DATASHEET

HD USB Device EDK with SpeedBridge Adapter

The Cadence® HD USB Device Emulation Development Kit (EDK) embeds a High-Density I/O SpeedBridge® Adapter to connect emulated USB 3.2 and 2.0 device designs to a real USB host-controller (xHCI). The HD USB device EDK supports USB 3.2 Gen2, Gen1, USB 2.0 and USB 1.1 in a single solution and allows efficient driver and application-level testing. Designed for pre-silicon RTL and integration of ASICs and systems on chip (SoCs), the solution can also reproduce post-silicon bugs, as the design runs in the actual target system. The solution verifies emulated designs with the actual ASIC/SoC software/hardware, driver development, and application development, and runs with existing USB software stacks and USB software test programs. Efficient and rapid adoption of the SpeedBridge Adapter is possible using the Cadence EDK platform, which provides a pre-validated, off-the-shelf, and data center-ready emulation server with the SpeedBridge Adapter pre-installed.

Pre-Validated, Off-the-Shelf Hardware Verification Solution

USB has become the world standard in connecting peripherals and mobile devices to PCs and each other. An off-the-shelf emulation solution for USB device designs, the HD USB device EDK offers fast bring-up times, a fast path to a sophisticated verification platform, and an easy connection to a modern server-class PC system running a variety of standard operating systems (OSs).

The HD USB device EDK targets SoC designs with USB 3.2 or USB 2.0 device controllers. The emulated USB device is compiled into the emulator and is connected to the HD USB device EDK externally using high-density I/O optical cables. At the device-controller emulation interface, the HD USB device EDK acts as the PHY transceiver to the USB device design under test (DUT). It allows the USB DUT to connect with a real USB xHCI controller and interact with its full software stack.

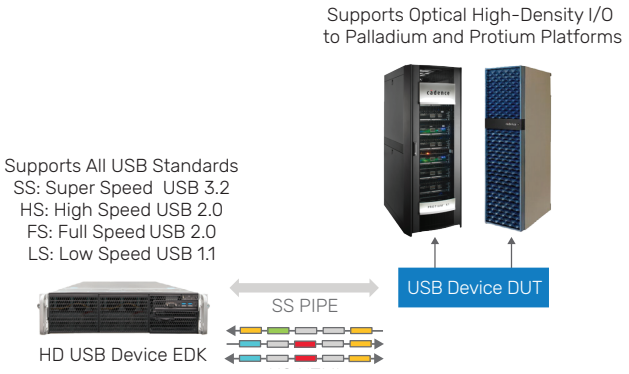

Figure 1: Cadence's HD USB Device EDK with SpeedBridge Adapter

The HD USB device EDK manages the link states as well as buffering data transferred between the USB device and the xHCI controller running in the EDK. It allows simultaneous traffic from USB 3.2, USB 2.0, and USB 1.1 SPLIT transactions, all over a single connection.

Cadence provides a scripting interface to allow analysis of the emulation-side protocol transactions in third-party testers. This allows detailed protocol analysis of huge streams of transactions flowing upstream and downstream between the Cadence Palladium® emulation system or Cadence Protium™ prototyping system and the real xHCI host controller. Once issues have been identified in the large, complex streams of data, it is then straightforward to use the extensive design debug capabilities of the Palladium or Protium series platforms.

The emulation interface supports the standard digital PIPE interface, universal transceiver macro interface (UTMI), or UTMI low pin interface (ULPI) that would normally connect to a USB transceiver. The HD USB device EDK provides the necessary virtualization of the USB transceiver so that an emulated device controller will connect and configure in a normal manner as if a real transceiver were being used.

With the high speed of in-circuit emulation, engineers can co-verify hardware and software together with USB application software. Engineers can use both hardware and software debug tools for ease of use and ease of debugging, so they don't sacrifice quality. They can use USB monitor and debug tools for their OSs to see low-level USB activities, performance testing, debug drivers, or application software. Cadence provides best-in-class hardware/software debug tools and methodologies.

