

Data No. R20-8006

MULTI-LAYER CERAMIC CAPACITORS Report.

Draft Specification.

This specification is draft specification, not final.

Therefore this may be changed at final specification.

Product Part No CT03X5R105M06AH022

Date: August 6, 2020
Kyocera

PREPD.

APPD.

Kyocera Corporation
Capacitor Division



1.Scope

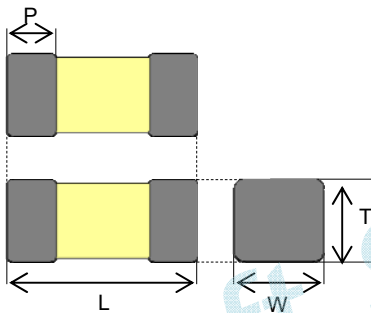
This specification sheet shall be applied to multilayer ceramic chip capacitors;Kyocera CT series.

2.Nomenclature

CT □□ □□ □□□ □ □□ A □ □□□
 Series (1) (2) (3) (4) (5) (6) (7) (8)

- (1) : Size
- (2) : Temperature Characteristics
- (3) : Capacitance
- (4) : Tolerance
- (5) : Rated Voltage
- (6) : External Electrode
- (7) : Packaging
- (8) : Thickness

(1)External Dimensions(Size)



External Dimension for Taping or Bulk (unit:mm)

| Type | L | W | T | P |
|------|-----------|-----------|----------|-----------|
| 03 | 0.60±0.09 | 0.30±0.09 | 0.22 max | 0.10~0.26 |

(2)Temperature Characteristics

| Characteristics | Applied voltage | Change in capacitance | Operating temperature range | Reference |
|-----------------|--------------------|-----------------------|-----------------------------|-----------|
| X5R | No applied voltage | Within +/-15% | -55°C~+85°C | 25°C |



(3)Capacitance Value

Capacitance is indicated by three numbers and a letter (see example as follows).
The first and second digits indicate the first two significant figures, and the final digit is a base 10 logarithmic multiplier in picofarads.

(Ex.)

| Code | Capacitance |
|------|-------------|
| 105 | 1,000,000pF |

(4)Tolerance

| Code | M |
|-----------|------|
| Tolerance | ±20% |

(5)Rated Voltage

| Code | 06 |
|---------|--------|
| Voltage | 6.3Vdc |

(6)Termination (External Electrode)

A: Nickel Barrier/ Tin

(7)Packaging Configuration

| Code | Packaging Configuration | Applying Size |
|------|------------------------------------|-------------------------------|
| H | Taping(2mm Pitch. ϕ 180 Reel) | Refer to Taping specification |

(8)Thickness

022 : 0.22mm max.

3.Operating temperature range

Refer to Item 2-(2)

4.Specifications and Test Methods

(Table 1-1)

| Item | Specification | | Measuring Conditions |
|-------------------------------|---|-----------------------------------|--|
| | X5R | | |
| Capacitance | Within specified tolerance value | | High Temperature Treatment (Table 2) C≤10μF Measuring frequency 1kHz±10% Measuring voltage Refer to (Table 3) |
| tanδ | Refer to (Table 3) | | |
| (*1)Insulation Resistance | Refer to (Table 3) | | Measure after charging with the rated voltage within 1 minutes at room conditions. |
| (*1)Dielectric Strength | No problem observed | | Applying 2.5 times of the rated voltage for 1 to 5 seconds. |
| Appearance | No serious defect | | Under Microscope |
| Resistance to Vibration | Appearance | No serious defect | Perform High Temperature Treatment (Table 2) , then measure the initial capacitance and tanδ. |
| | Capacitance Variation | Within specified tolerance value | Vibration frequency:10 to 55 (Hz) Swing width :1.5mm Sweep :10→55→10 Hz/1min x,y,z axis 2 hours/each Total 6 hours (Refer to Fig.1) |
| | tanδ | Satisfies initial specified value | |
| Resistance to Solder Leaching | Appearance | No serious defect | Perform High Temperature Treatment (Table 2) , then measure the initial capacitance and tanδ. |
| | Capacitance Variation | Within ±7.5% | After dipped molten solder, at 260±5°C for 10±0.5 seconds and kept at room conditions for 24±2 hours, measure and check the specifications. |
| | tanδ | Satisfies initial specified value | |
| | (*1)Insulation Resistance | Within specified tolerance value | *Pre-heat before immersion 1st: 80°C to 100°C for 120sec. 2st:150°C to 200°C for 120sec. |
| | (*1)Dielectric Strength | Resist without problem. | |
| Solderability | Coverage >= 90% Each termination end | | Soaking Condition <Sn-3Ag-0.5Cu> 245±5°C 3±0.5sec. <Sn63 Solder> 235±5°C 2±0.5sec. |

