



TRANSMITTING GaAs POWER AMPLIFIER IC

■ GENERAL DESCRIPTION

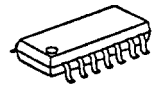
NJG1301 is a GaAs MMIC designed mainly for final stage power amplifier of PHS in Japan. It has input and output matching circuits internally, and it features low voltage and high efficiency operation. 21dBm output power is easily available with very low distortion.

Two types of small Plastic mold Package are adopted.

■ PACKAGE OUTLINE



NJG1301V



NJG1301E

■ APPLICATIONS

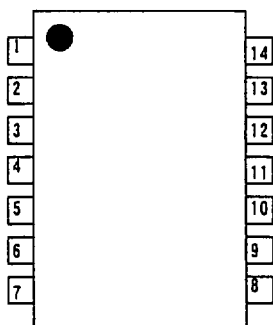
- PHS, Digital cordless phone
- Wireless LAN etc.

■ FEATURES

- Low voltage operation ($V_{DD}=3.0V$)
- Input and output internal matching circuits
- Low distortion ($P_{acp}=-60dBc$ Typ.@1.9GHz,21dBm)
- Low current consumption ($I_{DD}=185mA$ Typ.@1.9GHz,21dBm)
- Reduction of parasitic oscillation
- V type: SSOP14 Maximum Power Dissipation: 600mW($T_j=150^{\circ}C$,PCB: 24*30*1.0mm FR4)
- E type: EMP 14 Maximum Power Dissipation: 1000mW($T_j=150^{\circ}C$,PCB: 24*30*1.0mm FR4)

■ PIN CONFIGURATION

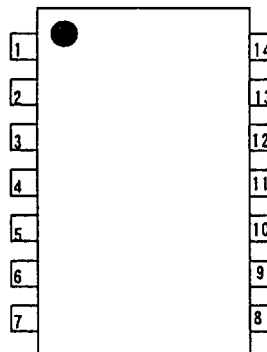
V Type
(Top View)



Pin Connection

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


■ ABSOLUTE MAXIMUM RATINGS
 $(Z_s=Z_o=50\text{ohm}, T_a=25^\circ\text{C})$

PARAMETER	SYMBOL	CONDITIONS	RATINGS	UNIT
Drain Voltage	V_{DD1}, V_{DD2}	$V_{GG1,2}=-0.9\text{V}$	6	V
Gate Voltage	V_{GG1}, V_{GG2}	$V_{DD1,2}=3.0\text{V}$	-4	V
Input Power	P_{in}	$V_{DD1,2}=3.0\text{V}, V_{GG1,2}=-0.9\text{V}$	10	dBm
Power Dissipation	P_D	24*30*1.0mm PCB : FR4, $T_j=150^\circ\text{C}$	(V Type) 600 (E Type) 1000	mW
Operating Temperature	T_{opr}		-30~+85	$^\circ\text{C}$
Storage Temperature	T_{stg}		-40~+150	$^\circ\text{C}$

■ ELECTRICAL CHARACTERISTICS
 $(f=1.9\text{GHz}, Z_s=Z_o=50\text{ohm}, T_a=25^\circ\text{C})$

