

IEEE Standard for SystemVerilog— Unified Hardware Design, Specification, and Verification Language

IEEE Computer Society
and the
IEEE Standards Association Corporate Advisory Group

Sponsored by the
Design Automation Standards Committee

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USA

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(Revision of
IEEE Std 1800-2009)

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Abstract: The definition of the language syntax and semantics for SystemVerilog, which is a unified hardware design, specification, and verification language, is provided. This standard includes support for modeling hardware at the behavioral, register transfer level (RTL), and gate-level abstraction levels, and for writing testbenches using coverage, assertions, object-oriented programming, and constrained random verification. The standard also provides application programming interfaces (APIs) to foreign programming languages.

Keywords: assertions, design automation, design verification, hardware description language, HDL, HDVL, IEEE 1800™, PLI, programming language interface, SystemVerilog, Verilog®, VPI

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Introduction

This introduction is not part of IEEE Std 1800-2012, IEEE Standard for SystemVerilog—Unified Hardware Design, Specification, and Verification Language.

The purpose of this standard is to provide the electronic design automation (EDA), semiconductor, and system design communities with a well-defined and official IEEE unified hardware design, specification, and verification standard language. The language is designed to coexist and enhance the hardware description and verification languages (HDVLS) presently used by designers while providing the capabilities lacking in those languages.

SystemVerilog is a unified hardware design, specification, and verification language based on the Accellera SystemVerilog 3.1a extensions to the Verilog hardware description language (HDL) [B3], published in 2004.^a Accellera is a consortium of EDA, semiconductor, and system companies. IEEE Std 1800 enables a productivity boost in design and validation and covers design, simulation, validation, and formal assertion-based verification flows.

SystemVerilog enables the use of a unified language for abstract and detailed specification of the design, specification of assertions, coverage, and testbench verification based on manual or automatic methodologies. SystemVerilog offers application programming interfaces (APIs) for coverage and assertions, and a direct programming interface (DPI) to access proprietary functionality. SystemVerilog offers methods that allow designers to continue to use present design languages when necessary to leverage existing designs and intellectual property (IP). This standardization project will provide the VLSI design engineers with a well-defined IEEE standard, which meets their requirements in design and validation, and which enables a step function increase in their productivity. This standardization project will also provide the EDA industry with a standard to which they can adhere and that they can support in order to deliver their solutions in this area.

^aThe numbers in brackets correspond to those of the bibliography in [Annex Q](#).

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Part One: Design and Verification Constructs

IEEE Standard for SystemVerilog— Unified Hardware Design, Specification, and Verification Language

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1. Overview

1.1 Scope

This standard provides the definition of the language syntax and semantics for the IEEE 1800™ SystemVerilog language, which is a unified hardware design, specification, and verification language. The standard includes support for behavioral, register transfer level (RTL), and gate-level hardware descriptions; testbench, coverage, assertion, object-oriented, and constrained random constructs; and also provides application programming interfaces (APIs) to foreign programming languages.

1.2 Purpose

This standard develops the IEEE 1800 SystemVerilog language in order to meet the increasing usage of the language in specification, design, and verification of hardware. This revision corrects errors and clarifies aspects of the language definition in IEEE Std 1800-2009.¹ This revision also provides enhanced features that ease design, improve verification, and enhance cross-language interactions.

1.3 Content summary

This standard serves as a complete specification of the SystemVerilog language. This standard contains the following:

- The formal syntax and semantics of all SystemVerilog constructs

¹Information on references can be found in [Clause 2](#).