V_{CTL}1=1.8V, V_{CTL}2=0V, V_{CTL}3=0V

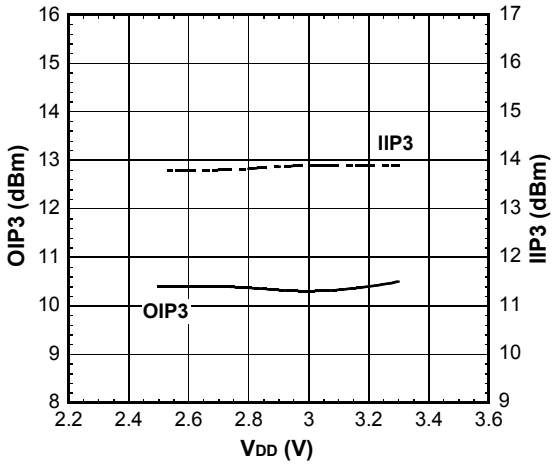
■**ELECTRICAL CHARACTERISTICS** (800MHz band Low Gain mode)

800MHz @Low Gain
Gain, NF vs. V_{DD}



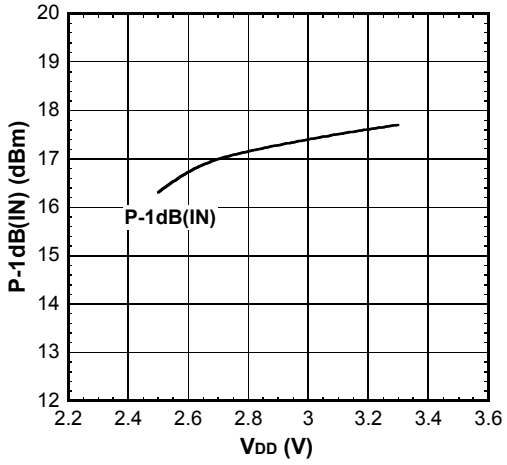
Condition
Ta=+25℃,
f=885MHz,
$V_{CTL}1$=1.8V, $V_{CTL}2$=0V, $V_{CTL}3$=0V

800MHz @Low Gain
OIP3, IIP3 vs. V_{DD}



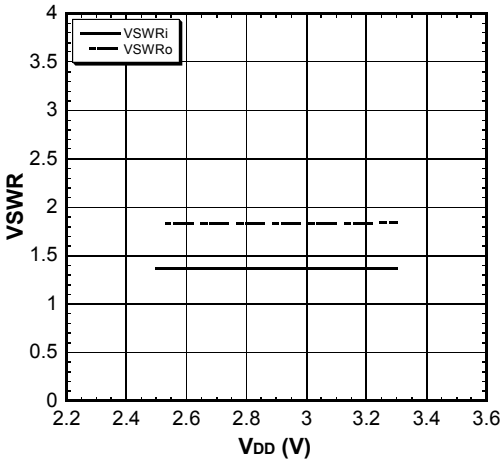
Condition
Ta=+25℃,
f1=885MHz, f2=f1+100kHz,
Pin=-20dBm,
$V_{CTL}1$=1.8V, $V_{CTL}2$=0V, $V_{CTL}3$=0V

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



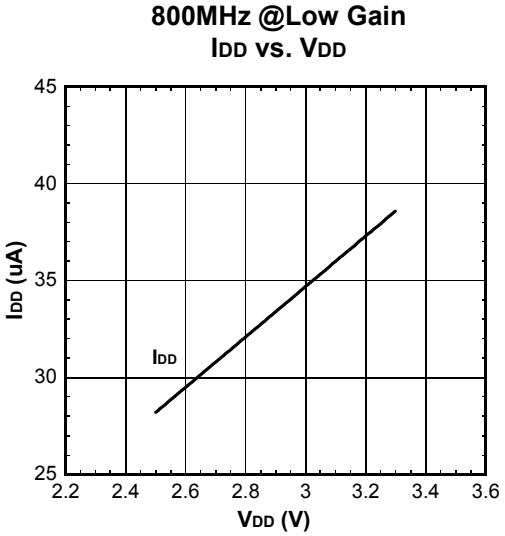
Condition
Ta=+25℃,
f=885MHz,
$V_{CTL}1$=1.8V, $V_{CTL}2$=0V, $V_{CTL}3$=0V

800MHz @Low Gain
VSWR vs. V_{DD}



Condition
Ta=+25℃,
f=885MHz,
$V_{CTL}1$=1.8V, $V_{CTL}2$=0V, $V_{CTL}3$=0V

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



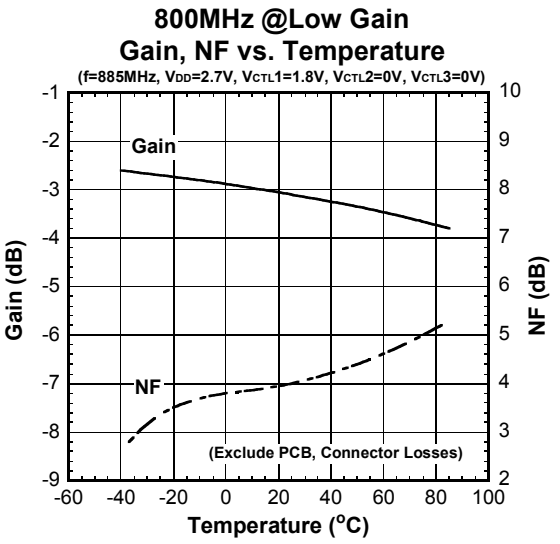
Condition

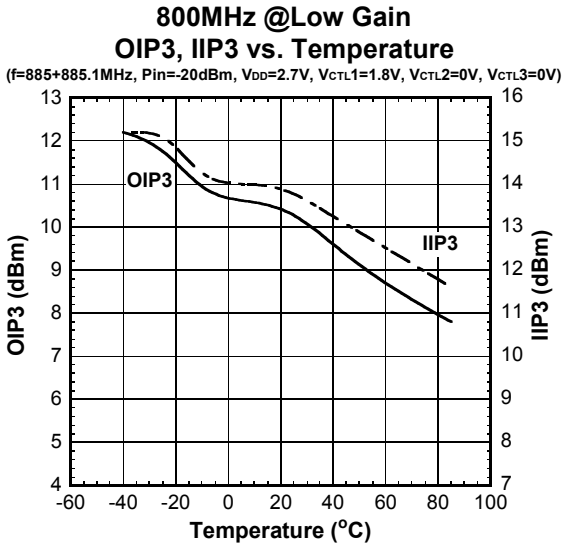
Ta=+25℃,

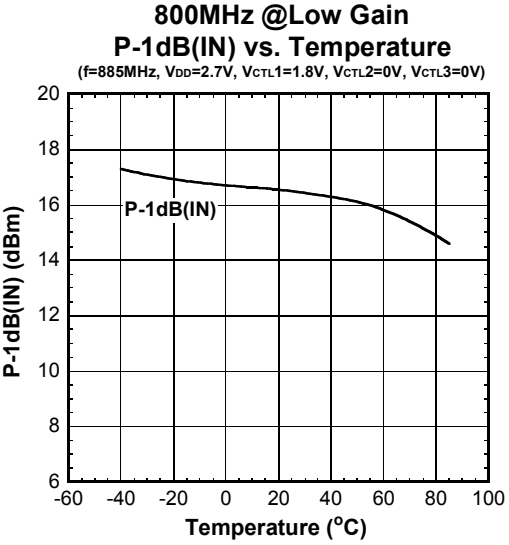
RF=OFF

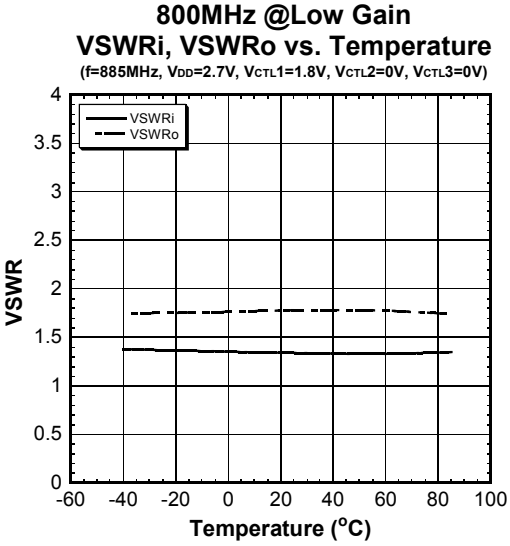
$V_{CTL}1$=1.8V, $V_{CTL}2$=0V, $V_{CTL}3$=0V

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

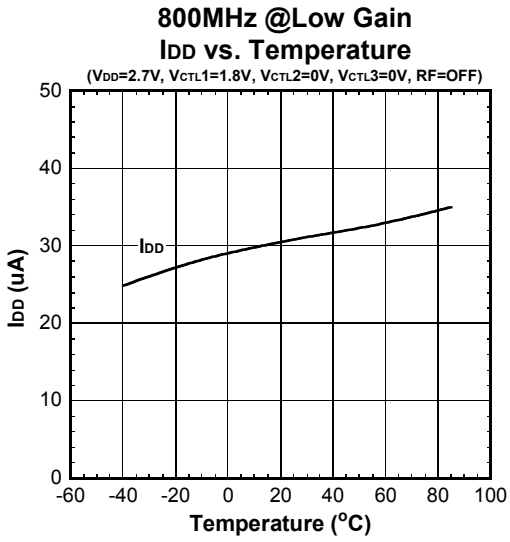






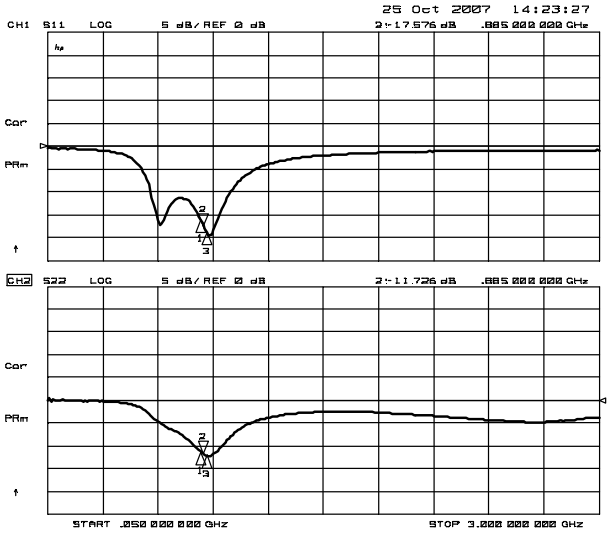


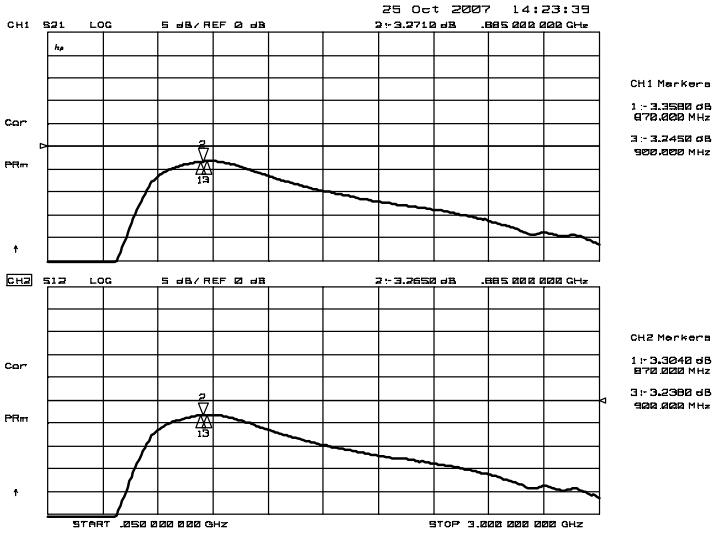
■**ELECTRICAL CHARACTERISTICS** (800MHz band Low Gain mode)

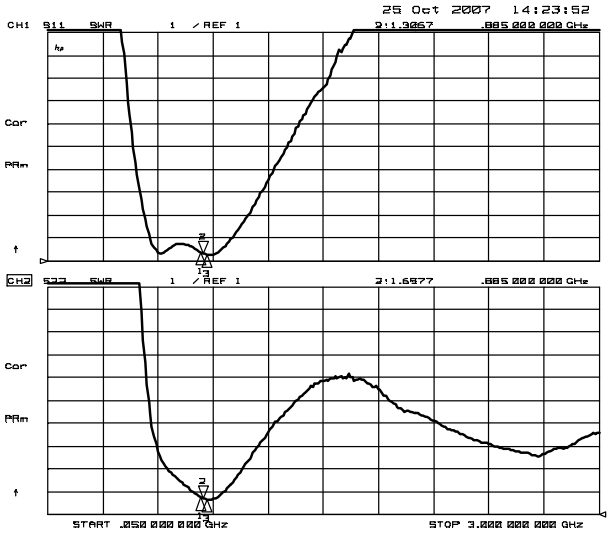


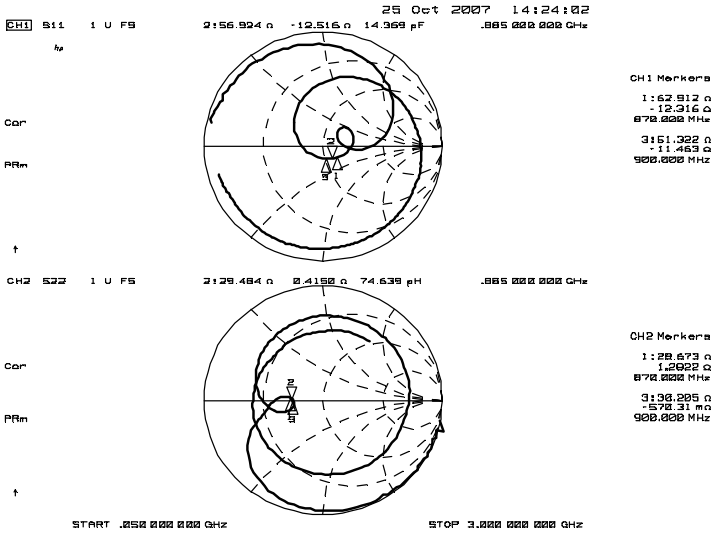
■ELECTRICAL CHARACTERISTICS (800MHz band Low Gain mode)

Condition : Ta=+25℃, V_{DD}= 2.7V, V_{CTL}1=1.8V, V_{CTL}2=0V, V_{CTL}3=0V



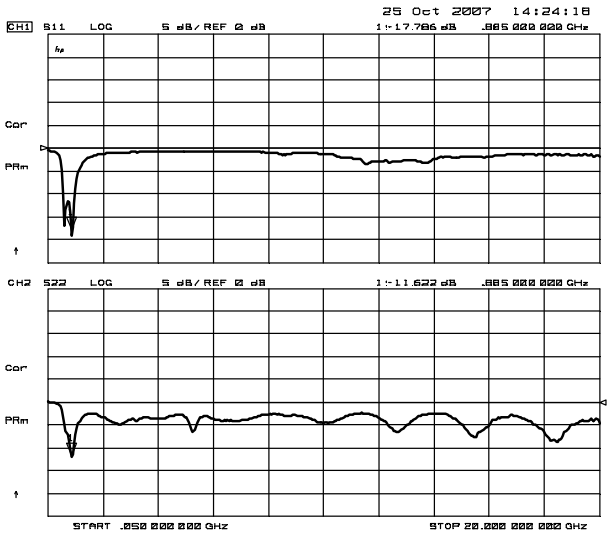


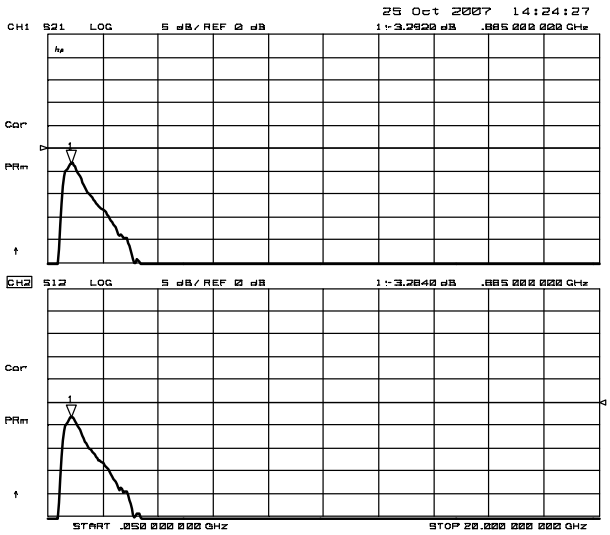


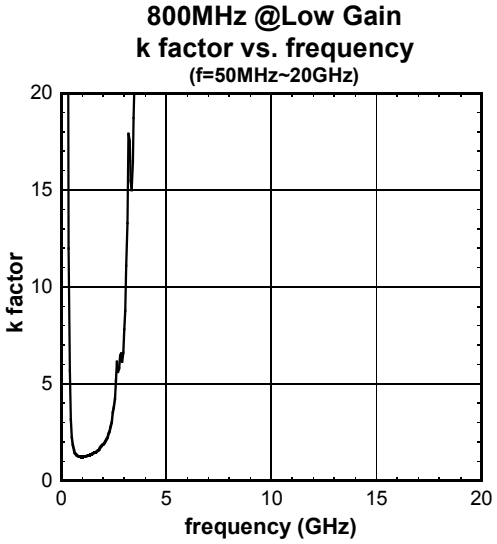


■**ELECTRICAL CHARACTERISTICS** (800MHz band Low Gain mode)

