SECURE CONNECTIONS
FOR A SMARTER WORLD

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 HDQFP 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, rollback support and automatic address translation
- 12-bit 1 Msps 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
- HDQFP and BGA packages

HDQFP PACKAGE TECHNOLOGY

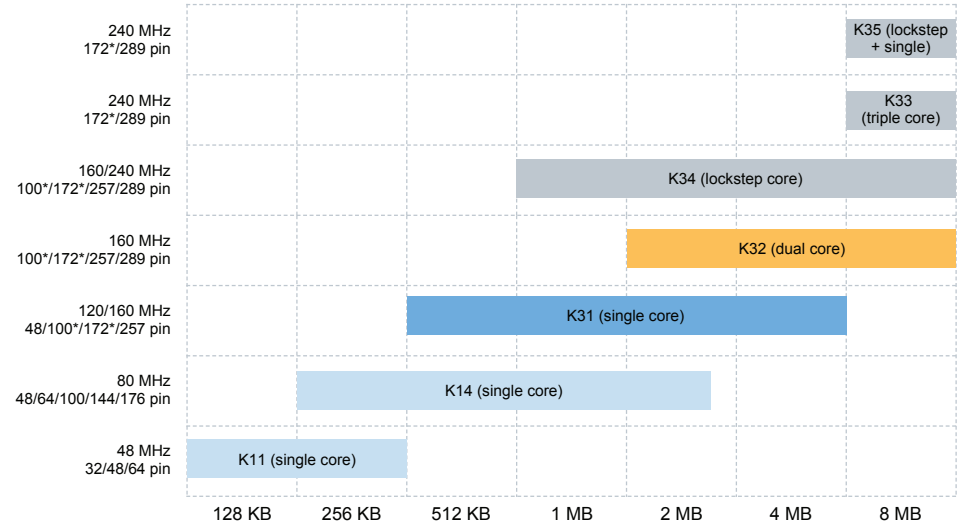
- QFP 'gull-wing and PLCC J-lead' in single package
- 172-pin (16 x 16 mm), 100-pin (10 x 10 mm), 0.65 mm pin pitch
- AEC-Q100 qualified: Grade 1 (-40 °C to +125 °C) and Grade 2 (-40 °C to +115 °C)

- 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 (100 Mbps/1 Gbps), CAN-FD, FlexIO (SPI/IIC/IIS/SENT protocol), serial audio interface, QSPI

PRODUCTION-GRADE SOFTWARE

- Real Time Drivers (RTD): free of charge (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, third-party support
- Model-Based Design Toolbox (MBDT) for MathWorks® MATLAB® software

S32K FAMILY SCALABILITY



*HDQFP

S32K3 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	AEC-Q100, 125 °C, 3.3/5 V	2 x Cortex-M7 @160 MHz		1 lockstep 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			
128 KB SRAM	192 KB SRAM	512 KB SRAM	FOTA (Firmware Over-the-Air)	256 KB SRAM	512 KB SRAM	256 KB SRAM	256 KB SRAM	512 KB 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			
16-ch. eDMA		32-ch. eDMA		32-ch. eDMA								
3 x CAN (3 x FD)	6 x CAN (6 x FD)		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)
		100 Mbit/s Ethernet (TSN)		100 Mbit/s Ethernet (TSN)					1 Gbit/s Ethernet (TSN)			
2 x I²C	2 x I²C	2 x I²C	eMIOS Timers, Analog Comparator, Logic Control Unit, Body Cross Triggering Unit, Trigger Mux	2 x I²C	2 x I²C	2 x I²C	2 x I²C	2 x I²C	2 x I²C			
4 x SPI*		6 x SPI*		4 x SPI*	6 x SPI*	4 x SPI*	4 x SPI*	6 x SPI*				
2 x 24-ch. 12-bit ADC		3 x 24-ch. 12-bit ADC		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				
		2 x SAI (I²S)	JTAG	2 x SAI (I²S)								
		Quad SPI	S32 Design Studio IDE	Quad SPI					Quad SPI + SDHC (SDIO)			
LQFP-48	HDQFP-172		Real-Time Drivers (AUTOSAR® and Non-AUTOSAR)	HDQFP-172								
HDQFP-100				HDQFP-100		HDQFP-100	HDQFP-100					
		MAPBGA-257	Security Framework Safety Software Framework Application Software		MAPBGA-257			MAPBGA-257	MAPBGA-289			

