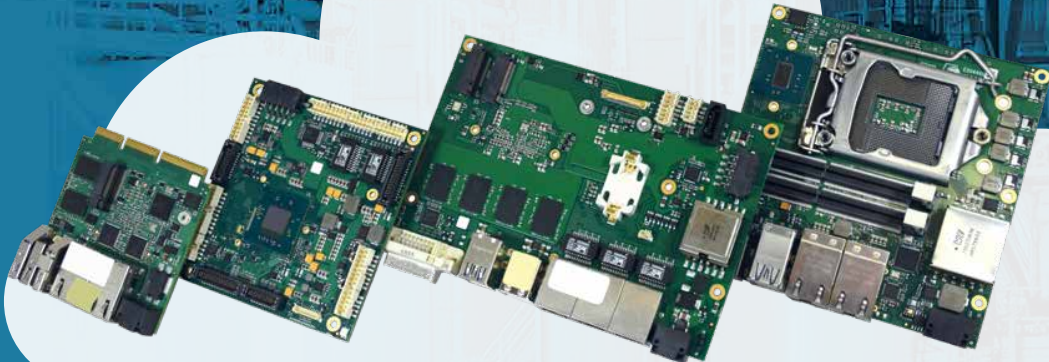# Embedded Solutions
SMARTER BY DESIGN®

The Deep Embedded Specialists

Leading the industry with high-performance embedded systems targeting demanding thermal and rugged environments for industrial applications.

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About ADL Embedded Solutions

OVER 25 YEARS OF SUCCESS

Founded in 1994, ADL Embedded Solutions, Inc., is a privately held company with headquarters in San Diego, CA. ADL Embedded Solutions provides flexible, reliable, and fast solutions to our customers at the speed they need to survive in the market.

We provide a wide range of embedded system solutions which rely heavily on our long history of CPU board design and manufacturing expertise. Our broad portfolio of CPU products range from the latest Intel Core i7 processors to the most current Intel Atom architectures and are available in a variety of form factors. This provides a strong foundation for the many embedded system products and services that ADL Embedded Solutions provides for our clients.

ADL Embedded Solutions is a leading provider of high-performance embedded systems targeting demanding thermal and rugged environments.

We provide board level, system and sub-system embedded solutions as well as consulting design services.

ISO 9001 MANUFACTURING

Our products are designed and manufactured under ISO 9001 with state-of-the art equipment and are fully factory tested prior to shipment. In addition, all computer boards and integrated systems are individually tested at ADL Embedded Solutions before shipment, including extended temperature testing when required.

CUSTOMER SUPPORT

Our committed staff of experienced, well-trained sales and technical engineers, provide our customers with project planning assistance, help with specific application requirements, and can recommend the best integrated solution for a project. Our Technical Support and Customer Service departments are here to ensure your product satisfaction after the sale. We support and service what we sell.

SERVICES

ADL Embedded Solutions can provide full CAD design, build and integration services for custom enclosures, including high IP requirements. Value-added services include ruggedization for high shock and vibration, extended temperature, and harsh environments, as well as CAD support including board models and full enclosure design, build and integration.

Smarter by Design

ADL Embedded Solutions employs a holistic approach to system design that makes careful consideration of not only customer needs and requirements but also environmental factors like mounting location, shock and vibration, thermal management, mechanical constraints and more to create a truly robust customer solution.

ADL Embedded Solutions is a leading provider of high-performance embedded systems targeting industrial markets such as factory automation, Vision, traffic engineering, unmanned systems, energy, transportation, as well as military and defense.

ADL is committed to collaborating with customers to design and build quality, reliable embedded solutions that meet their exacting requirements…from concept, through design, build and production.

ADL Embedded Solutions' product line boasts a broad portfolio of long-lived SBCs, ranging from low-power Intel® Atom® architecture through high-performance 7th generation Intel® Core™ i5/i7 processors that ensure access to the latest processor technology and long-lived availability.

ADL serves customers in a variety of markets,including Medical, Transportation, Defense, Aerospace, Communication, Security, Process Control, and Science.

EXCITING NEW PRODUCTS IN 2019

ADL Embedded Solutions' new board products for 2019 build of a strong foundation of Intel E3800-series Atom SBCs in form factors ranging for ultra-compact 75mmx75mm expandable SBCs to full-featured 3.5" SBC offerings. With features including wide operating temperature, rugged design, and 15 year availability these new boards will continue ADL's growth into rugged industrial industries including homeland security, ICS/SCADA cyber protection, traffic engineering, border security and much more.

Notable IIoT projects include cyber security edge devices using ADL's line of ultra-small 75mmx75mm SBCs are now being deployed into smart power grid applications where their compact size not only make field deployment easier, but also bring enhanced performance and security to these high-value infrastructure assets.

Technology Trends

Leveraging world-class system design and CPU board design capabilities, ADL Embedded Solutions continually strives to provide the latest Intel processor technologies, system products, and capabilities; as well as leading-edge CPU boards and peripherals.

FAMILY OF ADL SINGLEBOARD COMPUTERS

ADLE3900HD-FULL-FEATURED 3.5" SBC INTEL E3900-SERIES BASED

With the new fully featured 3.5" SBC ADLE3900HD ADL expands its range of rugged ultra low energy processor boards. A novelty in this class is the shock and vibration resistant soldered memory. With DDR4 this Intel® E3900-series Atom® board can be equipped up to 8GB. Additional operational reliability is achieved by the integrated DC-DC power supply, which is galvanically isolated. Additional UPS functionality can be installed optionally.

ADLE3900SEC – VERTICALLY EXPANDABLE 75MM X 75MM SBC INTEL E3900-SERIES BASED

The story of vertically expandable ADL processor boards continues! The successor of the Intel® E3900-series Atom® is now also available in this form factor. The soldered RAM gets an upgrade from DDR3 to DDR4 and the maximum memory capacity doubles to 8GB. The onboard power supply is now also galvanically isolated in this PCB class. The number of connections for fast USB3 devices has also been doubled, which directly benefits particularly memory and video-loaded applications.

ADLE3900HDC-VALUE-FEATURED 3.5" SBC INTEL E3900-SERIES BASED

ADL's new processor boards of the ADLE3900HDC series are based on the 3.5" SBCs successfully introduced with Intel Baytrail Atom. The cost-optimized HDC boards are now even more attractive! In addition to the modern equipment with 2x M.2 sockets and 3x 1 Gigabit network interfaces, shock and vibration resistant soldered DDR4 memory with up to 8GB is now available. Intel's latest SoC Atom processor (Intel® E3900-series Atom®) now offers secure 24/7 operation up to the extended temperature range as an industrial version. Additional UPS functionality can be installed optionally.

