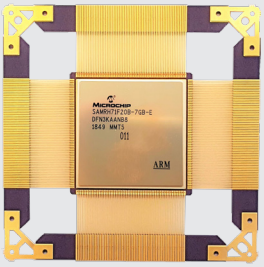
SAMRH71 Radiation Hardened Arm® Microcontroller

Summary

The SAMRH71 is a radiation hardened Microcontroller (MCU) providing the best combination of space connectivity interfaces along with high processing power more than 200 DMIPS. The SAMRH71 is designed for high-level radiation performances, extreme temperature and high reliability in space application. It takes advantage of the powerful Arm® Cortex®-M7 coupled with high band-width communication interfaces such as SpaceWire, MIL-STD-1553, CAN FD and Ethernet with TSN capabilities.



Core

- Arm Cortex-M7 Core running up to 100 MHz delivering 2.14 DMIPS/MHz
- 16 Kbytes of ICache and 16 Kbytes of DCache with Error Code Correction (ECC)
- Simple- and double-precision HW Floating Point Unit (FPU)
- Memory Protection Unit (MPU) with 16 zones
- DSP Instructions, Thumb®-2 Instruction Set
- Embedded Trace Module (ETM) with instruction trace stream, including Trace Port Interface Unit (TPIU)

Memory

- 128 Kbytes embedded Flash with build-in ECC (up to 2 errors correction)
- 384 Kbytes embedded SRAM for Tightly Coupled Memory (TCM) interface or System SRAM with ECC
- 768 Kbytes of multiport SRAM with ECC
- Hardened External Memory Controller (HEMC), to address PROM SRAM and SDRAM with variable data size (from 8- to 48-bits)
- Up to 2 Gbytes of external memory accessible with built-in ECC

System

- Built-in Power Fail Detect (PFD), programmable supply monitors and two independent Watchdog
- Non-Maskable Interrupt Controller (NMIC)
- Crystal or ceramic resonator oscillators: 3 to 20 MHz main oscillator with failure detection
- RTC with Gregorian calendar and UTC mode, waveform generation in low-power modes
- 32-bit low-power Real Time Timer (RTT)
- High-precision 4/8/10/12 MHz factory-trimmed internal RC oscillator
- 32.768 kHz crystal oscillator input or embedded 32 kHz (typical) RC oscillator as source of low-power mode device clock (SCLK)
- One PLL for system clock, one PLL for peripherals
- One dual-port 32-channel central DMA Controller (XDMAC)
- Four three-channel 32-bit Timer Counters (TC) with Capture, Waveform, Compare and PWM modes, Quadrature decoder logic and 2-bit Gray Up/Down Counter for stepper motor
- Two 4-channel 16-bit PWMs with complementary outputs, Dead Time Generator and several fault inputs per PWM for motor control, two external triggers to manage Power Factor Correction (PFC), DC-DC and lighting control

Communication Peripherals

- One 10/100 Ethernet MAC (GMAC) energy efficiency, AVB/TSN, time stamping and PTP support
- Ten FLEXCOMs, each supporting USART/UART, SPI and TWI/I²C.
- Single data rate transfer Quad I/O Serial Peripheral Interface (QSPI)
- CAN FD Controller compliant with CAN protocol version 2.0 Part A, B and CANFD specification
- SpaceWire interface with two SpaceWire ports with integrated RMAP support and embedded SpaceWire router
- One 1553 interface with redundant links compliant to MIL-STD-1553B standard

