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〕

K	0.45
V	0.5
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〕

K	0.45
V	0.5
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

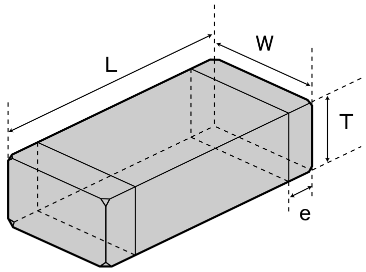
B	Bulk
T	Tape & reel

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)
			0.50±0.05 (0.020±0.002)	V	
			0.8±0.10 (0.031±0.004)	A	
□MK212 (0805)	2.0±0.10*1 (0.079±0.004)	1.25±0.10*1 (0.049±0.004)	0.45±0.05 (0.018±0.002)	K	0.5±0.25 (0.020±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*2 (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 *2 (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
　　　＊2. ±0.3mm公差あり
Note: ＊1. Includling dimension tolerance ±0.15mm (±0.006inch).
Note: ＊2. Includling dimension tolerance ±0.3mm (±0.012inch).

Unit：mm (inch)

4 CAPACITORS

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 107

Cap μF	3[digits]	B/X7R			B/X5R					X5R	C/X5S	F/Y5V			
	VDC	25	16	10	35	25	16	10	6.3	6.3	25	50	16	10	6.3
0.022	223	A													
0.033	333		A		A										
0.047	473		A		A										
0.068	683		A			A									
0.1	104		A			A						A			
0.15	154						A								
0.22	224						A						A		
0.33	334							A							
0.47	474						A	A					A		
0.68	684							A							
1	105			A		A	A	A			A		A	A	
1.5	155														
2.2	225							A	A				A	A	
3.3	335									A					
4.7	475									A					
6.8	685														
10	106														
22	226														
47	476														
100	107														

Type 212

Cap μF	3[digits]	B/X7R					B/X5R						X5R	C/X5S	F/Y5V			
	VDC	50	35	25	16	10	50	35	25	16	10	6.3	6.3	10	50	16	10	6.3
0.022	223																	
0.033	333																	
0.047	473	G																
0.068	683	G																
0.1	104	G																
0.15	154	G																
0.22	224						G											
0.33	334		G															
0.47	474							G							G			
0.68	684				G													
1	105				G	G			G	G					G			
1.5	155																	
2.2	225					G				G	G					G		
3.3	335										G							
4.7	475									G	G						G	
6.8	685																	
10	106										G	G		G			G	G
22	226												G					
47	476																	
100	107																	

Type 316

Cap μF	3[digits]	B/X7R						B/X5R				X5R	C/X5S	F/Y5V				
	VDC	50	35	25	16	10	6.3	25	16	10	6.3	6.3	25	50	35	25	16	10
0.022	223																	
0.033	333																	
0.047	473																	
0.068	683																	
0.1	104																	
0.15	154	F																
0.22	224	L		F														
0.33	334			F														
0.47	474	L																
0.68	684		L	L	F													
1	105		L		F													
1.5	155																	
2.2	225			L	L									G				
3.3	335				L	L		L	L									
4.7	475					L		L	L						G			
6.8	685										F							
10	106						L	L	L	L	L		L			L	L	F
22	226									L	L							L
47	476											L						
100	107																	

Type 325

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

Type 432

Cap μF	3[digits]	B/X5R				C/X5S		C/X6S	F/Y5V	
	VDC	25	16	10	6.3	50	25	6.3	10	6.3
0.022	223									
0.033	333									
0.047	473									
0.068	683									
0.1	104									
0.15	154									
0.22	224									
0.33	334									
0.47	474									
0.68	684									
1	105									
1.5	155									
2.2	225									
3.3	335									
4.7	475									
6.8	685									
10	106	M				M				
22	226		M	M			M			
47	476				M		M		M	
100	107				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	X5R	F/Y5V	B/X7R				B/X5R			X5R	F/Y5V			B/X7R	B/X5R				F/Y5V		B/X7R	B/X5R			E/Y5U	C/X5S
	VDC	6.3	4	6.3	50	25	16	10	16	10	6.3	6.3	50	10	6.3	10	25	16	10	6.3	10	6.3	25	16	10	6.3	6.3	6.3
μF	3[digits]																											
0.022	223				D																							
0.033	333				D																							
0.047	473					D																						
0.068	683					D																						
0.100	104																											
0.150	154															D												
0.220	224									K			D															
0.330	334																											
0.470	474	K					D																					
0.680	684						D																					
1.000	105	K		K				D	D		K						D						D					
1.500	155								D									D										
2.200	225		V						D	D				D		D		D										
3.300	335																		D						D			
4.700	475									D	D				D				D		D				D			
6.800	685																									D		
10.000	106											D							D	D		D		D	D			
22.000	226																									Y		
47.000	476																											
82.000	826																										N	
100.000	107																											Y

温度特性コード Temp. char.Code	温度特性 Temperature characteristics 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	静電容量許容差[%] Capacitance tolerance	tanδ[%] Dissipation factor
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		

＊： X5Rのみ対応するアイテムがあります。詳細はアイテム一覧を参照ください。
＊＊： 代表的な値を記載しています。詳細はアイテム一覧表を参照ください。
＊： Some of the parts are only applicable to X5R. Please refer to PART NUMBERS table.
＊＊： The figure indicates typical value. Please refer to PART NUMBERS table.

セレクションガイド Selection Guide P.8 etc
アイテム一覧 Part Numbers P.38
特性図 Electrical Characteristics P.42
梱包 Packaging P.76
信頼性 Reliability Data P.78
使用上の注意 Precautions P.84

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]
35V	GMK107 BJ333□A		0.033	B/X5R	2.5	R/W	±10% ±20%	0.8±0.1
	GMK107 BJ473□A		0.047	B/X5R	2.5			0.8±0.1
25V	TMK107 BJ223□A		0.022	B/X7R	2.5			0.8±0.1
	TMK107 BJ683□A		0.068	B/X5R	3.5			0.8±0.1
	TMK107 BJ104□A		0.1	B/X5R	3.5			0.8±0.1
	TMK107 BJ105□A*		1	B/X5R	5	R		0.8±0.1
16V	EMK107 BJ333□A		0.033	B/X7R	3.5	R/W		0.8±0.1
	EMK107 BJ473□A		0.047	B/X7R	3.5			0.8±0.1
	EMK107 BJ683□A		0.068	B/X7R	3.5			0.8±0.1
	EMK107 BJ104□A		0.1	B/X7R	3.5			0.8±0.1
	EMK107 BJ154□A		0.15	B/X5R	3.5			0.8±0.1
	EMK107 BJ224□A		0.22	B/X5R	3.5			0.8±0.1
	EMK107 BJ474□A*		0.47	B/X5R	3.5	R		0.8±0.1
	EMK107 BJ105□A*		1	B/X5R	5			0.8±0.1
10V	LMK107 BJ334□A		0.33	B/X5R	3.5	R/W		0.8±0.1
	LMK107 BJ474□A		0.47	B/X5R	3.5	R		0.8±0.1
	LMK107 BJ684□A		0.68	B/X5R	5			0.8±0.1
	LMK107 BJ105□A*		1	B/X7R	5			0.8±0.1
	LMK107 BJ225□A*		2.2	B/X5R	10			0.8±0.1
6.3V	JMK107 BJ474□K		0.47	B/X5R	5			0.45±0.05
	JMK107 BJ105□K*		1	B/X5R	10			0.45±0.05
	JMK107 BJ225□A*		2.2	B/X5R	10			0.8±0.1
	JMK107 BJ335□A*		3.3	X5R	10			0.8±0.1
	JMK107 BJ475MA*		4.7	X5R	10		±20%	0.8±0.1
4V	AMK107 BJ225□V*		2.2	X5R	10		±10%	0.5±0.05
50V	UMK107 C105□A		1	C/X5S	10		±20%	0.8±0.1
	UMK107 F104ZA		0.1	F/Y5V	7	R/W	+80% −20%	0.8±0.1
16V	EMK107 F224ZA		0.22	F/Y5V	7			0.8±0.1
	EMK107 F474ZA		0.47	F/Y5V	7			0.8±0.1
	EMK107 F105ZA*		1	F/Y5V	16	R		0.8±0.1
	EMK107 F225ZA*		2.2	F/Y5V	16			0.8±0.1
10V	LMK107 F105ZA		1	F/Y5V	16			0.8±0.1
	LMK107 F225ZA		2.2	F/Y5V	16			0.8±0.1
6.3	JMK107 F105ZK		1	F/Y5V	16			0.45±0.05

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.

アイテム一覧　PART NUMBERS

■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]
50V	UMK212 BJ223□D		0.022	B/X7R	2.5	R/W	±10% ±20%	0.85±0.1
	UMK212 BJ333□D		0.033	B/X7R	2.5			0.85±0.1
	UMK212 BJ473□G		0.047	B/X7R	2.5			1.25±0.1
	UMK212 BJ683□G		0.068	B/X7R	2.5			1.25±0.1
	UMK212 BJ104□G		0.1	B/X7R	2.5			1.25±0.1
	UMK212 BJ154□G		0.15	B/X7R	3.5			1.25±0.1
	UMK212 BJ224□G		0.22	B/X5R	3.5			1.25±0.1
35V	GMK212 BJ334□G		0.33	B/X7R	3.5			1.25±0.1
	GMK212 BJ474□G		0.47	B/X5R	3.5			1.25±0.1
25V	TMK212 BJ473□D		0.047	B/X7R	2.5			0.85±0.1
	TMK212 BJ683□D		0.068	B/X7R	2.5			0.85±0.1
	TMK212 BJ474□D		0.47	B/X5R	3.5	R		0.85±0.1
	TMK212 BJ105□G		1	B/X5R	5			1.25±0.1
16V	EMK212 BJ474□D		0.47	B/X7R	3.5	R/W		0.85±0.1
	EMK212 BJ684□D		0.68	B/X7R	3.5			0.85±0.1
	EMK212 BJ105□D		1	B/X5R	5	R		0.85±0.1
	EMK212 BJ155□D		1.5	B/X5R	5			0.85±0.1
	EMK212 BJ225□D*		2.2	B/X5R	5			0.85±0.1
	EMK212 BJ684□G		0.68	B/X7R	3.5	R/W		1.25±0.1
	EMK212 BJ105□G		1	B/X7R	3.5			1.25±0.1
	EMK212 BJ225□G		2.2	B/X5R	5	R		1.25±0.1
	EMK212 BJ475□G*		4.7	B/X5R	5			1.25±0.15
10V	LMK212 BJ224□K		0.22	B/X5R	3.5			0.45±0.05
	LMK212 BJ105□D		1	B/X7R	3.5			0.85±0.1
	LMK212 BJ225□D*		2.2	B/X5R	5			0.85±0.1
	LMK212 BJ475□D*		4.7	B/X5R	7.5			0.85±0.1
	LMK212 BJ105□G		1	B/X7R	3.5	R/W		1.25±0.1
	LMK212 BJ225□G		2.2	B/X7R	5	R		1.25±0.1
	LMK212 BJ335□G		3.3	B/X5R	5			1.25±0.1
	LMK212 BJ475□G*		4.7	B/X5R	5			1.25±0.15
	LMK212 BJ106□G*		10	B/X5R	10			1.25±0.15
6.3V	JMK212 BJ105□K		1	B/X5R	5			0.45±0.05
	JMK212 BJ475□D*		4.7	B/X5R	10			0.85±0.1
	JMK212 BJ106□D*		10	X5R	10			0.85±0.1
	JMK212 BJ475□G		4.7	B/X5R	5			1.25±0.15
	JMK212 BJ106□G*		10	B/X5R	10			1.25±0.15
	JMK212 BJ226MG*		22	X5R	10			1.25±0.15
10V	LMK212 C106□G*		10	C/X5S	10			1.25±0.1
50V	UMK212 F224ZD		0.22	F/Y5V	7	R/W	+80% −20%	0.85±0.1
	UMK212 F474ZG		0.47	F/Y5V	7			1.25±0.1
	UMK212 F105ZG		1	F/Y5V	7			1.25±0.1
16V	EMK212 F225ZG		2.2	F/Y5V	7			1.25±0.1
10V	LMK212 F225ZD		2.2	F/Y5V	9	R		0.85±0.1
	LMK212 F475ZG		4.7	F/Y5V	9			1.25±0.1
	LMK212 F106ZG		10	F/Y5V	16			1.25±0.1
6.3V	JMK212 F475ZD		4.7	F/Y5V	16			0.85±0.1
	JMK212 F106ZG		10	F/Y5V	16			1.25±0.1

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.

アイテム一覧　PART NUMBERS

■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]
50V	UMK316 BJ154□F		0.15	B/X7R	2.5	R/W	±10% ±20%	1.15±0.1
	UMK316 BJ224□L		0.22	B/X7R	2.5			1.6±0.2
	UMK316 BJ474□L		0.47	B/X7R	3.5			1.6±0.2
35V	GMK316 BJ684□L		0.68	B/X7R	3.5			1.6±0.2
	GMK316 BJ105□L		1	B/X7R	3.5			1.6±0.2
25V	TMK316 BJ154□D		0.15	B/X7R	2.5			0.85±0.1
	TMK316 BJ224□F		0.22	B/X7R	2.5			1.15±0.1
	TMK316 BJ334□F		0.33	B/X7R	2.5			1.15±0.1
	TMK316 BJ684□L		0.68	B/X7R	3.5			1.6±0.2
	TMK316 BJ105□D		1	B/X5R	3.5	R		0.85±0.1
	TMK316 BJ225□L		2.2	B/X7R	3.5			1.6±0.2
	TMK316 BJ335□L		3.3	B/X5R	3.5			1.6±0.2
	TMK316 BJ475□L*		4.7	B/X5R	5			1.6±0.2
	TMK316 BJ106□L*		10	B/X5R	5			1.6±0.2
16V	EMK316 BJ155□D		1.5	B/X5R	3.5			0.85±0.1
	EMK316 BJ225□D		2.2	B/X5R	3.5			0.85±0.1
	EMK316 BJ684□F		0.68	B/X7R	3.5	R/W		1.15±0.1
	EMK316 BJ105□F		1	B/X7R	3.5			1.15±0.1
	EMK316 BJ225□L		2.2	B/X7R	3.5			1.6±0.2
	EMK316 BJ335□L		3.3	B/X7R	3.5	R		1.6±0.2
	EMK316 BJ475□L		4.7	B/X5R	5			1.6±0.2
	EMK316 BJ106□L*		10	B/X5R	5			1.6±0.2
10V	LMK316 BJ335□D		3.3	B/X5R	5			0.85±0.1
	LMK316 BJ475 □D		4.7	B/X5R	5			0.85±0.1
	LMK316 BJ106 □D*		10	B/X5R	10			0.85±0.1
	LMK316 BJ335□L		3.3	B/X7R	3.5			1.6±0.2
	LMK316 BJ475□L		4.7	B/X7R	5			1.6±0.2
	LMK316 BJ106□L*		10	B/X5R	5			1.6±0.2
	LMK316 BJ226ML*		22	B/X5R	10		±20%	1.6±0.2
6.3V	JMK316 BJ685□F		6.8	B/X5R	10		±10% ±20%	1.15±0.1
	JMK316 BJ106□D*		10	B/X5R	10			0.85±0.1
	JMK316 BJ106□L		10	B/X7R	5			1.6±0.2
	JMK316 BJ226ML*		22	B/X5R	10		±20%	1.6±0.2
4V	AMK316 BJ476ML*		47	X5R	10			1.6±0.2
25V	TMK316 C106□L		10	C/X5S	10		±10% ±20%	1.6±0.2
50V	UMK316 F225ZG		2.2	F/Y5V	7	R/W	+80% −20%	1.25±0.1
35V	GMK316 F475ZG		4.7	F/Y5V	7	R		1.25±0.1
25V	TMK316 F106ZL		10	F/Y5V	9			1.6±0.2
16V	EMK316 F106ZL		10	F/Y5V	9			1.6±0.2
10V	LMK316 F475ZD		4.7	F/Y5V	9			0.85±0.1
	LMK316 F106ZF		10	F/Y5V	9			1.15±0.1
	LMK316 F226ZL		22	F/Y5V	16			1.6±0.2
6.3V	JMK316 F106ZD		10	F/Y5V	16			0.85±0.1

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.

