SMART NIGHT LIGHT

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AGENDA

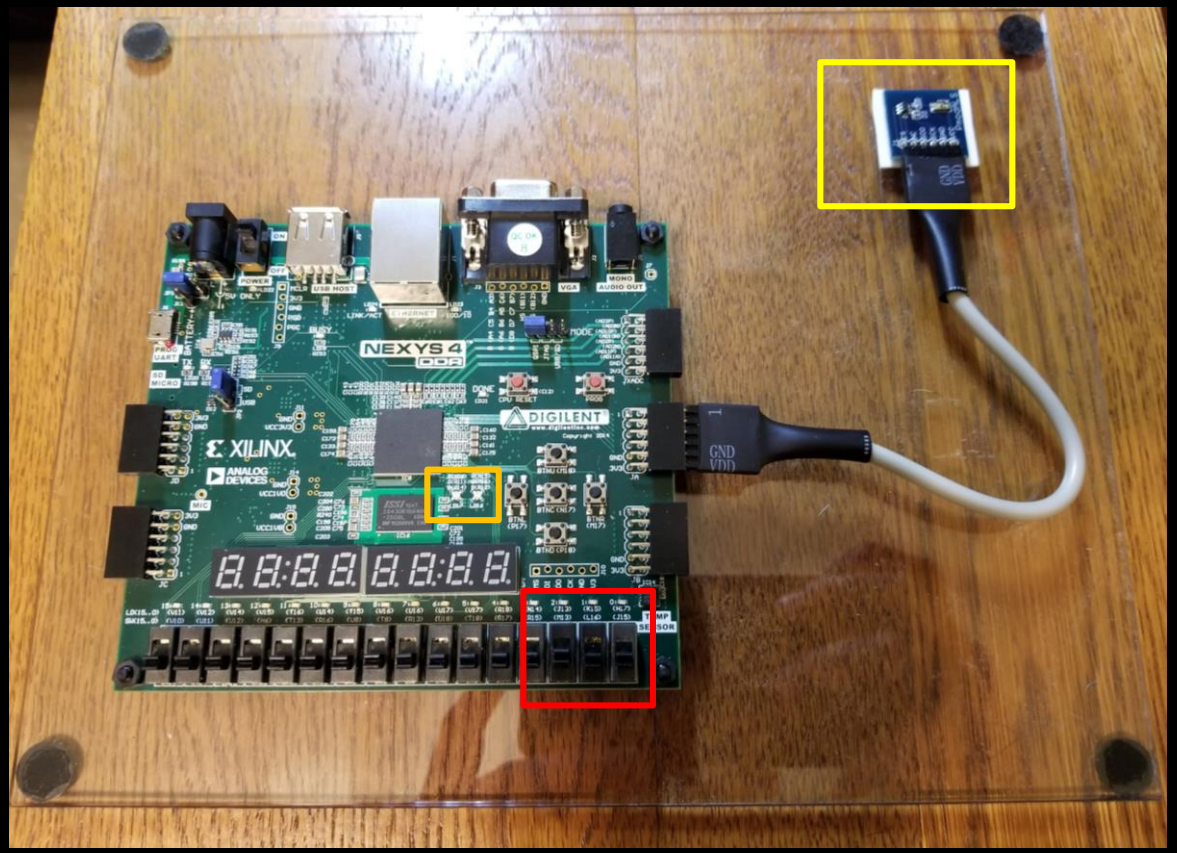
- Introduction
- Inputs and Outputs
- SPI Overview
- Finite State Machine
- Circuit Diagrams
- Demonstration
- Improvements
- References

