Automotive Zone Controller
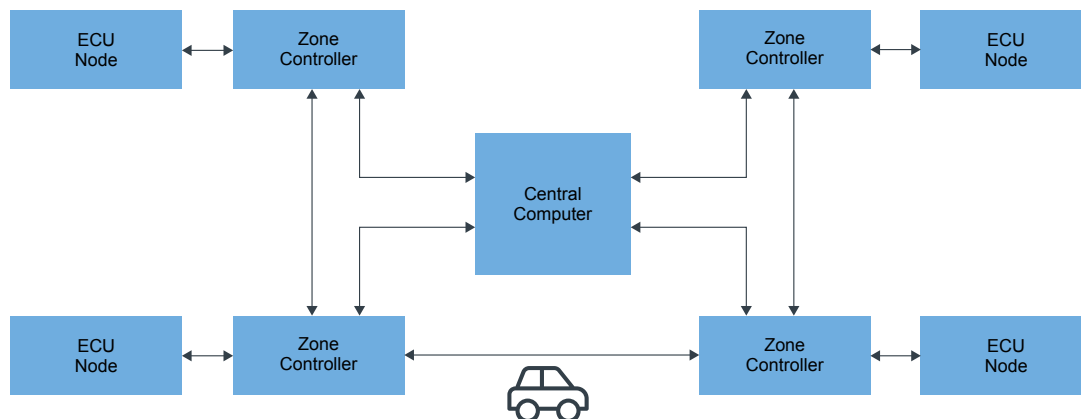
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Discover S32K5 - our newest high-performance, flexible automotive MCUs family designed to accelerate the shift to zonal SDV architectures.

Zonal architectures enable efficient power and data distribution around the vehicle, while improving wire cost, weight, and manufacturing. A key component in this architecture is the zone controller, it is responsible for connecting the high number of actuators and sensors to a central compute ECU and, depending on application distribution, can have a significant role in strategy within a zone.

OEMs are looking for more scalable and cost-efficient solutions to evolve the E/E architecture and meet future requirements for connected, electric, self-driving vehicles, as the number of services/ECUs within the vehicle grows. This evolution can come via logical distribution of functions onto less diverse software/hardware platforms, and through physical changes to a zonal-based network.

Zonal Architecture Block Diagram

```
  [ECU Node] ↔ [Zone Controller]        [Zone Controller] ↔ [ECU Node]
                     ↕        ↘       ↙       ↕
                          [Central Computer]
                     ↕        ↗       ↖       ↕
  [ECU Node] ↔ [Zone Controller] ↔ 🚗 ↔ [Zone Controller] ↔ [ECU Node]
```

