

## 1.6 GHz DIFFERENTIAL WIDE BAND AMPLIFIER SILICON BIPOLAR MONOLITHIC INTEGRATED CIRCUIT

### DESCRIPTION

The μPC2726T is a silicon microwave monolithic integrated circuit designed for miniature differential amplifier. This IC operates up to 1.6 GHz and therefore is suitable for BS tuner, mobile communication and measurement equipment applications. This IC can also use as differential oscillator application.

The μPC27xx series is manufactured using NEC's 20 GHz fr NESAT™ III silicon bipolar process. This process uses silicon nitride passivation film and gold metallization wirings. These materials can protect the chips from external pollution and prevent corrosion and migration. Thus, this process can produce the ICs with excellent performance, uniformity and reliability.

### FEATURES

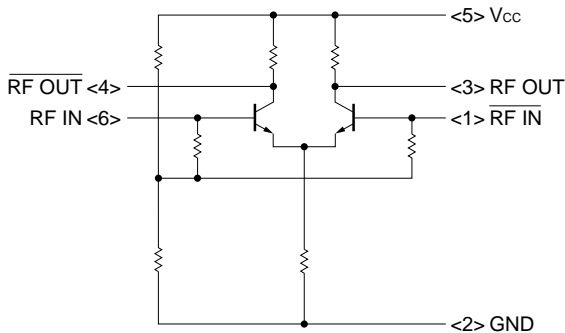
- Wide frequency response –  $f_u = 1.6 \text{ GHz} @ -3 \text{ dB } G_P, V_{CC} = 5 \text{ V}$
- Power gain –  $G_P = 15 \text{ dB} @ 5 \text{ V}$
- Low power consumption: 5 V, 15 mA TYP./2 V, 2.5 mA
- 6 pin mini mold for high-density surface mounting.

### ORDERING INFORMATION

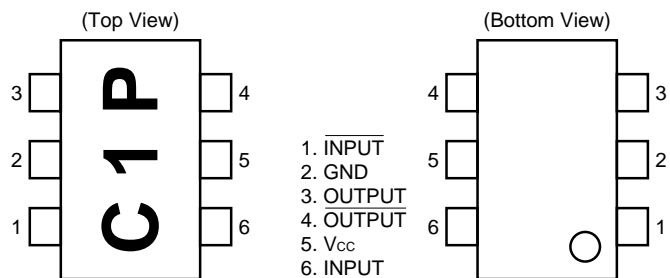
| PART NUMBER | PACKAGE         | SUPPLYING FORM   |
|-------------|-----------------|--|
| μPC2726T-E3 | 6 pin mini mold | Embossed tape 8 mm wide. 3 kp/reel.<br>Pin 1, 2, 3 face to perforation side of the tape. |

\* For evaluation sample order, please contact your local NEC sales office. (Part number: μPC2726T)

### EQUIVALENT CIRCUIT



### PIN CONNECTIONS



**Caution: Electro-static sensitive device**

**ABSOLUTE MAXIMUM RATINGS**

|  |                  |             |     |  |
|--|------------------|-------------|-----|--|
| Supply Voltage                         | V <sub>cc</sub>  | 6           | V   | T <sub>A</sub> = +25 °C  |
| Power Dissipation of Package Allowance | P <sub>D</sub>   | 280         | mW  | Mounted on 50 × 50 × 1.6 mm epoxy glass PWB at T <sub>A</sub> = +85 °C |
| Input Power                            | P <sub>in</sub>  | 0           | dBm | T <sub>A</sub> = +25 °C  |
| Operating Temperature                  | T <sub>opt</sub> | -40 to +85  | °C  |  |
| Storage Temperature                    | T <sub>stg</sub> | -55 to +150 | °C  |  |

**RECOMMENDED OPERATING CONDITIONS**

| PARAMETERS            | SYMBOL          | MIN. | TYP. | MAX. | UNIT |
|-----------------------|-----------------|------|------|------|------|
| Supply Voltage        | V <sub>cc</sub> | 4.5  | 5.0  | 5.5  | V    |
| Operating Temperature | T <sub>A</sub>  | -40  | +25  | +85  | °C   |

