



# NEC's 1/2W L, S-BAND SPDT SWITCH

## UPG158TB

### FEATURES

- **SWITCH CONTROL VOLTAGE:**  
 $V_{\text{cont}}(\text{H}) = 2.5 \text{ to } 5.3 \text{ V}$  (3.0 V TYP.)  
 $V_{\text{cont}}(\text{L}) = -0.2 \text{ to } +0.2 \text{ V}$  (0 V TYP.)
- **LOW INSERTION LOSS:**  
 $\text{LINS1} = 0.30 \text{ dB TYP. @ } f = 0.5 \text{ to } 1.0 \text{ GHz, } V_{\text{cont}} = 3.0 \text{ V/0 V}$   
 $\text{LINS2} = 0.40 \text{ dB TYP. @ } f = 2.0 \text{ GHz, } V_{\text{cont}} = 3.0 \text{ V/0 V}$   
 $\text{LINS3} = 0.90 \text{ dB MAX. @ } f = 2.0 \text{ to } 2.5 \text{ GHz, } V_{\text{cont}} = 3.0 \text{ V/0 V}$
- **HIGH ISOLATION:**  
 $\text{ISL1} = 27 \text{ dB TYP. @ } f = 0.5 \text{ to } 2.0 \text{ GHz, } V_{\text{cont}} = 3.0 \text{ V/0 V}$   
 $\text{ISL2} = 18 \text{ dB MIN. @ } f = 2.0 \text{ to } 2.5 \text{ GHz, } V_{\text{cont}} = 3.0 \text{ V/0 V}$
- **POWER HANDLING:**  
 $P_{\text{in}} (1 \text{ dB}) = +26.5 \text{ dBm TYP. @ } f = 1.0 \text{ GHz, } V_{\text{cont}} = 3.0 \text{ V/0 V}$
- **HIGH-DENSITY SURFACE MOUNTING:**  
6-pin super minimold package ( $2.0 \times 1.25 \times 0.9 \text{ mm}$ )

### DESCRIPTION

NEC's UPG158TB is a GaAs MMIC L, S-band SPDT (Single Pole Double Throw) switch developed for mobile phone and L, S-band applications.

This device can operate from 0.5 to 2.5 GHz, with low insertion loss and high isolation.

This device is housed in a 6-pin super minimold package. And this package is able to high-density surface mounting.

### APPLICATIONS

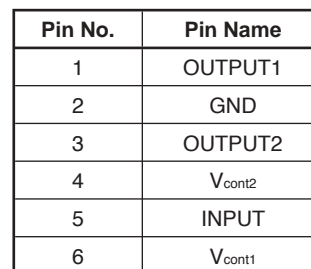
- L-band digital cellular or cordless telephone
- PCS, W-LAN, WLL and Bluetooth™
- Short Range Wireless

### ORDERING INFORMATION

| Part Number | Package              | Marking | Supplying Form  |
|-------------|----------------------|---------|---|
| UPG158TB-E3 | 6-pin super minimold | G1M     | <ul style="list-style-type: none"><li>• Embossed tape 8 mm wide</li><li>• Pin 1, 2, 3 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: UPG158TB

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



| $V_{cont1}$ | $V_{cont2}$ | INPUT-OUTPUT1 | INPUT-OUTPUT2 |
|-------------|-------------|---------------|---------------|
| Low         | High        | ON            | OFF           |
| High        | Low         | OFF           | ON            |

| Parameter                     | Symbol            | Ratings                        | Unit |
|-------------------------------|-------------------|--------------------------------|------|
| Switch Control Voltage        | V <sub>cont</sub> | −6.0 to +6.0 <sup>Note 1</sup> | V    |
| Input Power                   | P <sub>in</sub>   | +28                            | dBm  |
| Power Dissipation             | P <sub>D</sub>    | 150 <sup>Note 2</sup>          | mW   |
| Operating Ambient Temperature | T <sub>A</sub>    | −45 to +85                     | °C   |
| Storage Temperature           | T <sub>stg</sub>  | −55 to +150                    | °C   |

