

DATA SHEET

SURFACE-MOUNT CERAMIC
MULTILAYER CAPACITORS

Mid-voltage

NP0/X7R

100 V TO 630 V

0.47 pF to 1 μ F

RoHS compliant & Halogen Free



SCOPE

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

APPLICATIONS

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

FEATURES

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

ORDERING INFORMATION - GLOBAL PART NUMBER, PHYCOMP

CTC & I2NC

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 xxx x **B** x xxx
(1) (2) (3) (4) (5) (6) (7)

(1) SIZE – INCH BASED (METRIC)

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

(2) TOLERANCE

C = ±0.25 pF
D = ±0.5 pF
G = ±2%
J = ±5%
K = ±10%

(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 = NPO
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: 121 = 12 × 10¹ = 120 pF

PHYCOMP BRAND ordering codes

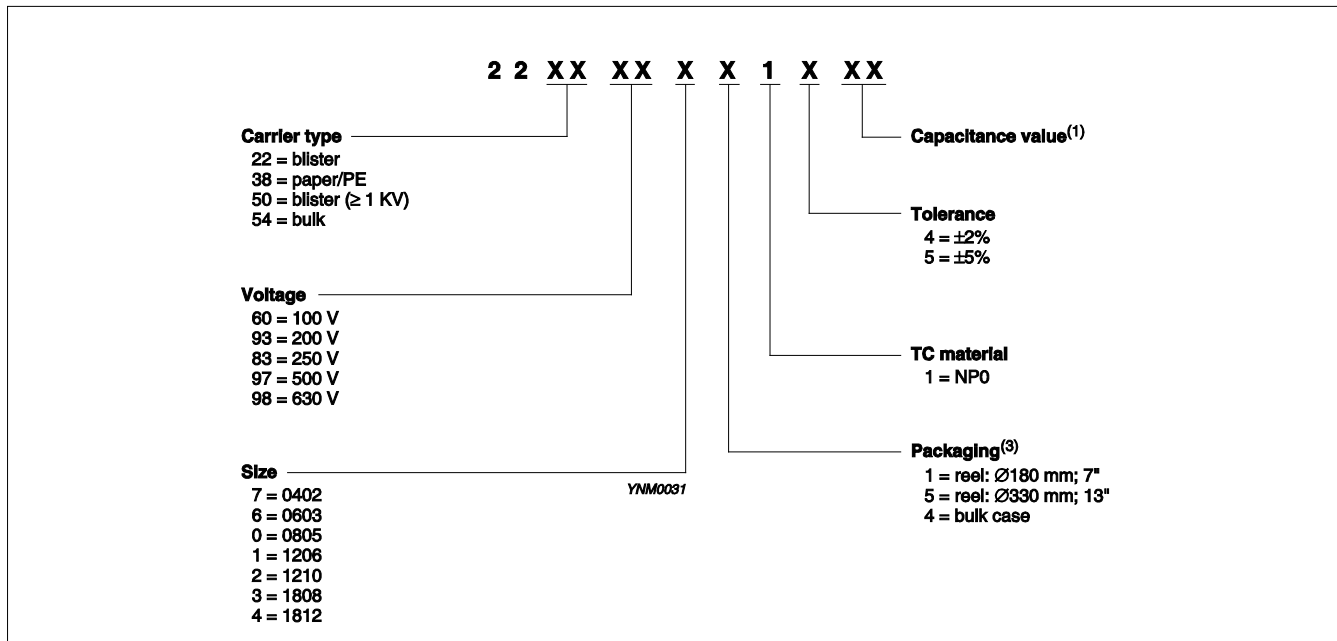
GLOBAL PART NUMBER (preferred), PHYCOMP CTC (for North America) and I2NC (traditional) codes are acceptable to order Phycomp brand products.

