

TENTATIVE TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

# TA1231F, TA1231FN

## UHF / VHF TUNER IC

The TA1231F and TA1231FN are 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.

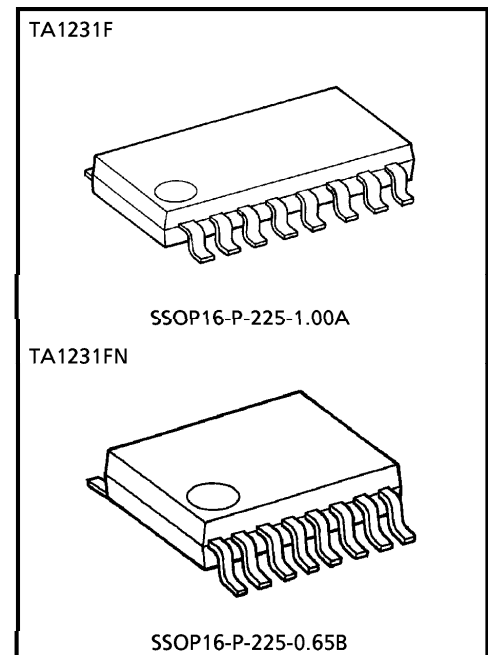
The package is an SSOP16-P-225A (1-mm pitch) or SSOP16-P-225B (0.65-mm pitch) optimal for surface mounting to help make tuners more compact.

### FEATURES

- Supply voltage : 9V
- VHF, CATV bands : MIX·OSC
- UHF band : MIX·OSC
- Built-in IF amp
- IF unbalanced output

(Note) These devices are easy to be damaged by high static voltage or electric fields.

In regards to this, please handle with care.

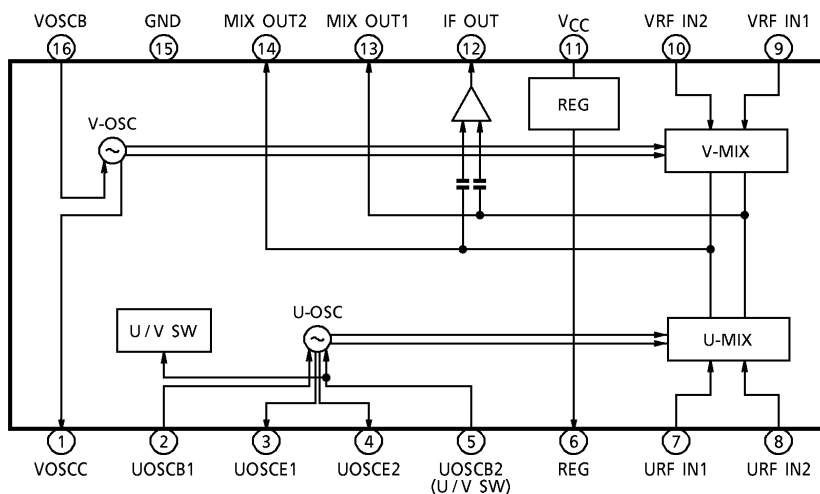


Weight  
 SSOP16-P-225-1.00A : 0.14g (Typ.)  
 SSOP16-P-225-0.65B : 0.07g (Typ.)

980910EBA1

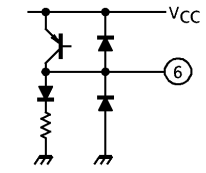
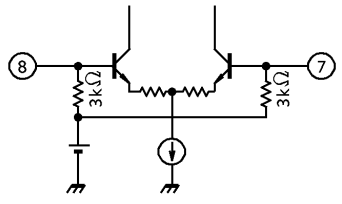
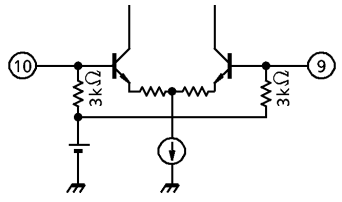
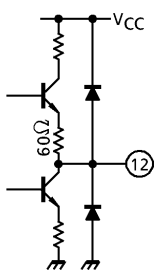
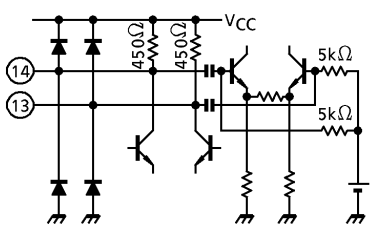
- TOSHIBA is continually working to improve the quality and the reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to observe standards of safety, and to avoid situations in which a malfunction or failure of a TOSHIBA product could cause loss of human life, bodily injury or damage to property. In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent products specifications. Also, please keep in mind the precautions and conditions set forth in the TOSHIBA Semiconductor Reliability Handbook.
- The products described in this document are subject to the foreign exchange and foreign trade laws.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.
- The information contained herein is subject to change without notice.

