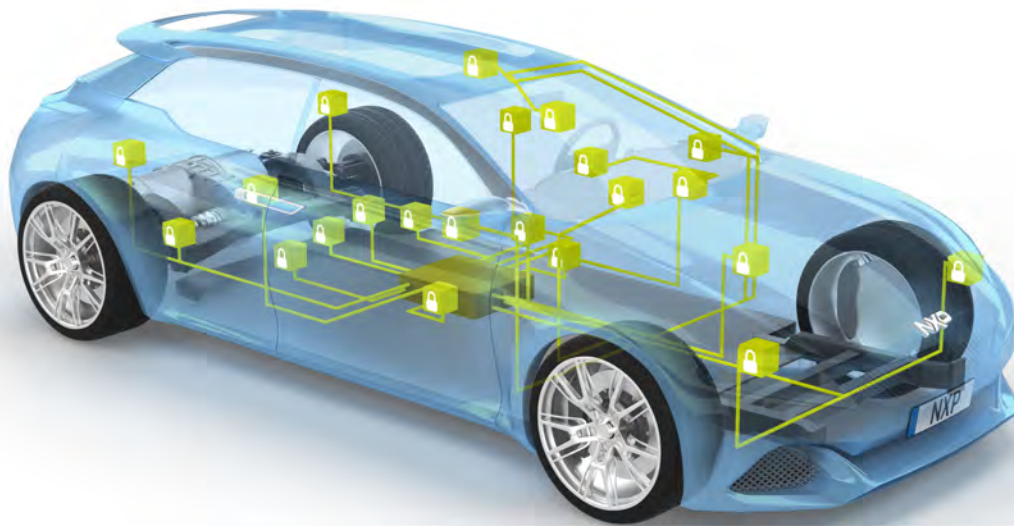




# S32K1 Arm® Cortex®-M BASED MCUs FOR AUTOMOTIVE AND INDUSTRIAL APPLICATIONS

The S32K1 family of 32-bit AEC-Q100 qualified MCUs combines a scalable family of Arm Cortex-M0-based microcontrollers built on long-lasting features with a comprehensive suite of production-grade tools. S32K1 MCUs are included in NXP's Product Longevity Program, guaranteeing a minimum of 15 years of assured supply.



## SCALABLE SINGLE PLATFORM

- Hardware- and Software- compatible MCU family
- 48 MHz Arm Cortex-M0+ core or up to 112 MHz Arm Cortex-M4F core
- Flash memory: from 128 KB up to 2 MB
- AEC-Q100 qualified: Grade 0, Grade 1, and Grade 2
- QFN, LQFP, MAPBGA packages, from 32 to 176 pin count

## FEATURES AND PERFORMANCE

- CAN FD, FlexIO, QSPI, Ethernet and serial audio interfaces
- Functional Safety compliant: ISO 26262 up to ASIL B
- Cryptographic Services Engine compressed (CSEc) security engine: AES-128 and SHE compliant
- Ultra-low-power performance

## COMPLETE SOFTWARE SOLUTION

- S32 Design Studio IDE: Eclipse, GCC, and debugger
- Production-grade S32 Software Development Kit (S32 SDK): SPICE Level 3 compliant, MISRA tested
- NXP AUTOSAR® MCAL (ISO 26262 and QM compliant) and OS
- Security firmware - NXP provided
- Core Self-Test Library for functional safety applications
- Production-grade ASIL compliant Real Time Drivers (RTD) support
- Model-Based Design Toolbox (MBDT) for MATLAB® and Simulink®, FreeMASTER (Lite) plus Motor Control Application Tunning (MCAT) tool, and Automotive Math and Motor Control Library (AMMCLib) set
- Third-party ecosystem support to reduce time-to-market

## S32K1 KEY FEATURES

The S32K1 MCU family provides a scalable platform with next-generation safety, security, connectivity and low-power features.



