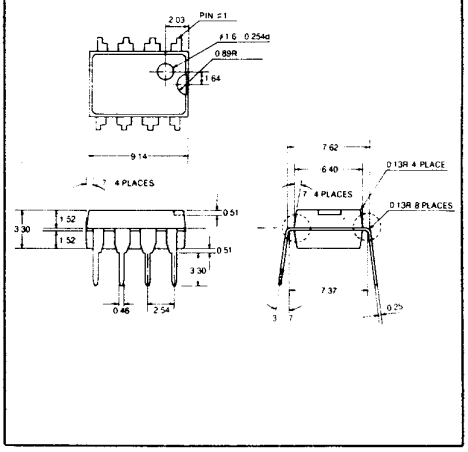
DBL 5001/2

TONE RINGER

8DIP Unit: mm



The oscillator frequencies can be adjusted over a wide range by selection of external components

☐ FEATURES

- ○ Designed telephone bell replacement
- ○ Adjustable 2-frequency tone
- ○ Low current drain
- ○ Built-in hysteresis prevents false triggering and rotary dial "Chirp"
- ○ External triggering ringer disable(5001)
- ○ Adjustable for reduced supply initiation current(5002)

☐ APPLICATIONS

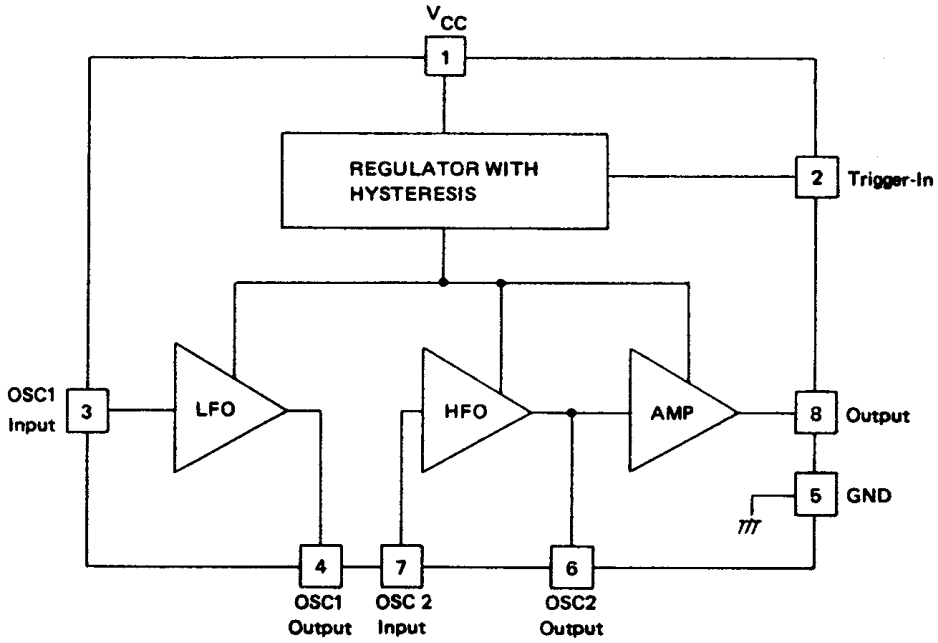
- ○ Telephone tone ringers
- ○ Alarms or other alerting devices
- ○ Extension tone ringer modules

☐ MAXIMUM RATINGS

Characteristics	Symbol	Rating	Unit
Supply Voltage	V_{CC}	30	V
Power Dissipation	P_D	400	mW
Operating Temperature	T_{opr}	−45~+65	°C
Storage Temperature	P_{stg}	−65~+150	°C

DBL 5001/2

☐ BLOCK DIAGRAM



LFO : Low Frequency Osc.
HFO : High Frquency Osc.
Pin 3, 4 : Low Frequency Time Constant
Pin 6, 7 : High Frequency Time Constant

*Regulator circuit has built-in hysteresis to prevent false triggering and rotary dial "Chirps".

