安富利基于S32K3的车身电子应用设计方案

Avnet Design Services -- Shanghai

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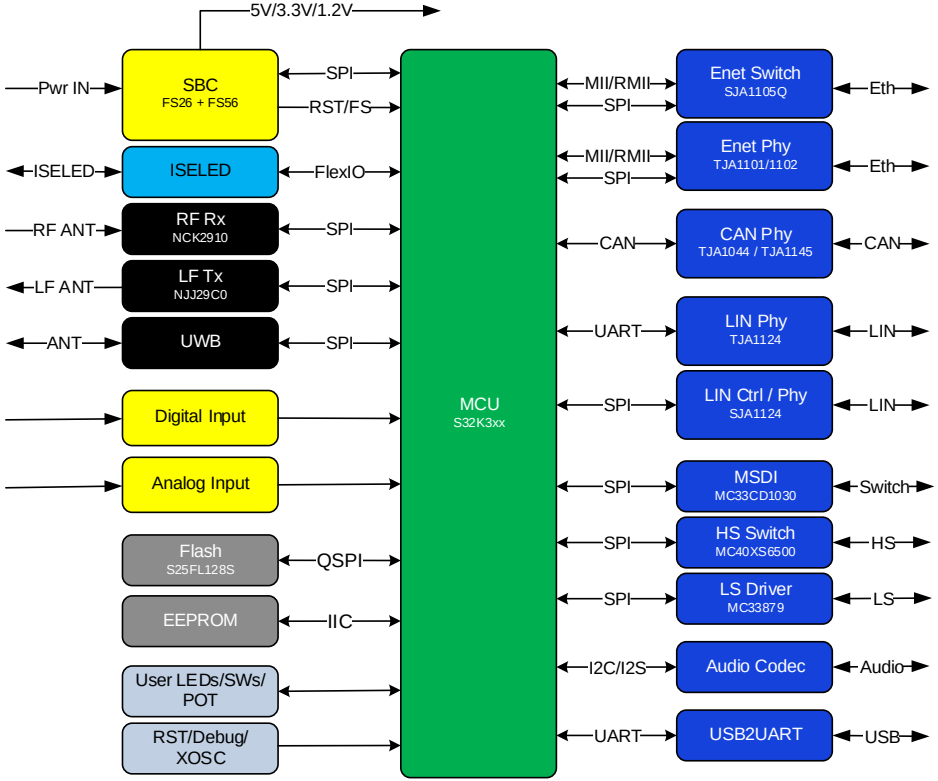
Reach Further™

S32K344 Body Domain Controller



Features

- Safety SBC FS26 supplies MCU with 5V, 3.3V, 1.5V and monitor MCU status;
- Ethernet switch SJA1105 and Ethernet phy TJA1101/TJA1102/DP83848C to provide 3ch automotive ethernet and 1ch industrial ethernet;
- CAN/CANFD phys TJA1044 and TJA1145 to provide 4ch CAN/CANFD;
- LIN controller/phy SJA1124 and LIN phy TJA1124 to provide 8ch LIN;
- QSPI Flash 128MB;
- LF driver and RF receiver for car access applications;
- 4ch high side driver and 8ch low side driver output;
- Audio Codec SGTL5000 connected to MCU via I2S;
- Accelerometer sensor MMA8452;

Key Components

- S32K344 -- NXP MCU
- SJA1105 -- NXP Switch
- TJA1101/TJA1102 -- NXP Ethernet PHY
- TJA1044/TJA1045 -- NXP CAN PHY

Target Applications

- ✓ Body Domain controller
- ✓ Gateway
- ✓ BCM

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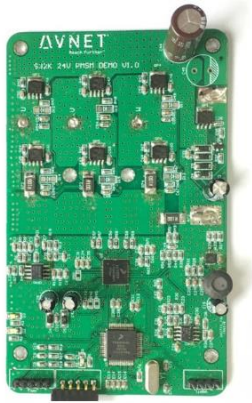
S32K344 Automotive Sensorless FOC Controller

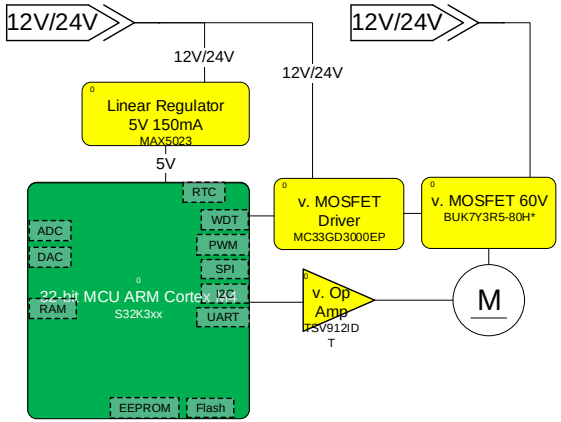


HVAC Blower

Features

- Sensorless FOC arithmetic
  - Higher efficiency, higher reliability
  - Lower noise, lower cost
- Cortex-M core
  - MC34GD3000,3phase driver,6V-58V
  - One , Two shunt FOC.
  - Over current, Over/under voltage protect.
  - Lose phase protect.
  - Forward wind restart.
  - Stall detected, protect hardware.

