ECE 372A Fall 2015 - Lecture 12

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October 6, 2015

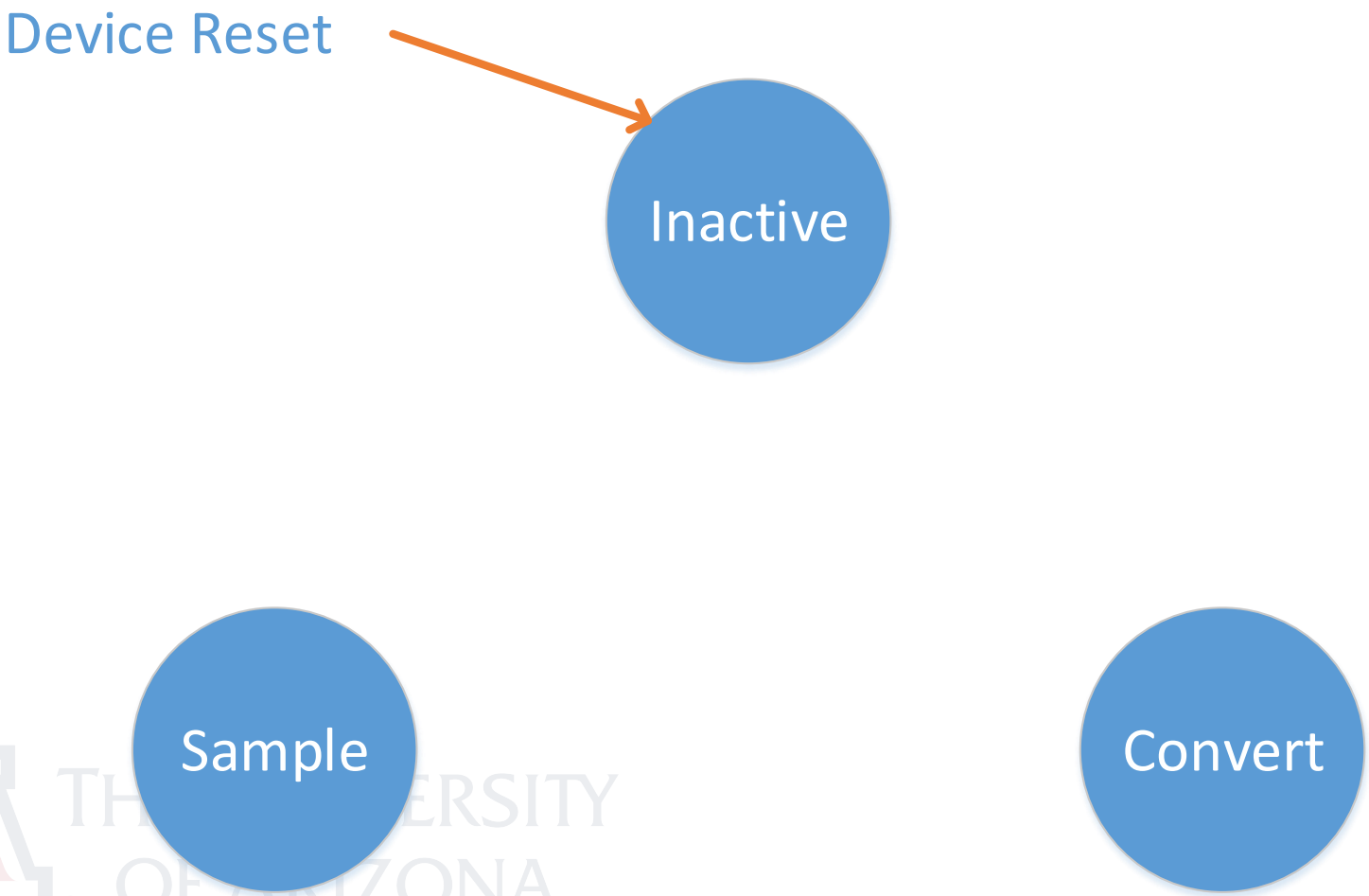
Outline

ADC

Reference Material

Section 17 in the Family Reference Manual
Section 22 in the PIC32MX Data Sheet

ADC Conversion Cycle



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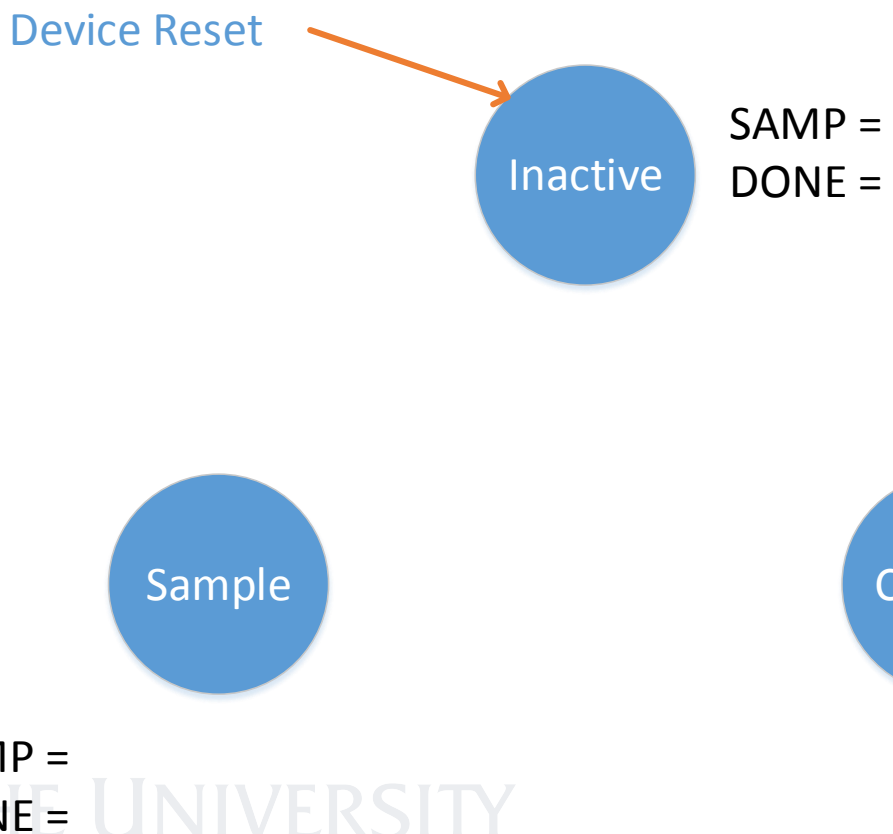

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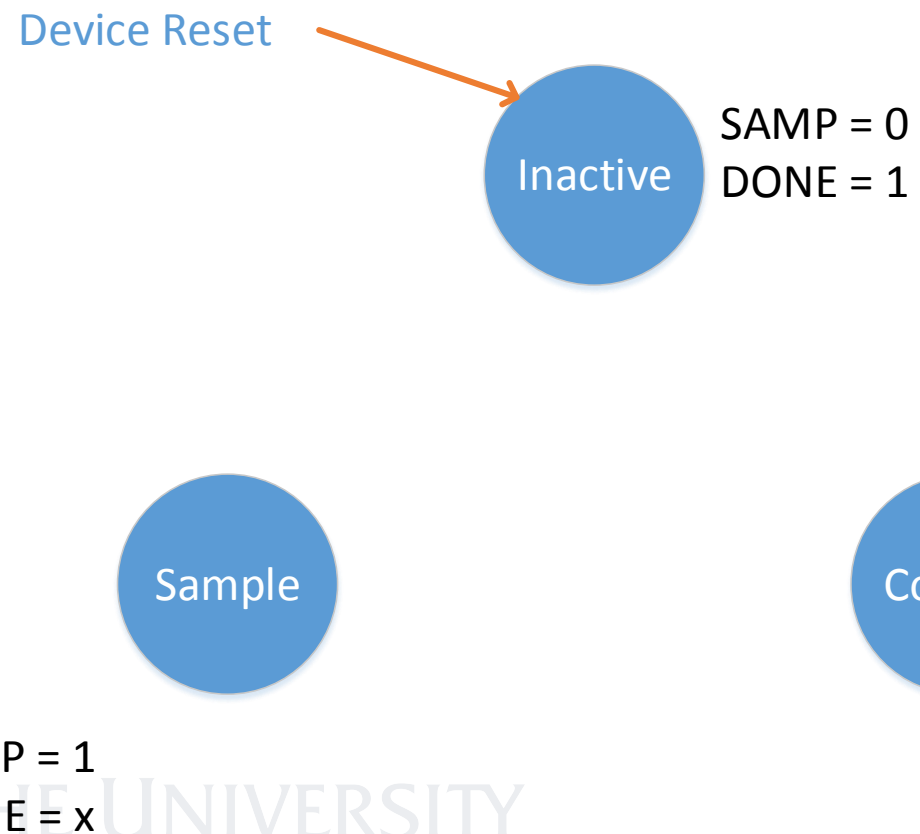

