



DATA SHEET

SURFACE-MOUNT CERAMIC MULTILAYER CAPACITORS Mid-voltage

NPO/X7R 100 V TO 630 V 0.47 pF to 2.2 µF

RoHS compliant & Halogen Free



yageo Phicomp

Surface-Mount Ceramic Multilayer Capacitors Mid-voltage NP0/X7R 100 V to 630 V

<u>SCOPE</u>

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

APPLICATIONS

PCs, Hard disk, Game PCs Power supplies, Charger LCD panel ADSL, Modem

<u>FEATURES</u>

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 <u>xxxx</u> <u>x</u> <u>x</u> <u>xxx</u> <u>x</u> B <u>x</u> <u>xxx</u> (1) (2) (3) (4) (5) (6) (7)

(I) SIZE - INCH BASED (METRIC)

0201 (0603) / 0402 (1005) / 0603 (1608) / 0805 (2012) / 1206 (3216) / 1210 (3225) 1808 (4520) / 1812 (4532)

(2) TOLERANCE

 $C = \pm 0.25 \text{ pF}$ $D = \pm 0.5 \text{ pF}$ $F = \pm 1\%$ $G = \pm 2\%$ $J = \pm 5\%$ $K = \pm 10\%$ $M = \pm 20\%$

(3) PACKING STYLE

- R = Paper/PE taping reel; Reel 7 inch
- K = Blister taping reel; Reel 7 inch
- P = Paper/PE taping reel; Reel 13 inch
- F = Blister taping reel; Reel 13 inch

(4) TC MATERIAL

NPO X7R

(5) RATED VOLTAGE

- 0 = 100 V
- A = 200 V
- Y = 250 V
- B = 500 V
- Z = 630 V

(6) PROCESS

N = NP0

B = Class 2 MLCC

(7) CAPACITANCE VALUE

2 significant digits+number of zeros

The 3rd digit signifies the multiplying factor, and letter R is decimal point

Example: $|2| = |2 \times |0| = |20 \text{ pF}$

Surface-Mount Ceramic Multilayer Capacitors Mid-voltage NP0/X7R 100 V to 630 V

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.

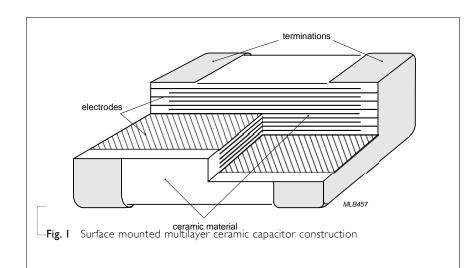
The inner electrodes are connected to the two end terminations and finally covered with a layer of plated tin (NiSn). The terminations are lead-free. A cross section of the structure is shown in Fig. I.

DIMENSION

2

Table I	For	outlines	see	fig.

4.5 ±0.40



L₂ / L₃ (mm) L₄ (mm) TYPE L_I (mm) W (mm) T (MM) min. max. min. 0201 0.6 ±0.03 0.3±0.03 0.20 0.3±0.03 0.10 0.20 0402 1.0 ±0.05 0.5 ± 0.05 0.5 ± 0.05 0.15 0.30 0.40 0603 1.6 ±0.10 0.8 ±0.10 0.20 0.8 ±0.10 0.60 0.40 2.0 ±0.10 1.25 ±0.10 0.6 ±0.10 0805 2.0 ±0.10 1.25 ±0.10 0.85 ±0.10 0.25 0.75 0.70 2.0 ±0.20 1.25 ±0.20 1.25 ±0.20 0.6 ±0.10 3.2 ±0.15 1.6 ±0.15 0.85 ±0.10 1206 1.25 ±0.20 0.25 0.75 1.40 3.2 ±0.30 1.6 ±0.20 1.6 ±0.20 3.2 ±0.30 1.6 ±0.30 1.6 ±0.30 0.85 ±0.10 3.2 ±0.20 2.5 ±0.20 1.25 ± 0.20 1210 0.25 0.75 1.40 1.6 ±0.20 2.5 ±0.20 3.2 ±0.30 2.0 ±0.20 1808 0.75 4.5 ± 0.40 2.0 ± 0.30 1.25 ±0.20 0.25 2.20 1812

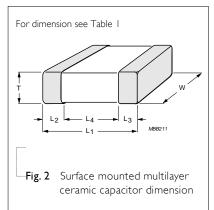
0.85 ±0.10

0.25

0.75

2.20

OUTLINES



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Product specification

3.2 ±0.30

YAGEO									Product specific	$\frac{4}{18}$
	Surface	-Mount Ce	ramic Mu	Itilayer Ca	apacitors	Mid-volta	ge NP0/X	7R 100 V to	630 V	18
<u>CAPACITA</u>	ANCE RAN	NGE & THIO	CKNESS FO	<u>Dr Npo</u>						
Table 2	izes from 02	201 to 0805								
CAP.	0201	0402	0603			0805				
	100V	100V	100 V	200 V	250 V	100 V	200 V	250 V	500 V	630V
0.22 pF				_						
0.47 pF										
0.56 pF										
0.68 pF										
0.82 pF										
I.0 pF										
I.2 pF										
I.5 pF										
1.8 pF										
2.2 pF 2.7 pF										
3.3 pF										
3.9 pF										
4.7 pF										
5.6 pF										
6.8 pF	0.3±0.03	0.5±0.05	0.8±0.1	0.8±0.1	0.8±0.1	0.6±0.1	0.6±0.1	0.6±0.1	0.6±0.1	0.6±0.1
8.2 pF										
10 pF										
I2 pF										
15 pF										
18 pF										
22 pF										
27 pF										
33 pF										
39 pF										
47 pF										
56 pF										
68 pF										
82 pF										
100 pF										