Block Diagram



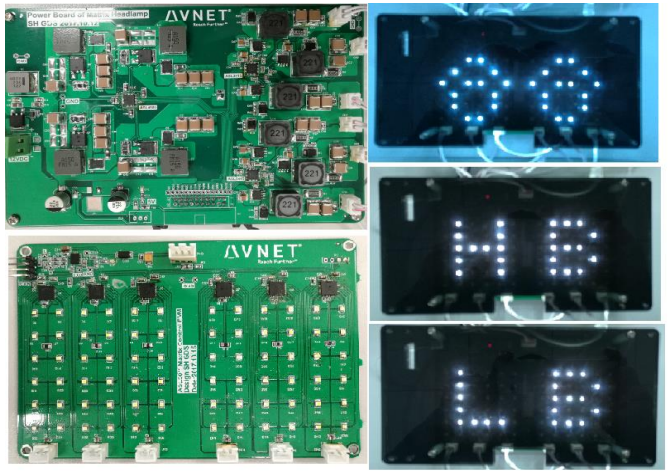
Key Components

- S32K344 -- NXP MCU
- MC33GD3000EP -- NXP 3phase driver
- BUK7K13-60E*7 -- Nexperia Mosfet

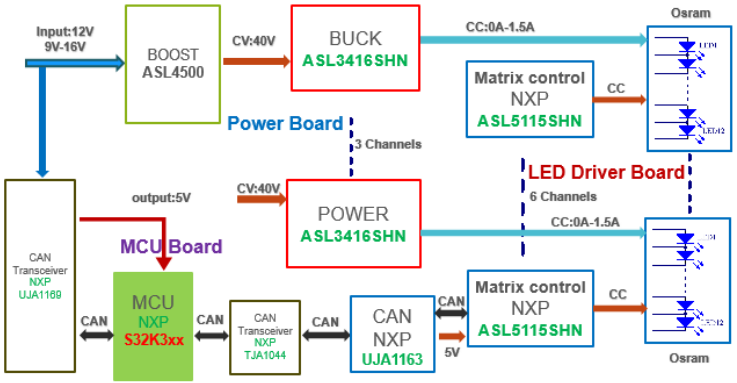
Target Applications

- ✓ Automotive HVAC blowers
- ✓ Oil pumps
- ✓ Water pumps
- ✓ Engine cooling fans
- ✓ Wipers

Matrix headlamp of NXP-- S32K344



Block Diagram



Overview

- The headlamp is an important part to ensure the safety of the vehicle. And the traditional automobile lighting system can not meet the people's increasing demand of safe driving. Intellectualization is the future development direction of automobile lighting. Matrix headlight lamps control system is a kind of intelligence system, It integrates DRL , turn signal, combination tail lamp , adaptive system formation, it can according to the surrounding environment for the LED illumination Angle and range of flexible control.

Features

- INPUT :9V-16V(MAX26V);
- The demo use ASL5108 to LED Matrix control , the ASL5108 contains 12 series switch array and CAN, it can control every LED and maximum six device in series.
- The driver use NXP's ASL4500 to BOOST and ASL3416 to BUCK ,constant current control for LED.
- The MCU use PS32K144UAV,use CAN port to control the ASL5115 , also can enable and adjust the output current of ASL3416.
- External CAN bus interface , BCM through CAN bus to control the LED.
- Each lamp with 36 ORSAM LUW CEUP. CE - 7 M8M 2 W LEDS .

Key Components

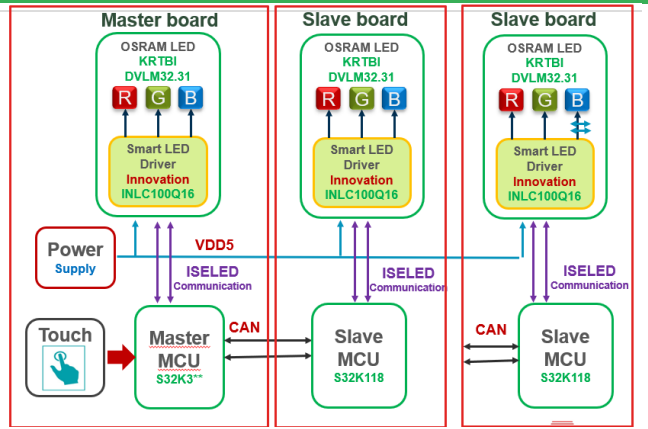
- ASL4500 + ASL3416 -- NXP: BOOST_BUCK
- ASL5*08 -- NXP: Matrix control
- S32K344 -- NXP： MCU control
- LUW CEUP. CE - 7 -- M8M : LED ORSAM
- SRR1210A-221M -- Inductor Bourns
- UJA1163 -- NXP :CAN
- MOS:BUK9275-100A*4, BUK7Y25-60E*6 -- Mosfet

Target Applications

- ✓ Automotive ADB
- ✓ High brightness LED matrix system

ISELED auto lighting with touch

Block Diagram



Features

- The ISELED EVM gives quick access to the new automotive lighting ecosystem provided by the ISELED alliance. It allows to demonstrate the digital LED concept and to create dynamic lighting sequences. Each RGB package includes an INLC100D controller chip from Inova Semiconductors with which the devices are calibrated to the same colourful gamut and brightness. All functions can be controlled via the S32K144 microcontroller unit (MCU) from NXP. that provides the ISELED serial communication protocol and touch controller. User s32k118 slave board controller can solve customer's EMC issue
- ISELED communication protocol
- Addressing of up to 4097 LEDs
- Half-duplex, bi-directional 2Mbit/s
- Digital controllable RGB LEDs
- Complete ecosystem, designed for automotive;
- Temperature compensation for LED;
- S32K344 master Controller :Touch sense and ISELED communication;

Key Components

- S32K3**: NXP MCU
- S32K118:NXP MCU
- TJA1044:NXP CAN
- KRTBI DVLM32.31– OSRAM LED

Target Applications

- ✓ Ambient lighting;
- ✓ Roof lighting;
- ✓ Display backlighting;
- ✓ Dynamic lighting effects;

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S32K3xx SAFETY MEASURES (ASIL D)

Redundant Hardware

- M7 delayed core lockstep
- Arm® INTC, L1 Controller memories
- Redundant check control unit (RCCU)

Protection against storage interference

- Arm MPU: controls master access rights
- XRDC memory protection
- XRDC peripheral protection
- AIPS peripheral protect, trusted master-slave connection
- Register protection mechanism
- Triple voting flip flops on critical registers

Program flow monitor

- Internal SW Watchdog
- External SW Watchdog
- Windowed watchdog with independent clock source

