

TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

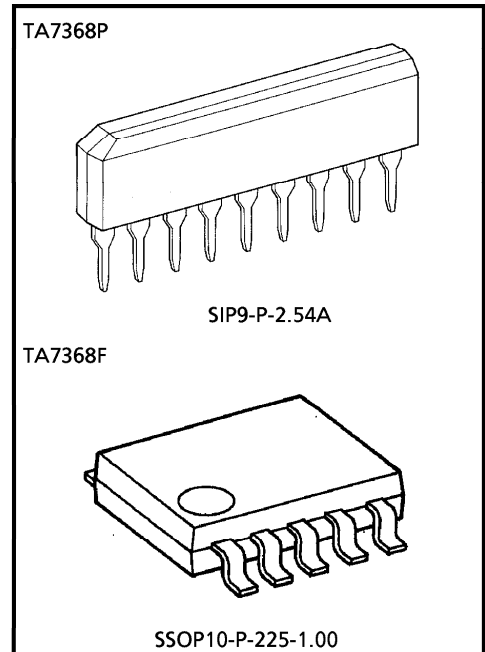
# TA7368P, TA7368F

## AUDIO POWER AMPLIFIER

The TA7368P and TA7368F are suitable for the audio power amplifier of portable cassette tape recorder and radio.

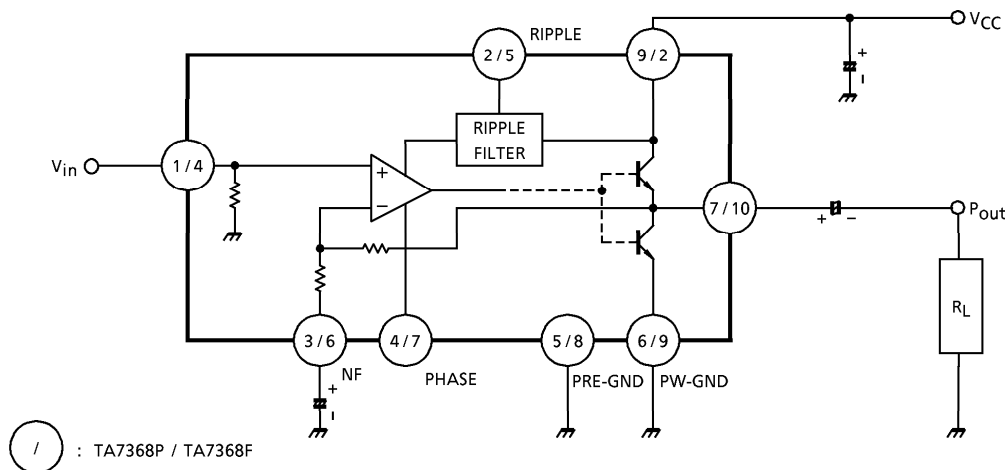
### FEATURES

- Very few external parts (Only three capacitors)
- Low quiescent current :  $I_{CCQ} = 6.6\text{mA}$  (Typ.) ( $V_{CC} = 6\text{V}$ )
- Output Power  
 TA7368P  
 :  $P_{out} = 720\text{mW}$  (Typ.) ( $V_{CC} = 6\text{V}$ ,  $R_L = 4\Omega$ , THD = 10%)  
 TA7368P/F  
 :  $P_{out} = 450\text{mW}$  (Typ.) ( $V_{CC} = 6\text{V}$ ,  $R_L = 8\Omega$ , THD = 10%)
- Voltage gain :  $G_V = 40\text{dB}$  (Typ.)
- Operating supply voltage range :  $V_{CC} = 2\sim 10\text{V}$  ( $T_a = 25^\circ\text{C}$ )



Weight  
 SIP9-P-2.54A : 0.92g (Typ.)  
 SSOP10-P-225-1.00 : 0.09g (Typ.)