GLOBAL PART NUMBER (PREFERRED)

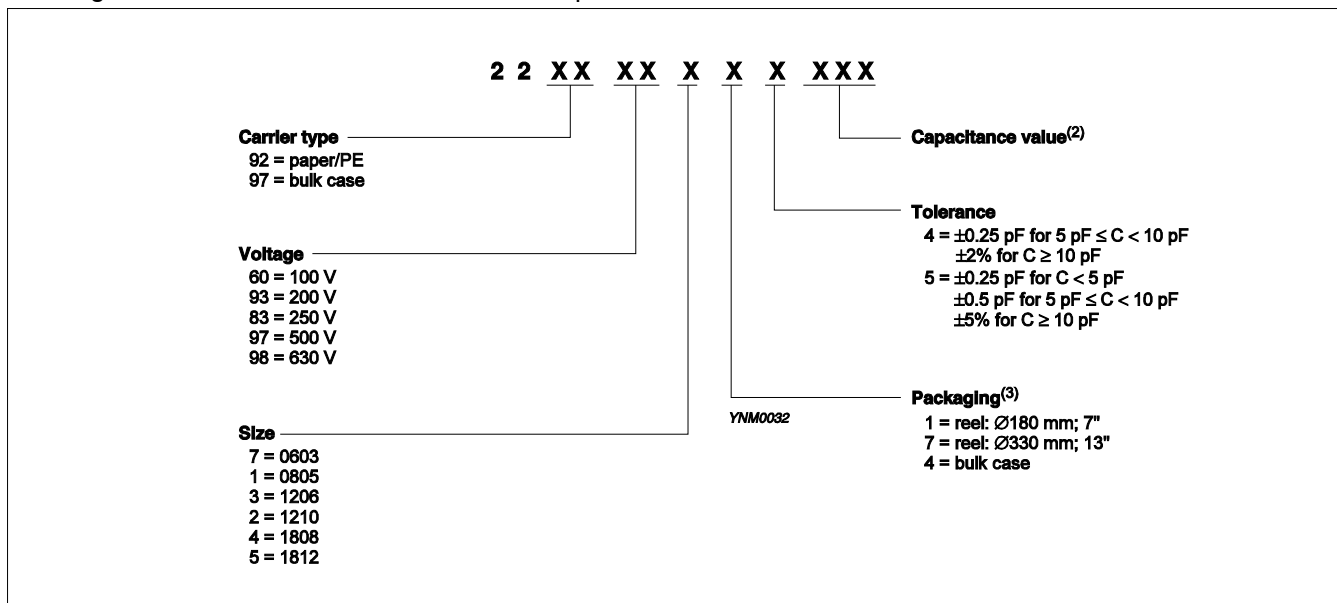
For detailed information of GLOBAL PART NUMBER and ordering example, please refer to page 2.

