

# APPROVAL SHEET

## MULTILAYER CERAMIC CAPACITORS

General Purpose Series (4V to 100V)

0201 to 1812 Sizes

NP0, X7R, Y5V, X6S, X7S & X5R Dielectrics

Halogen Free & RoHS Compliance

\*Contents in this sheet are subject to change without prior notice.

**Multilayer Ceramic Capacitors**

**1. DESCRIPTION**

MLCC consists of a conducting material and electrodes. To manufacture a chip-type SMT and achieve miniaturization, high density and high efficiency, ceramic condensers are used.

WTC's MLCC is made by NP0, X7R, X6S, X5R and Y5V dielectric material and which provides product with high electrical precision, stability and reliability.

**2. FEATURES**

- a. A wide selection of sizes is available (0201 to 1812).
- b. High capacitance in given case size.
- c. Capacitor with lead-free termination (pure Tin).

**3. APPLICATIONS**

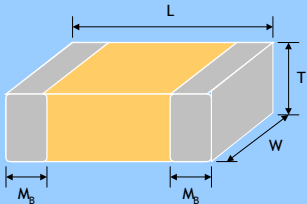
- a. For general digital circuit.
- b. For power supply bypass capacitors.
- c. For consumer electronics.
- d. For telecommunication.

**4. HOW TO ORDER**

| <u>1206</u>   | <u>B</u>  | <u>104</u>  | <u>K</u>  | <u>500</u>  | <u>C</u>           | <u>I</u>                                    |
|---|---|---|---|---|--------------------|---|
| <u>Size</u>   | <u>Dielectric</u>   | <u>Capacitance</u>  | <u>Tolerance</u>  | <u>Rated voltage</u>  | <u>Termination</u> | <u>Packaging style</u>                      |
| Inch (mm)<br><b>0201</b> (0603)<br><b>0402</b> (1005)<br><b>0603</b> (1608)<br><b>0805</b> (2012)<br><b>1206</b> (3216)<br><b>1210</b> (3225)<br><b>1812</b> (4532) | <b>N</b> =NP0<br>(COG)<br><b>B</b> =X7R<br><b>F</b> =Y5V<br><b>X</b> =X5R<br><b>S</b> =X6S<br><b>A</b> =X7S | Two significant digits followed by no. of zeros. And R is in place of decimal point.<br><br>eg.:<br>0R5=0.5pF<br>1R0=1.0pF<br>104=10x10 <sup>4</sup> =100nF | <b>A</b> =±0.05pF<br><b>B</b> =±0.1pF<br><b>C</b> =±0.25pF<br><b>D</b> =±0.5pF<br><b>F</b> =±1%<br><b>G</b> =±2%<br><b>J</b> =±5%<br><b>K</b> =±10%<br><b>M</b> =±20%<br><b>Z</b> =-20/+80% | Two significant digits followed by no. of zeros. And R is in place of decimal point.<br><br><b>4R0</b> =4 VDC<br><b>6R3</b> =6.3 VDC<br><b>100</b> =10 VDC<br><b>160</b> =16 VDC<br><b>250</b> =25 VDC<br><b>500</b> =50 VDC<br><b>101</b> =100 VDC | <b>C</b> =Cu/Ni/Sn | <b>T</b> =7" reeled<br><b>G</b> =13" reeled |

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**5. EXTERNAL DIMENSIONS**

| Outline   | Size Inch (mm) | L (mm)                 | W (mm)                  | T (mm)/Symbol           | Soldering Method *      | M <sub>B</sub> (mm)    |                        |           |
|---|----------------|------------------------|-------------------------|-------------------------|-------------------------|------------------------|------------------------|-----------|
|  <p>Fig. 1 The outline of MLCC</p> | 01R5 (0402)    | 0.4±0.02               | 0.2±0.02                | 0.2±0.02                | V                       | R                      | 0.10±0.03              |           |
|   | 0201 (0603)    | 0.6±0.03               | 0.3±0.03                | 0.3±0.03                | L                       | R                      | 0.15±0.05              |           |
|   |                | 0.6±0.05 <sup>#2</sup> | 0.3±0.05 <sup>#2</sup>  | 0.3±0.05 <sup>#2</sup>  |                         |                        | 0.15±0.1/-0.05         |           |
|   |                | 0.6±0.09 <sup>#3</sup> | 0.3±0.09 <sup>#3</sup>  | 0.3±0.09 <sup>#3</sup>  |                         |                        |                        |           |
|   | 0402 (1005)    | 1.00±0.05              | 0.50±0.05               | 0.50±0.05               | N                       | R                      | 0.25                   |           |
|   |                | 1.00±0.20              | 0.50±0.20               | 0.50±0.02/-0.05         | Q                       | R                      | +0.05/-0.10            |           |
|   | 0603 (1608)    | 1.60±0.10              | 0.80±0.10               | 0.80±0.07               | S                       | R / W                  | 0.40±0.15              |           |
|   |                | 1.60±0.15/-0.10        | 0.80±0.15/-0.10         | 0.50±0.10               | H                       | R / W                  |                        |           |
|   |                |                        |                         | 0.80±0.15/-0.10         | X                       | R / W                  |                        |           |
|   | 0805 (2012)    | 2.00±0.15              | 1.25±0.10               | 0.8±0.20 <sup>#1</sup>  | 0.8±0.20 <sup>#1</sup>  | 0.8±0.20 <sup>#1</sup> | 0.8±0.20 <sup>#1</sup> | 0.50±0.20 |
|   |                |                        |                         | 0.50±0.10               | H                       | R / W                  |                        |           |
|   |                |                        |                         | 0.60±0.10               | A                       | R / W                  |                        |           |
|   |                |                        |                         | 0.80±0.10               | B                       | R / W                  |                        |           |
|   |                |                        |                         | 1.25±0.10               | D                       | R                      |                        |           |
|   | 1206 (3216)    | 3.20±0.15              | 1.60±0.15               | 2.00±0.20               | 1.25±0.20               | 0.85±0.10              | T                      | R / W     |
|   |                |                        |                         | 1.25±0.20               | I                       | R                      |                        |           |
|   |                |                        |                         | 0.80±0.10               | B                       | R / W                  |                        |           |
|   |                |                        |                         | 0.95±0.10               | C                       | R                      |                        |           |
|   |                |                        |                         | 1.25±0.10               | D                       | R                      |                        |           |
|   | 1210 (3225)    | 3.20±0.20              | 1.60±0.20               | 3.20±0.30               | 2.50±0.20               | 1.15±0.15              | J                      | R         |
| 1.60±0.20   |                |                        |                         | G                       | R                       |                        |                        |           |
| 0.85±0.10   |                |                        |                         | T                       | R / W                   |                        |                        |           |
| 0.95±0.10   |                |                        |                         | C                       | R                       |                        |                        |           |
| 0.85±0.10   |                |                        |                         | T                       | R                       |                        |                        |           |
| 1808 (4520)   | 4.50±0.40      | 2.03±0.25              | 3.20±0.30               | 2.50±0.30               | 1.25±0.10               | D                      | R                      |           |
|   |                |                        | 2.50±0.30               | 2.00±0.20               | 1.60±0.20               | G                      | R                      |           |
|   |                |                        | 2.00±0.20               | K                       | R                       |                        |                        |           |
|   |                |                        | 2.50±0.30               | M                       | R                       |                        |                        |           |
|   |                |                        | 2.50±0.50 <sup>#4</sup> | 2.50±0.50 <sup>#4</sup> | 2.50±0.50 <sup>#4</sup> | M                      | R                      |           |
| 1812 (4532)   | 4.50±0.40      | 3.20±0.30              | 3.20±0.40               | 2.50±0.30               | 1.25±0.10               | D                      | R                      |           |
|   |                |                        | 2.50±0.30               | 2.00±0.20               | 1.60±0.20               | G                      | R                      |           |
|   |                |                        | 2.00±0.20               | K                       | R                       |                        |                        |           |
|   |                |                        | 2.50±0.30               | M                       | R                       |                        |                        |           |
|   |                |                        | 2.80±0.30               | U                       | R                       |                        |                        |           |

\* R = Reflow soldering process ; W = Wave soldering process.

\*\* For 1808/1812/1825\_200V~4000V and safety certificated products.

\*\*\* For 1206\_≥1000V, 1808/1812\_200V~4000V and safety certificated products.

#1: For 0603/Cap ≥ 10μF or 0603(≤ 6.3V)/Cap ≥ 4.7μF For 0603(>10V)/Cap > 1μF products.

#2: For 0201/ 0.1uF < Cap < 0.68uF products, Excluding 0201X334-474(≤ 6.3V) & 0201X224(≤ 10V).

#3: For 0201/Cap ≥ 0.68μF products.

#4: For 1210(100V)/Cap > 1μF or 1210(250V)/Cap > 0.47μF or 1210(400V~630V)/Cap > 0.22μF.

#5: For 1206(100V)/Cap ≥ 1.2μF products.

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**6. GENERAL ELECTRICAL DATA**

|                                   |   |                                   |                           |                       |                       |                       |
|-----------------------------------|---|-----------------------------------|---------------------------|-----------------------|-----------------------|-----------------------|
| <b>Dielectric</b>                 | NP0   | X7R                               | Y5V                       | X5R                   | X6S                   | X7S                   |
| <b>Size</b>                       | 0201, 0402, 0603, 0805, 1206, 1210, 1812  |                                   |                           |                       |                       |                       |
| <b>Capacitance range*</b>         | 0.1pF to 0.1μF  | 100pF to 47μF                     | 0.01μF to 100μF           | 100pF to 220μF        | 0.1μF to 100μF        | 0.1μF to 100μF        |
| <b>Capacitance tolerance**</b>    | Cap≤5pF <sup>#1</sup> :<br>A (±0.05pF), B (±0.1pF),<br>C (±0.25pF)<br>5pF<Cap<10pF:<br>C (±0.25pF), D (±0.5pF)<br>Cap≥10pF:<br>F (±1%), G (±2%),<br>J (±5%), K (±10%) | J (±5%),<br>K (±10%),<br>M (±20%) | M (±20%),<br>Z (-20/+80%) | K (±10%),<br>M (±20%) | K (±10%),<br>M (±20%) | K (±10%),<br>M (±20%) |
| <b>Rated voltage (WVDC)</b>       | 10V, 16V, 25V, 50V, 100V  | 6.3V, 10V, 16V, 25V, 50V, 100V    |                           |                       |                       |                       |
| <b>Operating temperature</b>      | -55 to +125°C   |                                   | -25 to +85°C              | -55 to +85°C          | -55 to +105°C         | -55 to +125°C         |
| <b>Capacitance characteristic</b> | ±30ppm  | ±15%                              | +30/-80%                  | ±15%                  | ±22%                  | ±22%                  |
| <b>Termination</b>                | Ni/Sn (lead-free termination)   |                                   |                           |                       |                       |                       |

#1: NP0, 0.1pF product only provide B tolerance; 0603N0R3/0R4 provide B&C tolerance.

\* Measured at the condition of 30~70% related humidity.

NP0: Apply 1.0±0.2Vrms, 1.0MHz±10% for Cap≤1000pF and 1.0±0.2Vrms, 1.0kHz±10% for Cap>1000pF, 25°C at ambient temperature

X7R/X6S/X5R/X7S: Please refer to page 13 "Reliability test conditions and requirements" for detail.

Y5V: Apply 1.0±0.2Vrms, 1.0kHz±10%, at 20°C ambient temperature.

\*\* Preconditioning for Class II MLCC: Perform a heat treatment at 150±10°C for 1 hour and then leave in ambient condition for 24±2 hours before measurement.



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**7. CAPACITANCE RANGE**

**7-1. NPO Dielectric 0201, 0402, 0603, 0805 Sizes**

| DIELECTRIC    | NPO                 |      |    |    |    |     |      |    |    |    |     |      |    |    |    |     |      |    |    |    |     |
|---------------|---------------------|------|----|----|----|-----|------|----|----|----|-----|------|----|----|----|-----|------|----|----|----|-----|
|               | SIZE                | 0201 |    |    |    |     | 0402 |    |    |    |     | 0603 |    |    |    |     | 0805 |    |    |    |     |
|               | RATED VOLTAGE (VDC) | 10   | 16 | 25 | 50 | 100 | 10   | 16 | 25 | 50 | 100 | 10   | 16 | 25 | 50 | 100 | 10   | 16 | 25 | 50 | 100 |
| 0.1pF (0R1)   | L                   | L    | L  | L  | L  | N   | N    | N  | N  |    |     |      |    |    |    |     |      |    |    |    |     |
| 0.2pF (0R2)   | L                   | L    | L  | L  | L  | N   | N    | N  | N  |    |     |      |    |    |    |     |      |    |    |    |     |
| 0.3pF (0R3)   | L                   | L    | L  | L  | L  | N   | N    | N  | N  |    | S   | S    | S  | S  |    |     |      |    |    |    |     |
| 0.4pF (0R4)   | L                   | L    | L  | L  | L  | N   | N    | N  | N  |    | S   | S    | S  | S  |    |     |      |    |    |    |     |
| 0.5pF (0R5)   | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 0.6pF (0R6)   | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 0.7pF (0R7)   | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 0.8pF (0R8)   | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 0.9pF (0R9)   | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 1.0pF (1R0)   | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 1.2pF (1R2)   | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 1.5pF (1R5)   | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 1.8pF (1R8)   | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 2.0pF (2R0)   | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 2.2pF (2R2)   | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 2.7pF (2R7)   | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 3.0pF (3R0)   | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 3.3pF (3R3)   | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 3.9pF (3R9)   | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 4.0pF (4R0)   | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 4.7pF (4R7)   | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 5.0pF (5R0)   | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 5.6pF (5R6)   | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 6.0pF (6R0)   | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 6.8pF (6R8)   | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 7.0pF (7R0)   | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 8.0pF (8R0)   | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 8.2pF (8R2)   | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 9.0pF (9R0)   | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 10pF (100)    | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 12pF (120)    | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 15pF (150)    | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 18pF (180)    | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 22pF (220)    | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 27pF (270)    | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 33pF (330)    | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 39pF (390)    | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 47pF (470)    | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 56pF (560)    | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 68pF (680)    | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 82pF (820)    | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 100pF (101)   | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 120pF (121)   | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 150pF (151)   | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 180pF (181)   | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 220pF (221)   | L                   | L    | L  | L  | L  | N   | N    | N  | N  | N  | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 270pF (271)   |                     |      | L  |    |    | N   | N    | N  | N  |    | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 330pF (331)   |                     |      | L  |    |    | N   | N    | N  | N  |    | S   | S    | S  | S  | S  | A   | A    | A  | A  | A  |     |
| 390pF (391)   |                     |      | L  |    |    | N   | N    | N  | N  |    | S   | S    | S  | S  | S  | B   | B    | B  | B  | B  |     |
| 470pF (471)   |                     |      | L  |    |    | N   | N    | N  | N  |    | S   | S    | S  | S  | S  | B   | B    | B  | B  | B  |     |
| 560pF (561)   |                     |      | L  |    |    | N   | N    | N  | N  |    | S   | S    | S  | S  | S  | B   | B    | B  | B  | B  |     |
| 680pF (681)   |                     |      |    |    |    | N   | N    | N  | N  |    | S   | S    | S  | S  | S  | B   | B    | B  | B  | B  |     |
| 820pF (821)   |                     |      |    |    |    | N   | N    | N  | N  |    | S   | S    | S  | S  | S  | B   | B    | B  | B  | B  |     |
| 1,000pF (102) |                     |      |    |    |    | N   | N    | N  | N  |    | S   | S    | S  | S  | S  | B   | B    | B  | B  | B  |     |
| 1,200pF (122) |                     |      |    |    |    |     |      |    |    |    | X   | X    | X  | X  | X  | B   | B    | B  | B  | B  |     |
| 1,500pF (152) |                     |      |    |    |    |     |      |    |    |    | X   | X    | X  | X  | X  | B   | B    | B  | B  | B  |     |
| 1,800pF (182) |                     |      |    |    |    |     |      |    |    |    | X   | X    | X  | X  | X  | B   | B    | B  | B  | B  |     |
| 2,200pF (222) |                     |      |    |    |    |     |      |    |    |    | X   | X    | X  | X  |    | B   | B    | B  | B  | B  |     |
| 2,700pF (272) |                     |      |    |    |    |     |      |    |    |    | X   | X    | X  | X  |    | D   | D    | D  | D  | D  |     |
| 3,300pF (332) |                     |      |    |    |    |     |      |    |    |    | X   | X    | X  | X  |    | D   | D    | D  | D  | D  |     |
| 3,900pF (392) |                     |      |    |    |    |     |      |    |    |    | X   | X    | X  | X  |    | D   | D    | D  | D  | D  |     |
| 4,700pF (472) |                     |      |    |    |    |     |      |    |    |    | X   | X    | X  | X  |    | D   | D    | D  | D  | D  |     |
| 5,600pF (562) |                     |      |    |    |    |     |      |    |    |    | X   | X    | X  | X  |    | D   | D    | D  | D  | D  |     |
| 6,800pF (682) |                     |      |    |    |    |     |      |    |    |    | X   | X    | X  | X  |    | D   | D    | D  | D  | D  |     |
| 8,200pF (822) |                     |      |    |    |    |     |      |    |    |    | X   | X    | X  | X  |    | D   | D    | D  | D  | D  |     |
| 0.010uF (103) |                     |      |    |    |    |     |      |    |    |    | X   | X    | X  | X  |    | D   | D    | D  | D  | D  |     |
| 0.012uF (123) |                     |      |    |    |    |     |      |    |    |    |     |      |    |    |    | D   | D    | D  | D  |    |     |
| 0.015uF (153) |                     |      |    |    |    |     |      |    |    |    |     |      |    |    |    | D   | D    | D  | D  |    |     |
| 0.018uF (183) |                     |      |    |    |    |     |      |    |    |    |     |      |    |    |    | D   | D    | D  | D  |    |     |
| 0.022uF (223) |                     |      |    |    |    |     |      |    |    |    |     |      |    |    |    | D   | D    | D  | D  |    |     |

1. The letter in cell is expressed the symbol of product thickness.
2. The letter in cell with " \* " mark is expressed capacitance tolerance "J" (±5%) only.
3. For more information about products with special capacitance or other data, please contact WTC local representative.