2. Mounted on double-sided copper-clad 50 × 50 × 1.6 mm epoxy glass PWB,  
T<sub>A</sub> = +85°C

| Parameter                  | Symbol                | MIN. | TYP. | MAX. | Unit |
|----------------------------|-----------------------|------|------|------|------|
| Switch Control Voltage (H) | V <sub>cont (H)</sub> | 2.5  | 3.0  | 5.3  | V    |
| Switch Control Voltage (L) | V <sub>cont (L)</sub> | −0.2 | 0    | 0.2  | V    |

## ELECTRICAL CHARACTERISTICS

(TA = +25°C, V<sub>cont</sub> = 3.0 V/0 V, DC blocking capacitors = 51 pF, unless otherwise specified)

| Parameter  | Symbol                 | Test Conditions    | MIN.  | TYP.  | MAX. | Unit |
|--|------------------------|--------------------|-------|-------|------|------|
| Insertion Loss 1                                 | L <sub>INS1</sub>      | f = 0.5 to 1.0 GHz | –     | 0.30  | 0.55 | dB   |
| Insertion Loss 2                                 | L <sub>INS2</sub>      | f = 2.0 GHz        | –     | 0.40  | 0.65 | dB   |
| Insertion Loss 3                                 | L <sub>INS3</sub>      | f = 2.0 to 2.5 GHz | –     | –     | 0.90 | dB   |
| Isolation 1                                      | ISL1                   | f = 0.5 to 2.0 GHz | 22    | 27    | –    | dB   |
| Isolation 2                                      | ISL2                   | f = 2.0 to 2.5 GHz | 18    | –     | –    | dB   |
| Input Return Loss 1                              | RL <sub>in1</sub>      | f = 0.5 to 2.0 GHz | 13    | 19    | –    | dB   |
| Input Return Loss 2                              | RL <sub>in2</sub>      | f = 2.0 to 2.5 GHz | 11    | –     | –    | dB   |
| Output Return Loss 1                             | RL <sub>out1</sub>     | f = 0.5 to 2.0 GHz | 13    | 19    | –    | dB   |
| Output Return Loss 2                             | RL <sub>out2</sub>     | f = 2.0 to 2.5 GHz | 11    | –     | –    | dB   |
| 1 dB Loss Compression<br>Input Power <b>Note</b> | P <sub>in</sub> (1 dB) | f = 1.0 GHz        | +22.0 | +26.5 | –    | dBm  |
| Switch Control Speed                             | t <sub>sw</sub>        |                    | –     | 50    | 200  | ns   |
| Switch Control Current                           | I <sub>cont</sub>      |                    | –     | 0.5   | 10   | μA   |

**Note** P<sub>in</sub> (1 dB) is measured the input power level when the insertion loss increases 1 dB more than that of linear range.

## STANDARD CHARACTERISTICS FOR REFERENCE

(TA = +25°C, V<sub>cont</sub> = 3.0 V/0 V, DC blocking capacitors = 51 pF, unless otherwise specified)

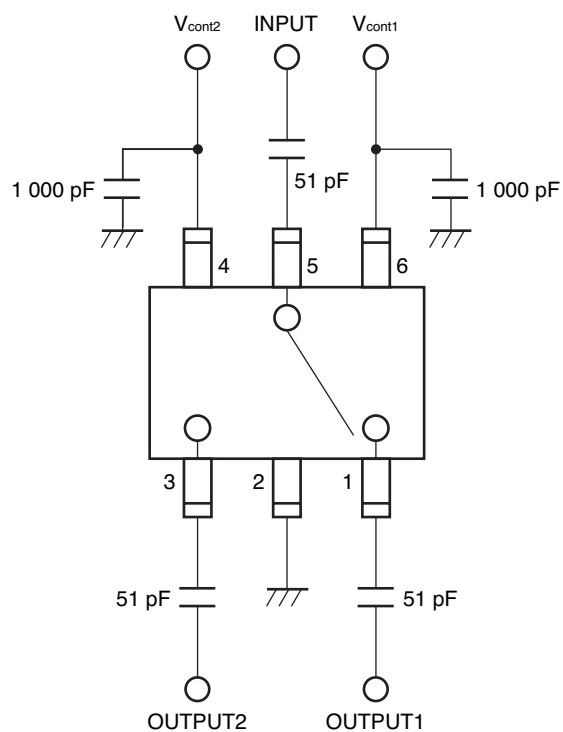
| Parameter  | Symbol                   | Test Conditions | MIN. | TYP.  | MAX. | Unit |
|--|--------------------------|-----------------|------|-------|------|------|
| 0.1 dB Loss Compression<br>Input Power <b>Note</b> | P <sub>in</sub> (0.1 dB) | f = 1.0 GHz     | –    | +23.0 | –    | dBm  |

**Note** P<sub>in</sub> (0.1 dB) is measured the input power level when the insertion loss increases 0.1 dB more than that of linear range.**Caution** It is necessary to use DC blocking capacitors with this device.

