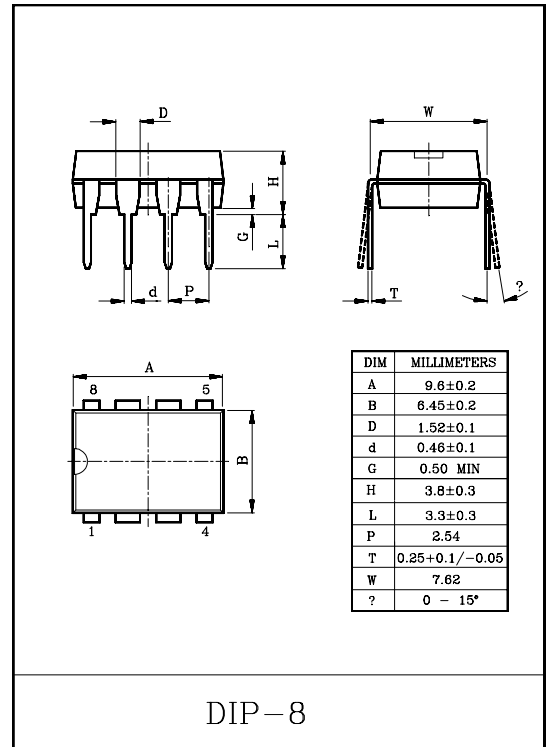


TONE RINGER FOR TELEPHONE

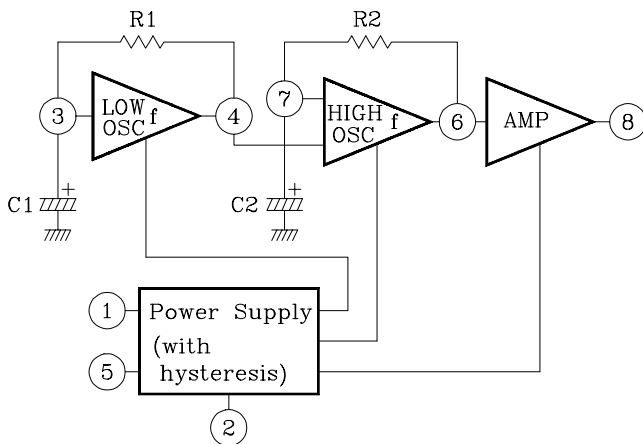
- Small Current Consumption.
- Oscillation Frequency Variable.
- Built-in Threshold Circuits Prevent False Triggering due to Power Noise as Well as 'Chirp' by Rotary Dialling.
- Few External Components.

MAXIMUM RATINGS (Ta=25°C)

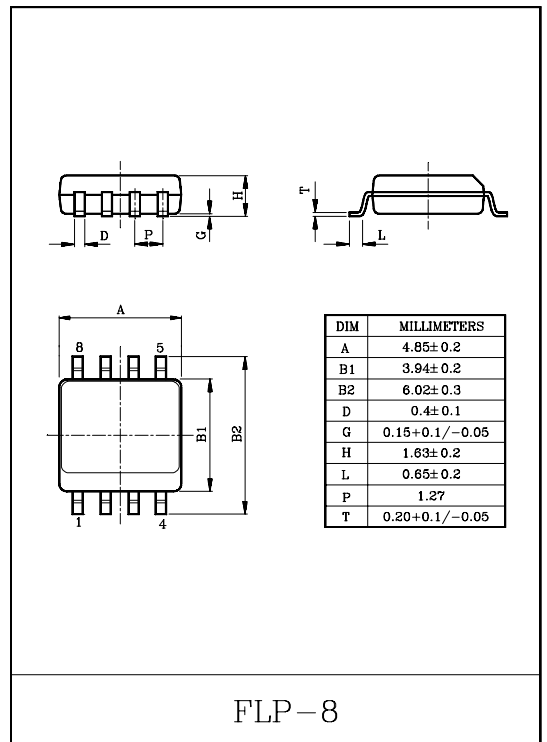
CHARACTERISTIC	SYMBOL	RATING	UNIT
Power Supply Voltage	V _{CC}	30	V
Power Dissipation	P Type	500	mW
	F Type	350	
Operating Temperature	T _{opr}	-30~75	°C
Storage Temperature	T _{stg}	-55~150	°C



