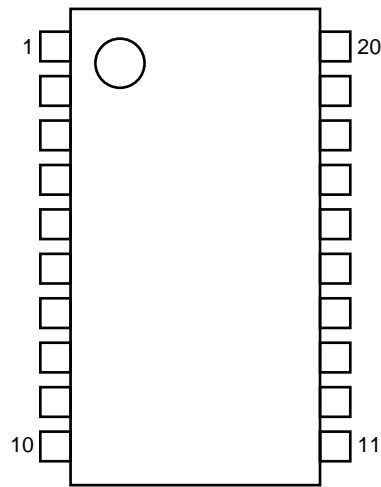


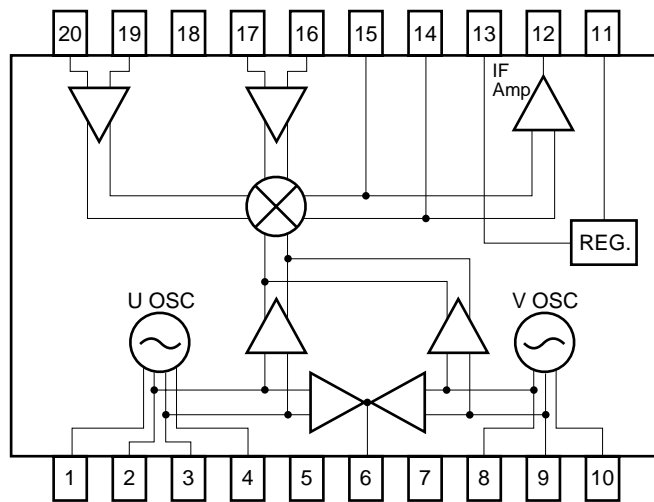


PIN CONFIGURATION (Top View)



- 1. UHF OSC Collector (Tr. 1)
- 2. UHF OSC Base (Tr. 2)
- 3. UHF OSC Base (Tr. 1)
- 4. UHF OSC Collector (Tr. 2)
- 5. UB
- 6. OSC OUTPUT
- 7. GND
- 8. VHF OSC Base (Tr. 1)
- 9. VHF OSC Base (Tr. 2)
- 10. VHF OSC Collector (Tr. 1)
- 11. REG
- 12. IF OUTPUT
- 13. V<sub>CC</sub>
- 14. MIX OUTPUT
- 15. MIX OUTPUT
- 16. VHF RF INPUT
- 17. VHF RF INPUT
- 18. GND
- 19. UHF RF INPUT
- 20. UHF RF INPUT

INTERNAL BLOCK DIAGRAM



PIN EXPLANATION

| Pin No. | Symbol                       | Pin Voltage TYP.<br>above: VHF mode<br>below: UHF mode | Function and Explanation  | Equivalent Circuit |  |
|---------|------------------------------|--|---|--------------------|--|
| 1       | UOSC<br>collector<br>(Tr. 1) | 6.90   | Collector pin of UHF oscillator.<br>Assemble LC resonator with 2 pin through capacitor $\approx 1$ pF to oscillate with active feedback loop.   |                    |  |
|         |                              | 6.25   |   |                    |  |
| 2       | UOSC<br>base (Tr. 2)         | 6.00   | Base pin of UHF oscillator with balance amplifier. Connected to LC resonator through feedback capacitor $\approx 300$ pF.   |                    |  |
|         |                              | 3.90   |   |                    |  |
| 3       | UOSC<br>base (Tr. 1)         | 6.00   | Base pin of UHF oscillator with balance amplifier. Connected to LC resonator through feedback capacitor $\approx 300$ pF.   |                    |  |
|         |                              | 3.90   |   |                    |  |
| 4       | UOSC<br>collector<br>(Tr. 2) | 6.90   | Collector pin of UHF oscillator with balance amplifier. Assemble LC resonator with 3 pin through capacitor $\approx 1$ pF to oscillate with active feedback loop.<br>Double balanced oscillator with transistor 1 and transistor 2. |                    |  |
|         |                              | 6.25   |   |                    |  |
| 5       | UB                           | —  | Switching pin for VHF or UHF operation.<br>VHF operation = open<br>UHF operation = 9.0 V  |                    |  |
|         |                              | 9.0  |   |                    |  |
| 6       | OSC<br>output                | 5.40   | UHF and VHF oscillator output pin. In case of F/S tuner application, connected PLL synthesizer IC's input pin.  |                    |  |
|         |                              | 5.40   |   |                    |  |
| 7       | GND                          | 0.0  | GND pin of VHF and UHF oscillator.  |                    |  |
|         |                              | 0.0  |   |                    |  |
| 8       | VOSC<br>base<br>(Tr. 1)      | 3.50   | Base pin of VHF oscillator. Grounded through capacitor $\approx 10$ pF.   |                    |  |
|         |                              | 5.90   |   |                    |  |
| 9       | VOSC<br>base<br>(Tr. 2)      | 3.50   | Base pin of VHF oscillator. Assemble LC resonator with 10 pin to oscillate with active feedback loop.   |                    |  |
|         |                              | 5.90   |   |                    |  |
| 10      | VOSC<br>collector<br>(Tr. 1) | 6.20   | Collector pin of VHF oscillator. Connected to LC resonator through feedback capacitor $\approx 3$ pF.   |                    |  |
|         |                              | 6.90   |   |                    |  |

| Pin No. | Symbol             | Pin Voltage TYP.<br>above: VHF mode<br>below: UHF mode | Function and Explanation   | Equivalent Circuit |
|---------|--------------------|--|--|--------------------|
| 11      | REG                | 6.90<br>6.90   | Monitor pin of regulator output voltage.   |                    |
| 12      | IF output          | 2.60<br>2.60   | IF output pin of VHF-UHF band functions.   |                    |
| 13      | Vcc                | 9.0<br>9.0   | Power supply pin for VHF-UHF band functions.   |                    |
| 14      | MIX output1        | 7.10<br>7.00   | VHF and UHF MIX output pins. These pins should be equipped with tank circuit to adjust intermediate frequency. |                    |
| 15      | MIX output2        | 7.10<br>7.00   |  |                    |
| 16      | VRF input (bypass) | 2.75<br>2.80   | Bypass pin for VHF MIX input. Grounded through capacitor.  |                    |
| 17      | VRF input          | 2.75<br>2.80   | VRF signal input pin from antenna.   |                    |
| 18      | GND                | 0.0<br>0.0   | GND pin of MIX, IF amplifier and regulator.  |                    |
| 19      | URF input (bypass) | -<br>2.65  | Bypass pin for UHF MIX input. Grounded through capacitor.  |                    |
| 20      | URF input          | -<br>2.65  | URF signal input pin from antenna.   |                    |

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

| Parameter                     | Symbol           | Condition                | Rating      | Unit |
|-------------------------------|------------------|--------------------------|-------------|------|
| Supply Voltage 1              | V <sub>CC</sub>  |                          | 11.0        | V    |
| Supply Voltage 2              | UB               |                          | 11.0        | V    |
| Power dissipation             | P <sub>D</sub>   | T <sub>A</sub> = 80 °C*1 | 700         | mW   |
| Operating ambient temperature | T <sub>A</sub>   |                          | -40 to +80  | °C   |
| Storage temperature           | T <sub>stg</sub> |                          | -60 to +150 | °C   |

\*1 Mounted on 50 × 50 × 1.6 mm double copper epoxy glass board.

