GaAs SPDT SWITCH IC

■ GENERAL DESCRIPTION

NJG1512V is a GaAs SPDT switch IC featuring a high isolation and low loss.

In the wide frequency range from 1MHz to 3GHz, this switch operates at low voltage from 2.5V.

A very small package is adopted.

It is suited for the switching of sending and receiving of the synthesizer.

■ PACKAGE OUTLINE

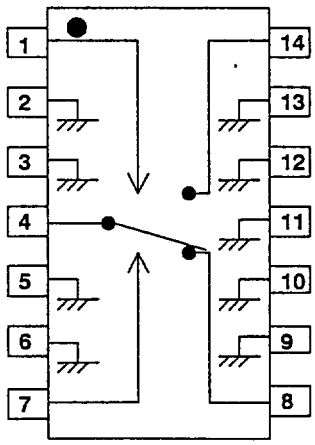
NJG1512V

■ FEATURE

●Single and low control voltage	+2.5～+5.5V
●High isolation	46dB Typ.@f=0.1～2GHz,P_{in}=0dBm
●Low insertion loss	0.8dB Typ.@f=2GHz,P_{in}=0dBm
●Low control current	2 μ A Typ.@f=0.1～2.5GHz,P_{in}=10dBm
●Small package	SSOP14

■ PIN CONFIGURATION

V TYPE
(Top View)



Pin Connection

1. V_{CTR2}
2. GND
3. GND
4. PC
5. GND
6. GND
7. V_{CTR1}
8. P1
9. GND
10. GND
11. GND
12. GND
13. GND
14. P2

■ TRUTH TABLE

"H"=$V_{CTR(H)}$, "L"=$V_{CTR(L)}$

V_{CTR1}	H	L	L	H
V_{CTR2}	L	H	L	H
PC-P1	OFF	ON	–	–
PC-P2	ON	OFF	–	–

■ ABSOLUTE MAXIMUM RATING

(T_a=25℃)

PARAMETER	SYNBOL	RATING	UNIT
Input Power	P_{in}	27	dBm
Control Voltage	V_{CTR}	6	V
Power Dissipation	P_D	600	mW
Operating Temp.	T_{opr}	-30～+85	℃
Storage Temp.	T_{stg}	-40～+150	℃

■ ELECTRICAL CHARACTERISTICS 1

(TEST CIRCUIT 1 : $V_{CTR(L)}$=0V、$V_{CTR(H)}$=2.7V、Z_S=Z_O=50ohm、Ta=25℃)

PARAMETER	SYNBOL	CONDITION	MIN	TYP	MAX	UNIT
Control Voltage(L)	$V_{CTR(L)}$	f=0.1～2.5GHz,P_{in}=10dBm	-0.2	0	0.2	V
Control Voltage(H)	$V_{CTR(H)}$	f=0.1～2.5GHz,P_{in}=10dBm	2.5	2.7	5.5	V
Control Current	I_{CTR}	f=0.1～2.5GHz,P_{in}=10dBm	-	2.0	4.0	uA
Isolation1	ISL1	f=0.1～2GHz,P_{in}=0dBm	43	46	-	dB
Insertion Loss 1	LOSS1	f=1GHz,P_{in}=0dBm	-	0.6	1.0	dB
Insertion Loss 2	LOSS2	f=2GHz,P_{in}=0dBm	-	0.8	1.2	dB
Input Power at 1dB Compression	P-1dB	f=2GHz	19.0	22.0	-	dBm
VSWR	V.S.W.R	f=0.1～2.5GHz,ON STATE	-	1.5	1.8	
Switching Speed	T_{SW}	f=0.1～2.5GHz	—	8	—	ns

