CASE STUDY

Keysight Test Solutions Help Enflame Tech Accelerate AI Chip Post-Silicon Validation

Enflame Tech is a start-up company that designs artificial intelligence (AI) chipsets. Focused on the deep learning accelerator system on chip (SoC) and software stack, Enflame designs AI training platform solutions for cloud service providers and data centers. This SoC is designed explicitly for AI acceleration. It has a unique and innovative architecture to support mainstream deep learning frameworks and features high-performance computing, high energy efficiency, programmability, and low cost.

AI chipsets play a critical role in the latest technologies needed to support the deployment of the Internet of Things (IoT), AI, big data, and cloud computing. Revisions of high-speed digital interface standards and products continue to evolve quickly. For example, though PCIe 4.0 products just began commercial implementation, the PCI-SIG® recently announced version 5.0 of the PCI Express standard and PCIe 6.0 is currently on the agenda for future development.

Enflame selected Keysight as a strategic partner to provide the latest high-speed digital interface test solutions to accelerate product development. “By using Keysight’s total solution for PCIe 4.0 transmitter (Tx), receiver (Rx), and channel test, we can speed up the post-silicon validation. Keysight’s M8040A high-performance BERT also provides the upgrade path for PCIe 5.0, which can maximize our investment and help us with the development of products for the next generation,” said Bob Deng, senior director, product and system engineering, Enflame Tech.

Company:

- Enflame Tech, an AI chipset designer focused on the deep learning accelerator SoC and software stack
- Company’s focus is AI training platform solutions for cloud service providers and data centers

Key Issues:

- The design margin of PCIe 4.0 and PCIe 5.0 is shrinking; demanding higher signal integrity of the test solution including Tx, Rx, and channel test
- Solutions for PCIe 4.0 16 Gb/s and CCIX today, upgradeable to PCIe 5.0 32 Gb/s for the future

Solutions:

- Keysight DSAZ504A 50 GHz bandwidth scope
- Keysight M8040A high-performance BERT; also provides support for PCIe 5.0 Rx test in the future
- Keysight N5225B network analyzer for 16 Gb/s design and verification

Result:

- Accelerated the high-speed I/O validation of their SoC and improved its engineering efficiency by about 20%

KEYSIGHT TECHNOLOGIES

The Key Issues

Data throughput and transmission bandwidth of both devices and systems need to increase to support the latest applications such as big data and cloud computing. This includes artificial intelligence technologies necessary to support autonomous driving and 5G.

Enflame designs deep learning silicon chipsets and platforms that support PCIe 4.0 now, and PCIe 5.0 in the future. They need a test and measurement solution that supports their current test needs, as well as those they anticipate in the future as they develop next-generation products.

The PCI-SIG launched plans for the PCIe 5.0 specification immediately following the completion of PCIe 4.0 and recently announced plans for PCIe 6.0.

