

JIS

JAPANESE INDUSTRIAL STANDARD

Fixed ceramic capacitors class 1 for use in electronic equipment

Ⓒ JIS C 6423—1991

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

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J I S



Fixed ceramic capacitors class 1 for use
in electronic equipment

C 6423-1991

1. Scope

This Japanese Industrial Standard specifies the fixed ceramic capacitors of Class 1, based on JIS C 5130, which employ mainly titanium oxide ceramics for the dielectrics and metal film for the electrodes.

Remarks 1: Fixed ceramic capacitors of Class 1 (hereafter referred to as capacitors) indicate capacitors used mainly for temperature compensation of such circuits as resonant circuits and general precise circuits in electronic equipment where stability of capacitance against temperature and a high Q are required.

2: The following Standards are cited in this Standard:

JIS C 0805-Packaging of electronic components on continuous tapes (Components with axial type and radial wire lead terminals)

JIS C 5101-General rules of fixed capacitors for electronic equipment

JIS C 5102-Test methods of fixed capacitors for electronic equipment

JIS C 5130-General rules of fixed ceramic capacitors for use in electronic equipment

JIS C 5700-General rules for reliability assured electronic components

JIS Z 9015-Sampling inspection procedures and tables by attributes with severity adjustment (Receiving inspection where a consumer can select suppliers)

3: The corresponding International Standards are as follows:

IEC 384-8 (1988) Fixed capacitors for use in electronic equipment. Part 8: Sectional specification: Fixed capacitors of ceramic dielectric, class 1

IEC 384-8-1 (1988) Fixed capacitors for use in electronic equipment. Part 8: Blank detail specification:
Fixed capacitors of ceramic dielectric, class 1. Assessment level E

4: The units and numerical values given in { } in this standard are based on the traditional units and are reference values.

2. Definitions

The principal definitions for this standard shall be those specified in JIS C 5130.

3. Type designation

3.1 Structure of type designation The type designation shall be structured as follows:

Symbol denot- ing class	Symbol denot- ing shape	Symbol denot- ing charac- teristic	Symbol denot- ing rated voltage	Symbol denot- ing nominal capaci- tance	Symbol denot- ing toler- ance on capaci- tance	Symbol denot- ing grade
3.2.1	3.2.2	3.2.3	3.2.4	3.2.5	3.2.6	3.2.7

Example: CC 45 CHJ 1 H 101 J C

Symbol denot- ing failure rate level	Symbol denot- ing outside dimen- sion	Symbol denoting classifi- cation of shaping of lead wire termination
3.2.8	3.2.9	3.2.10

Example: R 04 T

3.2 Symbol

3.2.1 Class of capacitors The symbol denoting the class of capacitors shall be CC.

3.2.2 Shape The symbol denoting the shape shall be 45, and shall comply with Table 1.

Table 1. Shape

Symbol	Outside shape	Enclosure	Termination	
			Class	Direction
45	Circular	Non-metallic enclosure	Lead wire	Uni-directional

3.2.3 Characteristics The symbol denoting the characteristics shall be expressed by a combination of 3 capital letters, as shown in Table 2. The 1st letter represents the nominal value of the temperature coefficient of capacitance, and the 2nd letter represents the tolerance on the temperature coefficient of capacitance. The symbol SL represents a range for the temperature coefficient of capacitance. The 3rd letter represents the category temperature range.

Table 2. Characteristics

Characteristic symbol	Nominal values of temperature coefficient of capacitance		Tolerance ⁽¹⁾ of temperature coefficient of capacitance		Category temperature range		Applicable nominal capacitance
	Symbol	Nominal value ppm/°C	Symbol	Tolerance ppm/°C	Symbol	Temperature °C	pF
CGD	C	0	G	± 30	D	-55 to +85	10 min.
CGJ					J	-25 to +85	
CHD			H	± 60	D	-55 to +85	4 min.
CHJ					J	-25 to +85	
CJD			J	± 120	D	-55 to +85	3
CJJ					J	-25 to +85	
CKD			K	± 250	D	-55 to +85	2 max.
CKJ					J	-25 to +85	
LHD	L	-80	H	± 60	D	-55 to +85	4 min.
LHJ					J	-25 to +85	
LJD			J	± 120	D	-55 to +85	3
LJJ					J	-25 to +85	
PHD	P	-150	H	± 60	D	-55 to +85	4 min.
PHJ					J	-25 to +85	
PJD			J	± 120	D	-55 to +85	3
PJJ					J	-25 to +85	

