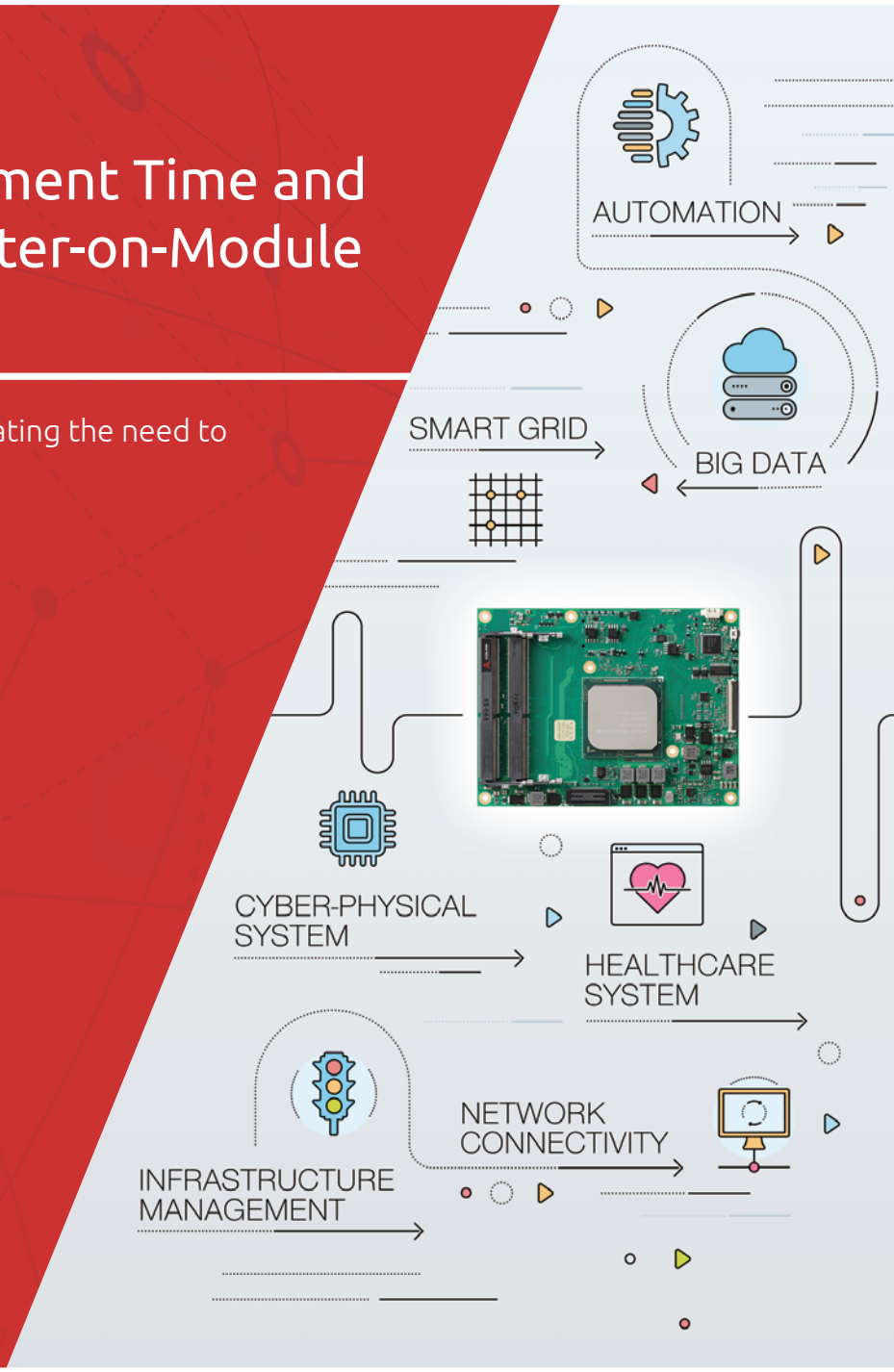
ADLINK
Leading EDGE COMPUTING

Solution Brief

Reducing Development Time and Effort with Computer-on-Module (COM)

Speed up time-to-market by eliminating the need to design complex computer systems.