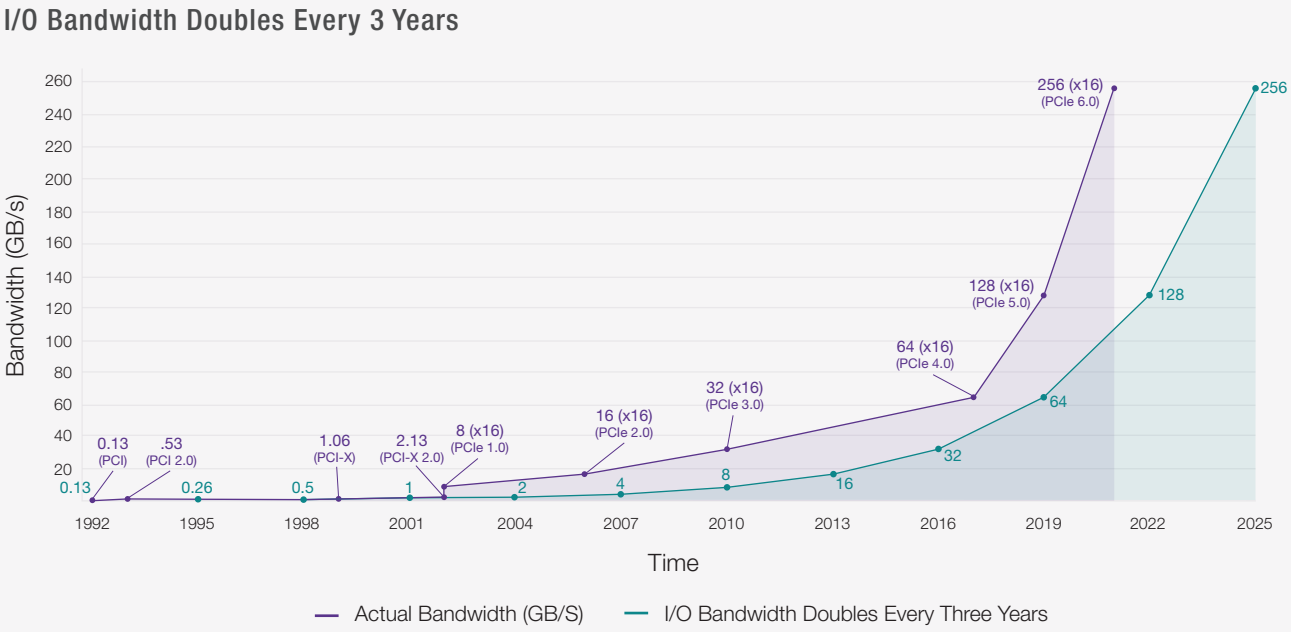

Figure 1. I/O BW doubles every three years

With I/O bandwidth doubling every three years, signals need to run at higher speeds, with faster edges, and lower amplitude. Design margins continue to decrease as the signal to noise ratio becomes difficult to differentiate. In high-speed serializer/deserializer (SerDes) designs, verification of the receiver, transmitter, as well as the channel are critical.

The Solution

Enflame used the following Keysight products for the research and development of its chipsets:

- DSAZ504A 50 GHz real-time oscilloscope
- M8040A high-performance BERT
- N5225B 50 GHz PNA

The recommended bandwidth for PCIe 4.0 16 Gb/s is 25 GHz and 50 GHz for PCIe 5.0. The DSAZ504A 50 GHz bandwidth oscilloscope is future proof to test PCIe 5.0. The M8040A high-performance BERT is also a scalable solution. Enflame configured the M8040A to test PCIe 4.0 16 Gb/s today. They can perform a software upgrade for 32 Gb/s bit error ratio (BER) test and even 32 Gbaud PAM4 test in the future.

