

# Tone ringer IC for telephone set

## BA8204/BA8204F

The BA8204 and BA8204F are tone ringer ICs which produce a bell sound from a ringing signal. The frequency of the bell sound can be varied by changing the constants of the external resistance and capacitors.

The ringer threshold voltage can be changed at the TRG pin.

Also, the output load can be selected, as a piezoelectric buzzer, a transformer coupled speaker, or other similar devices.

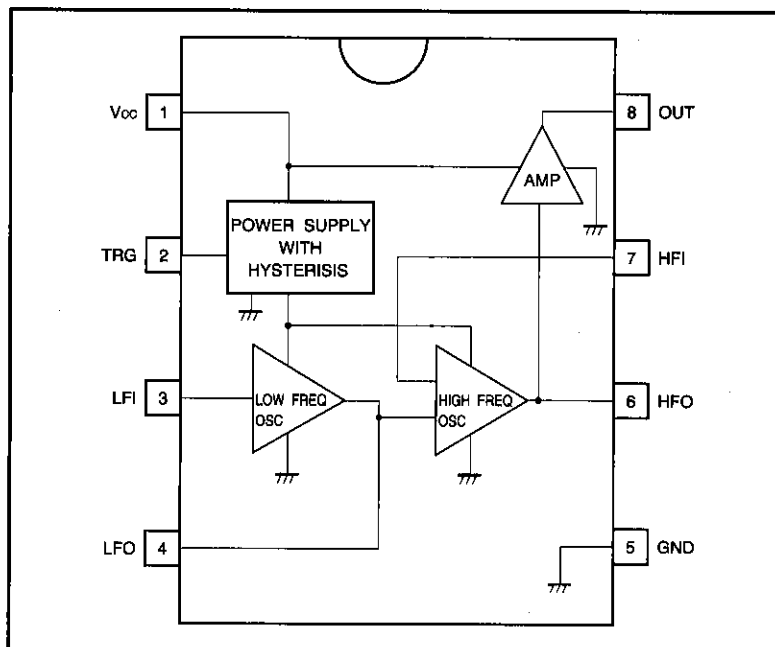
### ●Applications

Telephones, multi-function telephones, telephone answering machines, facsimile machines, equipment involving telephones

### ●Features

- 1) Low current consumption.
- 2) Withstands up to 40V.
- 3) Ringer threshold voltage can be changed at the TRG pin.
- 4) Pin layout is compatible with the BA6564A and ML8204.

### ●Block diagram



## ● Absolute maximum ratings (Ta=25°C)

Parameter	Symbol	Limits	Unit
Power supply voltage	V <sub>CC</sub>	40	V
Power dissipation	BA8204	500*1	mW
	BA8204F	450*2	
Operating temperature	T <sub>opr</sub>	-25~75	°C
Storage temperature	T <sub>stg</sub>	-55~125	°C

\*1 Reduced by 5mW for each increase in Ta of 1°C over 25°C.

\*2 Reduced by 4.5mW for each increase in Ta of 1°C over 25°C.

## ● Recommended operating conditions (Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Operating voltage	V <sub>opr</sub>	—	—	38	V

