Notice for TAIYO YUDEN products

Please read this notice before using the TAIYO YUDEN products.

⚠ REMINDERS

- Product information in this catalog is as of October 2016. All of the contents specified herein are subject to change without notice due to technical improvements, etc. Therefore, please check for the latest information carefully before practical application or use of our products.

  Please note that TAIYO YUDEN shall not be in any way responsible for any damages and defects in products or equipment incorporating our products, which are caused under the conditions other than those specified in this catalog or individual specification.

- Please contact TAIYO YUDEN for further details of product specifications as the individual specification is available.

- Please conduct validation and verification of our products in actual condition of mounting and operating environment before using our products.

- The products listed in this catalog are intended for use in general electronic equipment (e.g., AV equipment, OA equipment, home electric appliances, office equipment, information and communication equipment including, without limitation, mobile phone, and PC). Please be sure to contact TAIYO YUDEN for further information before using the products for any equipment which may directly cause loss of human life or bodily injury (e.g., transportation equipment including, without limitation, automotive powertrain control system, train control system, and ship control system, traffic signal equipment, disaster prevention equipment, medical equipment, highly public information network equipment including, without limitation, telephone exchange, and base station).

  Please do not incorporate our products into any equipment requiring high levels of safety and/or reliability (e.g., aerospace equipment, aviation equipment, nuclear control equipment, undersea equipment, military equipment).

  When our products are used even for high safety and/or reliability-required devices or circuits of general electronic equipment, it is strongly recommended to perform a thorough safety evaluation prior to use of our products and to install a protection circuit as necessary.

  Please note that unless you obtain prior written consent of TAIYO YUDEN, TAIYO YUDEN shall not be in any way responsible for any damages incurred by you or third parties arising from use of the products listed in this catalog for any equipment requiring inquiry to TAIYO YUDEN or prohibited for use by TAIYO YUDEN as described above.

- Please note that TAIYO YUDEN shall have no responsibility for any controversies or disputes that may occur in connection with a third party's intellectual property rights and other related rights arising from use of our products. TAIYO YUDEN grants no license for such rights.

- Please note that unless otherwise agreed in writing, the scope of warranty for our products is limited to the delivered our products themselves and TAIYO YUDEN shall not be in any way responsible for any damages resulting from a fault or defect in our products.

- The contents of this catalog are applicable to our products which are purchased from our sales offices or authorized distributors (hereinafter "TAIYO YUDEN's official sales channel"). Please note that the contents of this catalog are not applicable to our products purchased from any seller other than TAIYO YUDEN's official sales channel.

- Caution for Export
  Some of our products listed in this catalog may require specific procedures for export according to "U.S. Export Administration Regulations", "Foreign Exchange and Foreign Trade Control Law" of Japan, and other applicable regulations. Should you have any questions on this matter, please contact our sales staff.

AXIAL LEADED CERAMIC CAPACITORS

WAVE

■PARTS NUMBER

U	P	0 2 5	△ B	1 0 4	K ―	A ―	B	△ Z
①	②	③	④	⑤	⑥	⑦	⑧	⑨

△=Blank space

①Rated voltage

Code	Rated voltage[VDC]
L	10
E	16
T	25
G	35
U	50

②Series name

Code	Series name
P	Axial leaded capacitor

③Dimensions(L×φD)

Code	Dimensions(L×φD)[mm]
025	2.3×2.0 (Multilayer type)
050	3.2×2.2 (Multilayer type)
075	4.2×3.2 (Multilayer type)

④Temperature characteristics

Code	Temperature characteristics
CH	0±60(ppm/℃)
△B	±10%
B5	±15%
△F	+30/−85%

⑤Nominal capacitance

Code (example)	Nominal capacitance[pF]
010	1
1R2	1.2
103	10000

※R=Decimal point

⑥Capacitance tolerance

Code	Capacitance tolerance
D―	±0.5pF
J―	±5%
K―	±10%
M―	±20%
Z―	+80/−20%

⑦Lead Configurations

Code	Lead Configurations
A―	26mm lead space, ammo pack
B―	52mm lead space, ammo pack
KF	5.0mm pitch formed lead bulk
KE	7.5mm pitch formed lead bulk
NA	Axial lead, bulk

⑧Packaging

Code	Packaging
B	Ammo
C	Bulk

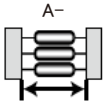
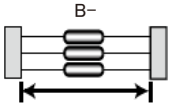
⑨Internal code

Code	Internal code
△△	Multilayer type (Standard)
△Z	
△J	Multilayer type (Low voltage type)

■STANDARD EXTERNAL DIMENSIONS／MINIMUM QUANTITY

Type	L	φD	φd	Minimum quantity[pcs]			
				Bulk			Taping
				NA	KF	KE	A−/B−
Multilayer type 025	2.3max (0.09max)	2.0max (0.079max)	0.45±0.05 (0.018±0.002)	1000	4000	—	5000
Multilayer type 050	3.2max (0.126max)	2.2max (0.087max)	0.45±0.05 (0.018±0.002)	1000	3000	—	3000
Multilayer type 075	4.2max (0.165max)	3.2max (0.126max)	0.55±0.05 (0.022±0.002)	1000	—	3000	2000

Unit:mm(inch)

Bulk			Taping	
Straight	Formed		Straight	
NA	KF	KE	A−	B−
	 Pitch:5.0(0.197)	 Pitch:7.5(0.295)	 26(1.024)	 52(2.047)

Unit:mm(inch)

■PARTS NUMBER　　＊All the Axial leaded capacitor of Catalog Lineup are Compliance RoHS.

●Multilayer 025 type Class 1

Parts number	Rated voltage[V]	Temperature characteristics	Nominal capacitance[pF]	Capacitance tolerance	Q	Insulation resistance [MΩ](min.)
UP025CH010D-□ Z	50	CH	1.0	±0.5pF	Q≧400+20C	10,000
UP025CH1R2D-□ Z	50	CH	1.2	±0.5pF	Q≧400+20C	10,000
UP025CH1R5D-□ Z	50	CH	1.5	±0.5pF	Q≧400+20C	10,000
UP025CH1R8D-□ Z	50	CH	1.8	±0.5pF	Q≧400+20C	10,000
UP025CH2R2D-□ Z	50	CH	2.2	±0.5pF	Q≧400+20C	10,000
UP025CH2R7D-□ Z	50	CH	2.7	±0.5pF	Q≧400+20C	10,000
UP025CH3R3D-□ Z	50	CH	3.3	±0.5pF	Q≧400+20C	10,000
UP025CH3R9D-□ Z	50	CH	3.9	±0.5pF	Q≧400+20C	10,000
UP025CH4R7D-□ Z	50	CH	4.7	±0.5pF	Q≧400+20C	10,000
UP025CH5R6K-□ Z	50	CH	5.6	±10%	Q≧400+20C	10,000
UP025CH6R8K-□ Z	50	CH	6.8	±10%	Q≧400+20C	10,000
UP025CH8R2K-□ Z	50	CH	8.2	±10%	Q≧400+20C	10,000
UP025CH100J-□ Z	50	CH	10	±5%	Q≧400+20C	10,000
UP025CH120J-□ Z	50	CH	12	±5%	Q≧400+20C	10,000
UP025CH150J-□ Z	50	CH	15	±5%	Q≧400+20C	10,000
UP025CH180J-□ Z	50	CH	18	±5%	Q≧400+20C	10,000
UP025CH220J-□ Z	50	CH	22	±5%	Q≧400+20C	10,000
UP025CH270J-□ Z	50	CH	27	±5%	Q≧400+20C	10,000
UP025CH330J-□ Z	50	CH	33	±5%	Q≧1000	10,000
UP025CH390J-□ Z	50	CH	39	±5%	Q≧1000	10,000
UP025CH470J-□ Z	50	CH	47	±5%	Q≧1000	10,000
UP025CH560J-□ Z	50	CH	56	±5%	Q≧1000	10,000
UP025CH680J-□ Z	50	CH	68	±5%	Q≧1000	10,000
UP025CH820J-□ Z	50	CH	82	±5%	Q≧1000	10,000
UP025CH101J-□ Z	50	CH	100	±5%	Q≧1000	10,000
UP025CH151J-□ Z	50	CH	150	±5%	Q≧1000	10,000
UP025CH221J-□ Z	50	CH	220	±5%	Q≧1000	10,000
UP025CH331J-□ Z	50	CH	330	±5%	Q≧1000	10,000
UP025CH471J-□ Z	50	CH	470	±5%	Q≧1000	10,000
UP025CH681J-□ Z	50	CH	680	±5%	Q≧1000	10,000
UP025CH102J-□ Z	50	CH	1 000	±5%	Q≧1000	10,000

・□ Please specify the lead configuration code.

