

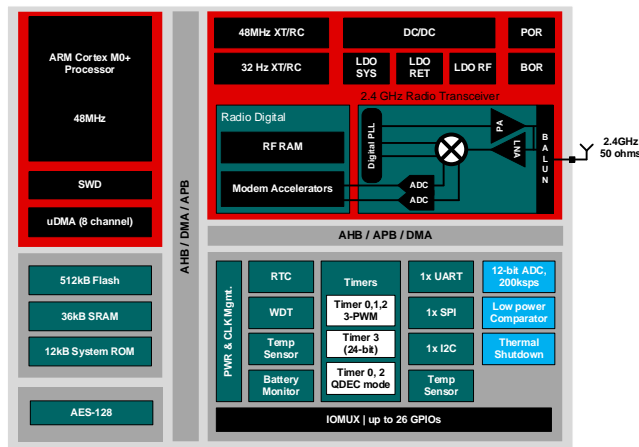
Texas Instruments IOT Solutions

Embedded Devices, Tools and Software

Jan 2023

Optimized hardware across cost, features, and quality

<https://www.ti.com/wireless-connectivity/bluetooth/cc2340.html>



CC2340R5

512KB flash, 36KB RAM, up to 26 IOs
4x4 (QFN24), 5x5 (QFN40), WCSP

Optimized for SoC applications with support for on-chip, dual-image OAD and secure firmware updates.

Scalable BLE support with programmable radio to enable latest features (direction finding, mesh, etc.)

Optimized Radio Design

2.4GHz RF Transceiver

- Bluetooth Low Energy 5.2: 2M PHY, LR, BLE mesh, Direction Finding, HADM
- Proprietary 2.4GHz
- IEEE 802.15.4 Zigbee, Thread, Matter

Industrial-grade performance

- Integrated BALUN
- TX output power: -20dBm to +8dBm
- RX sensitivity: -96dBm, 1Mbps
- Temp support from -40 to 125 deg. C
- 1.8V – 3.6V supply range

Extended battery life

- **Applications w/ long sleep intervals:** Standby current <700nA (with RTC, RAM retention)
- **Shelf life:** Reset/shutdown <150nA
- Radio Tx, Rx currents <5.3mA, Tx = 0dBm, VDDS = 3.0V
- **Duty-cycled use-cases:** Average radio currents TX = 0dBm, VDDS=3.0V
 - ❑ 1s CONN interval: ~6uA
 - ❑ 1s CONN ADV interval: ~10uA
 - ❑ 1s CONN ADV interval (17B payload): ~12uA

Connectivity | Wi-Fi Roadmap

TI Wi-Fi 4 (802.11 a / b / g / n)

Reliable performance and embedded security

Wi-Fi + BT/BLE
Transceiver

WL1831
2.4GHz, 1x1 SISO, WPA3
BT5.1 (BT + BLE)

TRX

Coex MOD

WL1831MOD
2.4GHz, 1x1 SISO, WPA3
BT5.1 (BT + BLE)

TRX

Coex MOD

WL1835MOD
2.4GHz, 2x2 MIMO/MRC, WPA3
BT4.0 (BT + BLE)

TRX

Coex MOD

WL1837MOD
2.4/5GHz, 2x2 MIMO/MRC, WPA3
BT5.1 (BT + BLE)

TRX

F B MOD

WL1801
2.4GHz, 1x1 SISO, WPA3

TRX

MOD

WL1801MOD
2.4GHz, 1x1 SISO, WPA3

TRX

MOD

WL1805MOD
2.4GHz, 2x2 MIMO/MRC, WPA3

TRX

MOD

WL1807MOD
2.4/5GHz, 2x2 MIMO/MRC

TRX

B MOD

Wi-Fi Wireless
rMCU

CC3220R
2.4GHz
256kB RAM + 1MB Flash

MA

Coex MOD

CC3220S & SF
2.4GHz
256kB RAM + 1MB Flash

MA

Coex MOD

CC3230S & SF
2.4GHz, WPA3
256kB RAM + 1MB Flash

MA

Coex MOD

matter
Support on
SF Devices

CC3235S & SF
2.4/5GHz
256kB RAM + 1MB Flash

MA

F B MOD

Wi-Fi Network
Processor

CC3120
2.4GHz

NWP

Coex MOD

CC3130
2.4GHz, WPA3

NWP

Coex MOD

CC3135
2.4/5GHz

NWP

B MOD



Reliable

20 years of Wi-Fi experience, interoperability tests, validation

Integrated Security

WPA3, Hardware accelerators, IoT and MCU security, FIPS validated

Low Power

Enables years of battery life time

Easier to Use

RF certified modules, SDK examples Cloud agents

BT/BLE COEX options

- Low Power
- Secure File system
- FIPS
- 5GHz band support +6GHz in Wi-Fi 6
- Bluetooth support
- Coexistence with BLE Devices
- Wi-Fi 6, 802.11ax
- 105C support
- TI Module

matter

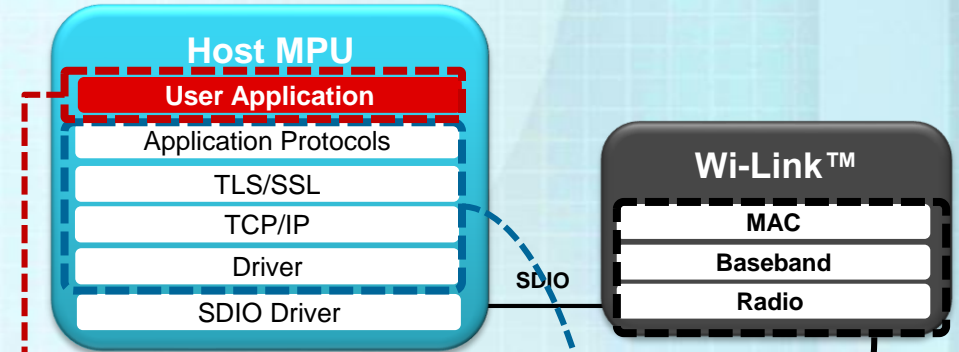
- In Definition
- Development
- Production

