



ANSI/EIA-60384-2-2014
Approved: October 6, 2014

EIA STANDARD

EIA-60384-2

Fixed Capacitors for Use in Electronic Equipment – Part 2: Sectional Specification – Fixed Metallized Polyethylene Terephthalate Film Dielectric d.c. Capacitors

EIA-60384-2
(IEC 60384-2:2011, IDT)

October 2014



NOTICE

EIA Engineering Standards and Publications are designed to serve the public interest through eliminating misunderstandings between manufacturers and purchasers, facilitating interchangeability and improvement of products, and assisting the purchaser in selecting and obtaining with minimum delay the proper product for his particular need. Existence of such Standards and Publications shall not in any respect preclude any member or nonmember of ECIA from manufacturing or selling products not conforming to such Standards and Publications, nor shall the existence of such Standards and Publications preclude their voluntary use by those other than ECIA members, whether the standard is to be used either domestically or internationally.

Standards and Publications are adopted by ECIA in accordance with the American National Standards Institute (ANSI) patent policy. By such action, ECIA does not assume any liability to any patent owner, nor does it assume any obligation whatever to parties adopting the Standard or Publication.

This EIA Standard is identical (IDT) with the International Standard IEC Publication 60384-2:2011: *Fixed Capacitors for Use in Electronic Equipment – Part 2: Sectional Specification – Fixed Metallized Polyethylene Terephthalate Film Dielectric d.c. Capacitors*.

This document is the EIA Standard EIA-60384-2 2014: *Fixed Capacitors for Use in Electronic Equipment – Part 2: Sectional Specification – Fixed Metallized Polyethylene Terephthalate Film Dielectric d.c. Capacitors*.

The text, figures and tables of IEC 60384-2:2011 are used in this Standard with the consent of the IEC and the American National Standards Institute (ANSI). These materials are subject to copyright claims of IEC and ECIA. No part of this publication may be reproduced in any form, including an electronic retrieval system, without the prior written permission of ECIA. All requests pertaining to EIA-60384-2 2014: Fixed Capacitors for Use in Electronic Equipment – Part 2: Sectional Specification – Fixed Metallized Polyethylene Terephthalate Film Dielectric d.c. Capacitors should be submitted to ECIA at the address below. The IEC copyrighted material has been reproduced with permission from ANSI. The IEC Foreword and Introduction are not part of the requirements of this standard but are included for information purposes only.

This Standard does not purport to address all safety problems associated with its use or all applicable regulatory requirements. It is the responsibility of the user of this Standard to establish appropriate safety and health practices and to determine the applicability of regulatory limitations before its use.

(From Standards Proposal No. 5286, formulated under the cognizance of the P-2.2 Committee on EIA Paper, Film, Mica & Wet Electrolytic Capacitors Standards and given final approval by the Steering Committee for Passive Electronic Components Standards (S-1)).

Published by

©Electronic Components Industry Association 2014
Standards & Technology Department
2214 Rock Hill Road, Suite 265
Herndon, VA 20170

**PLEASE!
DON'T VIOLATE
THE
LAW!**

This document is copyrighted by the ECIA and may not be reproduced without permission.

Organizations may obtain permission to reproduce a limited number of copies through entering into a license agreement. For information, contact:

IHS
15 Inverness Way East
Englewood, CO 80112-5704 or call
USA and Canada (1-877-413-5184), International (303-397-7956)

CONTENTS

FOREWORD	1
1 General	3
1.1 Scope	3
1.2 Object.....	3
1.3 Normative references	3
1.4 Information to be given in a detail specification	3
1.5 Terms and definitions	5
1.6 Marking.....	5
2 Preferred ratings and characteristics	6
2.1 Preferred characteristics	6
2.2 Preferred values of ratings	6
3 Quality assessment procedures	7
3.1 Primary stage of manufacture	7
3.2 Structurally similar components.....	7
3.3 Certified records of released lots	7
3.4 Qualification approval	7
3.5 Quality conformance inspection.....	14
4 Test and measurement procedures	16
4.1 Visual examination and check of dimensions.....	16
4.2 Electrical tests.....	16
4.3 Robustness of terminations.....	19
4.4 Resistance to soldering heat	19
4.5 Solderability	19
4.6 Rapid change of the temperature	20
4.7 Vibration	20
4.8 Bump.....	20
4.9 Shock	21
4.10 Climatic sequence	21
4.11 Damp heat, steady state	22
4.12 Endurance	23
4.13 Charge and discharge.....	23
4.14 Component solvent resistance	24
4.15 Solvent resistance of the marking.....	24
Bibliography.....	25
Table 1 – Sampling plan together with numbers of permissible non-conformance for qualification approval test	9
Table 2 – Test schedule for qualification approval	10
Table 3 – Lot-by-lot inspection	15
Table 4 – Periodic inspection	16
Table 5 – Test points and voltages	16
Table 6 – Tangent of loss angle requirements.....	17
Table 7 – Insulation resistance requirements	18
Table 8 – Correction factors.....	19

Table 9 – Preferred severities 21

Table 10 – Test conditions 23

Table 11 – Lead spacing..... 24

.....

INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –

Part 2: Sectional specification – Fixed metallized polyethylene terephthalate film dielectric d.c. capacitors

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 60384-2 has been prepared by IEC technical committee 40: Capacitors and resistors for electronic equipment.

This fourth edition cancels and replaces the third edition published in 2005 and contains the following significant technical changes with respect to the previous edition.

