



S32K3 ARM® CORTEX®-M7 BASED MCUS SIMPLIFYING SOFTWARE DEVELOPMENT FOR AUTOMOTIVE AND INDUSTRIAL

The S32K3 family includes scalable 32-bit Arm Cortex-M7 based MCUs in single, dual and Lockstep core configurations supporting up to ASIL D level safety. Features include a hardware security subsystem with NXP firmware, support for firmware over-the-air (FOTA) updates, and ISO 26262 compliant Real-Time Drivers (RTD) software package for AUTOSAR™ and non-AUTOSAR.

S32K3 MCUs are available in NXP's new MaxQFP packaging technology which reduces package footprint by up to 55% compared with standard QFP packages.

FEATURES AND PERFORMANCE

- Lockstep Arm Cortex-M7 cores, 120-240 MHz + FPU
- 512 KB, 8 MB Flash with ECC
- FOTA , A/B firmware swap with zero downtime and roll-back support. Automatic address translation
- 12-bit 1Msps ADCs, 16-bit eMIOS timers with logic control unit for motor control
- Low power Run and Standby modes, fast wake-up, clock and power gating
- MaxQFP and BGA packages

MAXQFP PACKAGE TECHNOLOGY

- QFP 'gull-wing' + PLCC 'J-lead' in single package
- 172-pin (16 x 16 mm), 100-pin (10 x 10 mm), and 0.65 mm pin pitch
- AEC-Q100 qualified: Grade 1 (-40° C to +125° C) and Grade 2 (-40° C to +105° C)



SAFETY, SECURITY AND CONNECTIVITY

- ISO 26262 up to ASIL D
- Fault collection and control unit (FCCU)
- Hardware and software watchdogs, clock/power/temperature monitors
- Safety documentation and SafeAssure® community support
- HSE security engine: AES-128/192/256, RSA and ECC encryption; secure boot and key storage; side channel protection; ISO 21434 intended
- Ethernet TSN and AVB (100Mbps/1Gbps), I3C, CAN-FD, FlexIO (SPI/IIC/IIS/SENT protocol), serial audio interface, QSPI

PRODUCTION-GRADE SOFTWARE

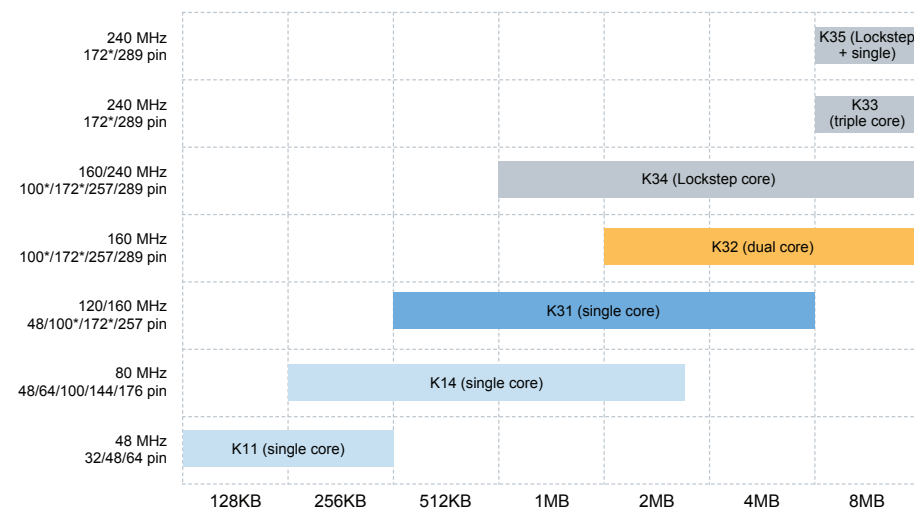
- Real-Time Drivers (RTD): free of charge for AUTOSAR and non- AUTOSAR, ASIL D compliant
- Security firmware: NXP provided, field upgradeable
- Safety Framework Software (SAF) and Core Self-Test library for functional safety applications
- S32 Design Studio IDE (S32DS): Eclipse, GCC and debugger, 3rd party support
- Model-Based Design Toolbox (MBDT) for MATLAB®



