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、単層形と積層形合わせて1pF～1μF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

・This widely used ceramic capacitor includes both monolithic and multilayer types to provide a wide capacitance range of 1pF through 1uF in one standard size and shape.
・Automatic insertion related costs are lower than with radial type capacitors.

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、X、Y、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, X, Y and F dielectrics are optimum for bypass capacitors.

形名表記法　ORDERING CODE

1 定格電圧〔VDC〕

E	16
T	25
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〕

050	3.5×1.9（単層形）
	3.2×2.2（積層形）
025	2.5×1.9（積層形）

4 温度特性

CH	0± 60(ppm/℃)
RH	−220± 60(ppm/℃)
UJ	−750±120(ppm/℃)
SL	+350～−1000(ppm/℃)
△B	(Y5P) ±10%（単層形） (X5R) ±15%（積層形）
△F	(Y5V) $^{+30}_{-85}$%
△X	(Y5R)±15%
△Y	(Y5S)±22%

△= スペース

5 公称静電容量〔pF〕

例	※R= 小数点
010	1
1R2	1.2
103	10000

6 容量許容差〔%〕

J−	± 5
K−	±10
M−	±20
N−	±30
Z−	± $^{80}_{20}$

7 リード形状〔mm〕

A−	26.0 テープ幅テービング
B−	52.0 テープ幅テービング
KE	7.5 ピッチフォーミング（単層タイプ）
KF	5.0 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

△△	単層標準品
△Z	積層標準品

△= スペース

U P 0 5 0 S L 0 1 0 M − A − B ○ ○
1 2 3 4 5 6 7 8 9

1 Rated voltage〔VDC〕

E	16
T	25
U	50

2 Type

P	Axial leaded capacitors

3 Outside Dimensions(L×φd)〔mm〕

050	3.5×1.9(monolithic type)
	3.2×2.2(multilayer type)
025	2.5×1.9(multilayer type)

4 Temperature characteristics〔ppm/℃〕

CH	0± 60
RH	−220± 60
UJ	−750±120
SL	+350～−1000
△B	(Y5P) ±10% (monolithic type) (X5R) ±15% (multilayer type)
△F	(Y5V) $^{+30}_{-85}$%
△X	(Y5R)±15%
△Y	(Y5S)±22%

△=Blank space

5 Nominal Capacitance〔pF〕

example	
010	1
1R2	1.2
103	10000

※R=decimal point

6 Capacitance Tolerances〔%〕

J−	± 5
K−	±10
M−	±20
N−	±30
Z−	± $^{80}_{20}$

7 Lead Configuration

A−	26mm lead space, ammo pack
B−	52mm lead space, ammo pack
KE	7.5mm pitch formed lead bulk(monolithic type)
KF	5.0mm pitch formed lead bulk
NA	Axial lead, bulk

8 Packaging

B	Ammo
C	Bulk

9 Internal code

△△	Monolithic type Standard products
△Z	Multilayer type Standard products

△=Blank space

外形寸法　EXTERNAL DIMENSIONS

TYPE	Dimensions L	Dimensions φD	Dimensions φd	テーピング品　Taped product ストレート　Straight	単品　Bulk Product ストレート　Straight	単品　Bulk Product フォーミング　Formed
単層形050 (Monolithic Type)	3.5max (0.138max)	1.9max (0.075max)	0.45±0.05 (0.018±0.002)	B 52mm (2.05)	NA	KF Pitch: 5mm (0.197) / KE Pitch: 7.5mm (0.295)
積層形050 (Multilayer Type)	3.2max (0.126max)	2.2max (0.087max)		A 26mm (1.02)	NA	KF Pitch: 5mm (0.197)
積層形025 (Multilayer Type)	2.5max (0.098max)	1.9max (0.075max)	0.40±0.05 (0.016±0.002)			

Unit : mm(inch)

概略バリエーション　AVAILABLE CAPACITANCE RANGE

単層タイプ (Monolithic type)
積層タイプ (Multilayer type)

Class 1　(Temperature compensating)

WV		50V(UP)				
Temp.char.		CH		RH	UJ	SL
Type cap.		050	025	050	050	050
[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 , 3 (High dielectric constant)

WV		50V(UP)				25V (TP)	16V (EP)	
Temp.char.		B		F		F	X	Y
Type cap.		050	025	050	025	050	050	050
[pF]	[pF：3digits]							
75	750							
82	820							
91	910							
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							
22000	223							
33000	333							
47000	473							
68000	683							
100000	104							
220000	224							
470000	474							
1000000	105							

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/℃	1.8pF(and less) ：M(±20%) 2.2～8.2pF ：K(±10%) 10pF(or over) ：J(±5%)	単層タイプ(Monolithic Type) Q≧400+20C 積層タイプ(Multilayer Type) Q≧400+20C, 33pF(and over) Q≧1000	1
RH		−220± 60ppm/℃		Q≧400+20・C, 16pF(and over) Q≧500	
UJ		−750±120ppm/℃		Q≧400+20・C	
SL		+350～−1000ppm/℃		Q≧400+20・C, 33pF(and over) Q≧500	
△B	Y5P	±10%	K (±10%)	単層タイプ(Monolithic Type) tanδ≦1.5%, 470pF(and over)tanδ≦2.5%	2, 3
	X5R	±15%		積層タイプ(Multilayer Type) 1200pF～39000pF ：tanδ≦3.5% 47000pF～100000pF ：tanδ≦5.0%	2
X(Y5R)		±15%	M(±20%)、N(±30%)	tanδ≦2.5%	3
Y(Y5S)		±22%	M(±20%)、N(±30%)	tanδ≦2.5%	3
△F	Y5V	±$^{30}_{85}$%	Z(±$^{80}_{20}$%)	単層タイプ(Monolithic Type) tanδ≦7.5%	3
				積層(Multilayer Type) 10000pF～100000pF ：tanδ≦7.5% 220000pF～470000pF ：tanδ≦10.0% 1000000pF ：tanδ≦15.0%	2

注1：温度特性の( )はEIA規格相当表示です。
注2：20℃における静電容量を基準。

Note 1：Temperature characteristics in ( ) are EIA Standard.
Note 2：Capacitance characteristics measured at 20℃

