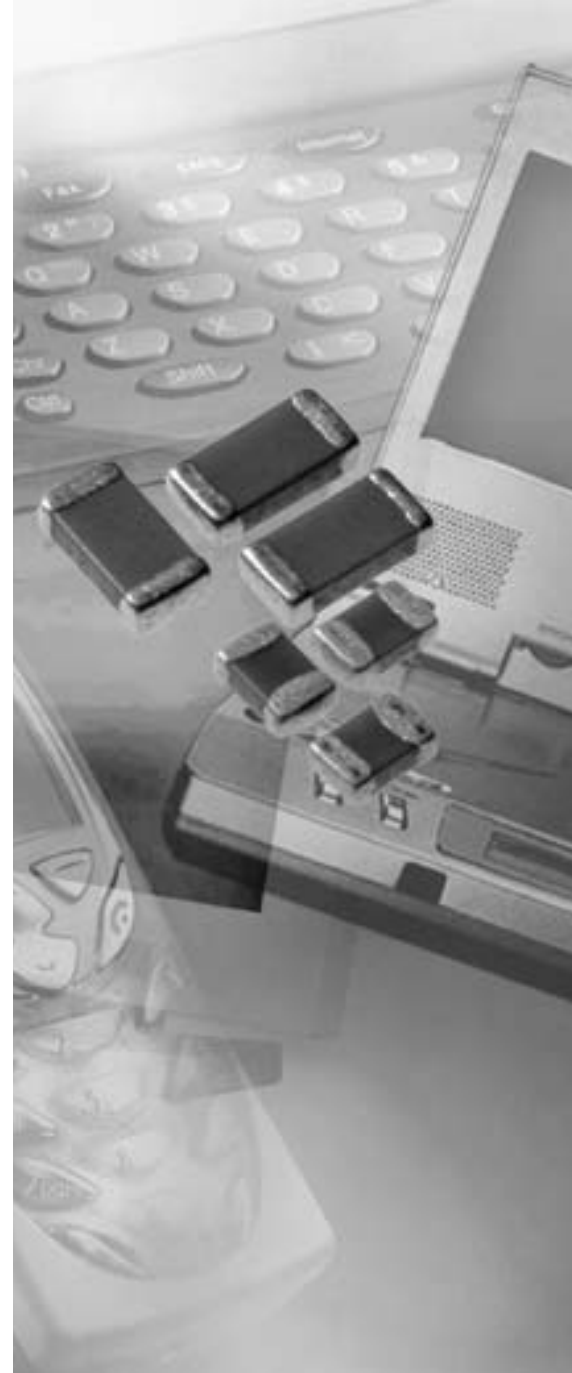


DATA SHEET

SURFACE-MOUNT CERAMIC MULTILAYER CAPACITORS

High-capacitance: Class 2, X5R and X7R
6.3 V TO 50 V



Surface-mount ceramic multilayer capacitors

High-capacitance: Class 2, X5R and X7R 6.3 V to 50 V

FEATURES

- Six standard sizes
- Supplied in tape on reel
- Nickel-barrier end termination

APPLICATIONS

- PCs, hard disk, game PCs
- Power supplies
- DVDs, camcorders
- Mobile phones, PDAs

DESCRIPTION

The capacitor consists of a rectangular block of ceramic dielectric in which a number of interleaved metal electrodes are contained. This structure gives rise to a high capacitance per unit volume.

The inner electrodes are connected to the two end terminations and finally covered with a layer of plated tin (NiSn). The terminations are lead-free. A cross section of the structure is shown in Fig.1.

QUICK REFERENCE DATA

DESCRIPTION	VALUE
Rated Voltage U_R (DC)	6.3 V, 10V, 16V, 25V and 50V
Capacitance range	see note 1.
6.3V	68 nF-47 μ F
10V	68nF-22 μ F
16V	68nF-4.7 μ F
25V	68nF-1 μ F
50V	68nF-1 μ F
Tolerance on capacitance after 1000 hours	$\pm 5\%$; $\pm 10\%$; $\pm 20\%$
Test voltage (DC) for 1 minute	$2.5 \times U_R$
Sectional specification	IEC 60384-10, second edition 1989-04
Detailed specification	Based on IEC 60384-1
End termination	NiSn; lead-free
Operating temperature range	X5R: -55 °C to 85 °C ; X7R -55 °C to 125 °C
Climatic category (IEC 60 068)	X5R : 55/85/21 ; X7R : 55/125/21

Note

1. Measured using a four-gauge method ; at 20 °C; 1 ± 0.2 V and 1 kHz for $C \leq 22 \mu\text{F}$; at 0.5 ± 0.1 V and 120 Hz for $C > 22 \mu\text{F}$.

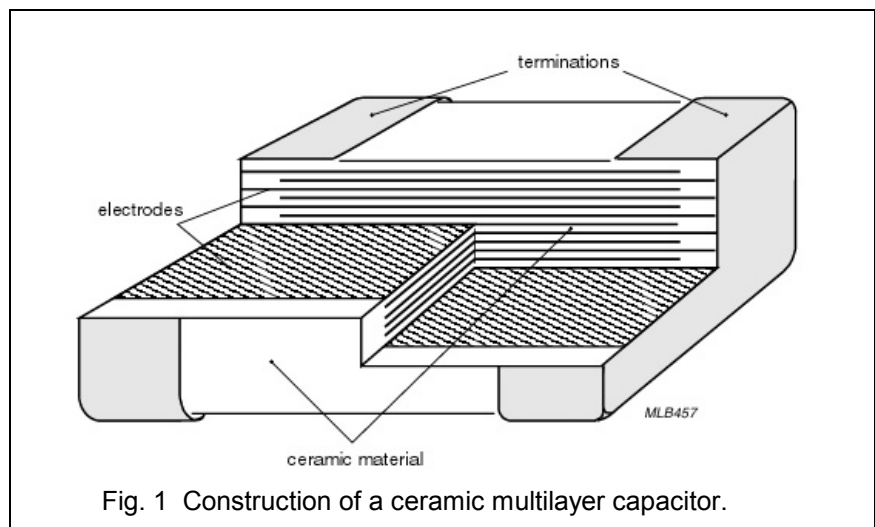
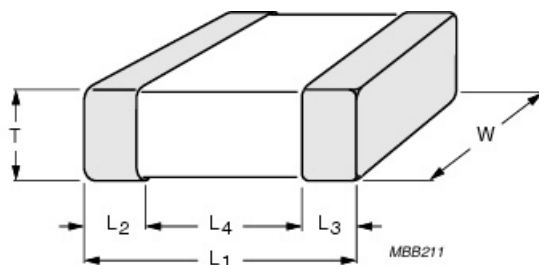


Fig. 1 Construction of a ceramic multilayer capacitor.