S32K FAMILY BLOCK DIAGRAM

| K311 | K312 | K314 | Common Features | K322 | K324 | K341 | K342 | K344 | K328 | K338 | K348 | K358 |
|--------------------------------|--------------------------|--------------------------|---|---------------------------|---------------------------|-----------------------------------|----------------------------|----------------------------|----------------------------|----------------------------|-----------------------------|--|
| 1 x Arm® Cortex-M7 @120 MHz | 1x Cortex-M7 @160 MHz | 1x Cortex-M7 @160 MHz | AEC-Q100, 125 °C, 3.3/5 V | 2 x Cortex-M7 @160 MHz | 2 x Cortex-M7 @160 MHz | 1 Lockstep Cortex-M7 @ 160 MHz | 2 x Cortex-M7 @ 160 MHz | 2 x Cortex-M7 @ 160 MHz | 2 x Cortex-M7 @ 160 MHz | 3 x Cortex-M7 @ 240 MHz | 1 LS Cortex-M7 @ 160 MHz | 1 LS Cortex-M7 + 1 Cortex-M7 @ 240 MHz |
| 1 MB Flash | 2 MB Flash | 4 MB Flash | HSE-B Crypto Security Engine | 2 MB Flash | 4 MB Flash | 1 MB Flash | 2 MB Flash | 4 MB Flash | 8 MB Flash | 8 MB Flash | 8 MB Flash | 8 MB Flash |
| 128 K SRAM | 192 K SRAM | 512 K SRAM | FOTA (Firmware Over-the-Air) | 256 k SRAM | 512 k SRAM | 256 k SRAM | 256 k SRAM | 512 k SRAM | 1152 KB SRAM | 1152 KB SRAM | 1152 KB SRAM | 1152 KB SRAM |
| up to 84 I/Os | up to 143 I/Os | up to 218 I/Os | Low-Power Operating Modes and Peripherals (LP UART, FlexIO) | up to 143 I/Os | up to 218 I/Os | up to 143 I/Os | up to 143 I/Os | up to 218 I/Os | up to 218 I/Os | up to 218 I/Os | up to 218 I/Os | up to 218 I/Os |
| 16-ch. eDMA | 32-ch. eDMA | 32-ch. eDMA | ASIL B/D Safety: (ECC Memories, MPU, CRC, Watchdogs) | 4 x CAN (4 x FD) | 6 x CAN (6 x FD) | 4 x CAN (4 x FD) | 4 x CAN (4 x FD) | 6 x CAN (6 x FD) | 8 x CAN (8 x FD) | 8 x CAN (8 x FD) | 8 x CAN (8 x FD) | 8 x CAN (8 x FD) |
| 1 x PC and 2 x PC | 1 x PC and 2 x PC | 2 x PC | eMIOS Timers, Analogue Comparator, Logic Control Unit, Body Cross Triggering Unit, Trigger Mux | 1 x PC and 2 x PC | 2 x PC | 1 x PC and 2 x PC | 1 x PC and 2 x PC | 2 x PC | 1 x PC and 2 x PC | 1 x PC and 2 x PC | 1 x PC and 2 x PC | 1 x PC and 2 x PC |
| 4 x SPI* | 6 x SPI* | 6 x SPI* | JTAG | 4 x SPI* | 6 x SPI* | 4 x SPI* | 4 x SPI* | 6 x SPI* | 6 x SPI* | 6 x SPI* | 6 x SPI* | 6 x SPI* |
| 2 x 24-ch. 12-bit ADC | 3 x 24-ch. 12-bit ADC | 3 x 24-ch. 12-bit ADC | S32 Design Studio IDE | 2 x 24-ch. 12-bit ADC | 3 x 24-ch. 12-bit ADC | 2 x 24-ch. 12-bit ADC | 2 x 24-ch. 12-bit ADC | 3 x 24-ch. 12-bit ADC | 3 x 24-ch. 12-bit ADC | 3 x 24-ch. 12-bit ADC | 3 x 24-ch. 12-bit ADC | 3 x 24-ch. 12-bit ADC |
| 2 x SAI (FS) | 2 x SAI (FS) | 2 x SAI (FS) | Real-Time Drivers (RTD) for AUTOSAR® and non-AUTOSAR | 2 x SAI (FS) | 2 x SAI (FS) | 2 x SAI (FS) | 2 x SAI (FS) | 2 x SAI (FS) | 2 x SAI (FS) | 2 x SAI (FS) | 2 x SAI (FS) | 2 x SAI (FS) |
| Quad SPI | Quad SPI | Quad SPI | Security FW Safety Software Framework Application Software | Quad SPI | Quad SPI | Quad SPI | Quad SPI | Quad SPI | Quad SPI | Quad SPI | Quad SPI | Quad SPI |
| LQFP-48 | MaxQFP-172 | MaxQFP-172 | | MaxQFP-100 | MaxQFP-100 | MaxQFP-100 | MaxQFP-100 | MaxQFP-100 | MaxQFP-172 | MaxQFP-172 | MaxQFP-172 | MaxQFP-172 |
| MaxQFP-100 | MAPBGA-257 | MAPBGA-257 | | MaxQFP-100 | MAPBGA-257 | MaxQFP-100 | MaxQFP-100 | MaxQFP-100 | MAPBGA-257 | MAPBGA-257 | MAPBGA-257 | MAPBGA-289 |