I. Values in shaded cells indicate thickness class in mm

Surface-Mount Ceramic Multilayer Capacitors Mid-voltage NP0/X7R 100 V to 630 V

CAPACITANCE RANGE & THICKNESS FOR NPO

Table 3 Sizes from 0603 to 0805 (continued)

CAP.	0402 100 V	0603 100 V	200 V	250 V	0805 100 ∨	200 V	250 V	500 V	630 V
I 20 pF I 50 pF						0.6± 0.1	0.6± 0.1	0.6± 0.1	0.6± 0.1
180 pF 220 pF									
270 pF 330 pF	0.5± 0.05		0.8± 0.1	0.8± 0.1	0.6± 0.1			0.85±0.1	0.85±0.1
390 pF 470 pF						0.85±0.1	0.85±0.1		
560 pF 680 pF								1.25±0.2	1.25±0.2
820 pF 1.0 nF 1.2 nF		0.8± 0.1							
I.5 nF					0.85±0.1				
2.2 nF 2.7 nF						1.25±0.2	1.25±0.2		
3.3 nF 3.9 nF									
4.7 nF 5.6 nF					1.25±0.2				
6.8 nF 8.2 nF									
10 nF 12 nF									
15 nF 18 nF									
22 nF									

ΝΟΤΕ

I. Values in shaded cells indicate thickness class in mm

2. Capacitance value of non E-12 series is on request

Product specification $\frac{5}{18}$

YAGEO	Phice	omp							Product sp	pecification 6
			Ceramic N	lultilayer	Capacito	Mid-v	oltage NF	P0/X7R 100	V to 630 V	18
CAPACITA	NCE DA	NGE & T		EOR NDO						
		206 to 2		<u>10K 1110</u>						
CAP.	1206					1210				
	100 V	200 V	250 V	500 V	630 V	100 V	200 V	250 V	500 V	630 V
0.47 pF										
0.56 pF										
0.68 pF										
0.82 pF										
I.0 pF										
I.2 pF										
1.5 pF										
1.8 pF										
2.2 pF										
2.7 pF										
3.3 pF										
3.9 pF										
4.7 pF										
5.6 pF	0.6±0.1	0.6±0.1	0.6±0.1							
6.8 pF	0.0±0.1	0.0±0.1	0.0±0.1							
8.2 pF										
10 pF										
I2 pF										
I5 pF										
18 pF										
22 pF										
27 pF				0.6±0.1	1.25±0.2					
33 pF				0.0±0.1	1.23±0.2					
39 pF										
47 pF										1.25±0.2
56 pF						1.25±0.2	1.25±0.2	1.25±0.2	1.25±0.2	1.20±0.2
68 pF						1,2010,2	1,2310,2	1,23±0,2	1,23±0,2	
82 pF										

I. Values in shaded cells indicate thickness class in ${\sf mm}$



YAGE	O ₁ Phí	comp								Product s	pecification 7
	Surfa	ce-Mount	t Ceramic	Multilaye	r Capacit	OIS Mid-	voltage	NP0/X7R	100	V to 630 V	18
CADACI	TANCER	ANCENS		6 600 NID	0						
		<u>ange a l</u> n 1206 to 12		<u>s FOR NP(</u> ed)	<u>u</u>						
CAP.	1206	111200 to 12		cu)		1210					
_	100 V	200 V	250 V	500 V	630 V	100 V	200 \	/ 2	50 V	500 V	630 V
100 pF											
120 pF											
150 pF											
180 pF											
220 pF											
270 pF		0.6±0.1	0.6±0.1	0.6±0.1							
330 pF											1.25±0.2
390 pF											
470 pF	0 () 0				1.25±0.2						
560 pF	0.6±0.1										
680 pF							1.25±0.	2 1.25	±0.2	1.25±0.2	
820 pF											
I.0 nF											
I.2 nF		0.85±0.1	0.85±0.1	0.85±0.1		1.25±0.2					
I.5 nF											
I.8 nF											
2.2 nF				1.25±0.2							
2.7 nF		1.25±0.2	1.25±0.2								
3.3 nF											
3.9 nF											
4.7 nF	0.85±0.1										
5.6 nF											
6.8 nF											
8.2 nF											
10 nF	1.25±0.2										
l2 nF											
15 nF											
18 nF						14102					
22 nF						1.6±0.2					

I. Values in shaded cells indicate thickness class in mm

) Phíco Surface		ic Multilayer Ca	nacitore	Mid-vol	tage NP0/X7R		pecification
	Junaco	-mvunt veran	ne multilayer va	iharirni 9		Idge NF0/A/K	100 10 050 1	
		NGE & THICKN	<u>ess for Npo</u>					
	Sizes 1812	1012						
CAP.		1812 100 V	200 V		250 V		500 V	630\
		100 V	200 1		250 1		300 1	
	10 pF 12 pF							
	12 pF 15 pF							
	18 pF							
	22 pF							
	27 pF							
	33 pF							
	39 pF							
	47 pF							
	56 pF							
	68 pF							
	82 pF							
	100 pF							
	120 pF							
	150 pF							
I	180 pF							
2	220 pF							
2	270 pF							1.25±0.2
3	330 pF							1,2010,2
3	390 pF							
	470 pF					1.2	5±0.2	
	560 pF							
	680 pF							
8	320 pF							
	l nF							
	I.2 nF		1.25±0.2		1.25±0.2			
	1.5 nF							
	1.8 nF							
	2.2 nF	1.25±0.2						
	2.7 nF 3.3 nF	1.23±0.2						
	3.9 nF							
	4.7 nF							
	5.6 nF							
	6.8 nF							
	8.2 nF							
	10 nF							
	I2 nF							
	15 nF							
	18 nF							
	22 nF							

