IEC 61249-4-19

Edition 1.0 2013-11

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Materials for printed boards and other interconnecting structures – Part 4-19: Sectional specification set for prepreg materials, unclad (for the manufacture of multilayer boards) – High performance 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 4-19: 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 à haute performance, d'inflammabilité définie (essai de combustion verticale), pour les assemblages sans plomb

IEC 61249-4-19:2013

Documents
Document Sharing Hub

Full document details: IEC 61249-4-19 2013

THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2013 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

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.

Useful links:

IEC publications search - www.iec.ch/searchpub

The advanced search enables you 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 on-line 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 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) on-line.

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.

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.

Liens utiles:

Recherche de publications CEI - www.iec.ch/searchpub

La recherche avancée vous permet de trouver des publications CEI en utilisant différents critères (numéro de référence, texte, comité d'études,…).
Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

Just Published CEI - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications de la CEI. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - www.electropedia.org

Le premier dictionnaire en ligne au monde de termes électroniques et électriques. Il contient plus de 30 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans les langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (VEI) en ligne.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: csc@iec.ch.

Documents
Document Sharing Hub

Full document details: IEC 61249-4-19 2013

IEC 61249-4-19

Edition 1.0 2013-11

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Materials for printed boards and other interconnecting structures – Part 4-19: Sectional specification set for prepreg materials, unclad (for the manufacture of multilayer boards) – High performance 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 4-19: 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 à haute performance, d'inflammabilité définie (essai de combustion verticale), pour les assemblages sans plomb

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE
CODE PRIX N

ICS 31.180

ISBN 978-2-8322-1167-0

Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.

AVA Documents
Document Sharing Hub

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

Full document details: IEC 61249-4-19 2013

CONTENTS

FOREWORD 4
1 Scope 6
2 Normative references 6
3 Materials and construction 6
3.1 General 6
3.2 Reinforcement 7
3.3 Resin system 7
4 Properties 7
4.1 Properties related to the appearance of the prepreg 7
4.1.1 General 7
4.1.2 Dewetted areas (fish eyes) 7
4.1.3 Broken filaments 7
4.1.4 Distortion 7
4.1.5 Creases 7
4.1.6 Edge conditions 8
4.2 Properties related to B-stage prepreg 8
4.2.1 General 8
4.2.2 Resin content 8
4.2.3 Treated weight 8
4.2.4 Resin flow 9
4.2.5 Scaled flow thickness 9
4.2.6 Melting viscosity 9
4.2.7 Gel time 9
4.2.8 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 (T_g) 10
4.3.6 Decomposition temperature (T_d) 10
4.3.7 Time to delamination 10
4.3.8 Z-axis expansion 11
5 Delivery form 11
5.1 General 11
5.2 Rolls 11
5.3 Sheets 11
5.4 Cut panels 11
6 Quality assurance 11
6.1 Quality system 11
6.2 Responsibility for inspection 12
6.3 Qualification inspection 12
6.4 Quality conformance inspection 12
6.5 Certificate of conformance 12
6.6 Safety data sheet 12

AVA Documents
Document Sharing Hub

Full document details: IEC 61249-4-19 2013

7 Packaging and marking 12
8 Shelf life 13
9 Ordering information 13
Bibliography 14

Table 1 – Flammability, vertical burning test 10
Table 2 – Decomposition temperature requirements 10
Table 3 – Time to delamination requirements 11
Table 4 – *Z*-axis expansion requirements 11

Documents
Document Sharing Hub

Full document details: IEC 61249-4-19 2013

INTERNATIONAL ELECTROTECHNICAL COMMISSION

MATERIALS FOR PRINTED BOARDS AND OTHER INTERCONNECTING STRUCTURES –

Part 4-19: Sectional specification set for prepreg materials, unclad (for the manufacture of multilayer boards) – High performance 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 61249-4-19 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
91/1126/FDIS	91/1148/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 publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

AVA Documents
Document Sharing Hub

Full document details: IEC 61249-4-19 2013

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 stability 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 61249-4-19 2013

MATERIALS FOR PRINTED BOARDS AND OTHER INTERCONNECTING STRUCTURES –

Part 4-19: Sectional specification set for prepreg materials, unclad (for the manufacture of multilayer boards) – High performance non-halogenated epoxide woven E-glass prepreg of defined flammability (vertical burning test) for lead-free assembly