●Multilayer 025 type Class 2

Parts number	Rated voltage[V]	Temperature characteristics	Nominal capacitance[pF]	Capacitance tolerance	tan δ	Insulation resistance [MΩ](min.)
UP025 B101K-□ Z	50	B	100	±10%	tan δ ≦3.5%	5,000
UP025 B121K-□ Z	50	B	120	±10%	tan δ ≦3.5%	5,000
UP025 B151K-□ Z	50	B	150	±10%	tan δ ≦3.5%	5,000
UP025 B181K-□ Z	50	B	180	±10%	tan δ ≦3.5%	5,000
UP025 B221K-□ Z	50	B	220	±10%	tan δ ≦3.5%	5,000
UP025 B271K-□ Z	50	B	270	±10%	tan δ ≦3.5%	5,000
UP025 B331K-□ Z	50	B	330	±10%	tan δ ≦3.5%	5,000
UP025 B391K-□ Z	50	B	390	±10%	tan δ ≦3.5%	5,000
UP025 B471K-□ Z	50	B	470	±10%	tan δ ≦3.5%	5,000
UP025 B561K-□ Z	50	B	560	±10%	tan δ ≦3.5%	5,000
UP025 B681K-□ Z	50	B	680	±10%	tan δ ≦3.5%	5,000
UP025 B821K-□ Z	50	B	820	±10%	tan δ ≦3.5%	5,000
UP025 B102K-□ Z	50	B	1 000	±10%	tan δ ≦3.5%	5,000
UP025 B122K-□ Z ★	50	B	1 200	±10%	tan δ ≦3.5%	5,000
UP025 B152K-□ Z	50	B	1 500	±10%	tan δ ≦3.5%	5,000
UP025 B222K-□ Z	50	B	2 200	±10%	tan δ ≦3.5%	5,000
UP025 B332K-□ Z	50	B	3 300	±10%	tan δ ≦3.5%	5,000
UP025 B472K-□ Z	50	B	4 700	±10%	tan δ ≦3.5%	5,000
UP025 B682K-□ Z	50	B	6 800	±10%	tan δ ≦3.5%	5,000
UP025 B103K-□ Z	50	B	10 000	±10%	tan δ ≦3.5%	5,000
UP025 B153K-□ Z ★	50	B	15 000	±10%	tan δ ≦3.5%	5,000
UP025 B223K-□ Z	50	B	22 000	±10%	tan δ ≦3.5%	5,000
UP025 B333K-□ Z	50	B	33 000	±10%	tan δ ≦3.5%	5,000
UP025 B473K-□ Z	50	B	47 000	±10%	tan δ ≦5.0%	1,000
UP025 B683K-□ Z	50	B	68 000	±10%	tan δ ≦5.0%	1,000
UP025 B104K-□ Z	50	B	100 000	±10%	tan δ ≦5.0%	1,000
EP025 B224K-□ Z	16	B	220 000	±10%	tan δ ≦5.0%	500
EP025 B474K-□ Z	16	B	470 000	±10%	tan δ ≦5.0%	200
EP025 B105K-□ Z	16	B	1 000 000	±10%	tan δ ≦7.5%	100
UP025B5105K-□ Z	50	B5	1 000 000	±10%	tan δ ≦12.5%	100
UP025 F103Z-□ Z	50	F	10 000	+80/−20%	tan δ ≦7.5%	1,000
UP025 F223Z-□ Z	50	F	22 000	+80/−20%	tan δ ≦7.5%	1,000
UP025 F473Z-□ Z	50	F	47 000	+80/−20%	tan δ ≦7.5%	1,000
UP025 F104Z-□ Z	50	F	100 000	+80/−20%	tan δ ≦7.5%	1,000
EP025 F224Z-□ Z ★	16	F	220 000	+80/−20%	tan δ ≦10.0%	500
EP025 F474Z-□ Z ★	16	F	470 000	+80/−20%	tan δ ≦10.0%	500
EP025 F105Z-□ Z ★	16	F	1 000 000	+80/−20%	tan δ ≦17.5%	250
EP025 B122M-□ J ★	16	B	1 200	±20%	tan δ ≦3.5%	5,000
EP025 B152M-□ J ★	16	B	1 500	±20%	tan δ ≦3.5%	5,000
EP025 B182M-□ J ★	16	B	1 800	±20%	tan δ ≦3.5%	5,000
EP025 B222M-□ J ★	16	B	2 200	±20%	tan δ ≦3.5%	5,000
EP025 B272M-□ J ★	16	B	2 700	±20%	tan δ ≦3.5%	5,000
EP025 B332M-□ J ★	16	B	3 300	±20%	tan δ ≦3.5%	5,000
EP025 B392M-□ J ★	16	B	3 900	±20%	tan δ ≦3.5%	5,000
EP025 B472M-□ J ★	16	B	4 700	±20%	tan δ ≦3.5%	5,000
EP025 B562M-□ J ★	16	B	5 600	±20%	tan δ ≦3.5%	5,000
EP025 B682M-□ J ★	16	B	6 800	±20%	tan δ ≦3.5%	5,000
EP025 B822M-□ J ★	16	B	8 200	±20%	tan δ ≦3.5%	5,000

・□ Please specify the lead configuration code.
★ : Option

▶This catalog contains the typical specification only due to the limitation of space. When you consider the purchase of our products, please check our specification. For details of each product (characteristics graph, reliability information, precautions for use, and so on), see our website (http://www.ty-top.com/) .

■PARTS NUMBER　　＊ All the Axial leaded capacitor of Catalog Lineup are Compliance RoHS.

Parts number	Rated voltage[V]	Temperature characteristics	Nominal capacitance[pF]	Capacitance tolerance	tan δ	Insulation resistance [MΩ] (min.)
EP025 B103M-□ J ★	16	B	10 000	±20%	tan δ ≦3.5%	5,000
EP025 B123M-□ J ★	16	B	12 000	±20%	tan δ ≦3.5%	5,000
EP025 B153M-□ J ★	16	B	15 000	±20%	tan δ ≦3.5%	5,000
EP025 B183M-□ J ★	16	B	18 000	±20%	tan δ ≦3.5%	5,000
EP025 B223M-□ J ★	16	B	22 000	±20%	tan δ ≦3.5%	5,000
TP025 F103Z-□ J ★	25	F	10 000	+80/−20%	tan δ ≦7.5%	1,000
TP025 F223Z-□ J ★	25	F	22 000	+80/−20%	tan δ ≦7.5%	1,000
TP025 F473Z-□ J ★	25	F	47 000	+80/−20%	tan δ ≦7.5%	1,000

・□ Please specify the lead configuration code.
★ : Option

●Multilayer 050 type Class 1

Parts number	Rated voltage[V]	Temperature characteristics	Nominal capacitance[pF]	Capacitance tolerance	Q	Insulation resistance [MΩ] (min.)
UP050CH220J-□ Z	50	CH	22	±5%	Q≧400+20C	10,000
UP050CH240J-□ Z ★	50	CH	24	±5%	Q≧400+20C	10,000
UP050CH270J-□ Z	50	CH	27	±5%	Q≧400+20C	10,000
UP050CH300J-□ Z ★	50	CH	30	±5%	Q≧1000	10,000
UP050CH330J-□ Z	50	CH	33	±5%	Q≧1000	10,000
UP050CH360J-□ Z ★	50	CH	36	±5%	Q≧1000	10,000
UP050CH390J-□ Z	50	CH	39	±5%	Q≧1000	10,000
UP050CH430J-□ Z ★	50	CH	43	±5%	Q≧1000	10,000
UP050CH470J-□ Z	50	CH	47	±5%	Q≧1000	10,000
UP050CH510J-□ Z ★	50	CH	51	±5%	Q≧1000	10,000
UP050CH560J-□ Z ★	50	CH	56	±5%	Q≧1000	10,000
UP050CH620J-□ Z ★	50	CH	62	±5%	Q≧1000	10,000
UP050CH680J-□ Z	50	CH	68	±5%	Q≧1000	10,000
UP050CH750J-□ Z ★	50	CH	75	±5%	Q≧1000	10,000
UP050CH820J-□ Z ★	50	CH	82	±5%	Q≧1000	10,000
UP050CH910J-□ Z ★	50	CH	91	±5%	Q≧1000	10,000
UP050CH101J-□ Z	50	CH	100	±5%	Q≧1000	10,000
UP050CH111J-□ Z ★	50	CH	110	±5%	Q≧1000	10,000
UP050CH121J-□ Z ★	50	CH	120	±5%	Q≧1000	10,000
UP050CH131J-□ Z ★	50	CH	130	±5%	Q≧1000	10,000
UP050CH151J-□ Z	50	CH	150	±5%	Q≧1000	10,000
UP050CH161J-□ Z ★	50	CH	160	±5%	Q≧1000	10,000
UP050CH181J-□ Z ★	50	CH	180	±5%	Q≧1000	10,000
UP050CH201J-□ Z ★	50	CH	200	±5%	Q≧1000	10,000
UP050CH221J-□ Z	50	CH	220	±5%	Q≧1000	10,000
UP050CH241J-□ Z ★	50	CH	240	±5%	Q≧1000	10,000
UP050CH271J-□ Z ★	50	CH	270	±5%	Q≧1000	10,000
UP050CH301J-□ Z ★	50	CH	300	±5%	Q≧1000	10,000
UP050CH331J-□ Z	50	CH	330	±5%	Q≧1000	10,000
UP050CH361J-□ Z ★	50	CH	360	±5%	Q≧1000	10,000
UP050CH391J-□ Z ★	50	CH	390	±5%	Q≧1000	10,000
UP050CH431J-□ Z ★	50	CH	430	±5%	Q≧1000	10,000
UP050CH471J-□ Z	50	CH	470	±5%	Q≧1000	10,000
UP050CH511J-□ Z ★	50	CH	510	±5%	Q≧1000	10,000
UP050CH561J-□ Z ★	50	CH	560	±5%	Q≧1000	10,000
UP050CH621J-□ Z ★	50	CH	620	±5%	Q≧1000	10,000
UP050CH681J-□ Z	50	CH	680	±5%	Q≧1000	10,000
UP050CH751J-□ Z ★	50	CH	750	±5%	Q≧1000	10,000
UP050CH821J-□ Z ★	50	CH	820	±5%	Q≧1000	10,000
UP050CH911J-□ Z ★	50	CH	910	±5%	Q≧1000	10,000
UP050CH102J-□ Z	50	CH	1 000	±5%	Q≧1000	10,000

・□ Please specify the lead configuration code.
★ : Option

■PARTS NUMBER　　＊All the Axial leaded capacitor of Catalog Lineup are Compliance RoHS.

