



# Driving the Future of Automotive Electronics

## Automotive Application Guide





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# Driving the Future of Automotive Electronics

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Infineon Technologies is a leading player and pioneer in automotive electronics. Our enduring success in this field is due to a clear strategic focus on automotive applications and standards, the understanding and insights that have emerged from over 40 years of dedicated experience and our ability to continually innovate this market with a broad portfolio of outstanding quality. Our sensors, microcontrollers and power semiconductors help automotive manufacturers achieve their increasingly challenging safety, affordability and efficiency targets. Above all, we are helping to create more sustainable mobility choices by lowering emissions and fuel consumption.

## Reducing road fatalities

New Car Assessment Programs (NCAP) all over the world and Governments are targeting to reduce road fatalities. The automotive industry actively contributes to road safety by developing and evolving technologies that reduce the likelihood or impact of accidents, for example through improvement of reactive airbag and stability control systems. Similarly, new active safety features include adaptive cruise control and lane departure warning, where the vehicle acts proactively before a crash happens.

Infineon is continuously optimizing the chipsets that enable the safety features designed to reduce the number of road accidents. Having the most rigorous EuroNCAP in mind, we lead the field in many safety innovations for passive, active and preventive safety Systems like RADAR technologies.

## Paving the way for more sustainable mobility choices

In an increasingly mobile society, carbon dioxide emissions are rising and fossil fuel reserves are dwindling. The automotive industry faces the challenge of powering today's mobile lifestyle while simultaneously reducing its carbon footprint. Electronic components play a key role in increasing energy efficiency.

The demand for alternative, more energy-efficient forms of mobility is increasingly geared toward electromobility. Drivetrain electrification, whether in hybrid electric vehicles or – ultimately – fully electric vehicles, has the advantages of higher energy efficiency and zero tailpipe emissions. As the world leader in automotive and advanced power electronics, with over ten years of experience in electromobility, Infineon delivers a broad suite of best-in-class microcontrollers, power semiconductors and sensors that are helping to solve today's electromobility challenges.



As we transition toward greater electromobility, Infineon is also working with leading car manufacturers and system suppliers to improve the energy efficiency of combustion engines and the various subsystems in today's vehicles. We offer a range of dedicated products and solutions targeting hotspots such as demand-driven accessories, energy management and electric power distribution. These solutions embody Infineon's commitment to the exceptional quality and reliability that the world's leading vehicle manufacturers expect.

## Meeting increased data security demands

As system complexity increases in cars, so too does the volume of data to be processed and distributed. Automakers therefore need to ensure that information is processed securely and protected against external access and manipulation (e.g. car tuning or counterfeit spare parts). Furthermore, new payment methods, such as parking fees or road tolls, require a secure flow of transaction data. Infineon can draw on years of expertise in chip card and identification systems to propel automotive data security to the next level.

## Complying with functional safety requirements

The increasing number of electronic systems leads to more and more considerations regarding the functional safety of vehicle systems. Infineon has adopted the ISO Standard 26262 to design the appropriate products but also to set up the appropriate processes for developing such products.





# Safety Applications

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Both customer demands and government legislation continue to improve traffic safety. Electric and Electronic Safety Systems play a key role in this trend. Electric power steering is a good example of how a safety application perfectly unites with improved fuel efficiency and enhanced comfort.

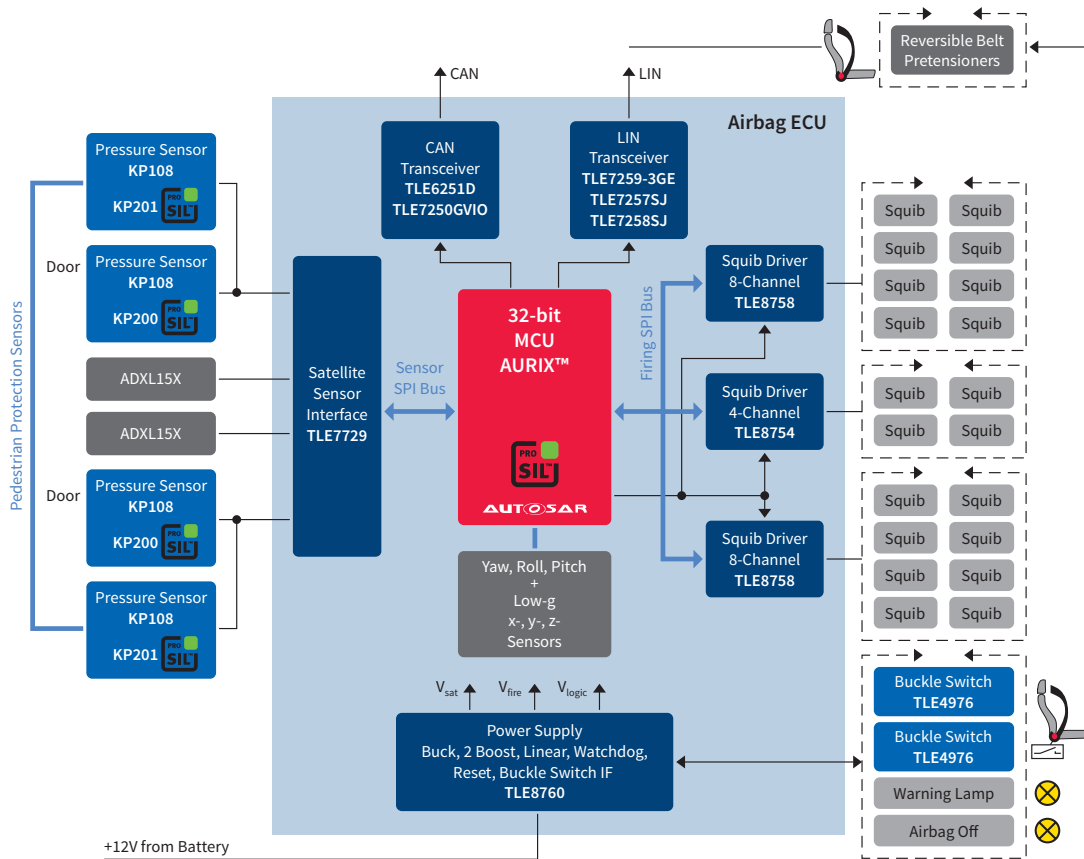
Infineon is the broadest supplier with a portfolio extending from intelligent sensors and microcontrollers through automotive power standard products and application-specific standard products (ASSPs) to highly integrated customized application-specific ICs (ASICs). This comprehensive product portfolio – combined with our application expertise gained during four decades of activity in the automotive industry – means we are ideally positioned to help customers overcome their key challenges. These challenges include ongoing application optimization plus the implementation of new features to meet stringent safety requirements. The ISO 26262 safety standard is one example of the exacting standards that apply today.

To help customers to efficiently reach the desired Automotive Safety Integrity Level (ASIL) certification, Infineon has already introduced its own PRO-SIL™ concept. This trademark clearly identifies the products which contain SIL-supporting features. The Infineon PRO-SIL™ concept includes safety-focused organization and business processes to generate hardware and software safety features, including safety documentation.

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. The ISO 26262 mandates more robust and comprehensive product development processes and functional safety concepts in automotive applications.

Infineon's PRO-SIL™ concept enables efficient ISO 26262-compliant safety application development. Across the full certification spectrum from Automotive Safety Integrity Levels ASIL-A to ASIL-D, our end-to-end PRO-SIL™ approach will help you with the assurance that Infineon hardware, software and functional safety concepts meet your design and compliance needs.

# Airbag System



## System Benefits

- Airbag systems are standard in most cars and are mandatory equipment in many countries, saving thousands of lives
- Infineon’s broad product spectrum supports scalability and flexibility for building systems from 4 to over 20 firing loops
- Full range of airbag ASSPs ranging from pressure sensors for side crash detection to driver and transceiver ICs
- High performance 32-bit AURIX™ MCU family with dedicated safety enables integration of multiple functions
- The parts are optimized in terms of system interoperability as well as best price-performance ratio
- This systems are mandatory to achieve highest possible scores in the various “New Car Assessment Programs” (NCAP) throughout the world and are even legislated in some countries

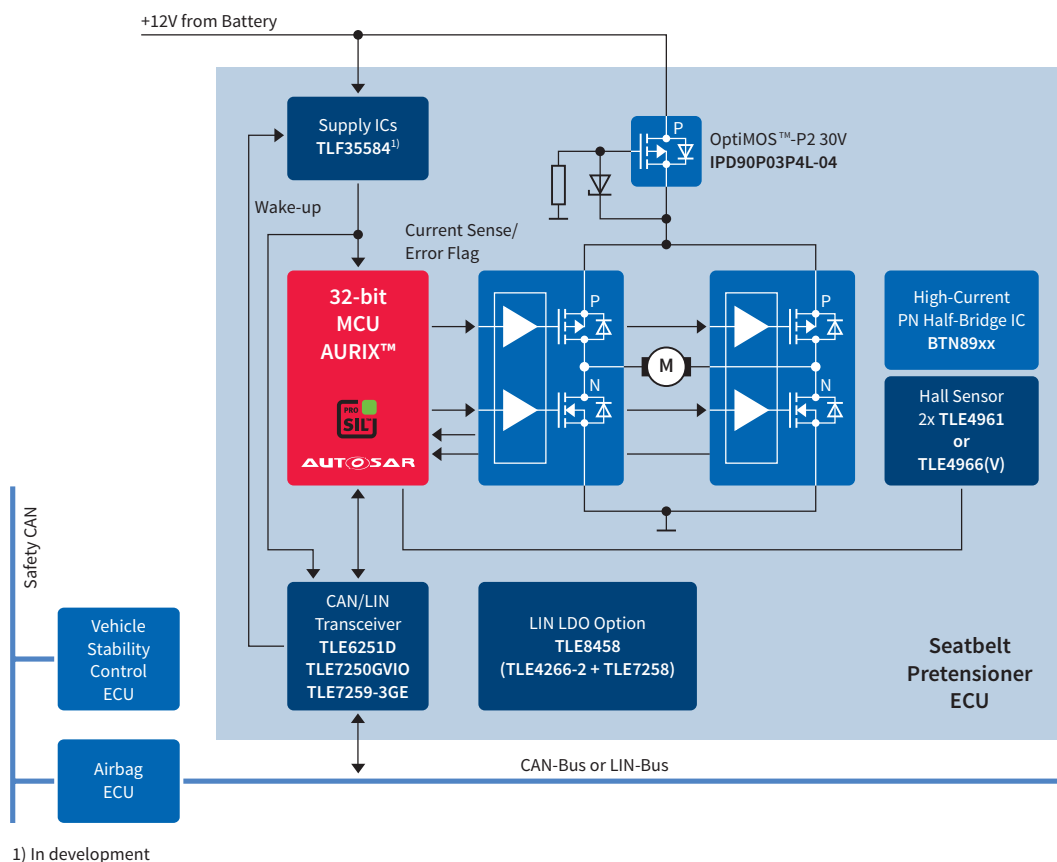
## Suggested Products

Product	Description
AURIX™	32-bit high-performance microcontroller family (PRO-SIL™)
TLE8754/8758	Airbag deployment ASSPs
TLE7729	Airbag satellite receiver
TLE6251D/TLE7250GVIO	CAN transceivers
TLE7259-3GE	LIN transceiver
KP108	Application-specific sensor for side airbag pressure sensing
KP200	Application-specific sensor for side airbag pressure sensing; fully PSi5-compliant (PRO-SIL™)
KP201	Application-specific sensor for pedestrian protection sensing (PRO-SIL™)
TLE4976	Hall switches for buckle switch application





# Reversible Seatbelt Pretensioner



## System Benefits

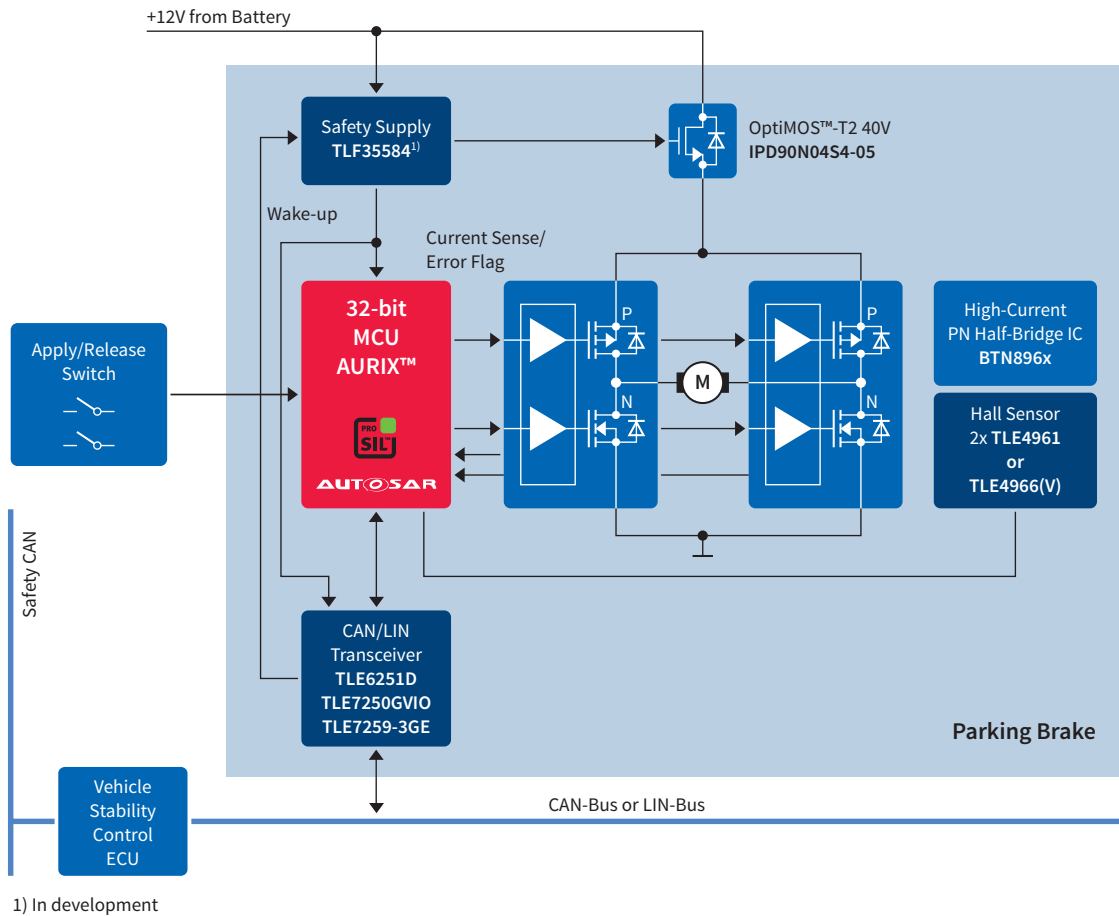
- Seatbelts are still the primary safety feature for protecting car passengers from severe harm
- Correct belt tension before a crash reduces the severity of injuries while also increasing passenger comfort during normal use
- Safety experts predict that reversible seatbelt pretensioners will become mainstream in the future
- The illustration shows the partitioning of an Infineon system solution for this application which includes supply, microcontroller, sensor, power and communication ICs

## Suggested Products

Product	Description
AURIX™	High-performance 32-bit multicore microcontroller family (PRO-SIL™)
TLF35584	System power supply with integrated watchdog (PRO-SIL™)
TLE6251D/TLE7250GVIO	CAN transceivers
TLE7259-3GE	LIN transceiver
TLE4961/TLE4966(V)	Hall switches for position/rotation sensing & rotor index counting
BTN89xx	High-current PN half-bridge ICs



# Electric Parking Brake



## System Benefits

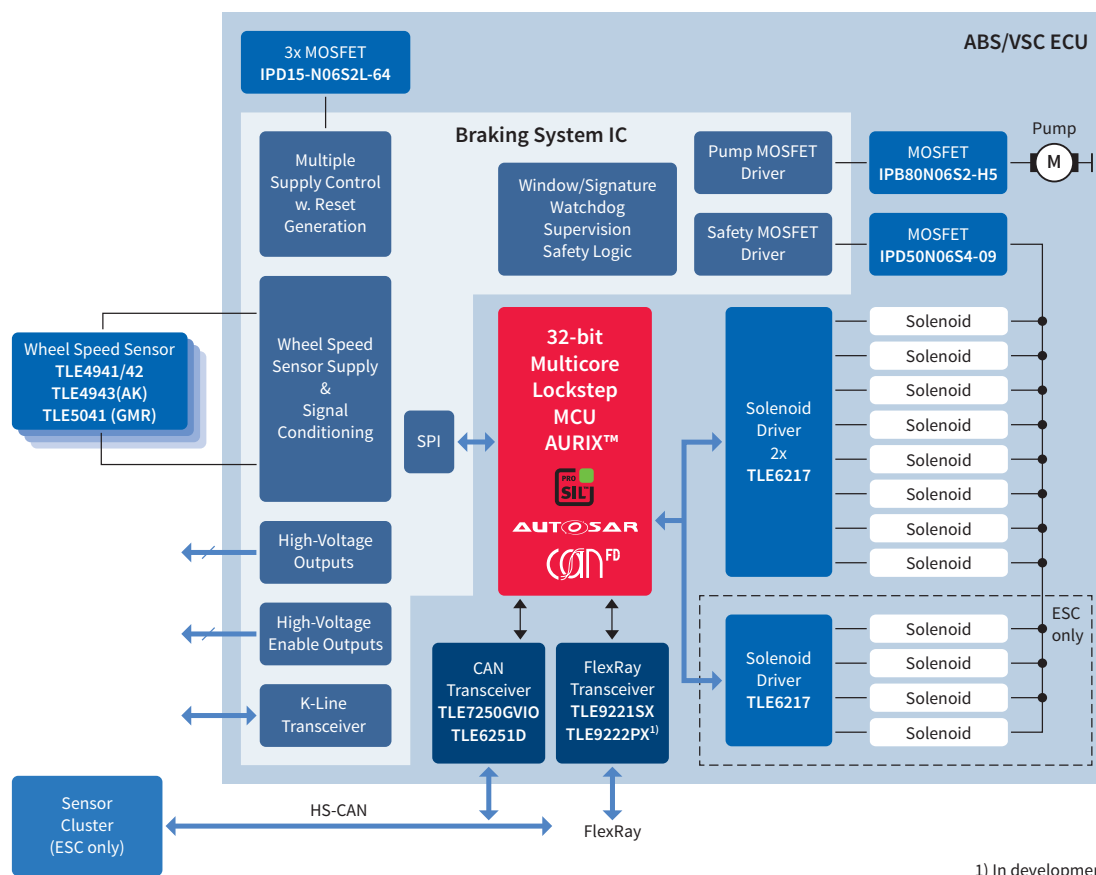
- The electric parking brake provides drivers with many more comfort and convenience features than the standard mechanical system
- Hill hold, launch control, roll-away prevention are possible
- These convenience features are in many cases safety-relevant and therefore should be implemented using safety-compliant hardware (according ISO 26262)

## Suggested Products

Product	Description
AURIX™	High-performance 32-bit multicore microcontroller family (PRO-SIL™)
TLF35584	System power supply with integrated watchdog (PRO-SIL™)
TLE6251D/TLE7250GVIO	CAN transceivers
TLE7259-3GE	LIN transceiver
TLE4961/TLE4966(V)	Hall switches for position/rotation sensing & rotor index counting
BTN89xx	High-current PN half-bridge ICs



# Braking



## System Benefits

- Vehicle stability control systems can be found in all car classes on our roads, providing safety while reducing braking distances and keeping the car under control in critical situations
- These systems are mandatory in order to achieve the highest possible scores in the various “New Car Assessment Programs” (NCAP) throughout the world and are even legislated in some countries
- Infineon’s range of products for braking systems stretches from scalable microcontrollers, state-of-the-art wheel speed sensors, CAN and FlexRay transceivers to MOSFETs and valve drivers

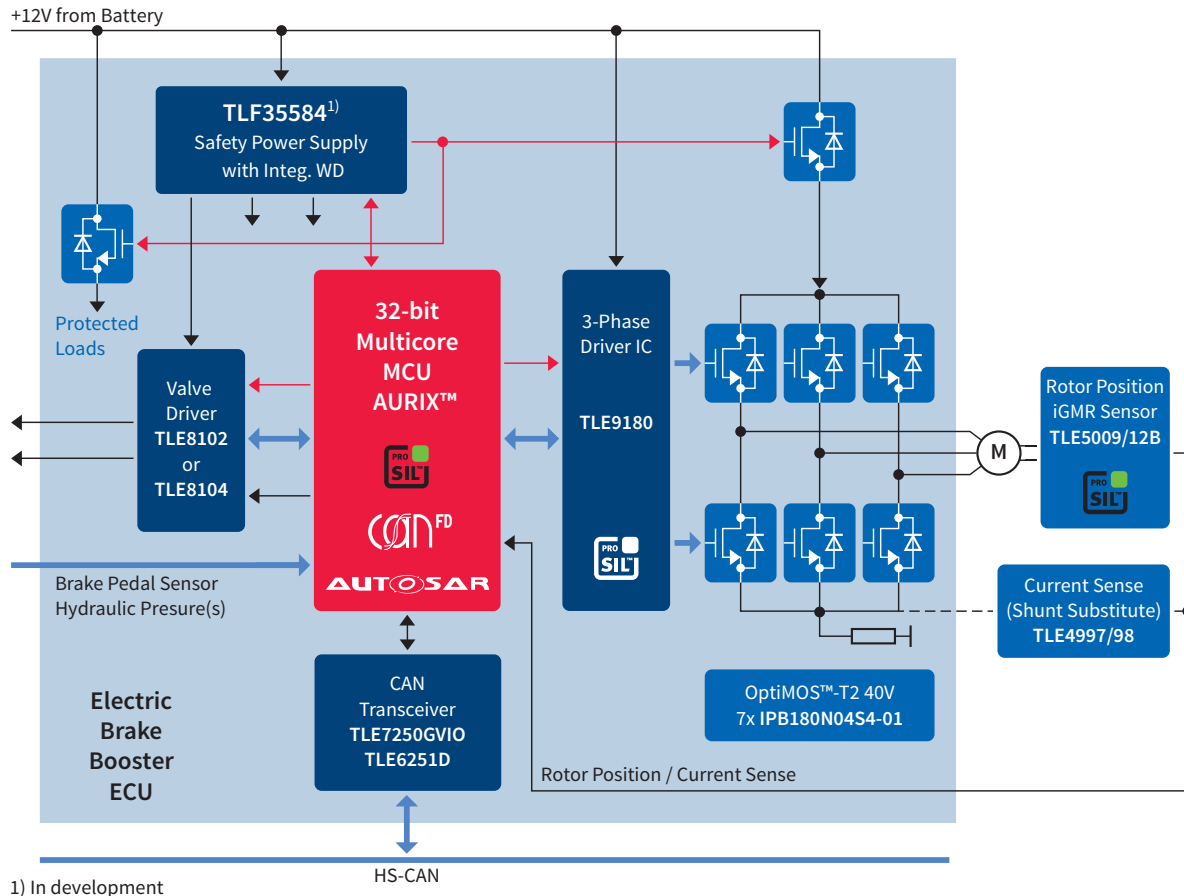
## Suggested Products

Product	Description
AURIX™	High-performance 32-bit multicore microcontroller family (PRO-SIL™)
TLE6251D, TLE7250GVIO	CAN transceivers
TLE6217	Quad solenoid driver
IPD60Nxxx	OptiMOS™ n-channel MOSFET family
TLE4941/42, TLE5041	Wheel speed sensors





# Electric Brake Booster



## System Benefits

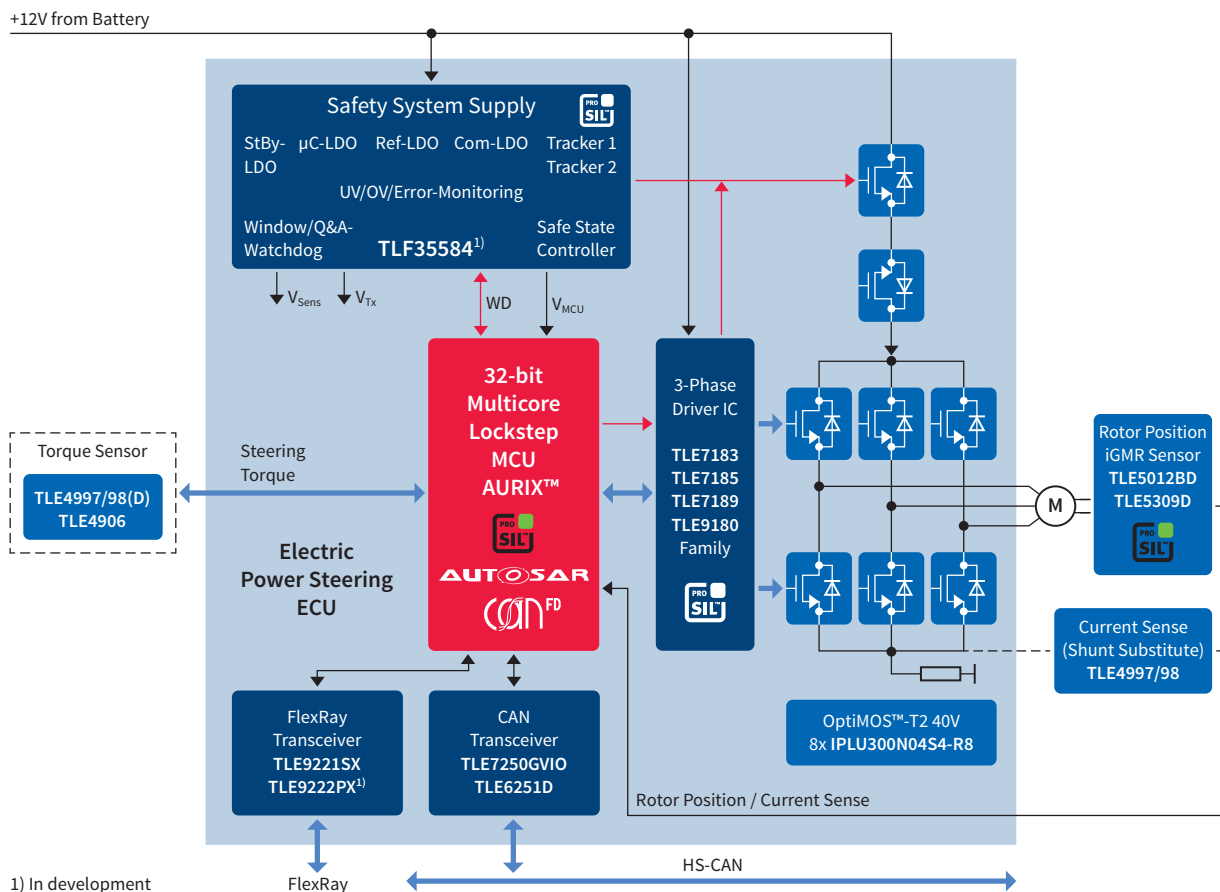
- Next-generation drivetrains, such as hybrid and electric vehicles and even today's highly efficient combustion engines, require a new braking assistance system
- Current systems are mainly dependent on vacuums generated by the combustion engine or vacuum pumps, which use up electrical energy as well as package space under the hood and are not flexible enough for the driver assistance systems of tomorrow
- The above illustration shows the new concept of a fully electric brake booster, incorporating vehicle stability control functionality with an efficient and flexible design