Figure 2. DSAZ504A 50 GHz oscilloscope supports both PCIe 4.0 and PCIe 5.0 test

Test Setup Using M8040A 32G/64G High-Performance BERT

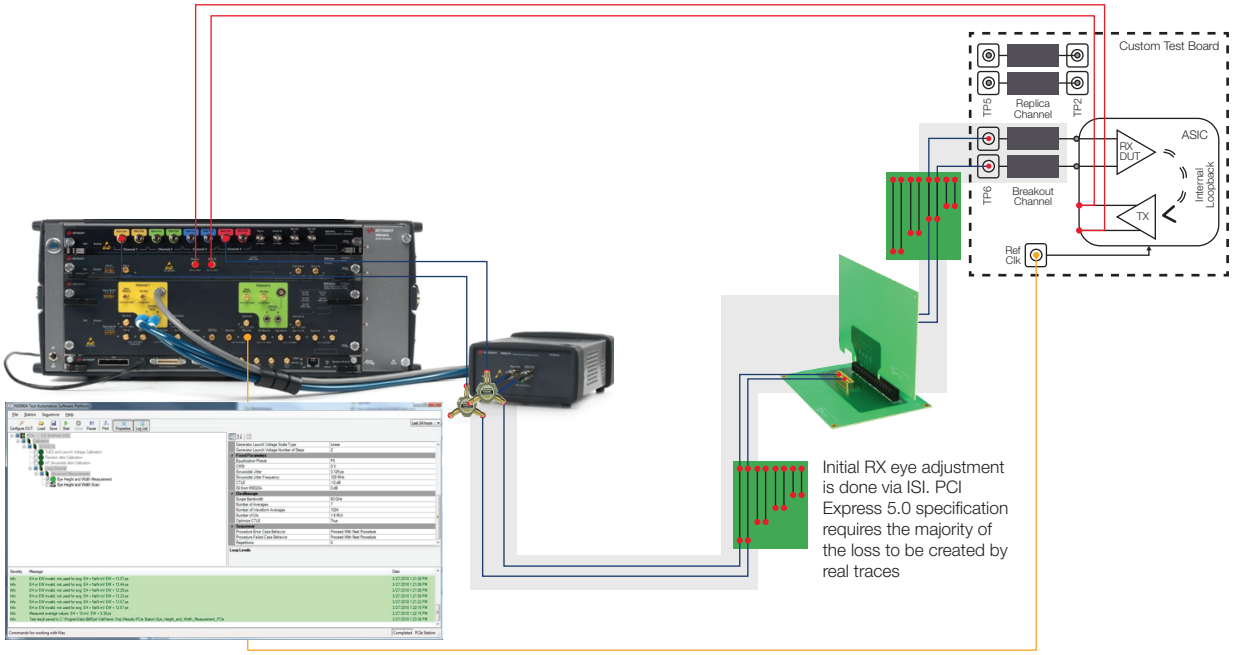

Figure 3. M8040A high-performance BERT supports PCIe 4.0 and PCIe 5.0

The N5225B 50 GHz PNA enabled Enflame to thoroughly test their high-speed signal channels, including insertion loss and return loss measurements.

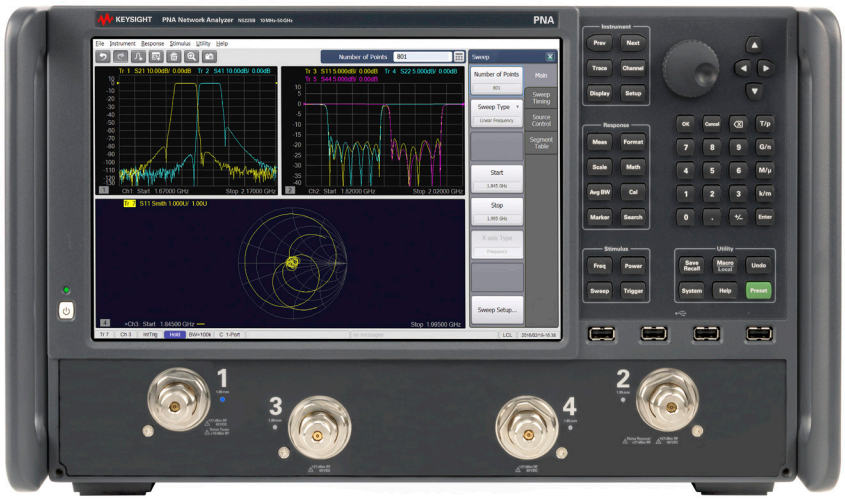

Figure 4. N5225B 50 GHz PNA for channel validation

Conclusion

As data centers migrate from 100GE to 200GE and 400GE to support emerging technologies, servers also need to upgrade from PCIe 3.0 to PCIe 4.0 and PCIe 5.0. With Keysight's state of the art test equipment, Enflame believes they can accelerate the high-speed I/O validation of their SoC and improve its engineering efficiency by about 20%. Since Keysight's test equipment already supports next-generation standards, Enflame ensures that their investment is future proof.

Related Links

- High-Speed Digital System Design
- PCI Express Solutions

Learn more at: www.keysight.com

For more information on Keysight Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at: www.keysight.com/find/contactus

KEYSIGHT TECHNOLOGIES