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CompArch FA15 Midterm

Bike Light Specification Document:

These are the specifications for a circuit to power an LED bike light. The bike light has four different settings: DIM, ON, BLINK, and OFF. A button click causes the bike light to change from one setting to the next.

Inputs: Button Click

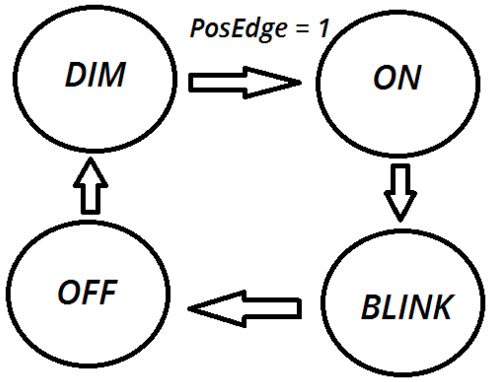
Outputs: Control signal for a single LED

Operational Modes: DIM: LED on at approximately half brightness

ON: LED on at full brightness

BLINKING: LED alternating between ON and OFF at a regular frequency

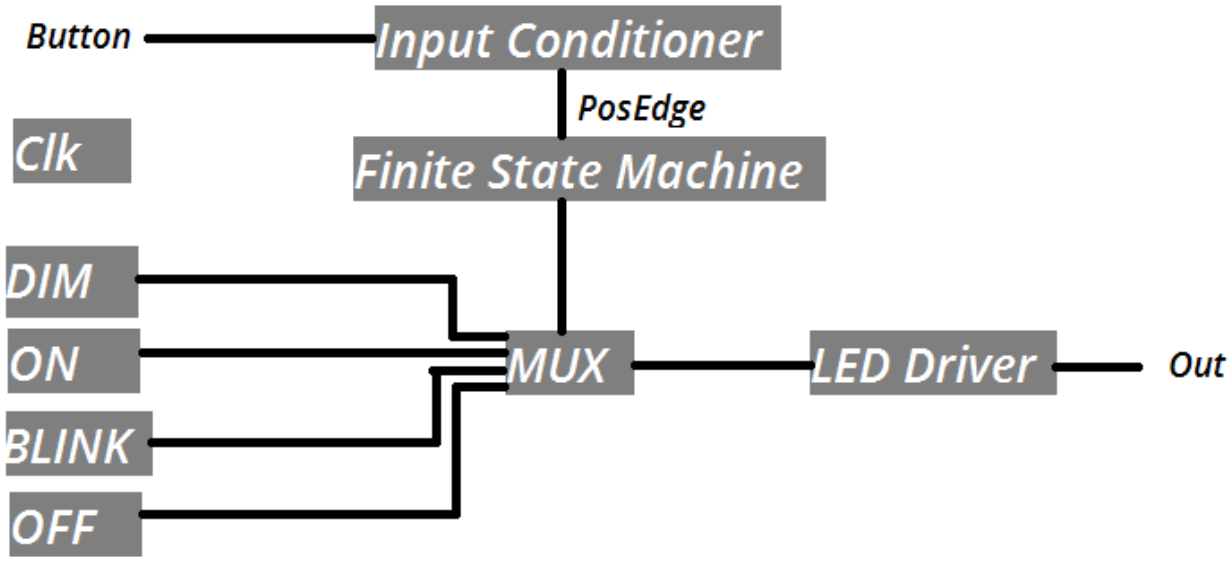
OFF: LED off



Measurements of relevant dimensions:

Frequency of BLINK: 0.5 Hz (1 second on, 1 second off)

Block Diagram:

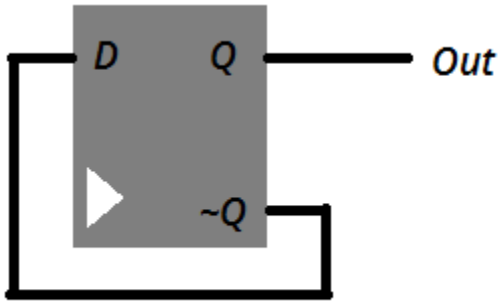


Component Schematics:

Here is each component of the block diagram on the gate or given component level. Given elements are included in parentheses.