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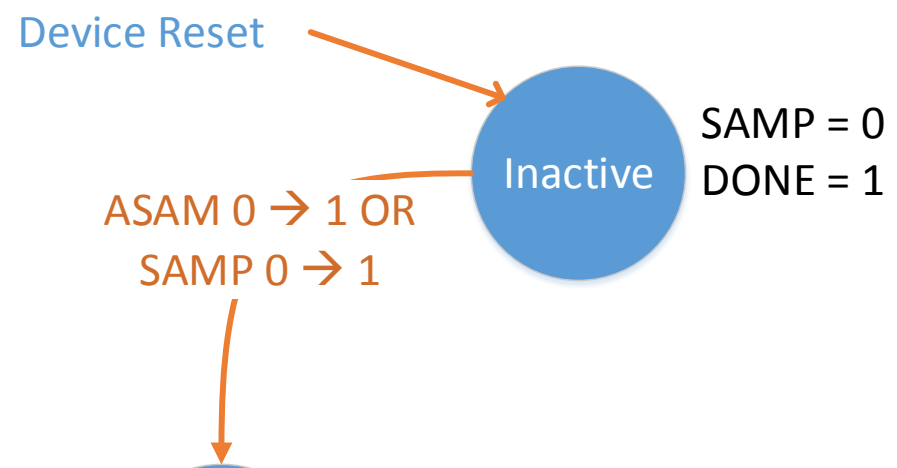
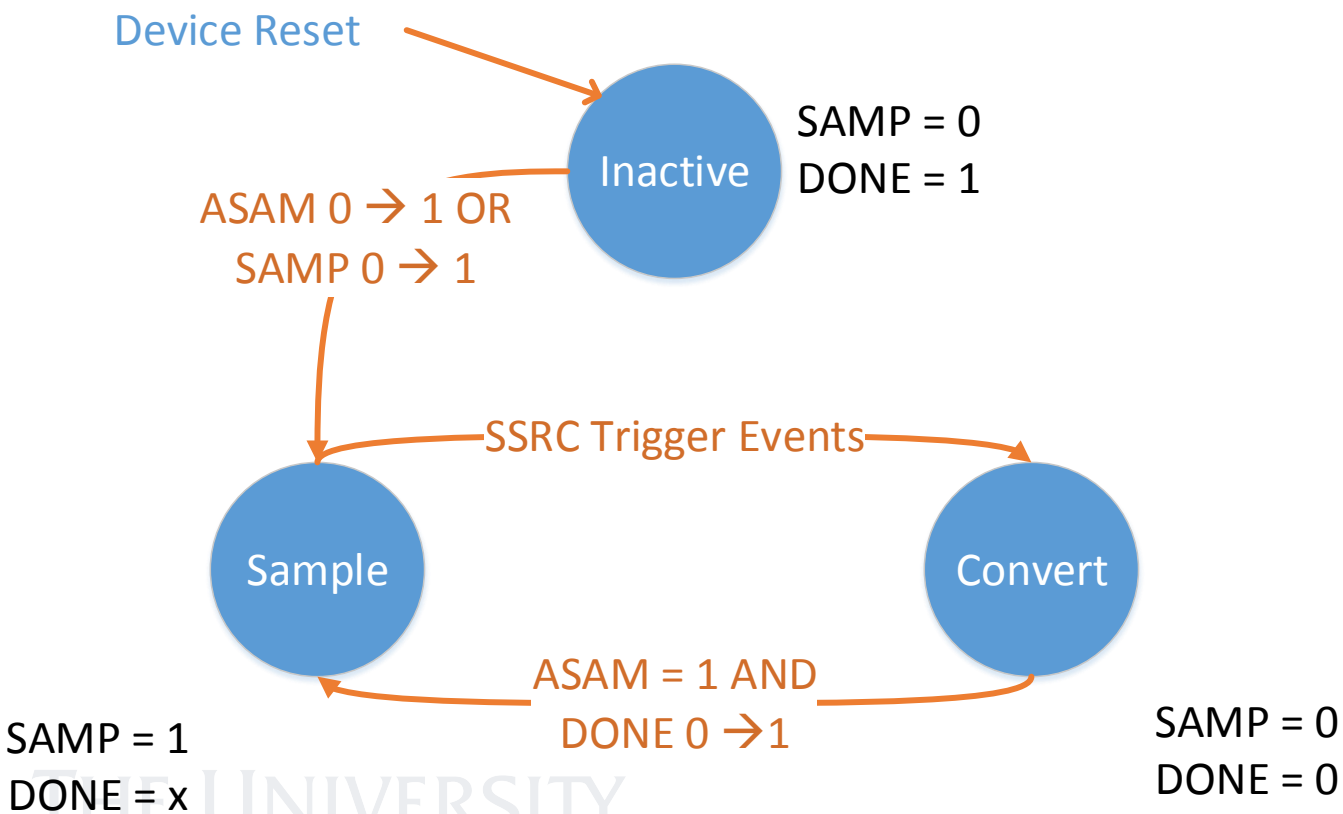


SSRC Trigger Events	
SSRC<2:0>	Event
0	SAMP 1→0
1	INT0
2	Timer3
3*	Timer5
4*	CTMU
6*	Alt. CTMU
7	Auto

* Available in select devices only.

ADC Conversion Cycle



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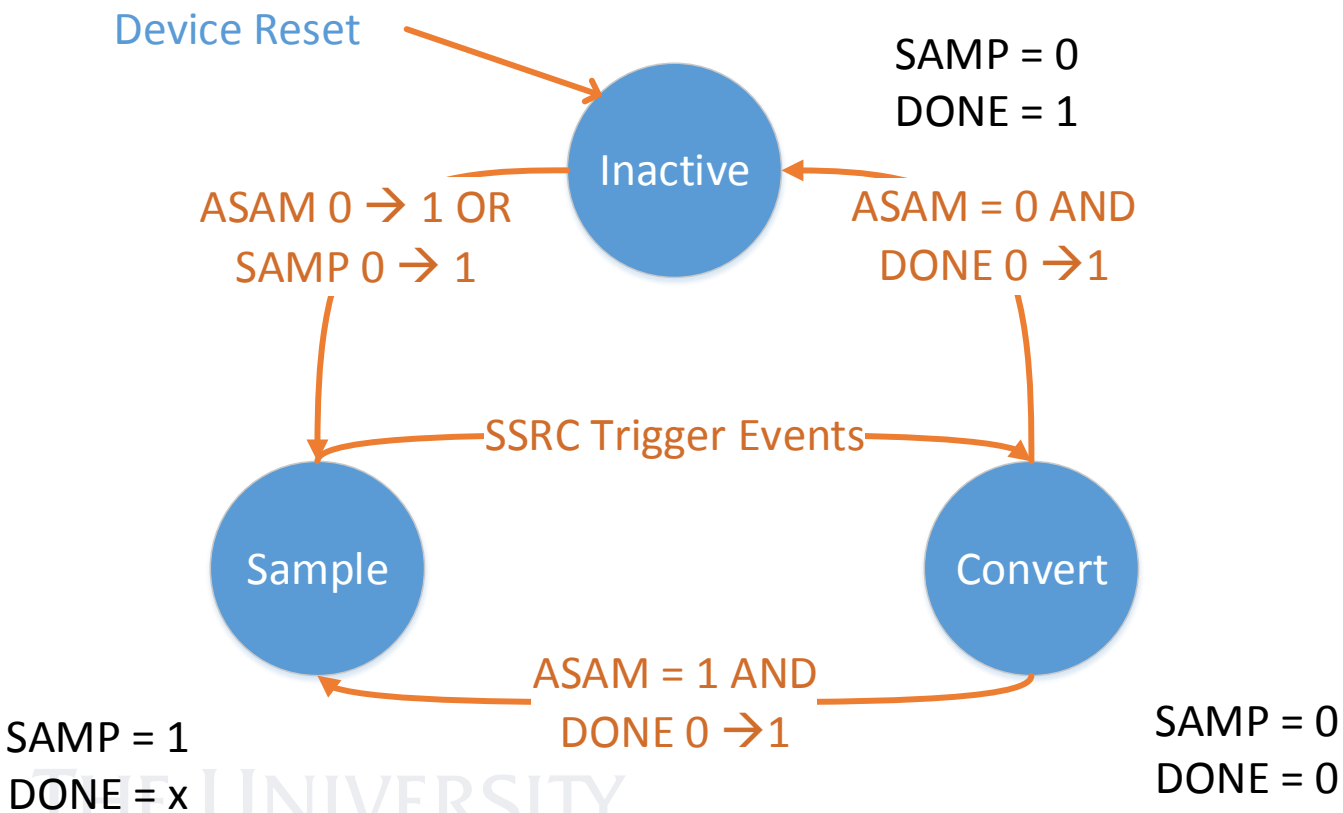

