Achieve Your Mission

VORAGO
TECHNOLOGIES

VORAGO Achieves Top U.S. Government Certification for Space-Grade Micro Circuit

VORAGO is proud to have achieved qualification by the Defense Logistics Agency (DLA) to the Qualified Manufacturers List (QML) Class Q+ for our VA41630 Arm Cortex M4 microcontroller (MCU).

This part passes the most stringent lot screening and qualification for a space grade microcircuit, providing the highest level of quality and reliability. It also offers Radiation Hardness Assurance (RHA) level R for a minimum of 100 krad(Si) Total Ionizing Dose (TID). We would like to thank DLA and NASA/JPL for all of their support to help us achieve this honor for our first government rated product and allow us to serve in the most important national missions.

As our first Standard Microcircuit Drawing (SMD), the 5962R2420301QXC offers designers the ability to scale a single design from a commercial LEO application to a GEO or deep space government mission without the need for redesign or requalification. With pin and software compatible versions across two levels of radiation capability, packaging, and qualification, VORAGO offers customers the ability to trade price for performance with a single device to fit any mission profile. One design, any orbit, any customer.

**Radiation-Hardened
Arm® Cortex®-M4 Microcontroller**
VA41630

Achieve Your Mission with VORAGO

Thank you for considering VORAGO for your specialized component needs.

VORAGO leads the industry in providing Arm®-based radiation-hardened and radiation-tolerant microcontrollers (MCUs) and microprocessors (MPUs), along with extreme-temperature components for Aerospace, Defense and Industrial projects around the globe. Our patented HARDSIL® technology uses cost-effective, high-volume manufacturing to harden any commercially designed semiconductor component for extreme environment operations.

VORAGO's Arm®-based M0, M4 and M55 microcontrollers provide stable platforms to design your most demanding Hi-rel applications. The flagship of VORAGO's radiation-hardened MCU line-up, the VA41630, is the most integrated rad-hard solution on the market today. Including a fully integrated non-volatile memory (NVM), the VA41630 provides the highest functional density for space-based applications.

Our newest addition to the VORAGO portfolio, the VA7230, is the first Arm®-based microprocessor (MPU) with an embedded graphics processor (GPU) targeted at space applications. The VA7230 offers two powerful Arm Cortex-A72 cores running up to 1.5 GHz. The embedded graphics processor enables more than ten billion floating-point operations per second of power-efficient performance to comfortably address the most challenging use cases.

The VA7230 will transform the high-performance edge by offering a power and performance-optimized applications microprocessor capable of supporting on-board computing, payload processing, as well as satellite imagery compression and processing.

We've created this guide to assist you in selecting the most appropriate components for your specific needs. You can find more information at voragotech.com, or reach out to us directly at info@voragotech.com.

We look forward to working with you and your team.

Bernd Lienhard, CEO

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Radiation-Tolerant
Arm® Cortex®-A72 Microprocessor
VA7230

Transforming the high performance edge.

Previously, GPU solutions were only possible with FPGA or discrete graphics processors, requiring higher cost and power solutions. VORAGO's first microprocessor, the VA7230, is the first Arm® MPU with an embedded graphics processor (GPU) targeted at space applications.

The VA7230 has dual Arm A72 cores running up to 1.5 GHz with an embedded graphics processor supporting 10.4 GFLOPS of power-efficient performance. With advanced security capabilities, Ethernet TSN and dual CAN-FD, the VA7230 can comfortably address the most challenging edge processing workloads, such as AI/ML and image processing and compression of satellite images.
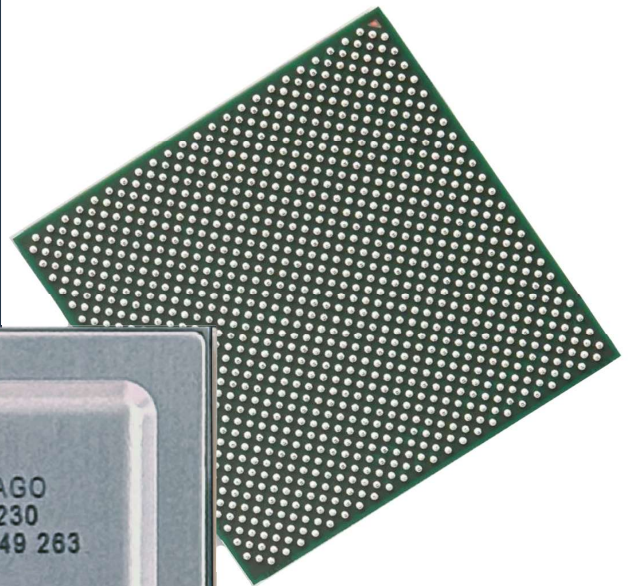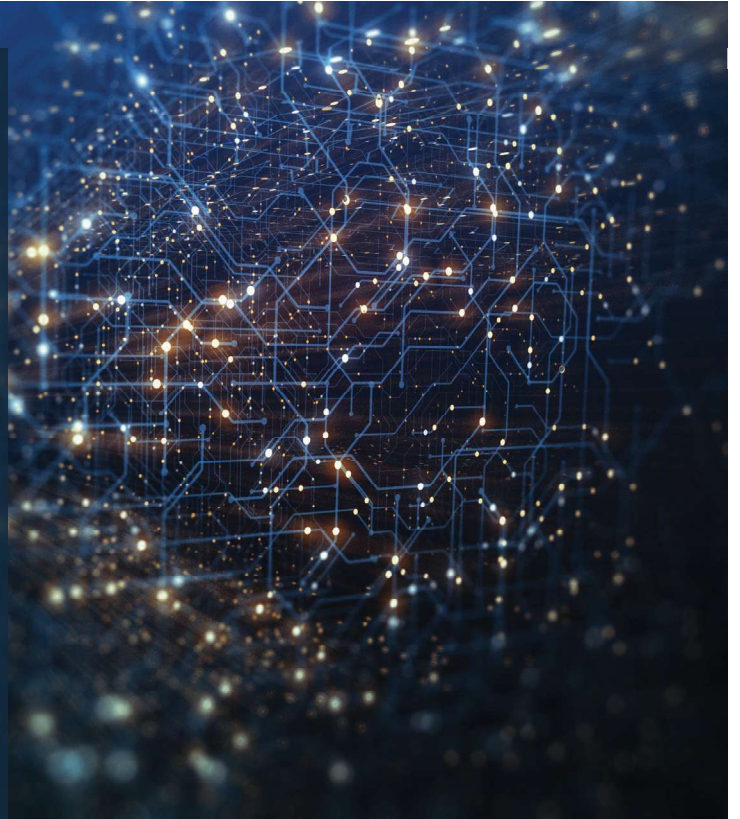
Radiation-Tolerant
Arm® Cortex®-A72 Microprocessor
VA7230

New

CPU Complex

Arm® Processor Core	2 x A72
FPU	Single and Double Precision
Arm® TrustZone®	Yes
Max Clock Frequency	1.5 GHz
Data Memory	32 KB L1 (w/ ECC)
Program Memory	48 KB L1
L2 Cache	1 MB (w/ ECC)

External Memory

DRAM Controller	32 bit DDR3/4 w/ ECC
SD/SDIO/eMMC	2

Graphics Subsystem

API	OpenGL ES 3.1, OpenCL 1.2
Performance	10.4 GFLOPS
SRAM	256 KB

Security

Secure Boot	Yes
Cryptographic Accelerator	Yes
Arm® TrustZone®	Yes

High Speed Interfaces

PCI Gen 3.0	2
SerDes lanes	4
USB 3.0 with PHY	2
SATA 6 Gbit/s	1

Standard Interfaces

GPIO	Up to 68
UART	8 (6 LP)
I2C	8
SPI	4
Timers	10 channel
CAN-FD	2

Ethernet Complex

Ethernet Controller	6 up to 2.5Gbps
Ethernet TSN	4 port switch

System Control

DMA Controller	Yes
Power Management	Multiple Low Power Modes
MMU	System Level

Specifications

TID krad (Si)	≥30
SEL immunity to LET	≥60
Operating Temp °C	-55 - 125

Packaging

BGA	448 pin FC-BGA
Size	17 x 17mm

Development Kit

Evaluation Board	VEB1, VEB2
Software	Linux BSP

Product Availability: Engineering Samples — Q3 2025 **Production Qualified** — QML Class N equivalent qualified – Q3 2026

