Infeon Technologies - TC234LP32F200FACKXUMA1 Datasheet

Welcome to E-XFL.COM

What is "Embedded - Microcontrollers"?

"Embedded - Microcontrollers" refer to small, integrated circuits designed to perform specific tasks within larger systems. These microcontrollers are essentially compact computers on a single chip, containing a processor core, memory, and programmable input/output peripherals. They are called "embedded" because they are embedded within electronic devices to control various functions, rather than serving as standalone computers. Microcontrollers are crucial in modern electronics, providing the intelligence and control needed for a wide range of applications.

Applications of "Embedded - Microcontrollers"

Details	
Product Status	Active
Core Processor	TriCore™
Core Size	32-Bit Single-Core
Speed	200MHz
Connectivity	CANbus, FlexRay, LINbus, QSPI
Peripherals	DMA, WDT
Number of I/O	120
Program Memory Size	2MB (2M x 8)
Program Memory Type	FLASH
EEPROM Size	128K x 8
RAM Size	192K x 8
Voltage - Supply (Vcc/Vdd)	3.3V
Data Converters	A/D 24x12b
Oscillator Type	External
Operating Temperature	-40°C ~ 125°C (TA)
Mounting Type	Surface Mount
Package / Case	144-LQFP Exposed Pad
Supplier Device Package	PG-TQFP-144-27
Purchase URL	https://www.e-xfl.com/product-detail/infineon-technologies/tc234lp32f200fackxuma1

Contents

Family highlights

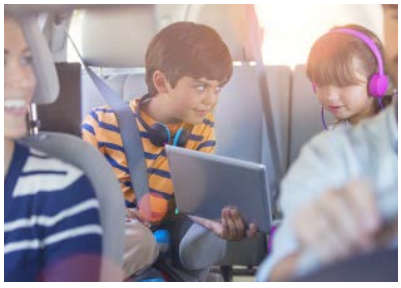
- Compatibility and scalability
- Lowest system cost
- Industry benchmark system performance
- Easy to use
- Broad portfolio
- Certified to automotive standards

Powertrain

Applications

- Gasoline direct injection
- Gasoline multi-port Injection
- Diesel direct injection
- Automatic transmission – hydraulic control
- Dry double clutch transmission – hydraulic control
- Dry double clutch transmission – electrical control
- Integrated (H)EV control
- (H)EV battery management system

Safety



Applications

- Chassis domain control
- Electric Power Steering (EPS)
- Active suspension control system
- Advanced airbag system
- Braking ECU
- Multi-purpose camera configuration
- Short-range radar (24 GHz) system
- Long-range radar (76/77 GHz) system

Connectivity

Applications

- Body domain controller
- Connected gateway
- Advanced body applications
- Telematics including software update over the air
- V2x communication
- eHorizon

Transportation

Applications

- Commercial and Agricultural Vehicle (CAV)
- Fun vehicle
- Transportation
- Trucks

Industrial & Multimarket

Applications

- Mobile controller
- Inverter
- Wind turbine inverter
- Solar panel

Evolution of TriCore™ generations

In 1999, Infineon launched the first generation of the AUDO (**AU**tomotive unifie**D** process**O**r) family. Based on a unified RISC/MCU/DSP processor core, this 32-bit TriCore™ microcontroller was a computational power horse. And the company has evolved and optimized the concept ever since – culminating in what is now the fifth TriCore™ generation.

The TriCore™ success story continues with the introduction of the AURIX™ multicore family. AURIX™ combines easy-to-use functional safety support, a strong increase in performance and a future-proven security solution in a highly scalable product family.

With its high real-time performance, embedded safety and security features, the TriCore™ family is the ideal platform for a wide range of automotive applications such as the control of combustion engines, electrical and hybrid vehicles, transmission control units, chassis domains, braking systems, electric power steering systems, airbags and advanced driver assistance systems. TriCore™-based products also deliver the versatility required for the industrial sector, excelling in optimized motor control applications and signal processing. Infineon's broad product portfolio allows engineers to choose from a wide range of memories, peripheral sets, frequencies, temperatures and packaging options. And all this with a high degree of compatibility across generations.

The new AURIX™ family members are manufactured in a 65nm embedded Flash technology designed for ultimate reliability in harsh automotive environments. Furthermore, the dual frontend concept ensures continuous supply.

As was the case with previous generations, safety software is also available to help manufacturers meet SIL/ ASIL safety standards, as well as AUTOSAR libraries which Infineon has been developing since 2005.

PRO-SIL™

Infineon's PRO-SIL™ program, designed to protect

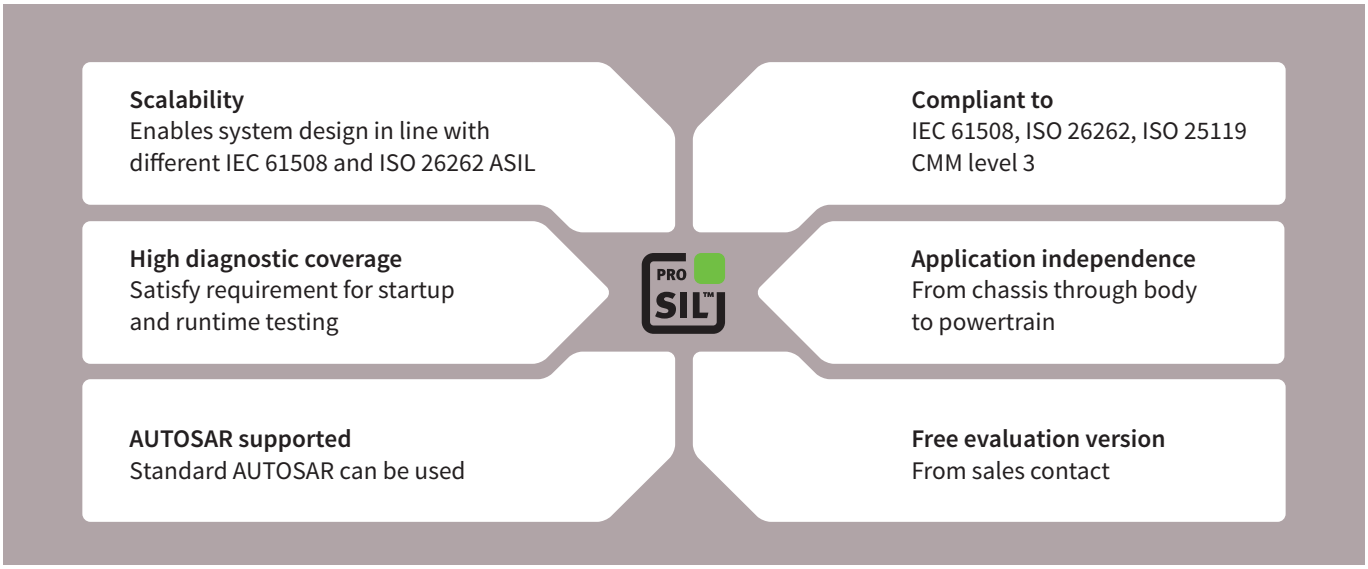
The functional complexity and levels of integration of real-time safety-critical applications continue to increase exponentially. In addition, the product life cycle of these applications has to meet stringent safety standards. Norms such as IEC 61508 and ISO 26262 mandate more robust and comprehensive product development processes and functional safety concepts in automotive and industrial applications.

Infineon's PRO-SIL™ safety program is designed to ease and speed up your automotive and industrial design to comply with such standards. Across the full certification spectrum from Safety Integrity Levels (SIL) 1 to 4 and Automotive Safety Integrity Levels (ASIL) A to D, our end-to-end PRO-SIL™ approach will help you select the right hardware, software and functional safety concepts to meet your design and compliance needs.

