

AAEON Takes “EPIC” Benefits Beyond the Standard

Overview

Standards-based, scalability, and ease of use: These are key attributes of successful commercial off-the-shelf (COTS) single board computers (SBCs). However, they represent just a fraction of what is desirable to have an ideal solution. With the AAEON family of EPIC solutions, these attributes are extended. Customers also achieve a highly-integrated, robust solution that addresses scalability and ease of use along with optimized thermal management.

EPIC: The Benefits of the Standard

In 2004, the PC/104 Embedded Consortium released the standard for Embedded Platform for Industrial Computing, more commonly referred to as EPIC. This standard for SBCs was intended to fill the gap that existed between the small, stackable PC/104 solutions and the larger EBX solutions. According to the PC/104 Embedded Consortium, “The purpose of this specification is to define a physical platform for mid-sized embedded Single Board Computer (SBC) with multiple I/O expansion options. Its size is midway between the industry standard PC/104 stackable format and EBX SBC format. This size board will support larger processors requiring large heat sinks. The added space also allows for combining features on an SBC which would normally be found on multiple PC/104 modules.”

Standard	Purpose	Dimensions	Board Area
PC/104	Stackable PC	3.550 x 3.775 inches (90.17 x 95.89 mm)	13.401 inch ² (86.46 cm ²)
EPIC	SBC	4.528 x 6.496 inches (115.00 x 165.00 mm)	29.414 inch ² (189.75 cm ²)
EBX	SBC	5.750 x 8.000 inches (146.05 x 203.20 mm)	46.000 inch ² (296.77 cm ²)

As noted by the PC/104 Consortium, the EPIC standard defines a board that has x and y dimensions well-suited for smaller embedded industrial PC systems. With more board level real estate, EPIC systems can accommodate greater I/O integration as compared to the sister PC/104 standard that would require more stack-on peripheral boards. The dimensional increase also allowed for the use of higher performance processor technologies that often call for advanced heat dissipation. Take note of this issue of heat dissipation as we will be coming back to it.

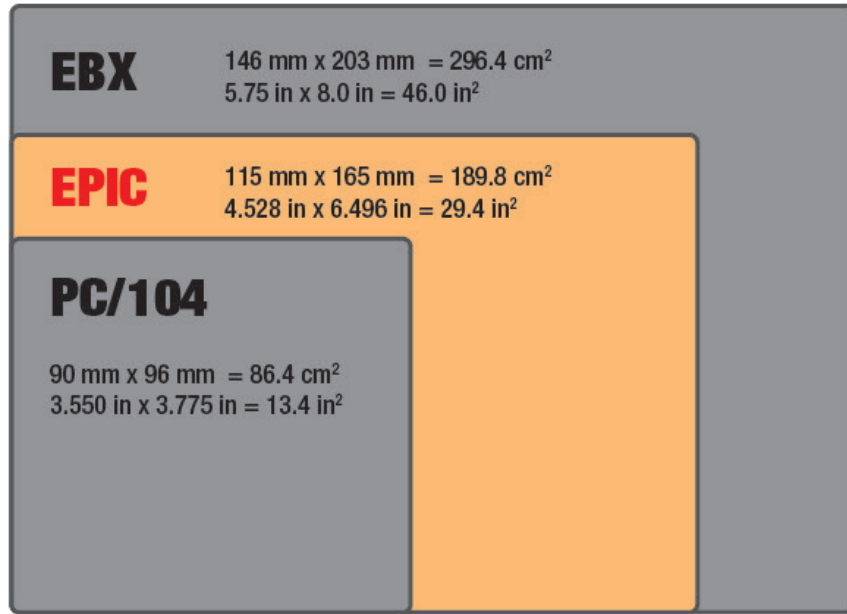


Figure 1 - Comparing the dimensions of EPIC vs. PC/104 and EBX (Source: PC/104 Embedded Consortium, pc104.org)

