

From MCU via MPU to FPGA with the Microchip Ecosystem

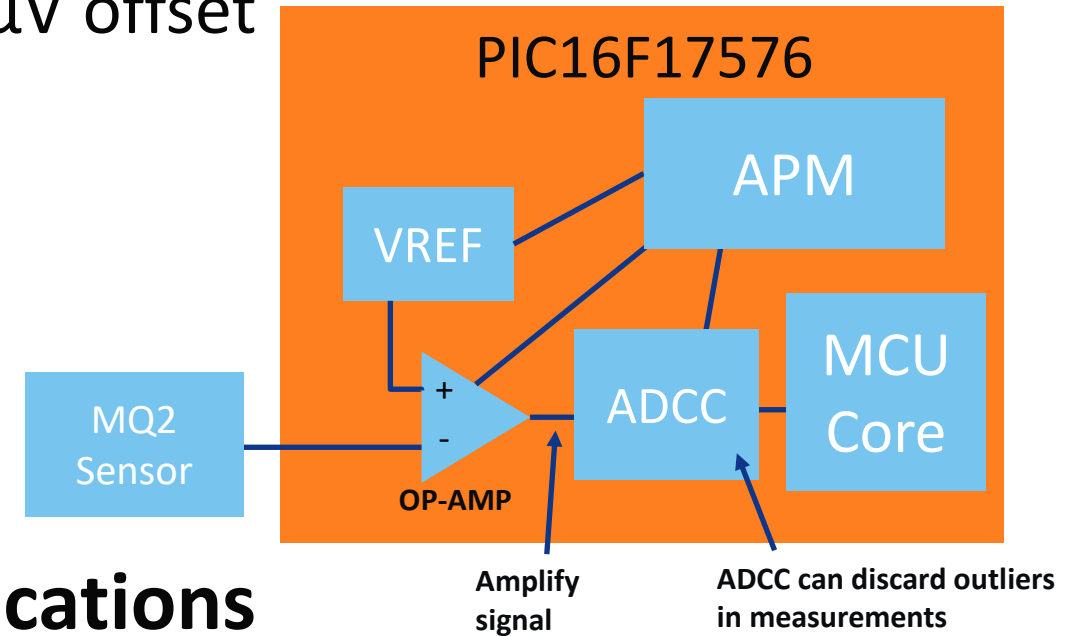


A Leading Provider of Smart, Connected and Secure Embedded Control Solutions

The Start : PIC16F17576

- **Most robust analog portfolio in PIC16 lineup**

- 4x OP-AMPs – Auto self calibration $\pm 500\mu\text{V}$ offset
- 2x 8-bit DAC
- 2x CMPs
- 12-bit differential ADCC



- **Designed for low-power analog applications**

- APM can shut down analog peripherals on-the-fly
- Brand new low-power comparator & VREF
 - Great for analog thresholding applications