**RECOMMENDED OPERATING RANGE**

| Parameter                     | Symbol          | MIN. | TYP. | MAX. | Unit |
|-------------------------------|-----------------|------|------|------|------|
| Supply voltage 1              | V <sub>CC</sub> | 8.0  | 9.0  | 10.0 | V    |
| Supply voltage 2              | UB              | 8.0  | 9.0  | 10.0 | V    |
| Operating ambient temperature | T <sub>A</sub>  | -20  | +25  | +80  | °C   |

**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C, V<sub>CC</sub> = 9 V, f<sub>IF</sub> = 45 MHz, P<sub>osc</sub> = -10 dBm)**

| Parameter              | Symbol               | Test Conditions   | MIN. | TYP. | MAX. | Unit |
|------------------------|----------------------|---|------|------|------|------|
| Circuit Current 1      | I <sub>CC1</sub>     | @VHF, no input signal *1                                | 36.0 | 48.0 | 56.0 | mA   |
| Circuit Current 2      | I <sub>CC2</sub>     | @UHF, no input signal *1                                | 37.0 | 50.0 | 60.0 | mA   |
| Conversion Gain 1      | CG1                  | f <sub>RF</sub> = 55 MHz, P <sub>RF</sub> = -30 dBm *2  | 19.5 | 23.0 | 26.5 | dB   |
| Conversion Gain 2      | CG2                  | f <sub>RF</sub> = 200 MHz, P <sub>RF</sub> = -30 dBm *2 | 19.5 | 23.0 | 26.5 | dB   |
| Conversion Gain 3      | CG3                  | f <sub>RF</sub> = 470 MHz, P <sub>RF</sub> = -30 dBm *2 | 20.5 | 24.0 | 27.5 | dB   |
| Conversion Gain 4      | CG4                  | f <sub>RF</sub> = 470 MHz, P <sub>RF</sub> = -30 dBm *2 | 28.5 | 32.0 | 35.5 | dB   |
| Conversion Gain 5      | CG5                  | f <sub>RF</sub> = 890 MHz, P <sub>RF</sub> = -30 dBm *2 | 28.5 | 32.0 | 35.5 | dB   |
| Noise Figure 1         | NF1                  | f <sub>RF</sub> = 55 MHz *3                             | —    | 11.0 | 14.0 | dB   |
| Noise Figure 2         | NF2                  | f <sub>RF</sub> = 200 MHz *3                            | —    | 11.0 | 14.0 | dB   |
| Noise Figure 3         | NF3                  | f <sub>RF</sub> = 470 MHz *3                            | —    | 11.0 | 14.0 | dB   |
| Noise Figure 4         | NF4                  | f <sub>RF</sub> = 470 MHz *3                            | —    | 9.0  | 12.0 | dB   |
| Noise Figure 5         | NF5                  | f <sub>RF</sub> = 890 MHz *3                            | —    | 10.0 | 13.0 | dB   |
| Maximum Output Power 1 | P <sub>O(sat)1</sub> | f <sub>RF</sub> = 55 MHz, P <sub>RF</sub> = 0 dBm *2    | 10.0 | 13.0 | —    | dBm  |
| Maximum Output Power 2 | P <sub>O(sat)2</sub> | f <sub>RF</sub> = 200 MHz, P <sub>RF</sub> = 0 dBm *2   | 10.0 | 13.0 | —    | dBm  |
| Maximum Output Power 3 | P <sub>O(sat)3</sub> | f <sub>RF</sub> = 470 MHz, P <sub>RF</sub> = 0 dBm *2   | 10.0 | 13.0 | —    | dBm  |
| Maximum Output Power 4 | P <sub>O(sat)4</sub> | f <sub>RF</sub> = 470 MHz, P <sub>RF</sub> = 0 dBm *2   | 10.0 | 13.0 | —    | dBm  |
| Maximum Output Power 5 | P <sub>O(sat)5</sub> | f <sub>RF</sub> = 890 MHz, P <sub>RF</sub> = 0 dBm *2   | 10.0 | 13.0 | —    | dBm  |

\*1 By measurement circuit 1

\*2 By measurement circuit 2

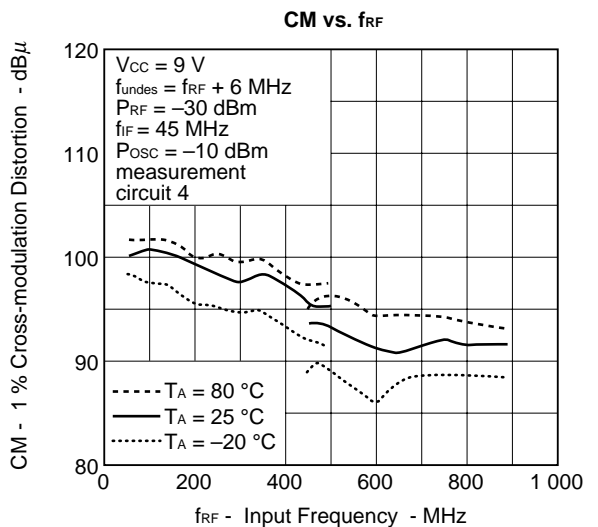
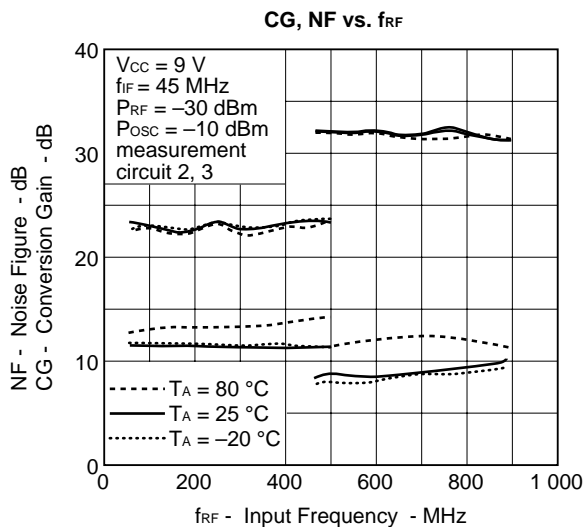
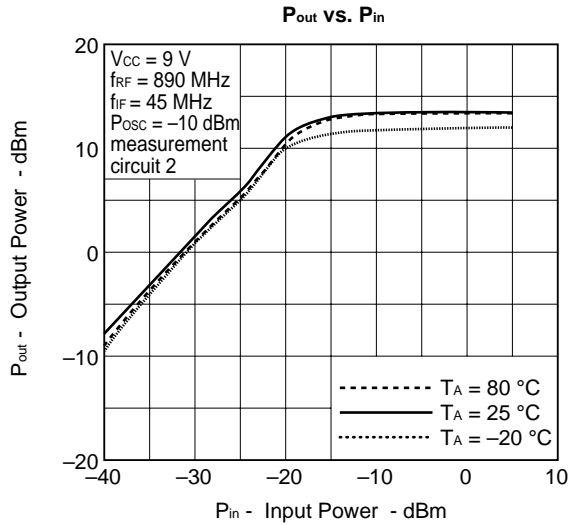
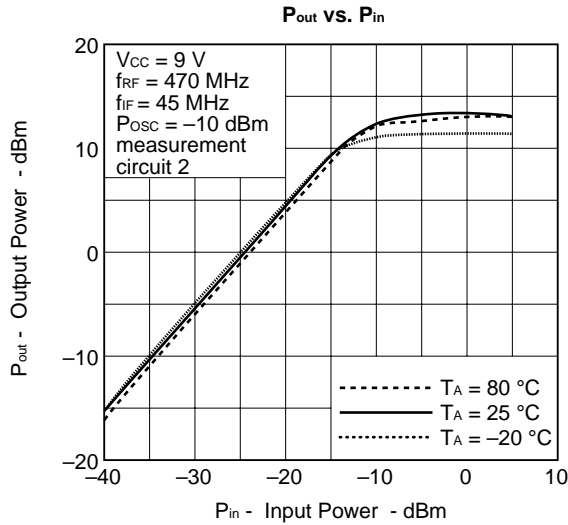
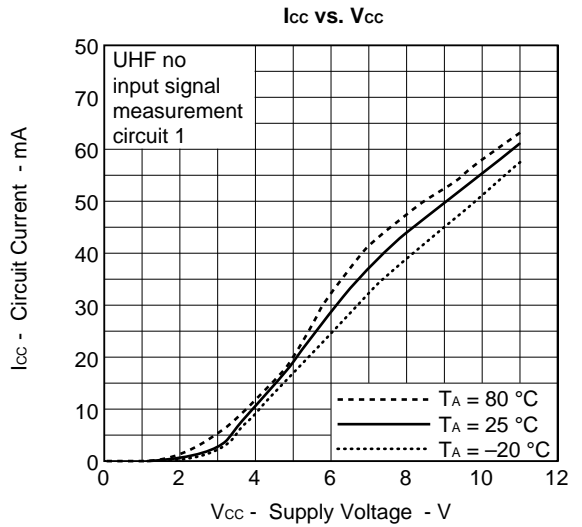
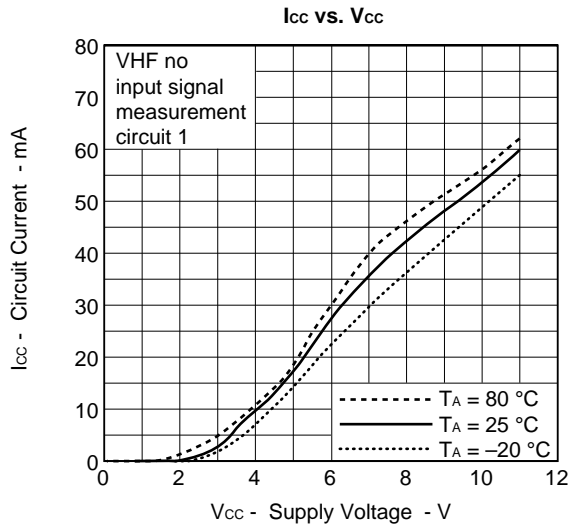
\*3 By measurement circuit 3

