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THE POWER OF VISION

MicroTCA Carrier Hub (MCH), 3rd gen, 40GbE/PCIe Gen 3 – UTC004

3rd Gen MCH, 40GbE/PCIe Gen 3

KEY FEATURES

- Single module, full size per AMC.0
- Unified 1GHz quad-core CPU for MCMC (MicroTCA Carrier Management Controller), Shelf Manager, Clocking, and Fabric management
- Automatic fail-over with redundant UTC004s
- 1GbE base switch with dual 100/1000/10G uplink
- Full Layer 2 or 3 managed Ethernet switches
- Non-blocking PCIe Gen 3, SRIO Gen 2, 10GbE/40GbE, or Crossbar Switch option to AMC fat pipes with options for up to 40GbE uplink
- Low-jitter M-LVDS clock distribution crossbar matrix
- PLL synthesizer for generating any clock frequency disciplined to GPS/SyncE/IEEE1588

Benefits of Choosing VadaTech

- Highest speed (40G/10G) MCH in the marketplace
- Crossbar clock matrix for low jitter, cleanest signals
- On-board high performance PLL synthesizer for generating any clock frequency
- VadaTech's Scorpionware® Shelf Management Software included at no additional cost
- Sophisticated clocking features enabling GPS/IEEE1588/SyncE/NTP Grand Master Clock
- Virtual JTAG capability for remote programming and debugging
- Full ecosystem of front and rear boards, enclosures, specialty modules, and test/dev products from one source
- AS9100 and ISO9001 certified company

The VadaTech UTC004 is the most feature-rich MicroTCA Carrier Hub (MCH) in the market. Its management software is based on VadaTech's robust Carrier Manager and Shelf Manager which have been deployed for years with proven results. The MCMC manages the Power Modules, Cooling Units, and up to 12 AMCs within the chassis. It also manages the optional PCIe Gen3, SRIO Gen2, 40GbE/10GbE or Crossbar Fat Pipe switches as well as the standard GbE with 10GbE uplink Base Channel switch. The Ethernet switches are managed with an enterprise grade Layer 2 or 3 switching/routing stack and they support Synchronous Ethernet.

The UTC004 runs Linux on its centralized quad-core CPU and is hot-swappable/fully redundant when used in conjunction with a second instance of the module. The firmware is HPM.2 compliant which allows for easy upgrades. It provides Master JTAG services to the AMCs via the JSM. The UTC004 has advanced clocking features including grand master clock and high-quality clock distribution/synthesis.

VadaTech can modify this product to meet special customer requirements. Contact us to discuss your application.

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IPMI CARRIER MANAGER / SHELF MANAGER / PROTOCOL ANALYZER

The UTC004 utilizes the same proven standards-compliant IPMI management stack that has been utilized successfully in our previous generation MCH products. It supports carrier manager, shelf manager, and protocol analyser operations to help facilitate a seamless chassis integration experience. The IPMI stack enables a rich feature set including:

- IPMI Version 2.0 with IPMI v1.5 compatibility
- SDR, FRU, and SEL storage interfaces (SEL stored in MRAM for high-speed/non-volatile/no-wear-out access)
- Intelligent temperature, voltage, and current sensing
- Shelf cooling policy
- Shelf activation and power management / Automatic fail-over/redundancy management
- Alarm controls
- Event notification and flexible alerting policies
- Backplane E-Keying
- CLI, SNMP, RMCP+, HTTP, and HPI
- IPMB Protocol Analyzer GUI for use on PC
- ScorpionWare GUI system manager integration tool on PC available separately

BASE CHANNEL ETHERNET SWITCH

The UTC004 provides includes as standard a GbE base channel switch which includes two 10GbE uplink 100/1000/10G RJ45 ports. This switch is fully Layer 2 or Layer 3 managed enabling a comprehensive enterprise-grade routing and switching feature set. It supports Synchronous Ethernet (SyncE) and IEEE1588.

