

General series of ceramic chip capacitors

◆Feature

*There is high reliability on monolithic structure of laminated layers.

*And its character of excellent soldering ability and soldering resistance ability is suitable for reflow soldering and peak soldering.

*It includes high and stable capacitance.

*High Frequency Type: This kind of dielectric material is considered as Class I capacitor. COG and COH capacitors have the most stable electrical performance, which almost does not change with the change of temperature, voltage or time, they are suitable for the low-loss and high stability requirement circuits.

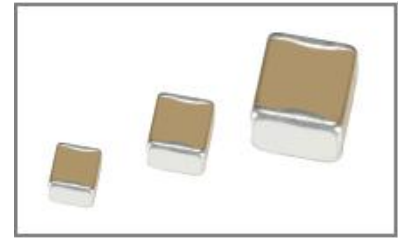
*X7R、X5R、X7S、X6S : X7R、X5R、X7S、X6S material is a kind of material has high dielectric constant. The capacitor made of this kind material is considered as Class II capacitor whose capacitance is higher than that of class I. These capacitors are classified as having a semi-stable temperature characteristic and used over a wide temperature range, such in these kinds of circuits, DC-blocking, decoupling, bypassing, frequency discriminating etc.

执行标准：GB/T 21041-2007 GB/T 21042-2007

Executive Standard: GB/T 21041-2007 GB/T 21042-2007

◆Application

*It is suitable for all kinds of filter, coupled, harmonic vibration, bypassing and high frequency circuits.

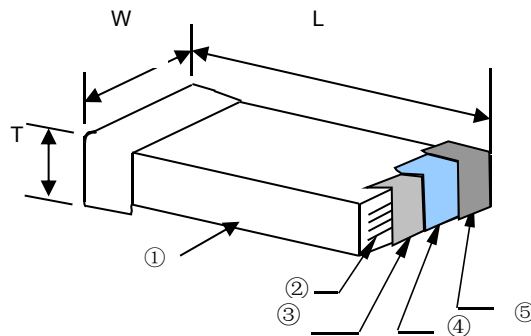


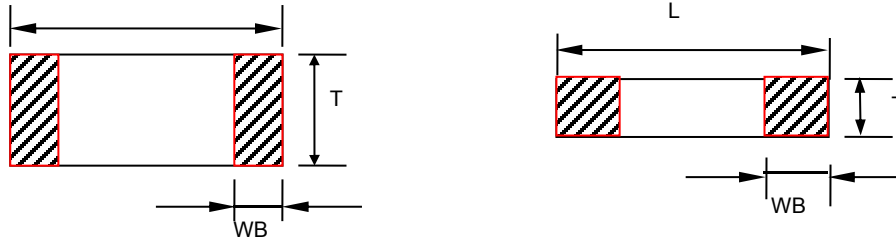
◆ How To Order

0805			CG		102		J		500		N		T	
Size Code			Nominal Capacitance		Rated Voltage unit: V		Package Styles							
Size Code	(L×W) inch	(L×W) mm	Express Method	Actual Value	Express Method	Actual Value	Express Method	Package Styles						
1005	0.01×0.005	0.40×0.20	0R5	0.5	6R3	6.3	B	Bulk Bag						
0201	0.02×0.01	0.60×0.30	1R0	1.0	500	50×10^0	T	Taping Package						
0402	0.04×0.02	1.00×0.50	102	10×10^2	201	20×10^1								
0603	0.06×0.03	1.60×0.80	Note: the first two digits are significant; third digit denotes number of zeros; R=decimal point.		Note: the first two digits are significant; third digit denotes number of zeros; R=decimal point.									
0805	0.08×0.05	2.00×1.25												
1206	0.12×0.06	3.20×1.60												
1210	0.12×0.10	3.20×2.50												
1808	0.18×0.08	4.50×2.00												
1812	0.18×0.12	4.50×3.20												
Dielectric Code			Capacitance Tolerance		Terminal Material Styles									
Dielectric Code	Dielectric		Code	Tolerance	Note		Termination Styles	Express Method						
CG	C0G		A	$\pm 0.05\text{pF}$	These Capacitance tolerance A, B, C, D are just applicable the capacitance that equals to or less than 10pF.		Copper Solderable Termination	C						
X	X5R		B	$\pm 0.10\text{pF}$										
B	X7R		C	$\pm 0.25\text{pF}$										
BS	X7S		D	$\pm 0.50\text{pF}$										
BT	X7T		F	$\pm 1\%$										
DS	X6S		G	$\pm 2\%$										
DT	X6T		J	$\pm 5\%$										
			K	$\pm 10\%$										
			M	$\pm 20\%$										
			S	-20% +50%										
			Z	-20% +80%										
						Nickel Barrier Termination	N							

◆ Product Structure

NO	Name
①	Ceramic dielectric
②	Inner electrode
③	Substrate electrode
④	Nickel Layer
⑤	Tin Layer



◆ Product Dimensions


Type		Dimensions (mm)				Special Instructions
British expression	Metric expression	L	W	T	WB	
1005	0402	0.4±0.02	0.2±0.02	0.2±0.02	0.1±0.03	All
0201	0603	0.6±0.03	0.3±0.03	0.3±0.03	0.15±0.05	C < 0.1μF
		0.6±0.05	0.3±0.05	0.3±0.05	0.15±0.05	0.1μF ≤ C < 1μF
		0.6±0.10	0.3±0.10	0.3±0.10	0.15±0.05	C ≥ 1μF
0402	1005	1.00±0.05	0.50±0.05	0.50±0.05	0.25±0.05	C < 1μF
		1.00±0.15	0.50±0.15	0.50±0.15	0.25±0.05	1μF ≤ C < 10μF
		1.00±0.20	0.50±0.20	0.50±0.20	0.25±0.05	C ≥ 10μF
0603	1608	1.60±0.10	0.80±0.10	0.80±0.10	0.35±0.20	C ≤ 1μF
		1.60±0.20	0.80±0.20	0.80±0.20	0.35±0.20	C > 1μF
0805	2012	2.00±0.20	1.25±0.20	0.80±0.20	0.50±0.20	C < 0.47μF
		2.00±0.20	1.25±0.20	1.25±0.20	0.50±0.20	C ≥ 0.47μF
1206	3216	3.20±0.30	1.60±0.30	0.80±0.20	0.60±0.30	C ≤ 220nF
		3.20±0.30	1.60±0.30	1.00±0.20	0.60±0.30	220nF < C < 1μF
		3.20±0.30	1.60±0.30	1.60±0.30	0.60±0.30	C ≥ 1μF
1210	3225	3.20±0.30	2.50±0.30	≤ 2.80	0.60±0.30	All
1808	4520	4.50±0.40	2.00±0.20	≤ 2.20	0.60±0.30	All
1812	4532	4.50±0.40	3.20±0.30	≤ 3.50	0.60±0.30	All

Note : 1、 The specific thickness of the product can read "capacity range and voltage "in this approval sheet

2、 We can design according to customer special requirements

◆ Temperature Coefficient /Characteristics

Dielectric	Reference Temperature Point	Temperature Coefficient	Operation Temperature Range
COG	20°C	0±30 ppm/°C	-55°C ~ 125°C
X7R	20°C	±15%	-55°C ~ 125°C
X7S	20°C	±22%	-55°C ~ 125°C
X7T	20°C	-33%~+22%	-55°C ~ 125°C
X6S	20°C	±22%	-55°C ~ 105°C
X6T	20°C	-33%~+22%	-55°C ~ 105°C
X5R	20°C	±15%	-55°C ~ 85°C

Note :Nominal temperature coefficient and allowed tolerance of class I are decided by the changing of the capacitance between 20°C and 85°C. Nominal temperature coefficient of class II are decided by the temperature of 20°C.

