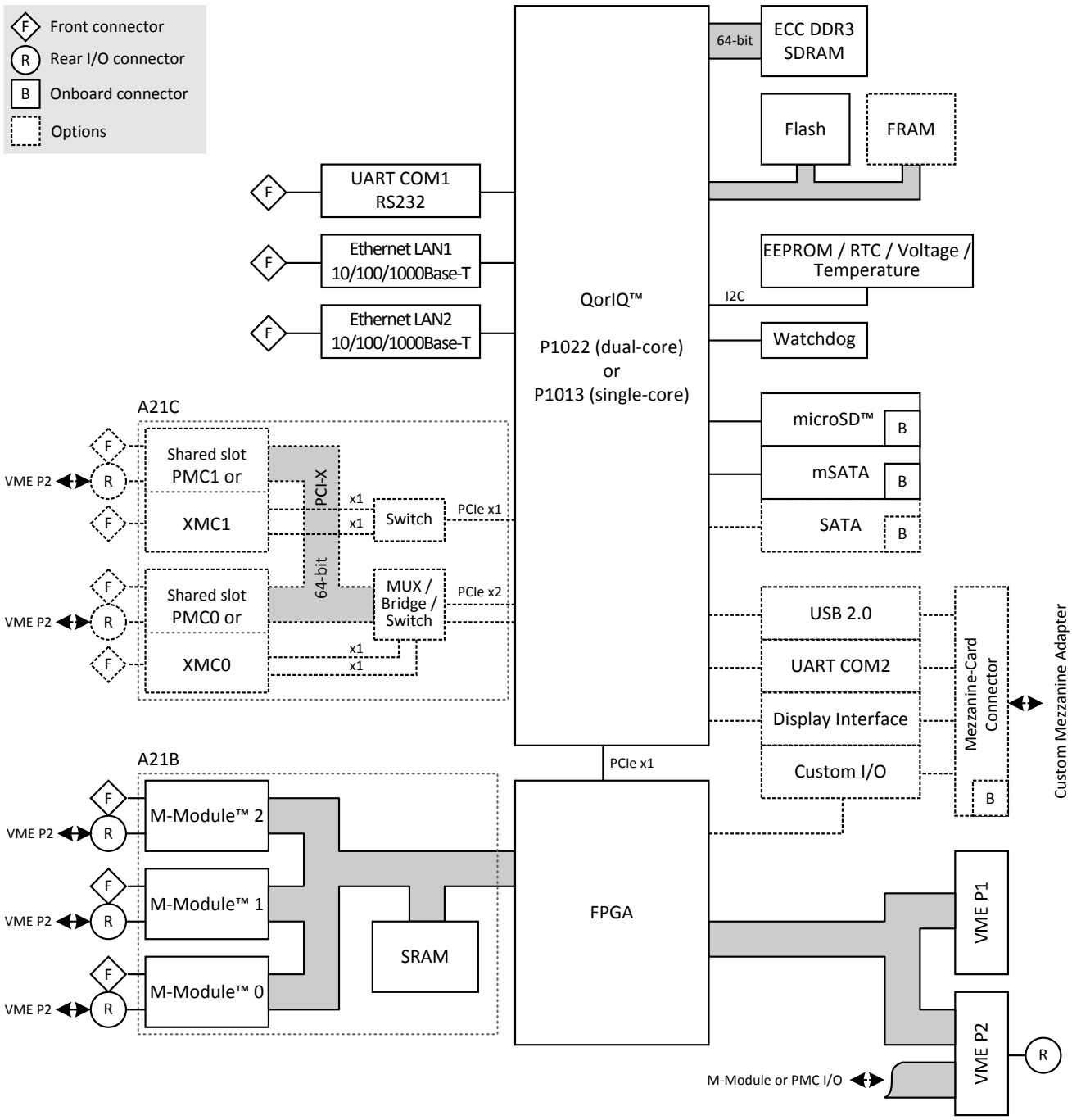
A21B – 6U VMEbus QorIQ™ P1013/P1022 CPU (M-Modules)

