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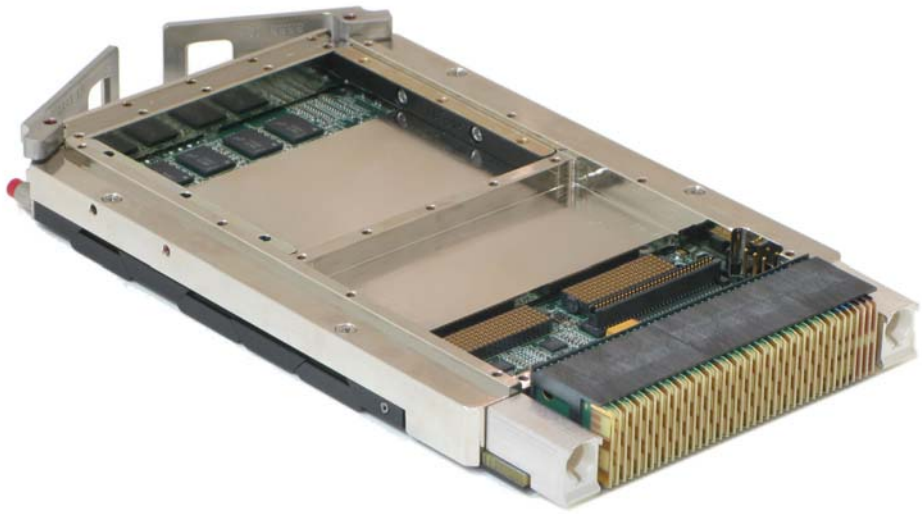
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Find the *Aitech Defense Systems C873* at our website: ***Click HERE***

C873

4th Gen. Intel Core™ i7 3U VPX SBC



- Rugged 3U VPX Single-Slot SBC
- 4th Generation Intel® Core™ i7 Processor
  - Quad Core @ 2.4 GHz
  - Intel Virtualization Technology (VT-x)
  - Streaming SIMD Extensions (SSE) 4.2
  - Intel Advanced Vector Extensions (AVX) 2.0
  - Integrated HD Graphics 4600
  - 6 MB Last Level Cache (LLC) shared between CPU and Integrated Graphics
- Memory Resources
  - Up to 16 GB Dual-channel DDR3L, @ 1600 MT/s with ECC
  - Up to 512 GB SATA Flash Disk
  - Dual BIOS Flash Devices
- I/O Interfaces
  - Four Gigabit Ethernet Ports
    - Two 1000Base-T Ports
    - Two 1000Base-BX/KX Ports
  - Four USB 2.0 Ports
  - Two SATA 2.0 Ports
  - Four Serial Ports
    - Two RS-232/422/485 Ports
    - Two RS-422/485 Ports
  - Eight Discrete I/O Lines
  - RGBHV and HDMI/DVI Display Outputs
  - High Definition Audio (In and Out)
- Multiple PCIe VPX Fabric on P1:
  - One PCIe x8 Gen 2.0
  - Two PCIe x4 Gen 2.0
  - Eight PCIe x1 Gen 2.0
- PMC/XMC Slot
  - PMC Slot supporting 32-bit PCI bus @ 66 MHz
  - XMC Slot supporting PCIe x8 Gen 2.0
- System Resources
  - Three Temperature Sensors
  - Real Time Clock
  - Avionics Windowed Watchdog Timer
  - Elapsed Time Recorder
  - Intelligent Platform Management Interface (IPMI)
- Software Support
  - Windows™
  - Linux®
  - VxWorks®
- OpenVPX Compliant per VITA 65
- Auto System/Peripheral Detection
- 2LM Compliant Option per VITA 48.2
- Conduction and Air-Cooled Versions
- Vibration and Shock Resistant

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C873 – 4th Generation Intel® Core™ i7 3U VPX SBC

Aitech's C873 is a high-performance 3U VPX SBC (Single Board Computer) for embedded and harsh environment applications. The heart of the C873 is Intel's newest platform (Haswell), featuring a 4th generation Intel® Core™ i7 Quad Core processor with integrated HD Graphics 4600, coupled with a companion Lynx Point QM87 I/O Platform Controller Hub (PCH).

