

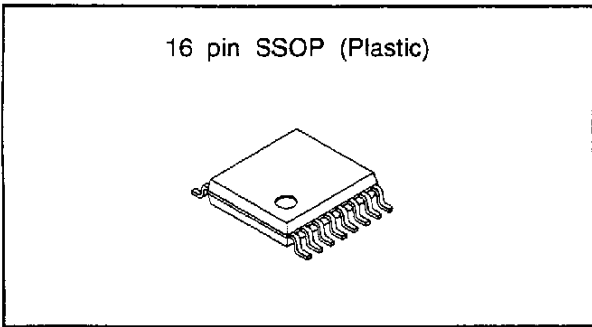
**L-band Down Converter IC**

**Description**

The CXA3008N-1/-2 is a monolithic IC to down-convert the L-band (1 to 2 GHz) signal for the satellite broadcasting receiver. It has a double-balanced mixer, local oscillator circuit and IF amplifier on chip.

**Features**

- Balance-type Colpitts oscillator circuit provides a stable and wide range oscillation. Especially, the CXA3008N-1 allows oscillation of up to 2.53 GHz for CS.
- Small leak of the local oscillation signal due to the double-balanced mixer.
- Local oscillator output circuit for PLL.
- Single 5 V power supply operation.
- Low current consumption.  $I_{cc}=55$  mA (typ.)
- 16-pin SSOP package contributes to reduction in set size.



**Absolute Maximum Ratings (Ta=25°C)**

|                               |      |             |    |
|-------------------------------|------|-------------|----|
| • Supply voltage              | Vcc  | 6.5         | V  |
| • Storage temperature         | Tstg | -55 to +150 | °C |
| • Allowable power dissipation | Pd   | 625         | mW |
| (When mounted on board)       |      |             |    |

**Operating Conditions**

|                       |      |             |    |
|-----------------------|------|-------------|----|
| • Supply voltage      | Vcc  | 4.75 to 5.3 | V  |
| • Ambient temperature | Topr | -20 to 75   | °C |

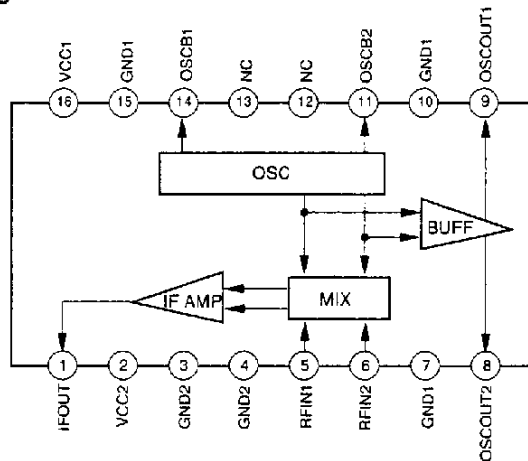
**Applications**

- First IF frequency conversion for BS/CS (CXA3008N-1)
- First IF frequency conversion for BS (CXA3008N-2)

**Structure**

Bipolar silicon monolithic IC

**Block Diagram and Pin Configuration**



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Pin Description and Equivalent Circuit

| Pin No. | Symbol   | Typical pin voltage (V) | Equivalent circuit | Description   |
|---------|----------|-------------------------|--------------------|---|
| 1       | IF OUT   | 2.6                     |                    | IF output.  |
| 2       | VCC2     | 5.0                     |                    | IF block power supply.  |
| 3       | GND2     | 0                       |                    | IF block GND.   |
| 4       | GND2     | 0                       |                    | IF block GND.   |
| 5       | RF IN1   | 1.5                     |                    | RF input.<br>Normally, a decoupling capacitor is connected at Pin 5 to GND and Pin 6 is used for input. |
| 6       | RF IN2   | 1.5                     |                    |   |
| 7       | GND1     | 0                       |                    | RF block GND.   |
| 8       | OSC OUT2 | 3.1                     |                    | Local oscillation output.   |
| 9       | OSC OUT1 | 3.1                     |                    |   |

| Pin No. | Symbol | Typical pin voltage (V) | Equivalent circuit | Description            |
|---------|--------|-------------------------|--------------------|------------------------|
| 10      | GND1   | 0                       |                    | RF block GND.          |
| 11      | OSC B2 | 2.4                     |                    | Oscillator.            |
| 12      | NC     | —                       |                    |                        |
| 13      | NC     | —                       |                    |                        |
| 14      | OSC B1 | 2.4                     |                    |                        |
| 15      | GND1   | 0                       |                    | RF block GND.          |
| 16      | VCC1   | 5.0                     |                    | RF block power supply. |

