TRANSMITTING GaAs POWER AMPLIFIER IC

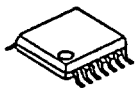
■ GENERAL DESCRIPTION

NJG1302 is a GaAs MMIC designed mainly for final stage power amplifier of PHS in Japan.

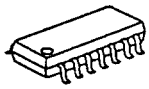
This is a variable gain type with 20dB dynamic range. It has input and output matching circuits internally and it features low voltage and high efficiency operation.21dBm output power is easily available with very low distortion.

Two types of small Plastic mold Package are adopted.

■ PACKAGE OUTLINE



NJG1302V



NJG1302E

■ APPLICATIONS

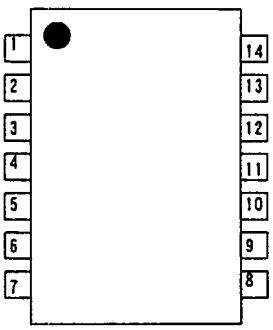
- PHS, Digital cordless phone
- Wireless LAN etc.

■ FEATURES

- Variable gain under low distortion
- Low voltage operation (V_{DD}=3.0V)
- Input and output internal matching circuits
- High gain (32dB Typ.)
- Low distortion (P_{acp}=-60dBc Typ.@1.9GHz,21dBm)
- Low current consumption (I_{DD}=195mA Typ.@1.9GHz,21dBm)
- Reduction of Parasitic oscillation
- V type: SSOP14 Maximum Power Dissipation: 600mW(Tj=150℃,PCB: 24*30*1.0mm FR4)
- E type: EMP 14 Maximum Power Dissipation: 1000mW(Tj=150℃,PCB: 24*30*1.0mm FR4)

■ PIN CONFIGURATION

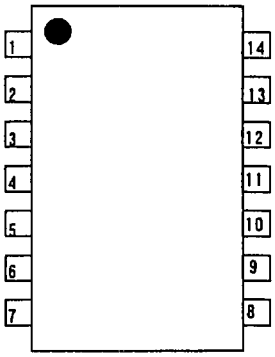
V Type
(Top View)



Pin Connection

1.RF_{in}	8.RF_{out}
2.GND	9.GND
3.V_{GG1}	10.V_{DD2}
4.GND	11.GND
5.V_{cont}	12.V_{DD1}
6.GND	13.GND
7.V_{GG2}	14.GND

E Type
(Top View)



Pin Connection

1.GND	8.GND
2.RF_{in}	9.RF_{out}
3.V_{GG1}	10.V_{DD2}
4.V_{cont}	11.GND
5.V_{GG2}	12.V_{DD1}
6.GND	13.GND
7.GND	14.GND

■ ABSOLUTE MAXIMUM RATINGS

(Z_s=Z_o=50ohm, T_a=25℃)

PARAMETER	SYMBOL	CONDITIONS	RATINGS	UNIT
Drain Voltage	V_{DD1},V_{DD2}	$V_{GG1,2}$=-0.9V	6	V
Gate Voltage	V_{GG1},V_{GG2}	$V_{DD1,2}$=3.0V	-4	V
Gain control voltage	V_{cont}	$V_{DD1,2}$=3.0V	-4	V
Input Power	P_{in}	$V_{DD1,2}$=3.0V,$V_{GG1,2}$=-0.9V	3	dBm
Power Dissipation	P_D	24*30*1.0mm PCB : FR4, T_j=150℃	(V Type) 600 (E Type)1000	mW
Operating Temperature	T_{opr}		-30～+85	℃
Storage Temperature	T_{stg}		-40～+150	℃

■ ELECTRICAL CHARACTERISTICS

(f=1.9GHz,Z_s=Z_o=50ohm,Ta=25℃)