STANDARD CHARACTERISTICS (Reference Values) (T<sub>A</sub> = 25 °C, V<sub>CC</sub> = 9 V)

| Parameter                         | Symbol | Test Conditions   | Value for Reference | Unit |
|-----------------------------------|--------|---|---------------------|------|
| 1 % cross-modulation distortion 1 | CM1    | f <sub>des</sub> = 55 MHz, f <sub>undes</sub> = f <sub>des</sub> + 6 MHz,<br>P <sub>des</sub> = -30 dBm, f <sub>iF</sub> = 45 MHz,<br>P <sub>osc</sub> = -10 dBm, AM 100 kHz, 30 %<br>modulation, DES/CM = 46 dBc *1  | 100                 | dBμ  |
| 1 % cross-modulation distortion 2 | CM2    | f <sub>des</sub> = 200 MHz, f <sub>undes</sub> = f <sub>des</sub> + 6 MHz,<br>P <sub>des</sub> = -30 dBm, f <sub>iF</sub> = 45 MHz,<br>P <sub>osc</sub> = -10 dBm, AM 100 kHz, 30 %<br>modulation, DES/CM = 46 dBc *1 | 100                 | dBμ  |
| 1 % cross-modulation distortion 3 | CM3    | f <sub>des</sub> = 470 MHz, f <sub>undes</sub> = f <sub>des</sub> + 6 MHz,<br>P <sub>des</sub> = -30 dBm, f <sub>iF</sub> = 45 MHz,<br>P <sub>osc</sub> = -10 dBm, AM 100 kHz, 30 %<br>modulation, DES/CM = 46 dBc *1 | 96                  | dBμ  |
| 1 % cross-modulation distortion 4 | CM4    | f <sub>des</sub> = 470 MHz, f <sub>undes</sub> = f <sub>des</sub> + 6 MHz,<br>P <sub>des</sub> = -30 dBm, f <sub>iF</sub> = 45 MHz,<br>P <sub>osc</sub> = -10 dBm, AM 100 kHz, 30 %<br>modulation, DES/CM = 46 dBc *1 | 94                  | dBμ  |
| 1 % cross-modulation distortion 5 | CM5    | f <sub>des</sub> = 890 MHz, f <sub>undes</sub> = f <sub>des</sub> + 6 MHz,<br>P <sub>des</sub> = -30 dBm, f <sub>iF</sub> = 45 MHz,<br>P <sub>osc</sub> = -10 dBm, AM 100 kHz, 30 %<br>modulation, DES/CM = 46 dBc *1 | 92                  | dBμ  |

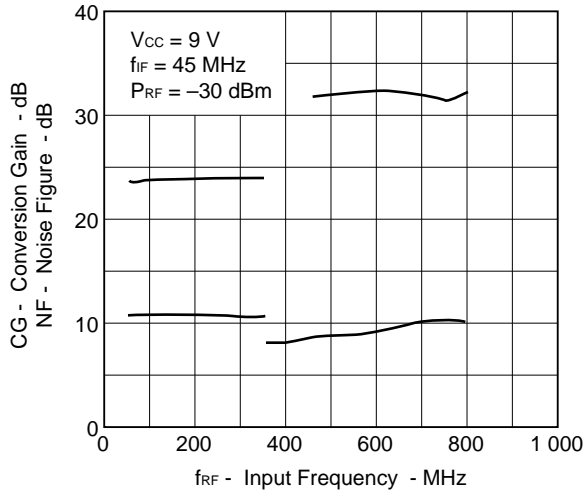
\*1 By measurement circuit 4

TYPICAL CHARACTERISTICS

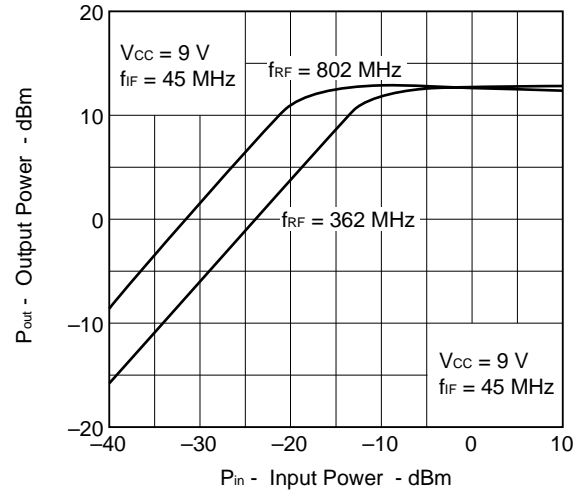


STANDARD CHARACTERISTICS (by application circuit example)