ADLE3900SEC-HORIZONTALLY EXPANDABLE 75MM X 75MM SBC INTEL E3900-SERIES BASED

Available for the first time! New in the portfolio are the vertically expandable ADL-SEC processor boards. These are aimed at users whose application requires the smallest possible form factor and where modular expandability continues to play a major role. The plug-on peripherals are manufactured according to customer-specific requirements. The number of connections for fast USB3 devices has also been doubled at the Intel® E3900-series Atom® based board, which directly benefits particularly memory and video-loaded applications.

THE REAL "CUSTOMER-SPECIFIC" EMBEDDED-PC

The demand for industrial-grade embedded PCs continues to grow in key industry segments. Much of this is driven by the advent of Industry 4.0 and IIoT applications which put an emphasis on controller and sensor intelligence to enable smart monitoring and control or datalinks to the network or cloud.

ADL's vast experience in military rugged, small form factor design have allowed us to create a number of compact SBCs, as small as 75mm x 75mm. These SBCs are the system building blocks that give customers the industrial solutions needed for a variety of demanding IIoT applications for secure networking and cybersecurity, ICS / SCADA, oil and gas, avionics, power grid protection or traffic engineering where reliable long-term operation in wide temperature or rugged conditions is an absolute must. Many of these solutions are backed by CPU availability as long as 15 years.

Real "custom" Embedded PCs

Our customers appreciate the compact design and robust construction. With the "ADL Custom Embedded-PC" series, which can be fully adapted to customer requirements, you can rely on proven design, top quality and reliability. Whether small dimensions, fanless operation or scalable upgradeable I/O extensions: The ADL EPC series adapts exactly to your requirements!
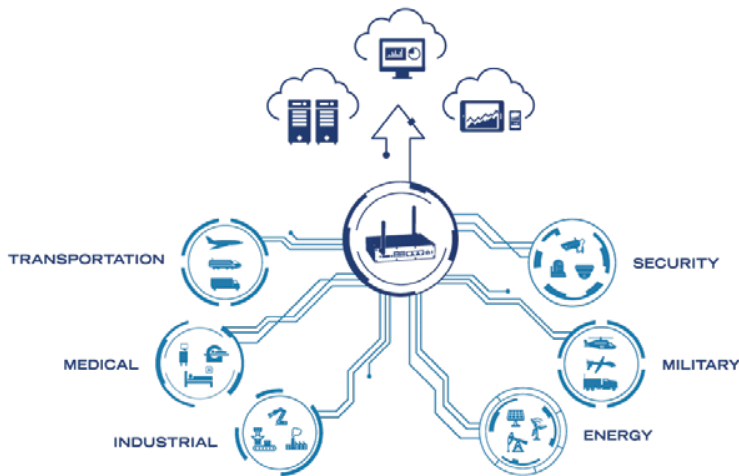
APPLICATIONS

- Industrial IoT (IIoT) network and cloud computing
- Cyber security edge devices for networks, ICS and SCADA threat security
- Secure networking (routing, traffic monitoring and gateways)
- Intelligent machinery and equipment controllers
- Unmanned or autonomous vehicle mission/payload computing
- Wind turbine datalogging and collision avoidance
- Oil and Gas

What's inside

The heart of many compact system designs is Intel® Atom® E3800 or E3900-based SBCs as small as 75mm x 75mm. These are standalone CPU boards which make possible compact systems as small as 3.4" x 3.7" x 1.3" but also offer expansion possibilities that maintain a small footprint or low profile depending on the application use. The expansion connector features a number of interfaces including PCIeX1, USB 2.0/3.0, SATA, SMBus and DisplayPort.

CUSTOMIZATION

ADL offers a range of COTS peripheral modules that can easily be integrated for added I/O functions like CAN, Ethernet, GPIO, Serial COM, storage and much more. Customers can also define custom peripheral boards for special I/O or power supply requirements as well as the custom enclosures necessary for complete solutions.

Customer Success Stories

CUSTOM EPC-BASED SECURITY DEVICE FOR IIOT

Developed for a large multi-national corporation headquartered in Europe which specializes in trusted security software and services. ADL developed a compact Intel Atom-based embedded PC (EPC) to allow the customer expansion into industrial IoT applications.

CUSTOMER BENEFITS

- Custom chassis colors (green, white, black) … ideal for deploying for different applications with different software features
- BIOS support for custom M.2 crypto storage device
- Rugged construction
- Wide temperature operation

CYBERTHREAT SECURITY EDGE DEVICE

Designed for retrofit into existing power sub-station infrastructure which is largely exposed to the elements, ADL designed a compact edge device with a host of critical features including rugged design, wide temperature and voltage and custom I/O for easy field deployment.

CUSTOMER BENEFITS

- Compact Size
- Wide Operating Temperature (-40C to 85°C)
- Long-term Availability of 15 years
- Custom Mezzanine to Address GPIO, Wide Input Voltage, LED and Configuration Switch Requirements

COMPACT, MILITARY AVIONICS EDGE DEVICE

Derived from a previous custom design, this compact edge device features a MILCOTS ¼ brick power supply for voltage compatibility with available military avionics power. The customer was able to leverage their original cybersecurity application software in a new environment.

CUSTOMER BENEFITS

- Compact Size
- Customized for MILCOTS power supply
- Wide Operating Temperature (-40C to 85°C)
- Long-term Availability of 15 years

Custom Systems

Embedded system design needs, challenges and constraints can vary widely and don't always abide by readily-available COTS solutions. Our staff of CPU designers and engineers can custom tailor embedded designs to meet a broad range of customer-specific space, power, electrical, or environmental requirements.

ROBUST DEVELOPMENT PROCESS

Aided by Solidworks® CAD design and simulation tools, our engineers can help conceptualize, design, manufacture, and system integrate turnkey embedded solutions for both military and rugged industrial applications.

Driven by the product lifecycle requirements of our military and industrial customers, ADL Embedded Solutions has developed a robust System Development Process designed to capture the myriad of requirements, specifications, and changes that can arise during a system development from initial consultation through prototyping and production release.

All system electrical, I/O, mechanical, and environmental requirements are fully documented, design reviewed, customer approved, and form the foundation for all current and future iterations of a customer's design throughout their lifecycle.

