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Part Model Thermal Guidelines for Electronic-Device Packages – XML Requirements

JEP30-T100A

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PART MODEL THERMAL GUIDELINE FOR ELECTRONIC-DEVICE PACKAGES - XML REQUIREMENTS

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PART MODEL THERMAL GUIDELINE FOR ELECTRONIC-DEVICE PACKAGES - XML REQUIREMENTS

(From JEDEC Board Ballots JCB-23-10 formulated under the cognizance of the JC-11 Committee on Mechanical Standardization.)

1 Scope

This standard establishes the requirements for exchanging part data between part manufacturers and their customers for electrical and electronic products. This standard applies to all forms of electronic parts. It forms part of the Part Model XML Schema, which covers the parental structure for the electrical, physical, thermal, assembly process classification data along with materials and substances that may be present in the supplied product or sub-products. This Guideline specifically focuses on the Thermal sub-section of the Part Model.

All releases of the [Thermal](#) sub-schema must be under the umbrella of the Part model Schema to ensure that the Part model schema is referencing the correct version of the thermal sub-schema. In addition, this will enable the [Thermal](#) sub-schema to connect to the Manufacturer Part Number and the Manufacturer of the Part.

1.1 Purpose

This standard is intended to benefit part manufacturers and their customers by providing consistency and efficiency to the transfer of part data from part manufacturer to customers. This standard specifically covers data applicable to the thermal modelling of the device.

2 Applicable Documents

The following documents form a part of this standard to the extent specified herein. The revision of the document in effect at the time of solicitation shall take precedence.

2.1 JEDEC (www.jedec.org)

JESD30J, *Descriptive Designation System for Electronic-device Packages*

JEP30, *Part Model Guidelines for Electronic-Device Packages – XML Requirements*

JEP30-10, *Part Model Schema*

JEP30-T101, *Part Model Thermal Schema*

JEP30-D10, *Part Model Schema Types Dictionary* (Required to support the Part Model Schema and each of its sectional sub-schemas.)

JESD15, *Thermal Modelling Overview*

JESD15-1, *Compact Thermal Model Overview*

JESD51, *Methodology for the Thermal Measurement of Component Packages (Single Semiconductor Device)*, Dec. 1995

JESD51-1, *Integrated Circuits Thermal Measurement Method – Electrical Test Method (Single Semiconductor Device)*

2.1 JEDEC (www.jedec.org) (cont'd)

JESD51-2, *Integrated Circuit Thermal Test Method Environmental Conditions – Natural Convection (Still Air)*

JESD51-6, *Integrated Circuit Thermal Test Method Environmental Conditions – Forced Convection (Moving Air)*

JESD51-12, *Guidelines for Reporting and Using Electronic Package Thermal Information*

JESD51-13, *Glossary of Thermal Measurement Terms and Definitions*

JESD51-53, *Terms, Definitions and Units Glossary for LED Thermal Testing*

JESD99C, *Terms, Definitions, and Letter Symbols for Microelectronic Devices*

2.2 IPC (www.ipc.org)

IPC-T-50, *Terms and Definitions for Interconnecting and Packaging Electronic Circuits*

3 Requirements

The following terms and definitions are applicable to this XML Schema.

3.1 Terms and Definitions

All definitions and terms associated with the Thermal Data are defined in the JESD51 series of documents, as listed in the applicable documents section. The Thermal details of the part are defined in the [ThermalSection](#) of the XML Schema.

All common Terms and Definitions that are used by more than one sectional sub-schema, such as any of the Electrical, Package, Environmental, Assembly Process Classification, are defined in the “Part Model Schema Types Library”.

All other definitions and terms necessary to define the schema, are defined by this document.

Part Model: A Part Model is a data representation described in an XML file that conforms to the rules and structure of the Part Model XML Schema.

NOTE 1 Companies who use the Part Model XML Files and claim compliance to JEDEC, must ensure that their Part Model XML file conforms to the specific released version of the Part Model XML Schema released by JEDEC.

NOTE 2 Section 4 will define the outline of the structure of the Thermal XML Schema. Specific components of the XML Schema and their hierarchy are specifically controlled by the JC-15 Standards Committee who retain the expertise for these structures.

NOTE 3 The [ThermalSection](#) of the schema forms part of the Part Model XML Schema and is not intended to act as a standalone schema. In addition, there is a “Part Model Schema Types Library” XML Schema, which is a common set of xml structures shared across the Part Model XML Schema and all of its sub-section schemas.