**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = +25 °C, V<sub>cc</sub> = 5. V, Z<sub>L</sub> = Z<sub>s</sub> = 50 Ω)**

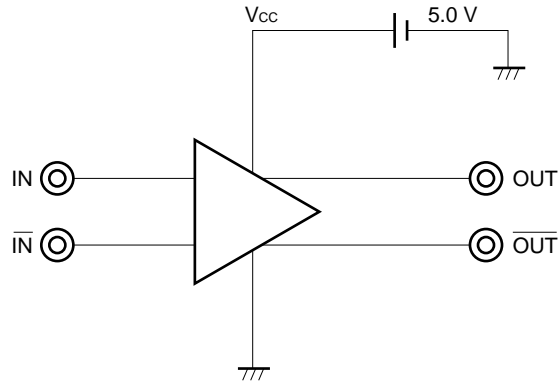
| PARAMETERS                      | SYMBOL              | MIN. | TYP. | MAX. | UNIT | TEST CONDITIONS                        |
|---------------------------------|---------------------|------|------|------|------|--|
| Circuit Current                 | I <sub>cc</sub>     | 8.0  | 11.5 | 15.0 | mA   | No input signal                        |
| Power Gain                      | G <sub>P</sub>      | 11.0 | 15   | 17.0 | dB   | f = 400 MHz                            |
| Noise Figure                    | NF                  |      | 4.5  | 6.0  | dB   | f = 400 MHz                            |
| Upper Limit Operating Frequency | f <sub>u</sub>      | 1.0  | 1.6  |      | GHz  | 3 dB down below flat gain at 0.4 GHz   |
| Isolation                       | ISL                 |      | 60   |      | dB   | f = 400 MHz                            |
| Input Return Loss               | RL <sub>in</sub>    |      | 2.0  |      | dB   | f = 400 MHz                            |
| Output Return Loss              | RL <sub>out</sub>   |      | 4.0  |      | dB   | f = 400 MHz                            |
| Maximum Output Level            | P <sub>O(sat)</sub> | -5   | -2   |      | dBm  | f = 400 MHz, P <sub>in</sub> = -10 dBm |

**STANDARD CHARACTERISTICS FOR REFERENCE (T<sub>A</sub> = +25 °C, Z<sub>L</sub> = Z<sub>s</sub> = 50 Ω)**

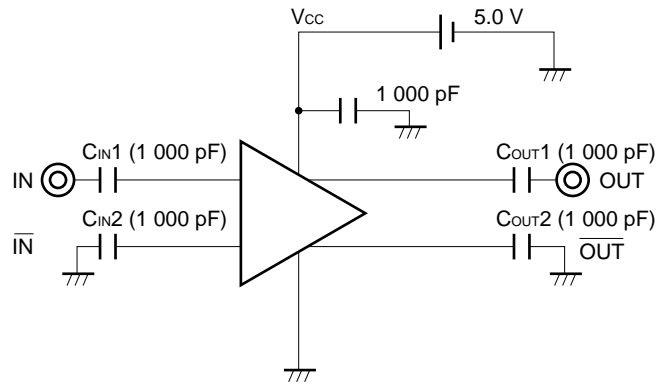
| PARAMETERS                           | SYMBOL              | REFERENCE VALUE | UNIT | TEST CONDITIONS   |
|--------------------------------------|---------------------|-----------------|------|---|
| Circuit Current                      | I <sub>cc</sub>     | 2.5             | mA   | V <sub>cc</sub> = 2 V, No input signal  |
| Power Gain                           | G <sub>P</sub>      | 4.5             | dB   | V <sub>cc</sub> = 2 V, f = 400 MHz  |
| Noise Figure                         | NF                  | 5.1             | dB   | V <sub>cc</sub> = 2 V, f = 400 MHz  |
| Upper Limit Operating Frequency      | f <sub>u</sub>      | 2.4             | GHz  | 3 dB down below flat gain at 0.4 GHz  |
| Isolation                            | ISL                 | 58              | dB   | V <sub>cc</sub> = 2 V, f = 400 MHz  |
| Input Return Loss                    | RL <sub>in</sub>    | 1.0             | dB   | V <sub>cc</sub> = 2 V, f = 400 MHz  |
| Output Return Loss                   | RL <sub>out</sub>   | 4.0             | dB   | V <sub>cc</sub> = 2 V, f = 400 MHz  |
| Maximum Output Power                 | P <sub>O(sat)</sub> | -14             | dBm  | V <sub>cc</sub> = 2 V, f = 400 MHz, P <sub>in</sub> = -10 dBm   |
| 3rd Order Intermodulation Distortion | IM <sub>3</sub>     | -29             | dBc  | V <sub>cc</sub> = 2 V, P <sub>O(each)</sub> = -25 dBm, f <sub>1</sub> = 400 MHz, f <sub>2</sub> = 402 MHz |
| 3rd Order Intermodulation Distortion | IM <sub>3</sub>     | -45             | dBc  | V <sub>cc</sub> = 5 V, P <sub>O(each)</sub> = -25 dBm, f <sub>1</sub> = 400 MHz, f <sub>2</sub> = 402 MHz |