Data integrity

- SRAM: ECC (data error correction and detection, address detection)
- SRAM: Column multiplexing to mitigate multi bit errors
- Cache memories: ECC and column multiplexing
- TCMs memories: ECC and column multiplexing
- NVM: ECC (data error correction)
- NVM: address encode (parallel address path check)
- NVM: EDC after ECC
- SRAMs: MBIST (RAMs)
- NVM: Array Integrity
- Data path
  - EDC gaskets (data and address buses)
  - XBIC monitor for AHB control signals attached to XBARs)
  - HW CRC

Clock Monitor

- Clock Monitoring (analog and system clocks at the end of clock tree generation)
- PLL loss of lock detection

Power supply monitoring

- LVDs (redundant Full and Reduce Mode)
- HVDs (Full Mode and ADC channel)
- Monitoring of internal supplies with reset reaction

Temperature monitoring

- ETS and route the output (temperature translated to Voltage) to the ADC channel
- Application SW reads converted temperature values once within FTTI

Self Test

- Self Test Control Unit
- SW Core Self Test
- ADC Self TEST

Error reporting

- Error reporting module
- Error injection module
- Fault Collection module with programmable reaction type (alarm, interrupt, functional reset)

Latent fault detection

- MBIST for all volatile memories
- LBIST: CMU, XRDC, FLASHC, PRAMCs, XBARS& XBICs, Platform and EDC gaskets, CMUs, XBICs, EDS gaskets, CRC, SWTs, EIM, ERM

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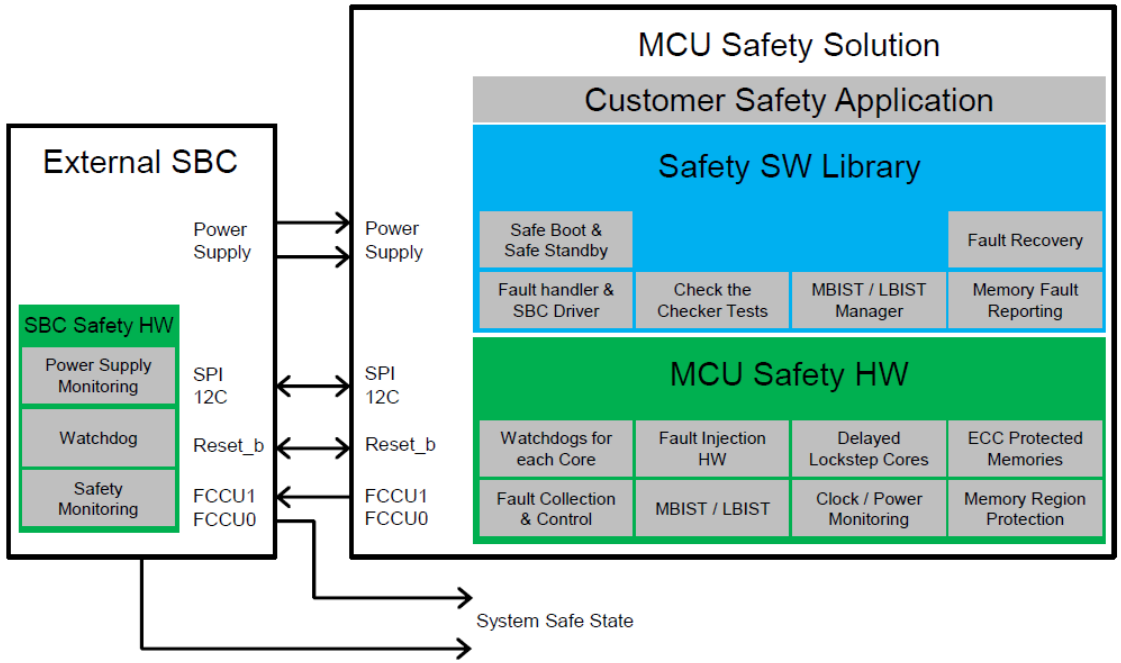
S32K3XX & FS26XX: SAFETY SYSTEM SOLUTION OVERVIEW

MCU System Solution consist of:

–MCU safety HW
–SW safety library (Interface to customer application)
–Customer safety application

External SBC (FS26xx)

–MCU power supplies monitoring
–MCU HW monitoring
–MCU SW monitoring
–Safety output(s) to set the system in a safe state



FS26 SBC FUNCTIONAL SAFETY FEATURES

OV/UV monitors (safety measure):
Programable OV threshold: 104.5% to 112%
Programable UV threshold: 95.5% to 88%
Programable OV/UV deglitch time

Safety Inputs (safety feature):
General purpose ERROR MON on WAKE2 pin
Configurable MCU error detection via FCCU pins
- Bi-stable operation
- 2 x independent inputs
- Single pin operation

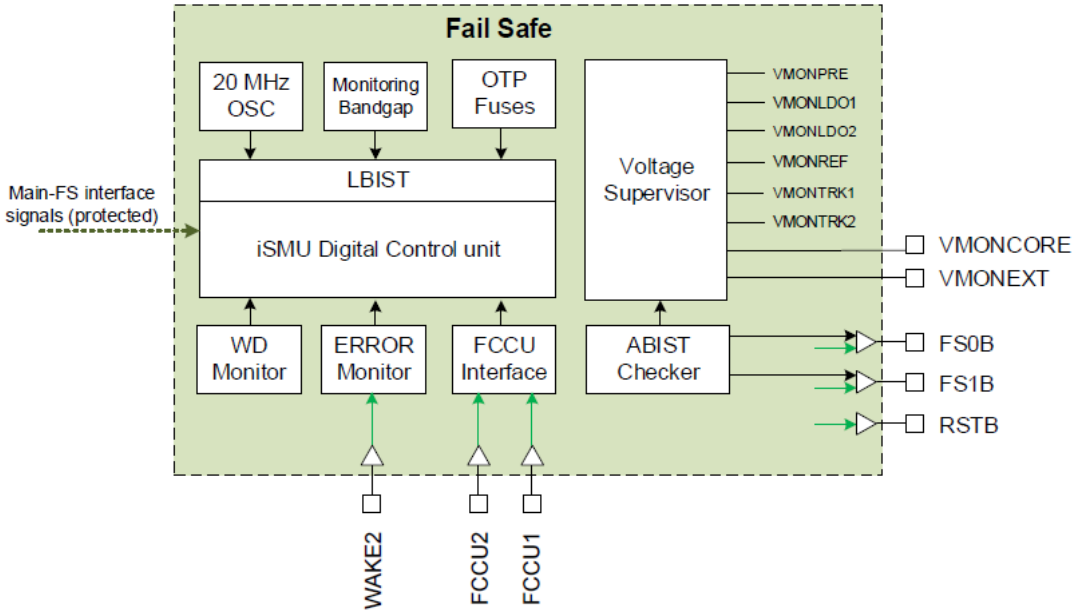
Watchdog Monitoring (safety feature):
Configurable Watchdog Monitoring via SPI communication
- Simple Watchdog (ASIL-B)
- Challenger Watchdog (ASIL-D)

