

NXP General Purpose Products & Solutions

- S32K1 Family

无处不在的汽车电子微控制器S32K1

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NXP 汽车微处理器产品市场经理

Jun 2020 |



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Agenda

- NXP S32K1 product family features
- S32K1 Software & Tools
- Reference designs based on S32K1



Global Megatrends: NXP to Lead This Industry Transformation



Autonomy

Saving lives:
90% of accidents caused by human error



Electrification

Zero emission:
increasing global regulations



Connectivity

Enjoying the ride:
One h per day spent in the car





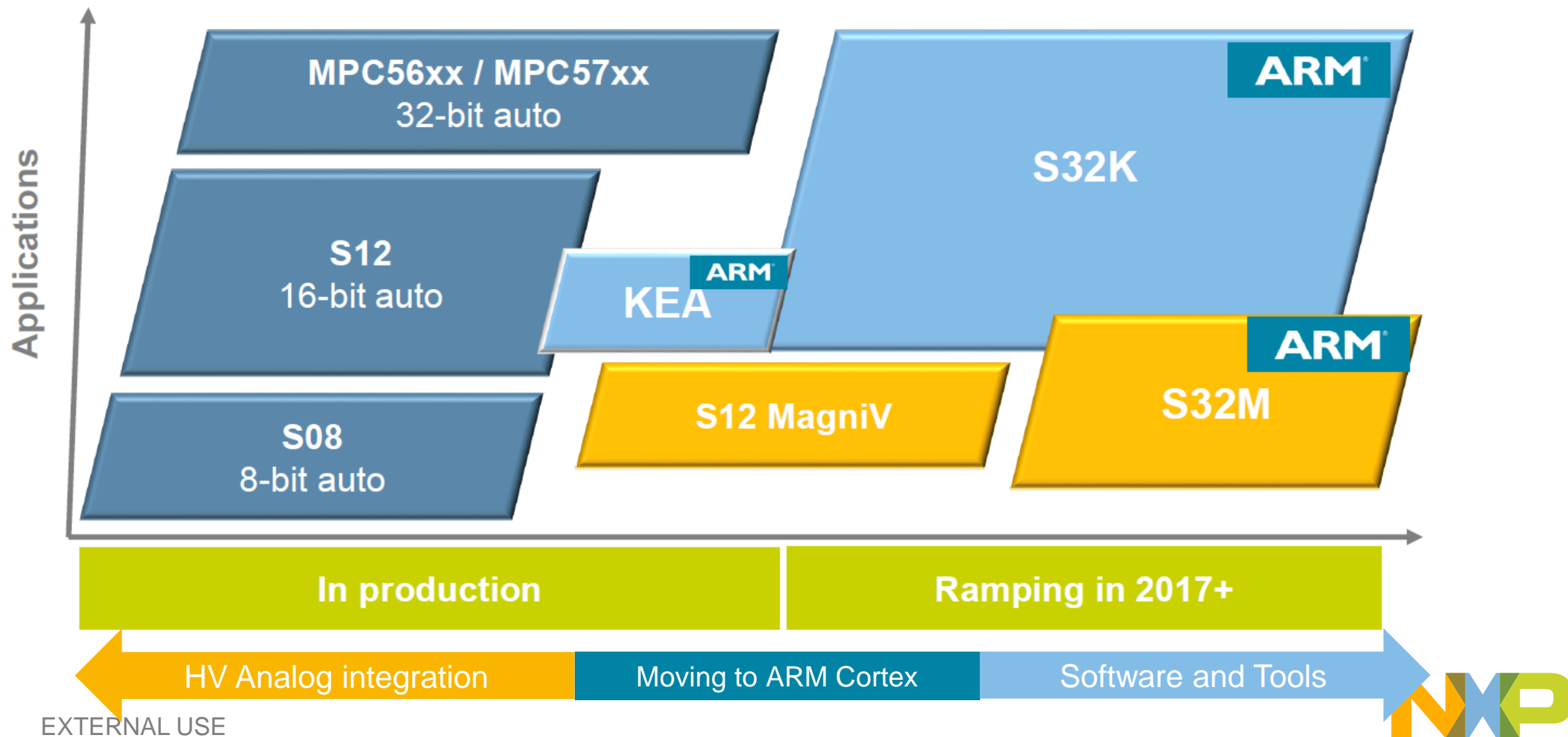
01.

