

TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

# TA2042F

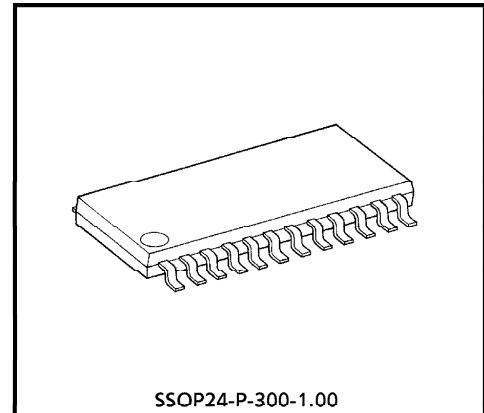
## DUAL PRE AMPLIFIER WITH A MUSIC SEARCH FOR AUTO REVERSE CAR STEREO

The TA2042F is dual pre amplifier with a music interval detection circuit for auto reverse car stereo.

This IC contains dual amplifier, forward/reverse control switch and metal/normal tape equalizer control switch.

### FEATURES

- Low Noise :  $V_{NI} = 0.7 \mu V_{rms}$  (Typ.)  
( $R_g = 620 \Omega$ , BW = 20~20kHz, NAB)
- No input coupling capacitor
- High Voltage Gain :  $G_{VO} = 100dB$  (Typ.)  
( $V_{CC} = 9V$ ,  $f = 1kHz$ )
- Built-in forward/reverse control switch.
- Built-in selecting the sensitivity of the music interval detection circuit.
- Built-in muting function.
- Operating supply voltage :  $V_{CC(opr)} = 6 \sim 15V$

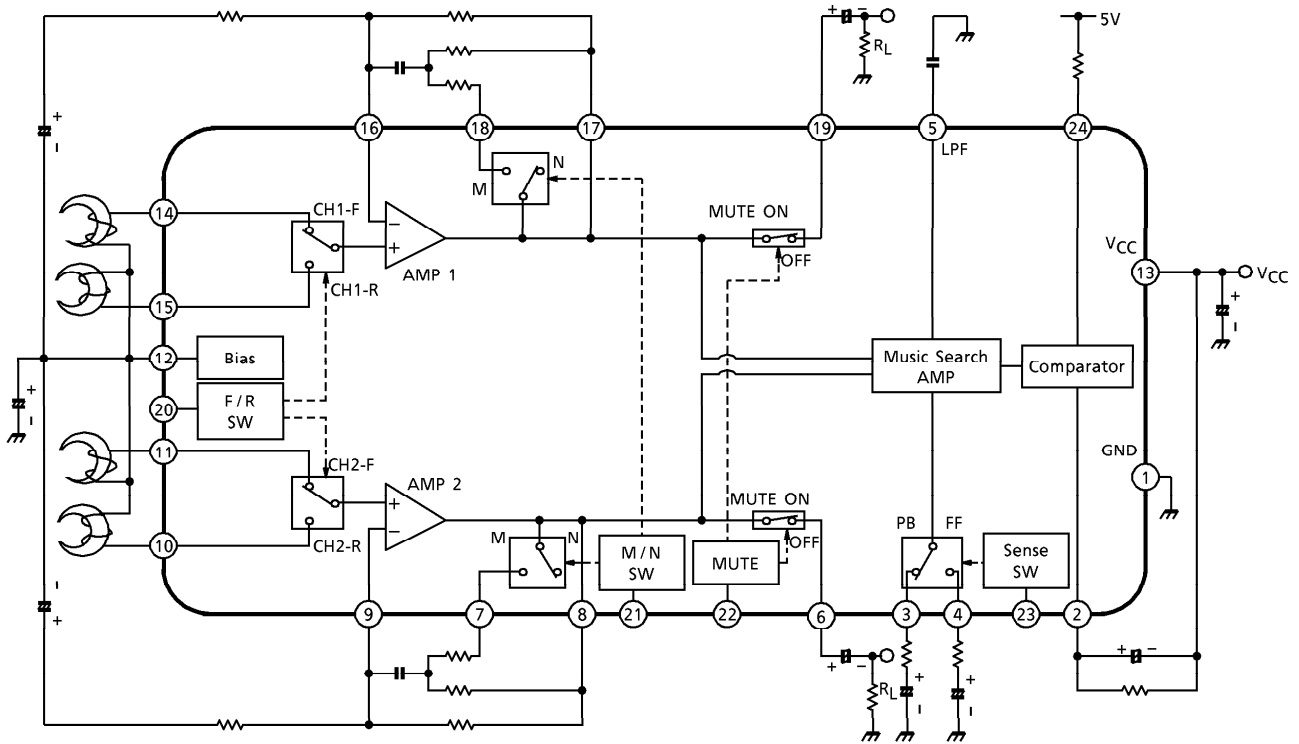


Weight : 0.31g (Typ.)

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BLOCK DIAGRAM



**APPLICATION INFORMATION**

**1. FORWARD, REVERSE SELECT SWITCH**

(1) Threshold voltage

Pin⑳ is coupled to the base of Q<sub>1</sub> (PNP-Tr) as shown in Fig.1.

The recommended Forward, Reverse Select circuit is shown in Fig.2.

