MICROCHIP

Microchip CAN Eco-system

June 2019

Microchip CAN Eco-system

Products:

- Radiation Tolerant microcontrollers
- Radiation Hardened microcontrollers

Hardware tools

- Evaluation board
- Programming and debugging tools

Software tools

- Microchip GUI development environment
- Third party GUI development environment

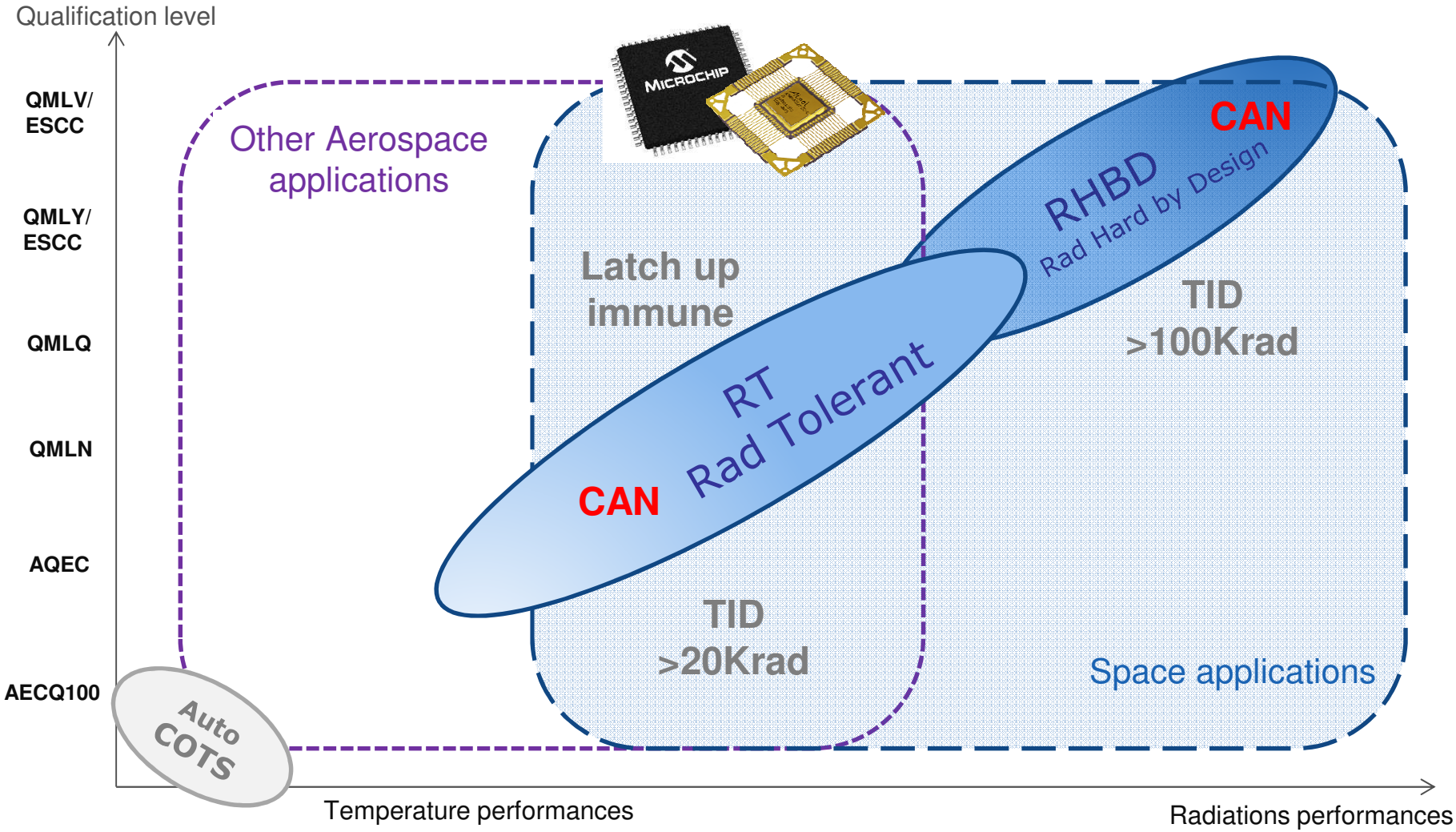
Software examples

- Microchip CAN transmit/received examples

Software library

- Third party CAN stack

CAN Scalable Solutions for Aerospace



Rad Tolerant devices - Concept

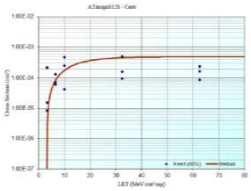
- ***Start from Industrial/Automotive products***
  - Same mask set
  - Same functionality
  - Same development tools

Easy access via commercial eval kit
Free tool chain & libraries
Same pin out as commercial device

- ***No compromise with Aerospace required quality***
  - Full wafer lot traceability
  - Space QML/ESCC screening (Visual inspection (TM2010), PIND test, Burn-in (PDA))
  - Space QML/ESCC qualification (Group A, B, C & D)
  - Avionic qualification, Military screening (Extended temperature)

Heavy ions
Protons

- ***Hardening of critical parameters***
  - Technology process change / tuning
    - Target no **single event latch-up up to 60 MeV/mg/cm2** @ 125°C
  - Embedded Flash & SRAM robustness, **SEFI LET > 30Mev**
  - Select best design candidate and Full characterization, blocks by blocks
    - **TiD > 20KRad** (Space)
    - **SEU LET > 3Mev**



Microchip CAN Total System Solution

- Wide range a microcontrollers with CAN capabilities.
- Low cost hardware tools (programmer, debugger) from automotive & Industrial worlds
- Free of charge GUI from Microchip to program, compile and debug your software
- Products supported by third party compiler environment
- Software code examples to received and transmit can frames on the network.
- External CAN stack from third party.