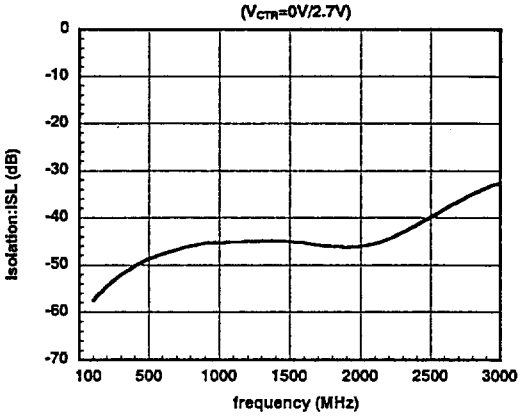
■ ELECTRICAL CHARACTERISTICS 2

(TEST CIRCUIT 2 : $V_{CTR(L)}$=0V、$V_{CTR(H)}$=2.7V、Z_S=Z_O=50ohm、Ta=25℃)

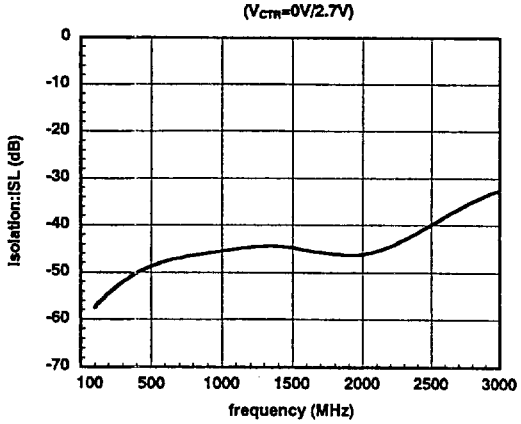
PARAMETER	SYNBOL	CONDITION	MIN	TYP	MAX	UNIT
Isolation2	ISL2	f=1～100MHz,P_{in}=0dBm	—	55	-	dB
Insertion Loss 3	LOSS3	f=1～100MHz,P_{in}=0dBm	-	0.5	—	dB