I2NC CODE

Ordering information for NP0 100 V to 630 V, C ≥ 10 pF

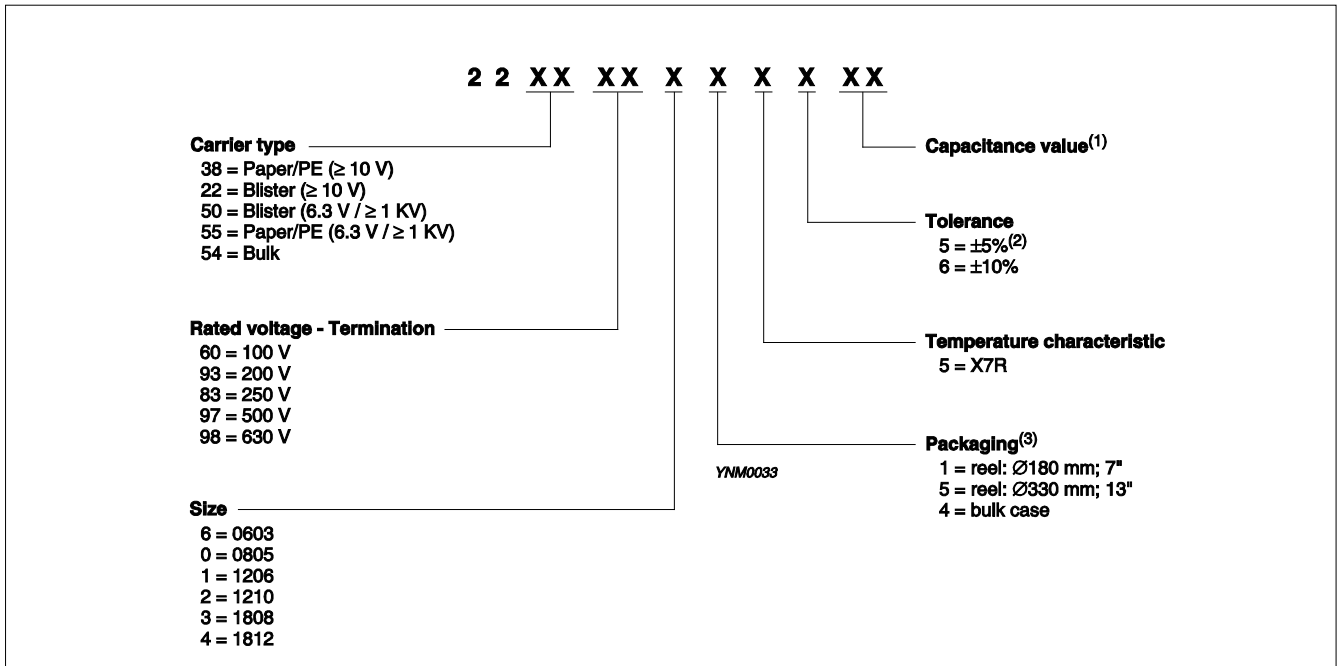


Ordering information for NP0 100 V to 630 V, C < 10 pF



(1) Please refer to "Last 2-digit of I2NC" in "CAPACITANCE RANGE & THICKNESS FOR NP0"
 (2) Please refer to "Last 3-digit of I2NC" in "CAPACITANCE RANGE & THICKNESS FOR NP0"
 (3) Quantity on reel depends on thickness classification; see table I4

Ordering information for X7R 100 V to 630 V



- (1) Please refer to "Last 2-digit of I2NC" in "CAPACITANCE RANGE & THICKNESS FOR X7R"
- (2) Tolerance ±5% doesn't available for full product range, please contact local sales force before order
- (3) Quantity on reel depends on thickness classification; see table I4

PHYCOMP CTC CODE (FOR NORTH AMERICA)

🔗 Example: 0603CG101J0B200

0603	CG	101	J	0	B	2	0	0
Size code	Temp. Char.	Capacitance in pF	Tolerance	Voltage	Termination	Packing	Marking	Range identifier
0402	CG = NP0	101 = 100 pF; the	C = ±0.25 pF	0 = 100 V	B = NiSn	2 = 180 mm	0 = no marking	0 = conv. Ceramic
0603	2R = X7R	third digit signifies	D = ±0.5 pF	B = 200 V		7" Paper/PE		D = Class 2 MLCC
0805		the multiplying	G = ±2%	C = 250 V		3 = 330 mm		
1206		factor:	J = ±5%	D = 500 V		13" Paper/PE		
1210		0 = × 1	K = ±10%	Z = 630 V		B = 180 mm		
1808		1 = × 10				7" Blister		
1812		2 = × 100				F = 330 mm		
		3 = × 1,000				13" Blister		
						P = Bulk case		

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.

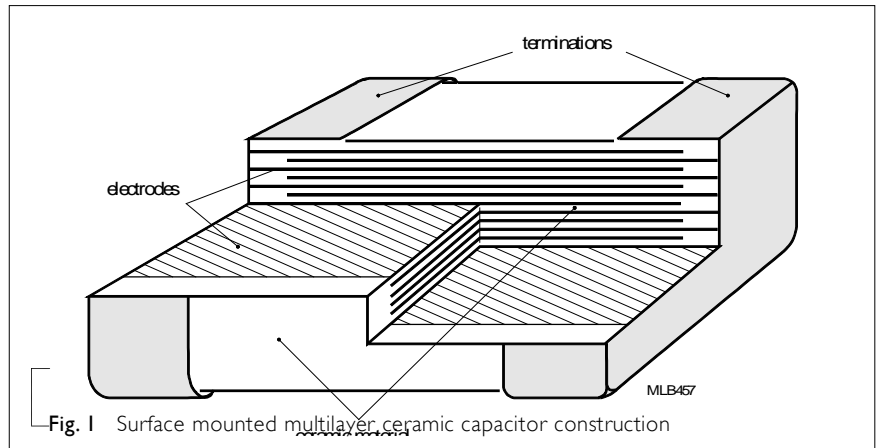


Fig.1 Surface mounted multilayer ceramic capacitor construction

DIMENSION

Table I For outlines see fig. 2

TYPE	L ₁ (mm)	W (mm)	T (MM)	L ₂ / L ₃ (mm)		L ₄ (mm)
				min.	max.	min.
0402	1.0 ±0.10	0.5 ±0.05	Refer to table 2 to 13	0.15	0.30	0.40
0603	1.6 ±0.10	0.8 ±0.10		0.20	0.60	0.40
0805	2.0 ±0.20	1.25 ±0.20		0.25	0.75	0.55
1206	3.2 ±0.30	1.6 ±0.20		0.25	0.75	1.40
1210	3.2 ±0.30	2.5 ±0.20		0.25	0.75	1.40
1808	4.5 ±0.40	2.0 ±0.30		0.25	0.75	2.20
1812	4.5 ±0.40	3.2 ±0.30		0.25	0.75	2.20

OUTLINES

For dimension see Table I

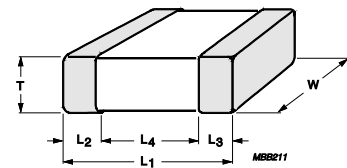


Fig.2 Surface mounted multilayer ceramic capacitor dimension

CAPACITANCE RANGE & THICKNESS FOR NP0

Table 2 Sizes from 0603 to 0805

CAP.	Last 3-digit of I2NC	0402		0603			0805			
		100V	100 V	200 V	250 V	100 V	200 V	250 V	500 V	630V
0.47 pF	477									
0.56 pF	567									
0.68 pF	687									
0.82 pF	827									
1.0 pF	108									
1.2 pF	128									
1.5 pF	158									
1.8 pF	188									
2.2 pF	228	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
2.7 pF	278									
3.3 pF	338									
3.9 pF	398									
4.7 pF	478									
5.6 pF	568									
6.8 pF	688									
8.2 pF	828									

Table 3 Sizes from 0402 to 0805

CAP.	Last 2-digit of I2NC	0402		0603			0805			
		100 V	100 V	200 V	250 V	100 V	200 V	250 V	500 V	630V
10 pF	23									
12 pF	24									
15 pF	25									
18 pF	26									
22 pF	27									
27 pF	28									
33 pF	29	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
39 pF	31									
47 pF	32									
56 pF	33									
68 pF	34									
82 pF	35									

NOTE

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

CAPACITANCE RANGE & THICKNESS FOR NP0

Table 4 Sizes from 0402 to 0805 (continued)

CAP.	Last 2-digit of	0402		0603			0805				
		12NC	100 V	100 V	200 V	250 V	100 V	200 V	250 V	500 V	630 V
100 pF	36	0.5±0.05									
120 pF	37										
150 pF	38							0.6±0.1	0.6±0.1	0.6±0.1	0.6±0.1
180 pF	39										
220 pF	41										
270 pF	42				0.8±0.1	0.8±0.1					
330 pF	43						0.6±0.1			0.85±0.1	0.85±0.1
390 pF	44										
470 pF	45							0.85±0.1	0.85±0.1		
560 pF	46			0.8±0.1							
680 pF	47									1.25±0.2	1.25±0.2
820 pF	48										
1.0 nF	49										
1.2 nF	51										
1.5 nF	52						0.85±0.1				
1.8 nF	53										
2.2 nF	54										
2.7 nF	55							1.25±0.2	1.25±0.2		
3.3 nF	56						1.25±0.2				
3.9 nF	57										
4.7 nF	58										
5.6 nF	59										
6.8 nF	61										
8.2 nF	62										
10 nF	63										
12 nF	64										
15 nF	65										
18 nF	66										
22 nF	67										

NOTE

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

CAPACITANCE RANGE & THICKNESS FOR NP0

Table 5 Sizes from 1206 to 1210

CAP.	Last 3-digit of	1206					1210					
		12NC	100 V	200 V	250 V	500 V	630 V	100 V	200 V	250 V	500 V	630 V
0.47 pF	477											
0.56 pF	567											
0.68 pF	687											
0.82 pF	827											
1.0 pF	108											
1.2 pF	128											
1.5 pF	158											
1.8 pF	188											
2.2 pF	228		0.6±0.1	0.6±0.1	0.6±0.1							
2.7 pF	278											
3.3 pF	338											
3.9 pF	398											
4.7 pF	478											
5.6 pF	568											
6.8 pF	688											
8.2 pF	828											

