



# 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

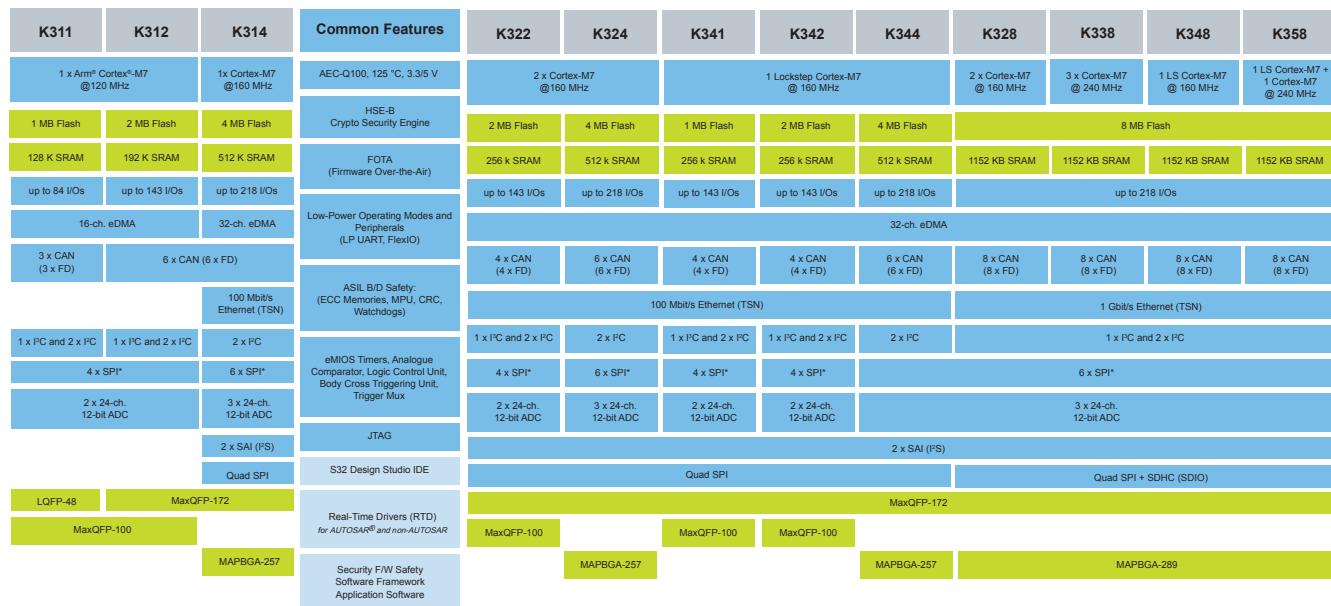
- ISO 26262 up to ASIL D
- Fault collection and control unit (FCCU)
- Hardware and software watchdogs, clock/power/temperature monitors
- Safety documentation and SafeAssure® community support
- HSE security engine: AES-128/192/256, RSA and ECC encryption; secure boot and key storage; side channel protection; 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

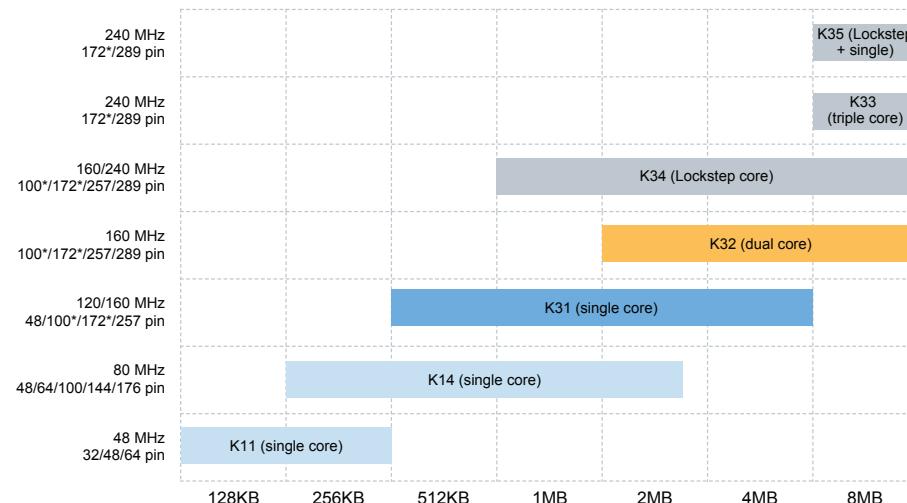
- Real-Time Drivers (RTD): free of charge for AUTOSAR and non- AUTOSAR, ASIL D compliant
- Security firmware: NXP provided, field upgradeable
- Safety Framework Software (SAF) and Core Self-Test library for functional safety applications
- S32 Design Studio IDE (S32DS): Eclipse, GCC and debugger, 3rd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



