Product Specification

RoHS compliant & Halogen Free

Surface-mount Ceramic Multilayer Capacitors

Part Description : X7R/2220/1.0uF/50V/±10%

Yageo Part number : CC2220KKX7R9BB105

SCOPE

This product specification is applied to Multi-layer Ceramic Capacitor used for General 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.

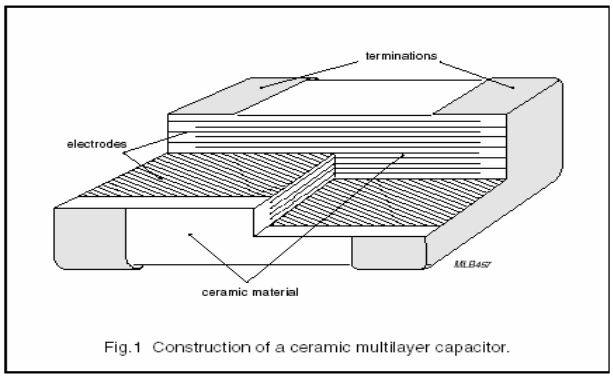


Fig.1 Construction of a ceramic multilayer capacitor.

MECHANICAL DATA

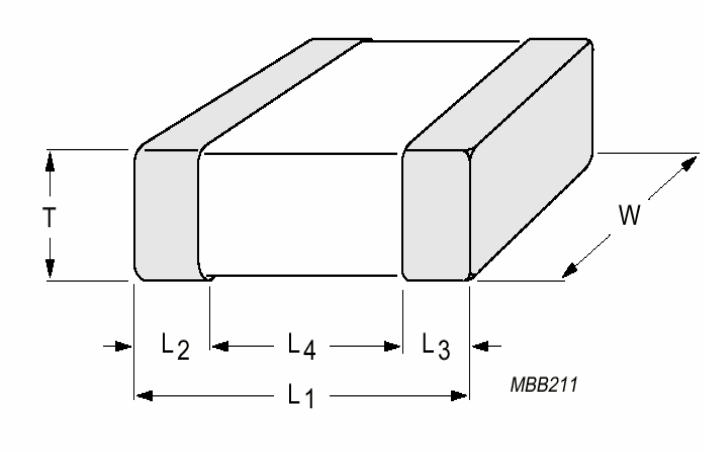


Fig. 2 Component outline

Physical dimensions (all in mm)

Size	L1	W	T	L2/L3		L4
				Min	Max	Min
2220	5.7 ±0.40	5.0 ±0.30	1.15±0.1	0.25	0.75	3.40

Thickness classification and packaging quantities:

Thickness Classification	Tape Width	Amount
1.15±0.1 mm	Embossed plastic tape reel 7"	1,500

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℃ to 35℃
--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.

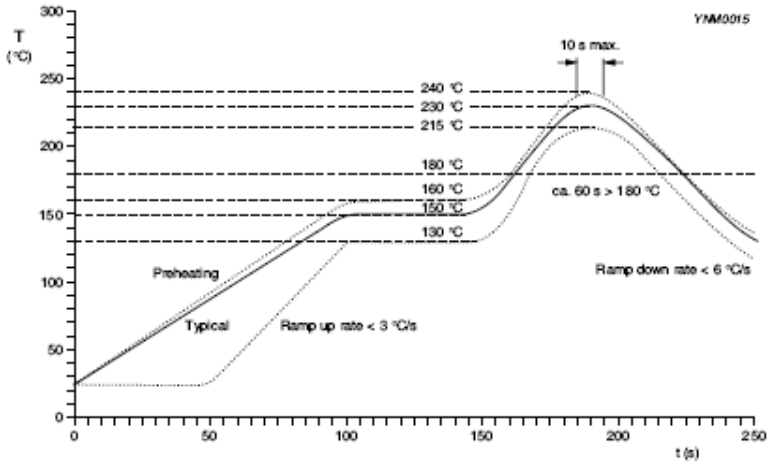
Capacitance range	1.0uF
Temperature range	-55°C to +125°C
Tolerance on capacitance after 1000 hours	±10%
Rated voltage UR(DC)	50V
Tan δ	≦2.5%
Insulation resistance after 1 minute at U_R (DC)	Rins. ≧ 10GOhm or Rins. x C≧ 500 s whichever is less.
Maximum capacitance change as a function of temperature	±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%.