NXP S32K1 product family features

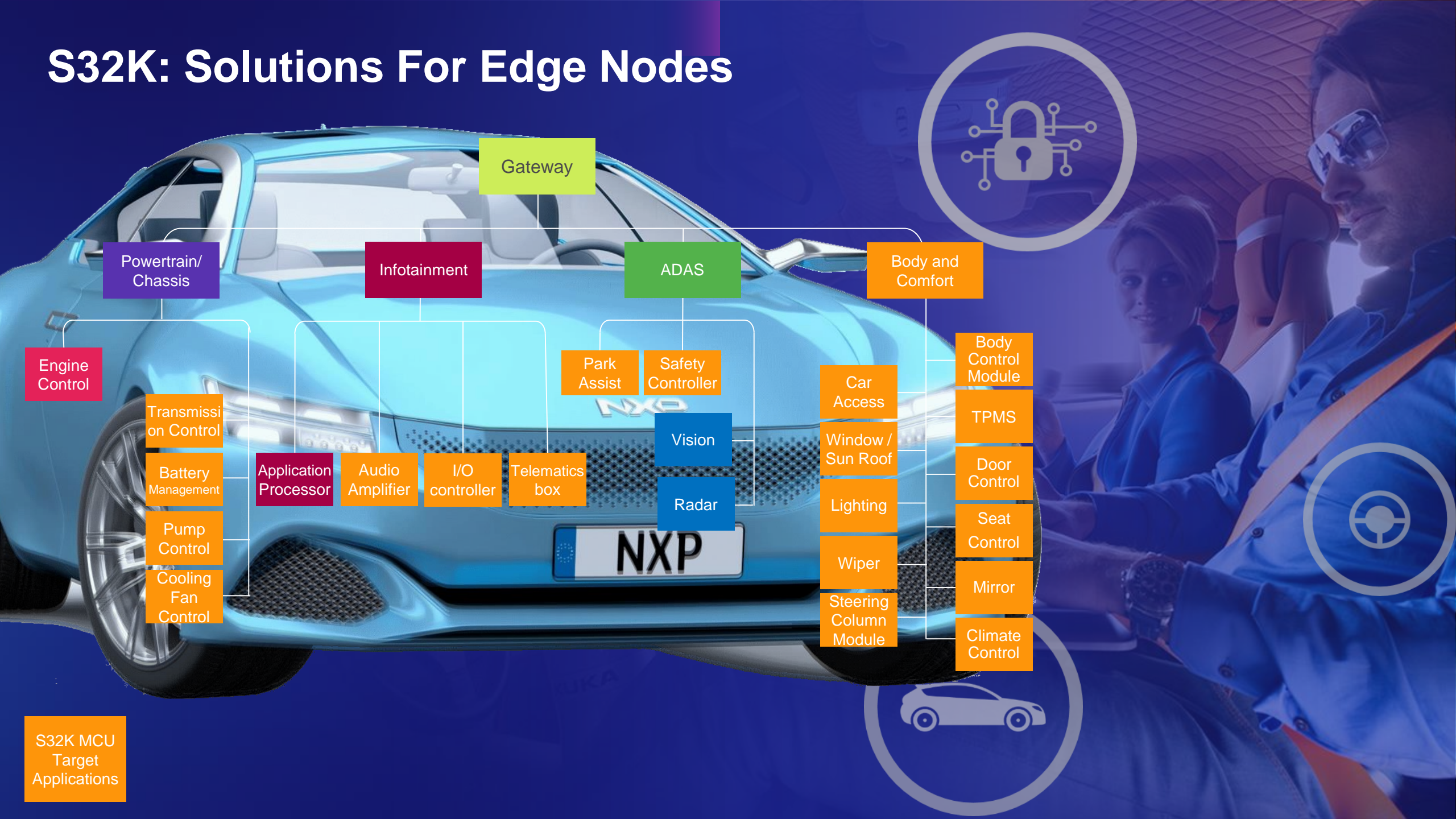
General Purpose MCU S32K1

汽车通用型微控制器S32K1产品家族特性

GPIS Portfolio - Expanding with ARM Based MCU Platforms



S32K: Solutions For Edge Nodes



S32K MCU
Target
Applications

S32K Target Apps: Truly General Purpose

Body Electronics



HVAC



Steering wheel



Lighting



Battery/Power mgmt



Doors



Body Controllers

Motor Control



Engine /
cooling fans



Wipers



Window lift



Diesel / Oil Pump

Infotainment



Head unit auxiliary
MCU



Wireless Charging,
NFC pairing

Chassis/Safety



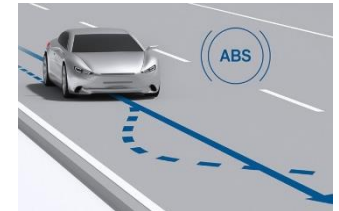
TPMS



Suspensions



Gear shifter



ABS

ADAS



Park Assist



Motorized cameras

S32K1 Family – Accelerating Automotive Software Design

Performance & Integration

Future proof designs

- ARM Cortex M4F and M0+ cores
- ISO CAN-FD, CSEc hardware security, ISO26262 ASIL-B functional safety
- Ultra low power

