大容量積層セラミックコンデンサ
HIGH VALUE MULTILAYER CERAMIC CAPACITORS

	code	Temp.characteristics	operating Temp. range
OPERATING TEMP.	BJ	B	−25～+85℃
		X7R	−55～+125℃
		X5R	−55～+85℃
	C	C	−25～+85℃
		X5S	−55～+85℃
		X6S	−55～+105℃
	E	E	−25～+85℃
		Y5U	−30～+85℃
	F	F	−25～+85℃
		Y5V	−30～+85℃

フロー／WAVE　　リフロー／REFLOW

特長　FEATURES

・電極にNi金属を使用し、端子電極部にメッキをしてあることにより、はんだ付け性および耐熱性にすぐれ、マイグレーションもほとんど発生せず、高い信頼性を示します
・等価直列抵抗(ESR)が小さく、ノイズ吸収性にすぐれています。特にタンタルおよびアルミ電解コンデンサに比較した場合
・高い許容リップル電流値
・高い定格電圧でありながら小型形状
・絶縁抵抗、破壊電圧が高く信頼性にすぐれる
等の特徴があります

・The use of Nickel(Ni) as material for both the internal and external electrodes improves the solderability and heat resistance characteristics. This almost completely eliminates migration and raises the level of reliability significantly.
・Low equivalent series resistance(ESR) provides excellent noise absorption characteristics.
・Compared to tantalum or aluminum electrolytic capacitors these ceramic capacitors offer a number of excellent features, including:
Higher permissible ripple current values
Smaller case sizes relative to rated voltage
Improved reliability due to higher insulation resistance and breakdown voltage.

用途　APPLICATIONS

・デジタル回路全般
・電源バイパスコンデンサ
液晶モジュール用
液晶駆動電圧ライン用
電源電圧の高いLSI、IC、OPアンプ用
・平滑コンデンサ
DC-DCコンバータ(入力、出力側用)
スイッチング電源(2次側用)

・General digital circuit
・Power supply bypass capacitors
Liquid crystal modules
Liquid crystal drive voltage lines
LS I, I C, converters(both for input and output)
・Smoothing capacitors
DC-DC converters (both for input and output)
Switching power supplies (secondary side)

形名表記法　ORDERING CODE

1 定格電圧 (VDC)

A	4
J	6.3
L	10
E	16
T	25
G	35
U	50

2 シリーズ名

M	積層コンデンサ

3 端子電極

K	メッキ品

4 形状寸法 (EIA)L×W(mm)

107(0603)	1.6×0.8
212(0805)	2.0×1.25
316(1206)	3.2×1.6
325(1210)	3.2×2.5
432(1812)	4.5×3.2

5 温度特性 (%)

△F	± 30/80
△C	±20
△E	± 20/55
B J	±10

△= スペース

6 公称静電容量 (pF)

例	
473	47,000
105	1,000,000

7 容量許容差

K	±10	%
M	±20	%
Z	± 80/20	%

8 製品厚み (mm)

A	0.8
D	0.85
F	1.15
G	1.25
H	1.5
L	1.6
N	1.9
Y	2.0max
M	2.5
U	3.2

9 個別仕様

–	標準

10 包装

B	単品 (袋づめ)
T	リールテーピング

11 当社管理記号

△	標準品

△= スペース

J M K 3 1 6 B J 1 0 6 M L – T ○
1 2 3 4 5 6 7 8 9 10 11

1 Rated voltage(VDC)

A	4
J	6.3
L	10
E	16
T	25
G	35
U	50

2 Series name

M	Multilayer Ceramic Capacitors

3 End termination

K	Plated

4 Dimensions(case size)(mm)

107(0603)	1.6×0.8
212(0805)	2.0×1.25
316(1206)	3.2×1.6
325(1210)	3.2×2.5
432(1812)	4.5×3.2

5 Temperature characteristics code

△F	Y5V	−30～+85℃ +22／−82%
B J	X7R	−55～+125℃ ±15%
B J	X5R	−55～+85℃ ±15%
△C	X5S	−55～+85℃ ±22%
△C	X6S	−55～+105℃ ±22%
△E	Y5U	−30～+85℃ +22% / −56%

△=Blank space

6 Nominal capacitance(pF)

example	
473	47,000
105	1,000,000

7 Capacitance tolerances(%)

K	±10
M	±20
Z	± 80/20

8 Thickness(mm)

A	0.8
D	0.85
F	1.15
G	1.25
H	1.5
L	1.6
N	1.9
Y	2.0max
M	2.5
U	3.2

9 Special code

–	Standard products

10 Packaging

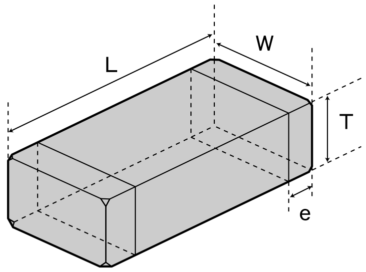
B	Bulk
T	Tape & reel

11 Internal code

△	Standard products

△=Blank space

外形寸法　EXTERNAL DIMENSIONS



Type (EIA)	L	W	T		e
□MK107 (0603)	1.6±0.10 (0.063±0.004)	0.8±0.10 (0.031±0.004)	0.45±0.05 (0.018±0.002)	K	0.35±0.25 (0.014±0.010)
			0.8±0.10 (0.031±0.004)	A	
□MK212 (0805)	2.0±0.10 (0.079±0.004)	1.25±0.10 (0.049±0.004)	0.45±0.05 (0.018±0.002)	K	0.5±0.25 (0.02±0.010)
			0.85±0.10 (0.033±0.004)	D	
			1.25±0.10 *1 (0.049±0.004)	G	
□MK316 (1206)	3.2±0.15 (0.126±0.006)	1.6±0.15 (0.063±0.006)	0.85±0.10 (0.033±0.004)	D	$0.5^{+0.35}_{-0.25}$ ($0.020^{+0.014}_{-0.010}$)
			1.15±0.10 (0.045±0.004)	F	
			1.25±0.10 (0.049±0.004)	G	
			1.6±0.20 (0.063±0.008)	L	
□MK325 (1210)	3.2±0.30 (0.126±0.012)	2.5±0.20 (0.098±0.008)	0.85±0.10 (0.033±0.004)	D	0.6±0.3 (0.024±0.012)
			1.15±0.10 (0.045±0.004)	F	
			1.5±0.10 (0.059±0.004)	H	
			1.9±0.20 (0.075±0.008)	N	
			$1.9^{+0.1}_{-0.2}$ ($0.075^{+0.004}_{-0.008}$)	Y	
			2.5±0.20 (0.098±0.008)	M	
□MK432 (1812)	4.5±0.40 (0.177±0.016)	3.2±0.30 (0.126±0.012)	$1.9^{+0.1}_{-0.2}$ ($0.075^{+0.004}_{-0.008}$)	Y	0.9±0.6 (0.035±0.024)
			2.5±0.20 (0.098±0.008)	M	
			3.2±0.30 (0.125±0.012)	U	

注：＊1. ±0.15mm公差あり
Note: ＊1. Including dimension tolerance ±0.15mm (±0.006inch).

Unit：mm (inch)

概略バリエーション　AVAILABLE CAPACITANCE RANGE

■汎用積層セラミックコンデンサ　General Multilayer Ceramic Capacitors

Cap	Type	107											212														316													325																432					
	TC	B/X7R		B/X5R					C/X5S	F/Y5V			B/X7R					B/X5R				C/X5S	F/Y5V				B/X7R						B/X5R		C/X5S	F/Y5V				B/X7R				B/X5R					E/Y5U	F/Y5V						B/X5R			C/X6S	F/Y5V	
	VDC	25	16	35	25	16	10	6.3	25	16	10	6.3	50	35	25	16	10	50	35	16	6.3	10	50	16	10	6.3	50	35	25	16	10	6.3	16	6.3	25	50	35	16	10	50	25	16	10	35	25	16	10	6.3	6.3	50	35	16	10	6.3	25	16	10	6.3	6.3	10	6.3
μF	3[digits]																																																												
0.022	223	A											D																																																
0.033	333		A	A									D																																																
0.047	473		A	A									G		D																																													
0.068	683		A		A								G		D																																													
0.1	104		A		A								G																																															
0.15	154					A							G														F		D																																
0.22	224					A				A								G					D				L		F																																
0.33	334						A							G															F																																
0.47	474						A			A									G				G				L																																		
0.68	684						A									G												L	L	F																															
1	105						A		A		A						G			G			G					L		F										H	D																				
1.5	155																																																												
2.2	225							A				A												G						L						G					H			N																	
3.3	335																														L.F		L								N																				
4.7	475																				G				G						L		L				G					N	F		N					H											
6.8	685																																	F																											
10	106																				G	G				G						L		L	L			L	L.F				N		M	N					H	F			M						
22	226																																	L					L							M	M	M					N.F			M	M				
47	476																																															M						N				M		M	
100	107																																																M					M				U	M		M

■低背積層セラミックコンデンサ　Low profile Multilayer Ceramic Capacitors

Cap	Type	107		212							316						325			432
	TC	B/X5R	F/Y5V	B/X7R		B/X5R			F/Y5V		B/X7R	B/X5R			F/Y5V		B/X7R	B/X5R		C/X6S
	VDC	6.3	6.3	16	10	16	10	6.3	10	6.3	10	16	10	6.3	10	6.3	25	10	6.3	6.3
μF	3[digits]																			
0.22	224						K													
0.33	334																			
0.47	474	K		D																
0.68	684			D																
1	105		K		D	D		K									D			
1.5	155					D														
2.2	225								D		D	D								
3.3	335												D					D		
4.7	475							D		D			D		D					
6.8	685																		D	
10	106													D		D			D	
22	226																		Y	
47	476																			
100	107																			Y

温度特性記号 Temp. char.Code	温度特性 Temperature characteristics					静電容量許容差[%] Capacitance tolerance	tanδ[%] Dissipation factor
	準拠規格 Applicable standard		温度範囲[℃] Temperature range	基準温度[℃] Ref. Temp.	静電容量変化率[%] Capacitance change		
BJ	JIS	B	−25～85	20	±10	±20(M) ±10(K)	2.5%max.**
	EIA	X7R*	−55～125	25	±15		
C	JIS	C	−25～85	20	±20		7.0%max.***
	EIA	X5S	−55～85	25	±22		
	EIA	X6S	−55～105	25	±22		
E	JIS	E	−25～85	20	+20−55	$^{+80}_{-20}$(Z)	7.0%max.****
	EIA	Y5U	−30～85	25	+22−56		
F	JIS	F	−25～85	20	+30−80		
	EIA	Y5V	−30～85	25	+22−82		

* ： Some exceptions apply, Refer to the available capacitance range table for the parts which are only available in X5R.*

** ： 3.5%max LMKtype 107type(C≦0.47μF)/212type(C≦1.0μF)/316type/325type/432type
EMKtype 107type/汎用212type/316type/325type/432type
TMKtype 107type(C<0.022μF)/316type(C>0.47μF)/325type(C<1.0μF)/432type
GMKtype 212type/316type/325type
UMKtype 212type(C>0.1μF)/316type(C≧0.47μF)/325type
5.0%max JMKtype 107type(C≦1.0μF)/汎用212type(C≦0.47μF)/低背212type(C≦1.0μF)
316type(C≦10μF)/325type(C≦22μF)/432type(C≦47μF)
LMKtype 107type(C>0.47μF)/212type(C≧2.2μF)
7.5%max JMKtype 低背212type(C≧4.7μF)
10%max JMKtype 107type(C>1.0μF)/212type(C>4.7μF)/316type(C>10μF)/
325type(C>22μF)/432type(C>47μF)

*** ： 10%max 107type/212type/316type

**** ： 9.0%max：LMKtype；212type, 汎用316type (C=10μF), 低背316type (C=4.7μF)
UMKtype；325type
16%max：JMKtype；107／212／316／325／432type
LMKtype；107／325／432, 汎用316type (C>10μF)

セレクションガイド Selection Guide ◀ P.8 etc
アイテム一覧 Part Numbers P.40 ▶
特性図 Electrical Characteristics P.44 ▶
梱包 Packaging P.78 ▶
信頼性 Reliability Data P.80 ▶
使用上の注意 Precautions P.86 ▶

アイテム一覧　PART NUMBERS

■107TYPE

定格電圧 RatedVoltage	形名 Ordering code		公称静電容量 Capacitance [μF]	温度特性 Temperature characteristics	tanδ Dissipation factor [%]Max.	実装条件 Soldering method R:リフロー Reflow soldering W:フロー Wave soldering	静電容量許容差 Capacitance tolerance	厚み Thickness [mm] (inch)
35V	GMK107BJ333□A		0.033	B/X5R	3.5	R/W	±10% ±20%	0.8±0.1
	GMK107BJ473□A		0.047	B/X5R	3.5			0.8±0.1
25V	TMK107BJ223□A		0.022	B/X7R	2.5			0.8±0.1
	TMK107BJ683□A		0.068	B/X5R	3.5			0.8±0.1
	TMK107BJ104□A		0.1	B/X5R	3.5			0.8±0.1
16V	EMK107BJ333□A		0.033	B/X7R	3.5			0.8±0.1
	EMK107BJ473□A		0.047	B/X7R	3.5			0.8±0.1
	EMK107BJ683□A		0.068	B/X7R	3.5			0.8±0.1
	EMK107BJ104□A		0.1	B/X7R	3.5			0.8±0.1
	EMK107BJ154□A		0.15	B/X5R	3.5			0.8±0.1
	EMK107BJ224□A		0.22	B/X5R	3.5			0.8±0.1
10V	LMK107BJ334□A		0.33	B/X5R	3.5			0.8±0.1
	LMK107BJ474□A		0.47	B/X5R	3.5	R		0.8±0.1
	LMK107BJ684□A		0.68	B/X5R	5			0.8±0.1
	LMK107BJ105□A		1	B/X5R	5			0.8±0.1
6.3V	JMK107BJ474□K		0.47	B/X5R	5			0.45±0.05
	JMK107BJ225□A*		2.2	B/X5R	10			0.8±0.1
4V	AMK107BJ475MA*		4.7	B/X5R	10			0.8±0.1
25V	TMK107C105□A		1	C/X5S	10	R	±20%	0.8±0.1
16V	EMK107F224ZA		0.22	F/Y5V	7	R/W	+80% −20%	0.8±0.1
	EMK107F474ZA		0.47	F/Y5V	7			0.8±0.1
10V	LMK107F105ZA		1	F/Y5V	16	R		0.8±0.1
6.3V	JMK107F105ZK		1	F/Y5V	16			0.45±0.05
	JMK107F225ZA		2.2	F/Y5V	16			0.8±0.1

■212TYPE

定格電圧 RatedVoltage	形名 Ordering code		公称静電容量 Capacitance [μF]	温度特性 Temperature characteristics	tanδ Dissipation factor [%]Max.	実装条件 Soldering method R:リフロー Reflow soldering W:フロー Wave soldering	静電容量許容差 Capacitance tolerance	厚み Thickness [mm] (inch)
50V	UMK212BJ223□D		0.022	B/X7R	2.5	R/W	±10% ±20%	0.85±0.1
	UMK212BJ333□D		0.033	B/X7R	2.5			0.85±0.1
	UMK212BJ473□G		0.047	B/X7R	2.5			1.25±0.1
	UMK212BJ683□G		0.068	B/X7R	2.5			1.25±0.1
	UMK212BJ104□G		0.1	B/X7R	2.5			1.25±0.1
	UMK212BJ154□G		0.15	B/X7R	3.5			1.25±0.1
	UMK212BJ224□G		0.22	B/X5R	3.5			1.25±0.1
35V	GMK212BJ334□G		0.33	B/X7R	3.5			1.25±0.1
	GMK212BJ474□G		0.47	B/X5R	3.5			1.25±0.1
25V	TMK212BJ473□D		0.047	B/X7R	2.5			0.85±0.1
	TMK212BJ683□D		0.068	B/X7R	2.5			0.85±0.1
16V	EMK212BJ474□D		0.47	B/X7R	3.5			0.85±0.1
	EMK212BJ684□D		0.68	B/X7R	3.5			0.85±0.1
	EMK212BJ684□G		0.68	B/X7R	3.5			1.25±0.1
	EMK212BJ105□G		1	B/X5R	3.5			1.25±0.1
	EMK212BJ105□D		1	B/X5R	5	R		0.85±0.1
	EMK212BJ155□D		1.5	B/X5R	5			0.85±0.1
10V	LMK212BJ224□K		0.22	B/X5R	3.5			0.45±0.05
	LMK212BJ105□D		1	B/X7R	3.5			0.85±0.1
	LMK212BJ105□G		1	B/X7R	3.5	R/W		1.25±0.1
	LMK212BJ225□G		2.2	B/X5R	5	R		1.25±0.1
	LMK212BJ335□G		3.3	B/X5R	5			1.25±0.15
6.3V	JMK212BJ105□K		1	B/X5R	5			0.45±0.05
	JMK212BJ475□D		4.7	B/X5R	10			0.85±0.1
	JMK212BJ475□G		4.7	B/X5R	5			1.25±0.15
	JMK212BJ106□G*		10	B/X5R	10			1.25±0.15
10V	LMK212C106□G*		10	C/X5S	10			1.25±0.15
50V	UMK212F224ZD		0.22	F/Y5V	7	R/W	+80% −20%	0.85±0.1
	UMK212F474ZG		0.47	F/Y5V	7			1.25±0.1
	UMK212F105ZG		1	F/Y5V	7			1.25±0.1
16V	EMK212F225ZG		2.2	F/Y5V	7			1.25±0.1
10V	LMK212F225ZG		2.2	F/Y5V	9	R		1.25±0.1
	LMK212F475ZG		4.7	F/Y5V	9			1.25±0.1
	LMK212F106ZG		10	F/Y5V	16			1.25±0.1
6.3V	JMK212F475ZD		4.7	F/Y5V	16			0.85±0.1

■316TYPE

定格電圧 RatedVoltage	形名 Ordering code		公称静電容量 Capacitance [μF]	温度特性 Temperature characteristics	tanδ Dissipation factor [%]Max.	実装条件 Soldering method R:リフロー Reflow soldering W:フロー Wave soldering	静電容量許容差 Capacitance tolerance	厚み Thickness [mm] (inch)
50V	UMK316BJ154□F		0.15	B/X7R	2.5	R/W	±10% ±20%	1.15±0.1
	UMK316BJ224□L		0.22	B/X7R	2.5			1.6±0.2
	UMK316BJ474□L		0.47	B/X7R	3.5			1.6±0.2
35V	GMK316BJ684□L		0.68	B/X7R	3.5			1.6±0.2
	GMK316BJ105□L		1	B/X7R	3.5			1.6±0.2
25V	TMK316BJ154□D		0.15	B/X7R	2.5			0.85±0.1
	TMK316BJ224□F		0.22	B/X7R	2.5			1.15±0.1
	TMK316BJ334□F		0.33	B/X7R	2.5			1.15±0.1
	TMK316BJ684□L		0.68	B/X7R	3.5			1.6±0.2
16V	EMK316BJ155□D		1.5	B/X5R	3.5	R		0.85±0.1
	EMK316BJ225□D		2.2	B/X5R	3.5			0.85±0.1
	EMK316BJ684□F		0.68	B/X7R	3.5	R/W		1.15±0.1
	EMK316BJ105□F		1	B/X7R	3.5			1.15±0.1
	EMK316BJ225□L		2.2	B/X7R	3.5			1.6±0.2
	EMK316BJ335□L		3.3	B/X5R	3.5	R		1.6±0.2
	EMK316BJ475□L		4.7	B/X5R	3.5			1.6±0.2
10V	LMK316BJ335□D		3.3	B/X5R	5			0.85±0.1
	LMK316BJ335□L		3.3	B/X7R	3.5			1.6±0.2
	LMK316BJ475□L		4.7	B/X7R	3.5			1.6±0.2
6.3V	JMK316BJ106□D*		10	B/X5R	10			0.85±0.1
	JMK316BJ106□L		10	B/X7R	5			1.6±0.2
	JMK316BJ226□L*		22	B/X5R	10			1.6±0.2
25V	TMK316C106□L		10	C/X5S	10			1.6±0.2
50V	UMK316F225ZG		2.2	F/Y5V	7	R/W	+80% −20%	1.25±0.1
35V	GMK316F475ZG		4.7	F/Y5V	7	R		1.25±0.1
16V	EMK316F106ZL		10	F/Y5V	9			1.6±0.2
10V	LMK316F475ZD		4.7	F/Y5V	9			0.85±0.1
	LMK316F106ZF		10	F/Y5V	16			1.15±0.1
	LMK316F226ZL		22	F/Y5V	16			1.6±0.2
6.3V	JMK316F106ZD		10	F/Y5V	16			0.85±0.1

アイテム一覧　PART NUMBERS

■325TYPE

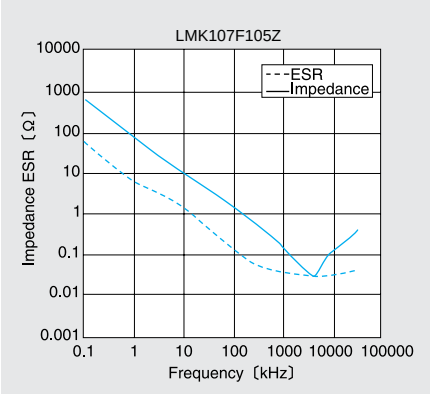
定格電圧 RatedVoltage	形名 Ordering code		公称静電容量 Capacitance [μF]	温度特性 Temperature characteristics	tanδ Dissipation factor [%]Max.	実装条件 Soldering method R:リフロー Reflow soldering W:フロー Wave soldering	静電容量許容差 Capacitance tolerance	厚み Thickness [mm] (inch)
50V	UMK325BJ105□H		1	B/X7R	3.5	R/W	±10%±20%	1.5±0.1
35V	GMK325BJ225MN		2.2	B/X5R	3.5	R	±20%	1.9±0.2
25V	TMK325BJ105MD		1	B/X7R	3.5			0.85±0.1
	TMK325BJ225MH		2.2	B/X7R	3.5			1.5±0.1
	TMK325BJ335MN		3.3	B/X7R	3.5			1.9±0.2
	TMK325BJ475MN		4.7	B/X5R	3.5			1.9±0.2
	TMK325BJ106MM*		10	B/X5R	3.5			2.5±0.2
16V	EMK325BJ475MN		4.7	B/X7R	3.5			1.9±0.2
	EMK325BJ106MN		10	B/X5R	3.5			1.9±0.2
	EMK325BJ226MM*		22	B/X5R	5			2.5±0.2
10V	LMK325BJ335MD		3.3	B/X5R	3.5			0.85±0.1
	LMK325BJ106MN		10	B/X7R	3.5			1.9±0.2
	LMK325BJ226MM		22	B/X5R	5			2.5±0.2
	LMK325BJ475MD		4.7	B/X5R	5			0.85±0.1
6.3V	JMK325BJ685MD		6.8	B/X5R	5			0.85±0.1
	JMK325BJ106MD		10	B/X5R	5			0.85±0.1
	JMK325BJ226MY		22	B/X5R	5			1.9+0.1／−0.2
	JMK325BJ226MM		22	B/X5R	5			2.5±0.2
	JMK325BJ476MM*		47	B/X5R	10			2.5±0.2
	JMK325E107ZM*		100	E/Y5U	16	R	+80% −20%	2.5±0.2
50V	UMK325F475ZH		4.7	F/Y5V	9			1.5±0.1
35V	GMK325F106ZH		10	F/Y5V	7			1.5±0.1
10V	LMK325F226ZN		22	F/Y5V	16			1.9±0.2
6.3V	JMK325F476ZN		47	F/Y5V	16			1.9±0.2
	JMK325F107ZM*		100	F/Y5V	16			2.5±0.2

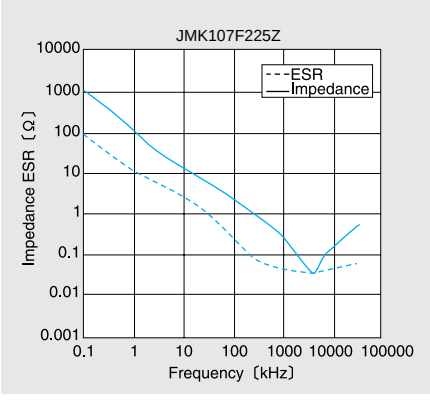
■432TYPE

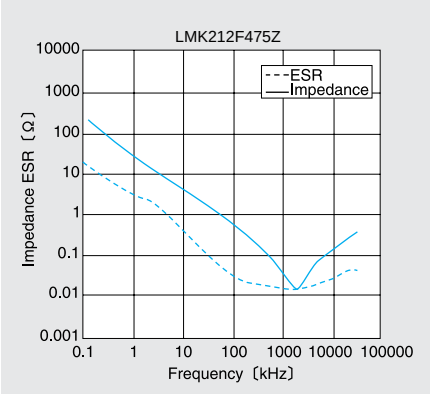
定格電圧 RatedVoltage	形名 Ordering code		公称静電容量 Capacitance [μF]	温度特性 Temperature characteristics	tanδ Dissipation factor [%]Max.	実装条件 Soldering method R:リフロー Reflow soldering W:フロー Wave soldering	静電容量許容差 Capacitance tolerance	厚み Thickness [mm] (inch)
25V	TMK432BJ106MM		10	B/X5R	3.5	R	±20%	2.5±0.2
16V	EMK432BJ226MM*		22	B/X5R	3.5			2.5±0.2
10V	LMK432BJ226MM		22	B/X5R	3.5			2.5±0.2
6.3V	JMK432BJ476MM*		47	B/X5R	5			2.5±0.2
	JMK432BJ107MU*		100	B/X5R	10			3.2±0.3
	JMK432C107MM*		100	C/X6S	10			2.5±0.2
	JMK432C107MY*		100	C/X5S	10			1.9+0.1／−0.2
10V	LMK432F476ZM*		47	F/Y5V	16	R	+80% −20%	2.5±0.2
6.3V	JMK432F107ZM*		100	F/Y5V	16			2.5±0.2

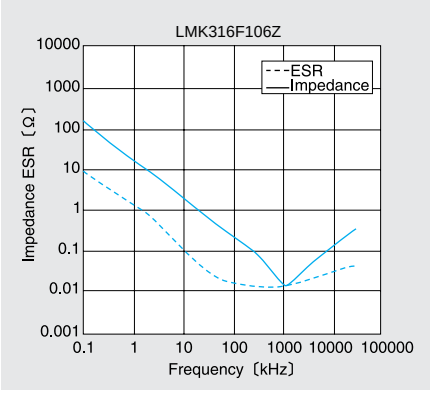
形名の□には静電容量許容差記号が入ります。　□ Please specify the capacitance tolerance code.
*高温負荷試験の試験電圧は定格電圧の1.5倍　* Test Voltage of Loading at high temperature test is 1.5 time of the rated voltage.