### Scalability

- Memory range from 128 KB to 2 MB
- Pin count from 32 to 176 pins
- QFN, LQFP, MAPBGA packages
- IP compatibility across family



### Security

- Cryptographic services engine (CSEc) module
- SHE compliant
- AES128 encryption and decryption
- Up to 20 key firmware
- Unique ID
- Secure boot
- Flash content protection in normal test mode



### Safety

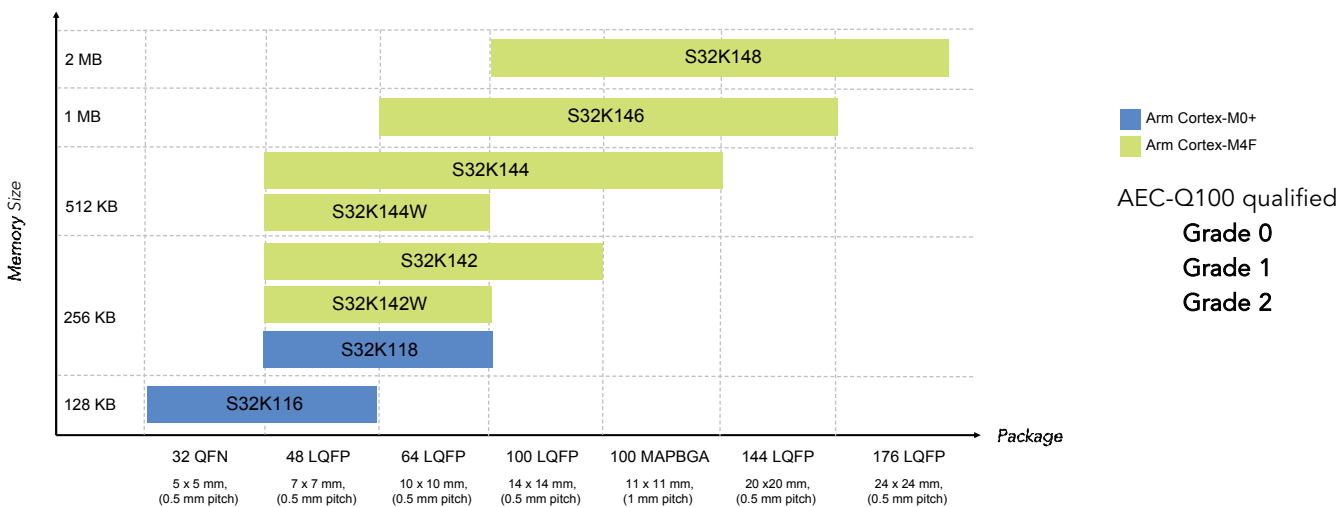
- ISO 26262 up to ASIL B compliant
- ECC on flash and SRAM MPU, CRC watchdog
- AEC-Q100 qualified: Grade 0 (-40° C to +150° C), Grade 1 (-40° C to +125° C), and Grade 2 (-40° C to +105° C)
- Core self-test library
- Failure Modes Effects and Diagnostic Analysis (FMEDA) and Safety Manual, SafeAssure® community support
- Technical support



### Connectivity

- FlexCAN**
  - Support CAN FD and standard CAN
  - 64-byte CAN FD at 8 Mbit/s
- FlexIO**
  - Emulation of UART, SPI, I<sup>2</sup>C, I<sup>2</sup>S, LCD RGB, PWM, LIN, etc.
- QUADSPI**
  - Interface to external flash device
  - Support SDR and HyperRAM modes
- Ethernet & Audio Interface**
  - 10/100 Mbit/s MAC
  - IEEE® 802.3-2002
  - Audio-Video Bridge (AVB)
  - IEEE-1588 timestamping

## MEMORY AND PACKAGE SCALABILITY



## ULTRA-LOW POWER

Combining multiple low-power operating modes with autonomous, low-power peripherals allowing control over dynamic and static power profiles.


- Seven active and standby modes (RUN/WAIT/STOP) with all memory and register contents and IO pin states maintained in all modes
- All I/O pins and several peripherals function as fast wake-up sources
- Analog, communication and timing peripherals operate autonomously via DMA with no CPU intervention
- Extensive clock gating for core and peripherals

VLPS	40 µA	at 5 V with LPTMR enabled
VLPR	1.07 mA	at 5 V @ 8 MHz
STOP1	6.3 mA	at 5 V @ 48 MHz
STOP2	7.2 mA	at 5 V @ 48 MHz
RUN	20.3 mA	at 5 V @ 48 MHz
HRUN	52.2 mA	at 5 V @ 112 MHz