I. Values in shaded cells indicate thickness class in mm



	Surface	-Mount Cer	amic Multil	ayer Capaci	itors Mid-v	Mid-voltage NP0/X7R 100 V to 630 V			
<u>CAPACIT</u>	<u>ANCE RAN</u>	NGE & THIC	KNESS FOR	<u>X7R</u>					
Table 7	Sizes from (0402 to 0805							
CAP.	0402	0603		0805					
	100 V	100 V	250 V	100 V	200 V	250 V	500 V	630 V	
100 pF									
150 pF									
220 pF									
330 pF									
470 pF									
680 pF	0.5.0.05				0.05 . 0 .	0.05 . 0 .		0.05 . 0.1	
I.0 nF	0.5±0.05			0 (+ 0 +	0.85±0.1	0.85±0.1	0.85±0.1	0.85±0.1	
1.5 nF				0.6±0.1					
2.2 nF 3.3 nF		0.8±0.1	0.8±0.1						
4.7 nF		0.0±0.1							
6.8 nF									
10 nF								1.25±0.2	
I5 nF							1.25±0.2	1.20 ±0.2	
22 nF				0.85±0.1					
33 nF					1.25±0.2	I.25±0.2 -			
47 nF									
68 nF									
100 nF									
150 nF				1.25±0.2					
220 nF									
330 nF									
470 nF									
ΙμF									

I. Values in shaded cells indicate thickness class in mm

2. Capacitance value of non E-6 series is on request

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- 3. For special ordering code, please contact local sales force before order
- 4. For product with 5% tolerance, please contact local sales force before order



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Product specification

YAGE) Phíc	omp							Product speci	ication 10
				lultilayer (Capacitor	S Mid-volt	age NP0/>	K7R 100 V	to 630 V	18
CAPACIT		<u>NGE & TI</u> 1 1206 to 12	<u>hickness</u>	<u>FOR X7R</u>						
CAP.	512es from	1 1 206 10 12	10			1210				
	100 V	200 V	250 V	500 V	630 V	100 V	200 V	250 V	500 V	630V
100 pF										
150 pF										
220 pF										
330 pF										
470 pF										
680 pF										
I.0 nF										
I.5 nF										
2.2 nF		0.85±0.1	0.85±0.1	1.25±0.2	1.25±0.2 -					
3.3 nF	0.85±0.1									
4.7 nF							0.85±0.1	0.85±0.1		
6.8 nF							0.03±0.1	0.05±0.1		1.25±0.2
10 nF									1.25±0.2	
15 nF	_			_		0.85±0.1				
22 nF					1.6±0.2					1.6±0.2
33 nF		1.25±0.2	1.25±0.2	1.6±0.2	1.0±0.2					2.0±0.2
47 nF		1,20 20,2	1.20 ±0.2							2.0 ± 0.2
68 nF							1.25±0.2	1.25±0.2	1.6±0.2	
100 nF	I.25±0.2 -	1.6±0.2	1.6±0.2						2.0±0.2	
150 nF										
220 nF						1.25±0.2 ⁻				
330 nF										
470 nF	1.6±0.2									
680 nF										
ΙμF						2.0±0.2				
2.2 µF	1.6±0.3									

I. Values in shaded cells indicate thickness class in mm

2. Capacitance value of non E-6 series is on request

3. For product with 5% tolerance, please contact local sales force before order



YAGEC) Phíco	тр				
	Surface	-Mount Ce	ramic Mul	tilayer Cap	acitors	Mid-volt
CAPACIT	'ANCE RAP	NGE & THIO	CKNESS FO	R X7R		
		1808 to 1812				
CAP.	1812	000 V (250.14	500.14	(20.)(
	100 V	200 V	250 V	500 V	630 V	
100 pF						
150 pF						
220 pF						
330 pF						
470 pF						
680 pF						
I.0 nF						
I.5 nF						
2.2 nF						
3.3 nF						
4.7 nF		0.85±0.1	0.85±0.1		1.35±0.2	
6.8 nF	0.85±0.1			1.25±0.2		
10 nF						
15 nF						
22 nF						
33 nF					1.6±0.2	
47 nF						
68 nF		1.25±0.2	1.25±0.2			
100 nF				1.6±0.2		
150 nF	1.25±0.2					
220 nF						
330 nF		1.6±0.2	1.6±0.2			
470 nF						
680 nF	1.6±0.2					r
ΙμF						<u>.</u>

- I. Values in shaded cells indicate thickness class in mm
- 2. Capacitance value of non E-6 series is on request
- 3. For product with 5% tolerance, please contact local sales force before order

Product specification 11

NP0/X7R 100 V to 630 V

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THICKNESS CLASSES AND PACKING QUANTITY