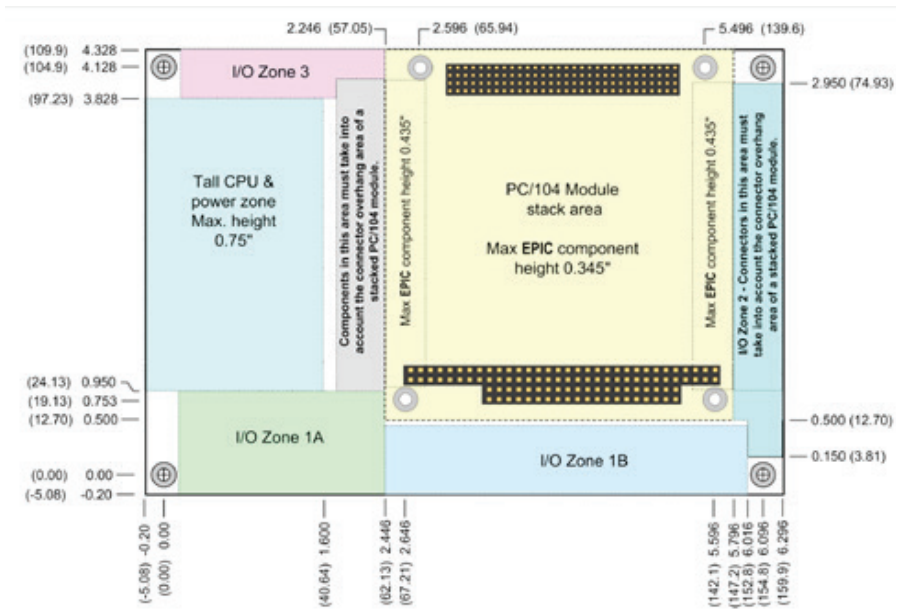


Figure 2 - Distribution of board-level real estate for EPIC SBCs as defined by the PC/104 Embedded Consortium (Source: PC104.org)

The AAEON EPIC Family of SBCs

Standards are beneficial in setting a base for innovation within a given scope. What makes the standard truly useful is how it is brought to market by industrial PC providers such as AAEON. EPIC solutions that address the following questions well are ones that offer the best long term benefit to solution developers serving their current needs and charting a course for serving those yet-to-be determined future requirements.

- What does the roadmap for an EPIC solution look like?
- How are the EPIC offerings differentiated from alternative SBC solutions?
- What migration considerations are taken into account for the EPIC family product offering?
- What is the thermal management implementation consistency from generation to generation within the EPIC portfolio?

The AAEON family of SBCs that follow the EPIC standard have taken these questions into consideration from design day one for each product within the family. From consistency of external connector placement and targeting of technology that supports low power consumption (Typical CPU TDP of 15 watts) for fanless system integration. AAEON EPIC SBCs also include a PCI-104 connector onboard to allow for easy integration of expansion boards.

