ADM-XRC-5T*/6T* Cooling Solutions

Introduction

This application note specifies details of Alpha Data's heat sink solutions for the ADM-XRC* series of products.

Related Documents

IEEE P1386/Draft 2.0 Common Mezzanine Card Family: CMC

ANSI/VITA 20 Conduction Cooled PMC

ANSI/VITA 48.2 Mechanical Specifications for Microcomputers Using REDI

Overview of Applicable Standards

All Alpha Data ADM-XRC* series cards comply with the PMC envelope as described in IEEE P1386. It is important to note that this envelope leaves 4.7mm for component height on the carrier and 4.7mm for component height on the mezzanine card (for a standard 10mm stacking height).

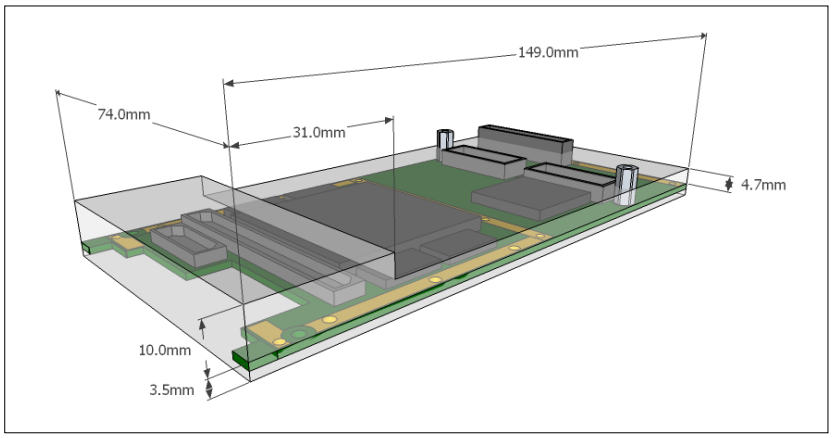

Figure 1: Mezzanine Card Envelope

Air Cooled Options

Air cooled heatsinks have a very simple rule to follow: As long as the heatsink stays within the mezzanine card envelope shown in Figure 1 the design will fit in air cooled systems. Alpha Data utilizes horizontal ribs to help guide airflow across the board while focusing the metalwork around the two FPGA's where most of the heat is generated.

Figure 2: ADM-XRC-5T2 Air Cooled Heatsink

Conduction Cooled Options

While Alpha Data adheres the VITA 20 spec for conduction cooling, there are some design attributes worth noting when incorporating Alpha Data boards into a host system. Figure 3 shows the dimensions required for a conduction cooled mezzanine card. Figure 4 shows the Alpha Data base design for conduction cooled mezzanine cards. The exceptions between these two designs are discussed in the next section.