COM Express® SMARC QSEVEN ETX®

www.adlinktech.com

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Computing technology is advancing at an incredible pace, pressuring equipment manufacturers to find ways keep up in order to stay competitive. For companies developing both high-end and entry-level products, this challenge is even greater due to the need to incorporate a wider range of technology. Manufacturers who need to satisfy a wide range of product requirements in a way that minimizes development effort and time-to-market should consider adopting a Computer-on-Module (COM) strategy.

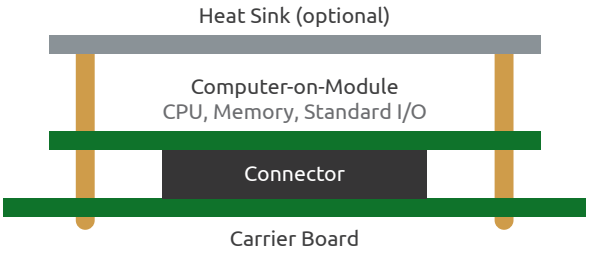


Figure 1: Application-Specific Components (e.g., I/O, ASICs, FPGAs)

What is Computer-on-Module?

A COM system, shown in Figure 1, is comprised of a compute module connected to a carrier board. The compute module contains the CPU, system memory, and standard I/O, and is intended to be part of a family of modules that support different cost-performance targets. The carrier board supports application-specific components, such as I/O, ASICs, FPGAs, and hardware accelerators.


Express-BD7


cExpress-AL

COM Standards

Equipment manufacturers can choose from a wide variety of COM standards to satisfy their requirements related to performance, cost, power consumption, size, and I/O, along with other options. The following describes a few of the most popular standards.

COM Express®

In 2005, the PCI Industrial Computer Manufacturers Group (PICMG) released the first COM Express standard, which has since expanded by adding module sizes and pinouts. Today, the specification covers a wide range of systems, spanning credit card-sized industrial controllers to high-performance edge servers. The standard pinouts allow equipment manufacturers to easily scale performance and take advantage of the latest CPUs.

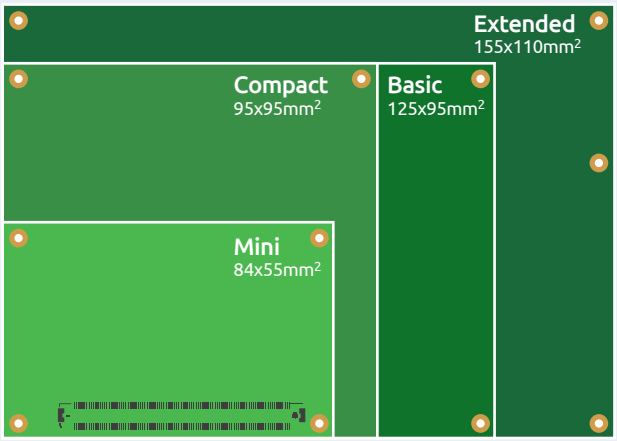
COM Express module sizes:

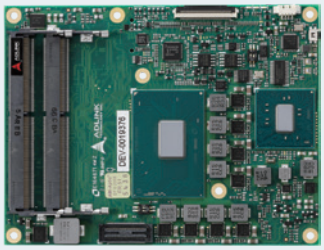
Mini: 55 × 84 mm (2.2 × 3.3 in)
- Power-efficient performance

Compact: 95 × 95 mm (3.7 × 3.7 in)
- Embedded system performance

Basic: 95 × 125 mm (3.7 × 4.9 in)
- Server performance

Extended: 110 × 155 mm (4.3 × 6.1 in)
- Highest performance




Express-KL

Sample of COM Express pinouts:

Type 6 connector:
- Versatile mix of I/O, up to four independent displays
- Industrial automation, medical, and transportation

Type 7 connector:
- Extra PCI Express lanes and 10 GbE ports
- Data center, server, and high data bandwidth

Types 10 connector:
- Ideal for ultra-small, low-power designs
- Portable devices and automotive

Type 2 connector:
- Legacy interfaces
- Conventional embedded applications

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Computer-on-Module (COM) Advantages

- Less development time and expense
- Highest performance
- Scalability
- Simpler inventory management
- Shorter regulatory time cycles

Why Computer-on-Module?

