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|---|--|--|
| <b>SPECIFICATION SHEET NO.</b>          | R1212- 1210B225K101MA  |  |
| <b>ORIGINAL MFG/PART NO.</b>            | Aillen Capacitors/1210B225K101MA   |  |
| <b>NEXTGEN PART CODE</b>                | 1210B225K101MA   | Indicate This Code For <a href="#">RFQ/Order</a> |
| <b>DATE</b>                             | Dec. 12, 2024  |  |
| <b>REVISION</b>                         | A9   | Updated With Most Recent Data                    |
| <b>DESCRIPTION AND MAIN PARAMETRICS</b> | <p>Low Voltage Multilayer Ceramic Chip Capacitors (MLCC), 1210 Series<br/>           Case 3225 Metric 1210, Dimension L3.20*W2.50*H2.50mm<br/>           Thickness: 2.80mm Max. Dielectric X7R, Capacitance 2.2μF, Tolerance ±10%<br/>           Rated Voltage 100V<br/>           Operating Temp. Range -55°C ~+125°C<br/>           Package in Tape/Reel, 1,000pcs/Reel<br/>           REACH/RoHS/RoHS III Compliant</p> |  |
| <b>CUSTOMER</b>                         |  |  |
| <b>CUSTOMER PART NUMBER</b>             |  |  |
| <b>CROSS REF. PART NUMBER</b>           |  |  |
| <b>MEMO</b>                             |  |  |

|                               |   |  |
|-------------------------------|---|--|
| <b>VENDOR APPROVE</b>         |   |  |
| Issued/Checked/Approved       |    |  |
|                               |  |  |
| Effective Date: Dec. 12, 2024 |   |  |

|                         |
|-------------------------|
| <b>CUSTOMER APPROVE</b> |
|                         |
| DATE:                   |

## DESCRIPTION

MLCC consists of a conducting material and electrodes. To manufacture a chip-type SMT and achieve miniaturization, high density and high efficiency, ceramic condensers are used. MLCC is made by NP0 (COG), X7R, X5R And X6S dielectric material and which provides product with high electrical precision, stability and reliability.



*Image shown is a representation only.*

*Exact specifications should be obtained from the product dimension.*

## MAIN FEATURE

- A Wide Selection Of Size Is Available
- Rated Voltage Range 6.3V ~ 100V
- High Capacitance In Given Case Size
- Temperature Characteristics: NP0 (COG), X7R, X5R and X6S
- Capacitor With Lead-free Termination (Pure Tin)
- REACH/RoHS/RoHS III Compliant



## APPLICATION

- General Digital Circuit
- Power Supply by pass capacitors
- Consumer Electronics
- Telecommunication

## ELECTRICAL CHARACTERISTICS

- See Page 4 ~Page 25 For Different Part Code And Rated Voltage.
- All Products Parameters are Subject To NextGen Components' Final Confirmation.

**HOW TO ORDER**

- Please Follow Up Part Code Guide And Indicate NextGen Part Code 1210B225K101MA For RFQ and Order.

**RFQ**

[Request For Quotation](#)

**PART CODE GUIDE**

| CODE | NAME                    | KEY SPECIFICATION OPTION  |
|------|-------------------------|---|
| 1210 | Size                    | 0201 (0603 Metric): L0.60*W0.30mm; 0402 (1005 Metric): L1.00*W0.50mm<br>0603 (1608 Metric ): L1.60*W0.80mm; 0805 (2012 Metric): L2.00*W1.25mm<br>1206 (3216 Metric): L3.20*W1.60mm; 1210 (3225 Metric): L3.20*W2.50mm<br>1812 (4532 Metric): L4.50*W3.20mm; 1825 (4563 Metric):L4.50*W6.30mm<br>2220 (5750 Metric): L5.70*W5.00mm; 2225 (5763 Metric ): L5.70*W6.30mm |
| B    | Temperature Coefficient | N: NPO (COG); B: X7R; W: X5R; S: X6S  |
| 225  | Capacitance             | Two significant digits followed by number of Zero, The 3rd digit signifies the multiplying factor, and letter R is decimal point.<br>8R2: 8.2pF; 101: 100pF; 152: 1500pF; 472: 4700pF; 680: 68pF; 225: 2.2μF  |
| K    | Tolerance               | A: ±0.05pF; B: ±0.1pF; C: ±0.25pF; D: ±0.5pF; F: ±1%; G: ±2%; J: ±5%; K: ±10%<br>M: ±20% ; Z: -20/+80%  |
| 101  | Rated Voltage           | Two significant digits followed by No. of zeros. "R" is in place of decimal point.<br>4R0: 4.0VDC; 6R3: 6.3VDC; 100: 10VDC; 160: 16 VDC; 250: 25 VDC; 500: 50 VDC;<br>101: 100VDC   |
| M    | Thickness               | M: 2.50±0.30mm, See Page 26 ~ page 28 (T's Symbol) for Different part code  |
| A    | Package                 | A: 1Kpcs/Reel; B: 2Kpcs/Reel; C: 3Kpcs/Reel; D: 4Kpcs/Reel; E: 15Kpcs/Reel;<br>I: 10Kpcs/Reel; J: 2.5Kpcs/Reel; K: 0.5 Kpcs/Reel  |
| ( )  | Internal Control        | Blank: N/A;<br>XX: Letter A~Z, a~z or digits (0~9) for Special/Custom Parameters  |

**ELECTRICAL CHARACTERISTICS** – 6.3V X5R FOR DIFFERENT PART CODE

| NEXTGEN<br>PART CODE | TEMP.<br>COEFFICIENT | CAPACITANCE | TOLERANCE | VOLTAGE | THICKNESS<br>(MAX.) | OPERATING<br>TEMP. RANGE | CAPACITANCE<br>CHARACTERISTIC |
|----------------------|----------------------|-------------|-----------|---------|---------------------|--------------------------|-------------------------------|
|                      | -                    | -           | -         | V       | mm                  | °C                       | -                             |
| 0201W104K6R3LE       | X5R                  | 0.1 µf      | ±10%      | 6.3     | 0.39                | -55 ~+85                 | ±15%                          |
| 0201W105K6R3LE       | X5R                  | 1 µF        | ±10%      | 6.3     | 0.39                | -55 ~+85                 | ±15%                          |
| 0201W105M6R3LE       | X5R                  | 1 µF        | ±20%      | 6.3     | 0.39                | -55 ~+85                 | ±15%                          |
| 0402W105K6R3HI       | X5R                  | 1 µF        | ±10%      | 6.3     | 0.70                | -55 ~+85                 | ±15%                          |
| 0402W105M6R3HI       | X5R                  | 1 µF        | ±20%      | 6.3     | 0.70                | -55 ~+85                 | ±15%                          |
| 0402W106M6R3HI       | X5R                  | 10 µF       | ±20%      | 6.3     | 0.70                | -55 ~+85                 | ±15%                          |
| 0402W224K6R3HI       | X5R                  | 0.22 µF     | ±10%      | 6.3     | 0.70                | -55 ~+85                 | ±15%                          |
| 0402W225K6R3HI       | X5R                  | 2.2 µF      | ±10%      | 6.3     | 0.70                | -55 ~+85                 | ±15%                          |
| 0402W225M6R3HI       | X5R                  | 2.2 µF      | ±20%      | 6.3     | 0.70                | -55 ~+85                 | ±15%                          |
| 0402W475M6R3HI       | X5R                  | 4.7 µF      | ±20%      | 6.3     | 0.70                | -55 ~+85                 | ±15%                          |
| 0603W106K6R3XD       | X5R                  | 10 µF       | ±10%      | 6.3     | 1.00                | -55 ~+85                 | ±15%                          |
| 0603W106M6R3XD       | X5R                  | 10 µF       | ±20%      | 6.3     | 1.00                | -55 ~+85                 | ±15%                          |
| 0603W225K6R3XD       | X5R                  | 2.2 µF      | ±10%      | 6.3     | 1.00                | -55 ~+85                 | ±15%                          |
| 0603W226M6R3XD       | X5R                  | 22 µF       | ±20%      | 6.3     | 1.00                | -55 ~+85                 | ±15%                          |
| 0603W475K6R3XD       | X5R                  | 4.7 µF      | ±10%      | 6.3     | 1.00                | -55 ~+85                 | ±15%                          |
| 0603W475M6R3XD       | X5R                  | 4.7 µF      | ±20%      | 6.3     | 1.00                | -55 ~+85                 | ±15%                          |
| 0805W106K6R3CC       | X5R                  | 10 µF       | ±10%      | 6.3     | 1.45                | -55 ~+85                 | ±15%                          |
| 0805W226M6R3CC       | X5R                  | 22 µF       | ±20%      | 6.3     | 1.45                | -55 ~+85                 | ±15%                          |
| 0805W476M6R3CC       | X5R                  | 47 µF       | ±20%      | 6.3     | 1.45                | -55 ~+85                 | ±15%                          |
| 1206W107M6R3PB       | X5R                  | 100 µF      | ±20%      | 6.3     | 1.90                | -55 ~+85                 | ±15%                          |

**ELECTRICAL CHARACTERISTICS** – 10V X5R & X7R FOR DIFFERENT PART CODE

| NEXTGEN<br>PART CODE | TEMP.<br>COEFFICIENT | CAPACITANCE | TOLERANCE | VOLTAGE | THICKNESS<br>(MAX.) | OPERATING<br>TEMP. RANGE | CAPACITANCE<br>CHARACTERISTIC |
|----------------------|----------------------|-------------|-----------|---------|---------------------|--------------------------|-------------------------------|
|                      | -                    | -           | -         | V       | mm                  | °C                       | -                             |
| 0201W104K100LE       | X5R                  | 0.1 µF      | ±10%      | 10      | 0.39                | -55 ~+85                 | ±15%                          |
| 0201W105M100LE       | X5R                  | 1 µF        | ±20%      | 10      | 0.39                | -55 ~+85                 | ±15%                          |
| 0402W104K100HI       | X5R                  | 0.1 µF      | ±10%      | 10      | 0.70                | -55 ~+85                 | ±15%                          |
| 0402W105K100HI       | X5R                  | 1 µF        | ±10%      | 10      | 0.70                | -55 ~+85                 | ±15%                          |
| 0402W106M100HI       | X5R                  | 10 µF       | ±20%      | 10      | 0.70                | -55 ~+85                 | ±15%                          |
| 0402W224K100HI       | X5R                  | 0.22 µF     | ±10%      | 10      | 0.70                | -55 ~+85                 | ±15%                          |
| 0402W225K100HI       | X5R                  | 2.2 µF      | ±10%      | 10      | 0.70                | -55 ~+85                 | ±15%                          |
| 0603B105K100XD       | X7R                  | 1 µF        | ±10%      | 10      | 1.00                | -55 ~+125                | ±15%                          |
| 0603B225K100XD       | X7R                  | 2.2 µF      | ±10%      | 10      | 1.00                | -55 ~+125                | ±15%                          |
| 0603W105K100XD       | X5R                  | 1 µF        | ±10%      | 10      | 1.00                | -55 ~+85                 | ±15%                          |
| 0603W106M100XD       | X5R                  | 10 µF       | ±20%      | 10      | 1.00                | -55 ~+85                 | ±15%                          |
| 0603W225K100XD       | X5R                  | 2.2 µF      | ±10%      | 10      | 1.00                | -55 ~+85                 | ±15%                          |
| 0603W226M100BD       | X5R                  | 22 µF       | ±20%      | 10      | 1.00                | -55 ~+85                 | ±15%                          |
| 0603W335K100XD       | X5R                  | 3.3 µF      | ±10%      | 10      | 1.00                | -55 ~+85                 | ±15%                          |
| 0603W475K100XD       | X5R                  | 4.7 µF      | ±10%      | 10      | 1.00                | -55 ~+85                 | ±15%                          |
| 0603W475M100XD       | X5R                  | 4.7 µF      | ±20%      | 10      | 1.00                | -55 ~+85                 | ±15%                          |
| 0805B105K100CC       | X7R                  | 1.0 µF      | ±10%      | 10      | 1.45                | -55 ~+125                | ±15%                          |
| 0805W226M100CC       | X5R                  | 22 µF       | ±20%      | 10      | 1.45                | -55 ~+85                 | ±15%                          |
| 0805B475K100CC       | X7R                  | 4.7 µF      | ±10%      | 10      | 1.45                | -55 ~+125                | ±15%                          |
| 1206B475K100PB       | X7R                  | 4.7 µF      | ±10%      | 10      | 1.90                | -55 ~+125                | ±15%                          |



**ELECTRICAL CHARACTERISTICS** – 16V X5R & X7R FOR DIFFERENT PART CODE

| NEXTGEN<br>PART CODE | TEMP.<br>COEFFICIENT | CAPACITANCE | TOLERANCE | VOLTAGE | THICKNESS<br>(MAX.) | OPERATING<br>TEMP. RANGE | CAPACITANCE<br>CHARACTERISTIC |
|----------------------|----------------------|-------------|-----------|---------|---------------------|--------------------------|-------------------------------|
|                      | -                    | -           | -         | V       | mm                  | °C                       | -                             |
| 0402B104K160HI       | X7R                  | 0.1 μF      | ±10%      | 16      | 0.70                | -55 ~+125                | ±15%                          |
| 0402B223K160HI       | X7R                  | 0.022 μF    | ±10%      | 16      | 0.70                | -55 ~+125                | ±15%                          |
| 0402W105K160HI       | X5R                  | 1 μF        | ±10%      | 16      | 0.70                | -55 ~+85                 | ±15%                          |
| 0603W106M160XD       | X5R                  | 10 μF       | ±20%      | 16      | 1.00                | -55 ~+85                 | ±15%                          |
| 0603B105K160XD       | X7R                  | 1 μF        | ±10%      | 16      | 1.00                | -55 ~+125                | ±15%                          |
| 0603B224K160SD       | X7R                  | 0.22 μF     | ±10%      | 16      | 0.90                | -55 ~+125                | ±15%                          |
| 0603W105K160XD       | X5R                  | 1 μF        | ±10%      | 16      | 1.00                | -55 ~+85                 | ±15%                          |
| 0603W106K160XD       | X5R                  | 10 μF       | ±10%      | 16      | 1.00                | -55 ~+85                 | ±15%                          |
| 0603W225K160XD       | X5R                  | 2.2 μF      | ±10%      | 16      | 1.00                | -55 ~+85                 | ±15%                          |
| 0603W475K160XD       | X5R                  | 4.7 μF      | ±10%      | 16      | 1.00                | -55 ~+85                 | ±15%                          |
| 0805B105K160CC       | X7R                  | 1.0 μF      | ±10%      | 16      | 1.45                | -55 ~+125                | ±15%                          |
| 0805B225K160CC       | X7R                  | 2.2 μF      | ±10%      | 16      | 1.45                | -55 ~+125                | ±15%                          |
| 0805B475K160CC       | X7R                  | 4.7 μF      | ±10%      | 16      | 1.45                | -55 ~+125                | ±15%                          |
| 1206B105K160JC       | X7R                  | 1 μF        | ±10%      | 16      | 1.35                | -55 ~+125                | ±15%                          |
| 1206W106K160PB       | X5R                  | 10 μF       | ±10%      | 16      | 1.90                | -55 ~+85                 | ±15%                          |
| 1206W226K160PB       | X5R                  | 22 μF       | ±10%      | 16      | 1.90                | -55 ~+85                 | ±15%                          |
| 1210B106K160KA       | X7R                  | 10 μF       | ±10%      | 16      | 2.20                | -55 ~+125                | ±15%                          |
| 1210B226K160MA       | X7R                  | 22 μF       | ±10%      | 16      | 2.80                | -55 ~+125                | ±15%                          |
| 1210B226M160MA       | X7R                  | 22 μF       | ±20%      | 16      | 2.80                | -55 ~+125                | ±15%                          |
| 1210B475K160KA       | X7R                  | 4.7 μF      | ±10%      | 16      | 2.20                | -55 ~+125                | ±15%                          |





