

X-SPDT SWITCH GaAs MMIC

■ GENERAL DESCRIPTION

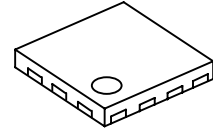
The NJG1662MD7 is a GaAs X (cross) - SPDT switch MMIC, which is designed for switching of balanced dual band filters.

The NJG1662MD7 features very low phase error between on-state paths, low insertion loss, low control voltage and wide frequency coverage. The ESD protection circuit are integrated in the IC to achieve high ESD tolerance.

The ultra-small and ultra-thin EQFN14-D7 package is adopted.

*) X-SPDT is a paired SPDT switch controlled synchronously. The X-SPDT includes two SPDT switches whose RF lines have a crossing inside the chip.

■ PACKAGE OUTLINE



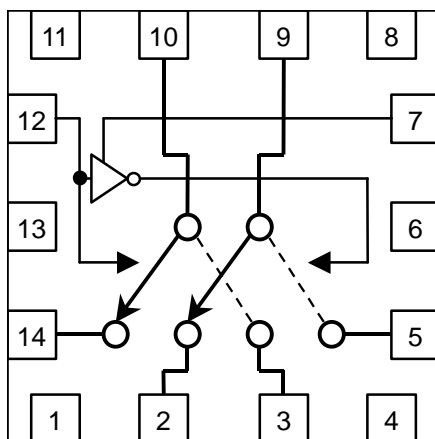
NJG1662MD7

■ FEATURES

- Low phase error ± 3 deg @f=2.0GHz
- Low operation voltage $V_{DD}=+1.5\sim+4.5V$
- Low control voltage $V_{CTL(H)}=+1.3V$ min.
- Low insertion loss 0.3dB typ. @f=1.0GHz, $P_{IN}=0dBm$
 0.4dB typ. @f=2.0GHz, $P_{IN}=0dBm$
- High isolation 28dB typ. @f=1.0GHz, $P_{IN}=0dBm$
 22dB typ. @f=2.0GHz, $P_{IN}=0dBm$
- Small and thin package EQFN14-D7 (Package size: 1.6x1.6x0.397mm typ., Lead and Halogen-Free)

■ PIN CONFIGURATION

(Top View)



- Pin connection
- | | |
|--------|----------|
| 1. GND | 10. PC1 |
| 2. PA2 | 11. GND |
| 3. PB1 | 12. VCTL |
| 4. GND | 13. GND |
| 5. PB2 | 14. PA1 |
| 6. GND | |
| 7. VDD | |
| 8. GND | |
| 9. PC2 | |

■ TRUTH TABLE

“H”= $V_{CTL(H)}$, “L”= $V_{CTL(L)}$

| ON PATH | VCTL |
|------------------|------|
| PC1-PA1, PC2-PA2 | H |
| PC1-PB1, PC2-PB2 | L |

NOTE: The Information on this datasheet will be subject to change without notice.

NJG1662MD7

■ ABSOLUTE MAXIMUM RATINGS

($T_a=+25^{\circ}\text{C}$, $Z_s=Z_l=50\Omega$)

| PARAMETER | SYMBOL | CONDITIONS | RATINGS | UNITS |
|-------------------|-----------|---|----------|--------------------|
| RF input power | P_{IN} | $V_{DD}=2.7\text{V}$, $V_{CTL}=0\text{V}/1.8\text{V}$ PC1,PC2,PA1,PA2,PB1,PB2 | 28 | dBm |
| Supply voltage | V_{DD} | VDD terminal | 5.0 | V |
| Control voltage | V_{CTL} | VCTL terminal | 5.0 | V |
| Power dissipation | P_D | On PCB | 1300 | mW |
| Operating temp. | T_{opr} | | -40~+85 | $^{\circ}\text{C}$ |
| Storage temp. | T_{stg} | | -55~+150 | $^{\circ}\text{C}$ |