SIZE CLOSSIFICATION CLOSSIFICATION CLASSIFICATION CODI TAPE WIDTH QUANTITY PR REL 0180 MH / 7 INCH Paper 0330 MM / 13 INCH Paper QUANTITY Bisser QUANTITY PR BLICK CSE 0401 0.3 ±003 mm 8 mm 15.000	Table I	0						
CODE CLASSIFICATION QUANTITY PER RELL Paper Bister Paper Bister PER BULK CASE 0402 0.3 ±0.03 mm 8 mm 15.000 50.000 50.000 0603 0.8 10.1 mm 8 mm 40.00 20.000 50.000 0663 0.8 10.1 mm 8 mm 40.00 20.000 10.000 0.8 0.1 mm 8 mm 40.00 15.000 80.000 0.8 0.8 10.1 mm 8 mm 40.00 10.000 0.6 40.1 mm 8 mm 30.00 10.000 1.00/1.15 10.1 mm 8 mm 30.00 10.000 1.6 4.0.15 mm 8 mm 25.00 10.000 1.6 4.0.15 mm 8 mm 30.00 1.15 4.0.15 mm 8 mm	SIZE	THICKNESS	TAPE WIDTH	Ø180 MM	/ 7 INCH	Ø330 MM /	13 INCH	OUANTITY
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 0605 0.6.6 ±0.1 mm 8 mm 4.000 15.000 15.000 0806 0.85 ±0.1 mm 8 mm 4.000 10.000 5.000 1206 0.6.6 ±0.1 mm 8 mm 4.000 10.000 5.000 1206 0.6.6 ±0.1 mm 8 mm 3.000 10.000 1.00 / 1.15 ±0.1 mm 8 mm 3.000 10.000 1.6 ±0.15 mm 8 mm 3.000 10.000 1.6 ±0.15 mm 8 mm 3.000 10.000 1.15 ±0.15 mm 8 mm 3.000 1.15 ±0.15 mm 8 mm 3.000 </th <th></th> <th></th> <th></th> <th>Paper</th> <th>Blister</th> <th>Paper</th> <th>Blister</th> <th></th>				Paper	Blister	Paper	Blister	
0603 0.8 ±0.1 mm 8 mm 4.000 15.000 15.000 0805 0.6 ±0.1 mm 8 mm 4.000 15.000 15.000 0805 0.6 ±0.1 mm 8 mm 4.000 15,000 80.000 125 ±0.2 mm 8 mm 4.000 15,000 80.000 0.8 / 0.85 ±0.1 mm 8 mm 4.000 15,000 1206 1.00 / 1.15 ±0.1 mm 8 mm 4.000 15,000 12106 1.6 ±0.2 mm 8 mm 3.000 10,000 1210 0.6 / 0.7 ±0.1 mm 8 mm 3.000 10,000 115 ±0.1 mm 8 mm 3.000 10,000 1.15 ±0.1 mm 8 mm 3.000 1.15 ±0.1 mm 8 mm <td>0201</td> <td>0.3 ±0.03 mm</td> <td>8 mm</td> <td>15,000</td> <td></td> <td>50,000</td> <td></td> <td></td>	0201	0.3 ±0.03 mm	8 mm	15,000		50,000		
0.6 ± 0.1 mm 0 mm 4,000 1,0000 1,0000 0805 0.8 / 0.85 ± 0.1 mm 8 mm 4,000 15,000 8,000 125 ± 0.2 mm 8 mm 4,000 10,000 5,000 0.6 ± 0.1 mm 8 mm 4,000 20,000 0.8 / 0.85 ± 0.1 mm 8 mm 4,000 20,000 1.00 / 1.15 ± 0.1 mm 8 mm 3,000 10,000 1.6 / 0.15 ± 0.1 mm 8 mm 2,000 10,000 1.15 ± 0.1 mm 8 mm 2,000 1.15 ± 0.1 mm 8 mm 3,000 1.15 ± 0.1 mm 8 mm 3,000	0402	0.5 ±0.05 mm	8 mm	10,000		50,000		50,000
0805 0.8 / 0.85 ± 0.1 mm 8 mm 4,000 15,000 8,000 1.25 ± 0.2 mm 8 mm 4,000 20,000 0.8 / 0.85 ± 0.1 mm 8 mm 4,000 20,000 0.8 / 0.85 ± 0.1 mm 8 mm 4,000 10,000 1.00 / 1.15 ± 0.1 mm 8 mm 3,000 10,000 1.6 ± 0.2 mm 8 mm 2,000 10,000 1.6 ± 0.2 mm 8 mm 2,000 10,000 1.6 ± 0.2 mm 8 mm 3,000 10,000 1.15 ± 0.1 mm 8 mm 3,000 1.15 ± 0.1 mm 8 mm 3,000 1.15 ± 0.1 mm 8 mm 3,000	0603	0.8 ±0.1 mm	8 mm	4,000		15,000		15,000
125 ±0.2 mm 8 mm 1000 5000 0.6 ±0.1 mm 8 mm 4000 10000 1206 1.00 / 1.15 ±0.1 mm 8 mm 4000 10000 1.00 / 1.15 ±0.1 mm 8 mm 3000 1.6 ±0.1 stol 8 mm 3000 10000 1.6 ±0.1 stol 8 mm 2.500 10000 1.6 ±0.2 mm 8 mm 2.000 8.000 1.6 ±0.1 mm 8 mm 3.000 10.000 1.15 ±0.1 mm 8 mm 3.000 10.000 1.15 ±0.1 mm 8 mm 3.000 1.6 / 1.9 ±0.2 mm 8 mm 3.000 1.5 ±0.1 mm 12 mm 3.000		0.6 ±0.1 mm	8 mm	4,000		20,000		10,000
1206 0.6 ± 0.1 mm 8 mm 4,000 20,000 0.8 / 0.85 ± 0.1 mm 8 mm 4,000 15,000 1.20 / 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 2,000 8,000 1.6 ± 0.2 mm 8 mm 4,000 10,000 1.6 ± 0.15 mm 8 mm 4,000 10,000 1.15 ± 0.11 mm 8 mm 3,000 10,000 1.15 ± 0.11 mm 8 mm 3,000 1.5 ± 0.11 mm 8 mm 3,000 1.5 ± 0.11 mm 12 mm 3,000	0805	0.8 / 0.85 ±0.1 mm	8 mm	4,000		15,000		8,000
1206 0.8 / 0.85 ±0.1 mm 8 mm 4.000 15.000 1.00 / 1.15 ±0.1 mm 8 mm 3.000 10.000 1.6 ±0.1 smm 8 mm 2.500 10.000 1.6 ±0.2 mm 8 mm 2.500 10.000 1.6 ±0.2 mm 8 mm 2.000 8.000 0.6 / 0.7 ±0.1 mm 8 mm 4.000 10.000 1.15 ±0.1 smm 8 mm 3.000 10.000 1.15 ±0.1 smm 8 mm 3.000 1.15 ±0.1 smm 8 mm 3.000 1.6 / 1.9 ±0.2 mm 8 mm 3.000 1.6 / 1.9 ±0.2 mm 8 mm 3.000		1.25 ±0.2 mm	8 mm		3,000		10,000	5,000