**Electrical Characteristics** (Ta=25°C, Vcc=5 V, refer to the Electrical Characteristics Measurement Circuit.)  
CXA3008N-1 (input frequency: 950 to 2050 MHz)

| No | Item   | Symbol          | Measurement conditions  | Min. | Typ. | Max. | Unit   |
|----|--|-----------------|---|------|------|------|--------|
| 1  | Current consumption                          | I <sub>cc</sub> | No signal   | 44.0 | 55.0 | 73.5 | mA     |
| 2  | Conversion gain *1                           | CG1             | f <sub>in</sub> = 950MHz, f <sub>IF</sub> = 480MHz  | 17   | 20   | 24   | dB     |
|    |  | CG2             | f <sub>in</sub> = 1450MHz, f <sub>IF</sub> = 480MHz   | 17   | 20   | 24.5 | dB     |
|    |  | CG3             | f <sub>in</sub> = 2050MHz, f <sub>IF</sub> = 480MHz   | 16   | 19.5 | 24.5 | dB     |
| 3  | Noise figure *1, 2                           | NF1             | f <sub>in</sub> = 950MHz, f <sub>IF</sub> = 480MHz  |      | 15.5 | 16.5 | dB     |
|    |  | NF2             | f <sub>in</sub> = 1450MHz, f <sub>IF</sub> = 480MHz   |      | 16.5 | 17.5 | dB     |
|    |  | NF3             | f <sub>in</sub> = 2050MHz, f <sub>IF</sub> = 480MHz   |      | 17.5 | 19   | dB     |
| 4  | Local oscillation output                     | Posc1           | f <sub>osc</sub> = 1350 to 1930MHz  | -5.5 | -2.0 |      | dBm    |
|    |  | Posc2           | f <sub>osc</sub> = 1930 to 2200MHz  | -6.5 | -3.0 |      | dBm    |
|    |  | Posc3           | f <sub>osc</sub> = 2200 to 2530MHz  | -9.0 | -5.0 |      | dBm    |
| 5  | IF maximum output                            | Po(sat)         | f <sub>IF</sub> = 480MHz  | 5.5  | 8.5  | 11.0 | dBm    |
| 6  | RF pin local oscillation leakage             | RFLK1           | f <sub>osc</sub> = 1350 to 1930MHz  |      |      | -18  | dBm    |
|    |  | RFLK2           | f <sub>osc</sub> = 1930 to 2200MHz  |      |      | -26  | dBm    |
|    |  | RFLK3           | f <sub>osc</sub> = 2200 to 2530MHz  |      |      | -20  | dBm    |
| 7  | IF pin local oscillation leakage             | IFLK1           | f <sub>osc</sub> = 1350 to 1930MHz  |      |      | -17  | dBm    |
|    |  | IFLK2           | f <sub>osc</sub> = 1930 to 2200MHz  |      |      | -32  | dBm    |
|    |  | IFLK3           | f <sub>osc</sub> = 2200 to 2530MHz  |      |      | -28  | dBm    |
| 8  | Third-order intermodulation distortion *1, 3 | IM3             | P <sub>in</sub> = -25dBm<br>f <sub>in</sub> = 950MHz + 960MHz<br>f <sub>out</sub> = 380MHz + 400MHz<br>S/I of 380MHz and 400MHz |      | 48.0 |      | dB     |
| 9  | Local oscillation phase noise                | CN1             | f <sub>osc</sub> =1350MHz, offset 10kHz   |      | 74   |      | dBc/Hz |
|    |  | CN2             | f <sub>osc</sub> =1350MHz, offset 100kHz  |      | 95   |      | dBc/Hz |
| 10 | IF output VSWR                               | IFVSWR          | f = 400MHz  |      | 1.2  |      |        |
| 11 | RF input impedance                           | r <sub>π</sub>  | f = 950MHz  |      | 270  |      | Ω      |
|    |  | C <sub>π</sub>  |   |      | 4    |      | pF     |

\*1) Measured value for untuned inputs.

