

**TENTATIVE**

TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT  
SILICON MONOLITHIC

# TA1284FN

## UHF / VHF TUNER IC (Low Phase Noise Oscillator)

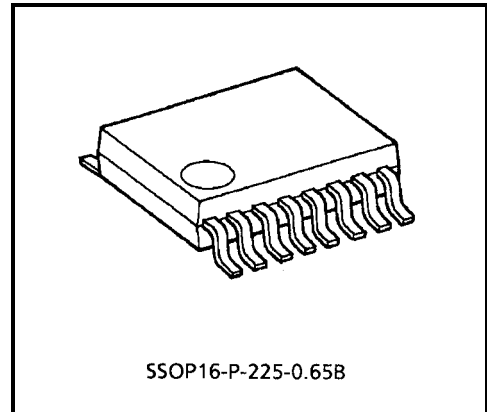
The TA1284FN is TV tuner IC which integrate mixer / oscillator for VHF and CATV bands, mixer / oscillator for UHF band, and IF amplifier on a single chip.

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

### FEATURES

- Supply voltage : 5V
- Built-in mixer / oscillator for VHF and CATV bands
- Built-in mixer / oscillator for UHF band
- Oscillator circuits is low phase noise.
- Built-in IF amplifier
- Low power dissipation.

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



Weight: 0.07g (Typ.)

000707EBA1

• TOSHIBA is continually working to improve the quality and 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 comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products 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 TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the "Handling Guide for Semiconductor Devices," or "TOSHIBA Semiconductor Reliability Handbook" etc..

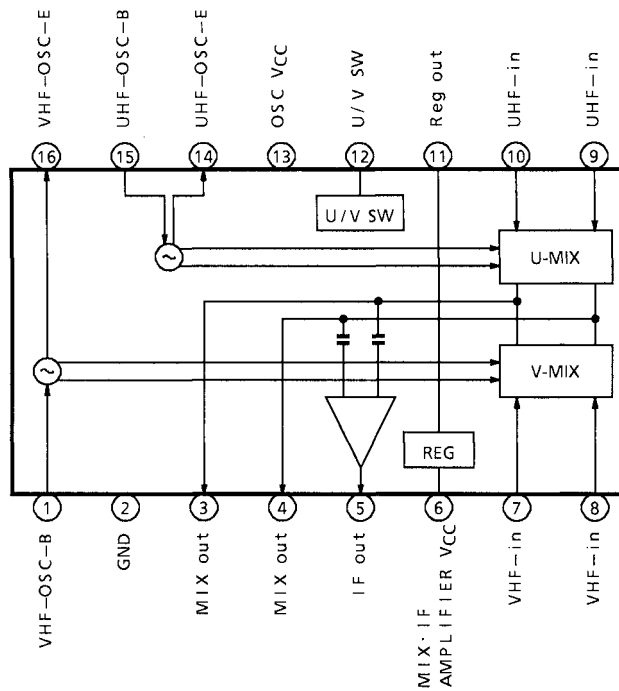
• The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These TOSHIBA products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury ("Unintended Usage"). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of TOSHIBA products listed in this document shall be made at the customer's own risk.

• 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.

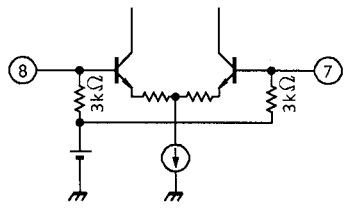
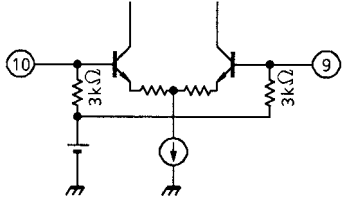
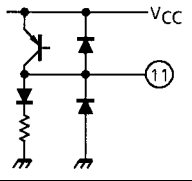
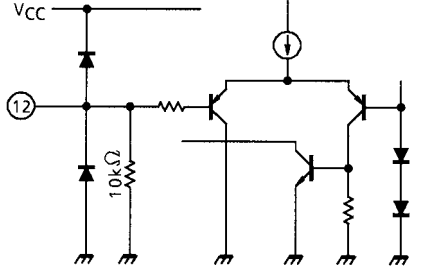
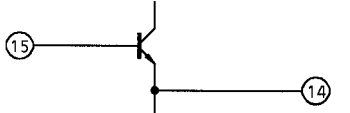
• The information contained herein is subject to change without notice.