ADC Conversion Cycle

Remember

- DONE is set in hardware, like an interrupt

ADC Conversion Cycle

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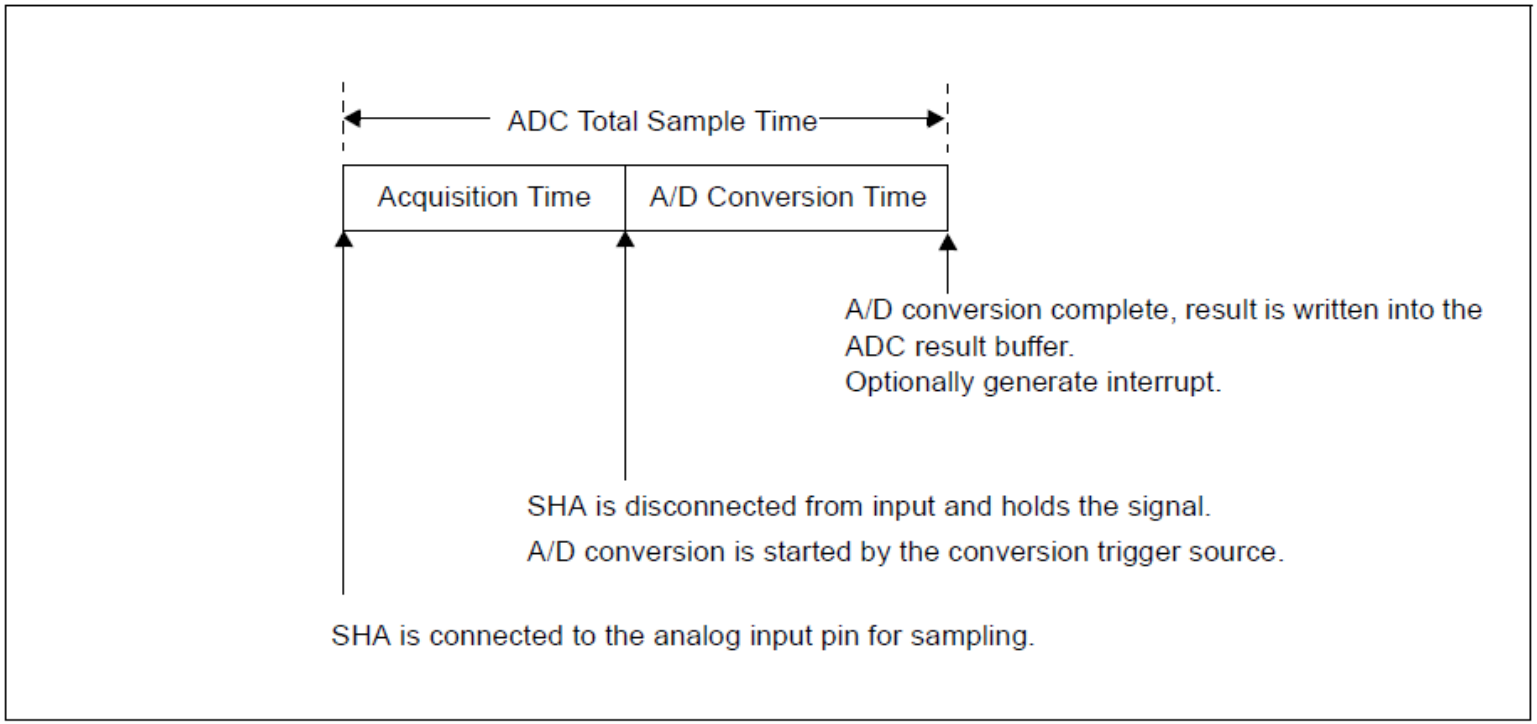
- DONE is set in hardware, like an interrupt
- SAMP can be set in hardware.

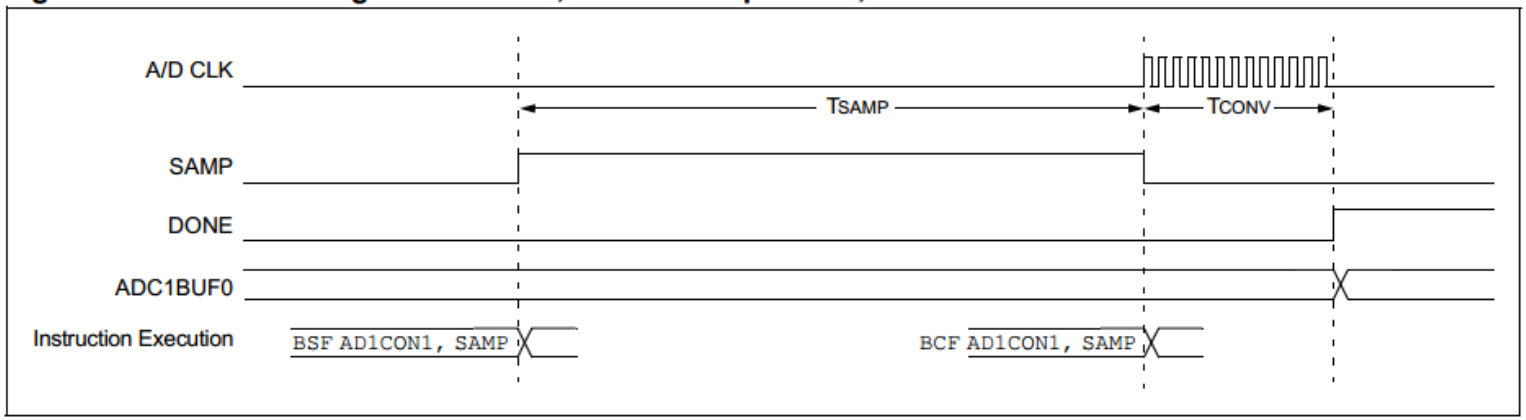
ADC Sampling Configurations

Figure 17-2: ADC Sample/Conversion Sequence



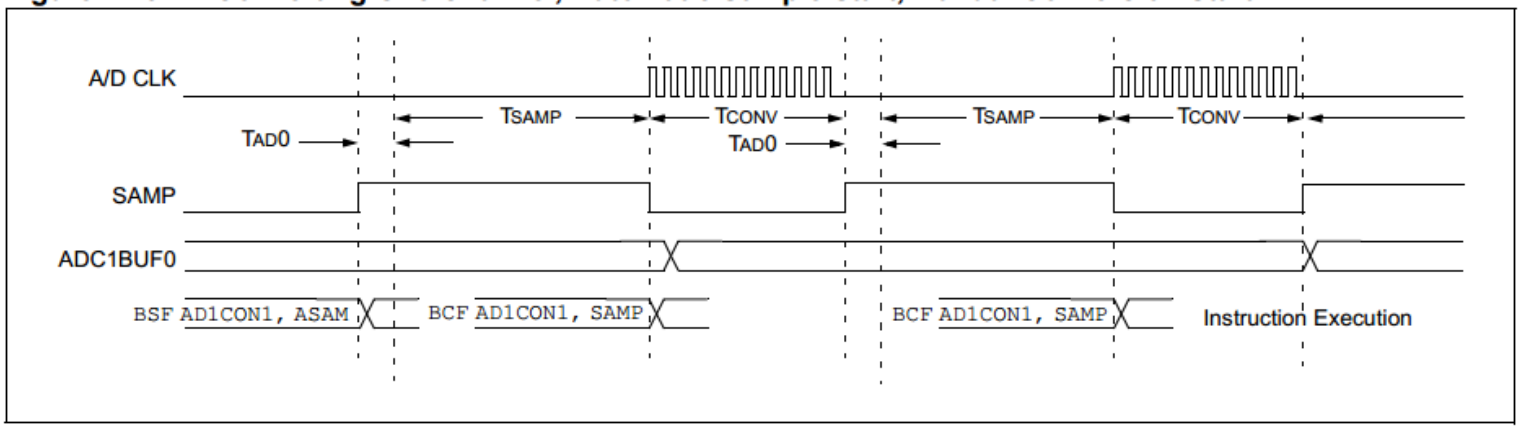
ADC Sampling Configurations

Figure 17-4: Converting One Channel, Manual Sample Start, Manual Conversion Start



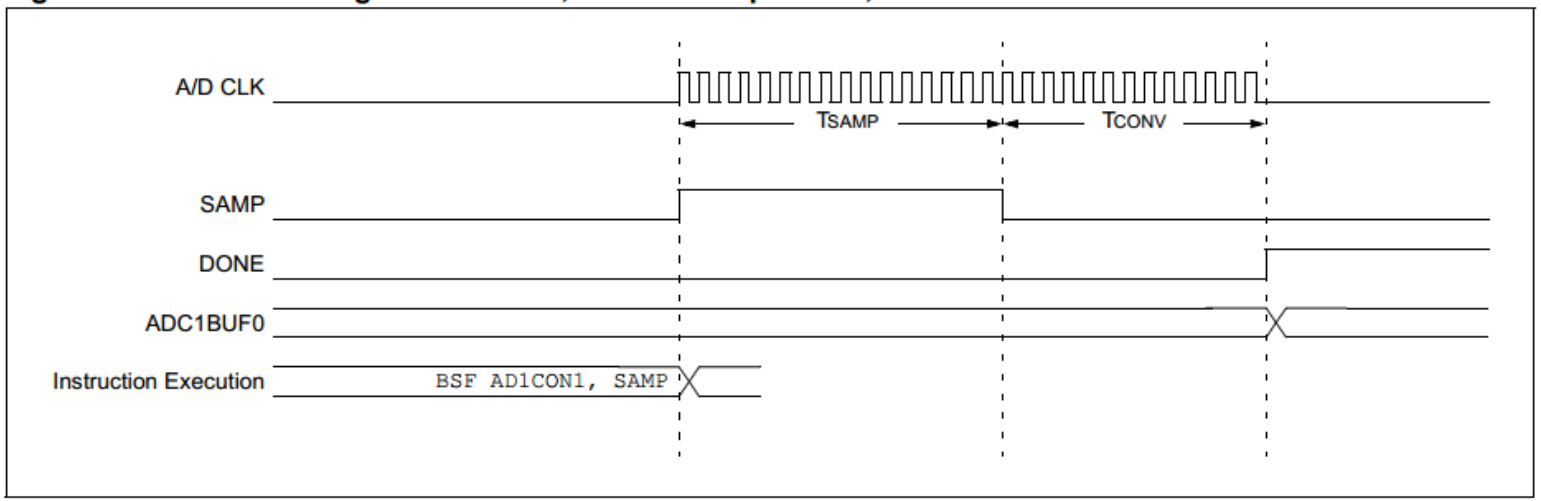
ADC Sampling Configurations

Figure 17-5: Converting One Channel, Automatic Sample Start, Manual Conversion Start



