

JIS

JAPANESE INDUSTRIAL STANDARD

**Sectional specification of
fixed multilayer ceramic chip capacitors
for use in electronic equipment**

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J I S

Sectional specification of
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C 6429-1996

1. **Scope** This Japanese Industrial Standard is the sectional specification of fixed multilayer ceramic chip capacitors mainly used for surface mounting on electronic equipment (hereafter referred to as "capacitors"), and specifies the type designation, ratings, materials, construction, dimensions, performances, test methods, markings and the matters to be specified in the detail specification.

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

- JIS C 0806 Packaging of electronic components on continuous tapes (Surface mounting devices)
 - JIS C 5001 General rules 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 C 6484 Copper-clad laminates for printed wiring boards — Glass fabric base, epoxy resin
 - JIS Z 9015 Sampling inspection procedures and tables by attributes with severity adjustment (receiving inspection where a consumer can select suppliers)
2. The International Standard corresponding to this Standard is given below:
- IEC 384-10 (1989) Fixed capacitors for use in electronic equipment
Part 10: Sectional specification: Fixed multilayer ceramic chip capacitors
Amendment 1 (1993)

2. **Definitions** For the purpose of this Standard, in addition to the definitions specified in JIS C 5101 and JIS C 5602, the following principal definitions apply:

- (1) multilayer ceramic chip capacitor A chip capacitor for surface mounting which consists of multilayer of piled-up ceramic dielectrics and metal electrodes used in electronic equipment circuits.
- (2) ceramic capacitor class 1 A capacitor employing ceramics as the dielectric which is suitable for resonant circuit of electronic equipment where low losses and high stability of capacitance are essential, and mainly used for temperature compensation.

This is also called temperature compensation ceramic capacitor.

- (3) ceramic capacitor class 2 A capacitor employing ceramics as the dielectric which is used for by-pass circuit or coupling circuit of electronic equipment where low losses and high stability of capacitance are comparatively not essential.

This is also called high permittivity ceramic capacitor.

- (4) rated temperature coefficient The nominal value of relative capacitance change per 1°C, between a prescribed temperature and the reference temperature (20°C) within the category temperature range of a capacitor.

The temperature coefficient shall be expressed in ppm/°C ($10^{-6}/^{\circ}\text{C}$).

- (5) tolerance on temperature coefficient The allowable range of deviation from the rated temperature coefficient.

Informative reference: The terms stated above are those used in IEC 384-10.

3. Preceding order of Standards If any conflict occurs among the following specifications, the precedence is as stated below.

- (1) Detail specification
- (2) Sectional specification (this specification JIS C 6429)
- (3) Generic specification (JIS C 5101)
- (4) Basic specification (JIS C 5001)

4. Type designation

4.1 Structure of type designation The type designation shall be structured by arranging the symbols as given below.

Symbol denoting class of capacitor	Symbol denoting style	Symbol denoting charac- teristics	Symbol denoting rated voltage	Symbol denoting nominal capaci- tance
4.2.1	4.2.2	4.2.3	4.2.4	4.2.5
Example: CC	725	CHB	1H	101

Symbol denoting tolerance on capaci- tance	Symbol denoting grade	Symbol denoting external dimen- sions	Symbol denoting supply form
4.2.6	4.2.7	4.2.8	4.2.9
Example: J	E	3216	T

4.2 Symbols

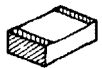
4.2.1 Class of capacitor The symbol denoting class of capacitor shall be as given in Table 1.

Table 1. Classification of capacitor

Symbol	Class of capacitor	Description
CC	Class 1	Temperature compensating ceramic capacitor
CK	Class 2	High permittivity ceramic capacitor

4.2.2 Style The symbol denoting the style shall consist of three numerals as given in Table 2.

Table 2. Style

Symbol	Style	Enclosure	Classification of termination	Position of termination	Informative reference figure
721	Square (chip)	No enclosure	Surface mounting termination (or electrode)	The terminations or electrodes are only on one surface.	
722				The terminations or electrodes are spreading over two surfaces.	
723				The terminations or electrodes are spreading over three surfaces.	
725				The terminations or electrodes are spreading over five surfaces.	
726				The terminations or electrodes are toward outside of the body.	
736		Non-metallic enclosure			
776		Non-metallic case			

Remarks: The shaded portion in the informative reference figure shows the surface mounting terminations (or electrodes).