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Frequency	freq	$V_{DD1,2}=3.0\text{V}$	1.89	-	1.92	GHz
Drain Voltage	$V_{DD1,2}$		2.9	3.0	5.0	V
Gate Voltage	$V_{GG1,2}$	$V_{DD1,2}=3.0\text{V}, I_{idle}=170\text{mA}$	-1.25	-0.9	-0.6	V
Idle Current *1	I_{idle}	$V_{DD1,2}=3.0\text{V}$, No RF Signal	165	170	175	mA
Operating Current *1	I_{DD}	$P_{out}=21\text{dBm}, V_{DD1,2}=3.0\text{V}$	170	185	195	mA
Gate Current *2	I_{GG}	$P_{out}=21\text{dBm}, V_{DD1,2}=3.0\text{V}$	-150	-70	-	uA
Small Signal Gain	Gain	$V_{DD1,2}=3.0\text{V}, I_{idle}=170\text{mA}$	20	23	26	dB
Gain Flatness	G_{flat}	$V_{DD1,2}=3.0\text{V}, I_{idle}=170\text{mA}$	0.0	0.5	1.0	dB
Pout at 1dB	P_{-1dB}	$V_{DD1,2}=3.0\text{V}$	21	22	-	dBm
Compression						
Adjacent Channel Leakage Power ①	P_{accp1}	$P_{out}=21\text{dBm}$, offset=600kHz, $P_{in}; \pi/4$ QPSK, $V_{DD1,2}=3.0\text{V}$	-	-60	-55	dBc
Adjacent Channel Leakage Power ②	P_{accp2}	$P_{out}=21\text{dBm}$, offset=900kHz, $P_{in}; \pi/4$ QPSK, $V_{DD1,2}=3.0\text{V}$	-	-65	-60	dBc
Harmonics	P_{sp}	$P_{out}=21\text{dBm}, V_{DD1,2}=3.0\text{V}$	-	-35	-30	dBc
Input VSWR	$VSWR_i$	$V_{DD1,2}=3.0\text{V}$	-	-	2.2	
Load VSWR Tolerance		$P_{out}=21\text{dBm}, V_{DD1,2}=3.0\text{V}$ Load VSWR=4:1, All Phase	Parasitic Oscillation for Fundamental Signal Level : $\leq -60\text{dBc}$			

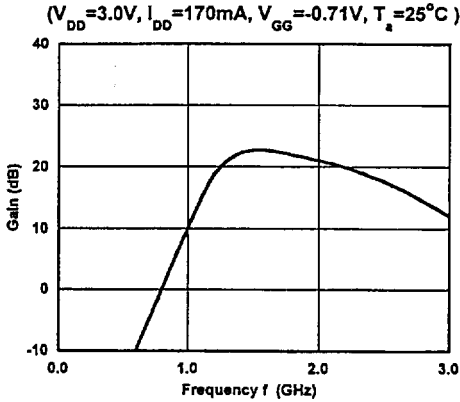
*1 ; V_{DD1} Terminal and V_{DD2} Terminal Total Current.

*2 ; V_{GG1} Terminal and V_{GG2} Terminal Total Current.