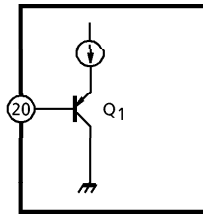


Fig.1

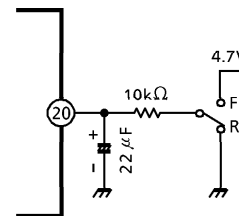


Fig.2

**2. EQUALIZER CONTROL SWITCH**

Pin㉑ is coupled to the base of Q<sub>2</sub> (PNP-Tr) as shown in Fig.3.

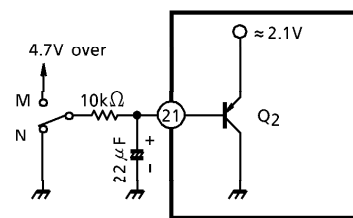


Fig.3

**3. MUTE CONTROL SWITCH**

Pin㉒ is coupled to the base of Q<sub>3</sub> (PNP-Tr) through 10kΩ resistance as shown in Fig.4.

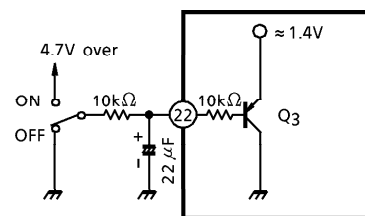


Fig.4

4. SENSITIVITY SELECT SWITCH

Pin 23 is to select the sensitivity of music search.

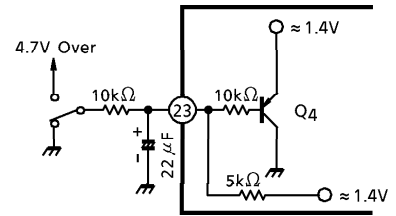


Fig.5

5. MUSIC SEARCH SYSTEM

① Sensor amp.

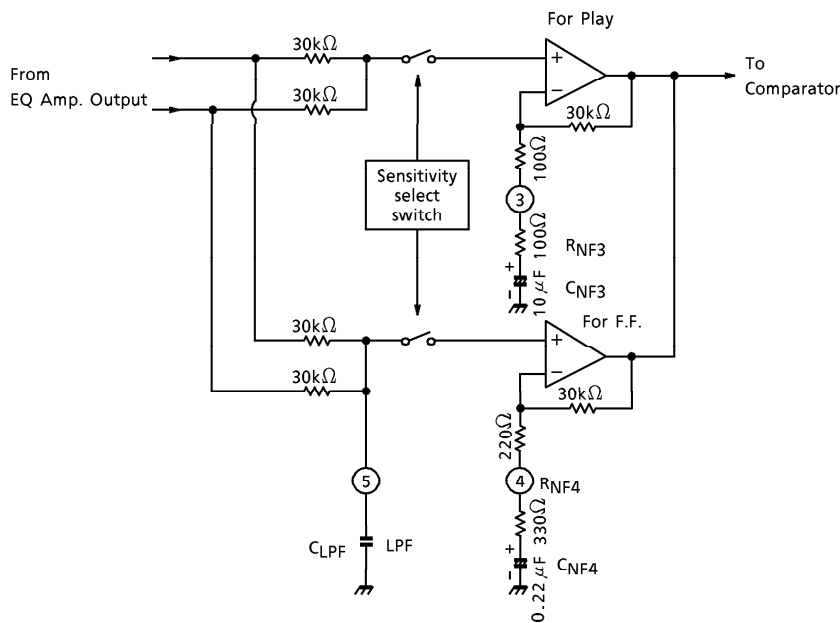


Fig.6 Sensor amp.

This portion is to amplify the voltage between some recorded music signal and next one.

Voltage gains are :

$$\text{For play mode : } G_V (\text{play}) = 20 \log \frac{30\text{k}\Omega + 100 + R_{NF3}}{100 + R_{NF3}} \text{ (dB)}$$

$$\text{For F.F. mode : } G_V (\text{F.F.}) = 20 \log \frac{30\text{k}\Omega + 220 + R_{NF4}}{220 + R_{NF4}} \text{ (dB)}$$

Lower side cut off frequency :

$$\text{For play mode : } f_L (\text{play}) = \frac{1}{2\pi C_{NF3} (100 + R_{NF3})} \text{ (Hz)}$$

$$\text{For F.F. mode : } f_L (\text{F.F.}) = \frac{1}{2\pi C_{NF4} (220 + R_{NF4})} \text{ (Hz)}$$

This  $R_{NF3}$  and  $R_{NF4}$  value decide the sensitivity of music searching, but be careful below as table.

| SENSITIVITY<br>( = $G_V$ (play), $G_V$ (F.F.) ) | INFLUENCE   |
|---|---|
| Too high  | Easy to misoperation or unstable condition.<br>Especially, there is influence by pin 2 voltage variation. |
| Too low   | Possible to be oscillation condition  |

Noise voltage level at tape F.F. mode is larger than play mode's one, and its noise is high frequency. Therefore the sense amp. for F.F. mode has L.P.F. (Low pass filter) circuit.

Its cut off frequency is :

$$f_H (\text{L.P.F.}) = \frac{1}{2\pi C_{LPF} (30\text{k}\Omega // 30\text{k}\Omega)} \text{ (Hz)}$$

② Comparator

This comparator judges whether the signal which is recorded on tape is music or noise. If the signal level from sensor amp. is more than " $V_{ref}$ ", this comparator judges it is "music". On the other hand, the signal level from sensor amp. is less than " $V_{ref}$ ", this judges "noise".