## Suggested Products

Product	Description
AURIX™	High-performance 32-bit multicore microcontroller family (PRO-SIL™)
TLF35584	System power supply with integrated watchdog (PRO-SIL™)
TLE9180	3-phase bridge driver IC for automotive safety applications (PRO-SIL™)
TLE6251D/TLE7250GVIO	CAN transceivers
TLE9221SX	FlexRay transceiver
IPB180N04S4-01	OptiMOS™-T 40V n-channel MOSFET family, optimized for EPS applications
TLE499x	Linear Hall sensor family for torque and current sensing
TLE5009/12	iGMR sensors for rotor position sensing



# Electric Power Steering (EPS)



## System Benefits

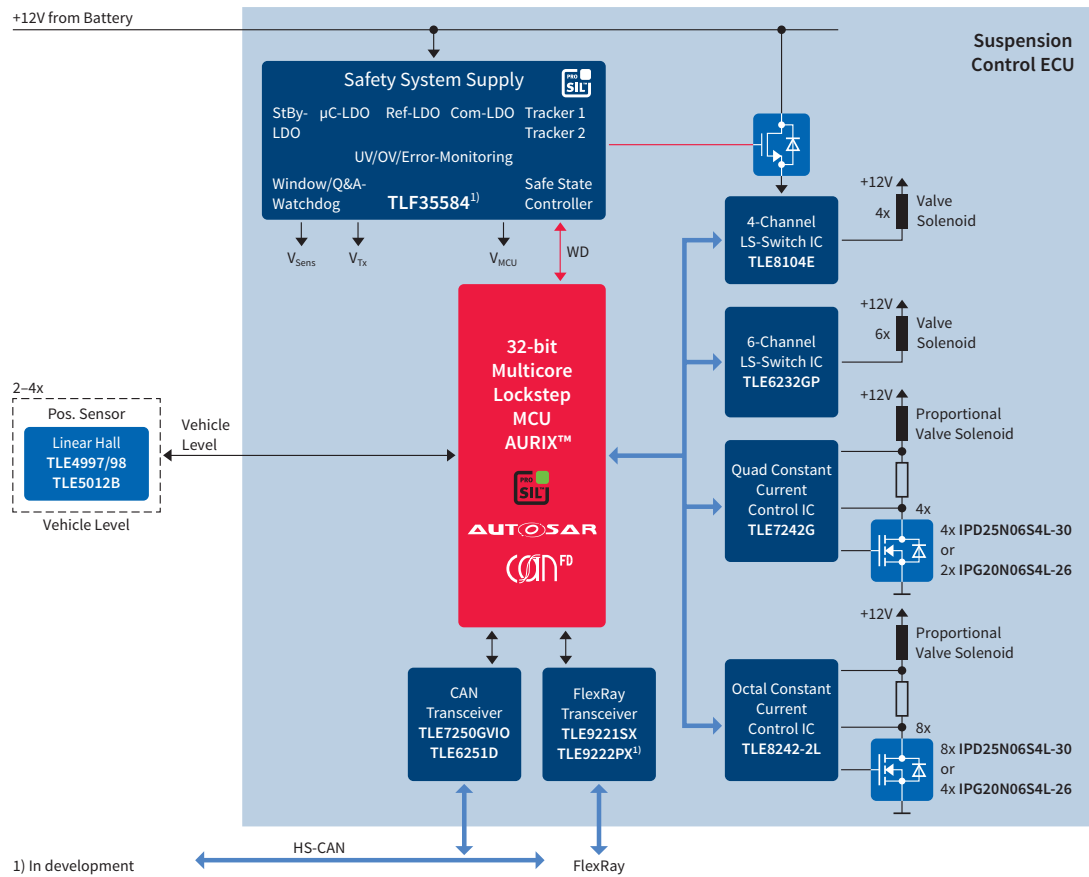
- Electric Power Steering (EPS) improves fuel efficiency by approximately 3% while having a positive effect on car handling, the overall driving experience and comfort
- It combines a compact design with reduced mounting costs
- EPS can be adapted via software to suit diverse car models as well as dedicated driving modes
- EPS is the steering technology needed to enable advanced driver assistance systems such as side-wind compensation, lane assist/keeping and parking assistance systems
- Infineon has over ten years of experience in this exciting application and provides the full range of ICs, from sensors to microcontrollers, and from bridge drivers to world-class MOSFETs

## Suggested Products

Product	Description
AURIX™	High-performance 32-bit multicore microcontroller family (PRO-SIL™)
TLF35584	System power supply with integrated watchdog (PRO-SIL™)
TLE718x	3-phase bridge driver IC family for EPS
TLE9180	3-phase bridge driver IC for automotive safety applications (PRO-SIL™)
TLE6251D/TLE7250GVIO	CAN transceivers
TLE9221SX	FlexRay transceiver
IPB180N04S4-01	OptiMOS™-T 40V n-channel MOSFET family in TOLL package, optimized for EPS applications
TLE499x	Linear Hall sensor family for torque and current sensing
TLE5009/12	iGMR sensors for rotor position sensing



# Active Suspension Control System



## System Benefits

- Advanced suspension systems originally used in high-end sports and luxury cars are now prevalent in the mid-market car segment
- By adapting both the vehicle's level and damping characteristics, these systems significantly improve car comfort, handling performance and driving safety
- Infineon's broad product spectrum – including high-end 32-bit microcontrollers as well as multi-channel drivers for bistable and analog valves – can cover the full range of suspension systems, ranging from car/load leveling, semi-active to active suspension and air-suspension systems

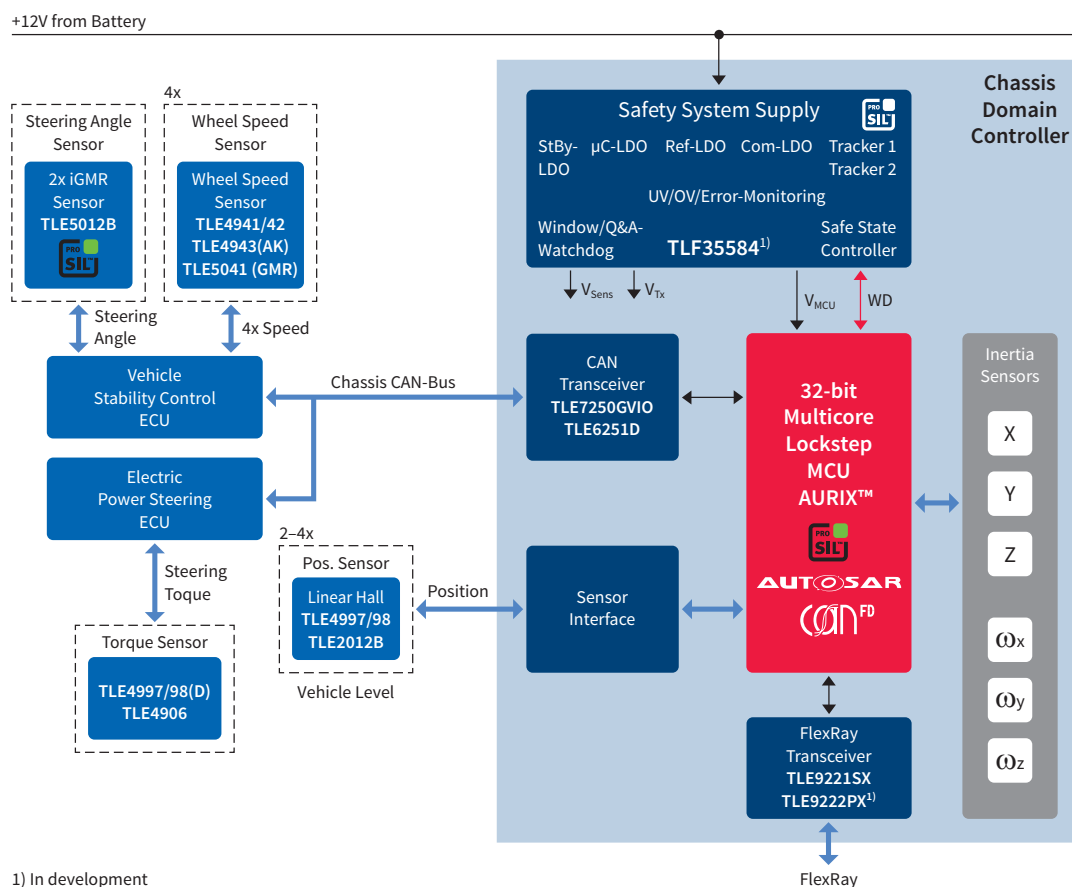
## Suggested Products

Product	Description
AURIX™	High-performance 32-bit multicore microcontroller family (PRO-SIL™)
TLF35584	System power supply with integrated watchdog (PRO-SIL™)
TLE6232GP	6-channel low-side switch IC
TLE8104E	4-channel low-side switch IC
TLE7242G	Quad constant current pre-driver IC
TLE6251D/TLE7250GVIO	CAN transceivers
TLE9221SX	FlexRay transceiver
TLE8242-2L	Octal constant current pre-driver IC
TLE4997/98	Linear Hall sensors for vehicle level sensing





# Chassis Domain Control



## System Benefits

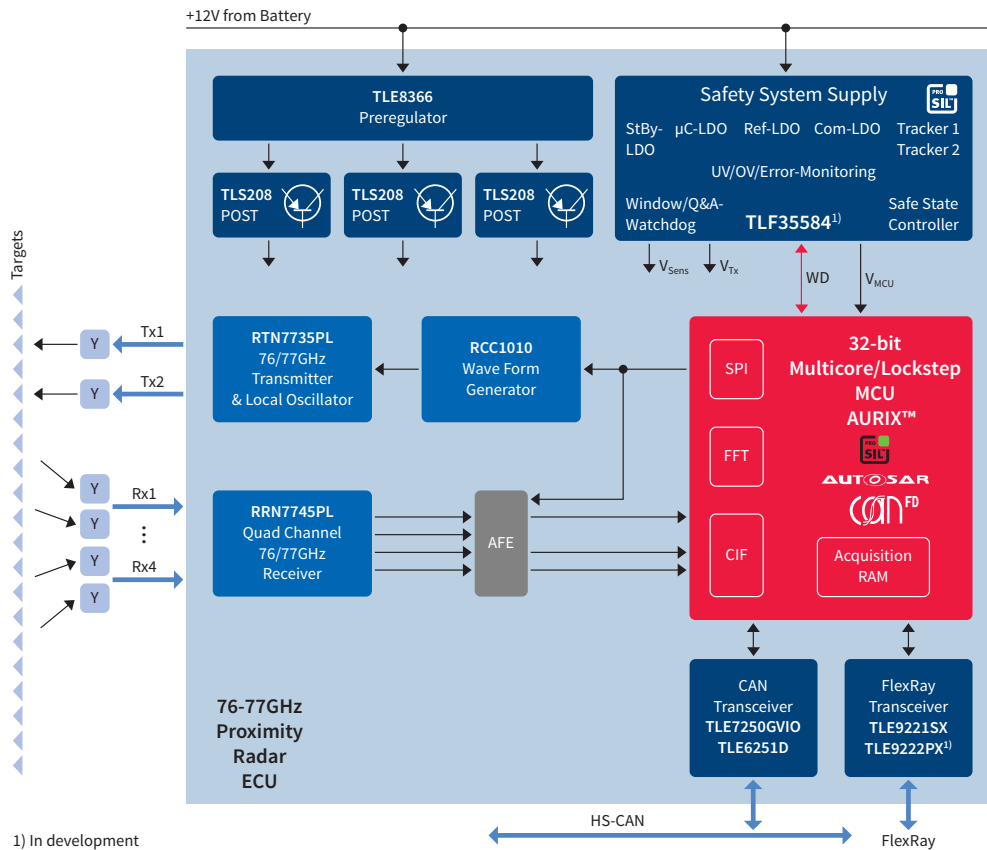
- The chassis domain control approach provides a high-performance, scalable and safe computing platform, including the sensor-cluster with all its multi-axle inertia sensors
- Domain controllers allow a cost-efficient x-check and fusion of the inertia sensor signals, as well as highly efficient and safe computing of the vehicle dynamic model
- Consequently, the chassis domain control unit represents a promising approach to perfectly coordinating functions such as VSC, semi-active suspension and drivetrain, especially when four-wheel drive with torque vectoring is required

## Suggested Products

Product	Description
AURIX™	High-performance 32-bit multicore microcontroller family (PRO-SIL™)
TLF35584	System power supply with integrated watchdog (PRO-SIL™)
TLE6251D/TLE7250GVIO	CAN transceivers
TLE9221SX	FlexRay transceiver
TLE5012	iGMR sensor with integrated 8-bit microcontroller
TLE4997/98	Linear Hall sensors



# Automotive 77GHz Radar System



## System Benefits

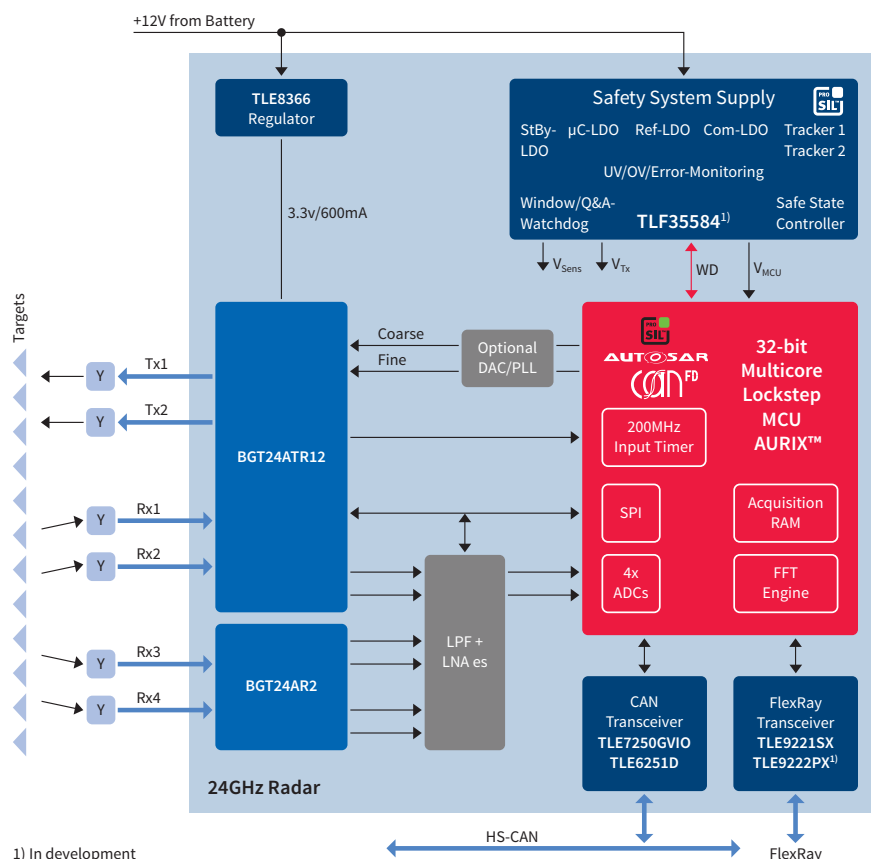
- Automotive radar sensors are a key technology for enabling future driver assistance functions and securing high ratings in the New Car Assessment Programs (NCAP) throughout the world
- The Radar System IC (RASIC™) series consists of a group of highly integrated functions for the 76–77GHz frequency range for automotive long and midrange radar systems
- The ICs offer a high level of integration and need only a few – if any – external components
- Infineon’s SiGe process benefits from its origins in the volume bipolar segment. Its most unique features are its high-frequency capability and robustness, which make it suitable for automotive environments across the full temperature range up to full automotive qualification according to AEC-Q100
- Infineon’s AURIX™ 32-bit multicore ADAS derivative offers a dedicated feature set for radar applications which, in many cases, renders additional DSP, external SRAM and external ADC ICs obsolete. This results in cost-efficient short-range radar implementation

## Suggested Products

Product	Description
AURIX™	Powerful 32-bit multicore microcontroller family with dedicated ADAS features (PRO-SIL™)
TLF35584	System power supply with integrated watchdog (PRO-SIL™)
TLE6251D/TLE7250GVIO	CAN transceivers
TLE9221SX	FlexRay transceiver
RTN7730	76/77GHz radar 2-channel transmitter IC
RRN7740	76/77GHz radar 4-channel receiver IC
RCC1010	Wave form generator IC



# Automotive 24GHz Radar System



## System Benefits

- Infineon’s 24GHz radar technology offers a cost-efficient solution for driver assistance systems such as autonomous emergency braking and blind spot detection
- The Infineon 24GHz transceiver is a highly integrated, SPI-controlled solution consisting of a VCO, medium power amplifier, power amplifier, frequency dividers, several sensors and two complete IQ receivers
- The signal generation unit is a standalone transmitter MMIC with the fully integrated IQ twin-receiver MMIC, in which two complex homodyne down-conversion mixers are combined; a lot of different system architectures can be served by combining the individual components
- With its SiGe-based technology, Infineon is the first big market player to offer a competitive solution with a long-term roadmap approach for any kind of short-range radar ADAS applications
- Infineon’s AURIX™ 32-bit multicore ADAS derivative offers a dedicated feature set for radar applications which, in many cases, renders additional DSP, external SRAM and external ADC ICs obsolete. This results in cost-efficient short-range radar implementation

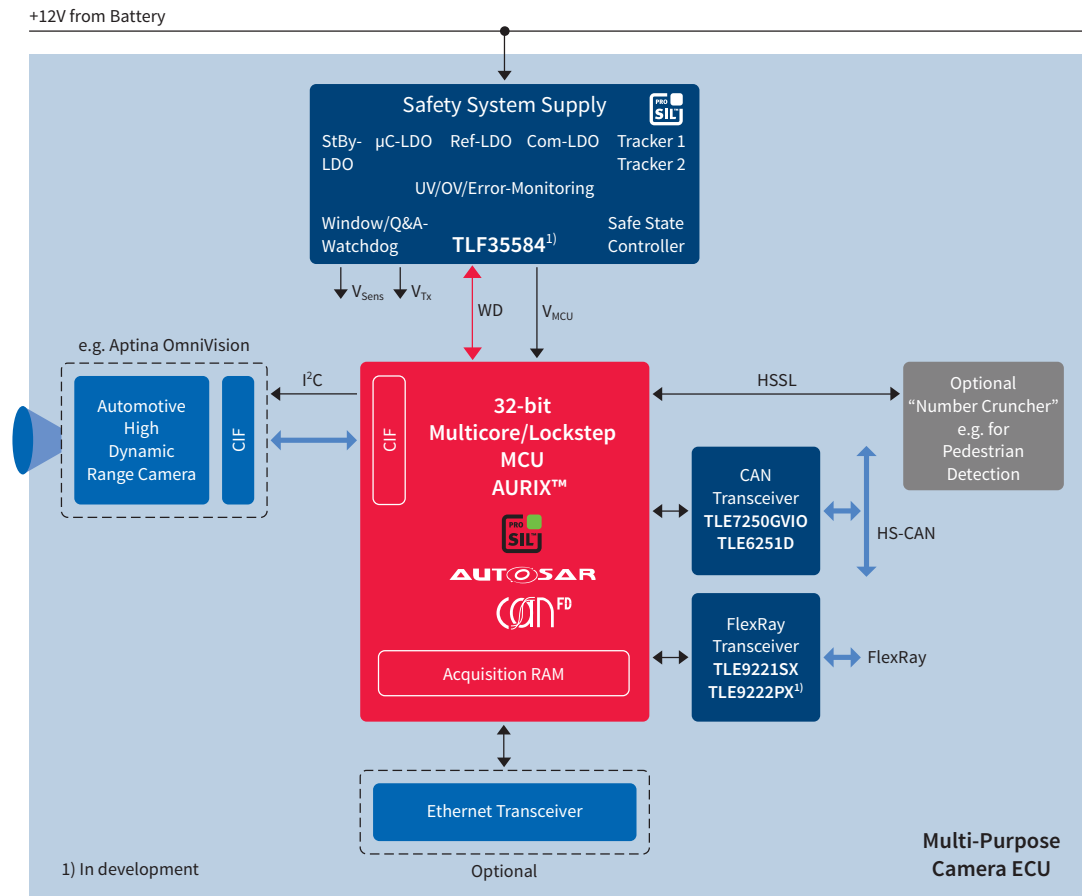
## Suggested Products

Product	Description
AURIX™	Powerful 32-bit multicore microcontroller family with dedicated ADAS features (PRO-SIL™)
TLF35584	System power supply with integrated watchdog (PRO-SIL™)
TLE6251D/TLE7250GVIO	CAN transceivers
TLE9221SX	FlexRay transceiver
BGT24AR2	24GHz radar 2-channel receiver IC
BGT24ATR12	24GHz radar 1-channel transmitter, 2-channel receiver IC





# Multi-Purpose Camera



## System Benefits

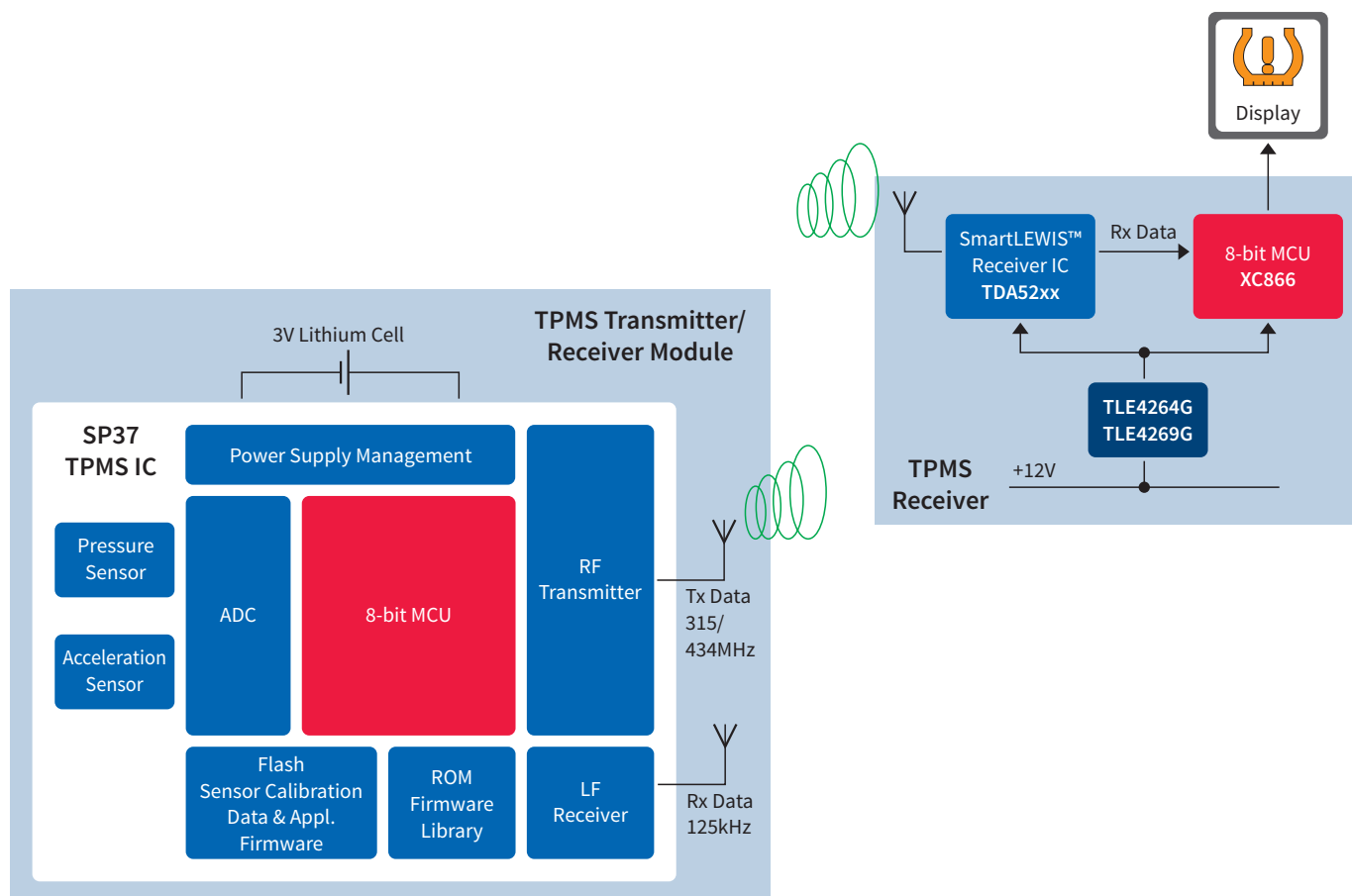
- The market for automotive cameras is quickly growing, enabling advanced driver assistance functions such as lane departure warning, forward collision warning, traffic sign recognition and pedestrian recognition
- Infineon offers a highly integrated solution to enable compact and efficient camera systems for the next generation of assistance functions
- This includes ISO 26262 support, innovative supply concepts and best-in-class power consumption
- AURIX™ multicore architecture includes encapsulation features to support freedom from interference between multiple applications

