



NEC's L, S-BAND 4W SPDT SWITCH

UPG2009TB

FEATURES

- **LOW INSERTION LOSS:**
LINS = 0.25 dB TYP. @ $V_{cont1/2} = 2.8 \text{ V/0 V}$, $f = 1.0 \text{ GHz}$
LINS = 0.30 dB TYP. @ $V_{cont1/2} = 2.8 \text{ V/0 V}$, $f = 2.0 \text{ GHz}$
- **HIGH ISOLATION:**
ISL = 28 dB TYP. @ $V_{cont1/2} = 2.8 \text{ V/0 V}$, $f = 2.0 \text{ GHz}$
- **POWER HANDLING:**
 $P_{in} (0.1\text{dB}) = 34 \text{ dBm TYP. @ } V_{cont1/2} = 2.8 \text{ V/0 V}$, $f = 1.0 \text{ GHz}$
 $P_{in} (1.0\text{dB}) = 36 \text{ dBm TYP. @ } V_{cont1/2} = 2.8 \text{ V/0 V}$, $f = 1.0 \text{ GHz}$
- **6-PIN SUPER MINIMOLD PACKAGE (2.0 × 1.25 × 0.9 mm)**

DESCRIPTION

The UPG2009TB is a L, S-band SPDT (Single Pole Double Throw) GaAs FET switch for digital cellular or cordless telephone application. The device can operate from 500 MHz to 2.5 GHz, with low insertion loss and high isolation.

APPLICATIONS

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

ORDERING INFORMATION

| Part Number | Package | Marking | Supplying Form |
|--------------|----------------------|---------|---|
| UPG2009TB-E3 | 6-pin super minimold | G2U | <ul style="list-style-type: none"> • Embossed tape 8 mm wide • Pin 1, 2, 3 face the perforation side of the tape • Qty 3 kpcs/reel |

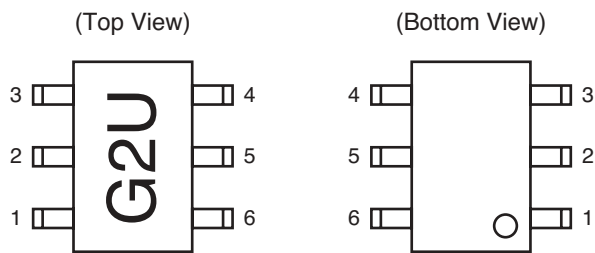
Remark To order evaluation samples, contact your nearby sales office.
Part number for sample order: UPG2009TB

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



UPG2009TB

PIN CONNECTIONS



| Pin No. | Pin Name |
|---------|----------|
| 1 | OUT1 |
| 2 | GND |
| 3 | OUT2 |
| 4 | VCont2 |
| 5 | IN |
| 6 | VCont1 |

ABSOLUTE MAXIMUM RATINGS (TA = 25°C, unless otherwise specified)

| Parameter | Symbol | Ratings | Unit |
|-------------------------------|-----------|---------------------------|------|
| Control Voltage 1, 2 | Vcont1, 2 | −6.0 to +6.0 Note1 | V |
| Input Power | Pin | +36 | dBm |
| Total Power Dissipation | Ptot | 0.15 | mW |
| Operating Ambient Temperature | TA | −45 to +85 | °C |
| Storage Temperature | Tstg | −55 to +150 | °C |

Note | Vcont1 − Vcont2 | ≤ 6.0 V

RECOMMENDED OPERATING RANGE (TA = 25°C)

| Parameter | Symbol | MIN. | TYP. | MAX. | Unit |
|------------------------|-----------|------|------|------|------|
| Control Voltage (High) | Vcont (H) | +2.7 | +2.8 | +3.0 | V |
| Control Voltage (Low) | Vcont (L) | −0.2 | 0 | +0.2 | V |

