

### DPDT SWITCH FOR 2.4 GHz AND 6 GHz DUAL-BAND WIRELESS LAN

#### DESCRIPTION

The  $\mu$ PG2164T5N is a GaAs MMIC DPDT (Double Pole Double Throw) switch which was developed for 2.4 GHz and 6 GHz dual-band wireless LAN. This device can operate frequency from 2.4 GHz band and 6 GHz band, having the low insertion loss and high isolation.

This device is housed in a 6-pin plastic TSON (Thin Small Out-line Non-leaded) package. And this package is able to high-density surface mounting.

#### FEATURES

- Operating frequency :  $f = 2.4$  to  $2.5$  GHz and  $4.9$  to  $6.0$  GHz
- Switch control voltage :  $V_{\text{cont}}(\text{H}) = 2.8$  to  $5.0$  V ( $3.0$  V TYP.)  
:  $V_{\text{cont}}(\text{L}) = -0.3$  to  $0.3$  V ( $0$  V TYP.)
- Low insertion loss :  $L_{\text{ins}1} = 0.50$  dB TYP. @  $f = 2.4$  to  $2.5$  GHz,  $V_{\text{cont}}(\text{H}) = 3.0$  V,  $V_{\text{cont}}(\text{L}) = 0$  V  
:  $L_{\text{ins}2} = 0.70$  dB TYP. @  $f = 4.9$  to  $6.0$  GHz,  $V_{\text{cont}}(\text{H}) = 3.0$  V,  $V_{\text{cont}}(\text{L}) = 0$  V
- High isolation :  $\text{ISL}1 = 25$  dB TYP. @  $f = 2.4$  to  $2.5$  GHz,  $V_{\text{cont}}(\text{H}) = 3.0$  V,  $V_{\text{cont}}(\text{L}) = 0$  V  
:  $\text{ISL}2 = 17$  dB TYP. @  $f = 4.9$  to  $6.0$  GHz,  $V_{\text{cont}}(\text{H}) = 3.0$  V,  $V_{\text{cont}}(\text{L}) = 0$  V
- Handling power :  $P_{\text{in}}(1 \text{ dB}) = +31.0$  dBm TYP. @  $f = 2.5$  GHz,  $V_{\text{cont}}(\text{H}) = 3.0$  V,  $V_{\text{cont}}(\text{L}) = 0$  V  
:  $P_{\text{in}}(1 \text{ dB}) = +29.0$  dBm TYP. @  $f = 6.0$  GHz,  $V_{\text{cont}}(\text{H}) = 3.0$  V,  $V_{\text{cont}}(\text{L}) = 0$  V
- High-density surface mounting : 6-pin plastic TSON package ( $1.5 \times 1.5 \times 0.37$  mm)

#### APPLICATION

- Dual-band wireless LAN (IEEE802.11a + b/g)

#### ORDERING INFORMATION

| Part Number        | Order Number         | Package                      | Marking | Supplying Form   |
|--------------------|----------------------|------------------------------|---------|--|
| $\mu$ PG2164T5N-E2 | $\mu$ PG2164T5N-E2-A | 6-pin plastic TSON (Pb-Free) | G5B     | <ul style="list-style-type: none"> <li>• Embossed tape 8 mm wide</li> <li>• Pin 1, 6 face the perforation side of the tape</li> <li>• Qty 3 kpcs/reel</li> </ul> |

