WIDE BAND AGC AMPLIFIER GaAs MMIC

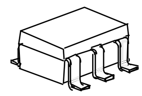
■GENERAL DESCRIPTION

NJG1101F is a GaAs MMIC designed mainly for wireless phone handsets at frequency range of 850MHz from 2.5GHz.

NJG1101F is a variable gain amplifier with 40 dB dynamic range and exhibits low current consumption.

MTP6 package is adopted.

■PACKAGE OUTLINE



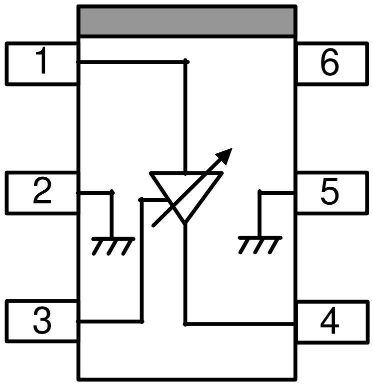
NJG1101F

■FEATURES

●Single and low voltage operation	V_{DD}=+3.0V typ.
●Low current consumption	I_{DD}=10mA typ.
●Small signal gain	18dB typ. @f=1.5GHz (f=0.85~2.5GHz @3dB down)
●Wide gain control range	40dB typ. @V_{CONT}=+0.1~+2.0V
●Pout at 1dB gain compression point	+1.5dBm typ. @f=1.5GHz
●Package	MTP6 (Mount Size: 2.8 x 2.9 x 1.2mm)

■PIN CONFIGURATION

F TYPE
(Top View)



Pin connection
1.RF_{in}
2.GND
3.V_{CONT}
4.RF_{out} & V_{DD}
5.GND
6.V_{DD}

Note: [mark] is a package orientation mark.

■ABSOLUTE MAXIMUM RATINGS

(T_a=+25°C, Z_s=Z_l=50Ω)

PARAMETER	SYMBOL	CONDITIONS	RATINGS	UNITS
Drain Voltage	V_{DD}		6	V
Gain Control Voltage	V_{CONT}	V_{DD}=3V	3	V
Input Power	P_{in}	V_{DD}=3V, V_{CONT}=2V	10	dBm
Power Dissipation	P_D		300	mW
Operating Temperature	T_{opr}		-40~+85	°C
Storage Temperature	T_{stg}		-55~+150	°C

■ELECTRICAL CHARACTERISTICS1 (Wide band: Measured at TEST CIRCUIT 1)

(T_a=25°C, Z_s=Z_l=50Ω)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Operating Frequency	freq	V_{DD}=3.0V	0.85	1.5	2.5	GHz
Drain Voltage	V_{DD}		2.7	3.0	5.0	V
Operating Current	I_{DD}	V_{DD}=3.0V, V_{CONT}=2V, P_{out}=-10dBm	-	10	13	mA
Small Signal Gain	Gain	V_{DD}=3.0V, V_{CONT}=2V, P_{out}=-10dBm, f=1.5GHz	15.5	18	21	dB
Gain Flatness	G_{flat}	V_{DD}=3.0V, V_{CONT}=2V, P_{in}=-25dBm f=0.85~2.5GHz	-	3	-	dB
Gain Control Range	G_{cont}	V_{DD}=3.0V, V_{CONT}=0.1~2.0V, P_{in}=-25dBm, f=1.5GHz	35	40	-	dB
Pout at 1dB Gain Compression point	P_{-1dB}	V_{DD}=3.0V, V_{CONT}=2V, f=1.5GHz	-	+1.5	-	dBm
Adjacent Channel Leakage Power (PDC Regulation)	P_{acp}	V_{DD}=3.0V, V_{CONT}=2V, P_{out}=-10dBm, f=1.5GHz Offset=50kHz, P_{in} ; π/4 DQPSK	-	-68	-	dBc

■**ELECTRICAL CHARACTERISTICS 2** (800MHz Band: Measured at TEST CIRCUIT 2)

(T_a=25°C, Z_s=Z_l=50Ω)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Operating Frequency	freq	V_{DD}=3.0V	850	938	960	MHz
Drain Voltage	V_{DD}		2.7	3.0	5.0	V
Operating Current	I_{DD}	V_{DD}=3.0V, V_{CONT}=2V, P_{out}=-10dBm	-	10	13	mA
Small Signal Gain	Gain	V_{DD}=3.0V, V_{CONT}=2V, P_{out}=-10dBm, f=1.5GHz	15.5	18	21	dB
Gain Flatness	G_{flat}	V_{DD}=3.0V, V_{CONT}=2V, P_{in}=-25dBm, f=0.85~2.5GHz	-	0.5	-	dB
Gain Control Range	G_{cont}	V_{DD}=3.0V, V_{CONT}=0.1~2.0V, P_{in}=-25dBm, f=1.5GHz	35	40	-	dB
Pout at 1dB Gain Compression point	P_{-1dB}	V_{DD}=3.0V, V_{CONT}=2V, f=1.5GHz	-	+1.5	-	dBm
Adjacent Channel Leakage Power (PDC Regulation)	P_{acp}	V_{DD}=3.0V, V_{CONT}=2V, P_{out}=-10dBm, f=1.5GHz offset=50kHz, P_{in} ; π/4 DQPSK	-	-68	-	dBc
Input VSWR	$VSWR_i$	V_{DD}=3.0V, V_{CONT}=2V, f=1.5GHz	-	1.8	-	
Output VSWR	$VSWR_o$	V_{DD}=3.0V, V_{CONT}=2V, f=1.5GHz	-	1.5	-	

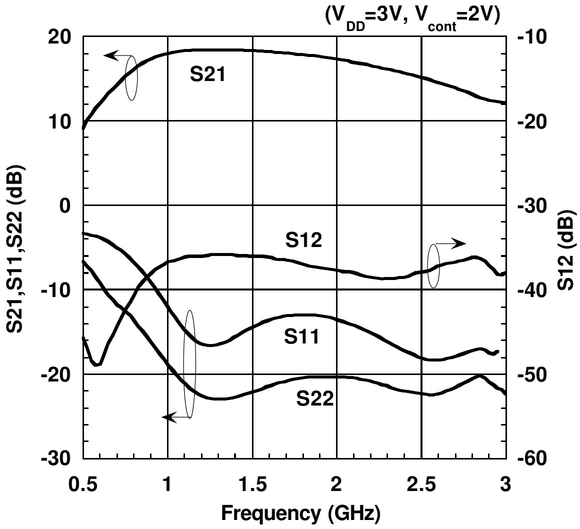
■**ELECTRICAL CHARACTERISTICS 3** (PDC1.5GHz/PHS1.9GH: Measured at TEST CIRCUIT 2)

(T_a=25°C, Z_s=Z_l=50Ω)