●Multilayer 050 type　Class 2

Parts number		Rated voltage[V]	Temperature characteristics	Nominal capacitance[pF]	Capacitance tolerance	tan δ	Insulation resistance [MΩ](min.)
UP050 B122K-□ Z	★	50	B	1 200	±10%	tan δ ≦3.5%	5,000
UP050 B152K-□ Z	★	50	B	1 500	±10%	tan δ ≦3.5%	5,000
UP050 B182K-□ Z	★	50	B	1 800	±10%	tan δ ≦3.5%	5,000
UP050 B222K-□ Z		50	B	2 200	±10%	tan δ ≦3.5%	5,000
UP050 B272K-□ Z	★	50	B	2 700	±10%	tan δ ≦3.5%	5,000
UP050 B332K-□ Z		50	B	3 300	±10%	tan δ ≦3.5%	5,000
UP050 B392K-□ Z	★	50	B	3 900	±10%	tan δ ≦3.5%	5,000
UP050 B472K-□ Z		50	B	4 700	±10%	tan δ ≦3.5%	5,000
UP050 B562K-□ Z	★	50	B	5 600	±10%	tan δ ≦3.5%	5,000
UP050 B682K-□ Z		50	B	6 800	±10%	tan δ ≦3.5%	5,000
UP050 B822K-□ Z	★	50	B	8 200	±10%	tan δ ≦3.5%	5,000
UP050 B103K-□ Z		50	B	10 000	±10%	tan δ ≦3.5%	5,000
UP050 B123K-□ Z	★	50	B	12 000	±10%	tan δ ≦3.5%	5,000
UP050 B153K-□ Z		50	B	15 000	±10%	tan δ ≦3.5%	5,000
UP050 B183K-□ Z	★	50	B	18 000	±10%	tan δ ≦3.5%	5,000
UP050 B223K-□ Z		50	B	2 2000	±10%	tan δ ≦3.5%	5,000
UP050 B273K-□ Z	★	50	B	27 000	±10%	tan δ ≦3.5%	5,000
UP050 B333K-□ Z		50	B	33 000	±10%	tan δ ≦3.5%	5,000
UP050 B393K-□ Z	★	50	B	39 000	±10%	tan δ ≦3.5%	5,000
UP050 B473K-□ Z		50	B	47 000	±10%	tan δ ≦5.0%	1,000
UP050 B563K-□ Z	★	50	B	56 000	±10%	tan δ ≦5.0%	1,000
UP050 B683K-□ Z		50	B	68 000	±10%	tan δ ≦5.0%	1,000
UP050 B823K-□ Z	★	50	B	82 000	±10%	tan δ ≦5.0%	1,000
UP050 B104K-□ Z		50	B	100 000	±10%	tan δ ≦5.0%	1,000
UP050 B224K-□ Z		50	B	220 000	±10%	tan δ ≦5.0%	500
UP050 B474K-□ Z		50	B	470 000	±10%	tan δ ≦5.0%	200
GP050 B105K-□ Z		35	B	1 000 000	±10%	tan δ ≦5.0%	100
EP050 B225K-□ Z		16	B	2 200 000	±10%	tan δ ≦7.5%	50
EP050 B475K-□ Z		16	B	4 700 000	±10%	tan δ ≦12.5%	20
EP050 B106K-□ Z		16	B	10 000 000	±10%	tan δ ≦12.5%	20
UP050 F103Z-□ Z		50	F	10 000	+80/-20%	tan δ ≦7.5%	1,000
UP050 F223Z-□ Z		50	F	22 000	+80/-20%	tan δ ≦7.5%	1,000
UP050 F473Z-□ Z		50	F	47 000	+80/-20%	tan δ ≦7.5%	1,000
UP050 F104Z-□ Z		50	F	100 000	+80/-20%	tan δ ≦7.5%	1,000
UP050 F224Z-□ Z		50	F	220 000	+80/-20%	tan δ ≦10.0%	500
UP050 F474Z-□ Z		50	F	470 000	+80/-20%	tan δ ≦10.0%	500
UP050 F105Z-□ Z		50	F	1 000 000	+80/-20%	tan δ ≦15.0%	250
EP050 F225Z-□ Z	★	16	F	2 200 000	+80/-20%	tan δ ≦15.0%	125
LP050 F475Z-□ Z	★	10	F	4 700 000	+80/-20%	tan δ ≦17.5%	50
LP050 F106Z-□ Z	★	10	F	10 000 000	+80/-20%	tan δ ≦17.5%	25

・□ Please specify the lead configuration code.
★ : Option

●Multilayer 075 type　Class 2

Parts number		Rated voltage[V]	Temperature characteristics	Nominal capacitance[pF]	Capacitance tolerance	tan δ	Insulation resistance [MΩ](min.)
UP075 B105K-□		50	B	1 000 000	±10%	tan δ ≦5.0%	100
GP075 B225K-□		35	B	2 200 000	±10%	tan δ ≦7.5%	50
GP075 B475K-□		35	B	4 700 000	±10%	tan δ ≦7.5%	20
TP075 B106K-□		25	B	10 000 000	±10%	tan δ ≦12.5%	20
UP075B5225K-□		50	B5	2 200 000	±10%	tan δ ≦12.5%	40
UP075B5475K-□	★	50	B5	4 700 000	±10%	tan δ ≦12.5%	10
GP075B5106K-□	★	35	B5	10 000 000	±10%	tan δ ≦12.5%	10
GP075 F106Z-□	★	35	F	10 000 000	+80/-20%	tan δ ≦17.5%	25

・□ Please specify the lead configuration code.
★ : Option

▶This catalog contains the typical specification only due to the limitation of space. When you consider the purchase of our products, please check our specification. For details of each product (characteristics graph, reliability information, precautions for use, and so on), see our website (http://www.ty-top.com/) .

Axial Leaded Ceramic Capacitors

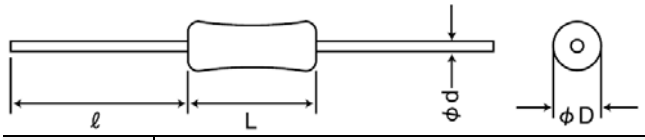
■PACKAGING

①Minimum Quantity

Type	Lead configuration code	Minimum Quantity [pcs]	
		Bulk	Taping
Multilayer type (075, 050, 025)	A－(1.024 inch wide)	－	2000(075) 3000(050) 5000(025)
	B－(2.047 inches wide)		
	NA	1000	－
	KE(075)	3000	
	KF(050)	3000	
	KF(025)	4000	

②Dimensions of Bulk Products

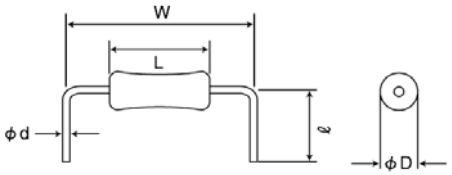
●NA configuration



Type	Dimensions(mm)			
	ϕD	L	ϕd	ℓ
Multilayer type 025	2.0max. (0.079max.)	2.3max. (0.09max.)	0.45±0.05 (0.018±0.002)	20.0min. (0.787min.)
Multilayer type 050	2.2max. (0.087max.)	3.2max. (0.126max.)	0.45±0.05 (0.018±0.002)	20.0min. (0.787min.)
Multilayer type 075	3.2max. (0.126max.)	4.2max. (0.165max.)	0.55±0.05 (0.022±0.002)	20.0min. (0.787min.)

Unit:mm(inch)

●KF/KE configuration

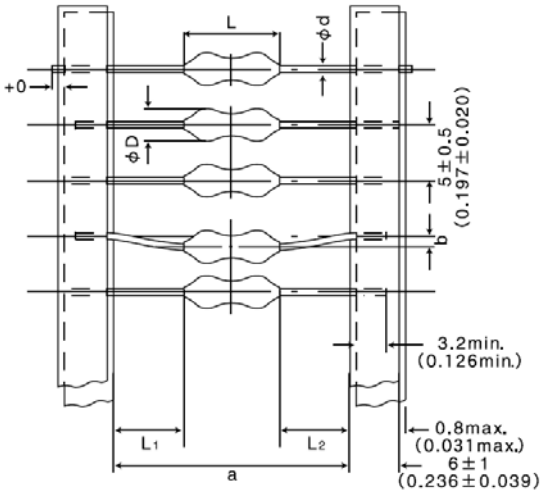


Type	Lead configuration code	Dimensions(mm)				
		ϕD	L	W	ϕd	ℓ
Multilayer type 025	KF	2.0max. (0.079max.)	2.3max. (0.09max.)	5.0±0.5 (0.197±0.020)	0.45±0.05 (0.018±0.002)	6.5±0.5 (0.256±0.020)
Multilayer type 050	KF	2.2max. (0.087max.)	3.2max. (0.126max.)	5.0±0.5 (0.197±0.020)	0.45±0.05 (0.018±0.002)	6.5±0.5 (0.256±0.020)
Multilayer type 075	KE	3.2max. (0.126max.)	4.2max. (0.165max.)	7.5±0.5 (0.295±0.020)	0.55±0.05 (0.022±0.002)	6.5±0.5 (0.256±0.020)

Unit:mm(inch)

③Taping Dimensions

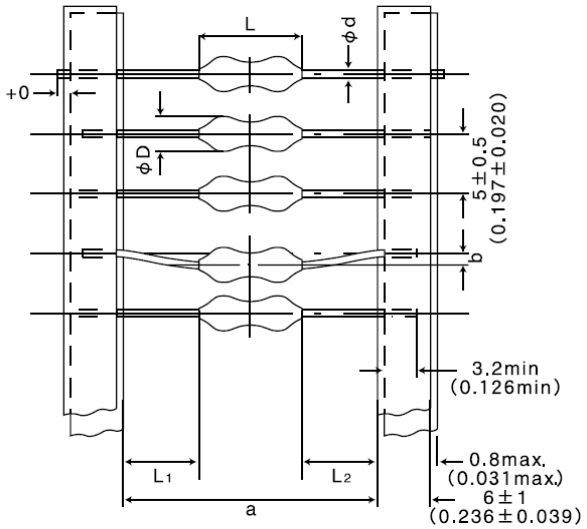
●A－(a：1.024 inch wide) configuration



Type	Dimensions (mm)						Minimum insertion pitch
	φD	L	a	b	| L1－L2 |	φd	
Multilayer type 025	2.0max. (0.079max.)	2.3max. (0.09max)	26＋0.5/－0 (1.024＋0.020/－0)	0.8max. (0.031max.)	0.5max. (0.020max.)	0.45±0.05 (0.018±0.002)	5.0 (0.197)
Multilayer type 050	2.2max. (0.087max.)	3.2max. (0.126max.)				0.45±0.05 (0.018±0.002)	
Multilayer type 075	3.2max. (0.126max.)	4.2max. (0.165max.)				0.55±0.05 (0.022±0.002)	7.5 (0.295)

Unit：mm (inch)

●B－(a：2.047 inches wide) configuration



Type	Dimensions (mm)						Minimum insertion pitch
	φD	L	a	b	| L1－L2 |	φd	
Multilayer type 025	2.0max. (0.079max.)	2.3max. (0.09max.)	52＋2/－1 (2.047＋0.079/－0.039)	1.2max. (0.047 max.)	1.0max. (0.039max.)	0.45±0.05 (0.018±0.002)	5.0 (0.197)
Multilayer type 050	2.2max. (0.087max.)	3.2max. (0.126max.)				0.45±0.05 (0.018±0.002)	
Multilayer type 075	3.2max. (0.126max.)	4.2max. (0.165max.)				0.55±0.05 (0.022±0.002)	7.5 (0.295)

Unit：mm (inch)

※Radial taping is available for 075 type (Optional)

Axial Leaded Ceramic Capacitors

■RELIABILITY DATA

1. Operating Temperature Range

Specified Value	Class1 (Temperature Compensating)	Multilayer type	−25 to +85℃
	Class2 (High Dielectric)	Multilayer type (Characteristics : B, B5)	
		Multilayer type (Characteristics : F)	

2. Storage Temperature Range

Specified Value	Class1 (Temperature Compensating)	Multilayer type	−25 to +85℃
	Class2 (High Dielectric)	Multilayer type (Characteristics : B, B5)	
		Multilayer type (Characteristics : F)	

3. Rate Voltage

Specified Value	Class1 (Temperature Compensating)	Multilayer type	50VDC
	Class2 (High Dielectric)	Multilayer type (Characteristics : B, B5)	16VDC, 25VDC, 35VDC, 50VDC
		Multilayer type (Characteristics : F)	10VDC, 16VDC, 25VDC, 35VDC, 50VDC

4. Withstanding Voltage

Between terminals

Specified Value	No abnormality	
Test Methods and Remarks	Applied voltage	: Rate Voltage × 3 (Class 1) : Rate Voltage × 2.5 (Class 2)
	Duration	: 1 to 5 sec.
	Charge/discharge current	: 50mA max. (Class 1,2)

Between terminals and body

Specified Value	No abnormality		
Test Methods and Remarks	Metal globule method	Applied voltage	: Rate Voltage × 2.5
		Duration	: 1 to 5 sec.
		Charge/Discharge current	: 50mA max.

