

Power electronic systems for car

Starter/Alternator

Infineon Technology offers an extensive product portfolio for Starter/Alternator systems - from Hall sensors, real time embedded control to smart power ICs which are capable to work in a 42V board network today.

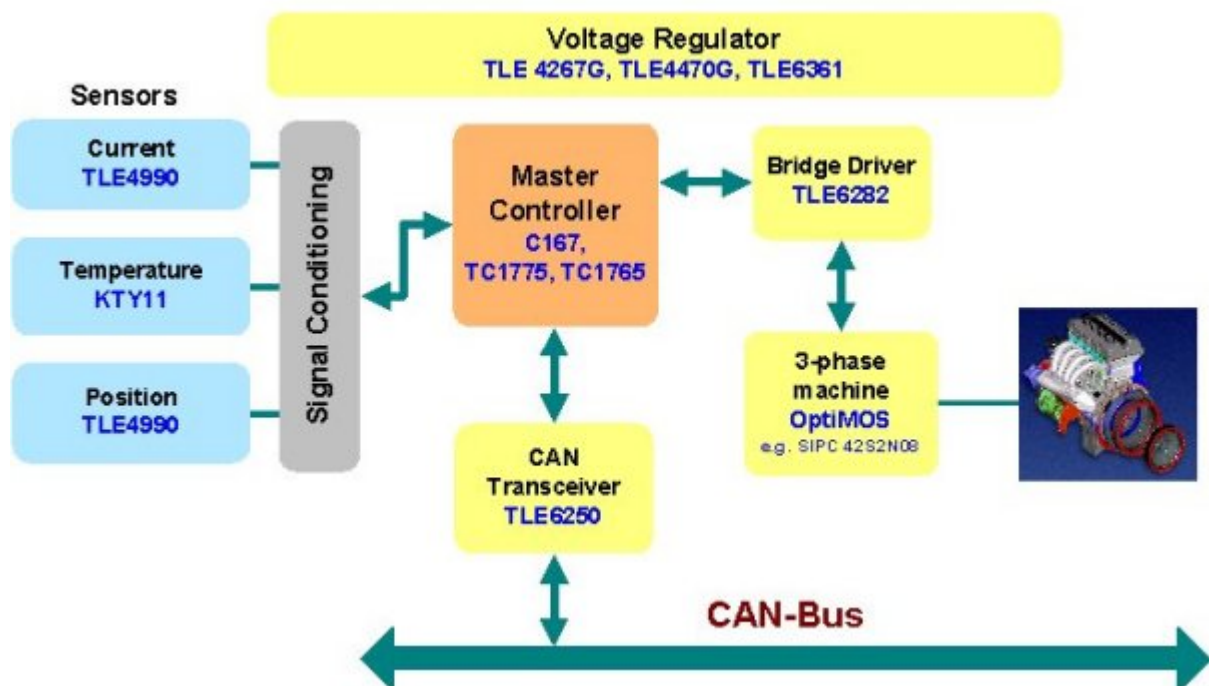
Examples:

Infineon's Hall-sensors like the TLE4990 are sensing position, speed and can be applied as current sensors.

Infineon's 16-Bit and 32-Bit microcontrollers are the perfect choice to control the electrical machine due to their dedicated automotive peripherals and perfect real time performance. The C167 family is the success story in Powertrain applications. The new 32-Bit TriCore™-based microcontrollers TC1765 and TC1775 - members of the so-called AUDDO™ family - are an excellent choice to control Starter/Alternator systems. The TriCore™ offers powerful DSP capabilities for this application.

A wide range of voltage classes, best in class RDSon, low thermal resistance and the capability to apply the product in an ambience with high temperature are some of the unique advantages of Infineon's power MOSFETS called OptiMOS™. Smart Bridge Driver ICs like the TLE6282 enable the accurate control of the power bridge and provide functionality regarding protection and diagnosis. One possible solution is to apply three times the TLE6282 as half bridge drivers. Infineon's high speed CAN transceiver allows the communication on a CAN bus to exchange information to the battery or engine management control unit.

Our excellent technology for power semiconductors allows us to offer power products capable to operate in a 42V board net today. The further integration of Infineon's devices into modules can be realized by eupec for mechatronic solutions (<http://www.eupec.de>).



Power Steering

INTRODUCTION

Concerning Power Steering one differentiates between Electro Hydraulic Power Steering (EHPS) - that uses conventional hydraulic power steering with an electric motor driven hydraulic pump, Electric Power Steering (EPS) - where the E-motor is attached directly to the steering gearbox with no hydraulic system, and the Electro Parking Aid (EPA) - based on EPS but only active at low speed.

With electronic systems becoming more and more important in cars, EPS is the future. Unlike its conventional counterpart, EPS is active only during the actual steering process. It also makes steering hydraulics obsolete, cuts fuel consumption by as much as 0.4l/100km, and is fast to install, making it a winning technology for manufacturers, motorists, and the environment.