CUSTOM SYSTEM PRODUCTION
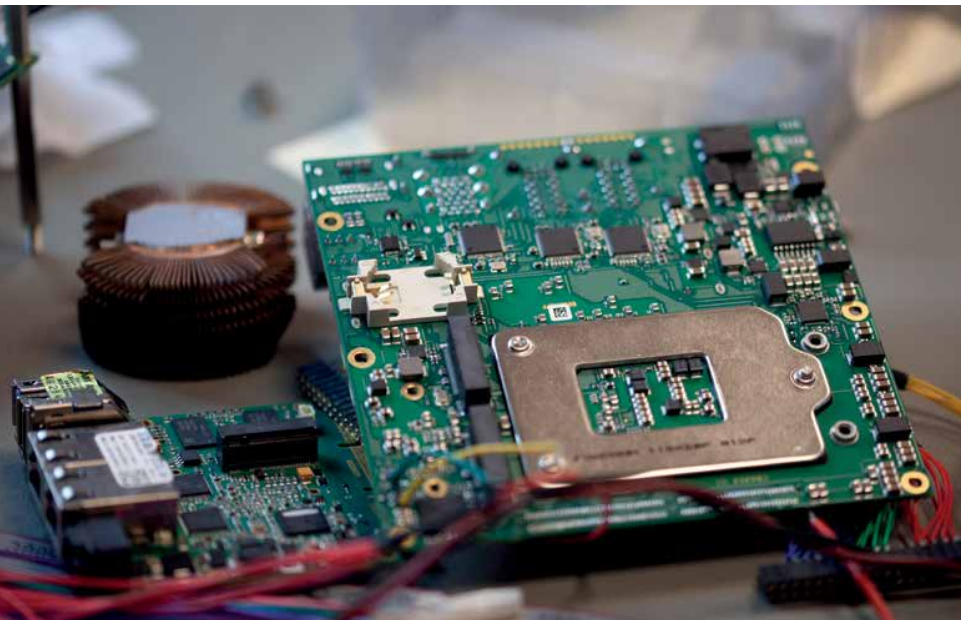
ADLMES9200 Rugged Chassis System

The rugged ADLMES9200 chassis system is a successor to ADL's popular ADLMES8200 IP65 chassis system with improvements that include lower weight, lower cost, quick and reliable IP67 integration for rugged military and industrial embedded systems.

APPLICATIONS INCLUDE:

- Mission/Payload Computers
- SWaP-constrained Embedded Systems for Mobile, Tactical, Airborne and Vehicle applications.
- Rugged industrial Oil and Gas
- Mining and Construction
- Commercial Unmanned Vehicles

FEATURES AND BENEFITS:

- Improved IP67 ingress protection.
- 1-piece unibody chassis design for lower cost and more reliable IP67 protection.
- EMC-compliant IP67 gasket(s)
- Conductive cooling option with flanged base for maximum operating temperature.
- Designed for MIL-STD 810F shock and vibration. Options for MIL-STD 461/704/1275 Power and EMI specifications.
- Supports all ADL PC/104 and 3.5" single board computers and power supplies.
- Full design and development services are available for custom chassis, cabling, integration, and modeling support.

ADLMES9200 Rugged Chassis System

LPP - E

LPP - C

P1P- E

P1P - C

TECHNICAL SPECIFICATIONS

Specification	Description
Model Sizes	LPP = 3 Card Capacity P1P = 5 Card Capacity
Dimensions (conductive/passive)	LPP = 84/102 x 175 x 170 mm P1P = 117/135 x 175 x 170 mm
Empty Weight	LPPE = 1,95 kg P1PE = 2,27 kg
Shock & Vibration	Designed for rugged industrial and MIL-STD 810 military/defense
EMI	Supports Power Supply Options For MIL-STD 461 Compliance
Power	Supports Power Supply Options For MIL-STD 704F/1275D Compliance.
Mounting	Flanged Plate - M6 Mounting Holes Additional Center Holes For Conductive pressure.

ORDERING OPTIONS

LPP/P1P Variant	Finned Top	Flanged Base	Active Fan*
A	X	X	
B	X	X	X
C	X		
D	X		X
E (Flat Top With Conductive Base)		X	

*P1P - D With
Active Fan Option

Compact, Industrial SBCs

ADL offers a wide variety of compact, industrial-grade SBCs ranging from low-power Atom boards to high-performance Intel Core SBCs intended for a host of rugged industrial and IIoT applications benefiting from compact design, wide operating temperature, availability up to 15 years and expert BIOS and engineering support.

INDUSTRIAL APPLICATIONS

- Secure Network Communication Devices and Gateways
- Edge Devices for Cyber Threat Security
- Industrial Control Systems (ICS) for Critical Infrastructure
- Industrial IoT (IIoT)
- Factory Automation
- Unmanned Systems and Robotics
- Commercial Drone Payload Computing

EDGE-CONNECT SBCS

ADL continues to innovate with smaller, feature-rich SBCs with modular expansion architectures to fit a variety of uses and environments.

This architecture addresses the increasing need of small form factor SBCs that allows system designers to deploy intelligent computers for network and cybersecurity edge devices and intelligent controllers for industrial automation of machinery and equipment.

LOW PROFILE HORIZONTAL EXPANSION

Using an edge connect architecture, the 75mm x 75mm ADLE3800SEC SBC enables low-profile expansion via interface resources including PCIe X1 lanes, SATA, USB 2.0, power, LEDs and more. This allows customers to standardize the computing module for efficiency of software and firmware maintenance while supporting a variety of product variants.

COTS and custom expansion options are available.

SMALL FOOTPRINT VERTICAL EXPANSION

For small footprint applications, stackable platforms like the 75mm x 75mm configuration shown at left allows the development of small, compact industrial solutions like the ADLEPC-1520 Atom industrial PC and the Stackable ADL120S (Intel Core i7) SBC.

COTS and custom expansion options are available.

DESIGNED FOR RUGGED INDUSTRIAL APPLICATIONS

Industrial embedded systems can run the gamut from benign factory floor or control room environments to harsh, rugged environments in oil and gas, train control, unmanned systems, alternative energy, transportation, security and surveillance, etc. This requires a particular type of SBC with easy-to-use connectors and interfaces, but also rugged features for shock and vibration as well as extended temperatures.

ADL Embedded Solutions' portfolio of 3.5" SBCs fills this void by leveraging expertise in military-rugged design to provide optimal solutions for rugged industrial applications.

3.5 Inch Embedded Single Board Computers

ADL Embedded Solutions 3.5" SBCs combine user functionality with industrial features like extended temperature operation and rugged build for intelligent systems on the factory floor as well as more harsh and rugged industrial environments.

ADL STANDARD 3.5" SBC & EMBEDDED PC CHASSIS

PC/104 COTS & MCOTS SBCs

ADL Embedded Solutions PC/104 SBCs feature a broad range of Intel® processors ranging from the latest, high-performance Intel Core i7 CPU to new low-power Intel Atom architectures.

PC/104 SINGLE BOARD COMPUTERS

The actual ADL PCIe/104 formfactor SBCs feature up to the latest generation of Intel Embedded Roadmap Core & Atom CPUs. Latest featuresets linke USB 3.1, SATA 6Gb/s as well as PCIe Gen 3.0 are available. Futureproof expansions with highspeed signaling such as CoaXPress, CameraLink and 10G LAN are available by 3rd party.

PCIE104 BOARDS & ADLMES9200 CHASSIS

DESIGNED FOR LONG-LIFE EMBEDDED APPLICATIONS

ADL Embedded Solutions' embedded power supplies are designed with long-lived, rugged military and industrial applications in mind.

