Innovative Service Around the Globe YAGEO

DATA SHEET

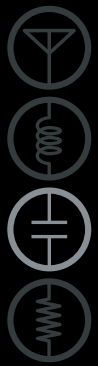
SURFACE-MOUNT CERAMIC MULTILAYER CAPACITORS

Mid-voltage: NP0/X7R

(Pb Free & RoHS compliant)

100 V TO 500 V

10 pF to 470 nF



YAGEO

Product specification – Sep 08, 2005 V. 0



SCOPE

This specification describes Mid-voltage NP0/X7R series chip capacitors with lead-free terminations.

APPLICATIONS

- PCs, hard disk, game PCs
- Power supplies
- LCD panel
- ADSL, modem

FEATURES

- Supplied in tape on reel
- Nickel-barrier end termination

ORDERING INFORMATION

Part number is identified by the series, size, tolerance, packing style, TC material, rated voltage and capacitance value.

YAGEO ORDERING CODE

CC	XXXX	X	X	XXX	X	B	X	XXX
	(1)	(2)	(3)	(4)	(5)		(6)	(7)

(1) SIZE – INCH BASED (METRIC)

0603 (1608)
0805 (2012)
1206 (3216)
1210 (3225)
1808 (4520)
1812 (4532)

(2) TOLERANCE

J = ±5%
K = ±10%

(3) PACKING STYLE

R = 7" paper tape
K = 7" blister tape
P = 13" paper tape
F = 13" blister tape
C = Bulk case

(4) TC MATERIAL

NP0
X7R

(5) RATED VOLTAGE

0 = 100 V
A = 200 V
Y = 250 V
B = 500 V

(6) PROCESS

B = BME
N = NME

(7) CAPACITANCE VALUE:

First two for significant figures and 3rd for number of zero
Letter "R" for decimal point

CONSTRUCTION

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.

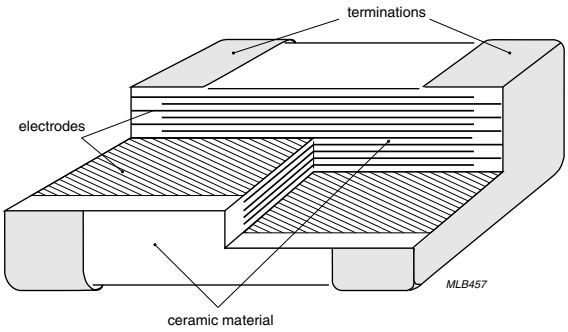


Fig. 1 Surface mounted multilayer ceramic capacitor construction

DIMENSION

For dimension see Table 1

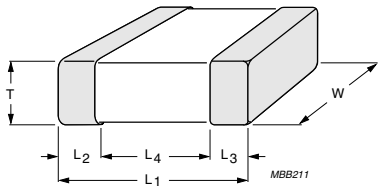


Fig. 2 Surface mounted multilayer ceramic capacitor dimension

Table 1

TYPE		CC0603	CC0805	CC1206	CC1210	CC1808	CC1812
L_1 (mm)		1.6 ±0.10	2.0 ±0.20	3.2±0.20	3.2 ±0.20	4.5 ±0.30	4.5 ±0.30
W (mm)		0.8 ±0.07	1.25 ±0.20	1.6±0.20	2.5 ±0.20	2.0 ±0.30	3.2 ±0.30
T (mm)		Refer to table 2 to 7					
L_2/L_3 (mm)	min.	0.20	0.25	0.25	0.25	0.25	0.25
	max.	0.50	0.75	0.75	0.75	0.75	0.75
L_4 (mm)	min.	0.60	0.55	1.40	1.40	2.20	2.20