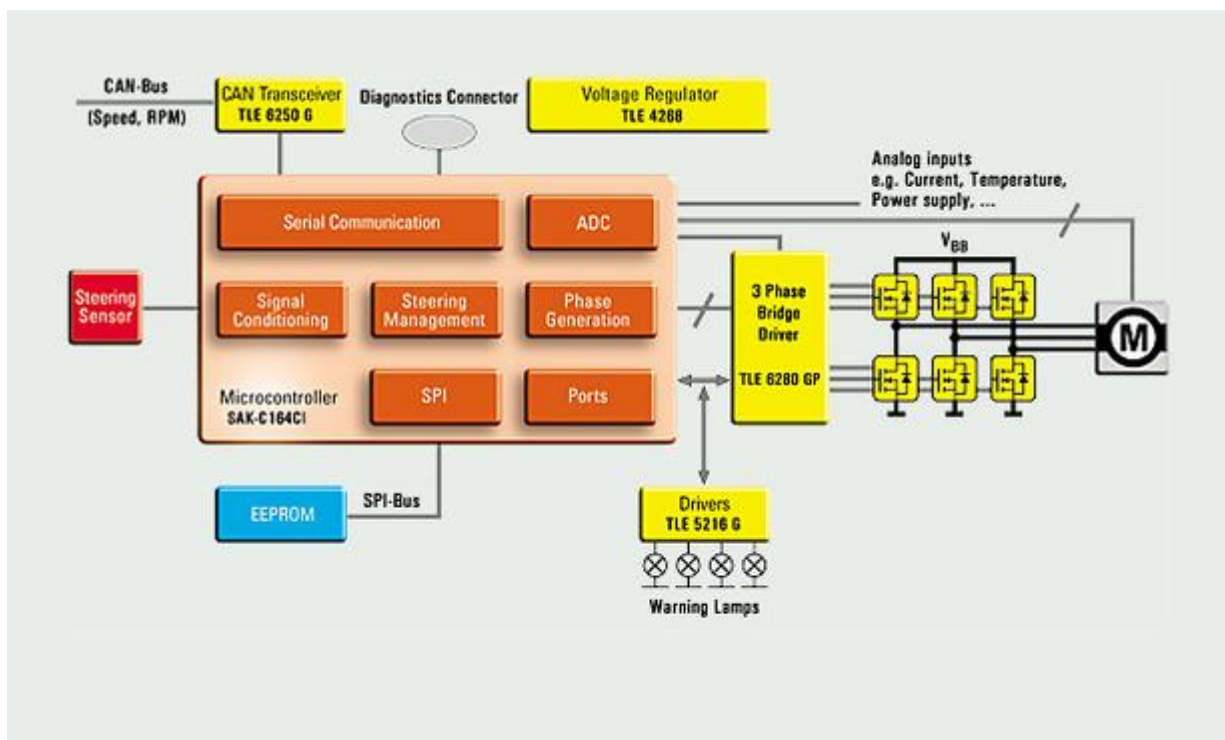
COMPONENTS

One possible configuration for an EPS solution is Infineon's C164 high performance 16-bit microcontroller with up to 64 KBytes of program memory, 4 KBytes of RAM, and a comprehensive peripheral set including 10-bit ADC, USART, SPI, dedicated timer unit, FullCAN in combination with TLE 6280 GP, and Power MOSFET as shown below.

The TLE 6280 GP is a three-phase bridge driver device that simplifies the control of the power steering motor. The dedicated timer structure of the microcontroller reduces development costs and simplifies board design.

The Power MOSFETs have an ultra low on-resistance whereas the OptiMOS technology allows the combination of such devices into TO 220 package. Their rugged design makes them ideal for automotive applications.

SCHEMATIC BLOCK DIAGRAM:



Restraint Systems - Airbag

- INTRODUCTION

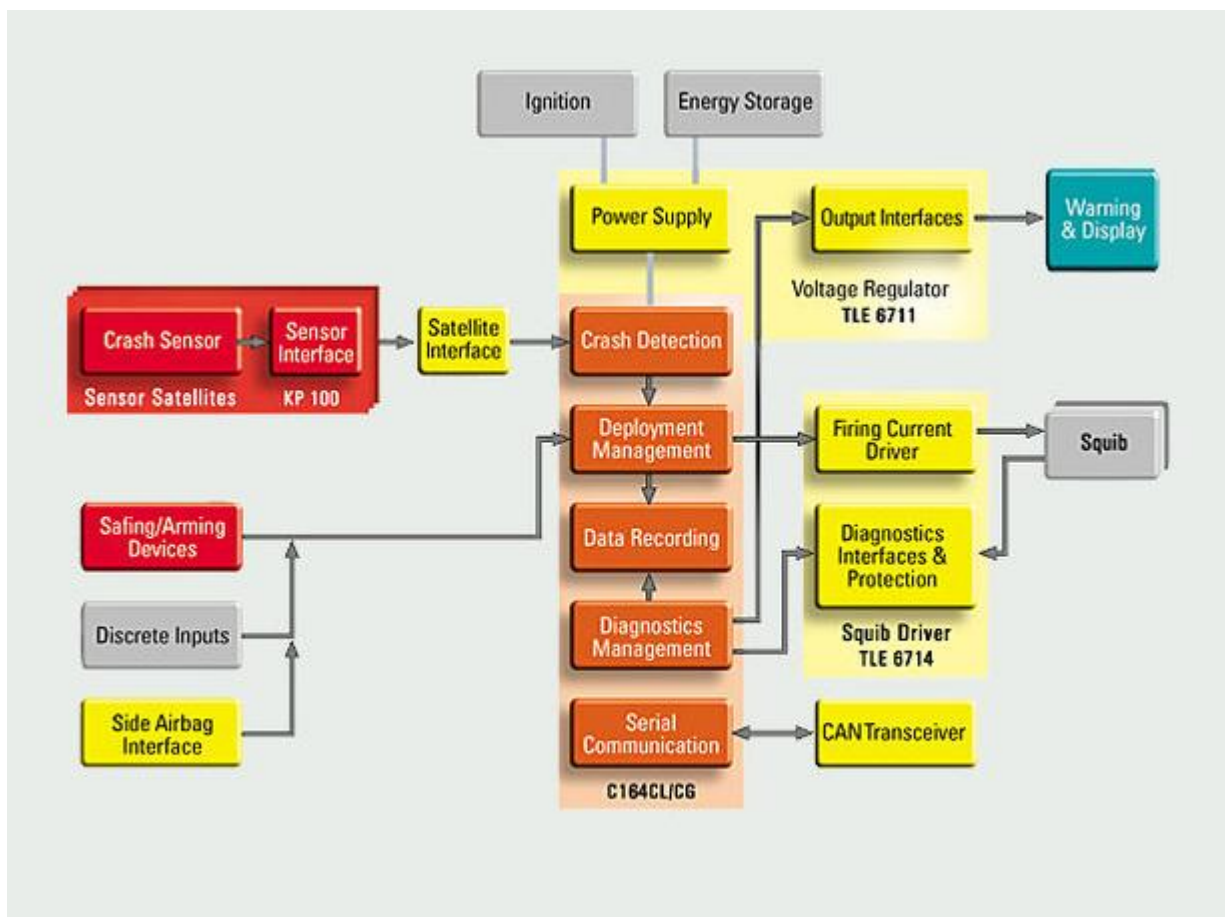
Since the airbag was introduced its reliability and safeness has been improved continuously. A very important role comes up to the microcontroller that determines when to fire the airbag(s) based on sensor data.