arm

CAN^{FD}



SAFE ASSURE
by NXP

Automotive-grade SW

Minimized complexity

- S32 Design Studio IDE
- Automotive-grade Software Development Kit (SDK)
- Autosar MCAL, 3rd party ecosystem



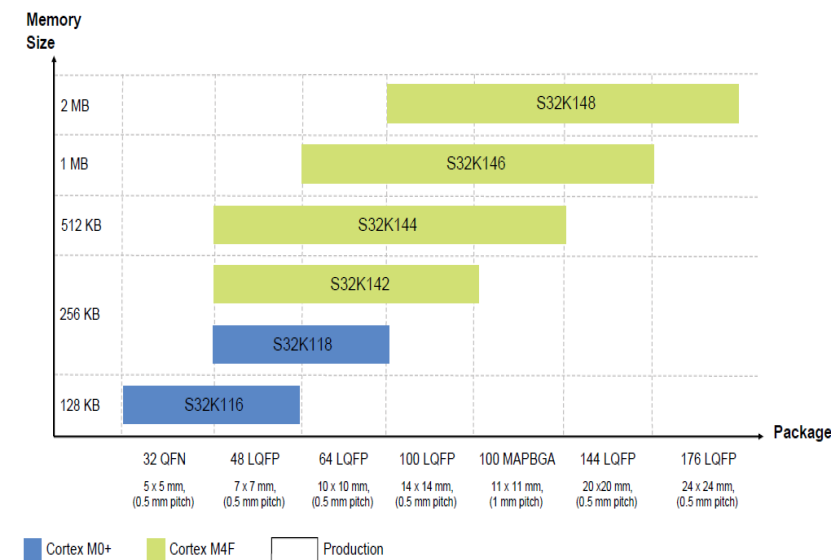
S32
SDK



Broad Portfolio

Maximised reuse

- 128KB to 2MB, 32 to 176 pins
- H/w and S/w compatibility
- AEC Q100 grade 1 qualified (125°C)*, min. 15 year longevity



Product Longevity

NXP

* Grade 0 device under development

S32K14x and S32K11x Features

New package
available

Mass
Production

S32K11x

S32K116

S32K118

Arm Cortex-M0+ @ 48MHz

128KB Flash

256KB Flash

16KB SRAM

24KB SRAM

up to 42 I/Os

up to 58 I/Os

4 channel eDMA

1x FlexCAN with 1x FD

1x 13-ch 12-bit ADC

1x 16-ch 12-bit ADC

QFN-32

LQFP-64

LQFP-48

Common Features

AEC-Q100, 125°C, 5V

CSEc Security Module

Low Power Operating Modes & Peripherals

ASIL-B Capable:
(ECC, MPU, CRC, W'DOGs)