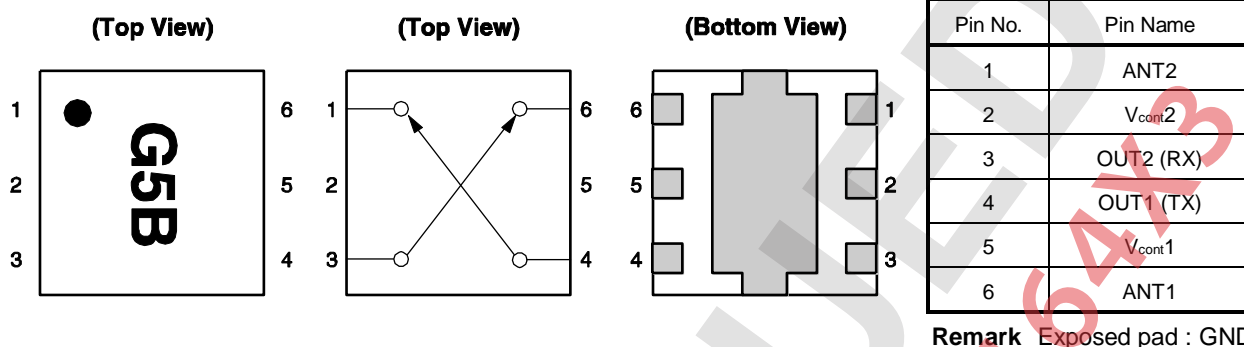
**Remark** To order evaluation samples, contact your nearby sales office.

Part number for sample order:  $\mu$ PG2164T5N-A

**Caution:** Observe precautions when handling because these devices are sensitive to electrostatic discharge

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## PIN CONNECTIONS AND INTERNAL BLOCK DIAGRAM



Remark Exposed pad : GND

## TRUTH TABLE

| V <sub>cont1</sub> | V <sub>cont2</sub> | ANT1-OUT1 (TX) | ANT1- OUT2 (RX) | ANT2- OUT1 (TX) | ANT2-OUT2 (RX) |
|--------------------|--------------------|----------------|-----------------|-----------------|----------------|
| High               | Low                | OFF            | ON              | ON              | OFF            |
| Low                | High               | ON             | OFF             | OFF             | ON             |

ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = +25°C, unless otherwise specified)

| Parameter                     | Symbol            | Ratings      | Unit |
|-------------------------------|-------------------|--------------|------|
| Switch Control Voltage        | V <sub>cont</sub> | -6.0 to +6.0 | V    |
| Input Power                   | P <sub>in</sub>   | +32          | dBm  |
| Operating Ambient Temperature | T <sub>A</sub>    | -45 to +85   | °C   |
| Storage Temperature           | T <sub>stg</sub>  | -55 to +135  | °C   |

RECOMMENDED OPERATING RANGE (T<sub>A</sub> = +25°C, unless otherwise specified)

| Parameter                  | Symbol                | MIN. | TYP. | MAX. | Unit |
|----------------------------|-----------------------|------|------|------|------|
| Switch Control Voltage (H) | V <sub>cont (H)</sub> | 2.8  | 3.0  | 5.0  | V    |
| Switch Control Voltage (L) | V <sub>cont (L)</sub> | -0.3 | 0    | 0.3  | V    |
| Operating Frequency 1      | f <sub>1</sub>        | 2.4  | —    | 2.5  | GHz  |
| Operating Frequency 2      | f <sub>2</sub>        | 4.9  | —    | 6.0  | GHz  |

**ELECTRICAL CHARACTERISTICS**

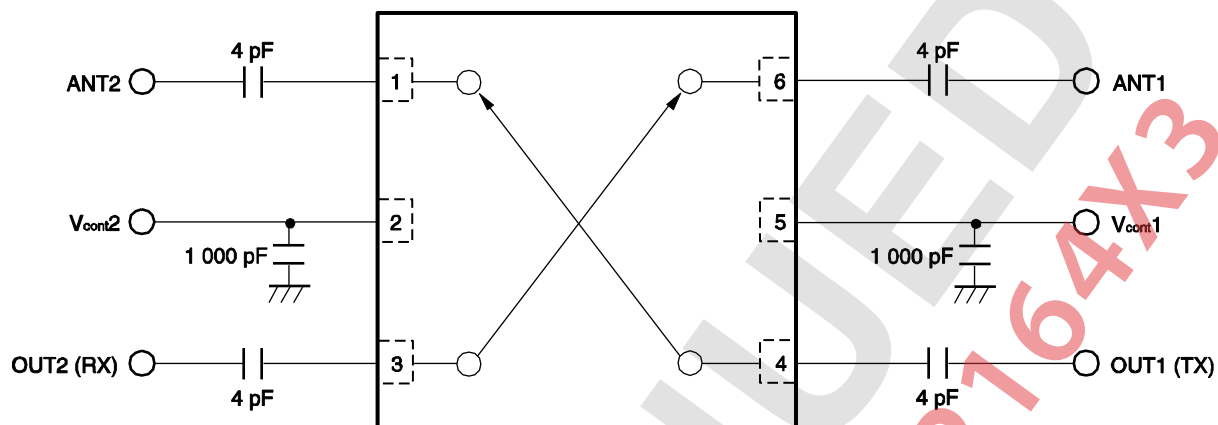
( $T_A = +25^\circ\text{C}$ ,  $V_{\text{cont (H)}} = 3.0\text{ V}$ ,  $V_{\text{cont (L)}} = 0\text{ V}$ ,  $Z_0 = 50\ \Omega$ , DC blocking capacitors = 4 pF, unless otherwise specified)

