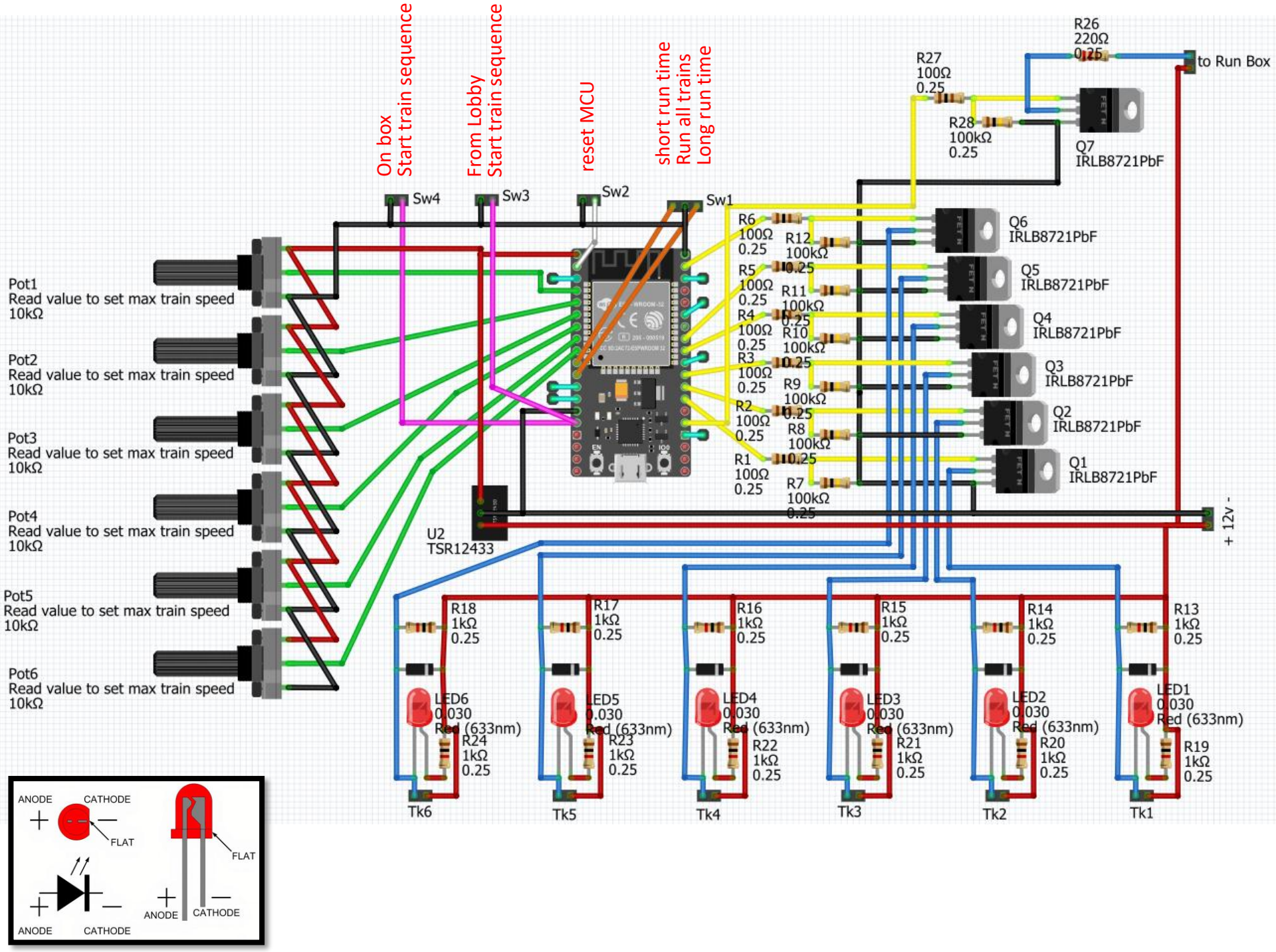
