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, Ethernet, 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/tc234lx32f200fabkxuma1

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™ micro-controller 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.

| AUDO | AUDO NG
(Next generation) | AUDO future | AUDO MAX | AURIX™ |

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™

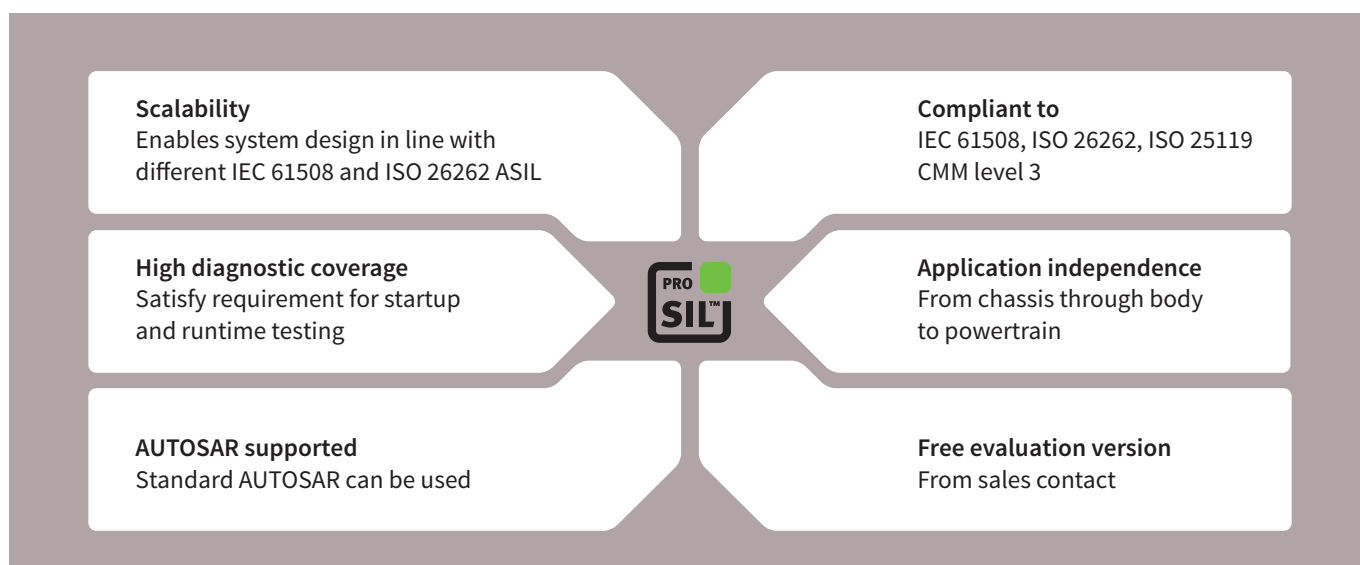## Infineon's PRO-SIL™ program, designed to protect

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.

Scalability
Enables system design in line with different IEC 61508 and ISO 26262 ASIL

High diagnostic coverage
Satisfy requirement for startup and runtime testing

AUTOSAR supported
Standard AUTOSAR can be used

Compliant to
IEC 61508, ISO 26262, ISO 25119
CMM level 3

Application independence
From chassis through body to powertrain

Free evaluation version
From sales contact

www.infineon.com/prosil

AURIX™ family package scalability

	TQFP-80	TQFP-100	LQFP-144 TQFP-144	LQFP-176	LFBGA-292	BGA-416	LFBGA-516
9x series up to 8 MB max. SRAM 2.75 MB triple-core					TC297	TC298	TC299
7x series up to 4 MB max. SRAM 472 KB triple-core				TC275	TC277		
6x series up to 2.5 MB max. SRAM 752 KB dual-core			TC264	TC265	TC267		
3x series up to 2 MB max. SRAM 708 KB Lockstep-core		TC233	TC234		TC237		
2x series up to 1 MB max. SRAM 96 KB Lockstep-core	TC222	TC223	TC224				
1x series up to 512 KB max. SRAM 56 KB Lockstep-core	TC212	TC213	TC214				

⬍ Upgrade/downgrade with pin-compatible packages

› Advanced package technologies deliver the best price/performance ratio
› Customers can choose between different devices in the same pin-compatible package

TriCore™ upgrade paths

LFBGA-516

BGA scalability

LFBGA-292

25 x 25 mm

17 x 17 mm
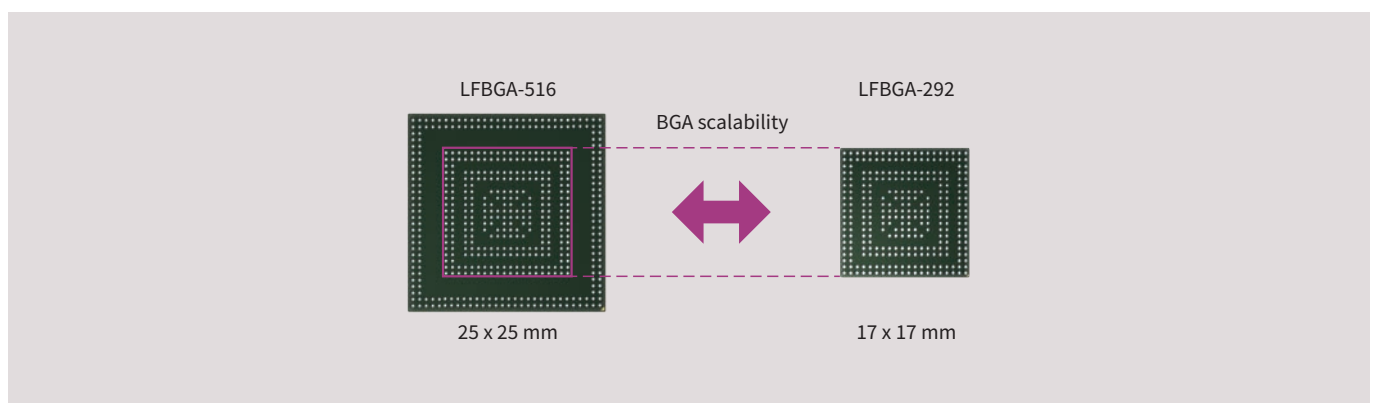
› LFBGA-292 and LFBGA-516 are ball compatible so that customers can build one PCB for both packages

