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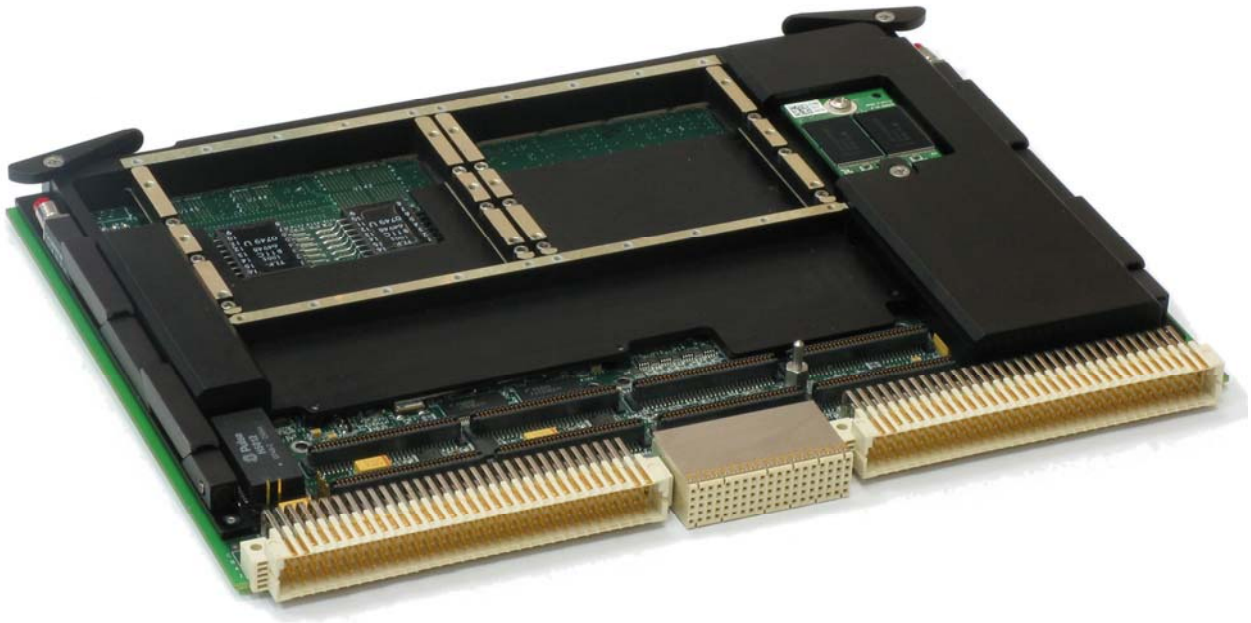
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Find the *Aitech Defense Systems C108* at our website: ***Click HERE***

C108

PowerPC® MPC7448 VME SBC



- Rugged 6U VME Single-Slot SBC
- VME64x Compliant
- PowerPC® 7448 @ 1.4 GHz, 1.0 GHz, or 600 MHz, with AltiVec™ Technology
- 32 kB L1 and 1 MB L2 Caches
- Up to 1 GB of SDRAM with ECC
- 32 MB Boot Flash Memory
- 128 MB User Flash Memory
- Up to 32 GB NAND Flash Memory
- Up to 8 GB USB SSD (Solid State Disk)
- 128 kB NVRAM
- 1 Gigabit Ethernet Port
- 2 Fast Ethernet Ports
- 2 USB 2.0 Ports
- 2 Dual-Redundant MIL-STD-1553B Ports
- Opto-Isolated CAN Bus 2.0B Interface
- 2 Standard UART Ports Supporting RS-232/422/485
- 6 Multi-Protocol High-Speed Serial Ports Supporting RS-232/422/485
- 16 Single-Ended TTL or 8 Differential RS-422 Discrete I/O Lines
- 2 PMC Slots
- Power Saving Modes
- Eight 32-Bit Timers
- 2 Watchdog Timers
- Electronic Elapsed Time Meter
- Real-Time Clock
- 8 High Performance DMA Engines
- 3 On-Board Temperature Sensors
- Pin-Compatible with C100, C101, and C103 SBCs
- Conduction- and Air-Cooled Versions
- RTOS Support:
  - Wind River - VxWorks®
  - Green Hills® - INTEGRITY®

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C108 High Performance and Low Power Combined with Extensive I/O

The C108 is a member of Aitech's renowned C10x VME SBC family. It is designed for harsh environment applications that require high performance, low power, and multiple I/O capabilities.