TEST CIRCUITS

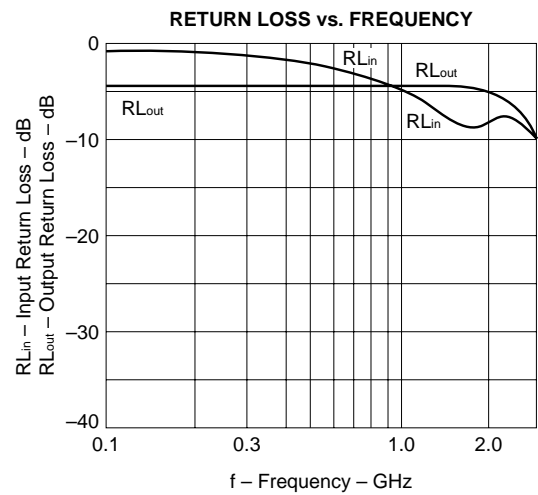
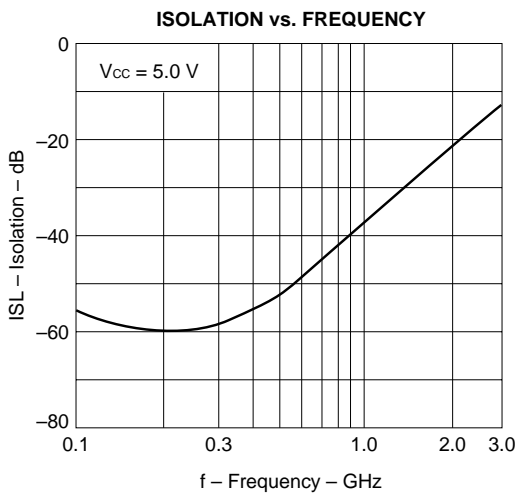
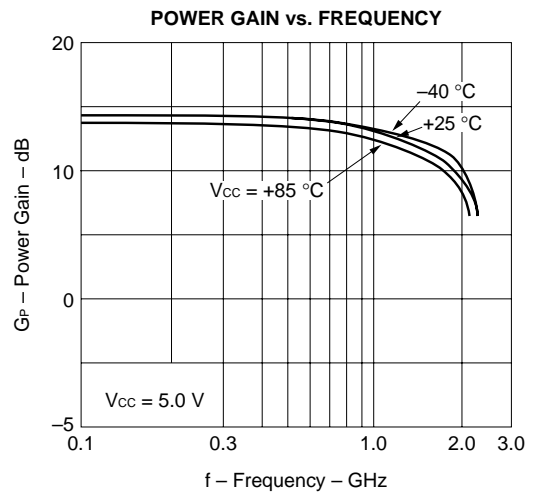
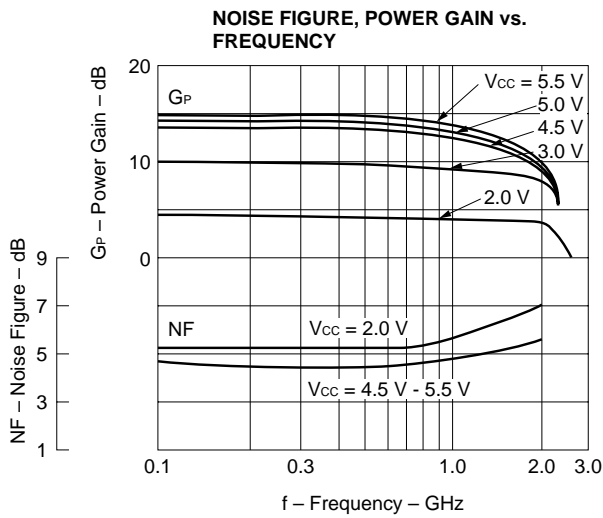
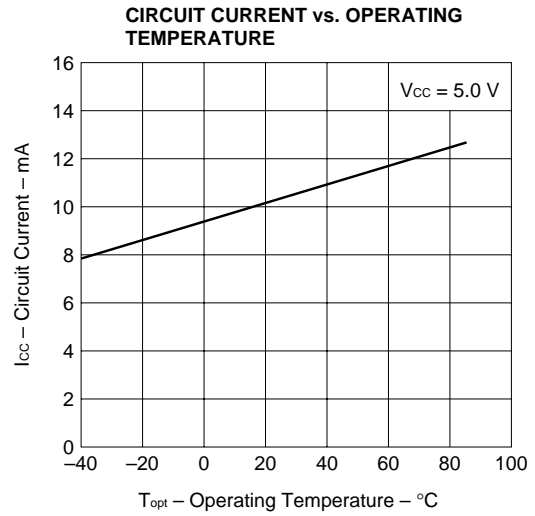
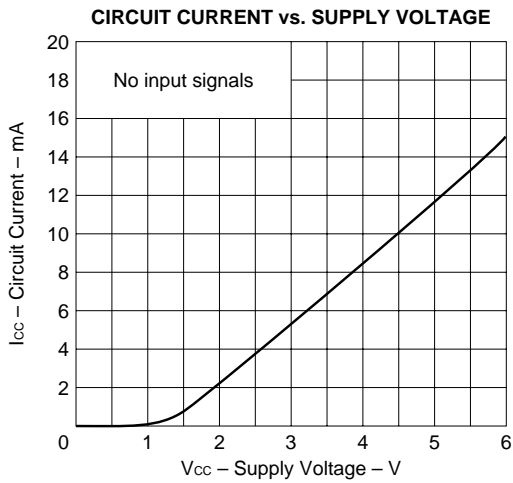
DC Parameters