Surface-mount ceramic multilayer capacitors

High-capacitance: Class 2, X5R and X7R 6.3 V to 50 V

MECHANICAL DATA



For dimensions see Table 1

Fig. 2 Component outline

Physical dimensions

Table 1 Capacitor dimensions; see Fig. 2

CASE SIZE	L ₁	W	T		L ₂ and L ₃		L ₄ MIN.
			MIN.	MAX.	MIN.	MAX.	
Dimensions in millimeters							
0402	1.0 ± 0.05	0.5 ± 0.05	0.45	0.55	0.20	0.30	0.40
0603	1.6 ± 0.10	0.8 ± 0.10	0.70	0.90	0.15	0.65	0.35
0805	2.0 ± 0.15	1.25 ± 0.20	0.50	1.45	0.25	0.75	0.55
1206	3.2 ± 0.20	1.6 ± 0.20	0.75	1.80	0.25	0.75	1.40
1210	3.2 ± 0.20	2.5 ± 0.20	0.50	2.70	0.25	0.75	1.40
1812	4.5 ± 0.40	3.2 ± 0.30	0.75	3.50	0.25	0.75	2.20
Dimensions in inches							
0402	0.040 ± 0.002	0.020 ± 0.002	0.018	0.022	0.008	0.012	0.016
0603	0.063 ± 0.004	0.032 ± 0.004	0.028	0.035	0.006	0.026	0.014
0805	0.079 ± 0.006	0.049 ± 0.006	0.020	0.057	0.010	0.030	0.022
1206	0.126 ± 0.008	0.063 ± 0.008	0.030	0.071	0.010	0.030	0.056
1210	0.126 ± 0.012	0.098 ± 0.008	0.020	0.106	0.010	0.030	0.056
1812	0.177 ± 0.008	0.126 ± 0.008	0.030	0.138	0.010	0.030	0.087

Surface-mount ceramic multilayer capacitors

High-capacitance: Class 2, X5R and X7R 6.3 V to 50 V

Selection Chart for X5R/X7R 6.3V and 10V high capacitance MLCC

C (µF)	Last two digits of 12NC	6,3V						10 V					
		0402	0603	0805	1206	1210	1812	0402	0603	0805	1206	1210	1812
0,068	47	0,5						0,5					
0,082	48												
0,1	49	0,5						0,5					
0,12	51												
0,15	52								0,8				
0,18	53								0,8				
0,22	54								0,8	0,6			
0,27	55									0,6			
0,33	56								0,8	0,85			
0,39	57									0,85			
0,47	58								0,8	0,85			
0,56	59									1,25			
0,68	61		0,8							1,25			
0,82	62									1,25			
1	63		0,8							1,25	0,85		
1,2	64										0,85		
1,5	65										1,15		
1,8	66										1,15		
2,2	67			1,25						1,25	1,15		
3,3	69			1,25							1,60		
4,7	72			1,25	1,60						1,60		
6,8	74												
10	76				1,60							1,9	
15	-												
22	81					2,5							2,5
33	83												
47	85						2,5						

Note

X5R	X7R
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1. Values in shaded cells indicate product thickness in mm; X5R: dark shading; X7R: light shading.

Surface-mount ceramic multilayer capacitors

High-capacitance: Class 2, X5R and X7R 6.3 V to 50 V

Selection Chart for X7R 16V, 25V and 50V high capacitance MLCC

C (µF)	Last two digits of 12NC	16V				25V			50V			
		0603	0805	1206	1210	0805	1206	1210	0805	1206	1210	1812
0,068	47	0,8	0,85			0,85			1,25	0,85		
0,082	48	0,8	0,85			0,85			1,25	0,85		
0,1	49	0,8	0,85			0,85	0,85		1,25	1,15	0,5-1,0	0,9-1,3
0,12	51		0,85				0,85			1,15	0,9-1,3	0,9-1,3
0,15	52		0,85				0,85			1,15	0,9-1,3	0,9-1,3
0,18	53		0,85				0,85				0,9-1,3	0,9-1,3
0,22	54		0,85	0,85			0,85	0,5-1,0			0,9-1,3	0,9-1,3
0,27	55		0,85	0,85			1,15	0,5-1,0				0,9-1,3
0,33	56		1,25	0,85			1,15	0,5-1,0				0,9-1,3
0,39	57		1,25	0,85				0,5-1,0				0,9-1,3
0,47	58		1,25	1,15				0,9-1,3				0,9-1,3
0,56	59			1,15								0,9-1,3
0,68	61			1,15								1,2-1,75
0,82	62			1,15								1,2-1,75
1	63			1,15				1,2-1,75				1,2-1,75
1,2	64											
1,5	65											
1,8	66											
2,2	67											
3,3	69											
4,7	72				1,9							

Note

X5R **X7R**

- Values in shaded cells indicate product thickness in mm; X5R: dark shading; X7R: light shading.

ELECTRICAL CHARACTERISTICS

Class 2 capacitors; X5R/X7R dielectrics; NiSn termination

Unless otherwise stated all electrical values apply at an ambient temperature of 20 ± 1 °C, an atmospheric pressure of 86 to 105 kPa, and a relative humidity of 63 to 67%.

PARAMETER DESCRIPTION	VALUE
Capacitance range; note 1	68 nF to 47 µF
Tolerance on capacitance after 1000 hours	$\pm 5\%$; $\pm 10\%$; $\pm 20\%$
Tan δ (loss factor)	See table 2
Insulation resistance after 1 minute at U_R (DC)	$R_{ins} \times C \geq 500$ s or 10 GΩ, whichever is less
Maximum capacitance change as function of temperature	$\pm 15\%$

Note

- Measured using a four-gauge method ; at 20 °C; 1 ± 0.2 V and 1 kHz for $C \leq 22$ µF; at 0.5 ± 0.1 V and 120 Hz for $C > 22$ µF.

Surface-mount ceramic multilayer capacitors

High-capacitance: Class 2, X5R and X7R 6.3 V to 50 V

Table 2: Product Specification, Ordering and Packaging Information for 0402-1812 size.

0402(1005 metric) size Product Specification, Ordering and Packaging Information.

Size	Cap. Value (µF)	DC Rated Voltage (Volt)	Temperature Characteristic TC	Capacitance Tolerance %	Loss Factor (%)	Thickness (mm)	Ordering Code 12 NC *1	Ordering Code Clear Text Code *2	Quantity per 7" reel
0402	0,068	6,3	X5R	±10%, ±20%	5,0%	0,50	2255 207 13()47	C0402()R X5R 5BB683	10.000
0402	0,068	10	X5R	±10%, ±20%	5,0%	0,50	2238 247 13()47	C0402()R X5R 6BB683	10.000
0402	0,1	6,3	X5R	±10%	5,0%	0,50	2255 207 13()49	C0402()R X5R 5BB104	10.000
0402	0,1	10	X5R	±10%, ±20%	5,0%	0,50	2238 247 13()49	C0402()R X5R 6BB104	10.000

Note

1. Specify capacitance tolerance on position 10 of the 12NC: 6 = ±10%; 7 = ±20%

For ordering code of large reel packing (330 mm/13"), change position 8 of the 12NC : specify 5 in stead of 1.

2. Specify capacitance tolerance on position 6 of the Clear Text Code: K = ±10%; M = ±20%

For ordering code of large reel packing (330 mm/13"), change position 6 of unified CTC: specify P in stead of R or F in stead of K .

- 1&2.** For quantity per reel for large reel (330 mm/13") packing see table 3.

0603(1608 metric) size Product Specification, Ordering and Packaging Information.