\*2) Noise figure is uncorrected for image.

\*3) Measure S/I of the desired intermediate frequency (400 MHz) and distortion component (380 MHz) with a spectrum analyzer, assuming input level of the reception frequency to be -25 dBm (when IC input pin is converted for 50Ω).

**Electrical Characteristics** (Ta=25°C, VCC=5 V, refer to the Electrical Characteristics Measurement Circuit.)  
 CXA3008N-2 (input frequency: 950 to 1450 MHz)

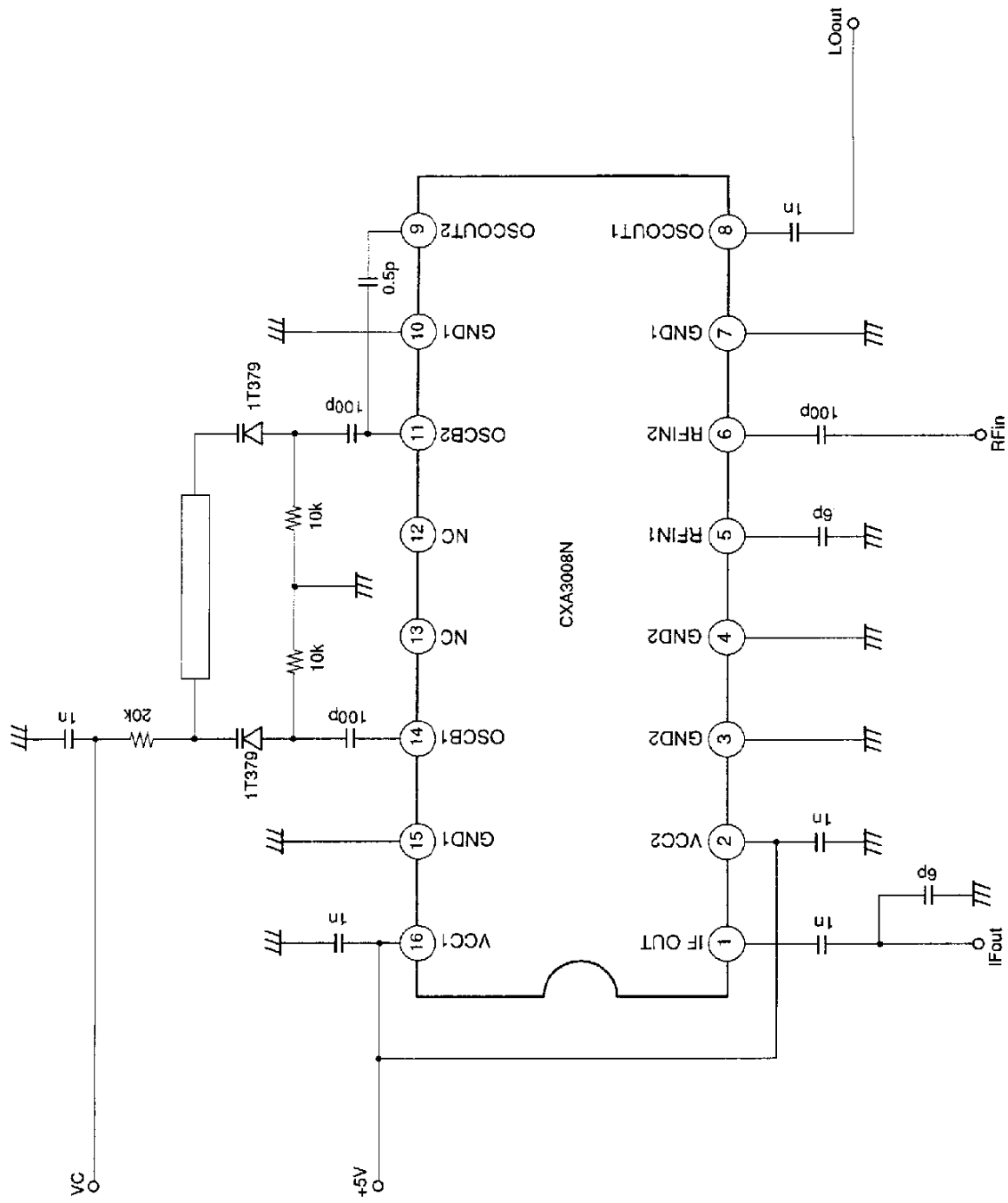
| No | Item  | Symbol  | Measurement conditions  | Min. | Typ. | Max. | Unit   |
|----|---|---------|---|------|------|------|--------|
| 1  | Current consumption                         | Icc     | No signal   | 35.5 | 55.0 | 73.5 | mA     |
| 2  | Conversion gain*1                           | CG1     | fin = 950MHz, fiF = 480MHz  | 15.5 | 20   | 24   | dB     |
|    |   | CG2     | fin = 1450MHz, fiF = 480MHz   | 15.5 | 20   | 24.5 | dB     |
| 3  | Noise figure*1, 2                           | NF1     | fin = 950MHz, fiF = 480MHz  |      | 15.5 | 17.0 | dB     |
|    |   | NF2     | fin = 1450MHz, fiF = 480MHz   |      | 16.5 | 18.0 | dB     |
