

TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

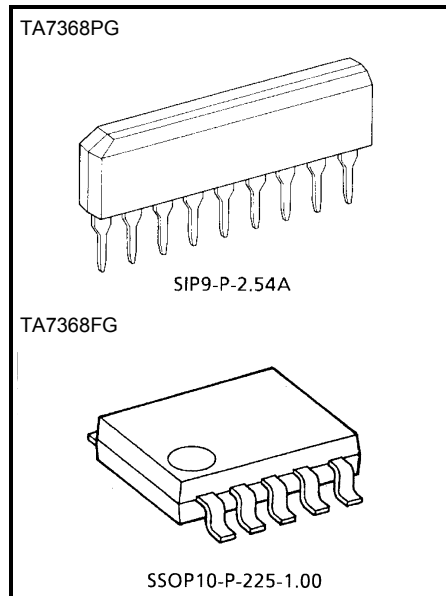
# TA7368PG, TA7368FG

## Audio Power Amplifier

The TA7368PG and TA7368FG are suitable for the audio power amplifier of portable cassette tape recorder and radio.

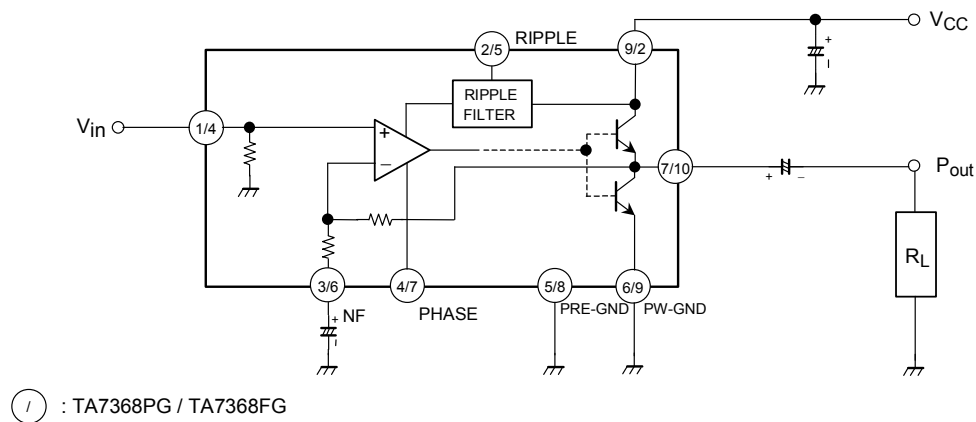
### Features

- Very few external parts (only three capacitors)
- Low quiescent current:  $I_{CCQ} = 6.6\text{mA}$  (typ.) ( $V_{CC} = 6\text{V}$ )
- Output power  
 TA7368PG  
 :  $P_{out} = 720\text{mW}$  (typ.) ( $V_{CC} = 6\text{V}$ ,  $R_L = 4\Omega$ , THD = 10%)  
 TA7368PG / FG  
 :  $P_{out} = 450\text{mW}$  (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



## Precaution For Use And Application

### 1. Input stage

The input stage of power amplifier (equivalent circuit) is comprised of a PNP differential pair (Q2 and Q3) preceded by a PNP emitter follower (Q1) 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  $G_V \approx 40\text{dB}$  by the resistors (R4 and R5) in IC, however, its reduction is possible through adding Rf 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  $G_V = 28\text{dB}$  or over.

### 3. Ripple rejection ratio

Adding CRIP, to ripple terminal 2 as shown in Figure 3, the ripple rejection ratio is improved from  $-25\text{dB}$  typ. to  $-45\text{dB}$  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.

