

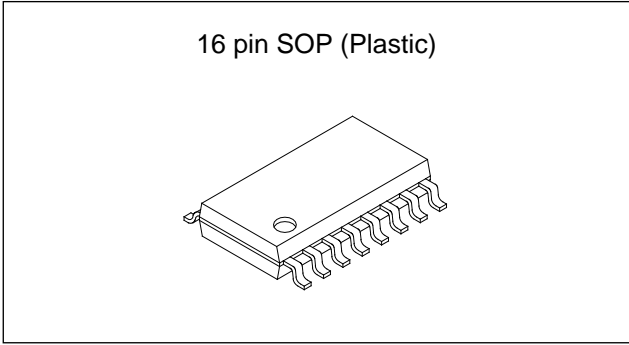
CXA1665AM/AM-S

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

Description

The CXA1665AM/AM-S 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 16-pin SOP package in response to the trend toward miniaturizing the tuner and automatic IC mounting. This IC achieves a large reduction of external parts in addition to miniaturizing the tuner and increasing manufacturing productivity, reliability and design efficiency.



Structure

Bipolar silicon monolithic IC

Features

- On-chip oscillator and mixer for UHF band
- Low noise figure
- Reduced spurious interference
- Superior cross modulation distortion
- Stable oscillating characteristics

Applications

- CTV tuner
- CATV UP-DOWN converter
- FM detector for 2nd IF satellite broadcasts

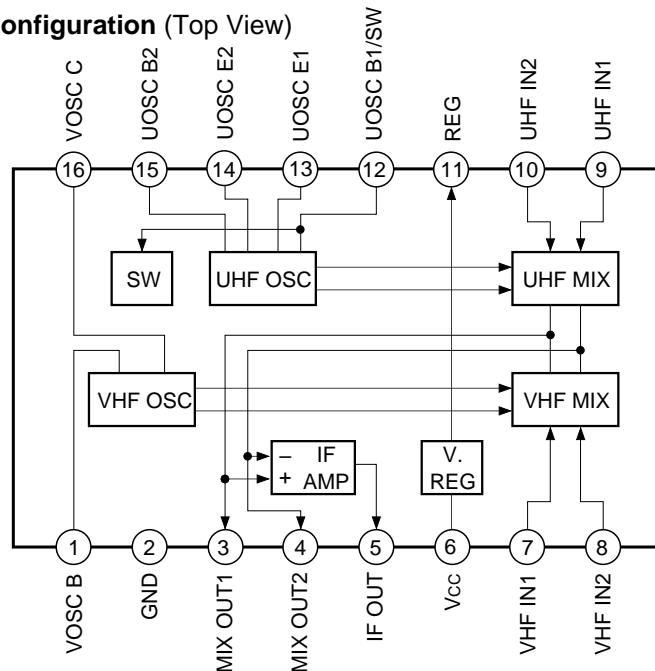
Absolute Maximum Ratings (Ta = 25°C)

- Supply voltage Vcc 11 V
- Storage temperature Tstg -65 to +150 °C
- Allowable power dissipation Pd 980 mW
(When mounted on a board)

Operation Conditions

- Supply voltage Vcc 9.0 ± 0.9 V
- Operating temperature Topr -20 to +75 °C

Block Diagram and Pin Configuration (Top View)



Sony reserves the right to change products and specifications without prior notice. This information does not convey any license by any implication or otherwise under any patents or other right. Application circuits shown, if any, are typical examples illustrating the operation of the devices. Sony cannot assume responsibility for any problems arising out of the use of these circuits.