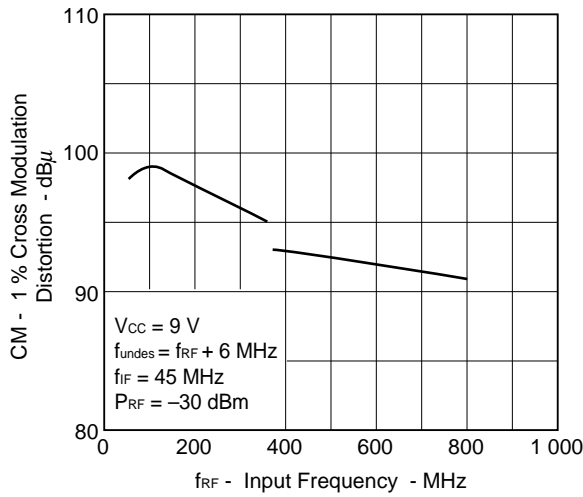
CG, NF vs.  $f_{RF}$



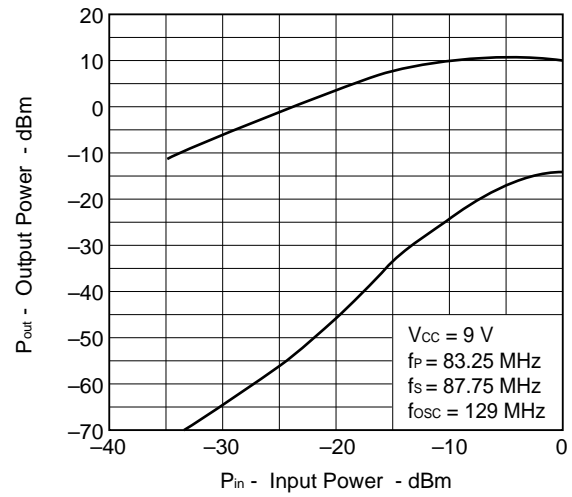
$P_{out}$  vs.  $P_{in}$



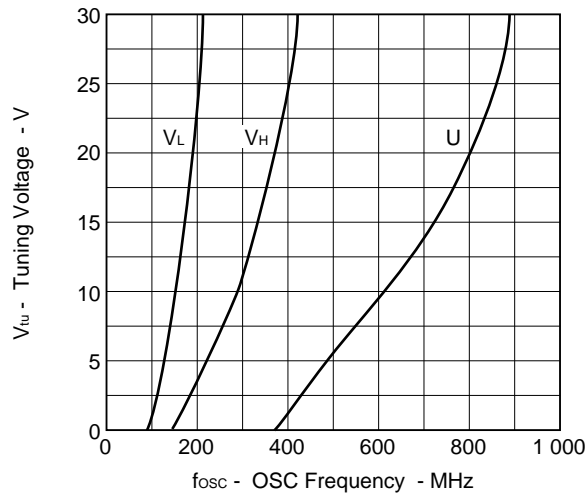
CM vs.  $f_{RF}$



6 Channel Beat



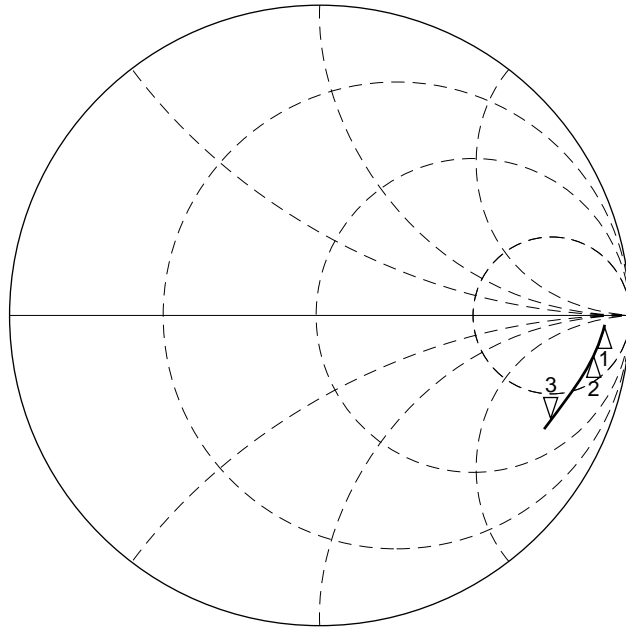
$V_{tu}$  vs.  $f_{osc}$





INPUT IMPEDANCE (by measurement circuit 5)

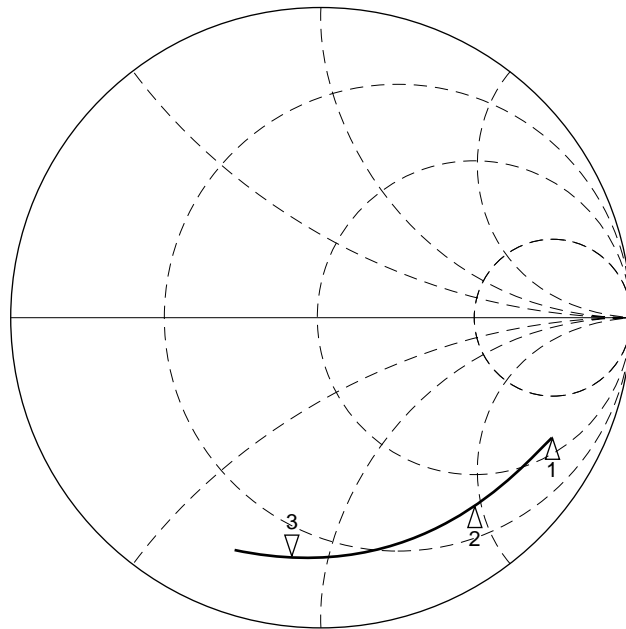
<VRF INPUT: 17 PIN>



- ▽ 1 45 MHz  
931.31Ω -247.16Ω
- ▽ 2 200 MHz  
358.08Ω -395.55Ω
- ▽ 3 470 MHz  
95.062Ω -184.34Ω

