Monish Nene

ESD LAB1 Report

**Things Learnt in Lab1**

Wire Wrapping

SPLD

ALE Frequency is $1/6^{th}$ of Crystal Frequency when no code is loaded in 8051.

**Toughest Thing to do**

Unsoldering a wrong component for replacing it with correct component.

| ECEN 5613<br>Spring 2018 | Embedded System Design<br>Lab #1 Signoff Sheet - Software | Week #1<br>1/20/2018 |
|---|---|---|

You will need to obtain the signature of your TA on the following items in order to receive credit.

The software portion of Lab #1 should be completed and signed off by **Friday, Feb. 2, 2018** in order to give you time to complete the hardware portion upon receipt of your parts kit. Both signoffs are due by **Friday, Feb. 9, 2018**. You need to submit both of your signoff sheets and other required elements by **11:59pm Saturday, Feb. 10, 2018**. Labs completed after the signature due date or submitted after the submission due date will usually receive grade reductions, but there is leniency on Lab #1.

Print your name below and then demonstrate your working hardware/firmware in order to obtain the necessary signatures. All items must be completed to get a signature, but partial credit is given for incomplete labs. Receiving a signature on this signoff sheet does not mean that your work is eligible for any particular grade; it merely indicates that you have completed the work at an acceptable level.

**Student Name:** Monish · H · Nene

**Checklist**

- ☑ Student demonstrates detailed knowledge of a simulator (Emily52/EdSim51) (including changing register values, editing data memory, using breakpoints, single stepping, uses /overlay option, etc.)
- ☑ Student assembly program works correctly
- ☑ Student demonstrates detailed knowledge of WinCUPL and WinSim, logic equations correct

**Student Answers to Lab Questions**

1. **How many bytes of code space does your program require?**
   (Show how you arrived at your answer.)
   Code Size? 0000 to 003F. → 64 bytes.

2. **How long did your program take to execute for X=0x8E and Y=0x0C? Assume an 11.0592 MHz clock and include the instructions executed from the beginning until you reach the ENDLOOP label. Show the TA your detailed calculations on the code listing during your signoff.**
   Execution Time? 119 μS experimental value.
   82 instructions. by setting breakpoint at ENDLOOP.

02/02/18.
TA signature and date

**Instructor/TA Comments:** ☐ ☐ ☐

| FOR INSTRUCTOR USE ONLY | Not Applicable | Poor/Not Complete | Meets Requirements | Exceeds Requirements | Outstanding |
|---|---|---|---|---|---|
| SPLD code | ☐ | ☐ | ☑ | ☐ | ☐ |
| Assembly Language Code Style | ☐ | ☐ | ☐ ✓ | ☐ | ☐ |
| Required Elements functionality | ☐ | ☐ | ☑ | ☐ | ☐ |
| Sign-off done without excessive retries | | ☐ | ☑ | | |
| Student understanding and skills | ☐ | ☐ | ☐ ✓ | ☐ | ☐ |
| Overall Demo Quality | ☐ | ☐ | ☑ | ☐ | ☐ |

**Comments:**

NOTE: This submission sheet should be the top/first sheet of your submission.