■ TYPICAL CHARACTERISTICS

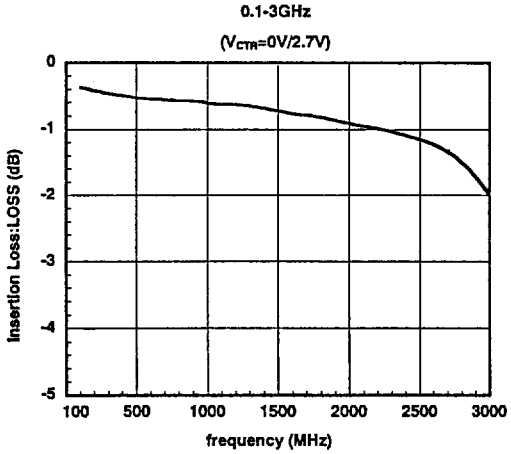
PC-P1 Isolation



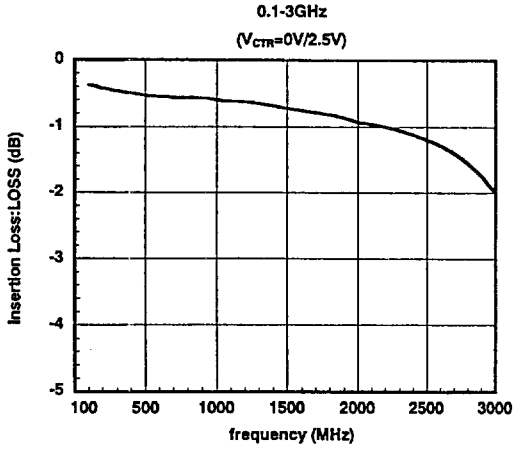
PC-P2 Isolation



PC-P1 Insertion Loss



PC-P2 Insertion Loss

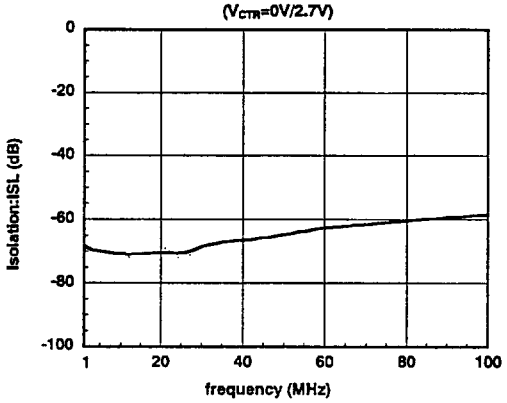


■ TYPICAL CHARACTERISTICS

PC-P1 Isolation

1-100MHz

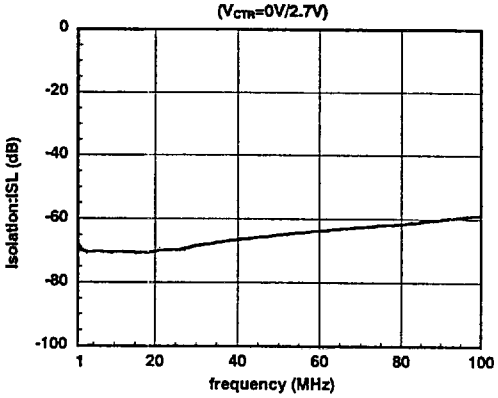
(V_{CTR}=0V/2.7V)



PC-P2 Isolation

1-100MHz

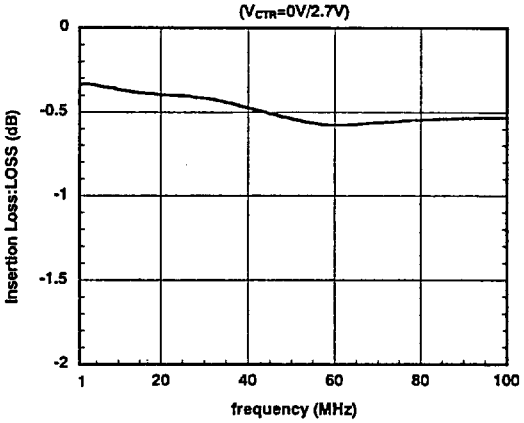
(V_{CTR}=0V/2.7V)



PC-P1 Insertion Loss

1-100MHz

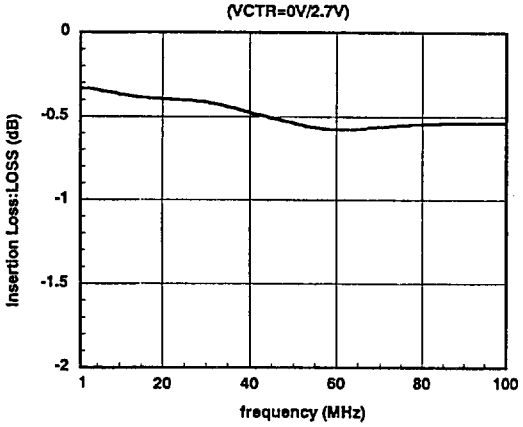
(V_{CTR}=0V/2.7V)



PC-P2 Insertion Loss

1-100MHz

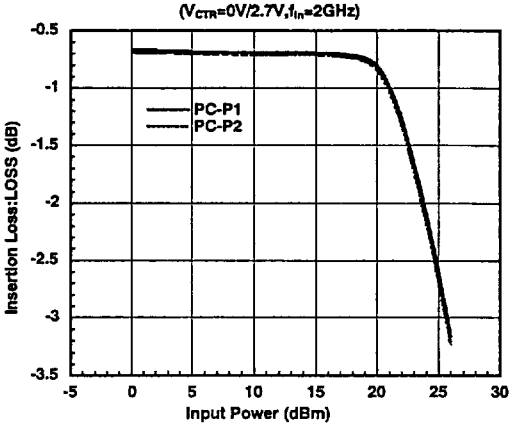
(VCTR=0V/2.7V)