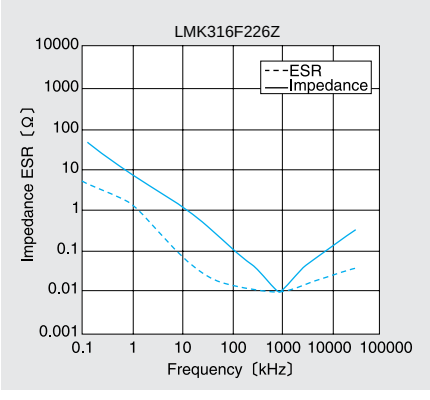
インピーダンス・ESR–周波数特性例　Example of Impedance ESR vs. Frequency characteristics
・当社積層セラミックコンデンサ例　(Taiyo Yuden multilayer ceramic capacitor)

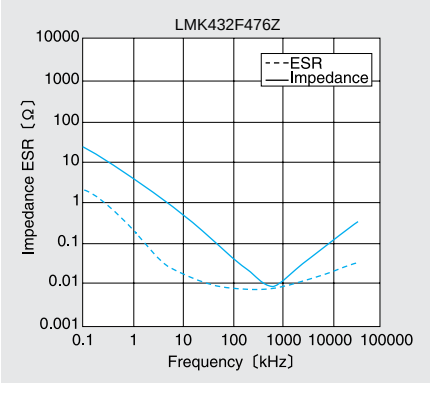


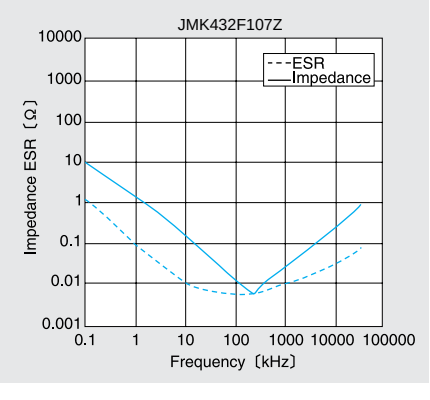


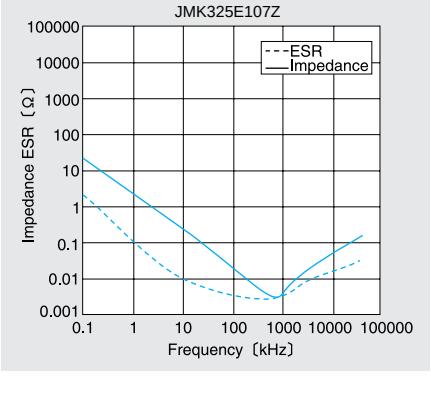




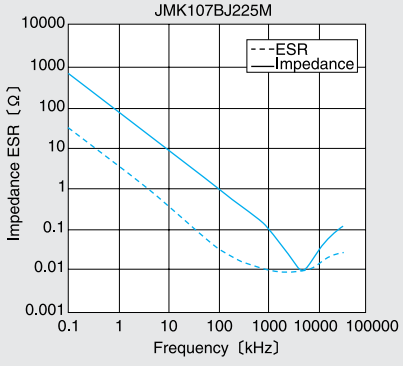








JMK107BJ225M



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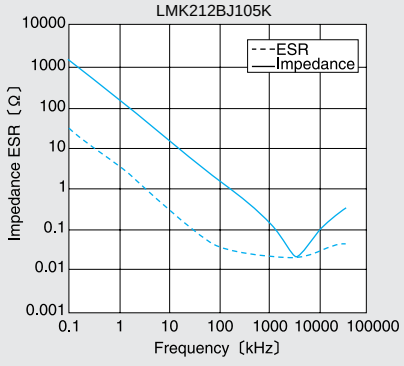
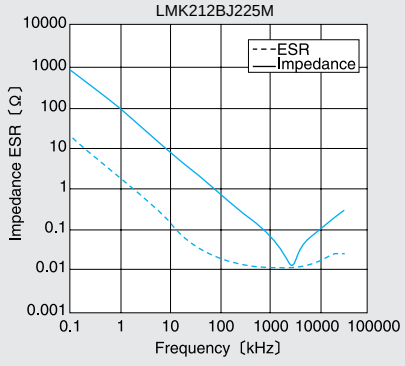


LMK212BJ225M



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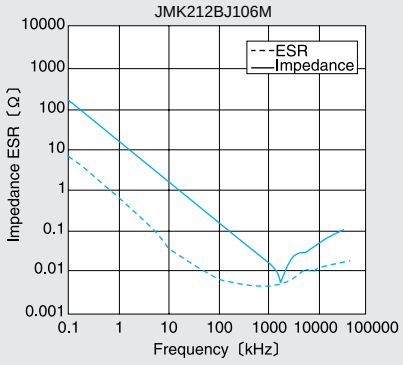
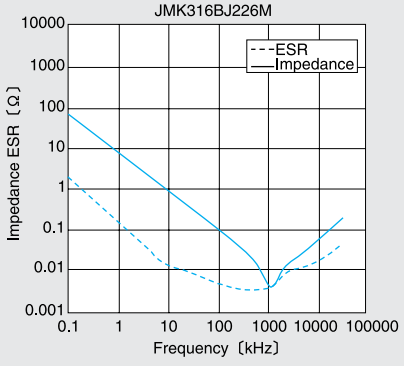
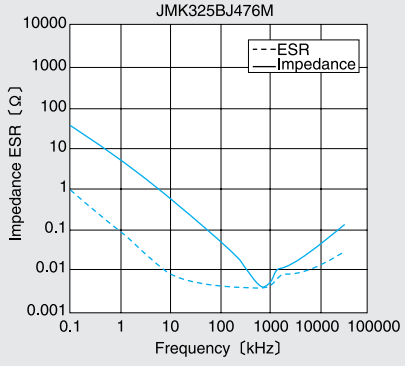


JMK316BJ226M



JMK325BJ476M



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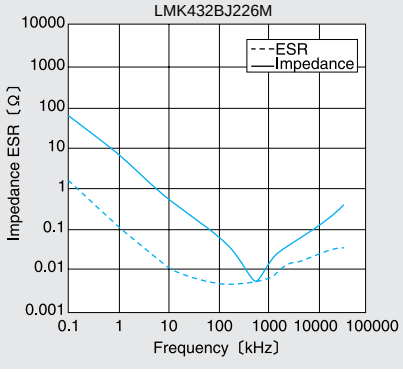
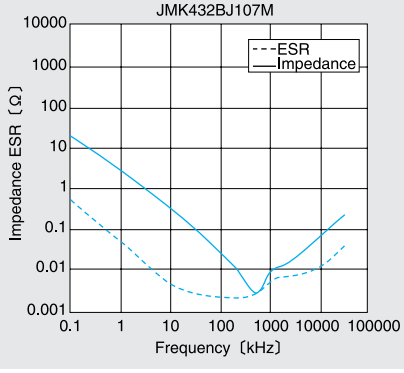
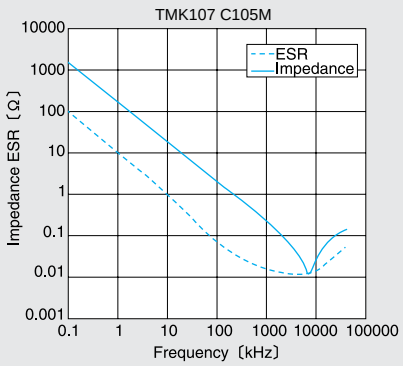


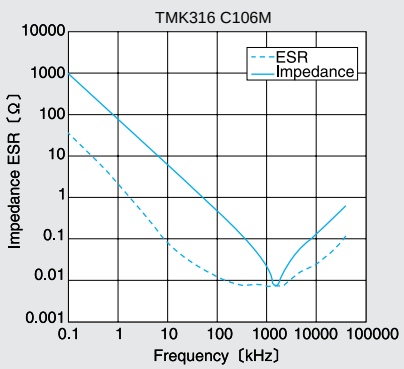
JMK432BJ107M



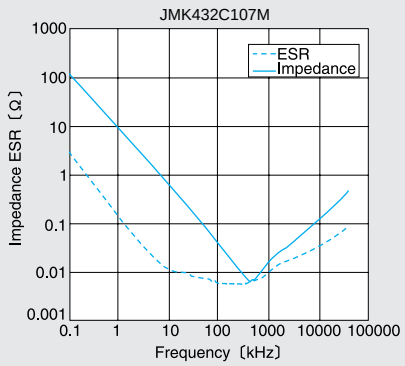
TMK107 C105M



TMK316 C106M



JMK432C107M



一般積層セラミックコンデンサ
（温度補償用・Class 1）
STANDARD MULTILAYER CERAMIC CAPACITORS (CLASS1 : TEMPERATURE COMPENSATING DIELECTRIC TYPE)

OPERATING TEMP.	−55～+125℃

フロー／WAVE　リフロー／REFLOW

特長　FEATURES

・実装密度の向上が図れます
・モノリシックの構造のため、信頼性が高い
・同一形状、静電容量範囲が広い

・Improve Higher Mounting Densities.
・Multilayer block structure provides higher reliability
・A wide range of capacitance values available in standard case sizes.

用途　APPLICATIONS

・一般電子機器用
・通信機器用（携帯電話、PHS、コードレス電話 etc.）

・General electronic equipment
・Communication equipment (portable telephones, PHS, other wireless applications, etc.)

形名表記法　ORDERING CODE

1 定格電圧〔VDC〕

E	16
T	25
U	50

2 シリーズ名

M	積層コンデンサ

3 端子電極

K	メッキ品

4 形状寸法(EIA)L×W〔mm〕

063(0201)	0.6×0.3
105(0402)	1.0×0.5
107(0603)	1.6×0.8

5 温度特性〔ppm/℃〕

C□	0：CG、CH、CJ、CK		
P□	−150：PH、PJ、PK		
R□	−220：RH、RJ、RK		
S□	−330：SH、SJ、SK	G	± 30
T□	−470：TH、TJ、TK	H	± 60
U□	−750：UJ、UK	J	±120
S L	+350～−1000	K	±250

□= 許容差

6 公称静電容量〔pF〕

例	
0R5	0.5
010	1
100	10

※R= 小数点

7 容量許容差

C	± 0.25 pF
D	± 0.5 pF
F	± 1 pF
J	± 5 %
K	± 10 %

8 製品厚み〔mm〕

P	0.3
W	0.5
Z	0.8

9 個別仕様

−	標準

10 包装

B	単品(袋詰め)
F	テーピング(2mmピッチ・178φ)
T	テーピング(4mmピッチ・178φ)

11 当社管理記号

△	標準品

△=スペース

U M K 1 0 5 C H 1 0 1 J W − F ○
1 2 3 4 5 6 7 8 9 10 11

1 Rated voltage〔VDC〕

E	16
T	25
U	50

2 Series name

M	Multilayer ceramic capacitor

3 End termination

K	Plated

4 Dimensions (case size)(EIA)L×W〔mm〕

063(0201)	0.6×0.3
105(0402)	1.0×0.5
107(0603)	1.6×0.8

5 Temperature characteristics〔ppm/℃〕

C□	0：CG、CH、CJ、CK (C0G、C0H、C0J、C0K)		
P□	−150：PH、PJ、PK (P2H、P2J、P2K)		
R□	−220：RH、RJ、RK (R2H、R2J、R2K)		
S□	−330：SH、SJ、SK (S2H、S2J、S2K)	2	± 30
T□	−470：TH、TJ、TK (T2H、T2J、T2K)	H	± 60
U□	−750：UJ、UK (U2J、U2K)	2J	±120
S L	+350～−1000	K	±250

□=Tolerance

6 Nominal Capacitance〔pF〕

example	
0R5	0.5
010	1
100	10

*R=decimal point

7 Capacitance Tolerance

C	± 0.25 pF
D	± 0.5 pF
F	± 1 pF
J	± 5 %
K	± 10 %

8 Thickness[mm]

P	0.3
W	0.5
Z	0.8

9 Special code

−	Standard Products

10 Packaging

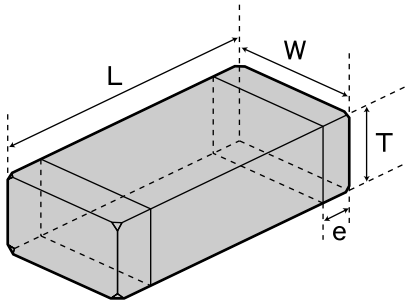
B	Bulk
F	Tape(2mm pitch・178φ)
T	Tape(4mm pitch・178φ)

11 Internal code

△	Standard Products

△=Blank space

外形寸法　EXTERNAL DIMENSIONS



Type(EIA)	L	W	T		e
□MK063 (0201)	0.6±0.03 (0.024±0.001)	0.3±0.03 (0.012±0.001)	0.3±0.03 (0.012±0.001)	P	0.15±0.05 (0.006±0.002)
□MK105 (0402)	1.0±0.05 (0.039±0.002)	0.5±0.05 (0.020±0.002)	0.5±0.05 (0.020±0.002)	W	0.25±0.10 (0.010±0.004)
□MK107 (0603)	1.6±0.10 (0.063±0.004)	0.8±0.10 (0.031±0.004)	0.8±0.10 (0.031±0.004)	Z	0.35±0.25 (0.014±0.010)

Unit：mm(inch)

概略バリエーション　AVAILABLE CAPACITANCE RANGE

Type	063	105						107			
Temp.char.	C□	R□ S□ T□ U□			C□	SL		C□	P□,T□ R□,S□	U□	SL
WV	25 V	16V			50 V	50 V		50V			
[pF]	[pF 3digits]										
0.5	0R5	P						Z	Z	Z	Z
1	010										
1.5	1R5										
2	020										
3	030										
4	040										
5	050										
6	060		W	W	W						
7	070										
8	080										
9	090		W								
10	100										
12	120					W					
15	150								Z		
18	180										
22	220										
27	270										
33	330										
39	390										
47	470										
56	560										
68	680										
82	820										
100	101										
120	121						W				
150	151										
180	181										
220	221										
270	271										
330	331										
390	391										
470	471										
560	561										
680	681										
820	821										
1000	102										

注：グラフの記号は製品の厚み記号です。

Note: Letter code in shaded areas are thickness codes.

温度特性　Temperature Characteristics

温度特性 Temperature char.(EIA)	温度係数範囲 〔ppm/℃〕※1 Temperature coefficient range	使用温度範囲 Operating Temp. range
C K(C0K)	0±250	−55～+125℃
C J(C0J)	0±120	
C H(C0H)	0±60	
C G(C0G)	0±30	
P K(P2K)	−150±250	
P J(P2J)	−150±120	
P H(P2H)	−150±60	
R K(R2K)	−220±250	
R J(R2J)	−220±120	
R H(R2H)	−220±60	
S K(S2K)	−330±250	
S J(S2J)	−330±120	
S H(S2H)	−330±60	
T K(T2K)	−470±250	
T J(T2J)	−470±120	
T H(T2H)	−470±60	
U K(U2K)	−750±250	
U J(U2J)	−750±120	
S L	−1000～+350	

※1：20℃における静電容量を基準。
Based on the capacitance at 20℃

静電容量許容差　Capacitance Tolerance Symbol

記号 Symbol	許容差 Tolerance	区分 Item
C	±0.25pF	～5pF
D	±0.5 pF	～10pF
F	±1pF	6～10 pF
J	±5 %	11pF～
K	±10 %	11pF～

Q

Q※2 Symbol	区分 Item
≧400+20・C※1	～27pF
≧1000	30pF～

※1：C=公称静電容量　Nominal capacitance〔pF〕

※2：測定周波数　Measurement Frequency= 1±0.1MHz(C≦1000pF)
1±0.1kHz (C>1000pF)

測定電圧　Measurement voltage = 0.5～5Vrms(C≦1000pF)
1±0.2Vrms(C>1000pF)

セレクションガイド Selection Guide ◀ P.8 etc
アイテム一覧 Part Numbers P.48 ▶
特性図 Electrical Characteristics ——— ▶
梱包 Packaging P.78 ▶
信頼性 Reliability Data P.80 ▶
使用上の注意 Precautions P.86 ▶

063TYPE

Class 1

定格電圧 Rated Voltage (DC)	形　名 Ordering code		温度特性 Temperature characteristics (EIA)																			公称静電容量 Capacitance [pF]	静電容量許容差 Capacitance tolerance [%]	厚み Thicknees [mm] (inch)
			CK (C0K)	CJ (C0J)	CH (C0H)	CG (C0G)	PK (P2K)	PJ (P2J)	PH (P2H)	RK (R2K)	RJ (R2J)	RH (R2H)	SK (S2K)	SJ (S2J)	SH (S2H)	TK (T2K)	TJ (T2J)	TH (T2H)	UK (U2K)	UJ (U2J)	SL			
25V	TMK 063 CK 0R5□P		●			●																0.5		0.3±0.03 (0.012±0.001)
	TMK 063 CK 010□P		●			●																1		
	TMK 063 CK 1R5□P		●			●																1.5	±0.25pF	
	TMK 063 CK 020□P		●			●																2	±0.5pF	
	TMK 063 CJ 030□P			●		●																3		
	TMK 063 CH 040□P				●	●																4		
	TMK 063 CH 050□P				●	●																5		
	TMK 063 CH 060□P				●	●																6		
	TMK 063 CH 070□P				●	●																7	±0.5pF	
	TMK 063 CH 080□P				●	●																8	±1pF	
	TMK 063 CH 090□P				●	●																9		
	TMK 063 CH 100□P				●	●																10		
	TMK 063 CH 120□P				●	●																12		
	TMK 063 CH 150□P				●	●																15		
	TMK 063 CH 180□P				●	●																18	±5	
	TMK 063 CH 220□P				●	●																22	±10	
	TMK 063 CH 270□P				●	●																27		
	TMK 063 CH 330□P				●	●																33		
	TMK 063 CH 390□P				●	●																39		
	TMK 063 CH 470□P				●	●																47		
	TMK 063 CH 560□P				●	●																56		
	TMK 063 CH 680□P				●	●																68		
	TMK 063 CH 820□P				●	●																82		
	TMK 063 CH 101□P				●	●																100		

注：形名の□には静電容量許容差記号が入ります。
△ Please specify the capacitance tolerance code.

105TYPE

Class 1

定格電圧 Rated Voltage (DC)	形　名 Ordering code		温度特性 Temperature characteristics (EIA)																			公称静電容量 Capacitance [pF]	静電容量許容差 Capacitance tolerance [%]	厚み Thickness [mm] (inch)
			CK (C0K)	CJ (C0J)	CH (C0H)	CG (C0G)	PK (P2K)	PJ (P2J)	PH (P2H)	RK (R2K)	RJ (R2J)	RH (R2H)	SK (S2K)	SJ (S2J)	SH (S2H)	TK (T2K)	TJ (T2J)	TH (T2H)	UK (U2K)	UJ (U2J)	SL			
50V	UMK 105 CK 0R5□W		●			●																0.5		0.5±0.05 (0.020±0.002)
	UMK 105 CK 010□W		●			●																1		
	UMK 105 CK 1R5□W		●			●																1.5	±0.25pF	
	UMK 105 CK 020□W		●			●																2	±0.5pF	
	UMK 105 CJ 030□W			●		●																3		
	UMK 105 CH 040□W				●	●																4		
	UMK 105 CH 050□W				●	●																5		
	UMK 105 CH 060□W				●	●																6		
	UMK 105 CH 070□W				●	●																7	±0.5pF	
	UMK 105 CH 080□W				●	●																8	±1pF	
	UMK 105 CH 090□W				●	●																9		
	UMK 105 CH 100□W				●	●																10		
	UMK 105 CH 120□W				●	●																12		
	UMK 105 CH 150□W				●	●																15		
	UMK 105 CH 180□W				●	●																18	±5	
	UMK 105 CH 220□W				●	●																22	±10	
	UMK 105 CH 270□W				●	●																27		
	UMK 105 CH 330□W				●	●																33		
	UMK 105 CH 390□W				●	●																39		
	UMK 105 CH 470□W				●	●																47		
	UMK 105 CH 560□W				●	●																56		
	UMK 105 CH 680□W				●	●																68		
	UMK 105 CH 820□W				●	●																82		
	UMK 105 CH 101□W				●	●																100		
	UMK 105 CH 121□W				●	●																120		
	UMK 105 CH 151□W				●	●																150		
	UMK 105 CH 181□W				●	●																180		
	UMK 105 CH 221□W				●	●																220		
	UMK 105 CH 271□W				●	●																270		
	UMK 105 SL 121□W																				●	120		
	UMK 105 SL 151□W																				●	150		
	UMK 105 SL 181□W																				●	180		
	UMK 105 SL 221□W																				●	220		
	UMK 105 SL 271□W																				●	270		
	UMK 105 SL 331□W																				●	330		

注：形名の□には静電容量許容差記号が入ります。
△ Please specify the capacitance tolerance code.

105TYPE

Class 1

定格電圧 Rated Voltage (DC)	形　名 Ordering code		温度特性 Temperature characteristics (EIA)																			公称静電容量 Capacitance [pF]	静電容量許容差 Capacitance tolerance [%]	厚み Thickness [mm] (inch)
			CK (C0K)	CJ (C0J)	CH (C0H)	CG (C0G)	PK (P2K)	PJ (P2J)	PH (P2H)	RK (R2K)	RJ (R2J)	RH (R2H)	SK (S2K)	SJ (S2J)	SH (S2H)	TK (T2K)	TJ (T2J)	TH (T2H)	UK (U2K)	UJ (U2J)	SL			
16V	EMK105△ 0 R 5 B W												●			●			●			0.5	±0.1pF	0.5±0.05 (0.020±0.002)
	EMK105△ 0 1 0 B W												●			●			●			1		
	EMK105△ 1 R 2 B W												●			●			●			1.2		
	EMK105△ 1 R 5 B W												●			●			●			1.5		
	EMK105△ 1 R 8 B W												●			●			●			1.8		
	EMK105△ 2 R 2 J W												●			●			●			2.2	±5%	
	EMK105△ 2 R 7 J W												●			●			●			2.7		
	EMK105△ 3 R 3 J W													●		●			●			3.3		
	EMK105△ 3 R 9 J W													●		●			●			3.9		
	EMK105△ 4 R 7 J W														●		●			●		4.7		
	EMK105△ 5 R 6 J W											●			●		●			●		5.6		
	EMK105△ 6 R 8 J W											●			●		●			●		6.8		
	EMK105△ 8 R 2 J W											●			●		●			●		8.2		
	EMK105△ 1 0 0 J W											●			●		●			●		10		
	EMK105△ 1 2 0 J W											●			●		●			●		12		
	EMK105△ 1 5 0 J W											●			●		●			●		15		
	EMK105△ 1 8 0 J W											●			●		●			●		18		
	EMK105△ 2 0 0 J W											●			●		●			●		20		

注：形名の△には温度特性、□には静電容量許容差記号が入ります。
△ Please specify the temperature characteristics code and □ the capacitance tolerance code.

107TYPE

Class 1

定格電圧 Rated Voltage (DC)	形　名 Ordering code		温度特性 Temperature characteristics (EIA)																		公称静電容量 Capacitance [pF]	静電容量許容差 Capacitance tolerance [%]	厚み Thickness [mm] (inch)
			CK (C0K)	CJ (C0J)	CH (C0H)	CG (C0G)	PK (P2K)	PJ (P2J)	PH (P2H)	RK (R2K)	RJ (R2J)	RH (R2H)	SK (S2K)	SJ (S2J)	SH (S2H)	TK (T2K)	TJ (T2J)	TH (T2H)	UK (U2K)	UJ (U2J)	SL			
50V	UMK 107　△ 0R5□Z		●				●			●			●			●			●		●	0.5		
	UMK 107　△ 010□Z		●				●			●			●			●			●		●	1		
	UMK 107　△ 1R5□Z		●				●			●			●			●			●		●	1.5	±0.25pF	
	UMK 107　△ 020□Z		●				●			●			●			●			●		●	2	±0.5 pF	
	UMK 107　△ 030□Z			●				●			●			●			●			●	●	3		
	UMK 107　△ 040□Z				●				●			●			●			●		●	●	4		
	UMK 107　△ 050□Z				●				●			●			●			●		●	●	5		
	UMK 107　△ 060□Z				●				●			●			●			●		●	●	6		
	UMK 107　△ 070□Z				●				●			●			●			●		●	●	7	±0.5pF	
	UMK 107　△ 080□Z				●				●			●			●			●		●	●	8	±1 pF	
	UMK 107　△ 090□Z				●				●			●			●			●		●	●	9		
	UMK 107　△ 100□Z				●	●			●			●			●			●		●	●	10		
	UMK 107　△ 120□Z				●	●			●			●			●			●		●	●	12	±5,±10	
	UMK 107　△ 150□Z				●	●			●			●			●			●		●	●	15	±5,±10	
	UMK 107　△ 180□Z				●	●			●			●			●			●		●	●	18	±5,±10	
	UMK 107　△ 220□Z				●	●			●			●			●			●		●	●	22	±5,±10	
	UMK 107　△ 270□Z				●	●			●			●			●			●		●	●	27	±5,±10	
	UMK 107　△ 330□Z				●	●			●			●			●			●		●	●	33	±5,±10	
	UMK 107　△ 390□Z				●	●			●			●			●			●		●	●	39	±5,±10	0.8±0.10
	UMK 107　△ 470□Z				●	●			●			●			●			●		●	●	47	±5,±10	(0.031±0.004)
	UMK 107　△ 560□Z				●	●			●			●			●			●		●	●	56	±5,±10	
	UMK 107　△ 680□Z				●	●			●			●			●			●		●	●	68	±5,±10	
	UMK 107　△ 820□Z				●	●			●			●			●			●		●	●	82	±5,±10	
	UMK 107　△ 101□Z				●	●			●			●			●			●		●	●	100	±5,±10	
	UMK 107　△ 121□Z				●	●			●			●			●			●		●	●	120	±5,±10	
	UMK 107　△ 151□Z				●	●			●			●			●			●		●	●	150	±5,±10	
	UMK 107　△ 181□Z				●	●			●			●			●			●		●	●	180	±5,±10	
	UMK 107　△ 221□Z				●	●			●			●			●			●		●	●	220	±5,±10	
	UMK 107　△ 271□Z				●	●			●			●			●			●		●	●	270	±5,±10	
	UMK 107　△ 331□Z				●	●														●	●	330	±5,±10	
	UMK 107　△ 391□Z				●	●														●	●	390	±5,±10	
	UMK 107　△ 471□Z				●	●														●	●	470	±5,±10	
	UMK 107　△ 561□Z				●	●														●	●	560	±5,±10	
	UMK 107　△ 681□Z				●	●														●	●	680	±5,±10	
	UMK 107　△ 821□Z				●	●														●	●	820	±5,±10	
	UMK 107　△ 102 □Z				●	●														●	●	1000	±5,±10	

注：形名の△には温度特性、□には静電容量許容差記号が入ります。

△ Please specify the temperature characteristics code and □ the capacitance tolerance code.

一般積層セラミックコンデンサ
（高誘電率系・Class 2）
STANDARD MULTILAYER CERAMIC CAPACITORS
(CLASS2 :HIGH DIELECTRIC CONSTANT TYPE)

	code	Temp.characteristics	operating Temp. range
OPERATING TEMP.	B/BJ	B	−25～+85℃
		X7R	−55～＋125℃
		X5R	−55～＋85℃
	F	F	−25～+85℃
		Y5V	−30～＋85℃

フロー／WAVE　　リフロー／REFLOW

特長　FEATURES

・実装密度の向上が図れます
・モノリシックの構造のため、信頼性が高い
・同一形状、静電容量範囲が広い

・Improve Higher Mounting Densities.
・Multilayer block structure provides higher reliability
・A wide range of capacitance values available in standard case sizes.

用途　APPLICATIONS

・一般電子機器用
・通信機器用（携帯電話、PHS、コードレス電話 etc.）

・General electronic equipment
・Communication equipment (portable telephones, PHS, other wireless applications, etc.)

形名表記法　ORDERING CODE

1 定格電圧〔VDC〕

A	4
J	6.3
L	10
E	16
T	25
U	50

2 シリーズ名

M	積層コンデンサ

3 端子電極

K	メッキ品

4 形状寸法(EIA)L×W〔mm〕

063(0201)	0.6×0.3
105(0402)	1.0×0.5
107(0603)	1.6×0.8

5 温度特性

△B,BJ	±10%
△F	±30/80%

△=スペース

6 公称静電容量〔pF〕

例	
102	1000
223	22000

7 容量許容差〔%〕

K	± 10
M	± 20
Z	± 80/20

8 製品厚み〔mm〕

P	0.3
V	0.5
Z	0.8

9 個別仕様

ー	標準

10 包装

B	単品(袋詰め)
F	テーピング(2mmピッチ・178φ)
T	テーピング(4mmピッチ・178φ)

11 当社管理記号

△	標準

△=スペース

L M K 1 0 5 B J 1 0 4 K V – F ○
1 2 3 4 5 6 7 8 9 10 11

1 Rated voltage〔VDC〕

A	4
J	6.3
L	10
E	16
T	25
U	50

2 Series name

M	Multilayer ceramic capacitors

3 End termination

K	Plated

4 Dimensions (case size)(LXW)〔mm〕

063(0201)	0.6×0.3
105(0402)	1.0×0.5
107(0603)	1.6×0.8

5 Temperature characteristics code

△B BJ	X7R	−55～+125℃ ±15%
	X5R	−55～+85℃ ±15%
△F	Y5V	−30～+85℃ ±22/82%

△=Blank space

6 Nominal Capacitance〔pF〕

example	
102	1000
223	22000

7 Capacitance Tolerance〔%〕

K	± 10
M	± 20
Z	± 80/20

8 Thickness〔mm〕

P	0.3
V	0.5
Z	0.8

9 Special code

ー	Standard products

10 Packaging

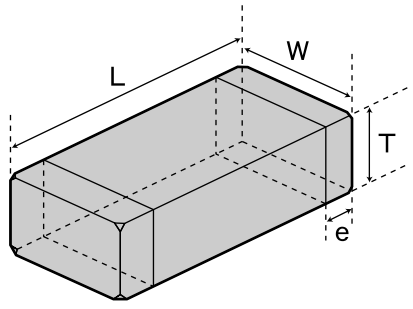
B	Bulk
F	Tape&Reel(2mm pitch・178φ)
T	Tape&Reel(4mm pitch・178φ)

11 Internal code

△	Standard Products

△=Blank space

外形寸法　EXTERNAL DIMENSIONS



Type(EIA)	L	W	T		e
□MK063 (0201)	0.6±0.03 (0.024±0.001)	0.3±0.03 (0.012±0.001)	0.3±0.03 (0.012±0.001)	P	0.15±0.05 (0.006±0.002)
□MK105 (0402)	1.0±0.05 (0.039±0.002)	0.5±0.05 (0.020±0.002)	0.5±0.05 (0.020±0.002)	V	0.25±0.10 (0.010±0.002)
□MK107 (0603)	1.6±0.10 (0.063±0.004)	0.8±0.10 (0.031±0.004)	0.8±0.10 (0.031±0.004)	Z	0.35±0.25 (0.014±0.010)

Unit：mm(inch)

概略バリエーション　AVAILABLE CAPACITANCE RANGE

■汎用積層セラミックコンデンサ（General Multilayer Ceramic capacitors）

Type		063				105										107			
Temp.char.		BJ/X5R		F/Y5V		BJ/X7R					F/Y5V					B/X7R		F/Y5V	
	WV	16V	10V	6.3V	4V	50V	25V	16V	10V	6.3V	50V	25V	16V	10V	6.3V	50V	25V	50V	25V
Cap [pF]	[pF 3digits]																		
100	101	P				V										Z			
150	151																		
220	221		P				V				V						Z	Z	
330	331							V				V						Z	
470	471			P					V*1				V						Z
680	681			P					V*1	V*1			V						Z
1000	102				P									V					
1500	152														V				
2200	222																		
3300	332																		
4700	472																		
6800	682																		
10000	103																		
15000	153																		
22000	223																		
33000	333																		
47000	473																		
68000	683																		
100000	104																		
220000	224																		
470000	474																		
1000000	105																		

注：グラフの記号は製品厚み記号です。　Note：Letter codes in shaded areas are thickness codes.　*1 Items are only available in X5R

温度特性　Temperature Characteristics

温度特性 Temperature Characteristics	温度範囲 Operating temp. range [℃]	基準温度 Ref. Temp. [℃]	静電容量変化率 Capacitance Change [%]
B	−25～85	20	±10
X7R	−55～125	25	±15
X5R	−55～85	25	±15
F	−25～85	20	+30 −80
Y5V	−30～85	25	+22 −82

静電容量許容差　Capacitance Tolerance

記号 Code	許容差 Tolerance	区分 Item
K	±10%	B Char.
M	±20%	B Char.
Z	+80% −20%	F Char.

tan δ

Type	tan δ ※1	区分 Item
063	≦3.5%	B Char. 16V
	≦5.0%	B Char. 10V
	≦16%	F Char. 6.3V
	≦20%	F Char. 4V
105	≦2.5%	B Char. 50V, 25V (0.0068μF)
	≦3.5%	B Char. 16V, 0.027~0.047μF, 25V (0.01μF)
	≦5.0%	F Char. 50V, 25V B Char. 0.056~0.22μF
	≦7.0%	F Char. 0.033μF, 0.047μF
	≦9.0%	F Char. 0.068μF~0.1μF
	≦11%	F Char. 0.22μF
	≦16%	F Char. 0.47μF
	≦20%	F Char. 1μF
107	≦2.5%	B Char.
	≦5.0%	F Char.

※1　測定周波数　Measurement frequency=1±0.1kHz
　　測定電圧　Measurement voltage　=1±0.2Vrms

セレクションガイド Selection Guide ◀ P.8
アイテム一覧 Part Numbers P.54 ▶
特性図 Electrical Characteristics — ▶
梱包 Packaging P.78 ▶
信頼性 Reliability Data P.80 ▶
使用上の注意 Precautions P.86 ▶
etc

063TYPE(0201 case size)

定格電圧 Rated Voltage (DC)	形名 Ordering code		公称静電容量 Capacitance (pF)	温度特性 Temp.Char	tanδ Dissipation factor (%)Max.	実装条件 Soldering method R:リフロー Reflow soldering W:フロー Wave soldering	静電容量許容差 Capacitance tolerance [%]	厚み Thickness (mm)(inch)
16V	EMK063 BJ101□P		100	B/X5R	3.5	R	±10% ±20%	0.3±0.03 (0.012±0.001)
	EMK063 BJ151□P		150					
	EMK063 BJ221□P		220					
	EMK063 BJ331□P		330					
	EMK063 BJ471□P		470					
	EMK063 BJ681□P		680					
	EMK063 BJ102□P		1000					
10V	LMK063 BJ152□P		1500		5			
	LMK063 BJ222□P		2200					
	LMK063 BJ332□P		3300					
	LMK063 BJ472□P		4700					
	LMK063 BJ682□P		6800					
	LMK063 BJ103□P		10000					
6.3V	JMK063 F223ZP		22000	F/Y5V	16	R	+80% −20%	0.3±0.03 (0.012±0.001)
	JMK063 F473ZP		47000					
4V	AMK063 F104ZP		100000		20			

形名の□には静電容量許容差記号が入ります。
□Please specify the capacitance tolerance code.