AVR SD – Functional Safety Enhanced MCUs

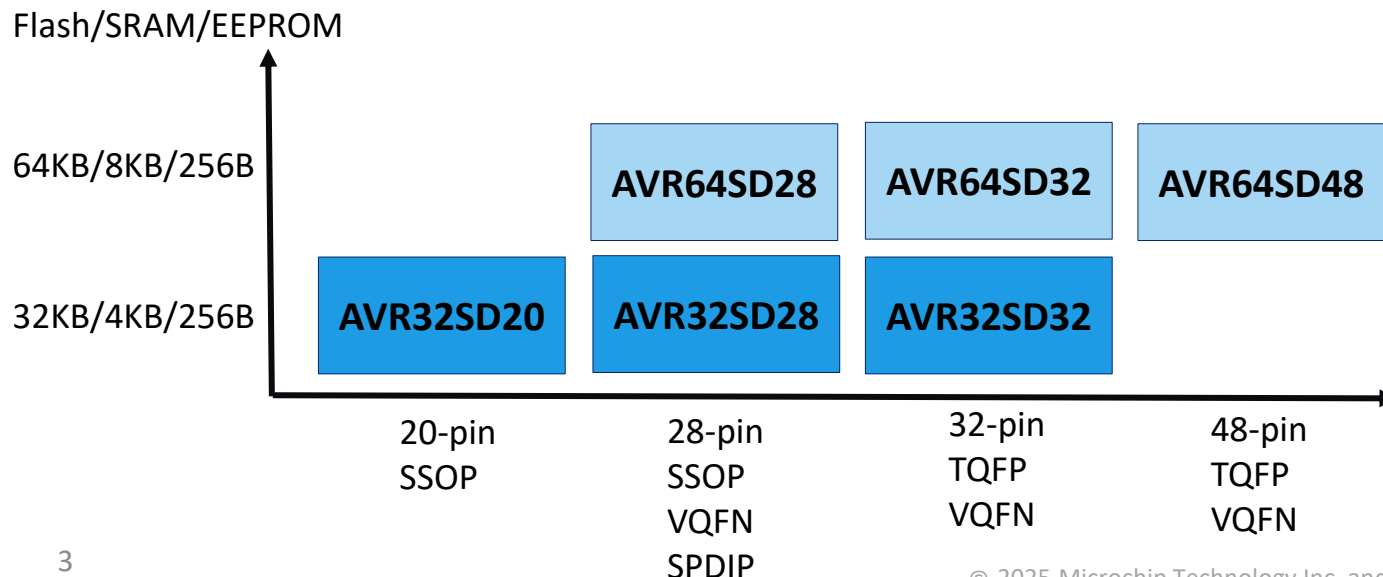
Designed in compliance with the ISO 26262 functional safety standard for ASIL C / SIL 2 applications



- Dual core lockstep CPU
- 20 MHz CPU clock speed
- Flash/SRAM/EEPROM with ECC:
- 512B User row
- 256B Key storage
- 2.7V – 5.5V Supply Voltage Range
- Industrial and Extended Temp Range
 - -40°C to 85°C & -40°C to 125°C



- Special features
 - Multi-Voltage IO (MVIO)
 - Event system (EVSYS)
 - Custom Configurable Logic (CCL)
 - Programming and debug interface disable (PDID)
- Analog
 - 2x 10-bit single ended ADCs
 - 1x 10-bit DAC
 - 3x Analog Comparators
 - 2x Zero-Cross Detectors (ZCD)
- Watchdogs
 - Asynchronous Window Watchdog (WDT)
 - Synchronous Window Watchdog (SWDT)



PIC32A - Analog Processing on 4×4 mm



High Performance Core *(-40 to 125°C)*

- 32-bit CPU Running at 200 MHz + 64bit FPU
- Enables faster AI/ML processing with 72-bit MAC



Accurate Measurements

- Advanced Analog Peripherals for High-Speed, Precision and Accuracy
- 40MSPS 12bit ADC / 100MHz GBWP OPAMPs / 12bit DAC / 78ps PWM



Safety & Security

- ECC on Flash/RAM, MBIST, IO Integrity Monitor, Clock Monitoring
- Immutable secure boot and flash access control for safe execution