- COMPONENTS

Infineon's 16-bit microcontroller C164CL/CG suits this application perfectly in combination with a micromachined acceleration sensor. The sensor provides measurement in two dimensions and including sensing, signal conditioning, system interface, and self-test capability.

Highly integrated power devices that reduce board space and pin count are dedicated to airbag applications. Application Specific ICs (ASICs) to fire and test the squibs are good examples. A power supply with step-down and step-up converters is fully integrated, too. This integration is possible due to Infineon's smart power technologies combining bipolar, CMOS, and DMOS, on one chip. Infineon has already shipped more than 53 million System IC devices for airbag applications.

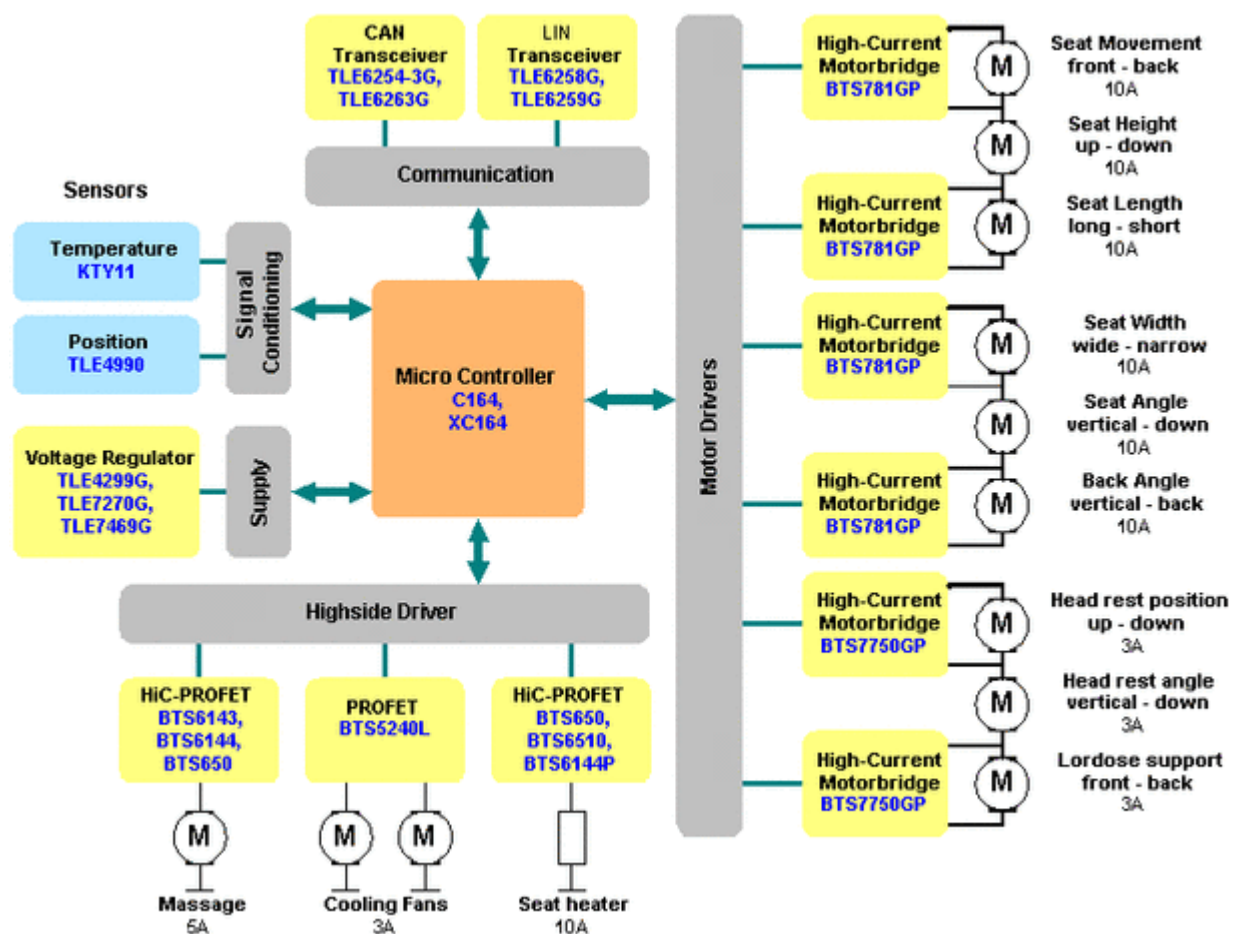
- SCHEMATIC DIAGRAM of an airbag Electronic Control Unit (ECU):