INTRODUCTION

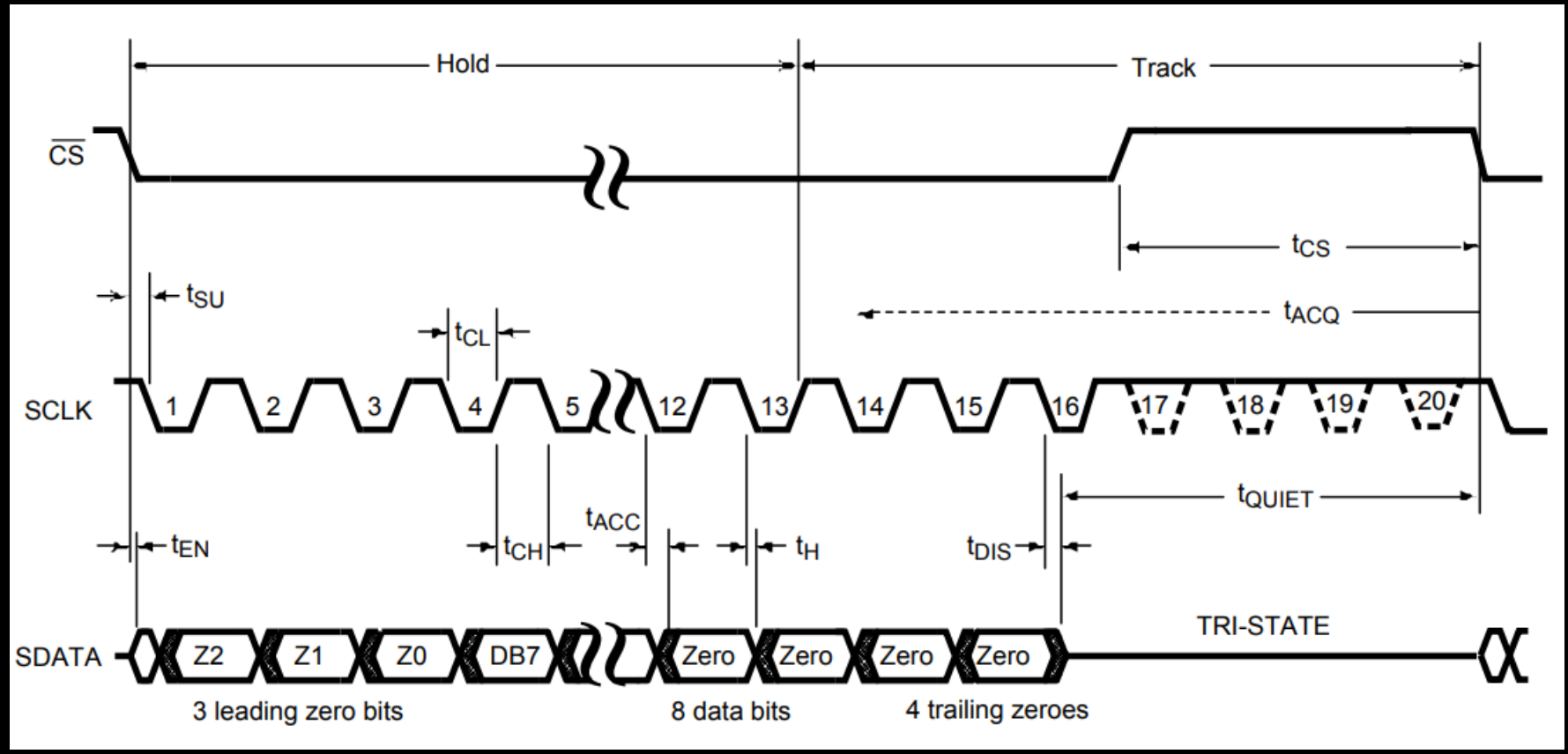
- Design a night light that can:
  - Feature multiple colors (for user customization)
  - Automatically dim in bright situations
  - Automatically brighten in dark situations
- The night light should also be able to:
  - Turn on full brightness at different colors