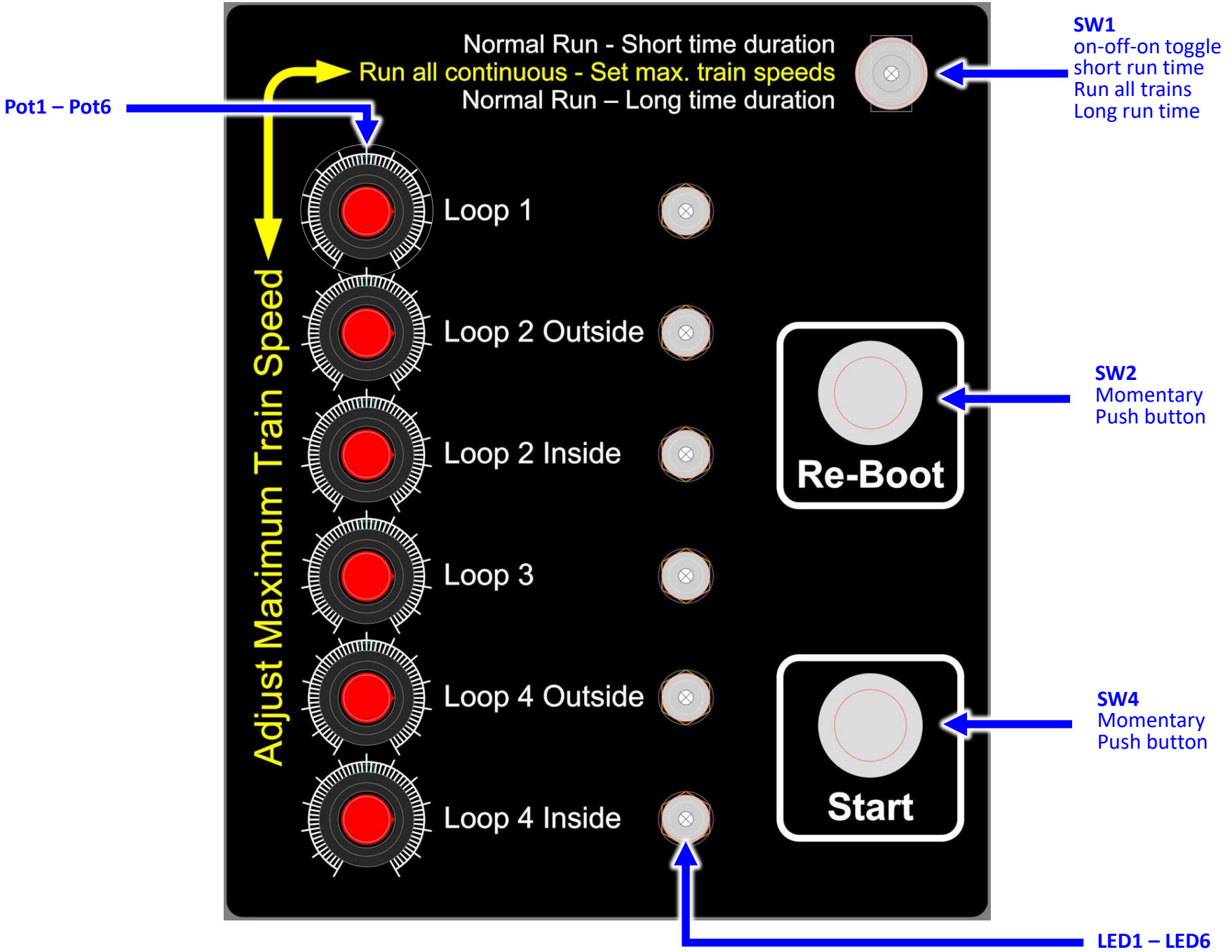