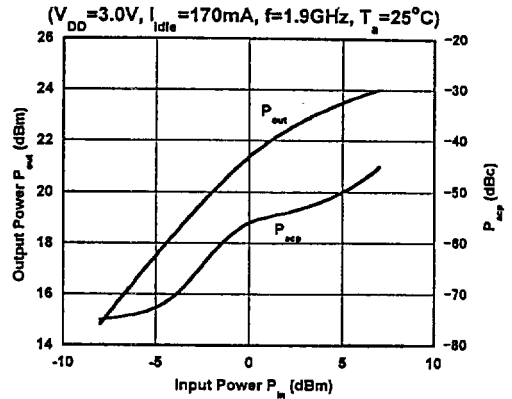


TYPICAL CHARACTERISTICS

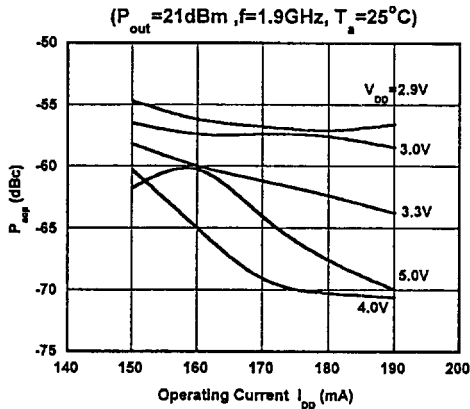
Gain vs. Frequency



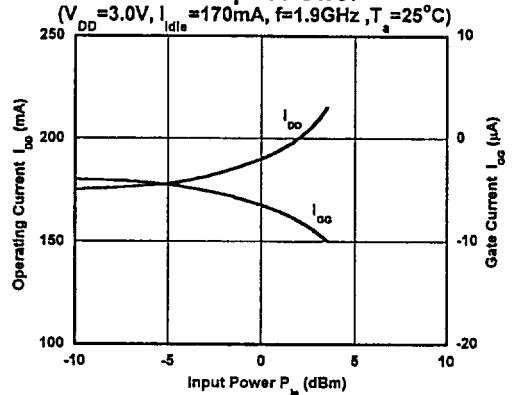
Output Power, P_{acp} vs. Input Power



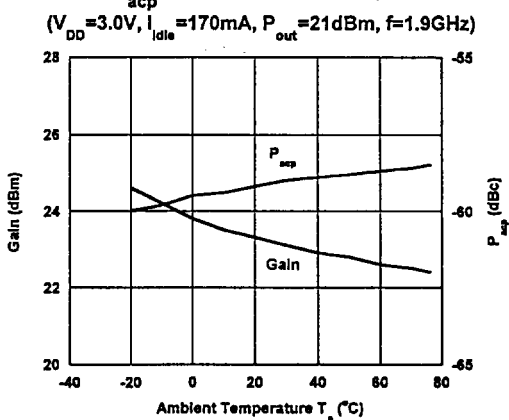
P_{acp} vs. Operating Current vs. V_{DD}



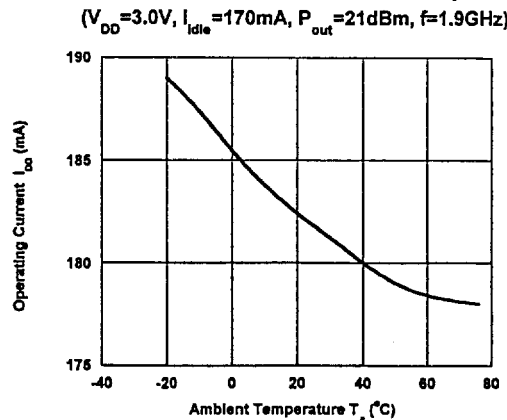
Operating Current, Gate Current vs. Input Power



Gain, P_{acp} vs. Ambient Temperature



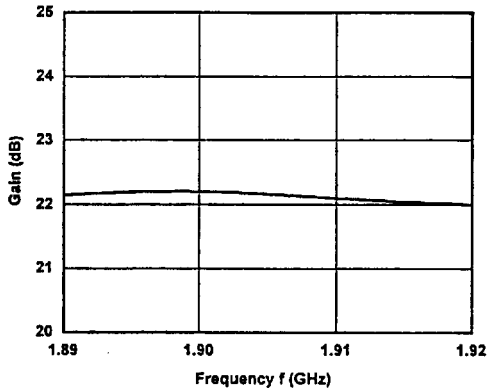
Operating Current vs. Ambient Temperature



TYPICAL CHARACTERISTICS

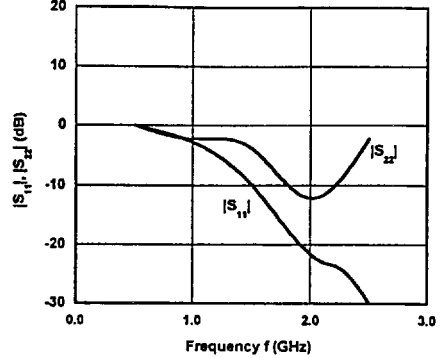
Gain vs. PHS Band Frequency

($V_{DD} = 3.0V, I_{DD} = 170mA, V_{GG} = -0.71V, T_a = 25^\circ C$)



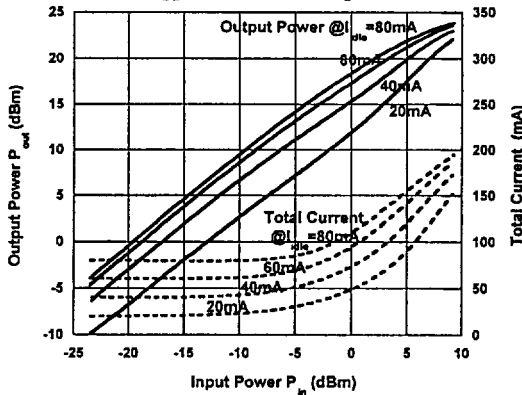
$|S_{11}|, |S_{22}|$ vs. Frequency

($V_{DD} = 3.0V, I_{DD} = 170mA, T_a = 25^\circ C$)