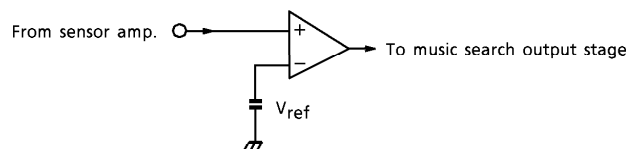


Fig.7 Comparator

③ Music search output stage

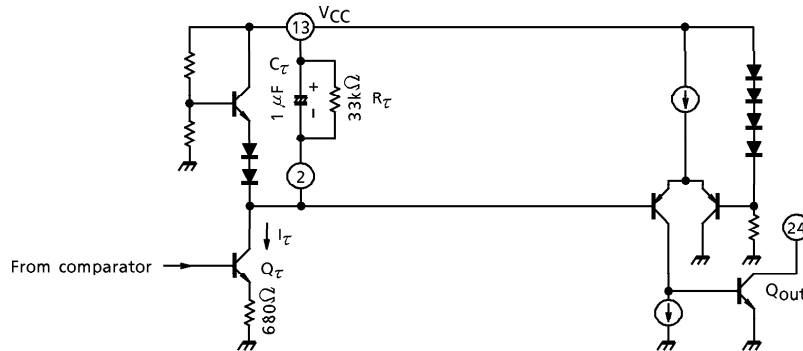


Fig.8 Output stage

To prevent misoperation of music searching, output stage has time constant circuit.

OPERATION FLOW TABLE

| COMPARATOR OUTPUT | Q <sub>τ</sub> | PIN② VOLTAGE | Q <sub>OUT</sub> = MUSIC SEARCH OUTPUT              |
|-------------------|----------------|--------------|---|
| H                 | ON             | Decrease     | "L" at pin② voltage become 「V <sub>CC</sub> - 2.7V」 |
| L                 | OFF            | Increase     | "H" at pin② voltage become 「V <sub>CC</sub> - 2.0V」 |

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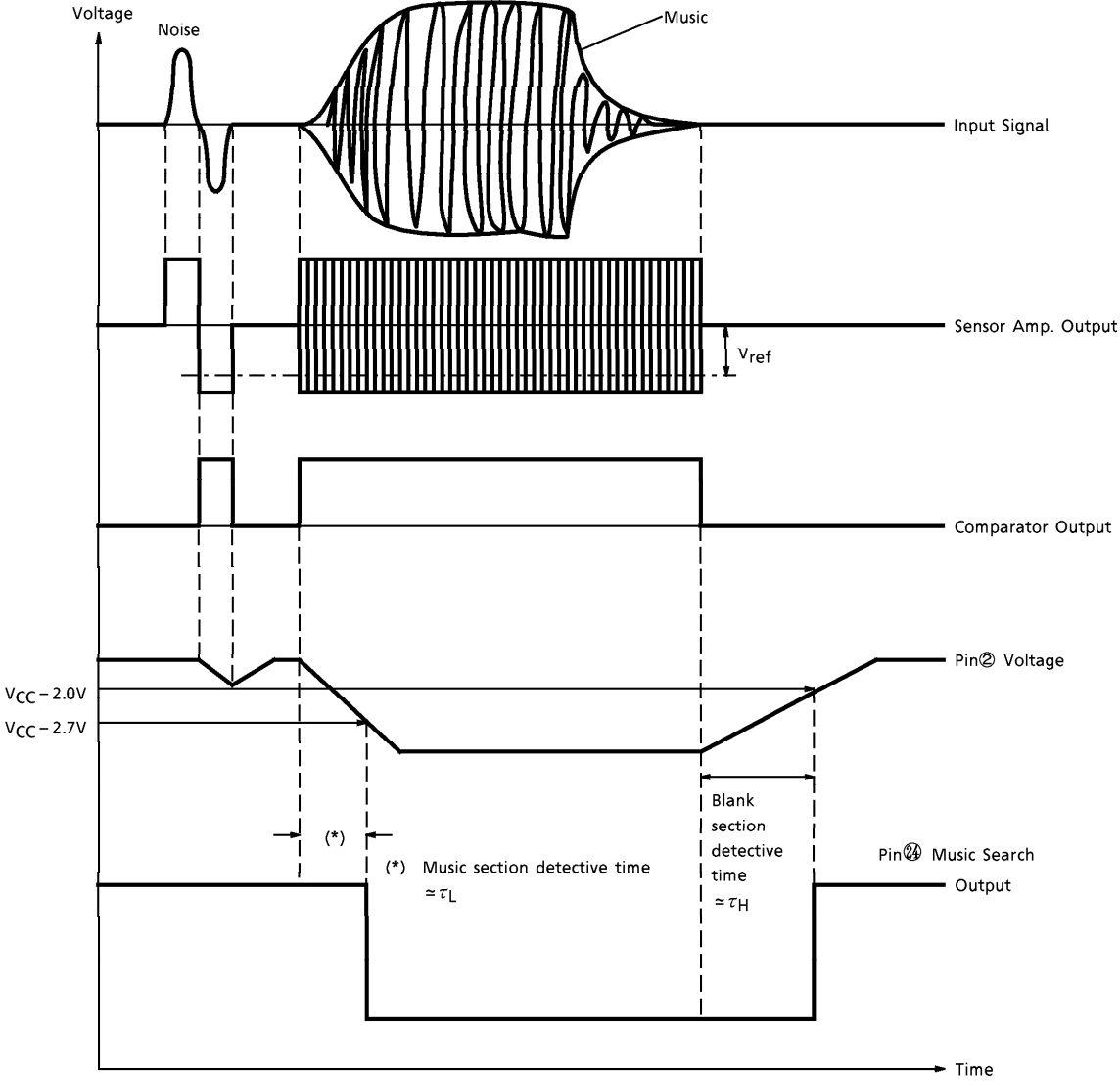
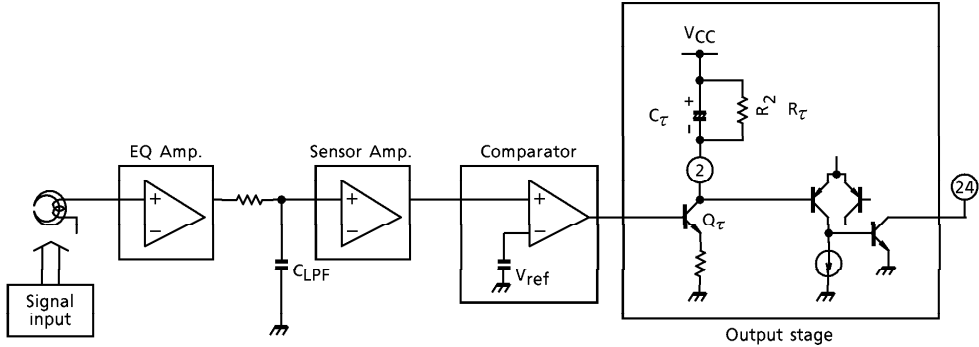
Time constant

