GaAs INTEGRATED CIRCUIT

# μPG2179TB

## L, S-BAND SPDT SWITCH

### DESCRIPTION

The μPG2179TB is a GaAs MMIC for L, S-band SPDT (Single Pole Double Throw) switch which were developed for mobile phone and another L, S-band application. This device can operate 2 control switching by control voltage 2.5 ★ to 5.3 V. This device can operate frequency from 0.05 to 3.0 GHz, having the 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.

### ★ FEATURES

- Switch control voltage : $V_{cont\ (H)}$ = 2.5 to 5.3 V (3.0 V TYP.)
  : $V_{cont\ (L)}$ = –0.2 to +0.2 V (0 V TYP.)
- Low insertion loss : $L_{ins1}$ = 0.25 dB TYP. @ f = 0.05 to 1.0 GHz, $V_{cont\ (H)}$ = 3.0 V, $V_{cont\ (L)}$ = 0 V
  : $L_{ins2}$ = 0.30 dB TYP. @ f = 1.0 to 2.0 GHz, $V_{cont\ (H)}$ = 3.0 V, $V_{cont\ (L)}$ = 0 V
  : $L_{ins3}$ = 0.35 dB TYP. @ f = 2.0 to 2.5 GHz, $V_{cont\ (H)}$ = 3.0 V, $V_{cont\ (L)}$ = 0 V
  : $L_{ins4}$ = 0.40 dB TYP. @ f = 2.5 to 3.0 GHz, $V_{cont\ (H)}$ = 3.0 V, $V_{cont\ (L)}$ = 0 V
- High isolation : ISL1 = 27 dB TYP. @ f = 0.05 to 2.0 GHz, $V_{cont\ (H)}$ = 3.0 V, $V_{cont\ (L)}$ = 0 V
  : ISL2 = 24 dB TYP. @ f = 2.0 to 3.0 GHz, $V_{cont\ (H)}$ = 3.0 V, $V_{cont\ (L)}$ = 0 V
- Handling power : $P_{in\ (0.1\ dB)}$ = +29.0 dBm TYP. @ f = 0.5 to 3.0 GHz, $V_{cont\ (H)}$ = 3.0 V, $V_{cont\ (L)}$ = 0 V
  : $P_{in\ (1\ dB)}$ = +32.0 dBm TYP. @ f = 0.5 to 3.0 GHz, $V_{cont\ (H)}$ = 3.0 V, $V_{cont\ (L)}$ = 0 V
- High-density surface mounting : 6-pin super minimold package (2.0 × 1.25 × 0.9 mm)



### APPLICATIONS

- L, S-band digital cellular or cordless telephone
- PCS, W-LAN, WLL and Bluetooth™ etc.

### ★ ORDERING INFORMATION

| Part Number | Package | Marking | Supplying Form |
|---|---|---|---|
| μPG2179TB-E4 | 6-pin super minimold | G4C | • Embossed tape 8 mm wide<br>• Pin 4, 5, 6 face the perforation side of the tape<br>• Qty 3 kpcs/reel |

**Remark** To order evaluation samples, contact your nearby sales office.
Part number for sample order: μPG2179TB

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



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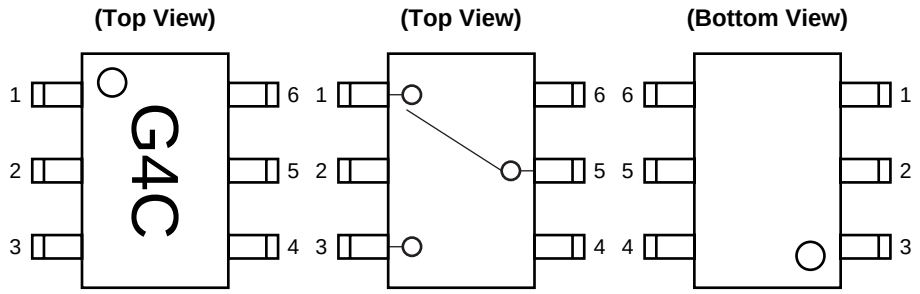
**The mark ★ shows major revised points.**

