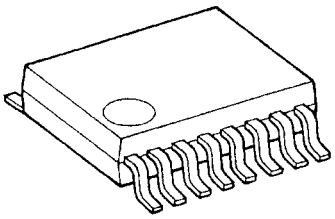
TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

# TA1281FN

UHF/VHF TUNER IC

The TA1281FN is TV tuner ICs which integrate on a single chip IF amp, a mixer/oscillator for VHF band and cable TV, together with a mixer/oscillator for UHF band.

Supply voltage of 5 V helps lower power dissipation from the set. Compact 16-pin SSOP makes the tuner more compact.



SSOP16-P-225-0.65B

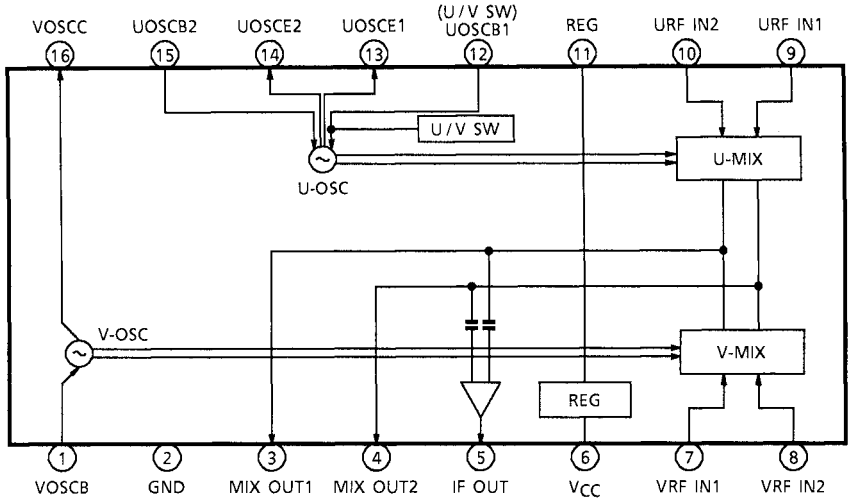
Weight: 0.07 g (typ.)

## Features

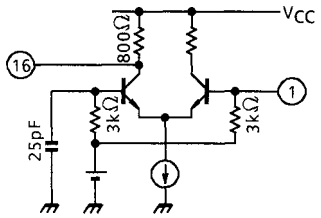
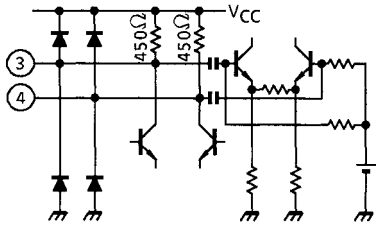
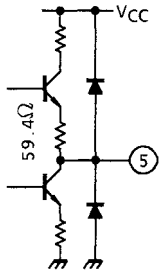
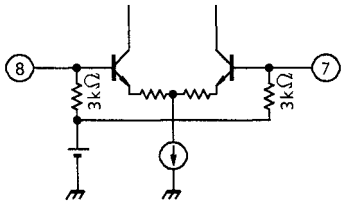
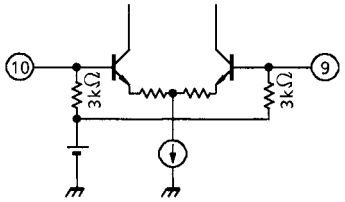
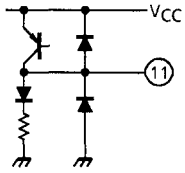
- Supply voltage: 5 V
- VHF, CATV bands: MIX · OSC
- UHF band: MIX · OSC
- Built-in IF amp
- IF unbalanced output
- Low power dissipation

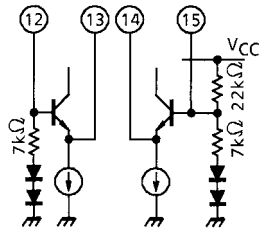
Note: These devices are easy damaged by high static voltage or electric fields. In regards to this, please handle with care.

