

# NEC

## BIPOLAR ANALOG INTEGRATED CIRCUIT

# $\mu$ PC2713T

### 1.2 GHz LOW NOISE WIDE BAND AMPLIFIER SILICON BIPOLAR MONOLITHIC INTEGRATED CIRCUIT

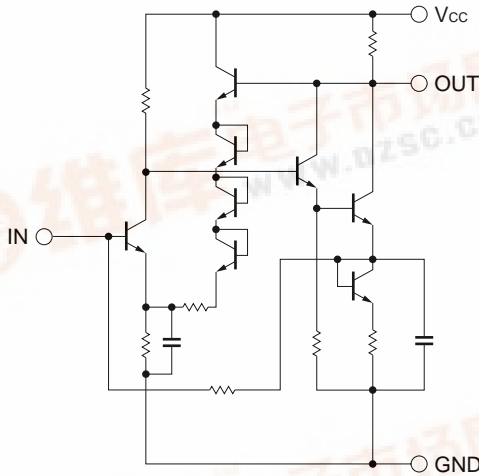
#### FEATURES

- High power gain : 29 dB TYP. @  $f = 0.5$  GHz
- Excellent frequency response: 1.2 GHz TYP. @ 3 dB down below the gain at 0.1 GHz
- Low noise figure : 3.2 dB TYP.
- Single supply voltage : 5 V
- Input and output matching :  $50 \Omega$
- Mini package : 6 pin mini mold

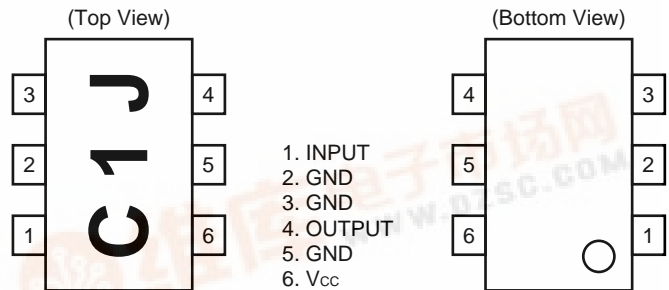
#### ORDERING INFORMATION

| PART NUMBER      | PACKAGE         | SUPPLYING FORM   |
|------------------|-----------------|--|
| $\mu$ PC2713T-E3 | 6 pin mini mold | Embossed tape 8 mm wide. QTY 3 kp/Reel.<br>Pin 1, 2, 3 face to perforation side of the tape. |

#### EQUIVALENT CIRCUIT



#### PIN CONNECTIONS



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

|                       |                  |             |     |
|-----------------------|------------------|-------------|-----|
| Supply Voltage        | V <sub>CC</sub>  | 6           | V   |
| Total Circuit Current | I <sub>CC</sub>  | 30          | mA  |
| Power Dissipation     | P <sub>D</sub>   | 280*        | mW  |
| Operating Temperature | T <sub>opt</sub> | -40 to +85  | °C  |
| Storage Temperature   | T <sub>stg</sub> | -55 to +150 | °C  |
| Input Power           | P <sub>in</sub>  | +10         | dBm |

\* Mounted on 50 × 50 × 1.6 mm double copper clad epoxy glass PWB (T<sub>A</sub> = +85 °C)

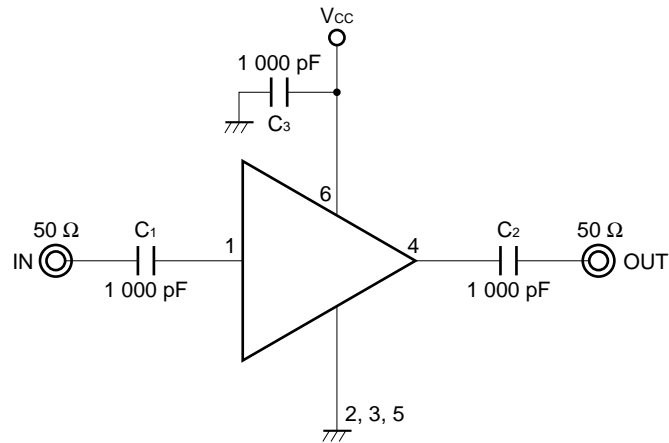
**RECOMMENDED OPERATING CONDITIONS**

| PARAMETER      | SYMBOL          | MIN. | TYP. | MAX. | UNIT |
|----------------|-----------------|------|------|------|------|
| Supply Voltage | V <sub>CC</sub> | 4.5  | 5.0  | 5.5  | V    |