Condition : Ta=+25℃, V_{DD}= 2.7V, V_{CTL}1=1.8V, V_{CTL}2=0V, V_{CTL}3=0V

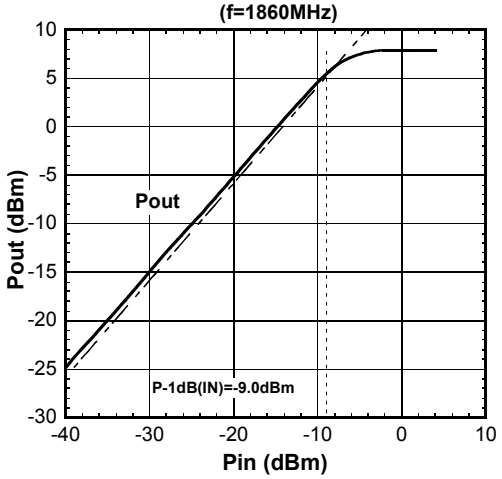






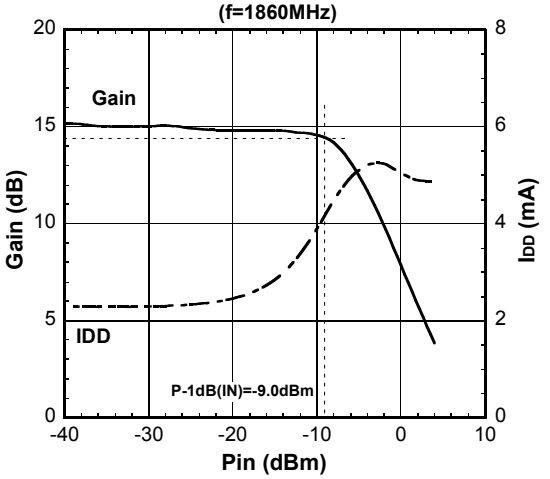
■**ELECTRICAL CHARACTERISTICS** (1.7GHz band High Gain mode)

1.7GHz @High Gain
Pout vs. Pin
(f=1860MHz)



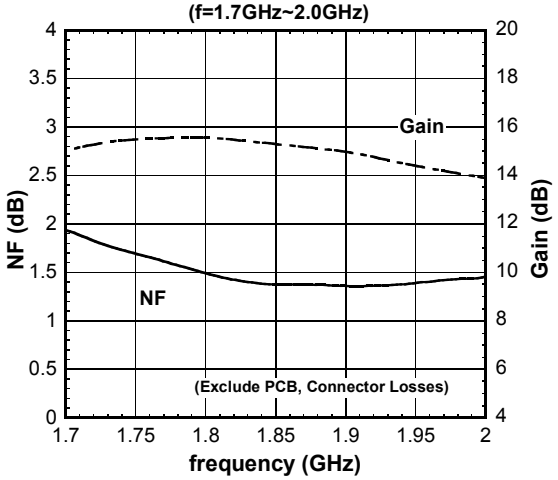
Condition
Ta=+25℃,
V_{DD}= 2.7V,
V_{CTL}1=0V, V_{CTL}2=1.8V, V_{CTL}3=1.8V

1.7GHz @High Gain
Gain, IDD vs. Pin
(f=1860MHz)



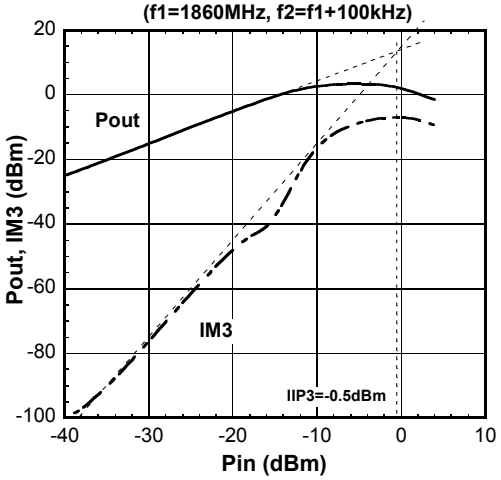
Condition
Ta=+25℃,
V_{DD}= 2.7V,
V_{CTL}1=0V, V_{CTL}2=1.8V, V_{CTL}3=1.8V

1.7GHz @High Gain
NF, Gain vs. frequency
(f=1.7GHz~2.0GHz)



Condition
Ta=+25℃,
V_{DD}= 2.7V,
V_{CTL}1=0V, V_{CTL}2=1.8V, V_{CTL}3=1.8V

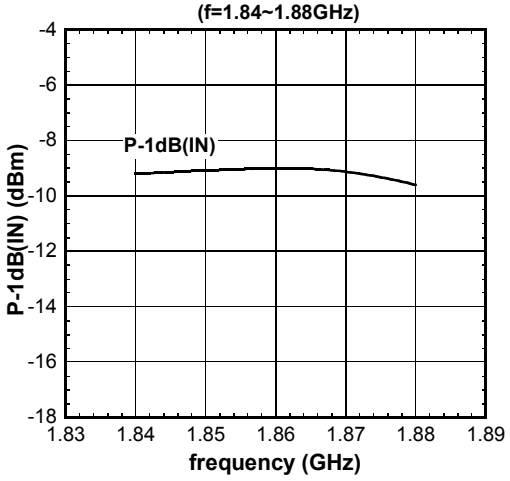
1.7GHz @High Gain
Pout, IM3 vs. Pin
(f1=1860MHz, f2=f1+100kHz)



Condition
Ta=+25℃,
V_{DD}= 2.7V,
V_{CTL}1=0V, V_{CTL}2=1.8V, V_{CTL}3=1.8V

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

1.7GHz @High Gain
P-1dB(IN) vs. frequency
(f=1.84~1.88GHz)



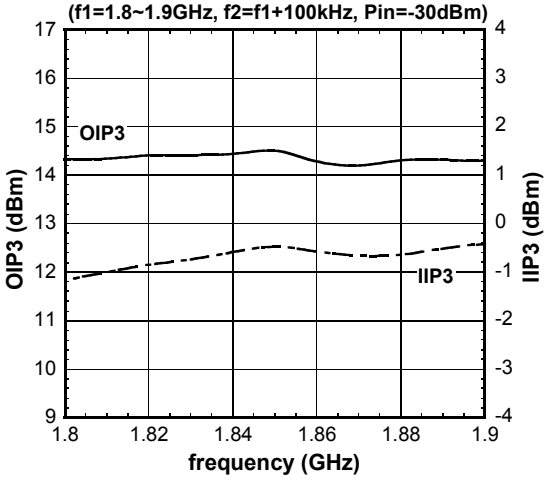
Condition

Ta=+25℃,

V_{DD}= 2.7V,

V_{CTL}1=0V, V_{CTL}2=1.8V, V_{CTL}3=1.8V

1.7GHz @High Gain
OIP3, IIP3 vs. frequency
(f1=1.8~1.9GHz, f2=f1+100kHz, Pin=-30dBm)



Condition

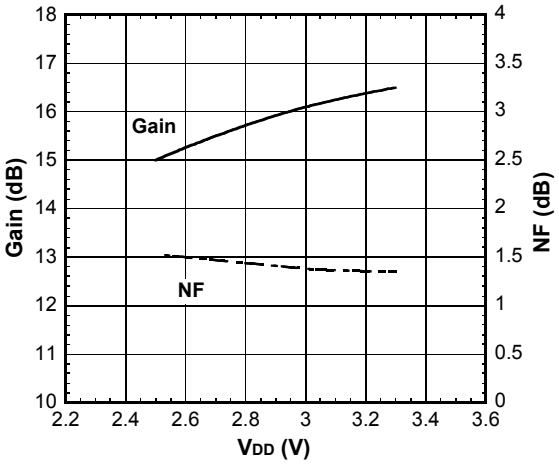
Ta=+25℃,

V_{DD}= 2.7V,

V_{CTL}1=0V, V_{CTL}2=1.8V, V_{CTL}3=1.8V

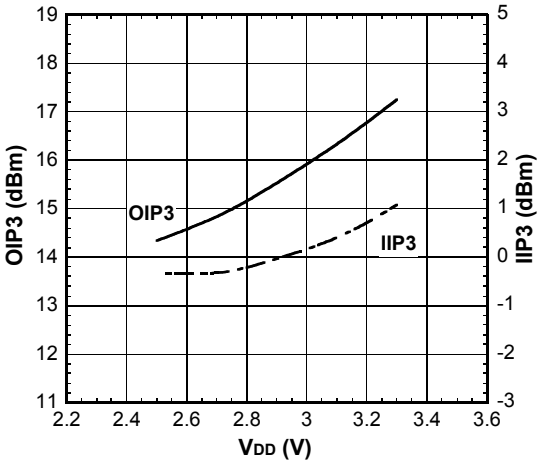
■**ELECTRICAL CHARACTERISTICS** (1.7GHz band High Gain mode)

1.7GHz @High Gain
Gain, NF vs. V_{DD}



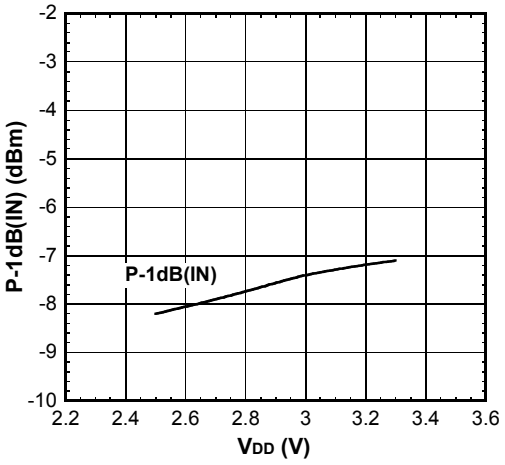
Condition
Ta=+25℃,
f=1860MHz,
$V_{CTL}1$=0V, $V_{CTL}2$=1.8V, $V_{CTL}3$=1.8V

1.7GHz @High Gain
OIP3, IIP3 vs. V_{DD}



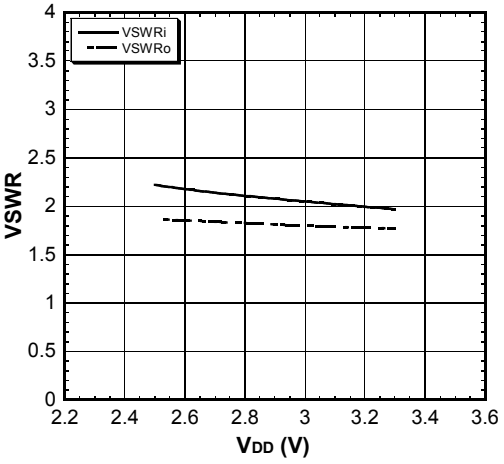
Condition
Ta=+25℃,
f1=1860MHz, f2=f1+100kHz,
Pin=-30dBm,
$V_{CTL}1$=0V, $V_{CTL}2$=1.8V, $V_{CTL}3$=1.8V

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



Condition
Ta=+25℃,
f=1860MHz,
$V_{CTL}1$=0V, $V_{CTL}2$=1.8V, $V_{CTL}3$=1.8V

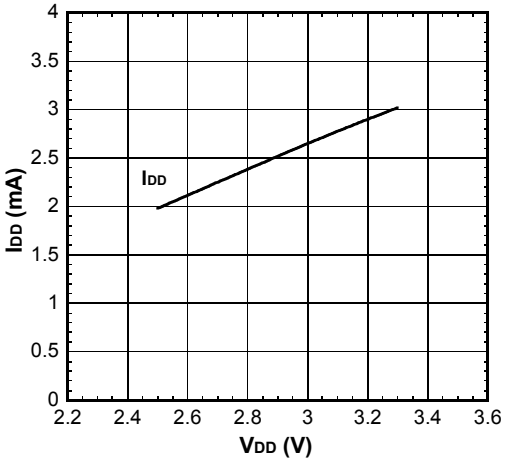
1.7GHz @High Gain
VSWR vs. V_{DD}



Condition
Ta=+25℃,
f=1860MHz,
$V_{CTL}1$=0V, $V_{CTL}2$=1.8V, $V_{CTL}3$=1.8V

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

1.7GHz @High Gain
I_{DD} vs. V_{DD}



Condition

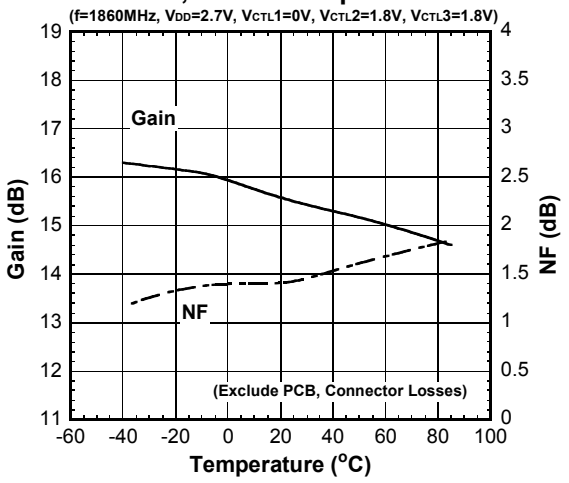
Ta=+25℃,

RF=OFF

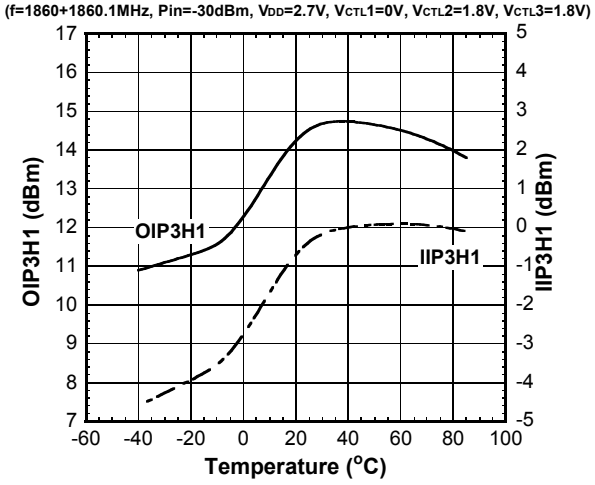
$V_{CTL}1$=0V, $V_{CTL}2$=1.8V, $V_{CTL}3$=1.8V

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

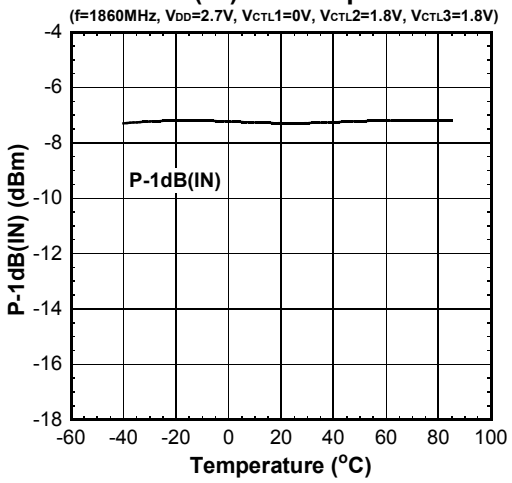
1.7GHz @High Gain
Gain, NF vs. Temperature



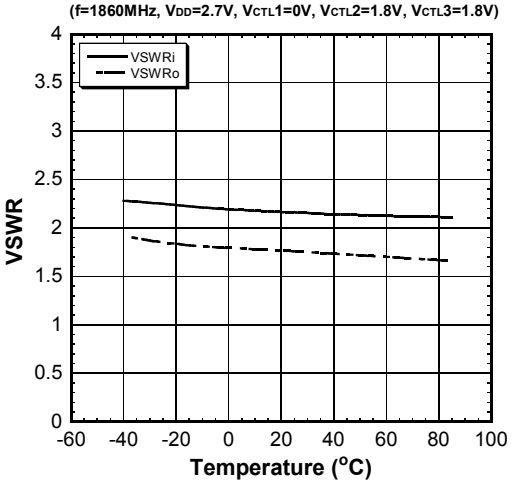
1.7GHz @High Gain
OIP3H1, IIP3H1 vs. Temperature



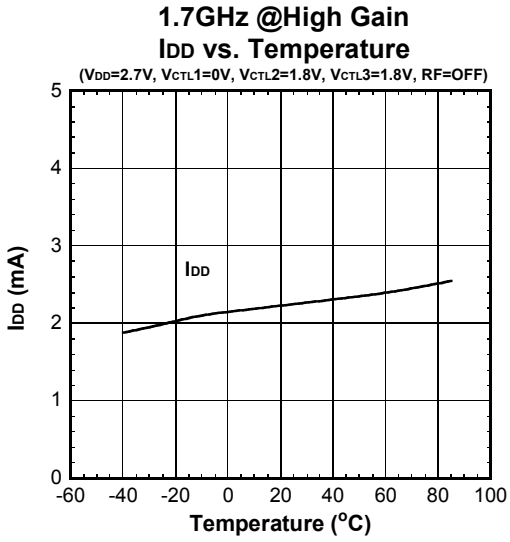
1.7GHz @High Gain
P-1dB(IN) vs. Temperature