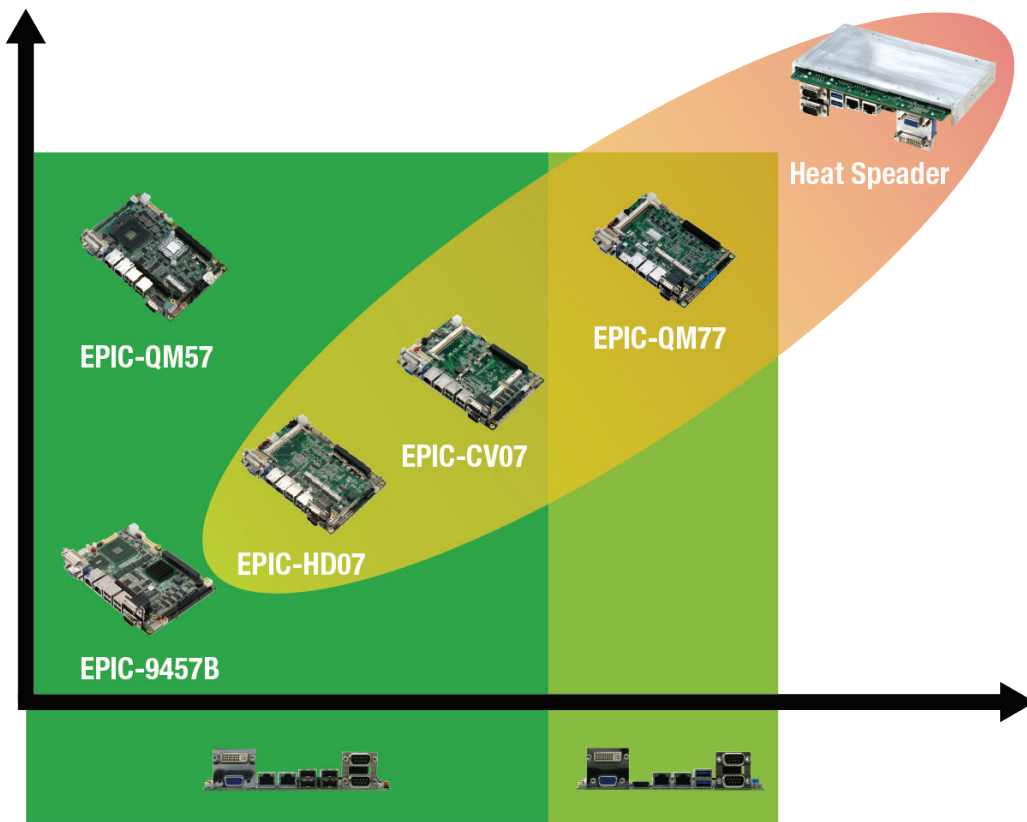


Figure 3 - A snapshot of the AAEON EPIC SBC portfolio highlighting consistency of design from product to product

As part of the effort to make optimal use of a solution’s overall design, AAEON strives to make EPIC SBCs that are component-like CPU boards. What this means is that one AAEON EPIC SBC is interchangeable with another. For example, application designs using the EPIC-HD07 can follow an upgrade path to the EPIC-CV07 without having to apply additional effort to update the bezel for external connectors. The standard mounting screw holes from one SBC to the next within the AAEON EPIC SBC family are consistent from design to design. Furthermore, the way that the heat generating components of the SBC are consistently populated onboard the SBC; the overall design can utilize consistent means of heat dissipation. Thus, migration from one generation to another or even within a single generation is optimized and scalability ensured.

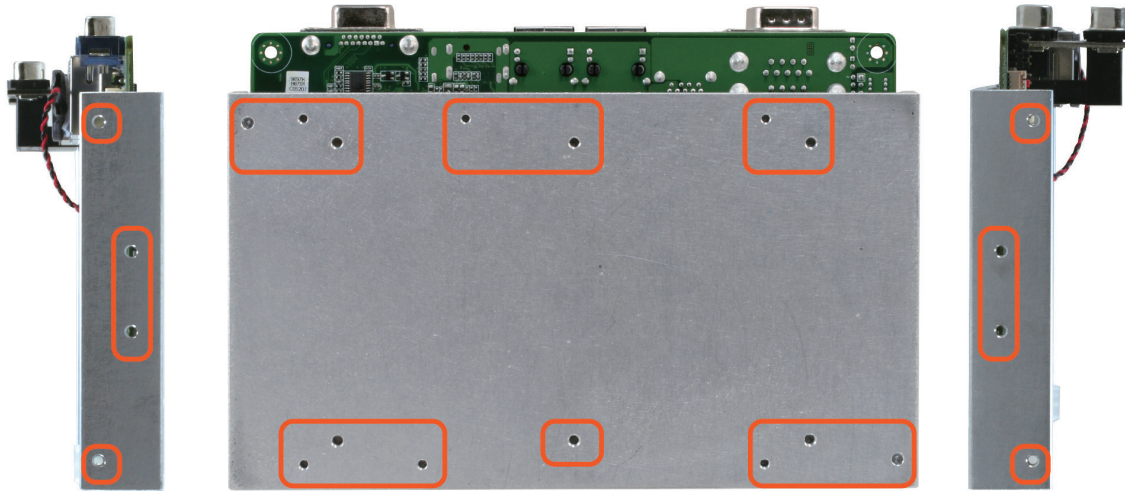


Figure 4 – By maintaining the same mounting screw holes location of AAEON EPIC SBCs from generation to generation, the SBC itself is an easy to use system component that supports scalability from generation to generation as well as within a single generation of an application design.