BLOCK DIAGRAM



TERMINAL FUNCTION

PIN No.	PIN NAME	FUNCTION	INTERFACE
1 16	VHF oscillator	VHF oscillator. To prevent abnormal oscillation, connect a resistor between pin 16 and the external capacitor.	
2 3 4 5	UHF oscillator	UHF oscillator. Pin 5 uses both as band switch. Connecting pin 5 to VCC via 22kΩ 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 10kΩ. Changing capacitor of 6pF connected to pins 2 and 5 of test circuit 2 varies the oscillation frequency range. Be careful not to set the constant too large, because abnormal oscillation may occur.	

PIN No.	PIN NAME	FUNCTION	INTERFACE
6	REG	Regulator output.	
7 8	UHF input	UHF-RF input. Either apply balanced input to pins 7 and 8, or ground pin 7 to AC and apply input to pin 8.	
9 10	VHF input	VHF-RF input. Normally ground pin 10 to AC using a capacitor and input to pin 9.	
11	VCC	VCC	—
12	IF output	IF output. Output impedance : 75Ω	
13 14	MIX output	Mixer output. For tuning, connect a tank circuit between pins 13 and 14.	
15	GND	GND	—

**MAXIMUM RATINGS (Ta = 25°C)**

CHARACTERISTIC	SYMBOL	RATING	UNIT
Power Supply Voltage	V <sub>CC</sub>	11	V
Power Dissipation	P <sub>D</sub>	(Note 1)	mW
Operating Temperature	T <sub>opr</sub>	- 20~75	°C
Storage Temperature	T <sub>stg</sub>	- 55~150	°C

(Note 1) 641mW for TA1231F  
568mW for TA1231FN

When using the device at above Ta = 25°C, decrease the power dissipation F-type by 5.2mW and FN-type by 4.6mW for each increase of 1°C.  
The above values are for the IC only. When using the device in an application, take the effect of heat dissipation into consideration.

**RECOMMENDED OPERATING CONDITION**

PIN No.	SYMBOL	MIN.	TYP.	MAX.	UNIT
11	V <sub>CC</sub>	8.1	9.0	9.9	V

**ELECTRICAL CHARACTERISTICS**

DC CHARACTERISTICS (Unless otherwise specified, V<sub>CC</sub> = 9V, Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Power Supply and Current for VHF	I <sub>CC-V</sub>	1	—	34	42	52	mA	
Power Supply and Current for UHF	I <sub>CC-U</sub>		—	37	44	56		
Terminal Voltage (*1)	Pin 1 for V	V1-V	1	—	6.5	6.9	7.3	V
	Pin 1 for U	V1-U		—		9		
	Pin 2 for V	V2-V		—	3.3	3.7	4.1	
	Pin 2 for U	V2-U		—	2.9	3.3	3.7	
	Pin 3 for V	V3-V		—	33.7	4.3	4.8	
	Pin 3 for U	V3-U		—	2.1	2.5	2.9	
	Pin 4 for V	V4-V		—		0		
	Pin 4 for U	V4-U		—	2.1	2.5	2.9	
	Pin 5 for V	V5-V		—		0		
	Pin 5 for U	V5-U		—	2.9	3.3	3.7	
	Pin 6 for V	V6-V		—	5.8	6.1	6.4	
	Pin 6 for U	V6-U		—	5.8	6.1	6.4	
	Pin 7 for V	V7-V		—	2.7	3.1	3.5	
	Pin 7 for U	V7-U		—	2.4	2.8	3.2	
	Pin 8 for V	V8-V		—	2.7	3.1	3.5	
	Pin 8 for U	V8-U		—	2.4	2.8	3.2	

CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Terminal Voltage (*1)	Pin 9 for V	V9-V	1	—	2.4	2.8	3.2	V
	Pin 9 for U	V9-U		—	2.7	3.1	3.5	
	Pin 10 for V	V10-V		—	2.4	2.8	3.2	
	Pin 10 for U	V10-U		—	2.7	3.1	3.5	
	Pin 12 for V	V12-V		—	4.7	5.1	5.5	
	Pin 12 for U	V12-U		—	4.7	5.1	5.5	
	Pin 13 for V	V13-V		—	6.8	7.2	7.6	
	Pin 13 for U	V13-U		—	6.6	7.0	7.4	
	Pin 14 for V	V14-V		—	6.8	7.2	7.6	
	Pin 14 for U	V14-U		—	6.6	7.0	7.4	
Pin 16 for V	V16-V	—	2.1	2.5	2.9			
Pin 16 for U	V16-U	—	2.5	2.9	3.3			

(\*1) upper : VHF mode  
 lower : UHF mode

**AC CHARACTERISTICS**

No.	CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION (*2)	MIN.	TYP.	MAX.	UNIT
1	Conversion Gain	CG	2	VHF-L	22.0	24.5	27.0	dB
				VHF-H	19.0	22.5	26.0	
				UHF	25.0	28.0	31.0	
2	Noise Figure	NF	2	VHF-L	—	11.0	13.0	dB
				VHF-H	—	14.0	17.0	
				UHF	—	11.0	13.0	
3	IF Out Power Level	IFp	2	VHF-L	10.0	13.0	—	dBmW
				VHF-H	10.0	13.0	—	
				UHF	10.0	13.0	—	
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	—	—	± 250	
				UHF	—	—	± 250	

No.	CHARACTERISTIC	SYMBOL	TEST CIR- CUIT	TEST CONDITION (*2)	MIN.	TYP.	MAX.	UNIT	
6	Switching On Drift	$\Delta f_s$	2	(Note 3)	VHF-L	—	—	$\pm 350$	kHz
					VHF-H	—	—	$\pm 350$	
					UHF	—	—	$\pm 400$	
7	1% Cross Modulation	CM	2	(Note 4)	VHF-L	85.0	89.0	—	dB $\mu$ V
					VHF-H	84.0	87.0	—	
					UHF	79.0	83.0	—	
8	Inter Modulation	IM3	2	(Note 5)	VHF-L	-65.0	-70.0	—	dBc
					VHF-H	-65.0	-70.0	—	
					UHF	-65.0	-70.0	—	
9	6-ch Beat	B <sub>6</sub>	2	(Note 6)	VHF-L (6ch)	-50.0	-53.0	—	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  $V_{CC} \pm 10\%$  with input level =  $-50\text{dBmW}$ ,  $V_{CC} = 9\text{V}$  as the reference.

## (Note 2) Frequency Shift

Measure frequency change when  $V_{CC} \pm 10\%$  with input level =  $-40\text{dBmW}$ ,  $V_{CC} = 9\text{V}$  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 :  $-30\text{dBmW}$ )

## (Note 4) 1% Cross Modulation

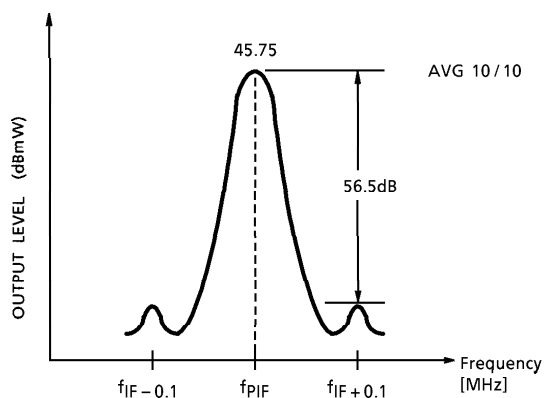
- $f_D = f_p$   $f_D$  : Input level =  $-30\text{dBmW}$

- $f_{UD} = f_D + 12\text{MHz}$   $100\text{kHz}$ , 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  $56.5\text{dB}$ .

