第18 屆數位訊號處理創思設計競賽說明

A Leading Provider of Smart, Connected and Secure Embedded Control Solutions

SMART | CONNECTED | SECURE

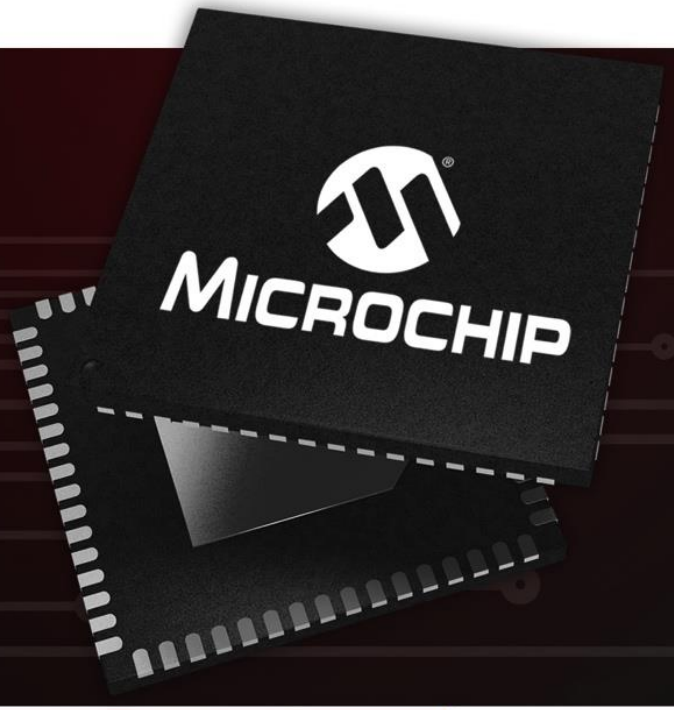
Calvin Ho

Oct,18,2022

Microchip 組別說明

- **競賽組別 : E 組**
- **Microchip數位訊號處理器應用組：**作品限定使用Microchip公司處理器之自製或自組應用電路，並且整合現有軟硬體技術成為一個創新的應用系統。
- Microchip 可以提供入圍並參加決賽的團隊指定的開發工具以及 IC 樣品
- 參賽隊伍也可利用既有的開發設備來進行軟硬體等的系統整合
  - 如有特殊需求也可以協商
- **除了主辦單位提供的獎狀及獎金，Microchip 另外提供公司發行的獎狀 給獲得前三名及佳作的團隊**

MICROCHIP



A Leading Provider of Smart, Connected and Secure Embedded Control Solutions



Microchip - Corporate Overview

Leading Total Systems Solutions Provider:

- High-performance standard and specialized Microcontrollers, Digital Signal Controllers and Microprocessors
- Mixed-Signal, Analog, Interface and Security solutions
- Clock and Timing solutions
- Wireless and Wired Connectivity solutions
- FPGA solutions
- Non-volatile EEPROM and Flash Memory solutions
- Flash IP solutions

Headquartered near Phoenix in Chandler, AZ

Our Vision

Be The Very Best Embedded Control Solutions Company Ever

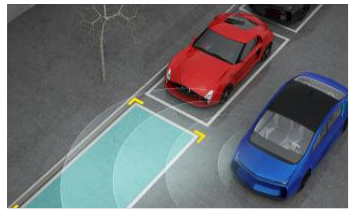
SMART | CONNECTED | SECURE

Combined Portfolio: End Markets

MCUs	Analog	Mixed Signal	Interface	Memory	Power Management	Switches & Controllers	High-Rel Discrete	Enterprise Storage	FPGA

Industrial 28%	Automotive 15%	Consumer 13%	Communications 14%	Computing 18%	A&D 12%














Microchip COMBINED CAPABILITIES Microsemi

Worldwide 8-bit Microcontroller Market Share

No.	1991 Rank	1996 Rank	2001 Rank	2005 Rank	2006-2009 Rank	2010 Rank	2014-2017 Rank	2021 Rank
1	Motorola	Motorola	Motorola	Motorola	Microchip	Renesas	Microchip	Microchip
2	Intel	NEC	Hitachi	Renesas	NEC	Microchip	NXP	NXP
3	Philips	Philips	NEC	Microchip	STMicro	Atmel	Renesas	Renesas
4	Mitsubishi	Hitachi	Microchip	NEC	Freescale	STMicro	STMicro	STMicro
5	NEC	Mitsubishi	STMicro	STMicro	Atmel	Samsung	CEC Huada	Others
6	Hitachi	Toshiba	Philips	Atmel	Renesas	Freescale	Cypress	
7	Toshiba	Matsushita	Toshiba	Toshiba	NXP	NXP	Si Labs	
8	Siemens	SGS-Thomson	Atmel	Philips	Cypress	Cypress	Datang	
9	TI	Intel	Matsushita	Fujitsu	Sony	Panasonic	SH Fudan	
10	Matsushita	Microchip	Sanyo	Infineon	Fujitsu	Fujitsu	Holtek	
11	National	Siemens	Samsung	Sanyo	Panasonic	Detang	Unigroup	
12	SGS-Thomson	Fujitsu	Mitsubishi	Samsung	Toshiba	NEC (1Q)	Panasonic	
13	Ricoh	TI	Infineon	Matsushita	Samsung	Sony	Nationz	
14	MHS	Sony	Sony	Sony	Datang	Toshiba	ABOV	
15	IIT	Zilog	TI	Sunplus	SI Labs	SI Labs	Ixys	
16	Sharp	Sharp	Fujitsu	Micronas	Holtek	JSC	Toshiba	
17	Fujitsu	Temic	Sunplus	Novatek	Infineon	Holtek	Sony	
18	Oki	Sanyo	Zilong	Intel	Elan	Infineon	On Semi	
19	Zilog	National	Novatek	Holtek	Winbond	Sonix	Sonix	
20	Sony	Oki	Micronas	Winbond	Denso	Elan	HZ Silan	
23	Microchip							

191%

Based on dollar shipment volume 1991-2021, Source: Gartner and Microchip

Worldwide 16-bit Microcontroller Market Share

No.	2004 Rank	2006 Rank	2008 Rank	2010 Rank	2012 Rank	2014 - 2016 Rank	2017-2019 Rank	2021 Rank
1	Renesas	Renesas	Renesas	Renesas	Renesas	Renesas	Renesas	Renesas
2	Infineon	Infineon	Infineon	Infineon	Infineon	Infineon	TI	Infineon
3	Freescale	Freescale	Samsung	TI	TI	Freescale/NXP	Infineon	TI
4	TI	Fujitsu	TI	Samsung	Freescale	TI	NXP	NXP
5	NEC	TI	Freescale	Freescale	Fujitsu	Microchip	Microchip	Microchip
6	Matsushita	Intel	Fujitsu	Fujitsu	Samsung	Spansion	Others	Others
7	Toshiba	Toshiba	Toshiba	Toshiba	Microchip	Samsung		
8	Fujitsu	NEC	Intel	Microchip	Toshiba	Toshiba		
9	Intel	Sunplus	NEC	Intel	Intel	INSIDE		
10	STMicro	Sony	Sony	Sony	INSIDE	EM Micro		
11	Oki	NXP	Panasonic	JSC Sitronics	Sony	NXP		
12	Sony	Micronas	NXP	Sunplus I	CEC Huada	Sunplus		
13	Micronas	Winbond	Winbond	Winbond	JSC	Sony		
14	Sunplus	Matsushita	Microchip	NXP	EM Micro	Ixys		
15	Winbond	Microchip	Micronas	Micronas	SH Fudan	Maxim		
16	Microchip	Samsung	Sunplus I	Sunplus MM	Sunplus	Datang		
17	Samsung	Oki	Sunplus MM	Seiko Epson	Datang	CEC Huada		
18	Philips	National	Sharp	Panasonic	Winbond	SSM		
19	Magnachip	Sharp	Rohm	Rohm	Ixys	Seiko Epsen		
20	Sharp	STMicro	Seiko		Seiko Epson	RTI Group		

Based on dollar shipment volume 1991-2021, Source: Gartner and Microchip

Worldwide 32-bit Microcontroller Market Share

No.	2010 Rank	2011 Rank	2012 Rank	2013 Rank	2014 Rank	2016-2017 Rank	2019 Rank	2020-2021 Rank
1	Renesas	Renesas	Renesas	Renesas	Renesas	Renesas	Renesas	ST-Micro
2	Freescale	Freescale	Freescale	Freescale	Freescale	NXP	NXP	NXP
3	TI	TI	ST-Micro	ST-Micro	ST-Micro	ST-Micro	ST-Micro	Renesas
4	ST-Micro	ST-Micro	TI	TI	TI	TI	Microchip	Infineon
5	Denso	NXP	Atmel	Atmel	Atmel	Infineon	Infineon	Microchip
6	Fujitsu	Denso	Denso	Infineon	NXP	Microchip	TI	TI
7	NXP	Atmel	Infineon	Denso	Infineon	Cypress	Cypress	Others
8	Atmel	Fujitsu	NXP	NXP	Denso	Others	Others	
9	Toshiba	Infineon	Toshiba	Melfas	Microchip			
10	Infineon	Toshiba	Fujitsu	Toshiba	Toshiba			
11	Panasonic	Panasonic	Panasonic	Microchip	Spansion			
12	Em Micro	EM Micro	Microchip	CEC-Huada	Cypress			
13	Rohm	Rohm	Melfas	Fujitsu	Samsung			
14	JSC	JSC	Samsung	Spansion	Melfas			
15	Shenzhen St	Microchip	Rohm	Cypress	Winbond			
16	Huahong	Shenzhen St	Energy Micro	Panasonic	Panasonic			
17	Seiko Epson	Huahong	CEC Huada	SH Huahong	Nationz Tech			
18	Winbond	Winbond	Nationz	SH Fudon	CEC Huada			
19	Microchip	Seiko Epson	SH Fudan	Winbond	Energy Micro			
20	Samsung	Samsung	Cypress	Datang	Rohm			

Based on dollar shipment volume 1991-2021, Source: Gartner and Microchip

32-bit PIC® & SAM Microcontroller

What Makes Microchip Unique in the 32-bit MCU Market?

- **A History of Product Longevity**
  - Unmatched dedication to product longevity lowers your risk and costs.
- **Industry Leading Development Support**
  - Most comprehensive and extensive development tools from any supplier. Millions of man hours worth of tools, software, and IP available to customers, supplied and supported by Microchip.
- **Broad Product Portfolio**
  - Microchip offers the broadest 32-bit MCU portfolio. We have a solution tailored to meet customer needs in a wide set of application spaces.
- **Lower Total Cost**
  - PIC32/SAM 32-bit MCUs are highly integrated with pin resource maximized, removing external components and reducing BOM cost and board space.