On box
Start train sequence
From Lobby
Start train sequence
reset MCU
short run time
Run all trains
Long run time
Sw4
Sw3
Sw2
Sw1
Pot1
Read value to set max train speed
10kΩ
Pot2
Read value to set max train speed
10kΩ
Pot3
Read value to set max train speed
10kΩ
Pot4
Read value to set max train speed
10kΩ
Pot5
Read value to set max train speed
10kΩ
Pot6
Read value to set max train speed
10kΩ
U2
TSR12433
R6 100Ω 0.25
R5 100Ω 0.25
R4 100Ω 0.25
R3 100Ω 0.25
R2 100Ω 0.25
R1 100Ω 0.25
R12 100kΩ 0.25
R11 100kΩ 0.25
R10 100kΩ 0.25
R9 100kΩ 0.25
R8 100kΩ 0.25
R7 100kΩ 0.25
R27 100Ω 0.25
R28 100kΩ 0.25
R26 220Ω 0.25
to Run Box
Q7 IRLB8721PbF
Q6 IRLB8721PbF
Q5 IRLB8721PbF
Q4 IRLB8721PbF
Q3 IRLB8721PbF
Q2 IRLB8721PbF
Q1 IRLB8721PbF
+ 12v -
R18 1kΩ 0.25
R17 1kΩ 0.25
R16 1kΩ 0.25
R15 1kΩ 0.25
R14 1kΩ 0.25
R13 1kΩ 0.25
LED6 0.030 Red (633nm)
LED5 0.030 Red (633nm)
LED4 0.030 Red (633nm)
LED3 0.030 Red (633nm)
LED2 0.030 Red (633nm)
LED1 0.030 Red (633nm)
R24 1kΩ 0.25
R23 1kΩ 0.25
R22 1kΩ 0.25
R21 1kΩ 0.25
R20 1kΩ 0.25
R19 1kΩ 0.25
Tk6
Tk5
Tk4
Tk3
Tk2
Tk1
ANODE
CATHODE
FLAT
ANODE
CATHODE
FLAT
ANODE
CATHODE