Size	Cap. Value (µF)	DC Rated Voltage (Volt)	Temperature Characteristic TC	Capacitance Tolerance %	Loss Factor (%)	Thickness (mm)	Ordering Code 12 NC *1	Ordering Code Clear Text Code *2	Quantity per 7" reel
0603	0,068	16	X7R	±5%, ±10%	3,5%	0,80	2238 786 15()47	C0603()R X7R 7BB683	4.000
0603	0,082	16	X7R	±5%, ±10%	3,5%	0,80	2238 786 15()48	C0603()R X7R 7BB823	4.000
0603	0,1	16	X7R	±5%, ±10%	3,5%	0,80	2238 786 15()49	C0603()R X7R 7BB104	4.000
0603	0,15	10	X7R	±10%	5,0%	0,80	2238 246 15()52	C0603()R X7R 6BB154	4.000
0603	0,18	10	X7R	±10%	5,0%	0,80	2238 246 15()53	C0603()R X7R 6BB184	4.000
0603	0,22	10	X7R	±10%	5,0%	0,80	2238 246 15()54	C0603()R X7R 6BB224	4.000
0603	0,33	10	X5R	±10%, ±20%	5,0%	0,80	2238 246 13()56	C0603()R X5R 6BB334	4.000
0603	0,47	10	X5R	±10%, ±20%	5,0%	0,80	2238 246 13()58	C0603()R X5R 6BB474	4.000
0603	0,68	6,3	X5R	±10%, ±20%	7,0%	0,80	2255 206 13()61	C0603()R X5R 5BB684	4.000
0603	1	6,3	X5R	±10%, ±20%	7,0%	0,80	2255 206 13()63	C0603()R X5R 5BB105	4.000

Note.

1. Specify capacitance tolerance on position 10 of the 12NC: 5 = ±5%; 6 = ±10%; 7 = ±20%

For ordering code of large reel packing (330 mm/13"), change position 8 of the 12NC : specify 5 in stead of 1.

2. Specify capacitance tolerance on position 6 of the Clear Text Code: J = ± 5%; K = ±10%;M = ±20%

For ordering code of large reel packing (330 mm/13"), change position 6 of unified CTC: specify P in stead of R or F in stead of K .

- 1&2.** For quantity per reel for large reel (330 mm/13") packing see table 3.

Surface-mount ceramic multilayer capacitors

High-capacitance: Class 2, X5R and X7R 6.3 V to 50 V

Table 2 (continued)

0805(2012 metric) size Product Specification, Ordering and Packaging Information.

Size	Cap. Value (µF)	DC Rated Voltage (Volt)	Temperature Characteristic TC	Capacitance Tolerance %	Loss Factor (%)	Thickness (mm)	Ordering Code 12 NC *1	Ordering Code Clear Text Code *2	Quantity per 7" reel
0805	0,068	16	X7R	±5%, ±10%	3,5%	0,60	2238 780 15()47	C0805()R X7R 7BB683	4.000
0805	0,068	25	X7R	±5%, ±10%	2,5%	0,85	2238 910 15()47	C0805()R X7R 8BB683	4.000
0805	0,068	50	X7R	±5%, ±10%	2,5%	1,25	2222 580 15()47	C0805()K X7R 9BB683	3.000
0805	0,082	16	X7R	±5%, ±10%	3,5%	0,85	2238 780 15()48	C0805()R X7R 7BB823	4.000
0805	0,082	25	X7R	±5%, ±10%	2,5%	0,85	2238 910 15()48	C0805()R X7R 8BB823	4.000
0805	0,082	50	X7R	±5%, ±10%	2,5%	1,25	2222 580 15()48	C0805()K X7R 9BB823	3.000
0805	0,1	16	X7R	±5%, ±10%	3,5%	0,85	2238 780 15()49	C0805()R X7R 7BB104	4.000
0805	0,1	25	X7R	±5%, ±10%	2,5%	0,85	2238 910 15()49	C0805()R X7R 8BB104	4.000
0805	0,1	50	X7R	±5%, ±10%	2,5%	1,25	2222 580 15()49	C0805()K X7R 9BB104	3.000
0805	0,12	16	X7R	±5%, ±10%	3,5%	0,85	2238 780 15()51	C0805()R X7R 7BB124	4.000
0805	0,15	16	X7R	±5%, ±10%	3,5%	0,85	2238 780 15()52	C0805()R X7R 7BB154	4.000
0805	0,18	16	X7R	±5%, ±10%	3,5%	0,85	2238 780 15()53	C0805()R X7R 7BB184	4.000
0805	0,22	10	X7R	±10%	5,0%	0,60	2238 240 15()54	C0805()R X7R 6BB224	4.000
0805	0,22	16	X7R	±5%, ±10%	3,5%	0,85	2238 780 15()54	C0805()R X7R 7BB224	4.000
0805	0,27	10	X7R	±10%	5,0%	0,60	2238 240 15()55	C0805()R X7R 6BB274	4.000
0805	0,27	16	X7R	±5%, ±10%	3,5%	0,85	2238 780 15()55	C0805()R X7R 7BB274	4.000
0805	0,33	10	X7R	±10%	5,0%	0,85	2238 240 15()56	C0805()R X7R 6BB334	4.000
0805	0,33	16	X7R	±5%, ±10%	3,5%	1,25	2222 780 15()56	C0805()K X7R 7BB334	3.000
0805	0,39	10	X7R	±10%	5,0%	0,85	2238 240 15()57	C0805()K X7R 6BB394	4.000
0805	0,39	16	X7R	±5%, ±10%	3,5%	1,25	2222 780 15()57	C0805()K X7R 7BB394	3.000
0805	0,47	10	X7R	±10%	5,0%	0,85	2238 240 15()58	C0805()R X7R 6BB474	4.000
0805	0,47	16	X7R	±5%, ±10%	3,5%	1,25	2222 780 15()58	C0805()K X7R 7BB474	3.000
0805	0,56	10	X7R	±10%	5,0%	1,25	2222 240 15()59	C0805()K X7R 6BB564	3.000
0805	0,68	10	X7R	±10%	5,0%	1,25	2222 240 15()61	C0805()K X7R 6BB684	3.000
0805	0,82	10	X7R	±10%	5,0%	1,25	2222 240 15()62	C0805()K X7R 6BB824	3.000
0805	1	10	X7R	±10%	5,0%	1,25	2222 240 15()63	C0805()K X7R 6BB105	3.000
0805	2,2	6,3	X5R	±10%, ±20%	7,0%	1,25	2250 200 13()67	C0805()K X5R 5BB225	3.000
0805	2,2	10	X5R	±10%, ±20%	7,0%	1,25	2222 240 13()67	C0805()K X5R 6BB225	3.000
0805	3,3	6,3	X5R	±10%, ±20%	7,0%	1,25	2250 200 13()69	C0805()K X5R 5BB335	3.000
0805	4,7	6,3	X5R	±10%, ±20%	7,0%	1,25	2250 200 13()72	C0805()K X5R 5BB475	3.000

Note.

1. Specify capacitance tolerance on position 10 of the 12NC: 5 = ±5%; 6 = ±10%; 7 = ±20%

For ordering code of large reel packing (330 mm/13"), change position 8 of the 12NC : specify 5 in stead of 1.

2. Specify capacitance tolerance on position 6 of the Clear Text Code: J = ± 5%; K = ±10%;M = ±20%

For ordering code of large reel packing (330 mm/13"),change position 6 of unified CTC: specify P in stead of R or F in stead of K .

1&2. For quantity per reel for large reel (330 mm/13") packing see table 3.