ELECTRICAL CHARACTERISTICS

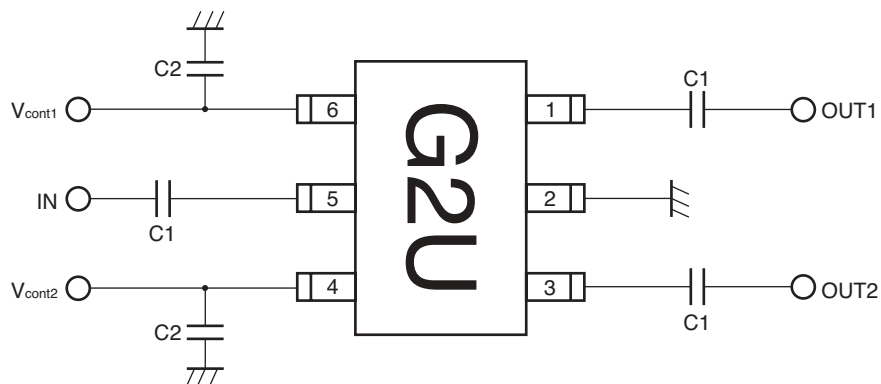
($T_A = +25^\circ\text{C}$, $V_{\text{cont}1} = 2.8\text{ V}$, $V_{\text{cont}2} = 0\text{ V}$ or $V_{\text{cont}1} = 0\text{ V}$, $V_{\text{cont}2} = 2.8$, $Z_o = 50\ \Omega$, off chip DC blocking capacitors value; 56 pF, unless otherwise specified)

| Parameter | Symbol | Test Conditions | MIN. | TYP. | MAX. | Unit |
|---|--------------------------------|---|------|------|------|---------------|
| Insertion Loss | L_{INS} | $f = 0.5\text{ to }1.0\text{ GHz}$ | – | 0.25 | 0.45 | dB |
| | | $f = 2.0\text{ GHz}$ | – | 0.30 | 0.50 | dB |
| | | $f = 2.5\text{ GHz}$ | – | 0.40 | – | dB |
| Isolation | ISL | $f = 0.5\text{ to }2.0\text{ GHz}$ | 24 | 28 | – | dB |
| | | $f = 2.5\text{ GHz}$ | – | 25 | – | dB |
| Input Return Loss | RL_{in} | $f = 0.5\text{ to }2.5\text{ GHz}$ | 15 | 20 | – | dB |
| Output Return Loss | RL_{out} | $f = 0.5\text{ to }2.5\text{ GHz}$ | 15 | 20 | – | dB |
| Input Power at 0.1 dB Compression Point Note | $P_{\text{in}(0.1\text{ dB})}$ | $f = 1.0\text{ GHz}$, $V_{\text{cont}} = 2.8\text{ V}/0\text{ V}$ | 32.5 | 34 | – | dBm |
| 2nd Harmonics | $2f_0$ | $f = 1.0\text{ GHz}$, $V_{\text{cont}} = 2.8\text{ V}/0\text{ V}$, $P_{\text{in}} = 30.5\text{ dBm}$ | 65 | 75 | – | dBc |
| 3rd Harmonics | $3f_0$ | $f = 1.0\text{ GHz}$, $V_{\text{cont}} = 2.8\text{ V}/0\text{ V}$, $P_{\text{in}} = 30.5\text{ dBm}$ | 65 | 75 | – | dBc |
| Switching Speed | t_{sw} | | – | 150 | – | ns |
| Control Current | I_{cont} | $V_{\text{cont}} = 2.8\text{ V}/0\text{ V}$, RF Non | – | 1 | 50 | μA |