PRO-SIL™ highlights

- Broad hardware portfolio from sensors to microcontrollers, along with analog and power management ICs providing SIL-supporting features.
- For ISO 26262 PRO-SIL™ products, safety concepts are in place to enable the required safety measures, testing, monitoring and diagnostics capabilities for your safety architecture.
- Comprehensive safety software packages for seamless integration are in place, such as the SafeTlib software for Infineon's AURIX™ microcontroller family
- Full range of support services – from consulting and design advice, including training, documentation and technical support – can be provided.
- Safety-focused organization and project management based on Infineon's zero defect program, safety culture and quality management system are in place.

Infineon's PRO-SIL™ logo guides you to our products (HW, SW, safety documentation) with SIL-supporting features. These products will simplify the implementation of customers' system design and improve time-to-market in achieving the desired functional safety level compliance.



www.infineon.com/prosil

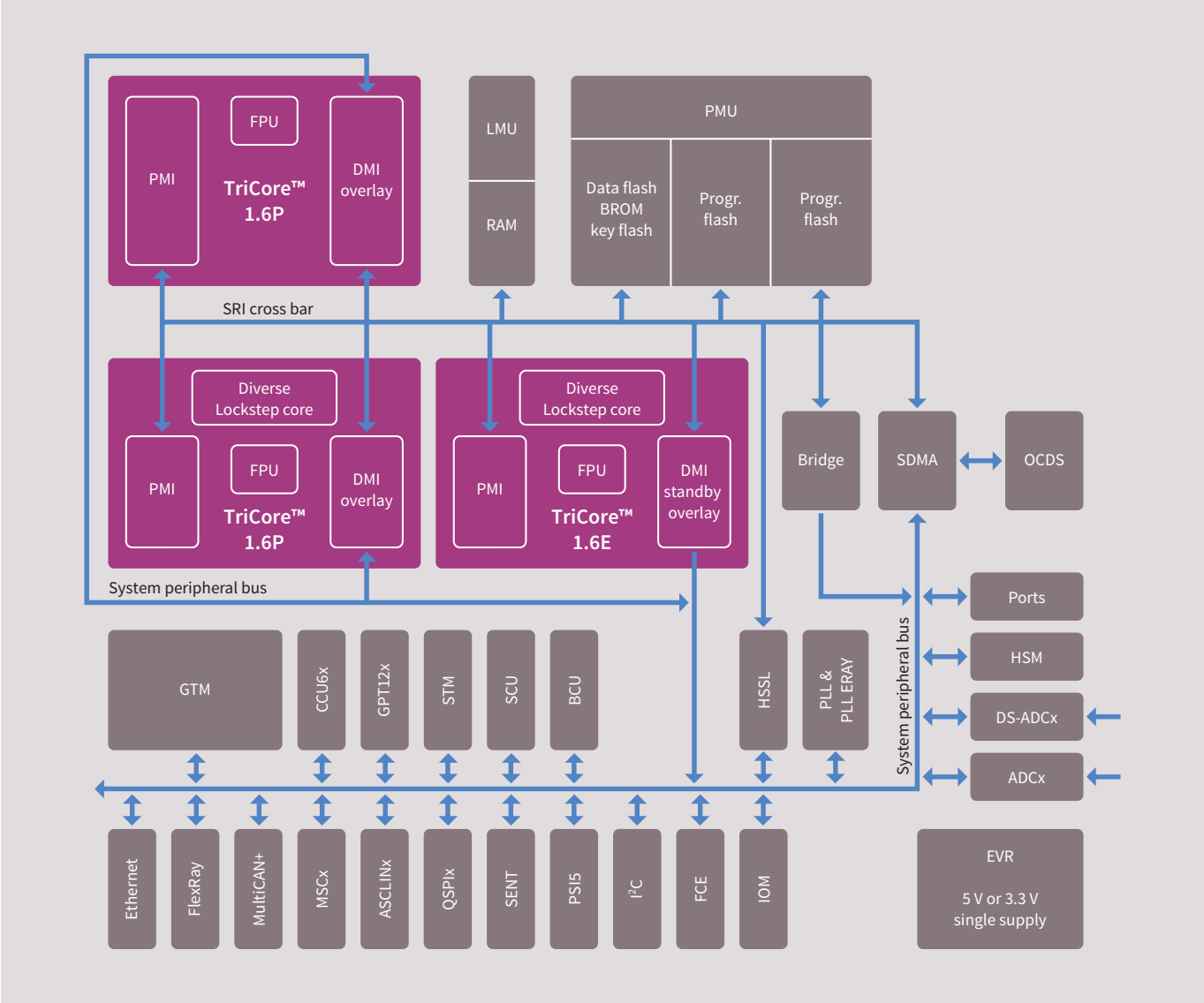
AURIX™ family system architecture

AURIX™ is Infineon's brand new family of microcontrollers serving exactly the needs of the automotive industry in terms of performance and safety. Its innovative multicore architecture, based on up to three independent 32-bit TriCore™ CPUs, has been designed to meet the highest safety standards while significantly increasing performance at the same time.

Using the AURIX™ platform, automotive developers will be able to control powertrain and safety applications with one single MCU platform. Developments using AURIX™ will require less effort to achieve the ASIL-D standard than with a classical lockstep architecture.

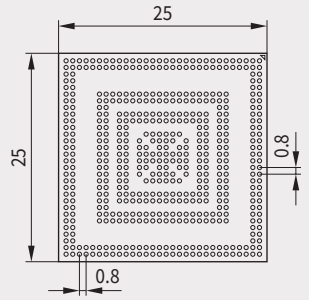
Customers wanting to reduce their time-to-market can now cut down their MCU safety development by 30%. By the same token, a performance surplus of 50% up to 100% allows for more functionality and offers a sufficient resource buffer for future requirements, keeping the power consumption on the single-core microcontroller level. While protecting IP, and preventing theft and fraud, AURIX™ provides an already built-in hardware security module.

With its special feature set, AURIX™ is the perfect match for powertrain applications (including hybrid and electrical vehicles) as well as safety applications (such as steering, braking, airbag and advanced driver assistance systems).

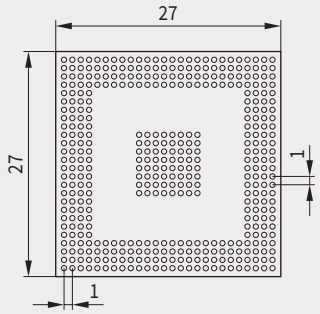


Package information[1)]

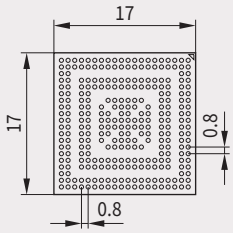
LFBGA-516



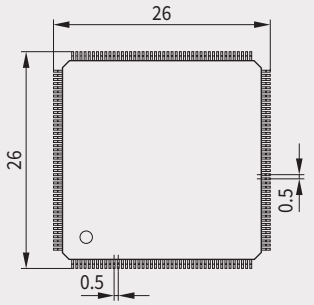
BGA-416



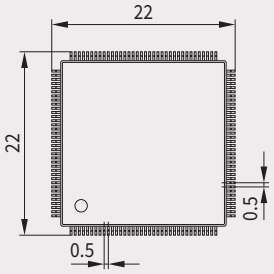
LFBGA-292



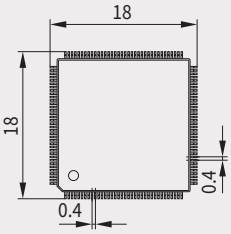
LQFP-176



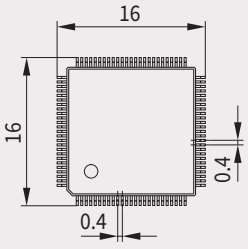
LQFP-144



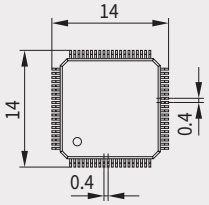
TQFP-144



TQFP-100



TQFP-80



1) For further information on Infineon packages, please visit our internet site at www.infineon.com/packages