- Table 1, Sampling plan together with numbers of permissible non-conformance for qualification approval test, has been adjusted.
- Table 3, Lot-by-lot inspection, has been changed, highlighting assessment level EZ only.
- Table 4, Periodic inspection, has been changed, highlighting assessment level EZ only.
- The preferred values of rated voltages have been updated in conformance with the basic series of preferred values R5 and R10 given in ISO 3.

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

FDIS	Report on voting
40/2129/FDIS	40/2142/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.

A list of all the 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 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.

.....

FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –

Part 2: Sectional specification – Fixed metallized polyethylene terephthalate film dielectric d.c. capacitors

1 General

1.1 Scope

This part of IEC 60384 applies to fixed capacitors for direct current, with metallized electrodes and polyethylene-terephthalate dielectric for use in electronic equipment.

These capacitors may have “self-healing properties” depending on conditions of use. They are primarily intended for applications where the a.c. component is small with respect to the rated voltage. Two performance grades of capacitors are covered, Grade 1 for long-life application and Grade 2 for general application.

Capacitors for electromagnetic interference suppression and surface mount fixed metallized polyethylene-terephthalate film dielectric d.c. capacitors are not included, but are covered by IEC 60384-14 and IEC 60384-19 respectively.

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 should be of equal or higher performance level, because lower performance levels are not permitted.

1.3 Normative references

The following referenced documents are indispensable for the application 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 60063:1963, *Preferred number series for resistors and capacitors*

Amendment 1 (1967)

Amendment 2 (1977)

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

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

ISO 3:1973, *Preferred numbers – Series of preferred numbers*

1.4 Information to be given in a detail specification

Detail specifications shall be derived from the relevant blank detail specification.

Detail specifications shall not specify requirements inferior to those of the generic, sectional or blank detail specification. When more severe requirements are included, they shall be listed in 1.9 of the detail specification and indicated in the test schedules, for example by an asterisk.

NOTE The information given in 1.4.1 may, for convenience, be presented in tabular form.

The following information shall be given in each detail specification and the values quoted shall preferably be selected from those given in the appropriate clause of this sectional specification.

1.4.1 Outline drawing and dimensions

These shall be an illustration of the capacitor as an aid to easy recognition and for comparison of the capacitor with others. Dimensions and their associated tolerances, which affect interchangeability and mounting, shall be given in the detail specification. All dimensions shall preferably be stated in millimetres.

Normally, the numerical values shall be given for the length of the body, the width and height of the body and the wire spacing, or for cylindrical types, the body diameter, and the length and diameter of the terminations. When necessary, for example, when a number of items (capacitance values/voltage ranges) are covered by a detail specification, the dimensions and their associated tolerances shall be placed in a table below the drawing.

When the configuration is other than described above, the detail specification shall state such dimensional information as will adequately describe the capacitor. When the capacitor is not designed for use on printed boards, this shall be clearly stated in the detail specification.

1.4.2 Mounting

The detail specification shall specify the method of mounting to be applied for normal use and for the application of the vibration and the bump or shock tests. The capacitors shall be mounted by their normal means. The design of the capacitor may be such that special mounting fixtures are required in its use. In this case, the detail specification shall describe the mounting fixtures and they shall be used in the application of the vibration and bump or shock tests.

1.4.3 Rating and characteristics

The ratings and characteristics shall be in accordance with the relevant clauses of this specification, together with the following.

1.4.3.1 Particular characteristics

Additional characteristics may be listed, when they are considered necessary to specify adequately the component for design and application purposes.

1.4.3.2 Soldering

The detail specification shall prescribe the test methods, severities and requirements applicable for the solderability and the resistance to solder heat test.

1.4.4 Marking

The detail specification shall specify the content of the marking on the capacitor and on the package. Deviations from 1.6 of this sectional specification shall be specifically stated.

1.5 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60384-1 and the following apply.

1.5.1

performance grade 1 capacitors (long-life)

capacitors for long-life applications with stringent requirements for the electrical parameters

1.5.2

performance grade 2 capacitors (general purpose)

capacitors for general application where the stringent requirements for Grade 1 capacitors are not necessary

1.5.3

rated voltage

U_R

maximum d.c. voltage which may be applied continuously to a capacitor at the rated temperature

NOTE The sum of the d.c. voltage and the peak a.c. voltage applied to the capacitor must not exceed the rated voltage. The value of the peak a.c. voltage must not exceed the following percentages of the rated voltage at the frequencies stated and must be not greater than 280 V:

50 Hz:	20 %
100 Hz:	15 %
1 000 Hz:	3 %
10 000 Hz:	1 %

unless otherwise specified in the detail specification.

1.6 Marking

See IEC 60384-1, 2.4 with the following details.

1.6.1 General

The information given in the marking is normally selected from the following list; the relative importance of each item is indicated by its position in the list:

- nominal capacitance;
- rated voltage (d.c. voltage may be indicated by the symbol $\underline{\underline{\quad}}$ or $\underline{\quad}$);
- tolerance on nominal capacitance;
- category voltage;
- year and month (or week) of manufacture;
- manufacturer's name or trade mark;
- climatic category;
- manufacturer's type designation;
- reference to the detail specification.

1.6.2 Marking of capacitors

The capacitor shall be clearly marked with a), b) and c) above and with as many as possible of the remaining items as is considered necessary. Any duplication of information in the marking on the capacitor should be avoided.