



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

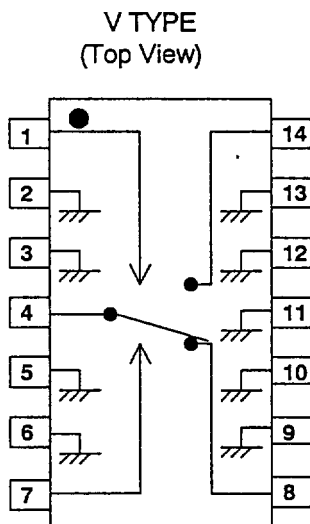


NJG1512V

■ 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



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
 $(T_a=25^{\circ}\text{C})$

PARAMETER	SYMBOL	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	$^{\circ}\text{C}$
Storage Temp.	T_{stg}	-40~+150	$^{\circ}\text{C}$

■ ELECTRICAL CHARACTERISTICS 1
 $(\text{TEST CIRCUIT 1 : } V_{CTR(L)}=0\text{V, } V_{CTR(H)}=2.7\text{V, } Z_S=Z_O=50\text{ohm, } T_a=25^{\circ}\text{C})$

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

■ ELECTRICAL CHARACTERISTICS 2
 $(\text{TEST CIRCUIT 2 : } V_{CTR(L)}=0\text{V, } V_{CTR(H)}=2.7\text{V, } Z_S=Z_O=50\text{ohm, } T_a=25^{\circ}\text{C})$

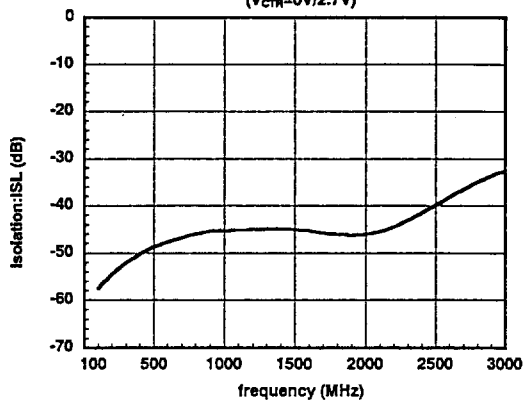
PARAMETER	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
Isolation2	ISL2	$f=1\sim 100\text{MHz, } P_{in}=0\text{dBm}$	-	55	-	dB
Insertion Loss 3	LOSS3	$f=1\sim 100\text{MHz, } P_{in}=0\text{dBm}$	-	0.5	-	dB



■ TYPICAL CHARACTERISTICS

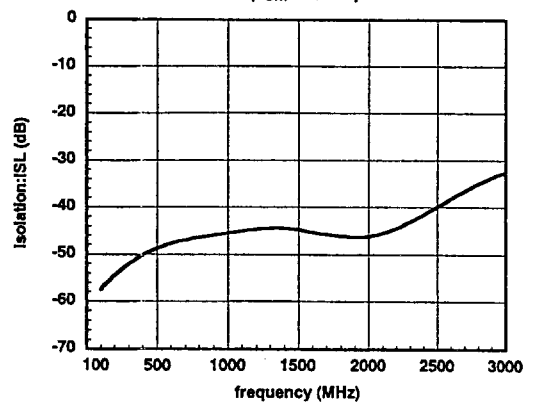
PC-P1 Isolation

0.1-3GHz
($V_{CTR}=0V/2.7V$)



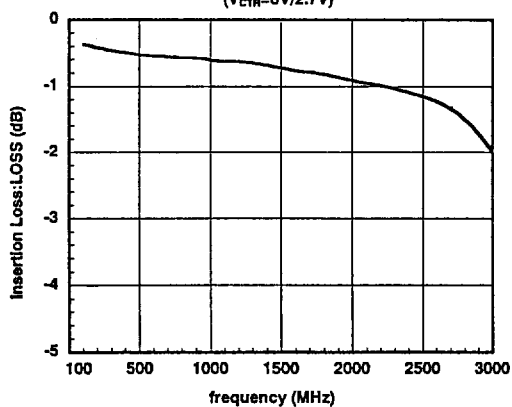
PC-P2 Isolation

0.1-3GHz
($V_{CTR}=0V/2.7V$)