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]
50V	UMK325 BJ105□H		1	B/X7R	3.5	R/W	±10%±20%	1.5±0.1
35V	GMK325 BJ225MN		2.2	B/X5R	3.5			1.9±0.2
25V	TMK325 BJ105MD		1	B/X7R	3.5			0.85±0.1
	TMK325 BJ225MH		2.2	B/X7R	3.5			1.5±0.1
	TMK325 BJ335MN		3.3	B/X7R	3.5			1.9±0.2
	TMK325 BJ475MN		4.7	B/X5R	3.5			1.9±0.2
	TMK325 BJ106MM*		10	B/X5R	3.5			2.5±0.2
	TMK325 BJ106MY		10	B/X5R	5			1.9+0.1／−0.2
16V	EMK325 BJ475MN		4.7	B/X7R	3.5			1.9±0.2
	EMK325 BJ106MD*		10	B/X5R	3.5			0.85±0.1
	EMK325 BJ106MN		10	B/X5R	5			1.9±0.2
	EMK325 BJ226MM*		22	B/X5R	5			2.5±0.2
10V	LMK325 BJ335MD		3.3	B/X5R	3.5		±20%	0.85±0.1
	LMK325 BJ106MN		10	B/X7R	3.5			1.9±0.2
	LMK325 BJ475MD		4.7	B/X5R	5			0.85±0.1
	LMK325 BJ106MD*		10	B/X5R	5			0.85±0.1
	LMK325 BJ226MY*		22	B/X5R	5	R		1.9+0.1／−0.2
	LMK325 BJ226MM*		22	B/X5R	5			2.5±0.2
	LMK325 BJ476MM*		47	B/X5R	10			2.5±0.2
6.3V	JMK325 BJ685MD		6.8	B/X5R	5			0.85±0.1
	JMK325 BJ226MY		22	B/X5R	5			1.9+0.1／−0.2
	JMK325 BJ476MM*		47	B/X5R	10			2.5±0.2
	JMK325 BJ826MN*		82	X5R	10			1.9±0.2
	JMK325 BJ107MM*		100	X5R	10			2.5±0.3
	JMK325 E826ZY*		82	E/Y5U	16		+80% −20%	1.9+0.1／−0.2
	JMK325 E107ZM*		100	E/Y5U	16			2.5±0.2
50V	UMK325 F475ZH		4.7	F/Y5V	9			1.5±0.1
35V	GMK325 F106ZH		10	F/Y5V	7			1.5±0.1
10V	LMK325 F226ZN		22	F/Y5V	16			1.9±0.2
	LMK325 F106ZF		10	F/Y5V	16			1.15±0.1
6.3V	JMK325 F476ZN		47	F/Y5V	16			1.9±0.2
	JMK325 F107ZM*		100	F/Y5V	16			2.5±0.2

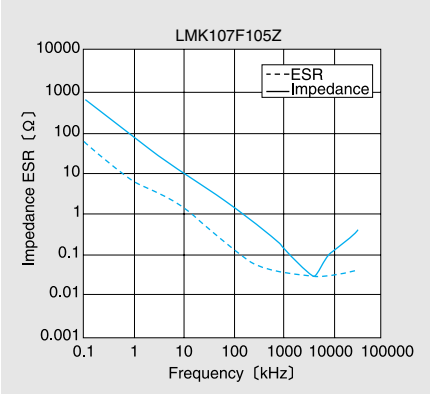
■432TYPE

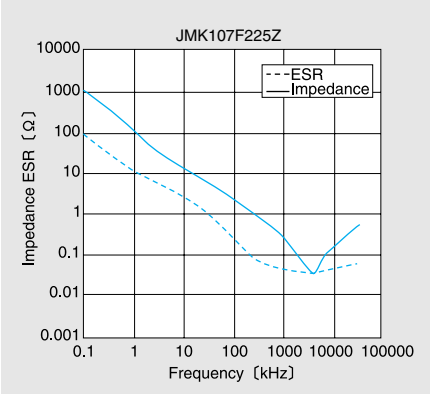
定格電圧 RatedVoltage	形名 Ordering code		公称静電容量 Capacitance [μF]	温度特性 Temperature characteristics	tanδ Dissipation factor [%]Max.	実装条件 Soldering method R:リフロー Reflow soldering W:フロー Wave soldering	静電容量許容差 Capacitance tolerance	厚み Thickness [mm]
25V	TMK432 BJ106MM		10	B/X5R	3.5			2.5±0.2
16V	EMK432 BJ226MM*		22	B/X5R	3.5			2.5±0.2
10V	LMK432 BJ226MM		22	B/X5R	3.5			2.5±0.2
6.3V	JMK432 BJ476MM*		47	B/X5R	5			2.5±0.2
	JMK432 BJ107MU*		100	B/X5R	10			3.2±0.3
50V	UMK432 C106MM*		10	C/X5S	5			2.5±0.2
25V	TMK432 C226MM*		22	C/X5S	5			2.5±0.2
	TMK432 C476MM*		47	C/X5S	5			2.5±0.2
6.3V	JMK432 C107MM*		100	C/X6S	7			2.5±0.2
	JMK432 C107MY*		100	C/X5S	10			1.9+0.1／−0.2
10V	LMK432 F476ZM*		47	F/Y5V	16		+80% −20%	2.5±0.2
6.3V	JMK432 F107ZM*		100	F/Y5V	16			2.5±0.2

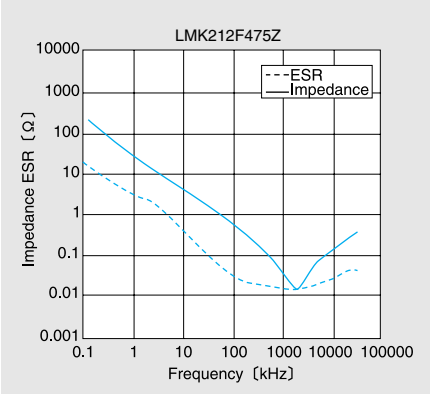
形名の□には静電容量許容差記号が入ります。　□ Please specify the capacitance tolerance code.

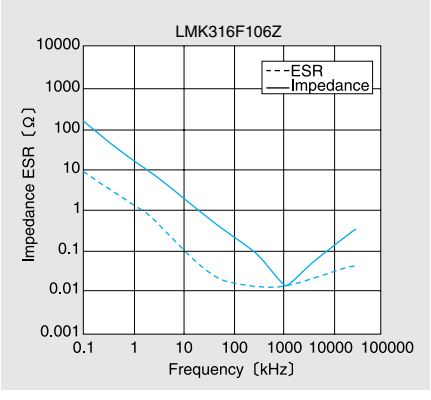
*高温負荷試験の試験電圧は定格電圧の1.5倍　* Test Voltage of Loading at high temperature test is 1.5 time of the rated voltage.

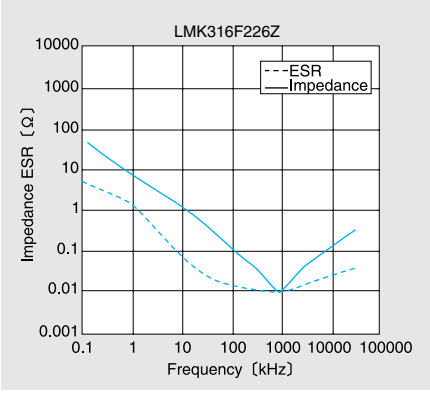
インピーダンス・ESR–周波数特性例　Example of Impedance ESR vs. Frequency characteristics
・当社積層セラミックコンデンサ例　(Taiyo Yuden multilayer ceramic capacitor)

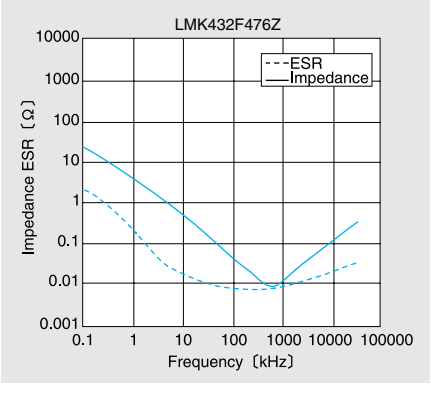


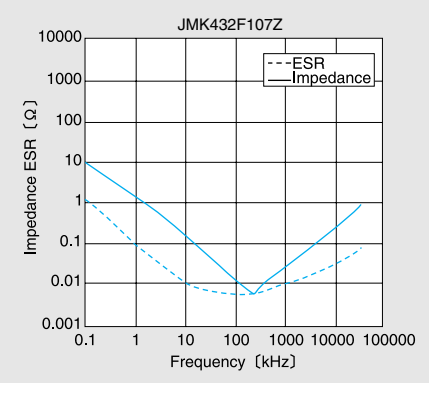


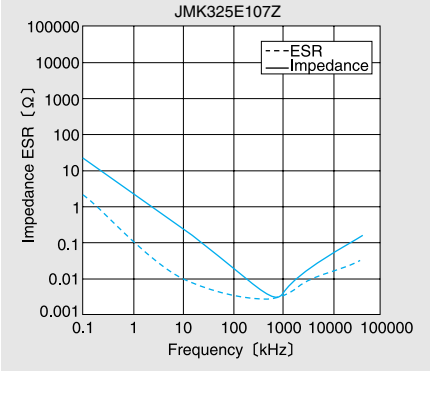




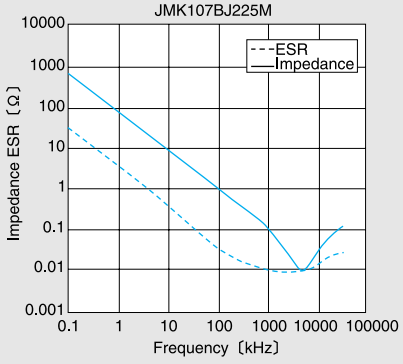




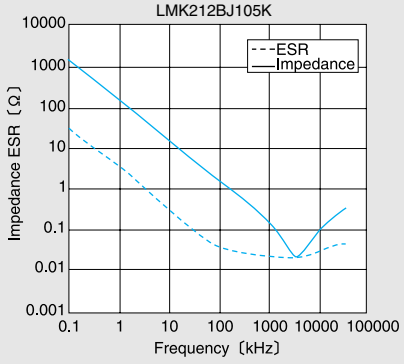




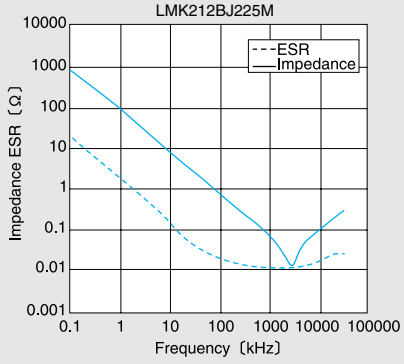
JMK107BJ225M



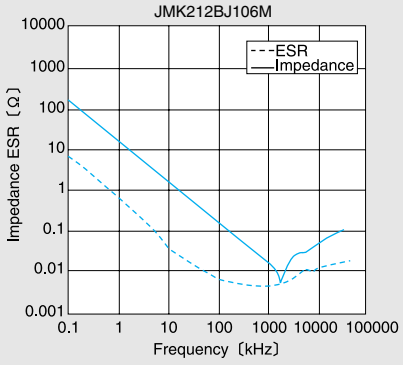
LMK212BJ105K



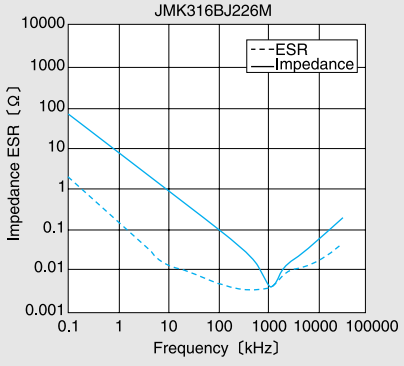
LMK212BJ225M



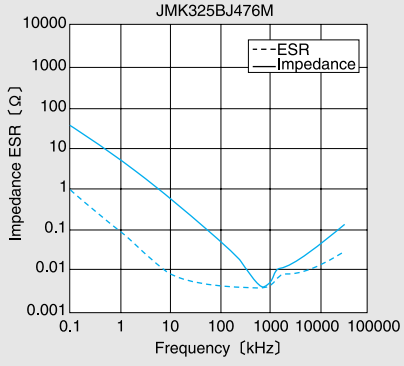
JMK212BJ106M



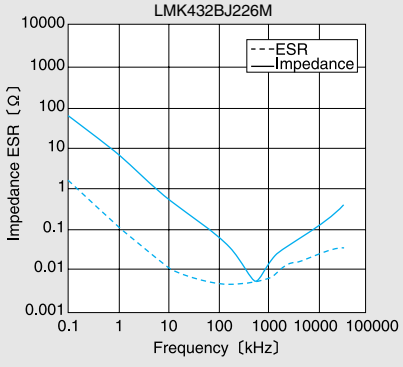
JMK316BJ226M



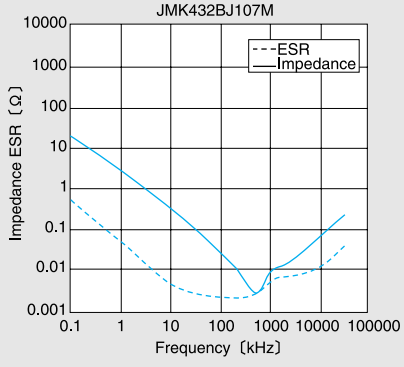
JMK325BJ476M



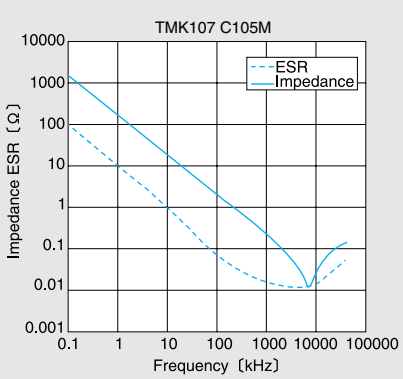
LMK432BJ226M



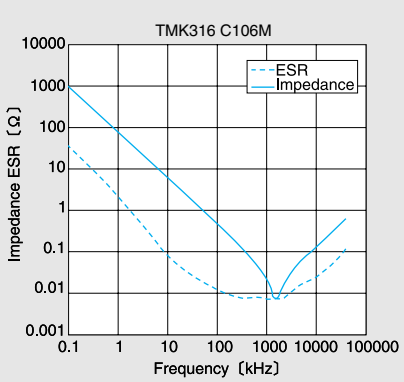
JMK432BJ107M



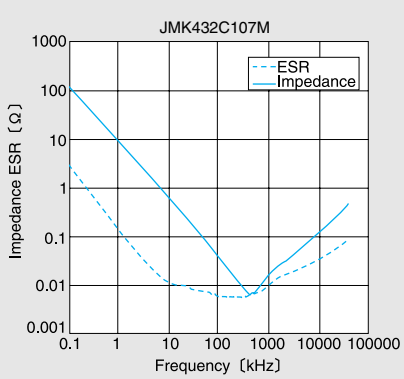
TMK107 C105M



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
V	0.5
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
V	0.5
W	0.5
Z	0.8

9 Special code

−	Standard Products

10 Packaging

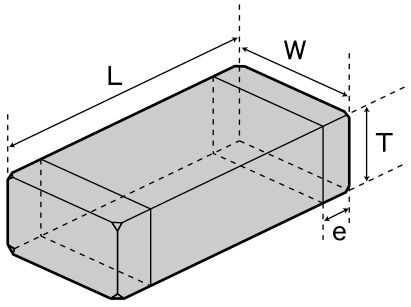
B	Bulk
F	Tape(2mm pitch・178φ)
T	Tape(4mm pitch・178φ)

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			50V			50V			
[pF]	[pF 3digits]										
0.5	0R5	P		W	W	W	W	Z	Z	Z	Z
1	010										
1.5	1R5										
2	020										
3	030										
4	040										
5	050										
6	060		W								
7	070										
8	080										
9	090										
10	100										
12	120										
15	150										
18	180										
22	220					V	V				
27	270										
33	330										
39	390										
47	470										
56	560										
68	680										
82	820					V	V				
100	101										
120	121										
150	151										
180	181						V				
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.46
特性図 Electrical Characteristics ——
梱包 Packaging P.76
信頼性 Reliability Data P.78
使用上の注意 Precautions P.84

063TYPE

Class 1

定格電圧 Rated Voltage (DC)	形　名 Ordering code		温度特性 Temperature characteristics (EIA) 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	公称静電容量 Capacitance [pF]	静電容量許容差 Capacitance tolerance [%]	厚み Thicknees [mm] (inch)
25V	TMK063 CK0R5□P		●																			0.5	±0.25pF ±0.5pF	0.3±0.03 (0.012±0.001)
	TMK063 CK010□P		●																			1		
	TMK063 CK1R5□P		●																			1.5		
	TMK063 CK020□P		●																			2		
	TMK063 CJ030□P			●																		3		
	TMK063 CH040□P				●																	4		
	TMK063 CH050□P				●																	5		
	TMK063 CH060□P				●																	6	±0.5pF ±1pF	
	TMK063 CH070□P				●																	7		
	TMK063 CH080□P				●																	8		
	TMK063 CH090□P				●																	9		
	TMK063 CH100□P				●																	10		
	TMK063 CH120□P				●																	12	±5 ±10	
	TMK063 CH150□P				●																	15		
	TMK063 CH180□P				●																	18		
	TMK063 CH220□P				●																	22		
	TMK063 CH270□P				●																	27		
	TMK063 CH330□P				●																	33		
	TMK063 CH390□P				●																	39		
	TMK063 CH470□P				●																	47		
	TMK063 CH560□P				●																	56		
	TMK063 CH680□P				●																	68		
	TMK063 CH820□P				●																	82		
	TMK063 CH101□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) 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	公称静電容量 Capacitance [pF]	静電容量許容差 Capacitance tolerance [%]	厚み Thickness [mm] (inch)
50V	UMK105 △0R5□W		●																●			0.5	±0.25pF ±0.5pF	0.5±0.05 (0.020±0.002)
	UMK105 △010□W		●																●			1		
	UMK105 △1R5□W		●																●			1.5		
	UMK105 △020□W		●																●			2		
	UMK105 △030□W			●															●			3		
	UMK105 △040□W				●															●		4		
	UMK105 △050□W				●															●		5		
	UMK105 △060□W				●															●		6	±0.5pF ±1pF	
	UMK105 △070□W				●															●		7		
	UMK105 △080□W				●															●		8		
	UMK105 △090□W				●															●		9		
	UMK105 △100□W				●															●		10		
	UMK105 △120□W				●															●		12	±5 ±10	
	UMK105 △150□W				●															●		15		
	UMK105 △180□W				●															●		18		
	UMK105 △220□V				●															●		22		
	UMK105 △270□V				●															●		27		
	UMK105 △330□V				●															●		33		
	UMK105 △390□V				●															●		39		
	UMK105 △470□V				●															●		47		
	UMK105 △560□V				●															●		56		
	UMK105 △680□V				●															●		68		
	UMK105 △820□V				●															●		82		
	UMK105 △101□V				●															●		100		
	UMK105 △121□V				●															●		120		
	UMK105 △151□V				●															●		150		
	UMK105 △181□V				●															●		180		
	UMK105 △221□V				●															●		220		
	UMK105 △271□V				●															●		270		
	UMK105 UJ331□V																			●		330		
	UMK105 SL121□V																				●	120		
	UMK105 SL151□V																				●	150		
	UMK105 SL181□V																				●	180		
	UMK105 SL221□V																				●	220		
	UMK105 SL271□V																				●	270		
	UMK105 SL331□V																				●	330		

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.

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　△0R5BW												●			●						0.5	±0.1pF	0.5±0.05 (0.020±0.002)
	EMK105　△010BW												●			●						1		
	EMK105　△1R2BW												●			●						1.2		
	EMK105　△1R5BW												●			●						1.5		
	EMK105　△1R8BW												●			●						1.8		
	EMK105　△2R2JW												●			●						2.2	±5%	
	EMK105　△2R7JW												●			●						2.7		
	EMK105　△3R3JW													●		●						3.3		
	EMK105　△3R9JW													●		●						3.9		
	EMK105　△4R7JW														●		●					4.7		
	EMK105　△5R6JW											●			●		●					5.6		
	EMK105　△6R8JW											●			●		●					6.8		
	EMK105　△8R2JW											●			●		●					8.2		
	EMK105　△100JW											●			●		●					10		
	EMK105　△120JW											●			●		●					12		
	EMK105　△150JW											●			●		●					15		
	EMK105　△180JW											●			●		●					18		
	EMK105　△200JW											●			●		●					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.

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

―	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

―	Standard products

10 Packaging

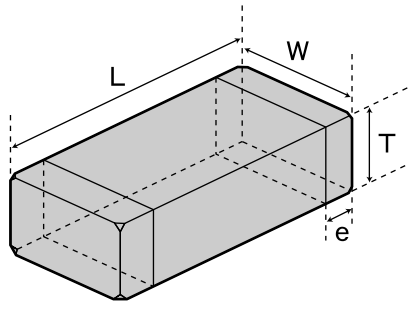
B	Bulk
F	Tape&Reel(2mm pitch・178φ)
T	Tape&Reel(4mm pitch・178φ)

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.		B/X5R			F/Y5V		B/X7R					F/Y5V					B/X7R		F/Y5V	
	WV	16V	10V	6.3V	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																			
330	331		P					V				V						Z		
470	471																			
680	681																			
1000	102								V				V						Z	
1500	152																			
2200	222			P	P									V					Z	Z
3300	332																			
4700	472			P	P										V					Z
6800	682																			
10000	103			P		P			V	V *1	V *1 *1				V					Z
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
	≦10%	B Char. 0.022～0.1μF
	≦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
	≦10%	B Char. 0.47μF～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 etc
アイテム一覧 Part Numbers P.52
特性図 Electrical Characteristics
梱包 Packaging P.76
信頼性 Reliability Data P.78
使用上の注意 Precautions P.89

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 BJ223□P		22000		10			
	JMK063 BJ473□P		47000					
	JMK063 BJ104□P*		100000	X5R				
	JMK063 F223ZP		22000	F/Y5V	16		+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		3.5			
	TMK105 BJ682□V		6800					
	TMK105 BJ103□V		10000					
16V	TDK105 BJ153□V		15000					
	TDK105 BJ223□V		22000					
	EMK105 BJ333□V		33000					
	EMK105 BJ473□V		47000					
	EMK105 BJ104□V*		100000	B/X5R	5			
10V	LMK105 BJ104□V		100000					
	LMK105 BJ224□V*		220000					
6.3V	JMK105 BJ224□V		220000					
	JMK105 BJ474□V*		470000	X5R	10			
	JMK105 BJ105□V*		1000000					
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.