(Averaging 10 times using a spectrum analyzer.)



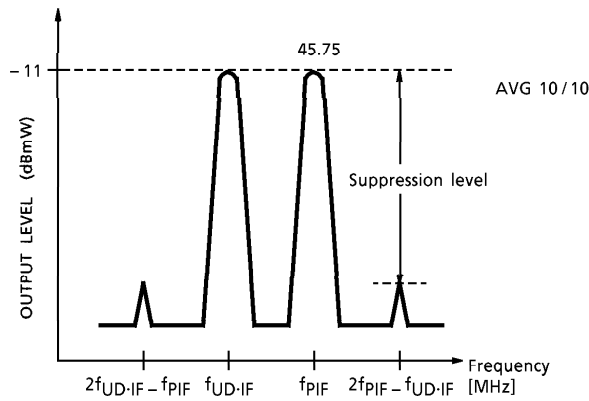
(Note 5) Inter Modulation

- $f_D = f_p$
- $f_{UD} = f_D + 1\text{MHz}$

Input the two signals above, and increase the input levels.

When the IF output level is  $-11\text{dBmW}$ , measure the suppression level.

(Averaging 10 times using a spectrum analyzer.)



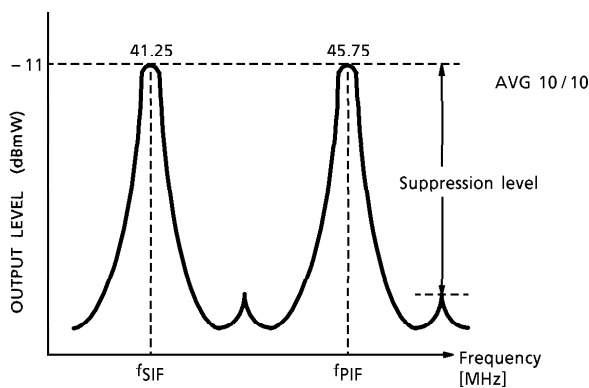
(Note 6) 6-ch Beat

- $f_p = 83.25\text{MHz}$  (USA : 6ch)
- $f_s = 87.75\text{MHz}$  (USA : 6ch)

Input the two signals above, and increase the input levels.

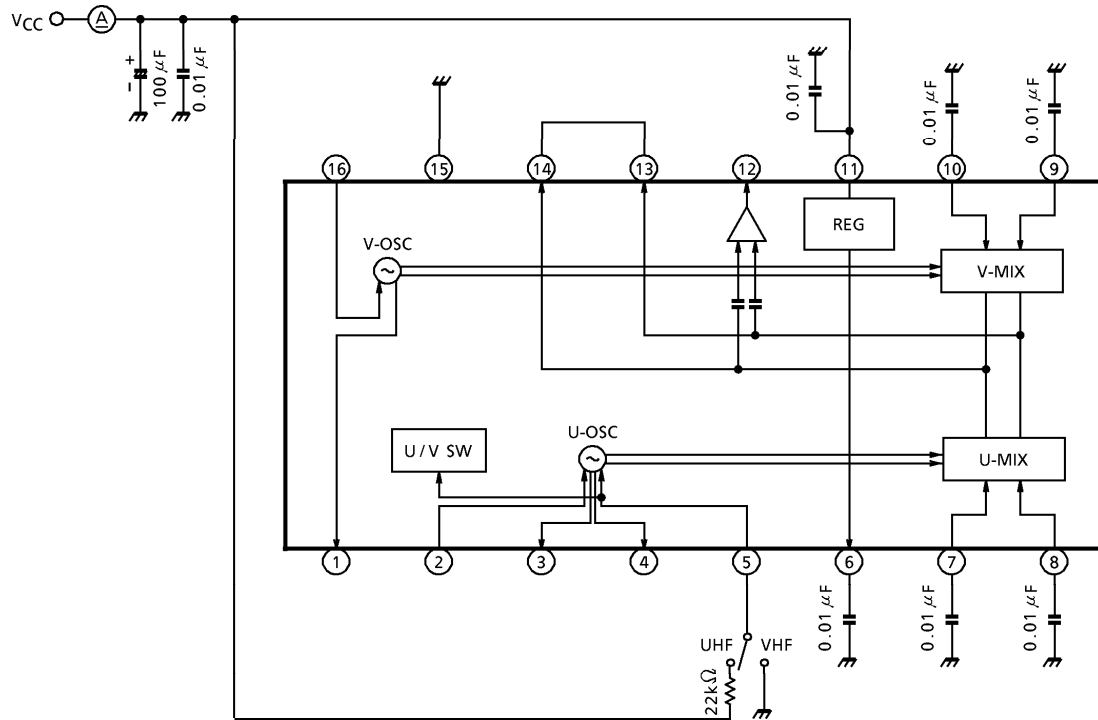
When the IF output level is  $-11\text{dBmW}$ , measure the suppression level.