Multilayer Ceramic Capacitors

Approval Sheet

7-1. NP0 Dielectric 1206, 1210, 1812 Sizes

| DIELECTRIC          |   | NP0  |    |    |    |     |      |    |    |    |     |      |    |    |     |
|---------------------|---|------|----|----|----|-----|------|----|----|----|-----|------|----|----|-----|
| SIZE                |   | 1206 |    |    |    |     | 1210 |    |    |    |     | 1812 |    |    |     |
| RATED VOLTAGE (VDC) |   | 10   | 16 | 25 | 50 | 100 | 10   | 16 | 25 | 50 | 100 | 16   | 25 | 50 | 100 |
| 1.0pF (1R0)         |   |      |    |    |    |     |      |    |    |    |     |      |    |    |     |
| 1.2pF (1R2)         | B | B    | B  | B  | B  |     |      |    |    |    |     |      |    |    |     |
| 1.5pF (1R5)         | B | B    | B  | B  | B  |     |      |    |    |    |     |      |    |    |     |
| 1.8pF (1R8)         | B | B    | B  | B  | B  |     |      |    |    |    |     |      |    |    |     |
| 2.2pF (2R2)         | B | B    | B  | B  | B  |     |      |    |    |    |     |      |    |    |     |
| 2.7pF (2R7)         | B | B    | B  | B  | B  |     |      |    |    |    |     |      |    |    |     |
| 3.3pF (3R3)         | B | B    | B  | B  | B  |     |      |    |    |    |     |      |    |    |     |
| 3.9pF (3R9)         | B | B    | B  | B  | B  |     |      |    |    |    |     |      |    |    |     |
| 4.7pF (4R7)         | B | B    | B  | B  | B  |     |      |    |    |    |     |      |    |    |     |
| 5.6pF (5R6)         | B | B    | B  | B  | B  |     |      |    |    |    |     |      |    |    |     |
| 6.8pF (6R8)         | B | B    | B  | B  | B  |     |      |    |    |    |     |      |    |    |     |
| 8.2pF (8R2)         | B | B    | B  | B  | B  |     |      |    |    |    |     |      |    |    |     |
| 10pF (100)          | B | B    | B  | B  | B  | C   | C    | C  | C  | C  | D   | D    | D  | D  |     |
| 12pF (120)          | B | B    | B  | B  | B  | C   | C    | C  | C  | C  | D   | D    | D  | D  |     |
| 15pF (150)          | B | B    | B  | B  | B  | C   | C    | C  | C  | C  | D   | D    | D  | D  |     |
| 18pF (180)          | B | B    | B  | B  | B  | C   | C    | C  | C  | C  | D   | D    | D  | D  |     |
| 22pF (220)          | B | B    | B  | B  | B  | C   | C    | C  | C  | C  | D   | D    | D  | D  |     |
| 27pF (270)          | B | B    | B  | B  | B  | C   | C    | C  | C  | C  | D   | D    | D  | D  |     |
| 33pF (330)          | B | B    | B  | B  | B  | C   | C    | C  | C  | C  | D   | D    | D  | D  |     |
| 39pF (390)          | B | B    | B  | B  | B  | C   | C    | C  | C  | C  | D   | D    | D  | D  |     |
| 47pF (470)          | B | B    | B  | B  | B  | C   | C    | C  | C  | C  | D   | D    | D  | D  |     |
| 56pF (560)          | B | B    | B  | B  | B  | C   | C    | C  | C  | C  | D   | D    | D  | D  |     |
| 68pF (680)          | B | B    | B  | B  | B  | C   | C    | C  | C  | C  | D   | D    | D  | D  |     |
| 82pF (820)          | B | B    | B  | B  | B  | C   | C    | C  | C  | C  | D   | D    | D  | D  |     |
| 100pF (101)         | B | B    | B  | B  | B  | C   | C    | C  | C  | C  | D   | D    | D  | D  |     |
| 120pF (121)         | B | B    | B  | B  | B  | C   | C    | C  | C  | C  | D   | D    | D  | D  |     |
| 150pF (151)         | B | B    | B  | B  | B  | C   | C    | C  | C  | C  | D   | D    | D  | D  |     |
| 180pF (181)         | B | B    | B  | B  | B  | C   | C    | C  | C  | C  | D   | D    | D  | D  |     |
| 220pF (221)         | B | B    | B  | B  | B  | C   | C    | C  | C  | C  | D   | D    | D  | D  |     |
| 270pF (271)         | B | B    | B  | B  | B  | C   | C    | C  | C  | C  | D   | D    | D  | D  |     |
| 330pF (331)         | B | B    | B  | B  | B  | C   | C    | C  | C  | C  | D   | D    | D  | D  |     |
| 390pF (391)         | B | B    | B  | B  | B  | C   | C    | C  | C  | C  | D   | D    | D  | D  |     |
| 470pF (471)         | B | B    | B  | B  | B  | C   | C    | C  | C  | C  | D   | D    | D  | D  |     |
| 560pF (561)         | B | B    | B  | B  | B  | C   | C    | C  | C  | C  | D   | D    | D  | D  |     |
| 680pF (681)         | B | B    | B  | B  | B  | C   | C    | C  | C  | C  | D   | D    | D  | D  |     |
| 820pF (821)         | B | B    | B  | B  | B  | C   | C    | C  | C  | C  | D   | D    | D  | D  |     |
| 1,000pF (102)       | B | B    | B  | B  | B  | C   | C    | C  | C  | C  | D   | D    | D  | D  |     |
| 1,200pF (122)       | B | B    | B  | B  | B  | C   | C    | C  | C  | C  | D   | D    | D  | D  |     |
| 1,500pF (152)       | B | B    | B  | B  | B  | C   | C    | C  | C  | C  | D   | D    | D  | D  |     |
| 1,800pF (182)       | B | B    | B  | B  | B  | C   | C    | C  | C  | C  | D   | D    | D  | D  |     |
| 2,200pF (222)       | B | B    | B  | B  | B  | C   | C    | C  | C  | C  | D   | D    | D  | D  |     |
| 2,700pF (272)       | B | B    | B  | B  | B  | C   | C    | C  | C  | C  | D   | D    | D  | D  |     |
| 3,300pF (332)       | B | B    | B  | B  | B  | C   | C    | C  | C  | C  | D   | D    | D  | D  |     |
| 3,900pF (392)       | B | B    | B  | B  | B  | C   | C    | C  | C  | C  | D   | D    | D  | D  |     |
| 4,700pF (472)       | B | B    | B  | B  | B  | C   | C    | C  | C  | C  | D   | D    | D  | D  |     |
| 5,600pF (562)       | B | B    | B  | B  | B  | C   | C    | C  | C  | C  | D   | D    | D  | D  |     |
| 6,800pF (682)       | C | C    | C  | C  | C  | C   | C    | C  | C  | C  | D   | D    | D  | D  |     |
| 8,200pF (822)       | D | D    | D  | D  | D  | C   | C    | C  | C  | C  | D   | D    | D  | D  |     |
| 0.010μF (103)       | D | D    | D  | D  | D  | C   | C    | C  | C  | C  | D   | D    | D  | D  |     |
| 0.012μF (123)       | P | P    | P  | P  | P  | D   | D    | D  | D  | D  | D   | D    | D  | D  |     |
| 0.015μF (153)       | P | P    | P  | P  | P  | D   | D    | D  | D  | D  | D   | D    | D  | D  |     |
| 0.018μF (183)       | P | P    | P  | P  | P  | K   | K    | K  | K  | K  | D   | D    | D  | D  |     |
| 0.022μF (223)       | P | P    | P  | P  | P  | K   | K    | K  | K  | K  | D   | D    | D  | D  |     |
| 0.027μF (273)       | P | P    | P  | P  | P  | K   | K    | K  | K  | K  | D   | D    | D  | D  |     |
| 0.033μF (333)       | P | P    | P  | P  | T  | K   | K    | K  | K  | K  | D   | D    | D  | D  |     |
| 0.039μF (393)       | P | P    | P  | P  |    | K   | K    | K  | K  | K  | M   | M    | M  | M  |     |
| 0.047μF (473)       | P | P    | P  | P  |    | K   | K    | K  | K  | K  | M   | M    | M  | M  |     |
| 0.056μF (563)       | P | P    | P  | P  |    |     |      |    |    |    | M   | M    | M  | M  |     |
| 0.068μF (683)       | P | P    | P  | P  |    |     |      |    |    |    | M   | M    | M  | M  |     |
| 0.082μF (823)       | P | P    | P  | P  |    |     |      |    |    |    | M   | M    | M  | M  |     |
| 0.1μF (104)         | P | P    | P  | P  |    |     |      |    |    |    | M   | M    | M  | M  |     |

1. The letter in cell is expressed the symbol of product thickness.
2. The letter in cell with “\*” mark is expressed capacitance tolerance “J” (±5%) only.
3. For more information about products with special capacitance or other data, please contact WTC local representative.

Multilayer Ceramic Capacitors

Approval Sheet

7-2. X7R Dielectric 0201, 0402, 0603, 0805 Sizes

| DIELECTRIC          |               | X7R  |    |    |    |    |      |    |    |    |    |     |      |    |    |    |    |     |      |    |    |    |    |     |     |    |    |    |    |     |
|---------------------|---------------|------|----|----|----|----|------|----|----|----|----|-----|------|----|----|----|----|-----|------|----|----|----|----|-----|-----|----|----|----|----|-----|
| SIZE                |               | 0201 |    |    |    |    | 0402 |    |    |    |    |     | 0603 |    |    |    |    |     | 0805 |    |    |    |    |     |     |    |    |    |    |     |
| RATED VOLTAGE (VDC) |               | 6.3  | 10 | 16 | 25 | 50 | 6.3  | 10 | 16 | 25 | 50 | 100 | 6.3  | 10 | 16 | 25 | 50 | 100 | 6.3  | 10 | 16 | 25 | 50 | 100 | 6.3 | 10 | 16 | 25 | 50 | 100 |
| Capacitance         | 100pF (101)   |      |    | L  | L  | L  |      | N  | N  | N  | N  | N   |      | S  | S  | S  | S  | S   |      | B  | B  | B  | B  | B   |     |    |    |    |    |     |
|                     | 120pF (121)   |      |    | L  | L  | L  |      | N  | N  | N  | N  | N   |      | S  | S  | S  | S  | S   |      | B  | B  | B  | B  | B   |     |    |    |    |    |     |
|                     | 150pF (151)   |      |    | L  | L  | L  |      | N  | N  | N  | N  | N   |      | S  | S  | S  | S  | S   |      | B  | B  | B  | B  | B   |     |    |    |    |    |     |
|                     | 180pF (181)   |      |    | L  | L  | L  |      | N  | N  | N  | N  | N   |      | S  | S  | S  | S  | S   |      | B  | B  | B  | B  | B   |     |    |    |    |    |     |
|                     | 220pF (221)   |      |    | L  | L  | L  |      | N  | N  | N  | N  | N   |      | S  | S  | S  | S  | S   |      | B  | B  | B  | B  | B   |     |    |    |    |    |     |
|                     | 270pF (271)   |      |    | L  | L  | L  |      | N  | N  | N  | N  | N   |      | S  | S  | S  | S  | S   |      | B  | B  | B  | B  | B   |     |    |    |    |    |     |
|                     | 330pF (331)   |      |    | L  | L  | L  |      | N  | N  | N  | N  | N   |      | S  | S  | S  | S  | S   |      | B  | B  | B  | B  | B   |     |    |    |    |    |     |
|                     | 390pF (391)   |      |    | L  | L  | L  |      | N  | N  | N  | N  | N   |      | S  | S  | S  | S  | S   |      | B  | B  | B  | B  | B   |     |    |    |    |    |     |
|                     | 470pF (471)   |      |    | L  | L  | L  |      | N  | N  | N  | N  | N   |      | S  | S  | S  | S  | S   |      | B  | B  | B  | B  | B   |     |    |    |    |    |     |
|                     | 560pF (561)   |      |    | L  | L  | L  |      | N  | N  | N  | N  | N   |      | S  | S  | S  | S  | S   |      | B  | B  | B  | B  | B   |     |    |    |    |    |     |
|                     | 680pF (681)   |      |    | L  | L  | L  |      | N  | N  | N  | N  | N   |      | S  | S  | S  | S  | S   |      | B  | B  | B  | B  | B   |     |    |    |    |    |     |
|                     | 820pF (821)   |      |    | L  | L  | L  |      | N  | N  | N  | N  | N   |      | S  | S  | S  | S  | S   |      | B  | B  | B  | B  | B   |     |    |    |    |    |     |
|                     | 1,000pF (102) | L    | L  | L  | L  | L  |      | N  | N  | N  | N  | N   |      | S  | S  | S  | S  | S   |      | B  | B  | B  | B  | B   |     |    |    |    |    |     |
|                     | 1,200pF (122) | L    | L  | L  | L  |    |      | N  | N  | N  | N  | N   |      | S  | S  | S  | S  | S   |      | B  | B  | B  | B  | B   |     |    |    |    |    |     |
|                     | 1,500pF (152) | L    | L  | L  | L  |    |      | N  | N  | N  | N  | N   |      | S  | S  | S  | S  | S   |      | B  | B  | B  | B  | B   |     |    |    |    |    |     |
|                     | 1,800pF (182) | L    | L  | L  | L  |    |      | N  | N  | N  | N  | N   |      | S  | S  | S  | S  | S   |      | B  | B  | B  | B  | B   |     |    |    |    |    |     |
|                     | 2,200pF (222) | L    | L  | L  | L  |    |      | N  | N  | N  | N  | N   |      | S  | S  | S  | S  | S   |      | B  | B  | B  | B  | B   |     |    |    |    |    |     |
|                     | 2,700pF (272) | L    | L  | L  | L  |    |      | N  | N  | N  | N  | N   |      | S  | S  | S  | S  | S   |      | B  | B  | B  | B  | B   |     |    |    |    |    |     |
|                     | 3,300pF (332) | L    | L  | L  | L  |    |      | N  | N  | N  | N  | N   |      | S  | S  | S  | S  | S   |      | B  | B  | B  | B  | B   |     |    |    |    |    |     |
|                     | 3,900pF (392) | L    | L  | L  | L  |    |      | N  | N  | N  | N  | N   |      | S  | S  | S  | S  | S   |      | B  | B  | B  | B  | B   |     |    |    |    |    |     |
|                     | 4,700pF (472) | L    | L  | L  | L  |    |      | N  | N  | N  | N  | N   |      | S  | S  | S  | S  | S   |      | B  | B  | B  | B  | B   |     |    |    |    |    |     |
|                     | 5,600pF (562) | L    | L  | L  | L  |    |      | N  | N  | N  | N  | N   |      | S  | S  | S  | S  | S   |      | B  | B  | B  | B  | B   |     |    |    |    |    |     |
|                     | 6,800pF (682) | L    | L  | L  |    |    |      | N  | N  | N  | N  | N   |      | S  | S  | S  | S  | S   |      | B  | B  | B  | B  | B   |     |    |    |    |    |     |
|                     | 8,200pF (822) | L    | L  | L  |    |    |      | N  | N  | N  | N  | N   |      | S  | S  | S  | S  | S   |      | B  | B  | B  | B  | B   |     |    |    |    |    |     |
|                     | 0.010μF (103) | L    | L  | L  | L  |    |      | N  | N  | N  | N  | N   |      | S  | S  | S  | S  | S   |      | B  | B  | B  | B  | B   |     |    |    |    |    |     |
|                     | 0.012μF (123) |      |    |    |    |    |      | N  | N  | N  | N  | N   |      | S  | S  | S  | S  | X   |      | B  | B  | B  | B  | B   |     |    |    |    |    |     |
|                     | 0.015μF (153) |      |    |    |    |    |      | N  | N  | N  | N  | N   |      | S  | S  | S  | S  | X   |      | B  | B  | B  | B  | B   |     |    |    |    |    |     |
|                     | 0.018μF (183) |      |    |    |    |    |      | N  | N  | N  | N  | N   |      | S  | S  | S  | S  | X   |      | B  | B  | B  | B  | B   |     |    |    |    |    |     |
|                     | 0.022μF (223) |      | L  | L  |    |    |      | N  | N  | N  | N  | N   |      | S  | S  | S  | S  | X   |      | B  | B  | B  | B  | B   |     |    |    |    |    |     |
|                     | 0.027μF (273) |      |    |    |    |    |      | N  | N  | N  | N  | N   |      | S  | S  | S  | S  | X   |      | B  | B  | B  | B  | B   | D   |    |    |    |    |     |
|                     | 0.033μF (333) |      |    |    |    |    |      | N  | N  | N  | N  | N   |      | S  | S  | S  | S  | X   | X    |    | B  | B  | B  | B   | B   | D  |    |    |    |     |
|                     | 0.039μF (393) |      |    |    |    |    |      | N  | N  | N  | N  | N   |      | S  | S  | S  | S  | X   | X    |    | B  | B  | B  | B   | B   | D  |    |    |    |     |
| 0.047μF (473)       |               |      |    |    |    |    | N    | N  | N  | N  | N  |     | S    | S  | S  | S  | X  | X   |      | B  | B  | B  | B  | B   | D   |    |    |    |    |     |
| 0.056μF (563)       |               |      |    |    |    |    | N    | N  | N  | N  | E  |     | S    | S  | S  | S  | X  | X   |      | B  | B  | B  | B  | B   | D   |    |    |    |    |     |
| 0.068μF (683)       |               |      |    |    |    |    | N    | N  | N  | N  | E  |     | S    | S  | S  | S  | X  | X   |      | B  | B  | B  | B  | B   | D   |    |    |    |    |     |
| 0.082μF (823)       |               |      |    |    |    |    | N    | N  | N  | N  | E  |     | S    | S  | S  | S  | X  | X   |      | B  | B  | B  | B  | B   | D   |    |    |    |    |     |
| 0.10μF (104)        |               |      |    |    |    |    | N    | N  | N  | N  | E  |     | S    | S  | S  | S  | X  | X   |      | B  | B  | B  | B  | B   | D   |    |    |    |    |     |
| 0.12μF (124)        |               |      |    |    |    |    |      |    |    |    |    |     | S    | S  | S  | X  |    |     | B    | B  | B  | B  | B  | I   |     |    |    |    |    |     |
| 0.15μF (154)        |               |      |    |    |    |    |      |    |    |    |    |     | S    | S  | S  | X  | X  |     | D    | D  | D  | D  | D  | I   |     |    |    |    |    |     |
| 0.18μF (184)        |               |      |    |    |    |    |      |    |    |    |    |     | S    | S  | S  | X  |    |     | D    | D  | D  | D  | D  | I   |     |    |    |    |    |     |
| 0.22μF (224)        |               |      |    |    |    |    | N    | N  | N  | N  |    |     | S    | S  | S  | X  | X  |     | D    | D  | D  | D  | D  | I   |     |    |    |    |    |     |
| 0.27μF (274)        |               |      |    |    |    |    |      |    |    |    |    |     | X    | X  | X  | X  |    |     | D    | D  | D  | D  | I  | I   |     |    |    |    |    |     |
| 0.33μF (334)        |               |      |    |    |    |    |      |    |    |    |    |     | X    | X  | X  | X  | X  |     | D    | D  | D  | D  | I  | I   |     |    |    |    |    |     |
| 0.39μF (394)        |               |      |    |    |    |    |      |    |    |    |    |     | X    | X  | X  | X  |    |     | D    | D  | D  | D  | I  | I   |     |    |    |    |    |     |
| 0.47μF (474)        |               |      |    |    |    |    | N    | N  |    |    |    |     | X    | X  | X  | X  | X  |     | D    | D  | D  | D  | I  | I   |     |    |    |    |    |     |
| 0.56μF (564)        |               |      |    |    |    |    |      |    |    |    |    |     | X    | X  | X  |    |    |     | D    | D  | D  |    |    |     |     |    |    |    |    |     |
| 0.68μF (684)        |               |      |    |    |    |    |      |    |    |    |    |     | X    | X  | X  |    |    |     | D    | D  | D  | I  |    |     |     |    |    |    |    |     |
| 0.82μF (824)        |               |      |    |    |    |    |      |    |    |    |    |     | X    | X  | X  |    |    |     | D    | D  | D  |    |    |     |     |    |    |    |    |     |
| 1.0μF (105)         |               |      |    |    |    |    | N    |    |    |    |    |     | X    | X  | X  | X  | X  |     | D    | D  | D  | I  |    |     |     |    |    |    |    |     |
| 1.5μF (155)         |               |      |    |    |    |    |      |    |    |    |    |     |      |    |    |    |    |     | I    | I  | I  | I  |    |     |     |    |    |    |    |     |
| 2.2μF (225)         |               |      |    |    |    |    |      |    |    |    |    |     | X    | X  | X  |    |    |     | I    | I  | I  | I  | I  |     |     |    |    |    |    |     |
| 3.3μF (335)         |               |      |    |    |    |    |      |    |    |    |    |     |      |    |    |    |    |     |      |    |    |    |    |     |     |    |    |    |    |     |
| 4.7μF (475)         |               |      |    |    |    |    |      |    |    |    |    |     | X    |    |    |    |    |     | I    | I  | I  | I  |    |     |     |    |    |    |    |     |
| 6.8μF (685)         |               |      |    |    |    |    |      |    |    |    |    |     |      |    |    |    |    |     |      |    |    |    |    |     |     |    |    |    |    |     |
| 10μF (106)          |               |      |    |    |    |    |      |    |    |    |    |     |      |    |    |    |    |     | I    | I  | I  | *  |    |     |     |    |    |    |    |     |
| 22μF (226)          |               |      |    |    |    |    |      |    |    |    |    |     |      |    |    |    |    |     |      |    |    |    |    |     |     |    |    |    |    |     |

1. The letter in cell is expressed the symbol of product thickness.
2. The letter in cell with “\*” mark is expressed product not in 10% (code “K”) tolerance.