セレクションガイド Selection Guide ◀ P.8 etc
アイテム一覧 Part Numbers P.130 ▶
特性図 Electrical Characteristics P.135 ▶
梱包 Packaging P.136 ▶
信頼性 Reliability Data P.138 ▶
使用上の注意 Precautions P.148 ▶

［単層タイプ Monolithic type］
Class 1

定格電圧 RatedVoltage (DC)	形名 Ordering code		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	UP050△010M−○		CH RH SL	1.0	±20%	Q≧400+20C (C:公称静電容量 capacitance[pF]) ただしRHは 16pF以上は Q≧500 but Q≧500 at 16pF or over of characteristic RH	10000MΩmin
	UP050△1R2M−○			1.2			
	UP050△1R5M−○			1.5			
	UP050△1R8M−○			1.8			
	UP050△2R2K−○		CH RH UJ SL	2.2	±10%		
	UP050△2R7K−○			2.7			
	UP050△3R3K−○			3.3			
	UP050△3R9K−○			3.9			
	UP050△4R7K−○			4.7			
	UP050△5R6K−○			5.6			
	UP050△6R8K−○			6.8			
	UP050△8R2K−○			8.2			
	UP050△100J−○			10	± 5%		
	UP050△110J−○			11			
	UP050△120J−○			12			
	UP050△130J−○			13			
	UP050△150J−○			15			
	UP050△160J−○			16			
	UP050△180J−○			18			
	UP050△200J−○		CH、UJ、SL	20			
	UP050△220J−○		UJ SL	22			
	UP050△240J−○			24			
	UP050△270J−○			27			
	UP050△300J−○			30			
	UP050SL330J−○		SL	33		Q≧500	
	UP050SL360J−○			36			
	UP050SL390J−○			39			
	UP050SL430J−○			43			
	UP050SL470J−○			47			
	UP050SL510J−○			51			
	UP050SL560J−○			56			
	UP050SL620J−○			62			
	UP050SL680J−○			68			

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025タイプ Multilayer 025 Type］
Class 2

定格電圧 RatedVoltage (DC)	形名 Ordering code		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
	UP025CH220J-○Z			22			
★	UP025CH240J-○Z			24		Q≧400+20C	
	UP025CH270J-○Z			27			
★	UP025CH300J-○Z			30			
	UP025CH330J-○Z			33			
★	UP025CH360J-○Z			36			
	UP025CH390J-○Z			39			
★	UP025CH430J-○Z			43			
	UP025CH470J-○Z			47			
★	UP025CH510J-○Z			51			
	UP025CH560J-○Z			56			
★	UP025CH620J-○Z			62			
	UP025CH680J-○Z			68			
★	UP025CH750J-○Z			75			
★	UP025CH820J-○Z			82			
★	UP025CH910J-○Z			91			
	UP025CH101J-○Z			100			
★	UP025CH111J-○Z			110			
★	UP025CH121J-○Z			120			
★	UP025CH131J-○Z			130			
50V	UP025CH151J-○Z		CH	150	± 5%	Q≧1000	10000MΩmin
★	UP025CH161J-○Z			160			
★	UP025CH181J-○Z			180			
★	UP025CH201J-○Z			200			
	UP025CH221J-○Z			220			
★	UP025CH241J-○Z			240			
★	UP025CH271J-○Z			270			
★	UP025CH301J-○Z			300			
	UP025CH331J-○Z			330			
★	UP025CH361J-○Z			360			
★	UP025CH391J-○Z			390			
★	UP025CH431J-○Z			430			
	UP025CH471J-○Z			470			
★	UP025CH511J-○Z			510			
★	UP025CH561J-○Z			560			
★	UP025CH621J-○Z			620			
	UP025CH681J-○Z			680			
★	UP025CH751J-○Z			750			
★	UP025CH821J-○Z			820			
★	UP025CH911J-○Z			910			
	UP025CH102J-○Z			1000			
★	UP025 B122K-○Z			1200			
	UP025 B152K-○Z			1500			
★	UP025 B182K-○Z			1800			
	UP025 B222K-○Z			2200			
★	UP025 B272K-○Z			2700			
	UP025 B332K-○Z			3300			
50V ★	UP025 B392K-○Z		B	3900	±10%	tanδ≦3.5%	5000MΩmin
	UP025 B472K-○Z			4700			
★	UP025 B562K-○Z			5600			
	UP025 B682K-○Z			6800			
★	UP025 B822K-○Z			8200			
	UP025 B103K-○Z			10000			
	UP025 F103Z-○Z			10000			
	UP025 F223Z-○Z			22000			
50V	UP025 F473Z-○Z		F	47000	$\pm^{80}_{20}$%	tanδ≦7.5%	1000MΩmin
	UP025 F104Z-○Z			100000			

［積層タイプ Multilayer type］
Class 1

定格電圧 RatedVoltage (DC)	形名 Ordering code		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
	UP050CH220J−○ Z			22			
★	UP050CH240J−○ Z			24		Q≧400+20C	
	UP050CH270J−○ Z			27			
★	UP050CH300J−○ Z			30			
	UP050CH330J−○ Z			33			
★	UP050CH360J−○ Z			36			
	UP050CH390J−○ Z			39			
★	UP050CH430J−○ Z			43			
	UP050CH470J−○ Z			47			
★	UP050CH510J−○ Z			51			
	UP050CH560J−○ Z			56			
★	UP050CH620J−○ Z			62			
	UP050CH680J−○ Z			68			
★	UP050CH750J−○ Z			75			
★	UP050CH820J−○ Z			82			
★	UP050CH910J−○ Z			91			
	UP050CH101J−○ Z			100			
★	UP050CH111J−○ Z			110			
★	UP050CH121J−○ Z			120			
★	UP050CH131J−○ Z			130			
50V	UP050CH151J−○ Z		CH	150	± 5%	Q≧1000	10000MΩmin
★	UP050CH161J−○ Z			160			
★	UP050CH181J−○ Z			180			
★	UP050CH201J−○ Z			200			
	UP050CH221J−○ Z			220			
★	UP050CH241J−○ Z			240			
★	UP050CH271J−○ Z			270			
★	UP050CH301J−○ Z			300			
	UP050CH331J−○ Z			330			
★	UP050CH361J−○ Z			360			
★	UP050CH391J−○ Z			390			
★	UP050CH431J−○ Z			430			
	UP050CH471J−○ Z			470			
★	UP050CH511J−○ Z			510			
★	UP050CH561J−○ Z			560			
★	UP050CH621J−○ Z			620			
	UP050CH681J−○ Z			680			
★	UP050CH751J−○ Z			750			
★	UP050CH821J−○ Z			820			
★	UP050CH911J−○ Z			910			
	UP050CH102J−○ Z			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