S32K3 FAMILY SCALABILITY



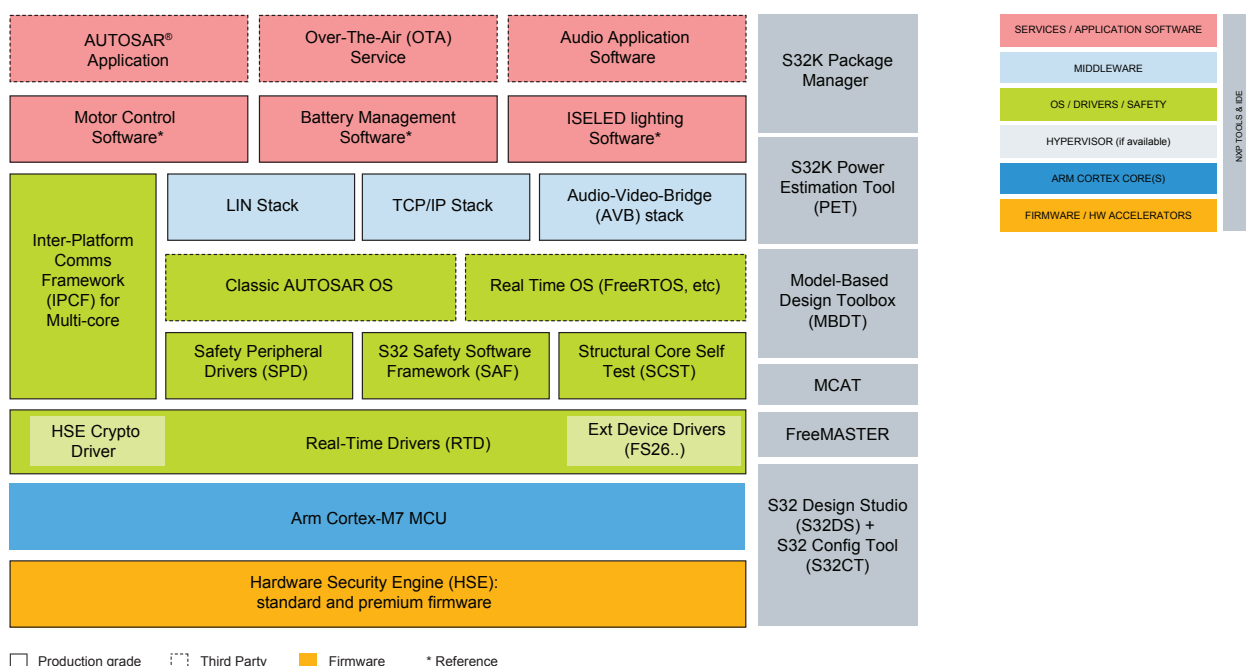
TARGET APPLICATIONS

- Body controllers
- Zone controllers
- Battery Management System (BMS)
- Infotainment IO controller
- E-shifter
- Motor control:
Belt-Start Generator (BSG), fan/
pump controller, turbo charger

