AUK Semiconductor

SL5001P/2P

TONE RINGER

Description

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(5001P)
- Adjustable for reduced supply initiation current(5002P)

Applications

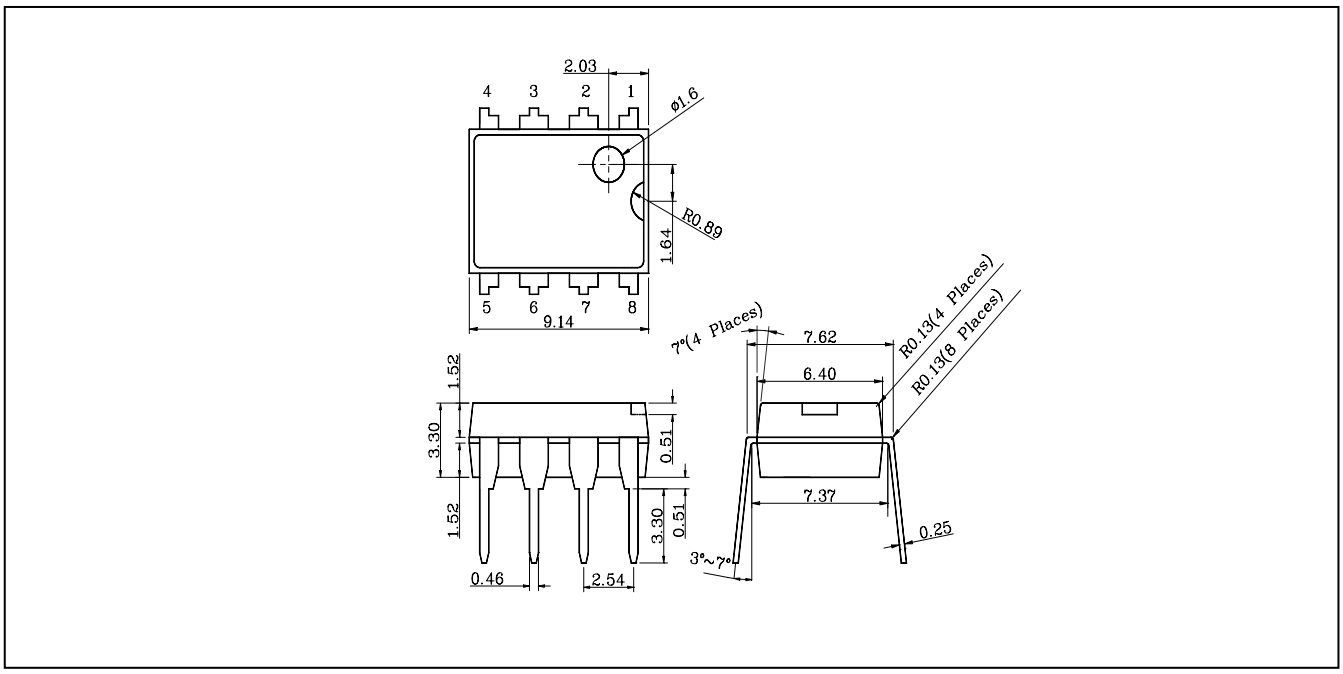
- Telephone tone ringers
- Alarms or other alerting devices
- Extension tone ringer modules