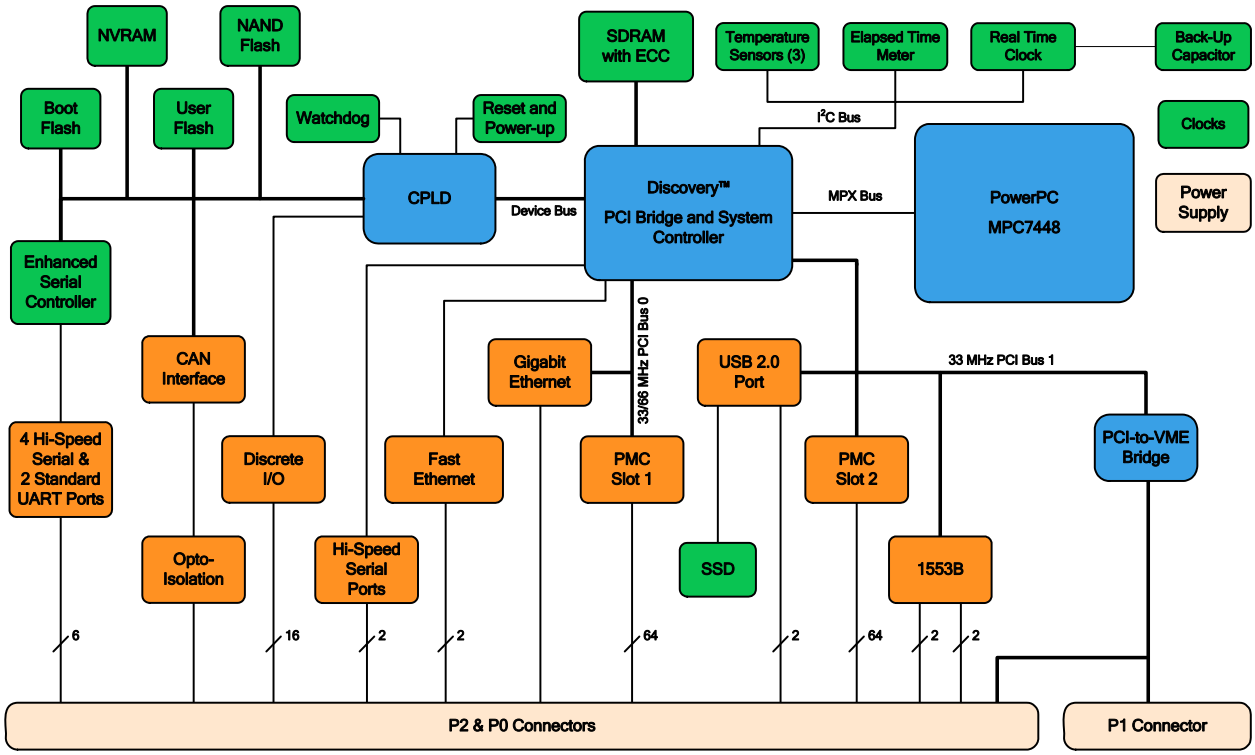
This powerful single-board computer combines an enhanced processing engine with versatile and flexible I/O. Powered by Freescale's advanced PowerPC® MPC7448 microprocessor at 1.4 GHz with integrated on-chip L1 and L2 caches, the C108 provides excellent processing capability while consuming minimum power and generating a low level of heat. For even lower power consumption and heat generation the C108L and C108U configurations are also available, with processors operating at 1.066 GHz and 600 MHz respectively.

The large, fast SDRAM array is supplemented by additional memory arrays, such as Flash for user application storage, high-density NAND Flash for mass storage purposes, USB Solid State Disk (SSD), and NVRAM for user/application-specific parameter storage.