BLOCK DIAGRAM

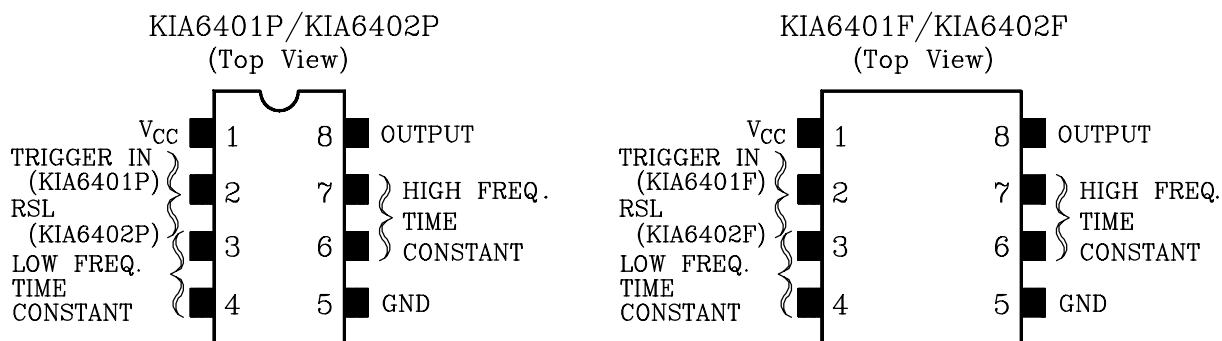


Note: R1,R2,C1, and C2 are parts externally mounted.



KIA6401P/F, KIA6402P/F

PIN CONNECTION



ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTICS	SYMBOL	TEST CIRCUIT	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	
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 (KIA6401P/F)	V _{Trig}	-	V _{CC} =15V, I(PIN)=100μA	7.8	10	11.5	V

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:

$$(1) f_L = 1/1.234 \cdot R_1 \cdot C_1 \text{ (Hz)} \quad (2) f_{H1} = 1/1.515 \cdot R_2 \cdot C_2 \text{ (Hz)} \quad (3) f_{H2} = 1.24 \cdot f_{H1} \text{ (Hz)}$$

KIA6401P/F, KIA6402P/F

METHOD OF USING PIN ②

1. KIA6401P/F METHOD OF USING TRIGGER IN

Usually PIN ② is used at an open state, but in the KIA6401P/F the TRIGGER IN terminal can prohibit oscillation and also can change the initiation supply voltage (V_{si}).

When the KIA6401P/F is oscillating ($V_{sus} < V_s$), if PIN ② is connected to GND as shown in Fig. 1a, the KIA6401P/F can stop oscillating. Further, the oscillation of the KIA6401P/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 $V_{sus} < V_s - V_{si}$, the oscillation of the KIA6401P/F can be started by forcing a current I_E ($4\mu A < I_E < 1mA$) into PIN ②.

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 as shown in Fig. 2a.

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 formula:

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

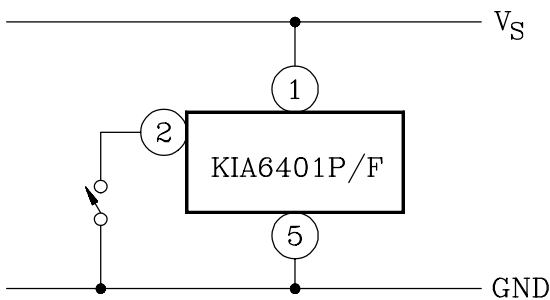


Fig. 1a

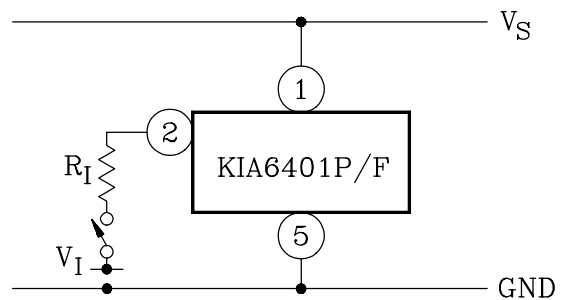
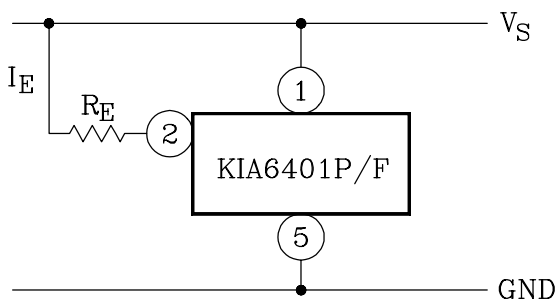


Fig. 1b $0 \leq V_I \leq 0.5V$
 $0 \leq R_I \leq 20k\Omega$



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

Fig. 2a

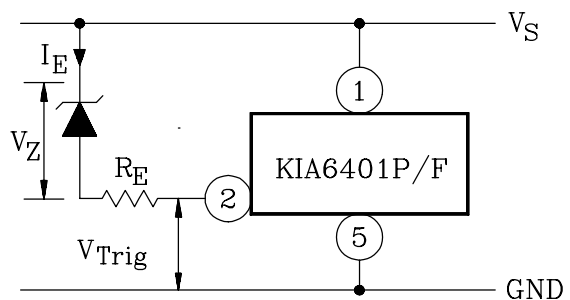


Fig. 2b

KIA6401P/F, KIA6402P/F

2. KIA6402P/F METHOD OF USING R_{SL}

In the KIA6402P/F the initiation supply current (I_{Si}) can be changed by using the R_{SL} terminal. The resistor R_{SL} is connected to GND from PIN② as shown in Fig. 3.

Further, the initiation supply current (I_{Si}) can be changed by changing the value of R_{SL} . Fig. 4 shows 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 at the time when $R_{SL}=6.8k\Omega$ coincides with that at the time when PIN② of the KIA6401P/F has been used at an open state.

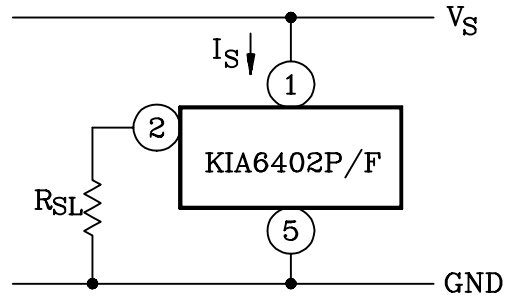
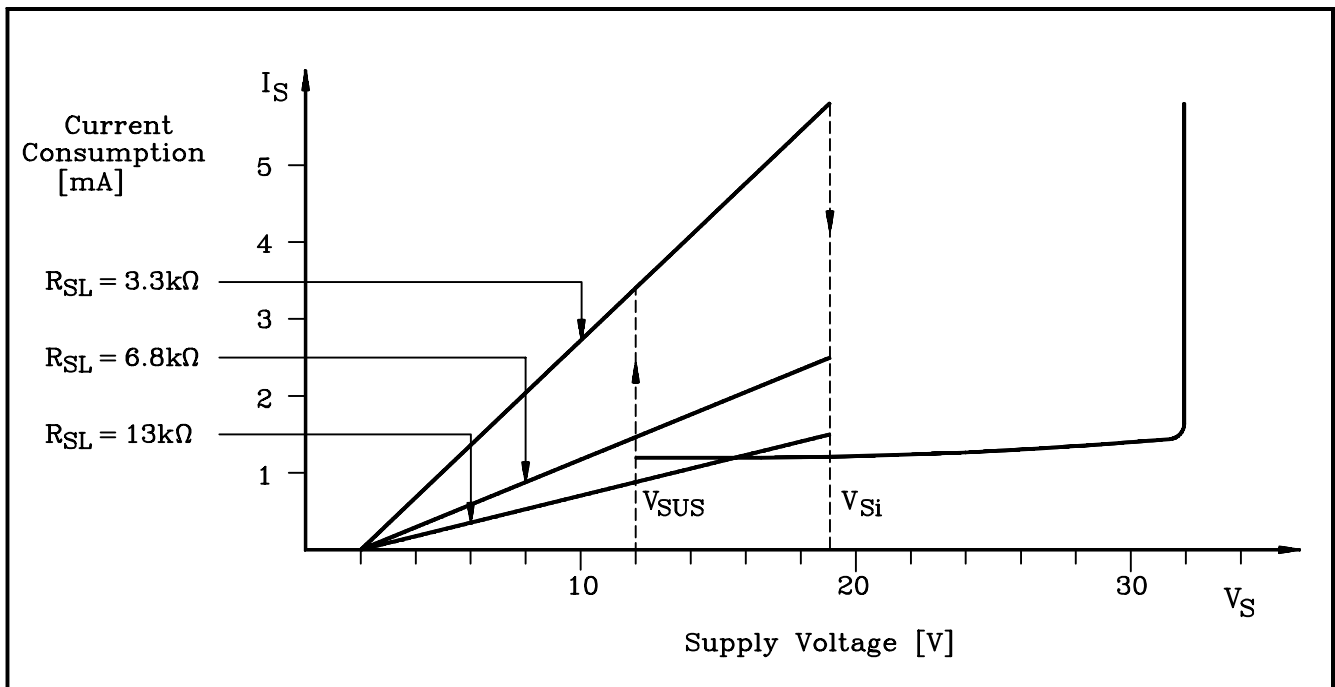


