

IN 277 Notes 7

The 555 Timer

A. Mohanty

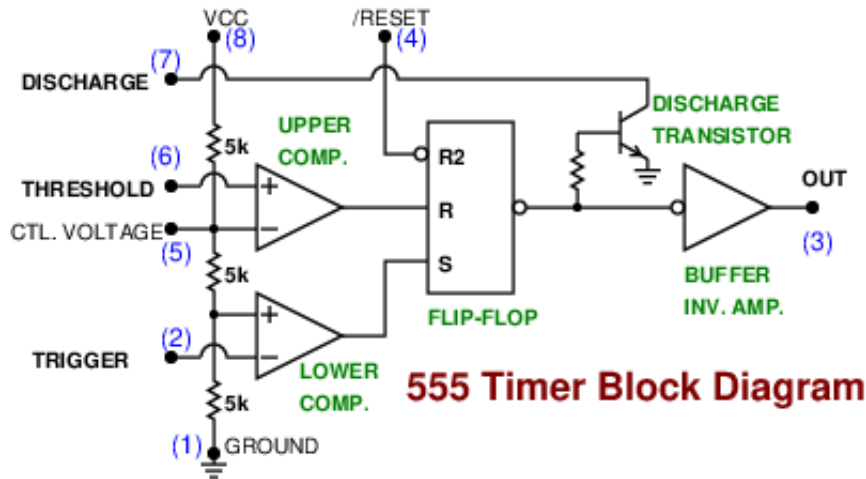
Department of Instrumentation and Applied Physics
Indian Institute of Science
Bangalore 560012

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555 Timer

- Introduced by Signetics in 1972
- Designed by Hans Camenzind
- Two main uses
 - Timer: Monostable multivibrator circuit
 - Oscillator: Astable multivibrator circuit
- Very popular IC
- Timing independent of supply voltage
- Can directly drive speaker, relay, MOSFET

555 Timer: Internal Structure

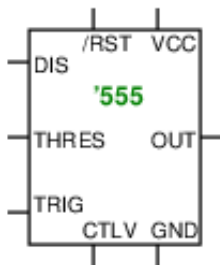


555 Timer Block Diagram

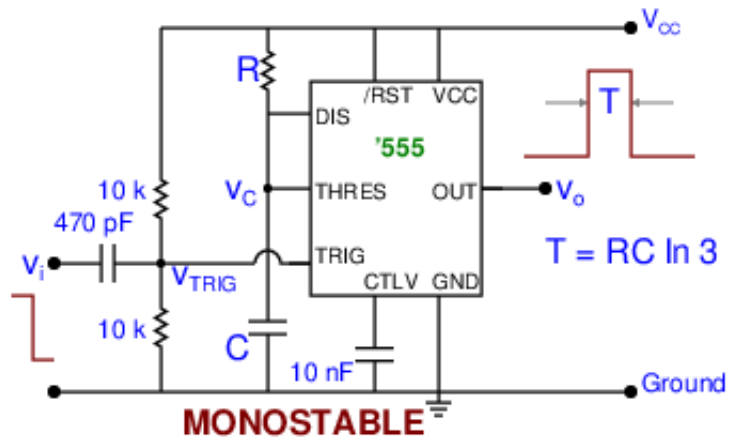
555 Timer: Internal Structure

- Voltage divider with three equal resistors
- Has two comparators driving a flip-flop
- Need to ensure that both comparator outputs are not high at the same time