AURIX™ family offers a complete roadmap for automotive security

	TQFP-100	TQFP-144	LQFP-176	LFBGA-292	LFBGA-516	Bare Die
9x series up to 8 MB				TC297T 270 MHz HSM	TC299T 270 MHz HSM	TC290T 270 MHz HSM
7x series up to 4 MB			TC275T 200 MHz HSM	TC277T 200 MHz HSM		TC270T 200 MHz HSM
3x series up to 2 MB	TC233L 200 MHz HSM	TC234L 200 MHz HSM		TC237L 200 MHz HSM		

High-end engine & transmission management
ADAS & sensor fusion domain control (H)EV System

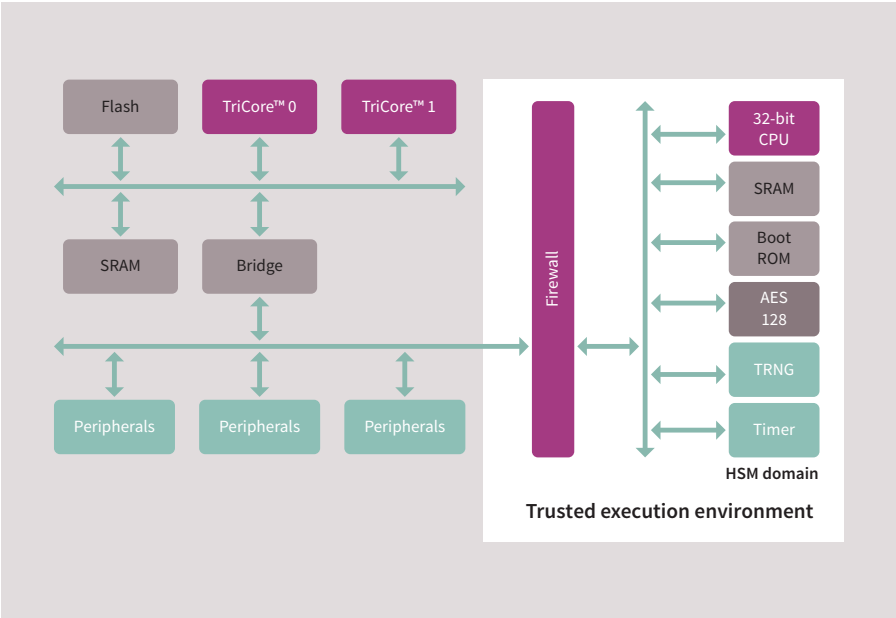
Mid-range engine & transmission management
High-end brake and EPS domain control (H)EV system

EPS airbag brake systems ADAS

Typical use cases

- Secure on-board communication
- Tuning protection
- Immobilizer
- Secure SW update

AURIX™ hardware security module – anchor of trust thanks to separated logical protection domain



AURIX™ Hardware Security Module (HSM)

- A highly flexible and programmable solution
  - AES128 and TRNG implemented in HW
  - Customer-specific requirements, such as HASH or asymmetric encryption, can be implemented in software
- Offers the performance required to encrypt/decrypt e.g. Ethernet traffic
- Secure key storage provided by separated HSM-DFLASH portion
  - Alternative secure key storage feasible in dedicated HSM-PFLASH sections
- SHE+ software

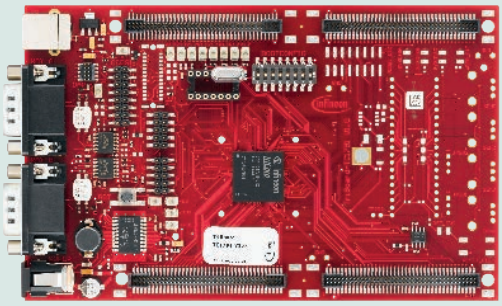
The SHE+ driver controls the hardware security peripheral in the HSM domain and interacts with the TriCore™ host core. SHE+ offers the AUTOSAR CRY interface for integrating the HSM security features into an automotive application, including interface to AUTOSAR, communication from TriCore™ to HSM and vice versa, key storage functionality and security peripheral drivers.

AURIX™ starter and application kits

Infineon Technologies AG starter kits – 32-bit microcontrollers

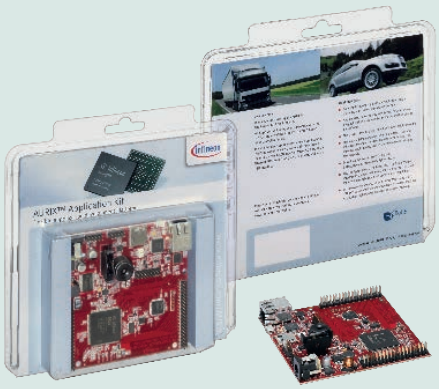
Triboards

Infineon Tricore™ family starter kits are powerful evaluation systems that enable evaluation and development well before the target hardware is available. They offer a solid platform for both hardware and software engineers to evaluate and prototype designs that are closely aligned with their final applications.



Application kits

To simplify the development of your own application, the kit comes with a variety of on-board components, including a highly integrated software development environment that gives you everything you need to compile, debug, and flash your AURIX™ multicore application.



System application kits

The system application kits provide a quick jump-start to typical microcontroller applications such as motor control, radar etc. These reference design kits provide faster design-in support for end applications by providing a reference board, application software, tooling and documentation.

www.infineon.com/AURIX-kits

Hardware Security Module (HSM)

HSM provides a secure computing platform, consisting of a 32-bit CPU, special access-protected memory for storing the cryptographic key and the unique subscriber identifiers, a hardware accelerator for the state-of-the-art AES-128 encryption that can be operated in different modes and specific hardware for generation of random numbers. A firewall separates HSM from the rest of AURIX™ microcontroller.

