# GTM_ATOM_PWM_1 for KIT_AURIX_TC297_TFT

## GTM ATOM PWM generation

AURIX™ TC2xx Microcontroller Training
V1.0.1

# Scope of work

**GTM ATOM is used to generate a PWM signal, which is driving the intensity of an LED.**

The LED is driven by pin 0 of the port 13. The state of the pin is controlled by the PWM signal generated by the ATOM timer of GTM.

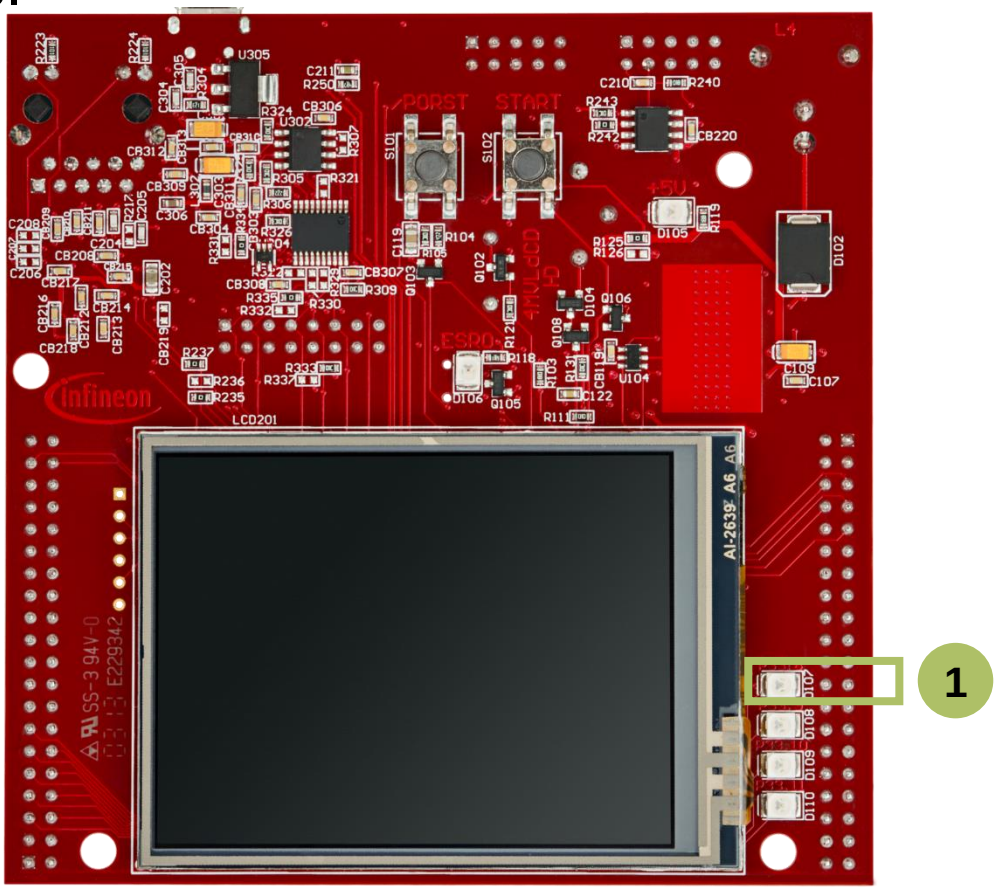
# Introduction

- The Generic Timer Module (GTM) is a modular timer unit designed to accommodate many timer applications.
- It has an in-built Advanced Router Unit (ARU) that can be used to exchange specific data between sub-modules without CPU interaction.
- The ARU-connected Timer Output Module (ATOM), which is part of the GTM, is able to generate complex output signals.
- The Clock Management Unit (CMU) is responsible for clock generation of the GTM. The Configurable Clock Generation Subunit (CFGU) provides eight clock sources for the GTM submodules: TIM, TBU, MON and ATOM.

# Hardware setup

This code example has been developed for the board KIT_AURIX_TC297_TFT_BC-Step.

LED D107 (1) is used for this example.