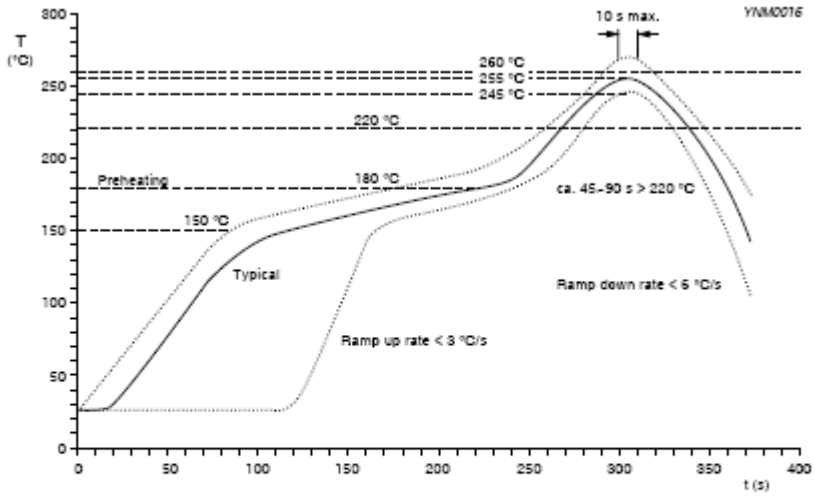
METHOD OF MOUNTING

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).



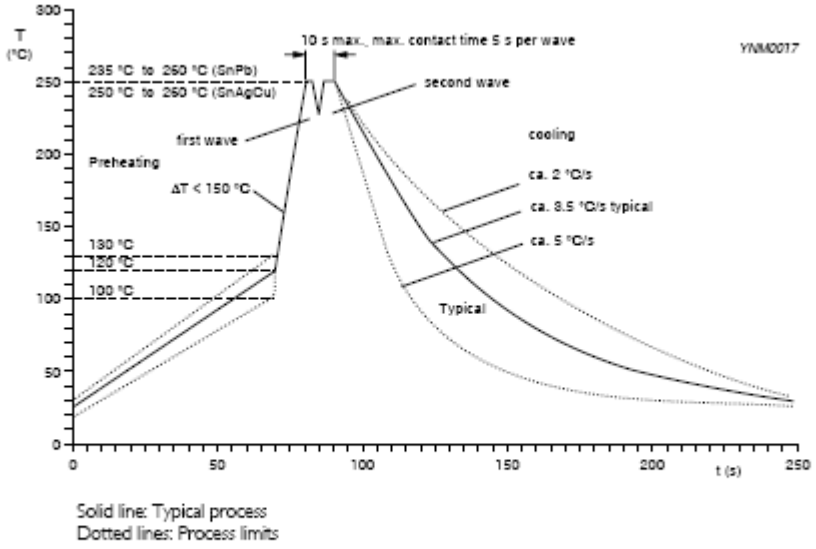
Solid line: Typical process (terminal temperature)
Dotted lines: Process limits - bottom process limit (terminal temperature) & upper process limit (top surface temperature).

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



Solid line: Typical process (terminal temperature)
Dotted lines: Process limits - bottom process limit (terminal temperature) & upper process limit (top surface temperature).

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



Solid line: Typical process
Dotted lines: Process limits

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

SOLDERING RECOMMENDATION

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

Test procedures and requirements.

<table>
<tr><th>TEST</th><th>PROCEDURE</th><th>REQUIREMENTS</th></tr>
<tr><td>Mounting</td><td>The capacitors may be mounted on printed-circuit boards or ceramic substrates</td><td>No visible damage</td></tr>
<tr><td>Visual inspection and dimension check</td><td>Any applicable method using x10 magnification</td><td>In accordance with specification</td></tr>
<tr><td>Capacitance</td><td>Class1：
C ≤1nF, f = 1 MHz;
C ＞1nF, f = 1 KHz;
NP0: measuring voltage 1 V at 20℃

Class 2：
Precondition:
150 +0/-10 ℃/1 hr , then keep for 24±1 hrs at room temp

C ≤10uF, f = 1 KHz; measuring voltage 1 V at 20℃
C ＞10uF, f = 120Hz; measuring voltage 0.5V at 20℃</td><td>Within specified tolerance</td></tr>
<tr><td>Dissipation Factor (D.F.)</td><td>Class1：
C ≤ 1nF, f = 1 MHz;
C ＞1nF, f = 1 KHz;
NP0: measuring voltage 1 V at 20 ℃