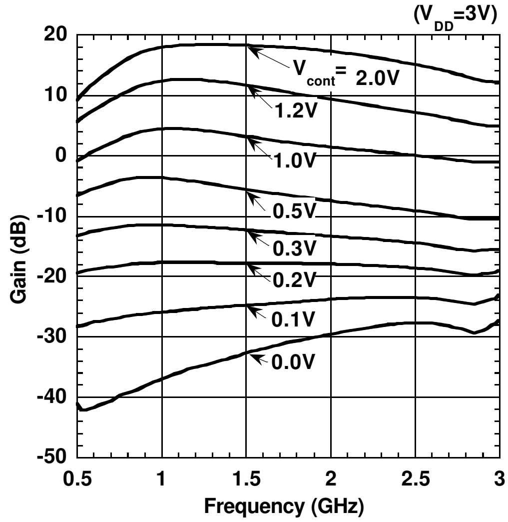
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Operating Frequency 1	freq1	V_{DD}=3.0V	1429	1441	1453	MHz
Operating Frequency 2	freq2	V_{DD}=3.0V	1800	1900	1920	MHz
Drain Voltage	V_{DD}		2.7	3.0	5.0	V
Operating Current	I_{DD}	V_{DD}=3.0V, V_{CONT}=2V, P_{out}=-10dBm	-	10	13	mA
Small Signal Gain	Gain	V_{DD}=3.0V, V_{CONT}=2V, P_{out}=-10dBm, f=1.5GHz	15.5	18	21	dB
Gain Flatness 1	G_{flat}1	V_{DD}=3.0V, V_{CONT}=2V, P_{in}=-25dBm, f=1429~1453MHz	-	0.5	-	dB
Gain Flatness 2	G_{flat}2	V_{DD}=3.0V, V_{CONT}=2V, P_{in}=-25dBm, f=1800~1920MHz	-	0.5	-	dB
Gain Control Range	G_{cont}	V_{DD}=3.0V, V_{CONT}=0.1~2.0V, P_{in}=-25dBm	35	40	-	dB
Pout at 1dB Gain Compression point 1	P_{-1dB}1	V_{DD}=3.0V, V_{CONT}=2V f=1429~1453MHz	-	+1.5	-	dBm
Pout at 1dB Gain Compression point 2	P_{-1dB}2	V_{DD}=3.0V, V_{CONT}=2V f=1800~1920MHz	-	+1.0	-	dBm
Adjacent Channel Leakage Power 1 (PDC Regulation)	P_{acp}1	V_{DD}=3.0V, V_{CONT}=2V, P_{out}=-10dBm, f=1441MHz offset=50kHz, P_{in} ; π/4 DQPSK	-	-68	-	dBc
Adjacent Channel Leakage Power 2 (PDC Regulation)	P_{acp}2	V_{DD}=3.0V, V_{CONT}=2V, P_{out}=-10dBm, f=1900MHz offset=50kHz, P_{in} ; π/4 DQPSK	-	-70	-	dBc
Input VSWR	$VSWR_i$	V_{DD}=3.0V, V_{CONT}=2V	-	1.8	-	
Output VSWR	$VSWR_o$	V_{DD}=3.0V, V_{CONT}=2V	-	1.5	-	

■TYPICAL CHARACTERISTICS 1 (Wide Band: Measured on TEST CIRCUIT 1)

