PWM Interfacing on eYFi-Mega Board

e-Yantra Team

Embedded Real-Time Systems Lab
Indian Institute of Technology-Bombay

IIT Bombay
July 4, 2022

Agenda for Discussion

1. Introduction
   - Pulse Width Modulation
   - Duty Cycle
   - Timers in AVR
2. PWM Generation in AVR
   - Timer/Counter (TCNTn)
   - Output Compare Register
   - PWM Signal
   - Required Functions

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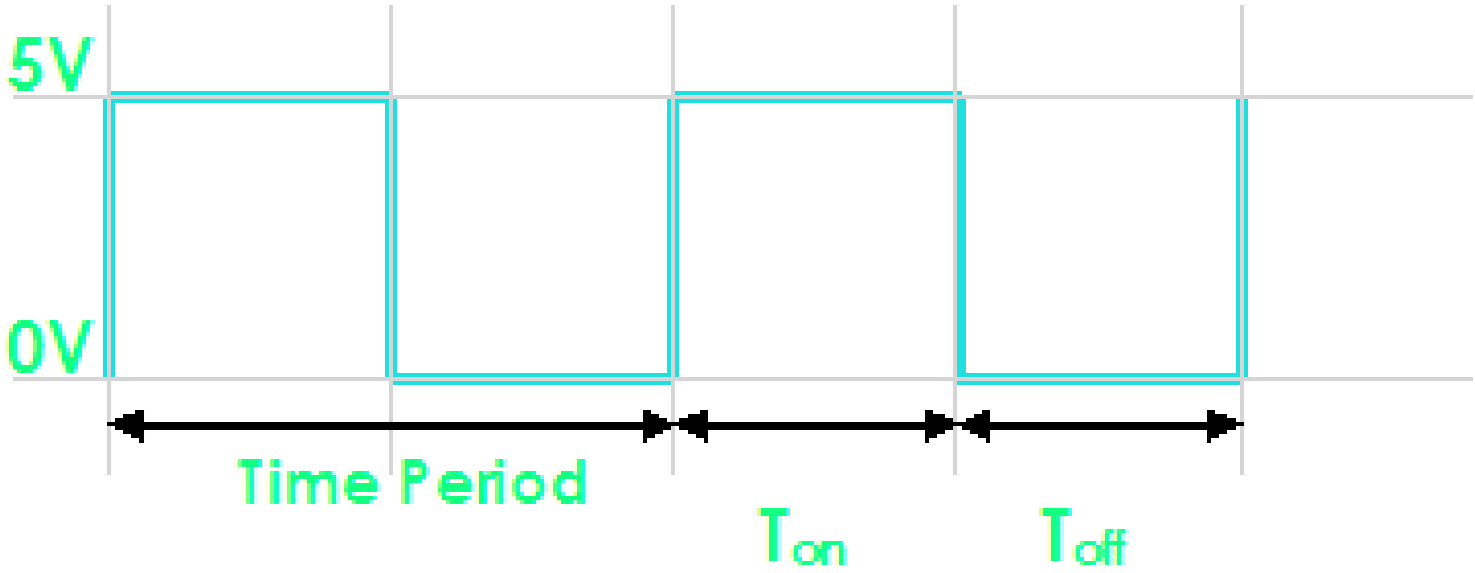

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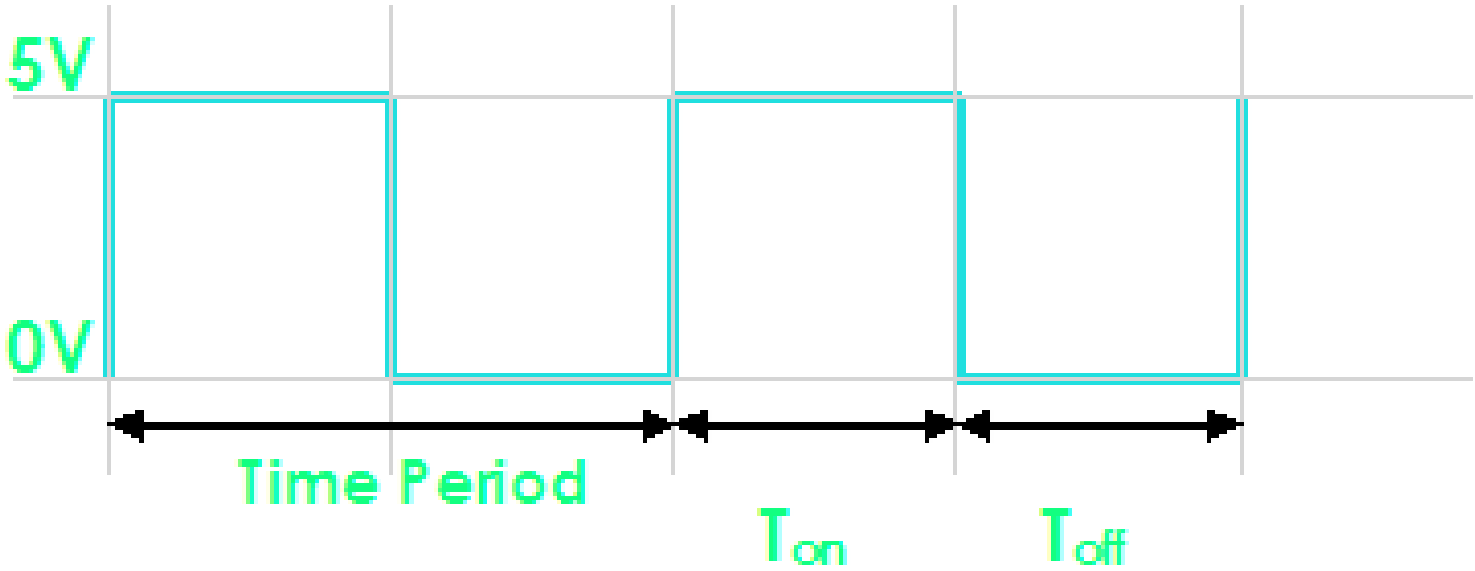

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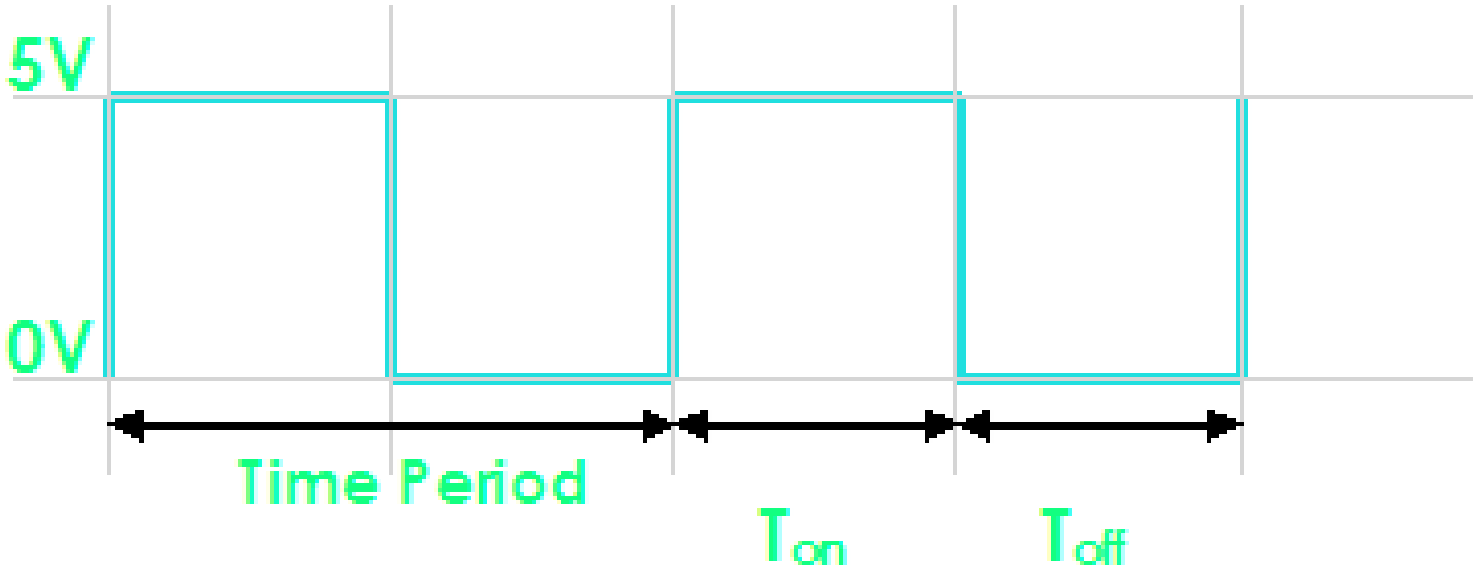