☐ ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, Ta = 25°C)

Characteristic	Symbol	Test condition	Min.	Typ.	Max.	Unit
Operating Supply Voltage	V_{CC}	—	—	—	29	V
Initiation Supply Voltage	$V_{CC(INI)}$	Trigger-In Open, No Load	17	19	21	V
Sustaining Voltage	V_{SUS}	Trigger-In Open, No Load	9.7	11	13	V
Initiation Supply Current	$I_{CC(INI)}$	R_{SL} = 6.8KΩ(5002)	1.4	2.5	4.2	mA
Sustaining Current	I_{SUS}	Vcc = Vsus, No Load	0.7	1.2	—	mA
Trigger Voltage	V_{TR}	5001	10.5	11	—	V
Trigger Current	I_{TR}	5001	10	20	1000	μA
Disable Voltage	V_{DIS}	5001	—	0.4	0.8	V
Disable Current	I_{DIS}	5001	−40	−50	—	μA
Output Voltage	V_{OUT}	V_{CC} = 21V, No Load	17	19	21	V
Oscillator Frequency Tolerance	Δf_O	—	—	—	±7	%

☐ ELECTRICAL CHARACTERISTICS (continued)

*1. Initiation supply voltage $V_{CC(INI)}$ must be exceeded to trigger oscillation.

2. Sustaining voltage(V_{SUS}) is the supply voltage required to maintain oscillation.

3. Trigger voltage(V_{TR}) and trigger current(I_{TR}) are the conditions applied to trigger in to start oscillation for $V_{SUS} \leqq V_{CC} \leqq V_{CC(INI)}$.

4. Disable voltage(V_{DIS}) and disable current(I_{DIS}) are the conditions applied to trigger in to inhibit oscillation for $V_{CC(INI)} < V_{CC}$

5. Trigger current must be limited to this value externally.

6. Oscillator frequencies are given by equations:

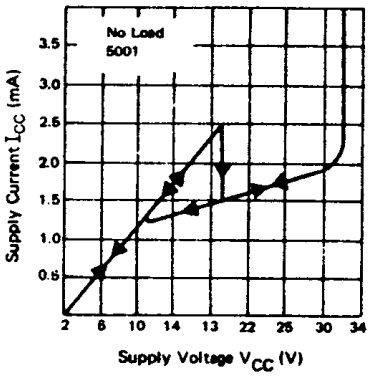
   ○ $f_L = 1/(1.234RC)$ where R is the resistance connected between pins 3 and 4, and C is the capacitance connected between pin 3 and ground.

   ○ $f_{H1} = 1/(1.515RC)$ where R is the resistance connected between pins 6 and 7, and C is capacitance connected between pin 6 and ground.
   Norminal rate(f_{HA}) is the HFO when the output of LFO is high

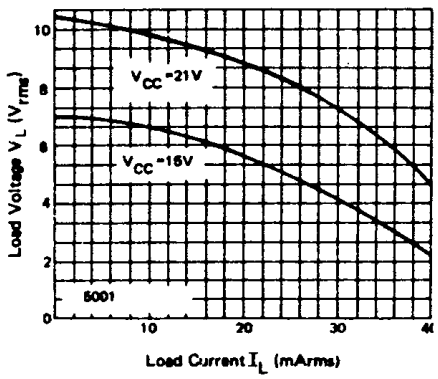
   ○ $f_{H2} = 1.25f_{H1}$, higher rate(f_{H2}) is the HFO when the output of LFO is low.