Ordering Information

Type NO.	Marking	Package Code
SL5001P	SL5001	DIP8
SL5002P	SL5002	DIP8

Outline Dimensions

unit : mm

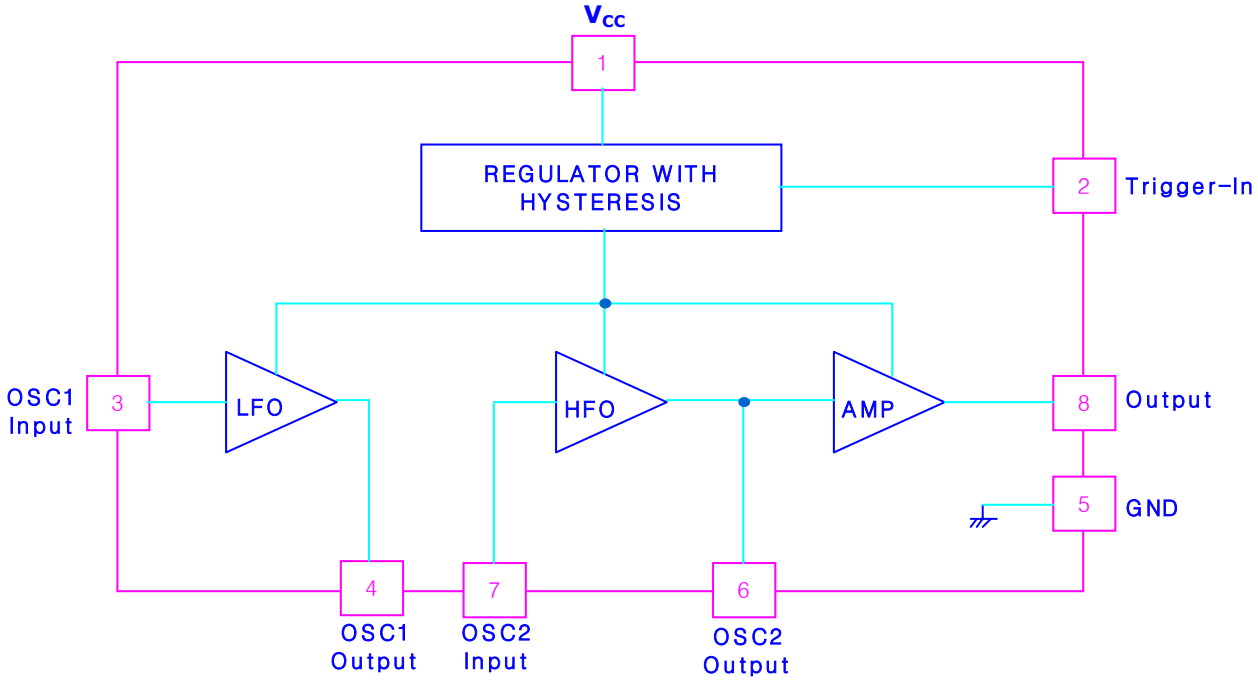


Absolute Maximum Ratings

(Ta = 25°C)

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

Block Diagram



LFO : Low Frequency OSC.
HFO : High Frequency 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(5002P)	0.8	2.5	4.2	mA
Sustaining Current	I_{SUS}	V_{CC}=V_{SUS}, No Load	0.7	1.2	-	mA
Trigger Voltage	V_{TR}	5001P	10.5	11	-	V
Trigger Current	I_{TR}	5001P	10	20	1000	μA
Disable Voltage	V_{DIS}	5001P	-	0.4	0.8	V
Disable Current	I_{DIS}	5001P	-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 $V_{SUS} \leq V_{CC} \leq V_{CC(INI)}$.

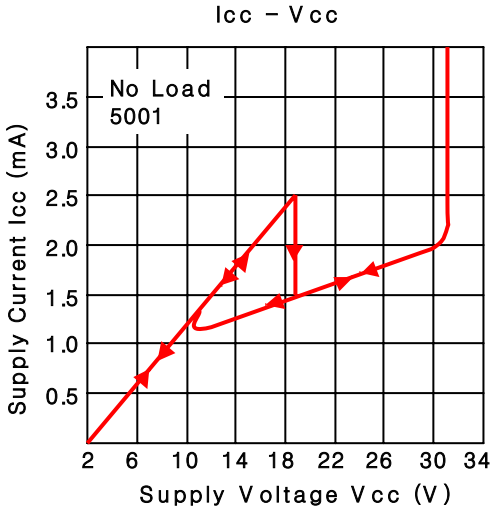
4.Disable voltage (V_{DIS}) and disable current(I_{DIS}) are the conditions applied to trigger in to inhibit oscillation for $V_{CC(INI)} < V_{CC}$