Class 2：
Precondition:
150 +0/-10 ℃/1 hr , then keep for 24±1 hrs at room temp

C ≤ 10uF, f = 1 KHz; measuring voltage 1 V at 20℃
C ＞10uF, f = 120Hz; measuring voltage 0.5V at 20℃</td><td>In accordance with specification</td></tr>
<tr><td>Insulation resistance</td><td>At Ur (DC) for 1 minute</td><td>In accordance with specification</td></tr>
<tr><td>Voltage proof</td><td>Specified stress voltage applied for 1~5 seconds
Ur≤100V: series applied 2.5Ur
100<Ur≤200 series applied (1.5Ur +100)
200<Ur≤500 series applied (1.3Ur +100)
Ur>500: 1.3Ur
Ur≧1000: 1.2Ur
Charge/Discharge current less than 50mA</td><td>No breakdown or flashover</td></tr>
<tr><td>Temperature coefficient</td><td>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.
<table>
<tr><th>Step</th><th>Temperature(℃)</th></tr>
<tr><td>a</td><td>25±2</td></tr>
<tr><td>b</td><td>Lower temperature±3℃</td></tr>
<tr><td>c</td><td>25±2</td></tr>
<tr><td>d</td><td>Upper Temperature±2℃</td></tr>
<tr><td>e</td><td>25±2</td></tr>
</table>
(1) Class Ⅰ
Temperature Coefficient shall be calculated from the formula as below
$\text{Temp. Coefficient} = \frac{C2 - C1}{C1 \times \triangle T} \times 10^6 \ [ppm/℃]$
C1: Capacitance at step c
C2: Capacitance at 125℃
△T: 100℃(=125℃-25℃)

(2) CLASS Ⅱ
Capacitance Change shall be calculated from the formula as below.
$\triangle C = \frac{C2 - C1}{C1} \times 100(\%)$
C1: Capacitance at step c
C2: Capacitance at step b or d</td><td>Class1:
Δ C/C: ±30ppm

Class2:
X7R/ X5R: Δ C/C: ±15%
Y5V: Δ C/C: 22~-82%</td></tr>
</table>

Test procedures and requirements.

TEST	PROCEDURE	REQUIREMENTS
Adhesion	A force applied for 10 sec 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	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 Δ C/C Class1: NP0 within ±1% or 0.5 pF, whichever is greater Class2: X7R/X5R/Y5V: ±10%
Resistance to soldering heat	Precondition: 150 +0/-10℃/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 >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.	Dissolution of the end face plating shall not exceed 25% of the length of the edge concerned. ΔC/C： Class1: NP0: within ±0.5% or 0.5 pF whichever is greater Class2: X7R/X5R: ±10% Y5V: ±20% D.F.: within initial specified value R_{ins}: within initial specified value
Solderability	The specimen shall be preheated to a temperature of (80 to 140)℃ and maintained for 30s to 60s. 1. Temperature: 235±5°C / Dipping time: 2 ±0.5 s 2. Temperature: 245±5°C / Dipping time: 3 ±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	Preconditioning; 150 +0/-10℃/1 hr, then keep for24±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.	No visual damage ΔC/C： Class1: NP0：within 1% or 1 pF, whichever is greater Class2: X7R/X5R：±15% Y5V：±20% D.F.： meet initial specified value R_{ins}： meet initial specified value

Test procedures and requirements.

TEST	PROCEDURE	REQUIREMENTS
Damp heat, with Ur load	1. Preconditioning, class 2 only： 150 +0/-10℃ /1 hr , then keep for 24±1hrs at room temp 2. Initial measure Spec: refer Initial spec (C, D, IR) 3. Damp heat test: 500±12 hours at 40±2°C; 90 to 95% R.H.; 1.0Ur applied. 4. Recovery. Class 1：6 to 24 hours Class 2：24±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 precondition according to IEC 60384 4.1 and then the requirement shall be met.	No visual damage after recovery ΔC/C： NP0：within ±2% or 1 pF, whichever is greater X7R/X5R：±15% Y5V：±30% D.F.： NP0：2 × specified value X7R/X5R： ≦16V：≦7% ≧25V：≦5% Y5V：≦15% R_{ins}： NP0： ≧2,500MΩ or RxC≧25s whichever is less X7R/X5R/Y5V： ≧500MΩ or RxC≧25s whichever is less
Endurance	1. Precondition, class 2 only: 150 +0/-10 ℃/1 hr , then keep for 24±1 hrs at room temp 2. Initial measure Spec: refer Initial spec C, D, IR 3. Endurance test: Temperature: NP0/X7R: 125℃ X5R/Y5V:85 ℃ Specified stress voltage applied for 1000 hrs Applied 2.0 x Ur for general product. 4. Recovery time: 24±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 precondition according to IEC 60384 4.1 and then the requirement shall be met.	No visual damage ΔC/C： NP0：within ±2% or 1 pF, whichever is greater X7R/X5R：± 15% Y5V：± 30% D.F.： NP0：2 × specified value X7R/X5R： ≦16V：≦7% ≧25V：≦5% Y5V：≦15% R_{ins}： NP0： ≧4,000MΩ or RxC≧40s whichever is less X7R/Y5V/X5R： ≧1000MΩ or RxC≧50s whichever is less