

# PRODUCT SPECIFICATION

**PRODUCT: MULTILAYER CERAMIC CAPACITOR**

**TYPE: RADIAL-LEADED TYPE CAPACITOR**

**CUSTOMER:** \_\_\_\_\_

**DOC. NO.:** D13-00-E-14

**Ver.:** 14

**APPROVED BY CUSTOMER**

**VENDOR :**

**WALSIN TECHNOLOGY CORPORATION**

566-1, KAO SHI ROAD, YANG-MEI  
TAO-YUAN, TAIWAN

**PAN OVERSEAS (GUANGZHOU) ELECTRONIC CO.,LTD.**

NO.277,HONG MING ROAD,EASTERN SECTION,  
GUANG ZHOU ECONOMIC AND TECHNOLOGY  
DEVELOPMENT ZONE,CHINA

**MAKER : PAN OVERSEAS (GUANGZHOU) ELECTRONIC CO.,LTD.**

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DEVELOPMENT ZONE,CHINA



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### Record of change

| Date       | Version | Description   | page                      |
|------------|---------|---|---------------------------|
| 2009.6.24  | 3       | 1. Add voltage code in Marking.   | 14                        |
| 2009.8.17  | 4       | 1. Change PSA & POE logo to Walsin & POE logo.  | all                       |
| 2012/5/31  | 5       | 1. Review the capacitance range.  | 13~14                     |
| 2012/11/20 | 6       | 1. Add "Table of contents".<br>2. Review the body size W/H/T according to the chip size.<br>3. Review the contents of description.<br>4. Correct the size of P1 for type RD20.  | 3<br>4<br>11<br>13        |
| 2013/5/6   | 7       | 1. Review the Lead diameter $\phi$ from $0.55\pm 0.05\text{mm}$ to $0.5\pm 0.05\text{mm}$<br>2. Add "H1 max" to lead configuration and size form.<br>3. Review the Solderability temperature from $235\pm 5^{\circ}\text{C}$ to $245\pm 5^{\circ}\text{C}$ .,Solderability time from $2\pm 0.5\text{s}$ to $5\pm 0.5\text{s}$ " | 4,12,13<br>4<br>8         |
| 2014/8/8   | 8       | 1. Review the item 8 from "Storing condition and term" to be "Operating and storage environment"<br>2. Delete the 1206size for RD20 type.<br>3. Delete the 500V ~630V type of 0805 size.<br>4. Review the D.F. spec according to MLCC spec of Walsin.   | 11<br>4<br>14<br>6,8,9,10 |
| 2015/11/24 | 9       | 1. Review the Part number defining.<br>2. Add the 1812 size for the D.F. spec according to MLCC spec of Walsin.<br>3. Review the Packing quantity.<br>4. Add voltage code in Marking for 2000V & 3000V.   | 4<br>6,8,9,10<br>14<br>15 |
| 2016/9/19  | 10      | 1. Review the Part number defining.<br>2. Review the Size code and capacitance (pF) available   | 4<br>15~17                |
| 2017/3/23  | 11      | 1. Delete the C Tolerance Code<br>2. Review the Packing specification   | 4<br>15                   |
| 2017/7/7   | 12      | 1. Review the Part number defining<br>2. Complete Marking statement(Add 2-figure code Marking)  | 4<br>18                   |
| 2017/11/8  | 13      | 1. Review the Part number defining ( add the 2220 size ) .<br>2. Review the D.F. spec according to MLCC spec of Walsin.<br>3. Add voltage code in Marking for 1500V & 2500V.  | 4<br>6,8,9,10<br>15       |
| 2018/12/19 | 14      | 1. Review the D.F. spec according to MLCC spec of Walsin.<br>2. Review the Size code and capacitance (pF) available   | 6,8,9,10<br>15~17         |

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**1. Scope:**

Its specification applies to Radial Series Ceramic Capacitor.


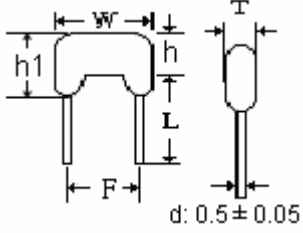

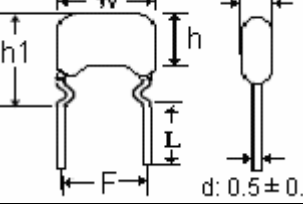

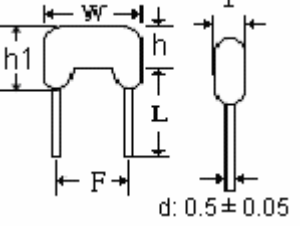
**2. Part number defining (SAP):**

| RD21         | B               |      |                               |  | 102  | K                                     | 500   | B              | 5                                    | C  | 07                      | B                            |
|--------------|-----------------|------|-------------------------------|--|--|---------------------------------------|---|----------------|--------------------------------------|--|-------------------------|------------------------------|
| Product Type | Dielectric Code |      |                               |  | Capacitance Code                           | Tolerance Code                        | Rated Voltage   | Packaging Code | Chip Size                            | Termination                              | Lead length             | Lead length Tolerance        |
| RD20         | Code            | T.C. | Operating Temperature         | Capacitance Change( $\Delta^{\circ}\text{C}$ ) | 100=10 pF<br>102=1000 pF                   | D= $\pm 0.5\text{pF}$<br>J= $\pm 5\%$ | 100=10V<br>250=25V  | B=Bulk         | 5=0805                               | L=Ag/Ni/Sn<br>AN=Ammo                    | Tapping:<br>AN=Ammo     | D=Tapping                    |
| RD21         | N               | NPO  | -55 ~ +125 $^{\circ}\text{C}$ | 0 $\pm 30$ (PPM/ $^{\circ}\text{C}$ )          | 103=10000 pF<br>1R5=1.5 pF                 | K= $\pm 10\%$<br>M= $\pm 20\%$        | 500=50V<br>101=100V<br>201=200V   | A=Ammo         | 6=1206                               | C=Cu/Ni/Sn<br>A=Ag/Ni/Sn<br>Halogen free | Bulk (ex):<br>07=7.0 mm | A= $\pm 0.5\text{mm}$        |
| RD30         | B               | X7R  | -55 ~ +125 $^{\circ}\text{C}$ | $\pm 15\%$                                     | 101=100 pF<br>472=4700 pF<br>104=100000 pF | Z= $+80\%$<br>/-20%                   | 251=250V<br>501=500V<br>631=630V<br>102=1000V<br>202=2000V<br>302=3000V |                | 0=1210<br>2=1812<br>8=1808<br>B=2220 | H=Cu/Ni/Sn<br>Halogen free               |                         | B= $\pm 1\text{mm}$<br>C=Min |
|              | F               | Y5V  | -25 ~ +85 $^{\circ}\text{C}$  | +30% ~ -80%                                    |  |                                       |   |                |                                      |  |                         |                              |

\* Remark about tolerance code:

NPO: Cap<10pF: D tolerance / Cap $\geq 10\text{pF}$ : J, K, M, Z, X7R: K、M, Y5V: M、Z

**3. Lead configuration and size: (Unit: mm)**

| Type Code | Chip size           | Dimensions (Unit:mm) |               |      |                   |  |                | Lead spacing(F)   |   | Lead Configuration |
|-----------|---------------------|----------------------|---------------|------|-------------------|--|----------------|---|---|--------------------|
|           |                     | Width (W)Max.        | Height (Max.) |      | Thickness (T)Max. | Lead length (L)                        | Taping         | Bulk  |   |                    |
|           |                     |                      | h             | h1   |                   |  |                |   |   |                    |
| RD20      | 0805                | 5.0                  | 4.5           | 6.0  | 3.5               | 2.5 $\pm 0.8$                          | 2.54 $\pm 1.0$ |   |   |                    |
| RD21      | 0805                | 5.0                  | 4.5           | 6.5  | 3.5               | Refer to the item "2. SAP Part Number" | 5.0 $\pm 0.8$  | 5.08 $\pm 1.0$  |   |                    |
|           | 1206                | 6.5                  | 5.0           | 7.0  | 4.0               |  |                |   |   |                    |
|           | 1210 (Special size) | 6.5                  | 5.5           | 7.5  | 5.0               |  |                |   |   |                    |
| RD30      | 1808                | 8.0                  | 6.0           | 7.5  | 5.5               | 5.0 $\pm 0.8$                          | 5.08 $\pm 1.0$ |   |   |                    |
|           | 1812                | 8.0                  | 6.5           | 8.0  | 5.5               |  |                |   |   |                    |
|           | 2220 (Special size) | 9.0                  | 9.0           | 10.0 | 6.0               |  |                |   |   |                    |

\* Lead diameter  $\Phi d$ : 0.5 +/-0.05mm

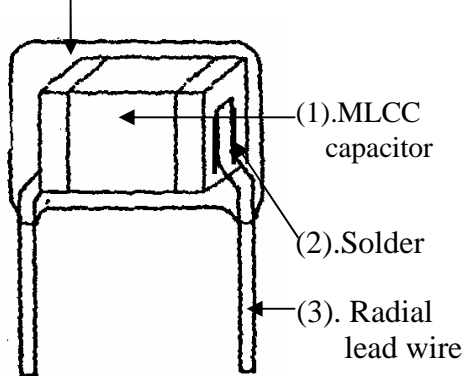
\* Special size : Customized

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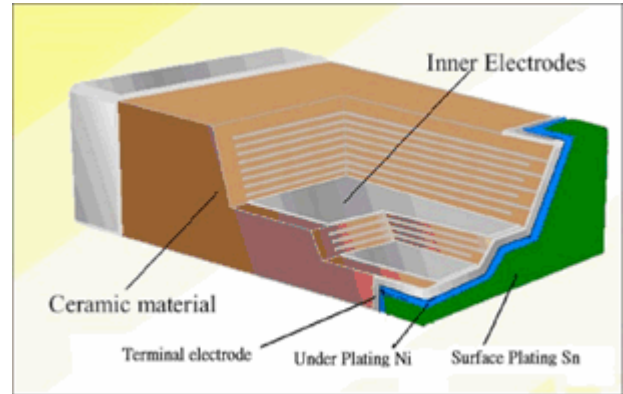
**4. Product structure:**

Radial capacitor

(4) Epoxy coating



(1). MLCC capacitor



| NO  | Part name        | Material           |                      |
|-----|------------------|--------------------|----------------------|
| (1) | MLCC capacitor   | Ceramic dielectric |                      |
|     |                  | Internal Electrode | Ag-Pd or Ni (BME)    |
|     |                  | Terminal electrode | Ag or Cu (BME) layer |
|     |                  | Under Plating      | Ni layer             |
|     |                  | Surface Plating    | Sn layer             |
| (2) | Solder           | Tin-silver         |                      |
| (3) | Radial Lead Wire | Tined CP wire      |                      |
| (4) | Coating          | Epoxy resin(Blue)  |                      |

**5. Specification and test method :**

**5.1 Test conditions:**

Tests shall, unless otherwise specified, be carried out at 15 to 35°C and RH 45 to 75%. If any doubt and argument has been encounter in judgement, the final test shall be done at 25±2°C, RH45 to 55% and 860~1060mbar. (Based on JIS standard)

**5.2 Handle procedure:**

To avoid unexpected testing results from occurring, the tested capacitor must be kept at room temperature for at least 30 minutes and completely discharged.

