



# NEC's 4.8 TO 5.85 GHz HIGH POWER GaAs MMIC SPDT SWITCH

## UPG2022T5G

### FEATURES

- **OPERATING FREQUENCY:**  
f = 4.8 to 5.85 GHz
- **LOW INSERTION LOSS:**  
0.8 dB TYP. @ f = 4.9 GHz  
0.7 dB TYP. @ f = 5.2 GHz  
0.8 dB TYP. @ f = 5.8 GHz
- **POWER HANDLING:**  
 $P_{in(0.1\text{ dB})} = +31\text{ dBm TYP. @ } f = 4.8\text{ to } 5.85\text{ GHz}$
- **CONTROL VOLTAGE:**  
 $V_{cont} = +2.8\text{ V/0 V}$
- **HIGH ISOLATION:**  
(Between INPUT and OUTPUT) = 23 dB TYP. @ f = 5.2 GHz  
(Between OUTPUT1 and OUTPUT2) = 22 dB TYP. @ f = 5.2
- **INPUT/OUTPUT RETURN LOSS:**  
10 dB MIN. @ f = 4.8 to 5.85 GHz
- **SWITCHING SPEED:**  
20 ns @  $t_{RISE}/t_{FALL}$  (10/90% RF)
- **6-PIN PLASTIC SON PACKAGE:**  
(2.0 × 3.0 × 0.75 mm)
- **LEAD FREE**

### DESCRIPTION

NEC's UPG2022T5G is a high power GaAs MMIC SPDT (Single Pole Double Throw) switch. This device can operate from 4.8 to 5.85 GHz with low insertion loss. It is housed in a 6-pin plastic SON package.

### APPLICATIONS

- 5 GHz BAND WLAN
- 5 GHz CORDLESS PHONES
- 5 GHz ELECTRONIC TOLL COLLECTION
- 5 GHz FIXED WIRELESS ACCESS

### ORDERING INFORMATION

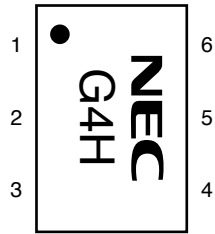
| PART NUMBER     | PACKAGE           | MARKING | SUPPLYING FORM  |
|-----------------|-------------------|---------|---|
| UPG2022T5G-E1-A | 6-pin plastic SON | G4H     | <ul style="list-style-type: none"> <li>• Embossed tape 8 mm wide</li> <li>• Pin 1 face the perforation side of the tape</li> <li>• Qty 3 kpcs/reel</li> </ul> |

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

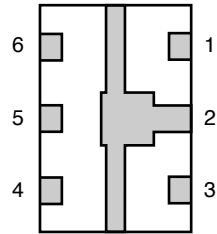
Part number for sample order: UPG2022T5G

**PIN CONNECTIONS**

(Top View)



(Bottom View)



| PIN NO. | PIN NAME           |
|---------|--------------------|
| 1       | OUTPUT1            |
| 2       | GND                |
| 3       | OUTPUT2            |
| 4       | V <sub>cont2</sub> |
| 5       | INPUT              |
| 6       | V <sub>cont1</sub> |

**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 <sup>Note</sup> | V    |
| Input Power                   | P <sub>in</sub>   | +36                          | dBm  |
| Operating Ambient Temperature | T <sub>A</sub>    | -45 to +85                   | °C   |
| Storage Temperature           | T <sub>stg</sub>  | -55 to +150                  | °C   |

**Notes** | V<sub>cont1</sub> - V<sub>cont2</sub> | ≤ 6.0 V

**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> | 2.7  | 2.8  | 3.3  | V    |
| Switch Control Voltage (L)    | V <sub>cont (L)</sub> | -0.2 | 0    | 0.2  | V    |
| Operating Frequency           | f                     | 4.8  |      | 5.85 | GHz  |
| Operating Ambient Temperature | T <sub>A</sub>        | -40  | +25  | +85  | °C   |

**ELECTRICAL CHARACTERISTICS** ( $T_A = +25^\circ\text{C}$ ,  $V_{\text{cont}} = 2.8 \text{ V/0 V}$ ,  $Z_0 = 50 \Omega$ , DC blocking capacitors = 27 pF, Each port, unless otherwise specified)