## BLOCK DIAGRAM



## TERMINAL FUNCTION

PIN No.	PIN NAME	FUNCTION	INTERFACE
1 16	VHF Oscillator	VHF oscillator. Oscillator circuit is low phase noise.	
2	GND	GND pin	—
3 4	MIX Output	Mixer output. For tuning, connect a tank circuit between pins 3 and 4.	
5	IF Output	IF output. Output impedance : 75Ω	
6	V <sub>CC</sub> (MIX·IF AMPLIFIER Block)	V <sub>CC</sub> (Mixer and IF amplifier block)	—

PIN No.	PIN NAME	FUNCTION	INTERFACE
7 8	VHF input	VHF-RF input. Normally, ground pin 7 to AC using a capacitor and input to pin 8.	
9 10	UHF input	UHF-RF input. Either apply balanced input to pins 9 and 10 or ground pin 10 to AC and input to pin 9.	
11	REG	Regulator output.	
12	U / V band switch	Band changeover switch. VHF ; [L] or Open UHF ; [H] * [L] = 0 V [H] = V <sub>CC</sub>	
13	V <sub>CC</sub> (OSC)	V <sub>CC</sub> pin (oscillator block)	—
14 15	UHF Oscillator	UHF oscillator. Oscillator circuit is low phase noise.	

## MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Power Supply Voltage	V <sub>CC</sub>	6.5	V
Power Dissipation	P <sub>D</sub>	568 [IC only]	mW
Operating Temperature	T <sub>opr</sub>	-20~85	°C
Storage Temperature	T <sub>stg</sub>	-55~150	°C

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

## OPERATING SUPPLY VOLTAGE

PIN No.	SYMBOL	MIN	TYP.	MAX	UNIT
6, 13	V <sub>CC</sub>	4.5	5.0	5.5	V

## ELECTRICAL CHARACTERISTICS

### DC CHARACTERISTICS (Unless otherwise specified, V<sub>CC</sub> = 5 V, 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	—	26.0	33.5	45.0	mA
Power Supply and Current For UHF		I <sub>CC-U</sub>		—	29.5	38.0	51.0	
Terminal Voltage (*1)	Pin 1 For VHF	V1-V	1	—	1.7	2.0	2.3	V
	Pin 1 For UHF	V1-U		—	0	0	0.2	
	Pin 3 For VHF	V3-V		—	3.6	3.9	4.2	
	Pin 3 For UHF	V3-U		—	3.3	3.6	4.0	
	Pin 4 For VHF	V4-V		—	3.6	3.9	4.2	
	Pin 4 For UHF	V4-U		—	3.3	3.6	4.0	
	Pin 5 For VHF	V5-V		—	1.9	2.2	2.6	
	Pin 5 For UHF	V5-U		—	1.9	2.2	2.6	
	Pin 7 For VHF	V7-V		—	1.4	1.7	2.0	
	Pin 7 For UHF	V7-U		—	1.4	1.7	2.0	
	Pin 8 For VHF	V8-V		—	1.4	1.7	2.0	
	Pin 8 For UHF	V8-U		—	1.4	1.7	2.0	
	Pin 9 For VHF	V9-V		—	1.4	1.7	2.0	
	Pin 9 For UHF	V9-U		—	1.3	1.6	1.9	
	Pin 10 For VHF	V10-V		—	1.4	1.7	2.0	
	Pin 10 For UHF	V10-U		—	1.3	1.6	1.9	
	Pin 11 For VH	V11-V		—	3.8	4.1	4.4	
	Pin 11 For UHF	V11-U		—	3.8	4.1	4.4	
	Pin 12 For VHF	V12-V		—	0	0	0	
	Pin 12 For UHF	V12-U		—	—	V <sub>CC</sub>	—	
Pin 14 For VHF	V14-V	—	0	0	0.2			
Pin 14 For UHF	V14-U	—	0.9	1.2	1.5			
Pin 15 For VHF	V15-V	—	0	0	0.2			
Pin 15 For UHF	V15-U	—	1.8	2.1	2.4			
Pin 16 For VHF	V16-V	—	0.9	1.2	1.5			
Pin 16 For UHF	V16-U	—	0	0	0.2			