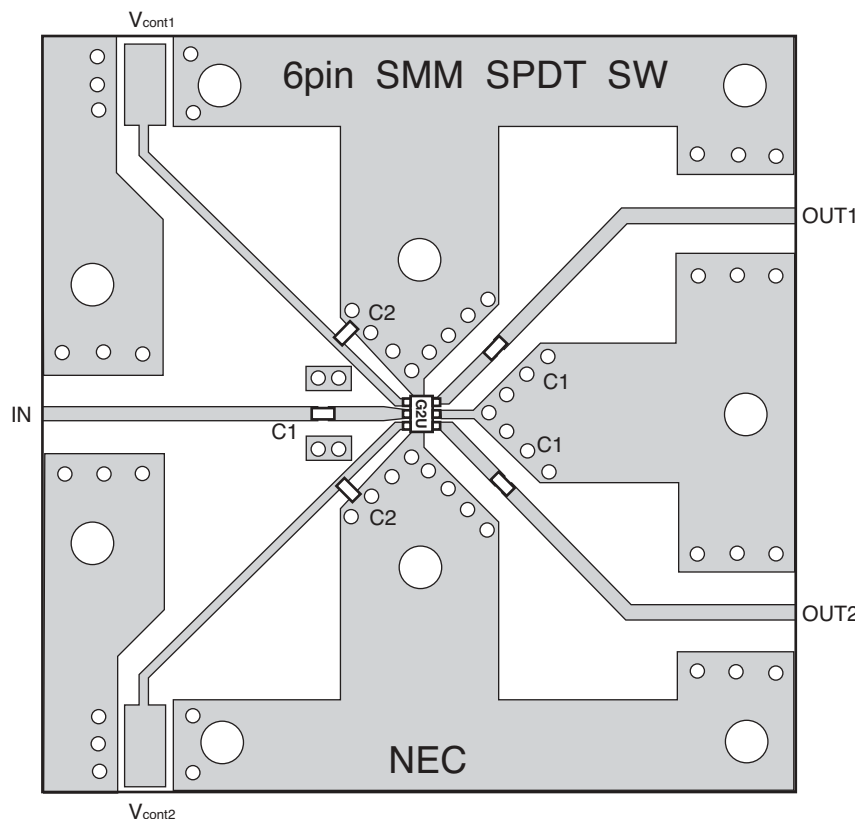
Note $P_{\text{in}}(0.1\text{ dB})$ is the measured input power level when the insertion loss increases 0.1 dB more than that of linear range. All other characteristics are measured in linear range.

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

EVALUATION CIRCUIT ($V_{cont1} = 2.8\text{ V}$, $V_{cont2} = 0\text{ V}$ or $V_{cont2} = 0\text{ V}$, $V_{cont1} = 2.8\text{ V}$, off chip DC blocking capacitors value $C1 = 56\text{ pF}$, $C2 = 1\ 000\text{ pF}$ (Bypass), using NEC standard evaluation board)



EVALUATION BOARD



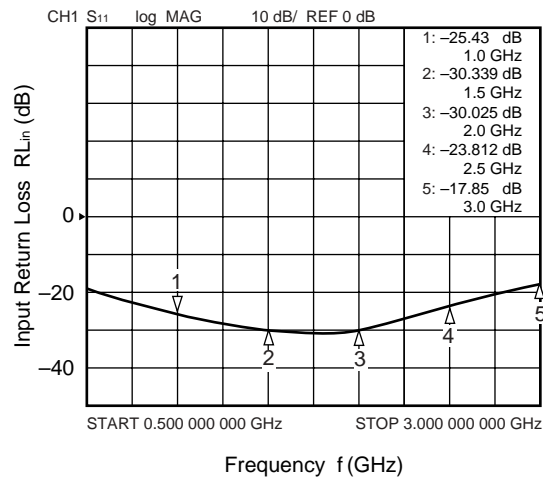
TRUTH TABLE

| V_{cont1} | V_{cont2} | IN-OUT1 | IN-OUT2 |
|-------------|-------------|---------|---------|
| Low | High | OFF | ON |
| High | Low | ON | OFF |

