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 2008. 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 usage of the Products.

Please note that Taiyo Yuden Co., Ltd. shall not be responsible for any defects in products or equipment incorporating such products, which are caused under the conditions other than those specified in this catalog or individual specification.

■ Please contact Taiyo Yuden Co., Ltd. for further details of product specifications as the individual specification is available.

■ Please conduct validation and verification of products in actual condition of mounting and operating environment before commercial shipment of the equipment.

■ All electronic components or functional modules listed in this catalog are developed, designed and intended for use in general electronics equipment.(for AV, office automation, household, office supply, information service, telecommunications, (such as mobile phone or PC) etc.). Before incorporating the components or devices into any equipment in the field such as transportation,(automotive control, train control, ship control), transportation signal, disaster prevention, medical, public information network (telephone exchange, base station) etc. which may have direct influence to harm or injure a human body, please contact Taiyo Yuden Co., Ltd. for more detail in advance.

Do not incorporate the products into any equipment in fields such as aerospace, aviation, nuclear control, submarine system, military, etc. where higher safety and reliability are especially required.

In addition, even electronic components or functional modules that are used for the general electronic equipment, if the equipment or the electric circuit require high safety or reliability function or performances, a sufficient reliability evaluation check for safety shall be performed before commercial shipment and moreover, due consideration to install a protective circuit is strongly recommended at customer's design stage.

■ The contents of this catalog are applicable to the products which are purchased from our sales offices or distributors (so called “TAIYO YUDEN’s official sales channel”).
It is only applicable to the products purchased from any of TAIYO YUDEN’s official sales channel.

■ Please note that Taiyo Yuden Co., Ltd. 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 your usage of products in this catalog. Taiyo Yuden Co., Ltd. grants no license for such rights.

■ Caution for export
Certain items in this catalog may require specific procedures for export according to “Foreign Exchange and Foreign Trade Control Law” of Japan, “U.S. Export Administration Regulations,” and other applicable regulations. Should you have any question or inquiry on this matter, please contact our sales staff.
Should you have any question or inquiry on this matter, please contact our sales staff.

アキシャルリード形セラミックコンデンサ
AXIAL LEADED CERAMIC CAPACITORS

OPERATING TEMP.	−25〜+85℃

フロー／WAVE

特長　FEATURES

・汎用型セラミックコンデンサで、合わせて1pF〜10μFと広い容量範囲で部品の標準化が可能
・ラジアルに比べ自挿コストが安く、部品高さ低減、実装密度アップ、在庫スペースも減少
・実装ピッチ5mmから26mmまでジャンパー線機能と兼用可能

・This widely used ceramic capacitor provide a wide capacitance range of 1pF through 10μF in one standard size and shape.
・Automatic insertion related costs are lower than with radial type capacitors.
・Mounting pitch can be between 5mm to 26mm which could be used as a jumper.

用途　APPLICATIONS

・Class1品は回路の温度特性補正及び周波数特性の安定化。B、F特はバイパスコンデンサに最適

・The class 1 temperature compensating (NPO) products can be used in circuits to stabilize frequency and temperature characteristics.
・The B, and F dielectrics are optimum for bypass capacitors.

形名表記法　ORDERING CODE

1 定格電圧〔VDC〕

L	10
E	16
T	25
G	35
U	50

2 形式

P	アキシャルリードコンデンサ

3 形状寸法(L×φd)〔mm〕

075	4.2×3.2(積層形)
050	3.2×2.2(積層形)
025	2.3×2.0(積層形)

4 温度特性

CH	0± 60(ppm/℃)
SL	+350〜−1000(ppm/℃)
△B	±10%
△F	$^{+30}_{-85}$ %

△=スペース

5 公称静電容量〔pF〕

例	
010	1
1R2	1.2
103	10000

※R=小数点

6 容量許容差

D−	±0.5pF
J−	± 5%
K−	±10%
M−	±20%
Z−	$\pm^{80}_{20}$ %

7 リード形状〔mm〕

A−	26mmテープ幅テーピング
B−	52mmテープ幅テーピング
KF	5.0ピッチフォーミング
KE	7.5ピッチフォーミング
NA	単品ストレートリード

8 梱包

B	つづら折り
C	袋づめ

9 当社管理記号

△,△Z	積層標準品
△J	積層品(低電圧タイプ)

△=スペース

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

1 Rated voltage〔VDC〕

L	10
E	16
T	25
G	35
U	50

2 Type

P	Axial leaded capacitors

3 Outside Dimensions(L×φd)〔mm〕

075	4.2×3.2(multilayer type)
050	3.2×2.2(multilayer type)
025	2.3×2.0(multilayer type)

4 Temperature haracteristics

CH	0± 60(ppm/℃)
SL	+350〜−1000(ppm/℃)
△B	±10%
△F	$^{+30}_{-85}$ %

△=Blank space

5 Nominal Capacitance〔pF〕

example	
010	1
1R2	1.2
103	10000

※R=decimal point

6 Capacitance Tolerances

D−	±0.5pF
J−	± 5%
K−	±10%
M−	±20%
Z−	$\pm^{80}_{20}$ %

7 Lead Configuration

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

8 Packaging

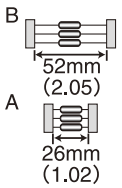
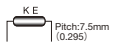
B	Ammo
C	Bulk

9 Internal code

△,△Z	Multilayer type Standard products
△J	Multilayer type (Low voltage products)

△=Blank space

外形寸法　EXTERNAL DIMENSIONS

TYPE	Dimensions			テーピング品　Taped product	単品　Bulk Product	
	L	φD	φd	ストレート　Straight	ストレート　Straight	フォーミング　Formed
積層形075 (Multilayer Type)	4.2max (0.165max)	3.2max (0.126max)	0.55±0.05 (0.022±0.002)			
積層形050 (Multilayer Type)	3.2max (0.126max)	2.2max (0.87max)	0.45±0.05 (0.018±0.002)			
積層形025 (Multilayer Type)	2.3max (0.09max)	2.0max (0.079max)				

Unit : mm(inch)

概略バリエーション　AVAILABLE CAPACITANCE RANGE

Class 1　(Temperature compensating)

WV		50V (UP)		
Temp.char.		CH		SL
Type cap.		025	050	025
[pF]	[pF : 3digits]			
1	010	■		■
1.2	1R2	■		■
1.5	1R5	■		■
1.8	1R8	■		■
2.2	2R2	■		■
2.7	2R7	■		■
3.3	3R3	■		■
3.9	3R9	■		■
4.7	4R7	■		■
5.6	5R6	■		■
6.8	6R8	■		■
8.2	8R2	■		■
10	100	■		■
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	■	■	■
100	101	■	■	
150	151	■	■	
220	221	■	■	
330	331	■	■	
470	471	■	■	
680	681	■	■	
1000	102	■	■	

Class 2　(High dielectric constant)　　積層タイプ (Multilayer type)

WV		50V(UP)					35V(GP)		25V(TP)		16V (EP)				10V(LP)
Temp.char.		B			F		B	F	B	F	B		F		F
Type cap.		025	050	075	025	050	050	075	075	025	025	050	025	050	050
[pF]	[pF : 3digits]														
100	101	■													
120	121	■													
150	151	■													
180	181	■													
220	221	■													
270	271	■													
330	331	■													
390	391	■													
470	471	■													
560	561	■													
680	681	■													
820	821	■													
1000	102	■													
1200	122	■	■								■				
1500	152	■	■								■				
1800	182	■	■								■				
2200	222	■	■								■				
2700	272	■	■								■				
3300	332	■	■								■				
3900	392	■	■								■				
4700	472	■	■								■				
5600	562	■	■								■				
6800	682	■	■								■				
8200	822	■	■								■				
10000	103	■	■		■	■				■	■				
12000	123	■	■		■	■				■	■				
15000	153	■	■		■	■				■	■				
18000	183	■	■		■	■				■	■				
22000	223	■	■		■	■				■	■				
27000	273	■	■		■	■				■	■				
33000	333	■	■		■	■				■	■				
39000	393	■	■		■	■				■	■				
47000	473	■	■		■	■				■	■				
56000	563	■	■		■	■				■	■				
68000	683	■	■		■	■				■	■				
82000	823	■	■		■	■				■	■				
100000	104	■	■		■	■				■	■				
220000	224	■	■		■	■				■	■		■		
470000	474	■	■		■	■				■	■		■		
1000000	105	■	■	■	■	■	■			■	■	■	■	■	
2200000	225	■	■	■	■	■	■	■		■	■	■	■	■	
4700000	475	■	■	■	■	■	■	■	■	■	■	■	■	■	■
10000000	106	■	■	■	■	■	■	■	■	■	■	■	■	■	■