# Monish Nene - ESD Lab 1 Execution time Calculations

| Instruction | Cycles | Normal execution | Multiplication overflow | Addition Overflow | | Quotient = | 10 |
|---|---|---|---|---|---|---|---|
| ORG 0000H | 0 | 0 | 0 | 0 | | Dividend (X)= | 142 |
| MOV A,#0FEH | 1 | 1 | 1 | 1 | | Divisor-1(Y)= | 12 |
| MOV B,#02H | 1 | 1 | 1 | 1 | | Multiplier Overflow = | 0 |
| MOV R5,A | 1 | 1 | 1 | 1 | | Addition Overflow= | 0 |
| MOV R2,#00H | 1 | 1 | 1 | 1 | | | |
| MOV R1,#30H | 1 | 1 | 1 | 1 | | | |
| MOV A,B | 1 | 1 | 1 | 1 | | | |
| INC A | 1 | 1 | 1 | 1 | | | |
| JZ AD_Over | 2 | 2 | 2 | 2 | | | |
| MOV B,A | 1 | 1 | 1 | 0 | | | |
| MOV A,R5 | 1 | 1 | 1 | 0 | | | |
| Divide: | 0 | 0 | 0 | 0 | | | |
| MOV R3,A | 1 | 10 | 10 | 0 | | | |
| SUBB A,B | 1 | 10 | 10 | 0 | | | |
| JC Divide_done | 2 | 20 | 20 | 0 | | | |
| INC R2 | 1 | 10 | 10 | 0 | | | |
| JMP Divide | 2 | 20 | 20 | 0 | | | |
| Divide_done: | 0 | 0 | 0 | 0 | | | |
| MOV R0,#21H | 1 | 1 | 1 | 0 | | | |
| MOV A,R2 | 1 | 1 | 1 | 0 | | | |
| MOV @R0,A | 1 | 1 | 1 | 0 | | | |
| MOV R0,#22H | 1 | 1 | 1 | 0 | | | |
| MOV A,R3 | 1 | 1 | 1 | 0 | | | |
| MOV @R0,A | 1 | 1 | 1 | 0 | | | |
| MOV A,R2 | 1 | 1 | 1 | 0 | | | |
| ADD A,#00H | 1 | 1 | 1 | 0 | | | |
| RLC A | 1 | 1 | 1 | 0 | | | |
| JC M_Over | 2 | 2 | 2 | 0 | | | |
| RLC A | 1 | 1 | 1 | 0 | | | |
| JC M_Over | 2 | 2 | 2 | 0 | | | |
| MOV R5,A | 1 | 1 | 0 | 0 | | | |
| MOV A,#00H | 1 | 1 | 0 | 0 | | | |
| MOV @R1,A | 1 | 1 | 0 | 0 | | | |
| MOV A,R5 | 1 | 1 | 0 | 0 | | | |
| Load_Result: | 0 | 0 | 0 | 0 | | | |
| MOV R0,#23H | 1 | 1 | 1 | 0 | | | |
| MOV @R0,A | 1 | 1 | 1 | 0 | | | |
| JMP ENDLOOP | 2 | 2 | 2 | 0 | | | |
| M_Over: | 0 | 0 | 0 | 0 | | | |
| MOV R5,A | 1 | 0 | 1 | 0 | | | |
| MOV A,#03H | 1 | 0 | 1 | 0 | | | |
| MOV @R1,A | 1 | 0 | 1 | 0 | | | |
| MOV A,R5 | 1 | 0 | 1 | 0 | | | |
| JMP Load_Result | 2 | 0 | 2 | 0 | | | |
| AD_Over: | 0 | 0 | 0 | 0 | | | |
| MOV A,#01H | 1 | 0 | 0 | 1 | | | |
| MOV @R1,A | 1 | 0 | 0 | 1 | | | |
| ENDLOOP: | 0 | 0 | 0 | 0 | | | |
| JMP ENDLOOP | 2 | 2 | 2 | 2 | | | |
| END | 0 | 0 | 0 | 0 | | | |
| | | | | | | | |
| | Total Cycles = | 105 | 107 | 13 | | | |
| | Ocsillator Cycles = | 1260 | 1284 | 156 | | | |
| | Execution Time (uS)= | 113.9322917 | 116.1024306 | 14.10590278 | | | |

| ECEN 5613 | Embedded System Design | Week #1 |
|---|---|---|
| Spring 2018 | Lab #1 Signoff Sheet - Hardware | 1/20/2018 |

Print your name below, answer the questions, and then demonstrate your working hardware in order to obtain the necessary signatures. All items must be completed to get a signature.

**Student Name:** Monish Nene

**Checklist**

- ☑ Schematic of acceptable quality, Student name on board in permanent ink
- ☑ Pins and signals labeled, decoupling capacitors, and two 28-pin wire wrap sockets present on board:
- ☑ Mounting hardware present (e.g. standoffs or an enclosure)
- ☑ Power switch and LED, voltage regulator functional, power jack present
- ☑ Power-on Reset (RC) and Run-time Reset (pushbutton), 8051 bypass cap is present
- ☑ RS-232 connector mounted, 74LS373 transparent latch wired
- ☑ Logic outputs correct (e.g. SPLD generation of /READ and /CSPERIPH; view SPLD code) [Only CSPERIPH shown /READ also shown]
- ☑ Student displays good knowledge of oscilloscope
- ☑ Peak to peak noise measured across processor VCC and GND is < 800mV
- ☑ Oscillator functional (check for correct ALE/XTAL2 signals after power on-off cycles)
- ☐ ARM development board functional, student can run the Out of Box Demo.

02/1

**Student Answers to Lab Questions**

1. **What voltage is present at the regulator input?** Use a digital multimeter. 7.983V
2. **What voltage is present at the regulator output?** Use a digital multimeter. 5.005V
3. **What peak to peak noise is present across the processor VCC and GND?** Use an oscilloscope.

