

# APPROVAL SHEET

## MULTILAYER CERAMIC CAPACITORS

General Purpose Series (10V to 100V)

0402 to 1812 Sizes

NP0, X7R & Y5V Dielectrics

RoHS Compliance

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

## 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 and Y5V dielectric material and which provides product with high electrical precision, stability and reliability.

## 2. FEATURES

- A wide selection of sizes is available (0402 to 1812).
- High capacitance in given case size.
- Capacitor with lead-free termination (pure Tin).

## 3. APPLICATIONS

- For general digital circuit.
- For power supply bypass capacitors.
- For consumer electronics.
- For telecommunication.

## 4. HOW TO ORDER

| <u>1206</u>                                                                                                                                   | <u>E</u>                                              | <u>104</u>                                                                                                                                                  | <u>Z</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>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 (COG)<br><b>B</b> =X7R<br><b>F</b> =Y5V | 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>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>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 (for NP0, X7R, Y5V dielectric)<br><b>L</b> =Ag/Ni/Sn (for partial NP0 items) | <b>T</b> =7" reeled<br><b>R</b> =7" reeled (2mm pitch for 0603 size; paper tape)<br><b>G</b> =13" reeled |

\* Partial NP0 items are with Ag/Ni/Sn terminations, please ref to below product range of NPO dielectric for detail.

## 5. EXTERNAL DIMENSIONS

| Size<br>Inch (mm) | L (mm)              | W (mm)              | T (mm)/Symbol       | Remark | M <sub>B</sub> (mm) |
|-------------------|---------------------|---------------------|---------------------|--------|---------------------|
| 0402 (1005)       | 1.00±0.05           | 0.50±0.05           | 0.50±0.05           | N #    | 0.25<br>+0.05/-0.10 |
| 0603 (1608)       | 1.60±0.10           | 0.80±0.10           | 0.80±0.07           | S      | 0.40±0.15           |
|                   | 1.60<br>+0.15/-0.10 | 0.80<br>+0.15/-0.10 | 0.80<br>+0.15/-0.10 | X      |                     |
| 0805 (2012)       | 2.00±0.15           | 1.25±0.10           | 0.60±0.10           | A      | 0.50±0.20           |
|                   |                     |                     | 0.80±0.10           | B      |                     |
|                   |                     |                     | 1.25±0.10           | D #    |                     |
|                   | 2.00±0.20           | 1.25±0.20           | 1.25±0.20           | I #    |                     |
| 1206 (3216)       | 3.20±0.15           | 1.60±0.15           | 0.80±0.10           | B      | 0.60±0.20           |
|                   |                     |                     | 0.95±0.10           | C      |                     |
|                   |                     |                     | 1.15±0.15           | J #    |                     |
|                   |                     |                     | 1.25±0.10           | D #    |                     |
|                   | 3.20±0.20           | 1.60±0.20           | 1.60±0.20           | G #    |                     |
|                   | 3.20+0.3/-0.1       | 1.60+0.3/0.1        | 1.60+0.30/-0.10     | P #    |                     |
| 1210 (3225)       | 3.20±0.30           | 2.50±0.20           | 0.95±0.10           | C #    | 0.75±0.25           |
|                   |                     |                     | 1.25±0.10           | D #    |                     |
|                   | 3.20±0.40           | 2.50±0.30           | 1.60±0.20           | G #    |                     |
|                   |                     |                     | 2.00±0.20           | K #    |                     |
|                   |                     |                     | 2.50±0.30           | M #    |                     |
| 1812 (4532)       | 4.50±0.40           | 3.20±0.30           | 1.25±0.10           | D #    | 0.75±0.25           |
|                   |                     |                     | 2.00±0.20           | K #    |                     |

# Reflow soldering only is recommended.

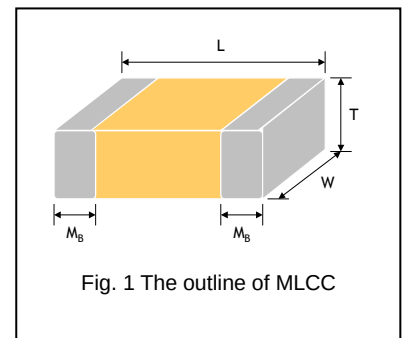


Fig. 1 The outline of MLCC

## 6. GENERAL ELECTRICAL DATA

| Dielectric                  | NP0                                                                                                                           | X7R                            | Y5V                    |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------|--------------------------------|------------------------|
| Size                        | 0402, 0603, 0805, 1206, 1210, 1812                                                                                            |                                |                        |
| Capacitance range*          | 0.5pF to 0.039μF                                                                                                              | 100pF to 0.82μF                | 10nF to 0.68μF         |
| Capacitance tolerance**     | Cap≤5pF: B (±0.1pF), C (±0.25pF)<br>5pF<Cap<10pF: C (±0.25pF), D (±0.5pF)<br>Cap≥10pF: F (±1%), G (±2%), J (±5%),<br>K (±10%) | J (±5%), K (±10%), M (±20%)    | M (±20%), Z (-20/+80%) |
| Rated voltage (WVDC)        | 10V, 16V, 25V, 50V, 100V                                                                                                      | 6.3V, 10V, 16V, 25V, 50V, 100V |                        |
| Tan δ*                      | Cap<30pF: Q≥400+20C<br>Cap≥30pF: Q≥1000                                                                                       | Note 1                         |                        |
| Insulation resistance at Ur | ≥10GΩ or RxC≥500Ω·F whichever is less                                                                                         |                                |                        |
| Operating temperature       | -55 to +125℃                                                                                                                  |                                | -25 to +85℃            |
| Capacitance characteristic  | ±30ppm                                                                                                                        | ±15%                           | +30/-80%               |
| Termination                 | Ni/Sn (lead-free termination)                                                                                                 |                                |                        |

\* 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℃ at ambient temperature

X7R: Apply 1.0±0.2Vrms, 1.0kHz±10%, at 25℃ ambient temperature.

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

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

Note 1:

### X7R/X5R

| Rated vol. | D.F. ≤ | Exception of D.F. ≤                                                         |
|------------|--------|-----------------------------------------------------------------------------|
| ≥50V       | 2.5%   | 3% 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF                             |
| 25V        | 3.5%   | 5% 0805 ≥ 1μF; 1210 ≥ 10μF                                                  |
|            |        | 7% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF                                              |
|            |        | 10% 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF                |
| 16V        | 3.5%   | 5% 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF |
|            |        | 10% 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF                  |
| 10V        | 5%     | 10% 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF;  |
|            |        | 15% 0201 ≥ 0.1μF; 0402 ≥ 1μF                                                |
| 6.3V       | 10%    | 15% 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1210 ≥ 100μF;                                |
|            |        | 20% 0402 ≥ 2.2μF                                                            |

### Y5V

| Rated vol.      | D.F. ≤ | Exception of D.F. ≤                                                      |
|-----------------|--------|--------------------------------------------------------------------------|
| ≥50V            | 5%     | 7% 0603 ≥ 0.1μF; 0805 ≥ 0.47μF; 1206 ≥ 4.7μF                             |
| 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%    | ---                                                                      |