(Table 1-2)

| Item | | Specification | Measuring Conditions |
|----------------------------|---------------------------|--|---|
| | | X5R | |
| Temperature Cycling | Appearance | No serious defect | Perform High Temperature Treatment (Table 2) , then measure the initial capacitance and tan δ . <Cycle> Room temperature (3 minutes) - Lowest operating temperature (30 minutes) – Room temperature (3 minutes) – Highest operating temperature (30 minutes). After 5 cycles of the above, keep at 150+0/-10°C for 1 hour and then let sit for 24 \pm 2 hours at room temperature, then measure. (Refer to Fig.1) |
| | Capacitance Variation | Refer to (Table 4) | |
| | tan δ | Satisfies initial specified value | |
| | (*1)Insulation Resistance | Refer to (Table 4) | |
| | (*1)Dielectric Strength | Resist without problem | |
| Load Humidity Resistance | Appearance | No serious defect | Perform High Temperature Treatment (Table 2) , then measure the initial capacitance and tan δ . Apply rated voltage for 500+12/-0 hours in pre-condition at 40 \pm 2°C, humidity 90% to 95%RH. After test , keep at 150+0/-10°C for 1 hour and then let sit for 24 \pm 2 hours at room temperature, then measure. |
| | Capacitance Variation | Refer to (Table 4) | |
| | tan δ | Less than 2 times of the initial value | |
| | (*1)Insulation Resistance | Refer to (Table 4) | |
| High Temperature Life Test | Appearance | No serious defect | Perform High Temperature Treatment (Table 2) , then measure the initial capacitance and tan δ . Apply voltage (Magnification of Applied voltage \times Rated voltage) for 1000+12/-0 hours in pre-condition at the highest temperature. * Magnification of Applied voltage: refer to (Table 4) After test , keep at 150+0/-10°C for 1 hour and then let sit for 24 \pm 2 hours at room temperature, then measure. |
| | Capacitance Variation | Refer to (Table 4) | |
| | tan δ | Less than 2 times of the initial value | |
| | (*1)Insulation Resistance | Refer to (Table 4) | |

(*1) Insulation Resistance/Dielectric Strength;Charging or discharging current for these tests Is limited under 50mA.

(Table 2)

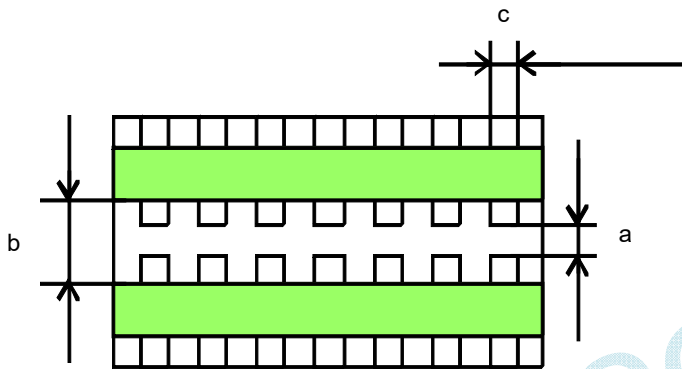
| | | |
|-------------------|----------------------------|--|
| Initial Treatment | High Temperature Treatment | Keep chip capacitor at 150°C +0/-10°C for 1 hour,Then leave chip capacitor at room temperature and normal humidity for 24 \pm 2 hours. |
|-------------------|----------------------------|--|

[Table3 Parts List]

| Product Part No | Tolerance | Dimension [mm] | | | tanδ [%]max | IR (initial) min | Capacitance/ tanδ Measuring voltage |
|--------------------|-----------|----------------|-----------|-----------|-------------|------------------|-------------------------------------|
| | | L | W | T | | | |
| CT03X5R105M06AH022 | M:±20% | 0.60±0.09 | 0.30±0.09 | 0.22 max. | 10.0% | 50 MΩ·μF | 0.5±0.1Vrms |

[Table4 test specifications]

| Product Part No □:Tolerance code | Temperature Cycling | | Load Humidity Resistance | | High Temperature Life Test | | |
|-------------------------------------|-----------------------|--------------------|--------------------------|--------------------|----------------------------|-----------------------|--------------------|
| | Capacitance Variation | IR (Minimum value) | Capacitance Variation | IR (Minimum value) | Voltage Bias [%] | Capacitance Variation | IR (Minimum value) |
| CT03X5R105M04AH022 | ±7.5% | 50 MΩ·μF | ±12.5% | 10 MΩ·μF | 100% | ±12.5% | 10 MΩ·μF |

