

# Product Specification

**RoHS compliant & Halogen Free**

**Surface-mount Ceramic Multilayer Capacitors**

Part Description : X7R/1210/220nF/250V/±10%

Yageo Part number : CC1210KKX7RYBB224

Phycomp 12 NC : 222283215654

Issue Date : 2011/11/28

**SCOPE**

This product specification is applied to Multi-layer Ceramic Capacitor used for High-Voltage electronic equipment.

**Description**

The capacitor consists of a rectangular block of ceramic dielectric in which a number of interleaved nickel 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.

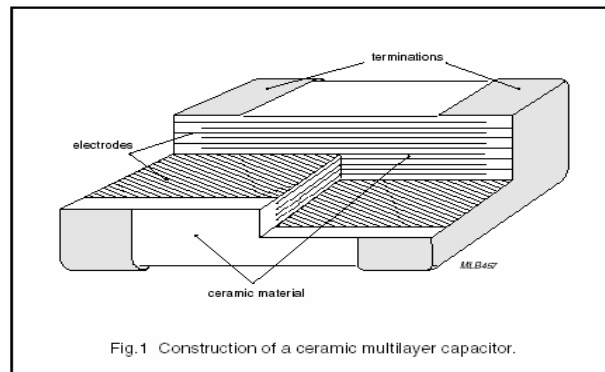


Fig.1 Construction of a ceramic multilayer capacitor.

**MECHANICAL DATA**

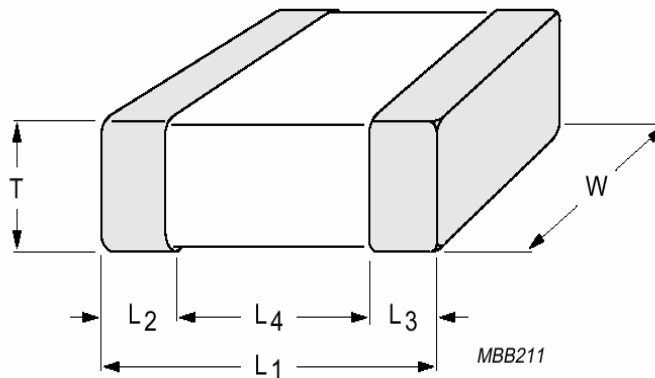


Fig. 2 Component outline

**Physical dimensions (all in mm)**

Size	L1	W	T	L2/L3		L4
				Min	Max	Min
1210	3.2 ±0.30	2.5 ±0.20	1.25±0.2	0.25	0.75	1.40

**Thickness classification and packaging quantities:**

Thickness Classification	Tape Width	Amount
1.25±0.2 mm	Embossed plastic tape reel 7"	3000

## ELECTRICAL CHARACTERISTICS

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.

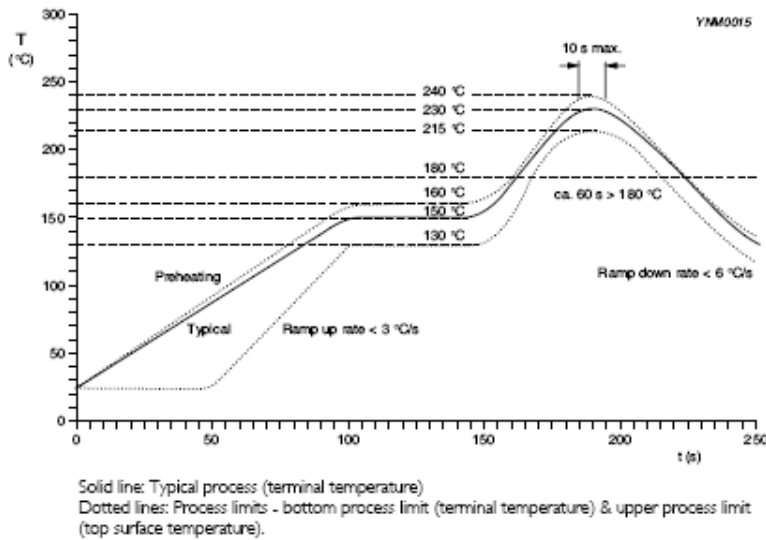
Capacitance range	220nF
Temperature range	-55°C to +125°C
Tolerance on capacitance after 1000 hours	±10%
Rated voltage UR(DC)	250V
Tan δ	≤ 2.5%
Insulation resistance after 1 minute at U <sub>R</sub> (DC)	Rins. ≥ 10GX or Rins. x C ≥ 500 s whichever is less.
Maximum capacitance change as a function of temperature	±15%
Terminations	Ni/Sn Barrier
Resistance to soldering heat	260°C, 10 sec

