

PD IEC/PAS 61182-12:2014



BSI Standards Publication

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

bsi.

...making excellence a habit.™

National foreword

This Published Document is the UK implementation of IEC/PAS 61182-12:2014.

The UK participation in its preparation was entrusted to Technical Committee EPL/501, Electronic assembly technology & Printed Electronics.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2014.

Published by BSI Standards Limited 2014

ISBN 978 0 580 86595 4

ICS 33.180.01

Compliance with a British Standard cannot confer immunity from legal obligations.

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 31 October 2014.

Amendments/corrigenda issued since publication

| Date | Text affected |
|-------------|----------------------|
|-------------|----------------------|



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