**ELECTRICAL CHARACTERISTICS – 25V NP0 (COG), X5R & X7R FOR DIFFERENT PART CODE**

| NEXTGEN<br>PART CODE | TEMP.<br>COEFFICIENT | CAPACITANCE | TOLERANCE | VOLTAGE | THICKNESS<br>(MAX.) | OPERATING<br>TEMP. RANGE | CAPACITANCE<br>CHARACTERISTIC |
|----------------------|----------------------|-------------|-----------|---------|---------------------|--------------------------|-------------------------------|
|                      | -                    | -           | -         | V       | mm                  | °C                       | -                             |
| 0201N100J250LE       | NP0 (COG)            | 10 pF       | ±5%       | 25      | 0.39                | -55 ~+125                | ±30ppm                        |
| 0201N101J250LE       | NP0 (COG)            | 100 pF      | ±5%       | 25      | 0.39                | -55 ~+125                | ±30ppm                        |
| 0201N6R8C250LE       | NP0 (COG)            | 6.8 pF      | ±0.25pF   | 25      | 0.39                | -55 ~+125                | ±30ppm                        |
| 0402B102K250HI       | X7R                  | 1000 pF     | ±10%      | 25      | 0.70                | -55 ~+125                | ±15%                          |
| 0402B104K250HI       | X7R                  | 0.1 μF      | ±10%      | 25      | 0.70                | -55 ~+125                | ±15%                          |
| 0402B123K250HI       | X7R                  | 0.012 μF    | ±10%      | 25      | 0.70                | -55 ~+125                | ±15%                          |
| 0402B473K250HI       | X7R                  | 0.047 μF    | ±10%      | 25      | 0.70                | -55 ~+125                | ±15%                          |
| 0402N102J250HI       | NP0 (COG)            | 1000 pF     | ±5%       | 25      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402W224K250HI       | X5R                  | 0.22 μF     | ±10%      | 25      | 0.70                | -55 ~+85                 | ±15%                          |
| 0603B101K250SD       | X7R                  | 100 pF      | ±10%      | 25      | 0.90                | -55 ~+125                | ±15%                          |
| 0603B104J250SD       | X7R                  | 0.1 μF      | ±5%       | 25      | 0.90                | -55 ~+125                | ±15%                          |
| 0603B104K250SD       | X7R                  | 0.1 μF      | ±10%      | 25      | 0.90                | -55 ~+125                | ±15%                          |
| 0603B105K250XD       | X7R                  | 1 μF        | ±10%      | 25      | 1.00                | -55 ~+125                | ±15%                          |
| 0603B223K250SD       | X7R                  | 0.022 μF    | ±10%      | 25      | 0.90                | -55 ~+125                | ±15%                          |
| 0603B224K250SD       | X7R                  | 0.22 μF     | ±10%      | 25      | 0.90                | -55 ~+125                | ±15%                          |
| 0603B224K250XD       | X7R                  | 0.22 μF     | ±10%      | 25      | 1.00                | -55 ~+125                | ±15%                          |
| 0603B472K250SD       | X7R                  | 4700 pF     | ±10%      | 25      | 0.90                | -55 ~+125                | ±15%                          |
| 0603W105K250BD       | X5R                  | 1 μF        | ±10%      | 25      | 1.00                | -55 ~+85                 | ±15%                          |
| 0603W105K250XD       | X5R                  | 1 μF        | ±10%      | 25      | 1.00                | -55 ~+85                 | ±15%                          |
| 0603W106M250XD       | X5R                  | 10 μF       | ±20%      | 25      | 1.00                | -55 ~+85                 | ±15%                          |

**ELECTRICAL CHARACTERISTICS** – 25V X5R & X7R FOR DIFFERENT PART CODE

| NEXTGEN<br>PART CODE | TEMP.<br>COEFFICIENT | CAPACITANCE   | TOLERANCE | VOLTAGE | THICKNESS<br>(MAX.) | OPERATING<br>TEMP. RANGE | CAPACITANCE<br>CHARACTERISTIC |
|----------------------|----------------------|---------------|-----------|---------|---------------------|--------------------------|-------------------------------|
|                      | -                    | -             | -         | V       | mm                  | °C                       | -                             |
| 0603W225K250XD       | X5R                  | 2.2 $\mu$ F   | $\pm$ 10% | 25      | 1.00                | -55 ~+85                 | $\pm$ 15%                     |
| 0603W475K250XD       | X5R                  | 4.7 $\mu$ F   | $\pm$ 10% | 25      | 1.00                | -55 ~+85                 | $\pm$ 15%                     |
| 0805B105J250CC       | X7R                  | 1.0 $\mu$ F   | $\pm$ 5%  | 25      | 1.45                | -55 ~+125                | $\pm$ 15%                     |
| 0805B105K250CC       | X7R                  | 1.0 $\mu$ F   | $\pm$ 10% | 25      | 1.45                | -55 ~+125                | $\pm$ 15%                     |
| 0805B225K250CC       | X7R                  | 2.2 $\mu$ F   | $\pm$ 10% | 25      | 1.45                | -55 ~+125                | $\pm$ 15%                     |
| 0805B333K250BD       | X7R                  | 0.033 $\mu$ F | $\pm$ 10% | 25      | 1.00                | -55 ~+125                | $\pm$ 15%                     |
| 0805B334K250CC       | X7R                  | 0.33 $\mu$ F  | $\pm$ 10% | 25      | 1.45                | -55 ~+125                | $\pm$ 15%                     |
| 0805B475K250CC       | X7R                  | 4.7 $\mu$ F   | $\pm$ 10% | 25      | 1.45                | -55 ~+125                | $\pm$ 15%                     |
| 0805B684K250CC       | X7R                  | 0.68 $\mu$ F  | $\pm$ 10% | 25      | 1.45                | -55 ~+125                | $\pm$ 15%                     |
| 0805W106K250CC       | X5R                  | 10 $\mu$ F    | $\pm$ 10% | 25      | 1.45                | -55 ~+85                 | $\pm$ 15%                     |
| 0805W225K250CC       | X5R                  | 2.2 $\mu$ F   | $\pm$ 10% | 25      | 1.45                | -55 ~+85                 | $\pm$ 15%                     |
| 0805W475K250CC       | X5R                  | 4.7 $\mu$ F   | $\pm$ 10% | 25      | 1.45                | -55 ~+85                 | $\pm$ 15%                     |
| 1206B105K250JC       | X7R                  | 1 $\mu$ F     | $\pm$ 10% | 25      | 1.35                | -55 ~+125                | $\pm$ 15%                     |
| 1206B106K250PB       | X7R                  | 10 $\mu$ F    | $\pm$ 10% | 25      | 1.90                | -55 ~+125                | $\pm$ 15%                     |
| 1206W106K250PB       | X5R                  | 10 $\mu$ F    | $\pm$ 10% | 25      | 1.90                | -55 ~+85                 | $\pm$ 15%                     |
| 1206W226K250PB       | X5R                  | 22 $\mu$ F    | $\pm$ 10% | 25      | 1.90                | -55 ~+85                 | $\pm$ 15%                     |
| 1210B106K250KA       | X7R                  | 10 $\mu$ F    | $\pm$ 10% | 25      | 2.20                | -55°C ~ 125              | $\pm$ 15%                     |
| 1210B226K250YA       | X7R                  | 22 $\mu$ F    | $\pm$ 10% | 25      | 1.90                | -55°C ~ 125              | $\pm$ 15%                     |
| 1210B226M250MA       | X7R                  | 22 $\mu$ F    | $\pm$ 20% | 25      | 2.80                | -55°C ~ 125              | $\pm$ 15%                     |
| 1210B474K250IC       | X7R                  | 0.47 $\mu$ F  | $\pm$ 10% | 25      | 1.05                | -55°C ~ 125              | $\pm$ 15%                     |



**ELECTRICAL CHARACTERISTICS** – 50V NP0 (COG) & X7R FOR DIFFERENT PART CODE

| NEXTGEN<br>PART CODE | TEMP.<br>COEFFICIENT | CAPACITANCE | TOLERANCE | VOLTAGE | THICKNESS<br>(MAX.) | OPERATING<br>TEMP. RANGE | CAPACITANCE<br>CHARACTERISTIC |
|----------------------|----------------------|-------------|-----------|---------|---------------------|--------------------------|-------------------------------|
|                      | -                    | -           | -         | V       | mm                  | °C                       | -                             |
| 0201N100J500LE       | NP0 (COG)            | 10 pF       | ±5%       | 50      | 0.39                | -55 ~+125                | ±30ppm                        |
| 0201N151J500LE       | NP0 (COG)            | 150 pF      | ±5%       | 50      | 0.39                | -55 ~+125                | ±30ppm                        |
| 0201N330J500LE       | NP0 (COG)            | 33 pF       | ±5%       | 50      | 0.39                | -55 ~+125                | ±30ppm                        |
| 0201N3R0C500LE       | NP0 (COG)            | 3 pF        | ±0.25pF   | 50      | 0.39                | -55 ~+125                | ±30ppm                        |
| 0201N3R3B500LE       | NP0 (COG)            | 3.3 pF      | ±0.1pF    | 50      | 0.39                | -55 ~+125                | ±30ppm                        |
| 0201N4R0C500LE       | NP0 (COG)            | 4 pF        | ±0.25pF   | 50      | 0.39                | -55 ~+125                | ±30ppm                        |
| 0201N6R2C500LE       | NP0 (COG)            | 6.2 pF      | ±0.25pF   | 50      | 0.39                | -55 ~+125                | ±30ppm                        |
| 0402B104K500HI       | X7R                  | 0.1 μF      | ±10%      | 50      | 0.70                | -55 ~+125                | ±15%                          |
| 0402B102K500HI       | X7R                  | 1000 pF     | ±10%      | 50      | 0.70                | -55 ~+125                | ±15%                          |
| 0402B103K500HI       | X7R                  | 0.01 μF     | ±10%      | 50      | 0.70                | -55 ~+125                | ±15%                          |
| 0402B223K500HI       | X7R                  | 0.022 μF    | ±10%      | 50      | 0.70                | -55 ~+125                | ±15%                          |
| 0402B682K500HI       | X7R                  | 6800 pF     | ±10%      | 50      | 0.70                | -55 ~+125                | ±15%                          |
| 0402N0R3B500HI       | NP0 (COG)            | 0.3 pF      | ±0.1pF    | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N0R8B500HI       | NP0 (COG)            | 0.8 pF      | ±0.1pF    | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N0R9B500HI       | NP0 (COG)            | 0.9 pF      | ±0.1pF    | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N100J500HI       | NP0 (COG)            | 10 pF       | ±5%       | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N101J500HI       | NP0 (COG)            | 100 pF      | ±5%       | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N180J500HI       | NP0 (COG)            | 18 pF       | ±5%       | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N1R0A500HI       | NP0 (COG)            | 1 pF        | ±0.05pF   | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N1R0B500HI       | NP0 (COG)            | 1 pF        | ±0.1pF    | 50      | 0.70                | -55 ~+125                | ±30ppm                        |

**ELECTRICAL CHARACTERISTICS – 50V NP0 (COG) FOR DIFFERENT PART CODE**

| NEXTGEN<br>PART CODE | TEMP.<br>COEFFICIENT | CAPACITANCE | TOLERANCE | VOLTAGE | THICKNESS<br>(MAX.) | OPERATING<br>TEMP. RANGE | CAPACITANCE<br>CHARACTERISTIC |
|----------------------|----------------------|-------------|-----------|---------|---------------------|--------------------------|-------------------------------|
|                      | -                    | -           | -         | V       | mm                  | °C                       | -                             |
| 0402N1R0C500HI       | NP0 (COG)            | 1 pF        | ±0.25pF   | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N1R2A500HI       | NP0 (COG)            | 1.2 pF      | ±0.05pF   | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N1R2B500HI       | NP0 (COG)            | 1.2 pF      | ±0.1pF    | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N1R2C500HI       | NP0 (COG)            | 1.2 pF      | ±0.25pF   | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N1R3A500HI       | NP0 (COG)            | 1.3 pF      | ±0.05pF   | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N1R3B500HI       | NP0 (COG)            | 1.3 pF      | ±0.1pF    | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N1R5C500HI       | NP0 (COG)            | 1.5 pF      | ±0.25pF   | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N1R6A500HI       | NP0 (COG)            | 1.6 pF      | ±0.05pF   | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N1R8B500HI       | NP0 (COG)            | 1.8 pF      | ±0.1pF    | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N1R8C500HI       | NP0 (COG)            | 1.8 pF      | ±0.25pF   | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N220J500HI       | NP0 (COG)            | 22 pF       | ±5%       | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N221J500HI       | NP0 (COG)            | 220 pF      | ±5%       | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N2R0B500HI       | NP0 (COG)            | 2 pF        | ±0.1pF    | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N2R2B500HI       | NP0 (COG)            | 2.2 pF      | ±0.1pF    | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N2R2C500HI       | NP0 (COG)            | 2.2 pF      | ±0.25pF   | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N2R4B500HI       | NP0 (COG)            | 2.4 pF      | ±0.1pF    | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N2R4C500HI       | NP0 (COG)            | 2.4 pF      | ±0.25pF   | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N2R7C500HI       | NP0 (COG)            | 2.7 pF      | ±0.25pF   | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N330J500HI       | NP0 (COG)            | 33 pF       | ±5%       | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N391F500HI       | NP0 (COG)            | 390 pF      | ±1%       | 50      | 0.70                | -55 ~+125                | ±30ppm                        |