◆Capacitance Range and Operating Voltage

*A list of the specific voltage-specific capacitors of Class I capacitors

Dielectric	COG									
	1005 (0.4mm*0.2mm)				0201 (0.6mm*0.3mm)		0402 (1.0mm*0.5mm)		0603 (1.6mm*0.8mm)	
Dimension	10V	16V	25V	50V	25V	50V	25V	50V	25V	50V
Capacity/ Voltage	10V	16V	25V	50V	25V	50V	25V	50V	25V	50V
0.1pF	0.2±0.02				0.3±0.03		0.50±0.05		0.80±0.10	
0.2pF										
0.5pF										
1pF										
1.2pF										
1.5pF										
1.8pF										
2.0pF										
2.2pF										
2.7pF										
3.0pF										
3.3pF										
3.6pF										
3.9pF										
4.7pF										
5.0pF	0.2±0.02				0.3±0.03		0.50±0.05		0.80±0.10	
5.6pF	0.3±0.03				0.50±0.05		0.50±0.05		0.80±0.10	
6.8pF										
8.0pF										
8.2pF										
10pF										
12pF										
15pF										
18pF										
22pF										
27pF										
33pF										
39pF										
47pF										
56pF										
68pF										
100pF										
120pF										
150pF										
180pF										
220pF										
270pF										
330pF										
390pF										
470pF										
560pF										

680pF							
1nF							
1.5nF							
1.8nF							
2.2nF							
2.7nF							
3.3nF							
4.7nF							
10nF							

Note: 1、Corresponding product design thickness , unit:mm 2、We can design according to customer special requirements

Dielectric	COG							
	0805 (2.0mm*1.25mm)		1206 (3.2mm*1.6mm)		1210 (3.2mm*2.5mm)		1812 (4.5mm*3.2mm)	
Dimension								
Capacity/ Voltage	25V	50V	25V	50V	25V	50V	25V	50V
0.1pF								
0.22pF								
0.3pF								
0.47pF								
1pF								
1.2pF								
1.5pF								
1.8pF								
2.0pF								
2.2pF								
2.7pF								
3.0pF								
3.3pF								
3.6pF								
3.9pF								
4.7pF								
5.0pF	0.8±0.02		0.8±0.02					
5.6pF								
6.8pF								
8.0pF								
8.2pF								
10pF								
12pF								
15pF								
18pF								
22pF								
27pF								
33pF								
39pF								
47pF								
56pF								
68pF								
100pF								

120pF					
150pF					
180pF					
220pF					
270pF					
330pF					
390pF					
470pF					
560pF					
680pF					
1nF					
1.5nF					
1.8nF					
2.2nF					
2.7nF					
3.3nF					
4.7nF					
6.8nF					
10nF		1.25±0.20			
12nF	1.25±0.20				
22nF					
33nF			1.60±0.30		
47nF					
100nF					

Note: 1、Corresponding product design thickness , unit:mm 2、We can design according to customer special requirement.

*A list of the specific voltage-specific capacitors of Class I capacitors

Dimension	1005 (0.4mm*0.2mm)															
	X7R 系列			X7S 系列			X7T 系列			X6S/X6T 系列			X5R 系列			
Capacity/ Voltage	6.3V	10V	16V	6.3V	10V	16V	6.3V	10V	16V	6.3V	10V	16V	6.3V	10V	16V	
120pF	0.2±0.02			0.2±0.02			0.2±0.02			0.2±0.02			0.2±0.02			
180pF																
220pF																
270pF																
330pF																
390pF																
470pF																
560pF																
680pF																
1nF																
1.2nF																
1.5nF																
1.8nF																
2.2nF																
2.7nF																
3.3nF																

3.9nF																																					
4.7nF																																					
5.6nF																																					
6.8nF																																					
10nF																																					
15nF																																					0.2±0.02

Dimension	0201 (0.6mm*0.3mm)																																			
	X7R 系列					X7S 系列					X7T 系列					X6S/X6T 系列					X5R 系列															
Dielectric	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V											
Capacity/ Voltage	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V											
120pF																																				
180pF																																				
220pF																																				
330pF																																				
470pF																																				
560pF																																				
680pF																																				
1nF																																				
2.2nF																																				
3.9nF																																				
4.7nF																																				
5.6nF																																				0.30±0.03
6.8nF																																				
10nF																																				
15nF																																				
18nF																																				
22nF																																				
33nF																																				

Note: 1、Corresponding product design thickness , unit:mm 2、 We can design according to customer special requirement

Dimension	0201 (0.6mm*0.3mm)																																			
	X7R 系列					X7S 系列					X7T 系列					X6S/X6T 系列					X5R 系列															
Dielectric	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V											
Capacity/ Voltage	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V											
47nF																																				
56nF																																				
68nF																																				
100nF																																				
220nF																																				
330nF																																				
470nF																																				
1μF																																				
2.2μF																																				

Dimension	0402 (1.0mm*0.5mm)																																													
	X7R 系列					X7S 系列					X7T 系列					X6S/X6T 系列					X5R 系列																									
Capacity/ Voltage	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V																					
330pF	0.50±0.05					0.50±0.05					0.50±0.05					0.50±0.05																														
470pF																																														
560pF																																														
680pF																																														
1nF																																														
2.2nF																																														
3.9nF																																														
4.7nF																																														
5.6nF																																														
6.8nF																																														
10nF																																														
15nF																																														
18nF																																														
22nF																																														
33nF																																														
47nF																																														
56nF																										0.50 ± 0.05																				
68nF																																														
100nF																										0.50±0.05																				
220nF	0.50±0.15					0.50±0.15					0.50±0.15					0.50±0.15					0.50±0.15																									
330nF	0.50±0.15					0.50±0.15					0.50±0.15																																			
470nF	0.50±0.15					0.50±0.15					0.50±0.15																																			
680nF	0.50±0.15					0.50±0.15					0.50±0.15																																			
1μF	0.50±0.20					0.50±0.20					0.50±0.20																																			
2.2μF						0.50±0.20					0.50±0.20					0.50±0.20																														
4.7μF																																				0.50±0.20										
6.8μF																																				0.50±0.20										
10μF																																				0.50±0.20										
																																				0.50±0.20										

Note: 1、Corresponding product design thickness , unit:mm 2、We can design according to customer special requirement

Dimension	0603 (1.6mm*0.8mm)																																													
	X7R 系列					X7S 系列					X7T 系列					X6S/X6T 系列					X5R 系列																									
Capacity/ Voltage	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V																					
330pF	0.8±0.1					0.8±0.1					0.8±0.1					0.8±0.1																														
470pF																																														
560pF																																														
680pF																																														
1nF																																														

2.2nF																									
3.9nF																									
4.7nF																									
5.6nF																									
6.8nF																									
10nF																									
15nF																									
18nF																									
22nF																									
33nF																									
47nF																									
56nF																									
68nF																									
100nF																									
220nF																									
330nF																									
470nF																									
680nF																0.8±0.1									
1μF																									
2.2 μF	0.8±0.2					0.8±0.2					0.8±0.2					0.8±0.2					0.8±0.2				
3.3 μF	0.8±0.2					0.8±0.2					0.8±0.2					0.8±0.2									
4.7 μF	0.8±0.2					0.8±0.2					0.8±0.2					0.8±0.2					0.8±0.2				
6.8 μF	0.8±0.2					0.8±0.2					0.8±0.2					0.8±0.2									
10 μF											0.8±0.2														
15 μF											0.8±0.2														
22 μF											0.8±0.2														
47μF											0.8±0.2					0.8±0.2									

Dimension	0805 (2.0mm*1.25mm)																													
	X7R 系列					X7S 系列					X7T 系列					X6S/X6T 系列					X5R 系列									
	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V					
330pF																														
470pF																														
560pF																														
680pF																														
1nF																														
2.2nF	0.8±0.2										0.8±0.2					0.8±0.2					0.8±0.2									
3.9nF																														
4.7nF																														
5.6nF																														
6.8nF																														
10nF																														
15nF																														

Note: 1、Corresponding product design thickness , unit:mm 2、We can design according to customer special requiremen

Dimension	0805 (2.0mm*1.25mm)																																												
	X7R 系列					X7S					X7T 系列					X6S/X6T 系列					X5R 系列																								
Capacity/ Voltage	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V																				
18nF	0.8±0.2					0.8±0.2					0.8±0.2					0.8±0.2																													
22nF																																													
33nF																																													
47nF																																													
56nF																																													
68nF																																													
100nF																																													
220nF																																													
330nF																																													
470nF	1.25±0.2					1.25±0.2					1.25±0.2					1.25±0.2																													
680nF																																													
1μF																																													
2.2μF																																													
3.3μF																					1.25±0.2					1.25±0.2					1.25±0.2					1.25±0.2									
4.7μF																																													
6.8μF	1.25±0.2					1.25±0.2					1.25±0.2					1.25±0.2																													
10μF																																													
15μF																																													
22μF																																													
47μF																																													

Dimension	1206 (3.2mm*1.6mm)																								
	X7R 系列					X7S 系列					X7T 系列					X6S/X6T 系列					X5R 系列				
Capacity/ Voltage	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V
330pF	0.8±0.2					0.8±0.2					0.8±0.2					0.8±0.2									
470pF																									
560pF																									
680pF																									
1nF																									
2.2nF																									
3.9nF																									
4.7nF																									
5.6nF																									
6.8nF																									
10nF																									
15nF																									
18nF																									
22nF																									
33nF																									
47nF																									
56nF																									
68nF																									