1.7GHz @High Gain
VSWRi, VSWRo vs. Temperature

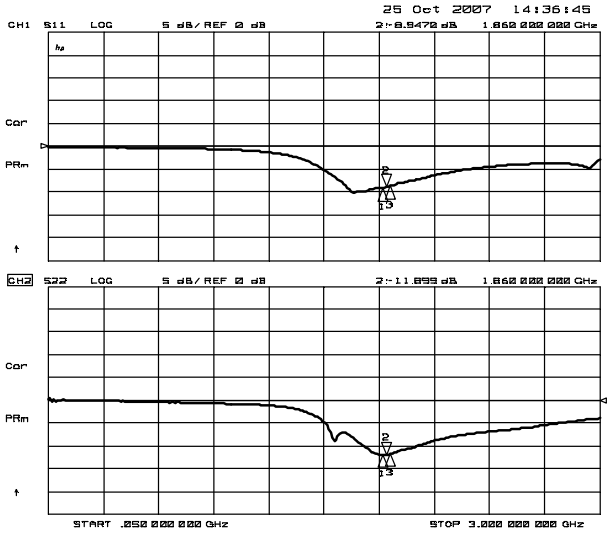


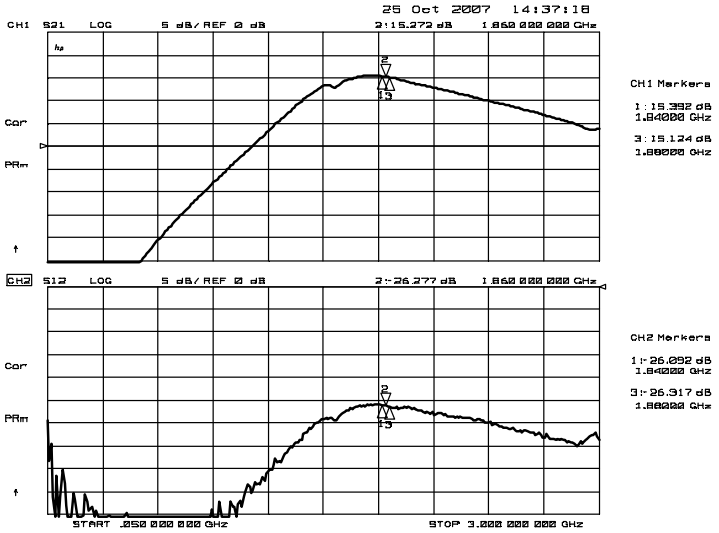
■**ELECTRICAL CHARACTERISTICS** (1.7GHz band High Gain mode)

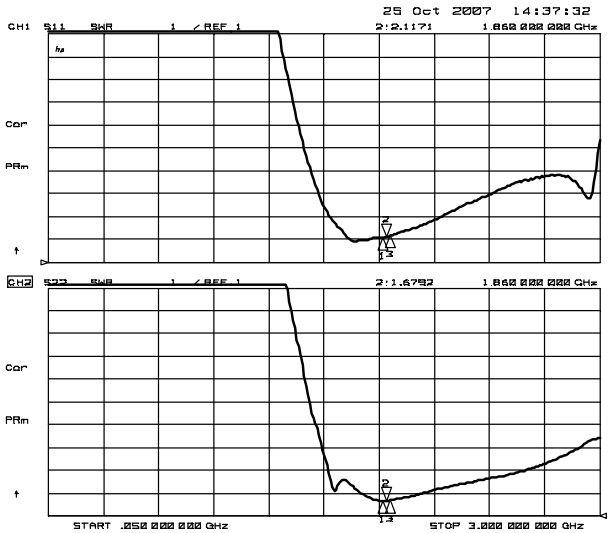


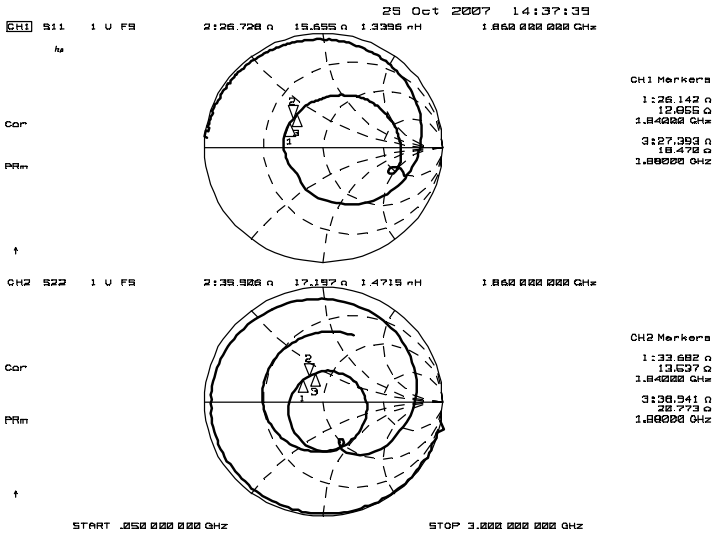
■ELECTRICAL CHARACTERISTICS (1.7GHz band High Gain mode)

Condition : Ta=+25°C, V_{DD}= 2.7V, V_{CTL}1=0V, V_{CTL}2=1.8V, V_{CTL}3=1.8V



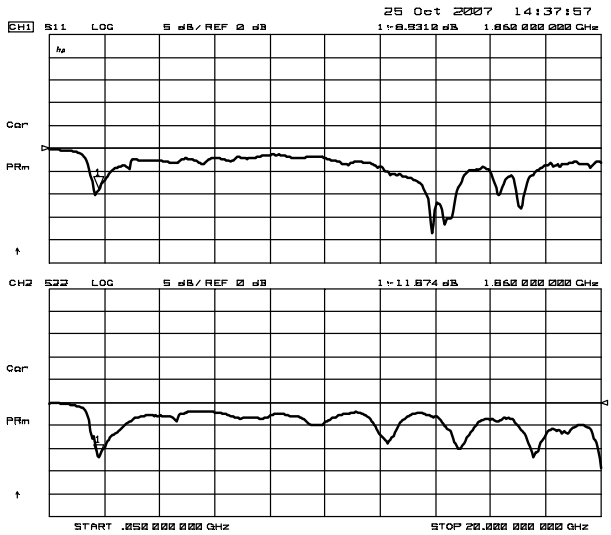


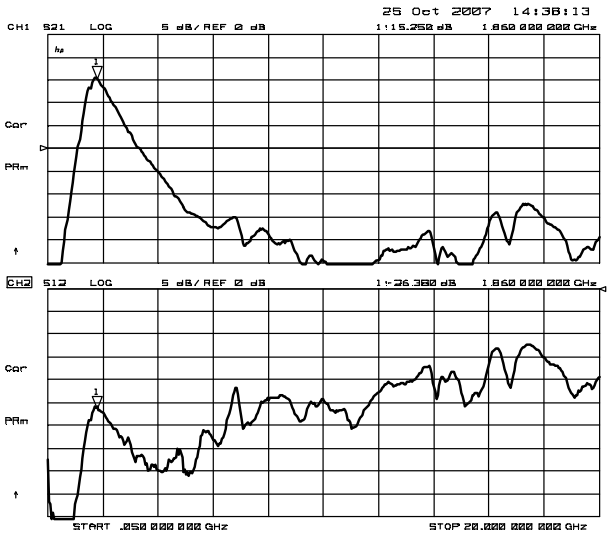


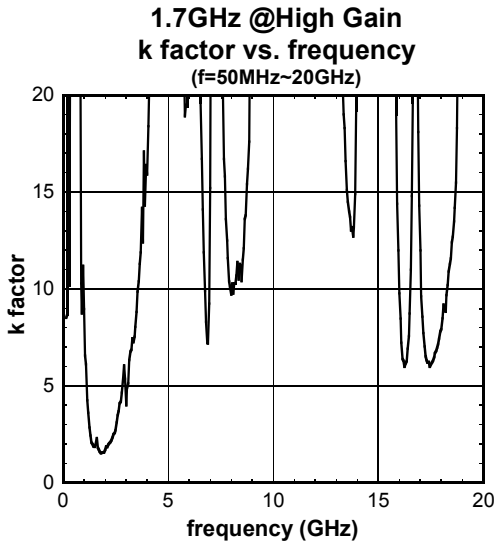


■**ELECTRICAL CHARACTERISTICS** (1.7GHz band High Gain mode)

Condition : Ta=+25°C, V_{DD}= 2.7V, V_{CTL}1=0V, V_{CTL}2=1.8V, V_{CTL}3=1.8V

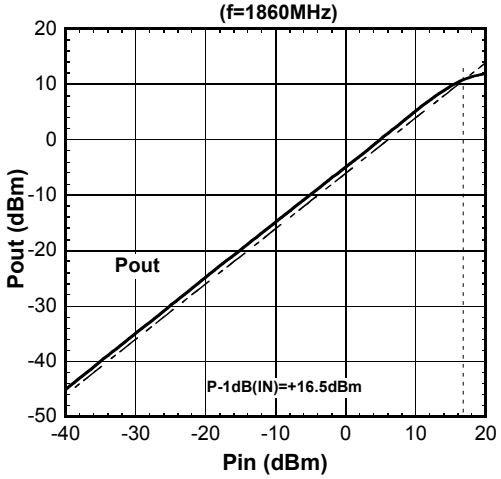






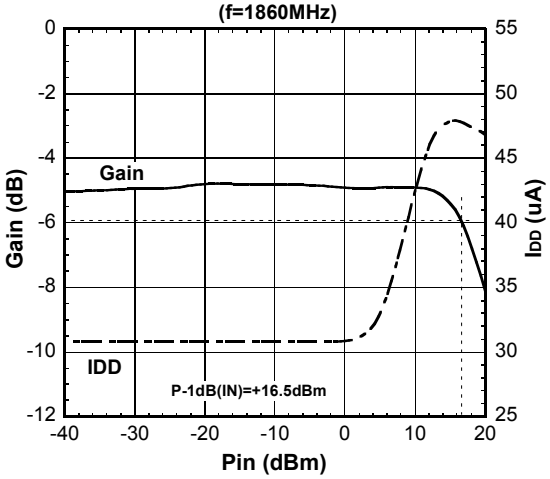
■**ELECTRICAL CHARACTERISTICS** (1.7GHz band Low Gain mode)

1.7GHz @Low Gain
Pout vs. Pin
(f=1860MHz)



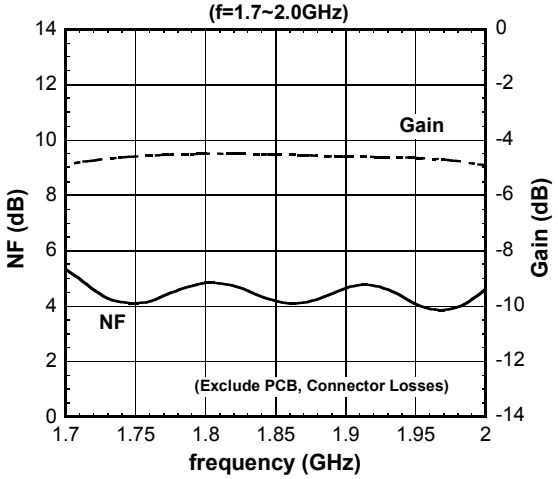
Condition
Ta=+25℃,
V_{DD}= 2.7V,
V_{CTL}1=0V, V_{CTL}2=1.8V, V_{CTL}3=0V

1.7GHz @Low Gain
Gain, IDD vs. Pin
(f=1860MHz)



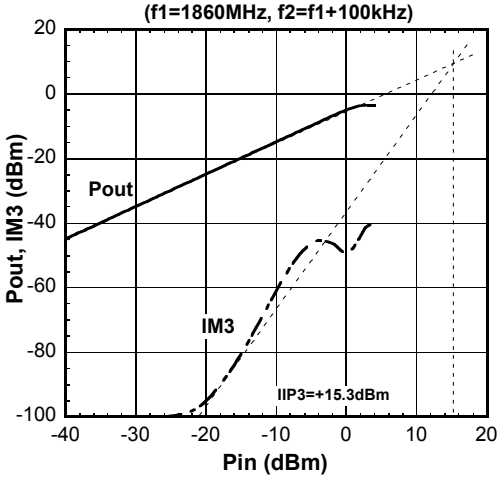
Condition
Ta=+25℃,
V_{DD}= 2.7V,
V_{CTL}1=0V, V_{CTL}2=1.8V, V_{CTL}3=0V

1.7GHz @Low Gain
NF, Gain vs. frequency
(f=1.7~2.0GHz)



Condition
Ta=+25℃,
V_{DD}= 2.7V,
V_{CTL}1=0V, V_{CTL}2=1.8V, V_{CTL}3=0V

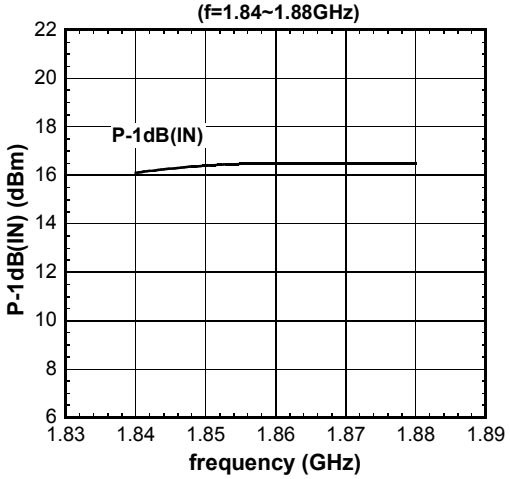
1.7GHz @Low Gain
Pout, IM3 vs. Pin
(f1=1860MHz, f2=f1+100kHz)



Condition
Ta=+25℃,
V_{DD}= 2.7V,
V_{CTL}1=0V, V_{CTL}2=1.8V, V_{CTL}3=0V

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

1.7GHz @ Low Gain
P-1dB(IN) vs. frequency
(f=1.84~1.88GHz)



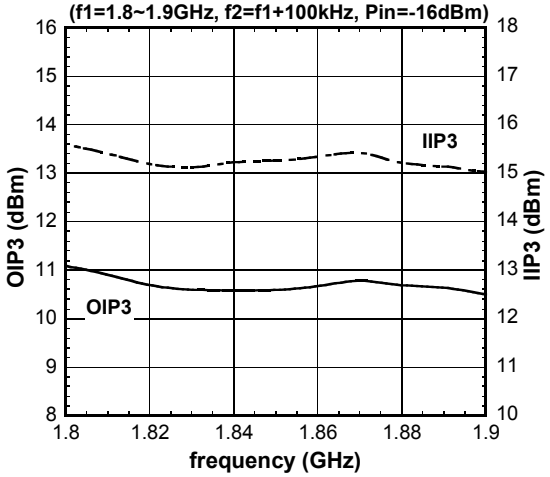
Condition

Ta=+25℃,

V_{DD}= 2.7V,

V_{CTL}1=0V, V_{CTL}2=1.8V, V_{CTL}3=0V

1.7GHz @Low Gain
OIP3, IIP3 vs. frequency
(f1=1.8~1.9GHz, f2=f1+100kHz, Pin=-16dBm)



Condition

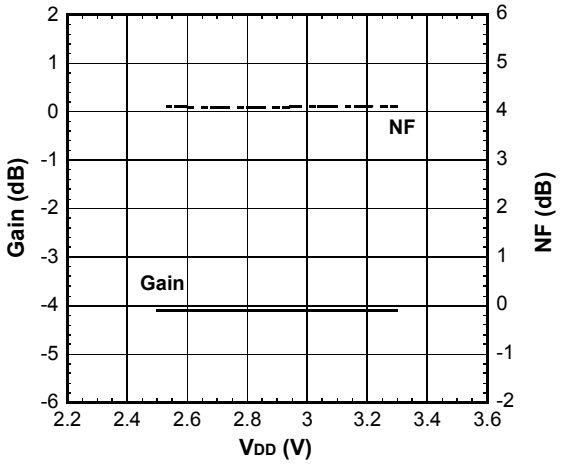
Ta=+25℃,

V_{DD}= 2.7V,

V_{CTL}1=0V, V_{CTL}2=1.8V, V_{CTL}3=0V

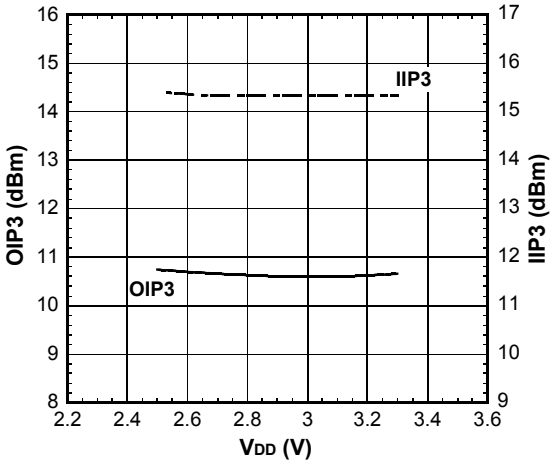
■**ELECTRICAL CHARACTERISTICS** (1.7GHz band Low Gain mode)

