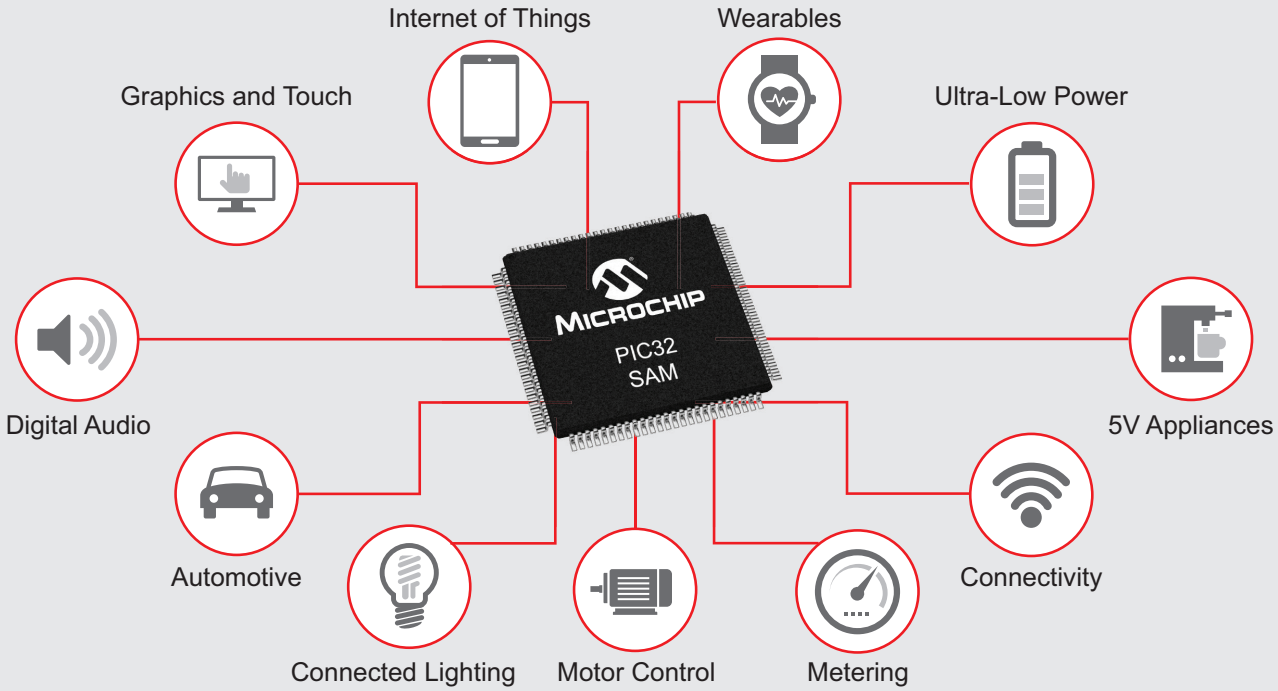
MICROCHIP

32-bit Microcontroller Families

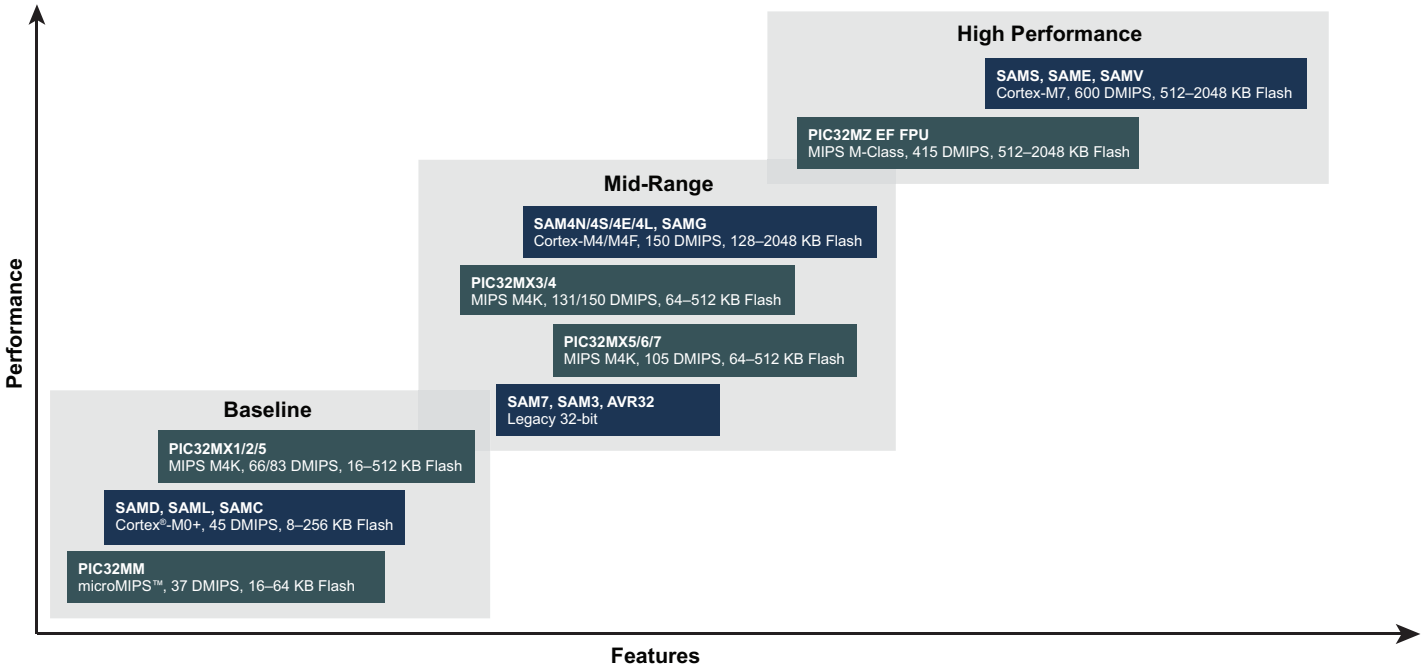
Industry's Broadest and Most Innovative 32-bit MCU Portfolio

www.microchip.com/32bit

Building on the heritage of Microchip Technology's world-leading 8- and 16-bit microcontrollers, the 32-bit family offers a wide range of products from the industry's lowest-power to highest-performance MCUs coupled with novel and easy-to-use software solutions. With a rich ecosystem of development tools, integrated development environments and third-party partners, Microchip's families of 32-bit microcontrollers accelerate a vast array of embedded designs ranging from secured Internet of Things (IoT) applications to general-purpose embedded control.