Self Test (safety mechanism):
Logic Built-in test at power up (LBIST)
Analog build-in test (ABIST):
- At power one
- ABIST on demand

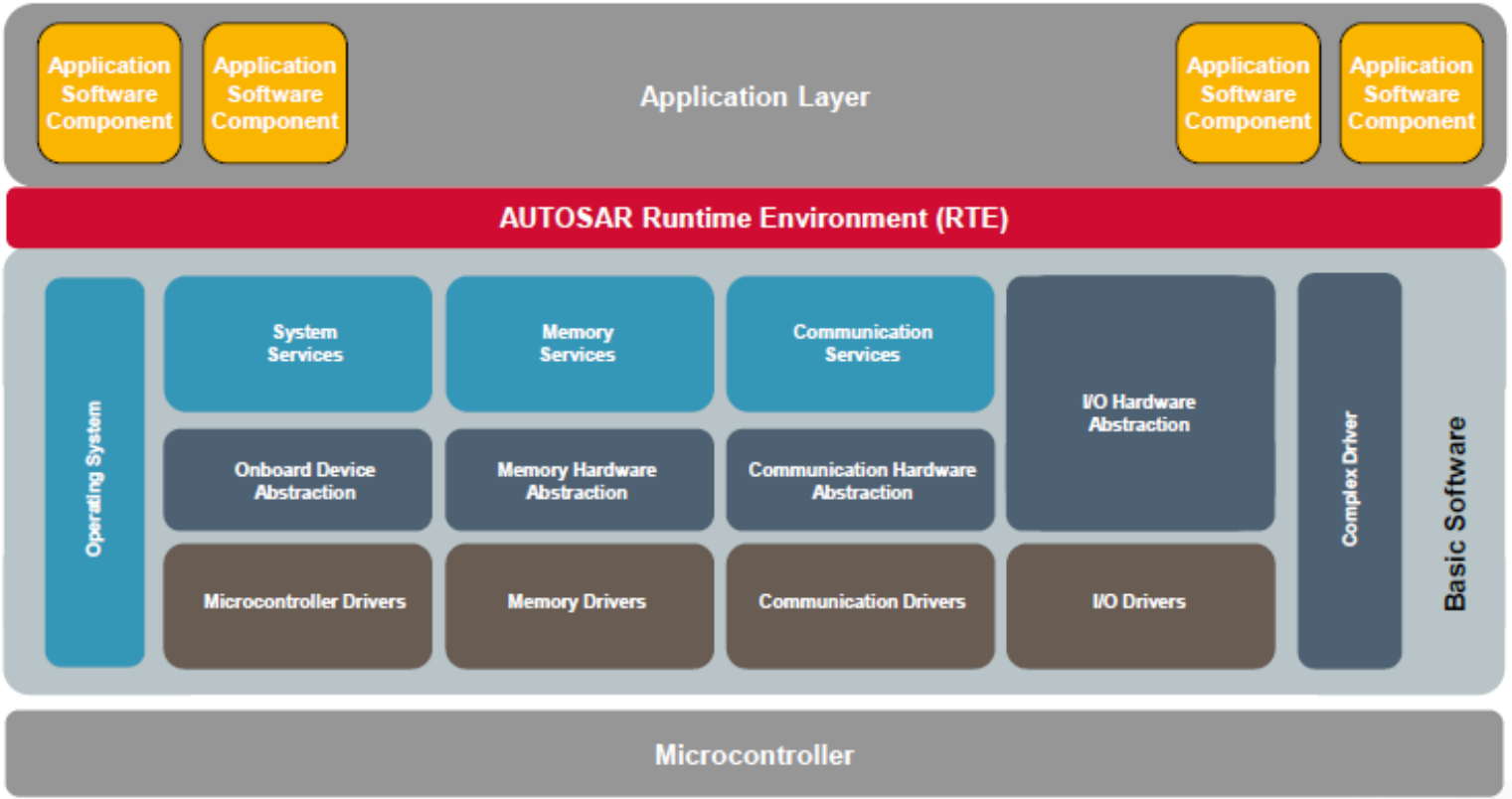
Safety Outputs (safety mechanism):
Primary Safety output on FS0B:
- ABIST + redundant control

Secondary Safety Output on FS1B:
- Configurable Reaction

MCU reset signal (RSTB)
- Bi-directional with PMIC reset control via the second Timer.