### BLOCK DIAGRAM



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**PRECAUTION FOR USE AND APPLICATION**

**1. Input stage**

The input stage of power amplifier (Equivalent circuit) is comprised of a PNP differential pair (Q<sub>2</sub> and Q<sub>3</sub>) preceded by a PNP emitter follower (Q<sub>1</sub>) which allows DC referencing of the source signal to ground. This eliminated the need for an input coupling capacitor. However, in case the brush noise of volume becomes a problem, provide serially a coupling capacitor to the input side.

**2. Adjustment of voltage gain**

The voltage gain is fixed at G<sub>V</sub>≒40dB by the resistors (R<sub>4</sub> and R<sub>5</sub>) in IC, however, its reduction is possible through adding R<sub>f</sub> as shown in Figure 2. In this case, the voltage gain is obtained by the following equation.

$$G_V = 20 \log \frac{R_5 + R_4 + R_f}{R_4 + R_f}$$

It is recommended to use this IC with the voltage gain of G<sub>V</sub>=28dB or over.

**3. Ripple rejection ratio**

Adding C<sub>RIP</sub>, to ripple terminal 2 as shown in Figure 3, the ripple rejection ratio is improved from -25dB Typ. to -45dB Typ.

**4. Power dissipation**

Care should be taken to use this IC below maximum power dissipation. Because it may over maximum rating depending on operating condition.

- TA7368P P<sub>D</sub> = 900mW (T<sub>a</sub> = 25°C)
- TA7368F P<sub>D</sub> = 400mW (T<sub>a</sub> = 25°C)

**5. Phase-compensation**

Small temperature coefficient and excellent frequency characteristic is needed by capacitors below.

- Oscillation preventing capacitors for power amplifier output
- Bypass capacitor for ripple filter
- Capacitor between V<sub>CC</sub> and GND

① : TA7368P / TA7368F

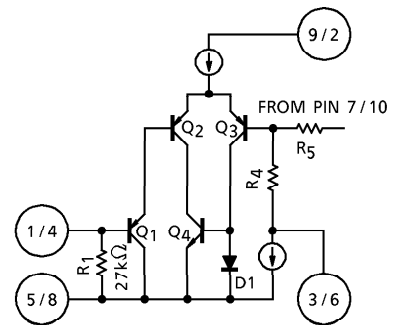


Fig.1

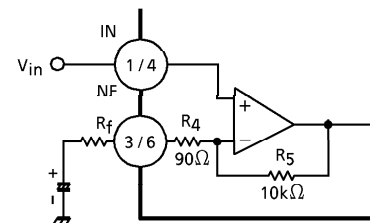


Fig.2

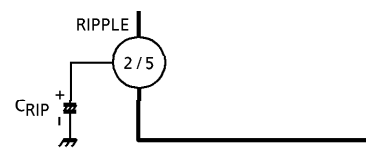


Fig.3

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**MAXIMUM RATINGS (Ta = 25°C)**

CHARACTERISTIC		SYMBOL	RATING	UNIT
Supply Voltage		V <sub>CC</sub>	14	V
Power Dissipation	TA7368P	P <sub>D</sub> (Note)	900	mW
	TA7368F		400	
Operating Temperature		T <sub>opr</sub>	-25~75	°C
Storage Temperature		T <sub>stg</sub>	-55~150	°C

(Note) Derated above Ta = 25°C in the proportion of 7.2mW/°C for TA7368P and of 3.2mW/°C for TA7368F.