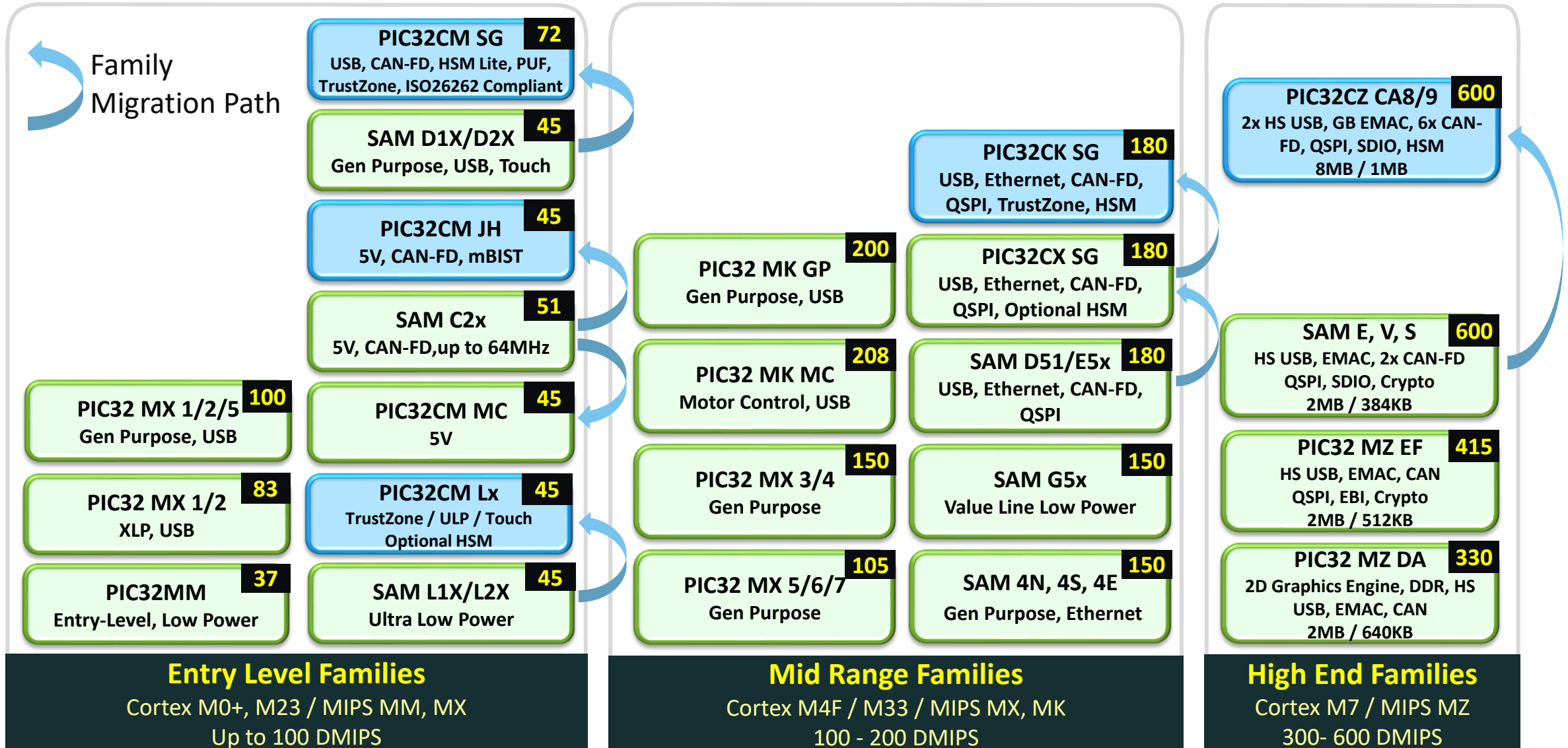
A Product for Every Application

In Production

New Products or
Family Additions

DMIPS

Family
Migration Path

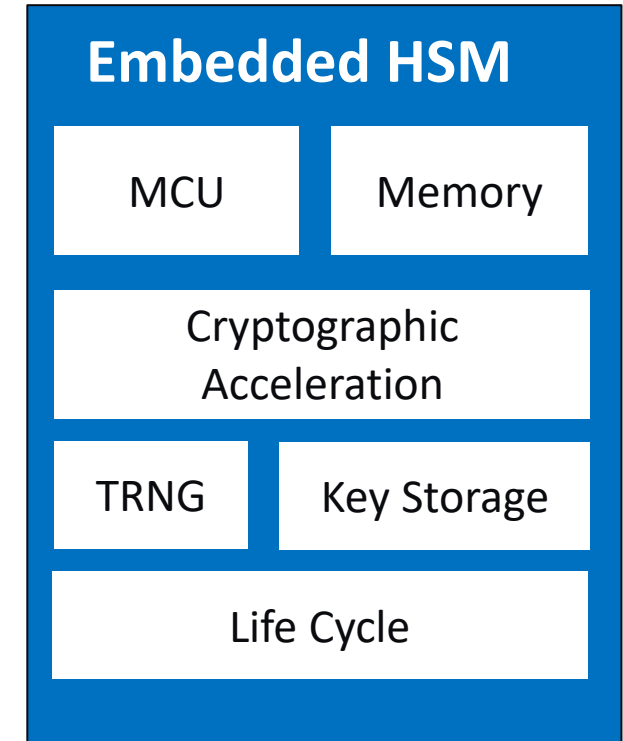


PIC32CZ CA9x with 1.2+ GBPS Encryption

32-Bit MCU Automotive Cybersecurity = HSM



- **User programmable Arm Cortex M0+**
 - Standard firmware available for turnkey operation
- **128 kB/256kB local RAM (firmware and data)**
 - CA90: 128kB
 - CA91: 256kB
- **High performance HW cryptographic accelerators**
 - AES, TDES, ChaCha20, SHA, Poly1305, RSA, ECC, DH
- **TRNG**
 - NIST SP800-90B Compliant
- **CPU offload with integrated scatter-gather DMA**
- **Automotive HSM firmware**
 - ETAS/eScript or Vector for HSM Firmware (require 192KB, i.e. CA91)
 - Evita Full Support
- **Encrypted nonvolatile key storage**
 - Dedicated secure flash pages
 - Anti-tamper Pins
 - Key provisioning by Microchip or customer
- **SW PUF (in development)**
- **Factory Provisioning Available**
- **Secure Boot/Secure Debug**



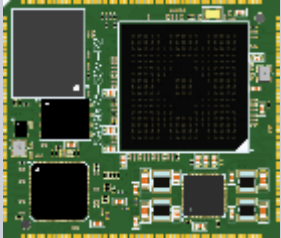
Microchip Graphics Suite

HTML-based Simulation

Native-code Simulation w/ Visual Studio Code



MPU SOMs

SAM9X60D1G-I/LZB	SAM9x75D2GN4-I/M4B	SAMA5D27-SOM1	SAMA5D27-WLSOM1
			
