Innovative Service Around the Globe YAGEO

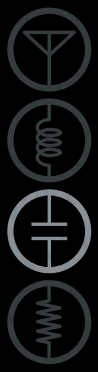
DATA SHEET

MULTILAYER CERAMIC CAPACITORS

CC Series

NP0

16V TO 100V



YAGEO

Product Specification - Aug. 13, 2003 V.04 Supersedes Date of Dec. 03, 2002

SCOPE

This specification describes Yageo CC NP0 series chip capacitors.

ORDERING INFORMATION

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

CC xxxx x x **NP0** x **BN** xxx
(1) (2) (3) (4) (5)

(1) SIZE

0402 (1005)
0603 (1608)
0805 (2012)
1206 (3216)
1210 (3225)
1812 (4832)

(2) TOLERANCE

B = ±0.1pF
C = ±0.25pF
D = ±0.5pF
F = ±1%
G = ±2%
J = ±5%

(3) PACKING STYLE

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

(4) RATED VOLTAGE

7 = 16V
8 = 25V
9 = 50V
0 = 100V

(5) CAPACITANCE VALUE:

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

CONSTRUCTION

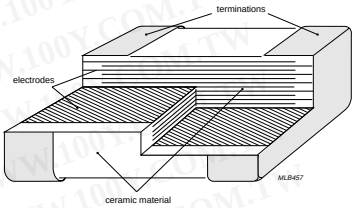


Fig. 1 Surface mounted multilayer ceramic capacitor construction

DIMENSION

For dimensions see Table 1

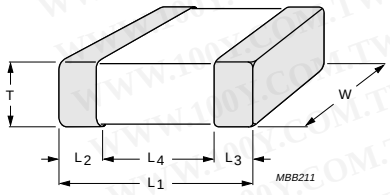


Fig. 2 Surface mounted multilayer ceramic capacitor dimension

Table 1

TYPE		CC0402	CC0603	CC0805	CC1206	CC1210	CC1812
L_1 (mm)		1.0±0.05	1.6±0.10	2.0±0.10	3.2±0.15	3.2±0.20	4.5±0.20
W (mm)		0.5±0.05	0.8±0.07	1.25±0.10	1.6±0.15	2.5±0.20	3.2±0.20
T (mm)	min.	0.45	0.73	0.50	0.50	0.50	0.50
	max.	0.55	0.87	1.35	1.35	1.80	1.80
L_2/L_3 (mm)	min.	0.15	0.20	0.25	0.25	0.25	0.25
	max.	0.30	0.60	0.75	0.75	0.75	0.75
L_4 (mm)	min.	0.40	0.40	0.55	1.40	1.40	2.20

CAPACITANCE RANGE & THICKNESS FOR 16V & 25V

Table 2

CAPACITANCE (pF)	16V 0402	16V 0603	25V 0402	25V 0603	25V 0805	25V 1206	25V 1210
150			0.5±0.05				
180							
220							
270	0.5±0.05						
330							
390							
470							
560							
680							
820							
1,000				0.8±0.07			
1,200							
1,500							
1,800							
2,200		0.8±0.07					
2,700							
3,300					0.85±0.1		
3,900					1.25±0.1		
4,700							
5,600							
6,800							
8,200						0.85±0.1	
10,000							
12,000							
15,000							0.5 to 1.0
18,000							
22,000							0.9 to 1.3

CAPACITANCE RANGE & THICKNESS FOR 50V & 100V

Table 3

CAPACITANCE (pF)	50V 0402	0603	0805	1206	1210	1812	100V 0603	0805	1206	1210	1812
0.47											
0.56											
0.68											
0.82											
1.0											
1.2											
1.5											
1.8											
2.2											
2.7											
3.3											
3.9											
4.7											
5.6											
6.8											
8.2											
10	0.5±0.05	0.8±0.07	0.6±0.1	0.6±0.1							
12											
15											
18											
22											
27											
33											
39											
47							0.8±0.07	0.6±0.1	0.6±0.1		
56											
82											
100											
120											
150											
180											
220											

CAPACITANCE RANGE & THICKNESS FOR 50V & 100V (CONT.)

Table 4

CAPACITANCE (pF)	50V 0402	0603	0805	1206	1210	1812	100V 0603	0805	1206	1210	1812
270		0.8±0.07	0.6±0.1	0.6±0.1	0.5 to 1.0	0.5 to 1.0	0.8±0.07	0.6±0.1	0.6±0.1	0.5 to 1.0	0.5 to 1.0
330											
390											
470											
560											
680											
820											
1,000											
1,200			0.85±0.1					0.85±0.1			
1,500											
1,800											
2,200			1.25±0.1	0.85±0.1		0.5 to 1.0		1.25±0.1	0.85±0.1		
2,700											
3,300											
3,900											
4,700				1.15±0.1					1.15±0.1		
5,600											
6,800											
8,200											
10,000											
12,000											
15,000											
18,000						0.9 to1.3					0.9 to 1.3
22,000											

THICKNESS CLASSES AND PACKING QUANTITY

Table 5

THICKNESS CLASSIFICATION (mm)	8mm TAPE WIDTH / AMOUNT PER REEL				12mm TAPE WIDTH / AMOUNT PER REEL	AMOUNT PER BULK CASE		
	Ø180mm, 7"		Ø330mm, 13"		Ø180mm, 7" Blister			
	Paper	Blister	Paper	Blister	1812	0402	0603	0805
0.5±0.05	10,000	---	50,000	---	---	50,000	---	---
0.6±0.10	4,000	---	20,000	---	---	---	---	10,000
0.8±0.07	4,000	---	15,000	---	---	---	15,000	---
0.85±0.10	4,000	---	15,000	---	---	---	---	8,000
0.5 to 1.0	---	4,000	---	10,000	2,000	---	---	---
0.9 to 1.3	---	3,000	---	10,000	1,500	---	---	---
1.15±0.10	---	3,000	---	10,000	---	---	---	---
1.25±0.10	---	3,000	---	10,000	---	---	---	5,000

ELECTRICAL CHARACTERISTICS

Table 6

CHARACTERISTICS	TEST CONDITIONS	REQUIREMENT
Operation temperature range	---	–55°C to +125°C
Temperature characteristic/coefficient (TC)	With respect to 20°C within operation temperature range	NP0 16V, 0±60ppm/K NP0>16V, 0±30ppm/K
Capacitance tolerance	With respect to 20°C C≤1000pF 1Vrms/1MHz C>1000pF 1Vrms/1KHz	C<5; ±0.1pF, ±0.25pF C≥5; ±0.25pF, ±0.5pF C≥10pF; ±2%, ±5%
Dissipation factor (Tan δ)	With respect to 20°C C≤1,000pF 1Vrms/1MHz C>1,000pF 1Vrms/1KHz	C<10pF Tan δ≤10(3/C+0.7) $\times 10^{-4}$ or 30×10^{-4} whichever is less C≥10pF, Tan δ≤10×10^{-4}
Insulation resistance (IR)	At Ur (rated voltage) for 1 minute Ur>500V, at 500V(DC) for 1minute	R_{ins} >10GΩ or $R_{ins}\times C$≥500s whichever is less
Dielectric withstanding Voltage	At 2.5xUr (for Ur≤100V) 1.5xUr+100V (for Ur>100V) for 5sec	No breakdown

TAPING REEL

Table 7

TAPE WIDE	8mm	8mm	12mm
ØA (mm)	180	330	180
ØB (mm)	62±1.5	62±1.5	62±1.5
ØD (mm)	20.5	20.5	20.5
ØC (mm)	12.75±0.15/–0	12.75±0.15/–0	12.75±0.15/–0
W (mm)	8.4+1.5/–0	8.4+1.5/–0	12.4+2/–0
T_{max} (mm)	14.4	14.4	18.4

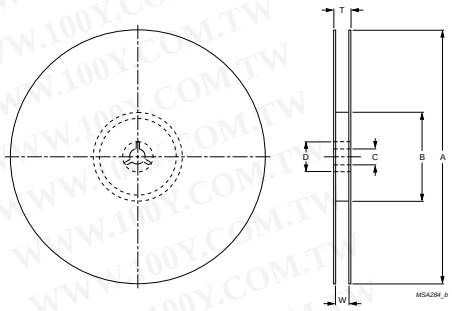


Fig. 3 Reel dimension

For dimension see Table 7

PAPER TAPE SPECIFICATION

Table 8

DIMENSION	0402	0603	0805	1206
A (mm)	0.62±0.05	1.10±0.05	1.65±0.05	2.0±0.1
B (mm)	1.12±0.05	1.90±0.05	2.4±0.05	3.5±0.1
W (mm)	8.0±0.2	8.0±0.2	8.0±0.2	8.0±0.2
E (mm)	1.75±0.1	1.75±0.1	1.75±0.1	1.75±0.1
F (mm)	3.5±0.05	3.5±0.05	3.5±0.05	3.5±0.05
P_0 (mm)	4±0.05	4±0.05	4±0.05	4±0.05
P_1 (mm)	2±0.05	4±0.1	4±0.1	4±0.1
P_2 (mm)	2±0.05	2±0.05	2±0.05	2±0.05
ØD_0 (mm)	1.5+0.1	1.5+0.1	1.5+0.1/–0	1.5+0.1/–0
T (mm)	0.6±0.05	0.95±0.05	0.95±0.05	0.95±0.05