| Parameter  | Symbol                   | Test Conditions  | MIN. | TYP.  | MAX. | Unit          |
|--|--------------------------|--|------|-------|------|---------------|
| Insertion Loss 1                                       | $L_{\text{ins1}}$        | $f = 2.4\text{ to }2.5\text{ GHz}$   | –    | 0.50  | 0.75 | dB            |
| Insertion Loss 2                                       | $L_{\text{ins2}}$        | $f = 4.9\text{ to }6.0\text{ GHz}$   | –    | 0.70  | 1.00 | dB            |
| Isolation 1 (ANT to OUT)                               | $ISL1$                   | $f = 2.4\text{ to }2.5\text{ GHz}$   | 22   | 25    | –    | dB            |
| Isolation 2 (ANT to OUT)                               | $ISL2$                   | $f = 4.9\text{ to }6.0\text{ GHz}$   | 14   | 17    | –    | dB            |
| Isolation 3 (ANT1 to ANT2, TX to RX)                   | $ISL3$                   | $f = 2.4\text{ to }2.5\text{ GHz}$   | 22   | 25    | –    | dB            |
| Isolation 4 (ANT1 to ANT2, TX to RX)                   | $ISL4$                   | $f = 4.9\text{ to }6.0\text{ GHz}$   | 15   | 17    | –    | dB            |
| Input Return Loss 1                                    | $RL_{\text{in1}}$        | $f = 2.4\text{ to }2.5\text{ GHz}$   | –    | 15    | –    | dB            |
| Input Return Loss 2                                    | $RL_{\text{in2}}$        | $f = 4.9\text{ to }6.0\text{ GHz}$   | –    | 15    | –    | dB            |
| Output Return Loss 1                                   | $RL_{\text{out1}}$       | $f = 2.4\text{ to }2.5\text{ GHz}$   | –    | 15    | –    | dB            |
| Output Return Loss 2                                   | $RL_{\text{out2}}$       | $f = 4.9\text{ to }6.0\text{ GHz}$   | –    | 15    | –    | dB            |
| 1 dB Loss Compression<br>Input Power 1 <sup>Note</sup> | $P_{\text{in (1 dB) 1}}$ | $f = 2.4\text{ to }2.5\text{ GHz}$   | –    | +31.0 | –    | dBm           |
| 1 dB Loss Compression<br>Input Power 2 <sup>Note</sup> | $P_{\text{in (1 dB) 2}}$ | $f = 4.9\text{ to }6.0\text{ GHz}$   | –    | +29.0 | –    | dBm           |
| Input 3rd Order Intercept Point                        | $IIP_3$                  | $f_1 = 2\ 500\text{ MHz}$ , $f_2 = 2\ 501\text{ MHz}$ ,<br>$P_{\text{in (1 tone)}} = +20\text{ dBm}$ | –    | +50   | –    | dBm           |
| Switch Control Current                                 | $I_{\text{cont}}$        |  | –    | 0.1   | 1.0  | $\mu\text{A}$ |
| Switch Control Speed                                   | $t_{\text{sw}}$          | 50% CTL to 90/10%  | –    | 50    | –    | ns            |

**Note**  $P_{\text{in (1 dB)}}$  is measured the input power level when the insertion loss increases more 1 dB than that of linear range.

