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 µA/MHz
- Deep sleep
  - 100 nA
- SRAM retention
  - 500 nA
- Wake up time
  - 1.2 µs (idle state)
- Benchmarks (SAML10, Cortex® M23)
  - EEMBC Certified ULPMark: 405
- 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 µA 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 × 2.43 mm WLCSP

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

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

SAML11 features Chip-level security and Arm TrustZone

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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 ultra-low power SAMD5x and E54 Arm Cortex-M4F based microcontrollers.

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.

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 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.

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

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