1 Scope

This part of IEC 61249 gives requirements for properties of prepreg that is mainly intended to be used as bonding sheets in connection with laminates according to IEC 61249-2-40 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 be also 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 170 °C minimum.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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, interconnection structures and assemblies – Part 2: Test methods for materials for interconnection structures*

IEC 61249-2-40, *Materials for printed boards and other interconnecting structures – Part 2-40: Reinforced base materials clad and unclad – High performance, non-halogenated epoxide woven E-glass laminate sheets of defined flammability (vertical burning test), copper-clad for lead-free assembly*

IEC/PAS 61249-6-3:2011, *Materials for printed boards and other interconnecting structures – Part 6-3: Reinforcements – Woven fibreglass fabrics*

ISO 9000:2005, *Quality management systems – Fundamentals and vocabulary*

ISO 11014:2009, *Safety data sheet for chemical products – Content and order of sections*

ISO 14001:2004, *Environmental management systems – Requirements with guidance for use*

3 Materials and construction

3.1 General

The prepreg consists of a reinforcing E-glass fabric which is impregnated with high performance, non-halogenated epoxide resin, partially cured to the B-stage. The flammability

AVA Documents Document Sharing Hub

Full document details: IEC 61249-4-19 2013

rating is achieved through the use of non-halogenated flame retardants reacted into the polymer. Inorganic fillers may be used. 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.

3.2 Reinforcement

Woven E-glass as specified in IEC/PAS 61249-6-3: woven E-glass fabric (for the manufacture of prepreg and copper-clad laminate).

3.3 Resin system

High performance, non-halogenated epoxide with a glass transition temperature after curing according to the manufacturer's instructions of 170 °C minimum. The flammability rating is achieved through the use of non-halogenated flame retardants reacted into the polymer. Inorganic fillers may be used. Contrast agents may be added to enhance processing such as automated optical inspection (AOI). The maximum total halogens contained in the resin plus reinforcement matrix is 1 500 ppm with a maximum chlorine of 900 ppm and maximum bromine being 900 ppm.

4 Properties

4.1 Properties related to the appearance of the prepreg

4.1.1 General

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 given shall apply when inspection is made in accordance with IEC 61189-2 test method 3V01.

4.1.2 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.

4.1.3 Broken filaments

When judging the presence of broken filaments their sizes and frequency of occurrence are 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 the user and supplier.

4.1.4 Distortion

When the prepreg is 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.

4.1.5 Creases

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

Documents
Document Sharing Hub
Full document details: IEC 61249-4-19 2013

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

4.1.6 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 more than 2 mm. Excessive occurrence of resin dust released during the cutting shall be removed before packaging for shipment.

4.2 Properties related to B-stage prepreg

4.2.1 General

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 the 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 characteristics marked (a) in combination with one characteristic marked (b). A maximum of one optional characteristic (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)

4.2.2 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 the user and supplier.

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

4.2.3 Treated weight

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

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

Documents
Document Sharing Hub

Full document details: IEC 61249-4-19 2013

4.2.4 Resin flow

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

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

4.2.5 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 the user and supplier.

4.2.6 Melting viscosity

When tested in accordance with test method 2C09 of IEC 61189-2, the nominal melt viscosity shall be as agreed upon between the user and supplier.

The tolerance around the ordered nominal value shall be ± 20 mPa·s, e.g., (240 ± 20) mPa·s.

4.2.7 Gel time

When tested in accordance with test method 2C02 of IEC 61189-2, the nominal gel time shall be as agreed upon between the user and supplier.

The tolerance around the ordered nominal value shall be ± 20 s, e.g., (160 ± 20) s.

4.2.8 Volatile content

When tested in accordance with test method 2C04 of IEC 61189-2, the volatile content shall be 0,5 % maximum.

4.3 Properties related to prepreg after curing

4.3.1 Electric strength

A total of 2 plies of prepreg of minimum size 300 mm × 300 mm shall be bonded together and cured in accordance with the manufacturer's recommendations whereupon the thickness shall be determined using a micrometer.

When tested in accordance with test method 2E11 of IEC 61189-2, the minimum electric strength shall be 25 V/μm.

4.3.2 Flammability

A number of plies of minimum size 300 mm × 300 mm of the prepreg under test shall be bonded together and cured in accordance with the manufacturer's recommendations. The number of plies shall be chosen so that a specimen thickness of approximately 0,4 mm to 0,5 mm is obtained as measured with a micrometer.

When tested in accordance with test method 2C06 of IEC 61189-2, the flammability shall be as shown in Table 1.

Documents
Document Sharing Hub
Full document details: IEC 61249-4-19 2013