MTBF is optimized through a careful choice of components, connectors, and design architecture to achieve MTBF > 600,000 hours. They are designed for extended temperature operation (-40°C to +85°C) and include
a robust set of MILCOTS features for use in military ground vehicles and avionics.

Small Form Factor (SFF) designs are optimized for side-by-side use with ADL Embedded Solutions' line of industrial 3.5" CPUs, but also work well in standalone SwaP-optimized military or space-constrained applications. 3D CAD models and design services are available for all power supply products.

Embedded Power Supplies

ADL Embedded Solutions' portfolio of embedded power supplies are optimally designed to work in conjunction with our CPU boards. These power supplies help provide a robust set of system building blocks for military and industrial embedded customers.

LONG-LIVED EMBEDDED POWER SUPPLIES

ADL Vision Solutions

From factory floor machine vision systems for automation, to robotics or commercial drone applications for science, agriculture and military surveillance Machine Vision is Everywhere!

ADL Embedded Solutions is well versed in all aspects of embedded vision design… high-speed framegrabbers, storage, processing, system design and thermal management.

MACHINE VISION IS EVERYWHERE!

ADL Embedded Solutions has been putting vision solutions together for customers for many years. This includes systems using NTSC/PAL, SDI, and HD-SDI to high-performance framegrabbers using the latest image capture interfaces like CoaXPress and Cameralink technologies.

APPLICATIONS

- Machine Vision for Factory Automation
- Commercial Drone Payload Computers for Hyperspectral, Multispectral, SWIR or LiDAR
- Traffic Surveillance
- Security Monitoring and Control
- Unmanned Systems - High Resolution Image/Video Capture
- High-Speed Automated Optical Inspection
- Very High-Resolution Line-Scan Image Acquisition
- Military and Defense ISR
- Very High Frame-Rate Motion Analysis and Recording

ADLVIS-1660 2-CH COAXPRESS ASSEMBLY

- PCIe/104 CoaXPress assembly
- Intel Core i7-4700EQ with 8GB DRAM
- Dual CXP-6 Ports
- GENICAM Compliant
- Euresys Memento Event Logging
- I/O Breakout board with GPIO, trigger, and LED Status
- PoCXP Safe Power; 17W

PCIe/104 4-CH CAMERALINK OPTION

- Captures from 1 or 2 Medium, Full, or 10-tap Camera Link Cameras
- Up to 4 Base Camera Link Cameras
- Line Scan or Area Scan
- Camera Frame Rate Sequence Capture
- Triggered Image Sequence Capture
- DMA Image Data to CPU Memory

EXPERT THERMAL DESIGN

ADL Embedded Solutions offers highly effective heat conductive and heat convective thermal solutions tailored to maximize the longevity of your SBC.

DESIGN AND ENGINEERING FEATURES INCLUDE:

- Designed to exacting specifications by our Solidworks® Design Team.

- Milled locally in US to tolerances of less than 1mil for critical dimensions.

- Anodized color coatings and trivalent chromate (TCP) coatings used for humidity protection and optimal thermal emissivity.

- Each thermal solution is custom design and characterized to each ADL Embedded Solutions SBC and verified through thermal chamber characterization.

- Each SBC includes at least one fansink convective cooling option and one or more heatspreader conduction cooling solutions.

- All SBC and thermal solutions are available in Solidworks® 3D CAD for spacing planning purposes.

- ADL Embedded Solutions also offers custom enclosure and thermal cooling design services.

Thermal Solutions

ADL Embedded Solutions provides a range of standard thermal solutions for all of our CPU products. We also provide thermal design and consultation services to help address unique thermal requirements. 3D CAD modeling support is readily available to aid space planning and thermal modeling.

ADLQM87PC
Shown with Copper Enhanced 0.6" Spreader for Wall Mounting

ADLQ170HDS
Shown with Copper Enhanced 0.375" Spreader for Wall Mounting

ADLQM67PC
Shown with 2" x 2" Fansink

Thermal Management

Robust embedded designs rely on knowledge of the required CPU performance, I/O, and power requirements as well as a careful consideration of the thermal envelope and the interplay between the various design elements.

ADL Embedded Solutions is an expert at balancing these various factors to develop optimal and reliable solutions for our clients.

DESIGN CONSIDERATIONS

Designing successful embedded systems demands efficient PCB design, choosing low power and long-life components, and the creation of an effective cooling solution within the parameters specified. Since heat reduces the life of embedded systems, efficient cooling solutions directly result in long-term reliability for the overall system.

THERMAL ANALYSIS

The difference between T_{jmax} (maximum CPU junction temperature allowable) of the CPU and the maximum $T_{ambient}$ (ambient temperature taken external to the thermal solution such as the heatsink for an open stack or external to the chassis for an embedded stack) defines the temperature delta which the thermal solution must achieve.

For example, commonly CPU $T_{jmax} = 100°C$, so if maximum $T_{ambient} = 85°C$, the thermal solution temperature rise cannot exceed 15°C.

In summary:

$$\text{Max } T_{delta} = T_{jmax} - \text{Max } T_{ambient}$$

Lower-powered SBCs such as Intel Atom architectures can often be sufficiently cooled through passive or forced convection (fan assisted) heatsink solutions and still meet extended temperature requirements.

Higher-powered architectures such as the Intel Core i7-series or GS45GME usually cannot meet extended -40°C to +85°C operation without a conduction cooling path to a larger metal structure (vehicle bulkhead, airframe, system cabinet, etc.) as described below.

Make note of maximum CPU load required and test final chassis enclosure under these conditions. Reduced CPU load translates directly into lower heat generation and reduced thermal cooling requirements.

ADL Embedded Solutions also offers custom enclosure and thermal cooling design services.