CAPACITANCE RANGE & THICKNESS FOR NP0 100V

Table 2 For NP0 100 V sizes from 0603 to 1812

CAPACITANCE	100 V					
(pF)	0603	0805	1206	1210	1808	1812
10						
12						
15						
18						
22						
27						
33						
39						
47						
56						
68						
82						
100	0.8 ±0.10	0.6 ±0.10				
120						
150			0.6 ±0.10			
180						
220						
270						
330						
390						
470						
560						
680						
820						
1,000						
1,200						
1,500		0.85 ±0.10				
1,800						
2,200				0.6 ±0.10	1.25 ±0.20	1.25 ±0.20
2,700						
3,300		1.25 ±0.20				
3,900			0.85 ±0.10			
4,700						
5,600			1.15±0.15	0.85 ±0.10		

Table 2 For NP0 100 V sizes from 0603 to 1812 (continued)

CAPACITANCE	100 V					
(pF)	0603	0805	1206	1210	1808	1812
6,800			1.15±0.15			
8,200			1.25 ±0.20	0.85 ±0.10		1.25 ±0.20
10,000						
12,000				1.25 ±0.20		0.85 ±0.10
15,000						
18,000						1.15±0.15
22,000						
27,000						
33,000						
39,000						
47,000						

NOTE

1. Values in shaded cells indicate thickness class in mm.
2. Capacitance range < 10 pF is on request.

CAPACITANCE RANGE & THICKNESS FOR NP0 200/250 V

Table 3 For NP0 200/250 V sizes from 0603 to 1812

CAPACITANCE	200/250 V					
(pF)	0603	0805	1206	1210	1808	1812
10						
12						
15						
18						
22						
27						
33						
39						
47	0.8 ±0.10	0.6 ±0.10	0.6 ±0.10			
56						
68						
82						
100						
120						
150						
180						

Table 3 For NP0 200/250 V sizes from 0603 to 1812 (continued)

CAPACITANCE	200/250 V					
(pF)	0603	0805	1206	1210	1808	1812
220	0.8 ±0.10	0.85 ±0.10	0.6 ±0.10			
270						
330						
390						
470						
560		1.25 ±0.20				
680						
820		0.8 ±0.10				
1,000			0.85 ±0.10			
1,200				1.25 ±0.20		
1,500		1.25 ±0.20	1.15±0.15			
1,800			0.8 ±0.10	0.85 ±0.10		1.25 ±0.20
2,200					1.25 ±0.20	
2,700			1.25 ±0.20	1.15±0.15		
3,300						
3,900						0.85 ±0.10
4,700				1.25 ±0.20		1.15±0.15
5,600						
6,800						
8,200						
10,000						

NOTE

1. Values in shaded cells indicate thickness class in mm.
2. Capacitance range < 10 pF is on request.

CAPACITANCE RANGE & THICKNESS FOR NP0 500 V

Table 4 For NP0 500 V sizes from 0805 to 1812

CAPACITANCE	500 V				
(pF)	0805	1206	1210	1808	1812
10	0.6 ±0.10	0.6 ±0.10			
12					
15					
18					
22					
27					

Table 4 For NP0 500 V sizes from 0805 to 1812 (continued)

CAPACITANCE	500 V				
(pF)	0805	1206	1210	1808	1812
33	0.6 ±0.10	0.6 ±0.10	0.85 ±0.10	1.25 ±0.20	1.25 ±0.20
39					
47					
56					
68					
82					
100					
120					
150					
180					
220					
270					
330	0.85 ±0.10				
390					
470		0.85 ±0.10			
560	1.25 ±0.20	1.15±0.15	1.15±0.15	1.25 ±0.20	1.15±0.15
680					
820					
1,000					
1,200		0.8 ±0.10			
1,500		1.25 ±0.20			
1,800					
2,200			1.25 ±0.20		
2,700					
3,300					
3,900					
4,700					
5,600					
6,800					
8,200					
10,000					

NOTE

1. Values in shaded cells indicate thickness class in mm.
2. Capacitance range < 10 pF is on request.

CAPACITANCE RANGE & THICKNESS FOR X7R 100V

Table 5 For X7R 100 V sizes from 0805 to 1812

CAPACITANCE	100 V					
(pF)	0603	0805	1206	1210	1808	1812
100	0.8 ±0.10					
150						
220						
330						
470						
680						
1,000						
1,500						
2,200		0.6 ±0.10	0.85 ±0.10			
3,300						
4,700						
6,800						
10,000						
15,000		0.85 ±0.10				
22,000						
33,000						
47,000		1.25 ±0.20				0.85 ±0.10
68,000			1.15±0.15	0.85 ±0.10	1.25 ±0.20	
100,000						1.15±0.15
150,000				1.15±0.15		
220,000				1.6 ±0.20		
330,000						
470,000						1.6 ±0.20
680,000						
1,000,000						