The COM modular design approach relieves equipment developers from being concerned with many aspects of complex, computer system design while allowing for differentiation on the carrier board. By using industry-standard, commercial off-the-shelf (COTS) products, equipment manufacturers can take advantage of many benefits, including:

1. Less development time and expense

For many equipment manufacturers, designing computer systems into their products is a complex and painful task that often does not create a competitive advantage. This task can be avoided by integrating COM products, which are complete computer systems, including processors, chipsets, memory, network interfaces, drivers, and BIOS. As a result, equipment manufacturers are free to focus their engineering design resources on developing differentiating features instead of designing complicated computer systems.

Equipment manufacturers can still differentiate their solutions with carrier board designs (e.g., size, shape, I/O, FPGA, etc.)

SMARC®

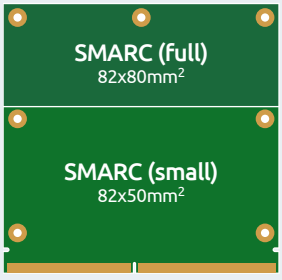
The SMARC (Smart Mobility ARChitecture) standard enables credit card-sized COM designs for use in highly-compact, mobile systems. Typically, SMARC modules consume just a few watts and may be powered by solar cells and/or batteries, creating opportunities in a broad range of operating environments: stationary, portable, outdoor, and in-vehicle.



LEC-AL

SMARC 2.0 defines a 314 pin connector that is flatter than COM Express; thereby enabling thinner designs. Equipment manufacturers can choose between two module sizes:

- 82 mm × 50 mm (3.2 x 2.0 in) – more compact
- 82 mm × 80 mm (3.2 x 3.1 in) – higher performance



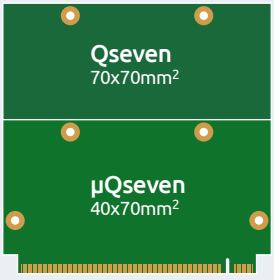
Qseven®

Like the SMARC standard, Qseven enables highly-compact COM modules and integrates all the core components of a common PC, making it well-suited for space-constrained, industrial designs. The 230 pin MXM connector is low profile and supports applications requiring graphics, audio, mass storage, networking, USB ports, and other interfaces. The Qseven standard defines two standardized form factors:



Q7-AL

- 40 mm × 70 mm (1.6 x 2.8 in) – more compact
- 70 mm × 70 mm (2.8 x 2.8 in) – higher performance



2. Highest performance

When an equipment manufacturer is pushing the boundaries of computing technologies, getting to market quickly with the latest CPUs is extremely important. This can be accomplished with COM products that are designed by leading computer designers who have access to early CPU samples and get direct technical support from CPU manufacturers. In many cases, COM products are available as soon as new high performance CPUs are launched, allowing equipment manufacturers to get a quick jump on delivering more powerful solutions.

3. Scalability

The marketplace often demands choices, and equipment manufacturers satisfy customers by offering a range of cost/performance options provided by a complete family of COM-based products. Equipment manufacturers can choose from a wide assortment of commercially-available COM products that are competitively priced.

With the COM approach, an equipment manufacturer's intellectual property (IP) and advances are contained on the carrier board and in software, not in the COM modules they use. This makes it easy to create a scalable product line that propagates a manufacturer's latest innovations and IP.

4. Simpler inventory management

Managing the bill of materials (BOM) for a computer system is a taxing job, one that equipment manufacturers can leave to a COM product vendor. It can take a lot of time to process purchase orders, monitor lead times, receive shipments, pay vendors, stock items, and track inventory levels. In addition, a lot of money is tied up in BOM inventory that could be used more productively elsewhere.

5. Shorter regulatory time cycles

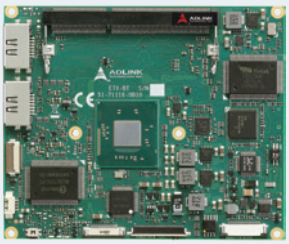
Equipment manufacturers seeking functional-safety certification, like IEC 65108, must exhaustively test various hardware and software components against a large number of possible conditions. This effort is compounded when certifying multiple systems.