   Measured value at processor package pins on top side of board: 350mV

   Measured value at wire wrap socket pins on bottom side of board: 400 mV
4. **How long is the processor held in reset after the run-time reset pushbutton is released?** Use an oscilloscope and try to measure the time between the release of the pushbutton and the time when noise from ALE is observed on the RST signal.

   Measured value: 174.4 mS
5. **What frequency is present at the ALE pin?** Use an oscilloscope. 1.8382 MHz.

2/9/18

**TA signature and date**

**Instructor/TA Comments:** ☐ ☐ ☐

| FOR INSTRUCTOR USE ONLY | Not Applicable | Poor/Not Complete | Meets Requirements | Exceeds Requirements | Outstanding |
|---|---|---|---|---|---|
| Schematics, SPLD code | ☐ | ☐ | ☑ | ☐ | ☐ |
| Hardware physical implementation | ☐ | ☐ | ☑ | ☐ | ☐ |
| Required Elements functionality | ☐ | ☐ | ☑ | ☐ | ☐ |
| Sign-off done without excessive retries | | ☐ | ☑ | | |
| Student understanding and skills | ☐ | ☐ | ☑ | ☐ | ☐ |
| Overall Demo Quality | ☐ | ☐ | ☑ | ☐ | ☐ |

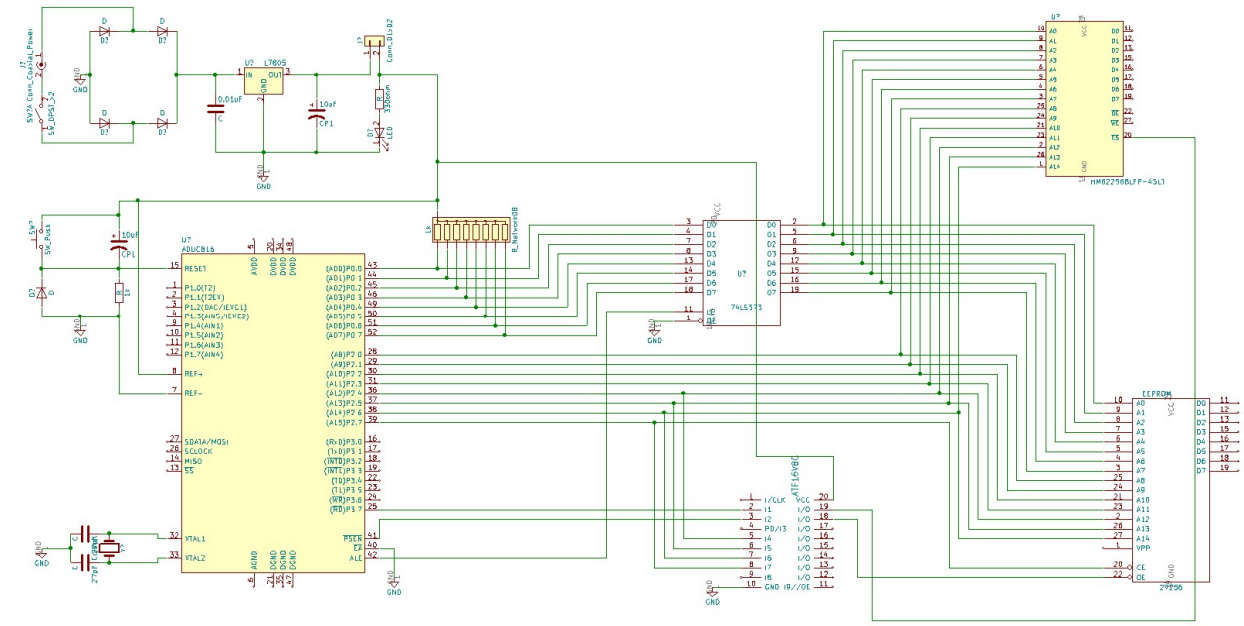
**Comments:**

- Decoupling Cap missing on schematics
- Arm key learnings

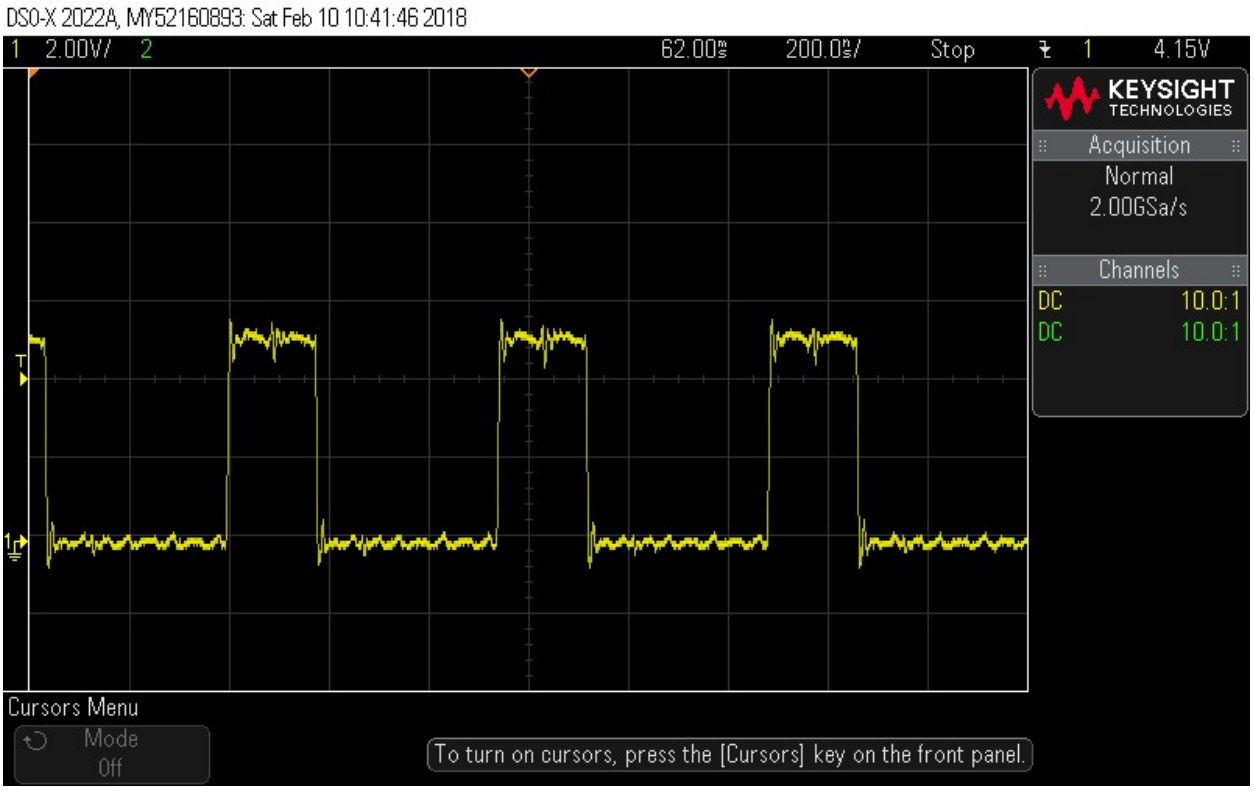
NOTE: This submission sheet should be the second sheet of your submission.