## 7. CAPACITANCE RANGE (NP0 Dielectric )

### 7-1 0402, 0603, 0805 Sizes

| DIELECTRIC    |             | NP0  |    |    |    |     |      |    |    |    |     |      |    |    |    |     |
|---------------|-------------|------|----|----|----|-----|------|----|----|----|-----|------|----|----|----|-----|
| SIZE          |             | 0402 |    |    |    |     | 0603 |    |    |    |     | 0805 |    |    |    |     |
| RATED VOLTAGE |             | 10   | 16 | 25 | 50 | 100 | 10   | 16 | 25 | 50 | 100 | 10   | 16 | 25 | 50 | 100 |
| Capacitance   | 0.1pF (0R1) | N    | N  | N  | N  |     |      |    |    |    |     |      |    |    |    |     |
|               | 0.2pF (0R2) | N    | N  | N  | N  |     |      |    |    |    |     |      |    |    |    |     |
|               | 0.3pF (0R3) | N    | N  | N  | N  |     |      |    |    |    |     |      |    |    |    |     |
|               | 0.4pF (0R4) | N    | N  | N  | N  |     |      |    |    |    |     |      |    |    |    |     |
|               | 0.5pF (0R5) | N    | N  | N  | N  | N   | S    | S  | S  | S  | S   | A    | A  | A  | A  | A   |
|               | 0.6pF (0R6) | N    | N  | N  | N  | N   | S    | S  | S  | S  | S   | A    | A  | A  | A  | A   |
|               | 0.7pF (0R7) | N    | N  | N  | N  | N   | S    | S  | S  | S  | S   | A    | A  | A  | A  | A   |
|               | 0.8pF (0R8) | N    | N  | N  | N  | N   | S    | S  | S  | S  | S   | A    | A  | A  | A  | A   |
|               | 0.9pF (0R9) | N    | N  | N  | N  | N   | S    | S  | S  | S  | S   | A    | A  | A  | A  | A   |
|               | 1.0pF (1R0) | N    | N  | N  | N  | N   | S    | S  | S  | S  | S   | A    | A  | A  | A  | A   |
|               | 1.2pF (1R2) | N    | N  | N  | N  | N   | S    | S  | S  | S  | S   | A    | A  | A  | A  | A   |
|               | 1.5pF (1R5) | N    | N  | N  | N  | N   | S    | S  | S  | S  | S   | A    | A  | A  | A  | A   |
|               | 1.8pF (1R8) | N    | N  | N  | N  | N   | S    | S  | S  | S  | S   | A    | A  | A  | A  | A   |
|               | 2.2pF (2R2) | N    | N  | N  | N  | N   | S    | S  | S  | S  | S   | A    | A  | A  | A  | A   |
|               | 2.7pF (2R7) | N    | N  | N  | N  | N   | S    | S  | S  | S  | S   | A    | A  | A  | A  | A   |
|               | 3.3pF (3R3) | N    | N  | N  | N  | N   | S    | S  | S  | S  | S   | A    | A  | A  | A  | A   |
|               | 3.9pF (3R9) | N    | N  | N  | N  | N   | S    | S  | S  | S  | S   | A    | A  | A  | A  | A   |
|               | 4.7pF (4R7) | N    | N  | N  | N  | N   | S    | S  | S  | S  | S   | A    | A  | A  | A  | A   |
|               | 5.6pF (5R6) | N    | N  | N  | N  | N   | S    | S  | S  | S  | S   | A    | A  | A  | A  | A   |
|               | 6.8pF (6R8) | N    | N  | N  | N  | N   | S    | S  | S  | S  | S   | A    | A  | A  | A  | A   |
|               | 8.2pF (8R2) | N    | N  | N  | N  | N   | S    | S  | S  | S  | S   | A    | A  | A  | A  | A   |
|               | 10pF (100)  | N    | N  | N  | N  | N   | S    | S  | S  | S  | S   | A    | A  | A  | A  | A   |
|               | 12pF (120)  | N    | N  | N  | N  | N   | S    | S  | S  | S  | S   | A    | A  | A  | A  | A   |
|               | 15pF (150)  | N    | N  | N  | N  | N   | S    | S  | S  | S  | S   | A    | A  | A  | A  | A   |
|               | 18pF (180)  | N    | N  | N  | N  | N   | S    | S  | S  | S  | S   | A    | A  | A  | A  | A   |
|               | 22pF (220)  | N    | N  | N  | N  | N   | S    | S  | S  | S  | S   | A    | A  | A  | A  | A   |
|               | 27pF (270)  | N    | N  | N  | N  | N   | S    | S  | S  | S  | S   | A    | A  | A  | A  | A   |
|               | 33pF (330)  | N    | N  | N  | N  | N   | S    | S  | S  | S  | S   | A    | A  | A  | A  | A   |
|               | 39pF (390)  | N    | N  | N  | N  | N   | S    | S  | S  | S  | S   | A    | A  | A  | A  | A   |
|               | 47pF (470)  | N    | N  | N  | N  | N   | S    | S  | S  | S  | S   | A    | A  | A  | A  | A   |
|               | 56pF (560)  | N    | N  | N  | N  | N   | S    | S  | S  | S  | S   | A    | A  | A  | A  | A   |
|               | 68pF (680)  | N    | N  | N  | N  | N   | S    | S  | S  | S  | S   | A    | A  | A  | A  | A   |
|               | 82pF (820)  | N    | N  | N  | N  | N   | S    | S  | S  | S  | S   | A    | A  | A  | A  | A   |
|               | 100pF (101) | N    | N  | N  | N  | N   | S    | S  | S  | S  | S   | A    | A  | A  | A  | A   |
|               | 120pF (121) | N    | N  | N  | N  | N   | S    | S  | S  | S  | S   | A    | A  | A  | A  | A   |
|               | 150pF (151) | N    | N  | N  | N  | N   | S    | S  | S  | S  | S   | A    | A  | A  | A  | A   |
|               | 180pF (181) | N    | N  | N  | N  | N   | S    | S  | S  | S  | S   | A    | A  | A  | A  | A   |
|               | 220pF (221) | N    | N  | N  | N  | N   | S    | S  | S  | S  | S   | A    | A  | A  | A  | A   |
|               | 270pF (271) | N    | N  | N  | N  |     | S    | S  | S  | S  | S   | A    | A  | A  | A  | A   |
|               | 330pF (331) | N    | N  | N  | N  |     | S    | S  | S  | S  | S   | A    | A  | A  | A  | A   |
|               | 390pF (391) | N    | N  | N  | N  |     | S    | S  | S  | S  | S   | B    | B  | B  | B  | B   |
|               | 470pF (471) | N    | N  | N  | N  |     | S    | S  | S  | S  | S   | B    | B  | B  | B  | B   |
|               | 560pF (561) | 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) |      |    |    |    |     | S    | S  | S  | S  | S   | B    | B  | B  | B  | B   |
| 1,000pF (102) |             |      |    |    |    | S   | S    | S  | S  | S  | B   | B    | B  | B  | B  |     |
| 1,200pF (122) |             |      |    |    |    | X   | X    | X  | X  |    | B   | B    | B  | B  | B  |     |
| 1,500pF (152) |             |      |    |    |    | X   | X    | X  | X  |    | B   | B    | B  | B  | B  |     |
| 1,800pF (182) |             |      |    |    |    | 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) |             |      |    |    |    |     |      |    |    |    | D   | D    | D  | D  | D  |     |
| 4,700pF (472) |             |      |    |    |    |     |      |    |    |    | D   | D    | D  | D  |    |     |
| 5,600pF (562) |             |      |    |    |    |     |      |    |    |    | D^  | D^   |    |    |    |     |
| 6,800pF (682) |             |      |    |    |    |     |      |    |    |    | D^  | D^   |    |    |    |     |
| 8,200pF (822) |             |      |    |    |    |     |      |    |    |    | D^  | D^   |    |    |    |     |
| 0.010uF (103) |             |      |    |    |    |     |      |    |    |    | D^  | D^   |    |    |    |     |
| 0.012uF (123) |             |      |    |    |    |     |      |    |    |    | D^  | D^   |    |    |    |     |

1. The letter in cell is expressed the symbol of product thickness.
2. The letter in cell with “^” mark is expressed product with Ag/Ni/Sn terminations.
3. For more information about products with special capacitance or other data, please contact WTC local representative.

7-2 1206, 1210, 1812 Sizes

| DIELECTRIC    |               | NP0  |    |    |    |     |      |    |    |    |     |      |    |     |
|---------------|---------------|------|----|----|----|-----|------|----|----|----|-----|------|----|-----|
| SIZE          |               | 1206 |    |    |    |     | 1210 |    |    |    |     | 1812 |    |     |
| RATED VOLTAGE |               | 10   | 16 | 25 | 50 | 100 | 10   | 16 | 25 | 50 | 100 | 16   | 50 | 100 |
| Capacitance   | 1.0pF (1R0)   |      |    |    |    |     |      |    |    |    |     |      |    |     |
|               | 1.2pF (1R2)   |      |    |    |    |     |      |    |    |    |     |      |    |     |
|               | 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   |
|               | 12pF (120)    | B    | B  | B  | B  | B   | C    | C  | C  | C  | C   | D    | D  | D   |
|               | 15pF (150)    | B    | B  | B  | B  | B   | C    | C  | C  | C  | C   | D    | D  | D   |
|               | 18pF (180)    | B    | B  | B  | B  | B   | C    | C  | C  | C  | C   | D    | D  | D   |
|               | 22pF (220)    | B    | B  | B  | B  | B   | C    | C  | C  | C  | C   | D    | D  | D   |
|               | 27pF (270)    | B    | B  | B  | B  | B   | C    | C  | C  | C  | C   | D    | D  | D   |
|               | 33pF (330)    | B    | B  | B  | B  | B   | C    | C  | C  | C  | C   | D    | D  | D   |
|               | 39pF (390)    | B    | B  | B  | B  | B   | C    | C  | C  | C  | C   | D    | D  | D   |
|               | 47pF (470)    | B    | B  | B  | B  | B   | C    | C  | C  | C  | C   | D    | D  | D   |
|               | 56pF (560)    | B    | B  | B  | B  | B   | C    | C  | C  | C  | C   | D    | D  | D   |
|               | 68pF (680)    | B    | B  | B  | B  | B   | C    | C  | C  | C  | C   | D    | D  | D   |
|               | 82pF (820)    | B    | B  | B  | B  | B   | C    | C  | C  | C  | C   | D    | D  | D   |
|               | 100pF (101)   | B    | B  | B  | B  | B   | C    | C  | C  | C  | C   | D    | D  | D   |
|               | 120pF (121)   | B    | B  | B  | B  | B   | C    | C  | C  | C  | C   | D    | D  | D   |
|               | 150pF (151)   | B    | B  | B  | B  | B   | C    | C  | C  | C  | C   | D    | D  | D   |
|               | 180pF (181)   | B    | B  | B  | B  | B   | C    | C  | C  | C  | C   | D    | D  | D   |
|               | 220pF (221)   | B    | B  | B  | B  | B   | C    | C  | C  | C  | C   | D    | D  | D   |
|               | 270pF (271)   | B    | B  | B  | B  | B   | C    | C  | C  | C  | C   | D    | D  | D   |
|               | 330pF (331)   | B    | B  | B  | B  | B   | C    | C  | C  | C  | C   | D    | D  | D   |
|               | 390pF (391)   | B    | B  | B  | B  | B   | C    | C  | C  | C  | C   | D    | D  | D   |
|               | 470pF (471)   | B    | B  | B  | B  | B   | C    | C  | C  | C  | C   | D    | D  | D   |
|               | 560pF (561)   | B    | B  | B  | B  | B   | C    | C  | C  | C  | C   | D    | D  | D   |
|               | 680pF (681)   | B    | B  | B  | B  | B   | C    | C  | C  | C  | C   | D    | D  | D   |
|               | 820pF (821)   | B    | B  | B  | B  | B   | C    | C  | C  | C  | C   | D    | D  | D   |
|               | 1,000pF (102) | B    | B  | B  | B  | B   | C    | C  | C  | C  | C   | D    | D  | D   |
|               | 1,200pF (122) | B    | B  | B  | B  | B   | C    | C  | C  | C  | C   | D    | D  | D   |
|               | 1,500pF (152) | B    | B  | B  | B  | B   | C    | C  | C  | C  | C   | D    | D  | D   |
|               | 1,800pF (182) | B    | B  | B  | B  | B   | C    | C  | C  | C  | C   | D    | D  | D   |
|               | 2,200pF (222) | B    | B  | B  | B  | B   | C    | C  | C  | C  | C   | D    | D  | D   |
|               | 2,700pF (272) | B    | B  | B  | B  | B   | C    | C  | C  | C  | C   | D    | D  | D   |
|               | 3,300pF (332) | B    | B  | B  | B  | B   | C    | C  | C  | C  | C   | D    | D  | D   |
|               | 3,900pF (392) | B    | B  | B  | B  | B   | C    | C  | C  | C  | C   | D    | D  | D   |
|               | 4,700pF (472) | B    | B  | B  | B  | B   | C    | C  | C  | C  | C   | D    | D  | D   |
|               | 5,600pF (562) | B    | B  | B  | B  | B   | C    | C  | C  | C  | C   | D    | D  | D   |
|               | 6,800pF (682) | C    | C  | C  | C  | C   | C    | C  | C  | C  | C   | D    | D  | D   |
|               | 8,200pF (822) | D    | D  | D  | D  | D   | C    | C  | C  | C  | C   | D    | D  | D   |
| 0.010μF (103) | D             | D    | D  | D  |    | C   | C    | C  | C  | C  | D   | D    | D  |     |
| 0.012μF (123) | D^            | D^   |    |    |    | C   | C    | D  | D  | D  | D   | D    | D  |     |
| 0.015μF (153) | D^            | D^   |    |    |    | C   | C    | D  | D  | D  | D   | D    | D  |     |
| 0.018μF (183) | D^            | D^   |    |    |    |     |      |    |    |    | D   | D    | D  |     |
| 0.022μF (223) | D^            | D^   |    |    |    |     |      |    |    |    | D   | D    | D  |     |
| 0.027μF (273) | D^            | D^   |    |    |    |     |      |    |    |    | D   | D    | D  |     |
| 0.033μF (333) | D^            | D^   |    |    |    |     |      |    |    |    | D   | D    | D  |     |
| 0.039μF (393) | G^            | G^   |    |    |    |     |      |    |    |    |     |      |    |     |