温度特性 Temperature char.	静電容量変化率 Capacitance change	容量許容差 Capacitance Tolerance	Q又はtanδ Q or tanδ	種類 Class
CH	0± 60ppm/℃	D(±0.5pF) M(±20%) K(±10%) J(±5%)	アイテム一覧参照 eng・Refer to the Part munber	1
SL	+350～−1000ppm/℃			
△B	±10%	K(±10%)		2
△F	± 30/85 %	Z(± 80/20 %)		

※20℃における静電容量を基準。　　※Capacitance characteristics measured at 20℃

セレクションガイド Selection Guide P.12
アイテム一覧 Part Numbers P.122
特性図 Electrical Characteristics P.126
梱包 Packaging P.127
信頼性 Reliability Data P.128
使用上の注意 Precautions P.146
etc

［積層025タイプ Multilayer 025 Type］

Class 1

定格電圧 RatedVoltage (DC)	形名 Ordering code		EHS (Environmental Hazardous Substances)	温度特性 Temperature characteristics	公称静電容量 Capacitance〔pF〕	容量許容差 Capacitance tolerance	Q or tanδ	絶縁抵抗 Insulation resistance
50V	UP025△010D－○ Z		RoHS	CH SL	1.0	±0.5pF	Q≧400+20C	10000MΩmin
	UP025△1R2D－○ Z		RoHS		1.2			
	UP025△1R5D－○ Z		RoHS		1.5			
	UP025△1R8D－○ Z		RoHS		1.8			
	UP025△2R2D－○ Z		RoHS		2.2			
	UP025△2R7D－○ Z		RoHS		2.7			
	UP025△3R3D－○ Z		RoHS		3.3			
	UP025△3R9D－○ Z		RoHS		3.9			
	UP025△4R7D－○ Z		RoHS		4.7			
	UP025△5R6K－○ Z		RoHS		5.6	±10%		
	UP025△6R8K－○ Z		RoHS		6.8			
	UP025△8R2K－○ Z		RoHS		8.2			
	UP025△100J－○ Z		RoHS		10	±5%		
	UP025△120J－○ Z		RoHS		12			
	UP025△150J－○ Z		RoHS		15			
	UP025△180J－○ Z		RoHS		18			
	UP025△220J－○ Z		RoHS		22			
	UP025△270J－○ Z		RoHS		27			
	UP025△330J－○ Z		RoHS		33		Q≧1000	
	UP025△390J－○ Z		RoHS		39			
	UP025△470J－○ Z		RoHS		47			
	UP025△560J－○ Z		RoHS		56			
	UP025△680J－○ Z		RoHS		68			
	UP025△820J－○ Z		RoHS		82			
	UP025CH101J－○ Z		RoHS	CH	100			
	UP025CH151J－○ Z		RoHS		150			
	UP025CH221J－○ Z		RoHS		220			
	UP025CH331J－○ Z		RoHS		330			
	UP025CH471J－○ Z		RoHS		470			
	UP025CH681J－○ Z		RoHS		680			
	UP025CH102J－○ Z		RoHS		1000			

形名の△には温度特性、○にはリード形状分類記号が入ります。

△Please specify the temperature characteristics code and ○ lead configuration code.

［積層025タイプ Multilayer 025 Type］
Class 2

定格電圧 RatedVoltage (DC)	形名 Ordering code		EHS (Environmental Hazardous Substances)	温度特性 Temperature characteristics	公称静電容量 Capacitance〔pF〕	容量許容差 Capacitance tolerance	Q or tan δ	絶縁抵抗 Insulation resistance
50V	UP025 B101K －○ Z		RoHS	B	100	±10%	tan δ ≦3.5%	5000MΩmin
	UP025 B121K －○ Z		RoHS		120			
	UP025 B151K －○ Z		RoHS		150			
	UP025 B181K －○ Z		RoHS		180			
	UP025 B221K －○ Z		RoHS		220			
	UP025 B271K －○ Z		RoHS		270			
	UP025 B331K －○ Z		RoHS		330			
	UP025 B391K －○ Z		RoHS		390			
	UP025 B471K －○ Z		RoHS		470			
	UP025 B561K －○ Z		RoHS		560			
	UP025 B681K －○ Z		RoHS		680			
	UP025 B821K －○ Z		RoHS		820			
	UP025 B102K －○ Z		RoHS		1000			
	UP025 B122K －○ Z		RoHS		1200			
	UP025 B152K －○ Z		RoHS		1500			
	UP025 B222K －○ Z		RoHS		2200			
	UP025 B332K －○ Z		RoHS		3300			
	UP025 B472K －○ Z		RoHS		4700			
	UP025 B682K －○ Z		RoHS		6800			
	UP025 B103K －○ Z		RoHS		10000			
	UP025 B153K －○ Z		RoHS		15000			
	UP025 B223K －○ Z		RoHS		22000			
	UP025 B333K －○ Z		RoHS		33000			
	UP025 B473K －○ Z		RoHS		47000		tan δ ≦5.0%	1000MΩmin
	UP025 B683K －○ Z		RoHS		68000			
	UP025 B104K －○ Z		RoHS		100000			
16V	EP025 B224K －○ Z		RoHS		220000			500MΩmin
	EP025 B474K －○ Z		RoHS		470000			200MΩmin
	EP025 B105K －○ Z		RoHS		1000000		tan δ ≦7.5%	100MΩmin
50V	UP025 F103Z －○ Z		RoHS	F	10000	+80 −20 %	tan δ ≦7.5%	1000MΩmin
	UP025 F223Z －○ Z		RoHS		22000			
	UP025 F473Z －○ Z		RoHS		47000			
	UP025 F104Z －○ Z		RoHS		100000			
16V	EP025 F224Z －○ Z		RoHS		220000		tan δ ≦10.0%	500MΩmin
	EP025 F474Z －○ Z		RoHS		470000			
	EP025 F105Z －○ Z		RoHS		1000000		tan δ ≦17.5%	250MΩmin
16V	EP025 B122M －○ J		RoHS	B	1200	±20%	tan δ ≦3.5%	5000MΩmin
	EP025 B152M －○ J		RoHS		1500			
	EP025 B182M －○ J		RoHS		1800			
	EP025 B222M －○ J		RoHS		2200			
	EP025 B272M －○ J		RoHS		2700			
	EP025 B332M －○ J		RoHS		3300			
	EP025 B392M －○ J		RoHS		3900			
	EP025 B472M －○ J		RoHS		4700			
	EP025 B562M －○ J		RoHS		5600			
	EP025 B682M －○ J		RoHS		6800			
	EP025 B822M －○ J		RoHS		8200			
	EP025 B103M －○ J		RoHS		10000			
	EP025 B123M －○ J		RoHS		12000			
	EP025 B153M －○ J		RoHS		15000			
	EP025 B183M －○ J		RoHS		18000			
	EP025 B223M －○ J		RoHS		22000			
25V	TP025 F103Z －○ J		RoHS	F	10000	+80 −20 %	tan δ ≦7.5%	1000MΩmin
	TP025 F223Z －○ J		RoHS		22000			
	TP025 F473Z －○ J		RoHS		47000			

形名の△には温度特性、○にはリード形状分類記号が入ります。
△Please specify the temperature characteristics code and ○ lead configuration code.