Normal Run - Short time duration
Run all continuous - Set max. train speeds
Normal Run – Long time duration
Pot1 – Pot6
SW1
on-off-on toggle
short run time
Run all trains
Long run time
Adjust Maximum Train Speed
Loop 1
Loop 2 Outside
Loop 2 Inside
Loop 3
Loop 4 Outside
Loop 4 Inside
Re-Boot
SW2
Momentary
Push button
Start
SW4
Momentary
Push button
LED1 – LED6

Behavior:

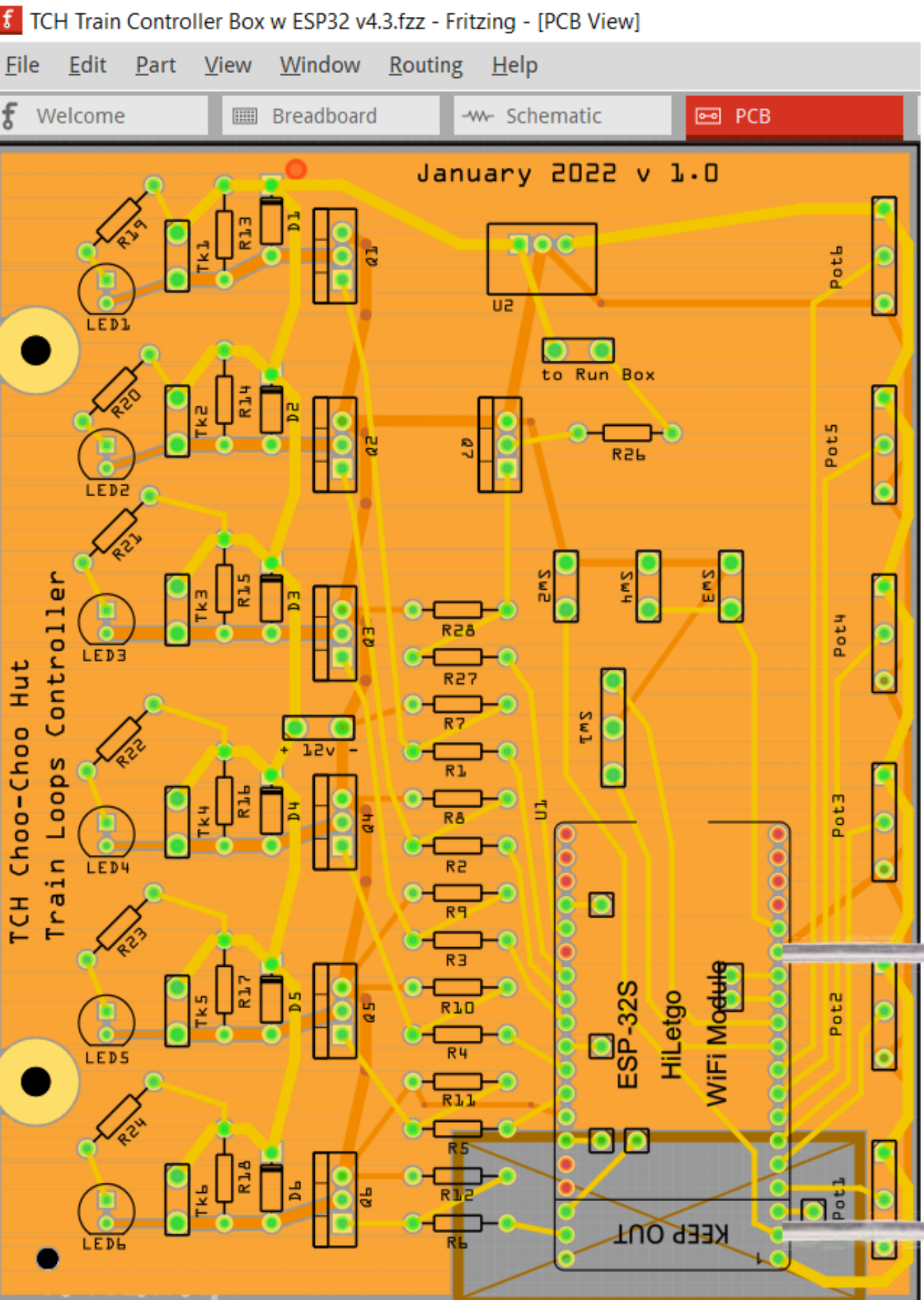
Train Run Event (TRE) begins when either momentary push button SW3 or SW4 are pressed.

1. All but 1 of the six track loops will be powered during a TRE. In each subsequent TRE, the loop that is idle increments. e.g.:
    a. First TRE, track loop 1 stays idle, second TRE, track loop 2 stays idle, etc.
    b. Alternately, which track loop that remains idle during a TRE would be chosen randomly
2. When TRE is triggered, the 5 tracks active tracks have the duty cycle increased from 0 to a value determined by the Pot for each loop. The time for the increase in duty cycle should be about 5 seconds.
3. At end of TRE, want trains to take about 5 seconds to stop.
4. During TRE, length of time trains run is determined from position of SW1
    a. The two on position determine how long it takes for trains to accelerate and deaccelerate.
5. Also, during entire time of each TRE, set the duty cycle of MOFST7 to 100%
6. Function of SW1 when switched to the off (center) position:
    a. Once SW1 is in off position, ignore input from SW3 or SW4
    b. Check if trains are running and it so, deaccelerate them to a stop.
    c. Once trains are all stopped, accelerate all 6 track loops and keep them running until SW1 is switched from the off position.
    d. During this time, read inputs from Pot1 – Pot6 and change duty cycles in real time, allowing operator to set the maximum speed for each train loop.
    e. Once SW1 is switched to either on position, deaccelerate trains to a stop, and then resume responding to inputs from SW3 and SW4