1.7GHz @Low Gain
Gain, NF vs. V_{DD}



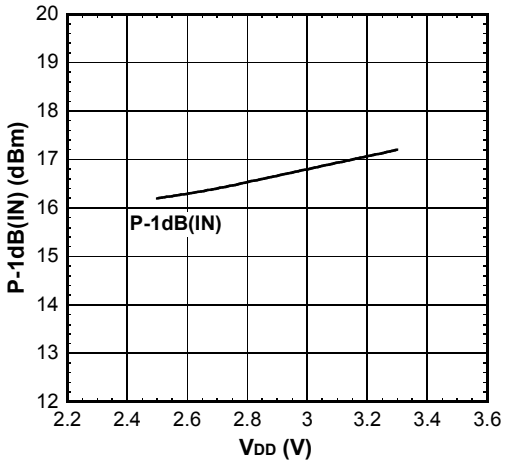
Condition
Ta=+25℃,
f=1860MHz,
$V_{CTL}1$=0V, $V_{CTL}2$=1.8V, $V_{CTL}3$=0V

1.7GHz @Low Gain
OIP3, IIP3 vs. V_{DD}



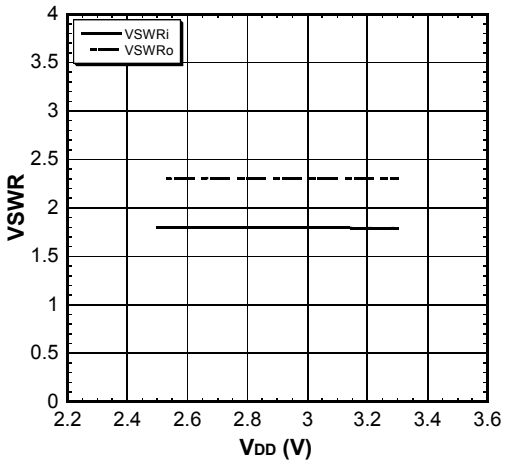
Condition
Ta=+25℃,
f1=1860MHz, f2=f1+100kHz,
Pin=-16dBm,
$V_{CTL}1$=0V, $V_{CTL}2$=1.8V, $V_{CTL}3$=0V

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



Condition
Ta=+25℃,
f=1860MHz,
$V_{CTL}1$=0V, $V_{CTL}2$=1.8V, $V_{CTL}3$=0V

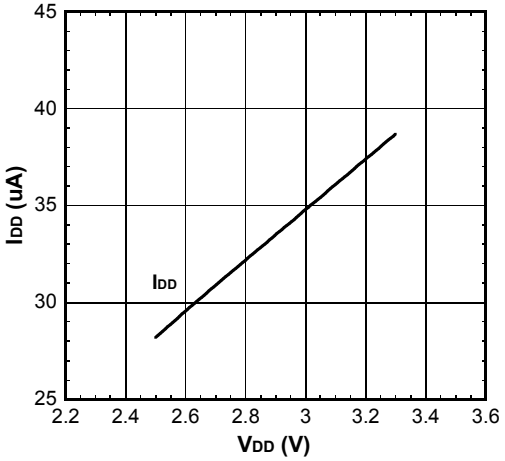
1.7GHz @Low Gain
VSWR vs. V_{DD}



Condition
Ta=+25℃,
f=1860MHz,
$V_{CTL}1$=0V, $V_{CTL}2$=1.8V, $V_{CTL}3$=0V

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

1.7GHz @Low Gain
I_{DD} vs. V_{DD}



Condition

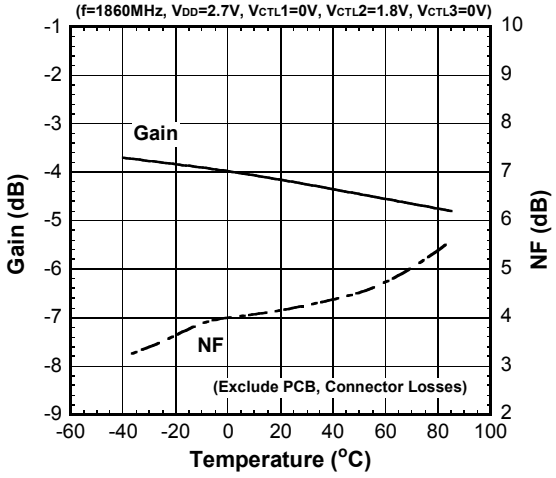
Ta=+25℃,

RF=OFF,

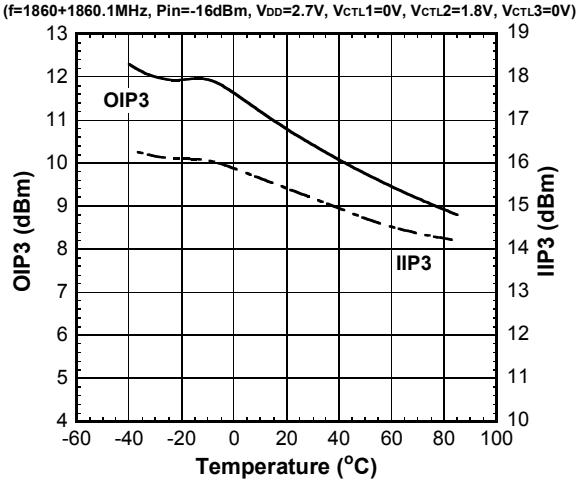
$V_{CTL}1$=0V, $V_{CTL}2$=1.8V, $V_{CTL}3$=0V

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

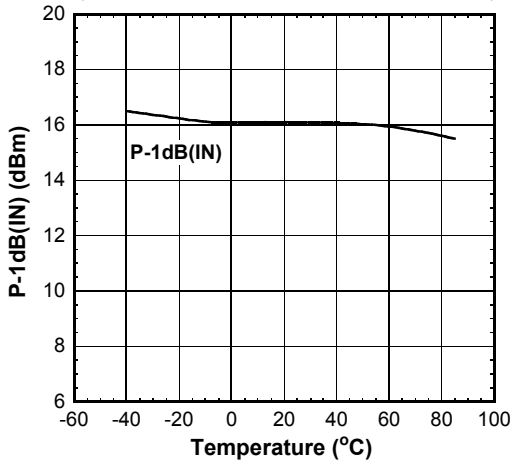
1.7GHz @Low Gain
Gain, NF vs. Temperature
(f=1860MHz, V_{DD}=2.7V, V_{CTL}1=0V, V_{CTL}2=1.8V, V_{CTL}3=0V)



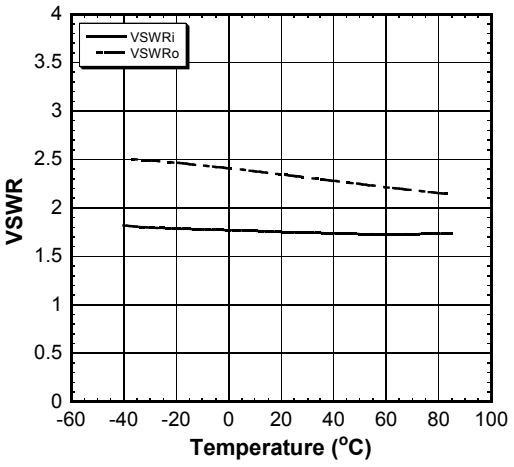
1.7GHz @Low Gain
OIP3, IIP3 vs. Temperature
(f=1860+1860.1MHz, Pin=-16dBm, V_{DD}=2.7V, V_{CTL}1=0V, V_{CTL}2=1.8V, V_{CTL}3=0V)



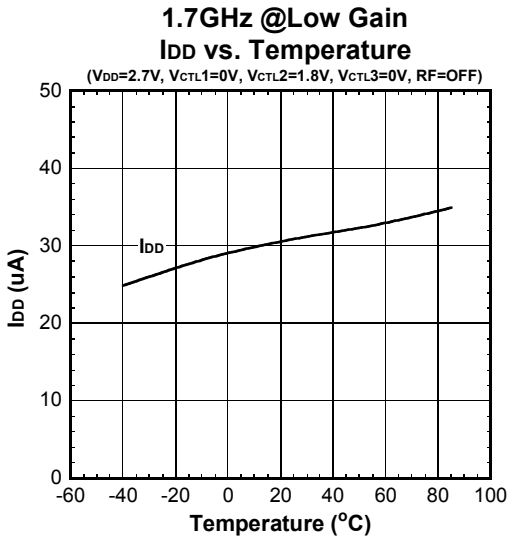
1.7GHz @Low Gain
P-1dB(IN) vs. Temperature
(f=1860MHz, V_{DD}=2.7V, V_{CTL}1=0V, V_{CTL}2=1.8V, V_{CTL}3=0V)



1.7GHz @Low Gain
VSWRi, VSWRo vs. Temperature
(f=1860MHz, V_{DD}=2.7V, V_{CTL}1=0V, V_{CTL}2=1.8V, V_{CTL}3=0V)

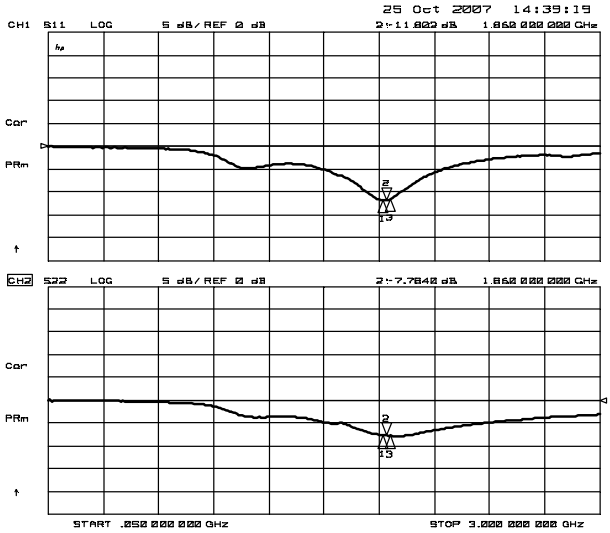


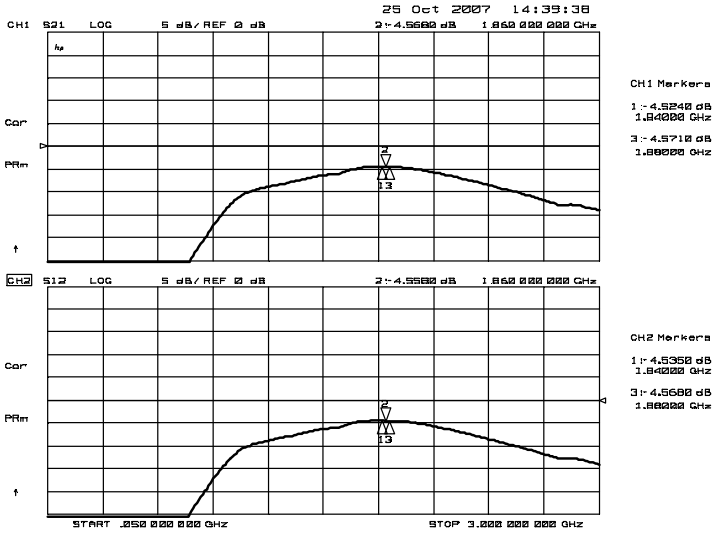
■**ELECTRICAL CHARACTERISTICS** (1.7GHz band Low Gain mode)

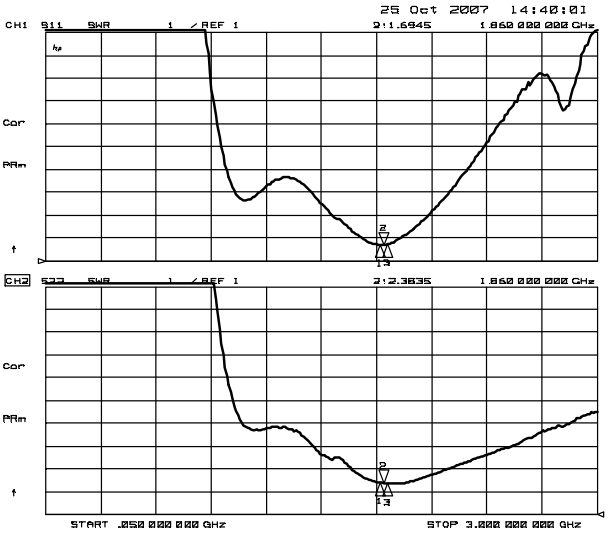


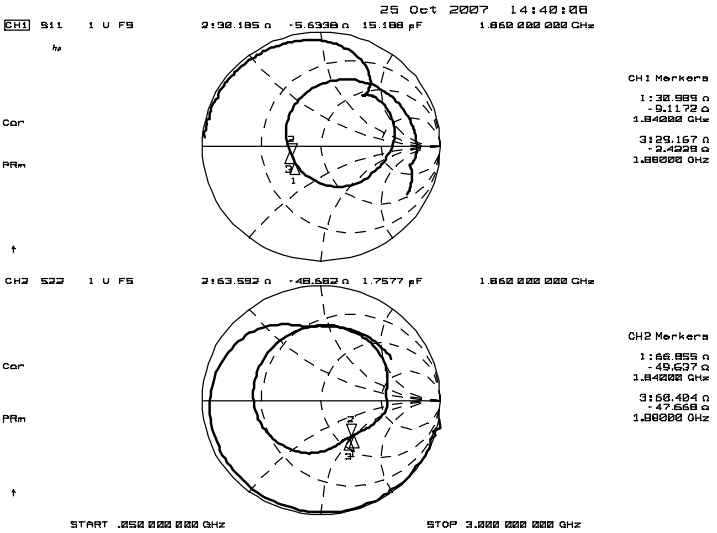
■ELECTRICAL CHARACTERISTICS (1.7GHz band Low Gain mode)

Condition : Ta=+25°C, V_{DD}= 2.7V, V_{CTL}1=0V, V_{CTL}2=1.8V, V_{CTL}3=0V



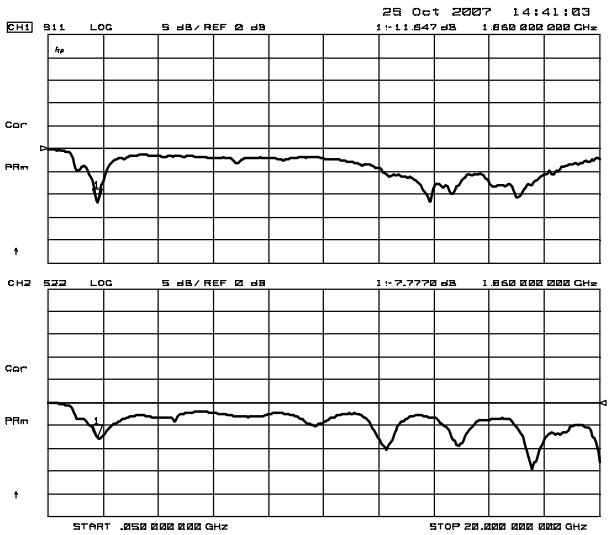


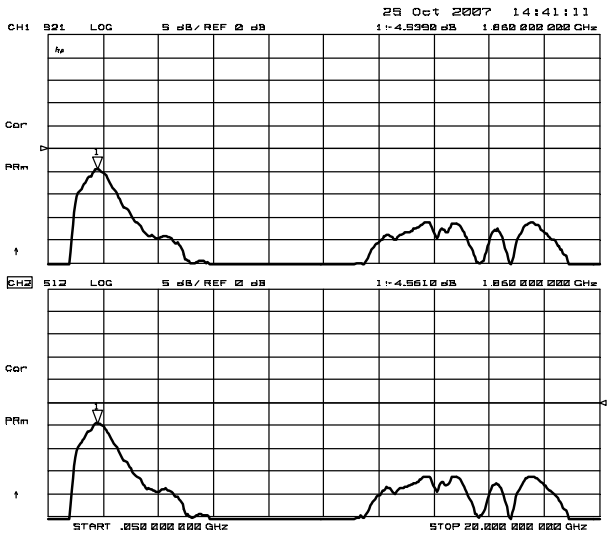


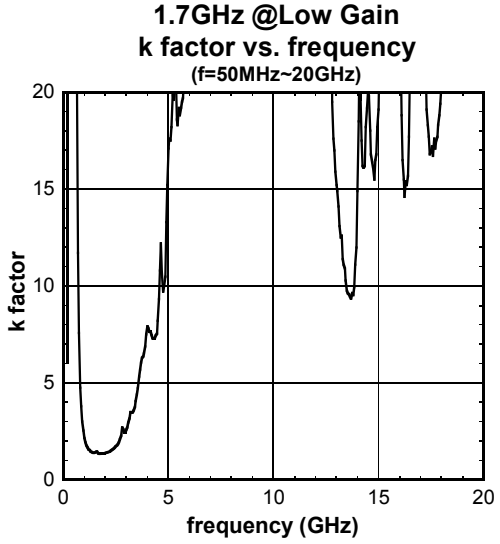


■**ELECTRICAL CHARACTERISTICS** (1.7GHz band Low Gain mode)