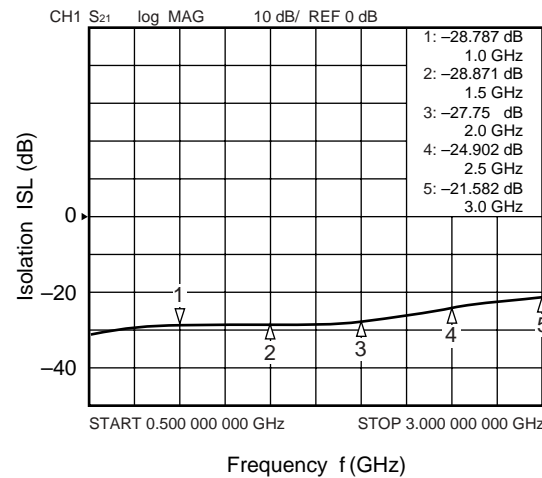
TYPICAL CHARACTERISTICS

(T_A = +25°C V_{cont1/2} = 2.8 V/0 V, P_{in} = 0 dBm, OUT2 side is 50 Ω termination)

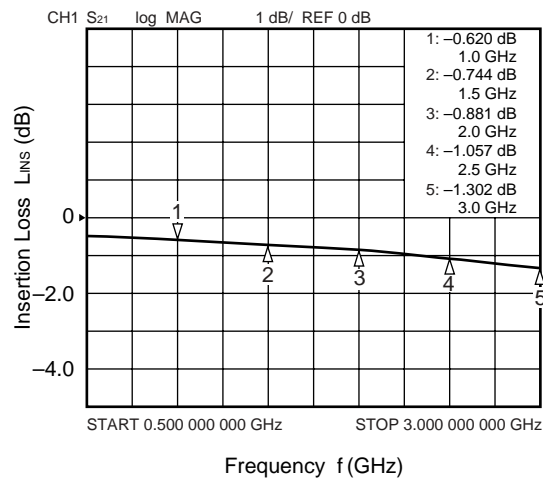
INPUT RETURN LOSS vs. FREQUENCY



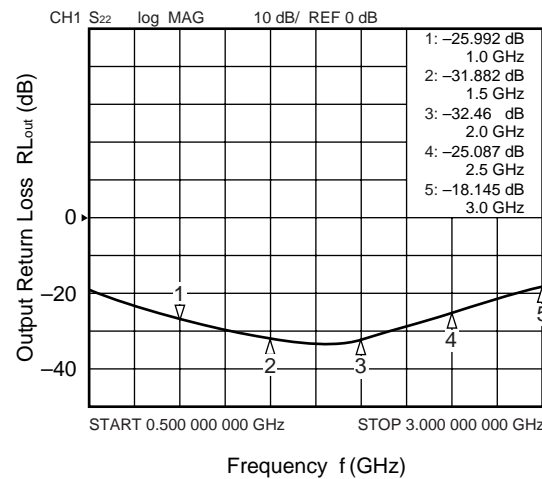
ISOLATION vs. FREQUENCY



INSERTION LOSS vs. FREQUENCY



OUTPUT RETURN LOSS vs. FREQUENCY



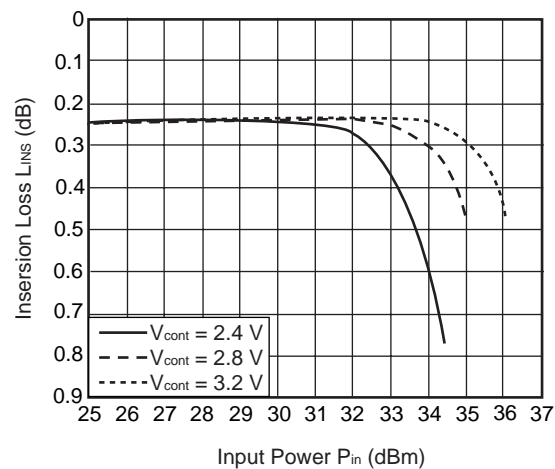
Caution These characteristics values include the losses of the NEC evaluation board.