In addition to its high performance processor architecture, the C108 provides unparalleled I/O capabilities, all integrated on board. I/O interfaces include a Gigabit Ethernet port, two Fast Ethernet ports, two dual-redundant MIL-STD-1553B interfaces, an opto-isolated CANBus 2.0B interface, two USB 2.0 ports, eight serial ports (six high-speed ports and two standard UART ports), and 16 single-ended TTL or 8 differential RS-422 discrete I/O channels. The C108 enables further enhancement of all this functionality by providing two PMC expansion slots.

The C108 internal architecture is based on two separate 64-bit wide PCI buses, one operating at 66/33 MHz and the other at 33 MHz, enabling separation of the slow PCI devices from the faster ones so that each PCI device can operate at its top speed. In order to achieve maximum bus utilization, multiple advanced programmable DMA engines are available for data transfer over the PCI buses.

The C108 implements a VME64x compliant interface using Tundra's Universe II PCI to VME Bridge.



C108 Block Diagram

Functional Description

Processor and Bus Architecture

The C108 is a powerful processing platform combining a high performance processor and extensive supporting memory arrays. The board's architecture was designed to maximize utilization of all bus interfaces.

Processor

The C108 features the high performance MPC7448 PowerPC® processor. The MPC7448 is a 32-bit processor integrating both L1 (32 kB instruction/data) and L2 (1 MB) caches on chip to support its powerful processing core.

The processor is available in 600 MHz, 1.066 Hz, or 1.4 GHz versions (with potentially higher frequency processors available in the future), and provides AltiVec support enabling the user to take advantage of the processor's real-time vector processing capabilities.

Dynamic Frequency Switching (DFS)

The DFS feature allows processor core frequency to be divided by two or four via software to reduce power consumption. The MPC7448 and the C108 itself remain fully functional in DFS mode, but operate at a lower level of processing.

Bus Architecture

In order to support the processing unit's high level of performance and to provide a fast highway for data transfer, the C108 implements the advanced, highly-integrated Discovery™ device.

The Discovery™ system controller performs both as the memory controller for the processor, and as its bridge to the PCI bus.

The Discovery™ system controller interfaces with the processor through the MPX bus at 133 MHz.

To maximize PCI bus utilization, and enable various PCI bus configurations, the C108 architecture was designed with two separate and totally independent PCI buses.

Both PCI buses support 64-bit operation and fully comply with PCI Rev. 2.2. The first PCI bus is capable of 33/66 MHz operation (depending on the operation capability of the PMC inserted in PMC slot 1) while the second PCI bus is operating at 33 MHz only. This allows separating fast PCI devices from slow ones and enables each I/O device to operate at its maximum speed.

Memory

The C108 is equipped with large memory arrays providing the user with extensive resources. These arrays include up to 1 GB fast SDRAM operating at 133 MHz, 32 MB linear Boot Flash, 128 MB linear User Flash, and up to 32 GB NAND Flash for solid-state mass storage applications.

All SDRAM banks are ECC protected, providing high data integrity.

In addition, the C108 provides 128 kB NVRAM (Non-Volatile RAM). This array is a fast Flash shadow type of RAM that does not require an external power supply to maintain its contents during power down.

Another Flash array is dedicated to Firmware storage, freeing all other arrays for user applications only.

USB Solid State Disk (SSD)

For convenient file storage, the C108 includes up to 8 GB of USB 2.0 SSD, connected to one of the C108 on-board USB Host controller ports. An integral controller enables high speed data transfers and provides wear leveling to ensure maximum longevity of the media.

VME

The C108 includes a Universe II PCI-VME Bridge device to enable interface between the local PCI architecture and the VME backplane.

The VME interface provides full master and slave capabilities, and supports the following:

- A32/A24/A16 addressing modes
- MBLT/BLT/D64/D32/D16/D8 data transfer modes
- Interrupter and handler capability on all seven VME interrupt lines
- Four mailbox and four location monitors for in-system board communication
- Full system controller functionality
- Flexible register set allowing manipulation of all VME options

The Universe II Bridge integrates large FIFOs for optimal usage of the two buses on which it resides (PCI and VME). In addition, it includes a DMA engine that supports a high rate of data transfer. The Bridge interconnects the PCI bus through a 64-bit/33 MHz PCI bus interface.