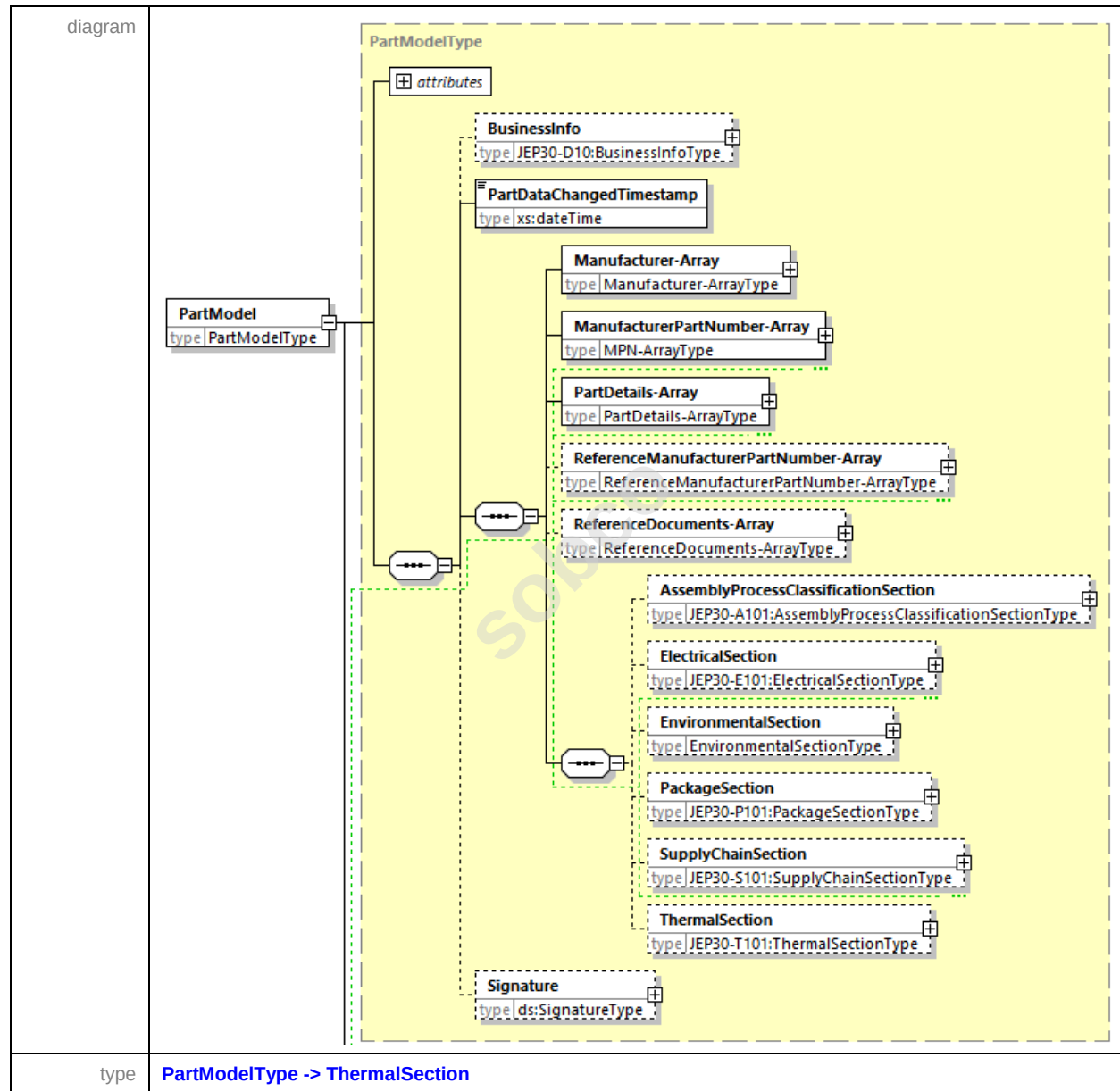
3.2 XML Schema Key Terms and Definitions

Reference the JEP30 publication for details of the “XML Schema Key Terms and Definitions”.

4 Part Model Schema Definition

The following section describes the XML Schema structure.

4.1 Part Model - Thermal Section



The [PartModelType](#) belongs to the “Part Model XML Schema”. The [ThermalSection](#) belongs to the “Part Model Thermal XML Schema”. The primary purpose of the Part Model Schema is to provide the structure for identifying unique parts (Manufacturer and MPN), and the structure to include the sub schemas which define the part details, as outline in the JEP30 - Part Model Guidelines for Electronic-Device Packages – XML Requirements.

4.1 Part Model - Thermal Section (cont'd)

This document covers the [ThermalSection](#), which is referenced from its parent's structure, the [PartModel](#). The contents under the [ThermalSection](#) is tied to the Manufacturer's name and Manufacturer's part number.