For dimension see Table 8

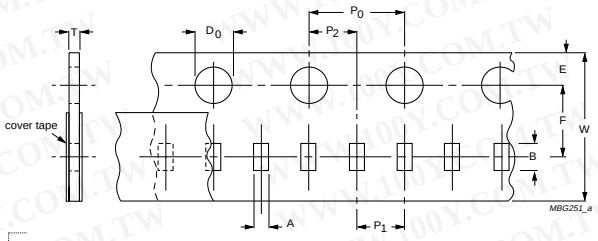


Fig. 4 Paper tape dimension

BLISTER TAPE SPECIFICATION

Table 9

DIMENSION	0805	1206	1210	1812
A (mm)	0.20	0.30	0.30	0.40
B (mm)	0.20	0.30	0.30	0.40
W (mm)	8.1±0.2	8.1±0.2	8.1±0.2	12.0±0.2
E (mm)	1.75±0.1	1.75±0.1	1.75±0.1	1.75±0.1
F (mm)	3.5±0.05	3.5±0.05	3.5±0.05	5.5±0.05
P_0 (mm)	4±0.1	4±0.1	4±0.1	4±0.1
P_1 (mm)	4±0.1	4±0.1	4±0.1	8±0.1
P_2 (mm)	2±0.05	2±0.05	2±0.05	2±0.05
ØD_0 (mm)	1.5+0.1/–0	1.5+0.1/–0	1.5+0.1/–0	1.5+0.1/–0
T_{max} (mm)	3.5	3.5	3.5	3.5

For dimension see Table 9

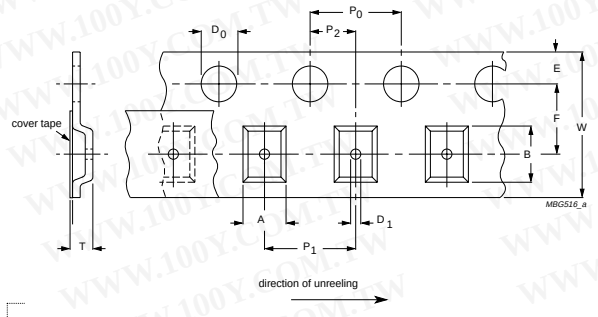


Fig. 5 Leader/trailer tape dimension

PACKING METHOD

LEADER/TRAILER TAPE SPECIFICATION

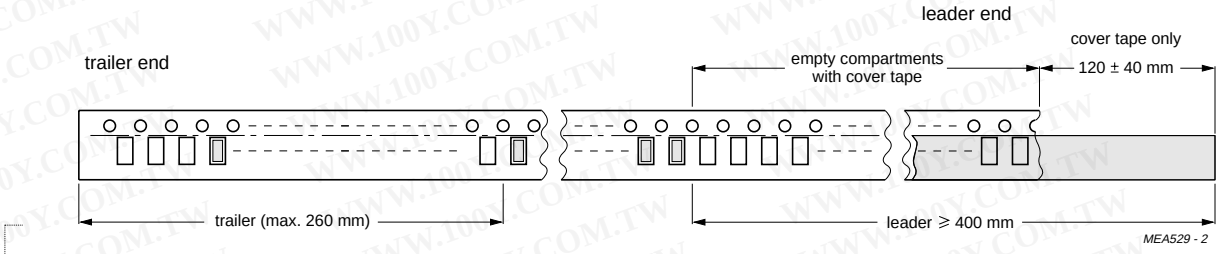


Fig. 6 Leader and trailer tape dimension

METHOD OF MOUNTING

For normal use the capacitors may be mounted on printed-circuit boards or ceramic substrates by applying wave soldering, reflow soldering (including vapor phase soldering) or conductive adhesive in accordance with CECC 00802 classification A.

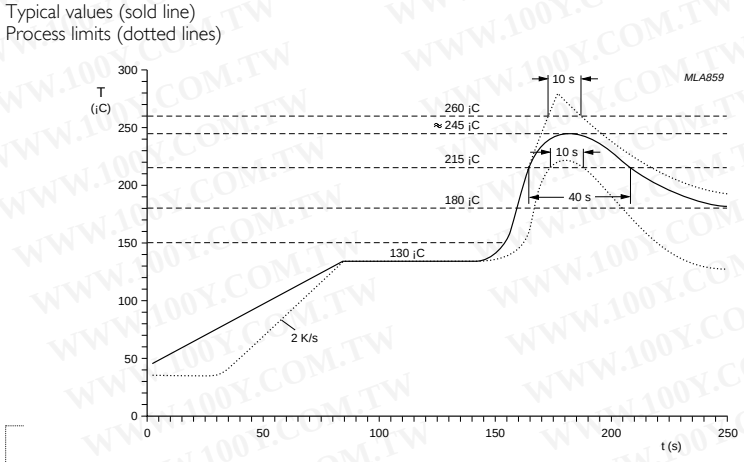


Fig. 7 Recommended reflow soldering profile

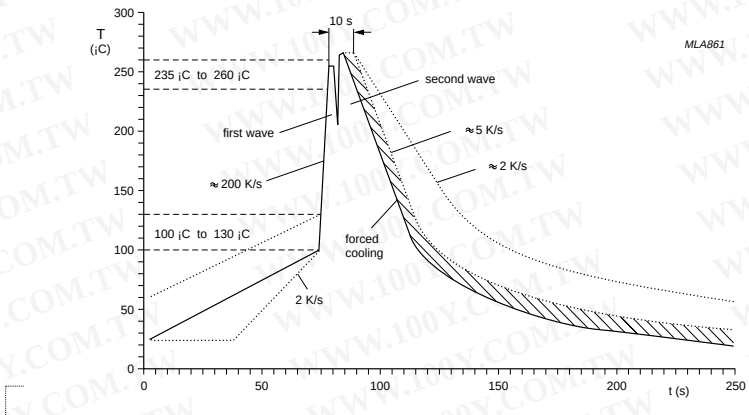


Fig. 8 Recommended wave soldering profile.

TEST AND REQUIREMENT

Table 10

IEC384-10	TEST ITEMS	CONDITIONS	REQUIREMENTS
4.9	Bending	Bending rate 1mm/s, jig. radius 340mm	ΔC/C≤1%
4.10	Resistance to soldering heat	260±5°C for 10±0.5s in static solder bath	ΔC/C within 0.5% or 0.5pF whichever is greater
4.11	Solderability	235±5°C for 2±0.5s in a static solder bath	75% minimum coverage of metallic area
4.12	Rapid change of temperature	–55°C to +125°C, 5 cycles	ΔC/C within 1% or 1pF, whichever is greater
4.14	Damp heat	At 40°C, 90 to 95% RH and Ur applied for 500 hours	ΔC/C within 2% or 1pF whichever is greater Tan δ≤2xspecified value IR≥2,500MΩ or RxC≥25s, whichever is less
4.15	Endurance	At upper category temperature 2xUr applied (1.5xUr for Ur>50V) for 1,000 hours	ΔC/C within 2% or 1pF whichever is greater Tan δ≤2xspecified value IR≥4,000MΩ or RxC≥40s, whichever is less

Innovative Service Around the Globe YAGEO

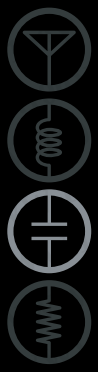
DATA SHEET

MULTILAYER CERAMIC CAPACITORS

CC Series

X7R

16V TO 100V



YAGEO

Product specification – Aug. 13, 2003 V.06 Supersedes Date of Jun. 19, 2003

SCOPE

This specification describes Yageo CC X7R series chip capacitors.

ORDERING INFORMATION

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

CC xxxx x x **X7R** x **BB** xxx
(1) (2) (3) (4) (5)

(1) SIZE – INCH BASED (METRIC)

0402 (1005)
0603 (1608)
0805 (2012)
1206 (3216)
1210 (3225)
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) RATED VOLTAGE

7 = 16V
8 = 25V
9 = 50V
0 = 100V

(5) CAPACITANCE VALUE:

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

CONSTRUCTION

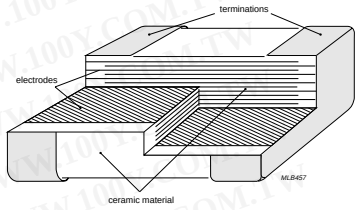


Fig. 1 Surface mounted multilayer ceramic capacitor construction

DIMENSION

For dimension see Table 1

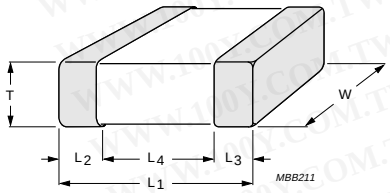


Fig. 2 Surface mounted multilayer ceramic capacitor dimension

Table 1

TYPE		CC0402	CC0603	CC0805	CC1206	CC1210	CC1812
L_1 (mm)		1.0±0.05	1.6±0.10	2.0±0.10	3.2±0.15	3.2±0.20	4.5±0.20
W (mm)		0.5±0.05	0.8±0.07	1.25±0.10	1.6±0.15	2.5±0.20	3.2±0.20
T (mm)	min.	0.45	0.73	0.50	0.50	0.50	0.50
	max.	0.55	0.87	1.35	1.35	1.80	1.80
L_2/L_3 (mm)	min.	0.15	0.20	0.25	0.25	0.25	0.25
	max.	0.30	0.60	0.75	0.75	0.75	0.75
L_4 (mm)	min.	0.40	0.40	0.55	1.40	1.40	2.20

CAPACITANCE RANGE & THICKNESS FOR 16V & 25V

Table 2

CAPACITANCE (nF)	16V 0402	0603	0805	1206	25V 0402	0603	0805	1206	1210
3.3					0.5±0.05				
4.7									
6.8	0.5±0.05								
10						0.8±0.07	0.6±0.1		
15									
22									
33		0.8±0.07	0.6±0.1						
47									
68							0.85±0.1		
100			0.85±0.1					0.85±0.1	
150									0.5 to 1.0
220				0.85±0.1					
330			1.25±0.1					1.15±0.1	
470									
680				1.15±0.1					
1,000									

CAPACITANCE RANGE & THICKNESS FOR 50V & 100V

Table 3

CAPACITANCE (nF)	50V 0402	0603	0805	1206	1210	1812	100V 0805	1206	1210	1812
0.10	0.5±0.05	0.8±0.07	0.6±0.1	0.85±0.1	0.5 to 1.0	0.9 to 1.3	0.6±0.1	0.85±0.1	0.5 to 1.0	0.9 to 1.3
0.15										
0.22										
0.33										
0.47										
0.68										
1.0										
1.5										
2.2										
3.3										
4.7										
6.8										
10							0.85±0.1			
15										
22										
33			0.85±0.1							
47										
68			0.85±0.1					1.15±0.1		
100										
150				1.15±0.1						
220										
330										
470										
680										
1,000						1.2 to 1.75				

