



BSI Standards Publication

Fixed capacitors for use in electronic equipment

Part 24: Sectional specification — Surface mount fixed tantalum electrolytic capacitors with conductive polymer solid electrolyte

National foreword

This British Standard is the UK implementation of EN 60384-24:2015. It is identical to IEC 60384-24:2015. It supersedes BS EN 60384-24:2006 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee EPL/40X, Capacitors and resistors for electronic equipment.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2015.

Published by BSI Standards Limited 2015

ISBN 978 0 580 78451 4

ICS 31.060.40; 31.060.50

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 October 2015.

Amendments/corrigenda issued since publication

Date	Text affected
-------------	----------------------

EUROPEAN STANDARD

EN 60384-24

NORME EUROPÉENNE

EUROPÄISCHE NORM

October 2015

ICS 31.060.40; 31.060.50

Supersedes EN 60384-24:2006

English Version

**Fixed capacitors for use in electronic equipment - Part 24:
Sectional specification - Surface mount fixed tantalum
electrolytic capacitors with conductive polymer solid electrolyte
(IEC 60384-24:2015)**

Condensateurs fixes utilisés dans les équipements
électroniques - Partie 24: Spécification intermédiaire -
Condensateurs fixes électrolytiques au tantale pour
montage en surface à électrolyte solide en polymère
conducteur
(IEC 60384-24:2015)

Festkondensatoren zur Verwendung in Geräten der
Elektronik -Teil 24: Rahmenspezifikation -
Oberflächenmontierbare Tantal-Elektrolyt-Kondensatoren
mit leitfähigem Polymerfestkörper-Elektrolyten
(IEC 60384-24:2015)

This European Standard was approved by CENELEC on 2015-08-26. 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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

European Foreword

The text of document 40/2382/FDIS, future edition 2 of IEC 60384-24, prepared by IEC TC 40, "Capacitors and resistors for electronic equipment" was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60384-24:2015.

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) 2016-05-26
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2018-08-26

This document supersedes EN 60384-24:2006.

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

Endorsement notice

The text of the International Standard IEC 60384-24:2015 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 standards indicated:

IEC 60384-3	NOTE	Harmonized as EN 60384-3.
IEC 60068-2-58:2004	NOTE	Harmonized as EN 60068-2-58:2004.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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.

NOTE 1 When 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.cenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60063	-	Preferred number series for resistors and capacitors	EN 60063	-
IEC 60068-1	2013	Environmental testing -- Part 1: General and guidance	EN 60068-1	2014
IEC 60384-1	2008	Fixed capacitors for use in electronic equipment -- Part 1: Generic specification	EN 60384-1	2009
IEC 61193-2	2007	Quality assessment systems -- Part 2: Selection and use of sampling plans for inspection of electronic components and packages	EN 61193-2	2007
ISO 3	-	Preferred numbers; Series of preferred numbers	-	-

CONTENTS

FOREWORD	5
1 General	7
1.1 Scope	7
1.2 Object	7
1.3 Normative references	7
1.4 Information to be given in a detail specification	7
1.4.1 General	7
1.4.2 Outline drawing and dimensions	8
1.4.3 Mounting	8
1.4.4 Ratings and characteristics	8
1.4.5 Marking	9
1.5 Terms and definitions	9
1.6 Marking	9
1.6.1 General	9
1.6.2 Information for marking	9
1.6.3 Marking on capacitors	9
1.6.4 Marking on packaging	9
2 Preferred ratings and characteristics	9
2.1 Preferred characteristics	9
2.2 Preferred values of ratings	10
2.2.1 Nominal capacitance (C_N)	10
2.2.2 Tolerance on nominal capacitance	10
2.2.3 Rated voltage (U_R)	10
2.2.4 Category voltage (U_C)	10
2.2.5 Surge voltage (U_{RS} or U_{CS})	10
2.2.6 Rated temperature	10
3 Quality assessment procedures	11
3.1 Primary stage of manufacture	11
3.2 Structurally similar components	11
3.3 Certified test records of released lots	11
3.4 Qualification approval procedures	11
3.4.1 General	11
3.4.2 Qualification approval on the basis of the fixed sample size procedure	11
3.4.3 Tests	12
3.5 Quality conformance inspections	19
3.5.1 Formation of inspection lots	19
3.5.2 Test schedule	20
3.5.3 Delayed delivery	20
3.5.4 Assessment levels	20
4 Test and measurement procedures	21
4.1 Preliminary drying	21
4.2 Measuring conditions	21
4.3 Mounting	21
4.4 Visual examination and check of dimensions	21
4.4.1 General	21
4.4.2 Visual examination and check of dimensions	21

