

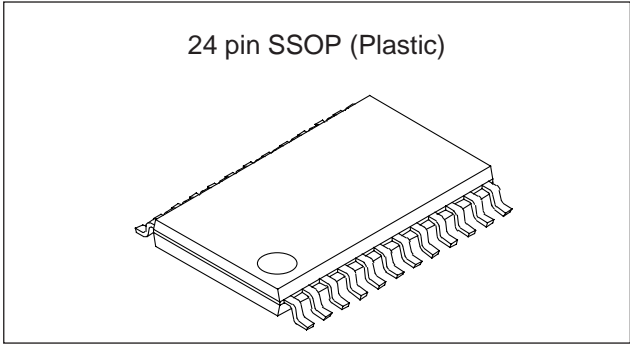
All Band TV Tuner IC (VHF-CATV-UHF)

Description

The CXA3095N is a single chip TV tuner IC which performs as an oscillator, mixer for VHF-CATV and UHF bands. An IF amplifier is also provided.

This IC adopts a 24-pin SSOP package (0.8mm pitch) in response to the trend toward miniaturizing the tuner and automatic IC mounting.

This IC is the inverted product of the CXA3025N pin assignment.



Features

- Low noise figure
- Superior cross modulation
- Low spurious
- Stable oscillating characteristics
- Local oscillator output for PLL
- Double tune filter connectable to MIX output
- Low thermal resistance package

Absolute Maximum Ratings

| | | | |
|-------------------------------|------------------|---------------------------|----|
| • Supply voltage | V _{CC} | 10.5 | V |
| • Storage temperature | T _{stg} | -65 to +150 | °C |
| • Allowable power dissipation | P _D | 1200 | mW |
| | | (when mounted on a board) | |

Structure

Bipolar silicon monolithic IC

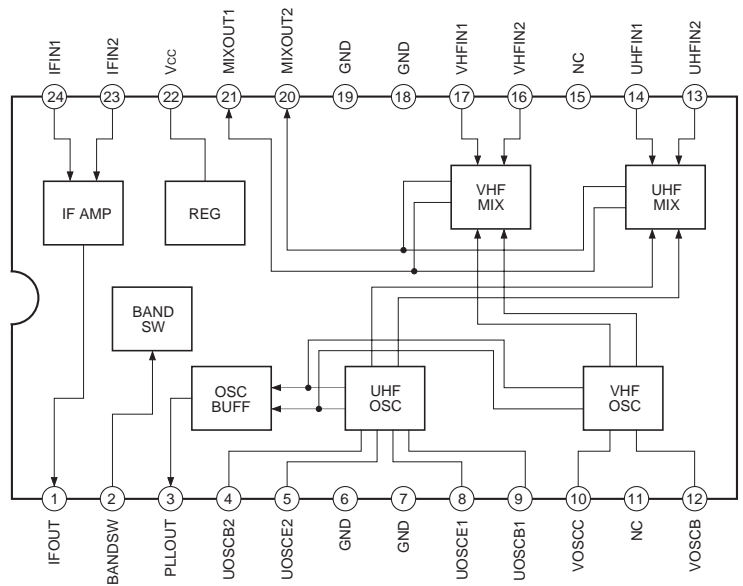
Operating Conditions

| | | | |
|-------------------------|------------------|------------|----|
| • Supply voltage | V _{CC} | 9.0 ± 0.9 | V |
| • Operating temperature | T _{opr} | -20 to +75 | °C |

Applications

- TV tuner
- CATV tuner
- VCR tuner

Block Diagram and Pin Configuration (Top View)



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Pin Description and Equivalent Circuit

| Pin NO. | Symbol | Pin voltage typ (V) | Equivalent circuit | Description |
|---------|--------|-----------------------------|--------------------|--|
| 1 | IFOUT | Under VHF operation: 4.5 | | IF output. |
| | | Under UHF operation: 4.5 | | |
| 2 | BANDSW | 0 | | Band switching. UHF operation when 3V or more voltage is applied externally, and VHF operation when OPEN or 0.5V or less voltage is applied. |
| | | 3 | | |
| 3 | PLLOUT | 5.8 | | PLL oscillator signal output. |
| | | 5.7 | | |
| 4 | UOSCB2 | 3.5 | | UHF oscillator. |
| 5 | UOSCE2 | 3.0 | | |
| 8 | UOSCE1 | 3.0 | | |
| | | 2.5 | | |
| 9 | UOSCB1 | 3.5 | | |
| | | 3.3 | | |
| 10 | VOSCC | 6.3 | | VHF oscillator. |
| | | 9.0 | | |
| 12 | VOSCB | 3.3 | | |
| | | 3.5 | | |
| 11 | NC | | | No connected. |