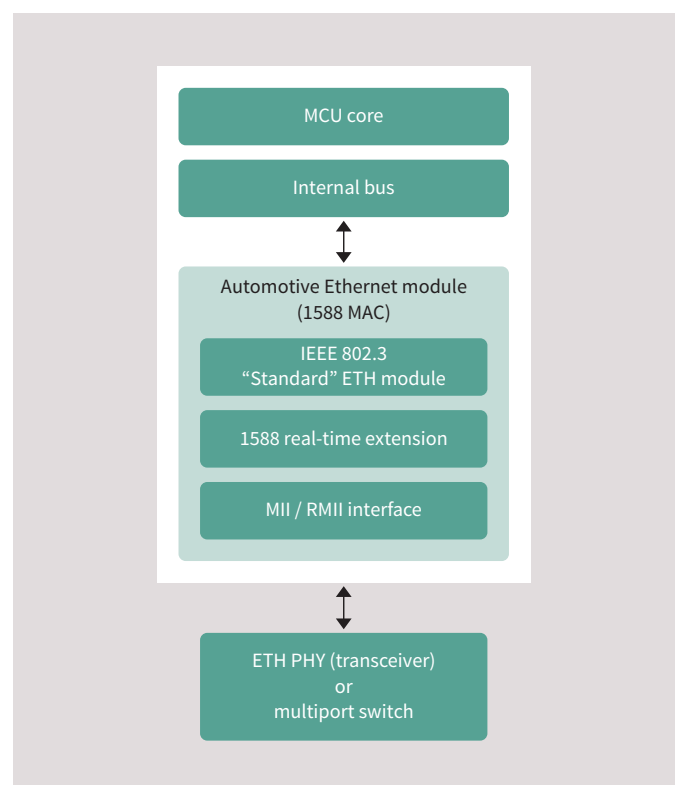# AURIX™ family communication innovation

AURIX™ MultiCAN

› Up to 6 CAN nodes with FD support available
› CAN standard V2.0 B active
› ISO11898-1 FDIS 2014 CAN-FD
› Specific AURIX™ variants support ISO11898-1 DIS 2015
› Resonator ready with asynchronous operation and choice of clock source
› Frequency scaling without baud rate change
› Energy saving: pretended networking and partial networking (ISO11898-6 transceiver support) support (also in CAN FD mode)
› Safety support: total amount of bus errors countable
› Message objects can be freely assigned among the nodes
› Configurable FIFO length, automatic gateway mode support
› Acceptance mask filtering for each message object

AURIX™
ISO 11898-6 transceiver support

Ethernet

Highlights

› MAC integrated in µC
› IEEE 802.3-2002 for Ethernet with support of IP, TCP/IP, UDP ...
› Real-time stamping support (IEEE 1588-2008) for clock synchronization
› Standard MII and RMII interfaces to PHY
› Fast Ethernet w/ 100 Mbit
› AUTOSAR V4 features supported
› Automatic CRC checksum and padding support
› AVB support

MCU core

Internal bus

Automotive Ethernet module
(1588 MAC)

IEEE 802.3
"Standard" ETH module

1588 real-time extension

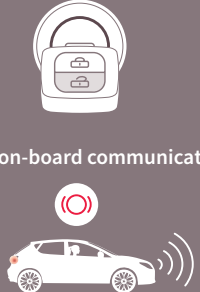MII / RMII interface

ETH PHY (transceiver)
or
multiport switch

AURIX™ security software

Infineon's AURIX™ 32-bit microcontroller family offers a wide portfolio of compatible devices with embedded Hardware Security Module (HSM), which offers cost-efficient solutions for all typical automotive security applications. The SHE+ driver controls the hardware security peripheral in the HSM domain and interacts with the TriCore™ host core. SHE+ comes with 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.

	HIS SHE	HSM SHE+ V1	HSM SHE+ envisioned
Key management	10 keys	20 keys	Configurable
Symmetric data encryption / decryption	HW-based AES-128-bit (ECB, CBC)	HW-based AES-128-bit (ECB, CBC, OFB, CFB, CTR, XTC, GCM)	●
MAC generation / verification	●	●	●
Safe MAC verification	–	●	●
Random number management	SHE PRNG	SHE PRNG TRNG	●
Secure boot	●	–	●
Debug access	–	–	Enhanced by HSM debug options
Other SHE services	●	●	●
Asymmetric encryption / decryption	–	–	SW-based RSA1024 SW-based ECC256

Typical applications	Tuning protection	Immobilizer / Secure-on-board communication	Possible extensions, depending on specific tier1 / OEM use case
Key management	●	●	●
Symmetric data encryption / decryption	●	●	●
MAC generation / verification	●	●	●
Safe MAC verification		(optional)	(optional)
Random number management	●	●	●
Secure boot	(optional)	(optional)	(optional)
Debug access	(for development)	(for development)	(for development)
Other SHE services	●	●	●
Asymmetric encryption / decryption	(optional in future)	(optional in future)	(optional in future)

Diesel direct injection

Application example

Engine management
Typical partitioning for DDI discrete

Battery (KL30)
Key (KL15)

Safety system supply

| StBy-LDO | µC-LDO | Ref-LDO | Com-LDO | Tracker 1 Tracker 2 |

UV/OV/error-monitoring

| Window/Q&A-watchdog | TLF35584 | Safe state controller |

5V/0.15 A · 5V/0.15 A · 5V/0.15 A · 3.3 V or 5 V/10 mA · 3.3 V or 5 V/0.6 A · 5V/0.2 A

Pedal position
TLE4997/98

EGR-throttle position
TLE4997/98

Fuel level
TLE4997/98

Swirl/tumble flap
TLE4997/98

Throttle position
TLE4998S

Temperature sensor(s)

Barometric pressure
KP23x, KP25x

Manifold air pressure
KP21x, KP22x, KP27x[1]

Knock sensor(s)

