IEC 63215-2

Edition 1.0 2023-10

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Endurance test methods for die attach materials – Part 2: Temperature cycling test method for die attach materials applied to discrete type power electronic devices

Méthodes d'essai d'endurance pour les matériaux de fixation de puce – Partie 2: Méthode d'essai de cycle thermique pour les matériaux de fixation de puce, appliquée aux dispositifs électroniques de puissance de type discret

iTeh Standards
(https://standards.iteh.ai)
Document Preview
https://standards.iteh.ai/catalog/standards/sist/d4bb26a5-0cf1-4ecc-a12d-1b23300d67e3/iec-63215-2-2023

IEC 63215-2:2023-10(en-fr)

THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2023 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 l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Secretariat
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
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 corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform
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 once a month by email.

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: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch
Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org
The world's leading online dictionary on electrotechnology, containing more than 22 300 terminological entries in English and French, with equivalent terms in 19 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

iTeh Standards
(https://standards.iteh.ai)
Document Preview
IEC 63215-2:2023
https://standards.iteh.ai/catalog/standards/sist/d4bb26a5-0cf1-4ecc-a12d-1b23300d67e3/iec-63215-2-2023

A propos de l'IEC
La Commission Electrotechnique Internationale (IEC) 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 IEC
Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Recherche de publications IEC - webstore.iec.ch/advsearchform
La recherche avancée permet de trouver des publications IEC 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.

IEC Just Published - webstore.iec.ch/justpublished
Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

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

IEC Products & Services Portal - products.iec.ch
Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

Electropedia - www.electropedia.org
Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 300 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 19 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

IEC 63215-2

Edition 1.0 2023-10

INTERNATIONAL STANDARD

NORME INTERNATIONALE

iTeh Standards
(https://standards.iteh.ai)
Document Preview

Endurance test methods for die attach materials – Part 2: Temperature cycling test method for die attach materials applied to discrete type power electronic devices

Méthodes d'essai d'endurance pour les matériaux de fixation de puce – Partie 2: Méthode d'essai de cycle thermique pour les matériaux de fixation de puce, appliquée aux dispositifs électroniques de puissance de type discret

https://standards.iteh.ai/catalog/standards/sist/d4bb26a5-0cf1-4ecc-a12d-1b23300d67e3/iec-63215-2-2023

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 31.190

ISBN 978-2-8322-7677-8

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.

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

CONTENTS

FOREWORD 4
1 Scope 6
2 Normative references 6
3 Terms, definitions and abbreviated terms 7
3.1 Terms and definitions 7
3.2 Abbreviated terms 7
4 General 7
5 Test apparatus 8
5.1 Die bonding equipment 8
5.2 Temperature cycling chamber 8
5.3 Thermal resistance measuring equipment 8
5.4 Ultrasonic flaw inspection equipment 8
6 Specimen 8
6.1 General 8
6.2 Preparation of specimen 9
7 Evaluation test 9
7.1 Test method 9
7.1.1 General 9
7.1.2 Temperature cycling test 9
7.1.3 Test conditions 10
7.1.4 End of test criteria 10
7.2 Inspection and measurement 10
7.2.1 Visual inspection 10
7.2.2 Thermal resistance measurement 10
7.2.3 Ultrasonic flaw inspection 11
7.3 Test procedure 11
7.3.1 Test preparation 11
7.3.2 Preconditioning 11
7.3.3 Initial measurement 11
7.3.4 Test 11
7.3.5 Intermediate measurement 11
7.3.6 Post-test treatment 11
7.3.7 Final judgment 11
8 Failure cycle 12
9 Items to be specified in the product specification 12
Annex A (normative) Thermal resistance measuring method at die attach region 13
A.1 Thermal resistance measuring method 13
A.1.1 General 13
A.1.2 Temperature characteristics measurement for TEG chip 13
A.1.3 Thermal resistance measurement method for TEG chip 14
A.2 Correction of thermal resistance criteria 15
Annex B (informative) Discrete type specimen preparation using a heating resistor TEG chip 18
B.1 Power electronic device specimen 18
B.1.1 General 18
B.1.2 Power electronic device chip 18

iTeh Standards
(https://standards.iteh.ai)
Document Preview
IEC 63215-2:2023
https://standards.iteh.ai/catalog/standards/sist/d4bb26a5-0cf1-4ecc-a12d-1b23300d67e3/iec-63215-2-2023