THICKNESS CLASSES AND PACKING QUANTITY

Table 4

THICKNESS CLASSIFICATION (mm)	8mm TAPE WIDTH / AMOUNT PER REEL				12mm TAPE WIDTH / AMOUNT PER REEL	AMOUNT PER BULK CASE		
	Ø180mm, 7"		Ø330mm, 13"		Ø180mm, 7" Blister			
	Paper	Blister	Paper	Blister	1812	0402	0603	0805
0.5±0.05	10,000	---	50,000	---	---	50,000	---	---
0.6±0.10	4,000	---	20,000	---	---	---	---	10,000
0.8±0.07	4,000	---	15,000	---	---	---	15,000	---
0.85±0.10	4,000	---	15,000	---	---	---	---	8,000
0.5 to 1.0	---	4,000	---	10,000	2,000	---	---	---
0.9 to 1.3	---	3,000	---	10,000	1,500	---	---	---
1.15±0.10	---	3,000	---	10,000	---	---	---	---
1.25±0.10	---	3,000	---	10,000	---	---	---	5,000
1.2 to 1.75	---	---	---	---	1,000	---	---	---

ELECTRICAL CHARACTERISTICS

Table 5

CHARACTERISTICS	TEST CONDITIONS	REQUIREMENT
Operation temperature range	---	–55°C to +125°C
Temperature characteristic/coefficient (TC)	With respect to 20°C within operation temperature range	±15%
Capacitance tolerance	1Vrms/1KHz at 20°C	±5%, ±10%
Dissipation factor (Tan δ)	1Vrms/1KHz at 20°C	25V, 50V &100V; ≤2.5% 16V; ≤3.5%
Insulation resistance (IR)	At Ur (rated voltage) for 1 minute	C≤10nF; R_{ins} ≥10GΩ C>10nF; R_{ins} × C≥500s
Dielectric withstanding Voltage	At 2.5×Ur (for Ur≤100V) 1.5×Ur+100V for 5sec	No breakdown

TAPING REEL

Table 6

TAPE WIDE	8mm	8mm	12mm
ØA (mm)	180	330	180
ØB (mm)	62±1.5	62±1.5	62±1.5
ØD (mm)	20.5	20.5	20.5
ØC (mm)	12.75±0.15/–0	12.75±0.15/–0	12.75±0.15/–0
W (mm)	8.4+1.5/–0	8.4+1.5/–0	12.4+2/–0
T_{max} (mm)	14.4	14.4	18.4

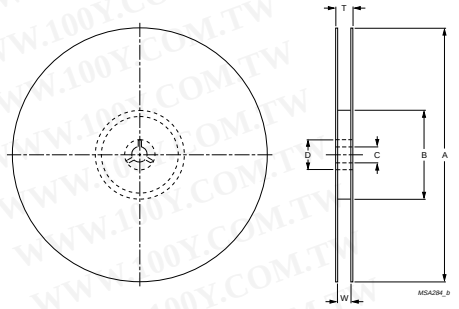


Fig. 3 Reel dimension

For dimension see Table 6

PAPER TAPE SPECIFICATION

Table 7

DIMENSION	0402	0603	0805	1206
A (mm)	0.62±0.05	1.10±0.05	1.65±0.05	2.0±0.1
B (mm)	1.12±0.05	1.90±0.05	2.4±0.05	3.5±0.1
W (mm)	8.0±0.2	8.0±0.2	8.0±0.2	8.0±0.2
E (mm)	1.75±0.1	1.75±0.1	1.75±0.1	1.75±0.1
F (mm)	3.5±0.05	3.5±0.05	3.5±0.05	3.5±0.05
P_0 (mm)	4±0.05	4±0.05	4±0.05	4±0.05
P_1 (mm)	2±0.05	4±0.1	4±0.1	4±0.1
P_2 (mm)	2±0.05	2±0.05	2±0.05	2±0.05
ØD_0 (mm)	1.5+0.1	1.5+0.1	1.5+0.1/–0	1.5+0.1/–0
T (mm)	0.6±0.05	0.95±0.05	0.95±0.05	0.95±0.05

For dimension see Table 7

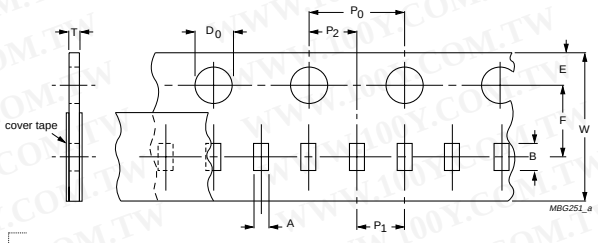


Fig. 4 Paper tape dimension

BLISTER TAPE SPECIFICATION

Table 8

DIMENSION	0805	1206	1210	1812
A (mm)	0.20	0.30	0.30	0.40
B (mm)	0.20	0.30	0.30	0.40
W (mm)	8.1±0.2	8.1±0.2	8.1±0.2	12.0±0.2
E (mm)	1.75±0.1	1.75±0.1	1.75±0.1	1.75±0.1
F (mm)	3.5±0.05	3.5±0.05	3.5±0.05	5.5±0.05
P_0 (mm)	4±0.1	4±0.1	4±0.1	4±0.1
P_1 (mm)	4±0.1	4±0.1	4±0.1	8±0.1
P_2 (mm)	2±0.05	2±0.05	2±0.05	2±0.05
ØD_0 (mm)	1.5+0.1/–0	1.5+0.1/–0	1.5+0.1/–0	1.5+0.1/–0
T_{max} (mm)	3.5	3.5	3.5	3.5

For dimension see Table 8

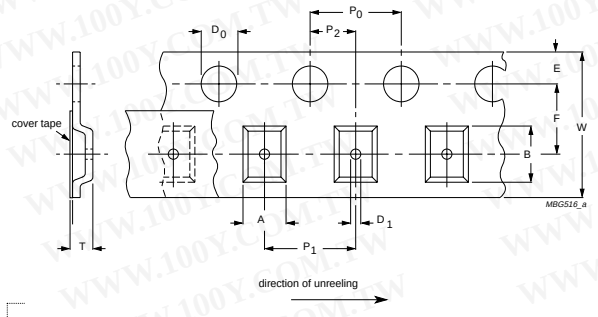


Fig. 5 Leader/trailer tape dimension

PACKING METHOD

LEADER/TRAILER TAPE SPECIFICATION

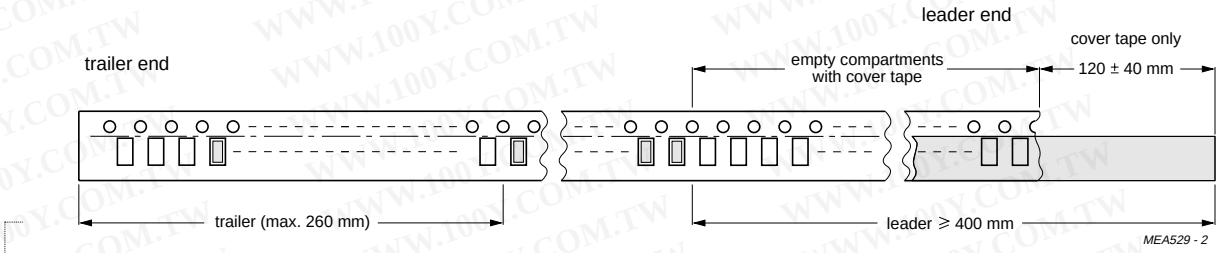


Fig. 6 Leader and trailer tape dimension

METHOD OF MOUNTING

For normal use the capacitors may be mounted on printed-circuit boards or ceramic substrates by applying wave soldering, reflow soldering (including vapor phase soldering) or conductive adhesive in accordance with CECC 00802 classification A.

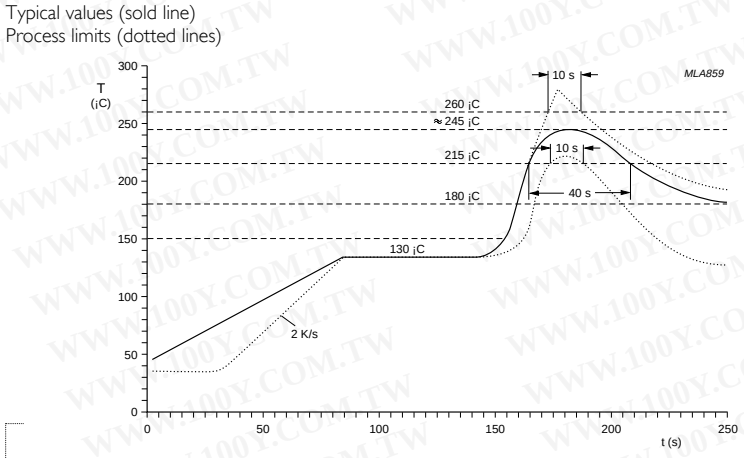


Fig. 7 Recommended reflow soldering profile

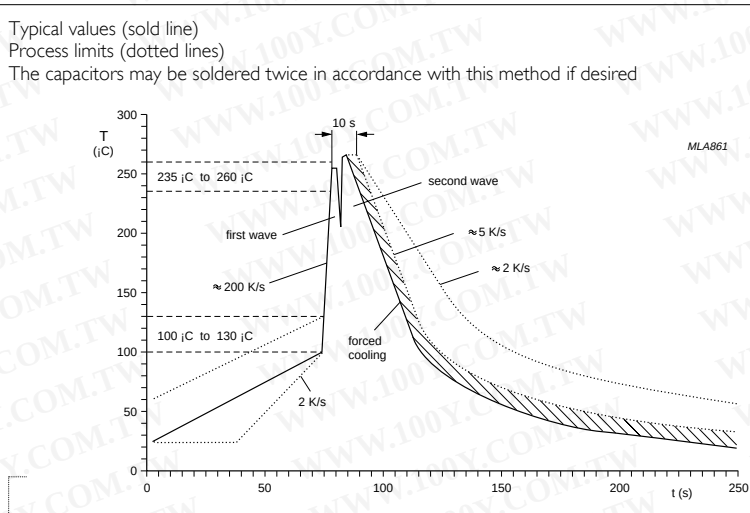


Fig. 8 Recommended wave soldering profile

TEST AND REQUIREMENT

Table 9

IEC384-10	TEST ITEMS	CONDITIONS	REQUIREMENTS
4.9	Bending	Bending rate 1mm/s, jig. radius 340mm	ΔC/C≤10%
4.10	Resistance to soldering heat	260±5°C for 10±0.5s in static solder bath	–5%≤ΔC/C≤10%
4.11	Solderability	235±5°C for 2±0.5s in a static solder bath	75% minimum coverage of metallic area
4.12	Rapid change of temperature	Preconditioning –55°C to +125°C, 5cycles	ΔC/C within 15%
4.14	Damp heat	Preconditioning At 40°C, 90 to 95% RH and Ur applied (max. 500V) for 500 hours	ΔC/C within 15% Tan δ≤7% IR≥500MΩ or RxC≥25s whichever is less
4.15	Endurance	Preconditioning 2xUr applied for 1,000 hours, at upper category temperature	ΔC/C within 20% Tan δ≤7% IR≥1,000MΩ or RxC≥50s whichever is less