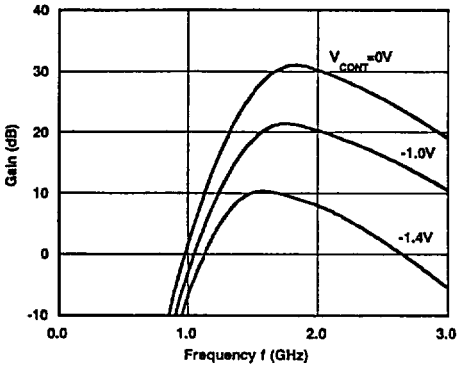
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Frequency	freq	$V_{DD1,2}$=3.0V	1.89	-	1.92	GHz
Drain Voltage	$V_{DD1,2}$		2.9	3.0	5.0	V
Gate Voltage	$V_{GG1,2}$	$V_{DD1,2}$=3.0V,I_{idle}=180mA	-1.25	-0.9	-0.6	V
Idle Current *1	I_{idle}	$V_{DD1,2}$=3.0V, No RF Signal	175	180	185	mA
Operating Current *1	I_{DD}	P_{out}=21dBm,$V_{DD1,2}$=3.0V	180	195	205	mA
Gate Current *2	I_{GG}	P_{out}=21dBm,$V_{DD1,2}$=3.0V	-150	-70	-	uA
Gain Control Terminal Current	I_{cont}	P_{out}=21dBm,$V_{DD1,2}$=3.0V -2.0V<V_{cont}<0.0V	-5	-2	-	uA
Gain Control Voltage			-2.0	-	0	V
Small Signal Gain	Gain	$V_{DD1,2}$=3.0V,I_{idle}=180mA	29	32	35	dB
Gain Flatness	G_{flat}	$V_{DD1,2}$=3.0V,I_{idle}=180mA	0.0	0.5	1.0	dB
Gain Control Range	G_{cont}	Vcont=2～0V,$V_{DD1,2}$=3.0V I_{idle}=180mA	18	20	23	dB
Pout at 1dB Compression	P_{-1dB}	$V_{DD1,2}$=3.0V	22	23	-	dBm
Adjacent Channel Leakage Power ①	P_{acp1}	P_{out}=21dBm,offset=600kHz, P_{in}; π/4 QPSK,$V_{DD1,2}$=3.0V	-	-60	-55	dBc
Adjacent Channel Leakage Power ②	P_{acp2}	P_{out}=21dBm,offset=900kHz, P_{in}; π/4 QPSK,$V_{DD1,2}$=3.0V	-	-65	-60	dBc
Harmonics	P_{sp}	P_{out}=21dBm,$V_{DD1,2}$=3.0V	-	-35	-30	dBc
Input VSWR	$VSWR_i$	$V_{DD1,2}$=3.0V	-	-	2.2	
Load VSWR Tolerance		P_{out}=21dBm,$V_{DD1,2}$=3.0V Load VSWR=4:1,All Phase	Parasitic Oscillation for Fundamental Signal Level : ≦-60dBc			

*1 ; V_{DD1} Terminal and V_{DD2} Terminal Total Current
*2 ; V_{GG1} Terminal and V_{GG2} Terminal Total Current

■TYPICAL CHARACTERISTICS

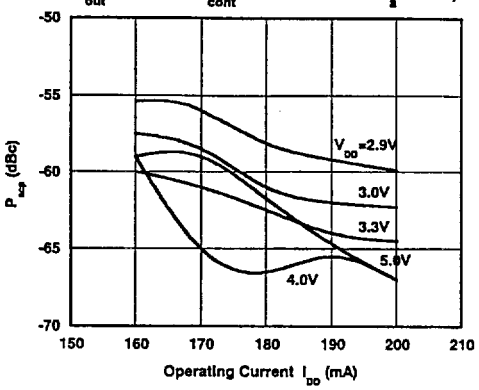
Gain vs. Frequency vs. Control Voltage

(V_{DD}=3.0V, I_{DD}=180mA, T_a=25°C)



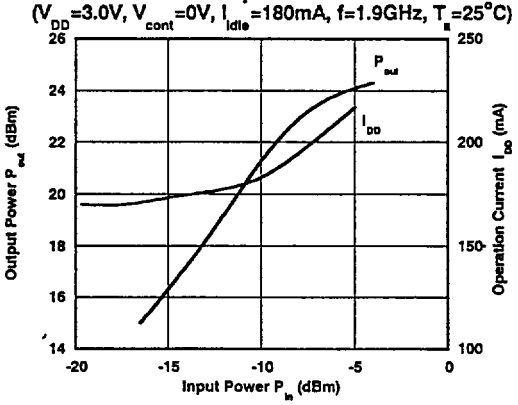
P_{acp} vs. Operating Current vs. V_{DD}

(P_{out}=21dBm, V_{cont}=0V, f=1.9GHz, T_a=25°C)



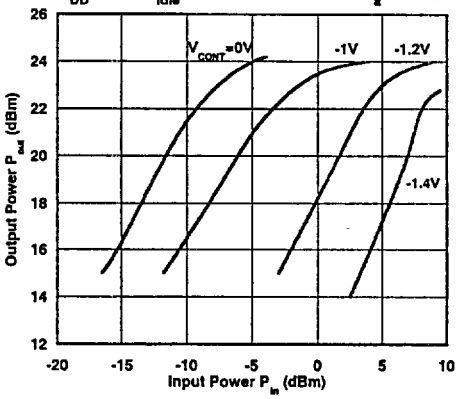
Output Power, Operating Current vs. Input Power