Pin Description and Equivalent Circuit

| Pin No. | Symbol | Typical voltage (V) | Equivalent circuit | Description |
|---------|----------|--------------------------|--------------------|--------------------------------------|
| 1 | VOSC B | Under VHF operating; 3.5 | | VHF oscillator. |
| | | Under UHF operating; 3.7 | | |
| 16 | VOSC C | 6.7 | | VHF oscillator. |
| | | 9.0 | | |
| 2 | GND | 0 | | GND |
| 3 | MIX OUT1 | 7.5 | | Mixer output and IF amplifier input. |
| | | 7.3 | | |
| 4 | MIX OUT2 | 7.5 | | Mixer output and IF amplifier input. |
| | | 7.3 | | |
| 5 | IF OUT | 4.5 | | IF output. |
| | | 4.5 | | |
| 6 | Vcc | 9 | | Power supply. |

| Pin No. | Symbol | Typical voltage (V) | Equivalent circuit | Description |
|---------|------------|---------------------|--------------------|---|
| 7 | VHF IN1 | 3.2 | | <p>VHF input; normally a decoupling capacitor is connected at Pin 7 to GND and Pin 8 is used for input.</p> |
| | | 3.3 | | |
| 8 | VHF IN2 | 3.2 | | |
| | | 3.3 | | |
| 9 | UHF IN1 | 3.3 | | <p>UHF input. The balanced input to Pins 9 and 10, or a decoupling capacitor is connected at Pin 10 to GND and Pin 9 is used for input.</p> |
| | | 3.2 | | |
| 10 | UHF IN2 | 3.3 | | |
| | | 3.2 | | |
| 11 | REG | 6 | | Regulator output. |
| 12 | UOSC B1/SW | 0 | | <p>UHF oscillator. Pin 12 is used for both U/V switches.</p> |
| 13 | UOSC E1 | 3.4 | | |
| | | 0 | | |
| 14 | UOSC E2 | 2.6 | | |
| | | 3.2 | | |
| 15 | UOSC B2 | 2.6 | | |
| | | 3.7 | | |
| | | 3.4 | | |

Electrical Characteristics

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

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|--------------------------|-------------|--|------|------|------|------|
| Circuit current | IccV | VHF operation; no signal | 30 | 45 | 58 | mA |
| | IccU | UHF operation; no signal | 29 | 44 | 57 | mA |
| Conversion gain*1 | CG1 | VHF operation; f _{RF} = 55MHz; Input level -40dBm | 20 | 23 | 26 | dB |
| | CG2 | VHF operation; f _{RF} = 360MHz; Input level -40dBm | 20 | 23 | 26 | dB |
| | CG3 | UHF operation; f _{RF} = 360MHz; Input level -40dBm | 25 | 28 | 31 | dB |
| | CG4 | UHF operation; f _{RF} = 800MHz; Input level -40dBm | 25 | 28 | 31 | dB |
| Noise figure*1 *2 *4 | NF1 | VHF operation; f _{RF} = 55MHz | | 10 | 13 | dB |
| | NF2 | VHF operation; f _{RF} = 360MHz | | 10 | 13 | dB |
| | NF3 | UHF operation; f _{RF} = 360MHz | | 7 | 11 | dB |
| | NF4 | UHF operation; f _{RF} = 800MHz | | 8 | 12 | dB |
| 1% cross modulation*1 *3 | CM1 | VHF operation; f _D = 55MHz, f _{UD} = ±12MHz | 96 | 100 | | dBμ |
| | CM2 | VHF operation; f _D = 360MHz, f _{UD} = ±12MHz | 94 | 98 | | dBμ |
| | CM3 | UHF operation; f _D = 360MHz, f _{UD} = ±12MHz | 88 | 92 | | dBμ |
| | CM4 | UHF operation; f _D = 800MHz, f _{UD} = ±12MHz | 87 | 91 | | dBμ |
| Max. output power | Pomax (sat) | 50Ω load | +8 | +11 | | dBm |
| Switch ON drift*4 | Δfsw1 | VHF operation; f _{osc} = 100MHz frequency drift for the time from 3s to 3min after switch ON | | | ±300 | kHz |
| | Δfsw2 | VHF operation; f _{osc} = 405MHz frequency drift for the time from 3s to 3min after switch ON | | | ±500 | kHz |
| | Δfsw3 | UHF operation; f _{osc} = 405MHz frequency drift for the time from 3s to 3min after switch ON | | | ±500 | kHz |
| | Δfsw4 | UHF operation; f _{osc} = 845MHz frequency drift for the time from 3s to 3min after switch ON | | | ±500 | kHz |
| +B supply voltage drift | Δfst1 | VHF operation; f _{osc} = 100MHz frequency shift when Vcc + 9V changes ±5% | | | ±200 | kHz |
| | Δfst2 | VHF operation; f _{osc} = 405MHz frequency shift when Vcc + 9V changes ±5% | | | ±250 | kHz |
| | Δfst3 | UHF operation; f _{osc} = 405MHz frequency shift when Vcc + 9V changes ±5% | | | ±250 | kHz |
| | Δfst4 | UHF operation; f _{osc} = 845MHz frequency shift when Vcc + 9V changes ±5% | | | ±250 | kHz |