## Suggested Products

Product	Description
AURIX™	High-performance 32-bit multicore microcontroller family (PRO-SIL™)
TLF35584	System power supply with integrated watchdog (PRO-SIL™)
TLE6251D/TLE7250GVIO	CAN transceivers
TLE9221SX	FlexRay transceiver



# Tire Pressure Monitoring System (TPMS)



## System Benefits

- TPMS ensures correct tire pressure, which is essential for car safety, handling, comfortable driving and tire lifetime
- Furthermore, accurate tire pressure prevents increased fuel consumption/CO<sub>2</sub> emissions
- TPMS is already mandatory in the USA, EU and South Korea
- Infineon’s TPMS IC SP37 provides
  - Various surveillance functions ensuring reliable measurements
  - Pre-calibrated pressure sensor system for instant use
  - Fully packaged sensor system proven to withstand harsh automotive environments
  - Microcontroller-based architecture enabling flexible system design
  - High level of integration for reducing overall system component count
  - Increased tire lifetime of up to 30%

## Suggested Products

Product	Description
XC8xx	8-bit microcontroller family with dual-cycle 8051 core
Supply ICs	Linear voltage regulators, DC/DC converters
TDA52xx	SmartLEWIS™ RX autonomous receiver
TDK51xx	Wireless control transmitter
SP37	Highly integrated TPMS with integrated microcontroller and RF transmitter for pressure ranges 450kPa, 900kPa, 1300kPa (trucks)



## Body Applications

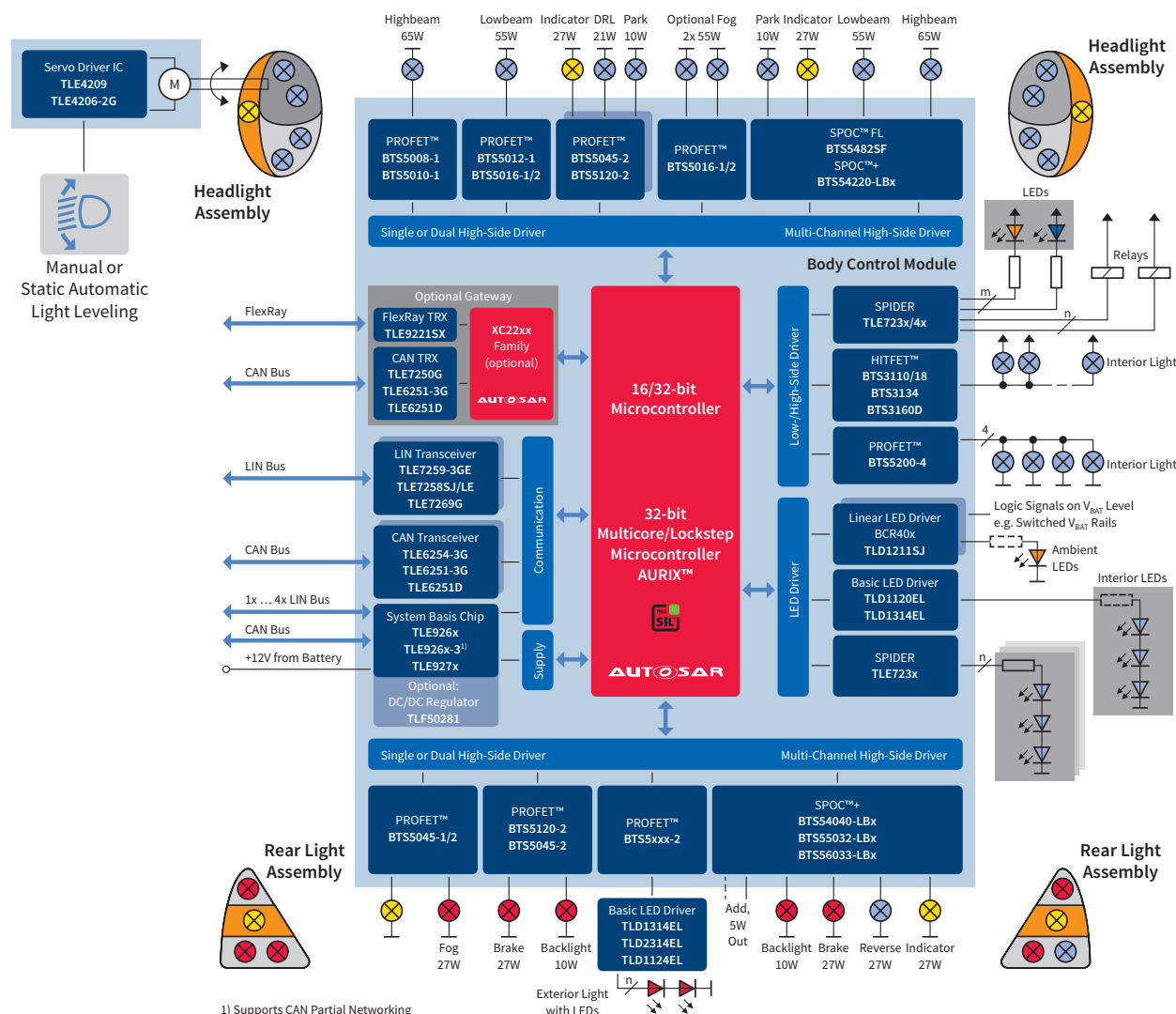
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Infineon offers a wide variety of products dedicated to body and interior electronics. These include protected power switches for bulb and motor control, dedicated system basis chips and easy-to-use Hall sensor solutions. Our powerful 16/32-bit XC2200 family and our low-cost 8-bit XC800 family deliver all the intelligence required at the heart of today's automotive body systems. The new TriCore™-based AURIX™ family provides sufficient performance, as well as dedicated safety and security features, to meet the needs of upcoming domain electronics modules. As one example, a **High-Feature Body Control Module with integrated Gateway** functionality is shown on page 22.

The following pages present well-known electronic modules for car body interior and comfort systems, such as the **Body Control Modules** including a dedicated low-cost version, the **Seat Electronics Module** and the **HVAC Control Module**. Further modules reveal the growing trend towards decentralized modules at the point of load, such as a **Front Light Module** or a **Smart Window Lift Module**.

Some new electronic module designs reflect the latest functional and architectural advances. One prominent example is a **Power Distribution System** for high-current applications supporting the trend to more advanced and efficient wiring harness systems in start/stop-capable vehicles. Another example is an **Interior Light Module with touch-sensitive control** based on a similar man-machine interface to that featured in the latest consumer electronics devices. Finally, the growing family of system-on-chip devices supports space- and cost-optimized single-chip solutions for various motor control applications, such as window lift, fuel pump and HVAC blower.

# Central Body Control Module



## System Benefits

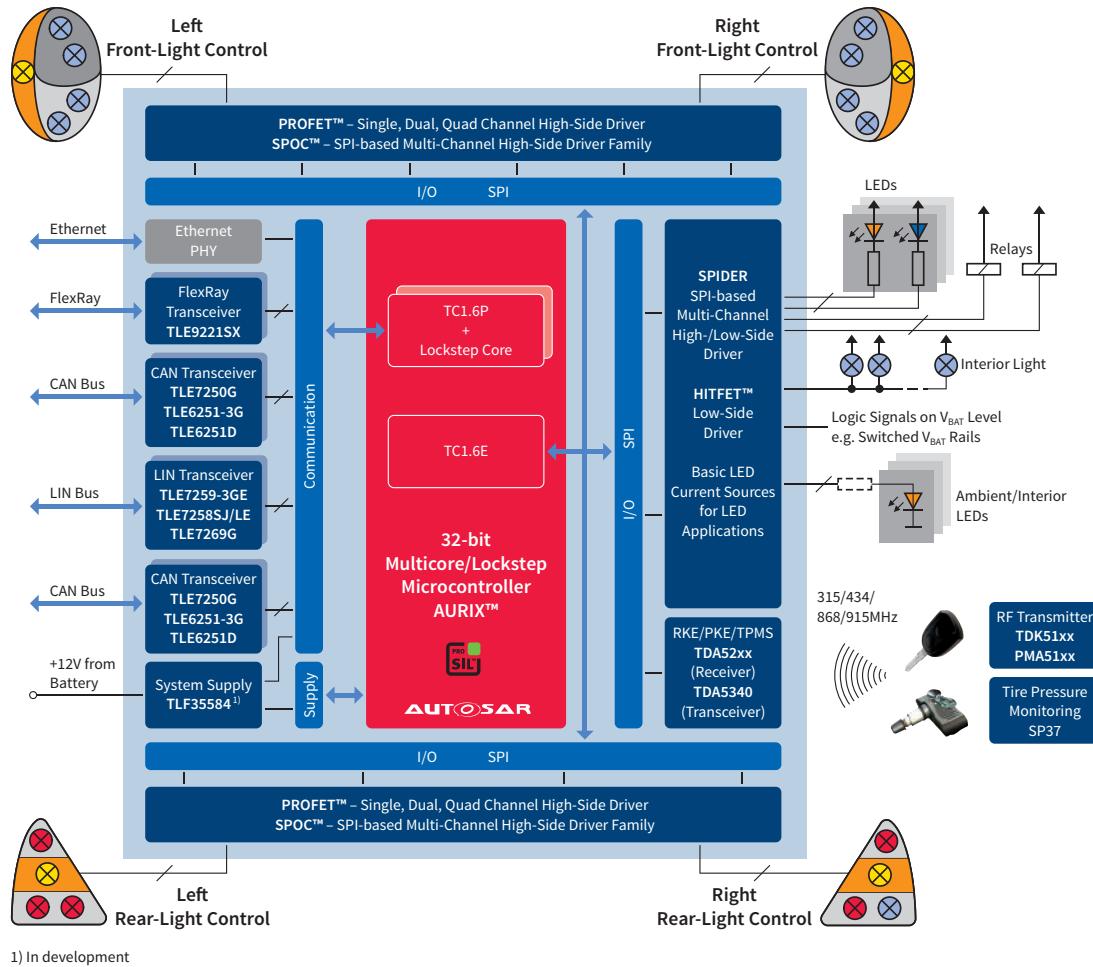
- Reduced board space due to integrated functionality
- Protected load control with sophisticated diagnostic features
- Supports the “Limp Home” functional safety concept
- High scalability and benchmark short-circuit robustness of power semiconductors (PROFET™)
- Supports a smooth transition to LEDs for interior and exterior lighting

## Suggested Products

Product	Description
AURIX™	Scalable 32-bit TriCore™ microcontroller family from single to multicore (PRO-SIL™)
XC22xx	16/32-bit microcontroller family with dedicated body features
Supply ICs	Voltage regulators, DC/DC converters
SPIDER, HITFET™	Single- and multi-channel protected high- and low-side switches
Basic LED Driver	Linear current sources for LED applications
SBCs, Network Transceiver	System basis chips, CAN, LIN and FlexRay transceiver
PROFET™, SPOC™+	Single- and multi-channel protected high-side switches



# High-Feature Body Control Module



## System Benefits

- AURIX™ multicore concept enables integration of two applications into one device
- AURIX™ supports safety requirements up to ASIL-D (ISO 26262)
- AURIX™ hardware encryption (HSM) enabling advanced security features
- Encapsulation feature allows software development without interference between multiple applications
- Very high integrated functionality enables reduced board space
- All features of a classic Body Control Module are available, including protected load control with sophisticated diagnostics

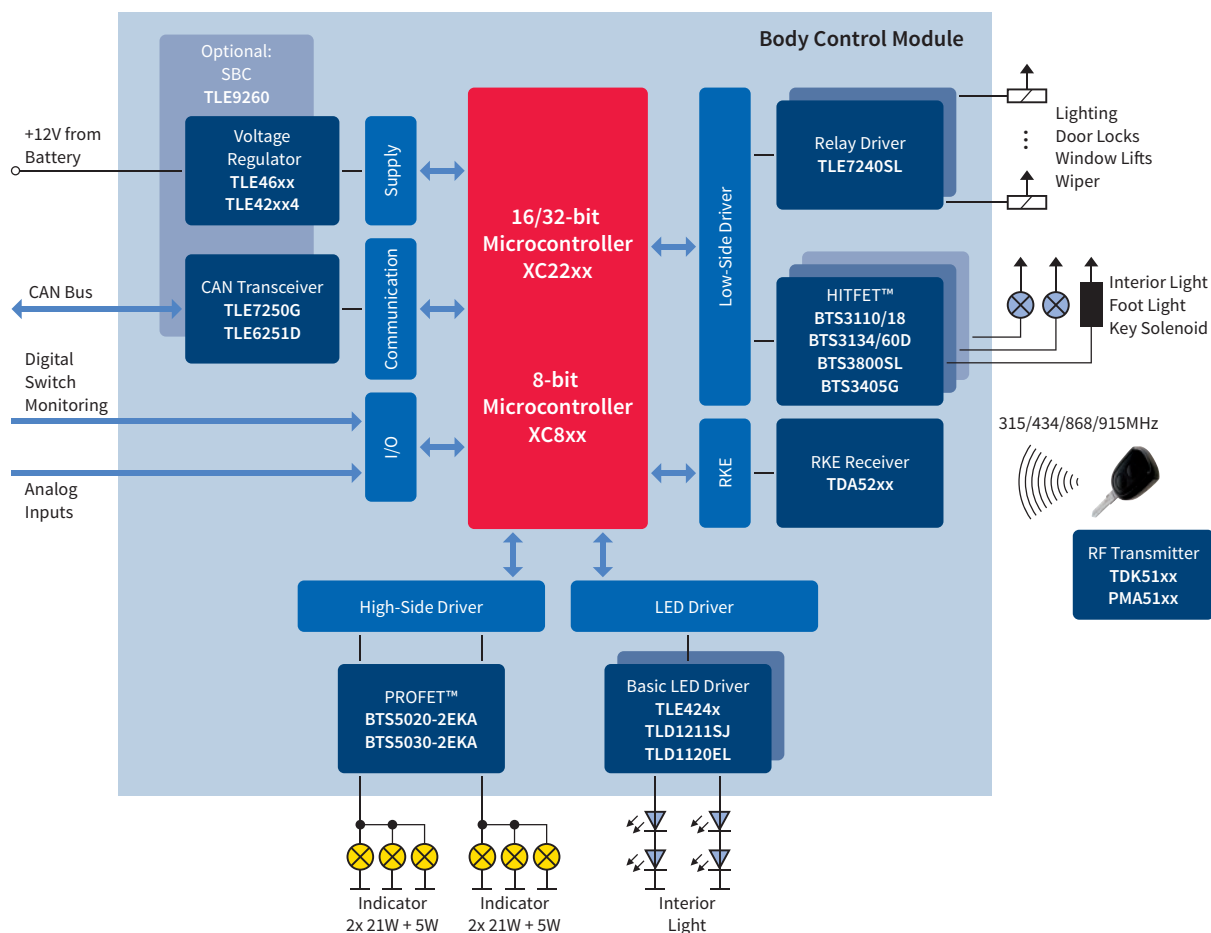
## Suggested Products

Product	Description
AURIX™	Scalable 32-bit TriCore™ microcontroller family from single to multicore (PRO-SIL™)
Supply ICs	Voltage regulators, DC/DC converters
SPIDER, HITFET™	Single- and multi-channel protected high- and low-side switches
Basic LED Driver	Linear current sources for LED applications
Network Transceiver	CAN, LIN, FlexRay transceiver
PROFET™, SPOC™	Single- and multi-channel protected high- and low-side switches
TDA52xx, TDK51xx, PMA51xx	Chipset for remote keyless entry and tire pressure monitoring applications





# Low-Cost Body Control Module



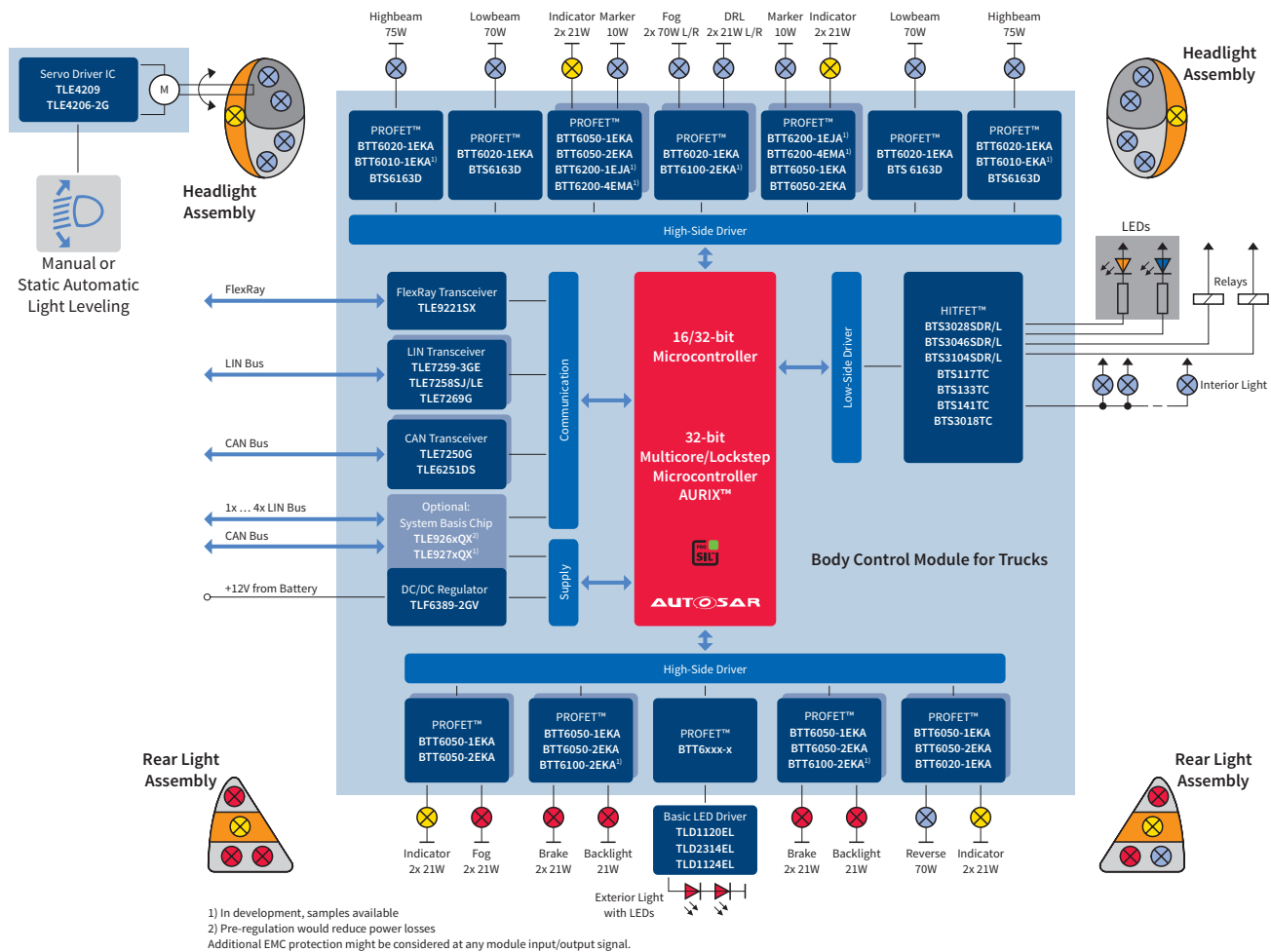
## System Benefits

- Single low-cost module solution for the car body electronics
- Scalability of the devices increases the reuse grade and design flexibility
- Benchmark short-circuit robustness of power semiconductors improves system reliability (PROFET™)
- Full integration of load protection and diagnostics reduces PCB area and improves the design quality

## Suggested Products

Product	Description
XC22xx , XC8xx	16/32-bit and 8-bit microcontroller families with dedicated body features
Supply ICs	Linear voltage regulators, DC/DC converters
SPIDER, HITFET™	Single- and multi-channel protected high- and low-side switches
Basic LED Driver	Linear current sources for LED applications
Network Transceiver	CAN and LIN transceiver
PROFET™	Protected high-side switches
TDA52xx, TDK51xx	Chipset for remote keyless entry applications

# Truck Body Control Module



## System Benefits

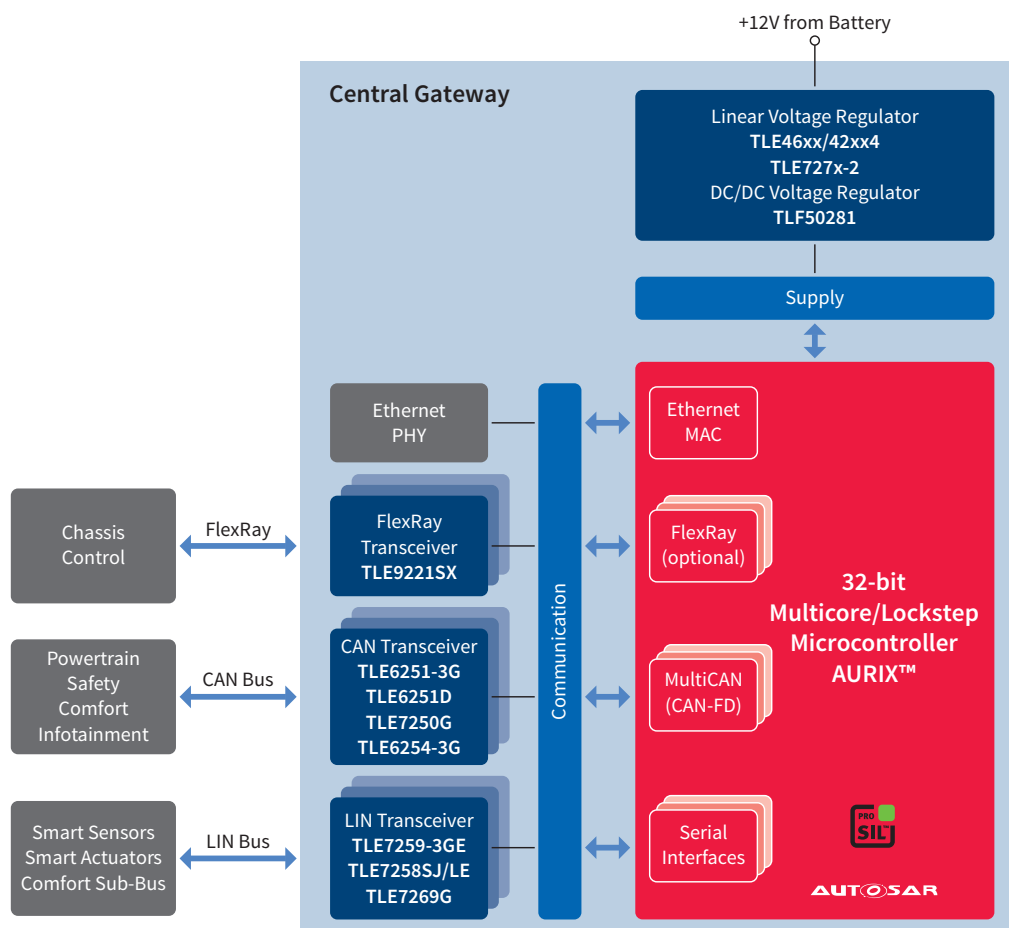
- Reduced board space due to integrated functionality
- PROFET™+ 24V provides excellent diagnostics and protection features and a high current sense accuracy even for the smallest loads, such as LEDs
- Supports the “Limp Home” functional safety concept
- Maximum design flexibility and less design effort due to identical footprint & pin-compatibility
- Automotive LED driver products supporting the transition of lighting solutions to LED only

## Suggested Products

Product	Description
AURIX™	Scalable 32-bit TriCore™ microcontroller family from single to multicore (PRO-SIL™)
XC22xx	16/32-bit microcontroller family with dedicated body features
Supply ICs	Voltage regulators, DC/DC converters
SPIDER, HITFET™	Single- and multi-channel protected high- and low-side switches
Basic LED Driver	Linear current sources for LED applications
SBCs, Network Transceiver	System basis chips, CAN, LIN and FlexRay transceiver
PROFET™	Single- and multi-channel protected high-side switches



# Gateway



## System Benefits

- Scalable microcontroller based on either XC2200 with up to 6 CAN / 10 USIC, or based on the high-performance AURIX™ family with multicore capability
- Routing functionality with a very low CPU load
- Dedicated microcontroller HW support for LIN, CAN, FlexRay (XC2200 and AURIX™) as well as Ethernet (AURIX™ only)
- Network transceiver supporting CAN, LIN and FlexRay
- Wide range of voltage supply ICs covering linear and DC/DC-based regulators

