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JIS C 5101-4 : 2010

(IEC 60384-4 : 2007)

(JEITA/JSA)

**Fixed capacitors for use in
electronic equipment—
Part 4: Sectional specification—
Aluminium electrolytic capacitors
with solid (MnO₂) and non-solid
electrolyte**

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee as the result of proposal for revision of Japanese Industrial Standard submitted by Japan Electronics and Information Technology Industries Association (JEITA)/Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14.

Consequently **JIS C 5101-4:1998** has been replaced with this Standard.

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JIS C 5101 series consists of the following 45 parts under the general title “*Fixed capacitors for use in electronic equipment*”:

JIS C 5101-1 *Part 1: Generic specification*

JIS C 5101-2 *Part 2: Sectional specification: Fixed metallized polyethylene-terephthalate film dielectric d.c. capacitors*

JIS C 5101-2-1 *Part 2-1: Blank detail specification: Fixed metallized polyethylene-terephthalate film dielectric d.c. capacitors—Assessment levels E and EZ*

JIS C 5101-3 *Part 3: Sectional specification—Surface mount fixed tantalum electrolytic capacitors with manganese dioxide solid electrolyte*

JIS C 5101-3-1 *Part 3-1: Blank detail specification—Surface mount fixed tantalum electrolytic capacitors with manganese dioxide solid electrolyte—Assessment level EZ*

JIS C 5101-4 *Part 4: Sectional specification—Aluminium electrolytic capacitors with solid (MnO₂) and non-solid electrolyte*

JIS C 5101-4-1 *Part 4-1: Blank detail specification—Fixed aluminium electrolytic capacitors with non-solid electrolyte—Assessment level EZ*

JIS C 5101-4-2 *Part 4-2: Blank detail specification—Fixed aluminium electrolytic capacitors with solid (MnO₂) electrolyte—Assessment level EZ*

JIS C 5101-8 *Part 8: Sectional specification: Fixed capacitors of ceramic dielectric, Class 1*

JIS C 5101-8-1 *Part 8-1: Blank detail specification: Fixed capacitors of ceramic dielectric, Class 1 Assessment level EZ*

- JIS C 5101-9 *Part 9: Sectional specification: Fixed capacitors of ceramic dielectric, Class 2*
- JIS C 5101-9-1 *Part 9-1: Blank detail specification: Fixed capacitors of ceramic dielectric, Class 2 Assessment level EZ*
- JIS C 5101-11 *Part 11: Sectional specification: Fixed polyethylene-terephthalate film dielectric metal foil d.c. capacitors*
- JIS C 5101-11-1 *Part 11: Blank detail specification: Fixed polyethylene-terephthalate film dielectric metal foil d.c. capacitors Assessment level E*
- JIS C 5101-13 *Part 13: Sectional specification—Fixed polypropylene film dielectric metal foil d.c. capacitors*
- JIS C 5101-13-1 *Part 13-1: Blank detail specification—Fixed polypropylene film dielectric metal foil d.c. capacitors—Assessment levels E and EZ*
- JIS C 5101-14 *Part 14: Sectional specification: Fixed capacitors for electromagnetic interference suppression and connection to the supply mains*
- JIS C 5101-14-1 *Part 14-1: Blank detail specification: Fixed capacitors for electromagnetic interference suppression and connection to the supply mains—Assessment level D*
- JIS C 5101-14-2 *Part 14-2: Blank detail specification: Fixed capacitors for electromagnetic interference suppression and connection to the supply mains—Safety tests only*
- JIS C 5101-14-3 *Part 14-3: Blank detail specification: Fixed capacitors for electromagnetic interference suppression and connection to the supply mains—Assessment level DZ*
- JIS C 5101-15 *Part 15: Sectional specification: Fixed tantalum capacitors with non-solid or solid electrolyte*
- JIS C 5101-15-1 *Part 15: Blank detail specification: Fixed tantalum capacitors with non-solid electrolyte and foil electrode Assessment level E*
- JIS C 5101-15-2 *Part 15: Blank detail specification: Fixed tantalum capacitors with non-solid electrolyte and porous anode Assessment level E*
- JIS C 5101-15-3 *Part 15: Blank detail specification: Fixed tantalum capacitors with solid electrolyte and porous anode Assessment level E*
- JIS C 5101-16 *Part 16: Sectional specification: Fixed metallized polypropylene film dielectric d.c. capacitors*
- JIS C 5101-16-1 *Part 16-1: Blank detail specification: Fixed metallized polypropylene film dielectric d.c. capacitors—Assessment levels E and EZ*
- JIS C 5101-17 *Part 17: Sectional specification: Fixed metallized polypropylene film dielectric a.c. and pulse capacitors*
- JIS C 5101-17-1 *Part 17-1: Blank detail specification: Fixed metallized polypropylene film dielectric a.c. and pulse capacitors—Assessment levels E and EZ*