5. Insulation Resistance

Specified Value	Class1 (Temperature Compensating)	Multilayer type	10000MΩ min.
	Class2 (High Dielectric)	Multilayer type (Characteristics : B, B5)	Rate voltage : 16VDC
			1200pF～22000pF (Item△J) : 5000MΩ min
			220000pF : 500MΩ min
			470000pF : 200MΩ min
			1000000pF : 100MΩ min
			2200000pF : 50MΩ min
			4700000pF : 20MΩ min
			10000000pF : 20MΩ min
			Rate voltage : 25VDC
			10000000pF : 20MΩ min
			Rate voltage : 35VDC
			1000000pF : 100MΩ min
			2200000pF : 50MΩ min
			4700000pF : 20MΩ min
			10000000pF : 10MΩ min
			Rate voltage : 50VDC
			100pF～39000pF : 5000MΩ min
			47000pF～100000pF : 1000MΩ min
			220000pF : 500MΩ min
			470000pF : 200MΩ min
			1000000pF : 100MΩ min
			2200000pF : 40MΩ min

			4700000pF : 10MΩ min
		Multilayer type (Characteristics:F)	Rate voltage : 10VDC
			4700000pF : 50MΩ min
			10000000pF : 25MΩ min
			Rate voltage : 16VDC
			220000pF : 500MΩ min
			470000pF : 500MΩ min
			1000000pF : 250MΩ min
			2200000pF : 125MΩ min
			Rate voltage : 25VDC
			10000pF～47000pF(ItemΔJ) : 1000MΩ min
			Rate voltage : 35VDC
			10000000pF : 25MΩ min
			Rate voltage : 50VDC
			10000pF～100000pF : 1000MΩ min
			220000pF～470000pF : 500MΩ min
			1000000pF : 250MΩ min
Test Methods and Remarks	Applied voltage : Rate voltage Duration : 60±5 sec.		

6. Capacitance

Specified Value	Class1 (Temperature Compensating)	Multilayer type	±0.5pF ±5% ±10%
	Class2 (High Dielectric)	Multilayer type (Characteristics:B, B5)	±10%, ±20%(ItemΔJ)
		Multilayer type (Characteristics:F)	+80/−20%
Test Methods and Remarks	Measuring frequency	: 1MHz±10%	(Class1 : C≦1000pF)
		: 1kHz±10%	(Class1 : C>1000pF)
		: 1kHz±10%	(Class2 : C≦10μF)
		: 120Hz±10%	(Class2 : C>10μF)
	Measuring voltage	: 1.0±0.5Vrms	(Class1 : C≦1000pF)
		: 1.0±0.2Vrms	(Class1 : C>1000pF)
		: 1.0±0.2Vrms	(Class2 : C≦10μF)
		: 0.5±0.1Vrms	(Class2 : C>10μF)
	Bias application	: None	

7. Q or Tangent of Loss Angle (tanδ)

Specified Value	Class1 (Temperature Compensating)	Multilayer type	30pF or under : Q≧400+20C 33pF or over : Q≧1000 C:Nominal Capacitance[pF]
	Class2 (High Dielectric)	Multilayer type (Characteristics:B, B5)	Rate voltage : 16VDC
			1200pF～22000pF(ItemΔJ) : 3.5% max
			220000pF～470000pF : 5.0% max
			1000000pF～2200000pF : 7.5% max
			4700000pF～10000000pF : 12.5% max
			Rate voltage : 25VDC
			10000000pF : 12.5% max
			Rate voltage : 35VDC
			1000000pF : 5.0% max
			2200000pF～4700000pF : 7.5% max
			10000000pF : 12.5% max
			Rate voltage : 50VDC
			100pF～39000pF : 3.5% max
			47000pF～1000000pF : 5.0% max
			(1000000pF/B5 : 12.5% max)
			2200000pF～4700000pF : 12.5% max
		Multilayer type (Characteristics:F)	Rate voltage : 10VDC
			4700000pF～10000000pF : 17.5% max
			Rate voltage : 16VDC
			220000pF : 10.0% max
			470000pF : 10.0% max
			1000000pF : 17.5% max
			2200000pF : 15.0% max
			Rate voltage : 25VDC
			10000pF～47000pF(ItemΔJ) : 7.5% max
			Rate voltage : 35VDC

			10000000pF : 17.5% max Rate voltage : 50VDC 10000pF～100000pF : 7.5% max 220000pF～470000pF : 10.0% max 1000000pF : 15.0% max
Test Methods and Remarks	Measuring frequency Measuring voltage Bias application	: 1MHz±10% : 1kHz±10% : 1kHz±10% : 120Hz±10% : 1.0±0.5Vrms : 1.0±0.2Vrms : 1.0±0.2Vrms : 0.5±0.1Vrms : None	(Class1 : C≦1000pF) (Class1 : C＞1000pF) (Class2 : C≦10 μF) (Class2 : C＞10 μF) (Class1 : C≦1000pF) (Class1 : C＞1000pF) (Class2 : C≦10 μF) (Class2 : C＞10 μF)

8. Capacitance : Change due to Temperature or Rate of Capacitance Change

When voltage is not applied

Specified Value	Class1 (Temperature Compensating)	Multilayer type	CH : 0±60 SL : －350～＋1000 [ppm/℃]
	Class2 (High Dielectric)	Multilayer type (Characteristics : B, B5)	±10% (B5 : ±15%)
		Multilayer type (Characteristics : F)	＋30/－85 %

Test Methods and Remarks

Measurement of capacitance at 20℃ and 85℃, －25℃ shall be made to calculate temperature characteristic by the following equation.
(Class 1)

$$\frac{(C_{85}-C_{20})}{C_{20}\times\Delta T}\times 10^{6}\ (\mathrm{ppm/℃})$$

Change of maximum capacitance deviation in step 1 to 5 (Class2)

Step	Temperature (℃)
1	20
2	－25
3	20 (Reference temperature)
4	85
5	20

※In the B5 characteristics is, the Temperatures of step 1,3, and 5 are 25℃.

9. Terminal Strength

Tensile

Specified Value	Class1 (Temperature Compensating)	Multilayer type	No abnomalities, such as cuts or looseness of terminals.
	Class2 (High Dielectric)	Multilayer type (Characteristics : B, B5)	
		Multilayer type (Characteristics : F)	

Test Methods and Remarks

Apply the stated tensile force progressively in the direction to draw terminal.

Nominal wire diameter [mm]	Tensile force [N]	Duration [s]
0.45・0.55	19.6	5

Torsional

Specified Value	Class1 (Temperature Compensating)	Multilayer type	No abnomalities, such as cuts or looseness of terminals.
	Class2 (High Dielectric)	Multilayer type (Characteristics : B, B5)	
		Multilayer type (Characteristics : F)	

Test Methods and Remarks

Suspend a weight of specified mass at the end of the terminals and incline the body through the angle of 90 degrees and return it to the initial position.
This operation is done over a period of 5 sec. Then second bend in the opposite direction shall be made.
Number of bends : 2 times

Nominal wire diameter [mm]	Bending force [N]	Mass weight [kg]
0.45・0.55	2.45	0.25

10. Resistance to Vibration

Specified Value	Class1 (Temperature Compensating)	Multilayer type	Appearance : No significant abnomality Withstanding Voltage : No abnomality

			Capacitance :
			4.7pF or under : Within ±0.5pF
			5.6pF～8.2pF : Within±10%
			10pF or over : Within±5%
			Q :
			30pF or under : Q≧400+20C
			33pF or over : Q≧1000
			Insulation resistance : 10000MΩ min
			C : Nominal Capacitance [pF]
	Class2(High Dielectric)	Multilayer type (Characteristics:B, B5)	Appearance : No significant abnomality
			Withstanding Voltage : No abnomality
			Rate Voltage : 16VDC
			Capacitance
			1200pF～22000pF(ItemΔJ) : Within ±20%
			220000pF~10000000pF : Within ±10%
			tanδ :
			1200pF～22000pF(ItemΔJ) : 3.5% max
			220000pF～470000pF : 5.0% max
			1000000pF～2200000pF : 7.5% max
			4700000pF～10000000pF : 12.5% max
			Insulation Resistance :
			1200pF～22000pF(ItemΔJ) : 5000MΩ min
			220000pF : 500MΩ min
			470000pF : 200MΩ min
			1000000pF : 100MΩ min
			2200000pF : 50MΩ min
			4700000pF～10000000pF : 20MΩ min
			Rate Voltage : 25VDC
			Capacitance : Within ±10%
			tanδ :
			10000000pF : 12.5% max
			Insulation Resistance :
			10000000pF : 20MΩ min
			Rate Voltage : 35VDC
			Capacitance : Within ±10%
			tanδ :
			1000000pF : 5.0% max
			2200000pF～4700000pF : 7.5% max
			10000000pF : 12.5% max
			Insulation Resistance :
			1000000pF : 100MΩ min
			2200000pF : 50MΩ min
			4700000pF : 20MΩ min
			10000000pF : 10MΩ min
			Rate Voltage : 50VDC
			Capacitance : Within ±10%
			tanδ :
			100pF～39000pF : 3.5% max
			47000pF～1000000pF : 5.0% max
			(1000000pF/B5 : 12.5% max)
			2200000pF～4700000pF : 12.5% max
			Insulation Resistance :
			100pF～39000pF : 5000MΩ min
			47000pF～100000pF : 1000MΩ min
			220000pF : 500MΩ min
			470000pF : 200MΩ min
			1000000pF : 100MΩ min
			2200000pF : 40MΩ min
			4700000pF : 10MΩ min
		Multilayer type (Characteristics:F)	Appearance : No significant abnomality
			Withstanding Voltage : No abnomality
			Rate Voltage : 10VDC
			Capacitance : Within +80/−20%
			tanδ :
			4700000pF～10000000pF : 17.5% max
			Insulation Resistance :
			4700000pF : 50MΩ min
			10000000pF : 25MΩ min
			Rate Voltage : 16VDC

