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 Structural Core Self-Test (SCST) 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
PARTNERS

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

S32K3 FAMILY OVERVIEW

<table>
<thead>
<tr>
<th>Family</th>
<th>Arm® Cortex®-M Cores</th>
<th>Flash/RAM</th>
<th>Package</th>
<th>CAN-FD/Ethernet (Optional)</th>
<th>Ambient Temperature (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S32K358</td>
<td>CM7 LS + CM7</td>
<td>8 MB/1MB</td>
<td>172 HDQFP, 289 MAPBGA</td>
<td>8/1 Gbps</td>
<td>-40 to 105/125</td>
</tr>
<tr>
<td>S32K348</td>
<td>CM7 LS</td>
<td>8 MB/1MB</td>
<td>172 HDQFP, 289 MAPBGA</td>
<td>8/1 Gbps</td>
<td>-40 to 105/125</td>
</tr>
<tr>
<td>S32K338</td>
<td>3x CM7</td>
<td>8 MB/1MB</td>
<td>172 HDQFP, 289 MAPBGA</td>
<td>8/1 Gbps</td>
<td>-40 to 105/125</td>
</tr>
<tr>
<td>S32K328</td>
<td>2x CM7</td>
<td>8 MB/1MB</td>
<td>172 HDQFP, 289 MAPBGA</td>
<td>8/1 Gbps</td>
<td>-40 to 105/125</td>
</tr>
<tr>
<td>S32K344</td>
<td>CM7 LS</td>
<td>4 MB/512 KB</td>
<td>172 HDQFP, 257 MAPBGA</td>
<td>6/100 Mbps</td>
<td>-40 to 105/125</td>
</tr>
<tr>
<td>S32K342</td>
<td>CM7 LS</td>
<td>2 MB/256 KB</td>
<td>100/172 HDQFP</td>
<td>4/100 Mbps</td>
<td>-40 to 105/125</td>
</tr>
<tr>
<td>S32K341</td>
<td>CM7 LS</td>
<td>1 MB/256 KB</td>
<td>100/172 HDQFP</td>
<td>4/100 Mbps</td>
<td>-40 to 105/125</td>
</tr>
<tr>
<td>S32K324</td>
<td>2x CM7</td>
<td>4 MB/512 KB</td>
<td>172 HDQFP, 257 MAPBGA</td>
<td>6/100 Mbps</td>
<td>-40 to 105/125</td>
</tr>
<tr>
<td>S32K322</td>
<td>2x CM7</td>
<td>2 MB/256 KB</td>
<td>100/172 HDQFP</td>
<td>4/100 Mbps</td>
<td>-40 to 105/125</td>
</tr>
<tr>
<td>S32K314</td>
<td>CM7</td>
<td>4 MB/512 KB</td>
<td>172 HDQFP, 257 MAPBGA</td>
<td>6/100 Mbps</td>
<td>-40 to 105/125</td>
</tr>
<tr>
<td>S32K312</td>
<td>CM7</td>
<td>2 MB/192 KB</td>
<td>100/172 HDQFP</td>
<td>6/-</td>
<td>-40 to 105/125</td>
</tr>
<tr>
<td>S32K311</td>
<td>CM7</td>
<td>1 MB/128 KB</td>
<td>48 LQFP, 100 HDQFP</td>
<td>3/-</td>
<td>-40 to 105/125</td>
</tr>
</tbody>
</table>
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:** Pre-compiled version of AMMCLib, 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**

• **Zephyr® RTOS**

• **Mbed TLS**

• **OTA demo**

S32K3 SOFTWARE ENABLEMENT

www.nxp.com/S32K3
### S32K3 HARDWARE TOOLS

#### S32K344 MOTOR CONTROL KIT (MCSPTE1AK344)
- 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

#### 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 adapter with P&E firmware and 10-pin JTAG connectors for external debuggers
- micro USB debug interface with virtual COM port
- Easy access to all the MCU I/O pins for prototyping
- Touch pad interface, push buttons, RGB LED, ADC
- [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

#### S32K3X4EVB-T172
- Supports S32K344/24/14 (172 HDQFP)
- 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-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 HARDWARE TOOLS cont.

S32K324 TRIPLE MOTOR CONTROL BOARD (MCTPTX1AK324)
- Supports S32K3 automotive general-purpose MCU
- Supports control 3x PMSM, 1x DCM and 4x valves, independently
- FS26 Power SBC, with +5.0 V, +3.3 V and +1.5 V
- [3] GD3000 3-phase brushless motor pre-driver
- H-Bridge driver module for legacy direct current (DC) motor control
- MC12XS6 High Side Driver module
- 10 pins SWD/JTAG Debugger interface
- On-board CAN, LIN and USB to UART interfaces

MR-CANHUBK344
- Supports S32K3 automotive general-purpose MCU
- FS26 Power SBC, with +5.0 V, +3.3 V and +1.5 V
- UART, SPI, I2C on JST-GH easy-to-build “Dronecode” standard connectors
- Expansion header for Motor PWM and GPIO
- Connector for 3rd party IMU (accel/gyro/mag)
- 100BASE-T1 Ethernet PHY with TJA1103 ASIL B Compliant
- SE050 Secure element with NFC (Near Field Communication)
- [6] CAN physical layers with TJA1443 (HS-CAN), TJA1463 (CAN S/C) and TJA1153 (Secure HS-CAN) and transceivers

S32K344-WB
- Supports S32K3 automotive general-purpose MCU
- FS26 Power SBC, with +5.0 V, +3.3 V and +1.5 V
- JTAG connectors for external debuggers
- SGTL5000 ultra-low power audio codec
- High-side driver, low-side driver and H-bridge driver
- Ethernet switch and 3x 100BASE-T1 with SJA1105QEL Five-ports AVB & TSN automotive Ethernet switch
- RF receiver
- NJJ29C2 low-frequency driver and receiver IC
- [4] CAN physical layers with TJA1044GT and TJA1145T high-speed CAN transceivers
- [8] LIN physical layers with TJA1124 and SJA1124 quad LIN commander transceivers

S32K3 RESOURCES

S32K3 product information
nxp.com/S32K3

S32K community
community.nxp.com

Real-Time Drivers
nxp.com/RTD

SafeAssure® community
nxp.com/SafeAssureCommunity

Product Longevity information
nxp.com/ProductLongevity