LPUART, LPSPI,
LPIIC, FlexIO

FlexTimers, LP Timers, Prog.
Delay Block

8-40MHz Ext. Osc,
8/48MHz Osc., 128KHz LPO

*JTAG

S32DS IDE, SDK

Autosar MCAL / OS

Application SW

S32K142

S32K144

S32K146

S32K148

Arm Cortex-M4F @ up to 112MHz

256KB Flash

512KB Flash

1MB Flash

2MB Flash

32KB SRAM

64KB SRAM

128KB SRAM

256KB SRAM

up to 89 I/Os

up to 128 I/Os

up to 156 I/Os

16 channel eDMA

2x FlexCAN
with 1x FD

3x FlexCAN
with 1x FD

3x FlexCAN
with 2x FD

3x FlexCAN
with 3x FD

2x 16-ch 12-bit ADC

2x 24-ch 12-bit
ADC

2x 32-ch 12-bit
ADC

LQFP-64

LQFP-176

LQFP-48

LQFP-144

LQFP-100

LQFP-100

MAPBGA-100

IEEE 1588
ENET

Quad SPI

ETM Trace

2x SAI

S32K14x





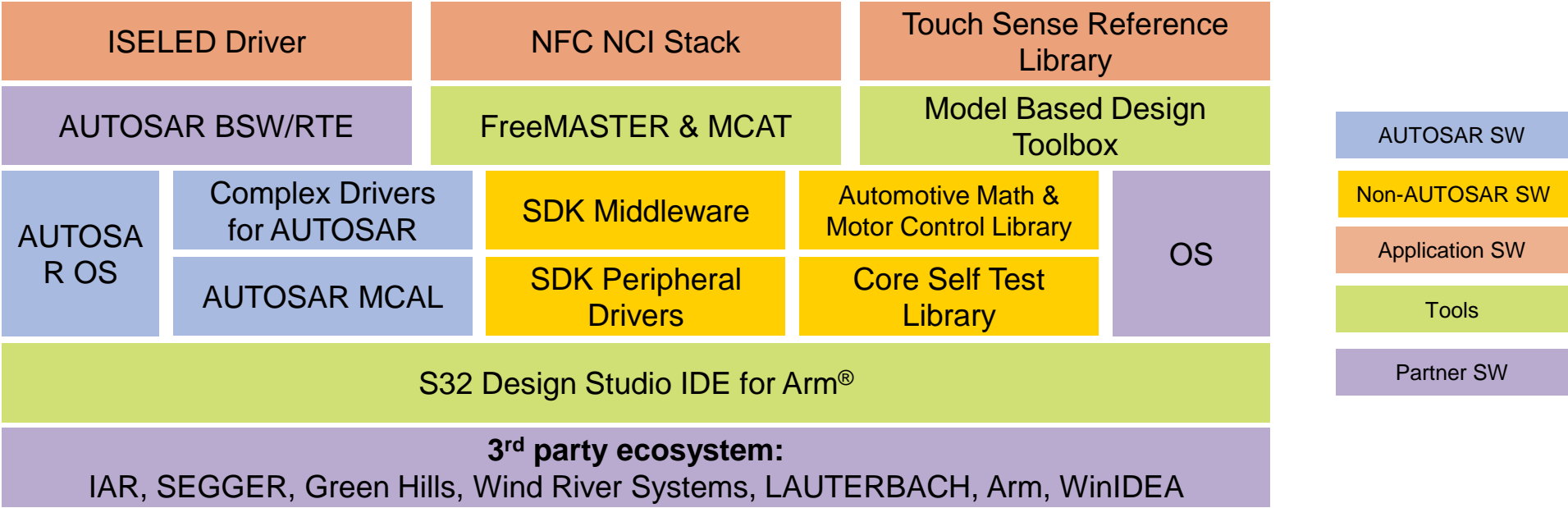
02.

S32K1 Software & Tools

General Purpose MCU S32K1

S32K1 软件&工具链生态介绍

S32K1 Software and Tools Overview



S32K1 SW & Tools Ecosystem Overview

Download from www.nxp.com/S32K

Runtime Software

AUTOSAR MCAL



- AUTOSAR MCU abstraction layer drivers.
- 4.0/4.2/4.3 versions for QM & ISO26262.
- ISO26262 functional safety documentation included.
- **Free** for evaluation (90-days license)

S32K Software Development Kit (SDK)



- **Free of charge** Automotive Non-AUTOSAR production grade SW.
- Graphical-based configuration with SPICE compliant.
- Integrated with S32 Design Studio and other IDEs.

Safety SW



- Safety element out of context and developed according to ISO26262 ASIL-B.
- **Free** reference software library helps to achieve functional safety in SW level.

