TOSHIBA INTEGRATED CIRCUIT
TECHNICAL DATA

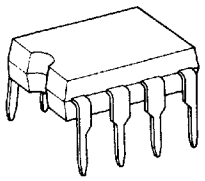
# TA31001P, TA31002P, TA31002AP
# TA31001F, TA31002F, TA31002AF

TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT
SILICON MONOLITHIC

## TONE RINGER (For telephone set)

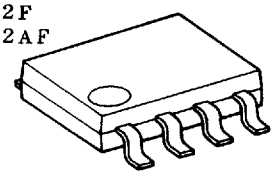
- Current consumption is small. (at no-load)
- Package is compact. (DIP-8 pin)
- Oscillation frequency is variable.
- Built-in threshold circuits prevent false triggering due to power noise as well as "chirps" due to rotary dial.
- Few external components.

TA31001P
TA31002P
TA31002AP



DIP8-P-300A

TA31001F
TA31002F
TA31002AF



SOP8-P-225

Weight:

DIP16-P-300A: 1.0g(Typ.)
SSOP16-P-225: 0.2g(Typ.)

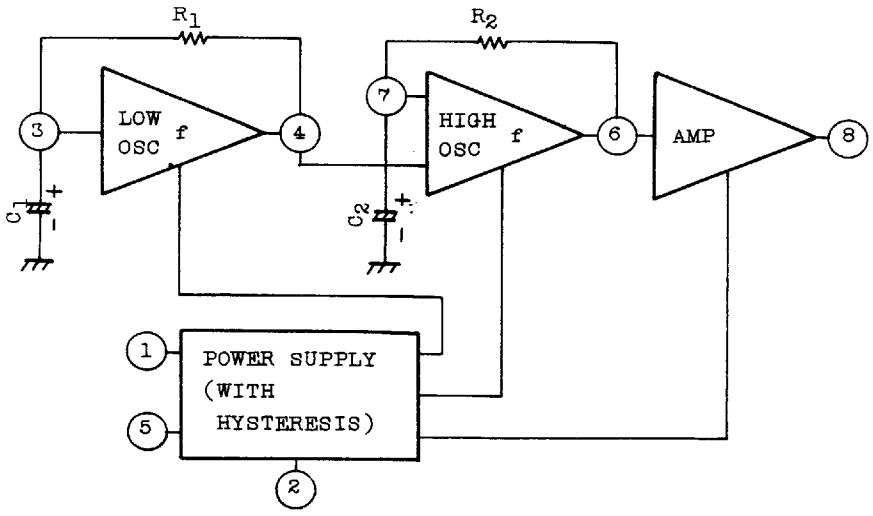
## DIFFERENCE BETWEEN TA31002P/F AND TA31002AP/AF

| NAME OF PRODUCT | INITIATION SUPPLY VOLTAGE | SUSTAINING SUPPLY VOLTAGE |
|---|---|---|
| TA31002P/F | 19V (Typ.) | 12V (Typ.) |
| TA31002AP/AF | 16V (Typ.) | 9V (Typ.) |

## MAXIMUM RATINGS (Ta=25°C)

| CHARACTERISTIC | | SYMBOL | RATING | UNIT |
|---|---|---|---|---|
| Power Supply Voltage | | $V_{CC}$ | 30 | V |
| Power Dissipation | P/AP Type | $P_D$ | 800 | mW |
| | F/AF Type | | 350 | |
| Operating Temperature | | Topr | -40~85 | °C |
| Storage Temperature | | Tstg | -55~150 | °C |

## BLOCK DIAGRAM

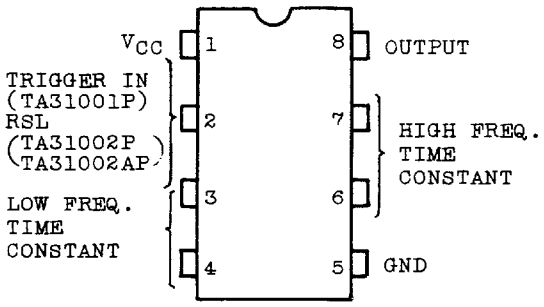



Note: $R_1$, $R_2$, $C_1$ and $C_2$ are parts externally mounted.