■ TYPICAL CHARACTERISTICS

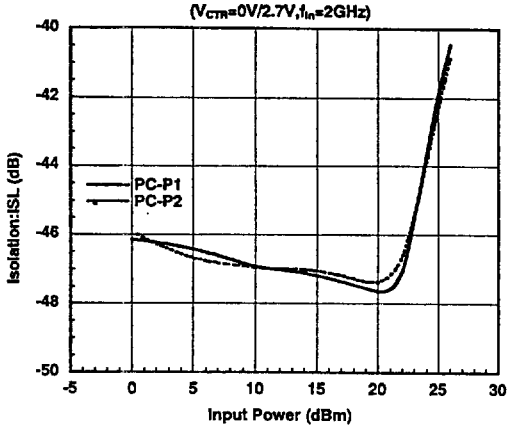
Insertion Loss vs. Input Power

(V_{CTR}=0V/2.7V,f_{in}=2GHz)



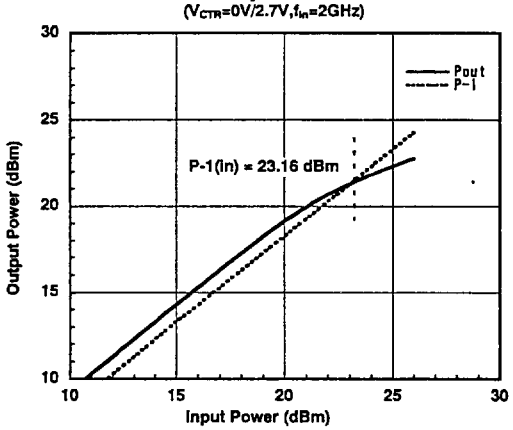
Isolation vs. Input Power

(V_{CTR}=0V/2.7V,f_{in}=2GHz)



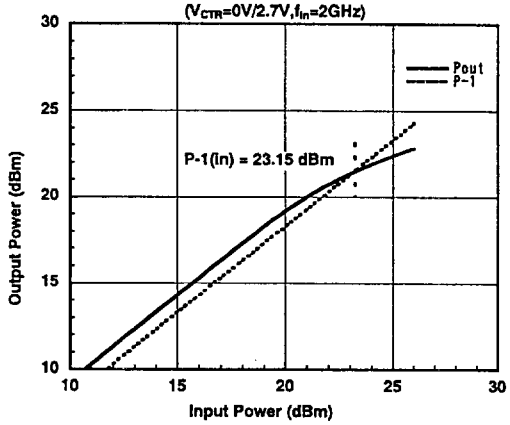
(PC-P1) Output Power vs. Input Power

(V_{CTR}=0V/2.7V,f_{in}=2GHz)



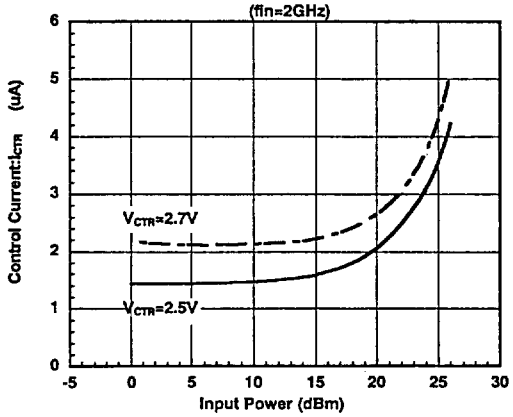
(PC-P2) Output Power vs. Input Power

(V_{CTR}=0V/2.7V,f_{in}=2GHz)



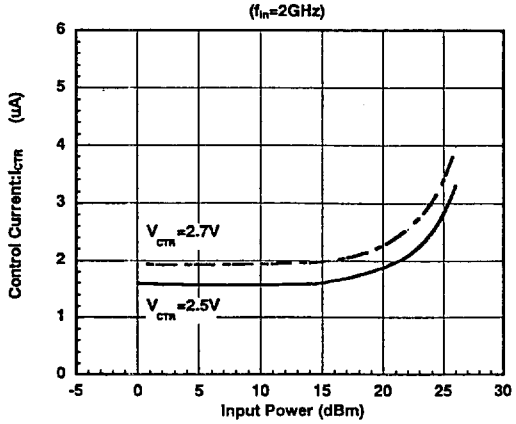
(PC-P1) Control Current vs. Input Power

(fin=2GHz)