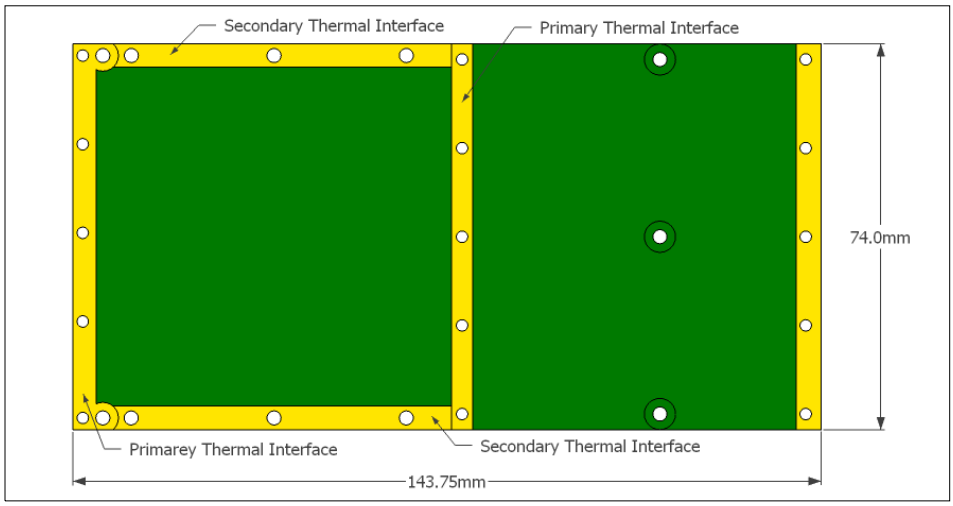

Figure 3: Mezzanine Thermal Interfaces

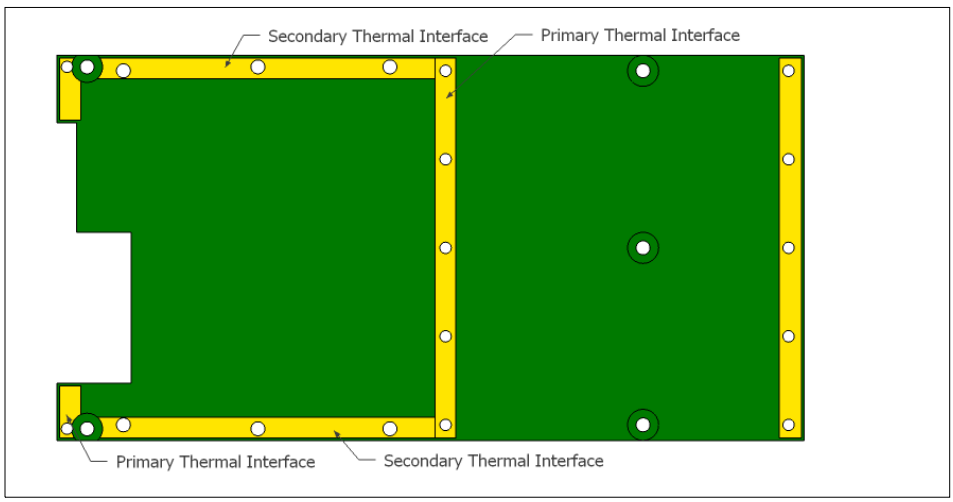

Figure 4: Alpha Data Base Conduction Cooling Design

Primary Thermal Interfaces

All Alpha Data mezzanine cards in the ADM-XRC-5T* and ADM-XRC-6T* series have primary thermal interfaces. However, due to Alpha Data's versatile XRM front IO interface, care must be taken when incorporating these boards into host systems. Any mezzanine card that utilizes front IO must modify the faceplate rib as specified by VITA 20 Note 3: "Conduction cooled mezzanine cards with faceplate I/O will require a modification to the faceplate rib. This will to some degree affect thermal and structural performance."

It is also worth noting that conduction cooled mezzanines are 5.25mm shorter than air cooled mezzanines as specified in VITA 20. Alpha Data leaves the last 5.25mm of all conduction cooling compliant mezzanines as keepout regions and removes the region for all conduction cooled boards. It is useful to keep this board region for air cooled boards because it provides additional bezel support.