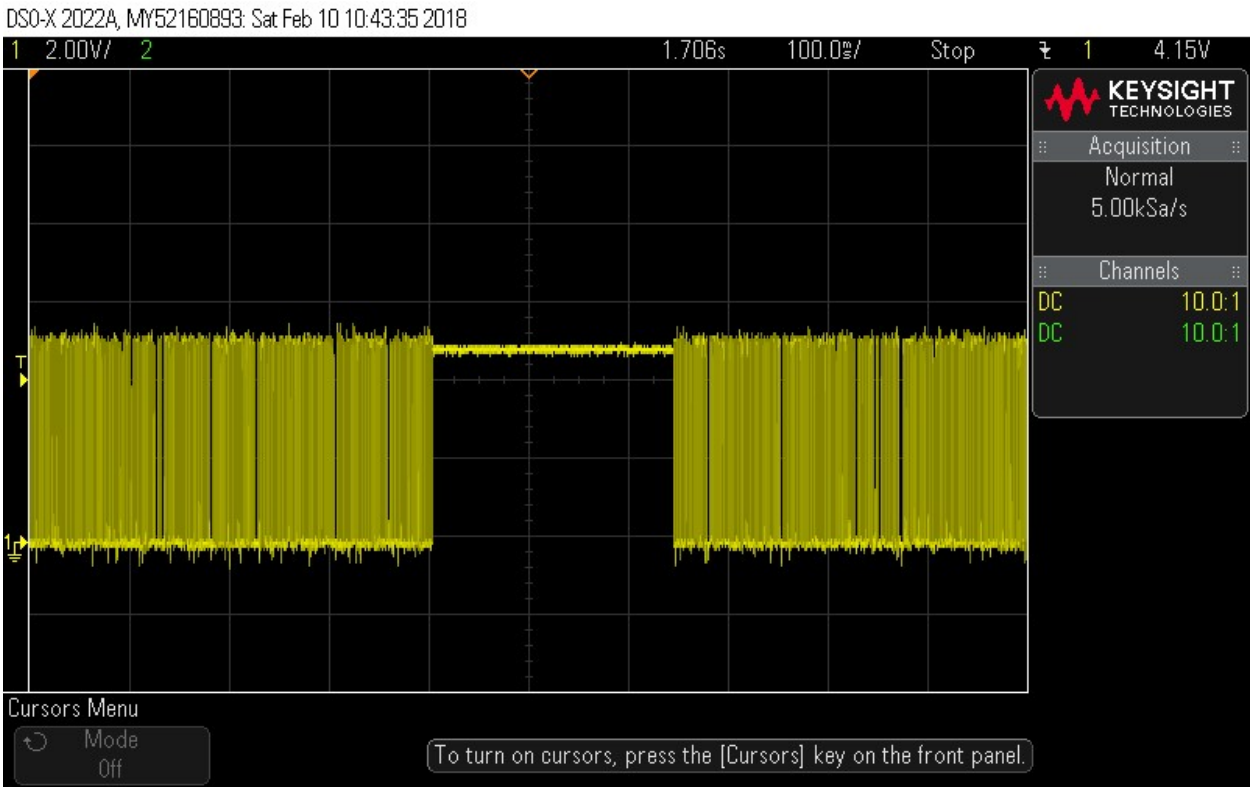
Schematic



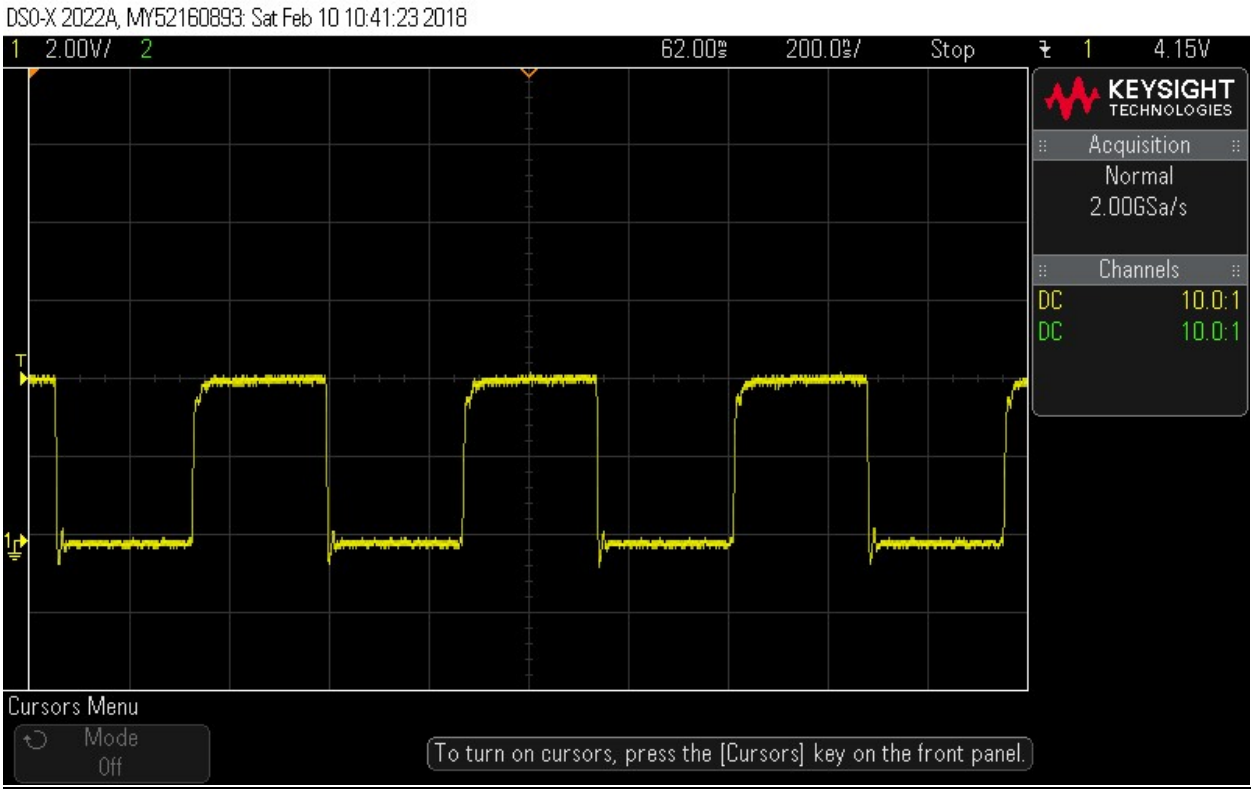
ALE



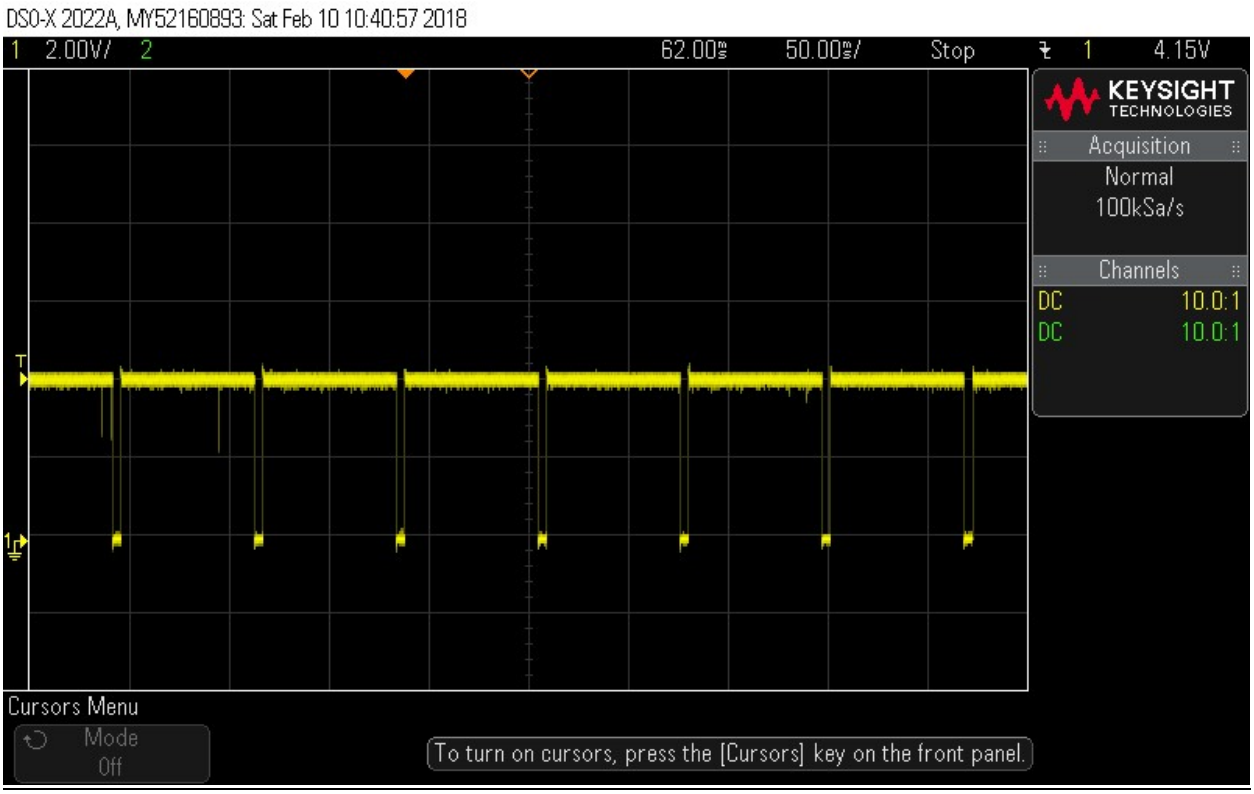

ALE signal on RESET




READ Output from ATF16V8C

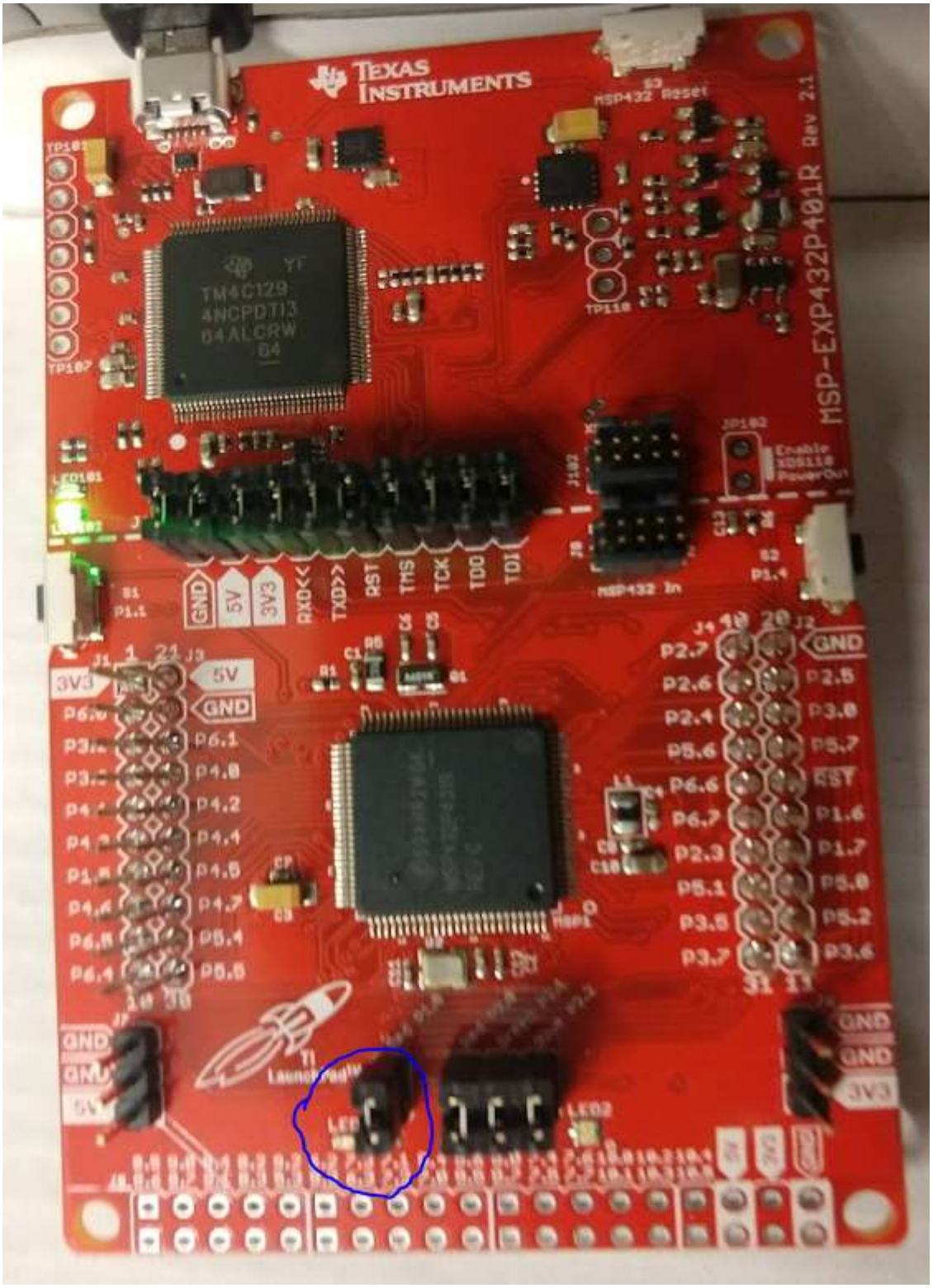


CSPERIH Output from ATF16V8C

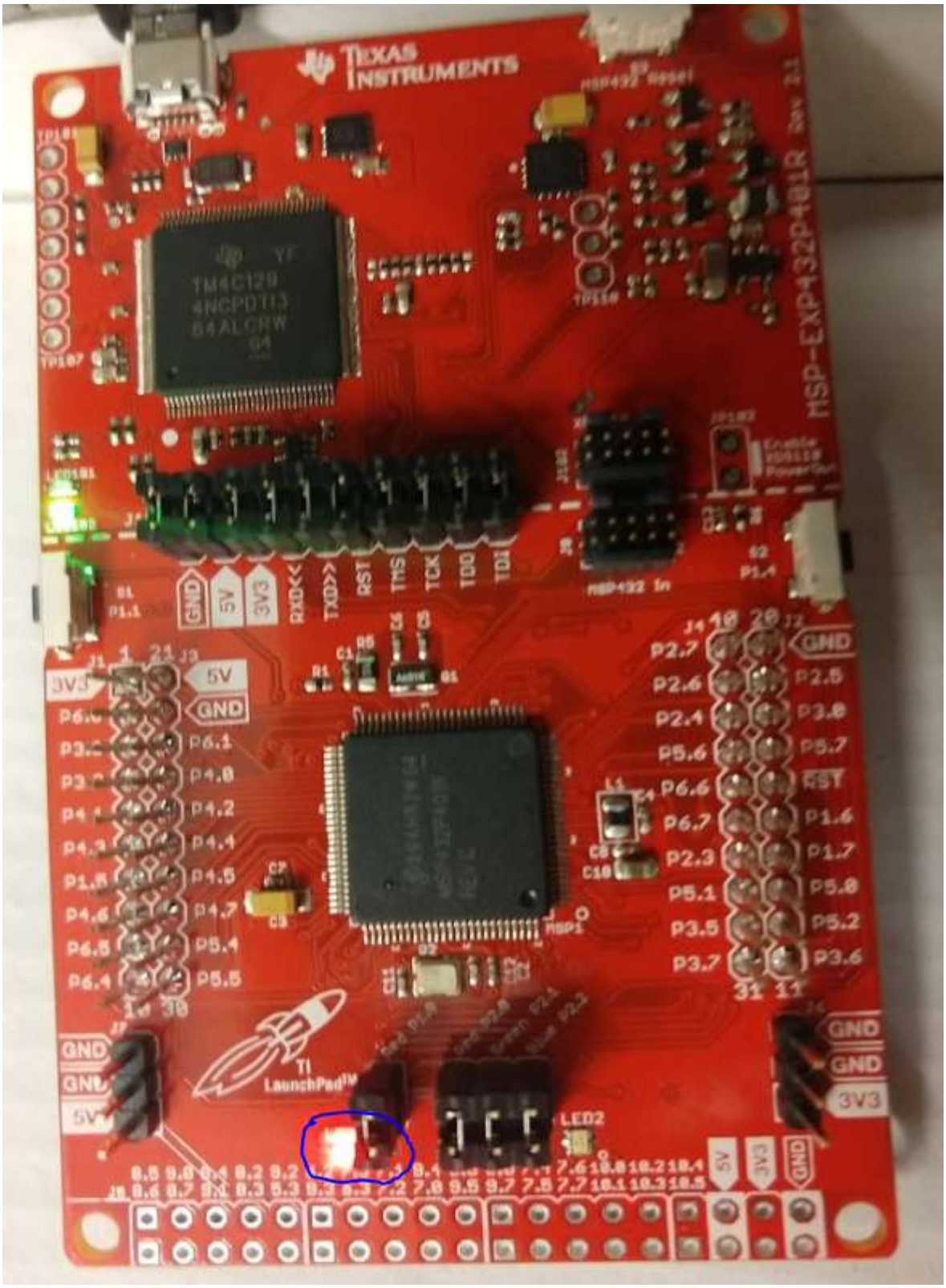


TI demo – Blinking LED example code

LED OFF



LED ON


TEXAS INSTRUMENTS
MSP-EXP432P401R
TM4C129
GND
5V
3V3
RXD<<
TXD>>
RST
TMS
TCK
TDO
TDI
P2.7
P2.6
P2.4
P5.6
P6.6
P6.7
P2.3
P5.1
P3.5
P3.7
P2.5
P3.0
P5.7
RST
P1.6
P1.7
P5.0
P5.2
P3.6
P6.1
P4.0
P4.2
P4.4
P4.5
P4.7
P5.4
P5.5
TI
LaunchPad
LED2