START 0.045000000 GHz  
STOP 0.500000000 GHz

<URF INPUT: 20 PIN>

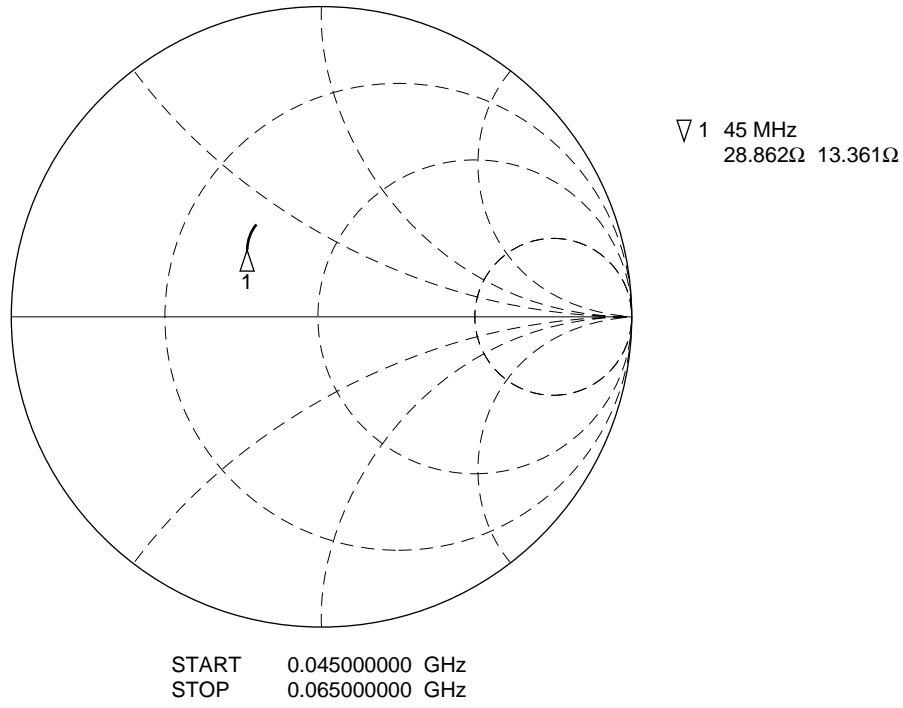


- ▽ 1 400 MHz  
71.531Ω -178.98Ω
- ▽ 2 600 MHz  
31.352Ω -96.094Ω
- ▽ 3 890 MHz  
10.85Ω -42.965Ω

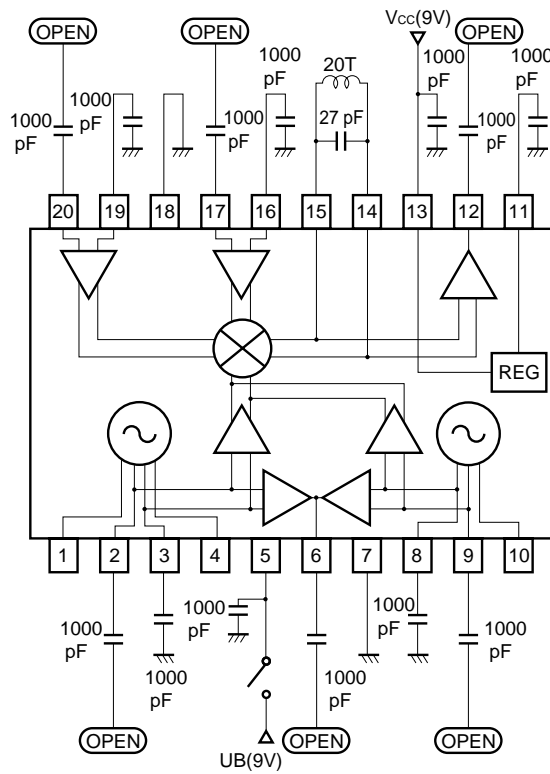
START 0.400000000 GHz  
STOP 1.000000000 GHz

OUTPUT IMPEDANCE (by measurement circuit 5)

<IF OUTPUT: 12 PIN>

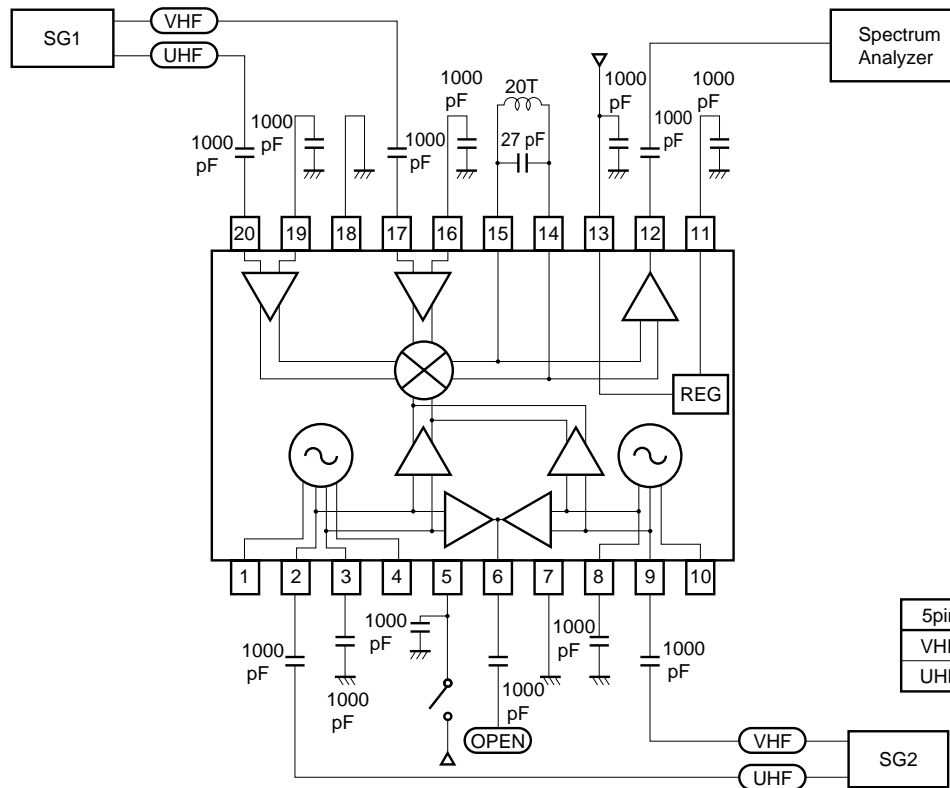


MEASUREMENT CIRCUIT 1



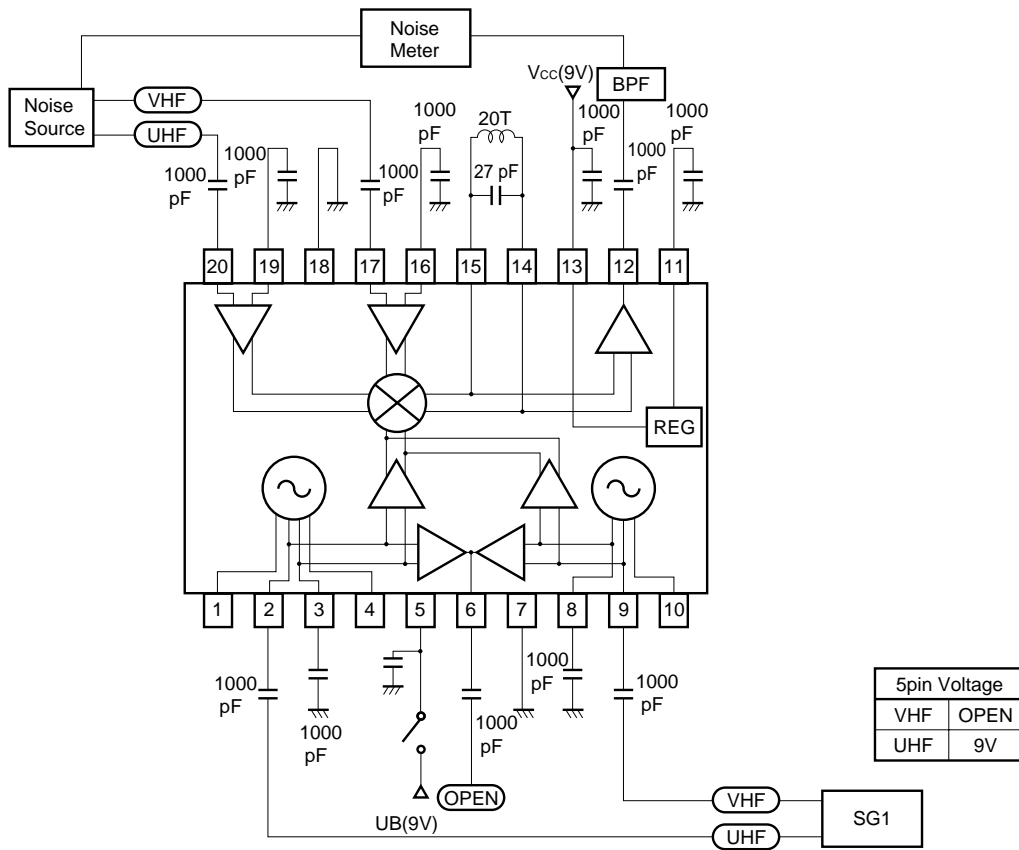
| 5pin Voltage |      |
|--------------|------|
| VHF          | OPEN |
| UHF          | 9V   |