AUTOSAR BSW Architecture – Sub-Layers



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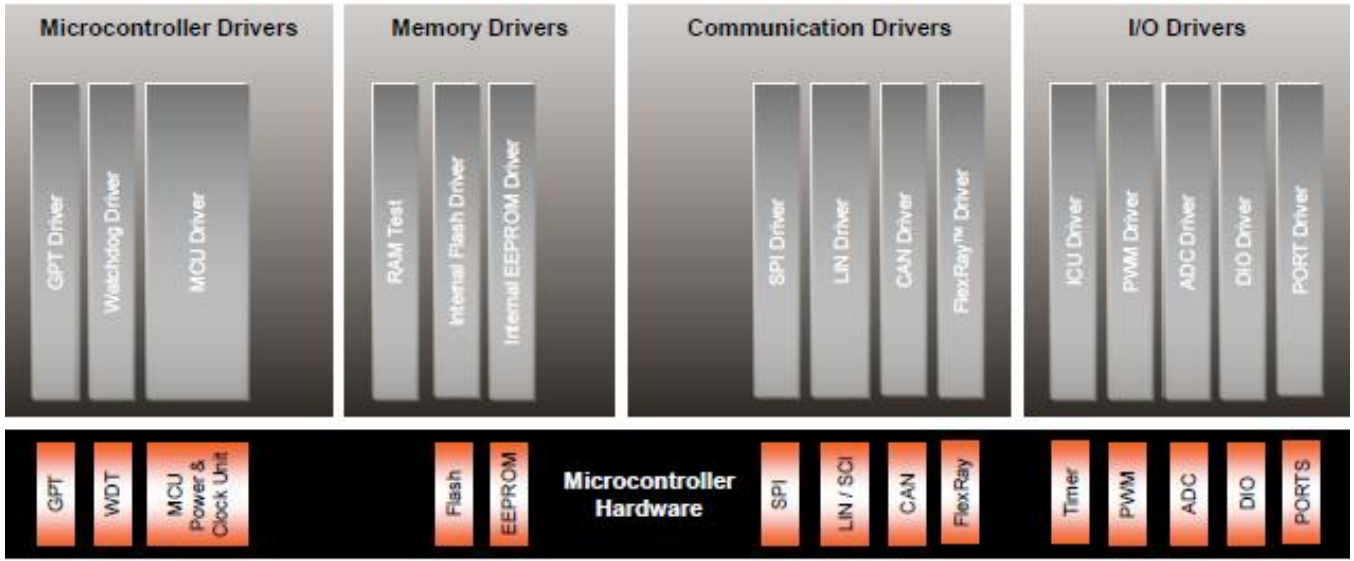
Microcontroller Abstraction Layer

Drivers of the Microcontroller Abstraction Layer

- Interfacing directly with microcontroller hardware (core and peripherals)
- Consists of the software module groups:
  - Microcontroller drivers
  - Memory drivers
  - Communication drivers
  - I/O drivers



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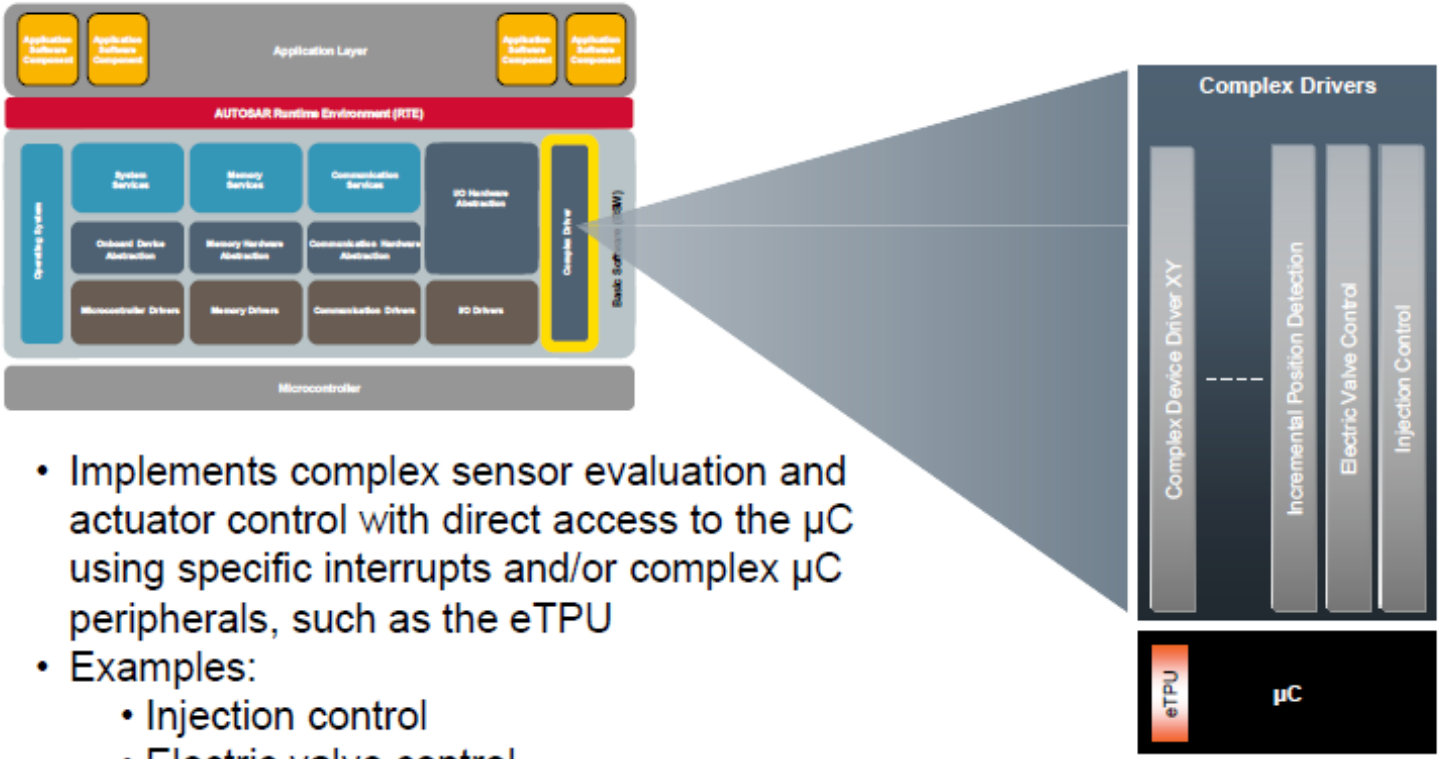
Autosar Layers(Complex Drivers)



- Implements complex sensor evaluation and actuator control with direct access to the µC using specific interrupts and/or complex µC peripherals, such as the eTPU
- Examples:
  - Injection control
  - Electric valve control
  - Incremental position detection