Benefits

High-performance verification

- Offers highest verification performance over all other methods without abstracting out critical portions of a real system
- Offers high-end verification performance that does not scale down the verification performance when used with multiple ports or multiple interconnect technologies
- Provides the fastest overall system-level verification performance when running a complete top-to-bottom real system environment

Rapid verification deployment

- Provides a pre-validated emulation interface fully compatible with the Palladium and Protium series platforms
- Enables rapid creation of system-level environments using the same hardware and software that the real silicon will use
- Rack-mountable HD USB device EDK system can be deployed in data centers as a virtual resource connected to the verification platform
- Provides a dynamically relocatable resource that is accessible by remote users when used with the Palladium platform
- Allows rapid and efficient design verification
- Fiber-based connection for flexible and robust data center deployment

Verification IP reuse

- Allows reuse between projects due to standards-compliant interfaces
- Eliminates re-implementation of custom, per project verification environments
- Improves productivity by getting the design running quickly without weeks or months of specialized test environment creation—the real EDK system and the xHCI controller are the test environment

Ensured quality

- Tested and verified by Cadence against independent verification IP and other user designs
- Built on top of mature SpeedBridge technology that has been deployed in many emulation environments over many years
- Allows use of standard third-party protocol analysis software

Debug capabilities

- Provides Cadence standard SpeedBridge configuration module access and remote control over standard IP networks
- Supports Cadence standard SpeedBridge View GUI access for easy control and debug

Reduced system risk

- Performs PIPE, ULPI, or UTMI interface testing at the physical level
- Runs full system enumeration connected to a real host controller in a real server PC
- Runs in standard OSs
- Does not abstract away low-level system connection issues that arise with real chipsets
- Runs the entire system-level suite, just as the design silicon will have to do when it is deployed, providing a necessary part of modern system verification
- Allows interaction with multiple system-level interconnects such as PCI Express® (PCIe®) and Ethernet, all in the same verification environment and without impacting verification performance

Features

- Supports standard SuperSpeed 3.2 Gen 2/1 PIPE
- Supports standard UTMI+ Interface to Peripherals (no OTG)
- Supports standard ULPI Interface to peripherals
- Supports PIPE 32-bit/16-bit/8-bit interfaces
- Supports ULPI/UTMI 8-bit/16-bit unidirectional/ bidirectional interfaces
- Connects to verification systems using direct connect optical fiber
- PIPE/UTMI/ULPI interfaces are presented to the compiled design to look like a standard USB 3.2/2.0/1.1 PHY
- Models a virtual back-to-back PHY connection to the host controller in the SpeedBridge Adapter
- Host controller uses a standard xHCI USB 3.2 register set, as viewed from the host system
- Supports Windows, Linux RHEL, CentOS, and other OSs with standard USB xHCI driver support
- Supports CONTROL, BULK, and INTERRUPT endpoint transactions
- Supports standard USB 3.2 transaction packets (TP), data packets (DP), and link management packets (LMP)
- Supports standard USB 3.2 Gen 2/1 LTSSM link training
- Supports USB 2.0 / 1.1 link and standard power modes, including SUSPEND / RESUME signaling

Cadence Services and Support

- Cadence application engineers can answer your technical questions by telephone, email, or internet—they can also provide technical assistance and custom training.
- Cadence-certified instructors teach more than 70 courses and bring their real-world experience into the classroom.
- More than 25 Internet Learning Series (iLS) online courses allow you the flexibility of training at your own computer via the internet.
- Cadence Online Support gives you 24x7 online access to a knowledgebase of the latest solutions, technical documentation, software downloads, and more.
- For more information, please visit www.cadence.com/support for support and www.cadence.com/training for training.

cadence®

Cadence is a pivotal leader in electronic design and computational expertise, using its Intelligent System Design strategy to turn design concepts into reality. Cadence customers are the world's most creative and innovative companies, delivering extraordinary electronic products from chips to boards to systems for the most dynamic market applications. **www.cadence.com**

14034 03/20 SA/RA/PDF