• SAM9X60D1G SIP • SAM9X60 + 1Gb DDR2 • 4Gb SLC NAND • Pre-programmed EUI-48 MAC address • MCP16501 PMIC • Single 3 – 5.5V supply • KSZ8081 - 10/100 PHY • 28 x 28mm QFN style PCB .65mm	• SAM9X75D2G SIP • SAM9X75 + 2Gb DDR2 • 4Gb SLC NAND • Pre-programmed EUI-48 MAC address • MCP16502 PMIC • Single 3 – 5.5V supply • LAN8840 – Gbit Ethernet PHY • 35 x 30mm QFN style PCB .65mm	• SAMA5D27C-D1G SIP • SAMA5D27C + 1Gb DDR2 • 64Mb QSPI Flash • Pre-programmed EUI-48 MAC address • MIC2800 PMIC • Single 3 – 5.5V supply • KSZ8081 - 10/100 PHY • 40 x 38mm QFN style PCB .8mm	• SAMA5D27C-LD2G SIP • SAMA5D27C + 2Gb LPDDR2 • 64Mb QSPI Flash • Pre-programmed EUI-48 MAC address • MCP16502 PMIC • Single 3 – 5.5V supply • WILC3000 – WiFi/BLE module • ECC608 secure element • KSZ8081 - 10/100 PHY • 40.8 x 40.8mm QFN style PCB .8mm

SAM9X7 Product Overview

Single-Core, Low-Cost MPU w/ MIPI/LVDS

- **MIPI DSI/CSI Combo PHY, LVDS and RGB**
 - MIPI → lower-cost display options
 - LVDS → higher reliability interface (automotive)
- **Similar connectivity options to SAM9X60**
 - Gigabit EMAC w/ IEEE-1588 and TSN support
- **Automotive qualified – VAO CPNs**
- **SOMs and SIPs up to 2Gb!**
 - Auto qualified 512Mb SIP in process
- **Small, specialty displays industrial, medical and automotive**