(\*1) Upper : VHF mode  
Lower : UHF mode

## AC CHARACTERISTICS (Unless otherwise specified, $V_{CC} = 5\text{ V}$ , $T_a = 25^\circ\text{C}$ )

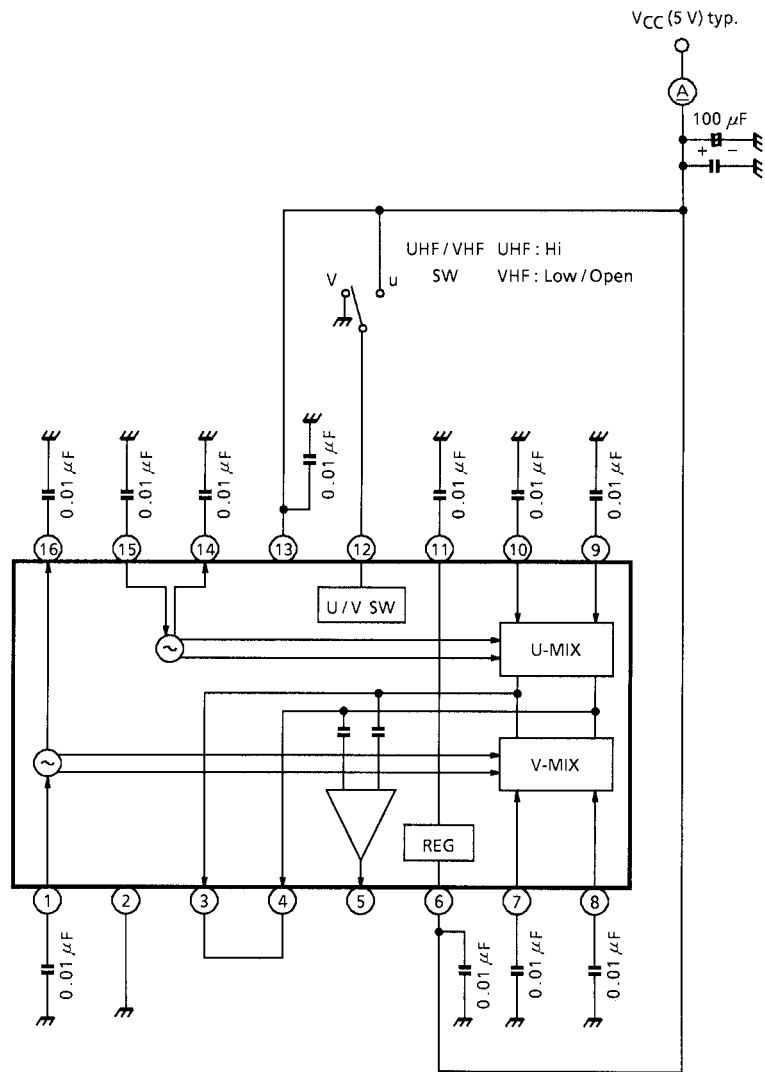
CHARACTERISTIC	SYMBOL	TEST CIRCUIT	BAND	TEST CONDITION(*2)	MIN	TYP.	MAX	UNIT
Conversion Gain (Note 1)	CG	2	VHF	fRF = 91.25 MHz	21.0	22.0	24.0	dB
			VHF	fRF = 217.25 MHz	21.0	22.0	24.5	
			UHF	fRF = 471.25 MHz	24.0	25.5	27.0	
			UHF	fRF = 765.25 MHz	23.0	24.5	26.5	
Noise Figure (Note 2)	NF	2	VHF	fRF = 91.25 MHz	—	9.0	10.0	dB
			VHF	fRF = 217.25 MHz	—	9.5	10.5	
			UHF	fRF = 471.25 MHz	—	9.0	9.5	
			UHF	fRF = 765.25 MHz	—	10.5	11.5	
IF Out Power Level (Note 3)	IFp	2	VHF	fRF = 91.25 MHz	8.5	9.5	—	dBm W
			VHF	fRF = 217.25 MHz	8.5	9.5	—	
			UHF	fRF = 471.25 MHz	8.5	9.5	—	
			UHF	fRF = 765.25 MHz	8.5	9.5	—	
Conversion Gain Shift (Note 4)	CGs	2	VHF	fRF = 91.25 MHz	—	—	±0.5	dB
			VHF	fRF = 217.25 MHz	—	—	±0.6	
			UHF	fRF = 471.25 MHz	—	—	±0.6	
