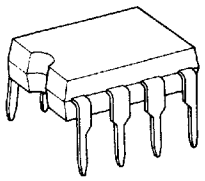
TA31001P, TA31002P, TA31002AP
TA31001F, TA31002F, TA31002AF

TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT
SILICON MONOLITHIC

TONE RINGER (For telephone set)

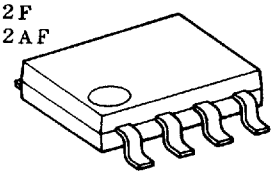
- Current consumption is small. (at no-load)
- Package is compact. (DIP-8 pin)
- Oscillation frequency is variable.
- Built-in threshold circuits prevent false triggering due to power noise as well as "chirps" due to rotary dial.
- Few external components.

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.)

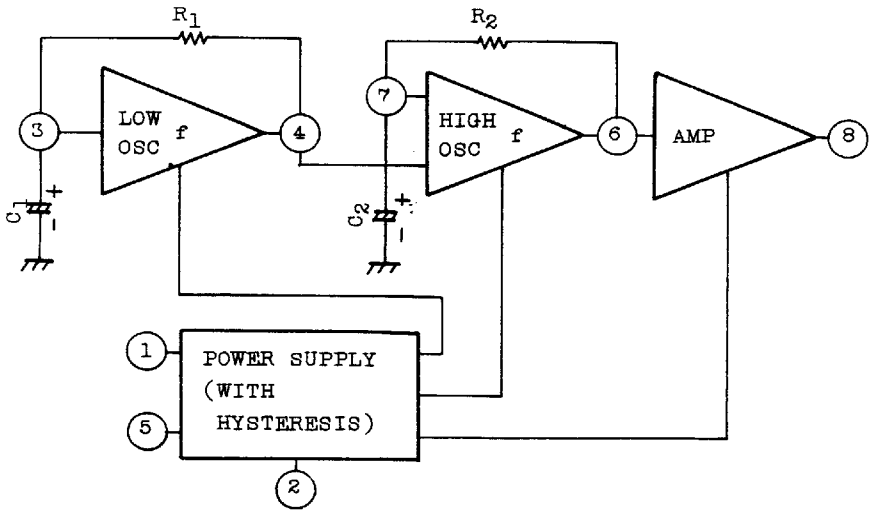
DIFFERENCE BETWEEN TA31002P/F AND TA31002AP/AF

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



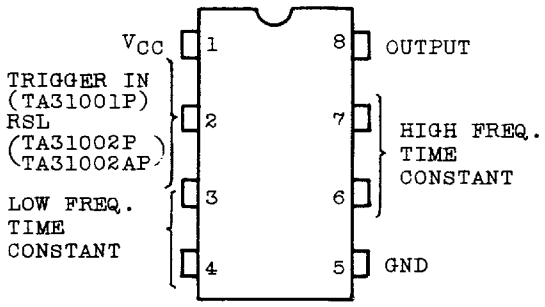
Note: R_1, R_2, C_1 and C_2 are parts externally mounted.

TA31001P, TA31002P, TA31002AP
TA31001F, TA31002F, TA31002AF

PIN CONNECTION

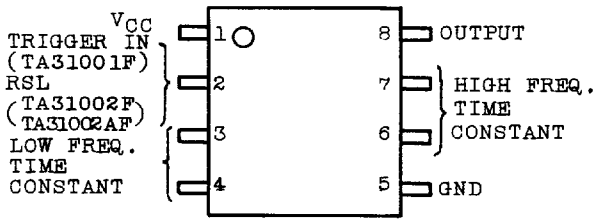
TA31001P/TA31002P/TA31002AP

(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}	-		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	
		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=7V	0.7	1.0	2.0	
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:

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

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

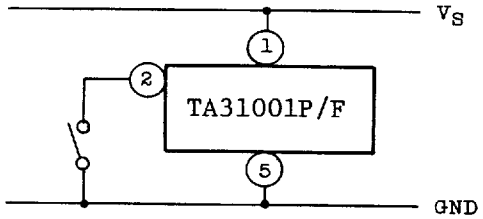


Fig. 1a

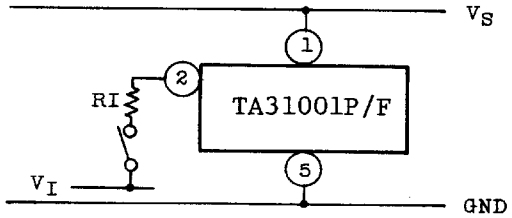
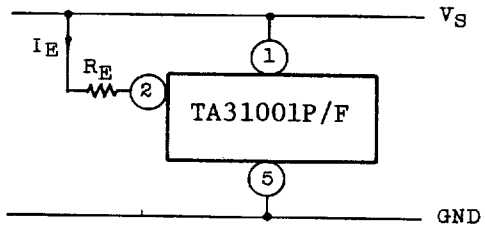