INPUTS AND OUTPUTS

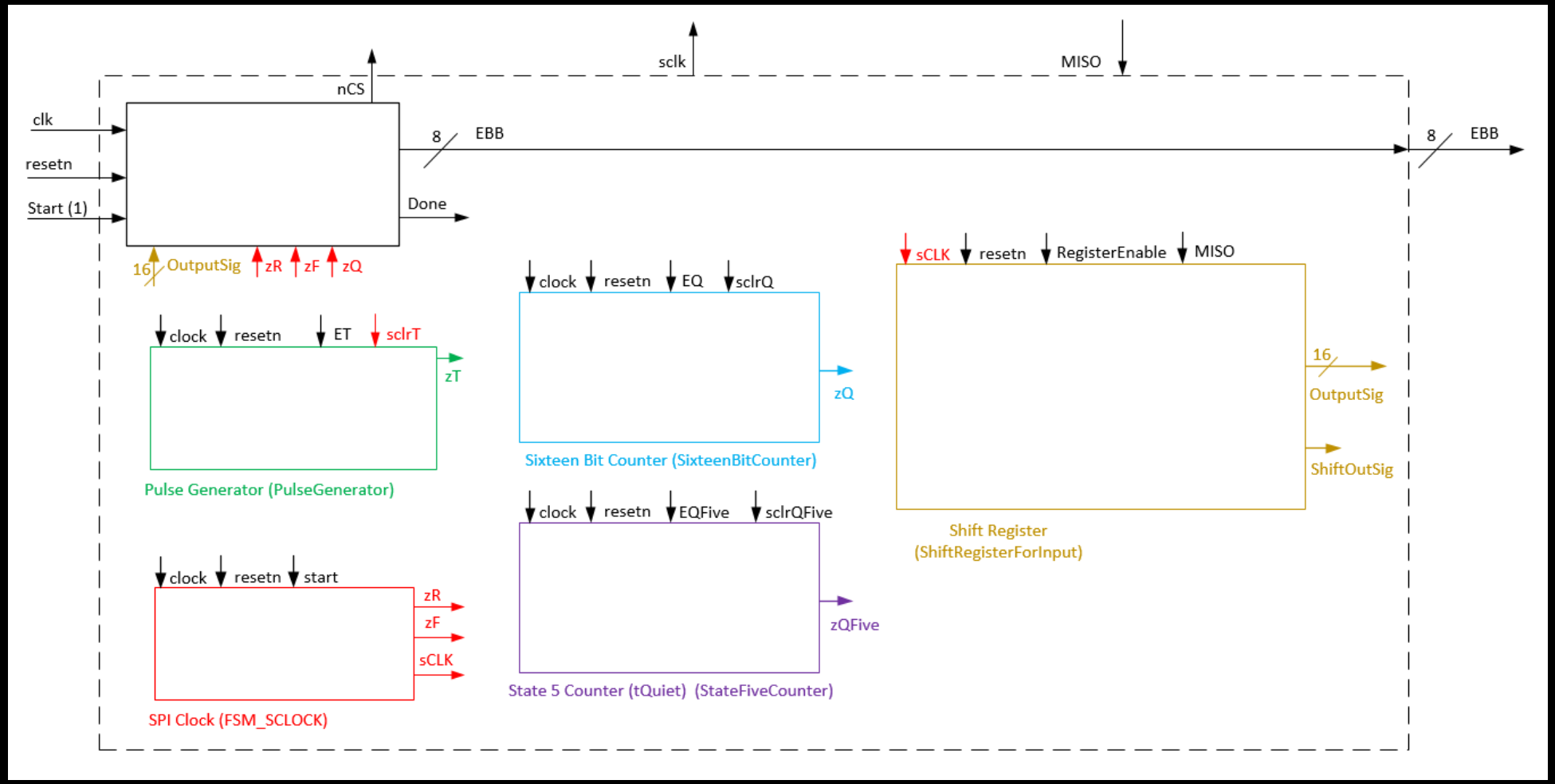
- Three Switches (Mode Selection)
- RGB LED's
- Ambient Light Sensor
  - CS (Chip Select)
  - SDO (Output, MISO)
    - (Master Input Slave Output)
  - SCK*
    - *The SPI Interface requires an external clock at frequency 1-4MHz