Our 32-bit MCU Platform is Designed Into a Broad Range of Applications

Consumer

Docking Station

Audio Headphones

White Goods Graphics

Wearables

Drone

Remote Control

Industrial

Engine Control

Lighting Control

HVAC Air Handler

Power Meter

Barcode Scanner

Security

Security System Panel

Photo ID Management

Automotive

Capacitive Touch

Smart Antenna

In-Cabin

Infotainment

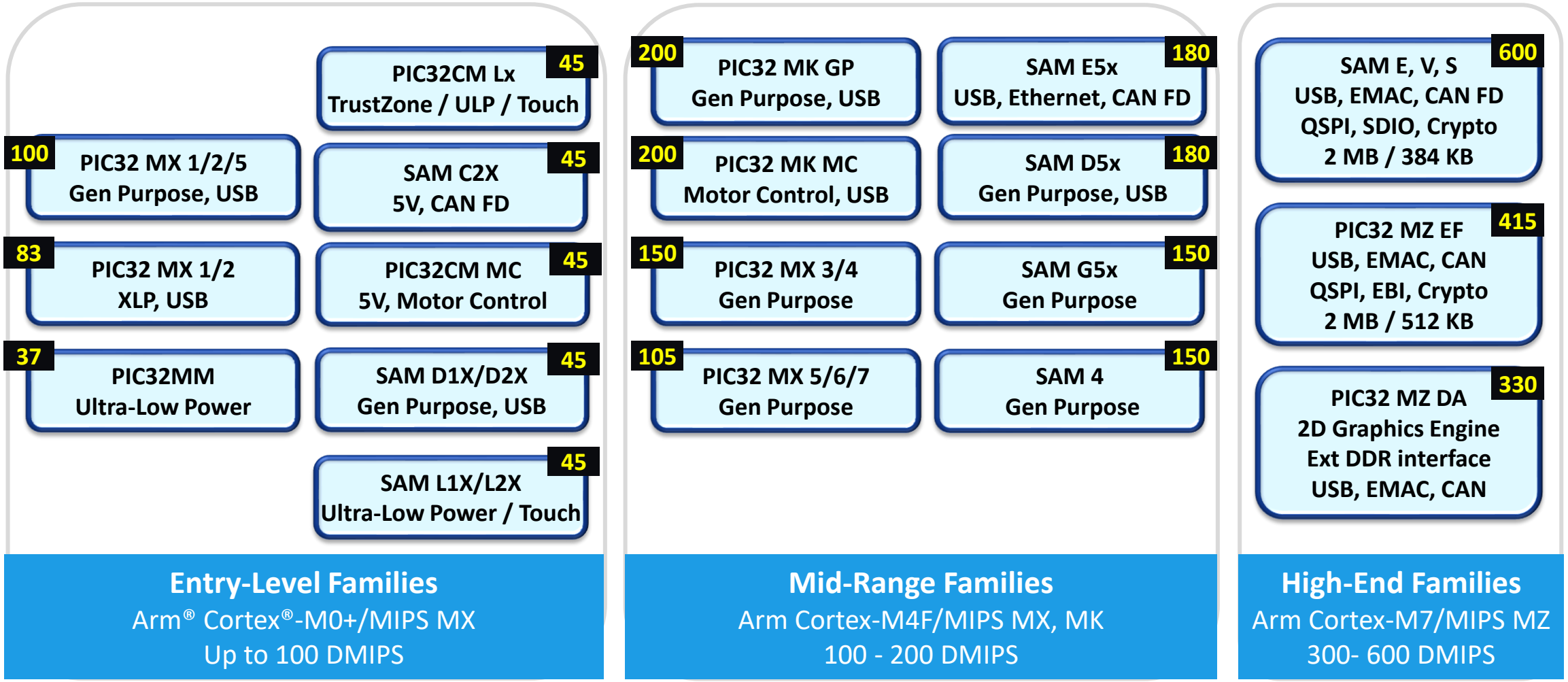
Diagnostics

Server Diagnostic Monitoring

Auto Diagnostic

A Product for Every Need

A Powerhouse 32-bit MCU Portfolio



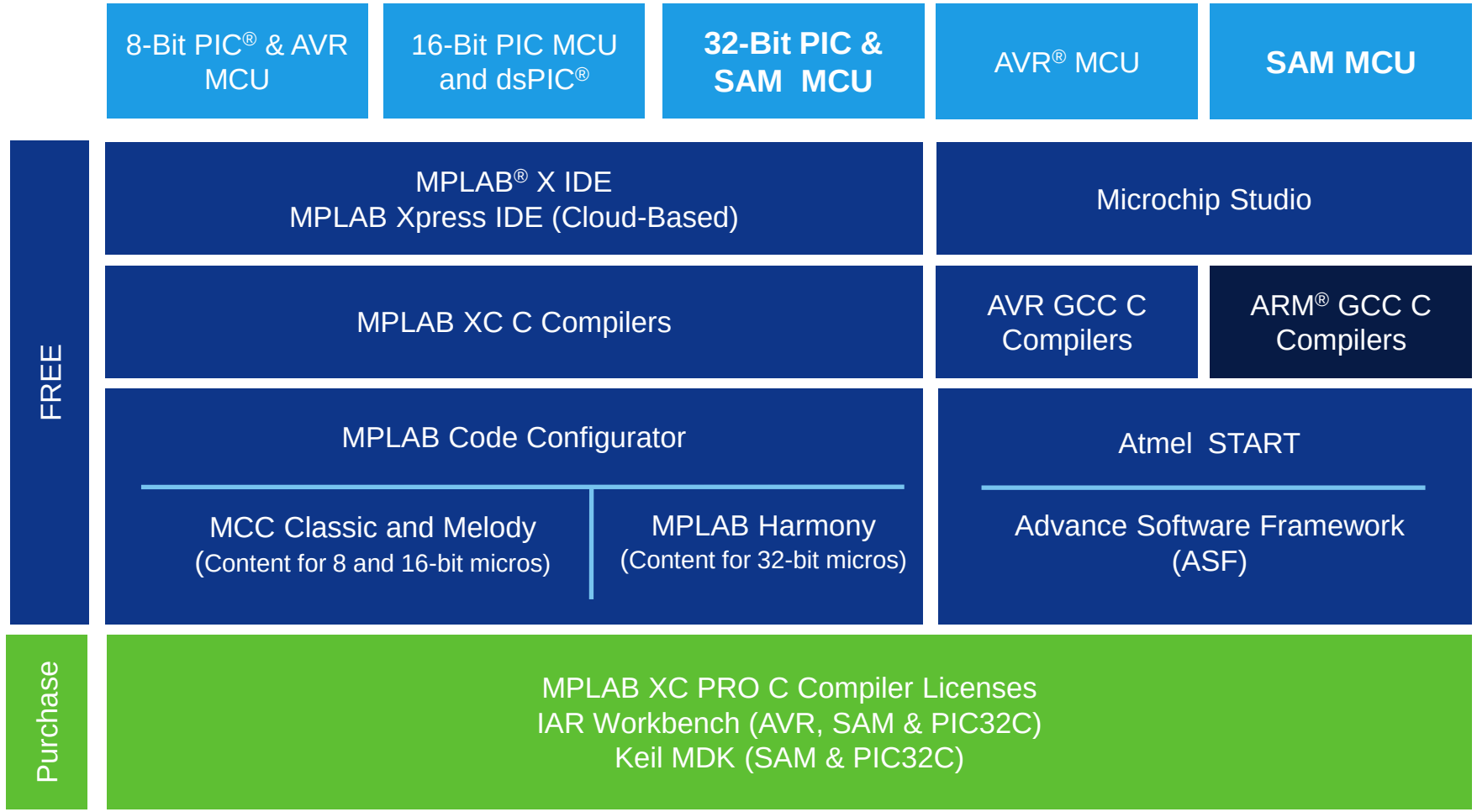
32-bit MCU Key Solutions

Application	Product Differentiation, Embedded Software Integration & Hardware Firmware Optimization
Connectivity	• Large Portfolio with integrated connectivity: CAN FD/CAN, High-Speed/Full-Speed USB, Ethernet/Ethernet-AVB, MediaLB® device • Free high-quality communication stacks (TCP/IP, USB, CAN)
Touch	• Leading capacitive touch solution • Comprehensive software solution and tools
Security	• Scalable security solutions that are fit to application needs • Comprehensive security ecosystem with custom key provisioning support
Graphics	• Visual design tools for effortless graphics design • MPLAB® Harmony and MPLAB Harmony Graphics Suite
Ultra-Low Power	• Power savings leader in active and sleep modes • Fast wakeup, SleepWalking and Event System
Motor Control	• Optimized motor control peripherals • Dev tools, SW algorithms and app notes
Automotive	• Touch, Audio, Ethernet-AVB, MOST®, AUTOSAR, CAN/CAN FD and LIN; AEC-Q100 Grade 1 / Grade 2 qualified
Functional Safety	• IEC 60730: Certified Class B Library for home appliances • IEC 61508: Certified SIL 2/3 Library for industrial applications • ISO 26262: FMEDA, Safety Manual for road vehicles

Featured 32-bit MCU by Functions

Target Functions	Sub-Market	Entry-Level	Mid-Range	High-End	Why Microchip?
Graphics	SLCD	SAM L22	SAM 4L		MPLAB® Harmony & Visual Design Tools: • Reduce time, cost and effort on non-differentiated code • Shorten your time to market
	Low/Mid End Graphics	PIC32MX SAMD	PIC32MX SAMD5x/E5x	PIC32MZ EF SAM S/E/V7x	
	Graphics HW & Acceleration (WVGA)			PIC32MZ DA	
Connectivity	CAN / CAN FD	PIC32MX5 / SAM C21	SAM 4E / E5x PIC32MK	PIC32MZ EF / DA SAM E7x	• Highly integrated connectivity: CAN FD/ CAN, High-Speed USB, Ethernet • Free, professional-grade communication stacks (TCP/IP, USB, CAN) & TLS/SSL security library
	High-Speed USB			PIC32MZ EF / DA SAM S7x	
	Ethernet		SAM E5x PIC32MX 6/7	PIC32MZ EF / DA SAM E7x	
Ultra-Low Power	Low Power in Active Mode; short wakeup time	PIC32CM Lx PIC32MM SAM L	SAM 4L SAMD5x/E5x		• Ultra-low power in active mode • Short wakeup time from sleep • Smart low-power peripherals • Low-power tools
Hardware Security	AES / TRNG (SHA / ECC / RSA / Anti-Tamper)	PIC32CM Lx SAM L11	SAM D5x / E5x	SAM S7x PIC32MZ EF / DA	• Scalable hardware security solutions with various security levels
Touch	Hardware Peripheral Touch (PTC)	PIC32CM Lx / SAM L / SAM D SAM C	SAM D5x / E5x		• No external components required • Superior water tolerance and faster response • Qtouch® library with high robustness and Class B Safety support
Functional Safety	IEC 60730 Class B IEC 61508 (SIL) ISO 26262 (ASIL)	SAM L / SAM D SAM C PIC32MX PIC32CM	PIC32MX/MK SAM D5x / E5x	PIC32MZ EF/DA SAM V7x	• IEC 60730 Certified Class B Library • IEC 61508 (SIL 2/3) Collateral & Certified Library • ISO 26262 (ASIL B) Collateral & Support
Automotive	AEC-Q100 Grade 1 / Grade 2 qualified	PIC32MM PIC32CM SAM D / C SAML1x	SAM D5x / E5x PIC32MK	SAM V7x PIC32MZ EF / DA	• Wide range offering: LIN/CAN FD connectivity, touch, graphics display, high performance • Solutions for E-AVB, MOST® technology, AUTOSAR

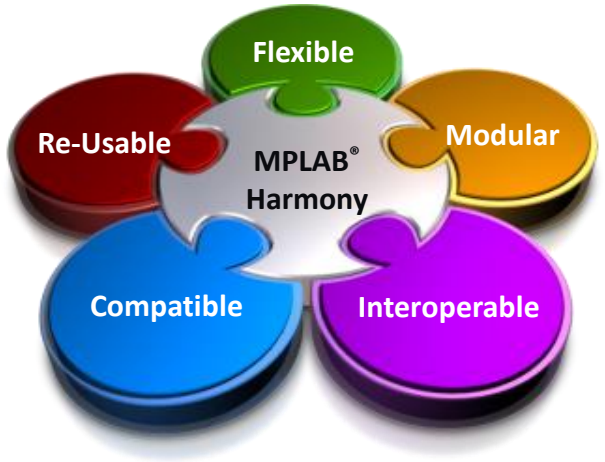
Unmatched Complement of Internal and Third-Party Development Tool Ecosystem



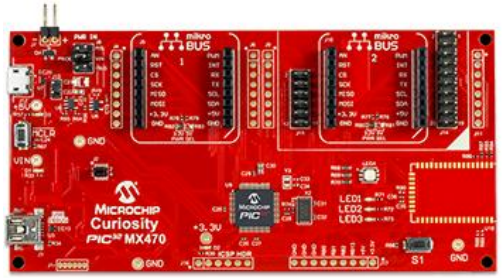
MPLAB® Harmony Speeds Development

An extension of the MPLAB ecosystem to create embedded systems firmware solutions for 32-bit MCU and MPU devices

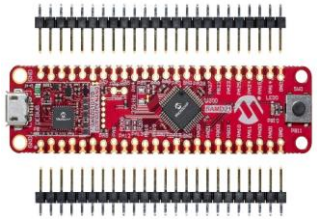
- **MPLAB Harmony v3 provides:**
  - Demo/Example Applications
  - Layered & Modular Libraries
    - Peripheral Libraries
    - Drivers & Services
    - Middleware
  - Software Stacks
    - USB, TCP/IP, Graphics, Security Solutions, Motor Control, Audio, etc.
  - Firmware Reference Model
  - Learn More About MPLAB Harmony



Vast Array of 32-bit Starter Kits and Development Boards



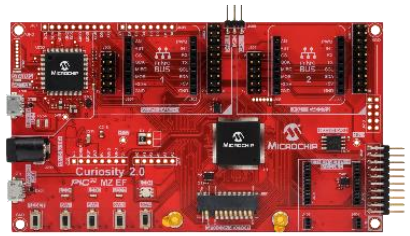
Curiosity PIC32MX470, DM320103



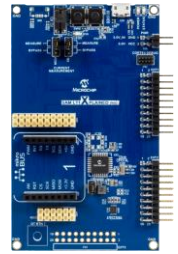
SAM D21 Curiosity Nano Evaluation Kit (DM320119)

SAM IoT-WG EV75S95A

SAM E70 Xplained Ultra (DM320113)



PIC32MZ EF Curiosity 2.0 (DM320209)



SAML11 Xplained Pro Evaluation Kit (DM320205)

maXTouch® Curiosity Pro Board (AC320007)

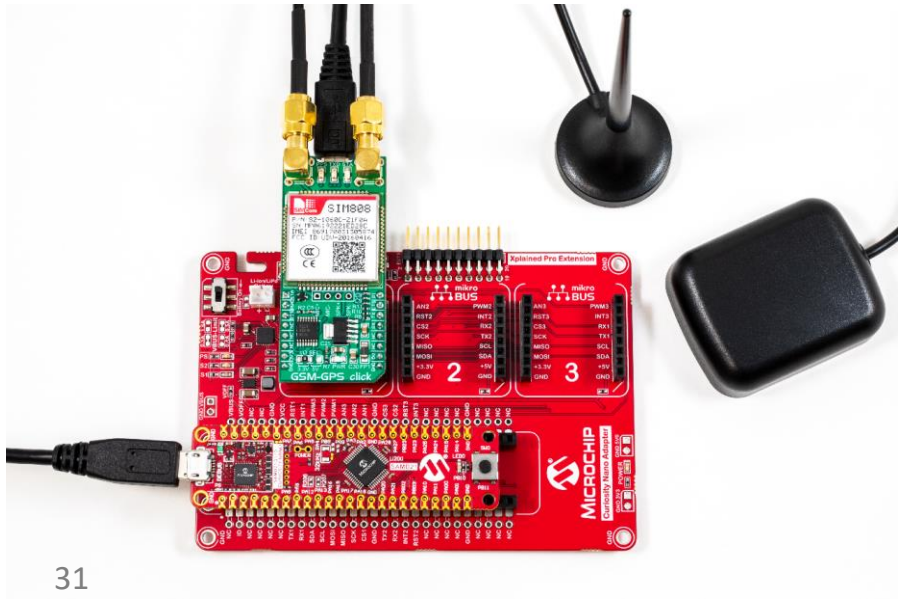
SAM D20 Xplained Pro, ATSAMD20-XPRO

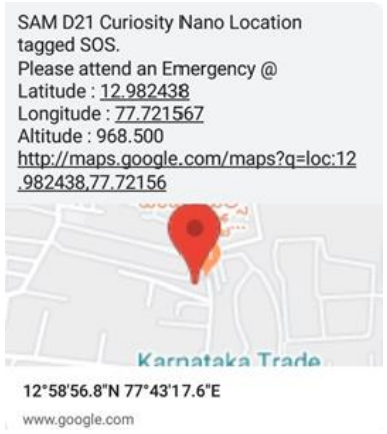
Graphics and Touch, EV14C17A

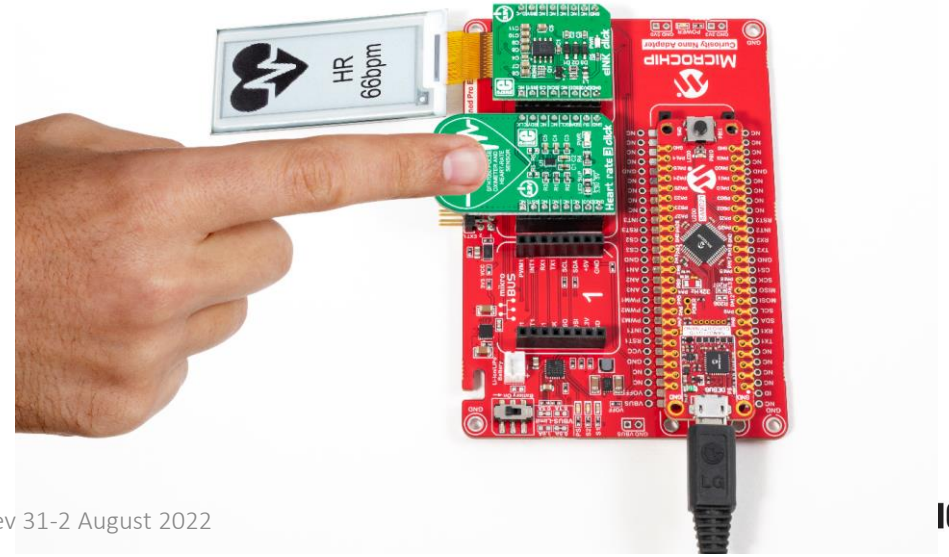
Broad Collection of Solutions

Improve Time to Market

- **32-bit Reference Designs & Solutions** Landing Page
  - Advance your prototyping efforts with our reference designs and solutions, developed using our hardware development boards in conjunction with our extension boards or MikroElektronika Click boards™ and supported by our free-to-use MPLAB® Harmony v3 embedded software development framework.
  - These reference designs are complete hardware and software solutions that include firmware source code, hardware design files and user guides.







Arm®-based Microprocessors Corporate Overview

Your Partner in MPU-based Design

- We reduce your learning curve and risk when designing a microprocessor-based system
- Production-ready System-on-Modules offer optimized and proven reference implementations
- All critical associated ICs from a single supplier
- Microchip software and tools follow our long-life practice
- MPU experts across the world provide training and technical support on-line and on-site

Designed with Microchip MPUs

Smartgrid Gateway

Smart Thermostat

White Goods HMI

PDU

Home & Building Gateway

Payment Terminal

2D Barcode Scanner

Label Printer

Surveillance System

Industrial HMI

Navigation Device

High-end Sound Box

Tracker for Cars or Trucks

Reduce Design Risk and Cost of Ownership

- **SiPs - MPUs w/ integrated DRAM**
  - Fewer PCB layers lowers system cost
  - Simplified PCB layout and reduced EMI risks
  - Removes DRAM obsolescence and price fluctuation
- **SOM – Full MPU System on a Module**
  - Industrial module qualification
    - Speeds PCB design and accelerates time to market
  - Full chip-down support with full design files available
- **MPUCheck now available!**
  - Free Microchip schematic design review service
- **Design and support for long lifecycle**
  - No hardware obsolescence of MPU
  - Long-term software support in Linux® and MPLAB® Harmony