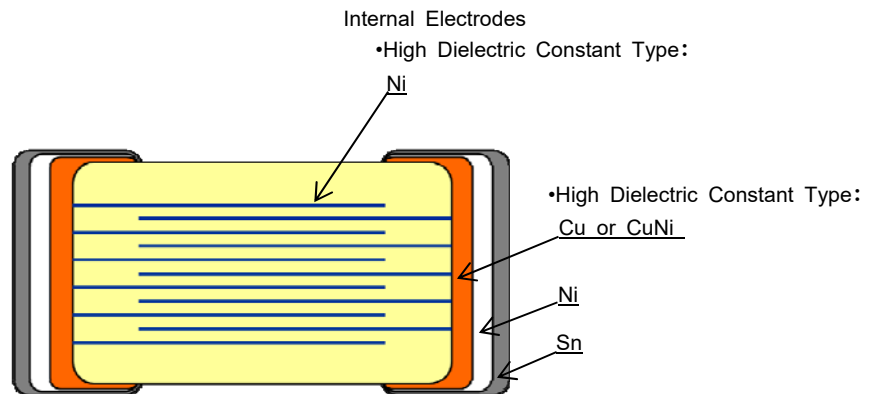


| type | a | b | c |
|------|------|------|------|
| 03 | 0.26 | 0.92 | 0.32 |

glass epoxy board

Fig.1 Substrate for temperature cycle test

[Structure]



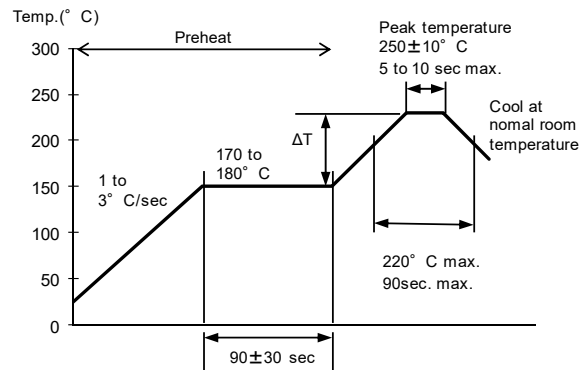
[Production facility]

Kagoshima Kokubu plant



■For lead-free soldering Recommended temperature profile

•Reflow profile



- (1) Minimize soldering time
- (2) Ensure that the temperature difference does not exceed 150 °C.
- (3) MLCC can withstand the above reflow conditions up to 3 times.
- (4) Cool naturally after soldering.

•Flow profile

Flow is not applicable for chips with size CT03.

Taping Specification

1.Application

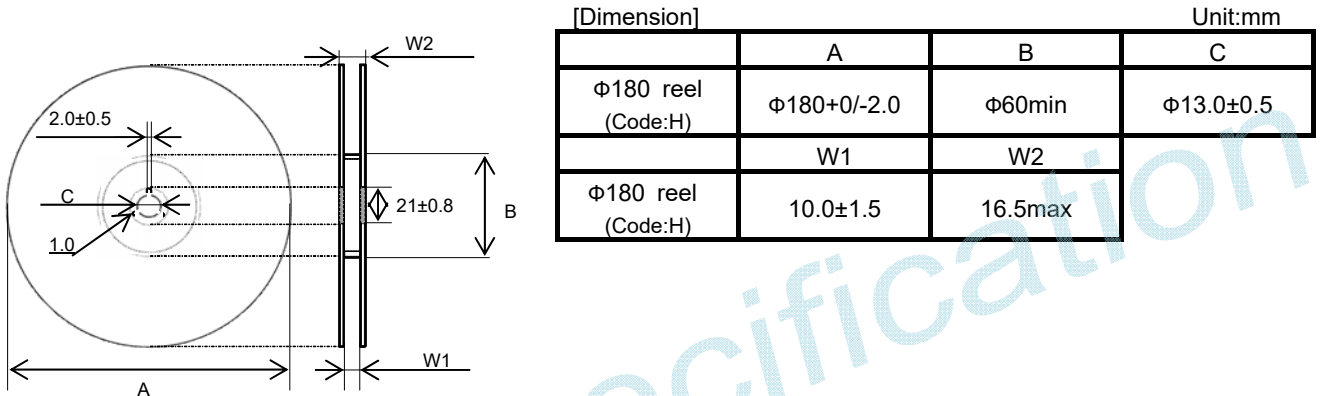
This specification applies to paper carrier tape of Kyocera multi-layer ceramic chip capacitor.