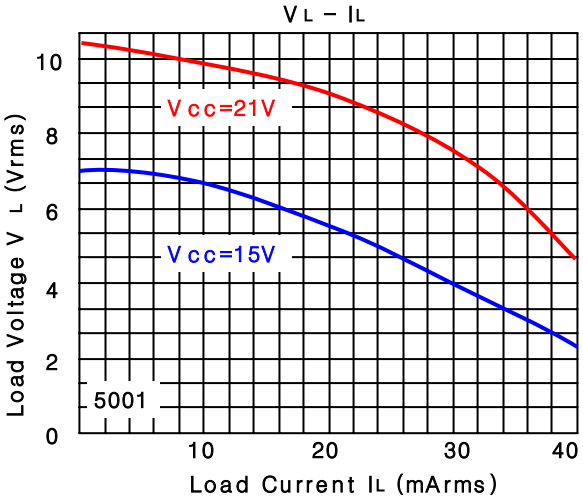
5.Trigger current must be limited to this value externally.

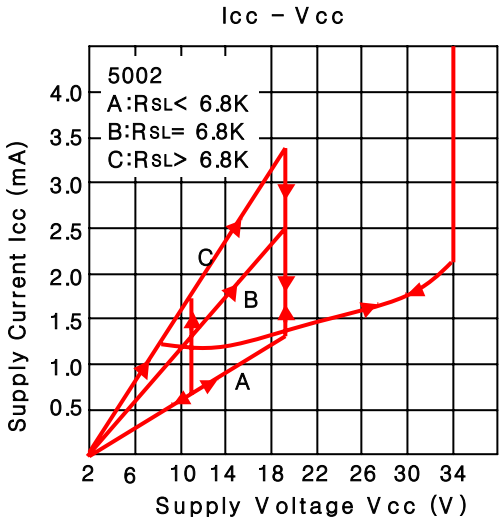
6.Oscillator frequencies are given by equations :

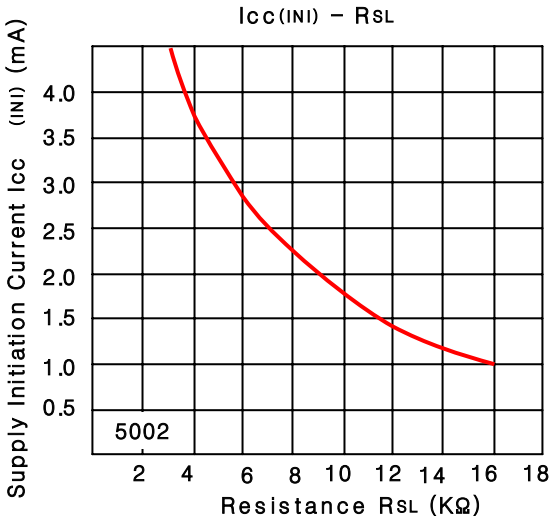
- f_L = 1/(1.234RC) where R is the resistance connected between pins 3 and 4, and C is the capacitance connected between pin 3 and ground.
- f_{H1} = 1/(1.515RC) where R is the resistance connected between pins 6 and 7, and C is capacitance connected between pin 6 and ground.
  Norminal rate (f_{HA}) 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



