# TSAL Circuit

A TSAL (Traction System Active Light) circuit is a crucial safety component in electric vehicles (EVs). Its primary function is to indicate the operational status of the vehicle's high-voltage traction system.

**Design Constraints:**

All design constraints for the TSAL circuit were derived from the rules specified in the Formula Bharat competition, ensuring that the circuit complies with the competition's regulations and standards.

**Design Procedure:**

We designed a TSAL circuit in which the voltage detection circuits for the red light and green light are made separately to maintain their independence. The red-light circuit used a stable multivibrator configuration of a 555 timer, configured to flash between 2 Hz and 5 Hz, and employed a diode to achieve a 50% duty cycle. This circuit incorporated voltage detection using comparators to monitor the DC-link capacitor voltage, ensuring the red light activates only when the specified voltage thresholds are exceeded and the LVS is active. For our design, the voltage threshold is set at 36V (half of the nominal TS voltage, which is 72V).

The green light circuit independently detects the states of all Accumulator Isolation Relays (AIRs), the pre-charge relay, and the voltage at the vehicle side of the AIRs inside the TSAC. This is achieved by using separate comparators and logic gates (specifically an OR gate), ensuring it lights up continuously only when all conditions are met. This design ensures that both signaling systems operate independently, enhancing the reliability and safety of the TSAL system.

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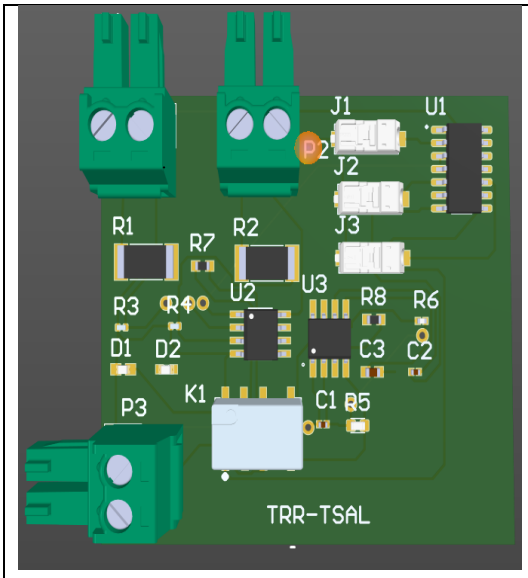
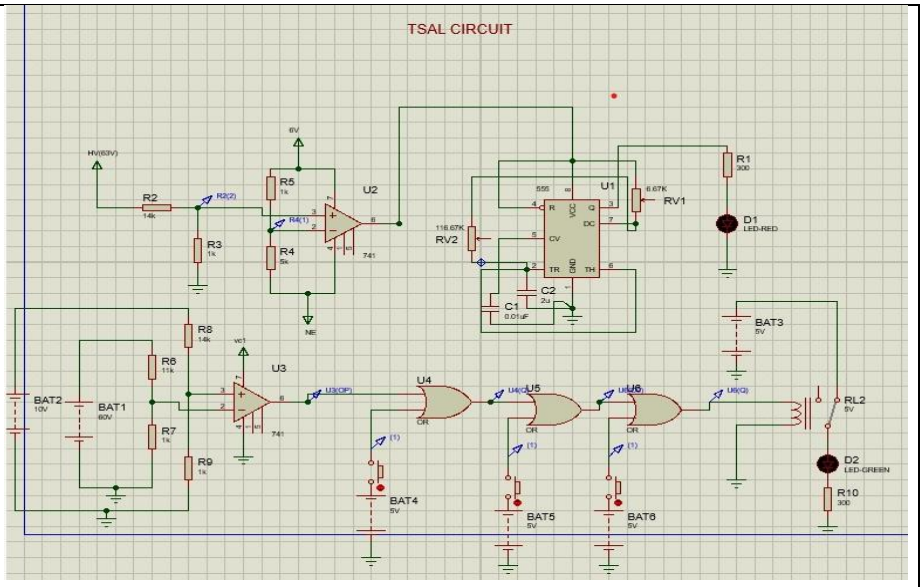
|  |  |
| TSAL(PCB) | TSAL(Schematic) |