100nF																												
220nF																												
330nF																												
470nF	1.25±0.2					1.25±0.2					1.25±0.2					1.25±0.2												
680nF																												
1μF	1.6±0.3					1.6±0.3					1.6±0.3					1.6±0.3					1.6±0.3							
2.2μF																												

Note: 1、Corresponding product design thickness , unit:mm 2、We can design according to customer special requirement

Dimension	1206 (3.2mm*1.6mm)																													
	X7R 系列					X7S 系列					X7T 系列					X6S/X6T 系列					X5R 系列									
Dielectric	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V
Capacity/ Voltage																														
3.3μF																														
4.7μF	1.6±0.3					1.6±0.3					1.6±0.3					1.6±0.3					1.6±0.3									
6.8μF																														
10μF																														
15μF	1.6±0.3					1.6±0.3					1.6±0.3					1.6±0.3					1.6±0.3									
22μF																														
47μF											1.6±0.3					1.6±0.3														
100μF											1.6±0.3					1.6±0.3														

Dimension	1210 (3.2mm*2.5mm)																								
	X7R 系列					X7S 系列					X7T 系列					X6S/X6T 系列					X5R 系列				
Capacity/ Voltage	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V
330pF	1.25±0.2					1.25±0.2					1.25±0.2					1.25±0.2									
470pF																									
560pF																									
680pF																									
1nF																									
2.2nF																									
3.9nF																									
4.7nF																									
5.6nF																									
6.8nF																									
10nF																									
15nF																									
18nF																									
22nF																									
33nF																									
47nF																									
56nF																									
68nF																									
100nF																									
220nF	1.4±0.2					1.4±0.2					1.4±0.2					1.4±0.2									
330nF	1.6±0.3					1.6±0.3					1.6±0.3					1.6±0.3									
470nF																									
680nF																									
1μF																									
2.2μF																									
3.3μF	2.5±0.3					2.5±0.3					2.5±0.3					2.5±0.3									
4.7μF																									
6.8μF	2.5±0.3					2.5±0.3					2.5±0.3					2.5±0.3					2.5±0.3		1.8±0.3		
10μF																									
15μF																									
22μF																									
47μF																									
100μF																									

Note: 1、Corresponding product design thickness , unit:mm 2、We can design according to customer special requirement

Dimension	1808 (4.5mm*2.0mm)																								
	X7R 系列					X7S 系列					X7T 系列					X6S/X6T 系列					X5R 系列				
Capacity/ Voltage	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V
330pF	1.6±0.3					1.6±0.3					1.6±0.3					1.6±0.3					1.6±0.3				
470pF	1.6±0.3					1.6±0.3					1.6±0.3					1.6±0.3					1.6±0.3				

560pF									
680pF									
1nF									
2.2nF									
3.9nF									
4.7nF									
5.6nF									
6.8nF									
10nF									
15nF									
18nF									
22nF									
33nF									
47nF									
56nF									
68nF									
100nF									
220nF									
330nF									
470nF									
680nF									
1μF									
2.2μF	1.6±0.3		1.6±0.3		1.6±0.3		1.6±0.3		1.6±0.3
3.3μF									
4.7μF									
6.8μF									

Dimension	1812 (4.5mm*3.2mm)																								
	X7R 系列					X7S 系列					X7T 系列					X6S/X6T 系列					X5R 系列				
Capacity/ Voltage	6.3 V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V
330pF	1.60±0.20					1.60±0.20					1.60±0.20					1.60±0.20					1.60±0.20				
470pF																									
560pF																									
680pF																									
1nF																									
2.2nF																									
3.9nF																									
4.7nF																									
5.6nF																									
6.8nF																									
10nF																									
15nF																									
18nF																									
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33nF																									
47nF																									
56nF																									

68nF					
100nF					
220nF					

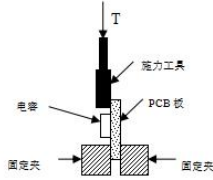
Dimension	1812 (4.5mm*3.2mm)																								
	X7R 系列					X7S 系列					X7T 系列					X6S/X6T 系列					X5R 系列				
Capacity/ Voltage	6.3 V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V
330nF	1.60±0.20					1.60±0.20					1.60±0.20					1.60±0.20					1.60±0.20				
470nF																									
680nF																									
1µF																									
2.2µF	2.0±0.20					2.0±0.20					2.0±0.20					2.0±0.20					2.0±0.20				
3.3µF																									
4.7µF																									
6.8µF																									

Note : 1、【】 General thickness corresponds to the capacity , unit : mm2、 We can design according to the customer requirements

◆ Reliability Test

Item	Technical Specification		Test Method and Remarks		
Capacitance	Class I	Should be within the specified tolerance.	Capacitance	Measuring Frequency	Measuring Voltage
			≤1000pF	1MHz±10%	1.0±0.2Vrms
			> 1000 pF	1KHz±10%	
Capacitance	Class II	Should be within the specified tolerance.	Test Temperature: 25°C±3°C		
			C≤10µF : Test Frequency: 1KHz±10% Test Voltage: 1.0±0.2Vrms		
			C > 10µF Test Frequency: 120±24 Hz Test Voltage: 0.5±0.1Vrms		
Insulation Resistance	Class I	C≤10 nF, Ri≥50000MΩ	Measuring Voltage: Rated Voltage (Max 500V) Duration: 60±5s Test Humidity: ≤75% Test Temperature: 25°C±3°C Test Current: ≤50mA		
		C > 10 nF, Ri•CR≥500S			
	Class II	C≤25 nF, Ri≥10000MΩ C > 25 nF, Ri•CR > 100S			
		注 : S=Ω·F			
Dissipation Factor	Class I	DF	Capacitance	Measuring Frequency	Measuring Voltage
		≤1/ (400+20C)	C < 30 pF	1MHz±10%	1.0±0.2Vrms
		≤0.1%	C≥30pF		

Item	Technical Specification								Test Method and Remarks		
Dissipation Factor	Class II	电压	DF($\times 10^{-4}$)	1005	0201	0402	0603	0805	1206 及以上	C \leq 10 μ F Test Frequency: 1KHz \pm 10% Test Voltage: 1.0 \pm 0.2Vrms C > 10 μ F X7R, X5R, X7T, X6S Test Frequency: 120 \pm 24Hz Test Voltage: 0.5 \pm 0.1Vrms	
		50V	\leq 250	—	—	\leq 10nF	< 100nF	—	\leq 680nF		
		\leq 350	—	\leq 3.3nF	\leq 47nF	< 470nF	\leq 1 μ F	\leq 2.2 μ F			
		\leq 500	—	\leq 10nF	\leq 0.1 μ F	—	—	—			
		\leq 750	—	—	—	—	\leq 2.2 μ F	\leq 4.7 μ F			
		\leq 1000	—	—	—	\leq 2.2 μ F	\leq 10 μ F	\leq 10 μ F			
		25V	\leq 250	—	—	\leq 10nF	< 100nF	—	\leq 680nF		
		\leq 350	—F	\leq 3.3nF	\leq 47nF	< 470nF	\leq 1 μ F	—			
		\leq 500	—	\leq 10nF	0.22 μ F	—	—	—			
		\leq 750	—	> 10nF	—	—	\leq 2.2 μ F	\leq 10 μ F			
		\leq 1000	—	\leq 100nF	\leq 2.2 μ F	\leq 10 μ F	\leq 22 μ F	\leq 22 μ F			
		16V	250	—	—	\leq 10nF	< 100nF	—	\leq 680nF		
		\leq 350	\leq 1nF	\leq 3.3nF	\leq 47nF	< 470nF	\leq 1 μ F	—			
		\leq 500	—	\leq 15nF	\leq 220nF	—	—	—			
		\leq 750	\leq 10nF	\leq 47nF	—	—	\leq 4.7 μ F	\leq 10 μ F			
		\leq 1000	—	\leq 100nF	\leq 4.7 μ F	\leq 10 μ F	\leq 22 μ F	\leq 47 μ F			
		10V	\leq 250	—	—	\leq 10nF	< 100nF	—	\leq 680nF		
		\leq 350	\leq 1nF	\leq 3.3nF	\leq 47nF	< 470nF	\leq 1 μ F	—			
		\leq 500	—	\leq 15nF	\leq 220nF	—	—	—			
		\leq 750	\leq 10nF	\leq 100nF	—	—	\leq 2.2 μ F	\leq 10 μ F			
		\leq 1000	—	\leq 2.2 μ F	\leq 10 μ F	\leq 22 μ F	\leq 47 μ F	\leq 100 μ F			
		\leq 6.3V	\leq 250	—	—	\leq 10nF	< 100nF	—	\leq 680nF		
		\leq 350	\leq 1nF	\leq 3.3nF	47nF	< 470nF	\leq 1 μ F	—			
		\leq 500	—	\leq 15nF	\leq 220nF	—	—	—			
		\leq 750	\leq 10nF	\leq 47nF	—	—	\leq 2.2 μ F	\leq 10 μ F			
\leq 1000	—	\leq 2.2 μ F	\leq 10 μ F	\leq 47 μ F	\leq 47 μ F	\leq 100 μ F					
Dielectric Withstanding Voltage	No breakdown or damage.			Measuring Voltage: ClassI:300% Rated voltage ClassII:250% Rated voltage Duration: 1~5s Charge/ Discharge Current: 50mA max. (This method excludes high-voltage MLCC)							
Solderability	At least 95% of the terminal electrode is covered by new solder. Visual Appearance: No visible damage.			Preheating conditions:80 to 120°C; 10~30s. Pb-Sn soldering Solder Temperature: 235 \pm 5°C Duration: 2 \pm 0.5s				Lead-free soldering Solder Temperature: 245 \pm 5°C Duration: 2 \pm 0.5s			