Cross-Section of PC/104 Stack With Heat Spreader

FEATURES

1. Power Supply
2. Peripheral
3. SBC
4. CPU Die
5. Chipset Die
6. ADL Heatspreader
7. Customer Chassis Wall/Base
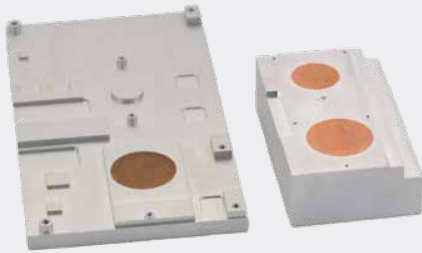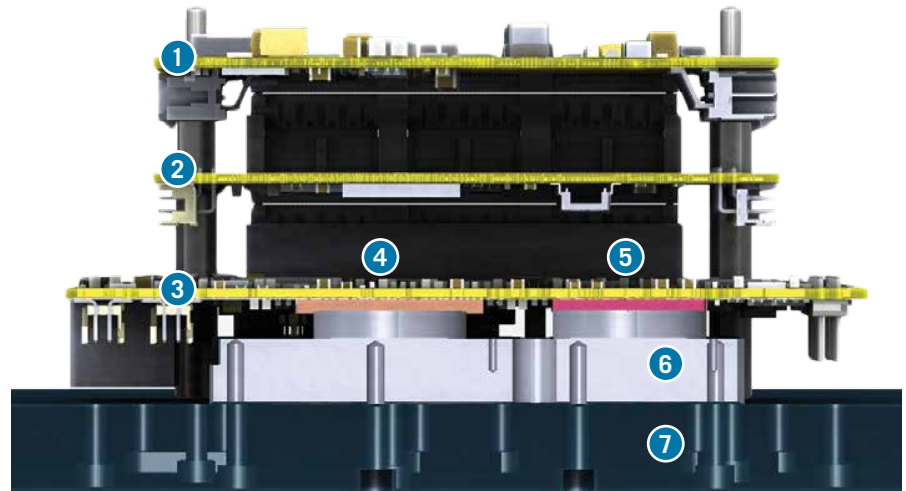
HEATSPREADERS

CHASSIS FIN

HEAT SPREADER AND CHASSIS COOLING KEY POINTS:

1. Using precision-milled heat spreaders specifically designed for each ADL Embedded Solutions platform, heat from the CPU/Chipset is conduction transferred to the chassis wall/base.

2. Heat spreaders are often copper-enhanced or high-performance / high temperature SBCs, include specialty coatings to optimize emissivity and are coupled with precision standoffs to maintain planarity and optimal mechanical coupling to the chassis wall.

3. The Chassis is designed by the customer or ADL Embedded Solutions to dissipate the heatconducted from the heat spreader as follows:

   Passive Convection Cooling through use of a finned chassis design that takes advantage of available airflow is just one example.

   Forced Convection Cooling of a finned chassis design by adding an appropriate externally-mounted fan.

   Conduction Cooling by mounting the chassis base in such a way as to make metal-to-metal contact with the vehicle bulkhead, airframe, system cabinet, etc., such that the chassis heat is conduction transferred to the larger metal structure. This is the more common cooling strategy for high-powered Intel Core i7 designs, especially quad-core CPUs.

Peripherals & Accessories

ADL Embedded Solutions provides a number of peripherals and accessories readily available to support customer projects. Beyond this, our focus on Standard Form Factors (SFF) make available a vast ecosystem of 3rd party peripherals and custom solutions from partner vendors.
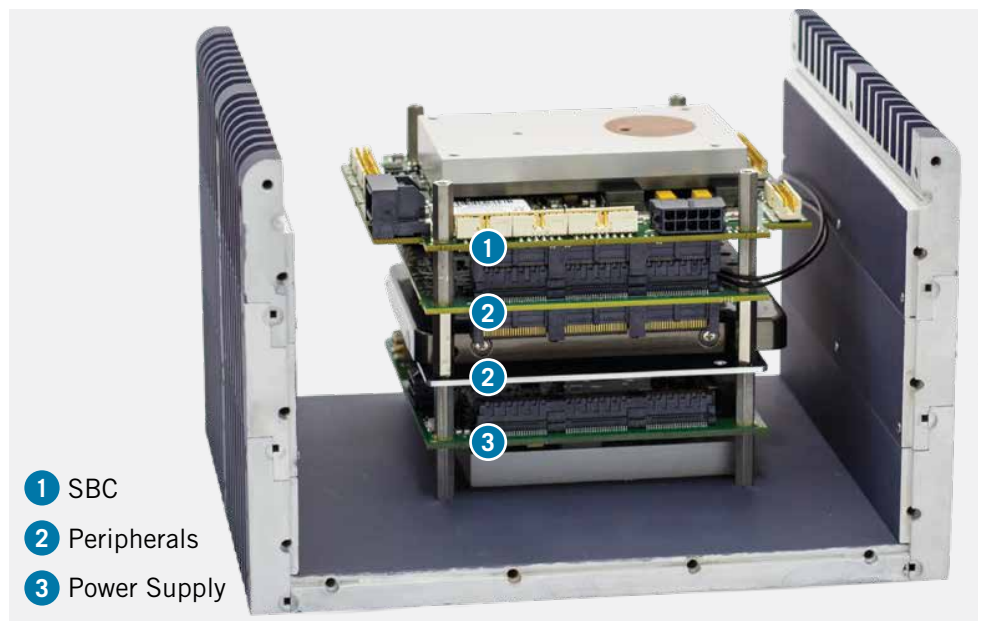
PERIPHERALS

ADL Embedded Solutions has a broad portfolio of I/O peripheral boards and modules to enable the many embedded solutions that our customers require. Our CPUs support a number of expansion busses including PCI-Express and USB 3.0. Peripheral form factors include PC/104, miniPCIe, mSATA, M2. (AHCI and PCIe), a number of custom modules and legacy peripherals like ISA and PCI.

ACCESSORIES

For our customers' convenience, ADL Embedded Solutions carries a wide-range of accessories, such as Drives, Compact Flash modules, individual cables, and cable kits. You can order these products alone, installed onto an SBC, or system sub-assembly.

SYSTEM ASSEMBLY

1. SBC
2. Peripherals
3. Power Supply

STRIVING TO PROVIDE ALL THE ELEMENTS FOR SUCCESS

Embedded Design is by nature a collaborative team process requiring engineering and technical skills including system design, mechanical and thermal design, electrical design, software development, cable design, and build, testing, and quality control.

Our engineering team excels at partnering with our customers to understand their needs and to provide top-notch engineering support, whether it's just providing CAD models or providing full-turnkey system design services. Support services include: driver support and development, Linux support, cable design, thermal design, BIOS services, and more.

Engineering & Design Services

ADL Embedded Solutions strives to be the best development partner possible for our customers every step of the way through their embedded design process. We have a broad range of engineering and design services to help make every customer design or concept a success.

