IEC 61249-4-17

Edition 1.0 2009-05

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Materials for printed boards and other interconnecting structures – Part 4-17: Sectional specification set for prepreg materials, unclad (for the manufacture of multilayer boards) – Non-halogenated epoxide woven E-glass prepreg of defined flammability (vertical burning test) for lead-free assembly

Matériaux pour circuits imprimés et autres structures d'interconnexion – Partie 4-17: Série de spécifications intermédiaires pour matériaux préimprégnés, non plaqués (pour la fabrication des cartes multicouches) – Tissu de verre époxyde préimprégné non halogéné de type E d'inflammabilité définie (essai de combustion verticale) destiné aux assemblages sans plomb

IEC 61249-4-17:2009

Documents
Document Sharing Hub
Full document details: IEC 61249-4-17 2009

THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2009 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.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de la CEI ou du Comité national de la CEI du pays du demandeur.
Si vous avez des questions sur le copyright de la CEI ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de la CEI de votre pays de résidence.

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland
Email: inmail@iec.ch
Web: 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.

- Catalogue of IEC publications: www.iec.ch/searchpub
The IEC on-line Catalogue enables you to search by a variety of criteria (reference number, text, technical committee,…). It also gives information on projects, withdrawn and replaced publications.
- IEC Just Published: www.iec.ch/online_news/justpub
Stay up to date on all new IEC publications. Just Published details twice a month all new publications released. Available on-line and also by email.
- Electropedia: www.electropedia.org
The world's leading online dictionary of electronic and electrical terms containing more than 20 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary online.
- Customer Service Centre: www.iec.ch/webstore/custserv
If you wish to give us your feedback on this publication or need further assistance, please visit the Customer Service Centre FAQ or contact us:
Email: csc@iec.ch
Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00

A propos de la CEI

La Commission Electrotechnique Internationale (CEI) est la première organisation mondiale qui élabore et publie des normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications CEI

Le contenu technique des publications de la CEI est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

- Catalogue des publications de la CEI: www.iec.ch/searchpub/cur_fut-f.htm
Le Catalogue en-ligne de la CEI vous permet d'effectuer des recherches en utilisant différents critères (numéro de référence, texte, comité d'études,…). Il donne aussi des informations sur les projets et les publications retirées ou remplacées.
- Just Published CEI: www.iec.ch/online_news/justpub
Restez informé sur les nouvelles publications de la CEI. Just Published détaille deux fois par mois les nouvelles publications parues. Disponible en-ligne et aussi par email.
- Electropedia: www.electropedia.org
Le premier dictionnaire en ligne au monde de termes électroniques et électriques. Il contient plus de 20 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans les langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International en ligne.
- Service Clients: www.iec.ch/webstore/custserv/custserv_entry-f.htm
Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions, visitez le FAQ du Service clients ou contactez-nous:
Email: csc@iec.ch
Tél.: +41 22 919 02 11
Fax: +41 22 919 03 00

Documents
Document Sharing Hub

Full document details: IEC 61249-4-17 2009

IEC 61249-4-17

Edition 1.0 2009-05

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Materials for printed boards and other interconnecting structures – Part 4-17: Sectional specification set for prepreg materials, unclad (for the manufacture of multilayer boards) – Non-halogenated epoxide woven E-glass prepreg of defined flammability (vertical burning test) for lead-free assembly

Matériaux pour circuits imprimés et autres structures d'interconnexion – Partie 4-17: Série de spécifications intermédiaires pour matériaux préimprégnés, non plaqués (pour la fabrication des cartes multicouches) – Tissu de verre époxyde préimprégné non halogéné de type E d'inflammabilité définie (essai de combustion verticale) destiné aux assemblages sans plomb

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE
CODE PRIX N

ICS 31.180

ISBN 978-2-88910-471-0

® Registered trademark of the International Electrotechnical Commission
Marque déposée de la Commission Electrotechnique Internationale