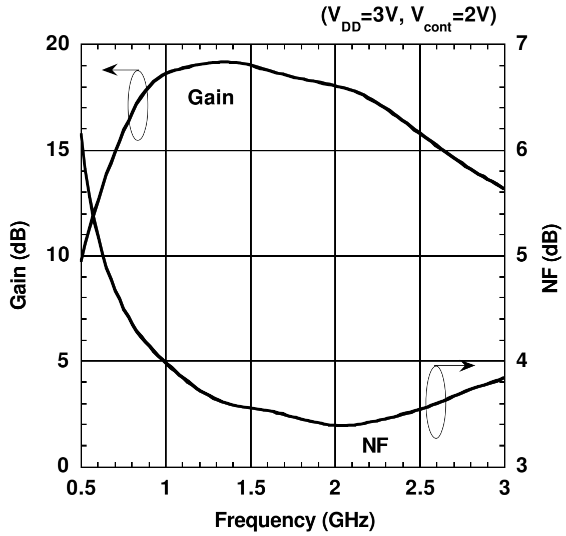
S21,S11,S22,S12 vs. FREQUENCY



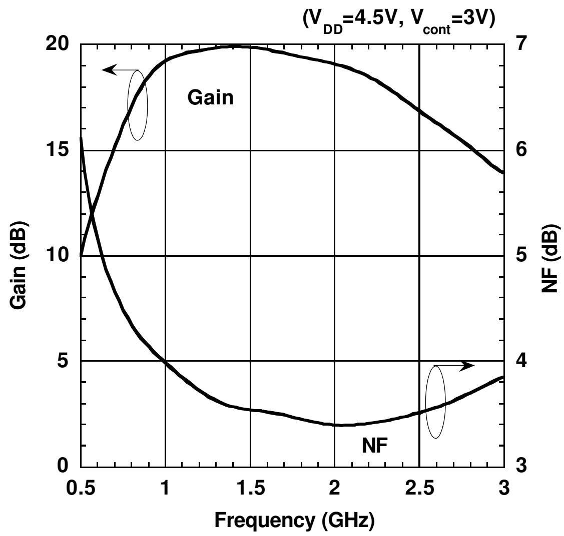
GAIN vs. FREQUENCY



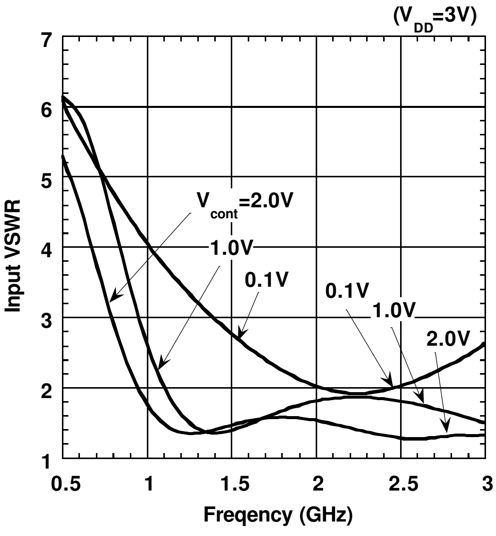
GAIN, NF vs. FREQUENCY



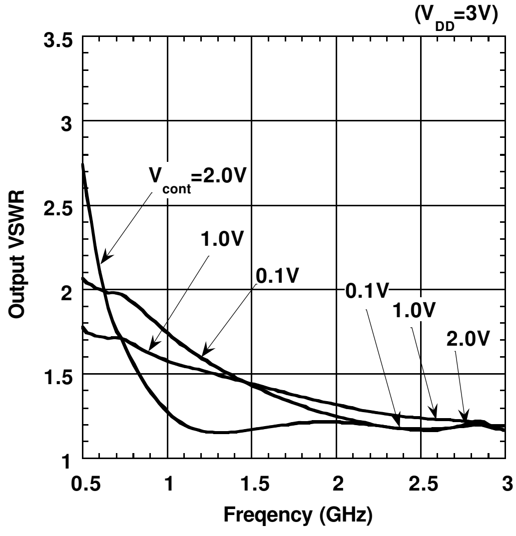
GAIN, NF vs. FREQUENCY



INPUT VSWR vs. FREQUENCY

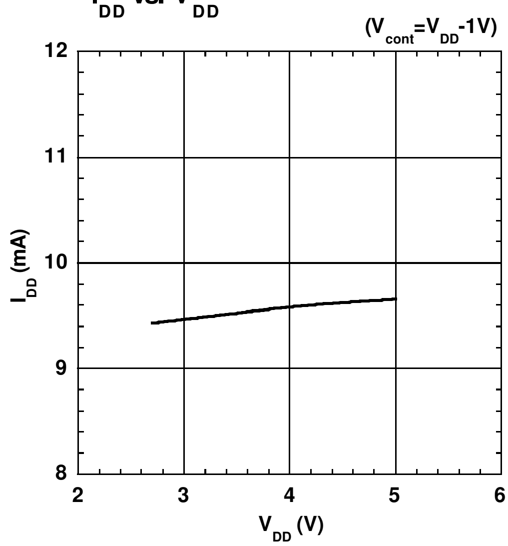


OUTPUT VSWR vs. FREQUENCY

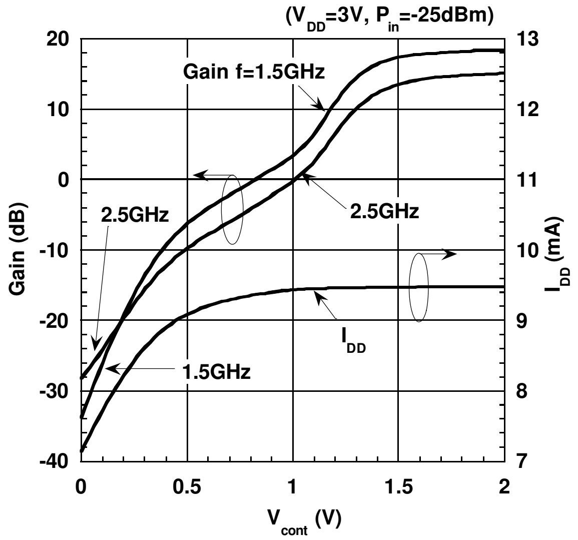


■**TYPICAL CHARACTERISTICS 1** (Wide Band: Measured on TEST CIRCUIT 1)

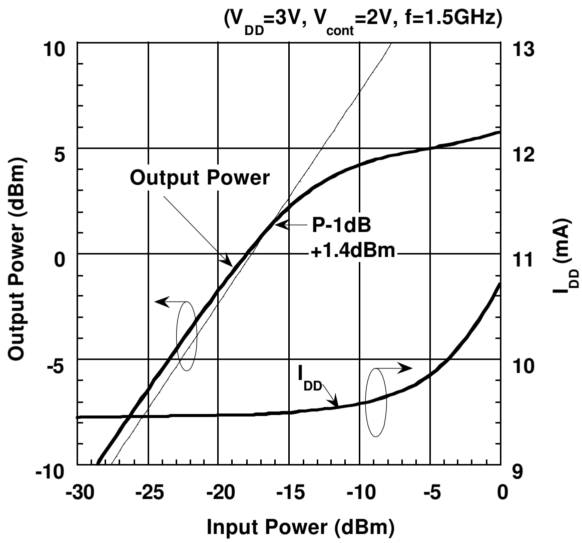
I_{DD} vs. V_{DD}



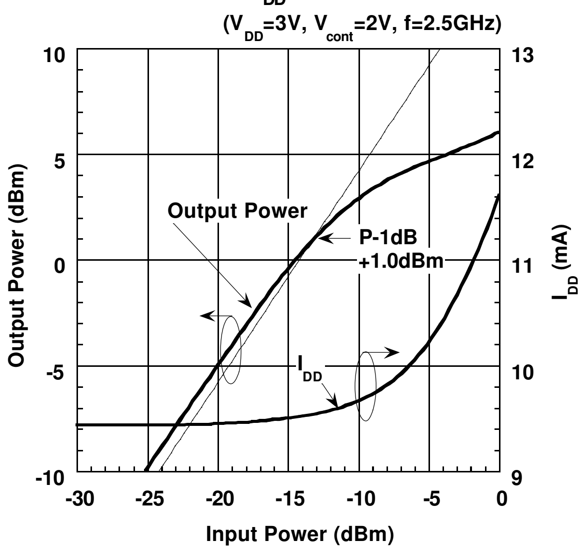
GAIN, I_{DD} vs. Vcont (Variable Gain)