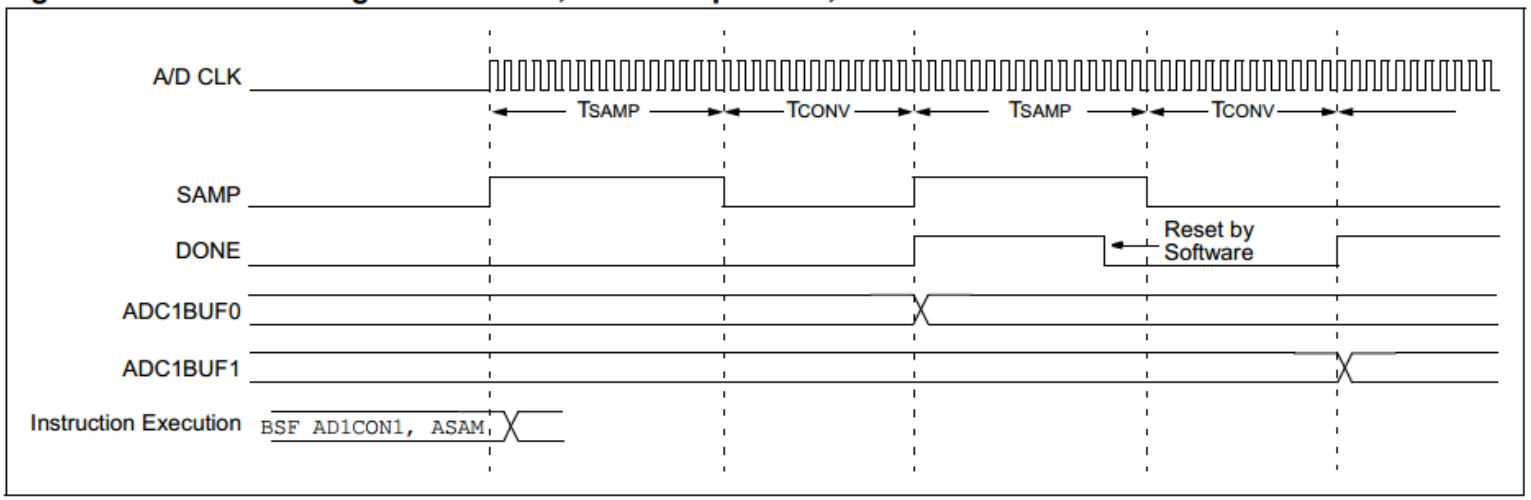
ADC Sampling Configurations

Figure 17-6: Converting One Channel, Manual Sample Start, TAD-Based Conversion Start



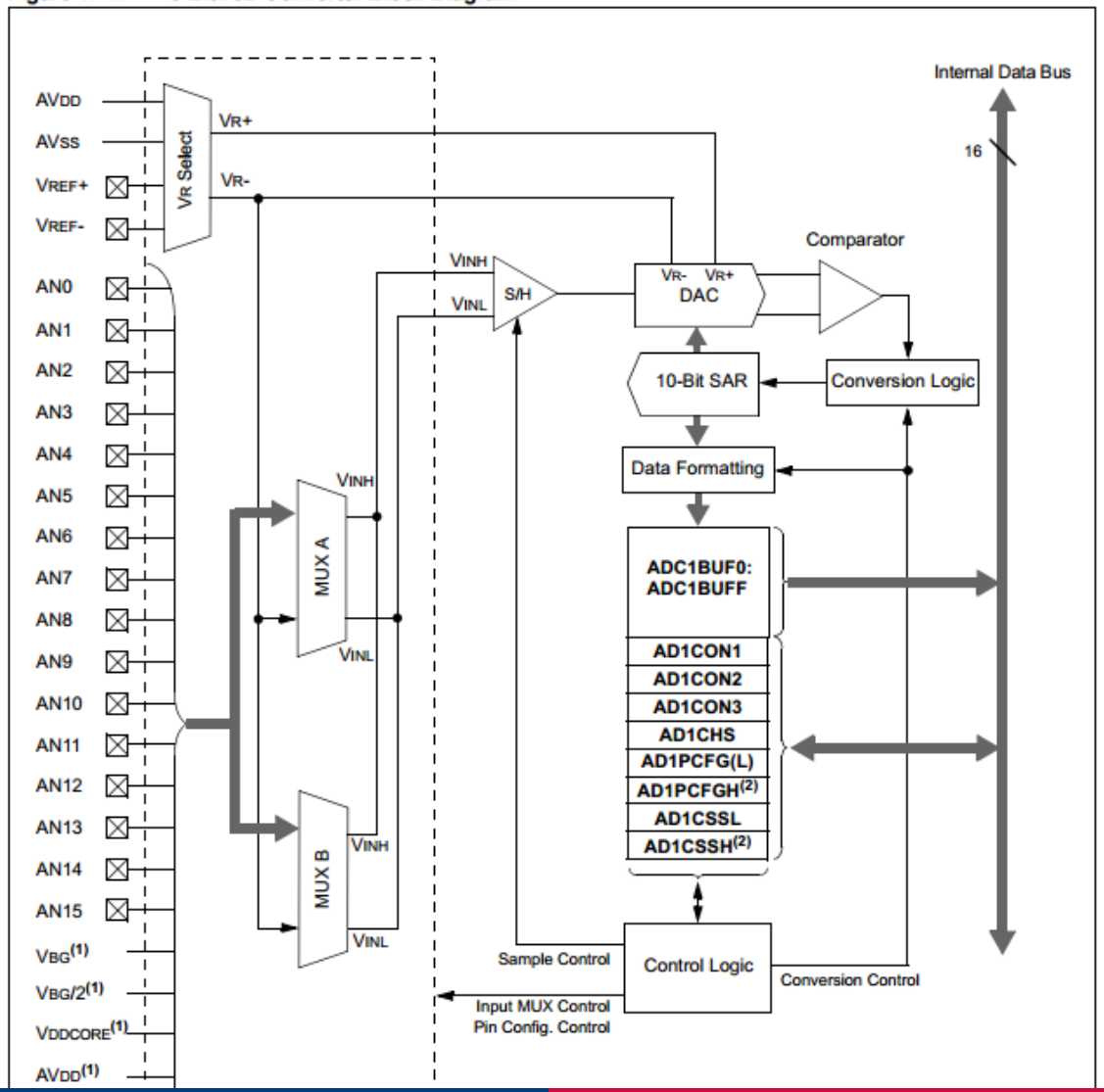
ADC Sampling Configurations

Figure 17-7: Converting One Channel, Auto-Sample Start, TAD-Based Conversion Start