PIN CONNECTION

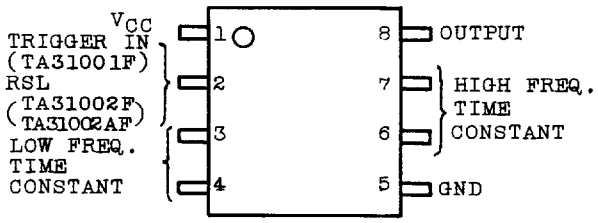
TA31001P/TA31002P/TA31002AP

(TOP VIEW)




TA31001F/TA31002F/TA31002AF

(TOP VIEW)




ELECTRICAL CHARACTERISTICS (Ta=25°C) TA31001P/F, TA31002P/F

| CHARACTERISTIC | | SYMBOL | TEST CIR-CUIT | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|---|---|
| Operating Voltage | | $V_{opr}$ | - | | - | - | 29 | V |
| Initiation Supply Voltage | | $V_{si}$ | - | (Note 1) | 17 | 19 | 21 | V |
| Sustaining Supply Voltage | | $V_{sus}$ | - | (Note 2) | 10.5 | 12 | - | V |
| Initiation Current Consumption | | $I_{si}$ | - | No-Load | 1.4 | 3.3 | 4.2 | mA |
| Sustaining Current Consumption | | $I_{sus}$ | - | No-Load | 0.7 | 1.4 | 2.5 | mA |
| Oscillation Frequency (Note 3) | | $f_L$ | - | $C_1$=0.47μF, $R_1$=165kΩ | 9 | 10 | 11 | Hz |
| | | $f_{H1}$ | - | $C_2$=6800pF, $R_2$=191kΩ | 461 | 512 | 563 | Hz |
| | | $f_{H2}$ | - | $C_2$=6800pF, $R_2$=191kΩ | 576 | 640 | 703 | Hz |
| Output Voltage | "H" Level | $V_{OH}$ | - | $V_{CC}$=24V, $I_{OH}$=-10mA PIN 7=GND | 20.0 | 21.5 | 22.5 | V |
| | "L" Level | $V_{OL}$ | - | $V_{CC}$=24V, $I_{OL}$=10mA PIN 7=7V | 0.7 | 1.0 | 2.0 | V |
| TRIGGER IN Terminal Operating Voltage (TA31001P/F) | | $V_{Trig}$ | - | $V_{CC}$=15V I(PIN)=100μA | 7.8 | 10 | 11.5 | V |

ELECTRICAL CHARACTERISTICS (Ta=25°C) TA31002AP/AF

| CHARACTERISTIC | | SYMBOL | TEST CIR-CUIT | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|---|---|
| Operating Voltage | | $V_{opr}$ | - | | - | - | 29 | V |
| Initiation Supply Voltage | | $V_{si}$ | - | (Note 1) | 14 | 16 | 18 | V |
| Sustaining Supply Voltage | | $V_{sus}$ | - | (Note 2) | 8.4 | 9.0 | - | V |
| Initiation Current Consumption | | $I_{si}$ | - | No-Load | 1.1 | 2.7 | 3.6 | mA |
| Sustaining Current Consumption | | $I_{sus}$ | - | | 0.3 | 0.8 | 1.8 | mA |
| Oscillation Frequency (Note 3) | | $f_L$ | - | $C_1$=0.47μF, $R_1$=165kΩ | 9 | 10 | 11 | Hz |
| | | $f_{H1}$ | - | $C_2$=6800pF, $R_2$=191kΩ | 461 | 512 | 563 | |
| | | $f_{H2}$ | | | 576 | 640 | 703 | |
| Output Voltage | "H" Level | $V_{OH}$ | - | $V_{CC}$=24V, $I_{OH}$=-10mA PIN 7=GND | 20.0 | 21.5 | 22.5 | V |
| | "L" Level | $V_{OL}$ | - | $V_{CC}$=24V, $I_{OL}$=10mA PIN 7=5V | 0.7 | 1.0 | 2.0 | |

Note 1. Initiation Supply Voltage ($V_{si}$) is a supply voltage required to start oscillation of the tone ringer.

