

# MULTILAYER CERAMIC CAPACITORS

TUV Safety Certified X1/Y2 Series (S2)



## 1. INTRODUCTION

WTC middle and high voltage series MLCC is designed by a special internal electrode pattern, which can reduce voltage concentrations by distributing voltage gradients throughout the entire capacitor. This special design also affords increased capacitance values in a given case size and voltage rating.

WTC S2 series MLCCs are designed for AC surge and lightning protection in line-to-ground interface. WTC's S2 (X1/Y2) series MLCC offering includes two standard case sizes with NP0 dielectric material.

## 2. FEATURES

- a. High voltage in a given case size.
- b. High stability and reliability.
- c. RoHS compliant.

## 3. APPLICATIONS

- a. Computer networks.
- b. Modems.
- c. Facsimile.



## 4. HOW TO ORDER

| <u>S2</u>     | <u>42</u>                                          | <u>N</u>                | <u>100</u>                                                                                                                                                               | <u>G</u>         | <u>302</u>                                                                                               | <u>L</u>           | <u>I</u>         |
|---------------|----------------------------------------------------|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|----------------------------------------------------------------------------------------------------------|--------------------|------------------|
| <u>Series</u> | <u>Size</u>                                        | <u>Dielectric</u>       | <u>Capacitance</u>                                                                                                                                                       | <u>Tolerance</u> | <u>Rated voltage</u>                                                                                     | <u>Termination</u> | <u>Packaging</u> |
| S2=X1/Y2      | 42=1808 (4520)<br>43=1812 (4532)<br>52=2211 (5728) | N=NP0<br>(C0H)<br>B=X7R | Two significant digits followed by no. of zeros. And R is in place of decimal point.<br><br>eg.:<br>R47=0.47pF<br>0R5=0.5pF<br>1R0=1.0pF<br>100=10x10 <sup>0</sup> =10pF | J=±5%<br>K=±10%  | Two significant digits followed by no. of zeros. And R is in place of decimal point.<br><br>302=3000 VDC | L=Ag/Ni/Sn         | T=7" reeled      |

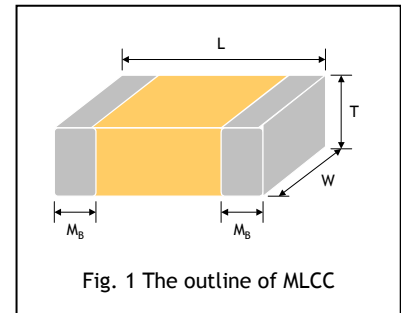
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## 5. EXTERNAL DIMENSIONS

| Size<br>Inch (mm) | L (mm)        | W (mm)     | T (mm)/Symbol |   | M <sub>B</sub> (mm) |
|-------------------|---------------|------------|---------------|---|---------------------|
| 1808 (4520)       | 4.50±0.5/-0.3 | 2.03±0.25  | 1.25±0.10     | D | 0.50±0.25           |
|                   |               |            | 2.00±0.20     | K |                     |
| 1812 (4532)       | 4.50±0.5/-0.3 | 3.20±0.30  | 1.25±0.10     | D | 0.50±0.25           |
|                   |               |            | 2.00±0.20     | K |                     |
| 2211 (5728)       | 5.70±0.40     | 2.800±0.30 | 1.60±0.20     | G | 0.85±0.55           |
|                   |               |            | 2.00±0.20     | K |                     |
|                   |               |            | 2.50±0.30     | M |                     |



Remark: Reflow soldering only is recommended.

## 6. GENERAL ELECTRICAL DATA

| Dielectric                       | NPO                                                                 | X7R              |
|----------------------------------|---------------------------------------------------------------------|------------------|
| Size                             | 1808, 1812                                                          | 1808, 1812, 2211 |
| Capacitance*                     | 10pF to 470pF                                                       |                  |
| Capacitance tolerance            | J (±5%), K (±10%)                                                   |                  |
| Rated voltage (WVAC)             | 250Vrms                                                             |                  |
| Q*                               | Cap<30pF: Q <sub>z</sub> ≥400+20C<br>Cap≥30pF: Q <sub>z</sub> ≥1000 | Tan δ≤2.5%       |
| Insulation resistance at Ur**    | ≥10GΩ                                                               |                  |
| Dielectric withstanding strength | 1500VAC                                                             |                  |
| Peak impulse voltage             | 5000V                                                               |                  |
| Operating temperature            | -55 to +125 °C                                                      |                  |
| Capacitance characteristic       | ±60ppm                                                              | ±15%             |
| Termination                      | Ni/Sn (lead-free termination)                                       |                  |
| TUV certified number             | R50021351                                                           |                  |
| Test standard                    | EN 132400, 1994+A2+A3+A4; IEC 60384-14, 1993+A1, Class X1Y2         |                  |

\* Measured at the conditions of 25 °C ambient temperature and 30-70% related humidity. Apply 1.0±0.2Vrms, 1.0MHz±10%.