Table 6 Sizes from 1206 to 1210

CAP.	Last 2-digit of	1206					1210					
		12NC	100 V	200 V	250 V	500 V	630 V	100 V	200 V	250 V	500 V	630 V
10 pF	23											
12 pF	24											
15 pF	25											
18 pF	26											
22 pF	27											
27 pF	28											
33 pF	29		0.6±0.1	0.6±0.1	0.6±0.1	0.6±0.1	1.25±0.2					
39 pF	31											
47 pF	32											
56 pF	33											
68 pF	34							1.25±0.2	1.25±0.2	1.25±0.2	1.25±0.2	
82 pF	35											1.25±0.2

NOTE

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

CAPACITANCE RANGE & THICKNESS FOR NP0

Table 7 Sizes from 1206 to 1210 (continued)

CAP.	Last 2-digit of	1206					1210					
		12NC	100 V	200 V	250 V	500 V	630 V	100 V	200 V	250 V	500 V	630 V
100 pF	36											
120 pF	37											
150 pF	38											1.25±0.2
180 pF	39											
220 pF	41											
270 pF	42			0.6±0.1	0.6±0.1	0.6±0.1						
330 pF	43						1.25±0.2					
390 pF	44											
470 pF	45										1.25±0.2	
560 pF	46		0.6±0.1						1.25±0.2	1.25±0.2		
680 pF	47											
820 pF	48											
1.0 nF	49							1.25±0.2				
1.2 nF	51			0.85±0.1	0.85±0.1	0.85±0.1						
1.5 nF	52											
1.8 nF	53											
2.2 nF	54											
2.7 nF	55			1.25±0.2	1.25±0.2							
3.3 nF	56											
3.9 nF	57											
4.7 nF	58		0.85±0.1									
5.6 nF	59											
6.8 nF	61											
8.2 nF	62											
10 nF	63		1.25±0.2									
12 nF	64											
15 nF	65											
18 nF	66											
22 nF	67											

NOTE

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

CAPACITANCE RANGE & THICKNESS FOR NP0

Table 8 Sizes 1812

CAP.	Last 2-digit of		1812		
	12NC	100 V	200 V	500 V	
10 pF	23				
12 pF	24				
15 pF	25				
18 pF	26				
22 pF	27				
27 pF	28				
33 pF	29				
39 pF	31				
47 pF	32				
56 pF	33				
68 pF	34				1.25±0.2
82 pF	35				

NOTE

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

Table 9 Sizes 1812 (continued)

CAP.	Last 2-digit of		1812		
	12NC	100 V	200 V	500 V	
100 pF	36				
120 pF	37				
150 pF	38				
180 pF	39				
220 pF	41				
270 pF	42				
330 pF	43				
390 pF	44				
470 pF	45				
560 pF	46				
680 pF	47				1.25±0.2
820 pF	48				
1 nF	49				
1.2 nF	51				
1.5 nF	52	1.25±0.2		1.25±0.2	
1.8 nF	53				
2.2 nF	54				
2.7 nF	55				
3.3 nF	56				
3.9 nF	57				
4.7 nF	58				
5.6 nF	59				
6.8 nF	61				
8.2 nF	62				
10 nF	63				
12 nF	64				
15 nF	65				
18 nF	66				
22 nF	67				

NOTE

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

CAPACITANCE RANGE & THICKNESS FOR X7R

Table 10 Sizes from 0603 to 0805

CAP.	Last 2-digit of I2NC	0402 100 V	0603 100 V	0805 100 V	200 V	250 V	500 V		
100 pF	09								
150 pF	12								
220 pF	14								
330 pF	16								
470 pF	18								
680 pF	21								
1.0 nF	23	0.5±0.05	0.8±0.1	0.6±0.1	0.85±0.1	0.85±0.1	0.85±0.1		
1.5 nF	25								
2.2 nF	27								
3.3 nF	29								
4.7 nF	32								
6.8 nF	34								
10 nF	36						1.25±0.2	1.25±0.2	1.25±0.2
15 nF	38					0.85±0.1			
22 nF	41								
33 nF	43								
47 nF	45								
68 nF	47			1.25±0.2					
100 nF	49								
150 nF	52								
220 nF	54								
330 nF	56								
470 nF	58								

NOTE

1. 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

CAPACITANCE RANGE & THICKNESS FOR X7R

Table 11 Sizes from 1206 to 1210

CAP.	Last 2-digit of I2NC	I206					I210			
		100 V	200 V	250 V	500 V	630 V	100 V	200 V	250 V	500 V
100 pF	09									
150 pF	12									
220 pF	14									
330 pF	16									
470 pF	18									
680 pF	21									
1.0 nF	23									
1.5 nF	25									
2.2 nF	27		0.85±0.1	0.85±0.1	1.25±0.2	1.25±0.2				
3.3 nF	29	0.85±0.1								
4.7 nF	32									
6.8 nF	34							0.85±0.1	0.85±0.1	
10 nF	36									1.25±0.2
15 nF	38						0.85±0.1			
22 nF	41					1.6±0.2				
33 nF	43		1.25±0.2	1.25±0.2	1.6±0.2					
47 nF	45							1.25±0.2	1.25±0.2	
68 nF	47									
100 nF	49		1.6±0.2	1.6±0.2						
150 nF	52	1.25±0.2								
220 nF	54						1.25±0.2			
330 nF	56									
470 nF	58	1.6±0.2								
680 nF	61									
1 µF	63	1.6±0.2					2.0±0.2			

NOTE

1. 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

CAPACITANCE RANGE & THICKNESS FOR X7R

Table 12 Sizes from 1808 to 1812

CAP.	Last 2-digit of 12NC	1808				1812				
		100 V	200 V	250 V	500 V	100 V	200 V	250 V	500 V	630 V
100 pF	09									
150 pF	12									
220 pF	14									
330 pF	16									
470 pF	18									
680 pF	21									
1.0 nF	23									
1.5 nF	25									
2.2 nF	27									
3.3 nF	29									
4.7 nF	32									1.35±0.2
6.8 nF	34									
10 nF	36				1.25±0.2		0.85±0.1	0.85±0.1		
15 nF	38	1.25±0.2	1.25±0.2	1.25±0.2		0.85±0.1			1.25±0.2	
22 nF	41									
33 nF	43									1.6±0.2
47 nF	45									
68 nF	47									
100 nF	49						1.25±0.2	1.25±0.2	1.6±0.2	
150 nF	52									
220 nF	54					1.25±0.2				
330 nF	56						1.6±0.2	1.6±0.2		
470 nF	58									
680 nF	61						1.6±0.2			
1 µF	63									

NOTE

1. 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

THICKNESS CLASSES AND PACKING QUANTITY

Table 13

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
	0.8 / 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	---	---
	0.8 / 0.85 ±0.1 mm	8 mm	4,000	---	15,000	---	---
	1.00 / 1.15 ±0.1 mm	8 mm	---	3,000	---	10,000	---
	1.25 ±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	---
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	---	---	---
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	---	8,000	---
	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	---	1,000	---	---	---
	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	---	---	---
2.5 ±0.2 mm	12 mm	---	500	---	---	---	

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 14

DESCRIPTION	VALUE
Capacitance range	0.47 pF to 1 μF
Capacitance tolerance	
NP0 C < 10 pF	±0.25 pF, ±0.5 pF
C ≥ 10 pF	±2%, ±5%
X7R	±5% ⁽¹⁾ , ±10%
Dissipation factor (D.F.)	
NP0 C < 30 pF	≤ 1 / (400 + 20C)
C ≥ 30 pF	≤ 0.1 %
X7R	≤ 2.5 %
Exception	0603/100V, 12nF ≤ C ≤ 100nF, ≤5%
Insulation resistance after 1 minute at U _r (DC)	$R_{ins} \geq 10 \text{ G}\Omega$ or $R_{ins} \times C \geq 500$ seconds whichever is less
Maximum capacitance change as a function of temperature (temperature characteristic/coefficient):	
NP0	±30 ppm/°C
X7R	±15%
Operating temperature range:	
NP0/X7R	-55 °C to +125 °C