*Low Power Serial Peripheral Interface (LPSPI) modules with DMA support

S32K3 FAMILY OVERVIEW

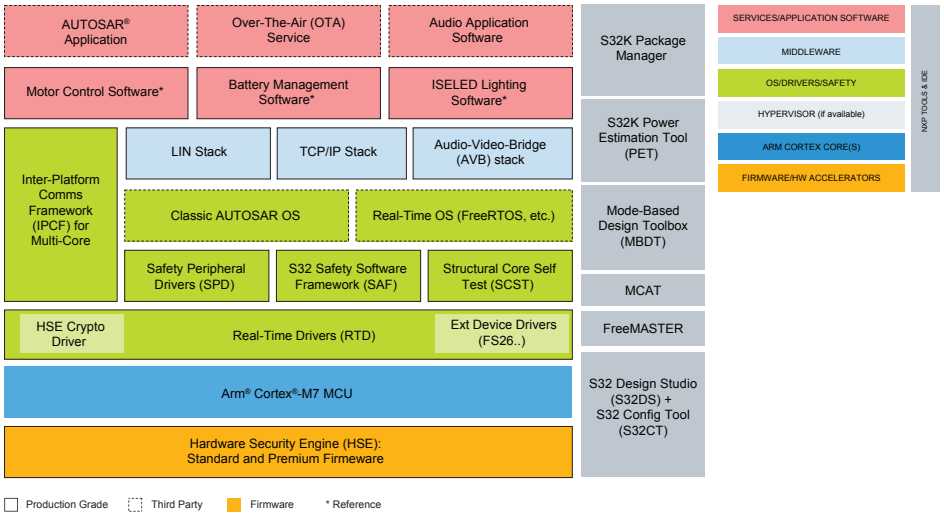
Family	Arm® Cortex®-M Cores	Flash/RAM	Package	CAN-FD/ Ethernet (Optional)	Ambient Temperature (°C)
S32K358	CM7 LS + CM7	8 MB/1MB	172 HDQFP, 289 MAPBGA	8/1 Gbps	-40 to 105/125
S32K348	CM7 LS	8 MB/1MB	172 HDQFP, 289 MAPBGA	8/1 Gbps	-40 to 105/125
S32K338	3x CM7	8 MB/1MB	172 HDQFP, 289 MAPBGA	8/1 Gbps	-40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

TARGET APPLICATIONS

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

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-customized version):** OEM-specific security firmware.
- **Automotive Math and Motor Control Library (AMMCLIB):** pre-compiled, highly optimized 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

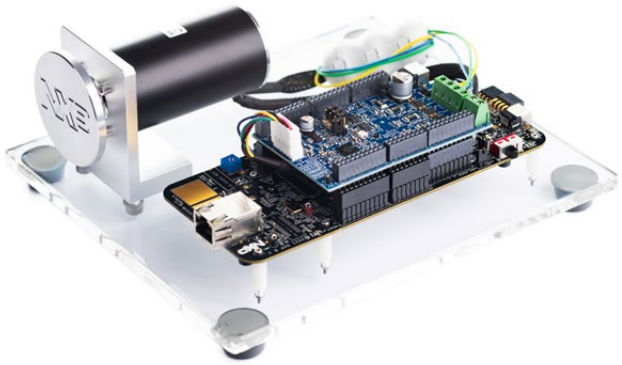
- **S32 Design Studio IDE for S32 Platform:** Eclipse-based, GNU compiler and debugger with support for third-party versions. S32 Config Tool for configuring RTD, pins, clocks, peripherals, DDR memory and OS.
- **Real-Time Drivers (RTD):** software drivers for AUTOSAR®/ non-AUTOSAR applications. Full processor IP coverage. ISO 26262 ASIL D compliant, AUTOSAR 4.4, SPICE level 3. Configure with S32 Config Tool, Elektrobit Tresos Studio or other partners' 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 and sharing, e.g., AUTOSAR/non-AUTOSAR on Cortex-M cores
- **Model-Based Design Toolbox (MBDT):** plug-in for MathWorks® MATLAB® Software and MathWorks Simulink® Software.
- **Motor Control Tools:** FreeMASTER real-time debug monitor and Motor Control Application Tuning (MCAT) to simplify motor control development.

