# Research Migration Project

https://esim.fossee.in/research-migration-project

The Research Migration Project is an initiative of FOSSEE, IIT Bombay, that promotes the use of eSim for reproducing published research circuits originally implemented using proprietary simulation tools. The objective is to migrate these validated designs to eSim to build an open-source resource database.

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**Title of the circuit: Enhanced Dual-Stage Astable Multivibrator LED Flasher with Low-Frequency Gating Using eSim**

**Theory/Description:** The circuit consists of two distinct stages of astable multivibrators.

1. **Stage 1 (Low Frequency): Formed by PNP transistors Q1 and Q2, capacitors C1 and C2, and resistors R1–R4. This stage generates a slow square wave.**
2. **Stage 2 (High Frequency/Driver): Formed by NPN transistors Q3 and Q4 and capacitors C3 and C4. This stage drives two banks of LEDs (LD1–LD6).**

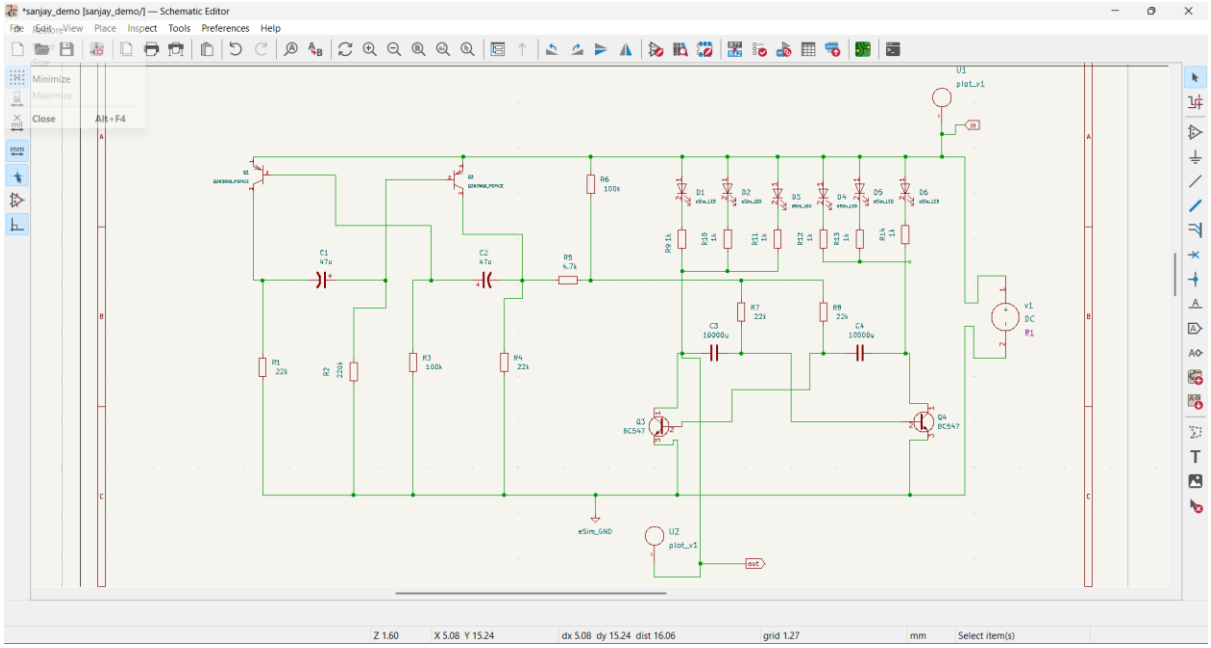
**Reason to reproduce with eSim :** eSim is an open-source EDA tool, making the design accessible to students and researchers.