- TA7368PG  $P_D = 900\text{mW}$  ( $T_a = 25^\circ\text{C}$ )
- TA7368FG  $P_D = 400\text{mW}$  ( $T_a = 25^\circ\text{C}$ )

### 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 VCC and GND

⊃ : TA7368PG / TA7368FG

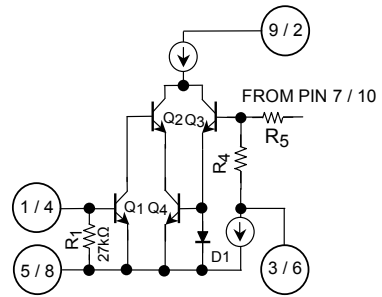


Fig.1

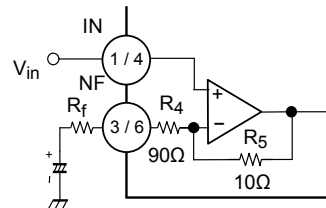


Fig.2

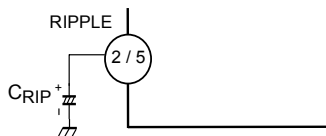


Fig.3

**Maximum Ratings (Ta = 25°C)**

| Characteristic        | Symbol           | Rating                | Unit |
|-----------------------|------------------|-----------------------|------|
| Supply voltage        | V <sub>CC</sub>  | 14                    | V    |
| Power dissipation     | TA7368PG         | P <sub>D</sub> (Note) | 900  |
|                       | TA7368FG         |                       |      |
| 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 TA7368PG and of 3.2mW / °C for TA7368FG.

**Electrical Characteristics For TA7368PG**

(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><br>Without C <sub>RIP</sub> | —    | 25   | —    | dB                |
| Input resistance          | R <sub>IN</sub>  | —            | —                                                                                        | —    | 27   | —    | kΩ                |

**Terminal Voltage For TA7368PG**

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 Characteristic For TA7368FG**

 (unless otherwise specified,  $V_{CC} = 6V$ ,  $f = 1kHz$ ,  $R_g = 600\Omega$ ,  $R_L = 8\Omega$ ,  $T_a = 25^\circ C$ )

| Characteristic            | Symbol    | Test Circuit | 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        | —            | $f_r = 100Hz, V_r = 0.3V_{rms}$ ,<br>Without $C_{RIP}$ | —    | 25   | —    | dB         |
| Input resistance          | $R_{IN}$  | —            | —                                                      | —    | 27   | —    | k $\Omega$ |

**Terminal Voltage For TA7368FG**

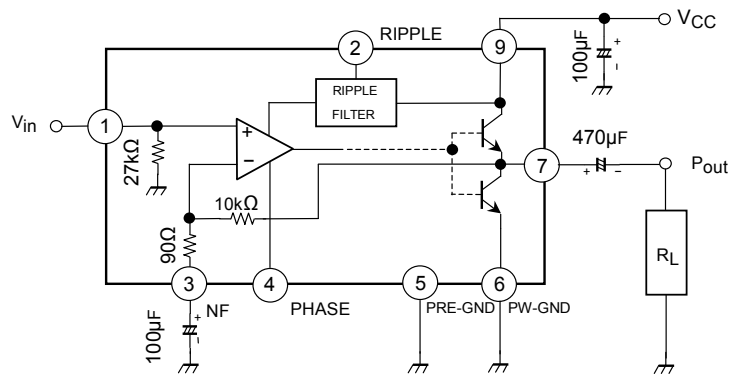
 Typical Terminal Voltage at no Signal with Test Circuit. ( $V_{CC} = 6V$ ,  $T_a = 25^\circ C$ )