NOTE

1. Values in shaded cells indicate thickness class in mm.

CAPACITANCE RANGE & THICKNESS FOR X7R 200/250 V

Table 6 For X7R 200/250 V sizes from 0805 to 1812

CAPACITANCE (pF)	200/250 V 0805	1206	1210	1808	1812
100					
150					
220					
330					
470					
680					
1,000	0.85 ±0.10				
1,500					
2,200					
3,300		0.85 ±0.10			
4,700					
6,800					
10,000	1.25 ±0.20		0.85 ±0.10		
15,000	0.8 ±0.10				
22,000	1.25 ±0.20	1.15±0.15			
33,000			1.15±0.15	1.25 ±0.20	
47,000		1.25 ±0.20			
68,000			1.25 ±0.20		
100,000					1.15±0.15
150,000					
220,000					1.6 ±0.20
330,000					2.0 ±0.20
470,000					
680,000					
1,000,000					

NOTE

1. Values in shaded cells indicate thickness class in mm.

CAPACITANCE RANGE & THICKNESS FOR X7R 500 V

Table 7 For X7R 500 V sizes from 0805 to 1812

CAPACITANCE (pF)	500 V 0805	1206	1210	1808	1812
100	0.8 ±0.10	1.15±0.15	1.15±0.15	1.25 ±0.20	1.15±0.15
150					
220					
330					
470					
680					
1,000					
1,500					
2,200					
3,300					
4,700					0.85 ±0.10
6,800					
10,000	1.25 ±0.20	1.25 ±0.20	1.25 ±0.20		
15,000					
22,000					1.25 ±0.20
33,000		1.6 ±0.20			
47,000					
68,000					
100,000					1.6 ±0.20
150,000					
220,000					
330,000					
470,000					
680,000					
1,000,000					

NOTE

1. Values in shaded cells indicate thickness class in mm.

THICKNESS CLASSES AND PACKING QUANTITY

Table 8

DESCRIPTION	SIZE CODE	THICKNESS CLASSIFICATION (mm)	8 mm TAPE WIDTH/AMOUNT PER REEL				12 mm TAPE WIDTH /AMOUNT PER REEL
			Ø180 mm, 7"		Ø330 mm, 13"		
			Paper	Blister	Paper	Blister	Ø180 mm, 7" Blister
Mid / High voltage	0603	0.8 ±0.10	4,000	---	---	---	---
	0805	0.6 ±0.10	4,000	---	---	---	---
		0.8 ±0.10	4,000	---	---	---	---
		0.85 ±0.1	4,000	---	---	---	---
		1.25 ±0.20	---	3,000	---	---	---
	1206	0.6 ±0.10	4,000	---	20,000	---	---
		0.8 ±0.10	4,000	---	---	---	---
		0.85 ±0.10	4,000	---	15,000	---	---
		1.00 ±0.10	---	3,000	---	10,000	---
		1.15 ±0.15	---	3,000	---	10,000	---
		1.25 ±0.20	---	3,000	---	---	---
	1210	0.6 ±0.10	---	4,000	---	15,000	---
		0.85 ±0.10	---	4,000	---	10,000	---
		1.15 ±0.15	---	3,000	---	10,000	---
		1.25 ±0.20	---	3,000	---	---	---
		1.6 ±0.20	---	2,000	---	---	---
	1808	1.15 ±0.15	---	---	---	---	1,500
		1.25 ±0.20	---	---	---	---	3,000
		1.35 ±0.15	---	---	---	---	1,000
		1.5 ±0.10	---	---	---	---	1,000
		1.6 ±0.20	---	---	---	---	2,000
		2.0 ±0.20	---	---	---	---	2,000
	1812	0.85 ±0.10	---	---	---	---	2,000
		1.15 ±0.15	---	---	---	---	1,500
		1.25 ±0.20	---	---	---	---	1,000
		1.35 ±0.15	---	---	---	---	1,000
		1.5 ±0.1	---	---	---	---	1,000
		1.6 ±0.2	---	---	---	---	1,000
		2.0 ±0.20	---	---	---	---	2,000