［単層タイプ Monolithic type］
Class 2, 3

定格電圧 RatedVoltage (DC)	形名 Ordering code		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	UP050 B750K−○		B	75	±10%	tanδ≦1.5%	10000MΩmin
	UP050 B820K−○			82			
	UP050 B910K−○			91			
	UP050 B101K−○			100			
	UP050 B121K−○			120			
	UP050 B151K−○			150			
	UP050 B181K−○			180			
	UP050 B221K−○			220			
	UP050 B271K−○			270			
	UP050 B331K−○			330			
	UP050 B391K−○			390			
	UP050 B471K−○			470		tanδ≦2.5%	1000MΩmin
	UP050 B561K−○			560			
	UP050 B681K−○			680			
	UP050 B821K−○			820			
	UP050 B102K−○			1000			
16V	EP050 X122□−○		X	1200	±20% ±30%		
	EP050 X152□−○			1500			
	EP050 X182□−○			1800			
	EP050 X222□−○			2200			
	EP050 X272□−○			2700			
	EP050 X332□−○			3300			
	EP050 X392□−○			3900			
	EP050 X472□−○			4700			
	EP050 X562□−○			5600			
	EP050 X682□−○			6800			
	EP050 Y822□−○		Y	8200			
	EP050 Y103□−○			10000			
25V	TP050 F103Z−○		F	10000	$\pm^{80}_{20}$%	tanδ≦7.5%	
	TP050 F223Z−○			22000			

形名の□には容量許容差、○にはリード形状分類記号が入ります。
□Please specify the capacitance tolerance code and ○ lead configuration code.

［積層タイプ Multilayer type］
Class 2

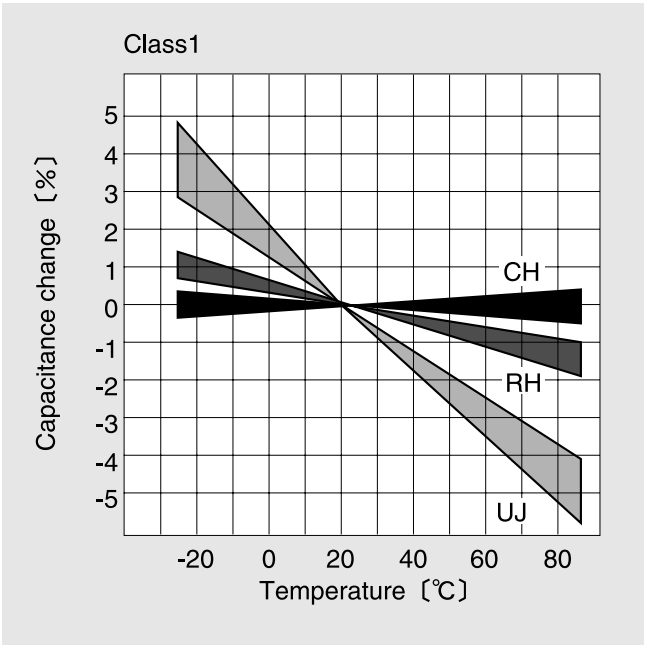
定格電圧 RatedVoltage (DC)	形名 Ordering code		温度特性 Temperature characteristics	公称静電容量 Capacitance (pF)	容量許容差 Capacitance tolerance	Q or tanδ	絶縁抵抗 Insulation resistance
★	UP050 B122K−○ Z		B	1200	±10%	tanδ≦3.5%	5000MΩmin
	UP050 B152K−○ Z			1500			
★	UP050 B182K−○ Z			1800			
	UP050 B222K−○ Z			2200			
★	UP050 B272K−○ Z			2700			
	UP050 B332K−○ Z			3300			
★	UP050 B392K−○ Z			3900			
	UP050 B472K−○ Z			4700			
★	UP050 B562K−○ Z			5600			
	UP050 B682K−○ Z			6800			
★	UP050 B822K−○ Z			8200			
50V	UP050 B103K−○ Z			10000			
★	UP050 B123K−○ Z			12000			
	UP050 B153K−○ Z			15000			
★	UP050 B183K−○ Z			18000			
	UP050 B223K−○ Z			22000			
★	UP050 B273K−○ Z			27000			
	UP050 B333K−○ Z			33000			
★	UP050 B393K−○ Z			39000			
	UP050 B473K−○ Z			47000		tanδ≦5.0%	1000MΩmin
★	UP050 B563K−○ Z			56000			
	UP050 B683K−○ Z			68000			
★	UP050 B823K−○ Z			82000			
	UP050 B104K−○ Z			100000			
	UP050 F103Z−○ Z		F	10000	$^{+80}_{-20}$ %	tanδ≦7.5%	1000MΩmin
	UP050 F223Z−○ Z			22000			
	UP050 F473Z−○ Z			47000			
50V	UP050 F104Z−○ Z			100000			
	UP050 F224Z−○ Z			220000		tanδ≦10.0%	500MΩmin
	UP050 F474Z−○ Z			470000			
	UP050 F105Z−○ Z			1000000		tanδ≦15%	250MΩmin