## STORAGE CONDITIONS

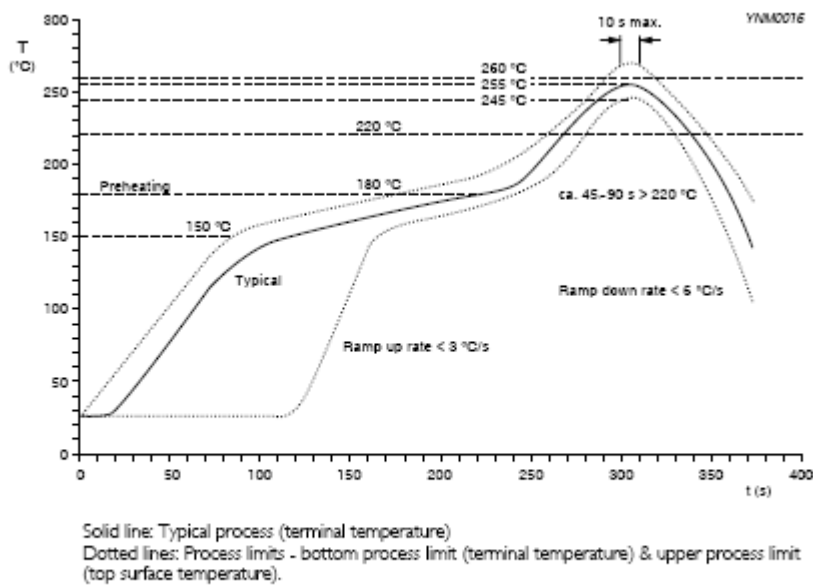
The products must be stored and shipping in an ambient temperature of less than 40°C with a relative humidity of less than 70%.

## METHOD OF MOUNTING

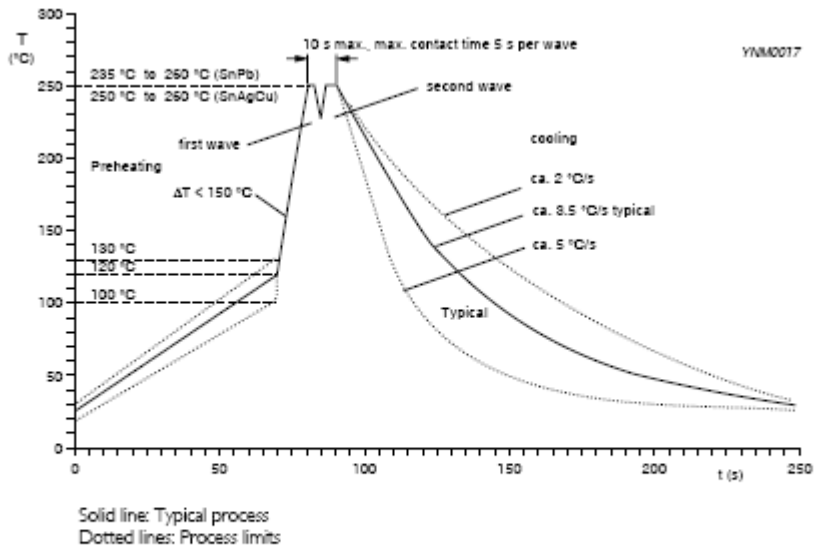
For normal use the capacitors may be mounted on printed-circuit boards or ceramic substrates by applying wave soldering, reflow soldering or conductive adhesive in accordance with "IEC 61760-1" (Standard method for the specification of surface mounting components).



Infrared soldering, forced gas convection reflow soldering - Temperature/time profile for SnPb solders



Infrared soldering, forced gas convection reflow soldering - Temperature/time profile for lead-free SnAgCu solders



Double wave soldering for SnPb and lead-free SnAgCu solder - Temperature/time profile (terminal temperature)

## SOLDERING RECOMMENDATION

Soldering Method	Size				
	0402	0603	0805	1206	$\geq 1210$
Reflow	$\geq 0.1$ uF	$\geq 1.0$ uF	$\geq 2.2$ uF	$\geq 4.7$ uF	Reflow only
Reflow / Wave	$< 0.1$ uF	$< 1.0$ uF	$< 2.2$ uF	$< 4.7$ uF	----

