

OVERVIEW

The **Genie-SSU** USB 3.0 Verification IP Products are the industry's most advanced verification solution for USB 3.0 based designs. The intelligent **Verification Engine** provides a full timing based bus functional model (BFM) for automatic constrained-random stimulus generation and protocol checking. It has a powerful Error Injector and extensive list of callbacks. A unique **Interface Inspector** provides the monitoring, checking, and scoreboarding capability along with protocol compliance, functional coverage and error reporting. A comprehensive **Compliance Suite** is available with test cases for complete verification including corner cases which relieves engineers from the need to manually write tasks. This provides the Perfect combination of tools to ensure design success.

The **Genie-SSU VIP** provides a quick and efficient way to verify any USB 3.0 based design – Host, Device, Hub or PHY. It supports the USB 3.0 specification and tests all layer levels of the USB 3.0 design – PHY, Link and Protocol. Genie-SSU provides a complete verification solution that includes multi-language support and OVM and VMM methodology.

The Genie-SSU VIP provides:

- Bus Functional Models
- Protocol Checker
- Protocol Monitor
- Scoreboard
- Report Generator
- Error Injector
- Extensive Functional Coverage
- Callback Capability



Fig. 1: Example Device Design Verification

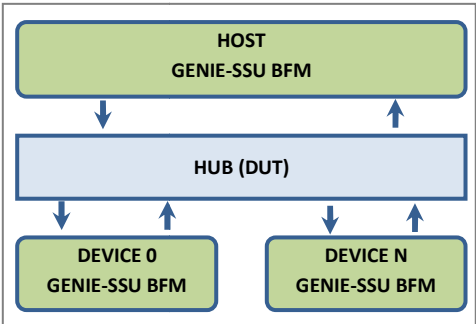


Fig. 2: Example Hub Design Verification

FEATURES

❖ Complete Functional USB 3.0 Verification - Host, Device, Hub & PHY	❖ Configurable for 0 to n endpoints
❖ Compliant to USB 3.0 specification	❖ System level and block level testing
❖ Operates at Super Speed USB rate of 5 GHz	❖ Supports USB 3.0 PIPE ver. 1.0 specification
❖ Automatic handling of Protocol, Link and PHY layer packets	❖ Automatic /user configurable generation of flow control packets
❖ Full Link Training & Status State Machines (LTSSM)	❖ Configurable packet size for data packet payloads
❖ Automatic /user configurable generation of isochronous time stamp packets (host configuration)	❖ Supports all USB transactions: Control, Isochronous, Interrupt, Bulk and Bulk Streaming
❖ Automatic /user configurable generation of all LMP packets	❖ Supports randomization for all BFM Knobs and error injections
❖ Supports Power Management : i. Low power mode enable/disable (U1/U2) ii. Suspend (U3) iii. Active state (U0) iv. Resume/Remote Wakeup	❖ Hub configuration support: i. Packet generation directed for Hubs ii. LMP packet generation iii. Data transactions to device connected to Hub iv. Generation/storing of Hub specific descriptors v. Control transactions specific to Hub
❖ Configurable TS1, TS2, TSEQ, SKP ordered set generation	❖ Supports Loopback
❖ Support for generation of all link commands	❖ Supports LFPS signal generation and detection
❖ Multiple Language Interface – SystemVerilog and Verilog	❖ Supports UVM and OVM
❖ Comprehensive Compliance Suite	❖ Easily integratable into any environment

PRODUCT DETAILS

USB Host

The Genie-SSU Host VIP provides a full timing, bus functional model (BFM) that operates at 5 Gbps, SuperSpeed rates. The BFM initiates data transfer cycles and emulates the interface. The programmable Error Injector permits errors to be inserted at any layer of the protocol.

- Host performs bus enumeration and allocates independent USB pipes for communication flow
- Program TP sequences for Bulk, Isochronous, Interrupt, Bulk Stream, and Control transfer types

USB Device

Like the Genie-SSU Host, the Genie-SSU Device supports all the features and functions of the USB 3.0 device specification. Multiple instantiations of the device model can be configured in the simulation environment to connect to a USB hub design.

