

JIS

JAPANESE INDUSTRIAL STANDARD

**General rules of fixed plastic
film capacitors for use in
electronic equipment**

JIS C 5111—1995

Translated and Published

by

Japanese Standards Association

Printed in Japan

In the event of any doubt arising,
the original Standard in Japanese is to be final authority.

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General rules of fixed plastic film capacitors
for use in electronic equipment

C 5111-1995

1. Scope This Japanese Industrial Standard is the sectional specification of fixed capacitors which employ plastic film as the main dielectric and which are mainly used for electronic equipment (hereafter referred to as "capacitors"), and specifies the bases for type designation, ratings, materials, construction, appearance, dimensions, marking, performance and for requirements to be specified in detail specifications.

Remarks 1. The following standards are cited in this Standard:

- JIS B 0205 Metric coarse screw threads
- JIS B 0207 Metric fine screw threads
- JIS C 0805 Packaging of electronic components on continuous tapes (components with axial type and radial wire lead terminals)
- JIS C 0806 Packaging of electronic components on continuous tapes (surface mounting devices)
- JIS C 2318 Polyester films for electrical purposes
- JIS C 2320 Electrical insulating oils
- JIS C 2330 Polypropylene films for electrical purposes
- JIS C 3102 Annealed copper wires for electrical purposes
- JIS C 5001 General rules for electronic components
- JIS C 5003 General test procedure of failure rate for electronic components
- JIS C 5101 General rules of fixed capacitors for use in electronic equipment
- JIS C 5102 Test methods of fixed capacitors for use in electronic equipment
- JIS C 5602 Glossary of passive components for electronic equipment
- JIS H 4160 Aluminium and aluminium alloy foils
- JIS Z 8601 Preferred numbers
- JIS Z 9015 Sampling inspection procedures and tables by attributes with severity adjustment (receiving inspection where a consumer can select suppliers)

2. The International standards corresponding to this Standard are given below.

These standards are called generically IEC 384 hereafter.

- IEC 384-2 (1982) Fixed capacitors for use in electronic equipment
Part 2: Sectional specification: Fixed metallized polyethylene-terephthalate film dielectric d.c. capacitors
Amendment 1 (1987)
Amendment 2 (1992)
- IEC 384-6 (1987) Fixed capacitors for use in electronic equipment
Part 6: sectional specification: Fixed metallized polycarbonate film dielectric d.c. capacitors
Amendment 1 (1992)
- IEC 384-7 (1991) Fixed capacitors for use in electronic equipment
Part 7: Sectional specification: Fixed polystyrene film dielectric metal foil d.c. capacitors
- IEC 384-11 (1988) Fixed capacitors for use in electronic equipment
Part 11: Sectional specification: Fixed polyethylene-terephthalate film dielectric metal foil d.c. capacitors
- IEC 384-12 (1988) Fixed capacitors for use in electronic equipment
Part 12: Sectional specification: Fixed polycarbonate film dielectric metal foil d.c. capacitors
- IEC 384-13 (1991) Fixed capacitors for use in electronic equipment
Part 13: Sectional specification: Fixed polypropylene film dielectric metal foil d.c. capacitors
- IEC 384-16 (1982) Fixed capacitors for use in electronic equipment
Part 16: Sectional specification: Fixed metallized polypropylene film dielectric d.c. capacitors
Amendment 1 (1987)
Amendment 2 (1992)
- IEC 384-19 (1993) Fixed capacitors for use in electronic equipment
Part 19: Sectional specification: Fixed metallized polyethylene-terephthalate film dielectric chip d.c. capacitors

2. Definitions For the purposes of this Standard, the definitions given in JIS C 5101 and JIS C 5602 shall apply.

The principal terms are as follows:

- (1) liquid impregnated capacitor A capacitor wherein capacitor element is impregnated with impregnant having fluidity under ordinary temperature.
- (2) solid impregnated capacitor A capacitor wherein capacitor element is impregnated with impregnant having no fluidity under ordinary temperature.
- (3) non-impregnated capacitor A capacitor wherein capacitor element is not impregnated.
- (4) liquid filled capacitor A capacitor whose whole volume of case is filled up with filling material having fluidity under ordinary temperature. It includes the ones having a space in its case to allow expansion of the liquid due to temperature change.
- (5) solid filled capacitor A capacitor whose whole volume of case is filled up with filling material having no fluidity under ordinary temperature.
- (6) non-inductive structure Such structure that the series inductance is minimized as possible in capacitors so constructed that the electrode and dielectric are piled alternately and then wound, or they are piled up.
- (7) self-healing The process by which capacitor functions are immediately restored due to disappearance of small area of electrode adjacent to the break point when a local dielectric breakdown of metallized film capacitor occurs.
- (8) extended foil structure Such structure of electrodes in capacitors wherein the electrode and dielectric are piled alternately and then wound or laminated that the electrodes are extended from the dielectric toward opposite sides each other in the crosswise direction of dielectric and the extended portion on each side is connected together to serve as the electrode. This is one kind of non-inductive structure.
- (9) tab structure Such structure that outgoing tabs or wires are inserted between wound electrode foil and dielectric, in capacitors wherein the electrode and dielectric are piled alternately and then wound.
- (10) bi-film capacitor A capacitor which employs plastic films of different kind as the dielectric.