2. Sustaining Supply Voltage ($V_{sus}$) is a supply voltage required to maintain oscillation of the tone ringer.

3. Oscillation frequency is determined by the following equations 1,2, and 3.
(1) $f_L=1/1.234 \cdot R_1 \cdot C_1$ (Hz), (2) $f_{H1}=1/1.515 \cdot R_2 \cdot C_2$ (Hz), (3) $f_{H2}=1.24\ f_{H1}$ (Hz)

METHOD OF USING PIN 2

1. TA31001P/F METHOD OF USING TRIGGER IN

Usually PIN 2 is used at an open state, but in the TA31001P/F, the TRIGGER IN terminal can prohibit oscillation and also can change the initiation supply voltage ($V_{si}$).

When the TA31001P/F is oscillating ($V_{sus} < V_S$), if PIN 2 is connected to GND as shown in Fig. 1a, the TA31001P/F can stop oscillating. Further, the oscillation of the TA31001P/F can be stopped by connecting PIN 2 to voltage $V_I$ through the resistor $R_I$ as shown in Fig. 1b.

In case of $V_{sus} < V_S \leq V_{si}$, the oscillation of the TA31001P/F can be started by forcing a current $I_E$ ($4\mu A < I_E < 1mA$) into PIN 2.

If PIN 2 is connected to Vs as shown in Fig. 2a, oscillation can be started under a lower supply voltage than the initiation supply voltage at the time when PIN 2 is used at an open state.

Further, the initiation supply voltage ($V_{si}$) can be changed by using a zener diode as shown in Fig. 2b.

$V_{si}$ is determined by the following formulas:

$$V_{si} = V_{Trig} + V_Z + 4R_E$$

$$R_E = \quad (M\Omega)$$

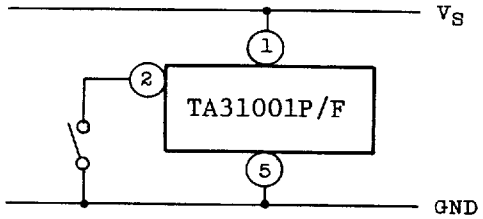



Fig. 1a

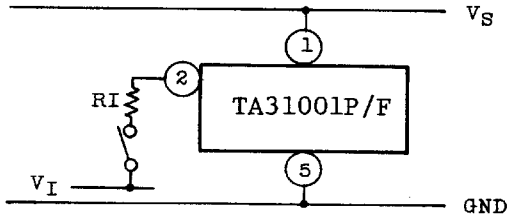
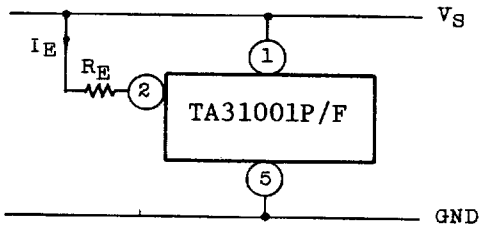



Fig. 1b $0 \leq V_I \leq 0.5V$

$0 \leq R_I \leq 20k\Omega$




$$10k\Omega < R_E < \frac{(V_S - 10)}{4} \quad (M\Omega)$$

Fig. 2a

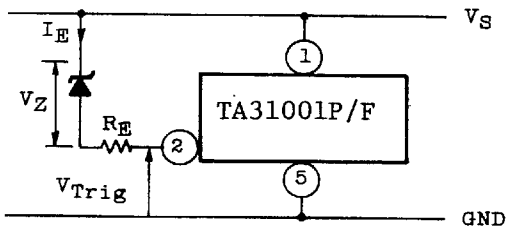



Fig. 2b

2. TA31002P/F, TA31002AP/AF METHOD OF USING RSL

In the TA31002P/F,TA31002AP/AF the initiation current consumption ($I_{si}$) can be changed by using the RSL terminal.

The resistor $R_{SL}$ is connected to GND from PIN 2 as shown in Fig. 3.

Further, the initiation current consumption ($I_{si}$) can be changed by changing the value of $R_{SL}$.

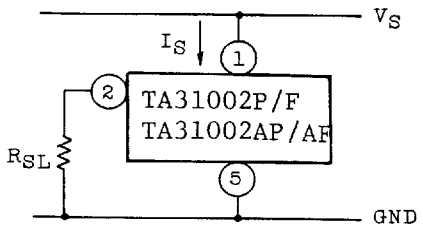



Fig. 3

Fig. 4 and Fig. 5 show the graph of $V_S$-$I_S$ characteristic at the time when $R_{SL}$ has been changed to three values. The $V_S$-$I_S$ characteristic in TA31002P/F at the time when $R_{SL}$=6.8kΩ coincides with that at the time when PIN 2 of the TA31001P/F has been used at an open state.