The [ComplianceToPartModelSchemaVersion](#) indicates the version of the Schema to which the XML file is to be validated against. All new releases to this document or XML Schema is governed by the rules outlined in JEP30, and must be released in sync with the Part Model.

"Each time that a Sub-schema gets updated, then the part model version also gets updated in order to release that Sub-schema under the umbrella of the Part model. This is because the Part Model must now reference the new version of Sub-schema, since all subschemas have their own version number. The parent schema includes them by referring to a precise version, so a version bump in the subschema requires a version bump in the parent only at the time of release of the Parent."

The [PartModelContentRevision](#) indicates the revision of the data for the Part that is submitted in the XML file. This enables the Component Manufacturer to provide a new XML file for a Part each time they wish to upgrade a new set of data for a part, in any of the sub-sections such as this [ThermalSection](#).

4.2 Manufacturer Part Number-Array

path	PartModel/ManufacturerPartNumber-Array.
diagram	
type	MPN-ArrayType , ManufacturerPartNumbersType , PartNumberType , OrderablePartNumber-ArrayType , JEP30-D10:SignatureDigestLinkType , ds:SignatureType .

The [ManufacturerPartNumber-Array](#) consists of a [ManufacturerPartNumbers](#) section that provide the definition of the part number, either via the [PartNumberSeries](#) or the [OrderablePartNumber](#). All Parts via their Part Number families or via their Orderable Part Numbers are connected to the details in the [ThermalSection](#) via the [PartDetails-Array](#) section.

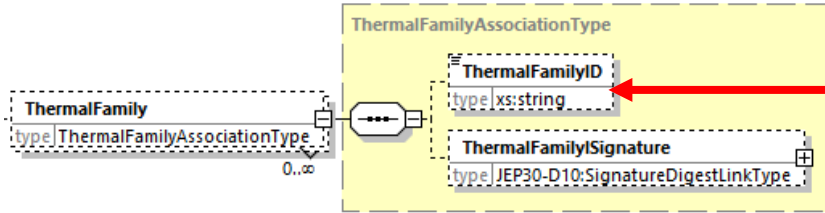
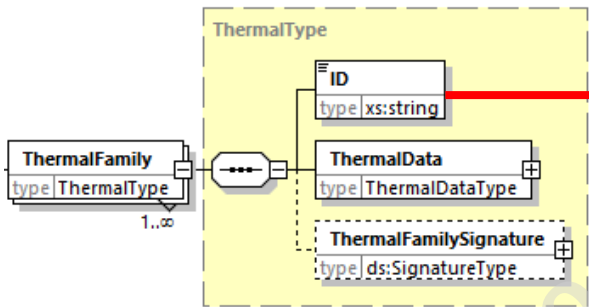
4.3 Linking the Manufacturing Part Number to a specific Thermal Data set

The linking of the Parts to its technical data is done via the [PartDetails-Array](#) section as outline in the JEP30 - Part Model Guidelines for Electronic-Device Packages – XML Requirements. This consists of two sections called [PartsSelection-Array](#) and [Association-Array](#) which defines the relationship between identifying the specific set of parts and how they are associated with the supply chain content. Reference the JEP30 parent document for more details on this association.

path	PartModel/PartDetails-Array/PartDetails/Association-Array/Association/Thermal-Array
diagram at the Association level	The diagram shows a dashed box labeled 'Thermal-Array' with 'type ThermalAssociation-ArrayType'. This is connected via a multiplicity box (0..∞) to a larger dashed box labeled 'ThermalAssociation-ArrayType'. Inside this box are two sub-sections: 'ThermalFamily' with 'type ThermalFamilyAssociationType' (0..∞) and 'ThermalModel' with 'type ThermalModelAssociationType' (0..∞).
type	ThermalFamilyAssociation-ArrayType , ThermalFamilyAssociationType , ThermalModelAssociationType .
diagram at the Thermal Section level	The diagram shows a dashed box labeled 'ThermalSection' with 'type ThermalSectionType'. This is connected via a multiplicity box (0..∞) to a dashed box labeled 'Thermal-Array' with 'type Thermal-ArrayType'. This is further connected via a multiplicity box (0..∞) to a dashed box labeled 'Thermal-ArrayType'. Inside this box are two sub-sections: 'ThermalFamily' with 'type ThermalType' (1..∞) and 'ThermalModel' with 'type ThermalModelType' (0..∞). A 'constraints' box is also present.
type	ThermalSectionType , Thermal-ArrayType , ThermalType , ThermalModelType .

The thermal content is now sub-grouped into 2 major sections as shown in the diagram. This enables each section to be digitally signed independently of each other. The linkage between the 2 sections is shown below.