SAM9X7

800MHz ARM926 (880 MIPS)
Up to 266MHz DDR3L

User Interface

2D GPU
MIPI DSI/CSI Combo PHY
LVDS
I2S, Class D Amplifier

Connectivity

Gbit Ethernet w/ IEEE1588 + TSN
2x CAN-FD
2x SD/eMMC
Octal/QSPI
3x HS USB

Security

AES/TDES/SHA/PUF
Secure Boot
EBI Scrambling
OTP for keys

AEC-Q100 Grade 2
-40 to 105°C

SAMA7G54 – AI / ML

Imaging, Audio and Connectivity

- **Single-core MPU w/ MIPI Camera open door to imaging-oriented AI/ML applications**



Low-frame rate AI/ML imaging applications



Audio Recognition

- **Complete audio sub-system**
 - I2S, PDM, SPDIF (Rx/Tx), 4 stereo ch ASRC
 - Audio demo platform in the works!
- **Large number of connectivity options**
 - Dual EMAC (Gigabit + 10/100) w/ 1588 and AVB
- **Well-suited for IoT security requirements**
- **SIPs up to 4Gb; 4x SOMs later this year**



Imaging/Camera Applications



intercom, commercial audio



Tracker/Telematics Gateways

SAMA7G5

1GHz Cortex A7 (1900 MIPS)
TFBGA343, 14 x 14mm .65 pitch
533MHz LPDDR3 Support

User Interface

MIPI-CSI2 Camera I/F
4x I2S, PDM, SPDIF/F
4x stereo ASRC

Connectivity

Dual EMAC (Gigabit + 10/100)
Octal / Quad SPI
3x HS USB / Type C
6x CAN-FD
3x SD/eMMC
12x FLEXCOMs