			UHF	fRF = 765.25 MHz	—	—	±0.8	
Frequency Shift (Note 5)	$\Delta f_B$	2	VHF	fRF = 91.25 MHz	—	—	±100	kHz
			VHF	fRF = 217.25 MHz	—	—	±100	
			UHF	fRF = 471.25 MHz	—	—	±500	
			UHF	fRF = 765.25 MHz	—	—	±300	
Switching On Drift (Note 6)	$\Delta f_s$	2	VHF	fRF = 91.25 MHz	—	—	±50	kHz
			VHF	fRF = 217.25 MHz	—	—	±50	
			UHF	fRF = 471.25 MHz	—	—	±100	
			UHF	fRF = 765.25 MHz	—	—	±100	
1% Cross Modulation (Note 7)	CM	2	VHF	fRF = 91.25 MHz	81.0	82.0	—	dB $\mu$ V
			VHF	fRF = 217.25 MHz	81.5	82.0	—	
			UHF	fRF = 471.25 MHz	72.0	75.0	—	
			UHF	fRF = 765.25 MHz	70.5	72.0	—	
Inter Modulation (Note 8)	IM3	2	VHF	fRF = 91.25 MHz	63.0	65.0	—	dB
			VHF	fRF = 217.25 MHz	62.5	65.0	—	
			UHF	fRF = 471.25 MHz	59.5	61.0	—	
			UHF	fRF = 765.25 MHz	58.0	61.0	—	
Phase Noise (10 kHz offset) (Note 9)	PN	2	VHF	fRF = 91.25 MHz	—	-97.0	-94.5	dBc / Hz
			VHF	fRF = 217.25 MHz	—	-99.0	-96.5	
			UHF	fRF = 471.25 MHz	—	-94.5	-92.0	
			UHF	fRF = 765.25 MHz	—	-91.5	-88.0	