REFERENCE SOFTWARE

For reference use, included in silicon cost

- **Platform Integration Software:** general software examples.
- **Communication Stacks (TCP/IP, LIN)**
- **FreeRTOS OS**

S32K3 HARDWARE TOOLS



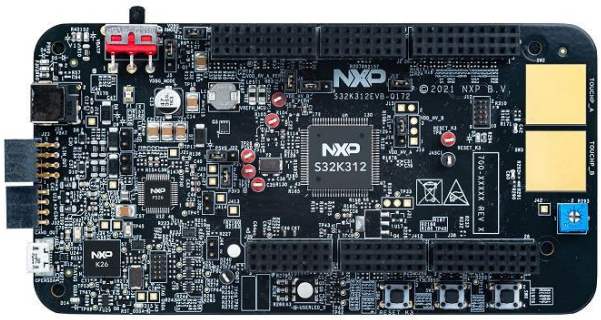
S32K344 MOTOR CONTROL KIT

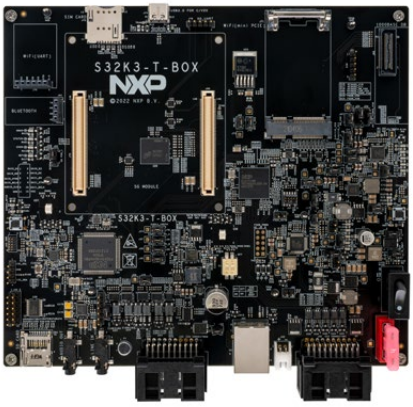
- Supports S32K3 automotive general-purpose MCU
- FS26 Power SBC, with +5.0 V, +3.3 V and +1.5 V
- GD3000 3-phase brushless motor pre-driver
- Integrated motor control shield compatible up to 12 V/5 A 3-phase power stage board based on SMARTMOS™ GD3000 pre-driver with condition monitoring and fault detection
- Low-Cost PM motor—3-phase PM motor equipped with Hall sensor, 24 VDC, 9000 RPM, 95 W, 42BLY3A78-24110
- USB cable
- 12 VDC power supply
- On-board S32K3 debug interface (including serial communication)
- On-board CAN, LIN and Ethernet (RJ45 connector) interfaces

S32K3X4EVB-T172

- Supports S32K344/24/14 (172HDQFP)
- FS26 Power SBC, with +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 JTAG connectors for external debuggers
- micro USB debug interface with virtual COM port
- Easy access to all the MCU I/O pins for prototyping
- Ethernet 100BASE-T1 Physical Layer interface
- Touch pad interface, 2x user push buttons, user RGB LED, and ADC rotary potentiometer
- [1] CAN physical layer with TJA1153 Secure HS-CAN (FD) Transceiver with Sleep Mode
- [2] LIN physical layers with TJA1022 Dual LIN 2.2A/SAE J2602 Transceiver

S32K3 HARDWARE TOOLS cont.





S32K312EVB-Q172

- Supports S32K312 (172 HDQFP)
- FS26 Power SBC: +5.0 V, +3.3 V, and +1.5 V
- Arduino® UNO footprint-compatible with expansion support
- Integrated debug interface with P&E firmware and 10-pin JTAG connectors for external debuggers
- Easy access to all the MCU I/O pins for prototyping
- Touch pad interface, push buttons, RGB LED, ADC Potentiometers
- [1] CAN physical layers with the TJA1043 CAN-FD transceiver with sleep mode
- [2] LIN physical layers with the TJA1022T: LIN 2.1/SAE J2602 transceiver

S32K3-T-BOX

- Reference design for cost-effective vehicle networking and telematics applications.
- Supports S32K344 with lockstep Arm® Cortex®-M7 (172 HDQFP)
- FS26 Power SBC, with +5.0 V, +3.3 V and +1.5 V.
- Features SJA1110 TSN Ethernet switch
- Features LIN, CAN FD and HS-CAN transceivers
- Features the SGTL5000 audio codec
- Wireless connectivity featuring the AW690 Wi-Fi® 6 SoC
- [1] CAN physical layers with the TJA1153 -Secure HS-CAN transceiver with sleep mode
- [2] CAN physical layers with the TJA1463 and TJA1462 CAN transceivers with sleep and standby modes
- [1] CAN FD physical layers with the TJA144x transceiver
- [4] LIN physical layers with the TJA1124 Quad-LIN commander

S32K3 RESOURCES

S32K3 product information
nxp.com/S32K3

SafeAssure® community
nxp.com/SafeAssureCommunity

S32K community
community.nxp.com

Product Longevity information
nxp.com/ProductLongevity

Real-Time Drivers
nxp.com/RTD

nxp.com/S32K3

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Product Longevity