Radiation-Tolerant
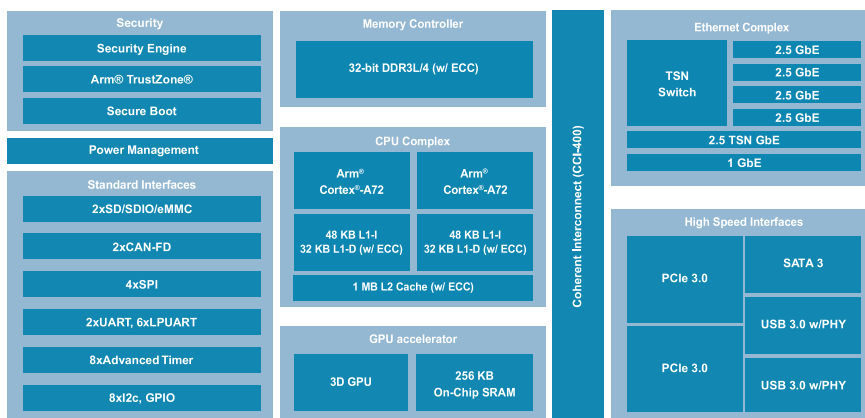# Arm® Cortex®-A72 Microprocessor
VA7230

Introducing our high-performance VA7230 featuring robust and reliable memory performance. Ideal for applications requiring high computational power and reliability, this processor is your solution for next-generation embedded systems.

Radiation Performance Target
≥ 30 krad(Si) @100 rad(Si)/sec (HDR)
≥ 100 krad(Si) @210 rad-(SI)/hr (LDR)
Single-Event Latch Up (SEL) Immunity: > 60 (MeVcm^2) /mg (@ T=125°C)x

Security		
Security Engine		
Arm® TrustZone®		
Secure Boot		

Power Management

Standard Interfaces
2xSD/SDIO/eMMC
2xCAN-FD
4xSPI
2xUART, 6xLPUART
8xAdvanced Timer
8xI2c, GPIO

Memory Controller
32-bit DDR3L/4 (w/ ECC)

CPU Complex	
Arm® Cortex®-A72	Arm® Cortex®-A72
48 KB L1-I 32 KB L1-D (w/ ECC)	48 KB L1-I 32 KB L1-D (w/ ECC)
1 MB L2 Cache (w/ ECC)	

GPU accelerator	
3D GPU	256 KB On-Chip SRAM

Coherent Interconnect (CCI-400)

Ethernet Complex	
TSN Switch	2.5 GbE
	2.5 GbE
	2.5 GbE
	2.5 GbE
2.5 TSN GbE	
1 GbE	

High Speed Interfaces	
PCIe 3.0	SATA 3
	USB 3.0 w/PHY
PCIe 3.0	
	USB 3.0 w/PHY

Package Options
BGA448 (17x17 mm)

Support
VEB 1 - VA7230 Development Board with Linux BSP
VEB 2 - Addition of VA41630 MikroBUS™

Product Availability
Development Board with Linux BSP – Now
Engineering Samples — Q3 2025
Production Qualified — QML Class N equivalent qualified – Q3 2026

Applications
Primary processing workloads
Edge computing and local server/router
AI/neural networks and number crunching workloads
Image processing and compression
Communications payloads

VORAGO
VA7230
SBYJ2449 263
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XOABSBA

Key Features

Dual 32/64-bit, up to 1.5 GHz Arm® Cortex®-A72 Cores with L1 and shared 1 MB L2 caches (w/ ECC), NEONTM SIMD and FPU
Integrated 3D GPU
(OpenCL 1.2, OpenGL ES 3.1, 10.4 GFLOPS)
with 256KB on-chip SRAM
32-bit DDR3L/DDR4
SDRAM Controller with SECDED ECC

Ethernet Interfaces
TSN capable 4-port embedded switch
6 total Ethernet Interfaces up to 2.5Gbps
(10/100/1000/2500 Mb/s)

Security
Security Engine with Cryptographic Offload
Arm TrustZone®
Secure Boot

High Speed Interfaces
2 x PCIe® Gen 3.0 controllers
Up to four SerDes lanes running at 8 GHz
root, complex and endpoint support
2 x USB 3.0 interfaces with integrated PHY host and device mode support
SATA 6 Gbit/s

Standard Interfaces
2xCAN-FD
2xSD/SDIO/eMMCI
4xSPI
2xUART, 6xLPUART
8xI2C, GPIO
8-ch Advanced Timer to support input capture, output compare and PWM

Operating Temperature
-55 to +125C, thermal monitoring unit

MCU SELECTOR GUIDE

Space Grade

	VA53230	VA42630	VA42620	VA41630	VA41620
Arm® Processor Core	2x M55	M4	M4	M4	M4
FPU	Single Precision	Single Precision	Single Precision	Single Precision	Single Precision
Max Clock Frequency	200 MHz	100 MHz	100 MHz	100 MHz	100 MHz
Data Memory	128 KB	64 KB	64 KB	64 KB	64 KB
Program Memory	512 KB	256 KB	256 KB	256 KB	256 KB
EDAC/Scrub Engine	Yes	Yes	Yes	Yes	Yes
GPIO	139	104	104	104	104
UART	4	3	3	3	3
I2C	4	3	3	3	3
SPI	4	3	3	3	3
DMA Controller	8 Channel	4 Channel	4 Channel	4 Channel	4 Channel
Temp Sensor	Yes	Yes	Yes	Yes	Yes
CAN-FD/CAN 2.0B	4x CAN-FD	2x CAN 2.0B	2x CAN 2.0B	2x CAN 2.0B	2x CAN 2.0B
10/100 Ethernet MAC	10/100 Mbps	10 Mbps	10 Mbps	10 Mbps	10 Mbps
Spacewire	2	1	1	1	1
32 bit Timers	32	24	24	24	24
ADC/DAC	Yes	Yes	Yes	Yes	Yes
Operating Temp °C	-55 - 125	-55 - 125	-55 - 125	-55 - 125	-55 - 125
Internal FRAM	256 KB	256 KB	–	256 KB	–
External Boot	–	–	256 KB	–	256 KB
External Parallel	8 or 16 or 32-bit	8 or 16-bit	8 or 16-bit	8 or 16-bit	8 or 16-bit
TID krad (Si)	200	30	30	200	300
SER w/ EDAC & Scrub	<1E-15 Errors	–	–	<1E-15 Errors	<1E-15 Errors
SEL immunity to LET [(MeV • cm²)/mg]	> 110	–	–	110	110
PQFP	No	176	176	176	176
CQFP	216	–	–	176	176
BGA	256	196	196	196	196
KGD	No	–	–	–	–
Development Kits	Yes	PEB 1	PEB 1	PEB 1	PEB 1

GPIO Voltage 3.3V ± 10% (1.2 V ± 10%) **Core** 1.5V ± 10%

				Industrial	
VA41629	**VA41628**	**VC91200**	**VA10805**	**VA41600**	**VA10800** *Phasing out effective September 2025*
M4	M4	M4	M0	M4	M0
Single Precision	Single Precision	Single Precision	–	Single Precision	–
100 MHz	50 MHz	50 MHz	50 MHz	100 MHz	50 MHz
64 KB	64 KB	64 KB	32 KB	64 KB	32 KB
256 KB	256 KB	256 KB	128 KB	256 KB	128 KB
Yes	Yes	Yes	–	Yes	–
104	75	–	56	104	56
3	3	2	2	3	2
3	3	2	2	3	2
3	3	–	3	3	3
4 Channel	4 Channel	4 Channel	–	4 Channel	–
Yes	Yes	Yes	–	Yes	–
–	–	–	–	2x CAN 2.0B	–
–	–	–	–	–	–
–	–	–	–	–	–
24	24	24	24	24	24
Yes	No	Yes	No	Yes	No
-55 - 125	-55 - 125	-55 - 125	-55 - 125	-55 - 200	-55 - 200
–	–	256 KB	–	–	–
256 KB	256 KB	–	128 KB	256 KB	128 KB
8 or 16-bit	8 or 16-bit	–	–	8 or 16-bit	–
300	300	200	300	–	–
<1E-15 Errors	<1E-15 Errors	<1E-15 Errors	–	–	–
110	110	110	110	–	–
176	–	176	128	–	128
–	128	–	–	176	128
196	196	–	–	–	–
–	–	–	Yes	–	Yes
PEB 3	PEB 2	PEB 4	PEB 1	REB 1	PEB 1