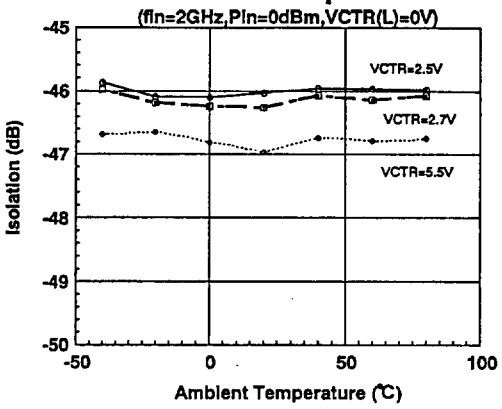
(PC-P2) Control Current vs. Input Power

(f_{in}=2GHz)

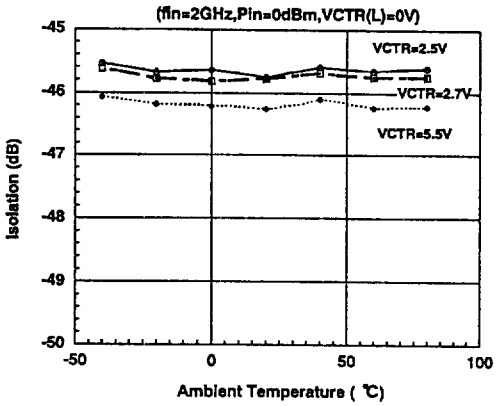


■ TYPICAL CHARACTERISTICS

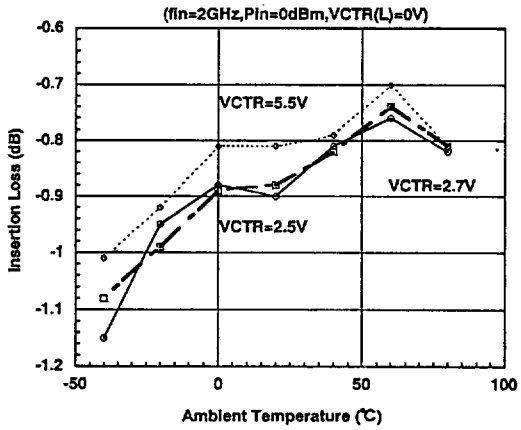
PC-P1,Isolation vs. Ambient Temperature



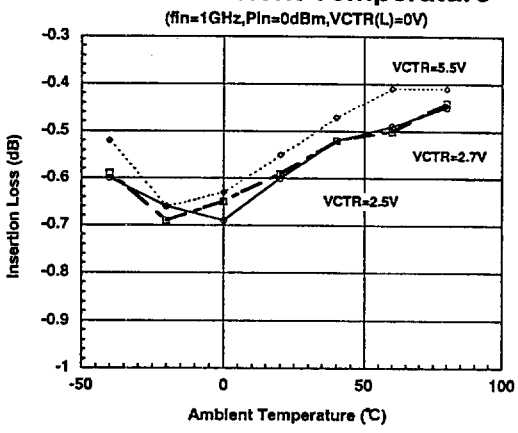