［積層タイプ Multilayer type］

Class 1

定格電圧 RatedVoltage (DC)	形名 Ordering code		EHS (Environmental Hazardous Substances)	温度特性 Temperature characteristics	公称静電容量 Capacitance〔pF〕	容量許容差 Capacitance tolerance	Q or tan δ	絶縁抵抗 Insulation resistance
	UP050CH220J−○ Z		RoHS		22			
★	UP050CH240J−○ Z		RoHS		24		Q≧400＋20C	
	UP050CH270J−○ Z		RoHS		27			
★	UP050CH300J−○ Z		RoHS		30			
	UP050CH330J−○ Z		RoHS		33			
★	UP050CH360J−○ Z		RoHS		36			
	UP050CH390J−○ Z		RoHS		39			
★	UP050CH430J−○ Z		RoHS		43			
	UP050CH470J−○ Z		RoHS		47			
★	UP050CH510J−○ Z		RoHS		51			
	UP050CH560J−○ Z		RoHS		56			
★	UP050CH620J−○ Z		RoHS		62			
	UP050CH680J−○ Z		RoHS		68			
★	UP050CH750J−○ Z		RoHS		75			
★	UP050CH820J−○ Z		RoHS		82			
★	UP050CH910J−○ Z		RoHS		91			
	UP050CH101J−○ Z		RoHS		100			
★	UP050CH111J−○ Z		RoHS		110			
★	UP050CH121J−○ Z		RoHS		120			
★	UP050CH131J−○ Z		RoHS		130			
50V	UP050CH151J−○ Z		RoHS	CH	150	± 5%	Q≧1000	10000MΩmin
★	UP050CH161J−○ Z		RoHS		160			
★	UP050CH181J−○ Z		RoHS		180			
★	UP050CH201J−○ Z		RoHS		200			
	UP050CH221J−○ Z		RoHS		220			
★	UP050CH241J−○ Z		RoHS		240			
★	UP050CH271J−○ Z		RoHS		270			
★	UP050CH301J−○ Z		RoHS		300			
	UP050CH331J−○ Z		RoHS		330			
★	UP050CH361J−○ Z		RoHS		360			
★	UP050CH391J−○ Z		RoHS		390			
★	UP050CH431J−○ Z		RoHS		430			
	UP050CH471J−○ Z		RoHS		470			
★	UP050CH511J−○ Z		RoHS		510			
★	UP050CH561J−○ Z		RoHS		560			
★	UP050CH621J−○ Z		RoHS		620			
	UP050CH681J−○ Z		RoHS		680			
★	UP050CH751J−○ Z		RoHS		750			
★	UP050CH821J−○ Z		RoHS		820			
★	UP050CH911J−○ Z		RoHS		910			
	UP050CH102J−○ Z		RoHS		1000			

形名の△には温度特性、○にはリード形状分類記号が入ります。　★：オプション対応

△Please specify the temperature characteristics code and ○ lead configuration code.

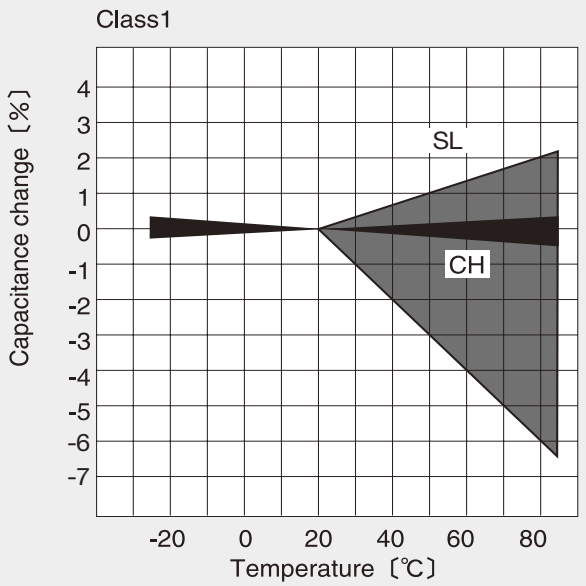
★ : Option

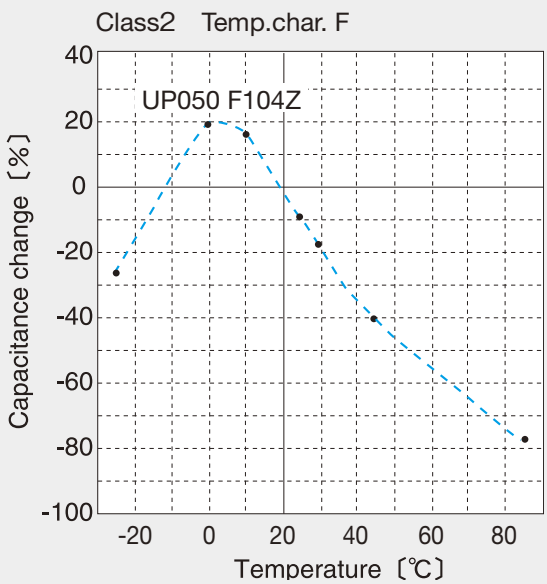
［積層タイプ Multilayer type］
Class 2

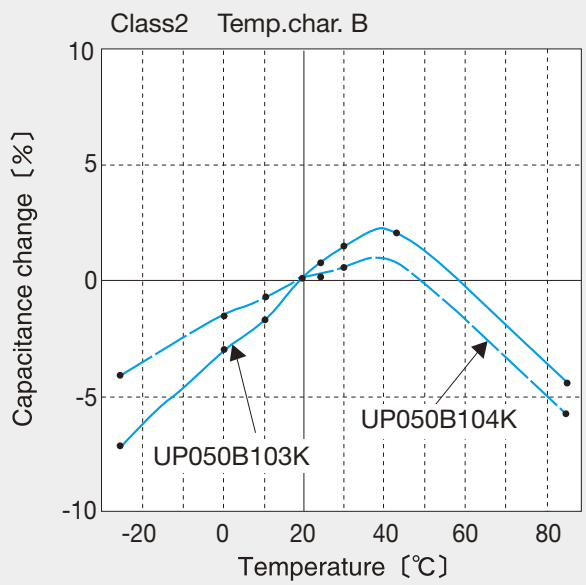
定格電圧 RatedVoltage (DC)	形名 Ordering code		EHS (Environmental Hazardous Substances)	温度特性 Temperature characteristics	公称静電容量 Capacitance [pF]	容量許容差 Capacitance tolerance	Q or tan δ	絶縁抵抗 Insulation resistance
★	UP050 B122K− ○Z		RoHS	B	1200	±10%	tan δ ≦3.5%	5000MΩmin
	UP050 B152K− ○Z		RoHS		1500			
★	UP050 B182K− ○Z		RoHS		1800			
	UP050 B222K− ○Z		RoHS		2200			
★	UP050 B272K− ○Z		RoHS		2700			
	UP050 B332K− ○Z		RoHS		3300			
★	UP050 B392K− ○Z		RoHS		3900			
	UP050 B472K− ○Z		RoHS		4700			
★	UP050 B562K− ○Z		RoHS		5600			
	UP050 B682K− ○Z		RoHS		6800			
★	UP050 B822K− ○Z		RoHS		8200			
	UP050 B103K− ○Z		RoHS		10000			
50V ★	UP050 B123K− ○Z		RoHS		12000			
	UP050 B153K− ○Z		RoHS		15000			
★	UP050 B183K− ○Z		RoHS		18000			
	UP050 B223K− ○Z		RoHS		22000			
★	UP050 B273K− ○Z		RoHS		27000			
	UP050 B333K− ○Z		RoHS		33000			
★	UP050 B393K− ○Z		RoHS		39000			
	UP050 B473K− ○Z		RoHS		47000		tan δ ≦5.0%	1000MΩmin
★	UP050 B563K− ○Z		RoHS		56000			
	UP050 B683K− ○Z		RoHS		68000			
★	UP050 B823K− ○Z		RoHS		82000			
	UP050 B104K− ○Z		RoHS		100000			
	UP050 B224K− ○Z		RoHS		220000			500MΩmin
	UP050 B474K− ○Z		RoHS		470000			200MΩmin
35V	GP050 B105K− ○Z		RoHS		1000000			100MΩmin
16V	EP050 B225K− ○Z		RoHS		2200000		tan δ ≦7.5%	50MΩmin
	EP050 B475K− ○Z		RoHS		4700000		tan δ ≦12.5%	20MΩmin
	EP050 B106K− ○Z		RoHS		10000000			
50V	UP050 F103Z− ○Z		RoHS	F	10000	+80 −20%	tan δ ≦7.5%	1000MΩmin
	UP050 F223Z− ○Z		RoHS		22000			
	UP050 F473Z− ○Z		RoHS		47000			
	UP050 F104Z− ○Z		RoHS		100000			
	UP050 F224Z− ○Z		RoHS		220000		tan δ ≦10.0%	500MΩmin
	UP050 F474Z− ○Z		RoHS		470000			
	UP050 F105Z− ○Z		RoHS		1000000		tan δ ≦15%	250MΩmin
16V	EP050 F225Z− ○Z		RoHS		2200000			125MΩmin
10V	LP050 F475Z− ○Z		RoHS		4700000		tan δ ≦17.5%	50MΩmin
	LP050 F106Z− ○Z		RoHS		10000000			25MΩmin
50V	UP075 B105K− ○		RoHS	B	1000000	±10%	tan δ ≦5.0%	100MΩmin
35V	GP075 B225K− ○		RoHS		2200000		tan δ ≦7.5%	50MΩmin
	GP075 B475K− ○		RoHS		4700000			20MΩmin
25V	TP075 B106K− ○		RoHS		10000000		tan δ ≦12.5%	
35V	GP075 F106Z− ○		RoHS	F	10000000	+80 −20%	tan δ ≦17.5%	25MΩmin