■ ELECTRICAL CHARACTERISTICS

(General conditions: $T_a=+25^{\circ}\text{C}$, $Z_s=Z_l=50\Omega$, $V_{DD}=2.7\text{V}$, $V_{CTL(L)}=0\text{V}$, $V_{CTL(H)}=1.8\text{V}$, with application circuit)

| PARAMETERS | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|--|---------------------|--|-----|-----|----------|---------------|
| Supply voltage | V_{DD} | | 1.5 | 2.7 | 4.5 | V |
| Operating current | I_{DD} | $P_{IN}=0\text{dBm}$ | - | 16 | 30 | μA |
| Control voltage (LOW) | $V_{CTL(L)}$ | | 0 | - | 0.4 | V |
| Control voltage (HIGH) | $V_{CTL(H)}$ | | 1.3 | 1.8 | V_{DD} | V |
| Control current | I_{CTL} | $f=2\text{GHz}$, $P_{IN}=0\text{dBm}$ | - | 5 | 10 | μA |
| Insertion loss 1 | LOSS1 | $f=1\text{GHz}$, $P_{IN}=0\text{dBm}$ | - | 0.3 | 0.45 | dB |
| Insertion loss 2 | LOSS2 | $f=2\text{GHz}$, $P_{IN}=0\text{dBm}$ | - | 0.4 | 0.55 | dB |
| Isolation 1 | ISL1 | PC1-PA1, PC2-PA2 PC1-PB1, PC2-PB2 $f=1\text{GHz}$, $P_{IN}=0\text{dBm}$ | 26 | 28 | - | dB |
| Isolation 2 | ISL2 | PC1-PA1, PC2-PA2 PC1-PB1, PC2-PB2 $f=2\text{GHz}$, $P_{IN}=0\text{dBm}$ | 20 | 22 | - | dB |
| Isolation 3 | ISL3 | PC1-PA1, PC2-PA2 PC1-PB1, PC2-PB2 $f=2.5\text{GHz}$, $P_{IN}=0\text{dBm}$ | 18 | 20 | - | dB |
| Isolation 4 | ISL4 | PC1-PC2 port $f=2\text{GHz}$, $P_{IN}=0\text{dBm}$ | 26 | 28 | - | dB |
| Phase error | PE | $f=2\text{GHz}$, between on paths | -3 | 0 | 3 | deg |
| Input power at 0.2dB compression point | $P_{-0.2\text{dB}}$ | $f=2\text{GHz}$ | 20 | 24 | - | dBm |
| VSWR | VSWR | $f=2\text{GHz}$, On port | - | 1.2 | 1.3 | |
| Switching time | T_{SW} | 50% CTL to 10%/90% RF | - | 1.5 | 5.0 | μs |

■ TERMINAL INFORMATION

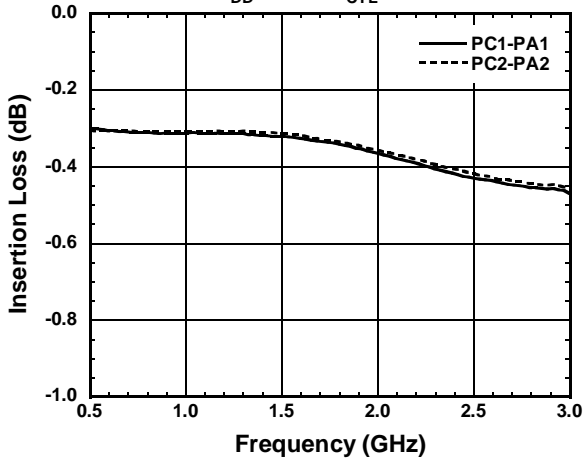
| No. | SYMBOL | DESCRIPTION |
|-----|--------|---|
| 1 | GND | Ground terminal. Please connect this terminal with ground plane as close as possible for good RF performance. |
| 2 | PA2 | This port is connected to PC2 terminal by applying High-level (1.3~4.5V) at VCTL terminal. An external capacitor is required to block DC voltage of internal circuit. |
| 3 | PB1 | This port is connected to PC1 terminal by applying Low-level (0~0.4V) at VCTL terminal. An external capacitor is required to block DC voltage of internal circuit. |
| 4 | GND | Ground terminal. Please connect this terminal with ground plane as close as possible for good RF performance. |
| 5 | PB2 | This port is connected to PC2 terminal by applying Low-level (0~0.4V) at VCTL terminal. An external capacitor is required to block DC voltage of internal circuit. |
| 6 | GND | Ground terminal. Please connect this terminal with ground plane as close as possible for good RF performance. |
| 7 | VDD | A supply voltage terminal (1.5~4.5V). Please place a bypass capacitor between this terminal and GND for avoiding RF noise from outside. |
| 8 | GND | Ground terminal. Please connect this terminal with ground plane as close as possible for good RF performance. |
| 9 | PC2 | Common RF port. This port is connected with either of PA2 or PB2. An external capacitor is required to block DC voltage of internal circuit. |
| 10 | PC1 | Common RF port. This port is connected with either of PA1 or PB1. An external capacitor is required to block DC voltage of internal circuit. |
| 11 | GND | Ground terminal. Please connect this terminal with ground plane as close as possible for good RF performance. |
| 12 | VCTL | Control signal input terminal. This terminal is set to high-level (1.3V~4.5V) or low-level (0~0.4V). |
| 13 | GND | Ground terminal. Please connect this terminal with ground plane as close as possible for good RF performance. |
| 14 | PA1 | This port is connected to PC1 terminal by applying High-level (1.3~4.5V) at VCTL terminal. An external capacitor is required to block DC voltage of internal circuit. |