Surface-mount ceramic multilayer capacitors

High-capacitance: Class 2, X5R and X7R 6.3 V to 50 V

Table 2 (continued)

1206(3216 metric) size Product Specification, Ordering and Packaging Information.

Size	Cap. Value (µF)	DC Rated Voltage (Volt)	Temperature Characteristic TC	Capacitance Tolerance %	Loss Factor (%)	Thickness (mm)	Ordering Code 12 NC *1	Ordering Code Clear Text Code *2	Quantity per 7" reel
1206	0,1	25	X7R	±5%, ±10%	2,5%	0,85	2238 911 15()49	C1206()R X7R 8BB104	4.000
1206	0,1	50	X7R	±5%, ±10%	2,5%	0,85	2238 581 15()49	C1206()R X7R 9BB104	4.000
1206	0,12	25	X7R	±5%, ±10%	2,5%	0,85	2238 911 15()51	C1206()R X7R 8BB124	4.000
1206	0,12	50	X7R	±5%, ±10%	2,5%	0,85	2238 581 15()51	C1206()R X7R 9BB124	4.000
1206	0,15	25	X7R	±5%, ±10%	2,5%	0,85	2238 911 15()52	C1206()R X7R 8BB154	4.000
1206	0,15	50	X7R	±5%, ±10%	2,5%	1,15	2222 581 15()52	C1206()K X7R 9BB154	3.000
1206	0,18	25	X7R	±5%, ±10%	2,5%	0,85	2238 911 15()53	C1206()R X7R 8BB184	4.000
1206	0,18	50	X7R	±5%, ±10%	2,5%	1,15	2222 581 15()53	C1206()K X7R 9BB184	3.000
1206	0,22	16	X7R	±5%, ±10%	3,5%	0,85	2238 781 15()54	C1206()R X7R 7BB224	4.000
1206	0,22	25	X7R	±5%, ±10%	2,5%	0,85	2238 911 15()54	C1206()R X7R 8BB224	4.000
1206	0,22	50	X7R	±5%, ±10%	2,5%	1,15	2222 581 15()54	C1206()K X7R 9BB224	3.000
1206	0,27	16	X7R	±5%, ±10%	3,5%	0,85	2238 781 15()55	C1206()R X7R 7BB274	4.000
1206	0,27	25	X7R	±5%, ±10%	2,5%	1,15	2222 911 15()55	C1206()K X7R 8BB274	3.000
1206	0,33	16	X7R	±5%, ±10%	3,5%	0,85	2238 781 15()56	C1206()R X7R 7BB334	4.000
1206	0,33	25	X7R	±5%, ±10%	2,5%	1,15	2222 911 15()56	C1206()K X7R 8BB334	3.000
1206	0,39	16	X7R	±5%, ±10%	3,5%	0,85	2238 781 15()57	C1206()R X7R 7BB394	4.000
1206	0,47	16	X7R	±5%, ±10%	3,5%	1,15	2222 781 15()58	C1206()K X7R 7BB474	3.000
1206	0,56	16	X7R	±5%, ±10%	3,5%	1,15	2222 781 15()59	C1206()K X7R 7BB564	3.000
1206	0,68	16	X7R	±5%, ±10%	3,5%	1,15	2222 781 15()61	C1206()K X7R 7BB684	3.000
1206	0,82	16	X7R	±5%, ±10%	3,5%	1,15	2222 781 15()62	C1206()K X7R 7BB824	3.000
1206	1	10	X7R	±10%	5,0%	0,85	2238 241 15()63	C1206()R X7R 6BB105	4.000
1206	1	16	X7R	±5%, ±10%	3,5%	1,15	2222 781 15()63	C1206()K X7R 7BB105	3.000
1206	1,2	10	X7R	±10%	5,0%	0,85	2238 241 15()64	C1206()R X7R 6BB125	4.000
1206	1,5	10	X7R	±10%	5,0%	1,15	2222 241 15()65	C1206()K X7R 6BB155	3.000
1206	1,8	10	X7R	±10%	5,0%	1,15	2222 241 15()66	C1206()K X7R 6BB185	3.000
1206	2,2	10	X7R	±10%	5,0%	1,15	2222 241 15()67	C1206()K X7R 6BB225	3.000
1206	3,3	10	X5R	±10%, ±20%	5,0%	1,60	2222 241 13()69	C1206()K X5R 6BB335	2.000
1206	4,7	10	X5R	±10%, ±20%	5,0%	1,60	2222 241 13()72	C1206()K X5R 6BB475	2.000
1206	4,7	6,3	X5R	±10%	7,0%	1,60	2250 201 13()72	C1206()K X5R 5BB475	3.000
1206	10	6,3	X5R	±10%, ±20%	7,0%	1,60	2250 201 13()76	C1206()K X5R 5BB106	2.000

Note.

1. Specify capacitance tolerance on position 10 of the 12NC: 5 = ±5%; 6 = ±10%; 7 = ±20%

For ordering code of large reel packing (330 mm/13"), change position 8 of the 12NC : specify 5 in stead of 1.

2. Specify capacitance tolerance on position 6 of the Clear Text Code: J = ± 5%; K = ±10%;M = ±20%

For ordering code of large reel packing (330 mm/13"), change position 6 of unified CTC: specify P in stead of R or F in stead of K .

1&2. For quantity per reel for large reel (330 mm/13") packing see table 3.

Surface-mount ceramic multilayer capacitors

High-capacitance: Class 2, X5R and X7R 6.3 V to 50 V

Table 2 (continued)

1210(3225 metric) size Product Specification, Ordering and Packaging Information.

Size	Cap. Value (µF)	DC Rated Voltage (Volt)	Temperature Characteristic TC	Capacitance Tolerance %	Loss Factor (%)	Thickness (mm)	Ordering Code 12 NC *1	Ordering Code Clear Text Code *2	Quantity per 7" reel
1210	0,1	50	X7R	±5%, ±10%	2,5%	0,95	2222 582 15()49	C1210()K X7R 9BB104	4.000
1210	0,12	50	X7R	±5%, ±10%	2,5%	1,20	2222 582 15()51	C1210()K X7R 9BB124	3.000
1210	0,15	50	X7R	±5%, ±10%	2,5%	1,20	2222 582 15()52	C1210()K X7R 9BB154	3.000
1210	0,18	50	X7R	±5%, ±10%	2,5%	1,20	2222 582 15()53	C1210()K X7R 9BB184	3.000
1210	0,22	25	X7R	±5%, ±10%	2,5%	0,95	2222 912 15()54	C1210()K X7R 8BB224	4.000
1210	0,22	50	X7R	±5%, ±10%	2,5%	1,20	2222 582 15()54	C1210()K X7R 9BB224	3.000
1210	0,27	25	X7R	±5%, ±10%	2,5%	0,95	2222 912 15()55	C1210()K X7R 9BB274	4.000
1210	0,33	25	X7R	±5%, ±10%	2,5%	0,95	2222 912 15()56	C1210()K X7R 8BB334	4.000
1210	0,39	25	X7R	±5%, ±10%	2,5%	0,95	2222 912 15()57	C1210()K X7R 8BB394	4.000
1210	0,47	25	X7R	±5%, ±10%	2,5%	1,20	2222 912 15()58	C1210()K X7R 8BB474	3.000
1210	1	25	X7R	±10%,±20%	3,5%	1,50	2222 912 15()63	C1210()K X7R 8BB105	2.000
1210	2,2	25	X7R	±10%,±20%	3,5%	1,50	2222 912 15()67	C1210()K X7R 8BB225	2.000
1210	3,3	25	X7R	±20%	3,5%	1,90	2222 912 15()69	C1210()K X7R 8BB335	2.000
1210	4,7	16	X7R	±20%	3,5%	1,90	2222 782 15()72	C1210()K X7R 7BB475	2.000
1210	10	10	X5R	±20%	3,5%	1,90	2222 242 13()76	C1210()K X5R 6BB106	2.000
1210	22	6,3	X5R	±20%	7,0%	2,50	2250 202 13()81	C1210()K X5R 5BB226	1.000

Note.

