IEC TS 61189-3-301

Edition 1.0 2016-07

TECHNICAL SPECIFICATION

colour inside

Test methods for electrical materials, printed boards and other interconnection structures and assemblies –
Part 3-301: Test methods for interconnection structures (printed boards) – Appearance inspection method for plated surfaces on PWB

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 31.180

ISBN 978-2-8322-3550-8

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

® Registered trademark of the International Electrotechnical Commission

CONTENTS

FOREWORD 3
1 Scope 5
2 Normative references 5
3 Terms and definitions 5
4 Test specimens 5
5 Equipment / apparatus 5
  5.1 Evaluation of lustre non-uniformity 5
  5.2 Evaluation of colour non-uniformity 6
6 Procedure 6
  6.1 Outline of the method 6
  6.2 Specimen preparation 6
  6.3 Imaging of surface roughness/chromaticity distribution 6
  6.4 Binarization of images 6
  6.5 Extraction of feature quantities 7
  6.6 Derivation of discriminant function 7
  6.7 System registration 7
7 Report 8
8 Additional information 8
Annex A (informative) Example of equipment and tested result for lustre non-uniformity 9
  A.1 Equipment for lustre non-uniformity inspection 9
  A.2 Tested result 9
    A.2.1 Surface roughness image 9
    A.2.2 Binarized image and feature extraction 11
    A.2.3 Frequency analysis of feature quantities 12
    A.2.4 Final estimate 12
Annex B (informative) Example of tested result for colour non-uniformity inspection 13
  B.1 Image analysis of colour non-uniformity 13
  B.2 Feature extraction and discriminant analysis 14
Bibliography 16

Figure 1 – Flow chart of the test procedure 6
Figure A.1 – Equipment prototype 9
Figure A.2 – Images of gold-plating of non-defective and defective products 10
Figure A.3 – Images of S- and P-polarized components, and Ψ’ for gold-plating with lustre non-uniformity 11
Figure A.4 – Image examples of gold-plating with lustre non-uniformity 11
Figure A.5 – Example of frequency analysis of feature quantity 12
Figure A.6 – Example of the final estimate of the quality of gold-plating 12
Figure B.1 – Images of gold-plating pads 13
Figure B.2 – Images of colour distribution 14
Figure B.3 – Frequency analysis example of a feature quantity 14
Figure B.4 – Example of the discriminant analysis result 15

INTERNATIONAL ELECTROTECHNICAL COMMISSION

____

TEST METHODS FOR ELECTRICAL MATERIALS, PRINTED BOARDS AND OTHER INTERCONNECTION STRUCTURES AND ASSEMBLIES –

Part 3-301: Test methods for interconnection structures (printed boards) – Appearance inspection method for plated surfaces on PWB

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.

The main task of IEC technical committees is to prepare International Standards. In exceptional circumstances, a technical committee may propose the publication of a technical specification when

- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC TS 61189-3-301, which is a technical specification, has been prepared by IEC technical committee 91: Electronics assembly technology.

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
91/1348/DTS	91/1376/RVC

Full information on the voting for the approval of this technical specification 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.

A list of all parts in the IEC 61189 series, published under the general title *Test methods for electrical materials, printed boards and other interconnection structures and assemblies*, 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 website under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- transformed into an International standard,
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

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.

TEST METHODS FOR ELECTRICAL MATERIALS, PRINTED BOARDS AND OTHER INTERCONNECTION STRUCTURES AND ASSEMBLIES –

Part 3-301: Test methods for interconnection structures (printed boards) – Appearance inspection method for plated surfaces on PWB

1 Scope

This part of IEC 61189 outlines a way to determine the appearance non-uniformity of both the lustre and colour on plated metal surfaces in printed wiring boards (PWBs). The method is applicable to gold, nickel and copper plating in PWBs.

2 Normative references

There are no normative references in this document.