1. The letter in cell is expressed the symbol of product thickness.
2. The letter in cell with “^” mark is expressed product with Ag/Ni/Sn terminations.
3. For more information about products with special capacitance or other data, please contact WTC local representative.

## 8. CAPACITANCE RANGE (X7R Dielectric)

### 8-1 0402, 0603, 0805 Sizes

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

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.

8-2 1206, 1210, 1812 Sizes

| DIELECTRIC    |               | X7R  |    |    |    |     |      |    |    |    |     |      |    |    |    |     |
|---------------|---------------|------|----|----|----|-----|------|----|----|----|-----|------|----|----|----|-----|
| SIZE          |               | 1206 |    |    |    |     | 1210 |    |    |    |     | 1812 |    |    |    |     |
| RATED VOLTAGE |               | 10   | 16 | 25 | 50 | 100 | 10   | 16 | 25 | 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  | D   | C    | C  | C  | C  | C   | D    | D  | D  | D  | D   |
|               | 0.10μF (104)  | B    | B  | B  | B  | D   | 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  | D   | 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  |     | C    | C  | C  | C  | G   | D    | D  | D  | D  | D   |
|               | 0.33μF (334)  | C    | C  | C  | D  |     | C    | C  | C  | D  | G   | D    | D  | D  | D  | D   |
|               | 0.39μF (394)  | C    | C  | J  | P  |     | C    | C  | C  | D  | M   | D    | D  | D  | D  | D   |
|               | 0.47μF (474)  | J    | J  | J  | P  |     | C    | C  | C  | D  | M   | D    | D  | D  | D  | K   |
|               | 0.56μF (564)  | J    | J  | J  | P  |     | D    | D  | D  | D  | M   | D    | D  | D  | D  | K   |
|               | 0.68μF (684)  | J    | J  | J  | P  |     | D    | D  | D  | D  | K   | D    | D  | D  | K  | K   |
|               | 0.82μF (824)  | J    | J  | J  | P  |     | D    | D  | D  | D  | K   | D    | D  | D  | K  | K   |

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.

## 9. CAPACITANCE RANGE (Y5V Dielectric)

### 9-1 0402, 0603, 0805 Sizes

| DIELECTRIC    |               | Y5V  |    |    |    |    |      |    |    |    |      |    |    |    |     |
|---------------|---------------|------|----|----|----|----|------|----|----|----|------|----|----|----|-----|
| SIZE          |               | 0402 |    |    |    |    | 0603 |    |    |    | 0805 |    |    |    |     |
| RATED VOLTAGE |               | 6.3  | 10 | 16 | 25 | 50 | 10   | 16 | 25 | 50 | 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  |    | 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  | N  |    |    | S    | S  | S  | S  | A    | A  | A  | A  |     |
|               | 0.22μF (224)  | N    | N  | N  |    |    | S    | S  | S  | S  | A    | A  | A  | A  |     |
|               | 0.33μF (334)  | N    | N  | N  |    |    | S    | S  | S  |    | B    | B  | B  | B  |     |
| 0.47μF (474)  | N             | N    | N  |    |    | S  | S    | X  |    | B  | B    | B  | B  |    |     |
| 0.68μF (684)  | N             |      |    |    |    | S  | X    |    |    | B  | B    | D  | D  |    |     |

### 9-2 1206, 1210, 1812 Sizes

| DIELECTRIC    |               | Y5V  |    |    |    |     |      |    |    |    |     |      |    |    |    |     |
|---------------|---------------|------|----|----|----|-----|------|----|----|----|-----|------|----|----|----|-----|
| SIZE          |               | 1206 |    |    |    |     | 1210 |    |    |    |     | 1812 |    |    |    |     |
| RATED VOLTAGE |               | 10   | 16 | 25 | 50 | 100 | 10   | 16 | 25 | 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  | C   | C    | C  | C  | C  | C   | D    | D  | D  | D  | D   |
|               | 0.22μF (224)  | B    | B  | B  | B  | C   | C    | C  | C  | C  | C   | D    | D  | D  | D  | D   |
|               | 0.33μF (334)  | 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. 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.

## 10. PACKAGING STYLE AND QUANTITY

| Size        | Thickness (mm)/Symbol |   | Paper tape |          | Plastic tape |          |
|-------------|-----------------------|---|------------|----------|--------------|----------|
|             |                       |   | 7" reel    | 13" reel | 7" reel      | 13" reel |
| 0402 (1005) | 0.50±0.05             | N | 10k        | 50k      | -            | -        |
| 0603 (1608) | 0.80±0.07             | S | 4k         | 15k      | -            | -        |
|             | 0.80+0.15/-0.10       | X | 4k         | 15k      | -            | -        |
| 0805 (2012) | 0.60±0.10             | A | 4k         | 15k      | -            | -        |
|             | 0.80±0.10             | B | 4k         | 15k      | -            | -        |
|             | 1.25±0.10             | D | -          | -        | 3k           | 10k      |
|             | 1.25±0.20             | I | -          | -        | 3k           | 10k      |
| 1206 (3216) | 0.80±0.10             | B | 4k         | 15k      | -            | -        |
|             | 0.95±0.10             | C | -          | -        | 3k           | 10k      |
|             | 1.15±0.15             | J | -          | -        | 3k           | 10k      |
|             | 1.25±0.10             | D | -          | -        | 3k           | 10k      |
|             | 1.60±0.20             | G | -          | -        | 2k           | 10k      |
|             | 1.60+0.30/-0.10       | P | -          | -        | 2k           | 9k       |
| 1210 (3225) | 0.95±0.10             | C | -          | -        | 3k           | 10k      |
|             | 1.25±0.10             | D | -          | -        | 3k           | 10k      |
|             | 1.60±0.20             | G | -          | -        | 2k           | -        |
|             | 2.00±0.20             | K | -          | -        | 1k           | 6k       |
|             | 2.50±0.30             | M | -          | -        | 1k           | -        |
| 1812 (4532) | 1.25±0.10             | D | -          | -        | 1k           | -        |
|             | 2.00±0.20             | K | -          | -        | 1k           | -        |