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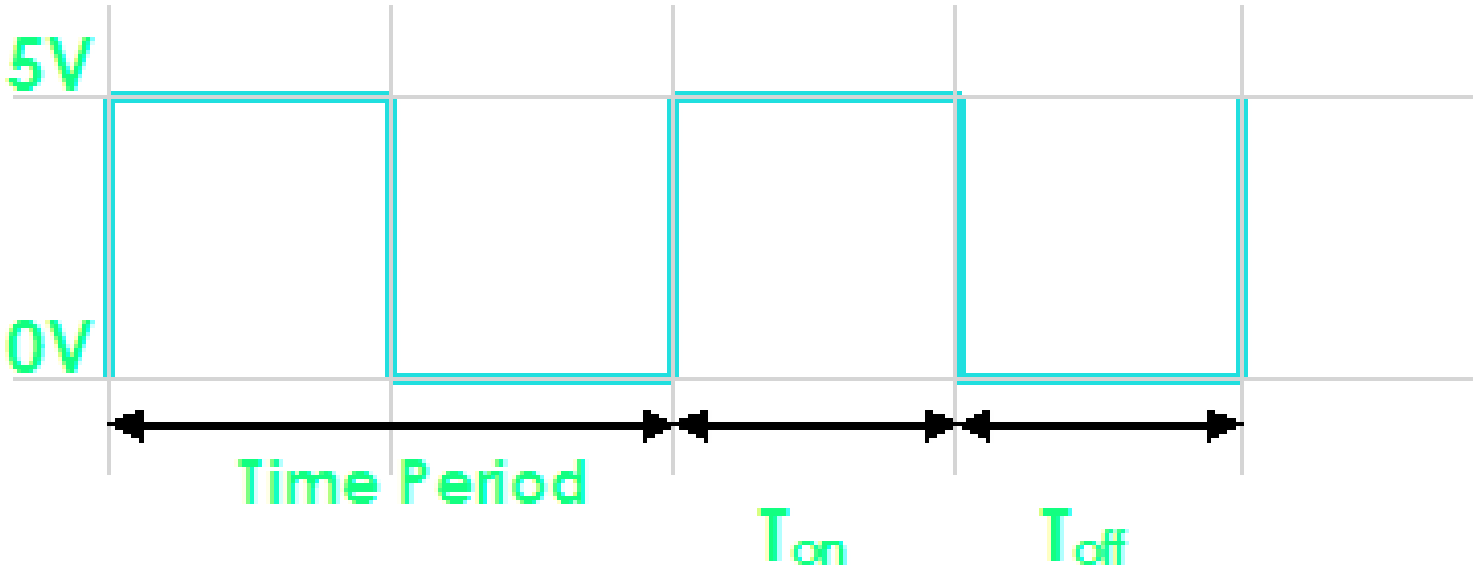

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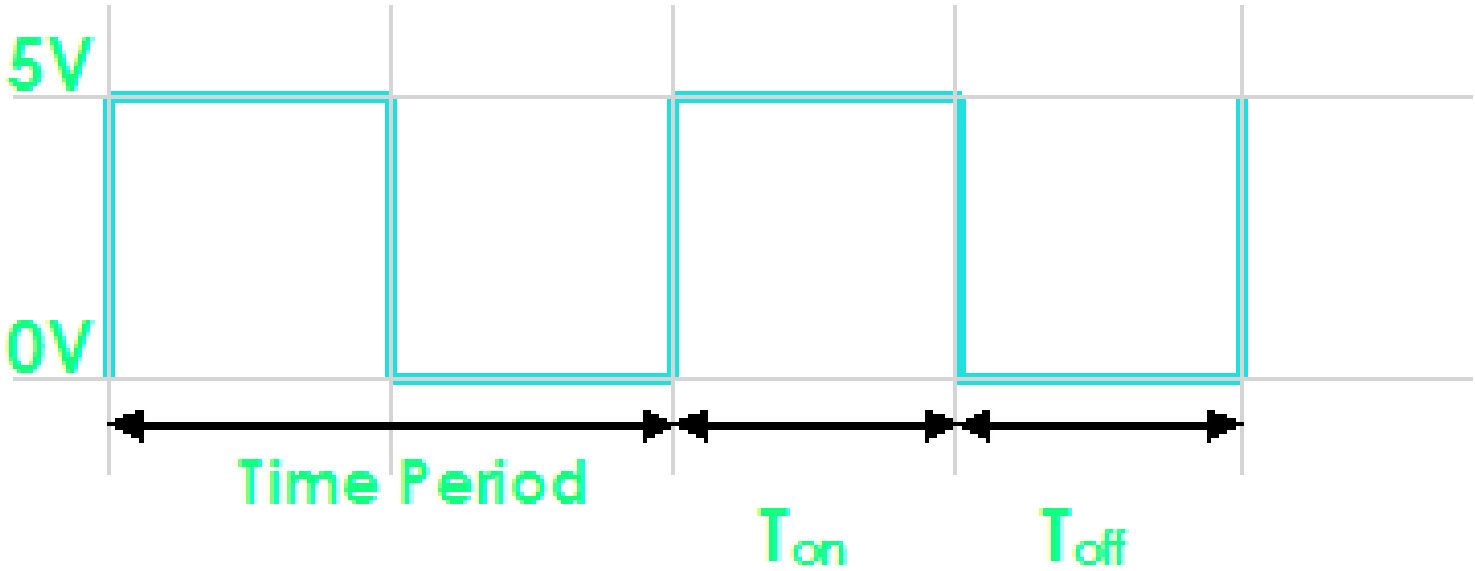

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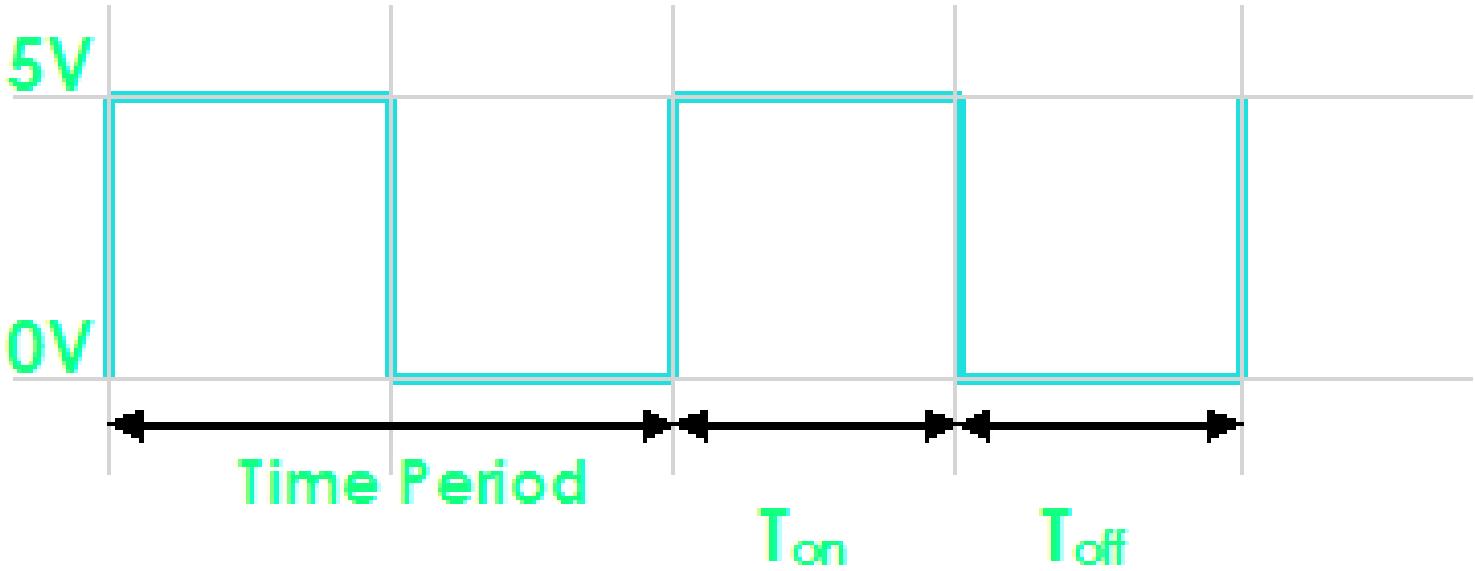

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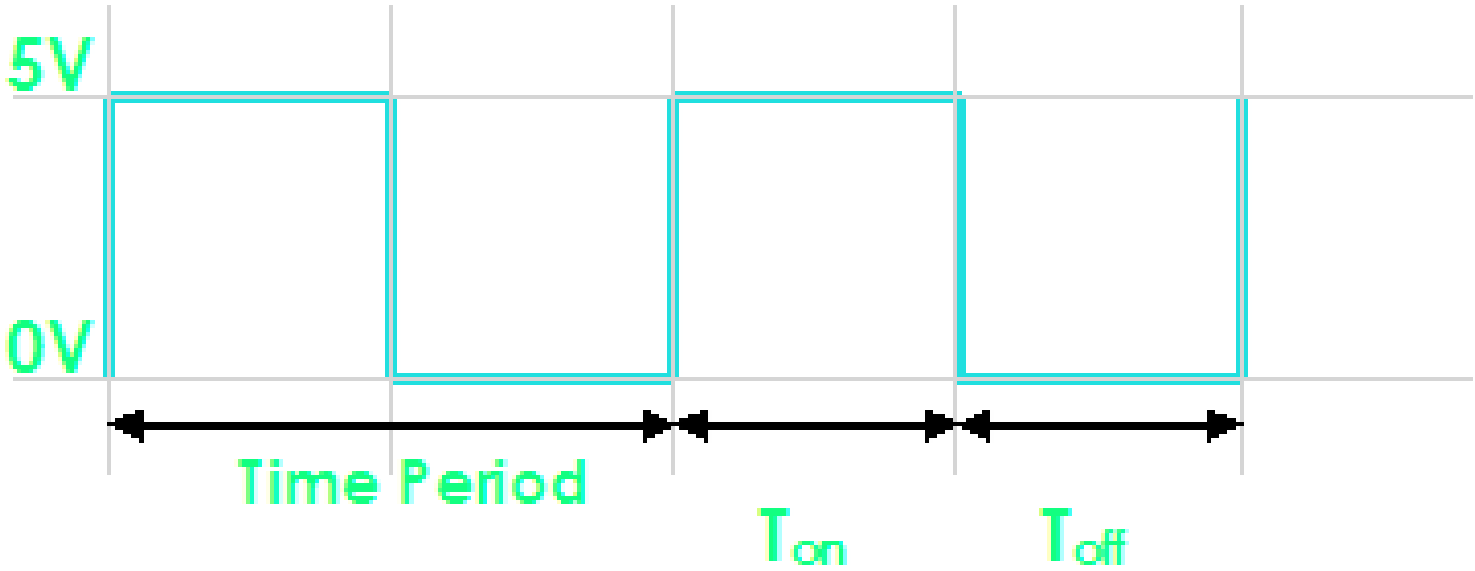