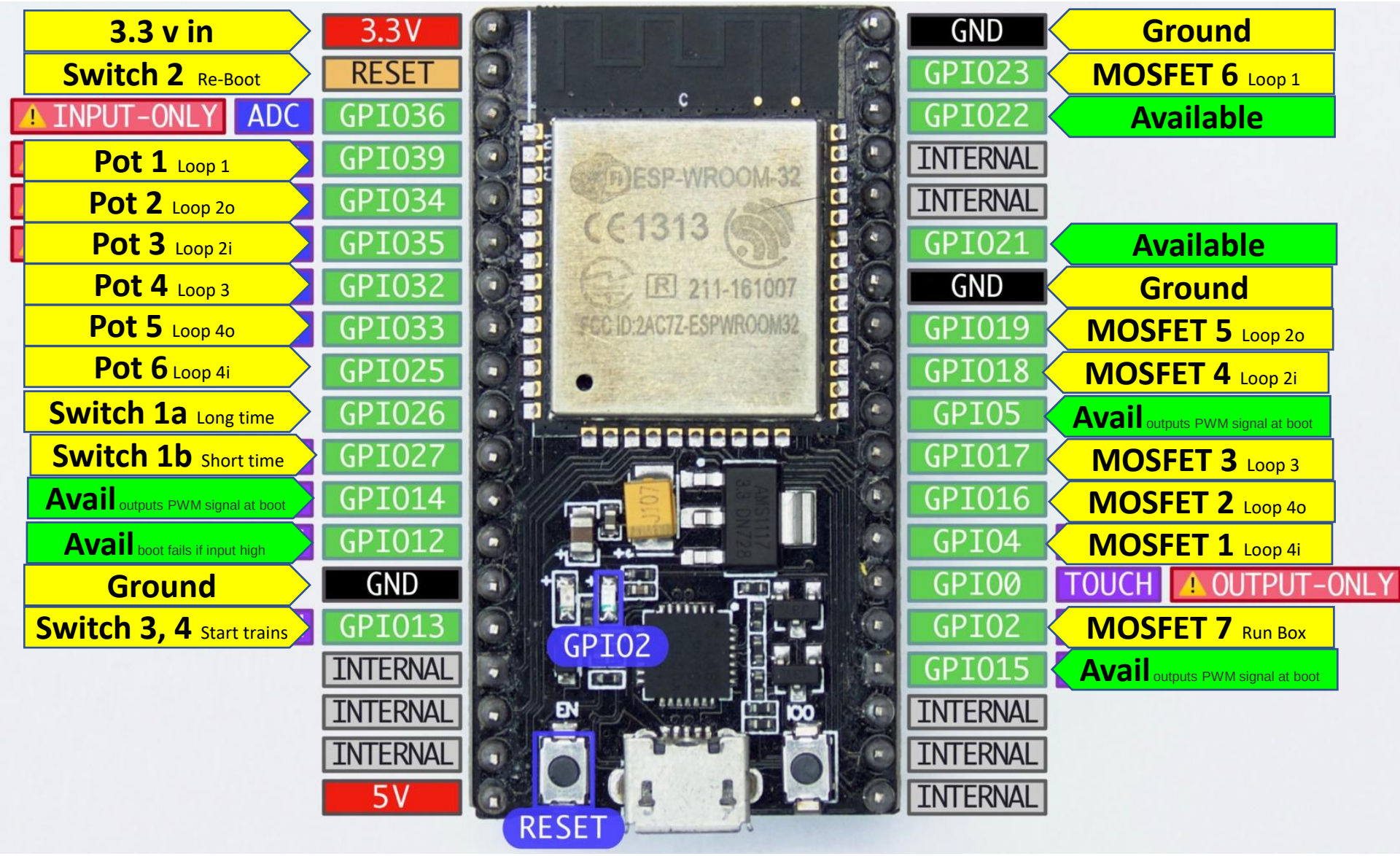
Input variables:

1. PWM frequency. Will probably settle on using 15kHz
2. Minimum Runtime of trains during TRE
3. Maximum Runtime of trains during TRE
4. The variable(s) that determine the time it takes to increase or decrease the Duty Cycle from 0% to 100%

CAUTION: Cannot have the Circuit connected to the external power supply while the ESP32 USB programming cable is connected!