Bootloader



- Unified bootloader based on UDS and TP protocol.
- High-quality reference SW.
- Efficiency to implement by reusing existing stack.
- **Free of charge**

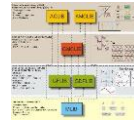
M0+/M4F Core Self Test



- Library of tests for Arm Cortex M0+/M4 core.
- Provides Diagnostic Coverage up to 90% in runtime.
- Developed according to ISO26262 ASIL-B.
- **Free** for evaluation (90-days license)

Application SW

Automotive Math & Motor Control Library



- Precompiled software library containing building blocks for wide range of motor control applications.
- Both binary and source code available.
- Production ready SW (SPICE Level 3, CMMI and ISO9001/TS16949)
- Control loop modeling with Matlab/Simulink® models.
- **Free** for evaluation (90-days license)

ISELED driver



- SW driver for smart LED lighting solution.
- Both SDK and AUTOSAR version.
- Price included in special parts.

ANFC NCI stack



- SW stack compliant with NFC NCI specification.
- Both SDK and AUTOSAR version.
- Price included in special parts.

Touch Sense Library



- Reference SW library for self-capacitance sensing.
- 1D Capacitive Touch Library
- Single chip solution for automotive TS.
- **Free of charge**

Tools

S32 DS IDE for Arm®



- Integrated Development Environment (IDE).
- Integrates S32K SDK.
- 3rd party compilers & debuggers ecosystem support.
- Supports S32K and Power Architecture (MPC) products, unlimited code size.
- **Free of charge**

FreeMASTER



- **Free** debugger for real-time applications.
- Support MCAT (Motor Control Application Tuning Tool).