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**5.3 Performance:**

| No.                | Item                        | Performance   | Test or inspection method   |               |                          |       |        |                             |       |          |        |            |        |                                   |        |      |  |                   |        |  |      |                                     |      |   |     |       |                             |        |  |      |                              |     |       |      |  |      |                             |         |              |     |      |  |                    |      |  |      |                           |                    |      |  |     |      |  |         |
|--------------------|-----------------------------|---|---|---------------|--------------------------|-------|--------|-----------------------------|-------|----------|--------|------------|--------|-----------------------------------|--------|------|--|-------------------|--------|--|------|-------------------------------------|------|---|-----|-------|-----------------------------|--------|--|------|------------------------------|-----|-------|------|--|------|-----------------------------|---------|--------------|-----|------|--|--------------------|------|--|------|---------------------------|--------------------|------|--|-----|------|--|---------|
| (1)                | Appearance structure size   | No defects which may affect performance.  | As section 3  |               |                          |       |        |                             |       |          |        |            |        |                                   |        |      |  |                   |        |  |      |                                     |      |   |     |       |                             |        |  |      |                              |     |       |      |  |      |                             |         |              |     |      |  |                    |      |  |      |                           |                    |      |  |     |      |  |         |
| (2)                | Withstand Voltage           | Withstand test voltage without Insulation breakdown or other damage.  | DC Tested voltage shall be applied for 1~5sec. Charge/discharge current shall not exceed 50 mA .<br><table border="1" style="margin-left: 20px;"> <tr> <th>Rated Voltage</th> <th>Tested Voltage</th> </tr> <tr> <td>&lt;100V</td> <td>2.5Ra</td> </tr> <tr> <td>100V</td> <td>3.0Ra</td> </tr> <tr> <td>200~300V</td> <td>2.0 Ra</td> </tr> <tr> <td>500~999V</td> <td>1.5 Ra</td> </tr> <tr> <td>1000~3000V</td> <td>1.2 Ra</td> </tr> </table> | Rated Voltage | Tested Voltage           | <100V | 2.5Ra  | 100V                        | 3.0Ra | 200~300V | 2.0 Ra | 500~999V   | 1.5 Ra | 1000~3000V                        | 1.2 Ra |      |  |                   |        |  |      |                                     |      |   |     |       |                             |        |  |      |                              |     |       |      |  |      |                             |         |              |     |      |  |                    |      |  |      |                           |                    |      |  |     |      |  |         |
| Rated Voltage      | Tested Voltage              |   |   |               |                          |       |        |                             |       |          |        |            |        |                                   |        |      |  |                   |        |  |      |                                     |      |   |     |       |                             |        |  |      |                              |     |       |      |  |      |                             |         |              |     |      |  |                    |      |  |      |                           |                    |      |  |     |      |  |         |
| <100V              | 2.5Ra                       |   |   |               |                          |       |        |                             |       |          |        |            |        |                                   |        |      |  |                   |        |  |      |                                     |      |   |     |       |                             |        |  |      |                              |     |       |      |  |      |                             |         |              |     |      |  |                    |      |  |      |                           |                    |      |  |     |      |  |         |
| 100V               | 3.0Ra                       |   |   |               |                          |       |        |                             |       |          |        |            |        |                                   |        |      |  |                   |        |  |      |                                     |      |   |     |       |                             |        |  |      |                              |     |       |      |  |      |                             |         |              |     |      |  |                    |      |  |      |                           |                    |      |  |     |      |  |         |
| 200~300V           | 2.0 Ra                      |   |   |               |                          |       |        |                             |       |          |        |            |        |                                   |        |      |  |                   |        |  |      |                                     |      |   |     |       |                             |        |  |      |                              |     |       |      |  |      |                             |         |              |     |      |  |                    |      |  |      |                           |                    |      |  |     |      |  |         |
| 500~999V           | 1.5 Ra                      |   |   |               |                          |       |        |                             |       |          |        |            |        |                                   |        |      |  |                   |        |  |      |                                     |      |   |     |       |                             |        |  |      |                              |     |       |      |  |      |                             |         |              |     |      |  |                    |      |  |      |                           |                    |      |  |     |      |  |         |
| 1000~3000V         | 1.2 Ra                      |   |   |               |                          |       |        |                             |       |          |        |            |        |                                   |        |      |  |                   |        |  |      |                                     |      |   |     |       |                             |        |  |      |                              |     |       |      |  |      |                             |         |              |     |      |  |                    |      |  |      |                           |                    |      |  |     |      |  |         |
| (3)                | Insulation resistance       | NPO:<br>10,000MΩ Min. or 500Ω *F Min<br>X7R、Y5V:<br>10GΩ Min or<br>R · C ≥ 500Ω · F<br>(Whichever is smaller)   | Insulation resistance shall be measured at 120±5 seconds after rated voltage applied.<br><table border="1" style="margin-left: 20px;"> <tr> <th>Rated Voltage</th> <th>Tested Voltage</th> </tr> <tr> <td>&lt;500V</td> <td>1.0 Ra</td> </tr> <tr> <td>≥ 500V</td> <td>500V</td> </tr> </table>   | Rated Voltage | Tested Voltage           | <500V | 1.0 Ra | ≥ 500V                      | 500V  |          |        |            |        |                                   |        |      |  |                   |        |  |      |                                     |      |   |     |       |                             |        |  |      |                              |     |       |      |  |      |                             |         |              |     |      |  |                    |      |  |      |                           |                    |      |  |     |      |  |         |
| Rated Voltage      | Tested Voltage              |   |   |               |                          |       |        |                             |       |          |        |            |        |                                   |        |      |  |                   |        |  |      |                                     |      |   |     |       |                             |        |  |      |                              |     |       |      |  |      |                             |         |              |     |      |  |                    |      |  |      |                           |                    |      |  |     |      |  |         |
| <500V              | 1.0 Ra                      |   |   |               |                          |       |        |                             |       |          |        |            |        |                                   |        |      |  |                   |        |  |      |                                     |      |   |     |       |                             |        |  |      |                              |     |       |      |  |      |                             |         |              |     |      |  |                    |      |  |      |                           |                    |      |  |     |      |  |         |
| ≥ 500V             | 500V                        |   |   |               |                          |       |        |                             |       |          |        |            |        |                                   |        |      |  |                   |        |  |      |                                     |      |   |     |       |                             |        |  |      |                              |     |       |      |  |      |                             |         |              |     |      |  |                    |      |  |      |                           |                    |      |  |     |      |  |         |
| (4)                | Capacitance                 | Within the specified tolerance.   | Measuring frequency & voltage:<br>NPO : > 1000pF :<br>1KHz±10%<br>1.0±0.2 Vrms<br>≤ 1000pF :<br>1MHz±10%<br>1.0±0.2 Vrms<br>X7R、Y5V :<br>C ≤ 10uF<br>1.0±0.2 Vrms<br>1KHz±10%<br>C > 10 uF<br>0.5±0.2 Vrms<br>120Hz±20%   |               |                          |       |        |                             |       |          |        |            |        |                                   |        |      |  |                   |        |  |      |                                     |      |   |     |       |                             |        |  |      |                              |     |       |      |  |      |                             |         |              |     |      |  |                    |      |  |      |                           |                    |      |  |     |      |  |         |
| (5)                | Dissipation Factor          | <table border="1" style="width: 100%;"> <tr> <td rowspan="2">NPO</td> <td colspan="3">More than 30pF: Q ≥ 1000</td> </tr> <tr> <td colspan="3">Less than 30pF: Q ≥ 400+20C</td> </tr> <tr> <td rowspan="6">X7R</td> <td>Rated vol.</td> <td>DF ≤</td> <td>Special chip size and capacitance</td> </tr> <tr> <td>&gt;1000V</td> <td>≤ 3%</td> <td></td> </tr> <tr> <td rowspan="3">≥ 100V<br/>≤ 1000V</td> <td>≤ 2.5%</td> <td></td> </tr> <tr> <td>≤ 3%</td> <td>1206 ≥ 0.47μF<br/>1812 &amp; 1808 &amp; 2220</td> </tr> <tr> <td>≤ 5%</td> <td>0805 &gt; 0.1μF, 1206 &gt; 1μF,<br/>1210 ≥ 2.2μF</td> </tr> <tr> <td rowspan="3">50V</td> <td>≤ 10%</td> <td>0805 &gt; 0.22μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td>≤ 2.5%</td> <td></td> </tr> <tr> <td>≤ 3%</td> <td>0805 ≥ 0.18μF, 1206 ≥ 0.47μF</td> </tr> <tr> <td rowspan="4">Y5V</td> <td rowspan="3">≥ 50V</td> <td>≤ 5%</td> <td></td> </tr> <tr> <td>≤ 7%</td> <td>0805 ≥ 0.47μF, 1206 ≥ 4.7μF</td> </tr> <tr> <td>≤ 12.5%</td> <td>1210 ≥ 6.8μF</td> </tr> <tr> <td>25V</td> <td>≤ 5%</td> <td></td> </tr> <tr> <td rowspan="3">16V<br/>(C &lt; 1.0μF)</td> <td>≤ 7%</td> <td>0805 ≥ 0.33μF,<br/>1206 ≥ 1μF, 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 9%</td> <td>1206 ≥ 4.7μF, 1210 ≥ 22μF</td> </tr> <tr> <td>16V<br/>(C ≥ 1.0μF)</td> <td>≤ 7%</td> <td></td> </tr> <tr> <td rowspan="2">10V</td> <td>≤ 9%</td> <td></td> </tr> <tr> <td>≤ 12.5%</td> <td>0805 ≥ 3.3μF; 1206 ≥ 10μF;<br/>1210 ≥ 22μF; 1812 ≥ 47μF</td> </tr> </table> |   | NPO           | More than 30pF: Q ≥ 1000 |       |        | Less than 30pF: Q ≥ 400+20C |       |          | X7R    | Rated vol. | DF ≤   | Special chip size and capacitance | >1000V | ≤ 3% |  | ≥ 100V<br>≤ 1000V | ≤ 2.5% |  | ≤ 3% | 1206 ≥ 0.47μF<br>1812 & 1808 & 2220 | ≤ 5% | 0805 > 0.1μF, 1206 > 1μF,<br>1210 ≥ 2.2μF | 50V | ≤ 10% | 0805 > 0.22μF; 1210 ≥ 3.3μF | ≤ 2.5% |  | ≤ 3% | 0805 ≥ 0.18μF, 1206 ≥ 0.47μF | Y5V | ≥ 50V | ≤ 5% |  | ≤ 7% | 0805 ≥ 0.47μF, 1206 ≥ 4.7μF | ≤ 12.5% | 1210 ≥ 6.8μF | 25V | ≤ 5% |  | 16V<br>(C < 1.0μF) | ≤ 7% | 0805 ≥ 0.33μF,<br>1206 ≥ 1μF, 1210 ≥ 4.7μF | ≤ 9% | 1206 ≥ 4.7μF, 1210 ≥ 22μF | 16V<br>(C ≥ 1.0μF) | ≤ 7% |  | 10V | ≤ 9% |  | ≤ 12.5% |
| NPO                | More than 30pF: Q ≥ 1000    |   |   |               |                          |       |        |                             |       |          |        |            |        |                                   |        |      |  |                   |        |  |      |                                     |      |   |     |       |                             |        |  |      |                              |     |       |      |  |      |                             |         |              |     |      |  |                    |      |  |      |                           |                    |      |  |     |      |  |         |
|                    | Less than 30pF: Q ≥ 400+20C |   |   |               |                          |       |        |                             |       |          |        |            |        |                                   |        |      |  |                   |        |  |      |                                     |      |   |     |       |                             |        |  |      |                              |     |       |      |  |      |                             |         |              |     |      |  |                    |      |  |      |                           |                    |      |  |     |      |  |         |
| X7R                | Rated vol.                  | DF ≤  | Special chip size and capacitance   |               |                          |       |        |                             |       |          |        |            |        |                                   |        |      |  |                   |        |  |      |                                     |      |   |     |       |                             |        |  |      |                              |     |       |      |  |      |                             |         |              |     |      |  |                    |      |  |      |                           |                    |      |  |     |      |  |         |
|                    | >1000V                      | ≤ 3%  |   |               |                          |       |        |                             |       |          |        |            |        |                                   |        |      |  |                   |        |  |      |                                     |      |   |     |       |                             |        |  |      |                              |     |       |      |  |      |                             |         |              |     |      |  |                    |      |  |      |                           |                    |      |  |     |      |  |         |
|                    | ≥ 100V<br>≤ 1000V           | ≤ 2.5%  |   |               |                          |       |        |                             |       |          |        |            |        |                                   |        |      |  |                   |        |  |      |                                     |      |   |     |       |                             |        |  |      |                              |     |       |      |  |      |                             |         |              |     |      |  |                    |      |  |      |                           |                    |      |  |     |      |  |         |
|                    |                             | ≤ 3%  | 1206 ≥ 0.47μF<br>1812 & 1808 & 2220   |               |                          |       |        |                             |       |          |        |            |        |                                   |        |      |  |                   |        |  |      |                                     |      |   |     |       |                             |        |  |      |                              |     |       |      |  |      |                             |         |              |     |      |  |                    |      |  |      |                           |                    |      |  |     |      |  |         |
|                    |                             | ≤ 5%  | 0805 > 0.1μF, 1206 > 1μF,<br>1210 ≥ 2.2μF   |               |                          |       |        |                             |       |          |        |            |        |                                   |        |      |  |                   |        |  |      |                                     |      |   |     |       |                             |        |  |      |                              |     |       |      |  |      |                             |         |              |     |      |  |                    |      |  |      |                           |                    |      |  |     |      |  |         |
|                    | 50V                         | ≤ 10%   | 0805 > 0.22μF; 1210 ≥ 3.3μF   |               |                          |       |        |                             |       |          |        |            |        |                                   |        |      |  |                   |        |  |      |                                     |      |   |     |       |                             |        |  |      |                              |     |       |      |  |      |                             |         |              |     |      |  |                    |      |  |      |                           |                    |      |  |     |      |  |         |
| ≤ 2.5%             |                             |   |   |               |                          |       |        |                             |       |          |        |            |        |                                   |        |      |  |                   |        |  |      |                                     |      |   |     |       |                             |        |  |      |                              |     |       |      |  |      |                             |         |              |     |      |  |                    |      |  |      |                           |                    |      |  |     |      |  |         |
| ≤ 3%               |                             | 0805 ≥ 0.18μF, 1206 ≥ 0.47μF  |   |               |                          |       |        |                             |       |          |        |            |        |                                   |        |      |  |                   |        |  |      |                                     |      |   |     |       |                             |        |  |      |                              |     |       |      |  |      |                             |         |              |     |      |  |                    |      |  |      |                           |                    |      |  |     |      |  |         |
| Y5V                | ≥ 50V                       | ≤ 5%  |   |               |                          |       |        |                             |       |          |        |            |        |                                   |        |      |  |                   |        |  |      |                                     |      |   |     |       |                             |        |  |      |                              |     |       |      |  |      |                             |         |              |     |      |  |                    |      |  |      |                           |                    |      |  |     |      |  |         |
|                    |                             | ≤ 7%  | 0805 ≥ 0.47μF, 1206 ≥ 4.7μF   |               |                          |       |        |                             |       |          |        |            |        |                                   |        |      |  |                   |        |  |      |                                     |      |   |     |       |                             |        |  |      |                              |     |       |      |  |      |                             |         |              |     |      |  |                    |      |  |      |                           |                    |      |  |     |      |  |         |
|                    |                             | ≤ 12.5%   | 1210 ≥ 6.8μF  |               |                          |       |        |                             |       |          |        |            |        |                                   |        |      |  |                   |        |  |      |                                     |      |   |     |       |                             |        |  |      |                              |     |       |      |  |      |                             |         |              |     |      |  |                    |      |  |      |                           |                    |      |  |     |      |  |         |
|                    | 25V                         | ≤ 5%  |   |               |                          |       |        |                             |       |          |        |            |        |                                   |        |      |  |                   |        |  |      |                                     |      |   |     |       |                             |        |  |      |                              |     |       |      |  |      |                             |         |              |     |      |  |                    |      |  |      |                           |                    |      |  |     |      |  |         |
| 16V<br>(C < 1.0μF) | ≤ 7%                        | 0805 ≥ 0.33μF,<br>1206 ≥ 1μF, 1210 ≥ 4.7μF  |   |               |                          |       |        |                             |       |          |        |            |        |                                   |        |      |  |                   |        |  |      |                                     |      |   |     |       |                             |        |  |      |                              |     |       |      |  |      |                             |         |              |     |      |  |                    |      |  |      |                           |                    |      |  |     |      |  |         |
|                    | ≤ 9%                        | 1206 ≥ 4.7μF, 1210 ≥ 22μF   |   |               |                          |       |        |                             |       |          |        |            |        |                                   |        |      |  |                   |        |  |      |                                     |      |   |     |       |                             |        |  |      |                              |     |       |      |  |      |                             |         |              |     |      |  |                    |      |  |      |                           |                    |      |  |     |      |  |         |
|                    | 16V<br>(C ≥ 1.0μF)          | ≤ 7%  |   |               |                          |       |        |                             |       |          |        |            |        |                                   |        |      |  |                   |        |  |      |                                     |      |   |     |       |                             |        |  |      |                              |     |       |      |  |      |                             |         |              |     |      |  |                    |      |  |      |                           |                    |      |  |     |      |  |         |
| 10V                | ≤ 9%                        |   |   |               |                          |       |        |                             |       |          |        |            |        |                                   |        |      |  |                   |        |  |      |                                     |      |   |     |       |                             |        |  |      |                              |     |       |      |  |      |                             |         |              |     |      |  |                    |      |  |      |                           |                    |      |  |     |      |  |         |
|                    | ≤ 12.5%                     | 0805 ≥ 3.3μF; 1206 ≥ 10μF;<br>1210 ≥ 22μF; 1812 ≥ 47μF  |   |               |                          |       |        |                             |       |          |        |            |        |                                   |        |      |  |                   |        |  |      |                                     |      |   |     |       |                             |        |  |      |                              |     |       |      |  |      |                             |         |              |     |      |  |                    |      |  |      |                           |                    |      |  |     |      |  |         |

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| No. | Item                                      | Performance                       |                           |   | Test or inspection method   |   |  |
|-----|---|-----------------------------------|---------------------------|---|---|---|--|
| (6) | Temperature Characteristic of Capacitance | Temperatures Coefficient          |                           |   | The temperature coefficient is determined using the capacitance measured at base temperature as a reference. Test the specimen in a range of maximum and minimum operation temperature that shown as left table.<br>* Base Temp $25 \pm 2^\circ\text{C}$<br>* Base Temp for Y5V: $20 \pm 2^\circ\text{C}$ |   |  |
|     |   | T.C.                              | Operating Temperature     | Capacitance Change ( $\Delta C$ )                                   |   |   |  |
|     |   | NPO                               | -55~+125 $^\circ\text{C}$ | $0 \pm 30(\text{ppm}/^\circ\text{C})$                               |   |   |  |
|     |   | X7R                               | -55~+125 $^\circ\text{C}$ | $\pm 15\%$  | Step  | Temperature( $^\circ\text{C}$ )   |  |
|     |   | Y5V                               | -25~+85 $^\circ\text{C}$  | +30%~ -80%  | 1   | Base Temp.(25 $^\circ\text{C}$ ) $\pm 2^\circ\text{C}$  |  |
|     |   |                                   |                           |   | 2   | Min. Operation Temp. $\pm 2^\circ\text{C}$  |  |
|     |   |                                   |                           |   | 3   | Base Temp.(25 $^\circ\text{C}$ ) $\pm 2^\circ\text{C}$  |  |
|     |   |                                   | 4                         | Max. Operation Temp. $\pm 2^\circ\text{C}$                          |   |   |  |
|     |   |                                   | 5                         | Base Temp.(25 $^\circ\text{C}$ ) $\pm 2^\circ\text{C}$              |   |   |  |
| (7) | Terminal strength                         | Tensile strength:<br>No breakdown |                           |   | Loading weight 0.5 Kgs is applied for 10 $\pm 1$ seconds  |   |  |
|     |   | Bending strength:<br>No breakdown |                           |   | Loading weight 0.25 Kgs is applied<br>Bending back and forth 90 degrees twice   |   |  |
| (8) | Soldering heat resistance                 | External appearance               | No mechanical damage.     |   |   | Lead wire or terminals shall be immersed (A) up to 2.0 mm from body (B) into the Molten solder of which temperature is 260+5 -0 $^\circ\text{C}$ for 3 $\pm 0.5$ sec. Then leave at standard test conditions for 24 $\pm 2$ hours, then measured.<br><br>*Preconditioning :<br>(only for Class 2):<br>Perform a heat treatment at 150 +0/-10 $^\circ\text{C}$ for one hour and then let sit for 48 $\pm 4$ hours at room temperature. |  |
|     |   | Cap. change ( $\Delta C/C$ )      | NPO                       | $\pm 2.5\%$ or<br>$\pm 0.25 \text{ pF max.}$<br>Whichever is larger |   |   |  |
|     |   |                                   | X7R                       | $\pm 7.5\%$   |   |   |  |
|     |   |                                   | Y5V                       | $\pm 20\%$  |   |   |  |
|     | D.F.                                      | To meet initial standard value    |                           |   |   |   |  |
|     | I.R.                                      | To meet initial standard value    |                           |   |   |   |  |

