ATCA BACKPLANES-MESH

ELMA
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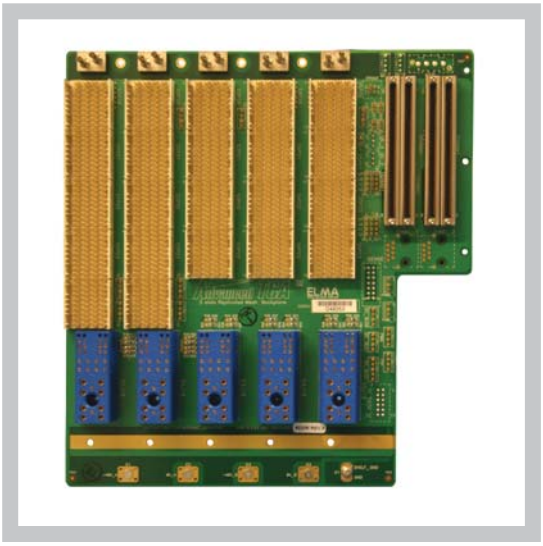


Features

- Compliant to PICMG 3.0 Rev. 3.0 specification
- Gigabyte/Terabyte per second bandwidth per shelf
- Connections to IPM Sentry shelf manager
- Controlled impedance stripline design
- Mesh Topology – (dual star and 1X, 2X, 3X Mesh topologies are implementable)
- Pluggable shelf manager slots using MicroTCA.0 connectors

Board Specifications

- 10 layers (2-slot), 18 layers (5, 14, 16-slot) 26 layers (6-slot)
- 2 oz. copper power and ground
- PCB UL recognized 94V-0
- PCB FR-4 or equivalent
- PCB .115" thick (2-slot), .181" (5-slot), .171" (6-slot), .136" (14-slot), .125" (16-slot)

Mechanical Specifications

- 5U, 7U heights
- 2, 5, 6, 14, and 16 slots
- 1.2" pitch

Description

The Elma Bustronic Mesh AdvancedTCA (ATCA) backplanes are compliant to the PICMG 3.0 Rev.1.0 specification. The experts in high-speed differential pair routing, Elma Bustronic's ATCA backplanes have been simulated and characterized by our signal integrity lab to optimize performance.

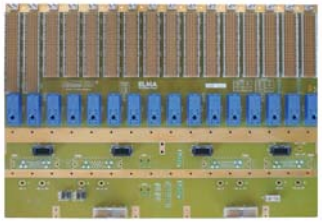
The 2-slot ATCA is a switchless 2X Replicated Mesh with point-to-point links between the slots. However, a 1X Mesh can be implemented on the 2-slot. The 5-slot and 6-slot are a 3X Replicated Mesh. However, Dual Star, 1X and 2X Meshes can all be implemented across the 5-slot backplane.

The 14 and 16-slot mesh backplanes have standard 1X full mesh topologies.