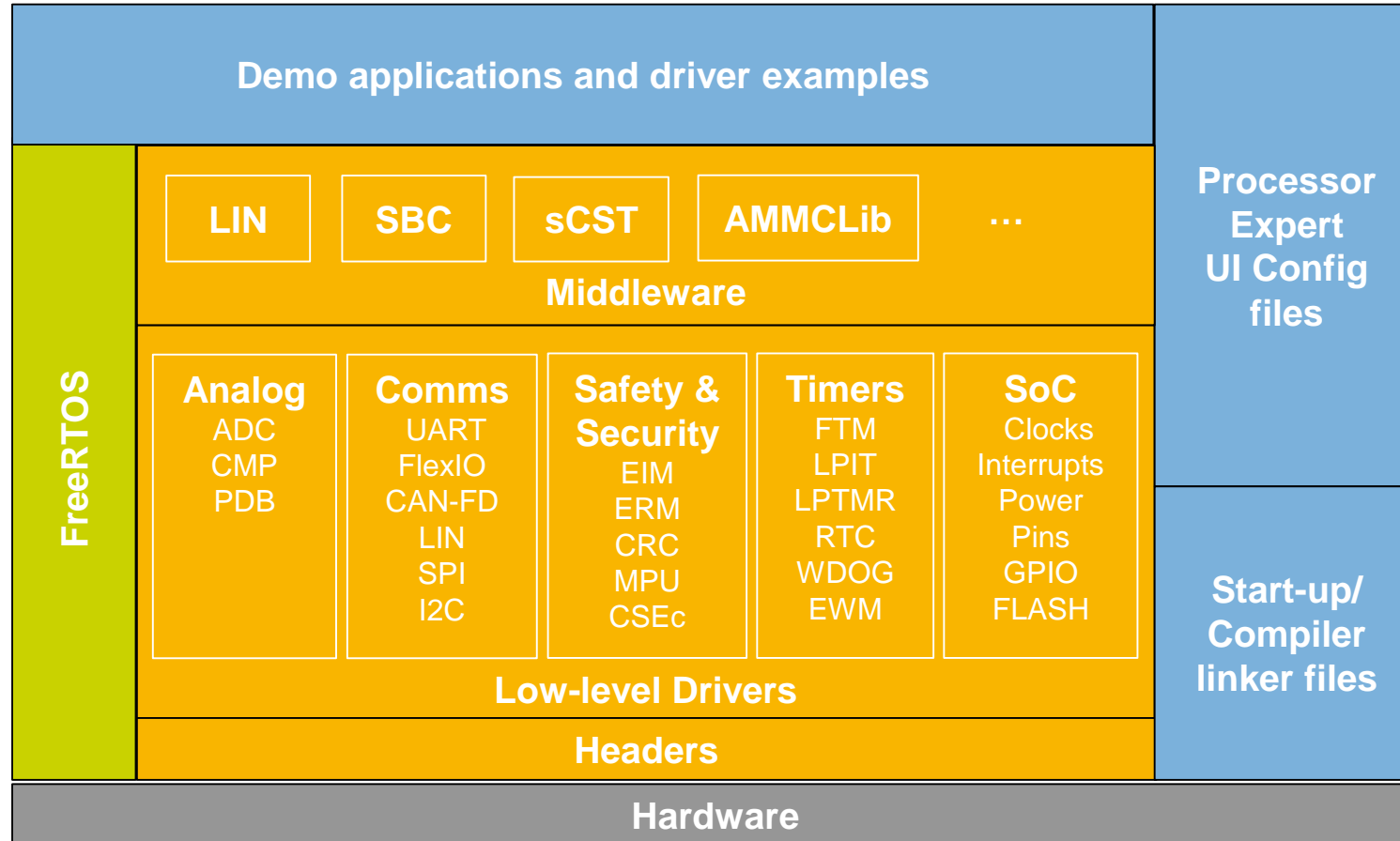
Model Based Design Toolbox

- Simulink™ Toolbox for configuring and generating software.
- Support to execute motor control algorithms.
- **Free of charge**

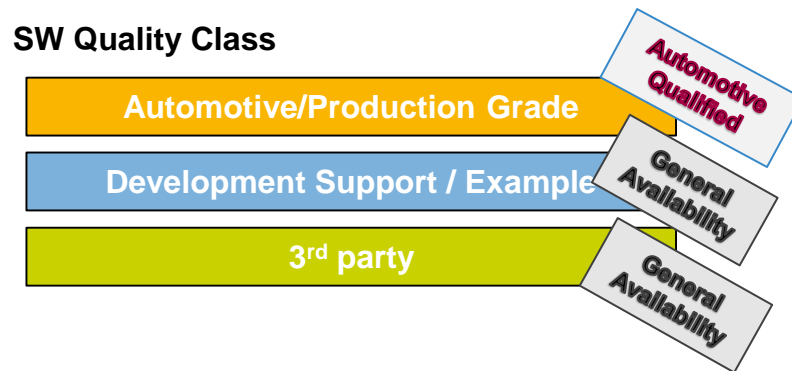
Third Parties and Partners



S32K SDK (Software Development Kit)



SW Quality Class



- Non-AUTOSAR, Automotive-grade & production ready: SPICE/CMMI Level 3 compliant, MISRA 2012 tested
- Layered Software Architecture. Graphical-based Configuration
- Low-level drivers for all MCU peripherals, optional middleware (LIN, NFC, Touch Sensing)
- FreeRTOS operating system
- Drivers for complementary NXP ICs e.g. System Basis Chips (SBC)
- Integrated with S32 Design Studio and other IDEs
- Documented source code, examples and demos for fast application start-up via simple drag & drop functionality





03.

Reference designs based on S32K1

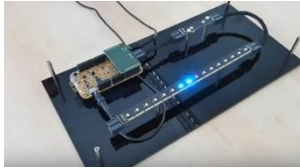
General Purpose MCU S32K1

基于S32K1的参考设计

System Solutions – Released already

ISELED Driver

- High-speed communication for creating **dynamic lighting effects**
- ISELED Driver for S32K
- Specific P/N
- SDK & Autosar 4.0/4.2



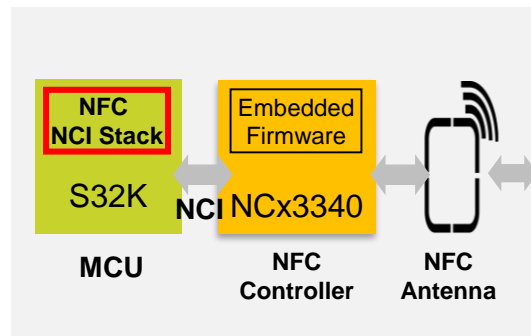
Touch Sense Reference library

- 1D Capacitive Touch Library
- SDK and Autosar
- Single chip solution for **automotive TS**.
- Suitable for up to 50 electrodes
- Passed water, glove, temp and EMI tests.