Typical consumption values across S32K1xx power modes

## S32K1 FAMILY OVERVIEW

S32K116	S32K118	Common Features	S32K142	S32K144	S32K146	S32K148	S32K142W	S32K144W
Arm Cortex-M0+ @ 48 MHz		AEC-Q100, 5 V	Arm Cortex-M4F @ up to 112 MHz				Arm Cortex-M4F @ up to 80 MHz	
128 KB Flash	256 KB Flash	CSEc Security Module	256 KB Flash	512 KB Flash	1 MB Flash	2 MB Flash	256 KB Flash	512 KB Flash
17 KB SRAM	24 KB SRAM	Low Power Operating Modes and Peripherals	32 KB SRAM	64 KB SRAM	128 KB SRAM	256 KB SRAM	32 KB SRAM	64 KB SRAM
up to 42 I/Os	up to 58 I/Os	ASIL-B Capable: (ECC, MPU, CRC, W'DOGs)	up to 89 I/Os		up to 128 I/Os	up to 156 I/Os	up to 58 I/Os	
4 channel eDMA		LPUART, LPSPi, LPIIC, FlexIO	16 channel eDMA					
1x FlexCAN with 1x FD		FlexTimers, LP Timers, Prog. Delay Block	2x FlexCAN with 1x FD	3x FlexCAN with 1x FD	3x FlexCAN with 2x FD	3x FlexCAN with 3x FD	2x FlexCAN with 2x FD	
1x 13-ch., 12-bit ADC	1x 16-ch., 12-bit ADC	8-40 MHz Ext. Osc, 8/48 MHz Osc., 128 KHz LPO	2x 16-ch., 12-bit ADC		2x 24-ch., 12-bit ADC	2x 32-ch., 12-bit ADC	2x 16-ch., 12-bit ADC	
		*JTAG			IEEE® 158 ENET			
		S32DS IDE, SDK			Quad SPI			
		Real Time Drivers (RTD)			ETM Trace			
		AUTOSAR MCAL/OS			2x SAI			
		Application SW						

 S32K14x only

## TARGET APPLICATIONS

### Automotive

- Seat control
- Window
- Interior lighting
- Door
- Sunroof
- Pump and fans, HVAC
- Powertrain sensors (NOx)
- Engine cooling fan
- eTurbo charger

### Industrial

- Factory automation
- Inverters
- Home audio
- Sensing
- Avionics
- Medical

## S32K1 PARTNERS

ARC CORE®

arm

AUTOSAR

OSMIC  
Software

Elektrobit

freeRTOS

Green Hills  
SOFTWARE

IAR  
SYSTEMS

KEIL™  
Tools by ARM

MathWorks®

VECTOR

WIND™

## S32K1 HARDWARE TOOLS

Development platforms for general purpose automotive and high-reliability industrial applications.



**MCSPT1AK116**  
3-phase BLDC/PMSM development kit with S32K116



**S32K116EVB2Q048**  
UJA1169 CAN/LIN PHY SBC



**S32K142EVB-Q100**  
UJA1169 CAN/LIN PHY SBC



**MCSPT1AK144**  
3-phase BLDC/PMSM development kit with S32K144



**S32K118EVB2Q048**  
UJA1169 CAN/LIN PHY SBC



**S32K144EVB-Q100**  
UJA1169 CAN/LIN PHY SBC



**DEVKIT-MOTORGD**  
Low-Cost motor control solution for DEVKIT platform



**S32K14WEVB-Q064** **NEW**  
UJA1169 CAN/LIN PHY SBC



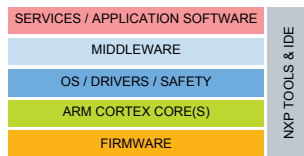
**S32K146EVB-Q144**  
UJA1169 CAN/LIN PHY SBC



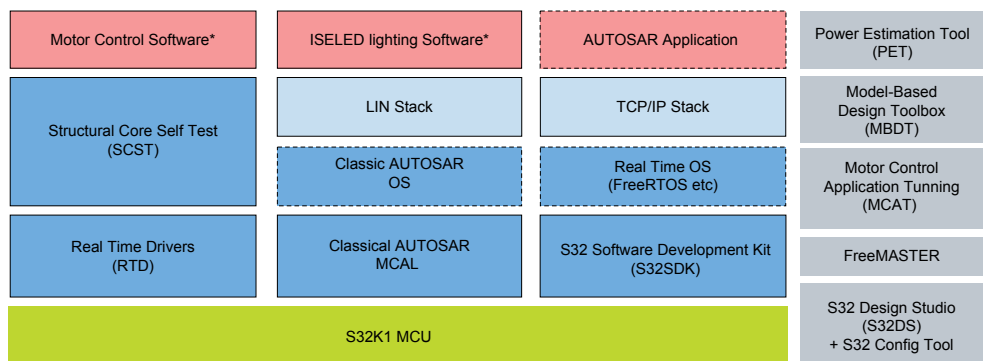
**S32K148EVB-Q176**  
UJA1132 CAN/LIN PHY SBC  
ADTJA1101-RMII Ethernet daughter card