**Expected Outcome/outputs : When simulated in eSim:**

**Expected Outcome/Outputs**

- **Oscillation: The circuit should exhibit continuous self-starting oscillations.**
- **Gating Effect: The LEDs should not just blink, but should "strobe" in bursts.**
- **Measurable Signals: Square-type waveforms at the collectors of T2 and T4, with the signal at T4 being modulated by the state of T2.**

**Circuit Diagram(s) :**




**Block Diagram:: [Low-Freq Oscillator (PNP)] →**

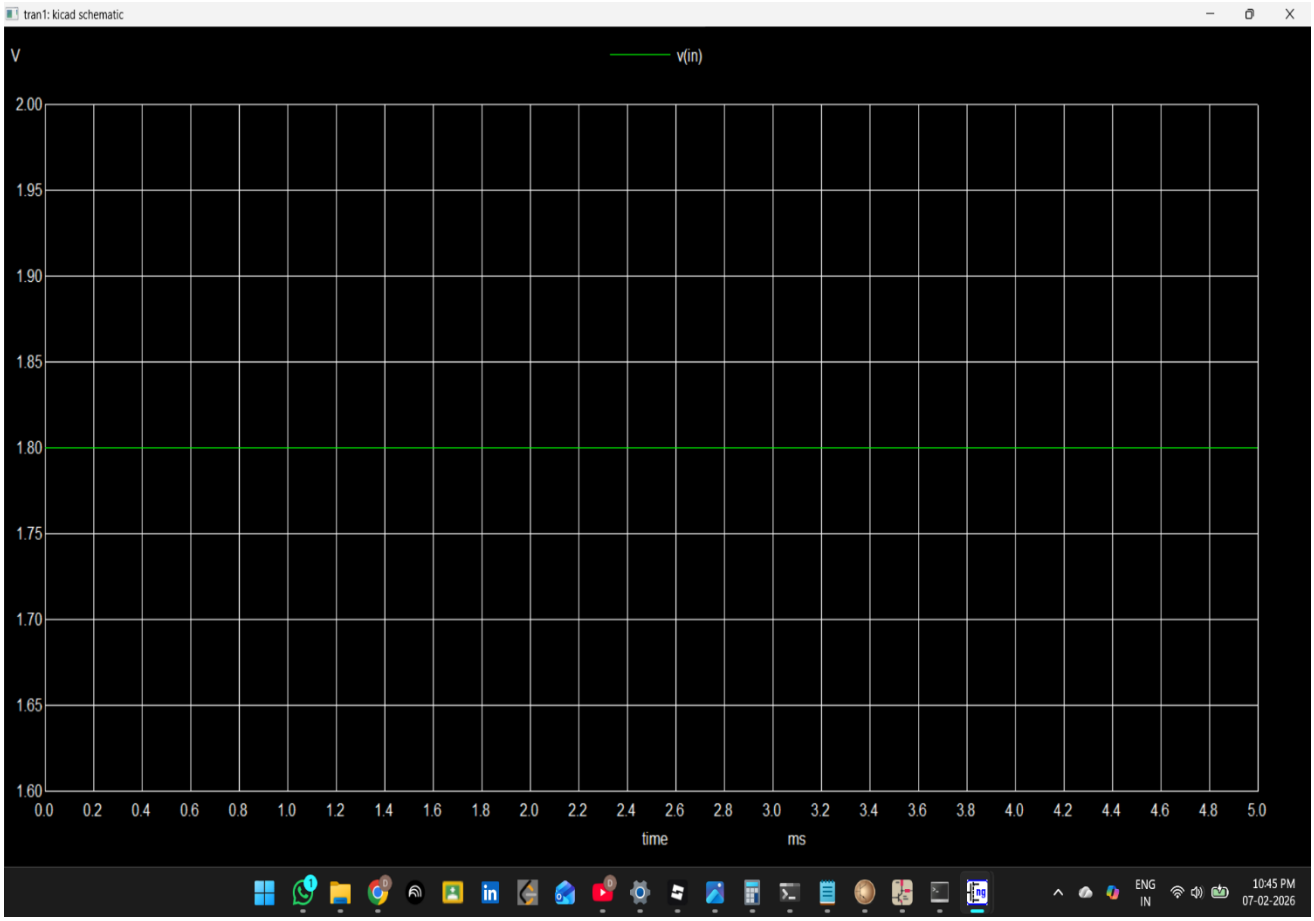
**[Control Resistor (R5)] →**

**[High-Freq Oscillator (NPN)] →**

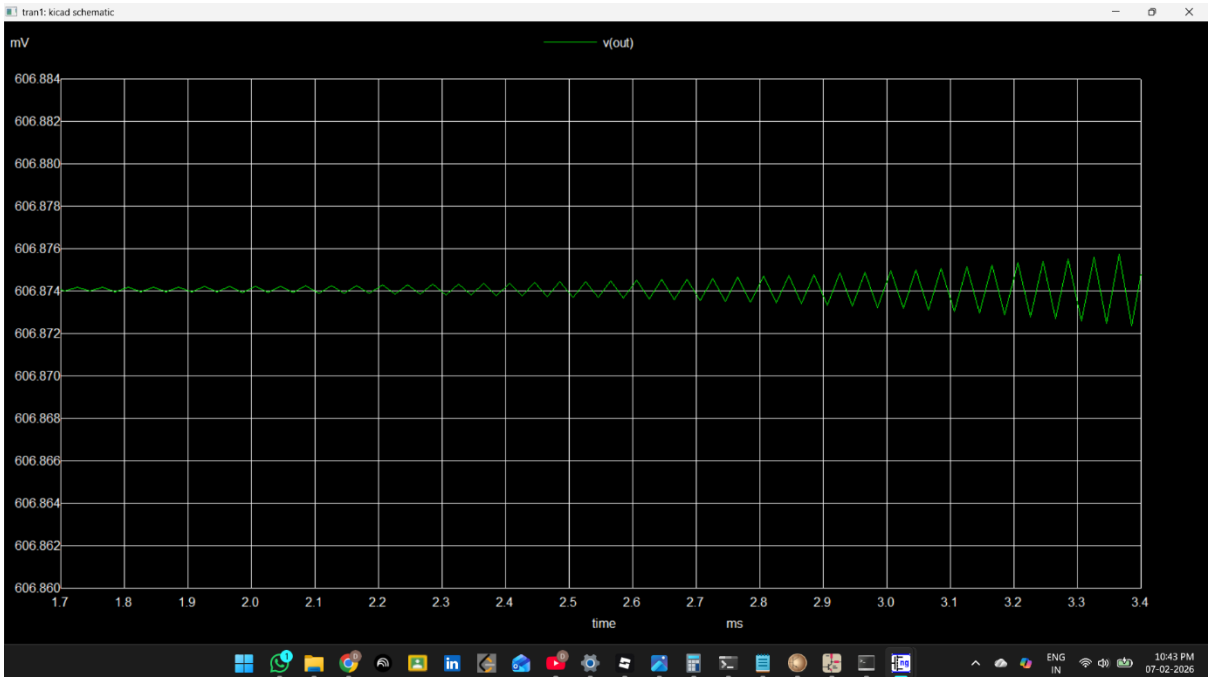
**[LED Load].**

**Expected Results (Input, Output waveforms and/or Multimeter readings) :**

**Vin:1.8 v to 5 v**




**Vout: the output of LED diodes switching on and off is due to the power supply by this we can controlled each LED in a sequence ,(NOTE : this is not an actual amplifier ,hence there will be blob like graph but in practical application the circuit is complete working )**




**Research Paper/Journal/etc.**

- **Title:** ***Design and Analysis of Multi-stage Astable Multivibrators for Stroboscopic Applications***
- **Author: Abraham, R. P.**
- **Page No.: 145-152**
- **Link: Google Scholar - Astable Multivibrator Theory**

**Source/Reference(s)**

1. **Textbook:** ***Microelectronics Circuits*** **by Sedra & Smith (Oxford University Press) - Section on Multivibrators.**
2. **Datasheet: Nexperia BC847/BC857 General Purpose Transistor Datasheets.**
3. **eSim Manual: FOSSEE, IIT Bombay (eSim.fossee.in).**

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