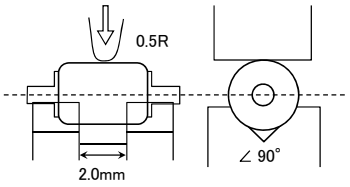
			Capacitance : Within ＋80/－20% tan δ : 220000pF : 10.0% max 470000pF : 10.0% max 1000000pF : 17.5% max 2200000pF : 15.0% max Insulation Resistance : 220000pF : 500MΩ min 470000pF : 500MΩ min 1000000pF : 250MΩ min 2200000pF : 125MΩ min Rate Voltage : 25VDC Capacitance : Within ＋80/－20% tan δ : 10000pF～47000pF(ItemΔJ) : 7.5% max Insulation Resistance : 10000pF～47000pF(ItemΔJ) : 1000MΩ min Rate Voltage : 35VDC Capacitance : Within ＋80/－20% tan δ : 10000000pF : 17.5% max Insulation Resistance 10000000pF : 25MΩ min Rate Voltage : 50VDC Capacitance : Within ＋80/－20% tan δ : 10000pF～100000pF : 7.5% max 220000pF～470000pF : 10.0% max 1000000pF : 15.0% max Insulation Resistance : 10000pF～100000pF : 1000MΩ min 220000pF～470000pF : 500MΩ min 1000000pF : 250MΩ min
Test Methods and Remarks	According to JIS C 5101-1 Vibration type : A Directions : 2 hrs each in X, Y and Z directions Total : 6 hrs Frequency range : 10 to 55 to 10Hz(1min) Amplitude : 1.5mm Mountin method : Soldering onto the PC board		

11. Free Fall			
Specified Value	Class1(Temperature Compensating)	Multilayer type	Appearance:No significant abnomality Withstanding Voltage:No abnomality Capacitance 4.7pF or under : Within ±0.5pF 5.6pF～8.2pF : Within ±10% 10pF or over : Within ±5% Q : 30pF or under : Q≧400+20C 33pF or over : Q≧1000 Insulation resistance : 10000MΩ min C : Nominal Capacitance [pF]
	Class2(High Dielectric)	Multilayer type (Characteristics:B, B5)	Appearance:No significant abnomality Withstanding Voltage:No abnomality Rate Voltage:16VDC Capacitance: 1200pF～22000pF(ItemΔJ) :Within ±20% 220000pF～10000000pF :Within ±10% tan δ: 1200pF～22000pF(ItemΔJ) :3.5% max 220000pF～470000pF :5.0% max 1000000pF～2200000pF :7.5% max 4700000pF～10000000pF :12.5% max Insulation resistance: 1200pF～22000pF(ItemΔJ) :5000MΩ min 220000pF :500MΩ min 470000pF :200MΩ min 1000000pF :100MΩ min

			2200000pF : 50MΩ min
			4700000pF～10000000pF : 20MΩ min
			Rate Voltage : 25VDC
			Capacitance : Within ±10%
			tan δ:
			10000000pF : 12.5% max
			Insulation resistance :
			10000000pF : 20MΩ min
			Rate Voltage : 35VDC
			Capacitance : Within ±10%
			tan δ:
			1000000pF : 5.0% max
			2200000pF～4700000pF : 7.5% max
			10000000pF : 12.5% max
			Insulation resistance :
			1000000pF : 100MΩ min
			2200000pF : 50MΩ min
			4700000pF : 20MΩ min
			10000000pF : 10MΩ min
			Rate Voltage : 50VDC
			Capacitance : Within ±10%
			tan δ:
			100pF～39000pF : 3.5% max
			47000pF～1000000pF : 5.0% max
			(1000000pF/B5 : 12.5% max)
			2200000pF～4700000pF : 12.5% max
			Insulation resistance :
			100pF～39000pF : 5000MΩ min
			47000pF～100000pF : 1000MΩ min
			220000pF : 500MΩ min
			470000pF : 200MΩ min
			1000000pF : 100MΩ min
			2200000pF : 40MΩ min
			4700000pF : 10MΩ min
		Multilayer type (Characteristics : F)	Appearance : No significant abnomality
			Withstanding Voltage : No abnomality
			Rate Voltage : 10VDC
			Capacitance : Within +80/−20%
			tan δ:
			4700000pF～10000000pF : 17.5% max
			Insulation resistance :
			4700000pF : 50MΩ min
			10000000pF : 25MΩ min
			Rate Voltage : 16VDC
			Capacitance : Within+80/−20%
			tan δ:
			220000pF : 10.0% max
			470000pF : 10.0% max
			1000000pF : 17.5% max
			2200000pF : 15.0% max
			Insulation resistance :
			220000pF : 500MΩ min
			470000pF : 500MΩ min
			1000000pF : 250MΩ min
			2200000pF : 125MΩ min
			Rate Voltage : 25VDC
			Capacitance : Within +80/−20%
			tan δ:
			10000pF～47000pF (ItemΔJ) : 7.5% max
			Insulation resistance :
			10000pF～47000pF (ItemΔJ) : 1000MΩ min
			Rate Voltage : 35VDC
			Capacitance : Within +80/−20%
			tan δ:
			10000000pF : 17.5% max
			Insulation resistance :
			10000000pF : 25MΩ min
			Rate Voltage : 50VDC
			Capacitance : Within +80/−20%

			tan δ: 10000pF～100000pF : 7.5% max 220000pF～470000pF : 10.0% max 1000000pF : 15.0% max Insulation resistance: 10000pF～100000pF : 1000MΩ min 220000pF～470000pF : 500MΩ min 1000000pF : 250MΩ min
Test Methods and Remarks	Drop Test : Free fall Impact material : Floor Height : 1 m Total number of drops : 5 times		

12. Body Strength

Specified Value	Class1 (Temperature Compensating)	Multilayer type	No abnomality such as damage.
	Class2 (High Dielectric)	Multilayer type (Characteristics: B, B5)	
		Multilayer type (Characteristics: F)	
Test Methods and Remarks	Applied force : 19.6N Duration : 5 sec. Speed : Shall attain to specified force in 2 sec.  1.5mm (025type)		

13. Solderability

Specified Value	Class1 (Temperature Compensating)	Multilayer type	At least 75% of lead surface is covered with new solder.
	Class2 (High Dielectric)	Multilayer type (Characteristics: B, B5)	
		Multilayer type (Characteristics: F)	
Test Methods and Remarks	Solder temperature : 230±5℃ Duration : 2±0.5 sec. (This test may be applicable after 6 months storage.)		

14. Soldering

Specified Value	Class1 (Temperature Compensating)	Multilayer type	Appearance: No significant abnomality Withstanding Voltage: No abnomality Capacitance change: 8.2pF or under : Within ±0.25pF 10pF or over : Within ±2.5% Q: 30pF or under : Q≧400+20C 33pF or over : Q≧1000 Insulation resistance : 10000MΩ min C: Nominal Capacitance [pF]
	Class2 (High Dielectric)	Multilayer type (Characteristics: B, B5)	Appearance: No significant abnomality Withstanding Voltage: No abnomality Rate Voltage: 16VDC Capacitance change: 1200pF～22000pF (Item△J) : Within±7.5% 220000pF～10000000pF : Within±10.0% tan δ: 1200pF～22000pF (Item△J) : 3.5% max 220000pF～470000pF : 5.0% max 1000000pF～2200000pF : 7.5% max 4700000pF～10000000pF : 12.5% max Insulation resistance: 1200pF～22000pF (Item△J) : 5000MΩ min 220000pF : 500MΩ min

			470000pF : 200MΩ min
			1000000pF : 100MΩ min
			2200000pF : 50MΩ min
			4700000pF～10000000pF : 20MΩ min
			Rate Voltage : 25VDC
			Capacitance change :
			10000000pF : Within ±10.0%
			tan δ:
			10000000pF : 12.5% max
			Insulation resistance :
			10000000pF : 20MΩ min
			Rate Voltage : 35VDC
			Capacitance change :
			1000000pF～10000000pF : Within ±10.0%
			tan δ:
			1000000pF : 5.0% max
			2200000pF～4700000pF : 7.5% max
			10000000pF : 12.5% max
			Insulation resistance :
			1000000pF : 100MΩ min
			2200000pF : 50MΩ min
			4700000pF : 20MΩ min
			10000000pF : 10MΩ min
			Rate Voltage : 50VDC
			Capacitance change :
			100pF～39000pF : Within ±7.5%
			47000pF～1000000pF : Within ±10.0%
			tan δ:
			100pF～39000pF : 3.5% max
			47000pF～1000000pF : 5.0% max
			(1000000pF/B5 : 12.5% max)
			2200000pF～4700000pF : 12.5% max
			Insulation resistance :
			100pF～39000pF : 5000MΩ min
			47000pF～100000pF : 1000MΩ min
			220000pF : 500MΩ min
			470000pF : 200MΩ min
			1000000pF : 100MΩ min
			2200000pF : 40MΩ min
			4700000pF : 10MΩ min
		Multilayer type (Characteristics : F)	Appearance : No significant abnormality
			Withstanding Voltage : No abnormality
			Rate Voltage : 10VDC
			Capacitance change : Within ±20%
			tan δ:
			4700000pF～10000000pF : 17.5% max
			Insulation resistance :
			4700000pF : 50MΩ min
			10000000pF : 25MΩ min
			Rate Voltage : 16VDC
			Capacitance change : Within ±20%
			tan δ:
			220000pF～470000pF : 10.0% max
			1000000pF : 17.5% max
			2200000pF : 15.0% max
			Insulation resistance :
			220000pF～470000pF : 500MΩ min
			1000000pF : 250MΩ min
			2200000pF : 125MΩ min
			Rate Voltage : 25VDC
			Capacitance change : Within ±20%
			tan δ:
			10000pF～47000pF (Item△J) : 7.5% max
			Insulation resistance :
			10000pF～47000pF (Item△J) : 1000MΩ min
			Rate Voltage : 35VDC
			Capacitance change : Within ±20%
			tan δ:
			10000000pF : 17.5% max