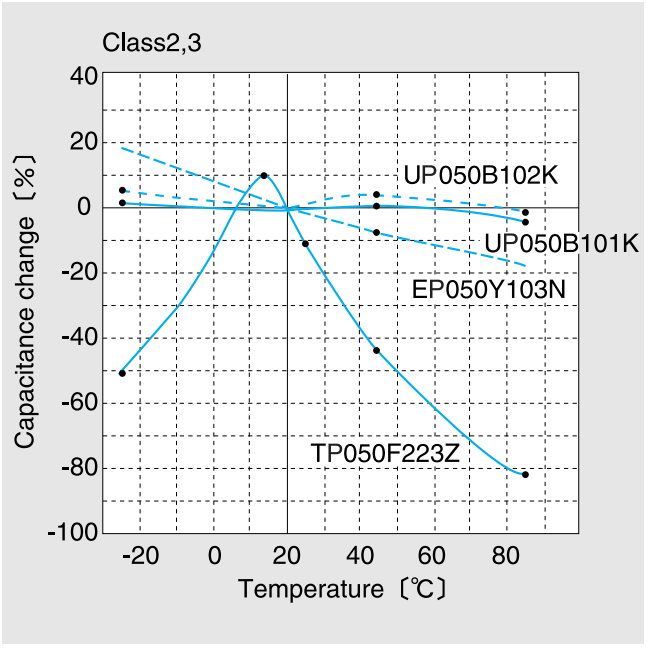
形名の△には温度特性、○にはリード形状分類記号が入ります。　★：オプション対応

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

★ : Option

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



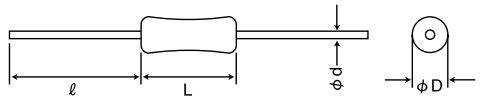


①最小受注単位数 Minimum Quantity

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 (050, 025)	A−(26mm幅) 1.024 inch wide	——	3000, 4000(025type)
	B−(52mm幅)2.047 inches wide	——	3000, 4000(025type)
	NA	1000	——
	KF	3000	——
単層形 Monolithic type	A−(26mm幅)1.024 inch wide	——	4000
	B−(52mm幅)2.047 inches wide	——	4000
	NA	1000	——
	KF	3000	——
	KE	3000	——

②製品単品形状　Dimensions of Bulk Products

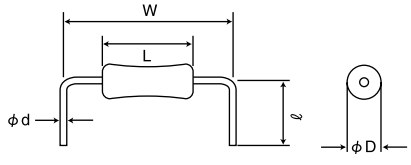
・NA形状　NA configuration



形　式 Type	寸　法 Dimensions(mm)			
	φD	L	φd	ℓ
積層形 025 Multilayer type	1.9max (0.075)	2.5max (0.098)	0.40±0.05 (0.016±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)
単層形 Monolithic type	1.9max (0.075)	3.5max (0.138)	0.45±0.05 (0.018±0.002)	20.0min (0.787)

Unit：mm(inch)

・KF/KE形状　KF/KE configuration

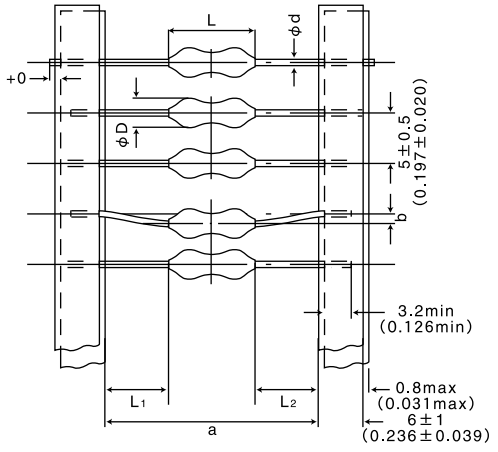


形　式 Type	リード形状記号 Lead configuration code	寸　法 Dimensions(mm)				
		φD	L	W	φd	ℓ
積層形 025 Multilayer type	KF	1.9max (0.075max)	2.5max (0.098max)	5.0±0.5 (0.197±0.020)	0.40±0.05 (0.016±0.002)	6.5±0.5 (0.256±0.020)
積層形 050 Multilayer type	KF	2.2max (0.087max)	3.2max (0.126max)	5.0±0.5 (0.197±0.020)	0.45±0.05 (0.018±0.002)	6.5±0.5 (0.256±0.020)
単層形 Monolithic type	KF	1.9max (0.075max)	3.5max (0.138max)	5.0±0.5 (0.197±0.020)	0.45±0.05 (0.018±0.002)	6.5±0.5 (0.256±0.020)
単層形 Monolithic type	KE	1.9max (0.075max)	3.5max (0.138max)	7.5±0.5 (0.295±0.020)	0.45±0.05 (0.018±0.002)	6.5±0.5 (0.256±0.020)

Unit：mm(inch)

③テーピング寸法　Taping Dimensions

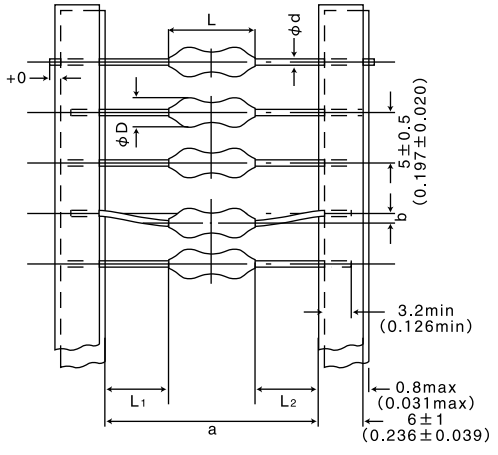
A−(a：26mm幅)形状(a：1.024 inch wide)configuration



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	1.9max (0.075max)	2.5max (0.098max)	$26^{+0.5}_{-0}$ ($1.024^{+0.020}_{-0}$)	0.8以下 (0.031 or less)	0.5max (0.020max.)	0.40±0.05 (0.016±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)	
単層形 Monolithic type	1.9max (0.075max)	3.5max (0.138max)					

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	1.9max (0.075max)	2.5max (0.098max)	52^{+2}_{-1} ($2.047^{+0.079}_{-0.039}$)	1.2以下 (0.047 or less)	1.0max (0.039max.)	0.40±0.05 (0.016±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)	
単層形 Monolithic type	1.9max (0.075max)	3.5max (0.138max)					

Unit：mm(inch)

