

DBL 5010

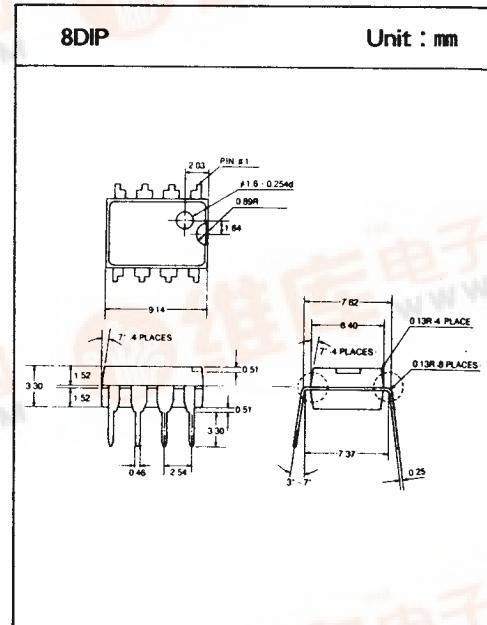
## **TONE RINGER WITH BRIDGE DIODE**

The DBL5010 is a bipolar IC designed to replace the mechanical bell in telephone sets. It generates two analog tones, and a warble frequency to drive either directly a piezo-ceramic transducer or a small loud-speaker in response to ringing signal on the telephone line.

## FEATURES

- Two tone output with warble
  - Fixed two tone frequency ratio
  - Powered by the normal telephone ringing signal
  - Internal supply regulation for low output tone variation
  - Built in surge protection
  - Bell tap suppression
  - High input impedance to low level voice band signals
  - Output rich in harmonics

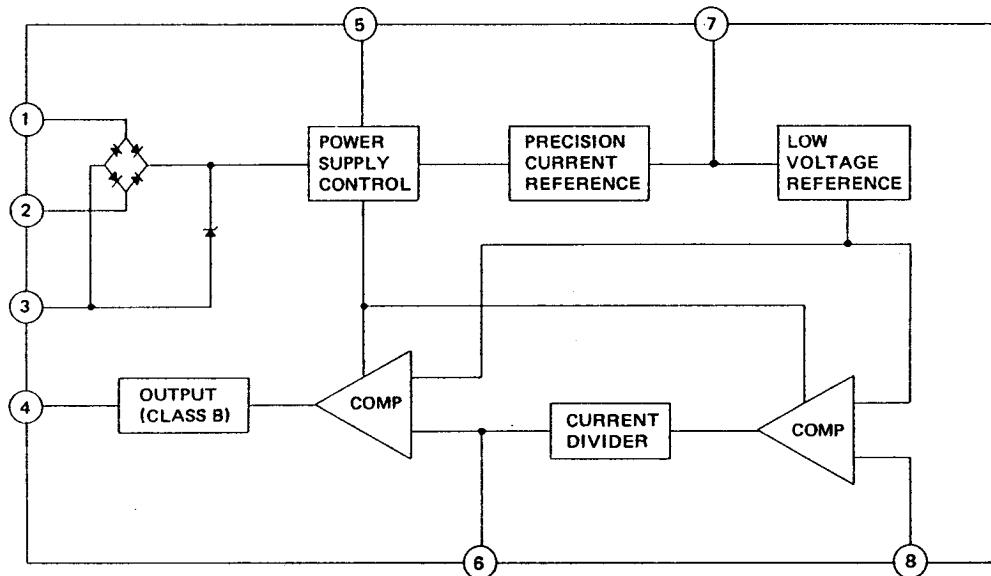
MAXIMUM RATINGS



Characteristic	Symbol	Rating	Unit
Power Dissipation(at 25°C)	P <sub>D</sub>	1.0	W
Operating Temperature	T <sub>opr</sub>	-40~+60	°C
Storage Temperature	T <sub>sto</sub>	-50~+125	°C