Security

ARM Trustzone
AES/TDES/SHA/RSA/ECC in HW
On-the-fly Enc/Dec
OTP for Keys

AEC-Q100 Grade 2
-40 to 105°C

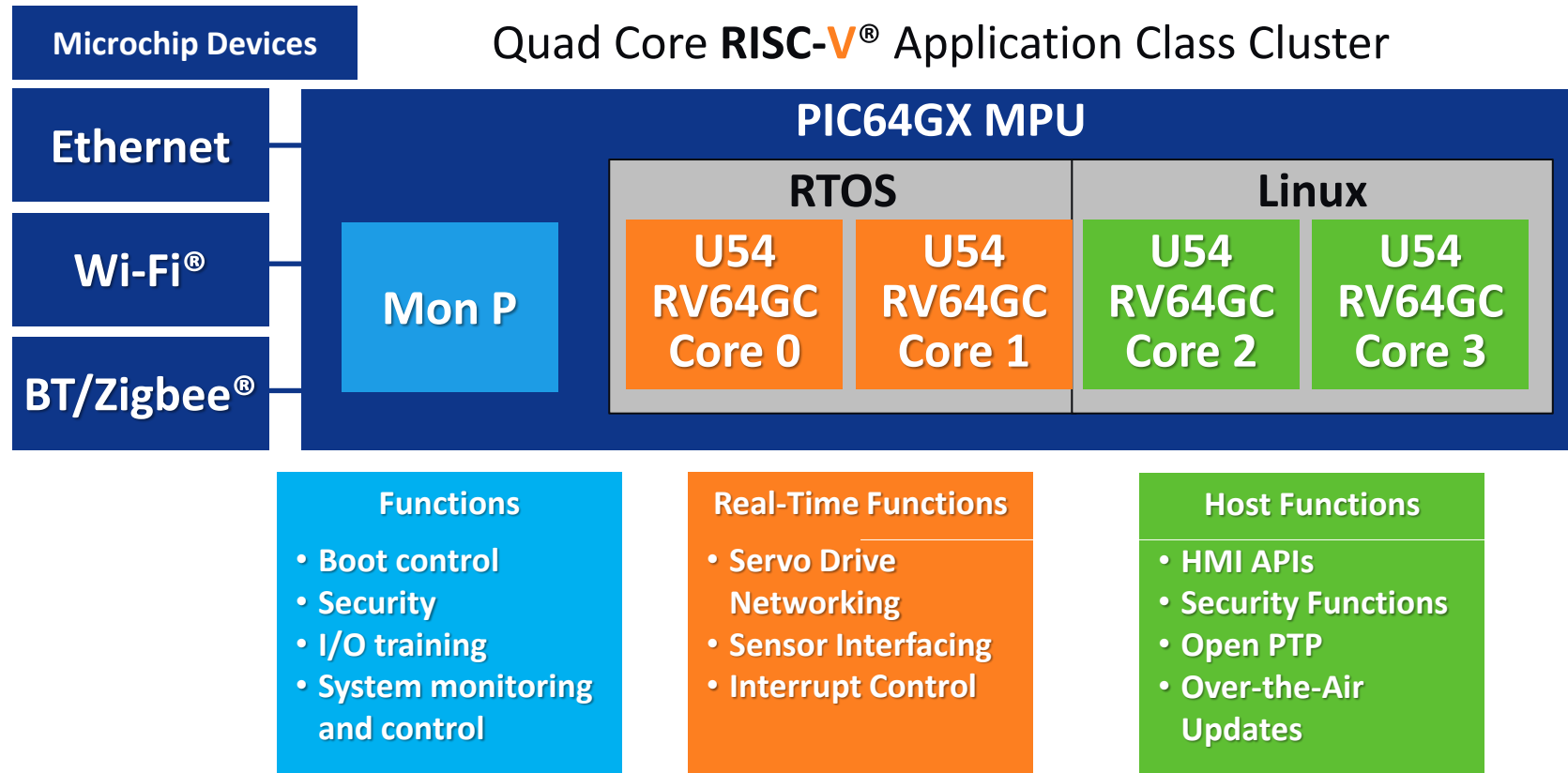
PIC64 - Industrial HMI and Motor Drive

Asymmetric Multi-Processing (Deterministic Operation)

Application: Industry 4.0 Drive



Bare Metal/RTOS Drives Time-Critical Signals for Servo Control, HMI APIs on Linux