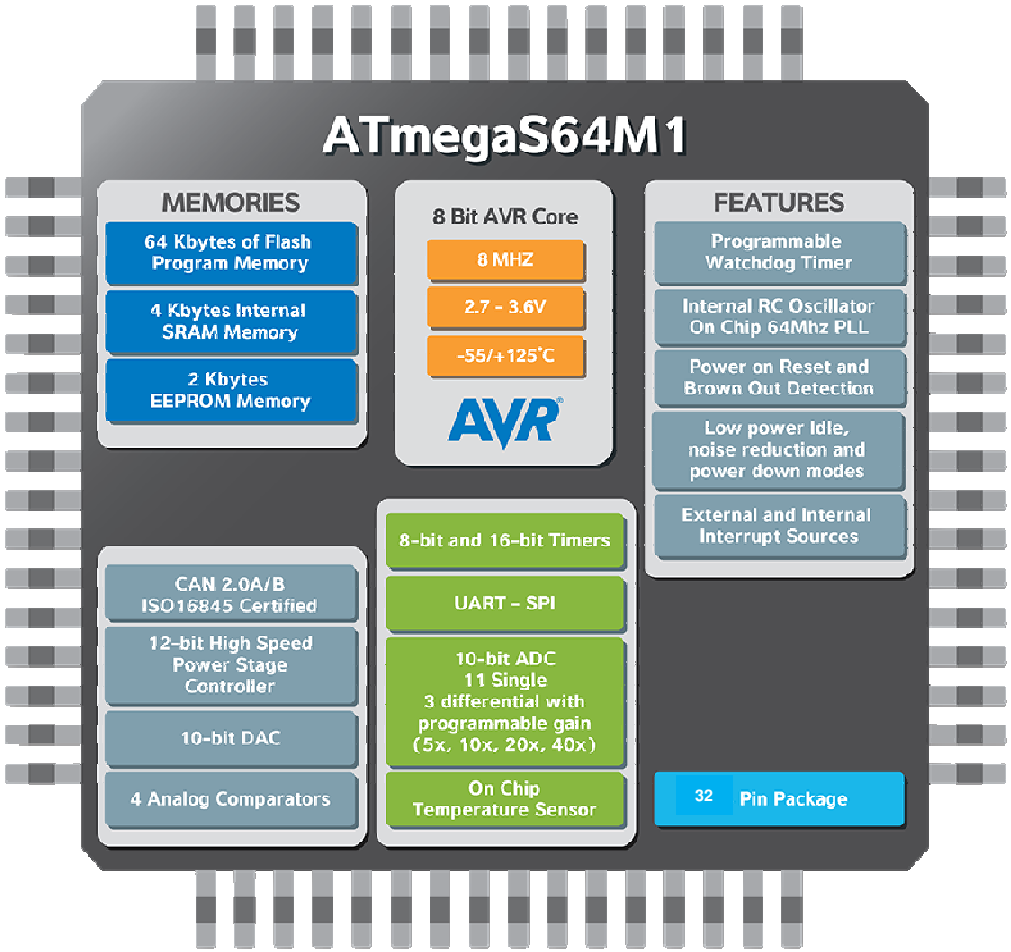
ATmegaS64M1 Rad Tolerant

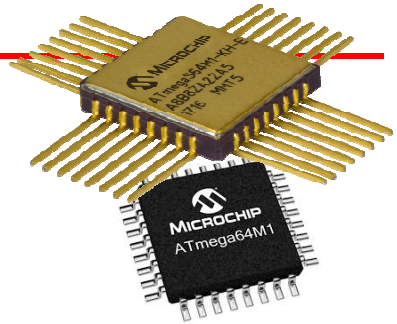
ES available
FM available

64KB Flash
4KB SRAM

Small package
QFP32

-55°C/125°C





AVR

CAN 1Mbit/s

Motor Control

DAC

ATmegaS64M1 Evaluation kit

- STK600 Motherboard (order code: ATSTK600)
https://www.microchip.com/developmenttools/ProductDetails/PartNo/ATSTK600

- STK600 RCPWM-22 Routing board (order code: ATSTK600-RC22)
https://www.microchip.com/developmenttools/ProductDetails/PartNo/ATSTK600-RC22

- STK600-TQFP32 (order code: ATSTK600-SC10)
https://www.microchip.com/developmenttools/ProductDetails/PartNo/ATSTK600-SC10

- Commercial part to be used with development boards (order code: ATmega64M1-AU)

Board features

- Leds
- Push buttons
- I/O's
- Can transceivers

CAN

ATmegaS64M1 Programing and debugging tools

ATmegaS64M1 can be programmed by USB link directly connected to STK600

Atmel ICE programmer and debugger
Ordering code P/N: ATATMEL-ICE

Atmel Studio, a all in one software PC based

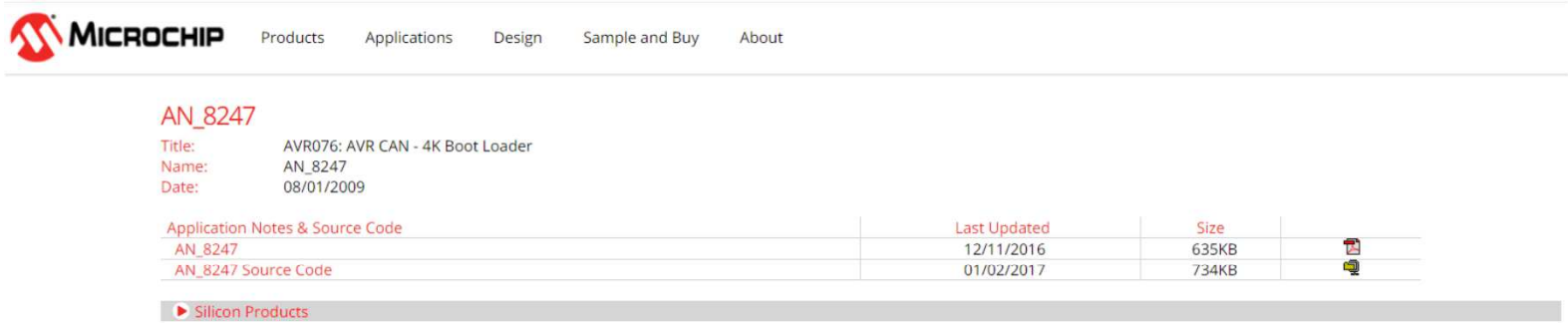
- Edit source code
- Compile (GCC or third party compiler)
- Program
- Simulate
- Emulate
- Debug

ATmegaS64M1 ASF & Application notes

ASF - Microchip Advance Software Framework

- Can drivers
- Basic examples for CAN Tx and Rx
- Basic examples source code for all the peripherals (ADC, Uart, Timers, SPI)
- PSC cookbook for PWM generation, automatic dead time insertion ……