ADC Circuit Schematic

Figure 17-1: 10-Bit A/D Converter Block Diagram



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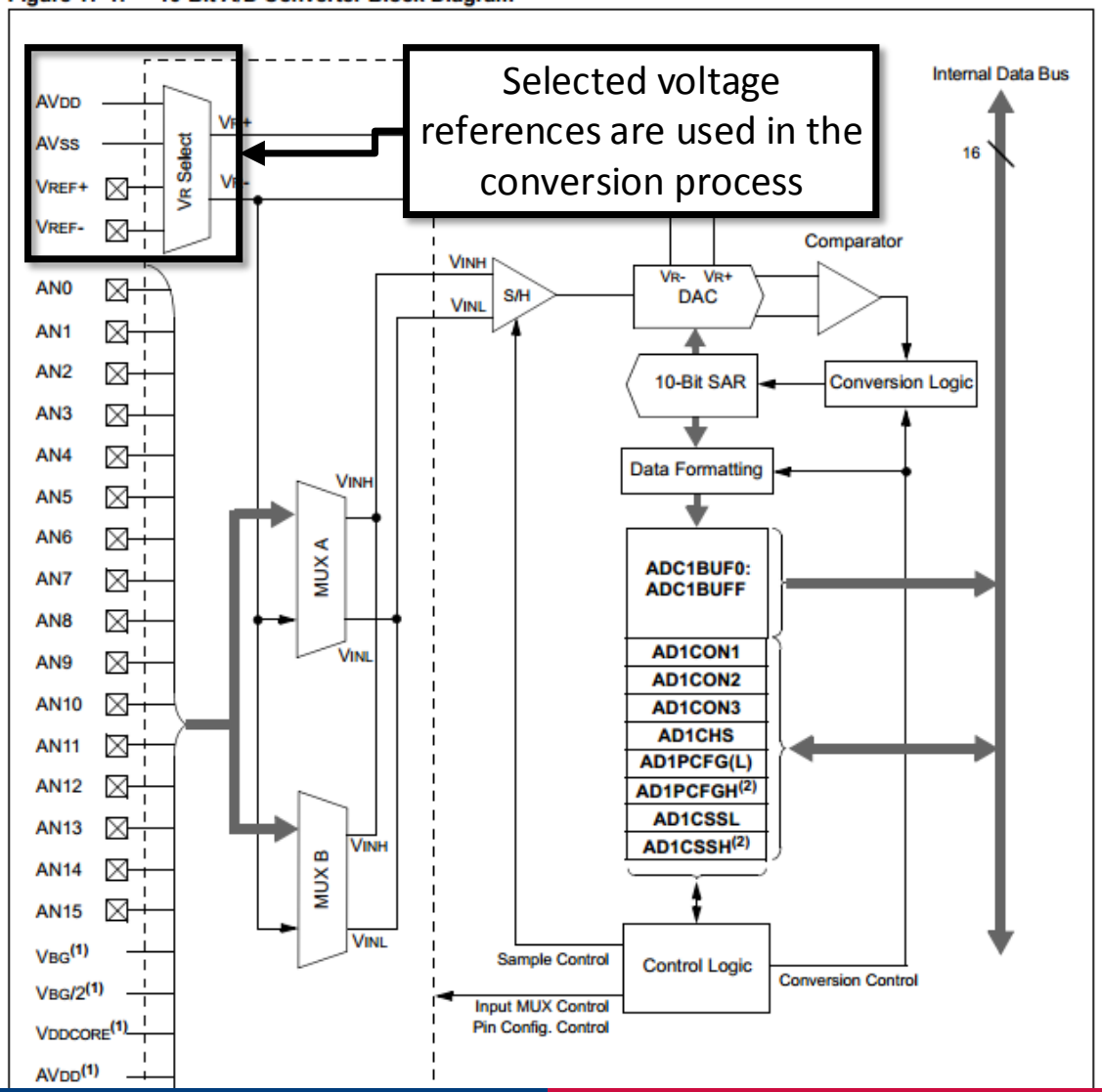

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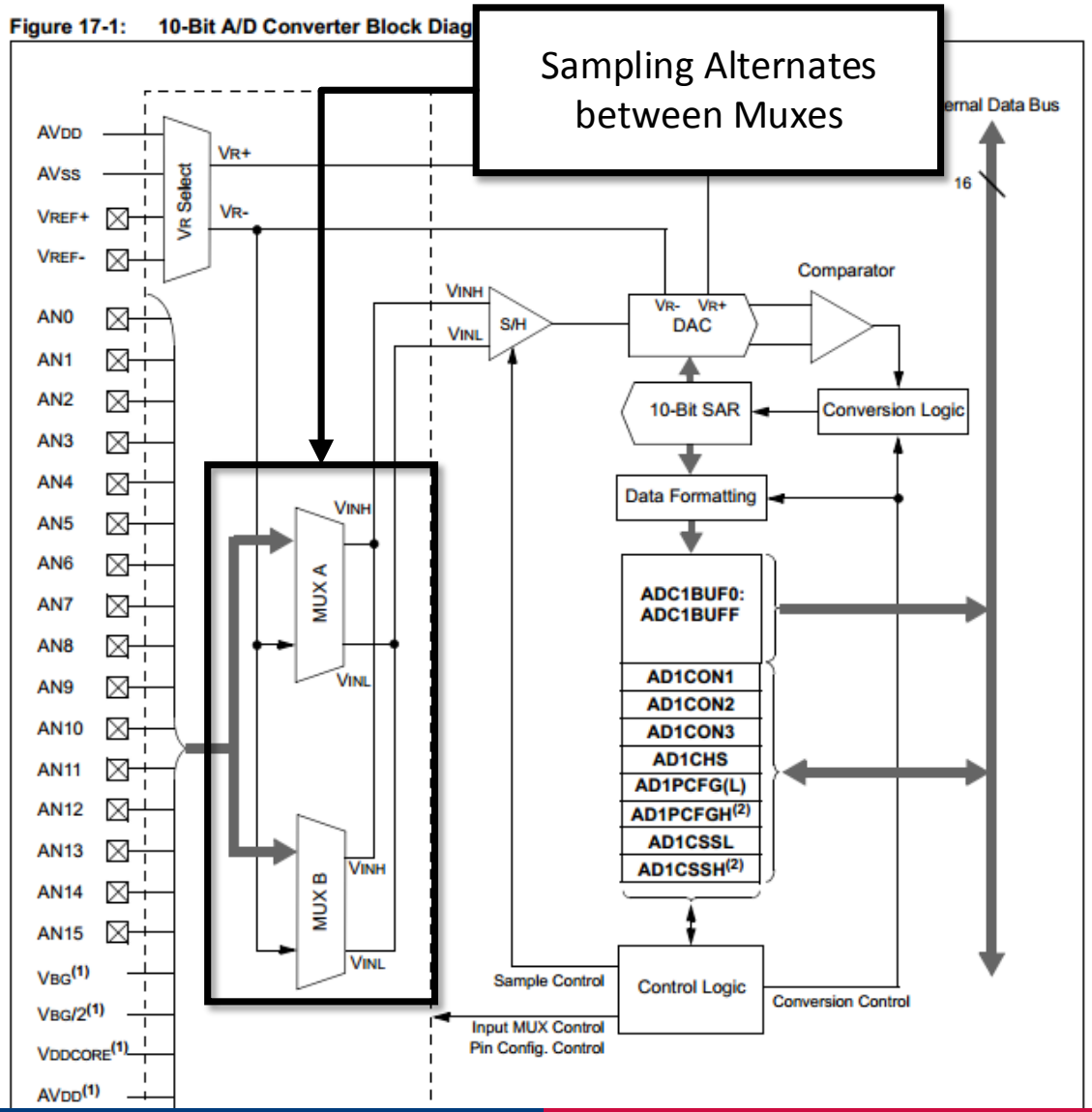

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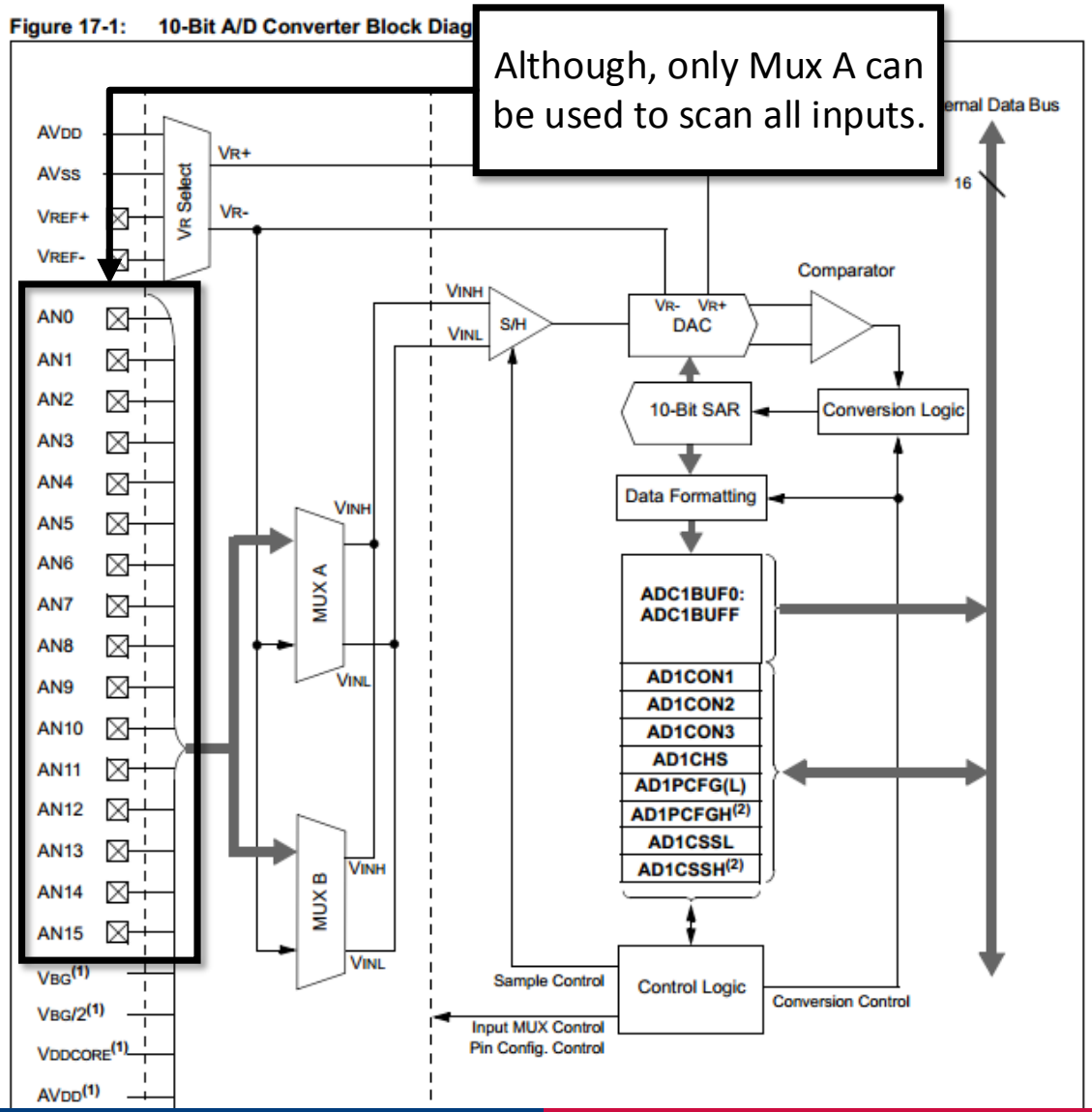