| Pin NO. | Symbol | Pin voltage typ (V) | Equivalent circuit | Description |
|----------------|---------|---------------------|--------------------|--|
| 13 | UHFIN2 | 3.4 | | <p>UHF input. The balanced input to Pins 13 and 14, or a capacitor is connected at Pin 13 to GND and Pin 14 is used for input.</p> |
| | | 3.2 | | |
| 14 | UHFIN1 | 3.4 | | |
| | | 3.2 | | |
| 15 | NC | | | No connected. |
| 16 | VHFIN2 | 3.2 | | <p>VHF input. Normally a capacitor is connected at Pin 17 to GND and Pin 16 is used for input.</p> |
| | | 3.4 | | |
| 17 | VHFIN1 | 3.2 | | |
| | | 3.4 | | |
| 6, 7 18, 19 | GND | 0 | | GND. |
| 20 | MIXOUT2 | 7.4 | | <p>Mixer output.</p> |
| | | 7.2 | | |
| 21 | MIXOUT1 | 7.4 | | |
| | | 7.2 | | |
| 22 | Vcc | 9.0 | | Power supply. |
| 23 | IFIN2 | — | | <p>IF amplifier input.</p> |
| | | — | | |
| 24 | IFIN1 | — | | |
| | | — | | |

Electrical Characteristics

See Electrical Characteristics Measurement Circuit (Ta = 25°C, Vcc = 9V)

| Item | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|---------------------------|-------------|--|------|------|------|------|
| Circuit current | IccV | VHF operation; no signal | 38 | 53 | 63 | mA |
| | IccU | UHF operation; no signal | 37 | 51 | 62 | mA |
| Conversion gain*1 | CG1 | VHF operation; f _{RF} = 55MHz; Input level -40dBm | 17 | 20 | 23 | dB |
| | CG2 | VHF operation; f _{RF} = 360MHz; Input level -40dBm | 18 | 21 | 24 | dB |
| | CG3 | UHF operation; f _{RF} = 360MHz; Input level -40dBm | 23 | 26 | 29 | dB |
| | CG4 | UHF operation; f _{RF} = 800MHz; Input level -40dBm | 23 | 26 | 29 | dB |
| Noise figure*1 *2 | NF1 | VHF operation; f _{RF} = 55MHz | | 13 | 16 | dB |
| | NF2 | VHF operation; f _{RF} = 360MHz | | 12 | 15 | dB |
| | NF3 | UHF operation; f _{RF} = 360MHz | | 9 | 13 | dB |
| | NF4 | UHF operation; f _{RF} = 800MHz | | 9 | 13 | dB |
| 1% cross modulation*1 *3 | CM1 | VHF operation; f _D = 55MHz, f _{UD} = ±12MHz | 99 | 102 | | dBμ |
| | CM2 | VHF operation; f _D = 360MHz, f _{UD} = ±12MHz | 97 | 100 | | dBμ |
| | CM3 | UHF operation; f _D = 360MHz, f _{UD} = ±12MHz | 91 | 94 | | dBμ |
| | CM4 | UHF operation; f _D = 800MHz, f _{UD} = ±12MHz | 89 | 92 | | dBμ |
| Max. output power | Pomax (sat) | 50Ω load | +8 | +10 | | dBm |
| Switch ON drift*4 | Δfsw1 | VHF operation; fosc = 100MHz | | | ±200 | kHz |
| | Δfsw2 | VHF operation; fosc = 405MHz | | | ±300 | kHz |
| | Δfsw3 | UHF operation; fosc = 405MHz | | | ±300 | kHz |
| | Δfsw4 | UHF operation; fosc = 845MHz | | | ±300 | kHz |
| +B supply voltage drift*5 | Δfst1 | VHF operation; fosc = 100MHz | | | ±100 | kHz |
| | Δfst2 | VHF operation; fosc = 405MHz | | | ±200 | kHz |
| | Δfst3 | UHF operation; fosc = 405MHz | | | ±150 | kHz |
| | Δfst4 | UHF operation; fosc = 845MHz | | | ±150 | kHz |
| PLL OUT output power | PoscV | VHF operation; 50Ω load | -20 | -10 | | dBm |
| | PoscU | UHF operation; 50Ω load | -20 | -10 | | dBm |
| Band switch voltage | VswV | VHF operation | 0 | | 0.5 | V |
| | VswU | UHF operation | 3 | | 10.5 | V |

*1 Measured value for untuned inputs.

*2 Noise figure is the direct-reading value of NF meter in DSB.