CAN Bootloader



Motor Control

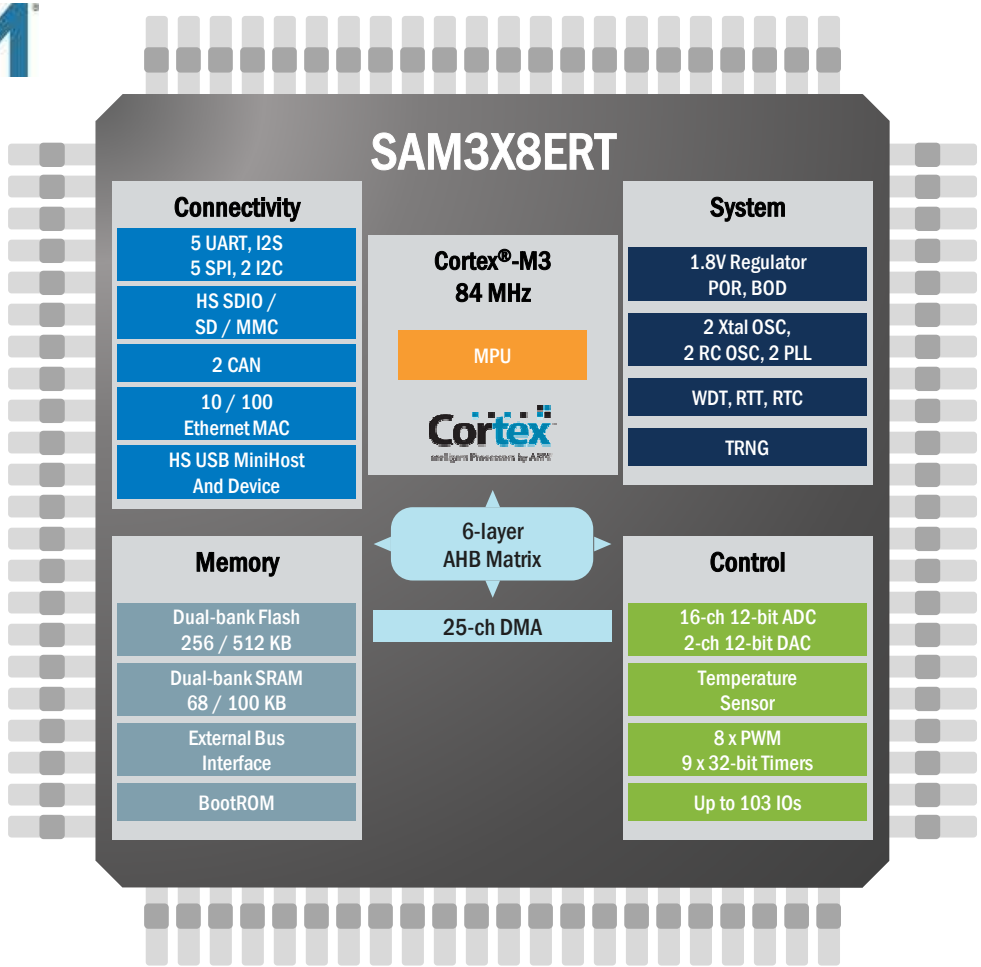
SAM3X8E Rad Tolerant

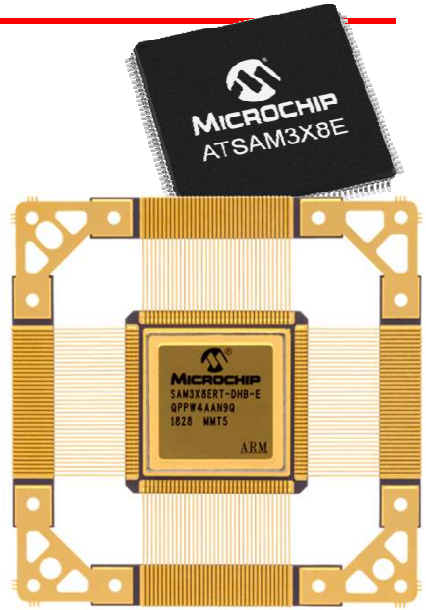
ES Q3-19
FM Q1-20

512KB Flash
100KB SRAM
Ext Mem

QFP144

-40°C/105°C





100 DMIPS

Dual CAN

Ethernet

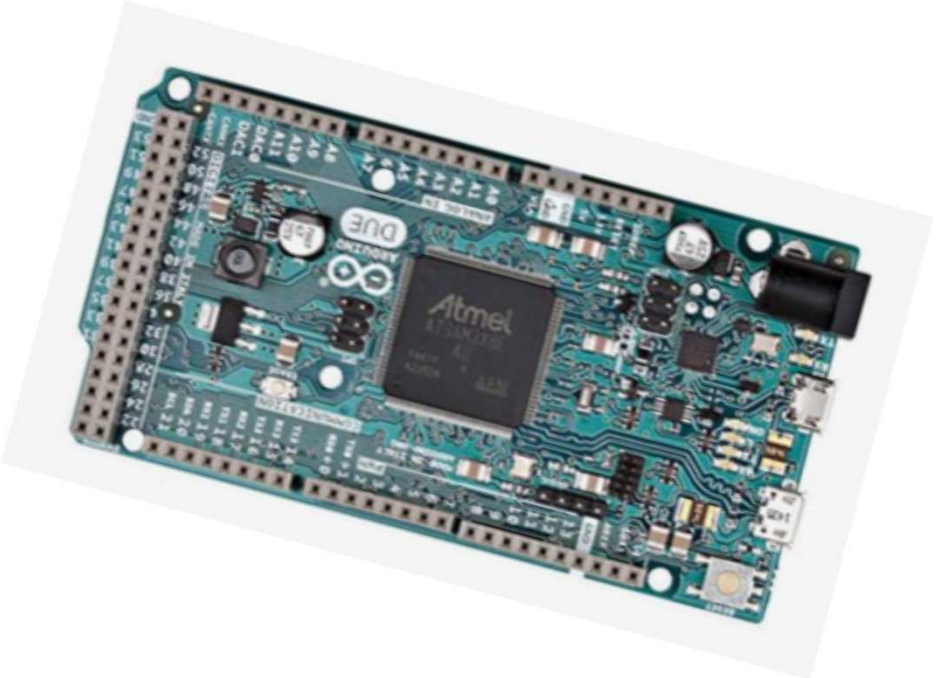
Dual Bank
Flash/SRAM

SAM3X8E Evaluation kit

Arduino Due

- 54 Digital IO
- 12 analog inputs

Digital CAN Rx/Tx on connector



SAM3X8E Programming and debugging tools

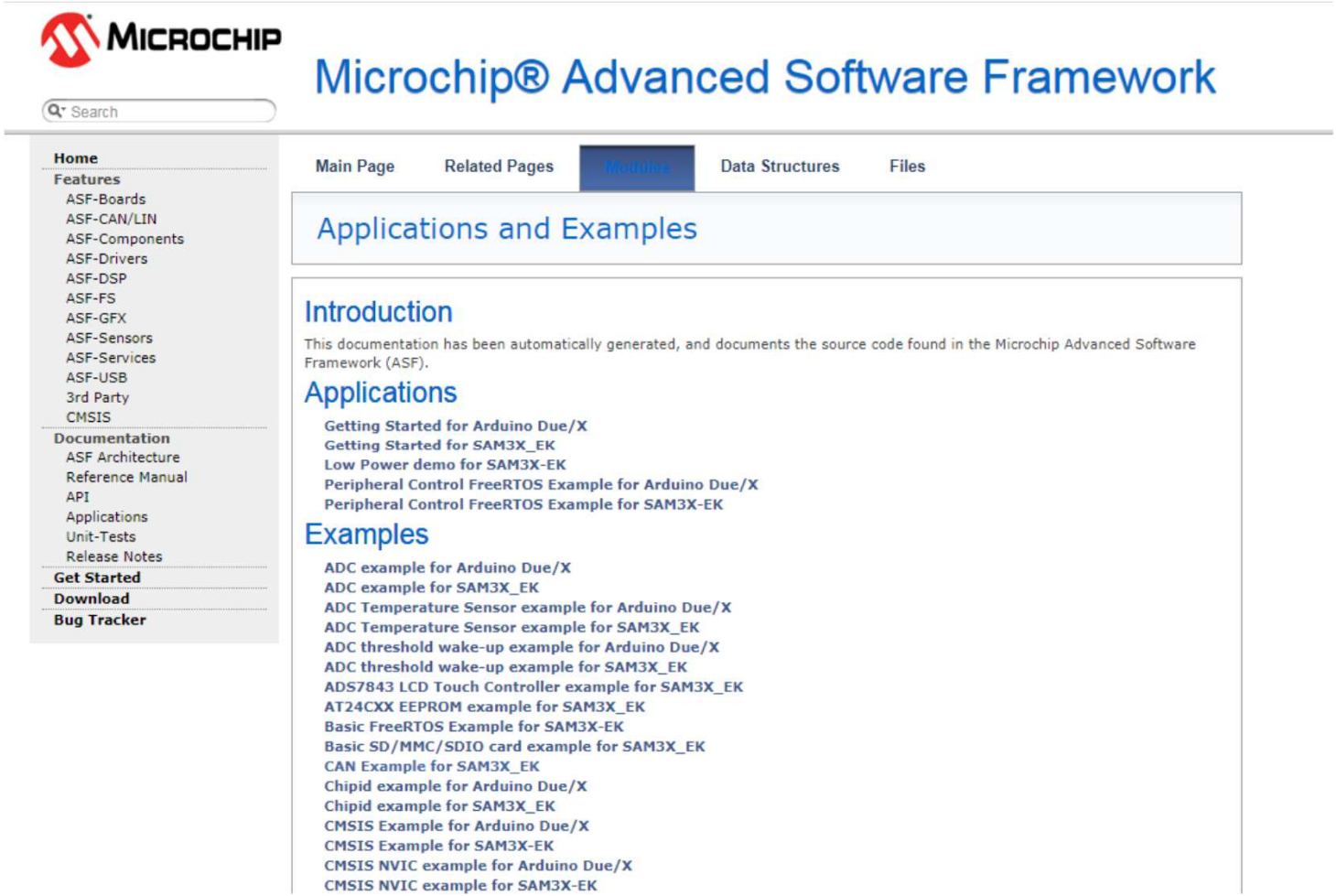
SAM3X8E can be programmed and debug using USB link directly connected to the Arduino Due. Atmel Ice debugger can also be used.