AXIAL LEADED CERAMIC CAPACITORS

Item		Specified Value					Test Methods and Remarks
		Temperature Compensating(Class 1)		High Permittivity(Class 2)		Semiconductor(Class 3)	
		Monolithic type	Multilayer Type	Monolithic type	Multilayer Type	Monolithic type	
1.Operating Temperature Range		-25 to +85℃	−55～+85℃	−25～+85℃	B:−25～+85℃ (X5R:−55～+85℃) F:−25～+85℃ (Y5V:−30～+85℃)	−25～+85℃	
2.Storage Temperature Range		-25 to +85℃					
3.Rated Voltage		50VDC		50VDC	16VDC,25VDC,50VDC	16VDC,25VDC,50VDC	
4.Withstanding Voltage	Between terminals	No abnormality					Applied voltage: Rated Voltage×3 (Class 1) (Class 2: Monolithic type) Rated Voltage×1.5 (Class 3: B) 18V (Class 3: X,Y) Rated Voltage×2 (Class 2: Multilayer type) (Class 3: F) Rated Voltage×2.5 (Class 2: Multilayer type 50VDC) Duration: 1 to 5 sec. Charge/discharge current: 50mA max. (Class 1,2) 10mA max. (Class 3)
	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		10,000 MΩ min.		10,000 MΩ min.	Rated voltage: 16 VDC F: 250 MΩ min. Rated voltage: 25 VDC B: 1,000 MΩ min. Rated voltage: 50 VDC B(X5R) : 1200pF~39000pF : 5000MΩmin. 47000pF~100000pF : 1000MΩmin. F(Y5V) : 10000pF~100000pF : 1000MΩmin. 220000pF~470000pF : 500MΩmin. 1000000pF : 250MΩmin.	1,000 MΩ min.	Applied voltage: Rated voltage Duration : 60±5 sec.
6.Capacitance		1.8 pF or under : ±20% 2.2 pF to 8.2 pF: ±10% 10 pF or over : ±5%	±5%	Rated voltage: 50 VDC B: 75 pF to 560 pF : ±10%	Rated voltage: 16 VDC F: 1,000,000 pF: $^{80}_{20}$ % Rated voltage: 25 VDC B: 100,000 pF: ±10% Rated voltage: 50 VDC B(X5R): ±10% F(Y5V): $^{+80}_{-20}$ %	Rated voltage: 16 VDC X: 1,200 pF to 6,800 pF: ±20%, ±30% Y: 8,200 pF, 10,000 pF : ±20%, ±30% Rated voltage: 25 VDC F: 10,000 pF, 22,000 pF : $^{+80}_{-20}$ % Rated voltage: 50 VDC B: 680 pF to 1,000 pF: ±10%	Measuring frequency 1MHz±20% (Class 1: Monolithic type) 1kHz±20% (Class 2: Monolithic type) (Class 3) 1MHz±10% (Class 1: Multilayer type C≦1000pF) 1kHz±10% (Class 1: Multilayer type C>1000pF) 1kHz±10% (Class 2: Multilayer type) Measuring voltage:1.0±0.5Vrms (Class 1,2) (Class 3: B,X,Y) 0.1Vrms max. (Class 3: F) Measuring temperature: 20℃ (Monolithic type) Bias application: None
7.Q or Tangent of Loss Angle		30 pF or under : Q≧400+20C 33 pF or over : Q≧500 16 pF to 18 pF of RH: Q≧500 C= Nominal capacitance [pF]	30 pF or under : Q≧400+20C 30 pF or over : Q≧1000	B: 75 pF to 390 pF: 1.5% max. 470 pF to 560 pF: 2.5% max	Rated voltage: 16 VDC F: 15.0% max. Rated voltage: 25 VDC B: 5.0% max. Rated voltage: 50 VDC B(X5R) : 1200pF~39000pF : 3.5% max. 47000pF~100000pF : 5.0% max. F(Y5V) : 10000pF~100000pF : 7.5% max. 220000pF~470000pF : 10.0% max. 1000000pF : 15.0% max.	Rated voltage: 16 VDC X: 2.5% max. Y: 2.5% max. Rated voltage: 25 VDC F: 7.5% max. Rated voltage: 50 VDC B: 2.5% max.	
8.Capacitance Change due to Temperature or Rate of Capacitance Change	(When voltage is not applied)	CH: 0±60 RH: -220±60 UJ: -750±120 SL: +350 to -1,000 [ppm/℃]	CH：0±60 [ppm/℃]	B: ±10%	Rated voltage: 16 VDC F: $^{+30}_{-85}$ % Rated voltage: 25 VDC B: ±10% Rated voltage: 50 VDC B:±10% (X5R:±15%) F: $^{+30}_{-85}$% (Y5V: $^{+22}_{-82}$ %)	Rated voltage: 16 VDC X: ±15% Y: ±22% Rated voltage: 25 VDC F: $^{+30}_{-85}$ % Rated voltage: 50 VDC B: ±10%	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/℃) $\frac{(C_{-25} - C_{20})}{C_{20} \times \triangle T} \times 10^6$ (ppm/℃) Change of maximum capacitance deviation in step 1 to 5 (Class 2,3) 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) Reference temperature for X5R and Y5V shall be +25℃

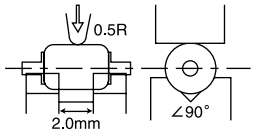
Withstanding voltage is also referred to as "voltage proof" under IEC specifications.