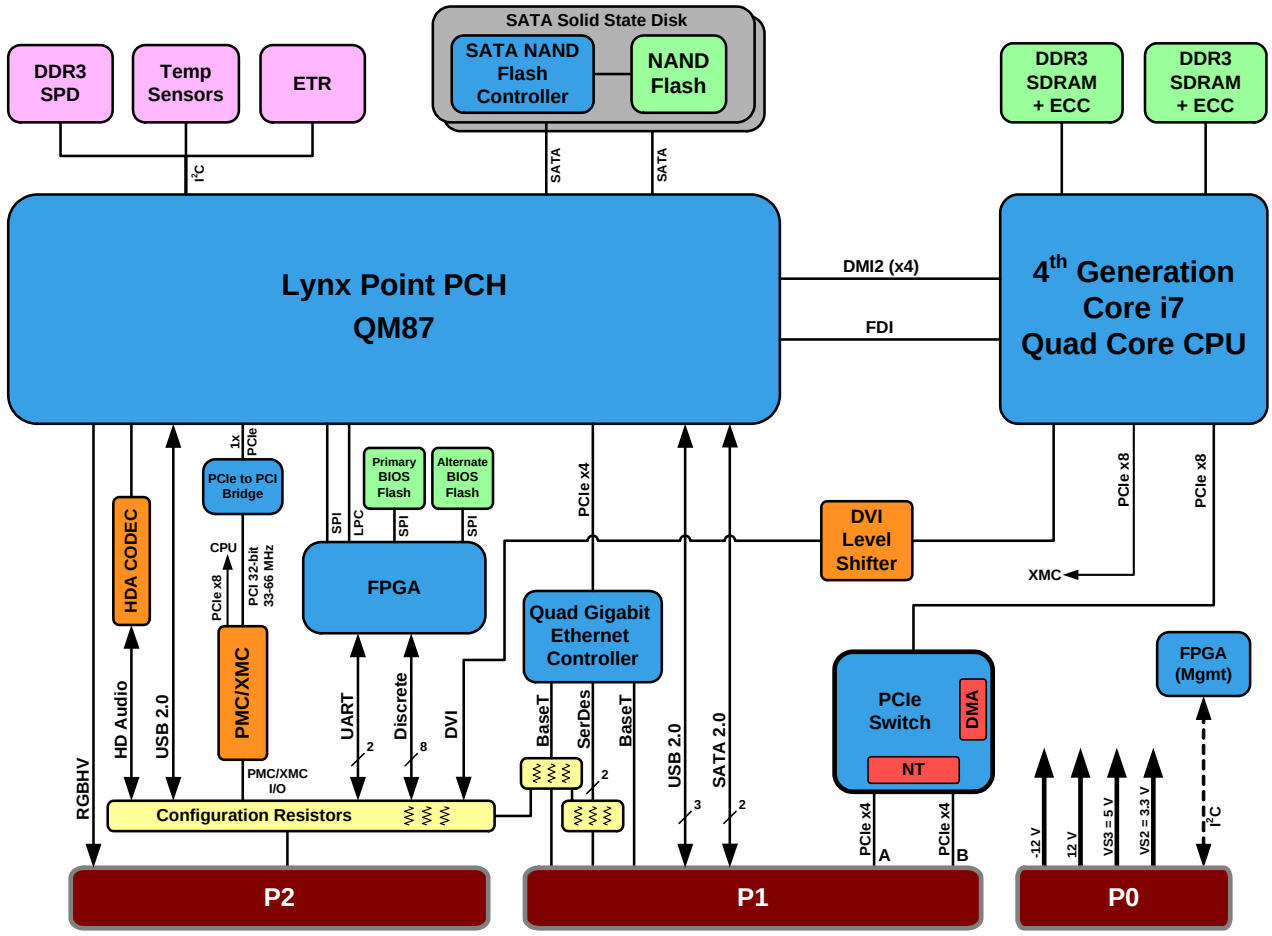
The processor's integrated 2D/3D graphics controller supports graphics and video processing and provides RGBHV and HDMI/DVI outputs.

