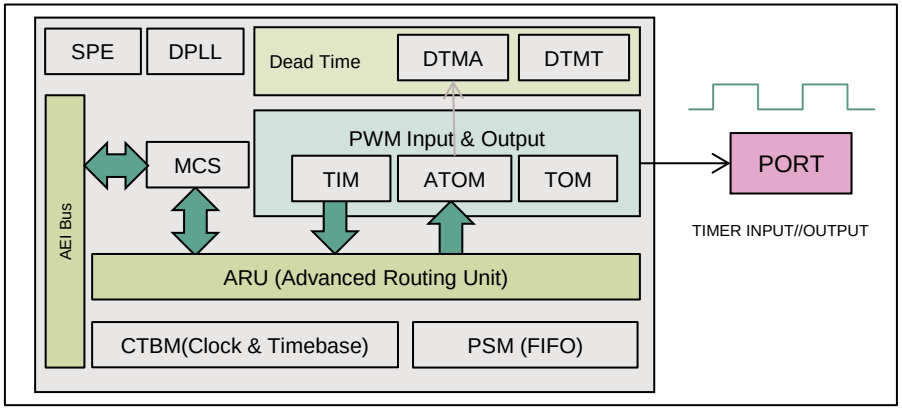
GTM
Generic Timer Module

AURIX™ TC4xx Microcontroller

V1.0.0 2024-09

GTM
Generic timer module



Highlights

› GTM is a modular timer unit designed to accommodate many timer applications including complex PWM generation, digital acquisition with filtering, motor control including BLDC. Timer resolution up to 24 bits with up to 5 ns (200MHz) time granularity