Innovative Service Around the Globe YAGEO

DATA SHEET

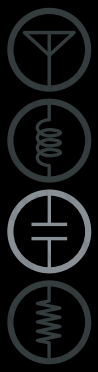
SURFACE-MOUNT CERAMIC MULTILAYER CAPACITORS

High-capacitance: Class 2, X5R/X7R

(Pb Free & RoHS compliant)

6.3 V TO 25 V

56 nF to 47 µF



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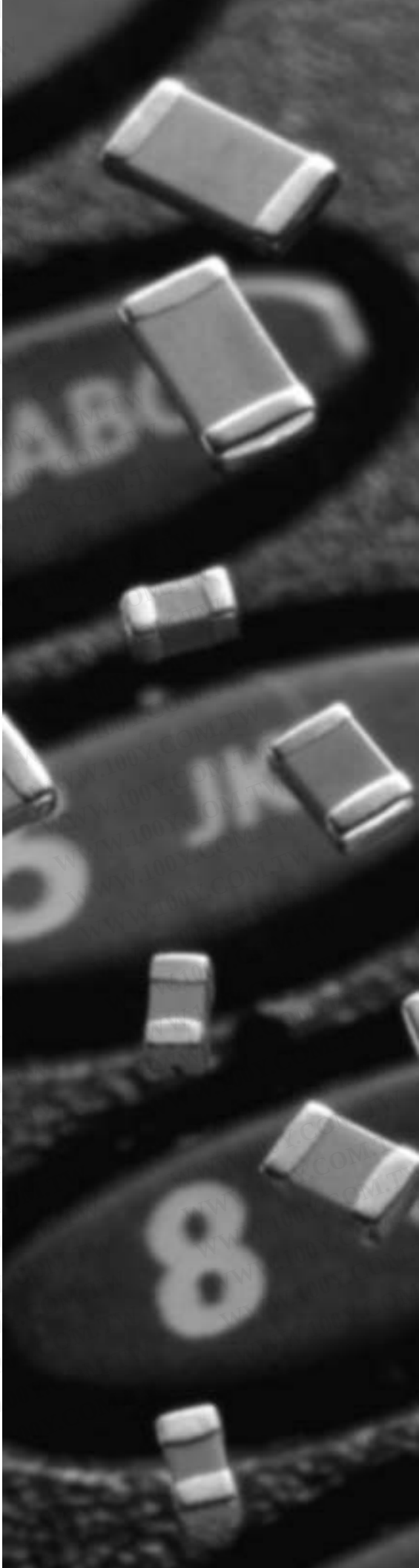
Product specification – Feb 18, 2005 V.10



SCOPE

This specification describes high capacitance X5R/X7R series chip capacitors with lead-free terminations.

APPLICATIONS

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

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	BB	XXX
	(1)	(2)	(3)	(4)	(5)		(6)

(1) SIZE – INCH BASED (METRIC)

0402 (1005)
0603 (1608)
0805 (2012)
1206 (3216)
1210 (3225)
1812 (4532)

(2) TOLERANCE

J = ±5%
K = ±10%
M = ±20%

(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

X5R
X7R

(5) RATED VOLTAGE

5 = 6.3 V
6 = 10 V
7 = 16 V
8 = 25 V

(6) 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.

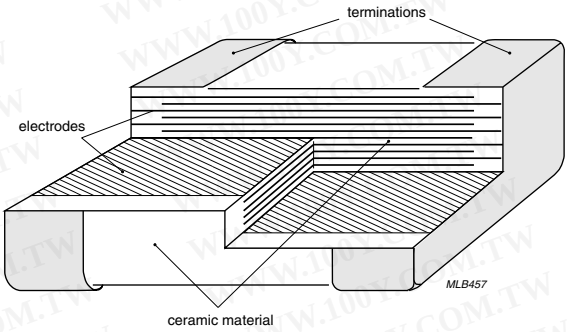


Fig. 1 Surface mounted multilayer ceramic capacitor construction

DIMENSION

For dimension see Table 1

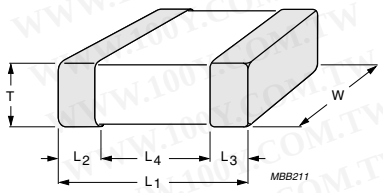


Fig. 2 Surface mounted multilayer ceramic capacitor dimension

Table 1

TYPE		CC0402	CC0603	CC0805	CC1206	CC1210	CC1812
L_1 (mm)		1.0 ±0.05	1.6 ±0.10	2.0 ±0.20	3.2±0.20	3.2 ±0.20	4.5 ±0.20
W (mm)		0.5 ±0.05	0.8 ±0.07	1.25 ±0.20	1.6±0.20	2.5 ±0.20	3.2 ±0.20
T (mm)		Refer to table 2 to 4					
L_2/L_3 (mm)	min.	0.15	0.20	0.25	0.25	0.25	0.25
	max.	0.30	0.50	0.75	0.75	0.75	0.75
L_4 (mm)	min.	0.40	0.60	0.55	1.40	1.40	2.20

CAPACITANCE RANGE & THICKNESS FOR X5R/X7R 6.3 V

Table 2

CAPACITANCE (µF)	6.3 V 0402	0603	0805	1206	1210
0.056					
0.068					
0.082					
0.10	0.5 ±0.05				
0.12					
0.15					
0.18					
0.22					
0.27					
0.33					
0.39					
0.47					
0.56					
0.68					
0.82					
1.0		0.8 ±0.07			
1.5		0.8 ±0.1			
2.2			1.25 ±0.1		
3.3			1.25 ±0.2		
4.7					
6.8					
10				1.6 ±0.2	
22					2.5 ±0.2
47					

NOTE

1. Values in shaded cells indicate thickness class in mm.
2. X5R: ; X7R: ; both X5R and X7R: .

CAPACITANCE RANGE & THICKNESS FOR X5R/X7R 10V

Table 3

CAPACITANCE (µF)	10 V 0402	0603	0805	1206	1210
0.056	0.5 ±0.05				
0.068					
0.082					
0.10	0.5 ±0.05				
0.12	0.5 ±0.05				
0.15					
0.18					
0.22					
0.27		0.8 ±0.07			
0.33					
0.39					
0.47					
0.56		0.8 ±0.07			
0.68					
0.82					
1.0			1.25 ±0.1		
1.5		0.8 ±0.1			
2.2			1.25 ±0.1		
3.3			1.25 ±0.2		
4.7				1.6 ±0.2	
6.8				1.6 ±0.2	
10					1.9 ±0.2
22					2.5 ±0.2

NOTE

1. Values in shaded cells indicate thickness class in mm.
2. X5R: ; X7R: ; both X5R and X7R: .

CAPACITANCE RANGE & THICKNESS FOR X5R/X7R 16V TO 25V

Table 4

CAPACITANCE (µF)	16V 0402	0603	0805	1206	1210	1812	25V 0603	1206	1210
0.056	0.5 ±0.05								
0.068									
0.082									
0.10									
0.12		0.8 ±0.07							
0.15									
0.18									
0.22									
0.27									
0.33							0.8 ±0.07		
0.39									
0.47									
0.56			1.25 ±0.2						
0.68									
0.82									
1.0								1.6 ±0.2	
1.5									
2.2				1.15 ±0.1					
3.3					1.9 ±0.2				1.9 ±0.2
4.7				1.6 ±0.2	1.9 ±0.2				
6.8					2.5 ±0.2				2.5 ±0.2
10									
22						2.5 ±0.2			