B.1.3 Base substrate ... 18
B.1.4 Package mould ... 19
B.1.5 Surface treatment ... 19
B.2 Die attach materials ... 19
B.3 Specimen preparation ... 19
Annex C (informative) Reliability performance index for die attach joint – Discrete type power electronic device ... 22
Bibliography ... 23

Figure 1 – Regions for evaluation for discrete type power electronic device ... 8
Figure 2 – Temperature cycling test ... 9
Figure A.1 – Example of the structure of the specimen using a TEG chip ... 13
Figure A.2 – Example of temperature characteristics – TEG chip ... 14
Figure A.3 – Example of structure for thermal resistance measurement for a power electronic device ... 15
Figure A.4 – Example of relationship between thermal resistance and die attach damage ... 16
Figure A.5 – Example of ultrasonic flaw inspection result ... 17
Figure B.1 – Example of TEG chip ... 18
Figure B.2 – Typical reflow soldering profile for Sn96,5Ag3Cu,5 solder alloy ... 20
Figure B.3 – Example of specimen – TEG chip ... 21

Table 1 – Temperature cycling test conditions ... 10
Table A.1 – Example of thermal resistance value (R_{th}) result ... 16
Table C.1 – Reliability performance index for die attach joint – Discrete type power electronic device ... 22

iTeh Standards
(https://standards.iteh.ai)
Document Preview
IEC 63215-2:2023
https://standards.iteh.ai/catalog/standards/sist/d4bb26a5-0cf1-4ecc-a12d-1b23300d67e3/iec-63215-2-2023

INTERNATIONAL ELECTROTECHNICAL COMMISSION

____

ENDURANCE TEST METHODS FOR DIE ATTACH MATERIALS –

Part 2: Temperature cycling test method for die attach materials applied to discrete type power electronic devices

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) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at https://patents.iec.ch. IEC shall not be held responsible for identifying any or all such patent rights.

iTeh Standards
(https://standards.iteh.ai)
Document Preview
IEC 63215-2:2023
https://standards.iteh.ai/catalog/standards/sist/d4bb26a5-0cf1-4ecc-a12d-1b23300d67e3/iec-63215-2-2023

IEC 63215-2 has been prepared by IEC technical committee 91: Electronics assembly technology. It is an International Standard.

The text of this International Standard is based on the following documents:

Draft	Report on voting
91/1895/FDIS	91/1912/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 63215 series, published under the general title *Endurance test methods for die attach materials*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

IMPORTANT – The "colour inside" logo on the cover page of this document 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.

iTeh Standards
(https://standards.iteh.ai)
Document Preview
IEC 63215-2:2023
https://standards.iteh.ai/catalog/standards/sist/d4bb26a5-0cf1-4ecc-a12d-1b23300d67e3/iec-63215-2-2023

ENDURANCE TEST METHODS FOR DIE ATTACH MATERIALS –

Part 2: Temperature cycling test method for die attach materials applied to discrete type power electronic devices

1 Scope

This part of IEC 63215 applies to the die attach materials and joining system applied to discrete type power electronic devices.

This document specifies the temperature cycling test method which takes into account the actual usage conditions of discrete type power electronic devices to evaluate reliability of the die attach joint materials and joining system, and establishes a classification level for joining reliability (reliability performance index).

The test method specified in this document is not intended to evaluate power semiconductor devices themselves.

The test method specified in this document is not regarded as the one for use to guarantee the reliability of the power semiconductor device packages.

iTeh Standards
(https://standards.iteh.ai)
Document Preview

NOTE The test result obtained using this document will not be used as absolute quantitative data, but for intercomparison with the other die attach materials results using the same setup.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 63215-2:2023

IEC 60068-2-14, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

IEC 60194-1, *Printed boards design, manufacture and assembly – Vocabulary – Part 1: Common usage in printed board and electronic assembly technologies*

IEC 60194-2, *Printed boards design, manufacture and assembly – Vocabulary – Part 2: Common usage in electronic technologies as well as printed board and electronic assembly technologies*

IEC 60747-15, *Semiconductor devices – Discrete devices – Part 15: Isolated power semiconductor devices*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, terms and definitions given in IEC 60194-1, IEC 60194-2, and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

3.1.1
TEG chip
chip with test patterns for process and device evaluation and control

Note 1 to entry: In this document, the heating resistor chip is as in 6.1.