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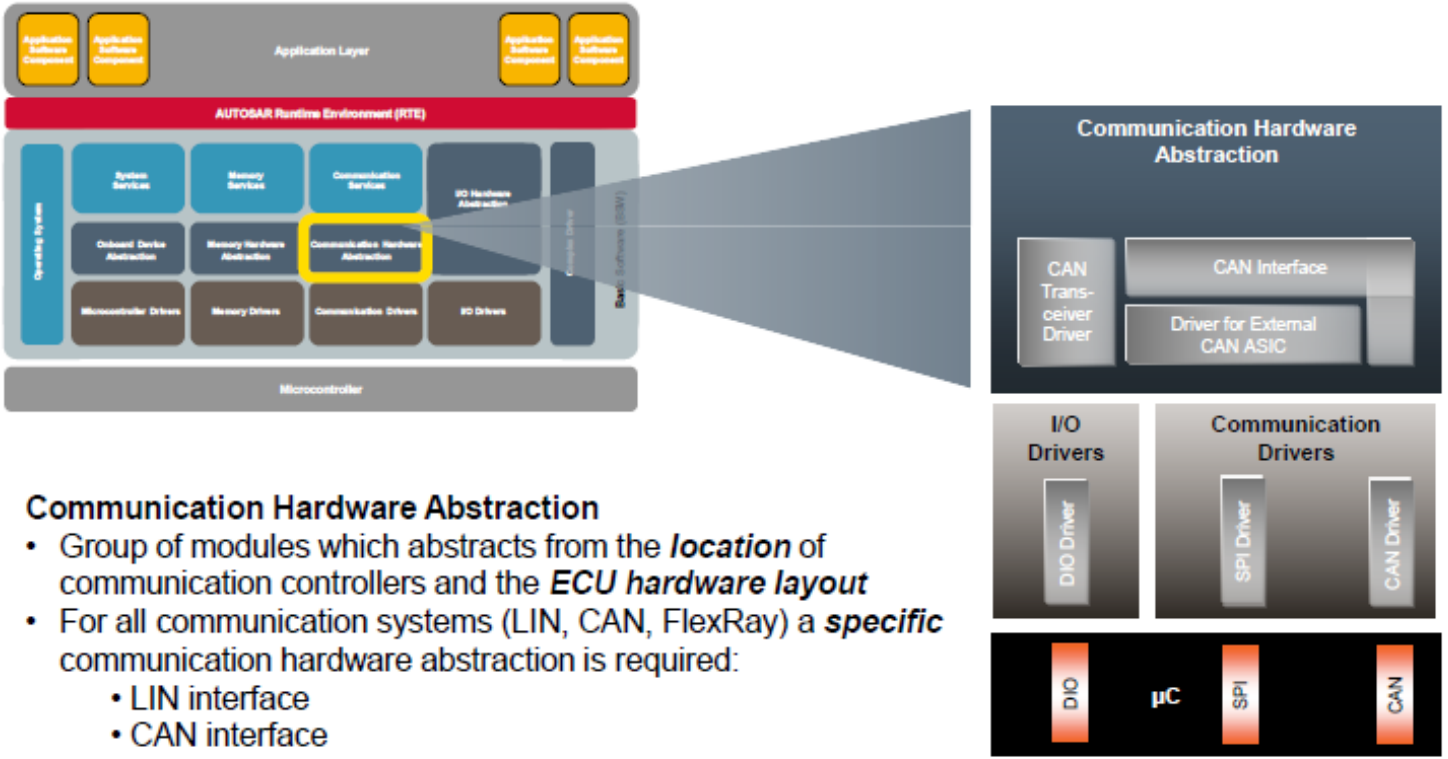
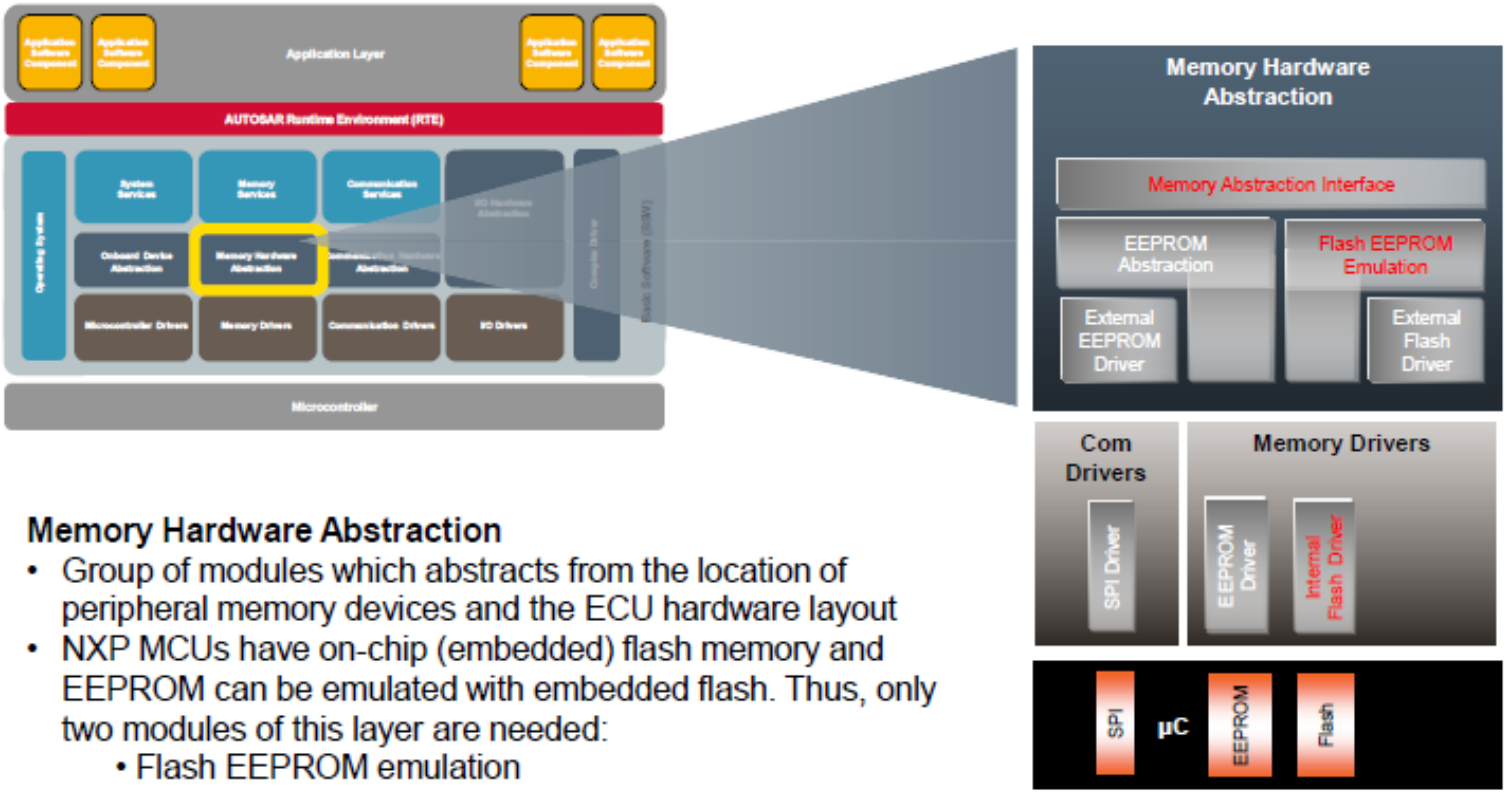
Communication Hardware Abstraction