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| SPECIFICATION OF MULTI-LAYER RADIAL-LEADED TYPE CAPACITOR | D13-00-E-14 | Ver: 14<br>Page: 8 / 18 |
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| No.                 | Item   | Performance  | Test or inspection method  |                       |                                   |                    |  |               |       |                             |        |  |                                  |                             |     |   |   |       |   |                 |              |                                 |                                       |         |     |   |  |      |                                   |        |      |               |      |                    |        |  |       |                             |     |      |  |      |                              |       |              |       |                                       |  |     |  |            |      |                                   |       |        |  |       |                             |       |              |     |        |  |       |   |       |                           |                 |       |  |                 |         |  |       |  |     |       |  |  |      |   |  |   |
|---------------------|--|--|--|-----------------------|-----------------------------------|--------------------|--|---------------|-------|-----------------------------|--------|--|----------------------------------|-----------------------------|-----|---|---|-------|---|-----------------|--------------|---------------------------------|---------------------------------------|---------|-----|---|--|------|-----------------------------------|--------|------|---------------|------|--------------------|--------|--|-------|-----------------------------|-----|------|--|------|------------------------------|-------|--------------|-------|---------------------------------------|--|-----|--|------------|------|-----------------------------------|-------|--------|--|-------|-----------------------------|-------|--------------|-----|--------|--|-------|---|-------|---------------------------|-----------------|-------|--|-----------------|---------|--|-------|--|-----|-------|--|--|------|---|--|---|
| (9)                 | Solderability  | Lead wire shall be soldered over 75% of the circumfluent direction   | To comply with JIS-C-5102 8.4 , the soldering temperature is 245±5°C and dipping time is 5±0.5 seconds.<br>Flux: weight ratio of Rosin 25% |                       |                                   |                    |  |               |       |                             |        |  |                                  |                             |     |   |   |       |   |                 |              |                                 |                                       |         |     |   |  |      |                                   |        |      |               |      |                    |        |  |       |                             |     |      |  |      |                              |       |              |       |                                       |  |     |  |            |      |                                   |       |        |  |       |                             |       |              |     |        |  |       |   |       |                           |                 |       |  |                 |         |  |       |  |     |       |  |  |      |   |  |   |
| (10)                | Humidity (Steady state)  | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">External appearance</td> <td colspan="2">No mechanical damage.</td> </tr> <tr> <td>Cap. change (ΔC/C)</td> <td colspan="2">NPO: ± 5% or ±0.5 pFmax. (Whichever is larger)<br/>X7R: ±12.5%<br/>Y5V: ±30%</td> </tr> <tr> <td>D.F.:</td> <td colspan="2">NPO:</td> </tr> <tr> <td></td> <td colspan="2">C ≥ 30pF: D.F. ≤ <math>\frac{1}{350}</math></td> </tr> <tr> <td></td> <td colspan="2">10pF ≤ C &lt; 30pF: D.F. ≤ <math>\frac{1}{275+2.5 * C}</math></td> </tr> <tr> <td></td> <td colspan="2">C &lt; 10pF: D.F. ≤ <math>\frac{1}{200+10 * C}</math></td> </tr> <tr> <td></td> <td colspan="2">PS: C: Nominal Capacitance (pF)</td> </tr> <tr> <td></td> <td style="text-align: center;">X7R</td> <td> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>Rated vol.</th> <th>DF ≤</th> <th>Special chip size and capacitance</th> </tr> <tr> <td rowspan="4">≥ 100V</td> <td>≤ 3%</td> <td>1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 6%</td> <td>1812 &amp; 1808 &amp; 2220</td> </tr> <tr> <td>≤ 7.5%</td> <td>0805 &gt; 0.1μF, 1206 &gt; 1μF, 1210 ≥ 2.2μF</td> </tr> <tr> <td>≤ 20%</td> <td>0805 &gt; 0.22μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td rowspan="4">50V</td> <td>≤ 3%</td> <td></td> </tr> <tr> <td>≤ 6%</td> <td>0805 ≥ 0.18μF, 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 10%</td> <td>1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 20%</td> <td>0805 ≥ 1μF, 1206 ≥ 2.2μF, 1210 ≥ 10μF</td> </tr> </table> </td> </tr> <tr> <td></td> <td style="text-align: center;">Y5V</td> <td> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>Rated vol.</th> <th>DF ≤</th> <th>Special chip size and capacitance</th> </tr> <tr> <td rowspan="3">≥ 50V</td> <td>≤ 7.5%</td> <td></td> </tr> <tr> <td>≤ 10%</td> <td>0805 ≥ 0.47μF, 1206 ≥ 4.7μF</td> </tr> <tr> <td>≤ 20%</td> <td>1210 ≥ 6.8μF</td> </tr> <tr> <td rowspan="3">25V</td> <td>≤ 7.5%</td> <td></td> </tr> <tr> <td>≤ 10%</td> <td>0805 ≥ 0.33μF, 1206 ≥ 1μF, 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 15%</td> <td>1206 ≥ 4.7μF, 1210 ≥ 22μF</td> </tr> <tr> <td>16V (C &lt; 1.0μF)</td> <td>≤ 10%</td> <td></td> </tr> <tr> <td rowspan="2">16V (C ≥ 1.0μF)</td> <td>≤ 12.5%</td> <td></td> </tr> <tr> <td>≤ 20%</td> <td>0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF;</td> </tr> <tr> <td>10V</td> <td>≤ 20%</td> <td></td> </tr> </table> </td> </tr> <tr> <td></td> <td>I.R.</td> <td>1GΩ min. or 50Ω *F (Whichever is smaller)</td> <td></td> </tr> </table> | External appearance  | No mechanical damage. |                                   | Cap. change (ΔC/C) | NPO: ± 5% or ±0.5 pFmax. (Whichever is larger)<br>X7R: ±12.5%<br>Y5V: ±30% |               | D.F.: | NPO:                        |        |  | C ≥ 30pF: D.F. ≤ $\frac{1}{350}$ |                             |     | 10pF ≤ C < 30pF: D.F. ≤ $\frac{1}{275+2.5 * C}$ |   |       | C < 10pF: D.F. ≤ $\frac{1}{200+10 * C}$ |                 |              | PS: C: Nominal Capacitance (pF) |                                       |         | X7R | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>Rated vol.</th> <th>DF ≤</th> <th>Special chip size and capacitance</th> </tr> <tr> <td rowspan="4">≥ 100V</td> <td>≤ 3%</td> <td>1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 6%</td> <td>1812 &amp; 1808 &amp; 2220</td> </tr> <tr> <td>≤ 7.5%</td> <td>0805 &gt; 0.1μF, 1206 &gt; 1μF, 1210 ≥ 2.2μF</td> </tr> <tr> <td>≤ 20%</td> <td>0805 &gt; 0.22μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td rowspan="4">50V</td> <td>≤ 3%</td> <td></td> </tr> <tr> <td>≤ 6%</td> <td>0805 ≥ 0.18μF, 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 10%</td> <td>1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 20%</td> <td>0805 ≥ 1μF, 1206 ≥ 2.2μF, 1210 ≥ 10μF</td> </tr> </table> | Rated vol.   | DF ≤ | Special chip size and capacitance | ≥ 100V | ≤ 3% | 1206 ≥ 0.47μF | ≤ 6% | 1812 & 1808 & 2220 | ≤ 7.5% | 0805 > 0.1μF, 1206 > 1μF, 1210 ≥ 2.2μF | ≤ 20% | 0805 > 0.22μF; 1210 ≥ 3.3μF | 50V | ≤ 3% |  | ≤ 6% | 0805 ≥ 0.18μF, 1206 ≥ 0.47μF | ≤ 10% | 1210 ≥ 4.7μF | ≤ 20% | 0805 ≥ 1μF, 1206 ≥ 2.2μF, 1210 ≥ 10μF |  | Y5V | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>Rated vol.</th> <th>DF ≤</th> <th>Special chip size and capacitance</th> </tr> <tr> <td rowspan="3">≥ 50V</td> <td>≤ 7.5%</td> <td></td> </tr> <tr> <td>≤ 10%</td> <td>0805 ≥ 0.47μF, 1206 ≥ 4.7μF</td> </tr> <tr> <td>≤ 20%</td> <td>1210 ≥ 6.8μF</td> </tr> <tr> <td rowspan="3">25V</td> <td>≤ 7.5%</td> <td></td> </tr> <tr> <td>≤ 10%</td> <td>0805 ≥ 0.33μF, 1206 ≥ 1μF, 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 15%</td> <td>1206 ≥ 4.7μF, 1210 ≥ 22μF</td> </tr> <tr> <td>16V (C &lt; 1.0μF)</td> <td>≤ 10%</td> <td></td> </tr> <tr> <td rowspan="2">16V (C ≥ 1.0μF)</td> <td>≤ 12.5%</td> <td></td> </tr> <tr> <td>≤ 20%</td> <td>0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF;</td> </tr> <tr> <td>10V</td> <td>≤ 20%</td> <td></td> </tr> </table> | Rated vol. | DF ≤ | Special chip size and capacitance | ≥ 50V | ≤ 7.5% |  | ≤ 10% | 0805 ≥ 0.47μF, 1206 ≥ 4.7μF | ≤ 20% | 1210 ≥ 6.8μF | 25V | ≤ 7.5% |  | ≤ 10% | 0805 ≥ 0.33μF, 1206 ≥ 1μF, 1210 ≥ 4.7μF | ≤ 15% | 1206 ≥ 4.7μF, 1210 ≥ 22μF | 16V (C < 1.0μF) | ≤ 10% |  | 16V (C ≥ 1.0μF) | ≤ 12.5% |  | ≤ 20% | 0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF; | 10V | ≤ 20% |  |  | I.R. | 1GΩ min. or 50Ω *F (Whichever is smaller) |  | Humidity (Steady state):<br>At temperature 40±2 °C and humidity 90 to 95%RH for 500 + 24/ - 0 hours.<br>Leave the capacitors in ambient condition for the following time before measurement.<br>Class 1 : 24±2 hours.<br>Class 2 : 48±4 hours.<br>* Charge / discharge current shall. not exceed 50 mA.<br>* Preconditioning : (only for Class 2):<br>Apply the rated DC voltage for 1hour at 150 ±5°C. Remove and let sit for 48±4 hours at room temperature. Perform initial measurement. |
| External appearance | No mechanical damage.  |  |  |                       |                                   |                    |  |               |       |                             |        |  |                                  |                             |     |   |   |       |   |                 |              |                                 |                                       |         |     |   |  |      |                                   |        |      |               |      |                    |        |  |       |                             |     |      |  |      |                              |       |              |       |                                       |  |     |  |            |      |                                   |       |        |  |       |                             |       |              |     |        |  |       |   |       |                           |                 |       |  |                 |         |  |       |  |     |       |  |  |      |   |  |   |
| Cap. change (ΔC/C)  | NPO: ± 5% or ±0.5 pFmax. (Whichever is larger)<br>X7R: ±12.5%<br>Y5V: ±30% |  |  |                       |                                   |                    |  |               |       |                             |        |  |                                  |                             |     |   |   |       |   |                 |              |                                 |                                       |         |     |   |  |      |                                   |        |      |               |      |                    |        |  |       |                             |     |      |  |      |                              |       |              |       |                                       |  |     |  |            |      |                                   |       |        |  |       |                             |       |              |     |        |  |       |   |       |                           |                 |       |  |                 |         |  |       |  |     |       |  |  |      |   |  |   |
| D.F.:               | NPO:   |  |  |                       |                                   |                    |  |               |       |                             |        |  |                                  |                             |     |   |   |       |   |                 |              |                                 |                                       |         |     |   |  |      |                                   |        |      |               |      |                    |        |  |       |                             |     |      |  |      |                              |       |              |       |                                       |  |     |  |            |      |                                   |       |        |  |       |                             |       |              |     |        |  |       |   |       |                           |                 |       |  |                 |         |  |       |  |     |       |  |  |      |   |  |   |
|                     | C ≥ 30pF: D.F. ≤ $\frac{1}{350}$   |  |  |                       |                                   |                    |  |               |       |                             |        |  |                                  |                             |     |   |   |       |   |                 |              |                                 |                                       |         |     |   |  |      |                                   |        |      |               |      |                    |        |  |       |                             |     |      |  |      |                              |       |              |       |                                       |  |     |  |            |      |                                   |       |        |  |       |                             |       |              |     |        |  |       |   |       |                           |                 |       |  |                 |         |  |       |  |     |       |  |  |      |   |  |   |
|                     | 10pF ≤ C < 30pF: D.F. ≤ $\frac{1}{275+2.5 * C}$                            |  |  |                       |                                   |                    |  |               |       |                             |        |  |                                  |                             |     |   |   |       |   |                 |              |                                 |                                       |         |     |   |  |      |                                   |        |      |               |      |                    |        |  |       |                             |     |      |  |      |                              |       |              |       |                                       |  |     |  |            |      |                                   |       |        |  |       |                             |       |              |     |        |  |       |   |       |                           |                 |       |  |                 |         |  |       |  |     |       |  |  |      |   |  |   |
|                     | C < 10pF: D.F. ≤ $\frac{1}{200+10 * C}$                                    |  |  |                       |                                   |                    |  |               |       |                             |        |  |                                  |                             |     |   |   |       |   |                 |              |                                 |                                       |         |     |   |  |      |                                   |        |      |               |      |                    |        |  |       |                             |     |      |  |      |                              |       |              |       |                                       |  |     |  |            |      |                                   |       |        |  |       |                             |       |              |     |        |  |       |   |       |                           |                 |       |  |                 |         |  |       |  |     |       |  |  |      |   |  |   |
|                     | PS: C: Nominal Capacitance (pF)  |  |  |                       |                                   |                    |  |               |       |                             |        |  |                                  |                             |     |   |   |       |   |                 |              |                                 |                                       |         |     |   |  |      |                                   |        |      |               |      |                    |        |  |       |                             |     |      |  |      |                              |       |              |       |                                       |  |     |  |            |      |                                   |       |        |  |       |                             |       |              |     |        |  |       |   |       |                           |                 |       |  |                 |         |  |       |  |     |       |  |  |      |   |  |   |
|                     | X7R  | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>Rated vol.</th> <th>DF ≤</th> <th>Special chip size and capacitance</th> </tr> <tr> <td rowspan="4">≥ 100V</td> <td>≤ 3%</td> <td>1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 6%</td> <td>1812 &amp; 1808 &amp; 2220</td> </tr> <tr> <td>≤ 7.5%</td> <td>0805 &gt; 0.1μF, 1206 &gt; 1μF, 1210 ≥ 2.2μF</td> </tr> <tr> <td>≤ 20%</td> <td>0805 &gt; 0.22μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td rowspan="4">50V</td> <td>≤ 3%</td> <td></td> </tr> <tr> <td>≤ 6%</td> <td>0805 ≥ 0.18μF, 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 10%</td> <td>1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 20%</td> <td>0805 ≥ 1μF, 1206 ≥ 2.2μF, 1210 ≥ 10μF</td> </tr> </table>  | Rated vol.   | DF ≤                  | Special chip size and capacitance | ≥ 100V             | ≤ 3%   | 1206 ≥ 0.47μF | ≤ 6%  | 1812 & 1808 & 2220          | ≤ 7.5% | 0805 > 0.1μF, 1206 > 1μF, 1210 ≥ 2.2μF | ≤ 20%                            | 0805 > 0.22μF; 1210 ≥ 3.3μF | 50V | ≤ 3%  |   | ≤ 6%  | 0805 ≥ 0.18μF, 1206 ≥ 0.47μF            | ≤ 10%           | 1210 ≥ 4.7μF | ≤ 20%                           | 0805 ≥ 1μF, 1206 ≥ 2.2μF, 1210 ≥ 10μF |         |     |   |  |      |                                   |        |      |               |      |                    |        |  |       |                             |     |      |  |      |                              |       |              |       |                                       |  |     |  |            |      |                                   |       |        |  |       |                             |       |              |     |        |  |       |   |       |                           |                 |       |  |                 |         |  |       |  |     |       |  |  |      |   |  |   |
| Rated vol.          | DF ≤   | Special chip size and capacitance  |  |                       |                                   |                    |  |               |       |                             |        |  |                                  |                             |     |   |   |       |   |                 |              |                                 |                                       |         |     |   |  |      |                                   |        |      |               |      |                    |        |  |       |                             |     |      |  |      |                              |       |              |       |                                       |  |     |  |            |      |                                   |       |        |  |       |                             |       |              |     |        |  |       |   |       |                           |                 |       |  |                 |         |  |       |  |     |       |  |  |      |   |  |   |
| ≥ 100V              | ≤ 3%   | 1206 ≥ 0.47μF  |  |                       |                                   |                    |  |               |       |                             |        |  |                                  |                             |     |   |   |       |   |                 |              |                                 |                                       |         |     |   |  |      |                                   |        |      |               |      |                    |        |  |       |                             |     |      |  |      |                              |       |              |       |                                       |  |     |  |            |      |                                   |       |        |  |       |                             |       |              |     |        |  |       |   |       |                           |                 |       |  |                 |         |  |       |  |     |       |  |  |      |   |  |   |