## PIN CONNECTIONS AND INTERNAL BLOCK DIAGRAM




| Pin No. | Pin Name |
|---|---|
| 1 | OUTPUT1 |
| 2 | GND |
| 3 | OUTPUT2 |
| 4 | $V_{cont2}$ |
| 5 | INPUT |
| 6 | $V_{cont1}$ |

## TRUTH TABLE

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

## ABSOLUTE MAXIMUM RATINGS ($T_A$ = +25°C, unless otherwise specified)

| Parameter | Symbol | Ratings | Unit |
|---|---|---|---|
| Switch Control Voltage | $V_{cont}$ | 6.0 Note | V |
| Input Power | $P_{in}$ | +33 | dBm |
| Operating Ambient Temperature | $T_A$ | –45 to +85 | °C |
| Storage Temperature | $T_{stg}$ | –55 to +150 | °C |

★ **Note** $|V_{cont1} - V_{cont2}| \leq 6.0$ V

## RECOMMENDED OPERATING RANGE ($T_A$ = +25°C, unless otherwise specified)

| Parameter | Symbol | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|
| ★ Switch Control Voltage (H) | $V_{cont\ (H)}$ | 2.5 | 3.0 | 5.3 | V |
| Switch Control Voltage (L) | $V_{cont\ (L)}$ | –0.2 | 0 | 0.2 | V |

## ★ ELECTRICAL CHARACTERISTICS

**($T_A$ = +25°C, $V_{cont\ (H)}$ = 3.0 V, $V_{cont\ (L)}$ = 0 V, DC cut capacitors = 100 pF, unless otherwise specified)**

| Parameter | Symbol | Test Conditions | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|
| Insertion Loss 1 | $L_{ins1}$ | f = 0.05 to 1.0 GHz Note1 | – | 0.25 | 0.45 | dB |
| Insertion Loss 2 | $L_{ins2}$ | f = 1.0 to 2.0 GHz | – | 0.30 | 0.50 | dB |
| Insertion Loss 3 | $L_{ins3}$ | f = 2.0 to 2.5 GHz | – | 0.35 | 0.55 | dB |
| Insertion Loss 4 | $L_{ins4}$ | f = 2.5 to 3.0 GHz | – | 0.40 | 0.60 | dB |
| Isolation 1 | ISL1 | f = 0.05 to 2.0 GHz Note1 | 23 | 27 | – | dB |
| Isolation 2 | ISL2 | f = 2.0 to 3.0 GHz | 20 | 24 | – | dB |
| Input Return Loss | $RL_{in}$ | f = 0.05 to 3.0 GHz Note1 | 15 | 20 | – | dB |
| Output Return Loss | $RL_{out}$ | f = 0.05 to 3.0 GHz Note1 | 15 | 20 | – | dB |
| 0.1 dB Loss Compression Input Power Note2 | $P_{in\ (0.1\ dB)}$ | f = 2.0 GHz | +25.5 | +29.0 | – | dBm |
| | | f = 2.5 GHz | +25.5 | +29.0 | – | dBm |
| | | f = 0.5 to 3.0 GHz | – | +29.0 | – | dBm |
| Switch Control Current | $I_{cont}$ | No signal | – | 4 | 20 | μA |
| Switch Control Speed | $t_{sw}$ | 50%CTL to 90/10%RF | – | 50 | 500 | ns |

**Note1.** DC cut capacitor = 1 000 pF at f = 0.05 to 0.5 GHz.

**2.** $P_{in\ (0.1\ dB)}$ is measured the input power level when the insertion loss increases more 0.1 dB than that of linear range.