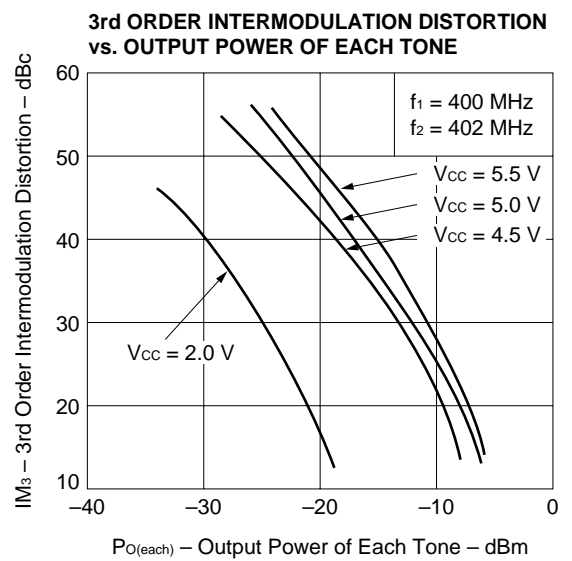
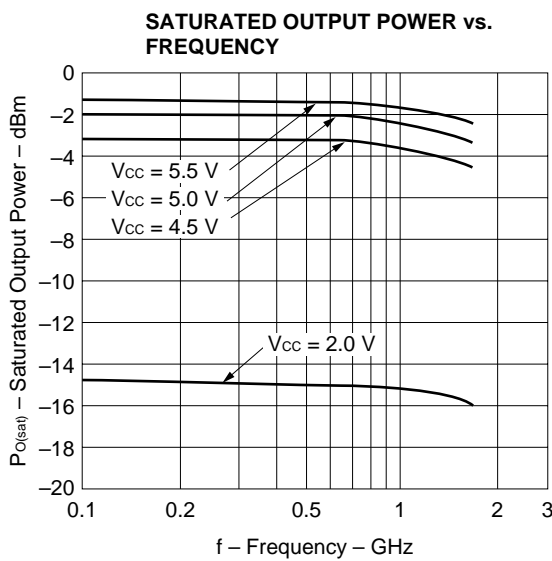
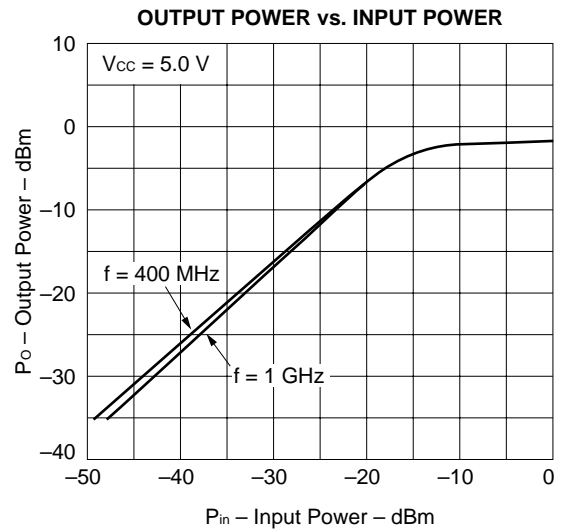