**ELECTRICAL CHARACTERISTICS** – 50V NP0 (COG), X5R & X7R FOR DIFFERENT PART CODE

| NEXTGEN<br>PART CODE | TEMP.<br>COEFFICIENT | CAPACITANCE | TOLERANCE | VOLTAGE | THICKNESS<br>(MAX.) | OPERATING<br>TEMP. RANGE | CAPACITANCE<br>CHARACTERISTIC |
|----------------------|----------------------|-------------|-----------|---------|---------------------|--------------------------|-------------------------------|
|                      | -                    | -           | -         | V       | mm                  | °C                       | -                             |
| 0402N3R3C500HI       | NP0 (COG)            | 3.3 pF      | ±0.25pF   | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N471J500HI       | NP0 (COG)            | 470 pF      | ±5%       | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N4R0C500HI       | NP0 (COG)            | 4 pF        | ±0.25pF   | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N4R7B500HI       | NP0 (COG)            | 4.7 pF      | ±0.1pF    | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N4R7C500HI       | NP0 (COG)            | 4.7 pF      | ±0.25pF   | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N5R6B500HI       | NP0 (COG)            | 5.6 pF      | ±0.1pF    | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N5R6C500HI       | NP0 (COG)            | 5.6 pF      | ±0.25pF   | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N6R0B500HI       | NP0 (COG)            | 6 pF        | ±0.1pF    | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N6R0C500HI       | NP0 (COG)            | 6 pF        | ±0.25pF   | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N6R2B500HI       | NP0 (COG)            | 6.2 pF      | ±0.1pF    | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N6R8B500HI       | NP0 (COG)            | 6.8 pF      | ±0.1pF    | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N6R8D500HI       | NP0 (COG)            | 6.8 pF      | ±0.5pF    | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N8R0C500HI       | NP0 (COG)            | 8.0 pF      | ±0.25pF   | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402N8R2C500HI       | NP0 (COG)            | 8.2 pF      | ±0.25pF   | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0402W104K500HI       | X5R                  | 0.1 μF      | ±10%      | 50      | 0.70                | -55 ~+85                 | ±15%                          |
| 0603B101K500SD       | X7R                  | 100 pF      | ±10%      | 50      | 0.90                | -55 ~+125                | ±15%                          |
| 0603B102K500SD       | X7R                  | 1000 pF     | ±10%      | 50      | 0.90                | -55 ~+125                | ±15%                          |
| 0603B103K500SD       | X7R                  | 0.01 μF     | ±10%      | 50      | 0.90                | -55 ~+125                | ±15%                          |
| 0603B104J500XD       | X7R                  | 0.1 μF      | ±5%       | 50      | 1.00                | -55 ~+125                | ±15%                          |
| 0603B104K500XD       | X7R                  | 0.1 μF      | ±10%      | 50      | 1.00                | -55 ~+125                | ±15%                          |

**ELECTRICAL CHARACTERISTICS** – 50V NP0 (COG) & X7R FOR DIFFERENT PART CODE

| NEXTGEN<br>PART CODE | TEMP.<br>COEFFICIENT | CAPACITANCE | TOLERANCE | VOLTAGE | THICKNESS<br>(MAX.) | OPERATING<br>TEMP. RANGE | CAPACITANCE<br>CHARACTERISTIC |
|----------------------|----------------------|-------------|-----------|---------|---------------------|--------------------------|-------------------------------|
|                      | -                    | -           | -         | V       | mm                  | °C                       | -                             |
| 0603B105K500XD       | X7R                  | 1 μF        | ±10%      | 50      | 1.00                | -55 ~+125                | ±15%                          |
| 0603B152K500SD       | X7R                  | 1500 pF     | ±10%      | 50      | 0.90                | -55 ~+125                | ±15%                          |
| 0603B221K500SD       | X7R                  | 220 pF      | ±10%      | 50      | 0.90                | -55 ~+125                | ±15%                          |
| 0603B222K500SD       | X7R                  | 2200 pF     | ±10%      | 50      | 0.90                | -55 ~+125                | ±15%                          |
| 0603B223K500SD       | X7R                  | 0.022 μF    | ±10%      | 50      | 0.90                | -55 ~+125                | ±15%                          |
| 0603B224K500XD       | X7R                  | 0.22 μF     | ±10%      | 50      | 1.00                | -55 ~+125                | ±15%                          |
| 0603B333K500XD       | X7R                  | 0.033 μF    | ±10%      | 50      | 1.00                | -55 ~+125                | ±15%                          |
| 0603B334K500XD       | X7R                  | 0.33 μF     | ±10%      | 50      | 1.00                | -55 ~+125                | ±15%                          |
| 0603B471K500SD       | X7R                  | 470 pF      | ±10%      | 50      | 0.90                | -55 ~+125                | ±15%                          |
| 0603B472K500SD       | X7R                  | 4700 pF     | ±10%      | 50      | 0.90                | -55 ~+125                | ±15%                          |
| 0603B474K500XD       | X7R                  | 0.47 μF     | ±10%      | 50      | 1.00                | -55 ~+125                | ±15%                          |
| 0603B681K500SD       | X7R                  | 680 pF      | ±10%      | 50      | 0.90                | -55 ~+125                | ±15%                          |
| 0603B682K500SD       | X7R                  | 6800 pF     | ±10%      | 50      | 0.90                | -55 ~+125                | ±15%                          |
| 0603N0R5B500SD       | NP0 (COG)            | 0.5 pF      | ±0.1pF    | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N100D500SD       | NP0 (COG)            | 10 pF       | ±0.5pF    | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N100F500SD       | NP0 (COG)            | 10 pF       | ±1%       | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N100G500SD       | NP0 (COG)            | 10 pF       | ±2%       | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N100J500SD       | NP0 (COG)            | 10 pF       | ±5%       | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N101J500SD       | NP0 (COG)            | 100 pF      | ±5%       | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N102J500SD       | NP0 (COG)            | 1000 pF     | ±5%       | 50      | 0.90                | -55 ~+125                | ±30ppm                        |

**ELECTRICAL CHARACTERISTICS – 50V NP0 (COG) FOR DIFFERENT PART CODE**

| NEXTGEN<br>PART CODE | TEMP.<br>COEFFICIENT | CAPACITANCE | TOLERANCE | VOLTAGE | THICKNESS<br>(MAX.) | OPERATING<br>TEMP. RANGE | CAPACITANCE<br>CHARACTERISTIC |
|----------------------|----------------------|-------------|-----------|---------|---------------------|--------------------------|-------------------------------|
|                      | -                    | -           | -         | V       | mm                  | °C                       | -                             |
| 0603N120F500SD       | NP0 (COG)            | 12 pF       | ±1%       | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N120J500SD       | NP0 (COG)            | 12 pF       | ±5%       | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N150J500SD       | NP0 (COG)            | 15 pF       | ±5%       | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N180J500SD       | NP0 (COG)            | 18 pF       | ±5%       | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N1R0B500SD       | NP0 (COG)            | 1.0 pF      | ±0.1pF    | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N1R2B500SD       | NP0 (COG)            | 1.2 pF      | ±0.1pF    | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N1R5B500SD       | NP0 (COG)            | 1.5 pF      | ±0.1pF    | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N1R5C500SD       | NP0 (COG)            | 1.5 pF      | ±0.25pF   | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N200J500SD       | NP0 (COG)            | 20 pF       | ±5%       | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N220J500SD       | NP0 (COG)            | 22 pF       | ±5%       | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N270J500SD       | NP0 (COG)            | 27 pF       | ±5%       | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N2R0C500SD       | NP0 (COG)            | 2 pF        | ±0.25pF   | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N2R2B500SD       | NP0 (COG)            | 2.2 pF      | ±0.1pF    | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N2R4B500SD       | NP0 (COG)            | 2.4 pF      | ±0.1pF    | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N2R5B500SD       | NP0 (COG)            | 2.5 pF      | ±0.1pF    | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N2R7B500SD       | NP0 (COG)            | 2.7 pF      | ±0.1pF    | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N300J500SD       | NP0 (COG)            | 30 pF       | ±5%       | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N330J500SD       | NP0 (COG)            | 33 pF       | ±5%       | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N331J500SD       | NP0 (COG)            | 330 pF      | ±5%       | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N391J500SD       | NP0 (COG)            | 390 pF      | ±5%       | 50      | 0.90                | -55 ~+125                | ±30ppm                        |



**ELECTRICAL CHARACTERISTICS – 50V NP0 (COG) FOR DIFFERENT PART CODE**

| NEXTGEN<br>PART CODE | TEMP.<br>COEFFICIENT | CAPACITANCE | TOLERANCE | VOLTAGE | THICKNESS<br>(MAX.) | OPERATING<br>TEMP. RANGE | CAPACITANCE<br>CHARACTERISTIC |
|----------------------|----------------------|-------------|-----------|---------|---------------------|--------------------------|-------------------------------|
|                      | -                    | -           | -         | V       | mm                  | °C                       | -                             |
| 0603N3R0B500SD       | NP0 (COG)            | 3 pF        | ±0.1pF    | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N3R3B500SD       | NP0 (COG)            | 3.3 pF      | ±0.1pF    | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N3R3C500SD       | NP0 (COG)            | 3.3 pF      | ±0.25pF   | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N3R3D500SD       | NP0 (COG)            | 3.3 pF      | ±0.5pF    | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N3R9C500SD       | NP0 (COG)            | 3.9 pF      | ±0.25pF   | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N3R9D500SD       | NP0 (COG)            | 3.9 pF      | ±0.5pF    | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N470J500SD       | NP0 (COG)            | 47 pF       | ±5%       | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N471J500SD       | NP0 (COG)            | 470 pF      | ±5%       | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N4R0B500SD       | NP0 (COG)            | 4 pF        | ±0.1pF    | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N560J500SD       | NP0 (COG)            | 56 pF       | ±5%       | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N5R0C500SD       | NP0 (COG)            | 5 pF        | ±0.25pF   | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N5R0D500SD       | NP0 (COG)            | 5 pF        | ±0.5pF    | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N5R6C500SD       | NP0 (COG)            | 5.6 pF      | ±0.25pF   | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N5R6D500SD       | NP0 (COG)            | 5.6 pF      | ±0.5pF    | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N680J500SD       | NP0 (COG)            | 68 pF       | ±5%       | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N6R0B500SD       | NP0 (COG)            | 6 pF        | ±0.1pF    | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N6R8C500SD       | NP0 (COG)            | 6.8 pF      | ±0.25pF   | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N6R8D500SD       | NP0 (COG)            | 6.8 pF      | ±0.5pF    | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N7R0D500SD       | NP0 (COG)            | 7 pF        | ±0.5pF    | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N820J500SD       | NP0 (COG)            | 82 pF       | ±5%       | 50      | 0.90                | -55 ~+125                | ±30ppm                        |

**ELECTRICAL CHARACTERISTICS** – 50V NP0 (COG), X5R & X7R FOR DIFFERENT PART CODE

| NEXTGEN<br>PART CODE | TEMP.<br>COEFFICIENT | CAPACITANCE | TOLERANCE | VOLTAGE | THICKNESS<br>(MAX.) | OPERATING<br>TEMP. RANGE | CAPACITANCE<br>CHARACTERISTIC |
|----------------------|----------------------|-------------|-----------|---------|---------------------|--------------------------|-------------------------------|
|                      | -                    | -           | -         | V       | mm                  | °C                       | -                             |
| 0603N8R0D500SD       | NP0 (COG)            | 8 pF        | ±0.5pF    | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N8R2C500SD       | NP0 (COG)            | 8.2 pF      | ±0.25pF   | 50      | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603W105K500XD       | X5R                  | 1 µF        | ±10%      | 50      | 1.00                | -55 ~+85                 | ±15%                          |
| 0603W225K500XD       | X5R                  | 22 µF       | ±10%      | 50      | 1.00                | -55 ~+85                 | ±15%                          |
| 0805B101K500BD       | X7R                  | 100 pF      | ±10%      | 50      | 1.00                | -55 ~+125                | ±15%                          |
| 0805B102K500BD       | X7R                  | 1000 pF     | ±10%      | 50      | 1.00                | -55 ~+125                | ±15%                          |
| 0805B103K500BD       | X7R                  | 0.01 µF     | ±10%      | 50      | 1.00                | -55 ~+125                | ±15%                          |
| 0805B104J500BD       | X7R                  | 0.1 µF      | ±5%       | 50      | 1.00                | -55 ~+125                | ±15%                          |
| 0805B104K500BD       | X7R                  | 0.1 µF      | ±10%      | 50      | 1.00                | -55 ~+125                | ±15%                          |
| 0805B105K500CC       | X7R                  | 1.0 µF      | ±10%      | 50      | 1.45                | -55 ~+125                | ±15%                          |
| 0805B221K500BD       | X7R                  | 220 pF      | ±10%      | 50      | 1.00                | -55 ~+125                | ±15%                          |
| 0805B224K500CC       | X7R                  | 0.22 µF     | ±10%      | 50      | 1.45                | -55 ~+125                | ±15%                          |
| 0805B225K500CC       | X7R                  | 2.2 µF      | ±10%      | 50      | 1.45                | -55 ~+125                | ±15%                          |
| 0805B331K500BD       | X7R                  | 330 pF      | ±10%      | 50      | 1.00                | -55 ~+125                | ±15%                          |
| 0805B332K500BD       | X7R                  | 3300 pF     | ±10%      | 50      | 1.00                | -55 ~+125                | ±15%                          |
| 0805B333K500BD       | X7R                  | 0.033 µF    | ±10%      | 50      | 1.00                | -55 ~+125                | ±15%                          |
| 0805B334K500CC       | X7R                  | 0.33 µF     | ±10%      | 50      | 1.45                | -55 ~+125                | ±15%                          |
| 0805B471K500BD       | X7R                  | 470 pF      | ±10%      | 50      | 1.00                | -55 ~+125                | ±15%                          |
| 0805B472K500BD       | X7R                  | 4700 pF     | ±10%      | 50      | 1.00                | -55 ~+125                | ±15%                          |
| 0805B474K500CC       | X7R                  | 0.47 µF     | ±10%      | 50      | 1.45                | -55 ~+125                | ±15%                          |

**ELECTRICAL CHARACTERISTICS** – 50V NP0 (COG) & X7R FOR DIFFERENT PART CODE

| NEXTGEN<br>PART CODE | TEMP.<br>COEFFICIENT | CAPACITANCE | TOLERANCE | VOLTAGE | THICKNESS<br>(MAX.) | OPERATING<br>TEMP. RANGE | CAPACITANCE<br>CHARACTERISTIC |
|----------------------|----------------------|-------------|-----------|---------|---------------------|--------------------------|-------------------------------|
|                      | -                    | -           | -         | V       | mm                  | °C                       | -                             |
| 0805B682K500BD       | X7R                  | 6800 pF     | ±10%      | 50      | 1.00                | -55 ~+125                | ±15%                          |
| 0805B684K500CC       | X7R                  | 0.68 μF     | ±10%      | 50      | 1.45                | -55 ~+125                | ±15%                          |
| 0805N101J500AD       | NP0 (COG)            | 100 pF      | ±5%       | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0805N102J500BD       | NP0 (COG)            | 1000 pF     | ±5%       | 50      | 1.00                | -55 ~+125                | ±30ppm                        |
| 0805N103J500AD       | NP0 (COG)            | 0.01 μF     | ±5%       | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0805N121J500AD       | NP0 (COG)            | 120 pF      | ±5%       | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0805N150J500AD       | NP0 (COG)            | 15 pF       | ±5%       | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0805N180J500AD       | NP0 (COG)            | 18 pF       | ±5%       | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0805N1R5C500AD       | NP0 (COG)            | 1.5 pF      | ±0.25pF   | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0805N220J500AD       | NP0 (COG)            | 22 pF       | ±5%       | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0805N221J500AD       | NP0 (COG)            | 220 pF      | ±5%       | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0805N2R7C500AD       | NP0 (COG)            | 2.7 pF      | ±0.25pF   | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0805N330J500AD       | NP0 (COG)            | 33 pF       | ±5%       | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0805N331J500AD       | NP0 (COG)            | 330 pF      | ±5%       | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0805N391J500AD       | NP0 (COG)            | 390 pF      | ±5%       | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0805N3R3C500AD       | NP0 (COG)            | 3.3 pF      | ±0.25pF   | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0805N470J500AD       | NP0 (COG)            | 47 pF       | ±5%       | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0805N471J500BD       | NP0 (COG)            | 470 pF      | ±5%       | 50      | 1.00                | -55 ~+125                | ±30ppm                        |
| 0805N4R7B500AD       | NP0 (COG)            | 4.7 pF      | ±0.1pF    | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0805N560J500AD       | NP0 (COG)            | 56 pF       | ±5%       | 50      | 0.70                | -55 ~+125                | ±30ppm                        |