Multilayer Ceramic Capacitors

7-2. X7R Dielectric 1206, 1210, 1812 Sizes

| DIELECTRIC          |               | X7R  |    |    |    |    |    |      |     |    |    |    |    |      |     |    |    |    |    |     |
|---------------------|---------------|------|----|----|----|----|----|------|-----|----|----|----|----|------|-----|----|----|----|----|-----|
| SIZE                |               | 1206 |    |    |    |    |    | 1210 |     |    |    |    |    | 1812 |     |    |    |    |    |     |
| RATED VOLTAGE (VDC) |               | 6.3  | 10 | 16 | 25 | 35 | 50 | 100  | 6.3 | 10 | 16 | 25 | 35 | 50   | 100 | 10 | 16 | 25 | 50 | 100 |
| Capacitance         | 100pF (101)   |      |    |    |    |    |    |      |     |    |    |    |    |      |     |    |    |    |    |     |
|                     | 120pF (121)   |      |    |    |    |    |    |      |     |    |    |    |    |      |     |    |    |    |    |     |
|                     | 150pF (151)   |      | B  | B  | B  |    | B  | B    |     |    |    |    |    |      |     |    |    |    |    |     |
|                     | 180pF (181)   |      | B  | B  | B  |    | B  | B    |     |    |    |    |    |      |     |    |    |    |    |     |
|                     | 220pF (221)   |      | B  | B  | B  |    | B  | B    |     |    |    |    |    |      |     |    |    |    |    |     |
|                     | 270pF (271)   |      | B  | B  | B  |    | B  | B    |     |    |    |    |    |      |     |    |    |    |    |     |
|                     | 330pF (331)   |      | B  | B  | B  |    | B  | B    |     |    |    |    |    |      |     |    |    |    |    |     |
|                     | 390pF (391)   |      | B  | B  | B  |    | B  | B    |     |    |    |    |    |      |     |    |    |    |    |     |
|                     | 470pF (471)   |      | B  | B  | B  |    | B  | B    |     |    |    |    |    |      |     |    |    |    |    |     |
|                     | 560pF (561)   |      | B  | B  | B  |    | B  | B    |     |    |    |    |    |      |     |    |    |    |    |     |
|                     | 680pF (681)   |      | B  | B  | B  |    | B  | B    |     |    |    |    |    |      |     |    |    |    |    |     |
|                     | 820pF (821)   |      | B  | B  | B  |    | B  | B    |     |    |    |    |    |      |     |    |    |    |    |     |
|                     | 1,000pF (102) |      | B  | B  | B  |    | B  | B    |     | C  | C  | C  |    | C    | C   | D  | D  | D  | D  | D   |
|                     | 1,200pF (122) |      | B  | B  | B  |    | B  | B    |     | C  | C  | C  |    | C    | C   | D  | D  | D  | D  | D   |
|                     | 1,500pF (152) |      | B  | B  | B  |    | B  | B    |     | C  | C  | C  |    | C    | C   | D  | D  | D  | D  | D   |
|                     | 1,800pF (182) |      | B  | B  | B  |    | B  | B    |     | C  | C  | C  |    | C    | C   | D  | D  | D  | D  | D   |
|                     | 2,200pF (222) |      | B  | B  | B  |    | B  | B    |     | C  | C  | C  |    | C    | C   | D  | D  | D  | D  | D   |
|                     | 2,700pF (272) |      | B  | B  | B  |    | B  | B    |     | C  | C  | C  |    | C    | C   | D  | D  | D  | D  | D   |
|                     | 3,300pF (332) |      | B  | B  | B  |    | B  | B    |     | C  | C  | C  |    | C    | C   | D  | D  | D  | D  | D   |
|                     | 3,900pF (392) |      | B  | B  | B  |    | B  | B    |     | C  | C  | C  |    | C    | C   | D  | D  | D  | D  | D   |
|                     | 4,700pF (472) |      | B  | B  | B  |    | B  | B    |     | C  | C  | C  |    | C    | C   | D  | D  | D  | D  | D   |
|                     | 5,600pF (562) |      | B  | B  | B  |    | B  | B    |     | C  | C  | C  |    | C    | C   | D  | D  | D  | D  | D   |
|                     | 6,800pF (682) |      | B  | B  | B  |    | B  | B    |     | C  | C  | C  |    | C    | C   | D  | D  | D  | D  | D   |
|                     | 8,200pF (822) |      | B  | B  | B  |    | B  | B    |     | C  | C  | C  |    | C    | C   | D  | D  | D  | D  | D   |
|                     | 0.010μF (103) |      | B  | B  | B  |    | B  | B    |     | C  | C  | C  |    | C    | C   | D  | D  | D  | D  | D   |
|                     | 0.012μF (123) |      | B  | B  | B  |    | B  | B    |     | C  | C  | C  |    | C    | C   | D  | D  | D  | D  | D   |
|                     | 0.015μF (153) |      | B  | B  | B  |    | B  | B    |     | C  | C  | C  |    | C    | C   | D  | D  | D  | D  | D   |
|                     | 0.018μF (183) |      | B  | B  | B  |    | B  | B    |     | C  | C  | C  |    | C    | C   | D  | D  | D  | D  | D   |
|                     | 0.022μF (223) |      | B  | B  | B  |    | B  | B    |     | C  | C  | C  |    | C    | C   | D  | D  | D  | D  | D   |
|                     | 0.027μF (273) |      | B  | B  | B  |    | B  | B    |     | C  | C  | C  |    | C    | C   | D  | D  | D  | D  | D   |
|                     | 0.033μF (333) |      | B  | B  | B  |    | B  | B    |     | C  | C  | C  |    | C    | C   | D  | D  | D  | D  | D   |
|                     | 0.039μF (393) |      | B  | B  | B  |    | B  | B    |     | C  | C  | C  |    | C    | C   | D  | D  | D  | D  | D   |
|                     | 0.047μF (473) |      | B  | B  | B  |    | B  | B    |     | C  | C  | C  |    | C    | C   | D  | D  | D  | D  | D   |
|                     | 0.056μF (563) |      | B  | B  | B  |    | B  | B    |     | C  | C  | C  |    | C    | C   | D  | D  | D  | D  | D   |
|                     | 0.068μF (683) |      | B  | B  | B  |    | B  | B    |     | C  | C  | C  |    | C    | C   | D  | D  | D  | D  | D   |
|                     | 0.082μF (823) |      | B  | B  | B  |    | B  | B    |     | C  | C  | C  |    | C    | C   | D  | D  | D  | D  | D   |
|                     | 0.10μF (104)  |      | B  | B  | B  |    | B  | C    |     | C  | C  | C  |    | C    | C   | D  | D  | D  | D  | D   |
|                     | 0.12μF (124)  |      | B  | B  | B  |    | B  | D    |     | C  | C  | C  |    | C    | C   | D  | D  | D  | D  | D   |
|                     | 0.15μF (154)  |      | C  | C  | C  |    | C  | G    |     | C  | C  | C  |    | C    | C   | D  | D  | D  | D  | D   |
|                     | 0.18μF (184)  |      | C  | C  | C  |    | C  | G    |     | C  | C  | C  |    | C    | D   | D  | D  | D  | D  | D   |
|                     | 0.22μF (224)  |      | C  | C  | C  |    | C  | G    |     | C  | C  | C  |    | C    | D   | D  | D  | D  | D  | D   |
|                     | 0.27μF (274)  |      | C  | C  | C  |    | D  | G    |     | C  | C  | C  |    | C    | G   | D  | D  | D  | D  | D   |
|                     | 0.33μF (334)  |      | C  | C  | C  |    | D  | G    |     | C  | C  | C  |    | D    | G   | D  | D  | D  | D  | D   |
|                     | 0.39μF (394)  |      | C  | C  | J  |    | P  | G    |     | C  | C  | C  |    | D    | M   | D  | D  | D  | D  | D   |
|                     | 0.47μF (474)  |      | J  | J  | J  |    | P  | G    |     | C  | C  | C  |    | D    | M   | D  | D  | D  | D  | K   |
| 0.56μF (564)        |               | J    | J  | J  |    | P  | P  |      | D   | D  | D  |    | D  | M    | D   | D  | D  | D  | K  |     |
| 0.68μF (684)        |               | J    | J  | J  |    | P  | P  |      | D   | D  | D  |    | D  | K    | D   | D  | D  | K  | K  |     |
| 0.82μF (824)        |               | J    | J  | J  |    | P  | P  |      | D   | D  | D  |    | D  | K    | D   | D  | D  | K  | K  |     |
| 1.0μF (105)         |               | J    | J  | J  |    | P  | P  |      | D   | D  | D  |    | D  | K    | D   | D  | D  | K  | K  |     |
| 1.5μF (155)         |               | J    | J  | J  | P  |    |    |      |     | G  | G  |    | M  | M    |     |    |    |    | K  |     |
| 2.2μF (225)         |               | J    | J  | J  | P  |    | P  |      |     | G  | G  |    | M  | M    |     |    |    | M  | M  |     |
| 3.3μF (335)         |               |      | P  | P  | P  |    |    |      |     | G  | G  |    | M  |      |     |    |    |    |    |     |
| 4.7μF (475)         |               | P    | P  | P  | P  |    | P  |      |     | K  | K  | K  |    | M    | M   |    |    |    |    |     |
| 6.8μF (685)         |               |      |    |    |    |    |    |      |     |    |    |    |    |      |     |    |    |    |    |     |
| 10μF (106)          |               | P    | P  | P  | P  | P  |    |      |     | K  | K  | K  | M  | M    |     |    |    |    |    |     |
| 22μF (226)          |               | P    | P  | P* |    |    |    |      |     | M  | M  | M  |    |      |     |    |    |    |    |     |
| 47μF (476)          |               |      |    |    |    |    |    |      | M   | M  |    |    |    |      |     |    |    |    |    |     |
| 100μF (107)         |               |      |    |    |    |    |    |      |     |    |    |    |    |      |     |    |    |    |    |     |

1. The letter in cell is expressed the symbol of product thickness.
2. The letter in cell with “\*” mark is expressed product not in 10% (code “K”) tolerance.



Multilayer Ceramic Capacitors

Approval Sheet

7-3. Y5V Dielectric 0402, 0603, 0805 Sizes

| DIELECTRIC          |               | Y5V  |    |    |    |    |      |    |    |    |    |      |    |    |    |    |     |
|---------------------|---------------|------|----|----|----|----|------|----|----|----|----|------|----|----|----|----|-----|
| SIZE                |               | 0402 |    |    |    |    | 0603 |    |    |    |    | 0805 |    |    |    |    |     |
| RATED VOLTAGE (VDC) |               | 6.3  | 10 | 16 | 25 | 50 | 6.3  | 10 | 16 | 25 | 50 | 6.3  | 10 | 16 | 25 | 50 | 100 |
| Capacitance         | 0.010μF (103) |      | N  | N  | N  | N  |      | S  | S  | S  | S  |      | A  | A  | A  | A  | B   |
|                     | 0.015μF (153) |      | N  | N  | N  | N  |      | S  | S  | S  | S  |      | A  | A  | A  | A  | B   |
|                     | 0.022μF (223) |      | N  | N  | N  | N  |      | S  | S  | S  | S  |      | A  | A  | A  | A  | B   |
|                     | 0.033μF (333) |      | N  | N  | N  | N  |      | S  | S  | S  | S  |      | A  | A  | A  | A  | B   |
|                     | 0.047μF (473) |      | N  | N  | N  | N  |      | S  | S  | S  | S  |      | A  | A  | A  | A  | B   |
|                     | 0.068μF (683) |      | N  | N  | N  |    |      | S  | S  | S  | S  |      | A  | A  | A  | A  | B   |
|                     | 0.10μF (104)  |      | N  | N  | N  |    |      | S  | S  | S  | S  |      | A  | A  | A  | A  | B   |
|                     | 0.15μF (154)  |      | N  |    |    |    |      | S  | S  | S  | S  |      | A  | A  | A  | A  |     |
|                     | 0.22μF (224)  | N    | N  |    |    |    |      | S  | S  | S  | S  |      | A  | A  | A  | A  |     |
|                     | 0.33μF (334)  | N    | N  |    |    |    |      | S  | S  | S  |    |      | B  | B  | B  | B  |     |
|                     | 0.47μF (474)  | N    | N  |    |    |    |      | S  | S  |    |    |      | B  | B  | B  | B  |     |
|                     | 0.68μF (684)  |      |    |    |    |    |      | S  | X  |    |    |      | B  | B  | D  | D  |     |
|                     | 1.0μF (105)   |      |    |    |    |    |      | S  | X  |    |    |      | B  | B  | D  | D  |     |
|                     | 1.5μF (155)   |      |    |    |    |    |      |    | S  |    |    |      | D  | D  |    |    |     |
|                     | 2.2μF (225)   |      |    |    |    |    | S    | S  |    |    |    |      | D  | D  |    |    |     |
|                     | 3.3μF (335)   |      |    |    |    |    |      |    |    |    |    |      | D  | D  |    |    |     |
|                     | 4.7μF (475)   |      |    |    |    |    |      |    |    |    |    |      | D  | D  |    |    |     |
|                     | 6.8μF (685)   |      |    |    |    |    |      |    |    |    |    |      | I  |    |    |    |     |
| 10μF (106)          |               |      |    |    |    |    |      |    |    |    | I  | I    |    |    |    |    |     |
| 22μF (226)          |               |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |     |

1. The letter in cell is expressed the symbol of product thickness.
2. For more information about products with special capacitance or other data, please contact WTC local representative.

7-3. Y5V Dielectric 1206, 1210, 1812 Sizes

| DIELECTRIC          |               | Y5V  |    |    |    |    |     |      |    |    |    |    |    |      |    |    |    |    |     |
|---------------------|---------------|------|----|----|----|----|-----|------|----|----|----|----|----|------|----|----|----|----|-----|
| SIZE                |               | 1206 |    |    |    |    |     | 1210 |    |    |    |    |    | 1812 |    |    |    |    |     |
| RATED VOLTAGE (VDC) |               | 6.3  | 10 | 16 | 25 | 50 | 100 | 6.3  | 10 | 16 | 25 | 35 | 50 | 100  | 10 | 16 | 25 | 50 | 100 |
| Capacitance         | 0.010μF (103) |      | B  | B  | B  | B  | B   |      |    |    |    |    |    | C    |    |    |    |    | D   |
|                     | 0.015μF (153) |      | B  | B  | B  | B  | B   |      |    |    |    |    |    | C    |    |    |    |    | D   |
|                     | 0.022μF (223) |      | B  | B  | B  | B  | B   |      |    |    |    |    |    | C    |    |    |    |    | D   |
|                     | 0.033μF (333) |      | B  | B  | B  | B  | B   |      |    |    |    |    |    | C    |    |    |    |    | D   |
|                     | 0.047μF (473) |      | B  | B  | B  | B  | B   |      |    |    |    |    |    | C    |    |    |    |    | D   |
|                     | 0.068μF (683) |      | B  | B  | B  | B  | B   |      |    |    |    |    |    | C    |    |    |    |    | D   |
|                     | 0.10μF (104)  |      | B  | B  | B  | B  | B   |      | C  | C  | C  |    | C  | C    | D  | D  | D  | D  | D   |
|                     | 0.15μF (154)  |      | B  | B  | B  | B  | B   | C    | C  | C  | C  |    | C  | C    | D  | D  | D  | D  | D   |
|                     | 0.22μF (224)  |      | B  | B  | B  | B  | B   | C    | C  | C  | C  |    | C  | C    | D  | D  | D  | D  | D   |
|                     | 0.33μF (334)  |      | B  | B  | B  | B  | B   |      | C  | C  | C  |    | C  | C    | D  | D  | D  | D  | D   |
|                     | 0.47μF (474)  |      | B  | B  | B  | B  |     |      | C  | C  | C  |    | C  |      | D  | D  | D  | D  | D   |
|                     | 0.68μF (684)  |      | B  | B  | B  | B  |     |      | C  | C  | C  |    | C  |      | D  | D  | D  | D  | D   |
|                     | 1.0μF (105)   |      | C  | C  | C  | C  |     |      | C  | C  | C  |    | C  |      | D  | D  | D  | D  | D   |
|                     | 1.5μF (155)   |      | C  | C  | C  |    |     |      | C  | C  | C  |    |    |      | D  | D  | D  | D  |     |
|                     | 2.2μF (225)   |      | C  | C  | C  |    |     |      | C  | C  | C  |    | G  |      | D  | D  | D  | D  |     |
|                     | 3.3μF (335)   |      | J  | J  | J  |    |     |      | C  | C  | C  |    |    |      | D  | D  | D  | D  |     |
|                     | 4.7μF (475)   |      | J  | J  | J  |    |     |      | C  | C  | D  |    | G  |      | D  | D  | D  | D  |     |
|                     | 6.8μF (685)   |      | J  | J  |    |    |     |      | C  | C  | D  |    |    |      | D  | D  | D  | D  |     |
| 10μF (106)          |               | J    | J  |    |    |    |     | D    | D  | G  | K  |    |    | D    | D  | D  |    |    |     |
| 22μF (226)          |               | P    |    |    |    |    |     |      | K  | K  |    |    |    |      |    |    |    |    |     |
| 47μF (476)          |               |      |    |    |    |    |     | K    | K  |    |    |    |    |      | M  |    |    |    |     |
| 100μF (107)         |               |      |    |    |    |    |     | M    |    |    |    |    |    |      |    |    |    |    |     |

1. The letter in cell is expressed the symbol of product thickness.
2. For more information about products with special capacitance or other data, please contact WTC local representative.

Multilayer Ceramic Capacitors

7-4. X5R Dielectric 0201, 0402, 0603, 0805, 1206, 1210 Sizes

| Dielectric          |               | X5R  |    |    |    |    |      |     |    |    |    |      |   |     |    |    |    |    |
|---------------------|---------------|------|----|----|----|----|------|-----|----|----|----|------|---|-----|----|----|----|----|
| Size                |               | 0201 |    |    |    |    | 0402 |     |    |    |    | 0603 |   |     |    |    |    |    |
| Rated Voltage (VDC) |               | 6.3  | 10 | 16 | 25 | 50 | 4    | 6.3 | 10 | 16 | 25 | 50   | 4 | 6.3 | 10 | 16 | 25 | 50 |
| Capacitance         | 100pF (101)   |      |    | L  | L  | L  |      |     |    |    |    |      |   |     |    |    |    |    |
|                     | 150pF (151)   |      |    | L  | L  | L  |      |     |    |    |    |      |   |     |    |    |    |    |
|                     | 220pF (221)   |      |    | L  | L  | L  |      |     |    |    |    |      |   |     |    |    |    |    |
|                     | 330pF (331)   |      |    | L  | L  | L  |      |     |    |    |    |      |   |     |    |    |    |    |
|                     | 470pF (471)   |      |    | L  | L  | L  |      |     |    |    |    |      |   |     |    |    |    |    |
|                     | 680pF (681)   |      |    | L  | L  | L  |      |     |    |    |    |      |   |     |    |    |    |    |
|                     | 820pF (821)   |      |    | L  | L  | L  |      |     |    |    |    |      |   |     |    |    |    |    |
|                     | 1,000pF (102) |      | L  | L  | L  | L  |      |     |    |    |    |      |   |     |    |    |    |    |
|                     | 1,500pF (152) |      | L  | L  | L  | L  |      |     |    |    |    |      |   |     |    |    |    |    |
|                     | 2,200pF (222) |      | L  | L  | L  | L  |      |     |    |    |    |      |   |     |    |    |    |    |
|                     | 2,700pF (272) |      | L  | L  | L  | L  |      |     |    |    |    |      |   |     |    |    |    |    |
|                     | 3,300pF (332) |      | L  | L  | L  | L  |      |     |    |    |    |      |   |     |    |    |    |    |
|                     | 4,700pF (472) |      | L  | L  | L  | L  |      |     |    |    |    |      |   |     |    |    |    |    |
|                     | 6,800pF (682) |      | L  | L  | L  | L  |      |     |    |    |    |      |   |     |    |    |    |    |
|                     | 0.010μF (103) | L    | L  | L  | L  | L  |      |     |    |    |    |      |   |     |    |    |    |    |
|                     | 0.015μF (153) | L    | L  |    |    |    |      |     |    |    |    |      |   |     |    |    |    | N  |
|                     | 0.022μF (223) | L    | L  | L  | L  |    |      |     |    |    |    |      |   |     |    |    |    | N  |
|                     | 0.033μF (333) | L    | L  |    |    |    |      |     |    | N  |    |      |   |     |    |    |    | N  |
|                     | 0.047μF (473) | L    | L  | L  | L  |    |      |     | N  | N  | N  |      |   |     |    |    |    | N  |
|                     | 0.068μF (683) | L    | L  |    |    |    |      |     | N  | N  | N  |      |   |     |    |    |    | E  |
|                     | 0.082μF (823) | L    | L  |    |    |    |      |     | N  | N  | N  |      |   |     |    |    |    | E  |
|                     | 0.10μF (104)  | L    | L  | L  | L  |    |      |     | N  | N  | N  | N    |   |     |    |    |    | E  |
|                     | 0.15μF (154)  |      |    |    |    |    |      |     | N  | N  | N  | N    |   |     |    |    |    |    |
|                     | 0.22μF (224)  | L    | L  | L* |    |    |      |     | N  | N  | N  | N    | N |     | X  | X  | X  | X  |
|                     | 0.33μF (334)  | L    |    |    |    |    |      |     | N  | N  | N  |      |   |     | X  | X  | X  | X  |
|                     | 0.47μF (474)  | L    |    |    |    |    |      |     | N  | N  | N  | N    | E |     | X  | X  | X  | X  |
|                     | 0.68μF (684)  |      |    |    |    |    |      |     | N  | N  |    |      |   |     | X  | X  | X  | X  |
|                     | 0.82μF (824)  |      |    |    |    |    |      |     |    |    |    |      |   |     | X  | X  | X  | X  |
|                     | 1.0μF (105)   | L    | L* | L* |    |    |      |     | N  | N  | N  | N    | E |     | X  | X  | X  | X  |
|                     | 1.5μF (155)   |      |    |    |    |    |      |     |    |    |    |      |   |     | X  | X  |    |    |
| 2.2μF (225)         | L*            | L*   |    |    |    |    |      | N   | N  | E  | E  |      |   | X   | X  | X  | X  |    |
| 3.3μF (335)         |               |      |    |    |    |    |      |     |    |    |    |      |   | X   | X  |    |    |    |
| 4.7μF (475)         |               |      |    |    |    |    |      | E   | E  | E* |    |      |   | X   | X  | X  | X  |    |
| 6.8μF (685)         |               |      |    |    |    |    |      |     |    |    |    |      |   |     |    |    |    |    |
| 10μF (106)          |               |      |    |    |    |    |      | E*  | E* | E* |    |      |   | X   | X  | X  | X* |    |
| 22μF (226)          |               |      |    |    |    |    |      | E*  |    |    |    |      |   | X*  | X* | X* |    |    |
| 47μF (476)          |               |      |    |    |    |    |      |     |    |    |    |      |   | X*  | X* |    |    |    |