2.Packing unit

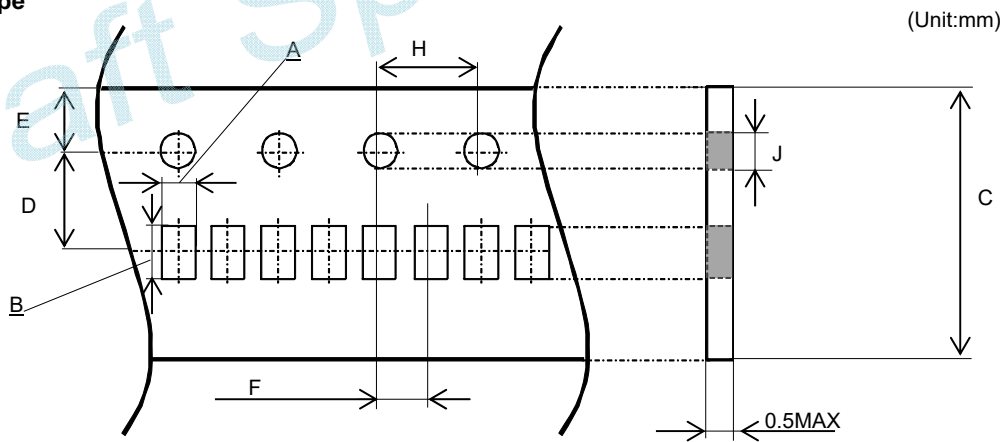
| type | thickness (unit:mm) | material of carrier tape | | width of carrier tape | | Φ180 reel quantity per reel |
|------|------------------------|-----------------------------|---------|-----------------------|------|-----------------------------------|
| | | paper | Plastic | 8mm | 12mm | |
| 03 | 0.22 max | ○ | - | ○ | - | 15000 |

3.Shape and dimintions

(1)Reel



(2)Carrier Tape



| Code | A | B | C | D | E | F | H | J |
|-----------|-------|-------|------|-------|------|-------|------|---------|
| Tolerance | ±0.03 | ±0.03 | ±0.3 | ±0.05 | ±0.1 | ±0.05 | ±0.1 | +0.1/-0 |
| Type | | | | | | | | |
| 03 | 0.42 | 0.72 | 8.0 | 3.5 | 1.75 | 2.0 | 4.0 | Φ1.5 |

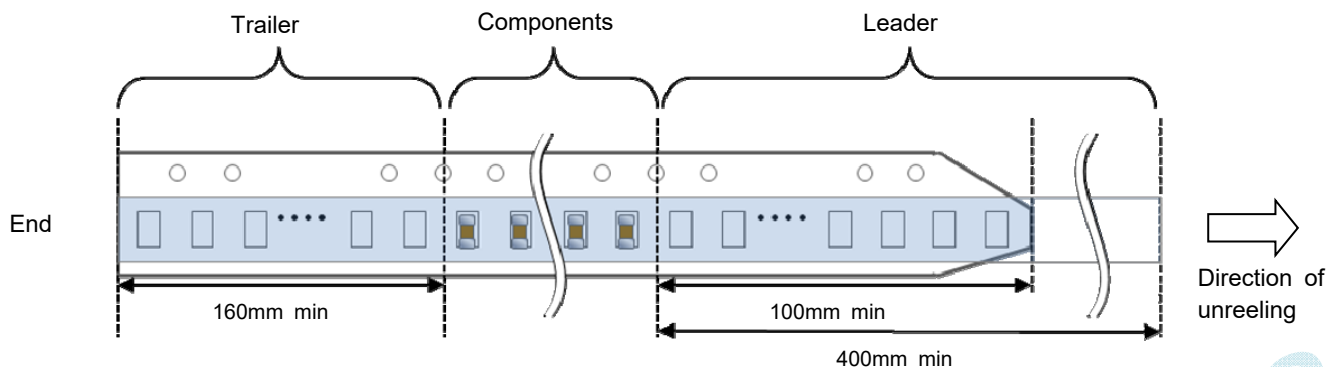
(unit:mm)



4.Packing method

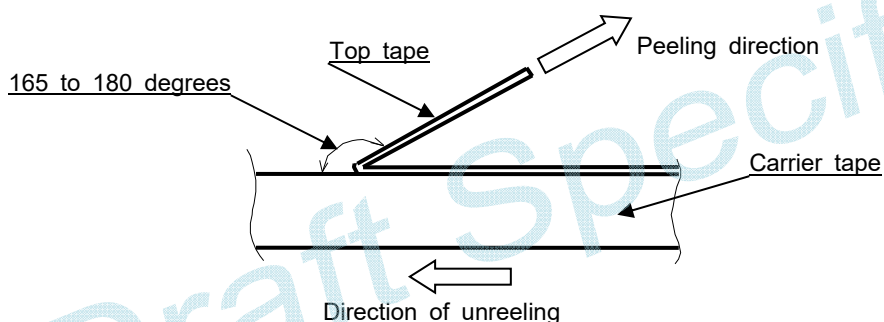
(1)Details of leader and trailer

- ①The tape will have a empty pocket at the leader and trailer of carrier tape.
- ②The tape end will not be stucked by glue in order to make it easier to peel off from reel.
- ③The feeding round hole will be on the right side against t leading direction.