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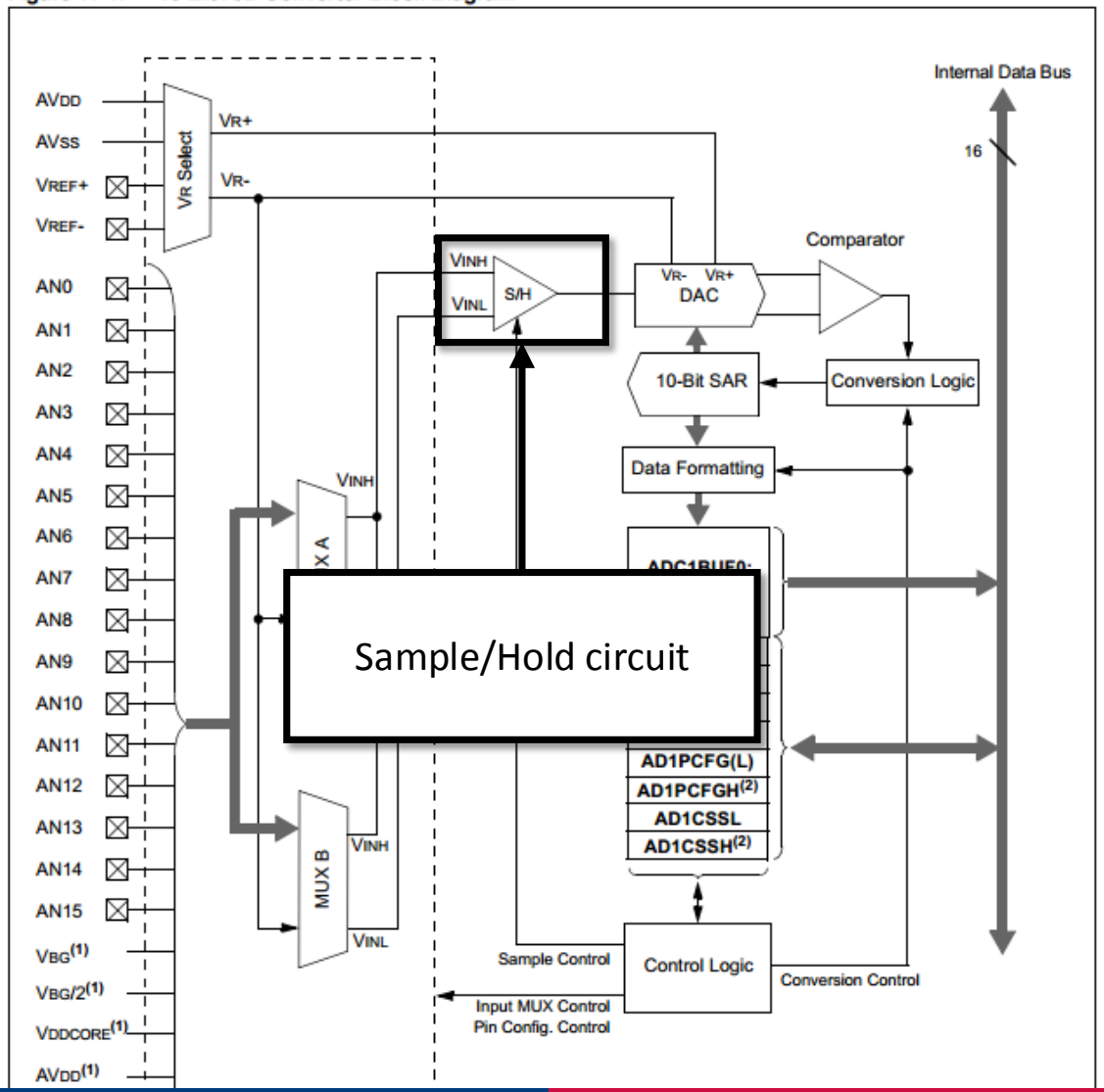

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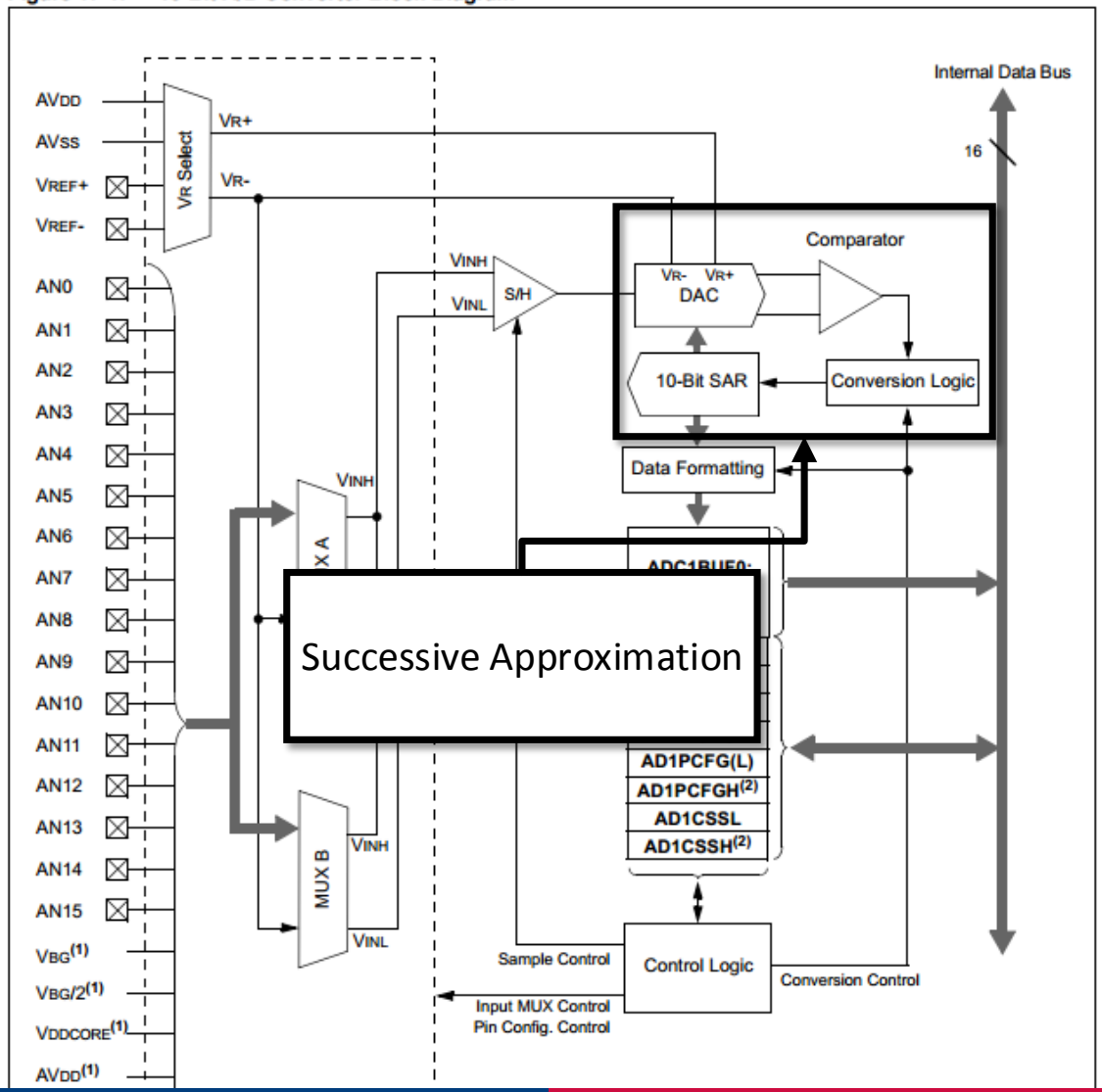

Outline

PWM

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Section 16 in the PIC32MX Family Reference Manual
Section 16 in the PIC32MX Data Sheet