- JIS C 5101-18 *Part 18: Sectional specification—Fixed aluminium electrolytic surface mount capacitors with solid (MnO₂) and non-solid electrolyte*
- JIS C 5101-18-1 *Part 18-1: Blank detail specification—Fixed aluminium electrolytic surface mount capacitors with solid (MnO₂) electrolyte—Assessment level EZ*
- JIS C 5101-18-2 *Part 18-2: Blank detail specification—Fixed aluminium electrolytic surface mount capacitors with non-solid electrolyte—Assessment level EZ*
- JIS C 5101-20 *Part 20: Sectional specification—Fixed metallized polyphenylene sulfide film dielectric surface mount d.c. capacitors*
- JIS C 5101-20-1 *Part 20-1: Blank detail specification—Fixed metallized polyphenylene sulfide film dielectric surface mount d.c. capacitors—Assessment level EZ*
- JIS C 5101-21 *Part 21: Sectional specification: Fixed surface mount multilayer capacitors of ceramic dielectric, Class 1*
- JIS C 5101-21-1 *Part 21-1: Blank detail specification: Fixed surface mount multilayer capacitors of ceramic dielectric, Class 1—Assessment level EZ*
- JIS C 5101-22 *Part 22: Sectional specification: Fixed surface mount multilayer capacitors of ceramic dielectric, Class 2*
- JIS C 5101-22-1 *Part 22-1: Blank detail specification: Fixed surface mount multilayer capacitors of ceramic dielectric, Class 2—Assessment level EZ*
- JIS C 5101-23 *Part 23: Sectional specification—Fixed surface mount metallized polyethylene naphthalate film dielectric DC capacitors*
- JIS C 5101-23-1 *Part 23-1: Blank detail specification—Fixed surface mount metallized polyethylene naphthalate film dielectric DC capacitors—Assessment level EZ*
- JIS C 5101-24 *Part 24: Sectional specification—Surface mount fixed tantalum electrolytic capacitors with conductive polymer solid electrolyte*
- JIS C 5101-24-1 *Part 24-1: Blank detail specification—Surface mount fixed tantalum electrolytic capacitors with conductive polymer solid electrolyte—Assessment level EZ*
- JIS C 5101-25 *Part 25: Sectional specification—Surface mount fixed aluminium electrolytic capacitors with conductive polymer solid electrolyte*
- JIS C 5101-25-1 *Part 25-1: Blank detail specification—Surface mount fixed aluminium electrolytic capacitors with conductive polymer solid electrolyte—Assessment level EZ*
- JIS C 5101-26 *Part 26: Sectional specification—Fixed aluminium electrolytic capacitors with conductive polymer solid electrolyte (to be published)*
- JIS C 5101-26-1 *Part 26-1: Blank detail specification—Fixed aluminium electrolytic capacitors with conductive polymer solid electrolyte—Assessment level EZ (to be published)*

**Fixed capacitors for use in
electronic equipment—
Part 4: Sectional specification—
Aluminium electrolytic capacitors with
solid (MnO₂) and non-solid electrolyte**

Introduction

This Japanese Industrial Standard has been prepared based on the fourth edition of **IEC 60384-4** published in 2007 without modifying the technical contents.

The portions with dotted underlines are the matters not given in corresponding International Standard.

1 General

1.1 Scope

This Standard is a sectional specification associated with generic specification **JIS C 5101-1** and applies to aluminium electrolytic capacitors with solid (MnO₂) and non-solid electrolyte primarily intended for d.c. applications for use in electronic equipment.

It covers capacitors for long-life applications and capacitors for general-purpose applications.

Capacitors for fixed surface mount aluminium electrolytic capacitors with solid (MnO₂) and non-solid electrolyte are not included but they are covered by **JIS C 5101-18**.

For capacitors for special-purpose applications, additional performance requirements may be listed when they are considered necessary to specify adequately for the application purposes.

NOTE : The International Standard corresponding to this Standard and the symbol of degree of correspondence are as follows:

IEC 60384-4:2007 *Fixed capacitors for use in electronic equipment—
Part 4: Sectional specification—Aluminium electrolytic capacitors with
solid (MnO₂) and non-solid electrolyte* (IDT)

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standard and **JIS** are IDT (identical), MOD (modified) and NEQ (not equivalent) according to **ISO/IEC Guide 21-1**.

1.2 Object

The principal object of this Standard is to prescribe preferred ratings and characteristics and to select from **JIS C 5101-1** 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.

1.3 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. For standards with the year indication, only the editions of the indicated year shall be applied and any revisions (including amendments) made thereafter shall not be applied. For those without the indication of the year, the most recent edition (including amendments) shall be applied.