● Electrical characteristics (Unless otherwise noted, Ta=25°C, V<sub>CC</sub>=24V)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	Measurement Circuit
Initial supply voltage	V <sub>ai</sub>	14	16	18	V	*1	Fig.5
Sustained operation supply voltage	V <sub>sus</sub>	8.2	9.8	11.2	V	*2	
Initial supply current	I <sub>ai</sub>	1.3	2.2	2.9	mA	No load, V <sub>CC</sub> =V <sub>ai</sub>	
Sustained operation supply current	I <sub>sus</sub>	0.22	0.4	0.7	mA	No load, V <sub>CC</sub> =V <sub>sus</sub>	
Oscillation frequency *3	f <sub>L</sub>	9	10	11	Hz	R <sub>1</sub> =773kΩ, C <sub>1</sub> =0.1μF	Fig.6
Oscillation frequency *3	f <sub>H1</sub>	446	512	563	Hz	R <sub>2</sub> =595kΩ, C <sub>2</sub> =0.0022μF	
Oscillation frequency *3	f <sub>H2</sub>	585	640	703	Hz	R <sub>2</sub> =595kΩ, C <sub>2</sub> =0.0022μF	
"H" output voltage	V <sub>OH</sub>	19.7	22.0	23.5	V	I <sub>OH</sub> =10mA, 7pin=GND	Fig.5
"L" output voltage	V <sub>OL</sub>	0.5	0.9	1.4	V	I <sub>OL</sub> =10mA, 7pin=6V	
Ringer threshold voltage	V <sub>TR</sub>	—	—	36.0	V <sub>rms</sub>	R <sub>TRG</sub> =330kΩ	Fig.4
Output leakage current	I <sub>LE</sub>	—	—	1.0	μA		Fig.5

\*1 The initial supply voltage is the power supply voltage required for the tone ringer to begin oscillating.

\*2 The sustained operation voltage is the power supply voltage required for the tone ringer to continue oscillating.

\*3 The oscillation frequency is determined using the following equation.

$$f_L = \frac{1}{1.234 \times R_1 \times C_1} \text{ (Hz)}$$

$$f_{H1} = \frac{1}{1.515 \times R_2 \times C_2} \text{ (Hz)}$$

$$f_{H2} = 1.24 \times f_{H1} \text{ (Hz)}$$

The recommended values for R<sub>1</sub> and R<sub>2</sub> are 330 kΩ or higher.

The ringer threshold voltage is the AC voltage required for the tone ringer to start ringing through the circuit shown in Fig. 4.