AXIAL LEADED CERAMIC CAPACITORS

Item		Specified Value					Test Methods and Remarks
		Temperature Compensating(Class 1)		High Permittivity(Class 2)		Semiconductor(Class 3)	
		Monolithic type	Multilayer Type	Monolithic type	Multilayer Type	Monolithic type	
9.Terminal Strength	Tensile	No abnormality such as cut lead, or looseness.					Apply the stated tensile force progressively in the direction to draw terminal. Nominal wire diameter [mm] / Tensile force [N] / Duration [s] 0.45 / 19.6 / 5
	Torsional	No abnormalities, 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] / Bending force [N] / Mass weight [kg] 0.45 / 2.45 / 0.25
10.Resistance to Vibration		Appearance: No significant abnormality Capacitance change: 1.8 pF or under : Within ±20% 2.2 pF to 8.2 pF: Within ±10% 10 pF or over : Within ± 5% Q : 30 pF or under : Q≧400+20C 33 pF or over : Q≧500 16 pF to 18 pF of RH: Q≧500 C= Nominal capacitance [pF] Insulation resistance: 10,000 MΩ min. Withstanding voltage: No abnormality	Appearance: No significant abnormality Capacitance change: Within ±5% Q : 30 pF or under : Q≧400+20C 30 pF or over : Q≧1000 Insulation resistance: 10,000 MΩ min. Withstanding voltage: No abnormality	Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 75 pF to 390 pF: 1.5% max. 470 pF to 560 pF: 2.5% max. Insulation resistance: 10,000 MΩ min. Withstanding voltage: No abnormality	Rated voltage: 16VDC Appearance: No significant abnormality Capacitance change: Within $^{+80}_{-20}$ % tan δ: 15.0% max. Insulation resistance: 250 MΩmin. Withstanding voltage: No abnormality Rated voltage: 25 VDC, Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 5.0% max. Insulation resistance: 1,000 MΩ min. Withstanding voltage: No abnormality Rated voltage: 50 VDC Appearance: No significant abnormality B(X5R) Capacitance change: Within±10 % tanδ: 1200pF~39000pF : 3.5%max. 47000pF~100000pF : 5.0%max. Insulation resistance: 1200pF~39000pF : 5000MΩmin. 47000pF~100000pF: 1000MΩmin. F(Y5V) Capacitance change: 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.	Rated voltage: 16 VDC Appearance: No significant abnormality Capacitance change : Within ±20%, Within ±30% tan δ: 2.5% max. Insulation resistance:1,000 MΩ min. Withstanding voltage: No abnormality Rated voltage: 25 VDC Appearance: No significant abnormality Capacitance change: Within $^{+80}_{-20}$ % tan δ: 7.5% max. Insulation resistance:1,000 MΩ min. Withstanding voltage: No abnormality Rated voltage: 50 VDC Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 2.5% max. Insulation resistance: 1,000 MΩ min. Withstanding voltage: No abnormality	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(1 min) Amplitude: 1.5 mm Mounting method: Soldering onto the PC board
11.Free Fall		Appearance: No significant abnormality Capacitance change: 1.8 pF or under : Within ±20% 2.2 pF to 8.2 pF: Within ±10% 10 pF or over : Within ± 5% Q: 30 pF or under : Q≧400+20C 33 pF or over : Q≧500 16 pF to 18 pF of RH: Q≧500 C= Nominal capacitance [pF] Insulation resistance: 10,000 MΩ min. Withstanding voltage: No abnormality	Appearance: No significant abnormality Capacitance change: Within ±5% Q: 30 pF or under : Q≧400+20C 30 pF or over : Q≧1000 Insulation resistance: 10,000 MΩ min. Withstanding voltage: No abnormality	Rated voltage: 50 VDC Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 75 pF to 390 pF: 1.5% max. 470 pF to 560 pF: 2.5% max. Insulation resistance: 10,000 MΩ min. Withstanding voltage: No abnormality	Rated voltage: 16 VDC Appearance: No significant abnormality Capacitance change: Within $^{+80}_{-20}$ % tan δ: 15.0% max. Insulation resistance: 250 MΩ min. Withstanding voltage: No abnormality Rated voltage: 25 VDC, Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 5.0% max. Insulation resistance: 1,000 MΩ min. Withstanding voltage: No abnormality Rated voltage: 50 VDC Appearance: No significant abnormality B(X5R) Capacitance change: Within±10 % tanδ: 1200pF~39000pF : 3.5%max. 47000pF~100000pF : 5.0%max. Insulation resistance: 1200pF~39000pF : 5000MΩmin. 47000pF~100000pF: 1000MΩmin. F(Y5V) Capacitance change: 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.	Rated voltage: 16 VDC Appearance: No significant abnormality Capacitance change: Within ±20%, Within ±30% tan δ: 2.5% max. Insulation resistance: 1000 MΩ min. Withstanding voltage: No abnormality Rated voltage: 25 VDC Appearance: No significant abnormality Capacitance change: Within $^{+80}_{-20}$ % tan δ: 7.5% max. Insulation resistance: 1,000 MΩ min. Withstanding voltage: No abnormality Rated voltage: 50 VDC Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 2.5% max. Insulation resistance: 1,000 MΩ min. Withstanding voltage: No abnormality	Drop Test: Free fall Impact material: Floor Height: 1 m Total number of drops: 5 times