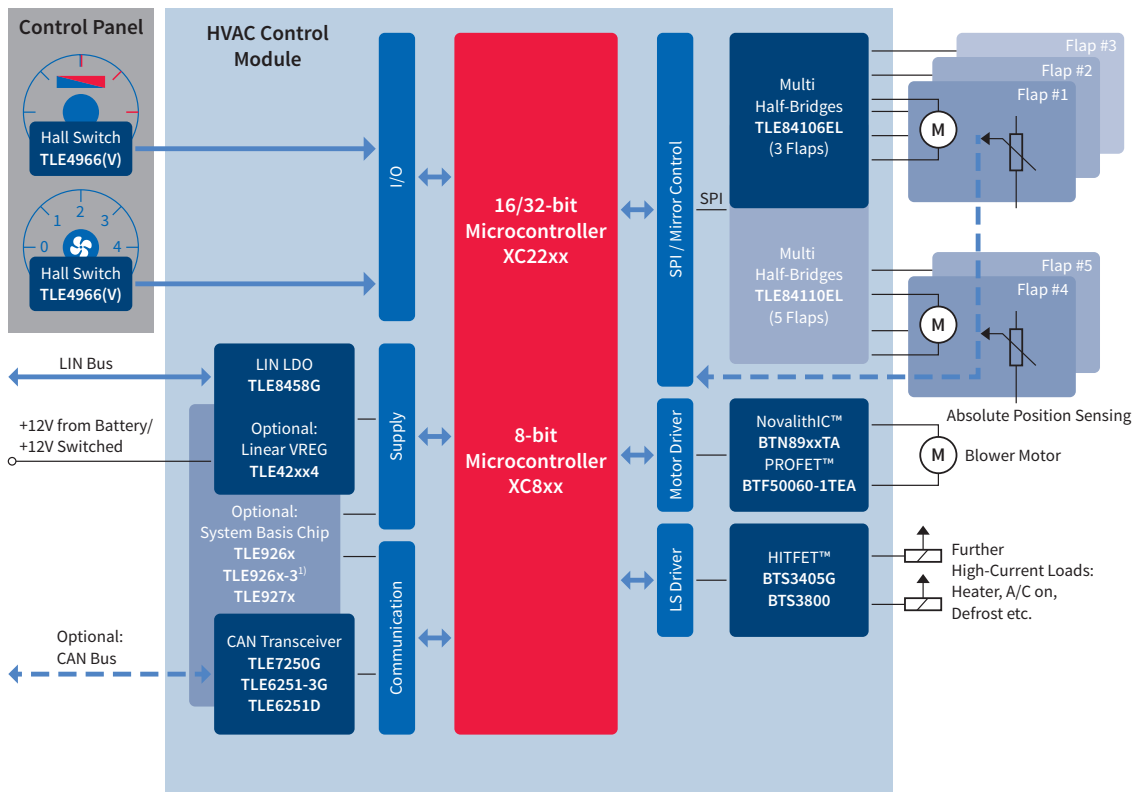
## Suggested Products



Product	Description
AURIX™	Scalable 32-bit TriCore™ microcontroller family from single to multicore (PRO-SIL™)
XC22xx	16/32-bit microcontroller family with dedicated body features
Supply ICs	Voltage regulators, DC/DC converters
Network Transceiver	CAN, LIN and FlexRay transceiver

# HVAC Control Module

Low to Mid-End / Manual + Semi-Automatic



1) Supports CAN partial networking

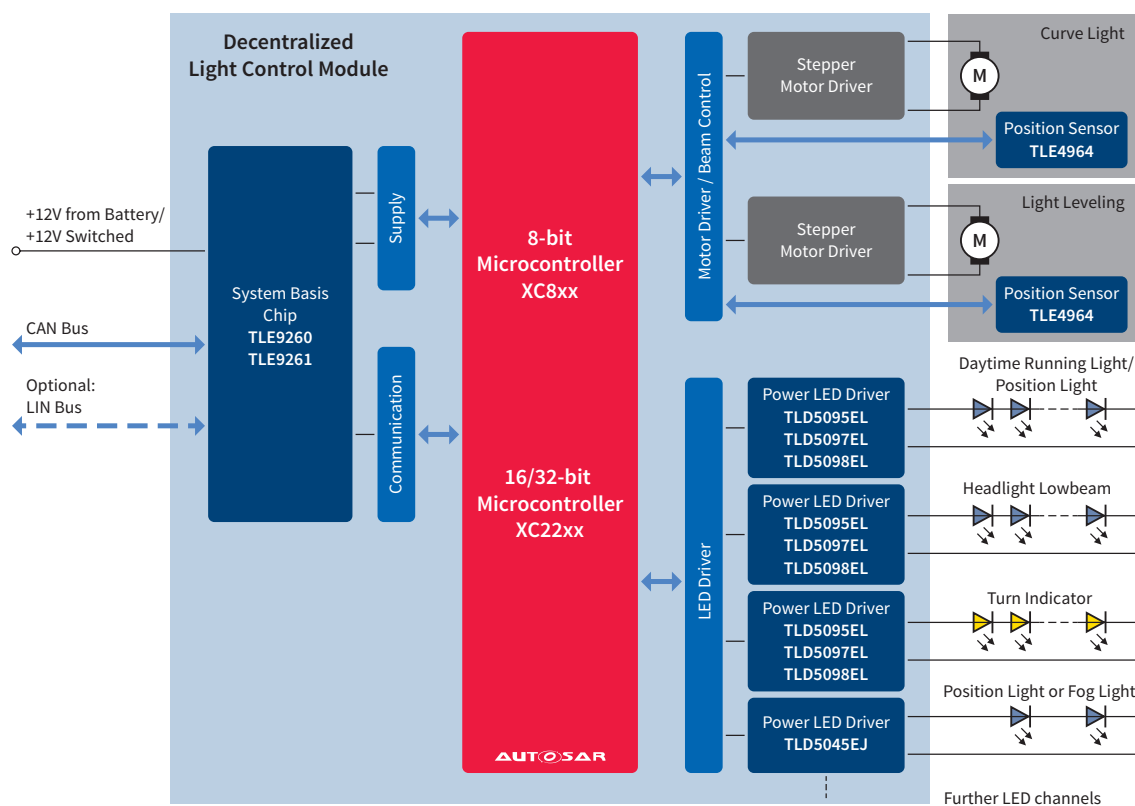
## System Benefits

- High-performance, scalable microcontroller family for various classes of HVAC control algorithms
- Integrated motor control with diagnostics
- Dedicated multi half-bridge devices for flap motor control with potentiometer feedback
- Powerful half-bridge devices (NovalithIC™) with high-frequency PWM capability for the blower control

## Suggested Products

Product	Description
XC22xx, XC8xx	16/32-bit and 8-bit microcontroller families with dedicated body features
Supply ICs	Linear voltage regulators, DC/DC converters
NovalithIC™, Multi Half-Bridges	Integrated motor control. Powerful half-bridge devices (NovalithIC™) with high-frequency PWM capability for blower control
TLE49xx	Hall switches
PROFET™	Protected high-side switch
HITFET™	Protected low-side switches
LIN LDO, Network Transceiver	CAN and LIN transceiver

# Decentralized Front Light Module



## System Benefits

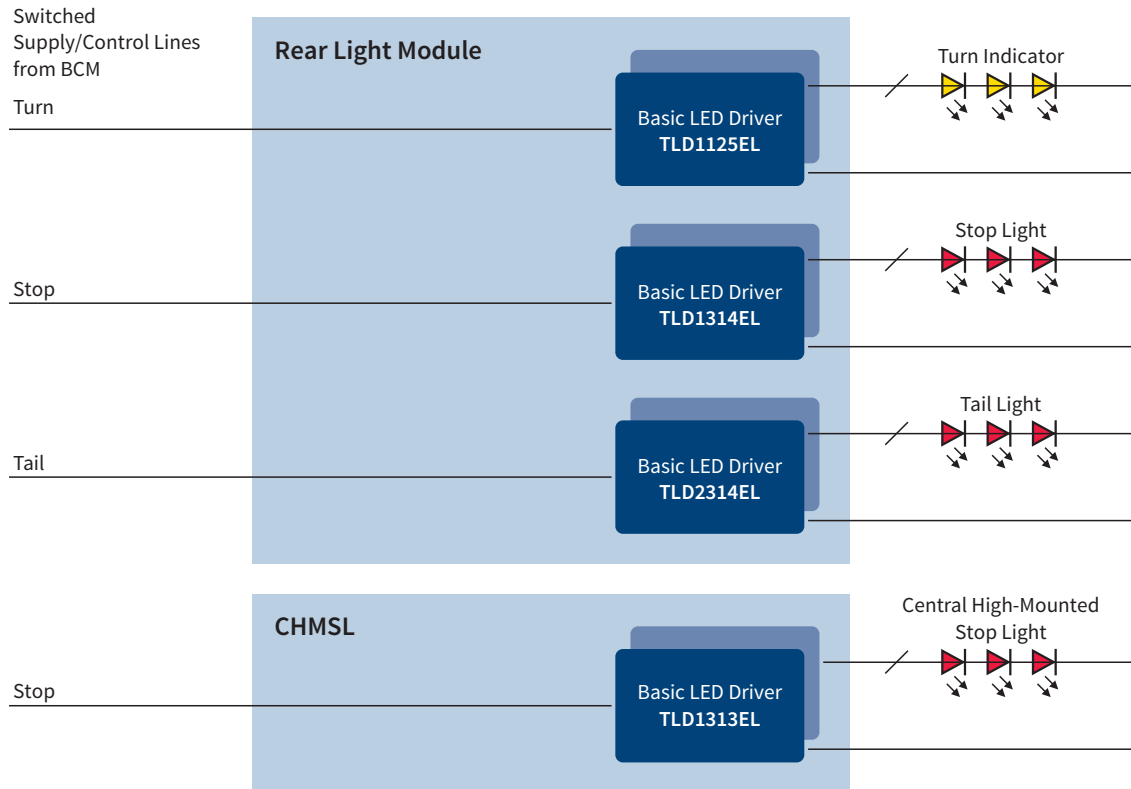
- Automotive LED drivers for high-brightness LEDs
- LED driver ICs supporting various DC/DC topologies (buck, boost, SEPIC, flyback)
- Microcontroller peripherals enable light control with a low CPU load
- System basis chips combine supply, network transceiver and supervision functions in a monolithic device

## Suggested Products

Product	Description
XC22xx, XC8xx	16/32-bit and 8-bit microcontroller families with dedicated body features
SBCs, Network Transceiver	System basis chips, CAN and LIN transceiver
Power LED Driver	DC/DC converter & controller for high-power LED lighting



# LED Rear Light Module



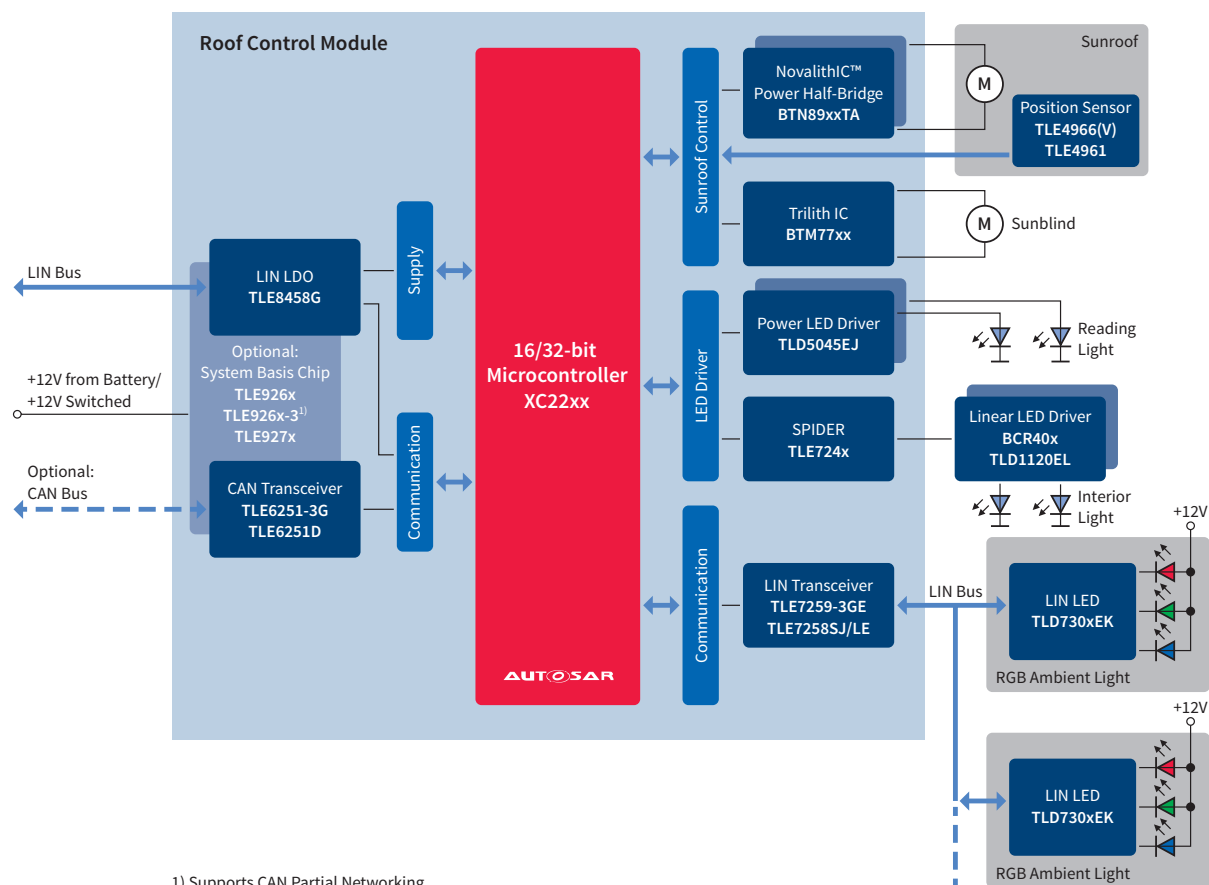
## System Benefits

- Integrated LED control with diagnostic and dimming capability
- Reduced system complexity and board space
- Pin-to-pin footprint compatibility
- Reduced effort for design adaptations
- Increased lifetime for LED and driver due to integrated protection

## Suggested Products

Product	Description
Basic LED Driver TLD11xx, TLD13xx, TLD23xx	Linear constant current sources with scalable feature set

# Roof Control Module with Interior & Ambient Light Control



1) Supports CAN Partial Networking

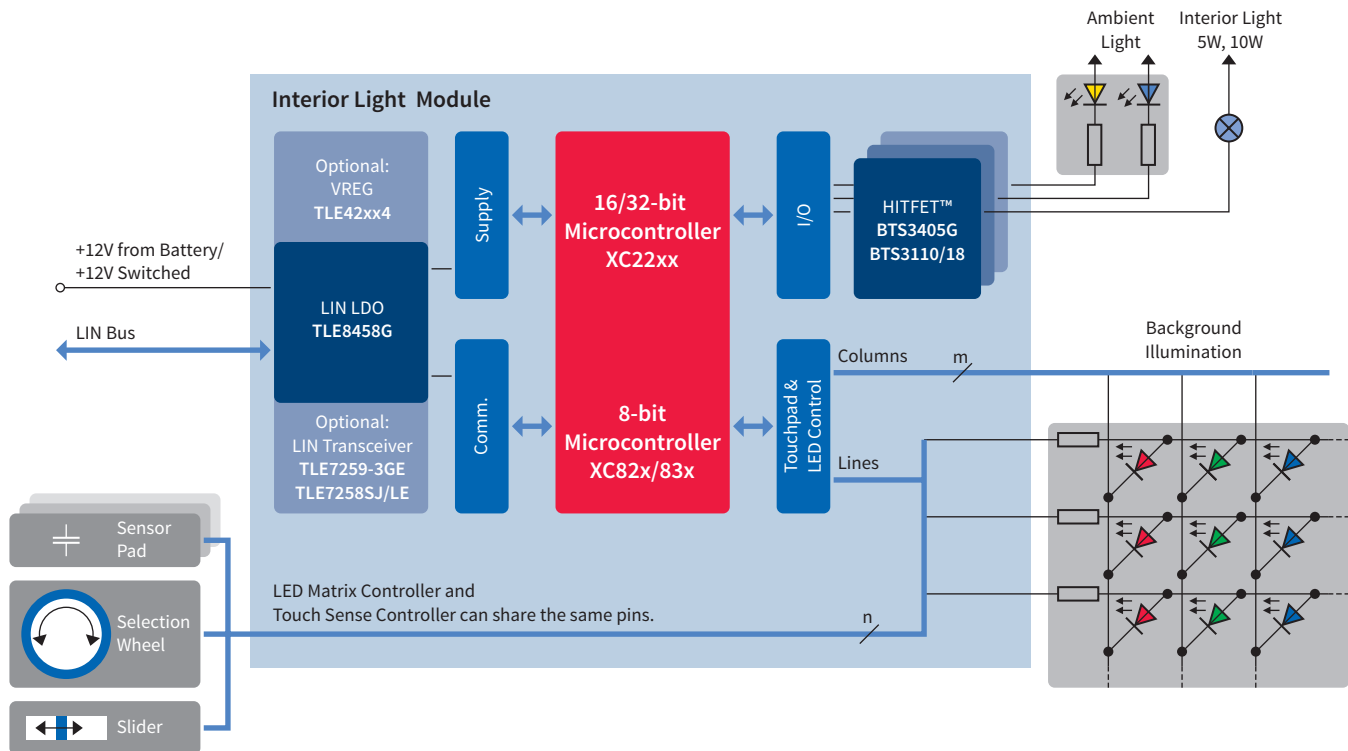
## System Benefits

- Integrated motor control with diagnostics
- Automotive LED drivers for high-brightness LEDs
- High-performance MCU supporting ripple count algorithms
- Dedicated LIN slave devices for RGB ambient lighting

## Suggested Products

Product	Description
XC22xx	16/32-bit microcontroller family with dedicated body features
LIN LDO, Network Transceiver	CAN and LIN transceiver
LIN LED Driver	Smart LED control system-on-chip for multi-color and RGB lighting
Power LED Driver	DC/DC converter & controller for high-power LED lighting
TrilithIC, NovalithIC™	Integrated motor control devices with diagnostics
SPIDER	Multi-channel protected high- and low-side switches
TLE49xx	Hall switches – magnetic field sensors with discrete output signal

# Interior Light Control with Capacitive Touch Sensor



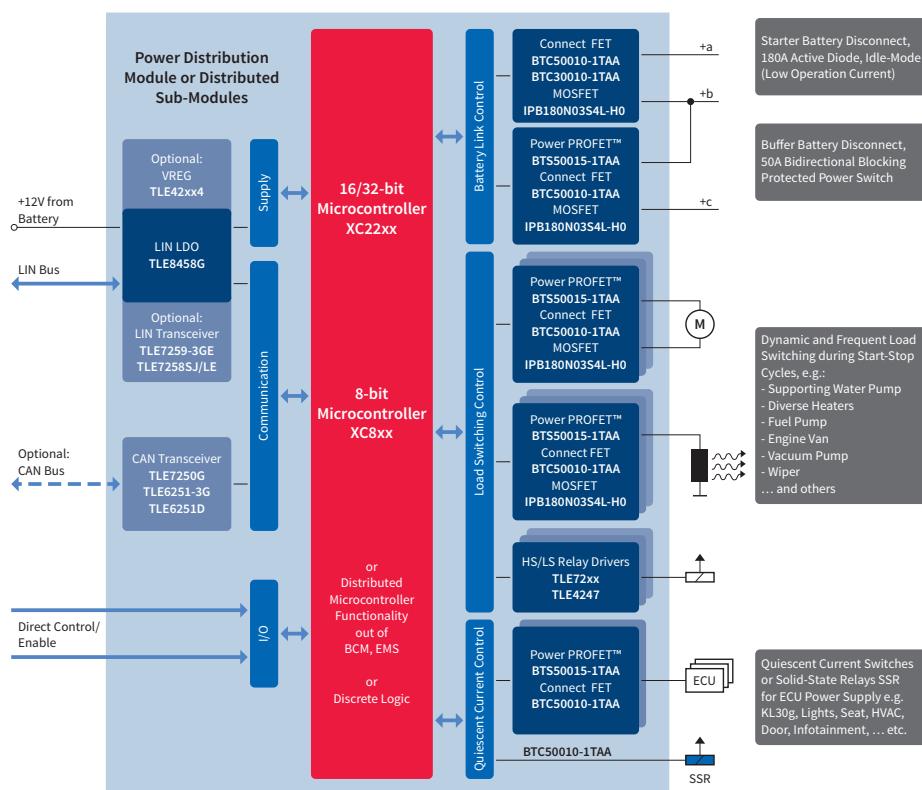
## System Benefits

- Replacing mechanical switches offers big system cost savings
- Robust and reliable touch sense control technology, especially in noisy environments in combination with multiple coverage options, such as acrylic glass (~2mm)
- Enables the efficient design of HMIs with up to 20 touch buttons
- Low pin count and cheap single-layer PCB solutions
- High feature integration: combined control and drive of displays or stepper motors with up to 50mA
- Easy and flexible implementation: optimized SW library for touch sense control in ROM means that flash memory and CPU resources are available for customer-specific solutions

## Suggested Products

Product	Description
XC22xx, XC8xx	16/32-bit and 8-bit microcontroller families with dedicated features for haptic/capacitive touch/LED control
LIN LDO	Voltage regulator with integrated LIN transceiver
HITFET™	Smart low-side switches

# Power Distribution for Start-Stop Systems with a Dual Battery Approach



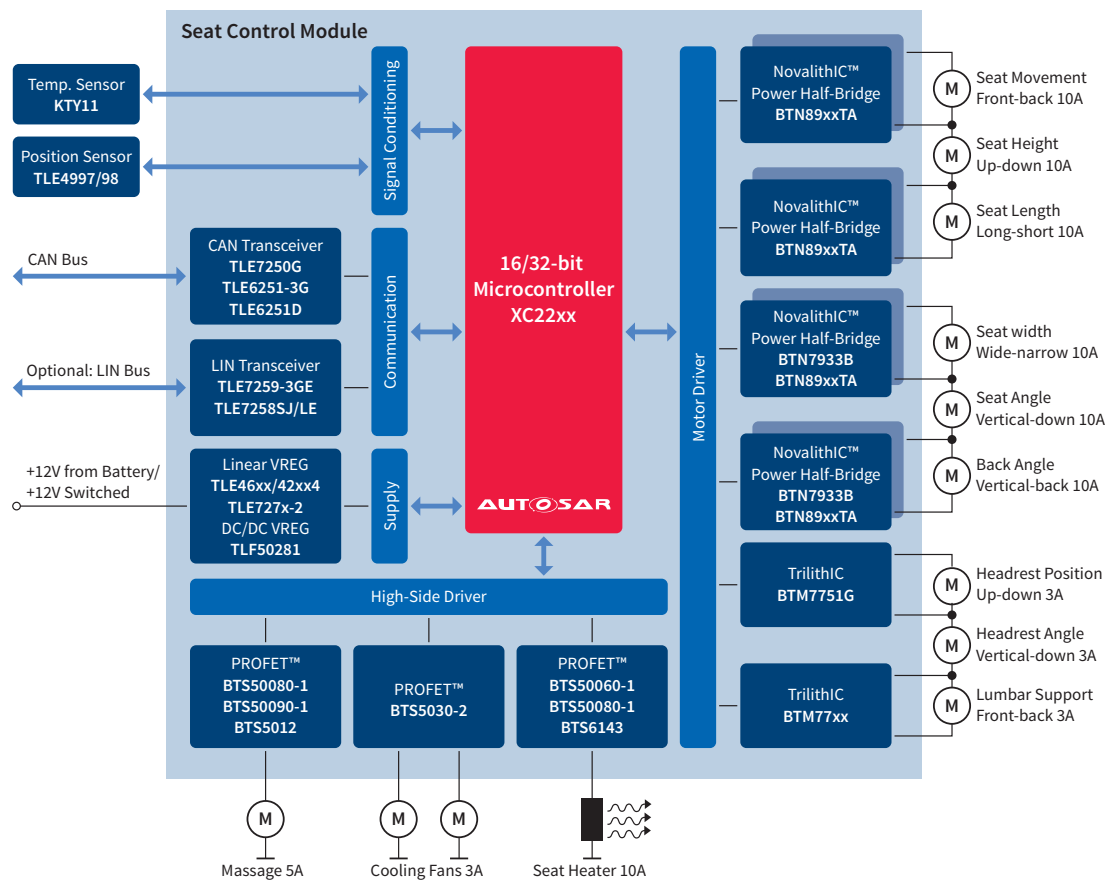
## System Benefits

- Smart high-current, high-power switching
- Solid-state power switch provides relay functionality with alternative fuse
- Low power losses due to extremely low-ohmic devices
- Alternative protection modes: smart or fuse protection
- Some power switches with current input control for long control wires
- Sophisticated diagnostic features
- High number of switching activations, negligible aging
- Bidirectional blocking power switches
- Active diode functionality
- Solid-state relay (power switch inside relay housing)
- Smart relay driver, optional with constant current control