☐ TYPICAL PERFORMANCE CHARACTERISTICS

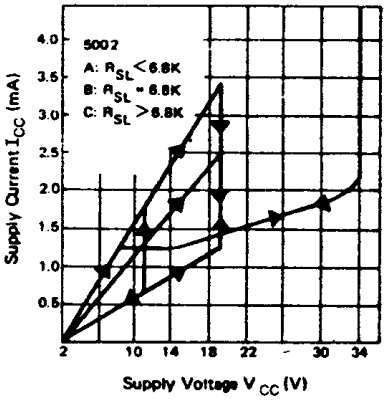
I_{CC}–V_{CC}



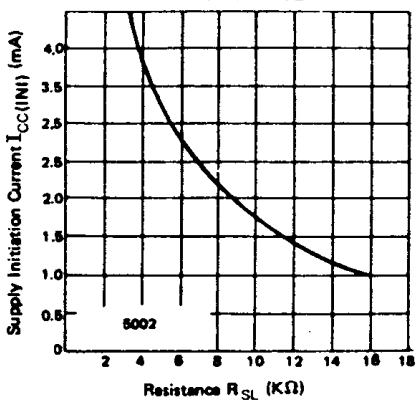
V_L–I_L



I_{CC}–V_{CC}

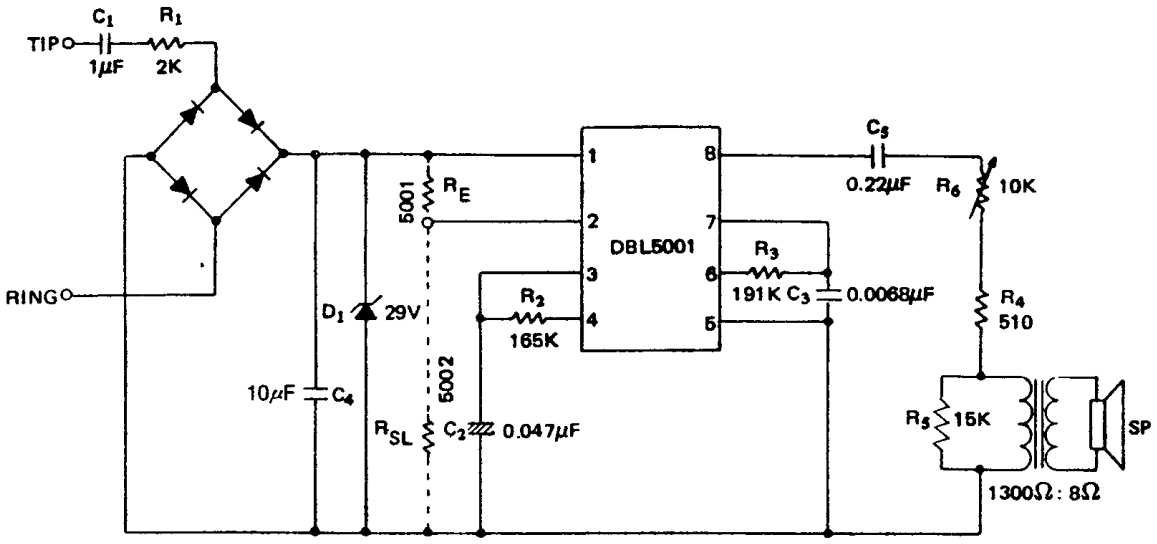


$I_{CC(INI)}$–R_{SL}



□ APPLICATION CIRCUITS AND INFORMATION

1. Typical Tone Ringer

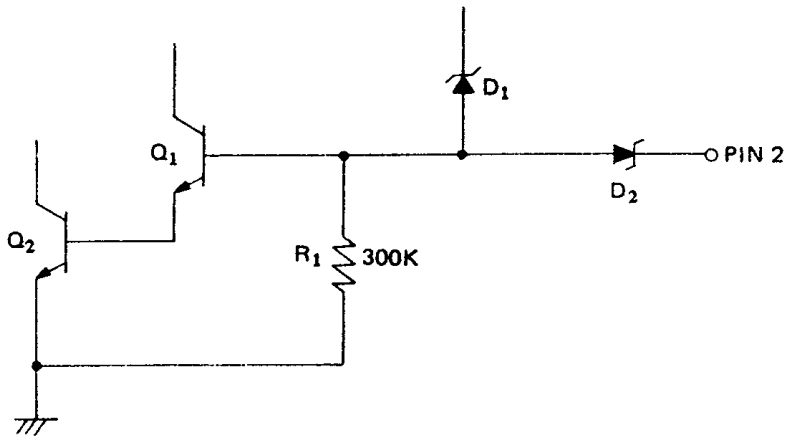


The AC ringing voltage appears across the TIP and RING inputs of the circuit and is attenuated by capacitor (C_1) and resistor (R_1). C_1 also provides isolation from DC voltages (48V) on the line. After full wave rectification by the bridge, the waveform is filtered by capacitor (C_4) to provide a DC sypply for Tone Ringer chip. As this voltage exceeds the initiation voltage $V_{CC(INI)}$ oscillation starts. With the components shown, the output frequency chops between f_{H1} and f_{H2} at a f_L rate. The loudspeaker load is coupled through a 1300Ω to 8Ω transformer. To prevent DC power supply regulation problems due to high source impedance of the telephone line and coupling components C_1 and R_1, while the output impedance of the 5001 circuit is qutie low, the load impedancd must be kept fairly high. The output coupling capacitor (C_5) is required with transformer coupled loads. The variable resistor (R_6) is used to adjust the audio amplitude and resistor (R_4) is a current limiting resistor. Resistor R_5 is a quenching resistor used to limit back emf generated by the inductive load when ringing stops. When driving a piezo-ceramic transducer type load, the coupling capacitor (C_5) is not required. However, a current limiting resistor is required as is a 29V zener diode in parallel with the transducer. This diode limits the voltage transients than can be generated by mechanical shocking of piezo-ceramic transducer.