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
U	50

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)

U 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
U	50

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

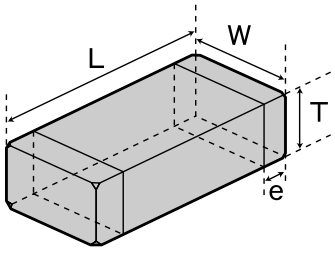
9 Special code

—	Standard Products

10 Packaging

B	Bulk
F	Tape&Reel(2mm pitch・178φ)

外形寸法　EXTERNAL DIMENSIONS



Type(EIA)	L	W	T	e
□VK105 (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

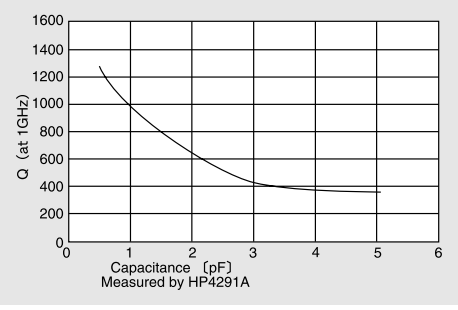
定格電圧 Rated Voltage (DC)	形　名 Ordering code		温度特性 Temperature characteristics CH	温度特性 Temperature characteristics RH	公称静電容量 Capacitance [pF]	静電容量許容差 Capacitance tolerance	Q規格値 (at 1GHz) Q (min)	厚み Thickness [mm]	Q typ.値 (参考値) Typical Q
E: 16V U: 50V	□VK105 CH0R3BW		●		0.3	±0.1pF	300	0.5±0.05	1200
	□VK105 CH0R4BW		●		0.4		300		1200
	□VK105 CH0R5BW		●		0.5		300		1200
	□VK105 CH0R6BW		●		0.6		300		1100
	□VK105 CH0R7BW		●		0.7		300		1100
	□VK105 CH0R8BW		●		0.8		300		1000
	□VK105 CH0R9BW		●		0.9		300		950
	□VK105 CH010BW		●		1.0		300		950
	□VK105 CH1R1BW		●		1.1		280		930
	□VK105 CH1R2BW		●		1.2		270		850
	□VK105 CH1R3BW		●		1.3		260		740
	□VK105 CH1R5BW		●		1.5		240		710
	□VK105 CH1R6BW		●		1.6		230		670
	□VK105 CH1R8BW		●		1.8		210		650
	□VK105 CH020BW		●		2.0		190		610
	□VK105 CH2R2JW		●		2.2	±5%	180		530
	□VK105 CH2R4JW		●		2.4		170		510
	□VK105 CH2R7JW		●		2.7		150		460
	□VK105 CH030JW		●		3.0		130		390
	□VK105 CH3R3JW		●		3.3		120		370
	□VK105 CH3R6JW		●		3.6		110		360
	□VK105 CH3R9JW		●		3.9		99		360
	□VK105 CH4R3JW		●		4.3		84		360
	□VK105 CH4R7JW		●		4.7		84		340
	□VK105 CH5R1JW		●		5.1		84		320
	□VK105 RH0R5BW			●	0.5	±0.1pF	300		1100
	□VK105 RH0R6BW			●	0.6		300		1000
	□VK105 RH0R7BW			●	0.7		300		1000
	□VK105 RH0R8BW			●	0.8		300		970
	□VK105 RH0R9BW			●	0.9		300		950
	□VK105 RH010BW			●	1.0		300		900
	□VK105 RH1R1BW			●	1.1		280		900
	□VK105 RH1R2BW			●	1.2		270		740
	□VK105 RH1R3BW			●	1.3		260		700
	□VK105 RH1R5BW			●	1.5		240		680
	□VK105 RH1R6BW			●	1.6		230		640
	□VK105 RH1R8BW			●	1.8		210		620
	□VK105 RH020BW			●	2.0		190		570
	□VK105 RH2R2JW			●	2.2	±5%	180		480
	□VK105 RH2R4JW			●	2.4		170		470
	□VK105 RH2R7JW			●	2.7		150		420
	□VK105 RH030JW			●	3.0		130		360
	□VK105 RH3R3JW			●	3.3		120		350
	□VK105 RH3R6JW			●	3.6		110		340
	□VK105 RH3R9JW			●	3.9		99		340
	□VK105 RH4R3JW			●	4.3		84		340
	□VK105 RH4R7JW			●	4.7		84		320
	□VK105 RH5R1JW			●	5.1		84		310

注：□には定格電圧記号がはいります。　□Please specify the Rated Voltage code.

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.55 ▶
特性図 Electrical Characteristics P.55 ▶
梱包 Packaging P.76 ▶
信頼性 Reliability Data P.78 ▶
使用上の注意 Precautions P.84 ▶
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

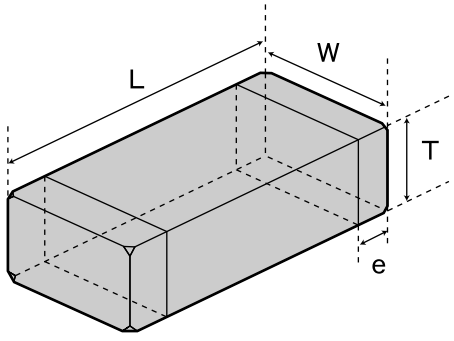
B	Bulk
T	Tape & reel

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	
	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.58 ▶
特性図 Electrical Characteristics P.58 ▶
梱包 Packaging P.76 ▶
信頼性 Reliability Data P.60 ▶
使用上の注意 Precautions P.84 ▶

アイテム一覧　PART NUMBERS

■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	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 SD102KA		1.0	Standard type	0.1	R	±10%*	0.8±0.1 (0.031±0.004)
	UMK107 SD122KA		1.2					
	UMK107 SD152KA		1.5					
	UMK107 SD182KA		1.8					
	UMK107 SD222KA		2.2					
	UMK107 SD272KA		2.7					
	UMK107 SD332KA		3.3					
25V	TMK107 SD392KA		3.9					
	TMK107 SD472KA		4.7					
16V	EMK107 SD562KA		5.6					
	EMK107 SD682KA		6.8					
	EMK107 SD822KA		8.2					
	EMK107 SD103KA		10					
10V	LMK107 SD123KA		12					
	LMK107 SD153KA		15					
	LMK107 SD183KA		18					
	LMK107 SD223KA		22					

*：J公差(±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	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	UMK212 SD392KD		3.9	Standard type	0.1	R	±10%*	0.85±0.1 (0.033±0.004)
	UMK212 SD472KD		4.7					
	UMK212 SD562KD		5.6					
	UMK212 SD682KD		6.8					
	UMK212 SD822KD		8.2					
	UMK212 SD103KD		10					
35V	GMK212 SD123KD		12					
	GMK212 SD153KD		15					
	GMK212 SD183KG		18					1.25±0.1 (0.049±0.004)
	GMK212 SD223KG		22					
	GMK212 SD273KG		27					
16V	EMK212 SD333KD		33					0.85±0.1 (0.033±0.004)
10V	LMK212 SD473KD		47					
	LMK212 SD683KG		68					1.25±0.1 (0.049±0.004)
	LMK212 SD104KG		100					

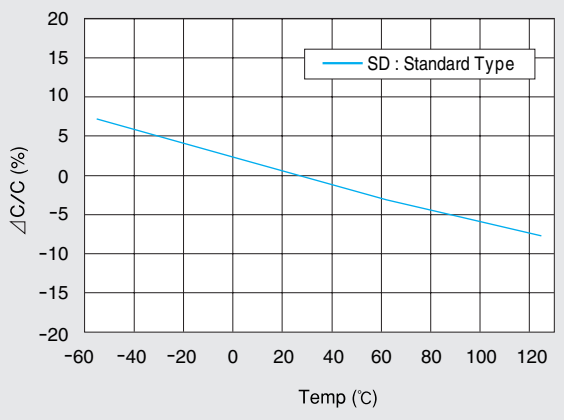
*：J公差(±5%)も対応致します。御相談ください。

■316TYPE (1206 case size)

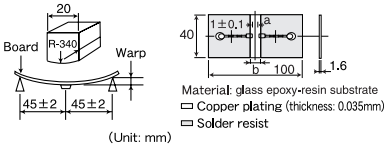
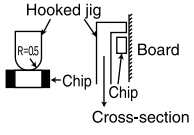
定格電圧 RatedVoltage	形　名 Ordering code		公称静電容量 Capacitance [nF]	温度特性 Temperature characteristics Standard type	tan δ Dissipation factor [%]Max.	実装条件 Soldering method R:リフロー Reflow soldering W:フロー Wave soldering	静電容量許容差 Capacitance tolerance	厚　み Thickness [mm](inch)
35V	GMK316 SD333KF		33	Standard type	0.1	R	±10%*	1.15±0.1 (0.045±0.004)
	GMK316 SD393KF		39					
25V	TMK316 SD473KF		47					
	TMK316 SD563KF		56					
	TMK316 SD683KF		68					
	TMK316 SD823KL		82					1.6±0.2 (0.063±0.008)
	TMK316 SD104KL		100					

*：J公差(±5%)も対応致します。御相談ください。

容量温度特性



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,

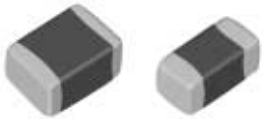
When there are questions concerning measurement results: In order to provide correlation data, the test shall be conducted under condition.

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

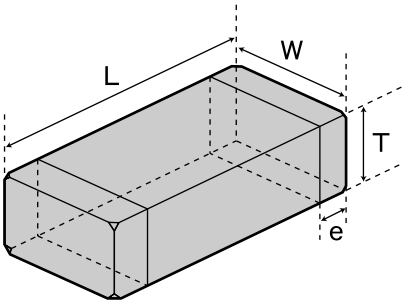
B	Bulk
T	Tape & reel

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 (0.049±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±0.3 (0.126±0.012)	2.5±0.20 (0.098±0.008)	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	BJ/X7R	BJ/X7R	BJ/X5R	BJ/X7R	BJ/X7R	BJ/X5R	BJ/X7R	BJ/X5R	BJ/X7R	BJ/X7R	BJ/X5R	BJ/X7R	BJ/X5R	BJ/X7R	BJ/X5R	BJ/X7R	BJ/X5R	BJ/X7R	BJ/X5R
Cap	VDC	100V	250V	250V	100V	250V	250V	630V	630V	100V	250V	250V	630V	630V	100V	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	G			L		L			F	N						M			M
0.22	224				L					N		N					M			
0.47	474									N					M			M		
1.0	105									N					M					
2.2	225															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%(100V) 2.5%(250V, 630V)
	EIA	X7R	−55～125	25	±15		
		X5R	−55～85	25	±15		

アイテム一覧　PART NUMBERS

■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	HMK212 BJ103□G		0.01	BJ/X7R	3.5	R	±10%, ±20%	1.25±0.1 (0.049±0.004)
	HMK212 BJ223□G		0.022					
	HMK212 BJ473□G		0.047					
	HMK212 BJ104□G		0.1					
250V	QMK212 BJ103□G		0.01		2.5			
	QMK212 BJ223□G		0.022	BJ/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	HMK316 BJ473□L		0.047	BJ/X7R	3.5	R	±10%, ±20%	1.6±0.2 (0.063±0.008)
	HMK316 BJ104□L		0.1					
	HMK316 BJ224□L		0.22					
250V	QMK316 BJ473□L		0.047		2.5			
	QMK316 BJ104□L		0.1	BJ/X5R				
630V	SMK316 BJ103□F		0.01	BJ/X7R				1.15±0.1 (0.045±0.004)
	SMK316 BJ223□L		0.022	BJ/X5R				1.6±0.2 (0.063±0.008)

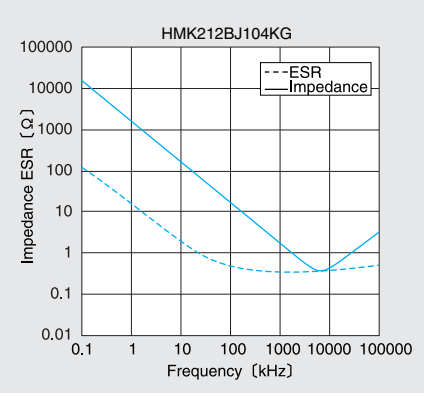
■325TYPE(1210 case size)

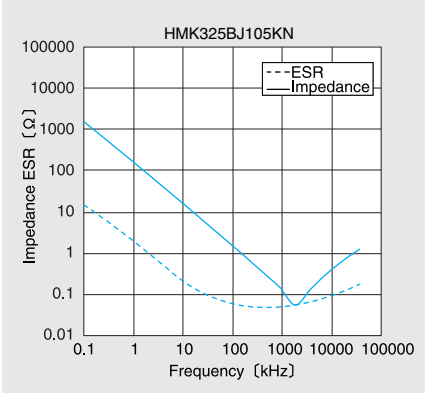
定格電圧 RatedVoltage	形名 Ordering code		公称静電容量 Capacitance [μF]	温度特性 Temperature characteristics	tanδ Dissipation factor [%]Max.	実装条件 Soldering method R:リフロー Reflow soldering W:フロー Wave soldering	静電容量許容差 Capacitance tolerance	厚み Thickness [mm] (inch)
100V	HMK325 BJ104□F		0.10	BJ/X7R	3.5	R	±10%, ±20%	1.15±0.1 (0.045±0.004)
	HMK325 BJ224□N		0.22					1.9±0.2 (0.075±0.008)
	HMK325 BJ474□N		0.47					
	HMK325 BJ105□N		0.1					
250V	QMK325 BJ473□N		0.047		2.5			
	QMK325 BJ104□N		0.10					
	QMK325 BJ224□N		0.22	BJ/X5R				
630V	SMK325 BJ223□N		0.022	BJ/X7R				
	SMK325 BJ473□N		0.047	BJ/X5R				

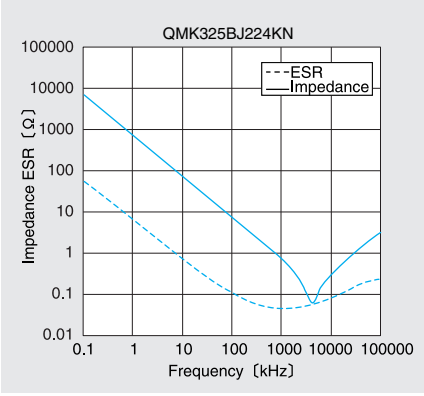
■432TYPE(1812 case size)

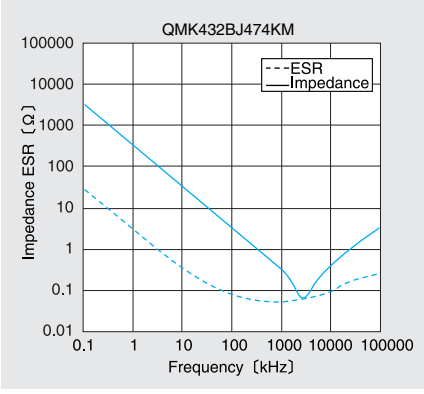
定格電圧 RatedVoltage	形名 Ordering code		公称静電容量 Capacitance [μF]	温度特性 Temperature characteristics	tanδ Dissipation factor [%]Max.	実装条件 Soldering method R:リフロー Reflow soldering W:フロー Wave soldering	静電容量許容差 Capacitance tolerance	厚み Thickness [mm] (inch)
100V	HMK432 BJ474□M		0.47	BJ/X7R	3.5	R	±10%, ±20%	2.5±0.2 (0.098±0.008)
	HMK432 BJ105□M		1.0					
	HMK432 BJ225□M		2.2	BJ/X5R				
250V	QMK432 BJ104□M		0.1	BJ/X7R	2.5			
	QMK432 BJ224□M		0.22					
	QMK432 BJ474□M		0.47	BJ/X5R				
630V	SMK432 BJ473□M		0.047	BJ/X7R				
	SMK432 BJ104□M		0.1	BJ/X5R				

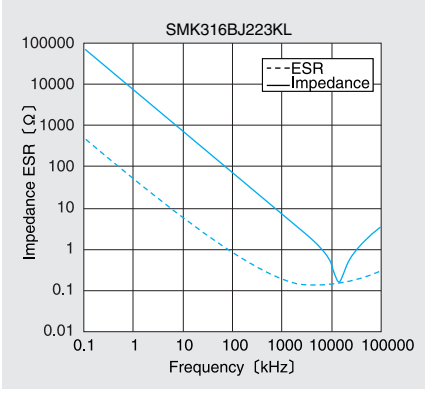
特性図　ELECTRICAL CHARACTERISTICS

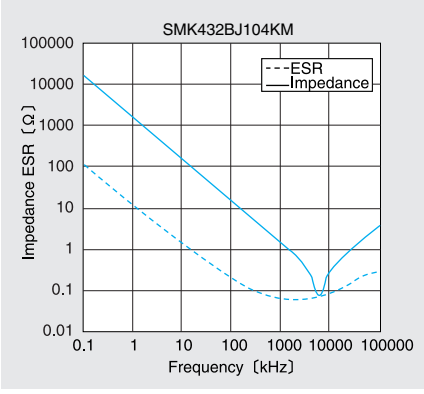




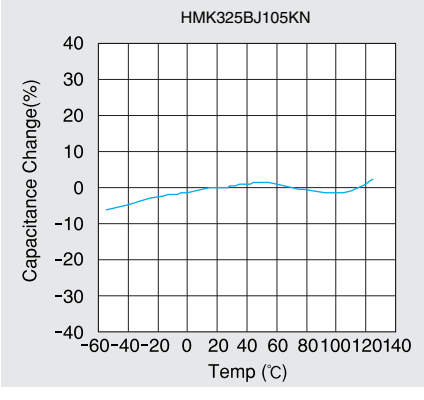




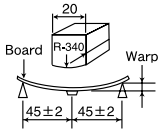
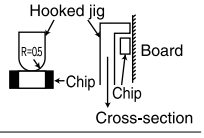