Table 2. (Continued)

Characteristic symbol	Nominal values of temperature coefficient of capacitance		Tolerance ⁽¹⁾ of temperature coefficient of capacitance		Category temperature range		Applicable nominal capacitance
	Symbol	Nominal value ppm/°C	Symbol	Tolerance ppm/°C	Symbol	Temperature °C	pF
RHD	R	-220	H	± 60	D	-55 to +85	4 min.
RHJ					J	-25 to +85	
RJD			J	± 120	D	-55 to +85	3
RJJ					J	-25 to +85	
RKD			K	± 250	D	-55 to +85	2 max.
RKJ					J	-25 to +85	
SHD	S	-330	H	± 60	D	-55 to +85	4 min.
SHJ					J	-25 to +85	
SJD			J	± 120	D	-55 to +85	3
SJJ					J	-25 to +85	
THD	T	-470	H	± 60	D	-55 to +85	4 min.
THJ					J	-25 to +85	
TJD			J	± 120	D	-55 to +85	3
TJJ					J	-25 to +85	
UJD	U	-750	J	± 120	D	-55 to +85	3 min.
UJJ					J	-25 to +85	
SLD		+350 to -1000 ppm/°C ⁽¹⁾			D	-55 to +85	0.5 min.
SLJ					J	-25 to +85	

Note (1) The tolerance on the temperature coefficient of capacitance and the range for the temperature coefficient of capacitance for the characteristics SLD and SLJ shall be the values from 20°C to the maximum category temperature.

3.2.4 Rated voltage The rated voltage shall be d.c. voltage, and the symbol shall comply with Table 3.

Table 3. Rated voltage

Symbol	Rated voltage V
1 H	50
2 H	500
3 A	1000
3 D	2000
3 F	3150
3 J	6300

3.2.5 Nominal capacitance The symbol denoting the nominal capacitance shall consist of 3 numerals in the unit of picofarads (pF). The 1st and 2nd numerals are the significant figures of the nominal capacitance, and the 3rd numeral is the number of following zeros. If there is a decimal point, it is expressed with one capital letter "R", in which case all numerals are significant figures.

Examples: R50 0.5 pF
 R75 0.75 pF
 1R5 1.5 pF
 1R0 1 pF
 100 10 pF
 101 100 pF

Remarks: R50 and 1R0 may be expressed by 0R5 and 010, respectively, although it is recommended not to use these.

3.2.6 Tolerance on capacitance The symbol denoting the tolerance on the capacitance shall be expressed by 1 capital letter, and shall comply with Table 4 and Table 5.

Table 4. Tolerance on capacitance
(For capacitance over 10 pF)

Symbol	J	K
Tolerance %	± 5	± 10

Table 5. Tolerance on capacitance
(For capacitance of 10 pF or less)

Symbol	C	D
Tolerance pF	± 0.25	± 0.5

3.2.7 Grade The symbol denoting the grade shall be expressed by 1 capital letter, as given in Table 6.

The combination of the characteristic and the grade for each rated voltage shall be as given in Table 7.

Table 6. Grade

Symbol	Contents of the grade
B	Requires quality evaluation, and its level is general level I.
C	Requires quality evaluation, and its level is simplified level.
E	Requires quality evaluation, and its level is general level II.
X	Not specified concerning quality evaluation.

Remarks: General level I and simplified level shall comply with 3 (Classification of reliability assurance levels) in JIS C 5700.

Informative reference: General level II corresponds to Assessment level E in IEC 384-8-1.

Table 7. Combination of grade and characteristic for each rated voltage

Grade symbol	Rated voltage V	Characteristic symbol							
		C△◇	L△◇	P△◇	R△◇	S△◇	T△◇	U△◇	SL◇
B, C, E	50, 500	○	○	○	○	○	○	○	○
X	50, 500	○	-	-	○	-	-	○	○
	1000 min.	-	-	-	-	-	-	-	○

Remarks 1: The characteristic symbol △ represents the tolerance on the temperature coefficient of capacitance, ◇ represents the category temperature range, and the others shall comply with Table 2.