*1 Measured value for untuned inputs.

*2 Noise figure is uncorrected for image.

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

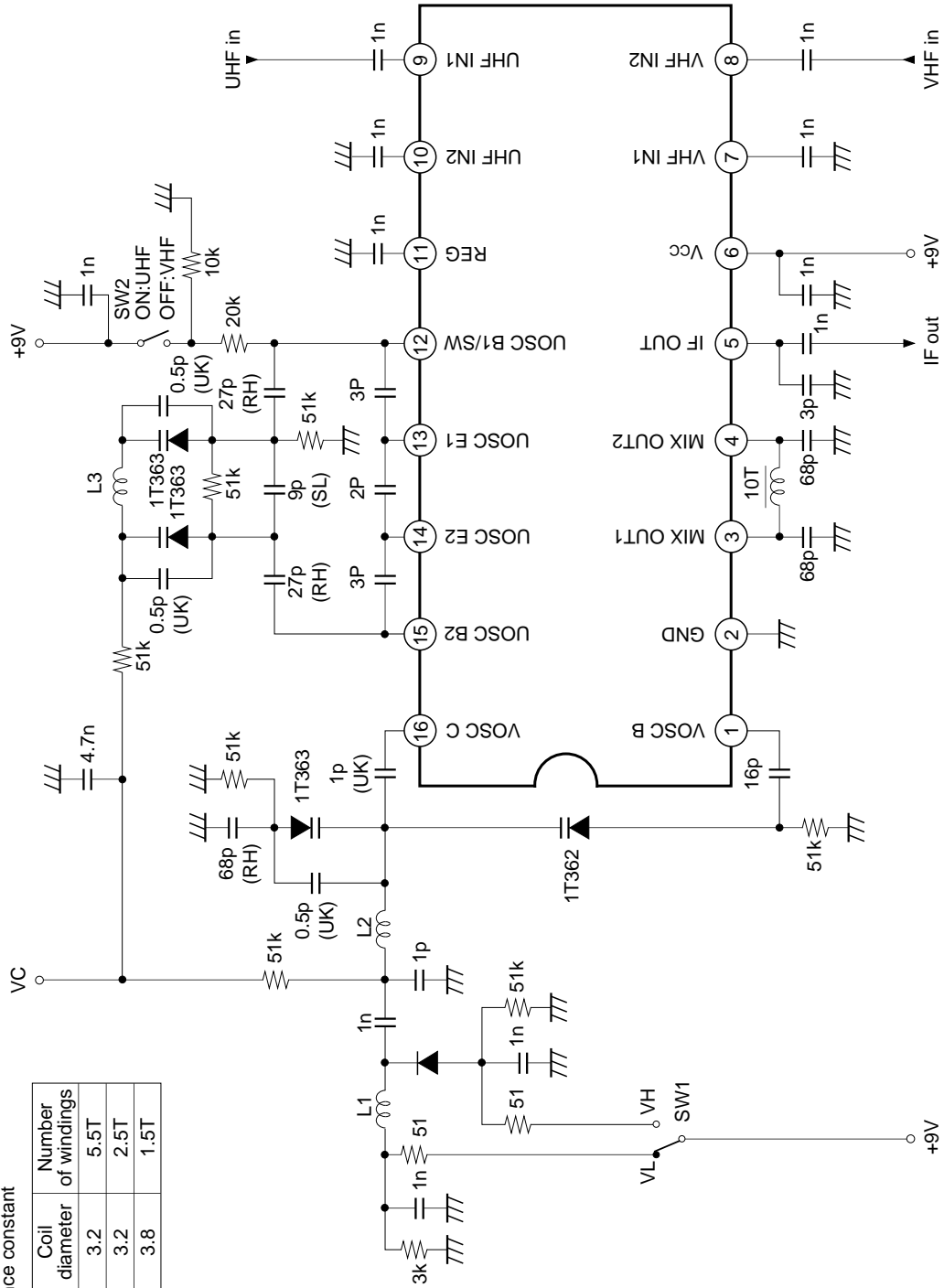
The measurement value is undesired signal level, it measured with a spectrum analyzer at S/I = 46dB.

