

Texas Instruments Embedded Processing Overview

Texas Instruments has the broadest portfolio of DSPs, microcontrollers (MCUs), differentiated ARM® processors, wireless connectivity solutions and complementary analog products, offering complete hardware and software system solutions for embedded developers. This portfolio offers the full range of power/performance requirements ensuring the right combination of attributes for the smallest portable devices to the largest multichannel systems and everything in between. In addition, TI offers design resources including extensive software (including open source), tools, technical training, in-person and online tech support, TI Designs and engineer-to-engineer forums at e2e.ti.com. Visit www.ti.com for technical literature, system block diagrams and more.

Low-Power MCUs

MSP430™ Ultra-Low-Power MCUs offer the lowest power consumption and the perfect mix of integrated peripherals with a common ecosystem for a wide range of sensing and measurement applications.

The SimpleLink™ MCU Platform offers the broadest portfolio of 32-bit ARM-based microcontrollers with industry-leading features including low power, robustness and integrated security to support more than ten differentiated wired and wireless protocols including *Bluetooth®* low energy, Sub-1 GHz and Wi-Fi®. Each device offers IoT developers a number of features to uniquely solve their problems, whether capturing high-precision 16-bit analog signal, enabling more security, achieving a range of over 20 kilometers or making a coin cell last for several years.

Performance MCUs

C2000™ Real-Time Control 32-bit MCUs are based on the industry-leading C28x CPU. This CPU features a powerful signal processing engine capable of addressing demanding closed-loop tasks thereby giving designers the means to improve system efficiency, reliability and flexibility.

Processors

Sitara™ Processors

TI's Sitara processors are optimized, scalable solutions with a broad portfolio of ARM Cortex-A8, Cortex-A9 and Cortex-A15 solutions. Sitara processors help innovators create a variety of feature-rich, low-power applications. These devices provide robust peripheral support including 3D graphics and industrial communications protocols among others, giving customers flexibility in design. Bringing together flexible hardware solutions with robust software tools enables customers using Sitara processors to create inspiring ARM designs that start to bridge the

gap between high-end MCUs and low-end ARM processor-based devices.

TI C5000™, C6000™ and KeyStone™ architecture DSP Platforms

TI offers the broadest selection of Digital Signal Processors on the market today. The ultra-low-power C5000 fixed-point DSPs offer processors with active core power below 0.15 mW/MHz, great for battery-powered applications. The C6000 family features fixed- and floating-point DSPs starting at 200 MHz and going as high as 1.25 GHz. The KeyStone multicore family of products use our highest-performance floating-point C66x DSP core as well as ARM Cortex-A15 CPUs in high-performance SoCs that deliver nearly 200 GFLOPS of performance for less than 20 W. Whether you are developing a battery-powered audio processing system, a higher-performance signal processing machine or systems in between, the breadth of the TI DSP processor portfolio provides a likely alternative for your project.

Jacinto™ Automotive Processors

From entry-level to premium system-on-chips (SoCs), TI offers a wide range of innovative automotive processors for the modern automobile. With a scalable architecture across Infotainment and ADAS solutions, TI provides maximum optimization for automotive OEMs and Tier 1 customers.

High-Performance, Single-Chip Radar Sensors

TI's 76–81 GHz mmWave sensor portfolio for automotive and industrial applications scales from a high-performance front-end radar to a single-chip radar sensor integrating an MCU and/or DSP. Designers can address advanced driver assistance systems (ADAS) and autonomous driving safety regulations— including ISO 26262, which enables Automotive Safety Integrity Level (ASIL)-B— with the AWR

mmWave family. The IWR mmWave sensor family for industrial applications enables developers to create systems detecting range, velocity and the angle of objects in applications like traffic monitoring, drones, robotics, level sensing and more. Leverage the easy-to-use mmWave SDK to get started today.

Software and Development Tools

TI's embedded solutions come with software and tools to make development easier and speed time to market. This includes support for open-source software including Linux® and Energia as well as TI software stacks, application examples and comprehensive SDKs for processor platforms and SimpleLink MCUs. TI's embedded tools range from EVMs and reference designs to LaunchPads, BoosterPacks, BeagleBoards and SensorTags to help developers bring their ideas to life.

Design Support

TI offers many options to support your designs and development using TI products.

