

DATA SHEET

SURFACE-MOUNT CERAMIC MULTILAYER CAPACITORS

High-Voltage

NP0/X7R

500 V TO 3 KV

0.47 pF to 33 nF

RoHS compliant & Halogen Free



SCOPE

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

APPLICATIONS

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

FEATURES

RoHS compliant
Halogen Free compliant
MSL class MSL 1
Soldering is compliant with J-STD-020D

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 X X XXX
(1) (2) (3) (4) (5) (6) (7) (8)

(1) SIZE – INCH BASED (METRIC)

0805 (2012) / 1206 (3216) / 1210 (3225) / 1808 (4520) / 1812 (4532) / 2220 (5750)

(2) TOLERANCE

B = ± 0.1 pF J = $\pm 5\%$
C = ± 0.25 pF K = $\pm 10\%$
D = ± 0.5 pF M = $\pm 20\%$
G = $\pm 2\%$

(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

* Paper taping reel:
1. case size 0805/1206, thickness less than 1.0mm.

* Blister taping reel:
1. case size 0805/1206, thickness more than 1.0mm.
2. 1210 to 2220.

(4) TC MATERIAL

NP0 = NP0
X7R = X7R

(5) RATED VOLTAGE

B = 500V	Floating design:
Z = 630V	C = 1KV
	D = 2 KV
	S = 2.5KV
	E = 3 KV

(6) CONTROL CODE

A: Anti-arc coating
B: Standard Type

(7) PROCESS

N = NP0
B = X7R

(8) CAPACITANCE VALUE

2 significant digits+number of zeros
The 3rd digit signifies the multiplying factor, and letter R is decimal point
Example: 121 = $12 \times 101 = 120$ pF

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.

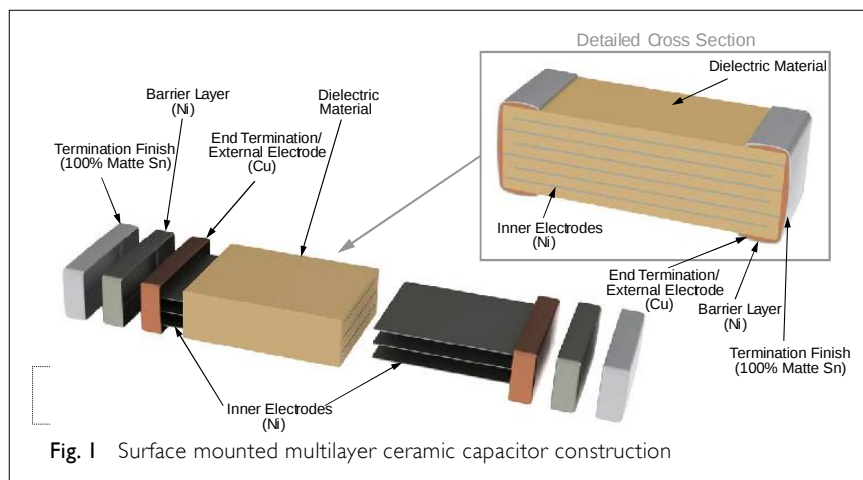


Fig. 1 Surface mounted multilayer ceramic capacitor construction

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.	
0805	2.0 ±0.10	1.25 ±0.10	0.60 ±0.10	0.25	0.75	0.70
			0.85 ±0.10			
			1.25 ±0.20			
1206	3.2 ±0.15	1.60 ±0.15	0.60 ±0.10	0.25	0.75	1.40
			0.85 ±0.10			
			1.25 ±0.20			
			1.60 ±0.20			
1210	3.2 ±0.20	2.50 ±0.20	0.85 ±0.10	0.25	0.85	1.40
			1.25 ±0.20			
			1.60 ±0.20			
			2.00 ±0.20			
1808	4.5 ±0.40	2.00 ±0.30	1.25 ±0.20	0.25	0.75	2.20
			1.35 ±0.15			
			1.60 ±0.20			
			2.00 ±0.20			
1812	4.5 ±0.40	3.20 ± 0.30	0.85 ±0.10	0.25	0.75	2.20
			1.25 ±0.20			
			1.35 ±0.15			
			1.60 ±0.20			
			2.00 ±0.20			
2220	5.7 ±0.40	5.0 ±0.3.	2.00 ±0.20	0.25	0.75	3.40

OUTLINES

For dimension see Table 1

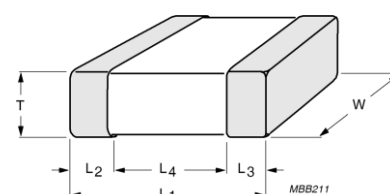


Fig. 2 Surface mounted multilayer ceramic capacitor dimension

CAPACITANCE RANGE & THICKNESS FOR NP0

Table 2 Sizes from 0805 to 1210

CAP.	0805			1206			1210						
	500 V	630 V	1 KV	500 V	630 V	1 KV	2 KV	3 KV	500 V	630 V	1 KV	2 KV	
1.0 pF	0.6±0.1	0.6±0.1				0.85±0.1							
1.2 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													
6.8 pF													
8.2 pF													
10 pF								0.85±0.1 1.25±0.2					
12 pF													
15 pF													
18 pF													
22 pF					0.85±0.1					1.25±0.2			
27 pF													
33 pF				0.6±0.1	1.25±0.2	1.25±0.2							
39 pF													
47 pF													
56 pF													
68 pF			1.25±0.2										
82 pF											1.25±0.2	1.25±0.2	1.25±0.2
100 pF											1.25±0.2		
120 pF													
150 pF													
180 pF													