WiLink™ & SimpleLink™ - Architectures

Wi-Link™ - WL18xx

Wi-Fi and BT/BLE transceiver (802.11 b,g,n,a)

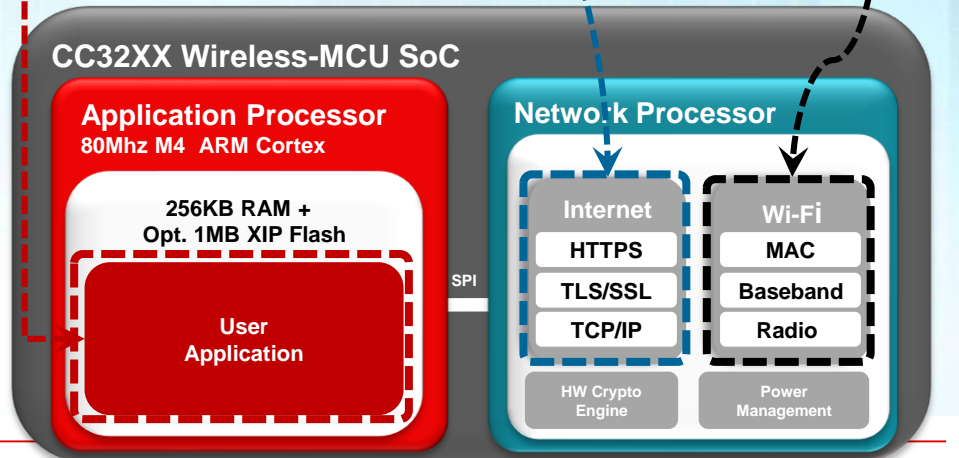
- High Performance with ~100Mbps throughput
- MPU centric applications or high MIPS MCU that runs the user application and the TCP/IP stack & internet protocols
- OS: Linux/Android/RTOS
- High Throughput ~100Mbps



SimpleLink™ - CC3xxx

Dual-Core Single-Chip Wi-Fi (802.11 b,g,n,a)

- Throughput ~20Mbps for low power applications
- User's dedicated MCU - ARM® Cortex™-M4 at 80MHz
- OS: RTOS
- TCP/IP stack and internet protocols run in the network processor
- Also available NWP only devices



AM62x Starter Kit EVM

Timelines:

Early dev. files (SCH/PCB) is now ready on MySecureSW.
EVM will be ready at AM62x APL

Target Market:

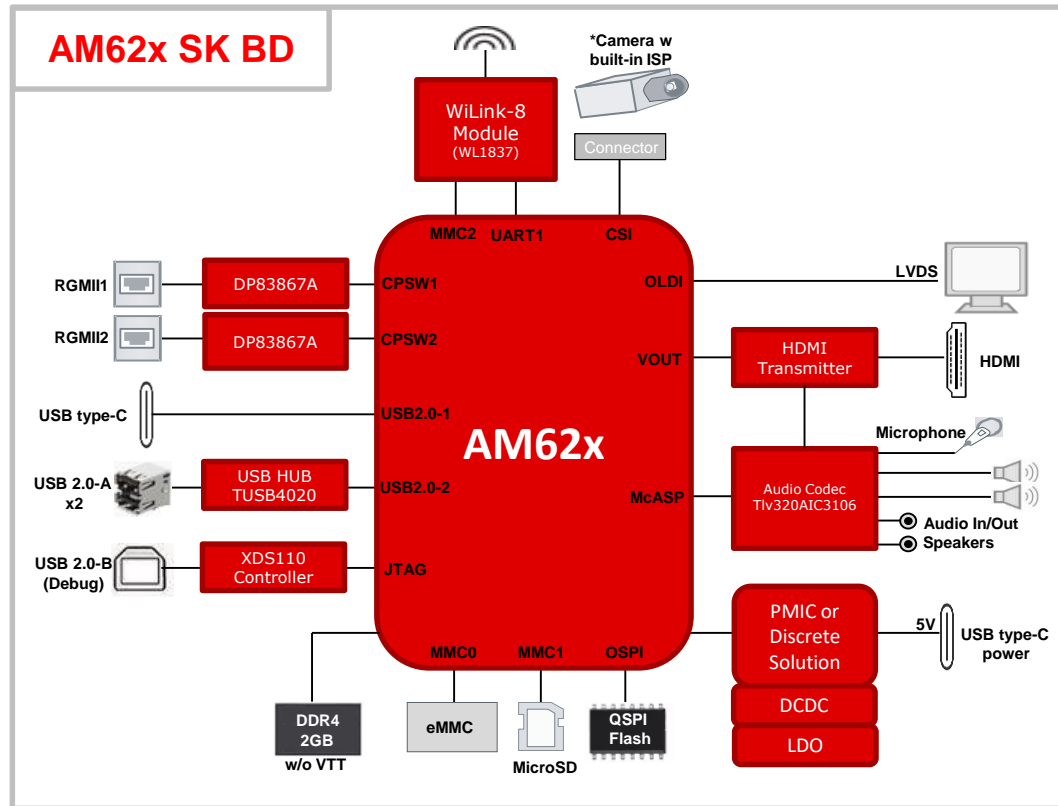
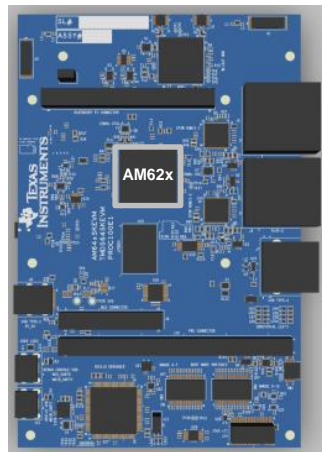
General Linux with WLAN and LVDS/HDMI options for display panels.