2 Slot

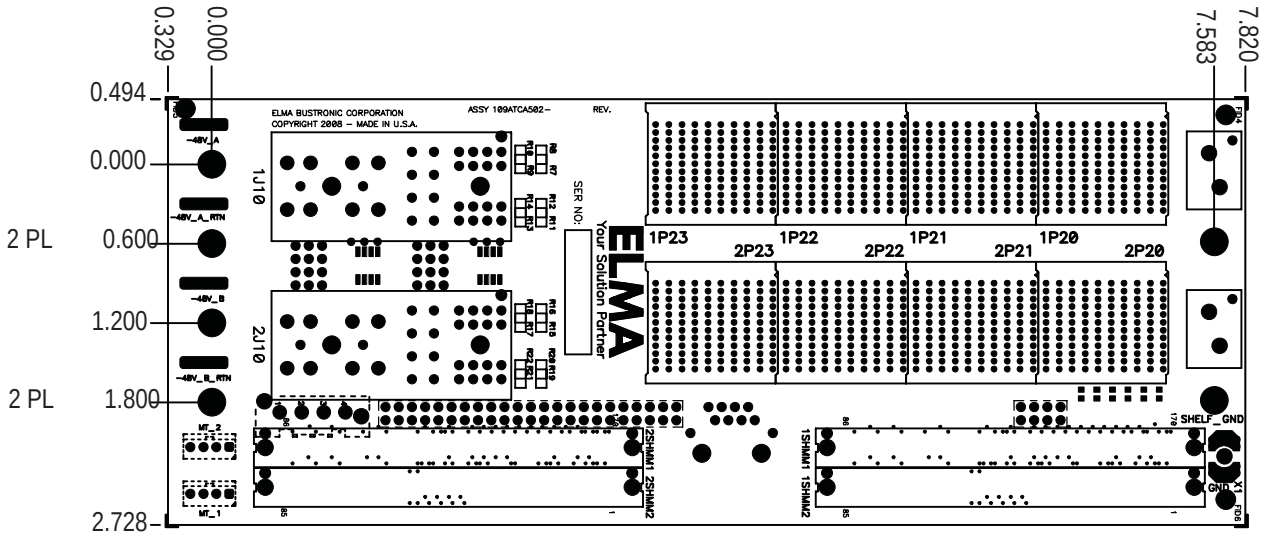
6 Slot

14 Slot

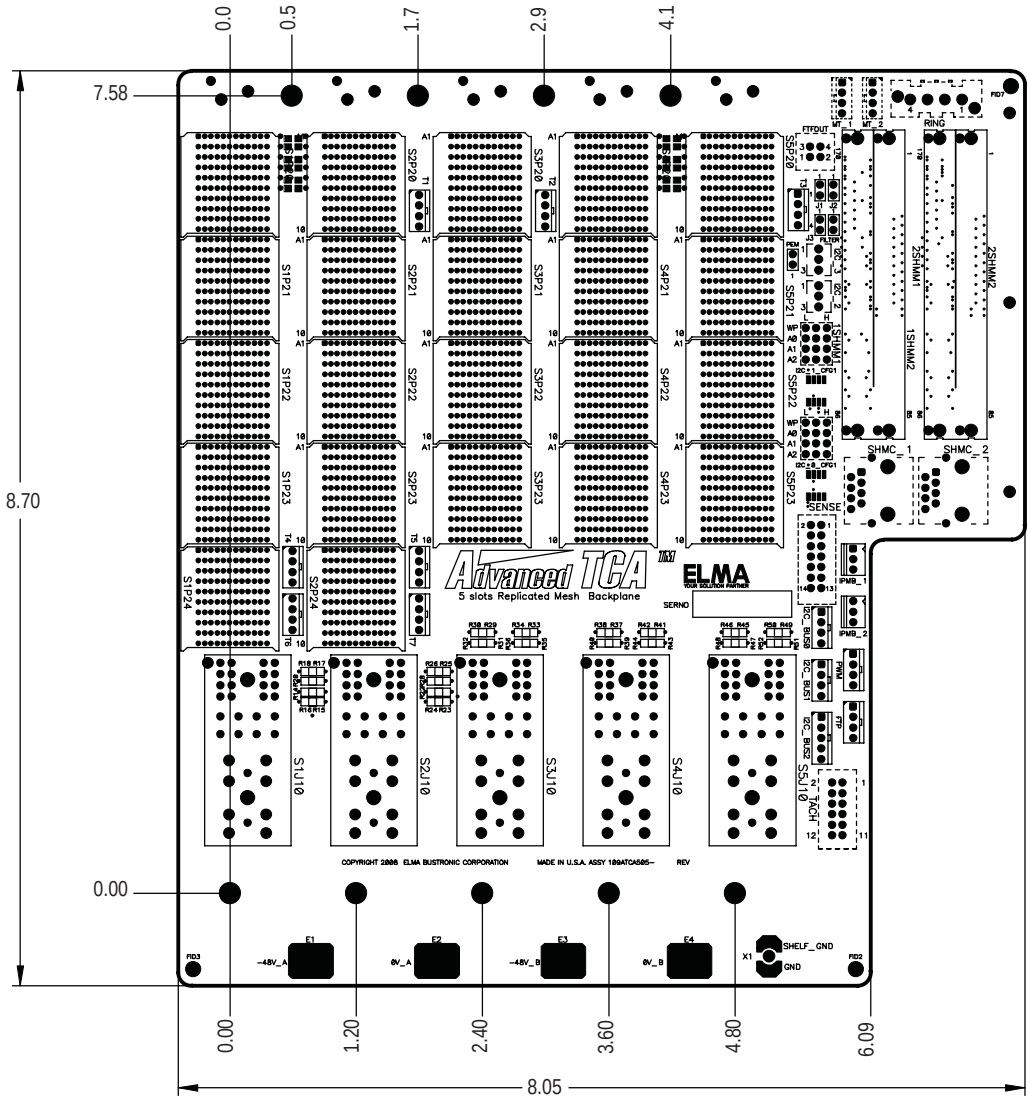


16 Slot

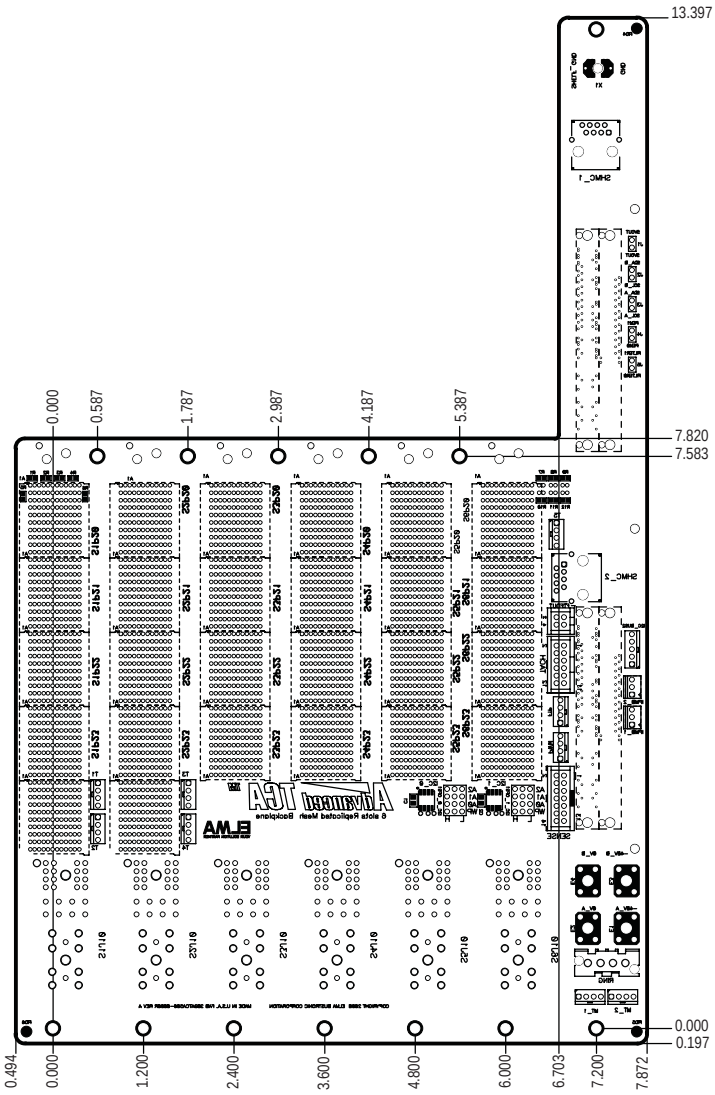
2-Slot Line Drawing



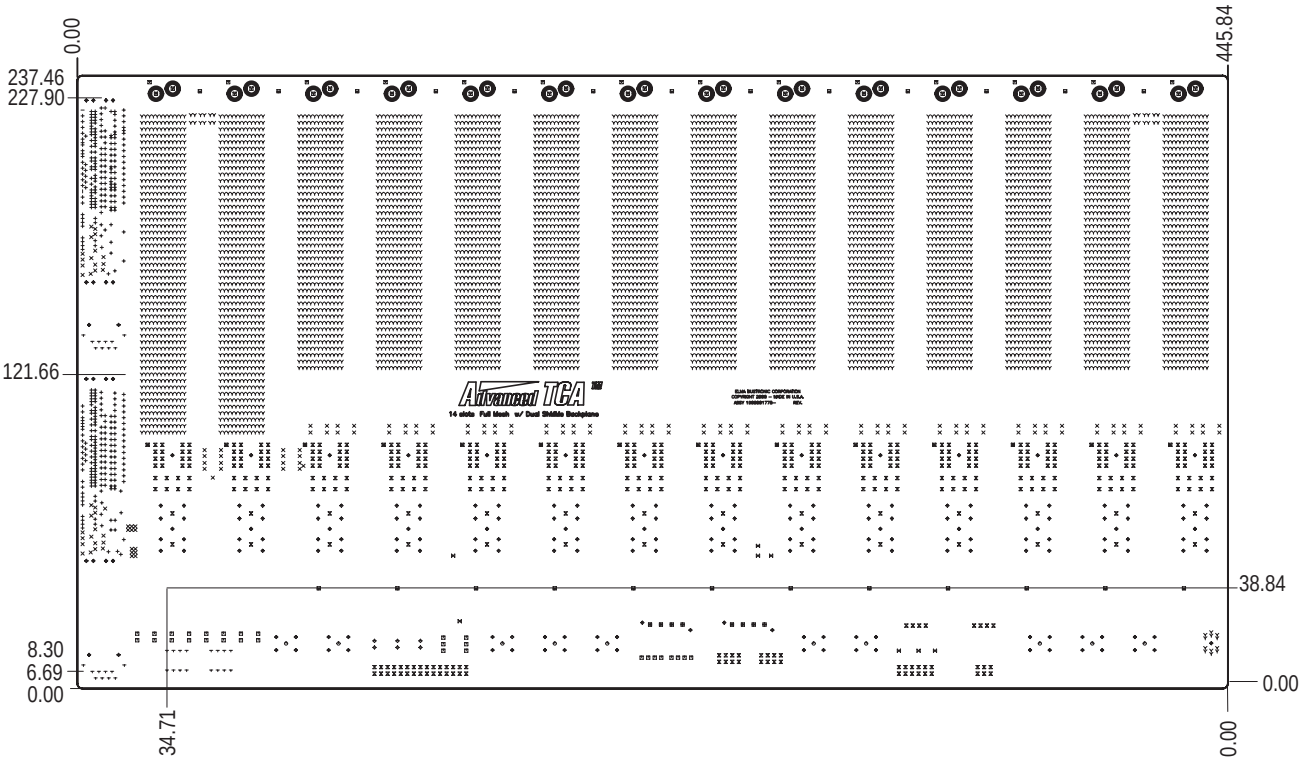
5-Slot Line Drawing



6-Slot Line Drawing



14-Slot Line Drawing



Order Information

Total Slots	Fabric Slots	Node Slots	Width (in.)	Height (in.)	Part Number
2	all	all	3.150	8.045	109ATCA502
5	all	all	6.710	8.750	109ATCA505
6	all	all	8.366	13.594	109ATCA506
14	all	all	16.780	9.030	1900001778
16	all	all	19.780	13.060	1900001495

ATCA BACKPLANES-MESH

Routing

The routing of the 5-slot and 6-slot Mesh ATCA backplanes are made up of 15 channels on each slot. Each channel has eight differential pairs and is designed as a XAUI link, which can run up to 10 Gbps (verified during signal integrity testing). For the 5-slot version, four channels from each slot create a full mesh, and using 12 channels a 3X Mesh can be implemented. Therefore, there are 3 XAUI connections between each of the slots. See pinout diagram below for details.

The 2-slot ATCA has direct point-to-point links between the two slots. The 14-slot and 16-slot have standard full mesh routing. See diagrams below for details.

Mesh Topology

In a Mesh topology (where each node acts as a fabric slot, interconnected to the other with point-to-point links), the data rates and protocols are not dependent of other data transfers in other slots. So, it is highly scalable, forgoing latency and determinism problems.

Mesh can be used in any slot size. However, the more slots used, the more difficulty in routing the numerous links. A 14-slot Mesh version would have very high layer counts and the expense of the backplane will rise. Therefore, Mesh configurations are attractive for smaller systems.