## Block Diagram



## Terminal Function

| Pin No. | Pin Name | Function | Interface |
|---|---|---|---|
| 1<br>16 | VHF oscillator | VHF oscillator.<br>To prevent abnormal oscillation, connect a resistor between pin 1 and the external capacitor. |  |
| 2 | GND | GND | — |
| 3<br>4 | MIX output | Mixer output.<br>For tuning, connect a tank circuit between pins 3 and 4. |  |
| 5 | IF output | IF output.<br>Output impedance : 75 Ω |  |
| 6 | $V_{CC}$ | $V_{CC}$ | — |
| 7<br>8 | VHF input | VHF-RF input. Normally, ground pin 7 to AC using a capacitor and input to pin 8. |  |
| 9<br>10 | UHF input | UHF-RF input.<br>Either apply balanced input to pins 9 and 10 or ground pin 10 to AC and input to pin 9. |  |
| 11 | REG | Regulator output. |  |

| Pin No. | Pin Name | Function | Interface |
|---|---|---|---|
| 12<br>13<br>14<br>15 | UHF oscillator | UHF oscillator.<br>Pin 12 uses both as band switch. Connecting pin 12 to $V_{CC}$ via 22 kΩ sets to UHF ; connecting pin 12 to GND sets to VHF. To use VHF SW voltage open rather than GND, connect a resistor of around 10 kΩ.<br>Changing capacitor of 6pF connected to pins 12 and 15 of test circuit 2 varies the oscillation frequency range. Be careful not to set the constant too large, because abnormal oscillation may occur. |  |

## Maximum Ratings (Ta = 25°C)

| Characteristics | Symbol | Rating | Unit |
|---|---|---|---|
| Power supply voltage | $V_{CC}$ | 6.5 | V |
| Power dissipation | $P_D$ | 568 | mW |
| Operating temperature | $T_{opr}$ | −20 to 85 | °C |
| Storage temperature | $T_{stg}$ | −55 to 150 | °C |

Note: When using the device at above Ta = 25°C, decrease the power 4.6 mW for each increase of 1°C.

## Operating Supply Voltage

| Pin No. | Symbol | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|
| 6 | $V_{CC}$ | 4.5 | 5.0 | 5.5 | V |

## Electrical Characteristics

### DC Characteristics (unless otherwise specified, $V_{CC}$ = 5V, Ta = 25°C)

| Characteristics | | Symbol | Test Circuit | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|---|---|
| Power supply and current for VHF | | $I_{CC}$-V | 1 | — | 21 | 29 | 36 | mA |
| Power supply and current for UHF | | $I_{CC}$-U | | — | 22 | 30 | 38 | |
| Terminal voltage (*1) | Pin 1 for VHF | V1-V | 1 | — | 1.8 | 2.1 | 2.5 | V |
| | Pin 1 for UHF | V1-U | | — | 2.0 | 2.3 | 2.7 | |
| | Pin 3 for VHF | V3-V | | — | 3.5 | 3.8 | 4.2 | |
| | Pin 3 for UHF | V3-U | | — | 3.4 | 3.7 | 4.1 | |
| | Pin 4 for VHF | V4-V | | — | 3.5 | 3.8 | 4.2 | |
| | Pin 4 for UHF | V4-U | | — | 3.4 | 3.7 | 4.1 | |
| | Pin 5 for VHF | V5-V | | — | 1.8 | 2.1 | 2.5 | |
| | Pin 5 for UHF | V5-U | | — | 1.8 | 2.1 | 2.5 | |
| | Pin 7 for VHF | V7-V | | — | 1.3 | 1.6 | 2.0 | |
| | Pin 7 for UHF | V7-U | | — | 1.4 | 1.7 | 2.1 | |
| | Pin 8 for VHF | V8-V | | — | 1.3 | 1.6 | 2.0 | |
| | Pin 8 for UHF | V8-U | | — | 1.4 | 1.7 | 2.1 | |
| | Pin 9 for VHF | V9-V | | — | 1.4 | 1.7 | 2.1 | |
| | Pin 9 for UHF | V9-U | | — | 1.3 | 1.6 | 2.0 | |
| | Pin 10 for VHF | V10-V | | — | 1.4 | 1.7 | 2.1 | |
| | Pin 10 for UHF | V10-U | | — | 1.3 | 1.6 | 2.0 | |
| | Pin 11 for VHF | V11-V | | — | 3.9 | 4.1 | 4.3 | |
| | Pin 11 for UHF | V11-U | | — | 3.9 | 4.1 | 4.3 | |
| | Pin 12 for VHF | V12-V | | — | | 0 | | |
| | Pin 12 for UHF | V12-U | | — | 1.8 | 2.1 | 2.5 | |
| | Pin 13 for VHF | V13-V | | — | | 0 | | |
| | Pin 13 for UHF | V13-U | | — | 1.0 | 1.3 | 1.7 | |
| | Pin 14 for VHF | V14-V | | — | 1.5 | 1.8 | 2.2 | |
| | Pin 14 for UHF | V14-U | | — | 1.0 | 1.3 | 1.7 | |
| | Pin 15 for VHF | V15-V | | — | 2.1 | 2.4 | 2.7 | |
| | Pin 15 for UHF | V15-U | | — | 1.8 | 2.1 | 2.5 | |
| | Pin 16 for VHF | V16-V | | — | 3.5 | 3.8 | 4.2 | |
| | Pin 16 for UHF | V16-U | | — | | 5.0 | | |

