

PIC® XLP and SAM picoPower® Technology 32-bit MCUs

Reduce Power Consumption While Maintaining Performance

Summary

Microchip's picoPower® Technology SAM and eXtreme Low Power (XLP) PIC32 MCU portfolio provides best-in-class power consumption numbers and fast wake-up times. They offer flexible power-saving techniques that significantly improve the battery life, reducing the number of times batteries need to be changed. They combine ultra-low power with Flash and SRAM that are large enough to run both the application and wireless stacks, ideal for a number of applications including the Internet of Things (IoT), consumer, industrial, medical and other battery-powered devices. They utilize low-leakage processes and libraries to deliver industry-leading low power consumption in active and all sleep modes.

Technology and Innovation

- picoPower technology: ultra-low power process and design (SAM MCUs)
- eXtreme Low Power (XLP) technology (PIC32 MCUs)
- Multiple power sources and clocking options
 - Linear, switching and battery backup
- Power and clock gating
- Low-power analog and peripherals
- Flexible sleep modes
 - Scale performance vs. power consumption
- Event system and Sleepwalking

Ultra-Low Power

- Active mode
 - 25 μ A/MHz
- Deep sleep
 - 100 nA
- SRAM retention
 - 500 nA
- Wake-up time
 - 1.2 μ s (idle state)
- Benchmarks (SAML11, Cortex® M23)
 - EEMBC Certified ULPMark: 410
- Fully operational down to 1.62V
 - While still maintaining all functionality, including analog functions

Advanced Features

- Chip-level security and Arm® TrustZone®
- Enhanced peripheral touch controller, water tolerant
 - 4 μ A standby, wake on touch support
- Event System
 - CPU Independent Inter-Peripheral communication, offloading and minimizing CPU Active Time
- SleepWalking with dynamic power gating
 - Allows MCU to be put into deep sleep and wake up only upon a pre-qualified event
- Low-power SERCOM and timer counters
- 1.93 mm $\times$ 2.43 mm WLCSP

32-bit Ultra-Low Power MCUs, Diverse Power and Performance Levels

	Performance	Memory	Active Current	Sleep Current SRAM Retention	Wake Up Time	Back-up Mode	Operating Voltage	Additional Features
SAML10/11	Cortex® M23, 32 MHz	16–64 KB Flash 4–16 KB SRAM	25 μ A/MHz	500 nA	1.5 μ s	100 nA	1.62V up to 3.6V	picoPower®, Event System, Sleep Walking
SAML11-KPH	Cortex M23, 32 MHz	32–64 KB Flash 8–16 KB SRAM	25 μ A/MHz	500 nA	1.5 μ s	100 nA	1.62V up to 3.6V	picoPower, Event System, Sleep Walking
SAML21/22	Cortex M0+, 48/32 MHz	32–256 KB Flash, 4–32 KB SRAM	35 μ A/MHz	900 nA	1.2 μ s	200 nA	1.62V up to 3.6V	picoPower, Event System, Sleep Walking
SAMD5x	Cortex M4F, 120 MHz	Up to 1 MB Flash, 256 KB SRAM	65 μ A/MHz	10 μ A	5 μ s	3 μ A	1.71V up to 3.6V	Event System, SleepWalking
SAMD1/2x	Cortex M0+, 48 MHz	8–256 KB Flash, 2–32 KB SRAM	70 μ A/MHz	3.5 μ A	4 μ s	No back up mode	1.62V up to 3.6V	Event System, SleepWalking
SAM4L	Cortex M4, 48 MHz	128–512 KB Flash, 32/64 KB SRAM	90 μ A/MHz	1.5 μ A	1.5 μ s	500 nA	1.68V up to 3.6V	picoPower, Event System, SleepWalking
SAMG5x	Cortex M4F, 48/96/120 MHz	256–512 KB Flash, 64–176 KB SRAM	100 μ A/MHz	7 μ A	3 μ s	1 μ A	1.62V up to 3.6V	picoPower, Event System, Sleep Walking
PIC32MX XLP	MIPS32 M4K® 25 MHz	128–256 KB Flash 32–64 KB RAM	250 μ A/MHz	13 μ A	–	673 nA	2.5V up to 3.6V	eXtreme Low Power (XLP)

SAML11 features chip-level security, Arm TrustZone and come with secure provisioning options supported by Secure Thingz Secure Deploy
SAML11-KPH devices are supported by Kinibi-M SDK and are pre-provisioned with Trustonic's Root of Trust key.