| 4  | Local oscillation output                    | Posc1   | fosc = 1350 to 1930MHz  | -5.5 | -2.0 |      | dBm    |
| 5  | IF maximum output                           | Po(sat) | fiF = 480MHz  | 5.5  | 8.5  | 11.0 | dBm    |
| 6  | RF pin local oscillation leakage            | RFLK1   | fosc = 1350 to 1930MHz  |      |      | -18  | dBm    |
| 7  | IF pin local oscillation leakage            | IFLK1   | fosc = 1350 to 1930MHz  |      |      | -17  | dBm    |
| 8  | Third-order intermodulation distortion*1, 3 | IM3     | Pin = -25dBm<br>fin = 950MHz + 960MHz<br>fout = 380MHz + 400MHz<br>S/I of 380MHz and 400MHz |      | 48.0 |      | dB     |
| 9  | Local oscillation phase noise               | CN1     | fosc=1350MHz, offset 10kHz  |      | 74   |      | dBc/Hz |
|    |   | CN2     | fosc=1350MHz, offset 100kHz   |      | 95   |      | dBc/Hz |
| 10 | IF output VSWR                              | IFVSWR  | f = 400MHz  |      | 1.2  |      |        |
| 11 | RF input impedance                          | rπ      | f = 950MHz  |      | 270  |      | Ω      |
|    |   | Cπ      |   |      | 4    |      | pF     |