PARTNERS



S32K3 SOFTWARE ENABLEMENT



PREMIUM SOFTWARE

for production use,
available under license

- **Safety Software Framework (SAF):** libraries for fault detection and reaction to single-point/latent faults during boot-up, runtime, and fault recovery. Reduces development effort for safety implementation. Full coverage of Software safety mechanisms within the MCU in S32K3xx Safety Manual.
- **Structural Core Self-Test (SCST) library:** for runtime detection of permanent hardware faults in processor cores, with 90% diagnostic coverage
- **HSE Firmware (OEM-customised version):** OEM-specific security firmware
- **Automotive Math and Motor Control Library (AMMCLIB):** pre-compiled, highly optimised libraries for a wide range of motor control and general math functions
- **Battery Management System (BMS) Safety Library:** in BMS reference design
- **ISELED LED lighting driver:** supports S32K MCUs in ISELED LED lighting applications

STANDARD SOFTWARE

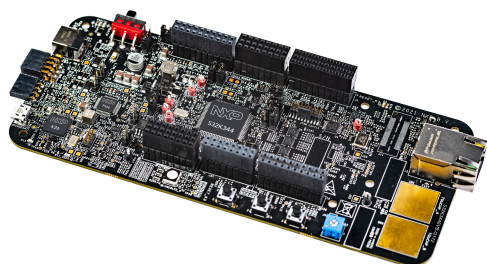
for production use,
included in silicon cost

- **Real-Time Drivers (RTD):** software drivers for AUTOSAR/non-AUTOSAR applications. Full processor IP coverage. ISO 26262 ASIL D compliant, AUTOSAR 4.4, SPICE level 3. Configure with S32 Config Tool, Elektrobit tresos Studio or other partner's tools
- **Safety Peripheral Drivers:** low-level drivers for safety peripherals: BIST manager and Extended Microcontroller Error Manager (eMcm). For safety framework development
- **HSE Firmware (standard version):** SHE+ support, field upgradeable, extended symmetric/asymmetric services, AUTOSAR compliant, industry-proven
- **Inter-Platform Communication Framework (IPCF):** middleware for inter-core communications and resource access/sharing e.g. AUTOSAR/non-AUTOSAR on Cortex M cores

REFERENCE SOFTWARE

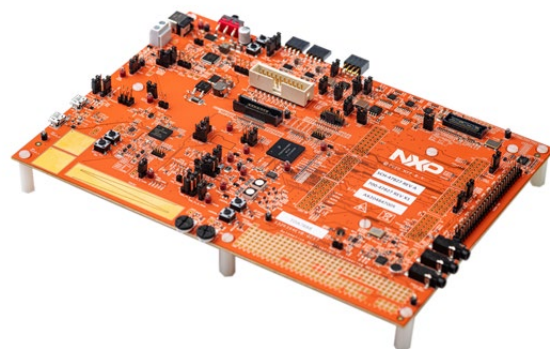
for reference use,
included in silicon cost

- **Platform Integration Software** –general software examples
- **Communication Stacks:** TCP/IP, LIN
- **FreeRTOS OS**
- **S32 Design Studio IDE for S32 Platform:** Eclipse-based, GNU compiler and debugger with support for 3rd party versions. S32 Config Tool for configuring: RTD /pins / clocks / peripherals / DDR memory / OS
- **Model-Based Design Toolbox (MBDT):** plug-in for MATLAB® and Simulink®
- **Motor Control Tools:** **FreeMASTER** real-time debug monitor and **Motor Control Application Tuning (MCAT)** to simplify motor control development



S32K3X4EVB-Q172

- Supports S32K344/24/14 (172MaxQFP)
- FS26 power SBC: +5.0 V, +3.3 V, and +1.5 V
- Arduino™ UNO footprint-compatible with expansion support
- Integrated debug adapter with P&E firmware and various JTAG connectors for external debuggers
- Easy access to all the MCU I/O pins for prototyping.
- MII/RMII Ethernet Interface: 10/100TBase Interface w/ RJ45 connector
- Touch Pad Interface, Push Buttons, RGB LED, ADC Potentiometers
- [1] CAN Physical Layers w/ the TJA1153 -Secure HS-CAN Transceiver with Sleep mode
- [2] LIN Physical Layers w/ the TJA1021: LIN 2.1/SAE J2602 Transceiver
- MX25L6433FM2R-08G 64Mb bits Serial NOR Flash Memory (Macronix)