Broad Portfolio with Smart Peripheral Mix and Multiple Performance Options



Most Comprehensive 32-bit MCU Solutions for a Wide Range of Applications

Device Family	Digital Audio/ Bluetooth®	Graphics/ Segmented Display	Connectivity	Touch	IoT: Nodes/ Gateways	Wearables/ Sensor Hubs	Appliances	Industrial Automation	Automotive	Motor Control	Metering	Connected Lighting
SAMD			✓	✓	✓	✓	✓		✓	✓		✓
SAML		✓	✓	✓	✓	✓	✓					
SAMC			✓	✓			✓	✓	✓	✓		
PIC32MM			✓		✓	✓	✓	✓		✓		
PIC32MX1/2/5	✓	✓	✓				✓	✓	✓			
SAM4S			✓					✓			✓	
SAM4L		✓	✓	✓	✓	✓	✓				✓	
SAM4N			✓					✓			✓	
SAM4E			✓		✓			✓			✓	
SAMG			✓		✓	✓		✓				
PIC32MX3/4	✓	✓	✓				✓		✓			
PIC32MX5/6/7		✓	✓		✓		✓		✓			✓
PIC32MZEF	✓	✓	✓		✓		✓	✓	✓		✓	✓
SAMS70/E70			✓		✓			✓				
SAMV7x			✓					✓	✓			

Breakthrough Innovative Features and Solutions

- Ultra low power: < 35 µA/MHz in Active Mode and 200 nA in Sleep Mode
- High Performance: up to 600 DMIPs performance with double-precision Hardware Floating Point and up to 2 MB dual-panel Flash and 512 KB SRAM
- Peripheral Touch Controller (PTC): dedicated hardware peripheral for robust capacitive touch solutions facilitating high moisture tolerance and noise immunity
- Sleepwalking: ability of the peripherals to perform a desired task while the CPU is asleep
- Event system: enables inter-peripheral communication and efficiently offloads the CPU
- Low-Cost Controllerless Graphics (LCCG) solutions
- Compact packaging options: chip scale packages down to 1.9 × 2.4 mm
- Advanced analog and connectivity peripherals
- microMIPS™ Instruction Set Architecture (ISA) for improved code density
- Dual-panel Flash options for live updates

SAMD, SAML and SAMC Series

Baseline SAM Family Features	SAMD10/11	SAMD20/21	SAMDA1	SAML21/22	SAMC20/21
• Cortex® M0+ • Event system • Sleepwalking peripherals • SERCOM • Peripheral Touch Controller (PTC) • 10-/12-bit DAC • Analog comparators • TRNG, AES, tamper detect, CRC • Supports crystal-less USB operation • Configurable Custom Logic (CCL) • I²S, ISO7816 • WDT, POR, BOR, RTC	48 MHz			48/32 MHz	48 MHz
	8/16 KB Flash	16–256 KB Flash	16–64 KB Flash	32–256 KB Flash	
	4 KB SRAM	2–32 KB RAM	4–8 KB SRAM	4–32 KB SRAM	
	14, 20, 24 pins	32, 48, 64 pins		32, 48, 64, 100 pins	32, 48, 56, 64 pins
	6 ch. DMA	Up to 12 ch. DMA	8 ch. DMA	16 ch. DMA	Up to 12 ch. DMA
	1 × TC for control	3 × TC for control			
	12-bit ADC, 350 ksps			12-bit ADC, 1 Msps	16-bit SDADC and two 12-bit ADC, 1 Msps
	FS USB Device	FS USB Host and Device			CAN-FD and CAN 2.0A/B
				3 × op amps SLCD Controller	DIVAS
			Automotive Qualified		5V Operation

Series Descriptions

- **SAMD10/11:** Smaller member of SAMD family with serial interfaces, timers, analog comparators and PTC. SAMD11 adds FS USB.
- **SAMD20/21:** Offers large memory options with rich set of peripherals including PTC, and provides flexibilty and ease-of-use with low power consumption. SAMD21 adds FS USB, DMA and timer counter for control.
- **SAMDA1:** Automotive-qualified microcontrollers, featuring embedded PTC enabling efficient button/slider/wheel solutions for automotive HMI and LIN applications.
- **SAML21/22:** Ultra-low power family with 12-bit ADC, analog comparators, PTC, security functions, TC for control and CCL. SAML21 runs at 48 MHz, consumes under 35 µA/MHz in active mode and 200 nA in sleep mode and features op amps, FS USB Host and Device and 12-bit DAC. SAML22 runs at 32 MHz and comes with an integrated SLCD controller, FS USB Device and 100-pin options.
- **SAMC20/21:** 5V MCU family for appliance and industrial applications. This family features 12-bit ADCs, hardware Divide and Square Root (DIVAS), PTC and high-end timers/counters. SAMC21 adds 16-bit Delta-Sigma ADC, CAN FD and CAN 2.0A/B.