Informative reference: These terms are used in IEC 384.

3. Priority of standards If there is any conflict among the standards given below, priority shall be given to the numerical sequence indicated.

- (1) Detail specification
- (2) Sectional specification (JIS C 5111)
- (3) Generic specification (JIS C 5101)
- (4) Basic specification (JIS C 5001)

4. Type designation

4.1 Structure of type designation Type designation shall be expressed as shown in the following arrangement:

Symbol denoting kind of capacitor	Symbol denoting style	Symbol denoting charac- teristics	Symbol denoting rated voltage	Symbol denoting rated ca- pacitance	Symbol denoting toler- ances on capaci- tance	Symbol denoting grade	Symbol denoting failure rate level	Symbol denoting other neces- sary items
4.2.1	4.2.2	4.2.3	4.2.4	4.2.5	4.2.6	4.2.7	4.2.8	4.2.9
Example 1. CQ	921	MG	2J	104	K	X	X	B
Example 2. CF	922	M1G	1J	105	K	E	M	B
Example 3. CU	14	AJ	1H	103	J	X	X	B

4.2 Symbols

4.2.1 Kind of capacitor The classification is made in accordance with the main materials of dielectric and kind of electrodes, and the symbol denoting kind is presented by two English capital letters as given in Table 1.

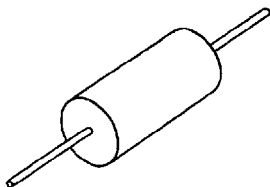
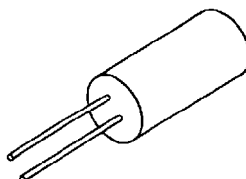
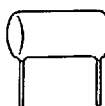
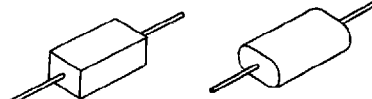
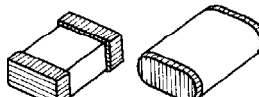
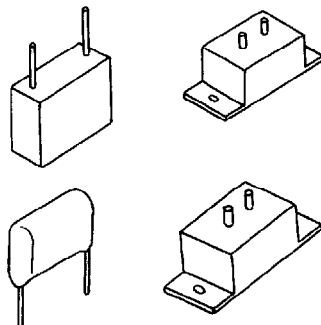
Table 1. Kind of capacitors

Symbol	Kind of capacitor	Main materials of dielectric	Kind of electrode
CF	Metallized plastic film capacitor	Plastic film	Vapour deposited metal film, or combination of vapour deposited metal film and metal foil
CQ	Plastic film capacitor		Metal foil
CU	Metallized bi-film capacitor	Combination of different plastic films	Vapour deposited metal film, or combination of vapour deposited metal film and metal foil
CW	Bi-film capacitor		Metal foil

4.2.2 Style The symbol denoting style shall be presented by two numerals as given in Table 2. For the Style Nos. 72, 73 and 77, however, a third numeral may be added to discriminate the position of front mounting termination (or electrode), so that each symbol as a result is composed of three numerals as given in Table 3.

Likewise, in the case of Style No. 92, a third numeral may be added to discriminate the kind of enclosure and lead-out means as given in Table 4.