105TYPE(0402 case size)

定格電圧 Rated Voltage (DC)	形名 Ordering code		公称静電容量 Capacitance (pF)	温度特性 Temp.Char	tanδ Dissipation factor (%)Max.	実装条件 Soldering method R:リフロー Reflow soldering W:フロー Wave soldering	静電容量許容差 Capacitance tolerance [%]	厚み Thickness (mm)(inch)
50V	UMK105 BJ221□V		220	B/X7R	2.5	R	±10% ±20%	0.5±0.05 (0.020±0.002)
	UMK105 BJ331□V		330					
	UMK105 BJ471□V		470					
	UMK105 BJ681□V		680					
	UMK105 BJ102□V		1000					
	UMK105 BJ152□V		1500					
	UMK105 BJ222□V		2200					
	UMK105 BJ332□V		3300					
25V	TMK105 BJ472□V		4700					
	TMK105 BJ682□V		6800					
	TMK105 BJ103□V		10000		3.5			
16V	EMK105 BJ153□V		15000					
	EMK105 BJ223□V		22000					
	EMK105 BJ333□V		33000					
	EMK105 BJ473□V		47000					
10V	LMK105 BJ683□V		68000	B/X5R	5			
	LMK105 BJ104□V		100000					
6.3V	JMK105 BJ224□V		220000					
50V	UMK105 F103ZV		10000	F/Y5V	5		+80% −20%	
25V	TMK105 F223ZV		22000					
16V	EMK105 F473ZV		47000		7			
	EMK105 F104ZV		100000		9			
10V	LMK105 F224ZV		220000		11			
6.3V	JMK105 F474ZV		470000		16			
	JMK105 F105ZV*		1000000		20			

形名の□には静電容量許容差記号が入ります。　□Please specify the capacitance tolerance code.
* 高温負荷試験の試験電圧は定格電圧の1.5倍　* Test voltage of Loading at high temperature test is 1.5 time of the rated voltage.

107TYPE(0603 case size)

定　格 電　圧 Rated Voltage (DC)	形　　名 Ordering code		公　　称 静電容量 Capacitance 〔pF〕	温度特性 Temp.Char	tan δ Dissipation factor 〔%〕Max.	実装条件 Soldering method R:リフロー Reflow soldering W: フロー Wave soldering	静電容量 許 容 差 Capacitance tolerance [%]	厚　　み Thickness 〔mm〕(inch)
50V	UMK107 B102□Z		1000	B/X7R	2.5	W, R	±10% ±20%	0.8±0.10 (0.031±0.004)
	UMK107 B152□Z		1500					
	UMK107 B222□Z		2200					
	UMK107 B332□Z		3300					
	UMK107 B472□Z		4700					
	UMK107 B682□Z		6800					
	UMK107 B103□Z		10000					
25V	TMK107 B153□Z		15000					
	TMK107 B223□Z		22000					
50V	UMK107 F103ZZ		10000	F/Y5V	5	W, R	+80% −20%	0.8±0.10 (0.031±0.004)
	UMK107 F223ZZ		22000					
25V	TMK107 F473ZZ		47000					
	TMK107 F104ZZ		100000					

形名の□には静電容量許容差記号が入ります。

□Please specify the capacitance tolerance code.

高周波積層セラミックコンデンサ
MULTILAYER CERAMIC CAPACITORS FOR HIGH FREQUENCY APPLICATIONS(1GHz+)

OPERATING TEMP.	−55～+125℃

リフロー／REFLOW

特長　FEATURES

・積層磁器コンデンサとしては高いQ値が高周波で得られる
・1005形状であるため、実装密度の向上、軽量化が図れる

・Q values in the high frequency range (1 GHz+) are excellent compared to other types of multilayer capacitors.
・The 1005(0402) case size is designed for high density mounting and weight reduction in various applications.

用途　APPLICATIONS

・高周波におけるコンデンサのQ値および小型化が求められる用途向き
VCO、TCXO etc
・高周波回路の特性調整用途

・Suitable for those high frequency applications in which a capacitor with both a high Q-value and small size is required such as portable communications and other wireless applications.
VCO, TCXO. etc.
・Adjustment of characteristics in high frequency circuit

形名表記法　ORDERING CODE

1 定格電圧〔VDC〕

E	16

2 シリーズ名

V	高周波用積層コンデンサ

3 端子電極

K	メッキ品

4 形状寸法(EIA)L×W〔mm〕

105(0402)	1.0×0.5

5 温度特性〔ppm/℃〕

CH	0±60
RH	−220±60

6 公称静電容量〔pF〕

例	
020	2
4R3	4.3

※R= 小数点

7 容量許容差

B	±0.1pF
J	±5%

8 製品厚み〔mm〕

W	0.5

9 個別仕様

—	標準

10 包装

B	単品(袋づめ)
F	リールテーピング品(178φ2mmピッチ)

E V K 1 0 5 R H 4 R 3 J W – F
1 2 3 4 5 6 7 8 9 10

1 Rated voltage〔VDC〕

E	16

2 Series name

V	MULTILAYER CERAMIC CAPACITORS FOR HIGH FREQUENCY

3 End termination

K	Plated

4 Dimensions (case size)(L×W)〔mm〕

105(0402)	1.0×0.5

5 Temperature characteristics〔ppm/℃〕

CH	0±60
RH	−220±60

6 Nominal Capacitance〔pF〕

example	
020	2
4R3	4.3

※R=Decimal point

7 Capacitance Tolerances

B	±0.1pF
J	±5%

8 Thickness〔mm〕

W	0.5

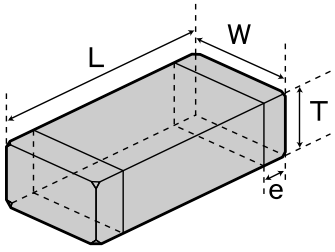
9 Special code

—	Standard Products

10 Packaging

B	Bulk
F	Tape&Reel(2mm pitch・178φ)

外形寸法　EXTERNAL DIMENSIONS



Type(EIA)	L	W	T	e
EVK105 (0402)	1.0±0.05 (0.039±0.002)	0.5±0.05 (0.020±0.002)	0.5±0.05 (0.020±0.002)	0.25±0.1 (0.010±0.004)

Unit：mm(inch)

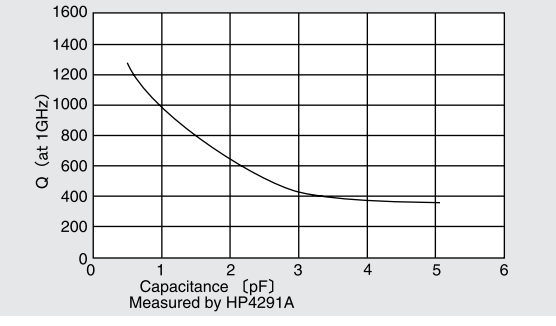
アイテム一覧　PART NUMBERS

定格電圧 Rated Voltage (DC)	形　名 Ordering code		温度特性 Temperature characteristics CH	温度特性 Temperature characteristics RH	公称静電容量 Capacitance [pF]	静電容量許容差 Capacitance tolerance	Q規格値 (at 1GHz) Q (min)	厚み Thickness [mm]	Q typ.値 (参考値) Typical Q
16V	EVK105CH0R3BW		●		0.3	±0.1pF	300	0.5±0.05	1200
	EVK105CH0R4BW		●		0.4		300		1200
	EVK105CH0R5BW		●		0.5		300		1200
	EVK105CH0R6BW		●		0.6		300		1100
	EVK105CH0R7BW		●		0.7		300		1100
	EVK105CH0R8BW		●		0.8		300		1000
	EVK105CH0R9BW		●		0.9		300		950
	EVK105CH010BW		●		1.0		300		950
	EVK105CH1R1BW		●		1.1		280		930
	EVK105CH1R2BW		●		1.2		270		850
	EVK105CH1R3BW		●		1.3		260		740
	EVK105CH1R5BW		●		1.5		240		710
	EVK105CH1R6BW		●		1.6		230		670
	EVK105CH1R8BW		●		1.8		210		650
	EVK105CH020BW		●		2.0		190		610
	EVK105CH2R2JW		●		2.2	±5%	180		530
	EVK105CH2R4JW		●		2.4		170		510
	EVK105CH2R7JW		●		2.7		150		460
	EVK105CH030JW		●		3.0		130		390
	EVK105CH3R3JW		●		3.3		120		370
	EVK105CH3R6JW		●		3.6		110		360
	EVK105CH3R9JW		●		3.9		99		360
	EVK105CH4R3JW		●		4.3		84		360
	EVK105CH4R7JW		●		4.7		84		340
	EVK105CH5R1JW		●		5.1		84		320
	EVK105RH0R5BW			●	0.5	±0.1pF	300		1100
	EVK105RH0R6BW			●	0.6		300		1000
	EVK105RH0R7BW			●	0.7		300		1000
	EVK105RH0R8BW			●	0.8		300		970
	EVK105RH0R9BW			●	0.9		300		950
	EVK105RH010BW			●	1.0		300		900
	EVK105RH1R1BW			●	1.1		280		900
	EVK105RH1R2BW			●	1.2		270		740
	EVK105RH1R3BW			●	1.3		260		700
	EVK105RH1R5BW			●	1.5		240		680
	EVK105RH1R6BW			●	1.6		230		640
	EVK105RH1R8BW			●	1.8		210		620
	EVK105RH020BW			●	2.0		190		570
	EVK105RH2R2JW			●	2.2	±5%	180		480
	EVK105RH2R4JW			●	2.4		170		470
	EVK105RH2R7JW			●	2.7		150		420
	EVK105RH030JW			●	3.0		130		360
	EVK105RH3R3JW			●	3.3		120		350
	EVK105RH3R6JW			●	3.6		110		340
	EVK105RH3R9JW			●	3.9		99		340
	EVK105RH4R3JW			●	4.3		84		340
	EVK105RH4R7JW			●	4.7		84		320
	EVK105RH5R1JW			●	5.1		84		310

仕様 SPECIFICATIONS

温度特性 Temperature Characteristics	使用温度範囲 Operating Temperature range	温度係数範囲 Temperature Coefficient range [ppm/℃]	静電容量許容差 Capacitance Tolerance (区分)
CH	−55～+125℃	0±60	±0.1pF(～2.0pF)
RH		−220±60	±5%　(2.2pF～)

■容量値とQの関係例（CH特性例）Capacitance vs Q value (Typical for CH T.C.)



セレクションガイド Selection Guide ◀ P.8
アイテム一覧 Part Numbers P.57 ▶
特性図 Electrical Characteristics P.57 ▶
梱包 Packaging P.78 ▶
信頼性 Reliability Data P.80 ▶
使用上の注意 Precautions P.86 ▶
etc

超低歪積層セラミックコンデンサ（CFCAP）
SUPER LOW DISTORTION MULTILAYER CERAMIC CAPACITORS (CFCAP)

OPERATING TEMP.	−55～+125℃

リフロー／REFLOW

特長　FEATURES

・新規開発を行った誘電体材料を使用し優れた温度特性と内部電極にNiを用いることで、小型・高容量・低コストを実現しました
・低歪み率、低ショックノイズでアナログ回路や携帯機器のデジタル回路に最適です
・耐熱性、耐破壊電圧、機械的強度が高くフィルムコンデンサの置き換えに最適です

・Newly developed dielectric material and the use of nickel for internal electrodes provide excellent temperature characteristics with high capacitance, small case size and low cost.
・Low distortion and low shock noise make these capacitors well suited for use in analog or digital mobile devices.
・Excellent heat-resistance, high break down voltage, and mechanical strength make these capacitors well suited for replacing film capacitors.

用途　APPLICATIONS

・AV関連機器などの信号回路
・アナログ信号のカップリング用途
・携帯電話のPLL回路
・良好な温度特性による時定数回路、発信回路、フィルタなど

・Signal line for AV products
・Analog signal coupling applications
・PLL circuit of mobile phones
・Good temperature characteristics for time constant circuits, oscillation circuits and filters

形名表記法　ORDERING CODE

1 定格電圧 (VDC)

U	50
G	35
T	25
E	16
L	10

2 シリーズ名

M	積層コンデンサ

3 端子電極

K	メッキ品

4 形状寸法 (EIA)L×W(mm)

107(0603)	1.6×0.8
212(0805)	2.0×1.25
316(1206)	3.2×1.6

5 シリーズ記号

SD	スタンダード

6 公称静電容量 (pF)

例	
223	22,000
104	100,000

7 容量許容差

K	±10	%

8 製品厚み (mm)

A	0.8
D	0.85
F	1.15
G	1.25
L	1.6

9 個別仕様

−	標準

10 包装

B	単品（袋づめ）
T	リールテーピング

11 当社管理記号

○	標準品

○= スペース

T M K 3 1 6 S D 1 0 4 K L − T ○
1 2 3 4 5 6 7 8 9 10 11

1 Rated voltage(VDC)

U	50
G	35
T	25
E	16
L	10

2

M	Multilayer ceramic capacitors

3 End termination

K	Plated

4 Dimensions(case size)(mm)

107(0603)	1.6×0.8
212(0805)	2.0×1.25
316(1206)	3.2×1.6

5 Series Symbol

SD	Standard

6 Nominal capacitance(pF)

example	
223	22,000
104	100,000

7 Capacitance tolerances(%)

K	±10

8 Thickness(mm)

A	0.8
D	0.85
F	1.15
G	1.25
L	1.6

9 Special code

−	Standard products

10 Packaging

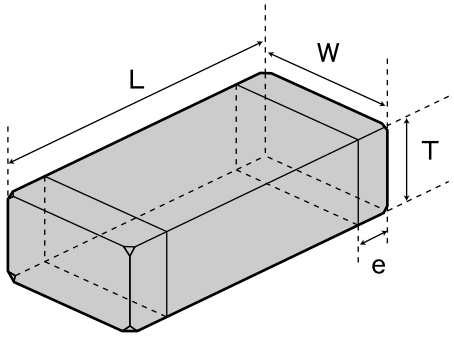
B	Bulk
T	Tape & reel

11 Internal code

○	Standard products

○=Blank space

外形寸法　EXTERNAL DIMENSIONS



Type(EIA)	L	W	T		e
TMK107 (0603)	1.6±0.10 (0.063±0.004)	0.8±0.10 (0.031±0.004)	0.8±0.10 (0.031±0.004)	A	0.35±0.25 (0.014±0.010)
TMK212 (0805)	2.0±0.10 (0.079±0.004)	1.25±0.10 (0.049±0.004)	0.85±0.10 (0.033±0.004)	D	0.5±0.25 (0.020±0.010)
			1.25±0.10 (0.049±0.004)	G	
TMK316 (1206)	3.2±0.15 (0.126±0.006)	1.6±0.15 (0.063±0.006)	1.15±0.10 (0.045±0.004)	F	$0.5^{+0.35}_{-0.25}$ ($0.020^{+0.014}_{-0.010}$)
			1.6±0.20 (0.063±0.008)	L	

Unit：mm (inch)

概略バリエーション　AVAILABLE CAPACITANCE RANGE

Cap	Type	107				212				316	
	Temp.Char	SD				SD				SD	SD
	VDC	50V	25V	16V	10V	50V	35V	16V	10V	35V	25V
[nF]	[pF:3digits]										
1	102	A									
1.5	152	A									
2.2	222	A									
3.3	332	A									
4.7	472		A			D					
6.8	682			A		D					
10	103			A		D					
15	153				A		D				
22	223				A		G				
33	333							D		F	
47	473								D		F
68	683								G		F
100	104								G		L

※グラフ記号は製品厚みを表します。　Letters inside the shaded boxes indicate thickness.

シリーズコード Series Code	静電容量許容差(%) Capacitance tolerance	tanδ(%) Dissipation factor
SD	±10(K)	0.1%max.

セレクションガイド Selection Guide ◀ P.8
アイテム一覧 Part Numbers P.60 ▶
特性図 Electrical Characteristics P.60 ▶
梱包 Packaging P.78 ▶
信頼性 Reliability Data P.62 ▶
使用上の注意 Precautions P.86 ▶

■107TYPE (0603 case size)

定格電圧 RatedVoltage	形　名 Ordering code		公称静電容量 Capacitance [nF]	温度特性 Temperature characteristics Standard type	tanδ Dissipation factor [%]Max.	実装条件 Soldering method R:リフロー Reflow soldering W:フロー Wave soldering	静電容量許容差 Capacitance tolerance	厚　み Thickness [mm](inch)
50V	UMK107SD102KA		1.0	Standard type	0.1	R	±10%*	0.8±0.1 (0.031±0.004)
	UMK107SD122KA		1.2					
	UMK107SD152KA		1.5					
	UMK107SD182KA		1.8					
	UMK107SD222KA		2.2					
	UMK107SD272KA		2.7					
	UMK107SD332KA		3.3					
25V	TMK107SD472KA		4.7					
16V	EMK107SD682KA		6.8					
	EMK107SD103KA		10					
10V	LMK107SD153KA		15					
	LMK107SD223KA		22					

*：J交差(±5%)も対応致します。御相談ください。

■212TYPE (0805 case size)

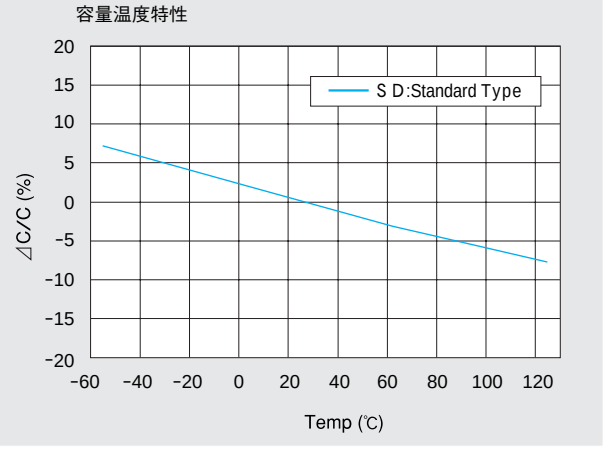
定格電圧 RatedVoltage	形　名 Ordering code		公称静電容量 Capacitance [nF]	温度特性 Temperature characteristics Standard type	tanδ Dissipation factor [%]Max.	実装条件 Soldering method R:リフロー Reflow soldering W:フロー Wave soldering	静電容量許容差 Capacitance tolerance	厚　み Thickness [mm](inch)
50V	UMK212SD392KD		3.9	Standard type	0.1	R	±10%*	0.85±0.1 (0.033±0.004)
	UMK212SD472KD		4.7					
	UMK212SD562KD		5.6					
	UMK212SD682KD		6.8					
	UMK212SD822KD		8.2					
	UMK212SD103KD		10					
35V	GMK212SD123KD		12					
	GMK212SD153KD		15					
	GMK212SD183KG		18					1.25±0.1 (0.049±0.004)
	GMK212SD223KG		22					
	GMK212SD273KG		27					
16V	EMK212SD333KD		33					0.85±0.1 (0.033±0.004)
10V	LMK212SD473KD		47					
	LMK212SD683KG		68					1.25±0.1 (0.049±0.004)
	LMK212SD104KG		100					

*：J交差(±5%)も対応致します。御相談ください。

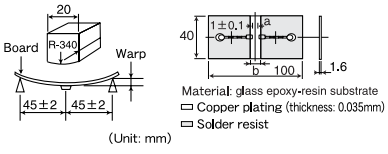
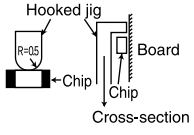
■316TYPE (1206 case size)

定格電圧 RatedVoltage	形　名 Ordering code		公称静電容量 Capacitance [nF]	温度特性 Temperature characteristics Standard type	tanδ Dissipation factor [%]Max.	実装条件 Soldering method R:リフロー Reflow soldering W:フロー Wave soldering	静電容量許容差 Capacitance tolerance	厚　み Thickness [mm](inch)
35V	GMK316SD333KF		33	Standard type	0.1	R	±10%*	1.15±0.1 (0.045±0.004)
	GMK316SD393KF		39					
25V	TMK316SD473KF		47					
	TMK316SD563KF		56					
	TMK316SD683KF		68					
	TMK316SD823KL		82					1.6±0.2 (0.063±0.008)
	TMK316SD104KL		100					

*：J交差(±5%)も対応致します。御相談ください。



Super Low Distortion Multilayer Ceramic Capacitors (CFCAP)

Item	Specified Value	Test Methods and Remarks
1.Operating Temperature Range	−55 to +125℃	
2.Storage Temperature Range	−55 to +125℃	
3.Rated Voltage	10VDC, 16VDC, 25VDC, 35VDC, 50VDC,	
4.Withstanding Voltage Between terminals	No breakdown or damage	Applied voltage: Rated voltage×3 Duration: 1 to 5 sec. Charge/discharge current: 50mA max.
5.Insulation Resistance	10000 MΩ or 500MΩ μF, whichever is smaller	Applied voltage: Rated voltage Duration: 60±5 sec. Charge/discharge current: 50mA max.
6.Capacitance (Tolerance)	±10%	Measuring frequency : 1 k Hz±10% Measuring voltage : 1±0.2Vrms Bias application: None
7.Tangent of Loss Angle (tan δ)	0.1%max	Measuring frequency : 1 k Hz±10% Measuring voltage : 1±0.2Vrms Bias application: None
8.Resistance to Flexure of Substrate	Appearance: No abnormality Capacitance change: ±5%	Warp: 1mm Speed: 0.5mm/second Duration:10 seconds The measurement shall be made with the board in the bent position. 
9. Body strength	———	
10. Adhesion of electrode	No separation or indication of separation of electrode.	Applied force: 5N Duration: 30 ±5 seconds 
11. Solderability	At least 95% of terminal electrode is covered by new solder.	Solder temp.: 230 ±5℃ Duration: 4 ±1 seconds
12. Resistance to soldering	Apppearance: No abnormality Capacitance change: ±2.5% max. tanδ: Initial value Insulation resistance: Initial value Withstanding voltage (between terminals): No abnormality	Solder temp.: 270 ±5℃ Duration: 3 ±0.5 seconds Preheating conditions: 80 to 100℃, 2 to 5 min. or 5 to 10 min. 150 to 200℃, 2 to 5 min. or 5 to 10 min. Recovery: Recovery for the following period under the standard condition after the test: 24 ±2hrs
13. Thermal shock	Appearance: No abnormality Capacitance change: ±2.5% max tanδ: Initial value Insulation resistance: Initial value Withstanding voltage (between terminals): No abnormality	Conditions for 1 cycle: Step 1: Minimum operating temperature $^{+0}_{-3}$℃ 30±3 minutes Step 2: Room temperature 2 to 3min. Step 3: Maximum operating temperature $^{-0}_{+3}$℃ 30±3 minutes Step 4: Room temperature 2 to 3min. Number of cycles: 5 times Recovery after the test: 24±2hrs
14. Damp heat (steady state)	Appearance: No abnormality Capacitance change: ±5% max tanδ: 0.5% max Insulation resistance 50MΩ μF or 1000MΩ whichever is smaller	Temperature:40±2℃ Humidity:90 to 95% RH Duration:500 $^{+24}_{-0}$ hrs Recovery: Recovery for the following period under the standard condition after the removal from test chamber: 24 ±2hrs

Super Low Distortion Multilayer Ceramic Capacitors (CFCAP)

Item	Specified Value	Test Methods and Remarks
15.Loading under Damp Heat	Appearance: No abnormality Capacitance change: ±7.5% max tanδ：0.5% max Insulation resistance: 25MΩ·μF or 500MΩ whichever is smaller	According to JIS C 5102 clause 9.9. Temperature:40±2℃ Humidity:90 to 95% RH Duration:500 $^{+24}_{-0}$ hrs Applied voltage: Rated voltage Charge/discharge current:50mA max Recovery: Recovery for the following period under the standard condition after the removal from test chamber: 24±2hrs
16.Loading at High Temperature	Appearance: No abnormality Capacitance change: ±3% max tanδ：0.35% max Insulation resistance: 50MΩ·μF or 1000MΩ whichever is smaller	According to JIS C 5102 clause 9.9. Temperature:125±3℃ Duration:1000 $^{+48}_{-0}$ hrs Applied voltage: Rated voltage x 2 Recovery: Recovery for the following period under the standard condition after the removal from test chamber: 24±2hrs

Note on standard condition: "standared condition" referred to herein is defined as follows.

Temperature: 5 to 35℃, Relative humidity: 45 to 85 %, Air pressure: 86 to 106kpa,

When there are questions concerning measurement results: In order to provide correlation data, the test shall be conducted under condition.

Temperature: 20±2℃, Relative humidity: 65 to 70 %, Air pressure: 86 to 106kpa

Unless otherwise specified,all the tests are conducted under the "standard condition."

中高耐圧積層セラミックコンデンサ
MEDIUM-HIGH VOLTAGE MULTILAYER CERAMIC CAPACITOR

	code	Temp.characteristics	operating Temp. range
OPERATING TEMP.	BJ	B	−25～+85℃
		X5R	−55～+85℃
		X7R	−55～+125℃

リフロー／REFLOW

特長　FEATURES

・内部電極にNi金属を使用しており、マイグレーションが発生せず、高信頼性を示す。
・高定格電圧でありながら小型形状

・The use of Nickel(Ni) as material for internal electrodes almost completely eliminates migration and high reliability
・Small case sizes with high rated voltage

用途　APPLICATIONS

・一般電話交換機
・インバータ
・無線、通信基地局

・General telephone exchange
・Inverter.
・Wireless and Telecommunication base.

形名表記法　ORDERING CODE

1 定格電圧 (VDC)

H	100
Q	250
S	630

2 シリーズ名

M	積層コンデンサ

3 端子電極

K	メッキ品

4 形状寸法 (EIA)L×W(mm)

212(0805)	2.0×1.25
316(1206)	3.2×1.6
325(1210)	3.2×2.5
432(1812)	4.5×3.2

5 温度特性 (%)

B J	±10

6 公称静電容量 (pF)

例	
104	100,000
105	1,000,000

7 容量許容差

K	±10%
M	±20%

8 製品厚み (mm)

G	1.25
F	1.15
L	1.6
N	1.9
M	2.5

9 個別仕様

−	標準

10 包装

B	単品(袋詰め)
T	リールテーピング

11 当社管理記号

△	標準品

△= スペース

H M K 3 1 6 B J 1 0 4 K L − T ○
1 2 3 4 5 6 7 8 9 10 11

1 Rated voltage(VDC)

H	100
Q	250
S	630

2 Series name

M	Multilayer ceramic capacitors

3 End termination

K	Plated

4 Dimensions(case size)(mm)

212(0805)	2.0×1.25
316(1206)	3.2×1.6
325(1210)	3.2×2.5
432(1812)	4.5×3.2

5 Temperature characteristics code

B J	X7R	−55～+125℃±15%
B J	X5R	−55～+85℃±15%

6 Nominal capacitance(pF)

example	
104	100,000
105	1,000,000

7 Capacitance tolerances(%)

K	±10
M	±20

8 Thickness(mm)

G	1.25
F	1.15
L	1.6
N	1.9
M	2.5

9 Special code

−	Standard products

10 Packaging

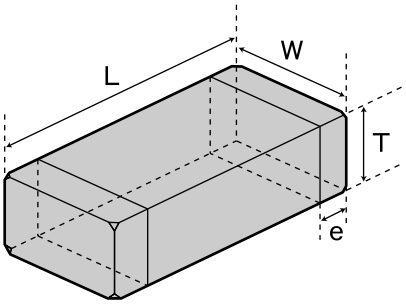
B	Bulk
T	Tape & reel

11 Internal code

△	Standard products

△=Blank space

外形寸法　EXTERNAL DIMENSIONS



Type(EIA)	L	W	T		e
□MK212 (0805)	2.0±0.10 (0.079±0.004)	1.25±0.10 (0.049±0.004)	1.25±0.10 (0.033±0.004)	G	0.3以上 (0.012min.)
□MK316 (1206)	3.2±0.15 (0.126±0.006)	1.6±0.15 (0.063±0.006)	1.15±0.10 (0.045±0.004)	F	0.3以上 (0.012min.)
			1.6±0.20 (0.063±0.008)	L	
□MK325 (1210)	3.2±0.15 (0.126±0.006)	2.5±0.20 (0.098±0.006)	1.15±0.10 (0.045±0.004)	F	0.3以上 (0.012min.)
			1.9±0.20 (0.075±0.008)	N	
□MK432 (1812)	4.5±0.4 (0.177±0.016)	3.2±0.30 (0.126±0.012)	2.5±0.20 (0.098±0.008)	M	0.3以上 (0.012min.)

Unit：mm(inch)

概略バリエーション　AVAILABLE CAPACITANCE RANGE

	Type	212			316					325					432				
	Temp.Char	B/X7R	B/X7R	B/X5R	B/X7R	B/X7R	B/X5R	B/X7R	B/X5R	B/X7R	B/X7R	B/X5R	B/X7R	B/X5R	B/X7R	B/X7R	B/X5R	B/X7R	B/X5R
Cap	VDC	100V	250V	250V	100V	250V	250V	630V	630V	100V	250V	250V	630V	630V	100V	250V	250V	630V	630V
[μF]	[pF:3digits]																		
0.01	103	G	G					F											
0.022	223	G		G					L				N						
0.047	473	G			L	L					N			N				M	
0.1	104				L		L			F	N					M			M
0.22	224				L					N		N				M			
0.47	474									N					M		M		
1.0	105														M				

※グラフ記号は製品厚みを表します。 Letters inside the shaded boxes indicate thickness.