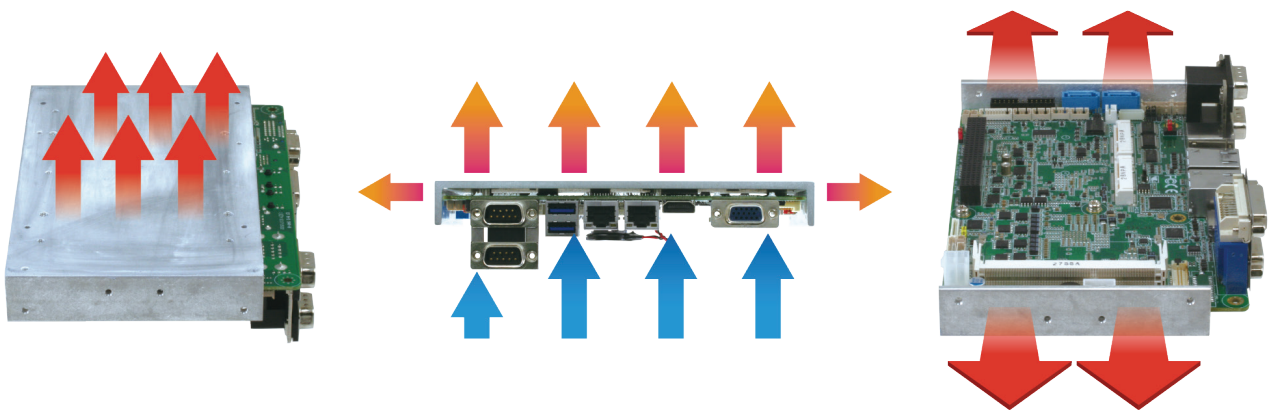


Figure 5 - The EPIC SBCs from AAEON take advantage of heat dissipation via thermal coupling to the enclosure.

What’s so “EPIC” about AAEON’s EPIC Family of SBCs?

Earlier in this whitepaper, the topic of thermal dissipation was noted as being important. So much so that AAEON has made it a key focus for design advancement especially for the EPIC family of SBCs.

Thermal management can be the most complex portion of solution design. It deals with design implementation to support mechanical and electrical functionality as influenced by the external to the system temperature of the use case. The handling of heat generated by components within the system can be even more challenging. AAEON strives to take the pain out of this internal heat handling by creating a board-level solution that can be consistently cooled from generation to generation with passive cooling alone.

In the three images below, it can be seen what heat is generated by the EPIC board and how that generated heat is dissipated effectively by moving it out of the component, off the board, through either a heat sink or heat spreader (depending on whether the component is on the top or bottom side of the board) and out through the enclosure. AAEON engineering has made a significant effort to put similar types of heat generating components (i.e. the chipset and CPUs) in consistent places so that the cooling solutions can be reused with minimal adaption from solution to solution.