## Suggested Products

Product	Description
XC22xx	16/32-bit microcontroller family
XC8xx	8-bit microcontroller family
Supply ICs	Voltage regulators, DC/DC converters
LIN LDO, Network Transceiver	System basis chips, LIN and CAN transceivers
Power PROFET™	BTS500xx protected power high-side switch
Connect FET	BTC500xx connecting power high-side switch
Connect FET	Companion BTC300xx Power MOSFET to be switched parallel to Connect FET
SPIDER	Protected multi-channel high-side and low-side switches
TLE4247	Constant current relay driver
SSR	Solid-state relay (power switch inside relay housing)
OptiMOS™-T2 IPBxxS4	Automotive trench power MOSFET

# Seat Control Module



## System Benefits

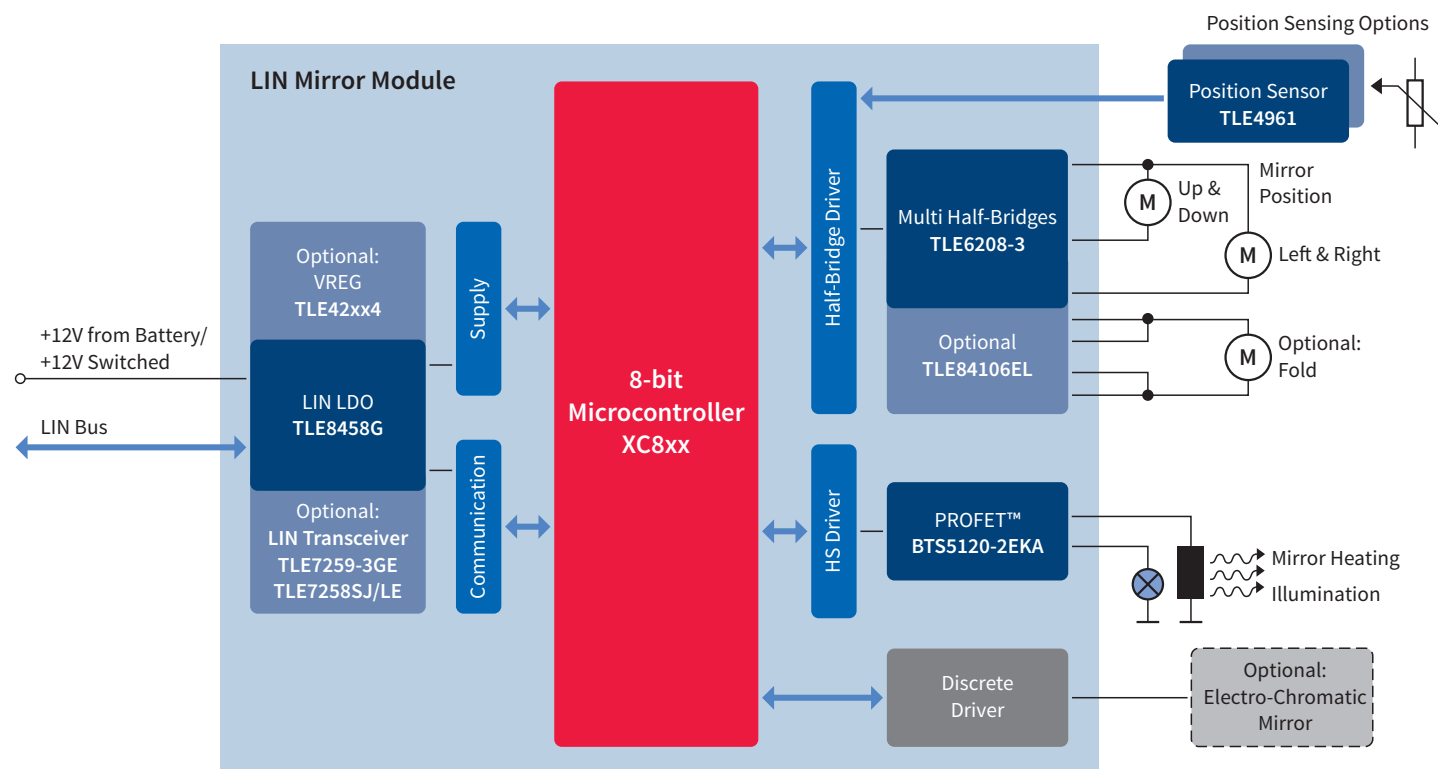
- System-in-a-package solutions for high-power integrated and protected motor control
- Reduced board space due to integrated functionality
- Protected load control with sophisticated diagnostic features

## Suggested Products

Product	Description
XC22xx	16/32-bit microcontroller family with dedicated body features
Supply ICs	Linear voltage regulators, DC/DC converters
Network Transceiver	CAN, LIN and FlexRay transceiver
PROFET™	Protected high-side switches
NovalithIC™, TrilithIC	Integrated motor control solutions with diagnostics
TLE499x	Linear Hall sensors – magnetic field sensors with linear output signal



# Decentralized Mirror Module



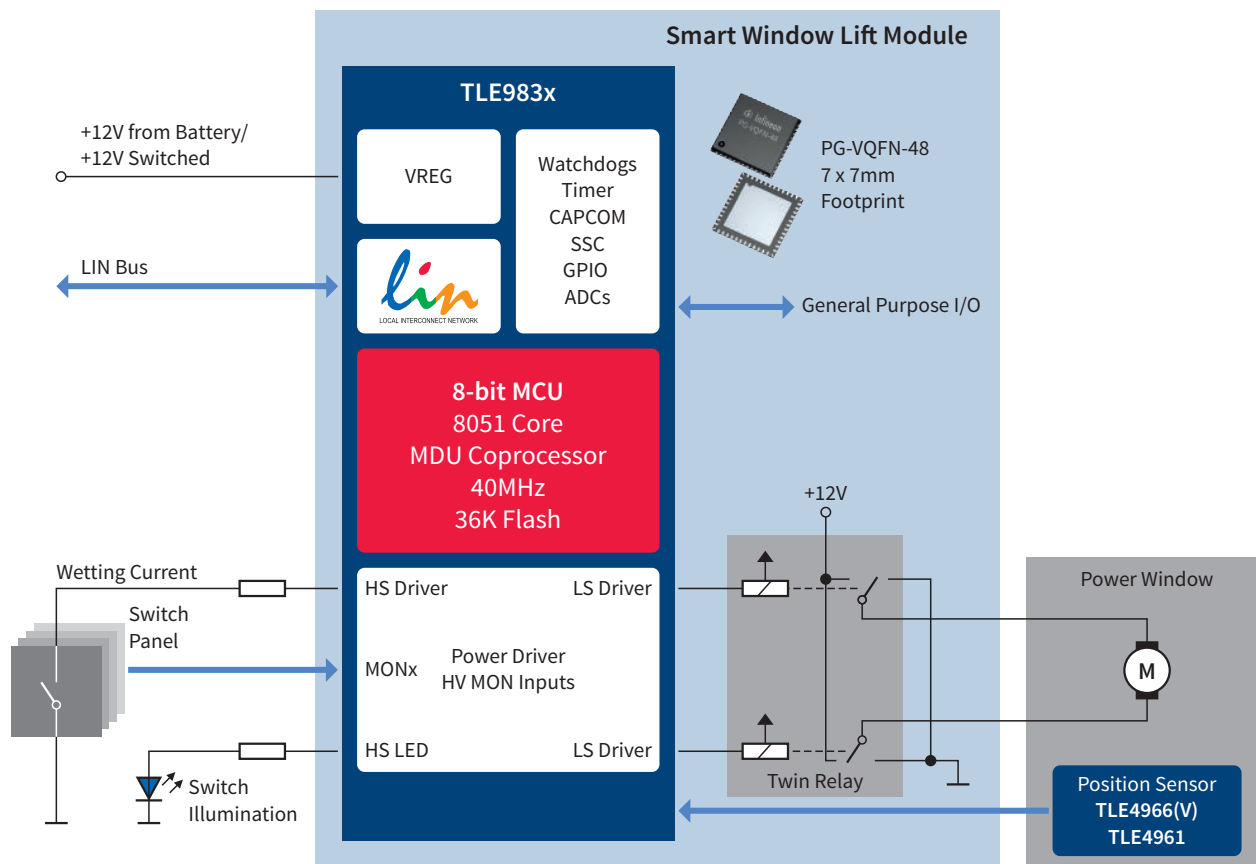
## System Benefits

- Low power consumption, as well as low quiescent current
- Excellent price-performance ratio
- Space-saving devices for integrated motor control  
(mirror x/y adjustment, optional fold feature)

## Suggested Products

Product	Description
XC8xx	Scalable, low-cost 8-bit microcontroller family
LIN LDO, Network Transceiver	CAN and LIN transceiver
PROFET™	Protected high-side switches
Multi Half-Bridges	Integrated motor control
TLE496x	Hall switches – magnetic field sensors with discrete output signal

# Smart Window Lift/Roof Control Module



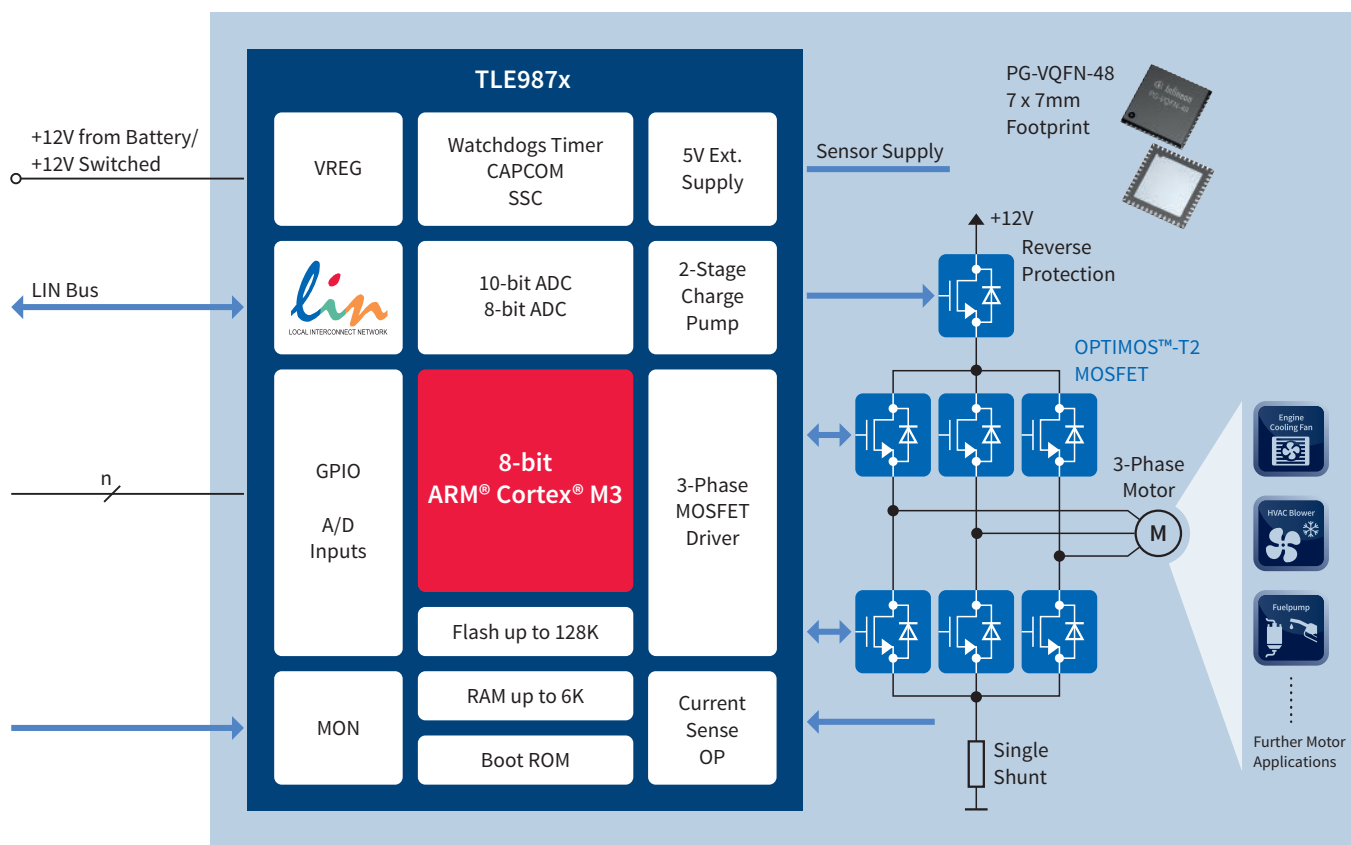
## System Benefits

- System-on-chip solution with integrated 8051 industry-standard microcontroller core
- Platform solution for a size- and weight-optimized relay-based motor control
- Integrated voltage regulator, LIN transceiver, switch inputs and relay driver
- Cyclic sense and cyclic wake-up capability saves average current consumption
- Package with very small form factor saves PCB board space
- Single-chip solution improves module reliability

## Suggested Products

Product	Description
TLE983x	Smart window lift system IC with integrated LIN interface
TLE496x	Hall switches – magnetic field sensors with discrete output signal

# System-on-Chip 3-Phase Motor Control



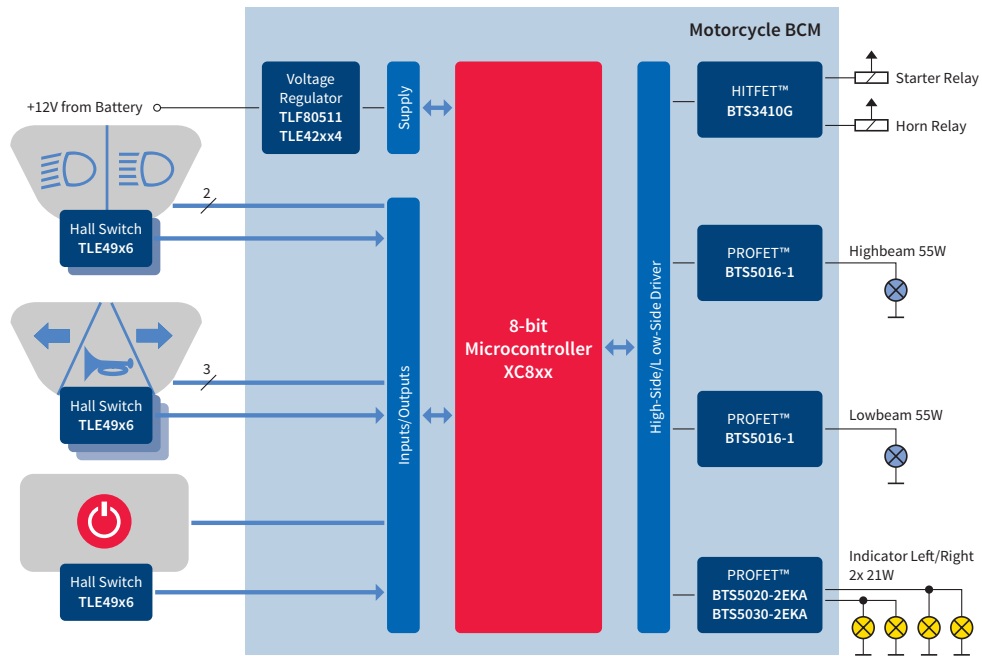
## System Benefits

- System-on-chip solution with integrated ARM® Cortex® M3 industry-standard microcontroller core
- Platform solution for a wide range of size- and weight-optimized motor applications
- Package with very small form factor saves PCB board space
- Integrated voltage regulator, LIN transceiver, switch input and direct control of n-channel MOSFETs
- Configurable MOSFET driver simplifies EMC design
- Supports various motor control algorithms including sensor-less control
- Integrated intelligent power-saving modes and energy management
- Single-chip solution improves module reliability

## Suggested Products

Product	Description
TLE987x	3-phase motor driver with Integrated ARM® Cortex™ M3 MCU
OptiMOS™-T2 IPBxxS4	Automotive trench power MOSFET

# Small Body Control Module for 2-Wheelers



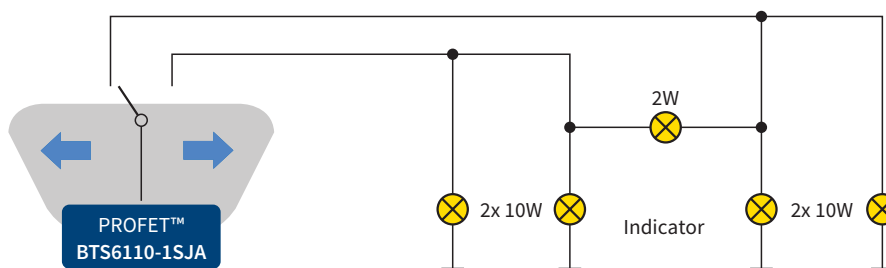
### System Benefits

- Compact design for basic control functions
- Protected load control and diagnostic capability
- Automotive-grade quality and reliability

### Suggested Products

Product	Description
XC8xx	8-bit microcontroller family with dedicated body features
Supply ICs	Voltage regulators, DC/DC converters
PROFET™	Single- and multi-channel protected high-side switches
HITFET™	Single- and multi-channel low-side switches

# Autonomous Turn Signal Driver for 2-Wheelers



### System Benefits

- Direct indicator relay replacement
- Compact size fits in reduced board space
- Autonomous frequency generation
- Minimum number of external devices required
- Reduced current consumption

### Suggested Products

Product	Description
BTS6110-1SJA	Single-channel smart high-side power switch



## Powertrain Applications

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The powertrain market is driven by the need to reduce the carbon footprint of cars through affordable, efficiency-enhancing innovations. Concrete measures include downsizing engines, reducing injection losses and increasing after-treatment efficiency. On the transmission side, carmakers are looking to optimize both the gear ratio and gear shifting. Other efficiency-enabling activities include reducing friction and hydraulic losses. In a more general context, the drive for greater ecology on the roads is pushing the transition toward vehicle electrification and hybridization.

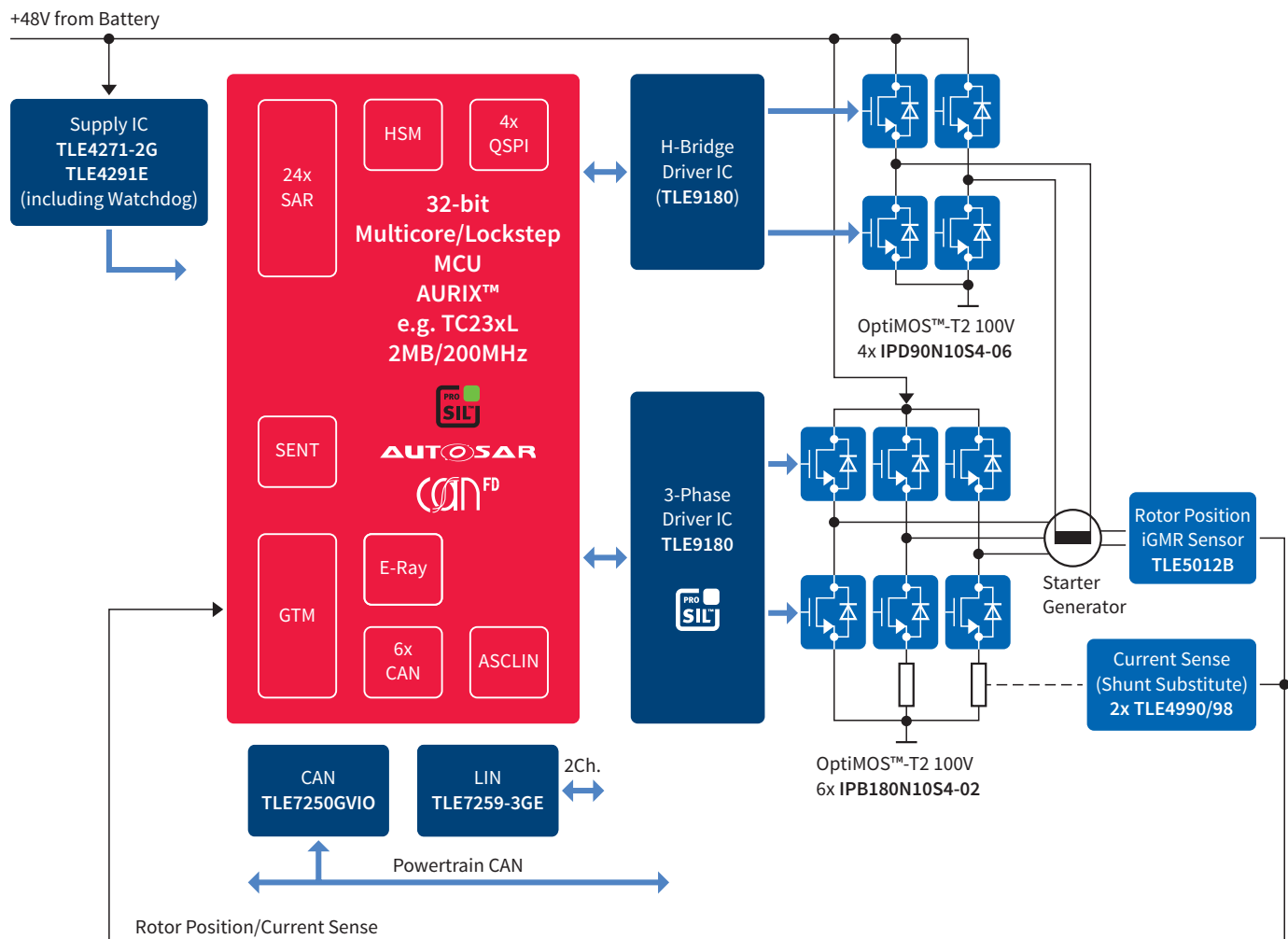
As one of the largest automotive semiconductor suppliers, Infineon has been active in the powertrain electronic business for over 40 years. Our position as innovation leader, coupled with long-term partnerships with OEMs, Tier 1 and engineering service providers, means we reap the benefits of in-depth system expertise and broad application competence. Infineon delivers an extensive range of optimized, competitive and scalable powertrain products and chipset solutions. The portfolio

covers the full sensor spectrum from position, over angle and speed to barometric and manifold pressure, supplemented by a strong 8-bit, 16-bit and 32-bit powertrain microcontroller portfolio. In addition to the necessary power components, such as voltage supplies, MOSFETs and IGBTs, smart low-side & high-side switches, CAN/LIN and FlexRay transceivers, the product range is rounded off by a multitude of high integrated automotive system ICs, such as engine management ICs, alternator regulators, system basis chips (SBC) and constant current control ICs for transmission control.

With regard to the ongoing electrification and hybridization of the drivetrain, we actively support our customers with reference solutions for charger and DC/DC, as well as inverter systems.

