



IEC PAS 61182-12

Edition 1.0 2014-08

PUBLICLY AVAILABLE SPECIFICATION

PRE-STANDARD



**Generic requirements for printed board assembly products manufacturing
description data and transfer methodology**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

PRICE CODE **XH**

ICS 31.180

ISBN 978-2-8322-1804-4

Warning! Make sure that you obtained this publication from an authorized distributor.

TABLE OF CONTENTS

1	SCOPE.....	1
	1.1 Focus and intent.....	1
	1.2 Notation	1
2	APPLICABLE DOCUMENTS.....	2
	2.1 Documentation conventions	2
3	REQUIREMENTS	5
	3.1 Rules concerning the use of XML and XML Schema.....	7
	3.1.1 File readability and uniformity.....	7
	3.1.2 File markers.....	7
	3.1.3 File extension	7
	3.1.4 File remarks.....	7
	3.1.5 Character set definition	7
	3.2 Data organization and identification rules	7
	3.2.1 Naming elements within a 258X File.....	8
	3.2.2 The Use of XML elements and types.....	8
	3.2.3 Attribute base types (governing templates).....	8
	3.2.4 Coordinate system and transformation rules	10
	3.3 Transformation characteristics (Xform).....	11
	3.3.1 The x and y Offset attributes	12
	3.3.2 The rotation attribute.....	12
	3.3.3 The mirror attribute	13
	3.3.4 The scale attribute	13
	3.3.5 The x and y Location attributes	13
	3.4 Substitution groups	14
	3.4.1 ColorGroup.....	16
	3.4.2 Feature	16
	3.4.3 Fiducial	16
	3.4.4 FirmwareGroup.....	17
	3.4.5 FontDef.....	18
	3.4.6 LineDescGroup.....	18
	3.4.7 FillDescGroup.....	19
	3.4.8 PolyStep	19
	3.4.9 Simple	20
	3.4.10 StandardPrimitive.....	20
	3.4.11 StandardShape.....	22
	3.4.12 UserPrimitive	22
	3.4.13 UserShape.....	23
4	CONTENT	24
	4.1 Content: FunctionMode	25
	4.1.1 USERDEF mode.....	26
	4.1.2 DESIGN mode	26

4.1.3	FABRICATION mode	27
4.1.4	ASSEMBLY mode	27
4.1.5	TEST mode	27
4.2	Function levels	27
4.2.1	USERDEF Mode Level 1	28
4.2.2	Design Levels	29
4.2.3	Fabrication Levels	31
4.2.4	Assembly Levels	33
4.2.5	Test Levels	35
4.3	Content: StepRef	37
4.4	Content: LayerRef	38
4.5	Content: BomRef	38
4.6	Content: AvlRef	39
4.7	Content: DictionaryStandard	39
4.7.1	StandardPrimitive: Butterfly	40
4.7.2	StandardPrimitive: Circle	42
4.7.3	StandardPrimitive: Contour	43
4.7.4	StandardPrimitive: Diamond	46
4.7.5	StandardPrimitive: Donut	47
4.7.6	StandardPrimitive: Ellipse	49
4.7.7	StandardPrimitive: Hexagon	50
4.7.8	StandardPrimitive: Moire	52
4.7.9	StandardPrimitive: Octagon	53
4.7.10	StandardPrimitive: Oval	54
4.7.11	StandardPrimitive: RectCenter	56
4.7.12	StandardPrimitive: RectCham	58
4.7.13	StandardPrimitive: RectCorner	60
4.7.14	StandardPrimitive: RectRound	62
4.7.15	StandardPrimitive: Thermal	64
4.7.16	StandardPrimitive: Triangle	66
4.8	Content: DictionaryUser	68
4.8.1	UserPrimitive, Simple	69
4.8.2	UserPrimitive: Text	75
4.8.3	UserPrimitive: UserSpecial	78
4.9	Content: DictionaryFont	79
4.9.1	FontDefEmbedded	80
4.9.2	FontDefExternal	81
4.9.3	FontDef: Glyph	81
4.9.4	FontDef: Glyph combination	82
4.10	Content: DictionaryLineDesc	82
4.10.1	LineDesc	84
4.10.2	LineDescRef	85
4.11	Content: DictionaryFillDesc	86
4.11.1	FillDesc	87

4.11.2	FillDescRef	89
4.12	Content: DictionaryColor	90
4.12.1	Color.....	91
4.12.2	ColorRef	91
4.13	Content: DictionaryFirmware	92
4.13.1	CachedFirmware.....	93
4.13.2	FirmwareRef	93
5	LOGISTIC HEADER	94
5.1	LogisticHeader	94
5.2	Role	95
5.3	Enterprise	96
5.4	Person	98
6	HISTORY RECORD.....	100
6.1	HistoryRecord	100
6.2	FileRevision	101
6.3	SoftwarePackage	102
6.4	ChangeRec	103
7	BOM (Material List).....	104
7.1	BOM Header	106
7.2	BomItem	106
7.2.1	BomDes.....	108
7.2.2	Characteristics	114
8	ELECTRONIC COMPUTER AIDED DESIGN (ECAD)	118
8.1	CadHeader.....	118
8.1.1	Spec	119
8.1.2	Property.....	133
8.1.3	ChangeRec.....	134
8.2	CadData.....	135
8.2.1	Layer	137
8.2.2	Stackup	143
8.2.3	Step.....	151
8.2.4	DfxMeasurementList	204
9	APPROVED VENDOR LIST (AVL).....	207
9.1	AvlHeader	208
9.2	AvlItem.....	209
9.2.1	AvlVmpn	209
10	GLOSSARY	212
10.1	Process Flow Descriptions	212
10.2	Terms and Definitions	212
10.3	Enumerated strings of 2581.....	213
11	REFERENCE INFORMATION.....	214
11.1	IPC	214
11.2	American National Standards Institute.....	214

