Open Standard Module (OSM): A Standardized System-in-Package for Embedded Systems.

Introduction to OSM

"System-in-package" refers to the integration of the core components required for an embedded system—such as the processor, memory, storage, and communications hardware—into a single package. With this approach, OSMs provide a complete, pre-validated solution for embedded systems, simplifying the design process and greatly reducing development time and costs.

In many ways, the OSM form factor resembles computer-on-module solutions like COM Express and SMARC. However, OSM offers a more compact form factor and a more rugged solderable BGA package. Thus, an OSM module is more like a component than a board-level solution.

The OSM standard specifies four sizes with downwards-compatible pinouts. The following table provides an overview of each size:

OSM Size L modules are particularly well-suited for demanding embedded applications that require significant processing performance, connectivity, and flexibility. As an example, the OSM-IMX8MP is a Size L module that delivers impressive AI and graphics capabilities in a low-power package. It offers:

- NXP® i.MX8M Plus series processor with quad-core Arm Cortex architecture along with an integrated 2.3 TOPS neural processor (NPU)
- Up to 8GB LPDDR4L memory and 128GB eMMC storage
- Vivante GC7000UL graphics with HDMI, LVDS, and DSI interfaces
- Dual GbE (one TSN capable), I²S, CAN, and USB interfaces

Modules like these can readily take on demanding assignments including robotics, autonomous vehicles, aerospace and defense systems, and consumer-oriented IoT devices.

It's important to note that the open-standard nature of OSMs promotes a broad ecosystem. Compatible modules are available from multiple vendors, helping

mitigate the risk of supply chain disruptions and ensuring a longer product lifecycle.

What's more, OSM modules can support any processor architecture that fits within its footprint. Developers can access Arm, RISC-V, and x86 solutions from Rockchip, NXP, Texas Instruments, Intel, MediaTek, Qualcomm, and more, giving developers more choice and flexibility in their designs.

Custom SBCs vs. OSMs

If design flexibility was all that mattered, custom SBCs would be hard to beat. However, there are other factors to consider. Custom SBC development is a major engineering effort, especially in the areas of signal integrity and thermal management. Software development can also be troublesome, as developers are often starting from a blank slate.

Furthermore, custom SBCs must undergo rigorous qualification testing to ensure they meet the necessary reliability and environmental standards for the target application. This testing can be time-consuming and expensive, further extending the development cycle and increasing costs.

In contrast, OSMs provide a streamlined and cost-effective approach. Because it offers a pre-validated form factor, OSM offloads the most challenging aspects of circuit design. Software design is also simplified because developers have a standardized starting point.

OSMs also offer several advantages in terms of flexibility and scalability. The standardized pin-out and interface specification allow developers to easily switch between different OSM vendors or upgrade to newer modules as technology advances, without requiring significant changes to the carrier board design. This modularity enables a more future-proof design approach and helps to protect the initial investment in custom hardware.

OSM vs. COMs

Like OSM, COMs also offer a pre-validated, standardized compute modules. Thus, COMs and OSM modules have similar benefits. However, traditional COMs are not suitable for some embedded applications.

Reliability and ruggedness are particular concerns for COMs, which attach to the carrier board through a connector that is a potential point of failure. OSMs offer a significant advantage over COMs in this regard, thanks to their solderable BGA package. By eliminating the need for a connector between the module and carrier board, OSMs provide superior resistance to vibration and mechanical stress.

COMs are also too large for some applications—another problem OSM solves. While COM Express module get no smaller than 55 x 84 mm, for example, OSM modules top out at just 45 x 45 mm. To put it another way, small COMs are typically the size of a credit card, while OSM is closer in size to a postage stamp.

The compact, solderable design of OSMs also makes them more suitable for automated assembly. In fact, OSMs can be delivered in tape and reel packaging or in trays, completely eliminating the need for hand placement. This production-optimized design enables OSM to achieve better cost efficiency than traditional COM-based systems, particularly for high-volume applications.

Another advantage of OSMs is their cross-architecture support. While COM standards are typically designed around a single processor architecture, OSMs are architecture-agnostic. Although OSM primarily targets lower-performance applications, it accepts up to 42.5 W input power, which gives it the ability to support x86 platforms and other high-end processors.

Adding Value to Your Embedded System Design

Even with all the advantages OSM provides, designing and developing a custom embedded system can still be a complex and time-consuming process. By partnering with an experienced OSM solution provider like ADLINK, you can streamline your development process, reduce time-to-market, and focus on your core competencies and application-specific requirements.

One possibility is to use a pre-engineered board-level solution based on the OSM specification. This approach reduces initial development costs and accelerates time-to-market while retaining the option to move to a custom OSM design for future products.

When the time comes for a custom design, Alcom can assist its customers with carrier board design services you create a scalable solution that optimizes performance while minimizing development overhead. Additionally, partnering with Alcom electronics gives you access to manufacturing support, software/firmware integration services, and many other supporting services.