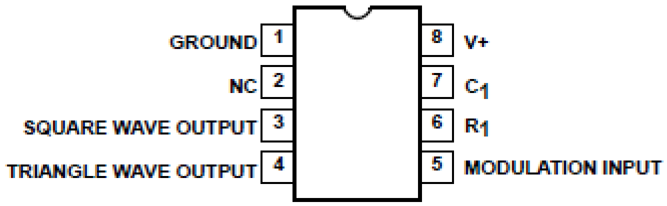
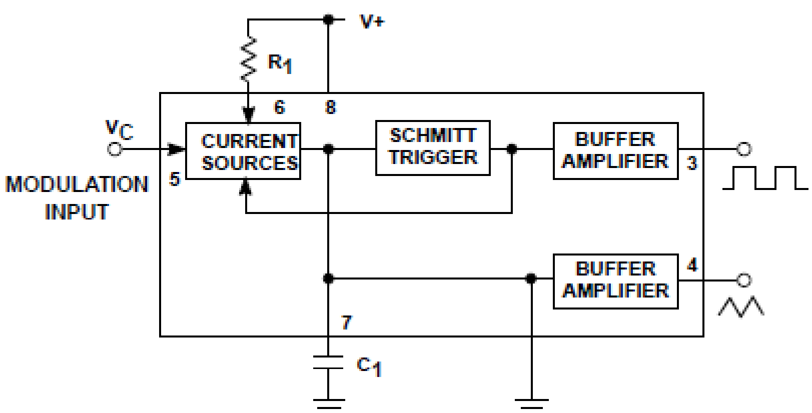
VOLTAGE CONTROLLED OSCILLATOR

A common type of VCO available in IC form is Signetics NE/SE566. The pin configuration and basic block diagram of 566 VCO are shown in figures below.





Referring to the circuit in the above figure, the capacitor c_1 is linearly charged or discharged by a constant current source/sink. The amount of current can be controlled by changing the voltage v_c applied at the modulating input (pin 5) or by changing the timing resistor R_1 external to the IC chip. The voltage at pin 6 is held at the same voltage as pin 5. Thus, if the modulating voltage at pin 5 is increased, the voltage at pin 6 also increases, resulting in less voltage across R_1 and thereby decreasing the charging current.

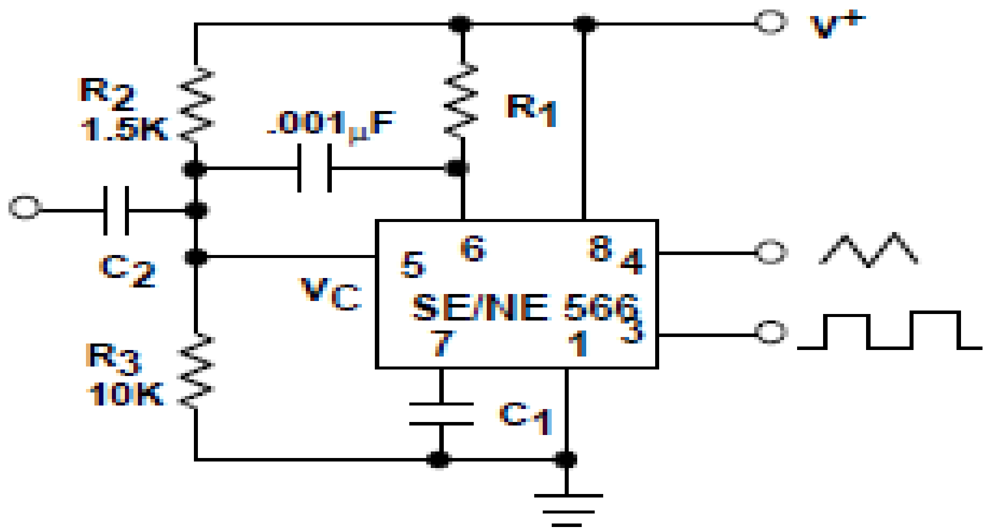
The voltage across the capacitor C_1 is applied to the inverting input terminal of Schmitt trigger via buffer amplifier. The output voltage swing of the Schmitt trigger is designed to V_{cc} and 0.5 V_{cc}. If $R_a = R_b$ in the positive feedback loop, the voltage at the non-inverting input terminal of Schmitt trigger swings from 0.5 V_{cc} to 0.25 V_{cc}. When the voltage on the capacitor c_1 exceeds 0.5 V_{cc} during charging, the output of the Schmitt trigger goes LOW (0.5 V_{cc}). The capacitor now discharges and when it is at 0.25 V_{cc}, the output of Schmitt trigger goes HIGH (V_{cc}). Since the source and sink currents are equal, capacitor charges and discharges for the same amount of time. This gives a triangular voltage waveform across c_1 which is also available at pin 4. The square wave output of the Schmitt trigger is inverted by buffer amplifier at pin 3. The output waveforms are shown near the pins 4 and 3.

The output frequency of the VCO can be given as follows:

$$f_O = \frac{2\,[(V+) - (V_C)]}{R_1\, C_1\, V+}$$

where V+ is V_{cc}.

The output frequency of the VCO can be changed either by (i) R_1, (ii) c_1 or (iii) the voltage v_c at the modulating input terminal pin 5. The voltage v_c can be varied by connecting a R_1R_2 circuit as shown in the figure below. The components $R_1$and c_1 are first selected so that VCO output frequency lies in the centre of the operating frequency range. Now the modulating input voltage is usually varied from 0.75 V_{cc} to V_{cc} which can produce a frequency variation of about 10 to 1.



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