PC-P2,Isolation vs. Ambient Temperature



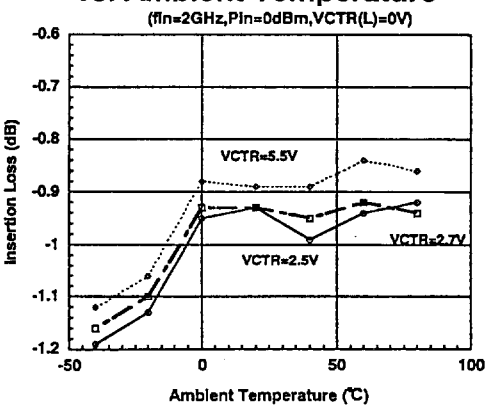
PC-P1,Insertion vs. Ambient Temperature



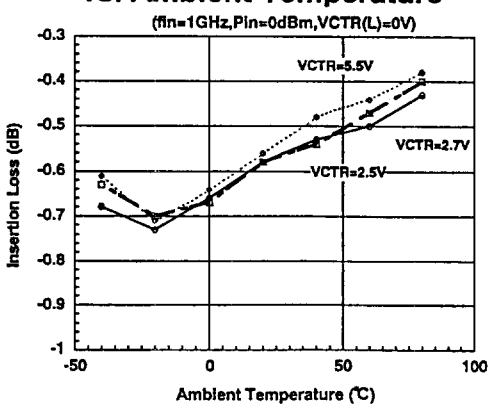
PC-P1,Insertion vs. Ambient Temperature



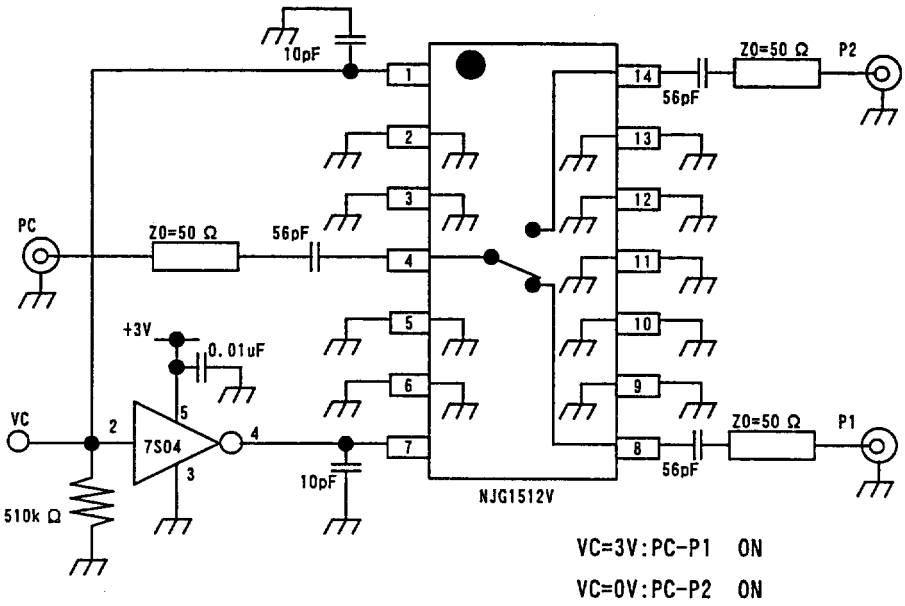
PC-P2,Insertion Loss vs. Ambient Temperature