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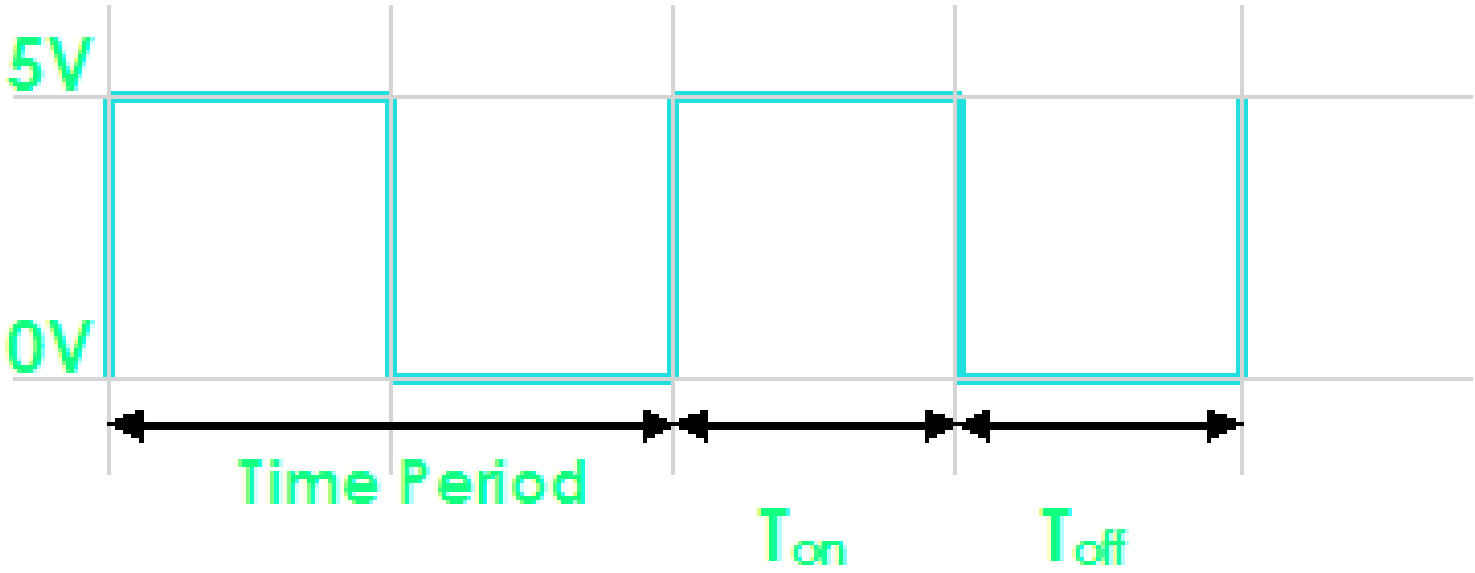

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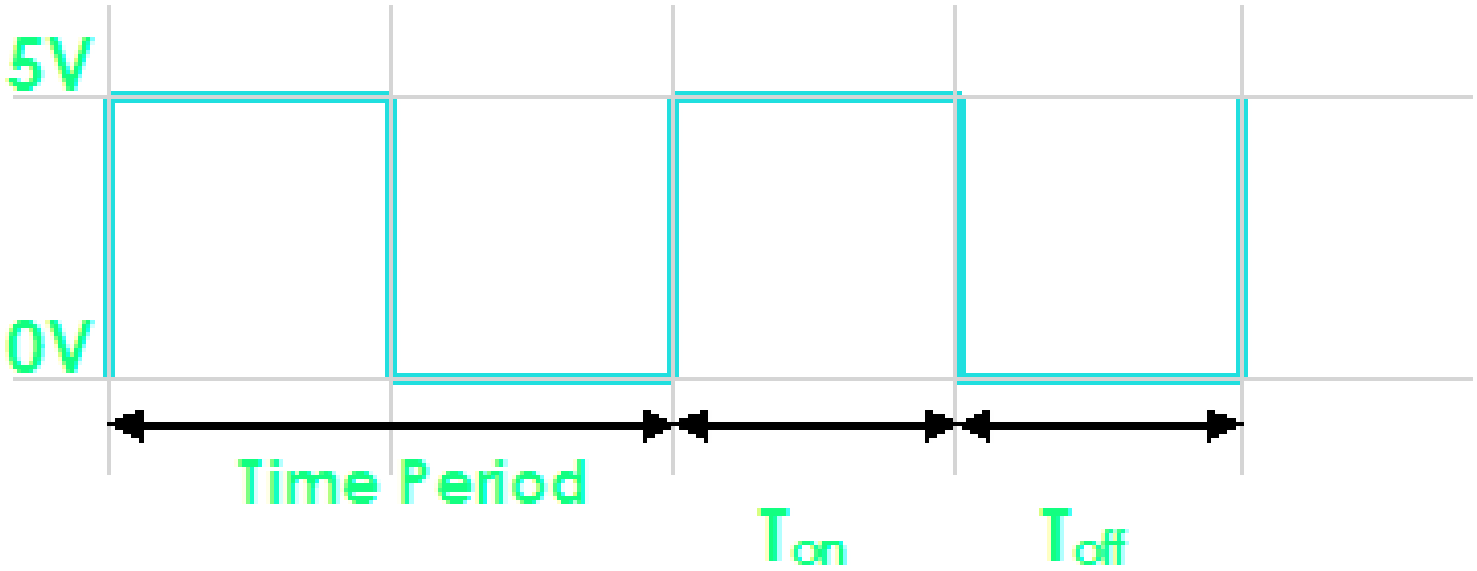

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- Ton = Time the output remains high.
- Toff = Time the output remains Low.
- When output is high the voltage is 5v
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- Time Period(T) = Ton + Toff
- Duty Cycle = Ton*100/(Ton + Toff)
- Duty Cycle = 50%

Duty Cycle (Contd..)