In-cylinder pressure sensors

Lambda sensor

Crankshaft
TLE502x/492x

Camshaft
TLE4986

32-bit Multicore/Lockstep MCU AURIX™ e.g. TC29xT 8 MB/300 MHz

HSM | 6x QSPI
84x SAR
10x DS
SENT
PSI5
GTM | 2x E-Ray | 3x MSB
Ethernet | HSSL
6x CAN | ASCLIN

| CAN TLE7250G | … | FlexRay TLE9221SX | … | LIN TLE7259-3GE | 2 ch. |

PROFET™
BTS500x0-1EGA
BTS500x0-1TMA/B
BTS500x0-1TEA/B | 6x 8 A | Glow plugs

Fast IGBT
e.g. IHD04N60RA/
IDH06N60RA | 6x 8 A | Piezo injectors

H-bridge for throttle
TLE8209-2SA | 8 A ch. | (eGas) throttle

General purpose
H-bridge
TLE9102SG | 5 A ch. | Turbo charger waste gate

H-bridge for EGR
TLE9102SG | 5 A ch. | EGR throttle

LS-switch Flex
PWM, current sense
Flex02
TLE8102SG | 2x 5/9 A | O2

LS-Switch Flex8
On-off outputs
TLE8108EM | 4x 0.5 A | Relays

LS-switch Flex
PWM outputs
Flex18
TLE8718SA | 4x 2.6 A | Solenoids
| 2x 2.6 A | WT / Solenoid
| 4x 1.7 A | Relays
| 2x 1 A | MIL / Lamp

Powertrain CAN

1) In development

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 scalable AURIX™ family includes the GTM, the de-facto industry standard timing module that supports highly complex engine management, while meeting the market's most stringent emissions regulations.

Application features

› Direct injection (piezo/magnetic)
› In-cylinder pressure measurement
› Hardware-supported security enhancements
› Throttle and EGR control
› Turbo charging
› Diesel particulate filter
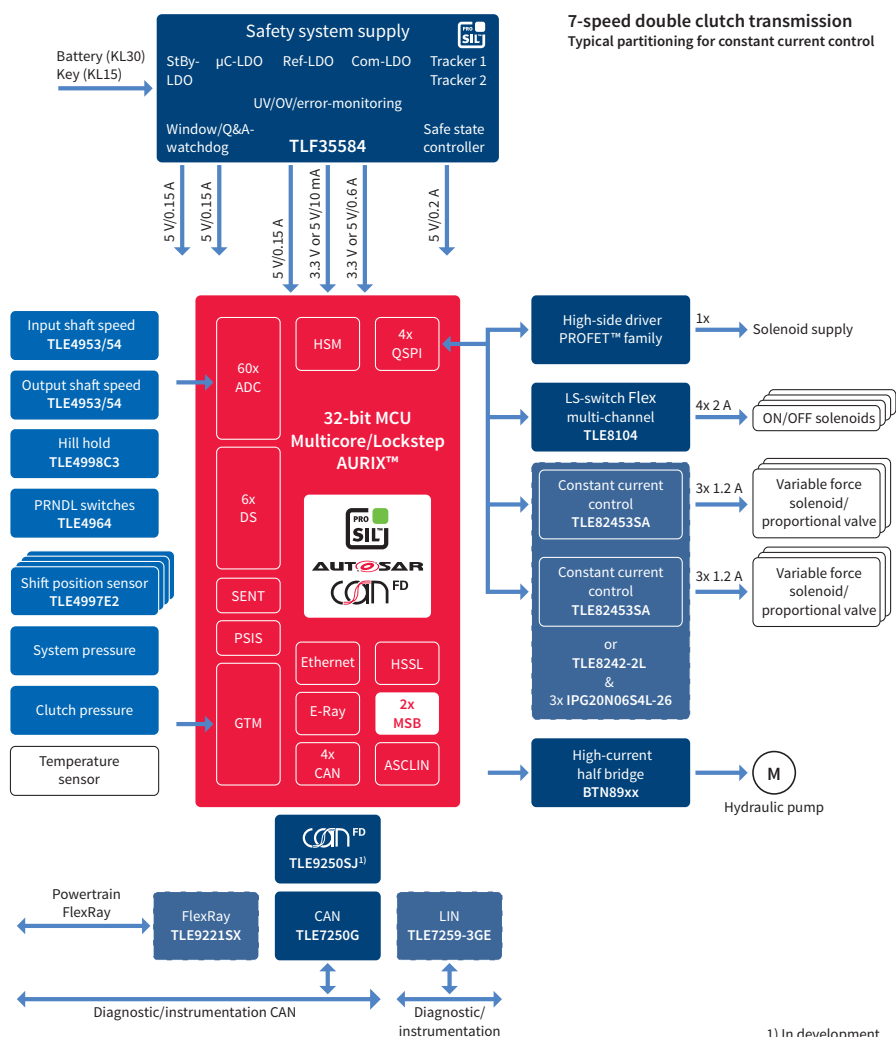› 'Blue' after-treatment support (e.g. urea-based SCR)

Suggested products

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

System benefits

› Microcontroller with best-in-class real-time performance
› Scalable platform – performance, memory size and I/Os
› Committed to reduce NOx and particulate matter in line with Euro 6 standard
› Hardware-supported IP/anti-theft protection and tuning protection
› Increased accuracy with in-cylinder pressure sensing via DS-ADC
› Enhanced communication (Ethernet)
› Dedicated peripherals for powertrain

Dry double clutch transmission – hydraulic control

Application example

7-speed double clutch transmission
Typical partitioning for constant current control

1) In development

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 rich scalability of the AURIX™ family permits a platform approach that meets the needs of a range of transmission system demands. Furthermore, the hot temperature package and bare die solutions enable AURIX™ to be used in both attached and integrated control units.

Application features

› Ultra-fast gear switching
› Closely coupled with engine control via high-speed CAN/CAN-FD/FlexRay link
› Support of four 3-phase DC-brushless E-drives (dry-DCT)
› High microcontroller junction bare die temperature

Suggested products

› TC275 – TriCore™ 32-bit microcontroller
› TC270 – Bare die TriCore™ 32-bit microcontroller

System benefits

› Improved fast clutch control
› Supports safety level up to ASIL-D
› Feature set optimized for wet and dry DCT designs
› Continuous torque on wheels ensures a sportive driving experience
› Hot bare die capabilities enable microcontrollers to be placed directly where they are needed in the system
› Hot bare die supports modular temperature-optimized TCU designs

AURIX™ for safety applications

AURIX™ made for safety

The AURIX™ architecture ISO 26262 compliant process is designed to efficiently meet ASIL-D on an application level. The platform uses up to 2 cores in TriCore™ diverse lockstep core technology, a diverse lockstep architecture combined with cutting-edge safety technology, such as safe internal communication buses or distributed memory protection system. Innovative encapsulation techniques allow the integration of software with various safety levels (QM to ASIL-D) from different sources, thereby significantly reducing system complexity. Thanks to this optimized approach, multiple applications and operating systems (such as steering, braking, airbag and advanced driver assistance systems) are seamlessly hosted on an unified platform. This leads to productivity gains of up to 30%, resulting in a smaller development outlay and reduced time-to-market for our customers.