Q<sub>out</sub> will be "L" :  $\tau_L = \frac{5.4 C_\tau}{I}$  (s) (I = 1mA)

"H" :  $\tau_H = C_\tau \cdot R_\tau \cdot \ell_n = \frac{\frac{V_{CC}}{2} + 2.0}{2.0}$  (s)

R<sub>τ</sub> must be used more than 22kΩ

④ Music searching flow



**MAXIMUM RATINGS** (Ta = 25°C)

| CHARACTERISTIC        | SYMBOL           | RATING   | UNIT |
|-----------------------|------------------|----------|------|
| Supply Voltage        | V <sub>CC</sub>  | 16       | V    |
| Power Dissipation     | P <sub>D</sub>   | 750      | mW   |
| Operating Temperature | T <sub>opr</sub> | - 30~85  | °C   |
| Storage Temperature   | T <sub>stg</sub> | - 55~150 | °C   |

(Note) Derated above Ta = 25°C in the proportion of 6mW/°C

**ELECTRICAL CHARACTERISTICS**

(Unless otherwise specified V<sub>CC</sub> = 9.0V, f = 1kHz, R<sub>L</sub> = 10kΩ, R<sub>g</sub> = 600Ω, Ta = 25°C,  
 (Normal EQ : EQ SW = 0.2V, Mute off : Mute SW = 0.2V, Play Mode : Sense SW = 0.2V)

| CHARACTERISTIC                   | SYMBOL               | TEST CIR-CUIT | TEST CONDITION   | MIN.   | TYP.   | MAX.   | UNIT             |
|----------------------------------|----------------------|---------------|--|--------|--------|--------|------------------|
| Quiescent Current                | I <sub>CCQ</sub> (1) | —             | V <sub>IN</sub> = 0 Normal EQ  | —      | 10     | 15     | mA               |
|                                  | I <sub>CCQ</sub> (2) |               | V <sub>IN</sub> = 0 Metal EQ<br>EQ SW = 4.7V   | —      | 11     | 16     |                  |
| Open Loop Gain                   | G <sub>VO</sub>      | —             | C <sub>f</sub> = 100μF, R <sub>f</sub> = 0   | —      | 100    | —      | dB               |
| Maximum Output Voltage           | V <sub>OM</sub>      | —             | THD = 1%   | 1.5    | 2.0    | —      | V <sub>rms</sub> |
| Total Harmonic Distortion        | THD                  | —             | V <sub>OUT</sub> = 0.5V <sub>rms</sub>   | —      | 0.03   | 0.12   | %                |
| Equivalent Input Noise Voltage   | V <sub>NI</sub>      | —             | R <sub>g</sub> = 620Ω,<br>BPF = 20~20kHz   | —      | 0.7    | 1.5    | μV               |
| Ripple Rejection                 | R.R.                 | —             | V <sub>RIP</sub> = - 20dBV,<br>f <sub>RIP</sub> = 100Hz  | 40     | 56     | —      | dB               |
| Cross Talk                       | C.T.                 | —             | V <sub>OUT</sub> = 1V <sub>rms</sub>   | 55     | 68     | —      | dB               |
| Forward / Reverse Cross Talk     | C.T.                 | —             | V <sub>OUT</sub> = 0.775V <sub>rms</sub><br>@Forward F / R SW = 0.2V<br>@Reverse F / R SW = 4.7V | 55     | 65     | —      | dB               |
| Mute Level                       | M.L.                 | —             | V <sub>OUT</sub> = - 10dBV<br>Mute ON :<br>Mute SW = 4.7V  | 60     | 78     | —      | dB               |
| Music Detective Input Level 1    | V <sub>ON1</sub>     | —             | f = 5kHz, PLAY   | - 90.5 | - 93.5 | - 96.5 | dBV              |
| Music Detective Input Level 2    | V <sub>ON2</sub>     | —             | f = 10kHz, Fast Forward  | - 78   | - 82   | —      | dBV              |
| Music Section Detective Time (*) | τ <sub>1</sub>       | —             | V <sub>IN</sub> = - 78dBV,<br>STEP INPUT   | —      | 7      | —      | ms               |
| Blank Section Detective Time (*) | τ <sub>2</sub>       | —             | V <sub>IN</sub> = - 66dBV,<br>STEP INPUT<br>Fast Forward :<br>Sense SW = 4.7V                    | —      | 48     | —      | ms               |