NOTE

1. Values in shaded cells indicate thickness class in mm
2. Capacitance value of non E-I2 series is on request

CAPACITANCE RANGE & THICKNESS FOR NP0**Table 3** Sizes from 0805 to 1210 (continued)

CAP.	0805			1206			1210				
	500 V	630 V	1 KV	500 V	630 V	1 KV	2 KV	3 KV	500 V	630 V	1 KV 2 KV
220 pF							1.25±0.2				1.25±0.2
270 pF											
330 pF	0.85±0.1	0.85±0.1									
390 pF				0.6±0.1							
470 pF						1.25±0.2				1.25±0.2	1.25±0.2
560 pF									1.25±0.2		
680 pF	1.25±0.2	1.25±0.2									
820 pF											
1.0 nF											
1.2 nF				0.85±0.1	1.25±0.2						
1.5 nF											
2.2 nF											
2.7 nF											
3.3 nF											
3.9 nF				1.25±0.2							
4.7 nF											
5.6 nF											
6.8 nF										2.0±0.2*	
8.2 nF									1.60±0.2*		
10 nF				1.6±0.2	1.6±0.2						
15 nF										2.5±0.3*	
22 nF									2.0±0.2*		
33 nF									2.5±0.3*		
47 nF											

NOTE

1. Values in shaded cells indicate thickness class in mm
2. Capacitance value of non E-12 series is on request
3. *: L: 3.2±0.40 W: 2.5±0.30

CAPACITANCE RANGE & THICKNESS FOR NP0

Table 4 Sizes from 1808 to 1812

CAP.	1808			1812				
	1 KV	2 KV	3 KV	500 V	630 V	1 KV	2 KV	3 KV
0.47 pF								
0.56 pF								
0.68 pF								
0.82 pF								
1.0 pF								
1.2 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								
6.8 pF								
8.2 pF								
10 pF								
12 pF								
15 pF								
18 pF								
22 pF								
27 pF								
33 pF			1.6±0.2					
39 pF						1.25±0.2	1.25±0.2	1.25±0.2
47 pF								
56 pF								
68 pF								
82 pF	1.25±0.2	1.25±0.2						
100 pF				1.25±0.2	1.25±0.2			
120 pF								
150 pF								
180 pF								

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 1808 to 1812 (continued)

CAP.	1808			1812					
	1 KV	2 KV	3 KV	500 V	630 V	1 KV	2 KV	3 KV	
220 pF	1.25±0.2	1.25±0.2		1.25±0.2	1.25±0.2	1.25±0.2		1.25±0.2	
270 pF									
330 pF									
390 pF									
470 pF							1.25±0.2		
560 pF									
680 pF									
820 pF									
1.0 nF									
1.2 nF									
1.5 nF									

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 6** Sizes from 0805 to 1210

CAP.	0805			1206					1210			
	500 V	630 V	1 KV	500 V	630 V	1 KV	2 KV	2.5KV	500 V	630 V	1 KV	2 KV
100 pF												
150 pF												
220 pF												
330 pF			0.85±0.1									
470 pF												1.25±0.2
680 pF							1.25±0.2					
1.0 nF	0.85±0.1	0.85±0.1						1.6±0.2				
1.5 nF						1.25±0.2					1.25±0.2	
2.2 nF			1.25±0.2	1.25±0.2	1.25±0.2							1.60±0.2
3.3 nF												
4.7 nF												
6.8 nF										1.25±0.2		
10 nF		1.25±0.2							1.25±0.2			
15 nF	1.25±0.2											
22 nF										1.6±0.2	1.6±0.2	
33 nF				1.60±0.2	1.60±0.2							
47 nF										2.0±0.2		
68 nF									1.6±0.2			
100 nF									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 products with 5% tolerance, please contact local sales force before ordering

CAPACITANCE RANGE & THICKNESS FOR X7R**Table 7** Sizes from 1808 to 2220

CAP.	1808			1812		2220		
	1 KV	2 KV	3 KV	500 V	630 V	1 KV	2 KV	3 KV
100 pF								
150 pF								
220 pF								
330 pF			1.6±0.2					
470 pF								
680 pF		1.35±0.15						
1.0 nF			2.0±0.2					1.6±0.2
1.5 nF	1.35±0.15							
2.2 nF		1.6±0.2					1.35±0.15	
3.3 nF								
4.7 nF					1.35±0.15	1.35±0.15		
6.8 nF								
10 nF	1.6±0.2			1.25±0.2				
15 nF								
22 nF								
33 nF						1.6±0.2		
47 nF					1.6±0.2			
68 nF								
100 nF				1.6±0.2	2.0±0.2			
150 nF								
220 nF								2.0±0.2
330 nF								
470 nF								
680 nF								
1 µF								