Furthermore, Infineon extends the microcontroller safety roadmap with devices dedicated to the Advanced Driver Assistance System (ADAS) segment, such as radar or camera applications. Innovation has been focused on system partitioning in order to further integrate system functionality and consequently reduce the complexity and area, providing our customers with highly optimized solutions. The new devices include high- speed interfaces, integrated hardware acceleration and enhanced ECU validation and instrumentation tools. All ADAS devices support ISO 26262 safety methodology, meaning that they can be involved in automatic decisions to assist drivers, such as emergency braking.
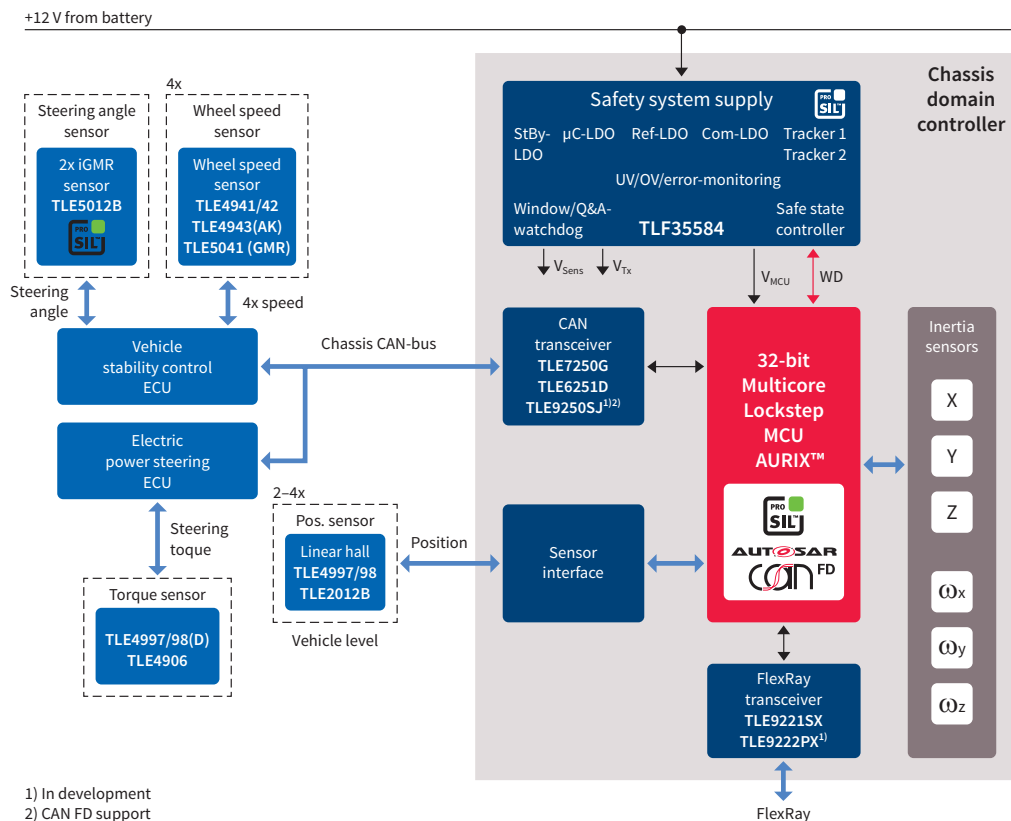
AURIX™ made for scalability

Thanks to its market-leading expertise, Infineon has translated customer demands for individual scalability into a universal product roadmap. Designed to optimize its customers' investment, the AURIX™ family comes with a comprehensive range of fully modular components, thereby ensuring long-term design flexibility. The devices range in the ultra high-end from a 300 MHz triple-core device with 8 MB of embedded Flash to a 200 MHz triple core with 4 MB of embedded Flash to a 200 MHz dual-core device with 2.5 MB of embedded Flash right down to 130 MHz and 80 MHz single-core and single-core lockstep devices with 1.5 MB, 1 MB and 0.5 MB of embedded Flash. The package portfolio includes a BGA-516 package with a ball-compatible BGA-292 package (I/O subset), and compatible QFP-176, QFP-144, QFP-100 to QFP-80 packages.

Chassis domain control

Application example

+12 V from battery

4x

Steering angle sensor

2x iGMR sensor
TLE5012B

Wheel speed sensor

Wheel speed sensor
TLE4941/42
TLE4943(AK)
TLE5041 (GMR)

Steering angle

4x speed

Vehicle stability control ECU

Chassis CAN-bus

Electric power steering ECU

2–4x

Steering toque

Pos. sensor

Linear hall
TLE4997/98
TLE2012B

Position

Torque sensor

TLE4997/98(D)
TLE4906

Vehicle level

Chassis domain controller

Safety system supply
StBy-LDO µC-LDO Ref-LDO Com-LDO Tracker 1
Tracker 2
UV/OV/error-monitoring
Window/Q&A-watchdog   **TLF35584**   Safe state controller

V_{Sens} V_{Tx} V_{MCU} WD

CAN transceiver
TLE7250G
TLE6251D
TLE9250SJ[1)2)]

32-bit Multicore Lockstep MCU AURIX™

Sensor interface

FlexRay transceiver
TLE9221SX
TLE9222PX[1)]

Inertia sensors

X

Y

Z

ωx

ωy

ωz

FlexRay

1) In development
2) CAN FD support

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 domain control systems. The latest diverse lockstep technology with clock delay (diverse lockstep core) reduces the software overhead significantly and enables fast time-to-market. Thanks to a scalable multicore system and innovative encapsulation techniques, this supports the integration of software with mixed-criticality levels from different sources, thereby allowing multiple applications and operating systems to be seamlessly hosted on an unified platform.