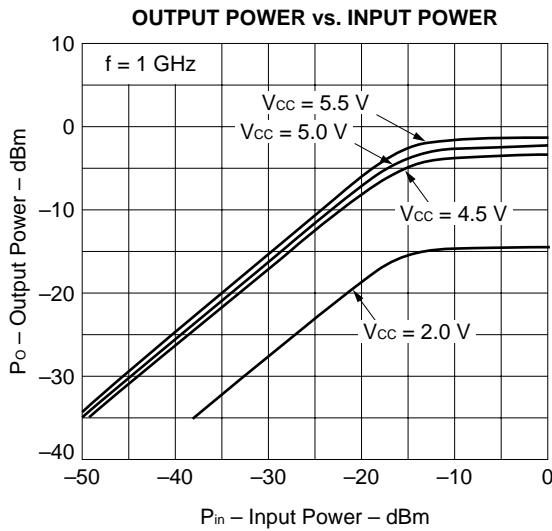
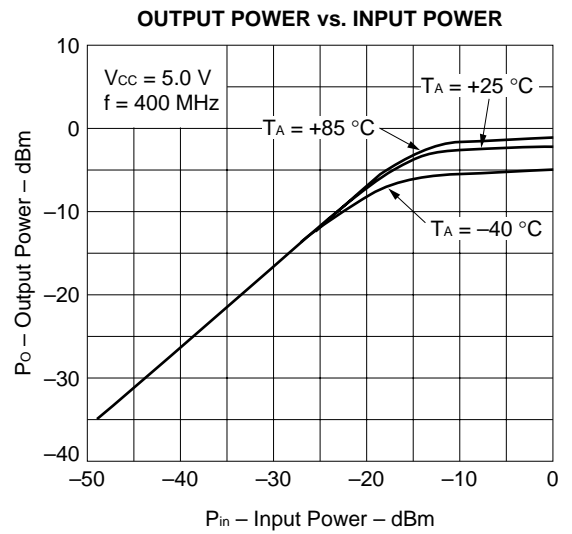
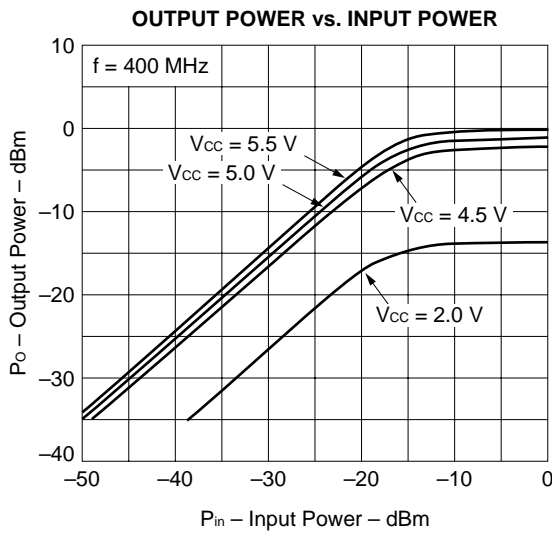