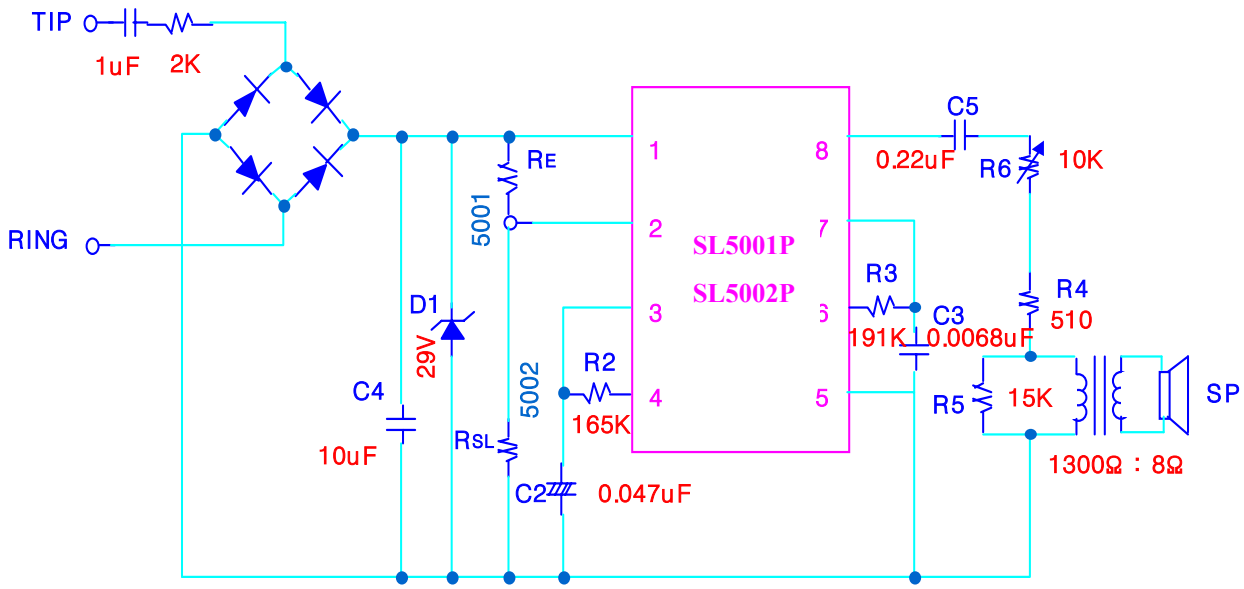






Application Circuit And Information

1.Typical Tone Ringer



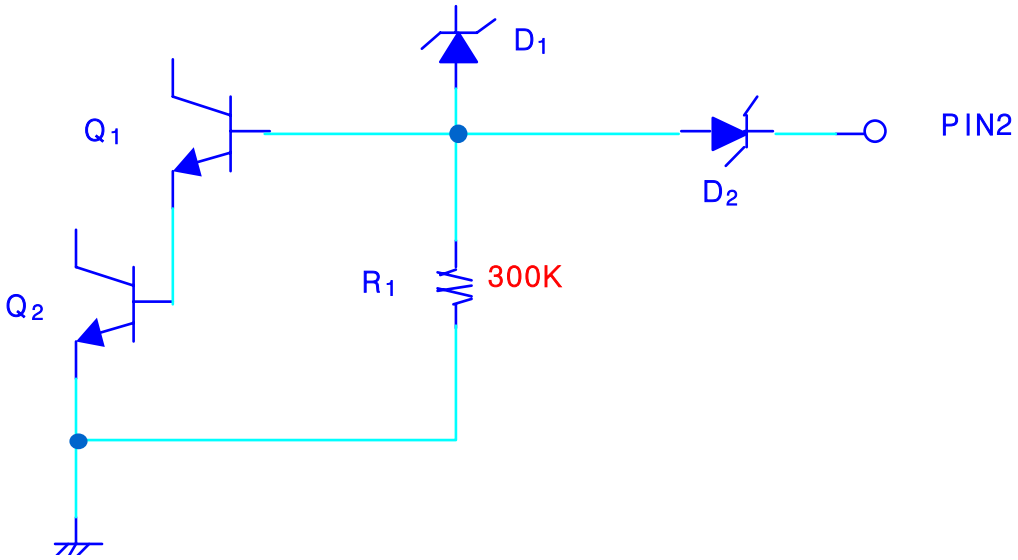
The AC ringing voltage appears across the TIP and RING inputs of the circuit and is attenuated by capacitor(C_1) and resistor (R_1). C_1 also provides isolation from DC voltages(48V) on the line. After full wave rectification by the bridge, the waveform is filtered by capacitor(C_4) to provide a DC supply 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 5001P circuit is quite low, the load impedance 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 5002P 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