| Dielectric          |             | X5R  |     |    |    |    |      |    |     |    |    |      |    |   |     |    |    |    |    |    |   |
|---------------------|-------------|------|-----|----|----|----|------|----|-----|----|----|------|----|---|-----|----|----|----|----|----|---|
| Size                |             | 0805 |     |    |    |    | 1206 |    |     |    |    | 1210 |    |   |     |    |    |    |    |    |   |
| Rated Voltage (VDC) |             | 4    | 6.3 | 10 | 16 | 25 | 50   | 4  | 6.3 | 10 | 16 | 25   | 50 | 4 | 6.3 | 10 | 16 | 25 | 35 | 50 |   |
| Capacitance         | 1.0μF (105) |      |     | D  | D  | D  | I    |    |     |    |    |      | P  |   |     |    |    |    |    |    |   |
|                     | 1.5μF (155) |      | I   | I  | I  | I  |      |    |     | J  | J  |      |    |   |     | K  | K  |    |    |    |   |
|                     | 2.2μF (225) |      | I   | I  | I  | I  | I    |    |     | J  | J  | P    | P  |   |     | K  | K  |    |    |    |   |
|                     | 3.3μF (335) |      | I   | I  | I  | I  | I    |    |     | P  | P  | P    | P  |   |     |    |    |    |    |    |   |
|                     | 4.7μF (475) |      | I   | I  | I  | I  | I    |    |     | P  | P  | P    | P  |   |     | K  | K  | K  |    |    |   |
|                     | 6.8μF (685) |      |     |    |    |    |      |    |     | P  | P  |      |    |   |     |    |    |    |    |    |   |
|                     | 10μF (106)  |      | I   | I  | I  | I  | I    |    |     | P  | P  | P    | P  | P |     | K  | K  | K  | K  | M  | M |
|                     | 22μF (226)  |      | I   | I* | I* | I* |      |    |     | P  | P  | P    | P  |   |     | M  | M  | M  | M  | M  |   |
|                     | 47μF (476)  |      | I*  | I* |    |    |      |    |     | P  | P  | P*   |    |   |     | M  | M  | M  | M* |    |   |
|                     | 100μF (107) | I*   | I*  |    |    |    |      |    |     | P  |    |      |    |   |     | M* | M* | M* |    |    |   |
| 220μF (227)         |             |      |     |    |    |    |      | P* |     |    |    |      |    |   | M*  | M* |    |    |    |    |   |

1. The letter in cell is expressed the symbol of product thickness.
2. The letter in cell with “ \* ” mark is expressed product not in 10% (code “K”) tolerance.

Multilayer Ceramic Capacitors

**7-5. X6S Dielectric 0201, 0402, 0603, 0805, 1206, 1210 Sizes**

| Dielectric          |              | X6S  |     |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |
|---------------------|--------------|------|-----|----|----|----|------|----|----|----|----|------|----|----|----|----|------|----|----|----|----|------|----|----|----|----|------|----|----|----|----|
| Size                |              | 0201 |     |    |    |    | 0402 |    |    |    |    | 0603 |    |    |    |    | 0805 |    |    |    |    | 1206 |    |    |    |    | 1210 |    |    |    |    |
| Rated Voltage (VDC) |              | 4    | 6.3 | 10 | 16 | 25 | 6.3  | 10 | 16 | 25 | 4  | 6.3  | 10 | 16 | 25 | 4  | 6.3  | 10 | 16 | 25 | 50 | 6.3  | 10 | 16 | 25 | 50 | 6.3  | 10 | 16 | 25 | 50 |
| Capacitance         | 0.10µF (104) | L    | L   | L  | L  | L  | N    |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |
|                     | 0.15µF (154) |      |     |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |
|                     | 0.22µF (224) |      | L   | L* |    |    | N    |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |
|                     | 0.33µF (334) |      |     |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |
|                     | 0.47µF (474) | L    |     |    |    |    | N    |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |
|                     | 0.68µF (684) |      |     |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |
|                     | 1.0µF (105)  | L*   | L*  |    |    |    | N    | N  | N  | E  |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |
|                     | 1.5µF (155)  |      |     |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |
|                     | 2.2µF (225)  |      |     |    |    |    | E    | E  | E  |    | X  | X    | X  | X  |    |    |      |    |    |    |    | I    |    |    |    |    |      |    |    |    |    |
|                     | 3.3µF (335)  |      |     |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |
|                     | 4.7µF (475)  |      |     |    |    |    | E    | E  |    |    | X  | X    | X  | X  | X  |    |      |    |    |    |    | I    | I  |    |    |    |      |    |    |    |    |
|                     | 6.8µF (685)  |      |     |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |
|                     | 10µF (106)   |      |     |    |    |    | E*   |    |    |    | X* | X*   | X* | X* |    | I  | I    | I  | I  | I  |    |      |    |    | P  |    |      |    |    |    |    |
|                     | 22µF (226)   |      |     |    |    |    |      |    |    |    | X* | X*   |    |    |    | I* | I*   | I* | I* |    |    |      | P  | P* | P  |    |      |    |    | M  |    |
| 47µF (476)          |              |      |     |    |    |    |      |    |    |    |    |      |    |    | I* | I* |      |    |    |    |    | P    |    |    |    |    | M    | M  | M  |    |    |
| 100µF (107)         |              |      |     |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    | M* | M*   |    |    |    |    |

1. The letter in cell is expressed the symbol of product thickness.
2. The letter in cell with "\*" mark is expressed product not in 10% (code "K") tolerance.

**7-6. X7S Dielectric 0402, 0603, 0805, 1206, 1210 Sizes**

| Dielectric          |             | X7S  |     |    |    |      |    |    |    |      |    |    |    |      |     |    |    |      |    |     |    |      |    |    |  |  |  |    |  |
|---------------------|-------------|------|-----|----|----|------|----|----|----|------|----|----|----|------|-----|----|----|------|----|-----|----|------|----|----|--|--|--|----|--|
| Size                |             | 0201 |     |    |    | 0402 |    |    |    | 0603 |    |    |    | 0805 |     |    |    | 1206 |    |     |    | 1210 |    |    |  |  |  |    |  |
| Rated Voltage (VDC) |             | 10V  | 6.3 | 10 | 16 | 6.3  | 10 | 16 | 25 | 10   | 16 | 25 | 50 | 100  | 6.3 | 10 | 16 | 25   | 50 | 6.3 | 10 | 16   | 25 | 50 |  |  |  |    |  |
| Capacitance         | 0.1µF (104) | L    |     |    |    |      |    |    |    |      |    |    |    |      |     |    |    |      |    |     |    |      |    |    |  |  |  |    |  |
|                     | 1.0µF (105) |      |     | E  |    |      |    |    |    |      |    |    |    |      |     |    |    |      |    |     |    |      |    |    |  |  |  |    |  |
|                     | 1.5µF (155) |      |     |    |    |      |    |    |    |      |    |    |    |      |     |    |    |      |    |     |    |      |    |    |  |  |  |    |  |
|                     | 2.2µF (225) |      | E   | E  |    |      |    |    | X  |      |    |    |    |      |     |    |    |      |    |     |    |      |    |    |  |  |  |    |  |
|                     | 3.3µF (335) |      |     |    |    |      |    |    |    |      |    |    |    |      |     |    |    |      |    |     |    |      |    |    |  |  |  |    |  |
|                     | 4.7µF (475) |      |     |    |    |      | X  | X  |    |      |    |    |    |      |     |    |    |      |    | I   |    |      |    |    |  |  |  |    |  |
|                     | 6.8µF (685) |      |     |    |    |      |    |    |    |      |    |    |    |      |     |    |    |      |    |     |    |      |    |    |  |  |  |    |  |
|                     | 10µF (106)  |      |     |    |    |      |    |    |    |      |    |    |    | I    | I   |    |    |      |    |     |    |      |    |    |  |  |  |    |  |
|                     | 22µF (226)  |      |     |    |    |      |    |    |    |      |    |    |    |      |     |    |    |      |    |     |    |      |    |    |  |  |  |    |  |
|                     | 47µF (476)  |      |     |    |    |      |    |    |    |      |    |    |    |      |     |    |    |      |    |     |    |      |    |    |  |  |  |    |  |
| 100µF (107)         |             |      |     |    |    |      |    |    |    |      |    |    |    |      |     |    |    |      |    |     |    |      |    |    |  |  |  | M* |  |

1. The letter in cell is expressed the symbol of product thickness.
2. The letter in cell with "\*" mark is expressed product not in 10% (code "K") tolerance.

**8. PACKAGING STYLE AND QUANTITY**

| Size            | Thickness (mm)/Symbol |   | Paper tape |          | Plastic tape |          |
|-----------------|-----------------------|---|------------|----------|--------------|----------|
|                 |                       |   | 7" reel    | 13" reel | 7" reel      | 13" reel |
| 0201 (0603)     | 0.30±0.03             | L | 15,000     | 70,000   | -            | -        |
|                 | 0.30±0.05             | L | 15,000     | -        | -            | -        |
|                 | 0.30±0.09             | L | 15,000     | -        | -            | -        |
| 0402 (1005)     | 0.50±0.05             | N | 10,000     | 50,000   | -            | -        |
|                 | 0.50+0.02/-0.05       | Q | 10,000     | 50,000   | -            | -        |
|                 | 0.50±0.20             | E | 10,000     | -        | -            | -        |
| 0603 (1608)     | 0.50±0.10             | H | 4,000      | -        | -            | -        |
|                 | 0.80±0.07             | S | 4,000      | 15,000   | -            | -        |
|                 | 0.80+0.15/-0.10       | X | 4,000      | 15,000   | -            | -        |
| 0805 (2012)     | 0.50±0.10             | H | 4,000      | 15,000   | -            | -        |
|                 | 0.60±0.10             | A | 4,000      | 15,000   | -            | -        |
|                 | 0.80±0.10             | B | 4,000      | 15,000   | -            | -        |
|                 | 0.85±0.10             | T | 4,000      | 15,000   | -            | -        |
|                 | 1.25±0.10             | D | -          | -        | 3,000        | 10,000   |
| 1.25±0.20       | I                     | - | -          | 3,000    | 10,000       |          |
| 1206 (3216)     | 0.80±0.10             | B | 4,000      | 15,000   | -            | -        |
|                 | 0.85±0.10             | T | 4,000      | 15,000   | -            | -        |
|                 | 0.95±0.10             | C | -          | -        | 3,000        | 10,000   |
|                 | 1.15±0.15             | J | -          | -        | 3,000        | 10,000   |
|                 | 1.25±0.10             | D | -          | -        | 3,000        | 10,000   |
|                 | 1.60±0.20             | G | -          | -        | 2,000        | 10,000   |
| 1.60+0.30/-0.10 | P                     | - | -          | 2,000    | 9,000        |          |
| 1210 (3225)     | 0.85±0.10             | T | -          | -        | 3,000        | 10,000   |
|                 | 0.95±0.10             | C | -          | -        | 3,000        | 10,000   |
|                 | 1.25±0.10             | D | -          | -        | 3,000        | 10,000   |
|                 | 1.60±0.20             | G | -          | -        | 2,000        | -        |
|                 | 2.00±0.20             | K | -          | -        | 1,000        | 6,000    |
| 2.50±0.30       | M                     | - | -          | 1,000    | 6,000        |          |
| 1808 (4520)     | 1.25±0.10             | D | -          | -        | 2,000        | 10,000   |
|                 | 1.40±0.15             | F | -          | -        | 2,000        | 10,000   |
|                 | 1.60±0.20             | G | -          | -        | 2,000        | 8,000    |
|                 | 2.00±0.20             | K | -          | -        | 1,000        | 6,000    |
| 1812 (4532)     | 1.25±0.10             | D | -          | -        | 1,000        | 5,000    |
|                 | 1.60±0.20             | G | -          | -        | 1,000        | -        |
|                 | 2.00±0.20             | K | -          | -        | 1,000        | -        |
|                 | 2.50±0.30             | M | -          | -        | 500          | 3,000    |
|                 | 2.80±0.30             | U | -          | -        | 500          | -        |

Unit: pieces

Multilayer Ceramic Capacitors

9. RELIABILITY TEST CONDITIONS AND REQUIREMENTS

| No.             | Item                            | Test Condition  | Requirements   |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
|-----------------|---------------------------------|---|--|------------|---------------------|---------------------|--------|--------|--|--|-----------------------------------|------|--------|--|----------------------------------|--|---|-----------------|---|---|--------------------|------|-----------------------|--|------------------------------------|--|---------------------|--------|---|---|---|-----|------|---|--------------------------------|--|------|-------|--|--------------------|-----------|----|-------|-----|-----|-----|
| 1.              | Visual and Mechanical           | ---   | * No remarkable defect.<br>* Dimensions to conform to individual specification sheet.  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
| 2.              | Capacitance                     | *Test temp.: Room Temperature.<br>*Class I: (NP0)<br>≤ 1000pF, 1.0±0.2Vrms · 1MHz±10%<br>> 1000pF, 1.0±0.2Vrms · 1KHz±10%<br>Class II: (X7R, X7E, X6S, X5R, X7S, Y5V)<br>C ≤ 10μF, 1.0±0.2Vrms · 1KHz±10% **<br>C > 10μF, 0.5±0.2Vrms · 120Hz±20%   | * Shall not exceed the limits given in the detailed spec.<br>NP0: Cap≥30pF, Q≥1000; Cap<30pF, Q≥400+20C<br>X7R:  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
| 3.              | Q/ D.F.<br>(Dissipation Factor) | ** Test condition: 0.5±0.2Vrms · 1KHz±10%<br>X7R:<br>0603/475(6.3V)<br>X5R:<br>0201 ≥ 224 (6.3V, 10V, 16V) #1,<br>0402 ≥ 475 (6.3V, 16V), 0402 ≥ 225(10V),<br>0603=106 (6.3V)<br>TT18X ≥ 475(10V) , TT15X series<br>X6S:<br>0201/474(4V), 0201 > 104 (6.3V, 10V),<br>0402 ≥ 225 (6.3V),<br>0402/475 (10V), 0603/106 (6.3V),<br>X7S:<br>0402/225(6.3V)<br><br>#1 Excluding<br>X5R/0201/105(6.3V); 225(10V) ,<br>0402X475M6R3<br>(1.0±0.2Vrms · 1KHz±10%) | <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th>Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥ 100V</td> <td rowspan="3">≤ 2.5%</td> <td>≤ 3% 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 5% 0603 ≥ 0.068μF; 0805 &gt; 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF;</td> </tr> <tr> <td>≤ 10% 0805 &gt; 0.22μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td rowspan="3">50V</td> <td rowspan="3">≤ 2.5%</td> <td>≤ 3% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 5% 0201 ≥ 0.01μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td>≤ 10% 0402 ≥ 0.012μF; 0603 &gt; 0.1μF; 0805/X7R &gt; 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">35V</td> <td rowspan="3">≤ 3.5%</td> <td>≤ 10% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤ 5% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤ 7% 0603 ≥ 0.33μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤ 3.5%</td> <td>≤ 10% 0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 12.5% 0402 ≥ 0.47μF</td> </tr> <tr> <td>≤ 5% 0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td rowspan="3">16V</td> <td rowspan="3">≤ 3.5%</td> <td>≤ 10% 0201/X7R ≥ 0.022μF; 0402 ≥ 0.22μF; 0603 &gt; 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 10% 0201 ≥ 0.012μF; 0402 ≥ 0.22μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 15% 0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> <tr> <td rowspan="3">10V</td> <td rowspan="3">≤ 5%</td> <td>≤ 10% 0201 ≥ 0.012μF; 0402 ≥ 0.22μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 15% 0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> <tr> <td>≤ 10% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF</td> </tr> <tr> <td rowspan="3">6.3V</td> <td rowspan="3">≤ 10%</td> <td>≤ 20% 0402 ≥ 2.2μF</td> </tr> <tr> <td>≤ 15% ---</td> </tr> <tr> <td>---</td> </tr> <tr> <td rowspan="2">4V</td> <td rowspan="2">≤ 15%</td> <td>---</td> </tr> <tr> <td>---</td> </tr> </tbody> </table>                | Rated vol. | D.F. ≤              | Exception of D.F. ≤ | ≥ 100V | ≤ 2.5% | ≤ 3% 1206 ≥ 0.47μF                             | ≤ 5% 0603 ≥ 0.068μF; 0805 > 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF; | ≤ 10% 0805 > 0.22μF; 1210 ≥ 3.3μF | 50V  | ≤ 2.5% | ≤ 3% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF | ≤ 5% 0201 ≥ 0.01μF; 1210 ≥ 3.3μF | ≤ 10% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805/X7R > 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF | 35V   | ≤ 3.5%          | ≤ 10% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF | ≤ 5% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF | ≤ 7% 0603 ≥ 0.33μF | 25V  | ≤ 3.5%                | ≤ 10% 0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF | ≤ 12.5% 0402 ≥ 0.47μF              | ≤ 5% 0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF | 16V                 | ≤ 3.5% | ≤ 10% 0201/X7R ≥ 0.022μF; 0402 ≥ 0.22μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF | ≤ 10% 0201 ≥ 0.012μF; 0402 ≥ 0.22μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF | ≤ 15% 0201 ≥ 0.1μF; 0402 ≥ 1μF  | 10V | ≤ 5% | ≤ 10% 0201 ≥ 0.012μF; 0402 ≥ 0.22μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF | ≤ 15% 0201 ≥ 0.1μF; 0402 ≥ 1μF | ≤ 10% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF | 6.3V | ≤ 10% | ≤ 20% 0402 ≥ 2.2μF   | ≤ 15% ---          | ---       | 4V | ≤ 15% | --- | --- |     |
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| ≥ 100V          | ≤ 2.5%                          | ≤ 3% 1206 ≥ 0.47μF  |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
|                 |                                 | ≤ 5% 0603 ≥ 0.068μF; 0805 > 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF;  |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
|                 |                                 | ≤ 10% 0805 > 0.22μF; 1210 ≥ 3.3μF   |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
| 50V             | ≤ 2.5%                          | ≤ 3% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF  |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
|                 |                                 | ≤ 5% 0201 ≥ 0.01μF; 1210 ≥ 3.3μF  |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
|                 |                                 | ≤ 10% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805/X7R > 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF  |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
| 35V             | ≤ 3.5%                          | ≤ 10% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF   |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
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|                 |                                 | ≤ 7% 0603 ≥ 0.33μF  |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
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|                 |                                 | ≤ 12.5% 0402 ≥ 0.47μF   |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
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| 16V             | ≤ 3.5%                          | ≤ 10% 0201/X7R ≥ 0.022μF; 0402 ≥ 0.22μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF   |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
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|                 |                                 | ≤ 15% 0201 ≥ 0.1μF; 0402 ≥ 1μF  |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
| 10V             | ≤ 5%                            | ≤ 10% 0201 ≥ 0.012μF; 0402 ≥ 0.22μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF   |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
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| 6.3V            | ≤ 10%                           | ≤ 20% 0402 ≥ 2.2μF  |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
|                 |                                 | ≤ 15% ---   |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
|                 |                                 | ---   |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
| 4V              | ≤ 15%                           | ---   |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
|                 |                                 | ---   |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
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| Rated vol.      | D.F. ≤                          | Exception of D.F. ≤   |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
| ≥ 100V          | ≤ 2.5%                          | ≤ 3% 1206 ≥ 0.47μF  |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
|                 |                                 | ≤ 5% 0603 ≥ 0.068μF; 0805 > 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF   |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
|                 |                                 | ≤ 10% 0805 > 0.22μF; 1210 ≥ 3.3μF   |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
| 50V             | ≤ 2.5%                          | ≤ 3% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF  |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
|                 |                                 | ≤ 5% 0201 ≥ 0.01μF; 1210 ≥ 3.3μF  |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
|                 |                                 | ≤ 10% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 ≥ 1μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF   |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
| 35V             | ≤ 3.5%                          | ≤ 10% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF   |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
|                 |                                 | ≤ 5% 0201 = 0.01μF; 0805 ≥ 1μF  |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
|                 |                                 | ≤ 7% 0603 ≥ 0.33μF  |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
| 25V             | ≤ 3.5%                          | ≤ 10% 0201 > 0.01μF; 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF  |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
|                 |                                 | ≤ 12.5% 0402 ≥ 0.47μF; 0805 = 10μF  |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
|                 |                                 | ≤ 5% 0201 = 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF  |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
| 16V             | ≤ 3.5%                          | ≤ 10% 0201 > 0.01μF; 0402 ≥ 0.22μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF  |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
|                 |                                 | ≤ 12.5% 0402 ≥ 1μF; 0805 = 10μF   |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
|                 |                                 | ≤ 10% 0201 ≥ 0.012μF; 0402 ≥ 0.22μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF; 01R5/X5R   |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
| 10V             | ≤ 5%                            | ≤ 15% 0201 > 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF   |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
|                 |                                 | ≤ 12.5% 0805 = 10μF   |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
|                 |                                 | ≤ 10% 0201 > 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF   |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
| 6.3V            | ≤ 10%                           | ≤ 15% 0201 > 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF  |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
|                 |                                 | ≤ 20% 0402 ≥ 2.2μF  |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
|                 |                                 | ≤ 15% ---   |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
| 4V              | ≤ 15%                           | ---   |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
|                 |                                 | ---   |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
|                 |                                 | ---   |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
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| Rated vol.      | D.F. ≤                          | Exception of D.F. ≤   |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
| ≥ 50V           | ≤ 5%                            | ≤ 7% 0603 ≥ 0.1μF; 0805 ≥ 0.47μF; 1206 ≥ 4.7μF  |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
|                 |                                 | ≤ 12.5% 1210 ≥ 6.8μF  |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
| 35V             | ≤ 7%                            | ---   |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
| 25V             | ≤ 5%                            | ≤ 7% 0402 ≥ 0.047μF; 0603 ≥ 0.1μF; 0805 ≥ 0.33μF; 1206 ≥ 1μF; 1210 ≥ 4.7μF  |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
|                 |                                 | ≤ 9% 0402 ≥ 0.068μF; 0603 ≥ 0.47μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF   |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
| 16V (C < 1.0μF) | ≤ 7%                            | ≤ 9% 0402 ≥ 0.068μF; 0603 ≥ 0.68μF  |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
| 16V (C ≥ 1.0μF) | ≤ 9%                            | ≤ 12.5% 0402 ≥ 0.22μF   |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
|                 |                                 | ≤ 12.5% 0603 ≥ 2.2μF; 0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF   |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
| 10V             | ≤ 12.5%                         | ≤ 20% 0402 ≥ 0.47μF   |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |
| 6.3V            | ≤ 20%                           | ---   |  |            |                     |                     |        |        |  |  |                                   |      |        |  |                                  |  |   |                 |   |   |                    |      |                       |  |                                    |  |                     |        |   |   |   |     |      |   |                                |  |      |       |  |                    |           |    |       |     |     |     |