(Averaging 10 times using a spectrum analyzer.)

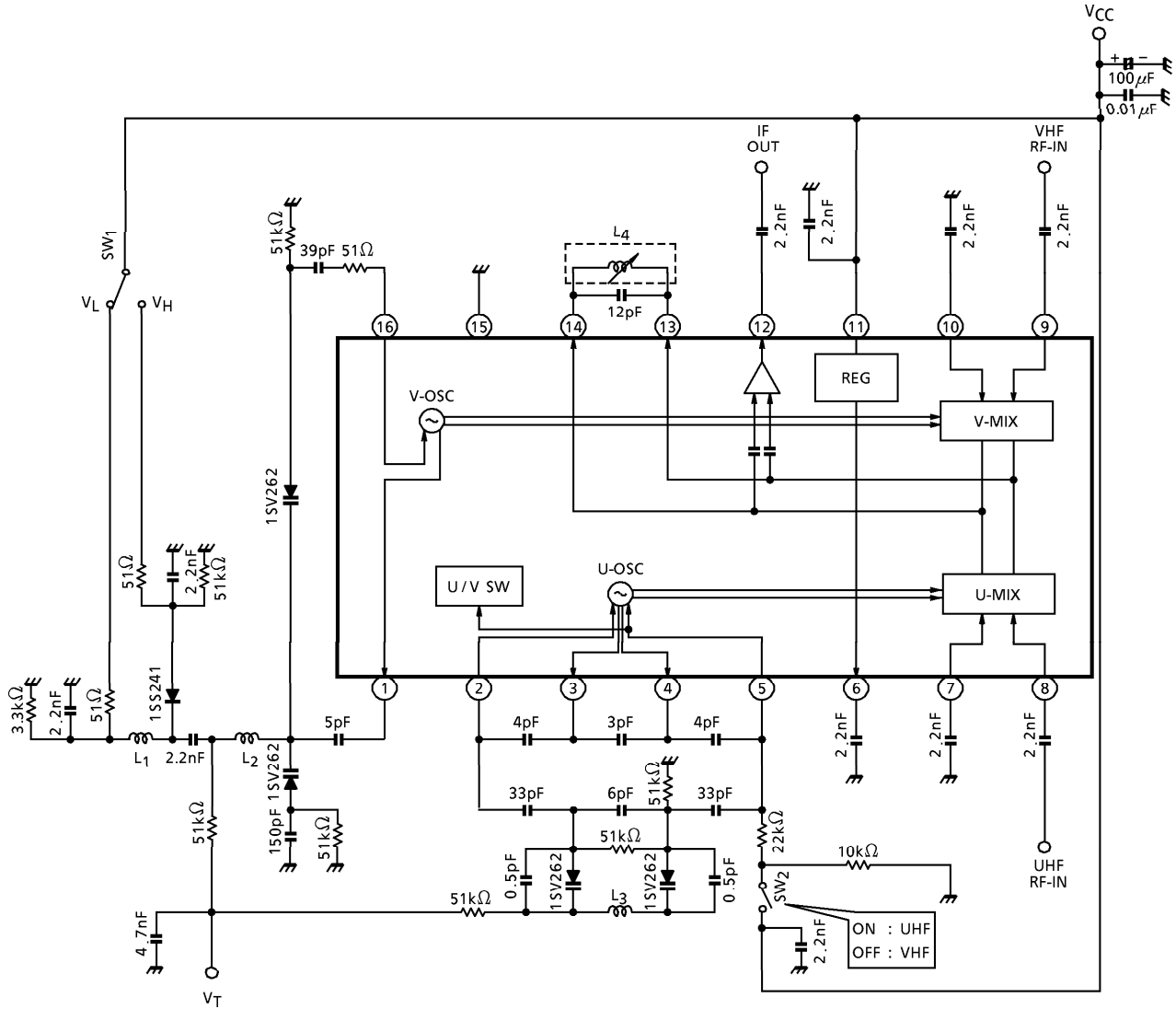




**TEST CIRCUIT 1**  
DC CHARACTERISTICS



TEST CIRCUIT 2  
AC CHARACTERISTICS



	LINE DIAMETER	TURN DIAMETER	NUMBER OF TURNS
L <sub>1</sub>	0.32mm	2.0mm	7.5T
L <sub>2</sub>	0.32mm	1.5mm	2.5T
L <sub>3</sub>	0.32mm	2.5mm	2.5T