- **Freescale™ PowerPC® QorIQ™ P1013, 800 MHz**
- **Up to dual-core P1022, 1.067 GHz**
- **64-bit VMEbus master and slave**
- **Up to 2 GB DDR3 DRAM soldered, ECC**
- **Up to 64 MB Flash and 128 KB FRAM**
- **microSD™ card and mSATA slot**
- **2 Gb Ethernet, 1 COM, additional I/O options**
- **3 M-Module slots**
- **U-Boot Universal Boot Loader**
- **-40 to +85°C screened**

The A21B is a Freescale™ QorIQ™ based single-board computer for embedded industrial applications. The SBC features full VME64 support and can be used as a master or a slave in a VMEbus environment. The A21B provides 1 MB local dual-ported SRAM for slave access and communication between the local CPU and another VMEbus master.
The CPU card comes with a single-core P1013 or dual-core P1022 QorIQ™ processor with up to 1.067 GHz clock frequency and a serial communication architecture. With two Gigabit Ethernet ports and one RS232 COM at the front, and DDR3 SDRAM with ECC, Flash and FRAM, the board offers the crucial basics of an industrial computer. To satisfy your needs for mass storage, you can use microSD™ cards and mSATA plug-in modules.
In addition, the A21B can be equipped with up to three M-Module mezzanine cards supporting both front I/O and rear I/O. M-Modules are ideal for real-world I/O like analog/binary process and instrumentation input/output. The modular combination of I/O functionality on a single-board computer allows to build up tailored control systems which appear as customized solutions based on standard components.
Its sister card, the A21C, offers two PMC/XMC slots instead of M-Modules, for different I/O requirements.
Where there's a need for even more or other I/O, the A21B also includes a custom mezzanine-card option that reduces the board by one M-Module but provides interfaces like USB 2.0, COM or even custom I/O controlled by the onboard FPGA. The mezzanine card is always an entirely customized adapter PCB, including front I/O, and makes the A21B a semi-custom solution.
The A21B supports operation in a -40°C to +85°C temperature range, and the board withstands shock and vibration.
The CPU board is supported by the U-Boot Universal Boot Loader, which can be used for bootstrapping operating systems, for hardware testing, or for debugging applications without running any operating system.

Diagram


Front connector
Rear I/O connector
Onboard connector
Options
UART COM1
RS232
Ethernet LAN1
10/100/1000Base-T
Ethernet LAN2
10/100/1000Base-T
QorIQ™
P1022 (dual-core)
or
P1013 (single-core)
64-bit
ECC DDR3
SDRAM
Flash
FRAM
EEPROM / RTC / Voltage / Temperature
I2C
Watchdog
microSD™
mSATA
SATA
USB 2.0
UART COM2
Display Interface
Custom I/O
Mezzanine-Card Connector
Custom Mezzanine Adapter
A21C
Shared slot
PMC1 or
XMC1
Shared slot
PMC0 or
XMC0
PCI-X
64-bit
x1
Switch
PCIe x1
MUX /
Bridge /
Switch
PCIe x2
VME P2
A21B
M-Module™ 2
M-Module™ 1
M-Module™ 0
SRAM
PCIe x1
FPGA
VME P1
VME P2
M-Module or PMC I/O