\* "Room condition" Temperature: 15 to 35°C, Relative humidity: 25 to 75%, Atmospheric pressure: 86 to 106kPa.

Multilayer Ceramic Capacitors

| No.   | Item                | Test Condition   | Requirements |        |  |  |        |  |
|---|---------------------|--|--------------|--------|--|--|--------|--|
| Q/ D.F.<br>(Dissipation<br>Factor)  |                     |  | X6S:         |        |  |  |        |  |
|   |                     |  | Rated vol.   | D.F. ≤ | Exception of D.F. ≤  |  |        |  |
|   |                     |  | ≥ 100V       | ≤ 2.5% | ≤ 3% 1206 ≥ 0.47μF<br>≤ 5% 0603 ≥ 0.068μF; 0805 > 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF<br>≤ 10% 0805 > 0.22μF; 1210 ≥ 3.3μF             |  |        |  |
|   |                     |  | 50V          | ≤ 2.5% | ≤ 3% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF<br>≤ 5% 0201 ≥ 0.01μF; 1210 ≥ 3.3μF                                   |  |        |  |
|   |                     |  |              |        | ≤ 10% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 ≥ 1μF;<br>1206 ≥ 2.2μF; 1210 ≥ 10μF   |  |        |  |
|   |                     |  |              |        | ≤ 3.5% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF   |  |        |  |
|   |                     |  | 25V          | ≤ 3.5% | ≤ 5% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF<br>≤ 7% 0603 ≥ 0.33μF  |  |        |  |
|   |                     |  |              |        | ≤ 10% 0201 ≥ 0.1μF; 0402 ≥ 0.10μF; 0603 ≥ 0.47μF;<br>0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF<br>≤ 12.5% 0402 ≥ 0.47μF; 0805 = 10μF |  |        |  |
|   |                     |  |              |        | ≤ 5% 0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF;<br>0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF                                    |  |        |  |
|   |                     |  | 16V          | ≤ 3.5% | ≤ 10% 0201 ≥ 0.1μF; 0402 ≥ 0.22μF;<br>0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF<br>≤ 12.5% 0402 = 1μF; 0805 = 10μF    |  |        |  |
|   |                     |  |              |        | ≤ 10% 0201 ≥ 0.012μF; 0402 ≥ 0.22μF;<br>0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF<br>≤ 12.5% 0805 = 10μF              |  |        |  |
|   |                     |  |              |        | ≤ 15% 0201 ≥ 0.1μF; 0402 ≥ 1μF   |  |        |  |
|   |                     |  | 10V          | ≤ 5%   | ≤ 10% 0201 ≥ 0.1μF; 0402 ≥ 0.47μF; 0603 ≥ 10μF;<br>0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF<br>≤ 20% 0402 ≥ 2.2μF                   |  |        |  |
|   |                     |  |              |        | ≤ 15% 0201 ≥ 0.1μF; 0402 ≥ 1μF   |  |        |  |
|   |                     |  |              |        | ≤ 15% 0201 ≥ 0.1μF; 0402 ≥ 1μF   |  |        |  |
|   |                     |  | 6.3V         | ≤ 10%  | ≤ 15% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF;<br>0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF<br>≤ 20% 0402 ≥ 2.2μF                      |  |        |  |
|   |                     |  |              |        | ≤ 20% 0402 ≥ 2.2μF   |  |        |  |
|   |                     |  |              |        | ---  |  |        |  |
|   |                     |  | 4V           | ≤ 15%  | ---  |  |        |  |
|   |                     |  |              |        | ---  |  |        |  |
|   |                     |  |              |        | ---  |  |        |  |
|   |                     |  |              |        |  | X7S:   |        |  |
|   |                     |  |              |        |  | Rated vol.   | D.F. ≤ | Exception of D.F. ≤  |
|   |                     |  |              |        |  | ≥ 100V   | ≤ 2.5% | ≤ 3% 1206 ≥ 0.47μF<br>≤ 5% 0603 ≥ 0.068μF; 0805 > 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF<br>≤ 10% 0805 > 0.22μF; 1210 ≥ 3.3μF |
|   |                     |  |              |        |  | 50V  | ≤ 2.5% | ≤ 3% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF<br>≤ 5% 0201 ≥ 0.01μF; 1210 ≥ 3.3μF                       |
|   |                     |  |              |        |  |  |        | ≤ 10% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 ≥ 1μF;<br>1206 ≥ 2.2μF; 1210 ≥ 10μF   |
|   |                     |  |              |        |  |  |        | ≤ 3.5% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF   |
|   |                     |  |              |        |  | 25V  | ≤ 3.5% | ≤ 5% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF<br>≤ 7% 0603 ≥ 0.33μF  |
| ≤ 10% 0201 ≥ 0.1μF; 0402 ≥ 0.10μF; 0603 ≥ 0.47μF;<br>0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF<br>≤ 12.5% 0402 ≥ 0.47μF |                     |  |              |        |  |  |        |  |
| ≤ 5% 0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF;<br>0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF                       |                     |  |              |        |  |  |        |  |
| 16V   | ≤ 3.5%              | ≤ 10% 0201 ≥ 0.1μF; 0402 ≥ 0.22μF;<br>0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF<br>≤ 10% 0201 ≥ 0.1μF; 0402 ≥ 0.22μF;<br>0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF<br>≤ 15% 0201 ≥ 0.1μF; 0402 ≥ 1μF |              |        |  |  |        |  |
|   |                     | ≤ 10% 0201 ≥ 0.012μF; 0402 ≥ 0.22μF;<br>0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF<br>≤ 15% 0201 ≥ 0.1μF; 0402 ≥ 1μF   |              |        |  |  |        |  |
|   |                     | ≤ 15% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF;<br>0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF<br>≤ 20% 0402 ≥ 2.2μF  |              |        |  |  |        |  |
| 10V   | ≤ 5%                | ≤ 10% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF;<br>0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF<br>≤ 20% 0402 ≥ 2.2μF  |              |        |  |  |        |  |
|   |                     | ≤ 15% 0201 ≥ 0.1μF; 0402 ≥ 1μF   |              |        |  |  |        |  |
|   |                     | ≤ 15% 0201 ≥ 0.1μF; 0402 ≥ 1μF   |              |        |  |  |        |  |
| 6.3V  | ≤ 10%               | ≤ 15% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF;<br>0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF<br>≤ 20% 0402 ≥ 2.2μF  |              |        |  |  |        |  |
|   |                     | ≤ 20% 0402 ≥ 2.2μF   |              |        |  |  |        |  |
|   |                     | ---  |              |        |  |  |        |  |
| 4V  | ≤ 15%               | ---  |              |        |  |  |        |  |
|   |                     | ---  |              |        |  |  |        |  |
|   |                     | ---  |              |        |  |  |        |  |
| 4.  | Dielectric Strength | * To apply voltage (≤100V) 250%.<br>* Duration: 1 to 5 sec.<br>* Charge and discharge current less than 50mA.  |              |        |  | * No evidence of damage or flash over during test. |        |  |

\* "Room condition" Temperature: 15 to 35°C, Relative humidity: 25 to 75%, Atmospheric pressure: 86 to 106kPa.

Multilayer Ceramic Capacitors

| No  | Item   | Test Condition   | Requirements   |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
|---|--|--|--|----------------|-----------------------|--------------------|---|---|---|--|--|---|-----------------------|-------------|---------------|-----------------------|------------------------------|---------------|------------------|--|----------------|--|---------------------------------------|---|---|--------------------------------------|-----|-------------------|-----|------------------|-------|------|------------------|--------------|------------------|----------------------|--|----------------|--|--|------|------|-------------|-------------|---|---------------------|---|-----------------|----------------|--|------|-----------|--------------|--------------|---|----------------------|
| 5.  | Insulation Resistance  | *Test temp.: Room Temperature.<br>*To apply rated voltage for MAX. 120sec.   | 10GΩ or RxC ≥ 500Ω-F whichever is smaller.<br>Class II (X7R, X7E, X5R,X6S,X7S,Y5V):  |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
|   |  |  | <table border="1"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: All X7R</td> <td rowspan="6">10GΩ or RxC ≥ 100 Ω-F whichever is smaller.</td> </tr> <tr> <td>50V:0402&gt;0.01μF;0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td> </tr> <tr> <td>35V:0805≥2.2μF;1206 ≥ 2.2μF;1210 ≥ 10μF</td> </tr> <tr> <td>25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF;1206≥10μF;1210≥10μF</td> </tr> <tr> <td>16V: 0201≥0.1μF,0402≥0.22μF;0603≥1μF;0805≥2.2μF;1206≥4.7μF;1210≥47μF</td> </tr> <tr> <td>10V:0201≥47nF;0402≥0.47μF;0603≥0.47μF;0805≥2.2μF;1206≥4.7μF;1210≥47μF</td> </tr> <tr> <td>6.3V ; 4V ; Size≥1812</td> <td></td> </tr> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> <tr> <td>All X6S items, All X7S items</td> <td rowspan="7">RxC ≥ 50 Ω-F.</td> </tr> <tr> <td>100V: 1210≥3.3μF</td> </tr> <tr> <td>50V: 0402≥0.1μF; 0603≥2.2μF; 0805≥10μF;1206≥10μF</td> </tr> <tr> <td>35V: 0603≥1μF;</td> </tr> <tr> <td>25V: 0201≥0.1μF; 0402≥2.2μF;0603≥10μF; 0805≥10μF;1206≥22μF</td> </tr> <tr> <td>16V: 0603≥10μF; 0402≥1μF; 0201≥0.22μF</td> </tr> <tr> <td>10V: 0201&gt;0.1μF; 0402≥1μF; 0603≥10μF; 0805≥47μF</td> </tr> <tr> <td>6.3V:0201≥0.1μF; 0402≥1μF; 0603&gt;4.7μF; 0805≥47μF; 1206≥10μF</td> </tr> <tr> <td>4V: 0603≥22μF; 0805≥47μF; 1206≥100μF</td> <td></td> </tr> </tbody> </table> | Rated voltage  | Insulation Resistance | 100V: All X7R      | 10GΩ or RxC ≥ 100 Ω-F whichever is smaller. | 50V:0402>0.01μF;0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF | 35V:0805≥2.2μF;1206 ≥ 2.2μF;1210 ≥ 10μF | 25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF;1206≥10μF;1210≥10μF | 16V: 0201≥0.1μF,0402≥0.22μF;0603≥1μF;0805≥2.2μF;1206≥4.7μF;1210≥47μF | 10V:0201≥47nF;0402≥0.47μF;0603≥0.47μF;0805≥2.2μF;1206≥4.7μF;1210≥47μF | 6.3V ; 4V ; Size≥1812 |             | Rated voltage | Insulation Resistance | All X6S items, All X7S items | RxC ≥ 50 Ω-F. | 100V: 1210≥3.3μF | 50V: 0402≥0.1μF; 0603≥2.2μF; 0805≥10μF;1206≥10μF | 35V: 0603≥1μF; | 25V: 0201≥0.1μF; 0402≥2.2μF;0603≥10μF; 0805≥10μF;1206≥22μF | 16V: 0603≥10μF; 0402≥1μF; 0201≥0.22μF | 10V: 0201>0.1μF; 0402≥1μF; 0603≥10μF; 0805≥47μF | 6.3V:0201≥0.1μF; 0402≥1μF; 0603>4.7μF; 0805≥47μF; 1206≥10μF | 4V: 0603≥22μF; 0805≥47μF; 1206≥100μF |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
| Rated voltage   | Insulation Resistance  |  |  |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
| 100V: All X7R   | 10GΩ or RxC ≥ 100 Ω-F whichever is smaller.                                |  |  |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
| 50V:0402>0.01μF;0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF                           |  |  |  |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
| 35V:0805≥2.2μF;1206 ≥ 2.2μF;1210 ≥ 10μF   |  |  |  |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
| 25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF;1206≥10μF;1210≥10μF                            |  |  |  |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
| 16V: 0201≥0.1μF,0402≥0.22μF;0603≥1μF;0805≥2.2μF;1206≥4.7μF;1210≥47μF              |  |  |  |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
| 10V:0201≥47nF;0402≥0.47μF;0603≥0.47μF;0805≥2.2μF;1206≥4.7μF;1210≥47μF             |  |  |  |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
| 6.3V ; 4V ; Size≥1812   |  |  |  |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
| Rated voltage   | Insulation Resistance  |  |  |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
| All X6S items, All X7S items  | RxC ≥ 50 Ω-F.  |  |  |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
| 100V: 1210≥3.3μF  |  |  |  |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
| 50V: 0402≥0.1μF; 0603≥2.2μF; 0805≥10μF;1206≥10μF                                  |  |  |  |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
| 35V: 0603≥1μF;  |  |  |  |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
| 25V: 0201≥0.1μF; 0402≥2.2μF;0603≥10μF; 0805≥10μF;1206≥22μF                        |  |  |  |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
| 16V: 0603≥10μF; 0402≥1μF; 0201≥0.22μF   |  |  |  |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
| 10V: 0201>0.1μF; 0402≥1μF; 0603≥10μF; 0805≥47μF                                   |  |  |  |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
| 6.3V:0201≥0.1μF; 0402≥1μF; 0603>4.7μF; 0805≥47μF; 1206≥10μF                       |  |  |  |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
| 4V: 0603≥22μF; 0805≥47μF; 1206≥100μF  |  |  |  |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
| 6.  | Temperature Coefficient  | With no electrical load.   |  |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
|   |  | <table border="1"> <thead> <tr> <th>T.C.</th> <th>Operating Temp</th> <th>T.C.</th> <th>Capacitance Change</th> </tr> </thead> <tbody> <tr> <td>NPO</td> <td>-55~125°C at 25°C</td> <td>NPO</td> <td>Within ±30ppm/°C</td> </tr> <tr> <td>X7R</td> <td>-55~125°C at 25°C</td> <td>X7R</td> <td>Within ±15%</td> </tr> <tr> <td>X7S</td> <td>-55 ~ 125°C at 25°C</td> <td>X7S</td> <td>Within ±22%</td> </tr> <tr> <td>X5R</td> <td>-55~ 85°C at 25°C</td> <td>X5R</td> <td>Within ±15%</td> </tr> <tr> <td>X6S</td> <td>-55~105°C at 25°C</td> <td>X6S</td> <td>Within ±22%</td> </tr> <tr> <td>Y5V</td> <td>-25~ 85°C at 20°C</td> <td>Y5V</td> <td>Within +30%/-80%</td> </tr> </tbody> </table> <p>* Before initial measurement (Class II only):<br/>To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.<br/>* Measurement voltage for Class II:</p> <table border="1"> <thead> <tr> <th>01005</th> <th>0201</th> </tr> </thead> <tbody> <tr> <td>Cap≤0.01μF: 0.5V</td> <td>Cap&lt;0.1μF:1V</td> </tr> <tr> <td>Cap&gt;0.01μF: 0.2V</td> <td>0.1μF≤Cap&lt;1μF: 0.2V*</td> </tr> <tr> <td></td> <td>Cap≥1μF: 0.1V*</td> </tr> <tr> <td>*0201X104/6.3V~25V: 0.5V<br/>0201X224/10V: 0.5V</td> <td>*0201S104/6.3V~16V: 0.3V<br/>0201S224/6.3V: 0.3V<br/>0201X105/6.3V&amp;10V: 0.3V</td> </tr> <tr> <th>0402</th> <th>0603</th> </tr> <tr> <td>Cap&lt;1μF: 1V</td> <td>Cap&lt;1μF: 1V</td> </tr> <tr> <td>Cap=1μF: 0.5V**<br/>0402B224-16V: 0.5V<br/>0402B474-10V: 0.5V<br/>0402X475M6R3: 0.5V</td> <td>1μF≤Cap≤4.7μF: 0.5V</td> </tr> <tr> <td>1μF&lt;Cap&lt;10μF: 0.2V<br/>**0402B105M6R3V: 0.2V</td> <td>Cap&gt;4.7μF: 0.2V</td> </tr> <tr> <td>Cap≥10μF: 0.1V</td> <td></td> </tr> <tr> <th>0805</th> <th>1206/1210</th> </tr> <tr> <td>Cap&lt;10μF: 1V</td> <td>Cap≤10μF: 1V</td> </tr> <tr> <td>Cap=10μF: 0.5V<br/>0805B475/6.3V~25V: 0.5V</td> <td>10μF&lt;Cap≤100μF: 0.5V</td> </tr> <tr> <td>Cap&gt;10μF: 0.2V</td> <td>Cap&gt;100μF: 0.2V</td> </tr> </tbody> </table> | T.C.   | Operating Temp | T.C.                  | Capacitance Change | NPO   | -55~125°C at 25°C                                       | NPO                                     | Within ±30ppm/°C                                       | X7R  | -55~125°C at 25°C   | X7R                   | Within ±15% | X7S           | -55 ~ 125°C at 25°C   | X7S                          | Within ±22%   | X5R              | -55~ 85°C at 25°C                                | X5R            | Within ±15%  | X6S                                   | -55~105°C at 25°C                               | X6S   | Within ±22%                          | Y5V | -25~ 85°C at 20°C | Y5V | Within +30%/-80% | 01005 | 0201 | Cap≤0.01μF: 0.5V | Cap<0.1μF:1V | Cap>0.01μF: 0.2V | 0.1μF≤Cap<1μF: 0.2V* |  | Cap≥1μF: 0.1V* | *0201X104/6.3V~25V: 0.5V<br>0201X224/10V: 0.5V | *0201S104/6.3V~16V: 0.3V<br>0201S224/6.3V: 0.3V<br>0201X105/6.3V&10V: 0.3V | 0402 | 0603 | Cap<1μF: 1V | Cap<1μF: 1V | Cap=1μF: 0.5V**<br>0402B224-16V: 0.5V<br>0402B474-10V: 0.5V<br>0402X475M6R3: 0.5V | 1μF≤Cap≤4.7μF: 0.5V | 1μF<Cap<10μF: 0.2V<br>**0402B105M6R3V: 0.2V | Cap>4.7μF: 0.2V | Cap≥10μF: 0.1V |  | 0805 | 1206/1210 | Cap<10μF: 1V | Cap≤10μF: 1V | Cap=10μF: 0.5V<br>0805B475/6.3V~25V: 0.5V | 10μF<Cap≤100μF: 0.5V |
| T.C.  | Operating Temp   | T.C.   | Capacitance Change   |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
| NPO   | -55~125°C at 25°C  | NPO  | Within ±30ppm/°C   |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
| X7R   | -55~125°C at 25°C  | X7R  | Within ±15%  |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
| X7S   | -55 ~ 125°C at 25°C  | X7S  | Within ±22%  |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
| X5R   | -55~ 85°C at 25°C  | X5R  | Within ±15%  |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
| X6S   | -55~105°C at 25°C  | X6S  | Within ±22%  |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
| Y5V   | -25~ 85°C at 20°C  | Y5V  | Within +30%/-80%   |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
| 01005   | 0201   |  |  |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
| Cap≤0.01μF: 0.5V  | Cap<0.1μF:1V   |  |  |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
| Cap>0.01μF: 0.2V  | 0.1μF≤Cap<1μF: 0.2V*   |  |  |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
|   | Cap≥1μF: 0.1V*   |  |  |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
| *0201X104/6.3V~25V: 0.5V<br>0201X224/10V: 0.5V                                    | *0201S104/6.3V~16V: 0.3V<br>0201S224/6.3V: 0.3V<br>0201X105/6.3V&10V: 0.3V |  |  |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
| 0402  | 0603   |  |  |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
| Cap<1μF: 1V   | Cap<1μF: 1V  |  |  |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
| Cap=1μF: 0.5V**<br>0402B224-16V: 0.5V<br>0402B474-10V: 0.5V<br>0402X475M6R3: 0.5V | 1μF≤Cap≤4.7μF: 0.5V  |  |  |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
| 1μF<Cap<10μF: 0.2V<br>**0402B105M6R3V: 0.2V                                       | Cap>4.7μF: 0.2V  |  |  |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
| Cap≥10μF: 0.1V  |  |  |  |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
| 0805  | 1206/1210  |  |  |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
| Cap<10μF: 1V  | Cap≤10μF: 1V   |  |  |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
| Cap=10μF: 0.5V<br>0805B475/6.3V~25V: 0.5V   | 10μF<Cap≤100μF: 0.5V   |  |  |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |
| Cap>10μF: 0.2V  | Cap>100μF: 0.2V  |  |  |                |                       |                    |   |   |   |  |  |   |                       |             |               |                       |                              |               |                  |  |                |  |                                       |   |   |                                      |     |                   |     |                  |       |      |                  |              |                  |                      |  |                |  |  |      |      |             |             |   |                     |   |                 |                |  |      |           |              |              |   |                      |