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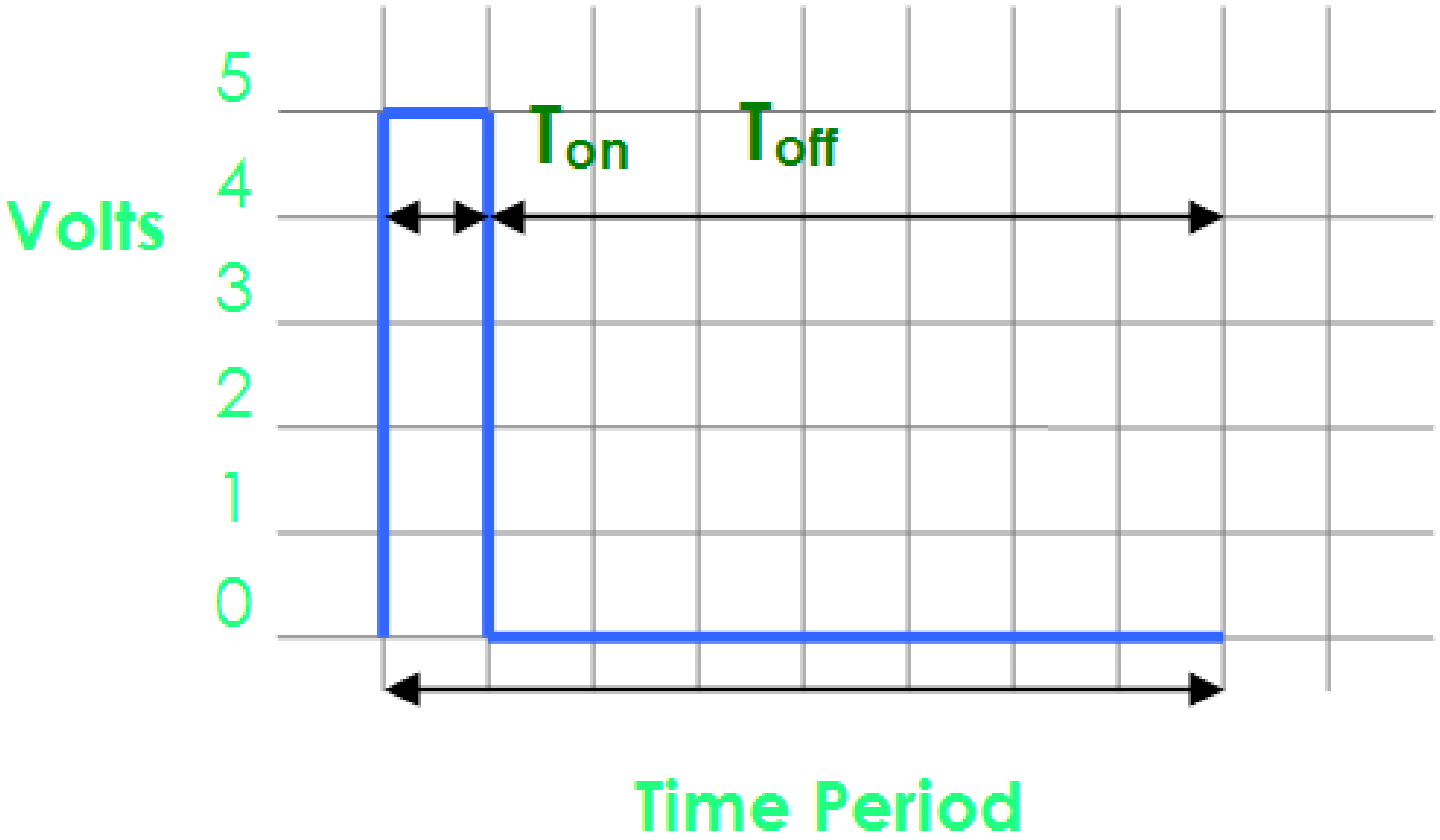
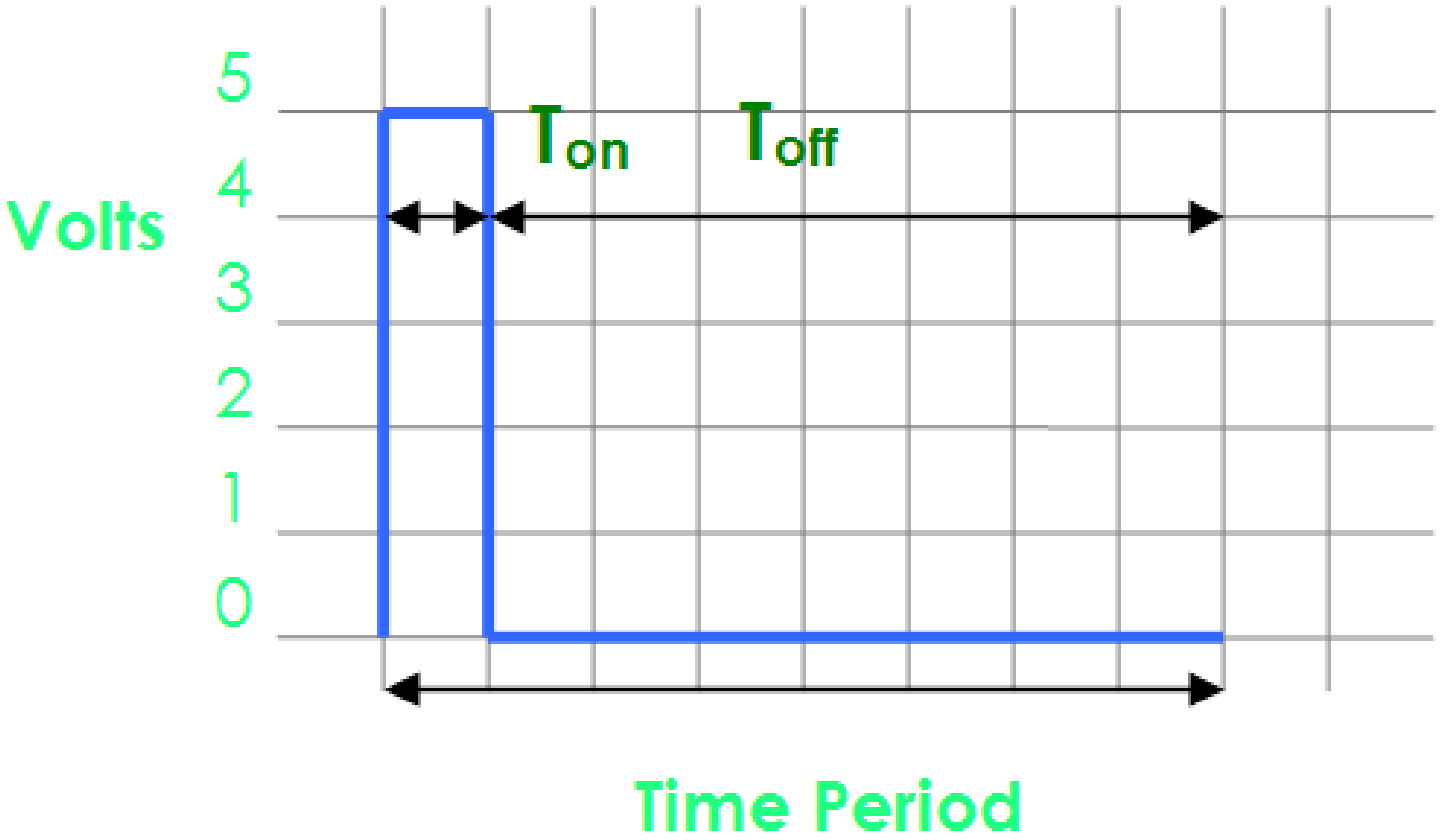
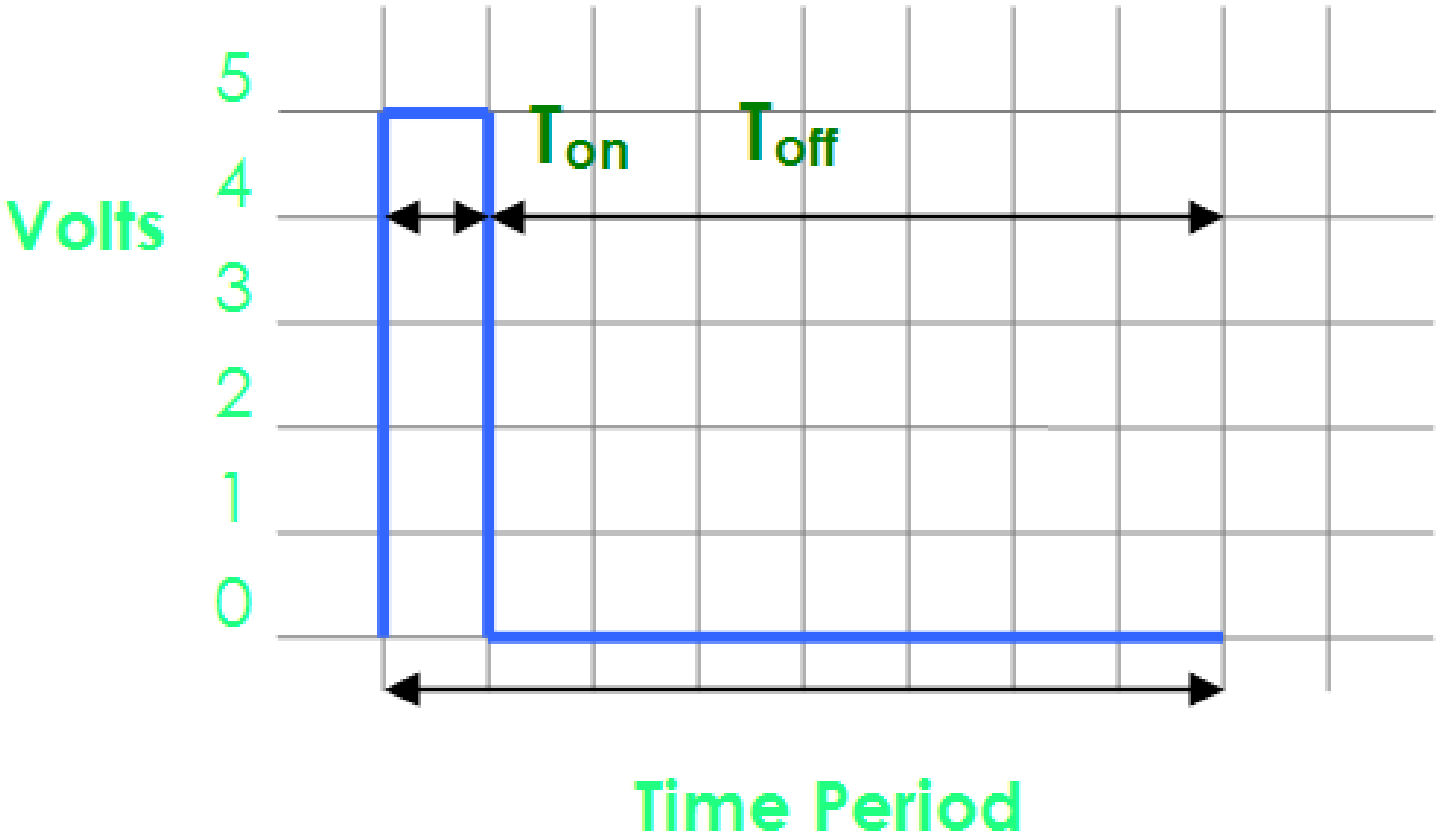


Duty Cycle (Contd..)



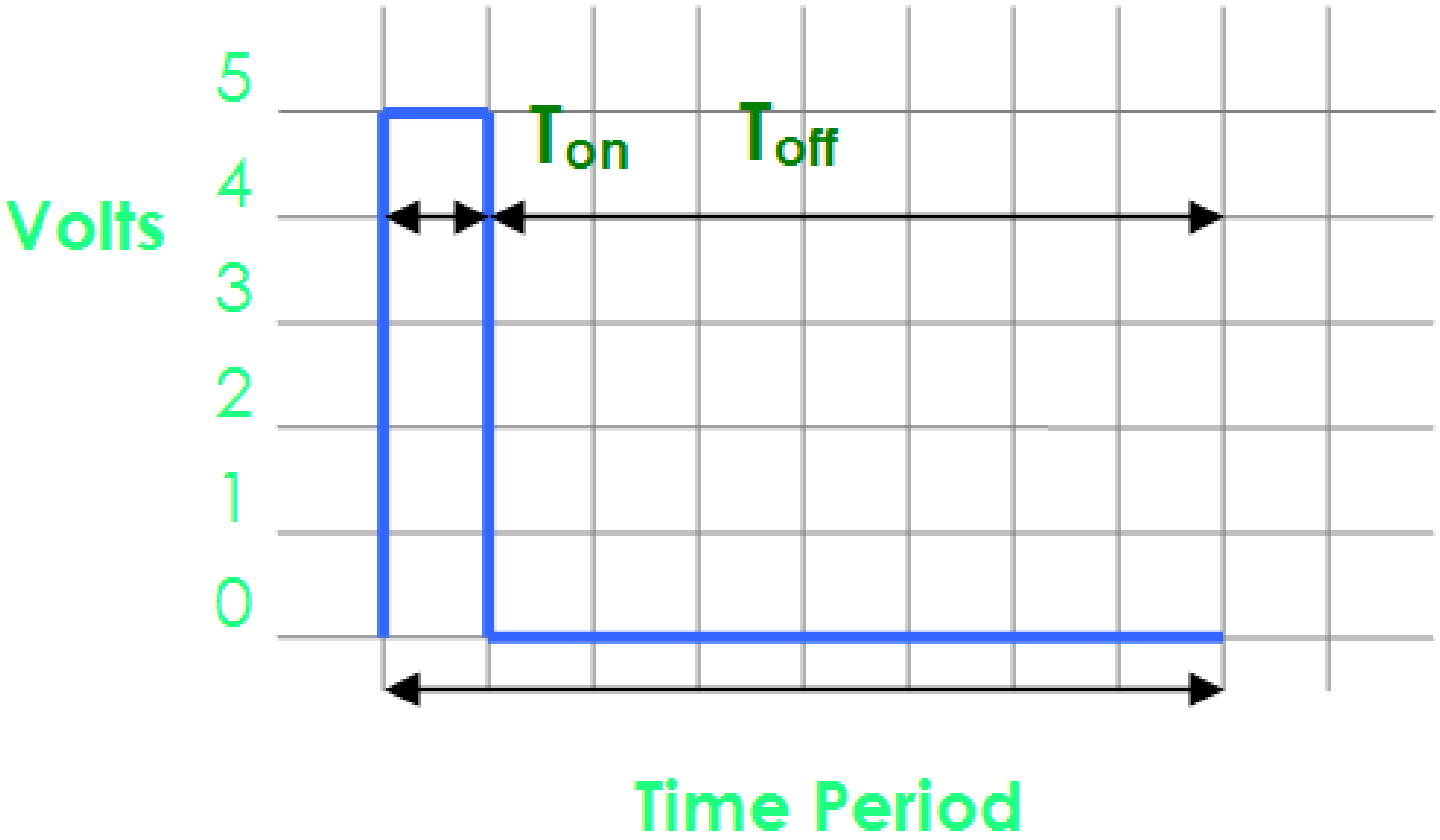
- Ton = Time the output remains high = 1

Duty Cycle (Contd..)