**ELECTRICAL CHARACTERISTICS FOR TA7368P**

(Unless otherwise specified, V<sub>CC</sub> = 6V, f = 1kHz, R<sub>g</sub> = 600Ω, R<sub>L</sub> = 4Ω, Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Quiescent Current	I <sub>CCQ</sub>	—	V <sub>CC</sub> = 3V, V <sub>in</sub> = 0	—	5.5	—	mA
			V <sub>CC</sub> = 6V, V <sub>in</sub> = 0	—	6.6	15	
			V <sub>CC</sub> = 9V, V <sub>in</sub> = 0	—	7.5	18	
Output Power	P <sub>out</sub>	—	V <sub>CC</sub> = 3V, R <sub>L</sub> = 4Ω, THD = 10%	—	120	—	mW
			V <sub>CC</sub> = 6V, R <sub>L</sub> = 4Ω, THD = 10%	500	720	—	
			V <sub>CC</sub> = 6V, R <sub>L</sub> = 8Ω, THD = 10%	300	450	—	
			V <sub>CC</sub> = 9V, R <sub>L</sub> = 8Ω, THD = 10%	800	1100	—	
			V <sub>CC</sub> = 9V, R <sub>L</sub> = 16Ω, THD = 10%	450	610	—	
Total Harmonic Distortion	THD	—	P <sub>out</sub> = 100mW	—	0.3	1.0	%
Voltage Gain	G <sub>V</sub>	—	V <sub>in</sub> = 0.5mV <sub>rms</sub>	37	40	43	dB
Output Noise Voltage	V <sub>no</sub>	—	R <sub>g</sub> = 10kΩ, BPF = 20Hz~20kHz	—	0.2	0.5	mV <sub>rms</sub>
Ripple Rejection Ratio	RR	—	f <sub>r</sub> = 100Hz, V <sub>r</sub> = 0.3V <sub>rms</sub> Without C <sub>RIP</sub>	—	25	—	dB
Input Resistance	R <sub>IN</sub>	—	—	—	27	—	kΩ

**TERMINAL VOLTAGE FOR TA7368P**

Typical terminal voltage at no signal with test circuit. (V<sub>CC</sub> = 6V, Ta = 25°C)

[Unit : V]

Terminal No.	1	2	3	4	5	6	7	8	9
DC Voltage (V)	0	2.40	0.62	0.64	0	0	2.61	NC	6.0

**ELECTRICAL CHARACTERISTICS FOR TA7368F**(Unless otherwise specified,  $V_{CC} = 6V$ ,  $f = 1kHz$ ,  $R_g = 600\Omega$ ,  $R_L = 8\Omega$ ,  $T_a = 25^\circ C$ )