NFC Stack

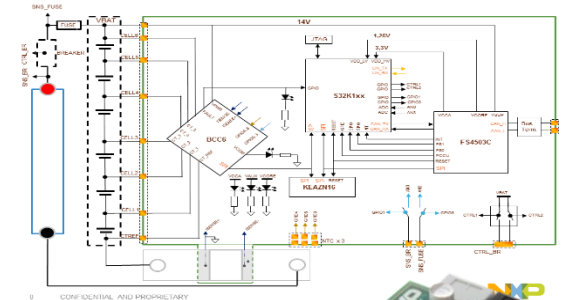
- **Interface** between MCU and NFC controller
- Specified by **NFC Forum**
- **Eases integration** of NFC controllers
- SDK and Autosar 4.0/4.2



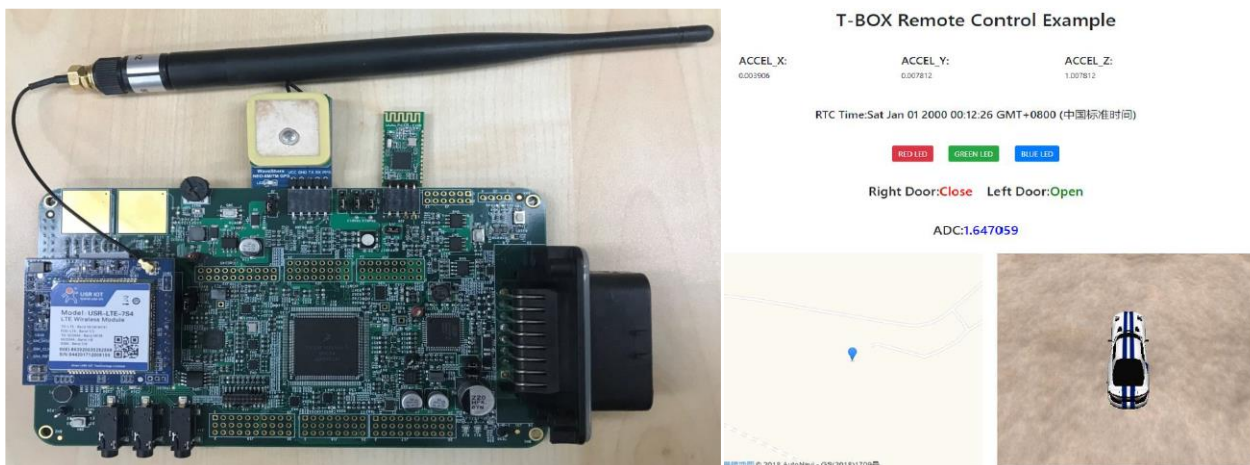
BMS Reference Design

- Turnkey solution for Safety Applications up to ASIL-C
- 4 NXP Devices:
- MCU S32K144 (ASIL-B)
 - MCU KEA (ASIL-A)
 - SBC
 - Battery Cell Management