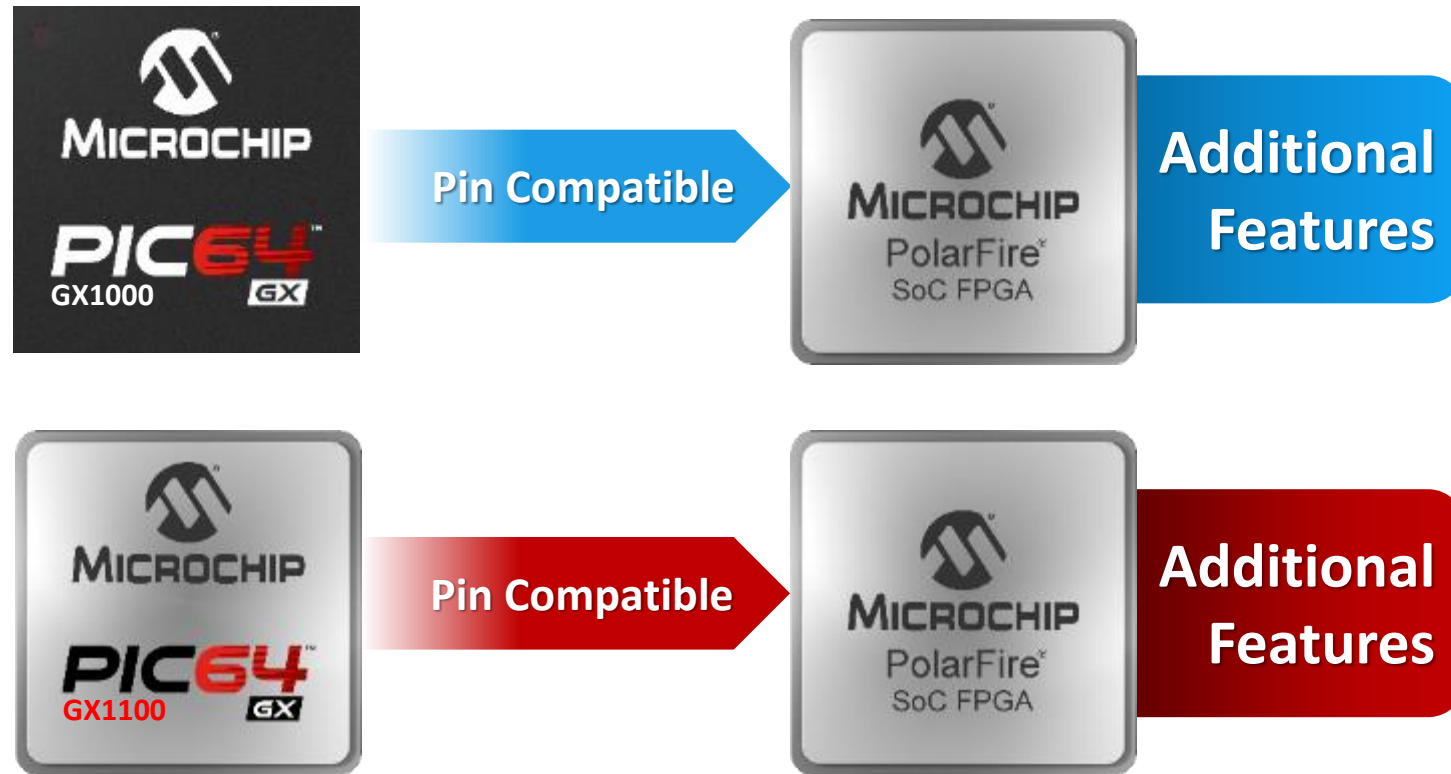
PIC64™



PIC64GX Scalability

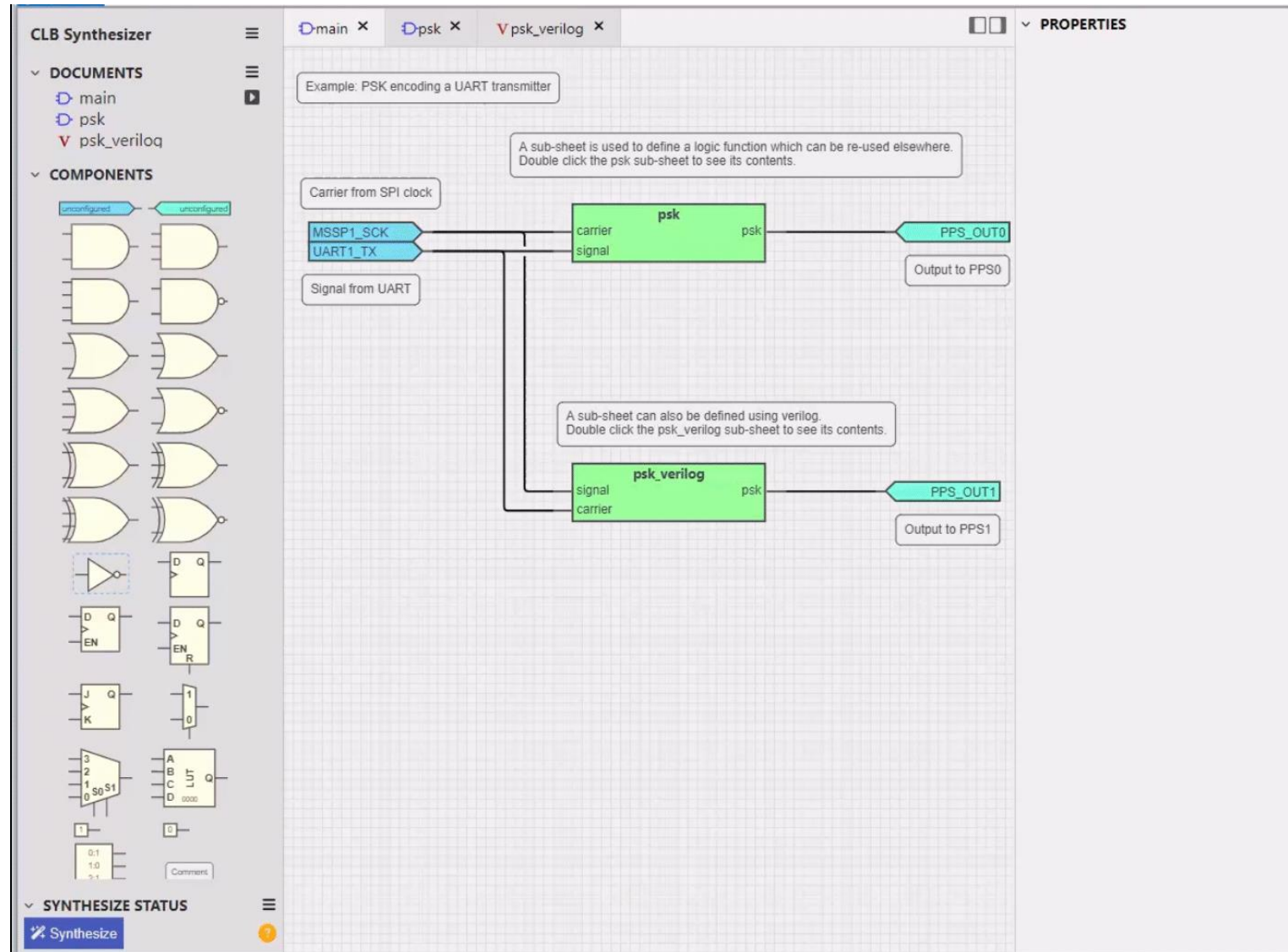
Fully Pin-Compatible with PolarFire SoC FPGAs