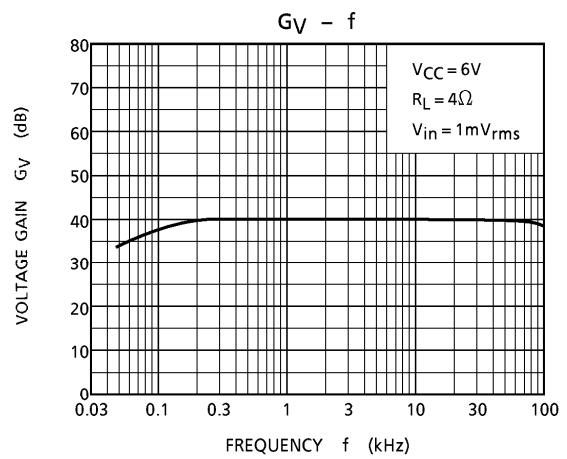
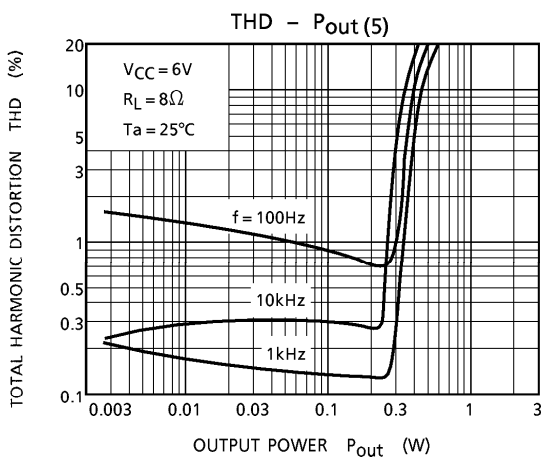
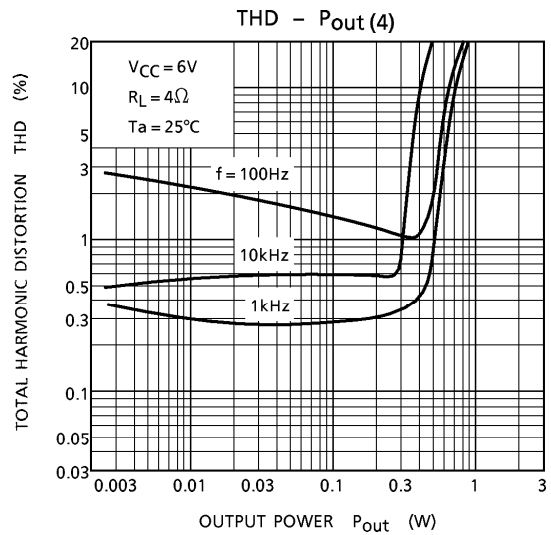
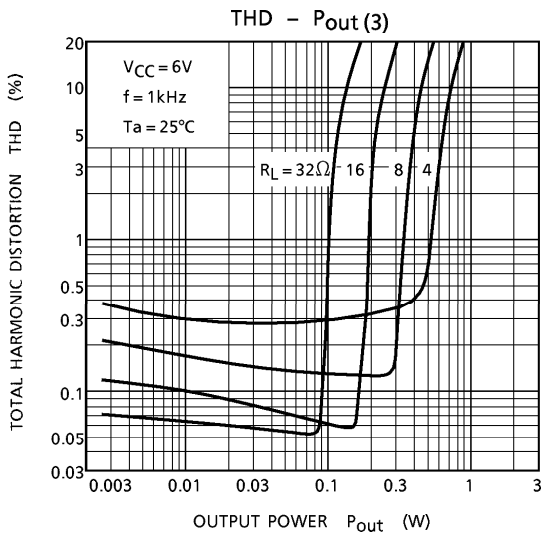
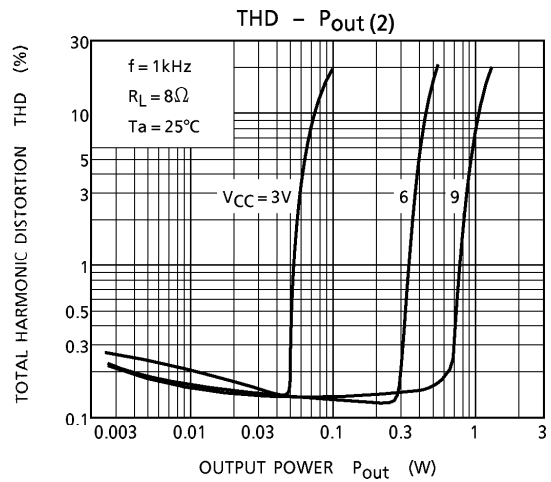
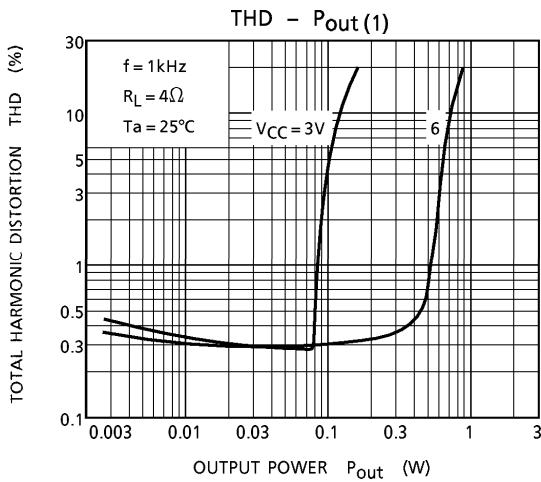
CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Quiescent Current	$I_{CCQ}$	—	$V_{CC} = 3V, V_{in} = 0$	—	5.5	—	mA
			$V_{CC} = 6V, V_{in} = 0$	—	6.6	15	
			$V_{CC} = 9V, V_{in} = 0$	—	7.5	18	
Output Power	$P_{out}$	—	$V_{CC} = 3V, R_L = 4\Omega, THD = 10\%$	—	120	—	mW
			$V_{CC} = 6V, R_L = 8\Omega, THD = 10\%$	300	450	—	
			$V_{CC} = 9V, R_L = 16\Omega, THD = 10\%$	450	610	—	
Total Harmonic Distortion	THD	—	$P_{out} = 100mW$	—	0.3	1.0	%
Voltage Gain	$G_V$	—	$V_{in} = 0.5mV_{rms}$	37	40	43	dB
Output Noise Voltage	$V_{no}$	—	$R_g = 10k\Omega, BPF = 20Hz \sim 20kHz$	—	0.2	0.5	$mV_{rms}$
Ripple Rejection Ratio	RR	—	$f_r = 100Hz, V_r = 0.3V_{rms},$ Without $C_{RIP}$	—	25	—	dB
Input Resistance	$R_{IN}$	—	—	—	27	—	$k\Omega$