NJG1662MD7

■ ELECTRICAL CHARACTERISTICS (With Application circuit, Loss of external circuit are excluded)

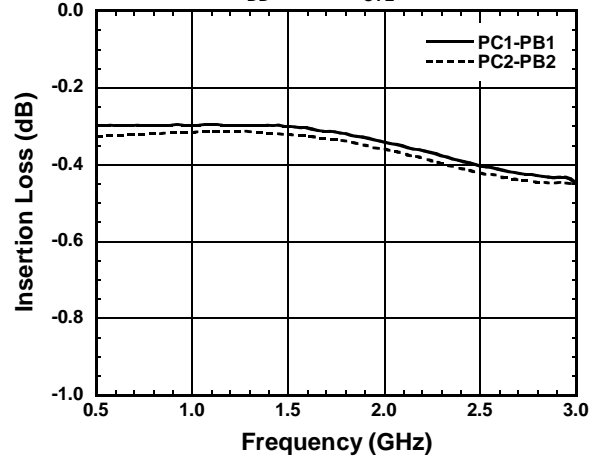
Insertion Loss vs. Frequency

($V_{DD}=2.7V, V_{CTL}=1.8V$)



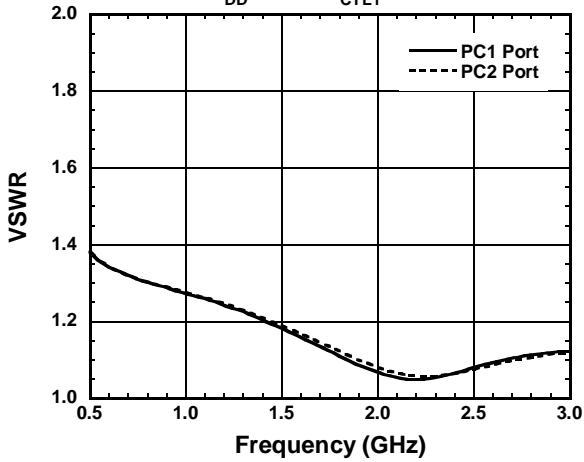
Insertion Loss vs. Frequency

($V_{DD}=2.7V, V_{CTL}=0V$)



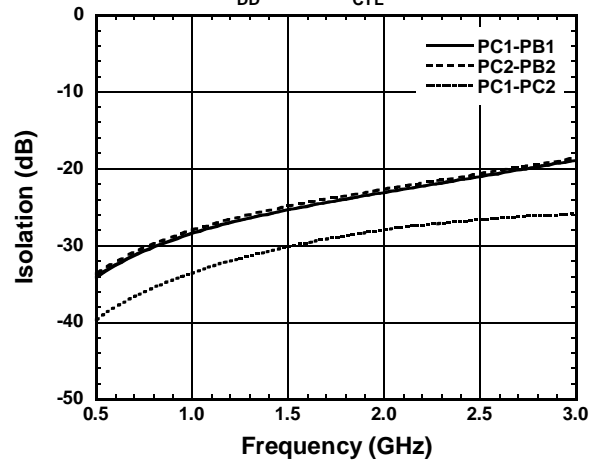
VSWR vs. Frequency

($V_{DD}=2.7V, V_{CTL1}=1.8V$)