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
› Communication peripherals: CAN, LIN, FlexRay, Ethernet
› 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
› Advanced communication with FlexRay and Ethernet
› Highest available performance with integrated FPU
› Flexible DMA unit
› Scalability over Flash, RAM and peripherals
› Proven safety concept to support ISO 26262
› Innovative supply concept leads to best-in-class power consumption

Suggested products
› TC29x
› TC27x

Active suspension control system

Application example
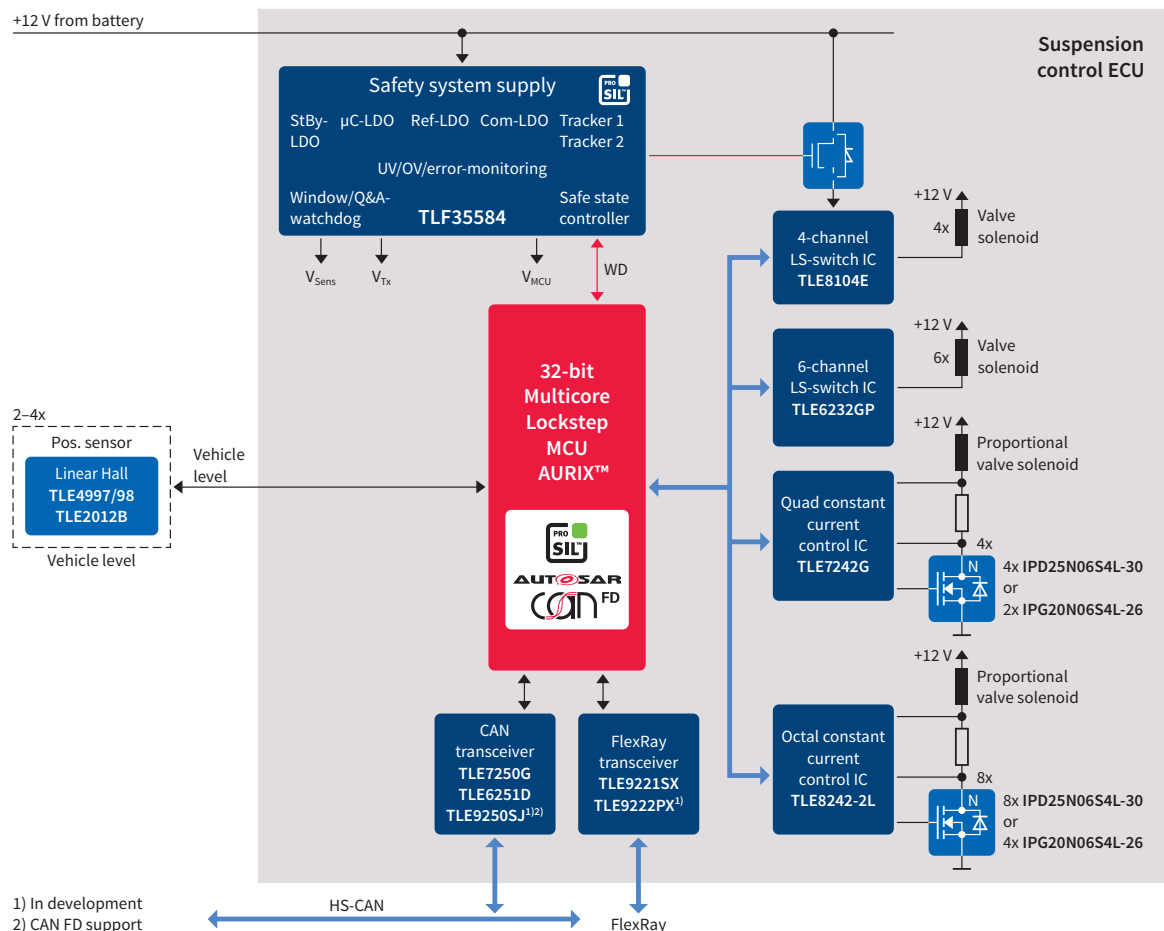
The new TriCore™ family AURIX™ with state-of-the-art safety features enables systems to achieve the highest safety level ASIL-D, which is already required in contemporary suspension systems.
The latest diverse lockstep technology with clock delay (diverse lockstep core) reduces the software overhead 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
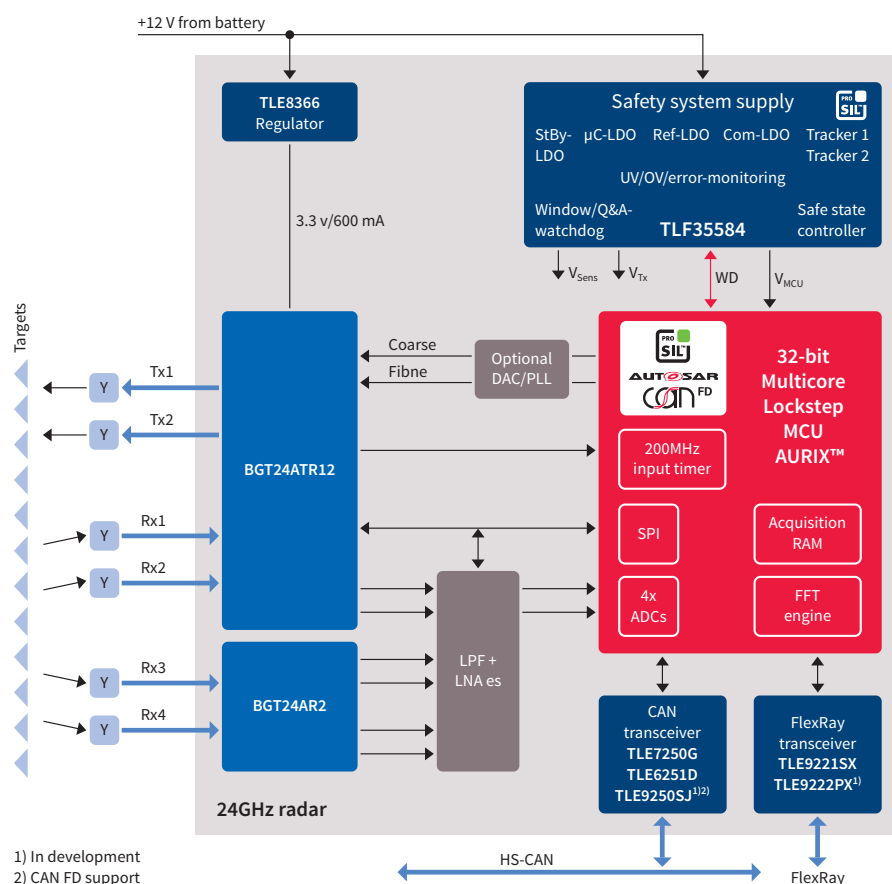   consumption and saves external component costs