3.2 Abbreviated terms

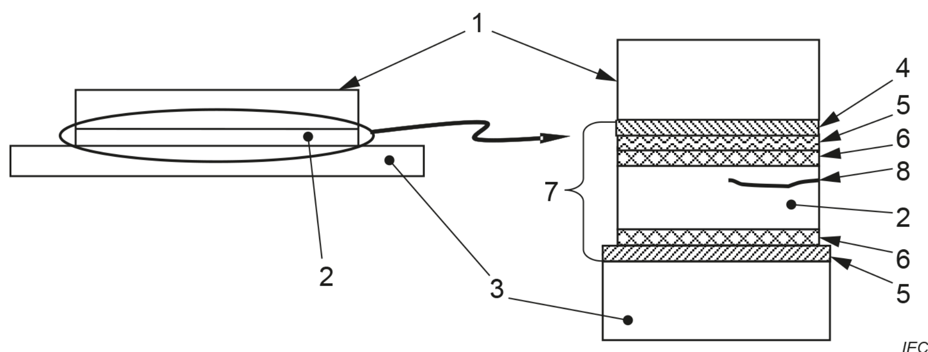
C-SAM	constant-depth mode scanning acoustic microscope
SAT	scanning acoustic tomography
TCT	temperature cycling test
TEG	test element group

iTeh Standards (https://standards.iteh.ai) Document Preview

4 General

The regions of the die attach materials and joining systems to be evaluated are shown in Figure 1. The test method in this document is applicable to evaluate the durability of the die attach materials against thermal stress to the power electronic devices but not to test the mechanical strength of the power electronic devices themselves.

Therefore, the conditions for accelerated stress conditioning by a cycling test can exceed the maximum allowable temperature range for the power electronic devices.



Key

1 power electronic device chip

2 die attach material

3 base substrate

4 device termination

5 plating layers

6 inter-metallic compound layers

7 regions for evaluation

8 crack

Figure 1 – Regions for evaluation for discrete type power electronic device

iTeh Standards
(https://standards.iteh.ai)
Document Preview

5 Test apparatus

5.1 Die bonding equipment

The die bonding equipment shall be able to realize the die bonding conditions.

IEC 63215-2:2023
https://standards.iteh.ai/catalog/standards/sist/d4bb26a5-0cf1-4ecc-a12d-1b23300d67e3/iec-63215-2-2023

5.2 Temperature cycling chamber

The temperature cycling chamber shall be able to realize the temperature cycling profile specified in Figure 2 and Table 1. The general requirements for the temperature cycling chamber shall be in accordance with test Na of IEC 60068-2-14.

5.3 Thermal resistance measuring equipment

The thermal resistance measuring equipment shall be able to measure thermal conductivity in accordance with IEC 60747-15, and also be able to calculate the thermal resistance value of the specimen as in Annex A.

5.4 Ultrasonic flaw inspection equipment

Ultrasonic flaw inspection equipment such as scanning acoustic tomography (SAT) or constant-depth mode scanning acoustic microscope (C-SAM) shall be able to detect cracks and voids in the die attach joint by non-destructive inspection of the ultrasonic scanning, and be able to calculate the crack propagation area ratio in die attach joint as in Annex A.

6 Specimen

6.1 General

The specimen shall be a heating element chip which is bonded using die attach material under evaluation on the base substrate. The heating element chip which is able to realize the test conditions specified in Clause 7, can be either a heating resistor chip (heater TEG chip, hereafter referred to as "TEG chip") or a power semiconductor device chip.

An example of the specimen structure is described in Annex B.

6.2 Preparation of specimen

The die attach joint is made by the reflow soldering method or sintering method, for example. Depending on the die attach material, a press joint system, or reduced pressure reflow or formic acid atmosphere reflow for oxidation/reduction operation, may be used to secure the joint.

The preparation process for an example structure of the power electronic device specimen is described in Annex B.

7 Evaluation test

7.1 Test method

7.1.1 General

The test method for evaluation shall be done by the temperature cycling test.

