SNS COLLEGE OF TECHNOLOGY

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE NAME : 23EET104-ANALOG ELECTRONIC CIRCUITS

Topic 6 : Schmitt trigger

Schmitt trigger

Basically, the Schmitt trigger is a multivibrator with two stable states, and the output stays in one of the steady states until further notice. The change from one stable condition to the other condition takes place as the input signal activates approximately.

The operation of multivibrator requires an amplifier with positive feedback with loop gain above unity. This circuit is frequently used to change square waves by gradually differing boundaries toward sharp edges used in digital circuits, as well as switch debouncing.

Schmitt trigger

Schmitt trigger can be defined as it is a regenerative comparator. It employs positive feedback and converts sinusoidal input into a square wave output.

The output of Schmitt Trigger swings at upper and lower threshold voltages, which are the reference voltages of the input waveform.

It is a bi-stable circuit in which the output swings between two steady-state voltage levels (High and Low) when the input reaches certain designed threshold voltage levels.

Schmitt Trigger using Transistors

•The main purpose of a Schmitt trigger is to generate a digital signal, which stated in other words is a signal whose only possible values are VCC (logic 1) or ground (logic 0).

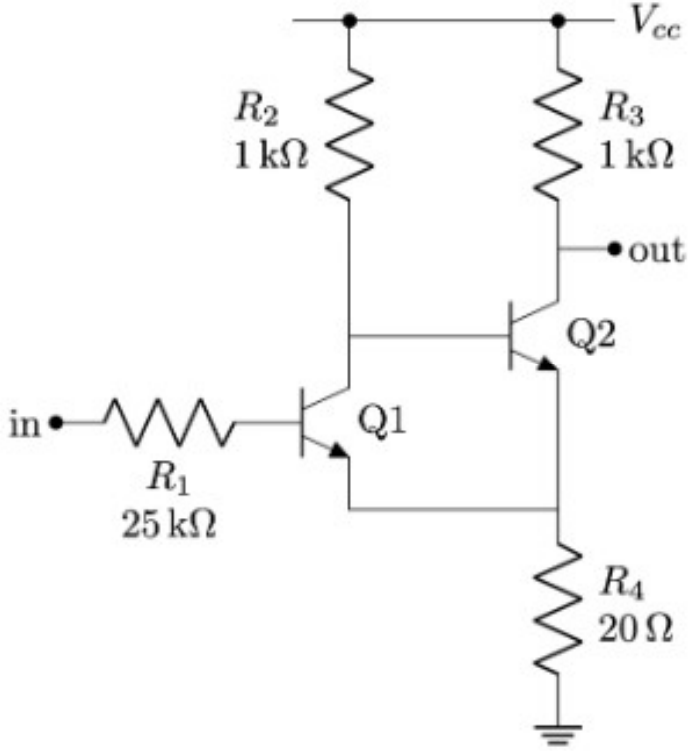
•The original analog signal can vary slowly in time so that the transition periods from high/low to low/high might not be fast enough.

•This circuit will act as a comparator with hysteresis whose thresholds for setting the output high or low will be defined by the design parameters.