Documents
Document Sharing Hub

Full document details: IEC 61249-4-17 2009

CONTENTS

FOREWORD 4
1 Scope 6
2 Normative references 6
3 Materials and construction 6
3.1 Reinforcement 6
3.2 Resin system 7
4 Properties 7
4.1 Properties related to the appearance of the prepreg 7
4.1.1 Dewetted areas (fish eyes) 7
4.1.2 Broken filaments 7
4.1.3 Distortion 7
4.1.4 Creases 7
4.1.5 Edge conditions 7
4.2 Properties related to B-stage prepreg 8
4.2.1 Resin content 8
4.2.2 Treated weight 8
4.2.3 Resin flow 8
4.2.4 Scaled flow thickness 8
4.2.5 Melting viscosity 9
4.2.6 Gel time 9
4.2.7 Volatile content 9
4.3 Properties related to prepreg after curing 9
4.3.1 Electric strength 9
4.3.2 Flammability 9
4.3.3 Relative permittivity and dissipation factor 10
4.3.4 Cured thickness 10
4.3.5 Glass transition temperature (Tg) 10
4.3.6 Decomposition temperature (Td) 10
4.3.7 Thermal resistance 10
4.3.8 Z-axis expansion 10
5 Delivery form 11
5.1 Rolls 11
5.2 Sheets 11
5.3 Cut panels 11
6 Quality assurance 11
6.1 Quality system 11
6.2 Responsibility for inspection 11
6.3 Qualification inspection 11
6.4 Quality conformance inspection 12
6.5 Certificate of conformance 12
6.6 Safety data sheet 12
7 Packaging and marking 12
8 Shelf life 12
9 Ordering information 13
Bibliography 14

AVA Documents
Document Sharing Hub

Full document details: IEC 61249-4-17 2009

Table 1 – Flammability, vertical burning test 9
Table 2 – Decomposition temperature requirements 10
Table 3 – Thermal resistance requirements 10
Table 4 – Z-Axis expansion requirements 11

Documents
Document Sharing Hub
Full document details: IEC 61249-4-17 2009

INTERNATIONAL ELECTROTECHNICAL COMMISSION

MATERIALS FOR PRINTED BOARDS AND OTHER INTERCONNECTING STRUCTURES –

Part 4-17: Sectional specification set for prepreg materials, unclad (for the manufacture of multilayer boards) – Non-halogenated epoxide woven E-glass prepreg of defined flammability (vertical burning test) for lead-free assembly

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.

International Standard IEC 61249-4-17 has been prepared by IEC technical committee 91: Electronics assembly technology.

The text of this standard is based on the following documents:

FDIS	Report on voting
91/853/FDIS	91/865/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This bilingual version, published in 2010-01, corresponds to the English version.

Documents
Document Sharing Hub

Full document details: IEC 61249-4-17 2009

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The French version of this standard has not been voted upon.

A list of all parts of the IEC 61249 series, under the general title *Materials for printed boards and other interconnecting structures*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

Documents
Document Sharing Hub

Full document details: IEC 61249-4-17 2009

MATERIALS FOR PRINTED BOARDS AND OTHER INTERCONNECTING STRUCTURES –

Part 4-17: Sectional specification set for prepreg materials, unclad (for the manufacture of multilayer boards) – Non-halogenated epoxide woven E-glass prepreg of defined flammability (vertical burning test) for lead-free assembly

1 Scope

This part of IEC 61249-4-17 gives requirements for properties of prepreg that are mainly intended to be used as bonding sheets in connection with laminates according IEC 61249-2-38 when manufacturing multilayer boards according to IEC 62326-4. Multilayer boards comprised of these materials are suitable for lead-free assembly processes. This material may also be used to bond other types of laminates.

Prepreg according to this standard is of defined flammability (vertical burning test). The flammability rating on fully cured prepreg is achieved through the use of non-halogenated fire retardants contained as an integral part of the polymeric structure. After curing of the prepreg according to the supplier's instructions, the glass transition temperature is defined to be 120 °C minimum.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61189-2:2006, *Test methods for electrical materials, printed boards and other interconnection structures and assemblies – Part 2: Test methods for materials for interconnection structures*

IEC 61249-2-38, *Materials for printed boards and other interconnecting structures – Part 2-38: Reinforced base materials, clad and unclad – Non-halogenated epoxide woven E-glass laminate sheets of defined flammability (vertical burning test), copper-clad for lead-free assembly*

IEC 62326-4, *Printed boards – Part 4: Rigid multilayer printed boards with interlayer connections – Sectional specification*

ISO 11014-1:1994, *Safety data sheet for chemical products – Part 1: Content and order of sections*

3 Materials and construction

The prepreg consists of a reinforcing E-glass fabric which is impregnated with di-functional and multi-functional epoxide resin and partially cured to the B-stage.