(\*2) IF = 58.75 [ MHz ]

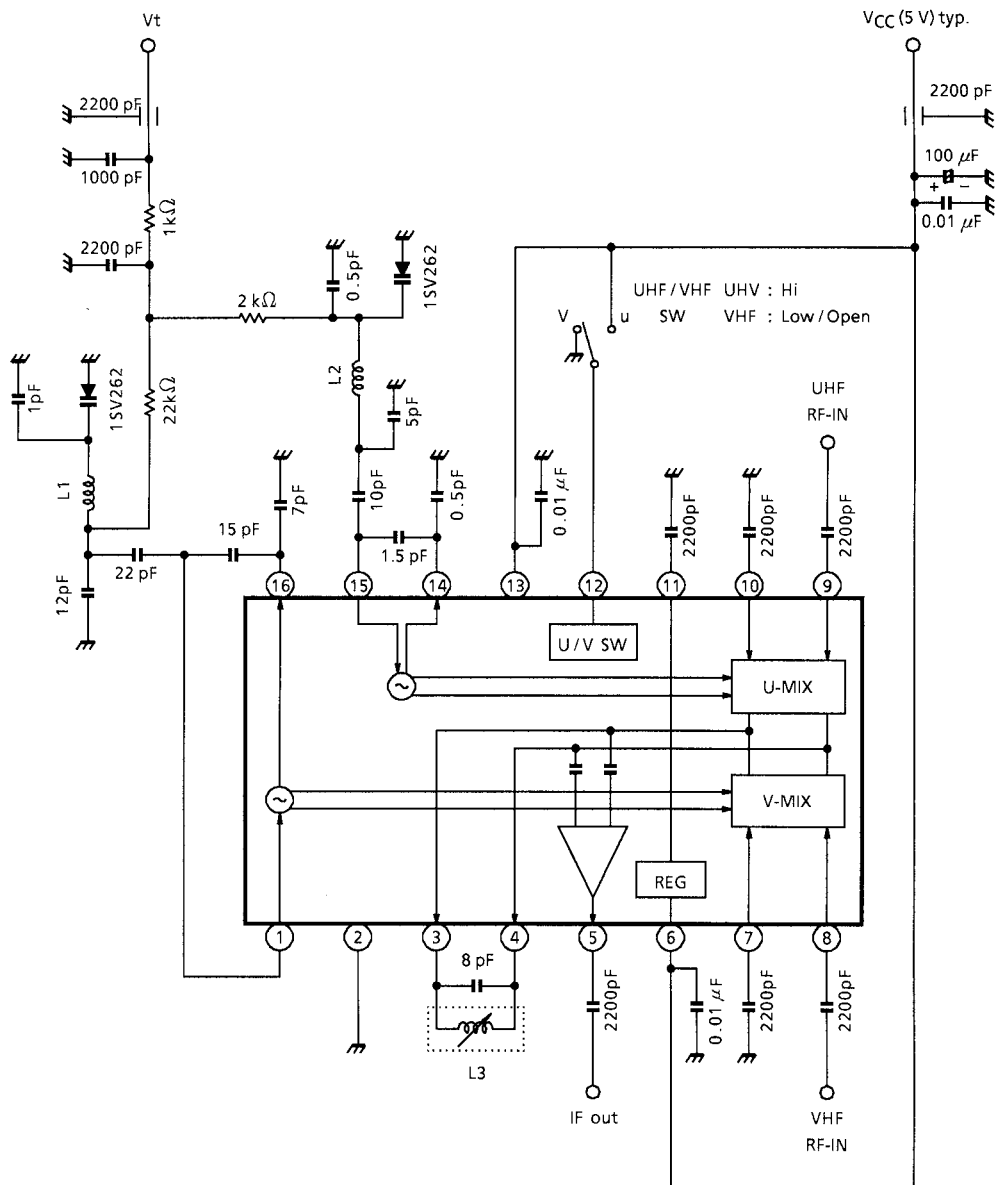
**TEST CONDITIONS**

- Note 1: Conversion Gain  
f<sub>RF</sub> input level = -30 dBmW
- Note 2: Noise Figure  
Noise Figure meter used.
- Note 3: IF Out Power Level  
Measure IF output level when it is maximum level.
- Note 4: Conversion Gain Shift  
The Conversion gain shift is defined as a change in conversion gain when supply voltage varies from VCC = 5 to 4.5 V or from VCC = 5 to 5.5 V.
- Note 5: Frequency Shift  
The frequency shift is defined as a change in oscillator frequency when the supply voltage varies from VCC = 5 to 4.5 V or from VCC = 5 to 5.5 V.
- Note 6: Switching On Drift  
Measure frequency change from 2 seconds after switching on to 3 minutes.
- Note 7: 1% Cross Modulation  
• f<sub>d</sub> = f<sub>p</sub> (f<sub>dRF</sub> input level = -30 dBmW)  
• f<sub>ud</sub> = f<sub>p</sub>+12 MHz 100 kHz, 30%AM  
Input two signals, and increase the f<sub>udRF</sub> input level.  
Measure the f<sub>udRF</sub> input level when the suppression level reaches 56.5 dB.
- Note 8: Inter Modulation  
• f<sub>d</sub> = f<sub>p</sub>  
• f<sub>ud</sub> = f<sub>p</sub>+1 MHz  
Input the two signals above, and increase the input levels.  
When the IF output level is -11 dBmW, measure the suppression level.
- Note 9: Phase Noise (10 kHz offset)  
Measure phase noise of 10 kHz offset.