# Implementation

**Configuring the ATOM**

The configuration of the ATOM is done once in the setup phase by calling the initialization function ***initGtmAtomPwm()*** containing the following steps:

- Enable the GTM by calling the function ***IfxGtm_enable()***.
- Set the CMU clock 0 frequency to 1 MHz with the function ***IfxGtm_Cmu_SetClkFrequency()***.
- Enable the CMU clock 0 by calling the function ***IfxGtm_Cmu_enableClocks()***.

The function ***IfxGtm_Atom_Pwm_initConfig()*** initializes an instance of the structure ***IfxGtm_Atom_Pwm_Config*** with its default values.

# Implementation

**Configuring the ATOM**

- The ***IfxGtm_Atom_Pwm_Config*** structure allows to set the following parameters to initialize the module:
  - ***atom*** – Selection of the ATOM which is counting (ATOM 2 in this example)
  - ***atomChannel*** – Selection of the channel which is driving the LED (Channel 5 in this example)
  - ***period*** – Setting of the period for the PWM signal to the desired value
  - ***pin.outputPin*** – Selection the LED as output pin
  - ***synchronousUpdateEnable*** – Enabling of Synchronous Update of the timer

- After configuration, the function ***IfxGtm_Atom_Pwm_init()*** initializes and activates the ATOM with the user configuration.

- Start the PWM with the function ***IfxGtm_Atom_Pwm_start()***.

All the functions used for the configuration of the ATOM are provided by the iLLD header ***IfxGtm_Atom_Pwm.h***.

# Implementation

**Setting the duty cycle**

The setting of the duty cycle is done by calling the function ***setDutyCycle()***, which contains the following steps:

- Set the ***dutyCycle*** parameters of the instance of the configuration structure to set theduty cycle for the PWM signal to the desired value
- Call the function ***IfxGtm_Atom_Pwm_init()*** to re-initialize and re-activates the ATOM with the new configuration.

The functions ***IfxGtm_Atom_Pwm_init()*** is provided by the iLLD header ***IfxGtm_Atom_Pwm.h***.

**Fading the LED**

The fading of the LED is done in the function ***fadeLED()*** by repetitively adding or removing a step value to the duty cycle of the PWM.

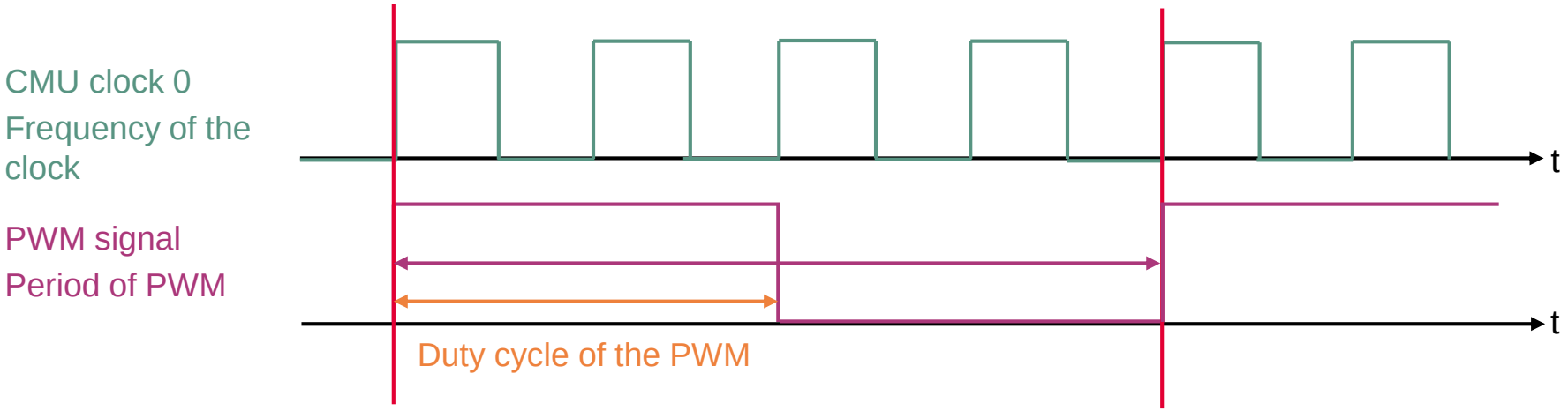
# Implementation

## Calculation example

The CMU clock 0 frequency ($f_{clk0}$) is set to 1 MHz in this example. The period value to have the desired PWM frequency ($f_{PWM}$) is calculated with the following formula:

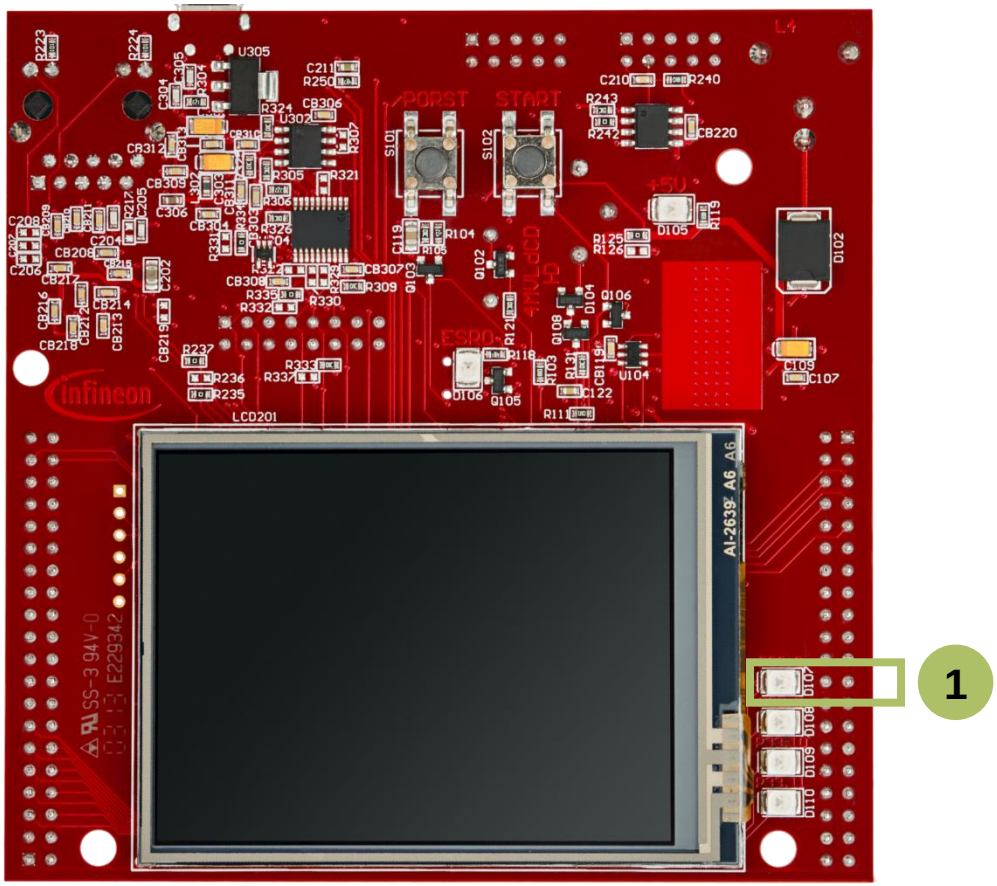
$$Period = \frac{f_{clk0}}{f_{PWM}}$$

In this example: $Period = \frac{1\ MHz}{200\ Hz} = 5\ 000$



# Run and Test

After code compilation and flashing the device, observe the **LED D107** (1), which should be fading.



# References


- AURIX™ Development Studio is available online:
- https://www.infineon.com/aurixdevelopmentstudio
- Use the *„Import...“* function to get access to more code examples.

- More code examples can be found on the GIT repository:
- https://github.com/Infineon/AURIX_code_examples

- For additional trainings, visit our webpage:
- https://www.infineon.com/aurix-expert-training

- For questions and support, use the AURIX™ Forum:
- https://www.infineonforums.com/forums/13-Aurix-Forum

# Revision history

| Revision | Description of change |
|---|---|
| V1.0.1 | Update of version to be in line with the code example’s version |
| V1.0.0 | Initial version |
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**Email: erratum@infineon.com**

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