In the 5002 circuit, the initiation supply current $I_{CC(INI)}$ can be changed by using external resistor(R_{SL}). The resistor (R_{SL}) is connected to GND from pin2. As this initiation voltage remains constant independent of R_{SL}, the supply initiation current $f_{CC(INI)}$ varies inversely with R_{SL}. Thus, increasing the value of R_{SL} will decrease the amount of AC ringing current required to trigger the device. R_{SL} can also be used to compensated for smaller AC line coupling capacitors which can be used to alter the ringer equivalence number of a tone ringer circuit I_{CC}-V_{CC} (5002) graph in typical performance characteristic illustrates the variation of supply current with supply voltage. Curve B(R_{SL} = 6.8KΩ) shows the I_{CC}-V_{CC} characteristic for 5001 circuit Tone Ringer. Curve A is a plot with R_{SL} < 6.8KΩ and shows a increase in the current drawn up to the initiation voltage $V_{CC(INI)}$. The I_{CC}-V_{CC} characteristic after initiation remains unchanged. Curve C shows the effect of increasing R_{SL} above 6.8KΩ. Initiation current decreases but again current after triggering is unchanged.

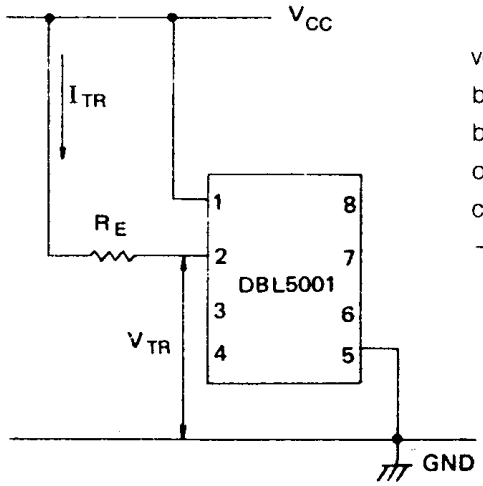
☐ APPLICATION CIRCUITS AND INFORMATION(continued)

2. Pin 2 Input Equivalent Circuit(5001)



Usually pin 2 is used at an open state, but in the 5001 circuit the trigger in terminal may be used to externally trigger osciallation for voltage in the range $V_{SUS} \leqq V_{CC} \leqq V_{CC(INI)}$ or disable ringer operation. The ringer circuit can only oscillate when Q_1 and Q_2 are conducting, Normally when supply voltage V_{CC} exceeds the supply initiation voltage $V_{CC(INI)}$ base Current flows into Q_1 via D_1 causing Q_1 and Q_2 conduct. This continues until V_{CC} is taken below the minimum sustaining voltage(V_{SUS})