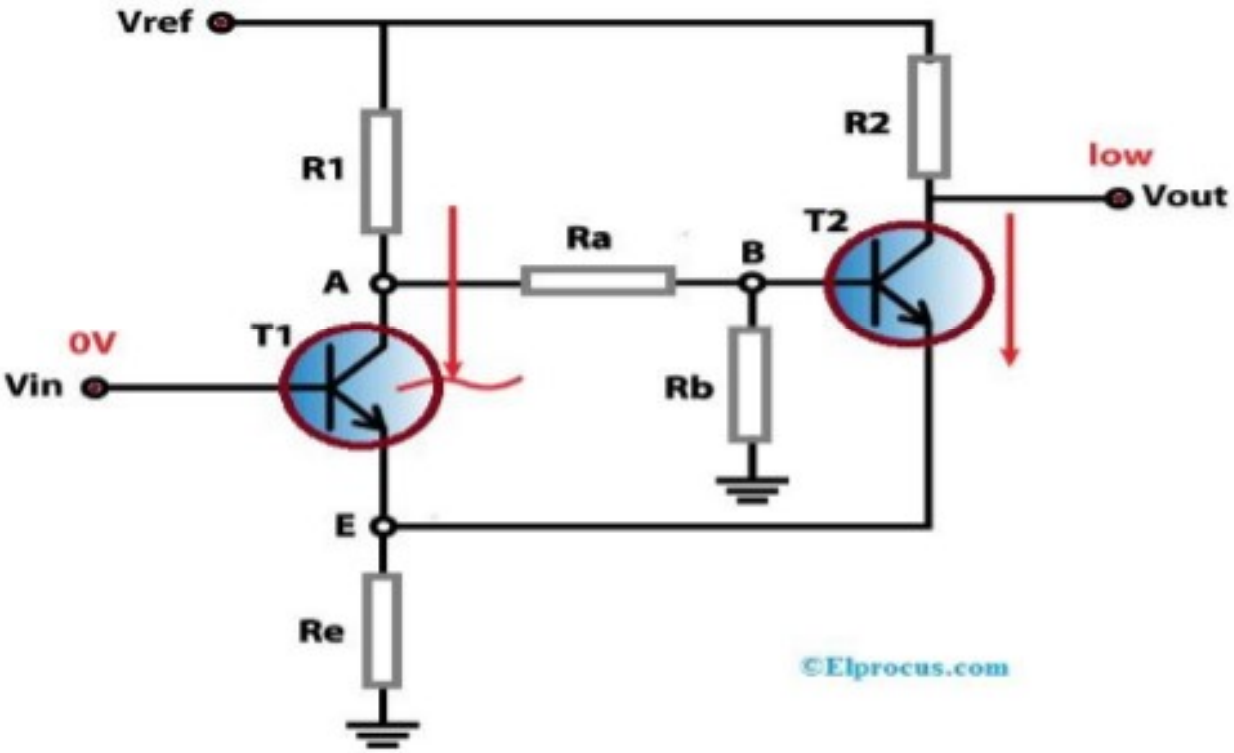
Schmitt trigger

When the input voltage (Vin) is 0 V, then the T1 transistor will not conduct, whereas the T2 transistor will conduct due to the voltage reference (Vref) with the voltage1.98.

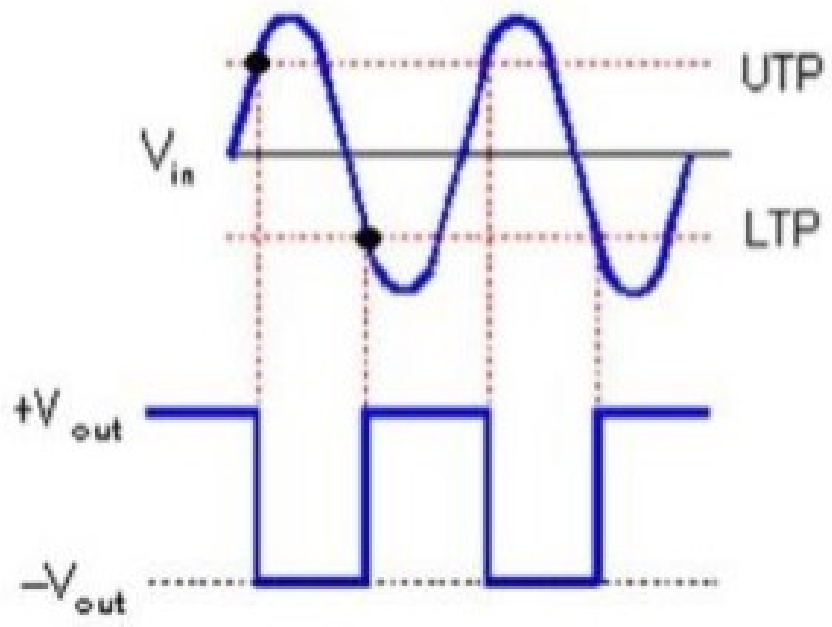
At node B, the circuit can be treated as a voltage divider to calculate the voltage with the help of following expressions.



Circuit diagram



Output waveform



Working

The conducting voltage of the T2 Transistor is low & the transistor emitter terminal voltage will be 0.7 V is lesser than the base terminal of the transistor that will be 1.28 V.

Vin = 0V, Vref = 5V
Va = (Ra + Rb/ Ra + Rb + R1) * Vref
Vb = (Rb/Rb + R1 + Ra) * Vref

Working

When we increase the input voltage, the T1 transistor value can be crossed so the transistor will conduct. This will be the reason to drop the base terminal voltage of the transistor T2.

When the T2 transistor is not conducting longer then the output voltage will be increased. Subsequently, the Vin (input voltage) at the T1 transistor base terminal will begin refusing & it will deactivate the transistor as the transistor base terminal voltage will be above 0.7 V of its emitter terminal.

References

Electronic Devices and Circuits By Salivahanan

Thank You