I/O Interfaces

In addition to its superior processing power and the more traditional I/O capabilities such as the Ethernet ports and serial channels, the C108 also provides more advanced interfaces such as Gigabit Ethernet, CAN, and USB 2.0 ports.

MIL-STD-1553B

The C108 provides two on-board dual-redundant MIL-STD-1553B ports, each of which is capable of BC, RT, and MT operation. These ports are implemented through two separate PCI controllers enabling 32-bit 33 MHz PCI bus operation.

The MIL-STD-1553B ports are routed to the VME P2 connector via transformer coupling (default) or direct coupling (optional).

Ethernet

The C108 provides three Ethernet ports, a Gigabit Ethernet and two Fast Ethernet ports. The Gigabit Ethernet interface supports 10BaseT/100BaseTX/ 1000BaseT and the Fast Ethernet ports support 10BaseT/100BaseTx.

The Gigabit Ethernet controller supports 64-bit @ 66 MHz PCI operation and resides on the fast PCI bus. This fast interface incorporates large FIFOs and a powerful DMA engine enabling high bandwidth for data transfer.

The fast Ethernet Controllers are integrated in the Discovery device, enabling fast access to the local SDRAM without loading any of the PCI buses.

Opto-Isolated CAN Bus 2.0B Interface

The C108 includes an opto-isolated CAN port, implemented through Philips' SJA1000 stand-alone Controller Area Network (CAN) controller.

The interface management logic interprets commands from FPGA2, controls addressing of the CAN registers, and provides interrupts and status information.

Two different modes of operation are implemented:

- BasicCAN mode
- PeliCAN mode with extended features

The CAN Controller supports the full CAN 2.0B protocol specification.

Serial I/O

The C108 provides a total of eight serial ports, six high-speed multi-protocol synchronous/asynchronous ports supporting all common serial communications protocols (UART, SUART, SDLC, HDLC, BISYNC, Transparent, etc.), and two standard UART ports.

USB

A USB Rev. 2.0 host controller (backward compliant with Rev. 1.0 and Rev. 1.1) provides EHCI/OHCI Root hubs. The controller integrates the USB transceivers supporting high-speed, full-speed, and low-speed signaling. The C108 is capable of providing power to down stream devices. The controller is a PCI device capable of high data transfer rates through the use of its internal FIFOs and DMA engine.

Two USB 2.0 ports are routed to the backplane and front panel connectors for user access, and a third port hosts the on-board USB SSD.

Discrete I/O

The C108 provides standard discrete I/O channels that may be configured as either 16 single ended TTL or 8 differential RS-422 channels. Each channel may be independently configured as input or output.

When configured as input each of the discrete channels may be programmed to generate an interrupt on any level shift event.

PMC I/O Expansion

The C108 provides two IEEE 1386-2001 or ANSI/VITA 20-2001 compliant PMC expansion slots for extended flexibility and integration of additional I/O to the board.

Each of the PMC slots resides on a different PCI bus. PMC slot 1 is located on the fast PCI bus supporting 64-bit at 66 MHz bus operation. PMC slot 2 is located on the slow PCI bus supporting 64-bit at 33 MHz bus operation.

Both PMC slots can host IEEE1386/ 1386.1-2001 compliant air-cooled and VITA 20-2001 compliant conduction-cooled PMC modules.

PMC slot 1 supports 3.3 V PCI signaling levels and is 5.0 V tolerant allowing insertion of any PMC module. The keying for this slot is universal (no key).

PMC slot 2 supports 5.0 V PCI signaling levels only. 3.3 V only PMC may not be installed in this slot. Keying at this slot allows the insertion of PMC modules capable of 5.0 V PCI signaling levels.

I/O Routing

All I/O interface signals are available at the C108 P2 and P0 VME rear panel connectors. The I/O interfaces require more I/O than is available at the VME connectors; therefore varying I/O configurations are available. For more information please contact an Aitech Systems representative.