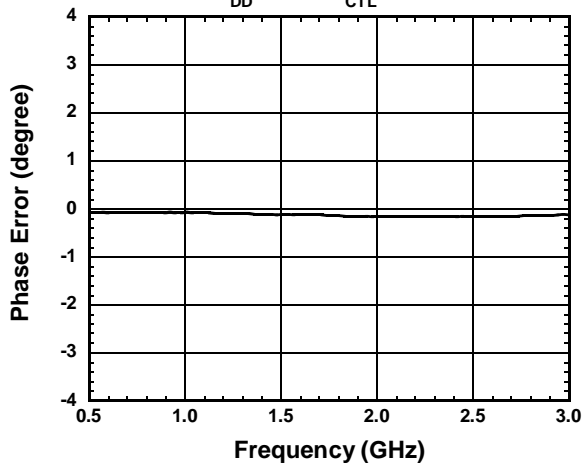
Isolation vs. Frequency

($V_{DD}=2.7V, V_{CTL}=1.8V$)



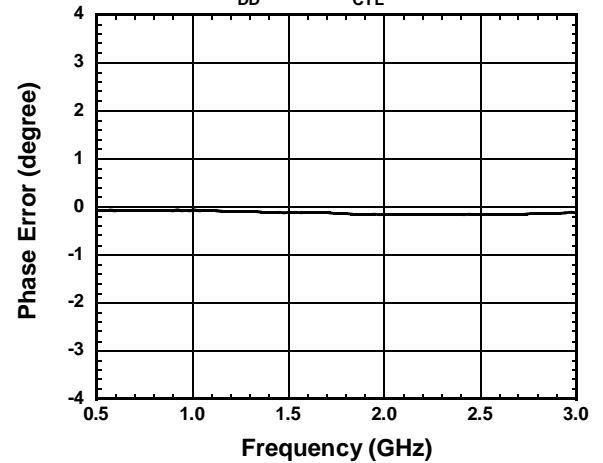
**PC1-PA1, PC2-PA2
Phase Error vs. Frequency**

($V_{DD}=2.7V, V_{CTL}=1.8V$)

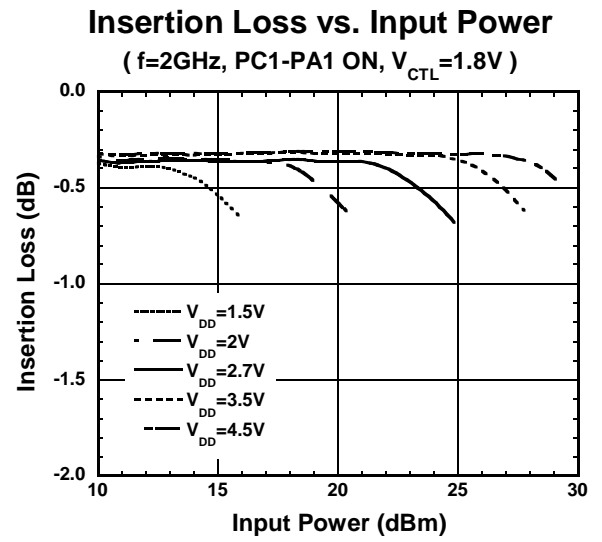
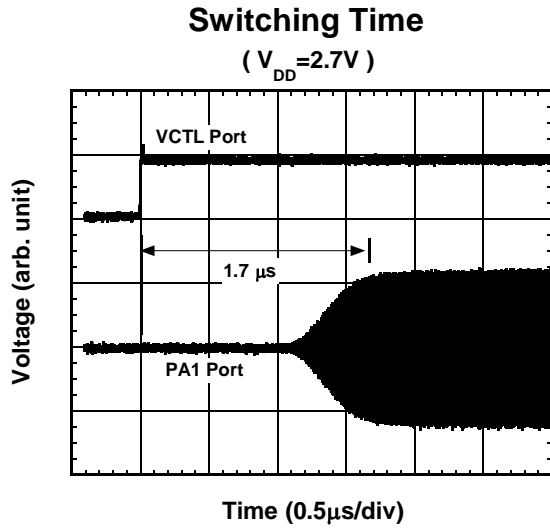