## ★ STANDARD CHARACTERISTICS FOR REFERENCE

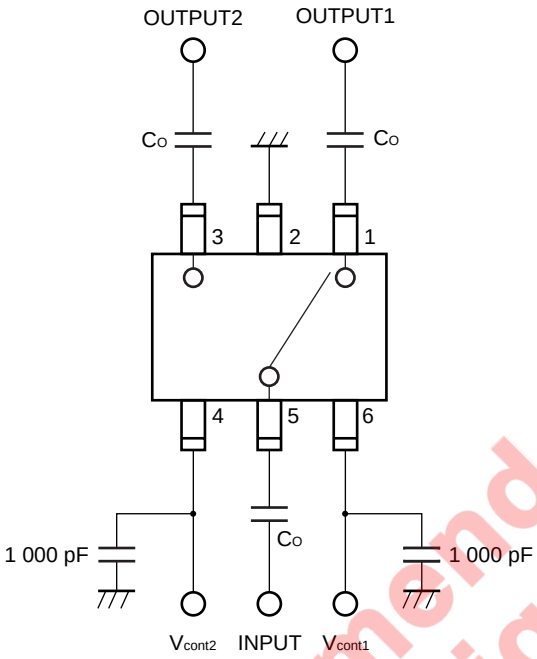
**($T_A$ = +25°C, $V_{cont\ (H)}$ = 3.0 V, $V_{cont\ (L)}$ = 0 V, DC cut capacitors = 100 pF, unless otherwise specified)**

| Parameter | Symbol | Test Conditions | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|
| 1 dB Loss Compression Input Power Note | $P_{in\ (1\ dB)}$ | f = 0.5 to 3.0 GHz | – | +32.0 | – | dBm |
| 3rd Order Intermodulation Intercept Point | $IIP_3$ | f = 0.5 to 3.0 GHz, 2 tone, 5 MHz spicing | – | +60.0 | – | dBm |

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

★ **Caution When using this IC, a DC coupling capacitor must be externally attached to the I/O pins. A DC coupling capacitor with a capacitance of 100 pF or lower is recommended when using a frequency of 0.5 GHz or higher, and one with a capacitance of 1,000 pF is recommended when using a frequency of less than 0.5 GHz. The ideal value changes depending on the frequency and bandwidth used, so select a capacitor with a suitable capacitance according to the usage conditions.**