## Submission Sheet

Instructions: Print your name below and sign the honor code pledge. Separate the signoff and submission sheets from the rest of the lab and turn in a scan (or clear picture) of these signed forms, the items in the checklist below, and the answers to any applicable lab questions in order to receive credit for your work. No cover sheet please. **Submit all items electronically via Desire2Learn to reduce paper usage. D2L is https://learn.colorado.edu.**

In addition to the items listed on the signoff checklist, be sure to review the lab for additional requirements for submission, including:

- ❑ Scan of signed and dated software signoff sheet as the top sheet (No cover sheet please)
- ❑ Scan of signed and dated hardware signoff sheet as the second sheet
- ❑ Scan of submission sheet with signed honor code pledge as the third sheet
- ❑ Full copy of complete and accurate schematic of acceptable quality (all components shown).
- ❑ Fully, neatly, and clearly commented code in .LST file. Ensure your printout is easy to read.

Make copies of your code, SPLD code, and schematic files and save them as an archive.

**Student Name:** Monish. H. Nene.

**Honor Code Pledge**: "On my honor, as a University of Colorado student, I have neither given nor received unauthorized assistance on this work. I have clearly acknowledged work that is not my own."

**Student Signature:** Monish

1. **How much power is dissipated in the regulator, assuming a load current of 300mA?** Assume that the regulator is drawing the max quiescent current shown in the data sheet (use the correct data sheet for the regulator you have on your board). Neatly show all your work.

Voltage Drop Across 7805 regulator
$= 7.6 - 5 = 2.6\ V.$
Load current = 300 mA
quiescent current @ 25°C = 5.2 mA
Power dissipated = Voltage drop × (current)
$= 2.6 \times (305.2)$ mA
$= 793.52$ mW
$= 0.7935$ Watts.

Calculated value: 0.7935 W

**Comments:**

NOTE: This submission sheet should be the third sheet of your submission.