\* "Room condition" Temperature: 15 to 35°C, Relative humidity: 25 to 75%, Atmospheric pressure: 86 to 106kPa.

Multilayer Ceramic Capacitors

| No.  | Item                                    | Test Condition  | Requirements  |            |             |   |                            |      |   |            |     |   |                            |      |   |            |     |   |
|------|---|---|---|------------|-------------|---|----------------------------|------|---|------------|-----|---|----------------------------|------|---|------------|-----|---|
| 7.   | <b>Adhesive Strength of Termination</b> | * Pressurizing force :<br>2N (0201) and 5N (≤0603) and 10N (>0603)<br>* Test time: 10±1 sec.  | * No remarkable damage or removal of the terminations.  |            |             |   |                            |      |   |            |     |   |                            |      |   |            |     |   |
| 8.   | <b>Vibration Resistance</b>             | * Vibration frequency: 10~55 Hz/min.<br>* Total amplitude: 1.5mm<br>* Test time: 6 hrs. (Two hrs each in three mutually perpendicular directions.)<br>* Before initial measurement (Class II only):<br>To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.<br>* Cap./DF(Q) Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.  | * No remarkable damage.<br>* Cap change and Q/D.F.: To meet initial spec.   |            |             |   |                            |      |   |            |     |   |                            |      |   |            |     |   |
| 9.   | <b>Solderability</b>                    | * Solder temperature: 235±5°C<br>* Dipping time: 2±0.5 sec.   | 95% min. coverage of all metalized area.  |            |             |   |                            |      |   |            |     |   |                            |      |   |            |     |   |
| 10.  | <b>Bending Test</b>                     | * The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1 mm per second until the deflection becomes 1 mm and then the pressure shall be maintained for 5±1 sec.<br>* Before initial measurement (Class II only):<br>To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.<br>* Measurement to be made after keeping at room temp. for 24±2 hrs.   | * No remarkable damage.<br>* Cap change :<br>NP0: within ±5% or 0.5pF whichever is larger<br>X7R, X5R, X6S, X7S: within ±12.5%<br>Y5V: within ±30%<br>(This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.) |            |             |   |                            |      |   |            |     |   |                            |      |   |            |     |   |
| 11.  | <b>Resistance to Soldering Heat</b>     | * Solder temperature: 260±5°C<br>* Dipping time: 10±1 sec<br>* Preheating: 120 to 150°C for 1 minute before immerse the capacitor in a eutectic solder.<br>* Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.<br>* Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.   | * No remarkable damage.<br>* Cap change:<br>NP0: within ±2.5% or 0.25pF whichever is larger<br>X7R, X5R, X6S, X7S: within ±7.5%<br>Y5V: within ±20%<br>* Q/D.F., I.R. and dielectric strength: To meet initial requirements.<br>* 25% max. leaching on each edge.                                   |            |             |   |                            |      |   |            |     |   |                            |      |   |            |     |   |
| 12.  | <b>Temperature Cycle</b>                | * Conduct the five cycles according to the temperatures and time. <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Step</th> <th>Temp. (°C)</th> <th>Time (min.)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Min. operating temp. +0/-3</td> <td>30±3</td> </tr> <tr> <td>2</td> <td>Room temp.</td> <td>2~3</td> </tr> <tr> <td>3</td> <td>Max. operating temp. +3/-0</td> <td>30±3</td> </tr> <tr> <td>4</td> <td>Room temp.</td> <td>2~3</td> </tr> </tbody> </table> * Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.<br>* Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. | Step  | Temp. (°C) | Time (min.) | 1 | Min. operating temp. +0/-3 | 30±3 | 2 | Room temp. | 2~3 | 3 | Max. operating temp. +3/-0 | 30±3 | 4 | Room temp. | 2~3 | * No remarkable damage.<br>* Cap change :<br>NP0: within ±2.5% or 0.25pF whichever is larger<br>X7R, X5R, X6S, X7S: within ±7.5%<br>Y5V: within ±20%<br>* Q/D.F., I.R. and dielectric strength: To meet initial requirements. |
| Step | Temp. (°C)                              | Time (min.)   |   |            |             |   |                            |      |   |            |     |   |                            |      |   |            |     |   |
| 1    | Min. operating temp. +0/-3              | 30±3  |   |            |             |   |                            |      |   |            |     |   |                            |      |   |            |     |   |
| 2    | Room temp.                              | 2~3   |   |            |             |   |                            |      |   |            |     |   |                            |      |   |            |     |   |
| 3    | Max. operating temp. +3/-0              | 30±3  |   |            |             |   |                            |      |   |            |     |   |                            |      |   |            |     |   |
| 4    | Room temp.                              | 2~3   |   |            |             |   |                            |      |   |            |     |   |                            |      |   |            |     |   |

\* "Room condition" Temperature: 15 to 35°C, Relative humidity: 25 to 75%, Atmospheric pressure: 86 to 106kPa.



Multilayer Ceramic Capacitors

| No. | Item  | Test Condition  | Requirements   |
|-----|---|---|--|
| 13. | Humidity (Damp Heat) Steady State   | *Test temp.: 40±2°C   | * No remarkable damage.  |
|     |   | *Humidity: 90~95%RH   | * Cap change:  |
|     |   | *Test time: 500+24/0hrs.  | NP0: within ±5% or 0.5pF whichever is larger                         |
|     |   | *Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. | X7R, X5R, X6S, X7S: ≥10V**, within ±12.5%; ≤6.3V within ±25%;        |
|     |   | * Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.    | **10V: 0603 ≥4.7µF; 0402 ≥1µF; 0201 ≥0.1µF, within ±25%;             |
|     |   |   | Y5V: ≥10V, within ±30%; ≤6.3V, within +30/-40%                       |
|     |   |   | * Q/D.F. value:  |
|     |   |   | NP0: More than 30pF Q≥350, 10pF≤C<30pF, Q≥275+2.5C                   |
|     |   |   | Less than 10pF Q≥200+10C   |
|     |   |   | X7R, X5R, X6S, X7S:  |
|     |   |   | Rated vol.   D.F. ≤   Exception of D.F. ≤                            |
|     |   |   | 100V   ≤3%   ≤6% 1206 ≥0.47µF  |
|     |   |   | 50V   ≤3%   ≤7.5% 0603 ≥0.068µF; 0805 >0.1µF; 1206 ≥1µF; 1210 ≥2.2µF |
|     |   |   | 35V   ≤5%   ≤20% 0805 >0.22µF; 1210 ≥3.3µF                           |
|     |   |   | 25V   ≤5%   ≤6% 0201(50V); 0603 ≥0.047µF; 0805 ≥0.18µF; 1206 ≥0.47µF |
|     | 16V   ≤5%   ≤10% 0201 ≥0.01µF; 1210 ≥3.3µF  |   |  |
|     | 10V   ≤7.5%   ≤20% 0402 ≥0.012µF; 0603 >0.1µF; 0805 ≥1µF (0805/X7R >0.47µF); 1206 ≥2.2µF; 1210 ≥10µF; |   |  |
|     | 6.3V   ≤15%   ≤30% 0603 ≥1µF; 0805 ≥2.2µF; 1206 ≥2.2µF; 1210 ≥10µF                                    |   |  |
|     | 4V   ≤20%   ---   ---   |   |  |
|     | Y5V:  |   |  |
|     | Rated vol.   D.F. ≤   Exception of D.F. ≤   |   |  |
|     | ≥50V   ≤7.5%   ≤10% 0603 ≥0.1µF; 0805 ≥0.47µF; 1206 ≥4.7µF  |   |  |
|     | 35V   ≤10%   ---   ---  |   |  |
|     | 25V   ≤7.5%   ≤10% 0402 ≥0.047µF; 0603 ≥0.1µF; 0805 ≥0.33µF; 1206 ≥1µF; 1210 ≥4.7µF                   |   |  |
|     | 16V (C<1.0µF)   ≤10%   ≤15% 0402 ≥0.068µF; 0603 ≥0.47µF; 1206 ≥4.7µF; 1210 ≥22µF                      |   |  |
|     | 16V (C≥1.0µF)   ≤12.5%   ≤20% 0402 ≥0.068µF; 0603 ≥0.68µF   |   |  |
|     | 10V   ≤20%   ≤30% 0402 ≥0.22µF  |   |  |
|     | 6.3V   ≤30%   ---   ---   |   |  |
|     | *I.R.: ≥10V, 1GΩ or 50 Ω-F whichever is smaller.  |   |  |
|     | Class II (X7R, X5R, X6S, X7S, Y5V)  |   |  |
|     | Rated voltage   Insulation Resistance   |   |  |
|     | 100V: All X7R; 1210 ≥3.3µF  | 1GΩ or RxC ≥ 10 Ω-F whichever is smaller.   |  |
|     | 50V: 0402 >0.01µF; 0603 ≥1µF; 0805 ≥1µF; 1206 ≥4.7µF; 1210 ≥4.7µF                                     |   |  |
|     | 35V: 0603 ≥1µF; 0805 ≥2.2µF; 1206 ≥2.2µF; 1210 ≥10µF  |   |  |
|     | 25V: 0201 ≥0.1µF; 0402 ≥0.22µF; 0603 ≥2.2µF; 0805 ≥2.2µF; 1206 ≥10µF; 1210 ≥10µF                      |   |  |
|     | 16V: 0201 ≥0.1µF; 0402 ≥0.22µF; 0603 ≥1µF; 0805 ≥2.2µF; 1206 ≥10µF; 1210 ≥47µF                        |   |  |
|     | 10V: 0201 ≥47nF; 0402 ≥0.47µF; 0603 ≥0.47µF; 0805 ≥2.2µF; 1206 ≥4.7µF; 1210 ≥47µF                     |   |  |
|     | 6.3V; 4V; All X6S/X7S items; Size ≥1812   |   |  |

\* "Room condition" Temperature: 15 to 35°C, Relative humidity: 25 to 75%, Atmospheric pressure: 86 to 106kPa.

Multilayer Ceramic Capacitors

| No | Item  | Test Condition  | Requirements  |
|----|---|---|---|
| 14 | Humidity (Damp Heat) Load   | *Test temp. : 40±2°C  | * No remarkable damage.   |
|    |   | *Humidity : 90-95%RH  | Cap change:   |
|    |   | *Test time : 500+24/-0 hrs.   | NP0: ±7.5% or 0.75pF whichever is larger.                           |
|    |   | *To apply voltage :   | X7R, X5R, X6S, X7S: ≥10V**, within ±12.5%; ≤ 6.3V within ±25%;      |
|    |   | Rated voltage (MAX. 500V)   | **10V: 0603 ≥ 4.7μF; 0402 ≥ 1μF; 0201 ≥ 0.1μF, within ±25%;         |
|    |   | *Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. | Y5V: ≥10V, within ±30%; ≤ 6.3V, within +30/-40%                     |
|    |   | * Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.    | Q/D.F. value:   |
|    |   |   | NP0: C≥30pF, Q≥200; C<30pF, Q≥100+10/3C                             |
|    |   |   | X7R, X5R, X6S, X7S:   |
|    |   |   | Rated vol. D.F. ≤ Exception of D.F. ≤                               |
|    |   |   | ≥100V ≤3% ≤6% 1206 ≥ 0.47μF   |
|    |   |   | ≤7.5% 0603 ≥ 0.068μF; 0805 > 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF        |
|    |   |   | ≤20% 0805 > 0.22μF; 1210 ≥ 3.3μF                                    |
|    |   |   | 50V ≤3% ≤6% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF |
|    | ≤10% 0201 ≥ 0.01μF; 1210 ≥ 3.3μF  |   |   |
|    | ≤20% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 ≥ 1μF (0805/X7R > 0.47μF); 1206 ≥ 2.2μF; 1210 ≥ 10μF;                   |   |   |
|    | 35V ≤5% ≤20% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF  |   |   |
|    | ≤10% 0201 ≥ 0.01μF (0201/X5R = 0.01μF); 0805 ≥ 1μF; 1210 ≥ 10μF*  |   |   |
|    | ≤14% 0603 ≥ 0.33μF  |   |   |
|    | 25V ≤5% ≤15% 0201 ≥ 0.1μF (0201/X5R > 0.01μF); 0603 ≥ 0.47μF; TTseries  |   |   |
|    | 0402 ≥ 0.10μF (0402/X7R ≥ 0.056μF); 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF (1210/X5R ≥ 10μF)*;                 |   |   |
|    | ≤20% 0402 ≥ 0.47μF  |   |   |
|    | 16V ≤5% ≤10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF   |   |   |
|    | ≤15% 0201 ≥ 0.01μF (0201/X7R ≥ 0.022μF); 0402 ≥ 0.033μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF |   |   |
|    | 10V ≤7.5% ≤15% 0201 ≥ 0.012μF; 0402 ≥ 0.22μF;   |   |   |
|    | 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF  |   |   |
|    | ≤20% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603/X5R ≥ 10μF; 01R5/X5R  |   |   |
|    | 6.3V ≤15% ≤30% 0201 ≥ 0.1μF; 0402 ≥ 1μF (0402/X6S ≥ 0.47μF);  |   |   |
|    | 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF  |   |   |
|    | 4V ≤20% --- ---   |   |   |
|    | Y5V:  |   |   |
|    | Rated vol. D.F. ≤ Exception of D.F. ≤   |   |   |
|    | ≥50V ≤7.5% ≤10% 0603 ≥ 0.1μF; 0805 ≥ 0.47μF; 1206 ≥ 4.7μF   |   |   |
|    | ≤20% 1210 ≥ 6.8μF   |   |   |
|    | 35V ≤10% --- ---  |   |   |
|    | 25V ≤7.5% ≤10% 0402 ≥ 0.047μF; 0603 ≥ 0.1μF;  |   |   |
|    | 0805 ≥ 0.33μF; 1206 ≥ 1μF; 1210 ≥ 4.7μF   |   |   |
|    | ≤15% 0402 ≥ 0.068μF; 0603 ≥ 0.47μF;   |   |   |
|    | 1206 ≥ 4.7μF; 1210 ≥ 22μF   |   |   |
|    | 16V (C<1.0μF) ≤10% ≤12.5% 0402 ≥ 0.068μF; 0603 ≥ 0.68μF   |   |   |
|    | ≤20% 0402 ≥ 0.22μF  |   |   |
|    | 16V (C ≥ 1.0μF) ≤12.5% ≤20% 0603 ≥ 2.2μF; 0805 ≥ 3.3μF;   |   |   |
|    | 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF   |   |   |
|    | 10V ≤20% ≤30% 0402 ≥ 0.47μF   |   |   |
|    | 6.3V ≤30% --- ---   |   |   |
|    | I.R.: ≥10V, 500MΩ or 25 Ω-F whichever is smaller.   |   |   |
|    | Class II (X7R, X5R, X6S, X7S, Y5V)  |   |   |
|    | Rated voltage Insulation Resistance   |   |   |
|    | 100V: All X7R; 1210 ≥ 3.3μF   | 500MΩ or RxC ≥ 5 Ω-F whichever is smaller.  |   |
|    | 50V: 0402 > 0.01μF; 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 4.7μF  |   |   |
|    | 35V: 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF  |   |   |
|    | 25V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 2.2μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 10μF                          |   |   |
|    | 16V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF                            |   |   |
|    | 10V: 0201 ≥ 47nF; 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF                         |   |   |
|    | 6.3V ; 4V ; All X6S/X7S items; Size ≥ 1812  |   |   |

\* "Room condition" Temperature: 15 to 35°C, Relative humidity: 25 to 75%, Atmospheric pressure: 86 to 106kPa.