Unit: pieces

## 11. 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                                                             | Class I:NP0                                                                                                   | * Shall not exceed the limits given in the detailed spec.                             |                                                                           |
| 3.                           | Q/ D.F.<br>(Dissipation Factor)                                         | Cap≤1000pF 1.0±0.2Vrms, 1MHz±10%                                                                              | NP0: Cap≥30pF, Q≥1000; Cap<30pF,Q≥400+20C                                             |                                                                           |
|                              |                                                                         | Cap>1000pF 1.0±0.2Vrms, 1KHz±10%                                                                              | X7R, X5R:                                                                             |                                                                           |
|                              |                                                                         |                                                                                                               | Rated vol. D.F. Exception of D.F. ≤                                                   |                                                                           |
|                              |                                                                         | ≥ 50V                                                                                                         | 2.5%                                                                                  | 3% 0603 ≥ 0.047μF; 0805 ≥ 0.18μF;1206 ≥ 0.47μF                            |
|                              |                                                                         | 25V                                                                                                           | 3.5%                                                                                  | 5% 0805 ≥ 1μF; 1210 ≥ 10μF                                                |
|                              |                                                                         |                                                                                                               |                                                                                       | 7% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF                                            |
|                              |                                                                         |                                                                                                               |                                                                                       | 10% 0402 ≥ 0.10μF;0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF               |
|                              |                                                                         | 16V                                                                                                           | 3.5%                                                                                  | 5% 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF;1206 ≥ 2.2μF;1210 ≥ 4.7μF |
|                              |                                                                         |                                                                                                               |                                                                                       | 10% 0603 ≥ 0.68μF;0805 ≥ 2.2μF; 1206 ≥ 4.7μF;1210 ≥ 22μF                  |
|                              |                                                                         | 10V                                                                                                           | 5%                                                                                    | 10% 0402 ≥ 0.33μF;0603 ≥ 0.33μF; 0805 ≥ 2.2μF;1206 ≥ 2.2μF;1210 ≥ 22μF;   |
| 15% 0201 ≥ 0.1μF; 0402 ≥ 1μF |                                                                         |                                                                                                               |                                                                                       |                                                                           |
| 6.3V                         | 10%                                                                     | 15% 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF;                                                     |                                                                                       |                                                                           |
|                              |                                                                         | 20% 0402 ≥ 2.2μF                                                                                              |                                                                                       |                                                                           |
|                              |                                                                         | Y5V:                                                                                                          |                                                                                       |                                                                           |
|                              |                                                                         | Rated vol. D.F. ≤ Exception of D.F. ≤                                                                         |                                                                                       |                                                                           |
|                              |                                                                         | ≥ 50V 5% 7% 0603 ≥ 0.1μF; 0805 ≥ 0.47μF; 1206 ≥ 4.7μF                                                         |                                                                                       |                                                                           |
|                              |                                                                         | 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                                                             |                                                                                       |                                                                           |
|                              |                                                                         | 12.5% 0402 ≥ 0.22μF                                                                                           |                                                                                       |                                                                           |
|                              |                                                                         | 16V (C ≥ 1.0μF) 9% 12.5% 0603 ≥ 2.2μF; 0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF                    |                                                                                       |                                                                           |
|                              |                                                                         | 10V 12.5% 20% 0402 ≥ 0.47μF                                                                                   |                                                                                       |                                                                           |
|                              |                                                                         | 6.3V 20% --- ---                                                                                              |                                                                                       |                                                                           |
| 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.                                    |                                                                           |
| 5.                           | Insulation Resistance                                                   | To apply rated voltage for max. 120 sec.                                                                      | 10GΩ or RxC ≥ 500Ω·F whichever is smaller.                                            |                                                                           |
|                              |                                                                         |                                                                                                               | Class II (X7R, X5R, Y5V)                                                              |                                                                           |
|                              |                                                                         |                                                                                                               | Rated voltage Insulation Resistance                                                   |                                                                           |
|                              |                                                                         |                                                                                                               | 100V: X7R                                                                             | 10GΩ or RxC ≥ 100 Ω·F whichever is smaller.                               |
|                              |                                                                         |                                                                                                               | 16V:0402≥0.22μF                                                                       |                                                                           |
|                              | 10V:0201≥47nF;0402≥0.47μF;0603≥0.47μF ; 0805≥2.2μF;1206≥4.7μF;1210≥47μF |                                                                                                               |                                                                                       |                                                                           |
|                              |                                                                         | 6.3V                                                                                                          |                                                                                       |                                                                           |
| 6.                           | Temperature Coefficient                                                 | With no electrical load.                                                                                      |                                                                                       |                                                                           |
|                              |                                                                         | T.C. Operating Temp                                                                                           | T.C. Capacitance Change                                                               |                                                                           |
|                              |                                                                         | NPO -55~125℃ at 25℃                                                                                           | NPO Within ±30ppm/℃                                                                   |                                                                           |
|                              |                                                                         | X7R -55~125℃ at 25℃                                                                                           | X7R Within ±15%                                                                       |                                                                           |
|                              |                                                                         | X5R -55~ 85℃ at 25℃                                                                                           | X5R Within ±15%                                                                       |                                                                           |
|                              |                                                                         | Y5V -25~ 85℃ at 20℃                                                                                           | Y5V Within +30%/-80%                                                                  |                                                                           |
| 7.                           | Adhesive Strength of Termination                                        | * Pressurizing force :<br>5N (≤0603) and 10N (>0603)<br>* Test time: 10±1 sec.                                | No remarkable damage or removal of the terminations.                                  |                                                                           |

| No.  | Item                         | Test Condition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Requirements                                                                                                                                                                                                                                                                                                                                       |           |             |   |                            |      |   |            |     |   |                            |      |   |            |     |                                                                                                                                                                                                                                                                                  |
|------|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------|---|----------------------------|------|---|------------|-----|---|----------------------------|------|---|------------|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8.   | Vibration Resistance         | <ul style="list-style-type: none"><li>* Vibration frequency: 10~55 Hz/min.</li><li>* Total amplitude: 1.5mm</li><li>* Test time: 6 hrs. (Two hrs each in three mutually perpendicular directions.)</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <ul style="list-style-type: none"><li>* No remarkable damage.</li><li>* Cap change and Q/D.F.: To meet initial spec.</li></ul>                                                                                                                                                                                                                     |           |             |   |                            |      |   |            |     |   |                            |      |   |            |     |                                                                                                                                                                                                                                                                                  |
| 9.   | Solderability                | <ul style="list-style-type: none"><li>* Solder temperature: 235±5℃</li><li>* Dipping time: 2±0.5 sec.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 95% min. coverage of all metalized area.                                                                                                                                                                                                                                                                                                           |           |             |   |                            |      |   |            |     |   |                            |      |   |            |     |                                                                                                                                                                                                                                                                                  |
| 10.  | Bending Test                 | <ul style="list-style-type: none"><li>* 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.</li><li>* Measurement to be made after keeping at room temp. for 24±2 hrs. (Class I) or 48±4 hrs. (Class II).</li></ul>                                                                                                                                                                                                                                                                                                                                          | <ul style="list-style-type: none"><li>* No remarkable damage.</li><li>* Cap change :<br/>NP0: within ±5% or 0.5pF whichever is larger<br/>X7R, X5R: 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.)</li></ul> |           |             |   |                            |      |   |            |     |   |                            |      |   |            |     |                                                                                                                                                                                                                                                                                  |
| 11.  | Resistance to Soldering Heat | <ul style="list-style-type: none"><li>* Solder temperature: 260±5℃</li><li>* Dipping time: 10±1 sec</li><li>* Preheating: 120 to 150℃ for 1 minute before immerse the capacitor in a eutectic solder.</li><li>* Before initial measurement (Class II only): Perform 150+0/-10℃ for 1 hr and then set for 48±4 hrs at room temp.</li><li>* Measurement to be made after keeping at room temp. for 24±2 hrs. (Class I) or 48±4 hrs. (Class II).</li></ul>                                                                                                                                                                                                                                                                 | <ul style="list-style-type: none"><li>* No remarkable damage.</li><li>* Cap change:<br/>NP0: within ±2.5% or 0.25pF whichever is larger<br/>X7R, X5R: within ±7.5%<br/>Y5V: within ±20%</li><li>* Q/D.F., I.R. and dielectric strength: To meet initial requirements.</li><li>* 25% max. leaching on each edge.</li></ul>                          |           |             |   |                            |      |   |            |     |   |                            |      |   |            |     |                                                                                                                                                                                                                                                                                  |
| 12.  | Temperature Cycle            | <ul style="list-style-type: none"><li>* Conduct the five cycles according to the temperatures and time.</li></ul> <table><tr><th>Step</th><th>Temp. (℃)</th><th>Time (min.)</th></tr><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></table> <ul style="list-style-type: none"><li>* Before initial measurement (Class II only): Perform 150+0/-10℃ for 1 hr and then set for 48±4 hrs at room temp.</li><li>* Measurement to be made after keeping at room temp. for 24±2 hrs. (Class I) or 48±4 hrs. (Class II).</li></ul> | Step                                                                                                                                                                                                                                                                                                                                               | Temp. (℃) | 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 | <ul style="list-style-type: none"><li>* No remarkable damage.</li><li>* Cap change :<br/>NP0: within ±2.5% or 0.25pF whichever is larger<br/>X7R, X5R: within ±7.5%<br/>Y5V: within ±20%</li><li>* Q/D.F., I.R. and dielectric strength: To meet initial requirements.</li></ul> |
| Step | Temp. (℃)                    | 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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                    |           |             |   |                            |      |   |            |     |   |                            |      |   |            |     |                                                                                                                                                                                                                                                                                  |