形名の△には温度特性、○にはリード形状分類記号が入ります。　★：オプション対応
△Please specify the temperature characteristics code and ○ lead configuration code.
★ : Option

・静電容量－温度特性　Capacitance -vs- Temperature Characteristics





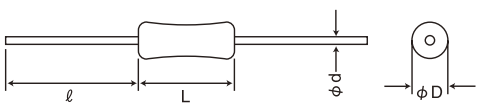


①最小受注単位数　Minimum Quantity

形式 Type	リード形状記号 Lead configuration code	最小受注単位数(PCS) Minimum Quantity	
		袋づめ Bulk	テーピング　Taping
積層形 Multilayer type (075, 050, 025)	A−(26mm幅) 1.024 inch wide	——	2000(075type) 3000(050type) 5000(025type)
	B−(52mm幅)2.047 inches wide	——	2000(075type) 3000(050type) 5000(025type)
	NA	1000	——
	KE (075type) KF (025,050type)	3000, 4000 (025 type)	——

②製品単品形状　Dimensions of Bulk Products

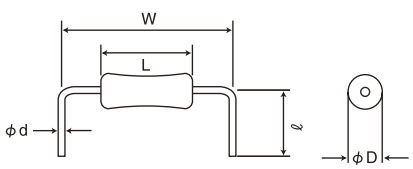
・NA形状　NA configuration



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

Unit：mm (inch)

・KF/KE形状　KF/KE configuration

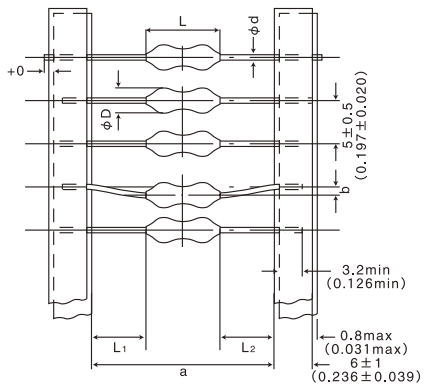


形　式 Type	リード形状記号 Lead configuration code	寸　法　Dimensions(mm)				
		φD	L	W	φd	ℓ
積層形 025 Multilayer type	KF	2.0max (0.079max)	2.3max (0.09max)	5.0±0.5 (0.197±0.020)	0.45±0.05 (0.018±0.002)	6.5±0.5 (0.256±0.020)
積層形 050 Multilayer type	KF	2.2max (0.087max)	3.2max (0.126max)	5.0±0.5 (0.197±0.020)	0.45±0.05 (0.018±0.002)	6.5±0.5 (0.256±0.020)
積層形 075 Multilayer type	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)

③テーピング寸法　Taping Dimensions

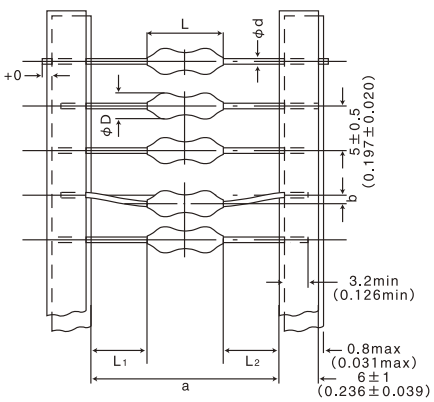
A−（a：26mm幅）形状（a：1.024 inch wide）configuration



形　式 Type	寸　法　Dimensions						最小挿入ピッチ Minimum insertion pitch
	φD	L	a	b	|L1−L2|	φd	
積層形 025 Multilayer type	2.0max (0.079max)	2.3max (0.09max)	$26^{+0.5}_{-0}$ ($1.024^{+0.020}_{-0}$)	0.8以下 (0.031 or less)	0.5max (0.020max.)	0.45±0.05 (0.018±0.002)	5.0 (0.197)
積層形 050 Multilayer type	2.2max (0.087max)	3.2max (0.126max)				0.45±0.05 (0.018±0.002)	
積層形 075 Multilayer type	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：52mm幅）形状（a：2.047 inches wide）configuration



形　式 Type	寸　法　Dimensions						最小挿入ピッチ Minimum insertion pitch
	φD	L	a	b	|L1−L2|	φd	
積層形 025 Multilayer type	2.0max (0.079max)	2.3max (0.09max)	52^{+2}_{-1} ($2.047^{+0.079}_{-0.039}$)	1.2以下 (0.047 or less)	1.0max (0.039max.)	0.45±0.05 (0.018±0.002)	5.0 (0.197)
積層形 050 Multilayer type	2.2max (0.087max)	3.2max (0.126max)				0.45±0.05 (0.018±0.002)	
積層形 075 Multilayer type	3.2max (0.126max)	4.2max (0.165max)				0.55±0.05 (0.022±0.002)	7.5 (0.295)

Unit：mm(inch)