4.3.1 Linking the Manufacturing Part Number to Thermal Family Content

path	PartModel/PartDetails-Array/PartDetails/Association-Array/Association/Thermal-Array/ThermalFamily	
diagram at the Electrical Parameters Association level	 The diagram shows a dashed box labeled ThermalFamilyAssociationType. Inside, there is a ThermalFamily element with a type of <code>ThermalFamilyAssociationType</code> and a cardinality of <code>0..∞</code>. To its right is a ThermalFamilySignature element with a type of <code>JEP30-D10:SignatureDigestLinkType</code>. A red arrow points from the ThermalFamilySignature element to the ThermalFamilyID element in the next diagram.	
type	ThermalFamilyAssociationType , <code>JEP30-D10:SignatureDigestLinkType</code> .	
path	PartModel/ThermalSection/Thermal-Array/ThermalFamily	
diagram at the Electrical Parameters-Array level	 The diagram shows a dashed box labeled ThermalType. Inside, there is a ThermalFamily element with a type of <code>ThermalType</code> and a cardinality of <code>1..∞</code>. To its right is a ThermalData element with a type of <code>ThermalDataType</code>. Below ThermalData is a ThermalFamilySignature element with a type of <code>ds:SignatureType</code>. A red arrow points from the ThermalFamilySignature element in this diagram to the ThermalFamilyID element in the next diagram.	
type	ThermalType , ThermalDataType , <code>ds:SignatureType</code> .	

The [ThermalFamilyID](#) references the [ThermalFamily/ID](#) under the [ThermalSection/Thermal-Array](#). This is enforced by the key named as [ThermalFamilyKey](#) that is assigned to the [ThermalFamily/ID](#) element, which is referenced by the [ThermalFamilyID](#) which has a Keyref that refers to the [JEP30-T101: ThermalFamilyKey](#).

4.3.2 Linking the Manufacturing Part Number to Thermal Model Content

path	PartModel/PartDetails-Array/PartDetails/Association-Array/Association/ThermalFamily-Array/ThermalModel
diagram at the Electrical Parameters Association level	The diagram shows a dashed box labeled ThermalModel with the type <code>ThermalModelAssociationType</code> and a cardinality of <code>0..∞</code>. This box is connected to a larger dashed box labeled ThermalModelAssociationType. Inside this box, there is an element ThermalModelID with type <code>xs:string</code> and an element ThermalModelSignature with type <code>JEP30-D10:SignatureDigestLinkType</code>. A red arrow points from the ThermalModelID element to the ID element in the next diagram.
type	ThermalModelAssociationType , JEP30-D10:SignatureDigestLinkType .
path	PartModel/ThermalSection/Thermal-Array/ThermalModel
diagram at the Electrical Parameters-Array level	The diagram shows a dashed box labeled ThermalModel with the type <code>ThermalModelType</code> and a cardinality of <code>0..∞</code>. This box is connected to a larger dashed box labeled ThermalModelType. Inside this box, there is an element ID with type <code>xs:string</code>, a choice element containing SPICE-Thermal (type <code>JEP30-D10:EmptyType</code>), VHDL-AMS (type <code>JEP30-D10:EmptyType</code>), FMU (type <code>JEP30-D10:EmptyType</code>), and MTX (type <code>JEP30-D10:EmptyType</code>), an element Other with type <code>xs:string</code>, an element Model with type <code>xs:string</code>, a dashed box ModelDescription with type <code>xs:string</code> and cardinality <code>0..∞</code>, and an element ThermalModelSignature with type <code>ds:SignatureType</code>. A red arrow points from the ID element to the ThermalModelID element in the first diagram.
type	ThermalModelType , JEP30-D10:EmptyType , ds:SignatureType .

The [ThermalModelID](#) references the [ThermalModel/ID](#) under the [ThermalSection/Thermal-Array](#). This is enforced by the key named as [ThermalModelKey](#) that is assigned to the [ThermalModel/ID](#) element, which is referenced by the [ThermalModelID](#) which has a Keyref that refers to the [JEP30-T101:ThermalModelKey](#).

4.4 Thermal Family

path	PartModel/ThermalSection/Thermal-Array/ThermalFamily/ThermalData.
diagram	
type	ThermalType, ThermalDataType, TemperatureRatingArrayType, ThermalMetricsArrayType, ThermalDataNetworkModelsType, UnitsforThermalDataType

ThermalData allows for the definition of temperature ratings (via the *TemperatureRating-Array*), thermal metrics (via the *ThermalMetrics-Array* and intended for part comparison purposes) and thermal models (via the *NetworkModels* and intended for simulation purposes). The *UnitsForThermalData* apply to all of the previous respective branches where applicable.