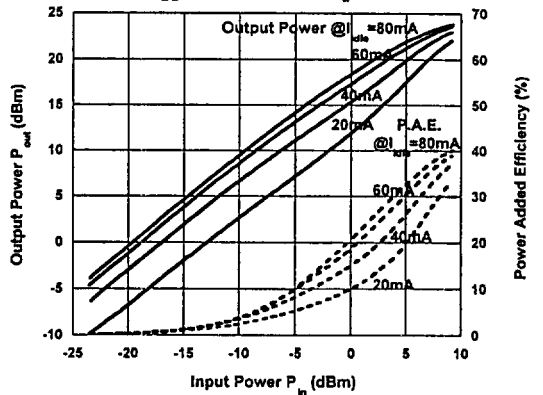
Output Power, Total Current vs. Input Power

($V_{DD} = 3V, f = 1.9GHz, T_a = 25^\circ C$)



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

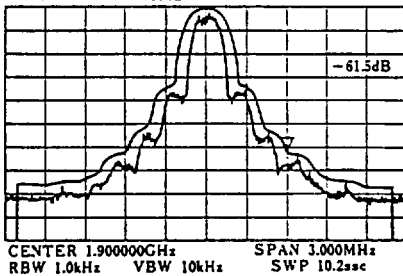
($V_{DD} = 3V, f = 1.9GHz, T_a = 25^\circ C$)



Output Spectrum

($V_{DD} = 3.0V, I_{DD} = 170mA, P_{out} = 21dBm, T_a = 25^\circ C$)

ATTEN 10dB
RL 0dBm

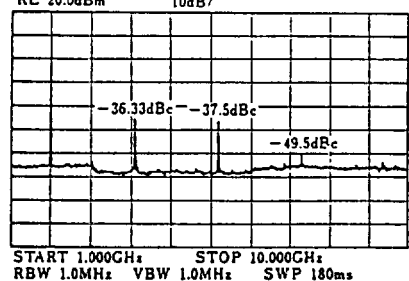


Harmonic Spectrum

(Suppressed Level for Fundamental Signal Level)

($P_{out} = 21dBm, V_{DD} = 3.0V, I_{DD} = 170mA, T_a = 25^\circ C$)

ATTEN 30dB
RL 20.0dBm

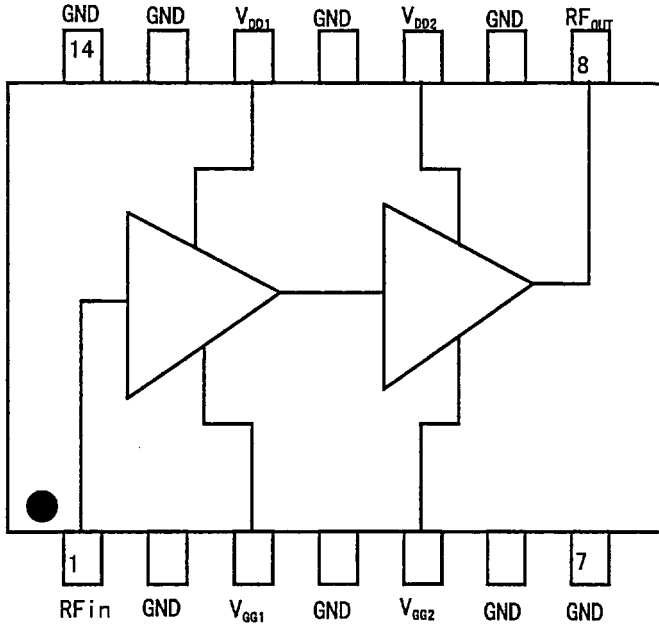


All adjacent channel leakage power used in these characteristics are those of 600KHz offset for fundamental wave at PHS operating condition($\pi/4$ QPSK)