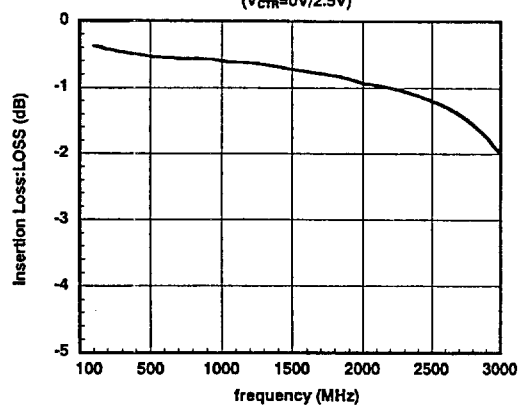
PC-P1 Insertion Loss

0.1-3GHz
($V_{CTR}=0V/2.7V$)



PC-P2 Insertion Loss

0.1-3GHz
($V_{CTR}=0V/2.5V$)

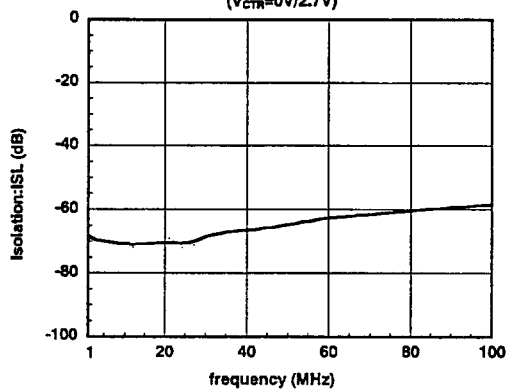




■ TYPICAL CHARACTERISTICS

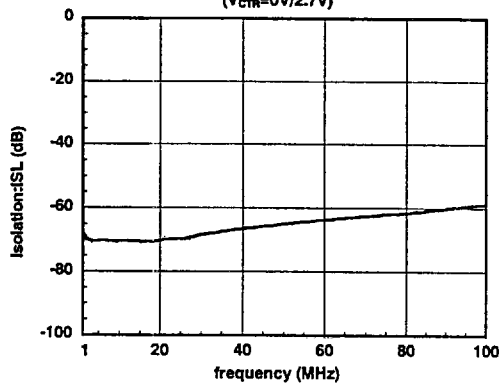
PC-P1 Isolation

1-100MHz
($V_{CTR}=0V/2.7V$)



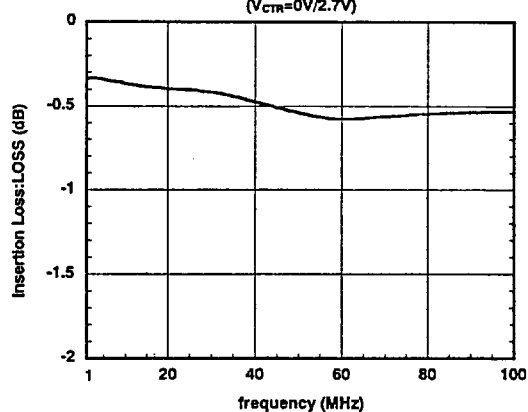
PC-P2 Isolation

1-100MHz
($V_{CTR}=0V/2.7V$)