PIC32MX1/2/5 and PIC32MM Series

Baseline PIC32 Family Features	PIC32MX1	PIC32MX2	PIC32MX5	PIC32MM
• MIPS core • UART • SPI • I²C • PPS • 32-bit CRC • RTCC • WDT, BOR, POR • Timer/compare/ capture	40/50 MHz			25 MHz
	16–512 KB Flash		64–512 KB Flash	16–64 KB Flash
	4–64 KB RAM		8–64 KB RAM	4–8 KB RAM
	28, 36, 44, 64, 100 pins		64, 100 pins	20, 28, 36, 40 pins
		FS USB Host, Device and OTG		
			CAN 2.0B	
	DMA and PMP			
	10-bit 1 Msps ADC			10-bit 200 ksps, 12-bit 300 ksps ADC
	Analog Comparators			
	I²S			
	AEC-Q100 Qualified			

Series Descriptions

- **PIC32MX1:** 32-bit family optimized for cost and performance with additional features such as DMA and PMP and more serial interfaces, comparators and ADC channels compared to the PIC32MM family. Targeted for general-purpose embedded control and graphics.
- **PIC32MX2:** Feature upgrade from PIC32MX1 with the addition of Full-Speed USB targeting cost-sensitive digital audio, graphics and USB applications.
- **PIC32MX5:** Feature upgrade from PIC32MX2 with the addition of CAN 2.0B targeting industrial, automotive (cabin/infotainment), digital audio, graphics, USB and CAN applications.
- **PIC32MM:** The PIC32MM family is the lowest-power and smallest member of the PIC32 family, offering sleep modes down to 500 nA and packages as small as 4 × 4 mm which makes them suitable for low-power and space-constrained applications. They are compatible with the PIC32MX1/MX2 families.

SAM4 and SAMG Series

Mid-Range SAM Family Features	SAM4N	SAM4S	SAM4E	SAM4L	SAMG
• Cortex® M4/M4F • DSP instructions and FPU • Event system • Sleepwalking peripherals • High I/O pin • 10-/12-bit DACs • Analog comparators • Communication (USB, CAN, Ethernet) • EBI with memory controller • Safety and security • ISO7816 • POR, BOR, WDT, RTC	100 MHz	120 MHz	120 MHz	48 MHz	120 MHz
	512 KB–1 MB Single Bank –	128 KB–2 MB Single/Dual Bank Cache	512 KB–1 MB Single Bank Cache	128–512 KB Single Bank –	256–512 KB Single Bank Cache
	64/80 KB SRAM	64–160 KB SRAM	128 KB SRAM	32/64 KB SRAM	64–176 KB SRAM
	48, 64, 100 pins		100, 144 pins	48, 64, 100 pins	49, 64 pins
	DMA	DMA	DMA	DMA	DMA
		FS USB Device – –	FS USB Device 2× CAN 1× Ethernet	FS USB Host & Device – –	FS USB Host & Device
		CMOS Interface		SLCD Controller	
	10-bit ADC, 510 ksps	12-bit ADC, 1 Msps	2 × 16-bit ADCs	12-bit ADC, 500 ksps	
		CRC – –	CRC AES –	CRC AES TRNG	CRC – –
		I²S/TDM		I²S	I²S

Series Descriptions

- **SAM4N:** Ideal for a wide range of applications in industrial automation, consumer and appliance and energy metering markets. Pin compatible with SAM3S, SAM3N and SAM7S.
- **SAM4S:** Features a multi-layer bus matrix, multi-channel Direct Memory Access (DMA) and distributed memory to support high data-rate communication.
- **SAM4E:** Offers a rich set of connectivity peripherals including 10/100 Mbps Ethernet MAC supporting IEEE 1588 and dual CAN 2.0B as well as single-precision FPU.
- **SAM4L:** Ideal for power-sensitive designs delivering down to 90 µA/MHz in Active Mode as well as Sleep Mode with full RAM retention of 1.5 µA and wake-up time of 1.5 µs.
- **SAMG:** Optimized for ultra-low power and high performance. Small form factor bundled with FPU, DMA and good SRAM-to-Flash ratio in a very tiny 3 × 3 mm WLCSP.

PIC32MX3/4 and PIC32MX5/6/7

Mid-Range PIC32 Family Features	PIC32MX3	PIC32MX4	PIC32MX5	PIC32MX6	PIC32MX7
• MIPS core • UART • SPI • I²C • PPS • 32-bit CRC • RTCC • WDT, BOR, POR • Timers/compare/ capture	Up to 120 MHz		80 MHz		
	64–512 KB Flash				
	16–128 KB RAM				
	64, 100, 124 pins		64, 100, 121, 124 pins		
		FS USB, Device, Host, OTG	FS USB, Device, Host, OTG		
			CAN 2.0B		Dual CAN 2.0B
				10/100 Ethernet MAC	
	DMA and PMP				
	10-bit 1 Msps ADC				
	Analog Comparators				
	I²S				
	AEC-Q100 Qualified				

Series Descriptions

- **PIC32MX3:** General-purpose 32-bit familiy with up to 120 MHz performance for complex embedded applications requiring larger code and data size.
- **PIC32MX4:** Feature upgrade from the PIC32MX3 family with the addition of Full-Speed USB targeting Bluetooth®, high-end digital audio, graphics and USB applications.
- **PIC32MX5:** Mid-range embedded connectivity family with large RAM, FS USB and CAN 2.0B targeting industrial, automotive (cabin/infotainment), USB and graphics applications.
- **PIC32MX6:** Mid-range embedded connectivity family with large RAM, FS USB and 10/100 Ethernet MAC targeting IoT, gateways, industrial, USB and graphics applications.
- **PIC32MX7:** Upgrade from the PIC32MX5 and PIC32MX6 families with a rich set of connectivity peripherals including dual CAN 2.0B, Full-Speed USB and 10/100 Ethernet MAC targeting a broad range of embedded connectivity applications.