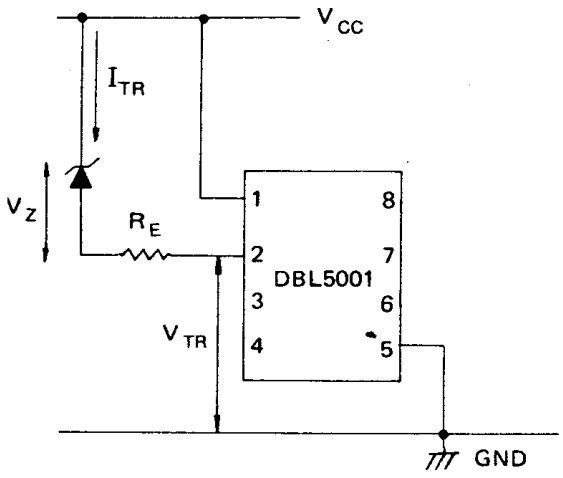
3. Enabling Oscillation of the 5001 circuit for Supply Voltages less than $V_{CC(INI)}$.



The 5001 Circuit can oscillate when powered from supply voltages in the range $V_{SUS} \leqq V_{CC} \leqq V_{CC(INI)}$. Oscillation is ensured by forcing a current I_{TR} ($10\mu A \leqq I_{TR} \leqq 1mA$) into pin 2 should be exceeded V_{TR} by the sum of zener voltage of D_3, the V_{BE} of Q_1 and the V_{BE} of Q_2(Typ. 11V). The required current drive can be provided by connecting a resistor R_E($20K\Omega \leqq R_E \leqq (V_{CC} - 11)/10M\Omega$) bewteen pin1 and V_{CC}.

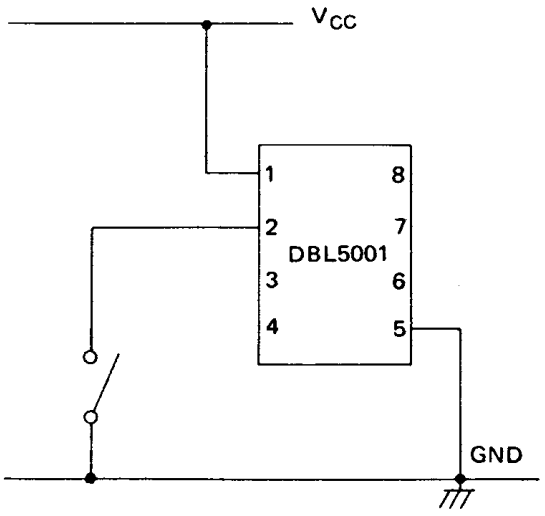
☐ APPLICATION CIRCUITS AND INPORMATION(continued)

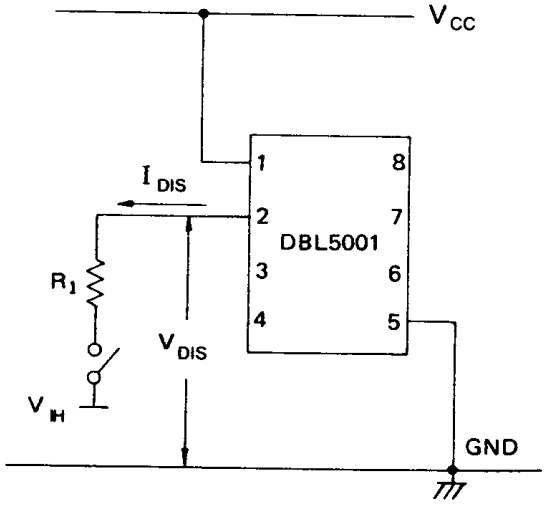
4. Reducing the Effective Value of $V_{CC(INI)}$ for the 5001 circuit.



To operate the 5001 circuit from a DC 12V supply, R_E should be typically 50KΩ, This operation can also be used to reduce the effective value of the $V_{CC(INI)}$, by inserting a zener diode in series with R_E. Then, this initiating voltage $V_{CC(INI)}$ is $V_{IR}+V_Z+10R_E$.

5. Inhibiting Oscillation of the 5001 circuit.





When the 5001 circuit is oscillating, this circuit may be inhibited for voltage in the range $V_{CC(INI)} < V_{CC} \leqq V_{CC(MAX.)}$ by sinking the current from D_1, starving Q_1 of base current. This is achieved by either grounding pin 2 or applying a voltage V_{IH} via a resistor R_1 to pin 2.