- TI Designs are reference designs with schematics, test data and design files to kick-start your development process for a wide-variety of applications. Visit ti.com/TIDesigns.
- TI E2E™ provides 24/7 online support to answer any questions you have about TI products. With a vast library of already answered questions as well as forums to ask new questions, TI engineers and community members are here to help. Visit e2e.ti.com.
- TI provides a wealth of online resources including training, comprehensive data sheets, device and tool user's guides, migration guides, application notes and more.

Complementary Analog Products

TI offers a range of complementary data converter, power management, amplifiers, interface and logic products to complete your design.

Applications Matrix Guideline

	MSP Microcontrollers	C2000™ Microcontrollers	Sitara™ ARM® Cortex®-A Processors	AWR and IWR mmWave Sensors	C5000™ / C6000™ Digital Signal Processors	Jacinto™ Automotive Processors	SimpleLink™ Wireless Microcontrollers
Audio							
Automotive							
Communications							
Industrial							
Medical							
Security							
Video							
Wireless							
Key feature	Ultra-low power	Real-time control	Scalable performance with robust peripheral options	High-accuracy single-chip sensor with processor	Scalable performance from ultra-low power to high performance	ADAS and infotainment systems	Easy-to-use, low-power connectivity

Low-Power MCUs

MSP430™ Microcontrollers

Ultra-Low-Power, 16-Bit Microcontrollers for Sensing and Measurement Applications

Get data sheets, samples, software, tools and application reports at: www.ti.com/msp

Key Applications

- Intelligent sensors and control
- Consumer electronics
- Test & measurement
- Utility metering
- Portable medical and instrumentation
- Security systems

Key Features

- **Ultra-low-power (ULP)** architecture enables battery life > 20 years
 - 100 μ A/MHz active mode
 - 700 nA RAM retention
 - 450 nA RTC mode
 - 7 low-power modes
 - Instantaneous wakeup
- **Integrated intelligent peripherals** to add analog functions and advanced functions including:
 - capacitive touch
 - ultrasonic sensing
 - low-energy vector math engine
 - 8- to 12-bit ADC
 - Transimpedance amplifier (TIA)
 - DMA
 - AES256
- **Easy to get started:** Complete development ecosystem of tools and software with kits starting at \$9.99, multiple IDE options and direct support available 24/7 at e2e.ti.com
- **Scalable platform** with 525+ MCUs, 25+ package options and up to 48 MHz of performance

Series	Capacitive-Sensing MCUs		Value-Line Sensing MCUs		Performance-Sensing MCUs		Other MSP430 MCUs	
	MSP430FR25x/FR26x	MSP430FR2xx/FR4x	MSP430G2x/i2x	MSP430FR5x/FR6x	MSP430F5x/F6x	MSP430F2x/F4x	MSP430F1x	
Max speed (MHz)	16	16	16	16	25	16	16	
FRAM (max KB)	16	16	56	256	512	120	120	
SRAM (max KB)	4	4	4	8	67	8	10	
GPIOs	15–19	16–64	4–32	17–83	29–90	14–80	10–48	
ADC	•	•	•	•	•	•	•	
DAC					•	•	•	
Comparator		•	•	•	•	•	•	
Timer	•	•	•	•	•	•	•	
UART	•	•	•	•	•	•	•	
I ² C	•	•	•	•	•	•	•	
SPI	•	•	•	•	•	•	•	
Multiplier	•	•	•	•	•	•	•	
DMA				•	•	•	•	
Op Amp		•			•	•	•	
LCD		•		•	•	•	•	
RTC	•	•		•	•	•		
1.8-V I/O					•			
CRC	•	•		•	•			
USB					•			
AES				•	•			

Capacitive-Sensing MCUs

MSP430 MCUs with CapTIvate™ touch technology provide the industry's lowest power and most noise-immune capacitive-sensing solutions. The MCUs can support capacitive sliders, wheels, up to 64 buttons and proximity implementations—all of which can operate through thick glass, plastic and metal overlays, and in moist, dirty or greasy conditions. Learn more at ti.com/captivate.

- Featured devices: **MSP430FR2633**, **MSP430FR2533**
- Featured development kit: **MSP-CAPT-FR2633**

Value-Line Sensing MCUs

The MSP430 Value-Line Sensing MCU portfolio adds intelligence and sensing to discrete functions with cost-effective MCUs that minimize the impact on the bill of materials. The portfolio offers options to migrate 8-bit MCU designs to gain additional performance and capabilities with a range of memory options from 0.5 KB to 56 KB. The MSP430FR2x and MSP430FR4x families have advanced analog integration options to support additional sensing functionality including a 10-bit analog-to-digital converter,

transimpedance amplifier or operational amplifier as well as LCD support. Learn more at ti.com/MSP430ValueLine.