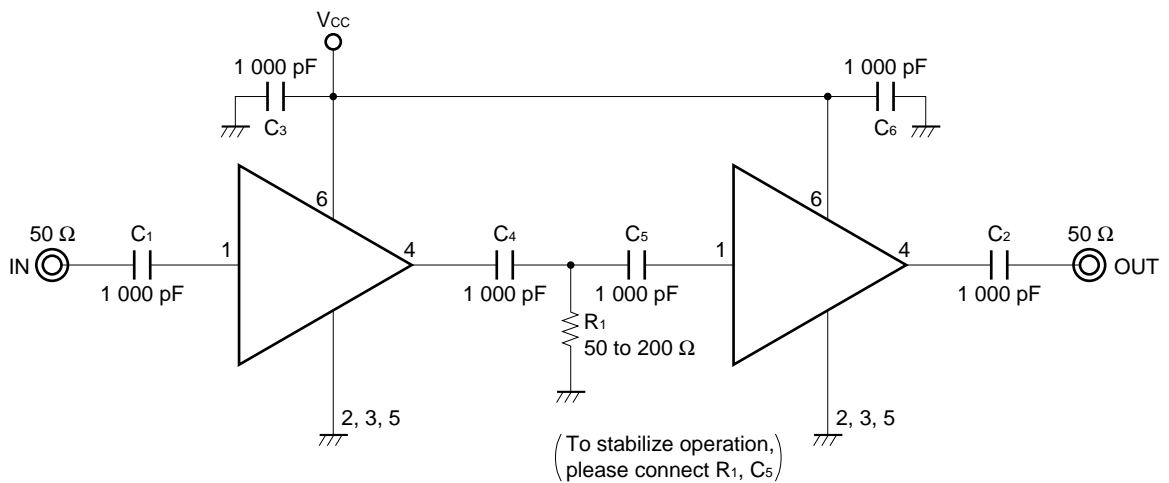
**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = +25 °C, V<sub>CC</sub> = 5.0 V, Z<sub>S</sub> = Z<sub>L</sub> = 50 Ω)**

| PARAMETER                       | SYMBOL              | MIN. | TYP. | MAX. | UNIT | TEST CONDITIONS                             |
|---------------------------------|---------------------|------|------|------|------|---|
| Circuit Current                 | I <sub>CC</sub>     | 9    | 12   | 15   | mA   | No Signal                                   |
| Power Gain                      | G <sub>P</sub>      | 26   | 29   | 33   | dB   | f = 0.5 GHz                                 |
| Maximum Output Level            | P <sub>O(sat)</sub> | +4   | +7   |      | dBm  | f = 0.5 GHz, P <sub>in</sub> = 0 dBm        |
| Noise Figure                    | NF                  |      | 3.2  | 4.5  | dB   | f = 0.5 GHz                                 |
| Upper Limit Operating Frequency | f <sub>u</sub>      | 0.9  | 1.2  |      | GHz  | 3 dB down below flat gain at<br>f = 0.1 GHz |
| Isolation                       | ISL                 | 35   | 40   |      | dB   | f = 0.5 GHz                                 |
| Input Return Loss               | RL <sub>in</sub>    | 10   | 13   |      | dB   | f = 0.5 GHz                                 |
| Output Return Loss              | RL <sub>out</sub>   | 6    | 9    |      | dB   | f = 0.5 GHz                                 |
| Gain Flatness                   | ΔG <sub>P</sub>     |      | ±0.8 |      | dB   | f = 0.1 to 0.8 GHz                          |