# 48V Micro-Hybrid

## (Start/Stop and High-Efficiency Generator)



### System Benefits

- Full range of products ranging from voltage regulators, transceivers, sensors, microcontrollers and smart power drivers
- Leading-edge OptiMOS™ MOSFET technology combined with a robust package to deliver best-in-class performance and outstanding current capacity
- Higher alternator efficiency thanks to MOSFET rectification
- Higher output current at low alternator RPM
- Advanced modes supported: engine brake emulation, car sailing/coasting, electrical car launch

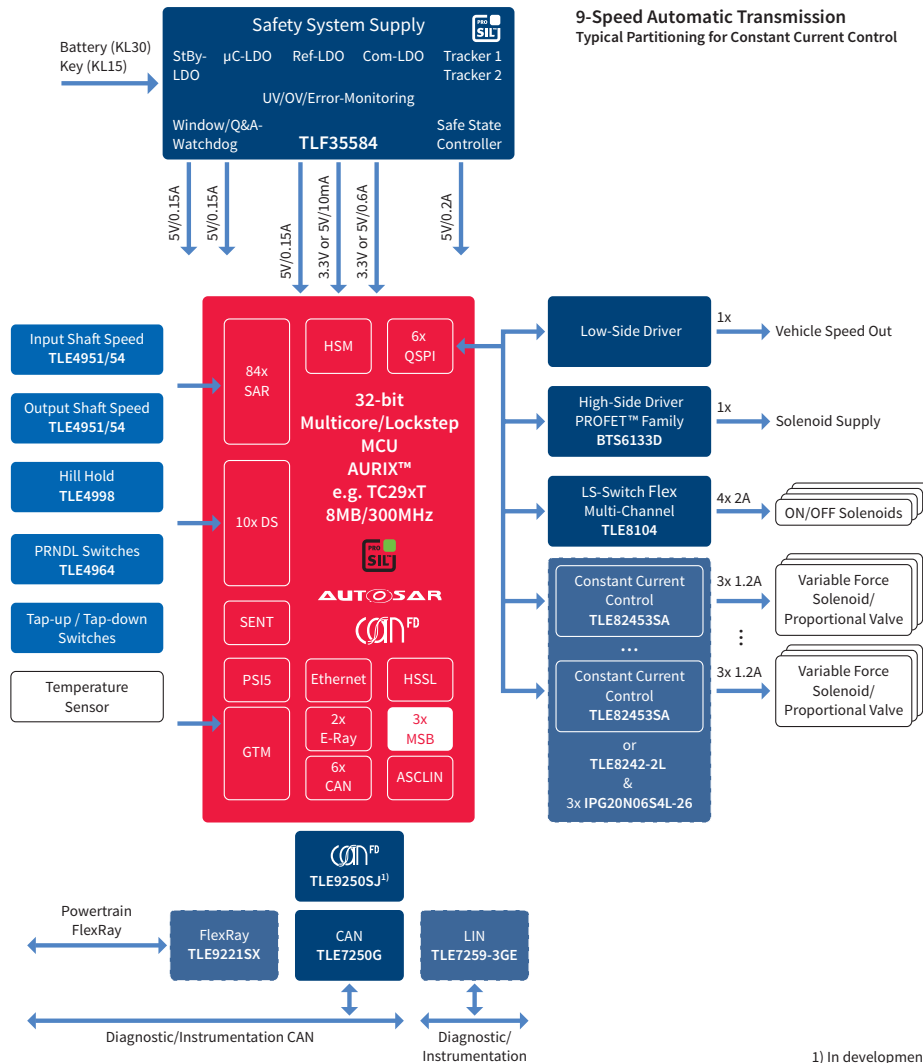


### Suggested Products

Product	Description
TC172x /TC23xL	Cost-optimized TriCore™ 32-bit microcontroller with dedicated motor control features
TLE9180	3-phase bridge driver IC (PRO-SIL™)
TLE7250GVIO	High-speed CAN transceiver
TLE42xx	5V low-dropout fixed-voltage regulator
IPB180N10S4-02	N-channel 100V MOSFET, optimized for high-current motor applications
IPD90N10S4-06	N-channel 100V MOSFET, optimized for high-current motor applications
TLE499x	Linear Hall sensor family for current sensing
TLE5012B	iGMR sensor for angle and rotor position sensing



# Automatic Transmission – Hydraulic Control



## System Benefits

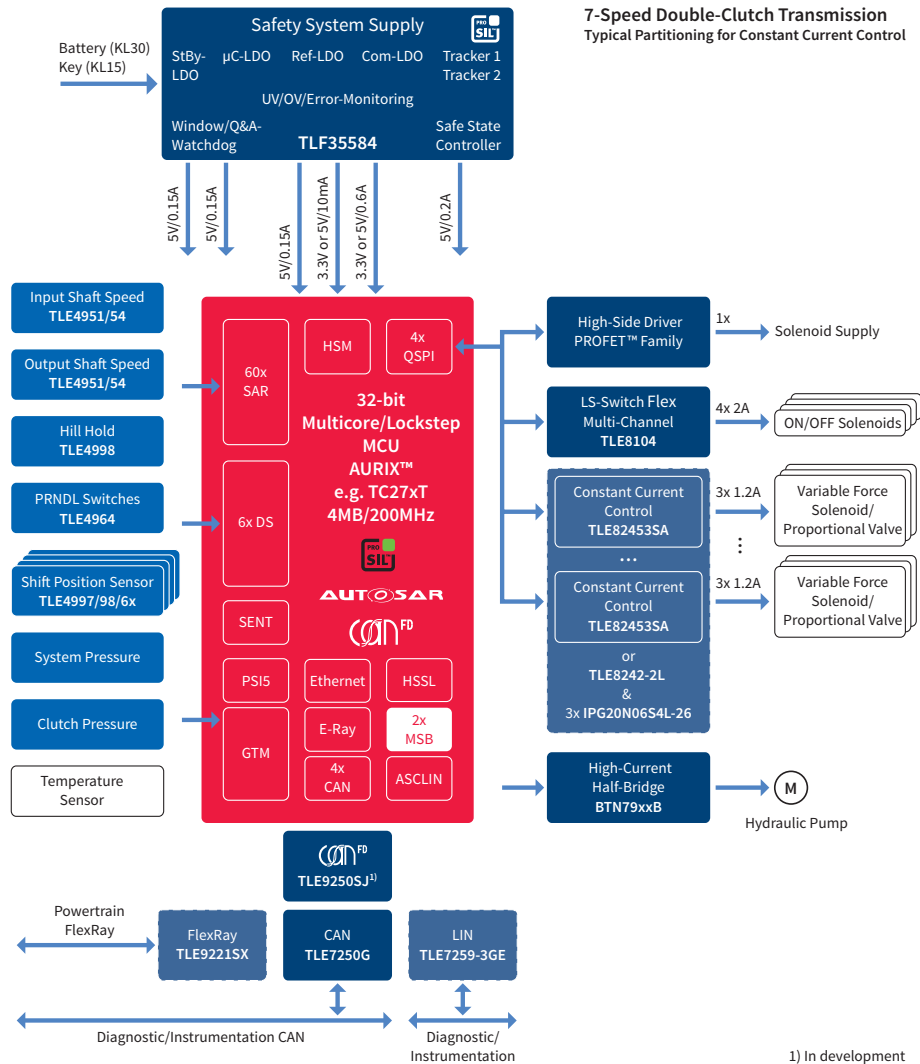
- Full range of products ranging from voltage regulators, transceivers, sensors, microcontrollers and smart power drivers
- Valve actuator ICs supporting highest precision current control
- Optimized sensors providing enhanced disturbance immunity (e.g. vibration) and direction detection
- High-temperature bare die IC supporting integrated transmission control up to the highest torque rate

## Suggested Products

Product	Description
TC17xx, TC2xxx TriCore™	32-bit microcontroller family, optimized for highly demanding powertrain applications
TLE7368-3E	High-efficiency system power supply
TLE82453SA/TLE8242-2L	Integrated transmission ICs for precise variable force or constant current solenoid control
PROFET™	Smart high-side switches
TLE495x	Precise and robust speed sensing
TLE499x/TLE496x	Robust and flexible position sensing



# Double-Clutch Transmission – Hydraulic Control



## System Benefits

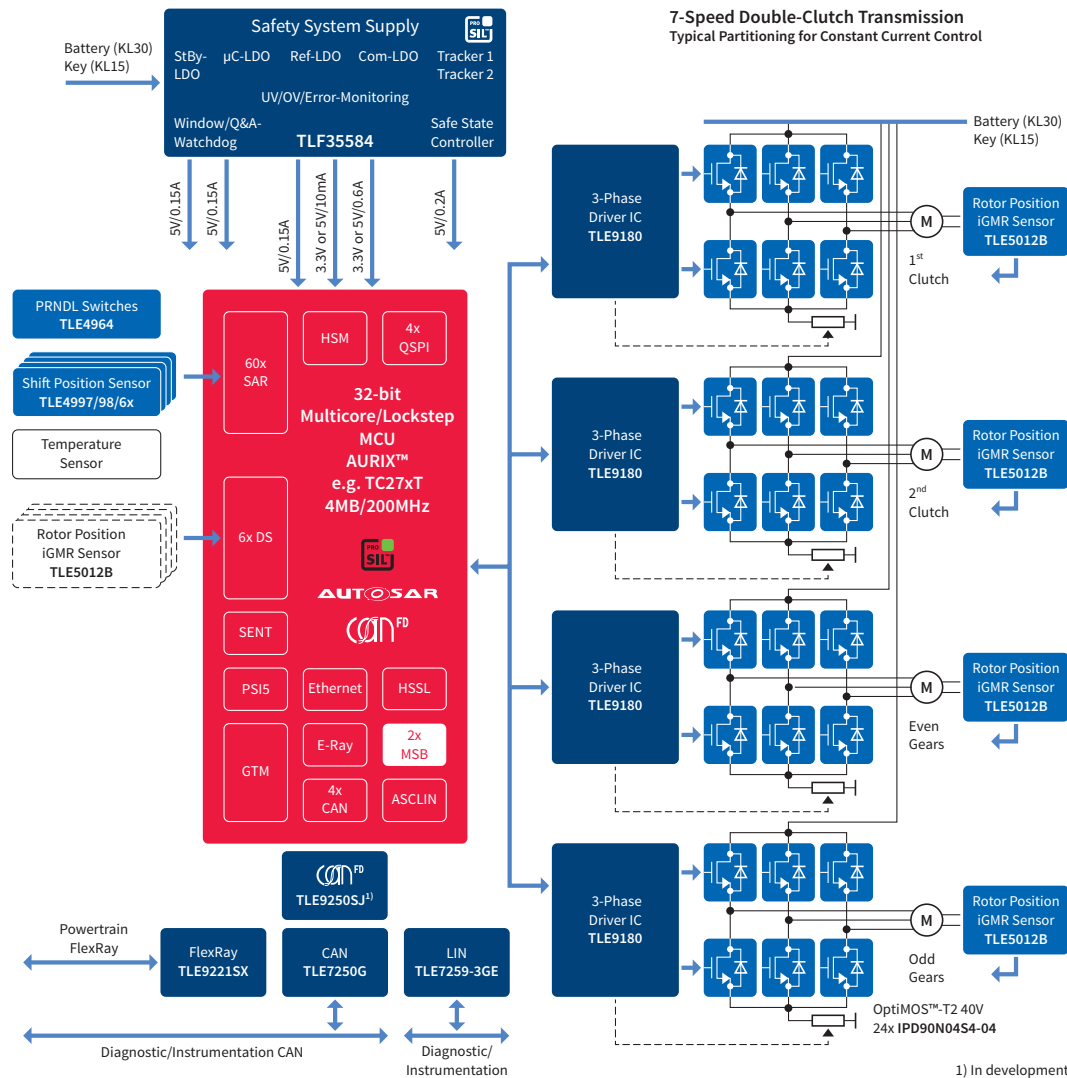
- Full range of products ranging from voltage regulators, transceivers, sensors, microcontrollers and smart power drivers
- Valve actuator ICs supporting highest precision current control
- Optimized sensors providing enhanced disturbance immunity (e.g. vibration) and direction detection
- High-temperature bare die IC supporting integrated transmission control up to the highest torque rate
- Coherent chipset solution for an easy and effective ISO 26262-compliant system implementation

## Suggested Products

Product	Description
TC17xx, TC2xxx TriCore™	32-bit microcontroller family, optimized for highly demanding powertrain applications
TLE7368-3E	High-efficiency system power supply
TLE82453SA/TLE8242-2L	Integrated transmission ICs for precise variable force or constant current solenoid control
PROFET™	Smart high-side switches
IPG20N06S4L-26	Dual n-channel 60V MOSFET in super S08 package, offering significant PCB board space savings
TLE495x	Precise and robust speed sensing
TLE499x/TLE496x	Robust and flexible position sensing



# Double-Clutch Transmission – Electrical Control



## System Benefits

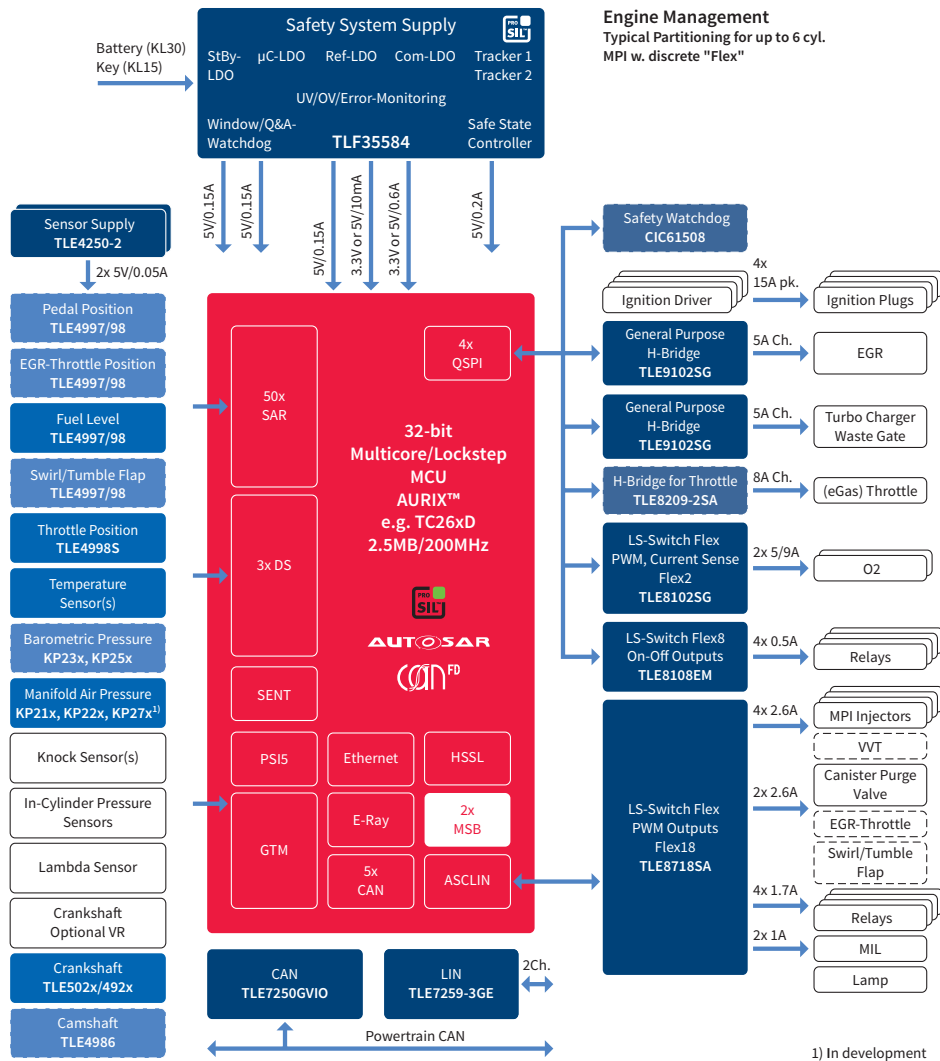
- Full range of products ranging from voltage regulators, transceivers, sensors, microcontrollers and smart power drivers
- Leading-edge OptiMOS™-T2 MOSFET technology combined with a robust package to deliver best-in-class performance and outstanding current capacity
- Optimized sensors providing enhanced disturbance immunity (e.g. vibration) and direction detection
- Reduces fuel consumption compared to manual transmission
- Coherent chipset solution for an easy and effective ISO 26262-compliant system implementation

## Suggested Products

Product	Description
TC17xx, TC2xxx TriCore™	32-bit microcontroller family, optimized for highly demanding powertrain applications
TLE7368-3E	High-efficiency system power supply
TLE718xx	Broad portfolio of automotive 3-phase bridge driver ICs for precise motor control; full functionality down to 5.5V
IPD90N04S4-04	N-channel 40V MOSFET, optimized for high-current motor applications
TLE5012B	iGMR sensor for angle and rotor position sensing



# Gasoline Multi-Port Injection – Discrete Solution



## System Benefits

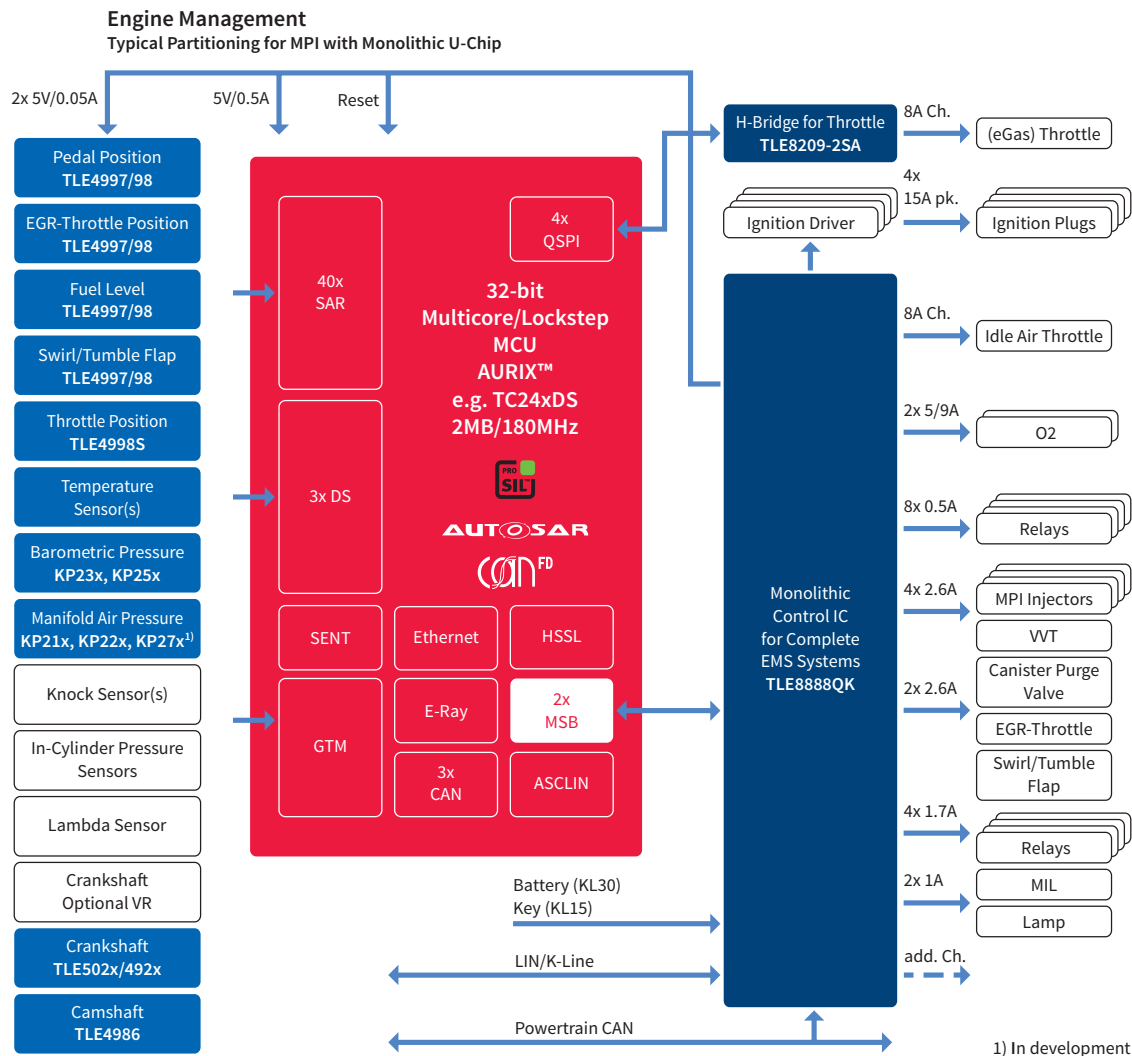
- Flexible and scalable product portfolio tailored to the cost and performance needs of the mid-end and entry segments
- Industry benchmark in embedded real-time performance facilitates pumping loss reduction, knock detection and efficient after-treatment
- Conforming with upcoming emission legislation at maximized fuel efficiency and with even more driving pleasure, the new sensor families provide enhanced measurement precision (e.g. ignition control, misfire detection)

## Suggested Products

Product	Description
TC17xx, TC2xxx TriCore™	32-bit microcontroller family, optimized for highly demanding powertrain applications
TLE7250GVIO/TLE7259-3GE	New CAN/LIN transceivers
TLE8209-2SA	Electronic throttle control (ETC) driver
TLE9102SG	New cost-efficient H-bridge driver for non-ETC use cases, such as exhaust gas recirculation (EGR), turbo charger waste gate, turbo charger geometry and other DC motor driver actuators
TLE81xx	Scalable FLEX smart multi-channel low-side switch family designed for powertrain applications
TLF35584	High-efficiency system power supply (PRO-SIL™)
TLE50xx, TLE49xx, KP2xx	Broad portfolio of pressure sensors (MAP & BAP) as well as magnetic cam- & crankshaft and position sensors
KP27x	Sensor with digital SENT interface in development



# Gasoline Multi-Port Injection – Integrated Solution



## System Benefits

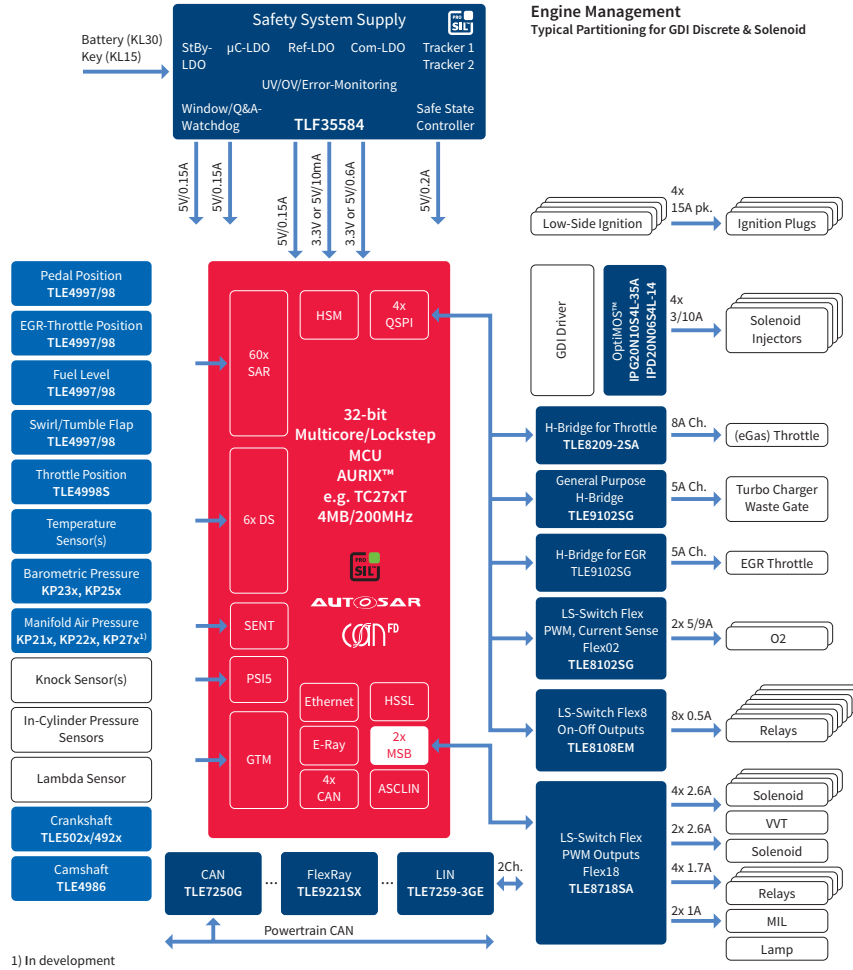
- Highest degree of integration resulting in minimized board space, optimized thermal performance and cost
- Industry benchmark in embedded real-time performance facilitates pumping loss reduction, knock detection and efficient after-treatment
- Conforming with upcoming emission legislation at maximized fuel efficiency and with even more driving pleasure, the new sensor families provide enhanced measurement precision (e.g. ignition control, misfire detection)

## Suggested Products

Product	Description
TC17xx, TC2xxx TriCore™	32-bit microcontroller family, optimized for highly demanding powertrain applications
TLE8888QK	Monolithic control IC for complete EMS systems
TLE8209-2SA	Electronic throttle control (ETC) driver
TLE50xx, TLE49xx, KP2xx	Broad portfolio of pressure sensors (MAP & BAP) as well as magnetic cam- & crankshaft and position sensors
KP27x	Sensor with digital SENT interface in development



# Gasoline Direct Injection



## System Benefits

- Flexible and scalable product portfolio tailored to the performance and real-time needs of the premium and value segments
- Conforming with the latest emission legislation at the highest possible fuel efficiency and maximum fun to drive
- Benchmark-setting real-time performance facilitates downsizing, direct injection, turbocharging and highly efficient after-treatment
- New sensor families provide enhanced measurement precision (e.g. ignition control, misfire detection)

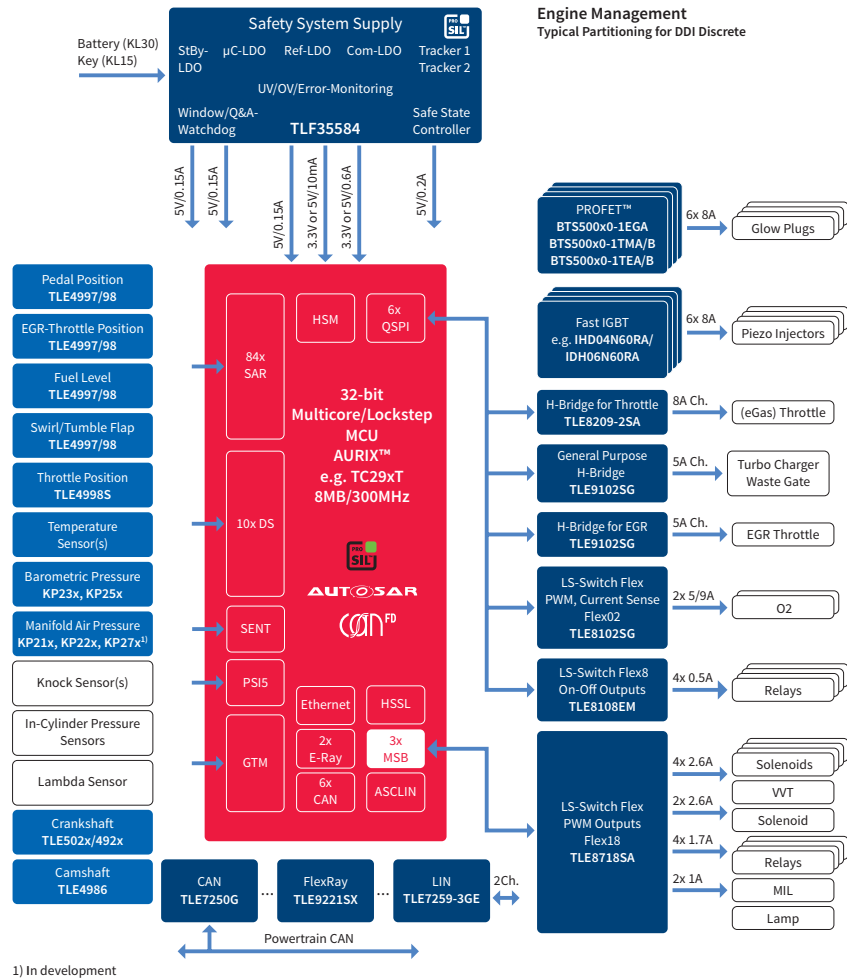
## Suggested Products

Product	Description
AURIX™	32-bit multicore TriCore™ microcontroller family, optimized for highly demanding powertrain applications (PRO-SIL™)
TLF35584	High-efficiency system power supply (PRO-SIL™)
TLE725x/TLE9221SX	New CAN/LIN/FlexRay transceivers
TLE8209-2SA	Electronic throttle control (ETC) driver
TLE9102SG	New cost-efficient H-bridge driver for non-ETC use cases, such as exhaust gas recirculation (EGR), turbo charger waste gate, turbo charger geometry and other DC motor driver actuators
TLE81xx	Scalable FLEX smart multi-channel low-side switch family designed for powertrain applications
TLE8718SA	Smart 18-channel low-side switch with micro-second channel
TLE50xx, TLE49xx, KP2xx	Broad portfolio of pressure sensors (MAP & BAP) as well as magnetic cam- & crankshaft and position sensors
KP27x	Sensor with digital SENT interface in development
IPG20N10S4L-35A	New 100V n-channel MOSFET products in compact Dual-SSO8 package