1. Specify capacitance tolerance on position 10 of the 12NC: 5 = ±5%; 6 = ±10%; 7 = ±20%

For ordering code of large reel packing (330 mm/13"), change position 8 of the 12NC : specify 5 in stead of 1.

2. Specify capacitance tolerance on position 6 of the Clear Text Code: J = ± 5%; K = ±10%;M = ±20%

For ordering code of large reel packing (330 mm/13"), change position 6 of unified CTC: specify P in stead of R or F in stead of K .

1&2. For quantity per reel for large reel (330 mm/13") packing see table 3.

Surface-mount ceramic multilayer capacitors

High-capacitance: Class 2, X5R and X7R 6.3 V to 50 V

Table 2 continued.

1812(4532 metric) size Product Specification, Ordering and Packaging Information.

Size	Cap. Value (µF)	DC Rated Voltage (Volt)	Temperature Characteristic TC	Capacitance Tolerance %	Loss Factor (%)	Thickness (mm)	Ordering Code 12 NC *1	Ordering Code Clear Text Code *2	Quantity per 7" reel
1812	0,1	50	X7R	±5%, ±10%	2,5%	1,20	2222 584 15()49	C1812()K X7R 9BB104	1.500
1812	0,12	50	X7R	±5%, ±10%	2,5%	1,20	2222 584 15()51	C1812()K X7R 9BB124	1.500
1812	0,15	50	X7R	±5%, ±10%	2,5%	1,20	2222 584 15()52	C1812()K X7R 9BB154	1.500
1812	0,18	50	X7R	±5%, ±10%	2,5%	1,20	2222 584 15()53	C1812()K X7R 9BB184	1.500
1812	0,22	50	X7R	±5%, ±10%	2,5%	1,20	2222 584 15()54	C1812()K X7R 9BB224	1.500
1812	0,27	50	X7R	±5%, ±10%	2,5%	1,20	2222 584 15()55	C1812()K X7R 9BB274	1.500
1812	0,33	50	X7R	±5%, ±10%	2,5%	1,20	2222 584 15()56	C1812()K X7R 9BB334	1.500
1812	0,39	50	X7R	±5%, ±10%	2,5%	1,20	2222 584 15()57	C1812()K X7R 9BB394	1.500
1812	0,47	50	X7R	±5%, ±10%	2,5%	1,20	2222 584 15()58	C1812()K X7R 9BB474	1.500
1812	0,56	50	X7R	±5%, ±10%	2,5%	1,20	2222 584 15()59	C1812()K X7R 9BB564	1.500
1812	0,68	50	X7R	±5%, ±10%	2,5%	1,60	2222 584 15()61	C1812()K X7R 9BB684	1.000
1812	0,82	50	X7R	±5%, ±10%	2,5%	1,60	2222 584 15()62	C1812()K X7R 9BB824	1.000
1812	1	50	X7R	±5%, ±10%	2,5%	1,60	2222 584 15()63	C1812()K X7R 9BB105	1.000
1812	10	25	X5R	±20%	3,5%	2,50	2222 914 13()76	C1812()K X5R 8BB106	500
1812	22	10	X5R	±20%	5,0%	2,50	2222 244 13()81	C1812()K X5R 6BB226	500
1812	47	6,3	X5R	±20%	7,0%	2,50	2250 204 13()85	C1812()K X5R 5BB476	500

Note.

1. Specify capacitance tolerance on position 10 of the 12NC: 5 = ±5%; 6 = ±10%; 7 = ±20%

For ordering code of large reel packing (330 mm/13"), change position 8 of the 12NC : specify 5 in stead of 1.

2. Specify capacitance tolerance on position 6 of the Clear Text Code: J = ± 5%; K = ±10%;M = ±20%

For ordering code of large reel packing (330 mm/13"), change position 6 of unified CTC: specify P in stead of R or F in stead of K .

1&2. For quantity per reel for large reel (330 mm/13") packing see table 3.

Surface-mount ceramic multilayer capacitors

High-capacitance: Class 2, X5R and X7R 6.3 V to 50 V

Table 3: Thickness classification and packaging quantity

THICKNESS CLASS (mm)	QUANTITY PER REEL					QUANTITY PER BULK CASE		
	Φ 180 mm; 7 "			Φ 330 mm; 13 "		0402	0603	0805
	PAPER	BLISTER		PAPER	BLISTER			
	8 mm	8 mm	12 mm	8 mm	8 mm			
0.50 ± 0.05	10 000	-	-	50000	-	50 000	-	-
0.60 ± 0.15	4 000	-	-	20000	-	-	-	10 000
0.80 ± 0.10	4 000	-	-	15000	-	-	15 000	-
0.85 ± 0.15	4 000	-	-	15000	-	-	-	8 000
0.5 to 1.0	-	4000	-	-	10000	-	-	-
0.9 to 1.3	-	3000	1500	-	10000	-	-	-
1.15 ± 0.10	-	3000	-	-	10000	-	-	-
1.2 to 1.75	-	2000	1200	-	-	-	-	-
1.25 ± 0.15	-	3000	-	-	10000	-	-	5 000
1.50 ± 0.10	-	2000	-	-	-	-	-	-
1.60 ± 0.15	-	2000 (1206) 1000 (1812)	-	-	-			
1.90 ± 0.20	-	2000	-	-	-	-	-	-
2.50 ± 0.20	-	1000	500	-	-	-	-	-
3.20 ± 0.30	-	-	250	-	-	-	-	-

ORDERING INFORMATION

Components may be ordered by using the Yageo 16-digit unified Yageo clear text code, the Phycomp 15-digit clear text code, or Phycomp's unique 12NC: Please consult your local sales office for preferred ordering codes.