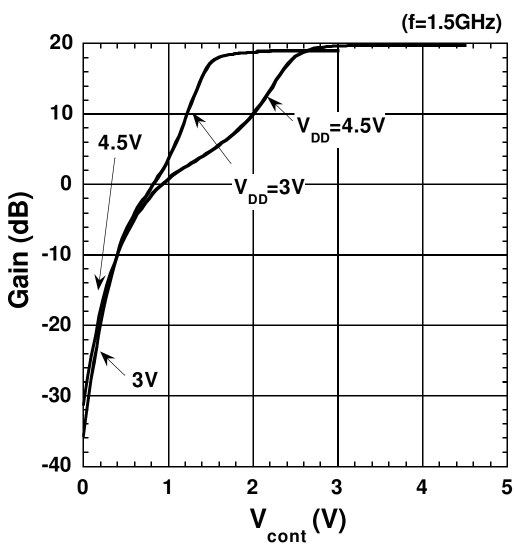
OUTPUT POWER, I_{DD} vs. INPUT POWER



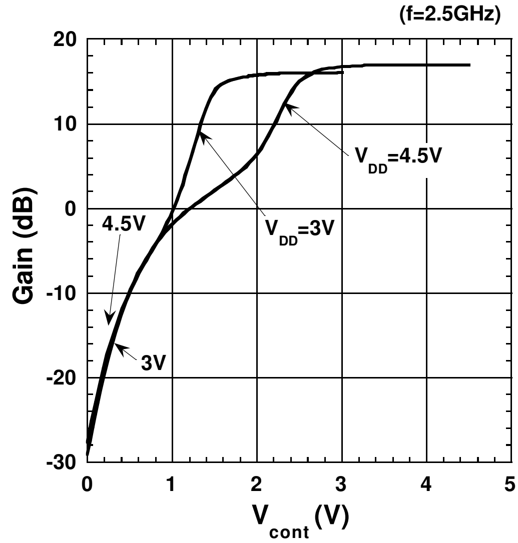
OUTPUT POWER, I_{DD} vs. INPUT POWER



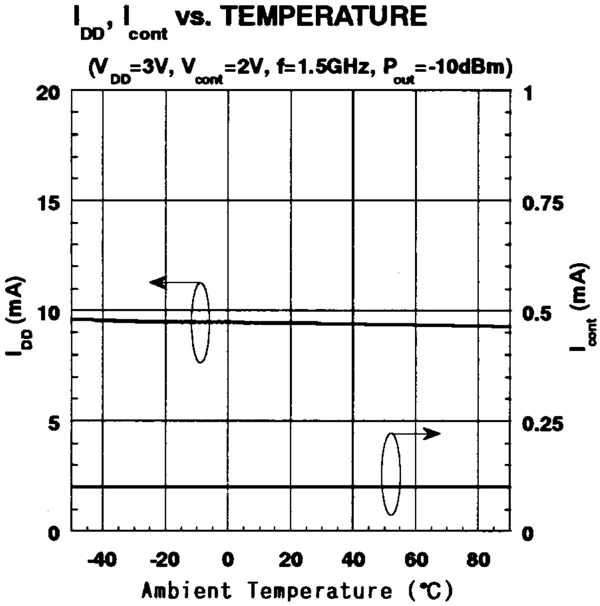
GAIN vs. Vcont

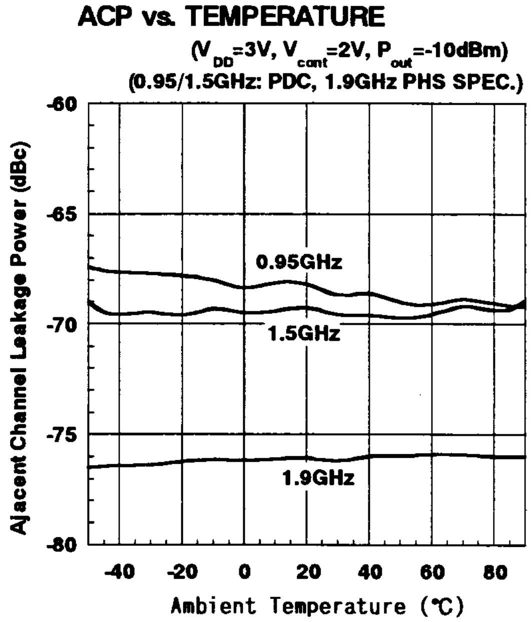


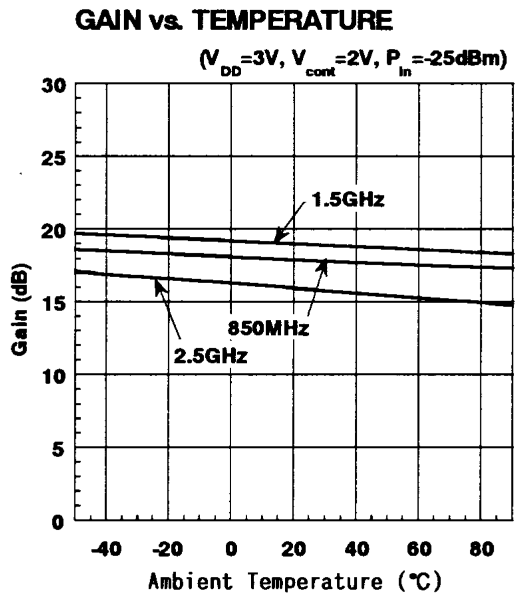
GAIN vs. Vcont

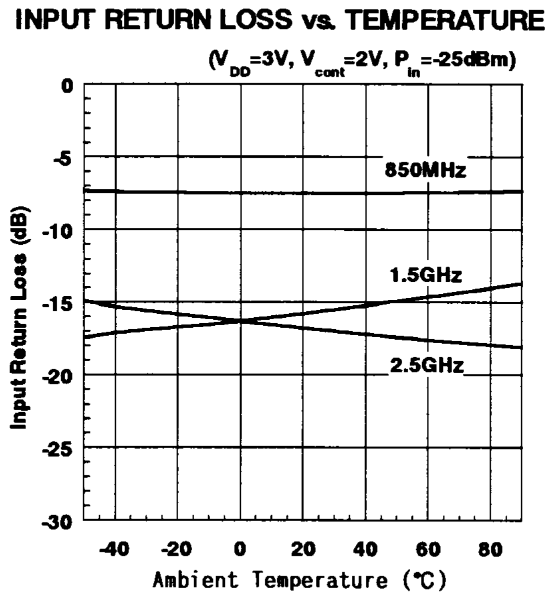


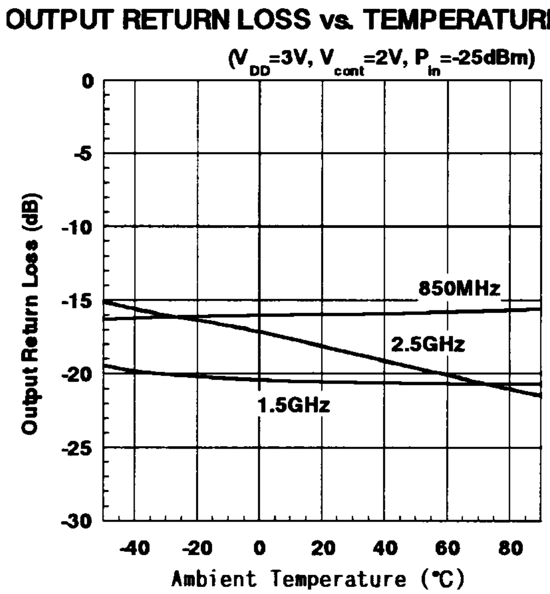
■TYPICAL CHARACTERISTICS 1 (Wide Band: Measured on TEST CIRCUIT 1)

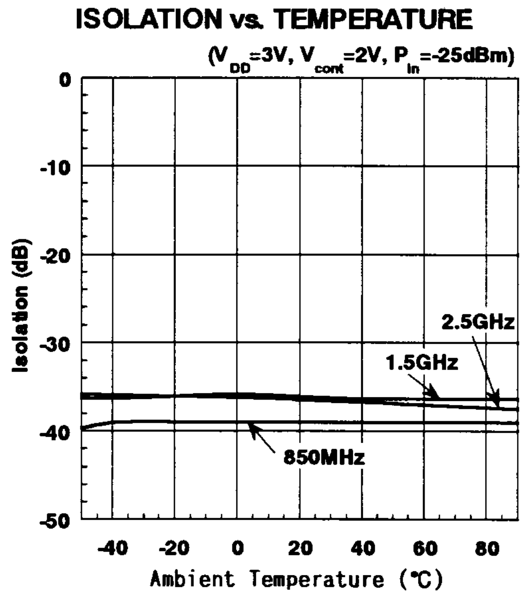






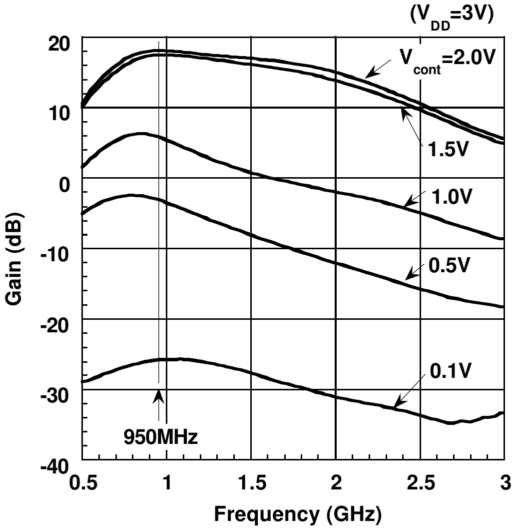




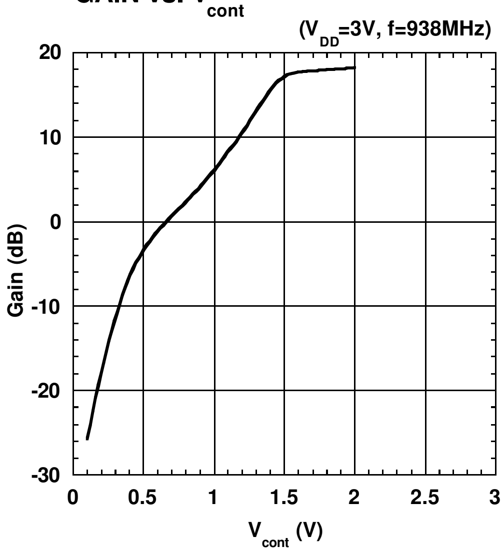


■TYPICAL CHARACTERISTICS 2 (PDC 800MHz Band: Measured on TEST CIRCUIT 2)