Communication Hardware Abstraction

- Group of modules which abstracts from the ***location*** of communication controllers and the ***ECU hardware layout***
- For all communication systems (LIN, CAN, FlexRay) a ***specific*** communication hardware abstraction is required:
  - LIN interface
  - CAN interface
  - FlexRay interface
- NXP MCUs have on-chip CAN controller, i.e., driver for external CAN ASIC not necessary

Memory Hardware Abstraction



Memory Hardware Abstraction

- Group of modules which abstracts from the location of peripheral memory devices and the ECU hardware layout
- NXP MCUs have on-chip (embedded) flash memory and EEPROM can be emulated with embedded flash. Thus, only two modules of this layer are needed:
  - Flash EEPROM emulation
  - Memory abstraction interface

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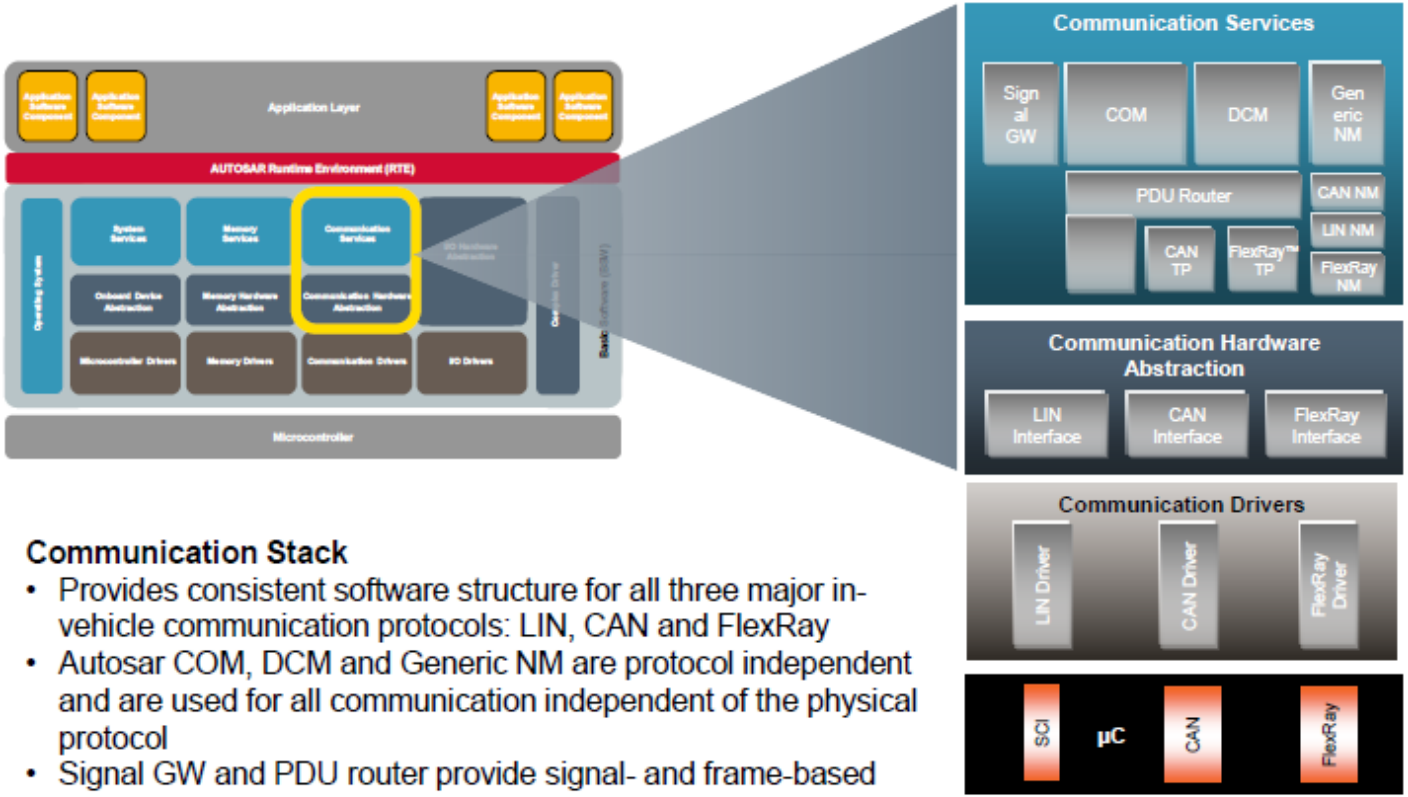
Communication Stack