温度特性コード Temp. char.Code	温度特性 Temperature characteristics					静電容量許容差(%) Capacitance tolerance	tanδ(%) Dissipation factor
	準拠規格 Applicable standard		温度範囲(℃) Temperature range	基準温度(℃) Ref. Temp.	静電容量変化率(%) Capacitance change		
BJ	JIS	B	−25～85	20	±10	±20(M) ±10(K)	3.5%
	EIA	X7R	−55～125	25	±15		
		X5R	−55～85	25	±15		

■212TYPE(0805 case size)

定格電圧 RatedVoltage	形名 Ordering code		公称静電容量 Capacitance [μF]	温度特性 Temperature characteristics	tanδ Dissipation factor [%]Max.	実装条件 Soldering method R:リフロー Reflow soldering W:フロー Wave soldering	静電容量許容差 Capacitance tolerance	厚み Thickness [mm] (inch)
100V	HMK212BJ103□G		0.01	B/X7R	3.5	R	±10%, ±20%	1.25±0.1 (0.033±0.004)
	HMK212BJ223□G		0.022					
	HMK212BJ473□G		0.047					
250V	QMK212BJ103□G		0.01	B/X7R				
	QMK212BJ223□G		0.022	B/X5R				

■316TYPE(1206 case size)

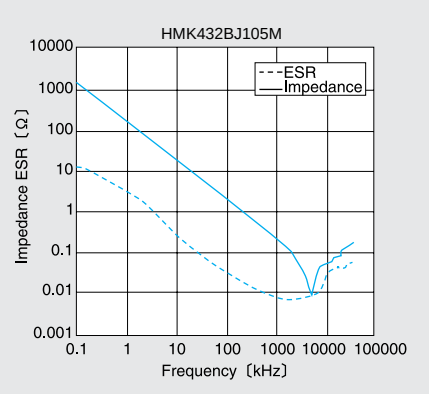
定格電圧 RatedVoltage	形名 Ordering code		公称静電容量 Capacitance [μF]	温度特性 Temperature characteristics	tanδ Dissipation factor [%]Max.	実装条件 Soldering method R:リフロー Reflow soldering W:フロー Wave soldering	静電容量許容差 Capacitance tolerance	厚み Thickness [mm] (inch)
100V	HMK316BJ473□L		0.047	B/X7R	3.5	R	±10%, ±20%	1.6±0.2 (0.063±0.008)
	HMK316BJ104□L		0.1					
	HMK316BJ224□L		0.22					
250V	QMK316BJ473□L		0.047					
	QMK316BJ104□L		0.1	B/X5R				
630V	SMK316BJ103□F		0.01	B/X7R				1.15±0.1 (0.045±0.004)
	SMK316BJ223□L		0.022	B/X5R				1.6±0.2 (0.063±0.008)

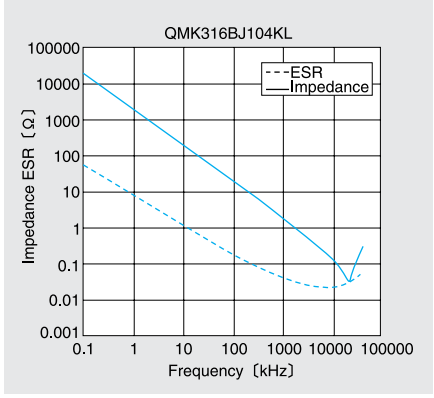
■325TYPE(1210 case size)

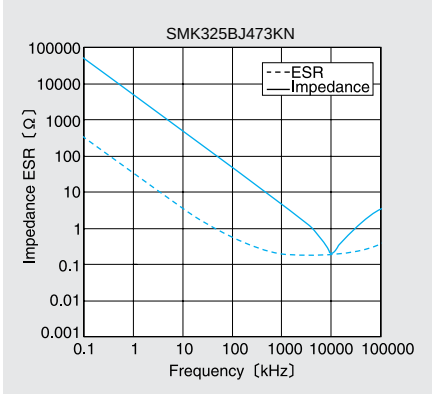
定格電圧 RatedVoltage	形名 Ordering code		公称静電容量 Capacitance [μF]	温度特性 Temperature characteristics	tanδ Dissipation factor [%]Max.	実装条件 Soldering method R:リフロー Reflow soldering W:フロー Wave soldering	静電容量許容差 Capacitance tolerance	厚み Thickness [mm] (inch)
100V	HMK325BJ104□F		0.10	B/X7R	3.5	R	±10%, ±20%	1.15±0.1 (0.045±0.004)
	HMK325BJ224□N		0.22					1.9±0.2 (0.075±0.008)
	HMK325BJ474□N		0.47					
250V	QMK325BJ473□N		0.47					
	QMK325BJ104□N		0.10					
	QMK325BJ224□N		0.22	B/X5R				
630V	SMK325BJ223□N		0.022	B/X7R				
	SMK325BJ473□N		0.047	B/X5R				

■432TYPE(1812 case size)

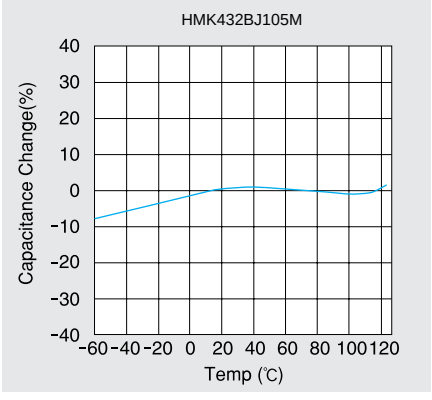
定格電圧 RatedVoltage	形名 Ordering code		公称静電容量 Capacitance [μF]	温度特性 Temperature characteristics	tanδ Dissipation factor [%]Max.	実装条件 Soldering method R:リフロー Reflow soldering W:フロー Wave soldering	静電容量許容差 Capacitance tolerance	厚み Thickness [mm] (inch)
100V	HMK432BJ474□M		0.47	B/X7R	3.5	R	±10%, ±20%	2.5±0.2 (0.098±0.008)
	HMK432BJ105□M		1.0					
250V	QMK432BJ104□M		0.1					
	QMK432BJ224□M		0.22					
	QMK432BJ474□M		0.47	B/X5R				
630V	SMK432BJ473□M		0.047	B/X7R				
	SMK432BJ104□M		0.1	B/X5R				



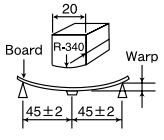
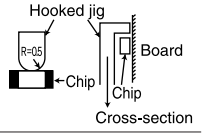




静電容量ー温度特性 Temperature characteristics



MEDIUM-HIGH VOLTAGE MULTILAYER CERAMIC CAPACITOR

Item	Specified Value	Test Methods and Remarks
1.Operating Temperature Range	X7R :-55 to +125℃ X5R: -55 to +85℃ B J : -25 to +85℃	
2.Storage Temperature Range	X7R :-55 to +125℃ X5R: -55 to +85℃ B J : -25 to +85℃	
3.Rated Voltage	100VDC, 250VDC, 630VDC	
4.Withstanding Voltage Between terminals	No breakdown or damage	Applied voltage:Rated voltage×2.5(100V) Rated voltage×2(250V) Rated voltage×1.2(630V) Duration：1～5sec. Chage/dischage current：50mAmax.
5.Insulation Resistance	100MΩ μF or 10GMΩ, whichever is smaller.	Applied voltage:Rated voltage Duration：60± 5 sec. Chage/dischage current：50mAmax.
6.Capacitance(Tolerance)	±20%、±10%	Measuring frequency:1kHz±10% Measuring voltage:1±0.2Vrms Bias application:None
7.Tangent of Loss Angel	3.5%max.	Measuring frequency:1kHz±10% Measuring voltage:1±0.2Vrms Bias application:None
8.Temperature Characteristic of Capacitance	B J : ±10%（-25 to +85℃） X7R: ±15%（-55 to +125℃） X5R: ±15%（-55 to +85℃）	According to JIS 5102 clause7.12. Charge of maximum capacitance deviation in step 1 to 5 Temperature at step 1:+25℃ Temperature at step 2:minimum operating temperature Temperature at step 3:+25℃(Reference temperature) Temperature at step 4:minimum operating temperature Temperature at step 5:+25℃ Reference temperature Characteristic B shall be +20℃
9.Resistance to Flexure of Substrate	Appearance:No abnormality Capacitance change:Within±10%	Warp:1mm Testing boade:glass epoxy-resin substrate Thickness:1.6mm The measurement shall be made with board in the bent position  (Unit: mm)
10.Adhesion of Electrode	No separation or indication of separation of electrode	Applied force:5N Duration:30±5sec. 
11.Solderability	At least 75% of terminal electrode is covered by solder	Solder temperature:230±5℃ Duration:4±1sec.
12.Resistance to Soldering	Appearance:No abnormality Capacitance change:Within±10%(×5R、BJ), ±15%(×7R) tanδ : Initial value Insulation resistance:Intial value Withstanding voltage(between terminals): No abnormality	Preconditioning:Thermal treatment(at 150℃ for 1hr) Solder temperature:270±5℃ Duration:3±0.5sec. Preheating conditions: 80 to 100℃, 2 to 5 min. 150 to 200℃, 2 to 5min. Recovery:Rcovery for the following reriod under the standerd condition after the test. 48±4hrs
13.Thermal shock	Appearance:No abnormality Capacitance change:Within±10%(×5R、BJ), ±15%(×7R) tanδ : Initial value Insulation resistance:Initial value	Preconditioning:Thermal treatment(at 150℃ for 1hr) Conditions for 1 cycle Step 1:Minimum operating temperature +0／−3℃ 30±3min. Step 2:Room temperature 2 to 3min. Step 3:Minimum operating temperature +0／−3℃ 30±3min. Step4:Room temperature 2 to 3min. Number of cycles:5 times Recovery after the test:48±4hrs

Item	Specified Value	Test Methods and Remarks
14.Damp Heat(steady state)	Appearance:No abnormality Capacitance change: Within±10%(X5R、BJ), ±15%(X7R) tan δ : 7%max. Insulation resistance:25MΩ μF	Preconditioning:Thermal treatment(at 150℃ for 1hr) Temperature:40±2℃ Humidity：90 to 95%RH Duration: 500+24/-0 hrs Recovery:Rcovery for the following reriod under the standerd condition after the removal from test chamber. 48±4hrs
15.Loading under Damp Heat	Appearance:No abnormality Capacitance change: Within±10%(X5R、BJ), ±15%(X7R) tan δ : 7%max. Insulation resistance:10MΩ・μFmin.	Preconditioning:Thermal treatment(at 150℃ for 1hr) Preconditioning:Voltage treatment Temperature:40±2℃ Humidity：90 to 95%RH Applied voltage:Rated voltage Chage/dischage current：50mAmax. Duration: 500+24/-0 hrs Recovery:Rcovery for the following reriod under the standerd condition after the removal from test chamber. 48±4hrs
16.Loading at High Temperature	Appearance:No abnormality Capacitance change: Within±10%(X5R、BJ), ±15%(X7R) tan δ : 7%max. Insulation resistance:50MΩ・μFmin.	According to JIS 5102 clause 9.10. Preconditioning:Voltage treatment Temperature:125±3℃ (X7R) 85±2℃(X5R,BJ) Applied voltage:Rated voltage x 2(100V) Rated voltage x 1.5(250V) Rated voltage x 1.2(630V) Chage/dischage current：50mAmax. Duration: 1000+24/-0 hrs Recovery:Rcovery for the following reriod under the standerd condition after the removal from test chamber. As for thermal treatment shall be performed prior to the recovery. 48±4hrs

アレイ形積層セラミックコンデンサ
ARRAY TYPE MULTILAYER CERAMIC CAPACITOR

	code	Temp.characteristics	operating Temp. range
OPERATING TEMP.	BJ	B	−25～+85℃
		X5R	−55～+85℃
		X7R	−55～+125℃
	CH	C0H	−55～+125℃

リフロー／REFLOW

特長　FEATURES

・2125形状で4回路構成であるため、より高密度、高効率な実装を実現
・1回路あたりの容量は1μFの大容量
・内部電極には、信頼性とコストパフォーマンスに優れたNiを使用しています。

・4 circuits in 2125 package allows higher placement density and efficiency
・The capacitance in each circuit, F or B dielectric, is 1μF
・Internal electrode is nickel for increased cost performance and reliability

用途　APPLICATIONS

・一般電子機器用
・通信機器用 (携帯電話、PHS、コードレス電話etc)

・General electronic equipment
・Communication equipment (mobile phone, PHS, cordless phone, etc.)

形名表記法　ORDERING CODE

1 定格電圧 (VDC)

J	6.3
L	10
E	16
T	25
U	50

2 シリーズ名

4	4 連積層コンデンサ
2	2 連積層コンデンサ

3 端子電極

K	メッキ品

4 形状寸法 (EIA)L×W(mm)

110(0504)	1.4×1.0
212(0805)	2.0×1.25

5 温度特性

B J	±10[%]
CH	0±60[ppm/℃]

6 公称静電容量 (pF)

例	
104	100,000
105	1,000,000

7 容量許容差

M	±20	%
K	±10	%

8 製品厚み (mm)

B	0.6
A	0.8
D	0.85

9 個別仕様

–	標準

10 包装

T	リールテーピング

11 当社管理記号

△	標準品

△= スペース

E 4 K 2 1 2 B J 1 0 4 M D – T ○
1 2 3 4 5 6 7 8 9 10 11

1 Rated voltage(VDC)

J	6.3
L	10
E	16
T	25
U	50

2 Series name

4	4 circuit multilayer capacitors
2	2 circuit multilayer capacitors

3 End termination

K	Plated

4 Dimensions(case size)(mm)

110(0504)	1.4×1.0
212(0805)	2.0×1.25

5 Temperature characteristics code

B J	X5R	−55～+85℃±15%
	X7R	−55～+125℃±15%
C H	C0H	0±60[ppm/℃]

6 Nominal capacitance(pF)

example	
104	100,000
105	1,000,000

7 Capacitance tolerances(%)

M	±20
K	±10

8 Thickness(mm)

B	0.6
A	0.8
D	0.85

9 Special code

–	Standard products

10 Packaging

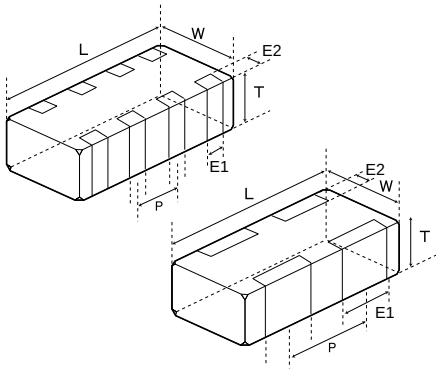
T	Tape & reel

11 Internal code

△	Standard products

△=Blank space

外形寸法　EXTERNAL DIMENSIONS



Type(EIA)	L	W	E1	E2	P	T	
□2K110 (0504)	1.37±0.07 (0.054±0.003)	1.00±0.08 (0.039±0.008)	0.36±0.10 (0.014±0.004)	0.20±0.10 (0.008±0.004)	0.64±0.10 (0.025±0.004)	B	0.60±0.06 (0.024±0.003)
						A	0.80±0.08 (0.031±0.003)
□4K212 (0805)	2.00±0.10 (0.079±0.004)	1.25±0.10 (0.049±0.004)	0.25±0.10 (0.010±0.004)	0.25±0.15 (0.010±0.006)	0.50±0.10 (0.020±0.004)	D	0.85±0.10 (0.033±0.004)
□2K212 (0805)	2.00±0.10 (0.079±0.004)	1.25±0.10 (0.049±0.004)	0.50±0.20 (0.020±0.008)	0.25±0.15 (0.010±0.006)	1.00±0.10 (0.039±0.004)	D	0.85±0.10 (0.033±0.004)

Unit：mm (inch)

概略バリエーション　AVAILABLE CAPACITANCE RANGE

BJ/ X7R, BJ/ X5R

Cap [μF]	Type	1410 2連 □2K110				2125 2連 □2K212		2125 4連 □4K212	
	Temp.Char	BJ/ X7R		BJ/ X5R		BJ/ X5R		BJ/ X5R	
	VDC	25V	16V	10V	6.3V	10V	6.3V	16V	10V
	[pF:3digits]								
0.01	103	B							
0.022	223	B							
0.047	473		B						
0.1	104		B					D	
0.22	224			B					D
0.47	474			A					
1.0	105				A	D			
2.2	225						D		

※グラフ記号は製品厚みを表します。　Letters inside the shaded boxes indicate thickness.

CH/ C0H

Cap [pF]	Type	1410 2連 □2K110
	Temp.Char	CH / C0G
	VDC	50V
	[pF:3digits]	
10	100	B
12	120	B
15	150	B
18	180	B
22	220	B
27	270	B
33	330	B
39	390	B
47	470	B
56	560	B
68	680	B
82	820	B
100	101	B

※グラフ記号は製品厚みを表します。
Letters inside the shaded boxes indicate thickness.

温度特性コード Temp. char.Code	温度特性 Temperature characteristics					静電容量許容差[%] Capacitance tolerance	tanδ[%] Dissipation factor
	準拠規格 Applicable standard		温度範囲[℃] Temperature range	基準温度[℃] Ref. Temp.	静電容量変化率 Capacitance change		
BJ	JIS	B	−25～85	20	±10[%]	±20(M) ±10(K)	5.0%max.*
	EIA	X5R	−55～85	25	±15[%]		
	EIA	X7R	−55～125	25	±15[%]		
CH	JIS	CH	−55～125	20	±60[ppm/℃]	±10(K)	0.1%max.**
	EIA	C0H	−55～125	25	±60[ppm/℃]		

* 10%　：　J2K　　3.5%　：　110type　　C＜0.1μF

**　　27pF以下　Q≧400+20・C　　30pF以上　Q≧1000

■1410TYPE (0504 case size)　　2連タイプ　(2 circuit type)

定格電圧 RatedVoltage	形名 Ordering code		公称静電容量 Capacitance [μF]	温度特性 Temperature characteristics	tanδ Dissipation factor[%]Max.	実装条件 Soldering method R:リフロー Reflow soldering W:フロー Wave soldering	静電容量許容差 Capacitance tolerance	厚み Thickness [mm](inch)
25V	T2K110BJ103□B		0.01	B/X7R	3.5	R	±20%[M] ±10%[K]	0.6±0.06 (0.024±0.002)
	T2K110BJ223□B		0.022					
16V	E2K110BJ473□B		0.047					
	E2K110BJ104□B		0.1		5			
10V	L2K110BJ224□B		0.22	B/X5R				
	L2K110BJ474MA		0.47					0.8±0.08 (0.031±0.003)
6.3V	J2K110BJ105MA		1.0		10			

定格電圧 RatedVoltage	形名 Ordering code		公称静電容量 Capacitance [pF]	温度特性 Temperature characteristics	Q symbol	実装条件 Soldering method R:リフロー Reflow soldering W:フロー Wave soldering	静電容量許容差 Capacitance tolerance	厚み Thickness [mm](inch)
50V	U2K110CH100FB		10	CH	400+20・C	R	±10%[K]	0.6±0.06 (0.024±0.002)
	U2K110CH120KB		12					
	U2K110CH150KB		15					
	U2K110CH180KB		18					
	U2K110CH220KB		22					
	U2K110CH270KB		27					
	U2K110CH330KB		33		1000 (0.1%)			
	U2K110CH390KB		39					
	U2K110CH470KB		47					
	U2K110CH560KB		56					
	U2K110CH680KB		68					
	U2K110CH820KB		82					
	U2K110CH101KB		100					

*:J交差(±5%)も対応致します。御相談ください。

■2125TYPE (0805 case size)　　4連タイプ　(4 circuit type)

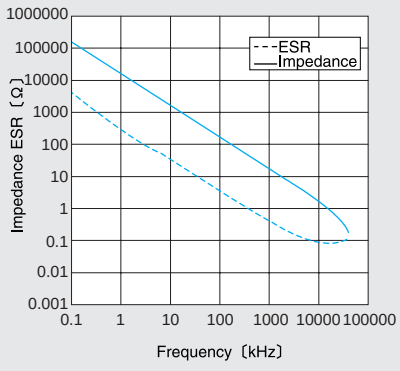
定格電圧 RatedVoltage	形名 Ordering code		公称静電容量 Capacitance [μF]	温度特性 Temperature characteristics	tanδ Dissipation factor[%]Max.	実装条件 Soldering method R:リフロー Reflow soldering W:フロー Wave soldering	静電容量許容差 Capacitance tolerance	厚み Thickness [mm](inch)
16V	E4K212BJ104□D		0.1	B/X5R	5	R	±20%[M] ±10%[K]	0.85±0.1 (0.033±0.004)
10V	L4K212BJ224□D		0.22					

■2125TYPE (0805 case size)　　2連タイプ　(2 circuit type)

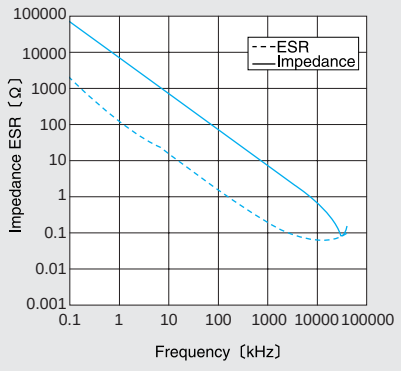
定格電圧 RatedVoltage	形名 Ordering code		公称静電容量 Capacitance [μF]	温度特性 Temperature characteristics	tanδ Dissipation factor[%]Max.	実装条件 Soldering method R:リフロー Reflow soldering W:フロー Wave soldering	静電容量許容差 Capacitance tolerance	厚み Thickness [mm](inch)
10V	L2K212BJ105MD		1.0	B/X5R	5	R	±20%[M]	0.85±0.1 (0.033±0.004)
6.3V	J2K212BJ225MD		2.2		10			

インピーダンス・ESR–周波数特性例　Example of Impedance ESR vs. Frequency characteristics
・当社積層セラミックコンデンサ例　(Taiyo Yuden multilayer ceramic capacitor)

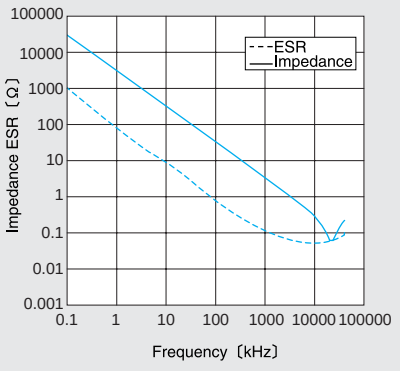
T2K110BJ103M



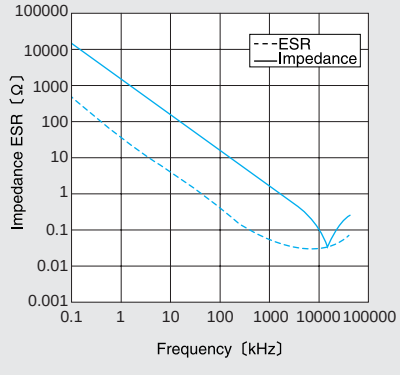
T2K110BJ223M



E2K110BJ473M



E2K110BJ104M



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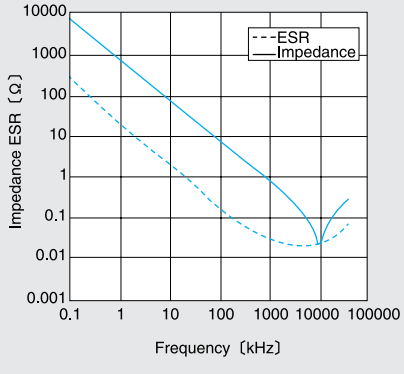

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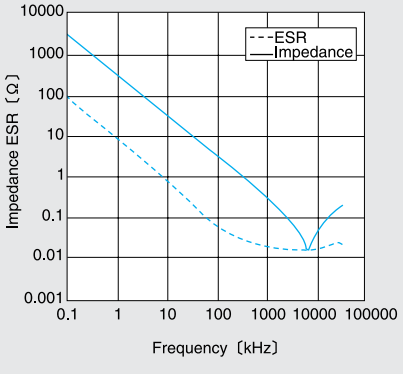
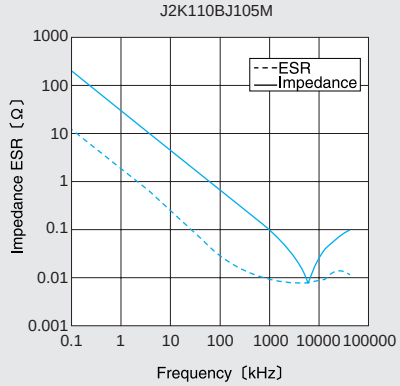
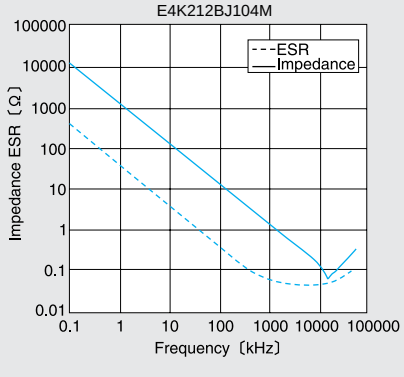


J2K110BJ105M



E4K212BJ104M



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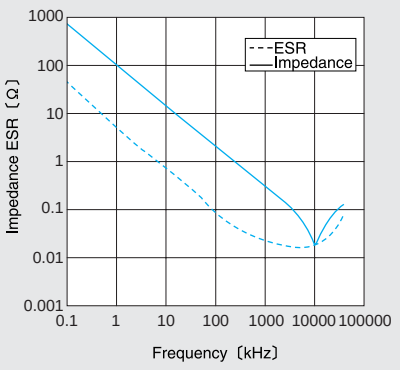

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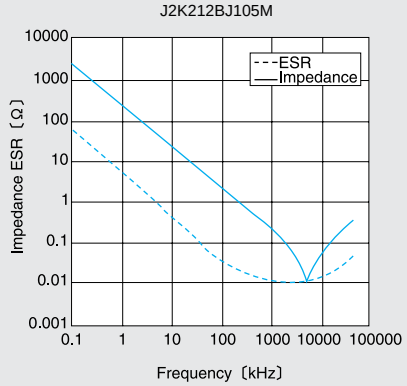

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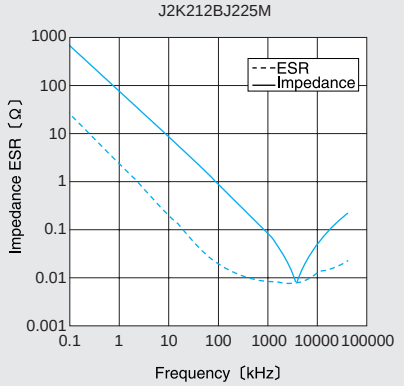


梱包　PACKAGING

①標準数量 Standard quantity

■袋づめ梱包 Bulk packaging

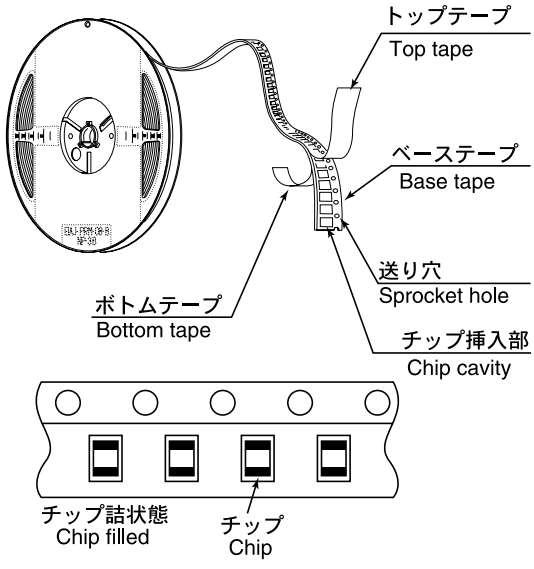
形式(EIA) Type	製品厚み Thickness mm(inch)	code	標準数量 Standard quantity [pcs]
□MK105(0402)	0.5 (0.020)	V, W	1000
E VK105(0402)		W	
□MK107(0603)	0.8 (0.031)	A	
		Z	
□2K110(0504)	0.8 (0.031)	A	
	0.6 (0.024)	B	
□MK212(0805)	0.85 (0.033)	D	
	1.25 (0.049)	G	
□4K212(0805)	0.85 (0.033)	D	
□2K212(0805)	0.85 (0.033)	D	
□MK316(1206)	0.85 (0.033)	D	
	1.15 (0.045)	F	
	1.25 (0.049)	G	
	1.6 (0.063)	L	
□MK325(1210)	0.85 (0.033)	D	
	1.15 (0.045)	F	
	1.5 (0.059)	H	
	1.9 (0.075)	N	
	2.0max (0.079)	Y	
	2.5 (0.098)	M	

■テーピング梱包　Taped packaging

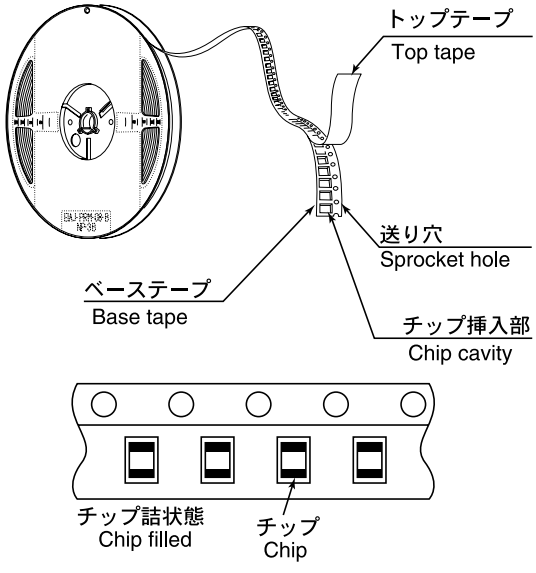
形式(EIA) Type	製品厚み Thickness mm(inch)	code	標準数量 Standard quantity [pcs] 紙テープ paper	エンボステープ Embossed tape
□MK063(0201)	0.3 (0.012)	P	15000	—
□MK105(0402)	0.5 (0.020)	V, W	10000	—
E VK105(0402)		W		
□MK107(0603)	0.45 (0.018)	K	4000	—
	0.8 (0.031)	A	4000	—
		Z		
□2K110(0504)	0.8 (0.031)	A	4000	—
	0.6 (0.024)	B	4000	—
□MK212(0805)	0.45 (0.018)	K	4000	—
	0.85 (0.033)	D	4000	—
	1.25 (0.049)	G	—	3000
□4K212(0805)	0.85 (0.033)	D	4000	—
□2K212(0805)	0.85 (0.033)	D	4000	—
□MK316(1206)	0.85 (0.033)	D	4000	—
	1.15 (0.045)	F	—	3000
	1.25 (0.049)	G		
	1.6 (0.063)	L	—	2000
□MK325(1210)	0.85 (0.033)	D	—	2000
	1.15 (0.045)	F		
	1.5 (0.059)	H		
	1.9 (0.075)	N		
	2.0max (0.079)	Y	—	2000
	2.5 (0.098)	M	—	500
□MK432(1812)	1.9 (0.075)	Y	—	500
	2.5 (0.098)	M		
	3.2 (0.125)	U		

