

# SAFETY

## Safety Concept

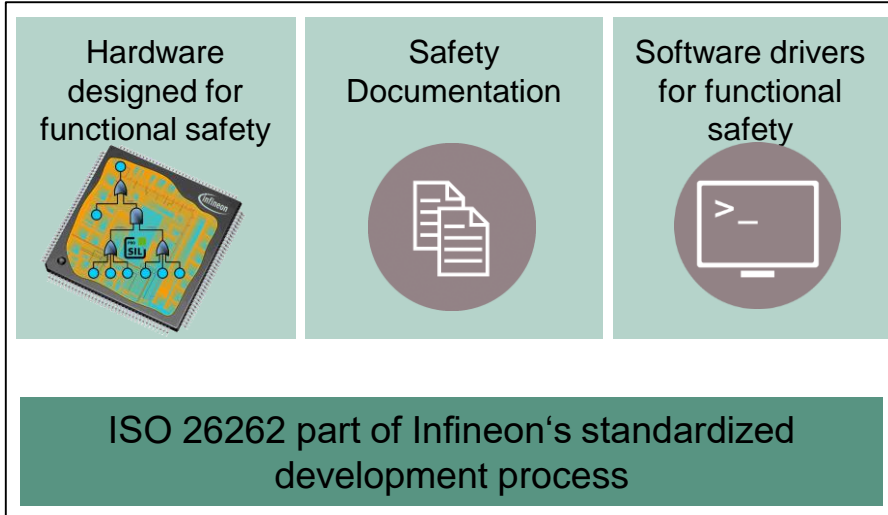
AURIX™ TC2xx Microcontroller Training  
V1.0 2019-03



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# SAFETY

## Safety Concept



## Highlights

- > AURIX™ was developed as a Safety Element out of Context (SEooC) fulfilling the applicable objectives of ISO 26262 up to ASIL D

## Key Features

ISO 26262 standardized development process

Hardware safety mechanisms

Safety documentation

## Customer Benefits

- > Support ISO 26262:2011 compliant applications development
- > Supports protection against random faults as described in safety manual
- > Accelerates the development of safety critical applications via SW libraries

## ISO 26262 standardized development process

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The scope of the SEooC comprises:

- › The AURIX™ microcontroller hardware component
- › Assumptions of use (AoU) related to the software elements that
  - support the integration to the AURIX microcontroller hardware components in a safety-related application
  - support the single point fault metric up to ASIL B for software applications target to utilize non-lockstep CPU core.
  - Note: The SafeTlib software product offered by Infineon supports the implementation of some of these assumptions
- › Assumptions of use related to the hardware environment including assumed external safety mechanisms
- › Assumptions of use related to the software environment
- › Assumptions of use related to the use of the safety mechanisms provided by the SEooC

All of the above support the development of safety critical applications which are ISO 26262:2011 compliant.

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## Hardware safety mechanisms

**Safe computing:**

- › Delayed Lockstep CPU with diverse layout

**Safe data and code storage:**

- › Error Detection Codes ECC for RAM and Flash memories
- › Memory Protection Unit MPU for code and data

**Safe intra chip communication:**

- › SRI Cross Bar: End-to-End monitoring of data and address failures using ECC

**Safe infrastructure:**

- › Clock frequency range monitors
- › Power supply range monitoring
- › Internal watchdog timers