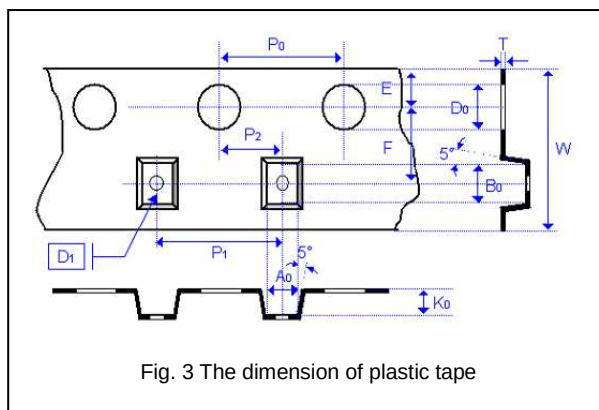
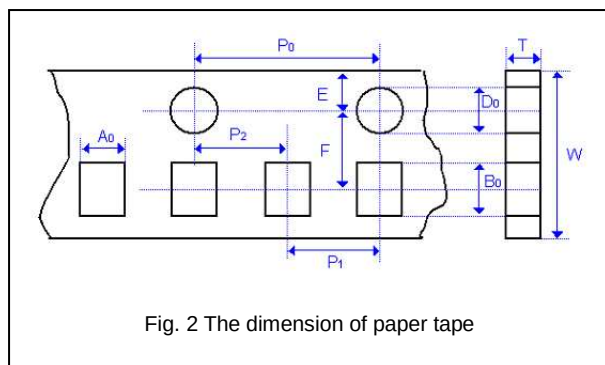
| No.                                                                                      | Item                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Test Condition                                                                                        | Requirements                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                     |                                              |                     |                                                                                          |       |                                           |     |                                              |     |     |     |                         |     |                                                                       |     |                                                          |               |     |       |                                                          |     |                                                                       |     |               |                 |                                                                      |     |                                                                    |      |     |     |                                                                    |      |     |     |     |
|------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|----------------------------------------------|---------------------|------------------------------------------------------------------------------------------|-------|-------------------------------------------|-----|----------------------------------------------|-----|-----|-----|-------------------------|-----|-----------------------------------------------------------------------|-----|----------------------------------------------------------|---------------|-----|-------|----------------------------------------------------------|-----|-----------------------------------------------------------------------|-----|---------------|-----------------|----------------------------------------------------------------------|-----|--------------------------------------------------------------------|------|-----|-----|--------------------------------------------------------------------|------|-----|-----|-----|
| 13.                                                                                      | Humidity (Damp Heat) Steady State                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | * Test temp.: 40±2℃                                                                                   | * No remarkable damage.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                     |                                              |                     |                                                                                          |       |                                           |     |                                              |     |     |     |                         |     |                                                                       |     |                                                          |               |     |       |                                                          |     |                                                                       |     |               |                 |                                                                      |     |                                                                    |      |     |     |                                                                    |      |     |     |     |
|                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | * Humidity: 90~95% RH                                                                                 | * Cap change:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                     |                                              |                     |                                                                                          |       |                                           |     |                                              |     |     |     |                         |     |                                                                       |     |                                                          |               |     |       |                                                          |     |                                                                       |     |               |                 |                                                                      |     |                                                                    |      |     |     |                                                                    |      |     |     |     |
|                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | * Test time: 500+24/-0hrs.                                                                            | NP0: within ±5% or 0.5pF whichever is larger                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                     |                                              |                     |                                                                                          |       |                                           |     |                                              |     |     |     |                         |     |                                                                       |     |                                                          |               |     |       |                                                          |     |                                                                       |     |               |                 |                                                                      |     |                                                                    |      |     |     |                                                                    |      |     |     |     |
|                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | * Measurement to be made after keeping at room temp. for 24±2 hrs. (Class I) or 48±4 hrs. (Class II). | X7R, X5R: ≥10V, within ±12.5%; 6.3V, 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<br>Less than 10pF Q≥200+10C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                     |                                              |                     |                                                                                          |       |                                           |     |                                              |     |     |     |                         |     |                                                                       |     |                                                          |               |     |       |                                                          |     |                                                                       |     |               |                 |                                                                      |     |                                                                    |      |     |     |                                                                    |      |     |     |     |
|                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                       | X7R, X5R:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                     |                                              |                     |                                                                                          |       |                                           |     |                                              |     |     |     |                         |     |                                                                       |     |                                                          |               |     |       |                                                          |     |                                                                       |     |               |                 |                                                                      |     |                                                                    |      |     |     |                                                                    |      |     |     |     |
|                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                       | <table><tr><th>Rated vol.</th><th>D.F. ≤</th><th colspan="2">Exception of D.F. ≤</th></tr><tr><td>≥ 50V</td><td>3%</td><td>6%</td><td>0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td></tr><tr><td rowspan="3">25V</td><td rowspan="3">5%</td><td>10%</td><td>0805 ≥ 1μF; 1210 ≥ 10μF</td></tr><tr><td>14%</td><td>0603 ≥ 0.33μF; 1206 ≥ 4.7μF</td></tr><tr><td>15%</td><td>0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF</td></tr><tr><td rowspan="2">16V</td><td rowspan="2">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>0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF 1206 ≥ 4.7μF; 1210 ≥ 22μF</td></tr><tr><td rowspan="2">10V</td><td rowspan="2">7.5%</td><td>15%</td><td>0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF 1206 ≥ 2.2μF; 1210 ≥ 22μF</td></tr><tr><td>20%</td><td>0201 ≥ 0.1μF ;0402 ≥ 1μF</td></tr><tr><td>6.3V</td><td>15%</td><td>30%</td><td>0402 ≥ 2.2μF ;0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF</td></tr></table> | Rated vol.          | D.F. ≤                                       | Exception of D.F. ≤ |                                                                                          | ≥ 50V | 3%                                        | 6%  | 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF | 25V | 5%  | 10% | 0805 ≥ 1μF; 1210 ≥ 10μF | 14% | 0603 ≥ 0.33μF; 1206 ≥ 4.7μF                                           | 15% | 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF | 16V           | 5%  | 10%   | 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF | 15% | 0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF 1206 ≥ 4.7μF; 1210 ≥ 22μF | 10V | 7.5%          | 15%             | 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF 1206 ≥ 2.2μF; 1210 ≥ 22μF | 20% | 0201 ≥ 0.1μF ;0402 ≥ 1μF                                           | 6.3V | 15% | 30% | 0402 ≥ 2.2μF ;0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF |      |     |     |     |
|                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Rated vol.                                                                                            | D.F. ≤                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Exception of D.F. ≤ |                                              |                     |                                                                                          |       |                                           |     |                                              |     |     |     |                         |     |                                                                       |     |                                                          |               |     |       |                                                          |     |                                                                       |     |               |                 |                                                                      |     |                                                                    |      |     |     |                                                                    |      |     |     |     |
|                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ≥ 50V                                                                                                 | 3%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 6%                  | 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF |                     |                                                                                          |       |                                           |     |                                              |     |     |     |                         |     |                                                                       |     |                                                          |               |     |       |                                                          |     |                                                                       |     |               |                 |                                                                      |     |                                                                    |      |     |     |                                                                    |      |     |     |     |
|                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 25V                                                                                                   | 5%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 10%                 | 0805 ≥ 1μF; 1210 ≥ 10μF                      |                     |                                                                                          |       |                                           |     |                                              |     |     |     |                         |     |                                                                       |     |                                                          |               |     |       |                                                          |     |                                                                       |     |               |                 |                                                                      |     |                                                                    |      |     |     |                                                                    |      |     |     |     |
|                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 14%                 | 0603 ≥ 0.33μF; 1206 ≥ 4.7μF                  |                     |                                                                                          |       |                                           |     |                                              |     |     |     |                         |     |                                                                       |     |                                                          |               |     |       |                                                          |     |                                                                       |     |               |                 |                                                                      |     |                                                                    |      |     |     |                                                                    |      |     |     |     |
| 15%                                                                                      | 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                     |                                              |                     |                                                                                          |       |                                           |     |                                              |     |     |     |                         |     |                                                                       |     |                                                          |               |     |       |                                                          |     |                                                                       |     |               |                 |                                                                      |     |                                                                    |      |     |     |                                                                    |      |     |     |     |
| 16V                                                                                      | 5%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 10%                                                                                                   | 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                     |                                              |                     |                                                                                          |       |                                           |     |                                              |     |     |     |                         |     |                                                                       |     |                                                          |               |     |       |                                                          |     |                                                                       |     |               |                 |                                                                      |     |                                                                    |      |     |     |                                                                    |      |     |     |     |