- Featured devices: **MSP430FR2000**, **MSP430FR2100**, **MSP430FR2111**, **MSP430FR2311**
- Featured development kits: **MSP-EXP430FR2311** and **MSP-EXP430FR4133** LaunchPad™ development kits

Performance-Sensing MCUs

The MSP430 Performance-Sensing MCU portfolio delivers a range of devices developed for applications requiring higher precision and more memory without sacrificing power. The portfolio features MCUs with an integrated ultrasonic analog front end or an energy-efficient low-energy accelerator for signal-processing applications among other features. The four MSP430 Performance-Sensing MCU families include unified memory options with infinite data logging and scalability to 512 KB. Learn more at

www.ti.com/MSP430Performance

- Featured devices: **MSP430FR5994**, **MSP430FR6047**
- Featured development kit: **MSP-EXP430FR5994** LaunchPad kit

SimpleLink™ Solutions

Low-Power Wireless Connectivity

Get samples, data sheets, tools and application reports at: www.ti.com/simplelink

Key Benefits

- Single software foundation
 - SDK based on common foundation of drivers, frameworks and libraries
 - Pre-integrated TI-RTOS kernel already deployed in thousands of products across multiple applications
 - POSIX-compliant API ensures compatibility with numerous third-party software components
- Faster development with unified tool chain, training and resources
 - One development environment across the whole portfolio of SimpleLink MCUs
 - Free cloud and offline tools with Code Composer Studio™ Cloud
 - SimpleLink Academy offers free, hands-on training
 - 24/7 support through the TI E2E™ community

TI's SimpleLink platform offers the broadest portfolio of 32-bit ARM-based microcontrollers (MCUs) with industry-leading features including low power and robustness, and integrated security to support more than ten differentiated wired and wireless protocols. Each device offers

developers a number of features to uniquely solve their problems, whether capturing high-precision 16-bit analog signal, enabling more security, achieving a range of over 20 kilometers or making a coin cell last for several years.

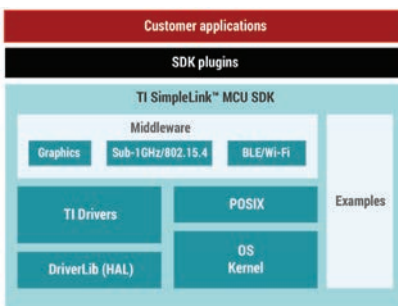
SimpleLink MCU Portfolio

Product	MSP432™	CC3120	CC3220	CC2640R2F	CC1350	CC1310
MCU type	Host MCU	Network processor	Wireless MCU	Wireless MCU	Wireless MCU	Wireless MCU
Application	✓	–	✓	✓	✓	✓
Wireless stack + RF	–	✓	✓	✓	✓	✓
Wireless technology	Connectivity with SDK plug-ins	Wi-Fi®	Wi-Fi	Bluetooth® low energy	Sub-1 GHz + Bluetooth low energy	Sub-1 GHz
Key differentiation	Capture analog signals at up to 16 ENOB using ADC14	Network processor with integrated all Wi-Fi and Internet protocols	Wi-Fi CERTIFIED™ single-chip MCU with enhanced security	Lowest power BT4.2 and BT5 Flash-based solution, auto qualified	World's first dual-band wireless MCU	Low power and longest range to achieve 20 kms on a coin cell
SimpleLink SDK compatible	✓	✓	✓	✓	✓	✓

SimpleLink MCU SDK

These devices are developed around a single software foundation providing 100 percent code reuse within the SimpleLink software development kits (SDKs). The SimpleLink MCU SDKs feature common components and device-specific middleware to speed up your time-to-market and provide a unified development experience across the entire SimpleLink MCU portfolio of wired and wireless devices. Intuitive and standardized APIs enable 100% application code portability.