# Diesel Direct Injection



## System Benefits

- Large and scalable product portfolio tailored to the performance needs of the entire diesel segment
- Conforming with upcoming emission legislation at maximum fuel efficiency and with the highest driving pleasure
- Benchmark-setting real-time performance facilitates in-cylinder pressure measurement and highly efficient after-treatment (incl. hot and cold EGR, oxidation catalyst, particulate treatment and NOx treatment)
- New sensor families provide enhanced measurement precision

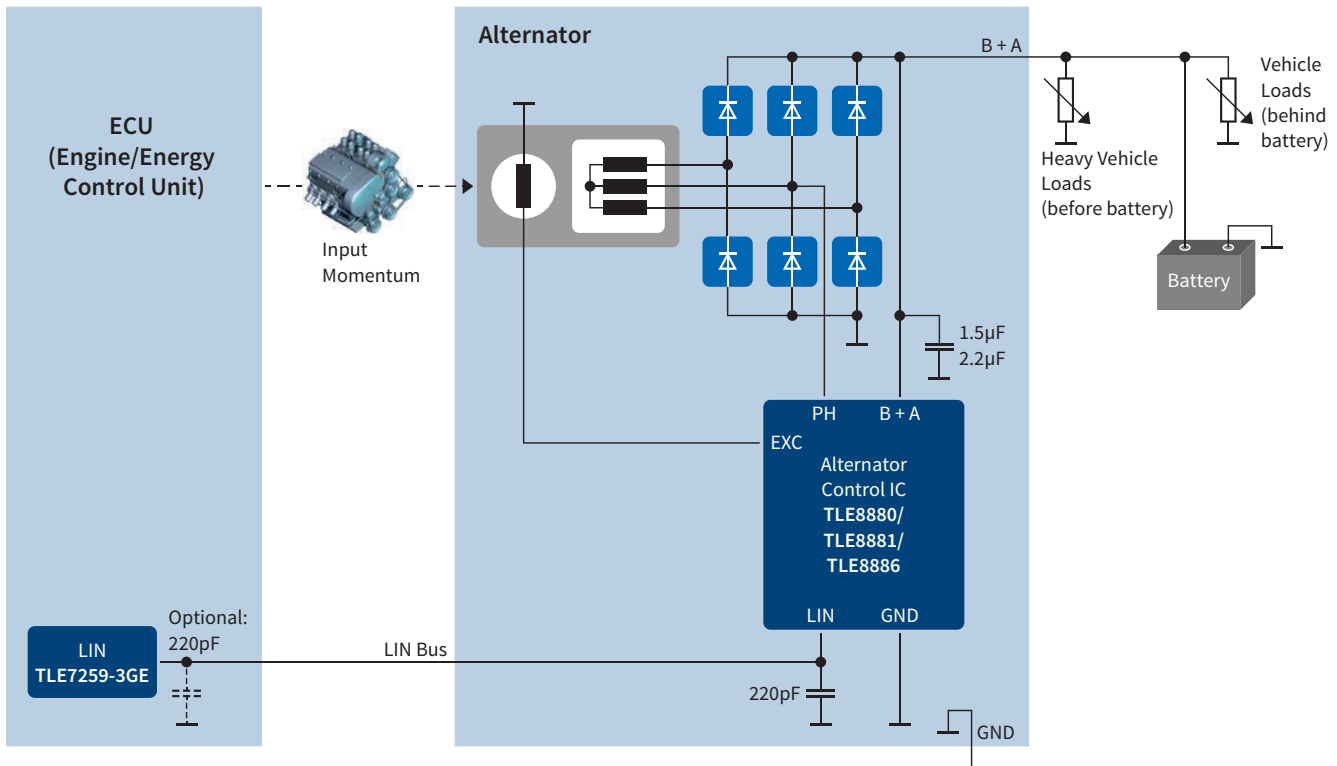
## Suggested Products

Product	Description
AURIX™	32-bit multicore TriCore™ microcontroller family, optimized for highly demanding powertrain applications (PRO-SIL™)
TLF35584	High-efficiency system power supply (PRO-SIL™)
TLE725x/TLE9221SX	New CAN/LIN/FlexRay transceivers
TLE8209-2SA	Electronic throttle control (ETC) driver
TLE9102SG	New cost-efficient H-bridge driver for non-ETC use cases, such as exhaust gas recirculation (EGR), turbo charger waste gate, turbo charger geometry and other DC motor driver actuators
TLE81xx	Scalable FLEX smart multi-channel low-side switch family designed for powertrain applications
TLE8718SA	Smart 18-channel low-side switch with micro-second channel
TLE50xx, TLE49xx, KP2xx	Broad portfolio of pressure sensors (MAP & BAP) as well as magnetic cam- & crankshaft and position sensors
KP27x	Sensor with digital SENT interface in development



# LIN Alternator Regulator

## Regular Diodes (3-phase example)



### System Benefits

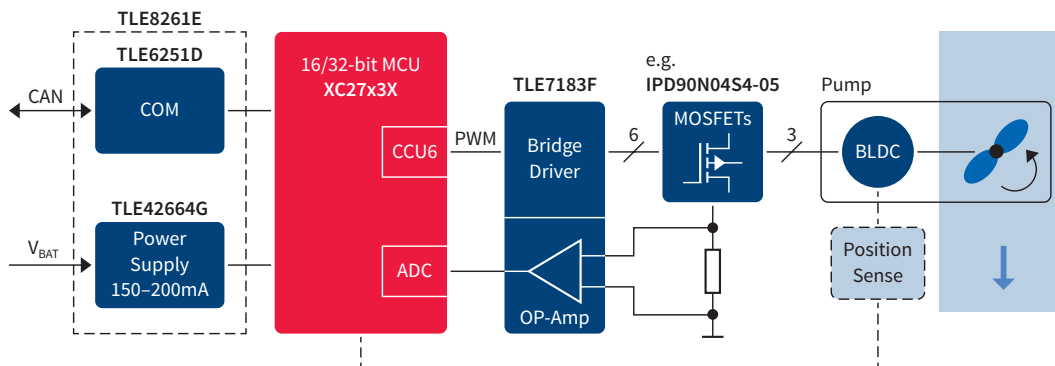
- Supporting conventional alternator and start-stop systems
- Fully digital PI regulation with very fast and accurate performance
- Compliant with VDA LIN-generator-regulator specifications
- Supports rectification with standard P/N diodes, low-loss diodes and MOSFETs
- EEPROM for outstanding flexibility during on-site customization of target application
- LIN interface (LIN 2.1 on physical layer, LIN 1.3/LIN2.1 on datalink layer)
- Very low quiescent current (less than 80µA at 25°C), excellent EMC performance
- High ESD resistivity of 8kV on all lines
- High current (12A) and temperature (up to 175°C) capability
- Available as bare die for mechatronic brush holder as well as in automotive industrial standard packages PG-TO-220-5
- Green product (RoHS-compliant) and AEC-Q100-qualified

### Suggested Products

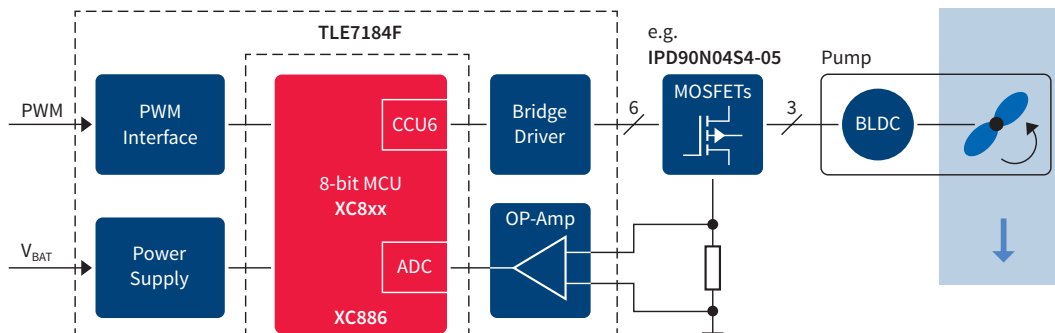
Product	Description
TLE8880/TLE8881	Monolithic full-feature regulator specifically designed for closed-loop voltage control in 12V automotive multi-phase alternators. This regulator is able to communicate with an engine-management or energy-management ECU through a standard LIN1.3 (datalink layer) interface. By using freely adjustable parameters, the regulator is able to operate even without any communication interface.
TLE8886	Same as TLE8880/TLE8881 but, among others, ECU communication via a standard LIN2.1 (datalink layer) interface
TLE7259-3GE	LIN transceiver with integrated wake-up and protection features

# Electric Water Pump

## High Performance



## Low Cost



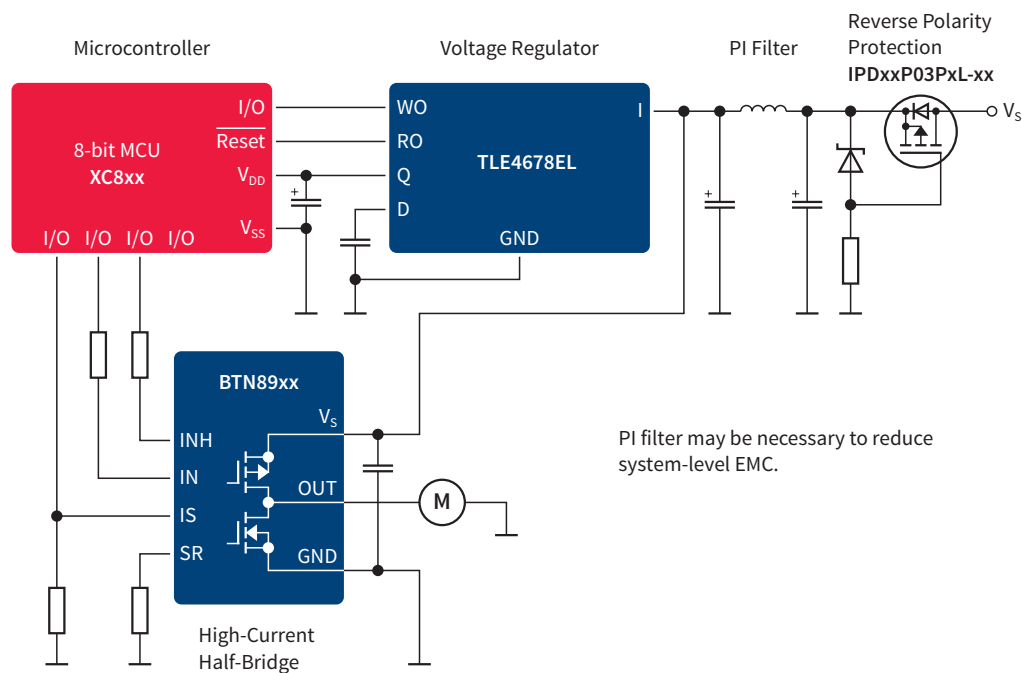
## System Benefits

- Large and scalable product portfolio tailored to performance & budget needs
- Fuel saving of > 4% compared to mechanical solution
- Improved thermal control of engine
- Enhanced pump efficiency
- Reduces power consumption

## Suggested Products

Product	Description
XC27xx	C166-compatible 16-bit microcontroller powertrain family (up to 1MB flash at 128MHz performance)
XC8xx	8051-compatible automotive 8-bit microcontrollers
TLE6251D	New CAN transceiver
TLE718x	High-current 3-phase bridge driver ICs
TLE826x	Monolithic integrated system basis chips (SBC) in enhanced power packages
TLE42xx	Low-dropout fixed-voltage regulator
IPD90N04S4-05	N-channel 40V MOSFET, optimized for high-current motor applications

# Fuel Pump



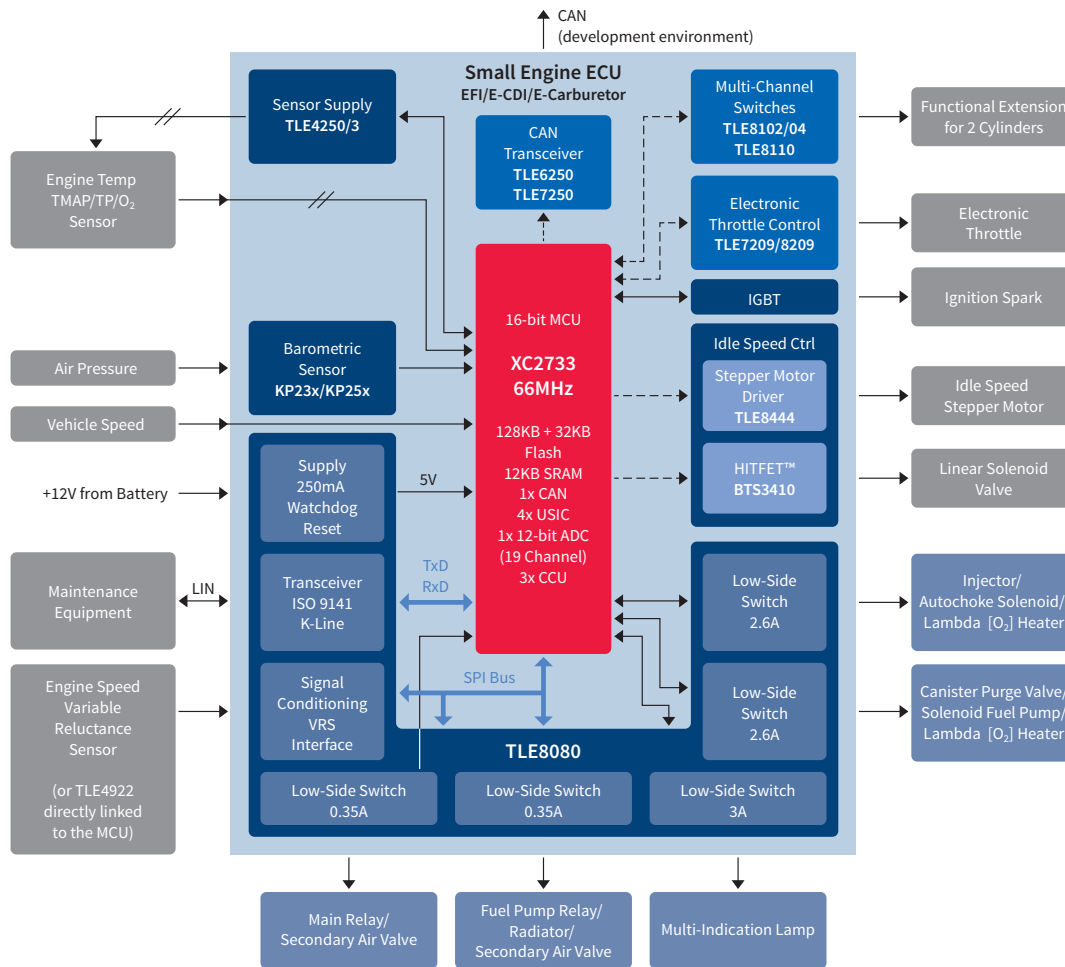
## System Benefits

- Large and scalable product portfolio tailored to performance & budget needs
- Fuel saving of > 1% compared to mechanical solution
- Lower hydrocarbon emissions
- Increased lifetime

## Suggested Products

Product	Description
XC8xx	8051-compatible automotive 8-bit microcontrollers
BTN89xx	NovalithIC™ integrates the high-current PN half-bridge family
TLE46xx	Low-dropout fixed-voltage regulator

# Small Engine Starter Kit



## Complete Infineon Reference Solution Including

- Small Engine Control Unit
- MECTRONIK MECLAB™ configuration and calibration software for running 1-cylinder 4-stroke combustion engine systems
- U-Connect XC2704 interface board USB-CAN
- Miniwiggler JTAG debugging interface
- Cable harness

## Target Applications

- Electronic Fuel Injection (EFI)
- Electronic e-carburetor
- Enhanced capacitor discharge ignition

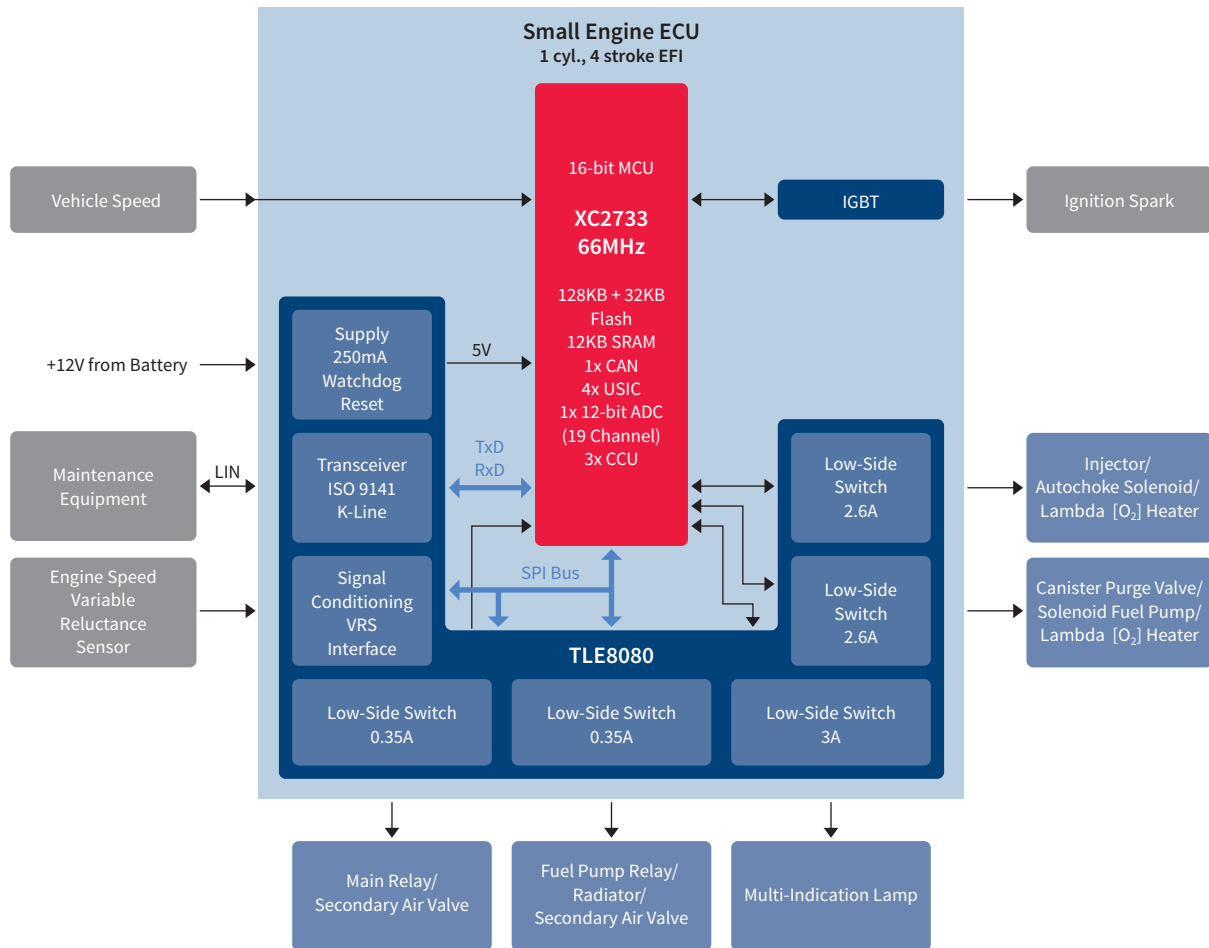
## Features/Benefits

- Easy to use as reference board
- Plug-and-play Electronic Control Unit (ECU)

## Suggested Products

Product	Description
XC2733	C166-compatible high-performance 16-bit MCU (up to 150KB flash at 66MHz performance)
TLE7209/8209	Electronic throttle control driver
TLE810x/8110	Multi-channel switches
TLE8444	Stepper motor driver
TLE8080EM	The power system chip for 1- and 2-cylinder small engine management
TLE42xx	Low-dropout fixed-voltage regulator
KP23x/KP25x	Barometric air pressure sensors (BAP) with analogue or SPI/digital interface
TLE4922	New magnetic speed sensor

# Small 1-Cylinder Combustion Engine Solution



## System Benefits

- Scalable chipset solutions supporting EFI, e-carburetor and CDI system approaches
- Highest feature density in smallest package supporting smallest form factor
- Single-device TLE8080EM solution for managing the entire electronic power interface of a 1-cylinder combustion engine
- Scalable and easy-to-use XC2700 family supporting easy-to-implement up- and downgrade options for functional enhancement or cost optimization
- CO<sub>2</sub> reduction of 17g/km and fuel efficiency increase of 16mpg

## Suggested Products

Product	Description
XC2733	C166-compatible high-performance 16-bit MCU (up to 128KB Flash at 66MHz performance)
TLE8080EM	The power system chip for 1- and 2-cylinder small engine management





## (H)EV Applications

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Although electric drivetrains are already more energy efficient than combustion models, further improvements are still required. Infineon delivers various chips and modules that can play a valuable role in minimizing power losses, maximizing power savings and boosting performance. As a leading supplier of high-power IGBT modules for drive and traction applications for many decades now, Infineon supplied the IGBT modules that powered the TGV to a new world speed record in 2007, for example. Drawing on its industrial experience, Infineon has developed dedicated (H)EV power modules delivering the ultimate in power density and efficiency.

As the world leader in advanced power and automotive electronics, Infineon has the broadest product portfolio for high-efficiency electric drivetrain designs. Combining affordability with ecology, our electromobility solutions help to significantly reduce the overall system cost of powertrain and electronics, increase mileage and improve battery efficiency. Carmakers and system suppliers can rely on best-in-class semiconductor products from Infineon Technologies to drive new innovations.

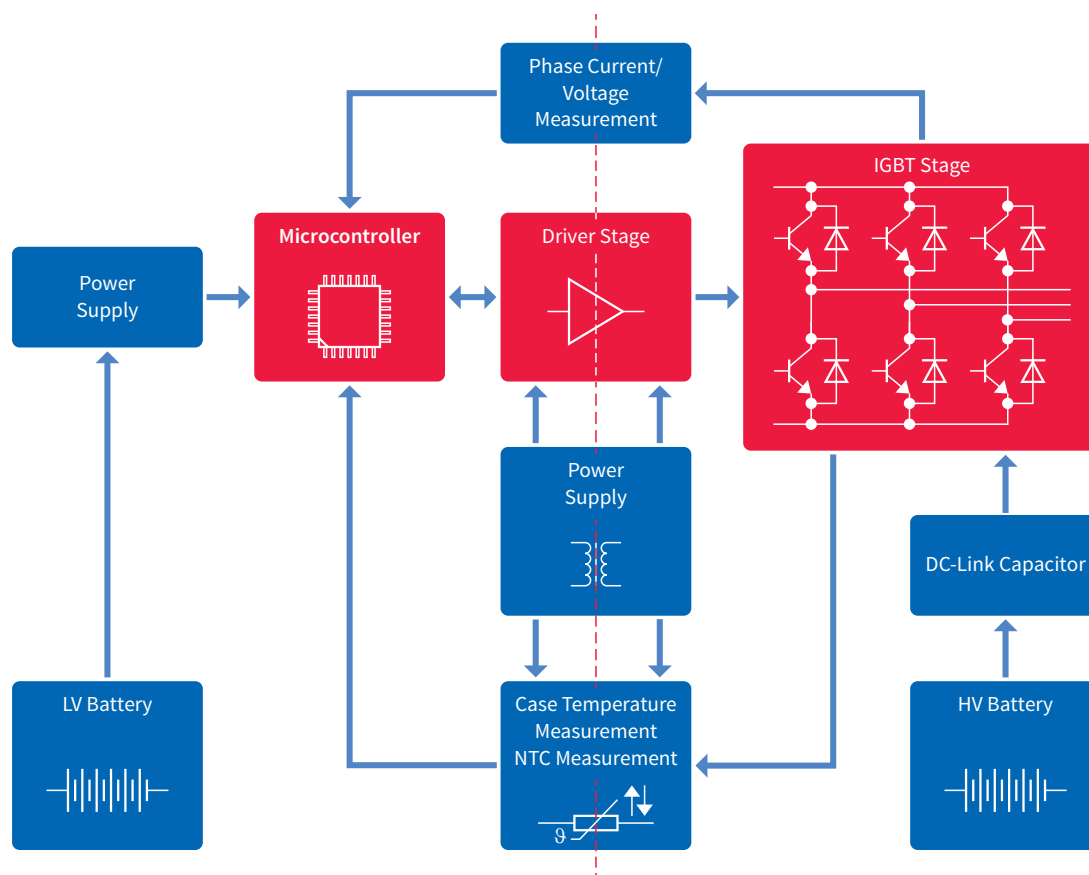
For instance, 75 Infineon semiconductors ensure a highly efficient electric drive in the new BMW i3, including, for example, a TriCore™ 32-bit microcontroller, HybridPACK™2 IGBT Power Module, EiceDRIVER™ products and CoolMOS™ high-voltage MOSFETs.

And this is only one example.