AC Parameters



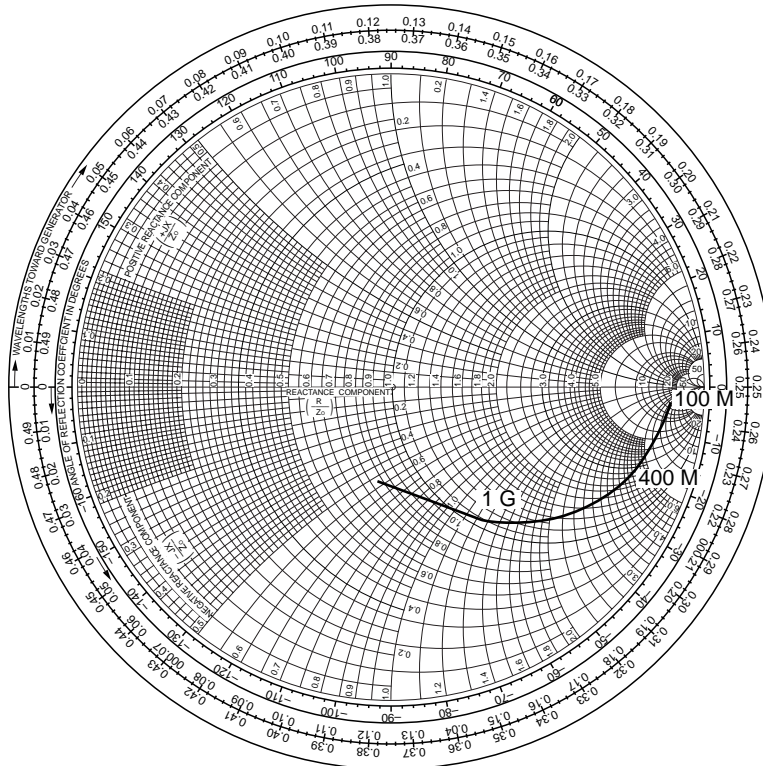
**TYPICAL CHARACTERISTICS** (Unless otherwise specified  $T_A = +25\text{ }^\circ\text{C}$ )