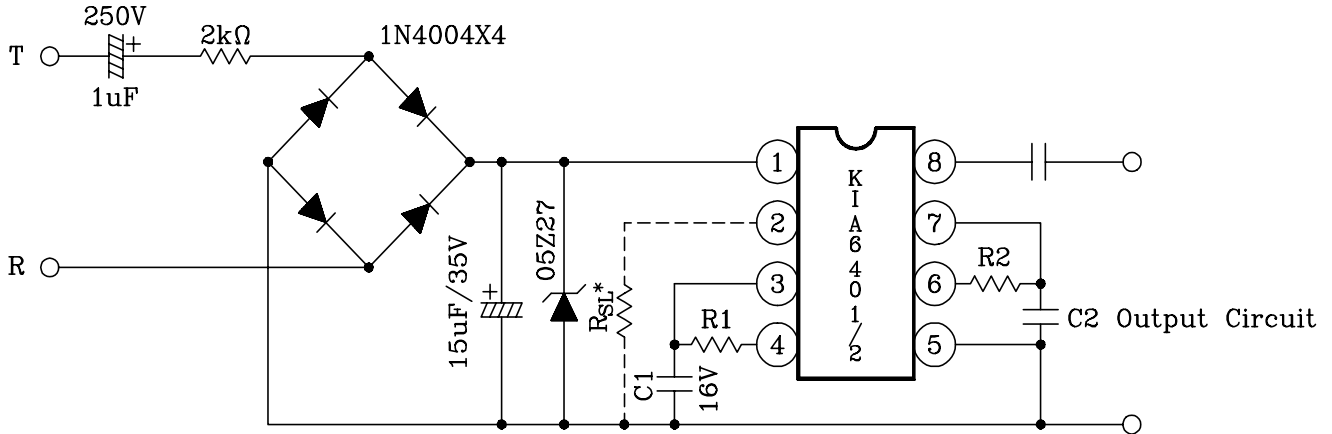
Fig. 3

KIA6402P/F SUPPLY VOLTAGE – CURRENT CONSUMPTION



KIA6401P/F, KIA6402P/F

APPLICATION CIRCUIT OF TONE RINGER



* Use for KIA6402P/F

$$R1, C1 \quad f_L = 1/1.234 \cdot R1 \cdot C1$$

$$f_{H1} = 1/1.515 \cdot R2 \cdot C2$$

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

* Example $R1 = 165k\Omega$ $R2 = 191k\Omega$
 $C1 = 0.47\mu F$ $C2 = 0.0068\mu F$

$$f_{Low} \approx 10Hz \quad f_{H1GH1} \approx 500Hz$$

$$f_{H1GH2} \approx 630Hz$$

Example of Output Circuit