TEST CIRCUIT



EXAMPLE OF APPLICATION CIRCUIT



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

Capacitors for Vcc, input and output pins

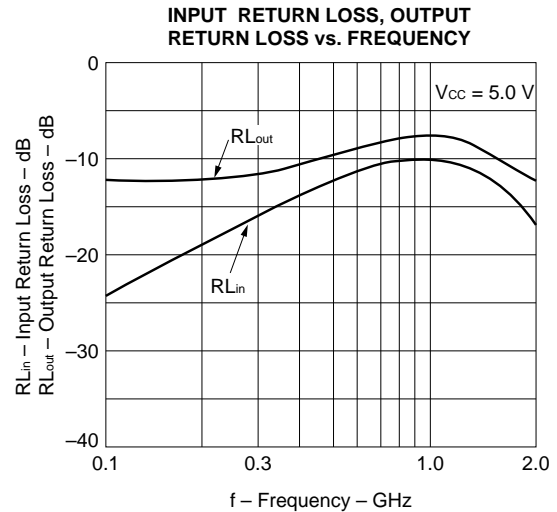
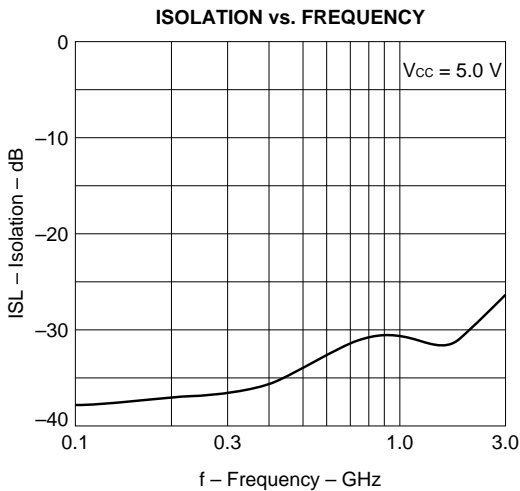
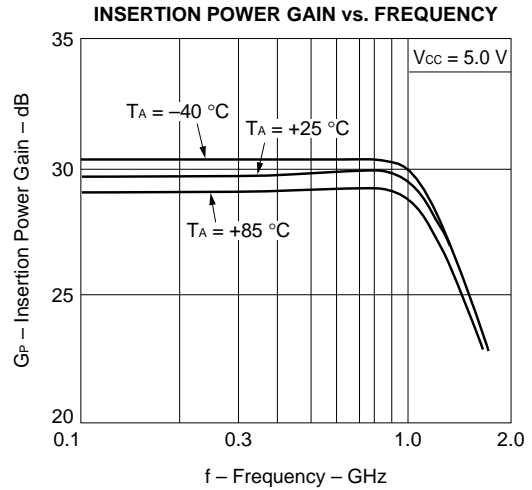
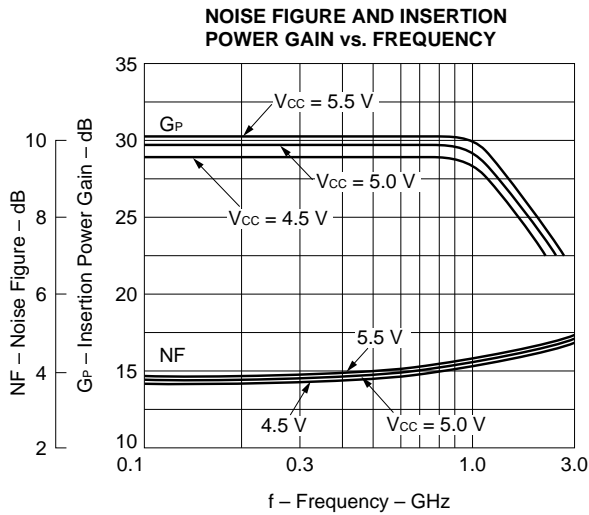
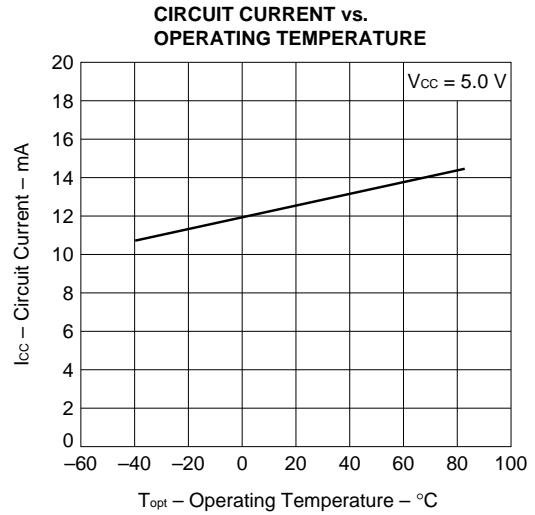
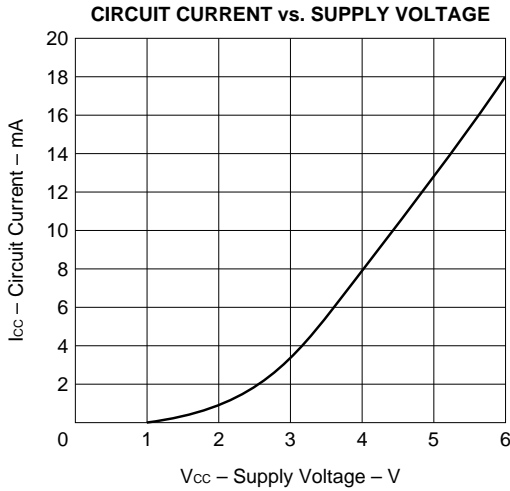
1 000 pF capacitors are recommendable as bypass capacitor for Vcc pin and coupling capacitors for input/output pins.