Condition : Ta=+25℃, V_{DD}= V_{INV} =2.7V, V_{CTL}1=0V, V_{CTL}2=1.8V, V_{CTL}3=0V

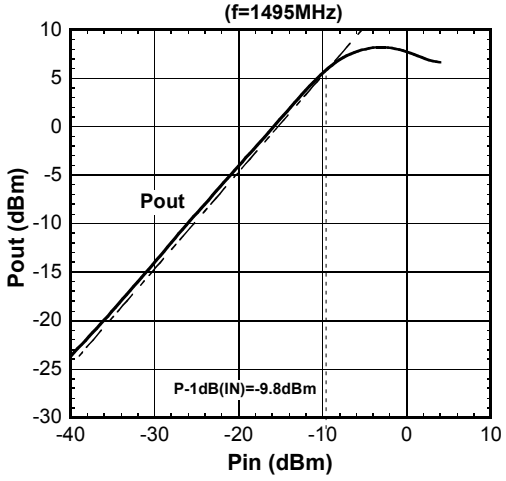






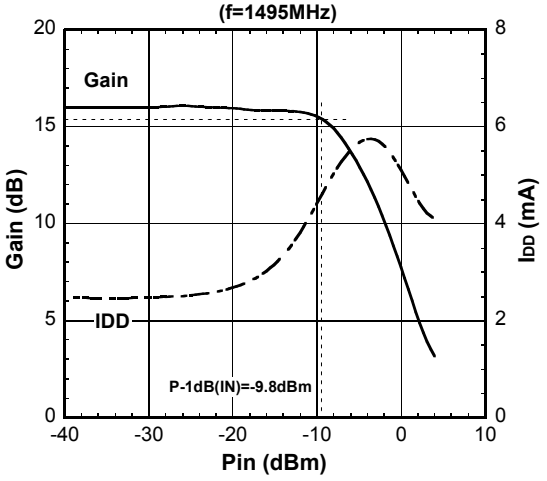
■**ELECTRICAL CHARACTERISTICS** (1.5GHz band High Gain mode)

1.5GHz @High Gain
Pout vs. Pin
(f=1495MHz)



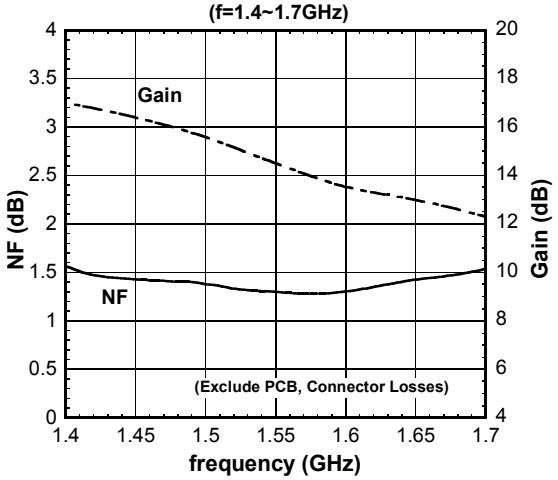
Condition
Ta=+25℃,
V_{DD}= 2.7V,
V_{CTL}1=1.8V, V_{CTL}2=1.8V, V_{CTL}3=1.8V

1.5GHz @High Gain
Gain, IDD vs. Pin
(f=1495MHz)



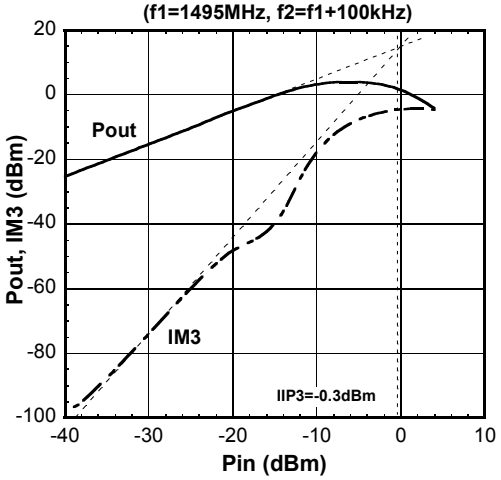
Condition
Ta=+25℃,
V_{DD}= 2.7V,
V_{CTL}1=1.8V, V_{CTL}2=1.8V, V_{CTL}3=1.8V

1.5GHz @High Gain
NF, Gain vs. frequency
(f=1.4~1.7GHz)



Condition
Ta=+25℃,
V_{DD}= 2.7V,
V_{CTL}1=1.8V, V_{CTL}2=1.8V, V_{CTL}3=1.8V

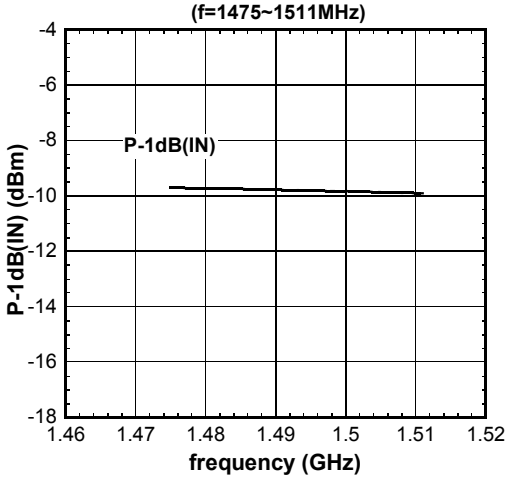
1.5GHz @High Gain
Pout, IM3 vs. Pin
(f1=1495MHz, f2=f1+100kHz)



Condition
Ta=+25℃,
V_{DD}= 2.7V,
V_{CTL}1=1.8V, V_{CTL}2=1.8V, V_{CTL}3=1.8V

■**ELECTRICAL CHARACTERISTICS** (1.5GHz band High Gain mode)

1.5GHz @High Gain
P-1dB(IN) vs. frequency
(f=1475~1511MHz)



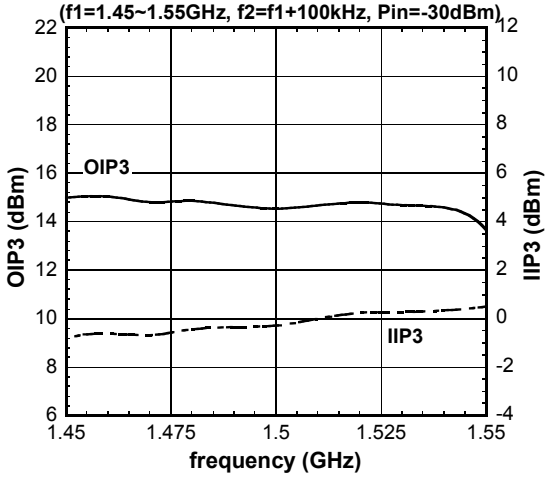
Condition

Ta=+25℃,

V_{DD}= 2.7V,

V_{CTL}1=1.8V, V_{CTL}2=1.8V, V_{CTL}3=1.8V

1.5GHz @High Gain
OIP3, IIP3 vs. frequency
(f1=1.45~1.55GHz, f2=f1+100kHz, Pin=-30dBm)



Condition

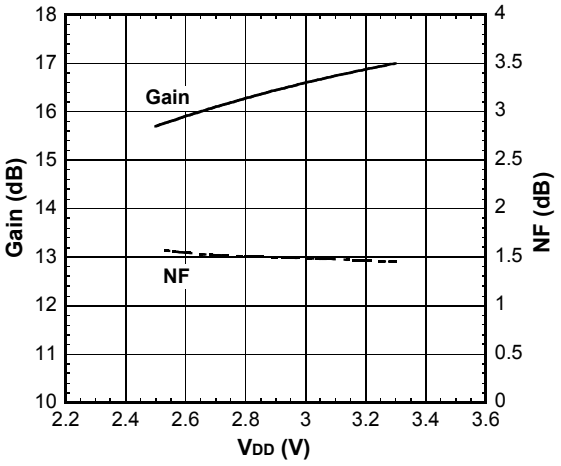
Ta=+25℃,

V_{DD}= 2.7V,

V_{CTL}1=1.8V, V_{CTL}2=1.8V, V_{CTL}3=1.8V

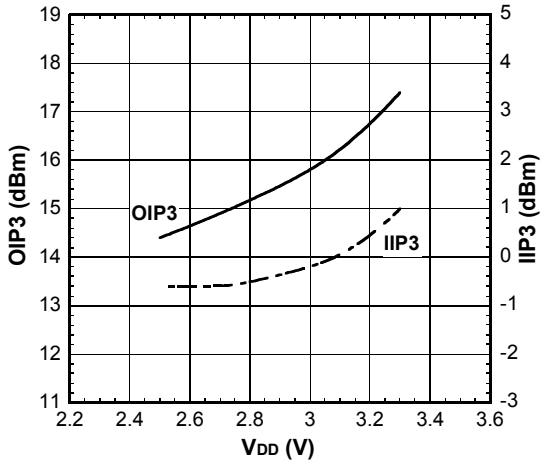
■**ELECTRICAL CHARACTERISTICS** (1.5GHz band High Gain mode)

1.5GHz @High Gain
Gain, NF vs. V_{DD}



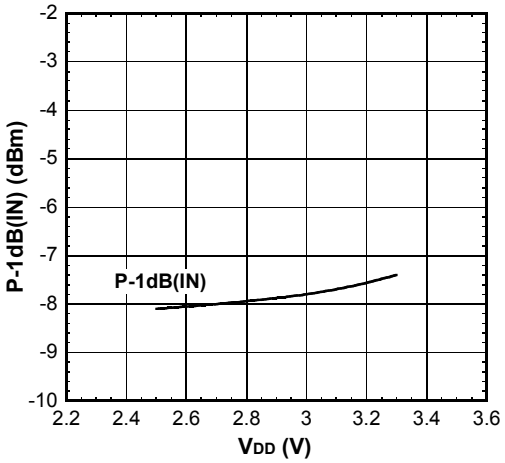
Condition
Ta=+25℃,
f=1495MHz,
$V_{CTL}1$=1.8V, $V_{CTL}2$=1.8V, $V_{CTL}3$=1.8V

1.5GHz @High Gain
OIP3, IIP3 vs. V_{DD}



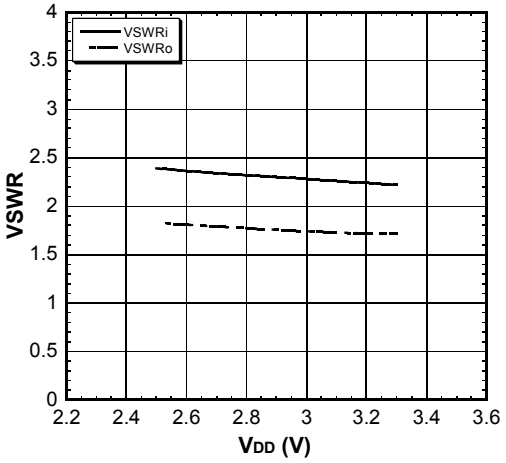
Condition
Ta=+25℃,
f1=1495MHz, f2=f1+100kHz,
Pin=-30dBm,
$V_{CTL}1$=1.8V, $V_{CTL}2$=1.8V, $V_{CTL}3$=1.8V

1.5GHz @High Gain
P-1dB(IN) vs. V_{DD}



Condition
Ta=+25℃,
f=1495MHz,
$V_{CTL}1$=1.8V, $V_{CTL}2$=1.8V, $V_{CTL}3$=1.8V

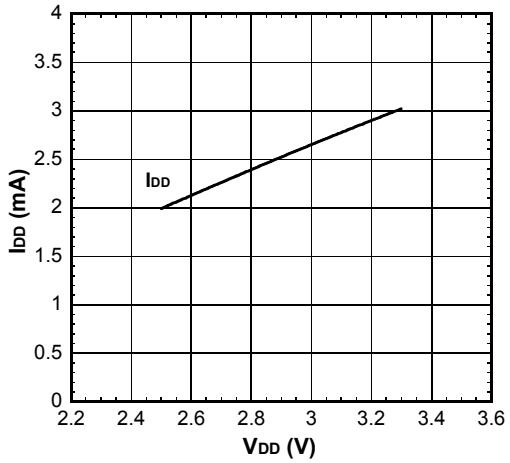
1.5GHz @High Gain
VSWR vs. V_{DD}



Condition
Ta=+25℃,
f=1495MHz,
$V_{CTL}1$=1.8V, $V_{CTL}2$=1.8V, $V_{CTL}3$=1.8V

■**ELECTRICAL CHARACTERISTICS** (1.5GHz band High Gain mode)

1.5GHz @High Gain
I_{DD} vs. V_{DD}



Condition

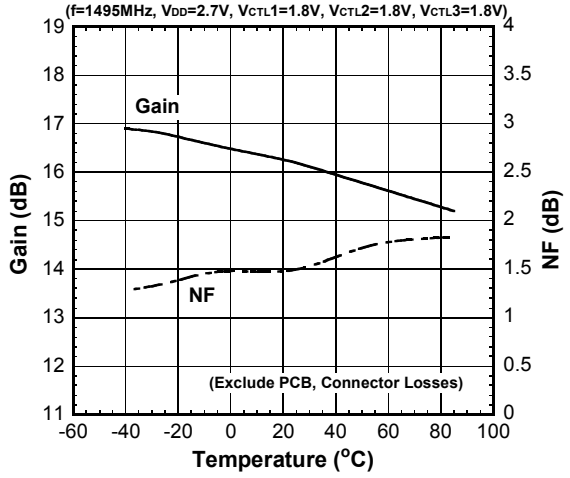
Ta=+25℃,

RF=OFF

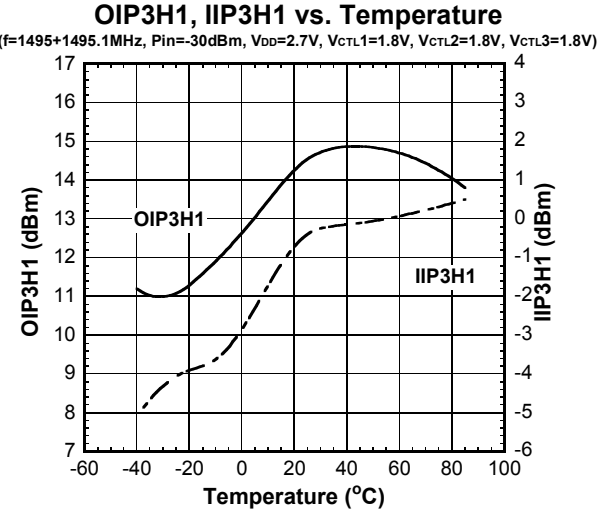
$V_{CTL}1$=1.8V, $V_{CTL}2$=1.8V, $V_{CTL}3$=1.8V

■**ELECTRICAL CHARACTERISTICS** (1.5GHz band High Gain mode)

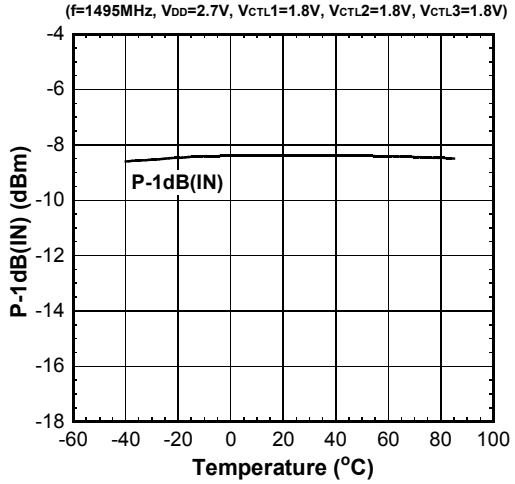
1.5GHz @High Gain
Gain, NF vs. Temperature



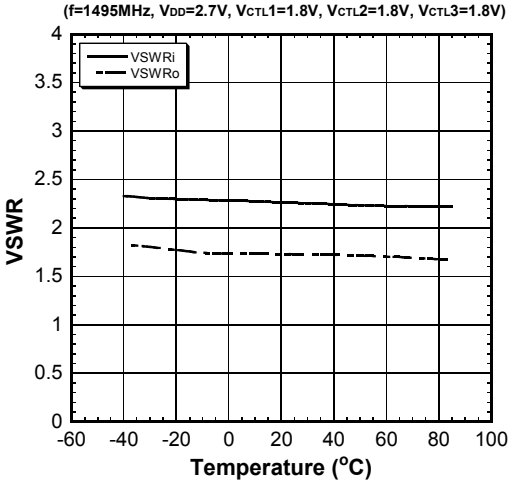
1.5GHz @High Gain
OIP3H1, IIP3H1 vs. Temperature



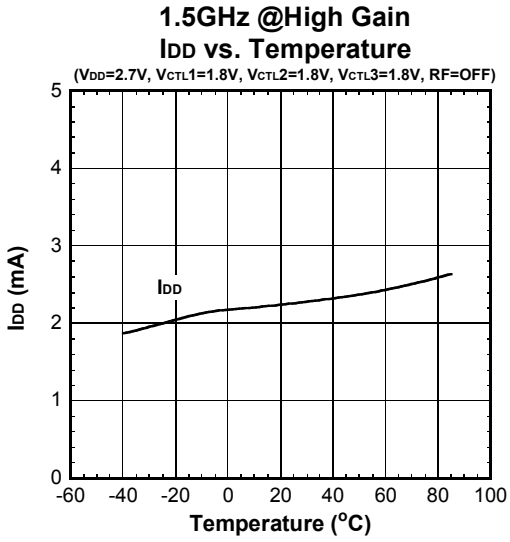
1.5GHz @High Gain
P-1dB(IN) vs. Temperature