SAMS70/E70/V7x Series

Feature	SAMS70	SAME70	SAMV70	SAMV71
Frequency	300 MHz			
Flash	512 KB/1 MB/2 MB	512 KB/1 MB/2 MB	512 KB/1 MB	512 KB/1/MB/2 MB
SRAM	256 KB/384 KB/384 KB	256 KB/384 KB/384 KB	256 KB/384 KB	256 KB/384 KB/384 KB
Backup SRAM	1 KB			
Ext. Bus Interface	16-bit (SDRAM, SRAM)			
Ethernet 1588 (MAC)	–	10/100 Mbps	–	10/100 Mbps
CAN FD	–	2	2	2
Media LB	–		Yes	
Hi-Speed USB	1			
Automotive Qualified	–		Yes	
Camera interface	1			
QSPI	1			
HSMCI/SDIO/eMMC	1× HS			
USART or SPI/UART	5/3			
SPI/I²C/SSC (I²S/TDM)	2/3/1			
12-bit ADC	2× 12-ch 2 Msps			
12-bit DAC	2-ch 2 Msps			
Timers/PWM	12/8			
Crypto	TRNG, AES 256, SHA 1/256			
Pin Count	64–144			
Package	QFN, QFP, BGA			

High Performance

- ARM® Cortex®-M7: 300 MHz, 1500 CoreMark™
- Single- and double-precision hardware Floating Point Unit (FPU)
- 16 kB+ 16 kB of I&D cache with ECC
- Execution in place from on-chip Flash NVM connected to QSPI and EBI
- Multi-port SRAM minimizing latency
- User-configurable SRAM and TCM size

Advanced Analog Front-End (AFE)

- Dual S&H, 12-bit ADC and 16-bit hardware averaging
- Differential input, programmable gain
- Automatic gain and offset error correction
- DMA support, hardware and software trigger

Features

- Hi-Speed USB host/device with integrated PHY
- Memory integrity check monitor
- CMOS camera interface
- Ethernet and dual CAN on SAME70 and SAMV71
- Sleepwalking on UART and I²C
- Event system

Temperature Options

- –40 to 105°C (industrial)
- AEC-Q100, –40 to 105°C (Grade 2)

PIC32MZ Series

Feature	PIC32MZ
Frequency	200/252 MHz
Floating Point Unit (FPU)	Supports 16- and 32-bit floating point data types
Flash	512 KB/1 MB/2 MB
RAM	128/256/512 KB
Boot Flash	160 KB
DMA	26 ch.
Ethernet	10/100 Ethernet MAC
USB	Hi-Speed Device, Host and OTG
CAN	Dual CAN 2.0B
ADC	12-bit, 18 Msps, 48 channel
Analog Comparators	Two AC with 32 programmable voltage references
TRNG	Yes
Crypto Engine	AES 256, DES/TDES, SHA1/256, MD-5, AES GCM
Timers/Compare/Capture	9/9/9
AEC-Q100 Grade 1 Qualified	Yes
RTCC	Yes
PMP	Yes
SQI™ Flash	50 MHz with single-, dual- and quad-lane modes
EBI	50 MHz, 16-bit (Asynch SRAM, NOR Flash, Camera Sensors, LCDs)
SPI/I²S	6
I²C	5
UART	6
Pin Count	64, 100, 124, 144
Packages	QFN, TQFP, VTLA, LQFP, TFBGA*

*Contact your local Microchip sales office for availability

High Performance

- MIPS M-Class Core: 252 MHz, 415 DMIPs
- Seven-stage FPU for 32-bit and 64-bit floating point math
- microMIPS mode for up to 35% smaller code size
- 16 KB I-Cache, 4 KB D-Cache
- DSP - enhanced core

Advanced Analog

- 12-bit ADC
  - 18 Msps, 6 S&H, 48 channel
  - Six digital comparators and filters
  - Sleep and Idle Mode operation
- Two analog comparators with 32 programmable voltage references
- Temperature sensor with ±2°C accuracy

Features

- Dual-panel Flash for live updates
- Memory management unit for optimum embedded OS execution
- Hi-Speed USB Device/Host/OTG with PHY
- 10/100 Ethernet MAC with MII and RMII interface
- Dual CAN 2.0B with DeviceNet addressing support
- EBI and PMP for graphics
- SPI/I²S and I²C for audio
- Crypto engine with TRNG for data encryption/decryption and authentication
- Peripheral Pin Select (PPS) for function remap

Temperature Options

- –40 to 85°C, –40 to 125°C
- AEC-Q100 (Grade 1 –40 to 125°C)

AVR32 Series

UC3L

Offers up to 256 KB Flash, 16 KB SRAM, 50 MHz performance and available in 48- and 64-pin options with PicoPower® peripherals, CAT module, Full-Speed USB and Flashvault code protection.

UC3C

Offers up to 512 KB Flash, 68 KB SRAM, 66 MHz performance and available in 64-, 100- and 144-pin options with automotive qualification, FPU, Ethernet, USB, dual CAN, dual LIN and FlashVault code protection.

UC3D

Offers up to 128 KB Flash, 16 KB SRAM, 48 MHz performance and available in 48- 64-pin options with hardware QTouch® technology, Full-Speed USB and CAT module.

UC3A3/A4

Offers up to 256 KB Flash, 128 KB SRAM, 84 MHz performance and available in 100- and144-pin options with Hi-Speed USB, NAND Flash and SDRAM interface, SD/SDIO, AES and crypto module.

UC3A0/A1

Offers up to 512 KB Flash, 64 KB SRAM, 66 MHz performance and available in 100- and 144-pin options with Ethernet MAC, USB and SDRAM interfaces.

UC3B

Offers up to 512 KB Flash, 96 KB SRAM, 60 MHz performance and available in 48- and 64-pin options with USB and I²S.

SAM7 Series

SAM7S

Offers up to 512 KB of dual-bank Flash, 64 KB SRAM, 55 MHz performance and available in 48- and 64-pin options with Full-Speed USB, SPI, USART, I²C and 10-bit ADC.

SAM7SE

Offers up to 512 KB of dual-bank Flash and 32 KB SRAM, 55 MHz performance and available in 128- and 144-pin options with EBI (supports static memory, NAND, CompactFlash® and SDRAM), Full-Speed USB, USART, SPI, I²C and 10-bit ADC.

SAM7X

Offers up to 512 KB dual-bank Flash, 128 KB SRAM, 55 MHz performance and available in 100-pin options with Full-Speed USB, Ethernet MAC, CAN 2.0A and 2.0B, USART, SPI, I²C and 10-bit ADC.

SAM7XC

Offers up to 512 KB dual-bank Flash, 128 KB SRAM, 55 MHz performance and available in 100-pin options with two crypto blocks, Full-Speed USB, Ethernet MAC, CAN 2.0A and 2.0B, USARTs, SPI, I²C and 10-bit ADC.