静電容量ー温度特性 Temperature characteristics



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 X 2.5(100V) Rated voltage X 2(250V) Rated voltage X 1.2(630V) Duration：1～5sec. Chage/dischage current：50mAmax.
5.Insulation Resistance	100MΩ μF or 10GΩ, whichever is smaller.	Applied voltage:Rated voltage(100V, 250V) 500V(630V) 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(100V). 2.5%max(250V, 630V).	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:maximum 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%(X5R、BJ), ±15%(X7R) 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±15%(100V), ±7.5%(250V, 630V) 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:Maximum 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±15% tan δ : 7%max(100V), 5%max(250V, 630V). Insulation resistance:25MΩ μF or 1000MΩ Whichever is smaller.	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±15% tan δ : 7%max(100V), 5%max(250V, 630V). Insulation resistance:10MΩ μF or 500MΩ Whichever is smaller.	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±15% tan δ : 7%max(100V), 5%max(250V, 630V). Insulation resistance:50MΩ μF or 1000MΩ Whichever is smaller.	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
316(1206)	3.2×1.6

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	%
F	±1pF	

8 製品厚み (mm)

B	0.6
A	0.8
D	0.85
F	1.15

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
316(1206)	3.2×1.6

5 Temperature characteristics code

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

6 Nominal capacitance(pF)

example	
104	100,000
105	1,000,000

7 Capacitance tolerances(%)

M	±20
K	±10
F	±1pF

8 Thickness(mm)

B	0.6
A	0.8
D	0.85
F	1.15

9 Special code

–	Standard products

10 Packaging

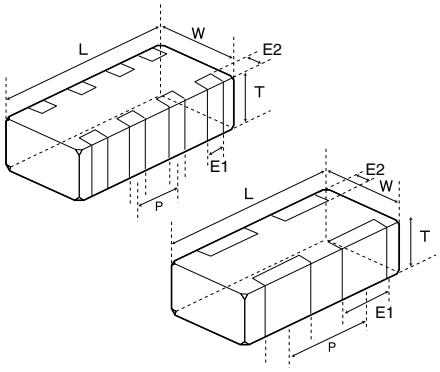
T	Tape & reel

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±0.003)	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)
□4K316 (1206)	3.20±0.15 (0.126±0.006)	1.60±0.15 (0.063±0.006)	0.40±0.20 (0.016±0.008)	0.30±0.20 (0.012±0.008)	0.80±0.10 (0.031±0.004)	F	1.15±0.15 (0.045±0.006)

Unit：mm (inch)

概略バリエーション　AVAILABLE CAPACITANCE RANGE

BJ/ X7R, BJ/ X5R

Cap	Type	1410 2連 □2K110				2125 2連 □2K212		2125 4連 □4K212				3216 4連 □4K316		
	Temp.Char	BJ/ X7R		BJ/ X5R		BJ/ X5R		BJ/ X5R				BJ/ X5R		
	VDC	25V	16V	10V	6.3V	10V	6.3V	25V	16V	10V	6.3V	16V	10V	6.3V
[μF]	[pF:3digits]													
0.01	103	B												
0.022	223	B												
0.047	473		B											
0.1	104		B					D	D					
0.22	224			B						D				
0.47	474			A						D				
1.0	105				A	D					D	F	F	F
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	Type	1410 2連 □2K110
	Temp.Char	CH / C0H
	VDC	50V
[pF]	[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% : J2K110, J4K212　　3.5% : 110type　　C<0.1μF

** 27pF以下　Q≧400+20・C　　30pF以上　Q≧1000

セレクションガイド Selection Guide P.8 etc
アイテム一覧 Part Numbers P.74
特性図 Electrical Characteristics P.75
梱包 Packaging P.76
信頼性 Reliability Data P.78
使用上の注意 Precautions P.84

アイテム一覧　PART NUMBERS

■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	T2K110 BJ103□B		0.01	B/X7R	3.5	R	±20%[M] ±10%[K]	0.6±0.06 (0.024±0.002)
	T2K110 BJ223□B		0.022					
16V	E2K110 BJ473□B		0.047					
	E2K110 BJ104□B		0.1		5			
10V	L2K110 BJ224□B		0.22	B/X5R				
	L2K110 BJ474MA		0.47					0.8±0.08 (0.031±0.003)
6.3V	J2K110 BJ105MA*		1.0	X5R	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	U2K110 CH100FB		10	CH	400+20・C	R	±10%[K]	0.6±0.06 (0.024±0.002)
	U2K110 CH120KB		12					
	U2K110 CH150KB		15					
	U2K110 CH180KB		18					
	U2K110 CH220KB		22					
	U2K110 CH270KB		27					
	U2K110 CH330KB		33		1000 (0.1%)			
	U2K110 CH390KB		39					
	U2K110 CH470KB		47					
	U2K110 CH560KB		56					
	U2K110 CH680KB		68					
	U2K110 CH820KB		82					
	U2K110 CH101KB		100					

■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)
25V	T4K212 BJ104□D		0.1	B/X5R	5	R	±20%[M] ±10%[K]	0.85±0.1 (0.033±0.004)
16V	E4K212 BJ104□D		0.1					
10V	L4K212 BJ224□D		0.22					
	L4K212 BJ474□D		0.47					
6.3V	J4K212 BJ105□D*		1.0	X5R	10			

■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	L2K212 BJ105MD		1.0	B/X5R	5	R	±20%[M]	0.85±0.1 (0.033±0.004)
6.3V	J2K212 BJ225MD*		2.2	X5R	10			

■3216TYPE (1206 case size)　　4連タイプ　(4 circuit type)

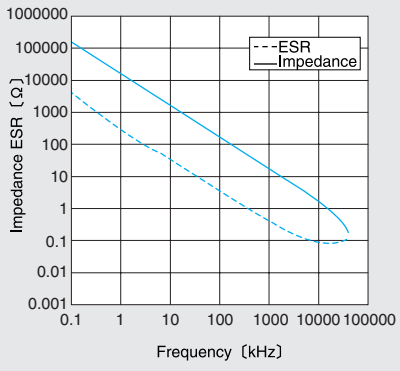
定格電圧 RatedVoltage	形名 Ordering code		公称静電容量 Capacitance [μF]	温度特性 Temperature characteristics	tanδ Dissipation factor[%]Max.	実装条件 Soldering method R:リフロー Reflow soldering W:フロー Wave soldering	静電容量許容差 Capacitance tolerance	厚み Thickness [mm](inch)
16V	E4K316 BJ105□F*		1.0	B/X5R	5	R	±20%[M] ±10%[K]	1.15±0.15 (0.045±0.006)
10V	L4K316 BJ105□F							
6.3V	J4K 316 BJ105□F							

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.

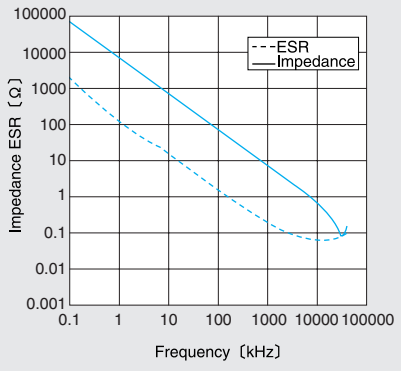
*高温負荷試験の試験電圧は定格電圧の1.5倍　　*Test voltage of Loading at high temperature test is 1.5 time of the rated voltage.

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)

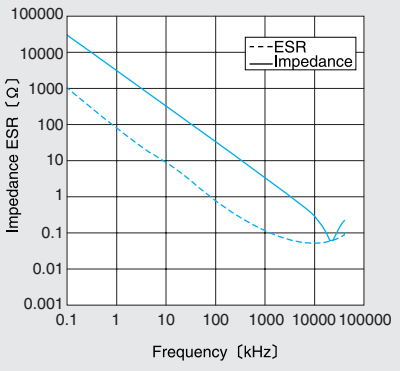
T2K110BJ103M



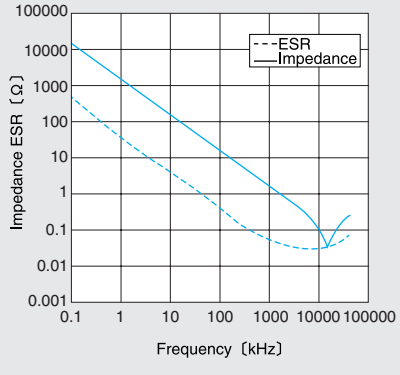
T2K110BJ223M



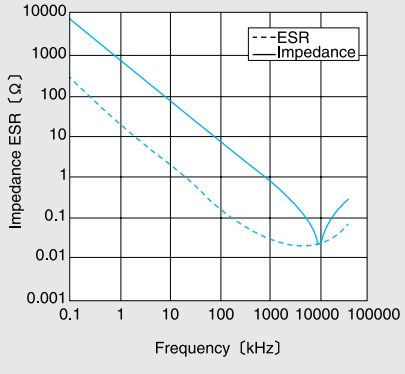
E2K110BJ473M



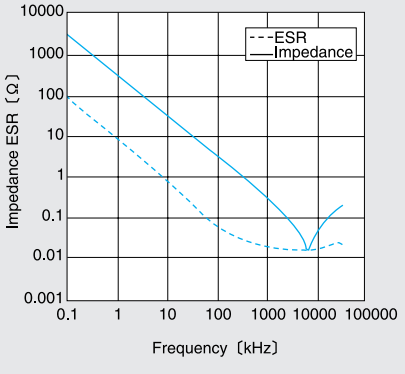
E2K110BJ104M



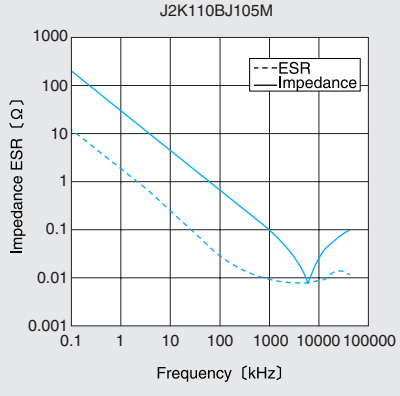
L2K110BJ224M



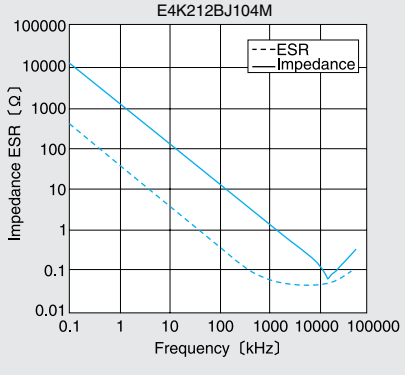
L2K110BJ474M



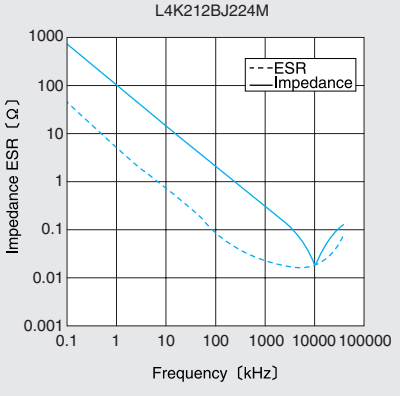
J2K110BJ105M



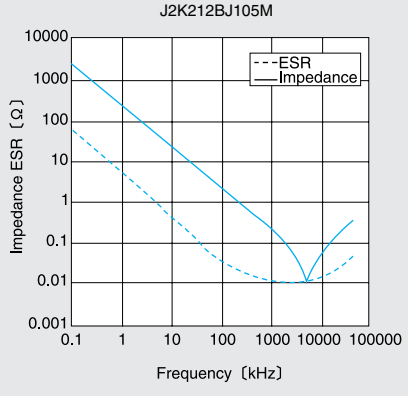
E4K212BJ104M



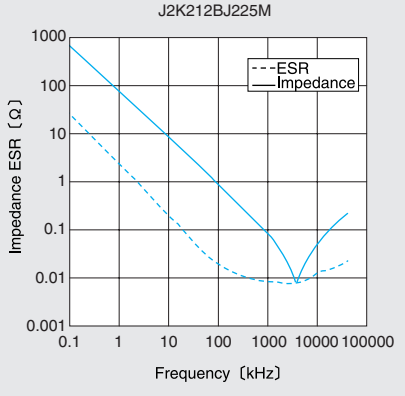
L4K212BJ224M



J2K212BJ105M



J2K212BJ225M



梱包　PACKAGING

①最小受注単位数 Minimum Quantity

■袋づめ梱包 Bulk packaging

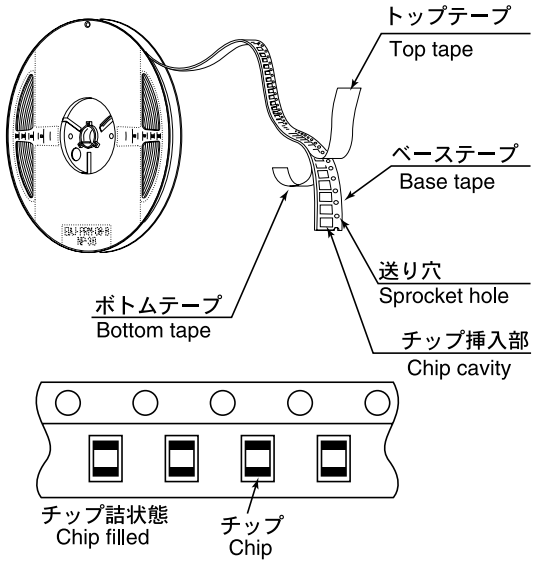
形式(EIA) Type	製品厚み Thickness		標準数量 Standard quantity [pcs]
	mm(inch)	code	
□MK105(0402)	0.5 (0.020)	V, W	1000
U VK105(0402)		W	
□MK107(0603)	0.8 (0.031)	A	
		Z	
□2K110(0504)	0.8 (0.031)	A	
	0.6 (0.024)	B	
□MK212(0805)	0.85 (0.033)	D	
	1.25 (0.049)	G	
□4K212(0805)	0.85 (0.033)	D	
□2K212(0805)	0.85 (0.033)	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

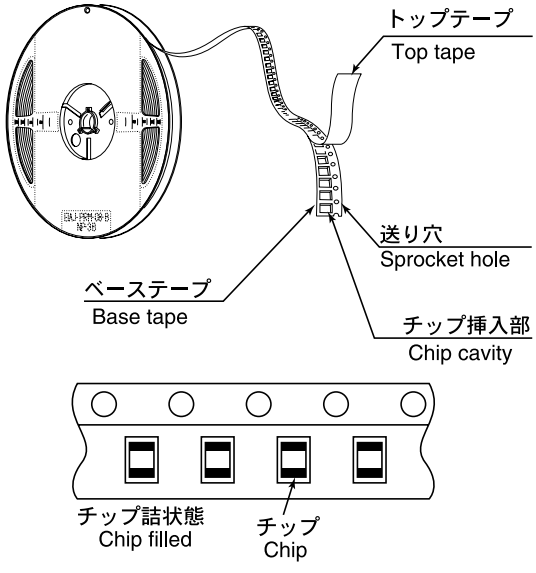
形式(EIA) Type	製品厚み Thickness		標準数量 Standard quantity [pcs]	
	mm(inch)	code	紙テープ paper	エンボステープ Embossed tape
□MK063(0201)	0.3 (0.012)	P	15000	—
□MK105(0402)	0.5 (0.020)	V, W	10000	—
U VK105(0402)		W		
□MK107(0603)	0.5 (0.020)	V	4000	—
	0.45 (0.018)	K	4000	—
	0.8 (0.031)	A	4000	—
		Z		
□2K110(0504)	0.8 (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) □4K316(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	—	1000
	2.5 (0.098)	M	—	500
	3.2 (0.125)	U		

②テーピング材質　Taping material

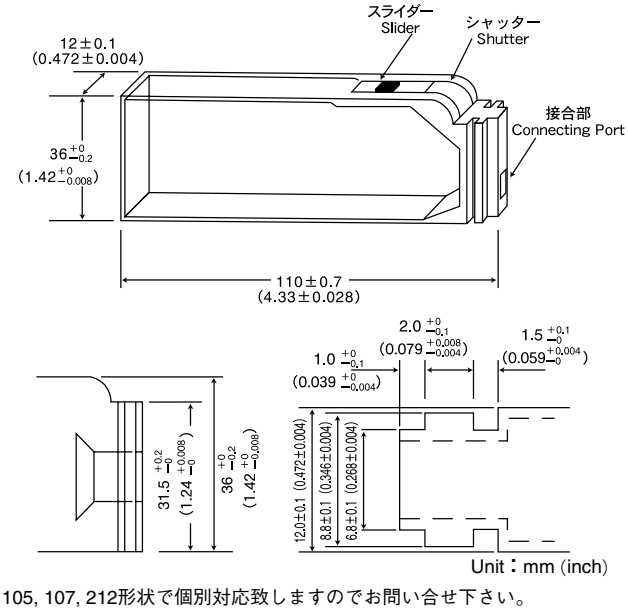
紙テープ
Card board carrier tape



エンボステープ
Embossed Tape



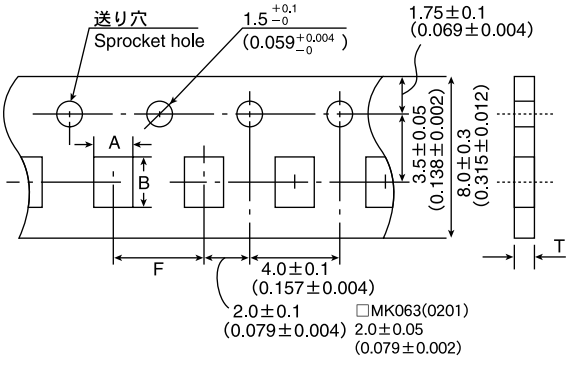
③バルクカセット　Bulk Cassette



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

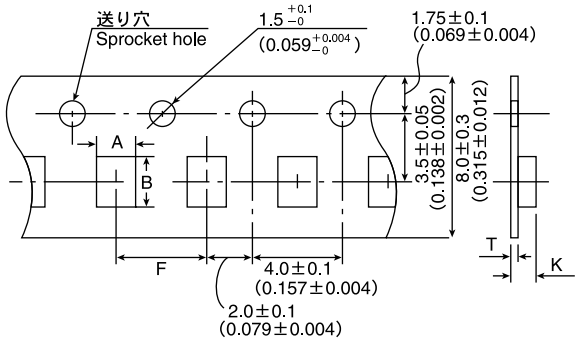
紙テープ　Paper Tape（8mm幅）(0.315inches wide)



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) U 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)

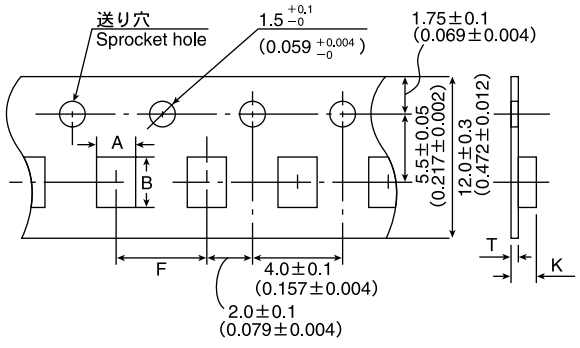
エンボステープ　Embossed tape（8mm幅）(0.315inches wide)



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) □4K316(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)

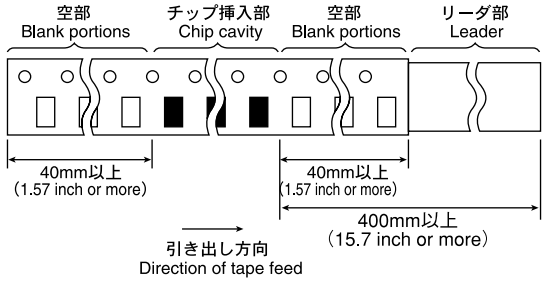
エンボステープ　Embossed tape（12mm幅）(0.472inches wide)



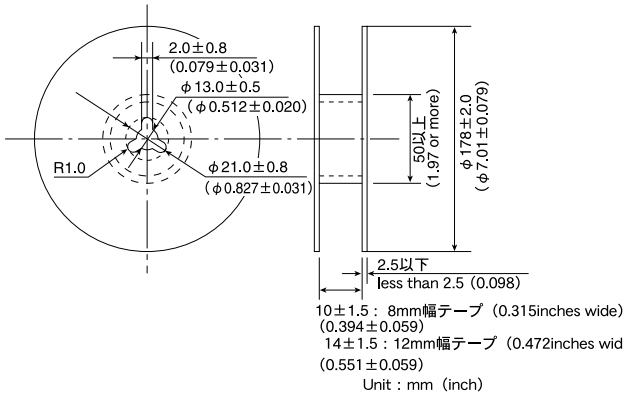
Type (EIA)	チップ挿入部 Chip cavity		挿入ピッチ Insertion Pitch	テープ厚み Tape Thickness	
	A	B	F	K	T
□MK432(1812)	3.7±0.2 (0.146±0.008)	4.9±0.2 (0.193±0.008)	8.0±0.1 (0.315±0.004)	4.0max. (0.157max.)	0.6max. (0.024max.)