Application Circuit And Information (continued)

coupling capacitors which can be used to alter the ringer equivalence number of a tone ringer circuit I_{CC}-V_{CC}(5002P) graph in typical performance characteristic illustrates the variation of supply current with supply voltage. Curve B(RSL=6.8kΩ) shows the I_{CC}-V_{CC} characteristic for 5001P circuit Tone Ringer. Curve A is a plot with R_{SL}< 6.8 KΩ 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 RSL above 6.8 KΩ. Initiation current decreases but again current after triggering is unchanged.

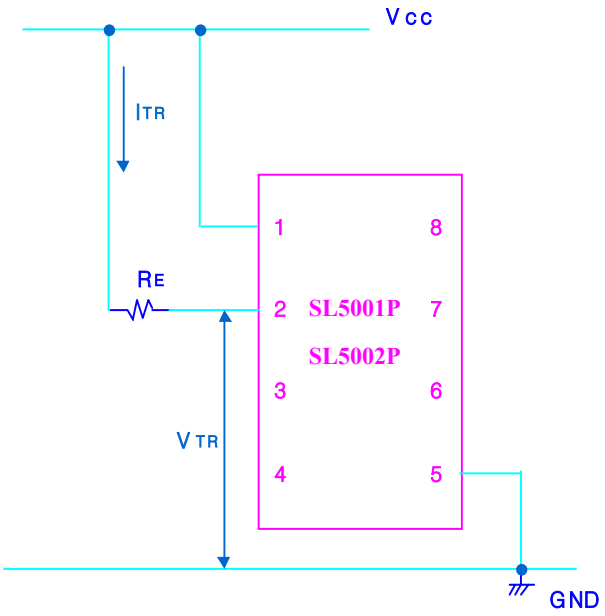
2. Pin 2 Input Equivalent Circuit(5001P)



Usually pin 2 is used at an open state, but in the 5001P circuit the trigger in terminal may be used to externally trigger oscillation for voltage in the range $V_{SUS} \leq V_{CC} \leq V_{CC(INI)}$ 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}).

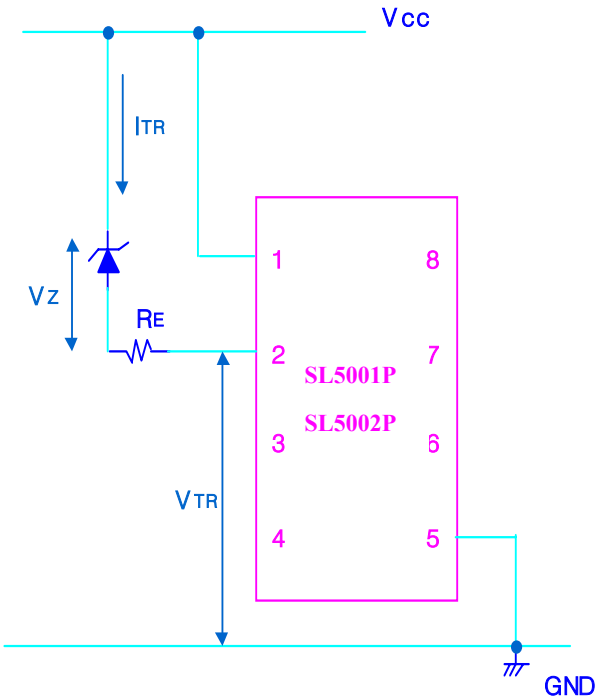
Application Circuits And Information (continued)

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



The 5001P Circuit can oscillate when powered from supply voltages in the range $V_{SUS} \leq V_{CC} \leq V_{CC(INI)}$. Oscillation is ensured by forcing a current I_{TR}(10uA≤ ITR≤ 1mA) into pin2 should be exceeded V_{TR} by the sum of zener voltage of D_3 the VBE of Q_1 and the VBE of Q_2(Typ. 11V). The required current drive can be provided by connecting a resistor R_E(20kΩ ≤ RE≤ (V_{CC}-11)/10MΩ) between pin1 and V_{CC}.