②テーピング材質　Taping material

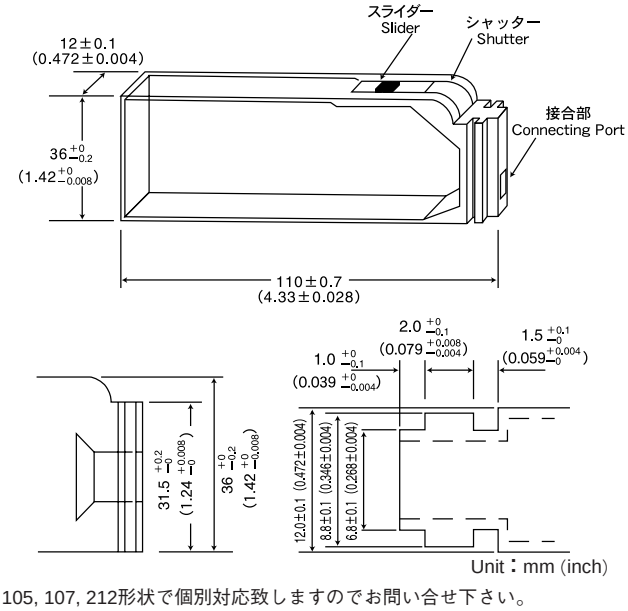
紙テープ
Card board carrier tape



エンボステープ
Embossed Tape



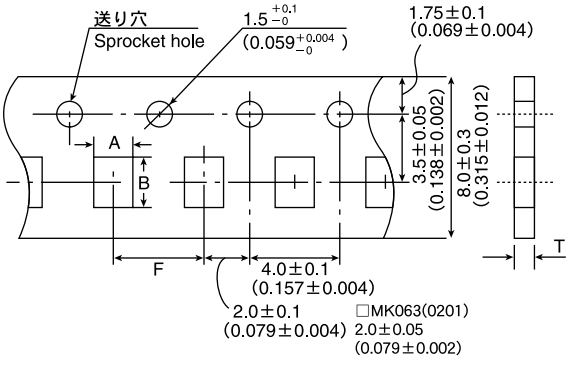
③バルクカセット　Bulk Cassette



105, 107, 212形状で個別対応致しますのでお問い合せ下さい。
Please contact any of our offices for accepting your requirement according to dimensions 0402, 0603, 0805.(inch)

③テーピング寸法　Taping dimensions

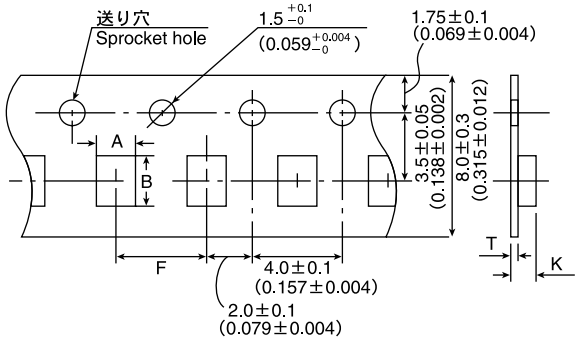
紙テープ　Paper Tape（8mm幅）(0.315inches wide)



Type (EIA)	チップ挿入部 Chip Cavity		挿入ピッチ Insertion Pitch	テープ厚み Tape Thickness
	A	B	F	T
□MK063(0201)	0.37±0.06 (0.06±0.002)	0.67±0.06 (0.027±0.002)	2.0±0.05 (0.079±0.002)	0.45max. (0.018max.)
□MK105(0402) E VK105(0402)	0.65±0.1 (0.026±0.004)	1.15±0.1 (0.045±0.004)	2.0±0.05 (0.079±0.002)	0.8max. (0.031max.)
□MK107(0603)	1.0±0.2 (0.039±0.008)	1.8±0.2 (0.071±0.008)	4.0±0.1 (0.157±0.004)	1.1max. (0.043max.)
□2K110(0504)	1.15±0.2 (0.045±0.008)	1.55±0.2 (0.061±0.008)	4.0±0.1 (0.157±0.004)	1.0max. (0.039max.)
□MK212(0805) □4K212(0805) □2K212(0805)	1.65±0.2 (0.065±0.008)	2.4±0.2 (0.094±0.008)	4.0±0.1 (0.157±0.004)	1.1max. (0.043max.)
□MK316(1206)	2.0±0.2 (0.079±0.008)	3.6±0.2 (0.142±0.008)		

Unit：mm(inch)

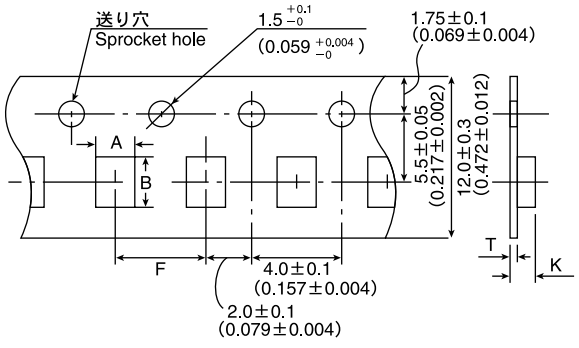
エンボステープ　Embossed tape（8mm幅）(0.315inches wide)



Type (EIA)	チップ挿入部 Chip cavity		挿入ピッチ Insertion Pitch	テープ厚み Tape Thickness	
	A	B	F	K	T
□MK212(0805)	1.65±0.2 (0.065±0.008)	2.4±0.2 (0.094±0.008)			
□MK316(1206)	2.0±0.2 (0.079±0.008)	3.6±0.2 (0.142±0.008)	4.0±0.1 (0.157±0.004)	2.5max. (0.098max.)	0.6max (0.024max.)
□MK325(1210)	2.8±0.2 (0.110±0.008)	3.6±0.2 (0.142±0.008)		3.4max. (0.134max.)	

Unit：mm(inch)

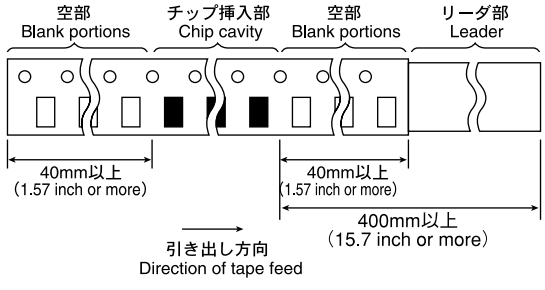
エンボステープ　Embossed tape（12mm幅）(0.472inches wide)



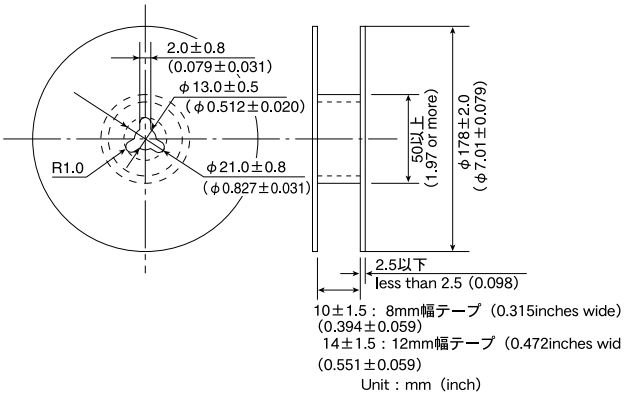
Type (EIA)	チップ挿入部 Chip cavity		挿入ピッチ Insertion Pitch	テープ厚み Tape Thickness	
	A	B	F	K	T
□MK432(1812)	3.7±0.2 (0.146±0.008)	4.9±0.2 (0.193±0.008)	8.0±0.1 (0.315±0.004)	3.4max. (0.134max.)	0.6max. (0.024max.)

Unit：mm(inch)

④リーダ部／空部　Leader and Blank portion

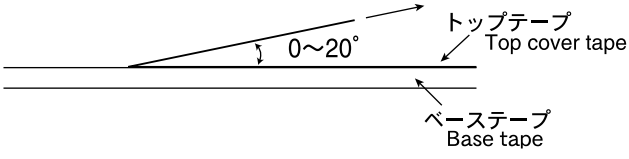


⑤リール寸法　Reel size

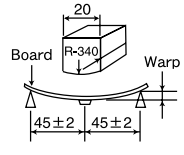


⑥トップテープ強度　Top Tape Strength

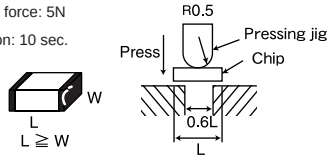
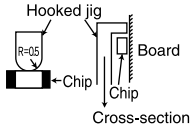
トップテープのはがし力は下図矢印方向にて0.1～0.7Nとなります。
The top tape requires a peel-off force of 0.1～0.7N in the direction of the arrow as illustrated below.



Multilayer Ceramic Capacitor Chips

Item	Specified Value				Test Methods and Remarks
	Temperature Compensating (Class 1)		High Permitivity (Class 2)		
	Standard	High Frequency Type	Standard Note1	High Value	
1.Operating Temperature Range	−55 to +125℃		B：−55 to +125℃ F：−25 to +85℃	−25 to +85℃	High Capacitance Type BJ(X7R)：−55～+125℃, BJ(X5R)：−55～+85℃ C(X5S)：−55～+85℃, C(X6S)：−55～+105℃ E(Y5U)：−30～+85℃, F(Y5V)：−30～+85℃
2.Storage Temperature Range	−55 to +125℃		B：−55 to +125℃ F：−25 to +85℃	−25 to +85℃	High Capacitance Type BJ(X7R)：−55～+125℃, BJ(X5R)：−55～+85℃ C(X5S)：−55～+85℃, C(X6S)：−55～+105℃ E(Y5U)：−30～+85℃, F(Y5V)：−30～+85℃
3.Rated Voltage	50VDC,25VDC, 16VDC	16VDC	50VDC,25VDC	50VDC,35VDC,25VDC 16VDC,10VDC,6.3VDC 4DVC	
4.Withstanding Voltage Between terminals	No breakdown or damage	No abnormality	No breakdown or damage		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)
5.Insulation Resistance	10000 MΩ min.		500 MΩ μF. or 10000 MΩ., whichever is the smaller. Note 4		Applied voltage: Rated voltage Duration: 60±5 sec. Charge/discharge current: 50mA max.
6.Capacitance (Tolerance)	0.5 to 5 pF: ±0.25 pF 1 to 10pF: ±0.5 pF 5 to 10 pF: ±1 pF 11 pF or over: ± 5% ±10% 105TYPER△, S△, T△, U△ only 0.5～2pF: ±0.1pF 2.2～20pF: ±5%	0.5 to 2 pF : ±0.1 pF 2.2 to 5.1 pF : ±5%	B: ±10%, ±20% F：$^{+80}_{-20}$ %	BJ：±10%、±20% C：±10%、±20% E：−20%／+80% F：−20%／+80%	Measuring frequency： Class1：1MHz±10%(C≦1000pF) 1 k Hz±10%(C>1000pF) Class2：1 k Hz±10%(C≦22μF) 120Hz±10Hz(C>22μF) Measuring voltage： Class1：0.5～5Vrms(C≦1000pF) 1±0.2Vrms(C>1000pF) Class2：1±0.2Vrms(C≦22μF) 0.5±0.1Vrms(C>22μF) Bias application: None
7.Q or Tangent of Loss Angle (tan δ)	Under 30 pF : Q≧400 + 20C 30 pF or over : Q≧1000 C= Nominal capacitance	Refer to detailed specification	B: 2.5% max.(50V, 25V) F: 5.0% max. (50V, 25V)	BJ：2.5%以下 3.5%以下※ 5.0%以下※ 10.0%以下※ C、E、F：7%以下 5.0%以下※ 9.0%以下※ 10.0%以下※ 11.0%以下※ 16.0%以下※ 20.0%以下※ See Table 1	Multilayer: Measuring frequency： Class1：1MHz±10%(C≦1000pF) 1 k Hz±10%(C>1000pF) Class2：1 k Hz±10%(C≦22μF) 120Hz±10Hz(C>22μF) Measuring voltage： Class1：0.5～5Vrms(C≦1000pF) 1±0.2Vrms(C>1000pF) Class2：1±0.2Vrms(C≦22μF) 0.5±0.1Vrms(C>22μF) Bias application: None High-Frequency-Multilayer: Measuring frequency: 1GHz Measuring equipment: HP4291A Measuring jig: HP16192A
8.Temperature Characteristic of Capacitance (Without voltage application)	CK：0±250 CJ：0±120 CH：0±60 CG：0±30 PK：−150±250 PJ：−150±120 PH：−150±60 RK：−220±250 RJ：−220±120 RH：−220±60 SK：−330±250 SJ：−330±120 SH：−330±60 TK：−470±250 TJ：−470±120 TH：−470±60 UK：−750±250 UJ：−750±120 SL：+350 to -1000 (ppm/℃)	CH：0±60 RH：−220±60 (ppm/℃)	B：±10%(−25～85℃) F：$^{+30}_{-80}$ %(−25～85℃) B(X7R)：±15% F(Y5V)：$^{+22}_{-82}$%	BJ：±10% (−25～+85℃) C：±20% (−25～+85℃) E：+20%／−55% (−25～+85℃) F：+30%／−80% (−25～+85℃) BJ(X7R、X5R)： ±15% C(X5S、X6S)： ±22% E(Y5U)： +22%／−56% F(Y5V)： +22%／−82%	According to JIS C 5102 clause 7.12. Temperature compensating: Measurement of capacitance at 20℃ and 85℃ shall be made to calculate temperature characteristic by the following equation. $\frac{(C_{85} - C_{20})}{C_{20} \times \triangle T} \times 10^{6}$ (ppm/℃) High permitivity: Change of maximum capacitance deviation in step 1 to 5 Temperature at step 1: +20℃ Temperature at step 2: minimum operating temperature Temperature at step 3: +20℃ (Reference temperature) Temperature at step 4: maximum operating temperature Temperature at step 5: +20℃ Reference temperature for X7R, X5R, X5S, X6S, Y5U and Y5V shall be +25℃
9.Resistance to Flexure of Substrate	Appearance: No abnormality Capacitance change: Within ±5% or ±0.5 pF, whichever is larger.	Appearance: No abnormality Capacitance change: Within±0.5 pF	Appearance: No abnormality Capacitance change: B, BJ, C: Within ±12.5% E, F: Within ±30%		Warp: 1mm Testing board: glass epoxy-resin substrate Thickness: 1.6mm (063 TYPE : 0.8mm) The measurement shall be made with board in the bent position.  (Unit: mm)

Multilayer Ceramic Capacitor Chips

Item	Specified Value				Test Methods and Remarks
	Temperature Compensating (Class 1)		High Permittivity (Class 2)		
	Standard	High Frequency Type	Standard Note1	High Value	
10.Body Strength	—	No mechanical damage.	—	—	High Frequency Multilayer: Applied force: 5N Duration: 10 sec. 
11.Adhesion of Electrode	No separation or indication of separation of electrode.				Applied force: 5N Duration: 30±5 sec. 
12.Solderability	At least 95% of terminal electrode is covered by new solder.				Solder temperature: 230±5℃ Duration: 4±1 sec.
13.Resistance to soldering	Appearance: No abnormality Capacitance change: Within ± 2.5% or ±0.25pF, whichever is larger. Q: Initial value Insulation resistance: Initial value Withstanding voltage (between terminals): No abnormality	Appearance: No abnormality Capacitance change: Within ±2.5% Q: Initial value Insulation resistance: Initial value Withstanding voltage (between terminals): No abnormality	Appearance: No abnormality Capacitance change: Within ±7.5% (B, BJ) Within ±15% (C) Within ±20% (E, F) tan δ: Initial value Insulation resistance: Initial value Withstanding voltage (between terminals): No abnormality		Preconditioning: Thermal treatment (at 150℃ for 1 hr) (Applicable to Class 2.) Solder temperature: 270±5℃ Duration: 3±0.5 sec. Preheating conditions: 80 to 100℃, 2 to 5 min. or 5 to 10 min. 150 to 200℃, 2 to 5 min. or 5 to 10 min. Recovery: Recovery for the following period under the standard condition after the test. 24±2 hrs (Class 1) 48±4 hrs (Class 2)
14.Thermal shock	Appearance: No abnormality Capacitance change: Within ± 2.5% or ±0.25pF, whichever is larger. Q: Initial value Insulation resistance: Initial value Withstanding voltage (between terminals): No abnormality	Appearance: No abnormality Capacitance change: Within ±0.25pF Q: Initial value Insulation resistance: Initial value Withstanding voltage (between terminals): No abnormality	Appearance: No abnormality Capacitance change: Within ±7.5% (B, BJ) Within ±15% (C) Within ±20% (E , F) tan δ: Initial value Insulation resistance: Initial value Withstanding voltage (between terminals): No abnormality		Preconditioning: Thermal treatment (at 150℃ for 1 hr) (Applicable to Class 2.) Conditions for 1 cycle: Step 1: Minimum operating temperature $^{+0}_{-3}$ ℃ 30±3 min. Step 2: Room temperature 2 to 3 min. Step 3: Maximum operating temperature $^{-0}_{+3}$ ℃ 30±3 min. Step 4: Room temperature 2 to 3 min. Number of cycles: 5 times Recovery after the test: 24±2 hrs (Class 1) 48±4 hrs (Class 2)
15.Damp Heat (steady state)	Appearance: No abnormality Capacitance change: Within ±5% or ±0.5pF, whichever is larger. Q: C≧30 pF : Q≧350 10≦C＜30 pF: Q≧275 + 2.5C C＜10 pF : Q≧200 + 10C C: Nominal capacitance Insulation resistance: 1000 MΩ min.	Appearance: No abnormality Capacitance change: Within ±0.5pF, Insulation resistance: 1000 MΩ min.	Appearance: No abnormality Capacitance change: B: Within ±12.5% F: Within ±30% tan δ: B: 5.0% max. F: 7.5% max. Insulation resistance: 50 MΩ μF or 1000 MΩ whichever is smaller.	Appearance: No abnormality Capacitance change: BJ:Within ±12.5% Within ±30%※※ C(X6S) Within ±25% C(X5S),E,F Within ±30% tan δ: BJ: 5.0% max. 7.5% max.※ 20.0% max.※ C, E, F: 11.0% max. 7.5% max.※ 15.0% max.※ 16.0% max.※ 19.5% max.※ 25.0% max.※ ※See Table.2 ※※See Table.5 Insulation resistance: 50 MΩ μF or 1000 MΩ whichever is smaller.	Multilayer： Preconditioning: Thermal treatment (at 150℃ for 1 hr) (Applicable to Class 2.) Temperature: 40±2℃ Humidity: 90 to 95% RH Duration: 500 $^{+24}_{-0}$ hrs 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) High-Frequency Multilayer: Temperature: 60±2℃ Humidity: 90 to 95% RH Duration: 500 $^{+24}_{-0}$ hrs Recovery: Recovery for the following period under the standard condition after the removal from test chamber. 24±2 hrs (Class 1)

Multilayer Ceramic Capacitor Chips

Item	Specified Value				Test Methods and Remarks
	Temperature Compensating (Class 1)		High Permittivity (Class 2)		
	Standard	High Frequency Type	Standard Note1	High Value	
16.Loading under Damp Heat	Appearance: No abnormality Capacitance change: Within ± 7.5% or ±0.75pF, whichever is larger. Q: C≧30 pF: Q≧200 C＜30 pF: Q≧100 + 10C/3 C： Nominal capacitance Insulation resistance: 500 MΩ min.	Appearance: No abnormality Capacitance change: C≦2 pF: Within ±0.4 pF C＞2 pF: Within ±0.75 pF C： Nominal capacitance Insulation resistance: 500 MΩ min.	Appearance: No abnormality Capacitance change: B: Within ±12.5% F: Within ±30% tan δ: B: 5.0% max. F: 7.5% max. Insulation resistance: 25 MΩ μF or 500 MΩ, whichever is the smaller.	Appearance: No abnormality Capacitance change: BJ：Within±12.5% Within±15%※※ Within±20%※※ Within±25%※※ Within±30%※※ C、E、F：Within±30% tanδ： BJ：5.0%max. 7.5%max.※ 20.0%max.※ C、E、F：11%max. 7.5%max.※ 15.0%max.※ 16.0%max.※ 19.5%max.※ 25.0%max.※ 30.0%max.※ 50.0%max.※ ※See Table.2 ※※See Table.5 Insulation resistance: 25 MΩ μF or 500 MΩ, whichever is the smaller.	According to JIS C 5102 Clause 9. 9. Multilayer: Preconditioning: Voltage treatment (Class 2) Temperature: 40±2℃ Humidity: 90 to 95% RH Duration: 500 $^{+24}_{-0}$ hrs Applied voltage: Rated voltage Charge and discharge current: 50mA max. (Class 1,2) 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) High-Frequency Multilayer: Temperature: 60±2℃ Humidity: 90 to 95% RH Duration: 500 $^{+24}_{-0}$ hrs Applied voltage: Rated voltage Charge and discharge current: 50mA max. Recovery: 24±2 hrs of recovery under the standard condition after the removal from test chamber.
17.Loading at High Temperature	Appearance: No abnormality Capacitance change: Within ±3% or ±0.3pF, whichever is larger. Q: C≧30 pF : Q≧350 10≦C＜30 pF: Q≧275 + 2.5C C＜10 pF: Q≧200 + 10C C： Nominal capacitance Insulation resistance: 1000 MΩ min.	Appearance: No abnormality Capacitance change: Within ±3% or ±0.3pF, whichever is larger. Insulation resistance: 1000 MΩ min.	Appearance: No abnormality Capacitance change: B: Within ±12.5% F: Within ±30% tan δ: B: 4.0% max. F: 7.5% max. Insulation resistance: 50 MΩ μF or 1000 MΩ, whichever is smaller.	Appearance: No abnormality Capacitance change: BJ：Within±12.5% Within±20%※※ Within±25%※※ C：Within±25%(X6S) Within±30%(X5S) E、F：Within±30% tanδ： BJ：5.0%max. 7.5%max.※ 20.0%max.※ C、F、F：11%max. 7.5%max.※ 15.0%max.※ 16.0%max.※ 19.5%max.※ 25.0%max.※ ※See Table.2 ※※See Table.5 Insulation resistance: 50 MΩ μF or 1000 MΩ, whichever is smaller.	According to JIS C 5102 clause 9.10. Multilayer: Preconditioning: Voltage treatment (Class 2) Temperature:125±3℃(Class 1, Class 2: B, BJ(X7R)) 85±2℃ (Class 2: BJ,F) Duration: 1000 $^{+48}_{-0}$ hrs Applied voltage: Rated voltage×2, , ×1.5（Table.4） Recovery: Recovery for the following period under the standard condition after the removal from test chamber. As for Ni product, thermal treatment shall be performed prior to the recovery. 24±2 hrs (Class 1) 48±4 hrs (Class 2) High-Frequency Multilayer: Temperature: 125±3℃ (Class 1) Duration: 1000 $^{+48}_{-0}$ hrs Applied voltage: Rated voltage×2 Recovery: 24±2 hrs of recovery under the standard condition after the removal from test chamber.

Note 1: For 105 type, specified in "High value".
Note 2: Thermal treatment (Multilayer): 1 hr of thermal treatment at 150 +0 /−10 ℃ followed by 48±4 hrs of recovery under the standard condition shall be performed before the measurement.
Note 3: Voltage treatment (Multilayer): 1 hr of voltage treatment under the specified temperature and voltage for testing followed by 48±4 hrs of recovery under the standard condition shall be performed before the measurement.
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, 65 to 70% relative humidity, and 86 to 106kPa of air pressure. Unless otherwise specified, all the tests are conducted under the "standard condition."
Note 4: Specified value for Instration Resistance of Table.3 only: 100MΩ μF or more.

Table.1

Item	tanδ
BJ:LMK type; 105 type (C≦0.047μF) 107 type (C≦0.47μF) 212 type (C≦1.0μF) 316 / 325 / 432 type EMK type; 063/105/107/212/316/432 type 325 type (C < 22μF) TMK type; 316 type (C > 0.47μF) 325 type (C≦0.47μF) 432 type GMK type; 212 type 316 type 325 type UMK type; 212 type (C > 0.1μF) 316 type (C ≧ 0.47μF) 325 type L2K type (C ≦ 0.047μF) 、T2K type	3.5%以下

Item	tanδ
BJ: JMK type; 063 type 107 type (C ≦ 1.0μF) 212 type (C ≦ 4.7μF)General 316 type (C ≦ 10μF)General 325 type (C ≦ 22μF) 432 type (C ≦ 47μF) LMK type; 105 type (C ≧ 0.056μF) 107 type (C > 0.47μF) 212 type (C ≧ 2.2μF) EMK type; 325 type (C ≧ 22μF) TMK type; 325 type (C > 4.7μF) E4K, L4K, J2K, L2K type F: 105 type (50V, 25V)	5.0%max.

Item	tanδ
F: LMK type; 212 type 316 type (C=10μF)：General (C=4.7μF)：Lowprofile 325 type (C > 10μF) EMK type; 105 type (C ≧0.068μF) UMK type; 325 type (C > 4.7μF)	9.0%max.
BJ: 表3 C: 107/212/316 type	10.0% max.
F: LMK type; 105 type (C =0.22μF)	11.0% max.
E、F: JMK type; 063 / 105 / 107 / 212 / 316 / 325 / 432 type LMK type; 107 type,325 type 432 type, 316 type (C> 10μF)	16.0%max.
F: JMK type; 105 type (C=1μF)	20.0%max.

Table.2

Item	tanδ
BJ: JMK type; 107 type (C > 2.2μF) 212type (C > 10μF) 316type (C > 22μF) 325type (C > 47μF) 432type (C > 100μF) LMK type; 063 type 105 type (C≧0.056μF) 107 type (C≧0.47μF) 212 type (C > 1μF) TMK type; 325 type (C≧10μF) E4K, L4K, J2K, L2K type F: 105 type (50V, 25V)	7.5%max.
BJ: EMK type; 325 type (C≧22μF)	10.0% max.
F: LMK type; 105 type (C=0.22μF) F: JMK type; 063 type	16.0% max.
F: JMK type; 105 / 107 / 212 / 316 / 325 / 432 type LMK type; 107 / 432 type	19.5%max.
BJ: Table.3	20.0%max.
F: JMK type; 105 type (C=1μF)	25.0%max.

Table.3

Item
BJ: JMK type; 105type (C>0.1μF) 107type (C>1.0μF) 212type (C>4.7μF)General (C≧4.7μF)Lowprofile 316type (C>10μF)General (C≧10μF)Lowprofile 325type (C>22μF) 432type (C>47μF)

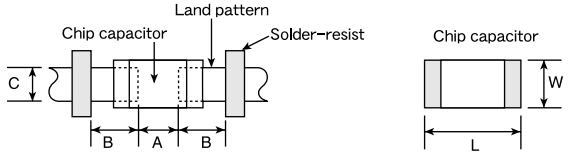
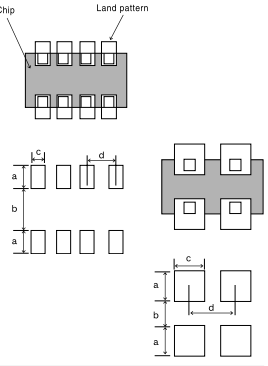
Table.4

Item
BJ: 105type (C>0.1μF)、107type (C>1.0μF) 212type (C>4.7μF)、316type (C>10μF) 325type (C>22μF)、432type (C>47μF) F: 105type (C>0.47μF)、212type (C>4.7μF) 325type (C>22μF)、432type (C>47μF)

Table.5

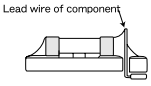
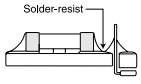
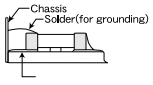
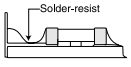
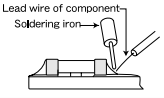
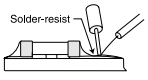
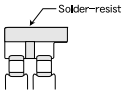
	Item			Capacitance change
Damp Heat	BJ: JMK type;	212 type	(C > 4.7μF)General (C ≧ 4.7μF)Lowprofile	Within±30%
Loading under Damp Heat	BJ: EMK type;	325type	(C ≧ 22μF)	Within±15%
	BJ: JMK type;	316 type	(C > 10μF)General (C ≧ 10μF)Lowprofile	Within±20%
		325 type	(C > 22μF)	
	TMK type;	325 type	(C ≧ 10μF)	
	BJ: JMK type;	107 type	(C ≧ 10μF)	Within±25%
	BJ: JMK type;	212 type	(C > 4.7μF)General (C ≧ 4.7μF)Lowprofile	Within±30%
Loading at high Temperature	BJ: JMK type;	212 type	(C > 4.7μF)General (C ≧ 4.7μF)Lowprofile	
		316 type	(C > 10μF)General (C ≧ 10μF)Lowprofile	Within±20%
		325 type	(C > 22μF)	
	TMK type;	325 type	(C ≧ 10μF)	
	BJ: JMK type;	107 type	(C > 10μF)	Within±25%

Precautions on the use of Multilayer 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. Operating Voltage (Verification of 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.	
2.PCB Design	Pattern configurations (Design of Land-patterns) 1. When capacitors are mounted on a PCB, the amount of solder used (size of fillet) can directly affect capacitor performance. Therefore, the following items must be carefully considered in the design of solder land patterns: (1) The amount of solder applied can affect the ability of chips to withstand mechanical stresses which may lead to breaking or cracking. Therefore, when designing land-patterns it is necessary to consider the appropriate size and configuration of the solder pads which in turn determines the amount of solder necessary to form the fillets. (2) When more than one part is jointly soldered onto the same land or pad, the pad must be designed so that each component's soldering point is separated by solder-resist.	1.The following diagrams and tables show some examples of recommended patterns to prevent excessive solder amourts.(larger fillets which extend above the component end terminations) Examples of improper pattern designs are also shown. (1) Recommended land dimensions for a typical chip capacitor land patterns for PCBs  Recommended land dimensions for wave-soldering (unit: mm) Type / Size L / Size W / A / B / C 107: 1.6 / 0.8 / 0.8~1.0 / 0.5~0.8 / 0.6~0.8 212: 2.0 / 1.25 / 1.0~1.4 / 0.8~1.5 / 0.9~1.2 316: 3.2 / 1.6 / 1.8~2.5 / 0.8~1.7 / 1.2~1.6 325: 3.2 / 2.5 / 1.8~2.5 / 0.8~1.7 / 1.8~2.5 Recommended land dimensions for reflow-soldering (unit: mm) Type / Size L / Size W / A / B / C 063: 0.6 / 0.3 / 0.20~0.30 / 0.20~0.30 / 0.25~0.40 105: 1.0 / 0.5 / 0.45~0.55 / 0.40~0.50 / 0.45~0.55 107: 1.6 / 0.8 / 0.6~0.8 / 0.6~0.8 / 0.6~0.8 212: 2.0 / 1.25 / 0.8~1.2 / 0.8~1.2 / 0.9~1.6 316: 3.2 / 1.6 / 1.8~2.5 / 1.0~1.5 / 1.2~2.0 325: 3.2 / 2.5 / 1.8~2.5 / 1.0~1.5 / 1.8~3.2 432: 4.5 / 3.2 / 2.5~3.5 / 1.5~1.8 / 2.3~3.5 550: 5.7 / 5.0 / 3.7~4.7 / 1.5~2.3 / 3.5~5.5 Excess solder can affect the ability of chips to withstand mechanical stresses. Therefore, please take proper precautions when designing land-patterns. Type / Size L / Size W / a / b / c / d 316 (4 circuits): 3.2 / 1.6 / 0.7~0.9 / 1 / 0.4~0.5 / 0.8 212 (4 circuits): 2.0 / 1.25 / 0.5~0.6 / 0.5~0.6 / 0.2~0.3 / 0.5 Type / Size L / Size W / a / b / c / d 212 (2 circuits): 2.0 / 1.25 / 0.5~0.6 / 0.5~0.6 / 0.5~0.6 / 1.0 110 (2 circuits): 1.37 / 1.0 / 0.35~0.45 / 0.55~0.65 / 0.3~0.4 / 0.64 

Precautions on the use of Multilayer Ceramic Capacitors

Stages	Precautions	Technical considerations
2.PCB Design		(2) Examples of good and bad solder application

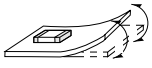
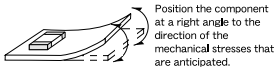
Items	Not recommended	Recommended
Mixed mounting of SMD and leaded components		
Component placement close to the chassis		
Hand-soldering of leaded components near mounted components		
Horizontal component placement		

Pattern configurations

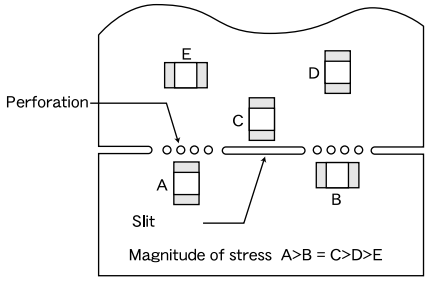
(Capacitor layout on panelized [breakaway] PC boards)

1. After capacitors have been mounted on the boards, chips can be subjected to mechanical stresses in subsequent manufacturing processes (PCB cutting, board inspection, mounting of additional parts, assembly into the chassis, wave soldering the reflow soldered boards etc.) For this reason, planning pattern configurations and the position of SMD capacitors should be carefully performed to minimize stress.