The value of DC blocking capacitors should be chosen to accommodate the frequency of operation, bandwidth, switching speed and the condition with the actual board of your system. The range of recommended DC blocking capacitor value is less than 100 pF.

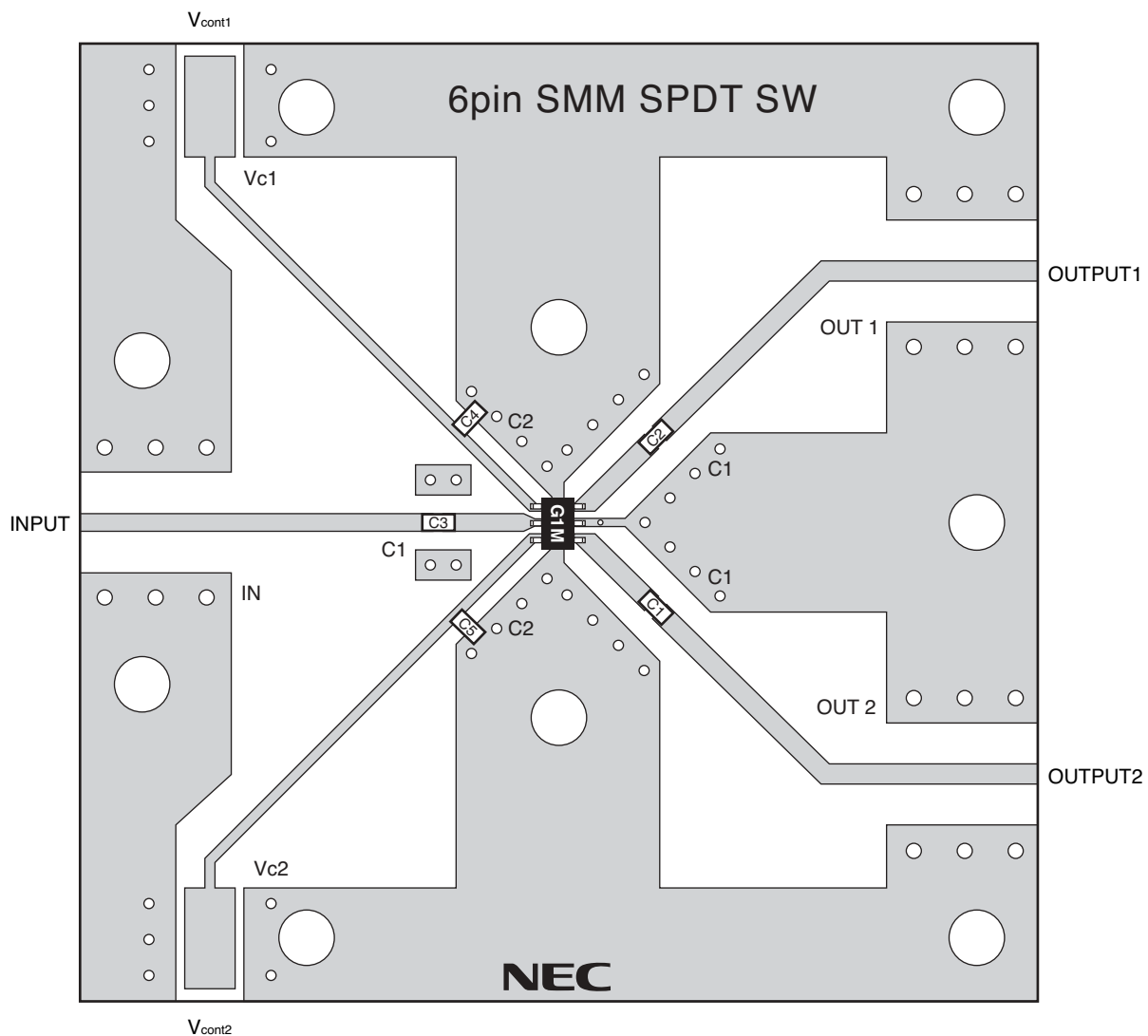
**EVALUATION CIRCUIT**

( $V_{\text{cont}} = 3.0 \text{ V/0 V}$ , DC blocking capacitors = 51 pF)