			Insulation resistance: 10000000pF : 25MΩ min Rate Voltage : 50VDC Capacitance change: 10000pF～1000000pF : Within 20.0% tan δ: 10000pF～100000pF : 7.5% max 220000pF～470000pF : 10.0% max 1000000pF : 15.0% max Insulation resistance: 10000pF～100000pF : 1000MΩ min 220000pF～470000pF : 500MΩ min 1000000pF : 250MΩ min
Test Methods and Remarks	Solder temperature : 270±5℃ Duration : 5±0.5 sec. Immersed conditions : Inserted into the PC board (with t=1.6mm, hole=1.0mm diameter) Preconditioning : 1 hr of preconditioning at 150 +0/−10℃ followed by 48±4 hrs of recovery under the standard condition. Recovery : Recovery for the following period under the standard condition after the test. 24±2 hrs (Class 1) 48±4 hrs (Class 2)		

15. Resistance to Solvent

Specified Value	Class1 (Temperature Compensating)	Multilayer type	No significant abnormality in appearance and legible marking.
	Class2 (High Dielectric)	Multilayer type (Characteristics : B, B5)	
		Multilayer type (Characteristics : F)	
Test Methods and Remarks	According to JIS C 5101-1 Type of test : Method 1 Solvent temperature : 20 to 25℃ Duration : 30±5 sec. Solvent Type : A in Table 23, Isopropyl alcohol		

16. Thermal Shock

Specified Value	Class1 (Temperature Compensating)	Multilayer type	Appearance : No significant abnomality Withstanding Voltage : No abnomality Capacitance change: 8.2pF or under : Within ±0.5pF 10pF or over : Within ±5.0% Q: 8.2pF or under : Q≧200+10C 10pF～30pF : Q≧275+2.5C 33pF or over : Q≧350 Insulation resistance : 1000MΩ min C : Nominal Capacitance [pF]
	Class2 (High Dielectric)	Multilayer type (Characteristics : B, B5)	Appearance : No significant abnomality Withstanding Voltage : No abnomality Rate voltage : 16VDC Capacitance change: 1200pF～22000pF (ItemΔJ) : Within ±12.5% 220000pF～10000000pF : Within ±15.0% tan δ: 1200pF～22000pF (ItemΔJ) : 5.0% max 220000pF～470000pF : 7.5% max 1000000pF～2200000pF : 10.0% max 4700000pF～10000000pF : 22.5% max Insulation resistance: 1200pF～22000pF (ItemΔJ) : 1000MΩ min 220000pF : 125MΩ min 470000pF : 50MΩ min 1000000pF : 25MΩ min 2200000pF : 12.5MΩ min 4700000pF～10000000pF : 5MΩ min Rate voltage : 25VDC Capacitance change: 10000000pF : Within ±15.0%

			tan δ:
			10000000pF : 15.0% max
			Insulation resistance:
			10000000pF : 5MΩ min
			Rate voltage : 35VDC
			Capacitance change:
			1000000pF : Within ±15.0%
			2200000pF～4700000pF : Within ±15.0%
			10000000pF : Within ±15.0%
			tan δ:
			1000000pF : 7.5% max
			2200000pF～4700000pF : 10.0% max
			10000000pF : 22.5% max
			Insulation resistance:
			1000000pF : 50MΩ min
			2200000pF : 25MΩ min
			4700000pF～10000000pF : 5MΩ min
			Rate voltage : 50VDC
			Capacitance change:
			100pF～39000pF : Within ±12.5%
			47000pF～4700000pF : Within ±15.0%
			(1000000pF/B5 : Within ±22.5%)
			tan δ:
			100pF～39000pF : 5.0% max
			47000pF～1000000pF : 7.5% max
			(1000000pF/B5 : Within ±17.5%)
			2200000pF～47000000pF : 22.5% max
			Insulation resistance:
			100pF～39000pF : 1000MΩ min
			47000pF～100000pF : 500MΩ min
			220000pF : 250MΩ min
			470000pF : 100MΩ min
			1000000pF : 50MΩ min
			2200000pF : 20MΩ min
			4700000pF : 5MΩ min
		Multilayer type (Characteristics : F)	Appearance : No significant abnomality
			Withstanding Voltage : No abnomality
			Rate voltage : 10VDC
			Capacitance change : Within ±30.0%
			tan δ:
			4700000pF～10000000pF : 20.0% max
			Insulation resistance:
			4700000pF : 10MΩ min
			10000000pF : 5MΩ min
			Rate voltage : 16VDC
			Capacitance change : Within ±30.0%
			tan δ:
			220000pF～470000pF : 15.0% max
			1000000pF : 22.5% max
			2200000pF : 17.5% max
			Insulation resistance:
			220000pF : 100MΩ min
			470000pF : 50MΩ min
			1000000pF : 25MΩ min
			2200000pF : 25MΩ min
			Rate voltage : 25VDC
			Capacitance change : Within ±30%
			tan δ :
			10000pF～47000pF (Item△J) : 12.5% max
			Insulation resistance:
			10000pF～47000pF (Item△J) : 500MΩ min
			Rate voltage : 35VDC
			Capacitance change : Within ±30.0%
			tan δ:
			10000000pF : 20.0% max
			Insulation resistance:
			10000000pF : 5MΩ min
			Rate voltage : 50VDC
			Capacitance change:

			10000pF～1000000pF : Within ±30.0% tan δ: 10000pF～100000pF : 12.5% max 220000pF～470000pF : 15.0% max 1000000pF : 17.5% max Insulation resistance: 10000pF～100000pF : 500MΩ min 220000pF～470000pF : 250MΩ min 1000000pF : 50MΩ min
Test Methods and Remarks	Conditions for 1 cycle Step / Temperature[℃] / Duration[min.] 1 / Room temperature / Within 3 2 / −25+0/−3 / 30±3 3 / Room temperature / Within 3 4 / +85+3/−0 / 30±3 5 / Room temperature / Within 3 Number of cycles : 5 Preconditioning : 1 hr of preconditioning at 150 +0/−10℃ followed by 48±4 hrs of recovery under the standard condition. Recovery : Recovery for the following period under the standard condition after the removal from test chamber. 24±2 hrs(Class 1) 48±4 hrs(Class 2)		

17. Damp Heat(steady state)

Specified Value	Class1(Temperature Compensating)	Multilayer type	Appearance:No significant abnomality Withstanding Voltage:No abnomality Capacitance change: 8.2pF or under : Within ±0.5pF 10pF or over : Within ±5.0% Q: 8.2pF or under : Q≧200+10C 10pF～30pF : Q≧275+2.5C 33pF or over : Q≧350 Insulation resistance : 1000MΩ min C : Nominal Capacitance [pF]
	Class2(High Dielectric)	Multilayer type (Characteristics:B, B5)	Appearance:No significant abnomality Withstanding Voltage:No abnomality Rate voltage:16VDC Capacitance change: 1200pF～22000pF(ItemΔJ) : Within ±12.5% 220000pF～10000000pF : Within ±15.0% tan δ: 1200pF～22000pF(ItemΔJ) : 5.0% max 220000pF～470000pF : 7.5% max 1000000pF～2200000pF : 10.0% max 4700000pF～10000000pF : 22.5% max Insulation resistance: 1200pF～22000pF(ItemΔJ) : 1000MΩ min 220000pF : 125MΩ min 470000pF : 50MΩ min 1000000pF : 25MΩ min 2200000pF : 12.5MΩ min 4700000pF～10000000pF : 5MΩ min Rate voltage:25VDC Capacitance change: 10000000pF : Within ±15.0% tan δ: 10000000pF : 15.0% max Insulation resistance: 10000000pF : 5MΩ min Rate voltage:35VDC Capacitance change: 1000000pF : Within ±15.0% 2200000pF～4700000pF : Within ±15.0% 10000000pF : Within ±15.0% tan δ: 1000000pF : 10.0% max 2200000pF～4700000pF : 10.0% max 10000000pF : 22.5% max

			Insulation resistance:
			1000000pF : 50MΩ min
			2200000pF : 25MΩ min
			4700000pF～10000000pF : 5MΩ min
			Rate voltage : 50VDC
			Capacitance change:
			100pF～39000pF : Within ±12.5%
			47000pF～4700000pF : Within ±15.0%
			(1000000pF/B5 : Within ±22.5%)
			tan δ:
			100pF～39000pF : 5.0% max
			47000pF～1000000pF : 7.5% max
			(1000000/B5 : 17.5% max)
			2200000pF～4700000pF : 22.5% max
			Insulation resistance:
			100pF～39000pF : 1000MΩ min
			47000pF～100000pF : 500MΩ min
			220000pF : 250MΩ min
			470000pF : 100MΩ min
			1000000pF : 50MΩ min
			2200000pF : 20MΩ min
			4700000pF : 5MΩ min
		Multilayer type (Characteristics : F)	Appearance : No significant abnomality
			Withstanding Voltage : No abnomality
			Rate voltage : 10VDC
			Capacitance change : Within ±30.0%
			tan δ:
			4700000pF～10000000pF : 20.0% max
			Insulation resistance:
			4700000pF : 10MΩ min
			10000000pF : 5MΩ min
			Rate voltage : 16VDC
			Capacitance change : Within ±30.0%
			tan δ:
			220000pF～470000pF : 15.0% max
			1000000pF : 22.5% max
			2200000pF : 17.5% max
			Insulation resistance:
			220000pF : 100MΩ min
			470000pF : 50MΩ min
			1000000pF : 25MΩ min
			2200000pF : 25MΩ min
			Rate voltage : 25VDC
			Capacitance change : Within ±30%
			tan δ:
			10000pF～47000pF (Item△J) : 12.5% max
			Insulation resistance:
			10000pF～47000pF (Item△J) : 500MΩ min
			Rate voltage : 35VDC
			Capacitance change : Within ±30.0%
			tan δ:
			10000000pF : 20.0% max
			Insulation resistance:
			10000000pF : 5MΩ min
			Rate voltage : 50VDC
			Capacitance change:
			10000pF～1000000pF : Within ±30.0%
			tan δ:
			10000pF～100000pF : 12.5% max
			220000pF～470000pF : 15.0% max
			1000000pF : 17.5% max
			Insulation resistance:
			10000pF～100000pF : 500MΩ min
			220000pF～470000pF : 250MΩ min
			1000000pF : 50MΩ min

Test Methods and Remarks	Temperature	: 40±2℃
	Humidity	: 90 to 95 % RH
	Duration	: 500hrs+24/−0 hrs
	Preconditioning	: 1 hr of preconditioning at 150+0/−10 ℃ followed by 48±4 hrs of recovery under the standard condition.