The SDK common foundation of drivers, frameworks and libraries enables developers to both access peripherals via portable and easy-to-use TI Drivers API as well as optimize via lower-level access with DriverLib hardware abstraction layer (HAL). Developers can leverage real-time and multitasking operations with the integrated TI-RTOS kernel, or tap into other APIs and OS/kernels with POSIX-compliant APIs. A wide range of plug-ins help developers realize additional connectivity and external functionalities. More information about **SimpleLink SDK and code portability.**



SimpleLink Portfolio Development Kits

MSP-EXP432P401R	CC3220SF-LAUNCHXL	LAUNCHXL-CC2640R2	LAUNCHXL-CC1350	LAUNCHXL-CC1310	CC1320BOOST
<ul style="list-style-type: none"> • SimpleLink MSP432 LaunchPad™ kit • Integrated 14-bit ADC • Host MCU 	<ul style="list-style-type: none"> • SimpleLink CC3220 LaunchPad kit • Wi-Fi support • Wireless MCU 	<ul style="list-style-type: none"> • SimpleLink CC2640R2F LaunchPad kit • Bluetooth low energy support • Wireless MCU 	<ul style="list-style-type: none"> • SimpleLink CC1350 LaunchPad kit • Sub-1 GHz + Bluetooth low energy support • Wireless MCU 	<ul style="list-style-type: none"> • SimpleLink CC1310 LaunchPad kit • Sub-1 GHz support • Wireless MCU 	<ul style="list-style-type: none"> • SimpleLink CC1350 BoosterPack™ plug-in module • Sub-1 GHz + Bluetooth low energy support • Wireless MCU

Performance MCUs

C2000™ Real-Time Control Microcontrollers

Performance MCUs for Applications Needing Low-Latency Closed-Loop Control

Learn more and get samples, data sheets, tools and application guides at: www.ti.com/c2000

Applications

- Digital motor control (white goods, industrial drives, medical)
- Digital power supplies (telecom and server rectifiers, wireless base-stations, UPS)
- Renewable energy (solar, wind, fuel cells)
- Intelligent LED lighting
- Automotive (HEV/EV, electric power steering, driver's assistance radar, wipers, HVAC, pumps)
- Power line communications (PLC)

Key Features

Processing

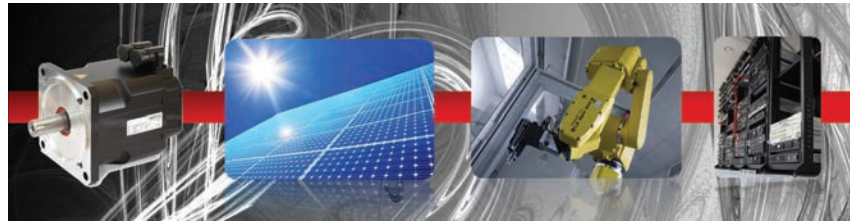
- More performance per MHz with 32-bit C28x DSP core optimized for complex single-cycle operations common to control theory
- Meet the demands of a wide range of applications with optimized processing options from 40 MIPS to 800 MIPS of performance
- Add functionality with the Control Law Accelerator (CLA) processing engine. Great for controlling multiple motors, power stages and more
- Accelerate complex control theory and signal processing, such as trigonometric math, FFTs, and complex math, with built-in hardware accelerators

Actuation

- Achieve higher system performance with micro edge positioning of PWM outputs, including support of PWM phase, duty cycle and period
- Control a variety of applications and power-stage topologies with ultra-configurable PWM generation
- Support even complex peak current mode control of power stages through ramp-generation logic and integrated analog comparators

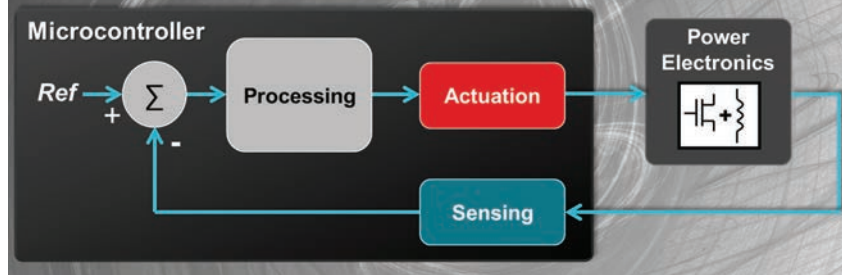
Sensing

- Accurately sample signals with 12-bit and 16-bit analog-to-digital converters (ADC)
- Run systems at high frequencies with ADC conversion rates up to 12.5 MSPS
- Protect systems better with responsive analog comparators – 30-ns response time
- Interface with high-performance external sensors using C2000 high-resolution captures