The C873 integrates large on-board memory arrays to support processor and user application needs. Memory resources include up to 16 GB dual-channel DDR3L SDRAM with ECC protection and up to 512 GB of SATA Flash disk storage for user/application-specific mass storage.

In addition to its high-performance processor architecture, the C873 provides a wide variety of I/O, including Gigabit Ethernet ports, USB 2.0 ports, SATA 2.0 ports, UART ports, general-purpose discrete I/O channels, and high-definition stereo audio I/O. To further expand its capabilities, the C873 is equipped with an industry-standard PMC/XMC slot.

The 3U VPX C873 is capable of communicating with one, two, or eight other PCIe VPX boards, eliminating the need for another switch in the system.

The C873 is available in air-cooled and conduction-cooled versions, including a 2 Level Maintenance (2LM) conduction-cooled configuration.



Functional Description

Processor and Bus Architecture

The C873 is a high-performance 3U VPX SBC, based on Intel's Haswell platform and supported by extensive memory arrays.

System Architecture

The C873 is based on the Intel 4th Generation Core i7 processor (Intel's high-performance, low-power mobile CPU) and the Lynx Point Platform Controller Hub (PCH-QM87). In this two-chip solution, the quad core processor, memory controller, and integrated graphics processing are provided by the Core i7, while platform I/O interfaces are provided by the PCH.

4th Generation Intel Core i7 Processor

Fabricated using 22-nanometer process technology, the 64-bit, quad core 4th generation Intel Core i7 processor provides the host interface controller, system memory interface (DDR3L), direct media interface, and integrated graphics processing, and also supports external graphics interfaces (over a PCIe port).

The processor includes two PCIe Gen. 3.0 x8 ports, one of which is routed to the XMC site, the other of which is routed to the VPX backplane via a PCIe Gen. 2.0 switch.

Lynx Point Platform Controller Hub (PCH)

The PCH integrates a number of I/O device controllers and interfaces supporting legacy and high-speed resources to allow system design flexibility. The PCH also integrates an RGBHV interface, which receives display data from the CPU's graphics controller over the Intel Flexible Display Interface (FDI).

Memory

SDRAM

Up to 16 GB of fast DDR3L SDRAM with error correction (ECC) operating at up to 1600 MT/s, configured in dual channels, provides maximum performance.

BIOS Flash Devices

The C873 is equipped with two 16 MB BIOS Flash devices. If the board fails to boot from the primary device, the boot process redirects to the alternate device.

Flash Disk

Two SATA 2.0 Flash Disks, one up to 512 GB and the other up to 32 GB, provide on-board mass storage, eliminating the need for externally attached storage media.

Note that all Flash Disks are SLC (Single-Level Cell), unless specified as MLC (Multi-Level Cell) in *Ordering Information* below.

Integrated Graphics

The C873 includes Intel's HD Graphics 4600, implemented on the processor module. The graphics core provides 20 execution units, and is capable of 2D/3D graphics processing, supporting Microsoft® DirectX® 11.1, OpenGL 4, and more.

The graphics core implements Intel's Floating Point technology, enhancing the visual quality of generated images.

The C873 provides video output interfaces supporting RGBHV at up to 1600x1200 @ 60 Hz, and single link HDMI/DVI at up to 1600x1200 @ 60 Hz.

I/O Interfaces

Ethernet

Two 10Base-T/100Base-TX/1000Base-T interfaces and two 1000Base-BX/KX interfaces are implemented in a Quad Gigabit LAN Controller (with integrated PHY) using four of the PCH PCIe lanes.

USB 2.0

USB Rev. 2.0 host controllers (backward compliant with Rev. 1.0 and Rev. 1.1) integrated in the PCH provide four USB 2.0 ports. The controllers integrate USB transceivers supporting high-speed, full-speed, and low-speed signaling. The C873 is capable of providing power to downstream devices.

SATA 2.0

Two SATA 2.0 interfaces enable connection of external mass storage devices to the C873. The SATA 2.0 interface is fully compliant with the Serial ATA 2.0 and 1.0 specifications with SATA 2.0 extensions.

Serial I/O

The C873 provides four UART serial ports.