	Recovery	: 24±2 hrs of recovery under the standard condition after the removal from test chamber. (Class 1) : 1 hr of preconditioning at 150+10/−0 ℃ followed by 48±4 hrs of recovery under the standard condition after the removal from chamber. (Class 2)

18. Loading under Damp Heat				
Specified Value	Class1 (Temperature Compensating)	Multilayer type	Appearance : No significant abnomality Withstanding Voltage : No abnomality	
			Capacitance change :	
			8.2pF or under	: Within ±0.75pF
			10pF or over	: Within ±7.5%
			Q :	
			30pF or under	: Q≧100+10/3*C
			33pF or over	: Q≧200
			Insulation resistance	: 500MΩ min
			C : Nominal Capacitance [pF]	
	Class2 (High Dielectric)	Multilayer type (Characteristics : B, B5)	Appearance : No significant abnomality Withstanding Voltage : No abnomality	
			Rate voltage : 16VDC	
			Capacitance change :	
			1200pF～22000pF (Item△J)	: Within ±12.5%
			220000pF～470000pF	: Within ±15.0%
			1000000pF～10000000pF	: Within ±22.5%
			tan δ :	
			1200pF～22000pF (Item△J)	: 5.0% max
			220000pF～470000pF	: 7.5% max
			1000000pF～2200000pF	: 10.0% max
			4700000pF～10000000pF	: 22.5% max
			Insulation resistance :	
			1200pF～22000pF (Item△J)	: 500MΩ min
			220000pF	: 50MΩ min
			470000pF	: 25MΩ min
			1000000pF	: 12.5MΩ min
			2200000pF	: 5.0MΩ min
			4700000pF～10000000pF	: 2.5MΩ min
			Rate voltage : 25VDC	
			Capacitance change :	
			10000000pF	: Within ±22.5%
			tan δ :	
			10000000pF	: 22.5% max
			Insulation resistance :	
			10000000pF	: 2.5MΩ min
			Rate voltage : 35VDC	
			Capacitance change :	
			1000000pF	: Within ±15.0%
			2200000pF	: Within ±15.0%
			4700000pF～10000000pF	: Within ±22.5%
			tan δ :	
			1000000pF	: 10.0% max
			2200000pF～4700000pF	: 10.0% max
			10000000pF	: 22.5% max
			Insulation resistance :	
			1000000pF	: 12.5MΩ min
			2200000pF	: 5.0MΩ min
			4700000pF～10000000pF	: 2.5MΩ min
			Rate voltage : 50VDC	
			Capacitance change :	
			100pF～39000pF	: Within ±12.5%
			47000pF～1000000pF	: Within ±15.0%
			(1000000pF/B5	: Within ±22.5%)
			2200000pF～4700000pF	: Within ±22.5%
			tan δ :	
			100pF～39000pF	: 5.0% max
			47000pF～1000000pF	: 7.5% max
			(1000000pF/B5	: 17.5% max)
			2200000pF～4700000pF	: 22.5% max
			Insulation resistance :	
			100pF～39000pF	: 500MΩ min
			47000pF～100000pF	: 250MΩ min

			220000pF	: 125MΩ min
			470000pF	: 25MΩ min
			1000000pF	: 12.5MΩ min
			2200000pF	: 10MΩ min
			4700000pF	: 2.5MΩ min
		Multilayer type (Characteristics : F)	Appearance : No significant abnomality Withstanding Voltage : No abnomality	
			Rate voltage : 10VDC	
			Capacitance change	: Within ±30.0%
			tan δ:	
			4700000pF～10000000pF	: 20.0% max
			Insulation resistance :	
			4700000pF	: 5MΩ min
			10000000pF	: 2.5MΩ min
			Rate voltage : 16VDC	
			Capacitance change	: Within ±30.0%
			tan δ:	
			220000pF～470000pF	: 15.0% max
			1000000pF	: 22.5% max
			2200000pF	: 17.5% max
			Insulation resistance :	
			220000pF	: 50MΩ min
			470000pF	: 25MΩ min
			1000000pF	: 12.5MΩ min
			2200000pF	: 12.5MΩ min
			Rate voltage : 25VDC	
			Capacitance change	: Within ±30.0%
			tan δ:	
			10000pF～47000pF (Item△J)	: 12.5% max
			Insulation resistance :	
			10000pF～47000pF (Item△J)	: 250MΩ min
			Rate voltage : 35VDC	
			Capacitance change	: Within ±30.0%
			tan δ:	
			10000000pF	: 20.0% max
			Insulation resistance :	
			10000000pF	: 2.5MΩ min
			Rate voltage : 50VDC	
			Capacitance change	:
			10000pF～1000000pF	: Within ±30.0%
			tan δ:	
			10000pF～100000pF	: 12.5% max
			220000pF～470000pF	: 15.0% max
			1000000pF	: 17.5% max
			Insulation resistance :	
			10000pF～100000pF	: 250MΩ min
			220000pF～470000pF	: 125MΩ min
			1000000pF	: 25MΩ min
Test Methods and Remarks	Temperature : 40±2℃ Humidity : 90 to 95 % RH Duration : 500 +24/−0 hrs Applied voltage : Rate voltage Preconditioning : 1 hr of preconditioning at 150 +0/−10 ℃ followed by 48±4 hrs of recovery under the standard condition. Recovery : 24±2 hrs of recovery under the standard condition after the removal from test cham-ber. (Class 1) : 1 hr of preconditioning at 150+10/−0 ℃ followed by 48±4 hrs of recovery under the standard condition after the removal from chamber. (Class 2)			

19. High Temperature Lading Test

Specified Value	Class1 (Temperature Compensating)	Multilayer type	Appearance : No significant abnomality Withstanding Voltage : No abnomality	
			Capacitance change :	
			8.2pF or under	: Within ±0.3pF
			10pF or over	: Within ±3.0%
			Q :	
			8.2pF or under	: Q≧200+10C
			10pF～30pF	: Q≧275+2.5C
			33pF or over	: Q≧350
			Insulation resistance	: 1000MΩ min

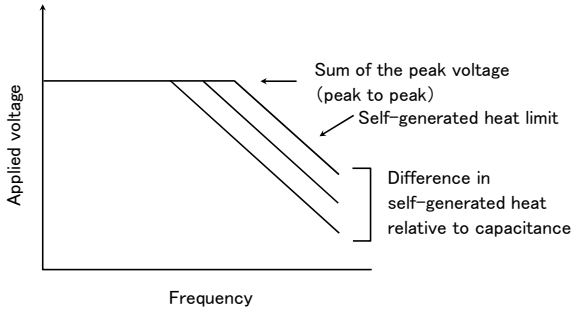
			C : Nominal Capacitance [pF]
	Class2 (High Dielectric)	Multilayer type (Characteristics : B, B5)	Appearance : No significant abnomality Withstanding Voltage : No abnomality
			Rate voltage : 16VDC
			Capacitance change : 1200pF～22000pF (Item△J) : Within ±12.5% 220000pF～470000pF : Within ±15.0% 1000000pF～10000000pF : Within ±22.5%
			tan δ : 1200pF～22000pF (Item△J) : 5.0% max 220000pF～470000pF : 7.5% max 1000000pF～2200000pF : 10.0% max 4700000pF～10000000pF : 22.5% max
			Insulation resistance : 1200pF～22000pF (Item△J) : 1000MΩ min 220000pF : 125MΩ min 470000pF : 50MΩ min 1000000pF : 25MΩ min 2200000pF : 12.5MΩ min 4700000pF～10000000pF : 5.0MΩ min
			Rate voltage : 25VDC
			Capacitance change : 10000000pF : Within ±22.5%
			tan δ : 10000000pF : 22.5% max
			Insulation resistance : 10000000pF : 5MΩ min
			Rate voltage : 35VDC
			Capacitance change : 1000000pF : Within ±15.0% 2200000pF : Within ±15.0% 4700000pF～10000000pF : Within ±22.5%
			tan δ : 1000000pF : 10.0% max 2200000pF～4700000pF : 10.0% max 10000000pF : 22.5% max
			Insulation resistance : 1000000pF : 25MΩ min 2200000pF : 25MΩ min 4700000pF～10000000pF : 5MΩ min
			Rate voltage : 50VDC
			Capacitance change : 100pF～39000pF : Within ±12.5% 47000pF～1000000pF : Within ±15.0% (1000000pF/B5 : Within ±22.5%) 2200000pF～4700000pF : Within ±22.5%
			tan δ : 100pF～39000pF : 5.0% max 47000pF～1000000pF : 7.5% max (1000000/B5 : 17.5% max) 2200000pF～4700000pF : 22.5% max
			Insulation resistance : 100pF～39000pF : 1000MΩ min 47000pF～100000pF : 500MΩ min 220000pF : 250MΩ min 470000pF : 100MΩ min 1000000pF : 50MΩ min 2200000pF : 20MΩ min 4700000pF : 5MΩ min
		Multilayer type (Characteristics : F)	Appearance : No significant abnomality Withstanding Voltage : No abnomality
			Rate voltage : 10VDC
			Capacitance change : Within ±30.0%
			tan δ : 4700000pF～10000000pF : 20.0% max
			Insulation resistance : 4700000pF : 10MΩ min 10000000pF : 5MΩ min
			Rate voltage : 16VDC