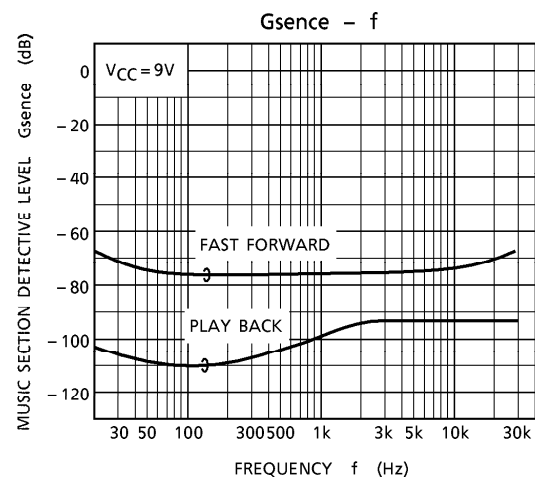
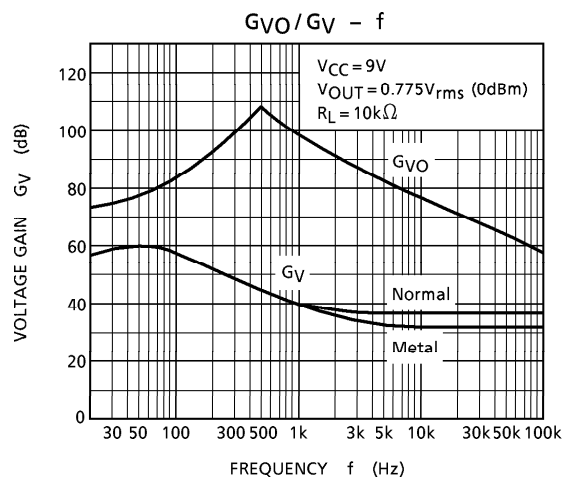
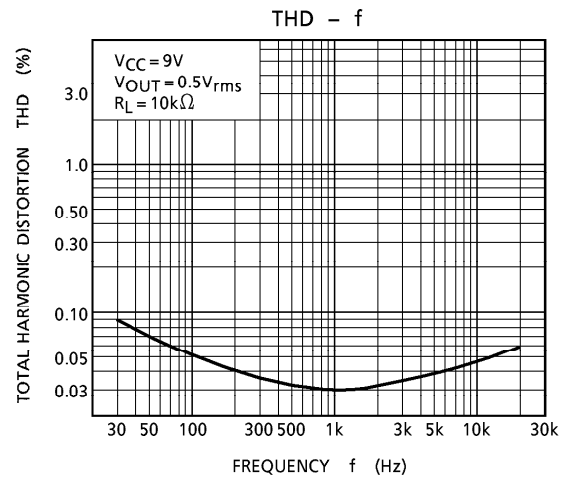
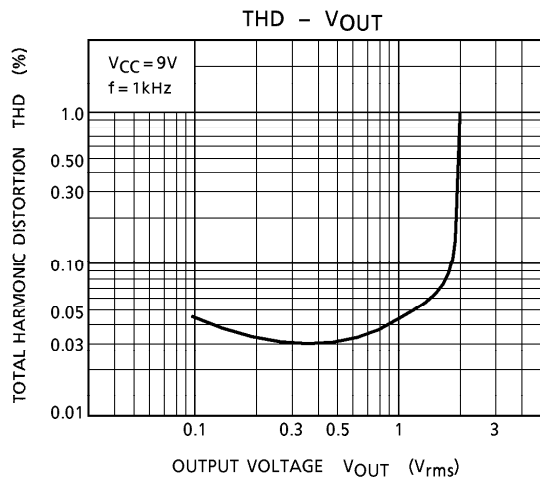
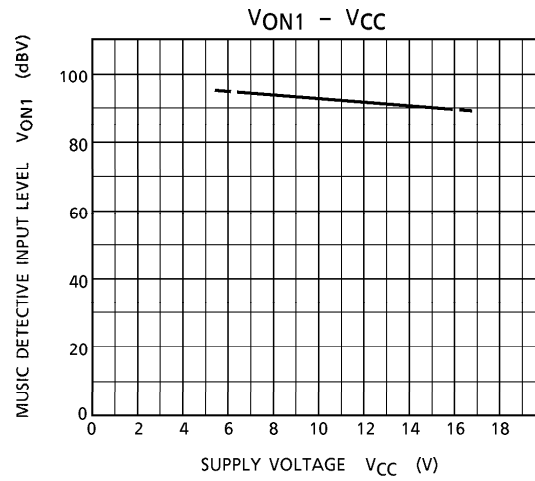
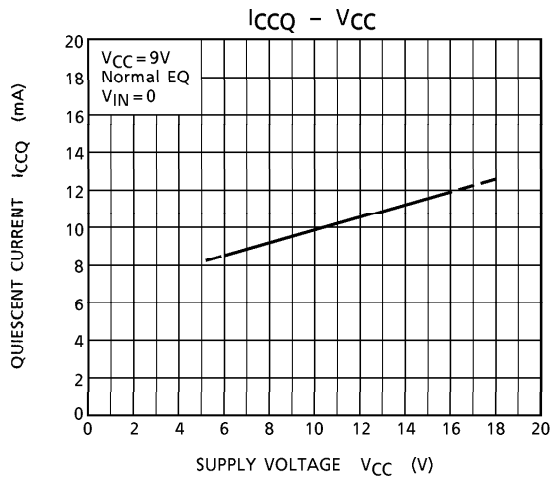
(\*) Design Guarantee (not tested)