Remark The graphs indicate nominal characteristics.

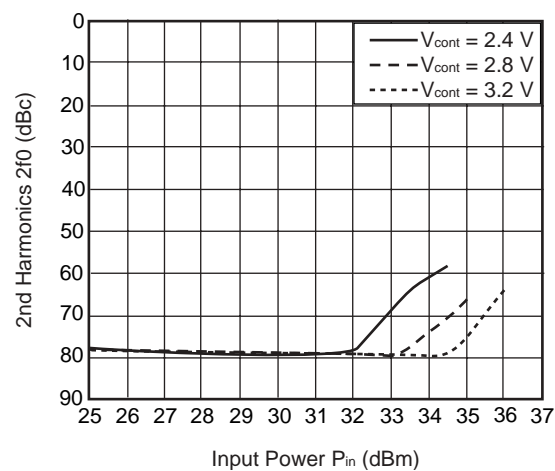
TYPICAL CHARACTERISTICS

($f = 2$ GHz, OUT2 side is $50\ \Omega$ termination)

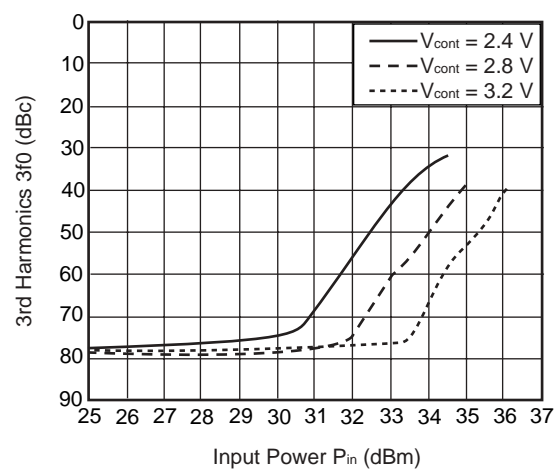
RELATION BETWEEN CONTROL
VOLTAGE OF INSERTION LOSS



RELATION BETWEEN CONTROL
VOLTAGE OF 2nd HARMONICS



RELATION BETWEEN CONTROL
VOLTAGE OF 3rd HARMONICS

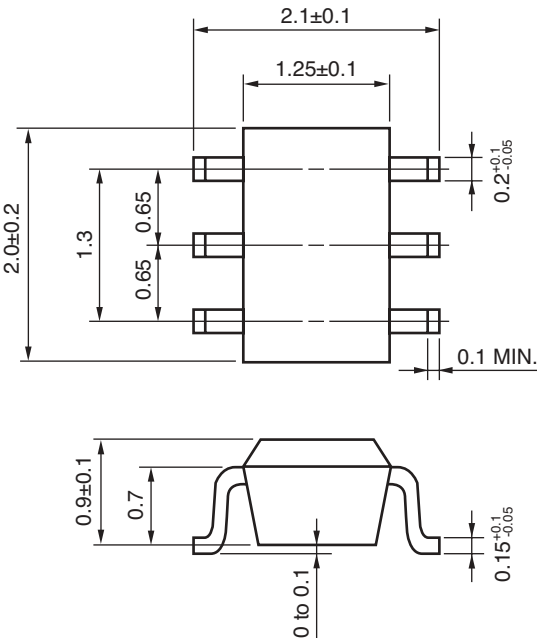


Remark The graphs indicate nominal characteristics.

UPG2009TB

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 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 | IR260 |
| VPS | Peak temperature (package surface temperature) : 215°C or below 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 | VP215 |
| Wave Soldering | Peak temperature (molten solder temperature) : 260°C or below 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 | WS260 |
| Partial Heating | Peak temperature (pin temperature) : 350°C or below Soldering time (per side of device) : 3 seconds or less 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

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.