FAT PIPES FABRICS

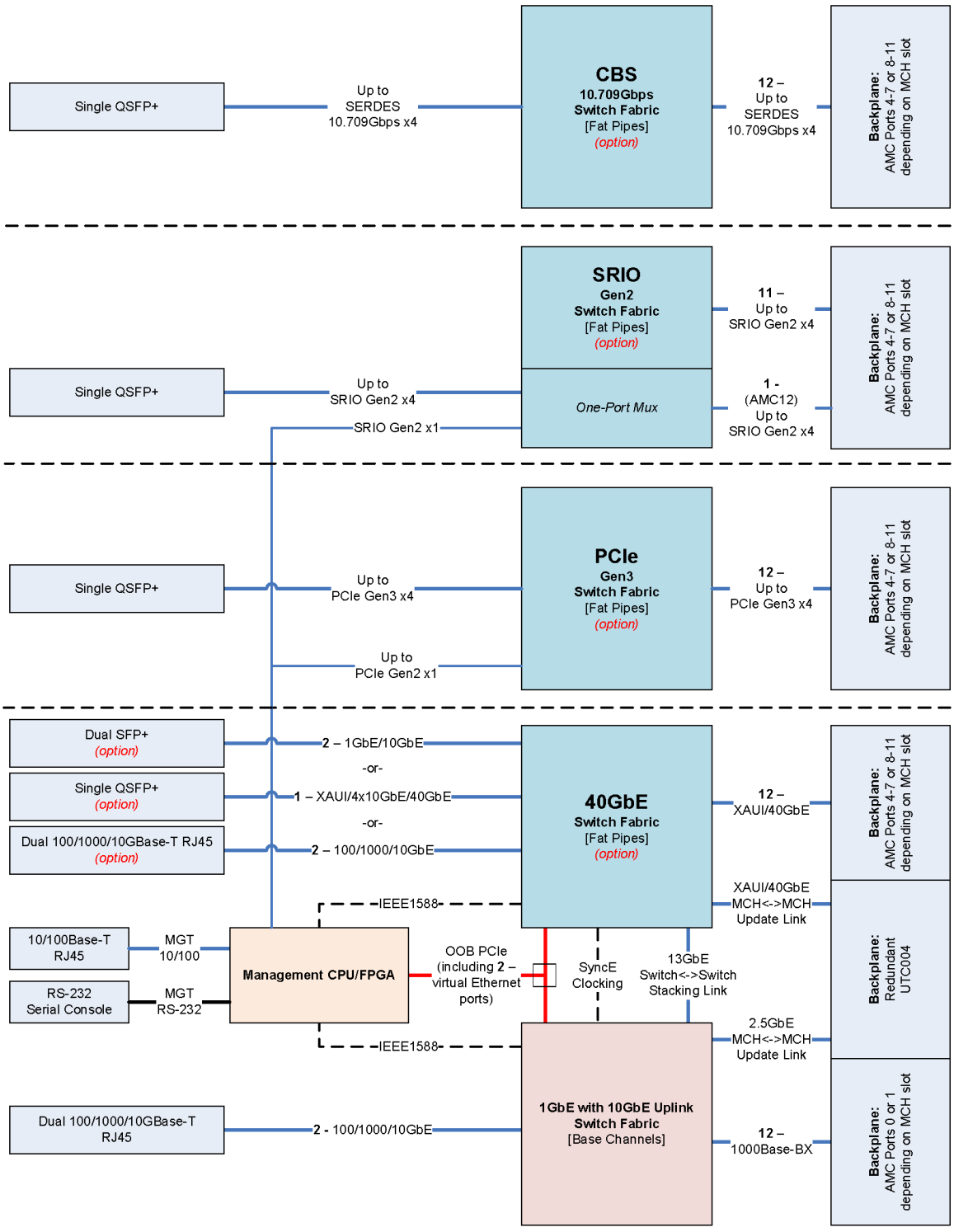
The UTC004 provides options for various fat pipes fabric options:

- 40GbE Switch with front single QSFP+ or dual SFP+ or dual 100/1000/10G RJ45 expansion/uplink ports
  - Full Layer 2 or 3 management enabling enterprise-grade switching and routing
  - Supports Synchronous Ethernet (SyncE) and IEEE1588 to facilitate advanced system synchronization via Ethernet
  - 320Gbps or 640Gbps aggregate bandwidth options for mixed 10GbE/40GbE and full 40GbE port configurations
- PCIe Gen3 Switch with front QSFP+ expansion/uplink port
  - Automatic speed negotiation for 2.5/5/8Gbps per lane
  - Virtual Switch/Multiple domain/Non-transparent port support to enable partitioning of the system with multiple root complexes
  - Includes an extra internal port which enables the GPS precision time-stamping engine (accessible from an AMC root complex board)
  - 1024Gbps aggregate bandwidth / non-blocking / cut-through architecture
- SRIO Gen2 x4 Switch with front QSFP+ expansion/uplink port
  - Supports 1.25/2.5/3.125/5/6.25Gbps per lane
  - 240Gbps aggregate bandwidth / non-blocking / cut-through architecture
- Cross-Bar Switch with front QSFP+ expansion/uplink port
  - Supports unicasting or multi-casting of any input SERDES lane to one or more output SERDES lane
  - 771Gbps aggregate bandwidth / asynchronous / non-blocking architecture passes through any data rate up to 10.709Gbps
  - SERDES protocol agnostic (no packet framing/handling within the switch, only the AMCs need to understand the protocol)

FABRIC CLOCK OPTION

The UTC004 has the capability to provide a 100MHz HCSL PCIe Gen3-compliant fabric clock to each AMC. This option enables the recommended synchronous PCIe clocking approach within the chassis when used in combination with the PCIe fabric.

FAT PIPE FABRIC VARIATIONS / GENERAL CONNECTIVITY



GPS AND GENERAL PURPOSE CLOCKS

The µTCA specification defines a set of clocks for telecom and non-telecom applications. The VadaTech UTC004 has the most sophisticated clocking distribution in the market to meet the most stringent requirements such as wireless infrastructure, high speed A/D, etc. The UTC004 supports the following GPS and general-purpose clocking features:

- uTCA.4-compliant low-jitter/low-skew backplane crossbar clock routing matrix for CLK1/CLK2/CLK3 for all AMCs
- Clock disciplining with arbitrary clock frequency output and holdover (Stratum-3 option) including 1PPS regeneration and holdover
- Flexible integration and synchronization between GPS, IEEE1588 / SyncE, and NTP clocking enabling Grand Master clock functionality
- 'Any Frequency' high-quality clock generation/jitter cleaning for up to two user clocks
- Supports hitless automatic clock failover for improved reliability
- Optional built-in GPS receiver enables direct time/clock synchronization to the GPS satellite constellation

The UTC004 supports flexible front panel clock port ordering options:

- Two DC-coupled LVCMOS Inputs/Outputs, or two AC-coupled Sine-wave Inputs, or one of each
- Built-in GPS receiver for time/location/clock synchronization plus a DC-coupled LVCMOS Input/Output

GPS RECEIVER ENABLED FEATURES

The UTC004 can be ordered with a GPS Receiver option. The receiver disciplines an on-board high-quality DPLL which is phase/frequency aligned to the atomic clocks in the GPS satellite constellation. The on-board clock synthesis/jitter cleaning capability can be utilized to convert this frequency into any frequency desired while still remaining locked to the GPS atomic clocks.

When the GPS Receiver option is purchased the UTC004 has the capability to re-transmit the incoming GPS data via Ethernet to other nodes in the network in the Trimble TSIP binary protocol format. This GPS data is also sent out the front panel GPS RS-232 serial port in the standard NMEA format for use by external equipment. When the GPS Receiver option is purchased along with the PCIe Fat Pipes fabric, the MCH also provides a precision PCIe Time-stamping Engine capability to a PrAMC PCIe Root Complex on the backplane. This engine appears as a PCIe device to the AMC card and a device driver is available which will allow the AMC card to read all GPS status including position, velocity, status, etc, in addition to precision timestamps, time trigger, and time event interrupt functionalities.

IEEE1588 PTP AND NTP GRAND MASTER CLOCK

The UTC004 can provide Ethernet time services to the chassis networks on both the GbE and 40GbE fabrics. It can be subordinate to an external PTP or NTP master server or when the GPS receiver option is purchased can act as a Grand Master clock utilizing the precision timing information provided via the GPS receiver and on-board disciplined oscillator.

SYNCHRONOUS ETHERNET

The UTC004 provides a Synchronous Ethernet (SyncE) on the GbE and 40GbE fabric ports. With this feature, ports on the 1G and/or 40G Ethernet switches can be designated as master or slave ports and the Ethernet fabrics within the chassis can be synchronized from end-to-end with external equipment. This feature utilizes advanced telecom-grade network synchronization PLLs to provide exceptional SyncE performance.