Unit：mm(inch)

④リーダ部／空部　Leader and Blank portion

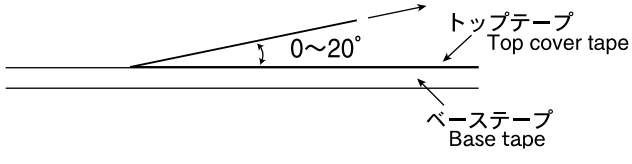


⑤リール寸法　Reel size

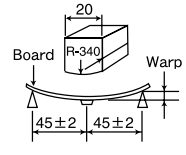


⑥トップテープ強度　Top Tape Strength

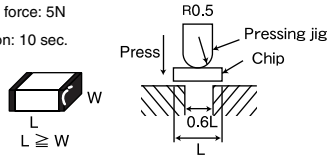
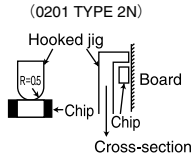
トップテープのはがし力は下図矢印方向にて0.1～0.7Nとなります。
The top tape requires a peel-off force of 0.1～0.7N in the direction of the arrow as illustrated below.



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 5		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：$^{+80}_{-20}$ %	B：±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)	B：2.5% max. C、E、F：7% max. Note 4	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)：$^{+22}_{-82}$%	B：±10% (−25～+85℃) C：±20% (−25～+85℃) E：+20%／−55% (−25～+85℃) F：+30%／−80% (−25～+85℃) B(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 Note 4 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 Note 4 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. Note 4 Insulation resistance: 50 MΩ μF or 1000 MΩ whichever is smaller. Note 5	Appearance: No abnormality Capacitance change: BJ:Within ±12.5% C(X6S) Within ±25% C(X5S),E,F Within ±30% tan δ: Note 4 BJ: 5.0% max. C, E, F: 11.0% max. Insulation resistance: 50 MΩ μF or 1000 MΩ whichever is smaller. Note 5	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)

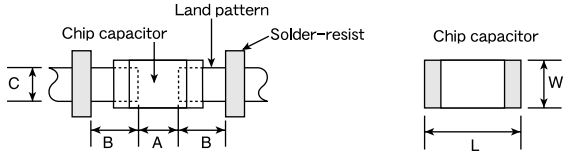
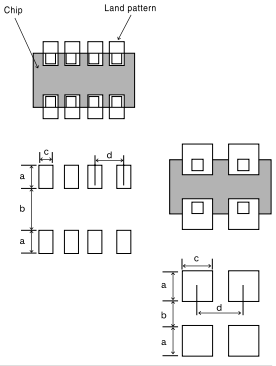
Multilayer Ceramic Capacitor Chips

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. Note 4 Insulation resistance: 25 MΩ μF or 500 MΩ, whichever is the smaller. Note 5	Appearance: No abnormality Capacitance change: BJ：Within±12.5% C、E、F：Within±30% tanδ： Note 4 BJ：5.0%max. C、E、F：11%max. Insulation resistance: 25 MΩ μF or 500 MΩ, whichever is the smaller. Note 5	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: Note 4 B: 4.0% max. F: 7.5% max. Insulation resistance: 50 MΩ μF or 1000 MΩ, whichever is smaller. Note 5	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： Note 4 BJ：5.0%max. C、F、F：11%max. Insulation resistance: 50 MΩ μF or 1000 MΩ, whichever is smaller. Note 5	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 Note 6 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 4, 5 :The figure indicates typical inspection. Please refer to individual specifications.
Note 6 :Some of the parts are applicable in rated voltage×1.5. Please refer to individual specifications.

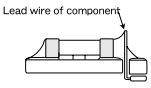
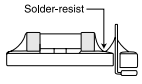
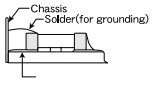
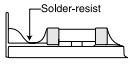
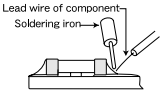
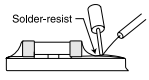
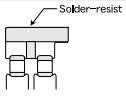
Note on standard condition: "standard condition" referred to herein is defined as follows: 5 to 35℃ of temperature, 45 to 85% relative humidity, and 86 to 106kPa of air pressure.
When there are questions concerning measurement results: In order to provide correlation data, the test shall be conducted 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."

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 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

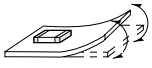
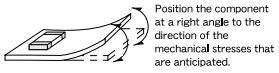
Items	Not recommended	Recommended
Mixed mounting of SMD and leaded components		
Component placement close to the chassis		
Hand-soldering of leaded components near mounted components		
Horizontal component placement		

Pattern configurations

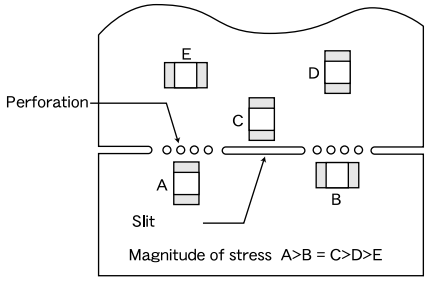
(Capacitor layout on panelized [breakaway] PC boards)

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.

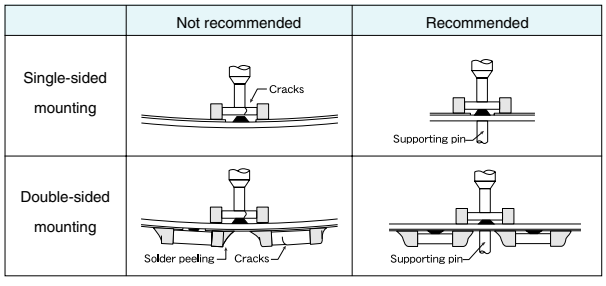
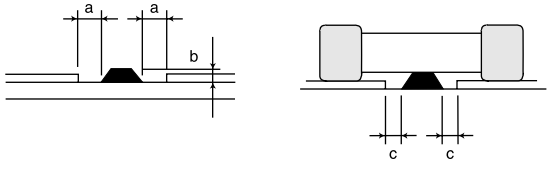
	Not recommended	Recommended
Deflection of the board		

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.

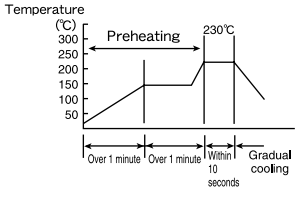
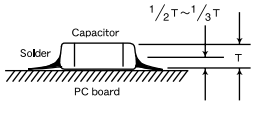
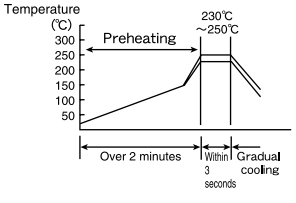


1-3. When breaking PC boards along their perforations, the amount of mechanical stress on the capacitors can vary according to the method used. The following methods are listed in order from least stressful to most stressful: push-back, slit, V-grooving, and perforation. Thus, any ideal SMD capacitor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

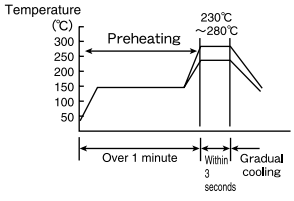
Precautions on the use of Multilayer Ceramic Capacitors

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:  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.
	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 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 Amount of adhesive After capacitors are bonded 

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
472	4700

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
472	4700

*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△		$+^{80}_{-20}$ %

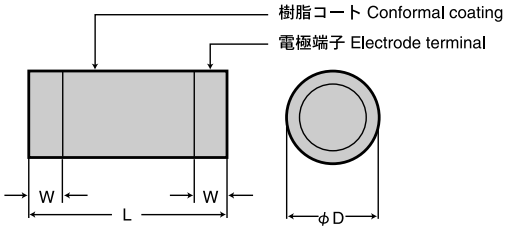
△=Blank space

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											
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±250ppm／℃		
RK	−220±250		
SK	−330±250	0.5～5pF	Q
TK	−470±250	C(±0.25pF)	400+20・Cmin
UK	−750±250		(C≦27pF)
CJ	0±120ppm／℃		
RJ	−220±120	6～10pF	
SJ	−330±120	D(±0.5pF)	500min
TJ	−470±120	F(±1pF)	(30≦C≦33pF)
UJ	−750±120		
CH	0±60ppm／℃	11～91pF	
RH	−220±60	J(±5%)	100min
SH	−330±60		(51≦C≦91pF)
TH	−470±60		
SL	+350～−1000ppm／℃		
B	±10%	K(±10%)	tanδ
W	±10%	M(±20%)	2.5%max
Y	±22%	N(±30%)	
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／℃		
RK	−220±250		
SK	−330±250	0.5～5pF	Q
TK	−470±250	C(±0.25pF)	400+20・Cmin
UK	−750±250		(C≦27pF)
CJ	0±120ppm／℃		
RJ	−220±120	6～10pF	
SJ	−330±120	D(±0.5pF)	1000min
TJ	−470±120	F(±1pF)	(30≦C≦39pF)
UJ	−750±120		
CH	0±60ppm／℃	11～56pF	
RH	−220±60	J(±5%)	500min
SH	−330±60		(43≦C≦56pF)
TH	−470±60		
SL	+350～−1000ppm／℃		
A	± 5%	K(±10%)	tanδ 1.5%max
B	±10%		tanδ
W	±10%	M(±20%)	2.5%max
Y	±22%	N(±30%)	
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.98 ▶
特性図 Electrical Characteristics P.102 ▶
梱包 Packaging P.104 ▶
信頼性 Reliability Data P.106 ▶
使用上の注意 Precautions P.116 ▶
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			
	UCN033 SL300□		SL	30		Q≧500	
	UCN033 SL330□			33			
	UCN033 SL360□			36			
	UCN033 SL390□			39			
	UCN033 SL430□			43		Q≧100	
	UCN033 SL470□			47			
	UCN033 SL510□			51			
	UCN033 SL560□			56			
	UCN033 SL680□			68			
	UCN033 SL750□			75			
	UCN033 SL820□			82			
	UCN033 SL910□			91			
	UCN033 SL101□			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	UCN033　B121□		B	120	±10% ±20%	tanδ≦2.5	10000MΩmin.
	UCN033　B151□			150			
	UCN033　B181□			180			
	UCN033　B221□			220			
	UCN033　B271□			270			
	UCN033　B331□			330			
	UCN033　W391□		W	390	±20% ±30%		1000MΩmin.
	UCN033　W471□			470			
	UCN033　W561□			560			
35V	TCN033　Y681□		Y	680	±20% ±30%		
	TCN033　Y821□			820			
	TCN033　Y102□			1000			
	TCN033　Y152□			1500			
	TCN033　Y222□			2200			
16V	BCN033　Y332□			3300			
	BCN033　Y472□			4700			
	ECN033　F103Z		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	2.5			
	UCN053 △030□		TJ,UJ,SL	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	
	UCN053 SL330□		SL	33			
	UCN053 SL360□			36			
	UCN053 SL390□			39			
	UCN053 SL430□			43		Q≧500	
	UCN053 SL470□			47			
	UCN053 SL510□			51			
	UCN053 SL560□			56			
	UCN053 SL620□			62			
	UCN053 SL680□			68			
	UCN053 SL750□			75		Q≧100	
	UCN053 SL820□			82			
	UCN053 SL910□			91			
	UCN053 SL101□			100			
	UCN053 SL121□			120			
	UCN053 SL151□			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。

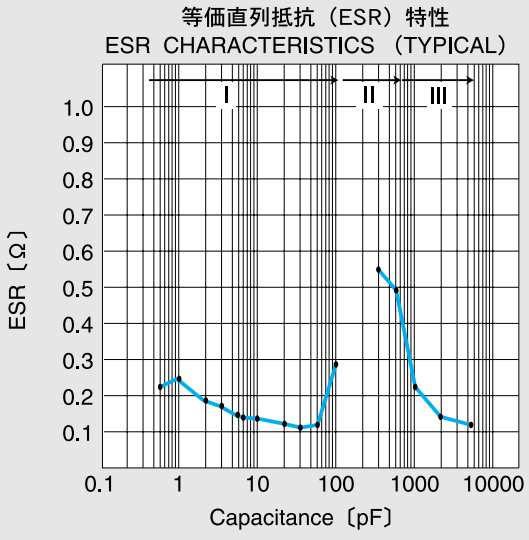
△ Please specify the temperature characteristics and □ capacitance tolerance code.

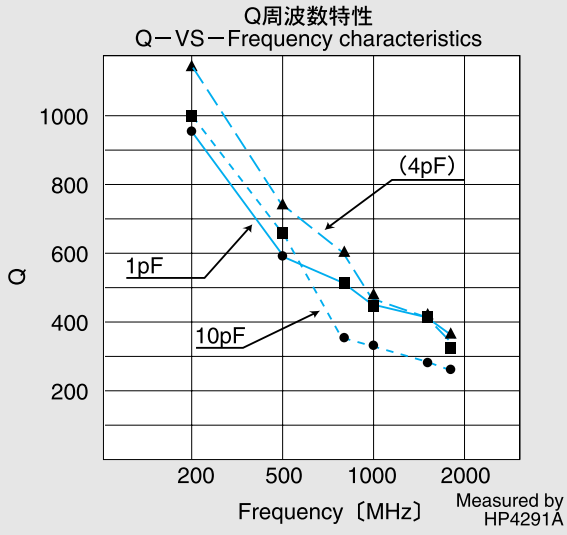
Class2、3

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	UCN053 A680 □		A	68	±10% ±20%	tanδ≦1.5%	10000MΩmin.
	UCN053 A820 □			82			
	UCN053 A101 □			100			
	UCN053 A121 □			120			
	UCN053 A151 □			150			
	UCN053 A181 □			180			
	UCN053 B221 □		B	220		tanδ≦2.5%	
	UCN053 B271 □			270			
	UCN053 B331 □			330			
	UCN053 B391 □			390			
	UCN053 B471 □			470			
	UCN053 W561 □		W	560	±20% ±30%		1000MΩmin.
	UCN053 W681 □			680			
	UCN053 W821 □			820			
35V	TCN053 Y681 □		Y	680	±20% ±30%		
	TCN053 Y821 □			820			
	TCN053 Y102 □			1000			
	TCN053 Y152 □			1500			
	TCN053 Y222 □			2200			
16V	BCN053 Y332 □			3300			
	BCN053 Y472 □			4700			
	BCN053 Y682 □			6800			
	BCN053 Y822 □			8200			
	ECN053 F103 □		F	10000	+80 −20 %	tanδ≦7.5%	
	ECN053 F153 □			15000			
	ECN053 F223 □			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.

