**EBD BIRD**

**Version 0.0 Draft 1**

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# Electrical Board DescriPtion ISS Enhancements

Electronic Board Description (EBD) has several major limitations. It does not support broadband models, it does not support coupled models, it does not support power delivery networks and finally it is limited to “Boards”, and excludes Multi-Chip Modules, Stacked Memory, Connectors and Cables. This BIRD describes several enhancements to EBD that addresses these limitations.

On Page 150, make the following changes:

# 8 Electrical Board Description

**INTRODUCTION**

A “board level component” is the generic term to be used to describe a module which can contain components or even other modules, and which can connect to another board (or boards) through a set (or serts) of user visible pins. The electrical connectivity of such a board level component is referred to as an “Electrical Board Description”. For example, a SIMM module is a board level component that is used to attach several DRAM components on the PCB to another board through edge connector pins. An electrical board description file (a .ebd file) is defined to describe the connections of a board level component between the module pins and its components on the board. Other examples of modules include but are not limited to connectors, cables, multi-chip modules and stacked memory.

What is, and is not, included in an Electrical Board Description is defined by its boundaries. For the definition of the boundaries, see the Description section under the [Path Description] Keyword.

(or TBD)

Usage Rules:

A .ebd file is intended to be a stand-alone file, not referenced by or included in any .ibs or .pkg file. Electrical Board Descriptions are stored in a file whose name looks like <filename>.ebd, where <filename> must conform to the naming rules given in Section 3 of this specification. The .ebd extension is mandatory.

Contents:

An .ebd file is structured similar to a standard .ibs file. It must contain the following keywords, as defined in IBIS: [IBIS Ver], [File Name], [File Rev], and [End]. It may also contain the following optional keywords: [Comment Char], [Date], [Source], [Notes], [Disclaimer], and [Copyright]. The actual board description is contained between the keywords [Begin Board Description] and [End Board Description], and includes the keywords listed below:

[Begin Board Description]

[Manufacturer]

[Number Of Pins]

[Pin List]

[Path Description]

[Connection]

[End Connection]

[External Designators]

[End External Designators]

[ISS Model]

[End ISS Model]

[Reference Designator Map]

[End Board Description]

More than one [Begin Board Description]/[End Board Description] keyword pair is allowed in a .ebd file.

On Page 151, make the following change:

*Keyword:* [Pin List]

*Required:* Yes

*Description:* Tells the parser the pin names of the user accessible pins. It also informs the parser which pins are connected to power and ground.

*Sub-Params:* signal\_name

*Usage Rules:* Following the [Pin List] keyword are two columns. The first column lists the pin name while the second lists the data book name of the signal connected to that pin. There must be as many pin\_name/signal\_name rows as there are pins given by the preceding [Number Of Pins] keyword. Pin names must be the alphanumeric external pin names of the part. The pin names cannot exceed twenty characters in length. Any pin associated with a signal name that begins with “GND” or “POWER” will be interpreted as connecting to the boards ground or power plane. In addition, NC is a legal signal name and indicates that the Pin is a “no connect”. As per the IBIS standard “GND,” “POWER,” and “NC” are case insensitive.

**INTRODUCTION**:

A “module level component” is the generic term to be used to describe an electrical module which can contain components, modules, and which can connect to another module through a set of external pins. A module can be a package with a single component, a package with multiple components, a board with zero, one, or multiple components, a board with zero, one, or multiple components, an interposer, a connector, or a cable. The external pins can be pins, ball pads, or connector sockets or plugs.

A fundamental assumption of the new [ISS Model] section is that the interconnect between the external pins, components, and modules can be represented by IBIS-ISS subckts and Touchstone files directly. Also, this current description does allow one to describe electrical coupling between connections.

A component is represented by an .ibs file which may represent either a die and package, or a bare die.

A connection is represented by a list of its external pins, component pins and module pins that have a small insertion loss at Nyquist between all of the pins.

*Keyword:* [External Designators]

*Required:* Yes

*Description:* This keyword is followed by one line for each designator of the module’s external connections.

*Usage Rules:* External connections are module pins, balls, or connector sockets or plugs. A module may have one or more external connections. This keyword is required if the module has two or more external connection designators. The first field of each line following [External Designators] until the keyword [End External Designators] must contain the name of an External Designator. The second field is Pin\_depth (in inches) and is optional.

*Example:*

[External Designators]

J1

P1 .1

*Keyword:* **[End** Designators**]**

*Required:* Yes.

*Description:* Indicates the end of the [External Designators].

*Other Notes:* In between the [Begin External Designators] and [End External Designators] are the list of external designators.

*Example:*

[End External Designators]

*Keyword:* [Connection] <Connection name>

*Required:* Yes

*Description:* This keyword is followed by one or more lines consisting of external pins and component pins that are connected. This list of connected pins is terminated by a [End Connection] record.

*Usage Rules:* An external pin or component pin can occur in one and only one connection.

An unconnected external pin or component pin would not be in any connection, or may be in a connection by itself.

*Example:*

[Connection] DQ1

DQ1 A1 U1.17 U2.17 U3.17

[End Connection]

*Keyword:* **[End** Connection**]**

*Required:* Yes.

*Description:* Indicates the end of the [Connection].

*Other Notes:* In between the [Connection] and [End Connection] are the list of pins in the connection.