Target Applications:

Industrial display applications, medical, Linux Gateways, single-board computers.

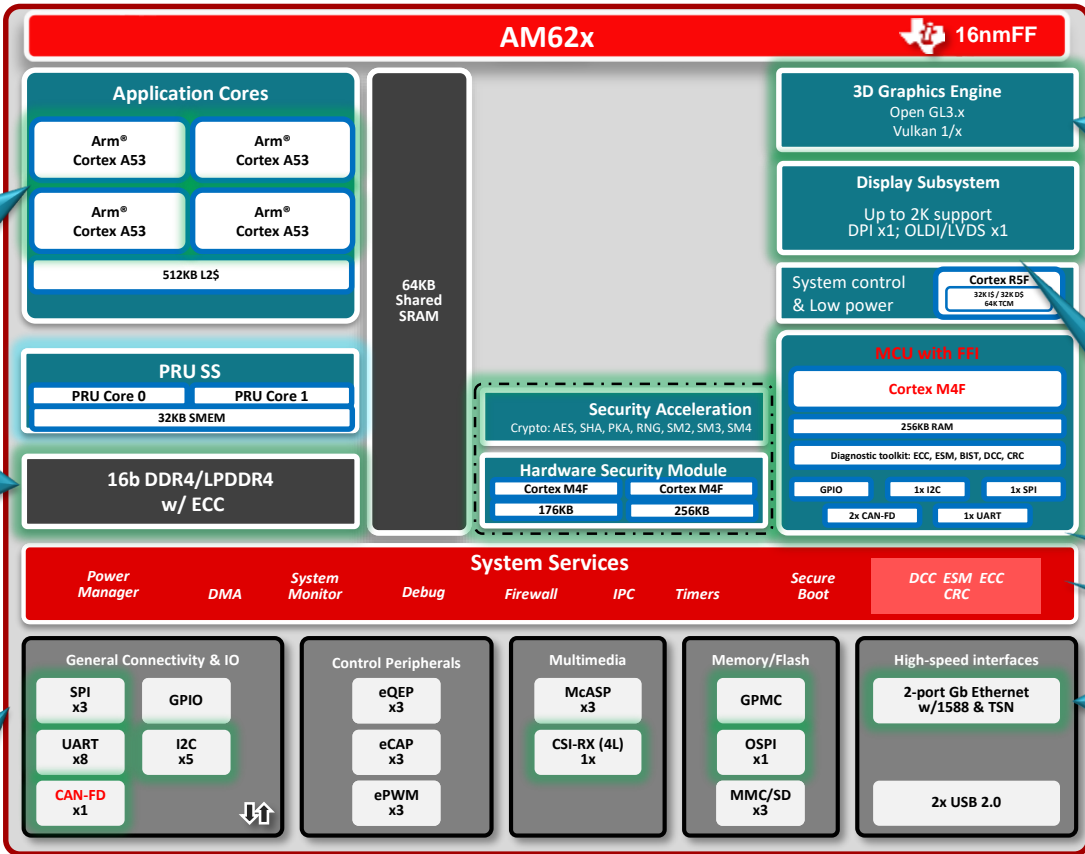
Target Cost:

\$149



*Camera module is not provided onboard

AM62x – Differentiation vs AM335x



ARM Performance Enhancement:

AM335x	AM62x
1x Cortex-A8	1/2/4x Cortex-A53
Up to 1GHz	Up to 1.4GHz
Up to 2K DMIPS	Up to 16.8KDMIPS

DDR Enhancement:

AM335x	AM62x
DDR3/DDR3L	DDR4/LPDDR4
Up to 800MTS	Up to 1600MTS
Throughput	2 times

Peripherals Enhancement:

AM335x	AM62x
UART x 6	UART x 9
CAN x 2	CAN-FD x 3
I2C x 3	I2C x 6
SPI x 2	SPI x 4
GPMC – 100MHz	GPMC – 133MHz

GPU Enhancement:

AM335x	AM62x
SGX530 @200MHz	AXE1-16M @500MHz
1.6G FLOPS	8G FLOPS
OpenGL ES 2.0	OpenGL ES 3.1 Vulkan

Display Feature Enhancement:

AM335x	AM62x
Single Display	Dual Display
RGB 888	DPI + LVDS
1080P30	2K (1080P60)

Functional safety: ASIL-B/SIL-2

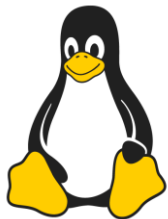
Standard Secure Boot

New Features:

AM335x	AM62x
-	CSI-RX (4L)
-	OSPI
ETH x2	ETH x2 (TSN)