- Ton = Time the output remains high = 1
- Toff = Time the output remains Low = 7

Duty Cycle (Contd..)



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- Duty Cycle = 12.5%

Duty Cycle (Contd..)

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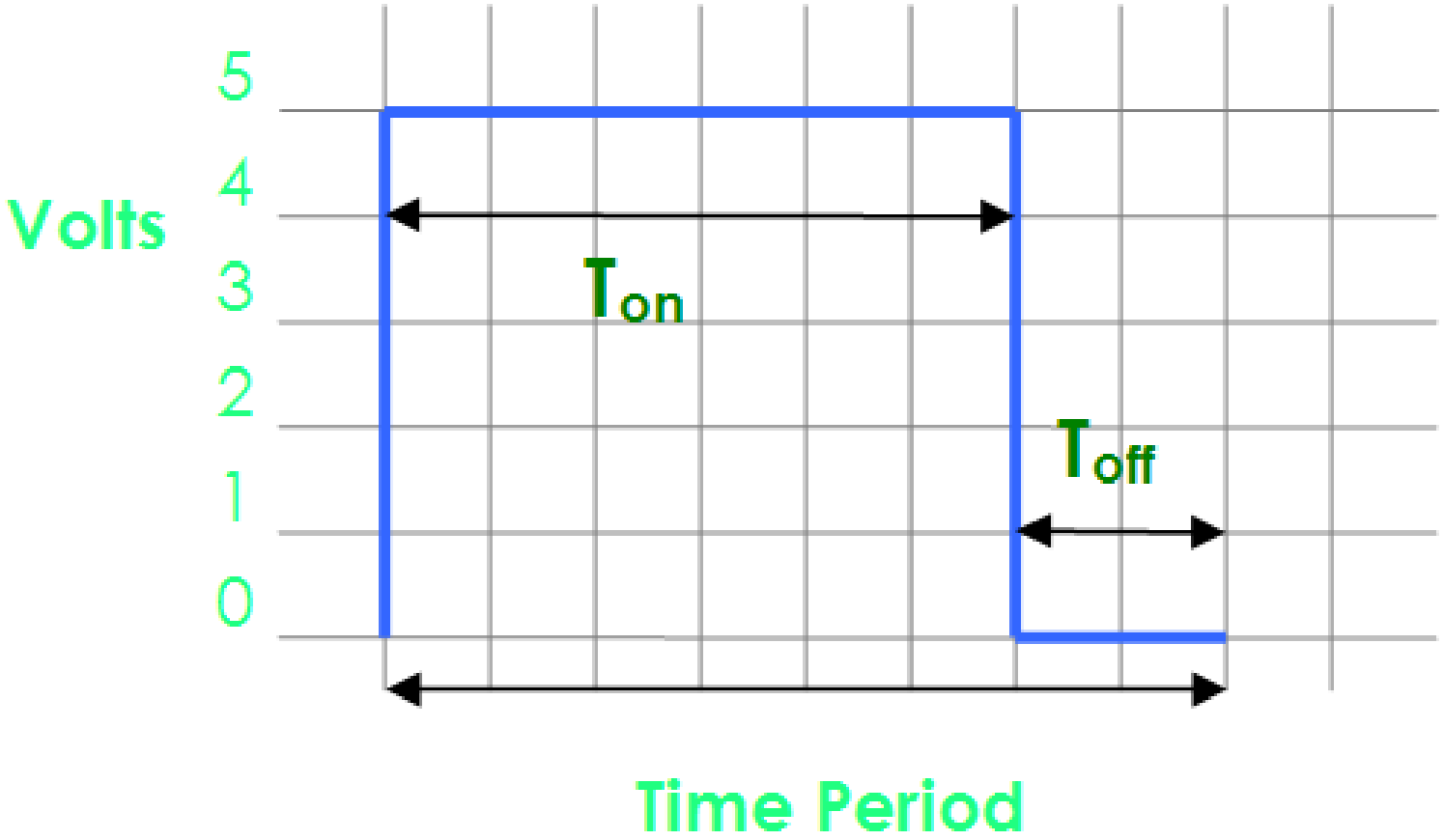

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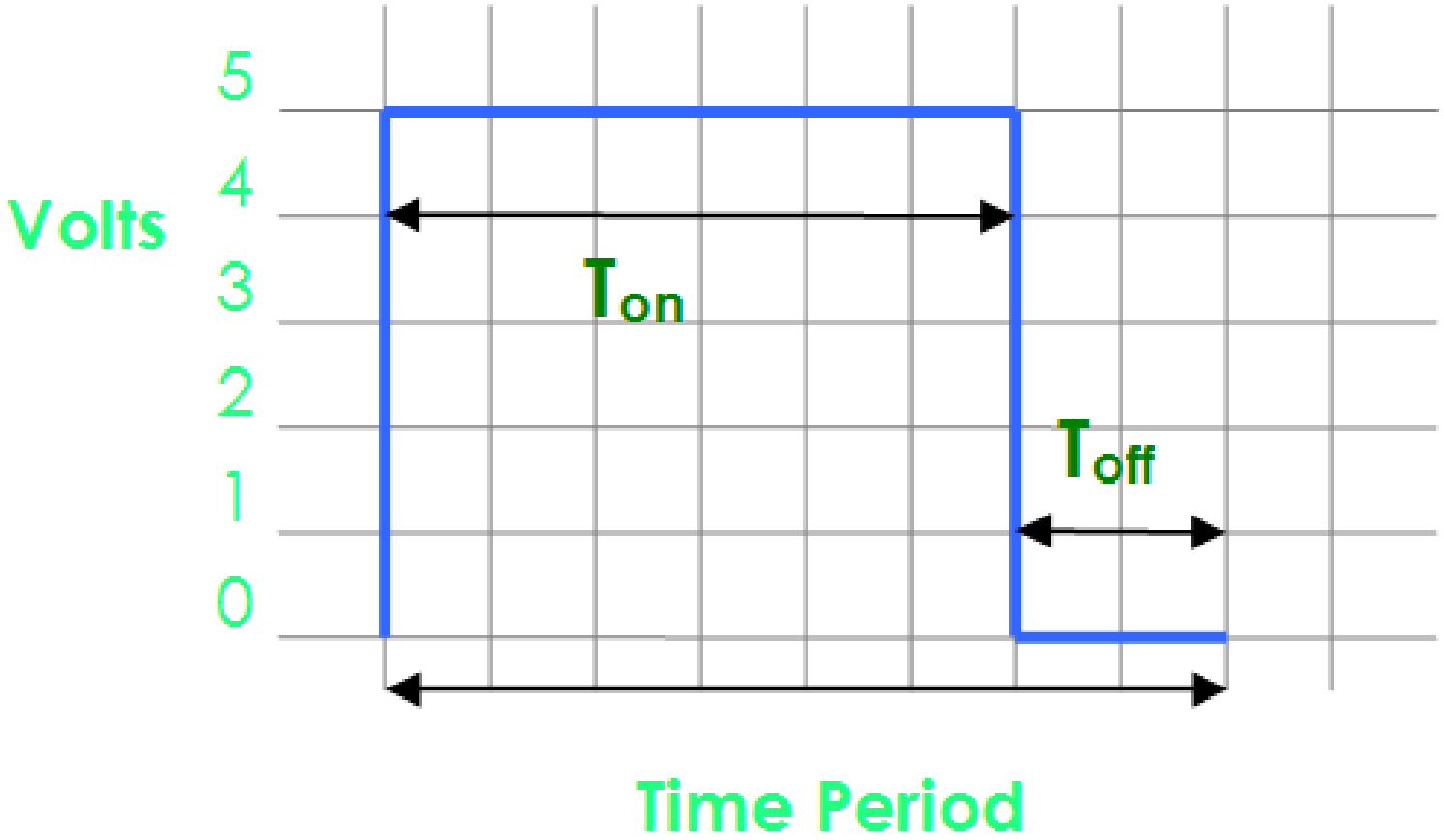