Suggested products
› TC27x
› TC26x
› TC23x
› TC22x

Short-range radar (24 GHz) system

Application example

+12 V from battery

TLE8366 Regulator	**Safety system supply** SIL

Safety system supply

StBy-LDO · µC-LDO · Ref-LDO · Com-LDO · Tracker 1 / Tracker 2

UV/OV/error-monitoring

Window/Q&A-watchdog · **TLF35584** · Safe state controller

3.3 v/600 mA

V_{Sens} · V_{Tx} · WD · V_{MCU}

Targets

Tx1 · Tx2

Coarse / Fibne — Optional DAC/PLL

32-bit Multicore Lockstep MCU AURIX™

PRO SIL · AUTOSAR CAN FD

200MHz input timer

SPI · Acquisition RAM

4x ADCs · FFT engine

BGT24ATR12

Rx1 · Rx2 · Rx3 · Rx4

LPF + LNA es

BGT24AR2

CAN transceiver **TLE7250G TLE6251D TLE9250SJ**[1)2)]

FlexRay transceiver **TLE9221SX TLE9222PX**[1)]

24GHz radar

1) In development
2) CAN FD support

HS-CAN · FlexRay

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
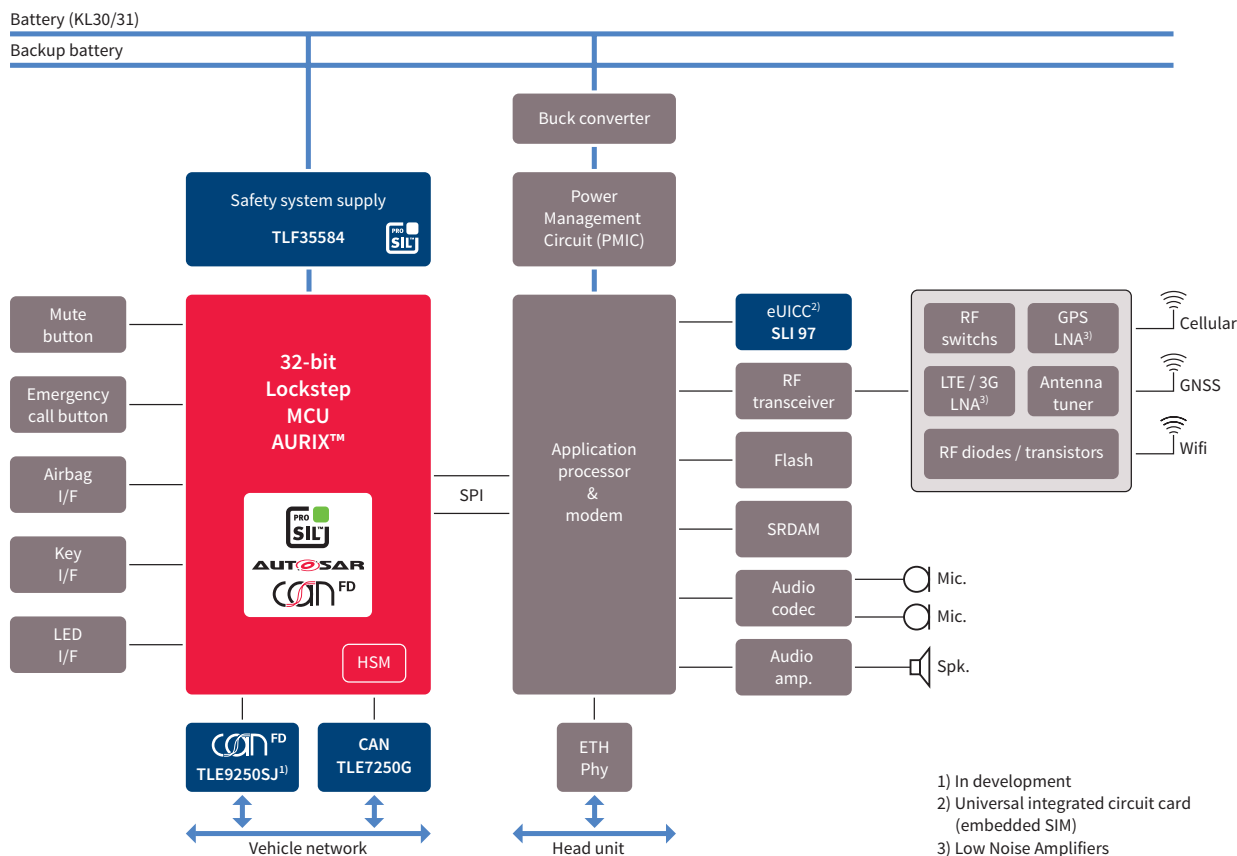› TC23xLA
› TC26xDA
› TC29xTA

PRO SIL™

AURIX™ for connectivity applications

Connectivity electronics systems embrace a broad variety of applications inside the car, covering comfort, safety and security as well as high-performance computing and in-vehicle networking. **This leads to the key strengths of the AURIX™ family**:

› **AUTOSAR** – With AUTOSAR 4, multicore architectures can be easily designed into vehicles. Infineon is one of the first implementers of a multicore architecture with AURIX™ ready for AUTOSAR 4.x. Furthermore, Infineon also provides the MCAL drivers developed according to the CMM 3 level.

› **Power consumption** – Innovative supply concept automatically adapts the power consumption to the actual performance requirements. Furthermore, the new trend of pretended networking and ECU degradation is actively supported.

› **Enhanced communication** – As cars incorporate an increasing amount of electronics, the body electronics module's responsibilities increase to handle the additional components and message traffic. Because of the gateway functionality of the BCM, the AURIX™ has enhanced communication capabilities to support communication between CAN FD, LIN, FlexRay™ and Ethernet buses.