AM62x Family | Operation System

Linux



- ✓ **Kernel** : 5.10 LTS
- ✓ **Sample: Jan. 2022**
- ✓ **APL**: Jun. 1st. 2022

Android



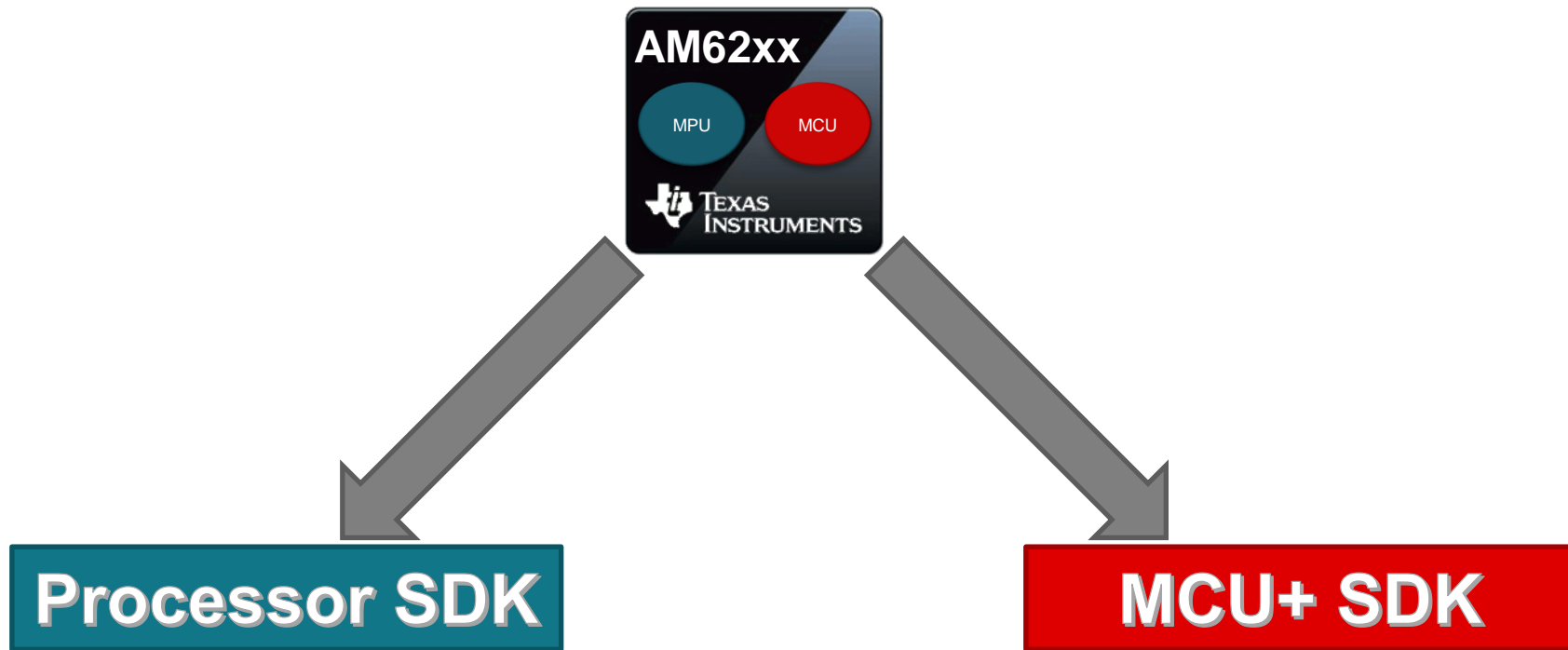
- ✓ **Version**: Android 12
- ✓ **Timeline**: Middle. 2022