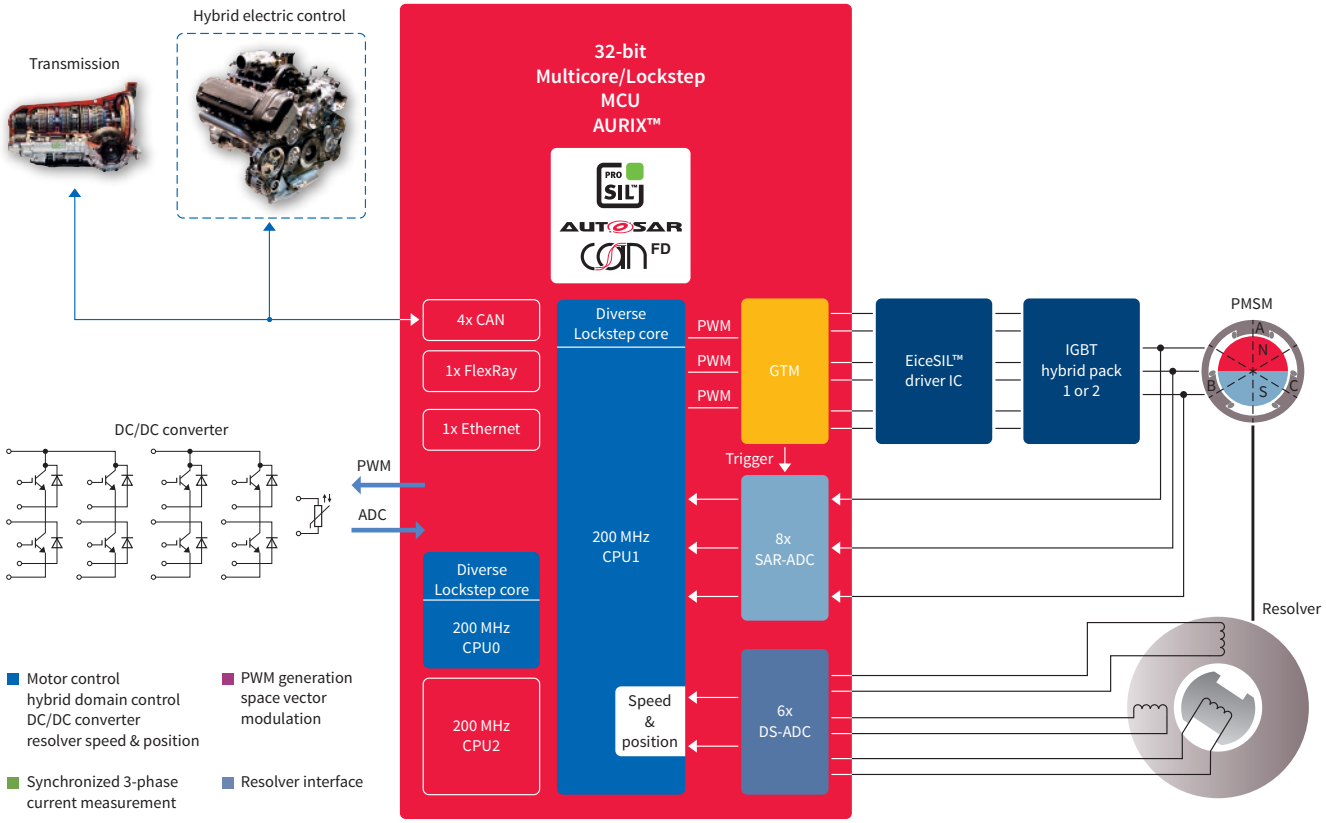
- A highly flexible and programmable solution
- AES-128 HW accelerator matching performance for automotive protocols
- Crypto- and Algorithm Agility by software
- AIS31 compliant True Random Number Generator (TRNG) with high random entropy over lifetime

Customer benefits

- **Secure platform** – HSM provides a secure platform, separated from the rest of the microcontrollers by a firewall, thereby creating a trusted execution environment.
- **Security standard compliance** – AURIX™ HSM fulfills SHE HIS and Evita Medium standards as well as provide some additional functionalities.
- **Backward compatibility** – AURIX™ security solutions are backward compatible to security SHE HIS implementations in previous TriCore™ based microcontroller families.
- **Security differentiation** - customized secure OEM or Tier1 crypto apps can be processed within trusted HSM execution environment and therefore allow independent HSM specific SW code review in reference to the huge application host SW from multiple parties. This helps to harden the security level by reliably avoiding potential security backdoors.
- **Convergence of security and safety** – AURIX™ microcontrollers address both functional safety as well as IT-security requirements, making sure those are properly integrated and not conflicting with one another.
- **Secure process** – Infineon can provide a secure personalization flow. 1st personalization step usually happens at the Tier1, where initial HSM SW and optional transportation key(s) are injected to the ECU. 2nd personalization step happens at the OEM, where a car specific Individual key(s) are injected. AURIX™ HSM offers device specific, individual random read-only key. Read-only key can be used for injected keys and make them invisible for the application SW layer.
- **Secure failure analysis** – for the purpose of preventing unpermitted debug access, AURIX™ HSM offers 256-bit password for debugger access protection. It is possible to create car specific debugger password, which can be stored in OEM/Tier1 data base or generated by secret algorithm. Destructive debugger entry functionality opens debugger access but initiates a persistent destructive action – device gets inoperable in native ECU car environment.

Integrated (H)EV control

Application example



The inverter controls the electric motor via an electric drivetrain. It resembles the Engine Management System (EMS) in vehicles with an internal combustion engine. It is seen as a key component in determining (H)EV drive behavior. The inverter captures energy released through regenerative braking and feeds this back to the battery. As a result, the range of the vehicle is directly related to the efficiency of the inverter. A safe, highly efficient inverter control system is crucial to the quality of driving.

Application features

- Multicore & lockstep architecture
- DS-ADC-enabled direct resolver-to-microcontroller
- Superior performance
- Customized PWM pattern generation

System benefits

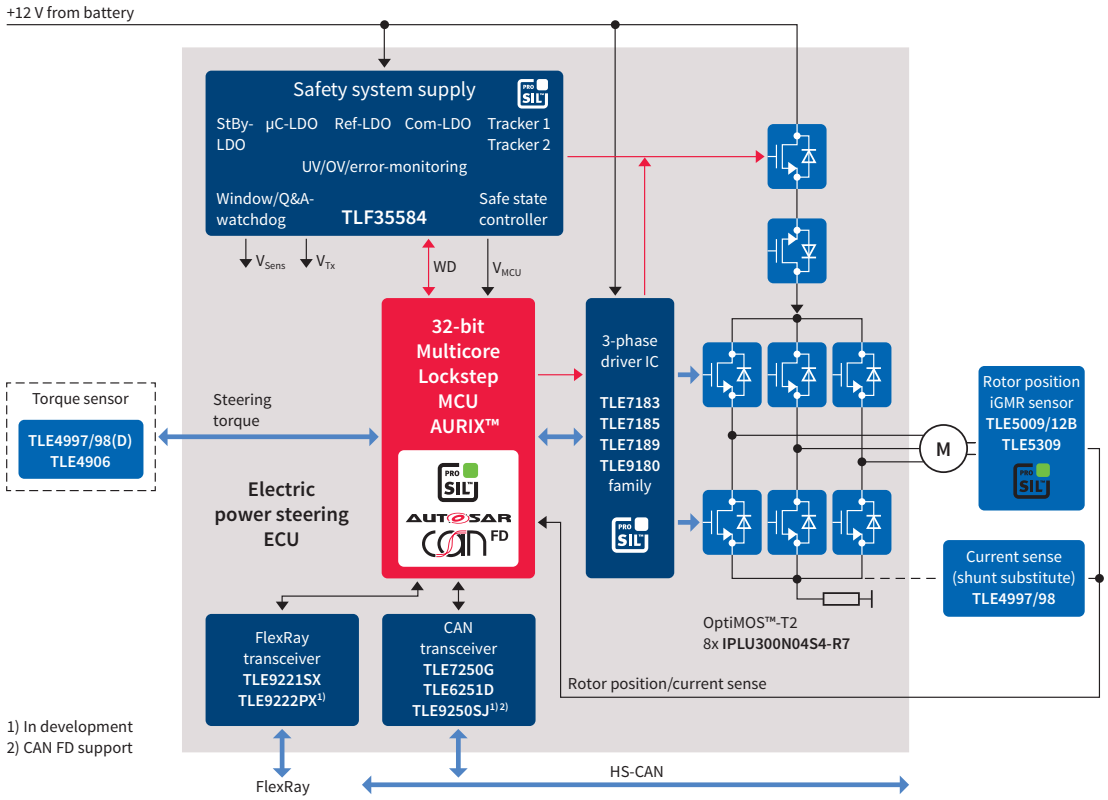
- ISO 26262 ASIL-C/D compliant
- No resolver IC needed, lower system cost
- Enables sub-system integration (driving HCU + inverter + DC/DC)
- Fine motor tuning

Suggested products

- TC29x – TriCore™ 32-bit microcontroller
- TC27x – TriCore™ 32-bit microcontroller

Electric Power Steering (EPS)

Application example



The new TriCore™ family AURIX™ with state-of-the-art safety features enables systems to achieve the highest safety level ASIL-D, which is already required in contemporary steering systems.
The latest diverse lockstep technology with clock delay (diverse lockstep core) reduces the software overhead significantly and enables fast time-to-market.
Its rich scalability meets a variety of different electric power steering system demands.