Seat Module

Seat Module Solution

In automotive comfort electronics, Seat Modules have become a mainstream solution over the past years. A Seat Module covers all the electrical functions which are located in the seat like the movement of the seat, adjustment of the seat height, adjustment of the back rest, head rest position. New comfort features like seat heating, seat ventilation and massage functionality are becoming more and more popular. To generate system cost advantage on the wire harness, the module is a stand-alone unit, controlled only by bus communication. Infineon offers a complete range of products for this application, covering all necessary functions such as communication, supply, power drivers, sensors and microcontrollers. Standard stand-alone products as well as Application Specific Standard Products (ASSPs) are available.



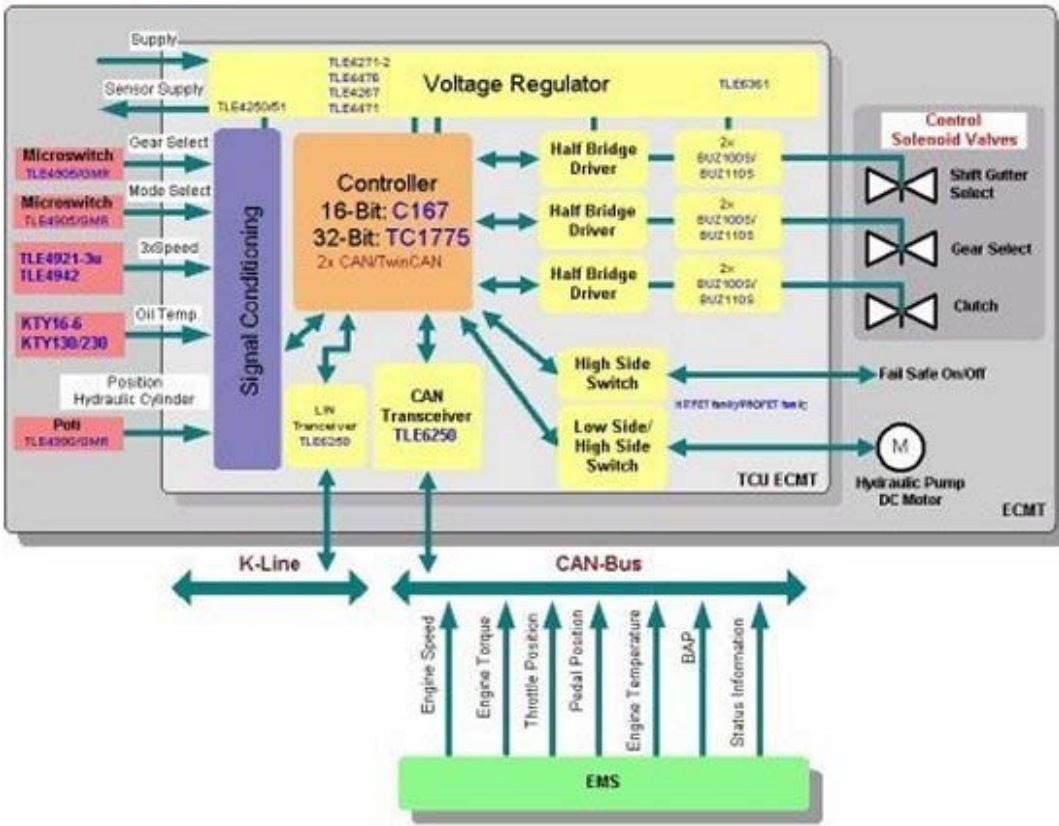
Transmission

To reduce the total system cost, increase system reliability, improve EMI behavior etc. there is a demand for integrated solutions. For integrated transmission systems we can find mechatronic solutions which integrates the ECU, sensors, actuators and wiring technology into a functional unit. Due to the harsh environment like high temperatures up to 150°C often the heat transfer is optimized by using bare chips, directly bonded onto an hybrid.