※075Typeはラジアルテーピングもオプション対応可能。

AXIAL LEADED CERAMIC CAPACITORS

Item		Specified Value			Test Methods and Remarks
		Temterature Compensating (Class1)	High Permittivity (Class2)		
		Multilayer type	Multilayer type (Characteristics :B)	Multilayer type (Characteristics :F)	
1.Operating Temperature Range		−25～+85℃			
2.Storage Temperature Range		−25～+85℃			
3.Rated Voltage		50VDC	16VDC、25VDC、35VDC、50VDC	10VDC、16VDC、25VDC、35VDC、50VDC	
4. Withstanding Voltage	Between terminals	No abnormality			Applied voltage : Rated Voltage×3 (Class 1) Rated Voltage×2.5 (Class 2) Duration : 1 to 5 sec. Charge/discharge current : 50mA max. (Class 1,2)
	Between terminals and body	No abnormality			Metal globule method Applied voltage : Rated Voltage×2.5 Duration : 1 to 5 sec. Charge/Discharge current : 50mA max.
5. Insulation Resistance		10000MΩmin.	Rated Ivoltage : 16VDC B : 1200pF～22000pF (Item : △) : 5000MΩmin 220000pF : 500MΩ min 470000pF : 200MΩ min 1000000pF : 100MΩ min 4700000pF : 20MΩ min 2200000pF : 50MΩ min 10000000pF : 20MΩmin Rated Ivoltage : 25VDC B : 10000000pF : 20MΩmin Rated Ivoltage : 35VDC B : 1000000pF : 100MΩ min 2200000pF : 50MΩ min 4700000pF : 20MΩ min Rated Ivoltage : 50VDC B : 100pF～39000pF : 5000MΩmin 47000pF～100000pF : 1000MΩmin 220000pF : 500MΩmin 470000pF : 200MΩmin 1000000pF : 100MΩmin	Rated Ivoltage : 10VDC F : 4700000pF : 50MΩmin 10000000pF : 25MΩmin Rated Ivoltage : 16VDC F : 220000pF : 500MΩmin 470000pF : 500MΩmin 1000000pF : 250MΩmin 2200000pF : 125MΩmin Rated voltage : 25VDC F : 10000pF～47000pF (Item△J) : 1000MΩmin Rated voltage : 35VDC F : 10000000pF : 25MΩmin Rated voltage : 50VDC F : 10000pF～100000pF : 1000MΩmin 220000pF～470000pF : 500MΩmin 1000000pF : 250MΩmin	Applied voltage : Rated voltage Duration : 60±5 sec.

Withstanding voltage is also referred to as "voltage proof" under IEC specifications.

AXIAL LEADED CERAMIC CAPACITORS

Item		Specified Value			Test Methods and Remarks
		Temterature Compensating (Class1)	High Permittivity (Class2)		
		Multilayer type	Multilayer type (Characteristics : B)	Multilayer type (Characteristics : F)	
6. Capacitance :		±0.5pF ± 5% ± 10%	B: ±10%、±20% (Item△J)	F : +80 −20%	Measuring frequency 1MHz±10% (Class 1 : C≦1000pF) 1kHz±10% (Class 1 : C>1000pF) 1kHz±10% (Class 2 : C≦10μF) 120Hz±10% (Class 2 : C>10μF) Measuring voltage 1.0±0.5Vrms (Class 1 : C≦1000pF) 1.0±0.2Vrms (Class 1 : C>1000pF) 1.0±0.2Vrms (Class 2 : C≦10μF) 0.5±0.1Vrms (Class 2 : C>10μF) Measuring temperature : 20℃ Bias application : None
7. Q or Tangent of Loss Angle		30pF or under : Q≧400+20C 33pF or over : Q≧1000 C : Nominal Capacitance : [pF]	Rated Ivoltage : 16VDC B : 1200pF~22000pF (Item△J) : 3.5%max 100000pF : 5.0%max 220000pF~470000pF : 5.0%max 1000000pF~2200000pF : 7.5%max 4700000pF~10000000pF : 12.5%max Rated Ivoltage : 25VDC B : 10000000pF : 12.5% max Rated Ivoltage : 35VDC B : 1000000pF : 5.0%max 2200000pF~4700000pF : 7.5% max Rated Ivoltage : 50VDC B : 100pF~39000pF : 3.5%max 47000pF~1000000pF : 5.0%max	Rated Ivoltage : 10VDC F : 4700000pF~10000000pF : 17.5% max Rated Ivoltage : 16VDC F : 220000pF : 10.0%max 470000pF : 10.0%max 1000000pF : 17.5%max 2200000pF : 15.0% max Rated Ivoltage : 25VDC F : 10000pF~47000pF (Item△J) : 7.5% max Rated Ivoltage : 35VDC F : 10000000pF : 17.5%max Rated Ivoltage : 50VDC F : 10000pF~100000pF : 7.5% max 220000pF~470000pF : 10.0% max 1000000pF : 15.0% max	
8. Capacitance : Change due to Temperature or Rate of Capacitance Change	(When voltage is not applied)	CH : 0±60 SL : −350~+1000 [ppm/℃]	B : ±10%	F : +30 −85%	Measurement of capacitance at 20℃ and 85℃, −25℃ shall be made to calculate temperature characteristic by the following equation. (Class 1) $\frac{(C_{85}-C_{20})}{C_{20}\times\triangle T}\times 10^6$ (ppm/℃) Change of maximum capacitance deviation in step 1 to 5 (Class 2) Temperature at step 1 : 20℃ Temperature at step 4 : 85℃ Temperature at step 2 : −25℃ Temperature at step 5 : 20℃ Temperature at step 3 : 20℃ (Reference temperature)
9. Terminal Strength	Tensile	No abnomalities, such as cuts or looseness of terminals.			Apply the stated tensile force progressively in the direction to draw terminal. Nominal wire diameter [mm] : 0.45 — Tensile force [N] : 19.6 — Duratio [s] : 5
	Torsional	No abnomalities, such as cuts or looseness of terminals.			Suspend a mass at the end the terminal, incline the body through angle of 90° and return it to 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] : 0.45 — Bending force [N] : 2.45 — Mass weight [kg] : 0.25

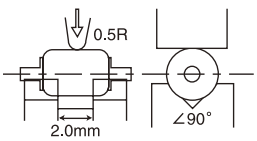
Withstanding voltage is also referred to as "voltage proof" under IEC specifications.

AXIAL LEADED CERAMIC CAPACITORS

Item	Specified Value			Test Methods and Remarks
	Temterature Compensating(Class1)	High Permittivity(Class2)		
	Multilayer type	Multilayer type(Characteristics :B)	Multilayer type(Characteristics :F)	
10. Resistance to Vaibration	Appearance：No significant abnomality Withstanding Voltage：No abnomality Capacitance： Within ±5% 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： 10000MΩmin. C：Nominal Capacitance：[pF]	Appearance：No significant abnomality Withstanding Voltage：No abnomality Rated Voltage: 16VDC B Capacitance： 1200pF～22000pF(Item△J)：Within ±20% 220000pF～10000000pF：Within ±10% tanδ: 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)：5000MΩmin 220000pF：500MΩ min 470000pF：200MΩ min 1000000pF：100MΩ min 2200000pF：50MΩ min 4700000pF～10000000pF：20MΩ min Rated Voltage: 25VDC B Capacitance：Within ±10% tanδ: 10000000pF：12.5%max Insulation Resistance: 10000000pF：20MΩmin Rated Voltage: 35VDC B Capacitance：Within ±10% tanδ: 1000000pF：5.0%max 2200000pF～4700000pF：7.5% max Insulation Resistance: 1000000pF：100MΩmin 2200000pF：50MΩ min 4700000pF：20MΩ min Rated Voltage: 50VDC B Capacitance：Within ±10% tanδ: 100pF～39000pF：3.5% max 47000pF ～1000000pF：5.0% max Insulation Resistance: 100pF～39000pF：5000MΩmin 47000pF～100000pF：1000MΩmin 220000pF：500MΩmin 470000pF：200MΩmin 1000000pF：100MΩmin	Appearance：No significant abnomality Withstanding Voltage：No abnomality Rated Voltage：10VDC F Capacitance：Within $^{+80}_{-20}$ % tanδ： 4700000pF～10000000pF： 17.5% max Insulation Resistance： 4700000pF：50MΩmin 10000000pF：25MΩmin Rated Voltage：16VDC F Capacitance：Within $^{+80}_{-20}$ % tanδ： 220000pF：10.0%max 470000pF：10.0%max 1000000pF：17.5%max 2200000pF：15.0%max Insulation Resistance: 220000pF：500MΩmin 470000pF：500MΩmin 1000000pF：250MΩmin 2200000pF：125MΩmin Rated Voltage：25VDC F Capacitance：Within $^{+80}_{-20}$ % tanδ： 10000pF～47000pF(Item△J)：7.5%max Insulation Resistance： 10000pF～47000pF(Item△J)：1000MΩmin Rated Voltage：35VDC F Capacitance：Within $^{+80}_{-20}$ % tanδ： 10000000pF：17.5%max Insulation Resistance： 10000000pF：25MΩmin Rated Voltage：50VDC F Capacitance：Within $^{+80}_{-20}$ % tanδ： 10000pF～100000pF：7.5%max 220000pF～470000pF：10.0%max 1000000pF：15.0%max Insulation Resistance： 10000pF～100000pF：1000MΩmin 220000pF～470000pF：500MΩmin 1000000pF：250MΩmin	According to JIS C 5102 clause 8.2 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：1.5 mm Mounting method：Soldering onto the PC board

Withstanding voltage is also referred to as "voltage proof" under IEC specifications.