Application features

- Flash 512 KB–8 MB
- Performance from 133 MHz–3x 300 MHz
- T_a = -40 °C … 145 °C
- Dedicated peripheral set: LIN, CAN, SPI, FlexRay , Ethernet
- Advanced timer unit for totally flexible PWM generation and hardware input capture
- Redundant flexible 12-bit ADC
- Hardware SENT interface for low CPU load
- Hardware-focused safety concept for reduced SW overhead
- Safety software: Infineon SafeTcore library
- ISO 26262 conformance to support safety requirements up to ASIL-D
- Availability of AUTOSAR 4.x

System benefits

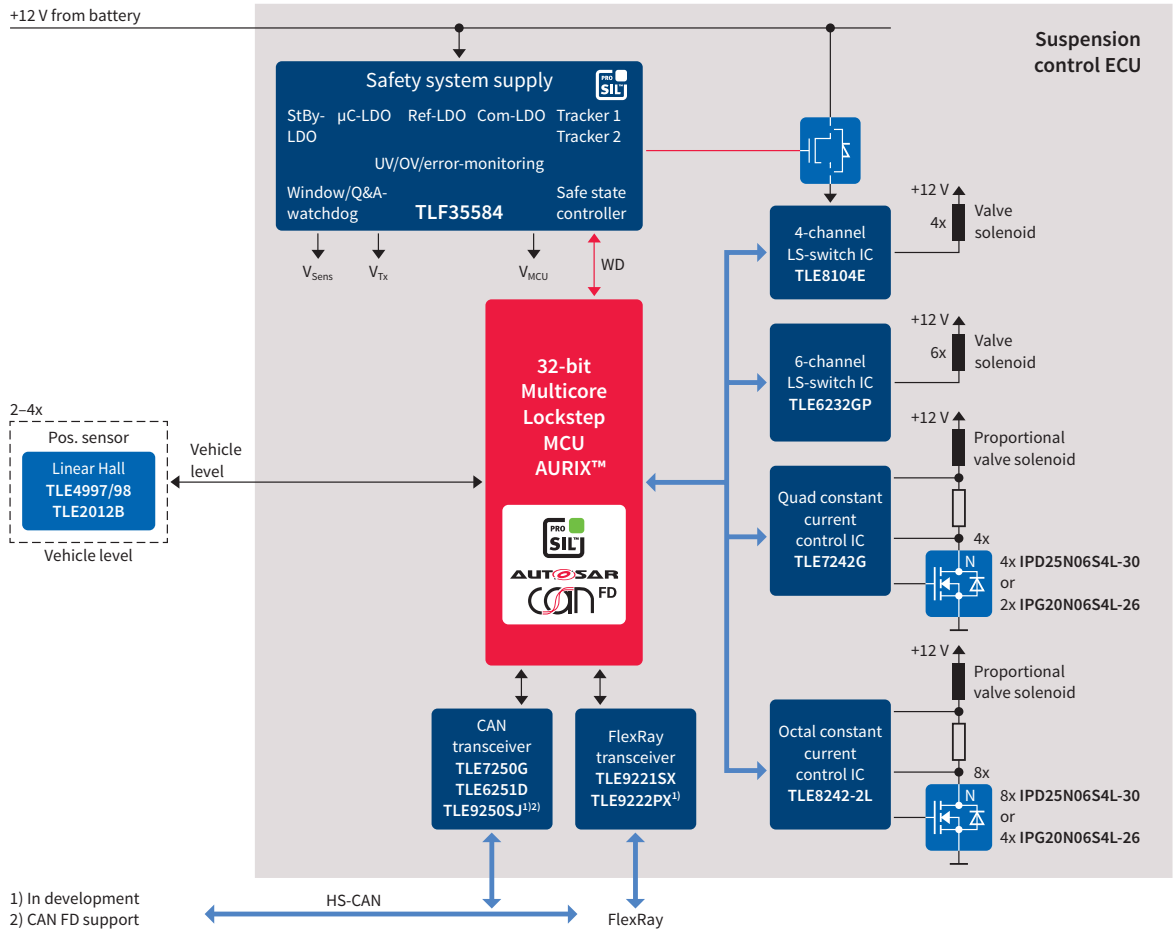
- Scalability over Flash, RAM and peripherals offering the best cost-performance ratio
- Serves all kinds of EPS systems, such as column or belt drive
- Proven safety concept to support ISO 26262
- Innovative supply concept leads to best-in-class power consumption

Suggested products

- TC26x
- TC23x
- TC22x

Active suspension control system

Application example



The new TriCore™ family AURIX™ with state-of-the-art safety features enables systems to achieve the highest safety level ASIL-D, which is already required in contemporary suspension systems.
The latest diverse lockstep technology with clock delay (diverse lockstep core) reduces the software overhead significantly and enables fast time-to-market.
The scalability supports an optimized fit in order to meet different OEM specifications.

Application features

- TriCore™ DSP functionality
- Best-in-class performance: triple TriCore™ with up to 300 MHz per core
- Supporting floating point and fix point with all cores
- Communication peripherals: CAN, LIN, FlexRay, Ethernet
- Innovative single supply 5 V or 3.3V
- Wide range of packages from 80-pin – 516-pin
- ISO 26262 conformance to support safety requirements up to ASIL-D
- Availability of AUTOSAR 4.x

System benefits

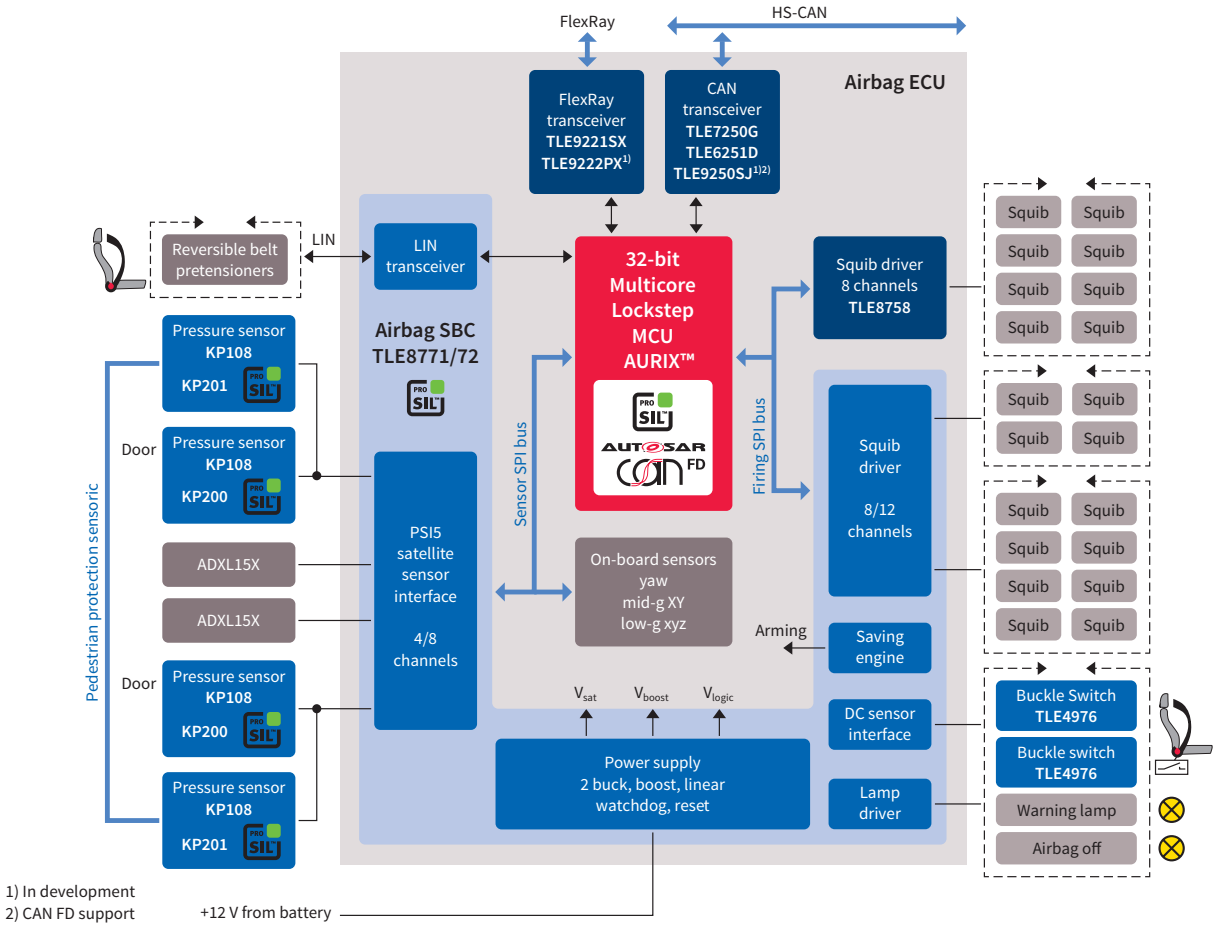
- Scalability over Flash, RAM and peripherals offering the best cost-performance ratio
- Proven safety concept to support ISO 26262
- Innovative supply concept leads to best-in-class power consumption and saves external component costs