Featured Hardware and Software Development Tools

SAML21 Xplained Pro Evaluation Kit (ATSAML21-XPRO-B)

This kit is ideal for evaluating and prototyping with the ultra-low power SAML21 Arm Cortex-M0+ based microcontrollers.

SAM L22 Xplained Pro Evaluation Kit

This kit is ideal for evaluating and prototyping with the ultra-low power SAML22 Arm Cortex-M0+ based microcontrollers. The kit includes TSLCD1 Xplained Pro extension board for touch and segment LCD application development.

SAME54 Xplained Pro (ATSAME54-XPRO)

This kit is ideal for evaluating and prototyping with the low power SAMD5x and E54 Arm Cortex-M4F based microcontrollers.

SAME54 Curiosity Ultra (DM320210)

This kit is ideal for evaluating and prototyping with the low power SAMD5x and E54 Arm Cortex-M4F based microcontrollers and comes with graphics card interface, Ethernet PHY and mikroBUS socket.

SAMD21 Xplained Pro Evaluation Kit (ATSAMD21-XPRO)

This kit is ideal for evaluating and prototyping with the low-power, high-performance SAMD21 Arm Cortex-M0+ based Flash microcontroller.

SAMG55 Xplained Pro Evaluation Kit (ATSAMG55-XPRO)

This kit is ideal for evaluation and prototyping with the SAMG55 Cortex-M4 processor-based microcontrollers.

Featured Reference Designs/Additional Tools

Ultra-Low Power Connected Demonstrator, Featuring SAML21 and BTLC1000 (ULPC-DEMO)

This tool demonstrates the lowest power Arm Cortex-M0+, SAML21 for wearable applications. It includes a small size fully certified Bluetooth® module sensor tag with Android™ app to display data, activity and environment monitor.

SAML22 Wearable Electrocardiogram (WECG) Reference Design

SAML22 is at the heart of this ECG reference design, driving the display, controlling and sensing the touch screen, interfacing with the BLE Radio (BTLC1000), and processing the NeuroSky BMD101 CardioChip and Bosch BHA250 Smart-Hub sensors

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SAML10 Xplained Pro Evaluation Kit (DM320204)

This kit is ideal for evaluating and prototyping with the ultra-low power SAM L10 Arm Cortex-M23 based microcontrollers.

PIC32MX274 XLP Starter Kit (DM320105)

Fully integrated 32-bit development platform featuring the high performance and eXtreme Low Power (XLP) PIC32MX274 series. The PIC32MX XLP offers developers an increase in performance at almost half of the current, enabling longer lasting, more feature rich battery applications.

SAML11 Xplained Pro Evaluation Kit (DM320205)

This kit is ideal for evaluating and prototyping with the ultra-low power and advanced security SAM L11 and SAM L11-KPH Arm Cortex-M23 based microcontrollers.

SAM4L Development System (ATSAM4L-EK)

This kit is ideal for evaluating and prototyping with the SAM4L Cortex-M4 processor-based microcontrollers. The board features LCD, USB, capacitive touch functionality and much more.

Power Debugger (ATPOWERDEBUGGER)

The Power Debugger streams power measurements and application debug data to Data Visualizer for real-time monitoring and analysis.

XLP Battery Life Estimator

The XLP Battery Life Estimator is a free PC Software tool to aid in developing low-power applications with Microchip's SAM and PIC MCUs featuring picoPower and XLP technologies.

to provide readings that include heart rate, heart age, heart rate variability and step count. In addition to acting as a standalone device, it can connect to Neurosky's smartphone app via BLE, to provide remote connectivity. Please contact your local Microchip sales office for availability

Data Visualizer – Power Consumption Measurement and Visualization Analysis Software Tool