TCH Train Controller Box w ESP32 v4.3.fzz - Fritzing - [PCB View]
File Edit Part View Window Routing Help
Welcome
Breadboard
Schematic
PCB
January 2022 v 1.0
TCH Choo-Choo Hut
Train Loops Controller
LED1
LED2
LED3
LED4
LED5
LED6
R19
R20
R21
R22
R23
R24
R13
R14
R15
R16
R17
R18
D1
D2
D3
D4
D5
D6
Q1
Q2
Q3
Q4
Q5
Q6
Tk1
Tk2
Tk3
Tk4
Tk5
Tk6
U2
to Run Box
Q7
R26
Pot6
Pot5
Pot4
Pot3
Pot2
Pot1
Sw2
Sw4
Sw3
Sw1
R28
R27
R7
R1
R8
R2
R9
R3
R10
R4
R11
R5
R12
R6
+ 12v -
U1
ESP-32S
HiLetgo
WiFi Module
KEEP OUT

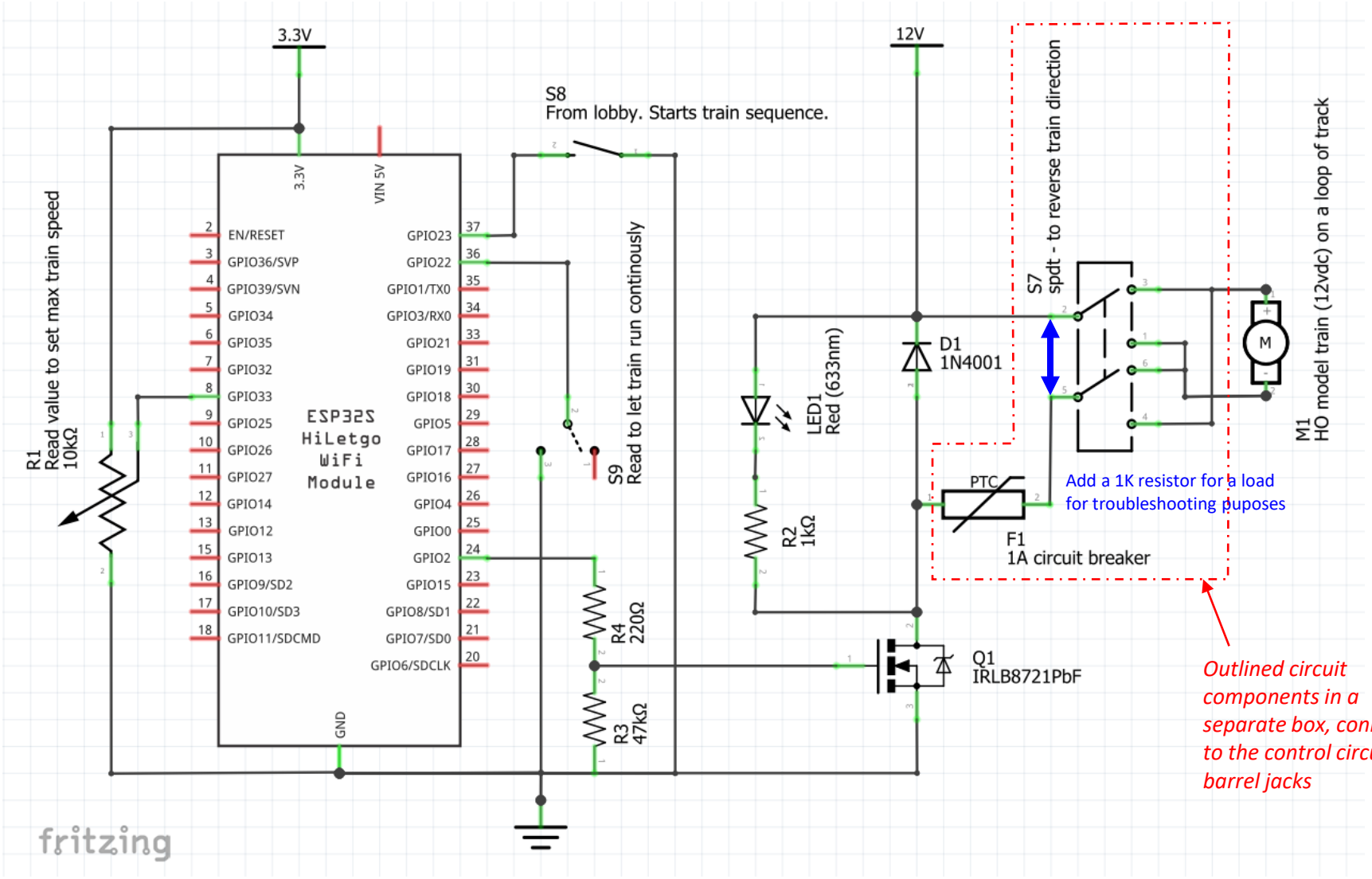
https://esphome.io/devices/nodemcu_esp32.html