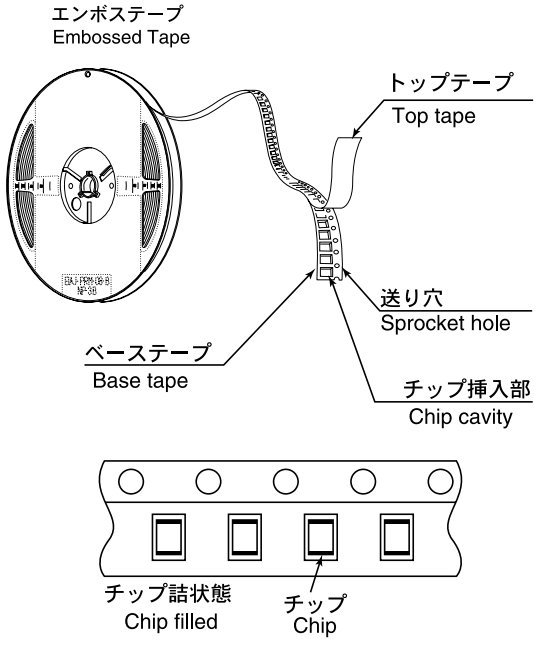

等価直列抵抗（ESR）特性
ESR CHARACTERISTICS （TYPICAL）
ESR〔Ω〕
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
I
II
III
0.1
1
10
100
1000
10000
Capacitance〔pF〕


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

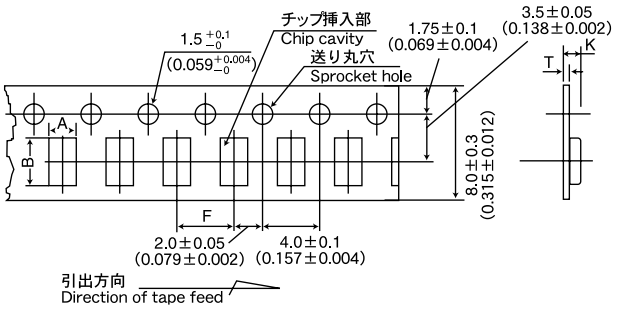
①最小受注単位数　Minimum Quantity

形式 Type	最小受注単位数(PCS) Minimum 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



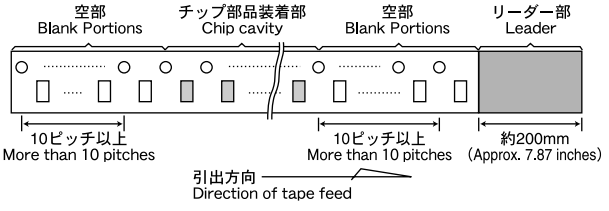
③テーピング寸法　Taping Dimensions



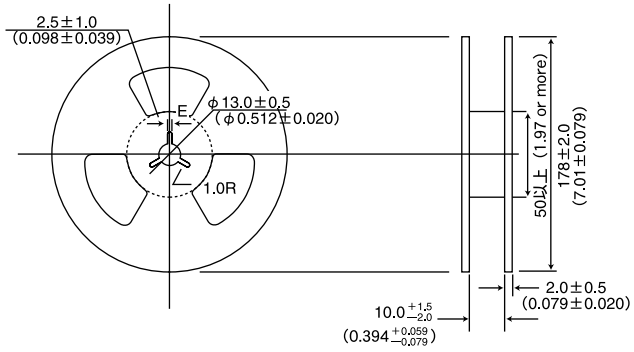
形式 Type	チップ挿入部 Chip cavity		挿入ピッチ Insertion Pitch	テープ厚み Tape Thickness	
	A	B	F	K	T
033	1.4±0.1 (0.055±0.004)	1.9±0.2 (0.075±0.008)	4.0±0.1 (0.157±0.004)	1.4max. (0.055max)	0.30max. (0.012max)
053	1.45±0.1 (0.057±0.004)	2.35±0.2 (0.093±0.008)	4.0±0.1 (0.157±0.004)	2.0max. (0.079max)	0.30max. (0.012max)

Unit：mm(inch)

④リーダー部／空部　Leader and Blank Portion



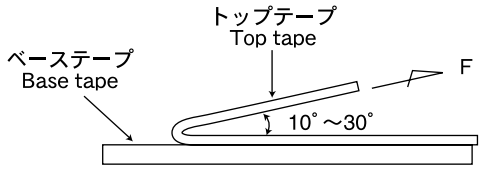
⑤リール寸法　Reel Size



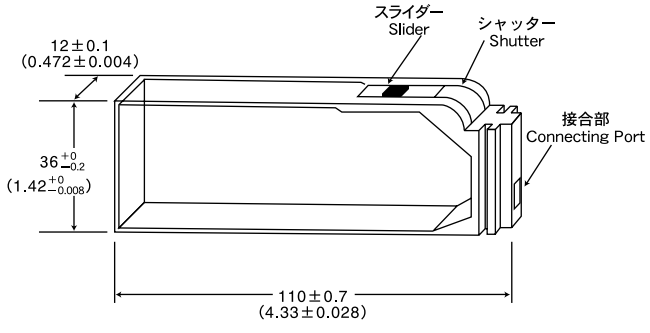
Unit = mm (inch)

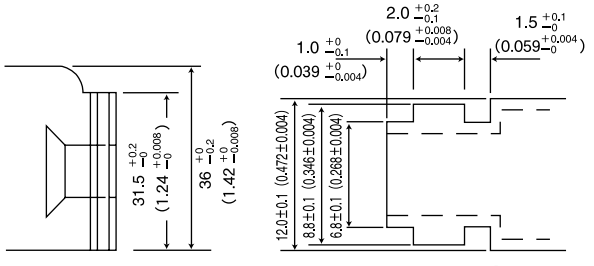
⑥トップテープ強度　Top Tape Strength

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





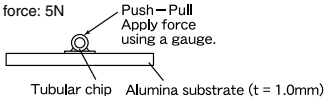
Unit：mm (inch)

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."

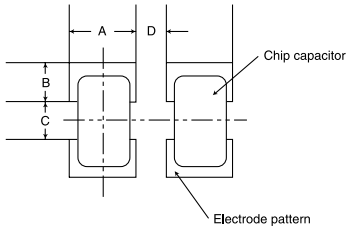
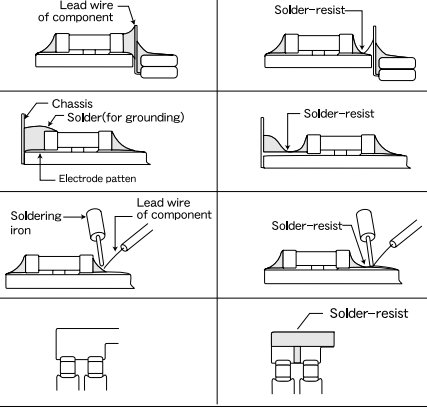
*Please specify the rated voltage code.

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: A 1.2, B 1.2, C 1.1, D 1.0; 033: A 1.0, B 1.0, C 0.8~1.0, D 0.8 Recommended land patterns for reflow soldering Unit: (mm) Type / Location: 053: A 1.2, B 0.8, C 1.0, D 0.5 or more; 033: A 0.9, B 0.6, C 0.9, D 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]

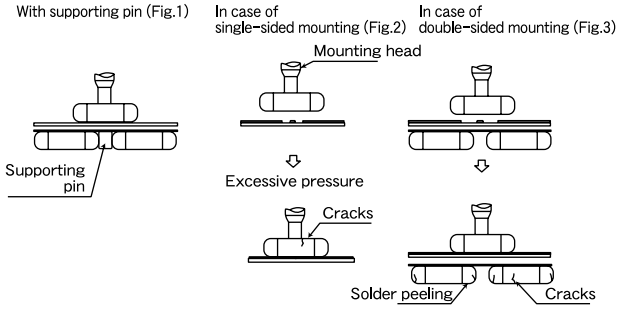
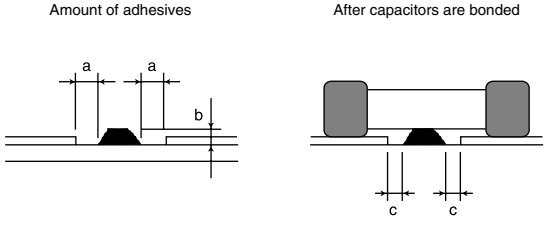
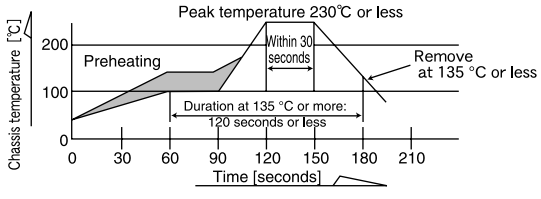
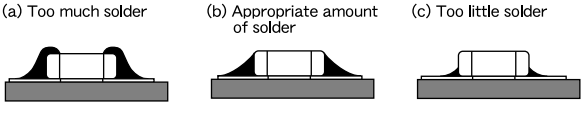


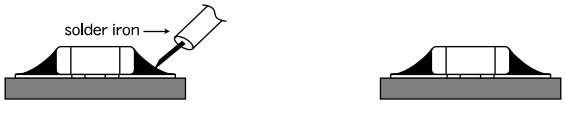
Figure	2125 case sizes as examples
a	0.3mm min
b	200～300μm (when two points applied)
c	Adhesives should not contact the pad



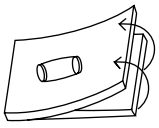
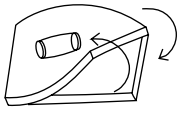
Precautions on the use of Tubular Type

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.	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 
	◆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. 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）
025	2.5×1.9（積層形）

4 温度特性

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

△= スペース

5 公称静電容量〔pF〕

例	※R= 小数点
010	1
1R2	1.2
103	10000

6 容量許容差〔%〕

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

7 リード形状〔mm〕

A−	26.0 テープ幅テービング
B−	52.0 テープ幅テービング
KE	7.5 ピッチフォーミング（単層タイプ）
KF	5.0 ピッチフォーミング
NA	単品ストレートリード

8 梱包

B	つづら折り
C	袋づめ

9 当社管理記号

△△	単層標準品
△Z	積層標準品

△= スペース

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

1 Rated voltage〔VDC〕

E	16
T	25
U	50

2 Type

P	Axial leaded capacitors

3 Outside Dimensions(L×φd)〔mm〕

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

4 Temperature characteristics〔ppm/℃〕

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

△=Blank space

5 Nominal Capacitance〔pF〕

example	
010	1
1R2	1.2
103	10000

※R=decimal point

6 Capacitance Tolerances〔%〕

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

7 Lead Configuration

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

8 Packaging

B	Ammo
C	Bulk

9 Internal code

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

△=Blank space

外形寸法　EXTERNAL DIMENSIONS

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

Unit : mm(inch)

概略バリエーション　AVAILABLE CAPACITANCE RANGE

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

Class 1　(Temperature compensating)

WV		50V(UP)				
Temp.char.		CH		RH	UJ	SL
Type cap.		050	025	050	050	050
[pF]	[pF：3digits]					
1	010					
1.2	1R2					
1.5	1R5					
1.8	1R8					
2.2	2R2					
2.7	2R7					
3.3	3R3					
3.9	3R9					
4.7	4R7					
5.6	5R6					
6.8	6R8					
8.2	8R2					
10	100					
11	110					
12	120					
13	130					
15	150					
16	160					
18	180					
20	200					
22	220					
24	240					
27	270					
30	300					
33	330					
36	360					
39	390					
43	430					
47	470					
51	510					
56	560					
62	620					
68	680					
100	101					
150	151					
220	221					
330	331					
470	471					
680	681					
1000	102					

Class 2 , 3 (High dielectric constant)

WV		50V(UP)				25V (TP)	16V (EP)	
Temp.char.		B		F		F	X	Y
Type cap.		050	025	050	025	050	050	050
[pF]	[pF：3digits]							
75	750							
82	820							
91	910							
100	101							
120	121							
150	151							
180	181							
220	221							
270	271							
330	331							
390	391							
470	471							
560	561							
680	681							
820	821							
1000	102							
1200	122							
1500	152							
1800	182							
2200	222							
2700	272							
3300	332							
3900	392							
4700	472							
5600	562							
6800	682							
8200	822							
10000	103							
22000	223							
33000	333							
47000	473							
68000	683							
100000	104							
220000	224							
470000	474							
1000000	105							

温度特性 Temperature char.		静電容量変化率 Capacitance change	容量許容差 Capacitance Tolerance	Q又はtanδ Q or tanδ	種類 Class
CH		0± 60ppm/℃	1.8pF(and less) ：M(±20%) 2.2～8.2pF ：K(±10%) 10pF(or over) ：J(±5%)	単層タイプ(Monolithic Type) Q≧400+20C 積層タイプ(Multilayer Type) Q≧400+20C, 33pF(and over) Q≧1000	1
RH		−220± 60ppm/℃		Q≧400+20・C, 16pF(and over) Q≧500	
UJ		−750±120ppm/℃		Q≧400+20・C	
SL		+350～−1000ppm/℃		Q≧400+20・C, 33pF(and over) Q≧500	
△B	Y5P	±10%	K (±10%)	単層タイプ(Monolithic Type) tanδ≦1.5%, 470pF(and over)tanδ≦2.5%	2, 3
	X5R	±15%		積層タイプ(Multilayer Type) 1200pF～39000pF ：tanδ≦3.5% 47000pF～100000pF ：tanδ≦5.0%	2
X(Y5R)		±15%	M(±20%)、N(±30%)	tanδ≦2.5%	3
Y(Y5S)		±22%	M(±20%)、N(±30%)	tanδ≦2.5%	3
△F	Y5V	±$^{30}_{85}$%	Z(±$^{80}_{20}$%)	単層タイプ(Monolithic Type) tanδ≦7.5%	3
				積層(Multilayer Type) 10000pF～100000pF ：tanδ≦7.5% 220000pF～470000pF ：tanδ≦10.0% 1000000pF ：tanδ≦15.0%	2

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

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

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

［単層タイプ Monolithic type］
Class 1

定格電圧 RatedVoltage (DC)	形名 Ordering code		温度特性 Temperature characteristics	公称静電容量 Capacitance (pF)	容量許容差 Capacitance tolerance	Q or tanδ	絶縁抵抗 Insulation resistance
50V	UP050△010M−○		CH RH SL	1.0	±20%	Q≧400+20C (C:公称静電容量 capacitance[pF]) ただしRHは 16pF以上は Q≧500 but Q≧500 at 16pF or over of characteristic RH	10000MΩmin
	UP050△1R2M−○			1.2			
	UP050△1R5M−○			1.5			
	UP050△1R8M−○			1.8			
	UP050△2R2K−○		CH RH UJ SL	2.2	±10%		
	UP050△2R7K−○			2.7			
	UP050△3R3K−○			3.3			
	UP050△3R9K−○			3.9			
	UP050△4R7K−○			4.7			
	UP050△5R6K−○			5.6			
	UP050△6R8K−○			6.8			
	UP050△8R2K−○			8.2			
	UP050△100J−○			10	± 5%		
	UP050△110J−○			11			
	UP050△120J−○			12			
	UP050△130J−○			13			
	UP050△150J−○			15			
	UP050△160J−○			16			
	UP050△180J−○			18			
	UP050△200J−○		CH、UJ、SL	20			
	UP050△220J−○		UJ SL	22			
	UP050△240J−○			24			
	UP050△270J−○			27			
	UP050△300J−○			30			
	UP050SL330J−○		SL	33		Q≧500	
	UP050SL360J−○			36			
	UP050SL390J−○			39			
	UP050SL430J−○			43			
	UP050SL470J−○			47			
	UP050SL510J−○			51			
	UP050SL560J−○			56			
	UP050SL620J−○			62			
	UP050SL680J−○			68			

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

［積層025タイプ Multilayer 025 Type］
Class 2

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

［積層タイプ Multilayer type］
Class 1

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

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

［単層タイプ Monolithic type］
Class 2, 3

定格電圧 RatedVoltage (DC)	形名 Ordering code		温度特性 Temperature characteristics	公称静電容量 Capacitance [pF]	容量許容差 Capacitance tolerance	Q or tanδ	絶縁抵抗 Insulation resistance
50V	UP050 B750K−○		B	75	±10%	tanδ≦1.5%	10000MΩmin
	UP050 B820K−○			82			
	UP050 B910K−○			91			
	UP050 B101K−○			100			
	UP050 B121K−○			120			
	UP050 B151K−○			150			
	UP050 B181K−○			180			
	UP050 B221K−○			220			
	UP050 B271K−○			270			
	UP050 B331K−○			330			
	UP050 B391K−○			390			
	UP050 B471K−○			470		tanδ≦2.5%	1000MΩmin
	UP050 B561K−○			560			
	UP050 B681K−○			680			
	UP050 B821K−○			820			
	UP050 B102K−○			1000			
16V	EP050 X122□−○		X	1200	±20% ±30%		
	EP050 X152□−○			1500			
	EP050 X182□−○			1800			
	EP050 X222□−○			2200			
	EP050 X272□−○			2700			
	EP050 X332□−○			3300			
	EP050 X392□−○			3900			
	EP050 X472□−○			4700			
	EP050 X562□−○			5600			
	EP050 X682□−○			6800			
	EP050 Y822□−○		Y	8200			
	EP050 Y103□−○			10000			
25V	TP050 F103Z−○		F	10000	$\pm^{80}_{20}$%	tanδ≦7.5%	
	TP050 F223Z−○			22000			

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

［積層タイプ Multilayer type］
Class 2

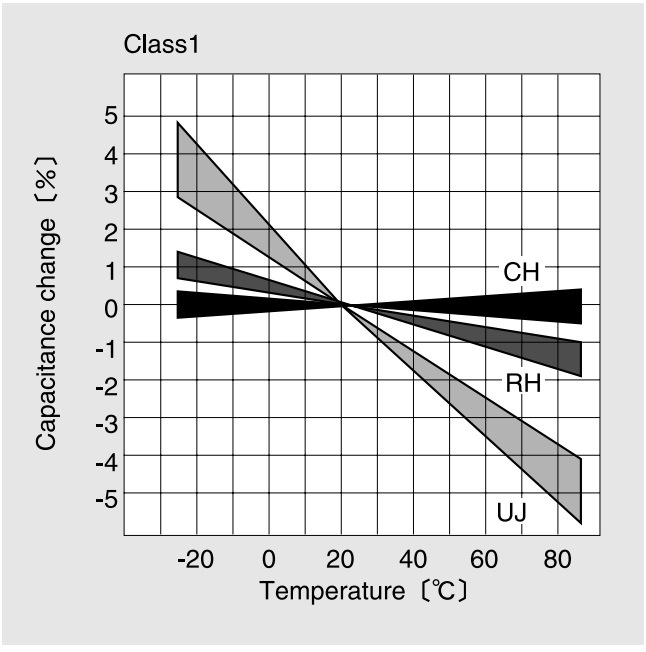
定格電圧 RatedVoltage (DC)	形名 Ordering code		温度特性 Temperature characteristics	公称静電容量 Capacitance (pF)	容量許容差 Capacitance tolerance	Q or tanδ	絶縁抵抗 Insulation resistance
★	UP050 B122K−○ Z		B	1200	±10%	tanδ≦3.5%	5000MΩmin
	UP050 B152K−○ Z			1500			
★	UP050 B182K−○ Z			1800			
	UP050 B222K−○ Z			2200			
★	UP050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

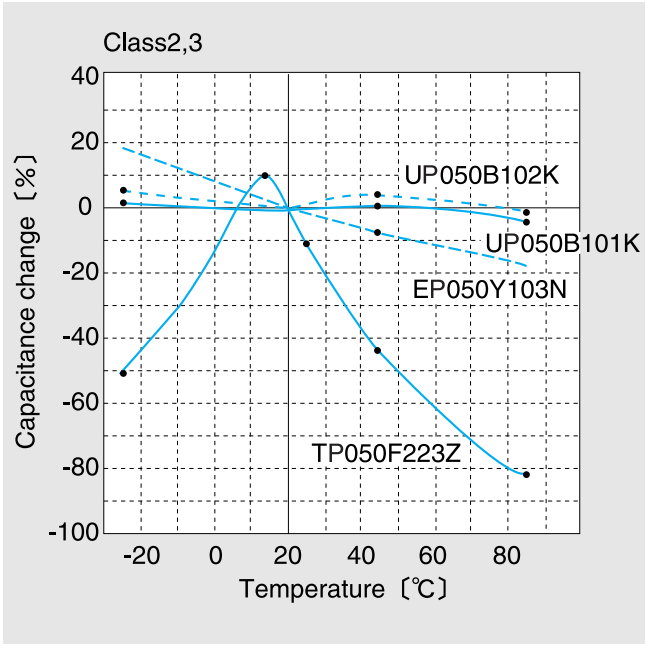
形名の△には温度特性、○にはリード形状分類記号が入ります。　★：オプション対応

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

★ : Option

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



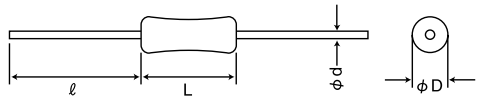


①最小受注単位数 Minimum Quantity

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

②製品単品形状　Dimensions of Bulk Products

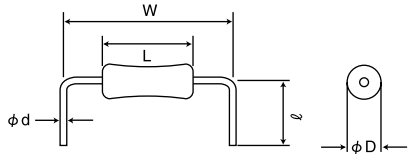
・NA形状　NA configuration



形　式 Type	寸　法 Dimensions(mm)			
	φD	L	φd	ℓ
積層形 025 Multilayer type	1.9max (0.075)	2.5max (0.098)	0.40±0.05 (0.016±0.002)	20.0min (0.787)
積層形 050 Multilayer type	2.2max (0.087)	3.2max (0.126)	0.45±0.05 (0.018±0.002)	20.0min (0.787)
単層形 Monolithic type	1.9max (0.075)	3.5max (0.138)	0.45±0.05 (0.018±0.002)	20.0min (0.787)