*4 Design guaranteed items.

Electrical Characteristics Measurement Circuit

Table 1. Inductance constant

| Wire diameter | Coil diameter | Number of windings |
|---------------|---------------|--------------------|
| L1 | 3.2 | 5.5T |
| L2 | 3.2 | 2.5T |
| L3 | 3.8 | 1.5T |



Description of Operation (See Electrical Characteristics Test Circuit.)**(1) VHF oscillator circuit**

The differential oscillator circuit with an output at Pin 16 and an input at Pin 1.

Connect an LC resonance circuit comprising a varicap diode to Pin 16 through a coupling capacitor. The positive feedback from the resonance circuit is applied to Pin 1 through a feedback capacitor to execute oscillation. Note that if a parasitic capacitance across Pins 1 and 16 is too large, it may cause undesired oscillation.

(2) VHF mixer circuit

This is a double-balanced mixer having small leakage of local oscillation signal. The RF signal is input to Pins 7 and 8. 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 with the signal supplied from oscillator. The converted RF is sent to the IF amplifier and output to Pins 3 and 4 simultaneously.

(3) UHF oscillator circuit

UHF oscillator is formed from two collector-grounded Colpitts oscillator, and oscillation is provided at the differential input through an LC resonator circuit including a varicap diode.

The Pin 12 also functions as UHF/VHF switch pin.

(4) UHF mixer circuit

This is the double-balanced mixer like the VHF mixer. The RF signal is input to Pins 9 and 10. There is a balanced differential input from pre-stage double tune circuit, or an unbalanced input to Pin 9 with the capacitor connected at Pin 10 to GND. Balanced input achieves better NF rather than unbalanced input.

Otherwise, the conditions and usage are the same as those for the VHF mixer circuit.

(5) IF amplifier circuit

The mixer output signal is amplified by the IF amplifier and output to Pin 5. The output impedance is about 75Ω.

(6) UHF/VHF switch circuit

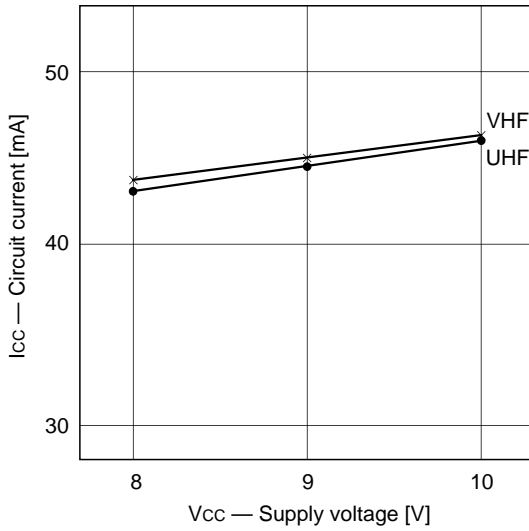
UHF/VHF mode is selected by the DC voltage at Pin 12. UHF operation is chosen by inputting 9V through a 20kΩ resistor, and VHF operation by inputting 0V. If the UHF switch voltage is 12V not 9V, adjust the resistance to approximately 30kΩ so that the DC voltage becomes almost equal between Pins 12 and 15. Be sure to connect a resistor for discharging (approx. 10kΩ) if OPEN not 0V is chosen for the VHF switch voltage.