Key Features

Advanced routing

Brush-less DC motor (BLDC) support

Common time base

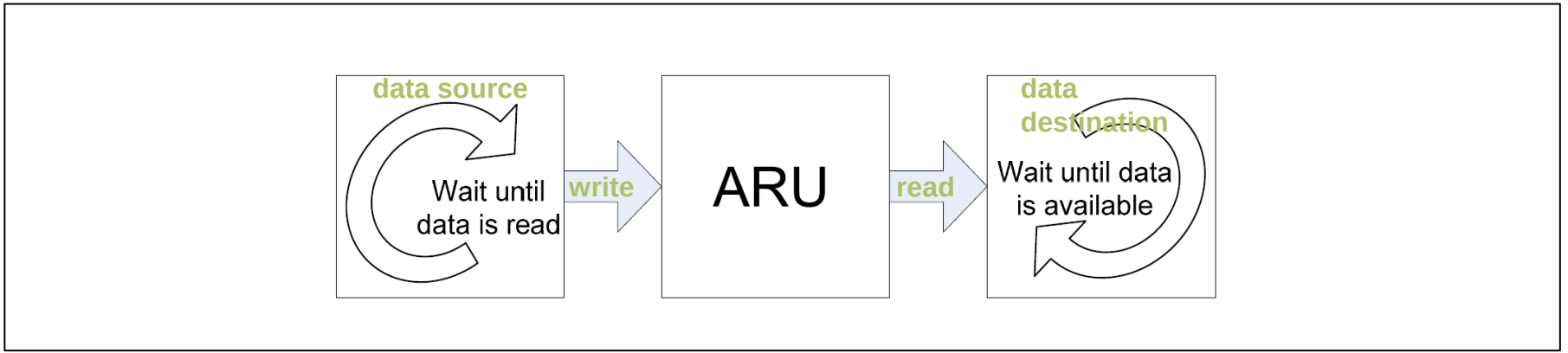
Customer Benefits

› Route information in hardware between sub-modules

› Brush-less DC motor control in HW. Reduced software overhead

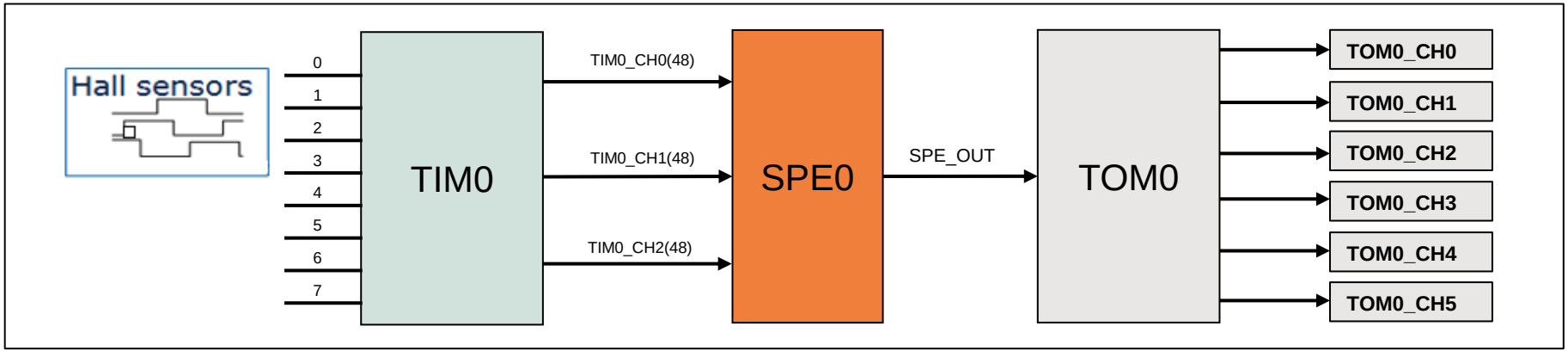
› Synchronize events in the timer using a common time base (CTBM)

GTM
Advanced routing



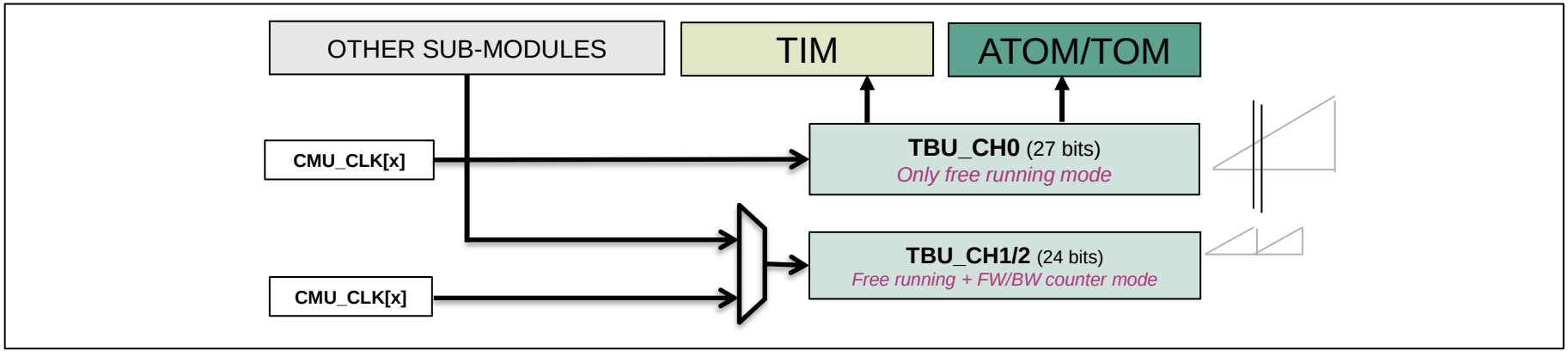
- GTM has an inbuilt advanced routing unit (ARU) that can be used to exchange specific data between sub-modules
- Routing follows round-robin scheduling
- Benefits:
  - Fixed round-trip time leads to deterministic scheduling
  - No need for an internal interrupt mechanism to exchange data
  - Possibility of cluster level isolation for freedom of interference for functional safety

GTM
Brush-less DC motor (BLDC) support



- Hardware support for Brush-less DC motor drive using the signal pattern evaluation (SPE) sub-module along with Timer input and output modules (TIM/(A)TOM) respectively
- Benefits:
  - Pattern matching algorithm in hardware
  - Rotation direction & validity detection
  - Possible to generate interrupts on specific rotation