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

## ILLUSTRATION OF THE TEST CIRCUIT ASSEMBLED ON EVALUATION BOARD

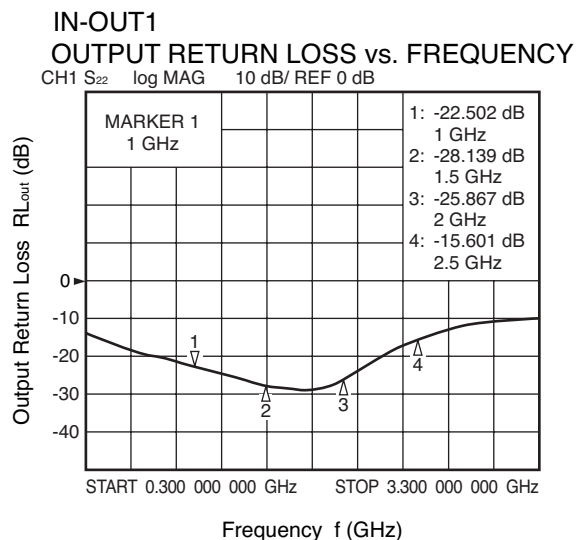
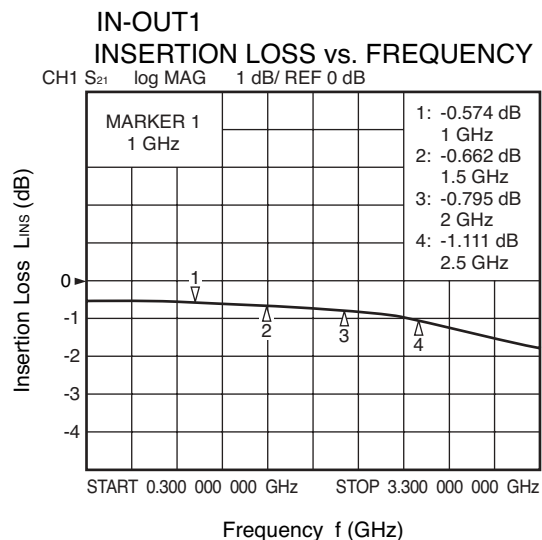
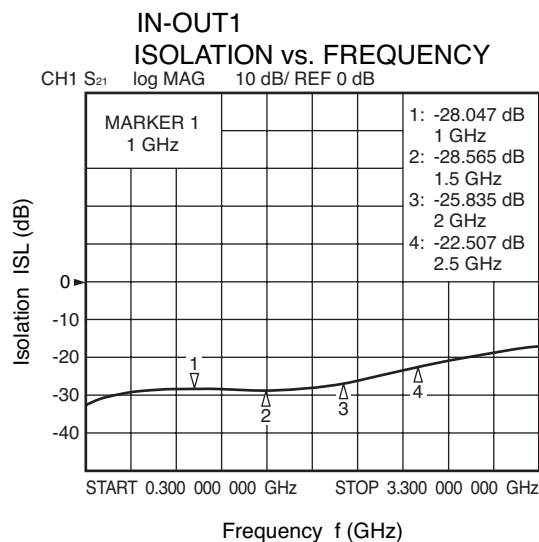
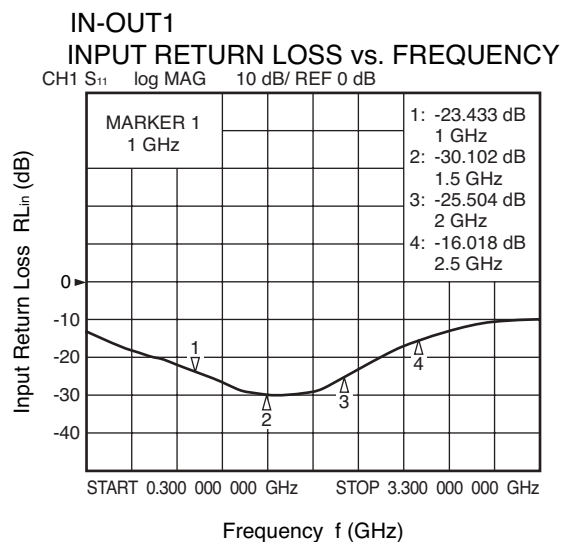
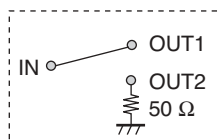