\*\* Measured at 500VDC for 60 sec. for Ur>500VDC.

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## 7. CAPACITANCE RANGE

| DIELECTRIC          |             | NPO  |      |
|---------------------|-------------|------|------|
| SIZE                |             | 1808 | 1812 |
| RATED VOLTAGE (VDC) |             | 3000 | 3000 |
| Capacitance         | 10pF (100)  | D    |      |
|                     | 12pF (120)  | D    | D    |
|                     | 15pF (150)  | D    | D    |
|                     | 18pF (180)  | D    | D    |
|                     | 22pF (220)  | D    | D    |
|                     | 27pF (270)  | D    | D    |
|                     | 33pF (330)  | D    | D    |
|                     | 39pF (390)  | D    | D    |
|                     | 47pF (470)  | D    | D    |
|                     | 56pF (560)  | D    | D    |
|                     | 68pF (680)  | D    | D    |
|                     | 82pF (820)  | D    | D    |
|                     | 100pF (101) | D    | D    |
|                     | 120pF (121) | D    | D    |
|                     | 150pF (151) | D    | D    |
|                     | 180pF (181) | K    | D    |
|                     | 220pF (221) | K    | D    |
|                     | 270pF (271) | K    | K    |
|                     | 330pF (331) |      | K    |
|                     | 390pF (391) |      | K    |
|                     | 470pF (471) |      | K    |

| DIELECTRIC          |               | X7R  |      |      |
|---------------------|---------------|------|------|------|
| SIZE                |               | 1808 | 1812 | 2211 |
| RATED VOLTAGE (VDC) |               | 3000 | 3000 | 3000 |
| Capacitance         | 56pF (560)    |      |      |      |
|                     | 68pF (680)    |      |      |      |
|                     | 82pF (820)    |      |      |      |
|                     | 100pF (101)   | G    |      |      |
|                     | 120pF (121)   | G    |      |      |
|                     | 150pF (151)   | G    | G    | G    |
|                     | 180pF (181)   | G    | G    | G    |
|                     | 220pF (221)   | G    | G    | G    |
|                     | 270pF (271)   | K    | G    | G    |
|                     | 330pF (331)   | K    | G    | G    |
|                     | 390pF (391)   | K    | G    | G    |
|                     | 470pF (471)   | K    | G    | K    |
|                     | 560pF (561)   | K    | G    | K    |
|                     | 680pF (681)   | K    | K    | K    |
|                     | 820pF (821)   | K    | K    | K    |
|                     | 1,000pF (102) | K    | M    | M    |
|                     | 1,200pF (122) |      |      | M    |
|                     | 1,500pF (152) |      |      | M    |
|                     | 1,800pF (182) |      |      | M    |
|                     | 2,200pF (222) |      |      | M    |

1. The letter in cell is expressed the symbol of product thickness.

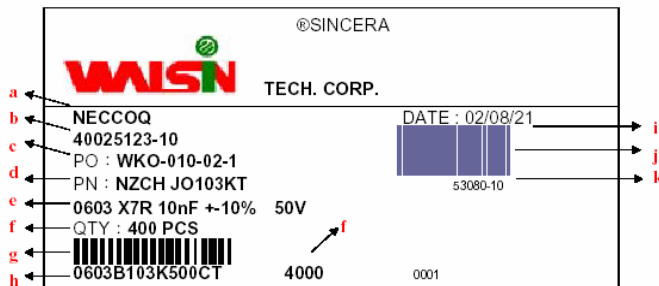


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## Description of customer label



- a. Customer name
- b. WTC order series and item number
- c. Customer P/O
- d. Customer P/N
- e. Description of product
- f. Quantity
- g. Bar code including quantity & WTC P/N or customer
- h. WTC P/N
- i. Shipping date
- j. Order bar code including series and item numbers
- k. Serial number of label