NOTE

1. Values in shaded cells indicate thickness class in mm.
2. X5R: ; X7R: ; both X5R and X7R: .

THICKNESS CLASSES AND PACKING QUANTITY

Table 5

DESCRIPTION	SIZE CODE	THICKNESS CLASSIFICATION (mm)	8 mm TAPE WIDTH/AMOUNT PER REEL				12 mm TAPE WIDTH /AMOUNT PER REEL	AMOUNT PER BULK CASE
			Ø180 mm, 7"		Ø330 mm, 13"			
			Paper	Blister	Paper	Blister	Ø180 mm, 7" Blister	
Discrete capacitors	0201	0.3 ±0.03	15,000	---	50,000	---	---	---
	0402	0.5 ±0.05	10,000	---	50,000	---	---	50,000
	0603	0.8 ±0.07	4,000	---	15,000	---	---	15,000
	0805	0.6 ±0.10	4,000	---	20,000	---	---	10,000
		0.85 ±0.1	4,000	---	15,000	---	---	8,000
		1.25 ±0.10	---	3,000	---	10,000	---	5,000
	1206	0.6 ±0.10	4,000	---	20,000	---	---	---
		0.85 ±0.10	4,000	---	15,000	---	---	---
		1.00 / 1.15 ±0.10	---	3,000	---	10,000	---	---
		1.6 ±0.15	---	2 500	---	10,000	---	---
		1.6 ±0.20	---	2,000	---	10,000	---	---
	1210	0.6 / 0.7 ±0.10	---	4,000	---	15,000	---	---
		0.85 ±0.10	---	4,000	---	10,000	---	---
		1.15 ±0.10	---	3,000	---	10,000	---	---
		1.15 ±0.15	---	3,000	---	10,000	---	---
		1.5 ±0.10	---	2,000	---	---	---	---
		1.6 / 1.9 ±0.20	---	2,000	---	---	---	---
		2.5 ±0.20	---	1,000	---	---	---	---
	1808	1.15 ±0.15	---	---	---	---	1 500	---
		1.35 ±0.15	---	---	---	---	1,000	---
		1.5 ±0.10	---	---	---	---	1,000	---
	1812	0.6 / 0.85 ±0.10	---	---	---	---	2,000	---
		1.15 ±0.10	---	---	---	---	1,500	---
		1.15 ±0.15	---	---	---	---	1,500	---
		1.35 ±0.15	---	---	---	---	1,000	---
		1.5 ±0.1	---	---	---	---	1,000	---
		1.6 ±0.2	---	---	---	---	1,000	---
Low inductance	0306	0.5 ±0.10	4,000	---	15,000	---	---	---
	0508	0.85 ±0.10	4,000	---	15,000	---	---	---
	0612	0.85 ±0.10	4,000	---	15,000	---	---	---
Arrays	0508	0.6 ±0.10	4,000	---	---	---	---	---
		0.85 ±0.10	4,000	---	---	---	---	---
	0612	0.8 ±0.10	4,000	---	---	---	---	---
		1.2 ±0.10	---	3,000	---	---	---	---

ELECTRICAL CHARACTERISTICS

CLASS 2 CAPACITORS; X5R/X7R DIELECTRIC; 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 6

DESCRIPTION	VALUE
Capacitance range (1)	56 nF to 47 µF
Capacitance tolerance (1) (2)	±5%, ±10%, and ±20%
Dissipation factor (D.F.) (1)	See table 7 - 12
Insulation resistance after 1 minute at U_r (DC)	$R_{ins} \geq 10$ GΩ or $R_{ins} \times C \geq 500$ seconds whichever is less
Maximum capacitance change as a function of temperature (temperature characteristic/coefficient)	±15%
Operating temperature range: X5R X7R	 –55 °C to +85 °C –55 °C to +125 °C

NOTE

1. f=1 KHz for C ≤ 10 µF; measuring at voltage 1 V_{rms}; f=120 Hz for C > 10 µF; measuring at voltage 0.5 V_{rms}.
2. ±5% capacitance tolerance is on request for capacitance value < 1 uF.

DISSIPATION FACTOR (D.F.) FOR SIZES 0402 TO 1812

Table 7 For size 0402 (1005 metric)

TC	SIZE	CAPACITANCE VALUE (µF)	CAPACITANCE TOLERANCE (%)	DC RATED VOLTAGE (V)	DISSIPATION FACTOR-D.F. (%)	THICKNESS (mm)
X5R	0402	0.10	±10; ±20	6.3	7.0	0.50
X5R	0402	0.12	±10; ±20	6.3	7.0	0.50
X5R	0402	0.15	±10; ±20	6.3	7.0	0.50
X5R	0402	0.18	±10; ±20	6.3	7.0	0.50
X5R	0402	0.22	±10; ±20	6.3	7.0	0.50
X5R	0402	0.27	±10; ±20	6.3	10.0	0.50
X5R	0402	0.33	±10; ±20	6.3	10.0	0.50
X5R	0402	0.39	±10; ±20	6.3	10.0	0.50
X5R	0402	0.47	±10; ±20	6.3	10.0	0.50
X5R	0402	0.56	±10; ±20	6.3	10.0	0.50
X5R	0402	0.68	±10; ±20	6.3	10.0	0.50
X5R	0402	0.82	±10; ±20	6.3	10.0	0.50
X5R	0402	1.00	±10; ±20	6.3	10.0	0.50
X7R	0402	0.056	±10; ±20	10	5.0	0.50
X7R	0402	0.068	±10; ±20	10	5.0	0.50
X7R	0402	0.082	±10; ±20	10	5.0	0.50
X5R	0402	0.10	±10; ±20	10	5.0	0.50
X7R	0402	0.10	±10; ±20	10	5.0	0.50
X5R	0402	0.12	±10; ±20	10	7.0	0.50
X5R	0402	0.15	±10; ±20	10	7.0	0.50
X5R	0402	0.18	±10; ±20	10	7.0	0.50
X5R	0402	0.22	±10; ±20	10	7.0	0.50
X5R	0402	0.056	±10; ±20	16	5.0	0.50
X7R	0402	0.056	±10; ±20	16	5.0	0.50
X5R	0402	0.068	±10; ±20	16	5.0	0.50
X7R	0402	0.068	±10; ±20	16	5.0	0.50
X5R	0402	0.082	±10; ±20	16	5.0	0.50
X7R	0402	0.082	±10; ±20	16	5.0	0.50
X5R	0402	0.10	±10; ±20	16	5.0	0.50
X7R	0402	0.10	±10; ±20	16	5.0	0.50

Table 8 For size 0603 (1608 metric)

TC	SIZE	CAPACITANCE VALUE (µF)	CAPACITANCE TOLERANCE (%)	DC RATED VOLTAGE (V)	DISSIPATION FACTOR-D.F. (%)	THICKNESS (mm)
X5R	0603	1.00	±10; ±20	6.3	7.0	0.80
X5R	0603	1.50	±10; ±20	6.3	10.0	0.80
X5R	0603	2.20	±10; ±20	6.3	10.0	0.80
X5R	0603	3.30	±10; ±20	6.3	10.0	0.80
X5R	0603	4.70	±20	6.3	10.0	0.80
X7R	0603	0.27	±10; ±20	10	5.0	0.80
X7R	0603	0.33	±10; ±20	10	5.0	0.80
X7R	0603	0.39	±10; ±20	10	5.0	0.80
X7R	0603	0.47	±10; ±20	10	5.0	0.80
X5R	0603	0.56	±10; ±20	10	7.0	0.80
X5R	0603	0.68	±10; ±20	10	7.0	0.80
X5R	0603	0.82	±10; ±20	10	7.0	0.80
X5R	0603	1.00	±10; ±20	10	7.0	0.80
X5R	0603	1.50	±10; ±20	10	7.0	0.80
X5R	0603	2.20	±10; ±20	10	10.0	0.80
X7R	0603	0.12	±10; ±20	16	5.0	0.80
X7R	0603	0.15	±10; ±20	16	5.0	0.80
X7R	0603	0.18	±10; ±20	16	5.0	0.80
X7R	0603	0.22	±10; ±20	16	5.0	0.80
X7R	0603	0.27	±10; ±20	16	5.0	0.80
X7R	0603	0.33	±10; ±20	16	5.0	0.80
X7R	0603	0.39	±10; ±20	16	5.0	0.80
X7R	0603	0.47	±10; ±20	16	5.0	0.80
X5R	0603	0.33	±10; ±20	25	5.0	0.80
X5R	0603	0.39	±10; ±20	25	5.0	0.80
X5R	0603	0.47	±10; ±20	25	5.0	0.80

Table 9 For size 0805 (2012 metric)

TC	SIZE	CAPACITANCE VALUE (µF)	CAPACITANCE TOLERANCE (%)	DC RATED VOLTAGE (V)	DISSIPATION FACTOR-D.F. (%)	THICKNESS (mm)
X5R	0805	2.20	±10; ±20	6.3	7.0	1.25
X7R	0805	2.20	±10; ±20	6.3	7.0	1.25
X5R	0805	3.30	±10; ±20	6.3	7.0	1.25
X5R	0805	4.70	±10; ±20	6.3	7.0	1.25
X5R	0805	6.80	±10; ±20	6.3	10.0	1.25
X5R	0805	10.00	±10; ±20	6.3	10.0	1.25
X7R	0805	1.00	±10; ±20	10	5.0	1.25
X7R	0805	1.50	±10; ±20	10	7.0	1.25
X5R	0805	2.20	±10; ±20	10	7.0	1.25
X7R	0805	2.20	±10; ±20	10	7.0	1.25
X5R	0805	3.30	±10; ±20	10	7.0	1.25
X5R	0805	4.70	±10; ±20	10	7.0	1.25
X5R	0805	6.80	±10; ±20	10	10.0	1.25
X5R	0805	10.00	±10; ±20	10	10.0	1.25
X7R	0805	0.56	±10; ±20	16	5.0	1.25
X7R	0805	0.68	±10; ±20	16	5.0	1.25
X7R	0805	0.82	±10; ±20	16	5.0	1.25
X7R	0805	1.00	±10; ±20	16	5.0	1.25

Table 10 For size 1206 (3216 metric)

TC	SIZE	CAPACITANCE VALUE (µF)	CAPACITANCE TOLERANCE (%)	DC RATED VOLTAGE (V)	DISSIPATION FACTOR-D.F. (%)	THICKNESS (mm)
X5R	1206	10.00	±10; ±20	6.3	7.5	1.60
X5R	1206	22.00	±10; ±20	6.3	10.0	1.60
X5R	1206	4.70	±10; ±20	10	5.0	1.60
X7R	1206	4.70	±10; ±20	10	5.0	1.60
X5R	1206	6.80	±10; ±20	10	7.5	1.60
X5R	1206	10.00	±10; ±20	10	7.5	1.60
X7R	1206	2.20	±10; ±20	16	5.0	1.15
X5R	1206	4.70	±10; ±20	16	5.0	1.60
X7R	1206	1.00	±10; ±20	25	7.5	1.60

Table 11 For size 1210 (3225 metric)