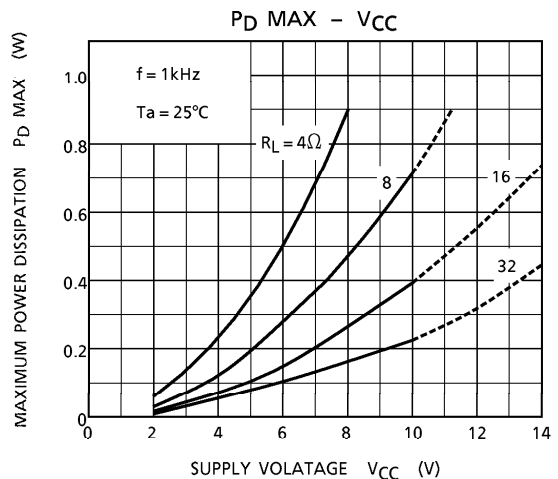
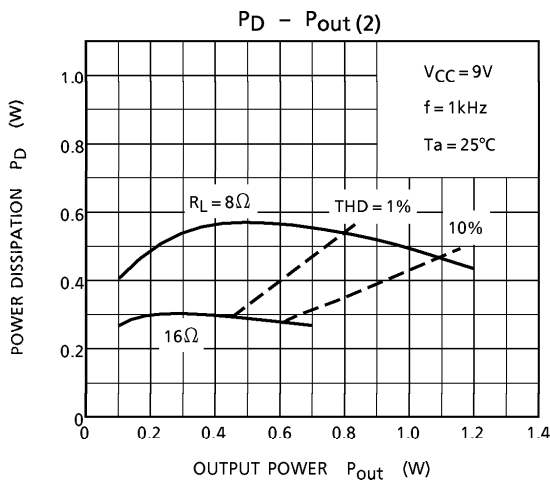
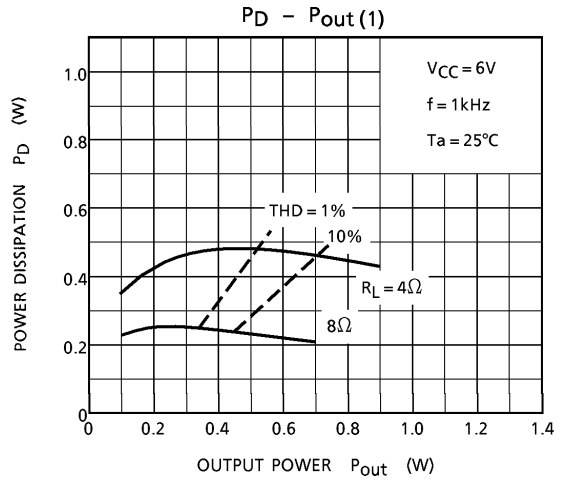
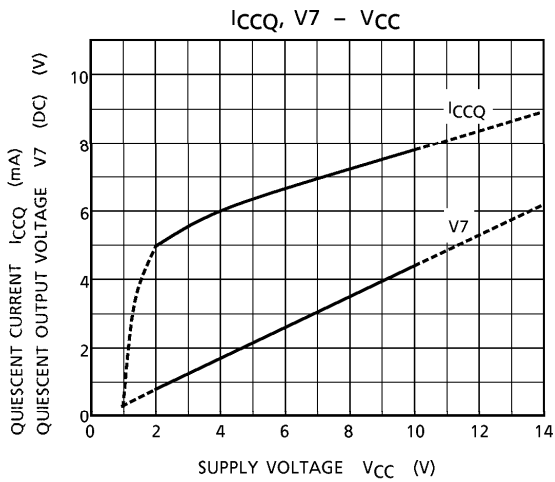
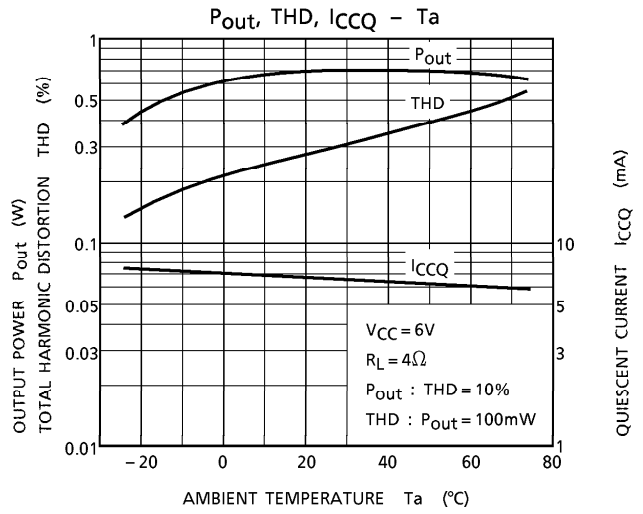
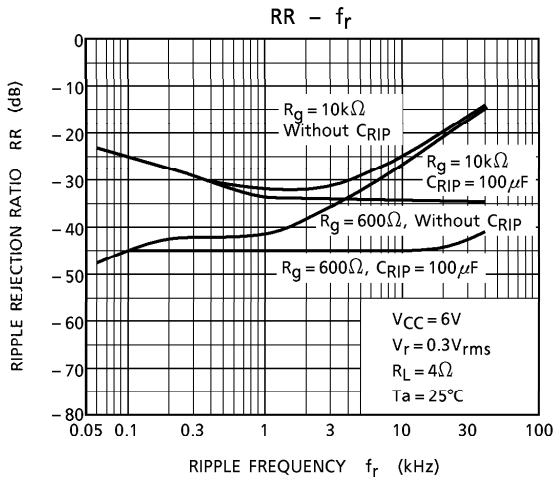
**TERMINAL VOLTAGE FOR TA7368F**Typical terminal voltage at no signal with test circuit. ( $V_{CC} = 6V$ ,  $T_a = 25^\circ C$ )