\*1) Measured value for untuned inputs.

\*2) Noise figure is uncorrected for image.

\*3) Measure S/I of the desired intermediate frequency (400 MHz) and distortion component (380 MHz) with a spectrum analyzer, assuming input level of the reception frequency to be -25 dBm (when IC input pin is converted for 50Ω).

Electrical Characteristics Measurement Circuit



**Description of Operation (Refer to the Electrical Characteristics Measurement Circuit.)**

## 1) Oscillator circuit

The oscillator circuit is formed with two Colpitts oscillators, and oscillation is provided at the differential input via an LC resonance circuit including a varicap diode. This is oscillated only by attaching an LC resonance circuit externally because feedback capacitance, etc. are built in for oscillation.

## 2) Mixer circuit

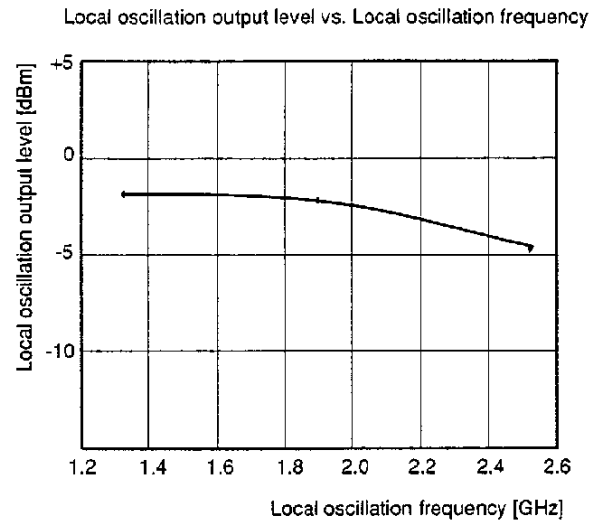
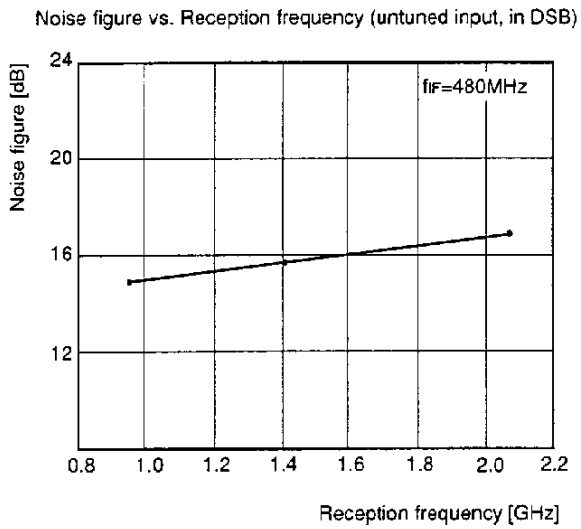
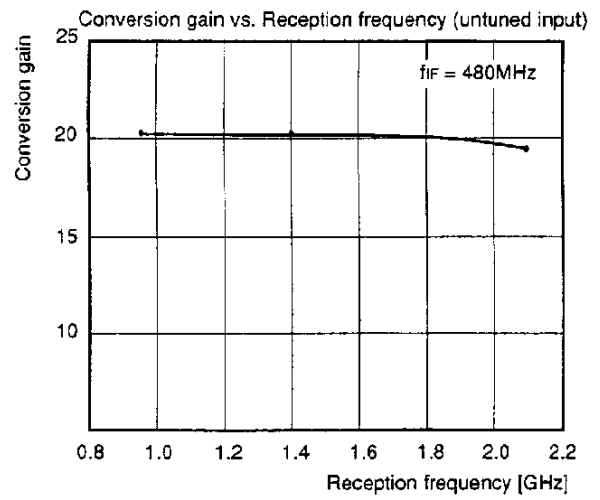
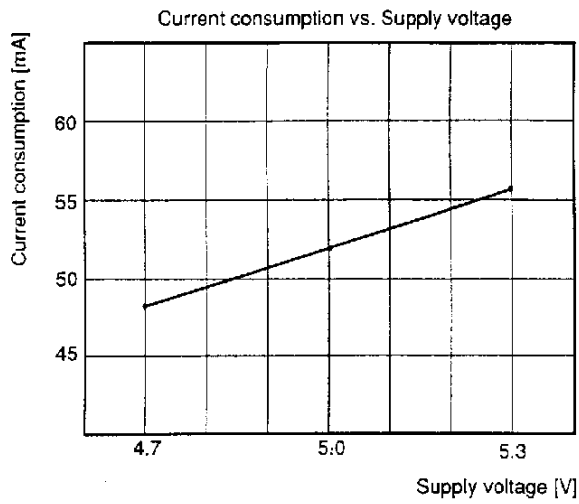
This is a double-balance mixer having small leak of local oscillation signal. The RF signal is input to Pins 5 and 6. In normal use, the signal is input to one pin while the other pin is connected to GND via decoupling capacitor. In this case, if the capacitor value for grounding is smaller (6 pF for the example of the Electrical Characteristics Measurement Circuit), the conversion gain has the better frequency characteristics.