Atmel ICE programmer and debugger
Ordering code P/N: ATATMEL-ICE

Atmel Studio, a all in one software PC based

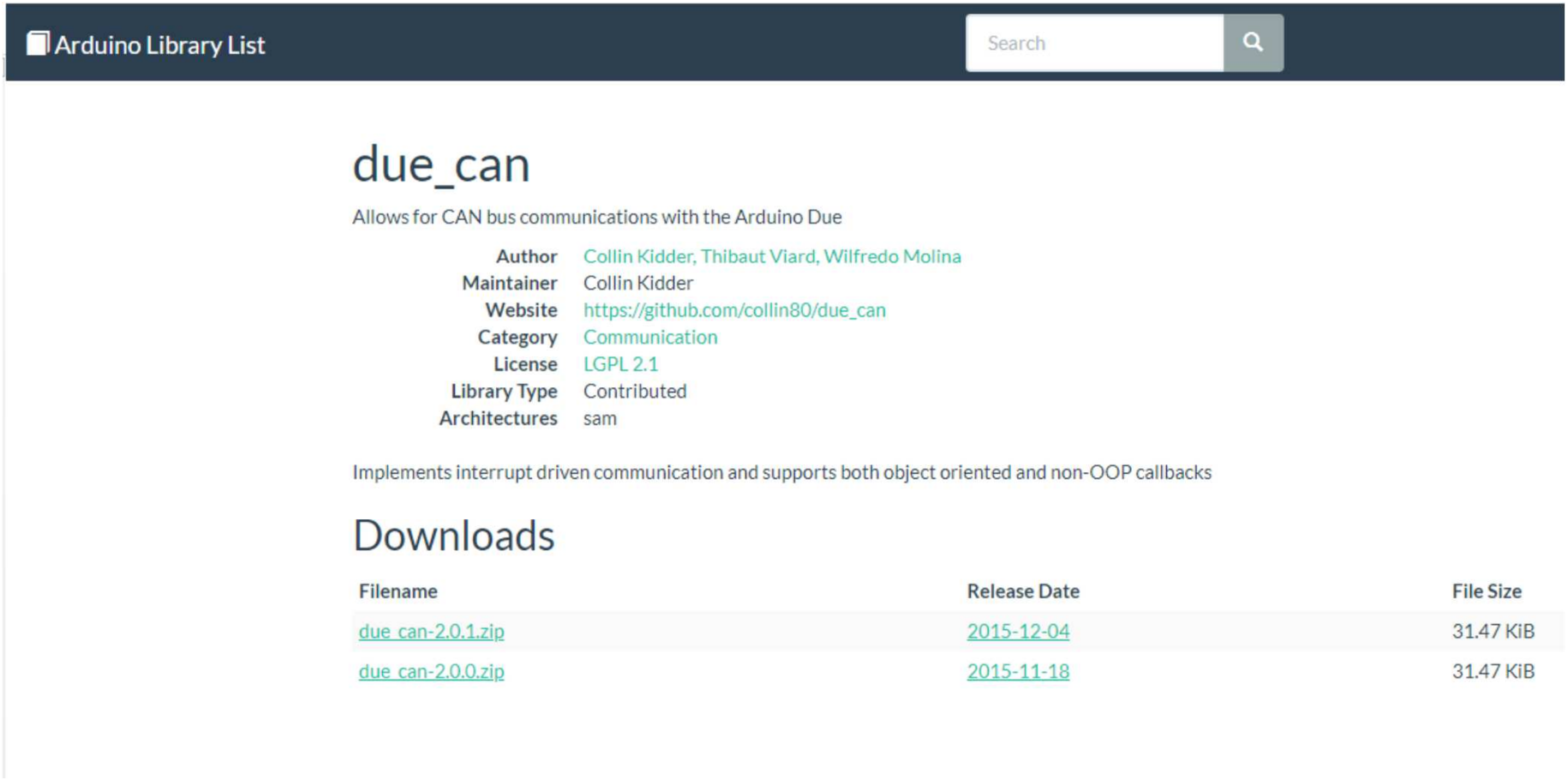
- Edit source code
- Compile (GCC or third party compiler)
- Program
- Simulate
- Emulate
- Debug