**Caution** This device is used it is necessary to use DC blocking capacitors.

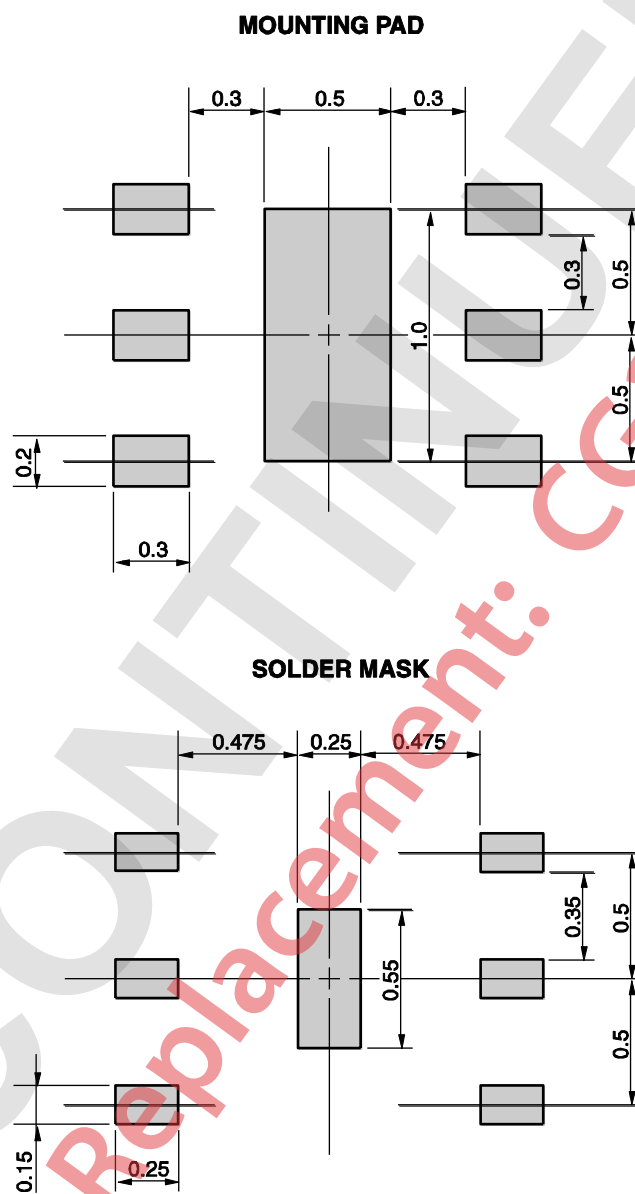
## EVALUATION CIRCUIT



The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

## MOUNTING PAD AND SOLDER MASK LAYOUT DIMENSIONS

6-PIN PLASTIC TSON (UNIT: mm)