## 3) IF amplifier circuit

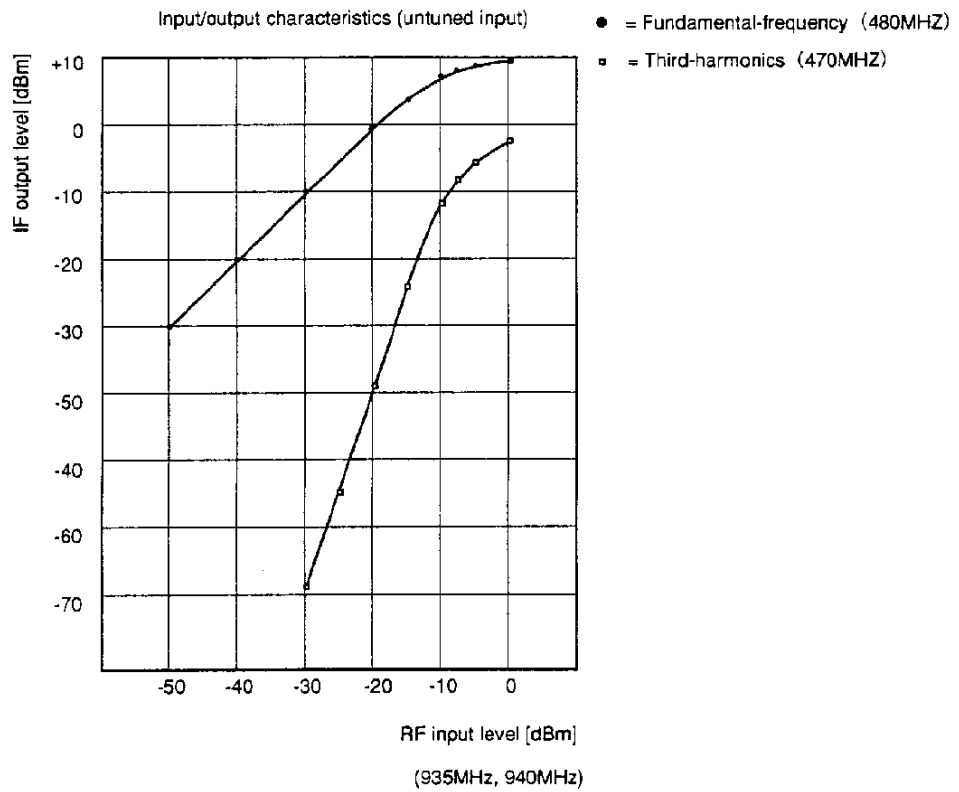
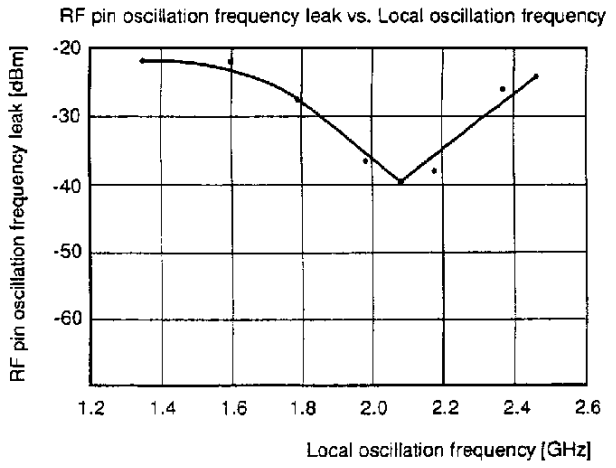
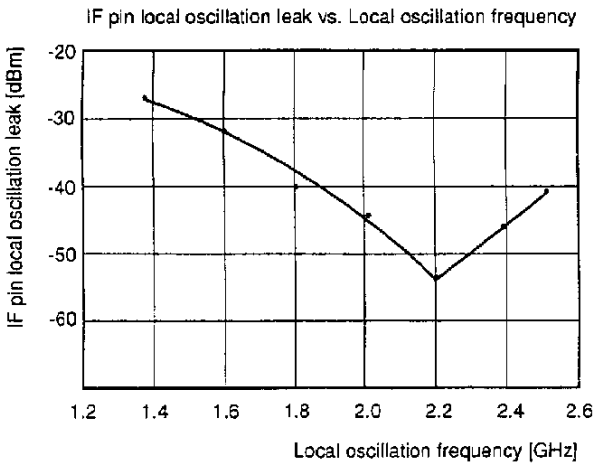
The mixer output signal is amplified by the IF amplifier and output to Pin 1. The IF output is emitter-follower output and output impedance is approximately  $50\Omega$  (400 MHz).