SAM3X8E Advanced Software Framework



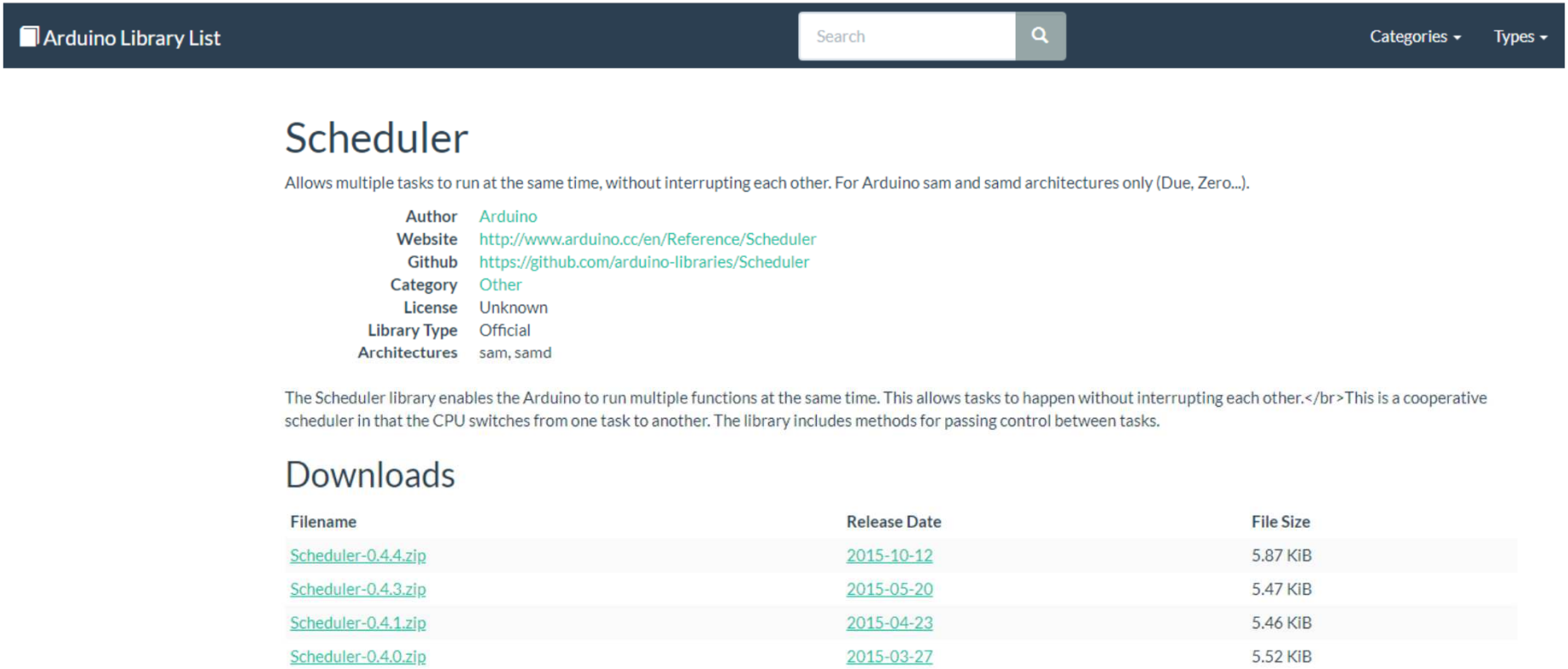
SAM3X8E Arduino Can example

https://www.arduinolibraries.info/libraries/due_can



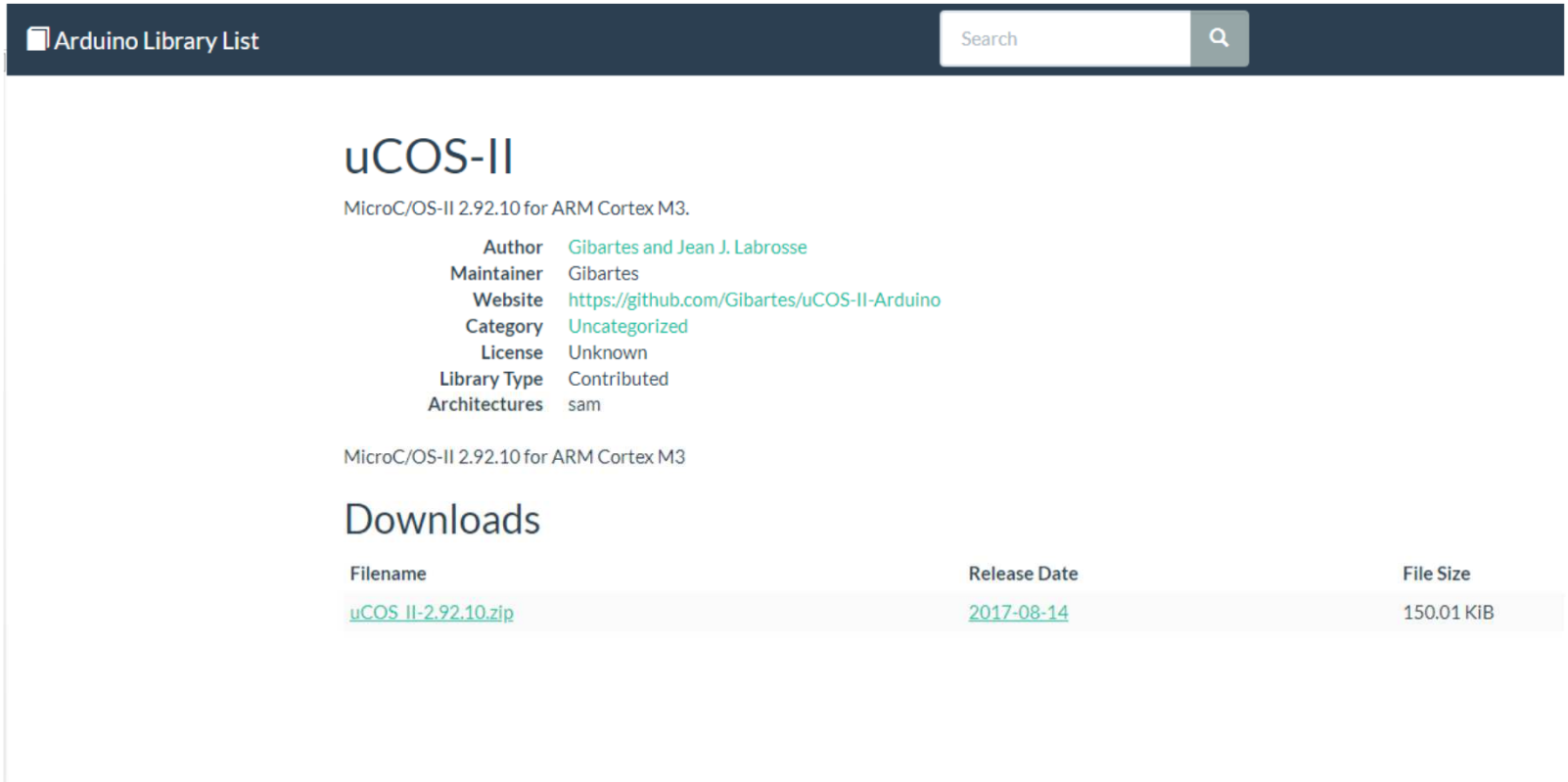
SAM3X8E Scheduler

https://www.arduinolibraries.info/libraries/scheduler



SAM3X8E uCos-II Operating System

https://www.arduinolibraries.info/libraries/u-cos-ii



SAM3X8E FreeRtos

https://www.freertos.org/RTOS_ports.html

Quick Start | Supported MCUs | PDF Books | Trace Tools | Ecosystem

Home
FreeRTOS Books and Manuals
FreeRTOS
About FreeRTOS
Features / Getting Started...
More Advanced...
Demo Projects
Supported Devices & Demos
Official & Contributed Definitions
Simple List of Ports
Officially Supported Demos
TCP/IP Demos
API Reference
Contact and Support
FreeRTOS Interactive!

Quick Start Guide
Support Forum
⇓ Download Source ⇓

FreeRTOS+ Ecosystem
FreeRTOS+TCP: Thread safe TCP/IP stack
SafeRTOS: TUV certified RTOS
OpenRTOS: Commercial Licensed RTOS

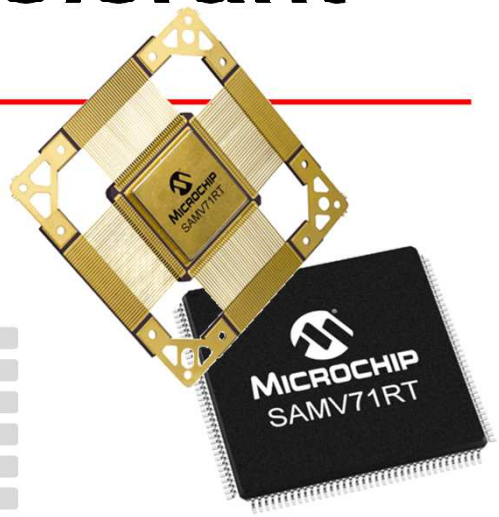
Official FreeRTOS Ports

Don't see an exact match for your microcontroller part number and compiler vendor choice? These demos can be adapted to any microcontroller within a supported microcontroller family. See the Creating a new FreeRTOS application and Adapting a FreeRTOS Demo documentation pages. As many IDEs are now based on Eclipse, also see the page that describes how to use virtual and linked paths in the Eclipse project explorer to ensure you do not need to copy the RTOS source files into an Eclipse project directory.

FreeRTOS ports are categorised as either being officially supported, or contributed. The Official and Contributed Definitions page describes the categories, and the rationale for making the distinction. This page only lists the official RTOS ports:

- Altera
  - Supported processor families: Cyclone V SoC (ARM Cortex-A9), Nios II
  - Supported tools: Altera SoC EDS (ARM DS-5 with GCC), Nios II IDE with GCC
- ARMv8-M
  - Supported processor families: ARM Cortex-M33 simulator
  - Supported tools: GCC (and ARMclang building the FreeRTOS ARMv8-M GCC port)
- Atmel
  - Supported processor families: SAMV7 (ARM Cortex-M7), SAM3 (ARM Cortex-M3), SAM4 (ARM Cortex-M4), SAMD20 (ARM Cortex-M0+), SAMA5 (ARM Cortex-A5), SAM7 (ARM7), SAM9 (ARM9), AT91, AVR and AVR32 UC3
  - Supported tools: IAR, GCC, Keil, Rowley CrossWorks