TC	SIZE	CAPACITANCE VALUE (µF)	CAPACITANCE TOLERANCE (%)	DC RATED VOLTAGE (V)	DISSIPATION FACTOR-D.F. (%)	THICKNESS (mm)
X5R	1210	22.00	±20	6.3	2.5	2.50
X5R	1210	47.00	±20	6.3	10.0	2.50
X5R	1210	10.00	±10; ±20	10	3.5	1.90
X5R	1210	22.00	±20	10	7.0	2.50
X5R	1210	3.30	±10; ±20	16	3.5	1.90
X5R	1210	4.70	±10; ±20	16	3.5	1.90
X7R	1210	4.70	±10; ±20	16	3.5	1.90
X5R	1210	6.80	±10; ±20	16	3.5	2.50
X5R	1210	10.00	±10; ±20	16	3.5	2.50
X5R	1210	3.30	±10; ±20	25	3.5	1.90
X5R	1210	4.70	±10; ±20	25	3.5	1.90
X5R	1210	6.80	±10; ±20	25	2.5	2.50
X5R	1210	10.00	±10; ±20	25	2.5	2.50

Table 12 For size 1812 (4532 metric)

TC	SIZE	CAPACITANCE VALUE (µF)	CAPACITANCE TOLERANCE (%)	DC RATED VOLTAGE (V)	DISSIPATION FACTOR-D.F. (%)	THICKNESS (mm)
X5R	1812	22.00	±10; ±20	16	3.5	2.50

SOLDERING RECOMMENDATION

Table 13

SOLDERING METHOD	SIZE 0402	0603	0805	1206	≥ 1210
Reflow	≥ 0.1 µF	≥ 1.0 µF	≥ 2.2 µF	≥ 4.7 µF	Reflow only
Reflow/Wave	< 0.1 µF	< 1.0 µF	< 2.2 µF	< 4.7 µF	---

TESTS AND REQUIREMENTS

Table 14 Test condition, procedure and requirements

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Mounting	IEC 60384-22 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	Precondition: 150 +0/–10 °C for 1 hour, then keep for 48 ±1 hours at room temperature f = 1 kHz for C ≤10 µF: measuring voltage 1 V_{rms} at 20 °C f = 120 Hz for C >10 µF: measuring voltage 0.5 V_{rms} at 20 °C	Within specified tolerance
Dissipation factor (D.F.)	4.5.2	f = 1 kHz for C ≤10 µF: measuring voltage 1 V_{rms} at 20 °C f = 120 Hz for C >10 µF: measuring voltage 0.5 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	2.5 × U_r for 1 minute	No breakdown or flashover
Temperature characteristic	4.6	Between minimum and maximum temperature	In accordance with specification
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
Bond strength of plating on end face	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 X5R/X7R: |ΔC/C|: ≤ 10% Y5V: |ΔC/C|: ≤ 20%

Table 14 Test condition, procedure and requirements (continued)

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
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 X5R/X7R: $\lvert\Delta C/C\rvert$: ≤ 10% Y5V: $\lvert\Delta C/C\rvert$: ≤ 20% 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: size ≤ 1206 for 2 ±0.5 seconds; size > 1206 for 4 ±0.5 seconds	The termination shall be well tinned.
Rapid change of temperature	IEC 60384-22 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 X5R/X7R: ≤ 15% Y5V: ≤ 20% D.F.: within initial specified value R_{ins}: within initial specified value
Damp heat steady state	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 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.	X5R/X7R: $\lvert\Delta C/C\rvert$: ±20% Y5V: $\lvert\Delta C/C\rvert$: ±30% D.F.: 2 × initial value max. R_{ins}: 1,000 MΩ or $R_{ins} \times C_r \geq 50$ seconds, whichever is less
Endurance	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.	X5R/X7R: $\lvert\Delta C/C\rvert$: ±20% Y5V: $\lvert\Delta C/C\rvert$: ±30% D.F.: 2 × initial value max. R_{ins}: 1,000 MΩ or $R_{ins} \times C_r \geq 50$ seconds, whichever is less

Table 14 Test condition, procedure and requirements (continued)

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Resistance to leaching	IEC 60384-10 4.10	Solder bath temperature: 260 ±5 °C Dipping time 30 ±0.5 seconds	Using visual enlargement of × 10, dissolution of the termination shall not exceed 10%
Damp heat, with U_r load	4.14	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.	X5R/X7R: $\lvert\Delta C/C\rvert$: ±20% Y5V: $\lvert\Delta C/C\rvert$: ±30% D.F.: 2 × initial value max. R_{ins}: 500 MΩ or $R_{ins} \times C_r \geq 25$ seconds, whichever is less

REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version 10	Feb 18, 2005	-	- Capacitance range extended
Version 8	Nov 19, 2004	-	- Extended capacitance 0.68 µF and 2.2 µF of X5R 0603 10 V
Version 7	Sep 09, 2004	-	- Updated contents
Version 6	Aug 13, 2004	-	- Extended capacitance to value 47 µF

Innovative Service Around the Globe YAGEO

DATA SHEET

SURFACE-MOUNT CERAMIC MULTILAYER CAPACITORS

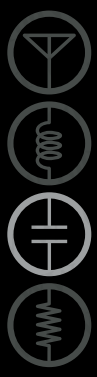
General purpose & High capacitance

Class 2, Y5V

6.3 V TO 50 V

10 nF to 47 µF

RoHS compliant



YAGEO Phicomp

Product Specification – Nov 04, 2009 V.1

SCOPE

This specification describes Y5V series chip capacitors with lead-free terminations.

APPLICATIONS

- Consumer electronics, for example:
  - Tuners
  - Television receivers
  - Video recorders
  - All types of cameras
  - Mobile telephones

FEATURES

- Supplied in tape on reel
- Nickel-barrier end termination
- RoHS compliant
- Halogen Free compliant

ORDERING INFORMATION - GLOBAL PART NUMBER, PHYCOMP CTC & 12NC

All part numbers are identified by the series, size, tolerance, TC material, packing style, voltage, process code, termination and capacitance value.

YAGEO BRAND ordering code

GLOBAL PART NUMBER (PREFERRED)

CC	XXXX	x	x	Y5V	x	BB	XXX
	(1)	(2)	(3)		(4)		(5)

(1) SIZE – INCH BASED (METRIC)

0201 (0603)
0402 (1005)
0603 (1608)
0805 (2012)
1206 (3216)
1210 (3225)

(2) TOLERANCE

M = ±20%
Z = –20% to +80%

(3) PACKING STYLE

R = Paper taping reel; Reel 7 inch
K = Blister taping reel; Reel 7 inch
P = Paper taping reel; Reel 13 inch
F = Blister taping reel; Reel 13 inch
C = Bulk case

(4) RATED VOLTAGE

5 = 6.3 V
6 = 10 V
7 = 16 V
8 = 25 V
9 = 50 V

(5) CAPACITANCE VALUE

2 significant digits+number of zeros
The 3rd digit signifies the multiplying factor, and letter R is decimal point
Example: 103 = 10 x 10^3 = 10,000 pF = 10 nF

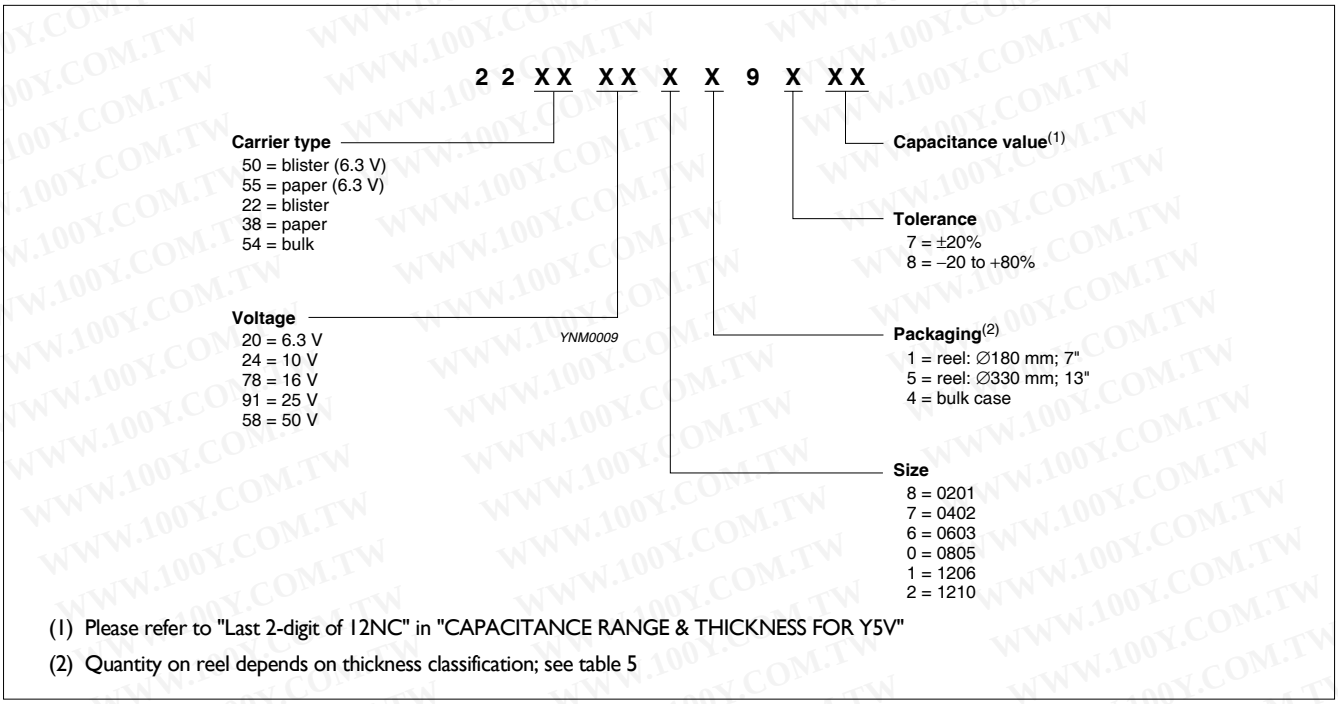
PHYCOMP BRAND ordering codes

GLOBAL PART NUMBER (preferred), PHYCOMP CTC (for North America) and 12NC (traditional) codes are acceptable to order Phycomp brand products.

GLOBAL PART NUMBER (PREFERRED)

For detailed information of GLOBAL PART NUMBER and ordering example, please refer to page 2.