S PARAMETER

S<sub>11</sub>-FREQUENCY



S<sub>22</sub>-FREQUENCY

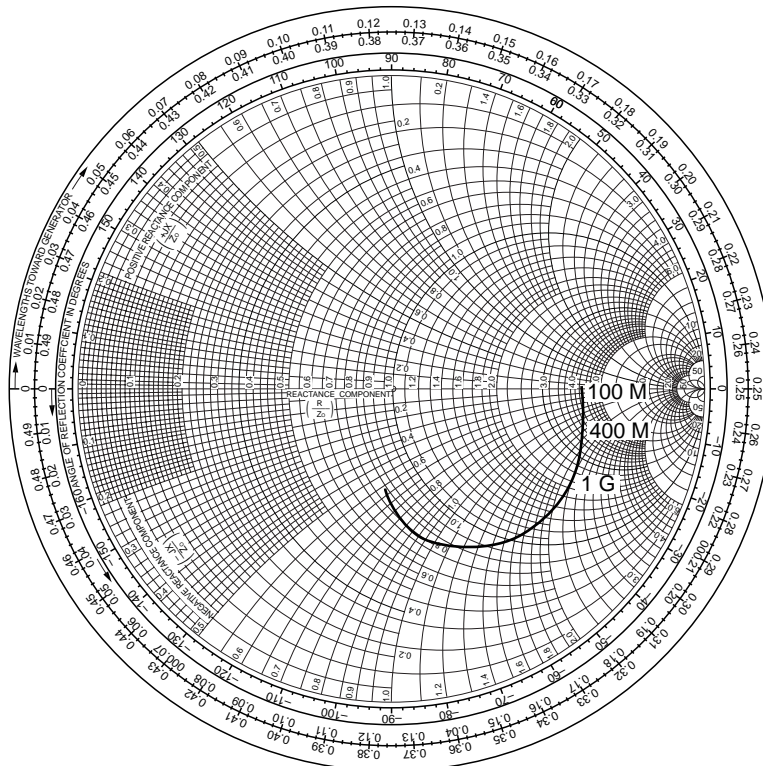
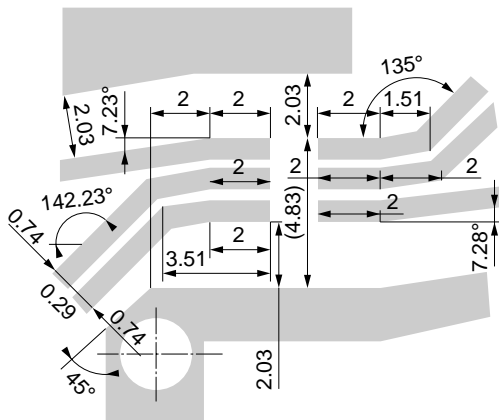
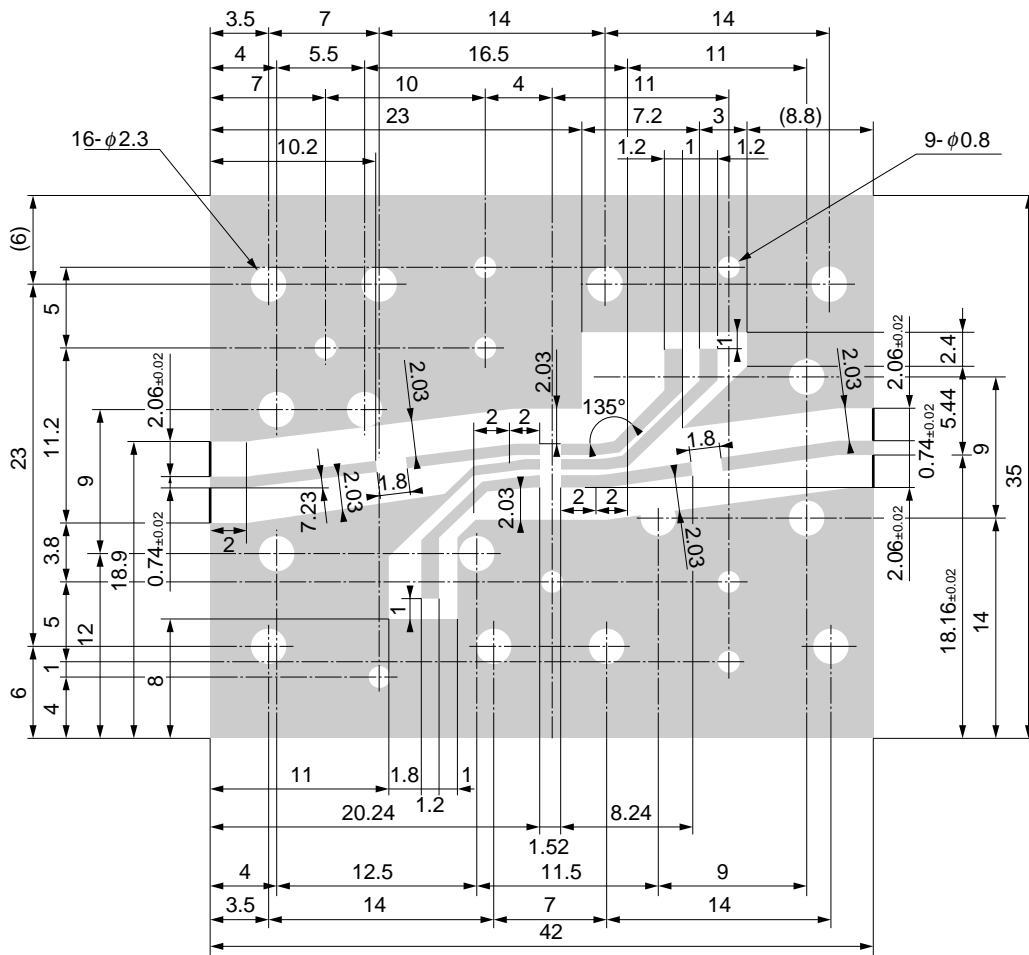