Note on Usage

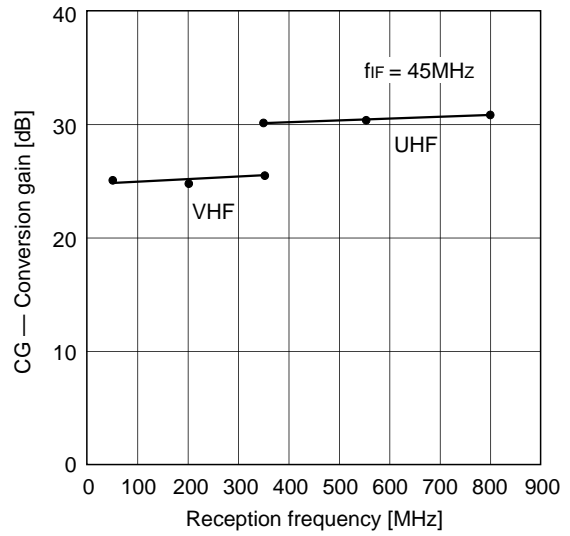
Care should be taken such as grounding in placing external parts because high frequencies are present. Adjust accordingly to prevent heat problems with special care such as the GND pattern for heat dissipation at the portion for IC mount where heat dissipations accumulate.

Example of Representative Characteristics

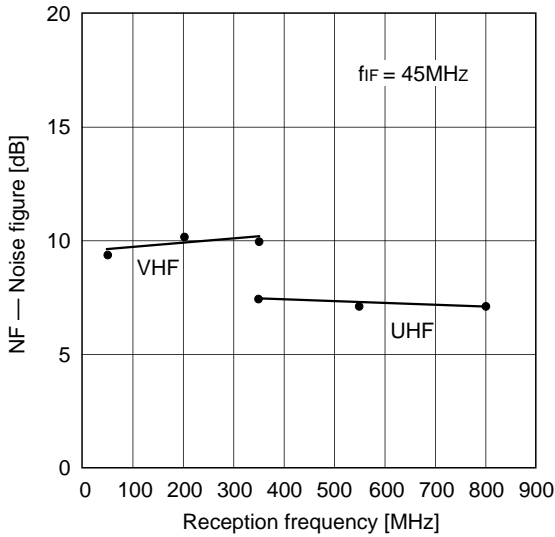
Circuit current vs. Supply voltage



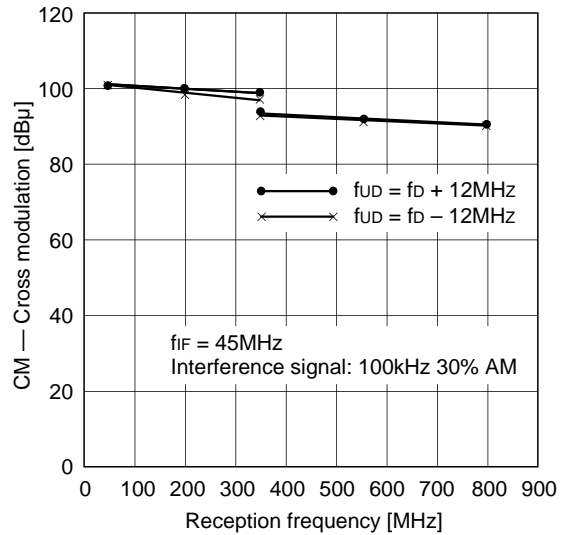
Conversion gain vs. Reception frequency (Untuned input)