Suggested products

- TC27x
- TC26x
- TC23x
- TC22x

Advanced airbag system

Application example



The new TriCore™ family AURIX™ with state-of-the-art safety features enables systems to achieve the highest safety level up to ASIL-D.
The scalability allows the selection of a single-core solution for basic airbag systems and multicore solutions for airbag systems with an integrated sensor cluster. The best cost-performance fit is offered by the wide range of Flash, performance and peripheral options available within the AURIX™ family.

Application features

- Scalable MCU family from single to multicore
- Flash 512 KB–8 MB
- Embedded EEPROM
- Performance from 133 MHz–3x 300 MHz
- Dedicated peripheral set: CAN, LIN, SPI, FlexRay, Ethernet
- Hardware-focused safety concept for reduced SW overhead
- Safety software: Infineon SafeTcore library
- ISO 26262 conformance to support safety requirements up to ASIL-D
- Availability of AUTOSAR 4.x

System benefits

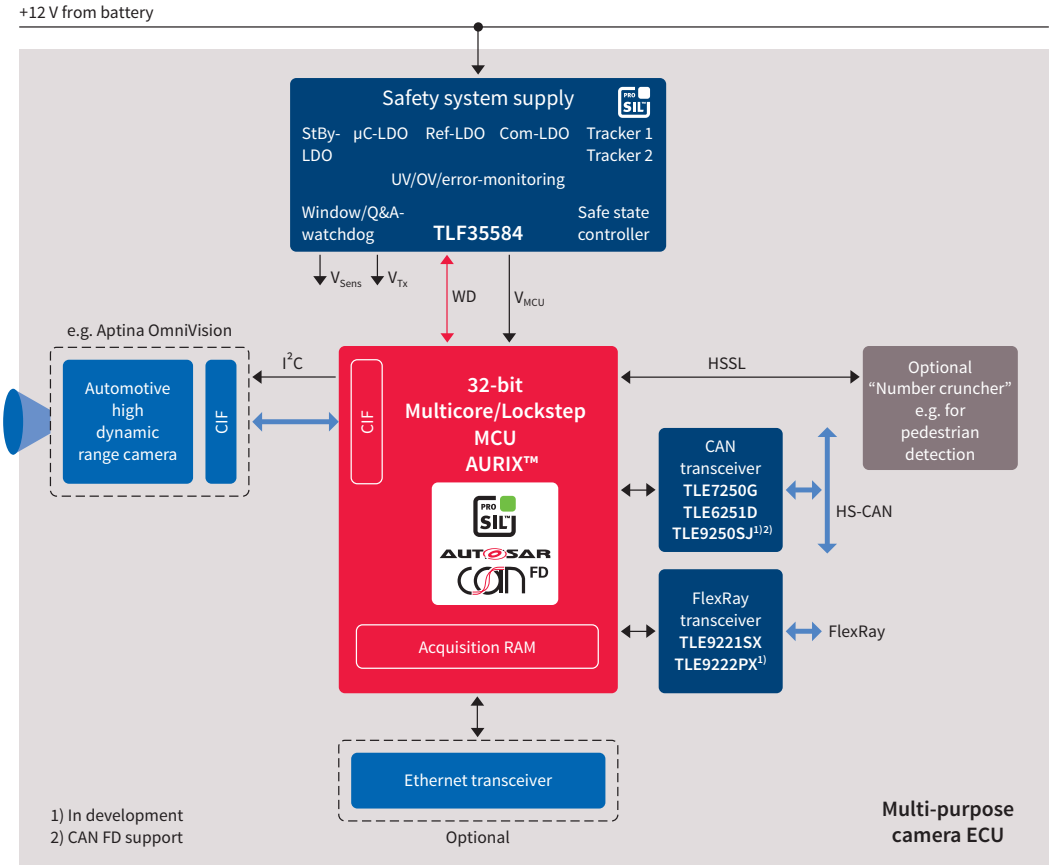
- Scalability over Flash, RAM and peripherals offering the best cost-performance ratio
- Proven safety concept to support ISO 26262
- Innovative supply concept leads to best-in-class power consumption

Suggested products

- TC23x
- TC22x
- TC21x

Multi-purpose camera configuration

Application example



The new TriCore™ family AURIX™ will enhance classic safety features with dedicated features to cater for multi-purpose camera systems.
The combination of new features, such as a picture pre-processing unit, camera interface, DSP functionality and increased SRAM, in conjunction with outstanding safety features enables a high level of scalability in order to achieve the best cost-performance ratio.

Application features

- TriCore™ DSP functionality
- Best-in-class performance: triple TriCore™ with up to 300 MHz per core
- Supporting floating point and fix point with all cores
- Up to 2.7 MB of internal RAM for picture information storage
- Picture pre-processing unit
- Camera interface up to 100 MHz
- Innovative single supply 5 V or 3.3 V
- External memory interface
- ISO 26262 conformance to support safety requirements up to ASIL-D
- Availability of AUTOSAR 4.x

