



JPCA

IEC PAS 62878-2-5

Edition 1.0 2015-08

PUBLICLY AVAILABLE SPECIFICATION

PRE-STANDARD



Device embedded substrate – Guidelines – Data format



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2015 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in 15 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

More than 60 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.



JPCA

IEC PAS 62878-2-5

Edition 1.0 2015-08

PUBLICLY AVAILABLE SPECIFICATION

PRE-STANDARD



Device embedded substrate – Guidelines – Data format

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 31.180; 31.190

ISBN 978-2-8322-2808-1

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

CONTENTS

FOREWORD	4
1 Scope	6
1.1 Purpose	7
1.2 Applicable range	7
1.2.1 Product	7
1.2.2 Process	8
1.3 Features	9
1.3.1 Maintenance of the device embedded substrate structure	9
1.3.2 Maintenance of SiP interposer structure	10
1.3.3 Maintenance of design data with a virtual layer of terminal positions of embedded device(s)	10
1.3.4 Maintenance of terminal structure and embedded device structure including SiP	11
1.3.5 Seamless ownership of design data	11
2 File description	12
2.1 File description summary	12
2.1.1 Types of data and their structure	12
2.1.2 File structure	14
2.2 3D expression	15
2.2.1 Coordinates	15
2.2.2 Position description	16
2.2.3 Relation between coordinate origin and board position	16
2.3 Layer concept	17
2.4 Substrate data	17
2.4.1 Layer map information	18
2.4.2 Device arrangement information	19
2.4.3 Basic figures	21
2.4.4 Net information	28
2.4.5 Artwork information	29
2.4.6 Package information	29
2.4.7 External port information	29
2.4.8 Internal port information	29
2.4.9 User expansion information	29
2.5 Defined data	29
2.5.1 Layer definition	30
2.5.2 Land definition	30
2.5.3 Via definition	31
2.5.4 Device definition	32
2.5.5 User expansion definition	33
3 Terminology	34
4 Commentary – Additional information	36
Figure 1.1 – Flow chart of design of device embedded substrate	7
Figure 1.2 – General concept of product	8
Figure 1.3 – Example of a structure of a device embedded substrate	10
Figure 1.4 – Examples of a structure of a SiP interposer	10

Figure 1.5 – Example of a laying terminal position of an embedded device in a virtual layer	11
Figure 1.6 – Example of showing structures of device embedding and terminals	11
Figure 1.7 – Example of showing structures of SiP and of a device embedding substrate	12
Figure 2.1 – Data structure	14
Figure 2.2 – One file structure (recommended)	15
Figure 2.3 – Two-File structure	15
Figure 2.4 – Definition of coordinates	16
Figure 2.5 – Position definition	16
Figure 2.6 – Relation between coordinates and board position	17
Figure 2.7 – Layer concept	17
Figure 2.8 – Construction of mounting layers	18
Figure 2.9 – Construction in the case of omission of mounting layers	19
Figure 2.10 – Layer definition in pad connection	20
Figure 2.11 – Layer definition in via connection	20
Figure 2.12 – XYZ axes rotation direction	21
Figure 2.13 – Point	22
Figure 2.14 – Area shapes	23
Figure 2.15 – Area shapes	23
Figure 2.16 – Letter data	24
Figure 2.17 – Text shape	24
Figure 2.18 – Bonding wire information	25
Figure 2.19 – Wire bonding shape	25
Figure 2.20 – Rectangular prismoid	26
Figure 2.21 – Examples of via specification	27
Figure 2.22 – Device definition	27
Figure 2.23 – Example of group such as dimension lines	28
Figure 2.24 – Data structure of net information	28
Figure 2.25 – Relation of layer definition data	30
Figure 2.26 – Land definitions	31
Figure 2.27 – Relation between hole information and land information	32
Figure 2.28 – Definitions of SiP, module and MEMS	33
Figure 2.29 – Definitions of package and mold components	33
Table 1.1 – Information required in production	9
Table 2.1 – List of data	13

INTERNATIONAL ELECTROTECHNICAL COMMISSION

DEVICE EMBEDDED SUBSTRATE – GUIDELINES – DATA FORMAT

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 62878-2-5 was submitted by the JPCA (Japan Electronics Packaging and Circuits Association) and has been processed by IEC technical committee 91: Electronics assembly technology.

It is based on JPCA-EB02 (2011). It is published as a double-logo IEC / JPCA PAS.

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
91/1257/PAS	91/1264/RVD

Following publication of this PAS, which is a pre-standard publication, 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 document using a colour printer.

This document is a preview generated by EVS

DEVICE EMBEDDED SUBSTRATE – GUIDELINES – DATA FORMAT

1 Scope

This part of IEC 62878 defines the data format for active and passive devices embedded inside an organic board whose electrical connections are made by means of a via, electroplating, conductive paste or printing of conductive material. The basic structures, the terminology, reliability tests and a design guide are described in the "Standard of device embedded substrate", JPCA EB01, fourth edition.

A device embedded substrate contains device(s) in the board and is connected in a 3D way. Conventional 2D design technology using GERBER format cannot describe all the connection information in a device embedded substrate. We have several proposals to express 3D data formats but they cannot describe the structures given in EB01. The JPCA Committee for standardization of device embedded substrates has studied various formats and developed a format, FUJIKO V-1.0, which can express substrate design data in CAM data used in actual production. This Publicly Available Specification (PAS) described the FUJIKO data format.

Figure 1.1 shows the design flow of a device embedded substrate. The design data can be directly sent to a board manufacturing system using the FUJIKO format, or can be converted to CAM data and then be used in production. The data contain 3D information of coordinates and shapes of devices used. It is possible to check the status of device embedding in a board, and also make it a common knowledge in production know-how of a production line.

This PAS describes the expression of 3D data information, the concept of layers, the structure of board data, and definitions of information repeatedly used in design.