NOTE

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

SOLDERING RECOMMENDATION

Table 15

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 16 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 1: f = 1 MHz for C ≤ 1 nF, measuring at voltage V _{rms} at 20 °C f = 1 KHz for C > 1 nF, measuring at voltage V _{rms} at 20 °C Class 2: f = 1 KHz for C ≤ 10 μF, measuring at voltage V _{rms} at 20 °C	Within specified tolerance
Dissipation Factor (D.F.)	4.5.2	Class 1: f = 1 MHz for C ≤ 1 nF, measuring at voltage V _{rms} at 20 °C f = 1 KHz for C > 1 nF, measuring at voltage V _{rms} at 20 °C Class 2: f = 1 KHz for C ≤ 10 μF, measuring at voltage V _{rms} at 20 °C	In accordance with specification
Insulation Resistance	4.5.3	U _r ≤ 500 V: At U _r for 1 minute U _r > 500 V: At 500 V for 1 minute	In accordance with specification
Temperature Coefficient	4.6	Class 1: Between minimum and maximum temperature NP0: -55 °C to +125 °C Normal Temperature: 20 °C	ΔC/C: Class 1: NP0: ±30 ppm/°C
Temperature Characteristic		Class 2: Between minimum and maximum temperature X7R: -55 °C to +125 °C Normal Temperature: 20 °C	Class 2 X7R: ±15%

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
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 \geq 0603: 5N
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 $\Delta C/C$ Class 1: NP0: within $\pm 1\%$ or 0.5 pF, whichever is greater Class2: X7R: $\pm 10\%$
Resistance to Soldering Heat	4.9	Precondition: 150 \pm 10 °C for 1 hour, then keep for 24 \pm 1 hours at room temperature Preheating: for size \leq 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 \pm 5 °C Dipping time: 10 \pm 0.5 seconds Recovery time: 24 \pm 2 hours	Dissolution of the end face plating shall not exceed 25% of the length of the edge concerned $\Delta C/C$ Class 1: NP0: within $\pm 0.5\%$ or 0.5 pF, whichever is greater Class2: X7R: $\pm 10\%$ 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 \pm 5 °C Dipping time: 2 \pm 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 \pm 5 °C Dipping time: 3 \pm 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	<p>Preconditioning: 150 +0/-10 °C for 1 hour, then keep for 24 ±1 hours at room temperature</p> <p>5 cycles with following detail: 30 minutes at lower category temperature 30 minutes at upper category temperature</p> <p>Recovery time 24 ±2 hours</p>	<p>No visual damage</p> <hr/> <p>$\Delta C/C$ Class 1: NP0: within ±1% or 1 pF, whichever is greater Class2: X7R: ±15%</p> <hr/> <p>D.F. meet initial specified value R_{ins} meet initial specified value</p>
Damp Heat	4.13	<ol style="list-style-type: none"> 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 Damp heat test: 500 ±12 hours at 40 ±2 °C; 90 to 95% R.H. Recovery: Class 1: 6 to 24 hours Class 2: 24 ±2 hours Final measure: C, D, IR <p>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.</p>	<p>No visual damage after recovery</p> <hr/> <p>$\Delta C/C$ Class 1: NP0: within ±2% or 1 pF, whichever is greater Class2: X7R: ±15%</p> <p>D.F. Class 1: NP0: ≤ 2 × specified value Class2: X7R: ≥ 25 V: ≤ 5%</p> <p>R_{ins} Class 1: NP0: ≥ 2,500 MΩ or $R_{ins} \times C_r \geq 25s$ whichever is less Class2: X7R: ≥ 500 MΩ or $R_{ins} \times C_r \geq 25s$ whichever is less</p>

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Endurance	IEC 60384-21/22 4.14	<ol style="list-style-type: none"> 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: Applied 2.0 × U_r for 100 V series Applied 1.5 × U_r for 200/250 V series Applied 1.3 × U_r for 500 V, 630 V series Applied 1.2 × U_r for 1 KV, 2 KV, 3 KV series Recovery time: 24 ±2 hours Final measure: C, D, IR <p>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.</p>	No visual damage <hr/> $\Delta C/C$ Class 1: NP0: within ±2% or 1 pF, whichever is greater Class 2: X7R: ±15% D.F. Class 1: NP0: ≤ 2 × specified value Class 2: X7R: ≥ 25 V: ≤ 5% R _{ins} Class 1: NP0: ≥ 4,000 MΩ or R _{ins} × C _r ≥ 40s whichever is less Class 2: X7R: ≥ 1,000 MΩ or R _{ins} × C _r ≥ 50s whichever is less
Voltage Proof	IEC 60384-1 4.6	Specified stress voltage applied for 1 minute U _r ≤ 100 V: series applied 2.5 U _r 100 V < U _r ≤ 200 V series applied (1.5 U _r + 100) 200 V < U _r ≤ 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 11	Apr. 24, 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 1	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