[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 |

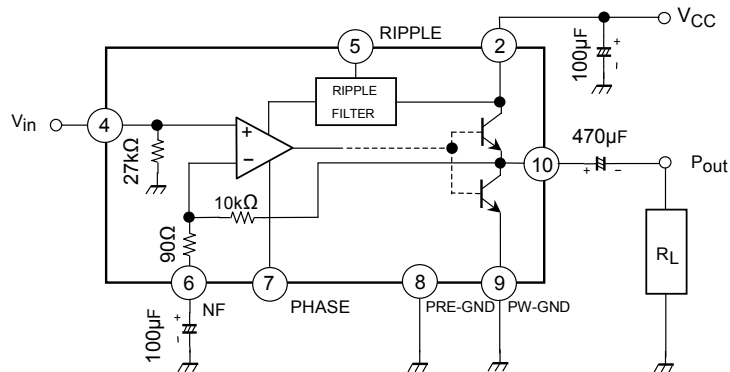
## Test Circuit

TA7368PG

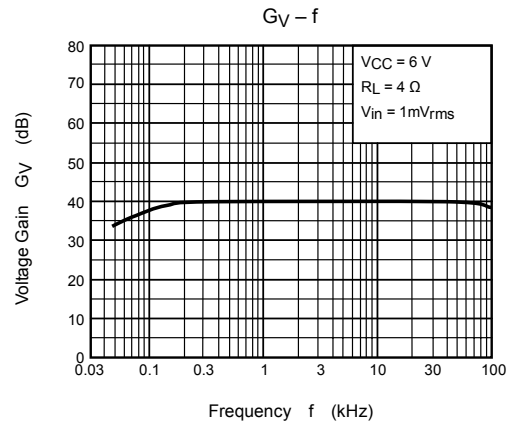