- Ton = Time the output remains High = 6

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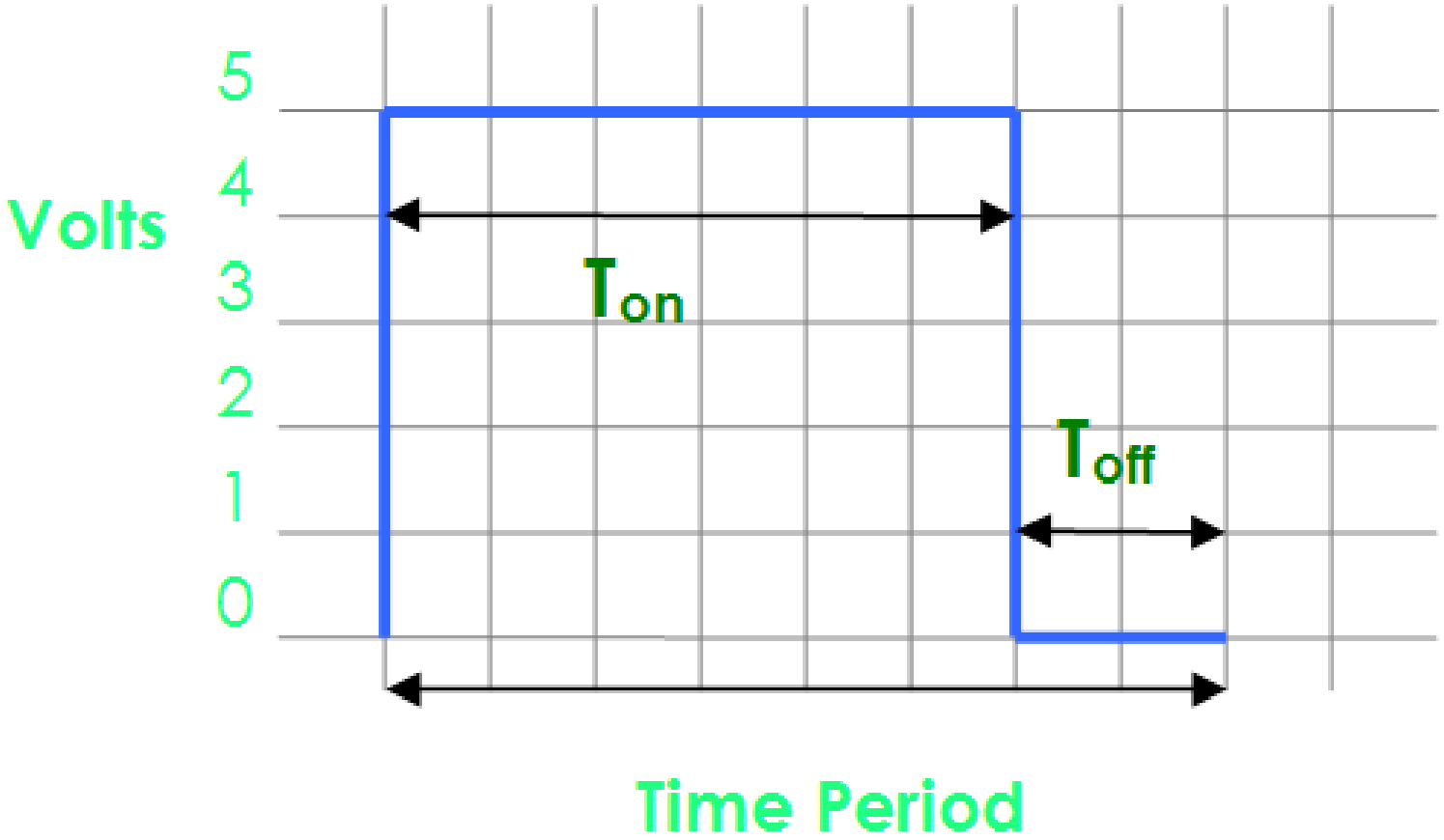
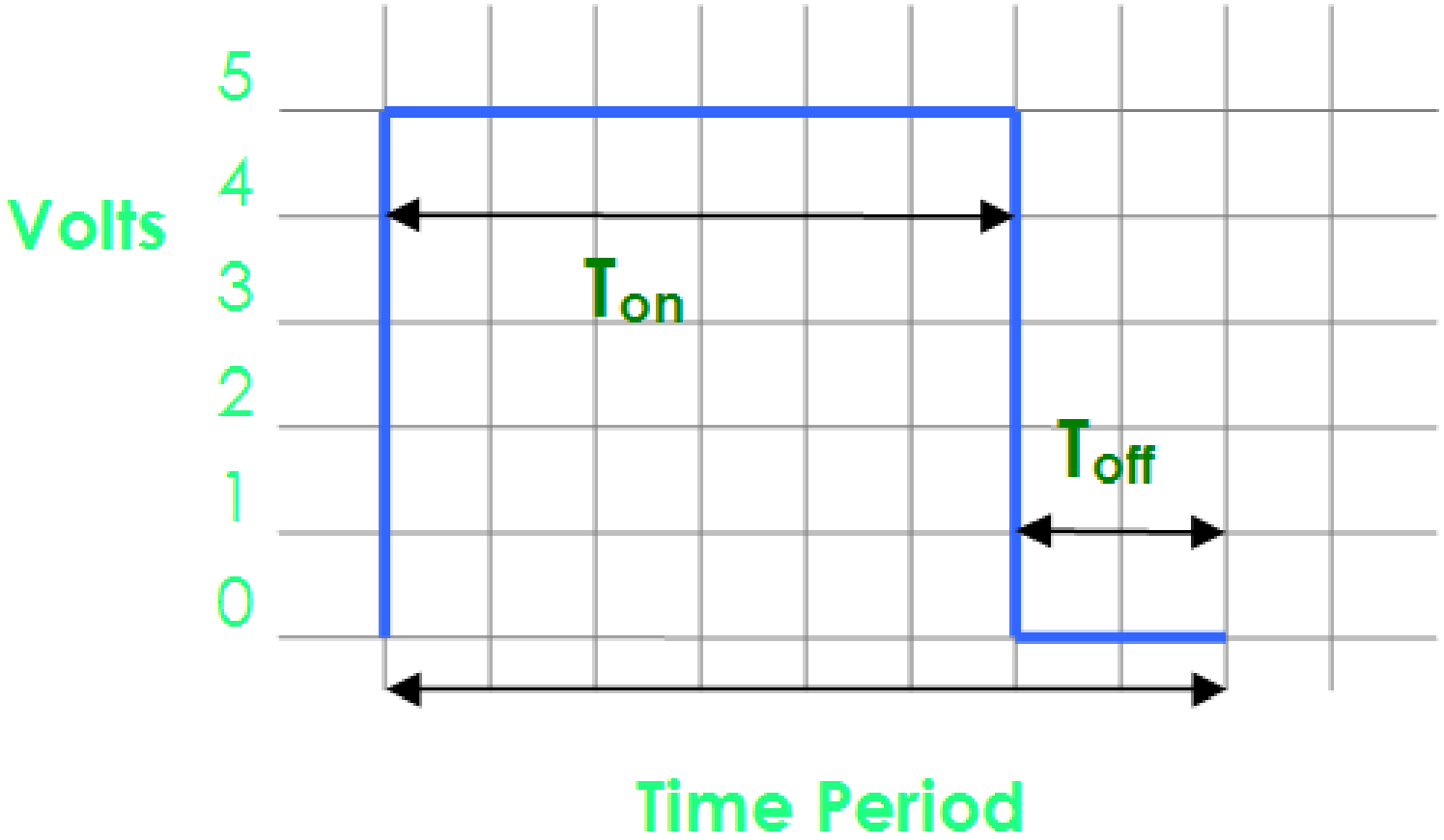


- Ton = Time the output remains High = 6
- Toff = Time the output remains Low = 2

Duty Cycle (Contd..)



- Ton = Time the output remains High = 6
- Toff = Time the output remains Low = 2
- Duty Cycle = 75%

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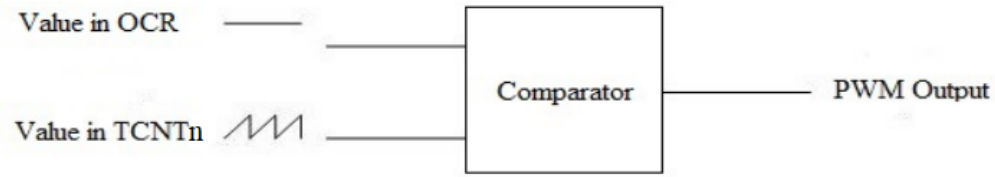

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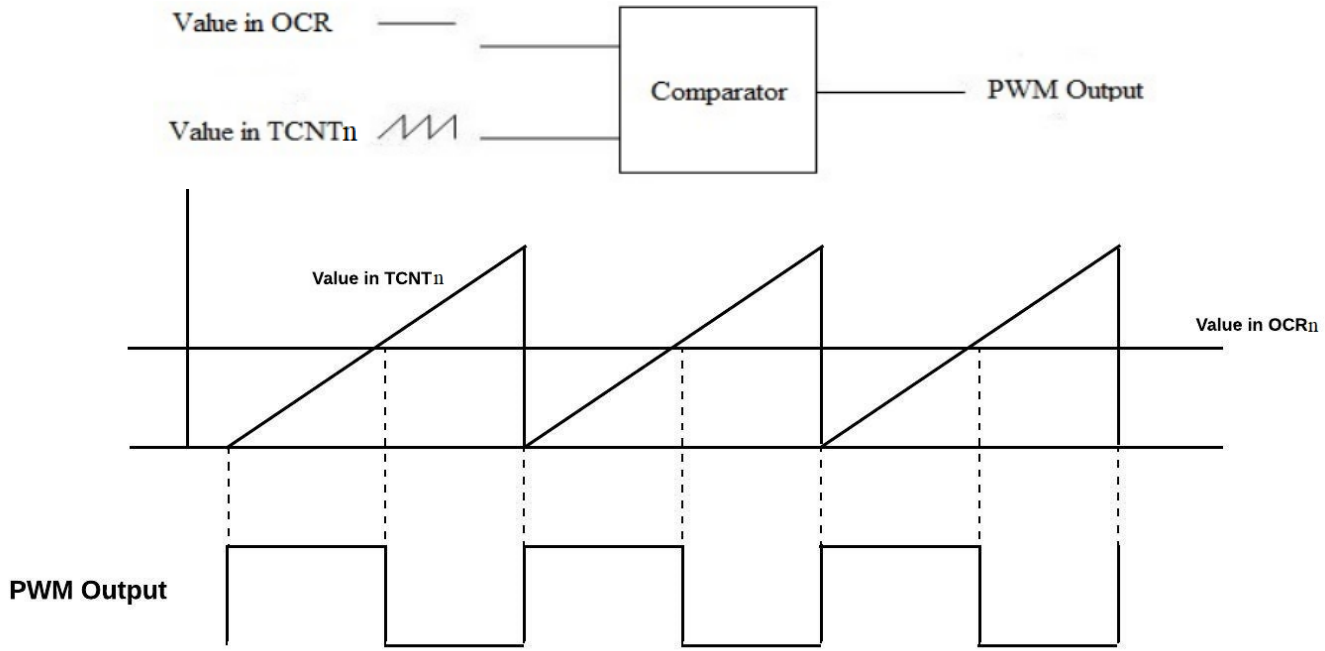