|                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 15%                                                                                                   | 0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF 1206 ≥ 4.7μF; 1210 ≥ 22μF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |                                              |                     |                                                                                          |       |                                           |     |                                              |     |     |     |                         |     |                                                                       |     |                                                          |               |     |       |                                                          |     |                                                                       |     |               |                 |                                                                      |     |                                                                    |      |     |     |                                                                    |      |     |     |     |
| 10V                                                                                      | 7.5%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 15%                                                                                                   | 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF 1206 ≥ 2.2μF; 1210 ≥ 22μF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                     |                                              |                     |                                                                                          |       |                                           |     |                                              |     |     |     |                         |     |                                                                       |     |                                                          |               |     |       |                                                          |     |                                                                       |     |               |                 |                                                                      |     |                                                                    |      |     |     |                                                                    |      |     |     |     |
|                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 20%                                                                                                   | 0201 ≥ 0.1μF ;0402 ≥ 1μF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                     |                                              |                     |                                                                                          |       |                                           |     |                                              |     |     |     |                         |     |                                                                       |     |                                                          |               |     |       |                                                          |     |                                                                       |     |               |                 |                                                                      |     |                                                                    |      |     |     |                                                                    |      |     |     |     |
| 6.3V                                                                                     | 15%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 30%                                                                                                   | 0402 ≥ 2.2μF ;0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                     |                                              |                     |                                                                                          |       |                                           |     |                                              |     |     |     |                         |     |                                                                       |     |                                                          |               |     |       |                                                          |     |                                                                       |     |               |                 |                                                                      |     |                                                                    |      |     |     |                                                                    |      |     |     |     |
|                                                                                          | Y5V:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                     |                                              |                     |                                                                                          |       |                                           |     |                                              |     |     |     |                         |     |                                                                       |     |                                                          |               |     |       |                                                          |     |                                                                       |     |               |                 |                                                                      |     |                                                                    |      |     |     |                                                                    |      |     |     |     |
|                                                                                          | <table><tr><th>Rated vol.</th><th>D.F. ≤</th><th colspan="2">Exception of D.F. ≤</th></tr><tr><td>≥ 50V</td><td>7.5%</td><td>10%</td><td>0603 ≥ 0.1μF; 0805 ≥ 0.47μF; 1206 ≥ 4.7μF</td></tr><tr><td>35V</td><td>10%</td><td>---</td><td>---</td></tr><tr><td rowspan="2">25V</td><td rowspan="2">7.5%</td><td>10%</td><td>0402 ≥ 0.047μF; 0603 ≥ 0.1μF; 0805 ≥ 0.33μF; 1206 ≥ 1μF; 1210 ≥ 4.7μF</td></tr><tr><td>15%</td><td>0402 ≥ 0.068μF; 0603 ≥ 0.47μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td></tr><tr><td>16V (C&lt;1.0μF)</td><td>10%</td><td>12.5%</td><td>0402 ≥ 0.068μF; 0603 ≥ 0.68μF</td></tr><tr><td></td><td></td><td>20%</td><td>0402 ≥ 0.22μF</td></tr><tr><td>16V (C ≥ 1.0μF)</td><td>12.5%</td><td>20%</td><td>0603 ≥ 2.2μF; 0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF;</td></tr><tr><td>10V</td><td>20%</td><td>30%</td><td>0402 ≥ 0.47μF</td></tr><tr><td>6.3V</td><td>30%</td><td>---</td><td>---</td></tr></table> | 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 | 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% | --- | --- |
| 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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |                                              |                     |                                                                                          |       |                                           |     |                                              |     |     |     |                         |     |                                                                       |     |                                                          |               |     |       |                                                          |     |                                                                       |     |               |                 |                                                                      |     |                                                                    |      |     |     |                                                                    |      |     |     |     |
|                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 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, 1GΩ or 50 Ω-F whichever is smaller.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                     |                                              |                     |                                                                                          |       |                                           |     |                                              |     |     |     |                         |     |                                                                       |     |                                                          |               |     |       |                                                          |     |                                                                       |     |               |                 |                                                                      |     |                                                                    |      |     |     |                                                                    |      |     |     |     |
|                                                                                          | Class II (X7R, X5R, Y5V)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                     |                                              |                     |                                                                                          |       |                                           |     |                                              |     |     |     |                         |     |                                                                       |     |                                                          |               |     |       |                                                          |     |                                                                       |     |               |                 |                                                                      |     |                                                                    |      |     |     |                                                                    |      |     |     |     |
|                                                                                          | <table><tr><th>Rated voltage</th><th>Insulation Resistance</th></tr><tr><td>100V: X7R</td><td rowspan="4">1GΩ or Rx C ≥ 10 Ω-F whichever is smaller.</td></tr><tr><td>16V: 0402 ≥ 0.22μF</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</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Rated voltage                                                                                         | Insulation Resistance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 100V: X7R           | 1GΩ or Rx C ≥ 10 Ω-F whichever is smaller.   | 16V: 0402 ≥ 0.22μF  | 10V: 0201 ≥ 47nF; 0402 ≥ 0.47μF; 0603 ≥ 0.47μF ; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF | 6.3V  |                                           |     |                                              |     |     |     |                         |     |                                                                       |     |                                                          |               |     |       |                                                          |     |                                                                       |     |               |                 |                                                                      |     |                                                                    |      |     |     |                                                                    |      |     |     |     |
| Rated voltage                                                                            | Insulation Resistance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                     |                                              |                     |                                                                                          |       |                                           |     |                                              |     |     |     |                         |     |                                                                       |     |                                                          |               |     |       |                                                          |     |                                                                       |     |               |                 |                                                                      |     |                                                                    |      |     |     |                                                                    |      |     |     |     |
| 100V: X7R                                                                                | 1GΩ or Rx C ≥ 10 Ω-F whichever is smaller.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                     |                                              |                     |                                                                                          |       |                                           |     |                                              |     |     |     |                         |     |                                                                       |     |                                                          |               |     |       |                                                          |     |                                                                       |     |               |                 |                                                                      |     |                                                                    |      |     |     |                                                                    |      |     |     |     |
| 16V: 0402 ≥ 0.22μF                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                     |                                              |                     |                                                                                          |       |                                           |     |                                              |     |     |     |                         |     |                                                                       |     |                                                          |               |     |       |                                                          |     |                                                                       |     |               |                 |                                                                      |     |                                                                    |      |     |     |                                                                    |      |     |     |     |
| 10V: 0201 ≥ 47nF; 0402 ≥ 0.47μF; 0603 ≥ 0.47μF ; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                     |                                              |                     |                                                                                          |       |                                           |     |                                              |     |     |     |                         |     |                                                                       |     |                                                          |               |     |       |                                                          |     |                                                                       |     |               |                 |                                                                      |     |                                                                    |      |     |     |                                                                    |      |     |     |     |
| 6.3V                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                     |                                              |                     |                                                                                          |       |                                           |     |                                              |     |     |     |                         |     |                                                                       |     |                                                          |               |     |       |                                                          |     |                                                                       |     |               |                 |                                                                      |     |                                                                    |      |     |     |                                                                    |      |     |     |     |