SAMV71Q21 Rad Tolerant



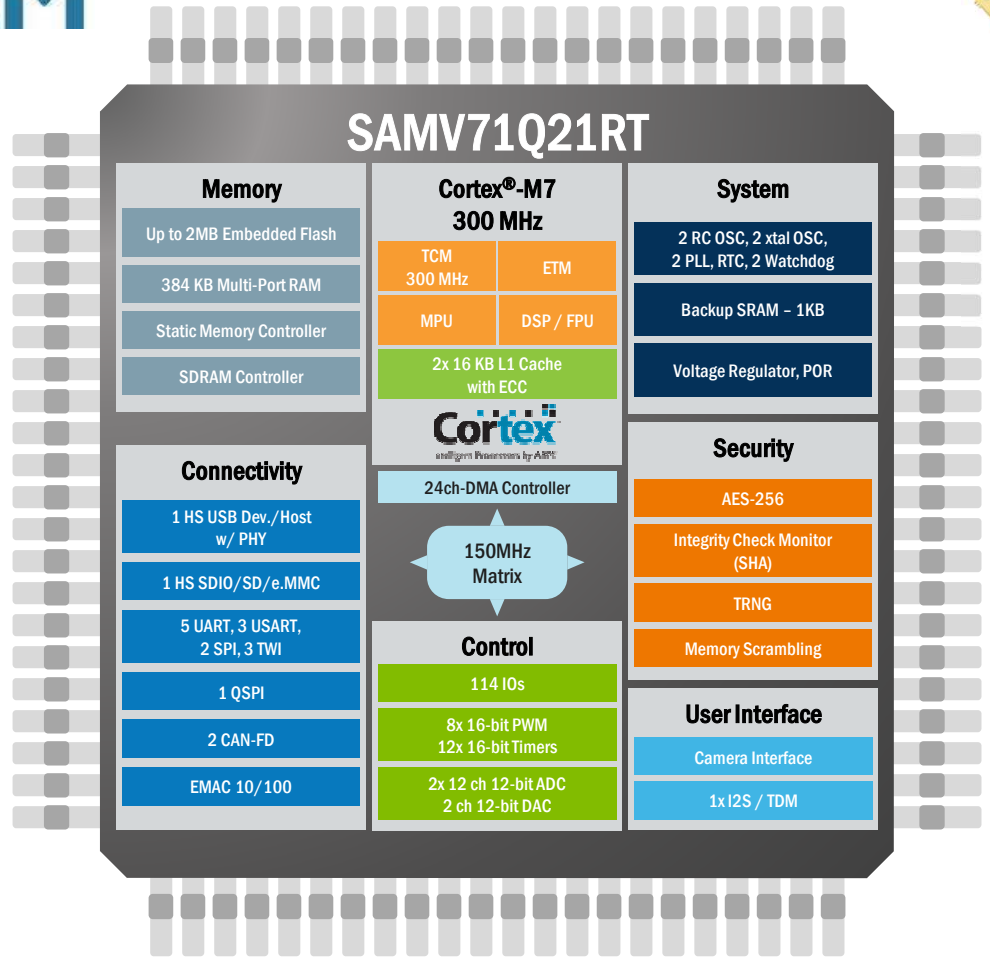
ES available
FM available

2MB Flash
384KB SRAM
Ext Mem

QFP144

-55°C/+125°C

TID 30Krad
SEL immune 60Mev



600 DMIPS

"R like" Archi
TCM/MPU/ECC

FPU/DSP copro

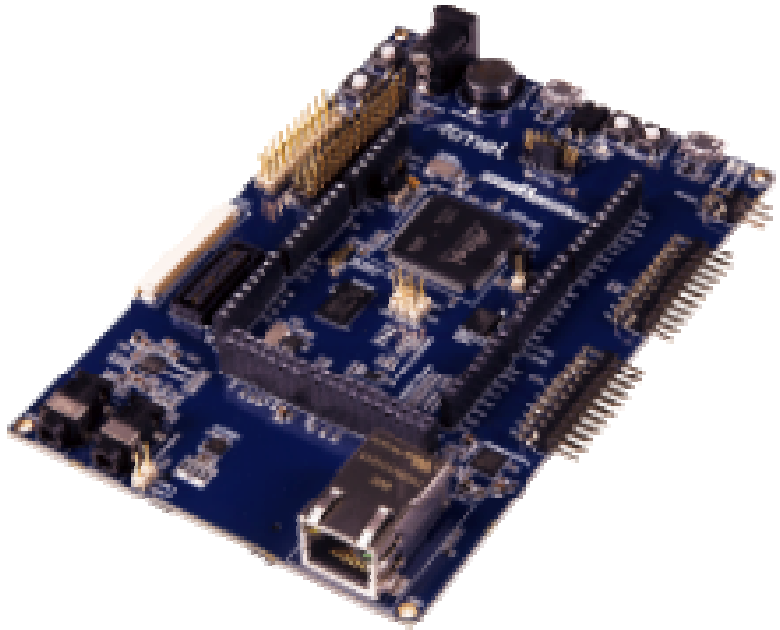
Dual CAN FD

Ethernet AVB

Crypto AES

SAMV71Q21 Evaluation kit

Xplained board
Ordering Code: ATSAMV71-XULT



Can FD transceiver integrated

On board programming and debugging though USB

SAMV71Q21 Programming and debugging tools

Atmel SAM-ICE Emulator
Ordering Code: AT91SAM-ICE

Trace module - J Trace segger

Atmel Studio, a all in one software PC based

- Edit source code
- Compile (GCC or third party compiler)
- Program
- Simulate
- Emulate
- Debug

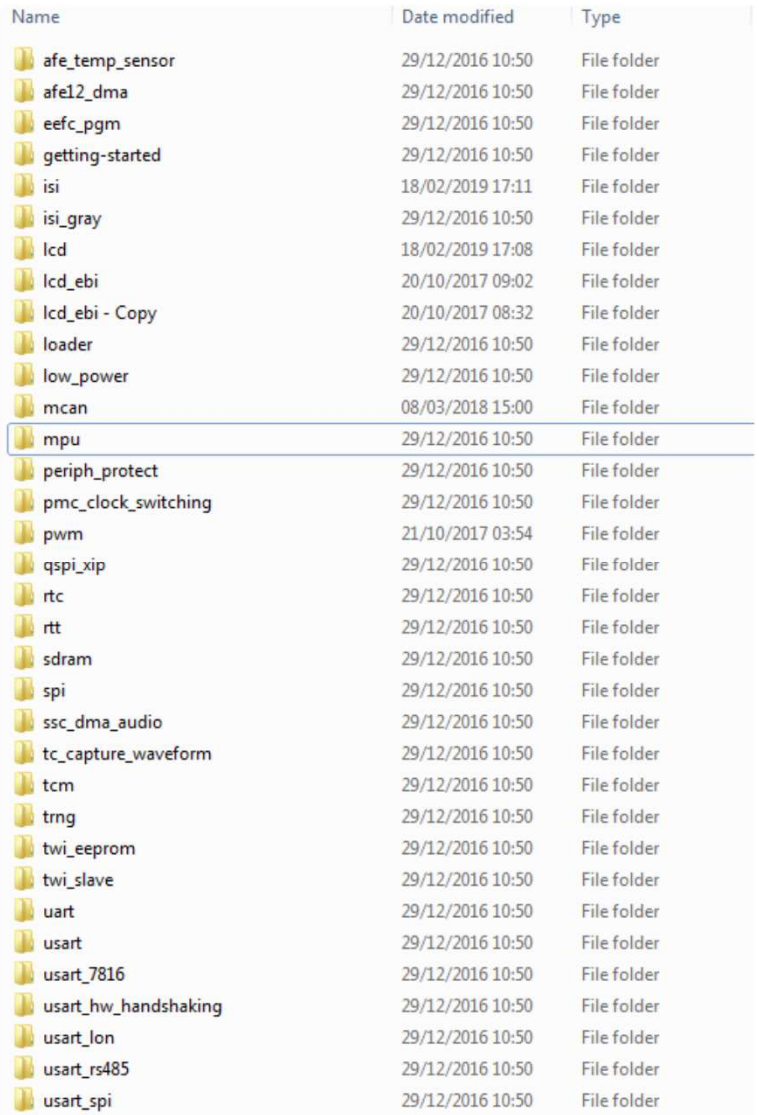
SAMV71Q21 Software packages

Ready to use Software example projects

- demo with detailed documentation for all péripheral of the mcu
- SAMV71 softpack 1.5 for AtmelStudio and IAR Ewarm, KEIL, XULT GNU

SAMV71Q21 MCHP Advanced Software Framework 3.0

- Reuse of all software drivers developed for Automotive version of SAMV71.