*1 : Upper : VHF mode
Lower : UHF mode

**AC Characteristics (unless otherwise specified, $V_{CC}$ = 5 V, Ta = 25°C)**

| No. | Characteristics | Symbol | Test Circuit | Test Condition | | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Conversion gain | CG | 2 | | VHF-L | 18 | 21 | 24 | dB |
| | | | | | VHF-H | 16 | 21 | 23 | |
| | | | | | UHF | 19 | 24 | 27 | |
| 2 | Noise figure | NF | 2 | | VHF-L | — | 10.5 | 11.5 | dB |
| | | | | | VHF-H | — | 12.5 | 14.5 | |
| | | | | | UHF | — | 11.0 | 13.0 | |
| 3 | IF out power level | IFp | 2 | | VHF-L | 5 | 7 | — | dBmW |
| | | | | | VHF-H | 5 | 7 | — | |
| | | | | | UHF | 5 | 7 | — | |
| 4 | Conversion gain shift | CGs | 2 | (Note 1) | VHF-L | — | — | ±1.0 | dB |
| | | | | | VHF-H | — | — | ±1.0 | |
| | | | | | UHF | — | — | ±1.0 | |
| 5 | Frequency shift | ΔfB | 2 | (Note 2) | VHF-L | — | — | ±200 | kHz |
| | | | | | VHF-H | — | — | ±350 | |
| | | | | | UHF | — | — | ±200 | |
| 6 | Switching on drift | Δfs | 2 | (Note 3) | VHF-L | — | — | ±100 | kHz |
| | | | | | VHF-H | — | — | ±100 | |
| | | | | | UHF | — | — | ±150 | |
| 7 | 1% cross modulation | CM | 2 | (Note 4) | VHF-L | 81.0 | 82.5 | — | dBμV |
| | | | | | VHF-H | 79.0 | 82.0 | — | |
| | | | | | UHF | 78.0 | 79.5 | — | |
| 8 | Inter modulation | IM3 | 2 | (Note 5) | VHF-L | −56 | −62 | — | dBc |
| | | | | | VHF-H | −54 | −61 | — | |
| | | | | | UHF | −54 | −62 | — | |
| 9 | 6-ch beat | $B_6$ | 2 | (Note 6) | VHF-L (6ch) | −55 | −60 | — | dBc |
| | | | | | VHF-H | — | — | — | |
| | | | | | UHF | — | — | — | |

*2 : $f_{IF}$ : 45.75 [MHz]
VHF-L : $f_{RF}$ = 55.25 [MHz]~127.25 [MHz]
VHF-H : $f_{RF}$ = 133.25 [MHz]~367.25 [MHz]
UHF : $f_{RF}$ = 373.25 [MHz]~801.25 [MHz]

## Test Conditions

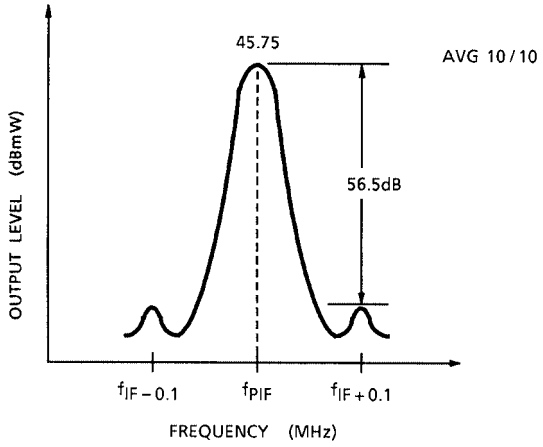
Note 1: Conversion Gain Shift
Measure conversion gain change when $V_{CC}$±10% with input level = −50dBmW, $V_{CC}$ = 5 V as the reference.

Note 2: Frequency Shift
Measure frequency change when $V_{CC}$±10% with input level = −40dBmW, $V_{CC}$ = 5 V as the reference.