AXIAL LEADED CERAMIC CAPACITORS

Item	Specified Value			Test Methods and Remarks
	Temterature Compensating(Class1)	High Permittivity(Class2)		
	Multilayer type	Multilayer type(Characteristics :B)	Multilayer type(Characteristics :F)	
11. Free Fall	Appearance : No significant abnomality Withstanding Voltage : No abnomality Capacitance : Within ±5% 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 : 10000MΩmin. C : Nominal Capacitance : [pF]	Appearance : No significant abnomality Withstanding Voltage : No abnomality Rated Voltage: 16VDC B Capacitance : 1200pF~22000pF(Item△J) : Within ±20% 220000pF~10000000pF : Within ±10% tanδ : 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) : 5000MΩmin 220000pF : 500MΩ min 470000pF : 200MΩ min 1000000pF : 100MΩ min 2200000pF : 50MΩ min 4700000pF~10000000pF : 20MΩ min Rated Voltage : 25VDC B Capacitance : Within ±10% tanδ : 10000000pF : 12.5%max Insulation Resistance: 10000000pF : 20MΩmin Rated Voltage: 35VDC B Capacitance : Within ±10% tanδ : 1000000pF : 5.0%max 2200000pF~4700000pF : 7.5% max Insulation Resistance: 1000000pF : 100MΩmin 2200000pF : 50MΩ min 4700000pF : 20MΩ min Rated Voltage: 50VDC B Capacitance : Within ±10% tanδ : 100pF~39000pF : 3.5% max 47000pF ~1000000pF : 5.0% max Insulation Resistance: 100pF~39000pF : 5000MΩmin 47000pF~100000pF : 1000MΩmin 220000pF : 500MΩmin 470000pF : 200MΩmin 1000000pF : 100MΩmin	Appearance : No significant abnomality Withstanding Voltage : No abnomality Rated Voltage : 10VDC F Capacitance : Within $^{+80}_{-20}$ % tanδ : 4700000pF~10000000pF : 17.5% max Insulation Resistance : 4700000pF : 50MΩmin 10000000pF : 25MΩmin Rated Voltage : 16VDC F Capacitance : Within $^{+80}_{-20}$ % tanδ : 220000pF : 10.0%max 470000pF : 10.0%max 1000000pF : 17.5%max 2200000pF : 15.0%max Insulation Resistance: 220000pF : 500MΩmin 470000pF : 500MΩmin 1000000pF : 250MΩmin 2200000pF : 125MΩmin Rated Voltage : 25VDC F Capacitance : Within $^{+80}_{-20}$ % tanδ : 10000pF~47000pF(Item△J) : 7.5%max Insulation Resistance : 10000pF~47000pF(Item△J) : 1000MΩmin Rated Voltage : 35VDC F Capacitance : Within $^{+80}_{-20}$ % tanδ : 10000000pF : 17.5% max Insulation Resistance : 10000000pF : 25MΩmin Rated Voltage : 50VDC F Capacitance : Within $^{+80}_{-20}$ % tanδ : 10000pF~100000pF : 7.5% max 220000pF~470000pF : 10.0% max 1000000pF : 15.0% max Insulation Resistance : 10000pF~100000pF : 1000MΩmin 220000pF~470000pF : 500MΩmin 1000000pF : 250MΩmin	Drop Test : Free fall Impact material : Floor Height : 1 m Total number of drops : 5 times
12. Body Strength	No abnomality such as damage.			Applied force : 19.6N Duration : 5 sec. Speed : Shall attain to specified force in 2 sec.  1.5mm (025type)
13. Solderability	At least 75% of lead surface is covered with new solder.			Solder temperature : 230±5℃ Duration : 2±0.5 sec. (This test may be applicable after 6 months storage.)

Withstanding voltage is also referred to as "voltage proof" under IEC specifications.

AXIAL LEADED CERAMIC CAPACITORS

Item	Specified Value			Test Methods and Remarks
	Temterature Compensating(Class1)	High Permittivity(Class2)		
	Multilayer type	Multilayer type(Characteristics :B)	Multilayer type(Characteristics :F)	
14. Soldering	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 :10000MΩmin. C：Nominal Capacitance ：[pF]	Appearance：No significant abnomality Withstanding Voltage：No abnomality Rated Voltage: 16VDC B Capacitance change： 1200pF～22000pF(Item△J)：Within ±7.5% 22000000pF～10000000pF ：Within ±10.0% tanδ： 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)：5000MΩmin 220000pF ：500MΩ min 470000pF ：200MΩ min 1000000pF ：100MΩ min 2200000pF ：50MΩmin 4700000pF~10000000pF ：20MΩ min Rated Voltage: 25VDC B Capacitance change： 10000000pF ：Within ±10.0% tanδ： 10000000pF ：12.5%max Insulation Resistance: 10000000pF ：20MΩmin Rated Voltage: 35VDC B Capacitance change： 1000000pF～4700000pF：Within ±10.0% tanδ： 1000000pF ：5.0%max 2200000pF～4700000pF ：7.5% max Insulation Resistance: 1000000pF ：100MΩmin 2200000pF ：50MΩmin 4700000pF ：20MΩmin Rated Voltage: 50VDC B Capacitance change： 100pF～39000pF ：Within ±7.5% 47000pF～1000000pF ：Within ±10.0% tanδ： 100pF～39000pF ：3.5%max 47000pF～1000000pF ：5.0%max Insulation Resistance: 100pF～39000pF ：5000MΩmin 47000pF～100000pF ：1000MΩmin 220000pF ：500MΩmin 470000pF ：200MΩmin 1000000pF ：100MΩmin	Appearance：No significant abnomality Withstanding Voltage：No abnomality Rated Voltage：10VDC F Capacitance change：Within ±20.0% tanδ： 4700000pF～10000000pF：17.5% max Insulation Resistance: 4700000pF ：50MΩmin 10000000pF ：25MΩmin Rated Voltage: 16VDC F Capacitance change：Within ±20.0% tanδ： 220000pF～470000pF：10.0%max 1000000pF ：17.5%max 2200000pF ：15.0%max Insulation Resistance: 220000pF～470000pF：500MΩmin 1000000pF ：250MΩmin 2200000pF ：125MΩmin Rated Voltage: 25VDC F Capacitance change：Within ±20.0% tanδ： 10000pF～47000pF(Item△J)：7.5% max Insulation Resistance: 10000pF～47000pF(Item△J)：1000MΩmin Rated Voltage: 35VDC F Capacitance change：Within ±20.0% tanδ： 10000000pF ：17.5% max Insulation Resistance: 10000000pF ：25MΩmin Rated Voltage: 50VDC F Capacitance change： 10000pF～1000000pF：Within ±20.0% tanδ： 10000pF～100000pF ：7.5% max 220000pF～470000pF：10.0% max 1000000pF ：15.0% max Insulation Resistance: 10000pF～100000pF ：1000MΩmin 220000pF～470000pF：500MΩmin 1000000pF ：250MΩmin	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)

Withstanding voltage is also referred to as "voltage proof" under IEC specifications.
Thermal Shock is also referred to as "rapid change of temperature" under IEC specifications.