Radiation Performance (Target):

Radiation Hardened:

Total Ionizing Dose (TID) > 200 krad(Si) with FRAM

Single-Event Latch-Up (SEL) immunity to LET > 110 MeV*cm2/mg

Radiation Tolerant:

Total Ionizing Dose (TID) > 50 krad(Si) with FRAM

Single-Event Latch-Up (SEL) immunity to LET > 60 MeV*cm2/mg

Key Features

Radiation Hardened
- HARDSIL® process technology
- Dual Interlocking Cells (DICE)
- Triple-Mode Redundancy (TMR)
- Error Detection and Correction (EDAC)
- Scrub Engine

Dual 32-bit Arm Cortex-M55 processor
- Single-precision Floating-Point Unit (FPU)
- Memory Protection Unit (MPU)
- Serial Wire Debug (SWD) & JTAG

Operating Voltage
- Single supply with on-chip LDO & DCDC
- I/O 3.3 V ± 0.3 V
- Core 1.2 V ± 0.1 V

Clocks
- PLL up to 200 MHz
- Internal 16 MHz heartbeat oscillator
- External clock and crystal support

Memory
- 8KByte iCache/16KByte dCache
- 256 KByte non-volatile memory (NVM)
- 512 KByte on-chip double word SRAM
- 128 KByte on-chip byte SRAM
- EDAC & Scrub Engine
- xSPI for internal NVM and external (1/2/4/8-bit)
- SPI memory
- External Bus Interface (EBI) for external 8/16/32-bit asynchronous parallel memory
- 8-channel DMA

Peripherals
- 139x GPIO
- Ethernet MAC with QoS
- 2x SpaceWire
- 4x Motor Controller
- 2x ADC 12-bit, 8 input pins (each)
- 4x DAC 12-bit
- 8x Analog Comparator
- 32x Timer/Counter with PWM
- 2x Watchdog + 1x Recovery Watchdog
- 4x UART
- 4x SPI
- 4x I2C
- 4x CAN FD

Operating Temperature
- -55 to +125 °C

Packages
- Plastic 256 BGA
- Ceramic 216 QFP

The VA5 family is VORAGO's first generation of dual-core Arm® Cortex®-M55 microcontrollers, offered in both radiation-hardened (RH) and radiation-tolerant (RT) versions. Designed for the extreme demands of space, defense, and autonomous missions, these MCUs deliver dual 32-bit cores with advanced fault tolerance, radiation mitigation, and power efficiency.

Product Availability:

- Engineering Samples: Q1 2026
- Development Kits: Q2 2026
- Qualification Samples: Q2 2026

Application Examples:

- Primary workloads and payloads
- Communications, Command & Control
- System Health & Performance Monitoring
- Propulsion Systems
- Robotics & Automation
- Software-Defined Radios (SDR)
- Antenna Systems & Arrays
- Optical Control Systems
- Additional Mission-Critical Functions

Ⓗ

VORAGO

VA53230–PG256F0PAA

Dual Arm®–Cortex® M55

Build Efficient, Accurate Motion Systems with Built-In Motor Control Toolkit

The VA5 family of microcontrollers integrates four advanced hardware motor controllers that offload the CPU and delivers high-performance control for BLDC and stepper motors.

Each controller supports up to four half-bridges with programmable commutation tables and multiple output waveforms for maximum flexibility:

- Built-in complementary drive, adjustable dead time, and robust timing features ensure smooth, efficient, and low-noise motor operation.

- Choose from Hall sensors, Hamming-encoded feedback, or quadrature encoders for precise, sensor-based position and speed control.

- Sensorless BLDC operation enabled by high-speed, synchronized ADC sampling, zero-cross detection, and automatic rotor-position finding.

- Integrated protection features—including over-current detection, analog comparators, and PWM-synchronized sampling— enhance system safety and reliability.

- Stepper motors benefit from dedicated control modes, programmable step rates, and 16-microstep capability for quiet, precise motion.

Overall, this motor-control subsystem empowers design engineers to build efficient, accurate, and feature-rich motion systems while dramatically reducing CPU load.

Radiation-Tolerant
Arm® Cortex®-M4 Microcontroller
VA42630

The VA42630 is the most integrated RT solution on the market today. Including a fully integrated non-volatile memory (NVM), the VA42630 provides the highest functional density for space-based applications.

Package Options
PQFP176 (20x20 mm)
BGA196 (12x12 mm)

Radiation Performance (Target):
Total Ionizing Dose (TID) > 50 krad(Si) with FRAM
Single-Event Latch Up (SEL) Immunity:
> 60 (MeVcm²) /mg (@ T=125°C)

Key Features

- Arm® M4 MCU with FPU
- SWD Interface
- Clock Rate up to 100 MHz

Operating Voltages

- Core: 1.5 V ± 10%
- I/O: 3.3 V ± 10%

Memory

- 64 KB on-chip Data SRAM
- 256 KB on-chip Program SRAM
- EDAC & Memory Scrubbing
- Integrated 256 KB NVM
- External Bus Interface

Peripherals

- 104 Configurable GPIO Pins
- 3xUART Interfaces
- 3xI2C Interfaces
- 3xSPI Interfaces
- 2xCAN 2.0 B
- Ethernet 10/100 MAC
- Full-Duplex Spacewire Interface
- 4-Ch DMA Controller
- 8-Ch ADC (12-bit, 600 ksps)
- 2-Ch DAC (12-bit)
- Integrated Temperature Sensor

Timer System

- 24 Configurable 32-bit Timers
- Input Capture, Output Compare, PWM,
- Counters, and Watchdog Timer

Temperature Range

- -55° to 125°C

Support

- PEB1 Development Board
- Software Kit

The VA42620 sets a new standard as the most integrated RT solution available, providing unmatched functional density to meet the demanding requirements of space-based application.
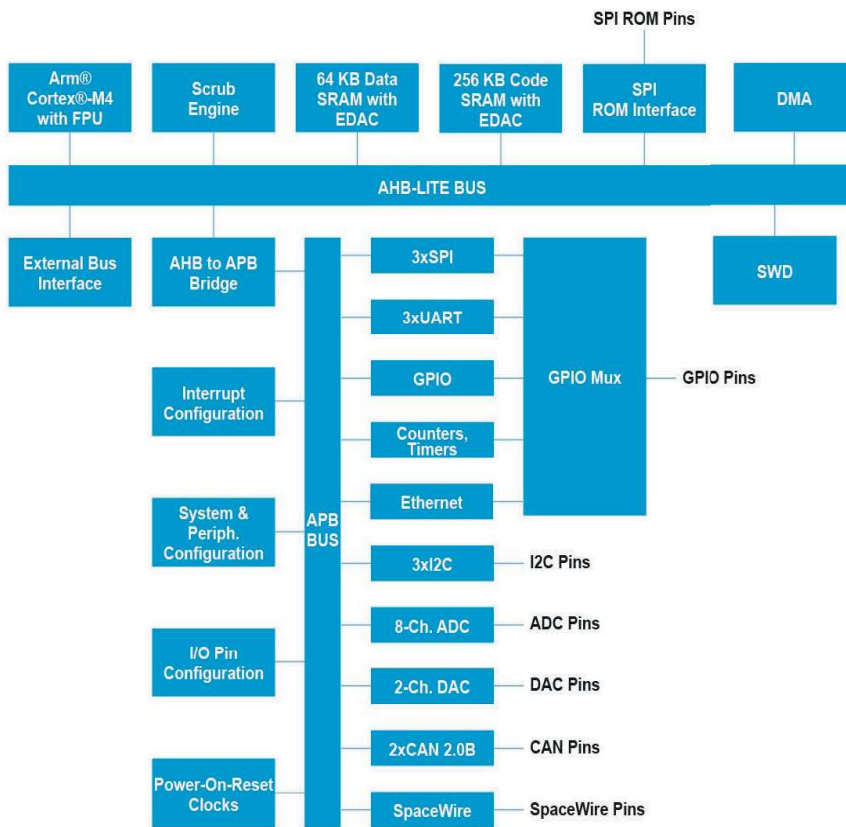
Package Options
PQFP176 (20x20 mm)
BGA196 (12x12 mm)