(V_{DD}=3.0V, V_{cont}=0V, I_{idle}=180mA, f=1.9GHz, T_a=25°C)



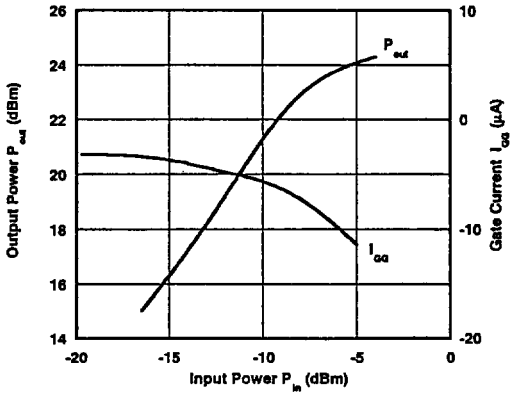
Output Power vs. Input Power vs. Control Voltage

(V_{DD}=3.0V, I_{idle}=180mA, f=1.9GHz, T_a=25°C)



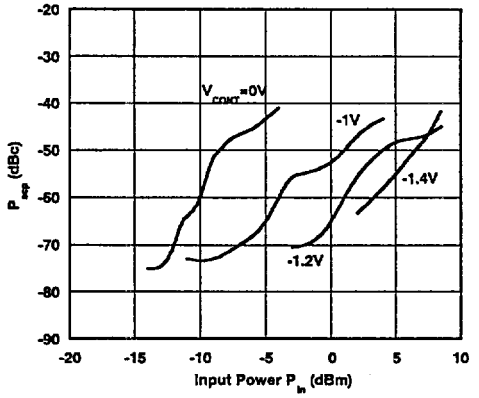
Output Power, Gate Current vs. Input Power

(V_{DD}=3.0V, V_{cont}=0V, I_{idle}=180mA, f=1.9GHz, T_a=25°C)



P_{acp} vs. Input Power vs. Control Voltage

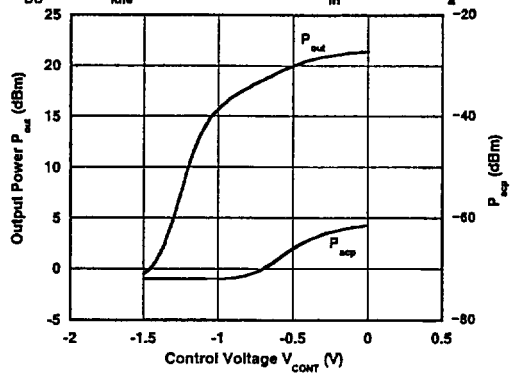
(V_{DD}=3.0V, I_{idle}=180mA, f=1.9GHz, T_a=25°C)



■TYPICAL CHARACTERISTICS

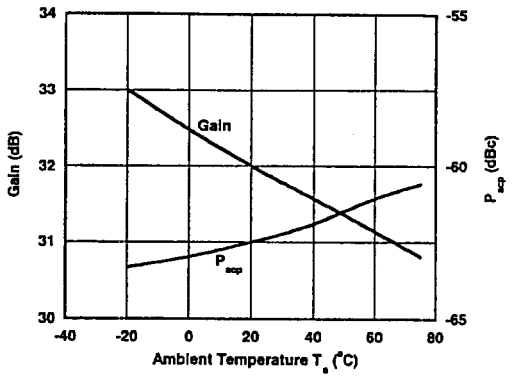
Output Power, P_{acp} vs. Control Voltage

(V_{DD}=3.0V, I_{idle}=180mA, f=1.9GHz, P_{in}=-11dBm, T_a=25°C)



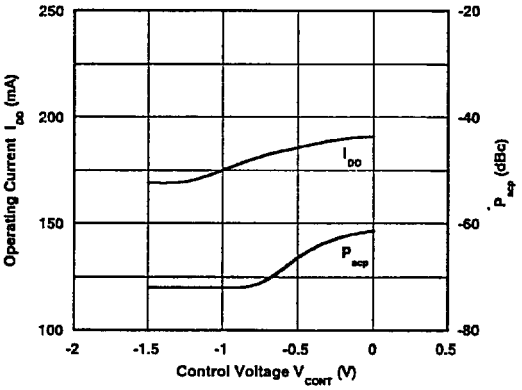
Gain, P_{acp} vs. Ambient Temperature

(V_{DD}=3.0V, V_{cont}=0V, I_{idle}=180mA, P_{out}=21dBm, f=1.9GHz)