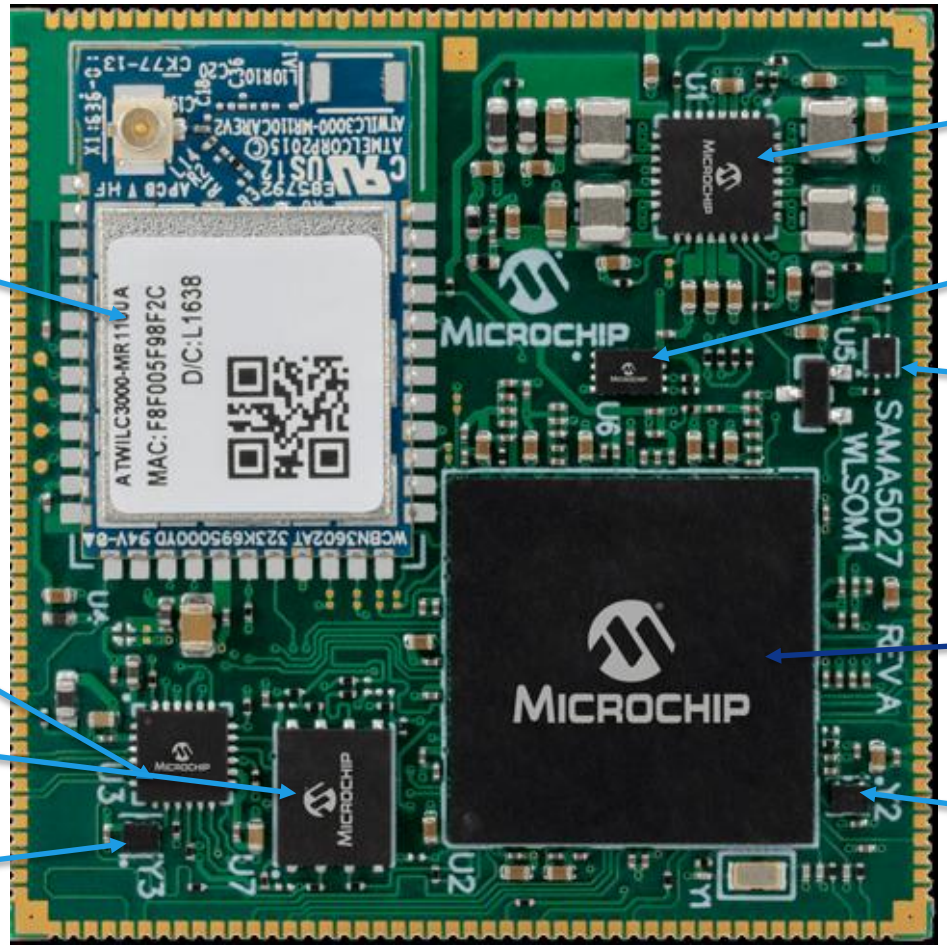
Production-Ready System-on-Modules

Wi-Fi® + BTLE Module
WILC3000

Ethernet 10/100 PHY
KSZ8081

64 Mb QSPI
SST26VF064

25 MHz Clock Oscillator
DSC6102



PMIC
MC16502

Secure Element
ECC608

Analog Comparator
MIC842

32-bit MPU
SAMA5D2 SiP

24 MHz Clock Oscillator
DSC6003

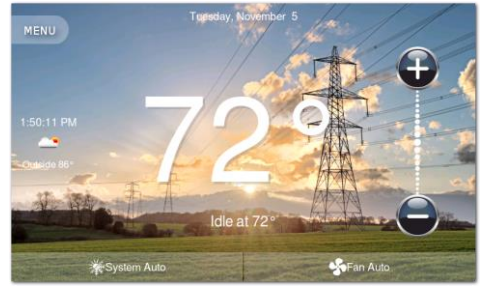
Linux® Benefits

- **Solid and proven code base**
  - Linux mainline review and acceptance process is known to be very demanding
- **Access to the largest developer's community**
  - Plethora of qualified Linux developers
  - Benefit from the support and reviews by the community
- **Ready-to-use and plug and play**
  - Largest set of device drivers, middleware and application layers for the embedded market, free of charge
- **Peace of mind**
  - Long life support

Ensemble Graphics Toolkit (EGT)

Create High-Performing Graphics with a Lower BOM Cost, Smaller Memories and Lower Power Consumption

- **Open-Source Linux® Graphical Display Development Software optimized for Microchip MPUs**
- **Anti-aliased 2D vector graphics with extensive widget, animation and effects libraries**
- **Enables multimedia playback on all supported Microchip MPUs**
- **Supports import of graphical assets from industry standard tools**



Scalable Graphics Solutions Across Platforms

Performance to Suit Your Needs

SAM D21 +OLED

SAM E54 +HVGA

PIC32MZ EF +WVGA

SAM E70 +WQVGA

PIC32MZDA + WVGA

MPLAB® HARMONY GRAPHICS SUITE

SAM9X60 + WVGA

SAMA5D2 + WVGA

Linux

ENSEMBLE GRAPHICS TOOLKIT

Ensemble Graphics Toolkit – Linux®

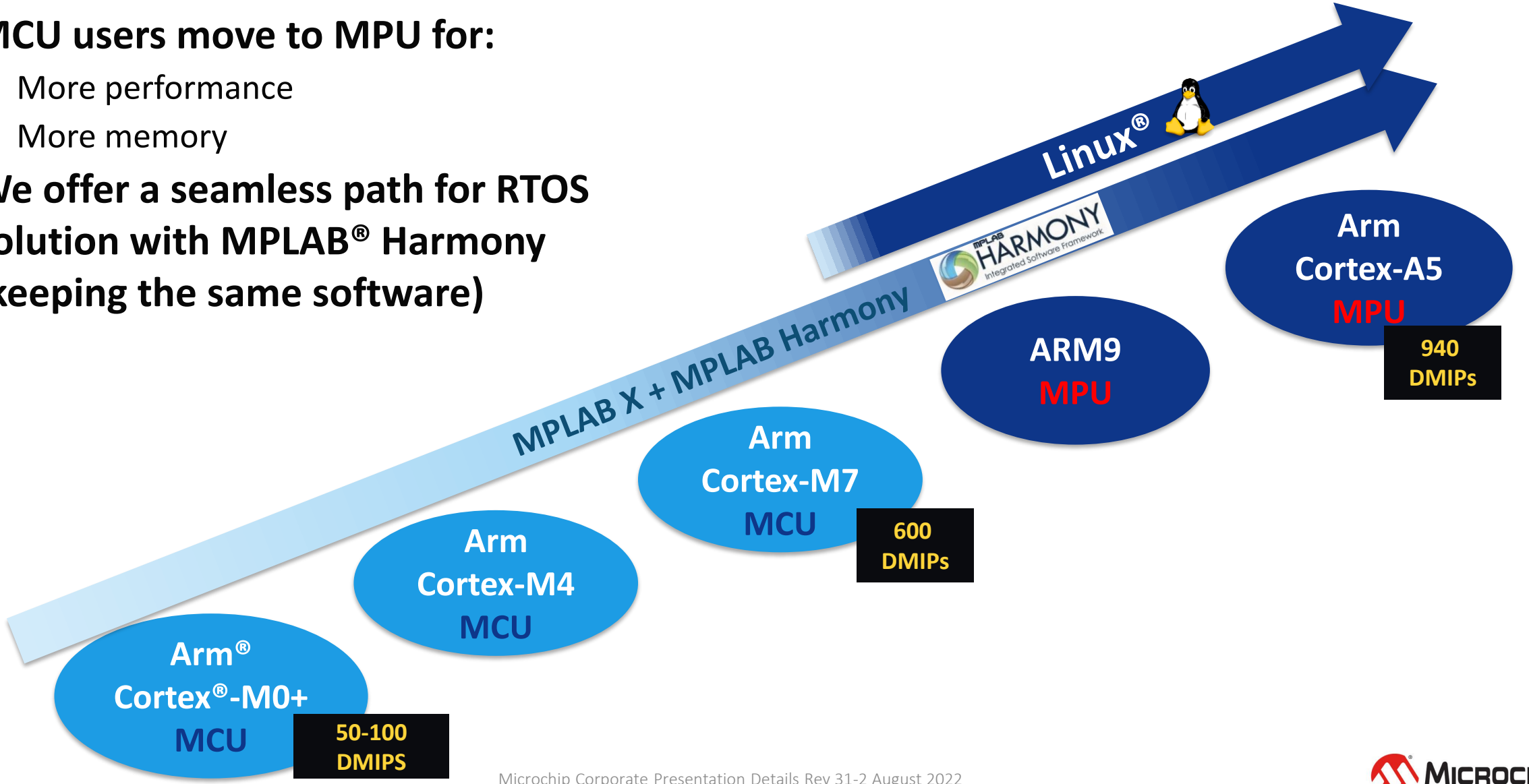
MPLAB® Harmony Graphics Suite – Bare-Metal / RTOS Designs

Display

Performance

A Seamless Migration Path From MCU to MPU

- **MCU users move to MPU for:**
  - More performance
  - More memory
- **We offer a seamless path for RTOS solution with MPLAB® Harmony (keeping the same software)**



Wireless Products

Microchip Wireless Solutions

Bluetooth® Audio	Bluetooth Low Energy	Wi-Fi®	802.15.4 Zigbee®	LoRa®	Car Access	Voice and Audio	Medical
Bluetooth®		Wi Fi™	MiWi™	LoRa®			
Headsets Earbuds Smart Speakers	IoT Devices Connected Sensors Home Automation	IoT Devices Home Automation Industrial Automation	Lighting Home Automation Metering Smart Cities	IoT Sensors Smart Cities Smart Agriculture	Keyless Entry	Speech Recognition Security Cameras	Hearing Aids Medical Implants Medical Monitoring Ingestible Capsules

Available Wi-Fi® Modules

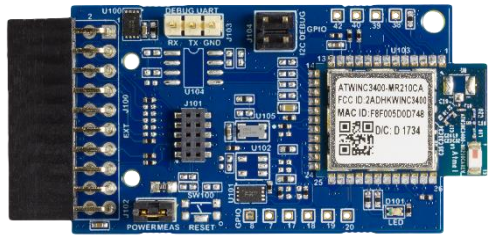
								
	ATWILC1000	**ATWILC3000 (+Bluetooth®)**	**ATWINC1500 (4 Mb Flash)**	**ATWINC1510 (8 Mb Flash)**	**ATWINC3400 (+Bluetooth)**	**ATSAMW25**	**WFI32E01**
802.11 Radio	b/g/n						
Tx Power	+18 dBm	+18 dBm	+18 dBm	+18 dBm	+17 dBm	+17 dBm	+20 dBm
Antenna	PCB/ Ext					PCB	PCB/Ext
TCP/IP Stack	External MPU/MCU		On Module				
MCU Support	Any 32-bit MPU/MCU	Any 32-bit MPU/MCU	Any 8-/16-/32-bit	Any 8-/16-/32-bit	Any 8-/16-/32-bit	Arm® Cortex®-M0 MCU Integrated	32-bit MIPS32® micro-Aptiv M-class 200MHz
Certifications	WFA, USA, Canada, China, Europe, Japan, Korea, Taiwan, India	Over 70+ Countries	WFA, USA, Canada, China, Europe, Japan, Korea, Taiwan, India			USA, Canada	USA, Canada, Europe

Arm and Cortex are registered trademarks of Arm Limited (or its subsidiaries) in the EU and other countries.

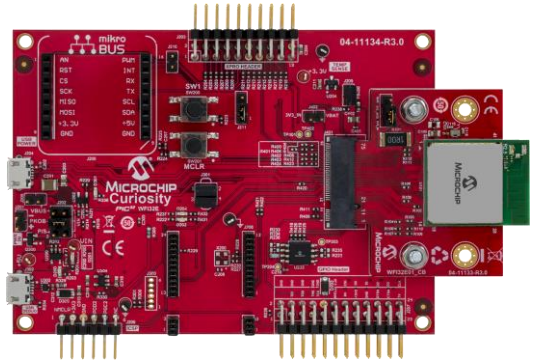
Microchip Wi-Fi® Evaluation Kits

ATWILC1000-SD
Linux® Evaluation Kit

ATWINC1500-XSTK
Xplained Pro Starter Kit



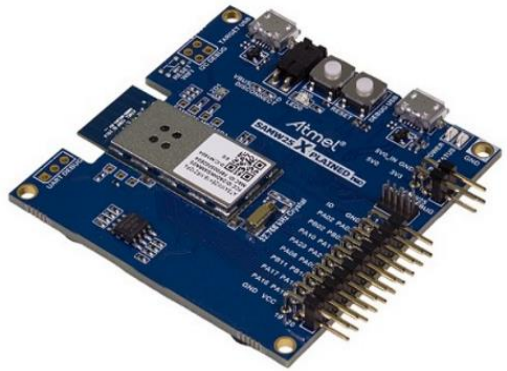
ATWINC3400-XPRO
Xplained Pro Starter Kit



PIC32 WFI32 Curiosity
Board (EV12F11A)

ATWILC3000-SD
Linux Evaluation Kit

Wi-Fi Smart Device
Enablement Kit
(AC164165)



ATSAMW25-XPRO
(ATWINC1510+D21+ECC508)

Microchip is offering Total System Solutions

Full Product Lifecycle Support

Microchip MCU 開發工具概要

Development Tool Ecosystem

DISCOVER

Feature Application Software

MPLAB DISCOVER

CONFIGURE

System Init.
Device Init.
Peripheral Init.

MPLAB CODE CONFIGURATOR

MPLAB HARMONY

DEVELOP

IDEs, Compilers
Example Code
Software Stacks

MPLAB DEVICE BLOCKS FOR SIMULINK

MPLAB X IDE

MPLAB POWERSMART DEVELOPMENT SUITE

MPLAB XPRESS IDE

MPLAB XC COMPILER

MPLAB MINDI ANALOG SIMULATOR

MICROCHIP STUDIO FOR AVR® AND SAM DEVICES

code plan release deploy operate monitor test build CI CD

GCC

MPLAB MOTORBENCH DEVELOPMENT SUITE

DEBUG

Evaluation Boards
Debuggers
Data Visualizer

MPLAB ICD4

MPLAB SNAP IN-CIRCUIT DEBUGGER

MPLAB PICKIT 4 IN-CIRCUIT DEBUGGER

MPLAB DATA VISUALIZER

MPLAB ICE 4

QUALIFY

Functional Safety
Code Profiling
Code Coverage
MISRA Check

TÜV SÜD

MPLAB ANALYSIS TOOL SUITE

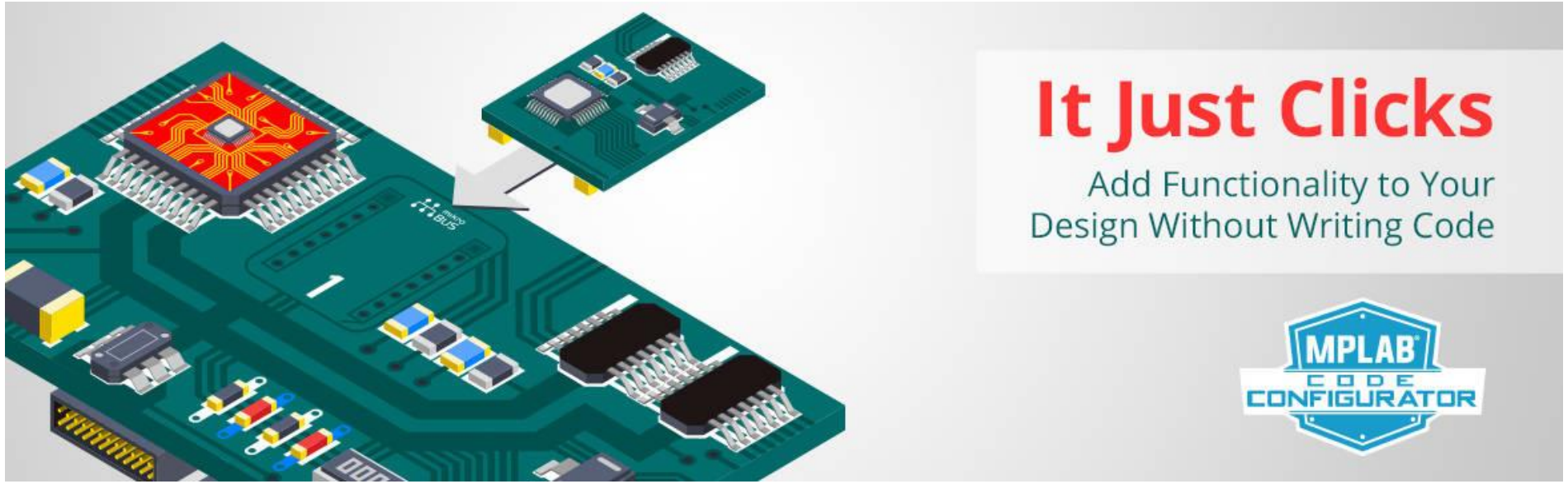
PRODUCTION

Programmers
Prog. Center
Third Party

Softlog Systems

MPLAB IPE

MPLAB Code Configure



- Free graphical programming environment
- Intuitive interface to quick-start development
- Automated configuration of peripherals
- Accelerates generation of production-ready code

MPLAB Harmony Configure

- Free development environment
- Easy-to-use graphical configuration features
- Point-and-click options selections
- Optimized peripheral libraries to simplify device setup
- Modular downloads and updates through GitHub
- Easy integration with FreeRTOS

開始專案的開發

- **Pick your operating system: Windows®, Linux® and macOS®**
- **Pick your compiler: MPLAB® XC, GCC or third-party**
- **Pick your programmer/debugger:**
  - MPLAB ICE 4, MPLAB ICD 4, MPLAB PICkit™ 4, MPLAB Snap
  - Atmel-ICE
  - Third-party
- **Extensions let you do even more!**