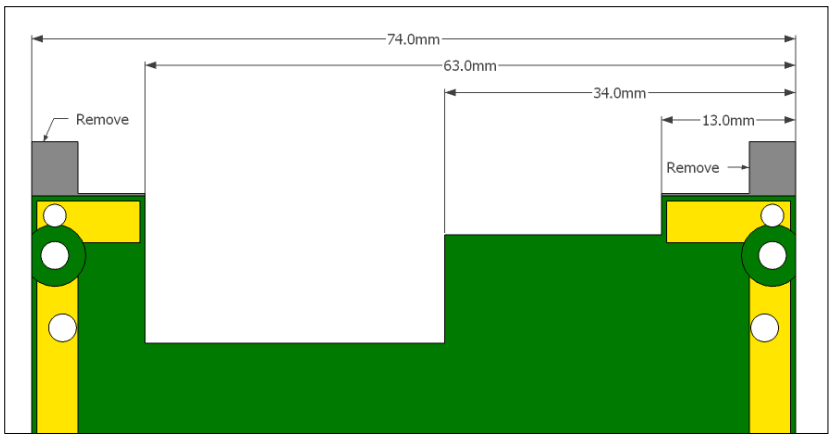

Figure 5: Alpha Data Base Conduction Cooling Front Panel Exception

Secondary Thermal Interfaces

All secondary thermal interfaces are optional as defined by the VITA spec. However, due to the increasing power dissipation of Alpha Data FPGA mezzanine cards, this secondary interface is becoming more important to keep systems running at acceptable temperatures. Alpha Data has made a minor modification to the secondary thermal interface to allow a mounting hole for the XRM IO interface as depicted in the figure below. This modification moves the final mounting hole of the secondary thermal interface out of alignment with the specification so it can be used as an XRM mounting point. This minor modification does not create any incompatibility with the standard and was incorporated because the XRM mounting hole location precedes the VITA specification.

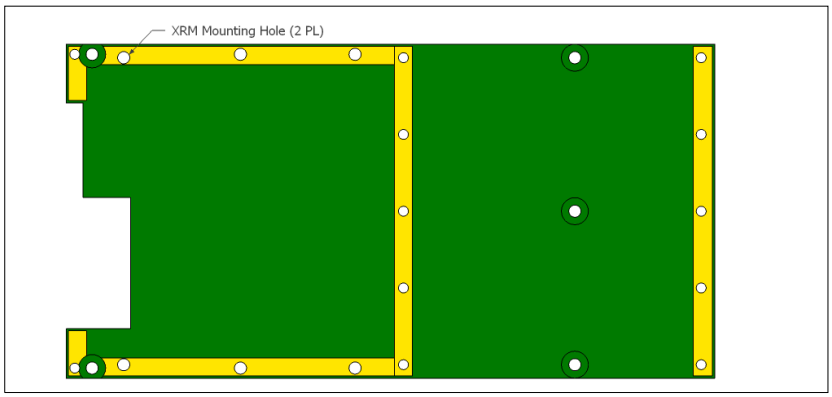

Figure 6: Alpha Data Base Conduction Cooling Secondary Interface Exception

Alpha Data attempts to design ADM-XRC-5T* and ADM-XRC-6T* cards with the optional secondary Thermal Interface specified in the VITA 20 standard. However, due to space constraints, it is not always possible to place this interface. The following table shows the details of different boards and the available thermal interfaces:

Part Number	Primary	Secondary
ADM-XRC-5T1	Yes	Yes
ADM-XRC-5TZ	Yes	No
ADM-XRC-5LX	Yes	Yes
ADM-XRC-5T2	Yes	No
ADM-XRC-5T2-ADV	Yes	No
ADM-XRC-5T2-ADV6	Yes	No
ADM-XRC-6T1	Yes	Yes
ADM-XRC-6TL	Yes	Yes
ADM-XRC-6TGE	Yes	Yes

Table 1: Available Thermal Interfaces by Part Number

Heatsinks Drawings And Images

Air Cooled Heatsinks

Alpha Data air cooled heatsinks are designed to fit within the PMC envelope specified in figure 1. This allows for total heatsink height of 4.7mm above the PMC/XMC card. Exceptions are made for the standoff positions at the rear connector interface and XRM site as seen in the images below. Alpha Data can also provide heatsinks for the underside of the board if additional cooling is needed.

ADM-XRC-5T2 Heatsink

For more detailed drawings please contact Alpha Data.