Radiation Performance (Target):
Total Ionizing Dose (TID) > 30 krad(Si) with FRAM
Single-Event Latch Up (SEL) Immunity:
> 60 (MeVcm²) /mg (@ T=125°C)

Key Features

- Arm® M4 MCU with FPU
- SWD Interface
- Clock Rate up to 100 MHz

Operating Voltages

- Core: 1.5 V ± 10%
- I/O: 3.3 V ± 10%

Memory

- 64 KB on-chip Data SRAM
- 256 KB on-chip Program SRAM
- EDAC & Memory Scrubbing
- External Bus Interface

Peripherals

- 104 Configurable GPIO Pins
- 3xUART Interfaces
- 3xI2C Interfaces
- 3xSPI Interfaces
- 2xCAN 2.0 B
- Ethernet 10/100 MAC
- Full-Duplex Spacewire Interface
- 4-Ch DMA Controller
- 8-Ch ADC (12-bit, 600 ksps)
- 2-Ch DAC (12-bit)
- Integrated Temperature Sensor

Timer System

- 24 Configurable 32-bit Timers
- Input Capture, Output Compare, PWM,
- Counters, and Watchdog Timer

Temperature Range

- -55° to 125°C

Support

- PEB1 Development Board
- Software Kit

Radiation-Hardened
Arm® Cortex®-M4 Microcontroller
VA41630

The VA41630, which has achieved the coveted and highest level of qualification for demanding space applications by the U.S. Defense Logistics Agency, is the most integrated RH solution on the market today, including a fully integrated non-volatile memory (NVM).

Radiation Performance
Total Ionizing Dose (TID) > 200 krad(Si) with FRAM
Soft Error Rate (SER) with EDAC & Scrub enabled: < 1E-15 errors/bit-day
Single-Event Latch Up (SEL) Immunity: > 110 (MeVcm²) /mg (@ T=125°C)
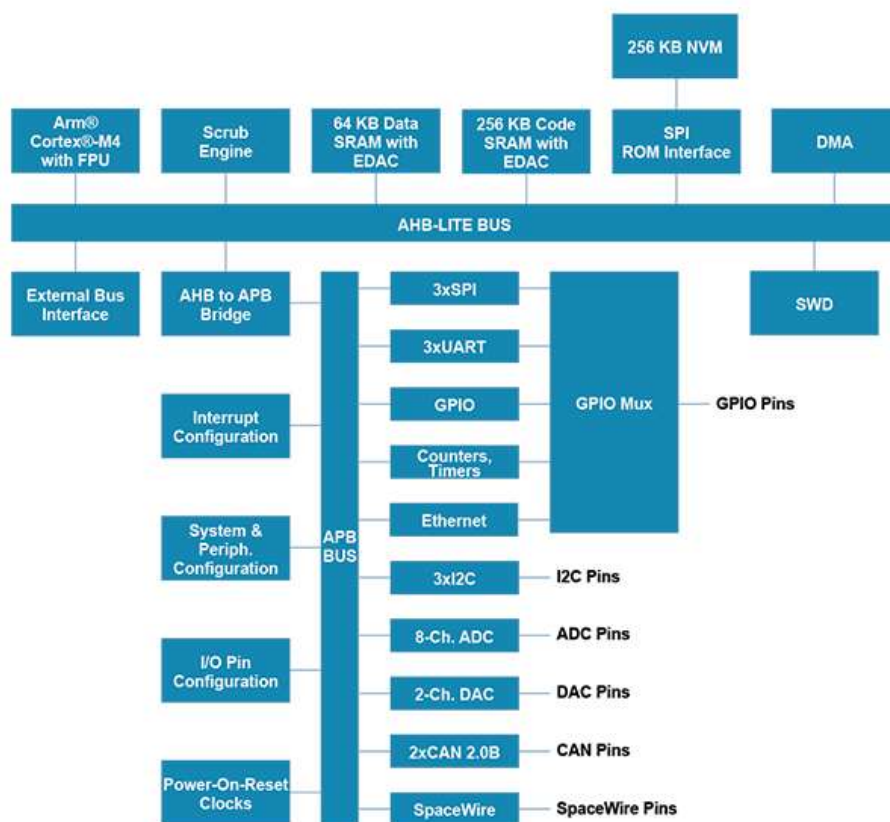
Package Options
CQFP176 (20x20 mm)
PQFP176 (20x20 mm)
BGA196 (12x12 mm)

Applications
Space
Aerospace
Defense

Product Availability
Mechanical Samples — Now
Production Qualified — Now
QML K, Q+ Grade — Built to Order

*See page 2 for more on U.S. government qualification

Key Features

Arm® M4 MCU with FPU
HARDSIL® Technology
SWD Interface
Clock Rate up to 100 MHz

Operating Voltages

Core: 1.5 V ± 10%
I/O: 3.3 V ± 10%

Memory

64 KB on-chip Data SRAM
256 KB on-chip Program SRAM
EDAC & Memory Scrubbing
Integrated 256 KB NVM
External Bus Interface

Peripherals

104 Configurable GPIO Pins
3xUART Interfaces
3xI2C Interfaces
3xSPI Interfaces
2xCAN 2.0 B
Ethernet 10/100 MAC
Full-Duplex Spacewire Interface
4-Ch DMA Controller
8-Ch ADC (12-bit, 600 ksps)
2-Ch DAC (12-bit)
Integrated Temperature Sensor

Timer System

24 Configurable 32-bit Timers
Input Capture, Output Compare, PWM, Counters, and Watchdog Timer

Temperature Range

-55° to 125°C

Support

PEB1 Development Board
Software Kit

Radiation-Hardened
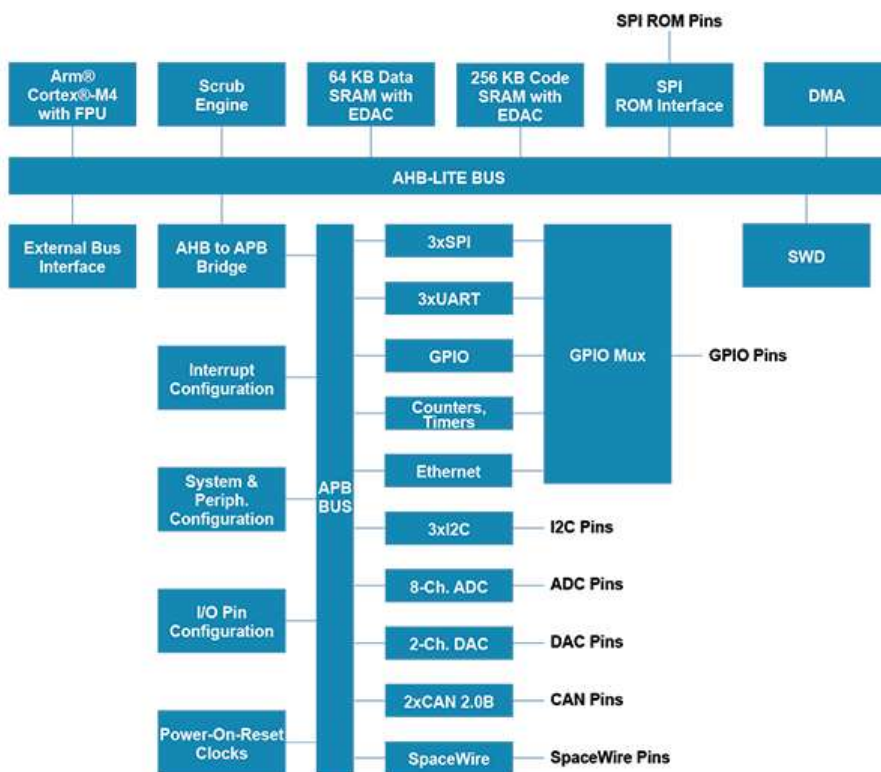# Arm® Cortex®-M4 Microcontroller
VA41620

The VA41620 has all of the features of the VA41630 but gives the user the flexibility to use their own external RH NVM without sacrificing performance or feature set.