PC-P2,Insertion vs. Ambient Temperature

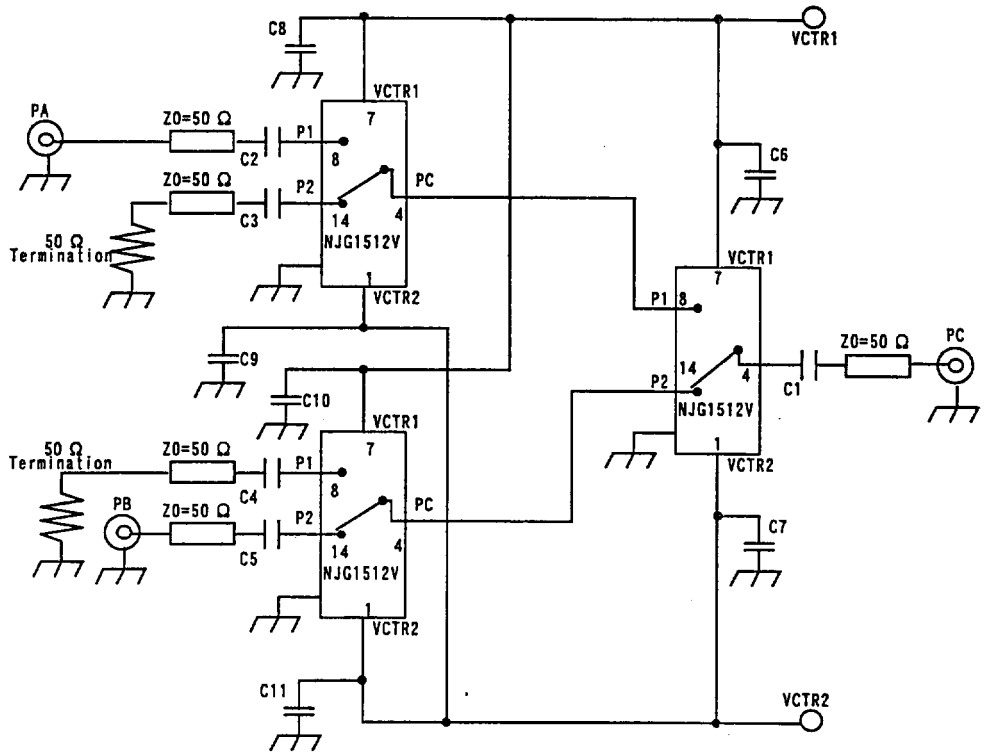


■ **Applications Circuit**: Single signal control circuit using C-MOS inverter

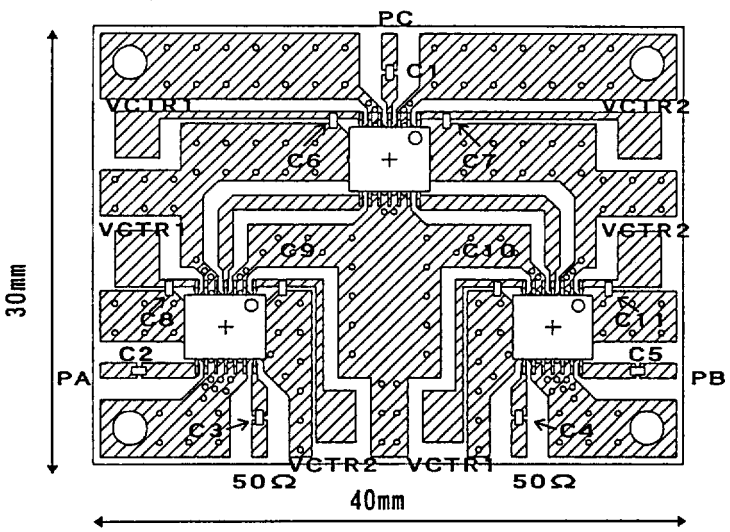


[1] Please connect the bi- pass capacitor to C-MOS inverter supply terminal.
[2] In order to keep the state of input impedance of inverter, Please pull-down with 510 k Ω of resister for C-MOS inverter input terminal.

■ **Applications Circuit2**: High Isolation SPDT Switch
(PA to PC,PB to PC,and PA to PB Isolation is greater then 70dB@fin=0.7~2GHz)