■ NXP Technology   ■ Non NXP Technology   ⌐ ¬ Optional Technology

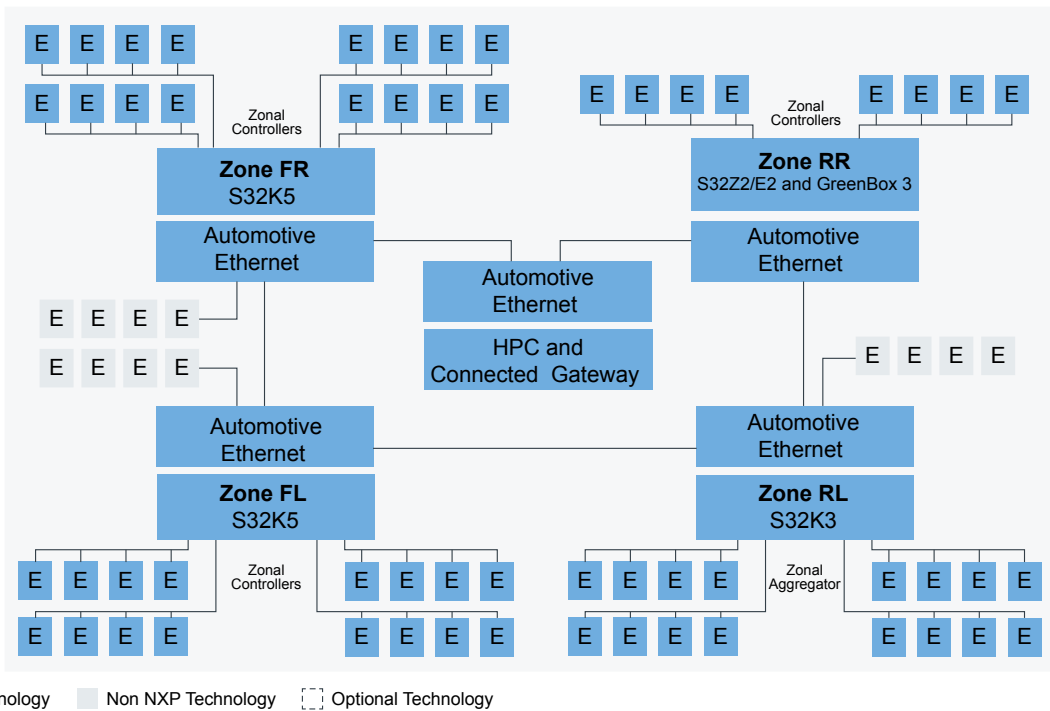| Recommended Products for Zonal Architecture	
Vehicle Computer	• S32N55: S32N55 Vehicle Super-Integration Processor • S32G3 Vehicle Networking Reference Design • S32G3: S32G3 Processors for Vehicle Networking • SJA1110: Multi-Gig Safe and Secure TSN Ethernet Switch with Integrated 100BASE-T1 PHYs • TJA1120: TJA1120, ASIL B Compliant Automotive Ethernet 1000BASE-T1 PHY Transceiver • TJA1104: TJA1104, MACsec Enabled ASIL B Compliant Automotive Ethernet 100BASE-T1 PHY Transceiver • VR5510: Multi-Channel (9) PMIC for S32G Processor – 8 High Power, 1 Low Power, Fit for ASIL D Safety Level • PF53: 12 A / 8 A / 15 A Core Supply Regulator with AVP and Watchdog
Microcontrollers (MCU)	• S32K3: S32K3 Microcontrollers for Automotive General Purpose
Zone Controller	• S32K5: S32K5 Automotive Microcontrollers • S32K3: S32K3 Microcontrollers for Automotive General Purpose

	• **S32Z2**: S32Z2 Safe and Secure High-Performance Real-Time Processors • **S32E2**: S32E2 Safe and Secure High-Performance Real-Time Processors with Actuation Support • **S32G3**: S32G3 Processors for Vehicle Networking • **S32G2**: S32G2 Processors for Vehicle Networking • **SJA1110**: Multi-Gig Safe and Secure TSN Ethernet Switch with Integrated 100BASE-T1 PHYs • **TJA1120**: TJA1120, ASIL B Compliant Automotive Ethernet 1000BASE-T1 PHY Transceiver • **TJA1104**: TJA1104, MACsec Enabled ASIL B Compliant Automotive Ethernet 100BASE-T1 PHY Transceiver • **SJA1124**: Quad LIN Commander Transceiver with LIN Commander Controller • **TJA1463**: CAN Signal Improvement Capability Transceiver with Sleep Mode • **VR5510**: Multi-Channel (9) PMIC for S32G Processor – 8 High Power, 1 Low Power, Fit for ASIL D Safety Level • **PF53**: 12 A / 8 A / 15 A Core Supply Regulator with AVP and Watchdog • **FS26**: Safety System Basis Chip with Low Power, for ASIL D Systems • **PF5030**: Multi-Channel PMIC for Automotive Applications • **FS86**: Safety System Basis Chip For Domain Controller, Fit For ASIL B and D
ECU Node	• **S32M2**: S32M2 Integrated Solution for 12V Motor Control • **S32K3**: S32K3 Microcontrollers for Automotive General Purpose • **S32K1**: S32K1 Microcontrollers for Automotive General Purpose • **S32K39-37-36**: S32K39/37/36 Microcontrollers for Electrification Applications • **TJA1463**: CAN Signal Improvement Capability Transceiver with Sleep Mode • **TJA1103**: TJA1103, ASIL B Compliant Automotive Ethernet 100BASE-T1 PHY Transceiver • **TJA1104**: TJA1104, MACsec Enabled ASIL B Compliant Automotive Ethernet 100BASE-T1 PHY Transceiver • **FS24**: Safety Mini CAN FD SBC for Automotive Applications Fit for ASIL B • **FS23**: Safety System Basis Chip (SBC) Family with Power Management, CAN and LIN • **FS26**: Safety System Basis Chip with Low Power, for ASIL D Systems

Zone Controller Reference Design Block Diagram

JTAG

CAN   8x CAN (SIG)   CAN (8x)   CAN Tx/Rx   Debug   SPI   3.3V 5V 12V

                                                                                          Quad
                                                              MCU   SPI   HS-Switch