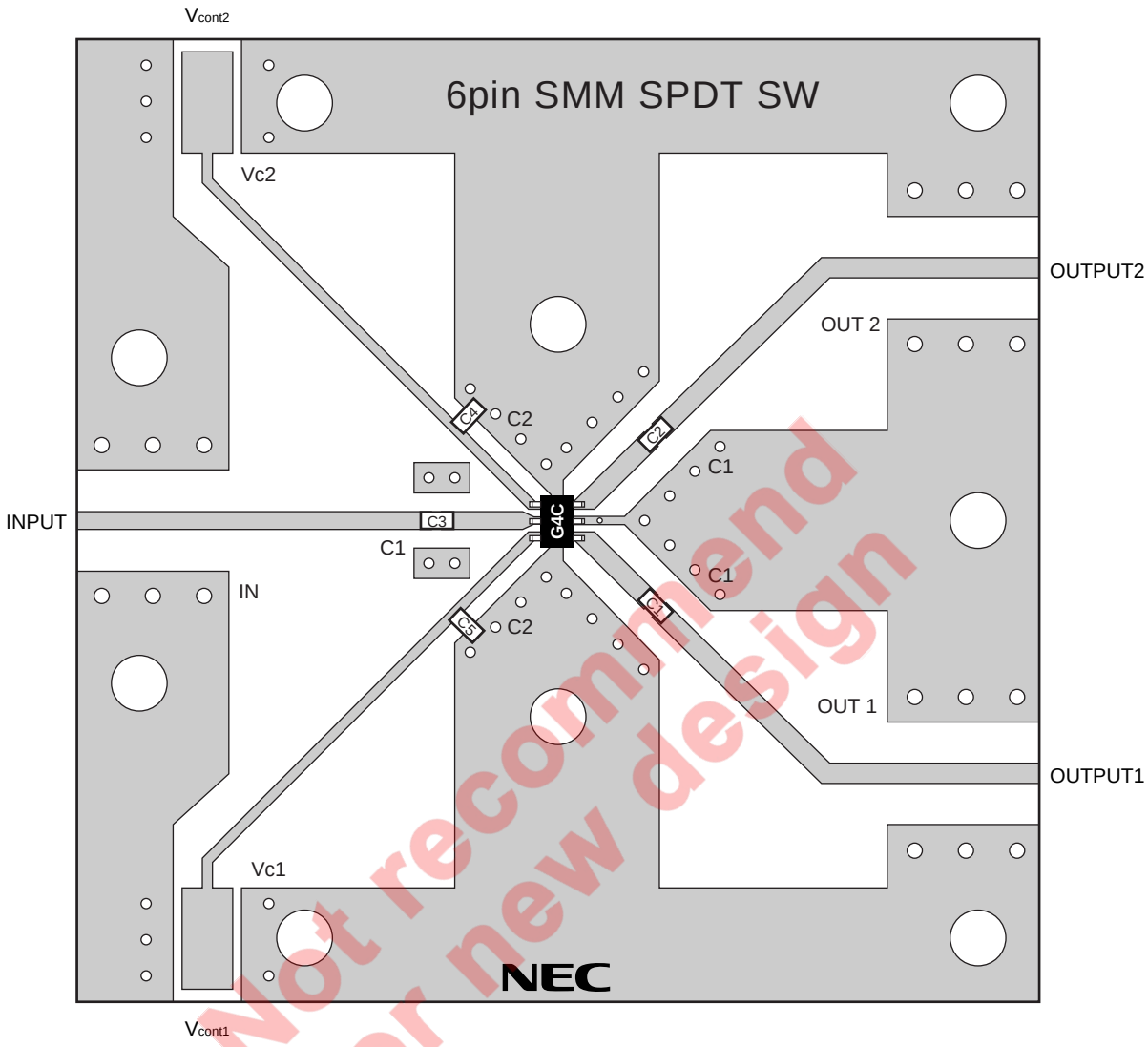
## ★ EVALUATION CIRCUIT




**Remark** $C_O$ : 0.05 to 0.5 GHz 1 000 pF
0.5 to 3.0 GHz 100 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





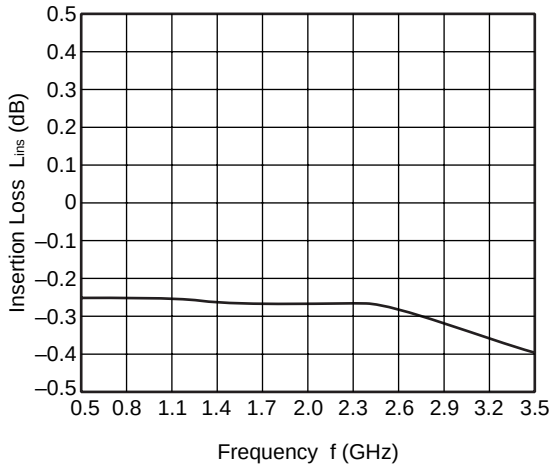

### USING THE NEC EVALUATION BOARD

| Symbol | Values |
|---|---|
| C1, C2, C3 | 100 pF |
| C4, C5 | 1 000 pF |

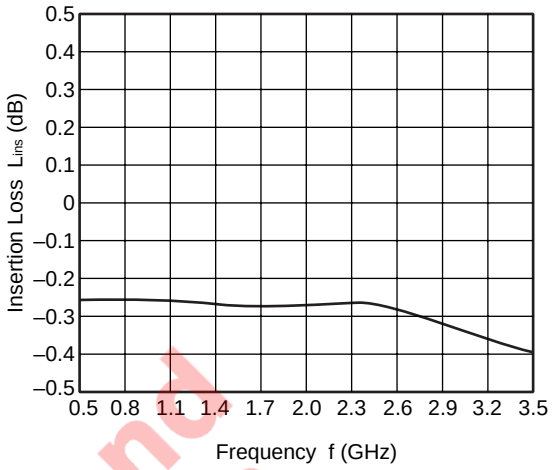
## TYPICAL CHARACTERISTICS

★ **($T_A$ = +25°C, $V_{cont\ (H)}$ = 3.0 V, $V_{cont\ (L)}$ = 0 V, DC cut capacitors = 100 pF, unless otherwise specified)**

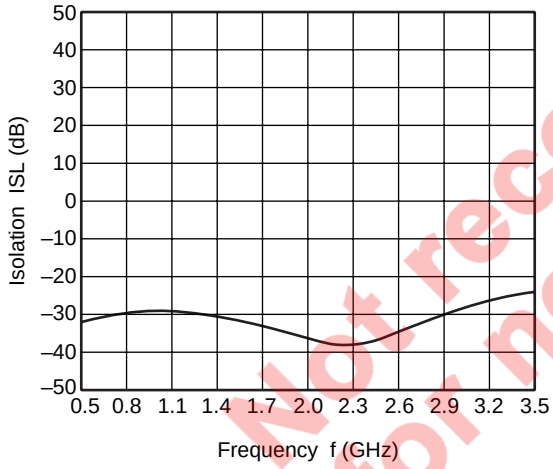
INPUT–OUTPUT1
INSERTION LOSS vs. FREQUENCY