On air-cooled versions, some of the I/O interfaces are available at the front panel. Refer to the front panel section for more information.

Timers

The C108 is equipped with eight 32-bit timer/counters. These timers provide high-resolution timing functionality as well as capability for long interval counting applications.

The C108 includes a Real-Time Clock (RTC) for time and date storage. The RTC is backed up by a large super-capacitor for long-term parameter storage.

Two watchdog timers are also available on the C108. A watchdog timer may be programmed for the required time-out interval, after which it will reset the board.

Front Panel Connectors and Switches

The air-cooled version of the board is provided with a front panel. The front panel includes the following:

- D-Type connector delivering two UART ports
- RJ-45 connector delivering one Ethernet port
- Reset Switch

Temperature Sensors

Three digital temperature sensors for thermal management and protection have been integrated into the design of the C108. Two sensors are located at the two edges of the board, and the third is in the PowerPC processor.

These sensors are software accessible via an I^2C interface.

Software

Test and Diagnostic Features

The C108 is supplied with an extensive firmware package including startup firmware (boot software), the AIMon monitor/debugger tool, the AIDiag diagnostic tool, and BIT. BIT may be executed during power-up, or at any time after the board has been booted.

A COP/JTAG interface to the processor provided for debugging and development purposes.

RTOS Support

A BSP (Board Support Package) for the C108 is available for several RTOSs (Real-Time Operating Systems), including WindRiver VxWorks, and Green Hills INTEGRITY®.

Other RTOS BSPs may be available upon request.

The BSP includes drivers for all on-board resources, enabling the user to take full advantage of the board's powerful features.

Mechanical Features

The C108 is available in two mechanical formats:

- Air-cooled per ANSI/VITA 1-1994
- Conduction-cooled per IEEE 1101.2

Both mechanical formats are single-slot 6U modules.

The C108's customized metal frame provides excellent rigidity and shock resistance, as well as an array of stiffeners to support rugged PMCs.

Dimensions

- Air-cooled: per ANSI/VITA 1-1994
- Conduction cooled: per IEEE 1101.2

Weight

Air-cooled form factor: < 625 g (1.38 lbs)

Conduction-cooled form factor: < 750 g (1.65 lbs)

Thermal Management

A careful mechanical design including custom heatsink modules combined with a customized metal frame provides for optimal heat dissipation and relief of the board.

The C108 provides both primary and secondary thermal interface support for CCPMCs (conduction-cooled PCI mezzanine cards).

Power Requirements

The C108 may be configured to receive all its power from the VME backplane's +5.0 V supply and generate +3.3 V using on-board power circuits, or it may be configured to take the +3.3 V from the backplane as defined in the VME64x specification.

Total power consumption of the C108 depends on its configuration and assembly options.

Fully featured and configured to operate from the +5.0 V power supply alone, typical power consumption of the C108 is as follows:

Input Voltage	Processor		
	600 MHz	1.066 GHz	1.4 GHz
+3.3 V	0 A		
+5.0 V	2.75/3.7 A	3.7/5.0 A	5.0/6.0 A
+12 V	0 A (no PMC/XMCs mounted)		
–12 V	0 A (no PMC/XMCs mounted)		
Power	13.75/18.5 W	18.5/25 W	25/30 A