**ELECTRICAL CHARACTERISTICS** – 50V NP0 (COG), X5R & X7R FOR DIFFERENT PART CODE

| NEXTGEN<br>PART CODE | TEMP.<br>COEFFICIENT | CAPACITANCE | TOLERANCE | VOLTAGE | THICKNESS<br>(MAX.) | OPERATING<br>TEMP. RANGE | CAPACITANCE<br>CHARACTERISTIC |
|----------------------|----------------------|-------------|-----------|---------|---------------------|--------------------------|-------------------------------|
|                      | -                    | -           | -         | V       | mm                  | °C                       | -                             |
| 0805N5R0C500AD       | NP0 (COG)            | 5 pF        | ±0.25pF   | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0805N681J500BD       | NP0 (COG)            | 680 pF      | ±5%       | 50      | 1.00                | -55 ~+125                | ±30ppm                        |
| 0805N6R8C500AD       | NP0 (COG)            | 6.8 pF      | ±0.25pF   | 50      | 0.70                | -55 ~+125                | ±30ppm                        |
| 0805W106K500CC       | X5R                  | 10 µF       | ±10%      | 50      | 1.45                | -55 ~+85                 | ±15%                          |
| 0805W225K500CC       | X5R                  | 2.2 µF      | ±10%      | 50      | 1.45                | -55 ~+85                 | ±15%                          |
| 0805W475K500CC       | X5R                  | 4.7 µF      | ±10%      | 50      | 1.45                | -55 ~+85                 | ±15%                          |
| 0805W475M500CC       | X5R                  | 4.7 µF      | ±20%      | 50      | 1.45                | -55 ~+85                 | ±15%                          |
| 1206B102K500BD       | X7R                  | 1000 pF     | ±10%      | 50      | 1.00                | -55 ~+125                | ±15%                          |
| 1206B104K500BD       | X7R                  | 0.1 µF      | ±10%      | 50      | 1.00                | -55 ~+125                | ±15%                          |
| 1206B105K500PB       | X7R                  | 1 µF        | ±10%      | 50      | 1.90                | -55 ~+125                | ±15%                          |
| 1206B331K500BD       | X7R                  | 330 pF      | ±10%      | 50      | 1.00                | -55 ~+125                | ±15%                          |
| 1206B475K500PB       | X7R                  | 4.7 µF      | ±10%      | 50      | 1.90                | -55 ~+125                | ±15%                          |
| 1206N1R5C500BD       | NP0 (COG)            | 1.5 pF      | ±0.25pF   | 50      | 1.00                | -55 ~+125                | ±30ppm                        |
| 1206N7R5C500BD       | NP0 (COG)            | 7.5 pF      | ±0.25pF   | 50      | 1.00                | -55 ~+125                | ±30ppm                        |
| 1206N8R2D500BD       | NP0 (COG)            | 8.2 pF      | ±0.5pF    | 50      | 1.00                | -55 ~+125                | ±30ppm                        |
| 1210B105K500CC       | X7R                  | 1 µF        | ±10%      | 50      | 1.45                | -55°C ~ 125              | ±15%                          |
| 1210B106K500MA       | X7R                  | 10 µF       | ±10%      | 50      | 2.80                | -55°C ~ 125              | ±15%                          |
| 1210B106M500MA       | X7R                  | 10 µF       | ±20%      | 50      | 2.80                | -55°C ~ 125              | ±15%                          |
| 1210N472J500IC       | NP0 (COG)            | 4700 pF     | ±5%       | 50      | 1.05                | -55°C ~ 125              | ±30ppm                        |
| 1210W106K500MA       | X5R                  | 10 µF       | ±10%      | 50      | 2.80                | -55°C ~ +85              | ±15%                          |



**ELECTRICAL CHARACTERISTICS** – 100V NPO (COG) & X7R FOR DIFFERENT PART CODE

| NEXTGEN<br>PART CODE | TEMP.<br>COEFFICIENT | CAPACITANCE | TOLERANCE | VOLTAGE | THICKNESS<br>(MAX.) | OPERATING<br>TEMP. RANGE | CAPACITANCE<br>CHARACTERISTIC |
|----------------------|----------------------|-------------|-----------|---------|---------------------|--------------------------|-------------------------------|
|                      | -                    | -           | -         | V       | mm                  | °C                       | -                             |
| 0603B101K101SD       | X7R                  | 100 pF      | ±10%      | 100     | 0.90                | -55 ~+125                | ±15%                          |
| 0603B102K101SD       | X7R                  | 1000 pF     | ±10%      | 100     | 0.90                | -55 ~+125                | ±15%                          |
| 0603B103K101SD       | X7R                  | 0.01 µF     | ±10%      | 100     | 0.90                | -55 ~+125                | ±15%                          |
| 0603B104K101XD       | X7R                  | 0.1 µF      | ±10%      | 100     | 1.00                | -55 ~+125                | ±15%                          |
| 0603B332K101SD       | X7R                  | 3300 pF     | ±10%      | 100     | 0.90                | -55 ~+125                | ±15%                          |
| 0603B472K101SD       | X7R                  | 4700 pF     | ±10%      | 100     | 0.90                | -55 ~+125                | ±15%                          |
| 0603B681K101SD       | X7R                  | 680 pF      | ±10%      | 100     | 0.90                | -55 ~+125                | ±15%                          |
| 0603B682K101SD       | X7R                  | 6800 pF     | ±10%      | 100     | 0.90                | -55 ~+125                | ±15%                          |
| 0603N101J101SD       | NPO (COG)            | 100 pF      | ±5%       | 100     | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N221G101SD       | NPO (COG)            | 220 pF      | ±2%       | 100     | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N330J101SD       | NPO (COG)            | 33 pF       | ±5%       | 100     | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N331J101SD       | NPO (COG)            | 330 pF      | ±5%       | 100     | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N470J101SD       | NPO (COG)            | 47 pF       | ±5%       | 100     | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N471J101SD       | NPO (COG)            | 470 pF      | ±5%       | 100     | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N511J101SD       | NPO (COG)            | 510 pF      | ±5%       | 100     | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N680F101SD       | NPO (COG)            | 68 pF       | ±1%       | 100     | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N680J101SD       | NPO (COG)            | 68 pF       | ±5%       | 100     | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N680K101SD       | NPO (COG)            | 68 pF       | ±10%      | 100     | 0.90                | -55 ~+125                | ±30ppm                        |
| 0603N820J101SD       | NPO (COG)            | 82 pF       | ±5%       | 100     | 0.90                | -55 ~+125                | ±30ppm                        |
| 0805B101K101BD       | X7R                  | 100 pF      | ±10%      | 100     | 1.00                | -55 ~+125                | ±15%                          |

**ELECTRICAL CHARACTERISTICS** – 100V NP0 (COG) & X7R FOR DIFFERENT PART CODE

| NEXTGEN<br>PART CODE | TEMP.<br>COEFFICIENT | CAPACITANCE | TOLERANCE | VOLTAGE | THICKNESS<br>(MAX.) | OPERATING<br>TEMP. RANGE | CAPACITANCE<br>CHARACTERISTIC |
|----------------------|----------------------|-------------|-----------|---------|---------------------|--------------------------|-------------------------------|
|                      | -                    | -           | -         | V       | mm                  | °C                       | -                             |
| 0805B102K101BD       | X7R                  | 1000 pF     | ±10%      | 100     | 1.00                | -55 ~+125                | ±15%                          |
| 0805B104K101CC       | X7R                  | 0.1 μF      | ±10%      | 100     | 1.45                | -55 ~+125                | ±15%                          |
| 0805B152K101BD       | X7R                  | 1500 pF     | ±10%      | 100     | 1.00                | -55 ~+125                | ±15%                          |
| 0805B153K101BD       | X7R                  | 0.015 μF    | ±10%      | 100     | 1.00                | -55 ~+125                | ±15%                          |
| 0805B221K101BD       | X7R                  | 220 pF      | ±10%      | 100     | 1.00                | -55 ~+125                | ±15%                          |
| 0805B222K101BD       | X7R                  | 2200 pF     | ±10%      | 100     | 1.00                | -55 ~+125                | ±15%                          |
| 0805B223K101BD       | X7R                  | 0.022 μF    | ±10%      | 100     | 1.00                | -55 ~+125                | ±15%                          |
| 0805B224K101CC       | X7R                  | 0.22 μF     | ±10%      | 100     | 1.45                | -55 ~+125                | ±15%                          |
| 0805B272K101BD       | X7R                  | 2700 pF     | ±10%      | 100     | 1.00                | -55 ~+125                | ±15%                          |
| 0805B471K101BD       | X7R                  | 470 pF      | ±10%      | 100     | 1.00                | -55 ~+125                | ±15%                          |
| 0805B472K101BD       | X7R                  | 4700 pF     | ±10%      | 100     | 1.00                | -55 ~+125                | ±15%                          |
| 0805B473K101CC       | X7R                  | 0.047 μF    | ±10%      | 100     | 1.45                | -55 ~+125                | ±15%                          |
| 0805N100J101AD       | NP0 (COG)            | 10 pF       | ±5%       | 100     | 0.70                | -55 ~+125                | ±30ppm                        |
| 0805N101J101AD       | NP0 (COG)            | 100 pF      | ±5%       | 100     | 0.70                | -55 ~+125                | ±30ppm                        |
| 0805N221J101AD       | NP0 (COG)            | 220 pF      | ±5%       | 100     | 0.70                | -55 ~+125                | ±30ppm                        |
| 0805N222K101XD       | NP0 (COG)            | 2200 pF     | ±10%      | 100     | 1.00                | -55 ~+125                | ±30ppm                        |
| 0805N2R2C101AD       | NP0 (COG)            | 2.2 pF      | ±0.25pF   | 100     | 0.70                | -55 ~+125                | ±30ppm                        |
| 0805N331J101AD       | NP0 (COG)            | 330 pF      | ±5%       | 100     | 0.70                | -55 ~+125                | ±30ppm                        |
| 0805N332J101CC       | NP0 (COG)            | 3300 pF     | ±5%       | 100     | 1.45                | -55 ~+125                | ±30ppm                        |
| 0805N470J101AD       | NP0 (COG)            | 47 pF       | ±5%       | 100     | 0.70                | -55 ~+125                | ±30ppm                        |

**ELECTRICAL CHARACTERISTICS** – 100V NP0 (COG) & X7R FOR DIFFERENT PART CODE

| NEXTGEN<br>PART CODE | TEMP.<br>COEFFICIENT | CAPACITANCE | TOLERANCE | VOLTAGE | THICKNESS<br>(MAX.) | OPERATING<br>TEMP. RANGE | CAPACITANCE<br>CHARACTERISTIC |
|----------------------|----------------------|-------------|-----------|---------|---------------------|--------------------------|-------------------------------|
|                      | -                    | -           | -         | V       | mm                  | °C                       | -                             |
| 0805N4R7C101AD       | NP0 (COG)            | 4.7 pF      | ±0.25pF   | 100     | 0.70                | -55 ~+125                | ±30ppm                        |
| 0805N561J101AD       | NP0 (COG)            | 560 pF      | ±5%       | 100     | 0.70                | -55 ~+125                | ±30ppm                        |
| 0805N681J101XD       | NP0 (COG)            | 680 pF      | ±5%       | 100     | 1.00                | -55 ~+125                | ±30ppm                        |
| 0805N821J101XD       | NP0 (COG)            | 820 pF      | ±5%       | 100     | 1.00                | -55 ~+125                | ±30ppm                        |
| 1206B102K101BD       | X7R                  | 1000 pF     | ±10%      | 100     | 1.00                | -55 ~+125                | ±15%                          |
| 1206B104K101CC       | X7R                  | 0.1 μF      | ±10%      | 100     | 1.45                | -55 ~+125                | ±15%                          |
| 1206B105K101PB       | X7R                  | 1 μF        | ±10%      | 100     | 1.90                | -55 ~+125                | ±15%                          |
| 1206B222K101BD       | X7R                  | 2200 pF     | ±10%      | 100     | 1.00                | -55 ~+125                | ±15%                          |
| 1206B224K101DC       | X7R                  | 0.22 μF     | ±10%      | 100     | 1.80                | -55 ~+125                | ±15%                          |
| 1206B225K101PB       | X7R                  | 2.2 μF      | ±10%      | 100     | 1.90                | -55 ~+125                | ±15%                          |
| 1206B334K101DC       | X7R                  | 0.33 μF     | ±10%      | 100     | 1.80                | -55 ~+125                | ±15%                          |
| 1206B471K101BD       | X7R                  | 470 pF      | ±10%      | 100     | 1.00                | -55 ~+125                | ±15%                          |
| 1206B472K101BD       | X7R                  | 4700 pF     | ±10%      | 100     | 1.00                | -55 ~+125                | ±15%                          |
| 1206N101J101BD       | NP0 (COG)            | 100 pF      | ±5%       | 100     | 1.00                | -55 ~+125                | ±30ppm                        |
| 1206N102J101BD       | NP0 (COG)            | 1000 pF     | ±5%       | 100     | 1.00                | -55 ~+125                | ±30ppm                        |
| 1206N152J101BD       | NP0 (COG)            | 1500 pF     | ±5%       | 100     | 1.00                | -55 ~+125                | ±30ppm                        |
| 1206N471J101BD       | NP0 (COG)            | 470 pF      | ±5%       | 100     | 1.00                | -55 ~+125                | ±30ppm                        |
| 1206N472J101BD       | NP0 (COG)            | 4700 pF     | ±5%       | 100     | 1.00                | -55 ~+125                | ±30ppm                        |
| 1206N680J101BD       | NP0 (COG)            | 68 pF       | ±5%       | 100     | 1.00                | -55 ~+125                | ±30ppm                        |
| 1210B105K101KA       | X7R                  | 1.0 μF      | ±10%      | 100     | 2.20                | -55°C ~ 125              | ±15%                          |





**DIMENSION** (Unit: mm)



| SIZE CODE | METRIC CODE | L             | W             | T (SYMBOL )     |   | SOLDERING METHOD | Mb                     |
|-----------|-------------|---------------|---------------|-----------------|---|------------------|------------------------|
|           |             |               |               |                 |   |                  |                        |
| 0201      | 0603        | 0.6<br>±0.09  | 0.30<br>±0.09 | 0.3±0.09        | L | R                | 0.15<br>+0.1/-0.05     |
|           |             |               |               |                 |   |                  |                        |
| 0402      | 1005        | 1.00<br>±0.20 | 0.50<br>±0.20 | 0.50±0.05       | N | R                | 0.25<br>+0.05/-0.10    |
|           |             |               |               | 0.50±0.10       | E | R                |                        |
|           |             |               |               | 0.50±0.20       | H | R                |                        |
| 0603      | 1608        | 1.60<br>±0.20 | 0.80<br>±0.20 | 0.50±0.20       | H | R/W              | 0.40<br>±0.15          |
|           |             |               |               | 0.80±0.10       | S | R/W              |                        |
|           |             |               |               | 0.85±0.15       | B | R/W              |                        |
|           |             |               |               | 0.80±0.20       | X | R/W              |                        |
| 0805      | 2012        | 2.00<br>±0.20 | 1.25<br>±0.20 | 0.50±0.20       | H | R                | 0.50<br>±0.20          |
|           |             |               |               | 0.60±0.10       | A | R/W              |                        |
|           |             |               |               | 0.80±0.20       | X | R/W              |                        |
|           |             |               |               | 0.85±0.15       | B | R/W              |                        |
|           |             |               |               | 1.25±0.20       | C | R                |                        |
| 1206      | 3216        | 3.20<br>±0.30 | 1.60<br>±0.30 | 0.85±0.15       | B | R/W              | 0.60±0.20<br>0.50±0.25 |
|           |             |               |               | 0.95±0.10       | I | R                |                        |
|           |             |               |               | 1.25±0.20       | C | R                |                        |
|           |             |               |               | 1.15±0.20       | J | R                |                        |
|           |             |               |               | 1.60±0.20       | D | R                |                        |
|           |             |               |               | 1.60±0.30       | Y | R                |                        |
|           |             |               |               | 1.60+0.30/-0.10 | P | R                |                        |