Creating safety.
With passion. **NewTec**
System-Entwicklung und Beratung



S32K1 New Released RDB



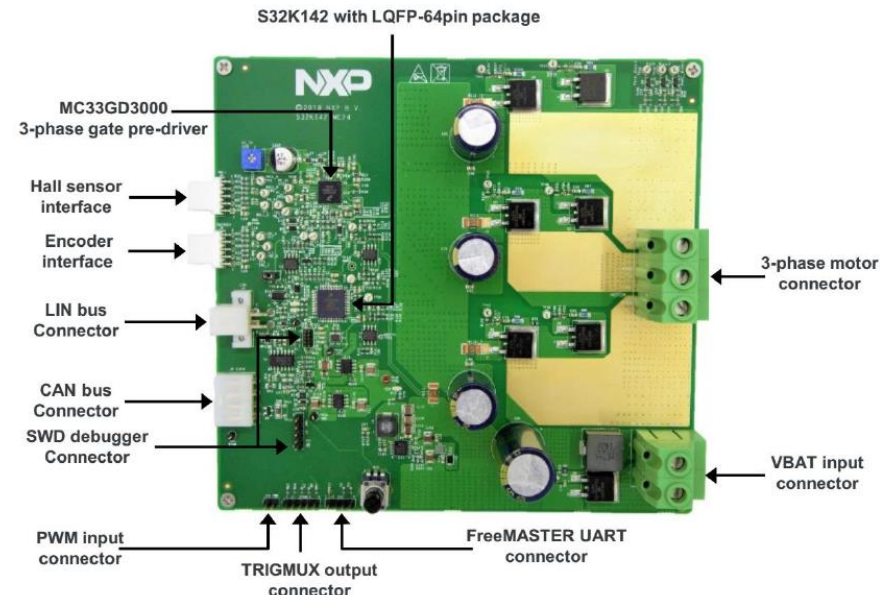
T-Box Ref design & Web Demo System

Hardware features

- Based on NXP [S32K148 MCU](#), with integrated ARM Cortex M4F core, operating @112MHz and DSP instruction, 2MB flash, 256KB SRAM and 4KB EEPROM
- T-BOX functions [extension interface](#): 1x UART BLE module, 1x UART GPS module, 1x UART 3G/4G module
- 2x user button input, 2x capacitance touch sense input, 1ch slide rheostat ADC input, RGB LED

Web demo system

- Display [real-time GPS](#) position info on Amap
- [Body status](#) – onboard buttons to simulate left & right door state, ADC capture simulated fuel capacity, RTC offer real-time calendar
- [Remote control](#) – simulated by onboard RGB LED



Motor Control Development Board

Hardware features

- Based on NXP [S32K142](#) high performance automotive grade MCU, MC33GD3000 gate pre driver
- Support [24V power supply](#) system with [up to 800W](#) automotive [BLDC/PMSM motor control](#) system
- Support multiple diagnose and protection covering UV, OV, OT, OC, Short, Stall Detection, etc.

Software package features

- Developed on NXP S32K1xx [SDK RTM3.0.0](#) and [AMMCLIB 1.1.15](#).
- Out of box motor control and tuning via [FreeMASTER MCAT](#).
- Provide S32DS IDE project and makefile project to support multi toolchain GHS, IAR and GCC and multi debugger Lauterbach, U-Multilink and J-LINK debugger.



More Detailed Product Info at www.nxp.com/S32K

S32K: Scalable Microcontrollers for Automotive General Purpose and high-reliability industrial

OVERVIEW	DOCUMENTATION	TOOLS & SOFTWARE	BUY/PARAMETRICS	PACKAGE/QUALITY	TRAINING & SUPPORT
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Jump To
Overview
Development Boards

Overview

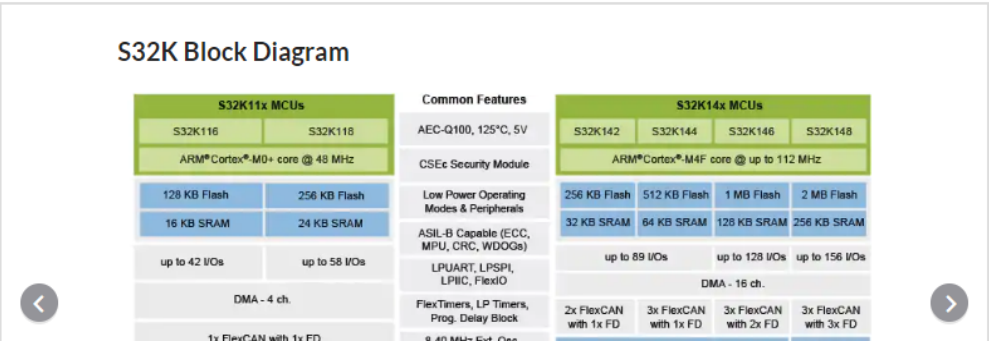
S32K is a scalable family of AEC-Q100 qualified 32-bit Arm® Cortex®-M4F and Cortex-M0+ based MCUs targeted for general purpose automotive and high-reliability industrial applications.

- Scalability – hardware and software compatible families with multiple performance, memory and feature options
- Integration – ISO CAN FD, CSEc hardware security, ASIL-B ISO26262 functional safety, ultra-low power performance
- Software
 - Free production grade Software Development Kit (SDK) and S32 Design Studio IDE
 - AUTOSAR and MCAL Support, third-party ecosystem

Data Sheets

Application Notes

Sample



Broad applications
Automotive and Industrial
Total solutions



Benefits to you
Future proof
Accelerates automotive
software design



Ready to go
Rich set of collaterals &
solutions available today

Contact Window:
NXP Local sales team
Local distribution team
Regional Marketing Manager: Ernest Gan (ernest.gan@nxp.com)



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