System benefits

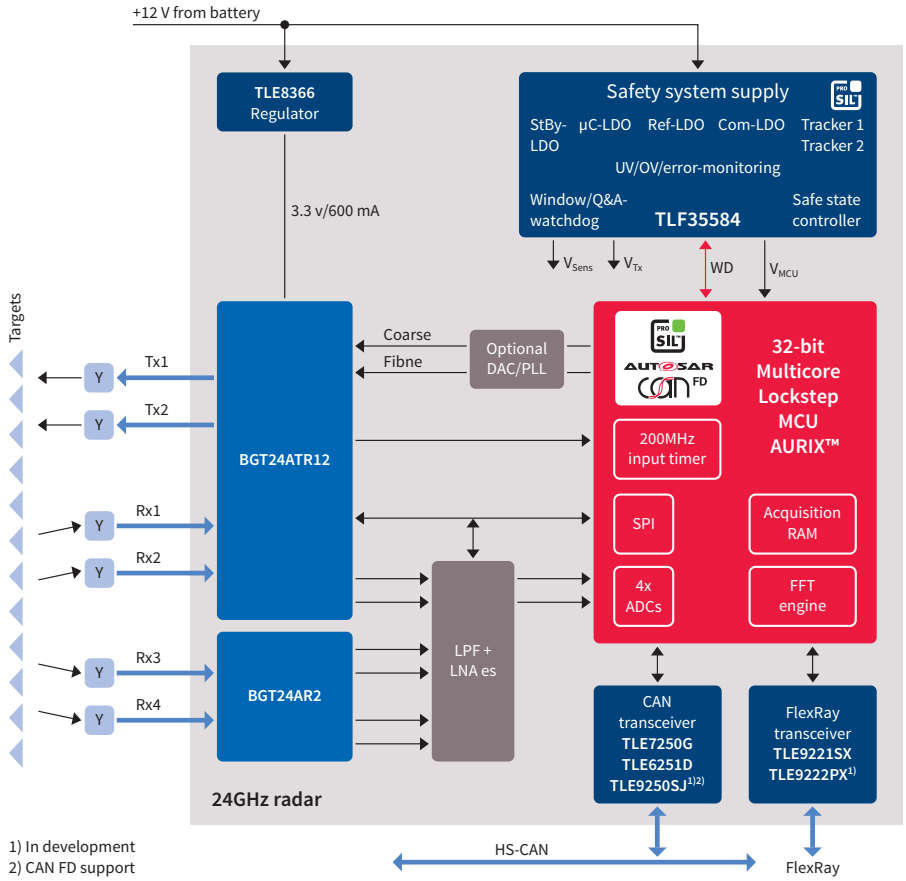
- High scalability option allows a dedicated performance feature fit for multiple camera applications from single automatic high beam systems up to multi-function systems (lane departure warning, forward collision warning, traffic sign recognition, pedestrian recognition etc.)
- High integration leads to reduced complexity
- Support for ISO 26262 decisions such as emergency braking
- Innovative supply concept leads to best-in-class power consumption

Suggested products

- TC29xTA

Short-range radar (24 GHz) system

Application example



The new TriCore™ family AURIX™ will enhance classic safety features with dedicated features to serve the needs of 24 GHz radar systems.
The combination of new features and increased SRAM, in conjunction with outstanding safety features, enables a high level of integration and reduction of complexity.

Application features

- Up to 752 KB RAM for radar image storage
- Radar signal processing with windowing functionality
- Flexibility in radar signal acquisition with 4x internal ADCs
- Possibility to connect external ADCs (interface to connect up to 16-bit ADCs)
- High-precision input timers
- High-precision output timers for DAC
- Innovative single supply 5 V or 3.3 V
- ISO 26262 compliance to support safety requirements up to ASIL-D
- Availability of AUTOSAR 4.x

System benefits

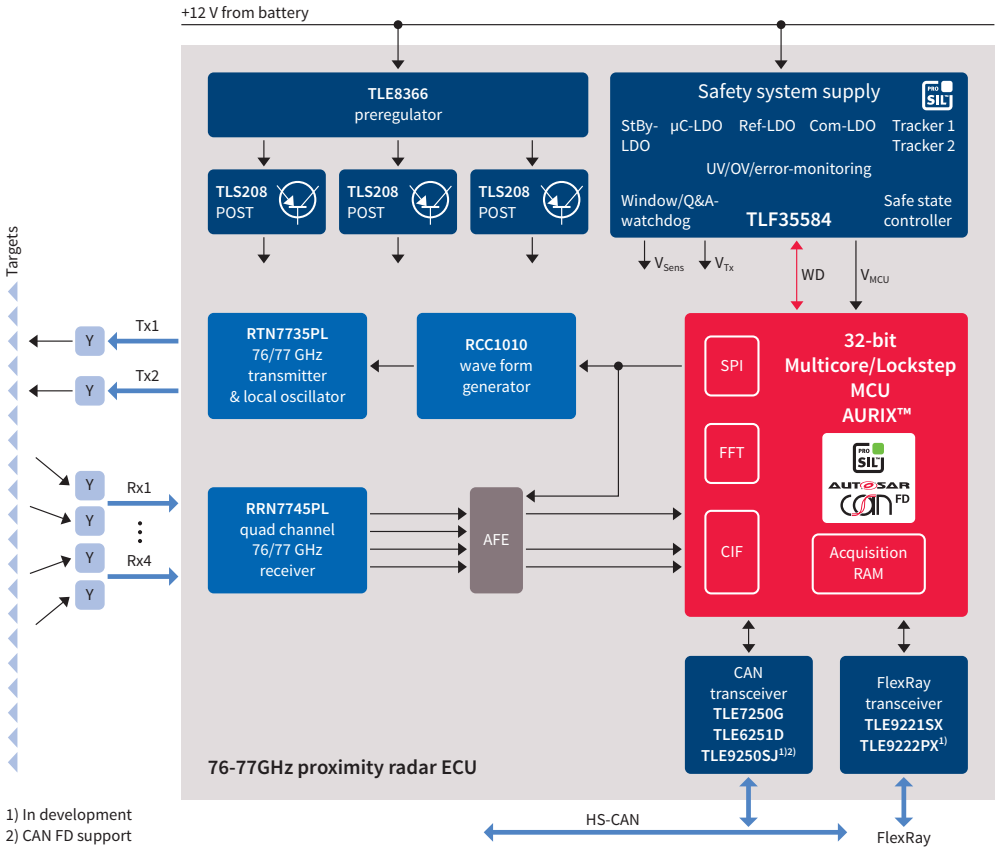
- High integration leads to significant cost savings
- High integration leads to reduced complexity
- ISO 26262 compliance supports safe input for functions such as emergency braking
- Innovative supply concept

Suggested products

- TC23xLA
- TC26xDA
- TC29xTA

Long-range radar (76/77 GHz) system

Application example



The new TriCore™ family AURIX™ will enhance classic safety features with dedicated features to serve the needs of 77 GHz radar systems.
The combination of new features and increased SRAM, in conjunction with outstanding safety features, enables a high level of integration and reduction of complexity.

Application features

- TriCore™ DSP functionality
- Best-in-class performance: triple TriCore™ with up to 300 MHz per core
- Up to 2.7 MB RAM for radar image storage
- Radar signal processing with windowing functionality
- Flexibility in radar signal acquisition with 4x internal ADCs
- Possibility to connect external ADCs (interface to connect up to 16-bit ADCs)
- High-precision input timers
- High-precision output timers for DAC
- Innovative single supply 5 V or 3.3 V
- External memory interface
- ISO 26262 compliance to support safety requirements up to ASIL-D
- Availability of AUTOSAR 4.x

System benefits

- High integration leads to significant cost savings
- High integration leads to reduced complexity
- ISO 26262 compliance supports safe input for functions such as emergency braking
- Innovative supply concept leads to best-in-class power consumption