## S32K1 SOFTWARE ECOSYSTEM

Supported by a complete ecosystem to minimize development effort and reduce time-to-market:



□ Production grade   □ Third Party   \* Reference



### S32 DESIGN STUDIO

- Free of charge, zero code limit, Eclipse based, supports GCC and third-party compilers
- Compatible with NXP's Advanced Math and Motor Control Library (AMMCLib)

### S32 SOFTWARE DEVELOPMENT KIT

- Free of charge, production-grade
- MISRA and SPICE Level 3 compliant low-level drivers for MCU peripherals
- Free RTOS operating system

### REAL TIME DRIVERS

- Production-grade, developed according to ISO 26262 functional safety process
- Applicable for both AUTOSAR 4.4 and non-AUTOSAR projects
- Classical AUTOSAR 4.0 / 4.2 /4.3 MCAL and Core Self-Test Library

## S32K1 ORDERING INFORMATION

Part numbers below are available for sampling on [nxp.com/S32K1](http://nxp.com/S32K1)

For a full list of all orderable part numbers see the attachment included with S32K1xx MCU family data sheet.

Part Number	Flash Size/RAM	Features	Cores	Package	Ambient Temperature				
FS32K116LAT0MFMT	128 KB/17 KB	CAN FD + FlexIO crypto security engine eDMA (4 ch.)	Arm Cortex-M0+ @ 48 MHz	32 QFN	AEC-Q100 Grade 1: -40° C to 125° C				
FS32K116LAT0MLFT				48 LQFP					
FS32K118LAT0MLFT	256 KB/25 KB			48 LQFP					
FS32K118LAT0MLHT				64 LQFP					
FS32K142HAT0MLFT	256 KB/32 KB	CAN FD + FlexIO crypto security engine eDMA (16 ch.)	Arm Cortex-M4F @ 80 MHz	48 LQFP					
FS32K142HAT0MLHT				64 LQFP					
FS32K142HAT0MLLT				100 LQFP					
FS32K144HAT0MLFT	512 KB/64 KB			CAN FD + FlexIO crypto security engine eDMA (16 ch.)		Arm Cortex-M4F @ 80 MHz	48 LQFP		
FS32K144HAT0MLHT							64 LQFP		
FS32K144HAT0MLLT							100 LQFP		
FS32K144HAT0MMHT							100 MAPBGA		
FS32K146HAT0MLHT	1 MB/128 KB						CAN FD + FlexIO crypto security engine eDMA (16 ch.)	Arm Cortex-M4F @ 80 MHz	64 LQFP
FS32K146HAT0MLLT					100 LQFP				
FS32K146HAT0MLQT					144 LQFP				
FS32K146HAT0MMHT					100 MAPBGA				
FS32K148UJT0VLLT	2 MB/256 KB				CAN FD + FlexIO crypto security engine eDMA (16 ch.) Ethernet; Serial audio interface; QSPI*				Arm Cortex-M4F @ 112 MHz
FS32K148UJT0VLQT		144 LQFP							
FS32K148UJT0VLUT		176 LQFP							
FS32K148UJT0VMHT		100 MAPBGA							
FS32K144WAT0WLHT	512 KB/64 KB	CAN FD + FlexIO crypto security engine eDMA (16-ch.)	Arm Cortex-M4F @ 80 MHz	64LQFP	AEC-Q100 Grade 0: -40° C to 150° C				
FS32K144WAT0WLFT				48LQFP					
FS32K142WAT0WLHT	256 KB/32 KB			64LQFP					
FS32K142WAT0WLFT				48LQFP					

\*QSPI not supported by S32K148-100 LQFP derivatives

## S32K1 RESOURCES

S32K1 product information  
[nxp.com/S32K1](http://nxp.com/S32K1)

SafeAssure® community  
[nxp.com/SafeAssureCommunity](http://nxp.com/SafeAssureCommunity)

S32K community  
[nxp.com/S32K1Community](http://nxp.com/S32K1Community)

Product Longevity information  
[nxp.com/ProductLongevity](http://nxp.com/ProductLongevity)

[nxp.com/S32K1](http://nxp.com/S32K1)

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