開發用的 Debug 工具

MPLAB® SNAP IN-CIRCUIT DEBUGGER

MPLAB® PICkit™ 4 IN-CIRCUIT DEBUGGER

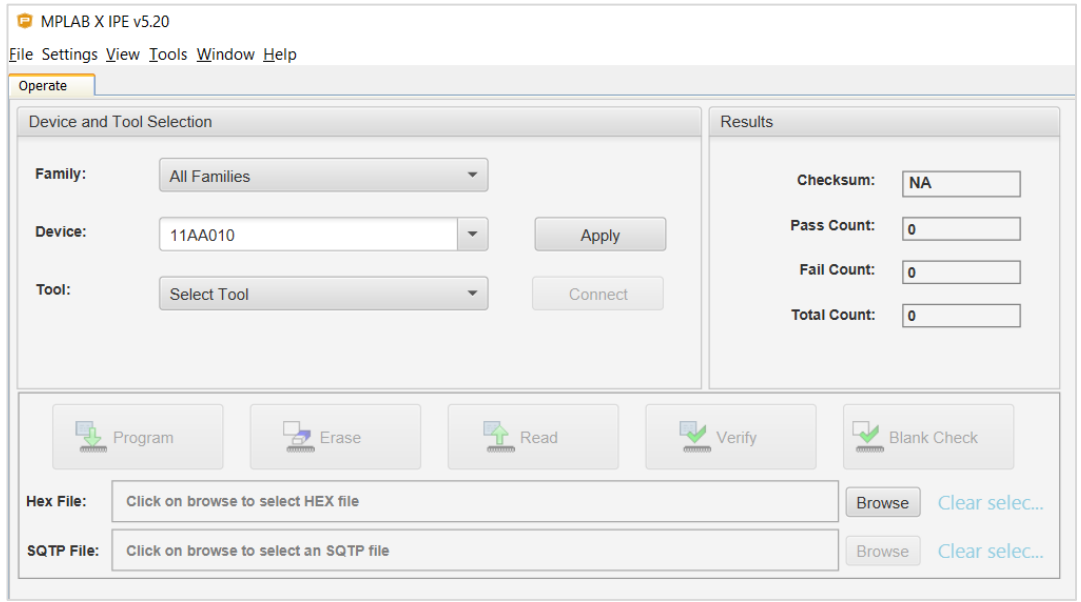
MPLAB® ICD 4

MPLAB® ICE 4

Debug

Feature	MPLAB® Snap	MPLAB® PICkit™ 4	Atmel-ICE	Power Debugger	MPLAB® ICD 4	MPLAB® ICE 4
Devices Supported	All	All	AVR, SAM	AVR, SAM	PIC, dsPIC, SAM	All
USB Powered	✓	✓	✓	✓	✓	✓
Over Voltage/Current Protection		✓	✓	✓	✓	✓
Software Breakpoints	✓	✓	✓	✓	✓	✓
Programmer-to-Go		✓				
Trace			✓	✓		✓
Power Measurement/Profiling				✓		✓
Price	$34.09	$76.99	$177.09	$252.99	$328.89	$1799.00

Production



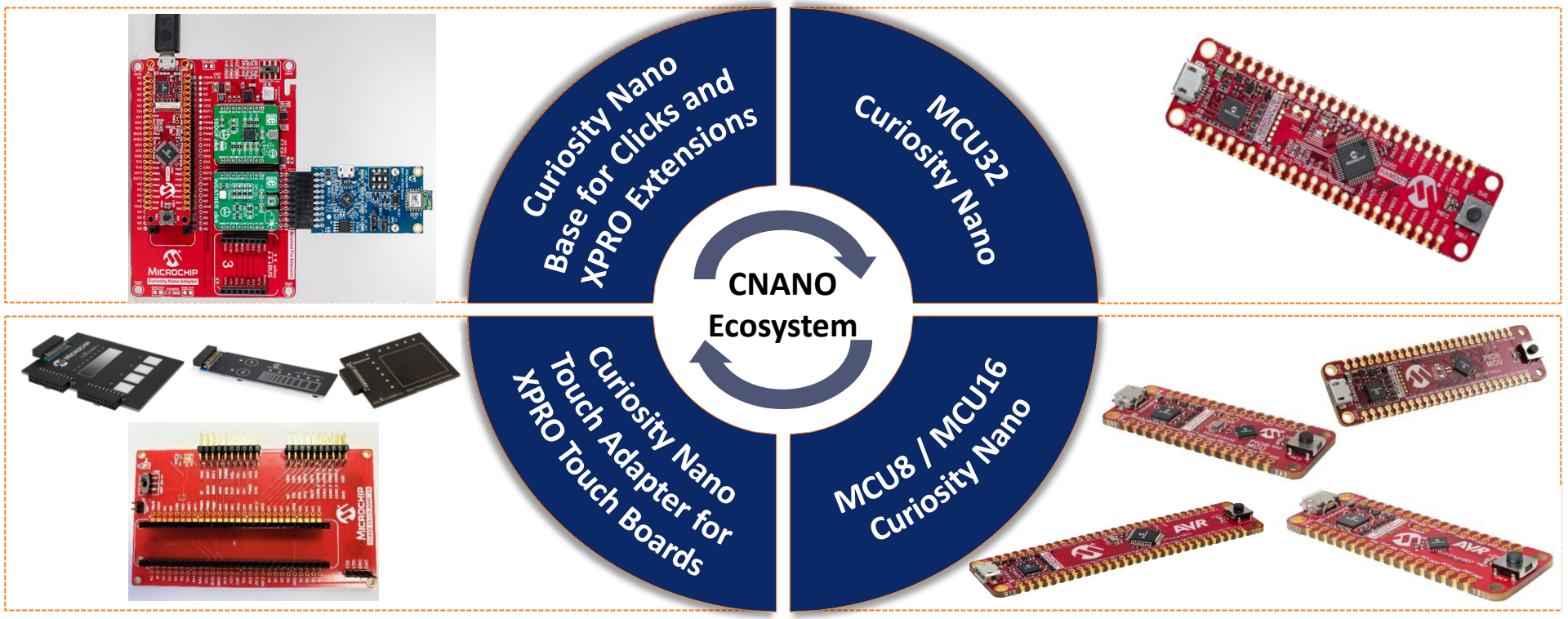
- **MPLAB® IPE**
  - Programming-only environment
    - Easy technician views
    - Loadable configurations for quick set-up
    - Use with your favorite MPLAB programmer or third-party programmers
      - SEGGER J-Link Programmer
      - Softlog gang programmers
- **Pick your device: PIC®, dsPIC®, AVR® and SAM**
- **Pick your operating system: Windows®, Linux®, and macOS®**

Microchip MCU 的入門開發平台
Curiosity Nano Platform

Curiosity Nano Development Ecosystem

Fully Integrated platform for 8-, 16- and 32-bit MCUs

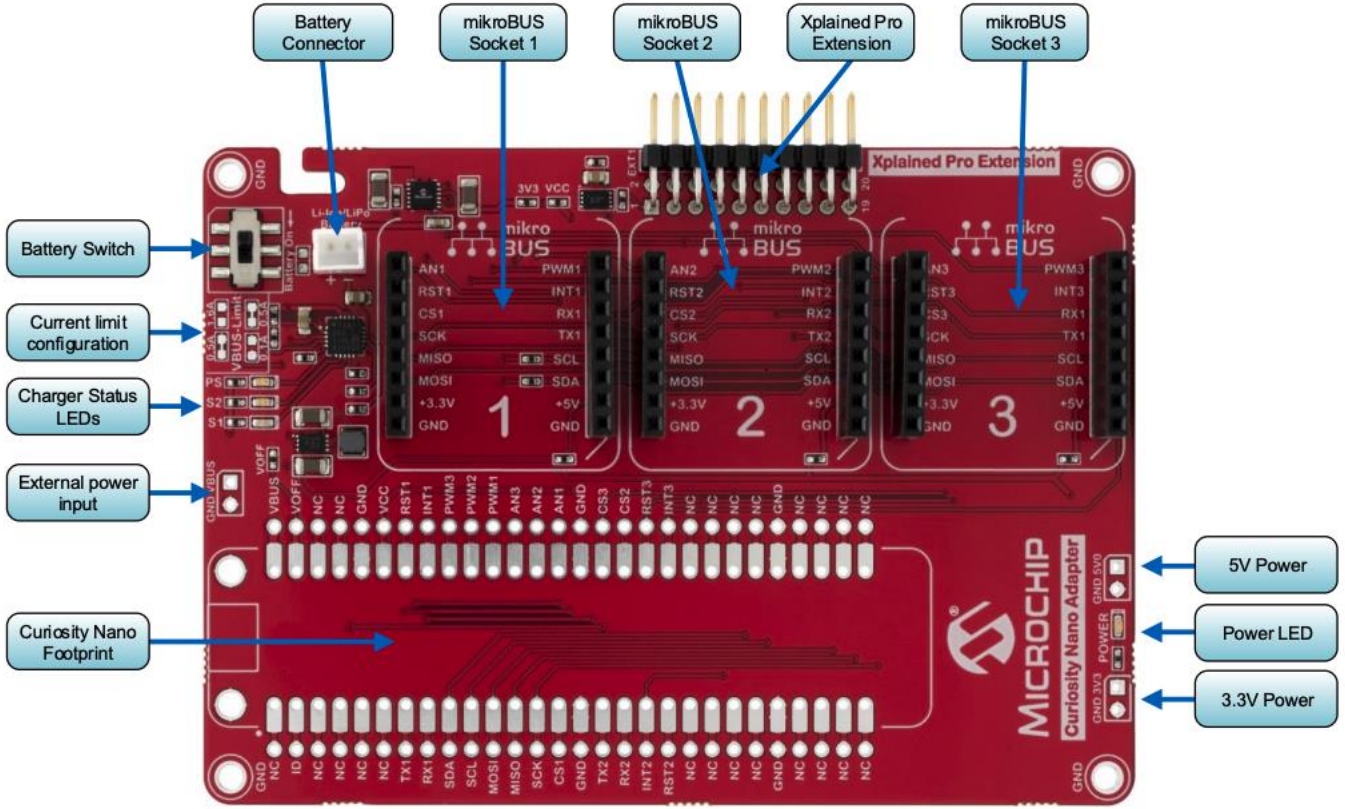
- **Standardized features, interfaces and design methodology, scalable from 8-/16-bit MCU for higher performance, to easily evaluate different architectures**
- **Lower cost entry point for device evaluation**
- **Full on-board programming and debug support**

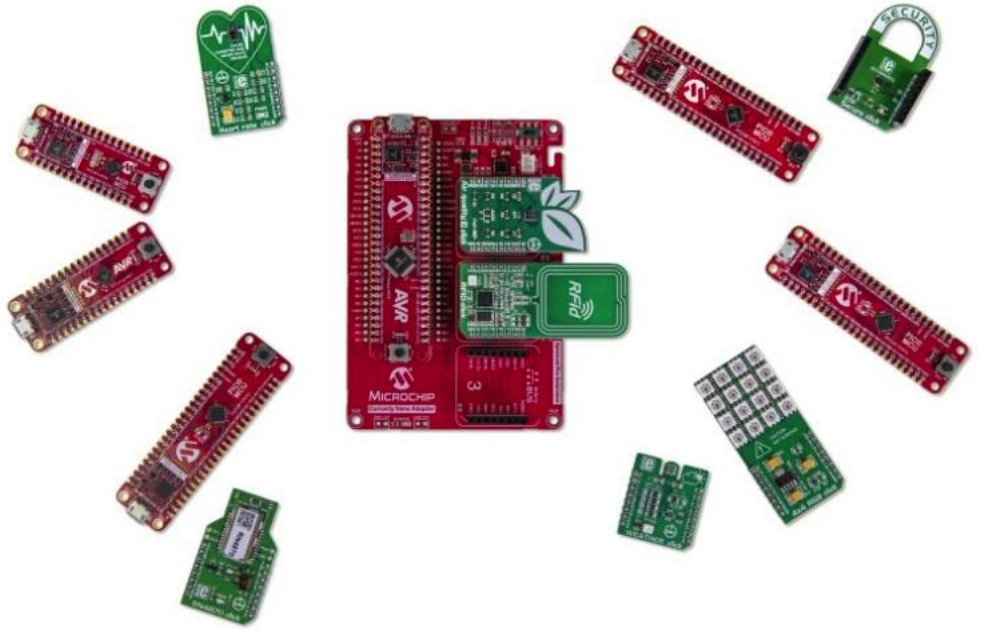


MICROCHIP

Microchip Curiosity Development Platform - AC164162

適用於多種開發平台的實驗平台





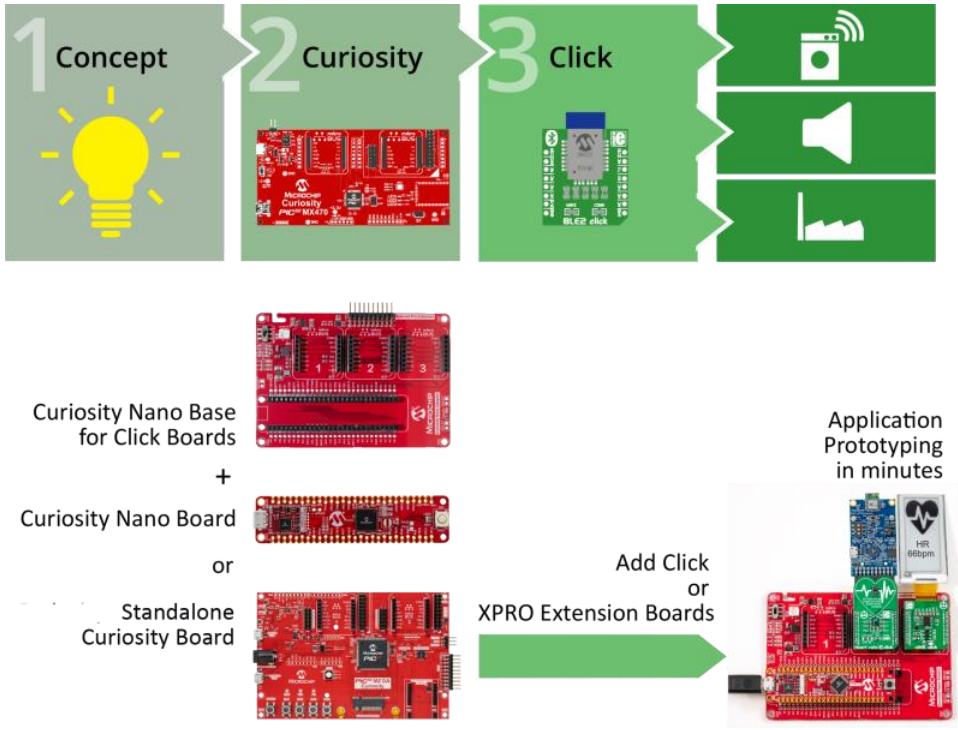
Rapid Prototyping with Curiosity Platform

New Web Landing Page to be launched

- **Expand your design:**
  - Add functionality quickly and effortlessly to your project using the vast selection of XPRO and Click extension boards
  - Save your tools investment through tool re-use.