12NC CODE



(1) Please refer to "Last 2-digit of 12NC" in "CAPACITANCE RANGE & THICKNESS FOR Y5V"

(2) Quantity on reel depends on thickness classification; see table 5

PHYCOMP CTC CODE (FOR NORTH AMERICA)

Example: 12062F105M8BB0D

1206	2F	105	M	8	B	B	0	D
Size code	Temp. Char.	Capacitance in pF	Tolerance	Voltage	Termination	Packing	Marking	Range identifier
0201 0402 0603 0805 1206 1210	2F = Y5V	101 = 100 pF; the third digit signifies the multiplying factor: 0 = × 1 1 = × 10 2 = × 100 3 = × 1,000 4 = × 10,000 5 = × 100,000 6 = × 1,000,000	M = ±20% Z = –20% to +80%	5 = 6.3 V 6 = 10 V 7 = 16 V 8 = 25 V 9 = 50 V	B = NiSn	2 = 180 mm 7" paper 3 = 330 mm 13" paper B = 180 mm 7" blister F = 330 mm 13" blister P = Bulk case	0 = no marking	D = Class 2 MLCC

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.

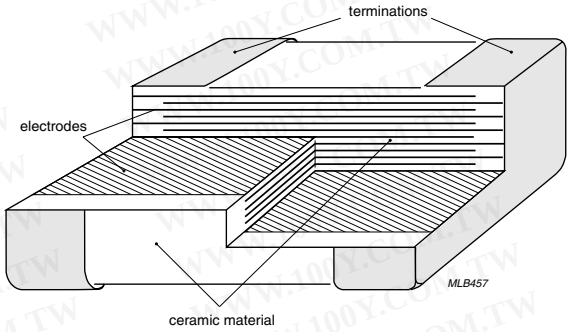


Fig. 1 Surface mounted multilayer ceramic capacitor construction

DIMENSION

Table 1 For outlines see fig. 2

TYPE	L_1 (mm)	W (mm)	T (MM)	L_2 / L_3 (mm)		L_4 (mm)
				min.	max.	min.
0201	0.6 ±0.03	0.3 ±0.03	Refer to table 2 to 4	0.10	0.20	0.20
0402	1.0 ±0.05	0.5 ±0.05		0.20	0.30	0.40
0603	1.6 ±0.10	0.8 ±0.10		0.20	0.60	0.40
0805	2.0 ±0.10 (1) 2.0 ±0.20 (2)	1.25 ±0.10 (1) 1.25 ±0.20 (2)		0.25	0.75	0.55
1206	3.2 ±0.15 (1) 3.2 ±0.20 (2)	1.6 ±0.15 (1) 1.6 ±0.20 (2)		0.25	0.75	1.40
1210	3.2 ±0.20 (1) 3.2 ±0.30 (2)	2.5 ±0.20 (1) 2.5 ±0.30 (2)		0.25	0.75	1.40
1812	4.5 ±0.20 (1) 4.5 ±0.40 (2)	3.2 ±0.20		0.25	0.75	2.20

NOTE

1. Dimension for size 0805 to 1812, C < 1 µF
2. Dimension for size 0805 to 1812, C ≥ 1 µF

OUTLINES

For dimension see Table 1

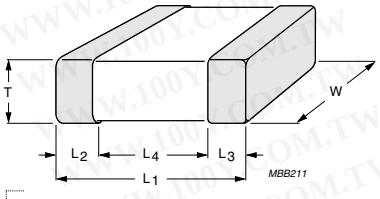


Fig. 2 Surface mounted multilayer ceramic capacitor dimension

CAPACITANCE RANGE & THICKNESS FOR Y5V

Table 2 Sizes from 0201 to 0402

CAP.	Last 2-digit of 12NC	0201		0402				
		6.3 V	25 V	6.3 V	10 V	16 V	25 V	50 V
10 nF	36		0.3±0.03					0.5±0.05
22 nF	41						0.5±0.05	
47 nF	45					0.5±0.05		
100 nF	49	0.3±0.03			0.5±0.05			
220 nF	52			0.5±0.05				
470 nF	58							
1.0 µF	63							
2.2 µF	67							
4.7 µF	72							
10 µF	76							
22 µF	81							
47 µF	85							

Table 3 Sizes from 0603 to 0805

CAP.	Last 2-digit of 12NC	0603					0805				
		6.3 V	10 V	16 V	25 V	50 V	6.3 V	10 V	16 V	25 V	50 V
10 nF	36										
22 nF	41					0.8±0.1				0.6±0.1	0.6±0.1
47 nF	45				0.8±0.1						
100 nF	49			0.8±0.1							
220 nF	52								0.6±0.1		0.85±0.1
470 nF	58									0.85±0.1	
1.0 µF	63		0.8±0.1						0.85±0.1		1.25±0.2
2.2 µF	67	0.8±0.1						0.85±0.1		1.25±0.2	
4.7 µF	72						0.85±0.1	0.85±0.1 1.25±0.2	1.25±0.2		
10 µF	76										
22 µF	81						1.25±0.2	1.25±0.2			
47 µF	85										

NOTE

1. Values in shaded cells indicate thickness class in mm
2. Capacitance value of non E-3 series is on request

CAPACITANCE RANGE & THICKNESS FOR Y5V

Table 4 Sizes from 1206 to 1210

CAP.	Last 2-digit of 12NC	1206					1210			
		6.3 V	10 V	16 V	25 V	50 V	6.3 V	10 V	16 V	25 V
10 nF	36				0.6±0.1	0.6±0.1				
22 nF	41									
47 nF	45									
100 nF	49									
220 nF	52									
470 nF	58				0.85±0.1	0.85±0.1				
1.0 µF	63									
2.2 µF	67		0.85±0.1	0.85±0.1						
4.7 µF	72									
10 µF	76	0.85±0.1		1.15±0.1	1.6±0.2			1.5±0.1	1.5±0.1	1.5±0.1
22 µF	81	1.6±0.2	1.6±0.2	1.6±0.2				1.6±0.2	1.6±0.2	
47 µF	85						2.0±0.2			

NOTE

1. Values in shaded cells indicate thickness class in mm
2. Capacitance value of non E-3 series is on request

THICKNESS CLASSES AND PACKING QUANTITY

Table 5

SIZE CODE	THICKNESS CLASSIFICATION	TAPE WIDTH QUANTITY PER REEL	Ø180 MM / 7 INCH		Ø330 MM / 13 INCH		QUANTITY PER BULK CASE
			Paper	Blister	Paper	Blister	
0201	0.3 ±0.03 mm	8 mm	15,000	---	50,000	---	---
0402	0.5 ±0.05 mm	8 mm	10,000	---	50,000	---	50,000
0603	0.8 ±0.1 mm	8 mm	4,000	---	15,000	---	15,000
0805	0.6 ±0.1 mm	8 mm	4,000	---	20,000	---	10,000
	0.85 ±0.1 mm	8 mm	4,000	---	15,000	---	8,000
	1.25 ±0.2 mm	8 mm	---	3,000	---	10,000	5,000
1206	0.6 ±0.1 mm	8 mm	4,000	---	20,000	---	---
	0.85 ±0.1 mm	8 mm	4,000	---	15,000	---	---
	1.00 / 1.15 ±0.1 mm	8 mm	---	3,000	---	10,000	---
	1.25 ±0.2 mm	8 mm	---	3,000	---	10,000	---
	1.6 ±0.15 mm	8 mm	---	2,500	---	10,000	---
	1.6 ±0.2 mm	8 mm	---	2,000	---	10,000	---
1210	0.6 / 0.7 ±0.1 mm	8 mm	---	4,000	---	15,000	---
	0.85 ±0.1 mm	8 mm	---	4,000	---	10,000	---
	1.15 ±0.1 mm	8 mm	---	3,000	---	10,000	---
	1.15 ±0.15 mm	8 mm	---	3,000	---	10,000	---
	1.25 ±0.2 mm	8 mm	---	3,000	---	---	---
	1.5 ±0.1 mm	8 mm	---	2,000	---	---	---
	1.6 / 1.9 ±0.2 mm	8 mm	---	2,000	---	---	---
	2.0 ±0.2 mm	8 mm	---	2,000 1,000	---	---	---
	2.5 ±0.2 mm	8 mm	---	1,000 500	---	---	---
1808	1.15 ±0.15 mm	12 mm	---	3,000	---	---	---
	1.25 ±0.2 mm	12 mm	---	3,000	---	---	---
	1.35 ±0.15 mm	12 mm	---	2,000	---	---	---
	1.5 ±0.1 mm	12 mm	---	2,000	---	---	---
	1.6 ±0.2 mm	12 mm	---	2,000	---	---	---
	2.0 ±0.2 mm	12 mm	---	2,000	---	---	---
1812	0.6 / 0.85 ±0.1 mm	12 mm	---	2,000	---	---	---
	1.15 ±0.1 mm	12 mm	---	1,500	---	---	---
	1.15 ±0.15 mm	12 mm	---	1,500	---	---	---
	1.35 ±0.15 mm	12 mm	---	1,000	---	---	---
	1.5 ±0.1 mm	12 mm	---	1,000	---	---	---
	1.6 ±0.2 mm	12 mm	---	1,000	---	---	---
	2.0 ±0.2 mm	12 mm	---	1,000	---	---	---
	2.5 ±0.2 mm	12 mm	---	500	50,000	---	---