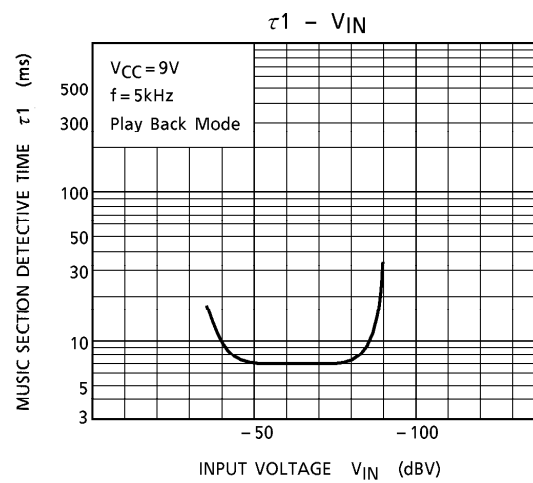
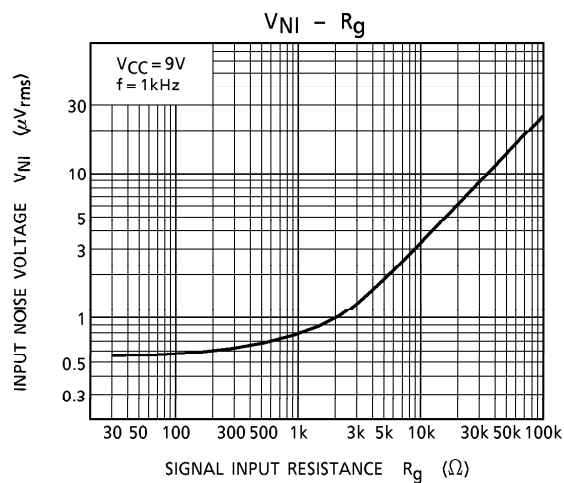
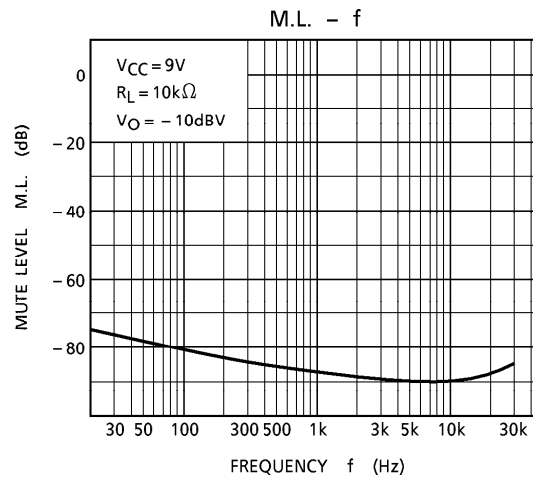
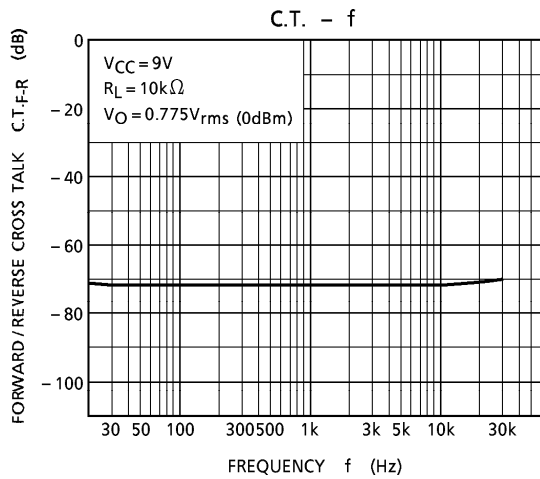
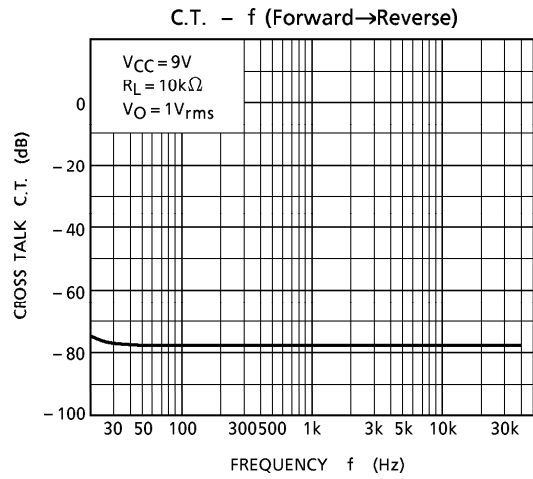
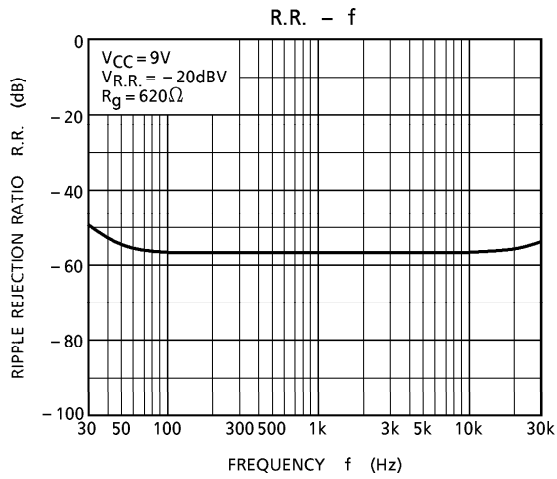