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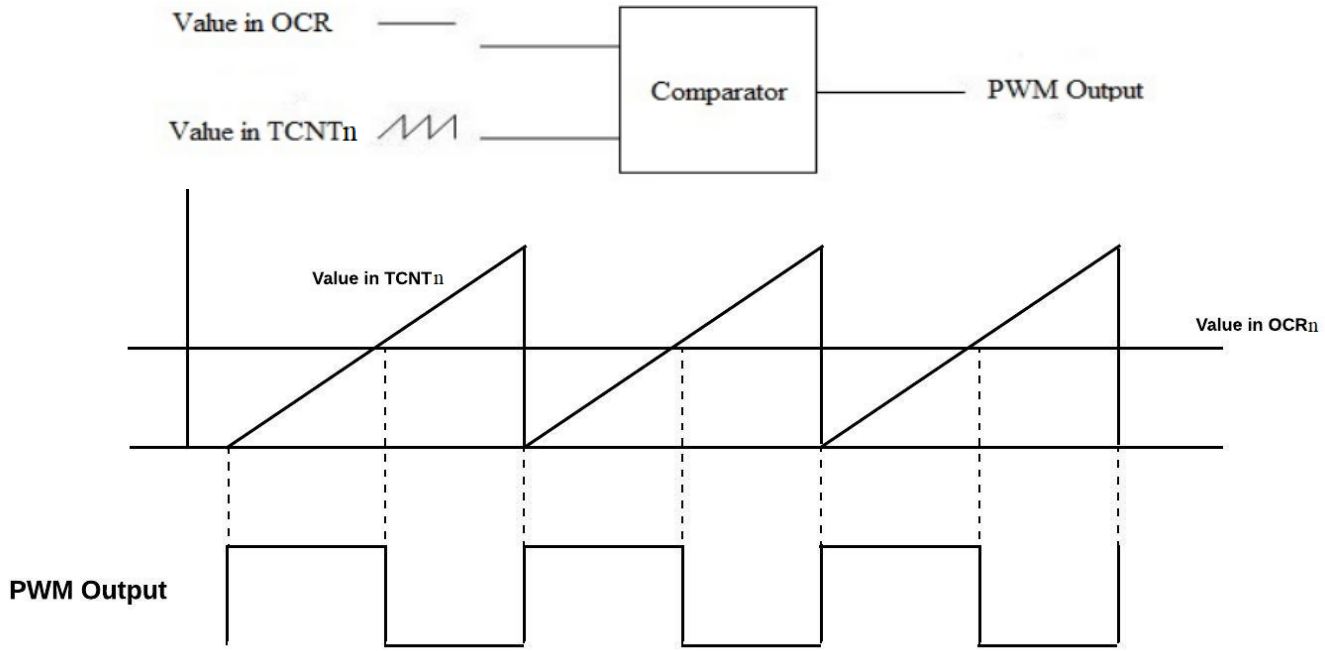

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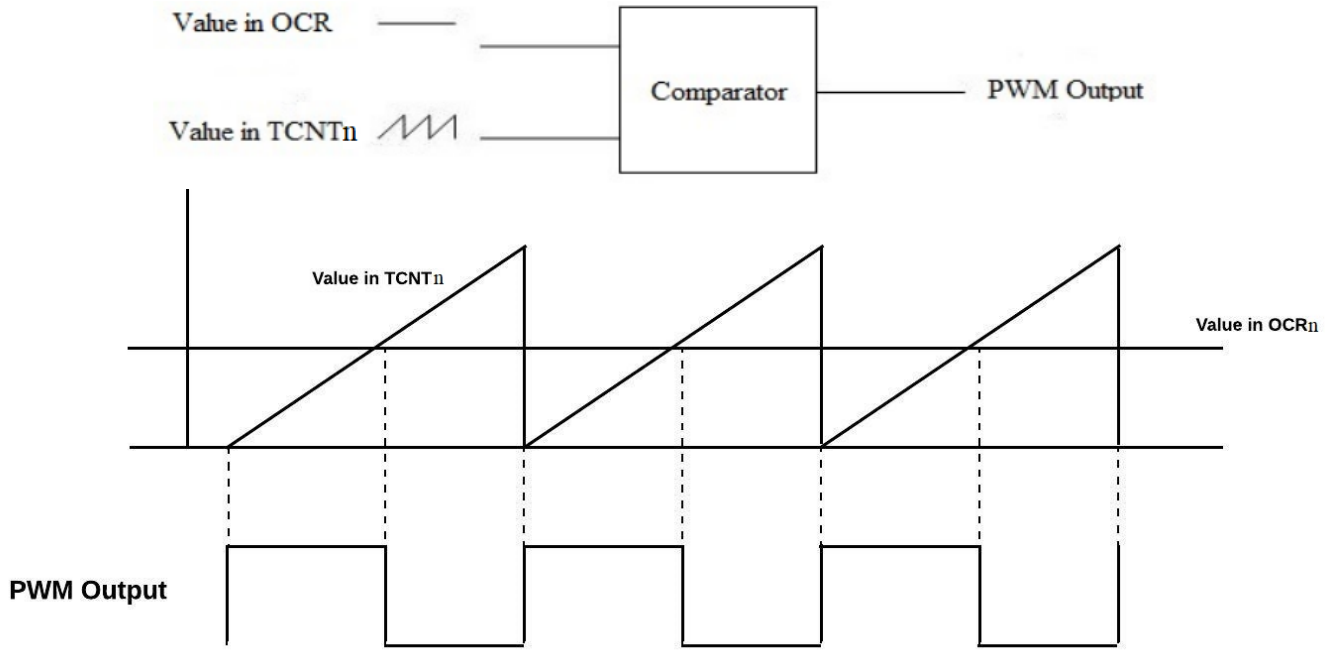

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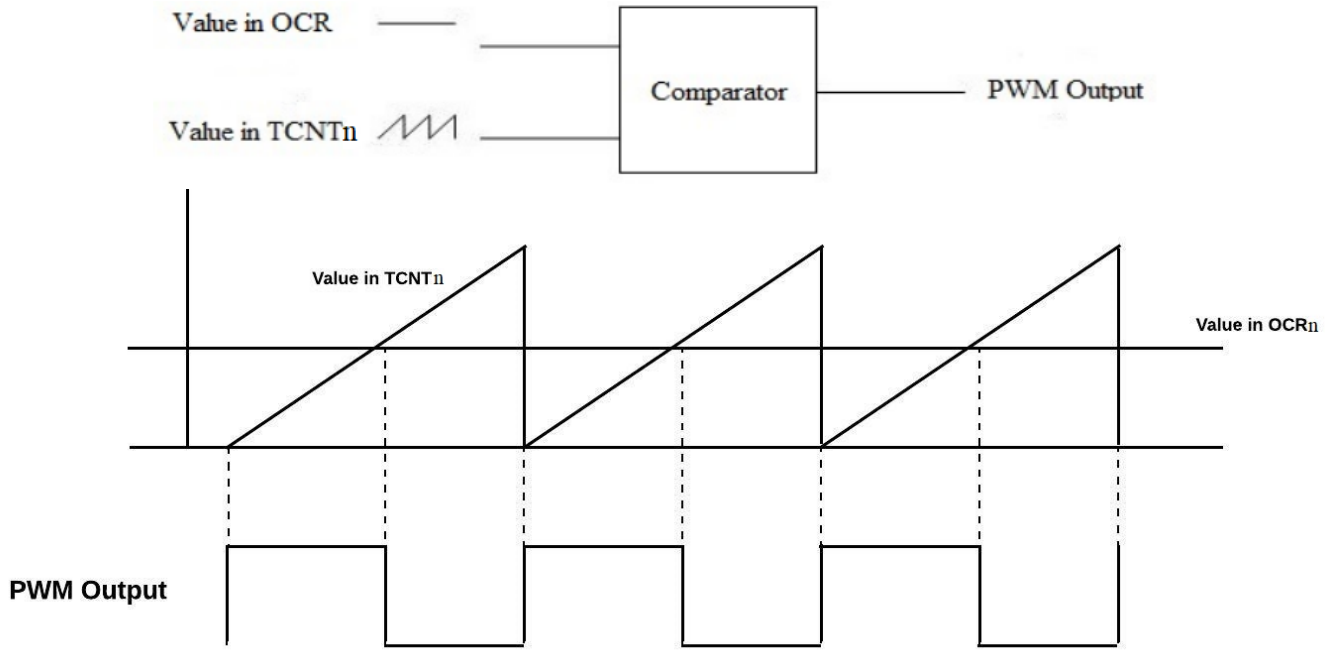