1-1. The following are examples of good and bad capacitor layout; SMD capacitors should be located to minimize any possible mechanical stresses from board warp or deflection.

	Not recommended	Recommended
Deflection of the board		

1-2. To layout the capacitors for the breakaway PC board, it should be noted that the amount of mechanical stresses given will vary depending on capacitor layout. The example below shows recommendations for better design.



1-3. When breaking PC boards along their perforations, the amount of mechanical stress on the capacitors can vary according to the method used. The following methods are listed in order from least stressful to most stressful: push-back, slit, V-grooving, and perforation. Thus, any ideal SMD capacitor layout must also consider the PCB splitting procedure.

Precautions on the use of Multilayer Ceramic Capacitors

Stages	Precautions	Technical considerations
3.Considerations for automatic placement	Adjustment of mounting machine 1. Excessive impact load should not be imposed on the capacitors when mounting onto the PC boards. 2. The maintenance and inspection of the mounters should be conducted periodically.	1. If the lower limit of the pick-up nozzle is low, too much force may be imposed on the capacitors, causing damage. To avoid this, the following points should be considered before lowering the pick-up nozzle: (1)The lower limit of the pick-up nozzle should be adjusted to the surface level of the PC board after correcting for deflection of the board. (2)The pick-up pressure should be adjusted between 1 and 3 N static loads. (3)To reduce the amount of deflection of the board caused by impact of the pick-up nozzle, supporting pins or back-up pins should be used under the PC board. The following diagrams show some typical examples of good pick-up nozzle placement:
	Selection of Adhesives 1. Mounting capacitors with adhesives in preliminary assembly, before the soldering stage, may lead to degraded capacitor characteristics unless the following factors are appropriately checked; the size of land patterns, type of adhesive, amount applied, hardening temperature and hardening period. Therefore, it is imperative to consult the manufacturer of the adhesives on proper usage and amounts of adhesive to use.	2. As the alignment pin wears out, adjustment of the nozzle height can cause chipping or cracking of the capacitors because of mechanical impact on the capacitors. To avoid this, the monitoring of the width between the alignment pin in the stopped position, and maintenance, inspection and replacement of the pin should be conducted periodically. 1. Some adhesives may cause reduced insulation resistance. The difference between the shrinkage percentage of the adhesive and that of the capacitors may result in stresses on the capacitors and lead to cracking. Moreover, too little or too much adhesive applied to the board may adversely affect component placement, so the following precautions should be noted in the application of adhesives. (1)Required adhesive characteristics a. The adhesive should be strong enough to hold parts on the board during the mounting & solder process. b. The adhesive should have sufficient strength at high temperatures. c. The adhesive should have good coating and thickness consistency. d. The adhesive should be used during its prescribed shelf life. e. The adhesive should harden rapidly f. The adhesive must not be contaminated. g. The adhesive should have excellent insulation characteristics. h. The adhesive should not be toxic and have no emission of toxic gasses. (2)The recommended amount of adhesives is as follows;

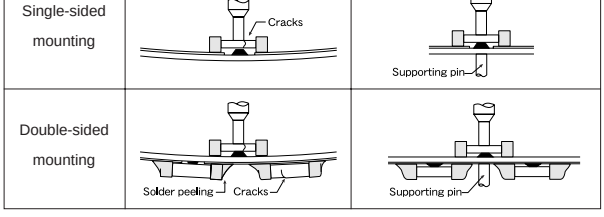
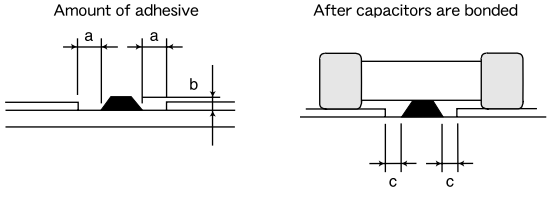
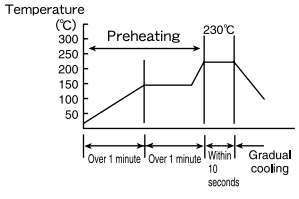
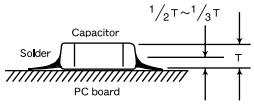
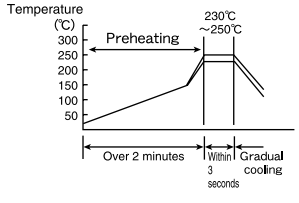


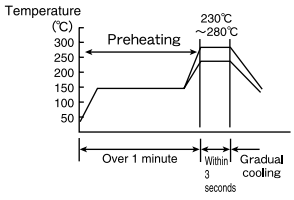
Figure	212/316 case sizes as examples
a	0.3mm min
b	100 ~120 μm
c	Adhesives should not contact the pad



Precautions on the use of Multilayer Ceramic Capacitors

Stages	Precautions	Technical considerations
4. Soldering	Selection of Flux 1. Since flux may have a significant effect on the performance of capacitors, it is necessary to verify the following conditions prior to use; (1)Flux used should be with less than or equal to 0.1 wt% (equivelent to chroline) of halogenated content. Flux having a strong acidity content should not be applied. (2)When soldering capacitors on the board, the amount of flux applied should be controlled at the optimum level. (3)When using water-soluble flux, special care should be taken to properly clean the boards.	1-1. When too much halogenated substance (Chlorine, etc.) content is used to activate the flux, or highly acidic flux is used, 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. 1-2. Flux is used to increase solderability in flow 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. 1-3. 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.
	Soldering Temperature, time, amount of solder, etc. are specified in accordance with the following recommended conditions.	1-1. Preheating when soldering Heating: Ceramic chip components should be preheated to within 100 to 130℃ of the soldering. Cooling: The temperature difference between the components and cleaning process should not be greater than 100℃. Ceramic chip capacitors are susceptible to thermal shock when exposed to rapid or concentrated heating or rapid cooling. Therefore, the soldering process must be conducted with great care so as to prevent malfunction of the components due to excessive thermal shock.
	And please contact us about peak temperature when you use lead-free paste.	Recommended conditions for soldering [Reflow soldering] Temperature profile  Caution 1. The ideal condition is to have solder mass (fillet) controlled to 1/2 to 1/3 of the thickness of the capacitor, as shown below:  2. Because excessive dwell times can detrimentally affect solderability, soldering duration should be kept as close to recommended times as possible. [Wave soldering] Temperature profile  Caution 1. Make sure the capacitors are preheated sufficiently. 2. The temperature difference between the capacitor and melted solder should not be greater than 100 to130℃ 3. Cooling after soldering should be as gradual as possible. 4. Wave soldering must not be applied to the capacitors designated as for reflow soldering only.

Precautions on the use of Multilayer Ceramic Capacitors

Stages	Precautions	Technical considerations
4. Soldering		[Hand soldering] Temperature profile  Caution 1. Use a 20W soldering iron with a maximum tip diameter of 1.0 mm. 2. The soldering iron should not directly touch the capacitor.
5.Cleaning	Cleaning conditions 1. When cleaning the PC board after the capacitors are all mounted, select the appropriate cleaning solution according to the type of flux used and purpose of the cleaning (e.g. to remove soldering flux or other materials from the production process.) 2. Cleaning conditions should be determined after verifying, through a test run, that the cleaning process does not affect the capacitor's characteristics.	1. The use of inappropriate solutions can cause foreign substances such as flux residue to adhere to the capacitor or deteriorate the capacitor's outer coating, resulting in a degradation of the capacitor's electrical properties (especially insulation resistance). 2. Inappropriate cleaning conditions (insufficient or excessive cleaning) may detrimentally affect the performance of the capacitors. (1)Excessive cleaning In the case of ultrasonic cleaning, too much power output can cause excessive vibration of the PC board which may lead to the cracking of the capacitor or the soldered portion, or decrease the terminal electrodes' strength. Thus the following conditions should be carefully checked; Ultrasonic output Below 20 W/ℓ Ultrasonic frequency Below 40 kHz Ultrasonic washing period 5 min. or less
6.Post cleaning processes	1. With some type of resins a decomposition gas or chemical reaction vapor may remain inside the resin during the hardening period or while left under normal storage conditions resulting in the deterioration of the capacitor's performance. 2. When a resin's hardening temperature is higher than the capacitor's operating temperature, the stresses generated by the excess heat may lead to capacitor damage or destruction. The use of such resins, molding materials etc. is not recommended.	
7.Handling	Breakaway PC boards (splitting along perforations) 1. When splitting the PC board after mounting capacitors and other components, care is required so as not to give any stresses of deflection or twisting to the board. 2. Board separation should not be done manually, but by using the appropriate devices. Mechanical considerations 1. Be careful not to subject the capacitors to excessive mechanical shocks. (1)If ceramic capacitors are dropped onto the floor or a hard surface, they should not be used. (2)When handling the mounted boards, be careful that the mounted components do not come in contact with or bump against other boards or components.	

Precautions on the use of Multilayer Ceramic Capacitors

Stages	Precautions	Technical considerations
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 The ambient temperature must be kept below 30℃. Even under ideal storage conditions capacitor electrode solderability decreases as time passes, so should be used within 6 months from the time of delivery. ・Ceramic chip capacitors should be kept where no chlorine or sulfur exists in the air. 2. The capacitance value of high dielectric constant capacitors (type 2 &3) will gradually decrease with the passage of time, so this should be taken into consideration in the circuit design. If such a capacitance reduction occurs, a heat treatment of 150℃ for 1hour will return the capacitance to its initial level.	1. If the parts are stored in a high temperature and humidity environment, problems such as reduced solderability caused by oxidation of terminal electrodes and deterioration of taping/packaging materials may take place. For this reason, components should be used within 6 months from the time of delivery. If exceeding the above period, please check solderability before using the capacitors.

高周波用円筒セラミックコンデンサ
(セラチップ)
TUBULAR TYPE CERAMIC CAPACITORS
(FOR HIGH FREQUENCY)

OPERATING TEMP.	−25℃～+85℃

フロー／WAVE　リフロー／REFLOW

特長　FEATURES

・高周波特性に優れる
　・インピーダンス特性が良好
　・等価直列抵抗(ESR)が小さい
　・高周波でのQ値が高い
・ハンダくわれ・ぬれ性に対する端子電極対応により、ハンダ付けの信頼性に優れる
・耐熱衝撃性に優れる
・寸法安定性に優れ、高い実装性を誇る
・基板曲げ時の耐ベンディング性に優れる
・チューナ特性に優れる

・Excellent high-frequency characteristics:
　* Good impedance characteristics
　* Low equivalent series resistance
　* Large Q-value at high frequencies
・Compatible with 0603 and 0805 component solder pad dimensions
・Highly resistant to heat and impact
・Excellent solderability and ability to withstand PCB bending
・Excellent tuner characteristics

用途　APPLICATIONS

・通信機器用
　携帯電話、PHS、コードレス電話etc
・民生機器用
　チューナ、ビデオ、テレビetc

・Communications Equipment: portable telephones, PHS, other wireless applications, etc.
・Consumer Electronic Appliances: tuners, video equipment, television sets, etc.

形名表記法　ORDERING CODE

1 定格電圧〔VDC〕

B	12 (16 可)
E	16
T	35
U	50

2 分類

CN	円筒コンデンサ

3 形状寸法〔mm〕

033	1.6×1.0
053	2.0×1.25

4 温度特性〔ppm/℃〕

△A	± 5%		
△B	±10%		
△F	$\pm^{30}_{80}$%		
△W	±10%		
△Y	±22%		
C□	0：CK、CJ、CH	□許容差	
R□	−220：RK,RJ,RH		
S□	−330：SK,SJ,SH	H	± 60
T□	−470：TK,TJ,TH	J	±120
U□	−750：UK,UJ	K	±250
SL	+350～−1000	L	±500

△=スペース

5 公称静電容量〔pF〕

例	
0R5	0.5
010	1
682	6800

R= 小数点

6 容量許容差

	10pF 以下	10pF 超
C△	± 0.25 pF	
D△	± 0.5 pF	
F△	± 1 pF	
J△		± 5%
K△		±10%
M△		±20%
N△		±30%
Z△		$+^{80}_{-20}$ %

△= スペース

7 包装

△△	単品(袋づめ)
−2	テーピング
−7	バルクカセット品

△= スペース

U C N 0 3 3 C H 1 0 0 D △ − 2
1 2 3 4 5 6 7

1 Rated voltage〔VDC〕

B	12 (Available up to 16)
E	16
T	35
U	50

2 Type

CN	Tubular capacitor

3 External Dimensions〔mm〕

033	1.6×1.0
053	2.0×1.25

4 Temperature characteristics〔ppm/℃〕

△A	± 5%		
△B	±10%		
△F	$\pm^{30}_{80}$%		
△W	±10%		
△Y	±22%		
C□	0：CK、CJ、CH	□=Tolerance	
R□	−220：RK,RJ,RH		
S□	−330：SK,SJ,SH	H	± 60
T□	−470：TK,TJ,TH	J	±120
U□	−750：UK,UJ	K	±250
SL	+350～−1000	L	±500

△=Blank space

5 Nominal Capacitance〔pF〕

0R5	0.5
010	1
682	6800

*R=decimal point

6 Capacitance Tolerances

	10pF≦	10pF>
C△	± 0.25 pF	
D△	± 0.5 pF	
F△	± 1 pF	
J△		± 5%
K△		±10%
M△		±20%
N△		±30%
Z△		$+^{80}_{-20}$ %

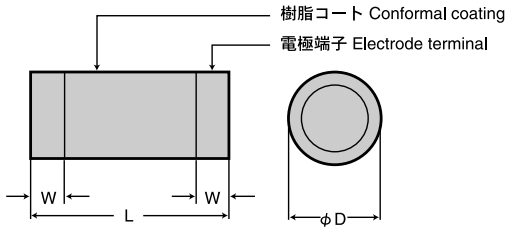
△=Blank space

7 Packaging

△△	Bulk
−2	Tape & reel
−7	Bulk cassette

△=Blank space

外形寸法　EXTERNAL DIMENSIONS



Type	L	φD	W
033	$1.6^{+0.2}_{-0.1}$ ($0.063^{+0.008}_{-0.004}$)	1.0±0.1 (0.039±0.004)	0.3±0.15 (0.012±0.006)
053	$2.0^{+0.2}_{-0.1}$ ($0.079^{+0.008}_{-0.004}$)	1.25±0.2 (0.049±0.008)	$0.3^{+0.2}_{-0.1}$ ($0.012^{+0.008}_{-0.004}$)

Unit：mm(inch)

概略バリエーション　AVAILABLE CAPACITANCE RANGE

Class1 (Temperature compensating)

WV	50V(UCN)											
Temp.char.	C□		R□		S□		T□		U□		SL	
Type	033	053	033	053	033	053	033	053	033	053	033	053
Cap [pF]	[pF 3digits]											
0.5	0R5											
0.75	R75											
1	010											
1.5	1R5											
2	020											
2.5	2R5											
3	030											
3.5	3R5											
4	040											
4.5	4R5											
5	050											
6	060											
7	070											
8	080											
9	090											
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											
68	680											
75	750											
82	820											
91	910											
100	101											
120	121											
150	151											

Class2、3 (High dielectric constant)

WV	50V(UCN)					35V(TCN)		16V(BCN)		16V(ECN)	
Temp.char.	A	B		W		Y		Y		F	
Type	053	033	053	033	053	033	053	033	053	033	053
Cap [pF]	[pF 3digits]										
68	680										
82	820										
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										
1500	152										
2200	222										
3300	332										
4700	472										
5600	562										
6800	682										
8200	822										
10000	103										
15000	153										
22000	223										

仕様　SPECIFICATIONS

033Type

温度特性 Temp.char.	静電容量変化率 Capacitance Change	静電容量許容差 CapacitanceTolerance	Q or tanδ
CK	0±250	0.5～5pF C(±0.25pF)	Q 400+20・Cmin (C≦27pF)
RK	−220±250		
SK	−330±250		
TK	−470±250		
UK	−750±250		
CJ	0±120ppm／℃	6～10pF D(±0.5pF) F(±1pF)	500min (30≦C≦33pF)
RJ	−220±120		
SJ	−330±120		
TJ	−470±120		
UJ	−750±120		
CH	0±60ppm／℃	11～91pF J(±5%)	100min (51≦C≦91pF)
RH	−220±60		
SH	−330±60		
TH	−470±60		
SL	+350～−1000ppm／℃		
B	±10%	K(±10%)	tanδ 2.5%max
W	±10%	M(±20%) N(±30%)	
Y	±22%		
F	$^{+30}_{-85}$%	Z($^{+80}_{-20}$%)	tanδ 7.5%max

053Type

温度特性 Temp.char.	静電容量変化率 Capacitance Change	静電容量許容差 CapacitanceTolerance	Q or tanδ
CK	0±250ppm／℃	0.5～5pF C(±0.25pF)	Q 400+20・Cmin (C≦27pF)
RK	−220±250		
SK	−330±250		
TK	−470±250		
UK	−750±250		
CJ	0±120ppm／℃	6～10pF D(±0.5pF) F(±1pF)	1000min (30≦C≦39pF)
RJ	−220±120		
SJ	−330±120		
TJ	−470±120		
UJ	−750±120		
CH	0±60ppm／℃	11～56pF J(±5%)	500min (43≦C≦56pF)
RH	−220±60		
SH	−330±60		
TH	−470±60		
SL	+350～−1000ppm／℃		
A	± 5%	K(±10%)	tanδ 1.5%max
B	±10%		tanδ 2.5%max
W	±10%	M(±20%) N(±30%)	
Y	±22%		
F	$^{+30}_{-85}$%	Z($^{+80}_{-20}$%)	tanδ 7.5%max

セレクションガイド Selection Guide ◀ P.8
アイテム一覧 Part Numbers P.100 ▶
特性図 Electrical Characteristics P.104 ▶
梱包 Packaging P.106 ▶
信頼性 Reliability Data P.108 ▶
使用上の注意 Precautions P.118 ▶
etc

033Type

Class1

定格電圧 RatedVoltage (DC)	形名 Ordering code		温度特性 Temperature characteristics	公称静電容量 Capacitance 〔pF〕	静電容量許容差 Capacitance tolerance	Q or tanδ	絶縁抵抗 Insulation resistance
50V	UCN033□0R5○		CK,RK SK,TK UK,SL	0.5	±0.25pF ±0.5 pF	Q≧400+20・C (C：静電容量) (C:capacitance)	10000MΩmin.
	UCN033□R75○			0.75			
	UCN033□ 010○			1			
	UCN033□1R5○			1.5			
	UCN033□020○			2			
	UCN033□2R5○		CJ,RJ,SJ	2.5			
	UCN033□030○		TJ,UJ,SL	3			
	UCN033□3R5○		CH RH SH TH UJ SL	3.5			
	UCN033□040○			4			
	UCN033□4R5○			4.5			
	UCN033□050○			5			
	UCN033□060○			6	±0.5pF ±1pF		
	UCN033□070○			7			
	UCN033□080○			8			
	UCN033□090○			9			
	UCN033□100○			10			
	UCN033□110○			11	± 5% ±10%		
	UCN033□120○			12			
	UCN033□130○			13			
	UCN033□150○		RH,SH,TH,UJ,SL	15			
	UCN033□160○		SH,TH,UJ,SL	16			
	UCN033□180○			18			
	UCN033□200○		TH,UJ,SL	20			
	UCN033□220○			22			
	UCN033□240○		UJ,SL	24			
	UCN033□270○			27			
	UCN033SL300○		SL	30		Q≧500	
	UCN033SL330○			33			
	UCN033SL360○			36			
	UCN033SL390○			39			
	UCN033SL430○			43		Q≧100	
	UCN033SL470○			47			
	UCN033SL510○			51			
	UCN033SL560○			56			
	UCN033SL680○			68			
	UCN033SL750○			75			
	UCN033SL820○			82			
	UCN033SL910○			91			
	UCN033SL101○			100			

形名の□は温度特性記号、○は静電容量許容差記号が入ります。　□ Please specify the temperature characteristics and ○ capacitance tolerance code.

Class2,3

定格電圧 RatedVoltage (DC)	形名 Ordering code		温度特性 Temperature characteristics	公称静電容量 Capacitance (pF)	静電容量許容差 Capacitance tolerance	Q or tanδ	絶縁抵抗 Insulation resistance
50V	UCN033B121○		B	120	±10% ±20%	tanδ≦2.5	10000MΩmin.
	UCN033B151○			150			
	UCN033B181○			180			
	UCN033B221○			220			
	UCN033B271○			270			
	UCN033B331○			330			
	UCN033W391○		W	390	±20% ±30%		1000MΩmin.
	UCN033W471○			470			
	UCN033W561○			560			
35V	TCN033Y681○		Y	680	±20% ±30%		
	TCN033Y821○			820			
	TCN033Y102○			1000			
	TCN033Y152○			1500			
	TCN033Y222○			2200			
16V	BCN033Y332○			3300			
	BCN033Y472○			4700			
	BCN033Y562○			5600			
	BCN033Y682○			6800			
	ECN033F103Z		F	10000	+80 −20%	tanδ≦7.5%	

形名の□は温度特性記号、○は静電容量許容差記号が入ります。　□ Please specify the temperature characteristics and ○ capacitance tolerance code.

053Type

Class1

定格電圧 RatedVoltage (DC)	形名 Ordering code		温度特性 Temperature characteristics	公称静電容量 Capacitance [pF]	静電容量許容差 Capacitance tolerance	Q or tanδ	絶縁抵抗 Insulation resistance
50V	UCN053□0R5○		CK,RK SK,TK UK,SL	0.5	±0.25pF ±0.5pF	Q≧400+20・C (C：静電容量) (C:capacitance)	10000MΩmin.
	UCN053□R75○			0.75			
	UCN053□010○			1			
	UCN053□1R5○			1.5			
	UCN053□020○			2			
	UCN053□2R5○		CJ,RJ,SJ TJ,UJ,SL	2.5			
	UCN053□030○			3			
	UCN053□3R5○		CH RH SH TH UJ SL	3.5			
	UCN053□040○			4			
	UCN053□4R5○			4.5			
	UCN053□050○			5			
	UCN053□060○			6	±0.5pF ±1pF		
	UCN053□070○			7			
	UCN053□080○			8			
	UCN053□090○			9			
	UCN053□100○			10			
	UCN053□110○			11	± 5% ±10%		
	UCN053□120○			12			
	UCN053□130○			13			
	UCN053□150○			15			
	UCN053□160○			16			
	UCN053□180○			18			
	UCN053□200○			20			
	UCN053□220○		SH,TH,UJ,SL	22			
	UCN053□240○		TH,UJ,SL	24			
	UCN053□270○			27			
	UCN053□300○		UJ,SL	30		Q≧1000	
	UCN053SL330○		SL	33			
	UCN053SL360○			36			
	UCN053SL390○			39			
	UCN053SL430○			43		Q≧500	
	UCN053SL470○			47			
	UCN053SL510○			51			
	UCN053SL560○			56			
	UCN053SL620○			62			
	UCN053SL680○			68			
	UCN053SL750○			75		Q≧100	
	UCN053SL820○			82			
	UCN053SL910○			91			
	UCN053SL101○			100			
	UCN053SL121○			120			
	UCN053SL151○			150			

形名の□は温度特性記号、○は静電容量許容差記号が入ります。

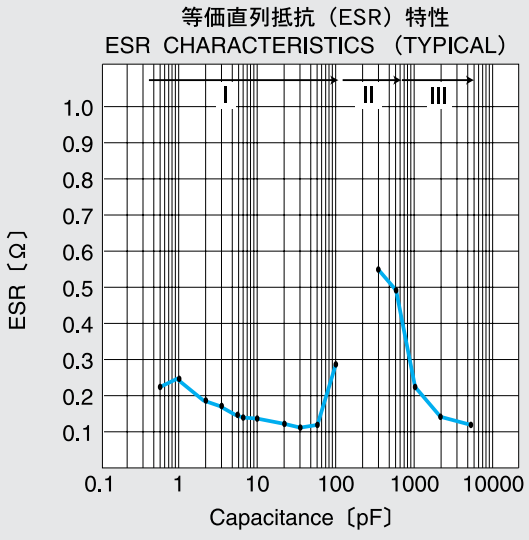
□ Please specify the temperature characteristics and ○ capacitance tolerance code.

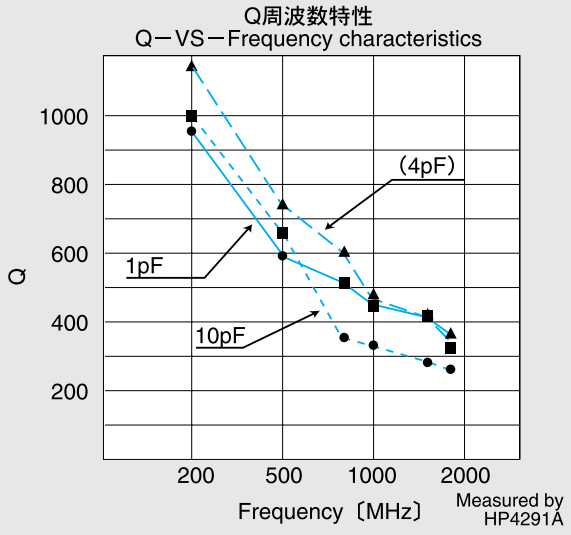
Class2、3

定格電圧 RatedVoltage (DC)	形名 Ordering code		温度特性 Temperature characteristics	公称静電容量 Capacitance (pF)	静電容量許容差 Capacitance tolerance	Q or tanδ	絶縁抵抗 Insulation resistance
50V	UCN053A680○		A	68	±10% ±20%	tanδ≦1.5%	10000MΩmin.
	UCN053A820○			82			
	UCN053A101○			100			
	UCN053A121○			120			
	UCN053A151○			150			
	UCN053A181○			180			
	UCN053B221○		B	220		tanδ≦2.5%	
	UCN053B271○			270			
	UCN053B331○			330			
	UCN053B391○			390			
	UCN053B471○			470			
	UCN053W561○		W	560	±20% ±30%		1000MΩmin.
	UCN053W681○			680			
	UCN053W821○			820			
35V	TCN053Y681○		Y	680	±20% ±30%		
	TCN053Y821○			820			
	TCN053Y102○			1000			
	TCN053Y152○			1500			
	TCN053Y222○			2200			
16V	BCN053Y332○			3300			
	BCN053Y472○			4700			
	BCN053Y682○			6800			
	BCN053Y822○			8200			
	ECN053F103Z		F	10000	+80 −20%	tanδ≦7.5%	
	ECN053F153Z			15000			
	ECN053F223Z			22000			

形名の○は静電容量許容差記号が入ります。

○ Please specify the capacitance tolerance code.