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afe12_dma	29/12/2016 10:50	File folder
eefc_pgm	29/12/2016 10:50	File folder
getting-started	29/12/2016 10:50	File folder
isi	18/02/2019 17:11	File folder
isi_gray	29/12/2016 10:50	File folder
lcd	18/02/2019 17:08	File folder
lcd_ebi	20/10/2017 09:02	File folder
lcd_ebi - Copy	20/10/2017 08:32	File folder
loader	29/12/2016 10:50	File folder
low_power	29/12/2016 10:50	File folder
mcan	08/03/2018 15:00	File folder
mpu	29/12/2016 10:50	File folder
periph_protect	29/12/2016 10:50	File folder
pmc_clock_switching	29/12/2016 10:50	File folder
pwm	21/10/2017 03:54	File folder
qspi_xip	29/12/2016 10:50	File folder
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rtt	29/12/2016 10:50	File folder
sdram	29/12/2016 10:50	File folder
spi	29/12/2016 10:50	File folder
ssc_dma_audio	29/12/2016 10:50	File folder
tc_capture_waveform	29/12/2016 10:50	File folder
tcm	29/12/2016 10:50	File folder
trng	29/12/2016 10:50	File folder
twi_eeprom	29/12/2016 10:50	File folder
twi_slave	29/12/2016 10:50	File folder
uart	29/12/2016 10:50	File folder
usart	29/12/2016 10:50	File folder
usart_7816	29/12/2016 10:50	File folder
usart_hw_handshaking	29/12/2016 10:50	File folder
usart_lon	29/12/2016 10:50	File folder
usart_rs485	29/12/2016 10:50	File folder
usart_spi	29/12/2016 10:50	File folder

SAMV71Q21 Third Party software

Free RTOS available on Microchip Advance Software framework

N7 Space development under ESA project

- **Bootloader compliant with the ESA SAVOIR requirements**
  - **Utilization of PUS-C stack supported by ASN.1/ACN formal modelling**
- **Board Support Package**
  - **Driver library for MCU**
- **CANopen library implementing tailored ECSS-E-ST-50-15C**
- **Demonstration applications based on RTEMS 5**

