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.)

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**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

- **WL1831MOD**
  - 2.4GHz, 1x1 SISO, WPA3
  - BT5.1 (BT + BLE)
- **WL1835MOD**
  - 2.4GHz, 2x2 MIMO/MRC, WPA3
  - BT4.0 (BT + BLE)
- **WL1837MOD**
  - 2.4GHz, 2x2 MIMO/MRC, WPA3
  - BT5.1 (BT + BLE)
- **WL1801MOD**
  - 2.4GHz, 1x1 SISO, WPA3
- **WL1805MOD**
  - 2.4GHz, 2x2 MIMO/MRC, WPA3
- **WL1807MOD**
  - 2.4GHz, 2x2 MIMO/MRC

**TL Wi-Fi Network Processor**

- **CC3220R**
  - 2.4GHz
  - 256kB RAM + 1MB Flash
- **CC3220S & SF**
  - 2.4GHz
  - 256kB RAM + 1MB Flash
- **CC3230S & SF**
  - 2.4GHz, WPA3
  - 256kB RAM + 1MB Flash
- **CC3235S & SF**
  - 2.4GHz
  - 256kB RAM + 1MB Flash

**TI Wi-Fi + BT/BLE Transceiver**

- **CC3120**
  - 2.4GHz
- **CC3130**
  - 2.4GHz, WPA3
- **CC3135**
  - 2.4GHz

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**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

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**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: Linus/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: 1x Cortex-A8
- AM62x: 1/2/4x Cortex-A53
- Up to 1GHz vs Up to 1.4GHz
- Up to 2K DMIPS vs Up to 16.8K DMIPS

DDR Enhancement:
- AM335x: DDR3/DDR3L vs AM62x: DDR4/LPDDR4
- Up to 800MTS vs Up to 1600MTS
- Throughput: 2 times

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

GPU Enhancement:
- AM335x: SGX530 @200MHz vs AM62x: AXE1-16M @500MHz
- 1.6G FLOPS vs 8G FLOPS
- OpenGL ES 2.0 vs OpenGL ES 3.1

Display Feature Enhancement:
- AM335x: Single Display vs AM62x: Dual Display
- RGB 888 vs DPI + LVDS
- 1080P30 vs 2K (1080P60)

DCC, ESM, ECC, CRC

Standard Secure Boot

New Features:
- AM335x: -
- AM62x: CSI-RX (4L), OSPI, ETH x2 (TSN)
AM62x Family | Operation System

Linux
- **Kernel**: 5.10 LTS
- **Sample**: Jan. 2022
- **APL**: Jun. 1\(^{st}\) 2022

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

RT-Linux
- **RT-Linux**: v5.10
- **Timeline**: Jun. 1\(^{st}\)

*depending on the timing*
Software Offering

AM62xx

MPU
MCU

Processor SDK

MCU+ SDK
Linux and FreeRTOS SDKs to provide baseline components – They work across all AM6x platforms

- "Plug and play" between SDKs to cater to integrated applications like gateways, fusion, autonomous driving
- 3P SDK Integration to use HLOS on Cortex A like QNX, Integrity and AutoSAR on R5F

Applications

- Surround View, Park Assist
- eMirror / Camera Mirror System
- Driver / Occupancy Monitoring
- Digital Cluster / HUD
- Telematics Control Unit
- …

Common SDK packages across Sitara™ AM6x Silicon

- Arm® Cortex®-A
- 3P SDK running on MPU (Cortex-A53) to replace Linux with QNX, GHS Integrity or Android
- Processor SDK Linux (PSDKL)
- 3P SDK running on R5F / M4F to replace FreeRTOS
- MCU+ SDK (FreeRTOS/Bare metal)
- TI C7x Arm® Cortex®-R
- Arm® Cortex®-M

AMI6x SoC Family

Surround View, Park Assist, eMirror / Camera Mirror System, Driver / Occupancy Monitoring, Digital Cluster / HUD, Telematics Control Unit, …
TI Processors