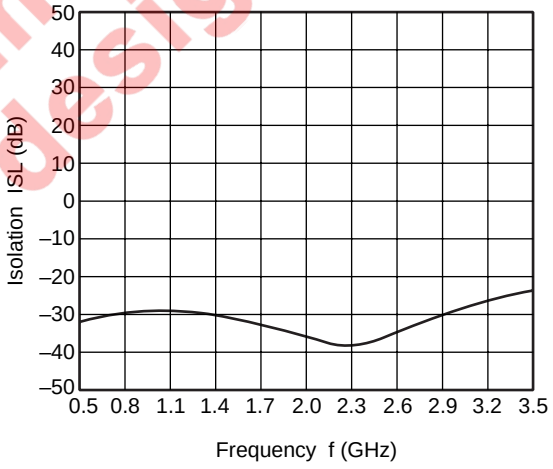

INPUT–OUTPUT2
INSERTION LOSS vs. FREQUENCY



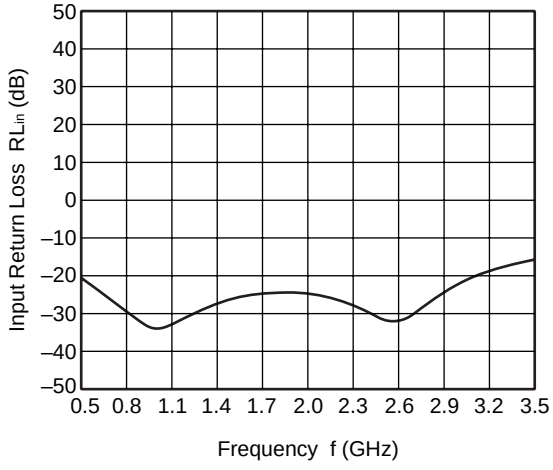

INPUT–OUTPUT1
ISOLATION vs. FREQUENCY



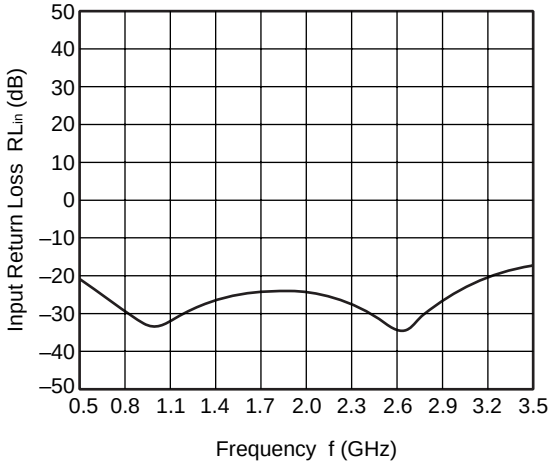

INPUT–OUTPUT2
ISOLATION vs. FREQUENCY




INPUT–OUTPUT1
INPUT RETURN LOSS vs. FREQUENCY



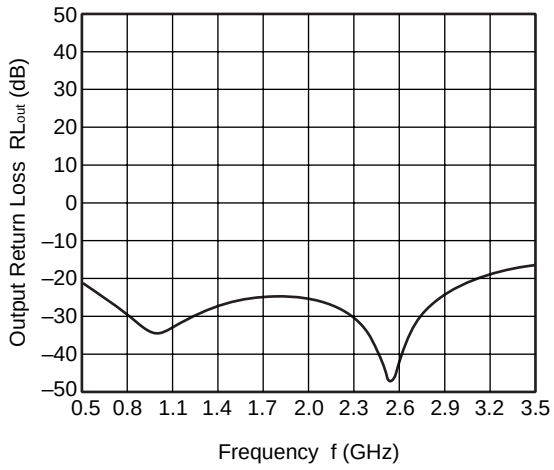

INPUT–OUTPUT2
INPUT RETURN LOSS vs. FREQUENCY



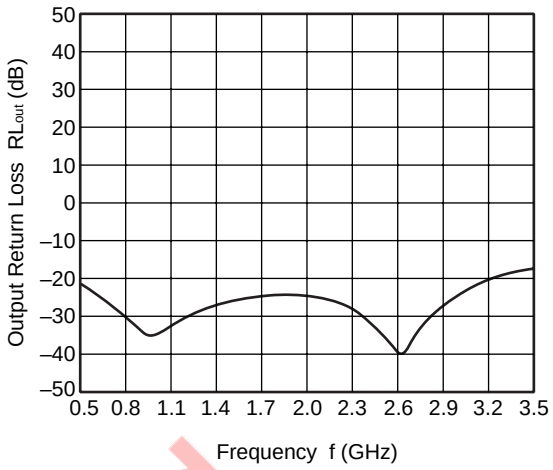



**Remark** The graphs indicate nominal characteristics.

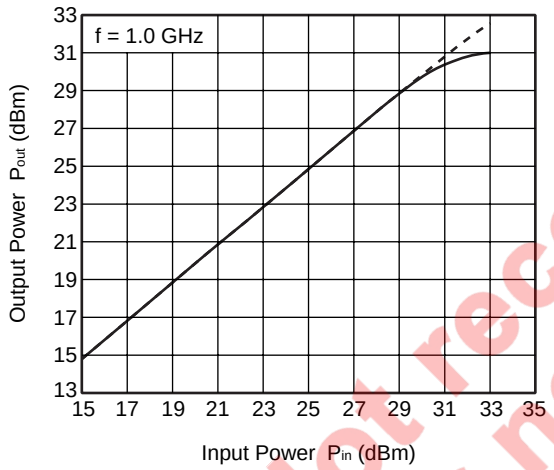