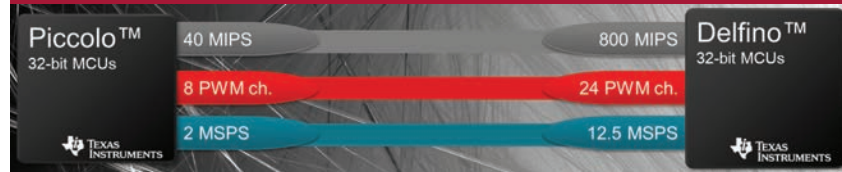
Built for Real-Time Control

Optimized architecture for processing, sensing and actuation to increase closed-loop performance.



Expansive Portfolio

Piccolo™ and Delfino™ MCU families serve wide-ranging real-time control applications.



Real Solutions for Real Applications

Technical application kits, libraries, and guides help you get your application up and running quicker.



Sitara™ Processors

Highly Integrated; Scalable From 300 MHz to 1.5 GHz with 3D Graphics

Get samples, data sheets, tools and application reports at: www.ti.com/sitara

Specifications

- ARM® Cortex®-A8 and Cortex-A15 processors
- Optional high-performance 3D graphics accelerator
- Optional Programmable Real-time Unit and Industrial Communication Sub-System (PRU-ICSS)
- Robust display options
- Optimized for low-power applications
- Linux®, Android™, RTOS and StarterWare™ software

Targeted Applications

Factory automation and control, human machine interface, medical, portable data terminals

Key Features

AM57x processors

- Up to two 1.5-GHz ARM Cortex-A15, two ARM Cortex-M4s, two C66x DSPs, one quad-core PRU-ICSS module
- Up to two SGX544 3D graphic accelerators, GC320 2D graphic accelerator, 1080p60 video accelerator and output to multi-display user interfaces

AM43xx processors

- Up to 1-GHz ARM Cortex-A9
- LPDDR2/DDR3(L)
- Quad-core PRU-ICSS
- Payment Card Industry (PCI) features
- I²C, magnetic card, SPI, smart card, UART, USB

AMIC110 SoC

- Up to 300-MHz ARM Cortex-A8
- External Memory Interfaces (EMIF)
- Integrated multi-protocol industrial communications, eliminating need for ASIC/FPGA
- Supports 10+ industrial Ethernet protocols such as EtherCAT®, PROFIBUS®, PROFINET®, EtherNet/IP™, HRS-PRP, POWERLINK, SERCOS III and more
- Dual-core PRU-ICSS
- Up to 300 M
- Easy migration from existing EtherCAT ASICs for more performance, scalability and software upgradability

AM335x processors

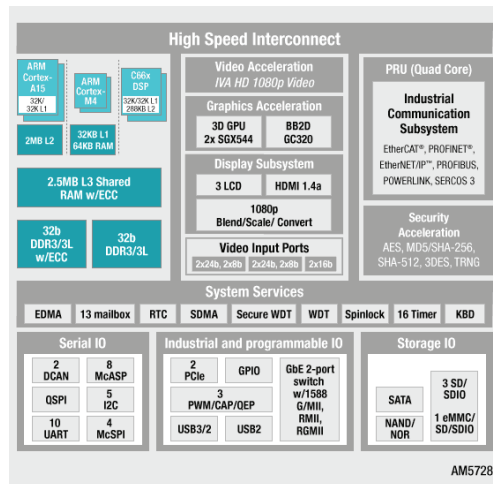
- Up to 1-GHz ARM Cortex-A8
- Optional 3D graphics accelerator, based on Imagination Technology's POWERVR™ SGX graphics accelerator, with up to 20 M/tri/s performance
- Support for LPDDR1/DDR2/DDR3 memory
- < 5 mW power
- PRU-ICSS subsystem provides additional device flexibility
- Optional support for industrial protocols such as EtherCAT, PROFIBUS, PROFINET, EtherNet/IP, HRS-PRP, POWERLINK and SERCOS III.