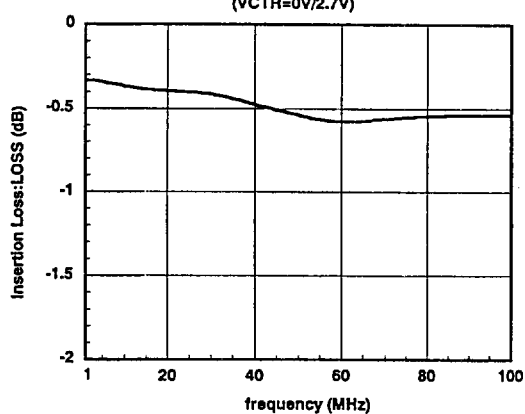
PC-P1 Insertion Loss

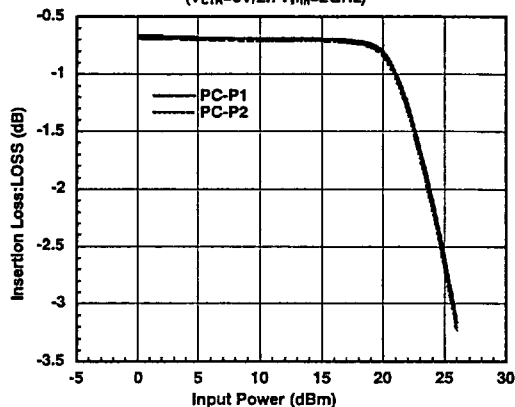
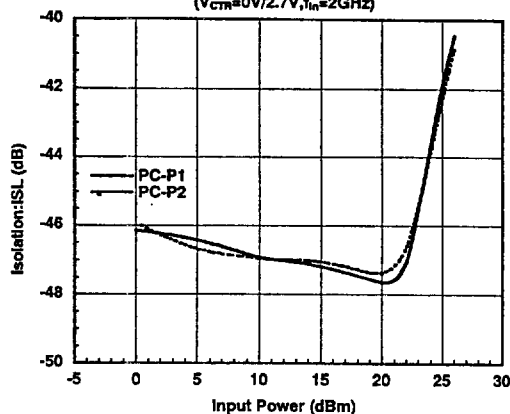
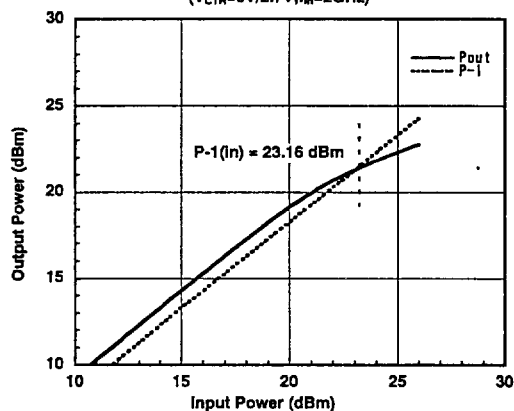
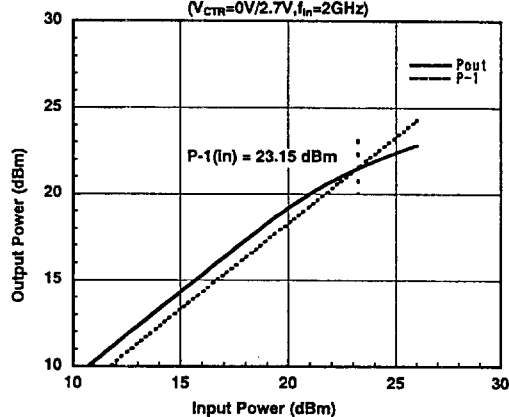
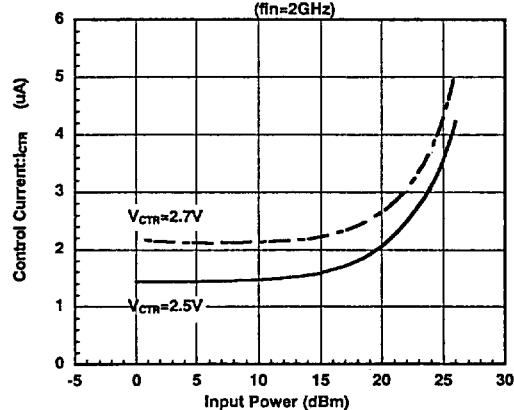
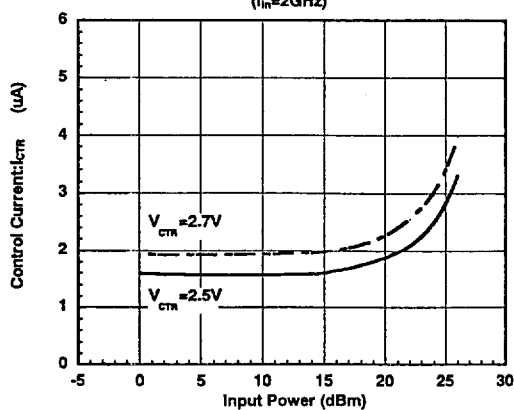
1-100MHz
($V_{CTR}=0V/2.7V$)