Suitable for all electric drivetrain architectures, Infineon's product portfolio comprises discrete components, power semiconductors, microcontrollers and sensors, as well as high-power modules. Thanks to our system expertise, we are able to provide complete chipsets offering optimized performance while reducing overall system costs.

Infineon's semiconductor solutions for (H)EV are testament to the company's ongoing commitment to deliver the exceptional quality and reliability that the world's leading car and automotive system manufacturers expect.

# (H)EV – Main Inverter



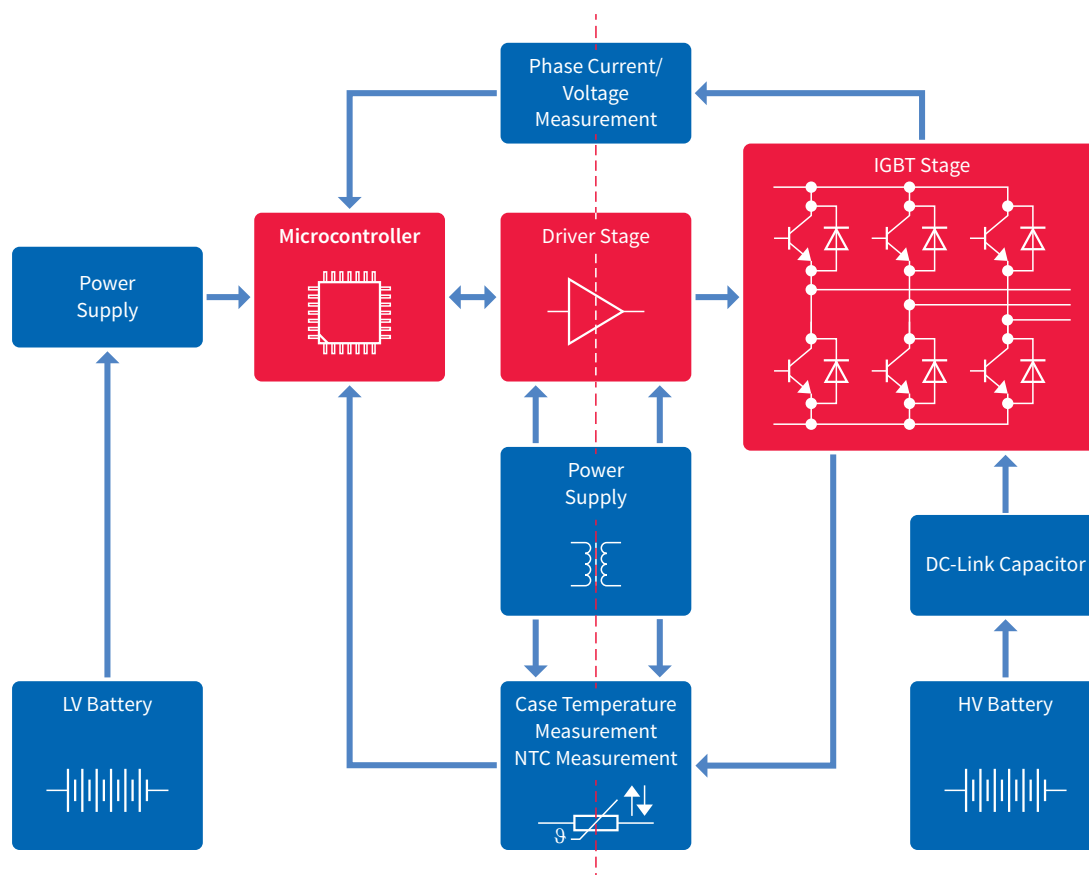
## System Benefits

- Fully automotive-qualified product portfolio supporting a wide range of motors, generators and power classes
- Highly efficient 3-phase driver due to very low conducting losses even at high switching frequencies
- Isolation-integrated in gate driver
- Wide range of 32-bit microcontroller solutions dedicated to (H)EV applications with a very cost-effective resolver interface
- Evaluation kit available to reduce system development time

## Suggested Products

Product	Description
TC26xD, TC27xT, TC29xT	High-performance 32-bit multicore lockstep microcontrollers
1ED020I12FA2	Automotive EiceDRIVER™, single-channel isolated IGBT driver for 650V/1200V IGBTs
1ED020I12FTA	Automotive EiceDRIVER™, single-channel isolated IGBT driver, two-level turnoff for 650V/1200V IGBTs
2ED020I12FA	Automotive EiceDRIVER™, dual-channel isolated IGBT driver for 650V/1200V IGBTs
1EDI2001AS/1EBN1001AE	New - Next generation EiceDRIVER™ supporting cost-effective implementation of ASIL-C/D systems - in development
HybridPACK™ 2 Enhanced	New - IGBT power module with 600A and 800A/680V and 400A/1200V for power ratings above 120kW
HybridPACK™ Drive	New - IGBT power module with 660A/750V for power ratings above 100kW – coming soon
HybridPACK™ 1 Pin-Fin	IGBT power module with 400A/705V (new) or 200A/1200V for power ratings above 70kW
HybridPACK™ 1	IGBT power module with 200A or 400A/705V (new) or 215A/400V (new) for power ratings up to 60kW
HybridPACK™ Light	IGBT power module with 200A/705V (new) for power ratings up to 20kW – coming soon

# (H)EV – Auxiliary Inverter



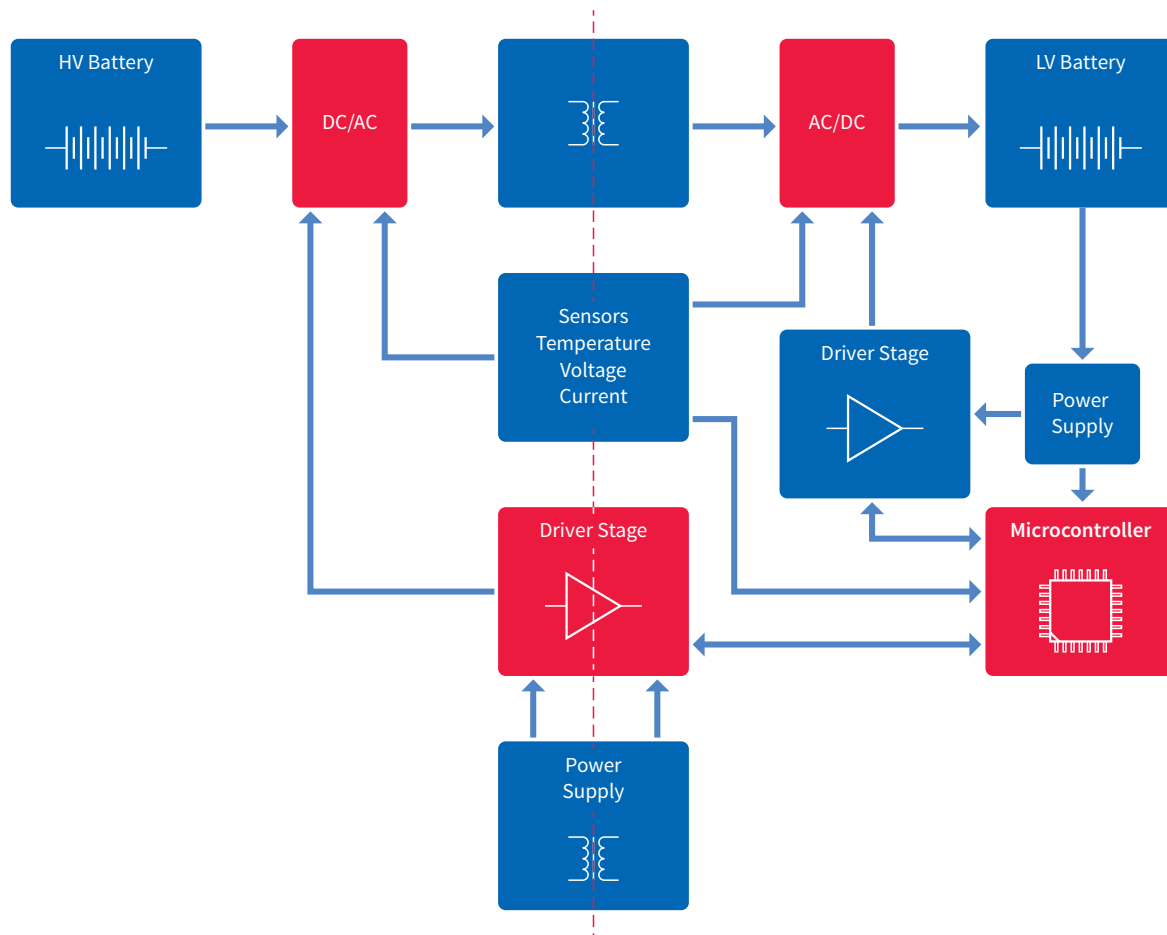
## System Benefits

- Fully automotive-qualified product portfolio including both power module and discrete solutions
- Isolation-integrated in gate driver
- Highly efficient 3-phase driver due to very low conducting losses even at high switching frequencies
- Broad 32-bit microcontroller solutions dedicated to (H)EV applications
- Evaluation kit available to reduce system development time

## Suggested Products

Product	Description
TC23xL, TC26xD	New 32-bit TriCore™ lockstep microcontroller
1ED020I12FA2	Automotive EiceDRIVER™, single-channel isolated IGBT driver for 650V/1200V IGBTs
1ED020I12FTA	Automotive EiceDRIVER™, single-channel isolated IGBT driver, two-level turnoff for 650V/1200V IGBTs
2ED020I12FA	Automotive EiceDRIVER™, dual-channel isolated IGBT driver for 50V/1200V IGBTs
IKxxxN60TA	IGBT discretes from 20A to 75A, 600V with soft, fast recovery anti-parallel EmCon HE diode
FS75R07W2E3_B11A & FS50R07W2E3_B11A	Easy IGBT power module for automotive drives with 50A or 75A/ 650V for power ratings up to 10kW, 1200V. IGBT power module on request.

# (H)EV – Auxiliary HV/LV DC/DC



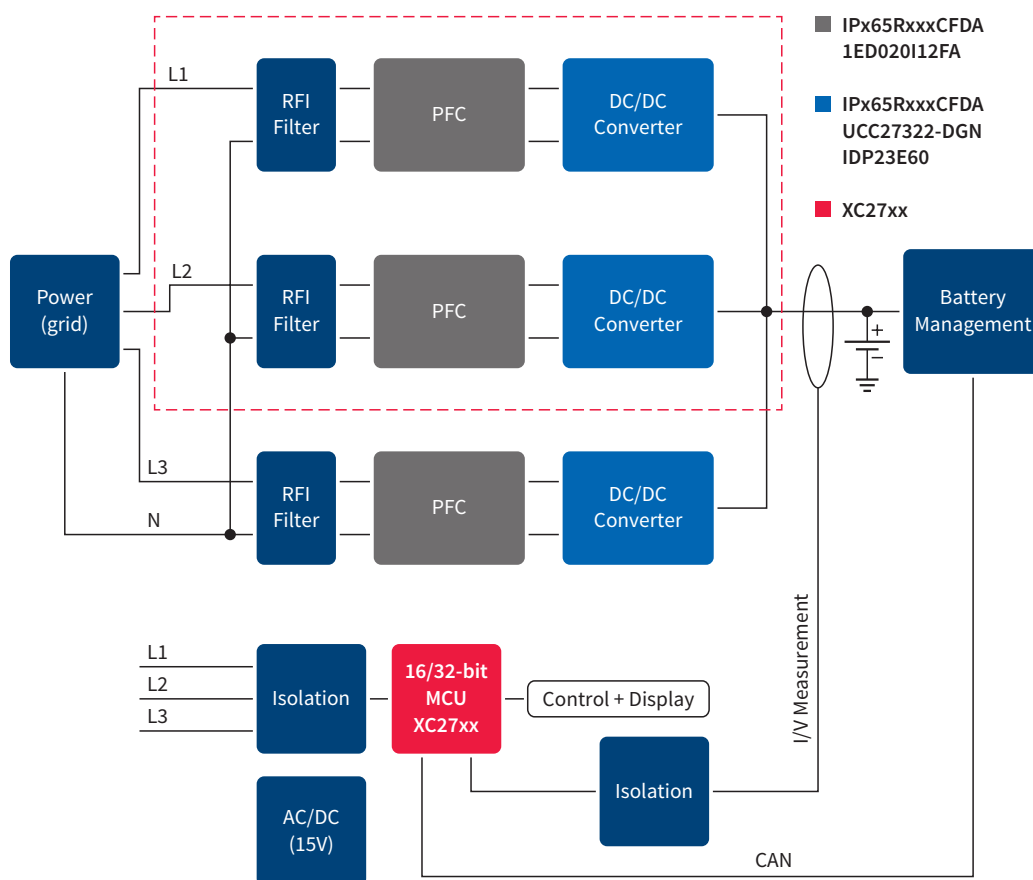
## System Benefits

- Fully automotive-qualified product portfolio including both power module and discrete solutions
- Supports a wide range of highly efficient conversion topologies (including bidirectional)
- Compact design with the highest power density
- Very low switching losses at high switching frequencies
- Isolation-integrated in gate driver
- High-performance 32-bit microcontroller solutions
- Evaluation kit available to reduce system development time

## Suggested Products

Product	Description
TC23xL, TC26xD	New 32-bit TriCore™ lockstep microcontroller
1ED020I12FA2	Automotive EiceDRIVER™, single-channel isolated IGBT driver for 650V/1200V IGBTs
2ED020I12FA	Automotive EiceDRIVER™, dual-channel isolated IGBT driver for 650V/1200V IGBTs
IPx65RxxxCFDA	650V CoolMOS™ discrete high-voltage MOSFETs with fast body diode
F4-75R07W1H3_B11A & F4-50R07W1H3_B11A	Easy IGBT power module for automotive HV/LV DC/DC converters: H-bridge with high-speed IGBT 3 and rapid diode 650V for switching frequencies up to 100kHz

# (H)EV – AC/DC (Battery Charger)



## System Benefits

- Suitable for plug-in hybrid and EV
- Integrated Power-Factor Correction (PFC)
- Galvanic isolation
- Wide range of input and output voltages
- Adjustable current limits
- Automotive standard communication (CAN)
- Modular concept enables 1 to 3-phase AC power supply

## Suggested Products

Product	Description
TC23xL, TC26xD	New 32-bit TriCore™ lockstep microcontroller
1ED020I12FA2	Automotive EiceDRIVER™, single-channel isolated IGBT driver for 650V/1200V IGBTs
1ED020I12FTA	Automotive EiceDRIVER™, single-channel isolated IGBT driver, two-level turnoff for 650V/1200V IGBTs
2ED020I12FA	Automotive EiceDRIVER™, dual-channel isolated IGBT driver for 650V/1200V IGBTs
CoolMOS™ (IPx65RxxxCFDA)	High-voltage automotive MOSFETs for low-power charging solutions (overnight)
Easy Automotive	Flexible power module solution for low-power charging solutions
HybridPACK™1	Power module solution for high-power charging with 200A/1200V

# Infineon's PRO-SIL™

## Supporting ISO 26262 Compliant System Development



Infineon's PRO-SIL™ concept includes safety-focused organization and business processes to generate hardware and software safety features, including safety documentation.

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. The ISO 26262 mandates more robust and comprehensive product development pro-

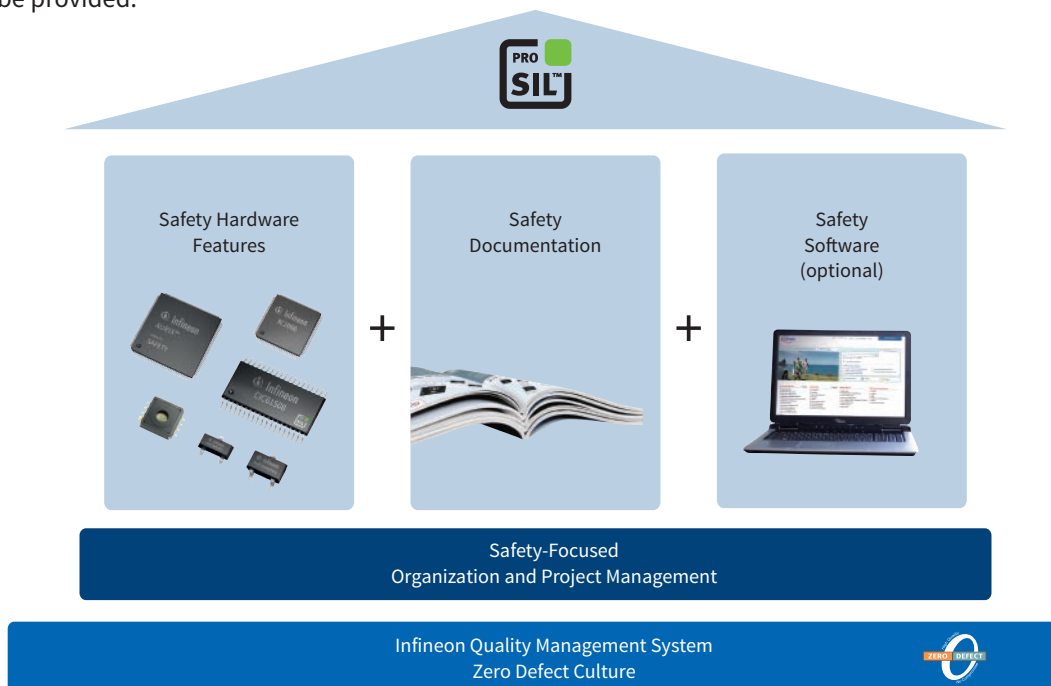
cesses and functional safety concepts in automotive applications.

Infineon's PRO-SIL™ concept enables efficient ISO 26262-compliant safety application development. Across the full certification spectrum from Automotive Safety Integrity Levels ASIL-A to ASIL-D, our end-to-end PRO-SIL™ approach will help you with the assurance that Infineon hardware, software and functional safety concepts meet your design and compliance needs.

### PRO-SIL™ Highlights

- Broad hardware portfolio including sensors and microcontrollers, along with analog and power management ICs providing SIL-supporting features.
- In the case of ISO 26262 PRO-SIL™ products, safety concepts are in place to enable the required safety measures, along with testing, monitoring and diagnostic capabilities for your safety architecture.
- Comprehensive safety software packages for integration are in place, such as the SafeTlib software for Infineon's AURIX™ microcontroller family.
- Full range of support services – extending from consulting and design advice to 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.

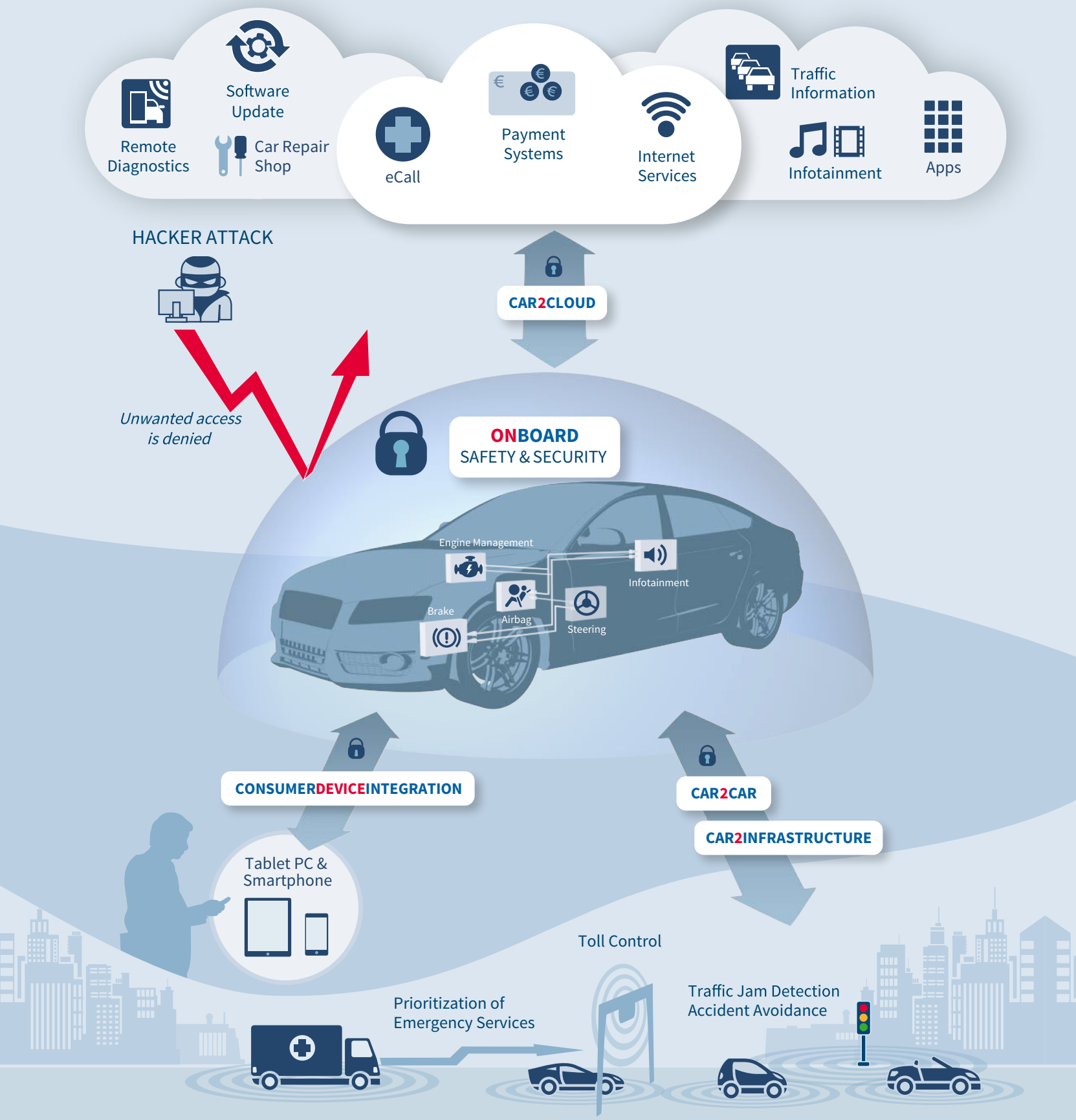
Infineon's PRO-SIL™ logo will guide you to our products (HW, SW, Safety Documentation) with SIL-supporting features. These products will simplify the implementation of customers' system design and improve time-to-market in achieving the desired functional safety level compliance.





# Infineon Car Security

Driving Trust





## Infineon's Next Level of Zero Defect Program – On the Way to Zero Defect Products and Services

The most valuable aspect of cars is the people they carry. Therefore, safety should never be compromised. This is the most important consideration for everybody involved in making automobiles – from the smallest suppliers to the manufacturers themselves. As car components become ever more complex, and as the number of control units in vehicles increases, the likelihood of a product failure becomes greater. Quality performance is a key differentiator for automotive market success. Our target of Zero Defects means:

- No quality events
- Defect-free product launches
- Automotive product quality of zero failed parts per million
- Low non-conformance costs
- Highest quality image in the market
- More business due to satisfied customers

### **No compromise when it comes to quality**

Infineon's "AUTOMOTIVE EXCELLENCE" program, which was established in 2003, was the most comprehensive quality policy in the semiconductor industry. The "NEXT LEVEL of ZERO DEFECT" program represents the next step in the company's ongoing quality evolution. This program is founded on four

pillars: people, products, processes and production. Thanks to our "no compromise" policy in all four pillars, our program really works. Our employees truly live and breathe the credos of Zero Defect and are dedicated to the highest quality requirements and understanding the importance of prevention. They are trained to develop an in-depth knowledge of the tools and methods used to avoid deviations and to solve problems by addressing both technical and systemic root causes.

### **On the way to Zero Defect products**

Some examples:

- The BEAR (BackEnd Automation Roadmap) project reduces manual handling
- "Top 5 Defects Reduction in Backend" deeply addresses technical and systemic root causes
- Quality Firewall: the "Highest outgoing product quality by intelligent outlier screening" subproject
- By extending the "Next Level of Zero Defect" program into the supplier base
- The project "Volume Ramp" will make sure that we provide highest quality from first delivery
- With "Requirement Driven Development Flow" we achieve that all customer requirements are addressed and verified



**“Next Level of Zero Defect” is your competitive advantage**

Many of our partners have expressed their satisfaction with the quality of our products and the way we execute the “Next Level of Zero Defect” program.

- “Honor Quality Award Toyota Hirose” received in 2010 for Zero Defect quality for the last four years. Infineon is the first non-Japanese company to receive this honor in this highest-level category.
- 7 quality awards from Toyota’s Hirose plant in 2004, 2006, 2007, 2008, 2009, 2010 and 2011
- “Supplier Performance Award” for the year 2008 and “Automotive Supplier of the Year 2009, 2010 and 2011” from Continental
- “Excellent Supplier Award 2008” from Hitachi Cable Japan
- PRIMP award 2013 from Japanese customer Omron

## Ask Infineon. Get connected with the answers.

Infineon offers its toll-free 0800/4001 service hotline as one central number, available 24/7 in English, Mandarin and German.

Our global connection service goes way beyond standard switchboard services by offering qualified support on the phone. Call us!

- Germany ..... 0800 951 951 951 (German/English)
- China, mainland ..... 4001 200 951 (Mandarin/English)
- India ..... 000 800 4402 951 (English)
- USA ..... 1-866 951 9519 (English/German)
- Other countries ..... 00\* 800 951 951 951 (English/German)
- Direct access ..... +49 89 234-0 (interconnection fee, German/English)


\* Please note: Some countries may require you to dial a code other than "00" to access this international number, please visit [www.infineon.com/service](http://www.infineon.com/service) for your country!

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