Note 3: Switching On Drift
Measure frequency change up to 3 minutes with the frequency at 2 seconds after switching on as the reference. (Input level : −30dBmW)

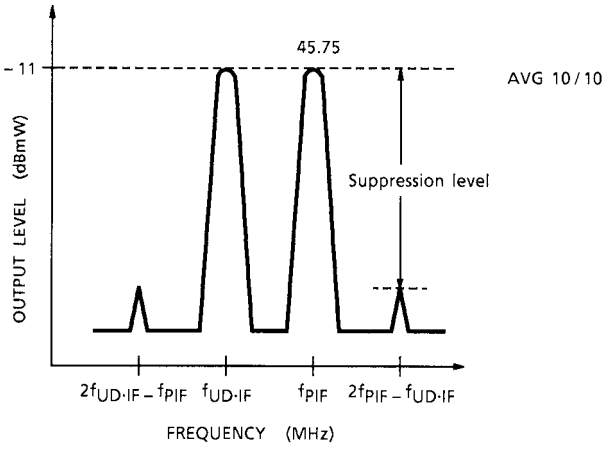
Note 4: 1% Cross Modulation
- $f_D = f_P$ $f_D$ : input level = −30dBmW
- $f_{UD} = f_D$+12 MHz 100 kHz, 30%AM

Input the two signals above, and increase the $f_{UD}$ input level.
Measure the $f_{UD}$ input level when the suppression level reaches 56.5dB. (Averaging 10 times using a spectrum analyzer)




Note 5: Inter Modulation
- $f_D = f_P$
- $f_{UD} = f_D$+1 MHz

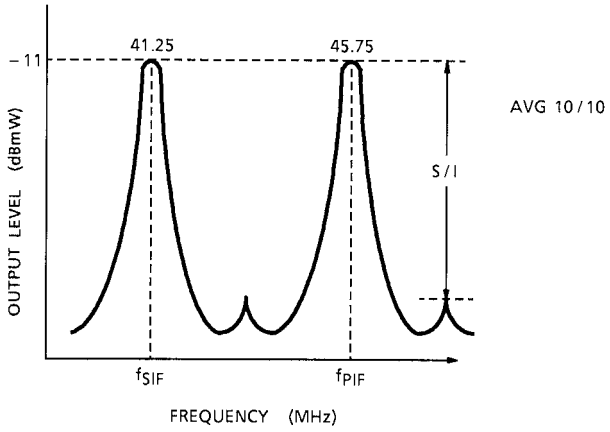
Input the two signals above, and increase the input levels.
When the IF out level is −11dBmW, measure the suppression level. (Averaging 10 times using a spectrum analyzer)



Note 6: 6-ch Beat

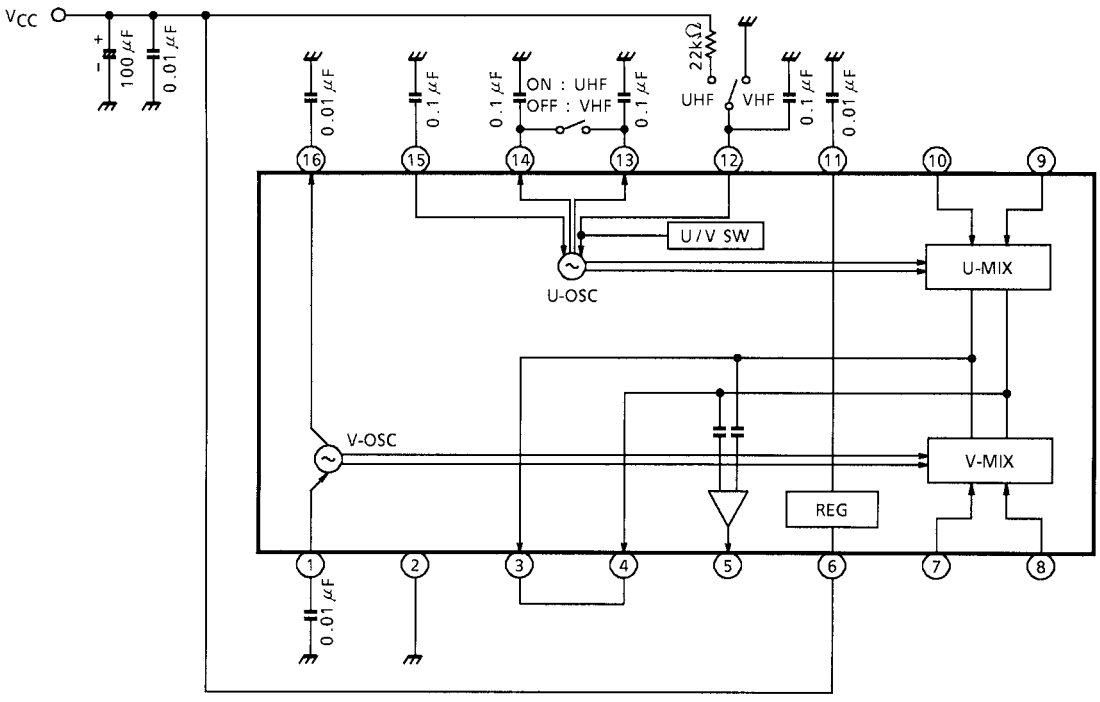
- $f_P$ = 83.25 MHz (USA : 6ch)
- $f_S$ = 87.75 MHz (USA : 6ch)