NOTE

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

ELECTRICAL CHARACTERISTICS**NP0/X7R DIELECTRIC CAPACITORS; NISN TERMINATIONS**

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

Table 8

DESCRIPTION		VALUE
Capacitance range		0.47 pF to 33 nF
Capacitance tolerance		
NP0	$C < 10$ pF	± 0.25 pF, ± 0.5 pF
	$C \geq 10$ pF	$\pm 2\%$, $\pm 5\%$
X7R		$\pm 5\%$ ⁽¹⁾ , $\pm 10\%$
Dissipation factor (D.F.)		
NP0	$C < 30$ pF	$\leq 1 / (400 + 20C)$
	$C \geq 30$ pF	$\leq 0.1\%$
X7R		$\leq 2.5\%$
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 $R_{ins} \times C \geq 100\text{ }\Omega \cdot \text{F}^{(2)}$
Maximum capacitance change as a function of temperature (temperature characteristic/coefficient):		
NP0		± 30 ppm/°C
X7R		$\pm 15\%$
Operating temperature range:		
NP0/X7R		-55 °C to $+125$ °C

NOTE

- $\pm 5\%$ tolerance of capacitance value isn't available for X7R full product range, please contact local sales force before ordering
- X7R/0805 ≥ 3.9 nF
X7R/1206 ≥ 12 nF
X7R/1210 ≥ 12 nF
X7R/1808 ≥ 18 nF
X7R/1812 ≥ 27 nF
X7R/2220 ≥ 150 nF

HIGH-VOLTAGE NP0

Sample limits (broken lines).
Requirement levels (dotted lines)