Two ports support full RS-232/422/485 physical interfaces.

Two additional ports, supporting RS-422/485 physical interfaces, are provided by configuring the discrete I/O lines to function as serial channels.

Serial ports are fully compliant with the 16550 programming model.

Discrete I/O

The C873 provides eight general-purpose discrete I/O lines, which are divided into four groups of two lines each. Each group may be configured as two single-ended channels or one differential RS-422 channel.

Each channel may be independently configured as input or output. When configured as inputs, each of these channels may be programmed to generate an interrupt on any level shift event.

HD Audio

The PCH supports Intel's High Definition (HD) Audio, which is compliant with Microsoft's Universal Audio Architecture (UAA). Using an HD Audio codec, the C873 provides stereo input and output interfaces.

PMC/XMC Expansion

The C873 provides an industry standard expansion slot for extended flexibility and integration of additional elements to the SBC. The expansion site is capable of operating as PMC or XMC.

The PMC site resides on a 32-bit PCI bus operating at 33/66 MHz, provided by the PCH via a PCIe to PCI bridge. The universal PMC site supports both 3.3 V and 5 V PCI I/O signaling levels; therefore the slot does not include a voltage key.

The XMC slot connects to the CPU subsystem through a PCIe x8 port. The PCIe interface supports x8, x4, x2, and x1 bus widths and is compliant with PCIe Gen. 2.0 at 5 GT/s per lane.

Note: The SDRAM devices on the second memory channel may cause a mechanical conflict with some PMC/XMCs. Contact an Aitech representative for more information.

I/O Routing

C873 on-board I/O resources and PMC/XMC I/O are available at the VPX backplane connectors in accordance with VITA 46.9 – pattern P64s for PMC or X24s+X8d+12d for XMC.

Due to the limited number of I/O pins available on the VPX P2 connector, it is not possible to simultaneously route all C873 on-board I/O plus all PMC/XMC I/O to the backplane. The C873 is therefore available in several factory configured variants providing different combinations of on-board and PMC/XMC I/O.

Refer to *I/O Variants* below for more information.

VPX Capabilities

VPX Data Plane Fabric Interfaces

The C873 uses a PCIe Gen 2.0 switch as a Data Plane interface to the backplane. The switch includes four DMA engines and provides two PCIe x4 ports (A and B) on the VPX P1 connector. The fabric interface can be configured as a single x8 port, two x4 ports, or eight x1 PCIe (VITA 46.4 compliant) ports, suitable for connecting with PCIe-based peripheral devices. Any PCIe port can be configured as non-transparent, enabling connection to remote root-complex boards.

VPX Control Plane Switch Support

The C873 is capable of connecting to a switch slot per VITA 46.9 by routing two Gigabit Ethernet ports to P1, enabling the designer to connect those ports to a switch slot per VITA 46.20.

OpenVPX Slot Profile

The C873 offers support for seven OpenVPX slot profiles, as defined in VITA 65.

The following slot profile options are specified when ordering the C873, and are configured by Aitech at the factory (see *Ordering Information* below):

SLT3-PAY-2F2U
- PAY = Payload board
- 2F = Two fat pipes (2 PCIe Lane x4)
- 2U = Two ultra-thin pipes (SerDes BX/KX)

SLT3-PAY-2F2T
- PAY = Payload board
- 2F = Two fat pipes (2 PCIe Lane x4)
- 2T = Two thin pipes (1000Base-T)

The SLT3-PAY-2F2T option is software configurable to support the following additional Data Plane configurations:

SLT3-PAY-1D
- PAY = Payload board
- 1D = 1 Double fat pipe (1 PCIe Lane x8)

SLT3-PAY-2F
- PAY = Payload board
- 2F = Two fat pipes (2 PCIe Lane x4)

SLT3-PAY-1F4U
- PAY = Payload board
- 1F = One fat pipe (1 PCIe Lane x4)
- 4U = 4 ultra-thin pipes (4 PCIe Lane x1)

SLT3-PAY-8U
- PAY = Payload board
- 8U = 8 ultra-thin pipes (8 PCIe Lane x1)

SLT3-PER-2F
- PER = Peripheral board
- 2F = Two fat pipes (2 PCIe Lane x4)

VITA 48 REDI Compliance

All configurations of the C873 are ANSI/VITA 48 REDI compliant.