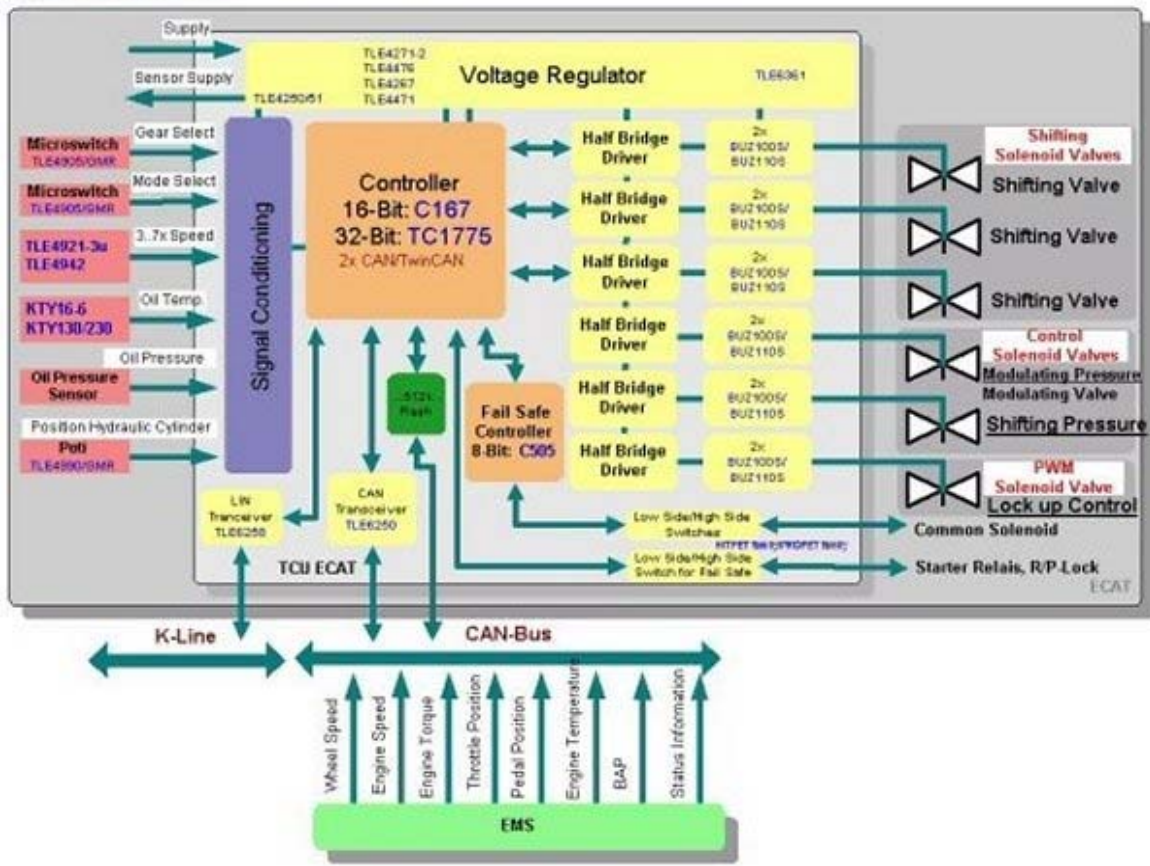
Infineon Technologies can offer an extensive product portfolio - packaged or bare die - from power semiconductors like switches, bridges and voltage regulators to microcontrollers, CAN- and LIN transceivers and sensors.



ECMT (Electronically Controlled Manual Transmission)



ECAT (Electronically Controlled Automatic Transmission)