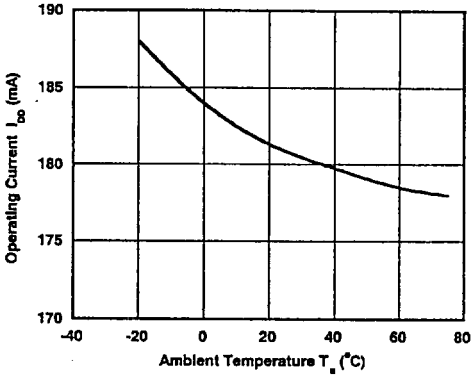
Operating Current, P_{acp} vs Control Voltage

(V_{DD}=3.0V, I_{idle}=180mA, f=1.9GHz, P_{in}=-11dBm, T_a=25°C)



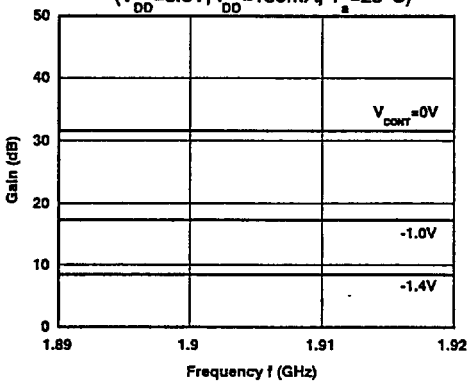
Operating Current vs. Ambient Temperature

(V_{DD}=3.0V, V_{cont}=0V, I_{idle}=180mA, P_{out}=21dBm, f=1.9GHz)



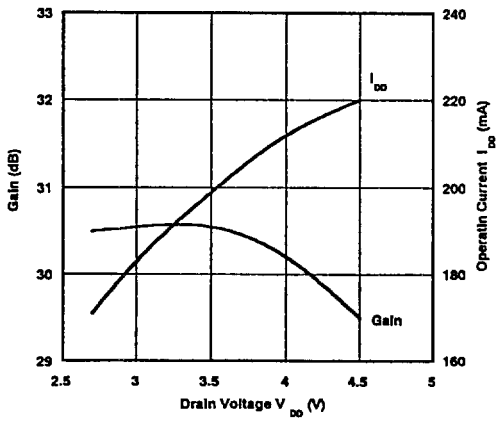
Gain vs. PHS Band Frequency vs. Control Voltage

(V_{DD}=3.0V, I_{DD}=180mA, T_a=25°C)



Gain, Operating Current vs. V_{DD}

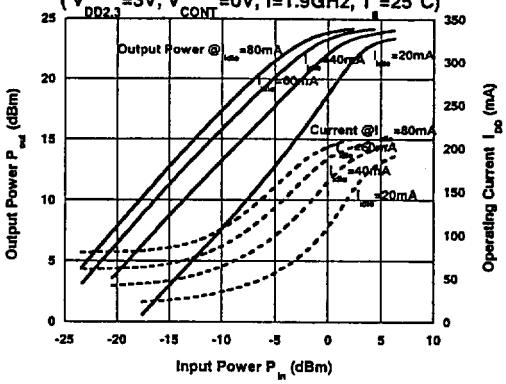
(V_{cont}=0V, I_{idle}=180mA@V_{DD}=3.6V, P_{out}=21dBm, f=1.9GHz, T_a=25°C)



■TYPICAL CHARACTERISTICS

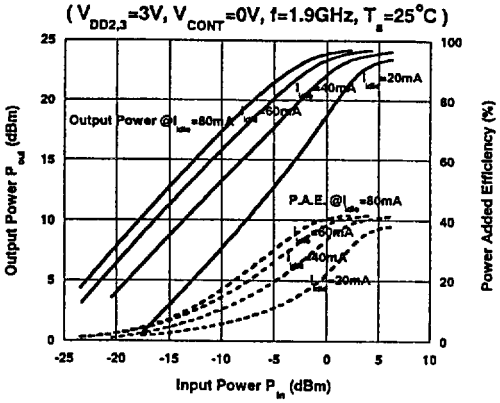
Output Power,Operating Current vs. Input Power

($V_{DD2,3}$=3V, V_{CONT}=0V, f=1.9GHz, T_a=25°C)



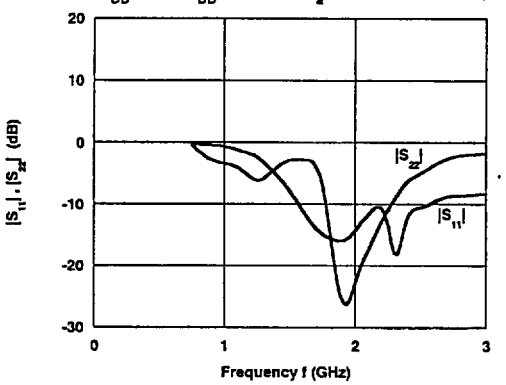
Output Power, P.A.E. vs. Input Power

($V_{DD2,3}$=3V, V_{CONT}=0V, f=1.9GHz, T_a=25°C)



