Power Electronics Circuits

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ECE 482 Lecture 2
January 19, 2016

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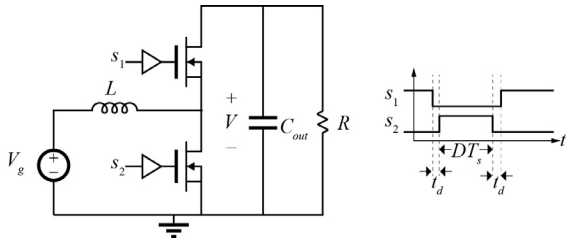
Announcements

- No prelab for Experiments 1 & 2
- Key Access
- Training needs to be completed and e-mail to Dr. Costinett before Thursday's class
- Meet in MK227 on Thursday

Experiment 1

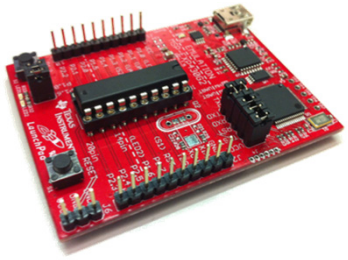
- Begin thinking about Experiment 1 process
  - What tests might you run to determine battery/motor parameters?
- Read through experiment procedure online before Thursday

Experiment 2



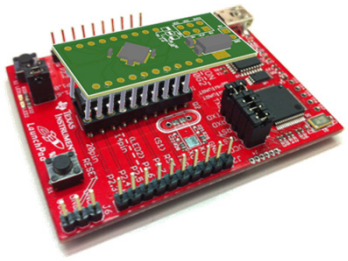
- Experiment 3 will build synchronous boost converter
- To operate open loop, need gate drive signals
- Experiment 2: brief introduction to MSP programming – Generate voltage-controlled PWM signals

Microprocessor: MSP430 Launchpad



- MSP430 microprocessors from Texas Instruments
- Programmable in C or ASM
- Ultra-low power (not a focus here)
- On-board USB bootloader
- Two LEDs, one switch
- Two timers, one 5-channel 10-bit ADC
- System clock up to 16 MHz

High Resolution PWM



MSP430G2553:

- 16 MHz clock
  - Max PWM resolution is 62.5ns

MSP430F2172:

- PWM 16x clock multiplier
  - Max PWM resolution is 4ns
- Final decision TBD; same programming approach applies in either case

MSP430 Documentation

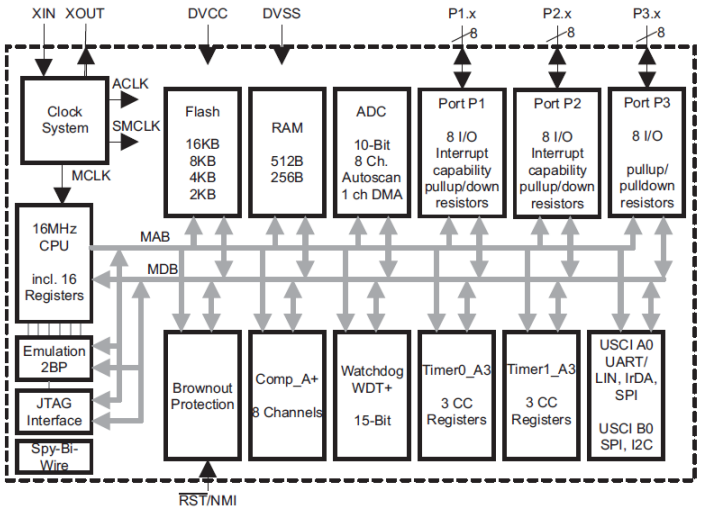
- User's Guide
  - http://www.ti.com/lit/ug/slau144j/slau144j.pdf
- Datasheet
  - http://www.ti.com/lit/ds/symlink/msp430g2553.pdf
- Errata
  - http://www.ti.com/lit/er/slaz440g/slaz440g.pdf