The COM approach helps shorten the time required to certify follow-on products. Once the carrier board and software code base have passed regulatory testing, follow-on products that reuse these same components require less testing.

In addition, COM product vendors can supply documentation for the computer system, which greatly reduces a manufacturer's overall system documentation effort.

ETX

The Embedded Technology eXtended (ETX) standard has full support for legacy PC interfaces such as PC/AT (serial, parallel), USB, audio, graphics, and Ethernet; but it does not incorporate more recent PC features, like PCI Express, the low-pin count (LPC) interface, or Audio Codec '97. The COM module form factor is 95 × 114 mm (3.7 × 4.5 in).



ETX-BT

Benefits

This diversity of COM modules allows developers to satisfy their cost/performance objectives while meeting various functional requirements. For instance, developers can choose from modules with ARM or x86 processors that span server-grade Intel® Xeon® processors to Intel Atom®, Intel® Celeron®, and Intel® Pentium®processors. The modules also deliver different levels of graphics performance, including up to three independent displays, 4K and H.265 standards, Intel® Iris™ Graphics, and HDMI 1.4a to CRT/VGA support. There are modules that integrate the latest standards and technologies (e.g., Type 7, SMARC 2.0) and others that maintain legacy form factors, such as ETX and COM Express Type 2. Some of these modules also satisfy Internet of Things (IoT) and edge-computing requirements with support for IEEE 1588, Coreboot, and ADLINK SEMA.

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ADLINK Advantages

- Standardization leadership
- Product innovation
- Product quality
- Product longevity
- Customer support

The ADLINK Advantage

ADLINK is an international company serving customers around the globe with technical expertise in the local language and time zone. Branch offices and design centers are located in Asia, Europe, and North America.

Leader in Computer-on-Module

Standardization Leadership: Industry standards enable ADLINK customers to focus on their core competencies, accelerate time-to-market, and lower costs. Since 2009, ADLINK has led and actively participated in standards committees to develop pin definitions, drive innovation, and ensure standards continue to meet customers' needs.

- COM Express: ADLINK's CTO of Americas chairs the COM Express subcommittee of PICMG, and ADLINK is leading the definition of the new COM Express 3.0 specification and Type 7 pinout.[1]
- SMARC (Smart Mobility ARChitecture): ADLINK worked with fellow embedded vendors to develop the standard.



ADLINK HALT Testing

Product Innovation: ADLINK is one of the world's leading vendors of COM products and solutions for the Industrial Internet of Things (IIoT), continuously moving forward with development and innovation. ADLINK COM products support leading embedded features and predictive maintenance, and assist developers with real-time optimizations and IoT API extensions to fog and the cloud.

Robust and Ruggedized COM Products

Product Quality: ADLINK is committed to providing the highest quality COM products, with priority given to robustness and ruggedness from design to testing to production, including:

- Compliance with MIL specifications
- Mandatory HALT testing

Product Longevity: ADLINK COM product lines are designed with embedded long-life parts to ensure standard boards and OEM/ODM custom boards can be produced with only minor changes to the fixed BOM for 7 to 10 years. When changes are necessary, advance notification and guidance is provided through the transition to new hardware or a BIOS revision. Through its close partnership with Intel and other CPU vendors, ADLINK delivers COM products with the latest technologies and solutions for customers.

Industry-Leading Customer Support

Design Support: Customers can verify their COM system designs at ADLINK's labs in Taiwan and the US, where it is possible to measure signal integrity during the design cycle and optimize performance prior to prototyping and testing. Local carrier board design services are also available. In addition, ADLINK provides software, firmware, and customized BIOS support for COM products.

Product Lifecycle Support: With ADLINK factories in Shanghai and Taipei, customers have a secure supply of very high-quality COM modules. With regional logistics, operations, and quality support centers located in Europe, US, Japan, and China, ADLINK is able to quickly deliver and support products worldwide. ADLINK enables a smooth end-of-life (EOL) migration by providing customers an early last buy announcement and production services after EOL.

1. "ADLINK Plays Key Role in Update of PICMG's COM Express® Standard and Associated Type 7 Pinout," July 28, 2016, https://emb.adlinktech.com/en/News_17090802572411224.aspx

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