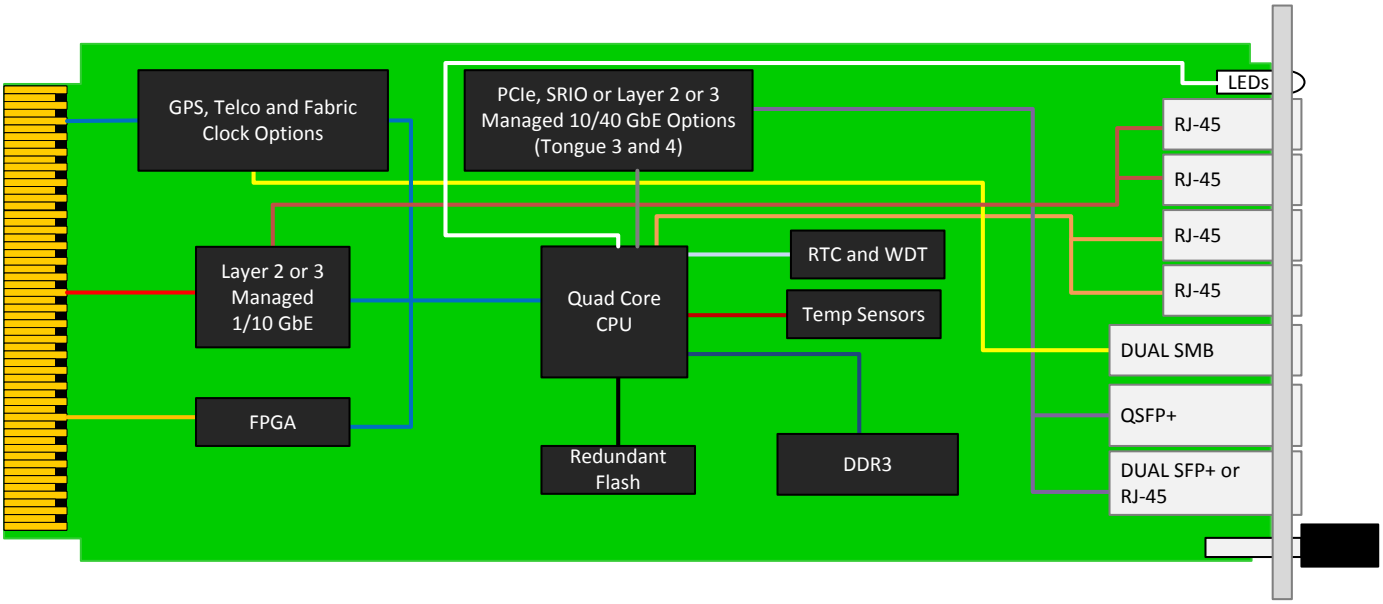
JTAG MASTER / JTAG VIA ETHERNET VIRTUAL PROBE

The UTC004 provide JTAG Master Capability to send out configuration data streams via the chassis JTAG Switch Module (JSM) to configure arbitrary JTAG Slave devices on AMC cards. Virtual Probe services are also available to provide JTAG via Ethernet for specific vendors such as Xilinx and Altera. This allows for standard development tools such as Xilinx iMPACT/ChipScope and Altera Programmer/SignalTap to treat the MCH/JSM combination as if it was a standard JTAG probe. This approach frees the developer from having to attach JTAG probes directly to the AMC or JSM which can be difficult when systems are already fully assembled. It also allows for remote debugging across long distances when required without the need to install additional JTAG equipment on-site.

INTEGRATION SERVICES AND APPLICATION-READY PLATFORMS

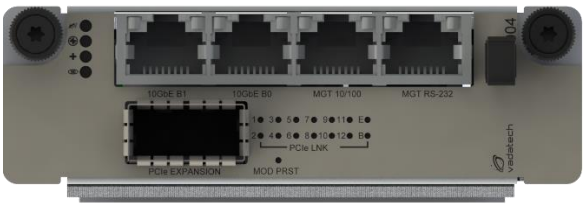
VadaTech has a full ecosystem of ATCA and µTCA products including chassis platforms, shelf managers, AMC modules, Switch and Payload Boards, Rear Transition Modules (RTM), Power Modules, and more. The company also offers integration services as well as pre-configured Application-Ready Platforms. Please contact VadaTech Sales for more information.