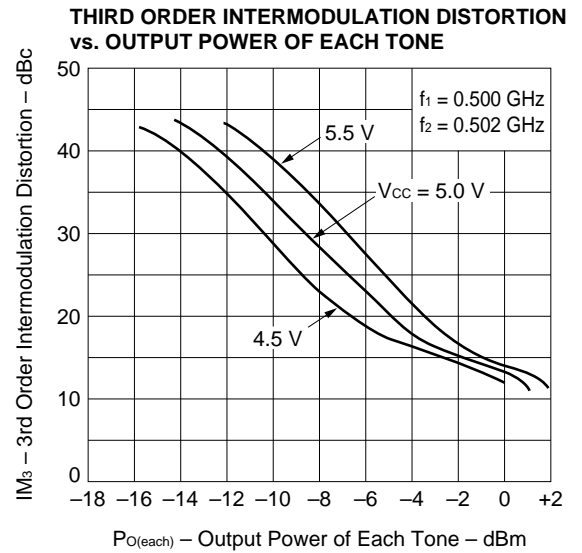
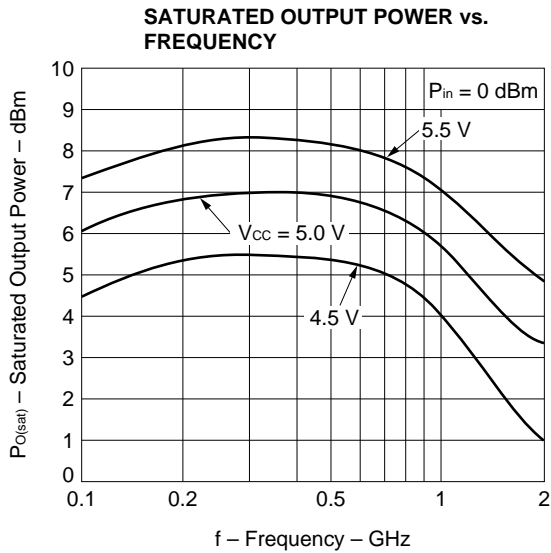
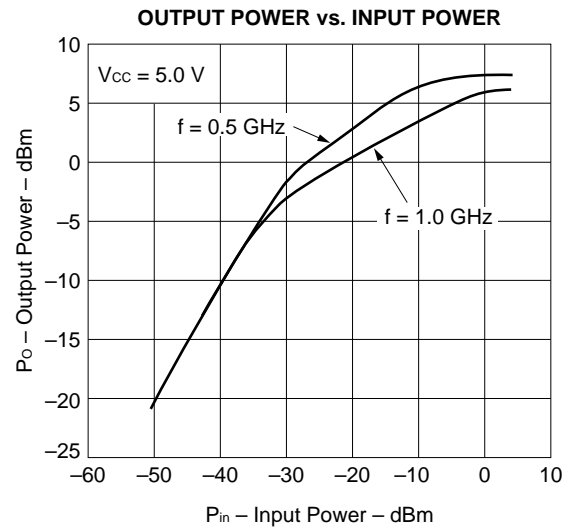
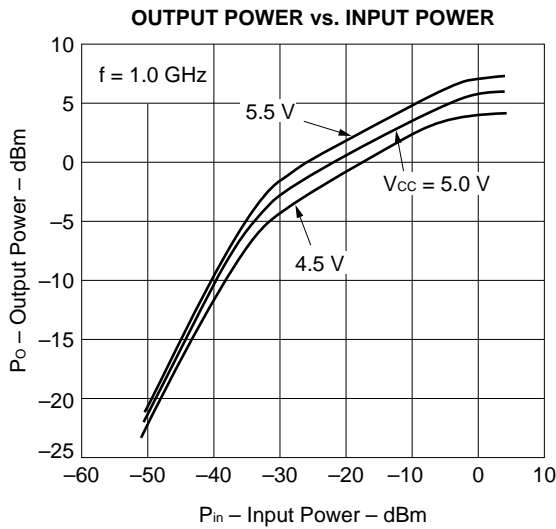
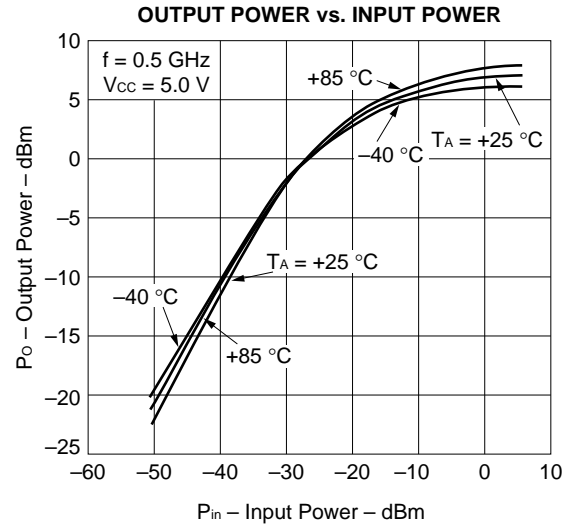
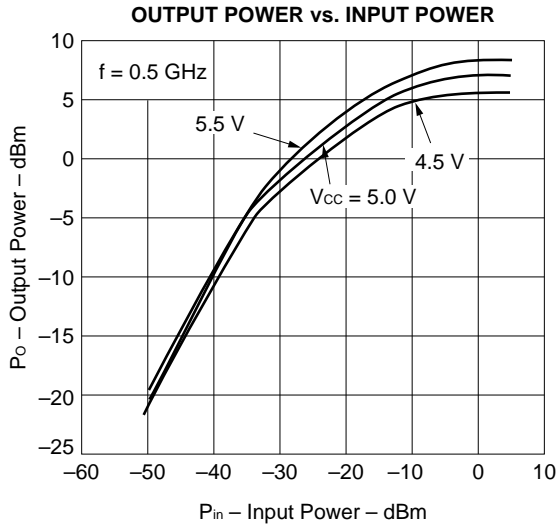
Bypass capacitor for Vcc pin is intended to minimize Vcc pin's ground impedance. Therefore, stable bias can be supplied against Vcc fluctuation.