Example Today

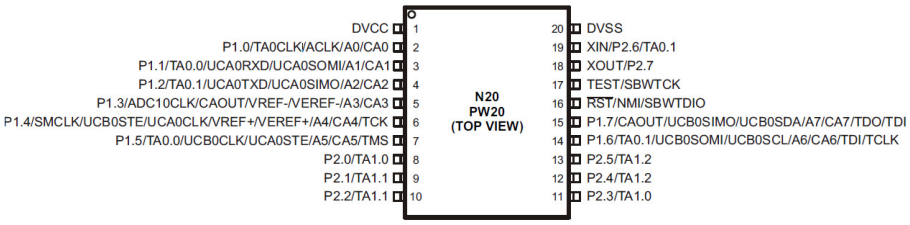
- General Purpose I/O
- System Clock
- TimerA
- Interrupts

MSP430 Internal Block Diagram

Functional Block Diagram, MSP430G2x53



Pin Assignments



NOTE: ADC10 is available on MSP430G2x53 devices only.

NOTE: The pulldown resistors of port P3 should be enabled by setting P3REN.x = 1.

Clock Module

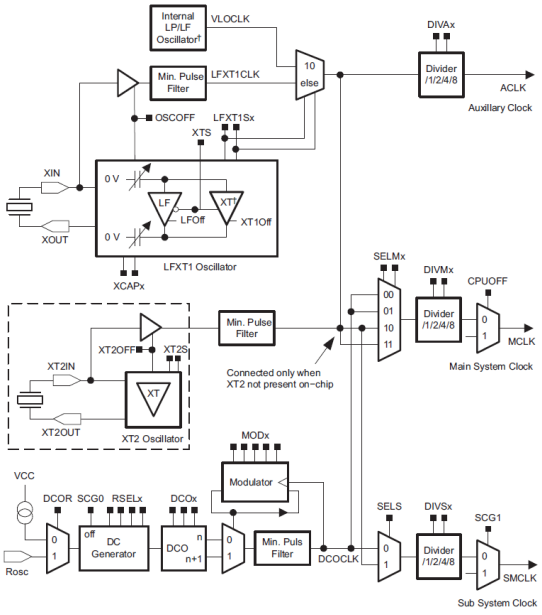


Figure 5-1. Basic Clock Module+ Block Diagram – MSP430F2xx

Timer A Operation – Up/Down Mode

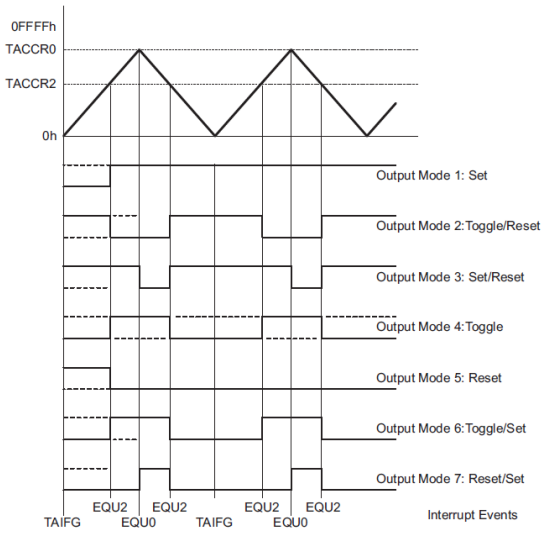


Figure 12-14. Output Example—Timer in Up/Down Mode

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Timer A Block Diagram

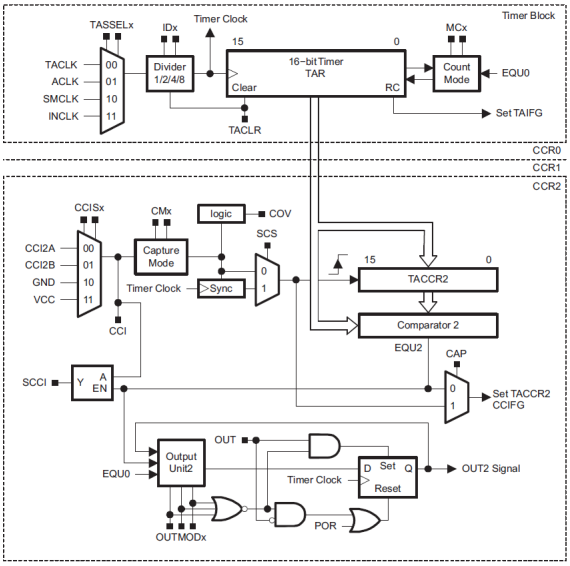

Figure 12-1. Timer_A Block Diagram