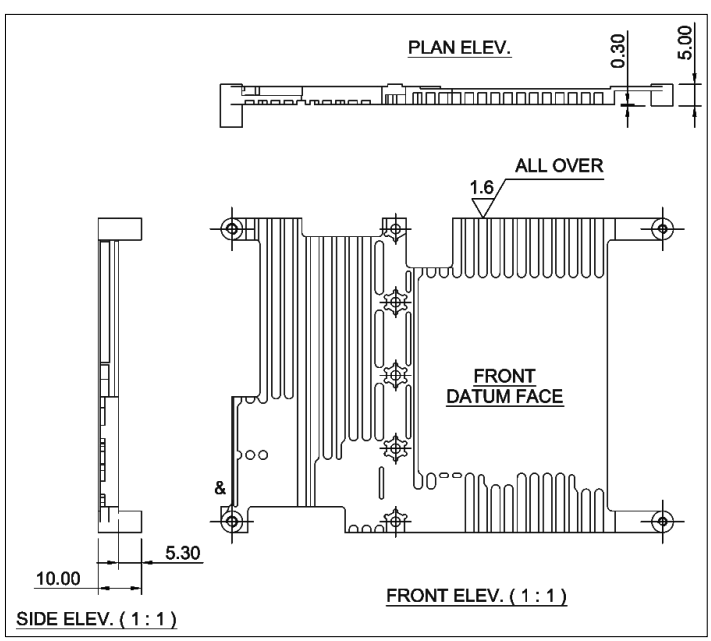

Figure 7: ADM-XRC-5T2 Heatsink

ADM-XRC-6T1 Heatsink

For more detailed drawings please contact Alpha Data.

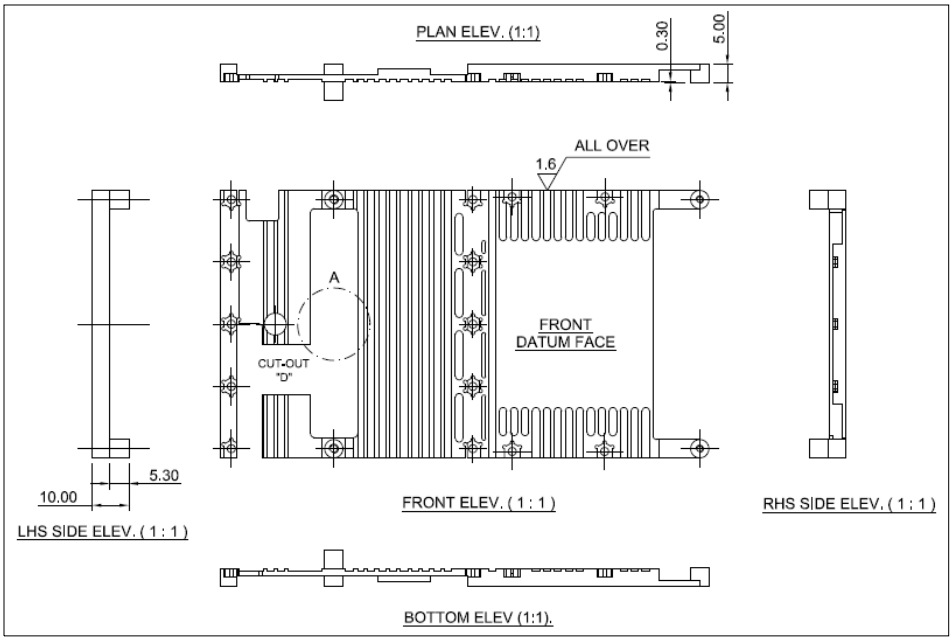

Figure 8: ADM-XRC-6T1 Heatsink

Conduction Cooled Heatsinks

Alpha Data conduction cooled heatsinks are designed to fit within a chassis that contains either a primary or secondary thermal interface rib. Also, Alpha Data conduction heatsinks require the presence of a metal plate on the carrier side heatsink (see example below). This is because the FPGA releases most of the heat out of the top of the component, and without metalwork between the carrier and mezzanine, the Alpha Data card will not be able to cool efficiently. Additionally, it is valuable to note that ANSI/VITA 20 does not allow for front panel connectors without customization. If a primary thermal interface is present along the front panel, XRM modules will not be allowed without customization. Alpha Data does offer customized cooling solutions as detailed in the next section.