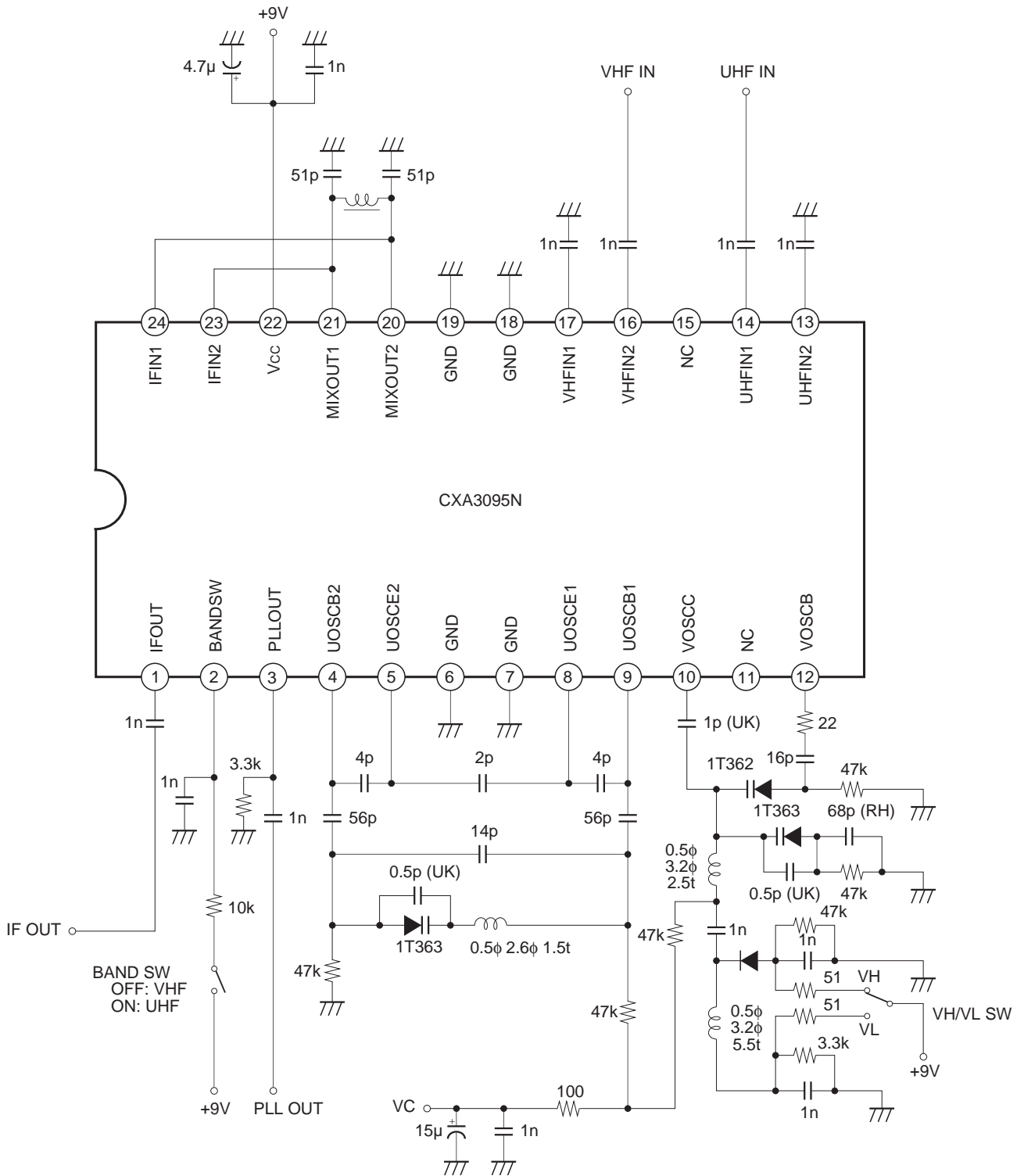
*3 Desired signal (f_D) input level is -33dBm. Undesired signal (f_{UD}) is 100kHz, 30%AM at ±12MHz.

The measurement value is undesired signal level, it measured with a spectrum analyzer at S/I = 46dB.

*4 Frequency variation form 3 seconds to 3 minutes after switch ON.

*5 Frequency variation when Vcc = 9V ± 5% variation.

Electrical Characteristics Measurement Circuit



Description of Operation (See Electrical Characteristics Measurement Circuit.)**VHF oscillator circuit**

The differential oscillator circuit with an output at Pin 10 and an input at Pin 12.

Connect an LC resonance circuit comprising a varicap diode to Pin 10 through a coupling capacitor.

The positive feedback from the resonance circuit is applied to Pin 12 through a feedback capacitor to execute oscillation. Note that if a parasitic capacitance across Pins 10 and 12 is too large, it may cause undesired stray oscillation.

VHF mixer circuit

This is a common emitter type double-balanced mixer having small leakage of local oscillation signal. The RF signal is input to Pins 16 and 17. In normal use, the signal is input to one pin while the other pin is connected to GND by decoupling capacitor. The RF signal is converted to IF frequency with the signal supplied from oscillator. The converted RF is sent to the IF frequency and output to Pins 20 and 21.

UHF oscillator circuit

UHF oscillator is formed from two collector-grounded Colpitts oscillators, and oscillation is provided at the differential input through an LC resonator circuit comprising a varicap diode. LC resonator comprising a varicap diode is connected across Pins 4, 5, 8, and 9.