COTS & MCOTS CUSTOM DESIGN AND ENGINEERING
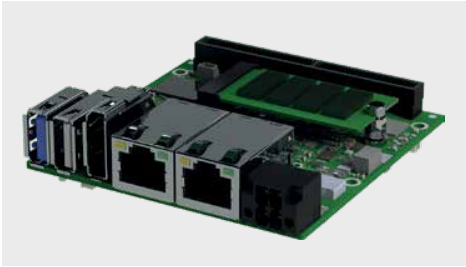
BROAD PORTFOLIO OF INTEL-BASED CPU BOARDS

ADL Embedded Solutions designs and manufactures a broad range of Single Board Computers in a variety of different form factors including PC/104, PC/104-PLUS, PCI/104, PCI/104-EXPRESS, PCIe/104, and 3.5" SBCs. Processor options range from the latest Intel CORE i7 processors to the low-power Intel Atom architecture for optimal flexibility of embedded design for our customers. Custom CPU board solutions can also be derived from any existing chipset/processor CPU product.
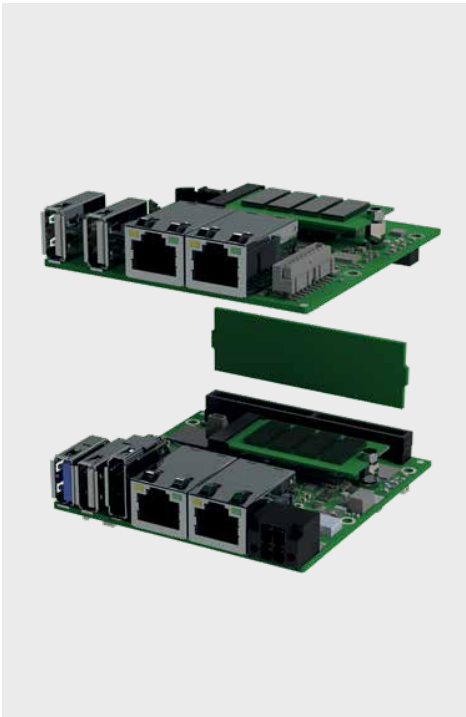
SYSTEM CONCEPT DEVELOPMENT

Working from customer requirements and concepts, ADL Embedded Solutions can help refine agreed upon critical design requirements. From these requirements, ADL Embedded Solutions can develop implementation strategies, while our Sales Engineers generate development quotes to help guide the NRE process. This collaborative process is the key to developing workable solutions that meet both cost and technical constraints. Often, an intervening "proof of concept" stage will precede commitment of NRE design resources.
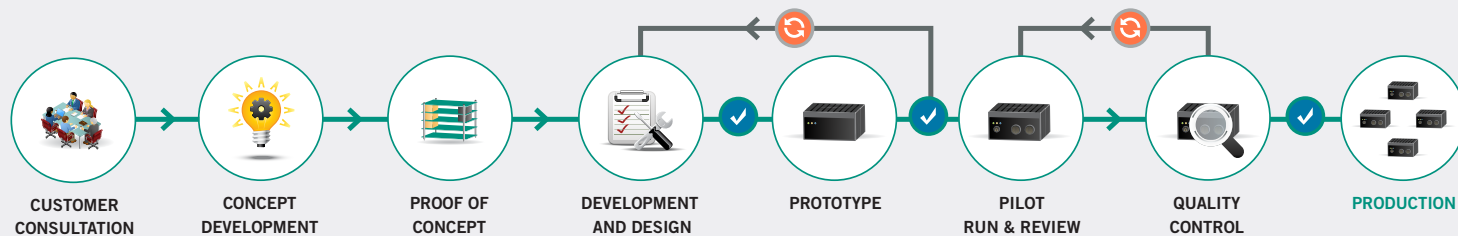
SYSTEM DESIGN

Tools like Solidworks® 3D CAD design software not only aid in rapid development of enclosure and system concepts, but also make for efficient communication of design concepts with customers to minimize development time and time to market. Once approved, Solidworks® 3D CAD designs also become the primary communication vehicle for documenting the system for customer SCDs (Source Control Drawings) as well as for follow-on manufacturing steps. Solidworks® CFD thermal simulation capabilities help ensure systems stay within their specified thermal envelope.
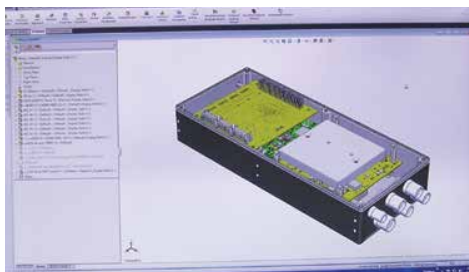
SYSTEM BUILD

Using our strong relationships with metalwork, milling, coating, and component vendors, ADL Embedded Solutions can make even the most complex system a reality. Typically, small quantity prototypes are built to validate manufacturing quality and mechanical specifications. Fully integrated systems are then built to validate ease of integration by production personnel, confirm electrical specifications, and shipped to the end-customer for system verification testing as well as any special tests such as vibration or EMI compliance testing.

OUR CUSTOM SYSTEM DEVELOPMENT PROCESS

CUSTOMER CONSULTATION → CONCEPT DEVELOPMENT → PROOF OF CONCEPT → DEVELOPMENT AND DESIGN → PROTOTYPE → PILOT RUN & REVIEW → QUALITY CONTROL → PRODUCTION

CUSTOM SYSTEM DESIGN AND BUILD

Working from customer requirements and concepts, ADL Embedded Solutions can help refine customer concepts to develop agreed upon critical design requirements. From these requirements, ADL Embedded Solutions can develop implementation strategies, while our Sales Engineers generate options quotes to help guide the NRE process. This collaborative process is the key to developing workable solutions that meet both cost and technical constraints.

CAD MODELING SUPPORT

3D modeling is a critical part of most embedded system design work.
ADL Embedded Solutions is well-versed in Inventor- and Solidworks®-based 3D CAD design and can provide CAD Modeling Support for space planning, system design review, thermal design and modeling, and much more. CAD models for all of our SBCs and select peripherals are available in both Solidworks® and STEP 203/214 formats upon request.

THERMAL DESIGN

ADL Embedded Solutions provides both standard and extended temperature range thermal solutions for all of our SBCs. In addition, ADL Embedded Solutions can provide custom thermal solutions (plates, heatsinks, and enclosures) as required by specific customer specifications. Working closely with local milling and coating facilities, ADL Embedded Solutions engineers can create thermal solutions for the entire thermal path from high-powered SBCs and peripherals to chassis walls and cooling plates. Solidworks® mechanical design tools and CFD thermal simulation software ensure an accurate and time-efficient design process.

SOFTWARE AND BIOS SUPPORT

ADL Embedded Solutions works directly with our board design team to provide BIOS and firmware engineering support including: BIOS-API health monitoring, GPIO, Fan, and watchdog control, Fixed BIOS/firmware revision control, Custom BIOS Configuration Settings and Defaults, etc. Strong collaboration between engineering and BIOS/firmware designers, allow ADL Embedded Solutions to provide a range of software development and driver services including: custom applications, driver support and development, custom operating system image loading during production, custom test scripts and test configurations, and firmware development.

CUSTOM CABLING

Development cable kits are available for all ADL Embedded Solutions CPU boards. In many cases, our standard cabling options are all that is required for a customer's project. Invariably though, custom cabling needs arise…whether it's a simple matter of changing the length of a standard cable, or custom designing a high-IP D38999 cabling harness, ADL Embedded Solutions engineers can help specify, design, and build to our customers' requirements.

Tech Brief: What is PC/104?