|                     | ≤ 6%   | 1812 & 1808 & 2220   |  |                       |                                   |                    |  |               |       |                             |        |  |                                  |                             |     |   |   |       |   |                 |              |                                 |                                       |         |     |   |  |      |                                   |        |      |               |      |                    |        |  |       |                             |     |      |  |      |                              |       |              |       |                                       |  |     |  |            |      |                                   |       |        |  |       |                             |       |              |     |        |  |       |   |       |                           |                 |       |  |                 |         |  |       |  |     |       |  |  |      |   |  |   |
|                     | ≤ 7.5%   | 0805 > 0.1μF, 1206 > 1μF, 1210 ≥ 2.2μF   |  |                       |                                   |                    |  |               |       |                             |        |  |                                  |                             |     |   |   |       |   |                 |              |                                 |                                       |         |     |   |  |      |                                   |        |      |               |      |                    |        |  |       |                             |     |      |  |      |                              |       |              |       |                                       |  |     |  |            |      |                                   |       |        |  |       |                             |       |              |     |        |  |       |   |       |                           |                 |       |  |                 |         |  |       |  |     |       |  |  |      |   |  |   |
|                     | ≤ 20%  | 0805 > 0.22μF; 1210 ≥ 3.3μF  |  |                       |                                   |                    |  |               |       |                             |        |  |                                  |                             |     |   |   |       |   |                 |              |                                 |                                       |         |     |   |  |      |                                   |        |      |               |      |                    |        |  |       |                             |     |      |  |      |                              |       |              |       |                                       |  |     |  |            |      |                                   |       |        |  |       |                             |       |              |     |        |  |       |   |       |                           |                 |       |  |                 |         |  |       |  |     |       |  |  |      |   |  |   |
| 50V                 | ≤ 3%   |  |  |                       |                                   |                    |  |               |       |                             |        |  |                                  |                             |     |   |   |       |   |                 |              |                                 |                                       |         |     |   |  |      |                                   |        |      |               |      |                    |        |  |       |                             |     |      |  |      |                              |       |              |       |                                       |  |     |  |            |      |                                   |       |        |  |       |                             |       |              |     |        |  |       |   |       |                           |                 |       |  |                 |         |  |       |  |     |       |  |  |      |   |  |   |
|                     | ≤ 6%   | 0805 ≥ 0.18μF, 1206 ≥ 0.47μF   |  |                       |                                   |                    |  |               |       |                             |        |  |                                  |                             |     |   |   |       |   |                 |              |                                 |                                       |         |     |   |  |      |                                   |        |      |               |      |                    |        |  |       |                             |     |      |  |      |                              |       |              |       |                                       |  |     |  |            |      |                                   |       |        |  |       |                             |       |              |     |        |  |       |   |       |                           |                 |       |  |                 |         |  |       |  |     |       |  |  |      |   |  |   |
|                     | ≤ 10%  | 1210 ≥ 4.7μF   |  |                       |                                   |                    |  |               |       |                             |        |  |                                  |                             |     |   |   |       |   |                 |              |                                 |                                       |         |     |   |  |      |                                   |        |      |               |      |                    |        |  |       |                             |     |      |  |      |                              |       |              |       |                                       |  |     |  |            |      |                                   |       |        |  |       |                             |       |              |     |        |  |       |   |       |                           |                 |       |  |                 |         |  |       |  |     |       |  |  |      |   |  |   |
|                     | ≤ 20%  | 0805 ≥ 1μF, 1206 ≥ 2.2μF, 1210 ≥ 10μF  |  |                       |                                   |                    |  |               |       |                             |        |  |                                  |                             |     |   |   |       |   |                 |              |                                 |                                       |         |     |   |  |      |                                   |        |      |               |      |                    |        |  |       |                             |     |      |  |      |                              |       |              |       |                                       |  |     |  |            |      |                                   |       |        |  |       |                             |       |              |     |        |  |       |   |       |                           |                 |       |  |                 |         |  |       |  |     |       |  |  |      |   |  |   |
|                     | Y5V  | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>Rated vol.</th> <th>DF ≤</th> <th>Special chip size and capacitance</th> </tr> <tr> <td rowspan="3">≥ 50V</td> <td>≤ 7.5%</td> <td></td> </tr> <tr> <td>≤ 10%</td> <td>0805 ≥ 0.47μF, 1206 ≥ 4.7μF</td> </tr> <tr> <td>≤ 20%</td> <td>1210 ≥ 6.8μF</td> </tr> <tr> <td rowspan="3">25V</td> <td>≤ 7.5%</td> <td></td> </tr> <tr> <td>≤ 10%</td> <td>0805 ≥ 0.33μF, 1206 ≥ 1μF, 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 15%</td> <td>1206 ≥ 4.7μF, 1210 ≥ 22μF</td> </tr> <tr> <td>16V (C &lt; 1.0μF)</td> <td>≤ 10%</td> <td></td> </tr> <tr> <td rowspan="2">16V (C ≥ 1.0μF)</td> <td>≤ 12.5%</td> <td></td> </tr> <tr> <td>≤ 20%</td> <td>0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF;</td> </tr> <tr> <td>10V</td> <td>≤ 20%</td> <td></td> </tr> </table>   | Rated vol.   | DF ≤                  | Special chip size and capacitance | ≥ 50V              | ≤ 7.5%   |               | ≤ 10% | 0805 ≥ 0.47μF, 1206 ≥ 4.7μF | ≤ 20%  | 1210 ≥ 6.8μF                           | 25V                              | ≤ 7.5%                      |     | ≤ 10%   | 0805 ≥ 0.33μF, 1206 ≥ 1μF, 1210 ≥ 4.7μF | ≤ 15% | 1206 ≥ 4.7μF, 1210 ≥ 22μF               | 16V (C < 1.0μF) | ≤ 10%        |                                 | 16V (C ≥ 1.0μF)                       | ≤ 12.5% |     | ≤ 20%   | 0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF; | 10V  | ≤ 20%                             |        |      |               |      |                    |        |  |       |                             |     |      |  |      |                              |       |              |       |                                       |  |     |  |            |      |                                   |       |        |  |       |                             |       |              |     |        |  |       |   |       |                           |                 |       |  |                 |         |  |       |  |     |       |  |  |      |   |  |   |
| Rated vol.          | DF ≤   | Special chip size and capacitance  |  |                       |                                   |                    |  |               |       |                             |        |  |                                  |                             |     |   |   |       |   |                 |              |                                 |                                       |         |     |   |  |      |                                   |        |      |               |      |                    |        |  |       |                             |     |      |  |      |                              |       |              |       |                                       |  |     |  |            |      |                                   |       |        |  |       |                             |       |              |     |        |  |       |   |       |                           |                 |       |  |                 |         |  |       |  |     |       |  |  |      |   |  |   |
| ≥ 50V               | ≤ 7.5%   |  |  |                       |                                   |                    |  |               |       |                             |        |  |                                  |                             |     |   |   |       |   |                 |              |                                 |                                       |         |     |   |  |      |                                   |        |      |               |      |                    |        |  |       |                             |     |      |  |      |                              |       |              |       |                                       |  |     |  |            |      |                                   |       |        |  |       |                             |       |              |     |        |  |       |   |       |                           |                 |       |  |                 |         |  |       |  |     |       |  |  |      |   |  |   |
|                     | ≤ 10%  | 0805 ≥ 0.47μF, 1206 ≥ 4.7μF  |  |                       |                                   |                    |  |               |       |                             |        |  |                                  |                             |     |   |   |       |   |                 |              |                                 |                                       |         |     |   |  |      |                                   |        |      |               |      |                    |        |  |       |                             |     |      |  |      |                              |       |              |       |                                       |  |     |  |            |      |                                   |       |        |  |       |                             |       |              |     |        |  |       |   |       |                           |                 |       |  |                 |         |  |       |  |     |       |  |  |      |   |  |   |
|                     | ≤ 20%  | 1210 ≥ 6.8μF   |  |                       |                                   |                    |  |               |       |                             |        |  |                                  |                             |     |   |   |       |   |                 |              |                                 |                                       |         |     |   |  |      |                                   |        |      |               |      |                    |        |  |       |                             |     |      |  |      |                              |       |              |       |                                       |  |     |  |            |      |                                   |       |        |  |       |                             |       |              |     |        |  |       |   |       |                           |                 |       |  |                 |         |  |       |  |     |       |  |  |      |   |  |   |
| 25V                 | ≤ 7.5%   |  |  |                       |                                   |                    |  |               |       |                             |        |  |                                  |                             |     |   |   |       |   |                 |              |                                 |                                       |         |     |   |  |      |                                   |        |      |               |      |                    |        |  |       |                             |     |      |  |      |                              |       |              |       |                                       |  |     |  |            |      |                                   |       |        |  |       |                             |       |              |     |        |  |       |   |       |                           |                 |       |  |                 |         |  |       |  |     |       |  |  |      |   |  |   |
|                     | ≤ 10%  | 0805 ≥ 0.33μF, 1206 ≥ 1μF, 1210 ≥ 4.7μF  |  |                       |                                   |                    |  |               |       |                             |        |  |                                  |                             |     |   |   |       |   |                 |              |                                 |                                       |         |     |   |  |      |                                   |        |      |               |      |                    |        |  |       |                             |     |      |  |      |                              |       |              |       |                                       |  |     |  |            |      |                                   |       |        |  |       |                             |       |              |     |        |  |       |   |       |                           |                 |       |  |                 |         |  |       |  |     |       |  |  |      |   |  |   |
|                     | ≤ 15%  | 1206 ≥ 4.7μF, 1210 ≥ 22μF  |  |                       |                                   |                    |  |               |       |                             |        |  |                                  |                             |     |   |   |       |   |                 |              |                                 |                                       |         |     |   |  |      |                                   |        |      |               |      |                    |        |  |       |                             |     |      |  |      |                              |       |              |       |                                       |  |     |  |            |      |                                   |       |        |  |       |                             |       |              |     |        |  |       |   |       |                           |                 |       |  |                 |         |  |       |  |     |       |  |  |      |   |  |   |
| 16V (C < 1.0μF)     | ≤ 10%  |  |  |                       |                                   |                    |  |               |       |                             |        |  |                                  |                             |     |   |   |       |   |                 |              |                                 |                                       |         |     |   |  |      |                                   |        |      |               |      |                    |        |  |       |                             |     |      |  |      |                              |       |              |       |                                       |  |     |  |            |      |                                   |       |        |  |       |                             |       |              |     |        |  |       |   |       |                           |                 |       |  |                 |         |  |       |  |     |       |  |  |      |   |  |   |
| 16V (C ≥ 1.0μF)     | ≤ 12.5%  |  |  |                       |                                   |                    |  |               |       |                             |        |  |                                  |                             |     |   |   |       |   |                 |              |                                 |                                       |         |     |   |  |      |                                   |        |      |               |      |                    |        |  |       |                             |     |      |  |      |                              |       |              |       |                                       |  |     |  |            |      |                                   |       |        |  |       |                             |       |              |     |        |  |       |   |       |                           |                 |       |  |                 |         |  |       |  |     |       |  |  |      |   |  |   |
|                     | ≤ 20%  | 0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF;   |  |                       |                                   |                    |  |               |       |                             |        |  |                                  |                             |     |   |   |       |   |                 |              |                                 |                                       |         |     |   |  |      |                                   |        |      |               |      |                    |        |  |       |                             |     |      |  |      |                              |       |              |       |                                       |  |     |  |            |      |                                   |       |        |  |       |                             |       |              |     |        |  |       |   |       |                           |                 |       |  |                 |         |  |       |  |     |       |  |  |      |   |  |   |
| 10V                 | ≤ 20%  |  |  |                       |                                   |                    |  |               |       |                             |        |  |                                  |                             |     |   |   |       |   |                 |              |                                 |                                       |         |     |   |  |      |                                   |        |      |               |      |                    |        |  |       |                             |     |      |  |      |                              |       |              |       |                                       |  |     |  |            |      |                                   |       |        |  |       |                             |       |              |     |        |  |       |   |       |                           |                 |       |  |                 |         |  |       |  |     |       |  |  |      |   |  |   |
|                     | I.R.   | 1GΩ min. or 50Ω *F (Whichever is smaller)  |  |                       |                                   |                    |  |               |       |                             |        |  |                                  |                             |     |   |   |       |   |                 |              |                                 |                                       |         |     |   |  |      |                                   |        |      |               |      |                    |        |  |       |                             |     |      |  |      |                              |       |              |       |                                       |  |     |  |            |      |                                   |       |        |  |       |                             |       |              |     |        |  |       |   |       |                           |                 |       |  |                 |         |  |       |  |     |       |  |  |      |   |  |   |