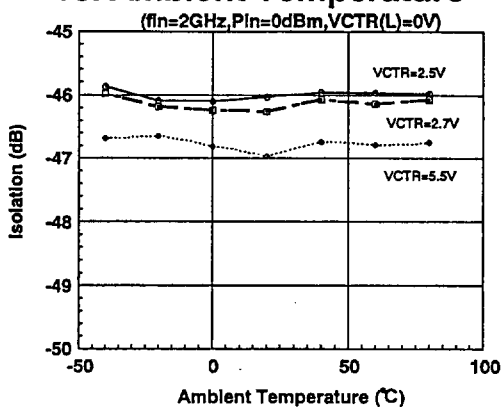
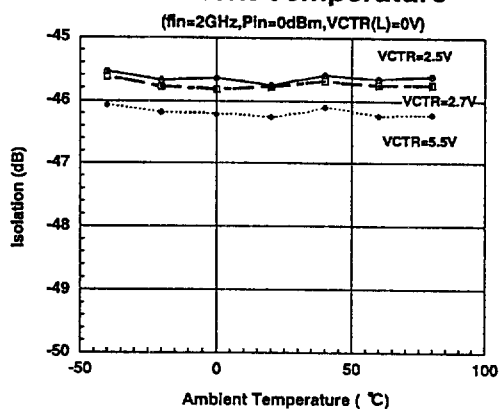
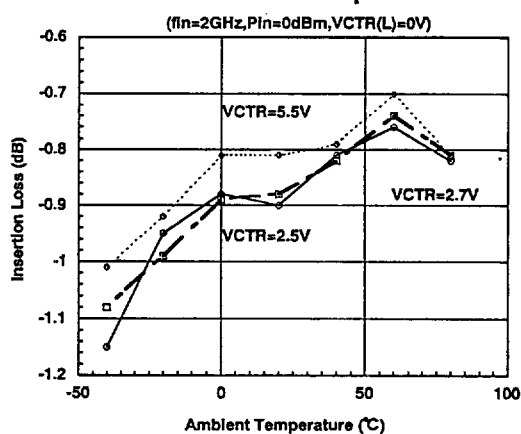
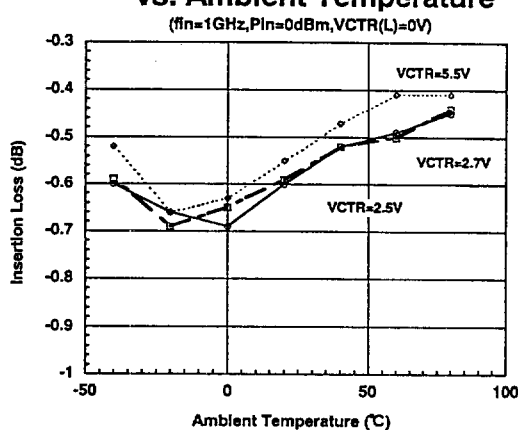
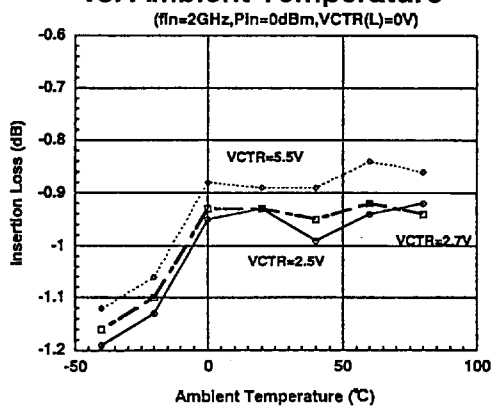
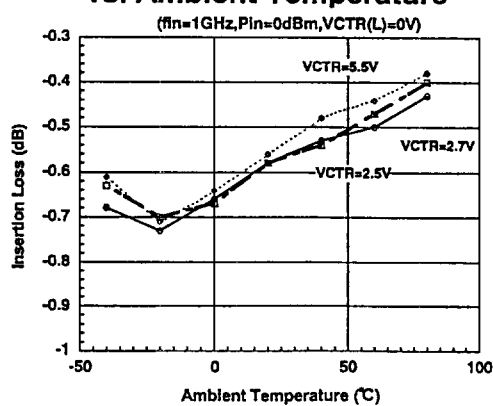


PC-P2 Insertion Loss

1-100MHz
($V_{CTR}=0V/2.7V$)