## TEST PROCEDURES AND REQUIREMENTS

### IEC 60384-21/22

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Mounting	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	<p>Class1 :</p> <p><math>C \leq 1\text{nF}</math>, <math>f = 1\text{ MHz}</math>;  <math>C &gt; 1\text{nF}</math>, <math>f = 1\text{ KHz}</math>;            NP0: measuring voltage 1 V at 20°C</p> <p>Class 2 :</p> <p><math>f = 1\text{ KHz}</math> for <math>C \leq 10\text{ }\mu\text{F}</math>, rated voltage &gt; 6.3 V, measuring at voltage 1 Vrms at 20 °C  <math>f = 1\text{ KHz}</math>, for <math>C \leq 10\text{ }\mu\text{F}</math>, rated voltage <math>\leq 6.3\text{ V}</math>, measuring at voltage 0.5 Vrms at 20 °C  <math>f = 120\text{Hz}</math>, for <math>C &gt; 10\mu\text{F}</math>, measuring at voltage 0.5V at 20°C</p>	Within specified tolerance
Dissipation Factor (D.F)	4.5.2	<p>Class1 :</p> <p><math>C \leq 1\text{nF}</math>, <math>f = 1\text{ MHz}</math>;  <math>C &gt; 1\text{nF}</math>, <math>f = 1\text{ KHz}</math>;            NP0: measuring voltage 1 V at 20°C</p> <p>Class 2 :</p> <p><math>f = 1\text{ KHz}</math> for <math>C \leq 10\text{ }\mu\text{F}</math>, rated voltage &gt; 6.3 V, measuring at voltage 1 Vrms at 20 °C  <math>f = 1\text{ KHz}</math>, for <math>C \leq 10\text{ }\mu\text{F}</math>, rated voltage <math>\leq 6.3\text{ V}</math>, measuring at voltage 0.5 Vrms at 20 °C  <math>f = 120\text{Hz}</math>, for <math>C &gt; 10\mu\text{F}</math>, measuring at voltage 0.5V at 20°C</p>	In accordance with specification
Insulation resistance	4.5.3	<p><math>U_r \leq 500\text{ V}</math>: At <math>U_r</math> for 1 minute  <math>U_r &gt; 500\text{ V}</math>: At 500 V for 1 minute</p>	In accordance with specification
Voltage proof	4.5.4	<p>Specified stress voltage applied for 1 minute</p> <p><math>U_r \leq 100\text{V}</math>: series applied <math>2.5U_r</math>  <math>100 &lt; U_r \leq 200</math> series applied <math>(1.5U_r + 100)</math>  <math>200 &lt; U_r \leq 500</math> series applied <math>(1.3U_r + 100)</math>  <math>U_r &gt; 500</math>: <math>1.3U_r</math>  <math>I</math>: 7.5mA</p>	No breakdown or flashover.
Temperature coefficient	4.6	<p>Class1 :</p> <p>Between minimum and maximum temperature            NP0: -55°C ~ +125°C            Normal Temperature: 20°C</p> <p>Class2 :</p> <p>Between minimum and maximum temperature            X7R: -55°C~+125°C            X5R: -55°C~+85°C            Y5V: -30°C~+85°C            Normal Temperature: 20°C</p>	<p>Class1:  <math>\Delta C/C</math>: <math>\pm 30\text{ppm}</math></p> <p>&lt;General purpose&gt;            X7R:<math>\Delta C/C</math>: <math>\pm 15\%</math>            Y5V:<math>\Delta C/C</math>: 22~-82%</p> <p>&lt;High-Cap purpose&gt;            X7R/X5R:<math>\Delta C/C</math>: <math>\pm 15\%</math>            Y5V: <math>\Delta C/C</math>: 22~-82%</p>

## TEST PROCEDURES AND REQUIREMENTS

### IEC 60384-21/22

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Temperature coefficient	4.6	<p>Class1 : Between minimum and maximum temperature NPO: -55°C ~ +125°C Normal Temperature: 20°C</p> <p>Class2 : Between minimum and maximum temperature X7R: -55°C~+125°C X5R: -55°C~+85°C Y5V: -30°C~+85°C Normal Temperature: 20°C</p>	<p>Class1: Δ C/C: ±30ppm</p> <p>&lt;General purpose&gt; X7R:ΔC/C: ±15% Y5V:ΔC/C: 22~-82%</p> <p>&lt;High-Cap purpose&gt; X7R/X5R:ΔC/C: ±15% Y5V: Δ C/C: 22~-82%</p>
Adhesion	4.7	A force applied for 10 sec to the line joining the terminations and in a plane parallel to the substrate.	<p>Force size ≥0603: ≥ 5N size =0402: ≥ 2.5N size =0201: ≥ 1N</p>
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 340mm	<p>No visible damage Δ C/C Class1: NPO within ±1% or 0.5 pF, whichever is greater Class2: X7R/X5R/Y5V: ±10%</p>
Resistance to soldering heat	4.9	<p>Precondition: 150 +0/-10°C/1 hr, then keep for 24±1 hrs at room temp Preheating: for size ≤1206:120 to 150°C for 1 minute; Preheating: for size &gt;1206:100 to 120 °C for 1 minute and 170 to 200°C for 1 minute. Solder bath temperature: 260 ± 5°C; Dipping time 10±0.5 s Recovery time 24±2 Hours.</p>	<p>Dissolution of the end face plating shall not exceed 25% of the length of the edge concerned. ΔC/C : Class1: NPO:within ±0.5% or 0.5 pF whichever is greater Class2: X7R/X5R: ±10% Y5V: ±20% D.F.: within initial specified value Rins: within initial specified value</p>
Solderability	4.10	<p>The specimen shall be preheated to a temperature of (80 to 140) °C and maintained for 30s to 60s. Temperature: 235±5°C Dipping time: 2 ±0.5 s Depth of immersion: 10mm</p>	The solder should cover over 95% of the critical area of each termination.