Item	Technical Specification			Test Method and Remarks														
Resistance to Soldering Heat	Item	Class	Class II	Preheating conditions: 100 to 200°C; 60-120 seconds. Solder Temperature: 265±5°C Duration: 10±1s Clean the capacitor with solvent and examine it with a 10X(min.) microscope. Recovery Time: 24±2h. Recovery condition: Room temperature														
	ΔC/C	≤±2.5% or ±0.25PF , whichever is larger	±15%															
	DF	Same to initial value.																
	IR	Same to initial value.																
	Appearance : No visible damage.At least 95% of the terminal electrode is covered by new solder.																	
Resistance to Flexure of Substrate (Bending Strength)	Appearance: No visible damage.			Test Board: PCB Warp: 1mm Speed: 1mm/sec. Unit: mm The measurement should be made with the board in														
	ΔC/C:	ClassI: ≤±5%或±0.5pF,whichever is larger. ClassII: ≤±10%																
Termination Adhesion	No visible damage.			As shown in the picture , Slowly apply a T force to the porcelain body on the side of the capacitor and hold for 60+1 seconds.														
	<table border="1"> <thead> <tr> <th>规格</th> <th>施加力 T</th> </tr> </thead> <tbody> <tr> <td>≤0402</td> <td>2N</td> </tr> <tr> <td>≥0603</td> <td>5N</td> </tr> </tbody> </table>				规格	施加力 T	≤0402	2N	≥0603	5N								
规格	施加力 T																	
≤0402	2N																	
≥0603	5N																	
Temperature Cycle	<table border="1"> <thead> <tr> <th>Item</th> <th>Class</th> <th>Class II</th> </tr> </thead> <tbody> <tr> <td>ΔC/C</td> <td>≤±1% or ±1pF , whichever is larger</td> <td>-15% ~+15%</td> </tr> </tbody> </table>			Item	Class	Class II	ΔC/C	≤±1% or ±1pF , whichever is larger	-15% ~+15%	Preheating conditions: up-category temperature, 1h Recovery time: 24±1h Initial Measurement Cycling Times: 5 times, 1 cycle, 4 steps:								
	Item	Class	Class II															
	ΔC/C	≤±1% or ±1pF , whichever is larger	-15% ~+15%															
No visible damage.			<table border="1"> <thead> <tr> <th>Step</th> <th>Temperature (°C)</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Low- category temp: -55</td> <td>30min</td> </tr> <tr> <td>2</td> <td>Normal temp : +20°C</td> <td>2 ~ 3min</td> </tr> <tr> <td>3</td> <td>Up- category temp (COG/X7R/X7T/X7S: +125 X5R:+85 X6S/X6T:+105)</td> <td>30min</td> </tr> <tr> <td>4</td> <td>Normal temp : +20°C</td> <td>2 ~ 3min</td> </tr> </tbody> </table>	Step	Temperature (°C)	Time	1	Low- category temp: -55	30min	2	Normal temp : +20°C	2 ~ 3min	3	Up- category temp (COG/X7R/X7T/X7S: +125 X5R:+85 X6S/X6T:+105)	30min	4	Normal temp : +20°C	2 ~ 3min
Step	Temperature (°C)	Time																
1	Low- category temp: -55	30min																
2	Normal temp : +20°C	2 ~ 3min																
3	Up- category temp (COG/X7R/X7T/X7S: +125 X5R:+85 X6S/X6T:+105)	30min																
4	Normal temp : +20°C	2 ~ 3min																
Recovery time after test:24±2h																		

Item	Technical Specification		Test Method and Remarks																		
Humidity load	ΔC/C	Class: $\pm 7.5\%$ or $\pm 0.75\text{pF}$, whichever is larger. ClassII: $\leq \pm 12.5\%$		※ Pretreatment (Class II) : After preheating at $140\text{ }^{\circ}\text{C} \sim 150\text{ }^{\circ}\text{C}$ for $1\text{h} \pm 10\text{min}$, place at room temperature for $24 \pm 2\text{h}$. Humidity: $90 \sim 95\% \text{RH}$ Voltage: Rated Voltage Duration: 500h Recovery Time: $24\text{h} \pm 2\text{h}$ Class 2 : $0201 \geq 47\text{nF}$, $0402 \geq 33\text{nF}$, $0603 \geq 1\mu\text{F}$, $0805 \geq 4.7\mu\text{F}$, $1206 \geq 10\mu\text{F}$ product need to keep in $150\text{ }^{\circ}\text{C}$, 1h after the test , and measurement to be made after being kept at room temperature for $24 \pm 2\text{h}$.																	
	DF	Not more than twice of initial value.																			
	IR	Class I	$R_i \geq 5000\text{M}\Omega$ 或 $R_i \cdot C_R \geq 50\text{S}$ whichever is smaller.																		
		Class II	$R_i \geq 1000\text{M}\Omega$ 或 $R_i \cdot C_R \geq 10\text{S}$ whichever is smaller.																		
Appearance: No visible damage.																					
Life Test	ΔC/C	Class I	$\leq \pm 3\%$ 或 $\pm 0.3\text{pF}$, whichever is larger.		※ Pretreatment (ClassII) :After preheating at $140\text{ }^{\circ}\text{C} \sim 150\text{ }^{\circ}\text{C}$ for $1\text{h} \pm 10\text{min}$, place at room temperature for $24 \pm 2\text{h}$. Low-Voltage ($< 100\text{V}$) Applied Voltage: $2 \cdot U_r$, except the table 1 Duration: 1000h Temperature : $125\text{ }^{\circ}\text{C}$ (C0G, X7R, X7S) $85\text{ }^{\circ}\text{C}$ (X5R) $105\text{ }^{\circ}\text{C}$ (X6S, X6T) Charge/ Discharge Current: 50mA max. Recovery Time: $24\text{h} \pm 2\text{h}$ Class 2 : $0201 \geq 47\text{nF}$, $0402 \geq 33\text{nF}$, $0603 \geq 1\mu\text{F}$, $0805 \geq 4.7\mu\text{F}$, $1206 \geq 10\mu\text{F}$ product need to keep in $150\text{ }^{\circ}\text{C}$, 1h after the																
		Class II	-20% ~ +20%																		
	DF	≤ 2 倍初始标准 Not more than twice of initial value.																			
	IR	Class I	$R_i \geq 4000\text{M}\Omega$ 或 $R_i \cdot C_R \geq 40\text{S}$ 取两者之中较小者 $R_i \geq 4000\text{M}\Omega$ 或 $R_i \cdot C_R \geq 40\text{S}$ whichever is smaller.																		
Class II		$R_i \geq 2000\text{M}\Omega$ 或 $R_i \cdot C_R \geq 50\text{S}$ whichever is smaller.																			
Appearance: No visible damage.																					
<table border="1" data-bbox="863 1361 1422 1597"> <thead> <tr> <th colspan="4" data-bbox="863 1361 1422 1395">table 1</th> </tr> <tr> <th data-bbox="863 1395 1034 1473">Capacitance</th> <th data-bbox="1034 1395 1153 1473">testing voltage</th> <th data-bbox="1153 1395 1321 1473">Capacitance</th> <th data-bbox="1321 1395 1422 1473">testing voltage</th> </tr> </thead> <tbody> <tr> <td data-bbox="863 1473 1034 1507">0201$\geq 10\text{nF}$</td> <td data-bbox="1034 1473 1153 1597" rowspan="3">1.5Ur</td> <td data-bbox="1153 1473 1321 1507">0805$\geq 0.47\mu\text{F}$</td> <td data-bbox="1321 1473 1422 1597" rowspan="3">1.5Ur</td> </tr> <tr> <td data-bbox="863 1507 1034 1541">0402$\geq 47\text{nF}$</td> <td data-bbox="1153 1507 1321 1541">1206$\geq 1\mu\text{F}$</td> </tr> <tr> <td data-bbox="863 1541 1034 1597">0603$\geq 220\text{nF}$</td> <td data-bbox="1153 1541 1321 1597">1210$\geq 1\mu\text{F}$</td> </tr> </tbody> </table>				table 1				Capacitance	testing voltage	Capacitance	testing voltage	0201 $\geq 10\text{nF}$	1.5Ur	0805 $\geq 0.47\mu\text{F}$	1.5Ur	0402 $\geq 47\text{nF}$	1206 $\geq 1\mu\text{F}$	0603 $\geq 220\text{nF}$	1210 $\geq 1\mu\text{F}$		
table 1																					
Capacitance	testing voltage	Capacitance	testing voltage																		
0201 $\geq 10\text{nF}$	1.5Ur	0805 $\geq 0.47\mu\text{F}$	1.5Ur																		
0402 $\geq 47\text{nF}$		1206 $\geq 1\mu\text{F}$																			
0603 $\geq 220\text{nF}$		1210 $\geq 1\mu\text{F}$																			
				test , and measurement to be made after being kept at room temperature for $24 \pm 2\text{h}$.																	