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|---|-------------|-------------------------|

| No.  | Item                              | Performance  | Test or inspection method   |  |            |           |                                   |  |     |                    |            |  |            |   |              |   |             |   |  |  |     |  |            |  |            |   |             |                            |             |  |  |  |     |                   |              |  |             |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |             |   |     |             |
|------|-----------------------------------|--|---|--|------------|-----------|-----------------------------------|--|-----|--------------------|------------|--|------------|---|--------------|---|-------------|---|--|--|-----|--|------------|--|------------|---|-------------|----------------------------|-------------|--|--|--|-----|-------------------|--------------|--|-------------|--|-------------|----------------------------|-----|--------------|--|-------------|--|-------------|--|---------------------------------|-------------|--|-----------------------------------|---------------|--|-------------|---|-----|-------------|
| (11) | Humidity load                     | External appearance  | No mechanical damage.   |  |            |           |                                   |  |     |                    |            |  |            |   |              |   |             |   |  |  |     |  |            |  |            |   |             |                            |             |  |  |  |     |                   |              |  |             |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |             |   |     |             |
|      |                                   | Cap. change ( $\Delta C/C$ )   | NPO: $\pm 5\%$ or $\pm 0.5 \text{ pFmax.}$<br>(Whichever is larger)<br>X7R: $\pm 12.5\%$<br>Y5V: $\pm 30\%$         |  |            |           |                                   |  |     |                    |            |  |            |   |              |   |             |   |  |  |     |  |            |  |            |   |             |                            |             |  |  |  |     |                   |              |  |             |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |             |   |     |             |
|      |                                   | <p>D.F.:</p> <p>NPO:</p> $C \geq 30\text{pF: D.F.} \leq \frac{1}{350}$ $10\text{pF} \leq C < 30\text{pF: D.F.} \leq \frac{1}{275+2.5 * C}$ $C < 10\text{pF: D.F.} \leq \frac{1}{200+10 * C}$ <p>PS: C: Nominal Capacitance (pF)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2"></th> <th rowspan="2">Rated vol.</th> <th rowspan="2">DF <math>\leq</math></th> <th>Special chip size and capacitance</th> </tr> </thead> <tbody> <tr> <td></td> </tr> <tr> <td rowspan="5">X7R</td> <td rowspan="5"><math>\geq 100\text{V}</math></td> <td><math>\leq 3\%</math></td> <td></td> </tr> <tr> <td><math>\leq 6\%</math></td> <td>1206 <math>\geq 0.47\mu\text{F}</math><br/>1812 &amp; 1808 &amp; 2220</td> </tr> <tr> <td><math>\leq 7.5\%</math></td> <td>0805 <math>&gt; 0.1\mu\text{F}</math>, 1206 <math>&gt; 1\mu\text{F}</math></td> </tr> <tr> <td><math>\leq 20\%</math></td> <td>0805 <math>&gt; 0.22\mu\text{F}</math>; 1210 <math>\geq 3.3\mu\text{F}</math></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td rowspan="5">50V</td> <td rowspan="5"></td> <td><math>\leq 3\%</math></td> <td></td> </tr> <tr> <td><math>\leq 6\%</math></td> <td>0805 <math>\geq 0.18\mu\text{F}</math>, 1206 <math>\geq 0.47\mu\text{F}</math></td> </tr> <tr> <td><math>\leq 10\%</math></td> <td>1210 <math>\geq 4.7\mu\text{F}</math></td> </tr> <tr> <td><math>\leq 20\%</math></td> <td>0805 <math>\geq 1\mu\text{F}</math>, 1206 <math>\geq 2.2\mu\text{F}</math>,<br/>1210 <math>\geq 10\mu\text{F}</math></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td rowspan="10">Y5V</td> <td rowspan="3"><math>\geq 50\text{V}</math></td> <td><math>\leq 7.5\%</math></td> <td></td> </tr> <tr> <td><math>\leq 10\%</math></td> <td>0805 <math>\geq 0.47\mu\text{F}</math>, 1206 <math>\geq 4.7\mu\text{F}</math></td> </tr> <tr> <td><math>\leq 20\%</math></td> <td>1210 <math>\geq 6.8\mu\text{F}</math></td> </tr> <tr> <td rowspan="3">25V</td> <td><math>\leq 7.5\%</math></td> <td></td> </tr> <tr> <td><math>\leq 10\%</math></td> <td>0805 <math>\geq 0.33\mu\text{F}</math>,<br/>1206 <math>\geq 1\mu\text{F}</math>, 1210 <math>\geq 4.7\mu\text{F}</math></td> </tr> <tr> <td><math>\leq 15\%</math></td> <td>1206 <math>\geq 4.7\mu\text{F}</math>, 1210 <math>\geq 22\mu\text{F}</math></td> </tr> <tr> <td>16V<br/>(C &lt; 1.0<math>\mu\text{F}</math>)</td> <td><math>\leq 10\%</math></td> <td></td> </tr> <tr> <td rowspan="2">16V<br/>(C <math>\geq 1.0\mu\text{F}</math>)</td> <td><math>\leq 12.5\%</math></td> <td></td> </tr> <tr> <td><math>\leq 20\%</math></td> <td>0805 <math>\geq 3.3\mu\text{F}</math>; 1206 <math>\geq 10\mu\text{F}</math>;<br/>1210 <math>\geq 22\mu\text{F}</math>; 1812 <math>\geq 47\mu\text{F}</math>;</td> </tr> <tr> <td>10V</td> <td><math>\leq 20\%</math></td> <td></td> </tr> </tbody> </table> |   |  | Rated vol. | DF $\leq$ | Special chip size and capacitance |  | X7R | $\geq 100\text{V}$ | $\leq 3\%$ |  | $\leq 6\%$ | 1206 $\geq 0.47\mu\text{F}$<br>1812 & 1808 & 2220 | $\leq 7.5\%$ | 0805 $> 0.1\mu\text{F}$ , 1206 $> 1\mu\text{F}$ | $\leq 20\%$ | 0805 $> 0.22\mu\text{F}$ ; 1210 $\geq 3.3\mu\text{F}$ |  |  | 50V |  | $\leq 3\%$ |  | $\leq 6\%$ | 0805 $\geq 0.18\mu\text{F}$ , 1206 $\geq 0.47\mu\text{F}$ | $\leq 10\%$ | 1210 $\geq 4.7\mu\text{F}$ | $\leq 20\%$ | 0805 $\geq 1\mu\text{F}$ , 1206 $\geq 2.2\mu\text{F}$ ,<br>1210 $\geq 10\mu\text{F}$ |  |  | Y5V | $\geq 50\text{V}$ | $\leq 7.5\%$ |  | $\leq 10\%$ | 0805 $\geq 0.47\mu\text{F}$ , 1206 $\geq 4.7\mu\text{F}$ | $\leq 20\%$ | 1210 $\geq 6.8\mu\text{F}$ | 25V | $\leq 7.5\%$ |  | $\leq 10\%$ | 0805 $\geq 0.33\mu\text{F}$ ,<br>1206 $\geq 1\mu\text{F}$ , 1210 $\geq 4.7\mu\text{F}$ | $\leq 15\%$ | 1206 $\geq 4.7\mu\text{F}$ , 1210 $\geq 22\mu\text{F}$ | 16V<br>(C < 1.0 $\mu\text{F}$ ) | $\leq 10\%$ |  | 16V<br>(C $\geq 1.0\mu\text{F}$ ) | $\leq 12.5\%$ |  | $\leq 20\%$ | 0805 $\geq 3.3\mu\text{F}$ ; 1206 $\geq 10\mu\text{F}$ ;<br>1210 $\geq 22\mu\text{F}$ ; 1812 $\geq 47\mu\text{F}$ ; | 10V | $\leq 20\%$ |
|      | Rated vol.                        | DF $\leq$  | Special chip size and capacitance   |  |            |           |                                   |  |     |                    |            |  |            |   |              |   |             |   |  |  |     |  |            |  |            |   |             |                            |             |  |  |  |     |                   |              |  |             |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |             |   |     |             |
|      |                                   |  |   |  |            |           |                                   |  |     |                    |            |  |            |   |              |   |             |   |  |  |     |  |            |  |            |   |             |                            |             |  |  |  |     |                   |              |  |             |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |             |   |     |             |
| X7R  | $\geq 100\text{V}$                | $\leq 3\%$   |   |  |            |           |                                   |  |     |                    |            |  |            |   |              |   |             |   |  |  |     |  |            |  |            |   |             |                            |             |  |  |  |     |                   |              |  |             |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |             |   |     |             |
|      |                                   | $\leq 6\%$   | 1206 $\geq 0.47\mu\text{F}$<br>1812 & 1808 & 2220   |  |            |           |                                   |  |     |                    |            |  |            |   |              |   |             |   |  |  |     |  |            |  |            |   |             |                            |             |  |  |  |     |                   |              |  |             |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |             |   |     |             |
|      |                                   | $\leq 7.5\%$   | 0805 $> 0.1\mu\text{F}$ , 1206 $> 1\mu\text{F}$   |  |            |           |                                   |  |     |                    |            |  |            |   |              |   |             |   |  |  |     |  |            |  |            |   |             |                            |             |  |  |  |     |                   |              |  |             |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |             |   |     |             |
|      |                                   | $\leq 20\%$  | 0805 $> 0.22\mu\text{F}$ ; 1210 $\geq 3.3\mu\text{F}$   |  |            |           |                                   |  |     |                    |            |  |            |   |              |   |             |   |  |  |     |  |            |  |            |   |             |                            |             |  |  |  |     |                   |              |  |             |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |             |   |     |             |
|      |                                   |  |   |  |            |           |                                   |  |     |                    |            |  |            |   |              |   |             |   |  |  |     |  |            |  |            |   |             |                            |             |  |  |  |     |                   |              |  |             |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |             |   |     |             |
| 50V  |                                   | $\leq 3\%$   |   |  |            |           |                                   |  |     |                    |            |  |            |   |              |   |             |   |  |  |     |  |            |  |            |   |             |                            |             |  |  |  |     |                   |              |  |             |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |             |   |     |             |
|      |                                   | $\leq 6\%$   | 0805 $\geq 0.18\mu\text{F}$ , 1206 $\geq 0.47\mu\text{F}$   |  |            |           |                                   |  |     |                    |            |  |            |   |              |   |             |   |  |  |     |  |            |  |            |   |             |                            |             |  |  |  |     |                   |              |  |             |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |             |   |     |             |
|      |                                   | $\leq 10\%$  | 1210 $\geq 4.7\mu\text{F}$  |  |            |           |                                   |  |     |                    |            |  |            |   |              |   |             |   |  |  |     |  |            |  |            |   |             |                            |             |  |  |  |     |                   |              |  |             |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |             |   |     |             |
|      |                                   | $\leq 20\%$  | 0805 $\geq 1\mu\text{F}$ , 1206 $\geq 2.2\mu\text{F}$ ,<br>1210 $\geq 10\mu\text{F}$                                |  |            |           |                                   |  |     |                    |            |  |            |   |              |   |             |   |  |  |     |  |            |  |            |   |             |                            |             |  |  |  |     |                   |              |  |             |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |             |   |     |             |
|      |                                   |  |   |  |            |           |                                   |  |     |                    |            |  |            |   |              |   |             |   |  |  |     |  |            |  |            |   |             |                            |             |  |  |  |     |                   |              |  |             |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |             |   |     |             |
| Y5V  | $\geq 50\text{V}$                 | $\leq 7.5\%$   |   |  |            |           |                                   |  |     |                    |            |  |            |   |              |   |             |   |  |  |     |  |            |  |            |   |             |                            |             |  |  |  |     |                   |              |  |             |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |             |   |     |             |
|      |                                   | $\leq 10\%$  | 0805 $\geq 0.47\mu\text{F}$ , 1206 $\geq 4.7\mu\text{F}$  |  |            |           |                                   |  |     |                    |            |  |            |   |              |   |             |   |  |  |     |  |            |  |            |   |             |                            |             |  |  |  |     |                   |              |  |             |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |             |   |     |             |
|      |                                   | $\leq 20\%$  | 1210 $\geq 6.8\mu\text{F}$  |  |            |           |                                   |  |     |                    |            |  |            |   |              |   |             |   |  |  |     |  |            |  |            |   |             |                            |             |  |  |  |     |                   |              |  |             |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |             |   |     |             |
|      | 25V                               | $\leq 7.5\%$   |   |  |            |           |                                   |  |     |                    |            |  |            |   |              |   |             |   |  |  |     |  |            |  |            |   |             |                            |             |  |  |  |     |                   |              |  |             |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |             |   |     |             |
|      |                                   | $\leq 10\%$  | 0805 $\geq 0.33\mu\text{F}$ ,<br>1206 $\geq 1\mu\text{F}$ , 1210 $\geq 4.7\mu\text{F}$                              |  |            |           |                                   |  |     |                    |            |  |            |   |              |   |             |   |  |  |     |  |            |  |            |   |             |                            |             |  |  |  |     |                   |              |  |             |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |             |   |     |             |
|      |                                   | $\leq 15\%$  | 1206 $\geq 4.7\mu\text{F}$ , 1210 $\geq 22\mu\text{F}$  |  |            |           |                                   |  |     |                    |            |  |            |   |              |   |             |   |  |  |     |  |            |  |            |   |             |                            |             |  |  |  |     |                   |              |  |             |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |             |   |     |             |
|      | 16V<br>(C < 1.0 $\mu\text{F}$ )   | $\leq 10\%$  |   |  |            |           |                                   |  |     |                    |            |  |            |   |              |   |             |   |  |  |     |  |            |  |            |   |             |                            |             |  |  |  |     |                   |              |  |             |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |             |   |     |             |
|      | 16V<br>(C $\geq 1.0\mu\text{F}$ ) | $\leq 12.5\%$  |   |  |            |           |                                   |  |     |                    |            |  |            |   |              |   |             |   |  |  |     |  |            |  |            |   |             |                            |             |  |  |  |     |                   |              |  |             |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |             |   |     |             |
|      |                                   | $\leq 20\%$  | 0805 $\geq 3.3\mu\text{F}$ ; 1206 $\geq 10\mu\text{F}$ ;<br>1210 $\geq 22\mu\text{F}$ ; 1812 $\geq 47\mu\text{F}$ ; |  |            |           |                                   |  |     |                    |            |  |            |   |              |   |             |   |  |  |     |  |            |  |            |   |             |                            |             |  |  |  |     |                   |              |  |             |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |             |   |     |             |
|      | 10V                               | $\leq 20\%$  |   |  |            |           |                                   |  |     |                    |            |  |            |   |              |   |             |   |  |  |     |  |            |  |            |   |             |                            |             |  |  |  |     |                   |              |  |             |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |             |   |     |             |
|      | I.R.                              | $500\text{M}\Omega$ min. or $25 \Omega * \text{F}$<br>(Whichever is smaller)   |   |  |            |           |                                   |  |     |                    |            |  |            |   |              |   |             |   |  |  |     |  |            |  |            |   |             |                            |             |  |  |  |     |                   |              |  |             |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |             |   |     |             |