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### IEC 60384-21/22

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Rapid change of temperatur	4.11	<p>Preconditioning; 150 +0/-10°C /1 hr, then keep for 24±1 hrs at room temp 5 cycles with following detail: 30 minutes at Lower Category Temperature; 30 minutes at Upper Category Temperature; Recovery time 24±2 Hours.</p>	<p>No visual damage ΔC/C : Class1: NP0 : within 1% or 1 pF, whichever is greater. Class2: X7R/X5R : ±15% Y5V : ±20%</p> <p>D.F. : meet initial specified value.</p> <p>Rins : meet initial specified value.</p>
Damp heat, with Ur load	4.13	<p>1. Preconditioning, class 2 only : 150 +0/-10°C /1 hr , then keep for 24±1hrs at room temp</p> <p>2. Initial measure Spec: refer Initial spec (C, D, IR)</p> <p>3. Damp heat test: 500±12 hours at 40±2°C; 90 to 95% R.H.; 1.0Ur applied.</p> <p>4. Recovery. Class 1 : 6 to 24 hours Class 2 : 24±2 hours</p> <p>5. Final measure: C, D, IR</p> <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>&lt;General purpose&gt; No visual damage after recovery. ΔC/C : NP0 : within ±2% or 1 pF, whichever is greater. X7R: ±15% Y5V: ±30% D.F. : NP0 : 2 x specified value X7R : ≤ 16V: ≤ 7%; ≥ 25V: ≤ 5% Y5V: ≤ 15% R<sub>ins</sub> : NP0 : ≥ 2,500MΩ or RxC ≥ 25s whichever is less. X7R/Y5V : ≥ 500MΩ or RxC ≥ 25s whichever is less.</p> <p>&lt;High-Cap purpose&gt; No visual damage after recovery. ΔC/C : X7R/X5R : ±20% Y5V : ±30% D.F.: 2 x initial value max Rins: 500 MΩ or Rins x Cr ≥ 25 s, whichever is less.</p>



## TEST PROCEDURES AND REQUIREMENTS

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TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Endurance	4.14	<p>1. Precondition, class 2 only: 150 +0/-10 °C/1 hr , then keep for 24±1 hrs at room temp.</p> <p>2. Initial measure Spec: refer Initial spec, C, D, IR</p> <p>3. Endurance test: Temperature: NP0/X7R: 125°C X5R/Y5V/Z5U:85 °C</p> <p>Specified stress voltage applied for 1000 hrs Applied 2.0 x Ur for general product. Applied 1.5 x Ur for high cap. product.</p> <p>High voltage series follows with below stress condition: Applied 1.3 x Ur for 500V series Applied 1.2 x Ur for 1KV, 2KV,3KV series.</p> <p>4. Recovery time: 24±2 hours</p> <p>5. Final measure: C ,D, IR</p> <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>&lt;General purpose&gt; No visual damage</p> <p>ΔC/C : NP0 : within ±2% or 1 pF, whichever is greater. X7R : ± 15% Y5V : ± 30% Z5U : ± 30%</p> <p>D.F. : NP0 : 2 × specified value X7R : ≤ 16V : ≤ 7% ≥ 25V : ≤ 5% Y5V : ≤ 15% Z5U : ≤ 12.5%</p> <p>R<sub>ins</sub> : NP0 : ≥ 4,000MΩ or RxC ≥ 40s, whichever is less. X7R/Y5V : ≥ 1000MΩ or RxC ≥ 50s, whichever is less.</p> <p>&lt;High-Cap purpose&gt; No visual damage</p> <p>Δ C/C: Class2: X7R/X5R: ±20% Y5V: ±30% D.F.: 2 x initial value max Rins: 1000 MW or Rins x Cr ≥ 50 s whichever is less.</p>