Multilayer Ceramic Capacitors

| No   | Item  | Test Condition  | Requirements  |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|--|---|---|---|-----------------------------|---|--|--|--|--|---|--|--|-------|-----------------------------|--------|------------|----------|---|------------|-----------------------------|-----------|---|------------|-------------|-----------|---|--|--|-------|---------------|---------------------|----------|-----------|--|-------|---|-------|---------------------|------|------------|-------|--|-------|---|-------|--------------------------------|-----------|--------|-------|--|-----------|---|-----------|---|------|-----------|-------|-----------|------|---------------------|----------|-----------|----------------------|-------------------------|---|-----|-----|-----|-----|-----|---|
| 15.  | High Temperature Load (Endurance)   | Test temp. :<br>NP0, X7R/X7E/X7S: 125±3°C<br>X6S: 105±3°C<br>X5R, Y5V: 85±3°C<br>Test time: 1000+24/-0 hrs.<br>To apply voltage:<br>(1) 100% of rated voltage for below range.  | No remarkable damage.<br>Cap change:<br>NP0: ±3.0% or ±0.3pF whichever is larger<br>X7R, X5R, X6S, X7S: ≥10V**, within ±12.5%; ≤ 6.3V within ±25%;<br>**10V: 0603≥4.7µF;0402≥1µF;0201≥0.1µF, within ±25%<br>Y5V: ≥10V, within ±30%; ≤ 6.3V, within +30/-40% |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   | <table border="1"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated voltage</th> <th>Capacitance</th> </tr> </thead> <tbody> <tr> <td rowspan="2">0201</td> <td rowspan="2">X5R/X7R/<br/>X6S/X7S</td> <td>≤ 10V</td> <td>C ≥ 0.1µF</td> </tr> <tr> <td>≥ 16V</td> <td>C &gt; 0.1µF</td> </tr> <tr> <td rowspan="4">0402</td> <td rowspan="2">X5R</td> <td>≤ 16V</td> <td>C &gt; 1.0µF</td> </tr> <tr> <td>25V, 50V</td> <td>C ≥ 1.0µF</td> </tr> <tr> <td rowspan="2">X6S</td> <td>6.3V, 10V</td> <td>C &gt; 1.0µF</td> </tr> <tr> <td>16V, 25V</td> <td>C ≥ 1.0µF</td> </tr> <tr> <td>X7R/X7S/Y5V</td> <td>6.3V, 10V</td> <td>C ≥ 1.0µF</td> </tr> </tbody> </table>   | Size  | Dielectric                  | Rated voltage   | Capacitance  | 0201   | X5R/X7R/<br>X6S/X7S  | ≤ 10V  | C ≥ 0.1µF   | ≥ 16V                                      | C > 0.1µF  | 0402  | X5R                         | ≤ 16V  | C > 1.0µF  | 25V, 50V | C ≥ 1.0µF   | X6S        | 6.3V, 10V                   | C > 1.0µF | 16V, 25V  | C ≥ 1.0µF  | X7R/X7S/Y5V | 6.3V, 10V | C ≥ 1.0µF   | Q/D.F. value:<br>NP0: More than 30pF, Q≥350<br>10pF≤C<30pF, Q≥275+2.5C<br>Less than 10pF, Q≥200+10C<br>X7R, X5R, X6S, X7S: |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   | Size  | Dielectric  | Rated voltage               | Capacitance   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   | 0201  | X5R/X7R/<br>X6S/X7S   | ≤ 10V                       | C ≥ 0.1µF   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   |   |   | ≥ 16V                       | C > 0.1µF   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   | 0402  | X5R   | ≤ 16V                       | C > 1.0µF   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   |   |   | 25V, 50V                    | C ≥ 1.0µF   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   |   | X6S   | 6.3V, 10V                   | C > 1.0µF   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   |   |   | 16V, 25V                    | C ≥ 1.0µF   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   | X7R/X7S/Y5V   | 6.3V, 10V   | C ≥ 1.0µF                   |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   | <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">100V</td> <td rowspan="3">≤ 3%</td> <td>≤ 6%</td> <td>1206 ≥ 0.47µF</td> </tr> <tr> <td>≤ 7.5%</td> <td>0603 ≥ 0.068µF; 0805 &gt; 0.1µF; 1206 ≥ 1µF; 1210 ≥ 2.2µF</td> </tr> <tr> <td>≤ 20%</td> <td>0805 &gt; 0.22µF; 1210 ≥ 3.3µF</td> </tr> <tr> <td rowspan="3">50V</td> <td rowspan="3">≤ 3%</td> <td>≤ 6%</td> <td>0201(50V); 0603 ≥ 0.047µF; 0805 ≥ 0.18µF; 1206 ≥ 0.47µF</td> </tr> <tr> <td>≤ 10%</td> <td>0201 ≥ 0.01µF; 1210 ≥ 3.3µF</td> </tr> <tr> <td>≤ 20%</td> <td>0402 ≥ 0.012µF; 0603 &gt; 0.1µF; 0805 ≥ 1µF(0805/X7R &gt; 0.47µF); 1206 ≥ 2.2µF; 1210 ≥ 10µF;</td> </tr> <tr> <td rowspan="3">35V</td> <td rowspan="3">≤ 5%</td> <td>≤ 20%</td> <td>0603 ≥ 1µF; 0805 ≥ 2.2µF; 1206 ≥ 2.2µF; 1210 ≥ 10µF</td> </tr> <tr> <td>≤ 10%</td> <td>0201 ≥ 0.01µF(0201/X5R = 0.01µF); 0805 ≥ 1µF; 1210 ≥ 10µF*</td> </tr> <tr> <td>≤ 14%</td> <td>0603 ≥ 0.33µF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤ 5%</td> <td>≤ 10%</td> <td>0201 ≥ 0.1µF(0201/X5R &gt; 0.01µF); 0603 ≥ 0.47µF; TTseries</td> </tr> <tr> <td>≤ 15%</td> <td>0402 ≥ 0.10µF(0402/X7R ≥ 0.056µF); 0805 ≥ 2.2µF; 1206 ≥ 4.7µF; 1210 ≥ 22µF(1210/X5R ≥ 10µF)*;</td> </tr> <tr> <td>≤ 20%</td> <td>0402 ≥ 0.47µF</td> </tr> <tr> <td rowspan="3">16V</td> <td rowspan="3">≤ 5%</td> <td>≤ 10%</td> <td>0603 ≥ 0.15µF; 0805 ≥ 0.68µF; 1206 ≥ 2.2µF; 1210 ≥ 4.7µF</td> </tr> <tr> <td>≤ 15%</td> <td>0201 ≥ 0.01µF(0201/X7R ≥ 0.022µF); 0402 ≥ 0.033µF; 0603 &gt; 0.47µF; 0805 ≥ 2.2µF; 1206 ≥ 4.7µF; 1210 ≥ 22µF</td> </tr> <tr> <td>≤ 15%</td> <td>0201 ≥ 0.012µF; 0402 ≥ 0.22µF;</td> </tr> <tr> <td rowspan="3">10V</td> <td rowspan="3">≤ 7.5%</td> <td>≤ 15%</td> <td>0603 ≥ 0.33µF; 0805 ≥ 2.2µF; 1206 ≥ 2.2µF; 1210 ≥ 22µF</td> </tr> <tr> <td>≤ 20%</td> <td>0201 ≥ 0.1µF; 0402 ≥ 1µF; 0603/X5R ≥ 10µF; 01R5/X5R</td> </tr> <tr> <td>≤ 30%</td> <td>0201 ≥ 0.1µF; 0402 ≥ 1µF(0402/X6S ≥ 0.47µF); 0603 ≥ 10µF; 0805 ≥ 4.7µF; 1206 ≥ 47µF; 1210 ≥ 100µF</td> </tr> <tr> <td rowspan="3">6.3V</td> <td rowspan="3">≤ 15%</td> <td>≤ 30%</td> <td>---</td> </tr> <tr> <td>---</td> <td>---</td> </tr> <tr> <td>---</td> <td>---</td> </tr> <tr> <td rowspan="3">4V</td> <td rowspan="3">≤ 20%</td> <td>---</td> <td>---</td> </tr> <tr> <td>---</td> <td>---</td> </tr> <tr> <td>---</td> <td>---</td> </tr> </tbody> </table> | Rated vol.  | D.F. ≤                      | Exception of D.F. ≤   |  | 100V   | ≤ 3%   | ≤ 6%   | 1206 ≥ 0.47µF   | ≤ 7.5%                                     | 0603 ≥ 0.068µF; 0805 > 0.1µF; 1206 ≥ 1µF; 1210 ≥ 2.2µF | ≤ 20% | 0805 > 0.22µF; 1210 ≥ 3.3µF | 50V    | ≤ 3%       | ≤ 6%     | 0201(50V); 0603 ≥ 0.047µF; 0805 ≥ 0.18µF; 1206 ≥ 0.47µF | ≤ 10%      | 0201 ≥ 0.01µF; 1210 ≥ 3.3µF | ≤ 20%     | 0402 ≥ 0.012µF; 0603 > 0.1µF; 0805 ≥ 1µF(0805/X7R > 0.47µF); 1206 ≥ 2.2µF; 1210 ≥ 10µF; | 35V        | ≤ 5%        | ≤ 20%     | 0603 ≥ 1µF; 0805 ≥ 2.2µF; 1206 ≥ 2.2µF; 1210 ≥ 10µF | ≤ 10%  | 0201 ≥ 0.01µF(0201/X5R = 0.01µF); 0805 ≥ 1µF; 1210 ≥ 10µF* | ≤ 14% | 0603 ≥ 0.33µF | 25V                 | ≤ 5%     | ≤ 10%     | 0201 ≥ 0.1µF(0201/X5R > 0.01µF); 0603 ≥ 0.47µF; TTseries | ≤ 15% | 0402 ≥ 0.10µF(0402/X7R ≥ 0.056µF); 0805 ≥ 2.2µF; 1206 ≥ 4.7µF; 1210 ≥ 22µF(1210/X5R ≥ 10µF)*; | ≤ 20% | 0402 ≥ 0.47µF       | 16V  | ≤ 5%       | ≤ 10% | 0603 ≥ 0.15µF; 0805 ≥ 0.68µF; 1206 ≥ 2.2µF; 1210 ≥ 4.7µF | ≤ 15% | 0201 ≥ 0.01µF(0201/X7R ≥ 0.022µF); 0402 ≥ 0.033µF; 0603 > 0.47µF; 0805 ≥ 2.2µF; 1206 ≥ 4.7µF; 1210 ≥ 22µF | ≤ 15% | 0201 ≥ 0.012µF; 0402 ≥ 0.22µF; | 10V       | ≤ 7.5% | ≤ 15% | 0603 ≥ 0.33µF; 0805 ≥ 2.2µF; 1206 ≥ 2.2µF; 1210 ≥ 22µF | ≤ 20%     | 0201 ≥ 0.1µF; 0402 ≥ 1µF; 0603/X5R ≥ 10µF; 01R5/X5R | ≤ 30%     | 0201 ≥ 0.1µF; 0402 ≥ 1µF(0402/X6S ≥ 0.47µF); 0603 ≥ 10µF; 0805 ≥ 4.7µF; 1206 ≥ 47µF; 1210 ≥ 100µF | 6.3V | ≤ 15%     | ≤ 30% | ---       | ---  | ---                 | ---      | ---       | 4V                   | ≤ 20%                   | ---   | --- | --- | --- | --- | --- | Y5V:<br>Rated vol. D.F. ≤ Exception of D.F. ≤<br>≥ 50V ≤ 7.5% ≤ 10% 0603 ≥ 0.1µF; 0805 ≥ 0.47µF; 1206 ≥ 4.7µF<br>≤ 20% 1210 ≥ 6.8µF<br>35V ≤ 10% --- ---<br>25V ≤ 7.5% ≤ 10% 0402 ≥ 0.047µF; 0603 ≥ 0.1µF; 0805 ≥ 0.33µF; 1206 ≥ 1µF; 1210 ≥ 4.7µF<br>≤ 15% 0402 ≥ 0.068µF; 0603 ≥ 0.47µF; 1206 ≥ 4.7µF; 1210 ≥ 22µF<br>16V ≤ 10% ≤ 12.5% 0402 ≥ 0.068µF; 0603 ≥ 0.68µF<br>(C < 1.0µF) ≤ 20% 0402 ≥ 0.22µF<br>16V ≤ 12.5% ≤ 20% 0603 ≥ 2.2µF; 0805 ≥ 3.3µF; 1206 ≥ 10µF; 1210 ≥ 22µF; 1812 ≥ 47µF<br>(C ≥ 1.0µF) ≤ 20% 0402 ≥ 0.47µF<br>10V ≤ 20% ≤ 30% 0402 ≥ 0.47µF<br>6.3V ≤ 30% --- --- |
|  |   | Rated vol.  | D.F. ≤  | Exception of D.F. ≤         |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   | 100V  | ≤ 3%  | ≤ 6%                        | 1206 ≥ 0.47µF   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   |   |   | ≤ 7.5%                      | 0603 ≥ 0.068µF; 0805 > 0.1µF; 1206 ≥ 1µF; 1210 ≥ 2.2µF  |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   |   |   | ≤ 20%                       | 0805 > 0.22µF; 1210 ≥ 3.3µF   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   | 50V   | ≤ 3%  | ≤ 6%                        | 0201(50V); 0603 ≥ 0.047µF; 0805 ≥ 0.18µF; 1206 ≥ 0.47µF   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   |   |   | ≤ 10%                       | 0201 ≥ 0.01µF; 1210 ≥ 3.3µF   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   |   |   | ≤ 20%                       | 0402 ≥ 0.012µF; 0603 > 0.1µF; 0805 ≥ 1µF(0805/X7R > 0.47µF); 1206 ≥ 2.2µF; 1210 ≥ 10µF;                   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   | 35V   | ≤ 5%  | ≤ 20%                       | 0603 ≥ 1µF; 0805 ≥ 2.2µF; 1206 ≥ 2.2µF; 1210 ≥ 10µF   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   |   |   | ≤ 10%                       | 0201 ≥ 0.01µF(0201/X5R = 0.01µF); 0805 ≥ 1µF; 1210 ≥ 10µF*  |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   |   |   | ≤ 14%                       | 0603 ≥ 0.33µF   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   | 25V   | ≤ 5%  | ≤ 10%                       | 0201 ≥ 0.1µF(0201/X5R > 0.01µF); 0603 ≥ 0.47µF; TTseries  |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   |   |   | ≤ 15%                       | 0402 ≥ 0.10µF(0402/X7R ≥ 0.056µF); 0805 ≥ 2.2µF; 1206 ≥ 4.7µF; 1210 ≥ 22µF(1210/X5R ≥ 10µF)*;             |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   |   |   | ≤ 20%                       | 0402 ≥ 0.47µF   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   | 16V   | ≤ 5%  | ≤ 10%                       | 0603 ≥ 0.15µF; 0805 ≥ 0.68µF; 1206 ≥ 2.2µF; 1210 ≥ 4.7µF  |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   |   |   | ≤ 15%                       | 0201 ≥ 0.01µF(0201/X7R ≥ 0.022µF); 0402 ≥ 0.033µF; 0603 > 0.47µF; 0805 ≥ 2.2µF; 1206 ≥ 4.7µF; 1210 ≥ 22µF |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   |   |   | ≤ 15%                       | 0201 ≥ 0.012µF; 0402 ≥ 0.22µF;  |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   | 10V   | ≤ 7.5%  | ≤ 15%                       | 0603 ≥ 0.33µF; 0805 ≥ 2.2µF; 1206 ≥ 2.2µF; 1210 ≥ 22µF  |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   |   |   | ≤ 20%                       | 0201 ≥ 0.1µF; 0402 ≥ 1µF; 0603/X5R ≥ 10µF; 01R5/X5R   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   |   |   | ≤ 30%                       | 0201 ≥ 0.1µF; 0402 ≥ 1µF(0402/X6S ≥ 0.47µF); 0603 ≥ 10µF; 0805 ≥ 4.7µF; 1206 ≥ 47µF; 1210 ≥ 100µF         |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
| 6.3V   | ≤ 15%   | ≤ 30%   | ---   |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   | ---   | ---   |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   | ---   | ---   |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
| 4V   | ≤ 20%   | ---   | ---   |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   | ---   | ---   |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   | ---   | ---   |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
| <table border="1"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated voltage</th> <th>Capacitance</th> </tr> </thead> <tbody> <tr> <td rowspan="2">0201</td> <td rowspan="2">X5R/X6S</td> <td>16V, 25V</td> <td>C = 0.1µF</td> </tr> <tr> <td>16V</td> <td>C ≥ 0.022µF</td> </tr> <tr> <td rowspan="3">0402</td> <td rowspan="2">X7R/X5R/<br/>X6S</td> <td>50V</td> <td>C &gt; 0.01µF</td> </tr> <tr> <td>10-25V</td> <td>C ≥ 0.22µF</td> </tr> <tr> <td>Y5V</td> <td>16V</td> <td>C ≥ 0.47µF</td> </tr> <tr> <td rowspan="5">0603</td> <td rowspan="2">X7S</td> <td>50V-100V</td> <td>C &gt; 0.22µF</td> </tr> <tr> <td>50V</td> <td>C &gt; 0.1µF</td> </tr> <tr> <td rowspan="2">X7R</td> <td>25V</td> <td>C = 1.0µF</td> </tr> <tr> <td>50V</td> <td>C ≥ 1.0µF</td> </tr> <tr> <td>X5R/X7R/<br/>X6S/X7S</td> <td>10V, 16V</td> <td>C ≥ 1.0µF</td> </tr> <tr> <td>Y5V</td> <td>16V</td> <td>C ≥ 2.2µF</td> </tr> <tr> <td rowspan="4">0805</td> <td rowspan="3">X5R/X7R/<br/>X6S/X7S</td> <td>100V</td> <td>C ≥ 0.47µF</td> </tr> <tr> <td>50V</td> <td>C ≥ 0.68µF</td> </tr> <tr> <td>35V</td> <td>C ≥ 2.2µF</td> </tr> <tr> <td>Y5V</td> <td>10-25V</td> <td>C ≥ 4.7µF</td> </tr> <tr> <td rowspan="4">1206</td> <td rowspan="2">X7R</td> <td>100V</td> <td>C ≥ 1.0µF</td> </tr> <tr> <td>50V</td> <td>C ≥ 2.2µF</td> </tr> <tr> <td rowspan="2">X5R/X6S/<br/>X7S</td> <td>100V</td> <td>C &gt; 1.0µF</td> </tr> <tr> <td>50V</td> <td>C = 4.7µF</td> </tr> <tr> <td rowspan="2">1210</td> <td rowspan="2">X5R/X7R/<br/>X6S/X7S</td> <td>50V-100V</td> <td>C ≥ 2.2µF</td> </tr> <tr> <td>1825<br/>2220<br/>2225</td> <td>X7R 100V-250V C ≥ 1.0µF</td> </tr> </tbody> </table> | Size  | Dielectric  | Rated voltage   | Capacitance                 | 0201  | X5R/X6S  | 16V, 25V   | C = 0.1µF  | 16V  | C ≥ 0.022µF   | 0402                                       | X7R/X5R/<br>X6S  | 50V   | C > 0.01µF                  | 10-25V | C ≥ 0.22µF | Y5V      | 16V   | C ≥ 0.47µF | 0603                        | X7S       | 50V-100V  | C > 0.22µF | 50V         | C > 0.1µF | X7R   | 25V  | C = 1.0µF  | 50V   | C ≥ 1.0µF     | X5R/X7R/<br>X6S/X7S | 10V, 16V | C ≥ 1.0µF | Y5V  | 16V   | C ≥ 2.2µF   | 0805  | X5R/X7R/<br>X6S/X7S | 100V | C ≥ 0.47µF | 50V   | C ≥ 0.68µF   | 35V   | C ≥ 2.2µF   | Y5V   | 10-25V                         | C ≥ 4.7µF | 1206   | X7R   | 100V   | C ≥ 1.0µF | 50V   | C ≥ 2.2µF | X5R/X6S/<br>X7S   | 100V | C > 1.0µF | 50V   | C = 4.7µF | 1210 | X5R/X7R/<br>X6S/X7S | 50V-100V | C ≥ 2.2µF | 1825<br>2220<br>2225 | X7R 100V-250V C ≥ 1.0µF | Class II (X7R, X5R, X6S, X7S, Y5V)<br>I.R.: ≥10V, 1GΩ or 50 Ω-F whichever is smaller.<br>Class II (X7R, X5R, X6S, X7S, Y5V) |     |     |     |     |     |   |
| Size   | Dielectric  | Rated voltage   | Capacitance   |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
| 0201   | X5R/X6S   | 16V, 25V  | C = 0.1µF   |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   | 16V   | C ≥ 0.022µF   |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
| 0402   | X7R/X5R/<br>X6S   | 50V   | C > 0.01µF  |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   | 10-25V  | C ≥ 0.22µF  |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  | Y5V   | 16V   | C ≥ 0.47µF  |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
| 0603   | X7S   | 50V-100V  | C > 0.22µF  |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   | 50V   | C > 0.1µF   |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  | X7R   | 25V   | C = 1.0µF   |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   | 50V   | C ≥ 1.0µF   |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  | X5R/X7R/<br>X6S/X7S   | 10V, 16V  | C ≥ 1.0µF   |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
| Y5V  | 16V   | C ≥ 2.2µF   |   |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
| 0805   | X5R/X7R/<br>X6S/X7S   | 100V  | C ≥ 0.47µF  |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   | 50V   | C ≥ 0.68µF  |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   | 35V   | C ≥ 2.2µF   |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  | Y5V   | 10-25V  | C ≥ 4.7µF   |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
| 1206   | X7R   | 100V  | C ≥ 1.0µF   |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   | 50V   | C ≥ 2.2µF   |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  | X5R/X6S/<br>X7S   | 100V  | C > 1.0µF   |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   | 50V   | C = 4.7µF   |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
| 1210   | X5R/X7R/<br>X6S/X7S   | 50V-100V  | C ≥ 2.2µF   |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   | 1825<br>2220<br>2225  | X7R 100V-250V C ≥ 1.0µF   |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
| <p>(3) ≤ 6.3V or C ≥ 10µF : 150% of rated voltage.<br/>(4) 10V ≤ Ur &lt; 250V: 200% of rated voltage.<br/>(5) 500V: 150% of rated voltage.<br/>(6) Ur ≥ 630V: 120% of rated voltage<br/>* Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.<br/>* Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.<br/>* De-rating conditions:</p>  | <table border="1"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: All X7R; 1210 ≥ 3.3µF</td> <td rowspan="7">1GΩ or RxC ≥ 10 Ω-F whichever is smaller.</td> </tr> <tr> <td>50V: 0402 &gt; 0.01µF; 0603 ≥ 1µF; 0805 ≥ 1µF; 1206 ≥ 4.7µF; 1210 ≥ 4.7µF</td> </tr> <tr> <td>35V: 0603 ≥ 1µF; 0805 ≥ 2.2µF; 1206 ≥ 2.2µF; 1210 ≥ 10µF</td> </tr> <tr> <td>25V: 0201 ≥ 0.1µF; 0402 ≥ 0.22µF; 0603 ≥ 2.2µF; 0805 ≥ 2.2µF; 1206 ≥ 10µF; 1210 ≥ 10µF</td> </tr> <tr> <td>16V: 0201 ≥ 0.1µF; 0402 ≥ 0.22µF; 0603 ≥ 1µF; 0805 ≥ 2.2µF; 1206 ≥ 10µF; 1210 ≥ 47µF</td> </tr> <tr> <td>10V: 0201 ≥ 47nF; 0402 ≥ 0.47µF; 0603 ≥ 0.47µF; 0805 ≥ 2.2µF; 1206 ≥ 4.7µF; 1210 ≥ 47µF</td> </tr> <tr> <td>6.3V ; 4V ; All X6S/X7S items; Size ≥ 1812</td> </tr> </tbody> </table> | Rated voltage   | Insulation Resistance   | 100V: All X7R; 1210 ≥ 3.3µF | 1GΩ or RxC ≥ 10 Ω-F whichever is smaller.   | 50V: 0402 > 0.01µF; 0603 ≥ 1µF; 0805 ≥ 1µF; 1206 ≥ 4.7µF; 1210 ≥ 4.7µF | 35V: 0603 ≥ 1µF; 0805 ≥ 2.2µF; 1206 ≥ 2.2µF; 1210 ≥ 10µF | 25V: 0201 ≥ 0.1µF; 0402 ≥ 0.22µF; 0603 ≥ 2.2µF; 0805 ≥ 2.2µF; 1206 ≥ 10µF; 1210 ≥ 10µF | 16V: 0201 ≥ 0.1µF; 0402 ≥ 0.22µF; 0603 ≥ 1µF; 0805 ≥ 2.2µF; 1206 ≥ 10µF; 1210 ≥ 47µF | 10V: 0201 ≥ 47nF; 0402 ≥ 0.47µF; 0603 ≥ 0.47µF; 0805 ≥ 2.2µF; 1206 ≥ 4.7µF; 1210 ≥ 47µF | 6.3V ; 4V ; All X6S/X7S items; Size ≥ 1812 |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
| Rated voltage  | Insulation Resistance   |   |   |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
| 100V: All X7R; 1210 ≥ 3.3µF  | 1GΩ or RxC ≥ 10 Ω-F whichever is smaller.   |   |   |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
| 50V: 0402 > 0.01µF; 0603 ≥ 1µF; 0805 ≥ 1µF; 1206 ≥ 4.7µF; 1210 ≥ 4.7µF   |   |   |   |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
| 35V: 0603 ≥ 1µF; 0805 ≥ 2.2µF; 1206 ≥ 2.2µF; 1210 ≥ 10µF   |   |   |   |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
| 25V: 0201 ≥ 0.1µF; 0402 ≥ 0.22µF; 0603 ≥ 2.2µF; 0805 ≥ 2.2µF; 1206 ≥ 10µF; 1210 ≥ 10µF   |   |   |   |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
| 16V: 0201 ≥ 0.1µF; 0402 ≥ 0.22µF; 0603 ≥ 1µF; 0805 ≥ 2.2µF; 1206 ≥ 10µF; 1210 ≥ 47µF   |   |   |   |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
| 10V: 0201 ≥ 47nF; 0402 ≥ 0.47µF; 0603 ≥ 0.47µF; 0805 ≥ 2.2µF; 1206 ≥ 4.7µF; 1210 ≥ 47µF  |   |   |   |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
| 6.3V ; 4V ; All X6S/X7S items; Size ≥ 1812   |   |   |   |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |
|  |   |   |   |                             |   |  |  |  |  |   |  |  |       |                             |        |            |          |   |            |                             |           |   |            |             |           |   |  |  |       |               |                     |          |           |  |       |   |       |                     |      |            |       |  |       |   |       |                                |           |        |       |  |           |   |           |   |      |           |       |           |      |                     |          |           |                      |                         |   |     |     |     |     |     |   |