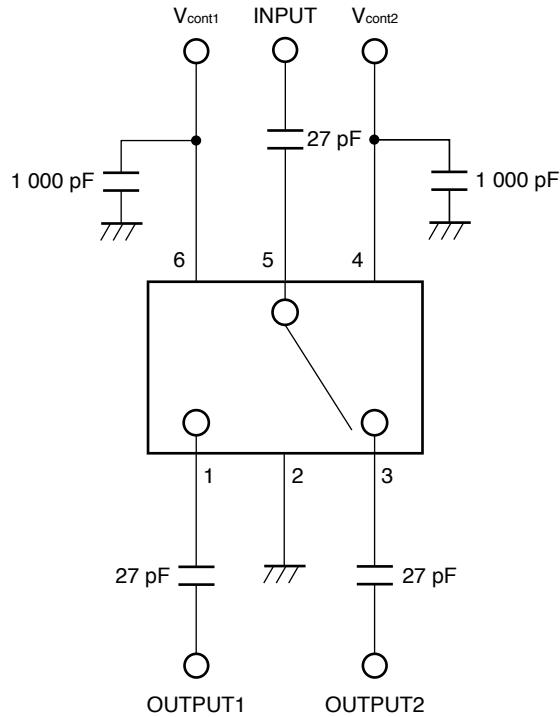
| PARAMETER                                    | SYMBOL                   | TEST CONDITIONS                               | MIN. | TYP. | MAX. | UNIT          |
|--|--------------------------|---|------|------|------|---------------|
| Insertion Loss                               | $L_{\text{INS}}$         | f = 4.9 GHz                                   | -    | 0.8  | 1.1  | dB            |
|  |                          | f = 5.2 GHz                                   | -    | 0.7  | 1.1  | dB            |
|  |                          | f = 5.8 GHz                                   | -    | 0.8  | 1.1  | dB            |
| Isolation 1<br>(between OUTPUT1 and OUTPUT2) | ISL1                     | f = 4.9 GHz                                   | 13   | 18   | -    | dB            |
|  |                          | f = 5.2 GHz                                   | 15   | 22   | -    | dB            |
|  |                          | f = 5.8 GHz                                   | 15   | 20   | -    | dB            |
| Input Return Loss                            | $RL_{\text{in}}$         | f = 4.9 GHz                                   | 10   | 22   | -    | dB            |
|  |                          | f = 5.2 GHz                                   | 10   | 29   | -    | dB            |
|  |                          | f = 5.8 GHz                                   | 10   | 19   | -    | dB            |
| Output Return Loss                           | $RL_{\text{out}}$        | f = 4.9 GHz                                   | 10   | 21   | -    | dB            |
|  |                          | f = 5.2 GHz                                   | 10   | 29   | -    | dB            |
|  |                          | f = 5.8 GHz                                   | 10   | 20   | -    | dB            |
| 0.1 dB Gain Compression Input Power          | $P_{\text{in (0.1 dB)}}$ | f = 4.9 to 5.8 GHz                            | 30   | 31   | -    | dBm           |
| Switching Control Speed                      | $t_{\text{SW}}$          | $t_{\text{RISE}}/t_{\text{FALL}}$ (10/90% RF) | -    | 20   | -    | ns            |
| Switching Control Current                    | $I_{\text{cont}}$        |   | -    | 0.5  | 1    | $\mu\text{A}$ |

**STANDARD CHARACTERISTICS FOR REFERENCE**

( $T_A = +25^\circ\text{C}$ ,  $V_{\text{cont}} = 2.8 \text{ V/0 V}$ ,  $Z_0 = 50 \Omega$ , DC blocking capacitors = 27 pF, Each port, unless otherwise specified)

| PARAMETER                                 | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|--------|-----------------|------|------|------|------|
| Isolation 2<br>(between INPUT and OUTPUT) | ISL2   | f = 4.9 GHz     | -    | 18   | -    | dB   |
|   |        | f = 5.2 GHz     | -    | 23   | -    | dB   |
|   |        | f = 5.8 GHz     | -    | 21   | -    | dB   |