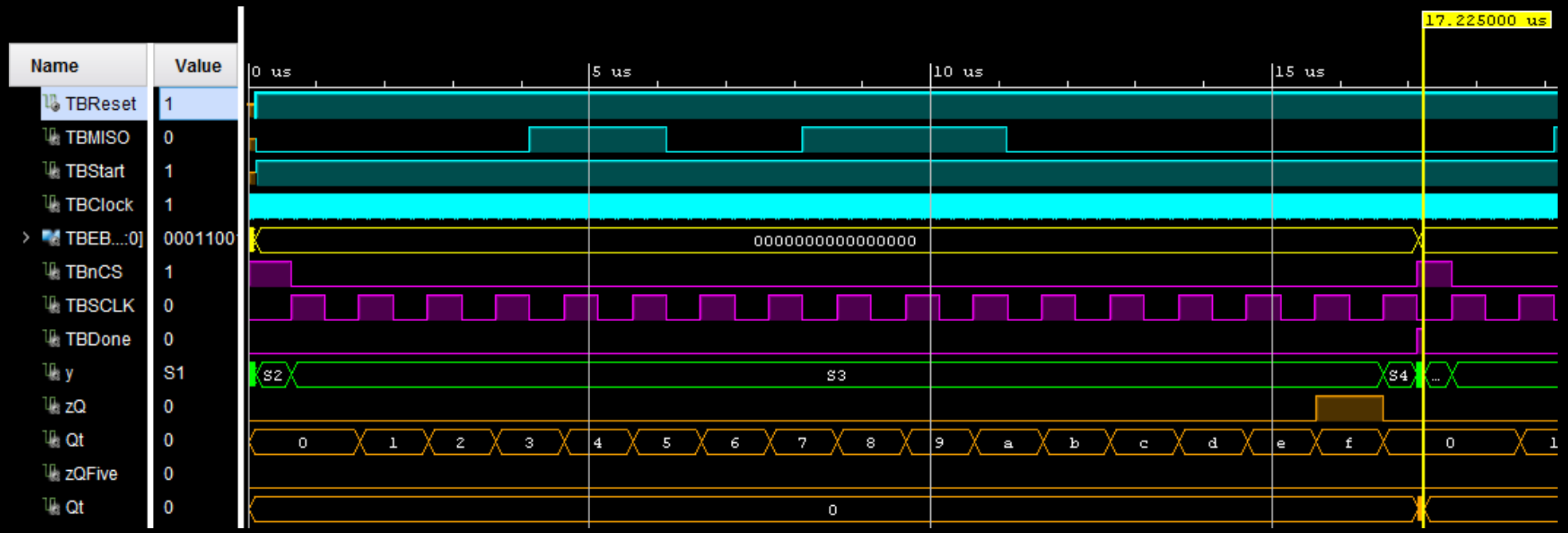
SPI INTERFACE

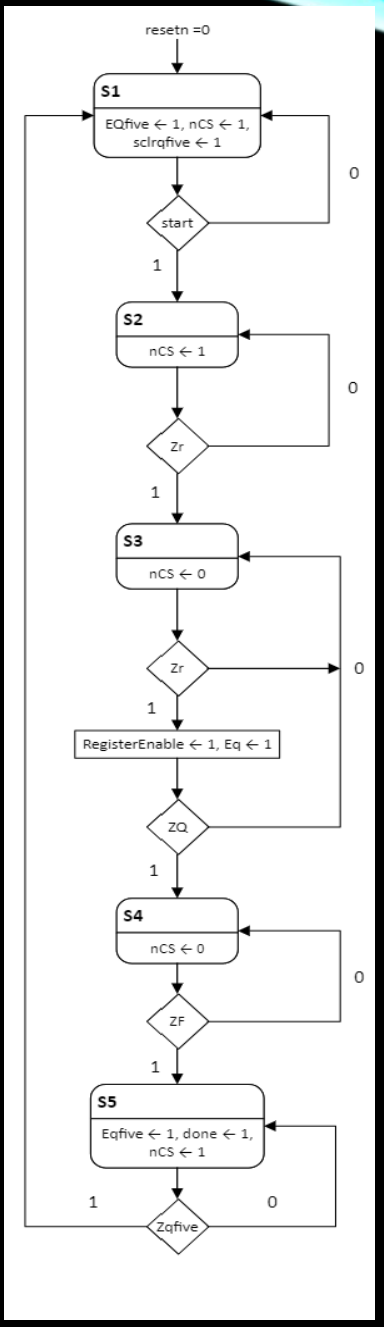


SPI CONTROL CIRCUIT

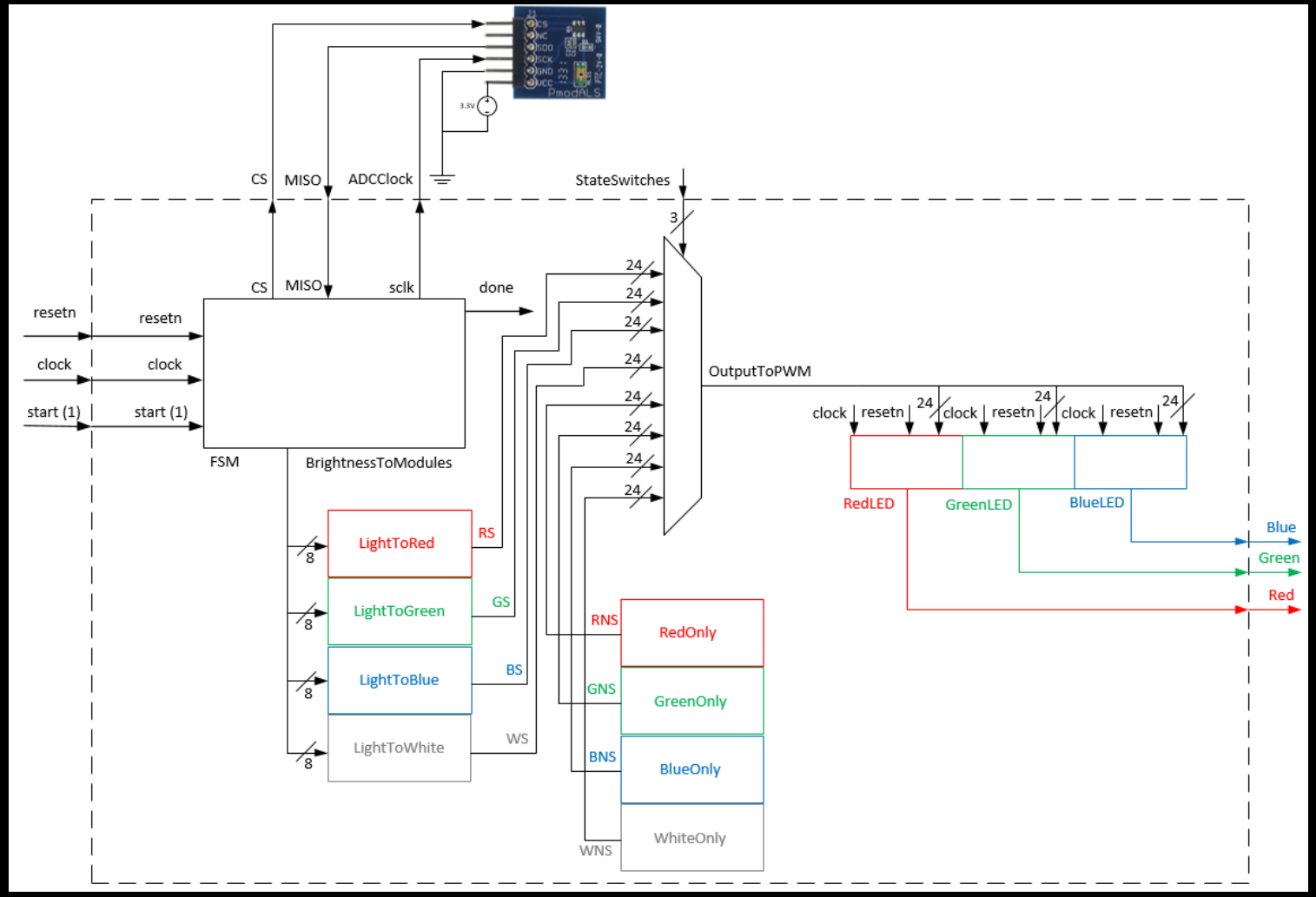


FINITE STATE MACHINE





TOP LEVEL DESIGN



DEMONSTRATION

CHALLENGES/OPEN ISSUES/SOLUTIONS

- Challenge: SPI Interface
  - This took up the most time on the project
- Challenge: Observing the response of the sensor to light
  - Open Issue: LEDs still on at fairly normal brightness
    - Solutions: Adding a lens/filter
    - Creating an LUT to control the LED brightness with lower resolution
- Future: Adding more options for color customization (Cyan, Yellow, Magenta, etc.)

PICTURE CREDITS

1. https://www.amazon.com/Maxxima-MLN-16-Night-Sensor-Lumens/dp/B00IXWYR42
2. http://www.ti.com/lit/ds/symlink/adc081s021.pdf