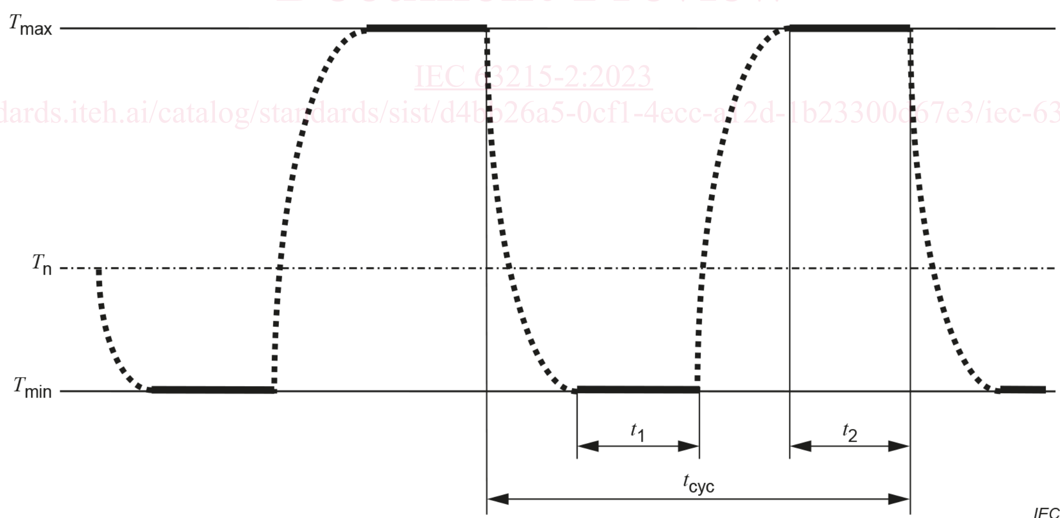
7.1.2 Temperature cycling test

The test shall be made in accordance with test Na of IEC 60068-2-14 and the following details.

Place the specimen in the temperature cycling chamber specified in 5.2 where the best airflow is obtained and where there is sufficient airflow around the specimen.

The temperature cycle shall be started from the low temperature side as shown in Figure 2. The test cycles shall be as specified in the product specification.

iTeh Standards (https://standards.iteh.ai) Document Preview IEC 63215-2:2023 https://standards.iteh.ai/catalog/standards/sist/d4bb26a5-0cf1-4ecc-a12d-1b23300c67e3/iec-63215-2-2023



Key

T_{max}	maximum storage temperature	t_1	hold time at T_{min}
T_n	normal ambient temperature	t_2	hold time at T_{max}
T_{min}	minimum storage temperature	t_{cyc}	one temperature cycle

Figure 2 – Temperature cycling test

7.1.3 Test conditions

The product specification shall specify the temperature cycling test conditions selected from Table 1.

Table 1 – Temperature cycling test conditions

Step	Test conditions		
	TA	**TB**	**TC**
T_{min} °C	–40 ± 5	–40 ± 5	–40 ± 5
T_{max} °C	150 ± 5	175 ± 5	200 ± 5
t_1, t_2	20 min or more		
Intermediate measurement	Unless otherwise specified in the product specification, the specified measurements shall be made at the following cycles: 0 (initial), 500, 1 000, 1 500		
Number of specimens	5 or more for each test condition		

Key

T_{min}: minimum storage temperature,

T_{max}: minimum storage temperature,

t_1 and t_2 start when the temperature of the specimen reaches the specified temperature.

The transition time from T_{min} to T_{max} and reverse transfer shall be within 3 min and include a cycle time with the duration to reach the thermal stabilizing time of the specimen (refer to IEC 60068-2-14).

iTeh Standards
(https://standards.iteh.ai)
Document Preview

7.1.4 End of test criteria

Each evaluation test shall be terminated if the thermal resistance value (R_{th}) of the specimen increases by 20 % from the initial measurement, unless otherwise specified in the product specification.

IEC 63215-2:2023
https://standards.iteh.ai/catalog/standards/sist/d4bb26a5-0cf1-4ecc-a12d-1b23300d67e3/iec-63215-2-2023

Each evaluation test shall continue up to the test cycles specified in the product specification, except if the end of the test criteria specified above is reached.

7.2 Inspection and measurement

7.2.1 Visual inspection

The specimen shall be subjected to visual inspection. There shall be no defect which would impair validity of the test result.

7.2.2 Thermal resistance measurement

Thermal resistance of the specimen shall be measured using thermal resistance measuring equipment specified in 5.3 and the adopted measuring method referred to as the static heating method specified in Annex A, to determine the degree of deterioration.

The thermal resistance measurement method such as the static heating method (heating method or cooling method) or dynamic heating method (thermal transient characterization method) which are used in the marketplace, may be used based upon the agreement between trading partners.

The thermal resistance shall be recorded so that the change in the thermal resistance value of one of the specimens can be traced.