In addition, the conduction-cooled C873 is optionally available in a 2 Level Maintenance (2LM) REDI configuration per ANSI/VITA 48.2 Type 1, with top and bottom covers shielding the complete C873 assembly including installed PMC/XMC modules.

Timers

The C873 includes one 32/64-bit and seven 32-bit timers/counters providing high-precision timing functionality. These timers can be chained together (cascaded) to support long timing interval counting applications.

A real-time clock (RTC) provides time and date keeping.

Both standard and windowed (avionics-style) watchdog timers are available on the C873. Implemented in the system FPGA, the windowed watchdog must be serviced within a software programmable window defined by minimum and maximum times. If serviced too early, too late, or not at all, this watchdog timer will generate a timeout event. It may be independently set to generate a non-maskable interrupt or to reset the SBC.

Elapsed Time Recorder

An on-board electronic Elapsed Time Recorder (ETR) records the C873's cumulative operating time and number of power on-off cycles in dedicated NVRAM. ETR data is software accessible by the user.

Intelligent Platform Management Interface (IPMI)

The C873 IPMI controller supports system-level management monitoring of board health and status via the I^2C bus at the P0 connector. This enables external monitoring of board resources such as rail voltages, board temperatures, and board information. The controller is powered by the VPX +3.3 Vdc Auxiliary power supply and is available even in the event of board failure or power loss.

Software

Test and Diagnostic Features

The C873 is supplied with a customized BIOS tailored to its architecture, capabilities, and features.

The BIOS includes POST capabilities as well as system configuration options for boot device, boot sequence, etc.

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

Operating Systems

The C873 with its custom BIOS fully supports installation and operation of the following operating systems:

- Microsoft Windows™
- Linux®
- WindRiver VxWorks®

Operating system specific device drivers are available for board resources.

Support for other operating systems may be available upon request.

Mechanical Features

All mechanical formats are single slot 3U modules.

A custom metal frame integral to the conduction-cooled version of the C873 provides excellent rigidity and shock resistance. The frame also provides an array of stiffeners to support rugged PMCs/XMCs.

Dimensions

- Air-cooled: per ANSI/VITA 48.1
- Conduction-cooled: per ANSI/VITA 48.2
- Conduction-cooled 2LM: per ANSI/VITA 48.2

Weight

Weights in grams (lbs) of the various C873 mechanical configurations (see *Ordering Information* below) are listed in the following table.

Cooling + Pitch			
A3	**R0**	**R2**	**R3**
<400 (0.9) * <700 (1.6) **	<780 (1.7)	<860 (1.9)	<930 (2.1)

* Commercial level ruggedization
** Rugged/military level ruggedization

Thermal Management

Careful mechanical design, including custom heatsinks combined with a metal frame, allow for optimal heat dissipation and relief of the board.

The C873 is also equipped with temperature sensors, located at temperature-critical locations, to monitor board temperature and provide temperature data to user application software. The processor monitors its own temperature and adjusts its operating frequencies in order to remain within thermal limits.

Power Requirements

The C873 takes all its power from the VPX backplane. It should be provided with +5.0 V, +3.3 V, +3.3V_AUX, and ±12 V_AUX as defined by the VPX specification (±12 V_AUX is required for PMC/XMC compliance only; the C873 does not require ±12 V_AUX for its own operation).

All other power sources required by C873 resources are generated on-board.

Total power consumption of the C873 depends on its configuration and assembly options.

In its fully featured configuration (no PMC/XMC installed), C873 power consumption, in Windows 7 idle condition and when running the PassMark® BurnInTest (CPU, memory, graphics), is as follows:

Input Voltage	Current
+3.3 V	1.8/1.8 (A)
+5.0 V	4/10 (A)
+3.3 V_AUX	200/200 (mA)
+12 V_AUX	0 A (no PMC/XMC mounted)
−12 V_AUX	0 A (no PMC/XMC mounted)
Power	26.6/56.6 (W)

Environmental Features

Please refer to the Aitech Ruggedization datasheet.