AXIAL LEADED CERAMIC CAPACITORS

Item	Specified Value			Test Methods and Remarks
	Temterature Compensating(Class1)	High Permittivity(Class2)		
	Multilayer type	Multilayer type(Characteristics :B)	Multilayer type(Characteristics :F)	
15. Resistance to Solvent	No significant abnormality in appearance and legible marking.			According to JIS C 5102 clause 8.7.4. 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	Appearance：No significant abnormality Withstanding Voltage：No abnormality 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： 1000MΩmin. C：Nominal Capacitance［pF］	Appearance :No significant abnomality Withstanding Voltage :No abnomality Rated Voltage: 16VDC B Capacitance change ： 1200pF～22000pF(Item△J)：Within ±12.5% 220000pF～10000000pF：Within ±15.0% tanδ: 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)：1000MΩmin 220000pF ：125MΩmin 470000pF ：50MΩmin 1000000pF ：25MΩmin 2200000pF ：12.5MΩmin 22000000pF ：5MΩmin Rated Voltage: 25VDC B Capacitance change ： 10000000pF ：Within ±15.0% tanδ: 10000000pF ：15.0%max Insulation Resistance: 10000000pF ：5MΩmin Rated Voltage: 35VDC B Capacitance change ： 1000000pF ：Within ±15.0% 2200000pF～4700000pF ：Within ±15.0% tanδ: 1000000pF ：7.5%max 2200000pF～4700000pF：10.0%max Insulation Resistance: 1000000pF ：25MΩmin 2200000pF ：25MΩmin 4700000pF ：5MΩmin Rated Voltage: 50VDC B Capacitance change： 100pF～39000pF ：Within ±12.5% 47000pF~1000000pF ：Within ±15.0% tanδ: 100pF～39000pF ：5.0%max 47000pF～1000000pF：7.5%max Insulation Resistance: 100pF～39000pF ：1000MΩmin 47000pF～100000pF ：500MΩmin 220000pF ：250MΩmin 470000pF ：100MΩmin 1000000pF ：50MΩmin	Appearance：No significant abnomality Withstanding Voltage：No abnomality Rated Voltage：10VDC F Capacitance change：Within ±30.0% tanδ： 4700000pF～10000000pF：20.0% max Insulation Resistance： 4700000pF ：10MΩmin 10000000pF ：5MΩmin Rated Voltage：16VDC F Capacitance change ：Within ±30.0% tanδ: 220000pF～470000pF：15.0%max 1000000pF ：22.5%max 2200000pF ：17.5% max Insulation Resistance: 220000pF ：100MΩmin 470000pF ：50MΩmin 1000000pF ：25MΩmin 2200000pF ：25MΩ min Rated Voltage：25VDC F Capacitance change：Within ±30.0% tanδ： 10000pF～47000pF(Item△J)：12.5%max Insulation Resistance： 10000pF～47000pF(Item△J)：500MΩmin Rated Voltage：35VDC F Capacitance change：Within ±30.0% tanδ： 10000000pF ：20.0%max Insulation Resistance： 10000000pF ：5MΩmin Rated Voltage：50VDC F Capacitance change： 10000pF～1000000pF ：Within ±30% tanδ： 10000pF～100000pF ：12.5%max 220000pF～470000pF：15.0%max 1000000pF ：17.5%max Insulation Resistance： 10000pF～100000pF ：500MΩmin 220000pF～470000pF：250MΩmin 1000000pF ：50MΩmin	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）

Withstanding voltage is also referred to as "voltage proof" under IEC specifications.
Thermal Shock is also referred to as "rapid change of temperature" under IEC specifications.

AXIAL LEADED CERAMIC CAPACITORS

Item	Specified Value			Test Methods and Remarks
	Temterature Compensating(Class1)	High Permittivity(Class2)		
	Multilayer type	Multilayer type(Characteristics :B)	Multilayer type(Characteristics :F)	
17. Damp Heat (steady state)	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： 1000MΩmin. C：Nominal Capacitance［pF］	Appearance：No significant abnomality Withstanding Voltage：No abnomality Rated Voltage：16VDC B Capacitance change： 1200pF～22000pF(Item△J)：Within ±12.5% 220000pF～10000000pF ：Within ±15.0% tanδ： 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)：1000MΩmin 220000pF ：125MΩmin 470000pF ：50MΩmin 1000000pF ：25MΩmin 2200000pF ：12.5MΩmin 4700000pF～10000000pF ：5MΩmin Rated Voltage：25VDC B Capacitance change： 10000000pF ：Within ±15.0% tanδ： 10000000pF ：15.0%max Insulation Resistance： 10000000pF ：5MΩmin Rated Voltage：35VDC Capacitance change： 1000000pF ：Within ±15.0% 2200000pF～4700000pF ：Within ±15.0% tanδ： 1000000pF ：10.0%max 2200000pF～4700000pF ：10.0%max Insulation Resistance: 1000000pF ：25MΩmin 2200000pF ：25MΩmin 4700000pF ：5MΩmin Rated Voltage：50VDC B Capacitance change： 100pF～39000pF ：Within ±12.5% 47000pF～1000000pF：Within ±15.0% tanδ： 100pF～39000pF ：5.0% max 47000pF～1000000pF ：7.5% max Insulation Resistance： 100pF～39000pF ：1000MΩmin 47000pF～100000pF ：500MΩmin 220000pF ：250MΩmin 470000pF ：100MΩmin 1000000pF ：50MΩmin	Appearance：No significant abnomality Withstanding Voltage：No abnomality Rated Voltage：10VDC F Capacitance change：Within ±30.0% tanδ： 4700000pF～10000000pF：20.0%max Insulation Resistance： 4700000pF ：10MΩmin 10000000pF ：5MΩmin Rated Voltage：16VDC F Capacitance change：Within ±30.0% tanδ： 220000pF～470000pF：15.0%max 1000000pF ：22.5%max 2200000pF ：17.5%max Insulation Resistance: 220000pF ：100MΩmin 470000pF ：50MΩmin 1000000pF ：25MΩmin 2200000pF ：25MΩmin Rated Voltage：25VDC F Capacitance change：Within ±30.0% tanδ： 10000pF～47000pF(Item△J)：12.5%max Insulation Resistance： 10000pF～47000pF(Item△J)：500MΩmin Rated Voltage：35VDC F Capacitance change：Within ±30.0% tanδ： 10000000pF ：20.0%max Insulation Resistance： 10000000pF ：5MΩmin Rated Voltage：50VDC F Capacitance change： 10000pF～1000000pF：Within ±30% tanδ： 10000pF～100000pF ：12.5% max 220000pF～470000pF ：15.0% max 1000000pF ：17.5% max Insulation Resistance： 10000pF～100000pF ：500MΩmin 220000pF～470000pF ：250MΩmin 1000000pF ：50MΩmin	emperature：40±2℃ Humidity：90 to 95 % RH Duration：500 $^{+24}_{-0}$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）

Withstanding voltage is also referred to as "voltage proof" under IEC specifications.