Unit：mm(inch)

・KF/KE形状　KF/KE configuration

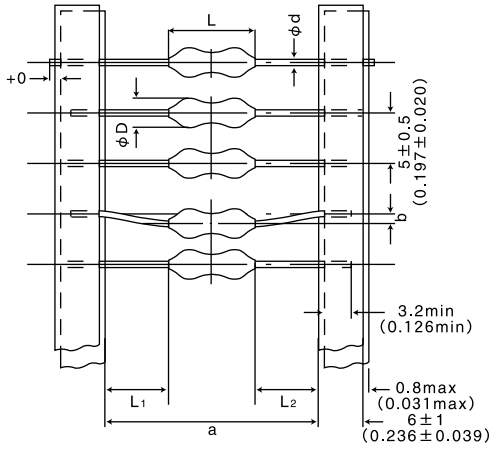


形　式 Type	リード形状記号 Lead configuration code	寸　法 Dimensions(mm)				
		φD	L	W	φd	ℓ
積層形 025 Multilayer type	KF	1.9max (0.075max)	2.5max (0.098max)	5.0±0.5 (0.197±0.020)	0.40±0.05 (0.016±0.002)	6.5±0.5 (0.256±0.020)
積層形 050 Multilayer type	KF	2.2max (0.087max)	3.2max (0.126max)	5.0±0.5 (0.197±0.020)	0.45±0.05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

Unit：mm(inch)

③テーピング寸法　Taping Dimensions

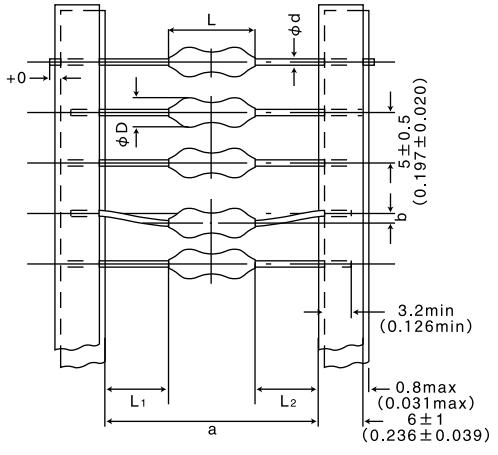
A−(a：26mm幅)形状(a：1.024 inch wide)configuration



形　式 Type	寸　法 Dimensions						最小挿入ピッチ Minimum insertion pitch
	φD	L	a	b	|L1−L2|	φd	
積層形 025 Multilayer type	1.9max (0.075max)	2.5max (0.098max)	$26^{+0.5}_{-0}$ ($1.024^{+0.020}_{-0}$)	0.8以下 (0.031 or less)	0.5max (0.020max.)	0.40±0.05 (0.016±0.002)	5.0 (0.197)
積層形 050 Multilayer type	2.2max (0.087max)	3.2max (0.126max)				0.45±0.05 (0.018±0.002)	
単層形 Monolithic type	1.9max (0.075max)	3.5max (0.138max)					

Unit：mm(inch)

B−(a：52mm幅)形状(a：2.047 inches wide)configuration



形　式 Type	寸　法 Dimensions						最小挿入ピッチ Minimum insertion pitch
	φD	L	a	b	|L1−L2|	φd	
積層形 025 Multilayer type	1.9max (0.075max)	2.5max (0.098max)	52^{+2}_{-1} ($2.047^{+0.079}_{-0.039}$)	1.2以下 (0.047 or less)	1.0max (0.039max.)	0.40±0.05 (0.016±0.002)	5.0 (0.197)
積層形 050 Multilayer type	2.2max (0.087max)	3.2max (0.126max)				0.45±0.05 (0.018±0.002)	
単層形 Monolithic type	1.9max (0.075max)	3.5max (0.138max)					

Unit：mm(inch)

AXIAL LEADED CERAMIC CAPACITORS

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

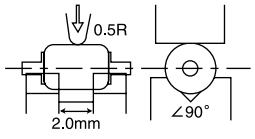
Withstanding voltage is also referred to as "voltage proof" under IEC specifications.

AXIAL LEADED CERAMIC CAPACITORS

Item		Specified Value					Test Methods and Remarks
		Temperature Compensating(Class 1)		High Permittivity(Class 2)		Semiconductor(Class 3)	
		Monolithic type	Multilayer Type	Monolithic type	Multilayer Type	Monolithic type	
9.Terminal Strength	Tensile	No abnormality such as cut lead, or looseness.					Apply the stated tensile force progressively in the direction to draw terminal. Nominal wire diameter [mm] / Tensile force [N] / Duration [s] 0.45 / 19.6 / 5
	Torsional	No abnormalities, such as cuts or looseness of terminals.					Suspend a mass at the end the terminal, incline the body through angle of 90˚ and return it to initial position. This operation is done over a period of 5 sec. Then second bend in the opposite direction shall be made. Number of bends : 2 times Nominal wire diameter [mm] / Bending force [N] / Mass weight [kg] 0.45 / 2.45 / 0.25
10.Resistance to Vibration		Appearance: No significant abnormality Capacitance change: 1.8 pF or under : Within ±20% 2.2 pF to 8.2 pF: Within ±10% 10 pF or over : Within ± 5% Q : 30 pF or under : Q≧400+20C 33 pF or over : Q≧500 16 pF to 18 pF of RH: Q≧500 C= Nominal capacitance [pF] Insulation resistance: 10,000 MΩ min. Withstanding voltage: No abnormality	Appearance: No significant abnormality Capacitance change: Within ±5% Q : 30 pF or under : Q≧400+20C 30 pF or over : Q≧1000 Insulation resistance: 10,000 MΩ min. Withstanding voltage: No abnormality	Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 75 pF to 390 pF: 1.5% max. 470 pF to 560 pF: 2.5% max. Insulation resistance: 10,000 MΩ min. Withstanding voltage: No abnormality	Rated voltage: 16VDC Appearance: No significant abnormality Capacitance change: Within $^{+80}_{-20}$ % tan δ: 15.0% max. Insulation resistance: 250 MΩmin. Withstanding voltage: No abnormality Rated voltage: 25 VDC, Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 5.0% max. Insulation resistance: 1,000 MΩ min. Withstanding voltage: No abnormality Rated voltage: 50 VDC Appearance: No significant abnormality B(X5R) Capacitance change: Within±10 % tanδ: 1200pF~39000pF : 3.5%max. 47000pF~100000pF : 5.0%max. Insulation resistance: 1200pF~39000pF : 5000MΩmin. 47000pF~100000pF: 1000MΩmin. F(Y5V) Capacitance change: Within $^{+80}_{-20}$% tanδ: 10000pF~100000pF: 7.5%max. 220000pF~470000pF: 10.0%max. 1000000pF : 15.0%max. Insulation resistance: 10000pF~100000pF: 1000MΩmin. 220000pF~470000pF: 500MΩmin. 1000000pF : 250MΩmin.	Rated voltage: 16 VDC Appearance: No significant abnormality Capacitance change : Within ±20%, Within ±30% tan δ: 2.5% max. Insulation resistance:1,000 MΩ min. Withstanding voltage: No abnormality Rated voltage: 25 VDC Appearance: No significant abnormality Capacitance change: Within $^{+80}_{-20}$ % tan δ: 7.5% max. Insulation resistance:1,000 MΩ min. Withstanding voltage: No abnormality Rated voltage: 50 VDC Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 2.5% max. Insulation resistance: 1,000 MΩ min. Withstanding voltage: No abnormality	According to JIS C 5102 clause 8.2 Vibration type: A Directions: 2 hrs each in X,Y and Z directions Total: 6 hrs Frequency range: 10 to 55 to 10Hz(1 min) Amplitude: 1.5 mm Mounting method: Soldering onto the PC board
11.Free Fall		Appearance: No significant abnormality Capacitance change: 1.8 pF or under : Within ±20% 2.2 pF to 8.2 pF: Within ±10% 10 pF or over : Within ± 5% Q: 30 pF or under : Q≧400+20C 33 pF or over : Q≧500 16 pF to 18 pF of RH: Q≧500 C= Nominal capacitance [pF] Insulation resistance: 10,000 MΩ min. Withstanding voltage: No abnormality	Appearance: No significant abnormality Capacitance change: Within ±5% Q: 30 pF or under : Q≧400+20C 30 pF or over : Q≧1000 Insulation resistance: 10,000 MΩ min. Withstanding voltage: No abnormality	Rated voltage: 50 VDC Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 75 pF to 390 pF: 1.5% max. 470 pF to 560 pF: 2.5% max. Insulation resistance: 10,000 MΩ min. Withstanding voltage: No abnormality	Rated voltage: 16 VDC Appearance: No significant abnormality Capacitance change: Within $^{+80}_{-20}$ % tan δ: 15.0% max. Insulation resistance: 250 MΩ min. Withstanding voltage: No abnormality Rated voltage: 25 VDC, Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 5.0% max. Insulation resistance: 1,000 MΩ min. Withstanding voltage: No abnormality Rated voltage: 50 VDC Appearance: No significant abnormality B(X5R) Capacitance change: Within±10 % tanδ: 1200pF~39000pF : 3.5%max. 47000pF~100000pF : 5.0%max. Insulation resistance: 1200pF~39000pF : 5000MΩmin. 47000pF~100000pF: 1000MΩmin. F(Y5V) Capacitance change: Within $^{+80}_{-20}$% tanδ: 10000pF~100000pF: 7.5%max. 220000pF~470000pF: 10.0%max. 1000000pF : 15.0%max. Insulation resistance: 10000pF~100000pF: 1000MΩmin. 220000pF~470000pF: 500MΩmin. 1000000pF : 250MΩmin.	Rated voltage: 16 VDC Appearance: No significant abnormality Capacitance change: Within ±20%, Within ±30% tan δ: 2.5% max. Insulation resistance: 1000 MΩ min. Withstanding voltage: No abnormality Rated voltage: 25 VDC Appearance: No significant abnormality Capacitance change: Within $^{+80}_{-20}$ % tan δ: 7.5% max. Insulation resistance: 1,000 MΩ min. Withstanding voltage: No abnormality Rated voltage: 50 VDC Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 2.5% max. Insulation resistance: 1,000 MΩ min. Withstanding voltage: No abnormality	Drop Test: Free fall Impact material: Floor Height: 1 m Total number of drops: 5 times

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

AXIAL LEADED CERAMIC CAPACITORS

Item	Specified Value					Test Methods and Remarks
	Temperature Compensating(Class 1)		High Permittivity(Class 2)		Semiconductor (Class 3)	
	Monolithic type	Multilayer Type	Monolithic type	Multilayer Type	Monolithic type	
12.Body Strength	No abnormality such as damage					Applied force: 19.6N Duration: 5 sec. Speed: Shall attain to specified force in 2 sec. 
13.Solderability	At least 75% of lead surface is covered with new solder.					Solder temperature: 230±5℃ Duration: 2±0.5 sec. (This test may be applicable after 6 months storage.)
14.Soldering	Appearance: No significant abnormality Capacitance change: 1.0 pF to 4.7pF : Within ±0.25 pF 5.6 pF or over : Within ±5% Q: 30 pF or under : Q≧400+20C 33 pF or over : Q≧500 16 pF to 18 pF of RH: Q≧500 C= Nominal capacitance [pF] Insulation resistance: 10,000 MΩ min. Withstanding voltage: No abnormality	Appearance: No significant abnormality Capacitance change: Within ±2.5% Q : 30 pF or under : Q≧400+20C 30 pF or over : Q≧1000 Insulation resistance: 10,000 MΩ min. Withstanding voltage: No abnormality	Rated voltage: 50 VDC Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 75 pF to 390 pF: 1.5% max. 470 pF to 560 pF: 2.5% max. Insulation resistance: 10,000 MΩ min. Withstanding voltage: No abnormality	Rated voltage: 16 VDC Appearance: No significant abnormality Capacitance change: Within±20% tan δ: 15.0% max. Insulation resistance: 250 MΩ min. Withstanding voltage: No abnormality Rated voltage: 25 VDC, Appearance: No significant abnormality Capacitance change: Within±10% tan δ: 5.0% max. Insulation resistance: 1,000 MΩ min. Withstanding voltage: No abnormality Rated voltage: 50 VDC Appearance: No significant abnormality B(X5R) Capacitance change: 1200pF~39000pF : Within 7.5% 47000pF~100000pF : Within 10.0% tanδ : 1200pF~39000pF : 3.5%max. 47000pF~100000pF : 5.0%max. Insulation resistance: 1200pF~39000pF : 5000MΩmin. 47000pF~100000pF: 1000MΩmin. F(Y5V) Capacitance change: 10000pF~1000000pF: Within20.0% tanδ : 10000pF~100000pF: 7.5%max. 220000pF~470000pF: 10.0%max. 1000000pF : 15.0%max. Insulation resistance: 10000pF~100000pF: 1000MΩmin. 220000pF~470000pF: 500MΩmin. 1000000pF : 250MΩmin. Withstanding voltage: No abnormality	Rated voltage: 16 VDC Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 2.5% max. Insulation resistance: 1,000 MΩ min. Withstanding voltage: No abnormality Rated voltage: 25 VDC Appearance: No significant abnormality Capacitance change: Within ±30% tan δ: 7.5% max. Insulation resistance: 1,000 MΩ min. Withstanding voltage: No abnormality Rated voltage: 50 VDC Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 2.5% max. Insulation resistance: 1,000 MΩ min. Withstanding voltage: No abnormality	(Class 1, Class 2: Monolithic type, Class 3) Solder temperature: 350±10℃ Duration: 3 $^{+0.5}_{-1.0}$ sec. or Solder temperature: 260±5℃ Duration: 10±1 sec. Immersed conditions: Inserted into the PC board (with t=1.6mm, hole=1.0mm diameter) Recovery: 4 to 24 hrs of recovery under the standard condition after the test. (Class 2: Multilayer type) Solder temperature: 270±5℃ Duration: 5±0.5 sec. Immersed conditions: Inserted into the PC board (with t=1.6mm, hole=1.0mm diameter) Preconditioning: 1 hr of preconditioning at 150 $^{+0}_{-10}$℃ followed by 48±4 hrs of recovery under the standard condition. Recovery: 48±4 hrs of recovery under the standard condition after the test.
15.Resistance to Solvent	No abnormality in appearance and legible marking.					According to JIS C 5102 clause 8.7.4. Type of test: Method 1 Solvent temperature: 20 to 25℃ Duration: 30±5 sec. Solvent Type: A in Table 23, Isopropyl alcohol
16.Thermal Shock	Appearance: No significant abnormality Capacitance change: 1.0 pF to 10 pF : Within ±0.5pF 11 pF or over : Within ±5% Q : Under 10 pF : Q≧200+10C 10 pF to 30 pF: Q≧275+2.5C 33 pF or over: Q≧250 16 pF to 18 pF of RH: Q≧250 C= Nominal capacitance [pF] Insulation resistance: 1,000 MΩ min. Withstanding voltage: No abnormality	Appearance: No significant abnormality Capacitance change: Within ±5% Q : 30 pF or under : Q≧275+2.5C 30 pF or over : Q≧350 Insulation resistance: 1,000 MΩ min. Withstanding voltage: No abnormality	Rated voltage: 50 VDC Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 75 pF to 390 pF: 2.5% max. 470 pF to 560 pF: 4% max. Insulation resistance: 1,000 MΩ min. Withstanding voltage: No abnormality	Rated voltage: 16 VDC Appearance: No significant abnormality Capacitance change: Within ±30% tan δ: 17.5% max. Insulation resistance: 50 MΩ min. Withstanding voltage: No abnormality Rated voltage: 25 VDC, Appearance: No significant abnormality Capacitance change: Within ±15% tan δ: 7.5% max. Insulation resistance: 500 MΩ min. Withstanding voltage: No abnormality Rated voltage: 50 VDC Appearance: No significant abnormality B(X5R) Capacitance change: 1200pF~39000pF : Within 12.5% 47000pF~100000pF : Within 15.0% tanδ : 1200pF~39000pF : 5.0%max. 47000pF~100000pF : 7.5%max. Insulation resistance: 1200pF~39000pF : 1000MΩmin. 47000pF~100000pF: 500MΩmin. F(Y5V) Capacitance change: 10000pF~1000000pF: Within30.0% tanδ : 10000pF~100000pF: 12.5%max. 220000pF~470000pF: 15.0%max. 1000000pF : 17.5%max. Insulation resistance: 10000pF~100000pF : 500MΩmin. 220000pF~470000pF : 250MΩmin. 1000000pF : 50MΩmin. Withstanding voltage: No abnormality	Rated voltage: 16 VDC Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 4% max. Insulation resistance: 500 MΩ min. Withstanding voltage: No abnormality Rated voltage: 25 VDC Appearance: No significant abnormality Capacitance change: Within ±30% tan δ: 12.5% max. Insulation resistance: 500 MΩ min. Withstanding voltage: No abnormality Rated voltage: 50 VDC Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 4% max. Insulation resistance: 500 MΩ min. Withstanding voltage: No abnormality	Conditions for 1 cycle Step / Temperature [℃] / Duration [min] 1 / Room temperature / Within 3 2 / −25 $^{+0}_{-3}$ / 30±3 3 / Room temperature / Within 3 4 / +85 $^{+3}_{-0}$ / 30±3 5 / Room temperature / Within 3 Number of cycles: 5 Preconditioning: 1 hr of preconditioning at 150 $^{+0}_{-10}$℃ followed by 48±4 hrs of recovery under the standard condition. (Class 2: Multilayer type) Recovery: 1 hr of recovery under the standard condition after the removal from test chamber. (Monolithic type) 48±4 hrs of recovery under the standard condition after the removal from test chamber. (Class 2: Multilayer type)