1206 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 8,000 0.6 / 0.7 ±0.1 mm 8 mm 4.000 15,000 0.8 ±0.1 mm 8 mm 3.000 10,000 1.15 ±0.1 mm 8 mm 3.000 1.15 ±0.1 mm 8 mm 3.000 1.15 ±0.1 mm 8 mm 3.000 1.6 / 1.9 ±0.2 mm 8 mm 3.000 1.6 / 1.9 ±0.2 mm 12 mm 3.000 1.808		0.6 ±0.1 mm	8 mm	4,000		20,000		
1206 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 8,000 0.6 / 0.7 ±0.1 mm 8 mm 4,000 15,000 0.85 ±0.1 mm 8 mm 3,000 10,000 1.15 ±0.1 mm 8 mm 3,000 10,000 1.25 ±0.2 mm 8 mm 3,000 10,000 1.5 ±0.1 mm 8 mm 3,000 1.6 / 1.9 ±0.2 mm 8 mm 3,000 2.0 ±0.2 mm 8 mm 3,000 1.6 / 1.9 ±0.2 mm 12 mm 3,000		0.8 / 0.85 ±0.1 mm	8 mm	4,000		15,000		
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 8,000 0.6 / 0.7 ±0.1 mm 8 mm 4,000 10,000 1.15 ±0.1 mm 8 mm 3,000 10,000 1.15 ±0.1 mm 8 mm 3,000 10,000 1.25 ±0.2 mm 8 mm 3,000 1.6 / 1.9 ±0.2 mm 8 mm 2,000 2.0 ±0.2 mm 8 mm 3,000 1.6 / 1.9 ±0.2 mm 12 mm 3,000 2.0 ±0.2 mm 12 mm 3,000 1.55 ±0.1 mm 12 m	1204	1.00 / 1.15 ±0.1 mm	8 mm		3,000		10,000	
11 1.6 ±0.2 mm 8 mm 2,000 8,000 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 ±0.1 mm 8 mm 3,000 10,000 1.25 ±0.2 mm 8 mm 3,000 1.6 / 1.9 ±0.2 mm 8 mm 2,000 2.0 ±0.2 mm 8 mm 2,000 2.5 ±0.2 mm 12 mm 3,000 1.15 ±0.15 mm 12 mm 3,000 1.45 ±0.1 mm 12 mm 3,000 1.5 ±0.1 mm	1200	1.25 ±0.2 mm	8 mm		3,000		10,000	
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1210 0.85 ±0.1 mm 8 mm 4,000 10,000 1.15 ±0.15 mm 8 mm 3,000 10,000 1.15 ±0.15 mm 8 mm 3,000 10,000 1.15 ±0.15 mm 8 mm 3,000 1.25 ±0.2 mm 8 mm 2,000 1.6/1.9 ±0.2 mm 8 mm 2,000 2.0 ±0.2 mm 8 mm 1,000 2.5 ±0.2 mm 8 mm 1,000 1.15 ±0.15 mm 12 mm 3,000 1.25 ±0.2 mm 12 mm 3,000 1.25 ±0.15 mm 12 mm 2,000 1.15 ±0.15 mm		1.6 ±0.2 mm	8 mm		2,000		8,000	
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1210 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 2.5 ±0.2 mm 8 mm 3,000 1.15 ±0.15 mm 12 mm 3,000 1.25 ±0.2 mm 12 mm 3,000 1.15 ±0.15 mm 12 mm 2,000 1.6 ±0.2 mm 12 mm 2,000 1.15 ±0.1 mm 12 mm 1,000		0.85 ±0.1 mm	8 mm		4,000		10,000	
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		1.15 ±0.15 mm	8 mm		3,000		10,000	
Is ±0.1 mm 8 mm 2,000 1.6 / 1.9 ±0.2 mm 8 mm 2,000		1.25 ±0.2 mm	8 mm		3,000			
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Image: 1.15 ±0.15 mm 12 mm 500		2.0 ±0.2 mm	8 mm					
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1808 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 8,000 2.0 ±0.2 mm 12 mm 2,000 8,000 2.0 ±0.2 mm 12 mm 2,000 8,000 1.15 ±0.1 mm 12 mm 2,000 1.15 ±0.1 mm 12 mm 1,000 1.15 ±0.15 mm 12 mm 1,000 1.15 ±0.15 mm 12 mm 1,000 1.25 ±0.2 mm 12 mm 1,000 1.5 ±0.1 mm 12 mm 1,000 1.6 ±0.2 mm <td< td=""><td></td><td>1.15 ±0.15 mm</td><td>l2 mm</td><td></td><td>3,000</td><td></td><td></td><td></td></td<>		1.15 ±0.15 mm	l2 mm		3,000			
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I.5 ±0.1 mm I2 mm 2,000	1808	1.35 ±0.15 mm	l2 mm		2,000			
2.0 ±0.2 mm 12 mm 2,000 0.6 / 0.85 ±0.1 mm 12 mm 2,000 1.15 ±0.1 mm 12 mm 1,000 1.15 ±0.1 mm 12 mm 1,000 1.15 ±0.15 mm 12 mm 1,000 1.25 ±0.2 mm 12 mm 1,000 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	1000	1.5 ±0.1 mm	l2 mm		2,000			
0.6 / 0.85 ±0.1 mm 12 mm 2,000 1.15 ±0.1 mm 12 mm 1,000 1.15 ±0.1 mm 12 mm 1,000 1.15 ±0.15 mm 12 mm 1,000 1.25 ±0.2 mm 12 mm 1,000 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		1.6 ±0.2 mm	l2 mm		2,000		8,000	
I.15 ±0.1 mm I2 mm I.000 III III I.15 ±0.15 mm I2 mm III IIII IIII IIIII IIIIII IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII		2.0 ±0.2 mm	l2 mm		2,000			
I 1.15 ±0.15 mm I 2 mm I,000		0.6 / 0.85 ±0.1 mm	l2 mm		2,000			
I 25 ±0.2 mm I2 mm I,000		1.15 ±0.1 mm	l2 mm		1,000			
1812 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		1.15 ±0.15 mm	l2 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		1.25 ±0.2 mm	l2 mm		1,000			
I.6 ±0.2 mm I2 mm I,000 2.0 ±0.2 mm I2 mm I,000	1812	1.35 ±0.15 mm	l2 mm		1,000			
2.0 ±0.2 mm 12 mm 1,000		1.5 ±0.1 mm	l2 mm		1,000			
		1.6 ±0.2 mm	12 mm		٥٥٥, ا			
		2.0 ±0.2 mm	12 mm		1,000			
					500			

