EMD

(Electronic Module Description Specification)

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Ratified TBD

1 ELECTRICAL MODULE DESCRIPTION

INTRODUCTION:

A "module level component" is the generic term to be used to describe an electronic module which can contain components, modules, and which can connect to another module through a set of user visible pins. The electrical connectivity of such a module level component is referred to as an "Electrical Module Description". An electrical module description file (an .emd file) is defined to describe the connections of a module level component between the module pins and its module pins, components and other modules. 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, and a cable.

A fundamental assumption regarding the electrical module description is that the interconnect between the module 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 a .ibs file which may represent either a die and package, or a bare die.

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

What is, and is not, included in an Electrical Module Description is defined by its boundaries. For the definition of the boundaries, see the Description section under the Interconnect Branch.

Usage Rules:

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

The Parameter Tree shall contain a Root, Branches and Leaves. The Root, Branch and Leaf names shall be "token strings" that may contain the characters " ", "(", or ")". They may not contain the tab or " character. If the token string contains " ", "(", or ")", the token must be surrounded by the "s. A Leaf may contain one or more values. Values shall be token strings. The rules for values token strings shall be the same as the rules for Root, Branch and Leaf token strings (may be contextual specific).

Contents:

A .emd file is structured using a Parameter Tree Structure. It must contain a descriptive Root, and the following Branches listed below:

General_Information

Module_Pin_List

Modules_and_Components

Connections

Interconnect

The General_Information Branch must contain the following Leaves:

EMD_Version

File_Name

File_Rev

The General_Information Branch may also contain the following optional Leaves:

Manufacturer

Date

Source

Notes

Disclaimer

Copyright

The actual module description is contained in the following Branches:

Module_Pin_List

Modules_and_Components

Connections

Interconnect

ROOT DEFINITION

Root: **<Root Name>**

Required: Yes

Description: Marks the beginning of an Electrical Module Description.

Usage Rules: The root name of the module level component.

Example:

```
("16Meg X 8 SIMM Module"
```

BRANCH DEFINITIONS:

Branch: **General_Information**

Required: Yes

Description: Branch contains Leaves containing requires and optional Leaves

Usage Rules: This Branch contains the required leaves EMD_Version, File_Name, File_Rev and may contain the optional Leaves Manufacturer, Date, Source, Notes, Disclaimer, Copyright

Example:

```
(16Meg_X_8_SIMM_Module
     (General_Description
```

GENERAL INFORMATION LEAF DEFINITIONS:

Leaf: **EMD_Version**

Required: Yes

Description: Declares the version .emd file.

Usage Rules: Following the leaf is the emd version.

Example:

```
(16Meg_X_8_SIMM_Module
     (General_Description
          (EMD_Version 1.0)
```

Leaf: **File_Name**

...

Leaf: **File_Rev**

…

Leaf: **Manufacturer**

Required: No

Description: Declares the manufacturer of the components(s) that use this .emd file.

Usage Rules: Following the leaf is the manufacturer's name. It must not exceed 40 characters, and can include blank characters. Each manufacturer must use a consistent name in all .emd files.

Example:

```
("16Meg X 8 SIMM Module"
     (General_Description
          (Manufacturer "Quality SIMM Corp.")
```

Leaf: **Date**

Leaf: **Source**

Leaf: **Notes**
Leaf: **Disclaimer**
Leaf: **Copyright**

Brance: **Module_Pin_List**

Required: Yes

Description: Branch contains Leaves containing module visible pins.

Usage Rules: This Branch contains leaves for each module visible pin. Each visible pin leaf shall consist of a pin_name and a connection_name.

Example:

```
(16Meg_X_8_SIMM_Module
     (Module_Pin_List
          (A1 DQ1)
          (A2 DQ2)
          (A3 DQ3)          | Connector pin_names might be A.A3, Bside.A3
                            | Will we need a list of Connectors?
     )
```

Branch: **Modules_and_Components**

Required: Yes

Description: Branch contains Leaves containing modules and components in the module.

Usage Rules: This Branch contains leaves for each module and component in the module. Each module and component leaf shall consist of a reference designator. If the leaf is a component its values are an IBIS file name and component. If the leaf is a module its value is the EMD file name.

Example:

```
(16Meg_X_8_SIMM_Module
     (Modules_and_Components
          (u23        pp100.ibs   Processor)
          (u24        simm.emd    ?)    |  .ebd?
          (u25        ls244.ibs   "NoName 74LS244a")
          (r26        r10K.ibs    My_10K_Pullup)
     )
```

Branch: **Connections**

Required: Yes

Description: Branch contains Leaves containing connections.

Usage Rules: This Branch contains leaves for each connection. Each connection shall consist of a connection_name followed by the visible pins and component and modules pins that are connected.

(Connections are also known as Extended Nets in some EDA tools.)

Example:
```
(16Meg_X_8_SIMM_Module
     (Connections
          (DQ1 A1 U1.17 U2.17 U3.17)
          (DQ2 A2 U1.18 U2.18 U3.18)
          (DQ3 A3 U1.19 U2.19 U3.19)
          (F12  A.F12 B.F12)   Connector connection

     )
```

Brance: **Interconnect**

Required: Yes

Description: Branch contains Branches containing Model ~~Connection~~ Interconnect Protocals for IBIS-ISS subckts and Touchstone files.

Usage Rules: This Branch contains branches containing Model Interconnect ~~Connection~~ Protocals (~~MCP~~MIP) for IBIS-ISS subckts and Touchstone files.. Each MIP ~~MCP~~ shall contain leaves (or Branches) defining the IBIS-ISS file and subckt name or Touchstone file. Each MIP shall contain ~~and~~ a Branch defining the ports of the IBIS-ISS subckt or Touchstone file.

An IBIS-ISS Interconnect may also contain a Parameter Branch, which shall contain Branches or Leaves for each Parameter that can be passed as parameters on the IBIS-ISS instance. If the parameter is a leaf, then it shall contains a single value that is a legal IBIS-ISS parameter value. If the parameter is a Branch, it may contain a single Corner leaf with Typ, Min, and Max values.

Note that 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 Interconnects.

Example:

```
(16Meg_X_8_SIMM_Module
     (Interconnect
         (DQ1
             (IBIS-_ISS_File xyz.iss dq1)
             (IBIS_ISS_Circuit (Corner dq1_typ dq1_slow dq1_fast)
             (Parameters
                  (Impedance 50ohms)
                  (Delay      (Corner 30ps 40ps 20ps)
                  (Tstonefile 'xyz_dqx.s2p')
             )
             (Ports
                  (1 A1)
                  (2 U1.17)
                  (3 U2.17)
                  (4 U3.17)
             )
         )
         (DQ2
             (Tstonefile (Corner DQ2_Typ.s4p DQ2_Slow.s4p
                                 DQ2_Fast.s4p))
             (Ports
                  (1 A2)
                  (2 U1.18)
                  (3 U2.18)
                  (4 U3.18)
             )
         )
         (DQ1_DQ2
```

```
            (Tstonefile DQ1_DQ2.s128p)
            (Ports
                (1 A1)
                (2 U1.17)
                (3 U2.17)
                (4 U3.17)
                (5 A2)
                (6 U1.18)
                (7 U2.18)
                (8 U3.18)
            )
        )
)
```