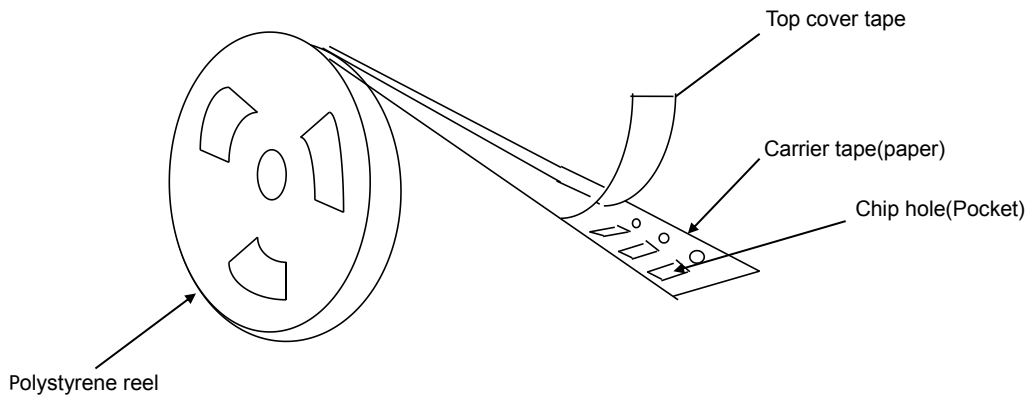
Note :

Pretreatment (only for class2 capacitor)

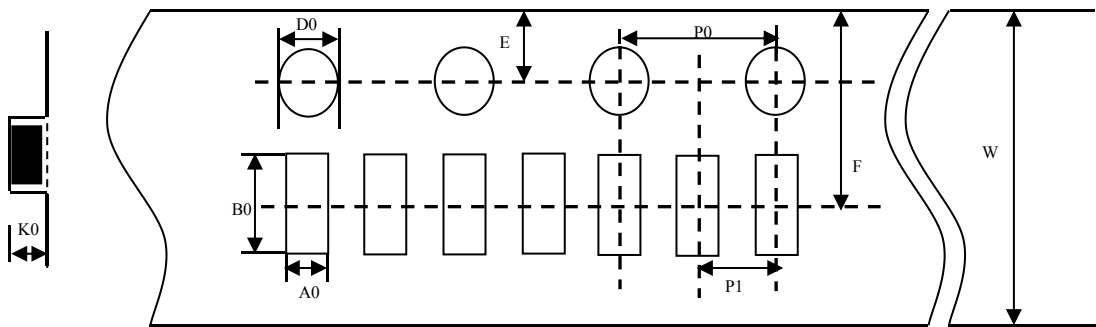
Pretreatment (only for class2 capacitor) is a method to treat the capacitor before measurement. First, place the capacitor in the up-category temperature or other specified higher temperature environment for 1hour. Then recovery the capacitor at standard pressure conditions for $24 \pm 1\text{hours}$.

◆ Package

* Embossed Plastic Taping



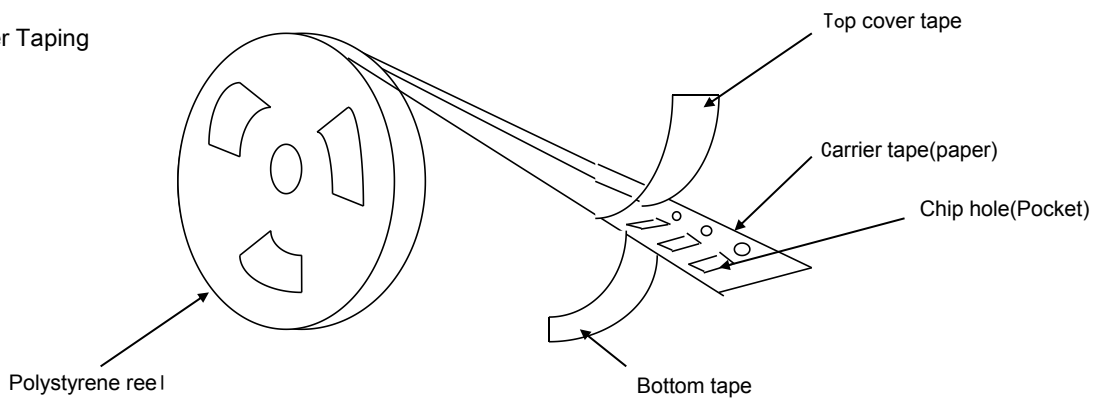
* The emboss plastic applies only to 1005 type , the dimensions as follows:



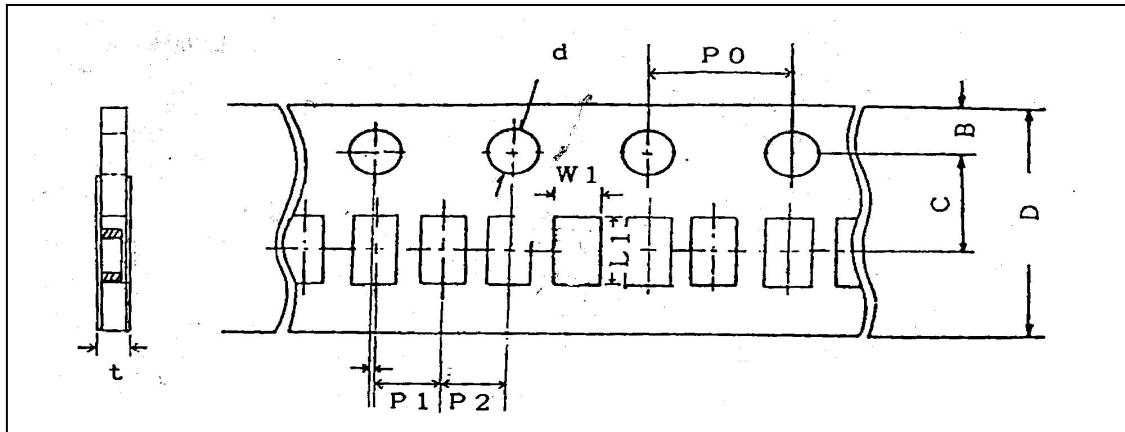
Unit : mm

W	P0	P1	E	F	D0	A0	B0	K0
4±0.05	2±0.04	1±0.02	0.9±0.05	1.8±0.02	0.8±0.04	0.24±0.02	0.45±0.02	0.24±0.02

* Paper Taping

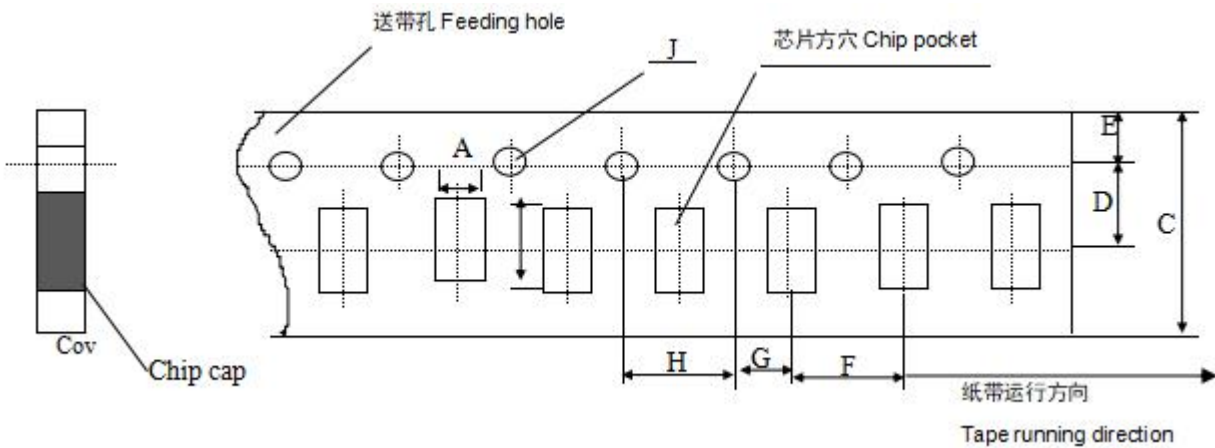


* Dimensions of paper taping for 1005, 0201, 0402 type



Code	W1	L1	D	C	B	P1	P2	P0	d	t
1005	0.24 ±0.02	0.45 ±0.02	8.00 ±0.10	3.50 ±0.05	1.75 ±0.10	2.00 ±0.05	2.00 ±0.05	4.00 ±0.10	1.50 -0/+0.10	0.30 Below
0201	0.37 ±0.10	0.67 ±0.10	8.00 ±0.10	3.50 ±0.05	1.75 ±0.10	2.00 ±0.05	2.00 ±0.05	4.00 ±0.10	1.50 -0/+0.10	0.80 Below
0402	0.65 ±0.10	1.15 ±0.10	8.00 ±0.10	3.50 ±0.05	1.75 ±0.10	2.00 ±0.05	2.00 ±0.05	4.00 ±0.10	1.50 -0/+0.10	0.80 Below

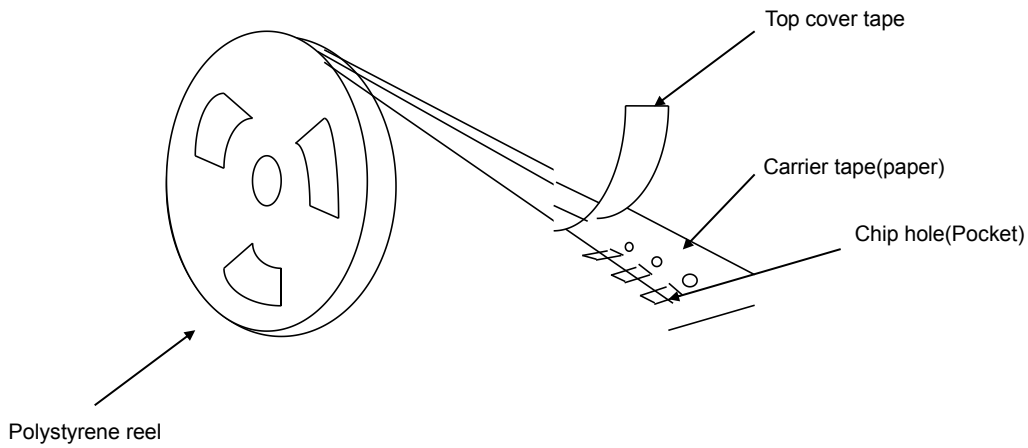
*Dimensions of paper taping for 0603 , 0805 , 1206 types.



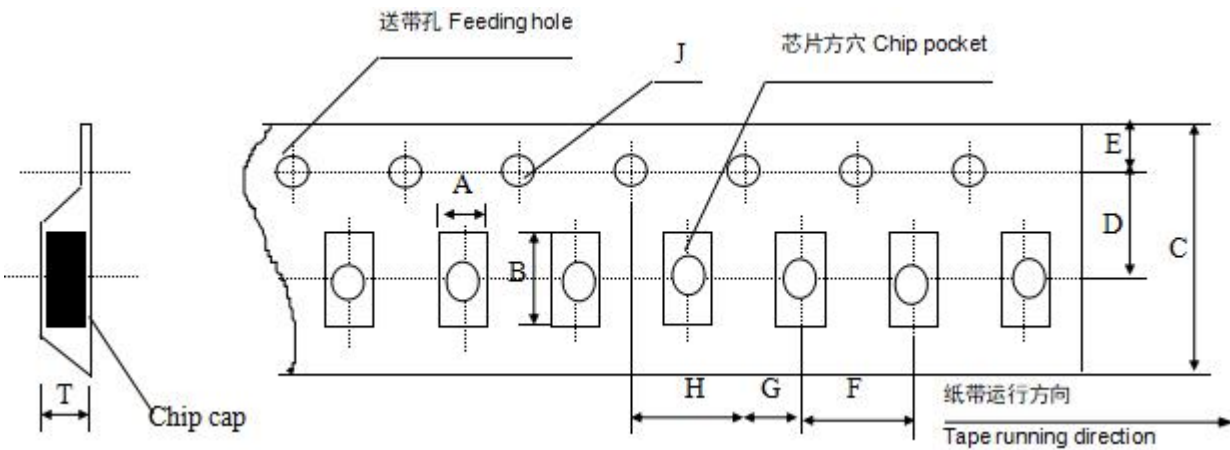
Unit : mm

Code paper size	A	B	C	D*	E	F	G*	H	J	T
0603	1.10 ±0.10	1.90 ±0.10	800 ±0.10	350 ±0.05	1.75 ±0.10	400 ±0.10	200 ±0.10	400 ±0.10	150 -0/+0.10	1.10 Max
0805	1.45 ±0.15	2.30 ±0.15	80 ±0.15	350 ±0.05	1.75 ±0.10	400 ±0.10	200 ±0.10	400 ±0.10	150 -0/+0.10	1.10 Max
1206	1.80 ±0.20	3.40 ±0.20	800 ±0.20	350 ±0.05	1.75 ±0.10	400 ±0.10	200 ±0.10	400 ±0.10	150 -0/+0.10	1.10 Max

* Embossed tapping



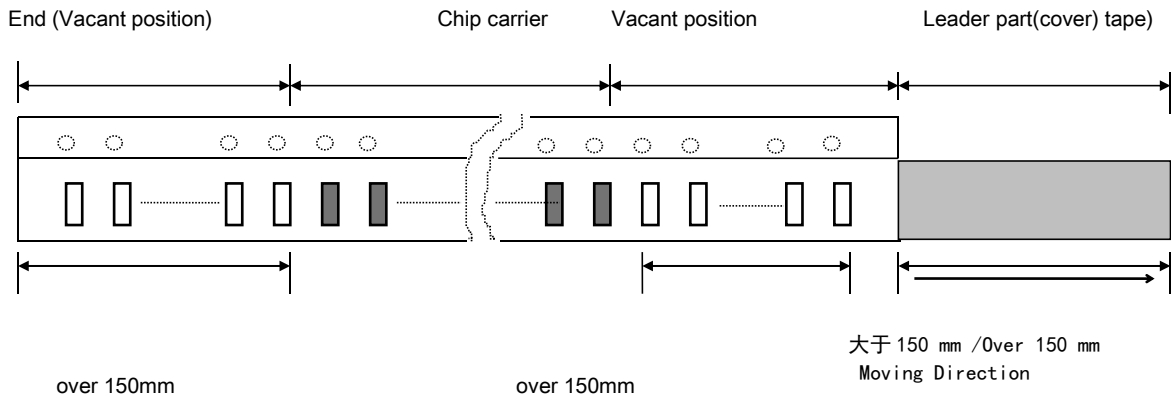
* Dimensions of embossed tapping for 0805~1812 type