MEASUREMENT CIRCUIT 2

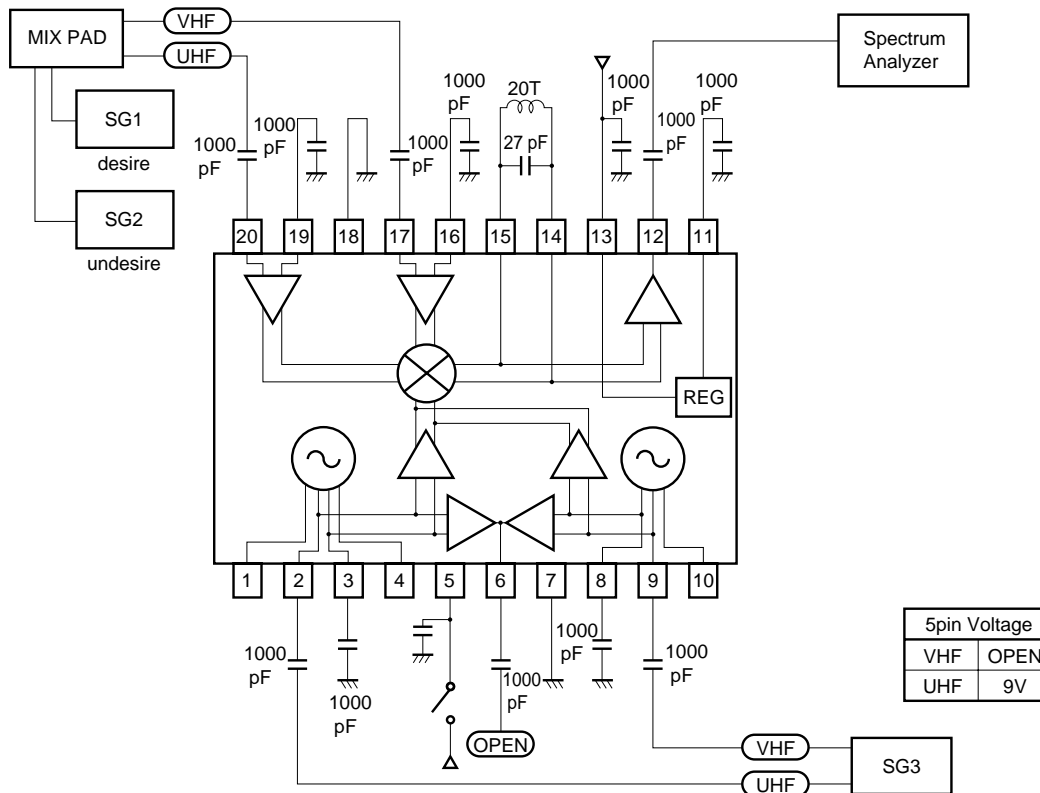


| 5pin Voltage |      |
|--------------|------|
| VHF          | OPEN |
| UHF          | 9V   |