**PC1-PA1, PC2-PA2
Phase Error vs. Frequency**

($V_{DD}=2.7V, V_{CTL}=1.8V$)



■ ELECTRICAL CHARACTERISTICS (With Application circuit, Loss of external circuit are excluded)

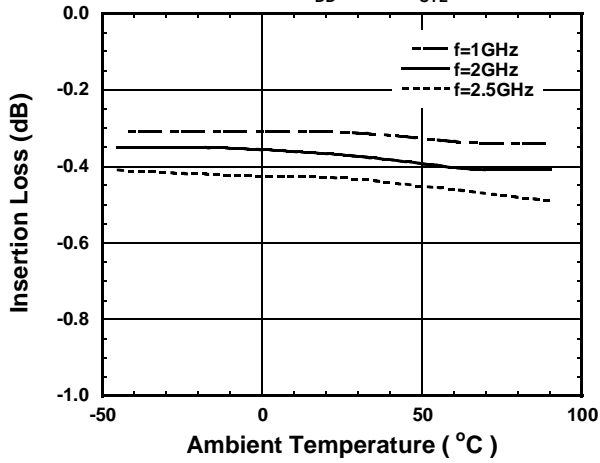


NJG1662MD7

■ ELECTRICAL CHARACTERISTICS (With Application circuit, Loss of external circuit are excluded)

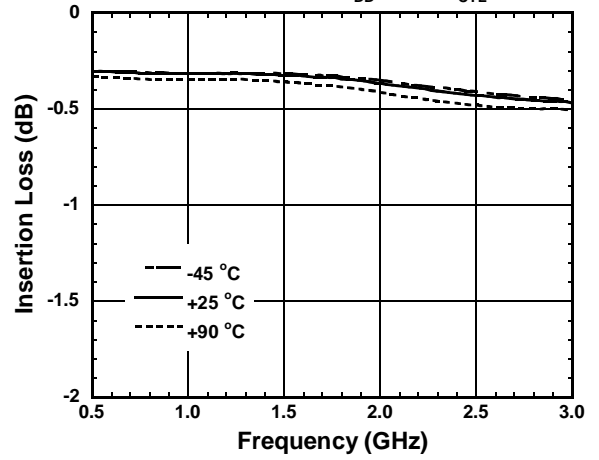
Insertion Loss vs. Ambient Temperature

(PC1-PA1 ON, $V_{DD}=2.7V$, $V_{CTL}=1.8V$)



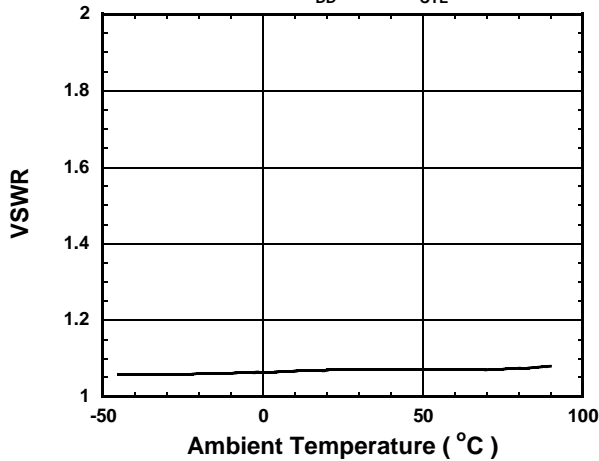
Insertion Loss vs. Frequency

(PC1-PA1 ON, $f=2GHz$, $V_{DD}=2.7V$, $V_{CTL}=1.8V$)