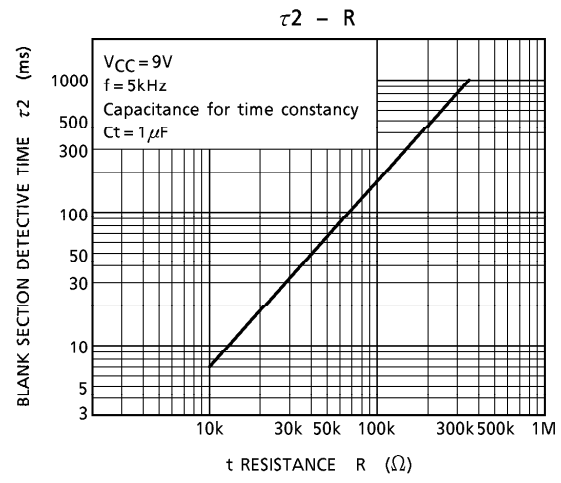
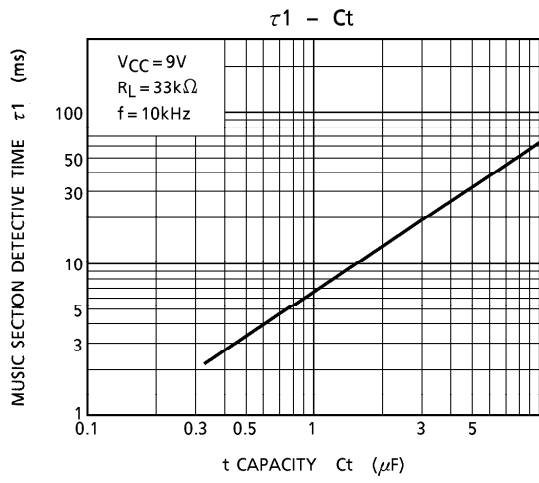
| CHARACTERISTIC                            | SYMBOL   | TEST CIRCUIT | TEST CONDITION   | MIN. | TYP. | MAX. | UNIT    |
|---|----------|--------------|--|------|------|------|---------|
| Output Sink Current ;<br>Logic is Low     | $I_{OL}$ | —            | $R1 = 1k\Omega$ , $V_{IN} = -78dBV$ ,<br>$f = 5kHz$                  | 1    | 5    | —    | mA      |
| Output Leak Current ;<br>Logic is High    | $I_{OH}$ | —            | $V_{IN} = -84dBV$ , $f = 10kHz$<br>Fast Forward :<br>Sense SW = 4.7V | —    | 1    | 10   | $\mu A$ |
| Logic Input Threshold Level<br>(Low) (*)  | $V_{IL}$ | —            |  | —    | —    | 0.2  | V       |
| Logic Input Threshold Level<br>(High) (*) | $V_{IH}$ | —            |  | 4.7  | —    | —    | V       |

(\*) Design Guarantee (not tested)