$|S_{11}|$, $|S_{22}|$ vs. Frequency

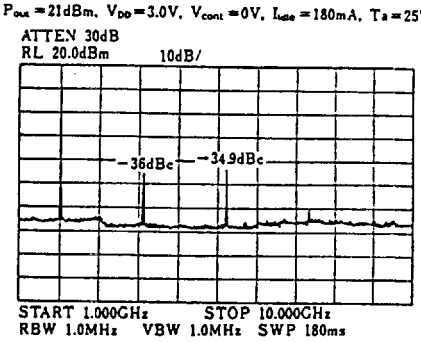
(V_{DD}=3.0V, I_{DD}=180mA, T_a=25°C, Vcont=0V)



Harmonic Spectrum

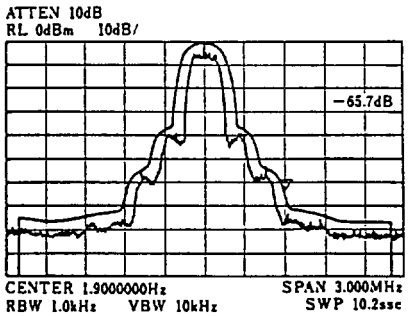
(Suppressed Level for Fundamental Signal Level)

(P_{out}=21dBm, V_{DD}=3.0V, V_{cont}=0V, I_{idle}=180mA, Ta=25°C)



Output Spectrum

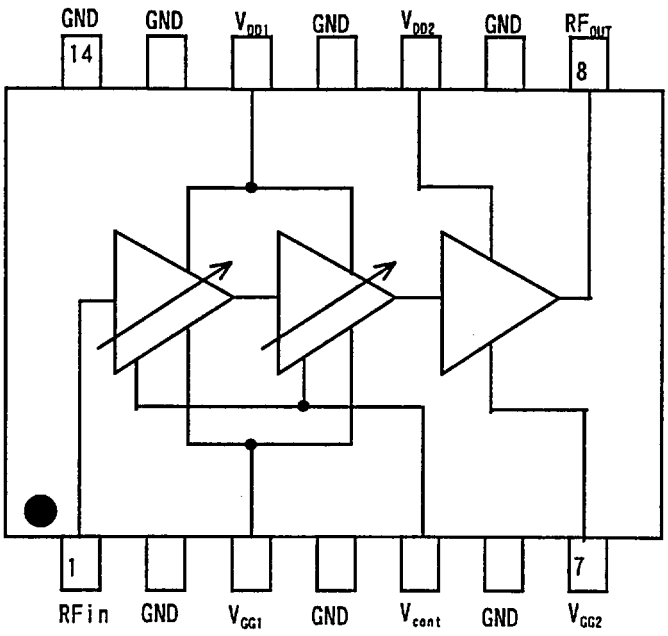
(V_{DD}=3.0V, I_{idle}=180mA, P_{out}=21dBm, V_{cont}=0V, Ta=25°C)



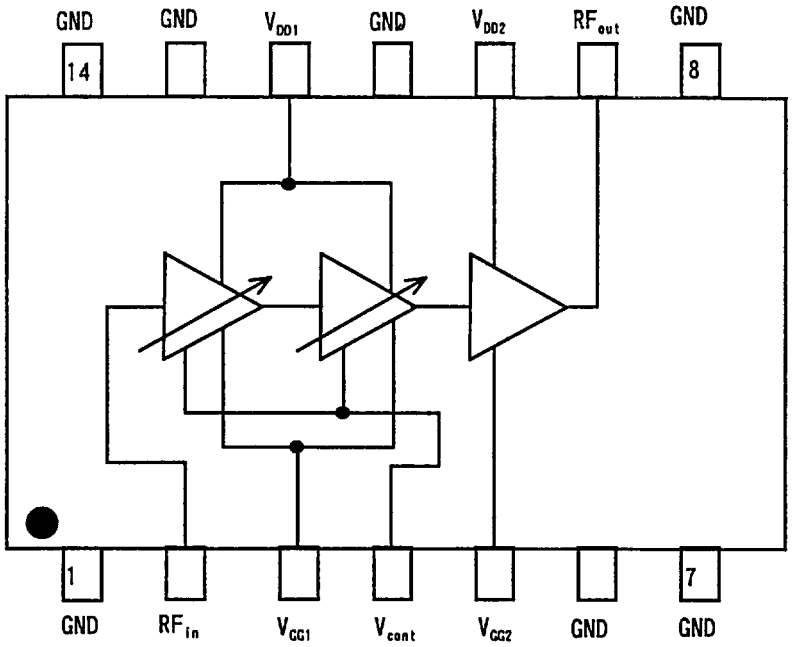
※All adjacent channel leakage power used in these characteristics are those of 600kHz offset for fundamental wave at PHS operating condition(π/4 QPSK)