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## □ BLOCK DIAGRAM



## □ PIN DESCRIPTION

Pin No.	Symbol	Function
1	Tip	tip and ring connections to the telephone line
2	Ring	through a series capacitor and resistor
3	GND	common connection for the DBL5010 circuits
4	Vout	tone output to a piezo-ceramic transducer
5	Vdc	internal DC positive power supply rail
6	OFC	high frequency timing circuit which controls the output frequency
7	WFC	time delay and low frequency timing circuit which controls the warble frequency
8	Iref	internal current control

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## OPERATING CHARACTERISTICS

(Unless otherwise specified, 25°C, SW1 : 2, SW2 : 3)

Characteristic	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Input Sensitivity	T <sub>s</sub>	Acoustic output from the minimum input burst of 200mSec	—	20	—	m Sec
Delay	T <sub>d</sub>	Initial charge time at C4	45	60	75	m Sec
Warble Rate	f <sub>w</sub>	The rate is determined by C4 and the current used to charge and discharge it	7.5	10	12.5	Hz
Output Tones	f <sub>OL</sub>	The frequencies determined by C3 and the current through it	410	512	614	Hz
	f <sub>OH</sub>	f <sub>OL</sub> (SW2 : 1), f <sub>OH</sub> (SW2 : 2)	512	640	768	Hz
Frequency Ratio	RF	f <sub>OL</sub> /f <sub>OH</sub>	—	0.8	—	

\* Burst Wave of 40 to 130mVrms at 20Hz

### \* NOTE

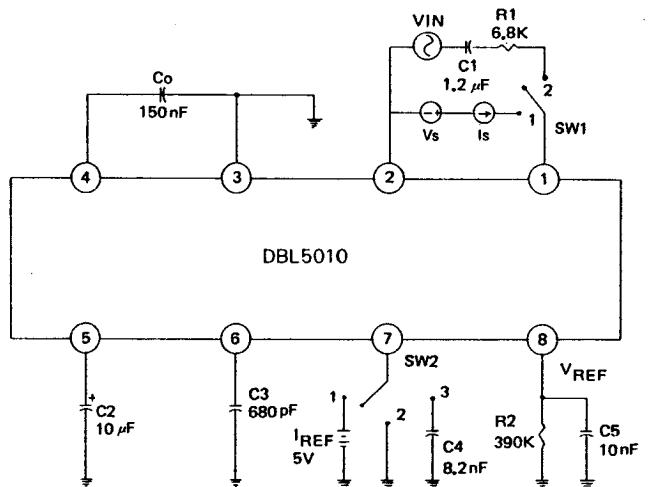
1. Initiation voltage(V<sub>si</sub>) is the supply voltage required to start the tone ringer oscillating.
2. Sustaining voltage(V<sub>sus</sub>) is the supply voltage required to maintain oscillation

## ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Standoff Voltage	V <sub>SO</sub>	V <sub>s</sub> adjusted until 0.2mA < I <sub>s</sub> < 0.5mA	7	8	9	V
Initiation Voltage	V <sub>si</sub>	V <sub>s</sub> adjusted until 0.9mA < I <sub>s</sub> < 1.1mA	17.9	19.4	20.8	V
Initiation Current	I <sub>si</sub>	V <sub>s</sub> = V <sub>si</sub> + 100mV	0.8	—	1.3	mA
Quiescent Current	I <sub>q</sub>	V <sub>s</sub> = V <sub>si</sub> - 200mV	0.4	—	0.7	mA
Discharge Current (anti bell Tap)	I <sub>d</sub>	I <sub>d</sub> = I <sub>si</sub> - I <sub>q</sub>	0.4	—	—	mA
Max. Input Voltage	V <sub>max</sub>	I <sub>s</sub> = 10mA	20	22	24	V
Sustaining Voltage	V <sub>sus</sub>	SW2 : 1	10.2	11.3	12.3	V
Sustaining Current	I <sub>sus</sub>	SW2 : 1	0.35	0.45	0.55	mA
Input Leakage Current	I <sub>L</sub>	V <sub>s</sub> < 7V	—	—	100	μA

