TIMER0 Driver for
AVR Microcontrollers

Software Requirement Specification Document

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• Scope of Document

This document specifies requirements on the module Timer0 Driver.

• Constraints

First scope for specification of requirements on basic software modules is systems which are not safety relevant. For this reason safety requirements are assigned to medium priority.

• Requirements Structure

Each module specific chapter contains a short functional description of the Basic Software Module. Requirements of the same kind within each chapter are grouped under the following headlines (where applicable):

Functional Requirements: -

- Types of Timer0
- Programme of timer0
- Interface.
- Registers of Timer0.

Non-Functional Requirements:-

- Timing Requirements.

- Resource Usage.
- Usability.

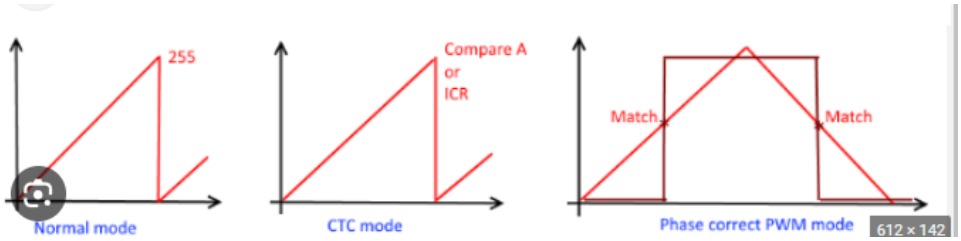
- Functional Overview
  - TIMER0 Driver, common functionality:

Generally, we use a timer/counter to generate time delays, waveforms, or to count events. Also, the timer is used for PWM generation, etc.

The timer module provides an event interface to the hardware timers.

The module uses the 8-bit timer 0 of the ATmega32. The timer is dynamically configured as needed by the registered alarms and should always be clocked as slow as possible to keep the interrupt load low. When no alarms are registered, the timer clock is disabled, and timer0 modes include:

1. Internal Timer: As an internal timer the unit ticks on the oscillator frequency. The oscillator frequency can be directly fed to the timer, or it can be pre-scaled. In this mode it is used to generate precise delays. Or as precise time counting machine.
2. External Counter: In this mode the unit is used to count events on a specific external pin on a MCU.
3. Pulse width Modulation (PWM) Generator: PWM is used in speed control of motors and various other applications



•Requirement Specification

• Functional Requirements

[SRS_REQ_1] The TIMER0 Driver shall support a function to initialise the timer.

[SRS_REQ_2] The driver shall be compatible with all AVR microcontrollers.

[SRS_REQ_3] The TIMER0 Driver shall support a specific basic static configuration.

[SRS_REQ_4] The TIMER0 Handler/Driver shall handle the chip

[SRS_REQ_5] The TIMER0Driver shall support functions that control the interrupt to make it enable or disable.

[SRS_REQ_6] The TIMER0 Driver Support function that make the timer work with normal mode.

[SRS_REQ_7] The TIMER0 Driver Support function that make the timer work with compare .

[SRS_REQ_9] The TIMER0 Driver Support function that make the timer work with FAST PWM.

[SRS_REQ_10] The TIMER0 Driver Support function that make the timer work with PHASE CORRECT.

[SRS_REQ_11] The TIMER0 Driver shall have a scalable functionality to fit the needs of the ECU.

• Non-functional requirements

[SRS_REQ_1] The driver shall be easy to use and understand.

[SRS_REQ_2] The driver shall be well-documented.

[SRS_REQ_3] The driver shall be efficient and use minimal resources.

[SRS_REQ_4] The driver shall be reliable and robust.

[SRS_REQ_5] In addition to the above requirements, the timer0 driver should also meet the following non-technical requirements

[SRS_REQ_6] The driver should be open source and freely available to use.

[SRS_REQ_7] The driver should be actively maintained and supported by the community.

[SRS_REQ_8] The driver should be well-tested and documented.

[SRS_REQ_9] The driver should be compatible with a variety of development tools and environments.