› **Safety** – The trend is toward the integration of safety targets in the requirements of advanced body systems such as lighting, BCM etc. To achieve the required ASIL level according to ISO 26262, AURIX™ has the capability to cover targets up to the highest safety integrity level ASIL-D.

› **Security** – In the future, the need for a high level of security will also expand into body applications. Cars are expected to hold even more information as they become smart cards on wheels for simplifying financial transactions at gas pumps, charging stations, parking lots, toll booths, drive-through shops and more. The vehicle will act as a smart card and pay your fee/fare – sometimes automatically. Hardware-based security is more robust than software-only security. AURIX™ provides a dedicated module, HSM (Hardware Secure Module), to cover the highest level of security.

Telematics control unit for over-the-air updates

Application example

Battery (KL30/31)
Backup battery

Buck converter	
Safety system supply **TLF35584**	Power Management Circuit (PMIC)

Mute button
Emergency call button
Airbag I/F
Key I/F
LED I/F

32-bit Lockstep MCU AURIX™

PRO SIL
AUTOSAR
CAN FD

HSM

SPI

Application processor & modem

eUICC[2] **SLI 97**
RF transceiver
Flash
SRDAM
Audio codec
Audio amp.

RF switchs | GPS LNA[3]
LTE / 3G LNA[3] | Antenna tuner
RF diodes / transistors

Cellular
GNSS
Wifi

Mic.
Mic.
Spk.

CAN FD **TLE9250SJ**[1]
CAN **TLE7250G**
ETH Phy

Vehicle network
Head unit

1) In development
2) Universal integrated circuit card (embedded SIM)
3) Low Noise Amplifiers

The telematics control unit connects the car to the outside world and thereby enables numerous new applications and functionalities. Software in different ECUs can be updated remotely, to either add new features or remove any software bugs that might be found during operation. This reduces the number of recalls and related costs and increases customer satisfaction. The possibility of adding new features opens up the door for new business models and revenue streams.

Application features
› eCall
› Remote diagnostics
› Payment systems
› Software update
› Feature upgrades
› Internet services
› etc.

System benefits
› System supplies, bock converter, active antenna supplies etc.
› Secure elements (eUICC, OPTIGA™ TPM 2.0, SLI 97 V2X etc.)
› RF switches, RF diodes/transistors, low-noise amplifiers (GPS, LTE etc.)
› Silicon microphone

Application features
› TC23x – TriCore™ 32-bit microcontroller
  – Superior Hardware Security Solution (HSM) + functional safety up to ASIL-D (e.g. eCall, V2x communication, software update of safety-critical ECUs)
  – Automotive & consumer interfaces (incl. CAN/-FD, FlexRay, Ethernet etc.)
  – Highly scalable product portfolio (starting with 2 MB & QFP-100 at the lowest end)

High-feature body control module with integrated gateway functionality

Application example
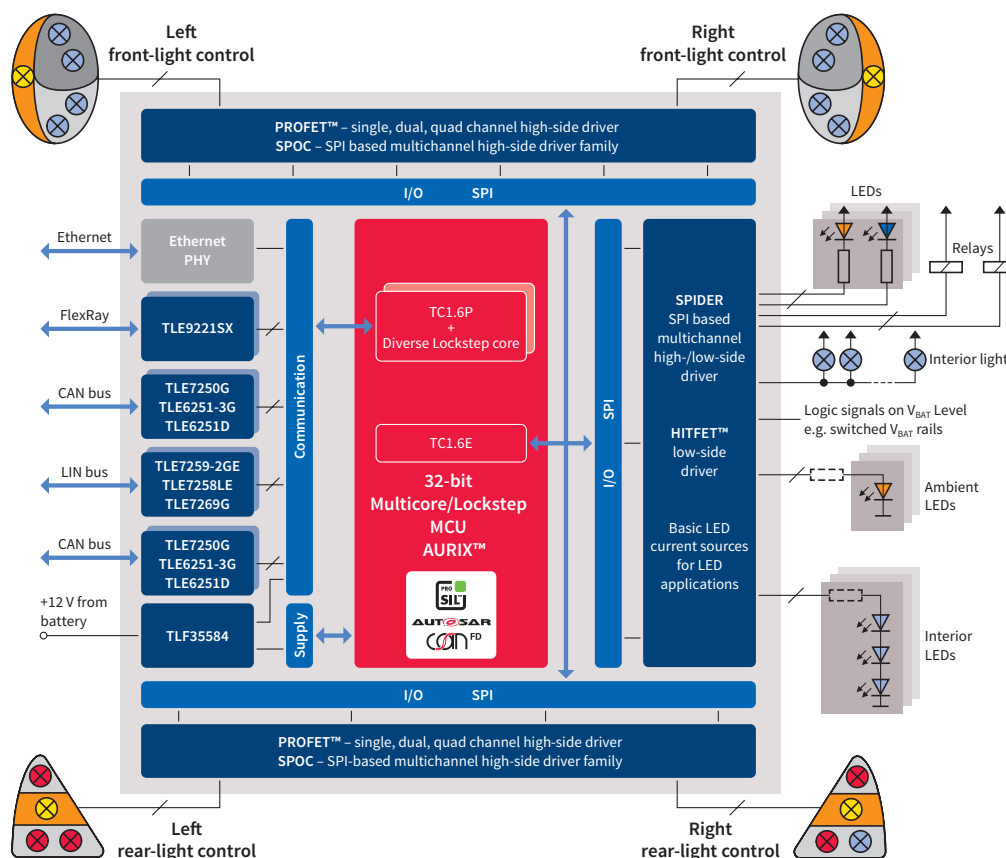
Body Control Module (BCM) application comprising internal and external lighting systems, as well as control of relays and voltage rails and further comfort functions such as door and wiper control. The central gateway manages all internal interfaces (i.e. motor management, in-car entertainment, dashboard or convenience control) and communication with external interfaces for after-sales software updates. The AURIX™ multicore concept enables the integration of two applications in one device, e.g. BCM and gateway.