ILLUSTRATION OF THE EVALUATION BOARD FOR TEST CIRCUIT



DETAIL LAYOUT

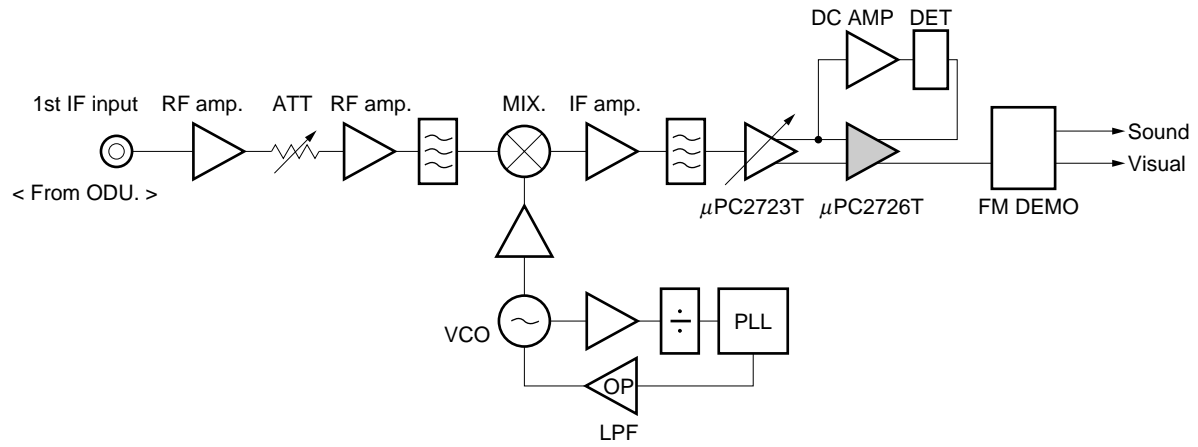
t = 0.4

**Note**

- (1) 50 × 50 × 0.5 mm double copper clad polyimide board.
- (2) Back side: GND pattern
- (3) Solder plated on pattern
- (4) ○: Through holes

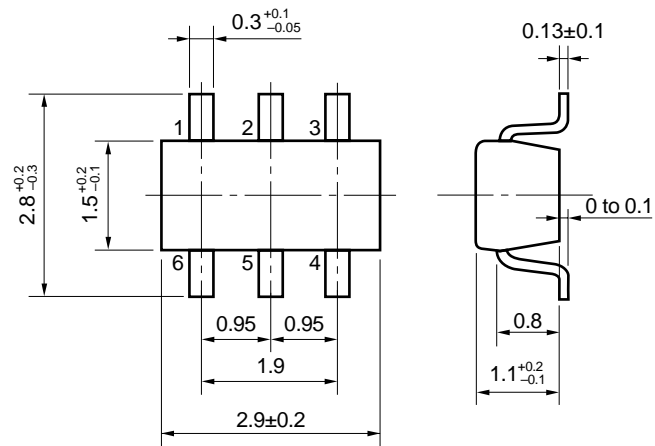
EXAMPLE FOR SYSTEM APPLICATION

DBS tuner





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 prevent an increase in ground impedance (which can cause undesired oscillation).
- (3) Keep the wiring length of the ground pins as short as possible.
- (4) Connect a bypass capacitor (having, for example, a capacitance of 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.

μPC2726T

| Soldering process   | 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]

The applicatoin circuit and circuit constants shown in this document are for reference only and may not be employed for mass production of the application system.

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Standard: Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots

Special: Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)

Specific: Aircrafts, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems or medical equipment for life support, etc.

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Anti-radioactive design is not implemented in this product.