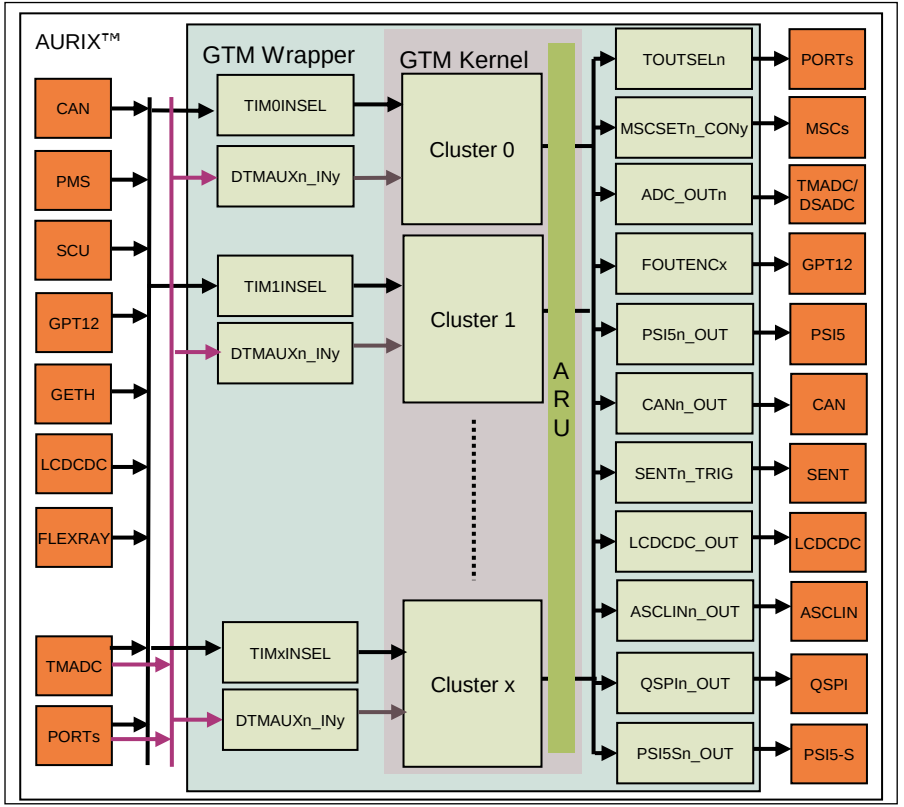
GTM
Common time base



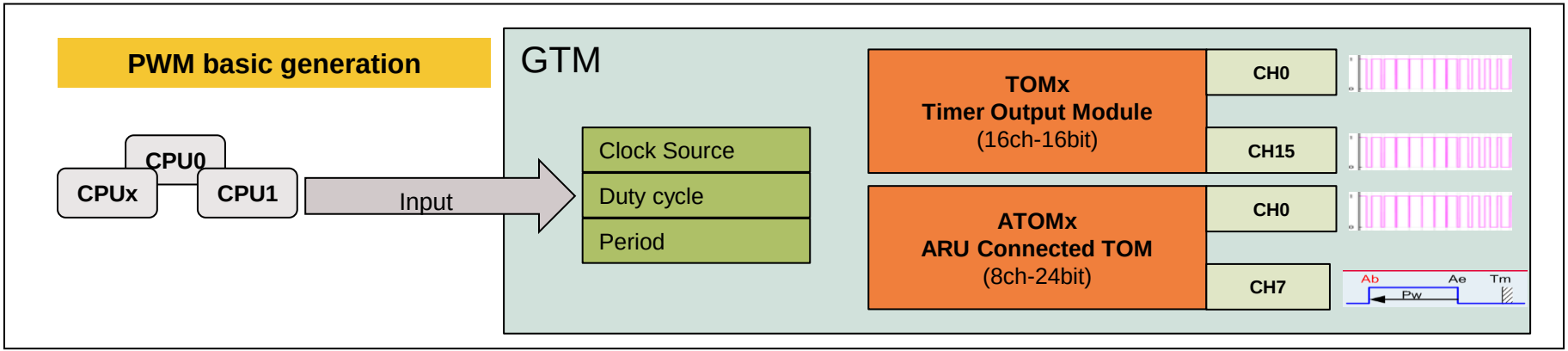
- GTM provides common-time base through the Time Base Unit (TBU) within the sub- module CTBM (Common time-base module)
- Common time-base provides ability to synchronize events in different sub-modules within GTM
- Benefits:
  - Timestamp from TBU on input events
  - Use timestamp from TBU as reference to achieve synchronous start of events between various timer outputs