Application features
› Scalable MCU family from single to multicore
› Encapsulation feature allows software development without interference for multiple applications
› Embedded EEPROM
› Advanced communication peripherals:
  CAN, LIN, SPI, FlexRay, Ethernet
› ISO 26262 conformance to support safety requirements up to ASIL-D
› Availability of AUTOSAR 4.x

System benefits
› Enables pretended networking and ECU degradation
› High integration leads to significant cost savings
› High integration leads to reduced complexity
› ISO 26262 compliance supports ASIL requirements
› Innovative supply concept leads to best-in-class power consumption

Suggested products
› TC29x
› TC23x
› TC22x
› TC21x

AURIX™ for industrial applications

High-performance, multicore and safety-demanding applications

The AURIX™ 32-bit microcontroller family is based on the Infineon TriCore™ high-performance core concept and provides a very high scalability family from single core to multi core.

The AURIX™ family enabling highest integrated safe memory sizes (SRAM up to 2.7 MB and flash memory up to 8 MB) and all memory is protected by hardware Error Correction Code (ECC). The devices reach more than 600 DMIPS at clock rates of up to 300 MHz and combine MCU & DSP instructions with an integrated FPU.

The integrated peripheral set is primarily targeted toward motor control and power conversion providing up to 11 ADCs, DS ADCs and a full set of diverse high-performance timers – namely the General Timer Module (GTM), CapCom 6, GPT12. This is one of the very few in the industry that is able to drive the upcoming three-level inverter topologies.

Furthermore the AURIX™ family supports the latest connectivity like Ethernet, CAN FD, Flexray and multiple other high speed interfaces.

Providing security and functional safety

In a global economy, IP protection and secure communication plays an increasingly important role. This demand is accounted for by the integration of special security modules providing the required means of safe key storage, along with secure boot and encryption on the hardware level. As one of the leaders in functional safety, Infineon has designed the TriCore™ MCUs to meet the growing demand for functional safety in the industrial market as specified in IEC 61508. Via our cooperation partner Hitex, Infineon offers a complete package comprising a microcontroller, safety supply with integrated watchdog TLF35584, software and documentation, achieving safety integrity levels up to SIL3.

The next generation of TriCore™-based microcontrollers – AURIX™ – will provide another significant performance milestone by integrating up to three cores in one device. The multicore concept is targeted at running concurrent applications in parallel. Some of the integrated cores integrate lockstep functionality and the peripherals can be allocated to individual cores. This allows running a combination of safety-critical tasks, such as controlling an inverter, with non-critical tasks, such as network communication, on a single MCU.

Wind turbine inverter

Application example
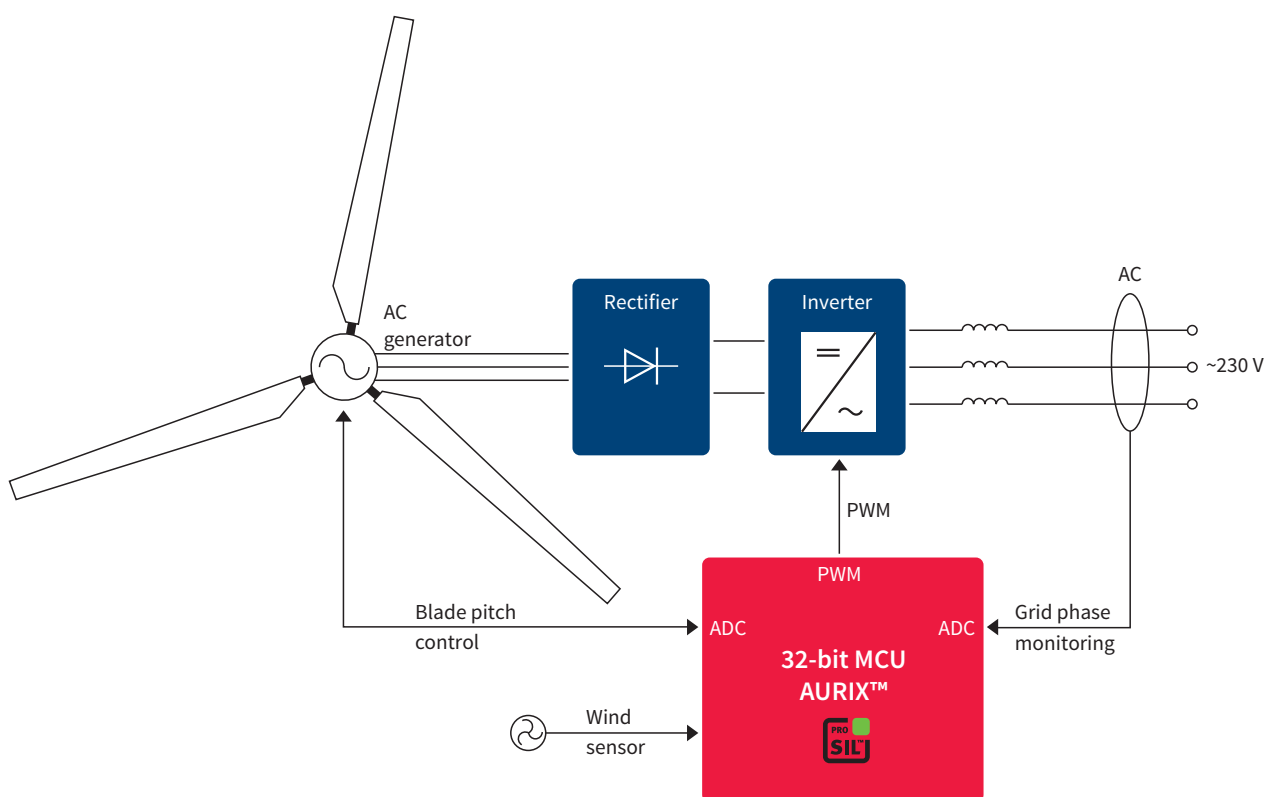
Application features
› Reliable blade pitch control
› Increased wind turbine efficiency
› Multiple modulation strategies (SVPWM, DPWM,
  soft-PWM, direct torque control) to support requirements
  for reduced noise emissions and increased efficiency
› Multiprocessor support for reliability and safety
› Support for 3-level inverter topologies

Suggested products
› TC26xD – TriCore™ 32-bit microcontroller
› TC27xT – TriCore™ 32-bit microcontroller

System benefits
› Diverse timer architecture: generic timer module (GTM),
  CCU6, GPT12
› 8 SAR-ADCs 12-bit resolution, 1 MSPS
› DS-ADC
› Resolver I/F
› Encoder I/F with digital noise filter
› IEC 61508 support - Integrity Level (SIL) 1 to 3
› Innovative single power supply concept