Micrium RTOS

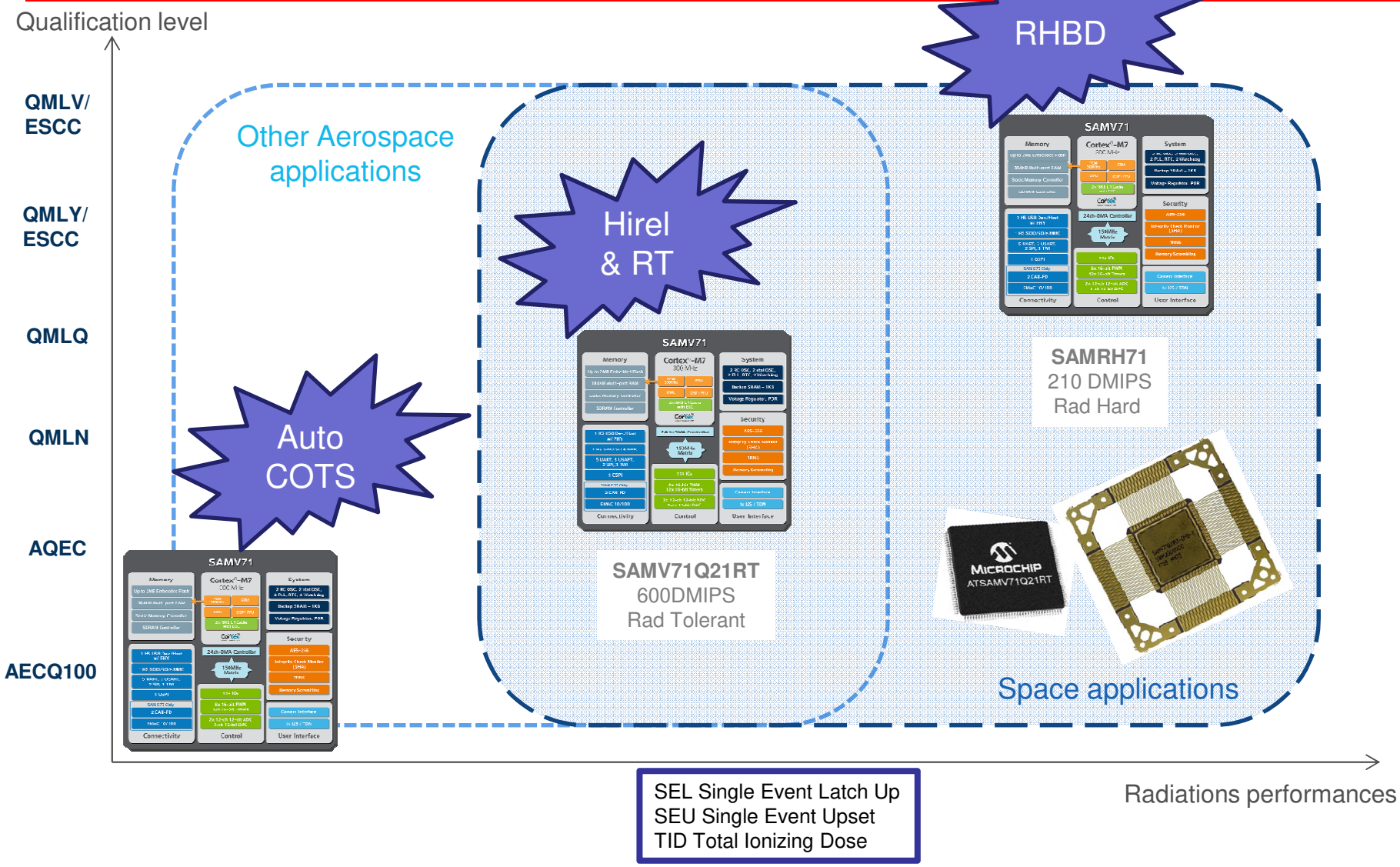
Micrium

µC/OS™
RTOS and Stacks

Ada is fully supported on the SAMV71Q21RT through GNAT Pro Bare Metal

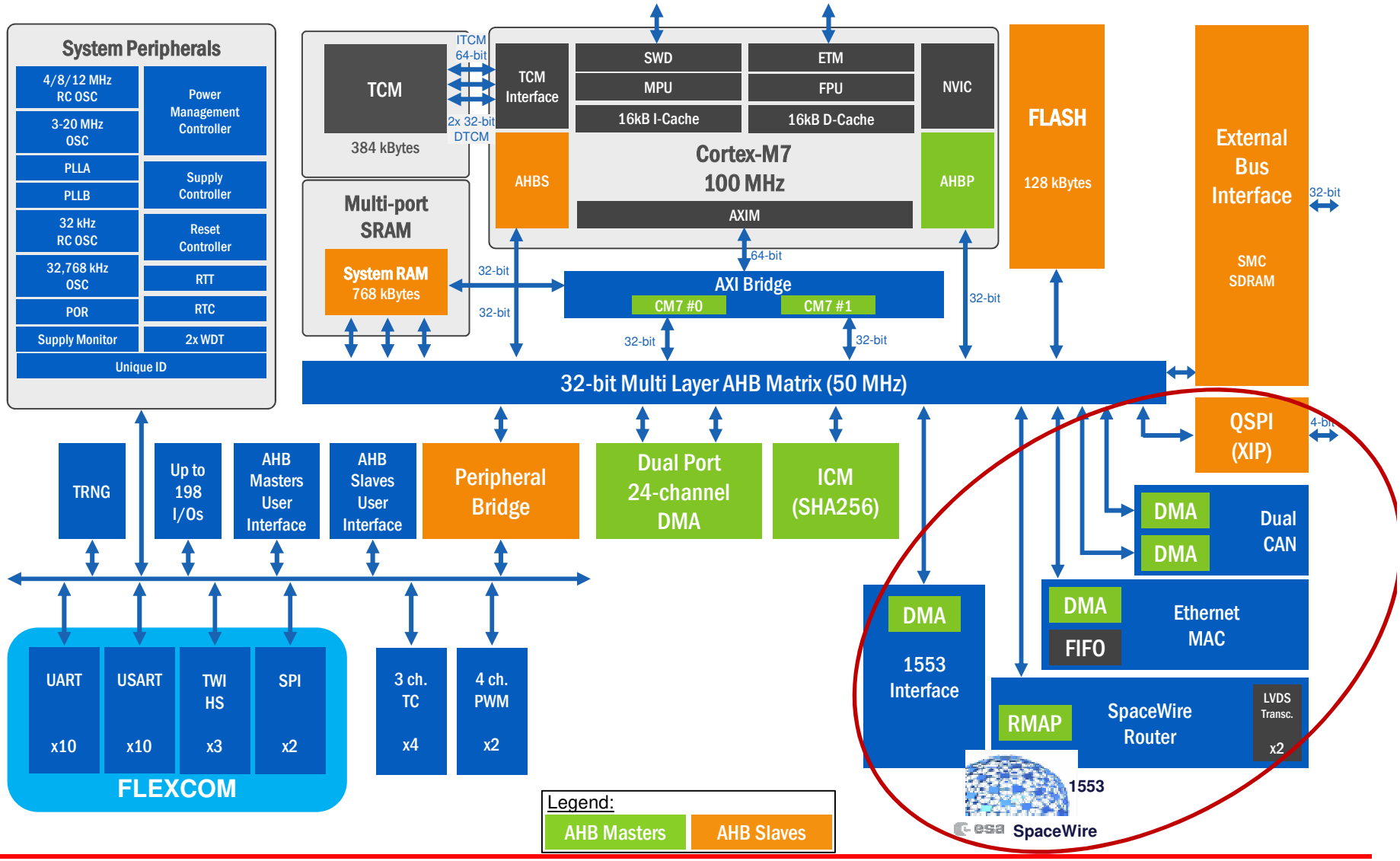
AdaCore

SAMV71 Scalable Unique Solution



SAMRH71 Architecture

Space Connectivity



SAMRH71 Evaluation kit

- 512Kbytes of PROM
- 256Mbits of SDRAM

- **Ethernet**
- **2 x SpaceWire**
- **2 x CAN FD**
- **2 x 1553**

- 4 x LEDs
- 3 x Pushbuttons
- Extension connector
- JTAG Debug connector
- TRACE connector

User guide

SAMRH71 Programming and debugging tools

Atmel SAM-ICE Programmer Debugger Emulator

Ordering Code: AT91SAM-ICE

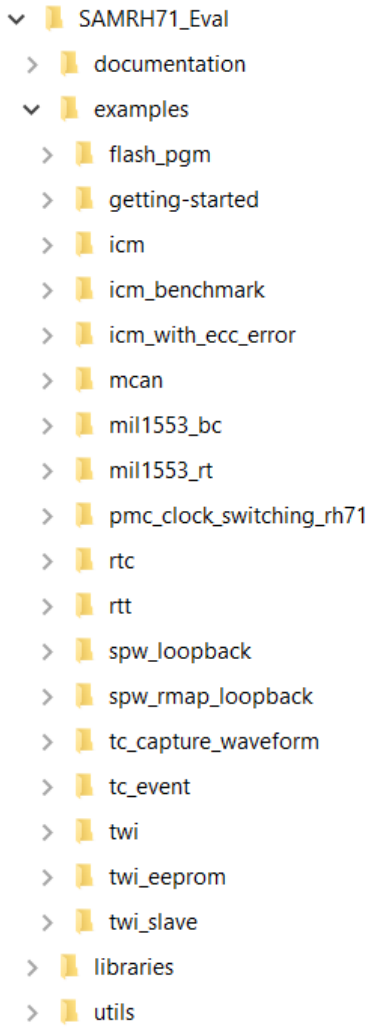
Trace module - J Trace segger

SAMRH71-Software Package

- **SAMRH71 Tools**
  - MPLAB/HARMONY support
  - ASTUDIO support

- **SAMRH71 Embedded Software -** Full set of software examples
  - Harmony Workbench
  - ASTUDIO Software Package (GCC & IAR)

- **SAMRH71 Documentation**
  - Datasheet
  - Evaluation Kit User Manual
  - Application Notes (Getting Started, ICM management, …)



Available from
https://www.microchip.com/wwwproducts/en/SAMRH71

SAMRH71 Third Party software

N7 Space ongoing development

BSW & BSP adaptation to the RH71

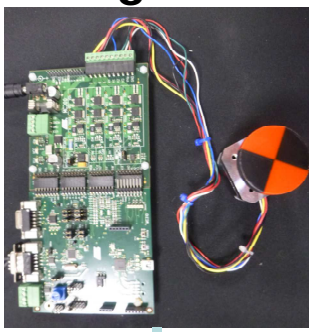
Support for SpaceWire and IO Switch Matrix
Remote application booting through SPI and RMAP

FreeRTOS integration

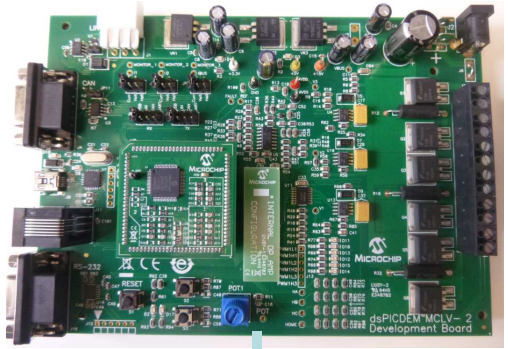
CAN Network
RT and RH Microcontrollers

ATmegaS64M1

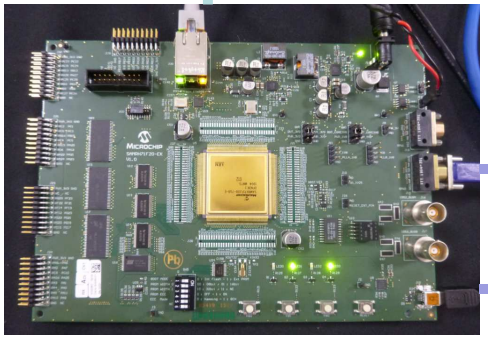
ATmegaS64M1



SAMV71RT



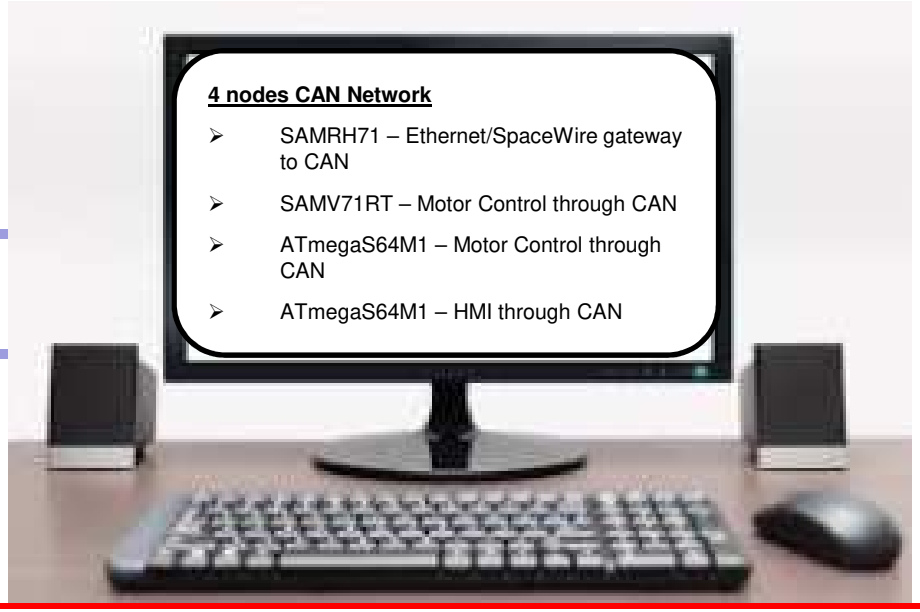
CAN Network



SAMRH71

SpaceWire

Ethernet



Visit us on our booth

to enjoy our

CAN Demo

MICROCHIP

THANK YOU!