Features can Easily be Added by Migrating to a PolarFire® SoC FPGA



How to Enter FPGA World?

- **Start small**
 - PIC16F13145 miniFPGA
 - DIP8 package available
- **Learn Verilog**
 - Go to try.microchip.com
- **Easy and Fun**
- **From Highschool level**



FPGA SoC Redefined

- **PolarFire SoC FPGAs**

- Deterministic, coherent 64-bit multi-core RISC-V CPU
- 25K to 460K LEs in FLASH
- 12.7 Gbps transceivers
- Up to 50% lower power than alternatives
- Integrated DDR3/4, LPDDR3/4 controller and PHY



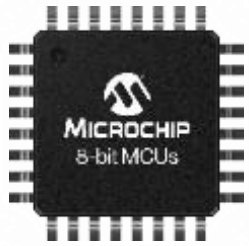
- **PIC16F131xx SoC**

- Deterministic 8-bit CPU
- 32 logic elements (RAM) Verilog and Schematics
- Frozen FPGA blocks (UART, Timer, I²C, etc.)
- On-board analog peripherals & True 5V (1.8V ... 5.5V)
- From 8pin package (including DIP)



Introducing MPLAB® IDE Extensions

8-Bit



PIC® MCU
AVR® MCU

16-Bit



PIC® MCU
dsPIC® DSC

32-Bit MCUs & MPUs



PIC MCU



SAM MPU

PIC64 Family of 64-bit MPUs



Quad-Core
5K DMIPs



Octal-Core
TSN Switch
26K DMIPS



Octal-Core
TSN Switch
Space-Grade
26K DMIPs



Supports Migration Across Compute Landscape and is Agnostic to ISA

MPLAB® AI Coding Assistant

- **Based on an extension from Continue.dev**
 - Released in November 2023
 - 806K downloads
 - Rated 4.5 out of 5
- **2 main functions**
 - Chat / Edit
 - Autocomplete
- **Trained with Microchip content**
- **Now available through the VS Code® Marketplace**



Thank you!



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