BLOCK DIAGRAM

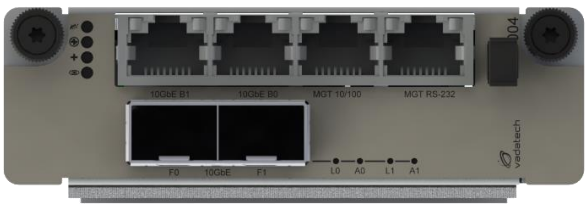


FRONT PANEL DIAGRAM & COMPARISON CHART FOR PREVIOUS VADATECH MCH GENERATIONS BELOW:

Feature	UTC001/2/3	UTC004
CPU Design/Upgrade Scheme	Up to 4 individual sub-system CPUs	Single quad core
Base/Fat Pipes Ethernet	GbE, 10 GbE	GbE, 40 GbE
Layer 2 Ethernet Fabrics (Switching)	Yes	Yes
Layer 3 Ethernet Fabrics (Routing)	No	Yes
Built-in GPS Receiver Option	No	Yes
Clock Routing/Synthesis	FPGA matrix/integer dividers	CBS matrix/PLL synthesis
IEEE 1588/NTP Grand Master Clock	No	Yes
Synchronous Ethernet	No	Yes
JTAG Master/Virtual Probe	No	Yes



UTC004 Front panel with QSFP+



UTC004 Front panel with dual SFP+

SPECIFICATIONS

Architecture		
Physical	Dimensions	Width: 2.89" (73.5 mm)
		Depth: 7.11" (180.6 mm)
Type	Controller	µTCA Carrier Hub (MCH)
Standards		
µTCA	Type	µTCA.0 Revision 1
AMC	Type	AMC.0 Revision 1
ATCA	Type	PICMG 3.0 Revision 2.0
Module Management	IPMI	IPMI Version 2.0
	HPM	HPM.1 Revision 1.0
Configuration		
Power	UTC004	Option load dependent (as the MCMC and Shelf only < 4 W)
Environmental	Temperature	Operating temperature: -5° to 55° C (air flow requirement of >200 LFM), industrial and military versions also available (See environmental spec sheet)
		Storage Temperature: –40° to +85° C
	Vibration	1G, 5 to 500 Hz on each axis
	Shock	30Gs each axis
	Relative Humidity	5 to 95 percent, non-condensing
Front Panel	Interface Connectors	RS-232 console port (RJ-45) for serial console and option for GPS NMEA serial data in/out
		Out-of-band LAN 10/100 from MCMC/Shelf Manager (RJ-45)
		Two in-band 100/1000/10G from Base Switch Fabric (RJ-45)
		Two CLK IN/OUT (SMB); CLK IN becomes GPS ANT IN with GPS receiver option
		Expansion for PCIe Gen 3, SRIO Gen 2, 40GbE, CBS: Single QSFP+, dual SFP+, Dual RJ-45
	LEDs	IPMI Management Control: Blue, Red, Amber, Green
		LNK/ACT, OOB PCIe error, ACTIVE MCMC, GPS receiver status, Clock: Ref Good, Freq Lock, Phase Lock, additional LEDs per each fat pipes fabric type
	Mechanical	Hot-swap switch input with +/-15KV ESD protection
	Temperature Sensor	Multiple temperature sensors on-board
Other		
MTFB	MIL Hand book 217-F @ TBD Hrs	
Certifications	Designed to meet FCC, CE and UL certifications where applicable	
Standards	VadaTech is certified to both the ISO9001:2000 and AS9100B:2004 standards	
Warranty	Two (2) years	
Trademarks and Disclaimer	The VadaTech logo is a registered trademark of VadaTech, Inc. Other registered trademarks are the property of their respective owners. AdvancedTCA™ and the AdvancedMC™ logo are trademarks of the PCI Industrial Computers Manufacturers Group. All rights reserved. Specification subject to change without notice	

ORDERING OPTIONS

UTC004 – ABC – DEF – GHJ – K00

A = Fabric Switch (Fat Pipes)