The right SoC for your industrial automation application

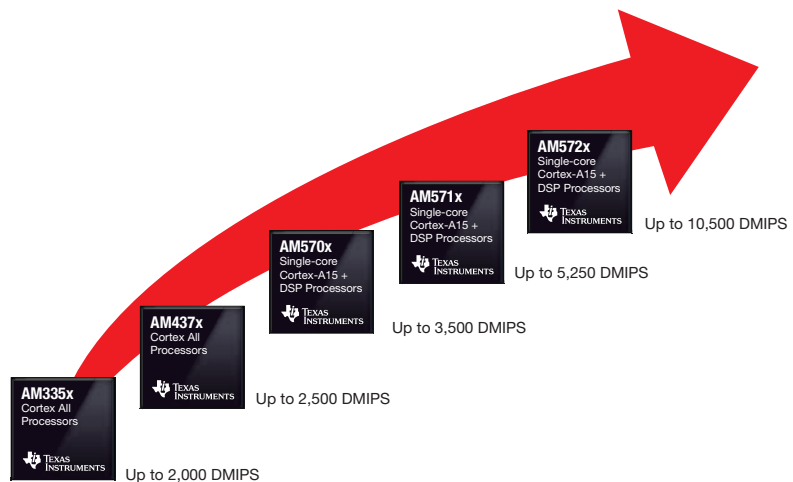


Sitara processor: Ideal for range of use cases and markets

By using ARM-based processors and common peripheral sets, Sitara processors offer highly reusable software code bases that allow designers to easily scale within the product family. Multiple operating frequencies, 3D graphics acceleration, multiple packaging options and temperature operating points provide optimal flexibility to fit most application requirements.



AM57x processor block diagram



Ti's scalable Sitara processor portfolio

C5000™, C6000™ and KeyStone™ Architecture DSP Platforms

Ultra-Low Power, Floating-Point and High-Performance Signal Processing

Get samples, data sheets, tools and application reports at: www.ti.com/dsp

Specifications

- C6000 high-performance fixed-/floating-point DSPs from 200 MHz to 1.25 GHz
- C5000 ultra-low-power fixed-point DSP—under 150 mW/MHz
- KeyStone multicore DSPs and SoCs with 2–8 DSP cores and up to 4 ARM Cortex-A15 CPUs—up to 200-GFLOPS performance
- Processor SDK—a single unified software platform based on Linux® and TI-RTOS delivering the same experience across product lines
- Code Composer Studio™ Integrated Development Environment—common development environment across all TI embedded products

Key Features

KeyStone™ high-performance DSPs

- Industry-leading 16 GFLOPS/W on KeyStone devices
- > 200 GFLOPS per device
- Up to 1.2-GHz embedded processing speeds
- High-speed DDR3 (supports DDR 3L)
- Large on-chip memory (up to 18 MB)
- High-speed I/O including GigE, PCIe Gen 2, and RapidIO®

C6000 high-performance DSPs

- Up to 1.2 GHz 32-bit
- Fixed-/floating-point DSP
- Up to 256 KB RAM
- DDR2, MDDR
- McBSP
- \$5.00 to \$200.00

C6000 DSP+ARM9™

- Up to 456 MHz
- Fixed-/floating-point DSP
- L2 cache
- DDR2
- McASP

C5000 ultra-low-power DSPs

- Up to 300 MHz
- 16-bit, fixed-point + FFT accelerator
- Up to 320 KB RAM
- Up to 256 KB ROM
- HS USB 2.0



AUDIO

A/V receivers and soundbars
Professional audio equipment
Voice assistant and user interface



RADIO AND COMMUNICATIONS

Land mobile radio
First responder communications



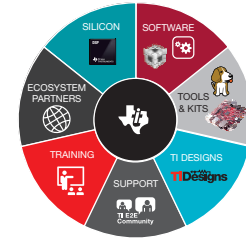
DEFENSE AND AEROSPACE

Radar systems
Communications systems
Flight control systems



GRID INFRASTRUCTURE

Power quality monitoring
Signal analysis
Grid communications



MACHINE VISION

Optical inspection equipment
Robotic guidance systems
Process control

Jacinto™ Automotive Processors

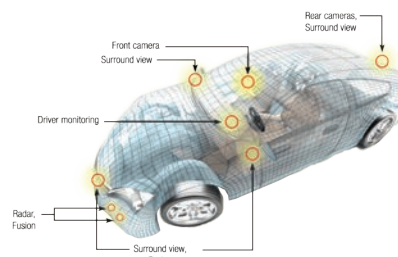
From entry-level to premium system-on-chips (SoCs), TI offers a wide range of innovative automotive processors for the modern automobile. With a scalable architecture and software across Infotainment and ADAS solutions, TI provides maximum optimization for automotive OEMs and Tier 1 customers.