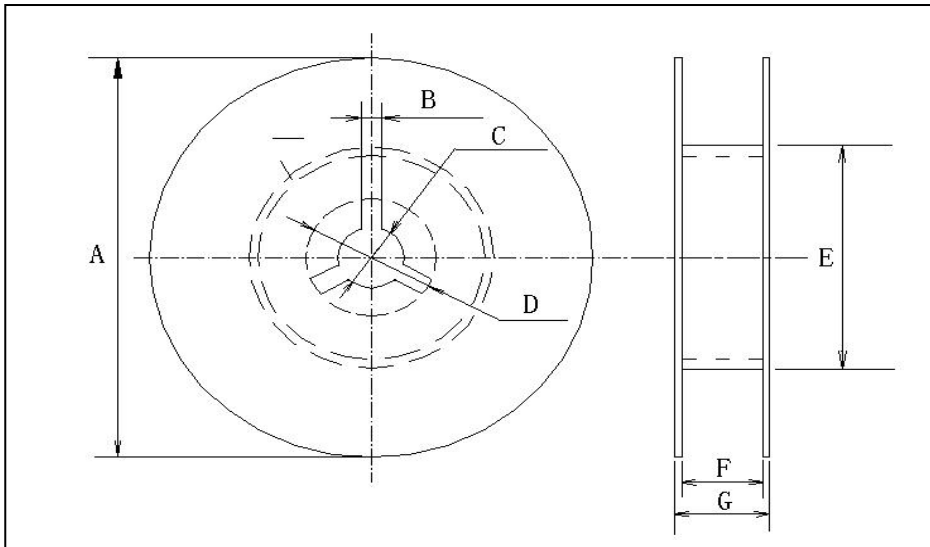
Code Tape size	A	B	C	D*	E	F	G*	H	J	T
0805	1.55 ± 0.20	2.35 ± 0.20	8.00 ± 0.20	3.50 ± 0.05	1.75 ± 0.10	4.00 ± 0.10	2.00 ± 0.10	4.00 ± 0.10	1.50 -0/+0.10	1.50 Max
1206	1.95 ± 0.20	3.60 ± 0.20	8.00 ± 0.20	3.50 ± 0.05	1.75 ± 0.10	4.00 ± 0.10	2.00 ± 0.10	4.00 ± 0.1	1.50 -0/+0.10	1.85 Max
1210	2.70 ± 0.10	3.42 ± 0.10	8.00 ± 0.10	3.50 ± 0.05	1.75 ± 0.10	4.00 ± 0.10	2.00 ± 0.05	4.00 ± 0.10	1.55 -0/+0.10	3.2 Max
1808	2.20 ± 0.10	4.95 ± 0.10	12.00 ± 0.10	5.50 ± 0.05	1.75 ± 0.10	4.00 ± 0.10	2.00 ± 0.05	4.00 ± 0.10	1.50 -0/+0.10	3.0 Max
1812	3.66 ± 0.10	4.95 ± 0.10	12.00 ± 0.10	5.50 ± 0.05	1.75 ± 0.10	8.00 ± 0.10	2.00 ± 0.05	4.00 ± 0.10	1.55 -0/+0.10	4.0 Max

Note : The place with “*” means where needs exactly dimensions.

* Structure of leader part and end part of the carrier paper



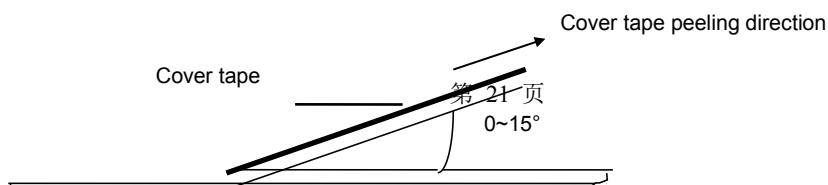
* Reel dimensions (unit: mm)

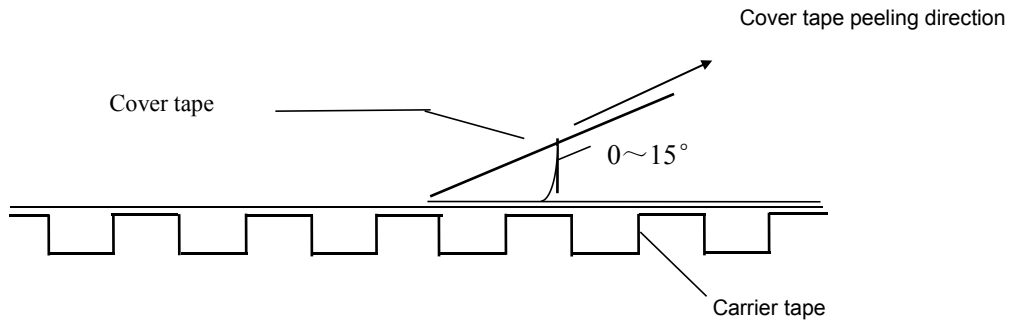


Reel model	A	B	C	D	E	F	G
7'REEL	$\phi 178 \pm 2.0$	3.0	$\phi 13 \pm 0.5$	$\phi 21 \pm 0.8$	$\phi 50$ 或更大 $\phi 50$ or more	10.0 ± 1.5	12max

* Taping specification : top tape peeling strength

Paper Taping



***Embossed Taping**


Standard: $0.1N < \text{peeling strength} < 0.7N$

No paper dirty remains on the scotch when peeling, and sticks to top and bottom tape.

*** Bulk Case Package**

单位 (unit) :mm

Symbol	A	B	T	C	D	E
Dimension	6.80±0.10	8.80±1.00	12.00±0.10	15.00+0.10/-0	2.00+0/-0.10	4.70±0.10
Symbol	F	W	G	H	L	I
Dimension	31.50+0.20/-0	36.00+0/-0.20	19.00±0.35	7.00±0.35	110.00±0.70	5.00±0.35

*** Packing Quantity**

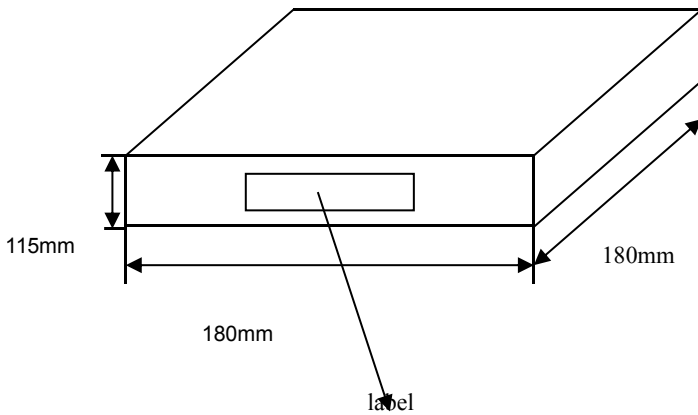
(SIZE)	Package Style & Quantity unit: pcs				
	EPT	PT	ET	BC	BP
1005	—	20000	—	—	—
0201	—	15000	—	—	—
0402	-----	10000	-----	20000	5000
0603	-----	4000	-----	15000	5000
0805	-----	4000	3000	10000	5000
1206	-----	4000	T≤1.35mm 3000 T > 1.35mm 2000	5000	5000
1210	-----	-----	T≤1.80mm 2000 T > 1.80mm 1000	-----	2000
1808	-----	-----	2000	-----	2000
1812	-----	-----	T≤1.85mm 1000 T > 1.85mm 500	-----	2000

Note : We can choose packing style and quantity can be according to the customer's requirement.

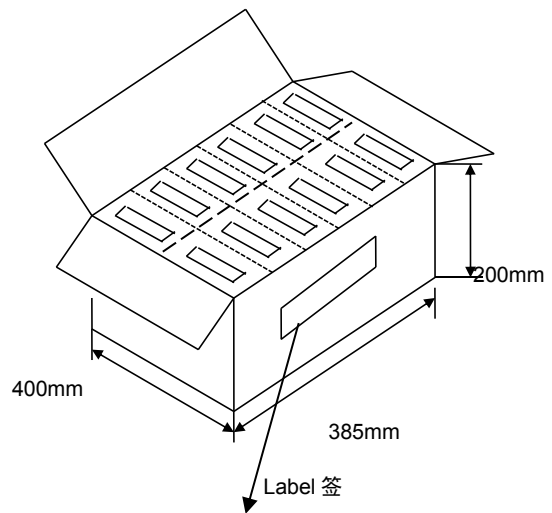
*** Outer packing**

The first package
 Quantity: 10 reels

The second package
 Quantity: 6 cases



PART No
QUANTITY
DATE



Production name
Quantity
Weight

◆ Storage Methods

* The guaranteed period for solderability is 12 months (Under deliver package condition).

* Storage conditions :

Temperature 5~40°C

Relative Humidity 20~70%

◆ Precautions For Use

The Multi-layer Ceramic Capacitors (MLCC) may fail in a short circuit mode in an open circuit mode when subjected to severe conditions of electrical environment and / or mechanical stress beyond the specified "rating" and specified "conditions" in the specification, which will result in burn out, flaming or glowing in the worst case. Following "precautions for "safety" and Application Notes shall be taken in your major consideration. If you have a question about the precautions for handling, please contact our engineering section or factory.