7.2.3 Ultrasonic flaw inspection

The image of die attach conditions of the same specimen crack and the other defects shall be taken using ultrasonic flaw inspection equipment specified in 5.4, to determine the degree of deterioration.

The image of ultrasonic flaw inspection and crack propagation area ratio shall be recorded for the die attach damage data recognized by two-valued image processing.

7.3 Test procedure

7.3.1 Test preparation

If the residue flux on the specimen has to be cleaned, the cleaning method should be specified in the product specification.

The mounting for the evaluation test shall be ensured.

7.3.2 Preconditioning

If required, the preconditioning conditions shall be specified in the product specification.

7.3.3 Initial measurement

All specimens shall be subjected to initial measurement in accordance with 7.2.

iTeh Standards
(https://standards.iteh.ai)
Document Preview

The measuring condition for the initial measurement should be specified in the product specification.

7.3.4 Test

All specimens shall be subjected to the test in accordance with 7.1.

IEC 63215-2:2023
https://standards.iteh.ai/catalog/standards/sist/d4bb26a5-0cf1-4ecc-a12d-1b23300d67e3/iec-63215-2-2023

7.3.5 Intermediate measurement

The specimen shall be taken from the temperature cycling chamber at the intermediate measuring cycle specified in Table 1.

All specimens shall be subjected to the thermal resistance measurement for intermediate measurement in accordance with 7.2.2.

All specimens shall be subjected to the ultrasonic flaw inspection for intermediate measurement in accordance with 7.2.3.

7.3.6 Post-test treatment

After the evaluation test, if it is necessary to align the measurement condition, the specimen shall be subjected to post-test conditioning specified in the product specification under the final measurement conditions. The product specification may specify the recovery period to cool down and the stabilizing temperature for the specimen.

7.3.7 Final judgment

The specimen shall be taken from the temperature cycling chamber at the end of the test.

At least one specimen shall be observed in the cross section to check the damage conditions of the die attach region. The specimen for the cross section should be selected by the result of ultrasonic inspection in accordance with 7.2.3.

The test results should be evaluated in conjunction with the intermediate measurement results.

The recorded thermal resistance data and the crack propagation area ratio (die attach damage data) should be analysed in correlation with each specimen individually.

If the thermal resistance value (R_{th}) increased up to 20 %, then the failure cycles shall be determined.

Once the test is completed, if the thermal resistance value (R_{th}) is not reached to 20 %, the specimen shall be evaluated by ultrasonic flaw inspection. If the horizontal crack propagation area ratio reaches up to 30 %, then it is necessary to determine the failure cycles.

Once the test has finished up to 1 500 cycles, if the thermal resistance value (R_{th}) is not reached to 20 % and the crack propagation area ratio is not reached up to 30 %, the specimen is judged to have performance index "Level 1" as shown in Annex C.

If the crack propagation area ratio at the end of the test criteria is significantly too small, the increased rate of thermal resistance value (R_{th}) of 20 % should be re-defined to a decreased value (e.g. 30 %) to determine the failure cycles.

The measuring condition for the final measurement should be specified in the product specification.

iTeh Standards
(https://standards.iteh.ai)
Document Preview

8 Failure cycle

The failure cycle of the specimen shall be the test cycles for which the end of the test criteria specified in 7.1.4 or failure criteria specified in the product specification are reached, due to crack propagation area at the die attach joint (interface).

IEC 63215-2:2023

The failure cycles for the temperature cycling test should be extrapolated from the thermal resistance change during the test to reach the end of the test criteria in 7.1.4.

The representative failure cycles of the specimens under the same test conditions shall be decided based on the statistical failure rate specified in the product specification. If the product specification does not specify the details, then the shortest failure cycle number shall be taken.

As a reference of the reliability performance for the specimen, the reliability performance index corresponding to the failure cycles in the temperature cycling test is as shown in Annex C.

9 Items to be specified in the product specification

The product specification shall specify the following items if applicable:

a) specification of the discrete type power electronic device (Clause 6)
b) evaluation test conditions, if other than specified in Table 1 (7.1.3);
c) end of test criteria (increasing ratio limit for thermal resistance) (7.1.4)
d) test preparation, if required (7.3.1)
e) preconditioning, if required (7.3.2)
f) initial measurement items and conditions (7.3.3)
g) post-test treatment (7.3.6)
h) final judgment items and conditions (7.3.7)
i) failure cycle and reliability performance level (Clause 8)