TDAx ADAS SoCs

TI's TDAx Driver Assistance System-on-Chip (SoC) family offers scalable and open solutions based on a heterogeneous hardware and common software architecture for Advanced Driver Assistance Systems (ADAS) applications including camera-based front (mono/stereo), rear, surround view and night vision systems, and multi-range radar and sensor fusion systems.

DRAx Infotainment SoCs

The DRAx family of automotive digital cockpit processors, paired with robust software and ecosystem offering bring unprecedented feature-rich, in-vehicle infotainment, instrument cluster and telematics features to the next-generation automobiles.

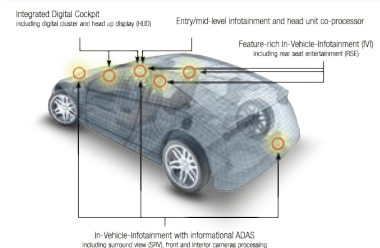


ADAS applications

- Front camera
- Surround view/rear camera
- Fusion
- Radar
- Driver monitoring

Infotainment applications

- Reconfigurable digital instrument cluster
- Entry-/mid-level infotainment and head unit co-processor
- Feature-rich In-Vehicle-Infotainment (IVI)
- In-Vehicle-Infotainment with informational ADAS
- Integrated digital cockpit



mmWave Sensor Portfolio (76–81 GHz)

AWR automotive radar sensors / IWR industrial mmWave sensors

Sense Range, Velocity and Angle with the Single-Chip mmWave Sensor Portfolio Integrating DSP and MCU

Get samples, data sheets, tools and application reports at: www.ti.com/mmWave

Key Features

- Up to 600-MHz C674x floating-point DSP
- Up to 200-MHz ARM Cortex-R4
- Integrated FFT accelerator
- Up to 4 receivers
- Up to 3 transmitters
- Internal memory up to 1.5 MB
- CAN, SPI, UART, CSI2 and LVDS
- Highly linear synthesizer

Automotive Applications

- *Proximity sensing*
Occupant detection, body sensor, in-cabin gesture recognition, driver monitoring
- *Short-range and ultra-short-range radar*
Blind spot, rear collision avoidance / warning, lane change assist, pedestrian/bicyclist detection, collision avoidance, cross traffic alert, 360 degree view, park assist
- *Mid- and long-range radar*
Adaptive cruise control, emergency braking, highly automated highway driving

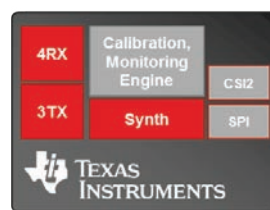
Industrial Applications

- *Level sensing*
Measure tank fluid level with unprecedented accuracy for inventory control and early leak detection
- *Forklifts*
Detect objects in obstructed views for intelligent safety
- *Perimeter security*
Enabling security systems with motion-sensitive detection and tracking
- *Traffic monitoring*
Detect traffic location and volume more accurately
- *Robotics*
Unprecedented accuracy at the micrometer level
- *Drones*
Enable autonomous flight for building, land surveying and delivering packages

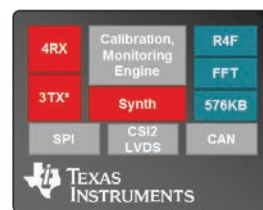
TI mmWave sensors

Designers can select the best processing power for their needs with a fully integrated CMOS single chip harnessing a best-in-class digital signal processor (DSP) and microcontroller (MCU) or a single-chip with just an MCU or DSP. The 76- to 81-GHz single-chip sensor families can dynamically adapt to changing conditions, bring multi modal functionality to avoid false positives and deliver ranges of sensing to multiple applications.

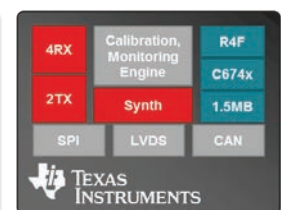
	IWR	AWR
Range	4 cm–250 m	4 cm–250 m
Range resolution	4-cm resolution <mm accuracy	4-cm resolution <mm accuracy
Velocity	300 km/hr	300 km/hr
Angle	1 degree	1 degree
Interface	SPI, CAN, CSI2	SPI, CAN, CAN-FD, CSI2
Temperature	–40°C to 105°C	–40°C to 125°C



AWR1243



xWR1443



xWR1642



AWR automotive radar sensors



IWR mmWave sensors

Development Kits, Software and Tools

Comprehensive, Easy-to-Use Development Kits, EVMs, Software and Tools

Find your software, tool options, code examples and more at: www.ti.com/Embedded-tools

Development kits and evaluation modules

Development kits and evaluation modules (EVMs) from TI and third parties are available to speed development on TI's embedded microcontrollers and processors. These development kits combined with extensive documentation, software and tools create a complete environment to get your design off to the right start.