Fig. 1b $0 \leq V_I \leq 0.5V$

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



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

Fig. 2a

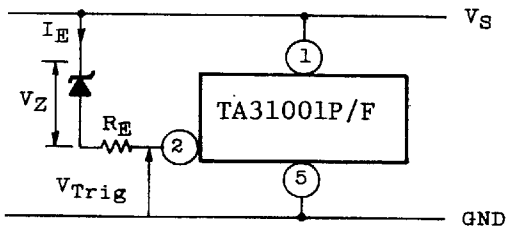


Fig. 2b

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}.

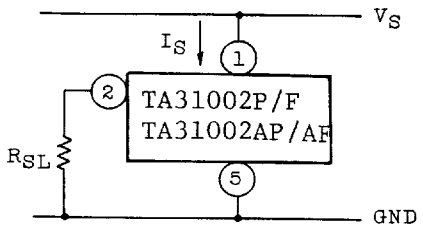


Fig. 3

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

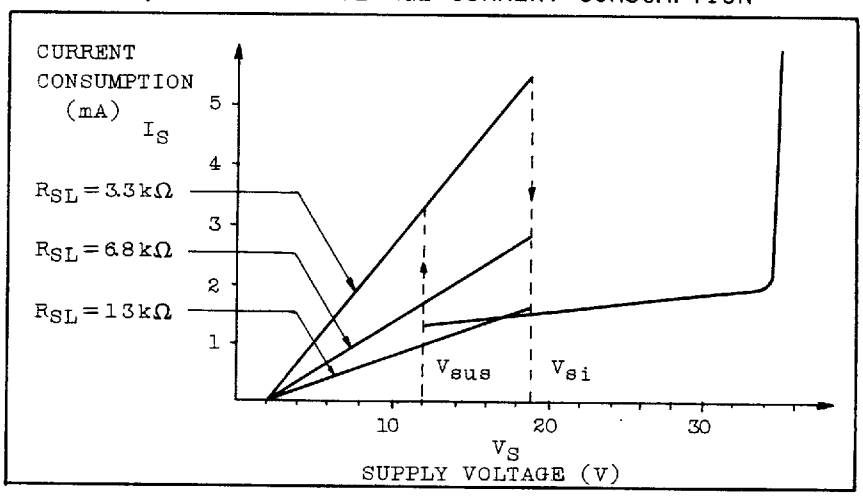


Fig. 4

TA31002AP/AF SUPPLY VOLTAGE-CURRENT CONSUMPTION

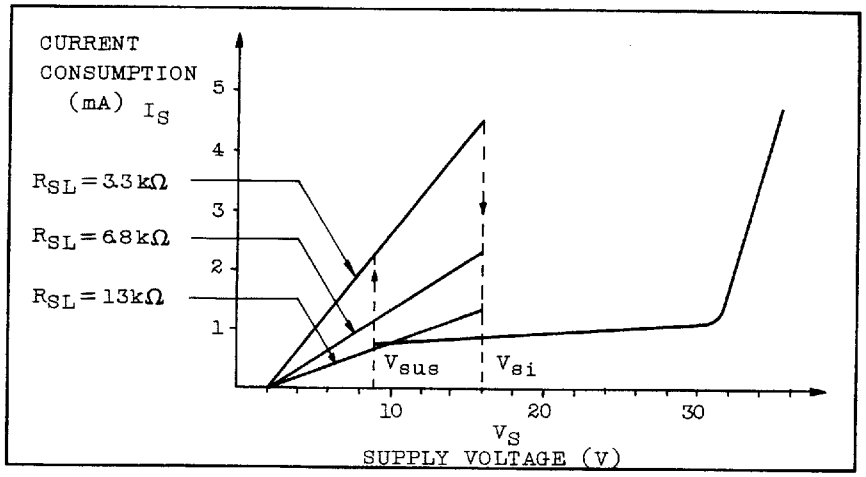
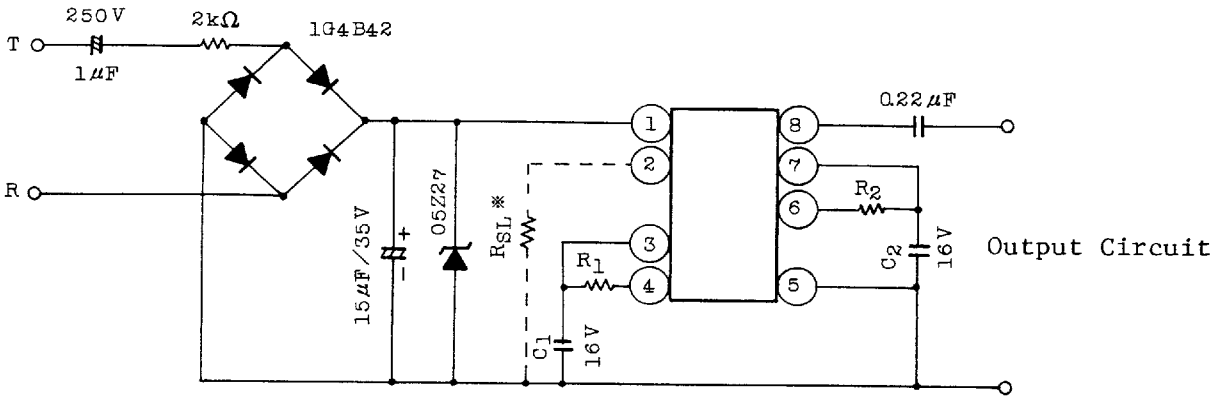