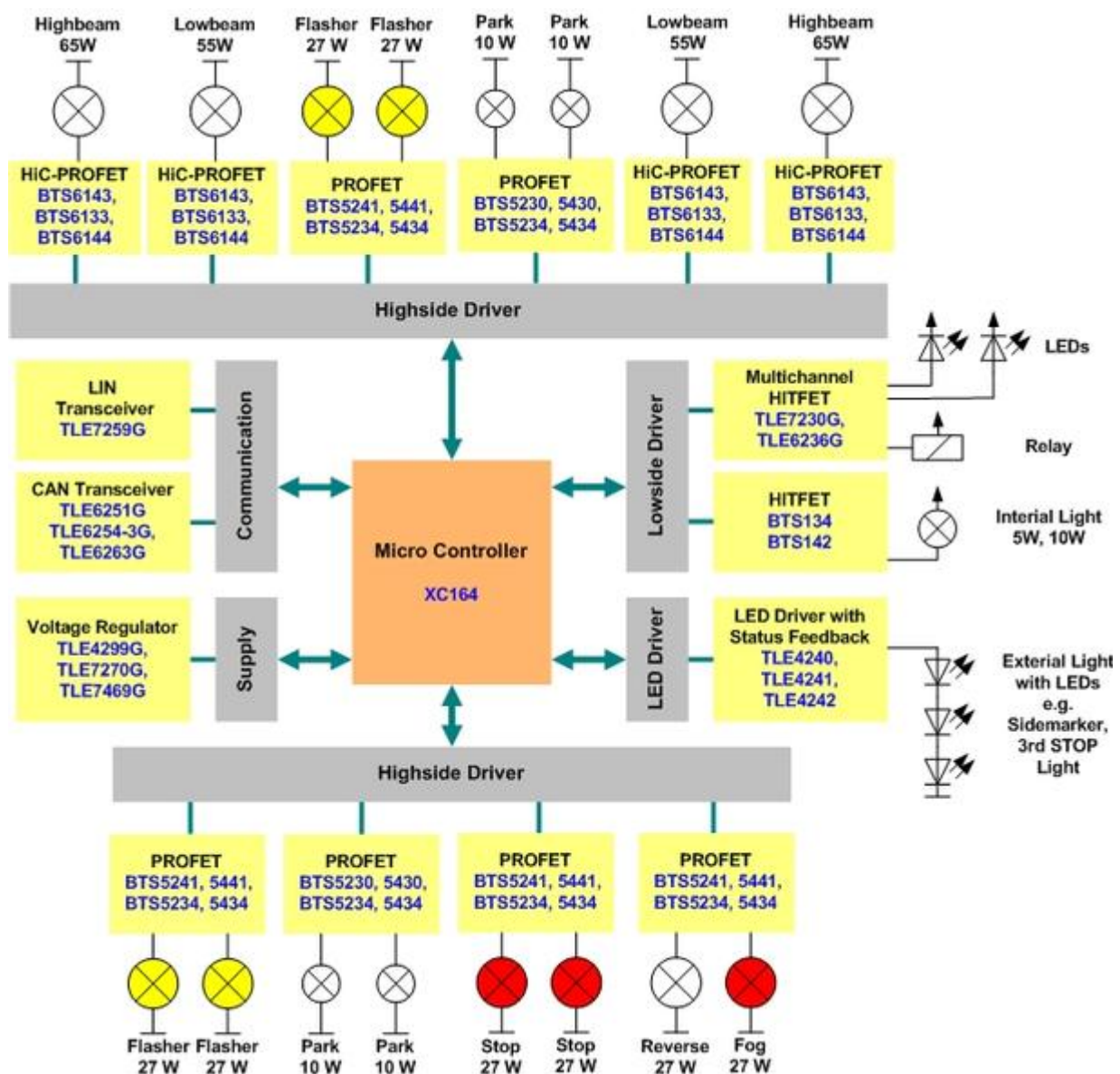
Light Control

Within automotive comfort electronics, the Central Body Controller with the Light Control is the key application in terms of functionality and silicon content. The central body control includes the switching of all the lights in the car, but also other functions like gate way and control of relays for heavy loads.

Today, the functionality of light control is increased dramatically. Besides the pure switching of the light, a complete protection and diagnosis is also required. Infineon's smart power devices protect the application and themselves, so there is no need for fuses anymore. This leads to a massive system cost reduction. By using smart semiconductors all kind of failures like short to ground, open load or broken wire can be detected. The use of devices the current sense feature enable the use of standard bulbs or LEDs with the same hardware.

From LEDs up to 65W highbeam or HIDL-Xenon lights, Infineon offers the right power driver. The board net voltage of a car can go up to 16V, but the bulbs have only a rating for 13.5V and overvoltage is dramatically reducing the lifetime. So the control and maintaining of the voltage at the bulb is done using a PWM frequency (pulse width modulation) of 100Hz and the duty cycle is depending on the board net voltage. Infineon Smart Power Switches are specially designed for PWM control including an active edge shaping for lowest EMC emissions.

Infineon offers a complete range of products for this application, covering all necessary functions such as Highside-Switches, Lowside-Switches, Relay and LED driver, communication, supply, sensors and microcontrollers. Standard stand-alone products as well as Application Specific Standard Products(ASSPs) are available.



Gasoline Engine Management

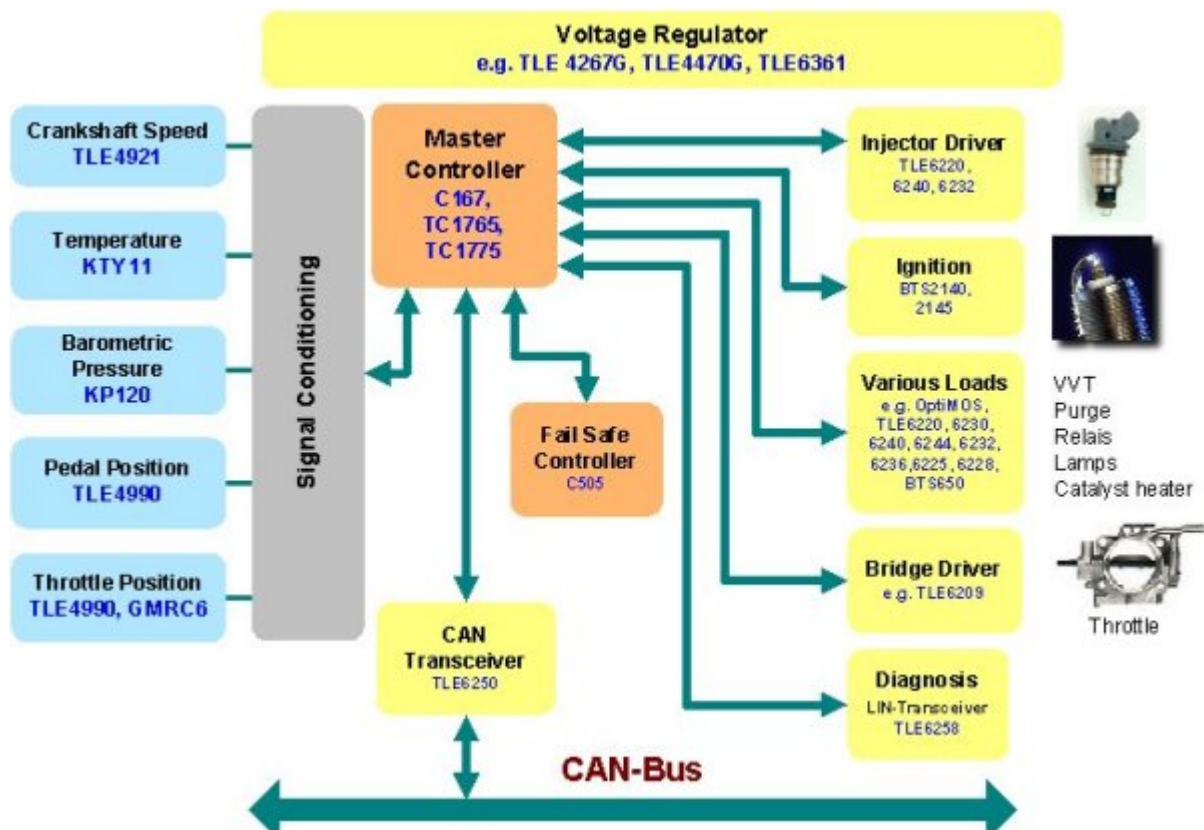
Gasoline engine management systems can be completely covered by Infineon's semiconductors - from micro-machined sensors, real time embedded control to smart power ICs which are capable to work in a 42V board network today.