1.5GHz @High Gain
VSWRi, VSWRo vs. Temperature

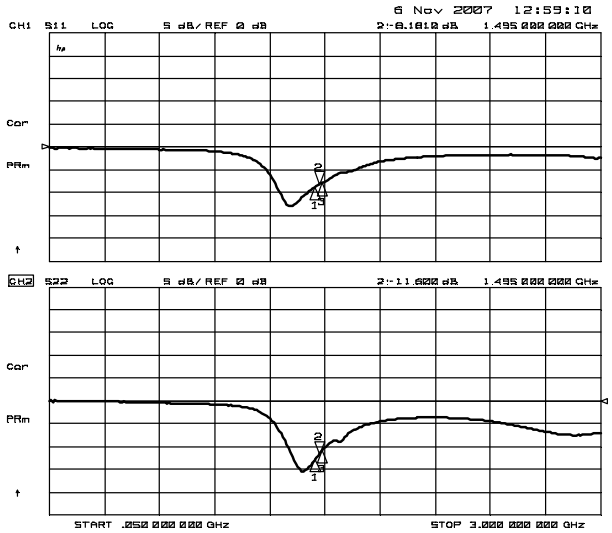


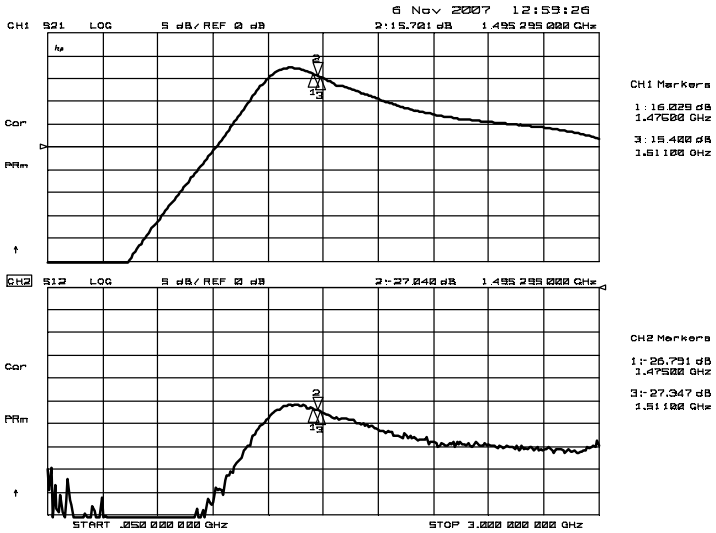
■**ELECTRICAL CHARACTERISTICS** (1.5GHz band High Gain mode)

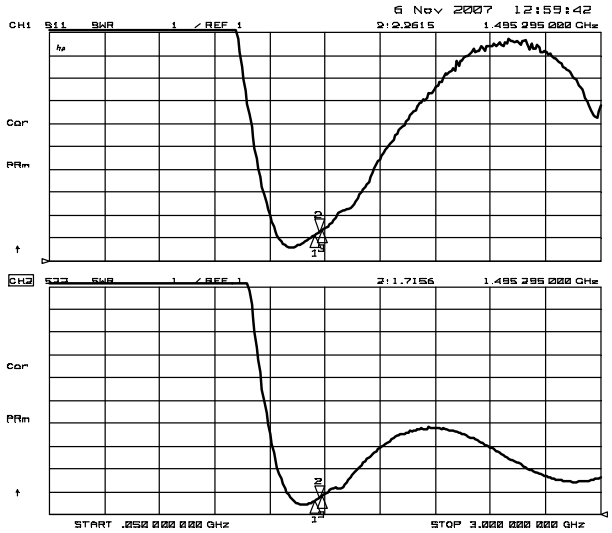


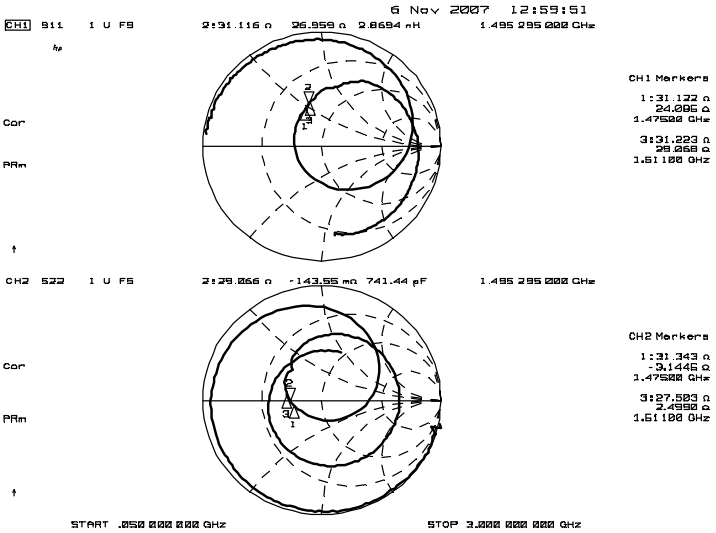
■ELECTRICAL CHARACTERISTICS (1.5GHz band High Gain mode)

Condition : Ta=+25℃, V_{DD}= 2.7V, V_{CTL}1=1.8V, V_{CTL}2=1.8V, V_{CTL}3=1.8V



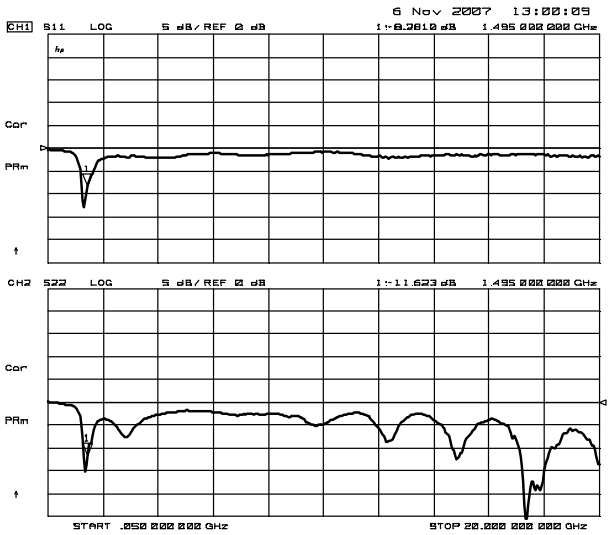


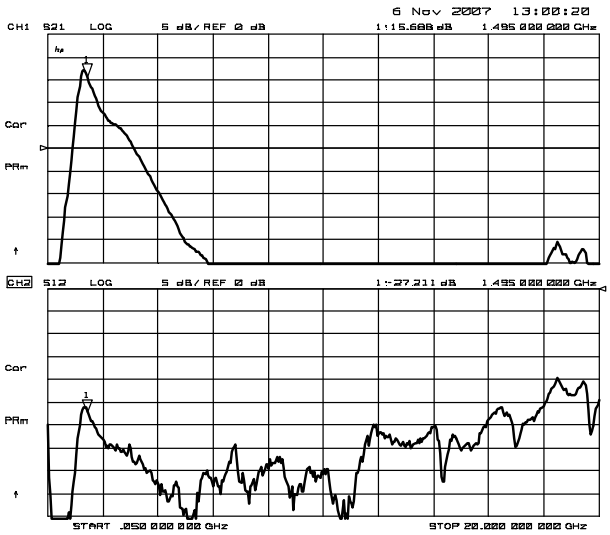


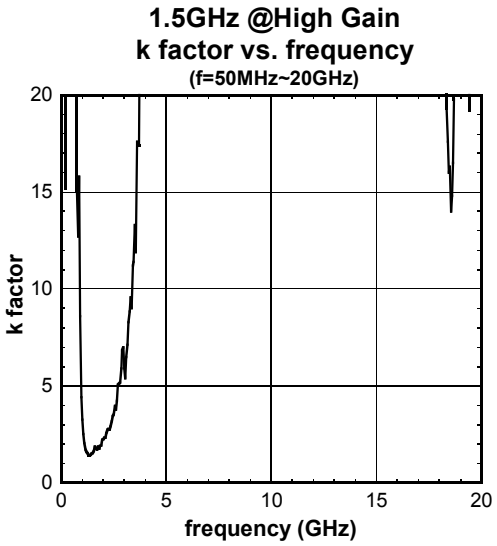


■**ELECTRICAL CHARACTERISTICS** (1.5GHz band High Gain mode)

Condition : Ta=+25℃, V_{DD}= 2.7V, V_{CTL}1=1.8V, V_{CTL}2=1.8V, V_{CTL}3=1.8V

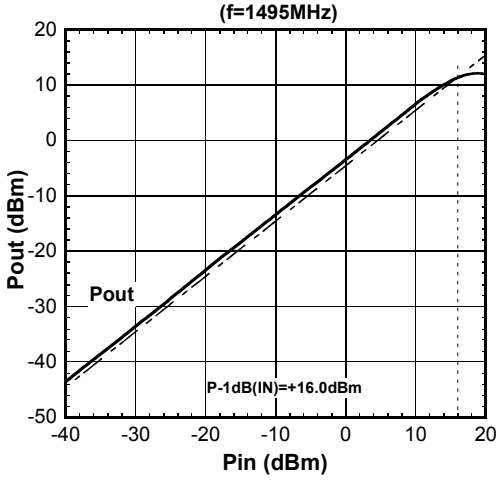






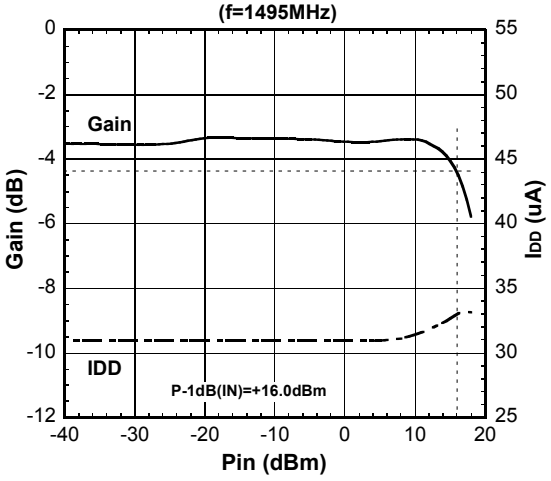
■**ELECTRICAL CHARACTERISTICS** (1.5GHz band Low Gain mode)

1.5GHz @Low Gain
Pout vs. Pin
(f=1495MHz)



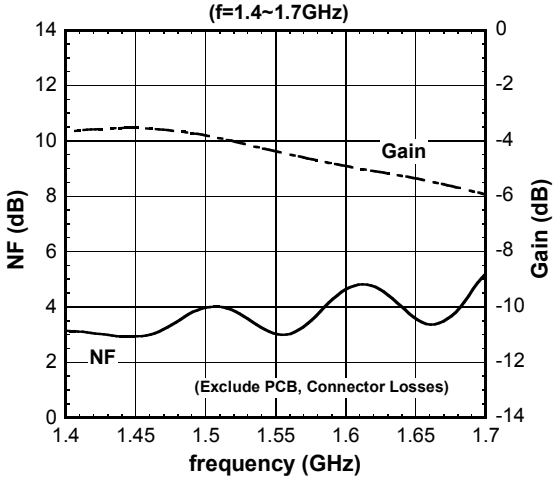
Condition
Ta=+25℃,
V_{DD}= 2.7V,
V_{CTL}1=1.8V, V_{CTL}2=1.8V, V_{CTL}3=0V

1.5GHz @Low Gain
Gain, IDD vs. Pin
(f=1495MHz)



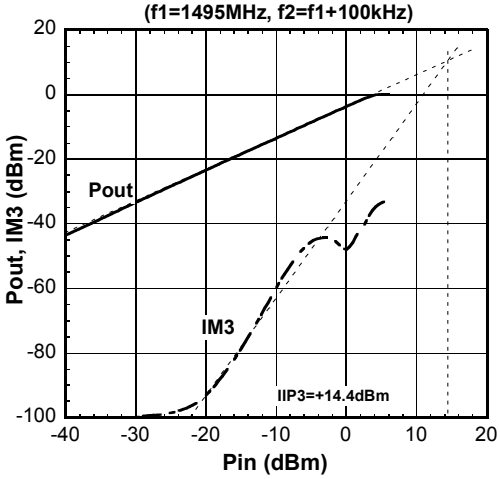
Condition
Ta=+25℃,
V_{DD}= 2.7V,
V_{CTL}1=1.8V, V_{CTL}2=1.8V, V_{CTL}3=0V

1.5GHz @Low Gain
NF, Gain vs. frequency
(f=1.4~1.7GHz)



Condition
Ta=+25℃,
V_{DD}= 2.7V,
V_{CTL}1=1.8V, V_{CTL}2=1.8V, V_{CTL}3=0V

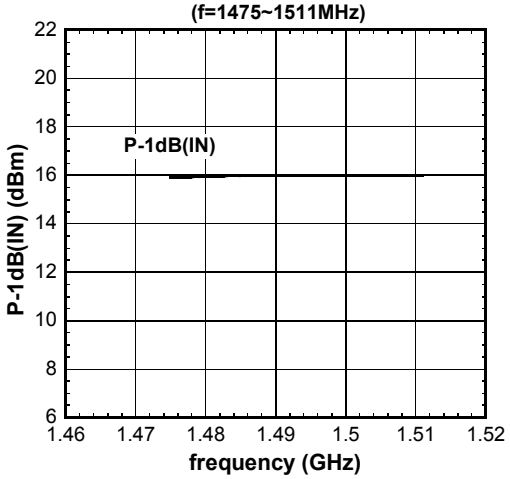
1.5GHz @Low Gain
Pout, IM3 vs. Pin
(f1=1495MHz, f2=f1+100kHz)



Condition
Ta=+25℃,
V_{DD}= 2.7V,
V_{CTL}1=1.8V, V_{CTL}2=1.8V, V_{CTL}3=0V

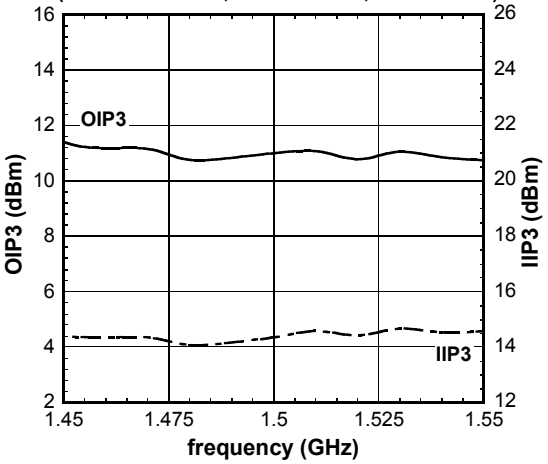
■**ELECTRICAL CHARACTERISTICS** (1.5GHz band Low Gain mode)

1.5GHz @Low Gain
P-1dB(IN) vs. frequency
(f=1475~1511MHz)



Condition
Ta=+25℃,
V_{DD}= 2.7V,
V_{CTL}1=1.8V, V_{CTL}2=1.8V, V_{CTL}3=0V

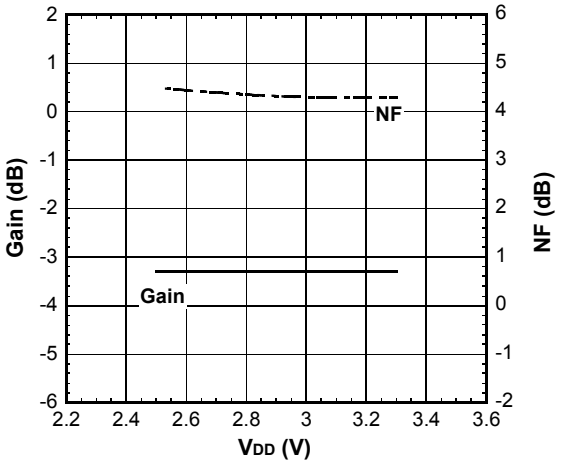
1.5GHz @Low Gain
OIP3, IIP3 vs. frequency
(f1=1.45~1.55GHz, f2=f1+100kHz, Pin=-16dBm)



Condition
Ta=+25℃,
V_{DD}= 2.7V,
V_{CTL}1=1.8V, V_{CTL}2=1.8V, V_{CTL}3=0V

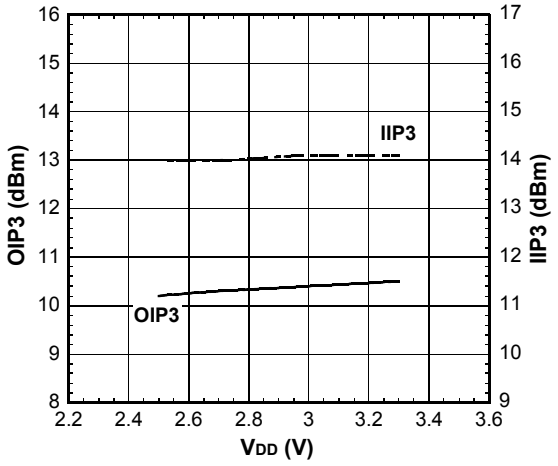
■**ELECTRICAL CHARACTERISTICS** (1.5GHz band Low Gain mode)