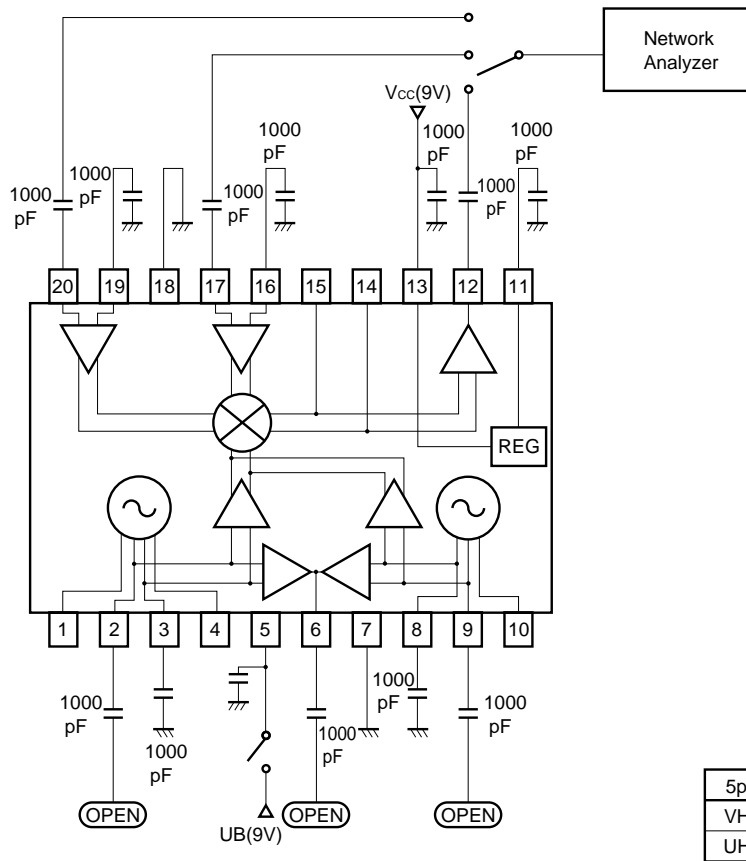
MEASUREMENT CIRCUIT 3



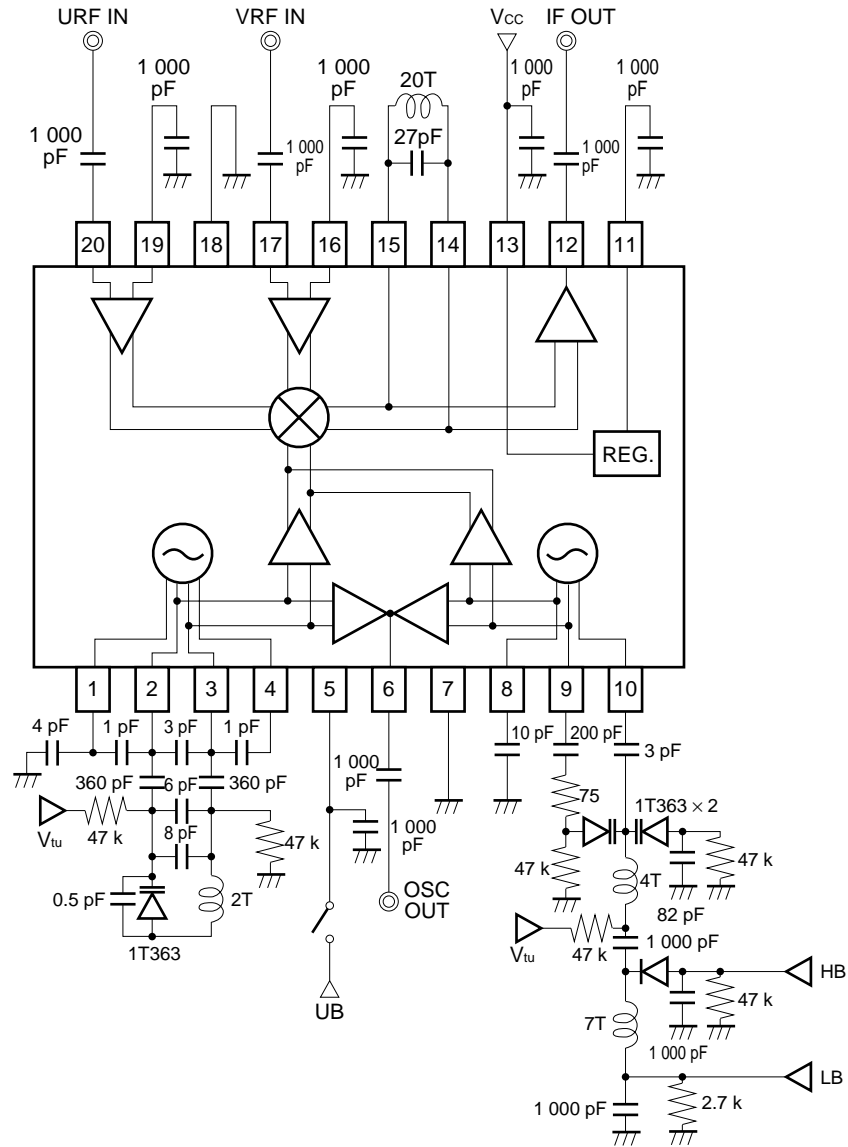
MEASUREMENT CIRCUIT 4



MEASUREMENT CIRCUIT 5



APPLICATION CIRCUIT EXAMPLE



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

ILLUSTRATION OF THE EVALUATION BOARD FOR APPLICATION CIRCUIT EXAMPLE (Surface)

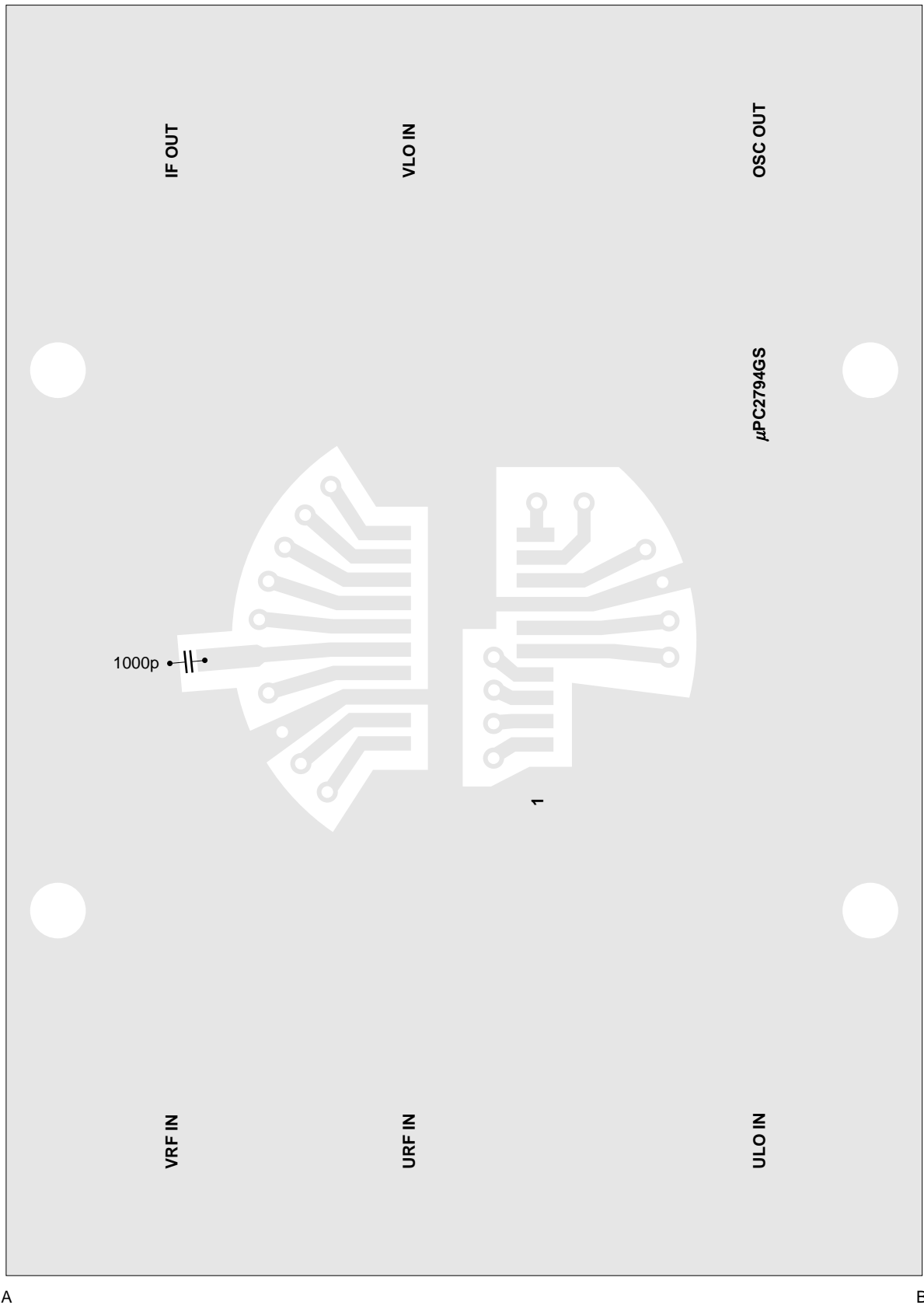
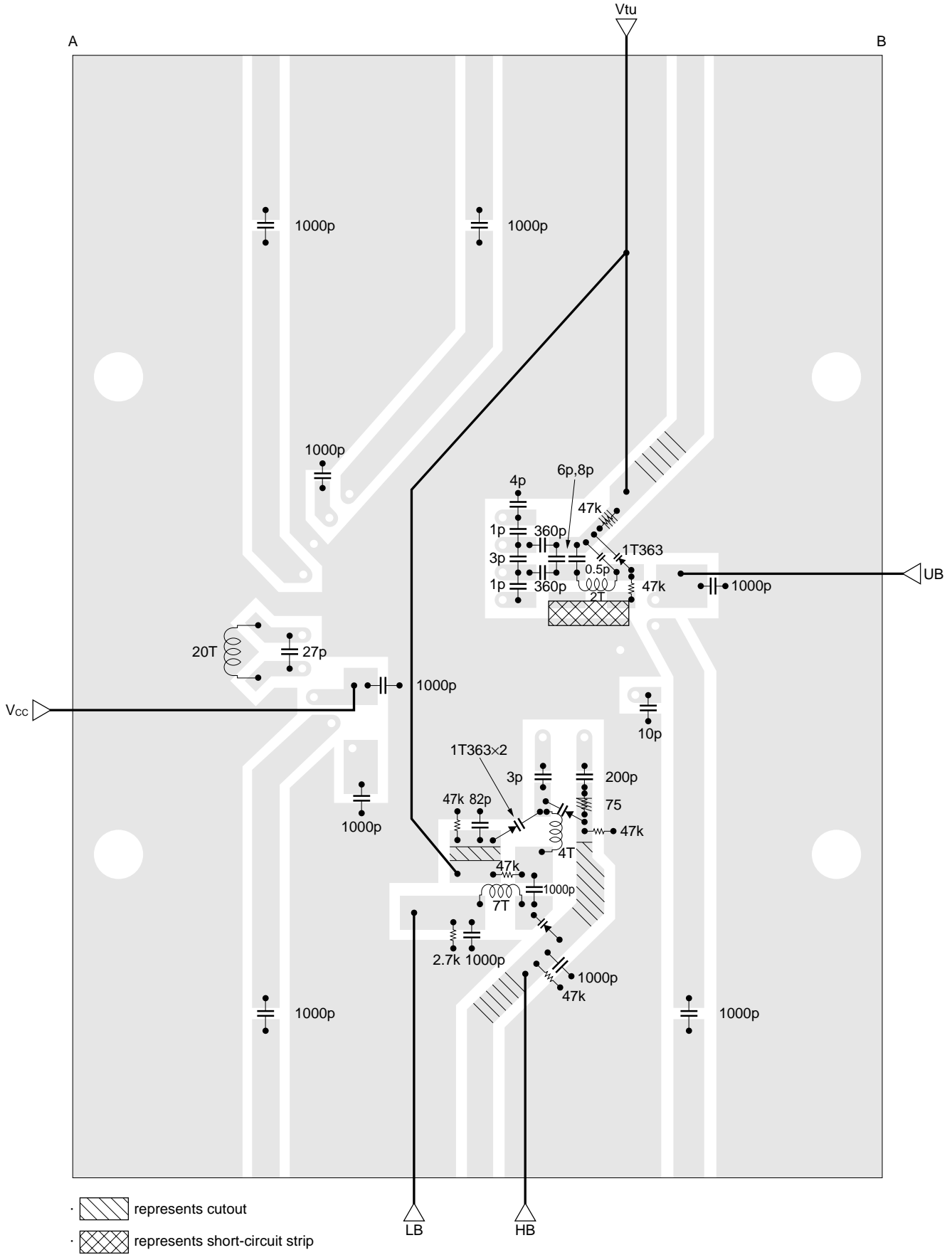