4.2.3 Characteristics

4.2.3.1 Characteristics of class 1 capacitors The symbol denoting characteristics shall be expressed by a combination of three English capital letters. The first letter represents the rated temperature coefficient as given in Table 3. The second letter represents tolerance on temperature coefficient in the temperature range of 20°C to 85°C as given in Table 4 (hereafter the combination of the rated temperature coefficient and the tolerance is called "temperature coefficient"). The third letter represents category temperature range, as given in Table 5.

The combination of the first letter (rated temperature coefficient) and the second letter (tolerance on temperature coefficient) shall be specified in the detail specification. However, the combination of SL means that the temperature coefficient is in the range of +350 ppm/°C to -1000 ppm/°C in the category temperature range of 20 % to 85 % irrespective of the numerical values in Tables 3 and 4.

The tolerance on temperature coefficient when the category temperature range is less than 20°C or exceeds 85°C, and the range of temperature coefficient for SL shall be specified in the detail specification.

Table 3. Rated temperature coefficient

Unit: ppm/°C

Symbol	Rated temperature coefficient	Symbol	Rated temperature coefficient
C	0	S	- 330
H	- 33	T	- 470
L	- 75	U	- 750
P	- 150	V	- 1000
R	- 220	W	- 1500

Informative reference: The symbols V and W above stated are symbols Q (-1000) and V(-1500) respectively in IEC 384-10.

Table 4. Tolerance on temperature coefficient

Unit: ppm/°C

Symbol	Tolerance on temperature coefficient
G	± 30
H	± 60
J	± 120
K	± 250

Table 5. Category temperature range

Unit: °C

Symbol	Category temperature range
B	- 55 to + 125
D	- 55 to + 85
J	- 25 to + 85
S	- 25 to + 125

4.2.3.2 Characteristics of class 2 capacitors The symbol denoting characteristics of class 2 capacitors shall be expressed by two English capital letters. The first letter represents the maximum relative change of capacitance based on the capacitance at reference temperature 20°C over the category temperature range, as given in Table 6 (hereafter the maximum relative change of capacitance over the category temperature range is referred to as "temperature characteristic"). The second letter represents the category temperature range as given in Table 5.

The temperature characteristic when 50% of the rated voltage is applied shall be specified in the detail specification.

Table 6. Relative change of capacitance

Unit: %

Symbol	Relative change of capacitance
B	± 10
R	± 15
D	+ 20 - 30
E	+ 22 - 56
F	+ 30 - 80

4.2.4 Rated voltage The symbol denoting rated voltage shall be as given in Table 7.

Table 7. Rated voltage

Unit: V

Symbol	Rated voltage	Symbol	Rated voltage
0G	4	1H	50
0J	6.3	1J	63
1A	10	2A	100
1C	16	2C	160
1E	25	2D	200
1G	40		

4.2.5 Nominal capacitance The symbol denoting nominal capacitance shall consist of three numerals. The first and second numerals mean the significant figures of nominal capacitance in the unit of picofarad (pF) and the third numeral means the number of zeros following to the significant figures. If there is a decimal, the decimal point is represented by R and all the numerals mean the significant figures in this case.

Examples:

R50	0.5 pF
1R0	1 pF
1R5	1.5 pF
150	15 pF
151	150 pF

Remarks: R50 may be expressed as 0R5, 1R0 as 010, but it is recommended not to use such expression as far as possible.

4.2.6 Tolerance on capacitance The symbols denoting tolerance on capacitance shall be as given in Tables 8 and 9.

Table 8. Tolerance of capacitors with nominal capacitance exceeding 10 pF

Unit: %

Symbol	F	G	J	K	M	S	Z
Tolerance on capacitance	± 1	± 2	± 5	± 10	± 20	+ 50 - 20	+ 80 - 20

Table 9. Tolerance of capacitors with nominal capacitance not exceeding 10 pF

Unit: pF

Symbol	B	C	D	F
Tolerance on capacitance	± 0.1	± 0.25	± 0.5	± 1

4.2.7 Grade The symbol denoting grade shall be as given in Table 10.

Table 10. Grade

Symbol	Description of grade
E	A level corresponding to the assessment level E of corresponding International Standard.
X	A level to which the quality assurance specified in Annex of this Standard (JIS C 6429) is not applicable.