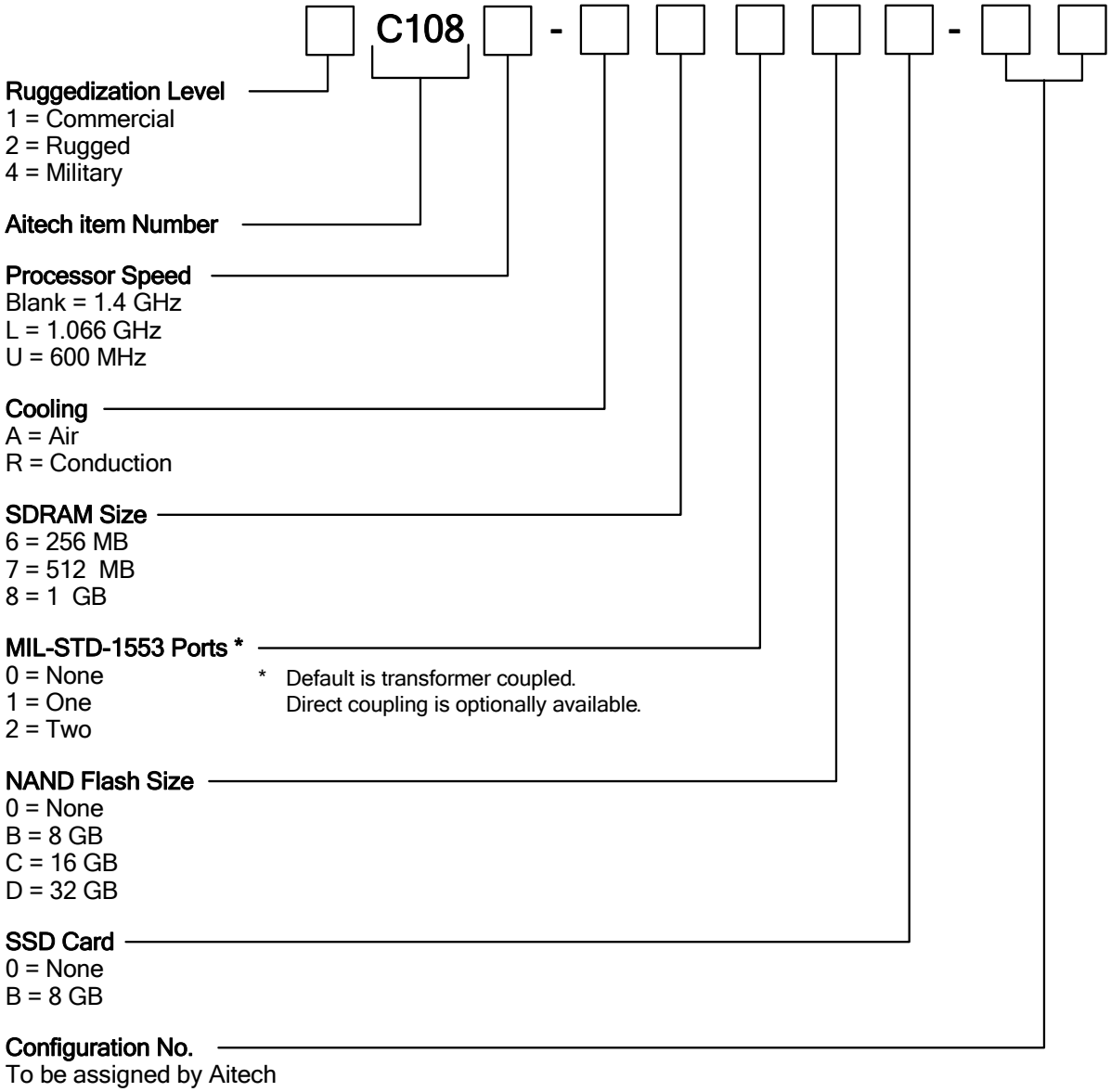
* Values are Typical/Maximum

Environmental Features

Please Refer to the Aitech Ruggedization Datasheet.

C108
PowerPC® MPC7448 VME SBC

Ordering Information for the C108



Ruggedization Level
1 = Commercial
2 = Rugged
4 = Military

Aitech item Number

Processor Speed
Blank = 1.4 GHz
L = 1.066 GHz
U = 600 MHz

Cooling
A = Air
R = Conduction

SDRAM Size
6 = 256 MB
7 = 512 MB
8 = 1 GB

MIL-STD-1553 Ports *
0 = None
1 = One
2 = Two

* Default is transformer coupled.
Direct coupling is optionally available.

NAND Flash Size
0 = None
B = 8 GB
C = 16 GB
D = 32 GB

SSD Card
0 = None
B = 8 GB

Configuration No.
To be assigned by Aitech

Example: 4C108L-R72CB-00

For more information about the C108 or any Aitech product, please contact Aitech Defense Systems sales department at (888) Aitech-8 (248-3248).

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