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Tone ringer

Telephones

●Electrical characteristic curves

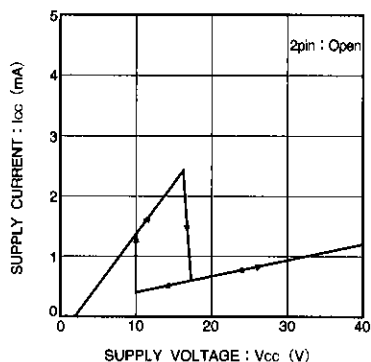


Fig. 1 Supply current vs. supply voltage characteristic

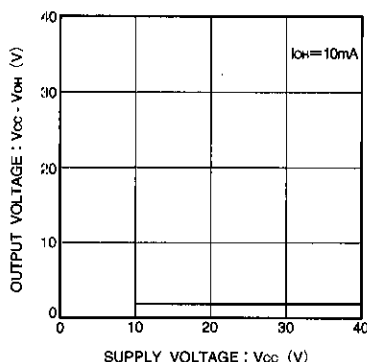


Fig. 2 Output voltage vs. supply voltage characteristic

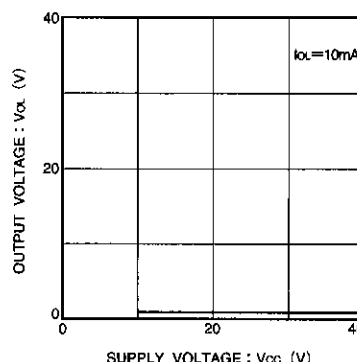


Fig. 3 Output voltage vs. supply voltage characteristic

●Measurement circuits

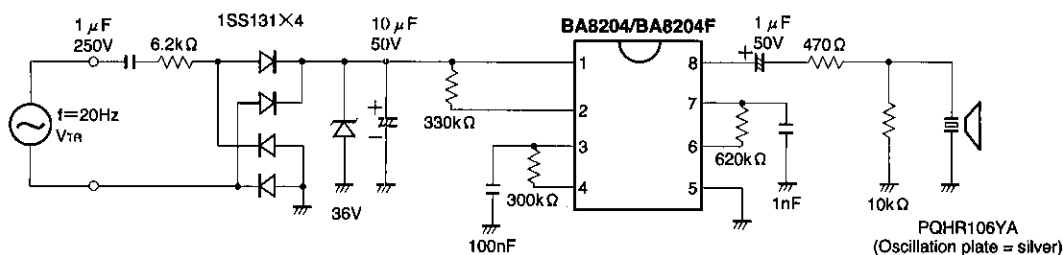
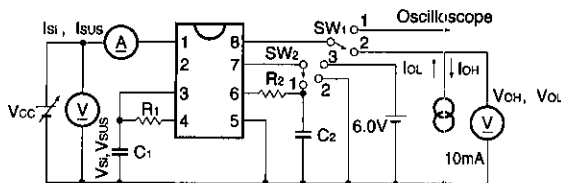


Fig. 4 Ringer threshold voltage measurement circuit

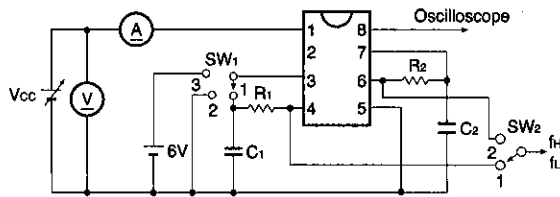


R<sub>1</sub> = 773kΩ, C<sub>1</sub> = 0.1µF  
R<sub>2</sub> = 595kΩ, C<sub>2</sub> = 0.0022µF

(Note) The table below shows the statuses for SW<sub>1</sub> and SW<sub>2</sub>.

Item	SW <sub>1</sub>	SW <sub>2</sub>
V <sub>sl</sub> , V <sub>sus</sub>	1	1
I <sub>sl</sub> , I <sub>sus</sub>	1	1
V <sub>OH</sub>	2	2
V <sub>OL</sub>	2	3

Fig. 5 Measurement circuit (1)



$R_1 = 773k\Omega$ ,  $C_1 = 0.1\mu F$   
 $R_2 = 595k\Omega$ ,  $C_2 = 0.0022\mu F$

(Note) The table below shows the statuses for SW<sub>1</sub> and SW<sub>2</sub>.

Item	SW <sub>1</sub>	SW <sub>2</sub>
f <sub>L</sub>	1	1
f <sub>H1</sub>	3	2
f <sub>H2</sub>	2	2

Fig. 6 Measurement circuit (2)

●Circuit operation

Using the TRG pin

With the BA8204 and BA8204F, the TRG pin can be used to change the initial supply voltage (V<sub>SI</sub>).

As shown in Figure 7, resistor R<sub>TRG</sub> is connected from the TRG pin (Pin 2) to V<sub>CC</sub>. The operation initiation voltage can be changed by changing the value of the resistor R<sub>TRG</sub>.

Figure 8 shows the supply voltage (V<sub>CC</sub>) - supply current (I<sub>CC</sub>) characteristics when the value of the resistor R<sub>TRG</sub> is changed.