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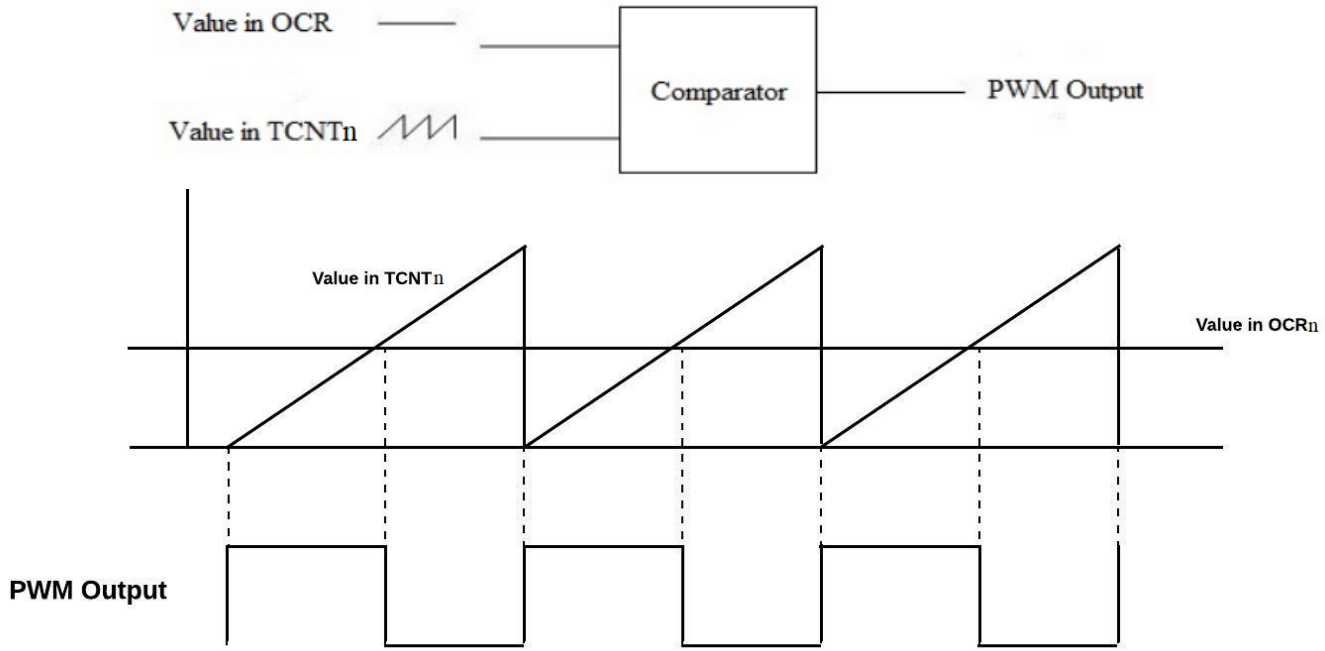

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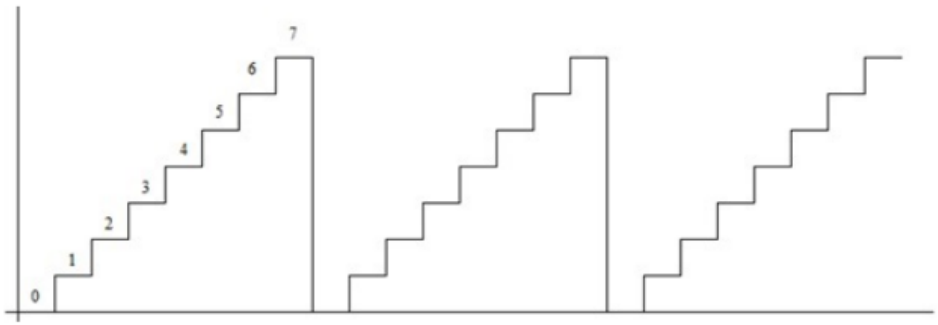

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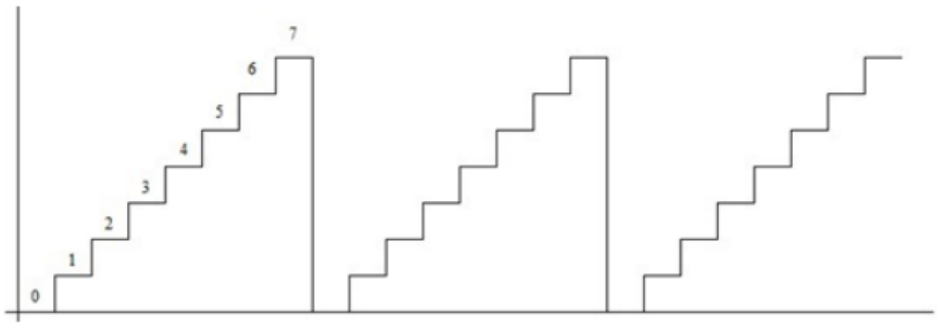

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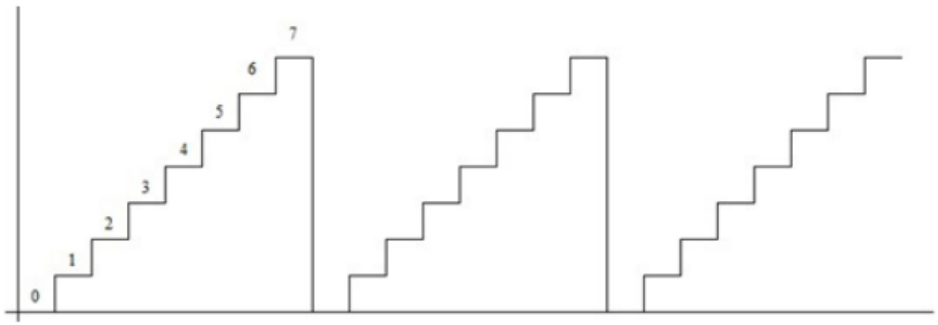

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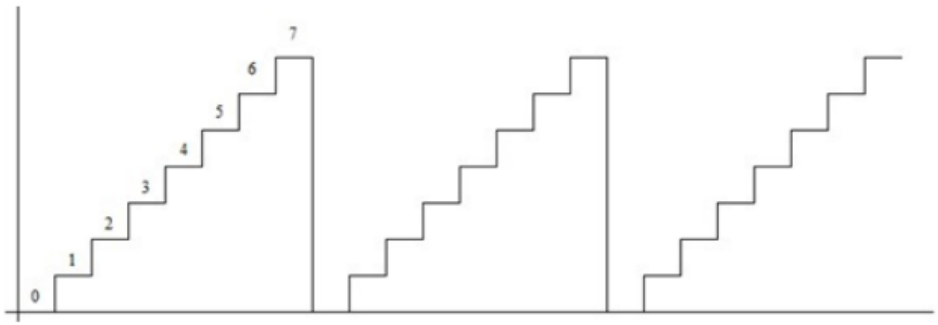

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6. We will use it in 8-bit mode, for PWM generation.

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3. For example, Output Compare Registers associated with Timer 5 for PWM generation: OCR5A, OCR5B and OCR5C.

PWM signal for pins OC5A OC5B

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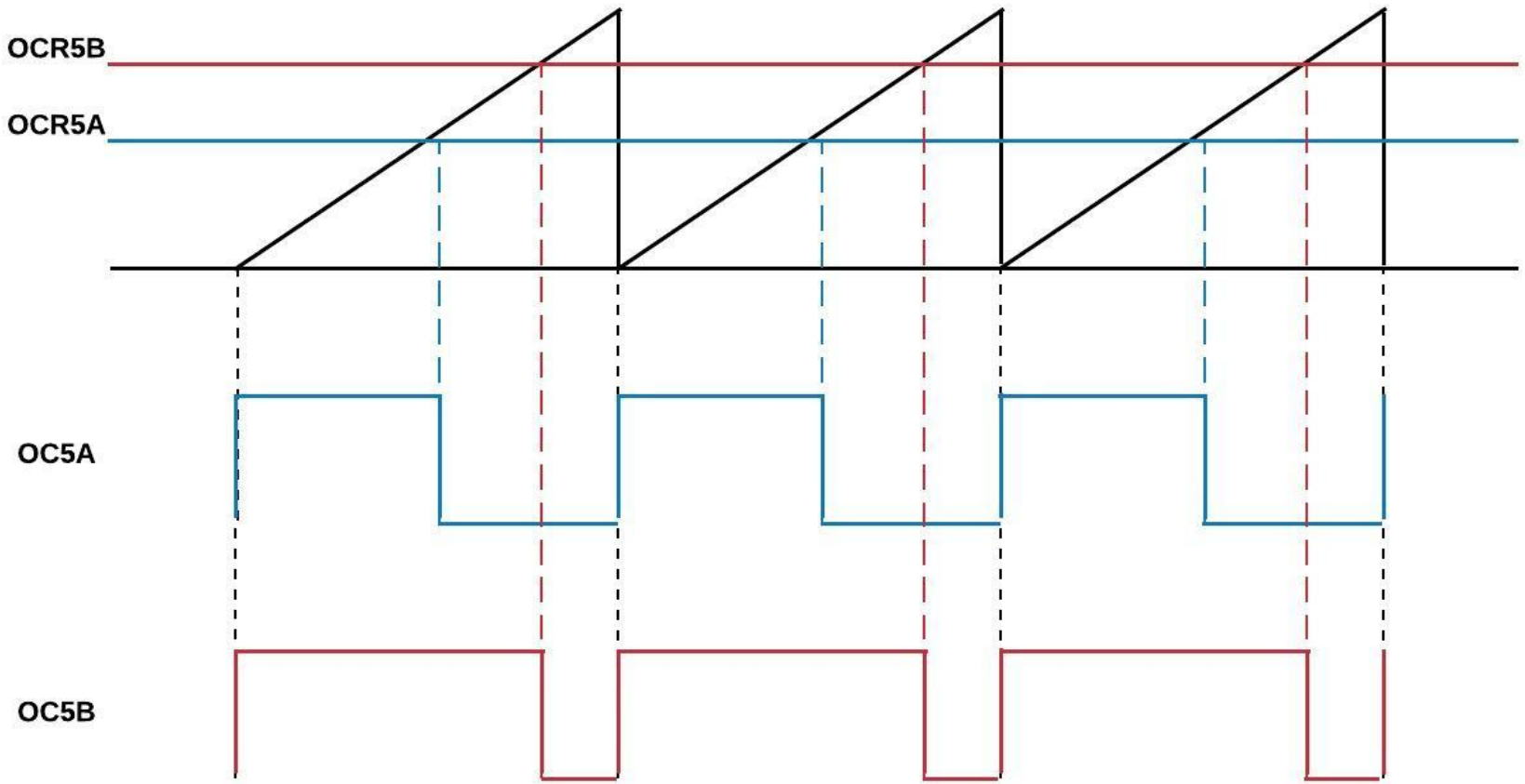

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- pinMode(pin_number, INPUT/OUTPUT);
- analogWrite(pin_number, 0 - 255);
  - Pins 2 - 13, 44 - 46 are PWM pins
  - 490 Hz (pins 4 and 13: 980 Hz)

Thank You!