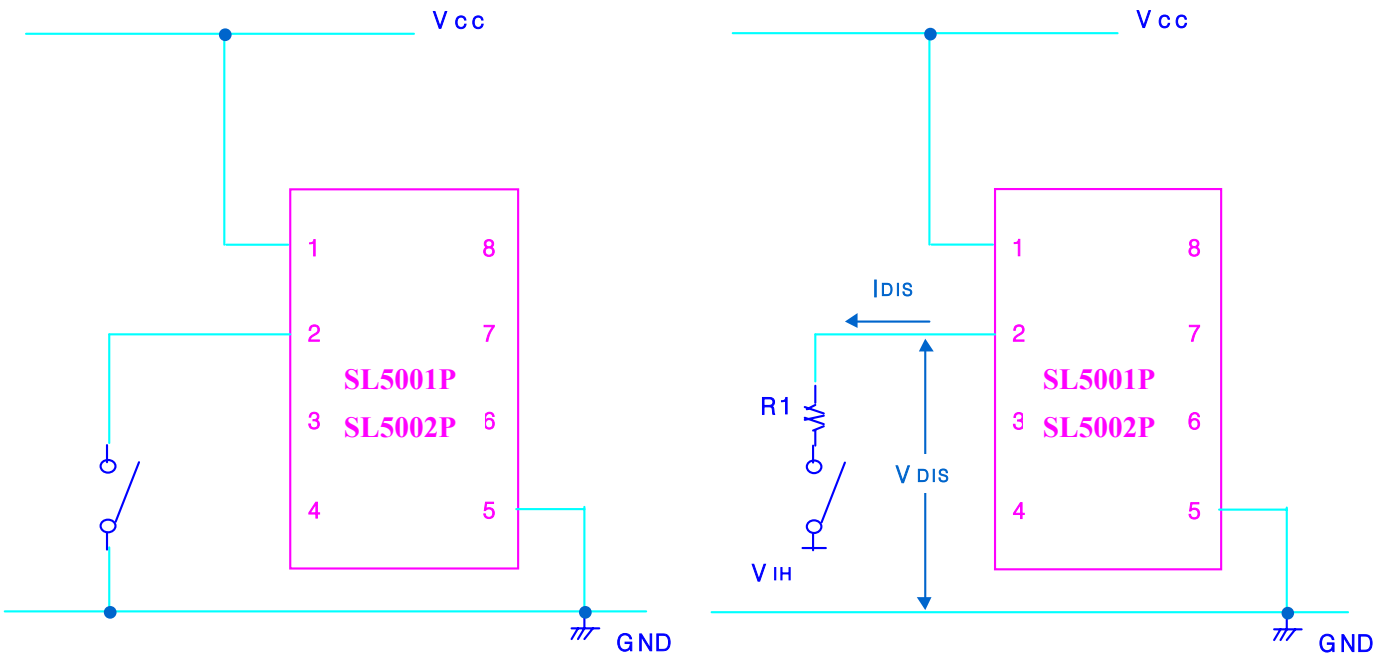
4. Reducing the Effective Value of $V_{CC(INI)}$ for the 5001P circuit



To operate the 5001P 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

Application Circuit And Information (continued)

5. Inhibiting Oscillation of the 5001P circuit



When the 5001P circuit is oscillating , this circuit may be inhibited for voltage in the range $V_{CC(INI)} < V_{CC} \leq V_{CC(MAX)}$ by sinking the current from D_1, starving Q_1 of base current. This is achieved by either grounding pin2 or applying a voltage V_{IH} via a resistor R_1 to pin2

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