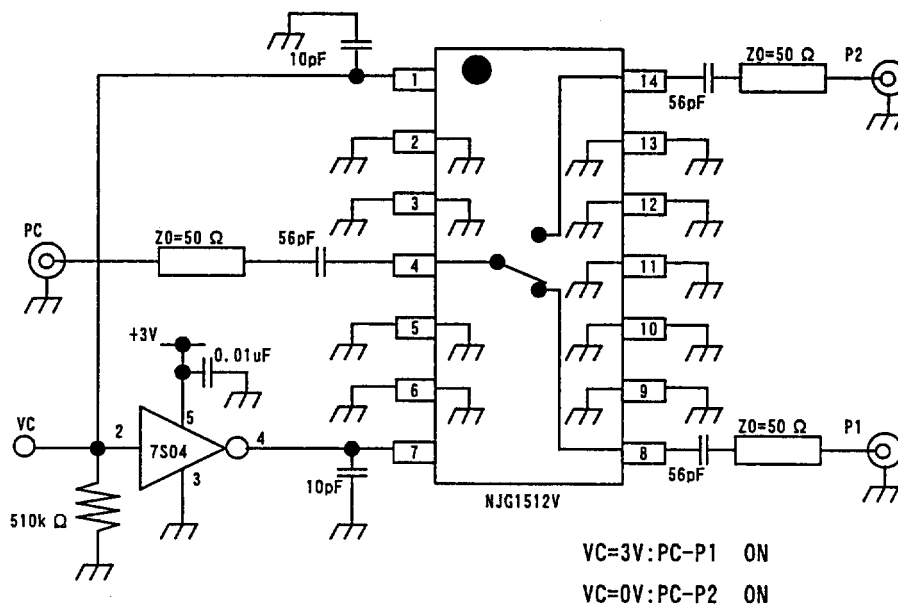



■ TYPICAL CHARACTERISTICS
**Insertion Loss
vs. Input Power**
 $(V_{CTR}=0V/2.7V, f_{in}=2GHz)$

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**
 $(f_{in}=2GHz)$

**(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

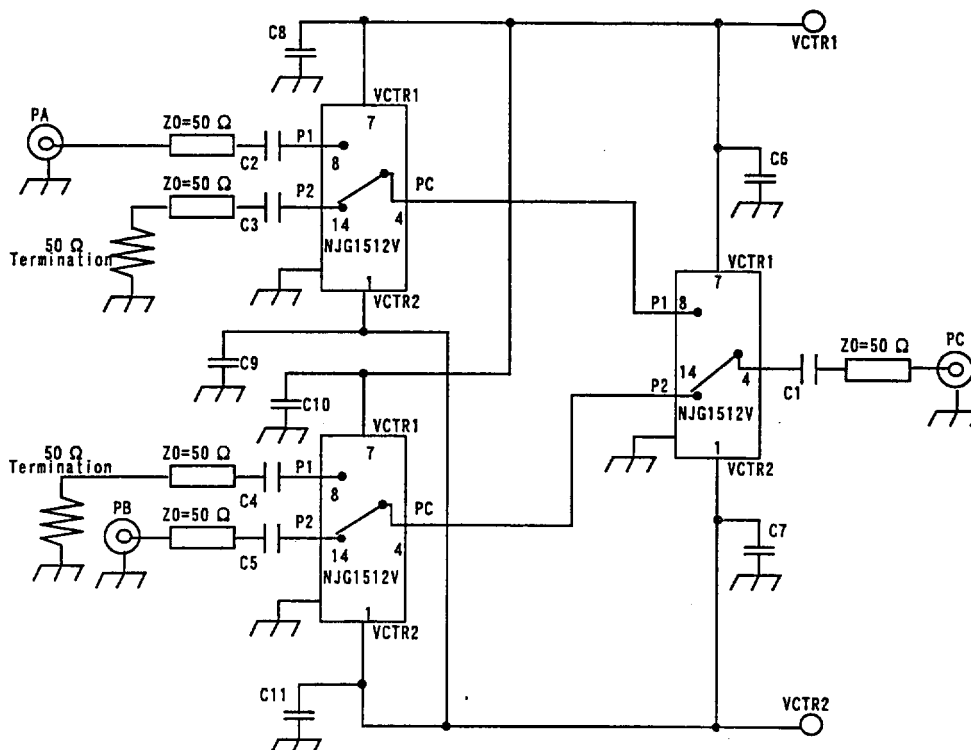


- [1] Please connect the bi-pass capacitor to C-MOS inverter supply terminal.
- [2] In order to keep the state of input impedance of inverter, Please pull-down with 510 k Ω of resistor for C-MOS inverter input terminal.