S32K3X4EVB-Q257

- Supports S32K344/24/14 (257BGA)
- FS26 power SBC: +5.0 V, +3.3 V, and +1.5 V
- Arduino UNO footprint-compatible with expansion support
- Integrated debug adapter with P&E firmware and various JTAG connectors for external debuggers.
- Easy access to all the MCU I/O pins for prototyping.
- MII/RMII Ethernet Daughter Board Connector. Compatible with ADTJA1101-RMII (order separately)
- Touch Pad Interface, Push Buttons, RGB LEDs, ADC Potentiometers and MMA8452Q 3-Axis Digital Accelerometer
- [2] CAN Physical Layers w/ the TJA1153 -Secure HS-CAN Transceiver with Sleep mode
- [2] LIN Physical Layers w/ the TJA1021: LIN 2.1/SAE J2602 Transceiver
- MX25L6433FM2R-08G 64Mb bits Serial NOR Flash Memory (Macronix)
- SAI Connector and SGTL5000 Audio Codec Interface

S32K3 FAMILY OVERVIEW

| Family | Arm Cortex –M Cores | Flash / RAM | Package | CAN-FD / ENET (optional) | Ambient Temp (°C) |
|---------|---------------------|----------------|------------------------|-----------------------------|----------------------|
| S32K358 | CM7 LS + CM7 | 8 Mb / 1 Mb | 172 MaxQFP, 289 MAPBGA | 8 / 1Gbps | -40 to 105/125 |
| S32K348 | CM7 LS | 8 Mb / 1 Mb | 172 MaxQFP, 289 MAPBGA | 8 / 1Gbps | -40 to 105/125 |
| S32K338 | 3x CM7 | 8 Mb / 1 Mb | 172 MaxQFP, 289 MAPBGA | 8 / 1Gbps | -40 to 105/125 |
| S32K328 | 2x CM7 | 8 Mb / 1 Mb | 172 MaxQFP, 289 MAPBGA | 8 / 1Gbps | -40 to 105/125 |
| S32K344 | CM7 LS | 4 Mb / 512 KB | 172 MaxQFP, 257 MAPBGA | 6 / 100Mbps | -40 to 105/125 |
| S32K342 | CM7 LS | 2 Mb / 256 KB | 100/172 MaxQFP | 4 / 100Mbps | -40 to 105/125 |
| S32K341 | CM7 LS | 1 Mb / 256 KB | 100/172 MaxQFP | 4 / 100Mbps | -40 to 105/125 |
| S32K324 | 2x CM7 | 4 Mb / 512 KB | 172 MaxQFP, 257 MAPBGA | 6 / 100Mbps | -40 to 105/125 |
| S32K322 | 2x CM7 | 2 Mb / 256 KB | 100/172 MaxQFP | 4 / 100Mbps | -40 to 105/125 |
| S32K314 | CM7 | 4 Mb / 512 KB | 172 MaxQFP, 257 MAPBGA | 6 / 100Mbps | -40 to 105/125 |
| S32K312 | CM7 | 2 Mb / 192 KB | 100/172 MaxQFP | 6 / - | -40 to 105/125 |
| S32K311 | CM7 | 1 Mb / 128 KB | 48 LQFP, 100 MaxQFP | 3 / - | -40 to 105/125 |
| S32K310 | CM7 | 512 KB / 64 KB | 48 LQFP, 100 MaxQFP | 3 / - | -40 to 105/125 |

S32K3 RESOURCES

S32K3 product information
[nxp.com/S32K3](https://www.nxp.com/S32K3)

Real-Time Drivers (RTD)
[nxp.com/RTD](https://www.nxp.com/RTD)

SafeAssure®
[nxp.com/SafeAssure](https://www.nxp.com/SafeAssure)

S32K community
community.nxp.com/S32K

Product Longevity
[nxp.com/ProductLongevity](https://www.nxp.com/ProductLongevity)

[nxp.com/S32K3](https://www.nxp.com/S32K3)

NXP, the NXP logo and SafeAssure are trademarks of NXP B.V. All other product or service names are the property of their respective owners. Arm, Cortex and Keil are trademarks trademarks or registered trademarks of Arm Limited (or its subsidiaries) in the US and/or elsewhere. The related technology may be protected by any or all patents, copyrights, designs and trade secrets. All rights reserved. © 2021 NXP B.V.

Document Number: S32KBRA4 REV 0

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

NXP:

[S32K3X4EVB-Q257](#) [S32K3X4EVB-Q172](#)