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

AXIAL LEADED CERAMIC CAPACITORS

Item	Specified Value					Test Methods and Remarks
	Temperature Compensating(Class 1)		High Permittivity(Class 2)		Semiconductor (Class 3)	
	Monolithic type	Multilayer Type	Monolithic type	Multilayer Type	Monolithic type	
12.Body Strength	No abnormality such as damage					Applied force: 19.6N Duration: 5 sec. Speed: Shall attain to specified force in 2 sec. 
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.)
14.Soldering	Appearance: No significant abnormality Capacitance change: 1.0 pF to 4.7pF : Within ±0.25 pF 5.6 pF or over : Within ±5% Q: 30 pF or under : Q≧400+20C 33 pF or over : Q≧500 16 pF to 18 pF of RH: Q≧500 C= Nominal capacitance [pF] Insulation resistance: 10,000 MΩ min. Withstanding voltage: No abnormality	Appearance: No significant abnormality Capacitance change: Within ±2.5% Q : 30 pF or under : Q≧400+20C 30 pF or over : Q≧1000 Insulation resistance: 10,000 MΩ min. Withstanding voltage: No abnormality	Rated voltage: 50 VDC Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 75 pF to 390 pF: 1.5% max. 470 pF to 560 pF: 2.5% max. Insulation resistance: 10,000 MΩ min. Withstanding voltage: No abnormality	Rated voltage: 16 VDC Appearance: No significant abnormality Capacitance change: Within±20% tan δ: 15.0% max. Insulation resistance: 250 MΩ min. Withstanding voltage: No abnormality Rated voltage: 25 VDC, Appearance: No significant abnormality Capacitance change: Within±10% tan δ: 5.0% max. Insulation resistance: 1,000 MΩ min. Withstanding voltage: No abnormality Rated voltage: 50 VDC Appearance: No significant abnormality B(X5R) Capacitance change: 1200pF~39000pF : Within 7.5% 47000pF~100000pF : Within 10.0% tanδ : 1200pF~39000pF : 3.5%max. 47000pF~100000pF : 5.0%max. Insulation resistance: 1200pF~39000pF : 5000MΩmin. 47000pF~100000pF: 1000MΩmin. F(Y5V) Capacitance change: 10000pF~1000000pF: Within20.0% 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. Withstanding voltage: No abnormality	Rated voltage: 16 VDC Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 2.5% max. Insulation resistance: 1,000 MΩ min. Withstanding voltage: No abnormality Rated voltage: 25 VDC Appearance: No significant abnormality Capacitance change: Within ±30% tan δ: 7.5% max. Insulation resistance: 1,000 MΩ min. Withstanding voltage: No abnormality Rated voltage: 50 VDC Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 2.5% max. Insulation resistance: 1,000 MΩ min. Withstanding voltage: No abnormality	(Class 1, Class 2: Monolithic type, Class 3) Solder temperature: 350±10℃ Duration: 3 $^{+0.5}_{-1.0}$ sec. or Solder temperature: 260±5℃ Duration: 10±1 sec. Immersed conditions: Inserted into the PC board (with t=1.6mm, hole=1.0mm diameter) Recovery: 4 to 24 hrs of recovery under the standard condition after the test. (Class 2: Multilayer type) 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: 48±4 hrs of recovery under the standard condition after the test.
15.Resistance to Solvent	No 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 Capacitance change: 1.0 pF to 10 pF : Within ±0.5pF 11 pF or over : Within ±5% Q : Under 10 pF : Q≧200+10C 10 pF to 30 pF: Q≧275+2.5C 33 pF or over: Q≧250 16 pF to 18 pF of RH: Q≧250 C= Nominal capacitance [pF] Insulation resistance: 1,000 MΩ min. Withstanding voltage: No abnormality	Appearance: No significant abnormality Capacitance change: Within ±5% Q : 30 pF or under : Q≧275+2.5C 30 pF or over : Q≧350 Insulation resistance: 1,000 MΩ min. Withstanding voltage: No abnormality	Rated voltage: 50 VDC Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 75 pF to 390 pF: 2.5% max. 470 pF to 560 pF: 4% max. Insulation resistance: 1,000 MΩ min. Withstanding voltage: No abnormality	Rated voltage: 16 VDC Appearance: No significant abnormality Capacitance change: Within ±30% tan δ: 17.5% max. Insulation resistance: 50 MΩ min. Withstanding voltage: No abnormality Rated voltage: 25 VDC, Appearance: No significant abnormality Capacitance change: Within ±15% tan δ: 7.5% max. Insulation resistance: 500 MΩ min. Withstanding voltage: No abnormality Rated voltage: 50 VDC Appearance: No significant abnormality B(X5R) Capacitance change: 1200pF~39000pF : Within 12.5% 47000pF~100000pF : Within 15.0% tanδ : 1200pF~39000pF : 5.0%max. 47000pF~100000pF : 7.5%max. Insulation resistance: 1200pF~39000pF : 1000MΩmin. 47000pF~100000pF: 500MΩmin. F(Y5V) Capacitance change: 10000pF~1000000pF: Within30.0% 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. Withstanding voltage: No abnormality	Rated voltage: 16 VDC Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 4% max. Insulation resistance: 500 MΩ min. Withstanding voltage: No abnormality Rated voltage: 25 VDC Appearance: No significant abnormality Capacitance change: Within ±30% tan δ: 12.5% max. Insulation resistance: 500 MΩ min. Withstanding voltage: No abnormality Rated voltage: 50 VDC Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 4% max. Insulation resistance: 500 MΩ min. Withstanding voltage: No abnormality	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. (Class 2: Multilayer type) Recovery: 1 hr of recovery under the standard condition after the removal from test chamber. (Monolithic type) 48±4 hrs of recovery under the standard condition after the removal from test chamber. (Class 2: Multilayer type)

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
	Temperature Compensating(Class 1)		High Permittivity(Class 2)		Semiconductor (Class 3)	
	Monolithic type	Multilayer Type	Monolithic type	Multilayer Type	Monolithic type	
17.Damp Heat (steady state)	Appearance: No significant abnormality Capacitance change: 1.0 pF to 10 pF : Within ±0.5pF 11 pF or over : Within ± 5% Q: Under 10 pF : Q≧200+10C 10 pF to 30 pF: Q≧275+2.5C 33 pF or over : Q≧250 16 pF to 18 pF of RH: Q≧250 C= Nominal capacitance [pF] Insulation resistance: 1,000 MΩ min. Withstanding voltage: No abnormality	Appearance: No significant abnormality Capacitance change: Within ±5% Q : 30 pF or under : Q≧275+2.5C 30 pF or over : Q≧350 Insulation resistance: 1,000 MΩ min. Withstanding voltage: No abnormality	Rated voltage: 50 VDC Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 75 pF to 390 pF: 2.5% max. 470 pF to 560 pF: 4% max. Insulation resistance: 1,000 MΩ min. Withstanding voltage: No abnormality	Rated voltage: 16 VDC Appearance: No significant abnormality Capacitance change: Within ±30% tan δ: 17.5% max. Insulation resistance: 50 MΩ min. Withstanding voltage: No abnormality Rated voltage: 25 VDC, Rated voltage: 50 VDC Appearance: No significant abnormality B(X5R) Capacitance change: 1200pF~39000pF : Within 12.5% 47000pF~100000pF : Within 15.0% tanδ : 1200pF~39000pF : 5.0%max. 47000pF~100000pF : 7.5%max. Insulation resistance: 1200pF~39000pF : 1000MΩmin. 47000pF~100000pF: 500MΩmin. F(Y5V) Capacitance change: 10000pF~1000000pF: Within30.0% 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. Withstanding voltage: No abnormality	Rated voltage: 16 VDC Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 4% max. Insulation resistance: 500 MΩ min. Withstanding voltage: No abnormality Rated voltage: 25 VDC Appearance: No significant abnormality Capacitance change: Within ±30% tan δ: 12.5% max. Insulation resistance: 500 MΩ min. Withstanding voltage: No abnormality Rated voltage: 50 VDC Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 4% max. Insulation resistance: 500 MΩ min. Withstanding voltage: No abnormality	Temperature: 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. (Class 2: Multilayer type) Recovery: 1 hr of recovery under the standard condition after the removal from test chamber. (Monolithic type) 24±2 hrs of recovery under the standard condition after the removal from test chamber. (Class 1: Multilayer type) 48±4 hrs of recovery under the standard condition after the removal from test chamber. (Class 2: Multilayer type)
18.Loading under Damp Heat	Appearance: No significant abnormality Capacitance change: 1.0 pF to 10 pF : Within ±0.75pF 11 pF or over : Within ±7.5% Q: 30 pF or under: Q≧100+ $\frac{10}{3}$ C 33 pF or over : Q≧125 16 pF to 18 pF of RH: Q≧125 C= Nominal capacitance [pF] Insulation resistance: 500 MΩ min. Withstanding voltage: No abnormality	Appearance: No significant abnormality Capacitance change: Within ±7.5% Q : 30 pF or under : Q≧100+10/3・C 30 pF or over : Q≧200 Insulation resistance: 500 MΩ min. Withstanding voltage: No abnormality	Rated voltage: 50 VDC Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 75 pF to 390 pF: 2.5% max. 470 pF to 560 pF: 5% max. Insulation resistance: 500 MΩ min. Withstanding voltage: No abnormality	Rated voltage: 16 VDC Appearance: No significant abnormality Capacitance change: Within ±30% tan δ: 17.5% max. Insulation resistance: 25 MΩ min. Withstanding voltage: No abnormality Rated voltage: 25 VDC, Rated voltage: 50 VDC Appearance: No significant abnormality B(X5R) Capacitance change: 1200pF~39000pF : Within 12.5% 47000pF~100000pF : Within 15.0% tanδ : 1200pF~39000pF : 5.0%max. 47000pF~100000pF : 7.5%max. Insulation resistance: 1200pF~39000pF : 500MΩmin. 47000pF~100000pF: 250MΩmin. F(Y5V) Capacitance change: 10000pF~1000000pF: Within30.0% 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. Withstanding voltage: No abnormality	Rated voltage: 16 VDC Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 5% max. Insulation resistance: 250 MΩ min. Withstanding voltage: No abnormality Rated voltage: 25 VDC Appearance: No significant abnormality Capacitance change: Within ±30% tan δ: 12.5% max. Insulation resistance: 250 MΩ min. Withstanding voltage: No abnormality Rated voltage: 50 VDC Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 5% max. Insulation resistance: 250 MΩ min. Withstanding voltage: No abnormality	Temperature: 40±2℃ Humidity: 90 to 95 % RH Duration: 500 $^{+24}_{0}$ hrs Applied voltage: Rated voltage Preconditioning: Voltage treatment (Class 2: Multilayer type) Recovery: 1 hr of recovery under the standard condition after the removal from test chamber. (Class 1, Class 2: Monolithic type) 24±2 hrs of recovery under the standard condition after the removal from test chamber. (Class 1: Multilayer type) 48±4 hrs of recovery under the standard condition after the removal from test chamber. (Class 2: Multilayer type) 30 min. of conditioning at 150±3℃ followed by 1 hr of recovery under the standard conditon after the removal from test chamber. (Class 3)