UHF mixer circuit

The double-balanced mixer like the VHF mixer is adopted. The RF signal is input to Pins 13 and 14. There is a balanced differential input from pre-stage double tune circuit, or an unbalanced input to Pin 14 with the capacitor connected at Pin 13 to GND. Otherwise, the conditions and usage are the same as those for the VHF mixer circuit.

IF amplifier circuit

The frequency converted signal at mixer is output from Pins 20 and 21, and input to IF input pins 23 and 24 through the external IF tune circuit. As an IF tune circuit, single tune circuit like the electrical characteristics measurement circuit or double tune circuit can be connected. The amplified signal at IF amplifier is output to Pin 1. The output impedance is approximately 75Ω .

Also, input block of the IF amplifier has a built-in coupling capacitor, and direct connection with the mixer output is possible.

UHF/VHF switch circuit

UHF operation is chosen by applying 3V or more voltage to Pin 2; VHF operation for 0V or OPEN.

PLL oscillator signal output circuit

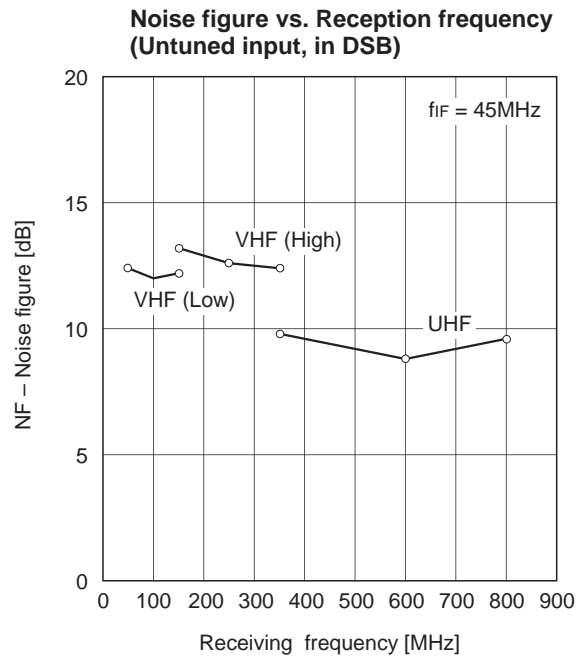
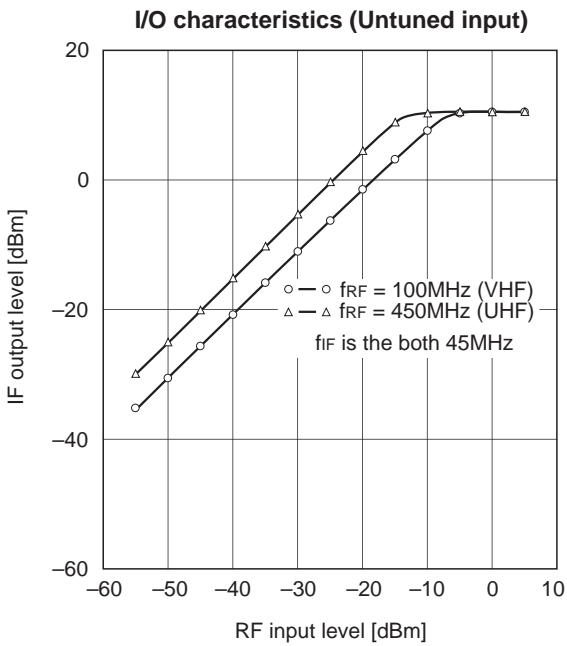
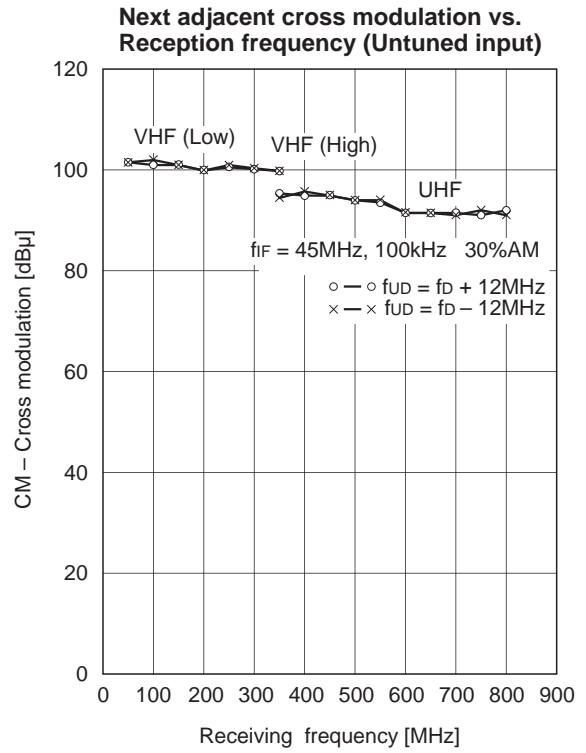
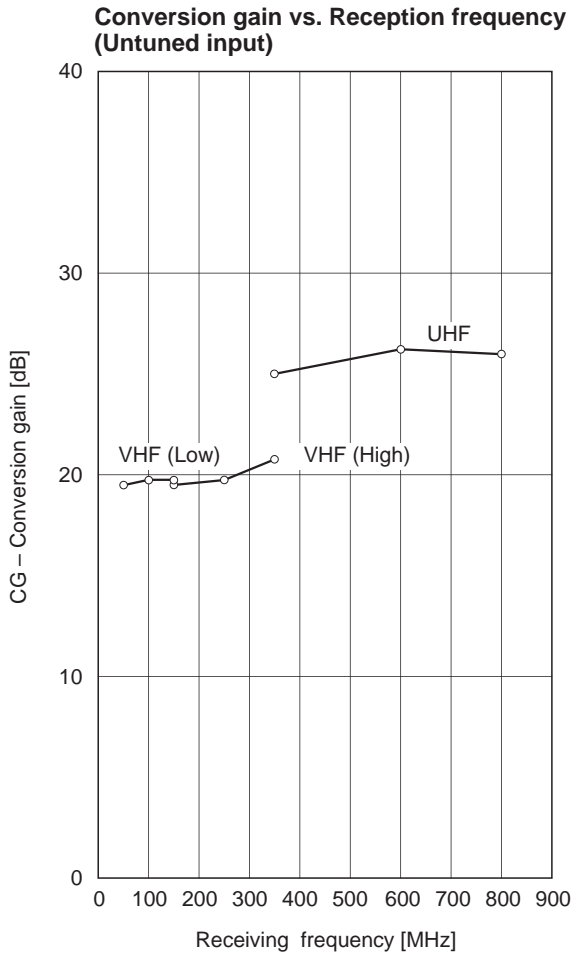
Oscillation signal is output to PLLOUT through buffer amplifier. The resistance connected to the output pin is for current adjustment flowing to buffer amplifier. The resistance value is adjusted depending on the connected load, and output distortion can be minimized.

