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IEEE Standard for Extensions to Standard Test Interface Language (STIL) (IEEE Std 1450™-1999) for Test Flow Specification

IEEE Computer Society

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Test Technology Standards Committee

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IEEE Std 1450.4™-2017

IEEE Standard for Extensions to Standard Test Interface Language (STIL) (IEEE Std 1450-1999) for Test Flow Specification

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Test Technology Standards Committee
of the
IEEE Computer Society

Approved 6 December 2017

IEEE-SA Standards Board

Abstract: IEEE Std 1450™-1999, which specifies the Standard Test Interface Language (STIL), is extended by this standard to provide an interface between test generation tools and test equipment with regard to the specification of the flow of execution of test program components. It defines structures so that test flows, sub-flows, and binning may be described in a manner that facilitates automated generation, modification, and/or manual maintenance and, although not yet a complete run-time test language, execution on automated test equipment (ATE). It also defines an interface between tester configurations (described by IEEE Std 1450-1999 and IEEE Std 1450.2™-2002) and test program components. It also defines a hierarchy of flows, sub-flows, and test components as well as structures for defining flow-related variables and processing expressions involving those variables. It provides structures that support automatic test program generation (ATPRG) and translation and that support running it natively as an ATE programming language. As an adjunct, IEEE Std 1450.3™-2007 may be used by ATPRG for tester rules checking.

Keywords: ATPG, ATPRG, automatic test program generator or generation, binning, CAE, computer-aided engineering, device under test, DUT, IC test, IEEE 1450.4™, integrated circuit test, test flow, test program description, test program language, TPG

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PDF: ISBN 978-1-5044-4643-3 STD22970
Print: ISBN 978-1-5044-4644-0 STDPD22970

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Introduction

This introduction is not part of IEEE Std 1450.4-2017, IEEE Standard for Extensions to Standard Test Interface Language (STIL) (IEEE Std 1450-1999) for Test Flow Specification.

This document is part of a set of IEEE 1450 standards, which cover the Standard Test Interface Language (STIL).

More specifically, this standard (STIL.4) extends IEEE Std 1450™-1999 (STIL.0) to provide an interface between test generation tools and test equipment with regard to the specification of the flow of execution of test program components. It defines

- Structures so that test flows, sub-flows, and binning may be described in a manner that facilitates automated generation, modification, and/or manual maintenance and, although not yet a complete run-time test language, execution on automated test equipment (ATE).
- An interface between tester configurations [described by STIL.0 and IEEE Std 1450.2™-2002 (STIL.2)] and test program components.
- A hierarchy of flows, sub-flows, and test components.
- Structures for defining flow-related variables and processing expressions involving those variables.
- Structures that support automatic test program generation (ATPG) and translation and that support running it natively as an ATE programming language. As an adjunct, IEEE Std 1450.3™-2007 (STIL.3) may be used by ATPRG for tester rules checking.

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1. Overview

1.1 General

Standard Test Interface Language (STIL) is a standard language that provides an interface between digital test generation tools and test equipment. This standard, referred to as STIL.4, extends IEEE Std 1450™-1999 (STIL.0) to define test flows, enable STIL to tester-language translation, and provide hooks for automatic test program generation (ATPRG).[1]

Test flows direct the execution and sequence of tests. STIL.4 defines TestProgram, Flow, FlowNode, Test, Bin, and FlowVariable blocks to support the definition of test flows. The STIL.4 TestProgram block invokes the test sequence that involves other STIL.4 blocks and references constructs from other STIL standards to create a complete flow. Test operations are defined down to the TestMethod or TestType/Test constructs, which identify invocation but not execution of specific test operations. Figure 1 diagrams the interaction of other STIL standards with STIL.4; when present, a STIL.4 TestProgram identifies the top of the STIL hierarchy.

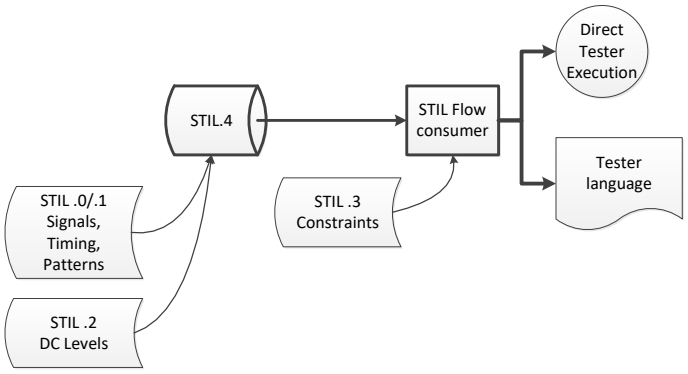

Figure 1— Diagram: STIL flow contents and application

[1] Information on normative references can be found in Clause 2.

STIL.4 supports multiple contexts of use as indicated in Figure 1. Some contexts leverage the ability to use predefined tester interfaces, and the definition of the flow can be specific to that context, in which case the STIL constructs are often directed for this specific context. Other contexts, such as ATPRG usage, require comprehensive and concise semantics in order to translate between tester environments. Not specific to context, STIL.4 identifies two levels of language use, identified with the STIL statement extensions Flow or FlowExtended.

Figure 2 shows a data flow envisioned for ATPRG using STIL. The goal is to, as comprehensively as possible, use STIL as a conduit for automatically generating test programs and retargeting them, i.e., moving them from one tester and/or test environment to another. Retargeting requires special considerations that are not addressed by this standard. Testers X and Y run STIL as the native language. Tester Z runs a proprietary language. Arrows from testers X and Y to ATPRG support incremental test program development.