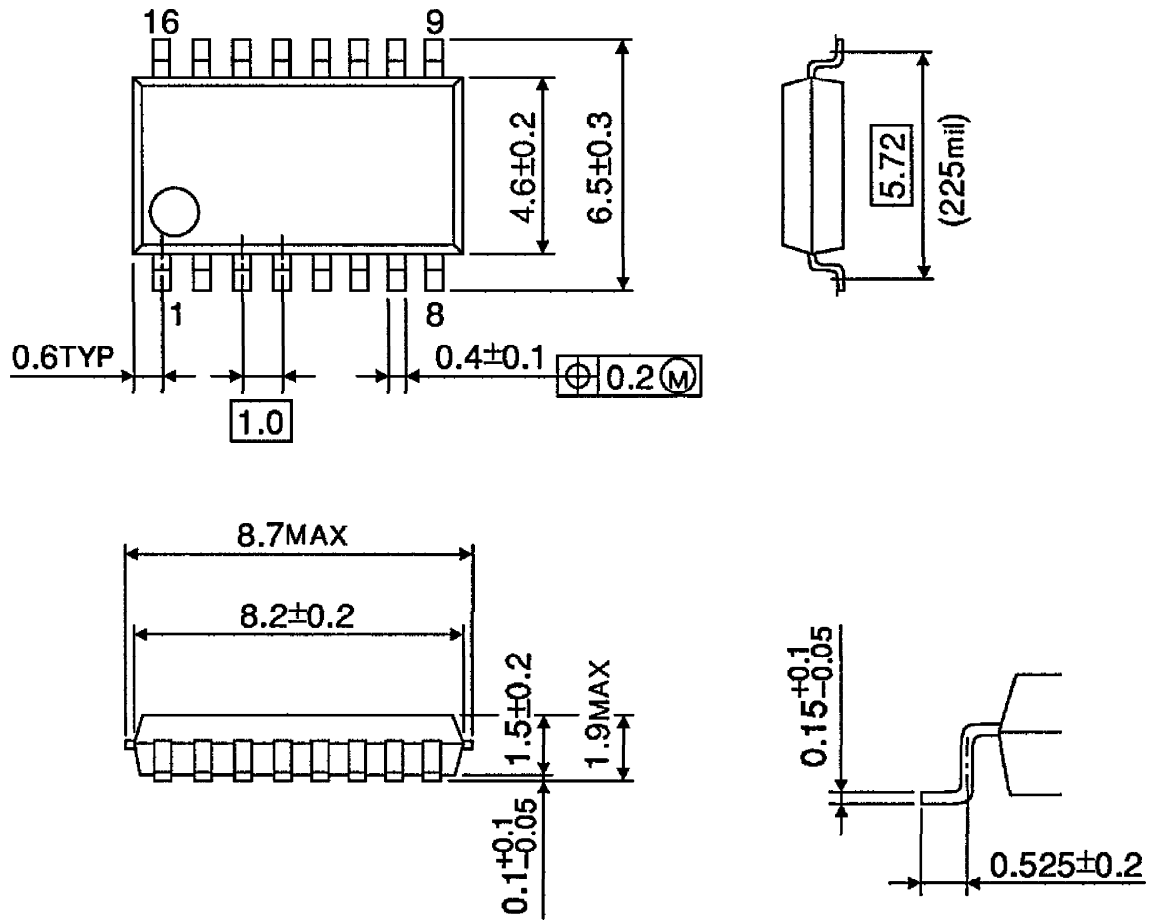
L<sub>4</sub> : 0.9μH ± 5%

SW<sub>1</sub>—V<sub>LOW</sub>/V<sub>HIGH</sub>

SW<sub>2</sub>—VHF/UHF

**OUTLINE DRAWING**  
SSOP16-P-225-1.00A