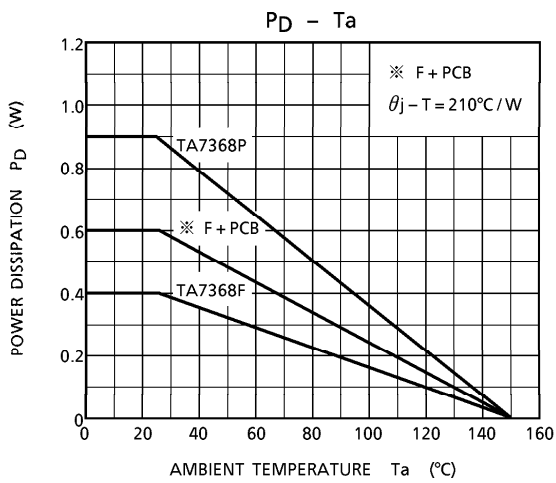
[Unit : V]

Terminal No.	1	2	3	4	5	6	7	8	9	10
DC Voltage (V)	NC	6.0	NC	0	2.40	0.62	0.64	0	0	2.61









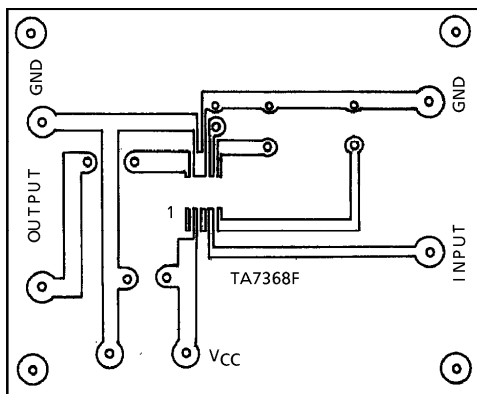
※ F + PCB

By being mounted on certain PCB's, flat packages increase the heat dissipating efficiency.

Data shown on the left is resulted from the measurement on the PCB recommended by Toshiba.

( $\theta_{j-T}$  : Thermal resistance)

Printed circuit board



60 × 47.5 (mm)