Space Environment

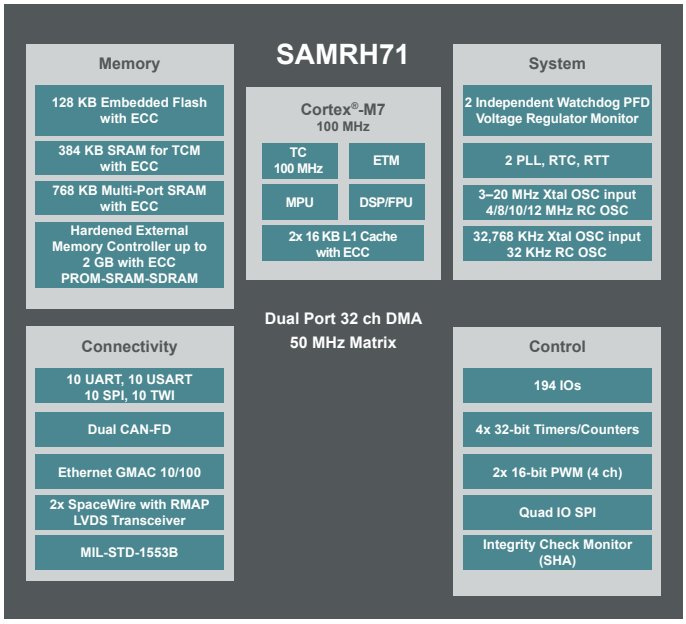
- 256-lead hermetic ceramic package
- BGA Hirel plastic for high-volume programs
- Space grade QML-Q/QML-V qualification
- Total Ionizing Dose (TID): 20 to 50 Krad (with Flash) >100 Krad (without Flash)
- Heavy ions and proton test
- Latchup immune SEL> 62 Mev
- SEU full characterization LET>20Mev
- Temperature range –55°C to +125°C

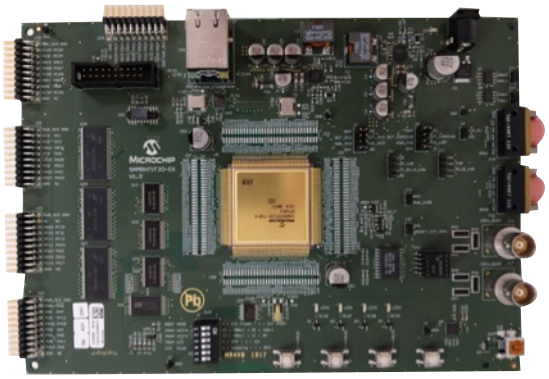
System Performance

- Deterministic code execution using TCM
- Complex calculation and co-processing (FPU)
- Communication threads parallelism (H matrix architecture)
- Low-latency memories access

Software Environnement

- Developement platform MPLAB® Harmony
- Software libraries, code as examples
- Many operating system supported: FreeRTOS, Rtems
- Space software services proposed by N7 space, Rtems, Addacore, Fentiss
- Heritage benefit from SAMV7 ecosystem: IAR, KEIL, MICRIUM, SEGGER





SAMRH71 Evaluation Kit
Supported by MPLAB Harmony

SAMRH71 Tools guide

Tool	Description	Part Number
SAMRH71 Evaluation Kit	The SAMRH71 Evaluation Kit is ideal for evaluate the SAMRH71 and prototype your own application using expansion connectors.	SAMRH71F20-EK
SAM-ICE Debugger	SAM-ICE is a JTAG emulator designed for SAM7 Arm® core-based MCUs and MPUs, including Thumb mode. It also supports Serial Wire Debug (SWD) and Serial Wire Viewer (SWV) from SAM-ICE hardware V6.	AT91SAM-ICE

Product Selection Guide

Part Number	Speed	Power supply	Package	Flow
SAMRH71F20C-7GB-E	100 MHz	3.0–3.6V	CQFP256	Engineering samples
SAMRH71F20C-7GB-MQ	100 MHz	3.0–3.6V	CQFP256	QML-Q Equivalent
SAMRH71F20C-7GB-SV	100 MHz	3.0–3.6V	CQFP256	QML-V Equivalent
SAMRH71F20C-7GB-SR	100 MHz	3.0–3.6V	CQFP256	QML-V RHA Equivalent

For plastic package, please contacts your sales office.

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