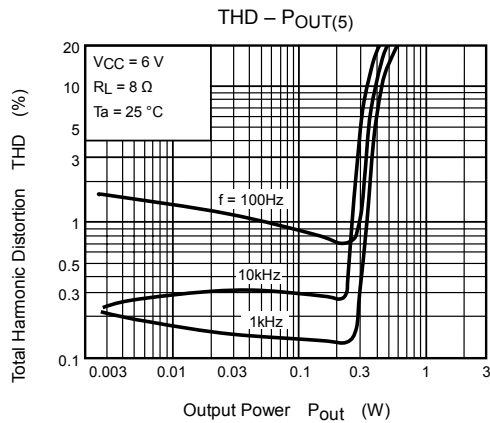
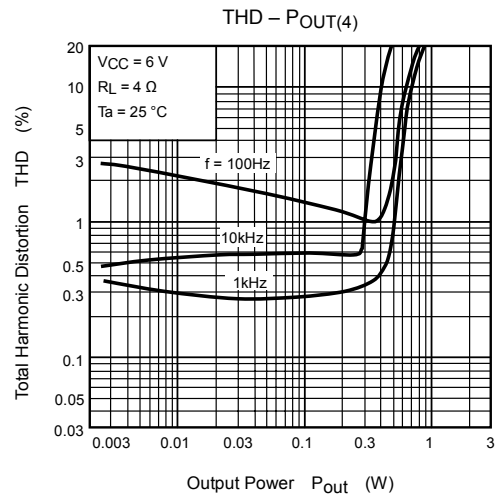
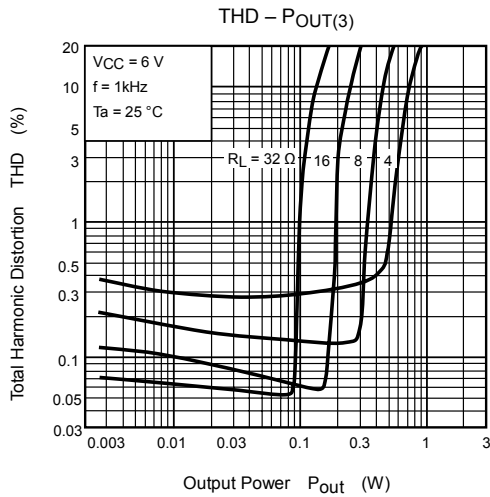
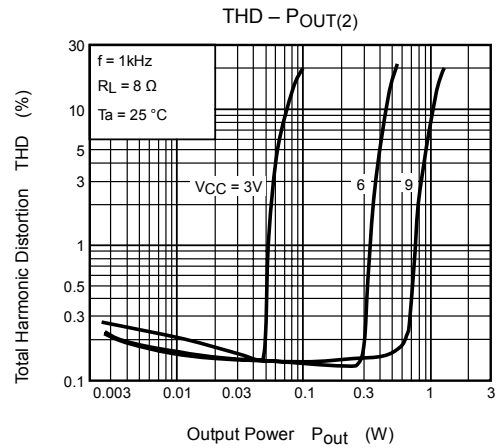
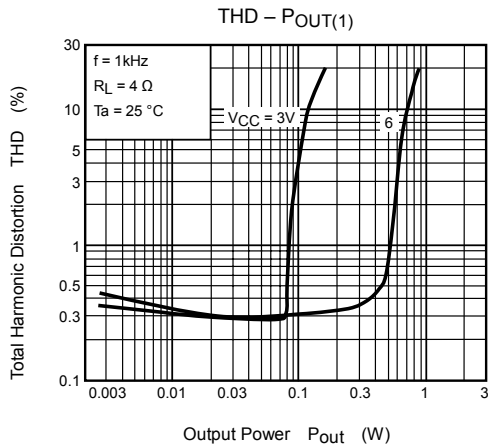


