GTM_ATOM_PWM_1
for KIT_AURIX_TC275_LK
GTM ATOM PWM generation

AURIX™ TC2xx Microcontroller Training
V1.0.0

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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 5 of the port 00. 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_TC275_LITE.

LED1 (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 1 in this example)
  - *atomChannel* – Selection of the channel which is driving the LED (Channel 4 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 the duty 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:

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

In this example: $\text{Period} = \frac{1\, \text{MHz}}{200\, \text{Hz}} = 5\,000$
Run and Test

After code compilation and flashing the device, observe the LED1, 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:
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