1.5GHz @Low Gain
Gain, NF vs. V_{DD}



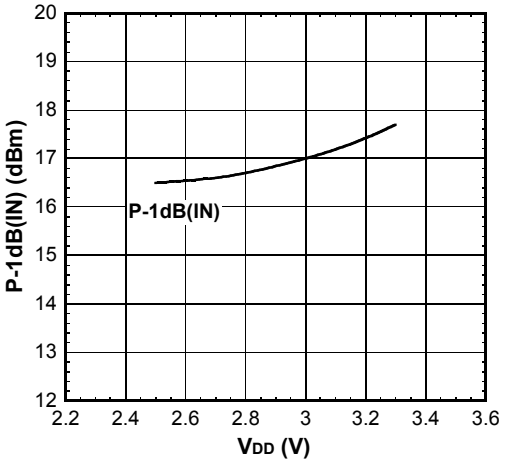
Condition
Ta=+25℃,
f=1495MHz,
$V_{CTL}1$=1.8V, $V_{CTL}2$=1.8V, $V_{CTL}3$=0V

1.5GHz @Low Gain
OIP3, IIP3 vs. V_{DD}



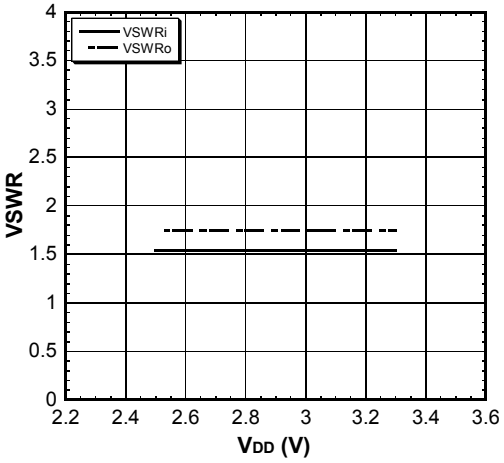
Condition
Ta=+25℃,
f1=1495MHz, f2=f1+100kHz,
Pin=-16dBm,
$V_{CTL}1$=1.8V, $V_{CTL}2$=1.8V, $V_{CTL}3$=0V

1.5GHz @Low Gain
P-1dB(IN) vs. V_{DD}



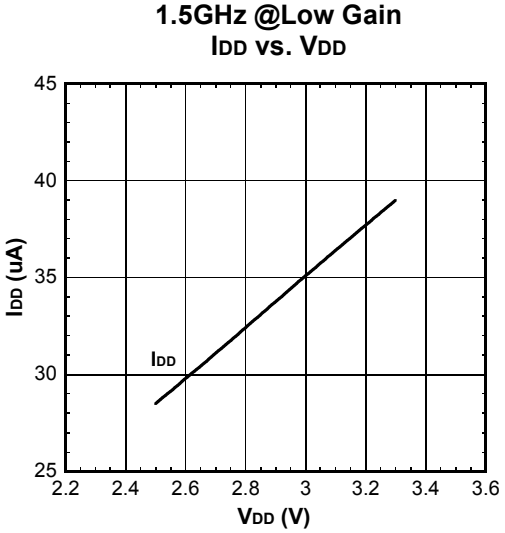
Condition
Ta=+25℃,
f=1495MHz,
$V_{CTL}1$=1.8V, $V_{CTL}2$=1.8V, $V_{CTL}3$=0V

1.5GHz @Low Gain
VSWR vs. V_{DD}



Condition
Ta=+25℃,
f=1495MHz,
$V_{CTL}1$=1.8V, $V_{CTL}2$=1.8V, $V_{CTL}3$=0V

■**ELECTRICAL CHARACTERISTICS** (1.5GHz band Low Gain mode)



Condition

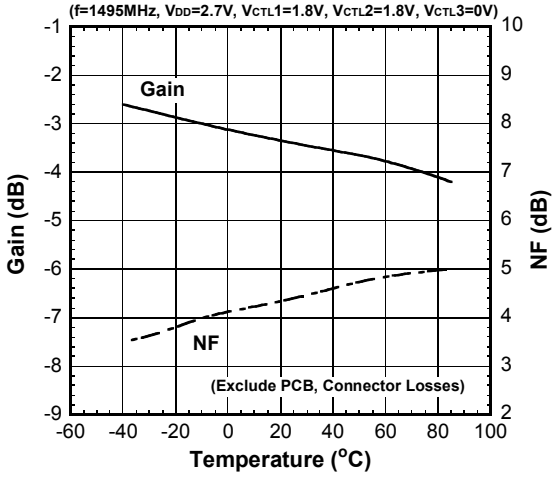
Ta=+25℃,

RF=OFF,

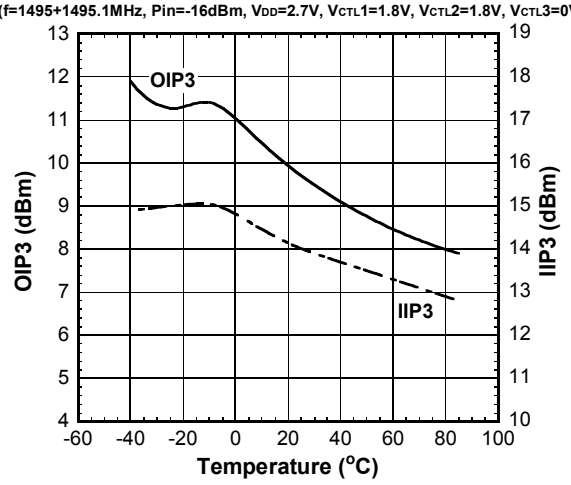
$V_{CTL}1$=1.8V, $V_{CTL}2$=1.8V, $V_{CTL}3$=0V

■**ELECTRICAL CHARACTERISTICS** (1.5GHz band Low Gain mode)

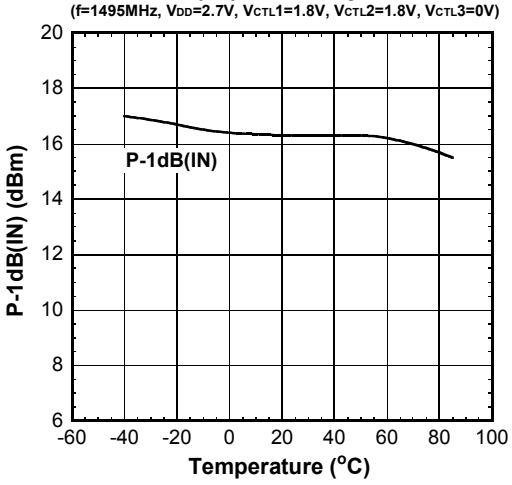
1.5GHz @Low Gain
Gain, NF vs. Temperature
(f=1495MHz, V_{DD}=2.7V, V_{CTL1}=1.8V, V_{CTL2}=1.8V, V_{CTL3}=0V)



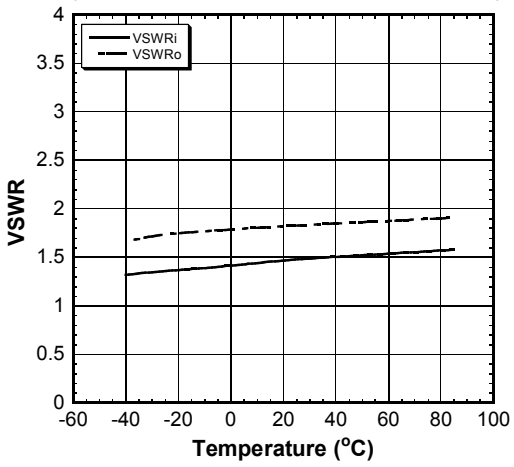
1.5GHz @Low Gain
OIP3, IIP3 vs. Temperature
(f=1495+1495.1MHz, Pin=-16dBm, V_{DD}=2.7V, V_{CTL1}=1.8V, V_{CTL2}=1.8V, V_{CTL3}=0V)



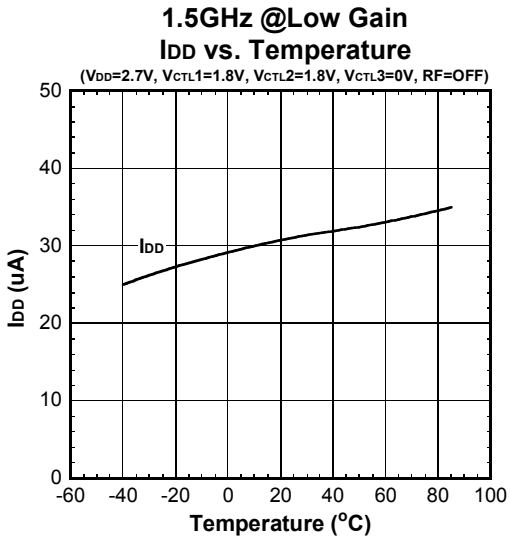
1.5GHz @Low Gain
P-1dB(IN) vs. Temperature
(f=1495MHz, V_{DD}=2.7V, V_{CTL1}=1.8V, V_{CTL2}=1.8V, V_{CTL3}=0V)



1.5GHz @Low Gain
VSWRi, VSWRo vs. Temperature
(f=1495MHz, V_{DD}=2.7V, V_{CTL1}=1.8V, V_{CTL2}=1.8V, V_{CTL3}=0V)

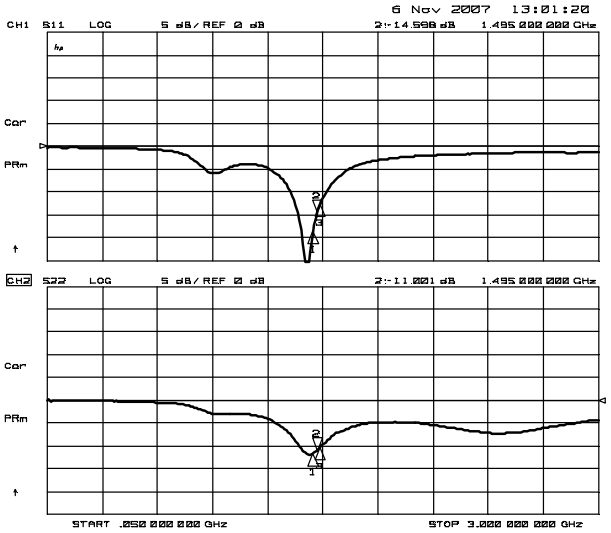


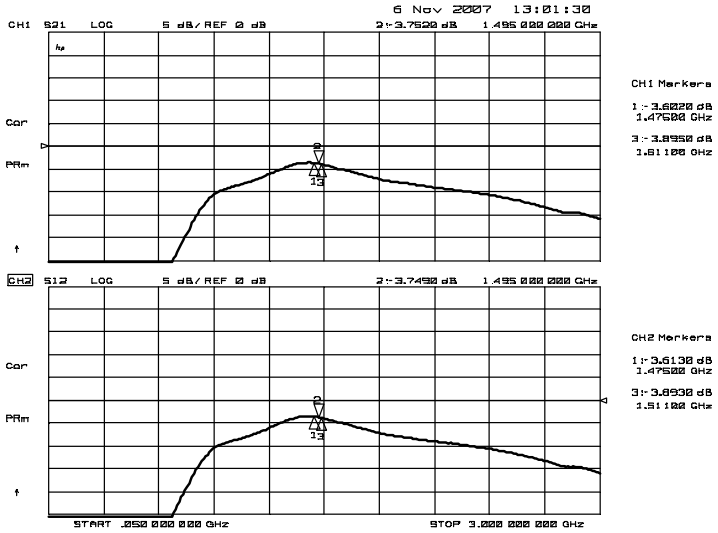
■**ELECTRICAL CHARACTERISTICS** (1.5GHz band Low Gain mode)

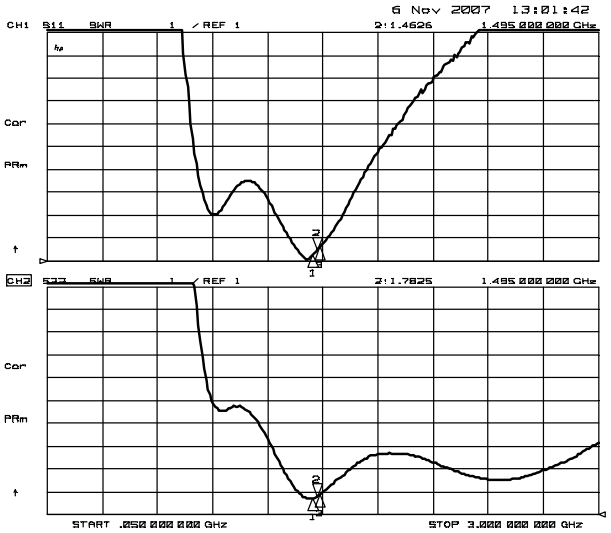


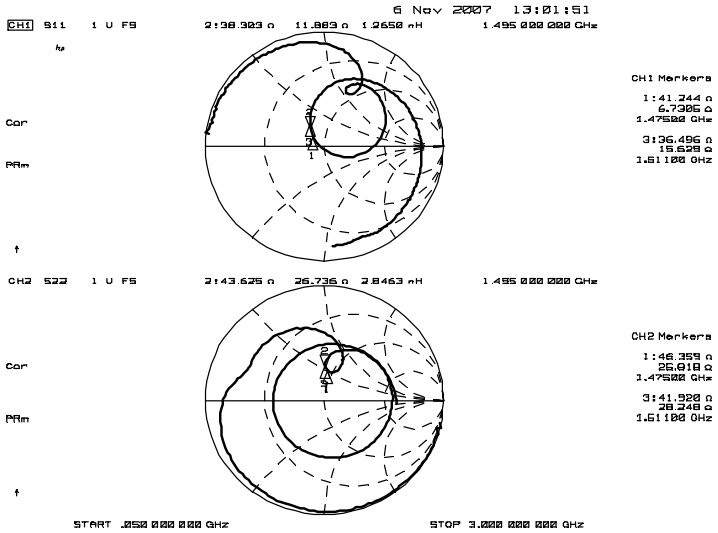
■ELECTRICAL CHARACTERISTICS (1.5GHz band Low Gain mode)

Condition : Ta=+25℃, V_{DD}= 2.7V, V_{CTL}1=1.8V, V_{CTL}2=1.8V, V_{CTL}3=0V



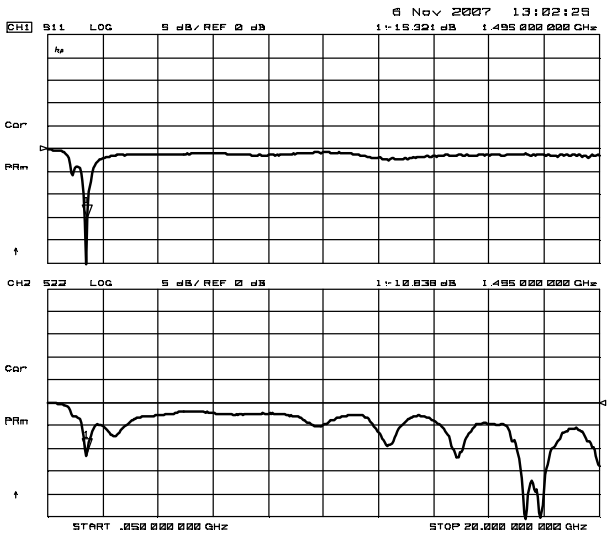


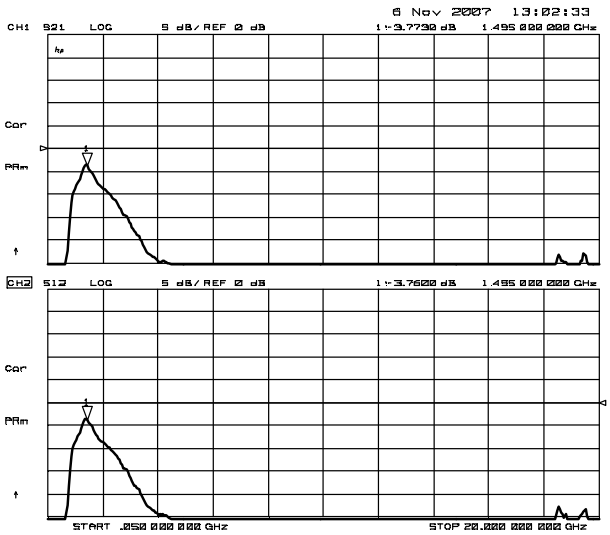


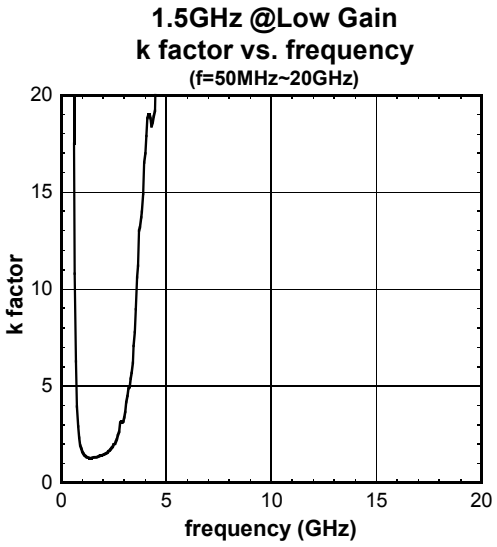


■**ELECTRICAL CHARACTERISTICS** (1.5GHz band Low Gain mode)