## S32K FAMILY BLOCK DIAGRAM



## S32K3 FAMILY SCALABILITY



\*MaxQFP

## TARGET APPLICATIONS

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

## PARTNERS

arm KEIL

Elektrobit

ETAS

Green Hills  
SOFTWARE

IAR  
SYSTEMS

iSYSTEM

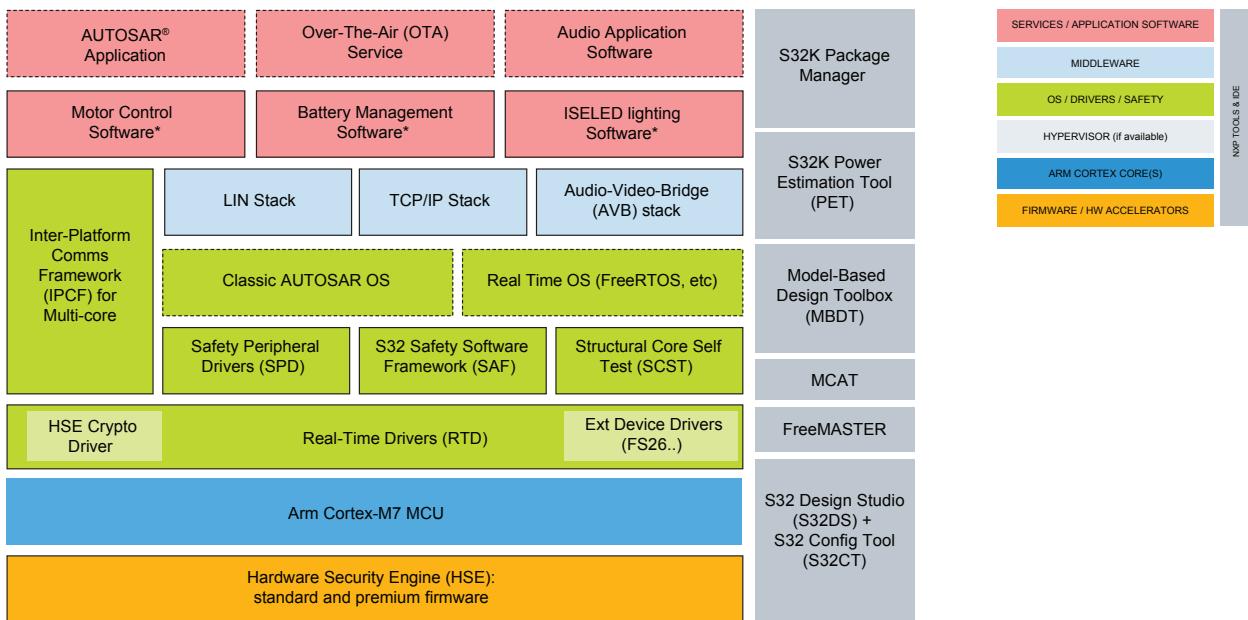
LAUTERBACH  
DEVELOPMENT TOOLS

MathWorks®

PE  
micro

VECTOR

## S32K3 SOFTWARE ENABLEMENT



□ Production grade    □ Third Party    ■ Firmware    \* Reference

### 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

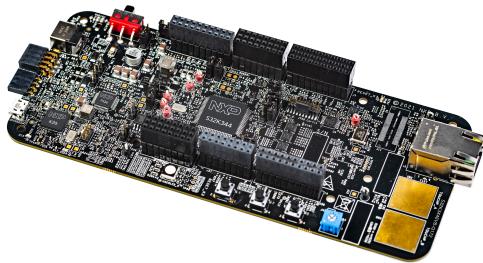
### STANDARD SOFTWARE for production use, included in silicon cost

- **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 (eMcem). 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

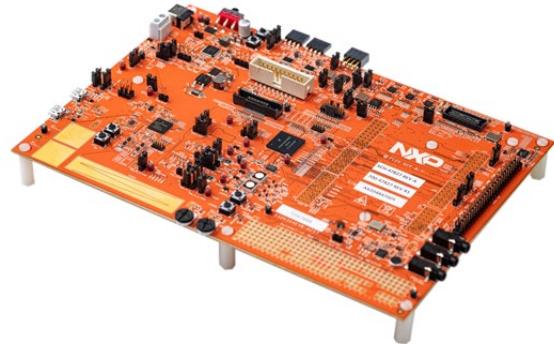
- **Platform Integration Software** –general software examples
- **Communication Stacks: TCP/IP, LIN**
- **FreeRTOS OS**
- **S32 Design Studio IDE for S32 Platform:** Eclipse-based, GNU compiler and debugger with support for 3rd party versions. S32 Config Tool for configuring: RTD /pins / clocks / peripherals / 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

## S32K3 HARDWARE TOOLS



### 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](http://nxp.com/S32K3)

Real-Time Drivers (RTD)

[nxp.com/RTD](http://nxp.com/RTD)

SafeAssure®

[nxp.com/SafeAssure](http://nxp.com/SafeAssure)

S32K community

[community.nxp.com/S32K](http://community.nxp.com/S32K)

Product Longevity

[nxp.com/ProductLongevity](http://nxp.com/ProductLongevity)

[nxp.com/S32K3](http://nxp.com/S32K3)

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