0 = None *(Base channel switch only)* [1]
1 = PCIe Gen 3 w/ QSFP+ Uplink
2 = SRIO Gen 2 w/ QSFP+ Uplink [2]
3 = 40GbE w/ 2x SFP+ Uplink
4 = 40GbE w/ 2x 10GBase-T RJ45 Uplink
5 = 40GbE w/ QSFP+ Uplink
6 = Cross Bar Switch w/ QSFP+ Uplink
7 = 10GbE w/ 2x SFP+ Uplink (Layer 2 managed only)
8 = 10GbE w/ QSFP+ Uplink (4 x 10GbE, Layer 2 managed only)

B = Included Transceiver Modules for Fabric Switch [3]

0 = None / Not Applicable
1 = SFP+ modules (10GBASE-SR) [4]
2 = SFP+ modules (10GBASE-LR) [4]
3 = SFP+ modules (1Gb LC/SX) [4]
4 = SFP+ modules (1Gb LC/LX) [4]
5 = SFP+ modules (1000Base-T) [4]
6 = QSFP+ module

C = 40GbE Switch Aggregate Bandwidth

0 = Not applicable
1 = 320Gbps (mix 10GbE/40GbE) [4]
2 = 640Gbps (full 40GbE) [4]

D = Front Panel Clocking [5]

0 = None *(Backplane clocking only)*
1 = Dual LVCMOS Clock In/Out
2 = Sine Wave In + LVCMOS In/Out
3 = Built-in GPS receiver + LVCMOS In/Out
4 = Dual Sine Wave In

E = Fabric B Ports Configuration [6]

0 = None *(Fabric B ports not connected)*
1 = Fixed 100MHz HCSL fabric clock for PCIe routed to backplane CLK3/FCLKA channels
2 = General-purpose M-LVDS clock matrix routed to backplane CLK3/FCLKA channels

F = Clock Holdover Stability

0 = Standard (XO)
1 = Stratum-3 (TCXO)

G = JTAG Virtual Probe

0 = None
1 = Included

H = MicroTCA Form Factor

0 = MTCA.0 (Base specification, Air-cooled)
1 = MTCA.1 (Rugged, Air-cooled)
2 = MTCA.2 (Hardened, Air/conduction-cooled)
3 = MTCA.3 (Hardened, Conduction-cooled)

J = Temperature & Coating

0 = Commercial, no coating (-5 to +55° C)
1 = Commercial Humiseal 1A33 Polyurethane (-5 to +55° C)
2 = Commercial, 1B31 Acrylic (-5 to +55° C)
3 = Industrial, no coating (–20 to +70° C)
4 = Industrial, Humiseal 1A33 Polyurethane (–20 to +70° C)
5 = Industrial, 1B31 Acrylic (–20 to +70° C)
6 = Military, Humiseal 1A33 Polyurethane (–40 to +85° C) [7]
7 = Military, 1B31 Acrylic (–40 to +85° C) [7]

K = Ethernet Switch Management

0 = IPInfusion stack (Routing and Switching protocols)
1 = VadaTech stack (Routing and Switching protocols)
2 = None

Notes:

1) A base channel GbE with 10 GbE uplink switch is always included regardless of the fabric switch (fat pipes) option.
2) When the SRIO expansion port is activated by software configuration the AMC 12 slot will not have SRIO due to port multiplexing.
3) When 'None' is selected any available SFP+/QSFP+ cages are shipped empty and will be the customer's responsibility to procure separately. SFP+ or QSFP+ selection for option B are limited by the selection of fabric switch front panel I/O type in option A.
4) This option is only applicable when selecting a 40GbE fabric switch option in option A.
5) Backplane M-LVDS clock routing and related PLL clocking features are provided regardless of the front panel clock option. When GPS (D=3) is selected, additional GPS -related features become available such as precision GPS time-stamping via PCIe, GPS data transmission via Ethernet, and GPS serial NMEA data 'Y' cable is provided.
6) The Fabric B ports configuration should be matched to the ordering options for CLK3 routing/terminations on the chassis backplane. E=1 is recommended for PCIe fabric applications, otherwise E=2 is recommended for maximum clocking flexibility. E=0 should only be selected if clock routing at the MCH connector would conflict with existing SAS/SATA routing on the backplane. These options correspond with the MCH backplane connector pin-out variations described in the µTCA standard.
7) At the edge of the module for conduction-cooled.

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