**Support for coexistence of elements:**

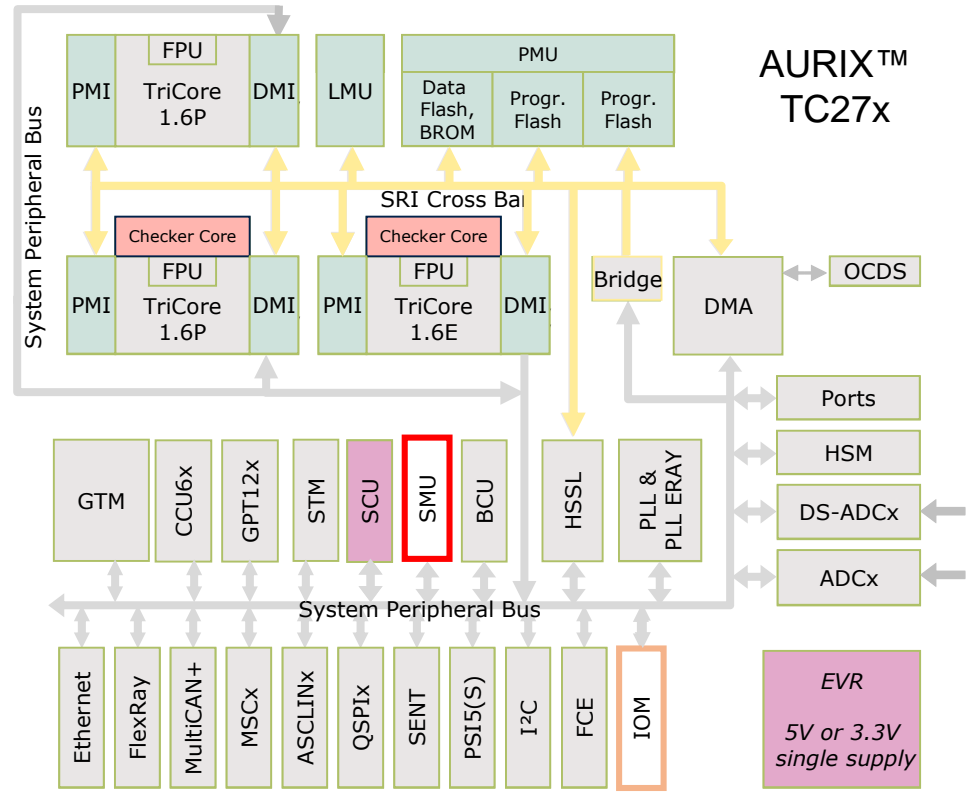
- › CPU Memory Protection
- › Bus Memory Protection
- › Register Access Protection

**Safety management unit:**

- › Configurable error handling

**I/O Monitor:**

- › Flexible logic analyzer to monitor or compare digital signals



### System/Software Engineers

- › Which safety mechanisms are available in AURIX™ hardware and how to use them?
- › Which external safety mechanisms are required?
- › Which safety mechanism shall be implement at the application-level?
- › How to monitor application dependent parts and which ones are independent?

FMEDA Extract

Safety Manual

Safety Case Report

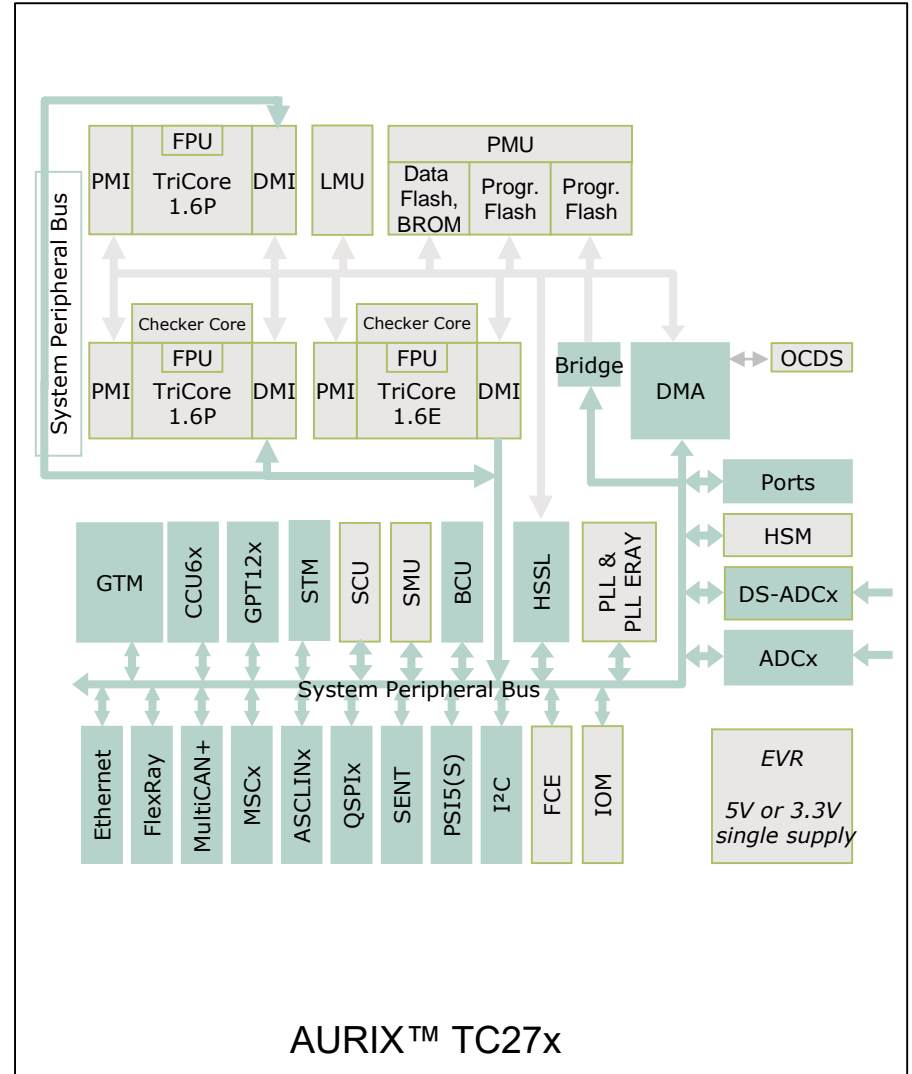
### Functional Safety Managers/Engineers/QM