Radiation Performance
TID > 300 krad(Si)
SER with EDAC & Scrub enabled: < 1E-15 errors/bit-day
SEL Immunity: > 110 (MeVcm²) /mg (@ T=125°C)

Package Options
CQFP176 (20x20 mm)
PQFP176 (20x20 mm)
BGA196 (12x12 mm)

Product Availability
Mechanical Samples — Now
Production Qualified — Now

Applications
Space
Aerospace
Defense

Key Features

Arm® M4 MCU with FPU
HARDSIL® Technology
SWD Interface
Clock Rate up to 100 MHz

Operating Voltages

Core: 1.5 V ± 10%
I/O: 3.3 V ± 10%

Memory

64 KB on-chip Data SRAM
256 KB on-chip Program SRAM
EDAC & Memory Scrubbing
External SPI NVM
External Bus Interface

Peripherals

104 Configurable GPIO Pins
3xUART Interfaces
3xI2C Interfaces
3xSPI Interfaces
2xCAN 2.0 B
Ethernet 10/100 MAC
Full-Duplex Spacewire Interface
4-Ch DMA Controller
8-Ch ADC (12-bit, 600 ksps)
2-Ch DAC (12-bit)
Integrated Temperature Sensor

Timer System

24 Configurable 32-bit Timers
Input Capture, Output Compare, PWM, Counters, and Watchdog Timer

Temperature Range

-55° to 125°C

Support

PEB1 Development Board
Software Kit

Radiation-Hardened
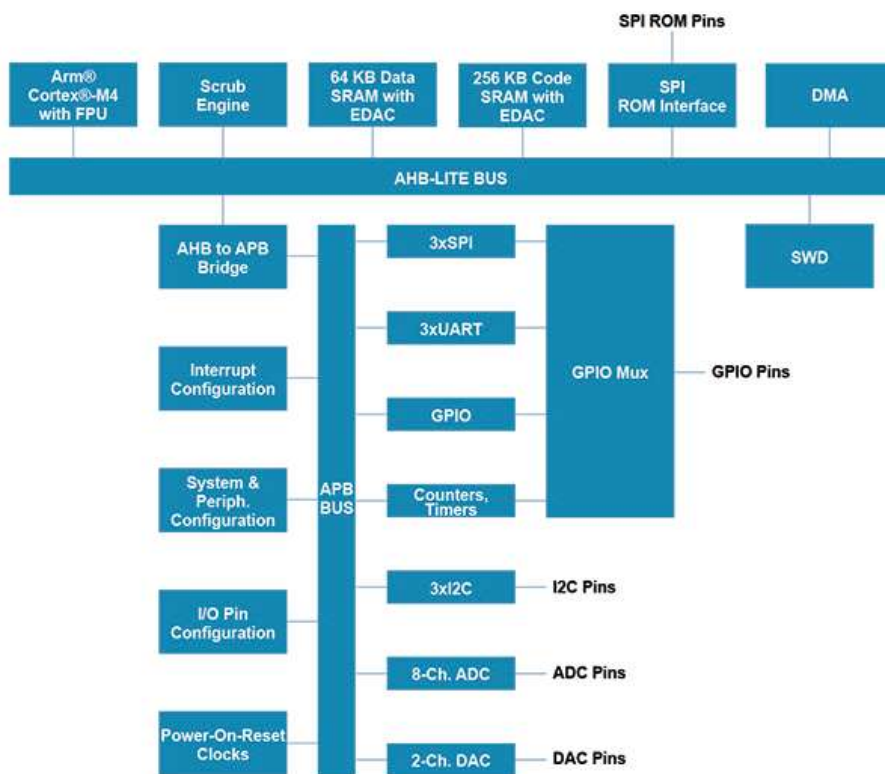# Arm® Cortex®-M4 Microcontroller
VA41629

This is the younger sibling of the VA41620; this removes some digital peripherals to reduce system costs further when these features are not required.

Radiation Performance
TID > 300 krad(Si)
SER with EDAC & Scrub enabled: < 1E-15 errors/bit-day
SEL Immunity: > 110 (MeVcm²) /mg (@ T=125°C)

Package Options
PQFP176 (20x20 mm)
BGA196 (12x12 mm)

Product Availability
Production Qualified — Now

Applications
Space
Aerospace
Defense

Key Features

Arm® M4 MCU
HARDSIL® Technology
Single Precision Floating Point Unit (FPU)
SWD Based Debug Interface
Clock Rate up to 100 MHz

Operating Voltages

Core: 1.5 V ± 10%
I/O: 3.3 V ± 10%

Memory

64 KB on-chip Data SRAM
256 KB on-chip Program SRAM
EDAC & Memory Scrubbing
External SPI NVM

Peripherals

104 Configurable GPIO Pins
3xUART Interfaces
3xI2C Interfaces
3xSPI Interfaces
4-Ch DMA Controller
8-Ch ADC (12-bit, 600 ksps)
2-Ch DAC (12-bit)
Integrated Temperature Sensor

Timer System

24 Configurable 32-bit Timers
Input Capture, Output Compare, PWM, Counters, and Watchdog Timer

Temperature Range

-55° to 125°C

Support

PEB3 Development Board
Software Kit

Radiation-Hardened
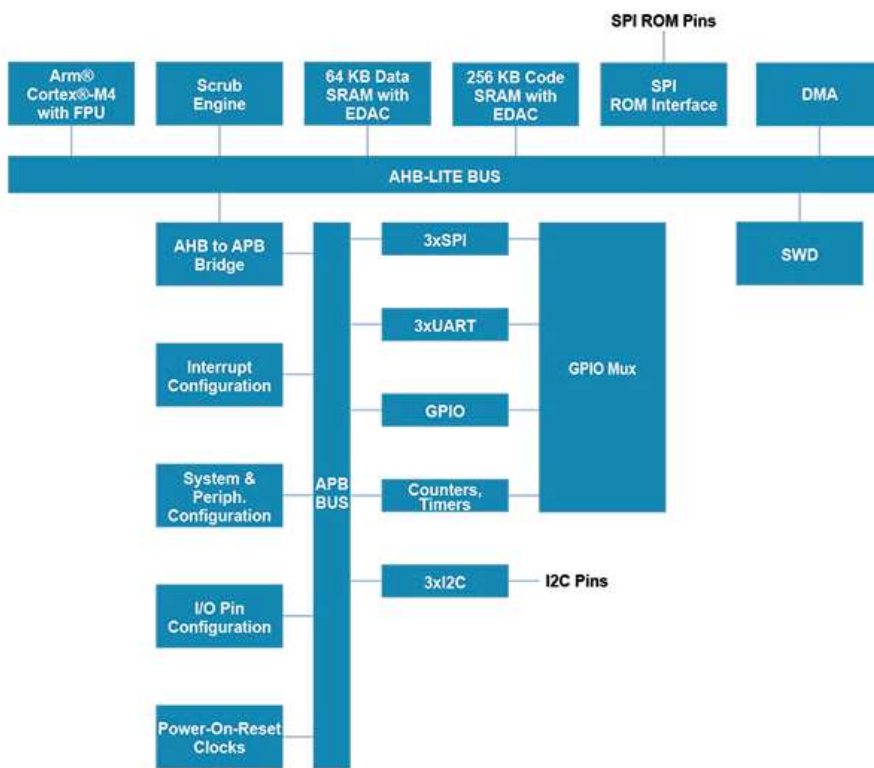# Arm® Cortex®-M4 Microcontroller
VA41628

The most cost-effective solution in the entire M4 line-up, the VA41628 is the perfect fit for digital-centric designs not requiring interfaces to external analog sensors.