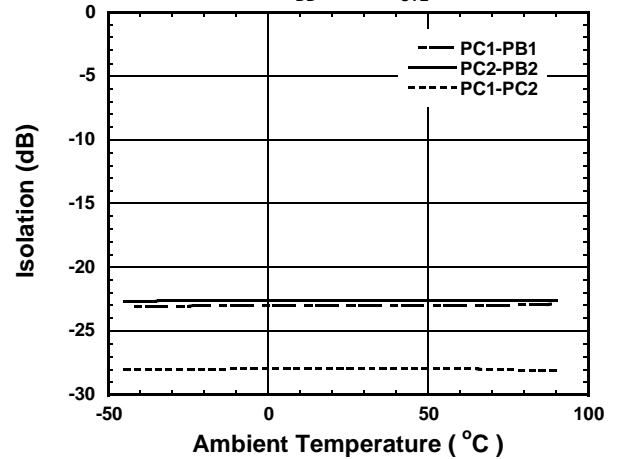
VSWR vs. Ambient Temperature

(PC1-PA1 ON, $V_{DD}=2.7V$, $V_{CTL}=1.8V$)



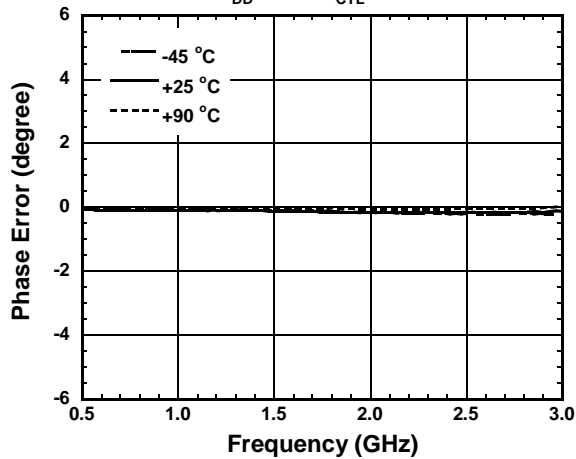
Isolation vs. Ambient Temperature

($f=2GHz$, $V_{DD}=2.7V$, $V_{CTL}=1.8V$)



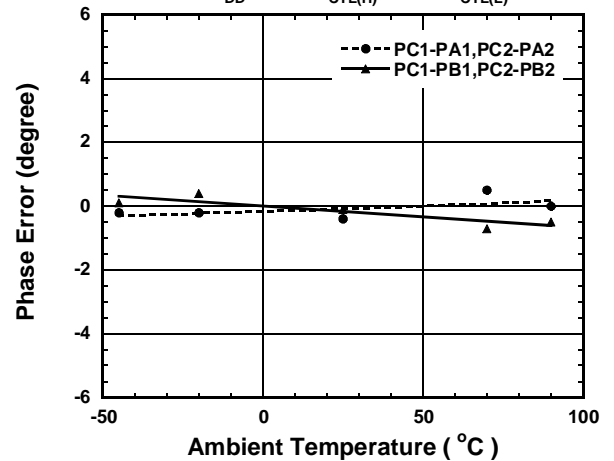
PC1-PA1, PC2-PA2 Phase Error vs. Frequency

($V_{DD}=2.7V$, $V_{CTL}=1.8V$)