Fig. 5

APPLICATION CIRCUIT OF TONE RINGER



※ Use for TA31002P/F, TA31002AP/AF

$f_L = 1/1.234R_1 \cdot C_1$

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

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

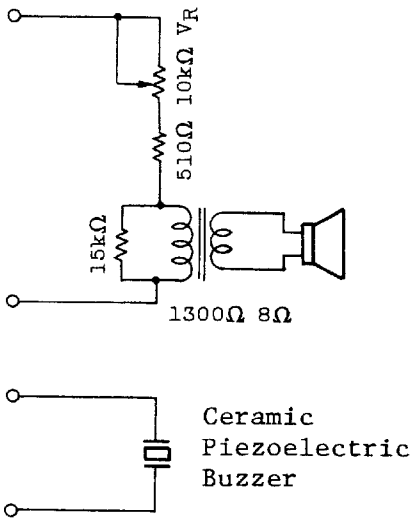
Example R_1=165kΩ R_2=191kΩ

C_1=0.47μF C_2=0.0068μF

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

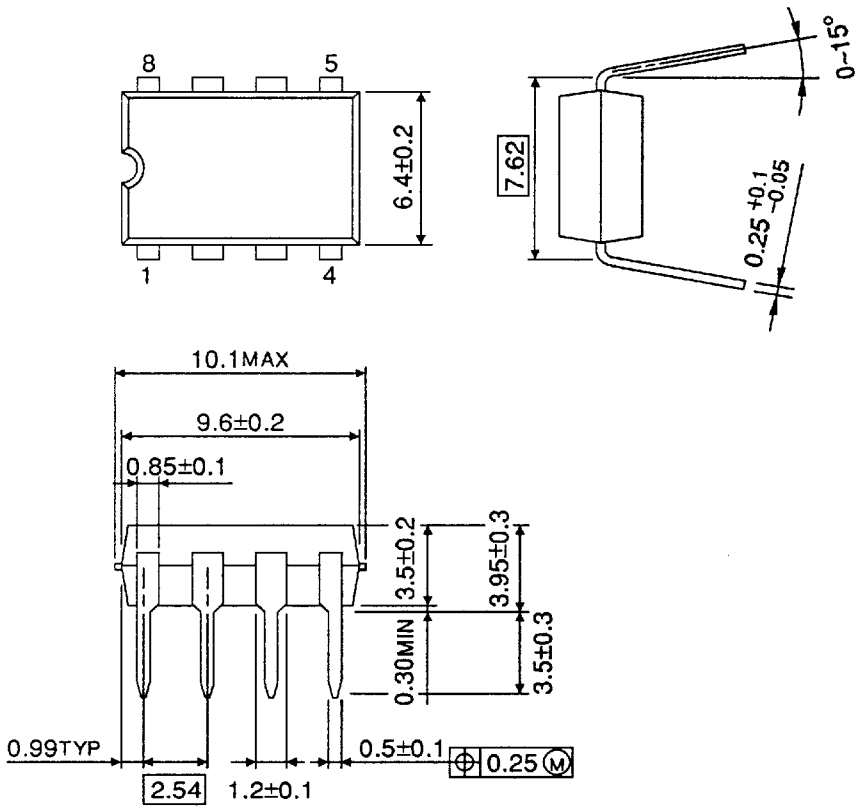
$f_{H2} \fallingdotseq 630Hz$

Example of
Output Circuit



OUTLINE DRAWING
DIP8-P-300A

Unit in mm



Weight : 0.5g (Typ.)