

VSI Alliance™

Virtual Component Identification Physical Tagging Standard

(IPP 1 3.0)

**Intellectual Property Protection
Development Working Group**

Released June 2000

Revision June 19, 2000

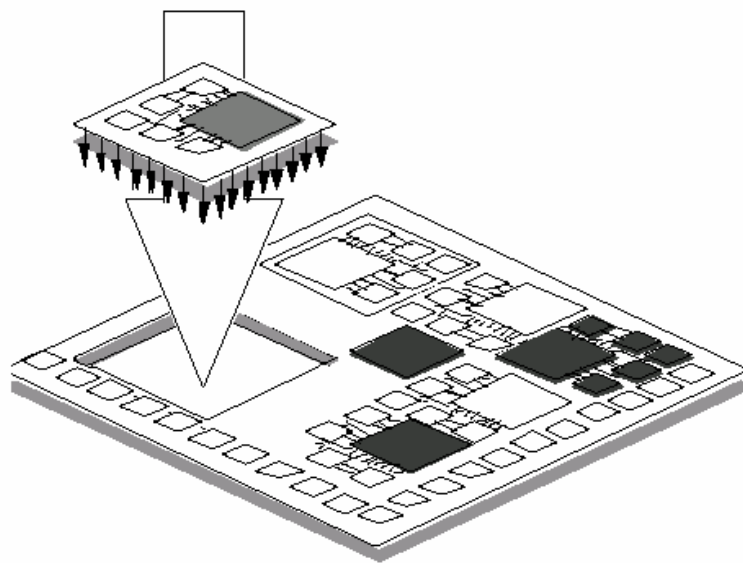
Draft revision April 5, 2004

DWG revision April 14, 2004

DWG revision April 28, 2004

Revision 2.0 Released June 2004

Revision 3.0 Released June 2006



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**Virtual Component Identification
Physical Tagging Standard
Development Working Group
Version 1 3.0**

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Revision History

Version 0.1 John G. Malecki, Initial version created 1999-10-17 for DWG review.
Version 1.0 S. Baker, Formatted Document 15Nov99
Version 1.0 Ian Mackintosh, Edited for TC approval 29Nov99
Version 1.0 S. Baker, Edited for Member Review 31Jan00
Version 1.0 S. Baker, Formatted for TC Review 18Apr00
Version 1.0 S. Baker, Formatted for Board Review - inserted H. Leeds edits from March-25Apr00
Version 1.0 W. Schroers, Copy Edited 01May00
Version 1.0 S. Baker, Formatted for Board Review - inserted W. Schroers edits 24May00
Version 1.0 S. Baker, Formatted for Final Release 9Jun00
Version 1.1 Draft John G. Malecki, edited by Kurt Woodland 22Nov03
Version 1.2 Draft John G. Malecki, edited by Kurt Woodland 12Jan04
Version 1.3 Draft John G. Malecki, edited by Kurt Woodland 5April04
Version 1.4 Draft John G. Malecki, edited by Kurt Woodland 5April04
Version 1.5 Draft John G. Malecki, edited by Kurt Woodland 6April04
Version 2.0DWG John G. Malecki, edited by Kurt Woodland and Ian Mackintosh 14April04
Version 2.0DWG John G. Malecki, edited by Kurt Woodland 28April04
Version 2.0 Ian Mackintosh, released following Member Review 30June04
Version 3.0 Ken Danti, released following pillar approval 30June06

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1. Overview

1.1 Scope and Field of Use

This standard provides semiconductor foundries and providers of virtual components with an automated and succinct means to track the use of IPs through the fabrication processes. This is accomplished by the use of tracking information embedded by IP providers in a Graphical Design System II-Stream (GDSII-Stream) file. This standard addresses only the tracking of IPs through the fabrication processes. This standard does not consider protection of the intellectual property (IP) within the component. The specified tracking mechanism is not secure. It is susceptible to tampering and is intended only to facilitate the passing, use and sharing of information among honest IP users and IP providers; nevertheless, its existence does afford a very low-level form of security.

1.2 Benefits

With the expanding use of IPs, it is now possible to create and realize semiconductor designs more quickly. This increased use of IPs also increases the need to know whose property is being included in these designs and what key information is being provided about that property. This standard provides the means of tracking and reporting such information easily and effectively.

As specified herein, a standard GDSII-Stream IP tracking format allows a foundry to use a single tool to examine a chip database and obtain a report of all the IPs that are present and tagged as prescribed by this standard. The resulting report contains defining information about ownership of the IP. This capability simplifies the work of the foundry and the IP developer in tracing and recording use of the IP.

1.3 Referenced Intellectual Property

This standard specifies the use of the GDSII-Stream format, which is owned by Cadence Design Systems, Inc. The use of this format within the field of use of this standard is licensed, at no cost, to users of this standard. The license can be found as “GDSII License” on the VSI Alliance website at www.vsi.org.