TA31002P/F SUPPLY VOLTAGE-CURRENT CONSUMPTION

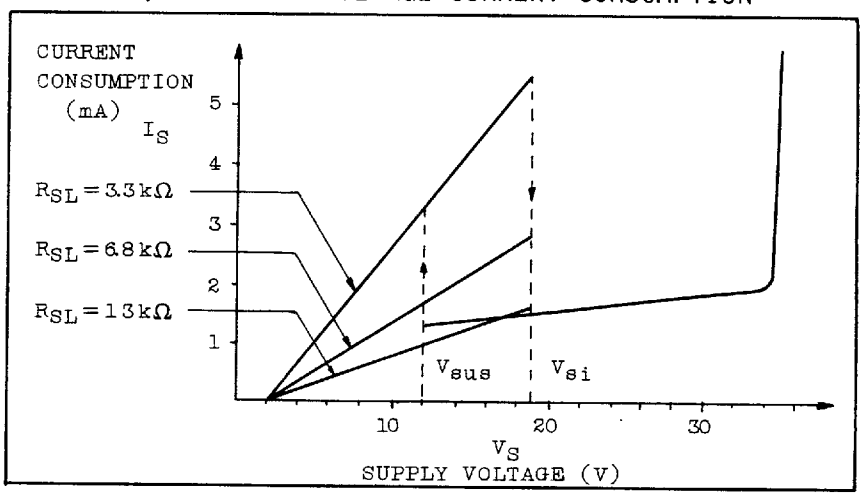



Fig. 4

TA31002AP/AF SUPPLY VOLTAGE-CURRENT CONSUMPTION

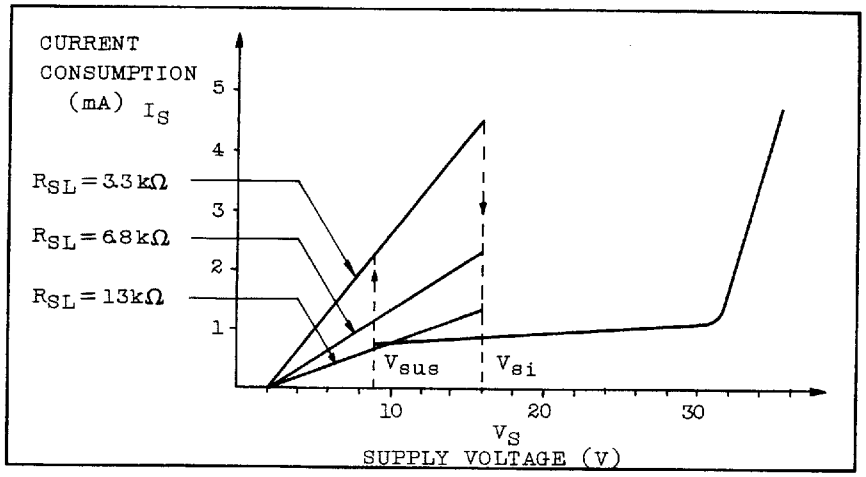
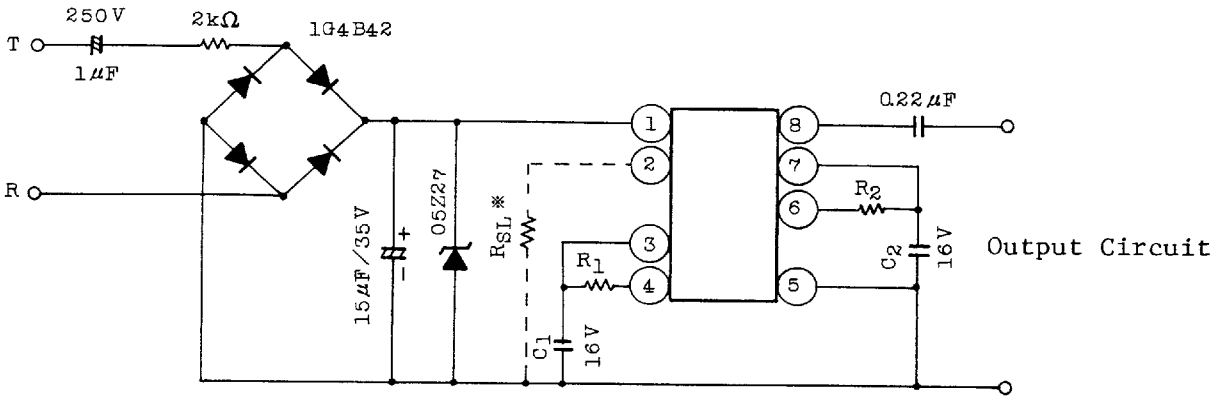