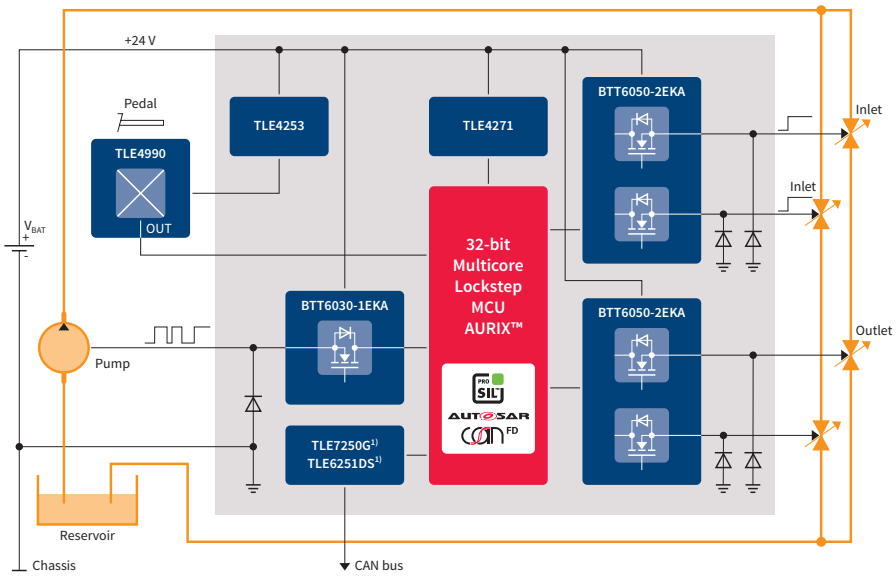
Suggested products

- TC26xDA
- TC29xTA

Commercial and Agricultural Vehicles (CAV)

A 24 V complete system solution for hydraulic/pneumatic management systems: power supply, sensors, microcontroller and high-side switches can be used without external protection in a 24 V system. Valves and pumps can be driven via linear activation or demand-controlled via PWM signals.

Hydraulic management system



1) If ECU permanently supplied, you may need to add external protection against load dump 400 ms above 40 V.

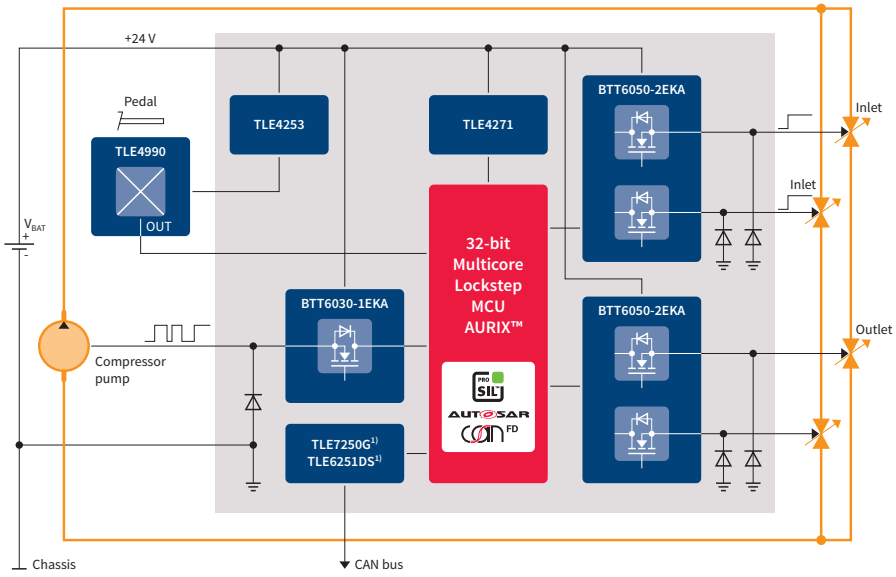
System benefits

- Valves and pumps can be driven via linear activation or demand-controlled via PWM signals
- Quad and dual channels are optimized to reduce costs and space for these applications
- Pin-to-pin and software compatibility
- ISO 26262, ASIL D/SIL 3 compliant
- AECQ-100

Suggested products

- TC23x
- TC22x
- TC21x

Pneumatic management system



1) If ECU permanently supplied, you may need to add external protection against load dump 400 ms above 40 V.

System benefits

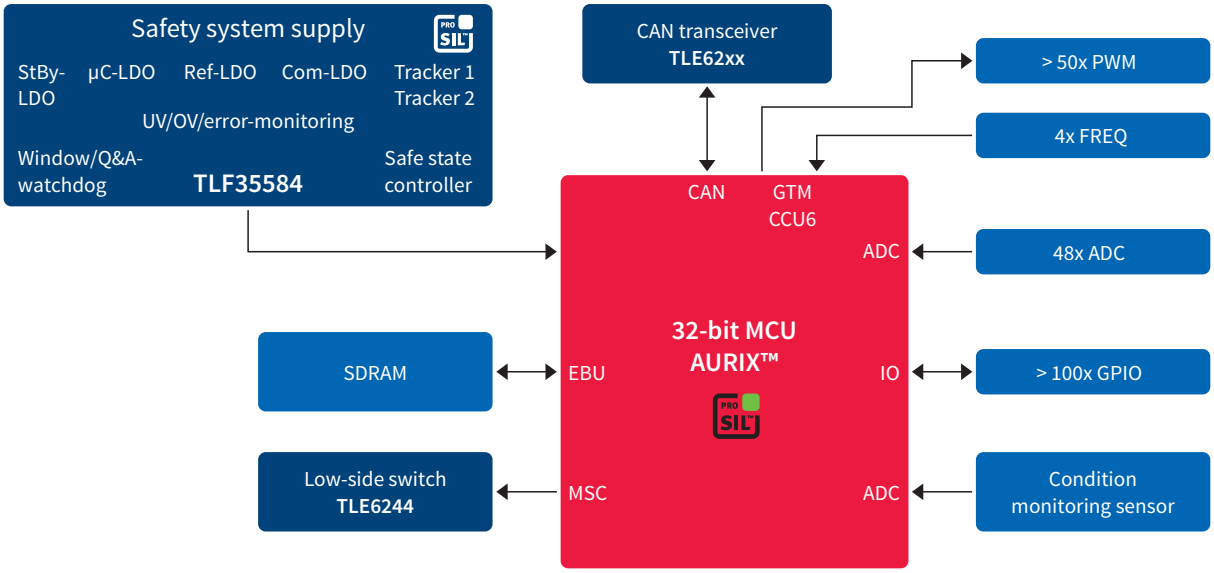
- Valves and pumps can be driven via linear activation or demand-controlled via PWM signals
- Quad and dual channels are optimized to reduce costs and space for these applications
- Pin-to-pin and software compatibility
- ISO 26262, ASIL D/SIL 3 compliant
- AECQ-100

Suggested products

- TC23x
- TC22x
- TC21x

Mobile controller

Application example



Application features

- Closed-loop control of solenoid currents
- Multitasking to drive hydraulic and electric actuators
- IEC 61131-3 support
- Tasking/Green Hills/GNU(Hightec)/windriver toolchain
- Ready for harsh environments
- IEC 61508 support - Integrity Level (SIL) 1 to 3

Suggested products

- TC26xD – TriCore™ 32-bit microcontroller
- TC27xT – TriCore™ 32-bit microcontroller

System benefits

- Scalable family with compatibility: SW, pin-out
- High-speed 200 MHz asymmetric single/dual/triple core
- Up to 50 Pulse-Width-Modulated (PWM) outputs
- Four 12-bit Analog to Digital Converters (SAR-ADC)
- 12-bit, up to 60 channels
- DS-ADC converter
- Temperature range up to T_a = 150 °C, T_j = 175 °C
- SAE J1939 supported for up to 6 CAN nodes incl. CAN FD
- 64 KB EEPROM
- Innovative single power supply concept

TriCore™ tool partners

Embedded software solutions AUTOSAR suites

Simulation/virtual prototyping

Integrated compiler environments

Auto code generation tools

Timing/scheduling analysis

Operating systems

Debugger and test tools

Data measurement/calibration/rapid prototyping

Programmer/flash tools

Software verification

Training/services

Free tooling

Free TriCore™ Entry Toolchain, MemTool, ACT