1.4 Definitions of Terms

BNF Backus-Naur Form (also Backus Normal Form)

GDSII-Stream	The property of Cadence Design Systems, Inc.
Metric	A parameter used to judge the value of a IP. This normally refers to area (in square microns), but may be any other parameter related to cost or value as selected by a vendor and/or foundry.
Tag	Text data embedded in a file that provides additional information required for business reporting (rather than manufacturing).
Tagging	The process of annotating a GDSII-Stream file with a Text Tag.
IP	Intellectual Property, specifically electronic design or silicon
VSIA	VSI Alliance, Incorporated

The terms used in the stream file scripts in this standard are defined in the “GDSII Description” (Appendix A Stream Format) located on the VSI Alliance web site at www.vsi.org.

1.5 Methodology

Providers of virtual components and/or CAD software may use this document to enhance their products by allowing them to be tracked by this industry standard methodology. Semiconductor foundries may use this industry standard methodology to scan all GDSII-Stream databases, which they fabricate. The tool will report the vendor of the physical components, product name and version. The foundry can use this information to improve its business mechanisms for tracing and reporting IP use when dealing with customers, partners and suppliers.

1.6. Relationship to Soft IP Tagging Standard

This specification deals with the tagging of "Hard IP", that is a virtual component or intellectual property that has been delivered to a customer in GDS II (or, Physical) form. A companion specification the "Virtual Component Identification Soft IP Tagging Standard" deals with the tagging of Virtual Components or intellectual property that has been delivered to a customer in RTL, gate level netlist, or script form. These two tagging specifications are compatible and result in information being stored in the GDS II file as a series of text lines. The two standards are compatible and complementary.

2. Specifications

This section specifies the encoding of information indicating the ownership of IP into the physical description of the IP, such that the ownership can be tracked and reported during the semiconductor fabrication processes. There is no practical limit to the number of instances, Vendors or IPs that can be tagged and tracked on a given IC design.

2.1 Required Information

Information must be encoded into the physical description of an IP so the semiconductor foundry can produce a report of the parameters indicating the ownership of the IP. The GDSII-Stream format is used for this purpose. This format's encoding mechanism allows for an arbitrary number of fields. The encoding must have at least the fields indicated in Table 1. These fields provide anyone reading the tags with the basis to produce a report containing the minimum required information prescribed by this standard for the tags listed below.

Table 1: Keywords

Keyword	Value
Vendor	A string indicating the IP vendor.
Product	A string indicating the IP product name.
Version	A string indicating the IP product's version.
Metric	A string representing a floating point number.
IP_Owner	A string indicating the IP Owner or creator organization within the vendor company
Techno	A string indicating the required process technology information for proper IP function
Area	A string indicating the IP area as a floating point number
Celltype	A string indicating the IP type of cell LIB = library component IP = IP Block LEAF = non critical sub-cell of an IP/LIB block
Cell_Id	A string indicating the IP cell name
Signature	A string indicating the IP layout checksum or signature to be developed
Tag_Spec	A string indicating the specification version used to defining tags used
Date_Time	A string indicating the date when IP was tagged YYYYMMDD

Please note that the GDSII-Stream specification limits the string length to a maximum of 512 characters. Please note that this limitation includes the keyword, spaces, and the special "& " characters. Keywords should never contain any whitespace within its name.

2.2 Optional Information

Users are allowed to add optional information fields. The keywords for these optional fields must begin with the _ character (the under-score) directly before the keyword name with no space. There should never be a space in the keyword name. There is always a space after the &. For example:

& _BitCellRevision 2.47

2.3 Encoding Mechanism

The information encoding mechanism allows for arbitrary keywords and values. The GDSII-Stream record type STRING is used to hold this keyword information. The tracking information is recognized by the first 2 characters of the string containing being "& ". There is always space after the "&". The string itself will always look like:

& Vendor Company Full Legal Name

If the first character of a string begins with the reserved character '&' followed by a space, then the expected sequence following the space is keyword, space, value. The reserved keywords are "Vendor," "Product," "Version," and "Metric." The Vendor string should include the complete legal name, including Inc., Corp., Ltd., etc. It is important that the information in these fields is not prone to misinterpretation, for example, use "Mentor Graphics Corp." and not "MGC," or "Mentor." Use of the name should be consistent across all IP's labeled for a single company.

Each set of information items is associated with the GDSII-Stream structure in which it is embedded.

The GDSII-Stream structure should not change the size or extent of the cell in which it is contained.

2.4 Reporting Mechanism

A GDSII-Stream file may be populated with tracking information from a variety of IP vendors. Upon scanning that file it must be possible to readily generate a report of the four fields specified in Table 1. It must be possible for the report to show this information for each and every IP on the chip. Table 2 is an example of such a report.

Table 2: Example Report

Vendor	Product	Count	Total Metric (Metric x Count)
X	ra1sh	3	331
X	ra2sh	2	37
Y	PLL	1	1300
Y	XCO	1	1200

The reporter should fail if a file does not meet the specification. Examples of failures are unrecognized keywords.

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At the option of the party producing the reports of tagged GDSII-Stream databases, a more detailed report (such as, listing each product instance and its version) may be generated.