Condition : Ta=+25℃, V_{DD}= V_{INV} =2.7V, V_{CTL}1=1.8V, V_{CTL}2=1.85V, V_{CTL}3=0V

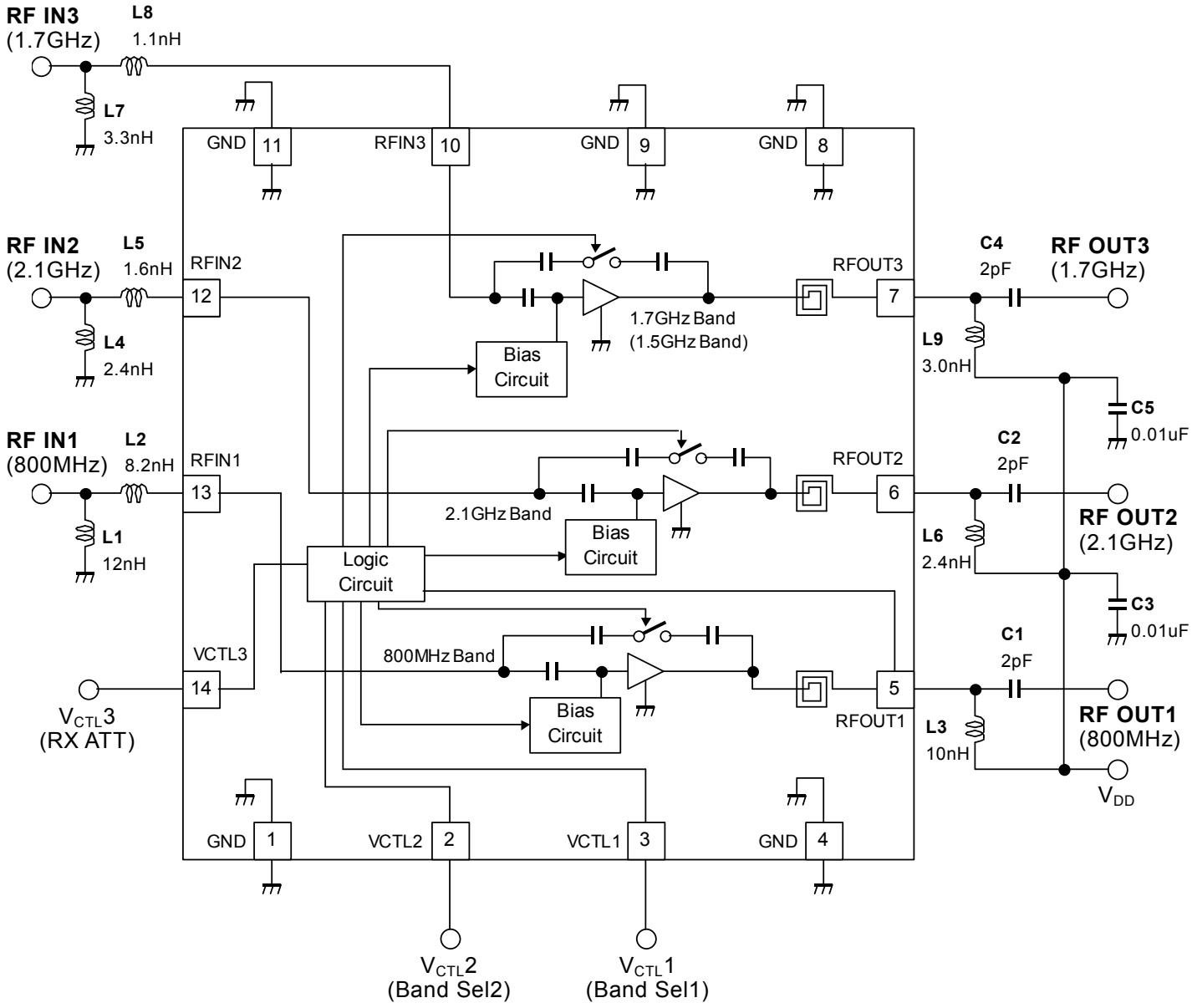






■ **APPLICATION CIRCUIT 1**（2.1GHz/800MHz/1.7GHz Band）

(Top View)



PARTS LIST

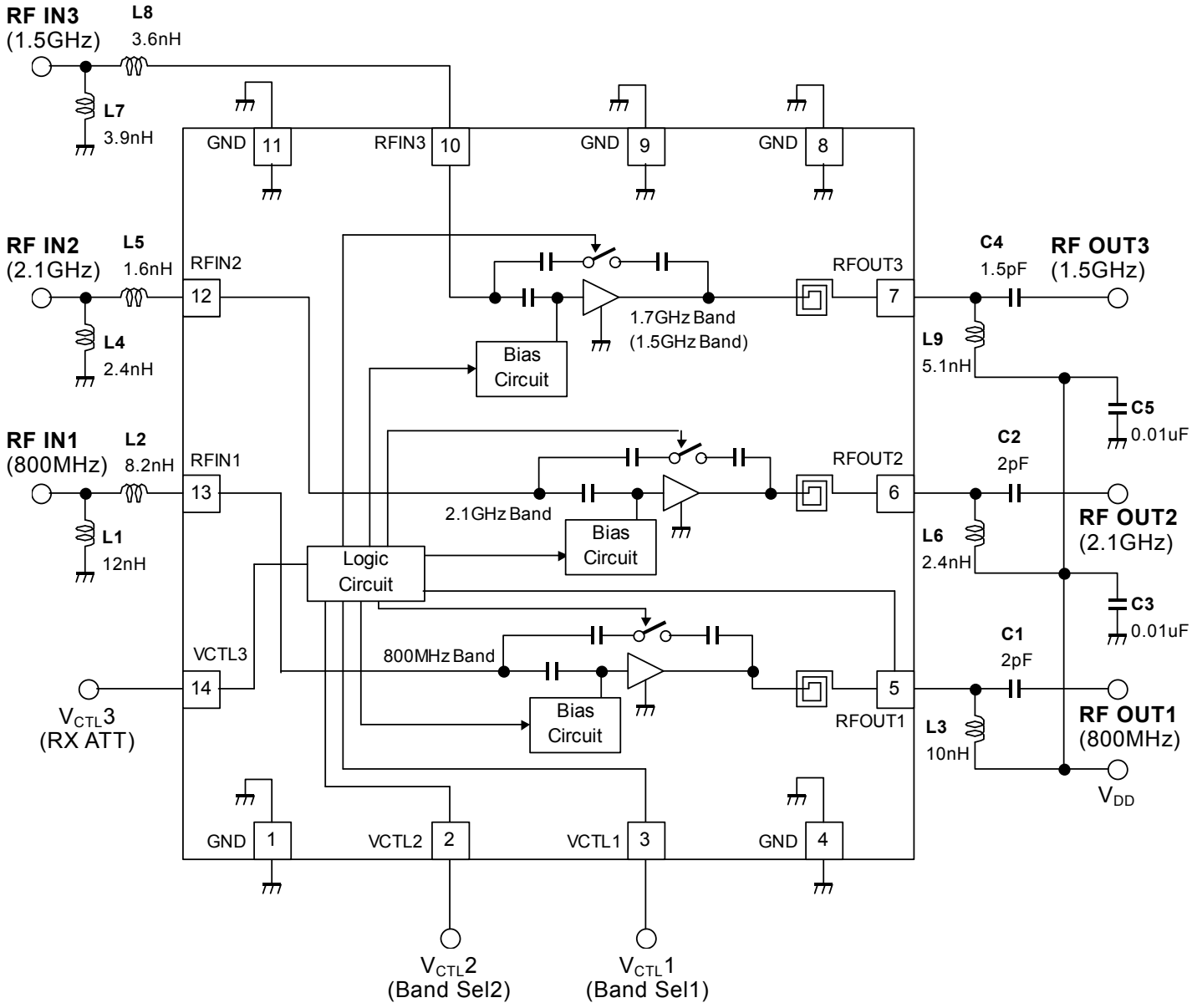
Parts ID	Notes
L1, L2, L4 ~L9	MURATA（LQP03T）0603 Size
L3	TDK（MLK0603）0603 Size
C1~C5	MURATA（GRM03）0603 Size

PRECAUTIONS

1) Please locate bypass capacitor C3 proximity to inductor L3 and L6.
2) Please locate bypass capacitor C5 proximity to inductor L9.
3) Ground terminal should be connected with the ground plane as short as possible.

■ APPLICATION CIRCUIT 2（2.1GHz/800MHz/1.5GHz Band）

(Top View)



PARTS LIST

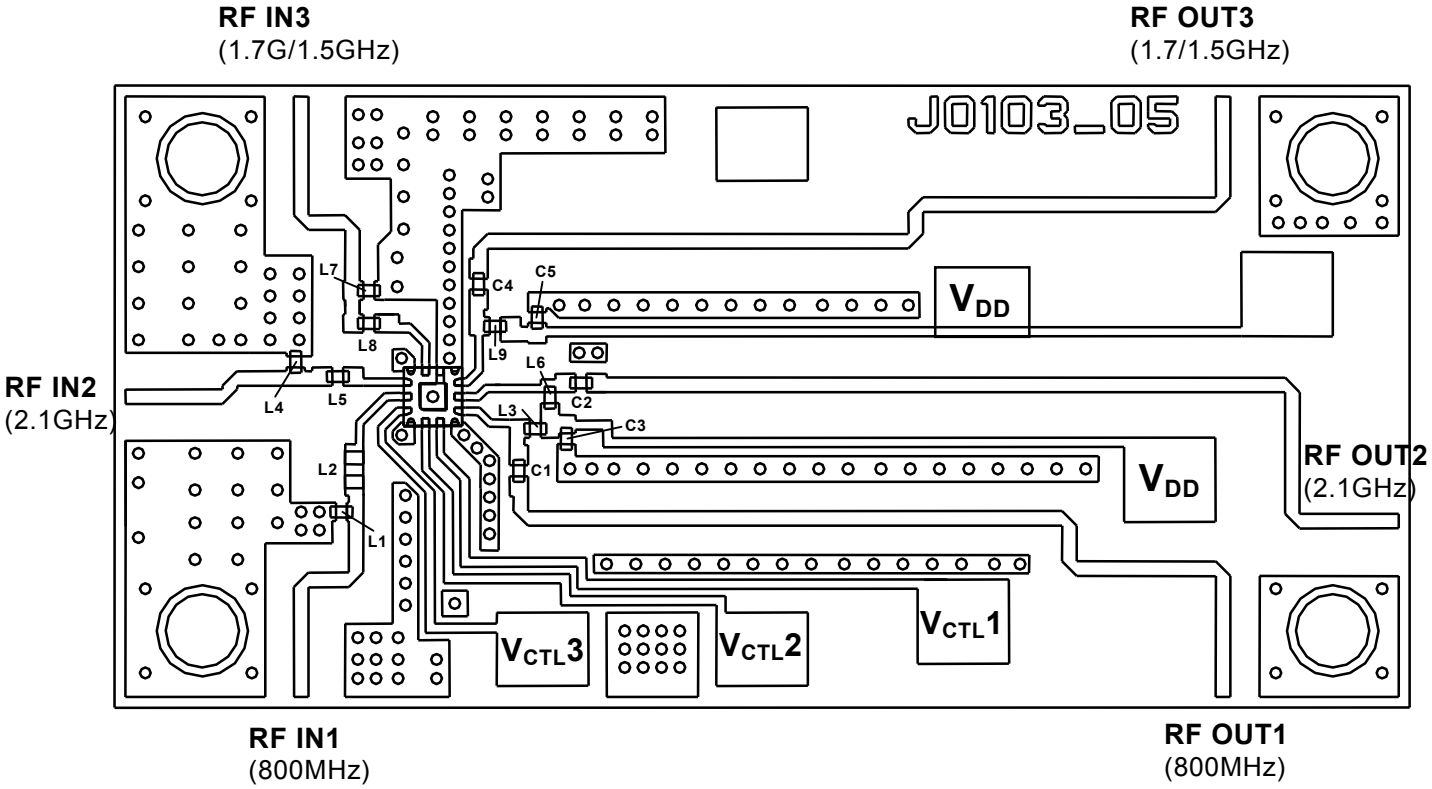
Parts ID	Notes
L1, L2, L4 ~L9	MURATA（LQP03T）0603 Size
L3	TDK（MLK0603）0603 Size
C1~C5	MURATA（GRM03）0603 Size

PRECAUTIONS

1) Please locate bypass capacitor C3 proximity to inductor L3 and L6.
2) Please locate bypass capacitor C5 proximity to inductor L9.
3) Ground terminal should be connected with the ground plane as short as possible.

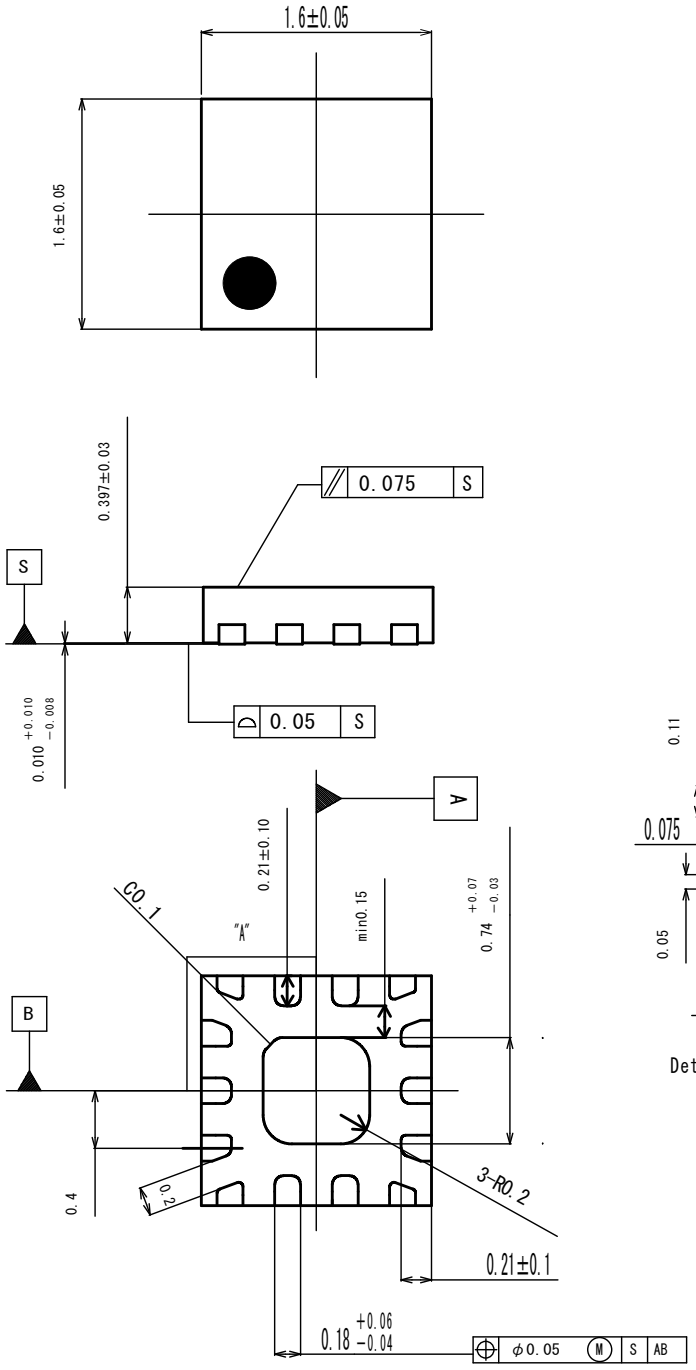
■ TEST PCB LAYOUT

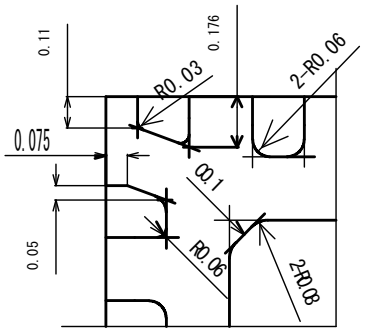
(Top View)



PCB (FR-4):
t=0.2mm
MICROSTRIP LINE WIDTH=0.4mm (Z_0=50ohm)
PCB SIZE=35.4mm x 17.0mm

■ PACKAGE OUTLINE (EQFN14-D7)





Details of"A" part (×2)

UNIT : mm

SUBSTRATE MATERIAL : Copper
TERMINAL FINISH : Sn-Bi plating
MOLD MATERIAL : Epoxy resin
MASS (TYP.) : 0.0034 (g)

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.