**DIMENSION** (Unit: mm)



| SIZE CODE | METRIC CODE | L             | W             | T (SYMBOL ) |   | SOLDERING METHOD | Mb   |
|-----------|-------------|---------------|---------------|-------------|---|------------------|--|
|           |             |               |               |             |   |                  |  |
| 1210      | 3225        | 3.20<br>±0.40 | 2.50<br>±0.30 | 0.85±0.15   | B | R                | 0.75±0.25  |
|           |             |               |               | 0.95±0.10   | I | R                |  |
|           |             |               |               | 1.25±0.20   | C | R                |  |
|           |             |               |               | 1.60±0.20   | D | R                |  |
|           |             |               |               | 1.60±0.30   | Y | R                |  |
|           |             |               |               | 2.00±0.20   | K | R                |  |
|           |             |               |               | 2.50±0.30   | M | R                |  |
| 1808      | 4520        | 4.50<br>±0.40 | 2.03<br>±0.25 | 1.25±0.20   | C | R                | 0.75±0.25<br>0.50±0.25*                          |
|           |             |               |               | 1.40±0.20   | F | R                |  |
|           |             |               |               | 1.60±0.20   | D | R                |  |
|           |             |               |               | 2.00±0.20   | K | R                |  |
| 1812      | 4532        | 4.50<br>±0.40 | 3.20<br>±0.40 | 1.25±0.20   | C | R                | 0.75±0.25<br>0.50±0.25*                          |
|           |             |               |               | 1.60±0.20   | D | R                |  |
|           |             |               |               | 2.00±0.20   | K | R                |  |
|           |             |               |               | 2.50±0.30   | M | R                |  |
|           |             |               |               | 2.80±0.30   | U | R                |  |
| 1825      | 4563        | 4.50<br>±0.40 | 6.30<br>±0.40 | 1.60±0.20   | D | R                | 0.75±0.35<br>0.85±0.35<br>0.85±0.35<br>0.85±0.35 |
|           |             |               |               | 2.00±0.20   | K | R                |  |
|           |             |               |               | 2.50±0.30   | M | R                |  |
|           |             |               |               | 2.80±0.30   | U | R                |  |

**DIMENSION** (Unit: mm)



| SIZE CODE | METRIC CODE | L             | W             | T (SYMBOL ) |   | SOLDERING METHOD | Mb        |
|-----------|-------------|---------------|---------------|-------------|---|------------------|-----------|
|           |             |               |               |             |   |                  |           |
| 2211      | 5728        | 5.70<br>±0.40 | 2.80<br>±0.30 | 1.60±0.20   | D | R                | 0.75±0.35 |
|           |             |               |               | 2.00±0.20   | K |                  |           |
|           |             |               |               | 2.50±0.30   | M |                  |           |
|           |             |               |               | 2.80±0.30   | U |                  |           |
| 2220      | 5750        | 5.70<br>±0.40 | 5.00<br>±0.40 | 1.60±0.20   | D | R                | 0.75±0.35 |
|           |             |               |               | 2.00±0.20   | K |                  |           |
|           |             |               |               | 2.50±0.30   | M |                  |           |
|           |             |               |               | 2.80±0.30   | U |                  |           |
| 2225      | 5763        | 5.70<br>±0.40 | 6.30<br>±0.40 | 1.60±0.20   | D | R                | 0.75±0.35 |
|           |             |               |               | 2.00±0.20   | K |                  |           |
|           |             |               |               | 2.50±0.30   | M |                  |           |
|           |             |               |               | 2.80±0.30   | U |                  |           |

**GENERAL ELECTRICAL CHARACTERISTICS**

| DIELECTRIC                 | NPO (COG)   | X7R                               | X5R                   | X6S                   |
|----------------------------|---|-----------------------------------|-----------------------|-----------------------|
| Size                       | 0201, 0402, 0603, 0805, 1206, 1210, 1812, 1825, 2220, 2225  |                                   |                       |                       |
| Capacitance Range*         | 0.1pF to 0.1μF  | 100pF to 47μF                     | 100pF to 220μF        | 0.1μF to 100μF        |
| Capacitance Tolerance      | Cap. ≤ 5pF (Note #1):<br>A (±0.05pF), B (±0.1pF),<br>C (±0.25pF)<br>5pF < Cap < 10pF:<br>C (±0.25pF), D (±0.5pF)<br>Cap ≥ 10pF:<br>F (±1%), G (±2%),<br>J (±5%), K (±10%) | J (±5%),<br>K (±10%),<br>M (±20%) | K (±10%),<br>M (±20%) | K (±10%),<br>M (±20%) |
| Rated Voltage              | 10V, 16V, 25V, 50V, 100V  | 6.3V, 10V, 16V, 25V, 50V, 100V    |                       |                       |
| Operating Temperature      | -55 ~ +125°C  |                                   | -55 ~ +85°C           | -55 ~ +105°C          |
| Capacitance Characteristic | ±30ppm  | ±15%                              | ±15%                  | ±22%                  |
| Termination                | Ni/Sn (lead-free termination)   |                                   |                       |                       |

**Note:**

- #1: NPO, 0.1pF product only provide B tolerance; 0603N0R4 provide B&C tolerance; 0603N0R3 only provide C tolerance.
- \* Measured at the condition of 30~70% related humidity.
- NPO: Apply 1.0±0.2Vrms, 1.0MHz±10% for Cap ≤ 1000pF and 1.0±0.2Vrms, 1.0kHz±10% for Cap > 1000pF, 25°C at ambient temperature.
- X7R/X6S/X5R/X6S: Please refer to “Reliability test conditions and requirements” for detail.
- \*\* Preconditioning for Class II MLCC: Perform a heat treatment at 150±10°C for 1 hour and then leave in ambient condition for 24±2 hours before measurement.

**X7R**

Table 1

| RATED VOL. | D.F. ≤ | EXCEPTION OF D.F. ≤ |  |
|------------|--------|---------------------|--|
| ≥100V      | ≤ 2.5% | ≤ 3%                | 1206 ≥ 0.47μF  |
|            |        | ≤ 5%                | 0603 ≥ 0.068μF; 0805 > 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF;                          |
|            |        | ≤ 10%               | 0805 > 0.22μF; 1210 ≥ 3.3μF  |
| 50V        | ≤ 2.5% | ≤3%                 | 0201(50V); 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF                                |
|            |        | ≤5%                 | 0201≥0.01uF; 1210≥4.7μF  |
|            |        | ≤10%                | 0402≥0.012μF; 0603>0.1μF; 0805/X7R>0.47μF; 1206≥2.2μF; 1210≥10μF;                |
| 35V        | ≤ 3.5% | ≤10%                | 0603≥1μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥10μF                                      |
| 25V        | ≤ 3.5% | ≤5%                 | 0201≥0.01μF; 0805≥1μF; 1210/X7R≥10μF   |
|            |        | ≤7%                 | 0603≥0.33μF  |
|            |        | ≤10%                | 0201≥0.1μF; 0402/X7R≥0.056μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF     |
|            |        | ≤12.5%              | 0402≥0.47μF  |
| 16V        | ≤3.5%  | ≤5%                 | 0201≥0.01μF; 0402≥0.033μF; 0603≥0.15μF; 0805≥0.68μF; 1206≥2.2μF; 1210≥4.7μF      |
|            |        | ≤10%                | 0201/X7R≥0.022μF; 0402≥ 0.22uF; 0603>0.47μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF;  |
| 10V        | ≤ 5.0% | ≤10%                | 0201≥0.012μF;0402≥0.22μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF;1210≥22μF:01R5/X5R |
|            |        | ≤15%                | 0201≥0.1μF; 0402≥1μF   |
| 6.3V       | ≤ 10%  | ≤15%                | 0201≥0.1μF; 0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF 1210 ≥100μF               |
|            |        | ≤20%                | 0402≥2.2μF   |
| 4V         | ≤15%   | -                   | -  |

**X5R**

Table 2

| RATED VOL.  | D.F. $\leq$  | EXCEPTION OF D.F. $\leq$ |   |
|-------------|--------------|--------------------------|---|
| $\geq 100V$ | $\leq 2.5\%$ | $\leq 3\%$               | 1206 $\geq 0.47\mu F$   |
|             |              | $\leq 5\%$               | 0603 $\geq 0.068\mu F$ ; 0805 $> 0.1\mu F$ ; 1206 $\geq 1\mu F$ ; 1210 $\geq 2.2\mu F$ ;  |
|             |              | $\leq 10\%$              | 0805 $> 0.22\mu F$ ; 1210 $\geq 3.3\mu F$   |
| 50V         | $\leq 2.5\%$ | $\leq 3\%$               | 0201(50V); 0603 $\geq 0.047\mu F$ ; 0805 $\geq 0.18\mu F$ ; 1206 $\geq 0.47\mu F$   |
|             |              | $\leq 5\%$               | 0201 $\geq 0.01\mu F$ ; 1210 $\geq 4.7\mu F$  |
|             |              | $\leq 10\%$              | 0402 $\geq 0.012\mu F$ ; 0603 $> 0.1\mu F$ ; 0805 $\geq 1\mu F$ ; 1206 $\geq 2.2\mu F$ ; 1210 $\geq 10\mu F$ ;                                    |
| 35V         | $\leq 3.5\%$ | $\leq 10\%$              | 0603 $\geq 1\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 2.2\mu F$ ; 1210 $\geq 10\mu F$  |
| 25V         | $\leq 3.5\%$ | $\leq 5\%$               | 0201 $\geq 0.01\mu F$ ; 0805 $\geq 1\mu F$ ; 1210/X7R $\geq 10\mu F$  |
|             |              | $\leq 7\%$               | 0603 $\geq 0.33\mu F$   |
|             |              | $\leq 10\%$              | 0201 $\geq 0.1\mu F$ ; 0402 $\geq 0.10\mu F$ ; 0603 $\geq 0.47\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 4.7\mu F$ ;<br>1210/X5R $\geq 10\mu F$ ; |
|             |              | $\leq 12.5\%$            | 0402 $\geq 0.47\mu F$   |
| 16V         | $\leq 3.5\%$ | $\leq 5\%$               | 0201 $\geq 0.01\mu F$ ; 0402 $\geq 0.033\mu F$ ; 0603 $\geq 0.15\mu F$ ; 0805 $\geq 0.68\mu F$ ;<br>1206 $\geq 2.2\mu F$ ; 1210 $\geq 4.7\mu F$   |
|             |              | $\leq 10\%$              | 0201 $\geq 0.1\mu F$ ; 0402 $\geq 0.22\mu F$ ; 01R5/X5R 0603 $> 0.47\mu F$ ; 0805 $\geq 2.2\mu F$ ;<br>1206 $\geq 4.7\mu F$ ; 1210 $\geq 22\mu F$ |
| 10V         | $\leq 5.0\%$ | $\leq 10\%$              | 0201 $\geq 0.012\mu F$ ; 0402 $\geq 0.22\mu F$ ; 0603 $\geq 0.33\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 2.2\mu F$ ;<br>1210 $\geq 22\mu F$     |
|             |              | $\leq 15\%$              | 0201 $\geq 0.1\mu F$ ; 0402 $\geq 1\mu F$   |
| 6.3V        | $\leq 10\%$  | $\leq 15\%$              | 0201 $\geq 0.1\mu F$ ; 0402 $\geq 1\mu F$ ; 0603 $\geq 10\mu F$ ; 0805 $\geq 4.7\mu F$ ; 1206 $\geq 47\mu F$<br>1210 $\geq 100\mu F$              |
|             |              | $\leq 20\%$              | 0402 $\geq 2.2\mu F$  |
| 4V          | $\leq 15\%$  | -                        | -   |

**X6S**

Table 3

| RATED VOL.  | D.F. $\leq$  | EXCEPTION OF D.F. $\leq$ |  |
|-------------|--------------|--------------------------|--|
| $\geq 100V$ | $\leq 2.5\%$ | $\leq 3\%$               | 1206 $\geq 0.47\mu F$  |
|             |              | $\leq 5\%$               | 0603 $\geq 0.068\mu F$ ; 0805 $> 0.1\mu F$ ; 1206 $\geq 1\mu F$ ; 1210 $\geq 2.2\mu F$ ;   |
|             |              | $\leq 10\%$              | 0805 $> 0.22\mu F$ ; 1210 $\geq 3.3\mu F$  |
| 50V         | $\leq 2.5\%$ | $\leq 3\%$               | 0201(50V); 0603 $\geq 0.047\mu F$ ; 0805 $\geq 0.18\mu F$ ; 1206 $\geq 0.47\mu F$  |
|             |              | $\leq 5\%$               | 0201 $\geq 0.01\mu F$ ; 1210 $\geq 4.7\mu F$   |
|             |              | $\leq 10\%$              | 0402 $\geq 0.012\mu F$ ; 0603 $> 0.1\mu F$ ; 0805 $\geq 1\mu F$ ; 1206 $\geq 2.2\mu F$ ; 1210 $\geq 10\mu F$ ;                               |
| 35V         | $\leq 3.5\%$ | $\leq 10\%$              | 0603 $\geq 1\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 2.2\mu F$ ; 1210 $\geq 10\mu F$   |
| 25V         | $\leq 3.5\%$ | $\leq 5\%$               | 0201 $\geq 0.01\mu F$ ; 0805 $\geq 1\mu F$ ; 1210/X7R $\geq 10\mu F$   |
|             |              | $\leq 7\%$               | 0603 $\geq 0.33\mu F$  |
|             |              | $\leq 10\%$              | 0201 $\geq 0.1\mu F$ ; 0402 $\geq 0.10\mu F$ ; 0603 $\geq 0.47\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 4.7\mu F$ ; 1210 $\geq 22\mu F$ ;   |
|             |              | $\leq 12.5\%$            | 0402 $\geq 0.47\mu F$  |
| 16V         | $\leq 3.5\%$ | $\leq 5\%$               | 0201 $\geq 0.01\mu F$ ; 0402 $\geq 0.033\mu F$ ; 0603 $\geq 0.15\mu F$ ; 0805 $\geq 0.68\mu F$ ; 1206 $\geq 2.2\mu F$ ; 1210 $\geq 4.7\mu F$ |
|             |              | $\leq 10\%$              | 0201 $\geq 0.1\mu F$ ; 0402 $\geq 0.22\mu F$ ; 0603 $> 0.47\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 4.7\mu F$ ; 1210 $\geq 22\mu F$        |
| 10V         | $\leq 5.0\%$ | $\leq 10\%$              | 0201 $\geq 0.012\mu F$ ; 0402 $\geq 0.22\mu F$ ; 0603 $\geq 0.33\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 2.2\mu F$ ; 1210 $\geq 22\mu F$   |
|             |              | $\leq 15\%$              | 0201 $\geq 0.1\mu F$ ; 0402 $\geq 1\mu F$  |
| 6.3V        | $\leq 10\%$  | $\leq 15\%$              | 0201 $\geq 0.1\mu F$ ; 0402/X6S $\geq 0.47\mu F$ ; 0603 $\geq 10\mu F$ ; 0805 $\geq 4.7\mu F$ ; 1206 $\geq 47\mu F$ 1210 $\geq 100\mu F$     |
|             |              | $\leq 20\%$              | 0402 $\geq 2.2\mu F$   |
| 4V          | $\leq 15\%$  | -                        | -  |



**CAPACITANCE RANGE** - NP0 (COG) DIELECTRIC SIZE 0201, 0402, 0603

Table 4-A

| SIZE        | 0201 |    |    | 0402 |    |    |    |     | 0603 |    |    |     |     |
|-------------|------|----|----|------|----|----|----|-----|------|----|----|-----|-----|
| VDC (V)     | 16   | 25 | 50 | 10   | 16 | 25 | 50 | 100 | 10   | 16 | 25 | 50  | 100 |
| 0.1pF (0R1) | L    | L  | L  | H    | H  | H  | H  |     |      |    |    |     |     |
| 0.2pF (0R2) | L    | L  | L  | H    | H  | H  | H  |     |      |    |    |     |     |
| 0.3pF (0R3) | L    | L  | L  | H    | H  | H  | H  |     |      |    |    |     |     |
| 0.4pF (0R4) | L    | L  | L  | H    | H  | H  | H  |     |      |    |    |     |     |
| 0.5pF (0R5) | L    | L  | L  | H    | H  | H  | H  | H   | S    | S  | S  | S   | S   |
| 0.6pF (0R6) | L    | L  | L  | H    | H  | H  | H  | H   | S    | S  | S  | S   | S   |
| 0.7pF (0R7) | L    | L  | L  | H    | H  | H  | H  | H   | S    | S  | S  | S   | S   |
| 0.8pF (0R8) | L    | L  | L  | H    | H  | H  | H  | H   | S    | S  | S  | S   | S   |
| 0.9pF (0R9) | L    | L  | L  | H    | H  | H  | H  | H   | S    | S  | S  | S   | S   |
| 1.0pF (1R0) | L    | L  | L  | H    | H  | H  | H  | H   | S    | S  | S  | S   | S   |
| 1.2pF (1R2) | L    | L  | L  | H    | H  | H  | H  | H   | S    | S  | S  | S   | S   |
| 1.5pF (1R5) | L    | L  | L  | H    | H  | H  | H  | H   | S    | S  | S  | S/B | S   |
| 1.6pF (1R6) |      |    |    |      |    |    | H  |     |      |    |    |     |     |
| 1.8pF (1R8) | L    | L  | L  | H    | H  | H  | H  | H   | S    | S  | S  | S   | S   |
| 2.0pF (2R0) | L    | L  | L  | H    | H  | H  | H  | H   | S    | S  | S  | S   | S   |
| 2.2pF (2R2) | L    | L  | L  | H    | H  | H  | H  | H   | S    | S  | S  | S   | S   |
| 2.7pF (2R7) | L    | L  | L  | H    | H  | H  | H  | H   | S    | S  | S  | S   | S   |
| 3.0pF (3R0) | L    | L  | L  | H    | H  | H  | H  | H   | S    | S  | S  | S   | S   |
| 3.3pF (3R3) | L    | L  | L  | H    | H  | H  | H  | H   | S    | S  | S  | S   | S   |
| 3.9pF (3R9) | L    | L  | L  | H    | H  | H  | H  | H   | S    | S  | S  | S/B | S   |
| 4.0pF (4R0) | L    | L  | L  | H    | H  | H  | H  | H   | S    | S  | S  | S   | S   |
| 4.7pF (4R7) | L    | L  | L  | H    | H  | H  | H  | H   | S    | S  | S  | S/B | S   |
| 5.0pF (5R0) | L    | L  | L  | H    | H  | H  | H  | H   | S    | S  | S  | S   | S   |
| 5.6pF (5R6) | L    | L  | L  | H    | H  | H  | H  | H   | S    | S  | S  | S/B | S   |
| 6.0pF (6R0) | L    | L  | L  | H    | H  | H  | H  | H   | S    | S  | S  | S   | S   |
| 6.8pF (6R8) | L    | L  | L  | H    | H  | H  | H  | H   | S    | S  | S  | S   | S   |
| 7.0pF (7R0) | L    | L  | L  | H    | H  | H  | H  | H   | S    | S  | S  | S/B | S   |
| 8.0pF (8R0) | L    | L  | L  | H    | H  | H  | H  | H   | S    | S  | S  | S   | S   |
| 8.2pF (8R2) | L    | L  | L  | H    | H  | H  | H  | H   | S    | S  | S  | S/B | S   |
| 9.0pF (9R0) | L    | L  | L  | H    | H  | H  | H  | H   | S    | S  | S  | S   | S   |

**CAPACITANCE RANGE** - NPO (COG) DIELECTRIC SIZE 0201, 0402, 0603

Table 4-B

| SIZE          | 0201 |    |    | 0402 |    |    |     |     | 0603 |    |     |     |     |
|---------------|------|----|----|------|----|----|-----|-----|------|----|-----|-----|-----|
| VDC (V)       | 16   | 25 | 50 | 10   | 16 | 25 | 50  | 100 | 10   | 16 | 25  | 50  | 100 |
| 10pF (100)    | L    | L  | L  | H    | H  | H  | H   | H   | S    | S  | S   | S   | S   |
| 12pF (120)    | L    | L  | L  | H    | H  | H  | H   | H   | S    | S  | S   | S   | S   |
| 15pF (150)    | L    | L  | L  | H    | H  | H  | H   | H   | S    | S  | S   | S/B | S   |
| 18pF (180)    | L    | L  | L  | H    | H  | H  | H   | H   | S    | S  | S   | S/B | S   |
| 22pF (220)    | L    | L  | L  | H    | H  | H  | H/N | H   | S    | S  | S   | S/B | S   |
| 27pF (270)    | L    | L  | L  | H    | H  | H  | H   | H   | S    | S  | S   | S   | S   |
| 30pF (300)    |      |    |    |      |    | H  |     |     |      |    |     |     |     |
| 33pF (330)    | L    | L  | L  | H    | H  | H  | H   | H   | S    | S  | S/B | S/B | S   |
| 39pF (390)    | L    | L  | L  | H    | H  | H  | H   | H   | S    | S  | S   | S   | S   |
| 47pF (470)    | L    | L  | L  | H    | H  | H  | H   | H   | S    | S  | S   | S/B | S   |
| 56pF (560)    | L    | L  | L  | H    | H  | H  | H   | H   | S    | S  | S   | S   | S   |
| 68pF (680)    | L    | L  | L  | H    | H  | H  | H   | H   | S    | S  | S   | S   | S   |
| 82pF (820)    | L    | L  | L  | H    | H  | H  | H   | H   | S    | S  | S   | S   | S   |
| 100pF (101)   | L    | L  | L  | H    | H  | H  | H/N | H   | S    | S  | S   | S/B | S   |
| 120pF (121)   | L    | L  | L  | H    | H  | H  | H   | H   | S    | S  | S   | S/B | S   |
| 150pF (151)   | L    | L  | L  | H    | H  | H  | H   | H   | S    | S  | S   | S   | S   |
| 180pF (181)   |      |    |    | H    | H  | H  | H   | H   | S    | S  | S   | S   | S   |
| 220pF (221)   |      |    |    | H    | H  | H  | H   | H   | S    | S  | S   | S   | S   |
| 270pF (271)   | L    |    |    | H    | H  | H  | H   |     | S    | S  | S   | S/B | S   |
| 330pF (331)   | L    |    |    | H    | H  | H  | H   |     | S    | S  | S   | S/B | S   |
| 390pF (391)   | L    |    |    | H    | H  | H  | H   |     | S    | S  | S   | S   | S   |
| 470pF (471)   | L    |    |    | H    | H  | H  | H   |     | S    | S  | S   | S   | S   |
| 560pF (561)   | L    |    |    | H    | H  | H  | H   |     | S    | S  | S   | S   | S   |
| 680pF (681)   |      |    |    | H    | H  | H  | H   |     | S    | S  | S   | S   | S   |
| 820pF (821)   |      | L  |    | H    | H  | H  | H   |     | S    | S  | S   | S   | S   |
| 1,000pF (102) |      |    |    | H    | H  | H  | H   |     | S    | S  | S/B | S   | S   |
| 1,200pF (122) |      |    |    |      |    |    |     |     | X    | X  | X   | X   | X   |
| 1,500pF (152) |      |    |    |      |    |    |     |     | X    | X  | X   | X   | X   |
| 1,800pF (182) |      |    |    |      |    |    |     |     | X    | X  | X   | X   |     |

**CAPACITANCE RANGE - NP0 (COG) DIELECTRIC SIZE 0603**

Table 4-C

| SIZE          | 0603 |    |    |     |
|---------------|------|----|----|-----|
| VDC (V)       | 10   | 16 | 25 | 50  |
| 2,200pF (222) | X    | X  | X  | X/B |
| 2,700pF (272) | X    | X  | X  | X/B |
| 3,300pF (332) | X    | X  | X  | X   |
| 3,900pF (392) | X    | X  | X  | X   |
| 4,700pF (472) | X    | X  | X  | X   |
| 5,600pF (562) | X    | X  | X  | X   |
| 6,800pF (682) | X    | X  | X  | S/X |
| 8,200pF (822) | X    | X  | X  | X   |
| 0.010μF (103) | X    | X  | X  | X   |

**CAPACITANCE RANGE - NP0 (COG) DIELECTRIC - SIZE 0805, 1206**

Table 4-D

| SIZE        | 0805 |    |    |    |     | 1206 |    |    |    |     |
|-------------|------|----|----|----|-----|------|----|----|----|-----|
|             | 10   | 16 | 25 | 50 | 100 | 10   | 16 | 25 | 50 | 100 |
| 0.5pF (0R5) | A    | A  | A  | A  | A   |      |    |    |    |     |
| 0.6pF (0R6) | A    | A  | A  | A  | A   |      |    |    |    |     |
| 0.7pF (0R7) | A    | A  | A  | A  | A   |      |    |    |    |     |
| 0.8pF (0R8) | A    | A  | A  | A  | A   |      |    |    |    |     |
| 0.9pF (0R9) | A    | A  | A  | A  | A   |      |    |    |    |     |
| 1.0pF (1R0) | A    | A  | A  | A  | A   |      |    |    | B  |     |
| 1.2pF (1R2) | A    | A  | A  | A  | A   | B    | B  | B  | B  | B   |
| 1.5pF (1R5) | A    | A  | A  | A  | A   | B    | B  | B  | B  | B   |
| 1.8pF (1R8) | A    | A  | A  | A  | A   | B    | B  | B  | B  | B   |
| 2.0pF (2R0) | A    | A  | A  | A  | A   |      |    |    |    |     |
| 2.2pF (2R2) | A    | A  | A  | A  | A   | B    | B  | B  | B  | B   |
| 2.7pF (2R7) | A    | A  | A  | A  | A   | B    | B  | B  | B  | B   |
| 3.0pF (3R0) | A    | A  | A  | A  | A   |      |    |    |    |     |
| 3.3pF (3R3) | A    | A  | A  | A  | A   | B    | B  | B  | B  | B   |
| 3.9pF (3R9) | A    | A  | A  | A  | A   | B    | B  | B  | B  | B   |
| 4.0pF (4R0) | A    | A  | A  | A  | A   |      |    |    |    |     |

**CAPACITANCE RANGE** - NP0 (COG) DIELECTRIC SIZE 0805, 1206

Table 4-E

| SIZE        | 0805 |    |    |    |     | 1206 |    |    |    |     |
|-------------|------|----|----|----|-----|------|----|----|----|-----|
| VDC (V)     | 10   | 16 | 25 | 50 | 100 | 10   | 16 | 25 | 50 | 100 |
| 4.7pF (4R7) | A    | A  | A  | A  | A   | B    | B  | B  | B  | B   |
| 5.0pF (5R0) | A    | A  | A  | A  | A   |      |    |    |    |     |
| 5.6pF (5R6) | A    | A  | A  | A  | A   | B    | B  | B  | B  | B   |
| 6.0pF (6R0) | A    | A  | A  | A  | A   |      |    |    |    |     |
| 6.8pF (6R8) | A    | A  | A  | A  | A   | B    | B  | B  | B  | B   |
| 7.0pF (7R0) | A    | A  | A  | A  | A   | B    | B  | B  | B  | B   |
| 8.0pF (8R0) | A    | A  | A  | A  | A   |      |    |    |    |     |
| 8.2pF (8R2) | A    | A  | A  | A  | A   | B    | B  | B  | B  | B   |
| 9.0pF (9R0) | A    | A  | A  | A  | A   |      |    |    |    |     |
| 10pF (100)  | A    | A  | A  | A  | A   | B    | B  | B  | B  | B   |
| 12pF (120)  | A    | A  | A  | A  | A   |      |    |    |    |     |
| 15pF (150)  | A    | A  | A  | A  | A   | B    | B  | B  | B  | B   |
| 18pF (180)  | A    | A  | A  | A  | A   | B    | B  | B  | B  | B   |
| 22pF (220)  | A    | A  | A  | A  | A   | B    | B  | B  | B  | B   |
| 27pF (270)  | A    | A  | A  | A  | A   | B    | B  | B  | B  | B   |
| 33pF (330)  | A    | A  | A  | A  | A   | B    | B  | B  | B  | B   |
| 39pF (390)  | A    | A  | A  | A  | A   | B    | B  | B  | B  | B   |
| 47pF (470)  | A    | A  | A  | A  | A   | B    | B  | B  | B  | B   |
| 56pF (560)  | A    | A  | A  | A  | A   | B    | B  | B  | B  | B   |
| 68pF (680)  | A    | A  | A  | A  | A   | B    | B  | B  | B  | B   |
| 82pF (820)  | A    | A  | A  | A  | A   | B    | B  | B  | B  | B   |
| 100pF (101) | A    | A  | A  | A  | A   | B    | B  | B  | B  | B   |
| 120pF (121) | A    | A  | A  | A  | A   | B    | B  | B  | B  | B   |
| 150pF (151) | A    | A  | A  | A  | A   | B    | B  | B  | B  | B   |
| 180pF (181) | A    | A  | A  | A  | A   | B    | B  | B  | B  | B   |
| 220pF (221) | A    | A  | A  | A  | A   | B    | B  | B  | B  | B   |
| 270pF (271) | A    | A  | A  | A  | A   | B    | B  | B  | B  | B   |
| 330pF (331) | A    | A  | A  | A  | A   | B    | B  | B  | B  | B   |
| 390pF (391) | B    | B  | B  | B  | B   | B    | B  | B  | B  | B   |
| 470pF (471) | B    | B  | B  | B  | B   |      |    |    |    |     |