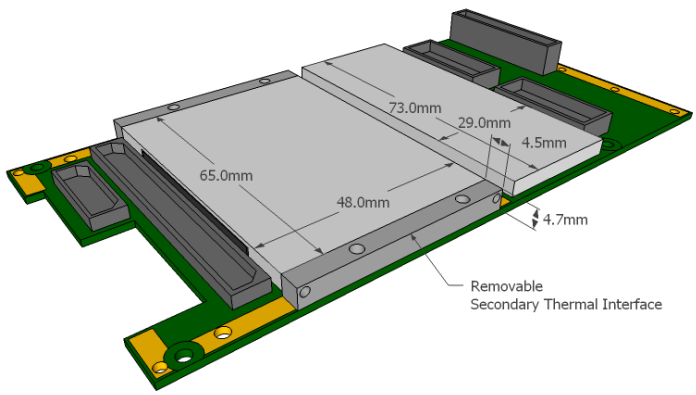

Figure 9: Commercial Alpha Data Conduction Heatsink

COTS Carrier Heat Frame Example

Due to shortcomings in the VITA 20 specification, Alpha Data requires carrier card heat frames posses a metal plate between the mezzanine and the carrier at the appropriate standoff height of 4.7mm above the carrier. This frame will provide support for the Alpha Data conduction heatsink while providing a route for the heat to escape the top of the FPGA. If the carrier has built in secondary rails, the modular secondary rail of the Alpha Data heatsink must be removed as shown in the example below. The clamping action of the mezzanine and carrier along with thermal pads will keep the heatsink in place. Please contact Alpha Data for more detailed drawings.

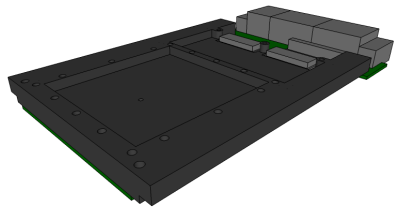

Figure 10: Commercial Carrier Heat Frame

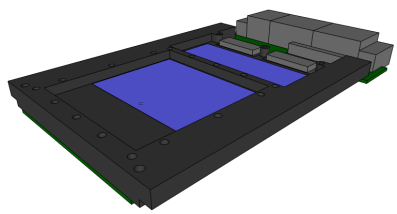

Figure 11: Commercial Carrier Heat Frame With Gap Pads

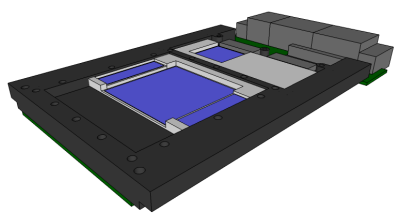

Figure 12: Commercial Carrier Heat Frame With Alpha Data Heatsink

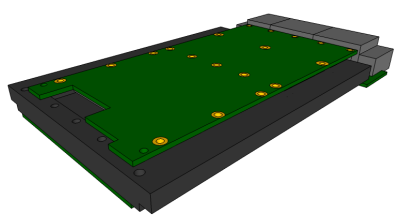

Figure 13: Complete Commercial Conduction Cooling Assembly

Custom Heatsink Solutions

While Alpha Data's commercial cooling solutions will provide sufficient heat transfer to ensure proper operation of Alpha Data mezzanine cards, custom solutions can provide significant advantages. By designing the entire assembly for a specific carrier/mezzanine combination not only is the efficiency of the thermal transfer greatly increased, but part counts are reduced while reliability is increased.

Customization can also provide a solution for customers with additional requirements not met by the commercially available heatsinks. Alpha Data has designed VITA 48.2 2-Level maintenance panels for certain boards and can provide solutions for customers whose systems have incompatible carrier heat frames.

Alpha Data has experience creating custom carrier/mezzanine combinations that produce excellent results with reasonable lead times and low cost. For more information please contact Alpha Data.

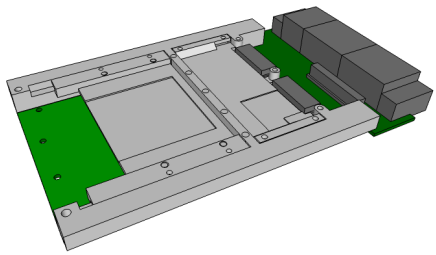

Figure 14: Custom Carrier Heat Frame

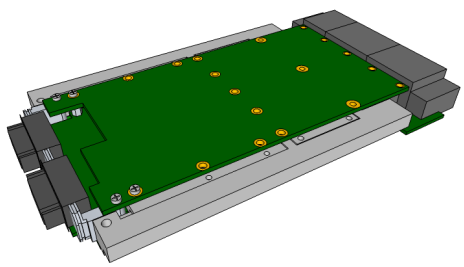

Figure 15: Complete Custom Assembly

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