Material : Phenol resin

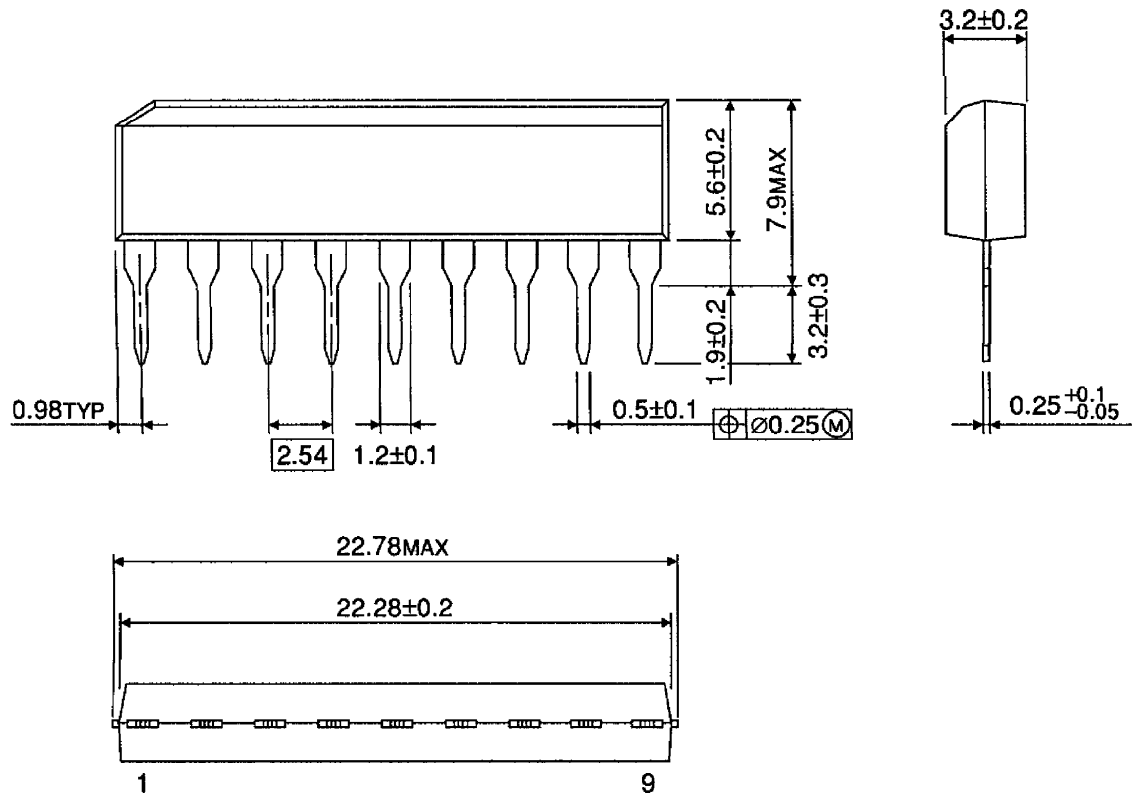
Thickness of copper leaf : 35 $\mu$ m

Plate thickness : 1.6mm



OUTLINE DRAWING  
SIP9-P-2.54A

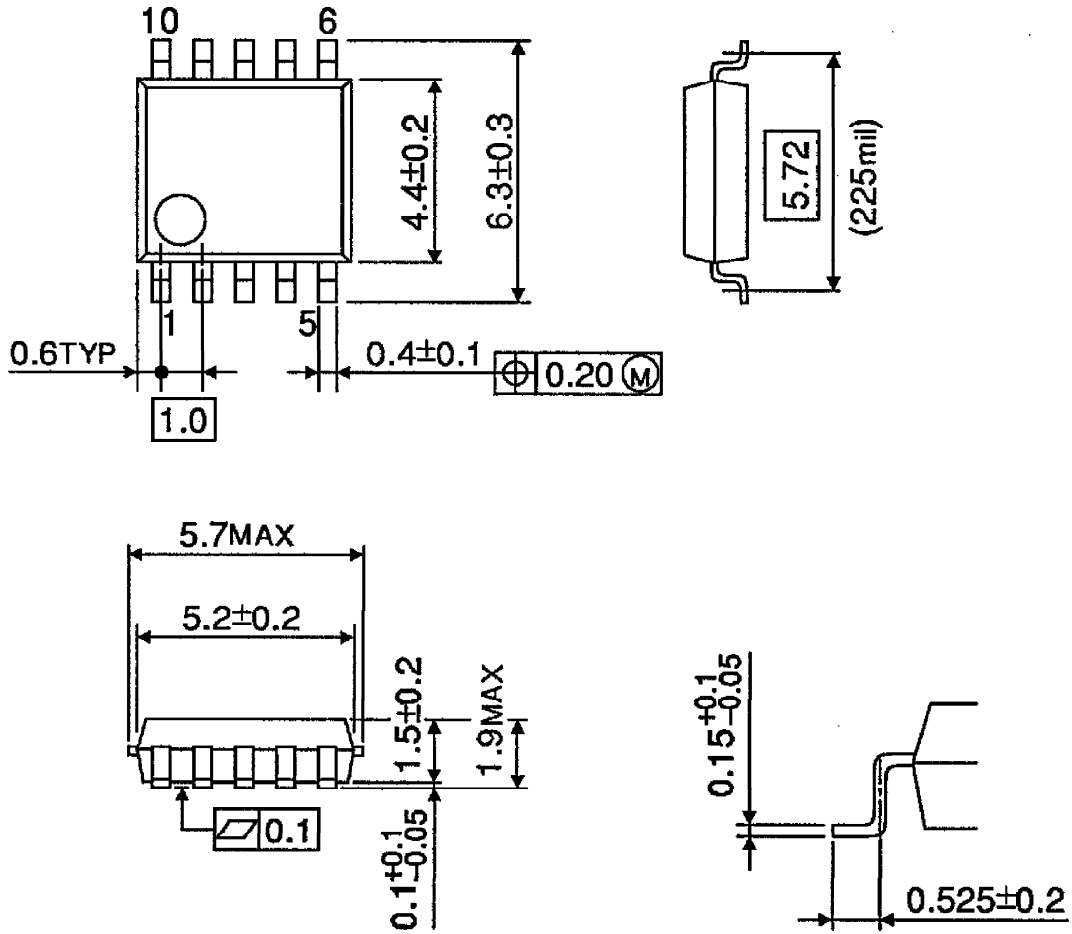
Unit : mm



Weight : 0.92g (Typ.)

**OUTLINE DRAWING**  
SSOP10-P-225-1.00

Unit : mm



Weight : 0.09g (Typ.)