11.3 Department of Defense	215
11.4 Electronic Industries Association	215
11.5 International Organization for Standards (ISO)	215
Appendix A IPC-7351 Naming Convention for Land Patterns	216
Appendix B Panel Instance File	220
Appendix C Potential Reference Designator Assignment for Non Electrical Items	225

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**GENERIC REQUIREMENTS FOR PRINTED BOARD ASSEMBLY PRODUCTS
MANUFACTURING DESCRIPTION DATA AND TRANSFER METHODOLOGY**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

A PAS is a technical specification not fulfilling the requirements for a standard, but made available to the public.

IEC PAS 61182-12, submitted by IPC has been processed by IEC technical committee 91: Electronics assembly technology. It is based on IPC-2581B. It is published as a double-logo PAS. The structure and editorial rules used in this PAS reflect the practice of the organization which submitted it.

The text of this PAS is based on the following document:

This PAS was approved for publication by the P-members of the committee concerned as indicated in the following document

Draft PAS	Report on voting
91/1182/PAS	91/1192/RVD

Following publication of this PAS, the technical committee or subcommittee concerned may transform it into an International Standard.

This PAS shall remain valid for an initial maximum period of 3 years starting from the publication date. The validity may be extended for a single period up to a maximum of 3 years, at the end of which it shall be published as another type of normative document, or shall be withdrawn.

IMPORTANT – The “colour inside” logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this publication using a colour printer.

Generic Requirements for Printed Board Assembly Products Manufacturing Description Data and Transfer Methodology

1 SCOPE

This standard specifies the XML schema that represents the intelligent data file format used to describe printed board and printed board assembly products with details sufficient for tooling, manufacturing, assembly, and inspection requirements. This format may be used for transmitting information between a printed board designer and a manufacturing or assembly facility. The data is most useful when the manufacturing cycle includes computer-aided processes and numerical control machines.

The data can be defined in either English or International System of Units (SI) units. The format is a convergence of the IPC-2511 “GenCAM” and the Valor Computerized Systems “ODB-X” format structure.

1.1 Focus and intent

The generic format requirements are provided in a series of standards focused on printed board manufacturing, assembly, and inspection testing. This standard series consists of a generic standard (IPC-2581) that contains all the general requirements. There are seven sectional standards that are focused on the XML details necessary to accumulate information in the single file, that addresses the needs of the manufacturing disciplines producing a particular product.

The sectional standards (IPC-2582 through 2588) paraphrase the important requirements and provide suggested usage and examples for the topic covered by the sectional standard.

1.2 Notation

Although the data would be contained in a single file, the file can have different purposes as described in Section 4. The XML schema used for this standard follows the notations set forth by the W3C and is as follows:

- element – Element appears exactly one time
- element? – Element may appear 0 or 1 times
- element* – Element may appear 0 or more times
- element+ – Element may appear 1 or more times

Any IPC-258X file is composed of a high level element (IPC-2581) that contains up to six sub-elements:

- Content – information about the contents of the 258X file
- LogisticHeader – information pertaining to the order and supply data
- HistoryRec – change information of the file
- Bom – Bill of Materials (Material List) information
- Ecad – Computer Aided Design (engineering) information
- Avl – Approved Vendors List information

2 APPLICABLE DOCUMENTS

The following documents contain requirements which, when referenced, constitutes provisions of IPC-2581. At the time of publication, the editions indicated were valid. All documents are subject to revision and parties entering into agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the documents indicated below.

The revision of the document in effect at the time of solicitation **shall** take precedence.

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

IPC-2501 *Definition for Web-Based Exchange of XML Data*

IPC-2524 *PWB Fabrication Data Quality Rating System*

IPC-2511 *Generic Requirements for Implementation of Product Manufacturing Description Data and Transfer XML Schema Methodology*

IPC-2571 *Generic Requirements for Electronics Manufacturing Supply Chain Communication - Product Data eXchange (PDX)*

IPC-2576 *Sectional Requirements for Electronics Manufacturing Supply Chain Communication of As-Built Product Data - Product Data eXchange*

IPC-2577 *Sectional Requirements for Supply Chain Communication of Manufacturing Quality Assessment - Product Data eXchange (PDX)*

IPC-2578 *Sectional Requirements for Supply Chain Communication of Bill of Material and Product Design Configuration Data - Product Data eXchange*

IPC-7351 *Generic Requirements for Surface Mount Design and Land Patterns*