Mesh configurations do not utilize a central switch fabric; all system slots can be used for data forwarding or processing resources, which makes maximum use of the physical system capacity. Another advantage of a full mesh is reduced start-up cost for partially equipped systems. Since the fabric capacity grows as you add system boards, there is no need to invest in expensive central fabrics that could have a great deal of unused capacity in lightly loaded systems, improving the economics of scaling. Further, all slots are identical, which eases installation and serviceability of the system. Mesh backplanes can support Star-based system configurations since Fabric Boards may be installed into logical slots 1 & 2. and Node Boards may be installed into all remaining slots just as done in a Dual Star Backplane.

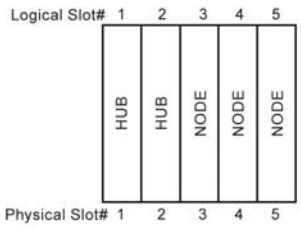
Update Channel Connections

The update channel connections for the 5-slot Mesh are 1-2, 4-5. The update channel connections for the 2-slot Mesh are 1-2. The update channel connections for the 6-slot Mesh are 1-2, 3-4, 5-6.

** For Shelf Manager Connector Pinout, see the ATCA User Manual. **

Logical/Physical Slot#		1	2	3	4	5	
Connector	Channel						
P20	Fabric Ch 15	-	-	-	-	-	4th Fabric Mesh
P20	Fabric Ch 14	-	-	-	-	-	
P20	Fabric Ch 13	-	-	-	-	-	
P21	Fabric Ch 12	S5-CH9	S5-CH10	S5-CH11	S5-CH12	S4-CH12	3rd Fabric Mesh
P21	Fabric Ch 11	S4-CH9	S4-CH10	S4-CH11	S3-CH11	S3-CH12	
P21	Fabric Ch 10	S3-CH9	S3-CH10	S2-CH10	S2-CH11	S2-CH12	
P21	Fabric Ch 9	S2-CH9	S1-CH9	S1-CH10	S1-CH11	S1-CH12	
P21	Fabric Ch 8	S5-CH5	S5-CH6	S5-CH7	S5-CH8	S4-CH8	2nd Fabric Mesh
P22	Fabric Ch 7	S4-CH5	S4-CH6	S4-CH7	S3-CH8	S3-CH8	
P22	Fabric Ch 6	S3-CH5	S3-CH6	S2-CH6	S2-CH7	S2-CH8	
P22	Fabric Ch 5	S2-CH5	S1-CH5	S1-CH6	S1-CH7	S1-CH8	
P22	Fabric Ch 4	S5-CH1	S5-CH2	S5-CH3	S5-CH4	S4-CH4	Primary Fabric Mesh
P22	Fabric Ch 3	S4-CH1	S4-CH2	S4-CH3	S3-CH3	S3-CH4	
P23	Fabric Ch 2	S3-CH1	S3-CH2	S2-CH2	S2-CH3	S2-CH4	
P23	Fabric Ch 1	S2-CH1	S1-CH1	S1-CH2	S1-CH3	S1-CH4	
P23	Base Ch 1	ShMC	ShMC	S1-CH3	S1-CH4	S1-CH5	
P23	Base Ch 2	S2-CH2	S1-CH2	S2-CH3	S2-CH4	S2-CH5	
P23	Base Ch 3	S3-CH1	S3-CH2	-	-	-	
P23	Base Ch 4	S4-CH1	S4-CH2	-	-	-	
P23	Base Ch 5	S5-CH1	S5-CH2	-	-	-	