Communication Stack

- Provides consistent software structure for all three major in-vehicle communication protocols: LIN, CAN and FlexRay
- Autosar COM, DCM and Generic NM are protocol independent and are used for all communication independent of the physical protocol
- Signal GW and PDU router provide signal- and frame-based gateway functionality

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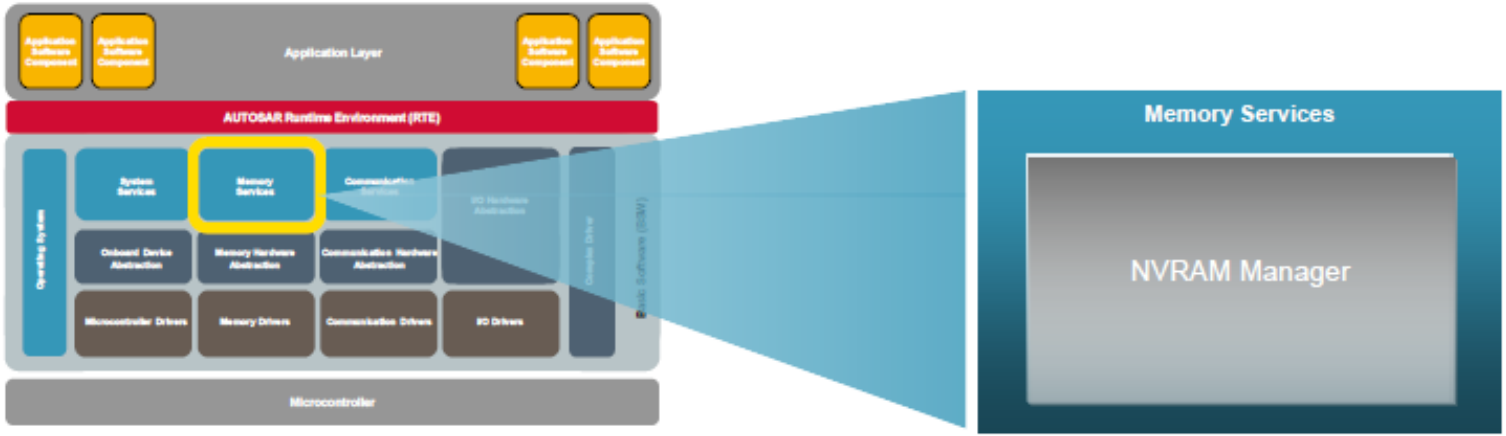
Memory Services



Memory Services

- Provides mechanisms for nonvolatile data management, such as saving, loading, checksum protection and verification, and reliable storage
- Uses different memory drivers
- Expects RAM mirror as data interface to the application for fast read access
- NVRAM Manager module is MCU independent

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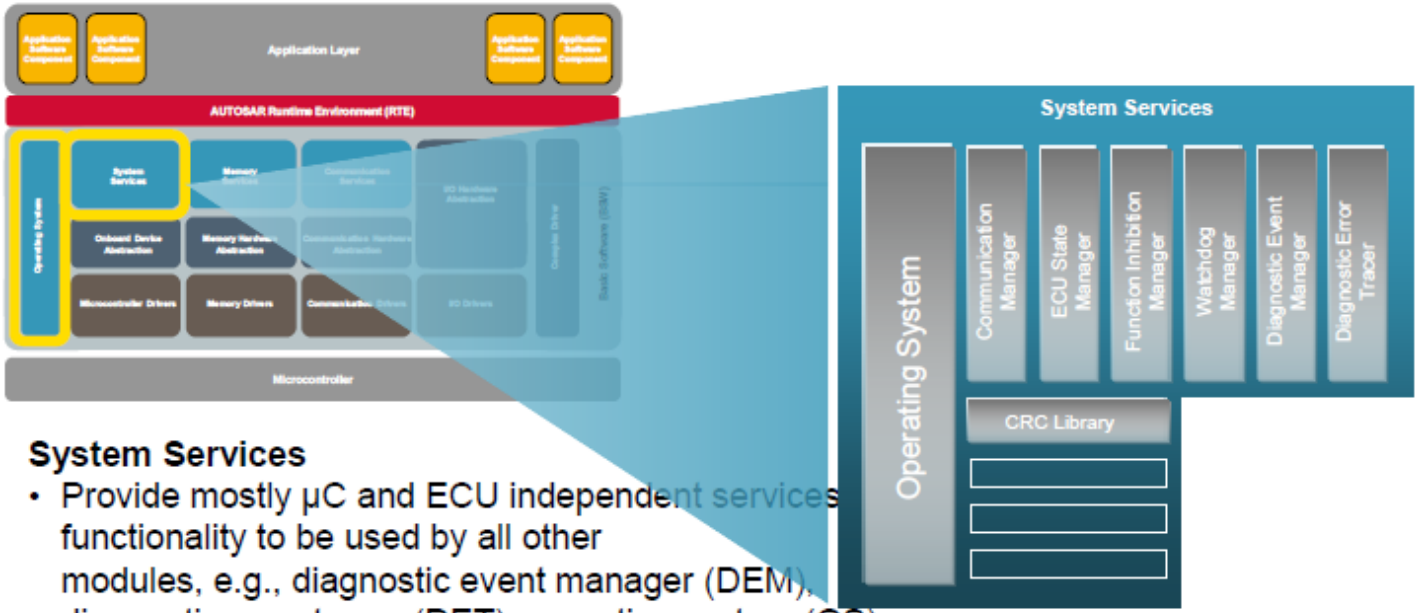
System Services



System Services

- Provide mostly µC and ECU independent services functionality to be used by all other modules, e.g., diagnostic event manager (DEM), diagnostic error tracer (DET), operating system (OS)
- OS is a system service that is MCU dependent, i.e., has to be optimized for each MCU
- Other modules can be application and/or hardware dependent (e.g., ECU state manager)

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Thank you