Radiation Performance
TID > 300 krad(Si) with FRAM
SER with EDAC & Scrub enabled: < 1E-15 errors/bit-day
SEL Immunity: > 110 (MeVcm²) /mg (at T=125°C)

Package Options
CQFP128 (14x14 mm)
BGA196 (12x12 mm)

Product Available Now

Applications
Space
Aerospace
Defense

Key Features

Arm® M4 MCU with FPU
HARDSIL® Technology
SWD Based Debug Interface
Clock Rate up to 50 MHz

Operating Voltages

Core: 1.5 V ± 10%
I/O: 3.3 V ± 10%

Memory

64 KB on-chip Data SRAM
256 KB on-chip Program SRAM
EDAC & Memory Scrubbing
External SPI NVM

Peripherals

75 Configurable GPIO Pins
3xUART Interfaces
3xI2C Interfaces
3xSPI Interfaces
4-Ch DMA Controller
Integrated Temperature Sensor

Timer System

24 Configurable 32-bit Timers
Input Capture, Output Compare, PWM, Counters, and Watchdog Timer

Temperature Range

-55° to 125°C

Support

PEB2 Development Board
Software Kit

Radiation-Hardened
Arm® Cortex®-M4 Microcontroller
VC91200

The first in a growing line of application-specific products, the VC91200 is a dedicated latch-up detection companion chip designed explicitly for harsh environments. Many customers use this solution with COTs designs to have an RH monitor for applications in low earth orbits.
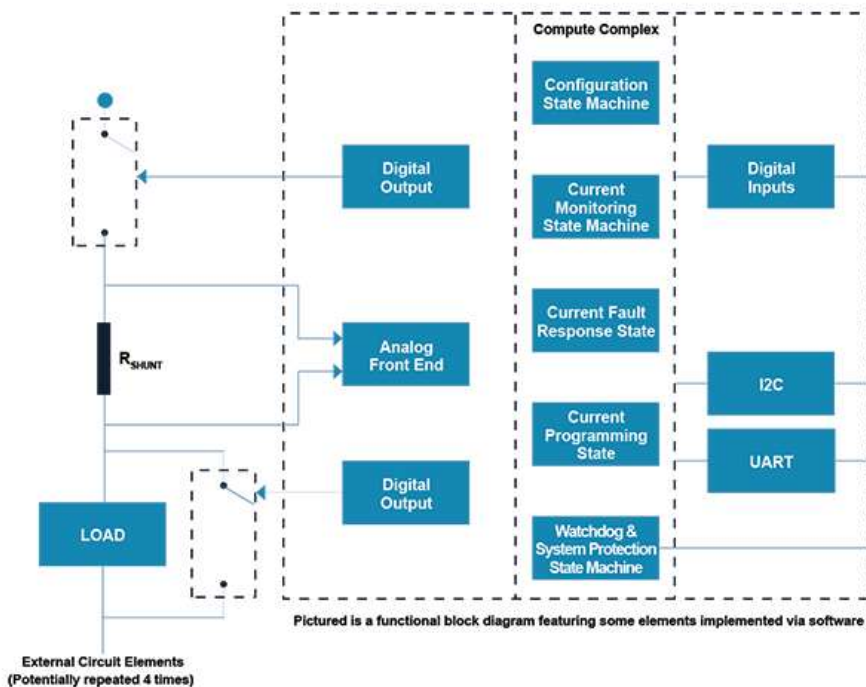
Radiation Performance

TID > 200 krad(Si)
Combined Single Event Functional Interrupt and
SER: < 1E-15 errors/bit-day
SEL Immunity: > 110 (MeVcm²) /mg (at T=125°C)

Pictured is a functional block diagram featuring some elements implemented via software

Key Features

HARDSIL® Technology
Programmable Digital Control Block
4-Channel Latch-Up Sensing Inputs
Programmable Current Trigger Levels
Temperature Sensor and Shutdown
Power Supply Sequencing
Watchdog Functionality

Operating Voltages

Core: 1.5 V ± 10%
I/O: 3.3 V ± 10%

Load Supply Range

1.8 V to 5.5 V

Configuration Settings

GPIO
UART
I2C

Temperature Range

-55° to 125°C

Support

PEB4 Development Kit

Package Options
PQFP176 (20x20 mm)
BGA196 (12x12 mm)

Product Available Now

Applications
Space
Aerospace
Defense

Radiation-Tolerant
Arm® Cortex®-M0 Microcontroller
VA10805

For the most cost-sensitive space applications, the VA10805 is ideal for smaller tasks, such as power sequencing, relay control, and valve actuation.
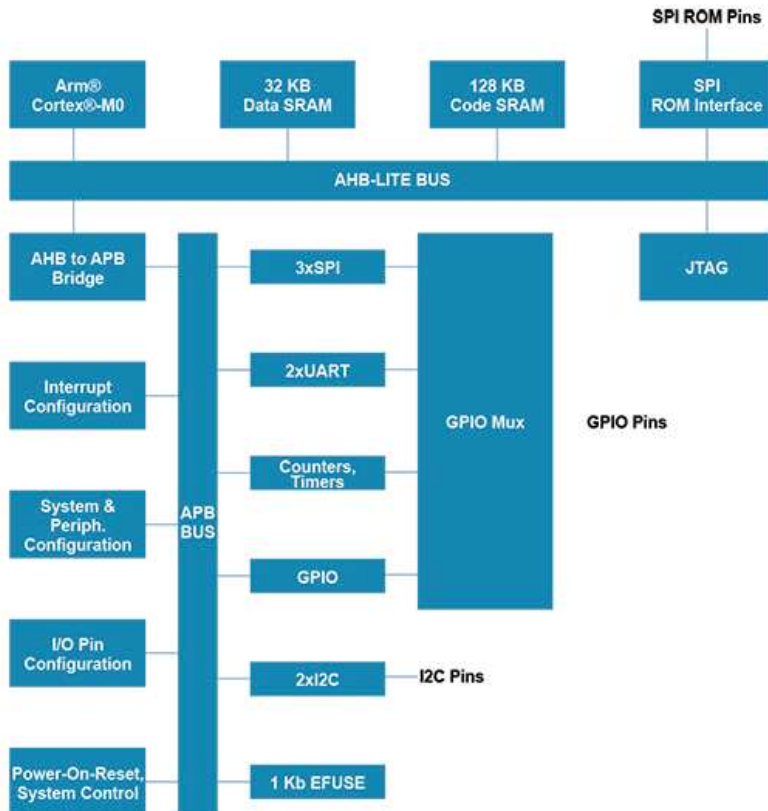
Package Options
PQFP128 (14x14 mm)

Product Available Now

Applications
Space
Aerospace
Defense

Key Features

Arm® M0 MCU
HARDSIL® Technology
JTAG Based Debug Interface
Clock Rate up to 50 MHz

Operating Voltages

Core: 1.5 V ± 10%
I/O: 3.3 V ± 10%

Memory

32 KB on-chip Data
128 KB on-chip Program
1 Kb User Programmable OTP

Peripherals

56 Configurable GPIO Pins
2xUART Interfaces
2xI2C Interfaces
3xSPI Interfaces

Timer System

24 Configurable 32-bit Counters/Timers
Input Capture, Output Compares
PWMs, Pulse Counters, Watchdog Timer

Temperature Range

-55° to 125°C

Support

REB1 Development Board
Software Kit

Extreme Temperature
Arm® Cortex®-M4 Microcontroller
VA41600

The VA41600 is a latch-up immune M4 class device designed for high-temperature applications. This device is ideal for down-hole sensors in the energy sector, high-temperature industrial control, and engine applications.
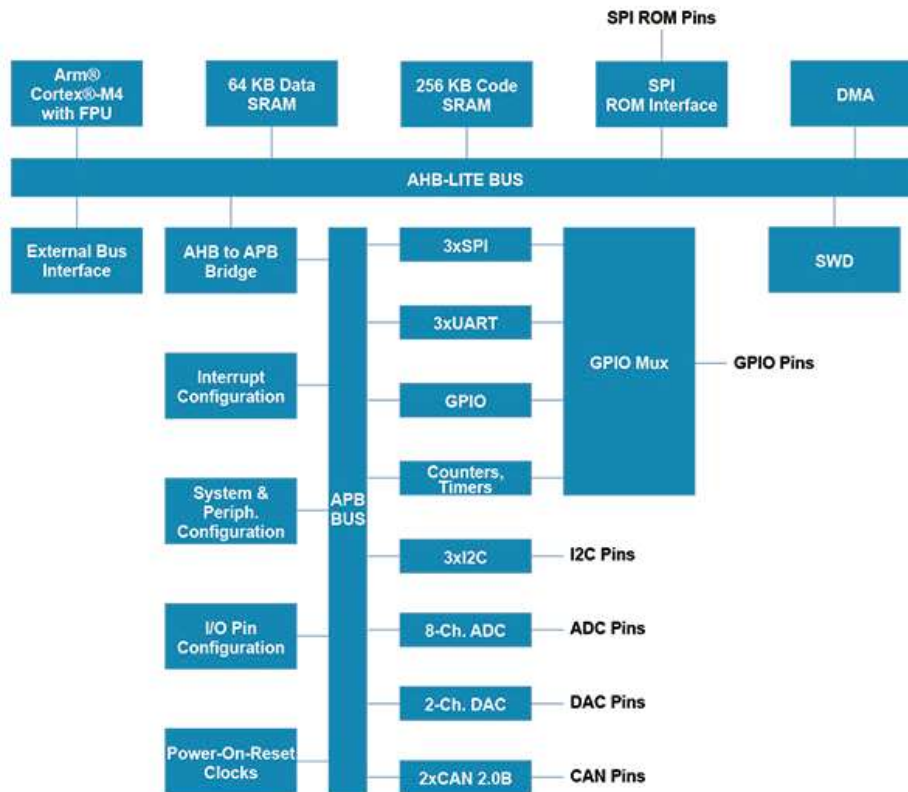
Package Options
CQFP176 (20x20 mm)