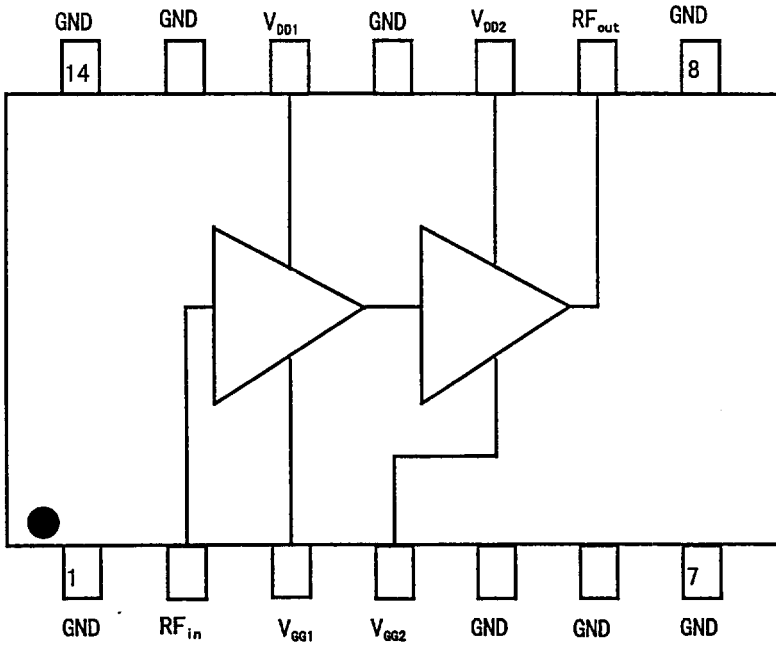


■ BLOCK DIAGRAM

V Type



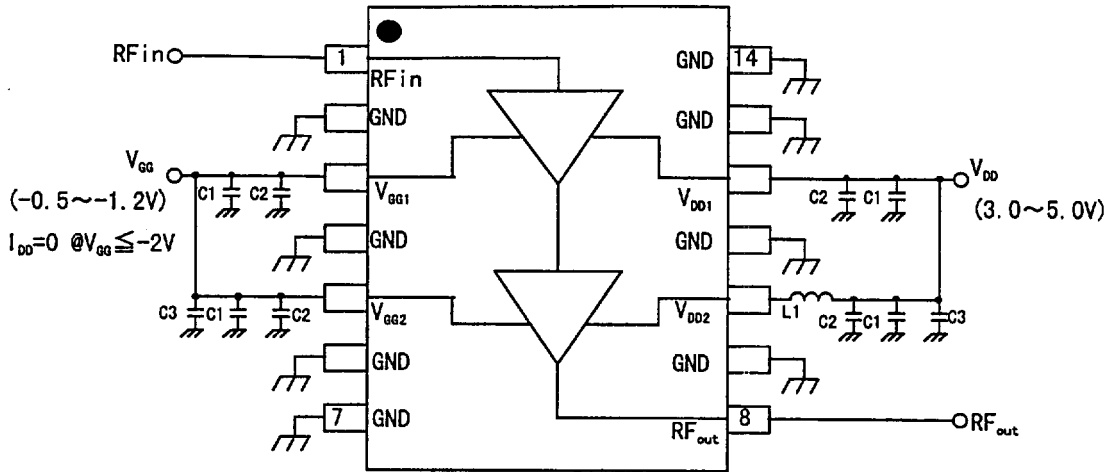
E Type





RECOMMENDED CIRCUITS

V Type



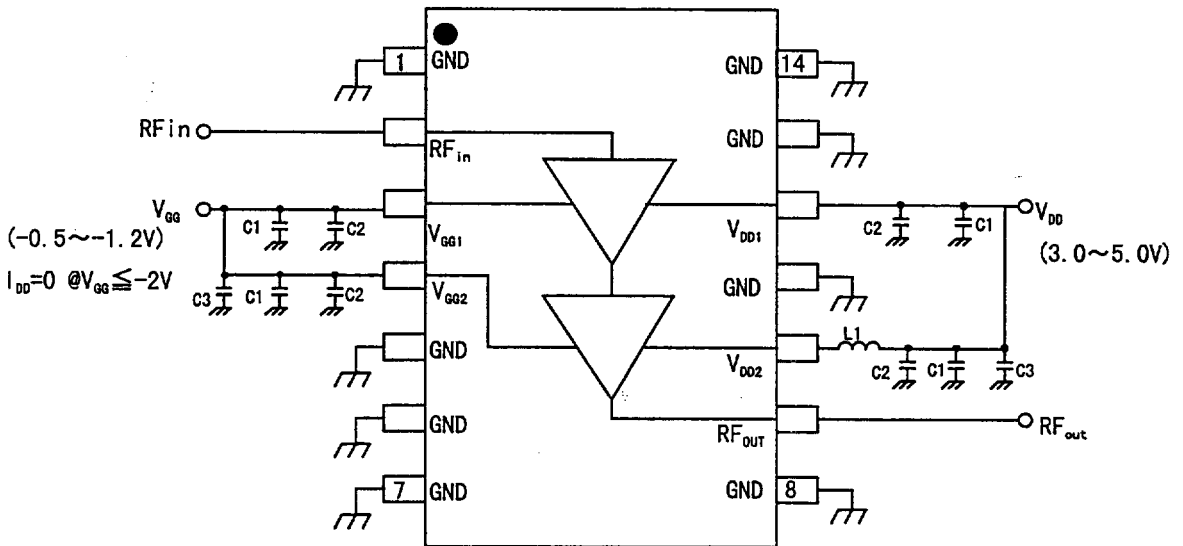
C1: 1000pF

C2: 33pF

C3: 1 μ F

C4: 5nH

E Type



C1: 1000pF

C2: 33pF

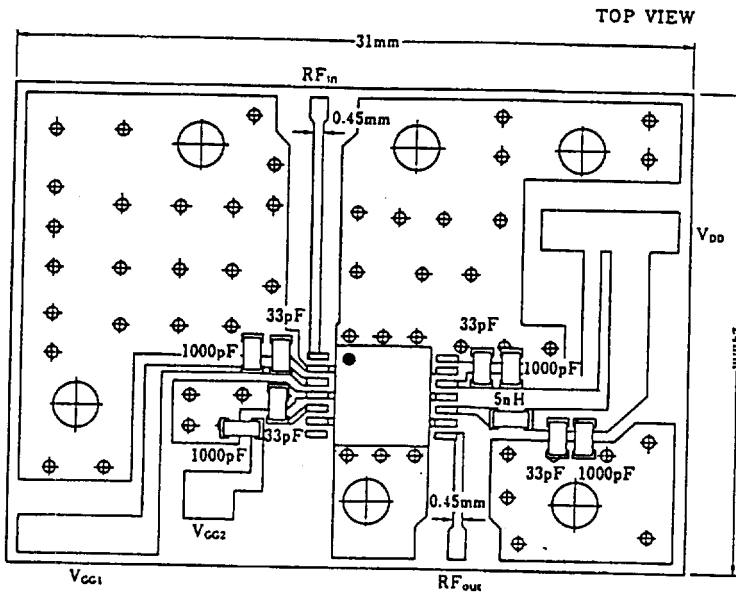