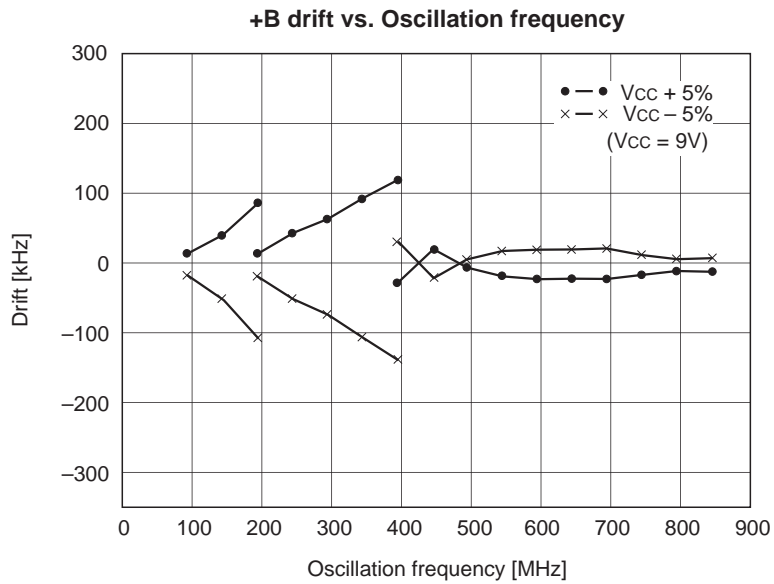
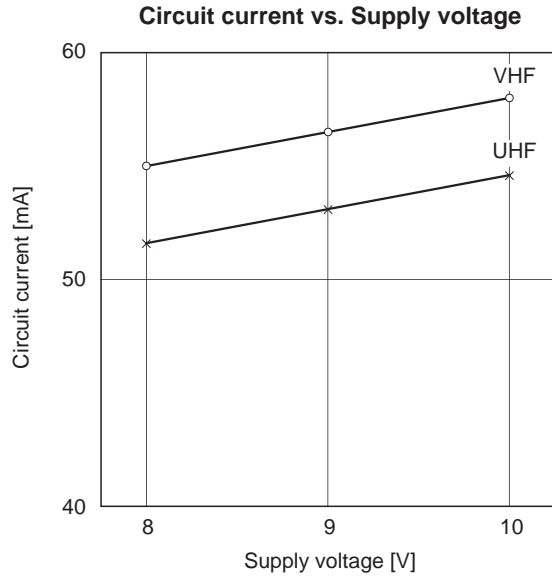
Notes on Usage

Care should be taken such as grounding in placing external parts because high frequencies are present. GND (Pins 6, 7, 18, and 19) are served both as heat dissipation pins, and adjust accordingly to prevent heat problems.