- Program USB Device requests to access USB device descriptors
- Support from 0 to N endpoints – each endpoint programmed separately
- Supports automatic response to all transaction types
- User configurable flow control – generation of ERDY and NRDY packets

USB PHY

Integrated into the Host and Device BFM, the USB PHY model provides accurate modelling at the serial or PIPE interface.

- Connect to RTL (MAC) on PIPE and PHY on serial side
- Clock and data recovery (SERDES)

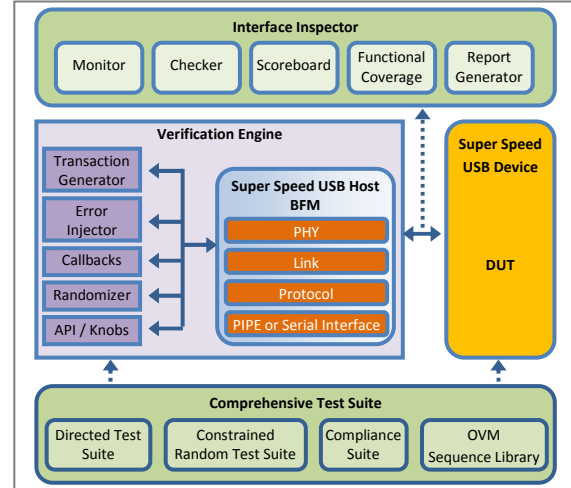


Fig. 3: SuperSpeed USB Device DUT

- 8b/10b encoder/decoder
- Elasticity buffer
- Serial transmission/reception at 5 GHz

USB Interface Inspector

An enhanced protocol checker and monitor with built in coverage features; it can be integrated into any USB 3.0 verification environment, between upstream and downstream ports.

- Checks for protocol compliance and flags violations
- Generates bus performance summary and transaction statistics
- Performs functional/feature/error/protocol compliance coverage

BENEFITS

- | | |
|--|--|
| ❖ Guarantees compliance to USB 3.0 specifications with ECN | ❖ Enable faster testbench development and complete USB design verification |
| ❖ Plug-and-play into all major simulation environments | ❖ Ensure first pass design success |
| ❖ Reduces risk to design flaws | ❖ Reduces overall design and verification costs |

USB 3.0 COMPLIANCE SUITE	USB 3.0 SOLUTIONS
<p>Developed by PerfectVIPs to thoroughly exercise USB 3.0 designs, the compliance suite is an advanced verification test suite that provides hundreds of test cases.</p> <ul style="list-style-type: none"> ▪ Verifies all layers of USB 3.0 designs ▪ Provides comprehensive design coverage targeted at Protocol, Link & PHY layers ▪ Unified customizable message formatting and reporting ▪ Inject error at all layers ▪ Pre-built cover groups for functional coverage analysis ▪ Powerful and flexible pre-built OVM sequence libraries for generating test scenarios for coverage driven verification ▪ Pre-built constraint library which allows constrained random stimulus generation ensuring robust verification ▪ Developed with actual customer designs 	<p>Developed by PerfectVIPs to address all USB 3.0 architectures, the following USB 3.0 SuperSpeed solutions are available.</p> <p>Verification IP:</p> <ul style="list-style-type: none"> ▪ USB 3.0 Host VIP ▪ USB 3.0 Device VIP ▪ USB 3.0/2.0 Host VIP ▪ USB 3.0/2.0 Device VIP ▪ USB 3.0 Interface Inspector <p>Compliance Suites:</p> <ul style="list-style-type: none"> ▪ USB 3.0 Host Compliance Test Suite ▪ USB 3.0 Device Compliance Test Suite ▪ USB 3.0 Hub Compliance Test Suite <p>Supported Simulators</p> <ul style="list-style-type: none"> ▪ Aldec, Cadence, Mentor and Synopsys