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Surface-Mount Ceramic Multilayer Capacitors Mid-voltage NP0/X7R 100 V to 630 V

ELECTRICAL CHARACTERISTICS

NP0/X7R DIELECTRIC CAPACITORS; NISN TERMINATIONS

Unless otherwise specified, all test and measurements shall be made under standard atmospheric conditions for testing as given in 5.3 of IEC 60068-1:

- Temperature: 15 °C to 35 °C
- Relative humidity: 25% to 75%
- Air pressure: 86 kPa to 106 kPa

Before the measurements are made, the capacitor shall be stored at the measuring temperature for a time sufficient to allow the entire capacitor to reach this temperature.

The period as prescribed for recovery at the end of a test is normally sufficient for this purpose.

Table	2		
DESCRIP	TION		VALUE
Capacitar	nce range	0.47 p	oF to 2.2 µF
Capacitar	nce tolerance		
NP0	C < 10 _P F	±0.25	pF, ±0.5 pF
	C ≥ 10 _P F	±2%, =	±5%, ±10%
X7R		±5% ⁽¹⁾ , ±	10%, ±20%
Dissipatio	on factor (D.F.)		
NP0	C < 30 _P F	≤ / (40	00 + 20C)
	C ≥ 30 _P F		≤ 0.1 %
X7R			≤ 2.5 %
Exception	n	X7R/0603/100V, 12nF ≤ C ≤ 100nF, X7R/1206/2.2µF/100V	≤ 5%
		X7R/1206/100V/1μF; X7R/1210/100V/1μF and 2.2μF;	≤ 3.5%
Insulation	n resistance after 1 minute at U _r (DC)	$R_{ins} \ge 10 \text{ G}\Omega \text{ or } R_{ins} \times C \ge 500 \text{ seconds which}$	never is less
	n capacitance change as a function of tempe ature characteristic/coefficient):	rature	
NP0		±	:30 ppm/°C
X7R			±15%
Operatin	g temperature range:		
NP0/X7	7R	-55 ℃ t	to +125 °C

ΝΟΤΕ

I. Capacitance tolerance ±5% doesn't available for X7R full product range, please contact local sales force before order

Surface-Mount Ceramic Multilayer Capacitors Mid-voltage NP0/X7R 100 V to 630 V

SOLDERING RECOMMENDATION

Table 12

SOLDERING METHOD	SIZE 0201	0402	0603	0805	1206	≥ 1210
Reflow	Reflow only	> 100 nF	> 1.0 µF	> 2.2 µF	> 2.2 µF	Reflow only
Reflow/Wave		≤ 100 nF	≤ 1.0 µF	≤ 2.2 µF	≤ 2.2 µF	