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

AXIAL LEADED CERAMIC CAPACITORS

Item	Specified Value					Test Methods and Remarks
	Temperature Compensating(Class 1)		High Permittivity(Class 2)		Semiconductor (Class 3)	
	Monolithic type	Multilayer Type	Monolithic type	Multilayer Type	Monolithic type	
17.Damp Heat (steady state)	Appearance: No significant abnormality Capacitance change: 1.0 pF to 10 pF : Within ±0.5pF 11 pF or over : Within ± 5% Q: Under 10 pF : Q≧200+10C 10 pF to 30 pF: Q≧275+2.5C 33 pF or over : Q≧250 16 pF to 18 pF of RH: Q≧250 C= Nominal capacitance [pF] Insulation resistance: 1,000 MΩ min. Withstanding voltage: No abnormality	Appearance: No significant abnormality Capacitance change: Within ±5% Q : 30 pF or under : Q≧275+2.5C 30 pF or over : Q≧350 Insulation resistance: 1,000 MΩ min. Withstanding voltage: No abnormality	Rated voltage: 50 VDC Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 75 pF to 390 pF: 2.5% max. 470 pF to 560 pF: 4% max. Insulation resistance: 1,000 MΩ min. Withstanding voltage: No abnormality	Rated voltage: 16 VDC Appearance: No significant abnormality Capacitance change: Within ±30% tan δ: 17.5% max. Insulation resistance: 50 MΩ min. Withstanding voltage: No abnormality Rated voltage: 25 VDC, Rated voltage: 50 VDC Appearance: No significant abnormality B(X5R) Capacitance change: 1200pF~39000pF : Within 12.5% 47000pF~100000pF : Within 15.0% tanδ : 1200pF~39000pF : 5.0%max. 47000pF~100000pF : 7.5%max. Insulation resistance: 1200pF~39000pF : 1000MΩmin. 47000pF~100000pF: 500MΩmin. F(Y5V) Capacitance change: 10000pF~1000000pF: Within30.0% tanδ : 10000pF~100000pF: 12.5%max. 220000pF~470000pF: 15.0%max. 1000000pF : 17.5%max. Insulation resistance: 10000pF~100000pF: 500MΩmin. 220000pF~470000pF: 250MΩmin. 1000000pF : 50MΩmin. Withstanding voltage: No abnormality	Rated voltage: 16 VDC Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 4% max. Insulation resistance: 500 MΩ min. Withstanding voltage: No abnormality Rated voltage: 25 VDC Appearance: No significant abnormality Capacitance change: Within ±30% tan δ: 12.5% max. Insulation resistance: 500 MΩ min. Withstanding voltage: No abnormality Rated voltage: 50 VDC Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 4% max. Insulation resistance: 500 MΩ min. Withstanding voltage: No abnormality	Temperature: 40±2℃ Humidity: 90 to 95 % RH Duration: 500 $^{+24}_{0}$ hrs Preconditioning: 1 hr of preconditioning at 150 $^{+0}_{-10}$℃ followed by 48±4 hrs of recovery under the standard condition. (Class 2: Multilayer type) Recovery: 1 hr of recovery under the standard condition after the removal from test chamber. (Monolithic type) 24±2 hrs of recovery under the standard condition after the removal from test chamber. (Class 1: Multilayer type) 48±4 hrs of recovery under the standard condition after the removal from test chamber. (Class 2: Multilayer type)
18.Loading under Damp Heat	Appearance: No significant abnormality Capacitance change: 1.0 pF to 10 pF : Within ±0.75pF 11 pF or over : Within ±7.5% Q: 30 pF or under: Q≧100+ $\frac{10}{3}$ C 33 pF or over : Q≧125 16 pF to 18 pF of RH: Q≧125 C= Nominal capacitance [pF] Insulation resistance: 500 MΩ min. Withstanding voltage: No abnormality	Appearance: No significant abnormality Capacitance change: Within ±7.5% Q : 30 pF or under : Q≧100+10/3・C 30 pF or over : Q≧200 Insulation resistance: 500 MΩ min. Withstanding voltage: No abnormality	Rated voltage: 50 VDC Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 75 pF to 390 pF: 2.5% max. 470 pF to 560 pF: 5% max. Insulation resistance: 500 MΩ min. Withstanding voltage: No abnormality	Rated voltage: 16 VDC Appearance: No significant abnormality Capacitance change: Within ±30% tan δ: 17.5% max. Insulation resistance: 25 MΩ min. Withstanding voltage: No abnormality Rated voltage: 25 VDC, Rated voltage: 50 VDC Appearance: No significant abnormality B(X5R) Capacitance change: 1200pF~39000pF : Within 12.5% 47000pF~100000pF : Within 15.0% tanδ : 1200pF~39000pF : 5.0%max. 47000pF~100000pF : 7.5%max. Insulation resistance: 1200pF~39000pF : 500MΩmin. 47000pF~100000pF: 250MΩmin. F(Y5V) Capacitance change: 10000pF~1000000pF: Within30.0% tanδ : 10000pF~100000pF: 12.5%max. 220000pF~470000pF: 15.0%max. 1000000pF : 17.5%max. Insulation resistance: 10000pF~100000pF : 250MΩmin. 220000pF~470000pF : 125MΩmin. 1000000pF : 25MΩmin. Withstanding voltage: No abnormality	Rated voltage: 16 VDC Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 5% max. Insulation resistance: 250 MΩ min. Withstanding voltage: No abnormality Rated voltage: 25 VDC Appearance: No significant abnormality Capacitance change: Within ±30% tan δ: 12.5% max. Insulation resistance: 250 MΩ min. Withstanding voltage: No abnormality Rated voltage: 50 VDC Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 5% max. Insulation resistance: 250 MΩ min. Withstanding voltage: No abnormality	Temperature: 40±2℃ Humidity: 90 to 95 % RH Duration: 500 $^{+24}_{0}$ hrs Applied voltage: Rated voltage Preconditioning: Voltage treatment (Class 2: Multilayer type) Recovery: 1 hr of recovery under the standard condition after the removal from test chamber. (Class 1, Class 2: Monolithic type) 24±2 hrs of recovery under the standard condition after the removal from test chamber. (Class 1: Multilayer type) 48±4 hrs of recovery under the standard condition after the removal from test chamber. (Class 2: Multilayer type) 30 min. of conditioning at 150±3℃ followed by 1 hr of recovery under the standard conditon after the removal from test chamber. (Class 3)

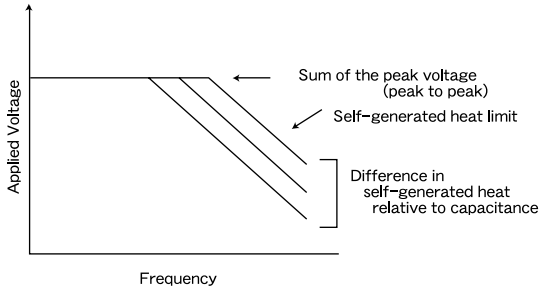
Withstanding voltage is also referred to as "voltage proof" under IEC specifications.

AXIAL LEADED CERAMIC CAPACITORS

Item	Specified Value					Test Methods and Remarks
	Temperature Compensating(Class 1)		High Permittivity(Class 2)		Semiconductor (Class 3)	
	Monolithic type	Multilayer Type	Monolithic type	Multilayer Type	Monolithic type	
19. High Temperature Loading Test	Appearance: No significant abnormality Capacitance change: 1.0 pF to 10 pF : Within ±0.3pF 11 pF or over : Within ± 3% Q: Under 10 pF : Q≧200+10C 10 pF to 30 pF : Q≧275+2.5C 33 pF or over : Q≧250 16 pF to 18 pF of RH: Q≧250 C= Nominal capacitance [pF] Insulation resistance: 1,000 MΩ min. Withstanding voltage: No abnormality	Appearance: No significant abnormality Capacitance change: Within ± 3% Q : 30 pF or under : Q≧275+2.5C 30 pF or over : Q≧350 Insulation resistance: 1,000 MΩ min. Withstanding voltage: No abnormality	Rated voltage: 50 VDC Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 75 pF to 390 pF: 2.5% max. 470 pF to 560 pF: 4% max. Insulation resistance: 1,000 MΩ min. Withstanding voltage: No abnormality	Rated voltage: 16 VDC Appearance: No significant abnormality Capacitance change: Within ±30% tan δ: 17.5% max. Insulation resistance: 50 MΩ min. Withstanding voltage: No abnormality Rated voltage: 25 VDC, Rated voltage: 50 VDC Appearance: No significant abnormality B(X5R) Capacitance change: 1200pF~39000pF : Within 12.5% 47000pF~100000pF : Within 15.0% tanδ : 1200pF~39000pF : 5.0%max. 47000pF~100000pF : 7.5%max. Insulation resistance: 1200pF~39000pF : 1000MΩmin. 47000pF~100000pF: 500MΩmin. F(Y5V) Capacitance change: 10000pF~1000000pF: Within30.0% tanδ : 10000pF~100000pF: 10.0%max. 220000pF~470000pF: 12.5%max. 1000000pF : 17.5%max. Insulation resistance: 10000pF~100000pF: 500MΩmin. 220000pF~470000pF: 250MΩmin. 1000000pF : 50MΩmin. Withstanding voltage: No abnormality	Rated voltage: 16 VDC Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 4% max. Insulation resistance: 500MΩ min. Withstanding voltage: No abnormality Rated voltage: 25 VDC Appearance: No significant abnormality Capacitance change: Within ±30% tan δ: 10% max. Insulation resistance: 500MΩ min. Withstanding voltage: No abnormality Rated voltage: 50 VDC Appearance: No significant abnormality Capacitance change: Within ±10% tan δ: 4% max. Insulation resistance: 500 MΩ min. Withstanding voltage: No abnormality	Temperature: 85 $^{+3}_{-0}$℃ Duration: 1000 $^{+48}_{-0}$ hrs Applied voltage: Rated voltage×2 (Class 1) (Class 2) Rated voltage×1.5 (Class 3: B, F) Rated voltage×1.125 (Class 3: X, Y) Preconditioning: Voltage treatment (Class 2: Multilayer type) Recovery: 1 hr of recovery under the standard condition after the removal from test chamber. (Class 1, Class 2: Monolithic type) 24±2hrs of recovery under the standard condition after the removal from test chamber. (Class1:Multilayer type) 48±4 hrs of recovery under the standard condition after the removal from test chamber. (Class 2: Multilayer type) As for Class2:Multilayer type B:47000pF~100000pF F:220000pF~1000000pF 1hr of conditioning at 150 $^{+0}_{-10}$℃ followed by 48±4 Hr of recovery under the standard condition after the removal from test chamber. 30 min. of conditioning at 150±3℃ followed by 1 hr of recovery under the standard condition after the removal from test chamber. (Class 3)

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

Precautions on the use of Axiel Leaded Ceramic Capacitors

Stages	Precautions	Technical considerations
1. Circuit Design	◆Verification of operating environment, electrical rating and performance 1. A malfunction in medical equipment, spacecraft, nuclear reactors, etc. may cause serious harm to human life or have severe social ramifications. As such, any capacitors to be used in such equipment may require higher safety and/or reliability considerations and should be clearly differentiated from components used in general purpose applications. ◆Verification of Rated voltage (DC rated voltage) 1. The operating voltage for capacitors must always be lower than their rated values. If an AC voltage is loaded on a DC voltage, the sum of the two peak voltages should be lower than the rated value of the capacitor chosen. For a circuit where both an AC and a pulse voltage may be present, the sum of their peak voltages should also be lower than the capacitor's rated voltage. 2. Even if the applied voltage is lower than the rated value, the reliability of capacitors might be reduced if either a high frequency AC voltage or a pulse voltage having rapid rise time is present in the circuit. ◆Self-generated heat (Verification of Temperature) 1. If the capacitors specified only for DC use are used in AC or pulse circuits, the AC or a pulse current can generate heat inside the capacitor so the self-generated temperature rise should be limited to within 20℃. The surface temperature measured should include this self-temperature rise. Therefore, it is required to limit capacitor surface temperature including self -generated heat should not exceed the maximum operating temperature of +85℃. ◆Operating Environment precautions 1. Capacitors should not be used in the following environments: (1)Environmental conditions to avoid a. exposure to water or salt water. b. exposure to moisture or condensation. c. exposure to corrosive gases (such as hydrogen sulfide, sulfurous acid, chlorine, and ammonia)	1-1. When an AC or a pulse voltage is applied to capacitors specified for DC use, even if the voltage is less than the rated voltage, the AC current or pulse current running through the capacitor will cause the capacitor to self-generate heat because of the loss characteristics. The amount of heat generated depends on the dielectric materials used, capacitance, applied voltage, frequency, voltage waveform, etc. The surface temperature changes due to emitted heat which differs by capacitor shape or mounting method. Please contact Taiyo Yuden with any questions regarding emitted heat levels in your particular application. It is recommend the temperature rise be measured in the actual circuit to be used. 1-2. For capacitors, the voltage and frequency relationship is generally determined by peak voltage at low frequencies, and by self-generated heat at high frequencies. (Refer to the following curve.) 
2. PCB Design	1. When capacitors are mounted onto a PC board, hole dimensions on the board should match the lead pitch of the component, if not it will cause breakage of the terminals or cracking of terminal roots covered with resin as excess stress travels through the terminal legs. As a result, humidity resistance performance would be lost and may lead to a reduction in insulation resistance and cause a withstand voltage failure.	
3. Considerations for automatic insertion	◆Adjustment Automatic Insertion machines (leaded components) 1. When inserting capacitors in a PC board by auto-insertion machines the impact load imposed on the capacitors should be minimized to prevent the leads from chucking or clinching.	

Precautions on the use of Axiel Leaded Ceramic Capacitors

Stages	Precautions	Technical considerations
4. Soldering	◆Selection of Flux 1. When soldering capacitors on the board, flux should be applied thinly and evenly. 2. Flux used should be with less than or equal to 0.1 wt% (equivalent to Chroline) of halogenated content. Flux having a strong acidity content should not be applied. 3. When using water-soluble flux, special care should be taken to properly clean the boards. ◆Wave Soldering 1.Temperature, time, amount of solder, etc. are specified in accordance with the following recommended conditions. 2. Do not immerse the entire capacitor in the flux during the soldering operation. Only solder the lead wires on the bottom of the board.	1. Flux is used to increase solderability in wave soldering, but if too much is applied, a large amount of flux gas may be emitted and may detrimentally affect solderability. To minimize the amount of flux applied, it is recommended to use a flux-bubbling system. 2. With too much halogenated substance (Chlorine, etc.) content is used to activate the flux, an excessive amount of residue after soldering may lead to corrosion of the terminal electrodes or degradation of insulation resistance on the surface of the capacitors. 3. Since the residue of water-soluble flux is easily dissolved by water content in the air, the residue on the surface of capacitors in high humidity conditions may cause a degradation of insulation resistance and therefore affect the reliability of the components. The cleaning methods and the capability of the machines used should also be considered carefully when selecting water-soluble flux. 1. If capacitors are used beyond the range of the recommended conditions, heat stresses may cause cracks inside the capacitors, and consequently degrade the reliability of the capacitors. 2. When the capacitors are dipped in solder, some soldered parts of the capacitor may melt due to solder heat and cause short-circuits or cracking of the ceramic material. Deterioration of the resin coating may lower insulation resistance and cause a reduction of withstand voltage.
5. Cleaning	◆Board cleaning 1. When cleaning the mounted PC boards, make sure that cleaning conditions are consistent with prescribed usage conditions.	1. The resin material used for the outer coating of capacitors is occasionally a wax substance for moisture resistance which can easily be dissolved by some solutions. So before cleaning, special care should be taken to test the component's vulnerability to the solutions used. When using water-soluble flux please clean the PCB with purified water sufficiently and dry thoroughly at the end of the process. Insufficient washing or drying could lower the reliability of the capacitors.
6. Post-cleaning-process	◆Application of resin molding, etc. to the PCB and components. 1. Please contact your local Taiyo Yuden sales office before performing resin coating or molding on mounted capacitors. Please verify on the actual application that the coating process will not adversely affect the component quality.	1-1. The thermal expansion and coefficient of contraction of the molded resin are not necessarily matched with those of the capacitor. The capacitors may be exposed to stresses due to thermal expansion and contraction during and after hardening. This may lower the specified characteristics and insulation resistance or cause reduced withstand voltage by cracking the ceramic or separating the coated resin from the ceramics. 1-2. With some types of mold resins, the resin's decomposition gas or reaction gas may remain inside the resin during the hardening period or while left under normal conditions, causing a deterioration of the capacitor's performance. 1-3. Some mold resins may have poor moisture proofing properties. Please verify the contents of the resins before they are applied. 1-4. Please contact Taiyo Yuden before using if the hardening process temperature of the mold resins is higher than the operating temperature of the capacitors.
7. Handling	◆Mechanical considerations 1. Be careful not to subject the capacitors to excessive mechanical shocks. Withstanding voltage failure may result. 2. If ceramic capacitors are dropped onto the floor or a hard surface they should not be used.	1. Because the capacitor is made of ceramic, mechanical shocks applied to the board may damage or crack the capacitors. 2.Ceramic capacitors which are dropped onto the floor or a hard surface may develop defects and have a higher risk of failure over time.
8. Storage conditions	◆Storage 1. To maintain the solderability of terminal electrodes and to keep the packaging material in good condition, care must be taken to control temperature and humidity in the storage area. Humidity should especially be kept as low as possible. Recommended conditions: Ambient temperature Below 40℃ Humidity Below 70% RH. Products should be used within 6 months after delivery. After the above period, the solderability should be checked before using the capacitors. 2. Capacitors should not be kept in an environment filled with decomposition gases such as (sulfurous hydrogen, sulfurous acid, chlorine, ammonia, etc.) 3. Capacitors should not be kept in a location where they may be exposed to moisture, condensation or direct sunlight.	1. Under high temperature/high humidity conditions, the decrease in solderability due to the oxidation of terminal electrodes and deterioration of taping and packaging characteristics may be accelerated.

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	$\pm^{80}_{20}$ %

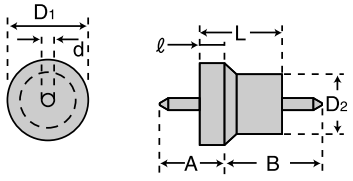
6 Lead Length

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%	$\pm^{80}_{20}$%		100V
G3		SL	2	Q≧50	± 0.5pF		150V
			22　33　43	Q≧100	± 10%		
			82		$\pm^{20}_{10}$%		
		Y(Y5S)	1000	tanδ≦5.0%	$\pm^{100}_{0}$%		100V
			2000		$\pm^{80}_{20}$%		

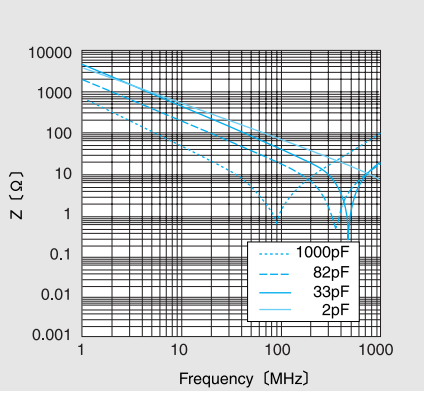
(注)温度特性の(　)はEIA規格相当表示です。

( ) Indicates EIA standard.

セレクションガイド Selection Guide ◀ P.8 etc
アイテム一覧 Part Numbers P.163 ▶
特性図 Electrical Characteristics P.164 ▶
梱包 Packaging P.164 ▶
信頼性 Reliability Data P.166 ▶
使用上の注意 Precautions P.170 ▶

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

最小受注単位数　Minimum Quantity

区分 Category	形式 Type	最小受注単位数　Minimum Quantity〔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 (Class 1)	Specified Value: Stepped feed-through capacitor series G (Class 3)	Test Methods and Remarks
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		2pF：± 0.5pF 22pF~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: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 : 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 : 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)	