■ BLOCK DIAGRAM

V Type

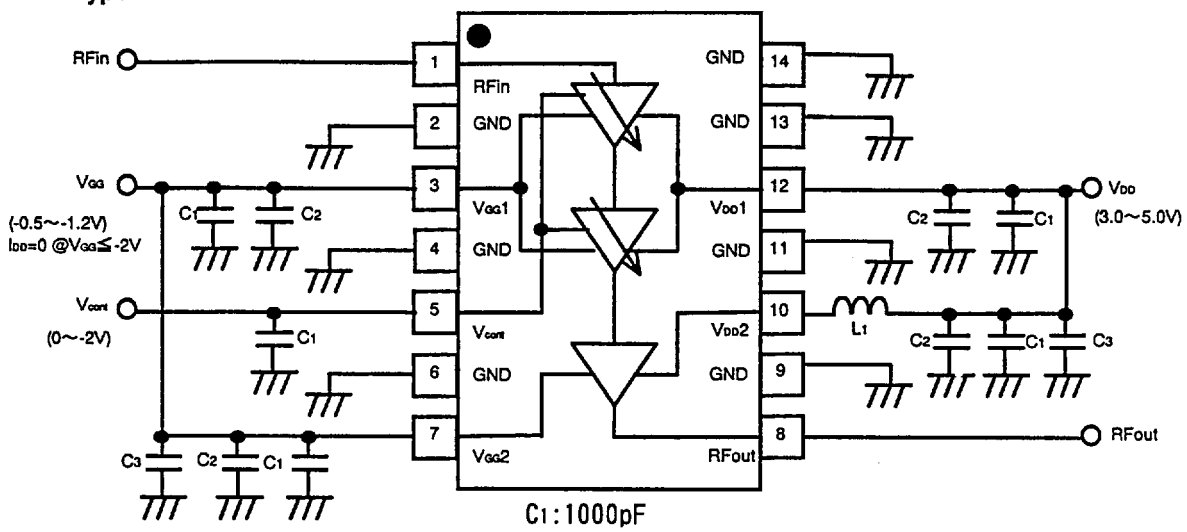


E Type



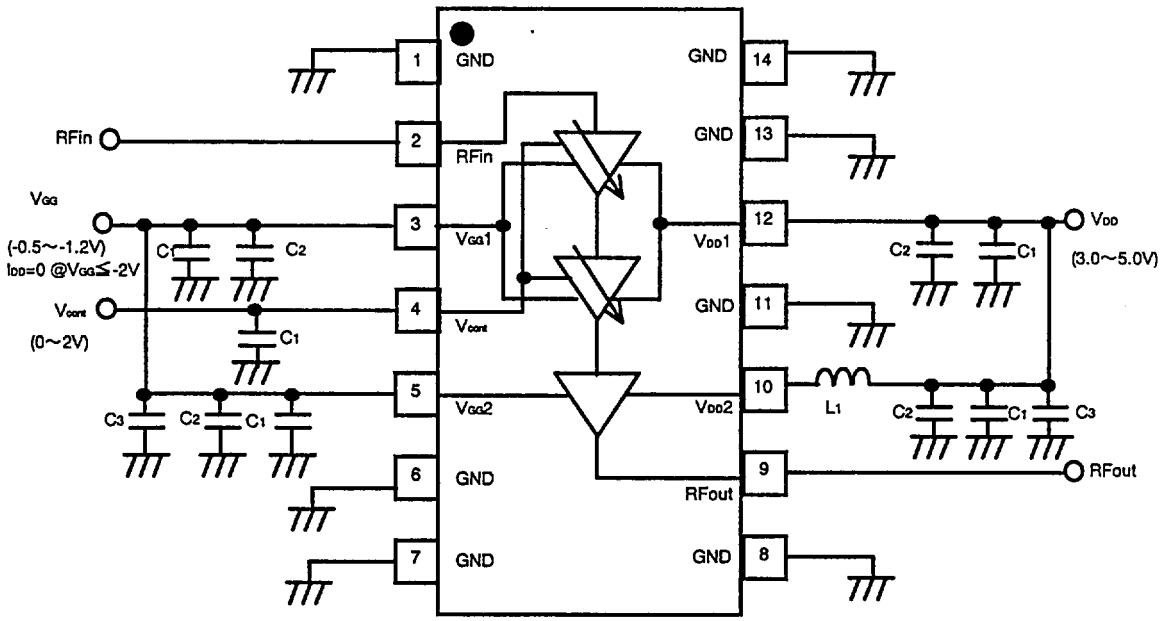
■RECOMMENDED CIRCUITS

V Type



C1:1000pF
C2:33pF
C3:1 μ F
L1:5nH

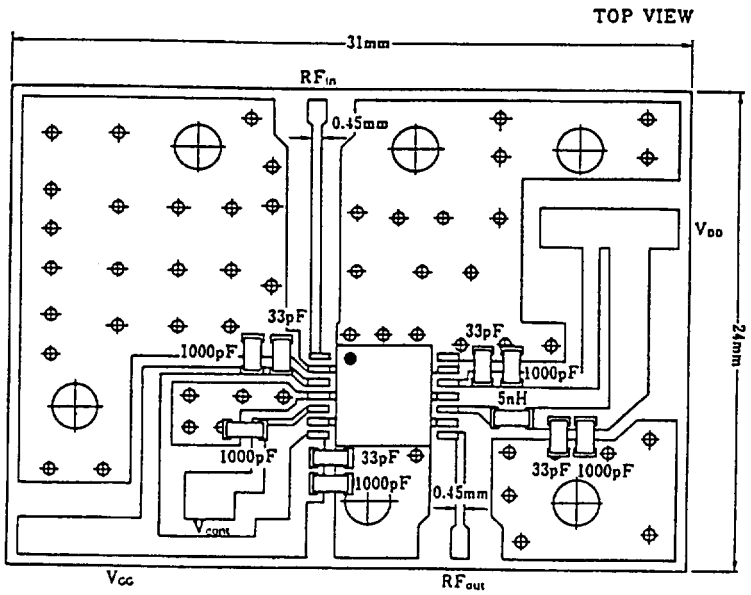