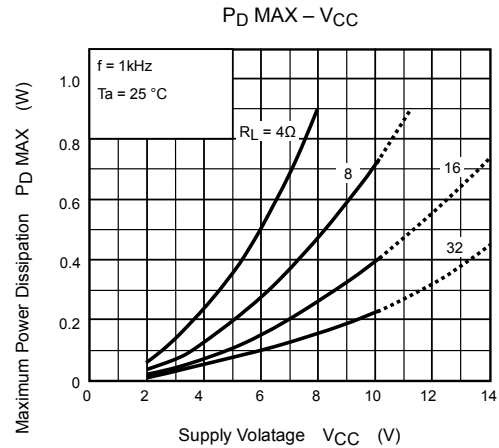
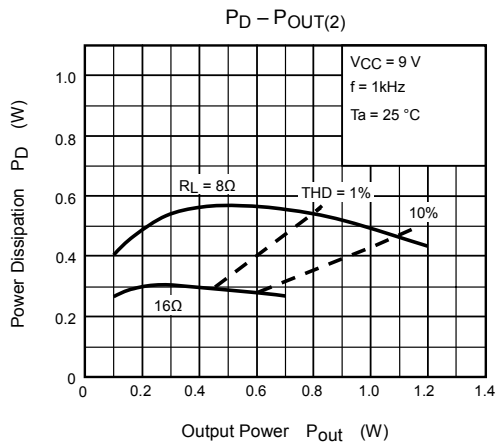
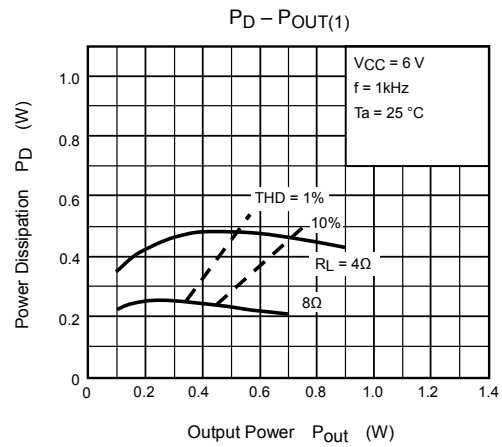
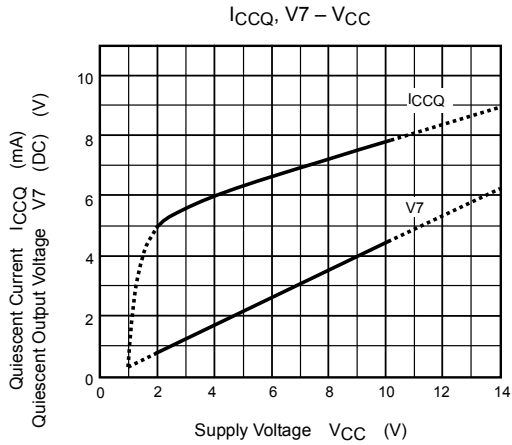
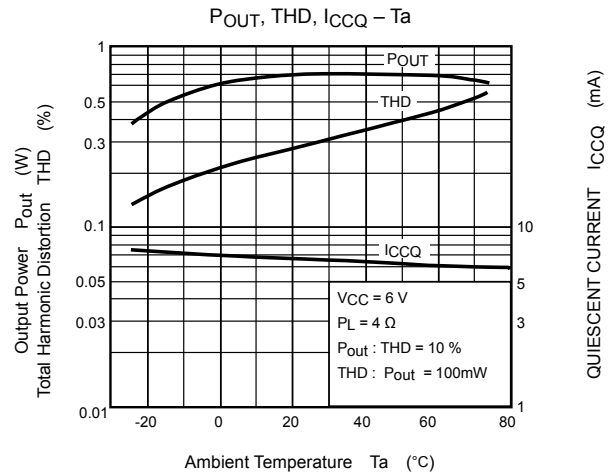
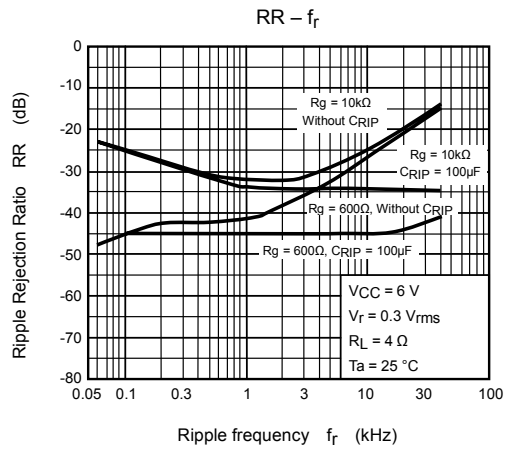
※ Pin(8): Non-connection