5.File Structure

5.1.1 Header file structure

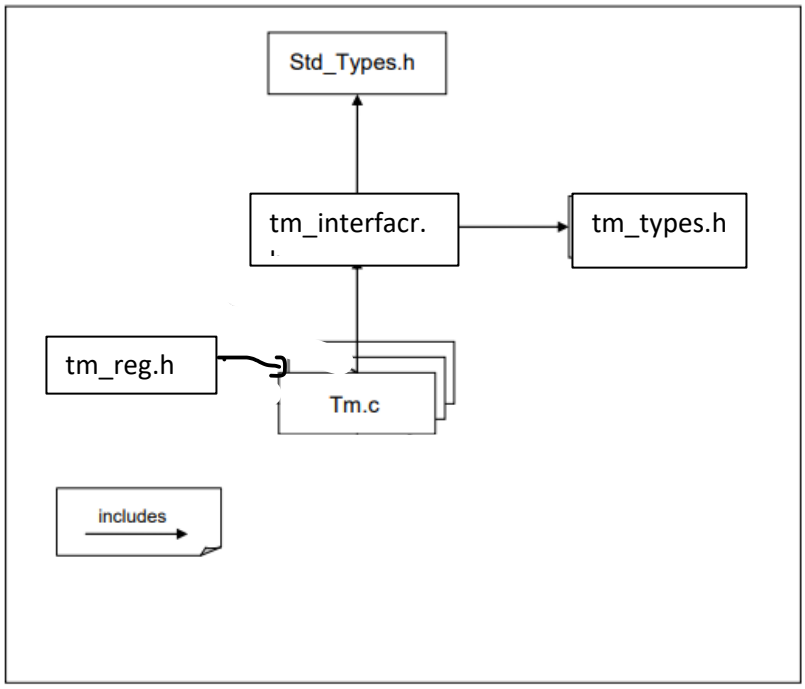
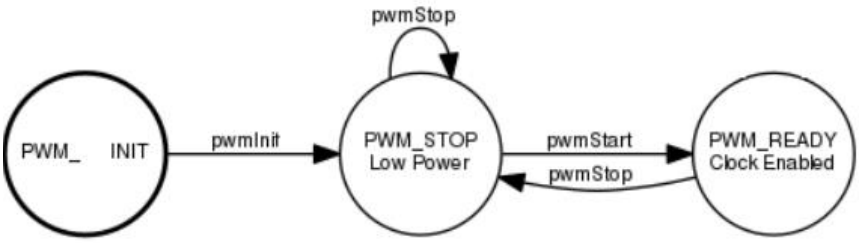


Figure 1: Include File Structure

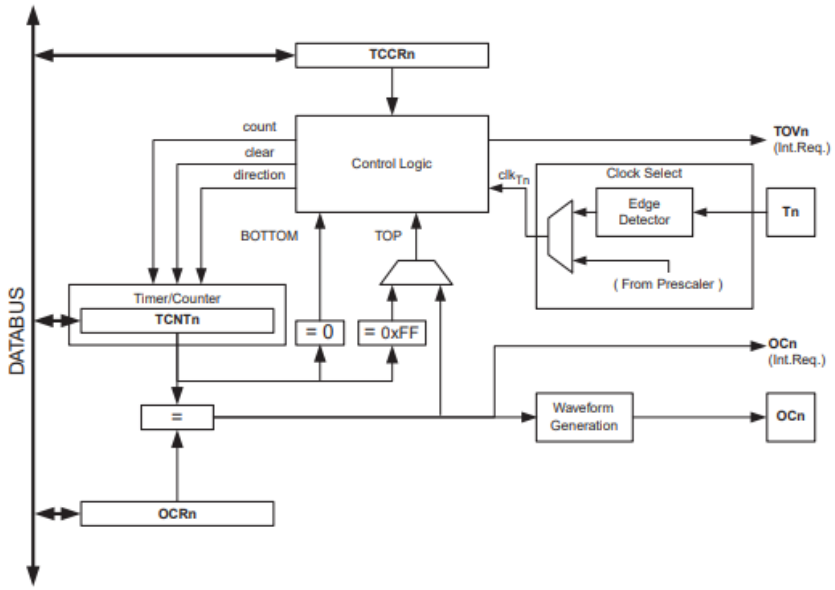
- State machine

PWM MODE:



Block diagram for timer0

Figure 27. 8-bit Timer/Counter Block Diagram



6. Acceptance Criteria

The timer0 driver shall be accepted when it meets the following criteria:

- The driver shall compile and run without errors on all AVR microcontrollers.
- The driver shall pass all unit tests.
- The driver shall pass all integration tests.
- The driver shall pass all system tests.

7.References

AVR Microcontroller Datasheets