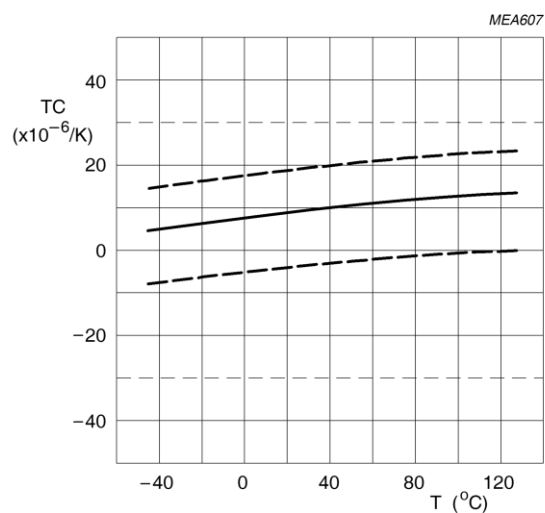


Fig. 3 Typical temperature coefficient as a function of temperature

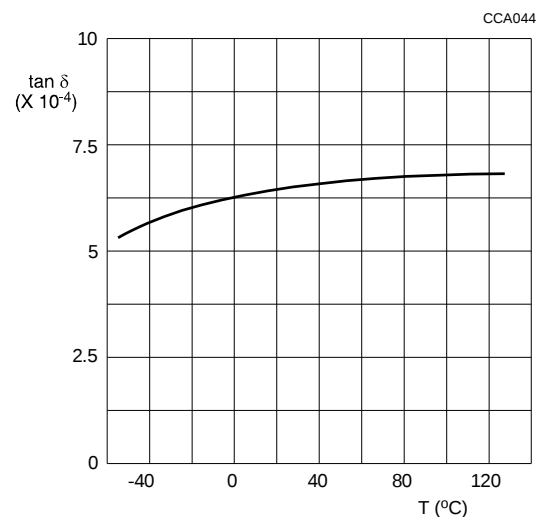


Fig. 4 Typical $\tan \delta$ as a function of temperature

HIGH-VOLTAGE X7R

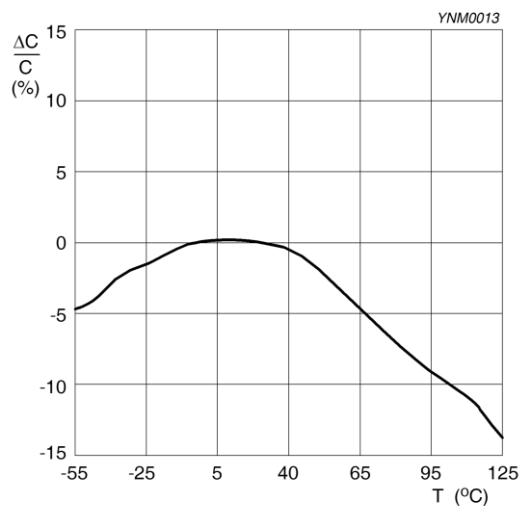


Fig. 5 Typical capacitance change as a function of temperature

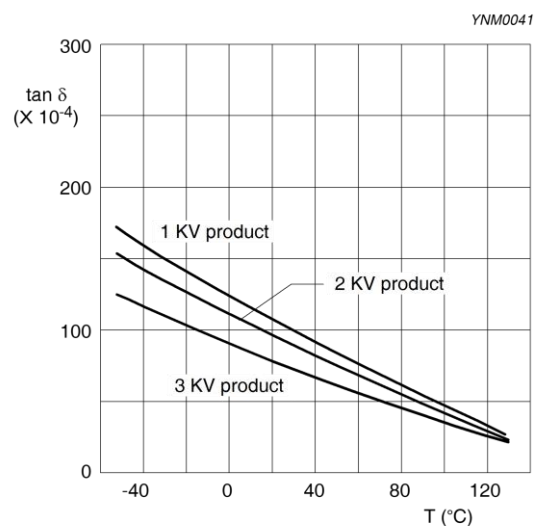


Fig. 6 Typical $\tan \delta$ as a function of temperature

SOLDERING RECOMMENDATION

Table 9

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

TESTS AND REQUIREMENTS

Table 10 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 $\times 10$ magnification	In accordance with specification
Capacitance	4.5.1	NP0: f = 1 MHz for $C \leq 1$ nF, measuring at voltage 1 V_{rms} at 20 °C f = 1 KHz for $C > 1$ nF, measuring at voltage 1 V_{rms} at 20 °C X7R: f = 1 KHz for $C \leq 10$ μ F, measuring at voltage 1 V_{rms} at 20 °C	Within specified tolerance
Dissipation Factor (D.F.)	4.5.2	NP0: f = 1 MHz for $C \leq 1$ nF, measuring at voltage 1 V_{rms} at 20 °C f = 1 KHz for $C > 1$ nF, measuring at voltage 1 V_{rms} at 20 °C X7R: f = 1 KHz for $C \leq 10$ μ F, measuring at voltage 1 V_{rms} at 20 °C	In accordance with specification
Insulation Resistance	4.5.3	$U_r \geq 500$ V: At 500 V for 1 minute	In accordance with specification

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.	NP0: Δ C/C: ±30ppm X7R: Δ C/C: ±15%									
		<table><tr><th>Step</th><th>Temperature(°C)</th></tr><tr><td>a</td><td>25±2</td></tr><tr><td>b</td><td>Lower temperature±3°C</td></tr><tr><td>c</td><td>25±2</td></tr><tr><td>d</td><td>Upper Temperature±2°C</td></tr><tr><td>e</td><td>25±2</td></tr></table> (1) NP0: Temperature Coefficient shall be calculated from the formula as below $\text{Temp, Coefficient} = \frac{C2 - C1}{C1 \times \Delta T} \times 10^6 \text{ [ppm/°C]}$ C1: Capacitance at step c C2: Capacitance at 125°C ΔT: 100°C (=125°C -25°C) (2) X7R: 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	Step	Temperature(°C)	a	25±2	b	Lower temperature±3°C	c	25±2	d	Upper Temperature±2°C
Step	Temperature(°C)											
a	25±2											
b	Lower temperature±3°C											
c	25±2											
d	Upper Temperature±2°C											
e	25±2											
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									
Bending Strength		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 5 mm	No visible damage ΔC/C NP0: within ±1% or 0.5 pF, whichever is greater X7R: ±10%									

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Resistance to Soldering Heat	4.9	Precondition: 150 $\pm$0/-10 $^{\circ}$C for 1 hour, then keep for 24 $\pm$1 hours at room temperature Preheating: for size $\leq$ 1206: 120 $^{\circ}$C to 150 $^{\circ}$C for 1 minute Preheating: for size $>$1206: 100 $^{\circ}$C to 120 $^{\circ}$C for 1 minute and 170 $^{\circ}$C to 200 $^{\circ}$C for 1 minute Solder bath temperature: 260 $\pm$5 $^{\circ}$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 $\Delta C/C$ NP0: within $\pm$0.5% or 0.5 pF, whichever is greater X7R: $\pm$10% D.F. within initial specified value R_{ins} within initial specified value
Solderability	4.10	Preheated to a temperature of 80 $^{\circ}$C to 140 $^{\circ}$C and maintained for 30 seconds to 60 seconds. 1. Temperature: 235$\pm$5°C / Dipping time: 2 $\pm$0.5 s 2. Temperature: 245$\pm$5°C / Dipping time: 3 $\pm$0.5 s (lead free)Depth of immersion: 10mm	The solder should cover over 95% of the critical area of each termination
Rapid Change of Temperature	IEC 60384-21/22 4.11	Preconditioning: 150 $\pm$0/-10 $^{\circ}$C for 1 hour, then keep for 24 $\pm$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 $\pm$2 hours	No visual damage $\Delta C/C$ NP0: within $\pm$1% or 1 pF, whichever is greater X7R: $\pm$15% D.F. meet initial specified value R_{ins} meet initial specified value
Damp Heat	4.13	1. Preconditioning, class 2 only: 150 $\pm$0/-10 $^{\circ}$C / 1 hour, then keep for 24 $\pm$1 hour at room temp 2. Initial measure: Spec: refer to initial spec C, D, IR 3. Damp heat test: 500 $\pm$12 hours at 40 $\pm$2 $^{\circ}$C; 90 to 95% R.H. 4. Recovery: NP0: 6 to 24 hours X7R: 24 $\pm$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 preconditioned according to "IEC 60384 4.1" and then the requirement shall be met.	No visual damage after recovery $\Delta C/C$ NP0: within $\pm$2% or 1 pF, whichever is greater X7R: $\pm$15% D.F. NP0: $\leq 2 \times$ specified value X7R: $\geq 25 V: \leq 5\%$ R_{ins} NP0: $\geq 2,500 M\Omega$ or $R_{ins} \times C_r \geq 25s$ whichever is less X7R: $\geq 500 M\Omega$ or $R_{ins} \times C_r \geq 25s$ whichever is less