Table 2. Styles

Symbol	External shape	Enclosure	Termination		Remarks	Informative reference figure
			Kind	Direction		
01	Cylindrical	Metal case	Lead wire	Opposite	—	
02					With sleeve	
05		Non-metal case			—	
08		No enclosure				
14		Non-metal enclosure				
06	Cylindrical	Non-metal case	Lead wire	Same (axial direction)	—	
09		No enclosure				
15		Non-metal enclosure				
07	Cylindrical	Non-metal case	Lead wire	Same (direction perpendicular to axes)	—	
16		Non-metal enclosure				
91	Square	Non-metal enclosure	Lead wire	Opposite	—	
98		Non-metal case				
72	Square (chip)	No enclosure	Surface mounting termination (or electrode)	Opposite	—	
73		Non-metal enclosure				
77		Non-metal case				
70	Square	Metal case	Lug	Same	—	
71					With mounting means	
74			Screw		—	
75					With mounting means	
78		Non-metal case	Lug		—	
79					With mounting means	
92		Non-metal enclosure	Lead wire		—	
97		No enclosure				
99		Non-metal case				

Remarks 1. Non-metal case includes resin mold.

2. Square one includes square board (flat square).

3. Lug termination includes plate termination and wrapping termination.
4. Lead wire termination includes lead frame.
5. Screw termination includes female screws as well as male screws.
6. Cylindrical capacitor means a capacitor whose length exceeds one half of the diameter.

Table 3. Position of surface mounting termination
(or electrode) of Style Nos. 72, 73 and 77

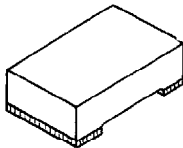
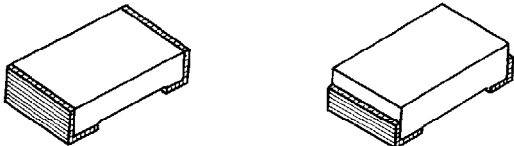
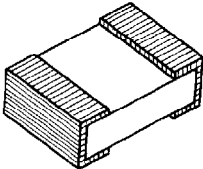
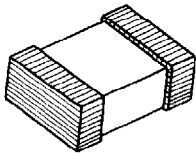
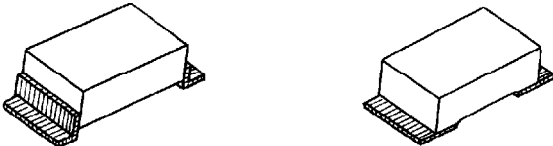
Symbol	Position of surface mounting terminations (or electrodes)	Informative reference figure
721 731 771	On one face of enclosure	
722 732 772	Over two faces of enclosure	
723 733 773	Over three faces of enclosure	
725 735 775	Over five faces of enclosure	
726 736 776	Directed outwardly from enclosure	

Table 4. Kind of enclosure and lead-out means of termination of Style No. 92

Symbol	Enclosure	Lead-out means of terminations	Informative reference figure	
921	Dip	Tab construction		
922		Extended foil construction		
923	Tape	Tab construction		
924		Extended foil construction		

4.2.3 Characteristics The symbol denoting characteristics shall be presented by the combination of two English capital letters; the first letter which indicates main material of dielectric shall be one taken from Table 5 or Table 6, and the second letter which indicates category temperature range shall be one taken from Table 7. When it is necessary to further subdivide the classification of characteristics, a numeral shall be added between the two English capital letters, constituting a three character symbols as a result.

This additional numeral shall be prescribed in detail specifications.

Table 5. Single dielectric

Symbol	Main material of dielectric	Symbol	Main material of dielectric
E	Polyethylene	P	Polypropylene
F	Polysulfone	S	Polystyrene
H	Polyphenylenesulfide	T	Polytetrafluoroethylene
M	Polyethylene terephthalate (polyester)	V	Polycarbonate
N	Polyethylene naphthalate	—	—

Table 6. Composite dielectrics

Symbol	Combinations of main materials of dielectrics
A	Polyethylene terephthalate (polyester) + Polypropylene
B	Polyethylene terephthalate (polyester) + Polycarbonate
D	Polypropylene + Polycarbonate

Table 7. Category temperature range

Unit: °C

Symbol	Category temperature range	Symbol	Category temperature range	Symbol	Category temperature range
A	− 55 to + 155	E	− 40 to + 125	K	− 25 to + 70
B	− 55 to + 125	F	− 40 to + 100	P	− 55 to + 105
C	− 55 to + 100	G	− 40 to + 85	Q	− 40 to + 105
D	− 55 to + 85	J	− 25 to + 85	R	− 25 to + 105

4.2.4 Rated voltage The symbol denoting rated voltage shall be presented by the combination of two alphanumerical characters; the first one is a numeral, and the second one is an English capital letter as given in Table 8.