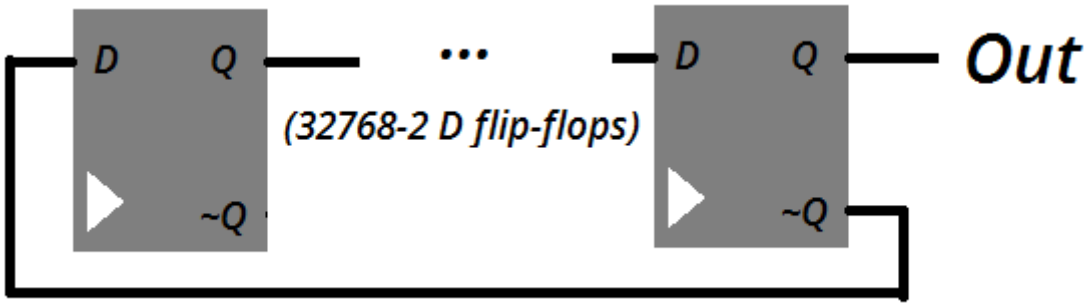
Clk: (given 32768 Hz Clk) size = 2

DIM: size = 13



ON: (given wire to 1) size = 0

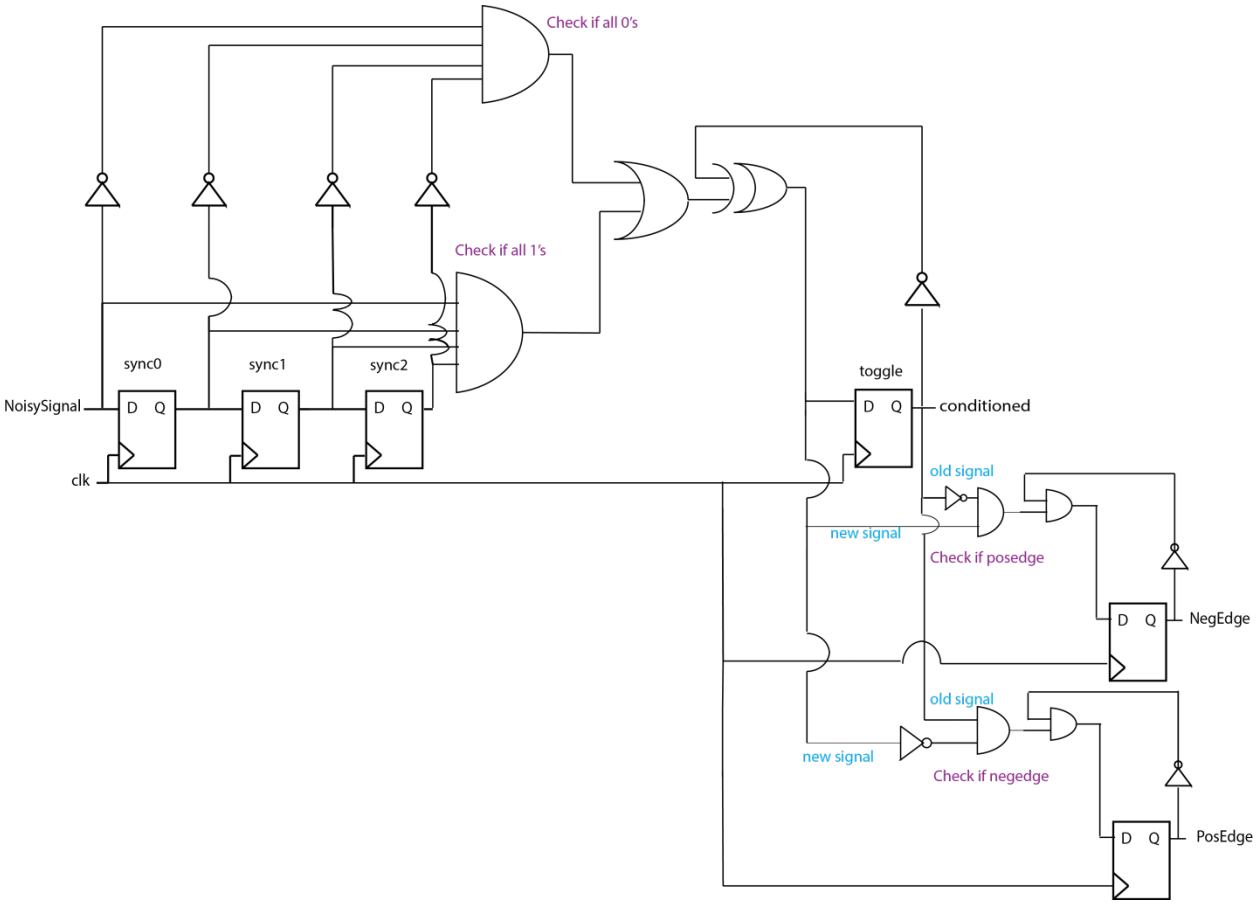
BLINK: size = 13*32768 = 425982



OFF: (given wire to ground) size = 0

Input Conditioner: size = 110

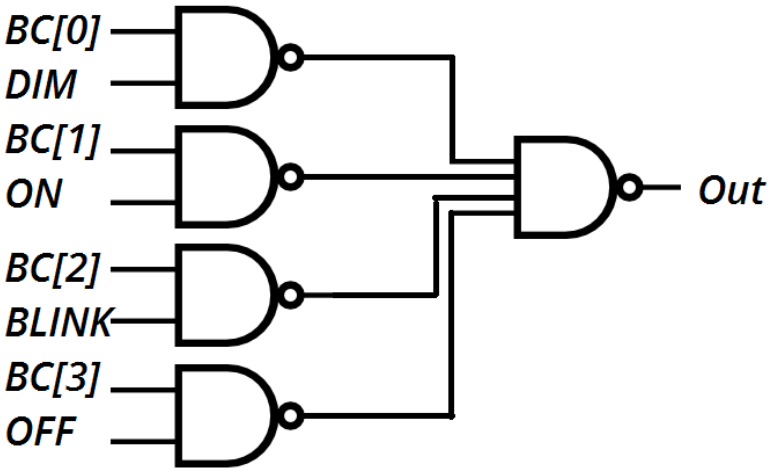
I used the full input conditioner from Lab2, but the only output used is PosEdge, so the NegEdge logic could be removed without affecting anything.



Finite State Machine: (given 4-stage ring counter) size = 83

MUX: size = 12

BC[i] is the ith output from the finite state machine, which is 1-hot, so only one of BC[i] will be 1.



LED Driver: (given) size = 211

Cost Estimation model:

Total size = 426415

This design could be made smaller by removing the parts of the input conditioner which are unnecessary, and by having the bike light blink at a faster frequency.