- **Save your development time**
  - Complete supporting development ecosystem: free MPLAB® IDE, functional safety qualified complier and MPLAB Harmony software development framework

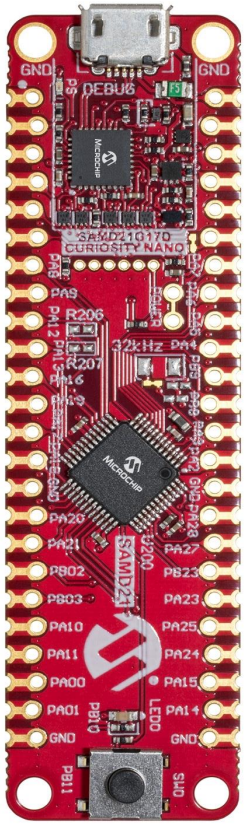
- **We have you back up with everything you need for a rapid prototyping:**
  - Hardware boards & expansion boards to support system design
  - Software tools and free software libraries such as USB, TCP/IP, motor control and graphics
  - Ready to use standalone application demo examples



MICROCHIP

Curiosity Nano Board Roadmap

Released



SAM D21

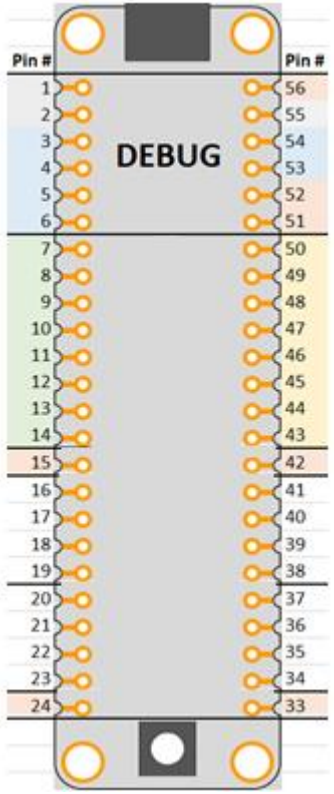
Released

SAM E51

Released

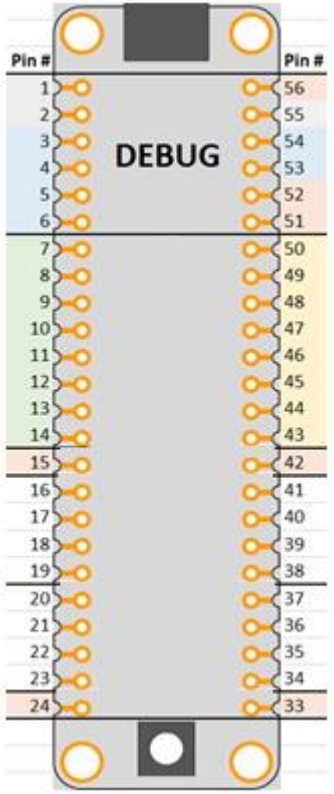
PIC32CM MC

Proposed



PIC32CM LS

Proposed



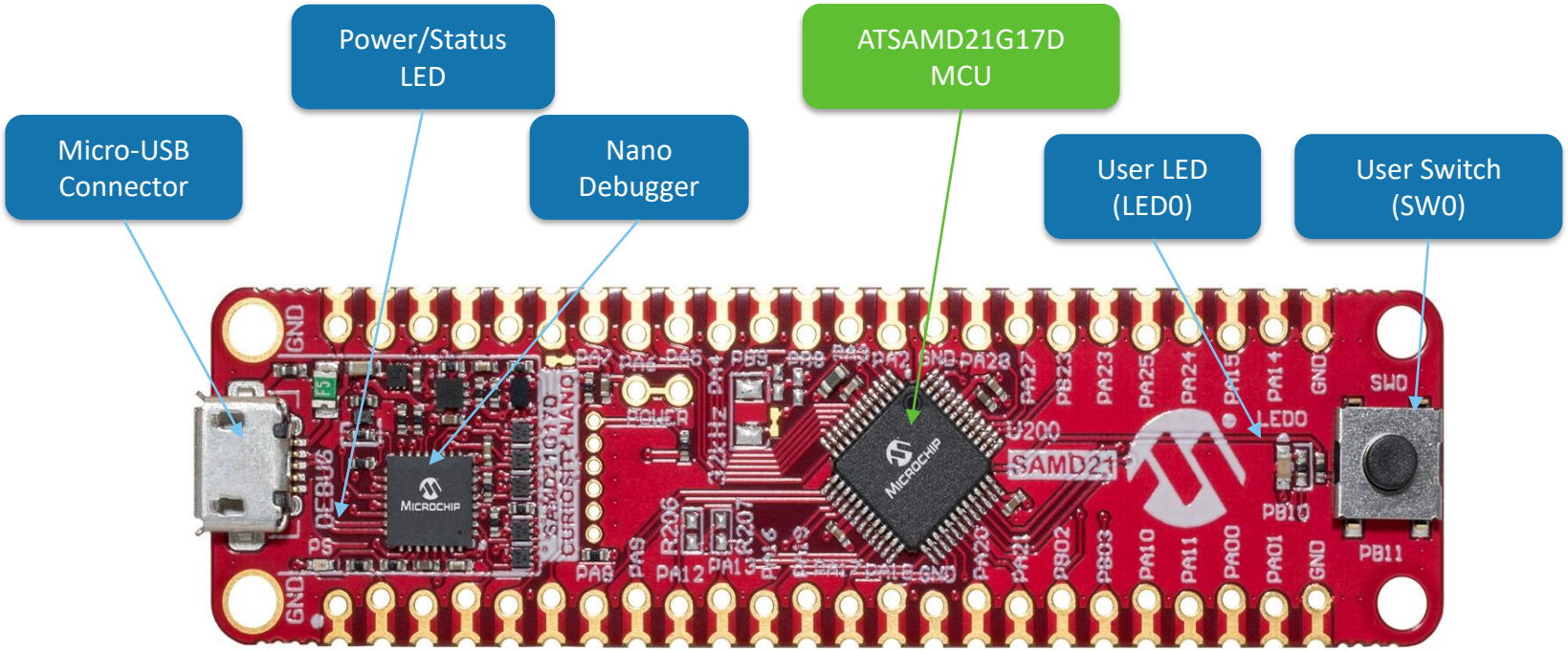
PIC32CM JH
(On hold)

MICROCHIP

SAMD21 Curiosity Nano

- SAM D21 Curiosity Nano (DM320119)
  - Available NOW; Resale Price: ~$15
  - SAMD21G17D (128Kb Flash/16Kb RAM)

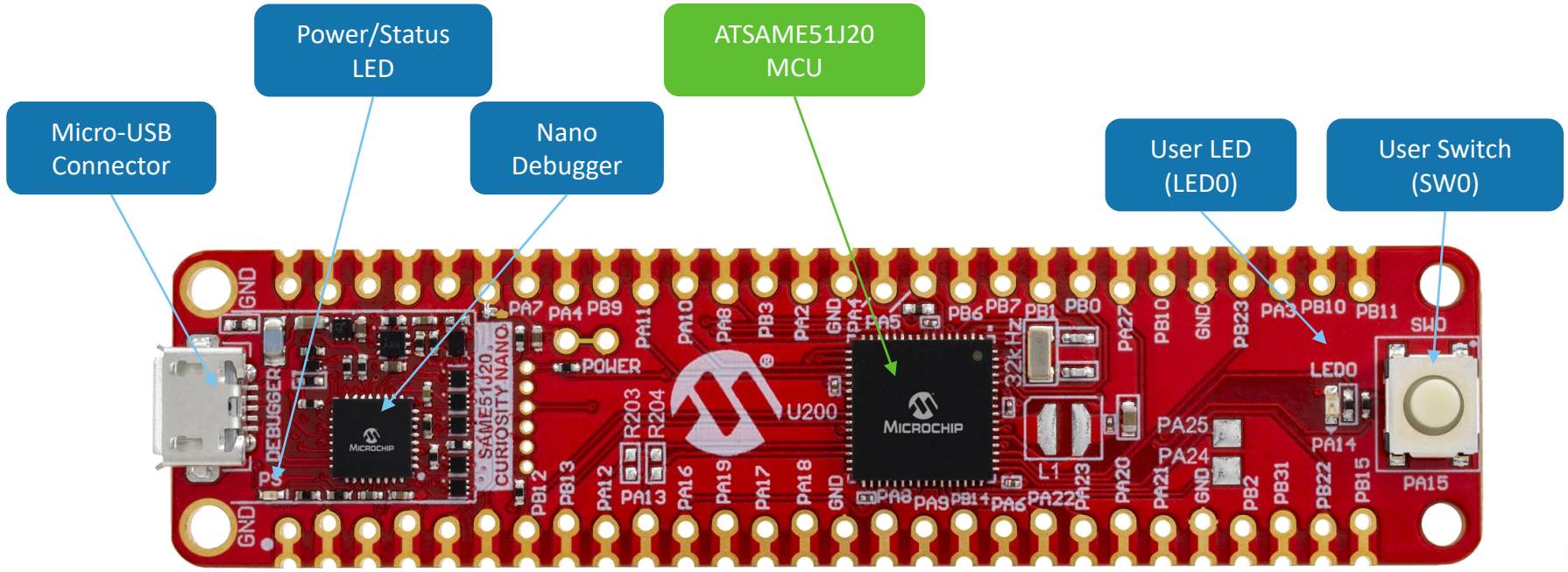
- **Application Demos**
  - Location Tagged SOS Application Demo
  - Fitness Tracker Application Demo
  - BLE based Weather Station and Motion Sensor Application Demo and more



MICROCHIP

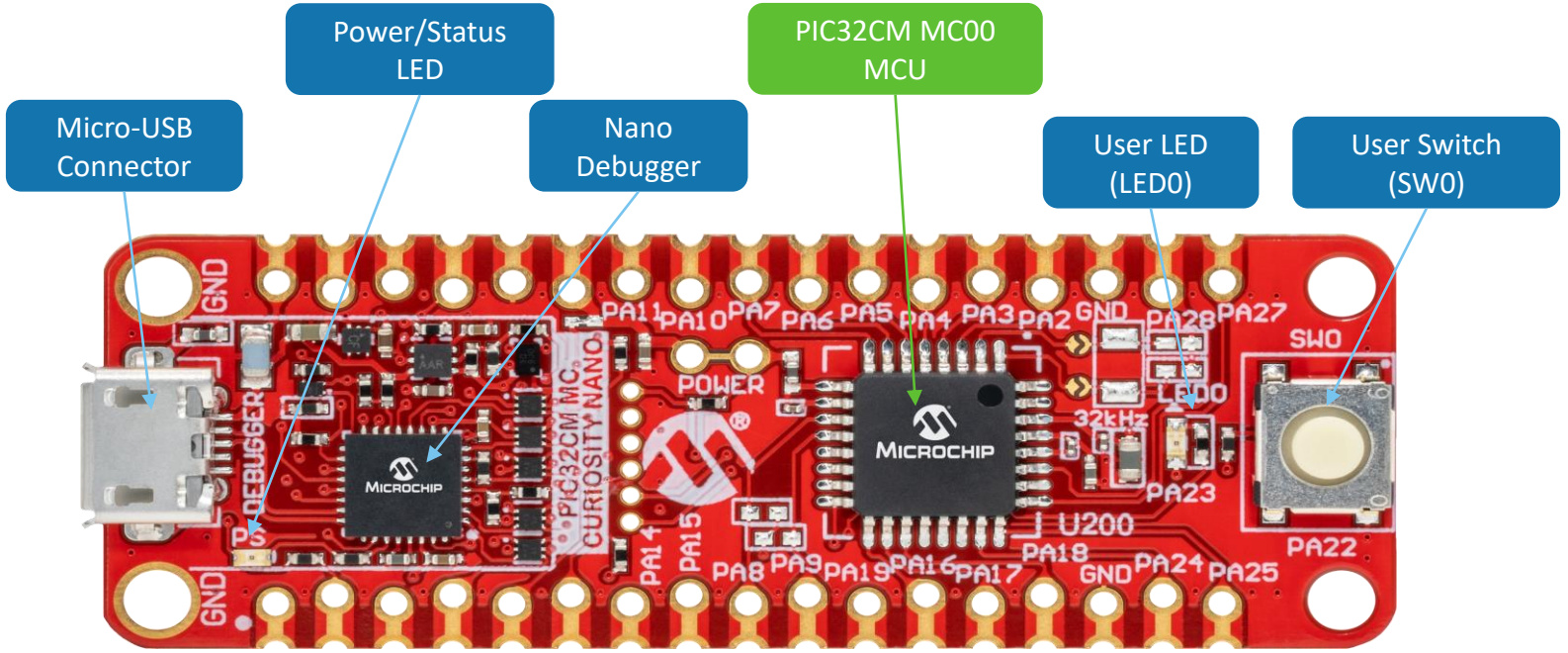
SAME51 Curiosity Nano

- SAM E51 Curiosity Nano (EV76S68A)
  - Available NOW; Resale Price: ~$15
  - SAME51J20 (1MB Flash/256KB RAM)
  - Supports CAN FD interface
- **Application Demo**
  - BLE Fitness Tracker Application Demo and more



PIC32CM MC00 Curiosity Nano

- PIC32CM MC00 Curiosity Nano (EV10N93A)
  - Resale Price: ~$15
  - SAME51J20 (1MB Flash/256KB RAM)
  - Supports CAN FD interface
- **Application Demo**
  - PIC32CM MC00 Getting Started Guide
  - Smart Appliance Control
  - Smart Tag Google Cloud IoT Core Application

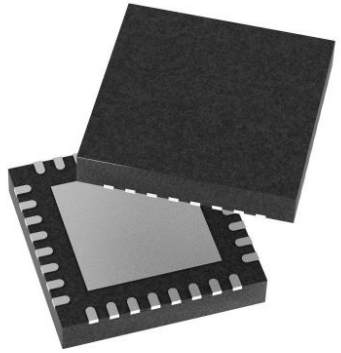


MICROCHIP

Microchip 有關的開發資源

Microchip Developer Help

https://www.microchip.com/en-us/education/developer-help



Learn Products

Learn what our products do, how their features work and how to configure them for your applications.

Learn More

Learn Solutions

Learn from application examples, code samples and how to configure our products to work in your application.

Learn More

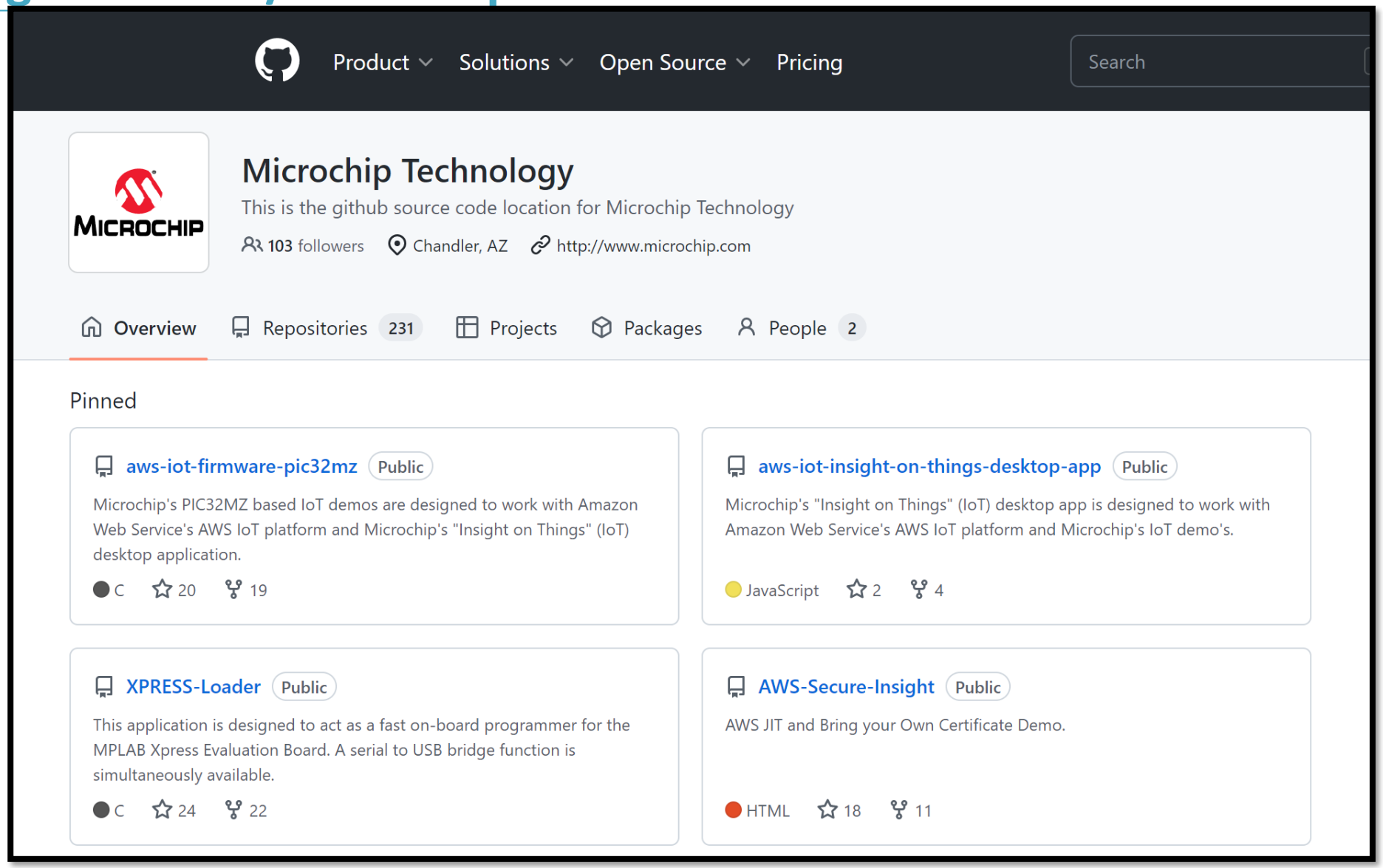
Learn Tools and Software

Learn how to use our development tools, both hardware and software, how to install them and how to get the most out of them when developing your application.