AXIAL LEADED CERAMIC CAPACITORS

Item	Specified Value			Test Methods and Remarks
	Temterature Compensating(Class1)	High Permittivity(Class2)		
	Multilayer type	Multilayer type(Characteristics :B)	Multilayer type(Characteristics :F)	
18. Loading under Damp Heat	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 : 500MΩmin. C : Nominal Capacitance [pF]	Appearance : No significant abnomality Withstanding Voltage : No abnomality Rated Voltage : 16VDC B Capacitance change : 1200pF~22000pF(Item△J) : Within ±12.5% 220000pF~1000000pF : Within ±15.0% 1000000pF~10000000pF : Within ±22.5% tanδ : 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) : 500MΩmin 220000pF : 50MΩmin 470000pF : 25MΩmin 1000000pF : 12.5MΩmin 2200000pF : 5.0MΩmin 4700000pF~10000000pF : 2.5MΩmin Rated Voltage : 25VDC B Capacitance change : 10000000pF :Within ±22.5.0% tanδ : 10000000pF : 22.5% max Insulation Resistance : 10000000pF : 2.5MΩmin Rated Voltage : 35VDC B Capacitance change : 1000000pF : Within ±15.0% 2200000pF : Within ±15.0% 4700000pF : Within ±22.5% tanδ : 1000000pF : 10.0% max 2200000pF~4700000pF : 10.0%max Insulation Resistance : 1000000pF : 12.5MΩmin 2200000pF : 5.0MΩmin 4700000pF : 2.5MΩmin Rated Voltage : 50VDC B Capacitance change : 100pF~39000pF : Within ±12.5% 47000pF~1000000pF : Within ±15.0% tanδ : 100pF~39000pF : 5.0%max 47000pF~1000000pF : 7.5%max Insulation Resistance : 100pF~39000pF : 500MΩ min 47000pF~100000pF : 250MΩ min 220000pF : 125MΩ min 470000pF : 25MΩ min 1000000pF : 12.5MΩ min	Appearance : No significant abnomality Withstanding Voltage : No abnomality Rated Voltage : 10VDC F Capacitance change : Within ±30.0% tanδ : 4700000pF~10000000pF : 20.0% max Insulation Resistance : 4700000pF : 5MΩmin 10000000pF : 2.5MΩmin Rated Voltage: 16VDC F Capacitance change : Within ±30.0% tanδ : 220000pF~470000pF : 15.0%max 1000000pF : 22.5%max 2200000pF : 17.5%max Insulation Resistance: 220000pF : 50MΩmin 470000pF : 25MΩmin 1000000pF : 12.5MΩmin 2200000pF : 12.5MΩ min Rated Voltage : 25VDC F Capacitance change : Within ±30.0% tanδ : 10000pF~47000pF(Item△J) : 12.5% max Insulation Resistance : 10000pF~47000pF(Item△J) : 250MΩmin Rated Voltage : 35VDC F Capacitance change : Within ±30.0% tanδ : 10000000pF : 20.0%max Insulation Resistance : 10000000pF : 2.5MΩmin Rated Voltage : 50VDC F Capacitance change : 10000pF~1000000pF : Within ±30.0% tanδ : 10000pF~100000pF : 12.5% max 220000pF~470000pF : 15.0% max 1000000pF : 17.5% max Insulation Resistance : 10000pF~100000pF : 250MΩmin 220000pF~470000pF : 125MΩmin 1000000pF : 25MΩmin	Temperature : 40±2℃ Humidity : 90 to 95 % RH Duration : 500 $^{+24}_{-0}$ hrs Applied voltage : Rated voltage Preconditioning : 1 hr of preconditioning at 150 $^{+10}_{-0}$ ℃ 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)

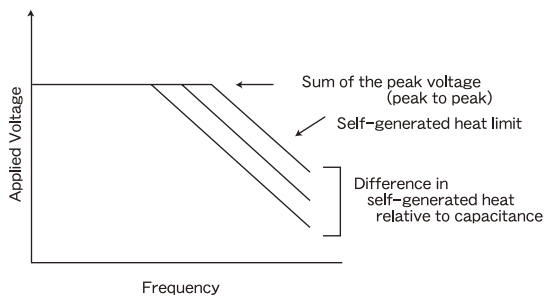
Withstanding voltage is also referred to as "voltage proof" under IEC specifications.

AXIAL LEADED CERAMIC CAPACITORS

Item	Specified Value			Test Methods and Remarks
	Temterature Compensating (Class1)	High Permittivity (Class2)		
	Multilayer type	Multilayer type (Characteristics :B)	Multilayer type (Characteristics :F)	
19. High Temperature Lading Test	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 : 1000MΩmin. C : Nominal Capacitance [pF]	Appearance : No significant abnomality Withstanding Voltage : No abnomality Rated Voltage : 16VDC B Capacitance change : 1200pF~22000pF (Item△J) : Within ±12.5% 220000pF~1000000pF : Within ±15.0% 1000000pF~10000000pF : Within ±22.5% tanδ : 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): 1000MΩmin 220000pF : 125MΩmin 470000pF : 50MΩmin 1000000pF : 25MΩmin 2200000pF : 12.5MΩmin 4700000pF~10000000pF : 5.0MΩmin Rated Voltage : 25VDC B Capacitance change : 10000000pF : Within ±22.5% tanδ : 10000000pF : 22.5% max Insulation Resistance : 10000000pF : 5MΩmin Rated Voltage : 35VDC B Capacitance change : 1000000pF : Within ±15.0% 2200000pF : Within ±15.0% 4700000pF : Within ±22.5% tanδ : 1000000pF : 10.0%max 2200000pF~4700000pF : 10.0%max Insulation Resistance : 1000000pF : 25MΩmin 2200000pF : 25MΩmin 4700000pF : 5MΩmin Rated Voltage : 50VDC B Capacitance change : 100pF~39000pF : Within ±12.5% 47000pF~1000000pF : Within ±15.0% tanδ : 100pF~39000pF : 5.0% max 47000pF~1000000pF : 7.5% max Insulation Resistance : 100pF~39000pF : 1000MΩmin 47000pF~100000pF : 500MΩmin 220000pF : 250MΩmin 470000pF : 100MΩmin 1000000pF : 50MΩmin	Appearance : No significant abnomality Withstanding Voltage : No abnomality Rated Voltage : 10VDC F Capacitance change : Within ±30.0% tanδ : 4700000pF~10000000pF : 20.0% max Insulation Resistance : 4700000pF : 10MΩmin 10000000pF : 5MΩmin Rated Voltage : 16VDC F Capacitance change : Within ±30.0% tanδ : 220000pF~470000pF : 15.0%max 1000000pF : 22.5%max 2200000pF : 17.5% max Insulation Resistance : 220000pF : 100MΩmin 470000pF : 50MΩmin 1000000pF : 25MΩmin 2200000pF : 25MΩmin Rated Voltage : 25VDC F Capacitance change : Within ±30.0% tanδ : 10000pF~47000pF (Item△J) : 10.0% max Insulation Resistance : 10000pF~47000pF (Item△J) : 500MΩmin Rated Voltage : 35VDC F Capacitance change : Within ±30.0% tanδ : 10000000pF : 20.0% max Insulation Resistance : 10000000pF : 5MΩmin Rated Voltage : 50VDC F Capacitance change : 10000pF~1000000pF : Within ±30.0% tanδ : 10000pF~100000pF : 10.0%max 220000pF~470000pF : 12.5%max 1000000pF : 17.5%max Insulation Resistance : 10000pF~100000pF : 500MΩmin 220000pF~470000pF : 250MΩmin 1000000pF : 50MΩmin	Temperature : 85± $^{3}_{0}$ ℃ Duration : 1000± $^{48}_{0}$ hrs Applied voltage : Rated voltage×2 Rated voltage×1.5 Class 2 : B 1000000pF (025Type) B 220000pF~10000000pF (050Type, 075Type) Preconditioning : 1 hr of preconditioning at 150 $^{+0}_{-10}$ ℃ 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 Axiel Leaded Ceramic Capacitors

Stages	Precautions	Technical considerations
1. Circuit Design	◆ 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. 2. Even if the applied voltage is lower than the rated value, the reliability of capacitors might be reduced if either a high frequency AC voltage or a pulse voltage having rapid rise time is present in the circuit. ◆ 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)	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 recommend 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	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	◆ 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.	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.

Precautions on the use of Axiel Leaded Ceramic Capacitors

Stages	Precautions	Technical considerations
4. Soldering	◆ Selection of Flux 1. When soldering capacitors 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 Chroline) 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: 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.	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. 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. 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	◆ Board cleaning 1. When cleaning the mounted PC boards, make sure that cleaning conditions are consistent with prescribed usage conditions.	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	◆ 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 verify on the actual application that the coating process will not adversely affect the component quality.	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 withstand 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, causing 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	◆ 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.	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	◆ 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.	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.