Table 8. Rated voltages

Unit: V

First character	Second character										
	A	B	C	D	E	F	V	G	H	J	K
1	10	—	16	—	25	—	35	40	50	63	—
2	100	125	160	200	250	—	—	400	500	630	800
3	1 000	1 250	1 600	2 000	2 500	3 150	—	4 000	5 000	6 300	8 000
4	10 000	12 500	16 000	20 000	25 000	31 500	35 000	40 000	—	—	—

- Remarks**
1. The first character expresses the power of 10 to multiply the numerical value shown by the second character. The second characters correspond to R10 preferred numbers specified in JIS Z 8601 as the basic numbers. However, the value denoted by V is the numerical value specified in this Standard (JIS C 5111).
 2. The "—" in this Table means "not applicable".

4.2.5 Rated capacitance The symbol denoting rated capacitance shall be expressed by three numerals by employing picofarad (pF) as the unit. The first two numerals indicate the significant figures of rated capacitance, and the last numeral indicates the number of zeroes following the significant figures.

Examples: 150 15 pF 151 150 pF
 102 1000 pF 103 10000 pF

4.2.6 Tolerances on capacitance The symbol denoting tolerances on capacitance shall be expressed by one English capital letter as given in Table 9.

Table 9. Tolerances on capacitance

Unit: %

Symbol	D	F	G	J	K	M
Tolerances on capacitance	± 0.5	± 1	± 2	± 5	± 10	± 20

4.2.7 Grade The symbol denoting grade shall be expressed by one English capital letter as given in Table 10.

Table 10. Grade

Symbol	Description of grade
B	A general level applicable to capacitors for which the quality assurance program in Annex 1 of JIS C 5101, quality level, test details, etc. are required at relatively higher levels.
C	A simplified level applicable to capacitors for which a level lower than the general level is required and some parts of test items may be omitted.
E	A level corresponding to the "assessment level E" in the corresponding International standard.
X	A level to which the quality assurance specified in Annexes of this Standard (JIS C 5111) is not applicable.

Informative reference: The "assessment level E" of corresponding International standard in the row of symbol E means the "assessment level E" specified in the sectional specifications based on IEC 384.

4.2.8 Failure rate level The symbol denoting failure rate level shall be expressed by one English capital letter as given in Table 11.

Table 11. Failure rate level

Unit: %/1000 h

Symbol	Failure rate
M	1.0
P	0.1
R	0.01
S	0.001
X	Unspecified

4.2.9 Other necessary items Symbols denoting other necessary items shall be used, when they are considered necessary to indicate performance, construction, materials, etc. that can not be expressed by 4.2.1 to 4.2.8 and other necessary items. In such a case, applicable symbols shall be specified in detail specifications. For this purpose, however, symbols shown in Table 11 shall not be used.

5. Rating

5.1 Category temperature range The category temperature range shall be as given in Table 7.

5.2 Rated voltage Rated voltage shall be as given in Table 8.

5.3 Rated capacitance For rated capacitances the numerals in E_6 to E_{24} series of numbers in Table 12 multiplied by 10^n (n is an integer) shall be used.

Table 12. E_6 to E_{24} series of numbers

E_6	E_{12}	E_{24}	E_6	E_{12}	E_{24}	E_6	E_{12}	E_{24}
1	1	1.0	2.2	2.2	2.2	4.7	4.7	4.7
		1.1			2.4			5.1
	1.2	1.2		2.7	2.7		5.6	5.6
		1.3			3.0			6.2
1.5	1.5	1.5	3.3	3.3	3.3	6.8	6.8	6.8
		1.6			3.6			7.5
	1.8	1.8		3.9	3.9		8.2	8.2
		2.0			4.3			9.1

5.4 Tolerances on capacitance Tolerances on capacitance shall be as given in Table 9.

Remarks: Tolerance on capacitance of $\pm 5\%$ (J) is corresponding to rated capacitances of E_{24} series of numbers, that of $\pm 10\%$ (K) to rated capacitances of E_{12} series of numbers and that of $\pm 20\%$ (M) to rated capacitances of E_6 series of numbers.

6. Materials, construction and dimensions

6.1 Materials Materials of each part which constitutes a capacitor shall be such that the electrical, mechanical and climatic performances of the capacitor prescribed in the relevant detail specifications are satisfied.

(1) Materials of enclosure Materials of enclosure shall be as given in Table 13.

Table 13. Materials of enclosure

Kind of enclosure	Materials
Metallic case	Metallic materials such as steel, aluminium, copper or copper alloy
Non-metallic case and non-metallic enclosure	Synthetic resin such as epoxy, phenol, polypropylene, polyester, non-metallic materials such as porcelain, glass

(2) Materials of dielectric Materials of dielectric shall be as given in Table 14.