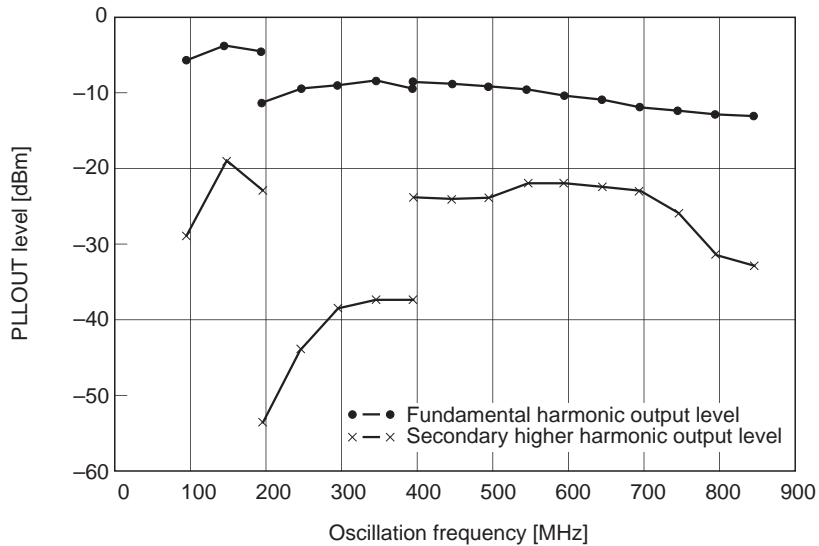
Please concern for damage by static electricity for high frequency input/output pins.

Example of Representative Characteristics

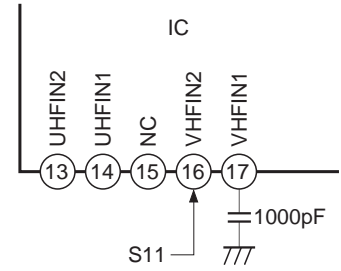
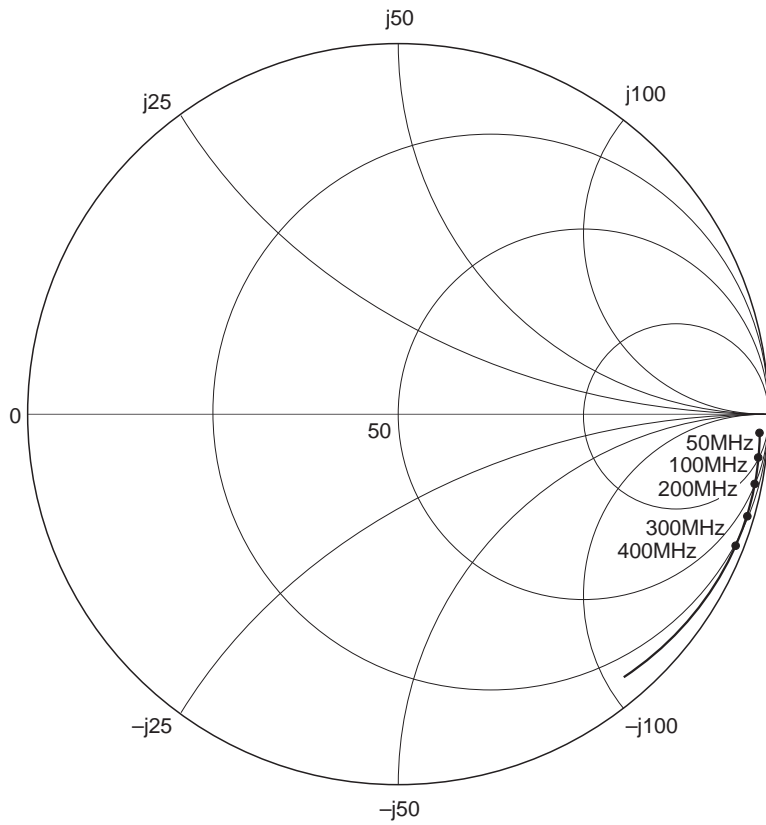




