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.
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.

I/O Bandwidth Doubles Every 3 Years

![I/O Bandwidth Doubles Every 3 Years](image)

**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

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