2: The mark ○ expresses that the item is applicable.

3.2.8 Failure rate level The symbol denoting the failure rate level shall be expressed by 1 capital letter, as given in Table 8.

Table 8. Failure rate level

Symbol	Failure rate %/1000 h	Applicable grade
M	1.0	B, C, E
P	0.1	
R	0.01	
S	0.001	
X	Not specified	B, C, E, X

3.2.9 Outside dimension The symbols denoting the outside dimension (hereafter referred to as the dimension symbol) shall be applicable for the capacitors of grade E and grade X, and of rated voltages 50 V and 500 V, and shall be expressed by 2 numerals, as given in Table 9.

The dimension symbols for each characteristic, each rated voltage, and each nominal capacitance are selected from Table 9, by agreement between the parties concerned.

Table 9. Outside dimensions

Symbol	Dimension mm
04	4.0
05	5.0
06	6.3
08	8.0
10	10.0
11	11.2
12	12.5
14	14.0
16	16.0
18	18.0
20	20.0
25	25.0

Remarks: Outside dimensions represent dimension *D* in Attached Tables 2 and 3.

3.2.10 Shaping classification of lead wire termination The symbol denoting the shaping classification of the lead wire termination shall be applicable for the lead wire termination shaped products and the taping shaped products, and shall be expressed by 1 capital letter, as given in Table 10.

Table 10. Shaping classification of lead wire termination

Symbol	Shaping classification of lead wire termination
F	Lead wire termination shaped products
T	Taping shaped products

4. Ratings

4.1 Category temperature range The category temperature range shall be classified as given in Table 2.

4.2 Rated voltage The rated voltages shall be as given in Table 3.

4.3 Nominal capacitance and tolerance on capacitance The combination of the nominal capacitance and the tolerance on capacitance shall be as given in Tables 11 and 12.

The combination of the shape, dimension, and nominal capacitance shall comply with Attached Tables 1 to 4. The combination of the dimension and nominal capacitance of the rated voltages 50 V and 500 V in the grades E and X shall be as agreed upon by the parties concerned.

5. Performance and test methods

5.1 Test method The test methods shall comply with JIS C 5102. The test methods for taping products shall comply with JIS C 0805.

The test method where JIS C 0805 is not applicable or for lead wire termination shaped products shall be as agreed upon by the parties concerned.

5.2 Performance The performance shall comply with Table 13. The performance for taping for taping types shall comply with JIS C 0805.

The performance where JIS C 0805 is not applicable or for the shaping of lead wire terminations shall be as agreed upon by the parties concerned.

Table 11. Combination of nominal capacitance
and Tolerance on capacitance
(10 pF or less)

Nominal capacitance pF	Tolerance on capacitance pF	
	± 0.25	± 0.5
0.5	○	-
0.75	○	-
1	○	-
1.5	○	-
2	○	-
3	○	-
4	○	-
5	○	-
6	-	○
7	-	○
8	-	○
9	-	○
10	-	○

Remarks: The mark ○ means that this is applicable.

Table 12. Combination of nominal capacitance and tolerance on capacitance
(Over 10 pF)

Nominal capacitance pF	Tolerance on capacitance %		Nominal capacitance pF	Tolerance on capacitance %	
	±5	±10		±5	±10
11	○	—	110	○	—
12	◎	◎	120	◎	◎
13	○	—	130	○	—
15	◎	◎	150	◎	◎
16	○	—	160	○	—
18	◎	◎	180	◎	◎
20	○	—	200	○	—
22	◎	◎	220	◎	◎
24	○	—	240	○	—
27	◎	◎	270	◎	◎
30	○	—	300	○	—
33	◎	◎	330	◎	◎
36	○	—	360	○	—
39	◎	◎	390	◎	◎
43	○	—	430	○	—
47	◎	◎	470	◎	◎
51	○	—	510	○	—
56	◎	◎	560	◎	◎
62	○	—	620	○	—
68	◎	◎	680	◎	◎
75	○	—	750	○	—
82	◎	◎	820	◎	◎
91	○	—	910	○	—
100	◎	◎	1 000	◎	◎

Remarks: The marks ○ and ◎ mean that this is applicable.
The mark ○ does not apply for Attached Table 4.