Technical Data

CPU	■ Freescale™ QorIQ™ P1022 or P1013, dual or single core □ 600 MHz, 800 MHz or 1.067 GHz □ Two/one high-performance Power Architecture e500v2 cores □ Double precision floating point support and signal processing engine (SPE) APU
Memory	■ 32 KB L1 instruction cache and 32 KB L1 data cache per processor core ■ 256 KB L2 cache with ECC ■ Up to 2 GB SDRAM system memory □ Soldered □ DDR3 with ECC support □ 333 MHz memory bus clock frequency (667 MT/s, 5.33 GB/s data rate) ■ Up to 64 MB boot/program Flash ■ 128 KB non-volatile FRAM ■ Serial EEPROM 4 kbits for factory settings
Mass Storage	■ microSD™ card slot □ Directly accessible on the board □ Connected to SDHC controller ■ mSATA disk slot □ Directly accessible on the board (via small adapter card) □ Connected via one SATA channel
I/O	■ Ethernet □ Two 10/100/1000Base-T Ethernet channels at the front □ RJ45 connectors at front panel □ Two front LEDs for each port to signal LAN link and activity status ■ One RS232 UART (COM1) □ RJ45 connector at front panel □ Data rates up to 230.4 kbit/s □ 16-byte transmit/receive buffer □ Handshake lines: CTS, RTS
Front Connections	■ Two Ethernet (RJ45) ■ One RS232 COM (RJ45) ■ M-Module front I/O if populated
Rear I/O	■ M-Module 0, 1 and 2
Mezzanine Extensions	■ Three M-Module slots □ Compliant with M-Module standard □ Characteristics: A08, A24, D16, D32, INTA, INTC, TRIGI, TRIGO
Miscellaneous	■ Real-time clock, buffered by a supercapacitor or battery (optional) □ Data retention of supercapacitor: typically up to one week ■ Watchdog ■ Voltage monitor and temperature sensor ■ Reset button and status LEDs at the front panel

Technical Data

VMEbus	■ Compliant with VME64 Specification ■ Slot-1 function with auto-detection ■ Master □ D08(EO):D16:D32:D64:A16:A24:A32:ADO:BLT:RMW ■ Slave □ D08(EO):D16:D32:D64:A16:A24:A32:BLT:RMW ■ 1 MB shared fast SRAM ■ DMA ■ Mailbox functionality ■ Interrupter D08(O):I(7-1):ROAK ■ Interrupt handler D08(O):IH(7-1) ■ Single level 3 fair requester ■ Single level 3 arbiter ■ Bus timer ■ Location Monitor ■ Performance □ Coupled read/write D32 non-block transfer rate tbd. MB/s □ DMA read/write D32 BLT transfer rate tbd. MB/s □ DMA read/write D64 MBLT transfer rate tbd. MB/s
Electrical Specifications	■ Supply voltage/power consumption: □ +5 V (-3%/+5%), 1.3 A typ. □ +3.3 V (-3%/+5%), 1 A typ. □ ±12 V (-5%/+5%), only provided for mezzanines that need 12 V
Mechanical Specifications	■ Dimensions: standard double Eurocard, 233.3 mm x 160 mm ■ Weight (without mezzanines): 428 g
Environmental Specifications	■ Temperature range (operation): □ -40..+85°C (screened) □ Airflow: min. 1.0 m/s ■ Temperature range (storage): -40..+85°C ■ Relative humidity (operation): max. 95% non-condensing ■ Relative humidity (storage): max. 95% non-condensing ■ Altitude: -300 m to +3000 m ■ Shock: 50 m/s², 30 ms (EN 61373) ■ Vibration (function): 1 m/s², 5 Hz - 150 Hz (EN 61373) ■ Vibration (lifetime): 7.9 m/s², 5 Hz - 150 Hz (EN 61373) ■ Conformal coating on request
MTBF	■ 346 417 h @ 40°C according to IEC/TR 62380 (RDF 2000)
Safety	■ PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers
EMC Conformity	■ EN 55022 (radio disturbance) ■ IEC 61000-4-2 (ESD) ■ IEC 61000-4-3 (electromagnetic field immunity) ■ IEC 61000-4-4 (burst) ■ IEC 61000-4-5 (surge) ■ IEC 61000-4-6 (conducted disturbances)
BIOS	■ U-Boot Universal Boot Loader
Software Support	■ Linux ■ VxWorks® ■ OS-9® (on request) ■ QNX® (on request) ■ For more information on supported operating system versions and drivers see Downloads.