SAM3 Series

SAM3N

Offers up to 64 KB Flash, 8 KB SRAM, 48 MHz performance and available in 48-, 64- and 100-pin options with touch support, USART, SPI, I²C , 10-bit ADC and 10-bit DAC.

SAM3S

Offers up to 512 KB dual-bank Flash, 64 KB SRAM, 64 MHz performance and available in 48-, 64- and 100-pin options with SDIO/SD/MMC interface, touch support, I²S, SPI, I²C, UARTs, 12-bit ADC and 12-bit DAC.

SAM3U

Offers up to 256 KB dual-bank Flash, 48 KB SRAM, 96 MHz performance and comes in 100- and 144-pin options with static memory controller, SDIO/SD/MMC interface, touch, HS USB, SPI, I²C, I²S, UARTs and 10-/12-bit ADCs.

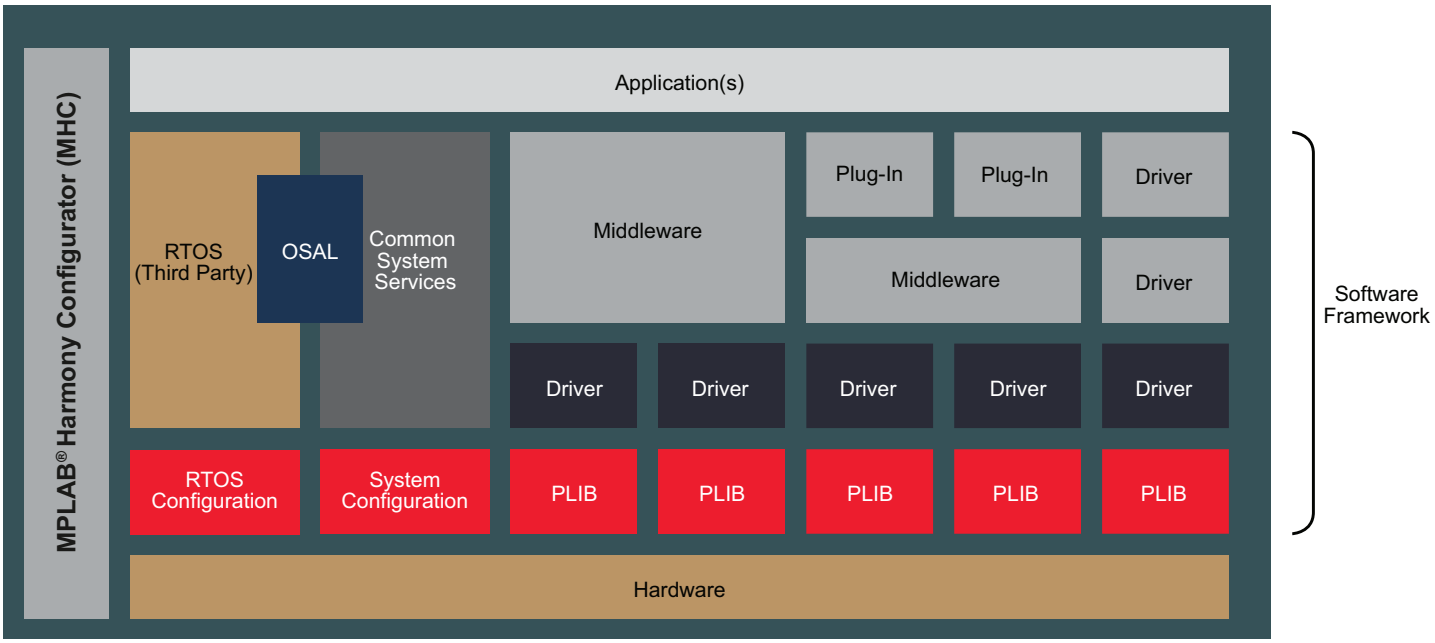
SAM3X/A

Offers up to 512 KB dual-bank Flash with safety and security features, 96 KB SRAM, 84 MHz performance and comes in 100- and 144-pin options with NAND Flash controller, touch, dual CAN, Ethernet MAC, HS USB, SDIO/SD/MMC interface, SPI, I²C, I²S, UARTs, 12-bit ADC and 12-bit DAC.

MPLAB® Harmony Software Framework for PIC32 MCUs

MPLAB Harmony is a flexible, abstracted, fully integrated firmware development environment for PIC32 microcontrollers. It enables robust framework development of interoperable RTOS-friendly libraries with quick and extensive Microchip support for third-party software integration. MPLAB Harmony includes a set of peripheral libraries, drivers and system services that are readily accessible for application development. It features the MPLAB Harmony Configurator (MHC) plug-in that provides a graphical way to select and configure all MPLAB Harmony components, including middleware, system services and peripherals, with ease.

MPLAB Harmony Block Diagram



Application Layer

- Implements desired overall behavior with abstracted hardware access

Common System Services

- Provides common functionality to avoid duplication and conflicts

Peripheral Libraries (PLIB) Layer

- Provides functional interface for PIC32 scalability

Middleware Layer

- Implements complex libraries and protocols (USB, TCP/IP, file systems, graphics)
- Provides a highly abstracted application program interface
- Supports third-party library integration

Device Driver Layer

- Provides highly abstracted interface to peripherals
- Controls access to the peripherals
- Supports blocking or non-blocking code

Key Features and Benefits

- Faster time to market
- Improved code interoperability
- Simplified support
- MPLAB Harmony Configurator (MHC) for enhanced user experience
- Improved 32-bit scalability
- MPLAB Harmony Graphics Composer
- Enhanced third-party software integration

PIC32 Software Solutions Support

USB	USB Host, Device, with Class Drivers (Audio, CDC, HID, MSD, Vendor)
Graphics and Touch	Microchip Graphics Library MPLAB® Harmony Graphics Composer Touch System Service Library SEGGER emWin Pro
CAN	CAN Driver and PLIB support for PIC32 MCUs
Audio and Speech	Basic Audio Decoders: Speex, WAV, Opus; Premium Audio Decoders: MP3, AAC, WMA USB Audio 2.0 Device Class (Hi-Res Audio); PIC32 Bluetooth Audio Software; FLAC
Wi-Fi®, Bluetooth® and Ethernet	Microchip TCP/IP with SSL and BSD; Bluetooth SPP Stack for PIC32; Wi-Fi Software Library; PIC32 Bluetooth Audio Software
IoT and Security	Cryptographic Library; wolfSSL SSL/TLS Library, wolfMQTT
Basic Libraries	File System Library; Floating Point Math Library; Peripheral Library; Class B; Fixed Point Math Library; Fixed Point DSP Library
Boot Loader	Serial Port Boot Loader USB Host Boot Loader Ethernet Boot Loader USB Device Boot Loader SD Card Boot Loader
RTOS	expresslogic Micrium Segger FreeRTOS OPENRTOS

Get the latest updates at www.microchip.com/harmony.