Coupling capacitors for input/output pins are intended to minimize RF serial impedance and cut DC.

To get flat gain from 100 MHz up, 1 000 pF capacitors are assembled on the test circuit. [Actually, 1 000 pF capacitors give flat gain at least 10 MHz. In the case of under 10 MHz operation, increase the value of coupling capacitor such as 2 200 pF. Because the coupling capacitors are determined by the equation of  $C = 1/(2 \pi fZ_s)$ .]

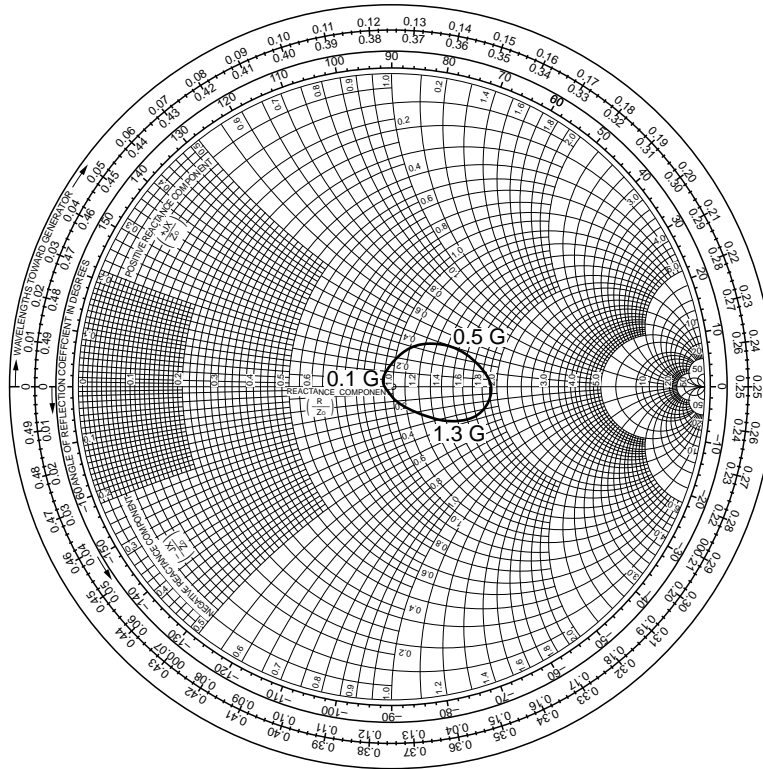
TYPICAL CHARACTERISTICS ( $T_A = +25\text{ }^\circ\text{C}$ )