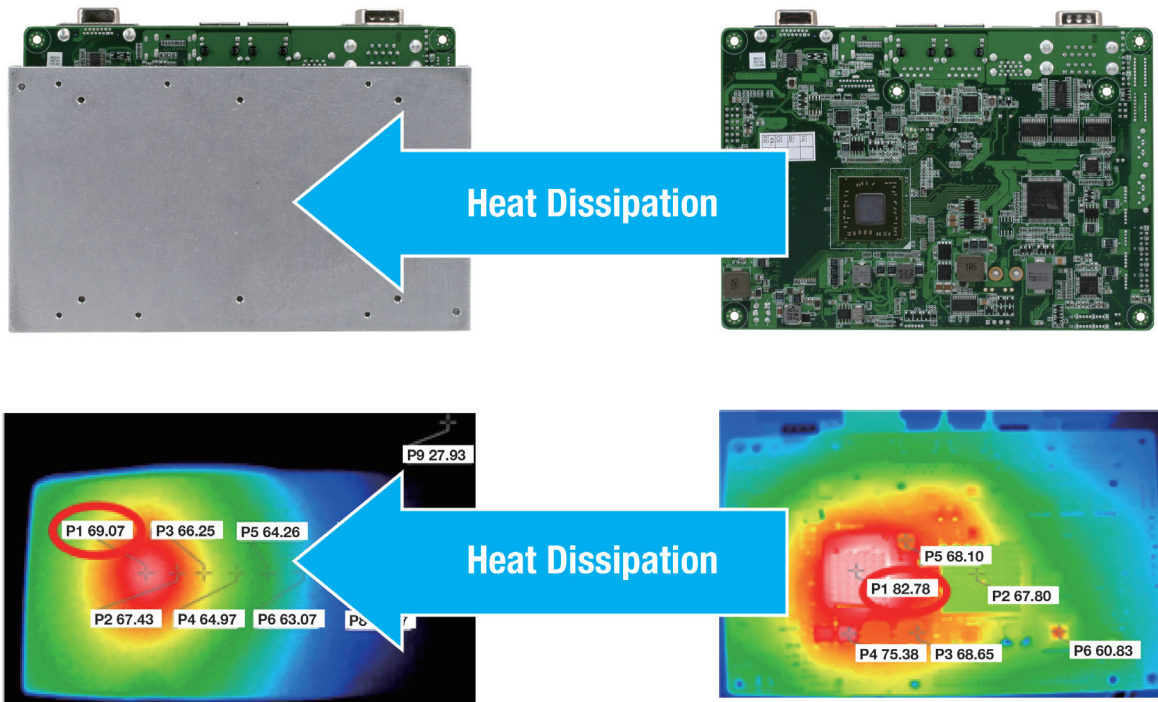


Figure 6 – The heat generated by the CPU and chipset of the AAEON EPIC SBC are dissipated by being thermally coupled to the enclosure.

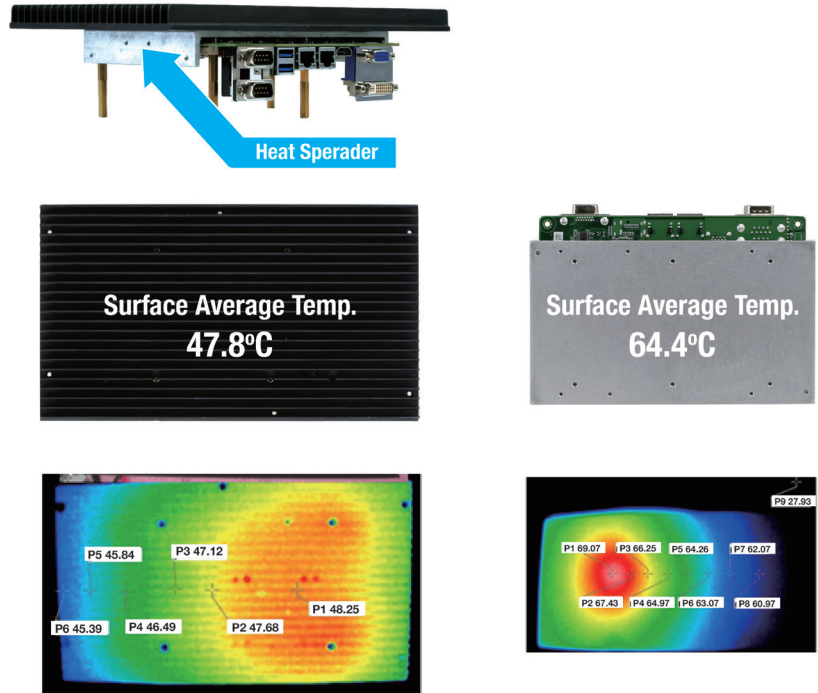


Figure 7 - In this example, the heat moved from the components to the heat spreader is further dissipated via fins added to the external portion of the enclosure. Before the dissipation capabilities of the fins are taken into consideration, it can be seen that the heat spreader itself is already increasing the thermal area over which the heat can be moved. This means that the heat is not concentrated all at the point of generation. The internal thermal solution remains consistent.