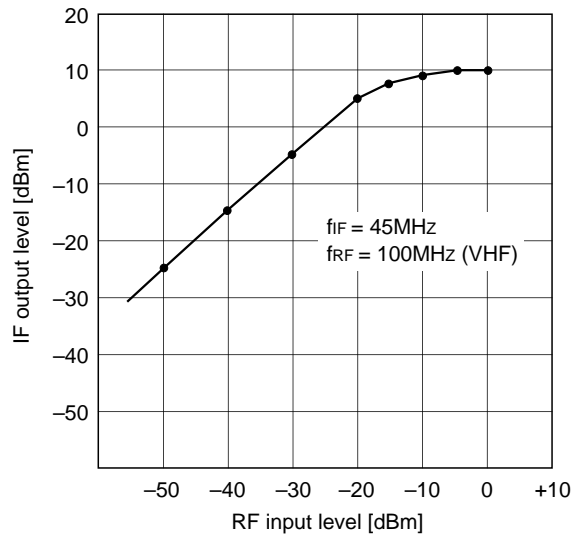
Noise figure vs. Reception frequency (Untuned input, in DSB)



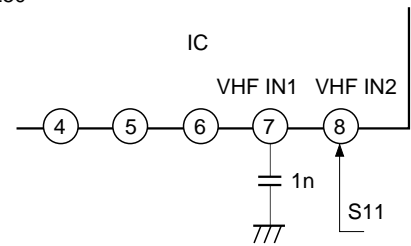
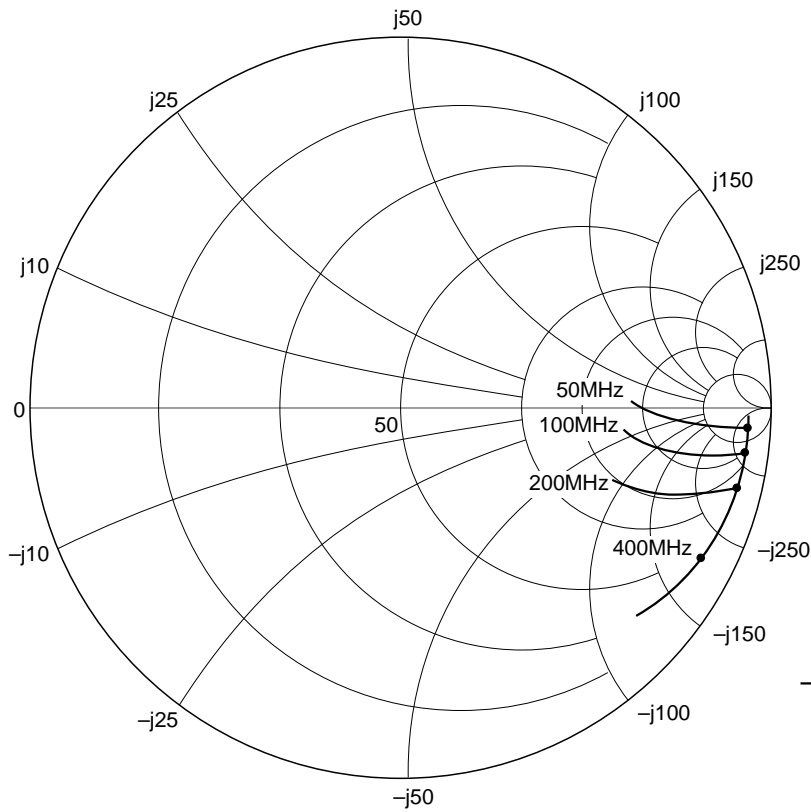
Next adjacent cross modulation vs. Reception frequency (Untuned input)