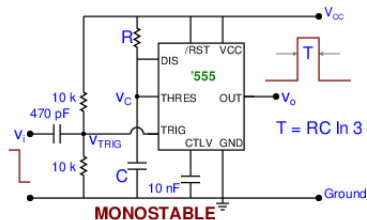
555 Timer: Block Element Symbol



Timer: 555 Monostable Multivibrator

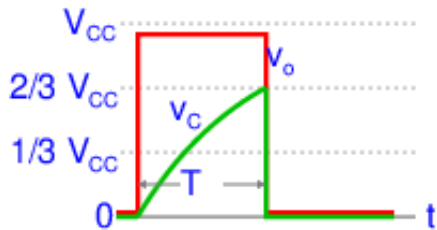


Timer: 555 Monostable Explanation



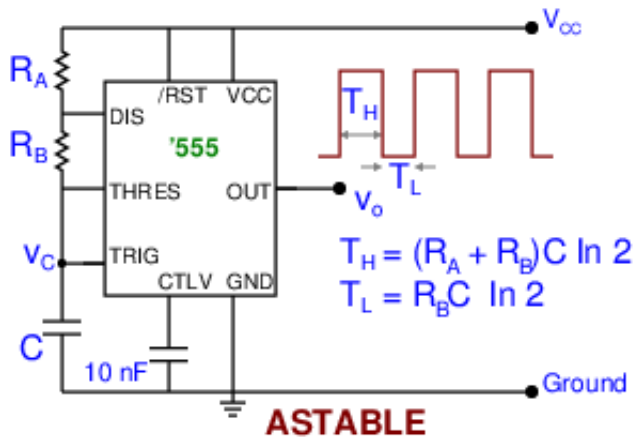
In the steady state, the output is LOW and the discharge transistor is ON. A falling edge at the input takes the voltage at the trigger fall below $\frac{1}{3} V_{CC}$. This sets the flip-flop to make the output HIGH and turn the discharge transistor OFF. The capacitor C starts charging from V_{CC} through resistor R . As soon as the voltage across the capacitor reaches (exceeds) $\frac{2}{3} V_{CC}$ the flip-flop is reset again making the output LOW and the discharge transistor ON. T , the duration for which the output is high is given by $T = RC \ln 3$.

555 Monostable Waveforms

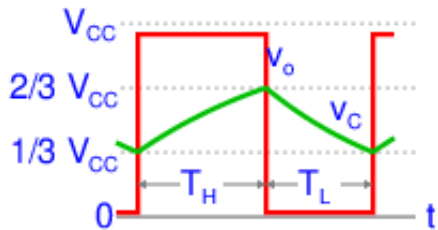


'555 Monostable Waveforms

Oscillator: 555 Astable Multivibrator

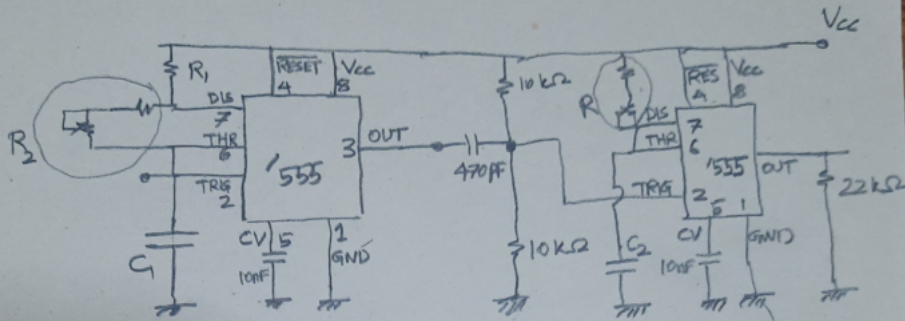


555 Astable Waveforms



'555 Astable Waveforms

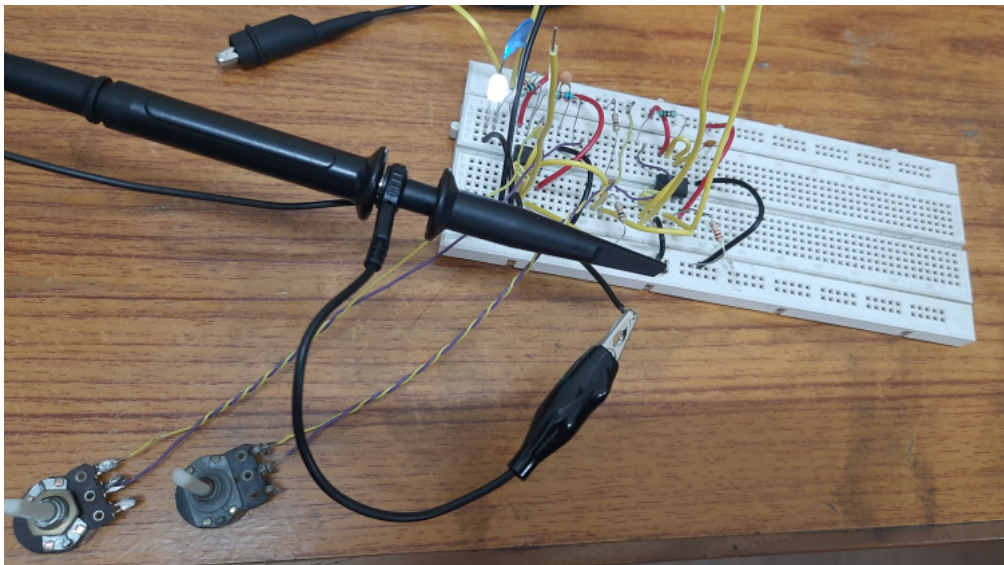
Timer Circuit Diagram



$V_{cc} : +12\text{ V}$
 $R_1 : 5.6\text{ k}\Omega$
 $R_2 : 5.6\text{ k}\Omega + 100\text{ k}\Omega\text{ variable}$
 $C_1 : 10\text{ nF}$

$R : 1\text{ k}\Omega + 10\text{ k}\Omega\text{ variable}$
 $C_2 : 10\text{ nF}$

Timer Circuit Implementation



Timer Circuit Waveforms