E Type



C1:1000pF
C2:33pF
C3:1 μ F
L1:10nH

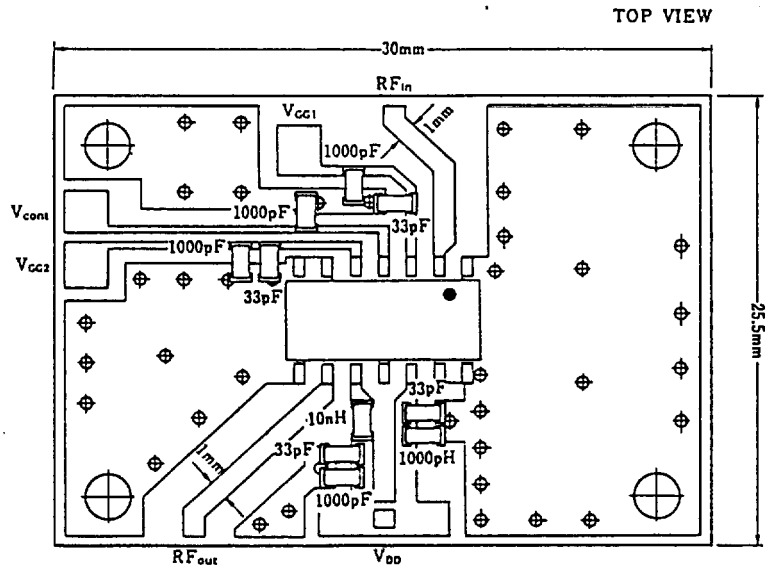
■RECOMMENDED PCB

V Type



PCB : FR4, t=0.2mm
CAPACITOR :
MURATA GRM39Serier
INDUCTOR :
TAIYO YUDEN HK2125Series