|   |             |                          |
|---|-------------|--------------------------|
| SPECIFICATION OF MULTI-LAYER RADIAL-LEADED TYPE CAPACITOR | D13-00-E-14 | Ver: 14<br>Page: 10 / 18 |
|---|-------------|--------------------------|

| No.                               | Item                             | Performance   | Test or inspection method   |                |                                   |       |            |       |                                  |   |                     |   |             |   |             |            |          |                         |   |             |                            |             |  |                          |      |           |                         |           |                                   |                   |              |  |  |             |  |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |  |             |   |     |             |  |
|-----------------------------------|----------------------------------|---|---|----------------|-----------------------------------|-------|------------|-------|----------------------------------|---|---------------------|---|-------------|---|-------------|------------|----------|-------------------------|---|-------------|----------------------------|-------------|--|--------------------------|------|-----------|-------------------------|-----------|-----------------------------------|-------------------|--------------|--|--|-------------|--|--|-------------|----------------------------|-----|--------------|--|-------------|--|-------------|--|---------------------------------|-------------|--|-----------------------------------|---------------|--|--|-------------|---|-----|-------------|--|
| (12)                              | Temperature Load                 | External appearance   | No mechanical damage.   |                |                                   |       |            |       |                                  |   |                     |   |             |   |             |            |          |                         |   |             |                            |             |  |                          |      |           |                         |           |                                   |                   |              |  |  |             |  |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |  |             |   |     |             |  |
|                                   |                                  | Cap. change ( $\Delta C/C$ )  | NPO: $\pm 3\%$ or $\pm 0.3\text{pFmax.}$<br>(Whichever is larger)<br>X7R: $\geq 10\text{V}, \pm 12.5\%$<br><br>Y5V: $\geq 10\text{V}, \pm 30\%$ |                |                                   |       |            |       |                                  |   |                     |   |             |   |             |            |          |                         |   |             |                            |             |  |                          |      |           |                         |           |                                   |                   |              |  |  |             |  |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |  |             |   |     |             |  |
|                                   |                                  | D.F.:   |   |                |                                   |       |            |       |                                  |   |                     |   |             |   |             |            |          |                         |   |             |                            |             |  |                          |      |           |                         |           |                                   |                   |              |  |  |             |  |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |  |             |   |     |             |  |
|                                   |                                  | NPO:<br>$C \geq 30\text{pF}: \text{D.F.} \leq \frac{1}{350}$<br>$10\text{pF} \leq C < 30\text{pF}: \text{D.F.} \leq \frac{1}{275 + 2.5 * C}$<br>$C < 10\text{pF}: \text{D.F.} \leq \frac{1}{200 + 10 * C}$<br>PS: C: Nominal Capacitance (pF)   |   |                |                                   |       |            |       |                                  |   |                     |   |             |   |             |            |          |                         |   |             |                            |             |  |                          |      |           |                         |           |                                   |                   |              |  |  |             |  |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |  |             |   |     |             |  |
|                                   |                                  | <table border="1" style="width: 100%;"> <tr> <th style="text-align: center;">Rated Voltage</th> <th style="text-align: center;">Tested Voltage</th> </tr> <tr> <td style="text-align: center;"><math>&lt; 500\text{V}</math></td> <td style="text-align: center;">2.0Ra</td> </tr> <tr> <td style="text-align: center;">500V</td> <td style="text-align: center;">1.5Ra</td> </tr> <tr> <td style="text-align: center;"><math>\geq 630\text{V}</math></td> <td style="text-align: center;">1.2Ra</td> </tr> <tr> <td style="text-align: center;"><math>\geq 1000\text{V}</math></td> <td style="text-align: center;">1.2Ra</td> </tr> </table> <p>PS: The test voltage is 150% of rated voltage for below range.</p> <table border="1" style="width: 100%;"> <tr> <th style="text-align: center;">Size</th> <th style="text-align: center;">Rated voltage</th> <th style="text-align: center;">Capacitance</th> </tr> <tr> <td style="text-align: center;">0805</td> <td style="text-align: center;">50V(X7R)</td> <td style="text-align: center;"><math>C \geq 2.2\mu\text{F}</math></td> </tr> <tr> <td></td> <td style="text-align: center;">100V(X7R)</td> <td style="text-align: center;"><math>C \geq 0.47\mu\text{F}</math></td> </tr> <tr> <td></td> <td style="text-align: center;">16V(Y5V)</td> <td style="text-align: center;"><math>C \geq 0.47\mu\text{F}</math></td> </tr> <tr> <td style="text-align: center;">1206</td> <td style="text-align: center;">100V(X7R)</td> <td style="text-align: center;"><math>C \geq 1.0\mu\text{F}</math></td> </tr> </table>  | Rated Voltage   | Tested Voltage | $< 500\text{V}$                   | 2.0Ra | 500V       | 1.5Ra | $\geq 630\text{V}$               | 1.2Ra   | $\geq 1000\text{V}$ | 1.2Ra   | Size        | Rated voltage   | Capacitance | 0805       | 50V(X7R) | $C \geq 2.2\mu\text{F}$ |   | 100V(X7R)   | $C \geq 0.47\mu\text{F}$   |             | 16V(Y5V)   | $C \geq 0.47\mu\text{F}$ | 1206 | 100V(X7R) | $C \geq 1.0\mu\text{F}$ |           |                                   |                   |              |  |  |             |  |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |  |             |   |     |             |  |
| Rated Voltage                     | Tested Voltage                   |   |   |                |                                   |       |            |       |                                  |   |                     |   |             |   |             |            |          |                         |   |             |                            |             |  |                          |      |           |                         |           |                                   |                   |              |  |  |             |  |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |  |             |   |     |             |  |
| $< 500\text{V}$                   | 2.0Ra                            |   |   |                |                                   |       |            |       |                                  |   |                     |   |             |   |             |            |          |                         |   |             |                            |             |  |                          |      |           |                         |           |                                   |                   |              |  |  |             |  |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |  |             |   |     |             |  |
| 500V                              | 1.5Ra                            |   |   |                |                                   |       |            |       |                                  |   |                     |   |             |   |             |            |          |                         |   |             |                            |             |  |                          |      |           |                         |           |                                   |                   |              |  |  |             |  |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |  |             |   |     |             |  |
| $\geq 630\text{V}$                | 1.2Ra                            |   |   |                |                                   |       |            |       |                                  |   |                     |   |             |   |             |            |          |                         |   |             |                            |             |  |                          |      |           |                         |           |                                   |                   |              |  |  |             |  |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |  |             |   |     |             |  |
| $\geq 1000\text{V}$               | 1.2Ra                            |   |   |                |                                   |       |            |       |                                  |   |                     |   |             |   |             |            |          |                         |   |             |                            |             |  |                          |      |           |                         |           |                                   |                   |              |  |  |             |  |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |  |             |   |     |             |  |
| Size                              | Rated voltage                    | Capacitance   |   |                |                                   |       |            |       |                                  |   |                     |   |             |   |             |            |          |                         |   |             |                            |             |  |                          |      |           |                         |           |                                   |                   |              |  |  |             |  |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |  |             |   |     |             |  |
| 0805                              | 50V(X7R)                         | $C \geq 2.2\mu\text{F}$   |   |                |                                   |       |            |       |                                  |   |                     |   |             |   |             |            |          |                         |   |             |                            |             |  |                          |      |           |                         |           |                                   |                   |              |  |  |             |  |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |  |             |   |     |             |  |
|                                   | 100V(X7R)                        | $C \geq 0.47\mu\text{F}$  |   |                |                                   |       |            |       |                                  |   |                     |   |             |   |             |            |          |                         |   |             |                            |             |  |                          |      |           |                         |           |                                   |                   |              |  |  |             |  |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |  |             |   |     |             |  |
|                                   | 16V(Y5V)                         | $C \geq 0.47\mu\text{F}$  |   |                |                                   |       |            |       |                                  |   |                     |   |             |   |             |            |          |                         |   |             |                            |             |  |                          |      |           |                         |           |                                   |                   |              |  |  |             |  |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |  |             |   |     |             |  |
| 1206                              | 100V(X7R)                        | $C \geq 1.0\mu\text{F}$   |   |                |                                   |       |            |       |                                  |   |                     |   |             |   |             |            |          |                         |   |             |                            |             |  |                          |      |           |                         |           |                                   |                   |              |  |  |             |  |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |  |             |   |     |             |  |
|                                   |                                  | <table border="1" style="width: 100%;"> <tr> <th style="text-align: center;">Rated vol.</th> <th style="text-align: center;">DF <math>\leq</math></th> <th style="text-align: center;">Special chip size and capacitance</th> </tr> <tr> <td rowspan="4" style="text-align: center; vertical-align: middle;">X7R</td> <td><math>\leq 3\%</math></td> <td></td> </tr> <tr> <td><math>\geq 100\text{V}</math><br/><math>\leq 6\%</math></td> <td>1206 <math>\geq 0.47\mu\text{F}</math><br/>1812 &amp; 1808 &amp; 2220</td> </tr> <tr> <td><math>\leq 7.5\%</math></td> <td>0805 <math>&gt; 0.1\mu\text{F}</math>, 1206 <math>&gt; 1\mu\text{F}</math></td> </tr> <tr> <td><math>\leq 20\%</math></td> <td>0805 <math>&gt; 0.22\mu\text{F}</math>; 1210 <math>\geq 3.3\mu\text{F}</math></td> </tr> <tr> <td rowspan="5" style="text-align: center; vertical-align: middle;">50V</td> <td><math>\leq 3\%</math></td> <td></td> </tr> <tr> <td><math>\leq 6\%</math></td> <td>0805 <math>\geq 0.18\mu\text{F}</math>, 1206 <math>\geq 0.47\mu\text{F}</math></td> </tr> <tr> <td><math>\leq 10\%</math></td> <td>1210 <math>\geq 4.7\mu\text{F}</math></td> </tr> <tr> <td><math>\leq 20\%</math></td> <td>0805 <math>\geq 1\mu\text{F}</math>, 1206 <math>\geq 2.2\mu\text{F}</math>,<br/>1210 <math>\geq 10\mu\text{F}</math></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td rowspan="8" style="text-align: center; vertical-align: middle;">Y5V</td> <td>Rated vol.</td> <td>DF <math>\leq</math></td> <td>Special chip size and capacitance</td> </tr> <tr> <td><math>\geq 50\text{V}</math></td> <td><math>\leq 7.5\%</math></td> <td></td> </tr> <tr> <td></td> <td><math>\leq 10\%</math></td> <td>0805 <math>\geq 0.47\mu\text{F}</math>, 1206 <math>\geq 4.7\mu\text{F}</math></td> </tr> <tr> <td></td> <td><math>\leq 20\%</math></td> <td>1210 <math>\geq 6.8\mu\text{F}</math></td> </tr> <tr> <td rowspan="3" style="text-align: center; vertical-align: middle;">25V</td> <td><math>\leq 7.5\%</math></td> <td></td> </tr> <tr> <td><math>\leq 10\%</math></td> <td>0805 <math>\geq 0.33\mu\text{F}</math>,<br/>1206 <math>\geq 1\mu\text{F}</math>, 1210 <math>\geq 4.7\mu\text{F}</math></td> </tr> <tr> <td><math>\leq 15\%</math></td> <td>1206 <math>\geq 4.7\mu\text{F}</math>, 1210 <math>\geq 22\mu\text{F}</math></td> </tr> <tr> <td>16V<br/>(C &lt; 1.0<math>\mu\text{F}</math>)</td> <td><math>\leq 10\%</math></td> <td></td> </tr> <tr> <td>16V<br/>(C <math>\geq 1.0\mu\text{F}</math>)</td> <td><math>\leq 12.5\%</math></td> <td></td> </tr> <tr> <td></td> <td><math>\leq 20\%</math></td> <td>0805 <math>\geq 3.3\mu\text{F}</math>; 1206 <math>\geq 10\mu\text{F}</math>;<br/>1210 <math>\geq 22\mu\text{F}</math>; 1812 <math>\geq 47\mu\text{F}</math>;</td> </tr> <tr> <td>10V</td> <td><math>\leq 20\%</math></td> <td></td> </tr> </table> <p>at maximum operating temperature <math>\pm 2^\circ\text{C}</math> for 1000 + 48 / - 0 hours.<br/>Leave the capacitors in ambient condition for the following time before measurement.<br/>Class I: 24 <math>\pm</math> 2 hours<br/>Class II: 48 <math>\pm</math> 4 hours</p> <p>* Charge / discharge current shall not exceed 50 mA.<br/>* Preconditioning : (only for Class 2):<br/>Apply 200% of the rated DC voltage for 1 hour at the maximum operating temperature <math>\pm 3^\circ\text{C}</math>.<br/>Remove and let sit for 48 <math>\pm</math> 4 hours at room temperature. Perform initial measurement.</p> | Rated vol.  | DF $\leq$      | Special chip size and capacitance | X7R   | $\leq 3\%$ |       | $\geq 100\text{V}$<br>$\leq 6\%$ | 1206 $\geq 0.47\mu\text{F}$<br>1812 & 1808 & 2220 | $\leq 7.5\%$        | 0805 $> 0.1\mu\text{F}$ , 1206 $> 1\mu\text{F}$ | $\leq 20\%$ | 0805 $> 0.22\mu\text{F}$ ; 1210 $\geq 3.3\mu\text{F}$ | 50V         | $\leq 3\%$ |          | $\leq 6\%$              | 0805 $\geq 0.18\mu\text{F}$ , 1206 $\geq 0.47\mu\text{F}$ | $\leq 10\%$ | 1210 $\geq 4.7\mu\text{F}$ | $\leq 20\%$ | 0805 $\geq 1\mu\text{F}$ , 1206 $\geq 2.2\mu\text{F}$ ,<br>1210 $\geq 10\mu\text{F}$ |                          |      | Y5V       | Rated vol.              | DF $\leq$ | Special chip size and capacitance | $\geq 50\text{V}$ | $\leq 7.5\%$ |  |  | $\leq 10\%$ | 0805 $\geq 0.47\mu\text{F}$ , 1206 $\geq 4.7\mu\text{F}$ |  | $\leq 20\%$ | 1210 $\geq 6.8\mu\text{F}$ | 25V | $\leq 7.5\%$ |  | $\leq 10\%$ | 0805 $\geq 0.33\mu\text{F}$ ,<br>1206 $\geq 1\mu\text{F}$ , 1210 $\geq 4.7\mu\text{F}$ | $\leq 15\%$ | 1206 $\geq 4.7\mu\text{F}$ , 1210 $\geq 22\mu\text{F}$ | 16V<br>(C < 1.0 $\mu\text{F}$ ) | $\leq 10\%$ |  | 16V<br>(C $\geq 1.0\mu\text{F}$ ) | $\leq 12.5\%$ |  |  | $\leq 20\%$ | 0805 $\geq 3.3\mu\text{F}$ ; 1206 $\geq 10\mu\text{F}$ ;<br>1210 $\geq 22\mu\text{F}$ ; 1812 $\geq 47\mu\text{F}$ ; | 10V | $\leq 20\%$ |  |
| Rated vol.                        | DF $\leq$                        | Special chip size and capacitance   |   |                |                                   |       |            |       |                                  |   |                     |   |             |   |             |            |          |                         |   |             |                            |             |  |                          |      |           |                         |           |                                   |                   |              |  |  |             |  |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |  |             |   |     |             |  |
| X7R                               | $\leq 3\%$                       |   |   |                |                                   |       |            |       |                                  |   |                     |   |             |   |             |            |          |                         |   |             |                            |             |  |                          |      |           |                         |           |                                   |                   |              |  |  |             |  |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |  |             |   |     |             |  |
|                                   | $\geq 100\text{V}$<br>$\leq 6\%$ | 1206 $\geq 0.47\mu\text{F}$<br>1812 & 1808 & 2220   |   |                |                                   |       |            |       |                                  |   |                     |   |             |   |             |            |          |                         |   |             |                            |             |  |                          |      |           |                         |           |                                   |                   |              |  |  |             |  |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |  |             |   |     |             |  |
|                                   | $\leq 7.5\%$                     | 0805 $> 0.1\mu\text{F}$ , 1206 $> 1\mu\text{F}$   |   |                |                                   |       |            |       |                                  |   |                     |   |             |   |             |            |          |                         |   |             |                            |             |  |                          |      |           |                         |           |                                   |                   |              |  |  |             |  |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |  |             |   |     |             |  |
|                                   | $\leq 20\%$                      | 0805 $> 0.22\mu\text{F}$ ; 1210 $\geq 3.3\mu\text{F}$   |   |                |                                   |       |            |       |                                  |   |                     |   |             |   |             |            |          |                         |   |             |                            |             |  |                          |      |           |                         |           |                                   |                   |              |  |  |             |  |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |  |             |   |     |             |  |
| 50V                               | $\leq 3\%$                       |   |   |                |                                   |       |            |       |                                  |   |                     |   |             |   |             |            |          |                         |   |             |                            |             |  |                          |      |           |                         |           |                                   |                   |              |  |  |             |  |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |  |             |   |     |             |  |
|                                   | $\leq 6\%$                       | 0805 $\geq 0.18\mu\text{F}$ , 1206 $\geq 0.47\mu\text{F}$   |   |                |                                   |       |            |       |                                  |   |                     |   |             |   |             |            |          |                         |   |             |                            |             |  |                          |      |           |                         |           |                                   |                   |              |  |  |             |  |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |  |             |   |     |             |  |
|                                   | $\leq 10\%$                      | 1210 $\geq 4.7\mu\text{F}$  |   |                |                                   |       |            |       |                                  |   |                     |   |             |   |             |            |          |                         |   |             |                            |             |  |                          |      |           |                         |           |                                   |                   |              |  |  |             |  |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |  |             |   |     |             |  |
|                                   | $\leq 20\%$                      | 0805 $\geq 1\mu\text{F}$ , 1206 $\geq 2.2\mu\text{F}$ ,<br>1210 $\geq 10\mu\text{F}$  |   |                |                                   |       |            |       |                                  |   |                     |   |             |   |             |            |          |                         |   |             |                            |             |  |                          |      |           |                         |           |                                   |                   |              |  |  |             |  |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |  |             |   |     |             |  |
|                                   |                                  |   |   |                |                                   |       |            |       |                                  |   |                     |   |             |   |             |            |          |                         |   |             |                            |             |  |                          |      |           |                         |           |                                   |                   |              |  |  |             |  |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |  |             |   |     |             |  |
| Y5V                               | Rated vol.                       | DF $\leq$   | Special chip size and capacitance   |                |                                   |       |            |       |                                  |   |                     |   |             |   |             |            |          |                         |   |             |                            |             |  |                          |      |           |                         |           |                                   |                   |              |  |  |             |  |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |  |             |   |     |             |  |
|                                   | $\geq 50\text{V}$                | $\leq 7.5\%$  |   |                |                                   |       |            |       |                                  |   |                     |   |             |   |             |            |          |                         |   |             |                            |             |  |                          |      |           |                         |           |                                   |                   |              |  |  |             |  |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |  |             |   |     |             |  |
|                                   |                                  | $\leq 10\%$   | 0805 $\geq 0.47\mu\text{F}$ , 1206 $\geq 4.7\mu\text{F}$  |                |                                   |       |            |       |                                  |   |                     |   |             |   |             |            |          |                         |   |             |                            |             |  |                          |      |           |                         |           |                                   |                   |              |  |  |             |  |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |  |             |   |     |             |  |
|                                   |                                  | $\leq 20\%$   | 1210 $\geq 6.8\mu\text{F}$  |                |                                   |       |            |       |                                  |   |                     |   |             |   |             |            |          |                         |   |             |                            |             |  |                          |      |           |                         |           |                                   |                   |              |  |  |             |  |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |  |             |   |     |             |  |
|                                   | 25V                              | $\leq 7.5\%$  |   |                |                                   |       |            |       |                                  |   |                     |   |             |   |             |            |          |                         |   |             |                            |             |  |                          |      |           |                         |           |                                   |                   |              |  |  |             |  |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |  |             |   |     |             |  |
|                                   |                                  | $\leq 10\%$   | 0805 $\geq 0.33\mu\text{F}$ ,<br>1206 $\geq 1\mu\text{F}$ , 1210 $\geq 4.7\mu\text{F}$  |                |                                   |       |            |       |                                  |   |                     |   |             |   |             |            |          |                         |   |             |                            |             |  |                          |      |           |                         |           |                                   |                   |              |  |  |             |  |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |  |             |   |     |             |  |
|                                   |                                  | $\leq 15\%$   | 1206 $\geq 4.7\mu\text{F}$ , 1210 $\geq 22\mu\text{F}$  |                |                                   |       |            |       |                                  |   |                     |   |             |   |             |            |          |                         |   |             |                            |             |  |                          |      |           |                         |           |                                   |                   |              |  |  |             |  |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |  |             |   |     |             |  |
|                                   | 16V<br>(C < 1.0 $\mu\text{F}$ )  | $\leq 10\%$   |   |                |                                   |       |            |       |                                  |   |                     |   |             |   |             |            |          |                         |   |             |                            |             |  |                          |      |           |                         |           |                                   |                   |              |  |  |             |  |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |  |             |   |     |             |  |
| 16V<br>(C $\geq 1.0\mu\text{F}$ ) | $\leq 12.5\%$                    |   |   |                |                                   |       |            |       |                                  |   |                     |   |             |   |             |            |          |                         |   |             |                            |             |  |                          |      |           |                         |           |                                   |                   |              |  |  |             |  |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |  |             |   |     |             |  |
|                                   | $\leq 20\%$                      | 0805 $\geq 3.3\mu\text{F}$ ; 1206 $\geq 10\mu\text{F}$ ;<br>1210 $\geq 22\mu\text{F}$ ; 1812 $\geq 47\mu\text{F}$ ;   |   |                |                                   |       |            |       |                                  |   |                     |   |             |   |             |            |          |                         |   |             |                            |             |  |                          |      |           |                         |           |                                   |                   |              |  |  |             |  |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |  |             |   |     |             |  |
| 10V                               | $\leq 20\%$                      |   |   |                |                                   |       |            |       |                                  |   |                     |   |             |   |             |            |          |                         |   |             |                            |             |  |                          |      |           |                         |           |                                   |                   |              |  |  |             |  |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |  |             |   |     |             |  |
|                                   | I.R.                             | 1000M $\Omega$ or 50 $\Omega$ *F<br>(Whichever is smaller)  |   |                |                                   |       |            |       |                                  |   |                     |   |             |   |             |            |          |                         |   |             |                            |             |  |                          |      |           |                         |           |                                   |                   |              |  |  |             |  |  |             |                            |     |              |  |             |  |             |  |                                 |             |  |                                   |               |  |  |             |   |     |             |  |

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|---|-------------|--------------------------|
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| No.  | Item              | Performance         |  | Test or inspection method  |  |                 |  |
|------|-------------------|---------------------|--|--|--|-----------------|--|
| (13) | Temperature cycle | External appearance | No mechanical damage.  |  | The capacitor shall be subject 5 cycles according to four heat treatments listed in the following table.<br>Then Leave the capacitors in ambient condition for the following time before measurement.<br>Class I: 24±2 hours<br>Class II: 48±4 hours |                 |  |
|      |                   | Cap. change (ΔC/C)  | NPO: ±2.5% or ±0.25pFmax.<br>( Whichever is larger)<br>X7R: ±7.5%<br>Y5V: ±20% |  |  |                 |  |
|      |                   | D.F.                | To meet initial standard value   |  |  |                 |  |
|      |                   | I.R.                | 10000MΩ min. or 500Ω *F (Whichever is smaller)                                 |  |  |                 |  |
|      |                   |                     |  |  |  |                 |  |
|      |                   |                     |  | Step   | Temperature (°C)   | Duration (min.) |  |
|      |                   |                     |  | 1  | Min. Operation Temp.±3   | 30±3            |  |
|      |                   |                     |  | 2  | Room Temp. (25°C)  | 2 ~ 3           |  |
|      |                   |                     |  | 3  | Max. Operation Temp.±3   | 30±2            |  |
|      |                   |                     |  | 4  | Room Temp. (25°C)  | 2 ~ 3           |  |
|      |                   |                     |  | *Preconditioning : (only for Class 2):<br>Perform a heat treatment at 150 +0-10°C for one hour and then let sit for 48±4 hours at room |  |                 |  |

### 6. Operating and storage environment:

The insulating coating of capacitors does not form a perfect seal; therefore, do not use or store capacitors in a corrosive atmosphere, especially where chloride gas, sulfide gas, acid, alkali, salt or the like are present. Also avoid exposure to moisture. Before cleaning, bonding or molding this product, verify that these processes do not affect product quality by testing the performance of a cleaned, bonded or molded product in the intended equipment. Store the capacitors where the temperature and relative humidity do not exceed 5 to 40 degrees centigrade and 20 to 70%. Use capacitors within 6 months after delivery.

### 7. Description:

Radial-Leaded, Epoxy-Dipped Multilayer ceramic capacitors are built by superior moisture and shock resistant Epoxy coating, can be supplied in both bulk or tape package for automatic insertion in printed circuit board. But must to avoid effect of external force when the capacitors are used automatic insertion because the inner chips are very weak and easy broken.

Our RD series capacitors have wide application in computer, data Processor, telecom communication, industrial control, and instrumentation equipment, etc.

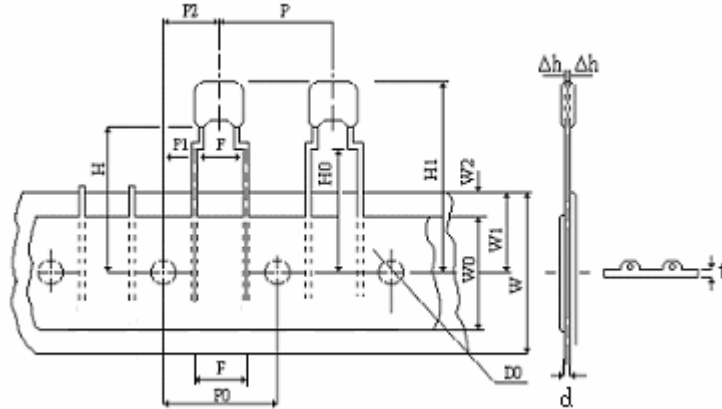
(Epoxy coated: Flame resistance for UL94 V-0 Approved)

|   |             |                          |
|---|-------------|--------------------------|
| SPECIFICATION OF MULTI-LAYER RADIAL-LEADED TYPE CAPACITOR | D13-00-E-14 | Ver: 14<br>Page: 12 / 18 |
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**8. Taping Figure and Specification:**

**8.1 RD21 Type Taping Figure and Specification**

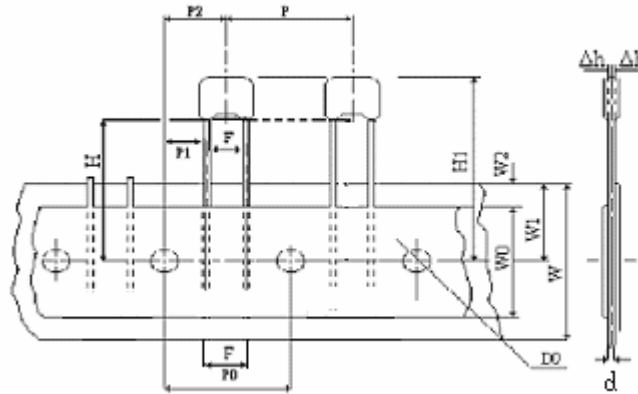
(Unit: mm)



| Description                            | Symbol | Dimension     | Remarks  |
|--|--------|---------------|--|
| Pitch Of Component                     | P      | 12.7±1.0      |  |
| Feed Hold Pitch                        | P0     | 12.7±0.3      | Cumulative Pitch Error :<br>±1.0 Mm/20 Pitches     |
| Feed Hold Center to Lead               | P1     | 3.85±0.7      |  |
| Feed Hold Center to Component Center   | P2     | 6.35±1.3      |  |
| Lead diameter                          | d      | 0.5±0.05      |  |
| Lead To Lead Spacing                   | F      | 5.0 ±0.8      | To Lead Tip Within Tolerance                       |
| Component Alignment, F-R               | Δh     | 2.0 Max       | The Alignment From The Center Of The Lead Is±1.0mm |
| Tape Width                             | W      | 18.0+1.0/-0.5 |  |
| Adhesive Tape Width                    | W0     | 11.0 Min.     |  |
| Hole Position                          | W1     | 9.0±0.5       |  |
| Adhesive Tape Position                 | W2     | 3.0 max.      |  |
| Height Of Bottom Body From Tape Center | H      | 18.0+2.0/-0   | H+12.5mm≤H1  |
| Lead-Wire Clinch Height                | H0     | 16.0±0.5      | 6.5≤H0-W1  |
| Component Height                       | H1     | 32.25 Max.    |  |
| Feed Hole Diameter                     | D0     | 4.0±0.2       |  |
| Tape Thickness                         | t      | 0.6±0.3       |  |