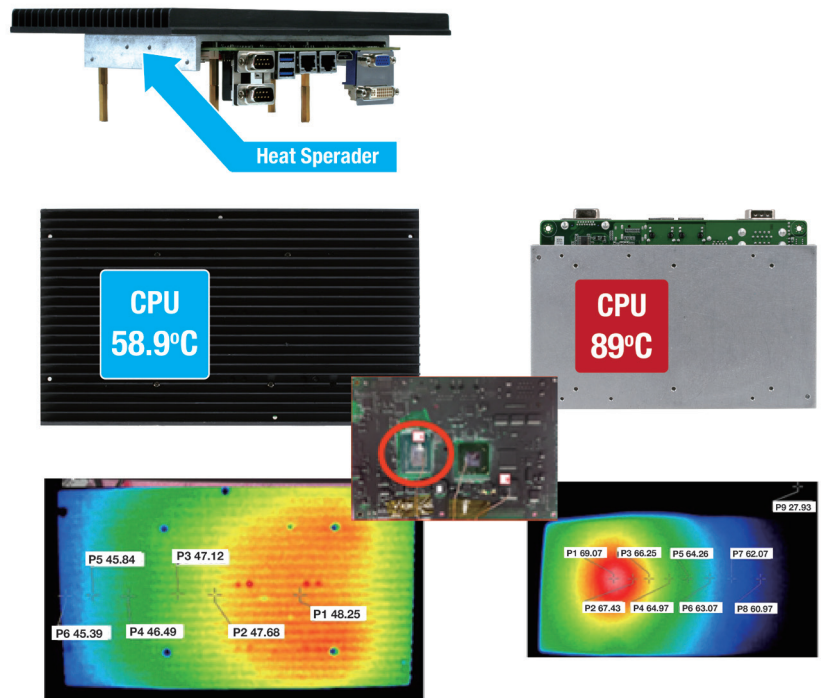


Figure 8 – In this figure, it can be understood that the added fins on top of the heat spreader plate move the heat even better than the heat spreader alone. The CPU is more effectively cooled. Through consistent thermal management, the processor of the AAEON EPIC SBC is sufficiently cooled to maintain optimal performance utilizing a consistent cooling solution. And the system itself remains in spec for utilization in the application’s target environment.

Following this consistent thermal management methodology, AAEON has been able to deliver an EPIC SBC solution that gives application developers the performance they need in a component-like product which they can more easily integrated into their complete system. Because of this consistency of mechanical and thermal design, the developer can achieve the scalability they desire from one generation of end application to the next or even within the same generation without jeopardizing a cost-effective total cost of ownership or fast time to market.

“EPIC” Technology in Action

The AAEON family of EPIC SBCs is a line of versatile solutions. These highly integrated SBCs can be found serving the requirements of various industry segments from mobile infotainment to industrial automation even in the retail space. Due to the fact that AAEON has made these EPIC SBCs as much like a component as possible in terms of mechanical and thermal considerations, the benefits that they bring to application developers are truly “EPIC” and considerably minimize the limitations for implementation.

EPIC Applications

Digital Signage



PPC HMI



TransPixel



Figure 9 - Examples of implementation of EPIC SBCs from AAEON ranging from mobile infotainment to industrial automation and retail.

About AAEON

AAEON is a leading manufacturer of advanced industrial and embedded computing platforms. Committed to innovative engineering, AAEON provides integrated solutions, hardware and services for premier OEM/ODMs and system integrators worldwide. Reliable and high quality computing platforms include industrial motherboards and systems, industrial displays, rugged tablets, PC/104 modules, PICMG half-size and full-size boards and COM modules, embedded SBCs, embedded controllers and related accessories. AAEON also offers customized end-to-end services from initial product conceptualization and product development on through to volume manufacturing and after-sales service programs. AAEON is an Associate member of the Intel Intelligent Systems Alliance.