Fig. 5

APPLICATION CIRCUIT OF TONE RINGER




※ Use for TA31002P/F, TA31002AP/AF

$f_L = 1/1.234R_1 \cdot C_1$

$f_{H1} = 1/1.515R_2 \cdot C_2$

$f_{H2} = 1.24f_{H1}$

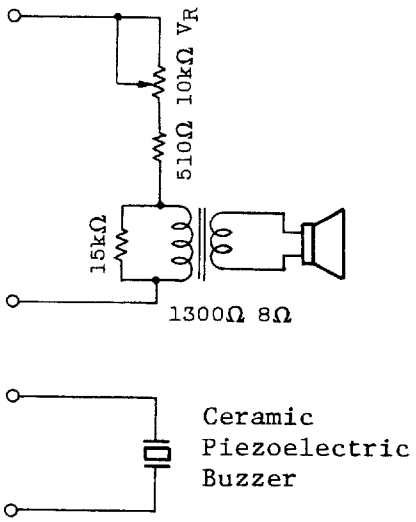
Example $R_1$=165kΩ $R_2$=191kΩ

$C_1$=0.47μF $C_2$=0.0068μF

$f_L \fallingdotseq 10Hz$ $f_{H1} \fallingdotseq 500Hz$

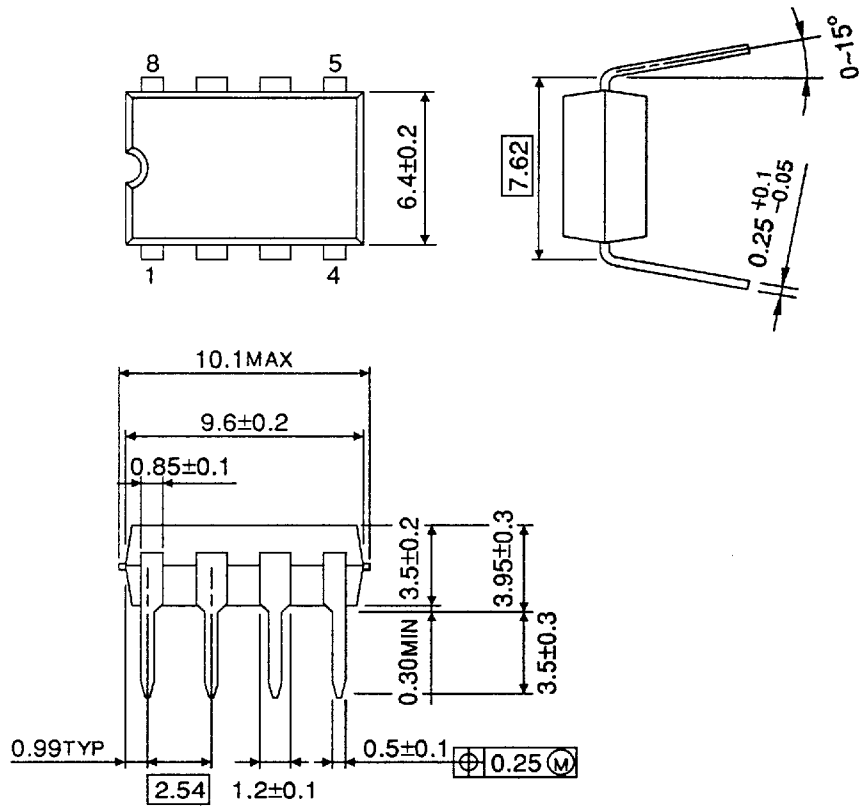
$f_{H2} \fallingdotseq 630Hz$

Example of
Output Circuit



## OUTLINE DRAWING
DIP8-P-300A

Unit in mm




Weight : 0.5g (Typ.)