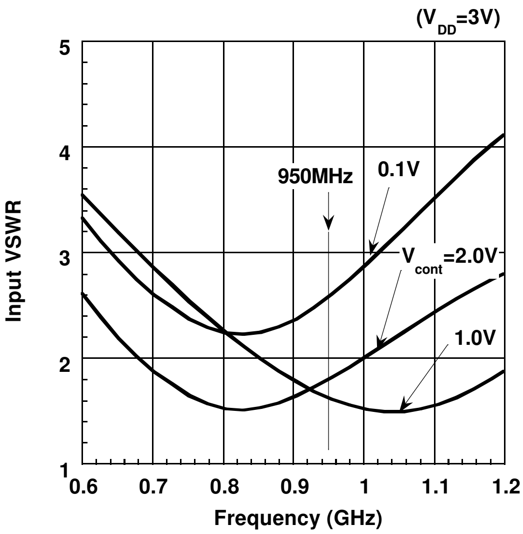
GAIN vs. FREQUENCY



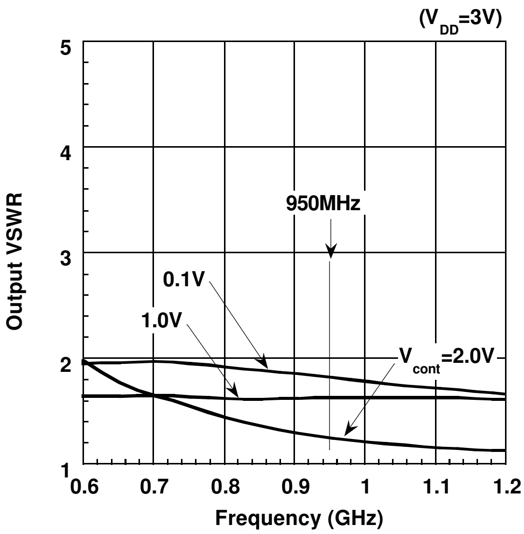
GAIN vs. V_{cont}



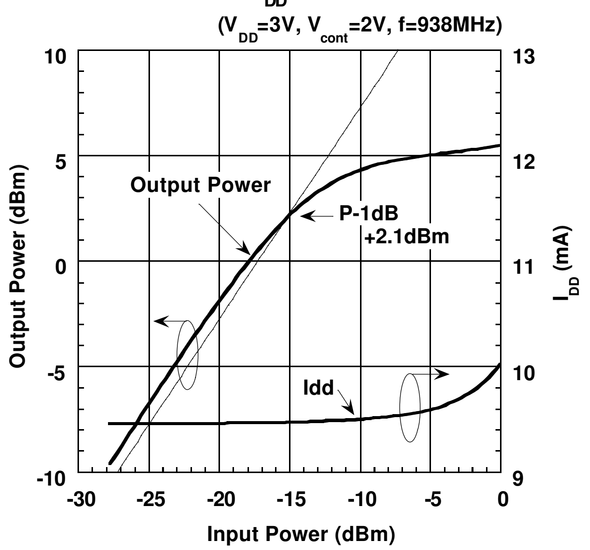
INPUT VSWR vs. FREQUENCY



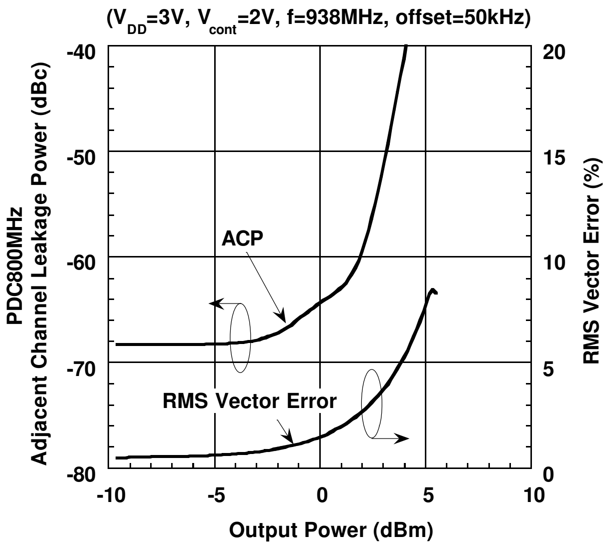
OUTPUT VSWR vs. FREQUENCY



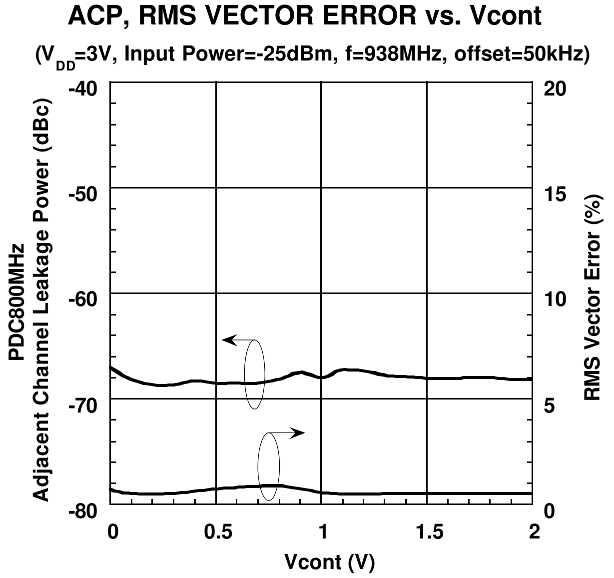
OUTPUT POWER, I_{DD} vs. INPUT POWER

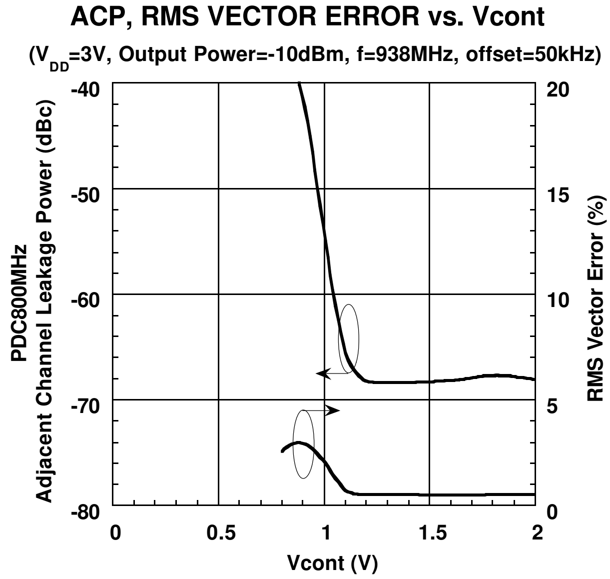


ACP, RMS VECTOR ERROR vs. OUTPUT POWER

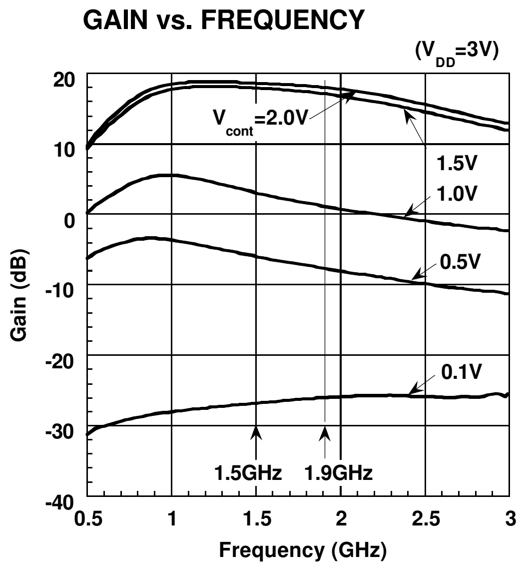