4.4.3	Requirements	21
4.5	Electrical tests	22
4.5.1	Leakage current.....	22
4.5.2	Capacitance	22
4.5.3	Tangent of loss angle ($\tan \delta$)	22
4.5.4	Equivalent series resistance (if required)	23
4.6	Resistance to soldering heat.....	23
4.6.1	General	23
4.6.2	Initial inspections.....	23
4.6.3	Test conditions	23
4.6.4	Recovery	23
4.6.5	Final inspections and requirements.....	23
4.7	Solderability.....	23
4.7.1	General	23
4.7.2	Final inspections and requirements.....	23
4.8	Shear test.....	23
4.9	Substrate bending test (if required).....	24
4.9.1	General	24
4.9.2	Initial inspections.....	24
4.9.3	Test conditions	24
4.9.4	Final inspections and requirements.....	24
4.10	Rapid change of temperature.....	24
4.10.1	General	24
4.10.2	Initial inspections.....	24
4.10.3	Test conditions	24
4.10.4	Recovery	24
4.10.5	Final inspections and requirements.....	24
4.11	Climatic sequence.....	24
4.11.1	General	24
4.11.2	Initial inspections.....	24
4.11.3	Dry heat	25
4.11.4	Damp heat, cyclic, test Db, first cycle	25
4.11.5	Cold.....	25
4.11.6	Damp heat, cyclic, test Db, remaining cycles	25
4.11.7	Recovery	25
4.11.8	Final inspections and requirements.....	25
4.12	Damp heat, steady state	25
4.12.1	General	25
4.12.2	Initial inspections.....	25
4.12.3	Test conditions	25
4.12.4	Recovery	25
4.12.5	Final inspections and requirements.....	25
4.13	Characteristics at high and low temperature.....	26
4.13.1	General	26
4.13.2	Initial inspections and requirements.....	26
4.14	Surge voltage	26
4.14.1	General	26
4.14.2	Initial inspections.....	26
4.14.3	Test conditions	26

4.14.4	Recovery	26
4.14.5	Final inspections and requirements.....	26
4.15	Endurance	26
4.15.1	General	26
4.15.2	Initial inspections.....	27
4.15.3	Test conditions	27
4.15.4	Recovery	27
4.15.5	Final inspections and requirements.....	27
4.16	Component solvent resistance (if required)	27
4.17	Solvent resistance of marking (if required)	27
4.18	High surge current (if required)	27
4.19	Storage at high temperature.....	27
4.19.1	General	27
4.19.2	Initial inspections.....	27
4.19.3	Test conditions	27
4.19.4	Recovery	27
4.19.5	Final inspections and requirements.....	28
Bibliography.....		29
Table 1 – Category and surge voltages		11
Table 2 – Category and surge voltages		11
Table 3 – Sampling plan for qualification approval, assessment level EZ		13
Table 4 – Test schedule for qualification approval (<i>1 of 6</i>)		14
Table 5 – Lot-by-lot inspection		20
Table 6 – Periodic inspection		21

INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –**Part 24: Sectional specification – Fixed tantalum electrolytic surface mount capacitors with conductive polymer solid electrolyte**

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 60384-24 has been prepared by IEC technical committee 40: Capacitors and resistors for electronic equipment.

This second edition cancels and replaces the first edition published in 2006 and constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) Revision of the structure in accordance with ISO/IEC Directives, Part 2:2011 (sixth edition) to the extent practicable, and harmonization between other similar kinds of documents.
- b) In addition, Clause 4 and all the tables have been reviewed in order to prevent duplications and contradictions.

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

FDIS	Report on voting
40/2382/FDIS	40/2395/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.

The list of all parts of the IEC 60384 series, under the general title *Fixed capacitors for use in electronic equipment*, 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

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

FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –

Part 24: Sectional specification – Fixed tantalum electrolytic surface mount capacitors with conductive polymer solid electrolyte

1 General

1.1 Scope

This part of IEC 60384 applies to fixed tantalum electrolytic surface mount capacitors with conductive polymer solid electrolyte primarily intended for d.c. applications for use in electronic equipment.

Fixed tantalum electrolytic surface mount capacitors with solid (MnO₂) electrolyte are not included but are covered by IEC 60384-3.

These capacitors are primarily intended for use in electronic equipment to be mounted directly on substrates for hybrid circuits or to printed boards.

Capacitors for special-purpose applications may need additional requirements.

1.2 Object

The object of this standard is to prescribe preferred ratings and characteristics and to select from IEC 60384-1 the appropriate quality assessment procedures, tests and measuring methods and to give general performance requirements for this type of capacitor. Test severities and requirements prescribed in detail specifications referring to this sectional specification shall be of equal or higher performance level, because lower performance levels are not permitted.

1.3 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 60063, *Preferred number series for resistors and capacitors*

IEC 60068-1:2013, *Environmental testing – Part 1: General and guidance*

IEC 60384-1:2008, *Fixed capacitors for use in electronic equipment – Part 1: Generic specification*

IEC 61193-2:2007, *Quality assessment systems – Part 2: Selection and use of sampling plans for inspection of electronic components and packages*

ISO 3, *Preferred numbers – Series of preferred numbers*

1.4 Information to be given in a detail specification

1.4.1 General

Detail specifications shall be derived from the blank detail specification.