RT-Linux

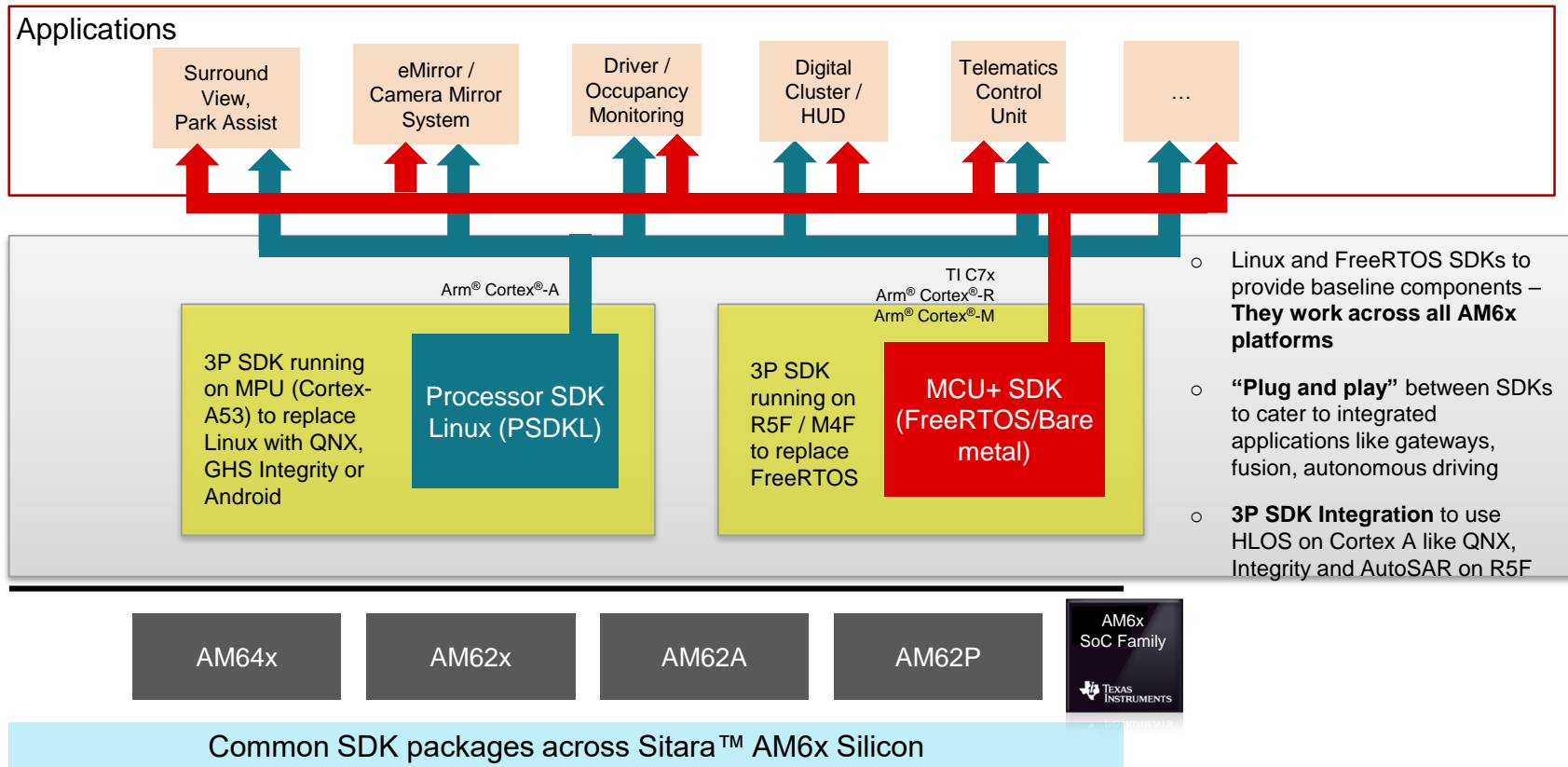


- ✓ **RT-Linux** : v5.10
- ✓ **Timeline**: Jun.1st

Software Offering



Sitara™ MPU | Software Development Kits (SDK)



TI Processors

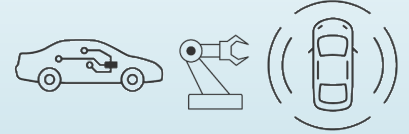
Sitara™ MCU



Sitara™ MPU



Jacinto™



Single scalable platform enabled by strong Processor SDK foundation on Linux, deep learning software, TSN and networking protocols, safety and security

High-perf. MCU

MPU

MPU + MCU

High-performance SOCs

AM22x, AM27x

DSP + Arm®
Microcontrollers

AM24x, AM26x

Networking, real-time
control, safety &
security

Most cost-effective solution
AM62x Family!

AM64x, AM67x

64-bit Arm® with real time control
and/or GPU, vision & analytics

DRA8x

Gateway & vehicle
compute

TDA4x

Advanced driver
assistance systems



**100% code
compatibility**



Safety



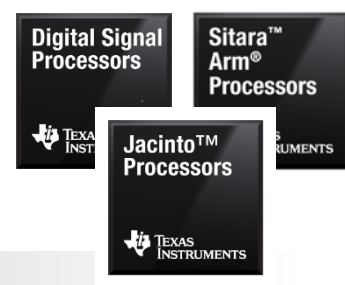
Security







**System
Performance**

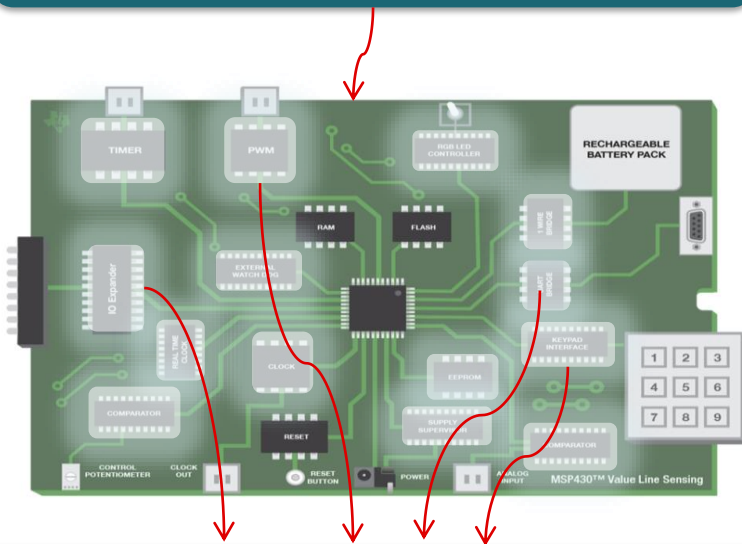
Processors overview

Scalable, cost-optimized portfolio with accelerators, analog integration, robust connectivity, security and functional safety designed for automotive and industrial markets



SoCs			
Single-core to quad-core Arm Cortex-A53 and A72 cores	Compute 	Control 	Dual-core to quad-core Arm Cortex-R5F with optional Lock-Step support
Secure-boot, run-time security, tamper protection and high-security modules	Functional Safety & Security	Analog 	High-level integration of high-performance ADC, DAC, comparators and PWM
Power-optimized neural network accelerators, audio DSP, and GPU	Deep Learning & Accelerators	Connect 	USB3, PCIe Switch, Ethernet Switch, Industrial Protocols, CAN-FD, and more
Open source device enablement for Mainline Linux, RTOS and Bare Metal 3P software support – AUTOSAR, QNX, ...	Unified Software Platform		Simplified tools (SysConfig) and libraries (DSPLIB, TIDL, ...) to accelerate development and performance entitlement
Power-optimized design	ASIL-B/D and SIL2 functional safety	-40 to 125C temperature range	Q100 automotive qualified options
Scalable platform with common software development kit and pin-to-pin compatibility in common packages			

Replace combinations of simple functions with a housekeeping MCU



Training



E-book



Software

Timer Functions

- External RTC with backup memory
- 7-Segment LED Stopwatch
- External Programmable Watchdog Timer
- Programmable System Wake-up Controller
- Simple RTC-based System Wake-up Controller
- Voltage Monitor with a Time Stamp