TESTS AND REQUIREMENTS

TEST	TEST METH	HOD	PROCEDURE	REQUIREMENTS	
Mounting	IEC 60384- 4.3 21/22		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 I: $f = MHz \text{ for } C \le nF$, measuring at voltage $ V_{rms} \text{ at } 20^{\circ}C$ $f = KHz \text{ for } C > nF$, measuring at voltage $ V_{rms} \text{ at } 20^{\circ}C$ Class 2: $f = KHz \text{ for } C \le 0 \ \mu\text{F}$, measuring at voltage $ V_{rms} \text{ at } 20^{\circ}C$	Within specified tolerance	
Dissipation Factor (D.F.)		4.5.2	Class I: $f = I \text{ MHz}$ for $C \le I \text{ nF}$, measuring at voltage $I \text{ V}_{rms}$ at 20°C $f = I \text{ KHz}$ for $C > I \text{ nF}$, measuring at voltage $I \text{ V}_{rms}$ at 20°C Class 2: $f = I \text{ KHz}$ for $C \le I0 \mu$ F, measuring at voltage $I \text{ V}_{rms}$ at 20°C	In accordance with specification (in Table 11)	
		4.5.3	$U_r \le 500$ V: At Ur for 1 minute $U_r > 500$ V: At 500 V for 1 minute	In accordance with specification (in Table 11)	

YAGEO Phicomp Surface-Mount Ceramic Multilayer Capacitors Mid-voltage NP0/X7R 100 V to 630 V

Product specification	15
(20.)/	18

TEST	TEST METH	HOD	PROCEDURE	REQUIREMENTS	
Temperature coefficient		4.6	Capacitance shall be measured by the steps shown in the following table. The capacitance change should be measured after 5 min at each specified temperature stage. Step Temperature(°C)	<pre><general purpose="" series=""> Class1: Δ C/C: ±30ppm Class2: X7R: Δ C/C: ±15%</general></pre>	
			a25±2bLower temperature±3°Cc25±2dUpper Temperature±2°Ce25±2	<high capacitance="" series=""> Class2: X7R/X5R: Δ C/C: ±15%</high>	
			(1) Class I Temperature Coefficient shall be calculated from the formula as below Temp, Coefficient = $\frac{C2 - C1}{C1 \times \Delta T} \times 10^6$ [ppm/°C] C1: Capacitance at step c C2: Capacitance at 125°C		
			$\Delta T: 100^{\circ}C (=125^{\circ}C - 25^{\circ}C)$ (2) Class II Capacitance Change shall be calculated from the formula as below $\Delta C = \frac{C2 - C1}{C1} \times 100\%$ C1: Capacitance at step c C2: Capacitance at step b or d		
Adhesion	IEC 60384- 21/22	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	
Bending Strength		4.8	Mounting in accordance with IEC 60384-22 paragraph 4.3	No visible damage	
			Conditions: bending I mm at a rate of I mm/s, radius jig 5 mm	Δ C/C Class 1: NP0: within ±1% or 0.5 pF, whichever is greater Class2: X7R: ±10%	



Surface-Mount Ceramic Multilayer Capacitors Mid-voltage NP0/X7R 100 V to 630 V

Product specification	16
630 V	18

TEST	TEST METH	HOD	PROCEDURE	REQUIREMENTS
Resistance to Soldering		4.9	Precondition: 150 +0/–10 °C for 1 hour, then keep for 24 ±1 hours at room	Dissolution of the end face plating shall not exceed 25% of the length of the edge concerned
Heat			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	Δ C/C Class 1: NP0: within ±0.5% or 0.5 pF, whichever is greater Class2: X7R: ±10%
			Solder bath temperature: 260 ±5 °C Dipping time: 10 ±0.5 seconds Recovery time: 24 ±2 hours	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.	The solder should cover over 95% of the critical area of each termination
			 Temperature: 235±5°C / Dipping time: 2 ±0.5 s Temperature: 245±5°C / Dipping time: 3 ±0.5 s (lead free) Depth of immersion: 10mm 	
Rapid Change of	IEC 60384- 21/22	4.11	Preconditioning 150 +0/–10 °C for 1 hour, then keep for _	No visual damage
Temperature			 24 ±1 hours at room temperature 5 cycles with following detail: 30 minutes at lower category temperature 30 minutes at upper category temperature 	Δ C/C Class 1: NP0: within ±1% or 1 pF, whichever is greater Class2: X7R: ±15%
			Recovery time 24 ±2 hours -	D.F. meet initial specified value R _{ins} meet initial specified value