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## □ TEST CIRCUIT

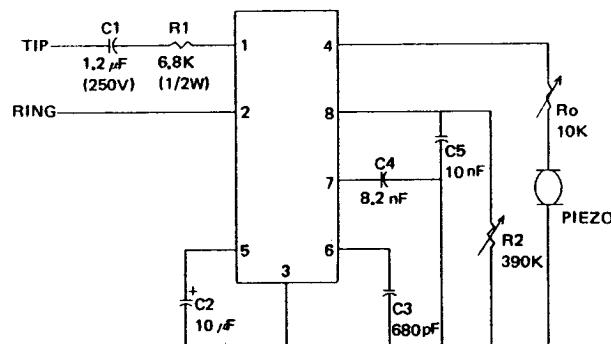


\* NOTE

$$f_W = \frac{1}{160} \cdot \frac{I_{REF}}{C_4} \quad f_{OL} = \frac{1}{40} \cdot \frac{I_{REF}}{C_3} \quad f_{OH} = \frac{1}{32} \cdot \frac{I_{REF}}{C_3}$$

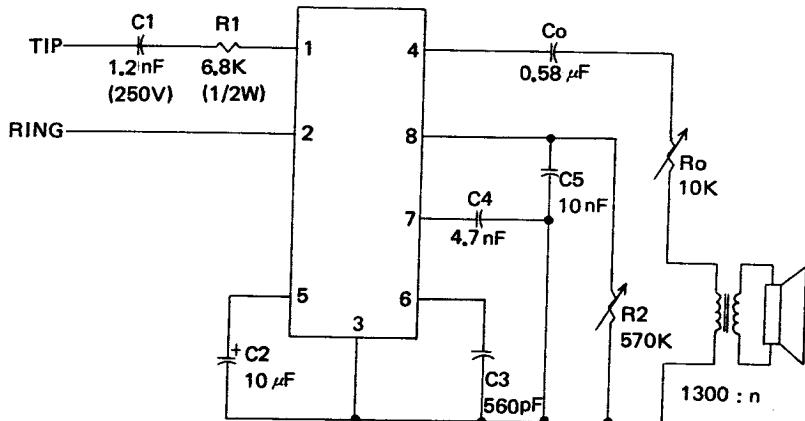
## □ APPLICATION CIRCUIT

### 1. FOR USING A PIEZO CERAMIC TRANSDUCER



# DBL 5010

## 2. FOR USING A LOUD SPEAKER LOAD



### FUNCTIONAL DESCRIPTION

In response to a ringing signal on the connected telephone line, DBL5010 generates an output tone (square wave) which alternates between  $f_{OL}$  and  $f_{OH}$  at a  $f_w$  warble rate to drive either a small loud speaker or a piezo-ceramic transducer with electrical characteristics equivalent to a 150nF capacitor. In case of using a loud speaker a 1300Ω to N transformer is needed. The output coupling capacitor ( $C_o$ ) is required with transformer coupled loads. The output frequencies are determined by external component values as shown in application circuit.

DBL5010 includes a diode bridge and a zener regulator to derive power for the device from the normal telephone ringing signal. The DBL5010 operates from ringing signals of 40 to 130 Vrms at 20Hz.

The DBL5010 withstands normal voltage surges due to lightning strikes on the telephone network. Surge protection is partly provided by the external components.

C1 and R1 as shown in application circuit.

Bell tap immunity is provided by a turn-on hysteresis and delay circuit. When the applied external signal exceeds an internal threshold, the reservoir capacitor (C5 in application circuit) charges until the voltage across it exceeds the initiation voltage. Subsequently, a 0.5mA discharge current is applied across C5 for 60mSec.

If the reservoir voltage falls below the initiation voltage during this delay period. The 60mSec delay is reset. If the reservoir voltage exceeds the initiation voltage without interruption during the delay period, the hysteresis circuit latches and turns on the alerting tone output. Tone output is maintained until the reservoir voltage falls below the sustaining voltage.