**Sitara™ MCU**
- AM22x, AM27x
- DSP + Arm® Microcontrollers
- Networking, real-time control, safety & security

**Sitara™ MPU**
- AM24x, AM26x
- Networking, real-time control, safety & security

**Jacinto™**
- DRA8x
- Gateway & vehicle compute
- Advanced driver assistance systems

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

**High-perf. MCU**
- AM22x, AM27x
- DSP + Arm® Microcontrollers

**MPU**
- AM24x, AM26x
- Networking, real-time control, safety & security

**MPU + MCU**
- AM64x, AM67x
- 64-bit Arm® with real-time control and/or GPU, vision & analytics

**High-performance SOCs**
- DRA8x
- Gateway & vehicle compute
- TDA4x
- Advanced driver assistance systems

**Most cost-effective solution**
- AM62x Family!

**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

<table>
<thead>
<tr>
<th>SoCs</th>
<th>Compute</th>
<th>Control</th>
<th>Connect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-core to quad-core <strong>Arm Cortex-A53 and A72 cores</strong></td>
<td>Secure-boot, run-time security, tamper protection and high-security modules</td>
<td>Functional Safety &amp; Security</td>
<td>USB3, PCIe Switch, Ethernet Switch, Industrial Protocols, CAN-FD, and more</td>
</tr>
</tbody>
</table>
| **Secure-boot, run-time security, tamper protection and high-security modules** | **Power-optimized neural network accelerators, audio DSP, and GPU** | **Deep Learning & Accelerators** | **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** |

<table>
<thead>
<tr>
<th>Power-optimized design</th>
<th>ASIL-B/D and SIL2 functional safety</th>
<th>-40 to 125°C temperature range</th>
<th>Q100 automotive qualified options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scalable platform with common software development kit and pin-to-pin compatibility in common packages</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
 Replace combinations of simple functions with a housekeeping MCU

**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

**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

**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

**Communication Functions**
- Single Wire Communication Host
- SPI IO Expander
- UART-to-UART Bridge
- UART-to-SPI Bridge
MSP430 General Purpose MCUs

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
- AES Encryption & decryption
- Low Energy Accelerator (LEA)

### Actuation / HMI
- High Resolution PWMs
- DAC
- Segment LCD

### Connectivity
- USB

### Analog / Sensing
- 10-bit ADC
- 12-bit ADC
- Programmable Gain Amplifiers
- 16-bit Sigma Delta ADC
- 24-bit Sigma Delta ADC
- Smart Analog Combo (SAC)
- Transimpedance Amplifier
- Analog Comparator
- Scan Interface
- Capacitive touch
- Ultrasonic Sensing

### 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

### 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
- **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

### Memory

<table>
<thead>
<tr>
<th>Memory</th>
<th>FR2676</th>
<th>FR2476</th>
<th>FR599x</th>
<th>FR255x</th>
<th>FR599x</th>
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</thead>
<tbody>
<tr>
<td>512KB</td>
<td></td>
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<td>F67xx</td>
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<td>F67xx</td>
</tr>
<tr>
<td>256KB</td>
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<td>F663x</td>
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<td>F67xx</td>
</tr>
<tr>
<td>0.5KB</td>
<td></td>
<td></td>
<td>FG628</td>
<td></td>
<td>FG628</td>
</tr>
</tbody>
</table>

### Pin count
- 16-20 pin
- 24-32 pin
- 40-48 pin
- 64-80 pin
- 100-pin - > 100-pin

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**Texas Instruments**
MSP430 General Purpose MCUs

End-to-end Development Resources

- MSP MCU
  - General-Purpose & Signal-Chain MCUs
  - Common software
  - Development Kits
  - TI Resource Explorer
  - Code Composer Studio™ IDE & 3P offerings
  - Reference Design & Training Videos
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

AM2x: [https://www.ti.com/product/AM2434](https://www.ti.com/product/AM2434)

MSPM0: [https://www.ti.com/product/MSPM0L1305](https://www.ti.com/product/MSPM0L1305)
AM243x Cortex®-R5F based microcontrollers

• 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 @ Tj=105°C (Ta=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