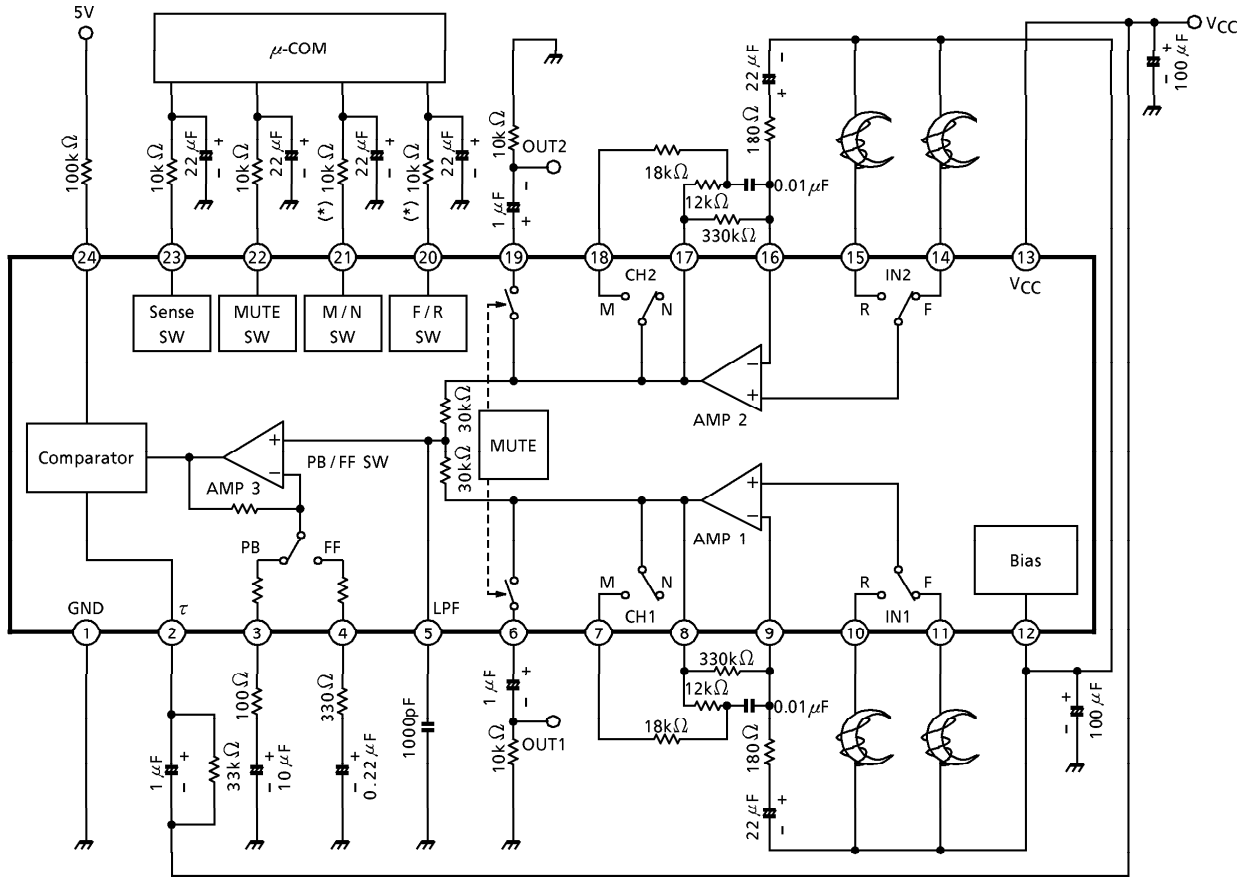








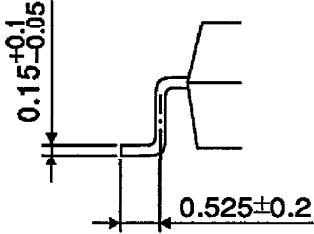
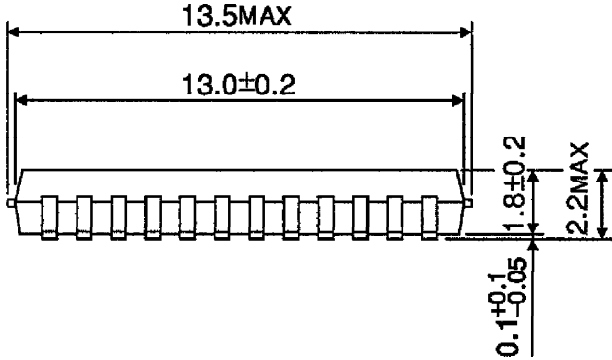
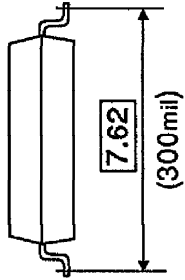
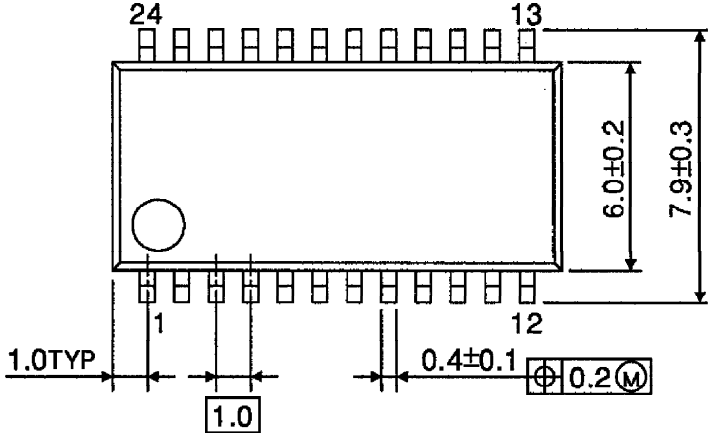
APPLICATION EXAMPLE



(\*) Caution : This value is different from before announced it.

OUTLINE DRAWING  
SSOP24-P-300-1.00

Unit : mm



Weight : 0.31g (Typ.)