## TEST CIRCUIT1 DC CHARACTERISTICS



## TEST CIRCUIT2 AC CHARACTERISTICS



- VHF :  $f_{RF} = 91.25 \text{ [MHz]} \sim 217.25 \text{ [MHz]}$
- UHF :  $f_{RF} = 471.25 \text{ [MHz]} \sim 765.25 \text{ [MHz]}$
- fIF :  $58.75 \text{ [MHz]}$

	LINE DIAMETER	TURN DIAMETER	NUMBER OF TURNS
L1	0.3	2.4 mm	7.5 T
L2	0.3	1.4 mm	2.5 T

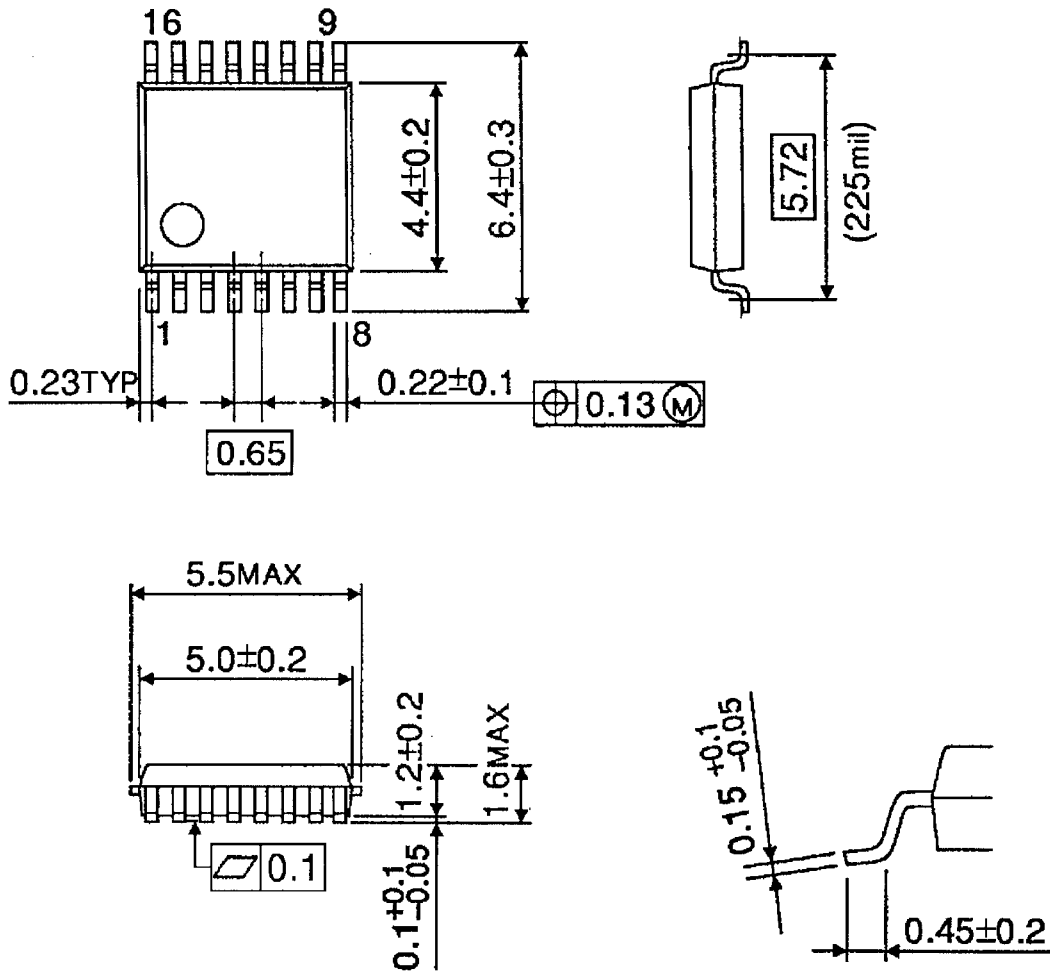
L3 =  $0.9 \mu\text{H} \pm 5\%$



**PACKAGE DIMENSIONS**

SSOP16-P-225-0.65B

Unit : mm



Weight: 0.07g (Typ.)