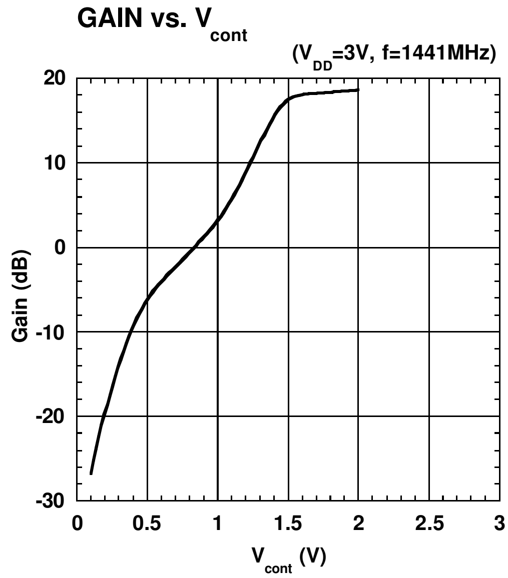
■**TYPICAL CHARACTERISTICS 2** (PDC 800MHz Band: Measured on TEST CIRCUIT 2)

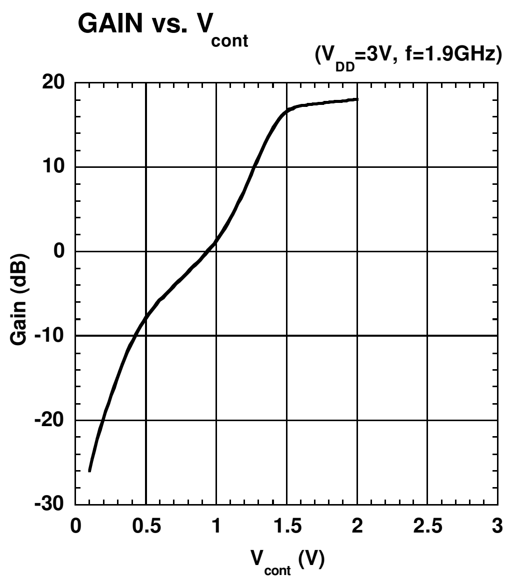


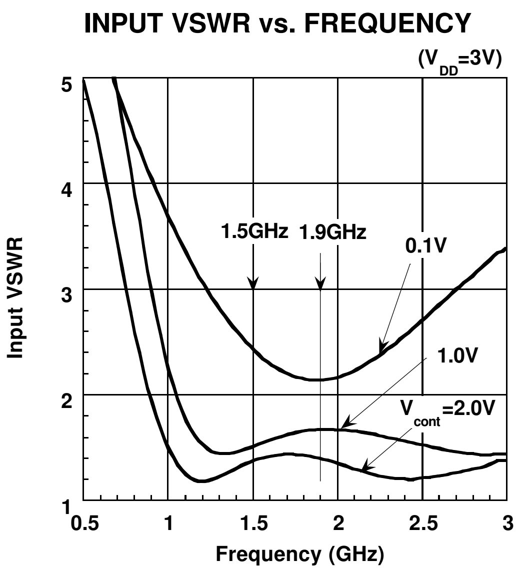


■**TYPICAL CHARACTERISTICS 3** (PDC1.5GHz/PHS1.9GHz Band: Measured on TEST CIRCUIT 2)



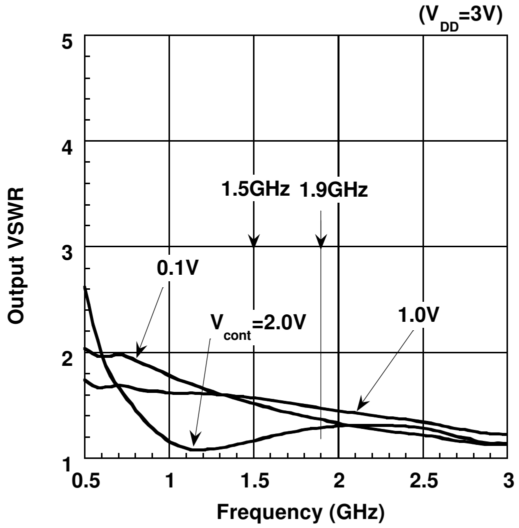




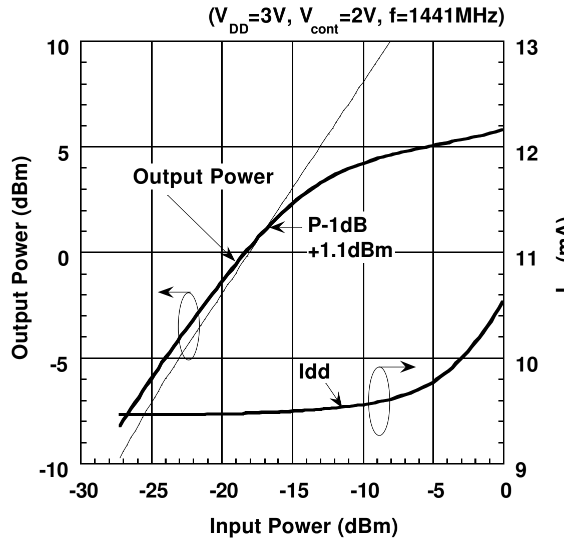


■TYPICAL CHARACTERISTICS 3 (PDC1.5GHz/PHS1.9GHz Band: Measured on TEST CIRCUIT 2)