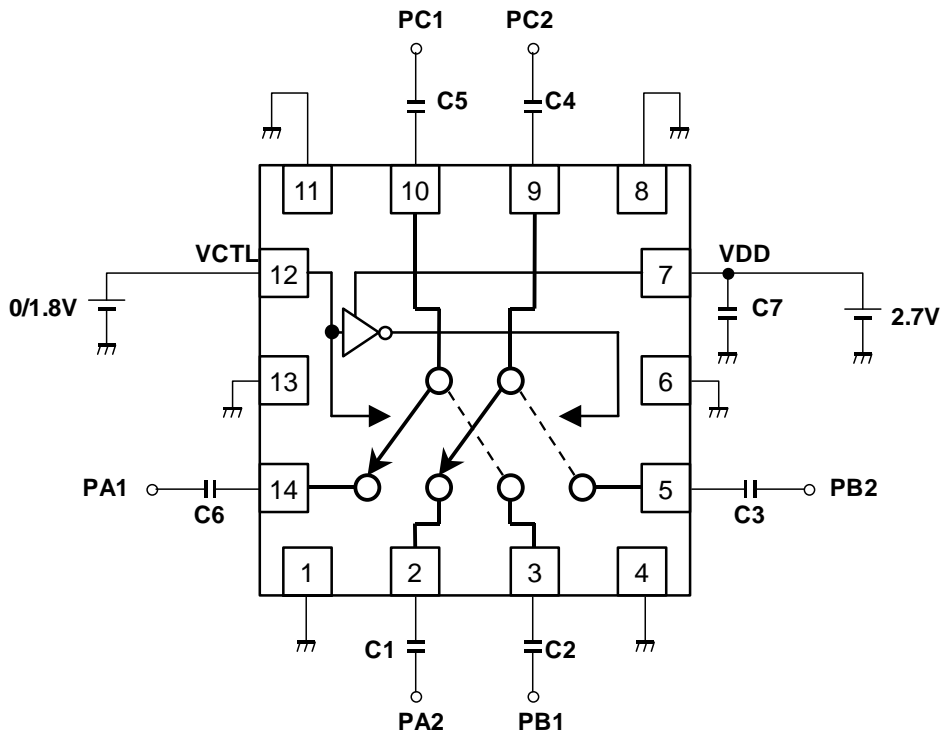


Phase Error vs. Ambient Temperature

($f=2GHz$, $V_{DD}=2.7V$, $V_{CTL(H)}=1.8V$, $V_{CTL(L)}=0V$)



APPLICATION CIRCUIT

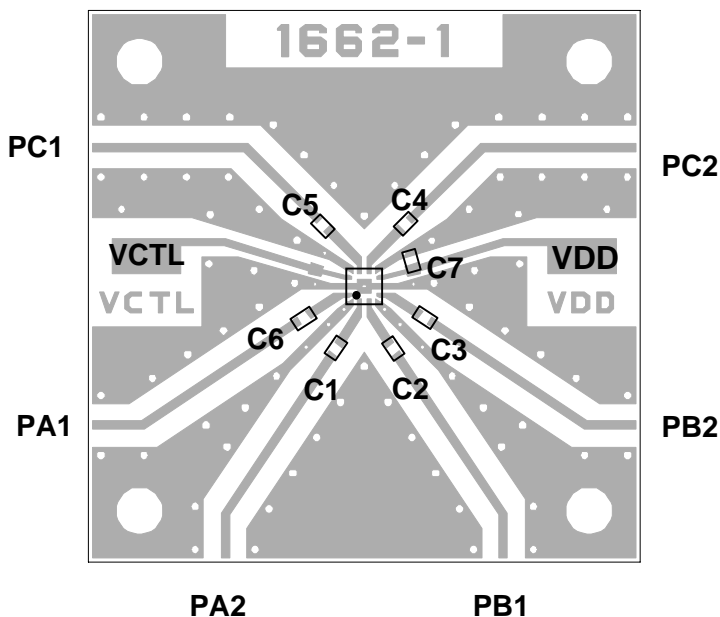


PARTS LIST

| Part ID | Value | Notes |
|---------|--------|----------------|
| C1~C6 | 56pF | MURATA (GRM15) |
| C7 | 1000pF | |

TEST PCB LAYOUT

(TOP VIEW)