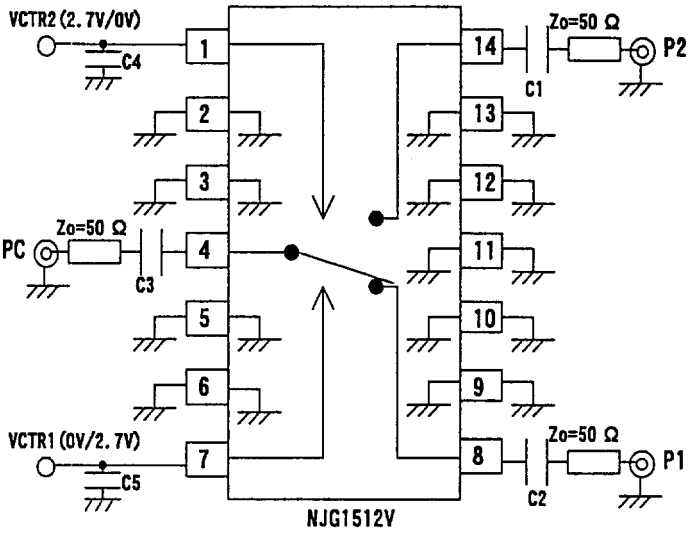
■**PCB design**



PCB:FR-4 t=0.5mm
STRIPLINE WIDTH=1mm
CAPACITOR:size 1005
C1—C5:56pF
C6—C11:10pF

NOTE: As the above schematic,two 50 Ω port should be terminate externally.

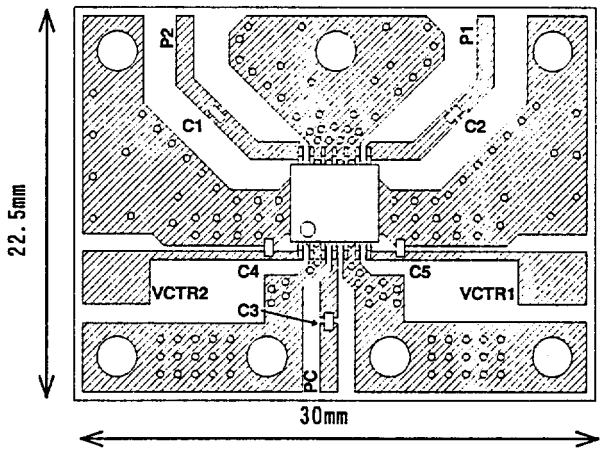
■ TEST CIRCUIT



	Test Circuit 1 0.5～2GHz	Test Circuit 2 1～500MHz
C1～C3	56pF	1000pF
C4,C5	10pF	1000pF

■ RECOMMMENDED PCB DESING

(TOP VIEW)



PCB:FR-4 t=0.5mm
STRIP LINE WIDTH=1mm
CAPACITOR:size 1005

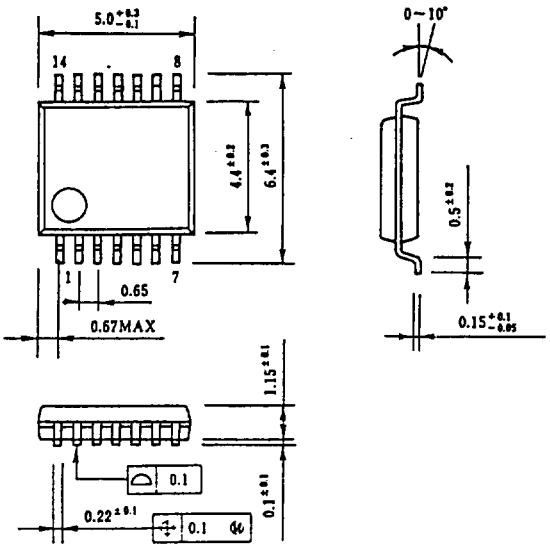
Usage precaution on device

[1] Outer capacitors should be connected to the input and output RF frequency terminals(P1,P2,PC)to block the DC current. The values of these capacitors depend on RF frequency. Please use 1000pF at 1～500MHz,and 56pF at 500MHz～2GHz.

[2] Decoupling capacitor should be connected to the control terminals (V_{CTR1},V_{CTR2})as near as possible. The value of these capacitors should be selected to 1000pF at 1～500MHz,and 10pF at 500MHz～2GHz. But take care of the switching time because the capacitors make the switching time late.

[3] In order to keep good isolation characteristics, the grand terminal (2,3,5,6,9～13 pin) should be connected to ground pattern with relatively wide width as near as possible, and Through-hole in the ground plane should be placed as near as possible too.

■ PACKAGE OUTLINE



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 dipose in fire or break up the this 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.