Learn More

Microchip in Github開放社群

https://github.com/microchiptech



Microchip in Youtube

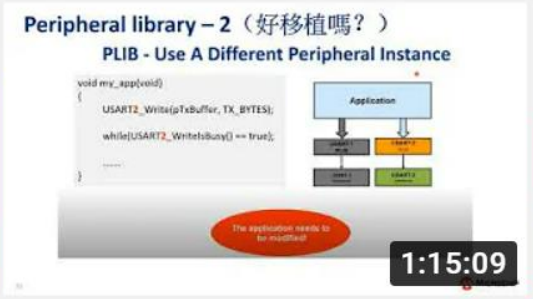
https://www.youtube.com/channel/UCtVXD_KbnLtfC1aTYY7ds2A/videos

2022 MU 選粹-1：使用 MPLAB® Harmony v3 周邊...

觀看次數：244次 • 6 個月前

2022 MU 選粹-1：使用 MPLAB® Harmony v3 周邊...

觀看次數：173次 • 6 個月前



2022 MU 選粹-2：使用 MPLAB® Harmony v3 軟體...

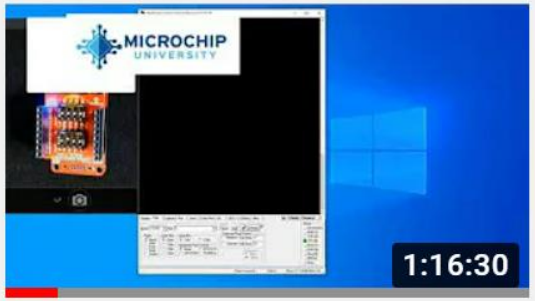
觀看次數：125次 • 6 個月前

Microchip FPGA 的低功耗應用

觀看次數：113次 • 8 個月前

玩轉MPLAB® X IDE技巧與提示實戰

觀看次數：683次 • 10 個月前



密碼學入門及實作探討

觀看次數：352次 • 10 個月前

Wi-Fi® SOC模組WFI32 (II) –– 參考範例應用篇

觀看次數：303次 • 11 個月前

Wi-Fi® SOC模組WFI32 (I) –– 介紹及軟體應用篇

觀看次數：248次 • 11 個月前

Microchip 台灣網站及討論區

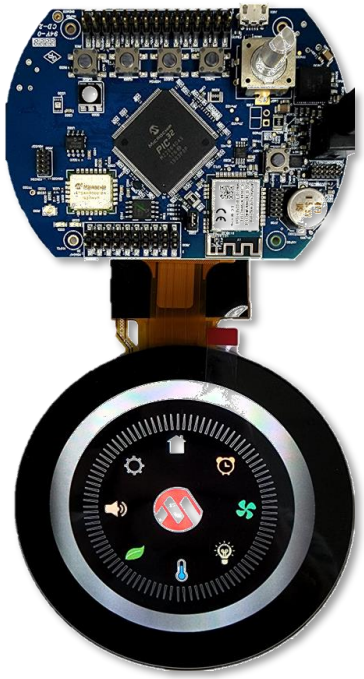
www.microchip.com.tw

Training Resource

Microchip CAE 空中教室 每周四下午 3:00 與 4:00
一周兩堂課, 每堂一小時的線上直播課程
所有課程皆由 Microchip台灣 CAE團隊 講師群主講
學習Microchip 開發工具與設計 8/16/32-bit MCU 的應用程式

學習 MPLAB Harmony Graphics Suite (MHGS) 與
PIC32MZ DA Radio Graphic Development Board (RGDB) 的
PIC3001GFX 課程將於 11月24日 開課, 請上台灣官網查看

www.microchip.com.tw



MICROCHIP

Training Resource - 校園菁英班

- 寒暑假開課、活動將於開課前公告於台灣網站接受報名

二、 活動規劃

活動預定錄取人數，請參閱下表。依報名先後順序錄取至額滿為止。

場次	時間	地點	預定人數
「微控制器校園菁英班」 課前準備日	2022/07/25[1]	線上虛擬教室[2]	A+B 班[3]
「微控制器校園菁英班」 實作訓練課程 校園菁英班(A)	2022/07/26 - 27[4]	線上虛擬教室	60[5]
「微控制器校園菁英班 實作訓練課程 校園菁英班(B)	2022/07/28 - 29[6]	線上虛擬教室	60

(線上虛擬教室使用 Microsoft Teams 軟體，請報名老師、學員務必註冊 Microsoft 帳號)

https://mu.microchip.com

可以選擇中文目錄來指定有中文字幕的課程或直接選擇 English Catalog

https://mu.microchip.com

MICROCHIP UNIVERSITY

漢語 登入

MICROCHIP UNIVERSITY

Microchip has been delivering superior learning for our clients over the last 23 years at our annual users' conference. Our goal for the new online Microchip University Program is to provide you with all the same information you need to design robust embedded control systems with Microchip solutions. All Microchip University courses are being offered for free at this time.

New classes are being added all the time - check back often to see new additions!

English Catalog | 中文目录 | 中文目錄 | 한국어 카탈로그

78

MU 現有超過 50 個不同的課程並陸續增加中

All Courses

All courses currently offered are listed below. New classes will be added on a monthly basis.

Syntax And Structure of C (免費, 132 分)

Fundamentals of the C Programming Language

Advanced C Programming (免費, 206 分)

This course covers many advanced concepts of the C programming language for embedded applications.

C Programming: Linked List Data Structures (免費, 59 分)

Learn how to use Linked List Data Structures to make your data access easier and more flexible

Intro to the MPLAB® X IDE (免費, 33 分)

This class covers the basics of the MPLAB X IDE. [English and Spanish subtitles available]

MPLAB® X Tips & Tricks (免費, 90 分)

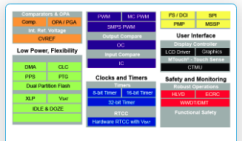
This is a collection of extremely useful tips and tricks that will help you get the most out of MPLAB® X. New tips added on 8/13/2021!

MPLAB® Code Configurator (免費, 74 分)

MPLAB® Code Configurator (MCC) for Simplified Embedded Software Development

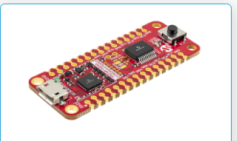
Visual Debugging with MPLAB® Data Visualizer (免費, 41 分)

In this class, we'll use MPLAB® Data Visualizer as a plugin to MPLAB X IDE to plot real-time data from PIC®, AVR® and SAM MCUs using the Curiosity Nano Platform, and Xplained Pro platforms.



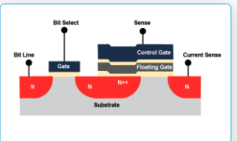
Creating Unique Digital and Analog Functionality by Interconnecting Core Independent Peripherals (CIPs) (免費, 90 分)

This class will cover in detail a number of applications that utilize multiple Core Independent Peripherals (CIPs) to simplify the design of different circuits.



Rapid Prototyping with the Curiosity Nano Platform (免費, 56 分)

This course will help you to get the most out of the Curiosity Nano development platform



NVRAM and EEPROM Selection and Design (免費, 52 分)

This class is an overview of external non-volatile memories

79

MU 最方便的入口：www.microchip.com.tw

軟體開發平台 - Free

MICROCHIP

8/16/32 位元 MCU 的 C Compiler – Free

MICROCHIP Products Solutions Tools and Software Support Education About Order Now

Tools and Software / MPLAB® XC Compilers

License Change Notice Downloads Documentation License Details High Priority Access (HPA)

MPLAB® XC Compilers

Available as free, unrestricted-use downloads, our award-winning MPLAB® XC C Compilers are comprehensive solutions for your project's software development. Finding the right compiler to support your device is simple:

- MPLAB XC8 supports all 8-bit PIC® and AVR® microcontrollers (MCUs)
- MPLAB XC16 supports all 16-bit PIC MCUs and dsPIC® Digital Signal Controllers (DSCs)
- MPLAB XC32/32++ supports all 32-bit PIC and SAM MCUs and MPUs

The first versions of the MPLAB XC compilers that supported Catalina were:

- MPLAB XC8 - v2.20
- MPLAB XC16 - v1.50
- MPLAB XC32 - v2.41

Microchip 針對設計競賽提供的開發工具

Microchip 贊助比賽隊伍的開發工具項目

http://www.microchip.com.tw/modules/tad_uploader/index.php?op=dlfile&cfsn=89&cat_sn=7&name=20221018%20dps%20tool%20apply.doc

項次	料號 & 品名	主要 CPU1	附註
1	APP-Nano-BASW-TW + EV76S68A	ATSAME51J20A	
2	EV14C17A - GRAPHICS AND TOUCH (IGAT)	ATSAME51J20A	
3	APP-Nano-BASE-TW + DM164150	PIC18F57Q43	
4	APP-Nano-BASE-TW + DM182030	PIC18F57Q84	
5	APP-Nano-BASE-TW + EV10K72A	PIC24FJ64GU205	
6	ATSAMW25-XPRO	ATSAMD21 + ATWINC1500	
7	APP-Nano-BASE-TW + DM320119	SAMD21G17D	
8.	APP-Nano-BASE-TW + APP-Nano-C21-D21-TW + PG164100 SNAP	ATSAMC21G17A	
9.	APP045 v4.2 + PG164100 SNAP	ATSAMD21G18A	
10	DM320013	PIC32MX470	
11	APP-SAM9X60 Hobby Kit (WiFi 版)	SAM9X60 MPU	
12	WIFI 7 CLICK - MiFi 的 Click 擴充版，需要擴充 WiFi 的功能可以申請此模組	ATWINC1510-MR210PB	
13	Others	請 e-mail microchip.tw@outlook.com	

MICROCHIP

開發工具及零件申請準則

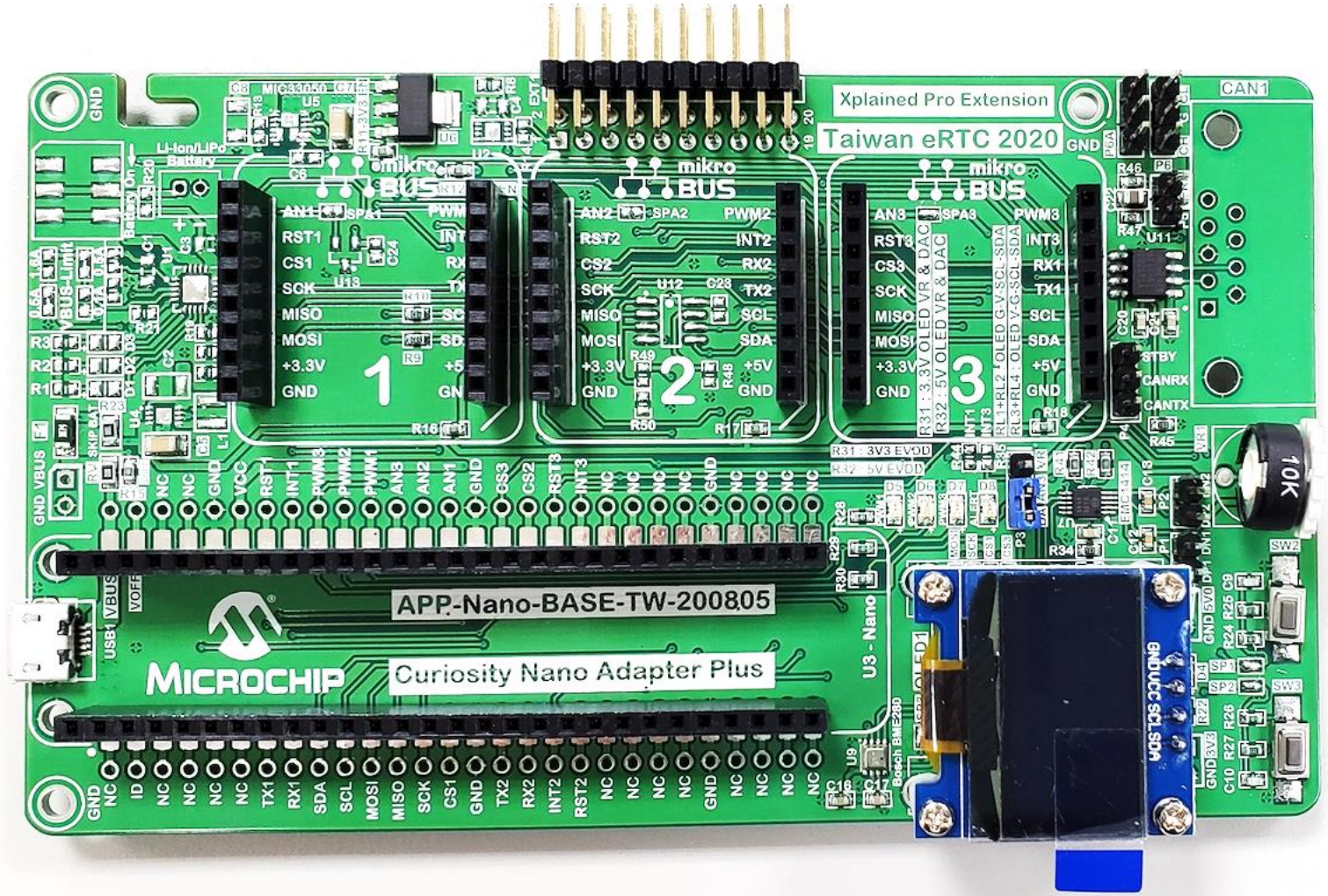
- Microchip 贊助比賽隊伍的開發工具之申請方式及注意事項 ：
  - 開發工具申請分為借用與贈與兩個階段
  - 請於附件一填妥所需的資料與欲申請的工具項目
  - 申請的開發工具在 2023 年 3 月比賽結束前一律為借用性質。
  - 若創意發想書未獲評審評定進入 2023 年 3 月份的決賽者，必須於 2023 年 4 月底前歸還申請之工具至 Microchip。
  - 若創意發想書獲評審評定進入 2023 年 3 月份的決賽伍，但未能出賽者，也必須於 2022 年 4 月底前歸還申請之工具至 Microchip。
  - 進入決賽之隊伍，並於 2023 年 3 月舉行之決賽實際出賽支隊伍，不論名次為何，都將可以保留向 Microchip 申請之開發工具。Microchip 將於決賽後將工具轉為贈與。
- Microchip 贊助比賽隊伍的零件樣品及申請方式 ：
  - 參賽隊伍可使用附件二，參考零件列表，直接向 Microchip 申請所需的零件
  - 建議盡量適用列表中的零件，以加速處理的速度
  - 如果所需零件不在列表上，請自行加在表單中的 A ~ H 的欄位中
  - 零件申請只要合理，項目及數量 Microchip 都不會多加限制。但請只申請要用於比賽專案的零件。一般所謂的合理數量大約是 3~5 pcs