Examples:

Pressure sensors for barometric and manifold pressure measurement are benchmark in terms of accuracy and space requirements. Infineon's Hall-sensors are sensing speed, angle and position for crank- and camshaft.

Infineon's 8-Bit, 16-Bit and 32-Bit microcontrollers can operate as master- and fail-safe-controller. The 8-Bit microcontroller C505 can be used in small engine ECUs with a good price/performance ratio. The C167 family is the success story in Powertrain applications. The new 32-Bit TriCore™-based microcontrollers TC1765 and TC1775 - members of the AUDDO™ family - are the excellent choice to reduce emission and fuel consumption.

Infineon provides a broad range of (smart) switches for all types of loads. We offer solutions for standard ignition and innovative ignition applications where the power stage is integrated to the coil with standard and smart IGBTs. Multi-Channel low side switches with several protection and diagnostic features are driving the injectors as well as they can serve various loads of the engine management system. MOSFETs of Infineon's OptiMOS™ family are the perfect choice where low R_{ds(on)} is needed. The TLE6209 represents one of the most used bridge driver IC in automotive applications and can perfectly drive the throttle. High-Current-PROFETs provide enough power to switch heavy loads like the catalyst heater. Single or multiple Low-Drop voltage regulators, DC/DC converters and CAN and LIN transceivers complete the portfolio.



Diesel Engine Management

Infineon Technology offers an extensive product portfolio for Diesel engine management systems like Common Rail - from micro-machined sensors to smart power ICs which are capable to work in a 42V board network today.

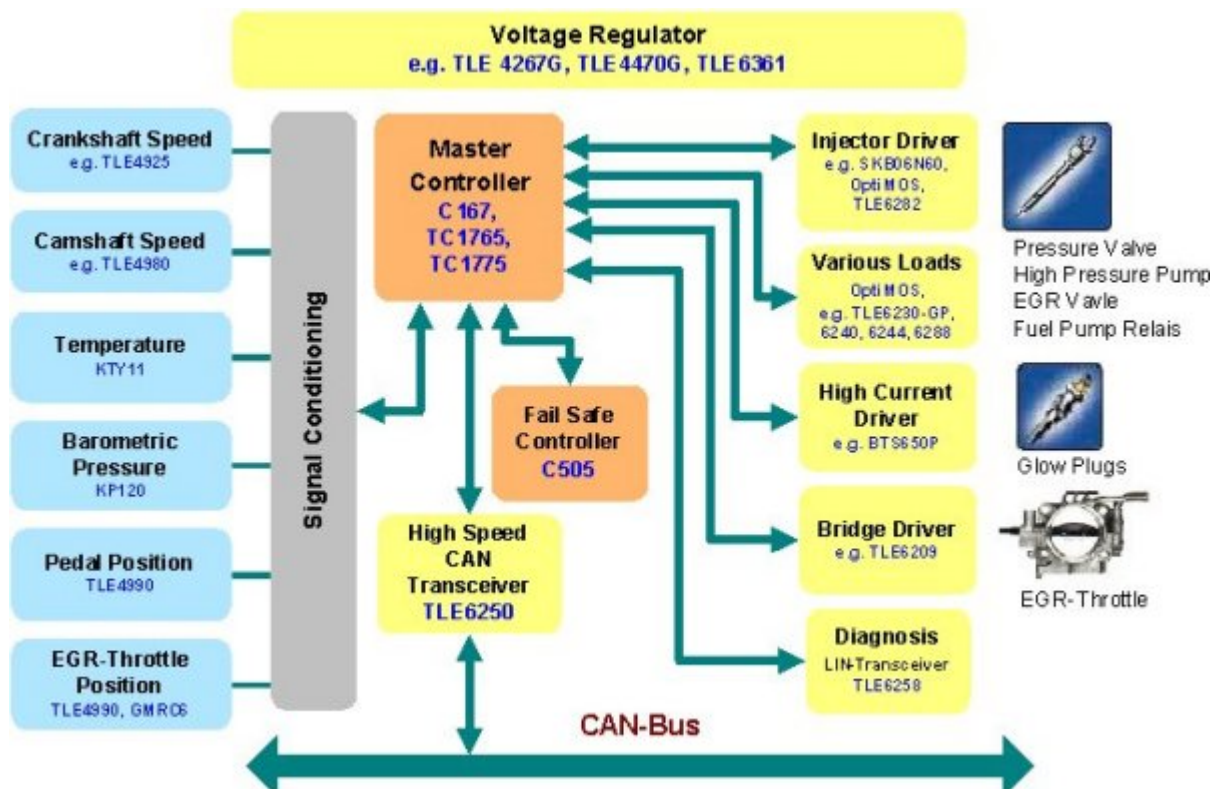
Examples:

Pressure sensors for barometric pressure measurement are benchmark in terms of accuracy and space requirements. Infineon's Hall-sensors are sensing speed, angle and position for crank- and camshaft.

Infineon's 8-Bit, 16-Bit and 32-Bit microcontrollers can operate as master- and fail-safe-controller. The 8-Bit microcontroller C505 can be used as a fail-safe-controller with a good price/performance ratio. The C167 family is the success story in Powertrain applications. The new 32-Bit TriCore™-based microcontrollers TC1765 and TC1775 - members of the AUDO™ family - are the excellent choice to control engine management systems.

