

# IBIS File Format Links

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(Presented by Randy Wolff, Micron Technology)



# Story of IBIS

- In the beginning ... (1993) **1** file format, 8 pages
- Then a committee got involved ...
- (2019) ... **17** or more formats or links to formats:
  - IBIS Version 7.0 (331 pages)
  - Touchstone 2.0 (34 pages)
  - IBIS-ISS (58 pages)
- Story of file formats given here



# File Format Legend

- **Green** – Official IBIS formats (**ebd, ibs, pkg, ami, ims, Touchstone, Ts4file, executable models, “txt”**)
  - Checked by **ibischk7** (with/without flags) or separately with **tschk2**
  - Content referenced in EBD and IBIS files are usually parsed (or checked for connectivity only)
  - Note, **tschk2** is an independent checker, separate from **ibischk7**
- **Red** – Official IBIS format, but no parser (**IBIS-ISS**)
- **Black** – Format managed by other specifications or standards
- **Touchstone** means official **Touchstone 1.0** and **Touchstone 2.0**



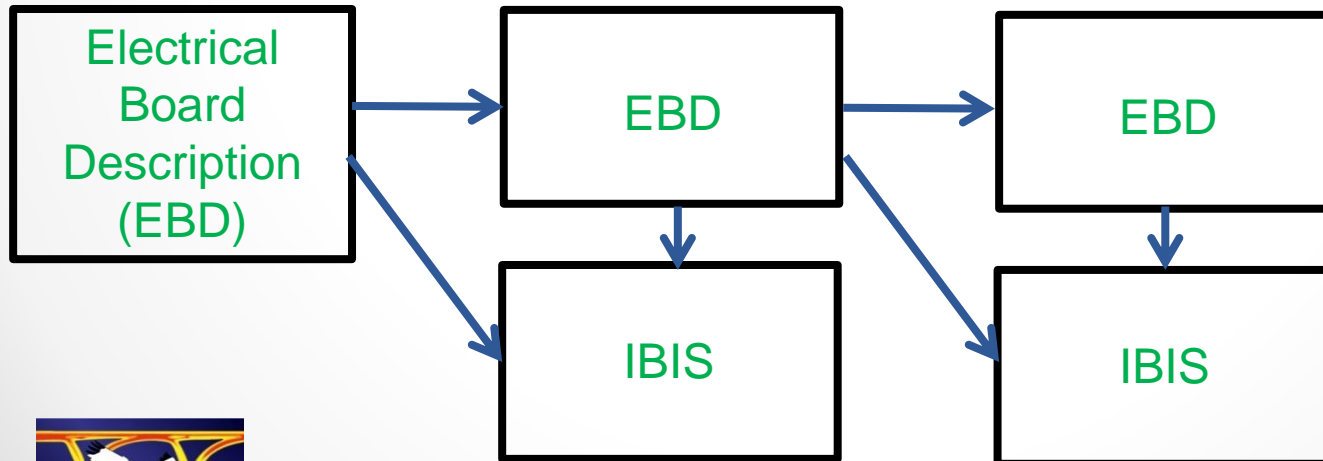
# File Name and Extension Reference

- **I/O Buffer Information Specification (IBIS) Version 7.0**
  - **Electrical Board Description (ebd) Section 8**
  - **IBIS (ibs) Sections 4-6, 12**
  - **Package Modeling (pkg) Section 7**
  - **IBIS-AMI (ami), Ts4File (usually s4p), Section 10**
  - **executable models (usually so, dll) Section 6**
  - **Interconnect Model Set (ims) Section 11**
- **Touchstone File Format Specification Version 2.0**
  - **Touchstone 1.0 (usually sNp)**
  - **Touchstone 2.0 (usually sNp)**
  - **Ts4file (usually s4p)**
- **IBIS Interconnect SPICE Subcircuit (IBIS-ISS) Specification Version 1.0**
  - **IBIS-ISS (usually iss)**



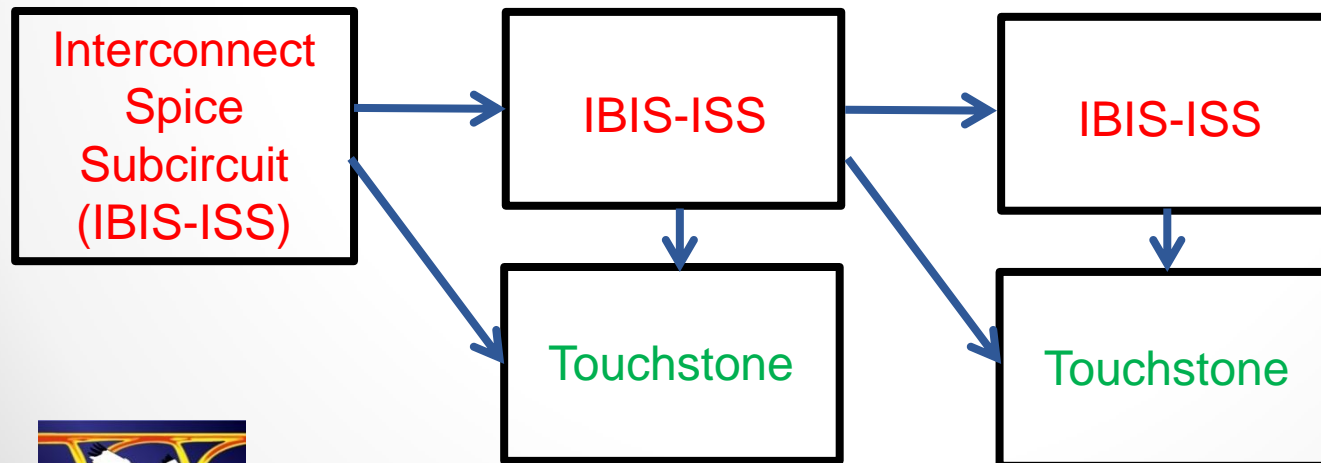
# Optional Internal IBIS Content and EBD Links