ELECTRICAL CHARACTERISTICS

NP0/X7R DIELECTRIC CAPACITORS; NISN TERMINATIONS

Unless otherwise stated all electrical values apply at an ambient temperature of 20±1 °C, an atmospheric pressure of 86 to 106 kPa, and a relative humidity of 63 to 67%.

Table 9

DESCRIPTION	VALUE
Capacitance range (1)	10 pF to 470 nF
Capacitance tolerance (1) :	
NP0	±5%
X7R	±10%
Dissipation factor (D.F.) (1):	
NP0	≤ 0.1%
X7R	≤ 2.5%
Insulation resistance after 1 minute at U_r (DC)	R_{ins} ≥ 10 GΩ or R_{ins} × C ≥ 500 seconds whichever is less
Maximum capacitance change as a function of temperature (temperature characteristic/coefficient):	
NP0	±30 ppm/°C
X7R	±15%
Operating temperature range:	
NP0/X7R	–55 °C to +125 °C

NOTE

1. NP0: frequency = 1 MHz for C ≤ 1 nF, measuring at voltage 1 V_{rms}; frequency = 1 KHz for C > 1 nF, measuring at voltage 1 V_{rms}
   X7R: frequency = 1 KHz for C ≤ 10 μF, measuring at voltage 1 V_{rms}.

TESTS AND REQUIREMENTS

Table 10 Test condition, procedure and requirements

TEST	TEST METHOD		PROCEDURE	REQUIREMENTS
Mounting	IEC 60384-21/22	4.3	The capacitors may be mounted on printed-circuit boards or ceramic substrates	No visible damage
Visual inspection and dimension check		4.4	Any applicable method using × 10 magnification	In accordance with specification
Capacitance		4.5.1	NP0: f = 1 MHz for C ≤ 1 nF, measuring at voltage 1 V_{rms} at 20 °C; f = 1 KHz for C > 1 nF, measuring at voltage 1 V_{rms} at 20 °C X7R: f = 1 KHz for C ≤ 10 μF, measuring at voltage 1 V_{rms} at 20 °C	Within specified tolerance
Dissipation factor (D.F.)		4.5.2	NP0: f = 1 MHz for C ≤ 1 nF, measuring at voltage 1 V_{rms} at 20 °C; f = 1 KHz for C > 1 nF, measuring at voltage 1 V_{rms} at 20 °C X7R: f = 1 KHz for C ≤ 10 μF, measuring at voltage 1 V_{rms} at 20 °C	In accordance with specification
Insulation resistance		4.5.3	At U_r (DC) for 1 minute	In accordance with specification
Voltage proof		4.5.4.2	Test voltage (DC) applied for 1 minute U_r ≤ 100 V: 2.5 × U_r applied to NP0/X7R series 100 V < U_r ≤ 200 V: 1.5 × U_r +100 V applied to NP0/X7R series 200 V < U_r ≤ 500 V: 1.3 × U_r +100 V applied to NP0/X7R series U_r > 500 V: 1.3 × U_r applied to NP0/X7R series I: 7.5 mA	No breakdown or flashover
Temperature characteristic		4.6	Between minimum and maximum temperature	NP0: |ΔC/C|: 30 ppm/°C X7R: |ΔC/C|: 15%
Adhesion		4.15	A force applied for 10 seconds to the line joining the terminations and in a plane parallel to the substrate for size ≥ 0603: a force of 5 N applied for size 0402: a force of 2.5 N applied	No visible damage

Table 10 Test condition, procedure and requirements (continued)