			Capacitance change : Within ±30.0% tan δ: 220000pF～470000pF : 15.0% max 1000000pF : 22.5% max 2200000pF : 17.5% max Insulation resistance: 220000pF : 100MΩ min 470000pF : 50MΩ min 1000000pF : 25MΩ min 2200000pF : 25MΩ min Rate voltage:25VDC Capacitance change : Within ±30% tan δ: 10000pF～47000pF(ItemΔJ) : 10.0% max Insulation resistance: 10000pF～47000pF(ItemΔJ) : 500MΩ min Rate voltage:35VDC Capacitance change : Within ±30.0% tan δ: 10000000pF : 20.0% max Insulation resistance: 10000000pF : 5MΩ min Rate voltage:50VDC Capacitance change: 10000pF～1000000pF : Within 30.0% tan δ: 10000pF～100000pF : 10.0% max 220000pF～470000pF : 12.5% max 1000000pF : 17.5% max Insulation resistance: 10000pF～100000pF : 500MΩ min 220000pF～470000pF : 250MΩ min 1000000pF : 50MΩ min
Test Methods and Remarks	Temperature : 85 ＋3/－0 ℃ Duration : 1000 ＋48/－0 hrs Applied voltage : Rate voltage × 2 : Rate voltage × 1.5 Class 2: B,B5 1000000pF(025Type) : B,B5 220000pF～10000000pF(050Type, 075Type) Preconditioning : 1 hr of preconditioning at 150 ＋10－0 ℃ followed by 48±4 hrs of recovery under the standard condition. Recovery : 24±2hrs of recovery under the standard condition after the removal from test chamber. (Class1) : 1 hr of preconditioning at 150＋10－0 ℃ followed by 48±4 hrs of recovery under the standard condition after the removal from chamber. (Class 2)		

Note on standard condition: "standard condition" referred to herein is defined as follows:
5 to 35℃ of temperature, 45 to 85% relative humidity, and 86 to 106kPa of air pressure.
When there are questions concerning measurement results:
In order to provide correlation data, the test shall be conducted under condition of 20±2℃ of temperature, 60 to 70% relative humidity, and 86 to 106kPa of air pressure.Unless otherwise specified, all the tests are conducted under the "standard condition."
Withstanding voltage is also referred to as "voltage proof" under IEC specifications.

Precautions on the use of Axial Leaded Ceramic Capacitors

■PRECAUTIONS

1. Circuit Design	
Precautions	◆Verification of operating environment, electrical rating and performance 1. A malfunction in medical equipment, spacecraft, nuclear reactors, etc. may cause serious harm to human life or have severe social ramifications. As such, any capacitors to be used in such equipment may require higher safety and/or reliability considerations and should be clearly differentiated from components used in general purpose applications. ◆Verification of Rated voltage(DC rated voltage) 1. The operating voltage for capacitors must always be lower than their rated values. If an AC voltage is loaded on a DC voltage, the sum of the two peak voltages should be lower than the rated value of the capacitor chosen. For a circuit where both an AC and a pulse voltage may be present, the sum of their peak voltages should also be lower than the capacitor's rated voltage. ◆Self-generated heat (Verification of Temperature) 1. If the capacitors specified only for DC use are used in AC or pulse circuits, the AC or a pulse current can generate heat inside the capacitor so the self-generated temperature rise should be limited to within 20℃. The surface temperature measured should include this self-temperature rise. Therefore, it is required to limit capacitor surface temperature including self -generated heat should not exceed the maximum operating temperature of +85℃. ◆Operating Environment precautions 1. Capacitors should not be used in the following environments: (1)Environmental conditions to avoid a. exposure to water or salt water. b. exposure to moisture or condensation. c. exposure to corrosive gases (such as hydrogen sulfide, sulfurous acid, chlorine, and ammonia)
Technical considerations	1-1. When an AC or a pulse voltage is applied to capacitors specified for DC use, even if the voltage is less than the rated voltage, the AC current or pulse current running through the capacitor will cause the capacitor to self-generate heat because of the loss characteristics. The amount of heat generated depends on the dielectric materials used, capacitance, applied voltage, frequency, voltage waveform, etc. The surface temperature changes due to emitted heat which differs by capacitor shape or mounting method. Please contact Taiyo Yuden with any questions regarding emitted heat levels in your particular application. It is recommended the temperature rise be measured in the actual circuit to be used. 1-2. For capacitors, the voltage and frequency relationship is generally determined by peak voltage at low frequencies, and by self-generated heat at high frequencies. (Refer to the following curve.) 

2. PCB Design	
Precautions	◆Design of the capacitor mount 1. When capacitors are mounted onto a PC board, hole dimensions on the board should match the lead pitch of the component, if not it will cause breakage of the terminals or cracking of terminal roots covered with resin as excess stress travels through the terminal legs. As a result, humidity resistance performance would be lost and may lead to a reduction in insulation resistance and cause a withstand voltage failure.

3. Considerations for automatic insertion	
Precautions	◆Adjustment Automatic Insertion machines(leaded components) 1. When inserting capacitors in a PC board by auto-insertion machines the impact load imposed on the capacitors should be minimized to prevent the leads from chucking or clinching.
Technical considerations	1. When installing products, care should be taken not to apply distortion stress as it may deform the products. 2. Our company recommends the method to place the lead with fewer loads that join the product.

4. Soldering

Precautions	◆Selection of Flux 1. When soldering capacitors are on the board, flux should be applied thinly and evenly. 2. Flux used should be with less than or equal to 0.1 wt% (equivalent to Chlorine) of halogenated content. Flux having a strong acidity content should not be applied. 3. When using water-soluble flux, special care should be taken to properly clean the boards. ◆Wave Soldering 1. Temperature, time, amount of solder, etc. are specified in accordance with the following recommended conditions. 2. Do not immerse the entire capacitor in the flux during the soldering operation. Only solder the lead wires on the bottom of the board. ◆Recommended conditions for using a soldering iron: 1. Put the soldering iron on the land-pattern. Soldering iron's temperature – below 350℃ Duration – 3 seconds or less Numbers of times – 1 times The soldering iron should not directly touch the capacitor.
Technical considerations	◆Selection of Flux 1. Flux is used to increase solderability in wave soldering, but if too much is applied, a large amount of flux gas may be emitted and may detrimentally affect solderability. To minimize the amount of flux applied, it is recommended to use a flux-bubbling system. 2. With too much halogenated substance (Chlorine, etc.) content is used to activate the flux, an excessive amount of residue after soldering may lead to corrosion of the terminal electrodes or degradation of insulation resistance on the surface of the capacitors. 3. Since the residue of water-soluble flux is easily dissolved by water content in the air, the residue on the surface of capacitors in high humidity conditions may cause a degradation of insulation resistance and therefore affect the reliability of the components. The cleaning methods and the capability of the machines used should also be considered carefully when selecting water-soluble flux. ◆Wave Soldering 1. If capacitors are used beyond the range of the recommended conditions, heat stresses may cause cracks inside the capacitors, and consequently degrade the reliability of the capacitors. 2. When the capacitors are dipped in solder, some soldered parts of the capacitor may melt due to solder heat and cause short-circuits or cracking of the ceramic material. Deterioration of the resin coating may lower insulation resistance and cause a reduction of withstand voltage. ◆Recommended conditions for using a soldering iron: 1. If products are used beyond the range of the recommended conditions, heat stress may deform the products, and consequently degrade the reliability of the products.

5. Cleaning	
Precautions	◆Board cleaning 1. When cleaning the mounted PC boards, make sure that cleaning conditions are consistent with prescribed usage conditions.
Technical considerations	1. The resin material used for the outer coating of capacitors is occasionally a wax substance for moisture resistance which can easily be dissolved by some solutions. So before cleaning, special care should be taken to test the component's vulnerability to the solutions used. When using water-soluble flux please clean the PCB with purified water sufficiently and dry thoroughly at the end of the process. Insufficient washing or drying could lower the reliability of the capacitors.

6. Post-cleaning-process	
Precautions	◆Application of resin molding, etc. to the PCB and components. 1. Please contact your local Taiyo Yuden sales office before performing resin coating or molding on mounted capacitors. Please contact your local Taiyo Yuden sales office in case of sealing the capacitor with resin or molding it on mounted capacitors. Please verify that the sealing or molding does not affect on the actual application in quality.
Technical considerations	1-1. The thermal expansion and coefficient of contraction of the molded resin are not necessarily matched with those of the capacitor. The capacitors may be exposed to stresses due to thermal expansion and contraction during and after hardening. This may lower the specified characteristics and insulation resistance or cause reduced withstanding voltage by cracking the ceramic or separating the coated resin from the ceramics. 1-2. With some types of mold resins, the resin's decomposition gas or reaction gas may remain inside the resin during the hardening period or while left under normal conditions, cause a deterioration of the capacitor's performance. 1-3. Some mold resins may have poor moisture proofing properties. Please verify the contents of the resins before they are applied. 1-4. Please contact Taiyo Yuden before using if the hardening process temperature of the mold resins is higher than the operating temperature of the capacitors.

7. Handling	
Precautions	◆Mechanical considerations 1. Be careful not to subject the capacitors to excessive mechanical shocks. Withstanding voltage failure may result. 2. If ceramic capacitors are dropped onto the floor or a hard surface they should not be used.
Technical considerations	1. Because the capacitor is made of ceramic, mechanical shocks applied to the board may damage or crack the capacitors. 2. Ceramic capacitors which are dropped onto the floor or a hard surface may develop defects and have a higher risk of failure over time.

8. Storage conditions

Precautions	◆Storage 1. To maintain the solderability of terminal electrodes and to keep the packaging material in good condition, care must be taken to control temperature and humidity in the storage area. Humidity should especially be kept as low as possible. Recommended conditions: Ambient temperature Below 40 ℃ Humidity Below 70% RH. Products should be used within 6 months after delivery. After the above period, the solderability should be checked before using the capacitors. 2. Capacitors should not be kept in an environment filled with decomposition gases such as sulfurous hydrogen, sulfurous acid, chlorine, ammonia, etc. 3. Capacitors should not be kept in a location where they may be exposed to moisture, condensation or direct sunlight.
Technical considerations	1. Under high temperature/high humidity conditions, the decrease in solderability due to the oxidation of terminal electrodes and deterioration of taping and packaging characteristics may be accelerated.

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