Fact Sheet

Industrial Functional Safety Module

Accelerate functional safety development for industrial systems

Developing systems capable of achieving IEC 61508 SIL 3 and ISO 13849-1 PL e requires far more than selecting safety-capable components. OEMs must define safety architectures, implement diagnostics, generate verification evidence, manage extensive documentation and navigate complex certification processes, often while facing limited functional safety expertise and aggressive development schedules.

InSaM, the Industrial Functional Safety Module reference design, provides a reusable functional safety foundation that combines certified hardware, safety software, pre-assessed architectures and supporting documentation in a structured system solution. Designed for industrial automation, robotics, motion control and energy infrastructure, InSaM helps manufacturers reduce development effort, accelerate certification activities and focus engineering resources on application differentiation rather than rebuilding safety infrastructure for each project.

Why InSaM?

Industrial OEMs face increasing pressure to:

- Accelerate certification timelines
- Address functional safety talent shortages
- Reduce development costs and risks
- Reuse safety investments across product families
- Support increasingly autonomous and connected systems

Key benefits

- **Accelerate certification:** predefined architectures, certified software and supporting documentation help reduce certification effort
- **Reuse across platforms:** apply a common safety foundation across multiple product families and applications
- **Reduce development risk:** start with proven hardware, software and safety concepts
- **Focus on differentiation:** direct more engineering effort toward application value rather than foundational safety functions
- **Scale across applications:** support motion control, industrial automation, robotics and energy infrastructure

The InSaM functional safety production package provides a reusable foundation

The package combines a reusable safety architecture with certified software, safety design, certification evidence and lifecycle governance. It gives manufacturers a more complete starting point for product integration and assessment.

Hardware design	1oo2D SIL 3/PL e reference architecture with dual safety MCUs, a safety PMIC, an AFE, safe inputs and outputs and defined hardware/software interfaces
Certified software	Safety drivers and scheduler, safety checkers, safety state manager, device and peripheral drivers, configuration interfaces and stack integration points
Safety design	Item and system-of-interest definitions, functional and technical safety concepts, requirements, architecture, specifications, and integration assumptions
Certification evidence	Safety and integration manuals, FMEA, FTA, CCFA, FMEDA, diagnostic metrics, V&V plans/reports, test/coverage evidence and traceability
Lifecycle governance	Structured safety case, release/configuration records, change-impact analysis, confirmation measures and maintenance/update responsibilities

*Reusable production-package structure

*The reusable baseline helps accelerate the journey, but it does not mean that the customer's final product is precertified. The customer remains responsible for application-specific integration, verification and validation, the final safety case and end-product certification.

Target applications

- Industrial automation
- Motion control
- Robotics and autonomous systems
- Power and energy infrastructure
- Building and vertical transportation
- Intelligent industrial equipment

System-level approach

Instead of treating functional safety as an isolated component, InSaM brings together:

- Safety processing
- Safety software
- Position feedback
- Industrial communications
- Documentation
- Certification artifacts

NXP technologies

Edge processing

- MCX E31 safety MCU family
- i.MX RT1180 industrial networking MCU
- Future support for i.MX 94 and i.MX 95-based systems

Power

- VR249 safety PMIC

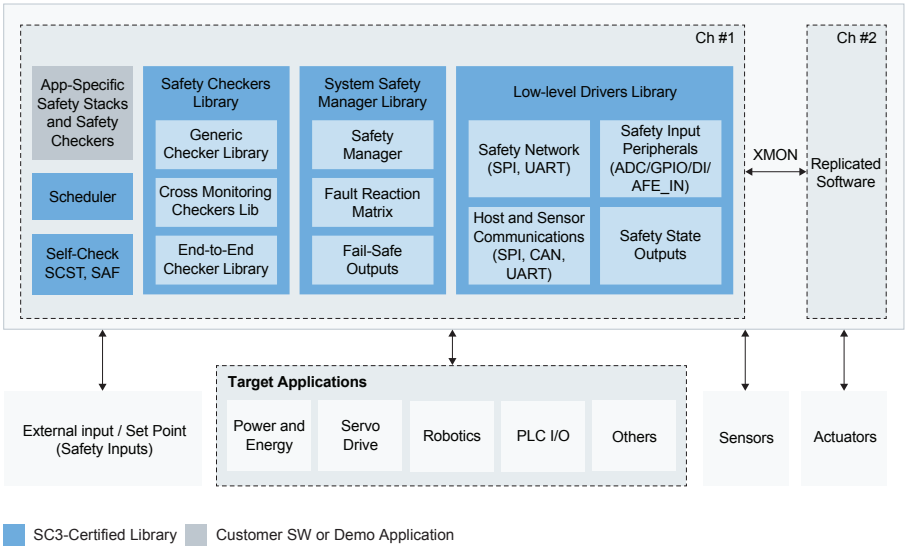
Analog

- NAFE11388 analog front-end

Connectivity

- EtherCAT®
- EtherNet/IP™
- PROFINET®
- Proprietary fieldbus protocols
- TSN

InSaM safety software block diagram



Ecosystem collaboration

InSaM is a coordinated ecosystem solution that gives customers a more complete safety-system foundation instead of requiring them to combine safety components, integration work and compliance evidence independently across multiple vendors

- **NXP Semiconductors:** system architecture, safety-capable silicon, reusable safety software, reference concepts and industrial system expertise
- **eInfochips:** engineering execution, system integration, verification and development of the certification artifacts supporting the InSaM process
- **Lattice Semiconductor:** multiprotocol encoder and position-feedback technologies that extend the safety path into safe-motion applications
- **Neuron Automation:** functional safety expertise spanning stack integration, safety PLCs, safety I/O and safety drives, including the FSoE path over EtherCAT® that connects subsystem safety to machine-level behavior
- **TÜV SÜD:** independent assessment and certification expertise, engaged early to help align the InSaM concept, supporting evidence and assessment boundary

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