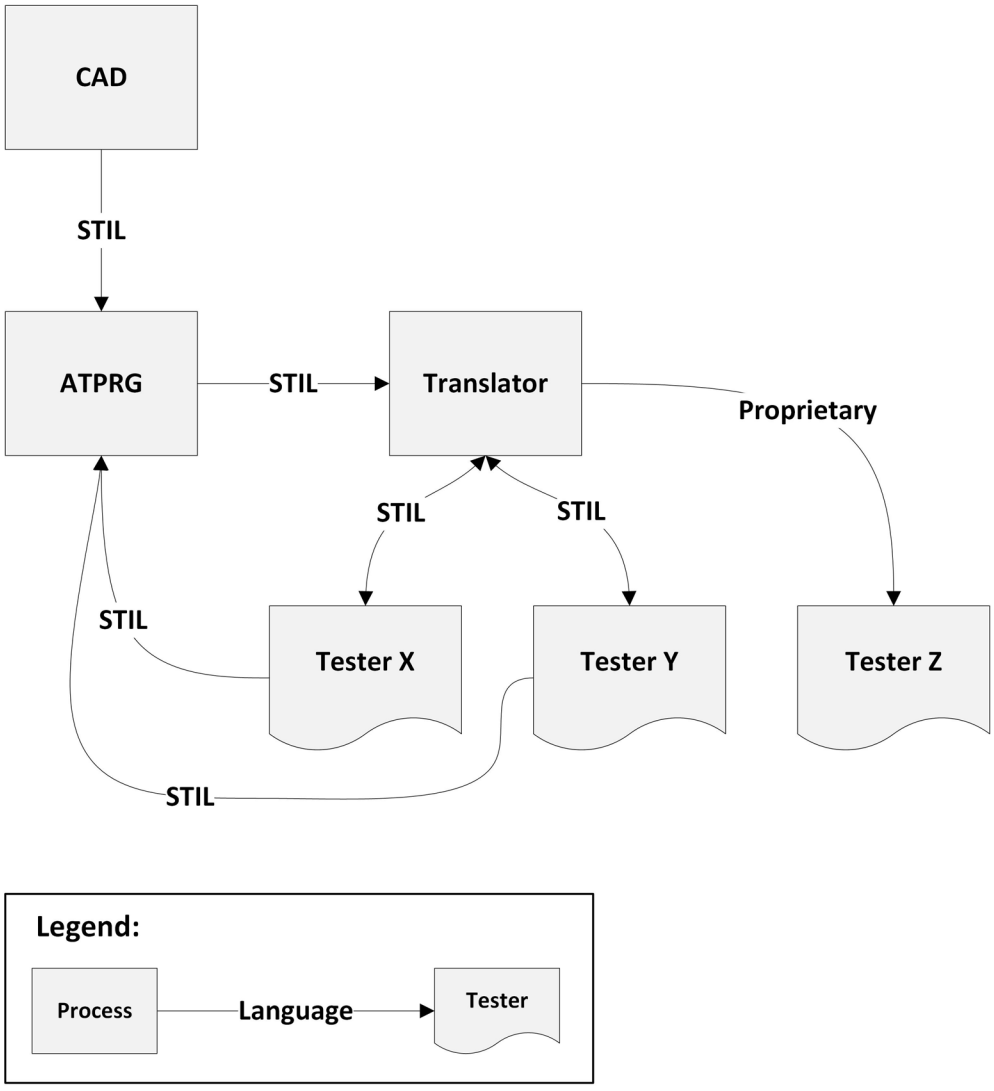

Figure 2—Diagram: ATPRG STIL data flow

1.2 Scope

This standard specifies extensions to STIL.0 that define the description of certain test flow and binning components of an integrated circuit (IC) test program in a test-hardware-independent manner. These extensions provide language constructs and semantics necessary to describe both the test program flow and the sequencing data needed to compose a test program to run on an automated test equipment (ATE) platform. The language constructs defined include structures for specifying the following:

- Order of execution of test program components
- Hierarchical test flow structures to facilitate automated modification or maintenance
- Common interfaces between the test flow environment and test program components
- Test flow variables to facilitate concurrent and serial test flow interactions
- Binning or categorization of tested ICs

The following aspects integral to test execution are specifically not addressed by this standard:

- The standardization of the interface between the prober or handler and tester is beyond the scope of STIL.4. STIL.4 requires that appropriate `AsynchronousEvent` signals shall be issued to the `TestProgram` triggering the corresponding entry-points.
- Input/output operations and exception handling.
- The definition of TestMethods is beyond the scope of this standard.

1.3 Purpose

STIL is the standard for the interchange of digital test data from the test generation environment (where a great deal of design information is used to generate device tests) to the test and manufacturing environment. The initial STIL standard (IEEE Std 1450-1999) addresses the essential digital test description information (i.e., signals, timing, vectors, and parameter specifications). Other aspects needed for testing devices are provided in extension activities such as this standard, which addresses test flow extensions to STIL.

The flow and binning constructs in this extension allow for developing a test program description in a common language; this common description can either be used as input to a test program generator that translates the description into the native language of specific IC ATE systems or be run directly on IC ATE systems that use IEEE 1450.4 as their native language.

2. Normative references

The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used, so each referenced document is cited in text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.

IEEE Std 754™-2008, Standard for Floating-Point Arithmetic. [2,3]

IEEE Std 1450™-1999, IEEE Standard Test Interface Language (STIL) for Digital Test Vector Data.[4]

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[3] IEEE publications are available from The Institute of Electrical and Electronics Engineers (http://standards.ieee.org/).
[4] This standard combined with IEEE Std 1450.2 and IEEE Std 1450.4 can be used to describe the minimum information required to generate a test program, i.e., timing, levels, patterns, and flow.