A complete accounting of all IPs occurring in a GDSII-Stream file (a single chip design) is required. This accounting must be accurate and allow for any hierarchical use of IP blocks that could occur if IPs are nested, one within another, rather than just placed side-by-side. Side-by-side IPs are fully accounted for, just as are multiply nested virtual components in both the example Tag Reading Program provided (Section 3.3), and the associated working copy available from the VSIA website (See Section 3). Any user of this standard should ensure similar accounting is maintained.

The report generator must analyze the hierarchy of the GDSII-Stream file to determine the count of the instances on a chip. For example, structure A may have 2 references to structure B and structure B may have 2 references to structure C. Assuming structure C is tagged with a IP vendor's product then, in the computation, the count for C is 4 and not 1. If the Metric for C is 20 units then the total metrics contribution is 80 units.

Lastly, note that this standard tags physical design data. Therefore, by definition, all IP's are essentially "Hard Blocks," whether the IP originated as a softcore, or an imported GDSII-Stream core.

2.5 Differences between the new and old versions

- 1) Tags may now placed on layers other than 63:63. We recommend that tag scanning programs trigger on the appearance of & as the first character of the text field.
- 2) The tag are allowed to be placed at any XY location and with any MAGnification. In the first version of the standard this point was glossed over.
- 3) Users may create their own tag fields. User keywords must start with the _ character.

2.6 Compatibility with the previous version

- v1 taggers should still work but we recommend that the MAG 0 records be added.
- v1 reporters may fail to find v2 tags that are not on layer 63:63.
- v1 reports may possibly fail if the there was explicit checking for the fixed keywords.

3. Syntax

Section 3.1 describes the specification in Backus Naur Form (BNF) notation. This is the same format as that used to specify GDSII-Stream.

3.1 Stream Syntax

Page 24 and 25 of the “GDSII Description” (Appendix A Stream Format), found on the VSIA website, describes the Stream syntax to be used.

This section contains a BNF representation of the Stream syntax for the tagging standard as defined in the Stream Format Standard. The Stream Format Standard may be found on the VSIA website.

An example text (ASCII) translation of the GDSII-Stream would be:

```
STRUCTURE MACRO_IP ;
TEXT ;
LAYER 63 ;
TEXTTYPE 63 ;
COORDINATE 0 0 ;
STRING & Vendor Yoyodyne, Inc. ;
END ELEMENT ;
TEXT ;
LAYER 63 ;
TEXTTYPE 63 ;
COORDINATE 0 0 ;
STRING & Product product ;
END ELEMENT ;
TEXT ;
LAYER 63 ;
TEXTTYPE 63 ;
COORDINATE 0 0 ;
STRING & Version version ;
END ELEMENT ;
TEXT ;
LAYER 63 ;
TEXTTYPE 63 ;
COORDINATE 0 0 ;
STRING & Metric 47.3 ;
END ELEMENT ;
```

The VSIA stream format standard in BNF is:

```
<structure> ::= BGNSTR STRNAME [STRCLASS] <tracking>* <element>* ENDSTR
<tracking> ::= TEXT LAYER TEXTTYPE [STRANS [MAG]] XY <idstring> ENDEL
<idstring> ::= STRING
```

The recommended magnification should be 0, however the user can choose any value.

The recommended xy coordinate should be 0, 0, however the user can choose any value.

The identifier string has the special syntax

```
<id_string> ::= & <space> <id_kwd_val>
<id_kwd_val> ::= "Vendor" <space> <value>
| "Product" <space> <value>
| "Version" <space> <value>
| "Metric" <space> <float_value>
“_” <printable_ASCII_char>+ <space> <value>
<printable_ASCII_char> ::= 'A' to 'Z' etc.
<float_value> ::= <integer> ['.' [<integer>]]
<integer> ::= <digit>+
<digit> ::= '0' .. '9'
```

<space> ::= ' '

4. Conclusion

A complete tagging standard has been described to permit foundries and virtual component (IP) users and providers to accurately account and track business transactions. The standard is provided as a means for tracking and tracing virtual components and is not portrayed to be an IP protection scheme.

5. Glossary

Artisan A provider of foundation IP

Artisan(tm) Software implementation of the VSIA tagging standard and reporting mechanism; available to Artisan's semiconductor partners.

BNF An acronym for "Backus Normal Form" (sometimes called, "Backus-Naur Form") used to describe syntax in computer languages.

CAD Computer Aided Design

Hard Blocks A GDSII-Stream representation of a virtual component

IP(P) Intellectual Property (Protection)

DWG Development Working Group

Soft Core A non-physical (i.e., not GDSII-Stream) view of a virtual component

IP Virtual Component

VSIA VSI Alliance

6. References and Acknowledgements

6.1 References

"Artisan(tm) User's Manual." Artisan Components, Inc. (c) 1999.

"The C Programming Language." Kerninghan & Ritchie. Prentice-Hall 1978.

"GDSII Description Stream Format Standard." VSI Contributed Technical Specification. Available from VSIA website <http://www.vsi.org/>.

6.2 Acknowledgements

Grateful thanks to the DWG members who contributed diligent and thoughtful care in the preparation of this standard.

Special thanks are due to the members of the Pilot Group who put this document through its initial paces.

Special thanks to: Artisan, ARM, Standard Microsystems, Sonics, TSMC and UMC.