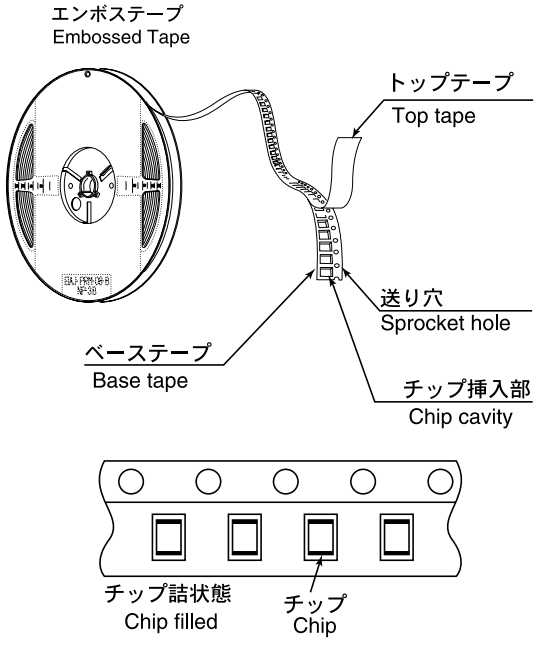

等価直列抵抗（ESR）特性
ESR CHARACTERISTICS （TYPICAL）
ESR〔Ω〕
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
I
II
III
0.1
1
10
100
1000
10000
Capacitance〔pF〕


Q周波数特性
Q－VS－Frequency characteristics
Q
1000
800
600
400
200
(4pF)
1pF
10pF
200
500
1000
2000
Frequency〔MHz〕
Measured by
HP4291A

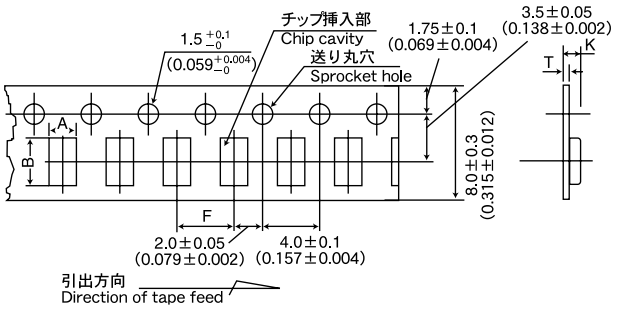
①標準数量　Standard quantity

形式 Type	標準数量(PCS) Standard quantity		
	袋づめ Bulk	バルクカセット Bulk cassette	テーピング Tape&Reel
033	5000	10000	3000
053	2000	6000	3000

②テーピング材質　Tape Material



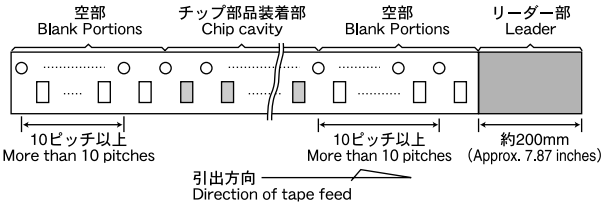
③テーピング寸法　Taping Dimensions



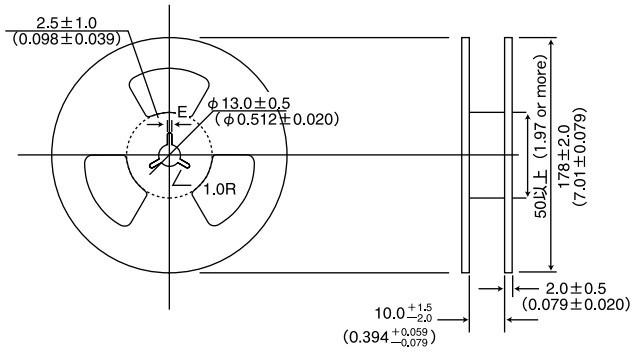
形　式 Type	チップ挿入部 Chip cavity		挿入ピッチ Insertion Pitch	テープ厚み Tape Thickness	
	A	B	F	K	T
033	1.4±0.1 (0.055±0.004)	1.9±0.2 (0.075±0.008)	4.0±0.1 (0.157±0.004)	1.4max. (0.055max)	0.30max. (0.012max)
053	1.45±0.1 (0.057±0.004)	2.35±0.2 (0.093±0.008)	4.0±0.1 (0.157±0.004)	2.0max. (0.079max)	0.30max. (0.012max)

Unit：mm(inch)

④リーダー部／空部　Leader and Blank Portion



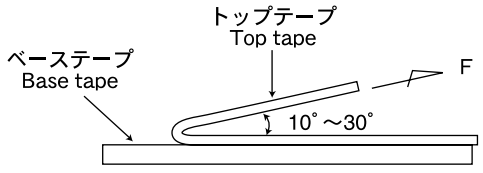
⑤リール寸法　Reel Size



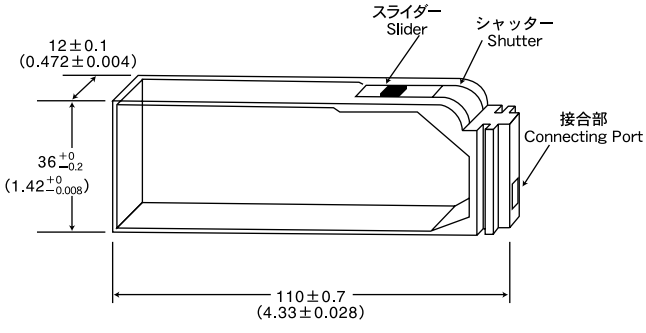
Unit = mm (inch)

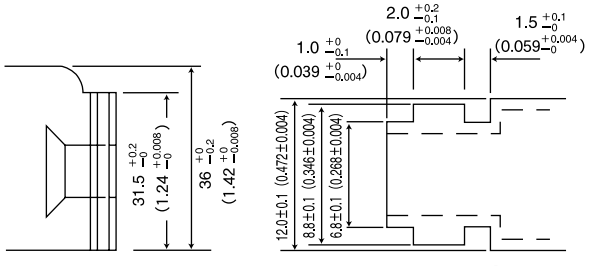
⑥トップテープ強度　Top Tape Strength

トップテープの剥離力は、下図矢印方向にて0.2～0.8Nとなります。
The top tape requires a peel-off force of 0.2 to 0.8N in the direction of the arrow as illutrated below.



⑦バルクカセット　Bulk Cassette





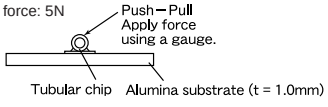
Unit：mm (inch)

TUBULAR TYPE CERAMIC CAPACITORS

Item		Specified Value			Test Methods and Remarks
		Temperature Compensating (Class 1)	High Permittivity (Class 2)	Semiconductor (Class 3)	
		Tubular(*CN)	Tubular(*CN)	Tubular(*CN)	
1.Operating Temperature Range		−25 to +85℃	−25 to +85℃	−25 to +85℃	
2.Storage Temperature Range		−25 to +85℃	−25 to +85℃	−25 to +85℃	
3.Rated Voltage		50VDC	50VDC	50 VDC, 35 VDC, 16 VDC	
4.Withstanding Voltage	Between terminals	No abnormality	No abnormality	No abnormality	Tubular (*CN): Applied voltage: Rated voltage×3 (Class 1) Rated voltage×2.5 (Class 2) Rated voltage×2 (Class 3) Duration: 1 to 5 sec. Charge/discharge current: 50mA max. (Class 1,2) 10mA max. (Class 3)
5.Insulation Resistance		10000 MΩ min	10000 MΩ min	1000 MΩ min	Applied voltage: Rated voltage Duration: 60±5 sec. Charge/discharge current: 10mA max. (Class 3)
6. Capacitance		0.5 to 5 pF : ±0.25 pF ±0.5 pF 6 to 10 pF : ±0.5 pF ±1 pF 11 pF or over : ± 5% ±10%	±10% ±20%	±20%, ±30% +80 −20%	Tubular (*CN): Measuring frequency: 1MHz ±20%(Class 1) 1kHz ±20%(Class 2,3) Measuring voltage: 1 ±0.5Vrms (Class1,2,3) 0.1Vrms max (Class3:F) Bias application: None
7.Q or Tangent of Loss Angle (tan δ)		053: Under 30 pF : Q≧400 + 20C 30 pF or over : Q≧1000 SL, 43 pF or over : Q≧500 033: Under 30 pF : Q≧400 + 20C SL, 30 to 39 pF : Q≧500 SL, 43 to 100 pF : Q≧100 C= Nominal capacitance	A: 1.5% max. B: 2.5% max.	W,Y: 2.5% max.	Tubular (*CN): Measuring frequency: 1MHz±20% (Class 1) 1kHz±20% (Class 2,3) Measuring voltage: 1 ±0.5Vrms (Class1,2,3) 0.1Vrms max (Class3:F) Bias application: None

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

TUBULAR TYPE CERAMIC CAPACITORS

Item		Specified Value			Test Methods and Remarks
		Temperature Compensating (Class 1)	High Permittivity (Class 2)	Semiconductor (Class 3)	
		Tubular(*CN)	Tubular(*CN)	Tubular(*CN)	
8.Capacitance Change due to Temperature or Rate of Capacitance Change	(When voltage is not applied)	CK：0±250 CJ：0±120 CH：0±60 RK：−220±250 RJ：−220±120 RH：−220±60 SK：−330±250 SJ：−330±120 SH：−330±60 TK：−470±250 TJ：−470±120 TH：−470±60 UK：−750±250 UJ：−750±120 SL：+350 to −1000 (ppm/℃)	A：±5% B：±10%	W：±10% Y：±22%	According to JIS C 5102 clause 7.12. Temperature compensating: Measurement of capacitance at 20℃ and 85℃ shall be made to calculate temperature characteristic by the following equation. $\frac{(C_{85}-C_{20})}{C_{20}\times\triangle T}\times10^6$ (ppm/℃) $\frac{(C_{-25}-C_{20})}{C_{20}\times\triangle T}\times10^6$ (ppm/℃) High permittivity and semiconductor types: Change of maximum capacitance deviation in step 1 to 5 Temperature at step 1: +20℃ Temperature at step 2: -25℃ Temperature at step 3: +20℃ (Reference temperature) Temperature at step 4: +85℃ Temperature at step 5: +20℃
9.Adhesion of Electrode		No damage	No damage	No damage	Tubular (*CN): Applied force: 5N 
10.Solderability		At least 80% of terminal electrodes is covered by new solder.	At least 80% of terminal electrodes is covered by new solder.	At least 80% of terminal electrodes is covered by new solder.	Tubular (*CN): According to JIS C 5102 clause 8.13. Solder temperature: 230±5℃ Duration: 4±1 sec.

TUBULAR TYPE CERAMIC CAPACITORS

Item	Specified Value			Test Methods and Remarks
	Temperature Compensating (Class 1)	High Permittivity (Class 2)	Semiconductor (Class 3)	
	Tubular(*CN)	Tubular(*CN)	Tubular(*CN)	
11.Resistance to Soldering Heat	Appearance: No abnormality Capacitance change: Within ±2.5% or ±0.25pF, whichever is larger. Q: Initial value Insulation resistance: Initial value Withstanding voltage (between terminals): No abnormality	Appearance: No abnormality Capacitance change: A: Within ±3% B: Within ±5% tan δ: Initial value Insulation resistance: Initial value Withstanding voltage (between terminals): No abnormality	Appearance: No abnormality Capacitance change: A: Within ±7.5% (B, BJ) B: Within ±20% (F) tan δ: Initial value Insulation resistance: Initial value Withstanding voltage (between terminals): No abnormality	Tubular (*CN): According to JIS C 5102 clause 8.14. Solder temperature: 270±5℃ Duration: 3±0.5 sec. Preheating conditions: 80 to 120℃, 2 min. 150 to 200℃, 2 min. Recovery: Recovery for the following period under the standard condition after the test. 24±2 hrs (Class 1) 48±4 hrs (Class 2,3) * The Class 3 requires thermal treatment after the test.
12.Thermal Shock	Appearance: No abnormality Capacitance change: Within ±2.5% or ±0.25pF, whichever is larger. Q: Initial value 0.5~27pF Q≧400+20C SL 30~39pF Q≧500 43~100pF Q≧100 Insulation resistance: Initial value Withstanding voltage (between terminals): No abnormality	Appearance: No abnormality Capacitance change: A: Within ±3% B: Within ±5% tan δ: Initial value Insulation resistance: Initial value Withstanding voltage (between terminals): No abnormality	Appearance: No abnormality Capacitance change: Within ±5 % tan δ:3%max. Insulation resistance: Initial value Withstanding voltage (between terminals): No abnormality	Tubular (*CN): Conditions for 1 cycle: Step 1: Room temperature 10 min. Step 2: -25 $^{+0}_{-3}$℃ 30 min. Step 3: Room temperature 10 min. Step 4: +85 $^{+3}_{-0}$℃ 30 min. Number of cycles: 5 Recovery: Recovery for the following period under the standard condition after the test. 24±2 hrs (Class 1) 48±4 hrs (Class 2,3)

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.

TUBULAR TYPE CERAMIC CAPACITORS

Item	Specified Value			Test Methods and Remarks
	Temperature Compensating (Class 1)	High Permittivity (Class 2)	Semiconductor (Class 3)	
	Tubular(*CN)	Tubular(*CN)	Tubular(*CN)	
13.Damp Heat (steady state)	Appearance : No abnormality Capacitance change: Within ±5% or ±0.5pF, whichever is larger. Q(033): 0.5 to 9 pF : Q≧200 + 10C 10 to 27 pF : Q≧275 + 2.5C 30 to 39 pF : Q≧250(SL) 43 to 100 pF: Q≧50 (SL) Q(053): C≧30 pF : Q≧350 10≦C<30 pF : Q≧275 + 2.5C C<10 pF : Q≧200 + 10C 053SL43 pF or over : Q≧250 C= Nominal capacitance Insulation resistance : 1000 MΩ min.	Appearance : No abnormality Capacitance change: A: Within ±7.5% B: Within ±10% tan δ: A : 3% max. B : 5% max. Insulation resistance: 1000 MΩ min.	Appearance : No abnormality Capacitance change: Within $^{+10}_{-15}$ % tan δ: 5% max. Insulation resistance : 500 MΩ min. (033) 1000MΩmin (053)	Tubular (*CN033,053): Temperature: 40±2℃ Humidity: 90 to 95% RH Duration: 500$^{+24}_{-0}$ hrs 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 2,3)
14.Loading under Damp Heat	Appearance: No abnormality Capacitance change: Within ±7.5% or ±0.75pF, whichever is larger. Q(033): 0.5 to 27 pF: Q≧100 + 10C/3 30 to 39 pF : Q≧250 (SL) 43 to 100 pF: Q≧30 (SL) Q(053): C≧30 pF: Q≧200 C<30 pF : Q≧100 + 10C/3 053SL43 pF or over: Q≧150 C= Nominal capacitance Insulation resistance: 500 MΩ min.	Appearance: No abnormality Capacitance change: A : Within ±7.5% B : Within ±10% tan δ: A : 5% max. B : 5% max. Insulation resistance: 500 MΩ min.	Appearance: No abnormality Capacitance change: Within $^{+10}_{-15}$ % tan δ: 5% max. Insulation resistance: 250 MΩ min.	According to JIS C 5102 clause 9.9. Tubular (*CN): Temperature: 40±2℃ Humidity: 90 to 95% RH Duration: 500 $^{+24}_{-0}$ hrs (*CN033,053) Applied voltage: Rated voltage Charge and discharge current: 50mA max. (Class 1,2) 10mA max. (Class 3) Recovery: Recovery for the following period under the standard condition after the removal from test chamber. As for Class 3, thermal treatment shall be performed prior to the recovery. 24±2 hrs (Class 1) 48±4 hrs (Class 2,3)

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

TUBULAR TYPE CERAMIC CAPACITORS

Item	Specified Value			Test Methods and Remarks
	Temperature Compensating (Class 1)	High Permittivity (Class 2)	Semiconductor (Class 3)	
	Tubular(*CN)	Tubular(*CN)	Tubular(*CN)	
15. Load Test under High Temp	Appearance: No abnormality Capacitance change: Within ±3% or ±0.3pF, whichever is larger. Q(033): 0.5 to 9 pF : Q≧200 + 10C 10 to 27 pF : Q≧275 + 2.5C 30 to 39 pF : Q≧250(SL) 43 to 100 pF: Q≧50 (SL) Q(053): C≧30 pF : Q≧350 10≦C＜30 pF: Q≧275 + 2.5C C＜10 pF : Q≧200 + 10C 053SL43 pF or over: Q≧250 C= Nominal capacitance Insulation resistance: 1000 MΩ min.	Appearance: No abnormality Capacitance change: A: Within ±7.5% B: Within ±10% tan δ: A : 3% max. B : 4% max. Insulation resistance: 1000 MΩ min.	Appearance: No abnormality Capacitance change: Within $^{+10}_{-15}$ % tan δ: 5% max. Insulation resistance: 500 MΩ min.	According to JIS C 5102 clause 9.10. Tubular (*CN): Temperature: 85±2℃ Duration: 1000 $^{+48}_{0}$ hrs (*CN033,053) Applied voltage: Rated voltage×2 (Class 1,2) Rated voltage×1.25 (Class 3) Charge and discharge current: 50mA max. (Class 1,2) 10mA max. (Class 3) Recovery: Recovery for the following period under the standard condition after the removal from test chamber. As for Class 3, thermal treatment shall be performed prior to the recovery. 24±2 hrs (Class 1) 48±4 hrs (Class 2,3)

Note 1: Thermal treatment (Tubular/*CN Class3): 1 hr of thermal treatment at 120±3℃ followed by 4 hrs of recovery under the standard condition shall be performed before the measurement.

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."

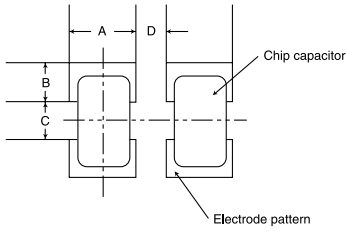
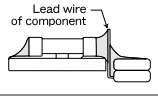
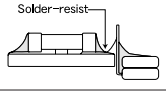
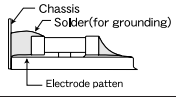
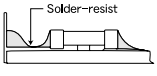
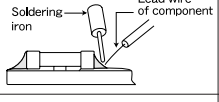
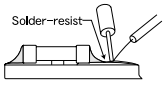
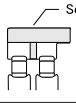
*Please specify the rated voltage code.

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

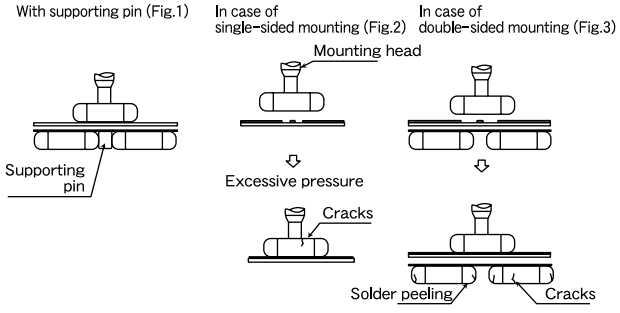
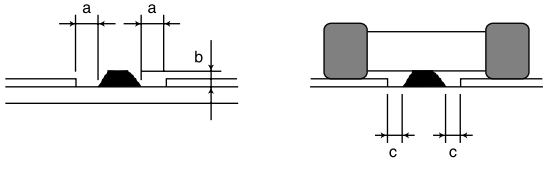
Precautions on the use of Tubular Type

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. ◆Operating Voltage (Verification of 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. ◆Operating Current (Limitation in the current) 1. General purpose capacitors are usually designed in a DC environment. Therefore, if capacitors are used in the circuits where AC or Pulse voltages are loaded, a large current running through the capacitor may result in a short-circuit due to self-generated heat. 2. Class 3 capacitors have limitations in charging and discharging current. Therefore, if the current is overloaded it may cause the capacitor to short-circuit, burn or smoke. ◆*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)	

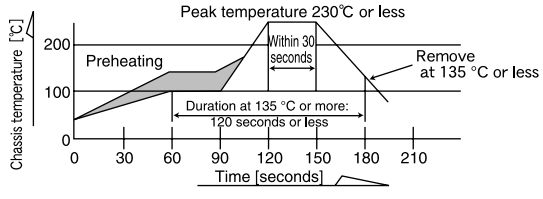
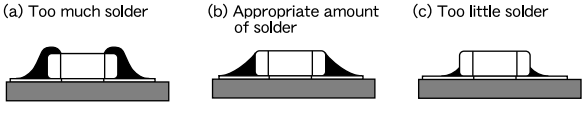
Precautions on the use of Tubular Type

Stages	Precautions	Technical considerations
2. PCB Design	◆Pattern configurations (Design of Land-patterns) 1. When capacitors are mounted on a PCB, the amount of solder used (size of fillet) can directly affect capacitor performance. Therefore, the following items must be carefully considered in the design of solder land patterns: (1) The amount of solder applied can affect the ability of chips to withstand mechanical stresses which may lead to breaking or cracking. Therefore, when designing land-patterns it is necessary to consider the appropriate size and configuration of the solder pads which in turn determines the amount of solder necessary to form the fillets. (2) When more than one part is jointly soldered onto the same land or pad, the pad must be designed so that each component's soldering point is separated by solder-resist.	1. The following diagrams and tables show some examples of recommended patterns to prevent excessive solder amounts (larger fillets which extend above the component end terminations). Examples of improper pattern designs are also shown. (1) Recommended land dimensions for a typical chip capacitor Electrode patterns for PCBs  Recommended land patterns for wave soldering Unit: (mm) Type / Location: 053 / 033 A: 1.2 / 1.0 B: 1.2 / 1.0 C: 1.1 / 0.8~1.0 D: 1.0 / 0.8 Recommended land patterns for reflow soldering Unit: (mm) Type / Location: 053 / 033 A: 1.2 / 0.9 B: 0.8 / 0.6 C: 1.0 / 0.9 D: 0.5 or more / 0.5 or more Notes; 1. When designing land patterns, rounded corners on the solder pad might result in better solderability. 2. The size of the solder pad can vary depending on the part location and amount of solder. Therefore, please carefully consider location and solder amounts when designing solder pads. • Examples of good and bad solder application Item / Not recommended / Lead wire of component Mixe-mounting of SMD and leaded components   Component placement close to the chassis   Hand-soldering of leaded components near mounted components   Horizontal component placement  

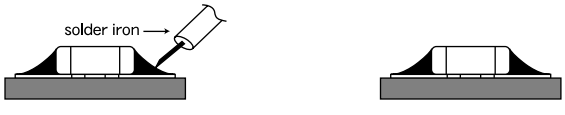
Precautions on the use of Tubular Type

Stages	Precautions	Technical considerations
3. Considerations for automatic placement	◆Adjustment of mounting machine-1 1. Excessive impact load should not be imposed on the capacitors when mounting onto the PC boards.	1. If the lower limit of the pick-up nozzle is low, too much force may be imposed on the capacitors, causing damage. To avoid this, the following points should be considered before lowering the pick-up nozzle: (1) The lower limit of the pick-up nozzle should be adjusted to the surface level of the PC board after correcting for deflection of the board. (2) The pick-up pressure should be adjusted between 1 and 3 N or less static loads. (3) In case of double-sided mounting, a supporting pin should be used under the PC board to minimize the effect of pick-up nozzle impact on the board. (Fig. 1) (4) The following figures show typical results when the bottom dead center of the pick-up nozzle is too low. (Figs 2,3) 
	◆Selection of Adhesives 1. Mounting capacitors with adhesives in preliminary assembly, before the soldering stage, may lead to degraded capacitor characteristics unless the following factors are appropriately checked; the size of land patterns, type of adhesive, amount applied, hardening temperature and hardening period. Therefore, it is imperative to consult the manufacturer of the adhesives on proper usage and amounts of adhesive to use.	1. Some adhesives may cause reduced insulation resistance. The difference between the shrinkage percentage of the adhesive and that of the capacitors may result in stresses on the capacitors and lead to cracking. Moreover, too little or too much adhesive applied to the board may adversely effect component placement, so the following precautions should be noted in the application of adhesives. (1)Required adhesive characteristics a. The adhesive should be strong enough to hold parts on the board during the mounting & solder process. b. The adhesive should have sufficient strength at high temperatures. c. The adhesive should have good coating and thickness consistency. d. The adhesive should be used during its prescribed shelf life. e. The adhesive should harden rapidly f. The adhesive must not be contaminated. g. The adhesive should have excellent insulation characteristics. h. The adhesive should not be toxic and have no emission of toxic gasses. (2)The recommended amount of adhesives is as follows; When using adhesives to mount capacitors on a PCB, inappropriate amounts of adhesive on the board may adversely affect component placement. Too little adhesive may cause the capacitors to fall off the board during the solder process. Too much adhesive may cause defective soldering due excessive flow of adhesive on to the land or solder pad. [Recommended conditions] Figure: 2125 case sizes as examples a: 0.3mm min b: 200～300μm (when two points applied) c: Adhesives should not contact the pad Amount of adhesives After capacitors are bonded 

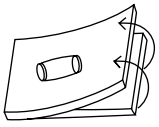
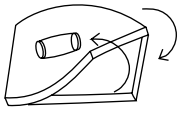
Precautions on the use of Tubular Type

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 Temperature, time, amount of solder, etc. are specified in accordance with the following recommended conditions. ◆*Reflow Soldering 1Temperature, time, amount of solder, etc. are specified in accordance with the following recommended conditions. 2. The time between solder paste application and capacitor placement should be as short as possible 3. The selection of appropriate solder materials is required.	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. 1-1. If capacitors are used beyond the range of the following recommended conditions, heat stresses may cause cracks inside the capacitors, and consequently degrade the reliability of the capacitors. Above all, rapid heating/cooling or partial heating tend to be the major causes of cracks. [Examples of reflow soldering]  1-2. Excessively long soldering times or high soldering temperatures may cause separation of the terminations from chip bodies, or leakage of capacity. 2. If solder paste is left exposed for a long period of time before capacitors are placed the surface dries out and a membrane film will form on the board surface causing a considerable reduction in solderability. 3. During the reflow process, when too much solder paste is applied excess solder mass can produce mechanical and heat stresses on the capacitors and may consequently result in the breakage or cracking of the components. On the other hand, too little solder paste will weaken the adhesion characteristics and may consequently cause separation of components and degrade the circuit reliability.  4. With inappropriate solder materials, solder balls may form. These solder balls must be thoroughly removed, since the balls would cause a reduction in capacitor electrical characteristics or degradation of reliability.

Precautions on the use of Tubular Type

<table>
<tr><th>Stages</th><th>Precautions</th><th>Technical considerations</th></tr>
<tr><td>4. Soldering</td><td>◆Hand soldering with iron
1 Temperature, time, amount of solder, etc. are specified in accordance with the following recommended conditions.
2. When touch-up work is required for repair, preheating must be conducted with appropriate temperature control.
3. Special attention should be paid to the diameter of the soldering iron tip and wattage when additional part mounting or repair work takes place.
4. The solder iron should only directly touch the external electrodes.
5. Ammount of solder should be applied at the appropriate level.</td><td>1. If capacitors are used beyond the range of the following recommended conditions, heat stresses may cause cracks inside the capacitors, and consequently degrade the reliability of the capacitors. Above all, rapid heating/cooling or partial heating tend to be the major causes of cracks.
2. Recommended conditions for solder iron touch-up
[Example of soldering iron]
<table>
<tr><th>Soldering iron's temperature [℃]</th><th>Watt [W]</th><th>Iron tip dia. [mm]</th></tr>
<tr><td>Below 270</td><td>Below 20</td><td>Below 3.0 in diameter</td></tr>
</table>
Temperature range between iron tip and preheating temperature. 130℃ or less
Duration 3 seconds or less
Number of times 3 times or less
3. Selection of soldering irons
Temperature at the tip of the soldering iron varies depending on the type of soldering iron. If the temperature at the tip of the soldering iron is too high thermal stresses may cause cracks in the component.
4. If the soldering iron tip touches the ceramic material directly, the component may develop heat stresses, and cracks.
5. During the solder iron process, when too much solder is used it can result in mechanical and heat stresses on the capacitors and may consequently result in the breakage or cracking of the components. On the other hand, too little solder will weaken the adhesion characteristics and may consequently cause separation of components and degrade the circuit reliability.
(Appropriate application of soldering iron) (Appropriate amount of solder)
 
</td></tr>
<tr><td>5. Cleaning</td><td>◆Board cleaning
1. When using ultrasonic cleaning on PC boards with capacitors, avoid subjecting the PCB directly to vibration. Special attention should be paid to output frequency and duration of ultrasonic cleaning.
2. Cleaning conditions should be determined after verifying, through a test run, that the cleaning process does not affect the capacitor's characteristics.</td><td>1. In the case of ultrasonic cleaning, too much power output can cause excessive vibration of the PC board which may lead to the cracking of the capacitor or the soldered portion, or decrease the terminal electrodes' strength. Thus the following conditions should be carefully checked;
Ultrasonic output Below 20 W/ℓ
Ultrasonic frequency Below 40 kHz
Ultrasonic clearning period 5 min. or less
2. In case of insufficient cleaning
(1) The halogenated content in the flux residue may lead to corrosion of the terminal electrodes or degradation of insulation resistance.
(2) When using water-soluble flux, it may degrade insulation resistance characteristics of the capacitor surface.</td></tr>
<tr><td>6. Post cleaning processes</td><td>◆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.</td><td>1-1. When a resin's hardening temperature is higher than the capacitor's operating temperature, the stresses generated by the excess heat may lead to capacitor damage or destruction.
1-2. With some type of resins a decomposition gas or chemical reaction vapor may remain inside the resin during the hardening period or while left under normal storage conditions resulting in the deterioration of the capacitor's performance.
1-3. Some types of coating or molding material may degrade humidity resistance. Therefore, it is highly recommended you contact the material manufacturer before using.</td></tr>
</table>

Precautions on the use of Tubular Type

Stages	Precautions	Technical considerations
7. Handling	◆Breakaway PC boards (splitting along perforations) 1. When splitting the PC board after mounting capacitors and other components, care is required so as not to give any stresses of deflection or twisting to the board. 2. Board separation should not be done manually, but by using the appropriate devices. ◆Mechanical considerations 1. Be careful not to subject the capacitors to excessive mechanical shocks. 2. If ceramic capacitors are dropped on the floor or a hard surface they should not be used.	1. If the board is subjected to the stresses of deflection and twisting (as shown below) when splitting or breaking away the boards, it may cause cracks in the board. Deflection  Twisting  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 deg ℃ Humidity Below 70% RH 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, so the products should be used within 6 months after delivery. After the above period, the solderability should be checked before using the capacitors. 2. Harmful gasses in the ambient air may also degrade the solderability of the terminal electrodes resulting in a deterioration of the capacitor's reliability. 3. Direct sunlight, the photochemical effect of resin coatings, or a rapid change in the humidity may cause condensation on or around the terminals. So special care must be taken to prevent reduced solderability or performance of the capacitors.

