Surface-mount Ceramic Multilayer Capacitors (RoHS compliant & Halogen Free)

CC0603KRX7R0BB473 (0603 ,X7R, 47nF, 100V, ±10%)

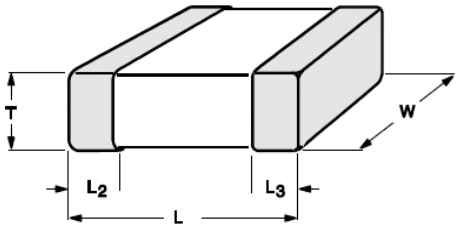
Spec Sheet

Scope

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

Yageo Part Number

CC	0603	K	R	X7R	0	BB	473
	(1) Dimension	(2) Cap Tol.	(3) Packaging	(4) TC	(5) Rated Volt.		(6) Capacitance



(1) External Dimensions

(Unit: mm)

L	1.6±0.1
W	0.8±0.1
T	0.8±0.1
L2/L3	0.20 to 0.60

(2) Capacitance Tolerance:	±10%
(4) Temperature Characteristics:	X7R
Temperature Range:	-55 to 125 ℃
Cap Change:	±15%
(5) Rated Voltage:	100V
(6) Capacitance:	68nF
(3) Package:	Paper Tape Reel 7"
Packaging Unit:	4,000 pcs
Resistance:	R x C > 500Ω.F
Dielectric Loss Tangent:	5%
RoHS Compliance:	Yes
Halogen Free:	Yes
Soldering Method:	Reflow/Wave

IEC-60384 Standard Specification and Test methods

<table>
<tr><th>Test Item</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

Dielectric loss tangent</td><td>Class1：
C ≤1nF, f = 1 MHz;
C ＞1nF, f = 1 KHz;
NPO: measuring voltage 1 V at room temp.
Class 2 (X5R, X6S, X7R, Y5V)：
Precondition:
150 +0/-10 ℃/1 hr , then keep for 24±1 hrs at room temp.
f = 1 KHz; measuring voltage 1 V at 20℃</td><td>Within specified tolerance</td></tr>
<tr><td>Insulation resistance</td><td>At Ur (DC) for 1 minute
Ur(DC) > 500V: At 500V for 1 minute</td><td>In accordance with specification</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>Class I:
Δ C/C: ±30ppm

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

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Test Item	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 5mm.	No visible damage Δ C/C: Class I, within ±1% or 0.5 pF, whichever is greater Class II: X7R, X5R:±10%, Y5V: ±20%
Resistance to soldering heat	Precondition: 150 +0/-10℃/1 hr, then keep for 24±1 hrs at room temp 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. Δ C/C: Class I, within ±0.5% or 0.5 pF, whichever is greater Class II: X7R, X5R:±10%, Y5V: ±20% DF: within initial specified value IR: 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	Precondition: 150 +0/-10℃/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.	No visual damage Δ C/C: Class I, within ±1% or 1 pF, whichever is greater Class II: X7R, X5R:±15%, Y5V: ±20% DF: within initial specified value IR: within initial specified value
Damp heat with Ur load	1. Precondition (Class II only): 150 +0/-10℃/1 hr, then keep for 24±1 hrs at room temp 2. Initial measure Spec: refer Initial spec (Cap, DF, 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: Cap, DF, 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 Δ C/C: Class I, within ±2% or 1 pF, whichever is greater Class II: X7R, X5R:±15%, Y5V: ±30% DF: Class I: 2 x specified value Class II: X7R/X5R: ≤16V： ≤7% or 2 x specified value whichever is greater ≧25V： ≤5% or 2 x specified value whichever is greater Y5V： ≤15% IR: Class I: ≧2,500MΩ or RxC≧25Ω.F whichever is less Class II: ≧500MΩ or RxC≧25Ω.F whichever is less