Yageo unified clear text code

Example: C0805KKX5R5BB225

Series	Size.	Tolerance	Packaging	TC Material	Voltage	Termination	Process	Cap value
C	0402	J = ± 5%	R = 180 mm; 7" paper	X5R	5 = 6.3 V	B= Ni-Barrier	B=BME	154 = 150 000 pF; the third digit signifies the multiplying factor; 4 = x 10 000 5 = x 100 000 6 = x 1 000 000 7 = x 10 000 000
	0603	K = ±10%	K = 180 mm; 7" blister	X7R	6 = 10 V			
	0805	M = ±20%	P = 330 mm; 13" paper		7 = 16 V			
	1206		F = 330 mm; 13" blister		8 = 25 V			
	1210		C = bulk case		9 = 50 V			
	1812							

Surface-mount ceramic multilayer capacitors

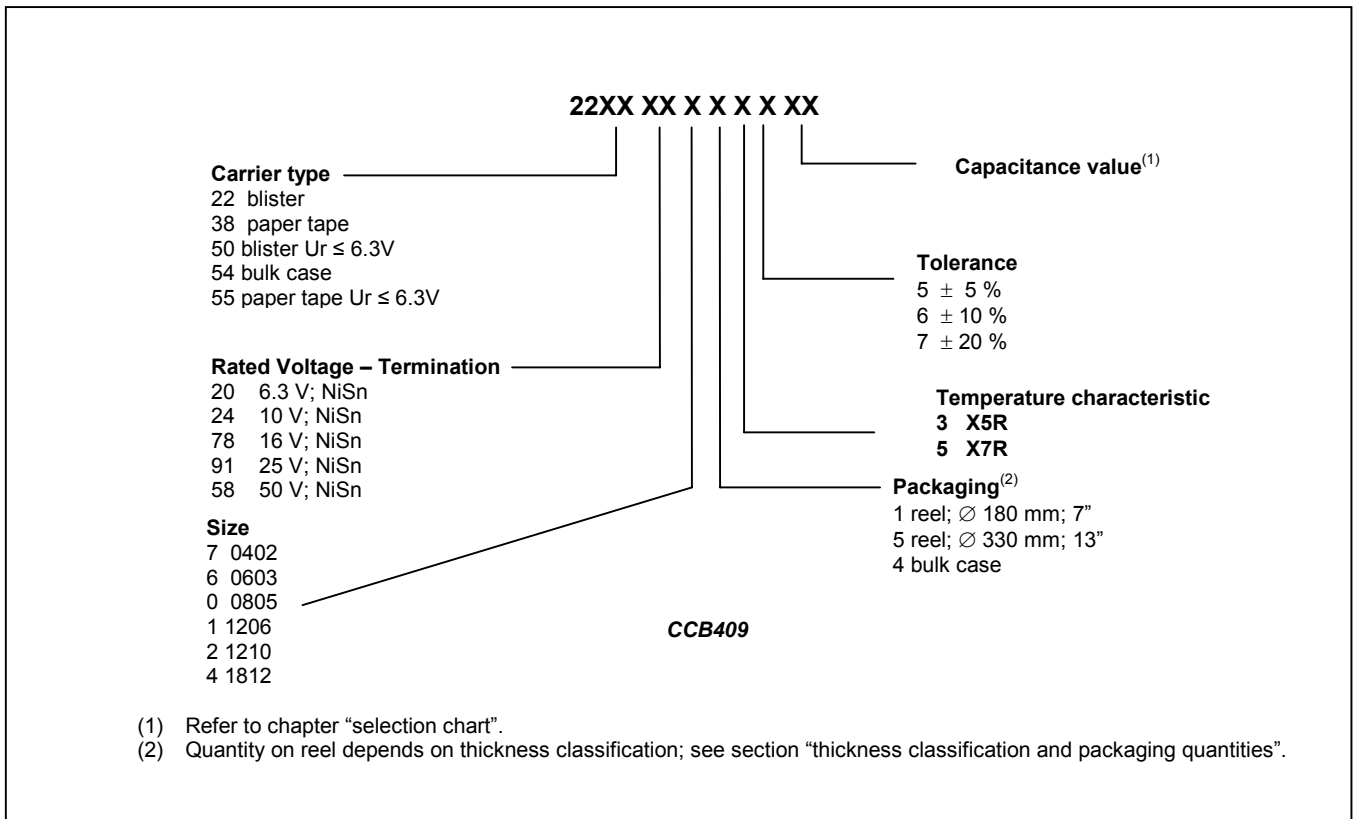
High-capacitance: Class 2, X5R and X7R 6.3 V to 50 V

Phycomp clear text code

Example: 06032R154K6BB0D

SIZE CODE	TEMP. CHAR.	CAPACITANCE	TOL.	VOLTAGE	TERMINATION	PACKAGING	MARKING	SERIES
0402	BJ = X5R	154 = 150 000 pF; the third digit signifies the multiplying factor;	J = ± 5%	5 = 6.3 V	B = NiSn	2 = 180 mm; 7" paper	0 = no marking	D = BME
0603	2R=X7R		K = ±10%	6 = 10 V		B = 180 mm; 7" blister		
0805		3 = x 1 000	M = ±20%	7 = 16 V		3 = 330 mm; 13" paper		
1206		4 = x 10 000		8 = 25 V		F = 330 mm; 13" blister		
1210		5 = x 100 000		9 = 50 V		P = bulk case		
1812		6 = x 1 000 000						
		7 = x 10 000 000						

Phycomp ordering code 12 NC



**Surface-mount ceramic
multilayer capacitors**
**High-capacitance: Class 2, X5R and X7R
6.3 V to 50 V**
ELECTRICAL CHARACTERISTICS
Class 2 capacitors; X5R/X7R dielectrics; NiSn termination

Unless otherwise stated all electrical values apply at an ambient temperature of 20 ± 1 °C, an atmospheric pressure of 86 to 105 kPa, and a relative humidity of 63 to 67%.

PARAMETER DESCRIPTION	VALUE
Capacitance range; note 1	68 nF to 47 μ F
Tolerance on capacitance after 1000 hours	$\pm 5\%$; $\pm 10\%$; $\pm 20\%$
Tan δ (loss factor)	See table 2
Insulation resistance after 1 minute at U_R (DC)	$R_{ins} \times C \geq 500$ s or 10 G Ω , whichever is less
Maximum capacitance change as function of temperature	$\pm 15\%$

Note

2. Measured using a four-gauge method ;at 20 °C; 1 ± 0.2 V and 1 kHz for $C \leq 22$ μ F; at 0.5 ± 0.1 V and 120 Hz for $C > 22$ μ F.

Surface-mount ceramic multilayer capacitors

High-capacitance: Class 2, X5R and X7R 6.3 V to 50 V

TEST AND REQUIREMENTS

Table 4: Soldering method, test specification category and requirement details.