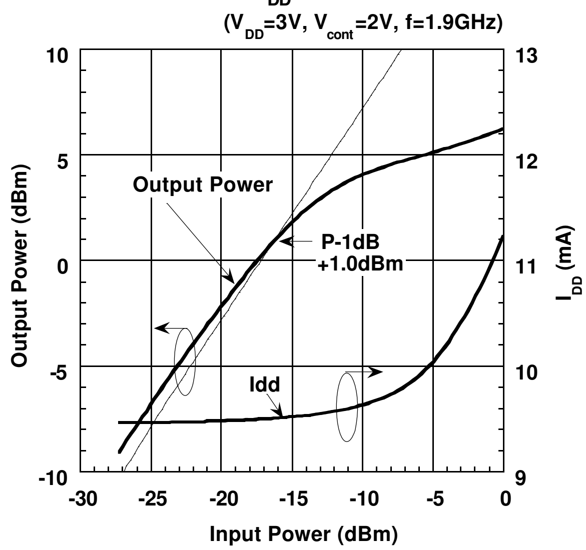
OUTPUT VSWR vs. FREQUENCY



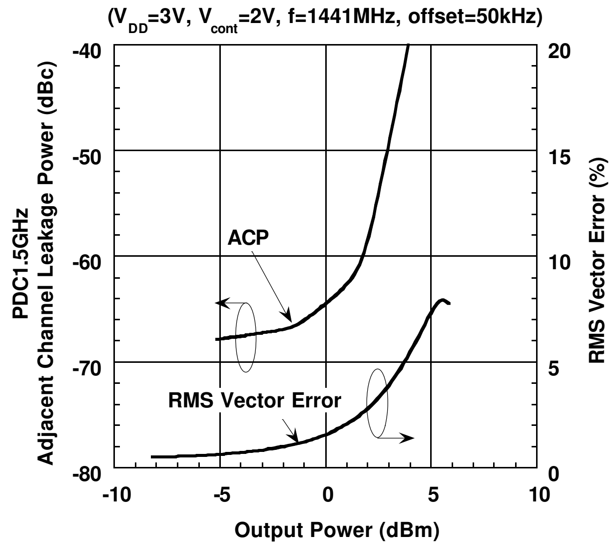
OUTPUT POWER, I_{DD} vs. INPUT POWER



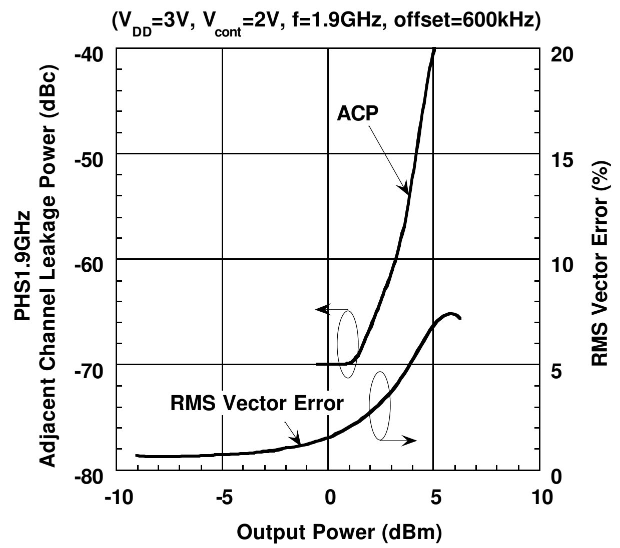
OUTPUT POWER, I_{DD} vs. INPUT POWER



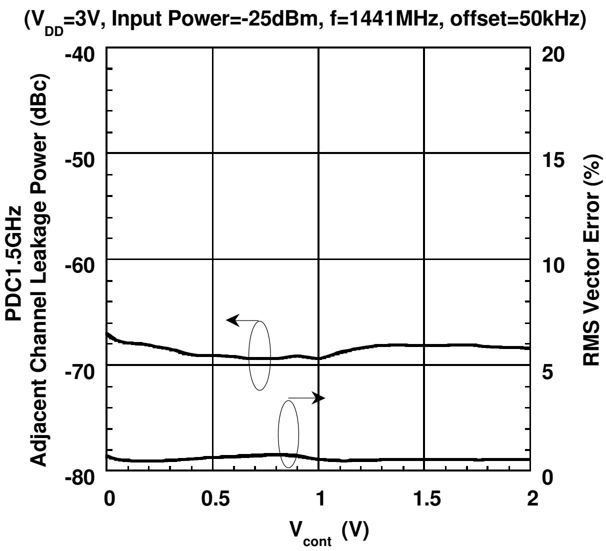
ACP, RMS VECTOR ERROR vs. OUTPUT POWER



ACP, RMS VECTOR ERROR vs. OUTPUT POWER



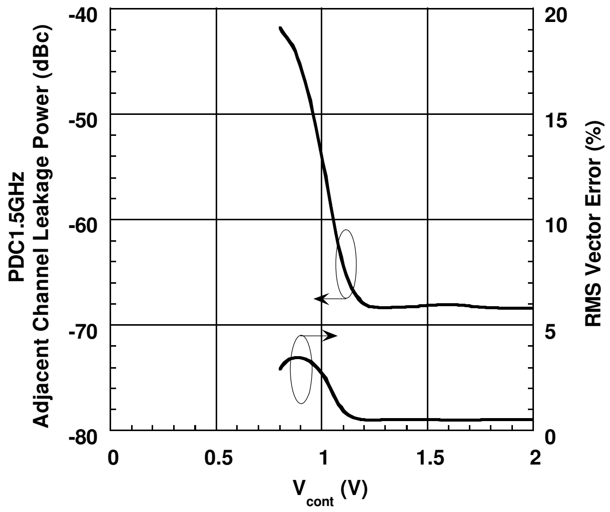
ACP, RMS VECTOR ERROR vs. Vcont



■**TYPICAL CHARACTERISTICS 3** (PDC1.5GHz/PHS1.9GHz Band: Measured on TEST CIRCUIT 2)

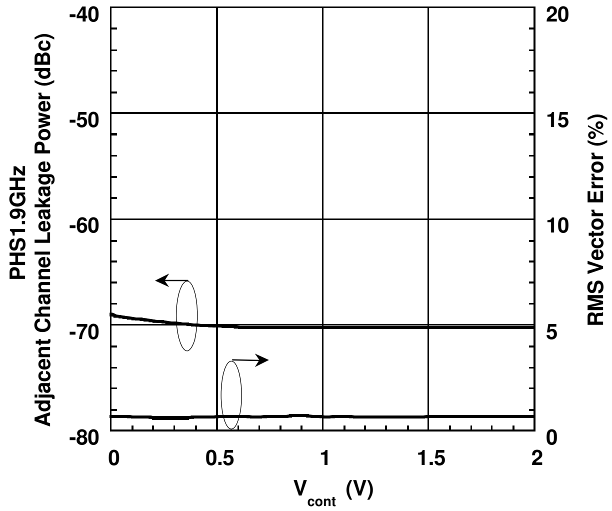
ACP, RMS VECTOR ERROR vs. Vcont

(V_{DD}=3V, Output Power=-10dBm, f=1441MHz, offset=50kHz)



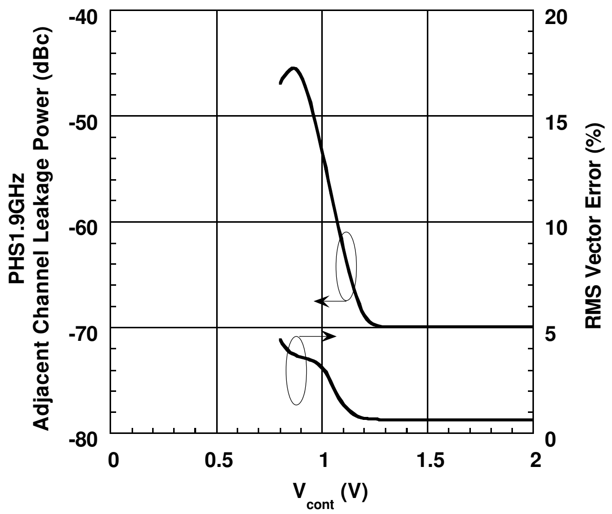
ACP, RMS VECTOR ERROR vs. Vcont

(V_{DD}=3V, Input Power=-25dBm, f=1.9GHz, offset=600kHz)