| No | Item                      | Test Condition                                       | Requirements                                     |
|----|---------------------------|------------------------------------------------------|--------------------------------------------------|
| 14 | Humidity (Damp Heat) Load | * Test temp.: 40±2℃                                  | * 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 : rated voltage.                  | X7R, X5R: ≥10V, within ±12.5%; 6.3V, within ±25% |
|    |                           | * Measurement to be made after keeping at room temp. | Y5V: ≥10V, within ±30%; 6.3V, within +30/-40%    |
|    |                           | for 24±2 hrs. (Class I) or 48±4 hrs. (Class II).     | Q/D.F. value:                                    |
|    |                           |                                                      | NP0: C≥30pF,Q≥200;C<30pF, Q≥100+10/3C            |
|    |                           |                                                      | X7R, X5R:                                        |
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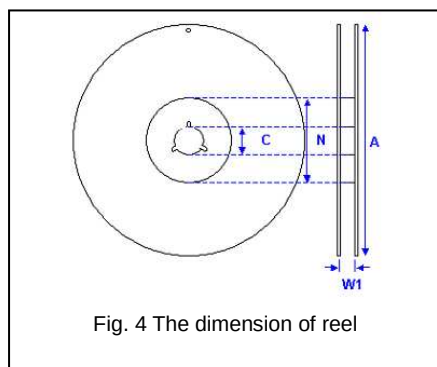
| No                                                                      | Item                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Test Condition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Requirements                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |               |                       |                    |                                         |                 |                                                                         |         |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
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| 15.                                                                     | High Temperature Load<br>(Endurance)                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Test temp. :<br>NP0, X7R/X7E: 125±3℃<br>X5R, Y5V: 85±3℃<br>Test time: 1000+24/-0 hrs.<br>To apply voltage:<br>(1) 6.3V or C≥10μF or TT series:<br>150% of rated voltage.<br>(2) 10V≤Ur<500V:<br>200% of rated voltage.<br>(3) 500V: 150% of rated voltage.<br>(4) Ur≥630V:<br>120% of rated voltage.<br>(5) 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: ≥10V, within ±12.5%; 6.3V, within ±25%<br>Y5V: ≥10V, within ±30%; 6.3V, within +30/-40%<br>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:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |               |                       |                    |                                         |                 |                                                                         |         |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
|                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <table><tr><th>Size</th><th>Dielectric</th><th>Rated voltage</th><th>Capacitance range</th></tr><tr><td>0201</td><td>X5R</td><td>6.3V,10V</td><td>C≥0.1μF</td></tr><tr><td>0402</td><td>X5R, Y5V</td><td>6.3V,10V</td><td>C≥1.0μF</td></tr><tr><td>0603</td><td>X5R</td><td>6.3V,10V</td><td>C≥4.7μF</td></tr><tr><td></td><td>Y5V</td><td></td><td>TT≥2.2μF</td></tr><tr><td>0805</td><td>X5R</td><td>6.3V</td><td>C≥22μF</td></tr><tr><td></td><td>Y5V</td><td></td><td>TT≥10μF</td></tr><tr><td>1206</td><td>X5R</td><td>6.3V</td><td>C≥47μF</td></tr><tr><td></td><td>Y5V</td><td></td><td>TT≥22μF</td></tr></table> | Size                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Dielectric    | Rated voltage         | Capacitance range  | 0201                                    | X5R             | 6.3V,10V                                                                | C≥0.1μF | 0402                                | X5R, Y5V | 6.3V,10V | C≥1.0μF | 0603    | X5R     | 6.3V,10V | C≥4.7μF |                                                           | Y5V  |                                                 | TT≥2.2μF      | 0805    | X5R   | 6.3V                      | C≥22μF  |  | Y5V |             | TT≥10μF       | 1206  | X5R | 6.3V                                                    | C≥47μF |     | Y5V |             | TT≥22μF | <table><tr><th>Rated vol.</th><th>D.F.≤</th><th colspan="2">Exception of D.F.≤</th></tr><tr><td>≥50V</td><td>3%</td><td>6%</td><td>0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF</td></tr><tr><td rowspan="3">25V</td><td rowspan="3">5%</td><td>10%</td><td>0805≥1μF; 1210≥10μF</td></tr><tr><td>14%</td><td>0603≥0.33μF;1206≥4.7μF</td></tr><tr><td>15%</td><td>0402≥0.10μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥6.8μF</td></tr><tr><td>16V</td><td>5%</td><td>10%</td><td>0603≥0.15μF; 0805≥0.68μF; 1206≥2.2μF; 1210≥4.7μF</td></tr><tr><td></td><td></td><td>15%</td><td>0402≥0.033μF; 0603≥0.68μF;0805≥2.2μF 1206≥4.7μF; 1210≥22μF</td></tr><tr><td>10V</td><td>7.5%</td><td>15%</td><td>0402≥0.33μF; 0603≥0.33μF;0805≥2.2μF 1206≥2.2μF; 1210≥22μF</td></tr><tr><td></td><td></td><td>20%</td><td>0201≥0.1μF ;0402≥1μF</td></tr><tr><td>6.3V</td><td>15%</td><td>30%</td><td>0402≥2.2μF ;0603≥10μF; 0805≥4.7μF; 1206≥47μF;1210≥100μF</td></tr></table> | Rated vol. | D.F.≤ | Exception of D.F.≤ |  | ≥50V | 3% | 6% | 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF | 25V | 5% | 10% | 0805≥1μF; 1210≥10μF | 14% | 0603≥0.33μF;1206≥4.7μF | 15% | 0402≥0.10μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥6.8μF | 16V | 5% | 10% | 0603≥0.15μF; 0805≥0.68μF; 1206≥2.2μF; 1210≥4.7μF |  |  | 15% | 0402≥0.033μF; 0603≥0.68μF;0805≥2.2μF 1206≥4.7μF; 1210≥22μF | 10V | 7.5% | 15% | 0402≥0.33μF; 0603≥0.33μF;0805≥2.2μF 1206≥2.2μF; 1210≥22μF |  |  | 20% | 0201≥0.1μF ;0402≥1μF | 6.3V | 15% | 30% | 0402≥2.2μF ;0603≥10μF; 0805≥4.7μF; 1206≥47μF;1210≥100μF |
|                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Size                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Dielectric                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Rated voltage | Capacitance range     |                    |                                         |                 |                                                                         |         |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
|                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 0201                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | X5R                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 6.3V,10V      | C≥0.1μF               |                    |                                         |                 |                                                                         |         |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
|                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 0402                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | X5R, Y5V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6.3V,10V      | C≥1.0μF               |                    |                                         |                 |                                                                         |         |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
|                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 0603                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | X5R                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 6.3V,10V      | C≥4.7μF               |                    |                                         |                 |                                                                         |         |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
|                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Y5V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |               | TT≥2.2μF              |                    |                                         |                 |                                                                         |         |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
|                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 0805                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | X5R                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 6.3V          | C≥22μF                |                    |                                         |                 |                                                                         |         |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
|                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Y5V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |               | TT≥10μF               |                    |                                         |                 |                                                                         |         |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
|                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1206                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | X5R                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 6.3V          | C≥47μF                |                    |                                         |                 |                                                                         |         |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
|                                                                         | Y5V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | TT≥22μF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |               |                       |                    |                                         |                 |                                                                         |         |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
| Rated vol.                                                              | D.F.≤                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Exception of D.F.≤                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |               |                       |                    |                                         |                 |                                                                         |         |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
| ≥50V                                                                    | 3%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |               |                       |                    |                                         |                 |                                                                         |         |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
| 25V                                                                     | 5%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 10%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0805≥1μF; 1210≥10μF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |               |                       |                    |                                         |                 |                                                                         |         |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
|                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 14%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0603≥0.33μF;1206≥4.7μF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |               |                       |                    |                                         |                 |                                                                         |         |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
|                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 15%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0402≥0.10μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥6.8μF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |               |                       |                    |                                         |                 |                                                                         |         |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
| 16V                                                                     | 5%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 10%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0603≥0.15μF; 0805≥0.68μF; 1206≥2.2μF; 1210≥4.7μF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |               |                       |                    |                                         |                 |                                                                         |         |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
|                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 15%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0402≥0.033μF; 0603≥0.68μF;0805≥2.2μF 1206≥4.7μF; 1210≥22μF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |               |                       |                    |                                         |                 |                                                                         |         |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
| 10V                                                                     | 7.5%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 15%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0402≥0.33μF; 0603≥0.33μF;0805≥2.2μF 1206≥2.2μF; 1210≥22μF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |               |                       |                    |                                         |                 |                                                                         |         |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
|                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 20%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0201≥0.1μF ;0402≥1μF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               |                       |                    |                                         |                 |                                                                         |         |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
| 6.3V                                                                    | 15%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 30%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0402≥2.2μF ;0603≥10μF; 0805≥4.7μF; 1206≥47μF;1210≥100μF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |               |                       |                    |                                         |                 |                                                                         |         |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
| (6)150% of rated voltage for below range.                               | <table><tr><th>Size</th><th>Dielectric</th><th>Rated voltage</th><th>Capacitance range</th></tr><tr><td rowspan="2">0402</td><td>X5R</td><td>10V,16V</td><td>C≥0.22μF</td></tr><tr><td>Y5V</td><td>16V</td><td>C≥0.47μF</td></tr><tr><td rowspan="2">0603</td><td>X5R</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="2">0805</td><td>X5R</td><td>10V</td><td>C≥4.7μF</td></tr><tr><td>Y5V</td><td>16V</td><td>C≥4.7μF</td></tr></table> | Size                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Dielectric                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Rated voltage | Capacitance range     | 0402               | X5R                                     | 10V,16V         | C≥0.22μF                                                                | Y5V     | 16V                                 | C≥0.47μF | 0603     | X5R     | 10V,16V | C≥1.0μF | Y5V      | 16V     | C≥2.2μF                                                   | 0805 | X5R                                             | 10V           | C≥4.7μF | Y5V   | 16V                       | C≥4.7μF |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
| Size                                                                    | Dielectric                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Rated voltage                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Capacitance range                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |               |                       |                    |                                         |                 |                                                                         |         |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
| 0402                                                                    | X5R                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 10V,16V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | C≥0.22μF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |               |                       |                    |                                         |                 |                                                                         |         |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
|                                                                         | Y5V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 16V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | C≥0.47μF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |               |                       |                    |                                         |                 |                                                                         |         |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
| 0603                                                                    | X5R                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 10V,16V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | C≥1.0μF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |               |                       |                    |                                         |                 |                                                                         |         |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
|                                                                         | Y5V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 16V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | C≥2.2μF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |               |                       |                    |                                         |                 |                                                                         |         |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
| 0805                                                                    | X5R                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 10V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | C≥4.7μF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |               |                       |                    |                                         |                 |                                                                         |         |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
|                                                                         | Y5V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 16V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | C≥4.7μF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |               |                       |                    |                                         |                 |                                                                         |         |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
|                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | * Measurement to be made after keeping at room temp. for 24±2 hrs. (Class I) or 48±4 hrs. (Class II).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |               |                       |                    |                                         |                 |                                                                         |         |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
|                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Y5V:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               |                       |                    |                                         |                 |                                                                         |         |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
|                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <table><tr><th>Rated vol.</th><th>D.F.≤</th><th colspan="2">Exception of D.F.≤</th></tr><tr><td>≥50V</td><td>7.5%</td><td>10%</td><td>0603≥0.1μF; 0805≥0.47μF; 1206≥4.7μF</td></tr><tr><td>35V</td><td>10%</td><td>---</td><td>---</td></tr><tr><td rowspan="2">25V</td><td rowspan="2">7.5%</td><td>10%</td><td>0402≥0.047μF;0603≥0.1μF; 0805≥0.33μF;1206≥1μF; 1210≥4.7μF</td></tr><tr><td>15%</td><td>0402≥0.068μF;0603≥0.47μF; 1206≥4.7μF; 1210≥22μF</td></tr><tr><td>16V (C&lt;1.0μF)</td><td>10%</td><td>12.5%</td><td>0402≥0.068μF; 0603≥0.68μF</td></tr><tr><td></td><td></td><td>20%</td><td>0402≥0.22μF</td></tr><tr><td>16V (C≥1.0μF)</td><td>12.5%</td><td>20%</td><td>0603≥2.2μF; 0805≥3.3μF; 1206≥10μF;1210≥22μF; 1812≥47μF;</td></tr><tr><td>10V</td><td>20%</td><td>30%</td><td>0402≥0.47μF</td></tr><tr><td>6.3V</td><td>30%</td><td>---</td><td>---</td></tr></table> | 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 | 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%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ---        | ---   |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
| 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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |               |                       |                    |                                         |                 |                                                                         |         |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
|                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 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, 1GΩ or 50 Ω-F whichever is smaller.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |               |                       |                    |                                         |                 |                                                                         |         |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
|                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Class II (X7R, X5R, Y5V)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |               |                       |                    |                                         |                 |                                                                         |         |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
|                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <table><tr><th>Rated voltage</th><th>Insulation Resistance</th></tr><tr><td>100V: X7R</td><td rowspan="4">1GΩ or RxC≥10 Ω-F whichever is smaller.</td></tr><tr><td>16V:0402≥0.22μF</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</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Rated voltage | Insulation Resistance | 100V: X7R          | 1GΩ or RxC≥10 Ω-F whichever is smaller. | 16V:0402≥0.22μF | 10V:0201≥47nF;0402≥0.47μF;0603≥0.47μF ; 0805≥2.2μF;1206≥4.7μF;1210≥47μF | 6.3V    |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
| Rated voltage                                                           | Insulation Resistance                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |               |                       |                    |                                         |                 |                                                                         |         |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
| 100V: X7R                                                               | 1GΩ or RxC≥10 Ω-F whichever is smaller.                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |               |                       |                    |                                         |                 |                                                                         |         |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
| 16V:0402≥0.22μF                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |               |                       |                    |                                         |                 |                                                                         |         |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
| 10V:0201≥47nF;0402≥0.47μF;0603≥0.47μF ; 0805≥2.2μF;1206≥4.7μF;1210≥47μF |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |               |                       |                    |                                         |                 |                                                                         |         |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |
| 6.3V                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |               |                       |                    |                                         |                 |                                                                         |         |                                     |          |          |         |         |         |          |         |                                                           |      |                                                 |               |         |       |                           |         |  |     |             |               |       |     |                                                         |        |     |     |             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |                    |  |      |    |    |                                        |     |    |     |                     |     |                        |     |                                                  |     |    |     |                                                  |  |  |     |                                                            |     |      |     |                                                           |  |  |     |                      |      |     |     |                                                         |