Pulse Width Modulation Functions

- Analog Input to PWM Output
- Dual output 8-bit PWM DAC
- Servo Motor Control
- Stepper Motor Control
- UART Software-Controlled RGB LED Color Mixing

System Functions

- ADC Wake and Transmit on Threshold
- EEPROM Emulation
- Low Power Hex Keypad
- Quadrature Encoder Position Counter
- Hysteresis Comparator with UART
- Multi-Function Reset Controller
- Single Slope Analog-to-Digital Conversion Technique
- Tamper Detection
- Programmable Clock Source
- Programmable Frequency-locked Loop

Communication Functions

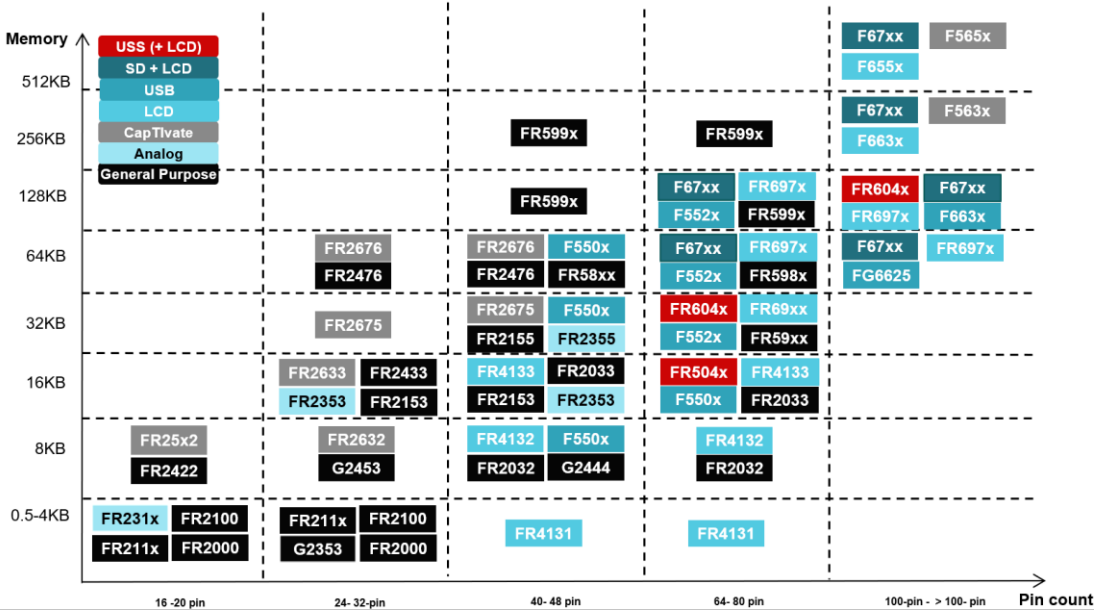
- Single Wire Communication Host
- SPI IO Expander
- UART-to-UART Bridge
- UART-to-SPI Bridge

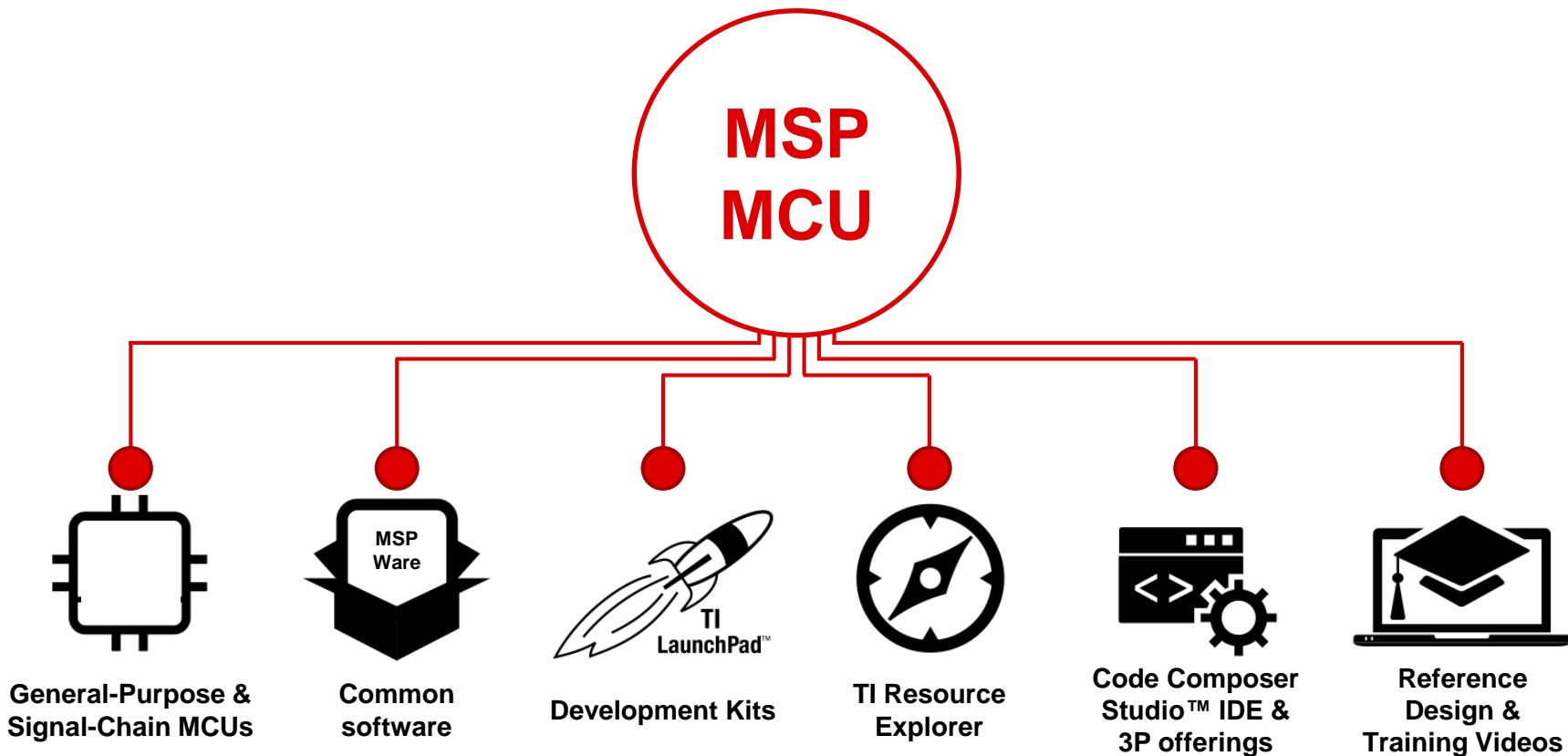
Broad portfolio with integrated signal chain elements