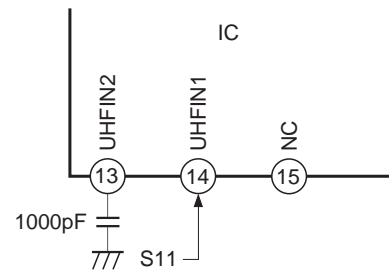
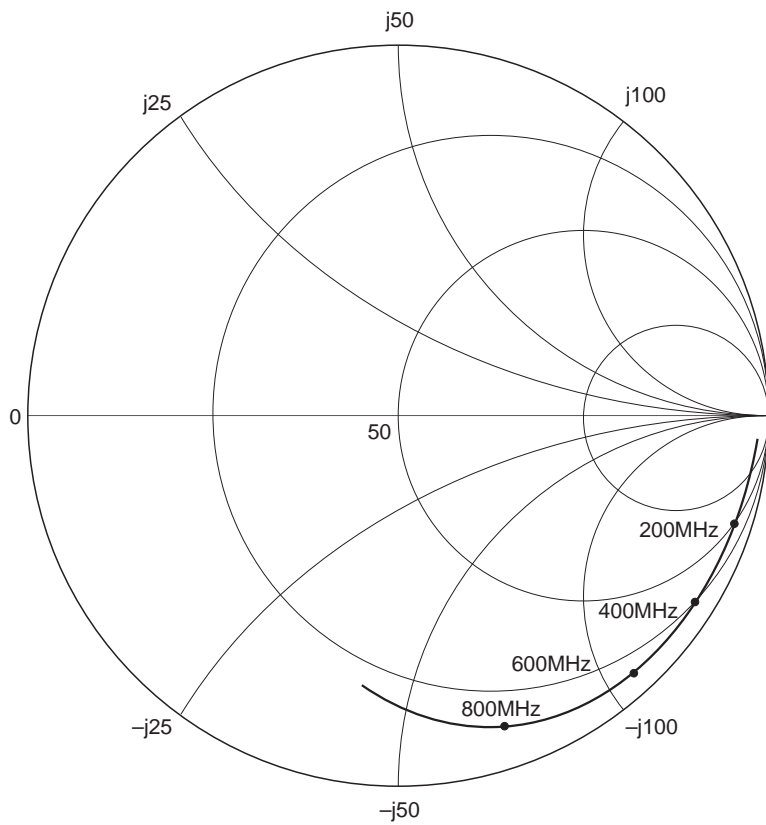
PLL0UT level (fundamental harmonic and secondary higher harmonic) vs. Oscillation frequency



