

1 Objective
Assemble the MSP430 adapter board and program the Texas Instruments MSP430 microcontroller. Design a simple embedded system capable of running on a wide range of power supply voltages. Justification of design decisions.

2 Pre-lab Tasks
1. Purchase MSP430 adapter board parts kit.
2. Install IAR’s Embedded Workbench KickStart for MSP430 (available on class website)
3. Study techniques on soldering surface mount parts
4. Assemble the MSP430 adapter board

3 Specification
Construct the MSP430 adapter board and verify all the connections using a microscope and continuity checks. Verify the fit of the pin headers by seating the board in a breadboard. Using the parts in the ECE 3724 parts kit or other ECE 4723/6723 approved parts, design a system that will periodically turn on an LED for 0.5 s and off for 2.0 s. Design a system using your new MSP430 board that will flash an LED on for 0.5 s and off for 2.0 s. Your system needs to be functional at 3.3 V, 2.5 V, and 2.0 V without changing the firmware nor the hardware components.

WARNING: Do NOT attempt to connect your TI MSP430 to 5.0 V, either to V_{dd} or any I/O pins. It will not survive the experience.

Your system must operate properly (using the same firmware) at V_{dd} = 2.0 V, V_{dd} = 2.5 V, and V_{dd} = 3.3 V. Your system should not require any component changes to alter the system voltage. You may change DIP switch settings to adjust the supply voltage V_{dd}.

4 Demonstrations
You must do the following before you leave lab:
1. Assemble the MSP430 adapter board and verify its connections and fit into a breadboard
2. Successfully program the MSP430

You must demonstrate the following to the lab TA (not necessarily before you leave lab):
1. Use the oscilloscope to measure the period and duty cycle of the flashing LED
2. Measure the supply current draw I_{dd}. The current I_{dd} you measure should be the current provided to the functional parts of your design, i.e. CPU, LEDs, etc. The measured current should not be for parts that are not germane to the task specified here. Measure the supply current I_{dd} for each unique period of operation for each supply voltage. Provide your results in a table and plot the current versus the supply voltage.
3. Measure the ground current sink $I_{ss}$. The current $I_{ss}$ you measure should be the current coming from the *functional* parts of your design, i.e. CPU, LEDs, etc. Measure the ground current $I_{ss}$ for each unique period of operation for each supply voltage. Provide your results in a table and plot the current versus the supply voltage.

5 Deliverables

1. Document showing your design analysis justifying component values and circuit topology. (“I put it together and it just worked” is not acceptable. You must justify your design decisions.) If you are unable to meet any of the design specifications, you must provide justification as to why it is *not* possible.

2. Schematic capture of your circuit showing all components and their values (include everything except the breadboard). Submit BOTH the “raw” electronic schematic file AND a PDF document suitable for printing. You may use any schematic capture tool you desire, but you are encouraged to use a tool which will allow ultimate import into PCB layout. You are encouraged to use Cadence/OrCAD or EagleCAD.

3. Table of values recorded during in-lab demonstrations, including all periods, duty cycles, and current at each operating supply voltage

4. Screenshot or other documentation as supporting evident of the values in the part above.

5. Compare the results of this lab with the results you obtained in Lab #1. Account for any differences.

6. Code tree of your developed firmware (with all code adhering to the ECE 4723/6723 coding conventions).

6 History

v1.0 5 SEPT 2006 – Initial version

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1Submit electronically to lab TA.