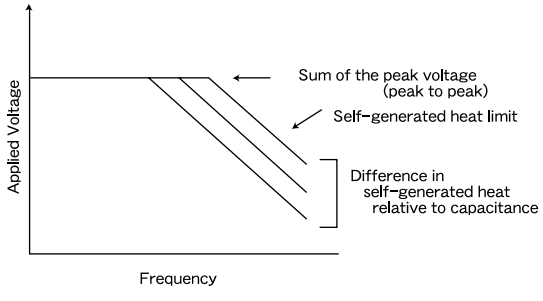
Withstanding voltage is also referred to as "voltage proof" under IEC specifications.

AXIAL LEADED CERAMIC CAPACITORS

Item	Specified Value					Test Methods and Remarks
	Temperature Compensating(Class 1)		High Permittivity(Class 2)		Semiconductor (Class 3)	
	Monolithic type	Multilayer Type	Monolithic type	Multilayer Type	Monolithic type	
19. High Temperature Loading Test	Appearance: No significant abnormality Capacitance change: 1.0 pF to 10 pF : Within ±0.3pF 11 pF or over : Within ± 3% Q: Under 10 pF : Q≧200+10C 10 pF to 30 pF : Q≧275+2.5C 33 pF or over : Q≧250 16 pF to 18 pF of RH: Q≧250 C= Nominal capacitance [pF] Insulation resistance: 1,000 MΩ min. Withstanding voltage: No abnormality	Appearance: No significant abnormality Capacitance change: Within ± 3% Q : 30 pF or under : Q≧275+2.5C 30 pF or over : Q≧350 Insulation resistance: 1,000 MΩ min. Withstanding voltage: No abnormality	Rated voltage: 50 VDC Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 75 pF to 390 pF: 2.5% max. 470 pF to 560 pF: 4% max. Insulation resistance: 1,000 MΩ min. Withstanding voltage: No abnormality	Rated voltage: 16 VDC Appearance: No significant abnormality Capacitance change: Within ±30% tan δ: 17.5% max. Insulation resistance: 50 MΩ min. Withstanding voltage: No abnormality Rated voltage: 25 VDC, Rated voltage: 50 VDC Appearance: No significant abnormality B(X5R) Capacitance change: 1200pF~39000pF : Within 12.5% 47000pF~100000pF : Within 15.0% tanδ : 1200pF~39000pF : 5.0%max. 47000pF~100000pF : 7.5%max. Insulation resistance: 1200pF~39000pF : 1000MΩmin. 47000pF~100000pF: 500MΩmin. F(Y5V) Capacitance change: 10000pF~1000000pF: Within30.0% 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. Withstanding voltage: No abnormality	Rated voltage: 16 VDC Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 4% max. Insulation resistance: 500MΩ min. Withstanding voltage: No abnormality Rated voltage: 25 VDC Appearance: No significant abnormality Capacitance change: Within ±30% tan δ: 10% max. Insulation resistance: 500MΩ min. Withstanding voltage: No abnormality Rated voltage: 50 VDC Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 4% max. Insulation resistance: 500 MΩ min. Withstanding voltage: No abnormality	Temperature: 85 $^{+3}_{-0}$℃ Duration: 1000 $^{+48}_{-0}$ hrs Applied voltage: Rated voltage×2 (Class 1) (Class 2) Rated voltage×1.5 (Class 3: B, F) Rated voltage×1.125 (Class 3: X, Y) Preconditioning: Voltage treatment (Class 2: Multilayer type) Recovery: 1 hr of recovery under the standard condition after the removal from test chamber. (Class 1, Class 2: Monolithic type) 24±2hrs of recovery under the standard condition after the removal from test chamber. (Class1:Multilayer type) 48±4 hrs of recovery under the standard condition after the removal from test chamber. (Class 2: Multilayer type) As for Class2:Multilayer type B:47000pF~100000pF F:220000pF~1000000pF 1hr of conditioning at 150 $^{+0}_{-10}$℃ followed by 48±4 Hr of recovery under the standard condition after the removal from test chamber. 30 min. of conditioning at 150±3℃ followed by 1 hr of recovery under the standard condition after the removal from test chamber. (Class 3)

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.	

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.	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.
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.