Informative reference: The assessment level E of corresponding International Standard means the assessment level E of IEC 384-10.

4.2.8 External dimensions The symbol denoting external dimensions shall consist of four numerals as given in Attached Fig. 1.

4.2.9 Supply form The symbol denoting supply form shall be used, when applicable, in accordance with Table 11.

Table 11. Supply form of capacitors

Symbol	Description of supply form
T	Taping
C	Bulk case
D	Disc pack

5. Ratings

5.1 Category temperature range The category temperature range shall be as given in Table 5.

The rated temperature is equal to the upper category temperature.

5.2 Rated voltage The rated voltage shall be as given in Table 7.

The category voltage is equal to the rated voltage.

Remarks: Hereafter, rated voltage is expressed by symbol U_R in some cases.

5.3 Nominal capacitance The nominal capacitance shall be expressed in picofarad (pF) and 10^n (n is an integer) times the numerical values in E3 to E24 series in Table 12 shall be used for the value of capacitance. However, the capacitance shall be as given in Table 13 for capacitors not exceeding 10 pF.

Remarks: Hereafter, the nominal capacitance is expressed by symbol C_R in some cases.

5.4 Tolerance on capacitance The tolerances on capacitances shall be expressed in percent (%) and be as shown in Table 12 in combination with the nominal capacitances. However, the tolerances shall be expressed in picofarad (pF) for capacitors of nominal capacitances not exceeding 10 pF, and be as shown in Table 13.

5.5 Combination of rated voltage and nominal capacitance of capacitors identical in class, characteristic, grade and size The combination of rated voltage and nominal capacitance of capacitors identical in class, characteristic, grade and size shall be specified in the detail specification.

Table 12. Preferred number for nominal capacitance and tolerance on capacitance
(capacitors with nominal capacitance exceeding 10 pF)

Preferred series of numbers	E3	E6	E12	E24	
Tolerance on capacitance and its symbol	+ 80 − 20 % (Z)	± 20 % (M) + 50 − 20 % (S)	± 10 % (K)	± 1 % (F) ± 2 % (G) ± 5 % (J)	
Preferred number for nominal capacitance	1.0	1.0	1.0	1.0	
				1.1	
				1.2	
	2.2	1.5	1.5	1.3	
				1.5	
				1.6	
				1.8	
				2.0	
				2.2	
				2.4	
				2.7	
				3.0	
		3.3		3.3	
				3.6	
				3.9	
	4.3				
	4.7			4.7	
				5.1	
				5.6	
	6.8			6.2	
				6.8	
				7.5	
				8.2	
				9.1	

Table 13. Nominal capacitance and tolerance thereon
(capacitors with nominal capacitance not exceeding 10 pF)

Tolerance on capacitance and its symbol	± 0.1 pF (B)	± 0.25 pF (C)	± 0.5 pF (D) ± 1 pF (F)
Nominal capacitance pF	0.5	0.5	
	0.75	0.75	
	1	1	
	1.5	1.5	
	2	2	
		3	
		4	
		5	
			6
			7
			8
			9
			10

Remarks: The numerical values of E12 series of numbers may be used other than the numerical values in Table 13 within the range of capacitances specified in table.

6. Material, construction, dimension and marking

6.1 Material Materials for various parts composing a capacitor shall be stable materials which satisfy the function of the capacitor.

6.2 Construction The construction shall be as stated below.

- (1) The capacitor element shall be so constructed that plural layers of ceramic dielectric and metal electrode are piled up.
- (2) The terminations or electrodes shall be firmly connected with the capacitor element electrodes electrically and mechanically.

Further, they shall be so treated that the soldering is easily done.

6.3 Dimensions The external dimensions of capacitors shall be as stated in Attached Fig. 1. However, the dimensions of capacitors with style symbols 726, 736 and 776 shall be specified in the detail specification.

6.4 Marking As a rule, marking is not done on the body of a capacitor, but if marking is done, it shall be as specified in 9.

7. Performances and test methods

7.1 Appearance There shall be no abnormalities such as remarkable scratch and crack on the appearance when a capacitor is tested by using a magnifier of magnification 10.

Further, the marking, if exists, shall be legible.