C3: 1 μ F

C4: 10nH



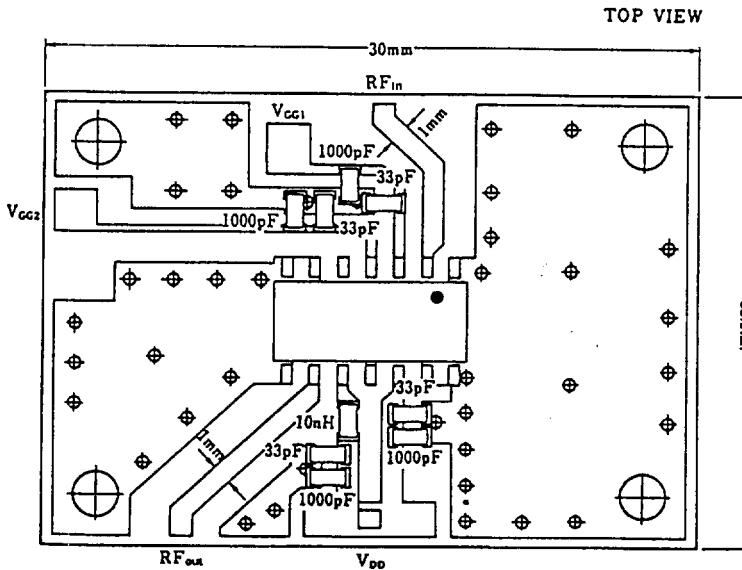
RECOMMENDED PCB DESIGN

V Type



PCB : FR4, t=0.2mm
 CAPACITOR :
 MURATA GRM39Series
 INDUCTOR :
 TAIYOYUDEN HK2125Series

E Type

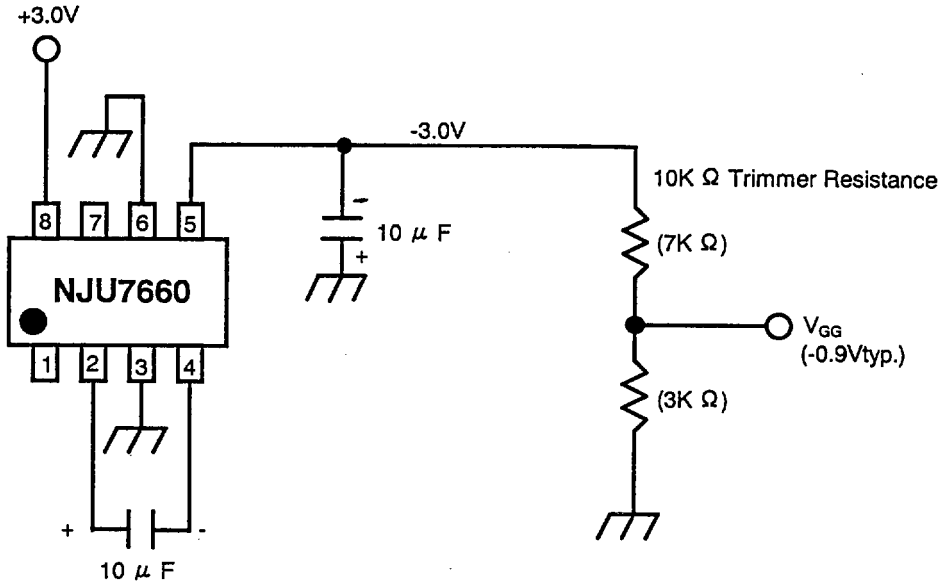


PCB : FR4, t=0.5mm
 CAPACITOR :
 MURATA GRM39Series
 INDUCTOR :