YAGEO Phícomp Surface-Mor

Surface-Mount Ceramic Mi	ultilayer Capacitors	Mid-voltage	NP0/X7R
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100 V to 630 V	
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TEST	EST TEST METHOD PROCEDURE			RE		REQUIREMENTS	
Damp Heat	4.13		 3. Preconditioning, class 2 only: 150 +0/-10 °C /1 hour, then keep for 24 ±1 hour at room temp 4. Initial measure: Spec: refer initial spec C, D, IR 5. Damp heat test: 500 ±12 hours at 40 ±2 °C; 90 to 95% R.H. 6. Recovery: Class 1: 6 to 24 hours Class 2: 24 ±2 hours 7. 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 <i>"IEC 60384 4.1"</i> and then the requirement shall be met. 			No visual damage after recovery	
						$eq:linear_line$	
						X7R: ≥ 500 M Ω or $R_{ins} \times C_r \ge 25s$ whichever is less	
Endurance	IEC 60384- 21/22	4.14	 Preconditioning, class 2 only: 150 +0/-10 °C /1 hour, then keep for 			No visual damage	
			24 ±1 hour at room temp 2. Initial measure: Spec: refer initial spec C, D, IR 3. Endurance test: Temperature: NP0/X7R: 125 °C Specified stress voltage applied for 1,000 hours: 4. High voltage series follows with below stress condition: Voltage NPO X7R $\leq 100V$ 2.0 × Ur 2.0 × Ur 200/250V 1.5 × Ur 1.5 × Ur 500/630V 1.3 × Ur 1.2 × Ur $\geq 1KV$ 1.2 × Ur 1.1 × Ur * NPO, 0603, 100V, 5.1nF to 10nF, apply voltage : 1.5 × Ur 5. Recovery time: 24 ±2 hours 6. 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		C, D, IR R: 125 °C applied for 1,000 hours: bws with below stress X7R 2.0 × Ur 1.5 × Ur 1.2 × Ur 1.1 × Ur F to 10nF, apply voltage : hours value is less than the ted, then after the other	$\begin{array}{l} \Delta C/C \\ Class I: \\ NP0: within \pm 2\% \ or \ I \ pF, whichever is greater \\ Class 2: \\ \times 7R: \pm 15\% \\ D.F. \\ Class I: \\ NP0: \leq 2 \times \text{specified value} \\ Class 2: \\ \times 7R: \geq 25 \ \forall: \leq 5\% \\ R_{\text{ins}} \\ Class I: \\ NP0: \geq 4,000 \ M\Omega \ or \\ R_{\text{ins}} \times C_r \geq 40s \ \text{whichever is less} \\ Class 2: \\ \times 7R: \geq 1,000 \ M\Omega \ or \\ R_{\text{ins}} \times C_r \geq 50s \ \text{whichever is less} \\ \end{array}$	
Voltage Proof		4.6	Specified structure Ur $\leq 100 \text{ V}$: 100 V < Ur (1.5 Ur + 100 V) (1.3 Ur + 100 Ur) Ur > 500 V: $Ur \geq 1000 \text{ V}$	ess voltage ap series applied ≤ 200 V serie 00) ≤ 500 V serie 10) 1.3 Ur ': 1.2 Ur	es applied	No breakdown or flashover	

Surface-Mount Ceramic Multilayer Capacitors Mid-voltage NP0/X7R 100 V to 630 V

<u>REVISION</u>	<u>HISTORY</u>

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version 22	Sep. 10, 2020	-	- Add
			NPO : 0603/100V/1.8nF to 10nF, 1206/250V/3.3nF to 3.9nF 1206/630V/2.2nF
			X7R : 0805/100V330nF to 1µF, 0805/250V/68nF to 100nF
			1206/100V/680nF, 1210/500V/68nF to 100nF, 1210/630V/47nF
			- Modify
			NPO :1210/100V/12nF to 15nF thickness to 1.25mm X7R :1210/630V/22nF thickness to 1.6mm
			1210/630V/27nF to 33nF thickness to 2.0mm
Version 21	Jul. 13, 2018	-	- Add
			NPO : 0402/120pF to 1nF/100V, 0603/1.2nF to 1.5nF/100V, 1206/1.8nF/630V, 1210/12nF to 22nF/100V
			X7R : 0805/33nF to 47nF/200 to 250V
Version 20	Sep. 14, 2017	-	- Dimension outlines updated
Version 19	Mar 7, 2017	-	- 0805 L4 spec updated
Version 18	Dec 9, 2016	-	- Soldering recommendation update
Version 17	Aug 16, 2016	-	- Capacitance range & thickness update
Version 16	Apr. 16, 2015	-	- Capacitance range & thickness
Version 15	Apr. 16, 2015	-	- Electrical characteristics update
Version 14	Sep. 25, 2014	-	- Electrical characteristics update
Version 13	Apr. 21, 2014	-	- Electrical characteristics update
Version 12	Dec. 12, 2013	-	- Electrical characteristics update
Version I I	Jun. 17, 2013	-	- Test method and procedure updated
Version 10	Nov 22, 2012	-	- Test method and procedure updated
Version 9	Feb 02, 2012	-	- Test method and procedure updated
Version 8	Apr 22, 2011	-	- NP0 0402 100V added
Version 7	Mar 01, 2011	-	- Dimension updated
Version 6	Sep 30, 2010	-	- Update the thickness of 0805 100V
Version 5	Sep 28, 2010	-	- Product range updated
			- Thickness classes and packing quantity table updated
Version 4	Jun 17, 2010	-	- Update the dimension of 0805, 1206 and 1812
Version 3	Mar 25, 2010	-	- Product range update
Version 2	Mar 15, 2010	-	- Product range update
Version I	Oct 30, 2009	-	- Change to dual brand datasheet that describe Mid-voltage NP0/X7R series with RoHS compliant
			- Replace the "100V to 630V" part of pdf files: UP-NP0X7R_MV_100-to- 500V_0, UY-NP0X7R_MV_100-to-500V_0, NP0_16V-to-100V_6, NP0_50-to-500V_10, X7R_16-to-500V_9 and X7R_16V-to-100V_9
			- Define global part number - Description of "Halogen Free compliant" added - Test method and procedure updated
Version 0	Sep 08, 2005	-	- New



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