Input the two signals above, and increase the input levels.
When the IF out level is −11dBmW, measure the suppression level. (Averaging 10 times using a spectrum analyzer)



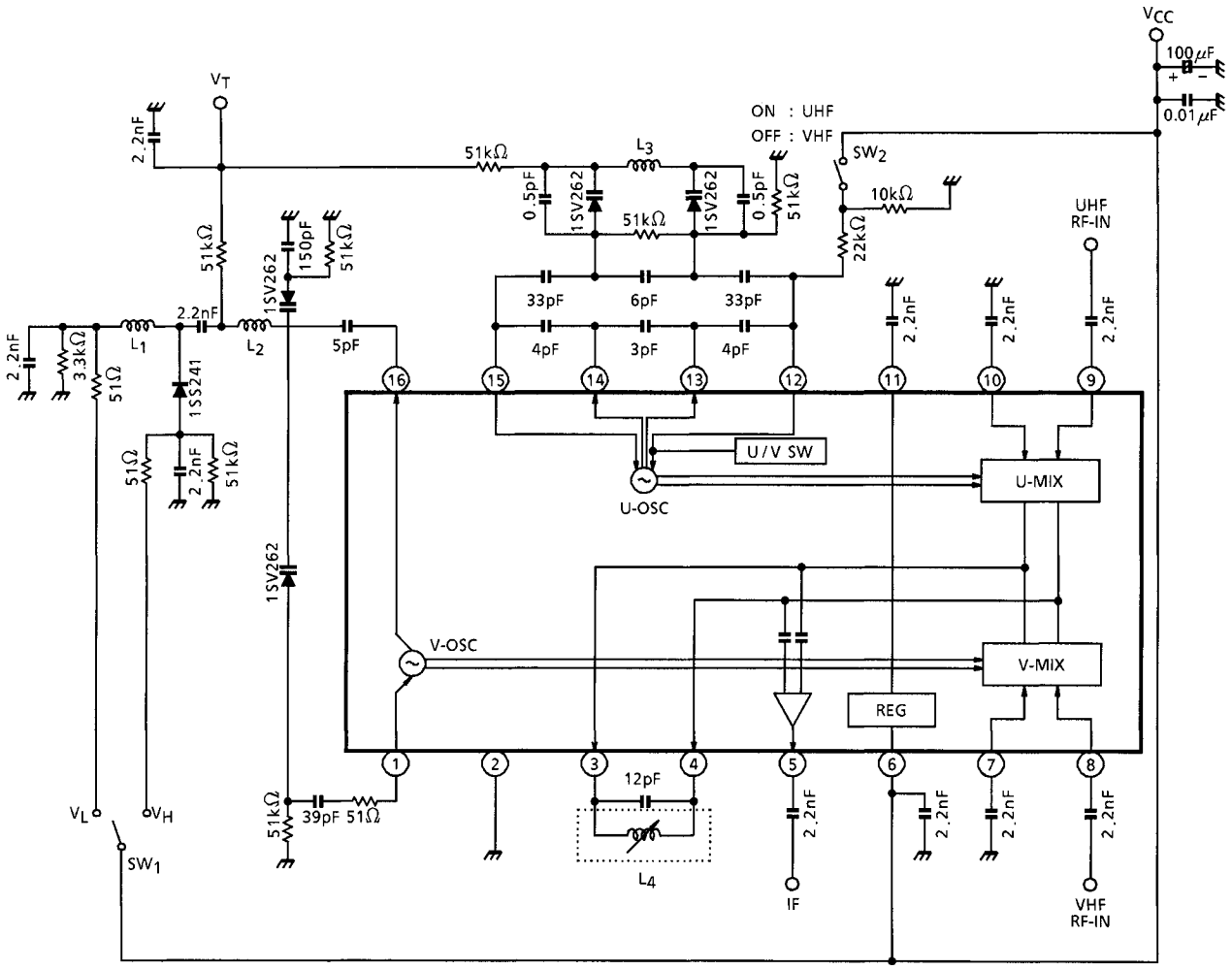

## Test Circuit1

### DC Characteristics



## Test Circuit2

### AC Characteristics




| | Line Diameter | Turn Diameter | Number of Turns |