## 8.2 RD20 Type Taping Figure and Specification

(Unit: mm)

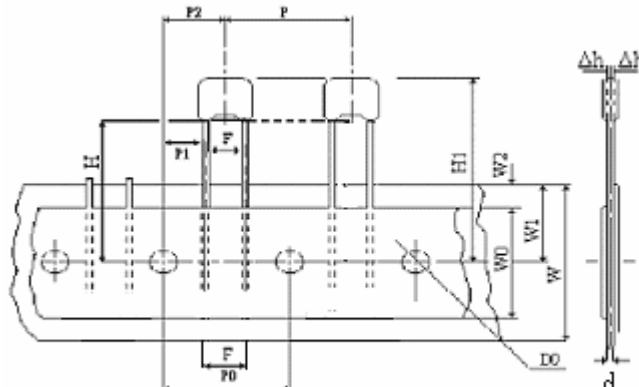


Unit: mm

| Description   | Symbol | Dimension     | Remarks  |
|---|--------|---------------|--|
| Pitch Of Component  | P      | 12.7±1.0      |  |
| Feed Hold Pitch   | P0     | 12.7±0.3      | Cumulative Pitch Error :<br>±1.0 Mm/20 Pitches     |
| Feed Hold Center to Lead  | P1     | 5.1±0.7       |  |
| Feed Hold Center to Component Center                                | P2     | 6.35±1.3      |  |
| Lead diameter   | d      | 0.5±0.05      |  |
| Lead To Lead Spacing  | F      | 2.5 ±0.8      | To Lead Tip Within Tolerance                       |
| Component Alignment, F-R  | Δh     | 2.0 Max       | The Alignment From The Center Of The Lead Is±1.0mm |
| Tape Width  | W      | 18.0+1.0/-0.5 |  |
| Adhesive Tape Width   | W0     | 11.0 Min.     |  |
| Hole Position   | W1     | 9.0±0.5       |  |
| Adhesive Tape Position  | W2     | 3.0 max.      |  |
| Lead-Wire Clinch Height from bottom of capacitor to the hold center | H      | 18.0±0.5      |  |
| Component Height  | H1     | 32.25 Max.    |  |
| Feed Hole Diameter  | D0     | 4.0±0.2       |  |
| Tape Thickness  | t      | 0.6±0.3       |  |

### 8.3 RD30 Type Taping Figure and Specification

(Unit: mm)



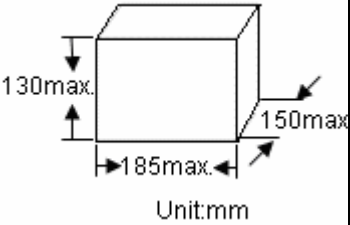
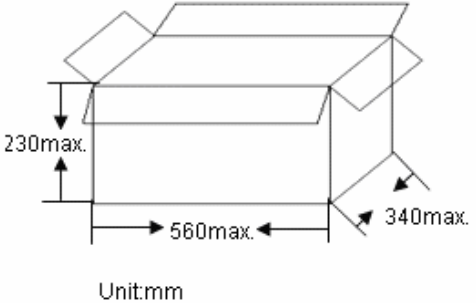
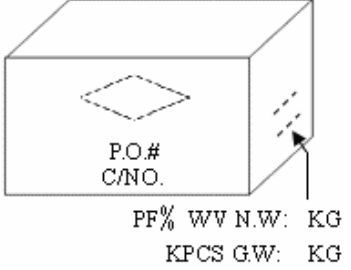
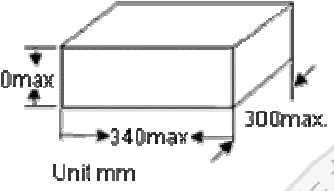
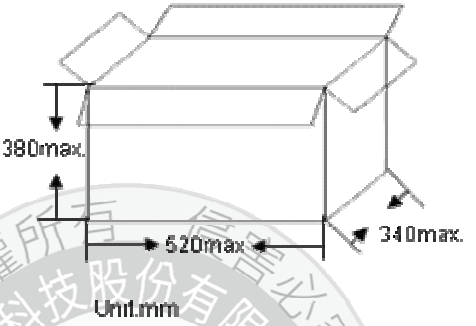
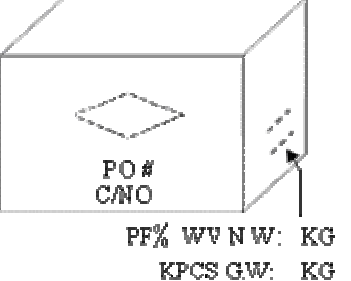
Unit: mm

| Description   | Symbol | Dimension     | Remarks  |
|---|--------|---------------|--|
| Pitch Of Component  | P      | 12.7±1.0      |  |
| Feed Hold Pitch   | P0     | 12.7±0.3      | Cumulative Pitch Error :<br>±1.0 Mm/20 Pitches     |
| Feed Hold Center to Lead  | P1     | 3.85±0.7      |  |
| Feed Hold Center to Component Center                                | P2     | 6.35±1.3      |  |
| Lead diameter   | d      | 0.5±0.05      |  |
| Lead To Lead Spacing  | F      | 5.0 ±0.8      | To Lead Tip Within Tolerance                       |
| Component Alignment, F-R  | Δh     | 2.0 Max       | The Alignment From The Center Of The Lead Is±1.0mm |
| Tape Width  | W      | 18.0+1.0/-0.5 |  |
| Adhesive Tape Width   | W0     | 11.0 Min.     |  |
| Hole Position   | W1     | 9.0±0.5       |  |
| Adhesive Tape Position  | W2     | 3.0 max.      |  |
| Lead-Wire Clinch Height from bottom of capacitor to the hold center | H      | 18.0±0.5      |  |
| Component Height  | H1     | 32.25 Max.    |  |
| Feed Hole Diameter  | D0     | 4.0±0.2       |  |
| Tape Thickness  | t      | 0.6±0.3       |  |

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**9. Packing specification :**

9.1 Packing size:

| Type        | Box   | Carton   |
|-------------|---|--|
| Bulk        |  <p>Unit:mm</p>  |  <p>Unit:mm</p>  <p>P.O.#<br/>C/NO.<br/>PF% WV N.W: KG<br/>KPCS G.W: KG</p> |
| Ammo taping |  <p>Unit:mm</p> |  <p>Unit:mm</p>  <p>PO#<br/>C/NO.<br/>PF% WV N.W: KG<br/>KPCS G.W: KG</p> |

9.2 Packing quantity:

| Chipsize            | Taping type       |                  | Bulk type        |
|---------------------|-------------------|------------------|------------------|
|                     | Quantity per reel | Quantity per box | Quantity per bag |
| 0805                | 2,000             | 2,000            | 1,000            |
| 1206,1210,1808,1812 | 1,500             | 1,500            | 1,000            |

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**10. Size code and capacitance (pF) available :**

**10.1 NPO Dielectric**

| Dielectric    | NPO  |                |     |     |                             |     |     |     |                             |     |      |    |                        |     |     |     |     |                        |     |     |      |      |      |     |     |      |      |      |   |  |
|---------------|------|----------------|-----|-----|-----------------------------|-----|-----|-----|-----------------------------|-----|------|----|------------------------|-----|-----|-----|-----|------------------------|-----|-----|------|------|------|-----|-----|------|------|------|---|--|
|               | 0805 |                |     |     | 1206                        |     |     |     |                             |     |      |    | 1210                   |     |     |     |     |                        |     |     | 1808 |      |      |     |     | 1812 |      |      |   |  |
|               | Size | 50 100 200 250 |     |     | 50 100 200 250 500 630 1000 |     |     |     | 50 100 200 250 500 630 1000 |     |      |    | 500 630 1000 2000 3000 |     |     |     |     | 500 630 1000 2000 3000 |     |     |      |      |      |     |     |      |      |      |   |  |
| Voltage (VDC) | 50   | 100            | 200 | 250 | 50                          | 100 | 200 | 250 | 500                         | 630 | 1000 | 50 | 100                    | 200 | 250 | 500 | 630 | 1000                   | 500 | 630 | 1000 | 2000 | 3000 | 500 | 630 | 1000 | 2000 | 3000 |   |  |
| 1.0pF (010)   | B    | B              | B   | B   |                             |     |     |     |                             |     |      |    |                        |     |     |     |     |                        |     |     |      |      |      |     |     |      |      |      |   |  |
| 1.2pF (1R2)   | B    | B              | B   | B   | B                           | B   |     |     |                             |     |      |    |                        |     |     |     |     |                        |     |     |      |      |      |     |     |      |      |      |   |  |
| 1.5pF (1R5)   | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    |    |                        |     |     |     |     |                        |     |     |      |      |      |     |     |      |      |      |   |  |
| 1.8pF (1R8)   | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    |    |                        |     |     |     |     |                        | B   | B   | B    | B    | B    |     |     |      |      |      |   |  |
| 2.2pF (2R2)   | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    |    |                        |     |     |     |     |                        | B   | B   | B    | B    | B    |     |     |      |      |      |   |  |
| 2.7pF (2R7)   | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    |    |                        |     |     |     |     |                        | B   | B   | B    | B    | B    |     |     |      |      |      |   |  |
| 3.3pF (3R3)   | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    |    |                        |     |     |     |     |                        | B   | B   | B    | B    | B    |     |     |      |      |      |   |  |
| 3.9pF (3R9)   | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    |    |                        |     |     |     |     |                        | B   | B   | B    | B    | B    |     |     |      |      |      |   |  |
| 4.7pF (4R7)   | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    |    |                        |     |     |     |     |                        | B   | B   | B    | B    | B    |     |     |      |      |      |   |  |
| 5.6pF (5R6)   | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    |    |                        |     |     |     |     |                        | B   | B   | B    | B    | B    |     |     |      |      |      |   |  |
| 6.8pF (6R8)   | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    |    |                        |     |     |     |     |                        | B   | B   | B    | B    | B    |     |     |      |      |      |   |  |
| 8.2pF (8R2)   | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    |    |                        |     |     |     |     |                        | B   | B   | B    | B    | B    |     |     |      |      |      |   |  |
| 10pF (100)    | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    | B  | B                      | B   | B   | B   | B   | B                      | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    | B |  |
| 12pF (120)    | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    | B  | B                      | B   | B   | B   | B   | B                      | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    | B |  |
| 15pF (150)    | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    | B  | B                      | B   | B   | B   | B   | B                      | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    | B |  |
| 18pF (180)    | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    | B  | B                      | B   | B   | B   | B   | B                      | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    | B |  |
| 22pF (220)    | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    | B  | B                      | B   | B   | B   | B   | B                      | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    | B |  |
| 27pF (270)    | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    | B  | B                      | B   | B   | B   | B   | B                      | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    | B |  |
| 33pF (330)    | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    | B  | B                      | B   | B   | B   | B   | B                      | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    | B |  |
| 39pF (390)    | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    | B  | B                      | B   | B   | B   | B   | B                      | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    | B |  |
| 47pF (470)    | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    | B  | B                      | B   | B   | B   | B   | B                      | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    | B |  |
| 56pF (560)    | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    | B  | B                      | B   | B   | B   | B   | B                      | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    | B |  |
| 68pF (680)    | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    | B  | B                      | B   | B   | B   | B   | B                      | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    | B |  |
| 82pF (820)    | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    | B  | B                      | B   | B   | B   | B   | B                      | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    | B |  |
| 100pF (101)   | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    | B  | B                      | B   | B   | B   | B   | B                      | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    | B |  |
| 120pF (121)   | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    | B  | B                      | B   | B   | B   | B   | B                      | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    | B |  |
| 150pF (151)   | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    | B  | B                      | B   | B   | B   | B   | B                      | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    | B |  |
| 180pF (181)   | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    | B  | B                      | B   | B   | B   | B   | B                      | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    | B |  |
| 220pF (221)   | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    | B  | B                      | B   | B   | B   | B   | B                      | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    | B |  |
| 270pF (271)   | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    | B  | B                      | B   | B   | B   | B   | B                      | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    | B |  |
| 330pF (331)   | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    | B  | B                      | B   | B   | B   | B   | B                      | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    | B |  |
| 390pF (391)   | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    | B  | B                      | B   | B   | B   | B   | B                      | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    | B |  |
| 470pF (471)   | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    | B  | B                      | B   | B   | B   | B   | B                      | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    | B |  |
| 560pF (561)   | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    | B  | B                      | B   | B   | B   | B   | B                      | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    | B |  |
| 680pF (681)   | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    | B  | B                      | B   | B   | B   | B   | B                      | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    | B |  |
| 820pF (821)   | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    | B  | B                      | B   | B   | B   | B   | B                      | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    | B |  |
| 1000pF (102)  | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    | B  | B                      | B   | B   | B   | B   | B                      | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    | B |  |
| 1200pF (122)  | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    | B  | B                      | B   | B   | B   | B   | B                      | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    | B |  |
| 1500pF (152)  | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    | B  | B                      | B   | B   | B   | B   | B                      | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    | B |  |
| 1800pF (182)  | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    | B  | B                      | B   | B   | B   | B   | B                      | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    | B |  |
| 2200pF (222)  | B    | B              | B   | B   | B                           | B   | B   | B   | B                           | B   | B    | B  | B                      | B   | B   | B   | B   | B                      | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    | B |  |
| 2700pF (272)  | B    | B              |     |     | B                           | B   | B   | B   | B                           | B   | B    | B  | B                      | B   | B   | B   | B   | B                      | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    | B |  |
| 3300pF (332)  | B    | B              |     |     | B                           | B   | B   | B   | B                           | B   | B    | B  | B                      | B   | B   | B   | B   | B                      | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    | B |  |
| 3900pF (392)  | B    | B              |     |     | B                           | B   | B   | B   | B                           | B   | B    | B  | B                      | B   | B   | B   | B   | B                      | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    | B |  |
| 4700pF (472)  | B    | B              |     |     | B                           | B   | B   | B   | B                           | B   | B    | B  | B                      | B   | B   | B   | B   | B                      | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    | B |  |
| 5600pF (562)  | B    | B              |     |     | B                           | B   |     |     |                             |     |      |    |                        |     |     |     |     |                        | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    | B |  |
| 6800pF (682)  | B    | B              |     |     | B                           | B   |     |     |                             |     |      |    |                        |     |     |     |     |                        | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    | B |  |
| 8200pF (822)  | B    |                |     |     | B                           | B   |     |     |                             |     |      |    |                        |     |     |     |     |                        | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    | B |  |
| 0.010uF (103) | B    |                |     |     | B                           | B   |     |     |                             |     |      |    |                        |     |     |     |     |                        | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    | B |  |
| 0.012uF (123) | B    |                |     |     | B                           | B   |     |     |                             |     |      |    |                        |     |     |     |     |                        | B   | B   |      |      |      |     |     |      |      |      |   |  |
| 0.015uF (153) | B    |                |     |     | B                           | B   |     |     |                             |     |      |    |                        |     |     |     |     |                        | B   | B   |      |      |      |     |     |      |      |      |   |  |
| 0.018uF (183) | B    |                |     |     | B                           | B   |     |     |                             |     |      |    |                        |     |     |     |     |                        | B   | B   |      |      |      |     |     |      |      |      |   |  |
| 0.022uF (223) | B    |                |     |     | B                           | B   |     |     |                             |     |      |    |                        |     |     |     |     |                        | B   | B   |      |      |      |     |     |      |      |      |   |  |
| 0.027uF (273) |      |                |     |     | B                           |     |     |     |                             |     |      |    |                        |     |     |     |     |                        | B   | B   |      |      |      |     |     |      |      |      |   |  |
| 0.033uF (333) |      |                |     |     | B                           | B   |     |     |                             |     |      |    |                        |     |     |     |     |                        | B   | B   |      |      |      |     |     |      |      |      |   |  |
| 0.039uF (393) |      |                |     |     | B                           |     |     |     |                             |     |      |    |                        |     |     |     |     |                        | B   |     |      |      |      |     |     |      |      |      |   |  |
| 0.047uF (473) |      |                |     |     | B                           |     |     |     |                             |     |      |    |                        |     |     |     |     |                        | B   |     |      |      |      |     |     |      |      |      |   |  |
| 0.056uF (563) |      |                |     |     | B                           |     |     |     |                             |     |      |    |                        |     |     |     |     |                        | B   |     |      |      |      |     |     |      |      |      |   |  |
| 0.068uF (683) |      |                |     |     | B                           |     |     |     |                             |     |      |    |                        |     |     |     |     |                        | B   |     |      |      |      |     |     |      |      |      |   |  |
| 0.082uF (823) |      |                |     |     | B                           |     |     |     |                             |     |      |    |                        |     |     |     |     |                        | B   |     |      |      |      |     |     |      |      |      |   |  |
| 0.1uF (104)   |      |                |     |     | B                           |     |     |     |                             |     |      |    |                        |     |     |     |     |                        | B   |     |      |      |      |     |     |      |      |      |   |  |

- ☆ The letter in cell is expressed the symbol of product terminations. B: (Cu/Ni/Sn)
- ☆ RD30 type can use Mlcc size 1808 and 1812, RD21 type can use Mlcc size 0805 and 1206, but RD20 type can only use Mlcc size 0805.