如何申請工具及零件

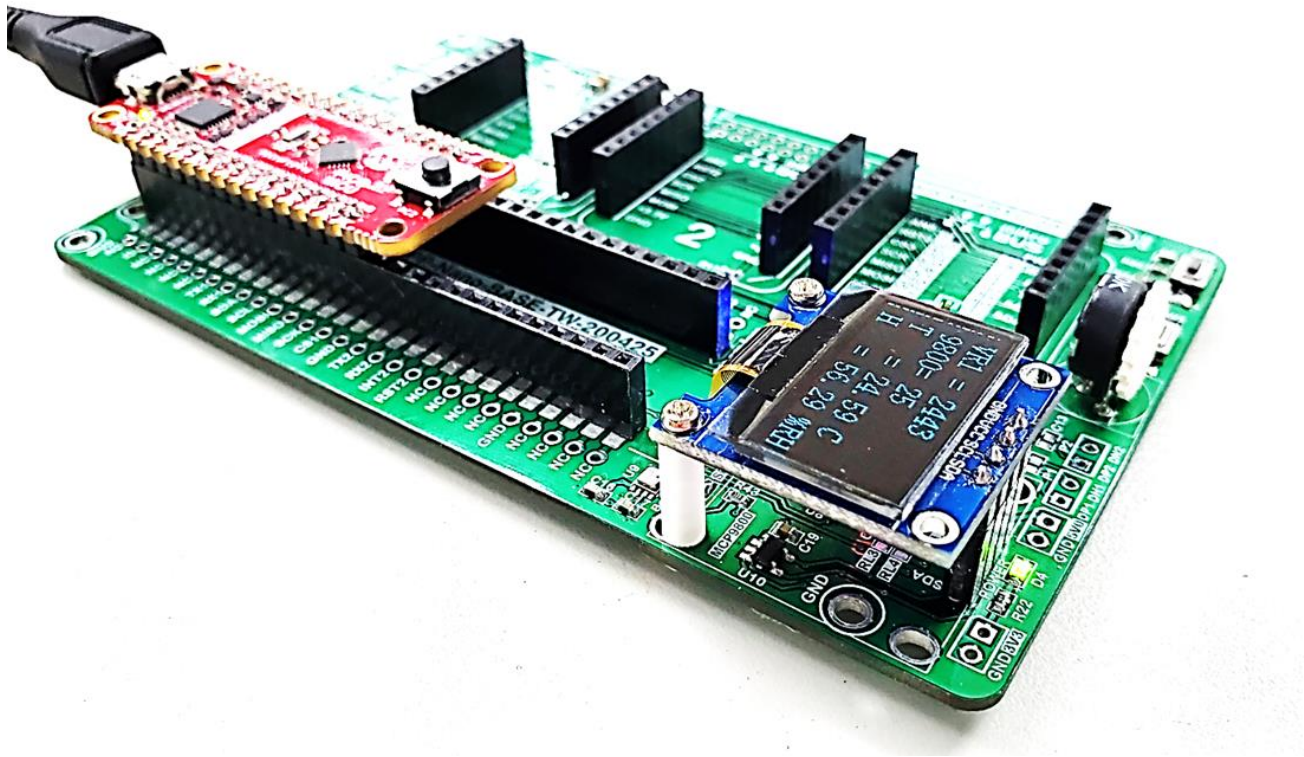
http://www.microchip.com.tw/modules/tad_link/index.php?link_sn=78

APP-Nano-BASE-TW 台灣加強版 – 相容於AC164162

目的 : 讓入門的學習更為方便、容易 --- 增加許多基礎周邊

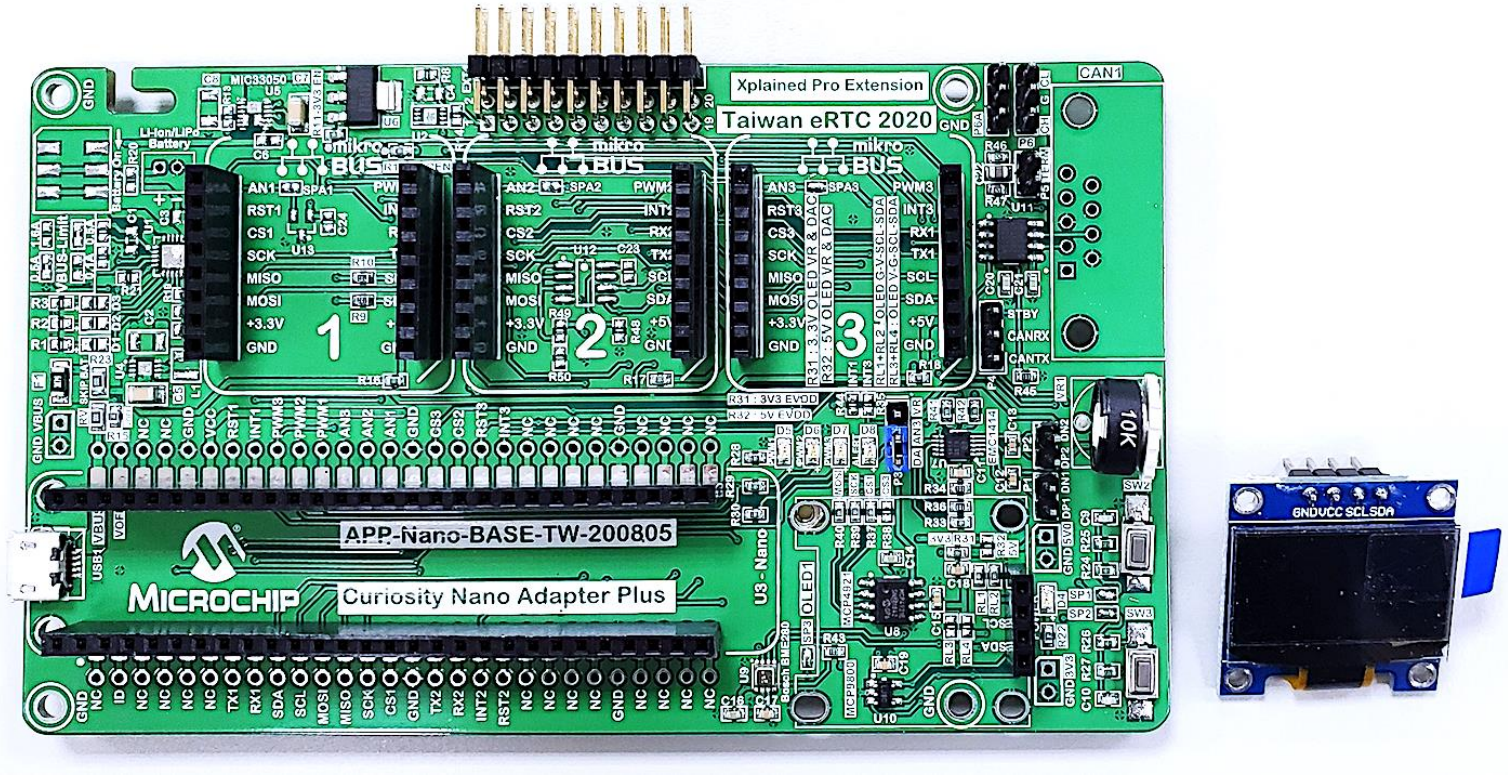


APP-Nano-BASE-TW Nano Board 使用範例
(實驗底板不含紅色的 Curiosity Nano Board)



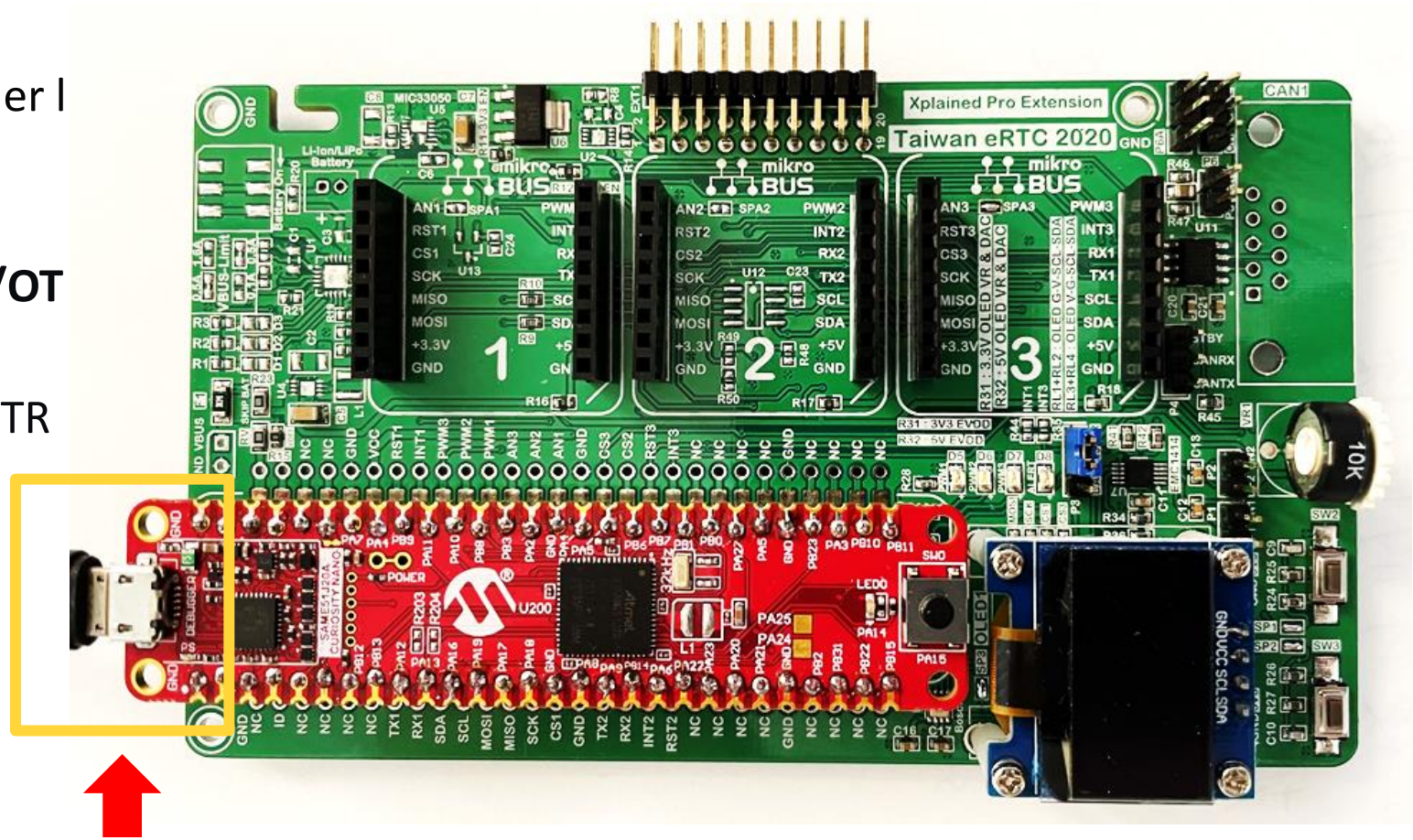
AC164162 可以搭載超過 10 種以上的 Microchip Curiosity Nano . 但是 APP-Nano-BASE-TW 加上更多的預置功能

- **2 個按鍵開關做信號輸入練習**
  - INT1 & INT2 Pin
- **4 個 LED 進行狀態輸出指示**
  - PWM1 , PWM2 , PWM3, ALERT (TEMP)
- **1 個 VR 作為可辨的類比輸入**
  - AN3
- **1 個使用 I²C 的 OLED Display**
  - (SH1106 controller)SDA & SCL
- **2 個 I²C Temp Censor**
  - MCP9800 & EMC1414
- **1 個 SPI 介面的 DAC**
  - MCP4921
- **1 個 CAN Transceiver & Connectors**
- **獨立的 USB 電源供應**
- **Bosch Sensor BME280**
  - Humidity sensor
  - Barometric pressure
  - Ambient Temperature



ATSAME51J20A 使用於 APP-Nano-BASE-TW 的實際範例

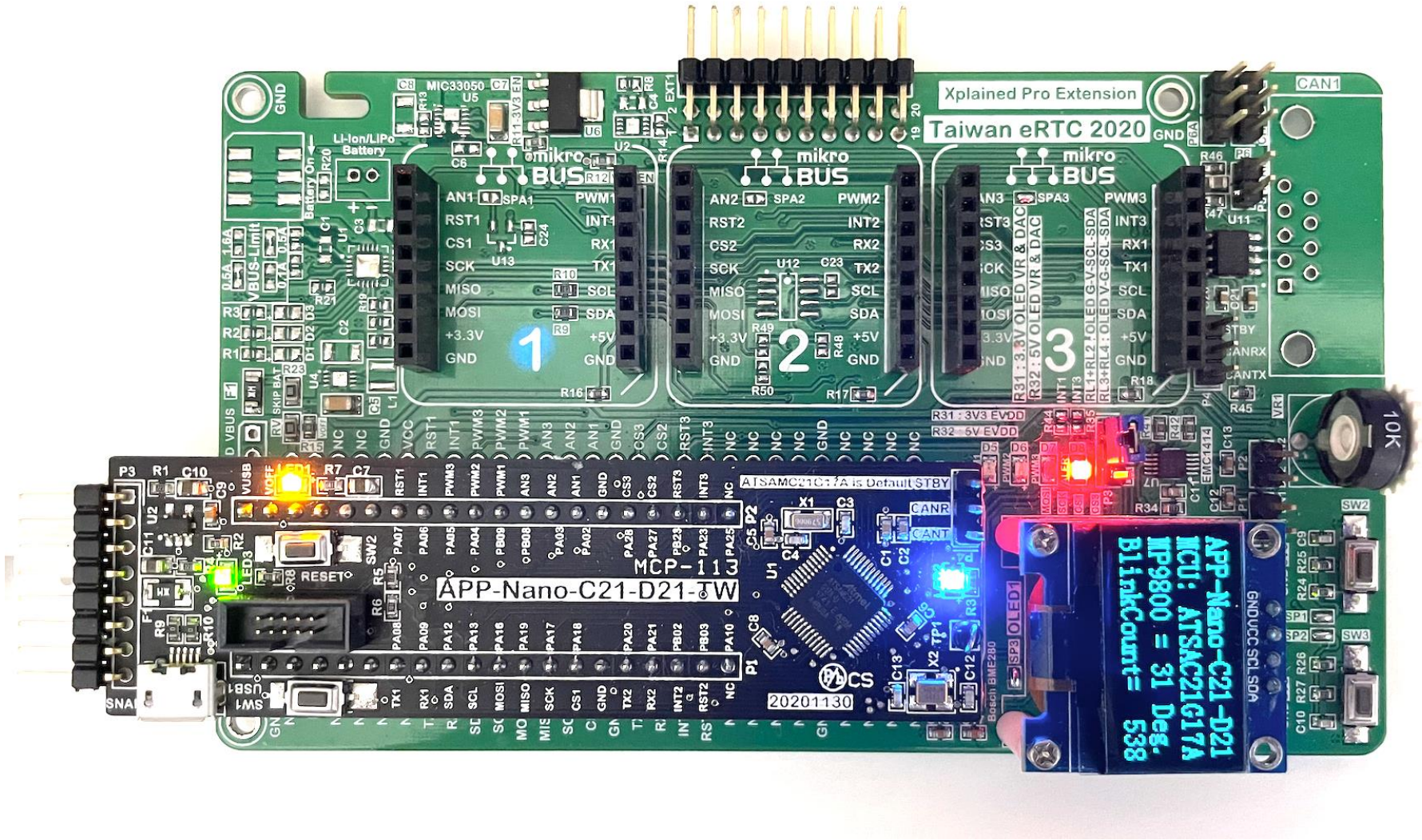
- **I²C OLED Display**
  - 128 * 64 Resolution
  - SH1306 controller organic / polymer l emitting diode
  - I²C Address : 0111100 = **0x3c**
- **I²C Temp Censor – MCP9800A5T-M/OT**
  - I²C Address : 1001101 = **0x4d**
- **I²C Temp Censor –** EMC1414-3-AIZL-TR
  - I²C Address : 0011000 = 0x18
- **Bosch Sensor BME280**
  - I²C Address : 1110110 = 0x76
  - Humidity sensor
  - Barometric pressure
  - Ambient Temperature



請由 Micro-USB 連接電腦並進行供電

MICROCHIP

APP-Nano-C21-D21-TW
搭配底板：APP-Nano-BASE-TW Nano Board 的實際狀況

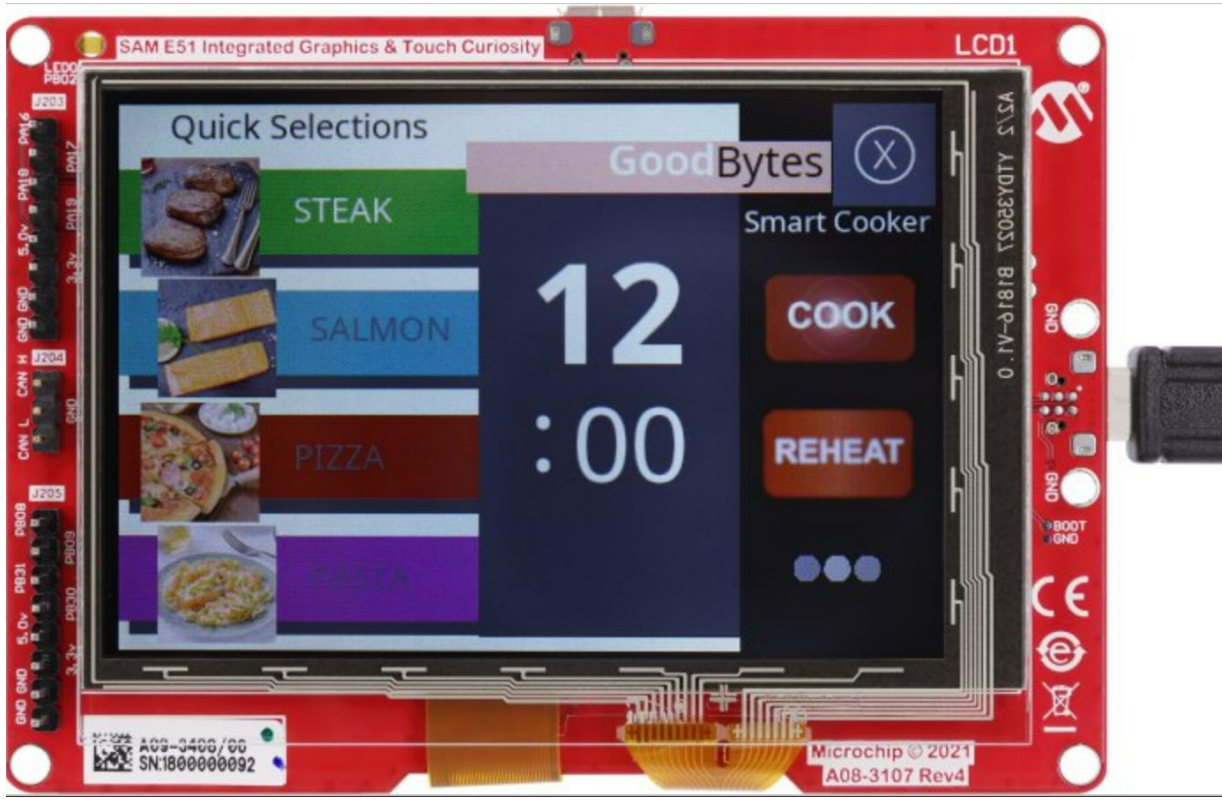


EV14C17A - SAM E51 Integrated Graphics and Touch Curiosity

Features

The following are key features of the evaluation kit.