Infineon provides a broad range of (smart) switches for all types of loads. We offer a solution for new piezo-injectors today: Fast S-IGBTs with anti-parallel diode of the DUOPACK family. The OptiMOS™ family is a perfect choice for magnetic injectors and for driving the fuel pump because of low Rdson. The TLE6209 represents one of the most used bridge driver IC in automotive applications and perfectly suits to EGR throttle applications. Smart power switches like multi-channel HITFETs (e.g. TLE6230-GP) and (High-Current-)PROFETs provide several protection and diagnostic features. Single or multiple Low-Drop voltage regulators, DC/DC converters and CAN and LIN transceivers complete the portfolio.

The microcontroller C164 family - packaged or bare die - matches excellently to control the EGR-throttle if there is a separate ECU.

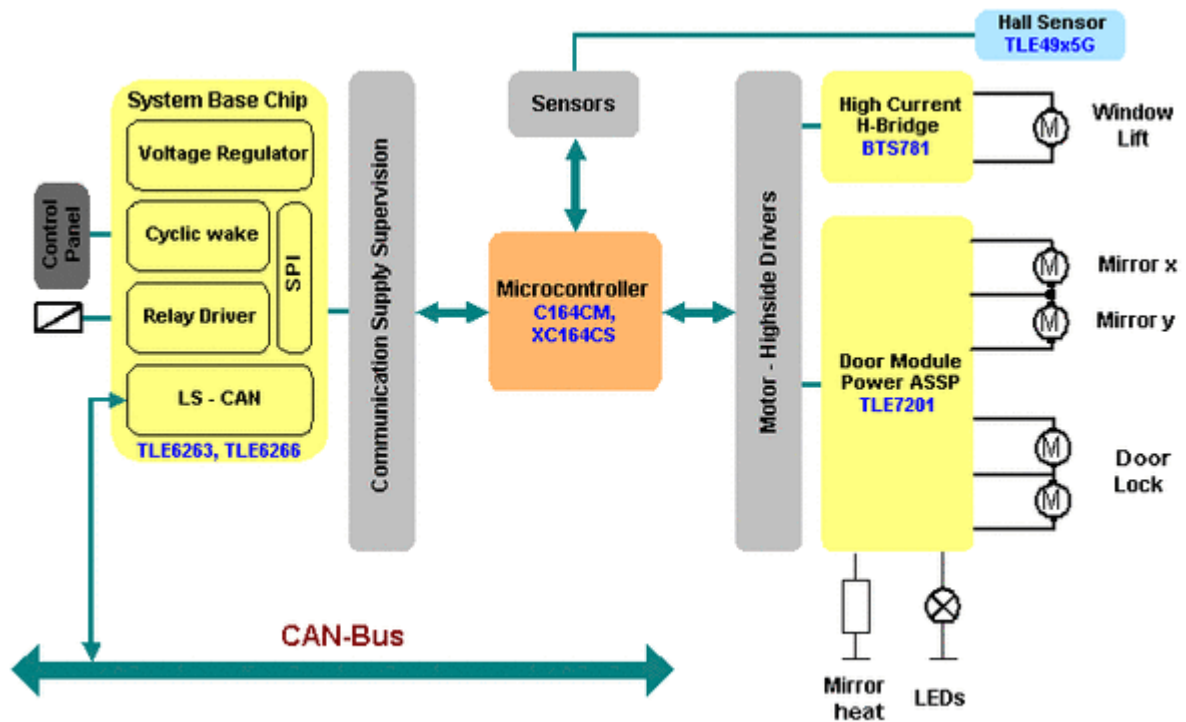


Door Zone Module

Door Module Solution

In automotive comfort electronics, Door Zone Modules have become a mainstream solution. A Door Zone Module covers all (or a part of) the electrical functions which are located in the mechanical door assembly like electrical door lock, electrified mirror, power window, lights, LEDs and the control panel. To generate system cost advantage on the wire harness, the module is a stand-alone unit, controlled by bus communication.

Infineon offers a complete range of products for this application, covering all necessary functions such as communication, supply, power drivers, sensors and microcontrollers. Standard stand-alone products as well as Application Specific Standard Products (ASSPs) are available.



Braking (ABS, ESP)

- INTRODUCTION

Anti-locking Brake Systems (ABS) - introduced 1978 by Bosch - have become a familiar feature in today's automobiles the Electronic Stability Program (ESP) will capture tomorrow's markets.

Although today's braking systems are fairly efficient, improvements in performance, comfort, assembly and maintenance is still possible. Brake-by-wire systems - the future in braking - meet these criteria best, as they have no mechanical or hydraulic connection between braking pedal and braking actuators. To be applicable fault-tolerant systems (e.g. safe power line and communication system) will be absolutely necessary.

Infineon is an active member of several associations that define new standards for x-by-wire technologies and is working on solutions that comply with the requirements regarding fail-safe and fault-tolerant systems.

- COMPONENTS

Based on advanced smart power technologies combining bipolar, CMOS and DMOS on the same chip, Infineon offers full-scale integration of the analog and power building blocks of an ABS/VSC ECU (Vehicle Stability Control, Electronic Control Unit). Other designs, e.g. with discrete power switches are possible, too.

8-bit or 16-bit microcontrollers of the C50x and C16x family are used as main or fail-safe controllers. The TriCore family combines microcontroller, microprocessor, and digital signal processing (DSP) capabilities and is well suited to the increasing requirements of CPU performance.

For further information please see links below.

- SCHEMATIC BLOCK DIAGRAM:

