



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



VAGEO Phicomp

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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 LCD panel ADSL, Modem

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 <u>XXXX</u> <u>X</u> <u>X</u> <u>XXX</u> <u>X</u> <u>B</u> <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

 $B = \pm 0.1 \text{ pF}$ $C = \pm 0.25 \text{ pF}$ $D = \pm 0.5 \text{ pF}$ $F = \pm 1\%$ $G = \pm 2\%$ $J = \pm 5\%$ $K = \pm 10\%$ $M = \pm 20\%$

(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
- C = Bulk case

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

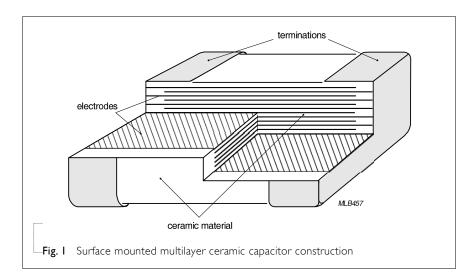
Surface-Mount Ceramic Multilayer Capacitors Mid-voltage NP0/X7R 100 V to 630 V

Product specification $\frac{3}{18}$

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

Table I For outlines see fig. 2

$\begin{array}{c ccccccccccccccccccccccccccccccccccc$) L ₄ (mm)	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	nin.	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$.20	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$.40	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$.40	
3.2 ±0.30 1.6 ±0.20 0.85 ±0.10 1206 1.25 ±0.20 0.25 0.75	.70	
1.6 ±0.20	.40	
3.2 ±0.30 1.6 ±0.30 1.6 ±0.30		
0.85 ±0.10 1210 3.2 ±0.30 2.5 ±0.20 1.25 ±0.20 0.25 0.75 1.4 2.0 ±0.20	.40	
1808 4.5 ±0.40 2.0 ±0.30 1.25 ±0.20 0.25 0.75 2.3	.20	
0.85 ±0.10 1812 4.5 ±0.40 3.2 ±0.30 1.25 ±0.20 0.25 0.75 2.2 1.6 ±0.20	20	

For dimension see Table 1 I L_2 L_4 L_3 MBB211Fig. 2 Surface mounted multilayer ceramic capacitor dimension

TAGEV	Phicor								Product specific	$\frac{4}{18}$
	Surface	-Mount Ce	ramic Mu	itilayer Ca	apacitors	Mid-voltage	NP0/X7R	100 V to	630 V	
	ANCE RAN	<u>IGE & THIO</u>	CKNESS FO	dr Npo						
	Sizes from 02									
CAP.	0201	0402	0603			0805				
	100V	100V	100 V	200 V	250 V	100 V	200 V	250 V	500 V	630\
0.22 pF	_									
0.47 pF										
0.56 pF										
0.68 pF										
0.82 pF										
I.0 pF										
I.2 pF										
1.5 pF										
I.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.
8.2 pF										
10 pF										
I2 pF										
I5 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

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



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

CAPACITANCE RANGE & THICKNESS FOR NPO

Table 3	Sizes fi	rom 0603	to 0805	(continued)
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CAP.	0402	0603	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		0805				
	100 V	100 V	200 V	250 V	100 V	200 V	250 V	500 V	630 V
120 pF									
150 pF						0.6± 0.1	0.6± 0.1	0.6± 0.1	0.6± 0.1
180 pF									
220 pF									
270 pF			0.8± 0.1	0.8± 0.1					
330 pF	0.5± 0.05		0.0 ± 0.1	0.0 ± 0.1	0.6± 0.1			0.85±0.1	0.85±0.1
390 pF	0.02 0.00	0.8± 0.1			0.02 0.1				
470 pF		0.01 0.1				0.85±0.1	0.85±0.1		
560 pF									
680 pF								1.25±0.2	1.25±0.2
820 pF								1.23±0.2	1,25±0,2
I.0 nF									
I.2 nF									
I.5 nF					0.85±0.1				
I.8 nF									
2.2 nF						1.25±0.2	1.25±0.2		
2.7 nF						1,25±0,2	1,23±0,2		
3.3 nF									
3.9 nF									
4.7 nF					I.25±0.2				
5.6 nF									
6.8 nF									
8.2 nF									
10 nF									
I2 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			eramic I	Aultilayer	Capacitor	Mid-v	oltage N	100/x7r	V to 630 V	Decification 4
CAPACIT	ance ra	<u>NGE & TH</u>	ICKNESS	<u>for npo</u>						
Table 4	Sizes from	1206 to 1210	1							
CAP.	1206 100 V	200 V	250 V	500 V	630 V	1210 100 V	200 V	250 V	500 V	630 \
0.47 pF		-				-		-		
0.56 pF										
0.68 pF										
0.82 pF										
1.0 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	0.6±0.1	0.6±0.1	0.6±0.1							
6.8 pF	0.6±0.1	0.0±0.1	0.6±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	1,2510,2					
39 pF								_		
47 pF										1.25±0.
56 pF						1.25±0.2	1.25±0.2	1.25±0.2	1.25±0.2	1,25±0.
68 pF						,,∠J⊥U,Z	1,2310,2	1,2310,2	1,2010,2	
82 pF										

- I. Values in shaded cells indicate thickness class in mm
- 2. Capacitance value of non E-12 series is on request



								1		
		<u>ANGE & 1</u> n 1206 to 12			<u>0</u>					
CAP.	1206	11 1 200 to 12		-0)		1210				
	100 V	200 V	250 V	500 V	630 V	100 V	200 V	250 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					1.25±0.2					
470 pF	0.6±0.1				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		0.85±0.1	0.85±0.1	0.85±0.1		1.25±0.2				
I.2 nF		0.00±0.1	0.00 ± 0.1	0.00 ± 0.1						
I.5 nF										
I.8 nF				1.25±0.2						
2.2 nF		1.25±0.2	1.25±0.2							
2.7 nF										
3.3 nF										_
3.9 nF										
4.7 nF	0.85±0.1									_
5.6 nF										
6.8 nF										
8.2 nF	I.25±0.2									
I0 nF										
I2 nF										
I5 nF						1.6±0.2				
18 nF										
22 nF										

Surface-Mount Ceramic Multilayer Capacitors Mid-voltage

ΝΟΤΕ

I. Values in shaded cells indicate thickness class in mm

YAGEO Phicomp

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

7 18

Product specification

NP0/X7R 100 V to 630 V

	Surface-	Mount Ceramic	Multilayer Cap	Acitors Mid-volt	age NP0/X7R 100	Product specification V to 630 V
CAPACI	TANCE RANG	GE & THICKNESS	FOR NPO			
Table 6	Sizes 1812					
CAP.		1812				
		100 V	200 V	250 V	500 V	630\
	10 pF					
	I2 pF					
	I5 pF					
	18 pF					
	22 pF					
	27 pF					
	33 pF					
	39 pF					
	47 pF					
	56 pF					
	68 pF					
	82 pF 100 pF					
	120 pF					
	120 pF 150 pF					
	180 pF					
	220 pF					
	270 pF					
	330 pF					1.25±0.2
	390 pF					
	470 pF					
	560 pF				1.25±0.2	
	680 pF					
	820 pF					
	l nF					
	I.2 nF			1.25±0.2		
	1.5 nF		1.25±0.2			
	1.8 nF					
	2.2 nF					
	2.7 nF	1.25±0.2				
	3.3 nF					
	3.9 nF					
	4.7 nF					
	5.6 nF					
	6.8 nF					
	8.2 nF					
	10 nF					
	l2 nF					
	15 nF					
	18 nF					
	22 nF					

NOTE

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

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



YAGEO) Phicon	np					F	Product specification 9
	Surface	Mount Cer	amic Multil	ayer Capaci	itors Mid-v	oltage NP0/X	7R 100 V to 6	530 V
CAPACIT	ANCE RAN	GE & THIC	KNESS FOR	X7R				
Table 7	Sizes from 0							
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								
I.0 nF	0.5±0.05				0.85±0.1	0.85±0.1	0.85±0.1	0.85±0.1
I.5 nF				0.6±0.1				
2.2 nF			0.8±0.1					
3.3 nF		0.8±0.1						
4.7 nF								
6.8 nF								
I0 nF								1.25±0.2

6.8 nF						
10 nF						1.25±0.2
15 nF					1.25±0.2	
22 nF		0.85±0.1	1.25±0.2	1.25±0.2		
33 nF						
47 nF						
68 nF						
100 nF		1.25±0.2				
150 nF						
220 nF						
330 nF						
470 nF						

I. Values in shaded cells indicate thickness class in mm

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

TAJEU) Phice	omp							Product speci	
	Surfac	e-Mount (Ceramic N	lultilayer	Capacitor	S Mid-volt	age NP0/>	(7R 100 V	to 630 V	18
<u>CAPACIT</u>		<u>NGE & TE</u> n 1206 to 12		<u>FOR X7R</u>						
CAP.	1206					1210				
	100 V	200 V	250 V	500 ∨	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		0.85±0.1	0.85±0.1		1.25±0.2 ⁻					
2.2 nF				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										1.25±0.2
10 nF 15 nF						0.85±0.1			1.25±0.2	
22 nF	-			-		0.85±0.1				
33 nF				1.6±0.2	1.6±0.2					1.6±0.2
47 nF		1.25±0.2	I.25±0.2	1.6±0.2						110±012
68 nF							1.25±0.2	I.25±0.2		
100 nF	1	1.6±0.2	1.6±0.2				1,23±0,2	1,23-0,2		
150 nF	I.25±0.2									
220 nF										
330 nF						I.25±0.2 -				
470 nF	1.6±0.2									
680 nF										
ΙμF	1.6±0.2					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

YAGEO	<u>Phicor</u>	np						Product	specification 1
	Surface	-Mount Ce	ramic Mul	tilayer Cap	acitors	Mid-voltage	NP0/X7R	100 V to 630 V	18
CAPACITA	ance ran	GE & THI	CKNESS FO	R X7R					
Table 9	Sizes from 1	808 to 1812							
CAP.	1808 100 ∨	200 V	250 V	500 V	1812 100 V		250 \	/ 500 ∨	630 V
100 pF	100 ¥	200 ¥	250 ¥	500 ¥	100 ¥	200 V	230	, <u> </u>	050 ¥
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									1.35±0.2
6.8 nF						0.85±0.1	0.85±0.		
10 nF					0.85±0.1			I.25±0.2	
15 nF				1.25±0.2					
22 nF	1.25±0.2	1.25±0.2	1.25±0.2						
33 nF									1.6±0.2
47 nF									
68 nF									
100 nF						1.25±0.2	1.25±0.2	1.6±0.2	
150 nF									
220 nF					1.25±0.2				
330 nF						1.6±0.2	1.6±0.2	2	
470 nF									
680 nF					1.6±0.2				
ΙμF									

- 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



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

THICKNESS CLASSES AND PACKING QUANTITY

Size COD THICKNESS CLASSIFICATION OUNTITY PR REL 0180 MH / 7 INCH Paper 033 0 MM / 13 INCH Paper OUANTITY Bisser OUANTITY PR BULK CAS 0402 0.3 ±0.03 mm 8 mm 15:000	Table I	0						
CODE CLASSIFICATION QUANTITY PER REL Paper Bister Paper Bister Per Bulk CASE 0201 0.3 ±0.03 mm 8 mm 15.000 0402 0.5 ±0.05 mm 8 mm 10.000 50.000 50.000 50.000 50.000 50.000 50.000 50.000 50.000 50.000 50.000 50.000 15.000 15.000 15.000 15.000 10.000 6.06.10 mm 8 mm 4.000 15.000	SIZE	THICKNESS	TAPE WIDTH					QUANTITY
0402 0.5 ±0.05 mm 0 mm 10000	CODE	CLASSIFICATION	QUANTITY PER REEL	Paper	Blister	Paper	Blister	
0603 0.8 ±0.1 mm 0 mm 4.000 15.000 15.000 0603 0.8 ±0.1 mm 8 mm 4.000 15.000 10.000 0.8 ± 0.1 mm 8 mm 4.000 15.000 10.000 125 ± 0.2 mm 8 mm 4.000 15.000 8.000 125 ± 0.2 mm 8 mm 4.000 15.000 0.8 / 0.85 ± 0.1 mm 8 mm 4.000 15.000 120 / 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 1.5 ± 0.1 mm 8 mm 3.000 1.5 ± 0.1 mm 8 mm 3.000		0.3 ±0.03 mm	8 mm	I 5,000		50,000		
06.9 0.6 ± 0.1 mm 0 mm 4,000 10,000 0805 0.8 / 0.85 ± 0.1 mm 8 mm 4,000 15,000 8,000 125 ± 0.2 mm 8 mm 4,000 15,000 8,000 1266 0.8 / 0.85 ± 0.1 mm 8 mm 4,000 10,000 5,000 100 / 1.15 ± 0.1 mm 8 mm 4,000 10,000 100 / 1.5 ± 0.1 mm 8 mm 3,000 10,000 1.6 / 0.7 10.1 mm 8 mm 2,000 10,000 0.6 / 0.7 10.1 mm 8 mm 3,000 10,000 1.15 ± 0.1 mm 8 mm		0.5 ±0.05 mm	8 mm	10,000		50,000		50,000
0805 08/085 ±0.1 mm 8 mm 4,000 15,000 8,000 125 ±0.2 mm 8 mm 4,000 20,000	0603	0.8 ±0.1 mm	8 mm	4,000		15,000		15,000
Isobe Isobe <th< td=""><td></td><td>0.6 ±0.1 mm</td><td>8 mm</td><td>4,000</td><td></td><td>20,000</td><td></td><td>10,000</td></th<>		0.6 ±0.1 mm	8 mm	4,000		20,000		10,000
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	0805	0.8 / 0.85 ±0.1 mm	8 mm	4,000		15,000		8,000
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$		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 2.000 8.000 1.6 ±0.2 mm 8 mm 2.000 8.000 0.6 / 0.7 ±0.1 mm 8 mm 4.000 15.000 0.6 / 0.7 ±0.1 mm 8 mm 4.000 15.000 0.15 ±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 1.6 / 1.9 ±0.2 mm 8 mm 3.000 1.6 ±0.1 mm 12 mm 3.000 <t< td=""><td></td><td>0.6 ±0.1 mm</td><td>8 mm</td><td>4,000</td><td></td><td>20,000</td><td></td><td></td></t<>		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 4,000 10,000 1.15 ±0.1 mm 8 mm 3,000 10,000 1.15 ±0.15 mm 8 mm 3,000 1.5 ±0.15 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 1.5 ±0.1 mm 12 mm 3,000 1.55 ±0.1 mm <td></td> <td>0.8 / 0.85 ±0.1 mm</td> <td>8 mm</td> <td>4,000</td> <td></td> <td>15,000</td> <td></td> <td></td>		0.8 / 0.85 ±0.1 mm	8 mm	4,000		15,000		
125 ±02 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 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 1.6 / 1.9 ±0.2 mm 8 mm 2,000 2.0 ±0.2 mm 8 mm 3,000 1.5 ±0.1 mm 12 mm 3,000 1.5 ±0.2 mm 12 mm 3,000 1.5 ±0.1 mm 12 mm	1206	1.00 / 1.15 ±0.1 mm	8 mm		3,000		10,000	
16 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 1.15 ±0.1 mm 8 mm 3,000 10,000 1.15 ±0.1 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 3,000 1.5 ±0.1 mm 12 mm 3,000 1.5 ±0.1 mm 12 mm 3,000 1.5 ±0.1 mm	1200	1.25 ±0.2 mm	8 mm		3,000		10,000	
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$		1.6 ±0.15 mm	8 mm		2,500		10,000	
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$		1.6 ±0.2 mm	8 mm		2,000		8,000	
Isolation Isolation <thisolation< th=""> <thisolation< th=""> <thi< td=""><td></td><td>0.6 / 0.7 ±0.1 mm</td><td>8 mm</td><td></td><td>4,000</td><td></td><td>15,000</td><td></td></thi<></thisolation<></thisolation<>		0.6 / 0.7 ±0.1 mm	8 mm		4,000		15,000	
1.15 ±0.15 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 2.0 ±0.2 mm 8 mm 500 2.5 ±0.2 mm 8 mm 500 1.15 ±0.15 mm 12 mm 3,000 1.15 ±0.15 mm 12 mm 3,000 1.15 ±0.15 mm 12 mm 2,000 1.35 ±0.15 mm 12 mm 2,000 1.6 ±0.2 mm 12 mm 2,000 1.15 ±0.1 mm 12 mm		0.85 ±0.1 mm	8 mm		4,000		10,000	
1210 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 500 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 3.000 1.35 ±0.15 mm 12 mm 2.000 1.6 ±0.2 mm 12 mm 2.000 1.6 ±0.2 mm 12 mm 1.000 1.15 ±0.1 mm 12 mm<		1.15 ±0.1 mm	8 mm		3,000		10,000	
$ 1210 = 1.5 \pm 0.1 \text{ mm}} 8 \text{ mm}} -2.000$	-	1.15 ±0.15 mm	8 mm		3,000		10,000	
Is ±0.1 mm 8 mm 2,000 <		1.25 ±0.2 mm	8 mm		3,000			
2.0 ±0.2 mm 8 mm 2.000 1.000 2.5 ±0.2 mm 8 mm 1.000 500 1.15 ±0.15 mm 12 mm 3.000 1.25 ±0.2 mm 12 mm 3.000 1.25 ±0.2 mm 12 mm 3.000 1.25 ±0.2 mm 12 mm 2.000 1.35 ±0.15 mm 12 mm 2.000 1.4 ±0.2 mm 12 mm 2.000 8.000 2.0 ±0.2 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 ±0.1 mm 12 mm	1210	1.5 ±0.1 mm	8 mm		2,000			
$1808 = \frac{1.20 \pm 0.2 \text{ mm}}{2.5 \pm 0.2 \text{ mm}} = 8 \text{ mm}} = \frac{1.000}{1,000} = \frac{1.15 \pm 0.15 \text{ mm}}{500} = \frac{1.15 \pm 0.15 \text{ mm}}{1.20 \text{ mm}} = \frac{1.000}{500} = \frac{1.15 \pm 0.15 \text{ mm}}{1.25 \pm 0.2 \text{ mm}} = \frac{1.20 \text{ mm}}{1.20 \text{ mm}} = \frac{1.2000}{1.000} = \frac{1.15 \pm 0.1 \text{ mm}}{1.20 \text{ mm}} = \frac{1.2000}{1.20 \text{ mm}} = \frac{1.15 \text{ mm}}{1.20 \text{ mm}} = \frac{1.000}{1.000} = \frac{1.15 \text{ mm}}{1.15 \pm 0.1 \text{ mm}} = \frac{1.20 \text{ mm}}{1.20 \text{ mm}} = \frac{1.000}{1.000} = \frac{1.15 \text{ mm}}{1.15 \pm 0.1 \text{ mm}} = \frac{1.20 \text{ mm}}{1.20 \text{ mm}} = \frac{1.000}{1.000} = \frac{1.15 \text{ mm}}{1.15 \text{ mm}} = \frac{1.20 \text{ mm}}{1.2000} = \frac{1.1000}{1.000} = 1.1000$		1.6 / 1.9 ±0.2 mm	8 mm		2,000			
Image: 100 mm 8 mm 500		2.0 ±0.2 mm	8 mm					
1808 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 1.5 ±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 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 1.5 ±0.15 mm 12 mm 1,000 1.6 ±0.2 mm 12		2.5 ±0.2 mm	8 mm					
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 2.0 ±0.2 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		1.15 ±0.15 mm	l2 mm		3,000			
1808 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 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 1.6 ±0.2 mm 12 mm 1,000 2.0 ±0.2 mm 12 mm 1,000		1.25 ±0.2 mm	l2 mm		3,000			
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		1.5 ±0.1 mm	l2 mm		2,000			
0.6 / 0.85 ±0.1 mm 12 mm 2,000		1.6 ±0.2 mm	l2 mm		2,000		8,000	
I.15 ±0.1 mm I2 mm I,000 I.15 ±0.15 mm I2 mm I,000 I.25 ±0.2 mm I2 mm I,000 I.35 ±0.15 mm I2 mm I,000 I.35 ±0.15 mm I2 mm I,000 I.5 ±0.1 mm I2 mm I,000 I.6 ±0.2 mm I2 mm I,000 I.6 ±0.2 mm I2 mm I,000 I.0 ±0.2 mm I2 mm I,000		2.0 ±0.2 mm	l2 mm		2,000			
I.15 ±0.15 mm I2 mm I,000		0.6 / 0.85 ±0.1 mm	I2 mm		2,000			
I 1.25 ±0.2 mm I 2 mm I,000 I 1.35 ±0.15 mm I 2 mm I,000 I 1.5 ±0.1 mm I 2 mm I,000 I 1.6 ±0.2 mm I 2 mm I,000 I 0.6 ±0.2 mm I 2 mm I,000 I 0.0 ±0.2 mm I 2 mm I,000		1.15 ±0.1 mm	l2 mm		1,000			
1812 1.35 ±0.15 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		1,000			
2.5 ±0.2 mm 12 mm 500		2.0 ±0.2 mm	l2 mm		1,000			
		2.5 ±0.2 mm	l2 mm		500			

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 DESCRIP			VALUE
Capacitar		0.47	pF to 2.2 μF
	nce tolerance	0.17	ρι το 2.2 μι
NP0	C < 10 pF	±0.25	pF, ±0.5 pF
	C ≥ 10 pF		±5%, ±10%
X7R		±5% ⁽¹⁾ , ±	10%, ±20%
Dissipatio	on factor (D.F.)		
NP0	C < 30 _P F	≤ / (4	100 + 20C)
	C ≥ 30 _P F		≤ 0.1 %
X7R			≤ 2.5 %
Exception	n	X7R /0603/100V, $12nF \le C \le 100nF$, X7R/1206/2.2uF/100V	≤ 5%
		X7R/1206/100V/1uF; X7R/1210/100V/1uF and 2.2uF;	≤ 3.5%
Insulation	n resistance after 1 minute at U_r (DC)	$R_{ins} \ge 10 \text{ G}\Omega$ or $R_{ins} \ge C \ge 500$ seconds which	hever is less
	n capacitance change as a function of tempe ture characteristic/coefficient):	rature	
NP0		±	-30 ppm/°C
X7R			±15%
	g temperature range:		
NP0/X7	7R	_55 °C	to +125 °C

NOTE

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 METI	нор	PROCEDURE	REQUIREMENTS
Mounting	IEC 60384- 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}$ at 20 °C $f = KHz \text{ for } C > nF$, measuring at voltage $ V_{rms}$ at 20 °C Class 2: $f = KHz \text{ for } C \le 10 \ \mu\text{F}$, measuring at voltage $ V_{rms}$ at 20 °C	Within specified tolerance
Dissipation Factor (D.F.)		4.5.2	Class I: $f = 1 \text{ MHz}$ for $C \le 1 \text{ nF}$, measuring at voltage 1 V _{ms} at 20 °C f = 1 KHz for $C > 1 nF$, measuring at voltage 1 V _{ms} at 20 °C Class 2: $f = 1 \text{ KHz}$ for $C \le 10 \mu$ F, measuring at voltage 1 V _{ms} at 20 °C	In accordance with specification
Insulation Resistance		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

Surface-Mount Ceramic Multilayer Capacitors	Mid-voltage	NP0/X7R	100 V to 630 V
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TEST	TEST METHOD	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. $\boxed{Step Temperature(^{\circ}C)}$ a 25±2 b Lower temperature±3°C c 25±2 d Upper Temperature±3°C e 25±2 (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 Change shall be calculated from the formula as below ΔT : 100°C(=125°C-25°C) (2) (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 c C2: Capacitance at step c C2: Capacitance at step c C1: Capacitance at step c C2: Capacitance at step c C2: Capacitance at step b or d	<general purpose="" series=""> Class1: Δ C/C: ±30ppm Class2: X7R: Δ C/C: ±15% Y5V: Δ C/C: 22~-82% <high capacitance="" series=""> Class2: X7R/X5R: Δ C/C: ±15% Y5V: Δ C/C: 22~-82%</high></general>
Adhesion	IEC 60384- 4.7 21/22	A force applied for 10 seconds to the line joining the terminations and in a plane parallel to the substrate	Force size ≥ 0603: 5N
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 $\frac{16}{18}$

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	ΔC/C Class 1: NP0: within ±0.5% or 0.5 pF, whichever is greater Class2: X7R: ±10%
			Solder bath temperature: $260 \pm 5 \text{ °C}$ 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. I. Temperature: 235±5°C	The solder should cover over 95% of the critical area of each termination
			 / Dipping time: 2 ±0.5 s 2. 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; 50 +0/–10 °C for hour, then keep for _	No visual damage
Temperature			24 \pm l hours at room temperature	ΔC/C Class 1:
			5 cycles with following detail: 30 minutes at lower category temperature 30 minutes at upper category temperature	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



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

TEST	TEST METH	IOD	PROCEDURE			REQUIREMENTS
Damp Heat		4.13		ing, class 2 only °C /1 hour, the at room temp re: itial spec C, D, est: urs at 40 ±2 °C .H. 24 hours e: C, D, IR itance value is permitted, the have been mac	IR IR C; less than the m after the other de the capacitor shall	REQUIREMENTSNo visual damage after recovery $\Delta C/C$ Class 1:NP0: within $\pm 2\%$ or 1 pF, whichever is greaterClass2: $\times 7R: \pm 15\%$ D.F.Class 1:NP0: $\leq 2 \times$ specified valueClass2: $\times 7R: \geq 25 \forall : \leq 5\%$ R_{ins} Class 1:NP0: $\geq 2,500 \text{ M}\Omega$ or $R_{ins} \times C_r \geq 25s$ whicheveris less
			be precondition then the requin		"IEC 60384 4.1" and met.	is less Class2: X7R: \geq 500 M Ω or R _{ins} x C _r \geq 25s whichever less
Endurance	IEC 60384- 21/22	4- 4.14	 Preconditioning, class 2 only: 150 +0/-10 °C /1 hour, then keep for 24 ±1 hour at room temp Initial measure: Spec: refer initial spec C, D, IR Endurance test: Temperature: NP0/X7R: 125 °C Specified stress voltage applied for 1,000 hours: High voltage series follows with below stress condition: 		n keep for IR 15 °C lied for 1,000 hours:	No visual damage $\Delta C/C$ Class I: NP0: within ±2% or 1 pF, whichever is greate Class 2: X7R: ±15% D.F. Class I: NP0: $\leq 2 \times$ specified value
			Voltage	NPO	X7R	Class2:
			≤ 100∨	2.0 x Ur	2.0 × Ur	X7R: ≥ 25 V: ≤ 5%
			200/250V	I.5 x Ur	1.5 x Ur	R _{ins}
			500/630V	1.3 x Ur	I.2 x Ur	Class I :
			\geq KV	I.2 x Ur	I.I x Ur	NP0: \geq 4,000 M Ω or
			5. Recovery tim	ne: 24 ±2 hour	s	$R_{ins} \times C_r \ge 40s$ whichever is less
			6. Final measure: C, D, IR			Class2:
			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.			X7R: \geq 1,000 M Ω or $R_{ins} \times C_r \geq$ 50s whichever is less
Voltage Proof 4.6		4.6	Specified stress voltage applied for $1 \sim 5$ seconds Ur ≤ 100 V: series applied 2.5 Ur 100 V $<$ Ur ≤ 200 V series applied (1.5 Ur + 100) 200 V $<$ Ur ≤ 500 V series applied (1.3 Ur + 100) Ur > 500 V: 1.3 Ur Ur ≥ 1000 V: 1.2 Ur Charge/Discharge current is less than 50 mA			No breakdown or flashover



Product specification 18 Surface-Mount Ceramic Multilayer Capacitors Mid-voltage NP0/X7R 100 V to 630 V

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version 21	Jul. 13, 2018	-	- Add NPO/0402/120pF to 1nF/100V, NPO/0603/1.2nF to 1.5nF/100V, NPO/1206/1.8nF/630V, NPO/1210/12nF to 22nF/100V
			- Add 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 11	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

<u>REVISION HISTORY</u>