|---|---|---|---|
| $L_1$ | 0.32 mm | 2.0 mm | 7.5 T |
| $L_2$ | 0.32 mm | 1.5 mm | 2.5 T |
| $L_3$ | 0.32 mm | 2.5 mm | 2.5 T |

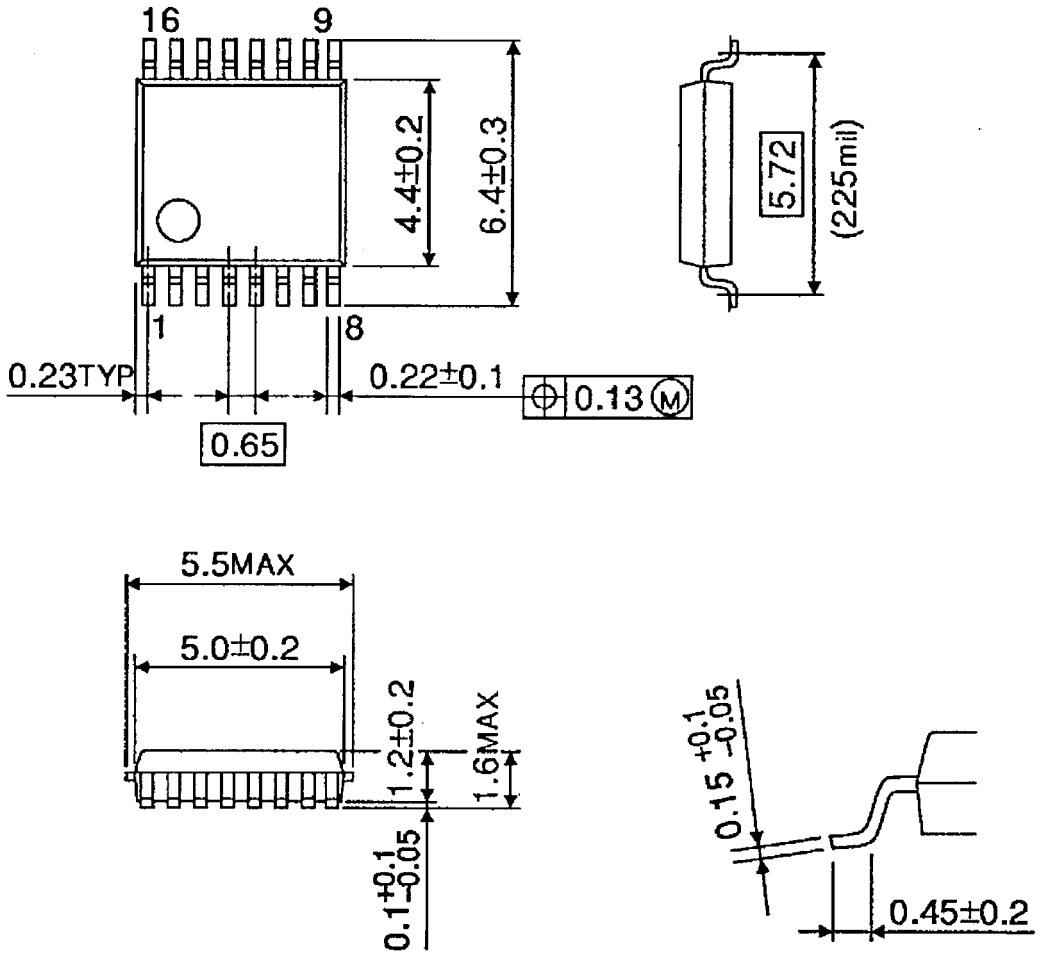
L4 = 0.9 μH ±5%

SW1 — $V_{LOW}$ / $V_{HI}$

SW2 — VHF / UHF

**Package Dimensions**

SSOP16-P-225-0.65B Unit : mm




Weight: 0.07 g (typ.)

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