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS									
Endurance	IEC 60384-21/22	4.14	No visual damage									
			$\Delta C/C$ NP0: within $\pm 2\%$ or 1 pF, whichever is greater X7R: $\pm 15\%$ D.F. NP0: $\leq 2 \times$ specified value X7R: ≥ 25 V: $\leq 5\%$ R_{ins} NP0: $\geq 4,000$ M Ω or $R_{ins} \times C_r \geq 40s$ whichever is less X7R: $\geq 1,000$ M Ω or $R_{ins} \times C_r \geq 50s$ whichever is less									
		1. Preconditioning, X7R only: 150 +0/-10 °C /1 hour, then keep for 24 $\pm$1 hour at room temp 2. Initial measure: Spec: refer to initial spec C, D, IR Endurance test: Temperature: NP0/X7R: 125 °C Specified stress voltage applied for 1,000 hours. High-Voltage series follows the stress conditions below: <table><tr><th>Voltage</th><th>NP0</th><th>X7R</th></tr><tr><td>500/630V</td><td>1.3 $\times$ Ur</td><td>1.2 $\times$ Ur</td></tr><tr><td>$\geq$ 1KV</td><td>1.2 $\times$ Ur</td><td>1.1 $\times$ Ur</td></tr></table> 3. Recovery time: 24 $\pm$2 hours 4. Final measure: C, D, IR *Applied 1.2 $\times$ Ur for NP0/1206/2.2nF to 10nF/500V to 630V. 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 preconditioned according to "IEC 60384 4.1" and then the requirement shall be met.	Voltage	NP0	X7R	500/630V	1.3 $\times$ Ur	1.2 $\times$ Ur	$\geq$ 1KV	1.2 $\times$ Ur	1.1 $\times$ Ur	
Voltage	NP0	X7R										
500/630V	1.3 $\times$ Ur	1.2 $\times$ Ur										
$\geq$ 1KV	1.2 $\times$ Ur	1.1 $\times$ Ur										
Voltage Proof		Specified stress voltage applied for 1~5 seconds Ur = 500 V series applied (1.3 Ur + 100) Ur > 500 V: 1.3 Ur Ur $\geq$ 1KV: 1.2 Ur Charge/Discharge current less than 50mA	No breakdown or flashover									

THICKNESS CLASSES AND PACKING QUANTITY

Table 11

SIZE CODE	THICKNESS CLASSIFICATION	PACKING CODE.		TAPE WIDTH	Ø180 MM / 7 INCH		Ø330 MM / 13 INCH		QUANTITY PER BULK CASE
		7 INCH	13 INCH		Paper	Blister	Paper	Blister	
0805	0.6 ±0.1 mm	R	P	8 mm	4,000	---	20,000	---	10,000
	0.85 ±0.1 mm	R	P	8 mm	4,000	---	15,000	---	8,000
	1.00 ±0.1 mm	K	F	8 mm	---	3,000	---	10,000	---
	1.25 ±0.2 mm	K	F	8 mm	---	3,000	---	10,000	5,000
1206	0.6 ±0.1 mm	R	P	8 mm	4,000	---	20,000	---	---
	0.85 ±0.1 mm	R	P	8 mm	4,000	---	15,000	---	---
	1.00 / 1.15 ±0.1 mm	K	F	8 mm	---	3,000	---	10,000	---
	1.25 ±0.2 mm	K	F	8 mm	---	3,000	---	10,000	---
	1.6 ±0.2 mm	K	F	8 mm	---	2,000	---	8,000	---
1210	0.85 ±0.1 mm	K	F	8 mm	---	4,000	---	10,000	---
	1.15 ±0.1 mm	K	F	8 mm	---	3,000	---	10,000	---
	1.15 ±0.15 mm	K	F	8 mm	---	3,000	---	10,000	---
	1.25 ±0.2 mm	K		8 mm	---	3,000	---	---	---
	1.5 ±0.1 mm	K		8 mm	---	2,000	---	---	---
	1.6 ±0.2 mm	K		8 mm	---	2,000	---	---	---
	2.0 ±0.2 mm	K		8 mm	---	2,000 1,000	---	---	---
	2.5 ±0.2 mm	K		8 mm	---	1,000 500	---	---	---
1808	1.15 ±0.15 mm	K		12 mm	---	3,000	---	---	---
	1.25 ±0.2 mm	K		12 mm	---	3,000	---	---	---
	1.35 ±0.15 mm	K		12 mm	---	2,000	---	---	---
	1.5 ±0.1 mm	K		12 mm	---	2,000	---	---	---
	1.6 ±0.2 mm	K		12 mm	---	2,000	---	---	---
	2.0 ±0.2 mm	K		12 mm	---	2,000	---	---	---
1812	0.6 / 0.85 ±0.1 mm	K		12 mm	---	2,000	---	---	---
	1.15 ±0.1 mm	K		12 mm	---	1,000	---	---	---
	1.15 ±0.15 mm	K		12 mm	---	1,000	---	---	---
	1.25 ±0.2 mm	K		12 mm	---	1,000	---	---	---
	1.35 ±0.15 mm	K		12 mm	---	1,000	---	---	---
	1.5 ±0.1 mm	K		12 mm	---	1,000	---	---	---
	1.6 ±0.2 mm	K		12 mm	---	1,000	---	---	---
	2.0 ±0.2 mm	K		12 mm	---	1,000	---	---	---
	2.5 ±0.2 mm	K		12 mm	---	500	---	---	---
2220	2.0 ±0.2 mm	K		12 mm	---	1,000	---	---	---