ELECTRICAL CHARACTERISTICS

Y5V 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 6

DESCRIPTION			VALUE
Capacitance range			10 nF to 47 µF
Capacitance tolerance			±20% –20% to +80%
Dissipation factor (D.F.)			
	≤ 6.3 V		≤ 15%
		Exception: 0805 ≥ 22 µF	≤ 20%
	10 V		≤ 12.5%
		Exception: 0402 ≥ 680 nF; 0603 ≥ 2.2 µF;	≤ 15%
		0805 ≥ 10 µF; 1206 ≥ 10 µF	≤ 20%
	16 V		≤ 9%
		Exception: 0603 ≥ 330 nF; 0805 ≥ 2.2 µF;	≤ 12.5%
		1206 ≥ 10 µF	
	≥ 25 V		≤ 5%
		Exception: 0603 ≥ 100 nF; 0805 ≥ 330 nF;	≤ 7%
		1206 ≥ 1 µF; 1210 ≥ 4.7 µF	
		0201 ≥ 10 nF; 0402 ≥ 22 nF;	≤ 9%
		0603 ≥ 270 nF; 0805 ≥ 470 nF;	
		1206 ≥ 10 µF	
Insulation resistance after 1 minute at U_r (DC)			R_{ins} ≥ 10 GΩ or R_{ins} × C_r ≥ 500 seconds whichever is less
Maximum capacitance change as a function of temperature (temperature characteristic/coefficient):			+22% to –82%
Operating temperature range:			–30 °C to +85 °C

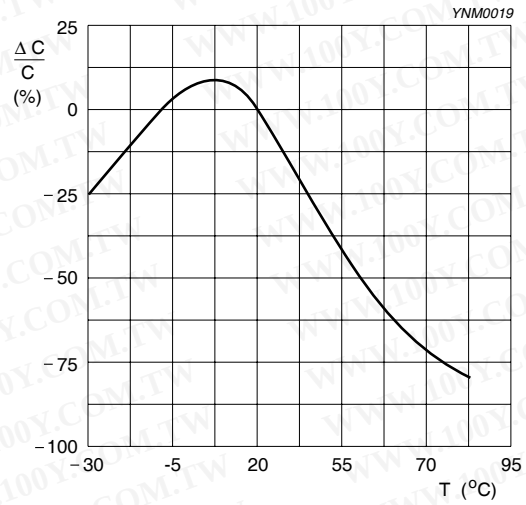


Fig. 3 Typical capacitance change as a function of temperature

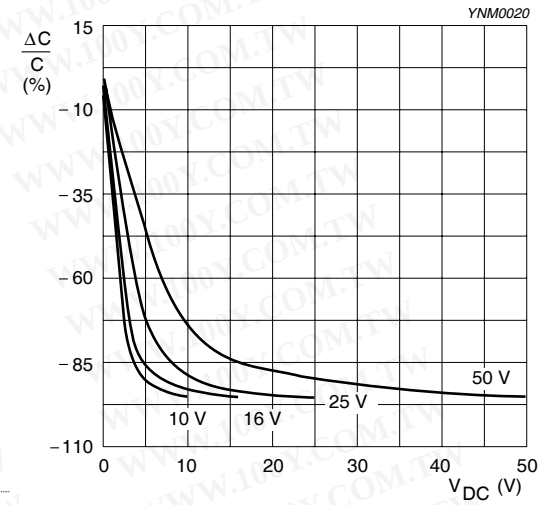


Fig. 4 Typical capacitance change with respect to the capacitance at 1 V as a function of DC voltage at 20 °C

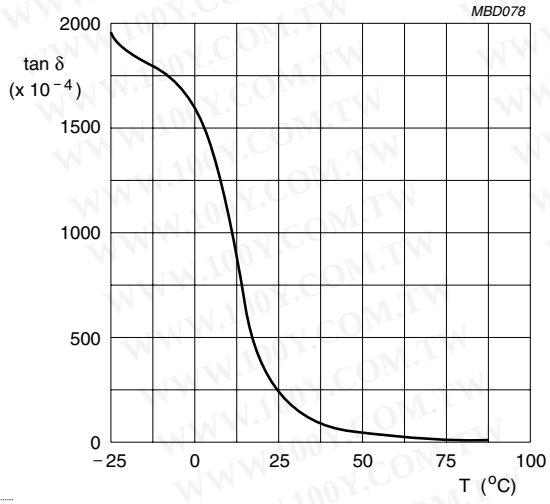


Fig. 5 Typical tan δ as a function of temperature

SOLDERING RECOMMENDATION

Table 7

SOLDERING METHOD	SIZE 0402	0603	0805	1206	≥ 1210
Reflow	≥ 0.1 µF	≥ 1.0 µF	≥ 2.2 µF	≥ 4.7 µF	Reflow only
Reflow/Wave	< 0.1 µF	< 1.0 µF	< 2.2 µF	< 4.7 µF	---

TESTS AND REQUIREMENTS

Table 8 Test procedures 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	Class 2: f = 1 KHz for C ≤ 10 μF, measuring at voltage 1 V_{rms} at 20 °C f = 120 Hz for C >10 μF, measuring at voltage 0.5 V_{rms} at 20 °C	Within specified tolerance
Dissipation factor (D.F.)		4.5.2	Class 2: f = 1 KHz for C ≤ 10 μF, measuring at voltage 1 V_{rms} at 20 °C f = 120 Hz for C > 10 μF, measuring at voltage 0.5 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
Temperature characteristic		4.6	Class 2: Between minimum and maximum temperature Y5V: -30 °C to +85 °C Normal Temperature: 20 °C	<General purpose series> ΔC/C Class 2: Y5V: 22% to -82% <High Capacitance series> ΔC/C Class 2: Y5V: 22% to -82%
Adhesion		4.7	A force applied for 10 seconds to the line joining the terminations and in a plane parallel to the substrate	Force size ≥ 0603: 5N size = 0402: 2.5N size = 0201: 1N

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 <General purpose series> ΔC/C Class2: Y5V: ±10% <High Capacitance series> ΔC/C Class2: Y5V: ±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 °C to 150 °C for 1 minute Preheating: for size >1206: 100 °C to 120 °C for 1 minute and 170 °C to 200 °C for 1 minute Solder bath temperature: 260 ±5 °C Dipping time: 10 ±0.5 seconds Recovery time: 24 ±2 hours	Dissolution of the end face plating shall not exceed 25% of the length of the edge concerned <General purpose series> ΔC/C Class2: Y5V: ±20% <High Capacitance series> ΔC/C Class2: Y5V: ±20% D.F. within initial specified value R_{ins} within initial specified value
Solderability	4.10	Preheated the temperature of 80 °C to 140 °C and maintained for 30 seconds to 60 seconds. Test conditions for lead containing solder alloy Temperature: 235 ±5 °C Dipping time: 2 ±0.2 seconds Depth of immersion: 10 mm Alloy Composition: 60/40 Sn/Pb Number of immersions: 1 Test conditions for leadfree containing solder alloy Temperature: 245 ±5 °C Dipping time: 3 ±0.3 seconds Depth of immersion: 10 mm Alloy Composition: SAC305 Number of immersions: 1	The solder should cover over 95% of the critical area of each termination

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Rapid change of temperature	IEC 60384-21/22 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 <General purpose series> ΔC/C Class2: Y5V: ±20% <High Capacitance series> ΔC/C Class2: Y5V: ±20% D.F. meet initial specified value R_{ins} meet initial specified value
Damp heat with U_r load	4.13	1. Preconditioning, class 2 only: 150 +0/-10 °C /1 hour, then keep for 24 ±1 hour at room temp 2. Initial measure: Spec: refer initial spec C, D, IR 3. Damp heat test: 500 ±12 hours at 40 ±2 °C; 90 to 95% R.H. 1.0 U_r applied 4. Recovery: Class 2: 24 ±2 hours 5. Final measure: C, D, IR P.S. If the capacitance value is less than the minimum value permitted, then after the other measurements have been made the capacitor shall be precondition according to *"IEC 60384 4.1"* and then the requirement shall be met.	No visual damage after recovery <General purpose series> ΔC/C Class2: Y5V: ±30% D.F. Class2: Y5V: ≤ 15% R_{ins} Class2: Y5V: ≥ 500 MΩ or $R_{ins} \times C_r \geq 25s$ whichever is less <High Capacitance series> ΔC/C Class2: Y5V: ±30% D.F. Class2: Y5V: 2 x initial value max R_{ins} Class2: Y5V: 500 MΩ or $R_{ins} \times C_r \geq 25s$ whichever is less

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Endurance	IEC 60384-21/22 4.14	1. Preconditioning, class 2 only: 150 +0/-10 °C /1 hour, then keep for 24 ±1 hour at room temp 2. Initial measure: Spec: refer initial spec C, D, IR 3. Endurance test: Temperature: Y5V: 85 °C Specified stress voltage applied for 1,000 hours: Applied 2.0 x U_r for general product. Applied 1.5 x U_r for high cap. product. 4. Recovery time: 24 ±2 hours 5. Final measure: C, D, IR P.S. If the capacitance value is less than the minimum value permitted, then after the other measurements have been made the capacitor shall be precondition according to *"IEC 60384 4.1"* and then the requirement shall be met.	No visual damage <General purpose series> ΔC/C Class2: Y5V: ±30% D.F. Class2: Y5V: ≤ 15% R_{ins} Class2: Y5V: ≥ 1,000 MΩ or $R_{ins} \times C_r \geq 50s$ whichever is less <High Capacitance series> ΔC/C Class 2: Y5V: ±30% D.F. Class 2: Y5V: 2 x initial value max R_{ins} Class 2: Y5V: 1,000 MΩ or $R_{ins} \times C_r \geq 50s$ whichever is less
Voltage proof	IEC 60384-1 4.6	Specified stress voltage applied for 1 minute $U_r \leq 100$ V: series applied 2.5 U_r 100 V < $U_r \leq 200$ V series applied (1.5 U_r + 100) 200 V < $U_r \leq 500$ V series applied (1.3 U_r + 100) $U_r > 500$ V: 1.3 U_r I: 7.5 mA	No breakdown or flashover

REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version 1	Nov 04, 2009	-	- Ordering code updated - Dimension updated
Version 0	Apr 15, 2009	-	- New datasheet for general purpose and high capacitance Y5V series with RoHS compliant - Replace the "6.3V to 50V" part of pdf files: Y5V_6.3V_10V_9_Preliminary, Y5V_10V-to-50V_10_Preliminary, Y5V_16V_25V_50V_11 - Combine 0201 from pdf files: UP-NP0X5RX7RY5V_0201_6.3-to-50V_2 and UY-NPOX5RX7RY5V_0201_6.3-to-50V_2 - Define global part number - Description of "Halogen Free compliant" added - Test method and procedure updated