**CAPACITANCE RANGE** - NPO (COG) DIELECTRIC SIZE 0805, 1206

Table 4-F

| SIZE          | 0805 |    |    |    |     | 1206 |    |    |    |     |
|---------------|------|----|----|----|-----|------|----|----|----|-----|
| VDC (V)       | 10   | 16 | 25 | 50 | 100 | 10   | 16 | 25 | 50 | 100 |
| 560pF (561)   | B    | B  | B  | B  | B   | B    | B  | B  | B  | B   |
| 680pF (681)   | B    | B  | B  | B  | B   | B    | B  | B  | B  | B   |
| 820pF (821)   | B    | B  | B  | B  | B   | B    | B  | B  | B  | B   |
| 1,000pF (102) | B    | B  | B  | B  | B   | B    | B  | B  | B  | B   |
| 1,200pF (122) | B    | B  | B  | B  | B   | B    | B  | B  | B  | B   |
| 1,500pF (152) | B    | B  | B  | B  | B   | B    | B  | B  | B  | B   |
| 1,800pF (182) | B    | B  | B  | B  | B   | B    | B  | B  | B  | B   |
| 2,200pF (222) | B    | B  | B  | B  | B   | B    | B  | B  | B  | B   |
| 2,700pF (272) | C    | C  | C  | C  | C   | B    | B  | B  | B  | B   |
| 3,300pF (332) | C    | C  | C  | C  | C   | B    | B  | B  | B  | B   |
| 3,900pF (392) | C    | C  | C  | C  | C   | B    | B  | B  | B  | B   |
| 4,700pF (472) | C    | C  | C  | C  | C   | B    | B  | B  | B  | B   |
| 5,600pF (562) | C    | C  | C  | C  | C   | B    | B  | B  | B  | B   |
| 6,800pF (682) | C    | C  | C  | C  | C   | I    | I  | I  | I  | I   |
| 8,200pF (822) | C    | C  | C  | C  |     | C    | C  | C  | C  | C   |
| 0.010μF (103) | C    | C  | C  | C  |     | C    | C  | C  | C  | C   |
| 0.012μF (123) | B    | B  | B  | B  |     | P    | P  | P  | P  | P   |
| 0.015μF (153) |      |    |    |    |     | P    | P  | P  | P  | P   |
| 0.018μF (183) | C    | C  | C  | C  |     | P    | P  | P  | P  | P   |
| 0.022μF (223) | C    | C  | C  | C  |     | P    | P  | P  | P  | P   |
| 0.027μF (273) |      |    |    |    |     | P    | P  | P  | P  |     |
| 0.033μF (333) |      |    |    |    |     | P    | P  | P  | P  |     |
| 0.039μF (393) |      |    |    |    |     | P    | P  | P  | P  |     |
| 0.047μF (473) |      |    |    |    |     | J    | J  | J  | J  |     |
| 0.056μF (563) |      |    |    |    |     | J    | J  | J  | J  |     |
| 0.068μF (683) |      |    |    |    |     | D    | D  | D  | D  |     |
| 0.082μF (823) |      |    |    |    |     | D    | D  | D  | D  |     |
| 0.1μF (104)   |      |    |    |    |     | D    | D  | D  | D  |     |

**CAPACITANCE RANGE - NP0 (COG) DIELECTRIC SIZE 1210, 1812**

Table 4-G

| SIZE          | 1210 |    |    |    |     | 1812 |    |     |
|---------------|------|----|----|----|-----|------|----|-----|
|               | 10   | 16 | 25 | 50 | 100 | 16   | 50 | 100 |
| VDC (V)       | 10   | 16 | 25 | 50 | 100 | 16   | 50 | 100 |
| 10pF (100)    | I    | I  | I  | I  | I   | C    | C  | C   |
| 15pF (150)    | I    | I  | I  | I  | I   | C    | C  | C   |
| 18pF (180)    | I    | I  | I  | I  | I   | C    | C  | C   |
| 22pF (220)    | I    | I  | I  | I  | I   | C    | C  | C   |
| 27pF (270)    | I    | I  | I  | I  | I   | C    | C  | C   |
| 33pF (330)    | I    | I  | I  | I  | I   | C    | C  | C   |
| 39pF (390)    | I    | I  | I  | I  | I   | C    | C  | C   |
| 47pF (470)    | I    | I  | I  | I  | I   | C    | C  | C   |
| 56pF (560)    | I    | I  | I  | I  | I   | C    | C  | C   |
| 68pF (680)    | I    | I  | I  | I  | I   | C    | C  | C   |
| 82pF (820)    | I    | I  | I  | I  | I   | C    | C  | C   |
| 100pF (101)   | I    | I  | I  | I  | I   | C    | C  | C   |
| 120pF (121)   | I    | I  | I  | I  | I   | C    | C  | C   |
| 150pF (151)   | I    | I  | I  | I  | I   | C    | C  | C   |
| 180pF (181)   | I    | I  | I  | I  | I   | C    | C  | C   |
| 220pF (221)   | I    | I  | I  | I  | I   | C    | C  | C   |
| 270pF (271)   | I    | I  | I  | I  | I   | C    | C  | C   |
| 330pF (331)   | I    | I  | I  | I  | I   | C    | C  | C   |
| 390pF (391)   | I    | I  | I  | I  | I   | C    | C  | C   |
| 560pF (561)   | I    | I  | I  | I  | I   | C    | C  | C   |
| 680pF (681)   | I    | I  | I  | I  | I   | C    | C  | C   |
| 820pF (821)   | I    | I  | I  | I  | I   | C    | C  | C   |
| 1,000pF (102) | I    | I  | I  | I  | I   | C    | C  | C   |
| 1,200pF (122) | I    | I  | I  | I  | I   | C    | C  | C   |
| 1,500pF (152) | I    | I  | I  | I  | I   | C    | C  | C   |
| 1,800pF (182) | I    | I  | I  | I  | I   | C    | C  | C   |
| 2,200pF (222) | I    | I  | I  | I  | I   | C    | C  | C   |
| 2,700pF (272) | I    | I  | I  | I  | I   | C    | C  | C   |
| 3,300pF (332) | I    | I  | I  | I  | I   | C    | C  | C   |
| 3,900pF (392) | I    | I  | I  | I  | I   | C    | C  | C   |



**CAPACITANCE RANGE - NP0 (COG) DIELECTRIC SIZE 1825, 2220, 2225**

Table 4- I

| SIZE          | 1825 |     | 2220 |     | 2225 |     |
|---------------|------|-----|------|-----|------|-----|
|               | 50   | 100 | 50   | 100 | 50   | 100 |
| VDC (V)       | 50   | 100 | 50   | 100 | 50   | 100 |
| 10pF (100)    | K    | K   | K    | K   | K    | K   |
| 12pF (120)    | K    | K   | K    | K   | K    | K   |
| 15pF (150)    | K    | K   | K    | K   | K    | K   |
| 18pF (180)    | K    | K   | K    | K   | K    | K   |
| 22pF (220)    | K    | K   | K    | K   | K    | K   |
| 27pF (270)    | K    | K   | K    | K   | K    | K   |
| 33pF (330)    | K    | K   | K    | K   | K    | K   |
| 39pF (390)    | K    | K   | K    | K   | K    | K   |
| 47pF (470)    | K    | K   | K    | K   | K    | K   |
| 56pF (560)    | K    | K   | K    | K   | K    | K   |
| 68pF (680)    | K    | K   | K    | K   | K    | K   |
| 82pF (820)    | K    | K   | K    | K   | K    | K   |
| 100pF (101)   | K    | K   | K    | K   | K    | K   |
| 120pF (121)   | K    | K   | K    | K   | K    | K   |
| 150pF (151)   | K    | K   | K    | K   | K    | K   |
| 180pF (181)   | K    | K   | K    | K   | K    | K   |
| 220pF (221)   | K    | K   | K    | K   | K    | K   |
| 270pF (271)   | K    | K   | K    | K   | K    | K   |
| 330pF (331)   | K    | K   | K    | K   | K    | K   |
| 390pF (391)   | K    | K   | K    | K   | K    | K   |
| 470pF (471)   | K    | K   | K    | K   | K    | K   |
| 560pF (561)   | K    | K   | K    | K   | K    | K   |
| 680pF (681)   | K    | K   | K    | K   | K    | K   |
| 820pF (821)   | K    | K   | K    | K   | K    | K   |
| 1,000pF (102) | K    | K   | K    | K   | K    | K   |
| 1,200pF (122) | K    | K   | K    | K   | K    | K   |
| 1,500pF (152) | K    | K   | K    | K   | K    | K   |
| 1,800pF (182) | K    | K   | K    | K   | K    | K   |
| 2,200pF (222) | K    | K   | K    | K   | K    | K   |
| 2,700pF (272) | K    | K   | K    | K   | K    | K   |





**CAPACITANCE RANGE** – X7R DIELECTRIC SIZE 0201, 0402

Table 5-A

| SIZE          | 0201 |    |    |    |    | 0402 |    |    |    |    |     |
|---------------|------|----|----|----|----|------|----|----|----|----|-----|
| VDC (V)       | 6.3  | 10 | 16 | 25 | 50 | 6.3  | 10 | 16 | 25 | 50 | 100 |
| 100pF (101)   | L    | L  | L  | L  | L  | H    | H  | H  | H  | H  | H   |
| 120pF (121)   | L    | L  | L  | L  | L  | H    | H  | H  | H  | H  | H   |
| 150pF (151)   | L    | L  | L  | L  | L  | H    | H  | H  | H  | H  | H   |
| 180pF (181)   | L    | L  | L  | L  | L  | H    | H  | H  | H  | H  | H   |
| 220pF (221)   | L    | L  | L  | L  | L  | H    | H  | H  | H  | H  | H   |
| 270pF (271)   | L    | L  | L  | L  | L  | H    | H  | H  | H  | H  | H   |
| 330pF (331)   | L    | L  | L  | L  | L  | H    | H  | H  | H  | H  | H   |
| 390pF (391)   | L    | L  | L  | L  | L  | H    | H  | H  | H  | H  | H   |
| 470pF (471)   | L    | L  | L  | L  | L  | H    | H  | H  | H  | H  | H   |
| 560pF (561)   | L    | L  | L  | L  | L  | H    | H  | H  | H  | H  | H   |
| 680pF (681)   | L    | L  | L  | L  | L  | H    | H  | H  | H  | H  | H   |
| 820pF (821)   | L    | L  | L  | L  | L  | H    | H  | H  | H  | H  | H   |
| 1,000pF (102) | L    | L  | L  | L  | L  | H    | H  | H  | H  | H  | H   |
| 1,200pF (122) | L    | L  | L  | L  | L  | H    | H  | H  | H  | H  | H   |
| 1,500pF (152) | L    | L  | L  | L  | L  | H    | H  | H  | H  | H  | H   |
| 1,800pF (182) | L    | L  | L  | L  | L  | H    | H  | H  | H  | H  | H   |
| 2,200pF (222) | L    | L  | L  | L  | L  | H    | H  | H  | H  | H  | H   |
| 2,700pF (272) | L    | L  | L  | L  | L  | H    | H  | H  | H  | H  | H   |
| 3,300pF (332) | L    | L  | L  | L  | L  | H    | H  | H  | H  | H  | H   |
| 3,900pF (392) | L    | L  | L  | L  | L  | H    | H  | H  | H  | H  | H   |
| 4,700pF (472) | L    | L  | L  | L  | L  | H    | H  | H  | H  | H  | H   |
| 5,600pF (562) | L    | L  | L  | L  | L  | H    | H  | H  | H  | H  |     |
| 6,800pF (682) | L    | L  | L  | L  | L  | H    | H  | H  | H  | H  |     |
| 8,200pF (822) | L    | L  | L  | L  | L  | H    | H  | H  | H  | H  |     |
| 0.010μF (103) | L    | L  | L  | L  | L  | H    | H  | H  | H  | H  |     |
| 0.012μF (123) |      |    |    |    |    | H    | H  | H  | H  | H  |     |
| 0.015μF (153) |      |    |    |    |    | H    | H  | H  | H  | H  |     |
| 0.018μF (183) |      |    |    |    |    | H    | H  | H  | H  | H  |     |
| 0.022μF (223) |      |    |    |    |    | H    | H  | H  | H  | H  |     |

**CAPACITANCE RANGE - NPO (COG) DIELECTRIC SIZE 1210, 1812**

Table 5-B

| SIZE          | 0402 |    |    |    |    |
|---------------|------|----|----|----|----|
| VDC (V)       | 6.3  | 10 | 16 | 25 | 50 |
| 0.027μF (273) | H    | H  | H  | H  | H  |
| 0.033μF (333) | H    | H  | H  | H  | H  |
| 0.039μF (393) | H    | H  | H  | H  | H  |
| 0.047μF (473) | H    | H  | H  | H  | H  |
| 0.056μF (563) | H    | H  | H  | H  | H  |
| 0.068μF (683) | H    | H  | H  | H  | H  |
| 0.082μF (823) | H    | H  | H  | H  | H  |
| 0.10μF (104)  | H    | H  | H  | H  | H  |
| 0.15μF (154)  | H    | H  | H  |    |    |
| 0.22μF (224)  | H    | H  | H  | H  |    |
| 0.47μF (474)  | H    | H  |    |    |    |
| 1.0μF (105)   | H    | H  |    |    |    |

**CAPACITANCE RANGE - X7R DIELECTRIC - SIZE 0603, 0805**

Table 5-C

| SIZE          | 0603 |    |    |     |     |     | 0805 |    |    |    |    |     |
|---------------|------|----|----|-----|-----|-----|------|----|----|----|----|-----|
| VDC (V)       | 6.3  | 10 | 16 | 25  | 50  | 100 | 6.3  | 10 | 16 | 25 | 50 | 100 |
| 100pF (101)   | S    | S  | S  | S/B | S/B | S   | B    | B  | B  | B  | B  | B   |
| 120pF (121)   | S    | S  | S  | S   | S   | S   | B    | B  | B  | B  | B  | B   |
| 150pF (151)   | S    | S  | S  | S   | S   | S   | B    | B  | B  | B  | B  | B   |
| 180pF (181)   | S    | S  | S  | S   | S   | S/B | B    | B  | B  | B  | B  | B   |
| 220pF (221)   | S    | S  | S  | S   | S/B | S   | B    | B  | B  | B  | B  | B   |
| 270pF (271)   | S    | S  | S  | S   | S   | S   | B    | B  | B  | B  | B  | B   |
| 330pF (331)   | S    | S  | S  | S   | S   | S   | B    | B  | B  | B  | B  | B   |
| 390pF (391)   | S    | S  | S  | S   | S   | S   | B    | B  | B  | B  | B  | B   |
| 470pF (471)   | S    | S  | S  | S   | S/B | S   | B    | B  | B  | B  | B  | B   |
| 560pF (561)   | S    | S  | S  | S   | S   | S   | B    | B  | B  | B  | B  | B   |
| 680pF (681)   | S    | S  | S  | S   | S   | S   | B    | B  | B  | B  | B  | B   |
| 820pF (821)   | S    | S  | S  | S   | S   | S   | B    | B  | B  | B  | B  | B   |
| 1,000pF (102) | S    | S  | S  | S/B | S/B | S/B | B    | B  | B  | B  | B  | B   |
| 1,200pF (122) | S    | S  | S  | S   | S   | S   | B    | B  | B  | B  | B  | B   |
| 1,500pF (152) | S    | S  | S  | S/B | S   | S   | B    | B  | B  | B  | B  | B   |