Table 13. Performance and test methods

No.	Item	Performance	Test method (JIS C 5102)	Informative reference (Essential point of JIS C 5102)												
1	Between terminals	No abnormality	Comply with 7.1 Test voltage:													
	Dielectric withstand voltage															
			<table><tr><td>Rated voltage</td><td>Grades B,C,X</td><td>Grade E</td></tr><tr><td>500 V or less</td><td>300 % of rated voltage</td><td>250 % of rated voltage</td></tr><tr><td>Over 500 V to and excluding 1 kV</td><td></td><td>150 % of rated voltage + 500 V</td></tr><tr><td>1 kV or more</td><td>200 % of rated voltage</td><td></td></tr></table> Application time: Grades B, C, X: 1 to 5 s Grade E: Quality approval test 1 min Periodic quality inspection 1 min Lot quality inspection 1 s Charge and discharge current: 50 mA or less.	Rated voltage	Grades B,C,X	Grade E	500 V or less	300 % of rated voltage	250 % of rated voltage	Over 500 V to and excluding 1 kV		150 % of rated voltage + 500 V	1 kV or more	200 % of rated voltage		
Rated voltage	Grades B,C,X	Grade E														
500 V or less	300 % of rated voltage	250 % of rated voltage														
Over 500 V to and excluding 1 kV		150 % of rated voltage + 500 V														
1 kV or more	200 % of rated voltage															

Table 13. (Continued)

No.	Item	Performance	Test method (JIS C 5102)	Informative reference (Essential point of JIS C 5102)									
	Between terminals and enclosure		Comply with 7.1 Test voltage: <table><tr><th>Rated voltage</th><th>Grades B,C,X</th><th>Grade E</th></tr><tr><td>500 V or less</td><td>250 % of rated voltage or 1.3 kV, whichever is lower.</td><td>250 % of rated voltage</td></tr><tr><td>Over 500 V</td><td></td><td>150 % of rated voltage + 500 V</td></tr></table> Application time: Grades B, C, X: 1 to 5 s Grade E: Quality approval test 1 min Periodic quality inspection 1 min Lot quality inspection 1 s Charge and discharge current: 50 mA or less. Application method of test voltage: Grades B, C, X: Metal small ball method in 7.1.3 (3.3). Grade E: V block method in 7.1.3 (3.1), Metal foil method in 7.1.3 (3.2), or Metal plate method in 7.1.3 (3.4).	Rated voltage	Grades B,C,X	Grade E	500 V or less	250 % of rated voltage or 1.3 kV, whichever is lower.	250 % of rated voltage	Over 500 V		150 % of rated voltage + 500 V	
Rated voltage	Grades B,C,X	Grade E											
500 V or less	250 % of rated voltage or 1.3 kV, whichever is lower.	250 % of rated voltage											
Over 500 V		150 % of rated voltage + 500 V											

Table 13. (Continued)

No.	Item	Performance	Test method (JIS C 5102)	Informative reference (Essential point of JIS C 5102)	
2	Insulation resistance	10000 MΩ or more	Comply with 7.6	Measuring voltage: Unit: V	
	Rated voltage			Measuring voltage	
	50			10	
		500 or more	500		
				Application time of voltage: 1 min + 5 s	
3	Capacitance	Within specified tolerance	Comply with 7.8 Measuring condition: Table 10-3	Measuring frequency: 1 MHz + 20 % Measuring voltage: 5 Vrms or less	
4	Q or dielectric dissipation factor (tan δ)	Grades B, C, X	Comply with 7.9 Measuring condition: Table 10-3	Measuring frequency: 1 MHz + 20 % Measuring voltage: 5 Vrms or less	
		Nominal capacitance pF			Specified value
		Under 30			$Q \geq 400 + 20 \cdot C_x$
		30 or more	$Q \geq 1000$		

Remarks: C_x in the Table represents the value of the nominal capacitance in pico Farads (pF).

