

Current And Future Challenges For An Open Chiplet Ecosystem

The needs of different markets require establishing additional chiplet standards that cover much more than those currently being implemented for interfaces.

By Andy Heinig

There are currently a variety of ways to approach chiplet systems. One is to have a closed system in which a manufacturer develops all the components in-house and is also in charge of commissioning and overseeing assembly. In this scenario, everything is coordinated within that company and no standards are required.

Another is to establish open chiplet systems. This approach taps a considerably larger future market, because it supports the development of new systems that meet the needs of multiple companies. The open chiplet system approach is particularly useful for the likes of startups looking to focus on developing one or several chiplets that will be part of an overall system. In this way, they can fully realize their innovative idea without having to worry about the other components.

Implementing such open chiplet systems hinges on establishing relevant standards. Current standardization efforts are focused on the interfaces that connect the various components. UCle and BoW are the most notable players driving forward standardization in this area.

Today, a variety of companies are showing increased demand for chiplets in applications ranging from data centers to automotive to metrology – with the latter focusing on heterogeneous integration of different circuit technologies. However, the challenges associated with open chiplet systems vary from application to application. In automotive, one of the main challenges lies in the boot process and in the security both of individual components and of the overall system. For data center applications, the focus is on ensuring that the overall system performs well. And in the field of measurement equipment, the priority is to facilitate the heterogeneous integration of different – and in some cases “exotic” – circuit technologies, which in turn requires the corresponding interfaces to be put in place.

Overcoming these challenges will mean establishing additional standards that cover much more than those currently being implemented for interfaces. There is definitely demand for a standard to bring consistency to the boot process and the activation of chiplet systems. Some developments have been made – for example through JTAG – with regard to individual circuits, but these must be significantly expanded and cannot yet be applied to chiplets. What’s more, a standard is required to ensure security – both for the chiplet system as a whole and for its individual components. Such a standard must cover various aspects, including the requirements for robust supply chains, system development, and the secure and certified installation of application software.

When it comes to open chiplet systems used in data centers – and in some areas of the automotive industry – future performance requirements call for much greater flexibility in terms of power supply. Standards are needed mainly with regard to the many different voltage levels in use, each of which places vastly diverging demands on electricity provision ranging from milliamps to several hundred amps. But here, too, there are no discernible efforts being made in the area of standardization.

Standards for testing chiplet systems are now on the horizon, but these would still have to be expanded to meet additional requirements. In the future, these standards must cover not only the test itself but also the corresponding access to processes for activation and fault localization. Access

to the activation process is necessary for all chiplet systems because if a system malfunctions at that stage, the only way to find out what went wrong is through destructive testing. Moreover, it is crucial that the cause of the fault be reasonably well pinned down, as the systems will then no longer be available for further tests. Standards governing fault localization are especially important for automotive applications, since meeting them is the only way to gain approvals from certification authorities.