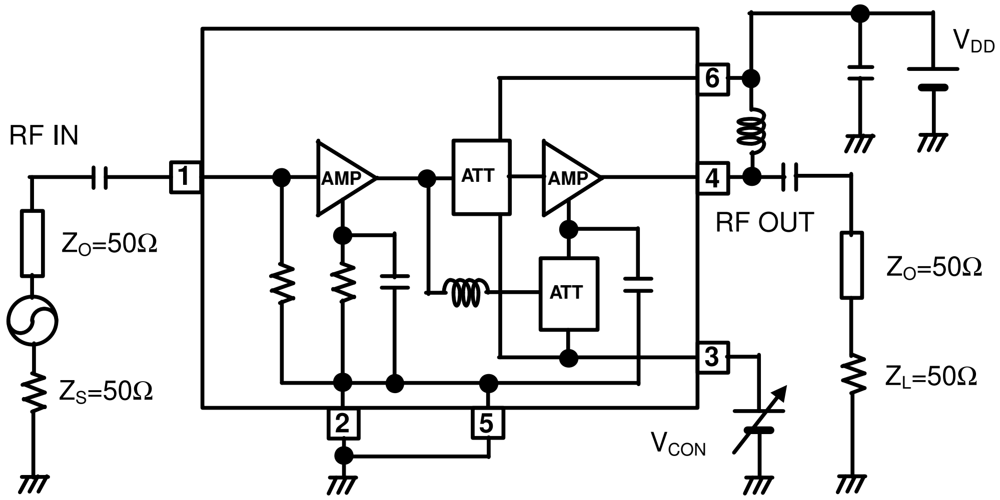


ACP, RMS VECTOR ERROR vs. Vcont

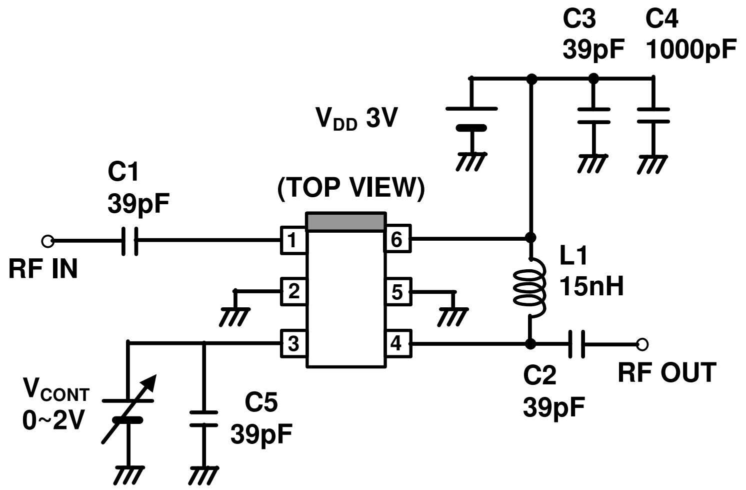
(V_{DD}=3V, Output Power=-10dBm, f=1.9GHz, offset=600kHz)



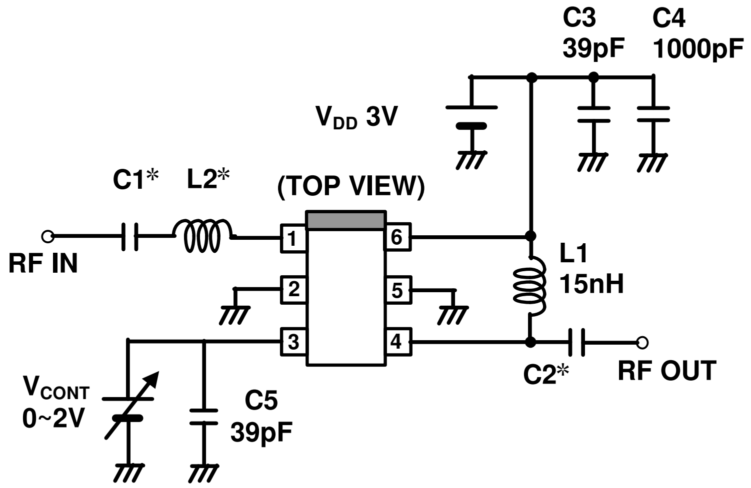
■APPLICATION CIRCUIT



■**TEST CIRCUIT1** (WIDE BAND)



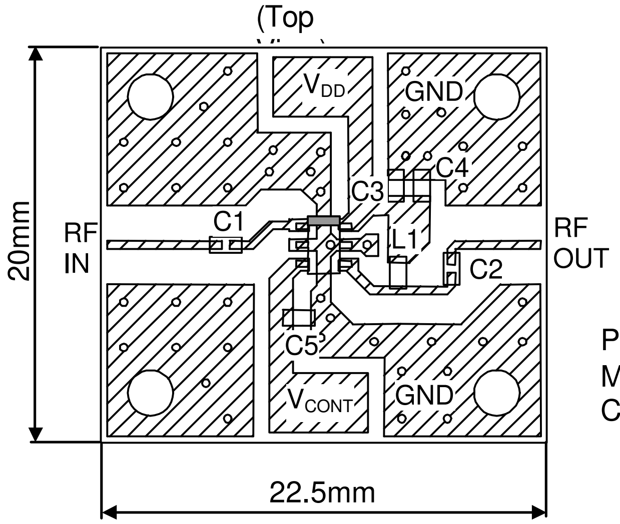
■**TEST CIRCUIT2** (PDC 800MHz, PDC 1.5GHz, PHS 1.9GHz)



***NOTE**

	C1	L2	C2
PDC800MHz	100pF	10nH	100pF
PDC1.5GHz/PHS1.9GHz	10pF	1.5nH	10pF

■**RECOMMENDED PCB DESIGN**



PCB: FR-4 f=0.2mm
MICROSTRIP LINE WIDTH=0.4mm (Z_O=50Ω)
CHIP SIZE: 1608

Notes:

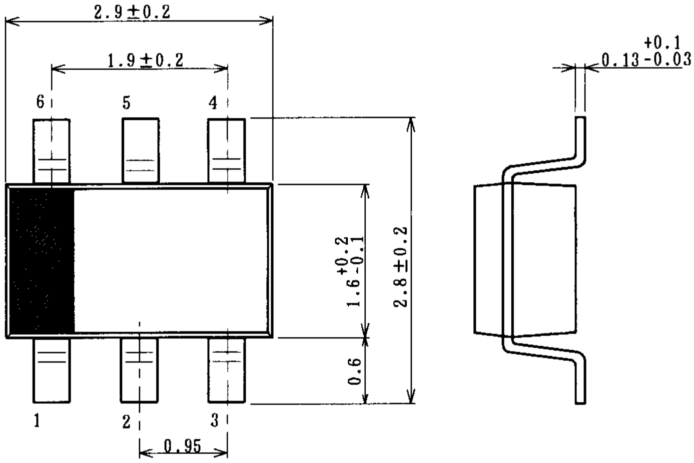
[1]Following chip capacitors work as bypass capacitor, and should be connected to corresponding terminals and the ground plane as close as possible.
①C3
②C4
③C5

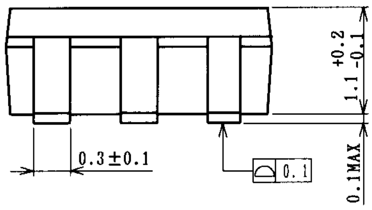
[2]Following chip capacitors are necessary to block DC bias.
①C1
②C2

[3]Parts list

Parts ID	Comment
C1~C5	MURATA GRM36 Series
L1~L2	TAIYO-YUDEN HK1608 Series

■PACKAGE OUTLINE (MTP6)





Lead material	: Copper
Lead surface finish	: Solder plating
Molding material	: Epoxy resin
UNIT	: mm
Weight	: 14mg

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.