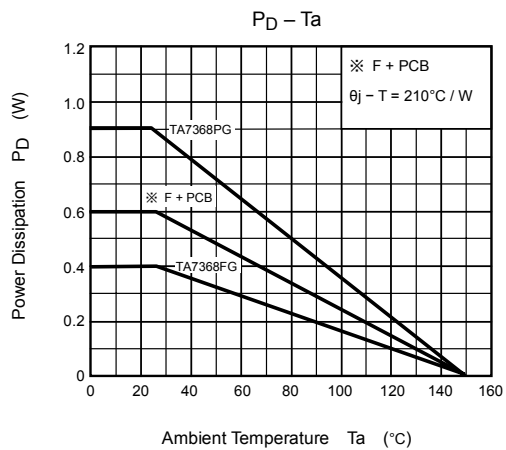
TA7368FG



※ Pin(1), (3): Non-connection







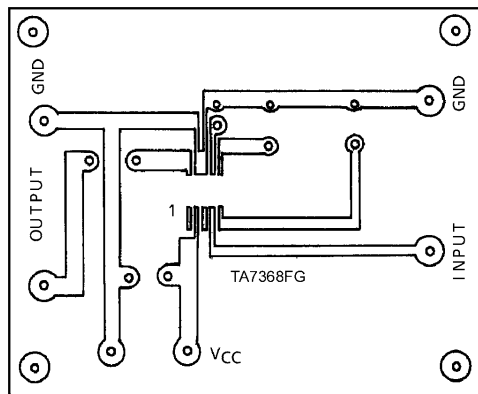
## ※ F+PCB

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



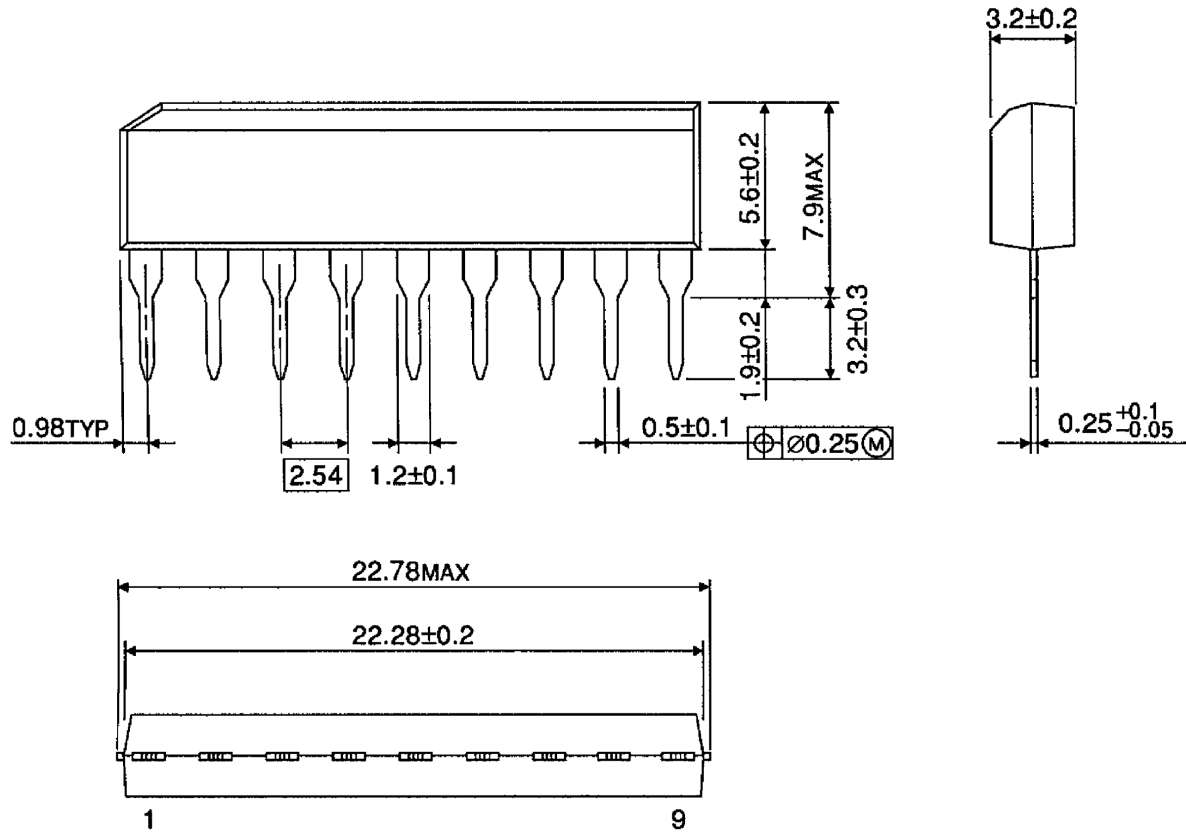
60 × 47.5 (mm)