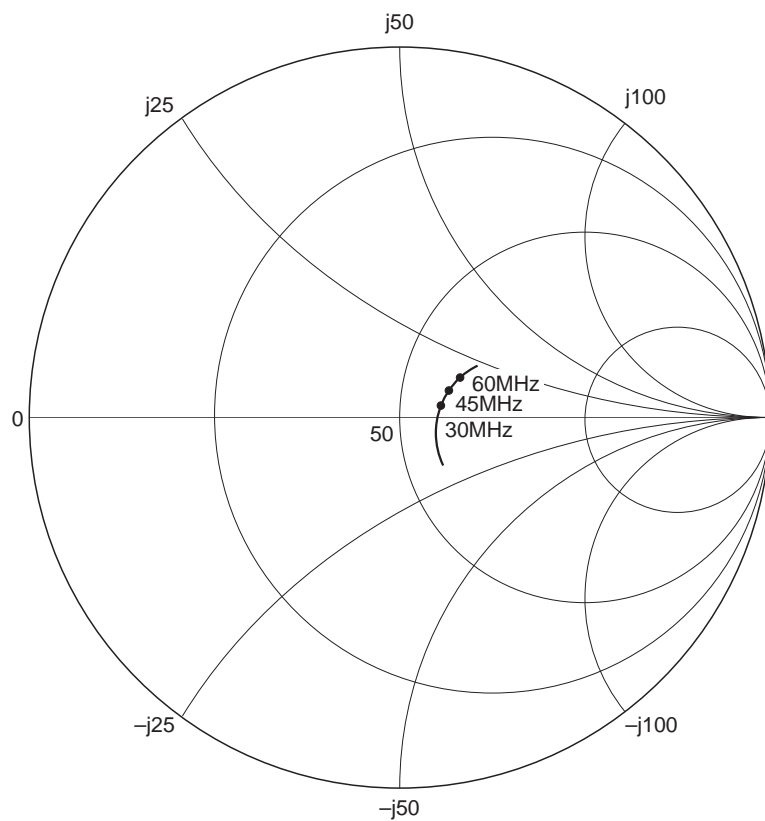
VHF Input Impedance



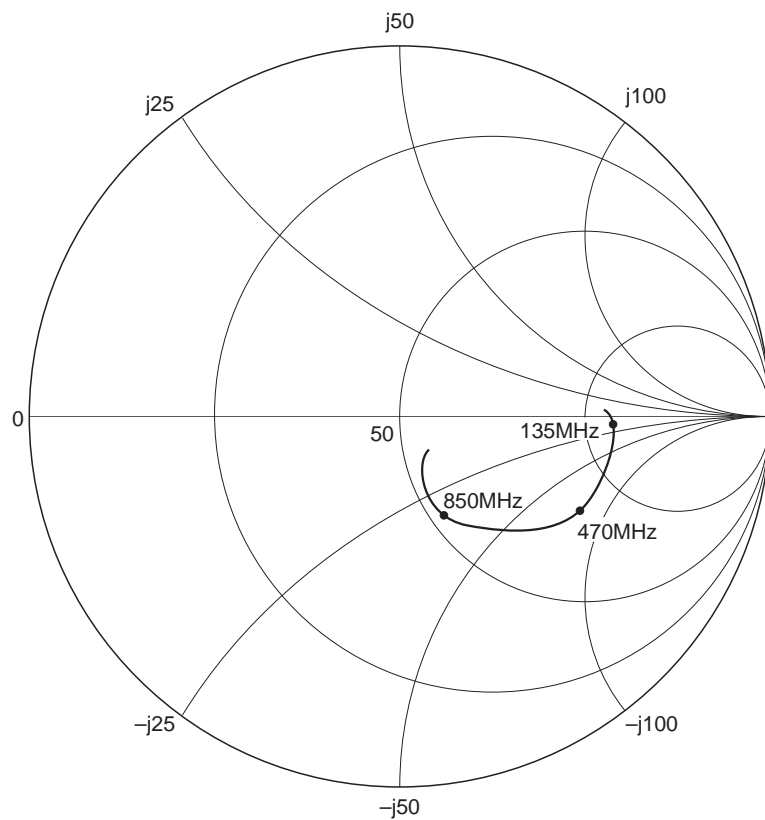
UHF Input Impedance



IF Output Impedance



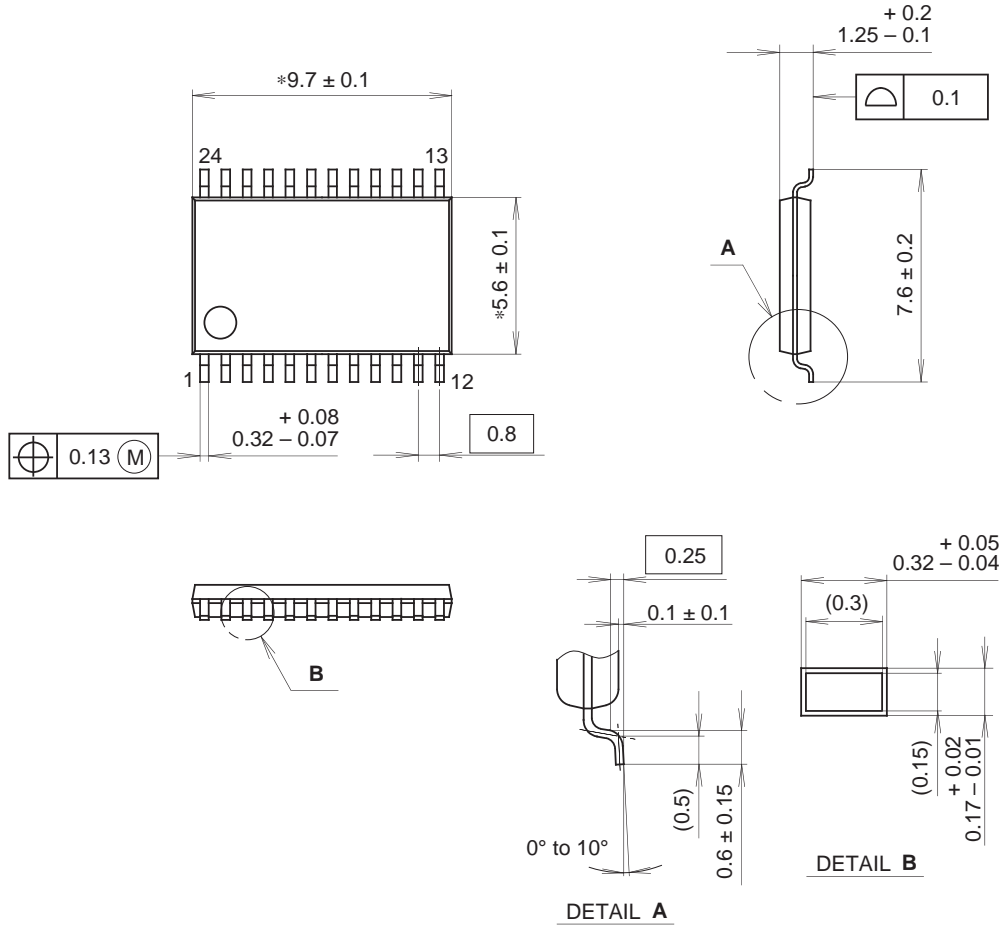
PLL Output Impedance



Package Outline

Unit : mm

24PIN SSOP (PLASTIC)



NOTE: Dimension "*" does not include mold protrusion.

PACKAGE STRUCTURE

| | |
|------------|----------------|
| SONY CODE | SSOP-24P-L03 |
| EIAJ CODE | SSOP024-P-0056 |
| JEDEC CODE | _____ |

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