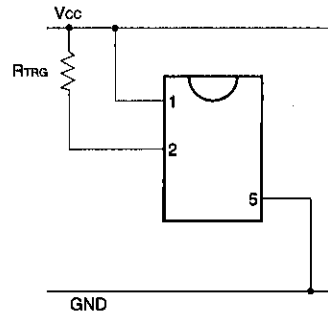


Fig. 7

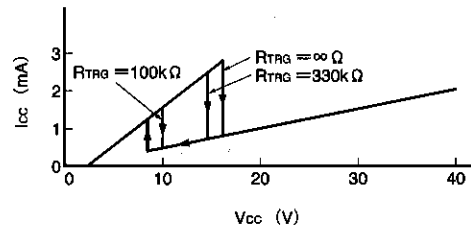


Fig. 8

●Pin description

Pin No.	Symbol	Name	Function
1	V <sub>CC</sub>	Power supply pin	This is the power supply pin for the IC. It is connected to the (⊕) pin of the diode bridge.
2	TRG	Trigger input pin	This is normally open, but can be used to change the operation initiation voltage or to inhibit oscillation when a resistor is connected between the V <sub>CC</sub> or GND pin, or when connected to a Zener diode.
3	LFI	Low-frequency time constant connector pin	This is connected to the time constant that determines the oscillation frequency on the warble side.
4	LFO		
5	GND	GND pin	This pin has the lowest potential on the IC. It is connected to the (⊖) pin of the diode bridge.
6	HFO	High-frequency time constant connector pin	This is connected to the time constant that determines the oscillation frequency on the tone side (the audible frequency side).
7	HFI		
8	OUT	Output pin	This is used to connect a piezoelectric buzzer, or to connect a dynamic speaker through a transistor.

● Operation notes

Ringing can be inhibited by connecting the TRG pin to GND. In this case, however, a zener diode should be used to suppress the  $V_{CC}$  pin voltage so it does not exceed 30V.

● Application example

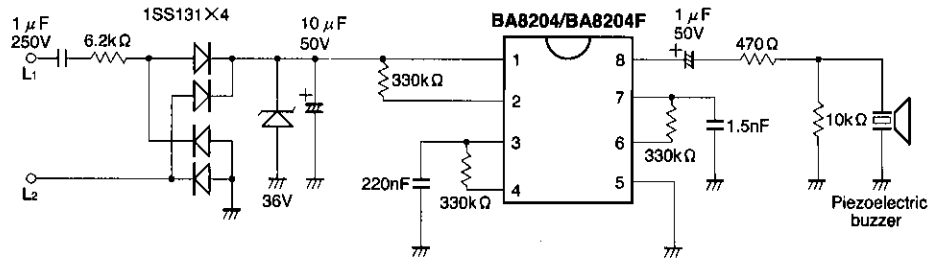
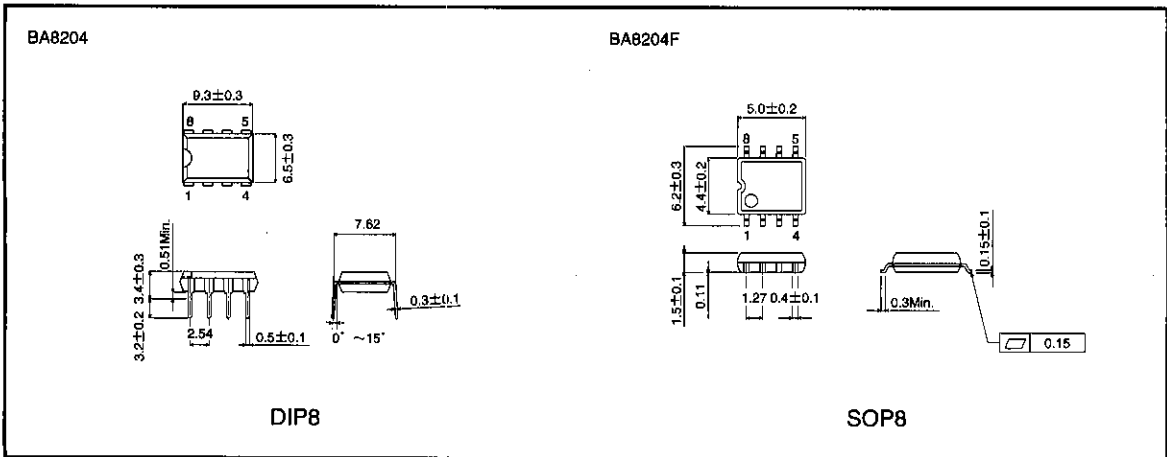


Fig. 9

● External dimensions (Units: mm)



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