Acromag, Incorporated
30765 S Wixom Rd, Wixom, MI 48393 USA
Tel: 248-624-1541 ■ http://www.acromag.com

Keeping Heat in Check: Conduction Cooling Expands Application Boundaries

Current application demands of PCI Mezzanine Card (PMC) modules have grown from the simple addition of I/O and low-level communications to the servicing and off-loading of high performance software defined radio (SDR), digital signal processing (DSP), co-processing, and now re-configurable FPGA-based computing with gigabit interfaces. This trend of putting more and more processing power on PMC modules has led to new challenges keeping these computer hot rods cool. Standard, or commercial-grade, modules typically accommodate operation in 0 to 70°C environments while industrial-grade models will tolerate a -40 to 85°C range. However, many applications require additional steps to keep board temperatures within acceptable ranges.

High performance computing applications generally consume more energy and thus generate more heat, yet these same applications often require condensation into smaller physical sizes which complicates cooling. When these electronics are installed in mobile military machinery such as Humvees, tanks and UAVs which are regularly exposed to extreme environments, the risks of overheating are compounded. Uncontrolled heat buildup can quickly destroy high priced computers.

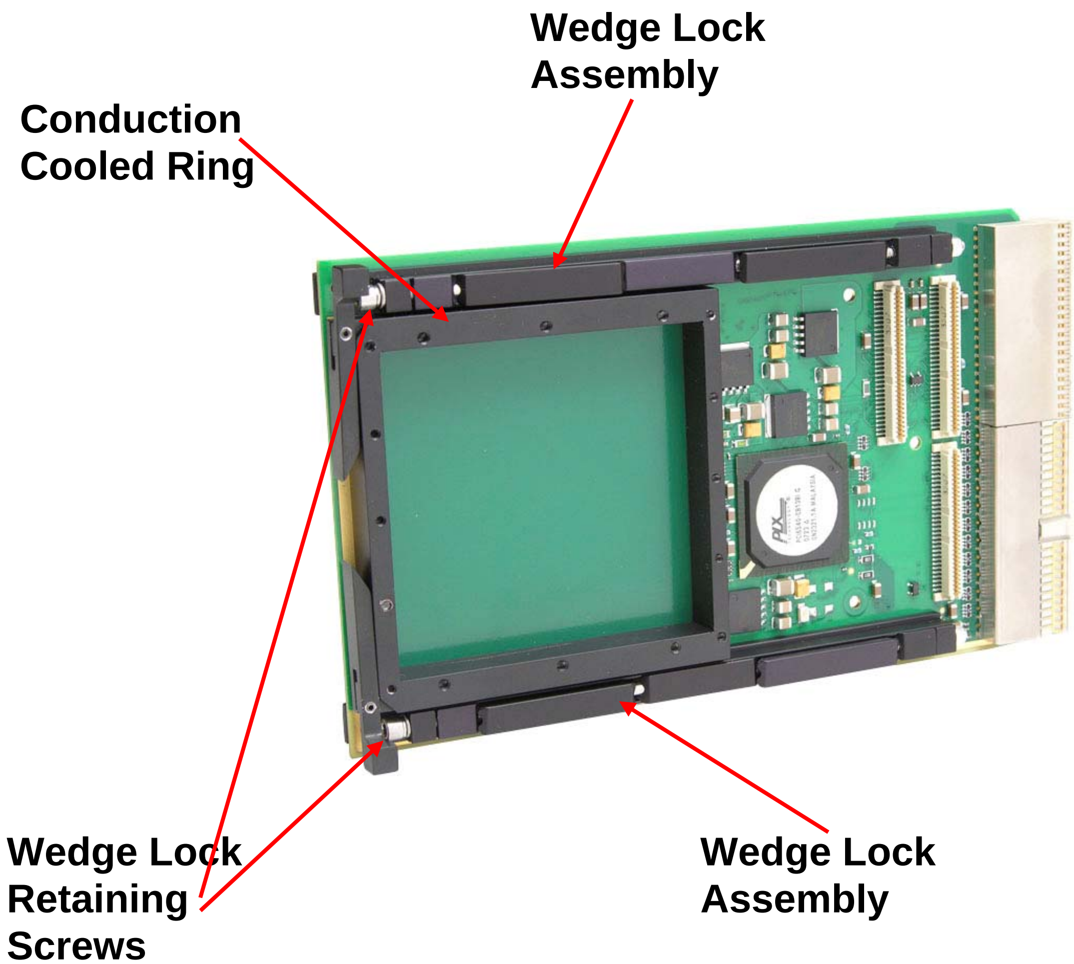
A number of technologies have been developed to deal with heat buildup, including forced air cooling, conduction cooling, and liquid cooling. Of these strategies, conduction cooling is the one technology which has been deployed and standardized to meet these new demands and make it possible for system design engineers to keep generated heat in check.

The ANSI/VITA 20 Conduction-Cooled PMC (CCPMC) Specification is designed so that heat generating components on PMC modules are connected to metallic thermal planes within the PMC. These thermal planes connect to a conduction-cooled ring surrounding an area dense with high-energy components. In conventional conduction-cooled applications, I/O is mapped to the rear I/O connector and front I/O is not used.

Acromag FPGA PMCs shown with and without plug-in AXM I/O extension modules

Despite the presence of the conduction-cooled ring on the PMC, these modules may be used in both conduction-cooled and convection-cooled applications. In fact, Acromag makes front I/O accessible on selected CCPMC FPGA modules by way of its AXM mezzanine technology illustrated in the photo above. Using plug-in AXM I/O modules, both front and rear I/O are readily accessible.

CCPMC carrier cards have a mating component fixture for the conduction-cooled ring found on the CCPMC. When the CCPMC module is secured to the CCPMC carrier card, heat generated on the module conducts through the thermal plane, to the conduction-cooled ring, into the mating fixture, and then to the wedge lock assembly of the carrier card. When the carrier card inserts into a conduction-cooled chassis, screws located at opposite sides of the carrier secure the wedge lock assembly creating a contact thermal conduction path for dissipation of heat from the CCPMC. The conduction-cooled chassis serves as a thermal energy reservoir which, when appropriately cooled, initiates the conductive cooling process for the CCPMC module.



Acromag's AcPC4610CC 3U Compact PCI Conduction Cooled PMC Carrier Card.

In the photo above of Acromag's 3U CompactPCI carrier card, notice the wedge lock assembly at the two edges of the carrier card, the retaining screws at the front edge, and the conduction-cooled ring which mates with the CCPMC. A 6U version of this module (Model AcPC4620CC) that holds two CCPMCs is also available and follows the same principles.