(2)Heat pressure tape

- ①Peeling strength to be 0.1~0.7N when peeling off the top tape by following method.
- ②When peeling top tape off, the glue will be stuck to the top tape side.
- ③Chip capacitor will not stuck on heat pressure tape and will be free in the cavity.



The peel-off angle:165~180 degree against the surface of carrier tape.
The peel-off speed:300mm/min.

(3)Carrier tape

- ①Chip will not fall off from carrier tape or carrier tape will not be damaged by bending than within aradius of 25mm.
- ②The chip are inserted continuously without any empty pocket.
- ③Chip will not be mis-mounted because of too big clearance between components and cavity. Also the waste of carrier tape will not fill a nozzle hole of mouting machine.

5.Indication and packing

- ①There will be following indication on one side of the reel: "PART NUMBER","LOT NUMBER", "QUANTITY","DATE OF MANUFACTURE","CUSTOMER'S NAME"
- ②There will be following indication on the reel box: "PART NUMBER","LOT NUMBER", "QUANTITY OF REEL","DATE OF MANUFACTURE","CUSTOMER'S NAME"
- ③We adequately pack the box to prevent chip capacitor from any mechanical damage during transportation.

Precautions

■ Handling

- 1) Cracks may occur unless otherwise avoiding excessive stress to the capacitors by the load of an adsorption nozzle, and bending of a substrate at the time of mounting.
- 2) Please arrange the capacitor position where they don't have too much stress of board bending after mounting.
- 3) Please design that the form and size of the land pattern has suitable solder amount.
Otherwise cracks may occur. The recommended fillet height shall be 1/2 to 1/3 of the thickness of capacitors.

■ Circuit Design

- 1) When AC voltage is superimposed on DC voltage, the zero-to-peak voltage shall not exceed the rated voltage. When the capacitor is to be employed in a circuit in which there is continuous application of a high frequency Voltage or a steep pulse voltage, even though it is within the rated voltage, please inquire to the manufacturer.
- 2) Please use the capacitor below the maximum temperature.
When using the capacitor in a self-heating AC circuit, please make sure the surface of the capacitor remains under the maximum temperature for usage. Also, please make certain temperature rises remain below 20 °C.

■ Resin coating

Please use the resin of low curing shrinkage type. (Otherwise cracks may occur).

■ Storage

- 1) When the components is stored in minimal packaging (a heat-sealed or chuck-type plastic bag), the bag should be kept closed. Once the bag has been opened, reseal it or store it in a desiccator.
- 2) Keep storage place temperature +5 to +40 °C, humidity 20 to 70% RH.
- 3) The storage atmosphere must be free of gas containing sulfur and chlorine. Also, avoid exposing the product to saline moisture. If the product is exposed to such atmospheres, the terminals will oxidize and solderability will be effected.
- 4) Precautions 1) to 3) apply to chip capacitors packaged in carrier tapes and bulk cases.
- 5) The solderability is assured for 6 months from our shipping date if the above storage precautions are followed.

■ Application Restriction

Please consult with us before using a capacitor in the equipment which requires a high degree reliability (medical equipment, aerospace applications, nuclear equipment.) Malfunctions in medical, space, nuclear power or other vital equipment may result in death or great social losses. Capacitors designed specially with high reliability are used for the equipment above.

■ Export regulation

When the applying products relate the strategic materials which are provided in Foreign Exchange and Foreign Trade Act and Foreign Trade Management Law, the export license based on these laws are required.

■ Disposal

Please dispose the capacitors according to the relating laws about the waste treatment and cleaning. Safety application guideline and detailed information of electrical properties are also provided in Kyocera home page:

URL: <http://www.kyocera.co.jp/electronic>

Notice:

This specification shall guarantee only monolithic capacitors. Please make sure the performance of capacitors after mounted on the assembled product.

Any failures occurred being used out of this specification shall not be guaranteed.

This specification shall be applied to the products purchased through the regular sales routes, such as the sale offices, the subsidiaries and the distributors, etc.).



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[>>Kyocera\(京瓷\)](#)