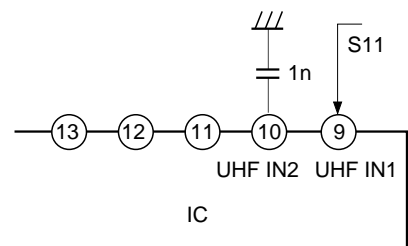
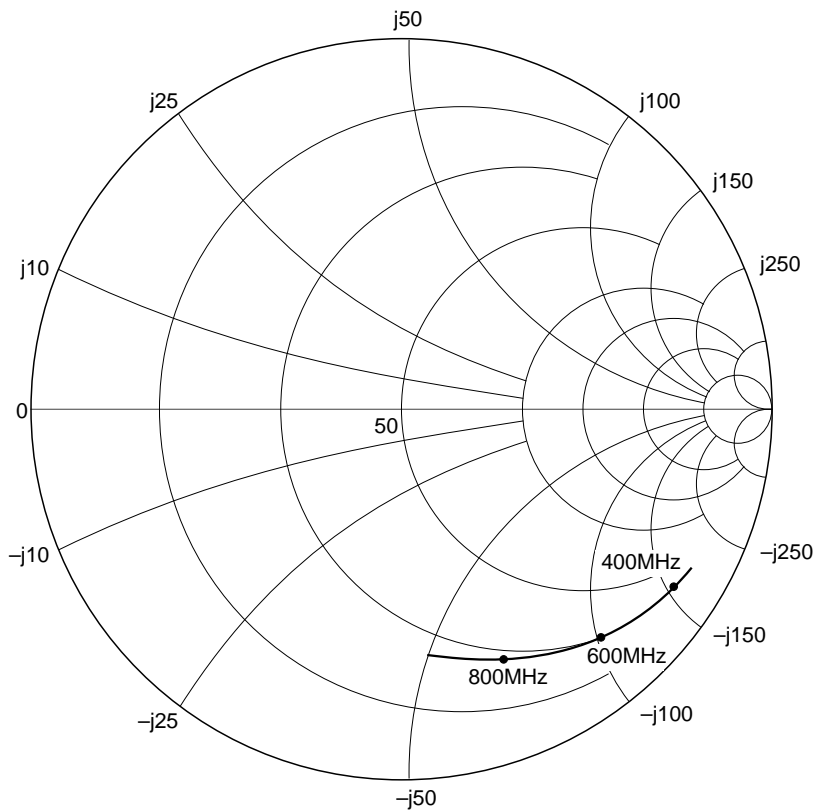
I/O characteristics (Untuned input)