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### 10.2 X7R Dielectric

| Dielectric    | X7R  |      |     |     |    |      |     |     |     |     |      |    |     |     |     |      |     |      |     |     |      |      |      |     |     |      |      |      |
|---------------|------|------|-----|-----|----|------|-----|-----|-----|-----|------|----|-----|-----|-----|------|-----|------|-----|-----|------|------|------|-----|-----|------|------|------|
|               | Size | 0805 |     |     |    | 1206 |     |     |     |     | 1210 |    |     |     |     | 1808 |     |      |     |     | 1812 |      |      |     |     |      |      |      |
| Voltage (VDC) | 50   | 100  | 200 | 250 | 50 | 100  | 200 | 250 | 500 | 630 | 1000 | 50 | 100 | 200 | 250 | 500  | 630 | 1000 | 500 | 630 | 1000 | 2000 | 3000 | 500 | 630 | 1000 | 2000 | 3000 |
| 100pF (101)   | B    | B    | B   | B   |    |      |     |     |     |     |      |    |     |     |     |      |     |      |     |     |      |      |      |     |     |      |      |      |
| 120pF (121)   | B    | B    | B   | B   |    |      |     |     |     |     |      |    |     |     |     |      |     |      |     |     |      |      |      |     |     |      |      |      |
| 150pF (151)   | B    | B    | B   | B   | B  | B    | B   | B   | B   | B   | B    |    |     |     |     |      |     |      | B   | B   | B    | B    | B    |     |     |      |      |      |
| 180pF (181)   | B    | B    | B   | B   | B  | B    | B   | B   | B   | B   | B    |    |     |     |     |      |     |      | B   | B   | B    | B    | B    |     |     |      |      |      |
| 220pF (221)   | B    | B    | B   | B   | B  | B    | B   | B   | B   | B   | B    |    |     |     |     |      |     |      | B   | B   | B    | B    | B    |     |     |      |      |      |
| 270pF (271)   | B    | B    | B   | B   | B  | B    | B   | B   | B   | B   | B    |    |     |     |     |      |     |      | B   | B   | B    | B    | B    |     |     |      | B    | B    |
| 330pF (331)   | B    | B    | B   | B   | B  | B    | B   | B   | B   | B   | B    |    |     |     |     |      |     |      | B   | B   | B    | B    | B    |     |     | B    | B    | B    |
| 390pF (391)   | B    | B    | B   | B   | B  | B    | B   | B   | B   | B   | B    |    |     |     |     |      |     |      | B   | B   | B    | B    | B    |     |     | B    | B    | B    |
| 470pF (471)   | B    | B    | B   | B   | B  | B    | B   | B   | B   | B   | B    |    |     |     |     |      |     |      | B   | B   | B    | B    | B    |     |     | B    | B    | B    |
| 560pF (561)   | B    | B    | B   | B   | B  | B    | B   | B   | B   | B   | B    |    |     |     |     |      |     |      | B   | B   | B    | B    | B    |     |     | B    | B    | B    |
| 680pF (681)   | B    | B    | B   | B   | B  | B    | B   | B   | B   | B   | B    |    |     |     |     |      |     |      | B   | B   | B    | B    | B    |     |     | B    | B    | B    |
| 820pF (821)   | B    | B    | B   | B   | B  | B    | B   | B   | B   | B   | B    |    |     |     |     |      |     |      | B   | B   | B    | B    | B    |     |     | B    | B    | B    |
| 1000pF (102)  | B    | B    | B   | B   | B  | B    | B   | B   | B   | B   | B    | B  | B   | B   | B   | B    | B   | B    | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    |
| 1200pF (122)  | B    | B    | B   | B   | B  | B    | B   | B   | B   | B   | B    | B  | B   | B   | B   | B    | B   | B    | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    |
| 1500pF (152)  | B    | B    | B   | B   | B  | B    | B   | B   | B   | B   | B    | B  | B   | B   | B   | B    | B   | B    | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    |
| 1800pF (182)  | B    | B    | B   | B   | B  | B    | B   | B   | B   | B   | B    | B  | B   | B   | B   | B    | B   | B    | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    |
| 2200pF (222)  | B    | B    | B   | B   | B  | B    | B   | B   | B   | B   | B    | B  | B   | B   | B   | B    | B   | B    | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    |
| 2700pF (272)  | B    | B    | B   | B   | B  | B    | B   | B   | B   | B   | B    | B  | B   | B   | B   | B    | B   | B    | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    |
| 3300pF (332)  | B    | B    | B   | B   | B  | B    | B   | B   | B   | B   | B    | B  | B   | B   | B   | B    | B   | B    | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    |
| 3900pF (392)  | B    | B    | B   | B   | B  | B    | B   | B   | B   | B   | B    | B  | B   | B   | B   | B    | B   | B    | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    |
| 4700pF (472)  | B    | B    | B   | B   | B  | B    | B   | B   | B   | B   | B    | B  | B   | B   | B   | B    | B   | B    | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    |
| 5600pF (562)  | B    | B    | B   | B   | B  | B    | B   | B   | B   | B   | B    | B  | B   | B   | B   | B    | B   | B    | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    |
| 6800pF (682)  | B    | B    | B   | B   | B  | B    | B   | B   | B   | B   | B    | B  | B   | B   | B   | B    | B   | B    | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    |
| 8200pF (822)  | B    | B    | B   | B   | B  | B    | B   | B   | B   | B   | B    | B  | B   | B   | B   | B    | B   | B    | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    |
| 0.01uF (103)  | B    | B    | B   | B   | B  | B    | B   | B   | B   | B   | B    | B  | B   | B   | B   | B    | B   | B    | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    |
| 0.012uF (123) | B    | B    | B   | B   | B  | B    | B   | B   | B   | B   | B    | B  | B   | B   | B   | B    | B   | B    | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    |
| 0.015uF (153) | B    | B    | B   | B   | B  | B    | B   | B   | B   | B   | B    | B  | B   | B   | B   | B    | B   | B    | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    |
| 0.018uF (183) | B    | B    | B   | B   | B  | B    | B   | B   | B   | B   | B    | B  | B   | B   | B   | B    | B   | B    | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    |
| 0.022uF (223) | B    | B    | B   | B   | B  | B    | B   | B   | B   | B   | B    | B  | B   | B   | B   | B    | B   | B    | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    |
| 0.027uF (273) | B    | B    | B   | B   | B  | B    | B   | B   | B   | B   | B    | B  | B   | B   | B   | B    | B   | B    | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    |
| 0.033uF (333) | B    | B    | B   | B   | B  | B    | B   | B   | B   | B   | B    | B  | B   | B   | B   | B    | B   | B    | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    |
| 0.039uF (393) | B    | B    | B   | B   | B  | B    | B   | B   | B   | B   | B    | B  | B   | B   | B   | B    | B   | B    | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    |
| 0.047uF (473) | B    | B    | B   | B   | B  | B    | B   | B   | B   | B   | B    | B  | B   | B   | B   | B    | B   | B    | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    |
| 0.056uF (563) | B    | B    | B   | B   | B  | B    | B   | B   | B   | B   | B    | B  | B   | B   | B   | B    | B   | B    | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    |
| 0.068uF (683) | B    | B    | B   | B   | B  | B    | B   | B   | B   | B   | B    | B  | B   | B   | B   | B    | B   | B    | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    |
| 0.082uF (823) | B    | B    | B   | B   | B  | B    | B   | B   | B   | B   | B    | B  | B   | B   | B   | B    | B   | B    | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    |
| 0.1uF (104)   | B    | B    | B   | B   | B  | B    | B   | B   | B   | B   | B    | B  | B   | B   | B   | B    | B   | B    | B   | B   | B    | B    | B    | B   | B   | B    | B    | B    |
| 0.12uF (124)  | B    | B    |     |     | B  | B    | B   | B   |     |     |      | B  | B   | B   | B   | B    | B   |      |     |     |      |      |      |     |     |      |      |      |
| 0.15uF (154)  | B    | B    |     |     | B  | B    | B   | B   |     |     |      | B  | B   | B   | B   | B    | B   |      |     |     |      |      |      |     |     |      |      |      |
| 0.18uF (184)  | B    | B    |     |     | B  | B    | B   | B   |     |     |      | B  | B   | B   | B   | B    | B   |      |     |     |      |      |      |     |     |      |      |      |
| 0.22uF (224)  | B    | B    |     |     | B  | B    | B   | B   |     |     |      | B  | B   | B   | B   | B    | B   |      |     |     |      |      |      |     |     |      |      |      |
| 0.27uF (274)  | B    |      |     |     | B  | B    |     |     |     |     |      | B  | B   | B   | B   | B    | B   |      |     |     |      |      |      |     |     |      |      |      |
| 0.33uF (334)  | B    |      |     |     | B  | B    |     |     |     |     |      | B  | B   | B   | B   | B    | B   |      |     |     |      |      |      |     |     |      |      |      |
| 0.39uF (394)  | B    |      |     |     | B  | B    |     |     |     |     |      | B  | B   | B   | B   | B    | B   |      |     |     |      |      |      |     |     |      |      |      |
| 0.47uF (474)  | B    | B    |     |     | B  | B    |     |     |     |     |      | B  | B   | B   | B   | B    | B   |      |     |     |      |      |      |     |     |      |      |      |
| 0.56uF (564)  |      |      |     |     | B  | B    |     |     |     |     |      | B  | B   | B   | B   | B    | B   |      |     |     |      |      |      |     |     |      |      |      |
| 0.68uF (684)  |      |      |     |     | B  | B    |     |     |     |     |      | B  | B   | B   | B   | B    | B   |      |     |     |      |      |      |     |     |      |      |      |
| 0.82uF (824)  |      |      |     |     | B  | B    |     |     |     |     |      | B  | B   |     |     |      |     |      |     |     |      |      |      |     |     |      |      |      |
| 1.0uF (105)   | B    |      |     |     | B  | B    |     |     |     |     |      | B  | B   |     |     |      |     |      |     |     |      |      |      |     |     |      |      |      |
| 1.5uF (155)   |      |      |     |     |    |      |     |     |     |     |      | B  | B   |     |     |      |     |      |     |     |      |      |      |     |     |      |      |      |
| 2.2uF (225)   | B    |      |     |     | B  | B    |     |     |     |     |      | B  | B   |     |     |      |     |      |     |     |      |      |      |     |     |      |      |      |
| 4.7uF (475)   |      |      |     |     | B  |      |     |     |     |     |      | B  |     |     |     |      |     |      |     |     |      |      |      |     |     |      |      |      |
| 10uF (106)    |      |      |     |     |    |      |     |     |     |     |      | B  |     |     |     |      |     |      |     |     |      |      |      |     |     |      |      |      |

- ☆ The letter in cell is expressed the symbol of product terminations. B: (Cu/Ni/Sn)
- ☆ RD30 type can use Mlcc size 1808 and 1812, RD21 type can use Mlcc size 0805 and 1206, but RD20 type can only use Mlcc size 0805.

|   |             |                          |
|---|-------------|--------------------------|
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|---|-------------|--------------------------|

### 10.3 Y5V Dielectric

| Dielectric    |               | Y5V  |    |    |    |     |     |      |    |    |    |    |     |      |     |    |    |    |    |      |     |     |    |     |     |     |   |   |
|---------------|---------------|------|----|----|----|-----|-----|------|----|----|----|----|-----|------|-----|----|----|----|----|------|-----|-----|----|-----|-----|-----|---|---|
| Capacitance   | Size          | 0805 |    |    |    |     |     | 1206 |    |    |    |    |     | 1210 |     |    |    |    |    | 1812 |     |     |    |     |     |     |   |   |
|               | Voltage (VDC) | 10   | 16 | 25 | 50 | 100 | 200 | 250  | 10 | 16 | 25 | 50 | 100 | 200  | 250 | 10 | 16 | 25 | 50 | 100  | 200 | 250 | 50 | 100 | 200 | 250 |   |   |
| 0.01uF (103)  | B             | B    | B  | B  | B  | B   | B   | B    | B  | B  | B  | B  | B   | B    | B   |    |    |    |    |      | B   | B   | B  |     |     | B   | B | B |
| 0.015uF (153) | B             | B    | B  | B  | B  | B   | B   | B    | B  | B  | B  | B  | B   | B    | B   |    |    |    |    |      | B   | B   | B  |     |     | B   | B | B |
| 0.022uF (223) | B             | B    | B  | B  | B  | B   | B   | B    | B  | B  | B  | B  | B   | B    | B   |    |    |    |    |      | B   | B   | B  |     |     | B   | B | B |
| 0.033uF (333) | B             | B    | B  | B  | B  | B   | B   | B    | B  | B  | B  | B  | B   | B    | B   |    |    |    |    |      | B   | B   | B  |     |     | B   | B | B |
| 0.047uF (473) | B             | B    | B  | B  | B  | B   | B   | B    | B  | B  | B  | B  | B   | B    | B   |    |    |    |    |      | B   | B   | B  |     |     | B   | B | B |
| 0.068uF (683) | B             | B    | B  | B  | B  | B   | B   | B    | B  | B  | B  | B  | B   | B    | B   |    |    |    |    |      | B   | B   | B  |     |     | B   | B | B |
| 0.1uF (104)   | B             | B    | B  | B  | B  |     |     |      | B  | B  | B  | B  | B   | B    | B   | B  | B  | B  | B  | B    | B   | B   | B  | B   | B   | B   | B | B |
| 0.15uF (154)  | B             | B    | B  | B  |    |     |     |      | B  | B  | B  | B  | B   | B    | B   | B  | B  | B  | B  | B    | B   | B   | B  | B   | B   | B   | B | B |
| 0.22uF (224)  | B             | B    | B  | B  |    |     |     |      | B  | B  | B  | B  | B   | B    | B   |    |    |    |    |      | B   | B   | B  | B   | B   | B   | B | B |
| 0.33uF (334)  | B             | B    | B  | B  |    |     |     |      | B  | B  | B  | B  |     |      |     |    |    |    |    |      | B   | B   | B  | B   | B   | B   | B | B |
| 0.47uF (474)  | B             | B    | B  | B  |    |     |     |      | B  | B  | B  | B  |     |      |     |    |    |    |    |      | B   | B   | B  | B   | B   | B   | B | B |
| 0.68uF (684)  | B             | B    | B  | B  |    |     |     |      | B  | B  | B  | B  |     |      |     |    |    |    |    |      | B   | B   | B  | B   | B   | B   | B | B |
| 1.0uF (105)   | B             | B    | B  | B  |    |     |     |      | B  | B  | B  | B  |     |      |     |    |    |    |    |      | B   | B   | B  | B   |     | B   | B | B |
| 1.5uF (155)   | B             | B    |    |    |    |     |     |      | B  | B  | B  |    |     |      |     |    |    |    |    |      | B   | B   | B  |     |     | B   |   |   |
| 2.2uF (225)   | B             | B    |    |    |    |     |     |      | B  | B  | B  |    |     |      |     |    |    |    |    |      | B   | B   | B  | B   |     | B   |   |   |
| 3.3uF (335)   | B             | B    |    |    |    |     |     |      | B  | B  | B  |    |     |      |     |    |    |    |    |      | B   | B   | B  | B   |     | B   |   |   |
| 4.7uF (475)   | B             | B    |    |    |    |     |     |      | B  | B  | B  |    |     |      |     |    |    |    |    |      | B   | B   | B  | B   |     | B   |   |   |
| 6.8uF (685)   | B             |      |    |    |    |     |     |      | B  | B  |    |    |     |      |     |    |    |    |    |      | B   | B   | B  |     |     | B   |   |   |
| 10uF (106)    | B             |      |    |    |    |     |     |      | B  | B  |    |    |     |      |     |    |    |    |    |      | B   | B   | B  |     |     | B   |   |   |
| 22uF (226)    |               |      |    |    |    |     |     |      | B  |    |    |    |     |      |     |    |    |    |    |      |     |     |    |     |     |     |   |   |

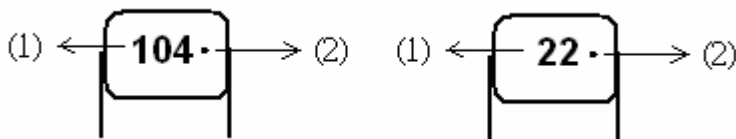
- ☆ The letter in cell is expressed the symbol of product terminations. B: (Cu/Ni/Sn)
- ☆ RD30 type can use Mlcc size 1808 and 1812, RD21 type can use Mlcc size 0805 and 1206, but RD20 type can only use Mlcc size 0805.

### 11. Marking:

| Rated voltage (VDC)   | 10               | 16               | 25                          | 50  | 100               | 200               | 250               | 500               | 630              | 1000       | 1500    | 2000       | 2500        | 3000         |
|-----------------------|------------------|------------------|-----------------------------|-----|-------------------|-------------------|-------------------|-------------------|------------------|------------|---------|------------|-------------|--------------|
| 3-figure code Marking | $\overline{104}$ | $10\overline{4}$ | $\overline{\overline{104}}$ | 104 | $\underline{104}$ | $\underline{104}$ | $\underline{104}$ | $\underline{104}$ | $\overline{104}$ | $\sim 104$ | $< 104$ | $104 \sim$ | $104 \succ$ | $\wedge 104$ |
| 2-figure code Marking | $\overline{22}$  | $2\overline{2}$  | $\overline{\overline{22}}$  | 22  | $\underline{22}$  | $\underline{22}$  | $\underline{22}$  | $\underline{22}$  | $\overline{22}$  | $\sim 22$  | $< 22$  | $22 \sim$  | $22 \succ$  | $\wedge 22$  |

3-figure code Marking

2-figure code Marking



(1) Rated capacitance:

Two significant digits followed by no. of zeros. And R is in place of decimal point.

ex.: 0R5=0.5pF 1R0=1.0pF 104=10x10<sup>4</sup> =100nF

(2) Halogen and Pb free: There is a “.” beside the capacitance code when the coating resin is

Halogen and Pb free Epoxy.