MPLAB Code Configurator

MPLAB Code Configurator (MCC) is a free, graphical programming environment that generates seamless, easy-to-understand C code to be inserted into your project. Using an intuitive interface, it enables and configures a rich set of peripherals and functions specific to your application.

MPLAB Code Configurator supports 8-bit, 16-bit and 32-bit PIC® microcontrollers and is incorporated into both the downloadable MPLAB X Integrated Development Environment (IDE) and the cloud-based MPLAB Xpress IDE.

Key Features

- Free graphical programming environment
- Intuitive interface for quick-start development
- Automated configuration of peripherals and functions
  - Minimized reliance upon product datasheet
  - Reduces overall design effort and time
- Accelerates generation of production-ready code

Atmel Software Framework (ASF)

The Atmel Software Framework provides software drivers and libraries to build applications for megaAVR®, XMEGA®, AVR32 and SAM devices. It has been designed to help develop and glue together the different components of a software design. It can easily integrate into an operating system or run as a standalone product. It features Atmel START, which allows you to select the MCU, and configure software components, drivers, middleware and example projects to tailor your embedded application in a usable and optimized manner.

Applications

- Provides application examples that are based on services, components and driver-modules

Services

- Provides more application-oriented software such as USB classes, FAT file system, architecture-optimized DSP library, graphical library, etc.

Components

- Provides software drivers to access external hardware components such as memory (for example SDRAM, SRAM, and NAND Flash), displays, sensors, wireless, etc.

Drivers

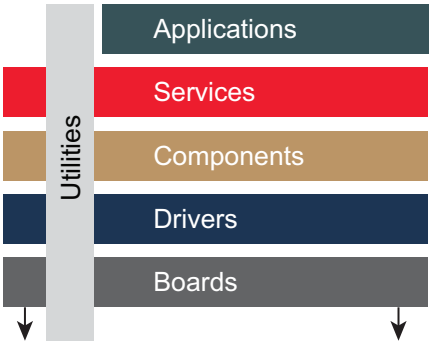
- Each driver is composed of a driver.c and driver.h file that provides low-level register interface functions to access a peripheral or device-specific feature

Boards

- Contains the various board definitions for the given architecture; the board code abstracts the modules above the board from the lower level details

Utilities

- Provides several linker script files, common files for the build system and C/C++ files with general usage defines, macros and functions



ASF is organized in layers for each supported family of devices.

Key Features and Benefits

- Simplifies the usage of microcontrollers, providing an abstraction to the hardware and high-value middleware
- Designed to be used for evaluation, prototyping, design and production phases
- Integrated in the Atmel Studio IDE with a graphical user interface or available standalone for GCC, IAR compilers
- Atmel START to easily select and configure software
- Data visualizer to profile applications run-time behavior and live power measurements
- QTouch composer allows you to seamlessly develop capacitive touch functionality to your application

SAM and AVR32 Software Solutions Support

Touch	QTouch® software library with QTouch composer and analyzer
USB	USB Device and Host stack with class drivers (CDC, HID, MSD, Vector)
Graphics	Graphics mono (demo on OLED), IJG jpeg support
TCP/IP	LwIP - Lightweight open source TCP/IP stack, TCP/IP Lite Stack
Wi-Fi®	WINC1500 library and demo
Bluetooth®	BTLC1000 Bluetooth Low Energy (BLE) stack and demo
802.15.4	Lightweight mesh software stack (lwMesh)
IoT, Security and Cloud	CryptoAuthentication™ library, LoRaWAN™ and Sigfox, PolarSSL/mbed TLS, Proximetry Cloud Agent
CAN	CAN 2.0B and CAN FD drivers
Sensor Library	Bosch BNO055, Microchip AT30TSE758, ADI ADXL345z, AKM AK8975, Honeywell HMC5883L, Invensense IMU-3000, Kionix KXTF9, OSRAM SFH5712/SFH7770, Pololu MMA7341L
Motor Control	BC-HALL, FOC-Sensorless
RTOS	FreeRTOS, Micrium

Comprehensive Suite of Development Tools

Microchip is the only silicon vendor with a full 8-, 16- and 32-bit MCU portfolio supported by a unified development environment. MPLAB X IDE is for PIC32 MCUs and Atmel Studio IDE is for SAM and AVR32 MCUs. Both are free and easy to use.

Developing with PIC32 Microcontrollers

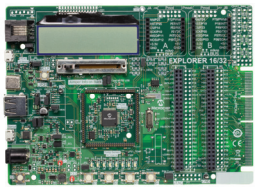
PIC32 Starter Kits

Getting started is easy with any of the fully integrated PIC32 Starter Kits. They are supported by MPLAB Harmony Software Framework which features various application demos, software libraries and Board Support Packages (BSP) for faster development. These starter kits include:

- MPLAB Harmony, MPLAB X IDE and MPLAB XC32 C Compiler*
- PIC32 starter board with integrated programmer and debugger
- Application demos, document and BSPs

*Free version has no code size limit and full optimizations. After 60 days some optimizations are disabled.

Explorer 16/32 Development Board (DM240001-2)



The Explorer 16/32 Development Board is a flexible and convenient development platform for 16-bit PIC24 MCUs, dsPIC® DSCs and 32-bit PIC32 MCUs. The board is driven by the processor Plug-in Modules (PIMs) and facilitates hardware expansion through the use of PICtail™ Plus daughter cards and mikroBUS™ accessory boards. The PIC32 PIMs are supported by the MPLAB Harmony framework featuring various application demos, software libraries and BSPs for faster development.