Legend: S = Slot #
Ch = Channel #



5-Slot Replicated Mesh Backplane Configuration

6-Slot Routing Table

Logical/Physical Slot#		1	2	3	4	5	6	
Connector	Channel							
P20	Fabric Ch 15	6-11	6-12	6-13	6-14	6-15	5-15	4th Fabric Mesh
P20	Fabric Ch 14	5-11	5-12	5-13	5-14	4-14	4-15	
P20	Fabric Ch 13	4-11	4-12	4-13	3-13	3-14	3-15	
P21	Fabric Ch 12	3-11	3-12	2-12	2-13	2-14	2-15	3rd Fabric Mesh
P21	Fabric Ch 11	2-11	1-11	1-12	1-13	1-14	1-15	
P21	Fabric Ch 10	6-6	6-7	6-8	6-9	6-10	5-10	
P21	Fabric Ch 9	5-6	5-7	5-8	5-9	4-9	4-10	
P21	Fabric Ch 8	4-6	4-7	4-8	3-8	3-9	3-10	2nd Fabric Mesh
P22	Fabric Ch 7	3-6	3-7	2-7	2-8	2-9	2-10	
P22	Fabric Ch 6	2-6	1-6	1-7	1-8	1-9	1-10	
P22	Fabric Ch 5	6-1	6-2	6-3	6-4	6-5	5-5	
P22	Fabric Ch 4	5-1	5-2	5-3	5-4	4-4	4-5	Primary Fabric Mesh
P22	Fabric Ch 3	4-1	4-2	4-3	3-3	3-4	3-5	
P23	Fabric Ch 2	3-1	3-2	2-2	2-3	2-4	2-5	
P23	Fabric Ch 1	2-1	2-1	1-2	1-3	1-4	1-5	
P23	Base Ch 1	ShMC	ShMC	1-3	1-4	1-5	1-6	
P23	Base Ch 2	2-2	1-2	2-3	2-4	2-5	2-6	
P23	Base Ch 3	3-1	3-2	-	-	-	-	
P23	Base Ch 4	4-1	4-2	-	-	-	-	
P23	Base Ch 5	5-1	5-2	-	-	-	-	
P23	Base Ch 6	6-1	6-2	-	-	-	-	

Format: Slot - Channel

14-Slot Mesh Routing Table

	Logical Slot #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Connector	Channel #														
P20	14														
P20	13	14-1	14-2	14-3	14-4	14-5	14-6	14-7	14-8	14-9	14-10	14-11	14-12	14-13	13-13
P20	12	13-1	13-2	13-3	13-4	13-5	13-6	13-7	13-8	13-9	13-10	13-11	13-12	12-12	12-13
P21	11	12-1	12-2	12-3	12-4	12-5	12-6	12-7	12-8	12-9	12-10	12-11	11-11	11-12	11-13
P21	10	11-1	11-2	11-3	11-4	11-5	11-6	11-7	11-8	11-9	11-10	10-10	10-11	10-12	10-13
P21	9	10-1	10-2	10-3	10-4	10-5	10-6	10-7	10-8	10-9	9-9	9-10	9-11	9-12	9-13
P21	8	9-1	9-2	9-3	9-4	9-5	9-6	9-7	9-8	8-8	8-9	8-10	8-11	8-12	8-13
P22	7	8-1	8-2	8-3	8-4	8-5	8-6	8-7	7-7	7-8	7-9	7-10	7-11	7-12	7-13
P22	6	7-1	7-2	7-3	7-4	7-5	7-6	6-6	6-7	6-8	6-9	6-10	6-11	6-12	6-13
P22	5	6-1	6-2	6-3	6-4	6-5	5-5	5-6	5-7	5-8	5-9	5-10	5-11	5-12	5-13
P22	4	5-1	5-2	5-3	5-4	4-4	4-5	4-6	4-7	4-8	4-9	4-10	4-11	4-12	4-13
P22	3	4-1	4-2	4-3	3-3	3-4	3-5	3-6	3-7	3-8	3-9	3-10	3-11	3-12	3-13
P23	2	3-1	3-2	2-2	2-3	2-4	2-5	2-6	2-7	2-8	2-9	2-10	2-11	2-12	2-13
P23	1	2-1	1-1	1-2	1-3	1-4	1-5	1-6	1-7	1-8	1-9	1-10	1-11	1-12	1-13

Note: The shading used in the above table shows discontinuity of the routing sequence across rows and columns in the table.

A Dual Star or Dual-Dual Star backplane will use a sub-set of this same Channell routing method. In the case of the Dual Star backplane, only those between slots 1 & 2 are required.