GTM
System integration

- GTM is integrated in AURIX™ to provide a flexible set of connections to other peripherals
- This includes:
  - PWM output & input to/from multiple ports
  - Trigger inputs to ADCs as well services request event inputs from ADC to GTM-TIM/DTMx
  - Trigger inputs to SENT, CAN, MSC and PSI5/PSI-5S
  - Introduced trigger connectivity to QSPI and ASCLIN
  - Direct internal connectivity of timer output to GPT12 timer for filtering function of TIM



Application example
Digital PWM output



Overview

- PWM generation with multiple channels with 16 or 24-bit resolution with as low as 5 ns granularity
- ATOM has variety of modes of operation to support different PWM outputs
- Data reception using the ARU on ATOM

Advantages

- Dynamic PWM generation with input of period/duty via the ARU
- Channel counter can be triggered/reset by its predecessor to achieve control of multiple channels with a reference channel

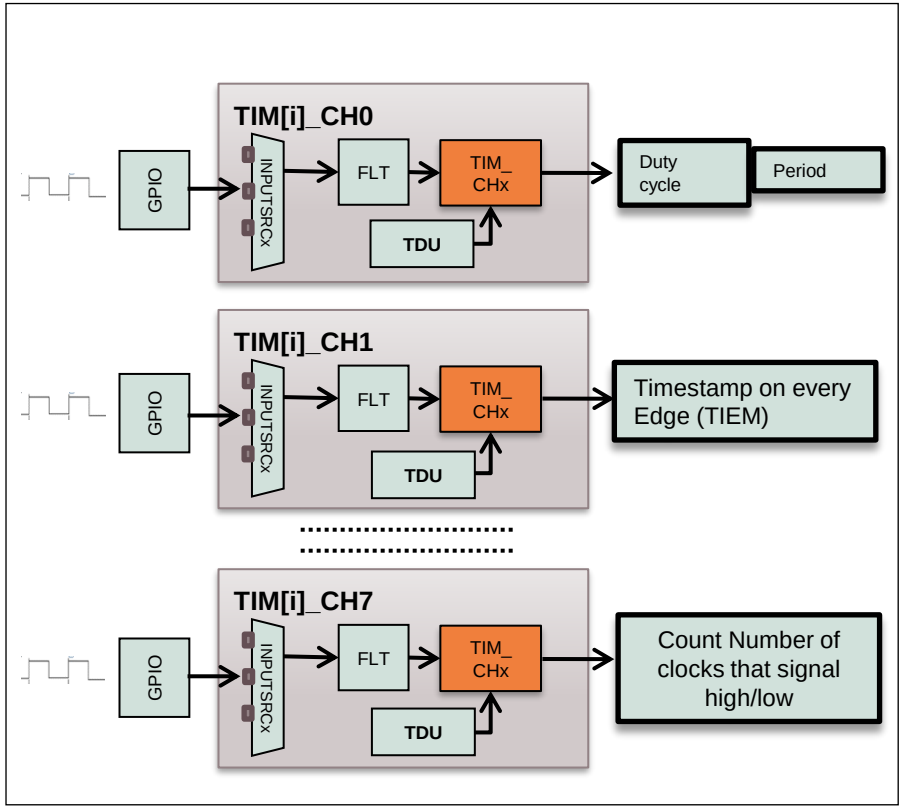
Application example
Digital input acquisition

Overview

- Each Timer Input Module (TIM) with 8 independent channels for input capture/measurements, each with its own filter module
- Multiple modes to support different measurements including period/duty, timestamp on desired active edges

Advantages

- Digital filtering of input PWM with glitches in hardware
- Time out detection using TDU (Timeout Detection Unit) within each TIM channel
- Routing TIM channel output results via ARU to other sub-modules without interrupts



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Edition 2024-09
Published by
Infineon Technologies AG
81726 Munich, Germany

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Document reference
AURIX_3_Generic_Timer_Module

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