LIN   4x LIN   LIN   UART Tx/Rx   SPI   Quad
                                                                                     HS-Switch
       4x LIN   LIN   SPI   GPIO   I/O

                                                                             SPI   3.3V   12V
                                                                             AMUX   22-ch Multi
VBAT1   Supply_MCU_CAN   Switch Detection   I/O
                                                              SPI   RGM II   Interface

                       12V   PMIC   3.3V   Supply_ETH
VBAT2   5V   Ethernet   SGMII   1000BASE-T1
                                                              Switch
                               PMIC   VSUP   SGMII   1000BASE-T1
                                          Supply_ETH   Ethernet
                                                                              100BASE-T1
                       QFLASH   QSPI   100BASE-T1
                                                                             100BASE-T1
                                                               Debug

                                                              JTAG

■ NXP Technology   ■ Non NXP Technology   [ ] Optional Technology

Recommended Products for Zone Controller Reference Design	
CAN	• TJA1463: CAN Signal Improvement Capability Transceiver with Sleep Mode
LIN	• TJA1124: Quad LIN Commander Transceiver for In-Vehicle Subnetworks
Second LIN	• SJA1124: Quad LIN Commander Transceiver with LIN Commander Controller
PMIC	• FS26: Safety System Basis Chip with Low Power, for ASIL D Systems

MCU	• S32K5: S32K5 Automotive Microcontrollers • S32K3: S32K3 Microcontrollers for Automotive General Purpose
Quad HS-Switch	• XS2410: Quad 100 mΩ / Dual 50 mΩ, 3.0 V to 60 V High-Side Switch
22Ch MSDI	• MC33978: 22 I/O MSDI Programmable Current Analog Mux
1Giga Ethernet Phy	• TJA1121: TJA1121, MACsec Enabled ASIL B Compliant Automotive Ethernet 1000BASE-T1 PHY Transceiver
Ethernet Switch	• SJA1110: Multi-Gig Safe and Secure TSN Ethernet Switch with Integrated 100BASE-T1 PHYs

Zone Control POC Block Diagram

Zonal Controllers — Zone FR S32K5 — Automotive Ethernet — HPC and Connected Gateway — Zone RR S32Z2/E2 and GreenBox 3 — Zonal Controllers — Automotive Ethernet — Zone FL S32K5 — Zonal Controllers — Zone RL S32K3 — Zonal Aggregator

☐ NXP Technology ☐ Non NXP Technology ☐ Optional Technology

Recommended Products for Zone Control POC	
Zone FR	• S32K5: S32K5 Automotive Microcontrollers • S32G2: S32G2 Processors for Vehicle Networking • S32G3: S32G3 Processors for Vehicle Networking • VR5510: Multi-Channel (9) PMIC for S32G Processor – 8 High Power, 1 Low Power, Fit for ASIL D Safety Level • PF53: 12 A / 8 A / 15 A Core Supply Regulator with AVP and Watchdog
Zone RR	• S32Z2: S32Z2 Safe and Secure High-Performance Real-Time Processors • FS86: Safety System Basis Chip For Domain Controller, Fit For ASIL B and D • PF5030: Multi-Channel PMIC for Automotive Applications
Zone FL	• S32K5: S32K5 Automotive Microcontrollers • S32G2: S32G2 Processors for Vehicle Networking • S32G3: S32G3 Processors for Vehicle Networking • VR5510: Multi-Channel (9) PMIC for S32G Processor – 8 High Power, 1 Low Power, Fit for ASIL D Safety Level

	• PF53: 12 A / 8 A / 15 A Core Supply Regulator with AVP and Watchdog
Zone RL	• S32K3: S32K3 Microcontrollers for Automotive General Purpose • FS26: Safety System Basic Chip with Low Power, for ASIL D Systems
Automotive Ethernet	• TJA1121: TJA1121, MACsec Enabled ASIL B Compliant Automotive Ethernet 1000BASE-T1 PHY Transceiver • TJA1120: TJA1120, ASIL B Compliant Automotive Ethernet 1000BASE-T1 PHY Transceiver • TJA1104: TJA1104, MACsec Enabled ASIL B Compliant Automotive Ethernet 100BASE-T1 PHY Transceiver • TJA1410: TJA1410, 10BASE-T1S PMD Transceiver

View our complete solution for Automotive Zone Controller.

Note: The information on this document is subject to change without notice.