PCB: FR-4, t=0.2mm

Capacitor Size: 1005

Strip Line Width: 0.4mm

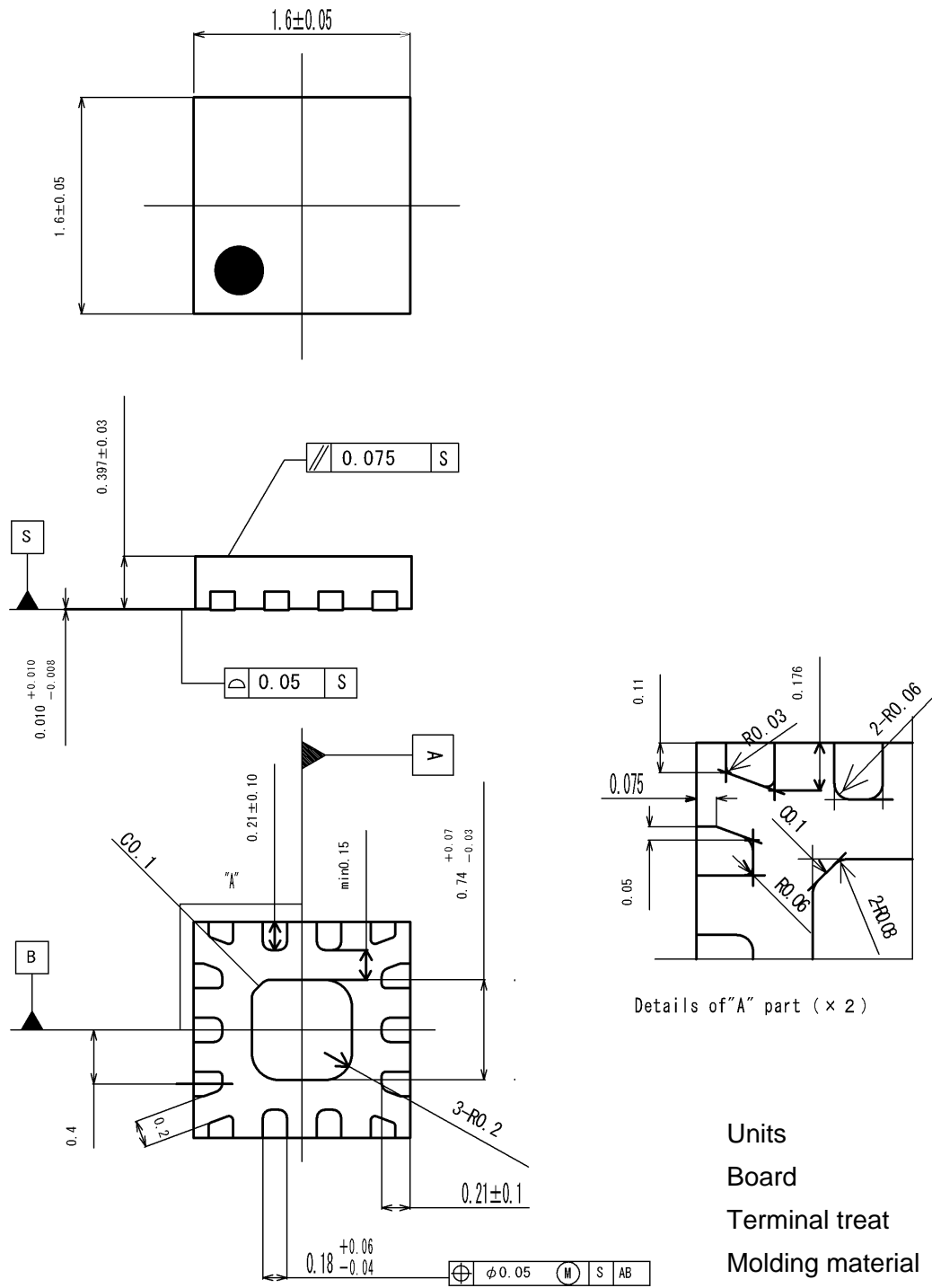
PCB Size: 26 x 26mm

Losses of PCB, capacitors and connectors

| Frequency (GHz) | Loss (dB) |
|-----------------|-----------|
| 1.0 | 0.38 |
| 2.0 | 0.51 |
| 2.5 | 0.55 |

NJG1662MD7

PACKAGE OUTLINE (EQFN14-D7)



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.

[CAUTION]

The specifications on this databook are only given for information, without any guarantee as regards either mistakes or omissions. The application circuits in this databook are described only to show representative usages of the product and not intended for the guarantee or permission of any right including the industrial rights.

This product may be damaged with electric static discharge (ESD) or spike voltage. Please handle with care to avoid these damages.



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

Телефон: 8 (812) 309 58 32 (многоканальный)

Факс: 8 (812) 320-02-42

Электронная почта: org@eplast1.ru

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.