PAPER/PE TAPE SPECIFICATION

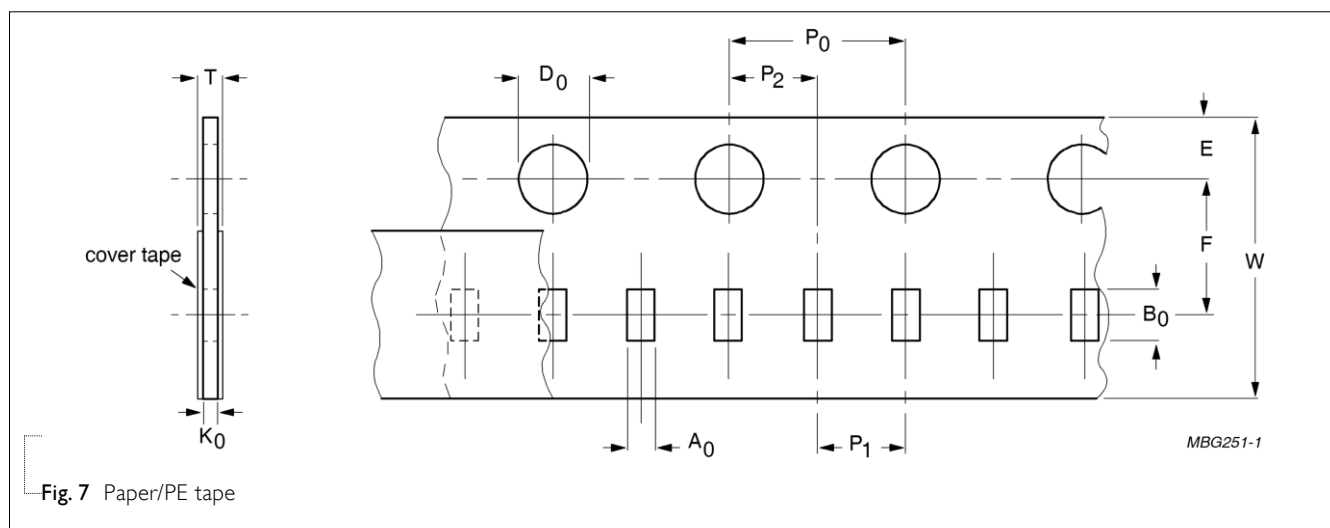


Fig. 7 Paper/PE tape

Table 12 Dimensions of paper/PE tape for relevant chip size; see Fig.3

SIZE	SYMBOL										Unit: mm
CODE	A_0	B_0	W	E	F	$P_0^{(1)}$	P_1	P_2	$\varnothing D_0$	K_0	T
0201	0.39 ± 0.06	0.70 ± 0.06	8.0 ± 0.20	1.75 ± 0.1	3.50 ± 0.05	4.0 ± 0.05	2.0 ± 0.05	2.0 ± 0.05	1.55 ± 0.03	0.38 ± 0.05	$(0.47 / 0.55) \pm 0.10$
0402	0.70 ± 0.15	1.21 ± 0.12	8.0 ± 0.20	1.75 ± 0.1	3.50 ± 0.05	4.0 ± 0.05	2.0 ± 0.05	2.0 ± 0.05	$1.50 + 0.1 / -0$	$(0.75 / 0.60) \pm 0.10$	$(0.85 / 0.70) \pm 0.10$
0603	1.05 ± 0.14	1.86 ± 0.13	8.0 ± 0.20	1.75 ± 0.1	3.50 ± 0.05	4.0 ± 0.10	4.0 ± 0.10	2.0 ± 0.05	$1.50 + 0.1 / -0$	$(1.05 / 0.95 / 0.75) \pm 0.10$	$(1.15 / 1.05 / 0.85) \pm 0.10$
0805	1.50 ± 0.15	2.26 ± 0.20	8.0 ± 0.20	1.75 ± 0.1	3.50 ± 0.05	4.0 ± 0.10	4.0 ± 0.10	2.0 ± 0.05	$1.50 + 0.1 / -0$	$(1.05 / 0.95 / 0.75) \pm 0.10$	$(1.15 / 1.05 / 0.85) \pm 0.10$
1206	1.90 ± 0.15	3.50 ± 0.20	8.0 ± 0.20	1.75 ± 0.1	3.50 ± 0.05	4.0 ± 0.10	4.0 ± 0.10	2.0 ± 0.05	$1.50 + 0.1 / -0$	$(0.95 / 0.75) \pm 0.10$	$(1.05 / 0.85) \pm 0.10$