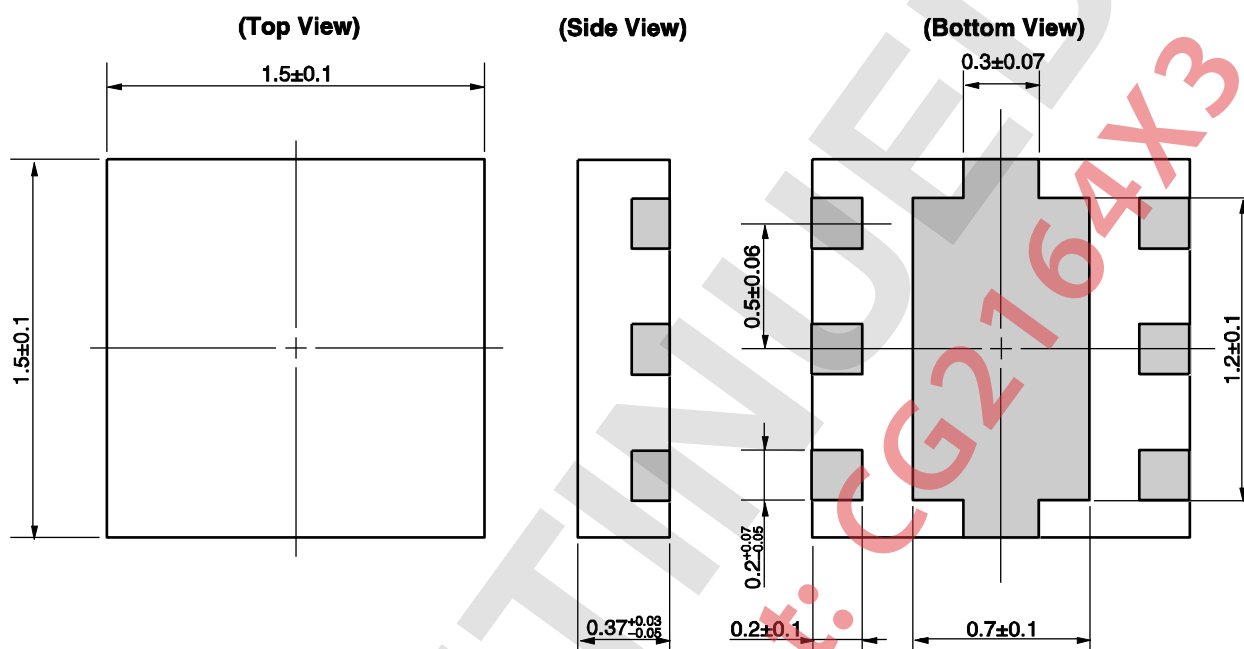


Solder thickness : 0.08 mm

**Remark** The mounting pad and solder mask layouts in this document are for reference only.

## &lt;R&gt; PACKAGE DIMENSIONS

6-PIN PLASTIC TSON (UNIT: mm)



**RECOMMENDED SOLDERING CONDITIONS**

This product should be soldered and mounted under the following recommended conditions. For soldering methods and conditions other than those recommended below, contact your nearby sales office.

| Soldering Method | Soldering Conditions  | Condition Symbol |
|------------------|---|------------------|
| Infrared Reflow  | Peak temperature (package surface temperature) : 260°C or below<br>Time at peak temperature : 10 seconds or less<br>Time at temperature of 220°C or higher : 60 seconds or less<br>Preheating time at 120 to 180°C : 120±30 seconds<br>Maximum number of reflow processes : 3 times<br>Maximum chlorine content of rosin flux (% mass) : 0.2%(Wt.) or below | IR260            |
| Wave Soldering   | Peak temperature (molten solder temperature) : 260°C or below<br>Time at peak temperature : 10 seconds or less<br>Preheating temperature (package surface temperature) : 120°C or below<br>Maximum number of flow processes : 1 time<br>Maximum chlorine content of rosin flux (% mass) : 0.2%(Wt.) or below  | WS260            |
| Partial Heating  | Peak temperature (terminal temperature) : 350°C or below<br>Soldering time (per side of device) : 3 seconds or less<br>Maximum chlorine content of rosin flux (% mass) : 0.2%(Wt.) or below   | HS350            |

**Caution** Do not use different soldering methods together (except for partial heating).

**Caution**

GaAs Products

This product uses gallium arsenide (GaAs).

GaAs vapor and powder are hazardous to human health if inhaled or ingested, so please observe the following points.

- Follow related laws and ordinances when disposing of the product. If there are no applicable laws and/or ordinances, dispose of the product as recommended below.
  1. Commission a disposal company able to (with a license to) collect, transport and dispose of materials that contain arsenic and other such industrial waste materials.
  2. Exclude the product from general industrial waste and household garbage, and ensure that the product is controlled (as industrial waste subject to special control) up until final disposal.
- Do not burn, destroy, cut, crush, or chemically dissolve the product.
- Do not lick the product or in any way allow it to enter the mouth.

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