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）

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−	$\pm^{80}_{20}$

7 リード形状〔mm〕

A−	26.0 テープ幅テーピング
B−	52.0 テープ幅テーピング
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)

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−	$\pm^{80}_{20}$

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) A 26mm (1.02)	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)			NA	KF Pitch: 5mm (0.197)

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. Cap		CH	RH	UJ	SL
[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. Cap		B	F	F	X	Y
[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
アイテム一覧 Part Numbers P.132
特性図 Electrical Characteristics P.136
梱包 Packaging P.137
信頼性 Reliability Data P.138
使用上の注意 Precautions P.148
etc

［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			

［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			
★	UP050CH431—○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

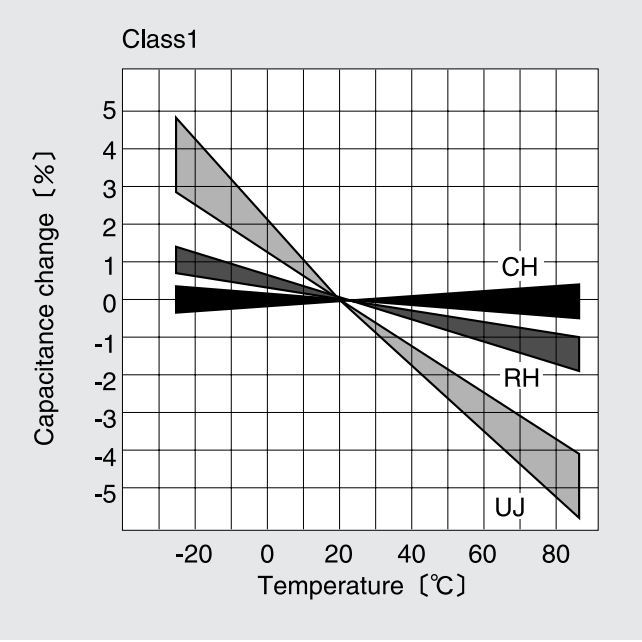
定格電圧 RatedVoltage (DC)	形名 Ordering code		温度特性 Temperature characteristics	公称静電容量 Capacitance 〔pF〕	容量許容差 Capacitance tolerance	Q or tanδ	絶縁抵抗 Insulation resistance
50V	UP050B750K－○		B	75	±10%	tanδ≦1.5%	10000MΩmin
	UP050B820K－○			82			
	UP050B910K－○			91			
	UP050B101K－○			100			
	UP050B121K－○			120			
	UP050B151K－○			150			
	UP050B181K－○			180			
	UP050B221K－○			220			
	UP050B271K－○			270			
	UP050B331K－○			330			
	UP050B391K－○			390			
	UP050B471K－○			470		tanδ≦2.5%	1000MΩmin
	UP050B561K－○			560			
	UP050B681K－○			680			
	UP050B821K－○			820			
	UP050B102K－○			1000			
16V	EP050X122△－○		X	1200	±20% ±30%		
	EP050X152△－○			1500			
	EP050X182△－○			1800			
	EP050X222△－○			2200			
	EP050X272△－○			2700			
	EP050X332△－○			3300			
	EP050X392△－○			3900			
	EP050X472△－○			4700			
	EP050X562△－○			5600			
	EP050X682△－○			6800			
	EP050Y822△－○		Y	8200			
	EP050Y103△－○			10000			
25V	TP050F103Z－○		F	10000	$\pm^{80}_{20}$%	tanδ≦7.5%	
	TP050F223Z－○			22000			

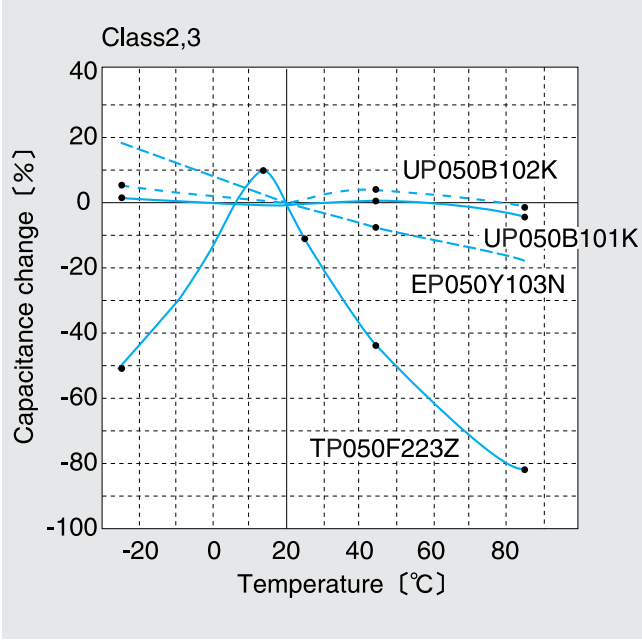
［積層タイプ Multilayer type］
Class 2

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
★	UP050B122K−○Z		B	1200	±10%	tanδ≦3.5%	5000MΩmin
	UP050B152K−○Z			1500			
★	UP050B182K−○Z			1800			
	UP050B222K−○Z			2200			
★	UP050B272K−○Z			2700			
	UP050B332K−○Z			3300			
★	UP050B392K−○Z			3900			
	UP050B472K−○Z			4700			
★	UP050B562K−○Z			5600			
	UP050B682K−○Z			6800			
★	UP050B822K−○Z			8200			
50V	UP050B103K−○Z			10000			
★	UP050B123K−○Z			12000			
	UP050B153K−○Z			15000			
★	UP050B183K−○Z			18000			
	UP050B223K−○Z			22000			
★	UP050B273K−○Z			27000			
	UP050B333K−○Z			33000			
★	UP050B393K−○Z			39000			
	UP050B473K−○Z			47000		tanδ≦5.0%	1000MΩmin
★	UP050B563K−○Z			56000			
	UP050B683K−○Z			68000			
★	UP050B823K−○Z			82000			
	UP050B104K−○Z			100000			
	UP050F103Z−○Z		F	10000	$^{+80}_{-20}$ %	tanδ≦7.5%	1000MΩmin
	UP050F223Z−○Z			22000			
	UP050F473Z−○Z			47000			
50V	UP050F104Z−○Z			100000			
	UP050F224Z−○Z			220000		tanδ≦10.0%	500MΩmin
	UP050F474Z−○Z			470000			
	UP050F105Z−○Z			1000000		tanδ≦15%	250MΩmin

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。　★：オプション対応
△Please specify the capacitance tolerance code and ○ lead configuration code.
★ : Option

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



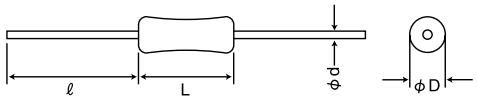


①標準数量　Standard quantity

形式 Type	リード形状記号 Lead configuration code	標準数量(PCS) Standard quantity	
		袋づめ Bulk	テーピング Taping
積層形 Multilayer type	A−(26mm幅) 1.024 inch wide	——	3000
	B−(52mm幅)2.047 inches wide	——	3000
	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

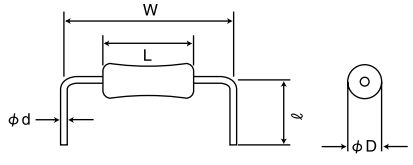
・NA形状　NA configuration



形　式 Type	寸　法　Dimensions(mm)			
	φD	L	φd	ℓ
積層形 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

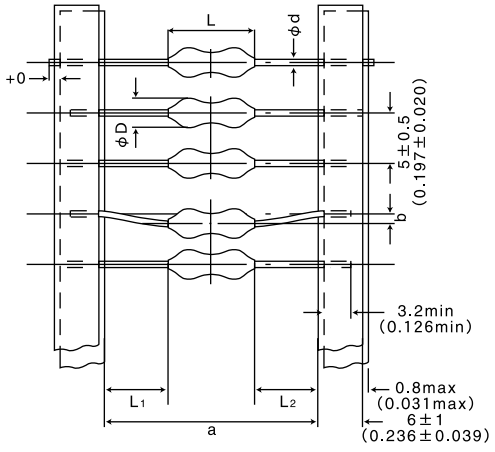


形　式 Type	リード形状記号 Lead configuration code	寸　法　Dimensions(mm)				
		φD	L	W	φd	ℓ
積層形 Multilayer type	KF	2.2max (0.087max)	3.2max (0.126max)	5.0±0.5 (0.197±0.020)	0.45±0.05 (0.018±0.020)	6.5±0.5 (0.256±0.020)
単層形 Monolithic type	KF	1.9max (0.075max)	3.5max (0.138max)	5.0±0.5 (0.197±0.020)	0.45±0.05 (0.018±0.020)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

Unit：mm(inch)

③テーピング寸法　Taping Dimensions

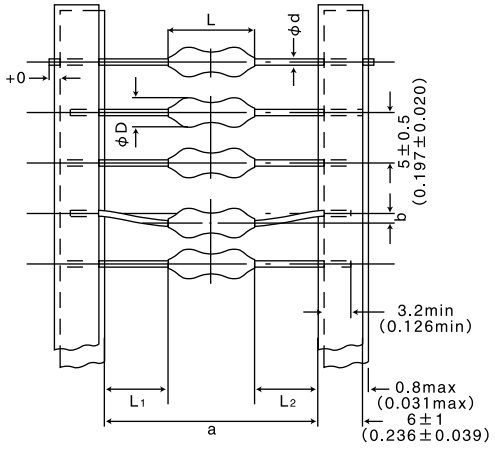
A−(a：26mm幅)形状(a：1.024 inch wide)configuration



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 Multilayer type	2.2 max (0.087max)	3.2 max (0.126max)	$26^{+0.5}_{-0}$ $(1.024^{+0.020}_{-0})$	0.8以下 (0.031 or less)	0.5max (0.020max.)	0.45±0.05 (0.018±0.002)	5.0 (0.197)
単層形 Monolithic type	1.9 max (0.075max)	3.5 max (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 Multilayer type	2.2 max (0.087max)	3.2 max (0.126max)	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)
単層形 Monolithic type	1.9 max (0.075max)	3.5 max (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℃

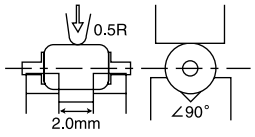
Withstanding voltage is also referred to as "voltage proof" under IEC specifications.

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)

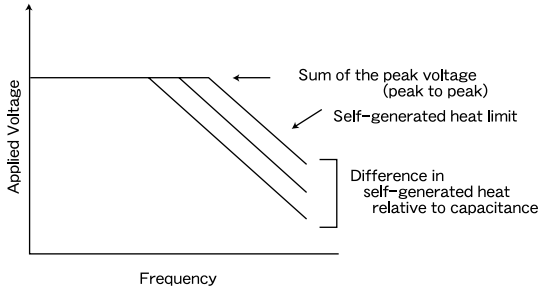
Withstanding voltage is also referred to as "voltage proof" under IEC specifications.

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.

USコンデンサ
US CAPACITORS

OPERATING TEMP.	−25～+85℃

フロー／WAVE

特長　FEATURES

形状は106形および146形があり、106形には外装絶縁形もラインアップ

・Available in two shapes:106 and 146.
insulated type is available in the 106 type.

用途　APPLICATIONS

IFT内蔵用

・For applications requiring a IFT built-in type capacitor.

形名表記法　ORDERING CODE

1 定格電圧〔VDC〕

U	50

2 形式・包装

CA	単品（袋詰め）− 絶縁形
S△	単品（袋詰め）− 非絶縁形
SH	梯子形 − 非絶縁形

△= スペース

3 形状〔mm〕

106	7mm 角用
146	5mm 角用

4 温度特性〔ppm/℃〕

CH	0±60
LH	−80±60
PH	−150±60
RH	−220±60
SH	−330±60
TH	−470±60
UJ	−750±120
UK	−750±250

5 公称静電容量〔pF〕

例	
100	10
221	220

6 容量許容差

D	± 0.5 pF
J	± 5 %
K	± 10 %
M	± 20 %

7 当社管理記号

△△△△	標準品

△= スペース

U S △ 1 0 6 R H 1 0 1 J ○ ○ ○ ○

1 2 3 4 5 6 7

1 Rated voltage〔VDC〕

U	50

2 Type

CA	Single unit:insulated
S△	Single unit:non-insulated
SH	Ladder type:non-insulated

△=Blank Space

3 External dimensions〔inch〕

106	7mm square
146	5mm square

4 Temperature characteristics〔ppm/℃〕

CH	0±60
LH	−80±60
PH	−150±60
RH	−220±60
SH	−330±60
TH	−470±60
UJ	−750±120
UK	−750±250

5 Nominal capacitance〔pF〕

example	
100	10
221	220

6 Capacitance tolerance

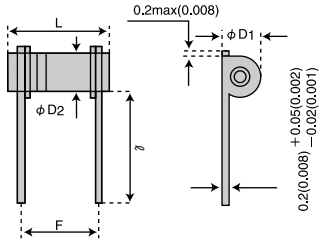
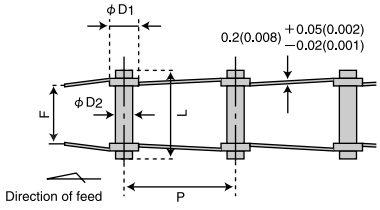
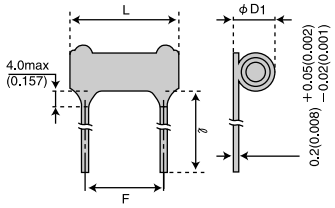
D	± 0.5 pF
J	± 5 %
K	± 10 %
M	± 20 %

7 Internal code

△△△△	Standard Product

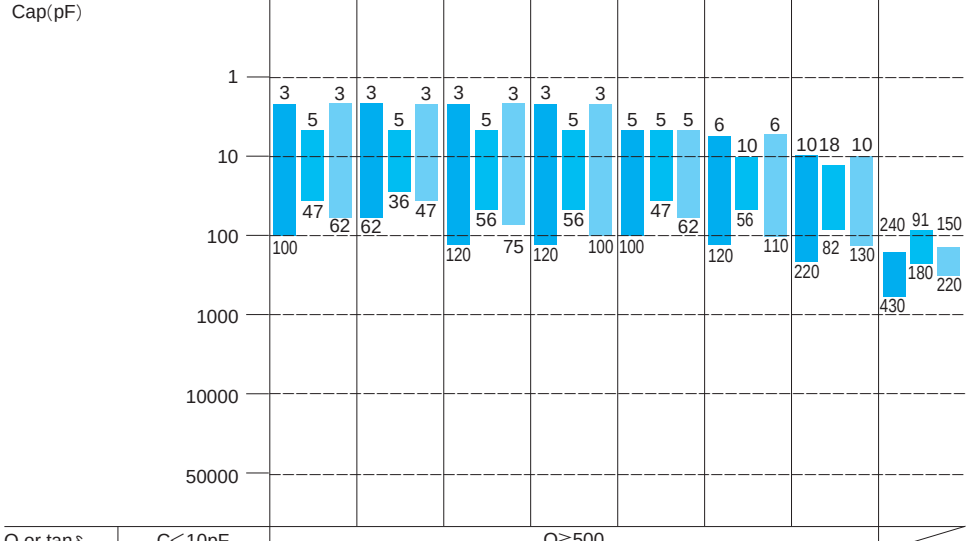
△=Blank Space

外形寸法　EXTERNAL DIMENSIONS

	非絶縁形 Non-insulated type				絶縁形 Insulated type
	単品形 Bulk type(□S)		はしご形 Ladder type(□SH)		単品 Bulk type(□CA)
Fig.					
TYPE	106	146	106	146	106
L	5.4±0.2(0.213±0.008)	4.45± 0 0.25 (0.175± 0 0.010)	5.4±0.2(0.213±0.008)	4.45± 0 0.25 (0.175± 0 0.010)	5.7max(0.224max)
ℓ	26min(1.02min)	26min(1.02min)	—	—	24min(0.945min)
φD1	2.3±0.2(0.091±0.008)	1.9± 0 0.3 (0.075± 0 0.012)	2.3±0.2(0.091±0.008)	1.9± 0 0.3 (0.075± 0 0.012)	2.5max(0.098max)
φD2	1.8±0.2(0.071±0.008)	1.5max(0.059max)	1.8±0.2(0.071±0.008)	1.5max(0.059max)	—
F	4.4±0.6(0.173±0.024)	3.4~4.3(0.134~0.169)	4.4±0.6(0.173±0.024)	3.4~4.3(0.134~0.169)	4.4±0.6(0.173±0.024)
P	—	—	29±1(1.14±0.039)	29±1(1.14±0.039)	—

Unit : mm(inch)

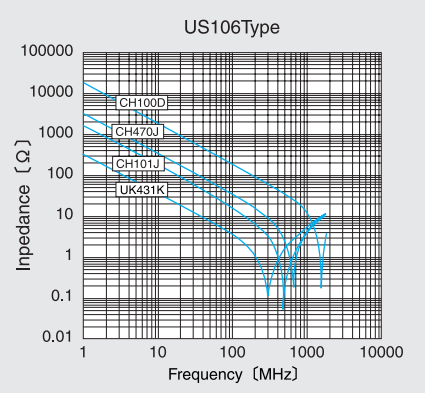
概略バリエーション　AVAILABLE CAPACITANCE RANGE

Class	Class 1							
WV	DC50V							
Temp. char.	CH	LH	PH	RH	SH	TH	UJ	UK
Cap(pF)								
Q or tanδ	C＜10pF	Q≧500						
	10pF≦C＜30pF	Q≧750						
	C≧30pF	Q≧1,000						Q≧500
絶縁抵抗 IR	10,000MΩmin							
耐電圧 Withstanding Voltage	DC150V							

□S, □SH 106Type
□S, □SH 146Type
□CA 106Type

セレクションガイド Selection Guide ◀ P.8
アイテム一覧 Part Numbers P.153 ▶
特性図 Electrical Characteristics P.154 ▶
梱包 Packaging P.155 ▶
信頼性 Reliability Data P.156 ▶
使用上の注意 Precautions P.158 ▶
etc

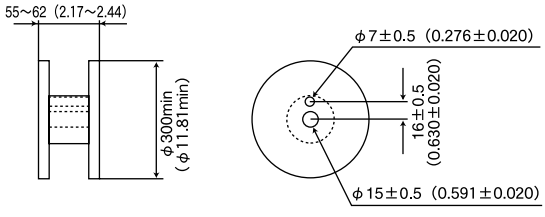
インピーダンス―周波数特性例　Inpedance-Frequency characteristics



①標準数量　(Standard quantity)
■袋づめ/はしご形リール Bulk/Reel

形　式 Type	標準数量(pcs.)	
	袋づめ Bulk	はしごリール Reel
□S　106 □S　146	1000	——
□SH106 □SH146	——	10000
□CA106	1000	——

②リール寸法 Reel Size



Unit : mm(inch)

US CAPACITORS

No. Item		Specified Value		Test Methods and Remarks
		Temperature Compensating(Class 1)		
		146 type	106 type	
1. Operating Temperature Range		−25 to +85℃		———
2. Storage Temperature Range		−25 to +85℃		———
3. Rated Voltage		50VDC		
4. With standing Voltage	Between terminals	No abmormality		Applied voltage: Rated voltage×3 (Class 1) Duration: 1 to 5 sec.
5. Insulation Resistance	Between terminals	10000 MΩ min.		Applied voltage: Rated voltage Duration: 60±5 sec.
6. Capacitance and Tolerance		10 pF or under : ± 0.5 pF 11 pF to 180 pF : ± 5%	10 pF or under : ± 0.5 pF 11 pF to 430 pF : ± 5%	Measuring frequency: 1MHz±20% (Class 1) Measuring voltage: 1.0±0.5Vrms Bias application: None
7. Q or Tangent of Loss Angle (tan δ)		Under 10 pF : Q≧500 10 pF to 27 pF : Q≧750 30 pF to 180 pF: Q≧1000 UK (30 pF or over): Q≧500		
10. Temperature Characteristic of Capacitance (Without voltage application)		CH: 0±60 LH:−80±60 PH:−150±60 RH:−220±60 SH:−330±60 TH:−470±60 UJ:−750±120 UK:−750±250		According to JIS C 5102 clause 7.12. Measurement of capacitance at 20℃ and 85℃ shall be made to calculate temperature characteristic by the following equation. (Class 1) $\frac{(C_{85}-C_{20})}{C_{20}\times\triangle T}\times10^6$(ppm/℃)
11.Terminal Strength	Tensile	No abnormality such as cut lead, or looseness.		Applied force: 2.5N Duration: 5 sec.
	Torsional	No abnormality such as cut lead, or looseness.		Suspend a mass of 100g 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
12. Solderability		Over 75% of the terminals shall be covered with fresh solder.		According to JIS C 5102 clause 8.4. Solder temperature: 230±5℃ Duration: 2±0.5 sec. Immersion depth: 4±0.8mm from terminal root Solder type: H63A (JIS Z 3282)
13. Damp Heat		Appearance: No significant abnormality Capacitance change: C to U (UJ): ±1.0% max. or ±0.1pF max., whichever is the greater. UK : ±2.0% max. or ±0.2pF max., whichever is the greater. Q: C to U (UJ): Under 10 pF : Q≧450 : 10 to 27 pF : Q≧695 : 30 to 180 pF: Q≧900 UK (30 pF or over) : Q≧450		Temperature: 40±3℃ Humidity: 90 to 95 %RH Duration: 500± $^{24}_{0}$ hrs Recovery: 48±4 hrs of recovery under the standard condition after the removal from test chamber.
14 High Temperature Loading Test		Appearance: No significant abnormality Capacitance change: C to U (UJ): ±1.0% max. or ±0.1pF max., whichever is the greater. UK : ±2.0% max. or ±0.2pF max., whichever is the greater. Q: C to U (UJ): Under 10 pF : Q≧450 : 10 to 27 pF : Q≧695 30 to 180 pF: Q≧900 UK (30 pF or over) : Q≧450		According to JIS C 5102 clause 9.10. Temperature: 85±3℃ Humidity: 90 to 95 %RH Duration: 1000± $^{48}_{0}$ hrs Applied voltage: Rated voltage×2 (Class 1) Recovery: 1 to 2 hrs of recovery under the standard condition after the removal from test chamber.

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 US 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. ◆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.
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 the component 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.	
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.	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.

Precautions on the use of US Capacitors

Stages	Precautions	Technical considerations
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.

貫通セラミックコンデンサ（段付形）
FEEDTHROUGH CERAMIC CAPACITORS (STEPPED TYPE)

OPERATING TEMP.	−25～+85℃

リフロー／REFLOW

特長　FEATURES

・電極がニッケルのため半田くわれやマイグレーションの心配がなく量産性に優れる

・Nickel plated electrodes reduce the possibility of corrosion, migration and improve productivity.

用途　APPLICATIONS

・チューナ・通信機等の妨害対策として最適・高周波領域におけるノイズ吸収性が優れ、光ディスク関連など各種デジタル機器のEMC対策として有効

・Used as an interference countermeasure in tuners and telecommunication equipment
・Excellent as a EMC countermeasure in various types of digital equipment due to their noise absorption features in high frequency applications.

形名表記法　ORDERING CODE

G series

1 定格電圧〔VDC〕

U	50

2 形状

G3	φ2.8 mm段付形
G1	φ1.85mm段付形

3 温度特性

△Y	± 22%
SL	+350～−1000ppm/℃

△=スペース

4 公称静電容量〔pF〕

例	
020	2
102	1,000

5 容量許容差

D	± 0.5 pF
K	± 10 %
M	± 20 %
V	$\pm^{20}_{10}$ %
P	$\pm^{100}_{0}$ %
Z	$\pm^{80}_{20}$ %

6 芯線寸法

0607	A寸 6.0mm・B寸 7.0mm
≀	≀
1714	A寸17.0mm・B寸14.0mm

7 当社管理記号

−−−A	標準品

U G 3 S L 0 2 0 D 0 6 0 7 ○ ○ ○ ○

1 2 3 4 5 6 7

1 Rated voltage〔VDC〕

U	50

2 Shape

G3	φ2.8mm
G1	φ1.85mm

3 Temperature characteristics

△Y	± 22%
S L	+350～−1000ppm/℃

△=Blank space

4 Nominal capacitance〔pF〕

020	2
102	1,000

5 Capacitance Tolerances

D	± 0.5 pF
K	± 10 %
M	± 20 %
V	$\pm^{20}_{10}$ %
P	$\pm^{100}_{0}$ %
Z	$\pm^{80}_{20}$ %

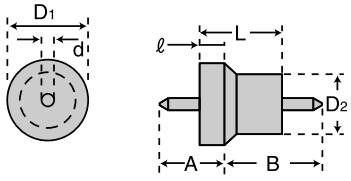
6 Lead Length

0607	A 6.0mm・B 7.0mm
≀	≀
1714	A 17.0mm・B 14.0mm

7 Internal code

−−−A	Standard product

外形寸法　EXTERNAL DIMENSIONS

	Gシリーズ Series G	
	リード付 Leaded type	
Fig.		
Dimensions		G1 / G3
	D1	1.85±0.1/0.15 (0.073) / 2.8±0.2 (0.110±0.008)
	D2	1.4±0.1 (0.055±0.004) / 2.0±0.1 (0.079±0.004)
	d	0.6±0.05 (0.024±0.002) / 0.6±0.05 (0.024±0.002)
	L	1.4±0.1 (0.055±0.004) / 2.0±0.5 (0.079±0.020)
	ℓ	0.5(参考値) (0.020) (reference) / 0.7(参考値) (0.028) (reference)
	A	6.0～17.0(1mmステップ) (0.236～0.669)(0.039 Step)
	B	7.0～14.0(1mmステップ) (0.276～0.551)(0.039 Step)

Unit：mm(inch)

バリエーション　AVAILABLE CAPACITANCE RANGE

G series

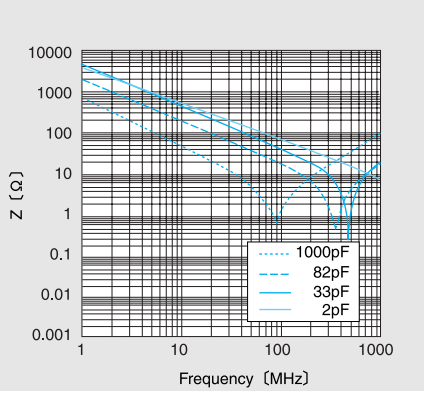
形　名 Type		温度特性 Temperature characteristics	公称静電容量 Capacitance [pF]	Q or tanδ	容量許容差 Capacitance tolerance	定格電圧 Rated voltage (DC)	耐電圧 withstanding voltage (DC)
G1		SL	2	Q≧50	± 0.5pF	50V	150V
			10	Q≧100	± 20%		
			33　43　82	Q≧100	± 10%		
		Y(Y5S)	1000	tanδ≦5.0%	±80/20%		100V
G3		SL	1　2	Q≧50	± 0.5pF		150V
			10　22　33　43	Q≧100	± 10%		
			82		±20/10%		
		Y(Y5S)	1000	tanδ≦5.0%	±100/0%		100V
			2000		±80/20%		

(注)温度特性の(　)はEIA規格相当表示です。

( ) Indicates EIA standard.

特性図　ELECTRICAL CHARACTERISTICS

インピーダンス―周波数特性例　Impedance - vs - Frequency characteristics



梱包　PACKAGING

標準数量　Standard quantity

区分 Category	形式 Type	標準数量〔pcs〕 袋詰め Bulk
段付 Stepped type	UG1 UG3	1000

FEEDTHROUGH CERAMIC CAPACITORS (STEPPED TYPE)

No. Item		Specified Value Stepped feed-through capacitor series G		Test Methods and Remarks
		(Class 1)	(Class 3)	
1.Operating Temperature Range		−25 to+85℃		
2.Storage Temperature Range		−25 to+85℃		
3. Rated Voltage		50 VDC		
4. Withstanding Voltage	Between terminals	No abnormality		According to JIS C 5102 clause 7.1.3. Applied voltage: 125V DC (Class 1) 100V DC (Class 3) Duratione: 60±5 sec.
5. Insulation Resistance	Between terminals	10000MΩ min.	1000MΩ min.	Applied voltage:Rated voltage Duration: 60±5 sec. Charge/discharge current shall not exceed 10mA. (Class 3)
6. Capacitance and Tolerance		1pF,2pF：± 0.5pF 10pF~43pF：±10% 82pF：$\pm^{20}_{10}$ % ※But series G110pF±20%82pF±10%	1000pF:$\pm^{100}_{0}$% 2000pF:$\pm^{80}_{20}$ %	Measuring frequency:1MHz±20% (Class 1) 1KHz±20% (Class 3) Measuring voltage:1.0±0.5Vrms Bias application: None
7. Q or Tangent of Loss Angle (tanδ)		See the attached table.		
8. Temperature Characteristic of Capacitance, without voltage application		SL:+350 to −1000ppm/℃	Y:±22%	According to JIS C 5102 clause 7.12. Measurement of capacitance at 20℃ and 85℃ 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/℃) (Class 2, 3) Change of maximum capacitance deviation in step 1 to 5 Temperature at step 1:20℃ Temperature at step 2:-25℃ Temperature at step 3:20℃ (Reference temperature) Temperature at step 4:85℃ Temperature at step 5:20℃
9. Terminal Strength	Tensile	No abnomalities, such as cuts or looseness of terminals		Applied force : 10N (Leaded type G series) Duration:5sec.
	Torsional	No abnormality such as cut lead, or looseness.		Fix the body, incline the terminal end through angle of 45° and return it to initial position. Then second bend in the opposite direction shall be made. Number of bends: 2 times
10. Resistance to Vibration		Appearance: No significant abnormality Capacitance change: Shall satisfy the initial characteristic.		According to JIS C 5102 clause 8.2. Vibration type: A Directions: 2hrs each in X,Y, and Z directions Total:6hrs Frequency range: 10 to 55 to 10Hz (1min.) Amplitude: 1.5mm Mounting method: Soldering onto PC board
11. Solderability		At least 75% of terminal electrode is covered by new solder.		According to JIS C 5102 clause 8.4. Solder temperature:230±5℃
12. Damp Heat		Appearance: No significant abnormality Capacitance change:Within±5.0% or ±0.5pF, whichever is larger. Q:1pF or 2pF : 50min. 10pF to 82pF : 75 min.	Appearance:No significant abnormality Capacitance change : Within±20% tanδ : 7.5%max.	Temperature:40±2℃ Humidity:90 to 95% RH Duration:500 $\pm^{24}_{0}$ hrs Recovery:1hr of recovery under the standard condition after the removal from test chamber.

FEEDTHROUGH CERAMIC CAPACITORS (STEPPED TYPE)

No. Item	Specified Value Stepped feed-through capacitor series G		Test Methods and Remarks
	(Class 1)	(Class 3)	
13. Loading under Damp Heat	Appearance : No significant abnormality Capacitance change : Within±5.0% or ±0.5 pF, whichever is the larger. Q : 1pF or 2pF : 50min. 10pF to 82pF : 75min.	Appearance : No significant abnormality Capacitance change : Within ±20% tanδ : 7.5% max.	Duration: 500 $\pm^{24}_{0}$ hrs Applied voltage: Rated voltage Recovery: 1 hr of recovery under the standard condition after the removal from test chamber.
14. High Temperature Loading Test	Appearance : No significant abnormality Capacitance change :Within±5.0% or±0.5 pF, whichever is the larger. Q : 1pF,2pF : 50 min. 10pF to 82pF : 75 min.	Appearance : No significant abnormality Capacitance change : Within±20% tanδ : 7.5% max.	According to JIS C 5102 clause 9.10. Temperature:85±2℃ Humidity:90 to 95% RH Duration:1000 $\pm^{48}_{0}$ hrs Applied voltage:Rated voltage×2 Recovery:1 to 2 hrs of recovery under the standard condition after the removal from test chamber. Charge/discharge current shall not exceed 50mA. (Class 1) Charge/discharge current shall not exceed 10mA. (Class 3)

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

FEEDTHROUGH CERAMIC CAPACITORS (STEPPED TYPE)

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. ◆Operating Environment precautions 1. capacitors should not 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)	