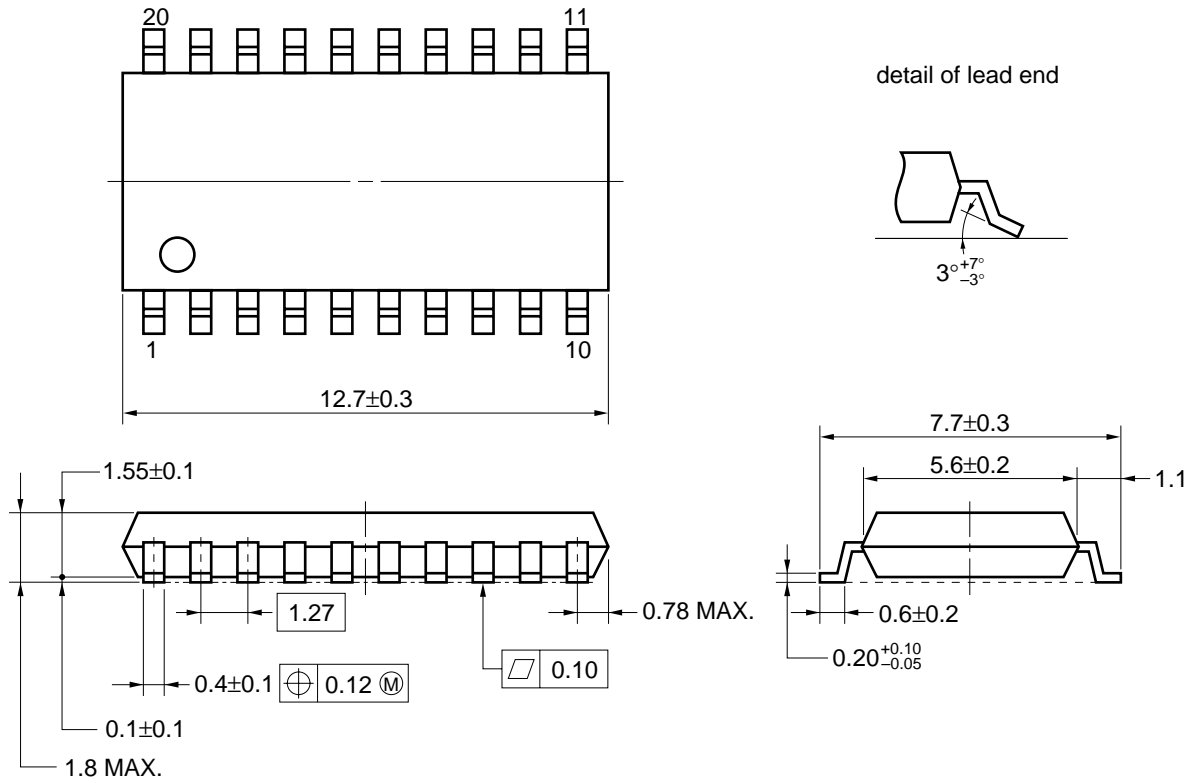
ILLUSTRATION OF THE EVALUATION BOARD FOR APPLICATION CIRCUIT EXAMPLE (Back side)





PACKAGE DIMENSIONS

★ 20 PIN PLASTIC SOP (300 mil) (UNIT: mm)



**NOTE** Each lead centerline is located within 0.12 mm of its true position (T.P.) at maximum material condition.

**NOTE ON CORRECT USE**

- (1) Observe precautions for handling because of electro-static sensitive devices.
- (2) Form a ground pattern as widely as possible to minimize ground impedance (to prevent undesires oscillation).
- (3) Keep the track length of the ground pins as short as possible.
- (4) A low pass filter must be attached to Vcc line.
- (5) A matching circuit must be externally attached to output port.

**RECOMMENDED SOLDERING CONDITIONS**

The following conditions (see table below) must be met when soldering this product.

Please consult with our sales officers in case other soldering process is used or in case soldering is done under different conditions.

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

**μPC2794GS**

| Soldering Process      | Soldering Conditions  | Symbol    |
|------------------------|---|-----------|
| Infrared ray reflow    | Peak package's surface temperature: 235 °C or below,<br>Reflow time: 30 seconds or below (210 °C or higher),<br>Number of reflow process: 3, Exposure limit*1: None | IR35-00-3 |
| VPS                    | Peak package's surface temperature: 215 °C or below,<br>Reflow time: 40 seconds or below (200 °C or higher),<br>Number of reflow process: 3, Exposure limit*1: None | VP15-00-3 |
| Partial heating method | Terminal temperature: 300 °C or below,<br>Flow time: 3 seconds or below,<br>Exposure limit*1: None  |           |

\*1 Exposure limit before soldering after dry-pack package is opened.

Storage conditions: 25 °C and relative humidity at 65 % or less.

**Caution Do not apply more than single process at once, except for "Partial heating method".**

[MEMO]

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  - NEC devices are classified into the following three quality grades:  
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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: Aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems or medical equipment for life support, etc.
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