

---

**Metode za preskušanje vzdržljivosti materialov za bondiranje čipov – 2. del:  
Metoda s preskusom temperaturnega cikliranja materialov za bondiranje čipov,  
uporabljenih za diskretne močnostne elektronske elemente**

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

Verfahren für die Haltbarkeitsprüfung von Werkstoffen zum Chip-Bonden - Teil 2:  
Verfahren für die Temperaturwechselprüfung von Werkstoffen zum Chip-Bonden von  
leistungselektronischen Bauelementen

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/c60c9a1d-0c76-4b90-85d9-3d688662054a/sist-en-iec-63215-2-2024>

**Ta slovenski standard je istoveten z: EN IEC 63215-2:2023**

---

**ICS:**

|        |                                  |                                 |
|--------|----------------------------------|---------------------------------|
| 31.190 | Sestavljeni elektronski elementi | Electronic component assemblies |
|--------|----------------------------------|---------------------------------|

**SIST EN IEC 63215-2:2024**

**en**



EUROPEAN STANDARD

EN IEC 63215-2

NORME EUROPÉENNE

EUROPÄISCHE NORM

December 2023

ICS 31.190

English Version

Endurance test methods for die attach materials - Part 2:  
Temperature cycling test method for die attach materials applied  
to discrete type power electronic devices  
(IEC 63215-2:2023)

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  
(IEC 63215-2:2023)

Verfahren für die Haltbarkeitsprüfung von Werkstoffen zum  
Chip-Bonden - Teil 2: Verfahren für die  
Temperaturwechselprüfung von Werkstoffen zum Chip-  
Bonden von leistungselektronischen Bauelementen  
(IEC 63215-2:2023)

This European Standard was approved by CENELEC on 2023-11-28. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.



European Committee for Electrotechnical Standardization  
Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

## EN IEC 63215-2:2023 (E)

### European foreword

The text of document 91/1895/FDIS, future edition 1 of IEC 63215-2, prepared by IEC/TC 91 "Electronics assembly technology" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 63215-2:2023.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2024-08-28
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2026-11-28

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

### Endorsement notice

The text of the International Standard IEC 63215-2:2023 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standard indicated:

IEC 61190-1-3 NOTE Approved as EN IEC 61190-1-3

IEC 61760-1:2020 NOTE Approved as EN IEC 61760-1:2020 (not modified)

<https://standards.iteh.ai/catalog/standards/sist/c60c9a1d-0c76-4b90-85d9-3d688662054a/sist-en-iec-63215-2-2024>

## Annex ZA (normative)

### Normative references to international publications with their corresponding European publications

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: [www.cencenelec.eu](http://www.cencenelec.eu).

| <u>Publication</u> | <u>Year</u> | <u>Title</u>   | <u>EN/HD</u>      | <u>Year</u> |
|--------------------|-------------|--|-------------------|-------------|
| IEC 60068-2-14     | -           | Environmental testing - Part 2-14: Tests - Test N: Change of temperature   | EN IEC 60068-2-14 | -           |
| 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   | EN 60747-15       | -           |

<https://standards.iteh.ai/catalog/standards/sist/c60c9a1d-0c76-4b90-85d9-3d688662054a/sist-en-iec-63215-2-2024>





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**

<https://standards.iteh.ai/>

<https://standards.iteh.ai/catalog/standards/sist/c60c9a1d-0c76-4b90-85d9-3d688662054a/sist-en-iec-63215-2-2024>

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.**

## 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 |



|  |                            |    |
|--|----------------------------|----|
| 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 |

## 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.

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.