## Constructions

| No. | Name             |              | NPO, X7R                 |
|-----|------------------|--------------|--------------------------|
| ①   | Ceramic material |              | BaTiO <sub>3</sub> based |
| ②   | Inner electrode  |              | AgPd alloy               |
| ③   | Termination      | Inner layer  | Ag                       |
| ④   |                  | Middle layer | Ni                       |
| ⑤   |                  | Outer layer  | Sn (Matt)                |

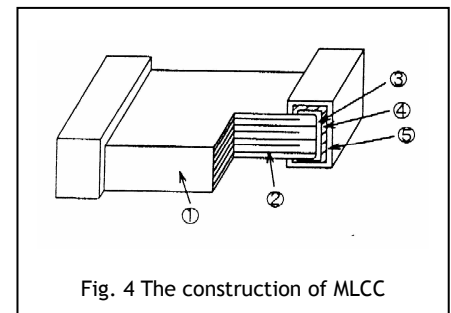


Fig. 4 The construction of MLCC

## RoHS compliance chart

| Dielectric | Lead (Pb) | Cadmium (Cd) | Chromium VI (Cr <sup>+6</sup> ) | Mercury (Hg) | PBBs | PBDEs |
|------------|-----------|--------------|---------------------------------|--------------|------|-------|
| NPO        | <100 ppm  | nd           | nd                              | nd           | nd   | nd    |
| X7R        | <100 ppm  | nd           | nd                              | nd           | nd   | nd    |

## Storage and handling conditions

- (1) To store products at 5 to 40°C ambient temperature and 20 to 70% related humidity conditions.
- (2) The product is recommended to be used within one year after shipment. Check solderability in case of shelf life extension is needed.

### Cautions:

- a. Don't store products in a corrosive environment such as sulfide, chloride gas, or acid. It may cause oxidization of electrode, which easily be resulted in poor soldering.
- b. To store products on the shelf and avoid exposure to moisture.
- c. Don't expose products to excessive shock, vibration, direct sunlight and so on.

### Recommended soldering conditions

The lead-free termination MLCCs are not only to be used on SMT against lead-free solder paste, but also suitable against lead-containing solder paste. If the optimized solder joint is requested, increasing soldering time, temperature and concentration of  $N_2$  within oven are recommended.

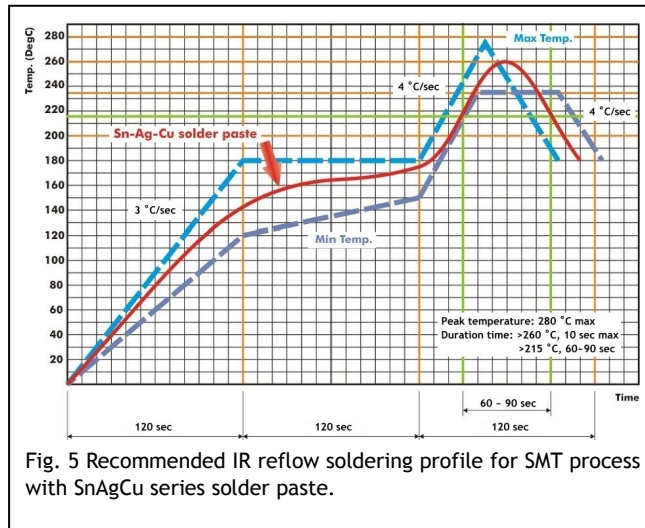


Fig. 5 Recommended IR reflow soldering profile for SMT process with SnAgCu series solder paste.

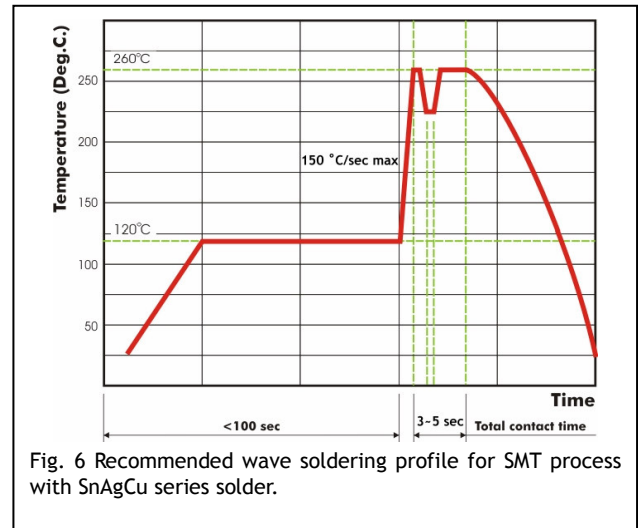


Fig. 6 Recommended wave soldering profile for SMT process with SnAgCu series solder.