Table 13. (Continued)

No.	Item	Performance	Test method (JIS C 5102)	Informative reference (Essential point of JIS C 5102)		
5	Temperature characteristic of capacitance	Grade E	Comply with 7.12. Measurement: Comply with 7.12.3 (2) Static method. Measuring condition: Table 12. Temperature of step 2: Characteristic ○△ D - 55°C Characteristic ○△ J - 25°C Temperature of step 4: 85°C			
		Nominal capacitance pF (x10)			Specified value	
		Under 5			$\tan \delta \leq 56$	
		5 or more under 50			$\tan \delta \leq 1.5 \left(\frac{150}{C_R} + 7 \right)$	
		50 or more			$\tan \delta \leq 15$	
	Temperature coefficient	Satisfy the value in Table 14.				
		Drift of capacitance			Grades B, C, X Within + 0.2% or 0.05 pF, whichever is larger.	
					Grade E Characteristics C △◇ to U △◇ Within + 0.3 % or + 0.05 pF, whichever is larger.	
					Characteristics SL ◇ Within + 1 % or + 0.05 pF, whichever is larger.	
	Step	Temperature °C				
					1	20 ± 2
					2	Lower category temperature ± 3
					3	20 ± 2
					4	Upper category temperature ± 2
	5	20 ± 2				

Remarks: Symbols denoting characteristics in the Table are represented as follows:

 $\bigcirc$: Nominal value of the temperature coefficient of capacitance Δ : tolerance of the temperature coefficient of capacitance $\diamond$: Category temperature range

Table 13. (Continued)

No.	Item	Performance	Test method (JIS C 5102)	(Informative reference (Essential point of JIS C 5102))												
6	Tensile strength	No abnormalities, such as cutting or looseness of terminals.	Comply with 8.1.	Tensile force is applied gradually in the lead-out direction of terminal. <table><tr><th>Nominal cross-sectional area</th><th>Nominal wire diameter mm (circular cross section)</th><th>Tensile force N{kgf}</th><th>Holding time s</th></tr><tr><td>mm² Over 0.07 to 0.2</td><td>Over 0.3 to 0.5</td><td>5 {0.51}</td><td>10 + 1</td></tr><tr><td>Over 0.2 to 0.5</td><td>Over 0.5 to 0.8</td><td>10 {1.0}</td><td></td></tr></table>	Nominal cross-sectional area	Nominal wire diameter mm (circular cross section)	Tensile force N{kgf}	Holding time s	mm ² Over 0.07 to 0.2	Over 0.3 to 0.5	5 {0.51}	10 + 1	Over 0.2 to 0.5	Over 0.5 to 0.8	10 {1.0}	
	Nominal cross-sectional area	Nominal wire diameter mm (circular cross section)			Tensile force N{kgf}	Holding time s										
mm ² Over 0.07 to 0.2	Over 0.3 to 0.5	5 {0.51}	10 + 1													
Over 0.2 to 0.5	Over 0.5 to 0.8	10 {1.0}														
	Torsional strength		Comply with 8.1.	Number of times: 2 times <table><tr><th>Nominal cross-sectional area</th><th>Nominal wire diameter mm (circular cross section)</th><th>Torsional force N{kgf}</th><th>(Reference) Mass of weight kg</th></tr><tr><td>mm² Over 0.07 to 0.2</td><td>Over 0.3 to 0.5</td><td>2.5 {0.25}</td><td>0.25</td></tr><tr><td>Over 0.2 to 0.5</td><td>Over 0.5 to 0.8</td><td>5 {0.51}</td><td>0.51</td></tr></table>	Nominal cross-sectional area	Nominal wire diameter mm (circular cross section)	Torsional force N{kgf}	(Reference) Mass of weight kg	mm ² Over 0.07 to 0.2	Over 0.3 to 0.5	2.5 {0.25}	0.25	Over 0.2 to 0.5	Over 0.5 to 0.8	5 {0.51}	0.51
Nominal cross-sectional area	Nominal wire diameter mm (circular cross section)	Torsional force N{kgf}	(Reference) Mass of weight kg													
mm ² Over 0.07 to 0.2	Over 0.3 to 0.5	2.5 {0.25}	0.25													
Over 0.2 to 0.5	Over 0.5 to 0.8	5 {0.51}	0.51													
Robustness of terminals																