## 4) PLL oscillation signal output circuit

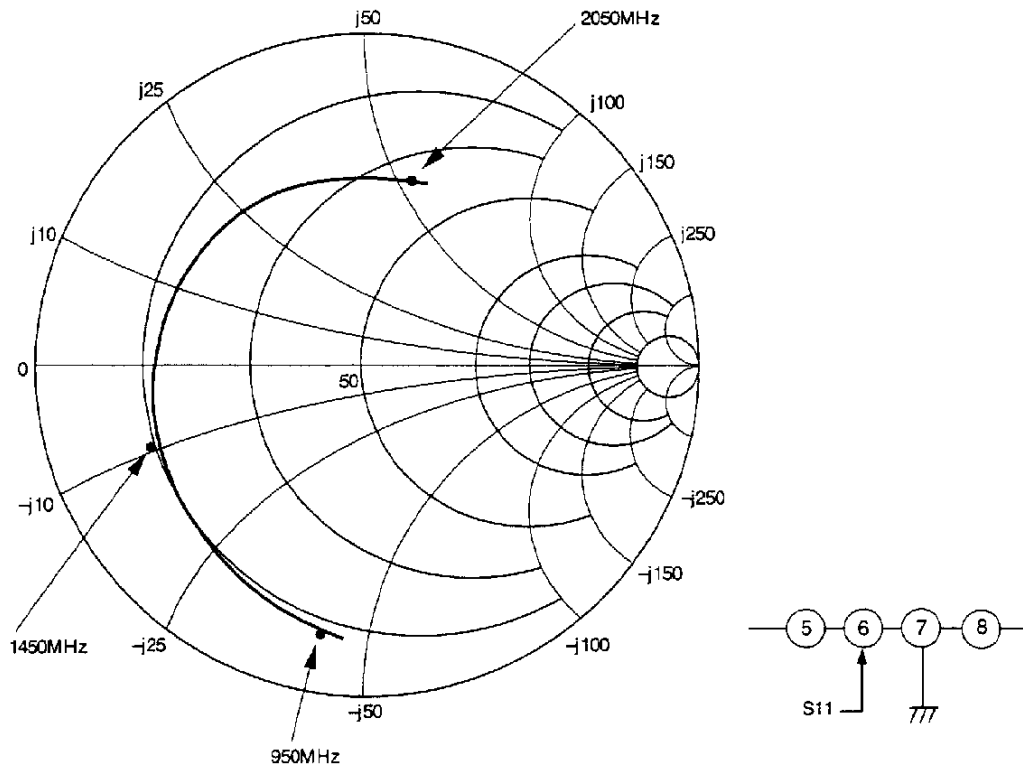
The output circuit is built in to drive the PLL for tuning. This is emitter-follower output and output impedance is approximately  $50\Omega$ .



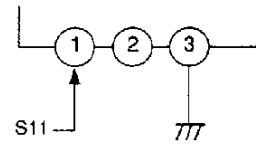
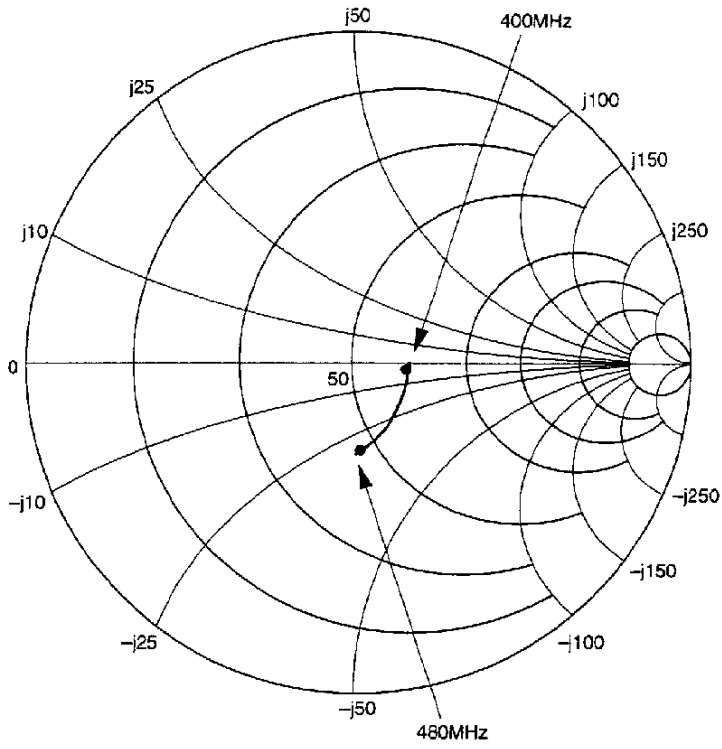