Configuration & Options

Standard Configurations

Article No.	CPU Type and Clock	System RAM	Flash	FRAM	SATA	Mezzanine Slots	Operating Temperature
01A021B00	P1013 single-core, 800 MHz	1 GB	32 MB	128 KB	Only mSATA	3 M-Modules	-40..+85°C
01A021C00	P1013 single-core, 800 MHz	1 GB	32 MB	128 KB	Only mSATA	2 PMC/XMC	-40..+85°C

Options

CPU	■ QorIQ™ P1022 or P1013 □ P1022: dual core □ P1013: single core ■ All processors available with 600 MHz, 800 MHz or 1.067 GHz
Memory	■ System RAM □ 1 GB or 2 GB ■ Boot/program Flash □ 32 MB or 64 MB ■ FRAM □ 0 KB or 128 KB
Mass Storage	■ Serial ATA (SATA) □ Onboard SATA connector for one additional port possible □ SATA Revision 2.x support □ Transfer rates up to 300 MB/s (3 Gbit/s) □ For connection of an in-system hard-disk drive
I/O	■ Various additional I/O possible using onboard mezzanine card □ Partly fixed set of interfaces, plus 16 pins for custom I/O □ One USB 2.0 port, EHCI implementation □ Additional UART COM interface □ Display interface □ Custom I/O functions can be implemented as FPGA IP cores (16 pins usable) □ Occupies the space of M-Module slot 3 □ Please note that the mezzanine card is always completely customized, including front I/O, no standard cards are available.
Mezzanine Slots	■ 2 PMC / XMC instead of M-Modules (A21C variety)
Miscellaneous	■ Back-up battery holder for real-time clock (RTC) (may be in mechanical conflict with M-Module slot 0)
Software Support	■ OS-9® ■ QNX®

Please note that some of these options may only be available for large volumes. Please ask our sales staff for more information.

Ordering Information

Standard A21B Models	**01A021B00**	A21B, Freescale™ QorIQ™ single-core P1013, 800 MHz, 1 GB DDR3 ECC SDRAM, 32 MB Flash, 3 M-Module slots, -40 to +85°C screened
Related Hardware	**01A021C00**	A21C, Freescale™ QorIQ™ single-core P1013, 800 MHz, 1 GB DDR3 ECC SDRAM, 32 MB Flash, 2 PMC/XMC slots, -40 to +85°C screened
Memory	**0751-0046**	MicroSD card, 2 GB, -40..+85°C
	0751-0051	SSD mSATA, 8 GB, -40..+85°C
	0751-0052	MicroSD card, 4 GB, -40..+85°C
Miscellaneous Accessories	**05F006-00**	RS232 interface cable RJ45 to 9-pin D-Sub (1 COM to 1 COM), 2m
	05M000-17	25 mounting screw sets to fix M-Modules on carrier boards
Software: Linux	This product is designed to work under Linux. See below for all available separate software packages.	
	10A021-90	General Linux BSP for A21B and A21C
	13MD05-90	MDIS5 System (and Device Driver) Package (MEN) for Linux. This software package includes most standard device drivers available from MEN.
	13Z014-90	Linux device driver (MEN) for PCI-to-VME bridge on A12, A13, A14, A15, A17, A19, A20, A21B/A21C and B11
Software: VxWorks®	This product is designed to work under VxWorks®. For details regarding supported/unsupported board functions please refer to the corresponding software data sheets.	
	10A021-60	VxWorks® 6.9 BSP (MEN) for A21B and A21C, SMP
Software: Firmware/BIOS	This product uses the U-Boot bootloader available from DENX together with board-specific additions from MEN.	
	14A021-00	U-Boot Bootloader (DENX/MEN) for A21B and A21C

For operating systems not mentioned here contact MEN sales.

Documentation	Compare Chart 6U VMEbus CPU and I/O cards » Download	
	20A021-00	A21B/A21C User Manual
	20A021BER	A21B Errata

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