Introduced in 1991 as an expansion method to add I/O to larger size embedded computers. Today, a huge selection of single board computers, I/O cards, and peripheral modules are available in the PC/104 form factor. Over 60 companies around the world offer CPUs, I/O boards, packaging, and accessories for PC/104.

PC/104 BACKGROUND

PC/104 is a stackable, embedded computer standard with a compact footprint and stackable bus architecture. Unlike a regular desktop PC which uses a backplane, PC/104 modules mate together via stackable ISA, PCI, and PCIe bus connectors. PC/104's success in embedded applications is due to:

Compact Size
90 x 96 mm (3.6" by 3.8")
Module Size

Self-Stacking
Expands Without Backplanes
or Card Cages

Rugged, Reliable Connectors
Reliable in Harsh Environments;
1000+ Mating Cycles as Compared
to <100 for COMs

Four-Corner Mounting Holes Assymetrical Layout with Increased Resistance to Shock and Vibration

Fully PC Compatible Reduced Development Costs and Time-To-Market

PC/104 BUS EVOLUTION

PC/104 stackable embedded PCs have followed the desktop PC leveraging on the hardware and software support developed for this popular platform.

ISA Connector

PC/104

PCI Connector

ISA Connector

PC/104-Plus

PCI Connector

PCI/104

PCI Connector

PCIe Connector

PCI/104-Express

PCIe Connector

PCIe/104
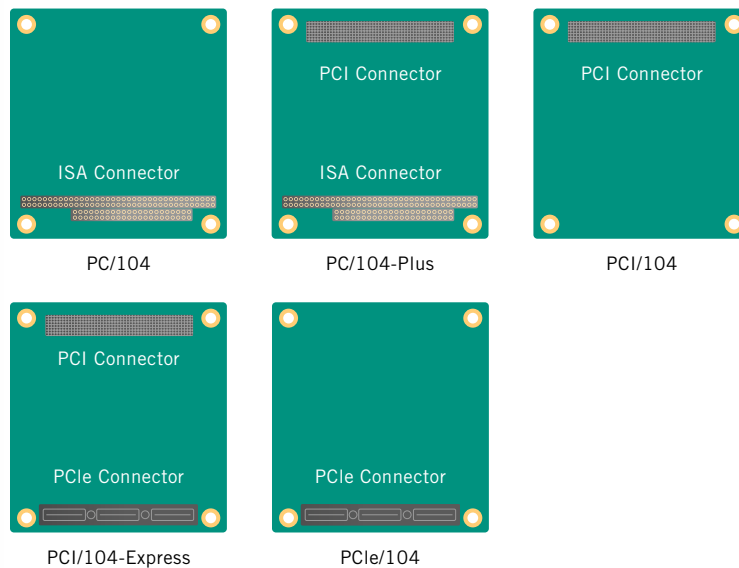
Down Stack Configuration Examples

The flexibility and expandability of the bus and mechanical layout allow many different stack configurations to support an array of diverse project requirements. See full specification below for more examples.

CUSTOM SBCS AND PERIPHERALS FOR OPTIMAL SIZE AND I/O CONFIGURATIONS

Space constrained solutions can be optimized by way of custom I/O boards that help collapse multiple I/O boards on the stack down to one board as illustrated in the example at right with an oversized I/O peripheral card.

Alternatively, custom, single board SBC solutions can also be created by ADL Embedded Solutions for optimal size and I/O configurations.
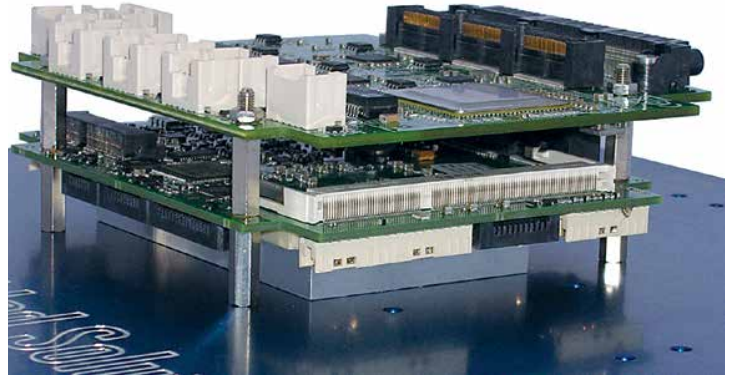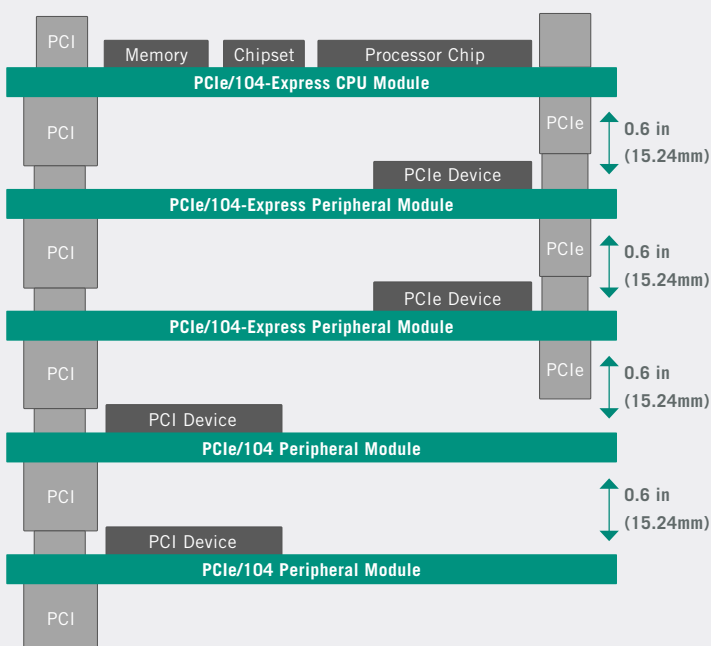
PCIe/104 ADLQM87PC with Custom I/O Board

PC/104
Embedded PC Modules

Specification Examples

PCIe/104-Express SBC Stack Example with PCIe/104 and PCI Modules

PCI

| Memory | Chipset | Processor Chip |

PCIe/104-Express CPU Module

PCI — PCIe

0.6 in (15.24mm)

PCIe Device

PCIe/104-Express Peripheral Module

PCI — PCIe

0.6 in (15.24mm)

PCIe Device

PCIe/104-Express Peripheral Module

PCI — PCIe

0.6 in (15.24mm)

PCI Device

PCIe/104 Peripheral Module

PCI

0.6 in (15.24mm)

PCI Device

PCIe/104 Peripheral Module

PCI

PCIe/104 SBC Stack Example with Bridge Card for PCI Modules

| Memory | Chipset | Processor Chip |

PCIe/104 CPU Module

PCIe

0.6 in (15.24mm)

PCIe Device

PCIe/104 Peripheral Module

PCIe

0.6 in (15.24mm)