*** Soldering Profile**

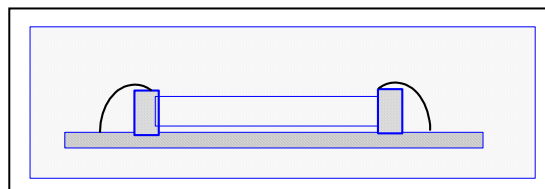
To avoid the crack problem by sudden temperature change, follow the temperature profile in the adjacent graph (refer to the graph in the enclosure page).

*** Manual Soldering**

Manual soldering can pose a great risk of creating thermal cracks in capacitors. The hot soldering iron tip comes into direct contact with the end terminations, and operator's careless may cause the tip of the soldering iron to come into direct contact with the ceramic body of the capacitor. Therefore the soldering iron must be handled carefully, and pay much attention to the selection of the soldering iron tip and temperature contact of the tip.

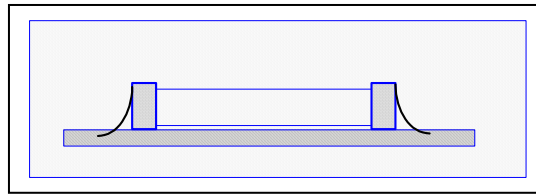
*Optimum Solder Amount for Reflow Soldering

Too much solder



Cracks tend to occur due to large stress.

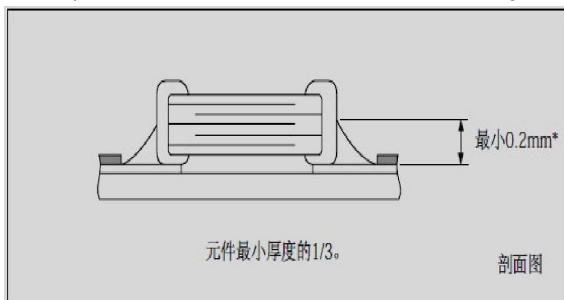
Not enough solder



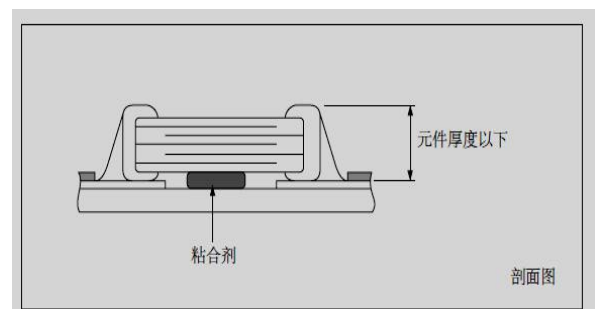
Weakholding force may cause badconnection between the capacitor and PCB.

* Recommended Soldering amounts

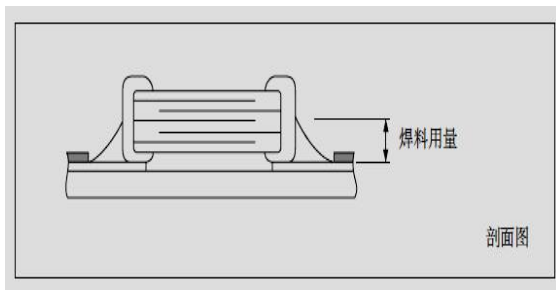
The optimal solder fillet amounts for re-flow soldering



The optimal solder fillet amounts for wave soldering



The optimal solder fillet amounts for reworking by using soldering iron



* Recommended Soldering Method

Size	Temperature Characteristics	RatedVoltage	Capacitance	Soldering Method
1005	C0G	/	/	R
	X7R/X5R/X7T/X6S	/	/	R
0201	C0G	/	/	R
	X7R/X5R/X7T/X6S	/	/	R

***Recommended Soldering Method**

Size	Temperature Characteristics	RatedVoltage	Capacitance	Soldering Method
0402	C0G	/	/	R
	X7R/X5R/X7T/X6S	/	/	R
0603	C0G	/	/	R/W
	X7R/X5R/X7T/X6S	/	C ≥ 1uf	R
			C < 1uf	R/W
0805	C0G	/	/	R/W
	X7R/X5R/X7T/X6S	/	C ≥ 4.7uf	R
			C < 4.7uf	R/W
1206	C0G	/	/	R/W
	X7R/X5R/X7T/X6S	/	C ≥ 10uf	R
			C < 10uf	R/W
≥1210	C0G	/	/	R
	X7R/X5R/X7T/X6S	/	/	R

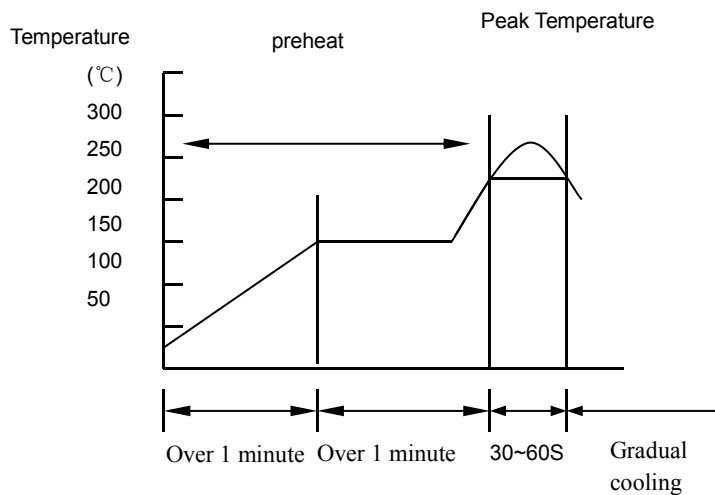
Soldering method :

Reflow Solering

Wave Soldering

◆ The temperature profile for soldering

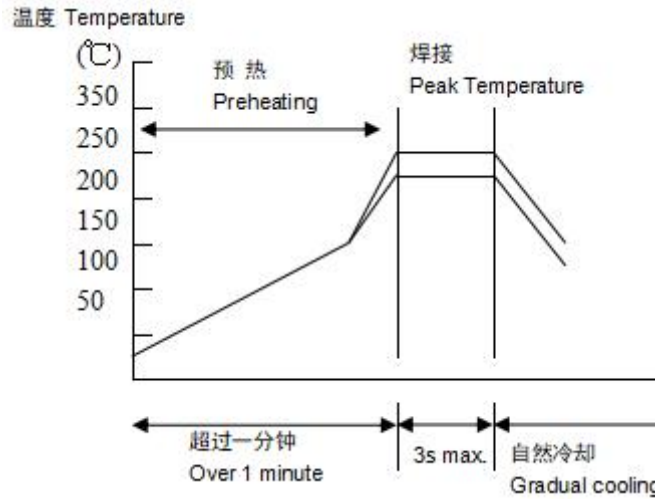
* Re-flow soldering



	Pb-Sn soldering	Lead-free soldering
Peak temperature	230°C~250°C	240°C~260°C

While in preheating, please keep the temperature difference between soldering temperature and surface temperature of chips as: $T \leq 150^{\circ}\text{C}$.

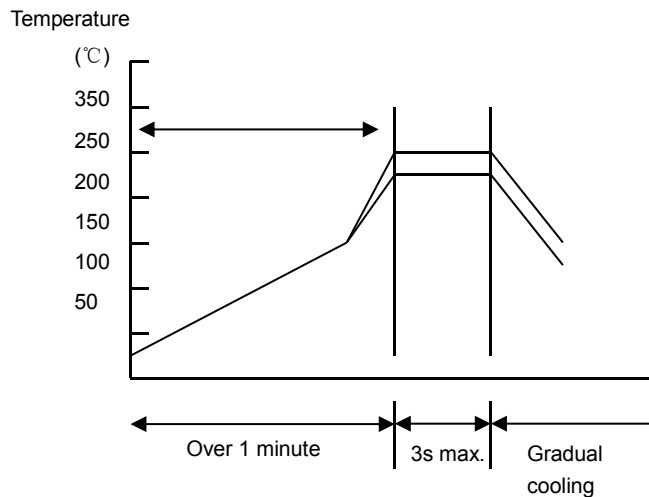
* Wave soldering



	Pb-Sn soldering	Lead-free soldering
Peak temperature	230°C ~ 260°C	240°C ~ 270°C

While in preheating, please keep the temperature difference between soldering temperature and surface temperature of chips as: $T \leq 150^\circ\text{C}$.

* Hand soldering



Conditions :

Preheating	Temperature of soldering iron head	Power of soldering iron	Diameter of soldering iron head	Soldering time	Solder paste amount	Restricted conditions
$\Delta \leq 130^\circ\text{C}$	Highest temperature: 350°C	20W at the highest	1mm recommended	3s at the longest	$\leq 1/2$ chip thickness	Please avoid the direct contact between soldering iron head and ceramic components

*The latest version of the content shall prevail