MSP430 ultra low power mixed-signal MCUs offer a broad portfolio with varying levels of analog signal chain integration for addressing a wide range of applications

- | | | |
|--|---|--|
| Processing
<ul style="list-style-type: none"> AES Encryption & decryption Low Energy Accelerator (LEA) | Analog / Sensing
<ul style="list-style-type: none"> 10-bit ADC 12-bit ADC Programmable Gain Amplifiers 16-bit Sigma Delta ADC 24-bit Sigma Delta ADC | Analog / Sensing
<ul style="list-style-type: none"> Smart Analog Combo (SAC) Transimpedance Amplifier Analog Comparator Scan Interface Capacitive touch Ultrasonic Sensing |
| Actuation / HMI
<ul style="list-style-type: none"> High Resolution PWMs DAC Segment LCD | Connectivity
<ul style="list-style-type: none"> USB | |

Features	
Max clock speed	16-25 MHz
Memory	0.5KB-512KB (FRAM / Flash)
Clock System	Multiple Internal & External oscillator options
Supply Range	1.8V-3.6V
Digital Peripherals	Timers: 16 bit Timers with Capture/Compare functions & PWM output, Real Time Clock, WDT, Processing & Security: Hardware Multiplier, LEA, AES, CRC Communication: UART, SPI, I2C, IrDA, USB
Analog Peripherals	10/12 bit SAR ADCs, 24 bit SD ADCs, OPA, PGA, Comparator, DAC, LCD Driver
Special analog functions	Ultrasonic Sensing, Scan Interface, Capacitive Touch