Material: Phenol resin  
Thickness of copper leaf: 35μm  
Plate thickness: 1.6mm

## Package Dimensions

SIP9-P-2.54A

Unit : mm

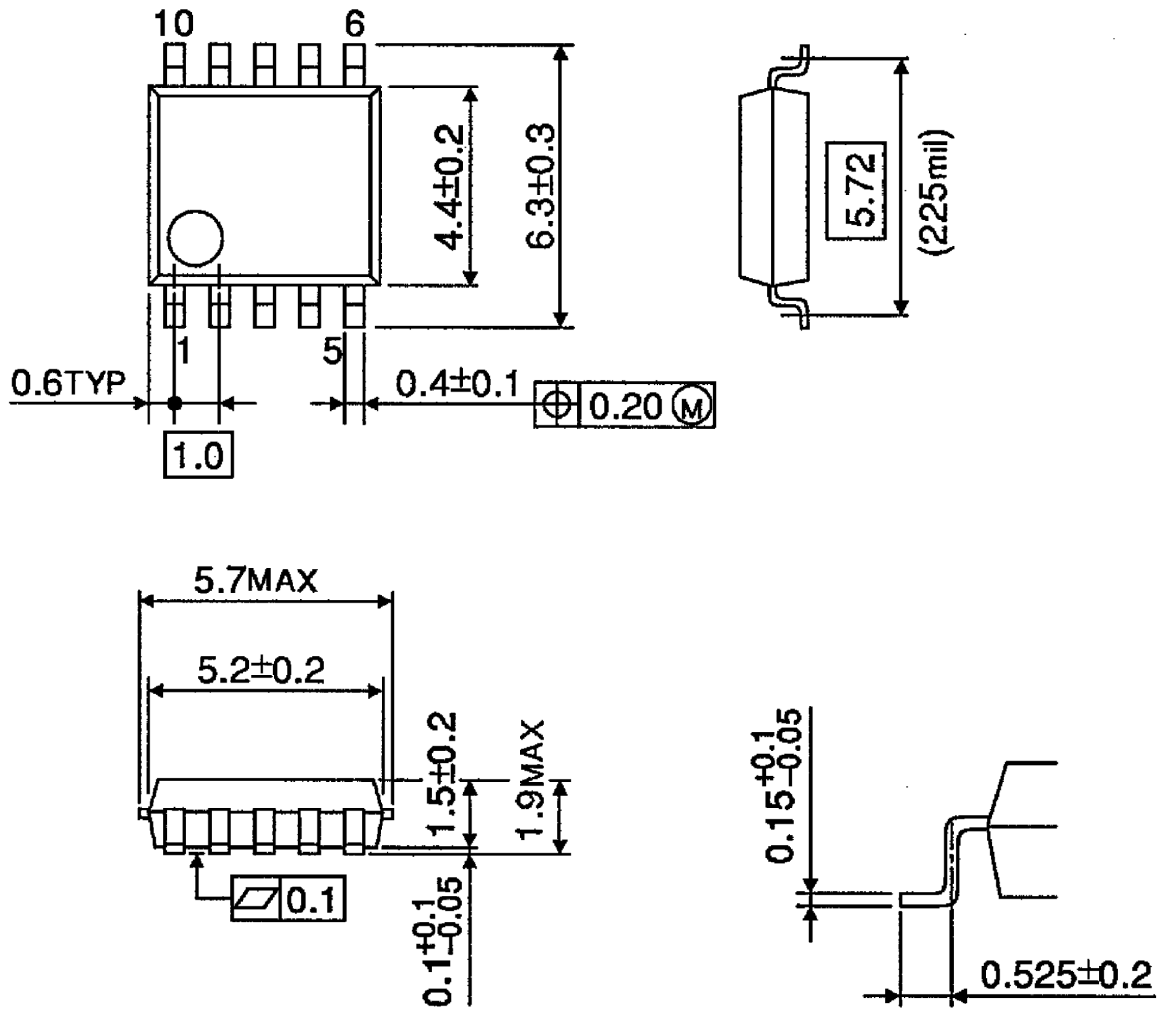


Weight: 0.92g (typ.)

**Package Dimensions**

SSOP10-P-225-1.00

Unit : mm



Weight: 0.09g (typ.)

About solderability, following conditions were confirmed

- Solderability

- (1) Use of Sn-63Pb solder Bath

- solder bath temperature = 230°C
    - dipping time = 5 seconds
    - the number of times = once
    - use of R-type flux

- (2) Use of Sn-3.0Ag-0.5Cu solder Bath

- solder bath temperature = 245°C
    - dipping time = 5 seconds
    - the number of times = once
    - use of R-type flux

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