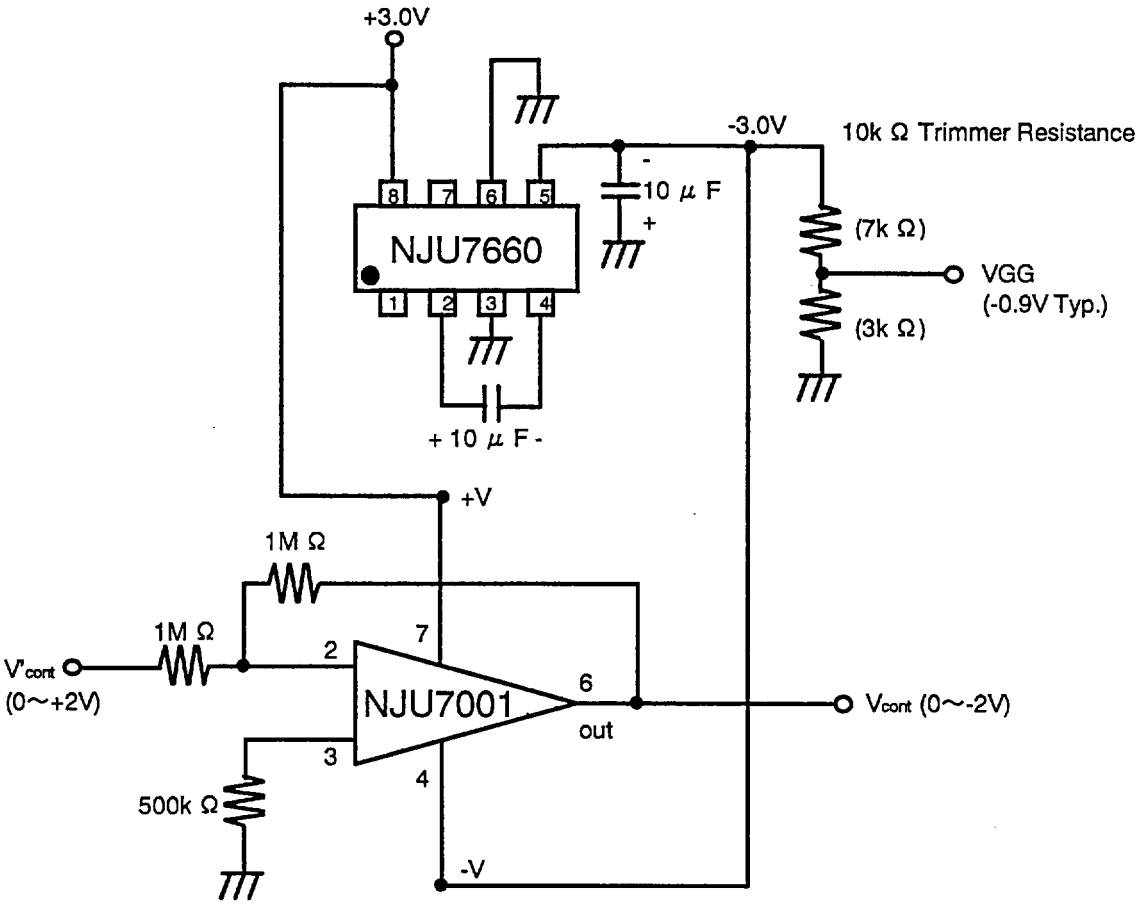
E Type



PCB : FR4, t=0.5mm
CAPACITOR :
MURATA GRM39Serier
INDUCTOR :
TAIYO YUDEN HK2125Series

The reflow method is recommended to install this device to PCB.

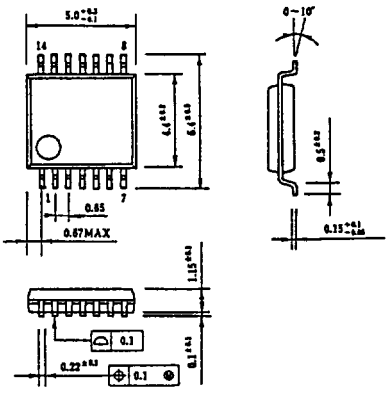
■RECOMMENDED CIRCUIT TO PRODUCE NEGATIVE VOLTAGE



■PACKAGE OUTLINE

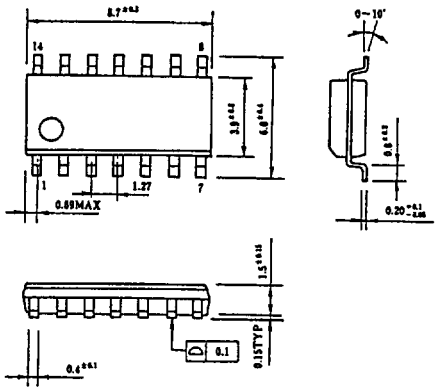
V Type

SSOP14



E Type

EMP14



UNIT:mm

Caution on using the products

A GaAs is used in this product. A GaAs is a harmful material.

- Don't eat or in the mouth.
- Don't dispose in fire or break up the products.
- Don't make a gas or a powdered with the chemical reaction.
- In the case of wasting the products, please obey the relation rule in the each country.

This product may be broken with static electric discharge or serge voltage.Therefore,please note a handling.

The other caution item

- The product specifications and descriptions listed in this catalog are subject to change at any time, without notice.
- We don't take upon ourselves the responsibilities that infringe on other people's rights of a patents bringing about the information and drawing in this catalog.
- It is not purpose to be equipped with the system needs a high reliability as air system, submarine cable system, atomic energy control system and medical instrument for keeping life.
- If you think the above system, please ask for the sales office before.