Product Availability
Engineering Samples — Q3 2025
Production — Q2 2026

Applications
Defense
Oil & Gas
Industrial

Key Features

Arm® M4 MCU with FPU
HARDSIL® Technology
SWD Interface
Clock Rate up to 100 MHz

Operating Voltages

Core: 1.5 V ± 10%
I/O: 3.3 V ± 10%

Memory

64 KB on-chip Data SRAM
256 KB on-chip Program SRAM
EDAC & Memory Scrubbing
External SPI NVM
External Bus Interface

Peripherals

104 Configurable GPIO Pins
3xUART Interfaces
3xI2C Interfaces
3xSPI Interfaces
2xCAN 2.0 B
Ethernet 10/100 MAC
Full-Duplex Spacewire Interface
4-Ch DMA Controller
8-Ch ADC (12-bit, 600 ksps)
2-Ch DAC (12-bit)
Integrated Temperature Sensor

Timer System

24 Configurable 32-bit Timers
Input Capture, Output Compare, PWM,
Counters, and Watchdog Timer

Temperature Range

-55° to 200°C

Support

PEB1 Development Board
Software Kit

Extreme Temperature
Arm® Cortex®-M0 Microcontroller
VA10800

For cost-sensitive high-temperature applications, nothing stands up to the VA10800. With thousands of service hours logged in 200°C environmental conditions, the VA10800 can take the heat and give you reliable operation – every time. It is being phased out, and VORAGO will recommend current and future alternatives.
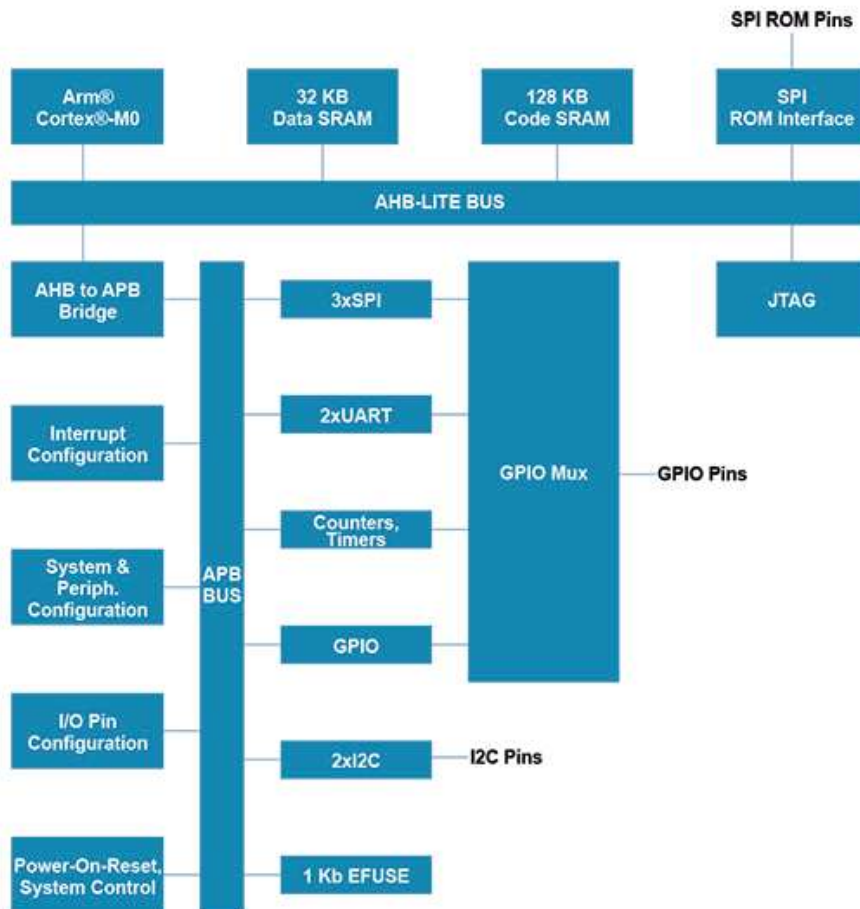
Package Options
CQFP128 (14x14 mm)
PQFP128 (14x14 mm)
Die Available

Product Availability
Phase Out Effective September 2025
Purchase VA10800 until 2/28/2026
Schedule shipments out until 8/31/2026

Applications
Defense
Oil & Gas
Industrial

Key Features

Arm® M0 MCU
HARDSIL® Technology
JTAG Based Debug Interface
Clock Rate up to 50 MHz

Operating Voltages

Core: 1.5 V ± 10%
I/O: 3.3 V ± 10%

Memory

32 KB on-chip Data
128 KB on-chip Program
1 Kb User Programmable OTP

Peripherals

56 Configurable GPIO Pins
2xUART Interfaces
2xI2C Interfaces
3xSPI Interfaces

Timer System

24 Configurable 32-bit Counters/Timers
Input Capture, Output Compares
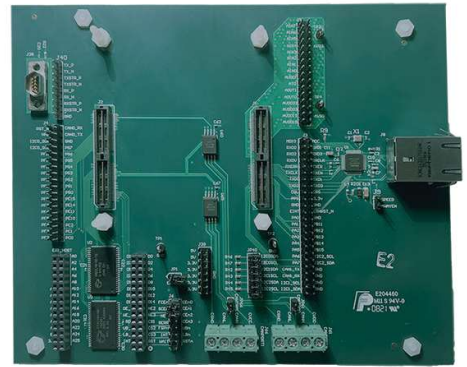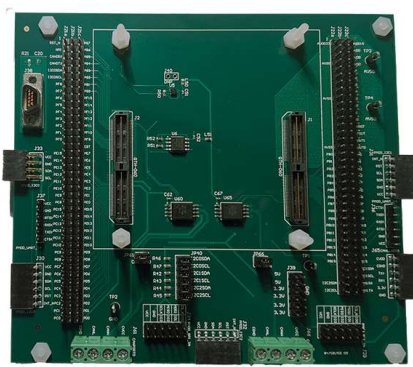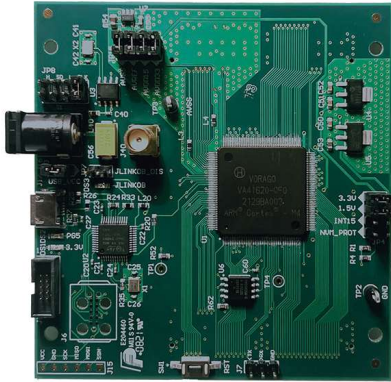PWMs, Pulse Counters, Watchdog Timer

Temperature Range

-55° to 200°C

Support

REB1 Development Board
Software Kit

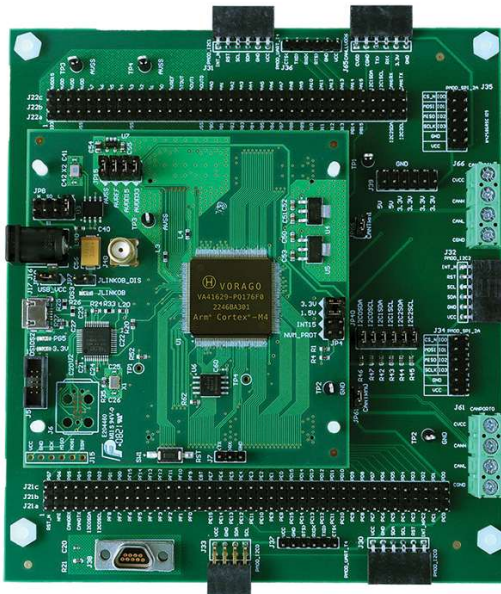# MCU Development Kits
& Reference Designs