Choose a Platform: Explorer 16/32 or Starter Kit Platform

Starter Kit Platform

Product Family	Starter Kit	Part Number
PIC32MX1/2/5	PIC32MX1/2/5 Starter Kit	DM320100
	PIC32 Bluetooth® Starter Kit	DM320018
	Microstick II	DM330013-2
PIC32MX3/4	PIC32 USB Starter Kit III	DM320003-3
	PIC32 Starter Kit	DM320001
	Curiosity PIC32MX Board	DM320103
PIC32MX5/6/7	PIC32 USB Starter Kit II	DM320003-2
	Wi-Fi® G Demo Board	DV102412
	PIC32 Ethernet Starter Kit II	DM320004-2
PIC32MZ	PIC32MZ with FPU Embedded Connectivity Starter Kit	DM320007
	PIC32MZ with FPU Embedded Connectivity Starter Kit with Crypto Engine	DM320007-C
	Curiosity PIC32MZ Development Board	DM320104

Explorer 16/32 Platform

Development Board	Part Number
Explorer 16/32 Development Board	DM240001-2

Product Family	Explorer 16/32 Plug-In Module	Part Number
PIC32MM	PIC32MM0064GPL036	MA320020
PIC32MX1/2/5	PIC32MX250F128D PIM	MA320011
	PIC32MX270F256D PIM	MA320014
	PIC32MX570F512L PIM	MA320015
PIC32MX3/4	PIC32MX360F512L PIM	MA320001
	PIC32MX460F512L PIM	MA320002
	PIC32MX450/470 PIM	MA320002-2
PIC32MX5/6/7	PIC32MX795F512L PIM	MA320003
PIC32MZ	PIC32MZ with FPU PIM	MA320019

PICtail Plus Daughter Boards for Both Starter Kit* and Explorer 16/32 Platforms

Application	PICtail™ Plus Daughter Board	Part Number
CAN	CAN/LIN Pictail (Plus) Daughter Card	AC164130-2
USB	USB PICtail Plus Daughter Card	AC164131
Ethernet	Ethernet PICtail Plus Daughter Card	AC164123
	Fast 100 Mbps Ethernet PICtail Plus Daughter Card	AC164132
M2M	Machine-to-Machine (M2M) PICtail Daughter Board	AC320011
Wi-Fi®	MRF24WN0MA module	AC164153
	MRF24WG0MA module	AC164149
802.15.4	MRF24J40ME PICtail/PICtail Plus Daughter Board	AC164143-1
	MRF24J40MA PICtail/PICtail Plus Daughter Baord	AC164134-1
Graphics	Low Cost Controllerless (LCC) PICtail Plus Daughter Board	AC164144
	Graphics Controller PICtail Plus Epson S1D13517 Board	AC164127-7
	PIC32 VGA Camera Sensor PICtail Plus Daughter Board	AC164150
Storage	PICtail Daughter Board for SD and MCC Cards	AC164122

*Note: Starter Kits require I/O Expansion Board (DM320002) to connect PICtail Plus Daughter Cards.

Expansion Boards and Development Kits

Expansion Board	Part Number
I/O Expansion Board	DM320002
Multimedia Expansion Board II (MEB II)	DM320005-2
Multimedia Expansion Board (MEB)	DM320005
5" WVGA PCAP Display for MEB II	AC320005
PIC32 Audio Codec Daughter Card	AC320100
PIC32 Audio DAC Daughter Card	AC320032-2
PIC32 GUI Development Board with PCAP Touch	DM320015

Development Kit	Part Number
PIC32 Bluetooth® Audio Development Kit	DV320032

PIMs for PIC32 Bluetooth® Audio Development Kit	Part Number
PIC32MZ EF Bluetooth Audio PIM	MA320018*
PIC32MX270F256D Bluetooth Audio PIM	MA320013*
PIC32MX270F512L Bluetooth Audio PIM	MA320017*

*Note: Does not work with Explorer 16/32 Development Board.

Emulators and Debuggers

Emulator/Debugger	Part Number
PICkit™ 3 In-Circuit Debugger	PG164130
MPLAB® ICD 3 In-Circuit Debugger	DV164035
MPLAB REAL ICE™ In-Circuit Emulator	DV244005

Developing with SAM and AVR32 Microcontrollers

SAM and AVR32 Xplained Platforms

Xplained is a fast prototyping and evaluation platform for SAM and AVR32 MCUs. These low-cost, easy-to-use evaluation kits are ideal for demonstrating the features and capabilities of your selected device, and can be customized with a wide range of extension boards. Development is easy with a rich selection of example projects and code drivers provided in the Atmel Software Framework (ASF), and with the support of Atmel Studio and third-party IDEs.

Choose from four types of Xplained platforms:

- **Xplained Pro** – A professional evaluation board featuring auto-identification in Atmel Studio, with an on-board debugger and standardized extension connectors
- **Xplained Mini** – An ultra-low-cost platform for evaluating low pin-count parts. It features an on-board debugger, access to all device pins, and auto-identification in Atmel Studio
- **Xplained Ultra** – An evaluation platform for high-end microcontrollers with access to high-speed data and external memory interfaces
- **Xplained** – A fast prototyping and evaluation platform for 32-bit AVR® and SAM microcontrollers