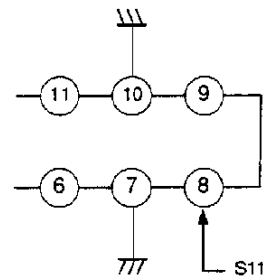
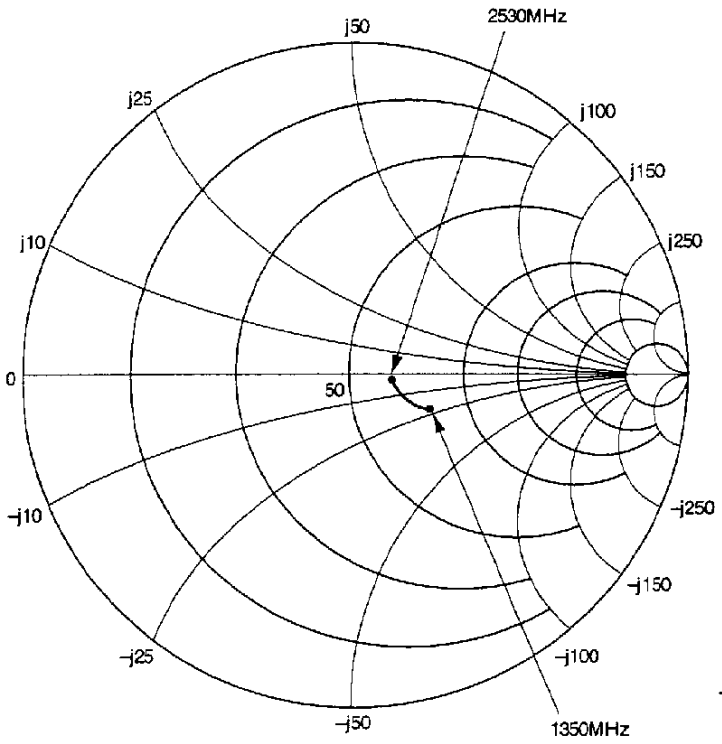
Input Impedance



**Output Impedance (IF)**

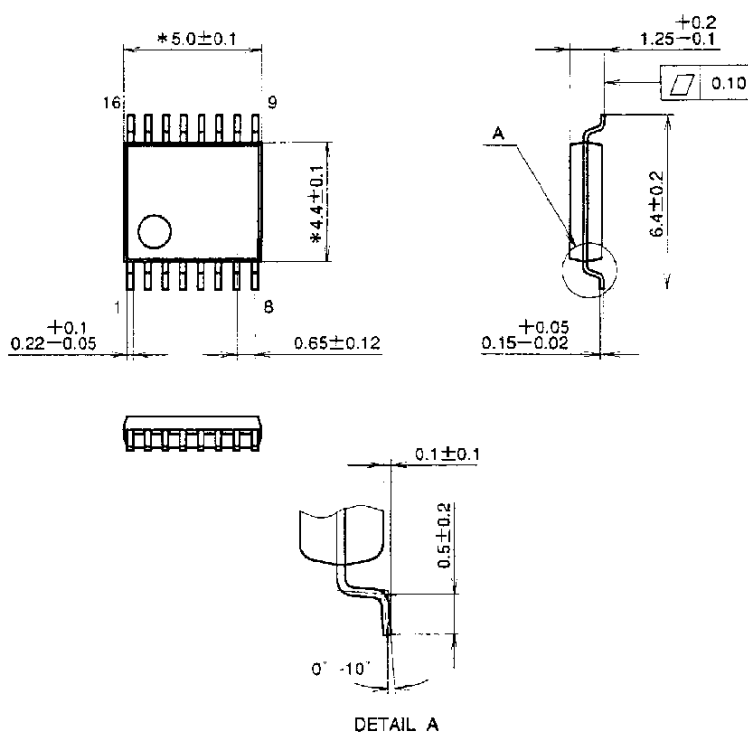


**Output Impedance (local oscillation output)**



Package Outline Unit : mm

16PIN SSOP (Plastic)



NOTE > Dimension "\*" does not include mold protrusion.

PACKAGE STRUCTURE

|            |                  |
|------------|------------------|
| SONY CODE  | SSOP-16P-L01     |
| EIAJ CODE  | SSOP016-P-0044-A |
| JEDEC CODE | -----            |

|                  |                   |
|------------------|-------------------|
| PACKAGE MATERIAL | EPOXY RESIN       |
| LEAD TREATMENT   | PALLADIUM PLATING |
| LEAD MATERIAL    | COPPER ALLOY      |
| PACKAGE WEIGHT   | 0.1g              |