## APPENDIXES

### ■ Tape & reel dimensions

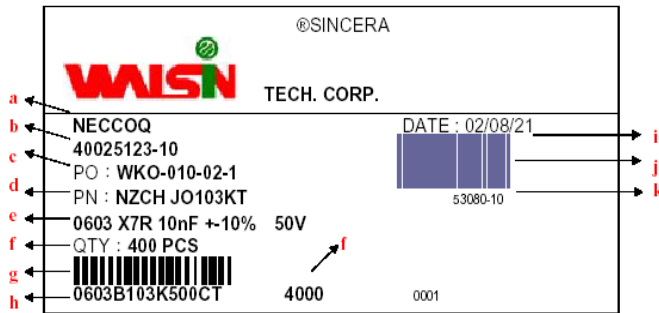


| Size              | 0402      | 0603      | 0805      |           |           | 1206      |           |           | 1210      |           | 1812      |
|-------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Thickness         | N         | S, X      | A         | B         | C, D, I   | B         | C, J, D   | G         | C, D, G   | M         | D, K      |
| A <sub>0</sub>    | 0.62±0.05 | 1.02±0.05 | 1.50±0.10 | 1.50±0.10 | <1.57     | 2.00±0.10 | <1.85     | <1.95     | <2.97     | <2.97     | <3.81     |
| B <sub>0</sub>    | 1.12±0.05 | 1.80±0.05 | 2.30±0.10 | 2.30±0.10 | <2.40     | 3.50±0.10 | <3.46     | <3.67     | <3.73     | <3.73     | <5.30     |
| T                 | 0.60±0.05 | 0.95±0.05 | 0.75±0.05 | 0.95±0.05 | 0.23±0.05 | 0.95±0.05 | 0.23±0.05 | 0.23±0.05 | 0.23±0.05 | 0.23±0.05 | 0.25±0.05 |
| K <sub>0</sub>    | -         | -         | -         | -         | <2.50     | -         | <2.50     | <2.50     | <2.50     | <3.00     | <2.50     |
| W                 | 8.00±0.10 | 8.00±0.10 | 8.00±0.10 | 8.00±0.10 | 8.00±0.10 | 8.00±0.10 | 8.00±0.10 | 8.00±0.10 | 8.00±0.10 | 8.00±0.10 | 12.0±0.20 |
| P <sub>0</sub>    | 4.00±0.10 | 4.00±0.10 | 4.00±0.10 | 4.00±0.10 | 4.00±0.10 | 4.00±0.10 | 4.00±0.10 | 4.00±0.10 | 4.00±0.10 | 4.00±0.10 | 4.00±0.10 |
| 10xP <sub>0</sub> | 40.0±0.10 | 40.0±0.10 | 40.0±0.10 | 40.0±0.10 | 40.0±0.10 | 40.0±0.10 | 40.0±0.10 | 40.0±0.10 | 40.0±0.10 | 40.0±0.10 | 40.0±0.10 |
| P <sub>1</sub>    | 2.00±0.05 | 4.00±0.10 | 4.00±0.10 | 4.00±0.10 | 4.00±0.10 | 4.00±0.10 | 4.00±0.10 | 4.00±0.10 | 4.00±0.10 | 4.00±0.10 | 8.00±0.10 |
| P <sub>2</sub>    | 2.00±0.05 | 2.00±0.05 | 2.00±0.05 | 2.00±0.05 | 2.00±0.05 | 2.00±0.05 | 2.00±0.05 | 2.00±0.05 | 2.00±0.05 | 2.00±0.05 | 2.00±0.05 |
| D <sub>0</sub>    | 1.55±0.05 | 1.55±0.05 | 1.55±0.05 | 1.55±0.05 | 1.50±0.05 | 1.50±0.05 | 1.50±0.05 | 1.50±0.05 | 1.50±0.05 | 1.50±0.05 | 1.50±0.05 |
| D <sub>1</sub>    | -         | -         | -         | -         | 1.00±0.10 | -         | 1.00±0.10 | 1.00±0.10 | 1.00±0.10 | 1.00±0.10 | 1.50±0.10 |
| E                 | 1.75±0.05 | 1.75±0.05 | 1.75±0.05 | 1.75±0.05 | 1.75±0.10 | 1.75±0.10 | 1.75±0.10 | 1.75±0.10 | 1.75±0.10 | 1.75±0.10 | 1.75±0.10 |
| F                 | 3.50±0.05 | 3.50±0.05 | 3.50±0.05 | 3.50±0.05 | 3.50±0.05 | 3.50±0.05 | 3.50±0.05 | 3.50±0.05 | 3.50±0.05 | 3.50±0.05 | 5.50±0.05 |



| Size           | 0402, 0603, 0805, 1206, 1210 |               |               | 1812          |
|----------------|------------------------------|---------------|---------------|---------------|
| Reel size      | 7"                           | 10"           | 13"           | 7"            |
| C              | 13.0+0.5/-0.2                | 13.0+0.5/-0.2 | 13.0+0.5/-0.2 | 13.0+0.5/-0.2 |
| W <sub>1</sub> | 8.4+1.5/-0                   | 8.4+1.5/-0    | 8.4+1.5/-0    | 12.4+2.0/-0   |
| A              | 178.0±0.10                   | 250.0±1.0     | 330.0±1.0     | 178.0±0.10    |
| N              | 60.0+1.0/-0                  | 100.0±1.0     | 100±1.0       | 60.0+1.0/-0   |

## ■ Description of customer label



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

## ■ Constructions

| No. | Name             | NPO*                     | NPO, X7R, Y5V |
|-----|------------------|--------------------------|---------------|
| ①   | Ceramic material | BaTiO <sub>3</sub> based |               |
| ②   | Inner electrode  | AgPd alloy               | Ni            |
| ③   | Termination      | Inner layer              | Ag            |
| ④   |                  | Middle layer             | Ni            |
| ⑤   |                  | Outer layer              | Sn            |

\* Partial NPO items are with Ag/Ni/Sn terminations, please ref to product range of NPO dielectric for detail.

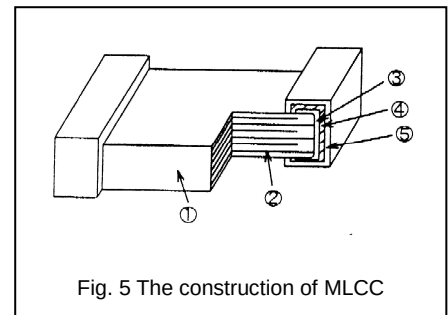


Fig. 5 The construction of MLCC

## ■ Storage and handling conditions

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

Cautions:

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

## Recommended soldering conditions

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

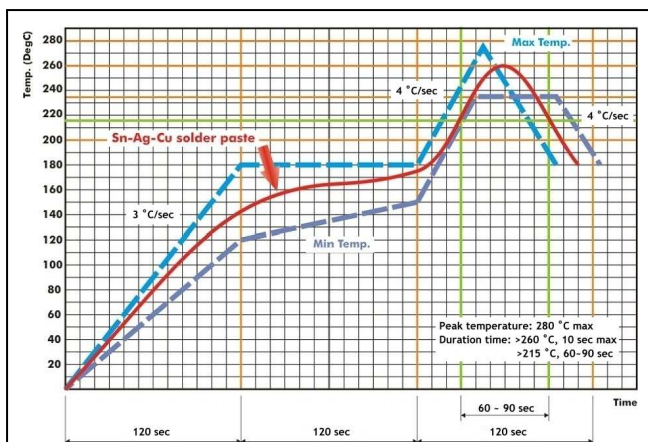


Fig. 6 Recommended IR reflow soldering profile for SMT process with SnAgCu series solder paste.

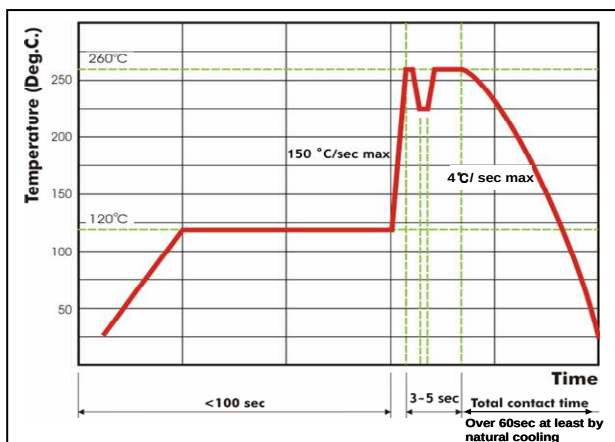


Fig. 7 Recommended wave soldering profile for SMT process with SnAgCu series solder.