GTM_ATOM_PWM_1
for KIT_AURIX_TC375_LK
GTM ATOM PWM generation
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_A2G_TC375_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 0 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-activate 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.
**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: $Period = \frac{1 \text{ MHz}}{200 \text{ Hz}} = 5 000$ ticks
Run and Test

After code compilation and flashing the device, observe the **LED1 (1)**, which should be fading.
References

- AURIX™ Development Studio is available online:
  - [https://www.infineon.com/aurixdevelopmentstudio](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](https://github.com/Infineon/AURIX_code_examples)

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

- For questions and support, use the AURIX™ Forum:
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