*Example:*

[End External Designators]

*Keyword:* [Begin ISS Model] <ISS Model Name>

*Required:* Yes

*Description:* Branch The data following this keyword, until the keyword [End ISS Model] contains Model Interconnect Protocols (MIP) for IBIS-ISS subckts or Touchstone files. The MIP describes the file containg the interconnect model, the ports of the interconnect model, the subckt name (if IBIS-ISS) and parameters that are used by the model

*Usage Rules:* An Interconnect might be for a single connection, a differential connections, a group of coupled signal connections, a supply connection, a group of supply connections, a group of supply and signal connections. A connection may appear in one or more Iss Models.

*Example:*

[Begin ISS Model] DQ1

…

[End ISS Model]

*Keyword:* **[End ISS Model]**

*Required:* Yes.

*Description:* Indicates the end of the formatted ISS model interface.

*Other Notes:* In between the [Begin ISS Model] and [End ISS Model] keywords is the interface to either IBIS-ISS models or Touchstone files.

*Example:*

[End ISS Model]

*Subparameter:* **[Language] IBIS-ISS|Touchstone**

*Required:* Yes.

*Description:* Indicates if the model is an IBIS-ISS subckt or a Touchstone file.

*Other Notes:*

*Example:*

[Language] IBIS-ISS

*Subparameter:* **[File] <format> <file name> {<file name> <file name>}**

*Required:* Yes.

*Description:* Defines the file(s) containing the model.

*Other Notes: The Files must be either IBIS-ISS files or Touchstone files.*

<format> need to points to a <format> section describing Value, DelayCorner, …

*Example:*

File Value my\_file.iss

*Subparameter:* **[Subckt] <format> <subckt name> {< subckt name> < subckt name>}**

*Required:* Yes if Language IBIS-ISS.

*Description:* Defines the subckt(s) in the [File]

*Other Notes:*

*Example:*

Subckt Value my\_subckt

*Subparameter:* **[Parameter] <name> <format> <param value> {<param value > <param value >}**

*Required:* Sometimes if Language IBIS-ISS.

*Description:* Defines the parameters that are to be passed into an instance of the IBIS-ISS subckt. <name> is the name of the parameter. <format> is described below. Depending on the <format> used there will be one or more than one <param value>. String parameters shall be enclosed in “’”.

*Other Notes:* One must watch there m and M’s when entering parameter value scale factors. Please consider the following table of parameter values and how IBIS and IBIS-ISS evaluate them:

Param IBIS IBIS-ISS

1m 1e-3 1e-3

1M 1e6 1e-3

1meg 1e-3 1e6

1Meg 1e6 1e6

Parameter values shall assume the IBIS interpretation. It is recommended that when generating these parameter records, that model makers use the 1m and 1Meg constructs to avoid any possible confusion by an EDA tool or User.

Parameters are not passed into a Touchstone file; however, there are two optional reserved parameters that are used in conjunction with Language Touchstone. They are FBASE and FMAX. They must be of Format Value. See the IBIS-ISS manual to understand how FBASE and FMAX should be used in conjunction with Touchstone files.

<format> may be

Value <value>

DelayCorner <Typ> <Fast> <Slow>

XtalkCorner <Typ> <Min Crosstalk> <Max Crosstalk>

DelayXtalkCorner <nine corners need to be listed>

Gaussian <Mean> <Gaussian>

Integer Range <Typ> <Min> <Max>

Real Range <Typ> <Min> <Max>

PDF <probability> <value> <probability> <value> <probability> <value> …

List <typical value> <value> <value> <value> <value> <value> …

*Examples:*

Parameter Length Value 11.

Parameter Tstonefile Value ‘abc.s2p’

*Subparameter:* **[Unused Port Termination] <resistance>**

*Required:*  No

*Description:* Defines the termination that is to be applied to the Ports of a subckt or Touchstone file that are not being used.

*Other Notes:* If this subparameter is defined the EDA should connect the unused Ports to GND through a **<resistance>** ohm resistor.

If this parameter is not defined and if Language is IBIS-ISS, then the EDA tool should connect the unused Ports to GND through a 1Meg ohm resistor. If Language is Touchstone, then the EDA tool should connect the unused Ports to GND through a resistor with the Touchstone File reference resistance of the Port.

*Example:*

[Unused Port Termination] 50

*Subparameter:* **Port <** Port Number **> < Port Name >**

*Required:* Yes

*Description:* Defines the Ports (Terminals) of the IBIS-ISS subckt or the Touchstone file.

<Port Number> must be an integer number greater or equal to 1 and less than or equal to the number of ports (aka terminals) of the IBIS-ISS subckt (or Toucshtone file). Two [Port] records may not have the same Port Number. If a Port Number does not exist in any of the [Port] records then the port is unused, and should be terminated according to the [Unused Port Termination Rules].

<Port Name> shall represent a specific external pin or component pin.

*Example:*

[Begin ISS Model] cb0

Language IBIS-ISS

File Value spice/DIMM\_CB0.sp

Subckt Value cb0

Port 1 48

Port 2 U5.D7

[End ISS Model]

[Begin ISS Model] ck0\_t\_diff

Language IBIS-ISS

File Value spice/DIMM\_CK0.sp

Subckt Value ck0\_t\_diff

Port 1 73

Port 2 74

Port 3 U1.F7

Port 4 U1.F8

Port 5 U2.F7

Port 6 U2.F8

Port 7 U3.F8

Port 8 U3.F7

Port 9 U4.F8

Port 10 U4.F7

Port 11 U5.F8

Port 12 U5.F7

Port 13 U6.F8

Port 14 U6.F7

Port 15 U7.F8

Port 16 U7.F7

Port 17 U8.F7

Port 18 U8.F8

Port 19 U9.F8

Port 20 U9.F7

[End ISS Model]