- › Computation of project specific hardware architectural metrics
- › Are all the required safety measures correctly implemented?
- › Assessment of AURIX™ compliance to the objective of ISO26262

# SAFETY

## System integration

- › Safety as a concept is an integrated part of the AURIX™, nonetheless there are aspects that are application dependent such as:
  - Ensuring redundancy over the analog and digital Inputs / Outputs and over communication protocols
  - Configuration of individual modules (e.g. peripherals) in a safe manner
  - Implementation/Fulfillment of AoU according to the Safety Manual as applicable for respective application



# Application example

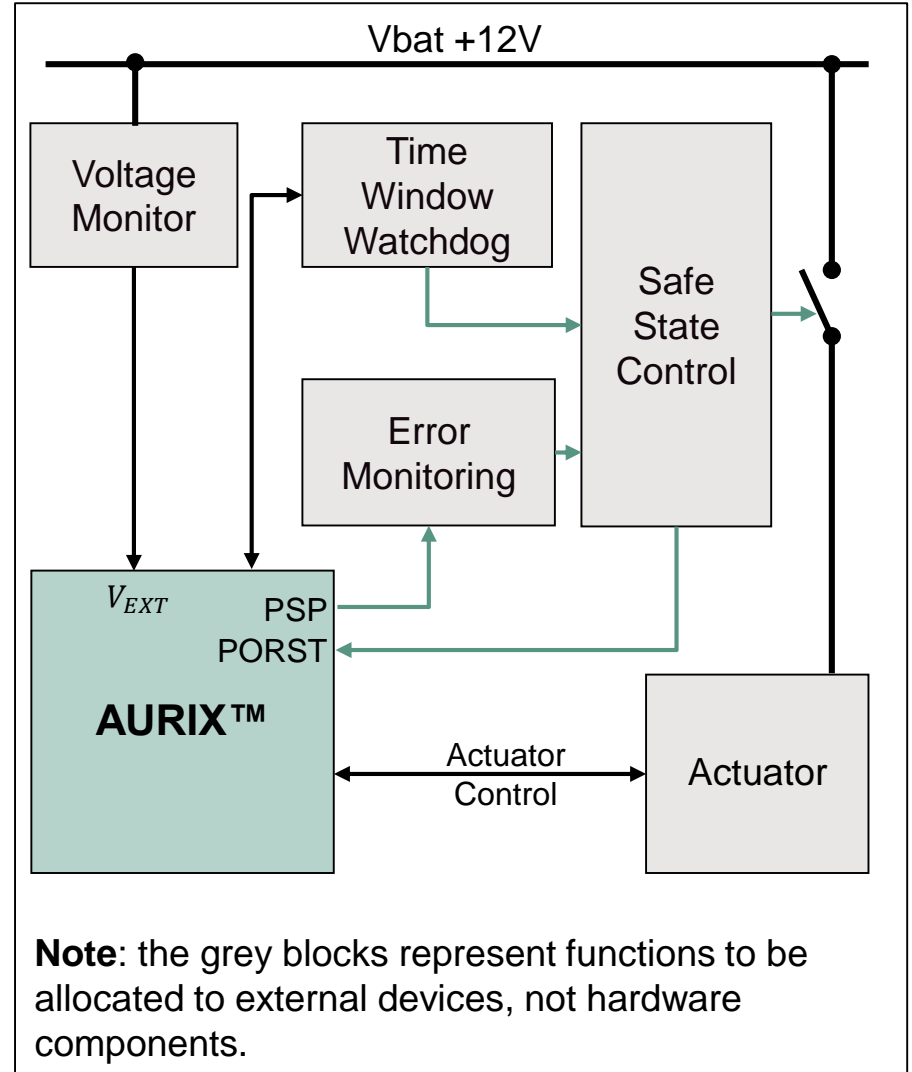
## External safety mechanisms

### Overview

- > AURIX™ can manage different fail scenarios such as detecting under/over voltage of the external supply, dependent failures which cause the diagnostic system to fail too

### Advantages

- > For all these fail scenarios, recommended reactions can be implemented, such as bringing the system in its safe state
- > Well defined reaction systems ensure that the faulty behavior of external components will not produce malfunctions



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**Email: [erratum@infineon.com](mailto:erratum@infineon.com)**

**Document reference**

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