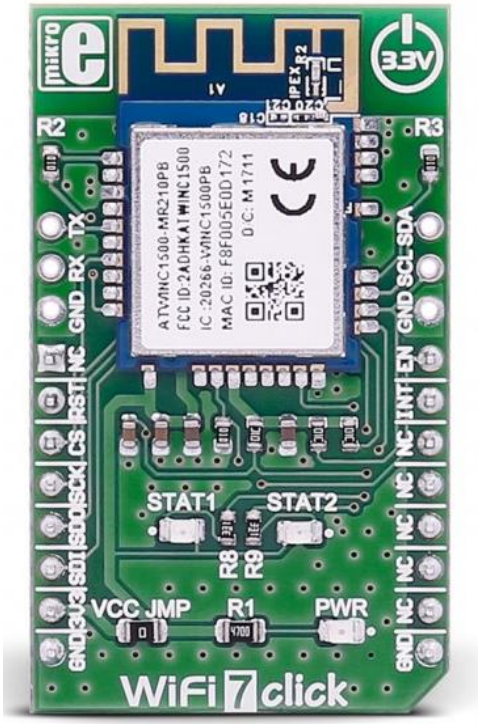
- ATSAME51J20A microcontroller
- One user LED
- On-board debugger
  - Board identification in MPLAB X IDE
  - One green power LED and status LED
  - Programing and debugging
  - Virtual COM port (CDC)
  - One Logic Analyzer (DGI GPIO)
- 8 MB QSPI Flash
- On-board CAN-FD transceiver
- USB powered
- Adjustable target voltage:
  - MIC5353 LDO regulator controlled by the on-board debugger
  - 1.7-3.6V output voltage
- 500 mA maximum output current (limited by ambient temperature and output voltage)
- 480 x 320 pixel TFT display with 16-bit color



WIFI 7 CLICK

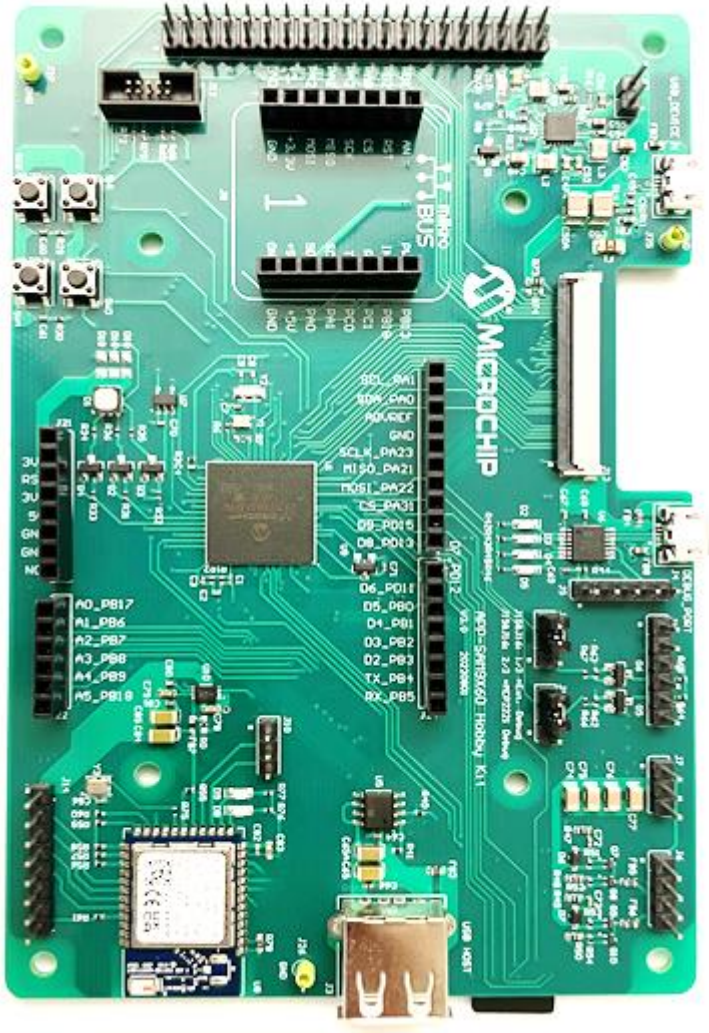
- 讓你的應用輕易的將 **WiFi** 的功能加入

Type	WiFi
Applications	Optimized for low power IoT applications
On-board modules	ATWINC1510-MR210PB
Key Features	IEEE® 802.11 b/g/n 20MHz solution, integrated PCB antenna, supports IEEE 802.11 WEP, WPA, WPA2 Security
Interface	GPIO,SPI
Compatibility	mikroBUS
Click board size	M (42.9 x 25.4 mm)
Input Voltage	3.3V



APP-SAM9X60 Hobby Kit 重要諸元 (WiFi 版)

- 建立開發者信心的開發平台
  - 使用 SAM9X60D1G SiP，降低設計的難度
  - 低密度的設計，減低周邊之間的干擾
  - 高彈性的設計，讓開發者可以練習系統的建構
  - Microchip TW 陸續會把更多資源放在 GitHub 上喔
  - SAM9X60D1G 的重要功能
    - 1Gbit integrated DDR2
    - 64 kB internal SRAM
    - 24-bit LCD Controller with overlays up to 1024x768 resolution
    - 2D Graphics Engine, Camera Interface
    - Dual 10/100 Ethernet, Dual CAN, Dual SD Card/eMMC
    - Two High-speed USB Host + One High-speed Host or Device
    - Thirteen FLEXCOMs (USART, SPI and I²C)
  - 常用開發方式
    - Free mainline Linux® Distribution
    - MPLAB® X Integrated Development Environment and MPLAB® Harmony v3
    - Multiple Third-party Software and Hardware Solutions



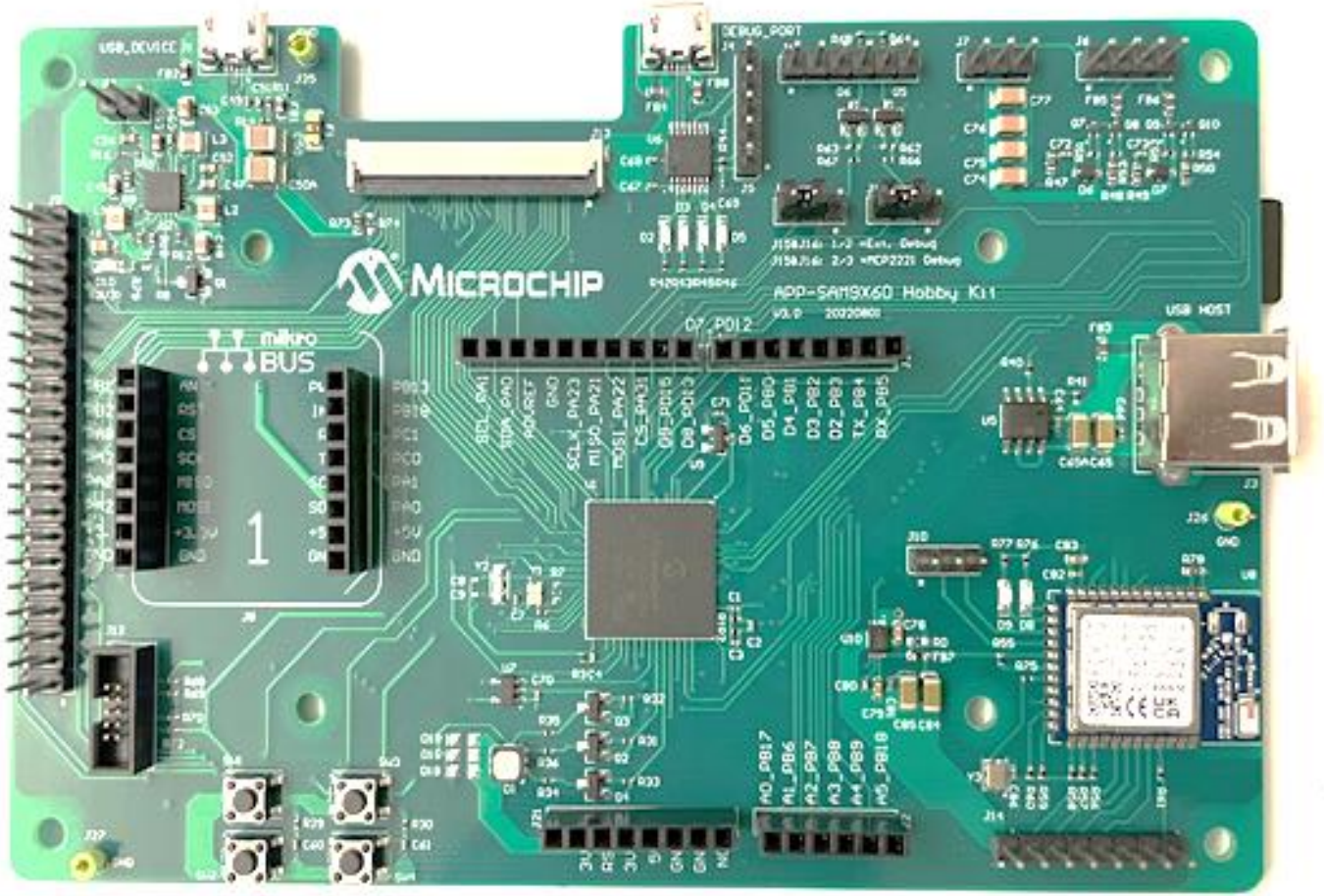
94

APP-SAM9X60 Hobby Kit 的介面 & 周邊

- APP-SAM9X60 的外接介面
  - Type-A USB Host interface
  - mikroBUS ™ 相容介面
  - Arduino 相容介面
  - Respberry Pi 相容介面
  - ATWILC3000 WiFi/BLE
  - LCD : 50-Pin Connector，使用 RGB666 的信號安排，可以連接與 Microchip AC320005-5 相容的 LCD Display
  - Audio Class D Amplifier
- Boot Media
  - SD-Card
  - Serial Flash – Optional

95

APP-SAM9X60 Hobby Kit 可搭配的 MU 課程



建構你的Linux開發系統

如何創建為Microchip MPU構建Linux解決方案的開發系統

免費 70 分

嵌入式Linux介紹

在ATSAMA5D27-SOM1-EK上探索嵌入式Linux

免費 97 分

探索Linux系統的建構

用Buildroot建構你的第一個嵌入式Linux系統

免費 40 分

MICROCHIP

APP-SAM9X60 Hobby Kit 與 LCD 連接的範例

MICROCHIP

APP-SAM9X60 Hobby Kit 多重的擴充選擇性

SpeakUp RFID Gyroscope Bluetooth

Microchip MPU 開發資源：Linux4sam

https://linux4sam.org/bin/view/Linux4SAM

Linux & Open Source for AT91 Microchip Microprocessors

Search

Print

LINUX4SAM

- Software tools
- AT91Bootstrap
- U-Boot
- Linux Kernel
- DT-Overlay

Open source solutions

- Yocto Project
- Buildroot
- OpenWrt

Applications

- Graphics Toolkit
- WiFi and Bluetooth

BOARDS

- SAM9X60 Curiosity
- SAMA7G5-EK
- SAMA5D2-ICP
- SAMA5D27 WLSOM1 EK
- SAM9X60-EK
- SAMA5D27 SOM1 EK
- SAMA5D2 PTC EK
- SAMA5D2 Xplained
- SAMA5D3 Xplained
- SAMA5D4 Xplained
- Older boards

FAQ

- FAQ updates by Boards
- FAQ updates by Components

USEFUL LINKS

- Microchip Microprocessors forums
- AT91 Community

Linux4SAM » WebHome

Welcome to Linux4SAM

Fork me on GitHub

Welcome to the main starting point for Linux OS on Microchip Microprocessors. Its aim is to centralize information about Linux kernel and open source projects on those products based on Arm cores (aka AT91).

Our goal is to be an interface with open source projects that include AT91 support. We do not want to duplicate information but to link as much as possible to good resources available on the Web.

Keep an eye on this website as it has been designed for instant update. We will try to make it live with the open source community and update AT91 information in those pages. To keep yourself informed, add WebRss or WebAtom feeds in your usual news reader.

Questions, feedback, patches and enhancement are the way open source communities live. Go to LinksToCommunities page for a natural way to interact with material presented on this website.

Latest News

Linux4SAM 2022.07 Curiosity demo directory NEW

New demo available for **SAM9X60 Curiosity** board. Based on updated components:

- Linux4Microchip based on Linux kernel 5.15.32
- Update to a new version AT91Bootstrap **4.0.4**
- U-Boot 2022.01 with Optimized/Improved NAND driver supporting Device Model
- New version for Microchip Ensemble Graphics Toolkit (EGT) **1.4** and associated applications
- Yocto Project 3.1 (Dunfell) with security LTS updates
- Buildroot generated from 2022.02.1 LTS revision using buildroot external

Enhancements are added on top of the official **v5.15** Linux kernel tag where most of the Microchip SoC features are already supported.

Here are the main additional enhancements:

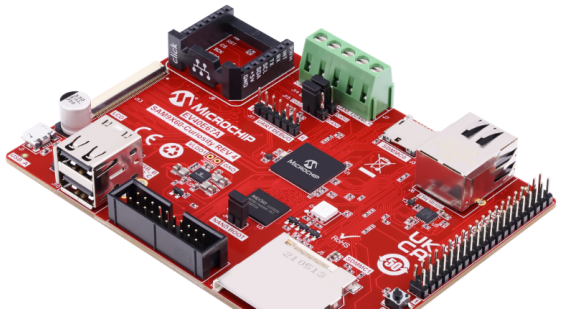
- Addition of support for the new SAM9X60 Curiosity kit

Demo Images. Choose *headless* (no video) or *graphics* option, your root filesystem flavor, flash and you're ready to go:

- Demo images for SAM9X60 Curiosity
- NAND and eMMC media types were flashed using SAM-BA 3.5

And all goodies of previous Linux4SAM revisions!

ENSEMBLE GRAPHICS TOOLKIT



MICROCHIP

使用 APP-Nano-BASE-TW 完成的 eRTC 線上學習影片

- **PIC16F18446-101**
  - http://www.microchip.com.tw/Data_CD/eLearning/RAW_Video_PIC16F18446_V2.mp4
- **PIC16F18446-201**
  - http://www.microchip.com.tw/Data_CD/eLearning/eRTC_PIC16F18446_201_All.mp4

MICROCHIP

Thank You