PEB1
For use with VA41630, VA41620, VA41600
Evaluation Kit
Based on a 32-bit Arm® Cortex®-M4 processor
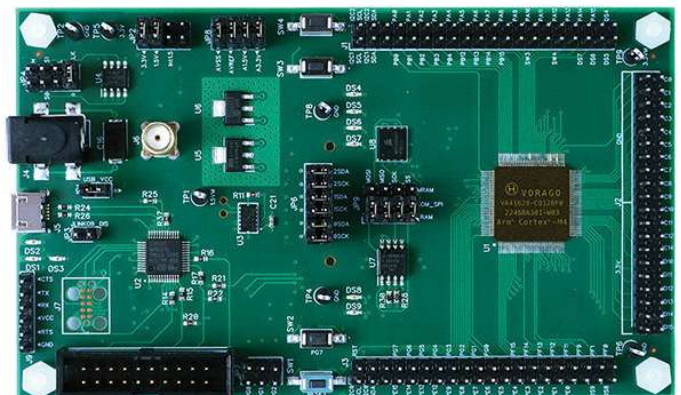Manufactured with HARDSIL®
Includes two daughter cards

PEB3
For use with VA41629
Evaluation Kit
Based on a 32-bit Arm® Cortex®-M4 processor
Manufactured with HARDSIL®
Includes one daughter card
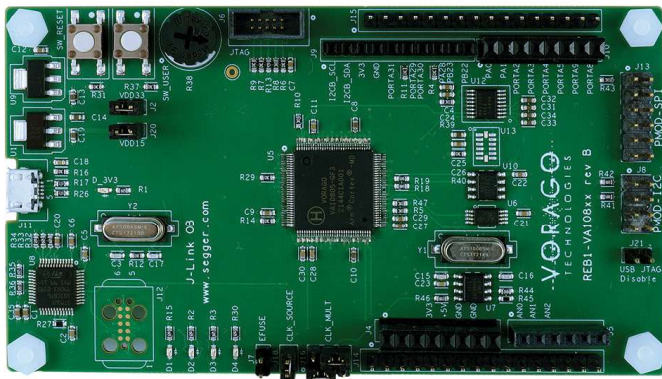

PEB2
For use with VA41628
Evaluation Board
Based on a 32-bit Arm® Cortex®-M4 processor
Manufactured with HARDSIL®

MCU Development Kits & Reference Designs

REB1
For use with VA10800, VA10805
Evaluation Board
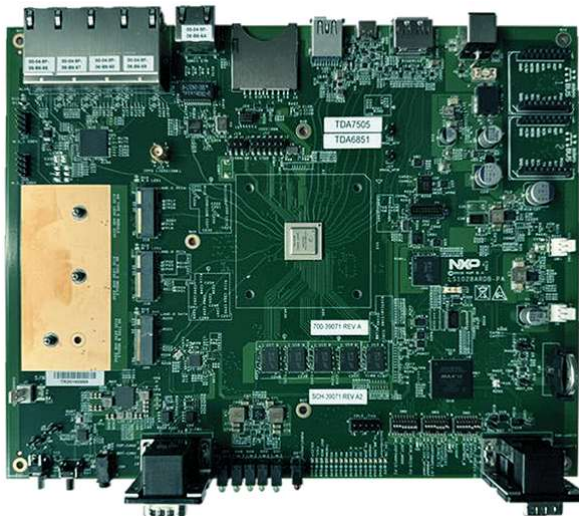Based on a 32-bit Arm® Cortex®-M0 processor
Manufactured with HARDSIL®

PEB4
For use with VC91200
Evaluation Board
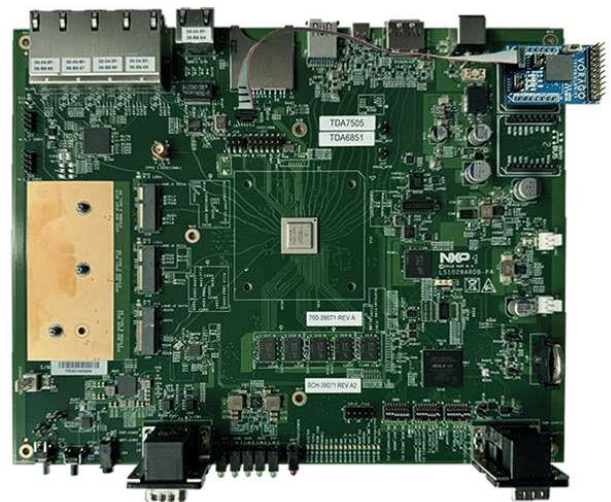Based on a 32-bit Arm® Cortex®-M4 processor
Manufactured with HARDSIL®

VEB1
For use with VA7230
Single board computer
Based on a 64-bit Arm® Cortex®-A72 processor

VEB2
For use with VA7230
Single board computer with mikroBUS®
Based on a 64-bit Arm® Cortex®-A72 processor

VORAGO Patented HARDSIL® Technology

HARDSIL® Technology by VORAGO

HARDSIL® enables fabrication of Radiation-Hardened (RH) electronic components using standard fab equipment. Compared with RH by Design (RHBD) techniques, HARDSIL® does not require specialized structures to deliver RH performance.

HARDSIL® facillitates creation of RH ICs with standard semiconductor design tools and collateral. Specialized design libraries or major process modifications are not necessary, allowing the transparent re-use of existing IP, design libraries, and collateral.

HARDSIL® FEATURES

- Uses standard manufacturing equipment

- Node-, Foundry-, and Process-Agnostic

- Leverages CMOS high-volume manufacturing

- Requires no specialized devices or design library

- May be combined with other RH techniques

- Compatible with planar and FinFET processes

PROTECTION FROM RADIATION EFFECTS

HARDSIL® Dramatically Improves Robustness Against:

- Total Ionizing Dose (TID)
- Single-Event Latch Up (SEL)
- Single-Event Upsets (SEU)

As compared to standard commercial processes.

Additional techniques may be combined with HARDSIL® to further enhance radiation hardness.

Innovative Rad-Hard (RH) solutions that fit seamlessly into existing process & design flows

VORAGO Technologies offers a unique approach to radiation hardening in new and existing processes for foundries and partners that develop and manufacture electronic components used in aerospace, automotive, nuclear, medical facility, food and instrument sterilization environments.

In contrast to standard commercial design and manufacturing processes, high-reliability RH electronic components must be designed and manufactured so that exposure to ionizing radiation and/or extreme temperatures does not result in malfunctions or catastrophic failure. VORAGO offers innovative technology without requiring extensive design changes or retooling of a foundry's manufacturing process to meet RH requirements - eliminating the need for costly and time-consuming adjustments or modifications.

USES MAINSTREAM COMMERCIAL IC MANUFACTURING

- Can run in factories anywhere
- Leverages high-volume manufacturing processes and equipment
- Adds radiation hardness to the latest commercial technologies
- No PPA penalty: Does not sacrifice power consumption, performance, or die size compared to the baseline commercial process

COMPATIBLE WITH MAINSTREAM COMMERCIAL IC DESIGN

- Fully design-agnostic
- Re-uses existing commercial design tools, flow and collateral, like PDK, cell libraries and IP
- Less die area and power consumption vs RHBD

IMPLEMENTED IN MULTIPLE FOUNDRIES

TSMC   GlobalFoundries   SkyWater Technologies   Texas Instruments

Scan to learn more about HARDSIL® technology

VORAGO
TECHNOLOGIES

VORAGO leads the industry in providing radiation-hardened and radiation-tolerant microcontrollers and microprocessors for the world's harshest environments in space, satellite, military & defense, terrestrial, and energy exploration around the globe.

VORAGO's patented HARDSIL® technology uses cost-effective, high-volume manufacturing to harden any commercially-designed semiconductor component.

Scan to get in touch or learn more about you can achieve your mission with VORAGO.

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VORAGO
TECHNOLOGIES