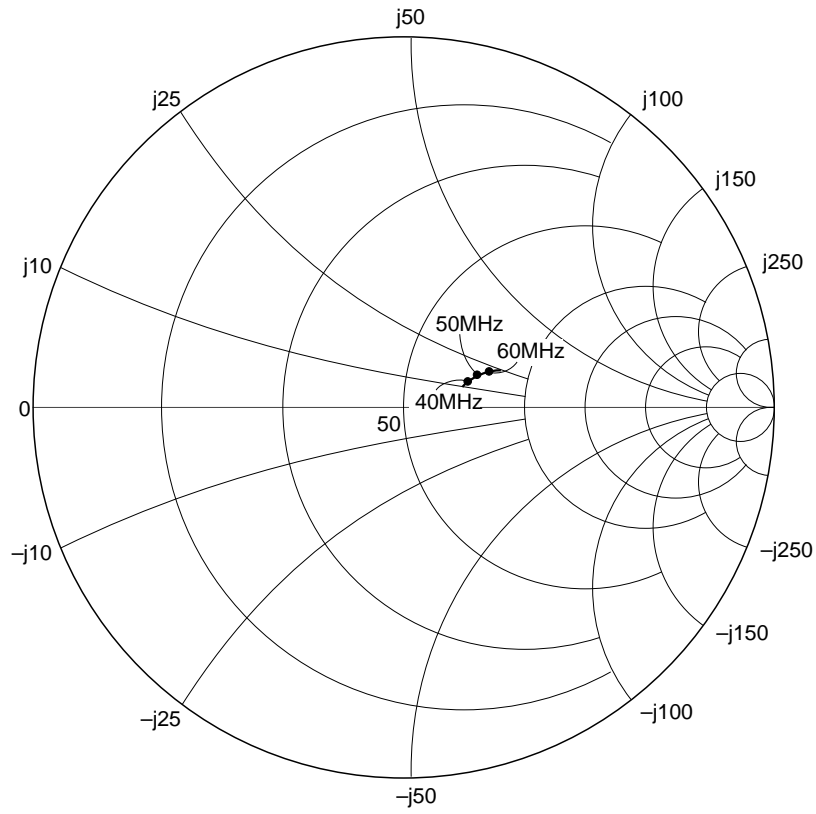
VHF Input Impedance



UHF Input Impedance



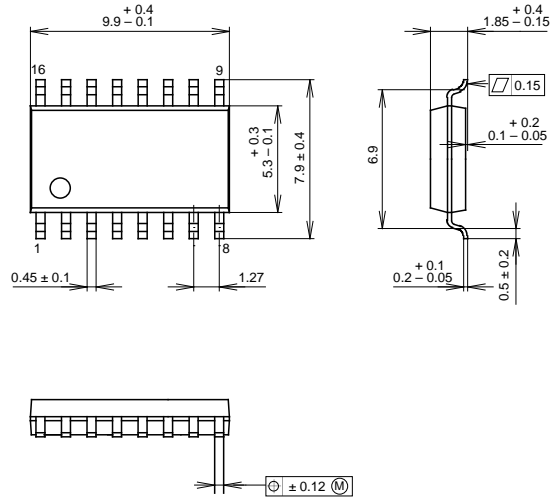
IF Output Impedance



Package Outline Unit: mm

CXA1665AM

16PIN SOP (PLASTIC) 300mil



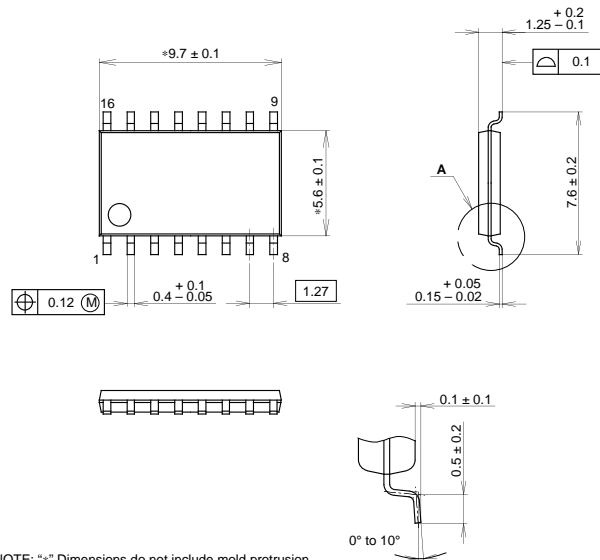
PACKAGE STRUCTURE

| | |
|------------|------------------|
| SONY CODE | SOP-16P-L01 |
| EIAJ CODE | +SOP016-P-0300-A |
| JEDEC CODE | _____ |

| | |
|------------------|----------------|
| PACKAGE MATERIAL | EPOXY RESIN |
| LEAD TREATMENT | SOLDER PLATING |
| LEAD MATERIAL | COPPER ALLOY |
| PACKAGE WEIGHT | 0.2g |

CXA1665AM-S

16PIN SOP(PLASTIC)



NOTE: "*" Dimensions do not include mold protrusion.

DETAIL A

PACKAGE STRUCTURE

| | |
|------------|---------------|
| SONY CODE | SOP-16P-L04 |
| EIAJ CODE | SOP016-P-0300 |
| JEDEC CODE | _____ |

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