3.1 Reinforcement

Woven E-glass as specified in future IEC 61249-6-3 (under consideration), Woven E-glass fabric (for the manufacture of prepreg and copper-clad laminate).

AVA Documents
Document Sharing Hub

Full document details: IEC 61249-4-17 2009

3.2 Resin system

Majority di-functional non-halogenated epoxide and modified non-halogenated epoxide with a glass transition temperature after curing according to the manufacturer's instructions of 120 °C minimum. The flammability rating is achieved through the use of non-halogenated flame retardants reacted into the polymer. Inorganic fillers may be used. The maximum total halogens contained in the resin plus reinforcement matrix is 1500 ppm with a maximum chlorine of 900 ppm and maximum bromine being 900 ppm. Contrast agents may be added to enhance processing such as automated optical inspection (AOI).

Its flame resistance is defined in terms of the flammability requirements of 4.3.2.

4 Properties

4.1 Properties related to the appearance of the prepreg

The prepreg shall be substantially free from defects that may have an impact on the material's fitness for use for the intended purpose.

For the following specific defects, the requirements of method 2V01 (under consideration) of IEC 61189-2 will apply as soon as this test will be available.

4.1.1 Dewetted areas (fish eyes)

Dewetted areas with a diameter >10 mm are not permissible.

Dewetted areas with a diameter ≤10 mm are permitted to an extent of a maximum 10 fish eyes in any 300 mm × 300 mm area of the prepreg.

4.1.2 Broken filaments

When judging the presence of broken filaments, not only are their sizes and frequency of occurrence important for assessing acceptability, but also the flow characteristic of the prepreg shall be taken into consideration. The acceptance conditions for broken filaments shall be as agreed upon between user and supplier.

4.1.3 Distortion

When the prepreg will be tested in accordance with test method 2M29 (under consideration) of IEC 61189-2, the distortion or non-perpendicular orientation of the fill or weft yarns in the glass fabric shall not exceed 10 % measured over any 300 mm test distance.

4.1.4 Creases

Creases caused by handling of the prepreg where only a negligible loss of resin has occurred are permitted.

Creases where the glass yarns are exposed due to loss of resin are not permitted.

4.1.5 Edge conditions

Cut-to-size panels shall have even edges and shall not show loss of resin at the edge due to the cutting process of more than 2 mm. Excessive occurrence of resin dust released during the cutting shall be removed before packaging for shipment.

Documents
Document Sharing Hub
Full document details: IEC 61249-4-17 2009

4.2 Properties related to B-stage prepreg

A number of characteristics can describe thickness, reactivity and rheology of B-stage prepreg. The choice of characteristics to be used as qualification and quality conformance testing as well as the nominal performance levels are as agreed upon between user and supplier.

Several of the characteristics shown below are interrelated and should not be specified individually. Ordering requirements should preferably be restricted to the glass style, one characteristic marked (a) in combination with one characteristic marked (b). One or both of the optional characteristics (c) of B-stage prepreg may be included.

Glass style

Thickness parameter

- Resin content (a)
- Treated weight (a)

Reactivity/rheology parameter

- Resin flow (b)
- Scaled flow thickness (b)
- Melt viscosity (b)
- Cured thickness (b)

Optional parameter

- Volatile content (c)
- Gel time (c)

4.2.1 Resin content

When tested in accordance with test method 2C03 or 2C10 of IEC 61189-2, the nominal resin content shall be as agreed upon between user and supplier.

The tolerance around the ordered nominal value shall be ±3 %, for example (45 ± 3) %.

4.2.2 Treated weight

When tested in accordance with test method 2C03 of IEC 61189-2, the nominal treated weight shall be as agreed upon between user and supplier.

The tolerance around the ordered nominal value shall be ±3 %, for example (350 ± 10,5) g.

4.2.3 Resin flow

When tested in accordance with test method 2M09 of IEC 61189-2, the nominal resin flow shall be as agreed upon between user and supplier.

The tolerance around the ordered nominal value shall be ± 5 %, for example (25 ± 5) %.

4.2.4 Scaled flow thickness

When tested in accordance with test method 2M26 of IEC 61189-2, the nominal scaled flow and the tolerance shall be as agreed upon between user and supplier.

Documents
Document Sharing Hub

Full document details: IEC 61249-4-17 2009