INPUT–OUTPUT1
OUTPUT RETURN LOSS vs. FREQUENCY



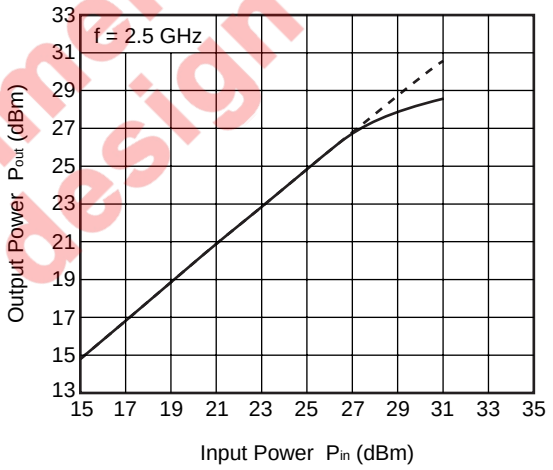

INPUT–OUTPUT2
OUTPUT RETURN LOSS vs. FREQUENCY




OUTPUT POWER vs. INPUT POWER




OUTPUT POWER vs. INPUT POWER

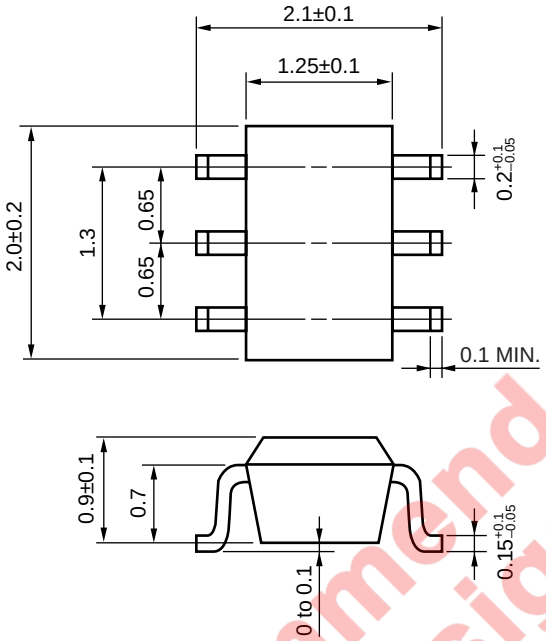





**Remark** The graphs indicate nominal characteristics.

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

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

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