TEST	TEST METHOD		PROCEDURE	REQUIREMENTS
Bond strength of plating on end face	IEC 60384-21/22	4.8	Mounting in accordance with IEC 60384-22 paragraph 4.3 Conditions: bending 1 mm at a rate of 1 mm/s, radius jig 340 mm	No visible damage NP0: $\lvert\Delta C/C\rvert$: ≤ 1% or 0.5 pF whichever is greater X7R: $\lvert\Delta C/C\rvert$: ≤ 10%
Resistance to soldering heat		4.9	Precondition: 150 +0/–10 °C for 1 hour, then keep for 24 ±1 hours at room temperature Preheating: for size ≤ 1206: 120 to 150 °C for 1 minute Preheating: 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 seconds Recovery time: 24 ±2 hours.	The termination shall be well tinned NP0: $\lvert\Delta C/C\rvert$: ≤ 0.5% or 0.5 pF whichever is greater X7R: $\lvert\Delta C/C\rvert$: ≤ 10% D.F.: within initial specified value R_{ins}: within initial specified value
Solderability		4.10	Unmounted chips completely immersed in a solder bath at 235 ±5 °C Dipping time: 2 ±0.5 seconds Depth of immersion: 10 mm	The termination shall be well tinned.
Rapid change of temperature		4.11	Preconditioning; 150 +0/–10 °C for 1 hour, then keep for 24 ±1 hours at room temperature 5 cycles with following detail: 30 minutes at lower category temperature; 30 minutes at upper category temperature Recovery time 24 ±2 hours.	No visual damage NP0: $\lvert\Delta C/C\rvert$: ≤ 1% or 1 pF whichever is greater X7R: $\lvert\Delta C/C\rvert$: ≤ 15% D.F.: within initial specified value R_{ins}: within initial specified value
Damp heat, with U_r load		4.13	Initial measurements; after 150 +0/-10 °C for 1 hour, then keep for 24 ±1 hours at room temperature Duration and conditions: 500 ±12 hours at 40 ±2 °C; 90 to 95% RH; U_r applied Final measurement: perform a heat treatment at 150 +0/–10 °C for 1 hour, final measurements shall be carried out 24 ±1 hours after recovery at room temperature without load.	NP0: $\lvert\Delta C/C\rvert$: ≤ 2% or 1 pF whichever is greater X7R: $\lvert\Delta C/C\rvert$: ≤ 15% NP0: D.F.: 2 × initial value max. X7R ≥ 100 V: D.F. ≤ 5% NP0: R_{ins} ≥ 2,500 MΩ or $R_{ins} \times C_r$ ≥ 25 seconds, whichever is less X7R: R_{ins} ≥ 500 MΩ or $R_{ins} \times C_r$ ≥ 25 seconds, whichever is less

Table 10 Test condition, procedure and requirements (continued)

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Endurance	IEC 60384-21/22 4.14	Preconditioning; Initial measurements; after 150 +0/-10 °C for 1 hour, then keep for 24 ±1 hours at room temperature Duration and conditions: 1,000 ±12 hours at upper category temperature with 1.5 × U_r voltage applied Final measurement: perform a heat treatment at 150 +0/–10 °C for 1 hour, final measurements shall be carried out 24 ±1 hours after recovery at room temperature without load.	NP0: $\lvert\Delta C/C\rvert$: ≤ 2% or 1 pF whichever is greater X7R: $\lvert\Delta C/C\rvert$: ≤ 15% NP0: D.F.: 2 × initial value max. X7R ≥ 100 V: D.F. ≤ 5% NP0: R_{ins} ≥ 4,000 MΩ or $R_{ins} \times C_r$ ≥ 40 seconds, whichever is less X7R: R_{ins} ≥ 1,000 MΩ or $R_{ins} \times C_r$ ≥ 50 seconds, whichever is less

REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version 0	Sep 08, 2005	-	- New

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Yageo:

CC0805KRX7R9BB392 CC0805KRX7R9BB393 CC0805KRX7R9BB471 CC0805KRX7R9BB472
CC0805KRX7R9BB562 CC0805KRX7R9BB681 CC0805KRX7R9BB682 CC0805KRX7R9BB821
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