NOTE

1. P_0 pitch tolerance over any 10 pitches is ± 0.2 mm

BLISTER TAPE SPECIFICATION

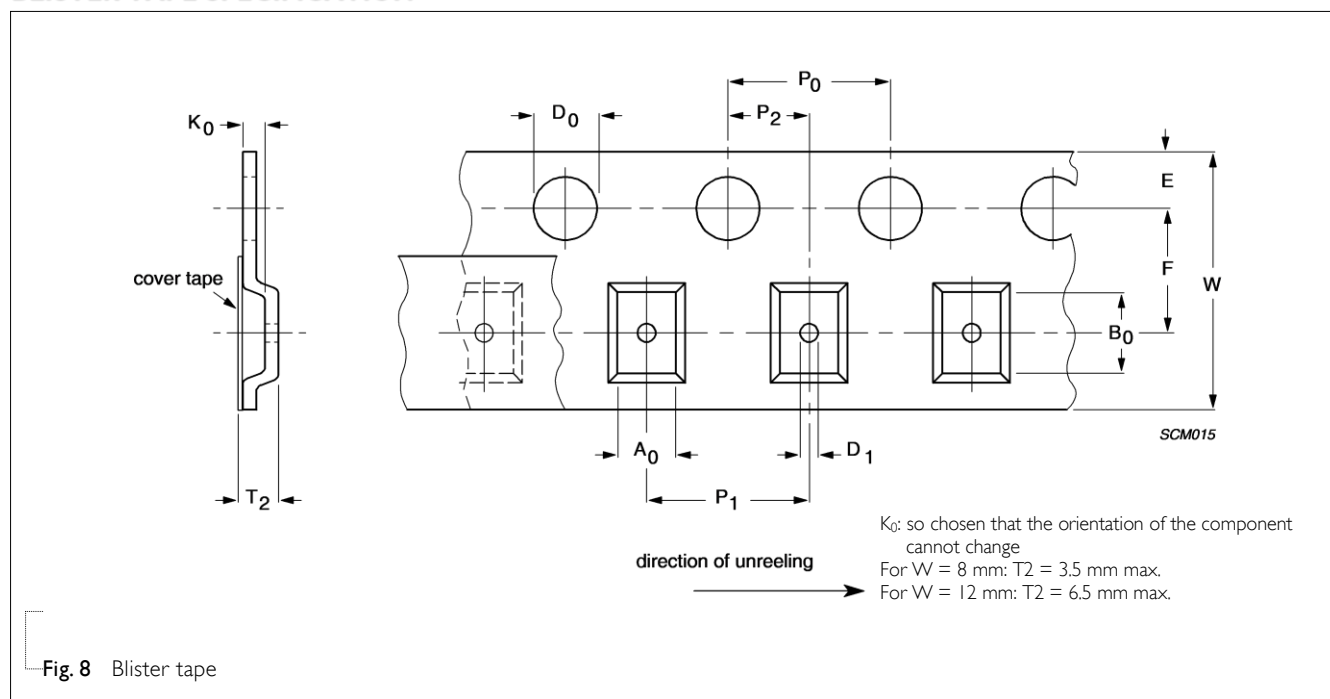


Table 13 Dimensions of blister tape for relevant chip size; see Fig.8

SIZE CODE	SYMBOL														Unit: mm	
	A ₀		B ₀		K ₀		W	E	F	ØD ₀	ØD _I	P ₀ (2)	P _I	P ₂	T ₂	
	Min.	Max.	Min.	Max.	Min.	Max.					Min.				Min.	Max.
0805	1.29	1.65	2.09	2.60	1.25	1.62	8.1 ±0.20	1.75 ±0.1	3.5 ±0.05	1.5 +0.1/-0.0	+0.1/-0.0	4.0 ±0.10	4.0 ±0.10	2.0 ±0.05	1.30	1.67
1206	1.65	2.12	3.30	3.75	1.22	2.15	8.1 ±0.20	1.75 ±0.1	3.5 ±0.05	1.5 +0.1/-0.0	+0.1/-0.0	4.0 ±0.10	4.0 ±0.10	2.0 ±0.05	1.27	2.20
1210	2.55	3.02	3.31	3.88	0.97	2.92	8.1 ±0.20	1.75 ±0.1	3.5 ±0.05	1.5 +0.1/-0.0	+0.1/-0.0	4.0 ±0.10	4.0 ±0.10	2.0 ±0.05	1.02	2.97
1808	2.05	2.55	4.80	5.45	1.30	2.45	12.1 ±0.20	1.75 ±0.1	5.5 ±0.05	1.5 +0.1/-0.0	1.5 +0.1/-0.0	4.0 ±0.10	4.0 ±0.10	2.0 ±0.05	1.35	2.50
1812	3.35	3.75	4.70	5.33	0.70	2.40	12.1 ±0.20	1.75 ±0.1	5.5 ±0.05	1.5 +0.1/-0.0	1.5 +0.1/-0.0	4.0 ±0.10	8.0 ±0.10	2.0 ±0.05	0.75	2.45
2220	5.12	5.32	5.84	6.04	1.28	1.48	12.0 ±0.20	1.75 ±0.1	5.5 ±0.05	1.5 +0.1/-0.0	1.5 +0.1/-0.0	4.0 ±0.10	8.0 ±0.10	2.0 ±0.05	1.33	1.53