## USING THE NEC EVALUATION BOARD

| Symbol     | Values   |
|------------|----------|
| C1, C2, C3 | 51 pF    |
| C4, C5     | 1 000 pF |

## TYPICAL CHARACTERISTICS

( $T_A = +25^\circ\text{C}$ ,  $V_{\text{cont}} = 3.0\text{ V/0 V}$ ,  $P_{\text{in}} = 0\text{ dBm}$ , unless otherwise specified)

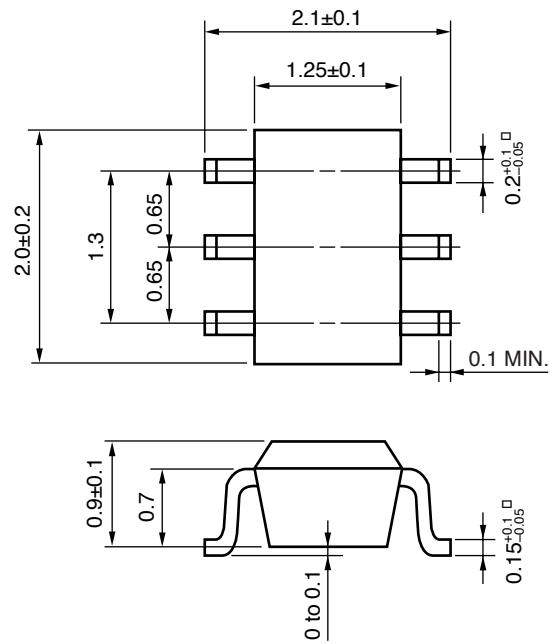


**Caution** Data includes loss of the test fixture.

**Remark** The graphs indicate nominal characteristics.

## PACKAGE DIMENSIONS

6-PIN SUPER MINIMOLD (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     | IR260            |
|                  | Time at peak temperature                             | : 10 seconds or less |                  |
|                  | Time at temperature of 220°C or higher               | : 60 seconds or less |                  |
|                  | Preheating time at 120 to 180°C                      | : 120±30 seconds     |                  |
|                  | Maximum number of reflow processes                   | : 3 times            |                  |
|                  | Maximum chlorine content of rosin flux (% mass)      | : 0.2%(Wt.) or below |                  |
| VPS              | Peak temperature (package surface temperature)       | : 215°C or below     | VP215            |
|                  | Time at temperature of 200°C or higher               | : 25 to 40 seconds   |                  |
|                  | Preheating time at 120 to 150°C                      | : 30 to 60 seconds   |                  |
|                  | Maximum number of reflow processes                   | : 3 times            |                  |
|                  | Maximum chlorine content of rosin flux (% mass)      | : 0.2%(Wt.) or below |                  |
| Wave Soldering   | Peak temperature (molten solder temperature)         | : 260°C or below     | WS260            |
|                  | Time at peak temperature                             | : 10 seconds or less |                  |
|                  | Preheating temperature (package surface temperature) | : 120°C or below     |                  |
|                  | Maximum number of flow processes                     | : 1 time             |                  |
|                  | Maximum chlorine content of rosin flux (% mass)      | : 0.2%(Wt.) or below |                  |
| Partial Heating  | Peak temperature (pin temperature)                   | : 350°C or below     | HS350            |
|                  | Soldering time (per side of device)                  | : 3 seconds or less  |                  |
|                  | Maximum chlorine content of rosin flux (% mass)      | : 0.2%(Wt.) or below |                  |

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

### Life Support Applications

These NEC products are not intended for use in life support devices, appliances, or systems where the malfunction of these products can reasonably be expected to result in personal injury. The customers of CEL using or selling these products for use in such applications do so at their own risk and agree to fully indemnify CEL for all damages resulting from such improper use or sale.

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