SAFETY
Safety Concept

AURIX™ 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
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ISO 26262 standardized development process

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
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Safety documentation

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?

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

FMEDA Extract

Safety Manual

Safety Case Report
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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

Note: the grey blocks represent functions to be allocated to external devices, not hardware components.
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