DATASHEET

HD USB Host EDK with SpeedBridge Adapter

System emulation under real-world operating conditions

The Cadence® High-Density (HD) USB Host Emulation Development Kit (EDK) embeds a High-Density I/O SpeedBridge® Adapter to connect real USB 3.2 and 2.0 devices to emulated host-controller designs. The EDK supports USB 3.2 Gen 1, USB 2.0, and USB 1.1 in a single solution that 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 through the use of the Cadence Emulation Development Kit (EDK) platform that provides a pre-validated, off-the-shelf, 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 Host-Controller designs, the HD USB Host EDK offers fast bring-up times, a fast path to a sophisticated verification platform, and an easy connection to real, modern USB peripherals such as SSDs, storage, keyboard and mouse, and mobile devices.

The HD USB Host EDK targets SoC designs with USB 3.2 or 2.0 host-controllers. The emulated USB host is compiled into the emulator and is connected to the HD USB Host EDK externally using high-density I/O optical cables. At the host-controller emulation interface, the HD USB Host EDK acts as the PHY transceiver to the USB Host design under test (DUT). It allows real USB 3.2 and 2.0 devices such as SSDs, hubs, mobile phones, tablets,

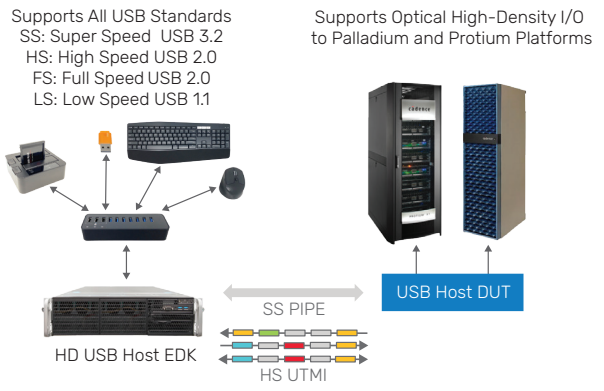

Figure 1: Cadence's HD USB Host EDK with SpeedBridge Adapter

USB flash drives, cameras, and printers to connect and communicate with the emulated USB host-controller.

The HD USB Host EDK manages the link states as well as buffering data transferred between the USB host and devices. It allows SuperSpeed hubs to connect to the HD USB Host EDK system and then permits simultaneous traffic from USB 3.2, USB 2.0, and USB 1.1 SPLIT transactions, all over a single connection.

A typical USB protocol exerciser/analyzer can be connected to the USB host design in the emulator via the HD USB Host EDK to analyze USB traffic or provide device emulation, timing analysis, and high-level protocol decoding. 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® or Protium™ series platforms and the real USB devices. 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 Host EDK provides the necessary virtualization of the USB transceiver so that an emulated host-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 debug, so they don't sacrifice quality. They can use USB monitor and debug tools for their operating systems 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 Host 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
- Provides fiber-based connection for flexible and robust data center deployment

VIP 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 USB devices are the test environment
- Allows use of standard third-party protocol analysis software

Ensured quality

- Tested and verified by Cadence against independent verification IP (VIP) and other user designs
- Built on top of mature SpeedBridge technology that has been deployed in many emulation environments over many years

Debug capabilities

- Provides a remote-controlled switch capability to allow the real USB devices to be connected directly to the EDK Host system for configuration and data management, without the need for physical access
- 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 real USB devices
- Runs in standard operating systems
- 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 performance

Features

USB 3.2 Gen 1	
Feature	Status
SuperSpeed link training Enumeration Normal Transactions	Supported
Link Layer full support except Compliance and Loopback	Supported
Protocol Layer full support	Supported
Interface with Emulation PIPE 32/16/8	Supported
CONTROL and BULK Endpoints	Supported
INTERRUPT Endpoints	Limited[1]
ISO Endpoints	Limited[1]
USB 3.2 Gen 1 Hub and SS Devices	Supported[2]
OTG	Not Supported

USB 2.0	
Feature	Status
HS/FS/LS Handshake+ Enumeration+ Normal Transaction	Supported
Link Layer full support except LPM L1	Supported
Protocol Layer full support including SPLIT transactions[3]	Supported
Emulation interfaces: UTMI 8-bit/16-bit+Uni/Bidi UTMI+ Level-1 HS/FS UTMI+ Level-2 HS/FS/LS ULPI 8-bit	Supported
CONTROL + BULK Endpoints	Supported
INTERRUPT Endpoints	Limited[1]
ISO Endpoints	Limited[1]
USB 2.0 Hub + High-Speed Device	Supported
USB 2.0 Hub + Full/Low-Speed Device (requires Split Transaction)	Supported
FSLSSerial Mode Non UTMI	Not Supported
USB1.x Hubs UTMI+ Level3	Not Supported
OTG	Not Supported

1. Periodic packets reallocated on the bus

2. Supports up to four SuperSpeed USB devices

3. SPLIT transaction capability allows a USB 2.0 hub with full-speed/low-speed devices, e.g., a keyboard and mouse

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 24×7 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**

© 2020 Cadence Design Systems, Inc. All rights reserved worldwide. Cadence, the Cadence logo, and the other Cadence marks found at www.cadence.com/go/trademarks are trademarks or registered trademarks of Cadence Design Systems, Inc. PCI Express and PCI are registered trademarks or trademarks of PCI-SIG. All other trademarks are the property of their respective owners.
13625 03/20 SA/RA/PDF