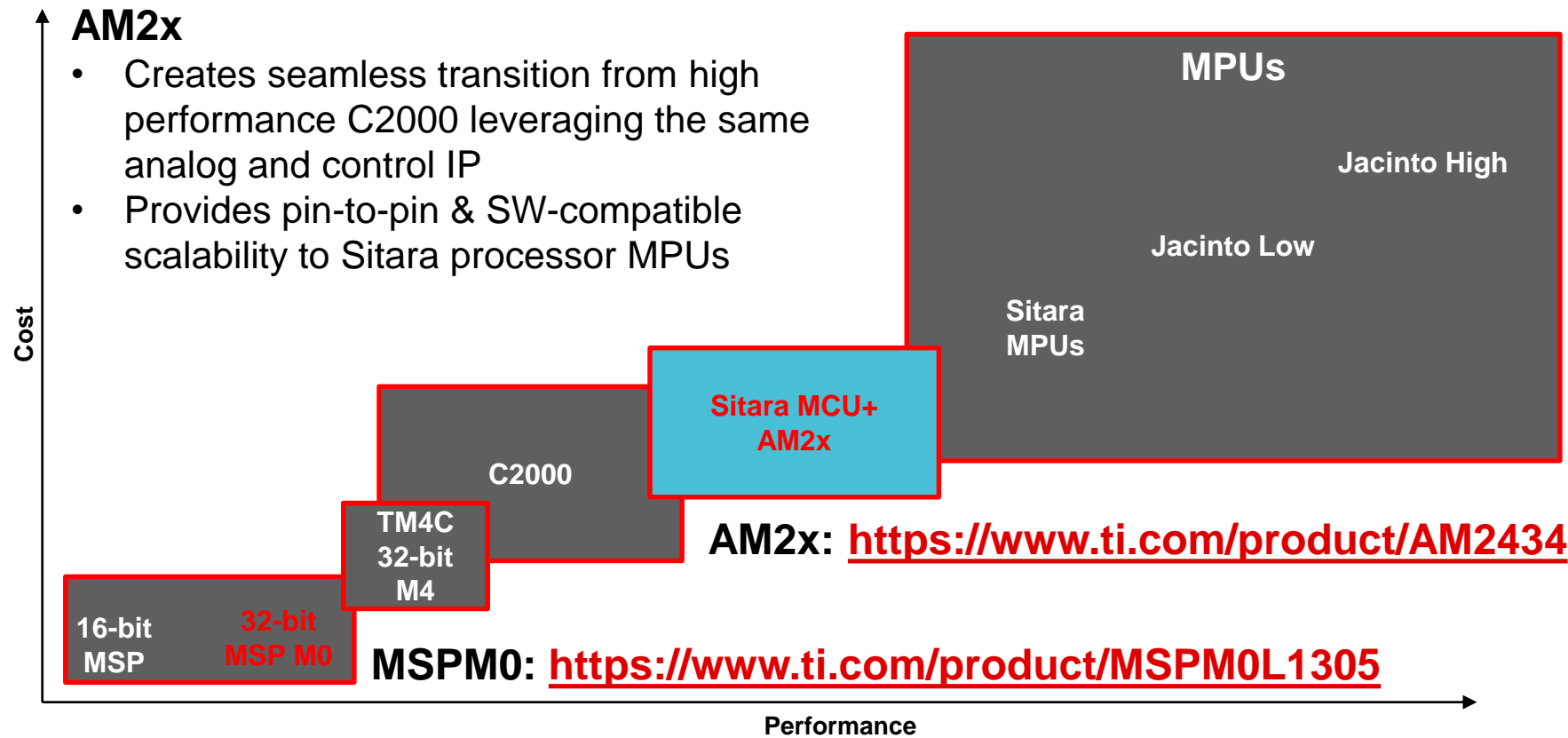




AM2x offers a seamless transition from TI's MCUs to MPUs

AM2x

- Creates seamless transition from high performance C2000 leveraging the same analog and control IP
- Provides pin-to-pin & SW-compatible scalability to Sitara processor MPUs



AM243x Cortex[®]-R5F based microcontrollers

Sampling NOW!

• Primary Cores & Memory

- 1-4x Cortex-R5F up to 800MHz, (6.4K DMIPS)
- Up to 2MB on-chip SRAM and optional DDR4/LPDDR4 EMIF
- ECC on all critical memories and DDR EMIF

• MCU with FFI - Functional Safety-Compliant

- 400MHz Cortex-M4F subsystem with freedom from interference (FFI) from rest of SoC for safety monitoring
 - Dedicated peripherals - I2C, SPI, UART & GPIO
 - 256KB SRAM with ECC
- Diagnostic tool kit for entire SoC with voltage, temperature, clock, ECC monitors and Error Signaling Module

• 2x PRU-ICSS-Gb

- Each PRU-ICSS-Gb can enable either industrial communication protocols or motor control interfaces

• Peripheral / IO Highlight

- 2-port Gb Ethernet with RGMII/RMII support
- Octal-SPI with XIP support and 4x chip select
- 8-bit eMMC/SD interface and 4-bit SD/SDIO interface
- RS485 support on UART, baud rates up to 10Mbps
- USB 2.0 with integrated PHY, host or device mode

• Integrated analog

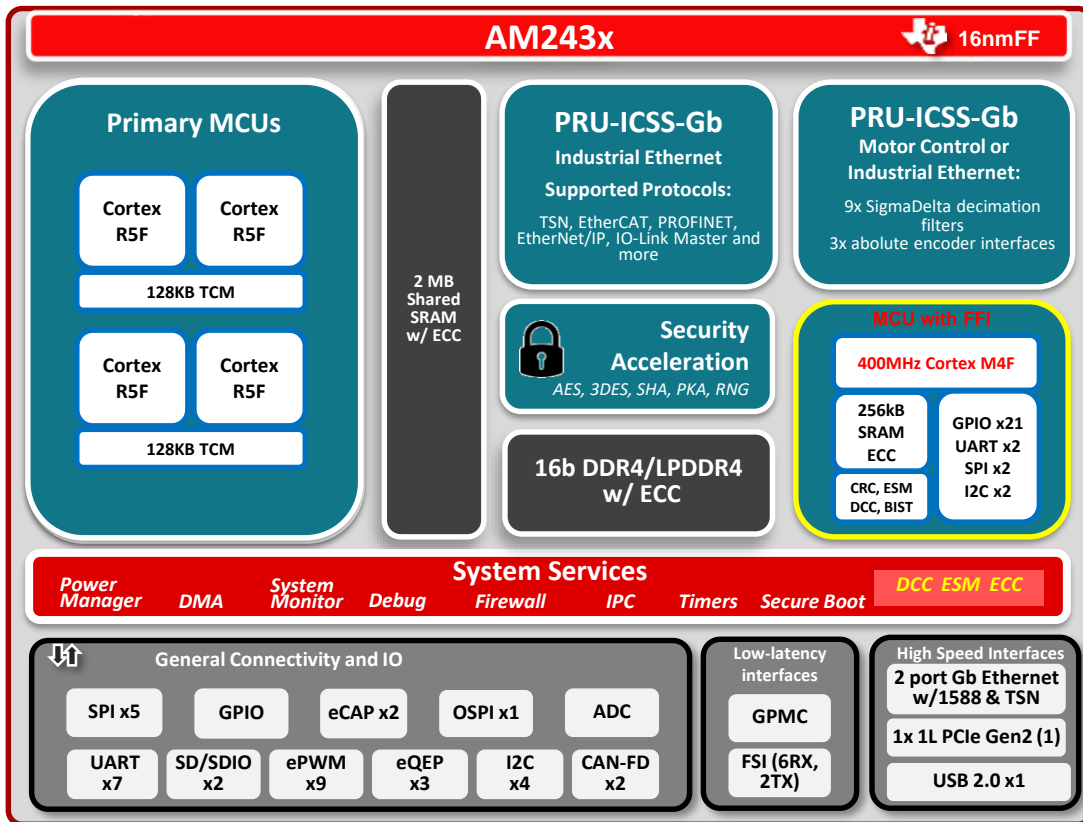
- 8-channel, 12-bit ADC with 4 MSPS
- Simple power solution, integrated voltage supervisors

• Power

- < 1 Watt typ. 100K POH @ T_j=105C (T_a=85 or higher)

• Package (ALV)

- 11mm x 11mm 0.5mm VCA™ (low cost PCB routing rules)
- 17mm x 17mm, 0.8mm ball pitch



The industry's best supply-chain

<https://news.ti.com/blog/2022/12/06/tis-latest-300-millimeter-wafer-fab-in-lehi-utah-begins-production>