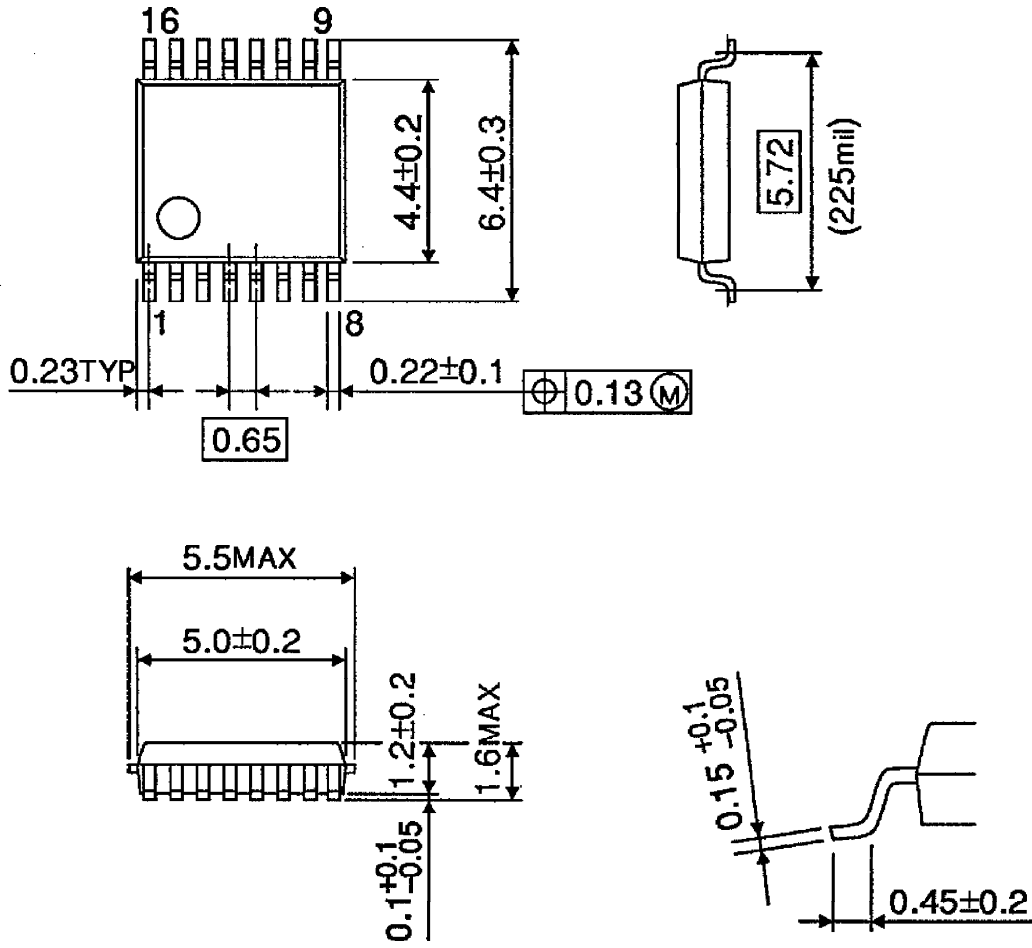
Unit : mm



Weight : 0.14g (Typ.)

**OUTLINE DRAWING**  
SSOP16-P-225-0.65B

Unit : mm



Weight : 0.07g (Typ.)