IEC-60384 Standard Specification and Test methods

Test Item	Procedure	Requirements
Endurance	1. Precondition (Class II only): 150 +0/-10℃/1 hr, then keep for 24±1 hrs at room temp 2. Initial measure Spec: refer Initial spec (Cap, DF, IR) 3. Endurance test: Temperature: NPO/X7R: 125℃ , X5R/Y5V: 85℃ Specified voltage applied for 1000 hrs Applied 200% Ur for 4V to 100V series Applied 150% Ur for 200V/250V series Applied 130% Ur for 500V/630V series Applied 120% Ur for 1000V and above series Recovery time: 24±2 hours 5. Final measure: Cap, DF, 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 Δ C/C: Class I, within ±2% or 1 pF, whichever is greater Class II: X7R, X5R:±15%, Y5V: ±30% DF: Class I: 2 x specified value Class II: X7R/X5R: ≤16V： ≤7% or 2 x specified value whichever is greater ≧25V： ≤5% or 2 x specified value whichever is greater Y5V： ≤15% IR: Class I: ≧4,000MΩ or RxC≧40Ω.F whichever is less Class II: ≧1000MΩ or RxC≧50Ω.F whichever is less
Voltage Proof	Specified stress voltage applied for 1 minute Ur ≤ 50 V: series applied 2.5 Ur Charge / Discharge current less than 50mA. Specified stress voltage applied for 1 ~5 sec. 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 = 630 V: 1.3 Ur Ur ≥ 1000 V: 1.2 Ur Charge / Discharge current less than 50mA.	No breakdown or flashover

Shelf Life & Storage Condition

According with international specification JIS 1997.

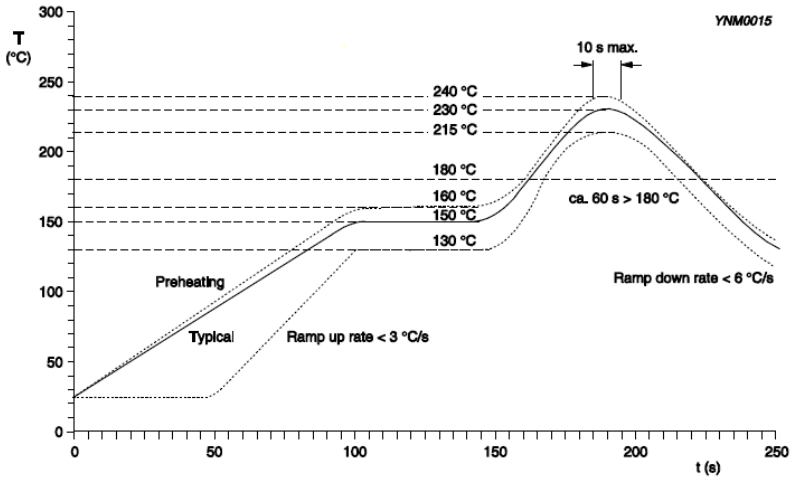
(1) Storage Condtions: Temperature -5 to 40℃
Relative humidity 40~60%

(2) Shelf Life: 2 years from date of manufacture

We recommend that the products are stored in their original packing (e.g. tape, reel).
They should never be touched by hand.

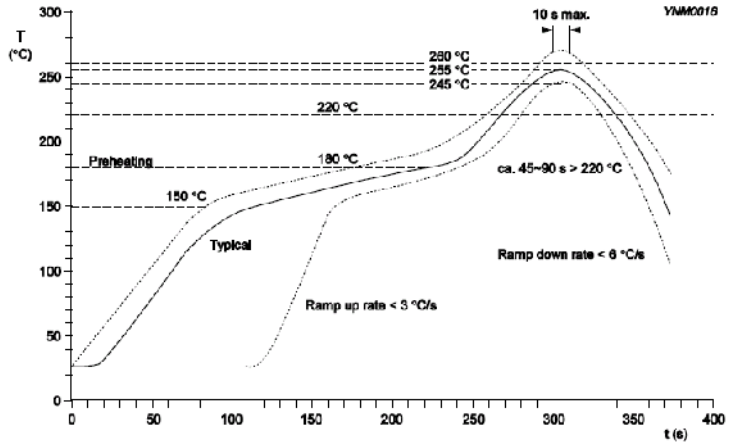
Soldering Condition

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).



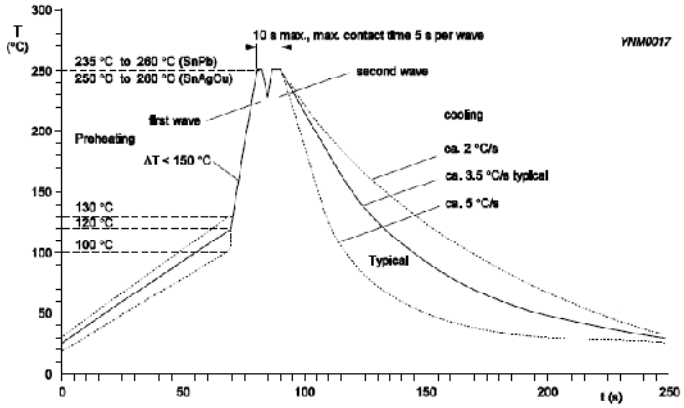
Solid line: Typical process (terminal temperature)
Dotted lines: Process limits - bottom process limit (terminal temperature) & upper process limit (top surface temperature).

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)