Introduction to PWM

Purpose of PWM

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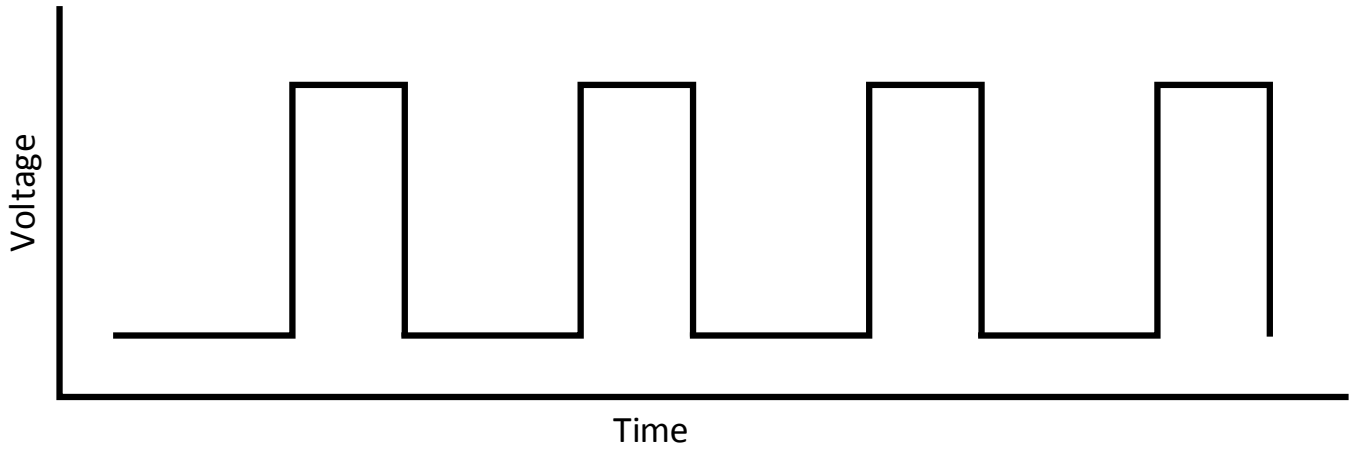
- PWM alternates between 'high' and 'low' so fast that the average voltage seen can be anywhere from V_{dd} to ground.
- This could be done with just delays, but delays stop the execution of code and this is not practical for many situations.

PWM Waveform



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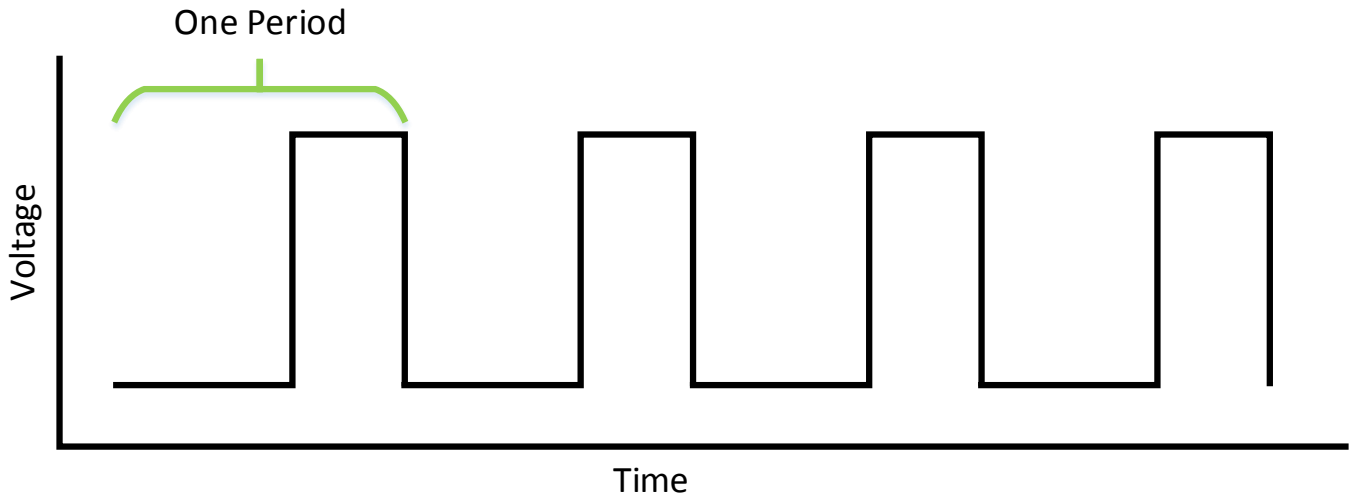

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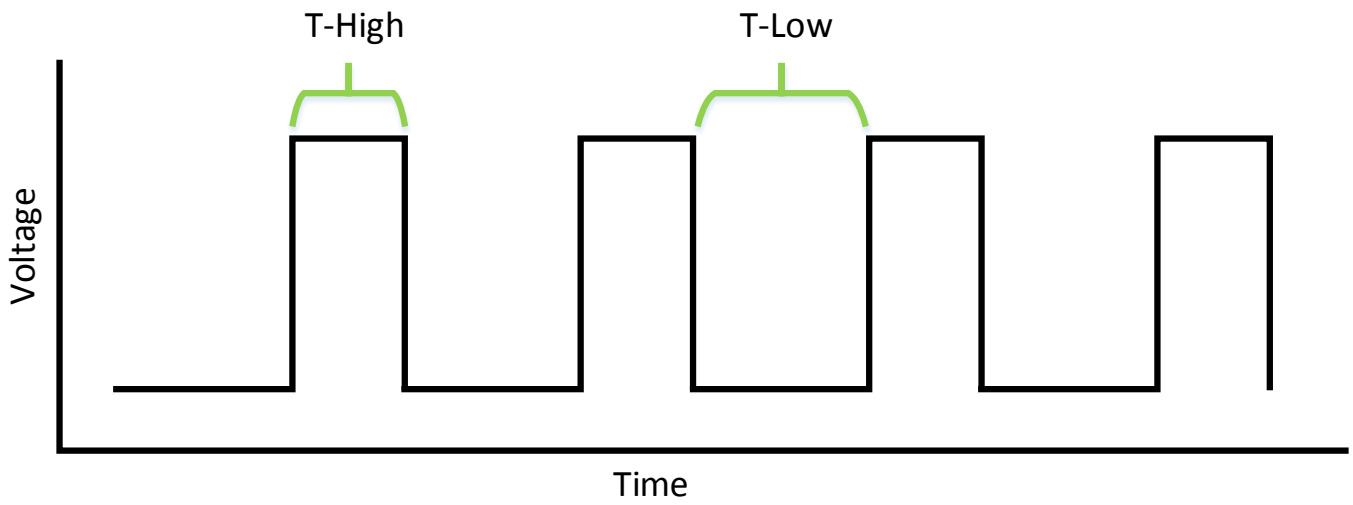

PWM Waveform

PWM Duty Cycle

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- An analog value V_a can be represented with a PWM with a duty cycle of $\frac{V_a}{V_{high}}$
- T_{total} determines the resolution. The smaller the period, the more analog values you can accurately represent.

PWM Waveform

PWM Example

- What *duty cycle* should be used to emulate 1V with $V_{high} = 5V$ and $V_{low} = 0$?

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- $T_{low} = .8T_{total}$

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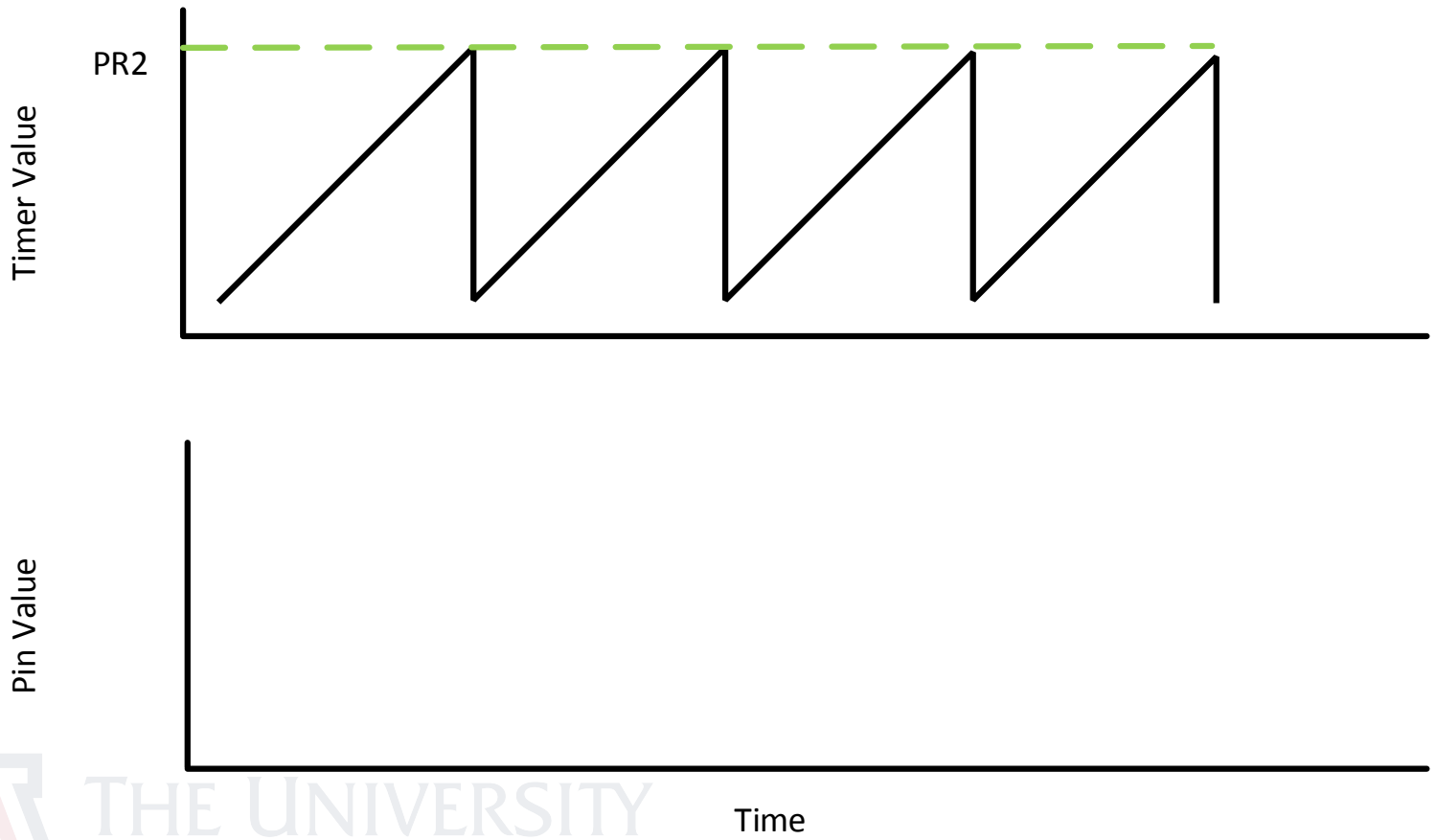