\* "Room condition" Temperature: 15 to 35°C, Relative humidity: 25 to 75%, Atmospheric pressure: 86 to 106kPa.

Multilayer Ceramic Capacitors

**APPENDIXES**

■ Tape & reel dimensions

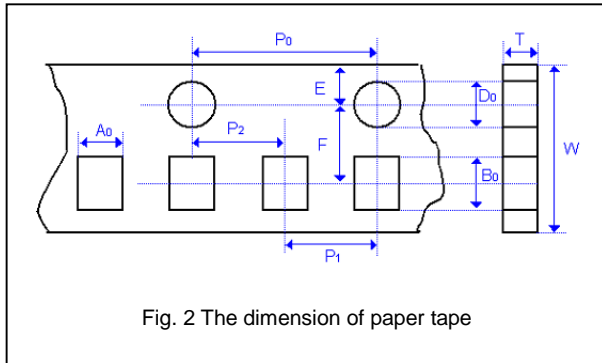


Fig. 2 The dimension of paper tape

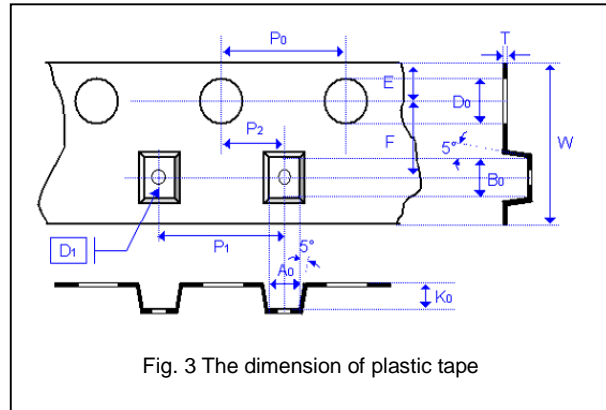


Fig. 3 The dimension of plastic tape

| Size                    | 0201             | 0402             | 0603             | 0805             |                  |                  | 1206             |                  |                  |                  | 1210             |                  |                  |                  | 1808             |                  | 1812             |                  |  |
|-------------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|--|
| Thickness               | L                | N,E              | S,H,X            | A,H              | B,T              | D,I              | B,T              | C,J,D            | G,P              | T                | C,D              | G,K              | M                | D,F              | G,K              | D,F              | G,K              | M,U              |  |
| <b>A<sub>0</sub></b>    | 0.40<br>+/-0.10  | 0.70<br>+/-0.20  | 1.05<br>+/-0.30  | 1.50<br>+/-0.20  | 1.50<br>+/-0.20  | < 1.80           | 1.90<br>+/-0.50  | < 2.00           | < 2.30           | < 3.05           | < 3.05           | < 3.05           | < 3.20           | < 2.50           | < 2.50           | < 3.90           | < 3.90           | < 3.90           |  |
| <b>B<sub>0</sub></b>    | 0.70<br>+/-0.10  | 1.20<br>+/-0.20  | 1.80<br>+/-0.30  | 2.30<br>+/-0.20  | 2.30<br>+/-0.20  | < 2.70           | 3.50<br>+/-0.50  | < 3.70           | < 4.00           | < 3.80           | < 3.80           | < 3.80           | < 4.00           | < 5.30           | < 5.30           | < 5.30           | < 5.30           | < 5.30           |  |
| <b>T</b>                | ≤ 0.55           | ≤ 0.80           | ≤ 1.20           | ≤ 1.15           | ≤ 1.20           | 0.23<br>+/-0.1   | ≤ 1.20           | 0.23<br>+/-0.1   | 0.23<br>+/-0.1   | 0.23<br>+/-0.1   | 0.23<br>+/-0.1   | 0.23<br>+/-0.1   | 0.23<br>+/-0.1   | 0.25<br>+/-0.1   | 0.25<br>+/-0.1   | 0.25<br>+/-0.1   | 0.25<br>+/-0.1   | 0.25<br>+/-0.1   |  |
| <b>K<sub>0</sub></b>    | -                | -                | -                | -                | -                | < 2.00           | -                | < 2.00           | < 2.50           | < 1.50           | < 2.00           | ≤ 2.50           | < 3.20           | < 2.00           | < 2.50           | < 2.00           | < 2.50           | < 3.50           |  |
| <b>W</b>                | 8.00<br>+/-0.30  | 8.00<br>+/-0.30  | 8.00<br>+/-0.30  | 8.00<br>+/-0.30  | 8.00<br>+/-0.30  | 8.00<br>+/-0.30  | 8.00<br>+/-0.30  | 8.00<br>+/-0.30  | 8.00<br>+/-0.30  | 8.00<br>+/-0.30  | 8.00<br>+/-0.30  | 8.00<br>+/-0.30  | 8.00<br>+/-0.30  | 12.00<br>+/-0.30 | 12.00<br>+/-0.30 | 12.00<br>+/-0.30 | 12.00<br>+/-0.30 | 12.00<br>+/-0.30 |  |
| <b>P<sub>0</sub></b>    | 4.00<br>+/-0.10  | 4.00<br>+/-0.10  | 4.00<br>+/-0.10  | 4.00<br>+/-0.10  | 4.00<br>+/-0.10  | 4.00<br>+/-0.10  | 4.00<br>+/-0.10  | 4.00<br>+/-0.10  | 4.00<br>+/-0.10  | 4.00<br>+/-0.10  | 4.00<br>+/-0.10  | 4.00<br>+/-0.10  | 4.00<br>+/-0.10  | 4.00<br>+/-0.10  | 4.00<br>+/-0.10  | 4.00<br>+/-0.10  | 4.00<br>+/-0.10  | 4.00<br>+/-0.10  |  |
| <b>10xP<sub>0</sub></b> | 40.00<br>+/-0.10 | 40.00<br>+/-0.10 | 40.00<br>+/-0.20 | 40.00<br>+/-0.20 | 40.00<br>+/-0.20 | 40.00<br>+/-0.20 | 40.00<br>+/-0.20 | 40.00<br>+/-0.20 | 40.00<br>+/-0.20 | 40.00<br>+/-0.20 | 40.00<br>+/-0.20 | 40.00<br>+/-0.20 | 40.00<br>+/-0.20 | 40.00<br>+/-0.20 | 40.00<br>+/-0.20 | 40.00<br>+/-0.20 | 40.00<br>+/-0.20 | 40.00<br>+/-0.20 |  |
| <b>P<sub>1</sub></b>    | 2.00<br>+/-0.05  | 2.00<br>+/-0.05  | 4.00<br>+/-0.10  | 4.00<br>+/-0.10  | 4.00<br>+/-0.10  | 4.00<br>+/-0.10  | 4.00<br>+/-0.10  | 4.00<br>+/-0.10  | 4.00<br>+/-0.10  | 4.00<br>+/-0.10  | 4.00<br>+/-0.10  | 4.00<br>+/-0.10  | 4.00<br>+/-0.10  | 4.00<br>+/-0.10  | 4.00<br>+/-0.10  | 8.00<br>+/-0.10  | 8.00<br>+/-0.10  | 8.00<br>+/-0.10  |  |
| <b>P<sub>2</sub></b>    | 2.00<br>+/-0.05  | 2.00<br>+/-0.05  | 2.00<br>+/-0.05  | 2.00<br>+/-0.05  | 2.00<br>+/-0.05  | 2.00<br>+/-0.05  | 2.00<br>+/-0.05  | 2.00<br>+/-0.05  | 2.00<br>+/-0.05  | 2.00<br>+/-0.05  | 2.00<br>+/-0.05  | 2.00<br>+/-0.05  | 2.00<br>+/-0.05  | 2.00<br>+/-0.10  | 2.00<br>+/-0.10  | 2.00<br>+/-0.10  | 2.00<br>+/-0.10  | 2.00<br>+/-0.10  |  |
| <b>D<sub>0</sub></b>    | 1.50<br>+0.1/-0  | 1.50<br>+0.1/-0  | 1.50<br>+0.1/-0  | 1.50<br>+0.1/-0  | 1.50<br>+0.1/-0  | 1.50<br>+0.1/-0  | 1.50<br>+0.1/-0  | 1.50<br>+0.1/-0  | 1.50<br>+0.1/-0  | 1.50<br>+0.1/-0  | 1.50<br>+0.1/-0  | 1.50<br>+0.1/-0  | 1.50<br>+0.1/-0  | 1.50<br>+0.1/-0  | 1.50<br>+0.1/-0  | 1.50<br>+0.1/-0  | 1.50<br>+0.1/-0  | 1.50<br>+0.1/-0  |  |
| <b>D<sub>1</sub></b>    | -                | -                | -                | -                | -                | 1.00<br>+/-0.10  | 1.00<br>+/-0.10  | 1.00<br>+/-0.10  | 1.00<br>+/-0.10  | 1.00<br>+/-0.10  | 1.00<br>+/-0.10  | 1.00<br>+/-0.10  | 1.00<br>+/-0.10  | 1.00<br>+/-0.10  | 1.00<br>+/-0.10  | 1.50<br>+/-0.10  | 1.50<br>+/-0.10  | 1.50<br>+/-0.10  |  |
| <b>E</b>                | 1.75<br>+/-0.10  | 1.75<br>+/-0.10  | 1.75<br>+/-0.10  | 1.75<br>+/-0.10  | 1.75<br>+/-0.10  | 1.75<br>+/-0.10  | 1.75<br>+/-0.10  | 1.75<br>+/-0.10  | 1.75<br>+/-0.10  | 1.75<br>+/-0.10  | 1.75<br>+/-0.10  | 1.75<br>+/-0.10  | 1.75<br>+/-0.10  | 1.75<br>+/-0.10  | 1.75<br>+/-0.10  | 1.75<br>+/-0.10  | 1.75<br>+/-0.10  | 1.75<br>+/-0.10  |  |
| <b>F</b>                | 3.50<br>+/-0.05  | 3.50<br>+/-0.05  | 3.50<br>+/-0.05  | 3.50<br>+/-0.05  | 3.50<br>+/-0.05  | 3.50<br>+/-0.05  | 3.50<br>+/-0.05  | 3.50<br>+/-0.05  | 3.50<br>+/-0.05  | 3.50<br>+/-0.05  | 3.50<br>+/-0.05  | 3.50<br>+/-0.05  | 3.50<br>+/-0.05  | 5.50<br>+/-0.10  | 5.50<br>+/-0.10  | 5.50<br>+/-0.10  | 5.50<br>+/-0.10  | 5.50<br>+/-0.10  |  |

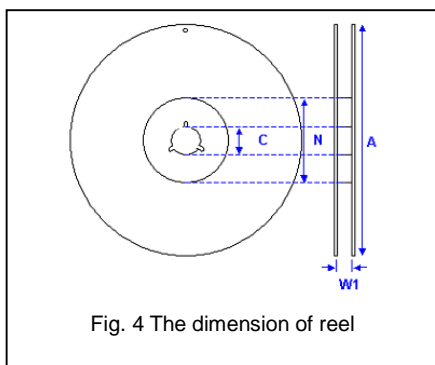
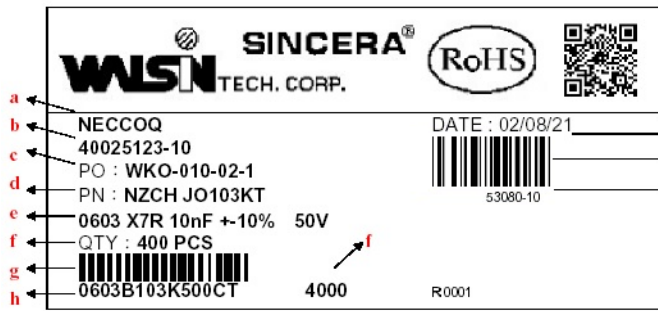


Fig. 4 The dimension of reel

| Size                 | 0201, 0402, 0603, 0805, 1206, 1210 |           |           | 1812        |
|----------------------|------------------------------------|-----------|-----------|-------------|
| <b>Reel size</b>     | 7"                                 | 10"       | 13"       | 7"          |
| <b>C</b>             | 13.0±0.5                           | 13.0±0.5  | 13.0±0.5  | 13.0±0.5    |
| <b>W<sub>1</sub></b> | 10.0±1.5                           | 10.0±1.5  | 10.0±1.5  | 12.4+2.0/-0 |
| <b>A</b>             | 178.0±2.0                          | 250.0±2.0 | 330.0±2.0 | 178.0±2.0   |
| <b>N</b>             | 60.0+1.0/-0                        | 50 min    | 50 min    | 60.0+1.0/-0 |

Multilayer Ceramic Capacitors

Example 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

\*Customized label is available upon request

Constructions

| No. | Name             | NPO                      | X7R, X5R, X6S, X7S, Y5V  |
|-----|------------------|--------------------------|--------------------------|
| ①   | Ceramic material | CaZrO <sub>3</sub> based | BaTiO <sub>3</sub> based |
| ②   | Inner electrode  |                          | Ni                       |
| ③   | Termination      | Inner layer              | Cu                       |
| ④   |                  | Middle layer             | Ni                       |
| ⑤   |                  | Outer layer              | Sn                       |

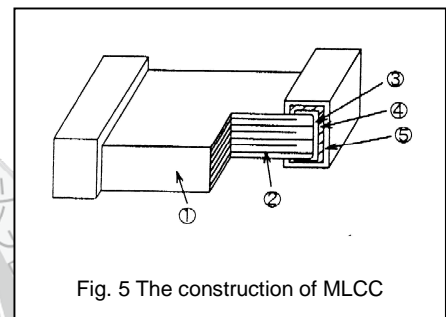


Fig. 5 The construction of MLCC

Storage and handling conditions

- (1) To store products at 5 to 40°C ambient temperature and 20 to 70% related humidity conditions; MSL Level 1.
- (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. The corrosive gas reacts on the terminal electrodes of capacitors, and results in the poor solderability. Do not store the capacitors in the ambience of corrosive gas (e.g., hydrogen sulfide, sulfur dioxide, chlorine, ammonia gas etc.)
- b. In corrosive atmosphere, solderability might be degraded, and silver migration might occur to cause low reliability.
- c. Due to the dewing by rapid humidity change, or the photochemical change of the terminal electrode by direct sunlight, the solderability and electrical performance may deteriorate. Do not store capacitors under direct sunlight or dewing condition. To store products on the shelf and avoid exposure to moisture.

**Multilayer Ceramic Capacitors**

**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<sub>2</sub> within oven are recommended.

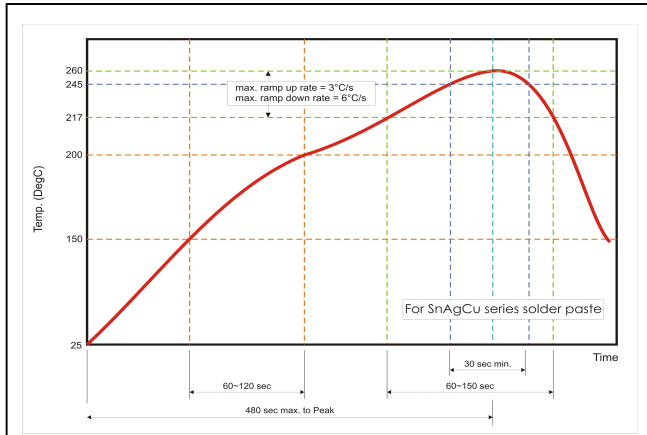


Fig. 6 Recommended reflow soldering profile for SMT process with SnAgCu series solder paste.

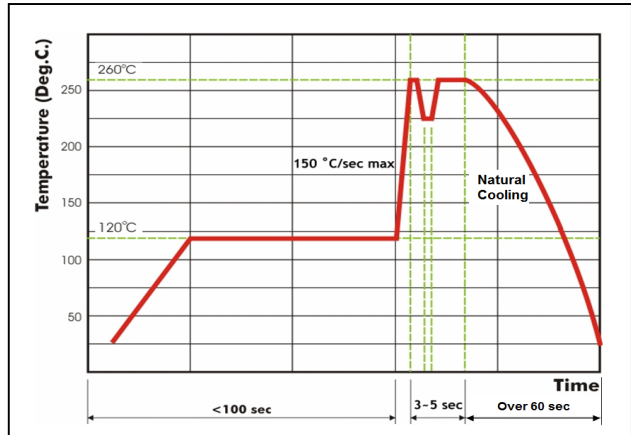


Fig. 7 Recommended wave soldering profile for SMT process with SnAgCu series solder.



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