S PARAMETER

S<sub>11</sub>-FREQUENCY



S<sub>22</sub>-FREQUENCY

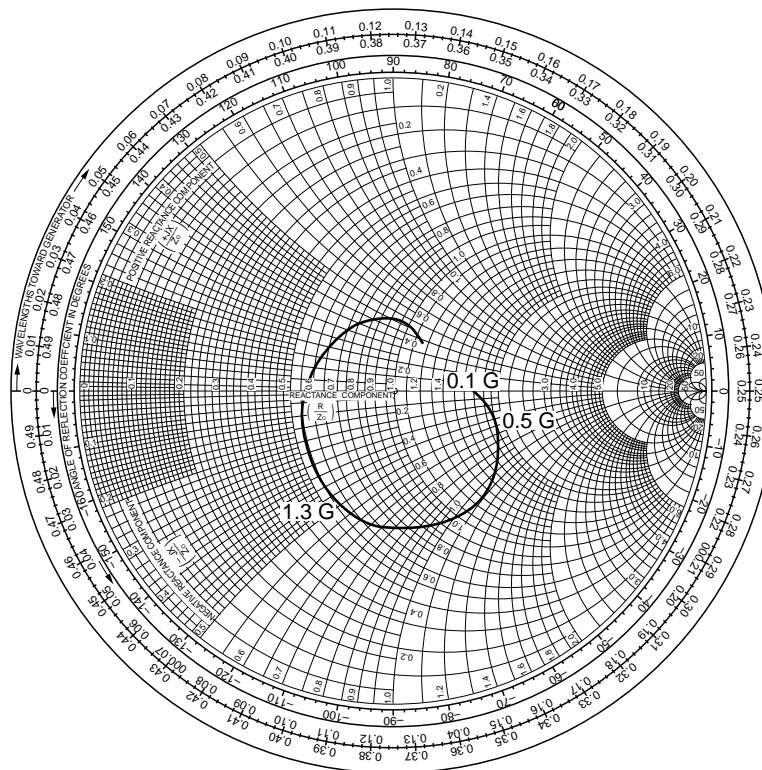
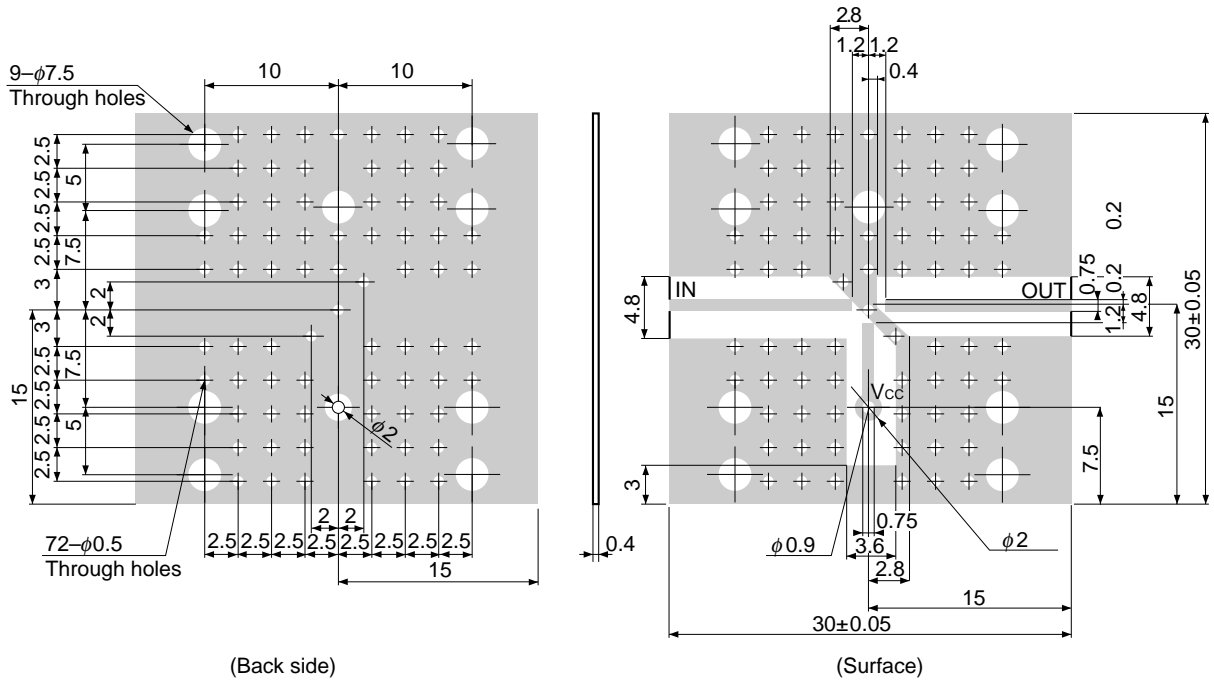