Size	Cap. Value (μF)	DC Rated Voltage (Volt)	Temperature Characteristic TC	Soldering Method	Test Specification Category	Max. Loss Factor after Dampheat Test	Max. Loss Factor after Endurance Test
0402	0,068	6,3	X5R	Reflow	High Cap.	7%	7%
0402	0,068	10	X5R	Reflow	High Cap.	7%	7%
0402	0,1	6,3	X5R	Reflow	High Cap.	7%	7%
0402	0,1	10	X5R	Reflow	High Cap.	7%	7%
0603	0,068	16	X7R	Wave/Reflow	Standard	7%	7%
0603	0,082	16	X7R	Wave/Reflow	Standard	7%	7%
0603	0,1	16	X7R	Wave/Reflow	Standard	7%	7%
0603	0,15	10	X7R	Wave/Reflow	Standard	7%	7%
0603	0,18	10	X7R	Wave/Reflow	Standard	7%	7%
0603	0,22	10	X7R	Wave/Reflow	Standard	7%	7%
0603	0,33	10	X5R	Wave/Reflow	High Cap.	5%	5%
0603	0,47	10	X5R	Reflow	High Cap.	8%	8%
0603	0,68	6,3	X5R	Reflow	High Cap.	8%	8%
0603	1	6,3	X5R	Reflow	High Cap.	8%	8%
0805	0,068	16	X7R	Wave/Reflow	Standard	7%	7%
0805	0,068	25	X7R	Wave/Reflow	Standard	7%	7%
0805	0,068	50	X7R	Wave/Reflow	Standard	7%	7%
0805	0,082	16	X7R	Wave/Reflow	Standard	7%	7%
0805	0,082	25	X7R	Wave/Reflow	Standard	7%	7%
0805	0,082	50	X7R	Wave/Reflow	Standard	7%	7%
0805	0,1	16	X7R	Wave/Reflow	Standard	7%	7%
0805	0,1	25	X7R	Wave/Reflow	Standard	7%	7%
0805	0,1	50	X7R	Wave/Reflow	Standard	7%	7%
0805	0,12	16	X7R	Wave/Reflow	Standard	7%	7%
0805	0,15	16	X7R	Wave/Reflow	Standard	7%	7%
0805	0,18	16	X7R	Wave/Reflow	Standard	7%	7%
0805	0,22	10	X7R	Wave/Reflow	Standard	7%	7%
0805	0,22	16	X7R	Wave/Reflow	Standard	7%	7%
0805	0,27	10	X7R	Wave/Reflow	Standard	7%	7%
0805	0,27	16	X7R	Wave/Reflow	Standard	7%	7%
0805	0,33	10	X7R	Wave/Reflow	Standard	7%	7%
0805	0,33	16	X7R	Wave/Reflow	Standard	7%	7%
0805	0,39	10	X7R	Wave/Reflow	Standard	7%	7%
0805	0,39	16	X7R	Wave/Reflow	Standard	7%	7%
0805	0,47	10	X7R	Wave/Reflow	Standard	7%	7%
0805	0,47	16	X7R	Wave/Reflow	Standard	7%	7%
0805	0,56	10	X7R	Wave/Reflow	Standard	7%	7%
0805	0,68	10	X7R	Wave/Reflow	Standard	7%	7%
0805	0,82	10	X7R	Wave/Reflow	Standard	7%	7%
0805	1	10	X7R	Wave/Reflow	Standard	7%	7%

Surface-mount ceramic multilayer capacitors

High-capacitance: Class 2, X5R and X7R 6.3 V to 50 V

Table 4 (continued): Soldering method, test specification category and requirement details.

Size	Cap. Value (μF)	DC Rated Voltage (Volt)	Temperature Characteristic TC	Soldering Method	Test Specification Category	Max. Loss Factor after Dampheat Test	Max. Loss Factor after Endurance Test
0805	2,2	6,3	X5R	Reflow	High Cap.	8%	8%
0805	2,2	10	X5R	Reflow	High Cap.	8%	8%
0805	3,3	6,3	X5R	Reflow	High Cap.	8%	8%
0805	4,7	6,3	X5R	Reflow	High Cap.	8%	8%
1206	0,1	25	X7R	Wave/Reflow	Standard	7%	7%
1206	0,1	50	X7R	Wave/Reflow	Standard	7%	7%
1206	0,12	25	X7R	Wave/Reflow	Standard	7%	7%
1206	0,12	50	X7R	Wave/Reflow	Standard	7%	7%
1206	0,15	25	X7R	Wave/Reflow	Standard	7%	7%
1206	0,15	50	X7R	Wave/Reflow	Standard	7%	7%
1206	0,18	25	X7R	Wave/Reflow	Standard	7%	7%
1206	0,18	50	X7R	Wave/Reflow	Standard	7%	7%
1206	0,22	16	X7R	Wave/Reflow	Standard	7%	7%
1206	0,22	25	X7R	Wave/Reflow	Standard	7%	7%
1206	0,22	50	X7R	Wave/Reflow	Standard	7%	7%
1206	0,27	16	X7R	Wave/Reflow	Standard	7%	7%
1206	0,27	25	X7R	Wave/Reflow	Standard	7%	7%
1206	0,33	16	X7R	Wave/Reflow	Standard	7%	7%
1206	0,33	25	X7R	Wave/Reflow	Standard	7%	7%
1206	0,39	16	X7R	Wave/Reflow	Standard	7%	7%
1206	0,47	16	X7R	Wave/Reflow	Standard	7%	7%
1206	0,56	16	X7R	Wave/Reflow	Standard	7%	7%
1206	0,68	16	X7R	Wave/Reflow	Standard	7%	7%
1206	0,82	16	X7R	Wave/Reflow	Standard	7%	7%
1206	1	10	X7R	Wave/Reflow	Standard	7%	7%
1206	1	16	X7R	Wave/Reflow	Standard	7%	7%
1206	1,2	10	X7R	Wave/Reflow	Standard	7%	7%
1206	1,5	10	X7R	Wave/Reflow	Standard	7%	7%
1206	1,8	10	X7R	Wave/Reflow	Standard	7%	7%
1206	2,2	10	X7R	Wave/Reflow	Standard	7%	7%
1206	3,3	10	X5R	Reflow	High Cap.	5%	5%
1206	4,7	10	X5R	Reflow	High Cap.	5%	5%
1206	4,7	6,3	X5R	Wave/Reflow	Standard	7%	7%
1206	10	6,3	X5R	Reflow	High Cap.	8%	8%

Surface-mount ceramic multilayer capacitors

High-capacitance: Class 2, X5R and X7R 6.3 V to 50 V

Table 4 (continued): Soldering method, test specification category and requirement details.

Size	Cap. Value (μF)	DC Rated Voltage (Volt)	Temperature Characteristic TC	Soldering Method	Test Specification Category	Max. Loss Factor after Dampheat Test	Max. Loss Factor after Endurance Test
1210	0,1	50	X7R	Wave/Reflow	Standard	7%	7%
1210	0,12	50	X7R	Wave/Reflow	Standard	7%	7%
1210	0,15	50	X7R	Wave/Reflow	Standard	7%	7%
1210	0,18	50	X7R	Wave/Reflow	Standard	7%	7%
1210	0,22	25	X7R	Wave/Reflow	Standard	7%	7%
1210	0,22	50	X7R	Wave/Reflow	Standard	7%	7%
1210	0,27	25	X7R	Wave/Reflow	Standard	7%	7%
1210	0,33	25	X7R	Wave/Reflow	Standard	7%	7%
1210	0,39	25	X7R	Wave/Reflow	Standard	7%	7%
1210	0,47	25	X7R	Wave/Reflow	Standard	7%	7%
1210	1	25	X7R	Reflow	High Cap.	5%	5%
1210	2,2	25	X7R	Reflow	High Cap.	5%	5%
1210	3,3	25	X7R	Reflow	High Cap.	5%	5%
1210	4,7	16	X7R	Reflow	High Cap.	5%	5%
1210	10	10	X5R	Reflow	High Cap.	5%	5%
1210	22	6,3	X5R	Reflow	High Cap.	8%	8%
1812	0,1	50	X7R	Reflow	Standard	7%	7%
1812	0,12	50	X7R	Reflow	Standard	7%	7%
1812	0,15	50	X7R	Reflow	Standard	7%	7%
1812	0,18	50	X7R	Reflow	Standard	7%	7%
1812	0,22	50	X7R	Reflow	Standard	7%	7%
1812	0,27	50	X7R	Reflow	Standard	7%	7%
1812	0,33	50	X7R	Reflow	Standard	7%	7%
1812	0,39	50	X7R	Reflow	Standard	7%	7%
1812	0,47	50	X7R	Reflow	Standard	7%	7%
1812	0,56	50	X7R	Reflow	Standard	7%	7%
1812	0,68	50	X7R	Reflow	Standard	7%	7%
1812	0,82	50	X7R	Reflow	Standard	7%	7%
1812	1	50	X7R	Reflow	Standard	7%	7%
1812	10	25	X5R	Reflow	High Cap.	5%	5%
1812	22	10	X5R	Reflow	High Cap.	5%	5%
1812	47	6,3	X5R	Reflow	High Cap.	8%	8%

Surface-mount ceramic multilayer capacitors

High-capacitance: Class 2, X5R and X7R 6.3 V to 50 V

Test procedures and requirements for high capacitance values.