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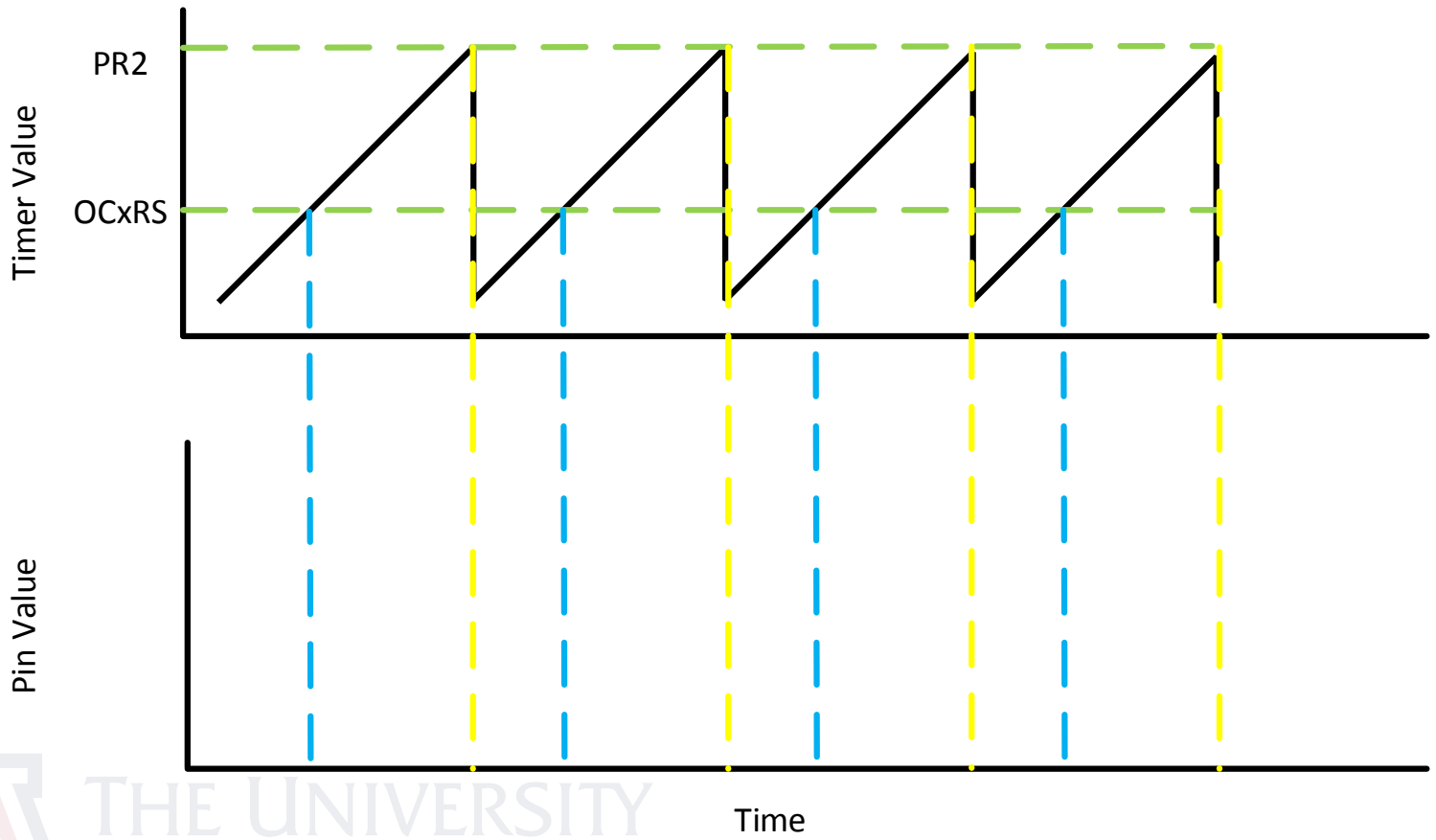

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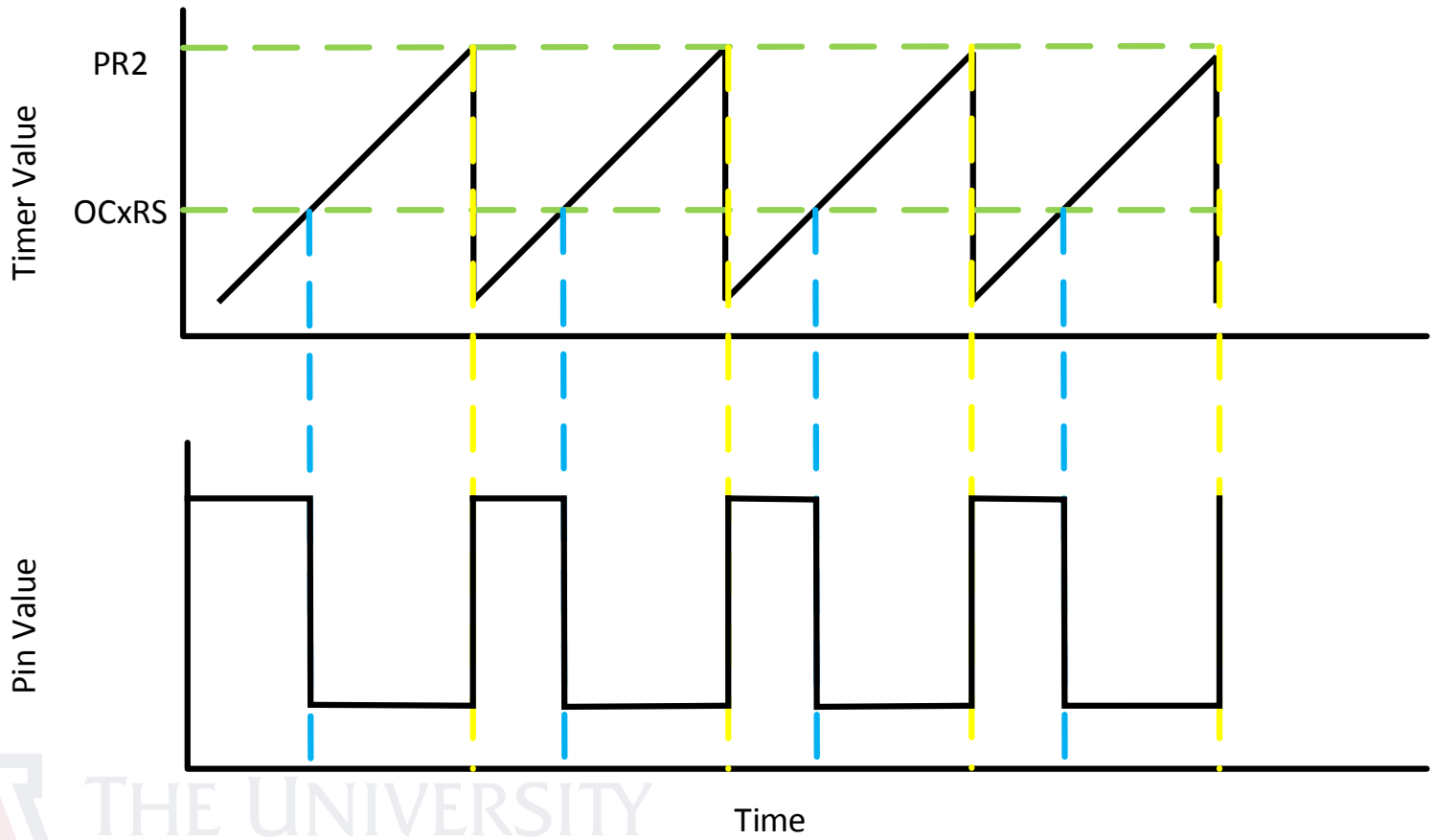

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PWM Usage

- TMR2 or TMR3 can be used for the PWM period.
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- Duty cycle $= \frac{OCxRS}{PRx}$

PWM Registers

PWM Registers

1. OCxCON
2. OCxR
3. OCxRS