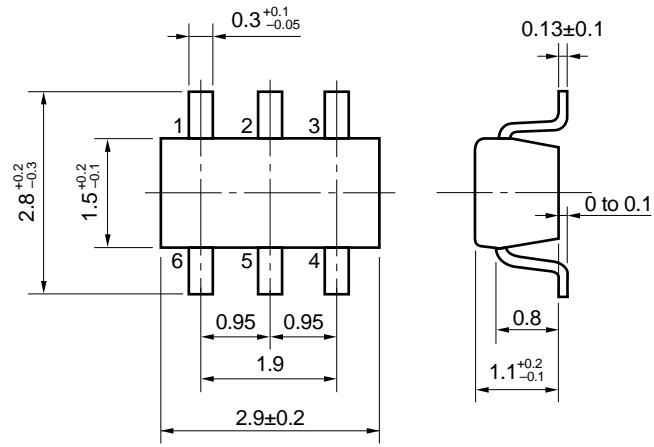
Illustration of evaluation board for the test circuit



Note

- (1) 30 × 30 × 0.4 mm double sided copper clad polyimide board.
- (2) Back side: GND pattern
- (3) Solder plated on pattern
- (4)  $\oplus$ : Through holes

6 PINS MINI MOLD PACKAGE DIMENSIONS (Unit: mm)





**NOTE ON CORRECT USE**

- (1) Observe precautions for handling because of electro-static sensitive devices.
- (2) Form a ground pattern as wide as possible to keep the minimum ground impedance (to prevent undesired oscillation).
- (3) Keep the track length of the ground pins as short as possible.
- (4) Connect a bypass capacitor (e.g. 1 000 pF) to the Vcc pin.

**RECOMMENDED SOLDERING CONDITIONS**

This product should be soldered in the following recommended conditions. Other soldering methods and conditions than the recommended conditions are to be consulted with our sales representatives.

μPC2712T

| Soldering method    | Soldering conditions   | Recommended condition symbols |
|---------------------|--|-------------------------------|
| Infrared ray reflow | Package peak temperature: 235 °C,<br>Hour: within 30 s. (more than 210 °C),<br>Time: 3 times, Limited days; no.* | IR35-00-3                     |
| VPS                 | Package peak temperature: 215 °C,<br>Hour: within 40 s. (more than 200 °C),<br>Time: 3 times, Limited days: no.* | VP15-00-3                     |
| Wave soldering      | Soldering tub temperature: less than 260 °C,<br>Hour: within 10 s.<br>Time: 1 time, Limited days: no.*           | WS60-00-1                     |
| Pin part heating    | Pin area temperature: less than 300 °C,<br>Hour: within 3 s.<br>Limited days: no.*                               |                               |

\*: It is the storage days after opening a dry pack, the storage conditions are 25 °C, less than 65 % RH.

**Note 1.** The combined use of soldering method is to be avoided (However, except the pin area heating method).

For details of recommended soldering conditions for surface mounting, refer to information document SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL (C10535E).

[MEMO]

[MEMO]

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