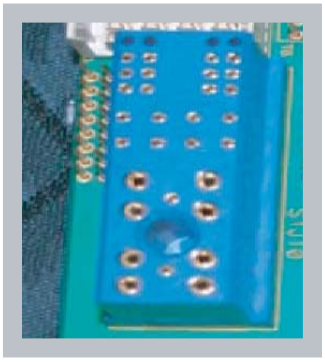
The Full Mesh backplane is capable of supporting Mesh and Star system topologies determined by the types of boards installed. For example, a Dual Star system configuration is created by installing Hub Boards into Logical Slots 1 & 2 and Node Boards into all other slots.

Fabric Interface Dual Star

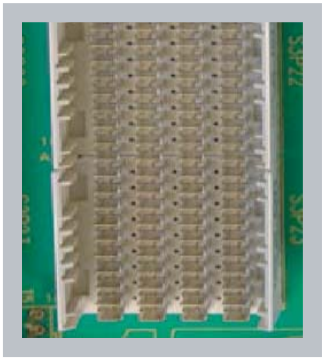
A backlane that supports only Dual Star configuration results from a Full Mesh backplane by depopulating all routing traces and backplane connectors except those that connect Channels 1 & 2 of each node slot to the Logical Slots 1 & 2 (Hub Slots) and those that connect Logical Slot 1 to Logical Slot 2. In a Dual Star backplane, Logical Slots 1 & 2 are dedicated as Hub Slots with up to 15 Channels each and all other Slots (up to 14) are Node Slots with Channels 1 & 2 mapped to the Hub slots.

ATCA BACKPLANES-MESH

Power Studs



VBP Power Connector



ZD Signal Connectors

Design Elements

Power Distribution

The Elma Bustronic ATCA backplane family uses the Positronic VPB series, part number VPB30W8F9300A1. Adequate numbers of 48V 6/32 studs are distributed throughout the backplane.

Materials and Finishes - VPB
Insulator: Glass-filled polyester, UL 94V-0, blue color.
Contacts: Precision-machined copper alloy with gold flash over nickel plate.

Electrical Characteristics -VPB
Contact Current Ratings, per UL 1977
Size 16 Power Contacts: 30 amperes continuous, all contacts under load.
Size 22 Signal Contacts: 2 amperes nominal rating.
Initial Contact Resistance;
Termination to termination:
Size 16 Contacts: 0.0022 ohms maximum,
Size 22 Contacts: 0.0085 ohms maximum,
Per IEC 512-2, Test 2b.
Working Temperature: -55°C to +125°C.

Common Contact Position Function - VPB
1-16 Low Speed Hardware Management
17-24 High Voltage Metallic Test and Ringing Generator Signals
25 Shelf Ground
26 Logic Ground
27/32 Enables for A and B power
28 A Return
29 B Return
30 A Early
31 B Early
33 A Voltage
34 B Voltage

Signal Connectors

The ZD connector is designed to handle over 5 Gbps speeds over standard FR-4 PCB material. The design includes shielded differential pair signal pins for high-performance.

Other Connectors

Shelf Management Connectors

Shmc1 connector goes to the Shmc port on slot 1.
Shmc2 connector goes to the Shmc port on slot 2.

Metal and Ring Connectors

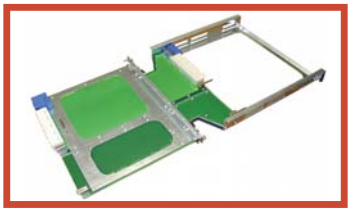
MT1 and MT2 are TYCO 880222-4. It mates to an EI Series receptacle with crimp termination, such as 172142-4 There is also an MT EI Series with IDC termination.

Ring Connector

The Ring connector is a Molex 71231-0005 which mates with the Molex 71694 and 5557 series.

Related Products from Elma Electronic:

- System Platforms – need a chassis for your backplane?
- ATCA Embedded Computing Products – SBCs, Switches, Shelf Managers, and More.



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- ATCA Extenders, AMC load boards, RTMs, test modules
- Thermal or backplane simulation/test, paint/silkscreen, customization, integration