EVALUATION CIRCUIT



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

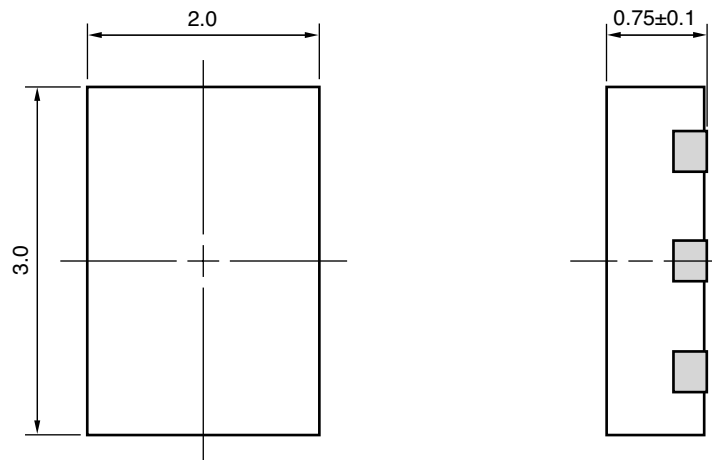
TRUTH TABLE OF SWITCHING BY CONDITION OF CONTROL VOLTAGE

|                    |                       | V <sub>CONT1</sub>    |                       |
|--------------------|-----------------------|-----------------------|-----------------------|
|                    |                       | V <sub>CONT</sub> (H) | V <sub>CONT</sub> (L) |
| V <sub>CONT2</sub> | V <sub>CONT</sub> (H) | <p><b>Note</b></p>    |                       |
|                    | V <sub>CONT</sub> (L) |                       | <p><b>Note</b></p>    |

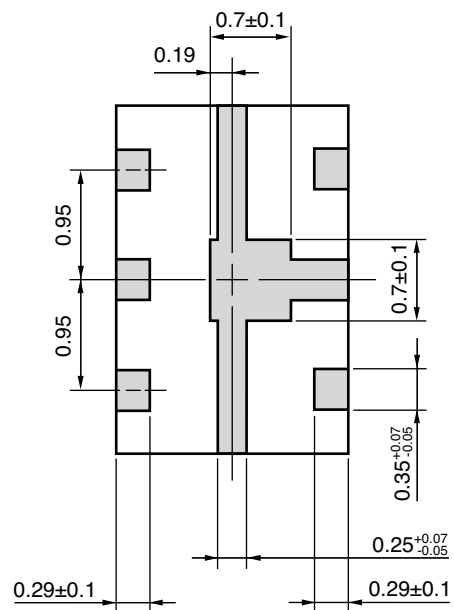
**Note** In case of  $V_{CONT1} = V_{CONT2} = \text{High}$  or  $V_{CONT1} = V_{CONT2} = \text{Low}$ , (that is same control voltage for both pins), input signal of INPUT (Pin 5) is output from OUTPUT1 (Pin 1) and OUTPUT2 (Pin 3).

## PACKAGE DIMENSIONS

## 6-PIN PLASTIC SON (UNIT:mm)



(Bottom View)



**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            |
| VPS              | Peak temperature (package surface temperature) : 215°C or below<br>Time at temperature of 200°C or higher : 25 to 40 seconds<br>Preheating time at 120 to 150°C : 30 to 60 seconds<br>Maximum number of reflow processes : 3 times<br>Maximum chlorine content of rosin flux (% mass) : 0.2%(Wt.) or below  | VP215            |
| 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 (pin 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).**

Life Support Applications

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05/18/2004

Subject: Compliance with EU Directives

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CEL Pb-free products have the same base part number with a suffix added. The suffix –A indicates that the device is Pb-free. The –AZ suffix is used to designate devices containing Pb which are exempted from the requirement of RoHS directive (\*). In all cases the devices have Pb-free terminals. All devices with these suffixes meet the requirements of the RoHS directive.

This status is based on CEL’s understanding of the EU Directives and knowledge of the materials that go into its products as of the date of disclosure of this information.

| Restricted Substance per RoHS | Concentration Limit per RoHS (values are not yet fixed) | Concentration contained in CEL devices |     |
|-------------------------------|---|--|-----|
|                               |   | -A                                     | -AZ |
| Lead (Pb)                     | < 1000 PPM  | Not Detected                           | (*) |
| Mercury                       | < 1000 PPM  | Not Detected                           |     |
| Cadmium                       | < 100 PPM   | Not Detected                           |     |
| Hexavalent Chromium           | < 1000 PPM  | Not Detected                           |     |
| PBB                           | < 1000 PPM  | Not Detected                           |     |
| PBDE                          | < 1000 PPM  | Not Detected                           |     |

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