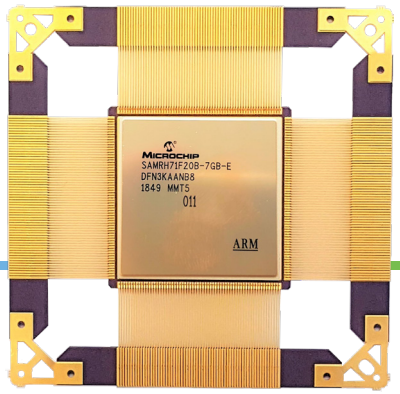
SAMRH71 Radiation-Hardened Arm® Microcontroller (MCU)



Summary

The SAMRH71 is a radiation-hardened MCU providing the best combination of space connectivity interfaces and high processing power of more than 200 DMIPS. The SAMRH71 is designed for high-level radiation performances, extreme temperature and high reliability in space applications. It takes advantage of the powerful Arm® Cortex®-M7 core coupled with high-bandwidth 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 two 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 two Gbytes of external memory accessible with built-in ECC

System

- Built-in Power Fail Detect (PFD), programmable supply monitors and two independent watchdog timers
- 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 and one PLL for peripherals
- One dual-port 32-channel central DMA Controller (XDMAC)
- Four three channel, 32-bit Timer Counters (TCs) 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 Media Access Control (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 CAN FD 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

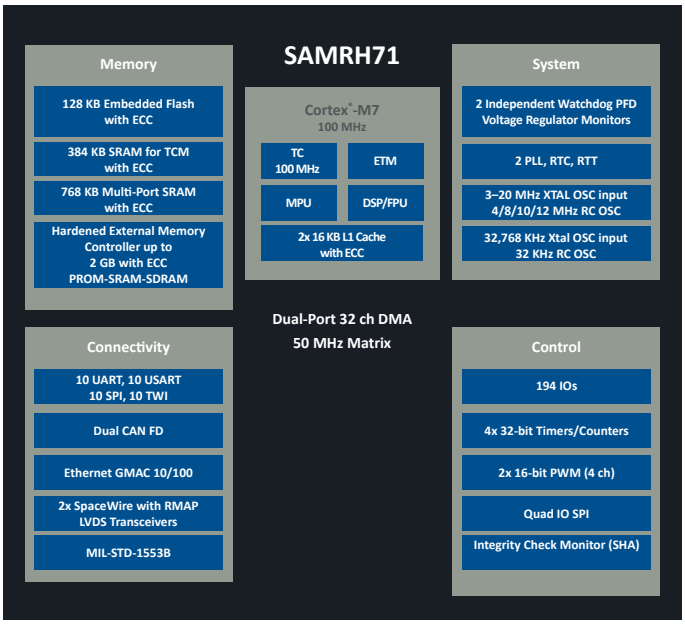
- CQFP256 hermetic ceramic package
- BGA625 HiRel plastic for high-volume programs
- Space-grade QML-Q/QML-V qualification
- Total Ionizing Dose (TID): 15 krad (with Flash)
- Heavy ions and proton test
- Latchup immune SEL> 62 MeV.cm^2.mg^{-1}
- SEU full characterization LET>20 MeV.cm^2.mg^{-1}
- Temperature 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

- Development platform MPLAB® Harmony
- Software libraries with code as examples
- Multiple operating systems supported: FreeRTOS™, RTEMS
- Space software services proposed by N7 Space, RTEMS, Addicore™, fentISS
- Heritage benefit from SAMV7 ecosystem: IAR, Arm Keil® compiler, 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 evaluating the SAMRH71 and prototyping your own application using expansion connectors.	SAMRH71F20-EK
J-32 Debug Probe	The J-32 Debug Probe Debugger/Programmer provides affordableDV164232 fast and easy debugging and programming for Microchip's PIC32 and SAM MCU and MPU products	DV164232

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
951200601	100 MHz	3.0–3.6V	CQFP256	ESCC QPL
951200601R	100 MHz	3.0–3.6V	CQFP256	ESCC QPL RHA
SAMRH71F20C-HFB-SN	100 MHz	3.0–3.6V	BGA625	HiRel Plastic (-SN)

For plastic packaging, please contact your sales office.