Software

Software is an important part of innovation for embedded developers. With free software downloads, code and application examples as well as online user's guides and technical support through E2E™, TI has the starting point for your next project and support to help you along the way.

Development tools

TI provides tools and resources for efficient embedded development in the cloud or on the desktop. From integrated development environments (IDEs) and compilers to tool chains and debuggers, TI has the tools you need to support your MCU- or processor-based design.

Code Composer Studio™ (CCS) is a free integrated development environment (IDE) that supports TI's Microcontroller and Embedded Processors portfolios. CCS IDE comprises a suite of tools used to develop and debug embedded applications. It includes an optimizing C/C++ compiler, source code editor, project build environment, debugger, profiler and many other features. To speed development CCS IDE is available in cloud and desktop versions.

TI also supports **Energyia**, an open-source and community-driven IDE and software framework with its microcontroller portfolio.

Development kits and evaluation modules

TI embedded family	Featured development kits
MSP430™ MCUs	MSP-EXP430FR5994 LaunchPad™ kit and MSP-EXP430FR4133 LaunchPad kit. See ti.com/msp for complete listing.
SimpleLink™ MCUs	SimpleLink LaunchPad development kits: MSP-EXP432P401R , CC3220SF-LAUNCHXL , LAUNCHXL-CC2640R2 , LAUNCHXL-CC1350 , and LAUNCHXL-CC1310 . See ti.com/simplelink
C2000™ MCUs	Delfino™ LaunchPad Kits: F28379D , F28377S Piccolo™ LaunchPad Kits: F28027 , InstaSPIN-MOTION See ti.com/c2000 for a complete listing
Sitara™, DSP and multicore processors	Starter kits for low-cost application development: TMDSSK3358 , TMDXSK437x Evaluation module for high-performance Sitara processors: TMDSEVM572X Evaluation module for the C66x DSP: TMDSEVM6678
mmWave sensors	Evaluation modules for the mmWave sensor portfolio: IWR1443B00ST , IWR1642B00ST , AWR1243B00ST , AWR1443B00ST and AWR1642B00ST
Automotive processors	TDAX ADAS tools and EVMs and DRAX infotainment tools and EVMs

Software

TI embedded family	Primary software
MSP430 MCUs	MSP430Ware is a collection of resources to create and build MSP430 MCU code. MSPWare is available as a component of Code Composer Studio™ IDE desktop and cloud versions, or as a standalone package.
SimpleLink MCUs	The SimpleLink SDK is a single software development environment for SimpleLink MCUs that offers flexible software and tool options, 100 percent code reuse and unprecedented scalability for IoT applications.
C2000 MCUs	controlSUITE™ for C2000™ microcontrollers is a cohesive set of software infrastructure, tools and documentation designed to minimize system development time. Further simplifying design efforts, powerSUITE for digital power designers and DesignDRIVE for industrial drive designers is included.
Sitara, DSP and multicore processors	Processor SDK is a unified software platform for TI's processors providing easy setup and fast out-of-the-box access to benchmarks and demos for Linux®, RT-Linux, TI-RTOS and Android™ operating systems.
mmWave sensors	mmWave SDK is a software platform for the TI mmWave Sensing Portfolio, providing the building blocks, demonstrations/examples, tools and documentation to begin development.
Automotive processors	Processor SDK Automotive is the foundational software development platform for TI's Jacinto DRAX and TDAX family of Infotainment and ADAS SoCs.

Development tools

TI embedded family	Featured development tools
MSP430 MCUs	MSP-FET debugger, EnergyTrace™ energy-based code analysis tool
SimpleLink MCUs	SimpleLink Academy training modules, TI Resource Explorer
C2000 MCUs	XDS110 Debug probe, UniFlash Flash programmer
Sitara, DSP and multicore processors	Clock tree tool , Pin MUX tool , Power estimation tool
mmWave sensors	mmWave sensing estimator , mmWave demo visualizer