IEC 60384-10	TEST	Spec. Class	PROCEDURE	REQUIREMENTS
4.4	Mounting	Standard	The capacitor may be mounted on printed-circuit boards or ceramic substrates by applying wave soldering, reflow soldering (including vapour phase soldering) or conductive adhesive	No visible damage
		High cap	The capacitor may be mounted on printed-circuit boards or ceramic substrates by reflow soldering or also by wave soldering as indicated in Table 4.	No visible damage
4.5	Visual inspection and dimension check	Standard / High Cap	Any applicable method using x 10 magnification	In accordance with specification
4.6.1	Capacitance	Standard	f = 1 kHz; measuring voltage 1 VRMS at 20 °C	Within specified tolerance.
		High cap	f = 1 kHz for C ≤ 22 uF: measuring voltage 1 VRMS at 20 °C	Within specified tolerance, at 72 hr after deageing.
		High cap	f = 120 Hz for C > 22 uF: measuring voltage 0.5 VRMS at 20 °C	Within specified tolerance, at 72 hr after deageing.
4.6.2	Tan δ	Standard	f = 1 kHz; measuring voltage 1 VRMS at 20 °C	In accordance with specification given in table 2.
		High cap	f = 1 kHz for C ≤ 22 uF: measuring voltage 1 VRMS at 20 °C	
		High cap	f = 120 Hz for C > 22 uF: measuring voltage 0.5 VRMS at 20 °C	
4.6.3	Insulation resistance	Standard / High Cap	At UR (DC) for 1 minute	In accordance with specification
4.6.4	Voltage proof	Standard / High Cap	2.5 x UR for 1 minute	No breakdown or flashover
4.7.1	Temperature characteristic	Standard / High Cap	Between minimum and maximum temperature	In accordance with specification
4.8	Adhesion	Standard / High Cap	A force of 5 N applied for 10 sec to the line joining the terminations and in a plane parallel to the substrate	No visible damage
4.9	Bond strength of plating on end face	Standard / High Cap	Mounting in accordance with IEC 60384-1 paragraph 4.35	No visible damage
			Conditions: bending 1 mm at a rate of 1 mm/s, radius jig 340 mm	Delta C/C : ≤ 10%
4.10	Resistance to soldering heat Test Tb	Standard	Preconditioning :120 to 150 °C for 1 minute;	
			Solder bath temperature: 260 ± 5°C ; Dipping time 10±0.5 s	The termination shall be well tinned
			Recovery time 24 Hours.	Delta C/C : ≤ 10%
		High cap	Preconditioning: for size ≤1206:120 to 150 °C for 1 minute;	
			Preconditioning: for size >1206:100 to 120 °C for 1 minute and 170 to 200 °C for 1 minute.	
			Solder bath temperature: 260 ± 5°C ; Dipping time 10±0.5 s	The termination shall be well tinned
			Recovery time 48 Hours.	Delta C/C : ≤ 10%

Surface-mount ceramic multilayer capacitors

High-capacitance: Class 2, X5R and X7R 6.3 V to 50 V

Test procedures and requirements for high capacitance values (continued).

IEC 60384-10	TEST	Spec. Class	PROCEDURE	REQUIREMENTS
4.10	Resistance to leaching	Standard / High Cap	Dipping in a static solder bath; Solder bath temperature: $260 \pm 5^\circ\text{C}$; Dipping time 30 ± 0.5 s	Using visual enlargement of x 10, dissolution of the termination shall not exceed 10%
4.11	Solderability Test Ta	Standard / High Cap	Zero hour test, and test after storage (20 to 24 month) in original packing in normal atmosphere. Unmounted chips completely immersed in a solder bath at $235 \pm 5^\circ\text{C}$	
		Standard	Dipping time : 2 ± 0.5 s	The termination shall be well tinned.
		High cap	Dipping time size ≤ 1206 for 2 ± 0.5 s; Size > 1206 for 4 ± 0.5 s	The termination shall be well tinned.
4.12	Rapid change of temperature : Test Na	Standard / High Cap	Preconditioning;	No visual damage;
		Standard	5 cycles with following detail: 30 minutes at Lower category temperature, 30 minutes at Upper category temperature; 2-3 minutes for temperature change;	$ \Delta C/C : \leq 15\%$
		Standard / High Cap	5 cycles with following detail: 30 minutes at Lower category temperature; 2-3 minutes at room temperature; 30 minutes at Upper category temperature;	$ \Delta C/C : \leq 15\%$
		Standard / High Cap	Recovery time 48 Hours.	
4.14	Damp heat steady state: Test Ca	Standard	Preconditioning;	$ \Delta C/C : \leq 15\%$
			Duration and conditions: 56 days at 40°C ; 90 to 95% RH; Ur applied (max. 500V)	$\tan \delta$: According to Table 4
			Recovery time 48 Hours.	Rins: 1000 M Ω or Rins x Cr ≥ 25 s, whichever is less
		High cap	Preconditioning;	$ \Delta C/C : \leq 15\%$
			Initial measurements; After loading the products with a load of UR at 40°C for 1 hour initial measurements shall be carried out 48 hours after recovery at room temperature without load.	$\tan \delta$: According to Table 4
			Duration and conditions: 500 ± 12 hours at 40°C ; 90 to 95 % RH; Ur applied	Rins: 500 M Ω or Rins x Cr ≥ 25 s, whichever is less
			Final measurement after 48 hours recovery without load, at room temperature.	
4.15	Endurance	Standard	Preconditioning	$ \Delta C/C : \leq 15\%$
			Duration and conditions: 1000 hours at upper temperature category with 2 x Ur voltage applied.	$\tan \delta$: According to Table 4
				Rins: 2000 M Ω or Rins x Cr ≥ 50 s, whichever is less
		High cap	Preconditioning	
			Initial measurements; After loading the products with a load of 1.5 x UR at upper category temperature for 1 hour initial measurements shall be carried out 48 hours after deageing followed by 48 hours recovery.	$ \Delta C/C : \leq 15\% *1$ *1: 20 % for 0805 10 uF
			Duration and conditions: 1000 hours at upper temperature category with 1.5x Ur voltage applied.	$\tan \delta$: According to Table 4
			Final measurement after 48 hours recovery without load, at room temperature.	Rins: 1000 M Ω or Rins x Cr ≥ 50 s, whichever is less

**Surface-mount ceramic
multilayer capacitors****High Capacitance: Class 2, X5R and X7R
6.3 V to 50 V****REVISION HISTORY**

Revision	Date	Change Notification	Description
Rev.1	2003 Sep 16	-	- Updated company logo
Rev. 0	2002 Aug 16	-	-