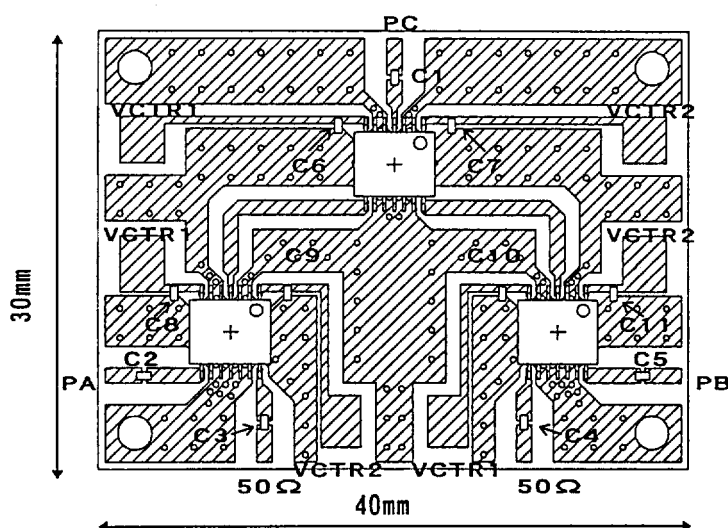


■ Applications Circuit2: High Isolation SPDT Switch

(PA to PC, PB to PC, and PA to PB Isolation is greater than 70dB@fin=0.7~2GHz)



■ PCB design

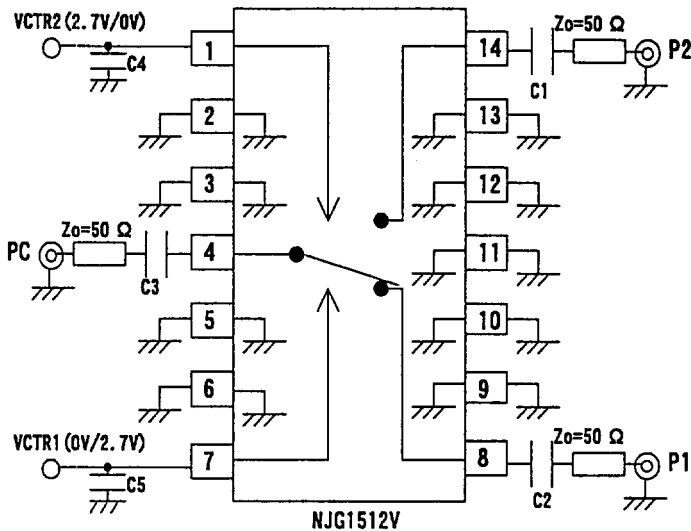


PCB:FR-4 t=0.5mm
 STRIPLINE WIDTH=1mm
 CAPACITOR:size 1005
 C1—C5:56pF
 C6—C11:10pF

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

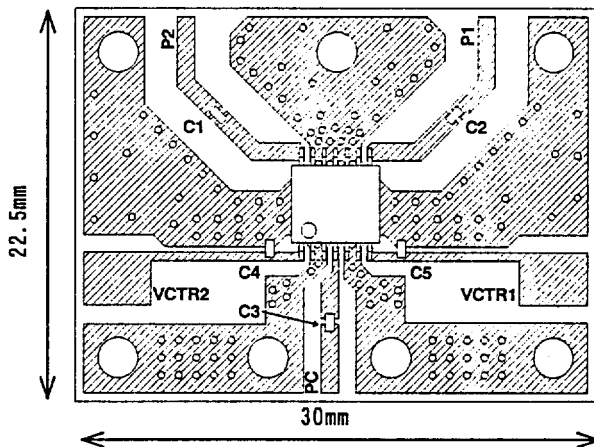


■ TEST CIRCUIT



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

■ RECOMMENDED PCB DESING (TOP VIEW)



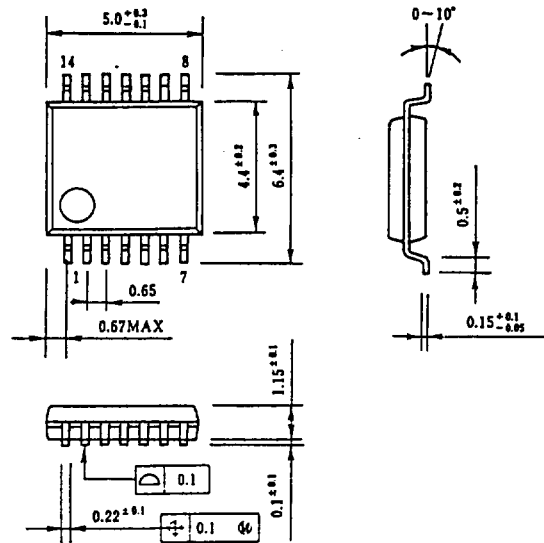
PCB:FR-4 $t=0.5\text{mm}$
 STRIP LINE WIDTH $\pm 1\text{mm}$
 CAPACITOR:size 1005

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.

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