Accessories

Optional accessories for the C873 include the TM870 Rear Transition Module (RTM) and the CM870 3U VPX PMC/XMC Carrier.

For system integration and other development purposes, the TM870 RTM provides convenient access via standard connectors to the C873 I/O interfaces and all PMC/XMC I/O. The RTM supports both the air-cooled and conduction-cooled versions of the C873 when mounted in a commercial air-cooled chassis.

The CM870 is a 3U VPX PMC/XMC carrier on which any industry standard PMC/XMC can be mounted. Using one or more CM870s, system functionality can be significantly expanded by enabling the C873 to control additional PMCs/XMCs over the VPX backplane.

Please refer to the TM870 and CM870 datasheets for additional information.

C873

4th Gen. Intel Core™ i7 3U VPX SBC

I/O Variants

The C873 is available in several standard configuration variants, providing different combinations of on-board and PMC/XMC I/O.

In addition to the standard variants, custom configurations are available per customer request. For more information, contact an Aitech sales representative.

Quantities of available I/O, for the standard C873 I/O variants, are listed in the table below.

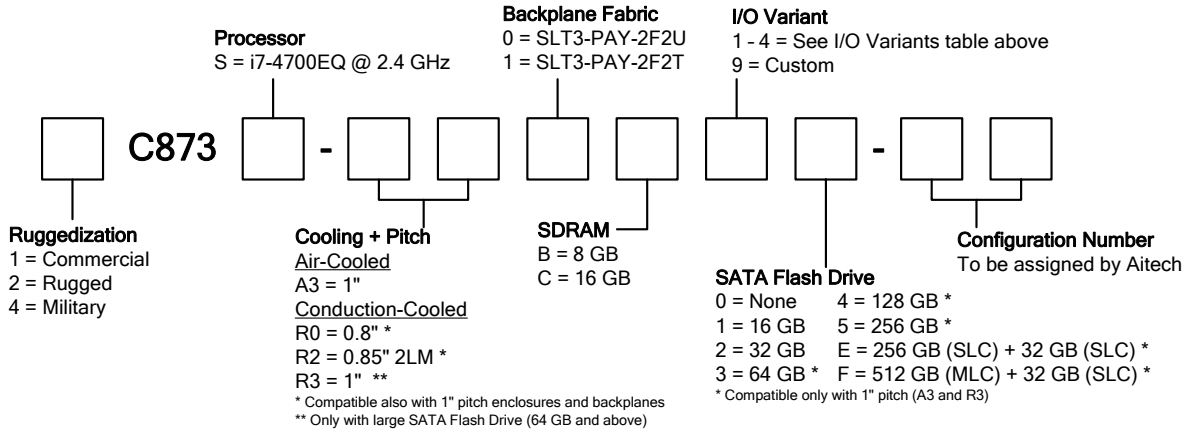
	Variant			
Resource	**1**	**2**	**3**	**4**
USB 2.0	4	4	3	3
SATA 2.0	2	2	1	1
GbE Ports: 1000Base-T+1000Base-KX/BX	2+0 (1) or 2+2 (2)	2+0 (1) or 2+2 (2)	2+0 (1) or 1+2 (2)	2+0 (1) or 1+2 (2)
Audio In	1	1	0	0
Audio Out	1	1	0	0
RGBHV	1	1	1	1
DVI/HDMI	1	1	0	0
Serial Ports (RS-232/422/485)	2	2	1	1
Discrete I/O Lines/Serial Ports (RS-422/485) (3)	8/2	8/2	4/1	4/1
PMC I/O	35 (1) or 27 (2)	N/A	64	N/A
XMC I/O: Diff Pairs+SE	N/A	7+21 (1) or 3+21 (2)	N/A	20+24

(1) In slot profile SLT3-PAY-2F2T

(2) In slot profile SLT3-PAY-2F2U

(3) Four discrete I/O lines can be configured as an RS-422/485 serial port

Ordering Information



Example: 4C873S-R01B22-00

For more information about the C873 or any Aitech product, please contact Aitech Defense Systems sales department at (888) Aitech-8 (248-3248).

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