JIS C 0025:1988 *Basic environmental testing procedures Part 2: Tests Test N: Change of temperature*

JIS C 5063 *Preferred number series for resistors and capacitors*

NOTE : Corresponding International Standard: IEC 60063:1963 *Preferred number series for resistors and capacitors* and Amendment 1:1967 and Amendment 2:1977 (IDT)

JIS C 5101-1:2010 *Fixed capacitors for use in electronic equipment—Part 1: Generic specification*

NOTE : Corresponding International Standard: IEC 60384-1:2008 *Fixed capacitors for use in electronic equipment—Part 1: Generic specification* (IDT)

JIS C 60068-1:1993 *Environmental testing Part 1: General and guidance*

NOTE : Corresponding International Standard: IEC 60068-1:1988 *Environmental testing—Part 1: General and guidance* and Amendment 1:1992 (IDT)

JIS C 60068-2-17:2001 *Basic environmental testing procedures—Part 2: Tests—Test Q: Sealing*

NOTE : Corresponding International Standard: IEC 60068-2-17:1994 *Basic environmental testing procedures—Part 2: Tests—Test Q: Sealing* (IDT)

JIS C 60068-2-54 *Environmental testing—Part 2-54: Tests—Test Ta: Solderability testing of electronic components by the wetting balance method*

NOTE : Corresponding International Standard: IEC 60068-2-54 *Environmental testing—Part 2-54: Tests—Test Ta: Solderability testing of electronic components by the wetting balance method* (MOD)

JIS Z 8601 *Preferred numbers*

NOTE : Corresponding International Standard: ISO 3:1973 *Preferred numbers—Series of preferred numbers* (MOD)

JIS Z 9015-1 *Sampling procedures for inspection by attributes—Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

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 (*).

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

There 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 millimeters (mm).

NOTE : The dimensions and tolerances thereof may be presented in tabular form.

Normally, the numerical values shall be given for the length of the body, the width and height of the body in addition to the width and length of the terminations and the wire spacing, or for cylindrical types, and body diameter, and the length and diameter of the terminations and the wire spacing.

NOTE : For tag terminations and screw terminations, following items are specified in addition to the diameter and length of the body.

Tag terminations: Width, thickness and length of the terminal plates in addition to the wiring position and wire spacing

Screw terminations: Nominal designation of thread, nominal length and thread length in addition to the wiring position and wire spacing

When a number of items (nominal 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 Ratings and characteristics

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

1.4.3.1 Nominal capacitance range

See 2.2.1.

NOTE : When products approved to the detail specification have different ranges, in the case of **IEC Quality Assessment System (IECQ)**, the following statement should be added: "The range of nominal capacitance available in each voltage range is given in Qualification approval certificate".

1.4.3.2 Particular characteristics

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

1.4.3.3 Soldering

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

1.4.4 Marking

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

1.5 Terms and definitions

For the purposes of this Standard, the following terms and definitions, in addition to the applicable terms and definitions of **JIS C 5101-1**, apply.

1.5.1 capacitance of an electrolytic capacitor

capacitance of an equivalent circuit having capacitance and resistance in series measured with alternating current approximately sinusoidal waveform at a specified frequency

1.5.2 long-life grade capacitors

capacitors intended for applications where a high degree of stability of characteristics over a long life is essential

The materials are chosen and the manufacture carried out so that improved performance is obtained with consequent increase in life.

1.5.3 general-purpose grade capacitors

capacitors intended by applications where the high performance level of long-life grade capacitors is not required

1.5.4 reverse voltage (for polar capacitors only)

voltage applied to the capacitor terminals in the reverse polarity direction

1.6 Marking

According to **2.4** of **JIS C 5101-1**, with the following details.

1.6.1 Marking on capacitors and packages

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:

- a) nominal capacitance;
- b) rated voltage (d.c. voltage may be indicated by the symbol: --- or —);
- c) category voltage and category temperatures (for long-life grade capacitors only);
- d) polarity of the terminations: for multi-section capacitors, the nominal capacitance and rated voltage of the sections connected to each termination shall be shown in an unambiguous way. The termination of a capacitor section which is intended for direct connection to the rectifier (so-called reservoir section) shall be marked with the number 1 or with the colour red;
- e) tolerance on nominal capacitance;
- f) reference to the grade (for long-life grade capacitors only). The abbreviation LL may be used for marking purposes;
- g) year and month (or year and week) of manufacture;
- h) manufacturer's name or trade mark;
- i) climatic category;
- j) manufacturer's type designation;
- k) reference to the detail specification.

1.6.2 Marking on capacitors

The capacitor shall be clearly marked with **a)**, **b)**, **c)**, **d)**, **e)** and **f)** above 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.

1.6.3 Marking on packages

The package containing the capacitor(s) shall be clearly marked with all the information listed in **1.6.1**. The polarity shall not be marked unless marking is possible according to the packaging style.

1.6.4 Additional marking

Any additional marking other than that specified in **1.6.1** shall be so applied that no confusion can arise.

2 Preferred ratings and characteristics

2.1 Preferred characteristics

The values given in detail specifications shall preferably be selected from the following.

2.1.1 Preferred climatic categories

The capacitors covered by this Standard are classified into climatic categories according to the general rules given in clause 8 of **JIS C 60068-1**.

The lower and upper category temperature and the duration of the damp-heat steady-state test shall be chosen from the following.