 TAIYO YUDEN HK2125Series

The reflow method recommended to install this device to PCB



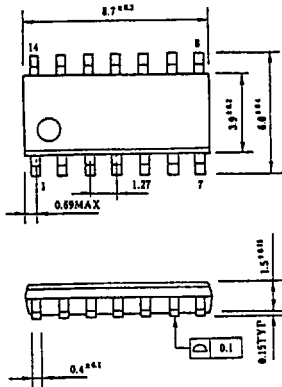
RECOMMENDED CIRCUIT TO PRODUCE NEGATIVE VOLTAGE



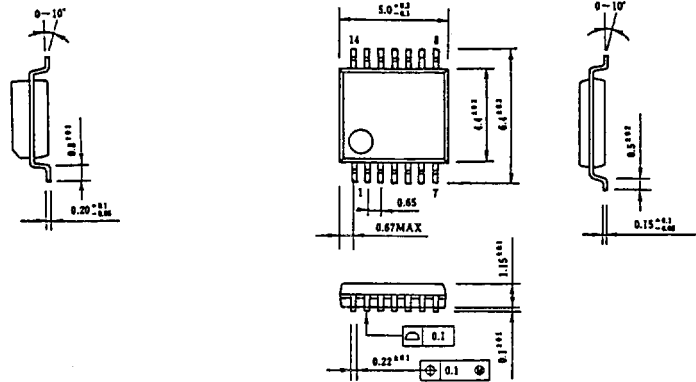


■ PACKAGE OUTLINE

EMPI4



SSOP14



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.