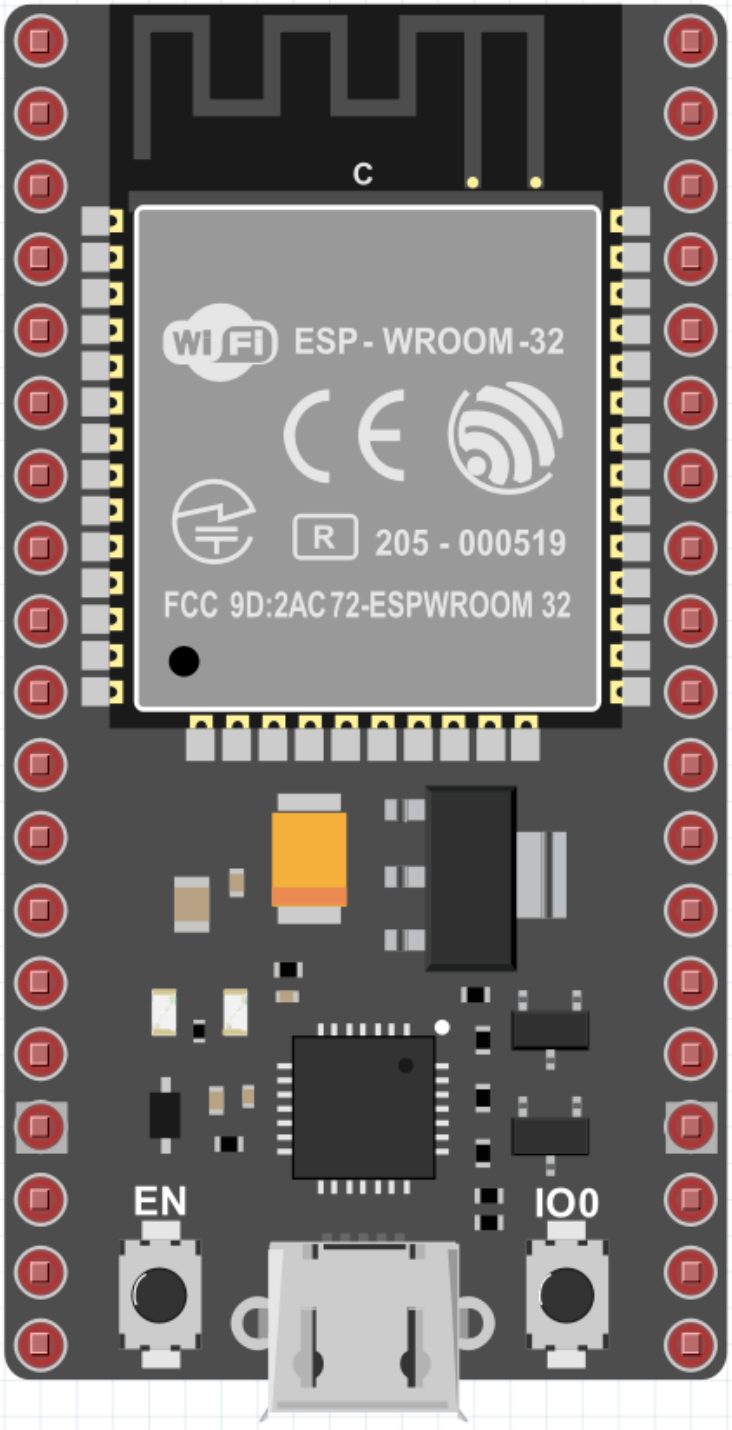


Texas Children's Hospital

Choo-Choo Hut

Train Layout Control Box




C
WI FI
ESP - WROOM -32
R
205 - 000519
FCC 9D:2AC 72-ESPWROOM 32
EN
IO0