Basic IBIS [Component], [Model], etc.	Package [Define Package Model]	Multilingual (requires external files)	Interconnect Model Sets [Interconnect Model Set]
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# Optional Internal IBIS Content and IBIS-ISS Links

Basic IBIS [Component], [Model], etc.	Package [Define Package Model]	Multilingual (requires external files)	Interconnect Model Sets [Interconnect Model Set]
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# Basic IBIS External File Links

Basic IBIS [Component], [Model], etc.	Package [Define Package Model]	Multilingual  (requires external files)	Interconnect Model Sets [Interconnect Model Set]
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**ami**

**Ts4file (subset of Touchstone under ami)**

**Executable models (dll, so, etc.)**



# Optional External Package File Link

Basic IBIS [Component], [Model], etc.	Package [Define Package Model]	Multilingual  (requires external files)	Interconnect Model Sets [Interconnect Model Set]
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pkg





# Multilingual External File Links

Basic IBIS [Component], [Model], etc.	Package [Define Package Model]	Multilingual  (requires external files)	Interconnect Model Sets [Interconnect Model Set]
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**ami (for passing parameters)**

**“txt” (text file for passing parameters)**

**IBIS-ISS (can call Touchstone and other files)**

**SPICE (Berkeley Version 3F5)**

**VHDL-AMS**

**Verilog-AMS**

**VHDL-A(MS)**

**Verilog-A(MS)**



# Interconnect Model Set

## External File Links

Basic IBIS [Component], [Model], etc.	Package [Define Package Model]	Multilingual  (requires external files)	Interconnect Model Sets [Interconnect Model Set]
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ims  
IBIS-ISS  
Touchstone



# File Formats With IBIS

- ebd
- ibs
- ami
- Executable models (dll, so, etc.)
- Ts4file
- pkg
- ami (for parameter passing)
- “txt” text format (for parameter passing)
- **IBIS-ISS**
- **SPICE**
- **VHDL-AMS, Verilog-AMS, VHDL-A(MS), Verilog-A(MS)**
- ims
- **Touchstone 1.0, Touchstone 2.0**



# Example of EBD to IBIS to IMS Linkage (Without Details)

**abc.ebd**

U1.23 ...

U1.24 ...

[Reference Designator Map]

U1 **def.ibs** **DEF**

**def.ibs**

[Component] **DEF**

[Pin]

23 IO1 IO\_Buf

24 IO2 IO\_Buf

[Interconnect Model Group]

**GHI** **ghi.ims**

[End Interconnect Model Group]

**ghi.ims**

[Interconnect Model Set] **GHI**

[Interconnect Model] Pin23

File\_IBIS-ISS **jkl.iss** **pin23**

1 pin\_name **23**

[End Interconnect Model]

|

[Interconnect Model] Pin24

File\_TS **mno.s1p**

1 pin\_name **24**

2 A\_gnd

[End Interconnect Model]

[End Interconnect Model Set]

EBD: Pins 23, 24 in **abc.ebd** → **def.ibs** → **ghi.ims**  
and terminal 1 used for 23 in **ghi.ims** → **jkl.iss**  
and terminal 1 used for 24 in **ghi.ims** → **mno.s1p**

**jkl.iss**

.subckt **pin23** 1

R\_term 1 0

.ends

**mno.s1p**

...

0 1 0

2 0.9 0.005

...



**ibischk7 -ebd abc.ebd checks abc.ebd, def.ibs, ghi.ims**

# Observations

- **17 or more file format links in IBIS**
- **12 or more file formats supported by IBIS Specifications or by format restrictions**
  - Restrictions means requirements in certain files such as executable models, parameter passing formats and Ts4file
- **ibischk7 and tschk2 check syntax and content of files**
  - Individual files by flags `-ebd`, `-pkg`, `-ami`, `-ims`
  - Top level files AND linked files
  - `tschk2` conversions: Touchstone 1.0  $\leftrightarrow$  Touchstone 2.0
- **Some checking or linking is not defined (e.g., to Touchstone, IBIS-ISS)**



# Past and Future File Formats

- Past (unused formats)
  - Rail Version 1.2 (ral) and railchk1 (for timing)
  - IBIS Interconnect Modeling Specification (ICM) Version 1.1 (typically icm) and icmchk1
- Possible future file formats and links
  - Electrical Module Description (EMD) with links to emd, ems, ibs, IBIS-ISS, and Touchstone
  - Touchstone advances
- A lot has happened and is happening in the IBIS Committee