NOTE

1. Typical capacitor displacement in pocket
2. P_0 pitch tolerance over any 10 pitches is ± 0.2 mm

REEL SPECIFICATION

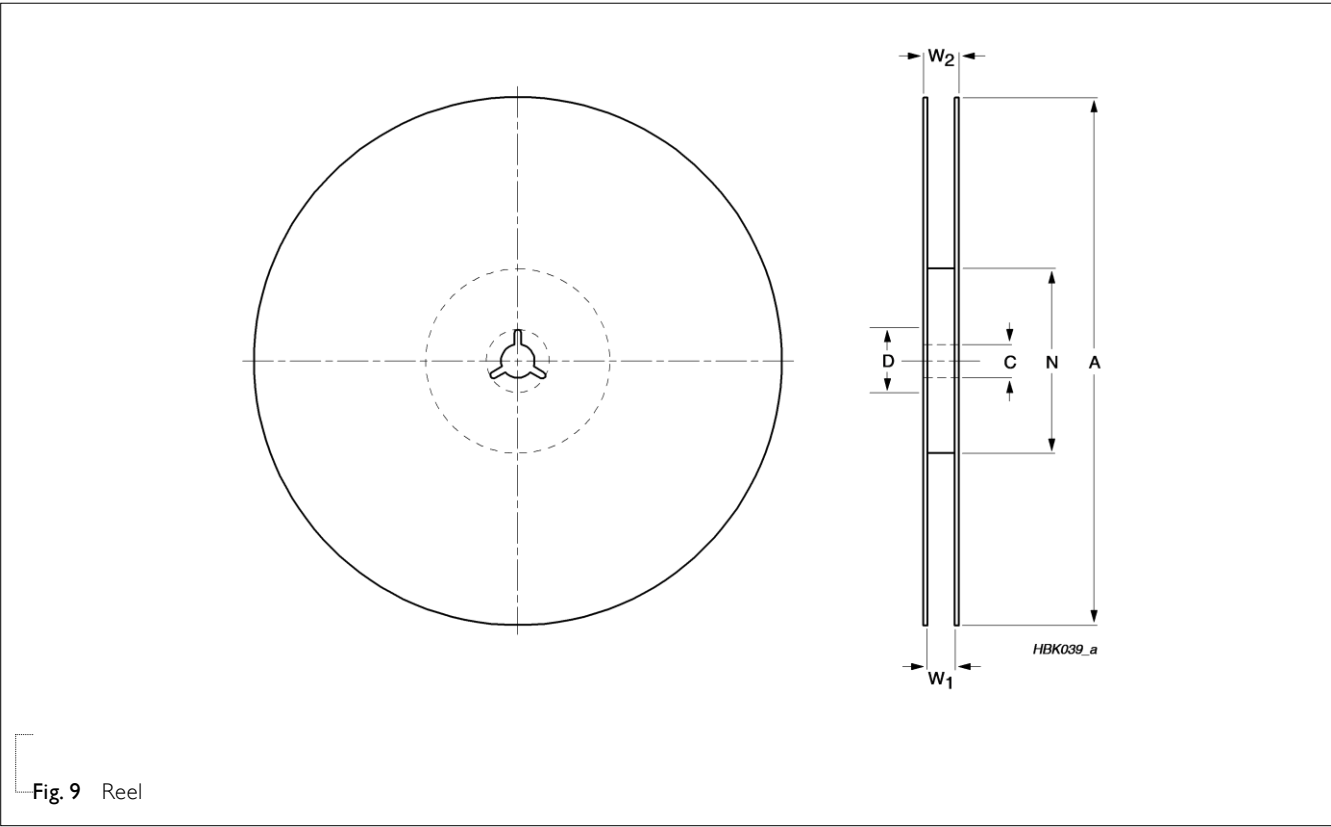


Table 14 Reel dimensions; see Fig.9

TAPE WIDTH	SYMBOL			Unit: mm	
	A	N	C	W ₁	W _{2max.}
8 (Ø178 mm/7")	178 ±1.0	60 ±1.0	13 +0.50/-0.20	9.4 ±1.5	14.4
8 (Ø330 mm/13")	330 ±1.0	100 ±1.0	13 +0.50/-0.20	9.0 ±0.2	14.4
12 (Ø178 mm/7")	178 ±1.0	60 ±1.0	13 +0.50/-0.20	13.4 ±1.5	18.4

PROPERTIES OF REEL

Material: polystyrene

Surface resistance: <10¹⁰ Ω/sq.

REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version 17	Mar. 13, 2025	-	- Update 1210, 1812 dimension
Version 16	May 10, 2023	-	- Add NP0/1206/2.2nF to 10nF/500V to 630V
Version 15	Dec. 15, 2021	-	- I.R. Spec. updated X7R/0805/≥3.9nF
			X7R/1206/≥12nF
			X7R/1210/≥12nF
			X7R/1808/≥18nF
			X7R/1812/≥27nF
Version 14	Oct. 26, 2021	-	X7R/2220/≥150nF
			- 0805 / 1206 / 1210 dimension updated
			- Add 500V/630V
			- Add NP0/1206/0.47pF to 10pF with 0.85 mm
			- Add X7R/0805/1.5nF to 3.3nF/1KV. NP0/0805/ 56pF to 82pF/1KV
Version 12	Dec. 01, 2020	-	- Add X7R/0805/1.5nF to 3.3nF/1KV. NP0/0805/ 56pF to 82pF/1KV
Version 11	Jul. 13, 2018	-	- Add NP0/1206/10pF to 47pF/3KV
Version 10	Mar. 7, 2017	-	- 0805 L4 spec updated
Version 9	Jan. 16, 2017	-	- Product range updated
Version 8	Oct. 12, 2015	-	- Product range updated
Version 7	May 21, 2014	-	- Product range updated
Version 6	Jun. 17, 2012	-	- Product range updated
Version 5	Sep 25, 2012	-	- Product range updated
Version 4	Aug 08, 2011	-	- Product range updated
Version 3	Jan 19, 2011	-	- Dimension updated
Version 2	Feb 02, 2010	-	- Add NP0 0805 1KV
			- Change to dual brand datasheet that describe High-Voltage NP0/X7R series with RoHS compliant
			- Replace the high voltage part of pdf files: UP-NP0X7R_HV_1K-to-4KV_I and UY-NP0X7R_HV_1K-to-4KV_I
			- Description of "Halogen Free compliant" added
			- Product range updated
Version 1	Sep 30, 2005	-	- Define global part number
			- Test method and procedure updated
			- Thickness revised
			- New
Version 0	Sep 12, 2005	-	- New

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