PCI to PCIe Bridge

PCIe/104 to PCI 104 Bridge Module

PCI — PCIe

0.6 in (15.24mm)

PCI Device

PCIe/104 Peripheral Module

PCI

0.6 in (15.24mm)

PCI Device

PCIe/104 Peripheral Module

PCI
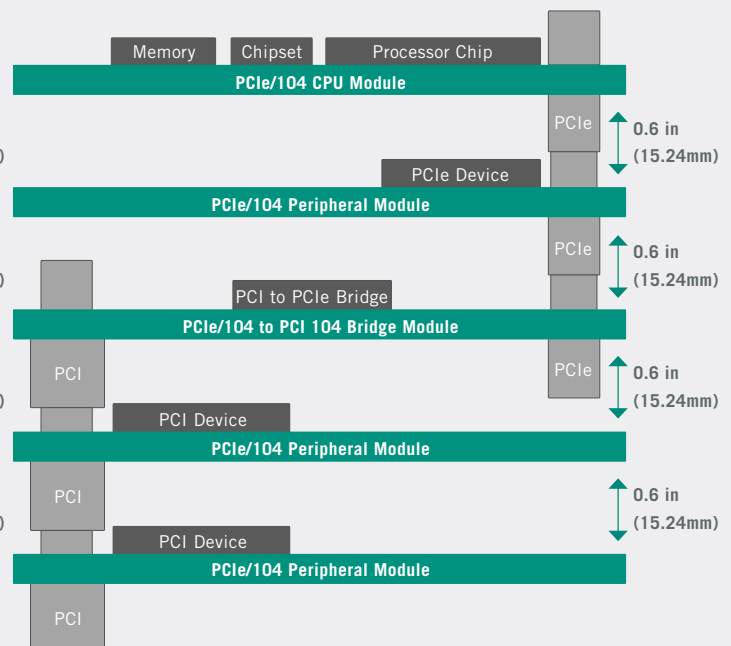
ADL, Case Studies

COMMERCIAL DRONE CAMERALINK PAYLOAD COMPUTER

Designed for commercial shortwave IR (SWIR) customer application using DJI Ronin MX gimbal, this payload computer features 2x Cameralink base-rate ports for SWIR or Hyperspectral camera use, 2x USB 3.0 ports, and Intel Dual Core i7 CPU, 802.11 Wifi connectivity, and rugged milled aluminum chassis design.

IIOT EDGE DEVICE FOR ICS CYBER SECURITY

Using the ADLEPC-1520 mini industrial PC (58 x 86 x 94 mm), ADL recently used the modular architecture of this compact, fanless PC to create a custom edge device targeting cyber threat security of US power utility sub-stations. Key to the success of this project, aside from the customer's value-added security software, was compact size to ease retrofitting, long-term available (15 year) processors, wide operating temperature, wide input voltages and expert design and engineering services for custom board, firmware and driver development.

FACIAL RECOGNITION FOR NOAA FISH COUNT SURVEYS

ADL Embedded Solutions worked closely with the NMFS Alaska Fisheries Science Center to make key improvements to their Camera-Trawl system including: GeniCam vision compliance, Intel Quad i7 CPU performance, IP-67 rated ingress protection and reduction of overall size of the enclosure for mounting flexibility and ease of storage and transportation.

ADL, Markets We Serve

TRANSPORTATION

Embedded PC Solutions can be leveraged in many Transportation applications. Owing to their ruggedness and flexible I/O, what is deployed in one environment is often easily adaptable to another.

Transportation applications can range from solar-powered ticket and information kiosk to tracking and remote power train control in all manners of Transportation environments from Automotive and Avionics to Passenger and Freight Railway.

Areas Include:
- Railway
- Aeronautical Systems
- Automotive Fleet Management
- Traffic Control Management
- Vehicle Advanced System Development

ENERGY

The Energy Sector has come to rely on embedded SBC systems to serve their small to medium volume computation and control node needs.

Energy Infrastructure represents a long-run cyclical upgrade market that benefits greatly from carrying their application investments across multiple generations of hardware.

Areas Include:
- Motor Control Systems
- Oil and Gas Drilling and Exploration
- Mining
- Renewable Energy
- Energy Distribution
- Infrastructure Inspection
- Leak Detection

IIOT & CYBER SECURITY

Industrial Control Systems (ICS) and SCADA are rapidly evolving to keep pace with innovations in IIoT and cloud computing, as well as cyber-threat security of high-value infrastructure.

Embedded hardware must keep pace with rugged, compact, wide-temperature and long-lived products to meet these demands.

Areas Include:
- IIoT Edge Devices
- ICS/SCADA Cyber Threat Security
- Secure Networking
- Network Traffic Monitoring
- Cross-Domain Solutions (CDS)
- NIST, NIAP, DISA Compliant Hardware

INDUSTRIAL

Embedded PC systems offer an encompassing mix of legacy hardware and software support with planned migrations to future hardware.

This results in significant economic advantages by leveraging existing hardware and software as well as shortening the development cycle for new Industrial Automation Systems. Wireless communications, control, and monitoring among industrial devices to enhance capabilities and efficiencies that provide a competitive advantage. Modular/Flexible system platforms and components provide added functionality and upgradability.

Areas Include:
- Process Control
- Robotics
- Building Automation
- Autonomous Factory-Networked Device Systems
- Machine Vision

MEDICAL

There are many reasons to choose high reliability, long-life embedded SBCs and systems for medical industry applications.

The use of COTS Embedded SBCs reduces time to market by enabling Medical OEM manufacturers to focus their expertise on their platform designs, rather than on CPU engine technology. ADL Embedded Solutions offers the best in embedded solutions that provide the performance to drive systems like Medical Imaging where advanced graphics capabilities are a necessity for clear 2D and 3D rendering.

Areas Include:
- Imaging
- Medical Instrumentation
- Biological Inspection Systems

GOVERNMENT & DEFENSE

Technology spending in Government and Defense over the next ten years will place heavy emphasis on Unmanned Aerial Vehicles (UAVs), as well as supporting infrastructure, such as ground control stations, shipboard control stations, and Command and Control Systems. Supporting UAS and battlefield infrastructure like Command and Control and Secure Communications/Networking Systems will also evolve to scale with the ever-increasing demand for secure, distributed communication bandwidth.

Extended Temperature/Ruggedized Systems with long-term Product Support make embedded systems the appropriate choice in these harsh and demanding environments.

Areas Include:
- Avionics ISR
- Secure Communications and Networking
- Command and Control
- Imaging and DSP
- UAV & UAS
- Ground Penetrating Radar Detection

Contact Us

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**TECHNOLOGY STANDARDS
& CERTIFICATIONS**

ISO 9001:2015 CERTIFIED
SMITHERS
QUALITY ASSESSMENTS

(intel)

PC/104
Embedded PC Modules

BBB
ACCREDITED
BUSINESS