Xplained Pro Platform

Product Family	Board	Part Number
SAMC	SAMC21 Xplained Pro	ATSAMC21-XPRO
SAMD	SAMDA1 Xplained Pro	ATSAMDA1-XPRO
	SAMD11 Xplained Pro	ATSAMD11-XPRO
	SAMD20 Xplained Pro	ATSAMD20-XPRO
	SAMD21 Xplained Pro	ATSAMD21-XPRO
SAML	SAML21 Xplained Pro	ATSAML21-XPRO-B
	SAML22 Xplained Pro	ATSAML22-XPRO-B
SAMG	SAMG53 Xplained Pro	ATSAMG53-XPRO
	SAMG55 Xplained Pro	ATSAMG55-XPRO
SAM4	SAM4E Xplained Pro	ATSAM4E-XPRO
	SAM4L Xplained Pro	ATSAM4L-XPRO
	SAM4L Xplained Pro Starter Kit	ATSAM4L-XSTK
	SAM4L8 Xplained Pro	ATSAM4L8-XPRO
	SAM4N Xplained Pro	ATSAM4N-XPRO
	SAM4S Xplained Pro	ATSAM4S-XPRO
	SAM4S Xplained Pro Starter Kit	ATSAM4S-XSTK

Xplained Mini Platform

Product Family	Board	Part Number
SAMD	SAMD10 Xplained Mini	ATSAMD10-XMINI

Xplained Ultra Platform

Product Family	Board	Part Number
SAMV	SAMV71 Xplained Ultra	ATSAMV71-XULT

Xplained Platform

Product Family	Board	Part Number
SAM4	SAM4S Xplained	ATSAM4S-XPLD
SAME	SAME70 Xplained	ATSAME70-XPLD

Legacy Xplained Platform

Product Family	Board	Part Number
AVR32	UC3-A3 Xplained	AT32UC3A3-XPLD
	UC3-L0 Xplained	AT32UC3L0-XPLD

Extension Boards

The following Extension Boards are add-on boards for Xplained Pro Kits for expanded functionality.

Application	Extension Board	Part Number
Connectivity	WINC1500 Xplained Pro (Wi-Fi®)	ATWINC1500-XPRO
	BTLC1000 Xplained Pro (BLE)	ATBTLC1000-XPRO
	Ethernet1 Xplained Pro	ATETHERNET1-XPRO
	Sigfox Extension Board (EU 868 MHz)	ATA8520-EK6-E
	Sigfox Extension Board (US 902 MHz)	ATA8520-EK3-E
Touch and Graphics	QT1 Xplained Pro	ATQT1-XPRO
	QT2 Xplained Pro	ATQT2-XPRO
	QT3 Xplained Pro	ATQT3-XPRO
	QT4 Xplained Pro	ATQT4-XPRO
	QT6 Xplained Pro	ATQT6-XPRO
	maxTouch® Xplained Pro	ATMXT-XPRO
	mXT143E Xplained	ATmXT143E-XPLD
	SLCD1 Xplained Pro	ATSLCD1-XPRO
General Purpose	OLED1 Xplained Pro	ATOLED1-XPRO
	PROTO1 Xplained Pro	ATPROTO1-XPRO
	I/O1 Xplained Pro	ATIO1-XPRO
Sensors	BNO055 Xplained Pro	ATBNO055-XPRO
	Inertial One Sensor Board	ATAVRSBIN1
	Pressure One Sensor Board	ATAVRSBPR1
	Inertial Two Sensor Board	ATAVRSBIN2
	Light and Proximity One Sensor Board	ATAVRSBLP1
Security	CryptoAuth Xplained Pro	ATCRYPTOAUTH-XPRO
	CryptoAuthentication Xplained	ATAVRSECURITYX

Programming and Debugging

Programmer/Debugger	Part Number
Atmel-ICE	ATATMEL-ICE

Reference Designs and Demo Kits

Product Family	Board	Part Number
SAMC20	SAMC20 QTR Demo	ATSAMC20-QTRDEMO
SAMC21	SAMC21 MCU Card for BLDC 24V Motor Control Kit	ATSAMC21MOTOR
	SAMC21 Industrial CAN Touch Demo	ATSAMC21-XPRO (2×), ATQT1-XPRO (2×)
SAMD20	SAMD20 QTouch® Robustness Evaluation Kit	ATSAMD20-ATRDEMO
SAMD21	BLDC 24V Motor Control Kit	ATSAMD21BLDC24V-STK
	SAMD21E16L Motor Control Card	ATSAMD21E16MOTOR
	Multifunction Compact Keyboard Reference Design	N/A
	SAMD21 Blood Pressure Beacon	ATSAMD21-XPRO, ATBTLC1000-XPRO
	SAMD21 - BNO005 (BMF055 9-Axis Sensor)	ATSAMD21-XPRO, ATBNO055-XPRO
	Smart Plug Reference Design	ATSMARTPLUG-US
SAML21	Ultra-Low-Power Demo with SAML21 and BTLC1000	ATULPC-DEMO
	SAML21 Low-Power QTouch Demo	ATSAML21-XPRO-B, ATQT3-XPRO, ATPOWERDEBUGGER
SAML22	SAML22 Thermostat IoT Node	N/A
SAM4S	SAM4S Reference Design with PIR Sensor Camera	ATSAM4S-WPIR-RD
SAMV71	V71 Ethernet AVB Demo	ATSAMV71-XULT (2×)
	SAMV71 Wi-Fi® Camera	N/A

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(H) MPLAB Harmony Software Framework compatible

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WLCSP	1.9 × 2.4	20
	2.8 × 2.6	35
	2.9 × 2.7	45
	2.84 × 2.84	49
	3.2 × 3.4	56
	5.2 × 5.3	64
QFN	4 × 4	24
	5 × 5	32
	6 × 6	28
	7 × 7	48
	8 × 8	44
	9 × 9	64
UFBGA	5 × 5	64
	6 × 6	100
	6 × 6	144
VFGBA	7 × 7	100
TFBGA	7 × 7	100
	7 × 7	144
	10 × 10	121

Package	Size (mm)	Pin Count
FFBGA	11 × 11	144
LFBGA	11 × 11	144
	15 × 15	288
TQFP	7 × 7	48
	10 × 10	44
	10 × 10	64
	12 × 12	100
	14 × 14	100
	16 × 16	144
LQFP	20 × 20	176
	20 × 20	144
VTLA	5 × 5	36
	6 × 6	44
	9 × 9	124
SOIC	3.9 × 8.7	14
	7.5 × 12.8	20
	7.5 × 17.9	28
SSOP	5.3 × 10.2	28
SPDIP	7.3 × 34.7	28

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