**CAPACITANCE RANGE - X7R DIELECTRIC - SIZE 0603, 0805**

Table 5-D

| SIZE          | 0603    |     |     |     |     |    | 0805 |     |    |    |    |    |     |
|---------------|---------|-----|-----|-----|-----|----|------|-----|----|----|----|----|-----|
|               | VDC (V) | 6.3 | 10  | 16  | 25  | 50 | 100  | 6.3 | 10 | 16 | 25 | 50 | 100 |
| 1,800pF (182) | S       | S   | S   | S   | S   | S  | S    | B   | B  | B  | B  | B  | B   |
| 2,200pF (222) | S       | S   | S   | S   | S/B | S  | S    | B   | B  | B  | B  | B  | B   |
| 2,700pF (272) | S       | S   | S   | S   | S/B | S  | S    | B   | B  | B  | B  | B  | B   |
| 3,300pF (332) | S       | S   | S   | S   | S   | S  | S    | B   | B  | B  | B  | B  | B   |
| 3,900pF (392) | S       | S   | S   | S   | S   | S  | S    | B   | B  | B  | B  | B  | B   |
| 4,700pF (472) | S       | S   | S   | S   | S   | S  | S    | B   | B  | B  | B  | B  | B   |
| 5,600pF (562) | S       | S   | S   | S   | S   | S  | S    | B   | B  | B  | B  | B  | B   |
| 6,800pF (682) | S       | S   | S   | S/B | S   | S  | S    | B   | B  | B  | B  | B  | B   |
| 8,200pF (822) | S       | S   | S   | S   | S   | S  | S    | B   | B  | B  | B  | B  | B   |
| 0.010μF (103) | S       | S   | S   | S/B | S/B | S  | S    | B   | B  | B  | B  | B  | B   |
| 0.012μF (123) | S       | S   | S   | S   | S   | X  | X    | B   | B  | B  | B  | B  | B   |
| 0.015μF (153) | S       | S   | S   | S/B | S/B | X  | X    | B   | B  | B  | B  | B  | B   |
| 0.018μF (183) | S       | S   | S   | S   | S   | X  | X    | B   | B  | B  | B  | B  | B   |
| 0.022μF (223) | S       | S   | S   | S   | S/B | X  | X    | B   | B  | B  | B  | B  | B   |
| 0.027μF (273) | S       | S   | S   | S   | S/B | X  | X    | B   | B  | B  | B  | B  | C   |
| 0.033μF (333) | S       | S   | S   | S   | X/B | X  | X    | B   | B  | B  | B  | B  | C   |
| 0.039μF (393) | S       | S   | S   | S   | X   | X  | X    | B   | B  | B  | B  | B  | C   |
| 0.047μF (473) | S       | S   | S   | S   | X   | X  | X    | B   | B  | B  | B  | B  | C   |
| 0.056μF (563) | S       | S   | S   | S   | X   | X  | X    | B   | B  | B  | B  | B  | C   |
| 0.068μF (683) | S       | S   | S   | S   | X/B | X  | X    | B   | B  | B  | B  | B  | C   |
| 0.082μF (823) | S       | S   | S   | S   | X   | X  | X    | B   | B  | B  | B  | B  | C   |
| 0.10μF (104)  | S       | S   | S/B | S/B | X   | X  | X    | B   | B  | B  | B  | B  | C   |
| 0.12μF (124)  | S       | S   | S   | X   |     |    |      | B   | B  | B  | B  | C  | C   |
| 0.15μF (154)  | S       | S   | S/B | X   |     |    |      | C   | C  | C  | C  | C  | C   |
| 0.18μF (184)  | S       | S   | S   | X   |     |    |      | C   | C  | C  | C  | C  | C   |
| 0.22μF (224)  | S       | S   | S/B | X/B | X   |    |      | C   | C  | C  | C  | C  | C   |
| 0.27μF (274)  | X       | X   | X   | X   |     |    |      | C   | C  | C  | C  | C  |     |
| 0.33μF (334)  | X       | X   | X   | X   |     |    |      | C   | C  | C  | C  | C  |     |
| 0.39μF (394)  | X       | X   | X   | X   |     |    |      | C   | C  | C  | C  | C  |     |

**CAPACITANCE RANGE - X7R DIELECTRIC - SIZE 0603, 0805**

Table 5-E

| SIZE         | 0603    |     |     |     |    | 0805 |     |    |    |    |    |     |
|--------------|---------|-----|-----|-----|----|------|-----|----|----|----|----|-----|
|              | VDC (V) | 6.3 | 10  | 16  | 25 | 50   | 6.3 | 10 | 16 | 25 | 50 | 100 |
| 0.47µF (474) | X       | X   | X/B | X/B | X  |      | C   | C  | C  | C  | C  | C   |
| 0.56µF (564) | X       | X   | X   |     |    |      | C   | C  | C  | C  |    |     |
| 0.68µF (684) | X       | X   | X   |     |    |      | C   | C  | C  | C  |    |     |
| 0.82µF (824) | X       | X   | X   |     |    |      | C   | C  | C  | C  |    |     |
| 1.0µF (105)  | X       | X   | X   | X   | X  |      | C   | C  | C  | C  | C  |     |
| 1.5µF (155)  |         |     |     |     |    |      | C   | C  | C  | C  |    |     |
| 2.2µF (225)  | X       | X/B | X   |     |    |      | C   | C  | C  | C  | C  |     |
| 4.7µF (475)  | X       | X   | X   |     |    |      | C   | C  | C  | C  |    |     |
| 10µF (106)   |         |     |     |     |    |      | C*  | C* | C* |    |    |     |

**CAPACITANCE RANGE - X7R DIELECTRIC - SIZE 1206, 1210**

Table 5-F

| SIZE          | 1206    |     |    |    |    |    | 1210 |    |    |    |    |     |
|---------------|---------|-----|----|----|----|----|------|----|----|----|----|-----|
|               | VDC (V) | 6.3 | 10 | 16 | 25 | 50 | 100  | 10 | 16 | 25 | 50 | 100 |
| 150pF (151)   | B       | B   | B  | B  | B  | B  | B    |    |    |    |    |     |
| 180pF (181)   | B       | B   | B  | B  | B  | B  | B    |    |    |    |    |     |
| 220pF (221)   | B       | B   | B  | B  | B  | B  | B    |    |    |    |    |     |
| 270pF (271)   | B       | B   | B  | B  | B  | B  | B    |    |    |    |    |     |
| 330pF (331)   | B       | B   | B  | B  | B  | B  | B    |    |    |    |    |     |
| 390pF (391)   | B       | B   | B  | B  | B  | B  | B    |    |    |    |    |     |
| 470pF (471)   | B       | B   | B  | B  | B  | B  | B    |    |    |    |    |     |
| 560pF (561)   | B       | B   | B  | B  | B  | B  | B    |    |    |    |    |     |
| 680pF (681)   | B       | B   | B  | B  | B  | B  | B    |    |    |    |    |     |
| 820pF (821)   | B       | B   | B  | B  | B  | B  | B    |    |    |    |    |     |
| 1,000pF (102) | B       | B   | B  | B  | B  | B  | B    | I  | I  | I  | I  | I   |
| 1,200pF (122) | B       | B   | B  | B  | B  | B  | B    | I  | I  | I  | I  | I   |
| 1,500pF (152) | B       | B   | B  | B  | B  | B  | B    | I  | I  | I  | I  | I   |
| 1,800pF (182) | B       | B   | B  | B  | B  | B  | B    | I  | I  | I  | I  | I   |
| 2,200pF (222) | B       | B   | B  | B  | B  | B  | B    | I  | I  | I  | I  | I   |
| 2,700pF (272) | B       | B   | B  | B  | B  | B  | B    | I  | I  | I  | I  | I   |
| 3,300pF (332) | B       | B   | B  | B  | B  | B  | B    | I  | I  | I  | I  | I   |

**CAPACITANCE RANGE - X7R DIELECTRIC - SIZE 1206, 1210**

Table 5-G

| SIZE          | 1206 |    |    |    |     |     | 1210 |    |    |    |     |
|---------------|------|----|----|----|-----|-----|------|----|----|----|-----|
| VDC (V)       | 6.3  | 10 | 16 | 25 | 50  | 100 | 10   | 16 | 25 | 50 | 100 |
| 3,900pF (392) | B    | B  | B  | B  | B   | B   | I    | I  | I  | I  | I   |
| 4,700pF (472) | B    | B  | B  | B  | B   | B   | I    | I  | I  | I  | I   |
| 5,600pF (562) | B    | B  | B  | B  | B   | B   | I    | I  | I  | I  | I   |
| 6,800pF (682) | B    | B  | B  | B  | B   | B   | I    | I  | I  | I  | I   |
| 8,200pF (822) | B    | B  | B  | B  | B   | B   | I    | I  | I  | I  | I   |
| 0.010μF (103) | B    | B  | B  | B  | B   | B   | I    | I  | I  | I  | I   |
| 0.012μF (123) | B    | B  | B  | B  | B   | B   | I    | I  | I  | I  | I   |
| 0.015μF (153) | B    | B  | B  | B  | B   | B   | I    | I  | I  | I  | I   |
| 0.018μF (183) | B    | B  | B  | B  | B   | B   | I    | I  | I  | I  | I   |
| 0.022μF (223) | B    | B  | B  | B  | B   | B   | I    | I  | I  | I  | I   |
| 0.027μF (273) | B    | B  | B  | B  | B   | B   | I    | I  | I  | I  | I   |
| 0.033μF (333) | B    | B  | B  | B  | B   | B   | I    | I  | I  | I  | I   |
| 0.039μF (393) | B    | B  | B  | B  | B   | B   | I    | I  | I  | I  | I   |
| 0.047μF (473) | B    | B  | B  | B  | B   | B   | I    | I  | I  | I  | I   |
| 0.056μF (563) | B    | B  | B  | B  | B   | B   | I    | I  | I  | I  | I   |
| 0.068μF (683) | B    | B  | B  | B  | B   | B   | I    | I  | I  | I  | I   |
| 0.082μF (823) | B    | B  | B  | B  | B   | C   | I    | I  | I  | I  | I   |
| 0.10μF (104)  | B    | B  | B  | B  | B   | C   | I    | I  | I  | I  | I   |
| 0.12μF (124)  | B    | B  | B  | B  | B   | C   | I    | I  | I  | I  | I   |
| 0.15μF (154)  | I    | I  | I  | I  | I   | D   | I    | I  | I  | I  | C   |
| 0.18μF (184)  | I    | I  | I  | I  | I   | D   | I    | I  | I  | I  | C   |
| 0.22μF (224)  | I    | I  | I  | I  | I/B | D   | I    | I  | I  | I  | C   |
| 0.27μF (274)  | I    | I  | I  | I  | C   | D   | I    | I  | I  | I  | D   |
| 0.33μF (334)  | I    | I  | I  | I  | C   | D   | I    | I  | I  | C  | D   |
| 0.39μF (394)  | I    | I  | I  | J  | P   | D   | I    | I  | I  | C  | M   |
| 0.47μF (474)  | J    | J  | J  | J  | P   | D   | I    | I  | I  | C  | M   |
| 0.56μF (564)  | J    | J  | J  | J  | P   | P   | C    | C  | C  | C  | M   |
| 0.68μF (684)  | J    | J  | J  | J  | P   | P   | C    | C  | C  | C  | K   |
| 0.82μF (824)  | J    | J  | J  | J  | P   | P   | C    | C  | C  | C  | K   |

**CAPACITANCE RANGE - X7R DIELECTRIC - SIZE 1206, 1210**

Table 5-H

| SIZE        | 1206 |    |    |    |    |     | 1210 |    |    |    |     |
|-------------|------|----|----|----|----|-----|------|----|----|----|-----|
| VDC (V)     | 6.3  | 10 | 16 | 25 | 50 | 100 | 10   | 16 | 25 | 50 | 100 |
| 1.0μF (105) | J    | J  | J  | J  | P  | P   | C    | C  | C  | C  | K   |
| 1.5μF (155) | J    | J  | J  | P  |    |     |      | D  | D  | M  | M   |
| 2.2μF (225) | J    | J  | J  | P  | P  | P   |      | D  | D  | M  | M   |
| 3.3μF (475) | P    | P  | P  | P  |    |     |      | D  | D  | M  |     |
| 4.7μF (475) | P    | P  | P  | P  | P  |     | K    | K  | K  | M  | M   |
| 10μF (106)  | P    | P  | P  | P  |    |     | K    | K  | K  | M  |     |
| 22μF (226)  | P*   | P* | P* |    |    |     | M    | M  | M  |    |     |
| 47μF (476)  |      |    |    |    |    |     | M    |    |    |    |     |
| 100μF (107) | P*   | P* |    |    |    |     |      |    |    |    |     |

**CAPACITANCE RANGE - X7R DIELECTRIC - SIZE 1812**

Table 5-I

| SIZE          | 1812 |    |    |    |     |
|---------------|------|----|----|----|-----|
| VDC (V)       | 10   | 16 | 25 | 50 | 100 |
| 1,000pF (102) | C    | C  | C  | C  | C   |
| 1,200pF (122) | C    | C  | C  | C  | C   |
| 1,500pF (152) | C    | C  | C  | C  | C   |
| 1,800pF (182) | C    | C  | C  | C  | C   |
| 2,200pF (222) | C    | C  | C  | C  | C   |
| 2,700pF (272) | C    | C  | C  | C  | C   |
| 3,300pF (332) | C    | C  | C  | C  | C   |
| 3,900pF (392) | C    | C  | C  | C  | C   |
| 4,700pF (472) | C    | C  | C  | C  | C   |
| 5,600pF (562) | C    | C  | C  | C  | C   |
| 6,800pF (682) | C    | C  | C  | C  | C   |
| 8,200pF (822) | C    | C  | C  | C  | C   |
| 0.010μF (103) | C    | C  | C  | C  | C   |
| 0.012μF (123) | C    | C  | C  | C  | C   |
| 0.015μF (153) | C    | C  | C  | C  | C   |
| 0.018μF (183) | C    | C  | C  | C  | C   |

**CAPACITANCE RANGE - X7R DIELECTRIC - SIZE 1812**

Table 5-J

| SIZE          | 1812 |    |    |    |     |
|---------------|------|----|----|----|-----|
| VDC (V)       | 10   | 16 | 25 | 50 | 100 |
| 0.022μF (223) | C    | C  | C  | C  | C   |
| 0.027μF (273) | C    | C  | C  | C  | C   |
| 0.033μF (333) | C    | C  | C  | C  | C   |
| 0.039μF (393) | C    | C  | C  | C  | C   |
| 0.047μF (473) | C    | C  | C  | C  | C   |
| 0.056μF (563) | C    | C  | C  | C  | C   |
| 0.068μF (683) | C    | C  | C  | C  | C   |
| 0.082μF (823) | C    | C  | C  | C  | C   |
| 0.10μF (104)  | C    | C  | C  | C  | C   |
| 0.12μF (124)  | C    | C  | C  | C  | C   |
| 0.15μF (154)  | C    | C  | C  | C  | C   |
| 0.18μF (184)  | C    | C  | C  | C  | C   |
| 0.22μF (224)  | C    | C  | C  | C  | C   |
| 0.27μF (274)  | C    | C  | C  | C  | C   |
| 0.33μF (334)  | C    | C  | C  | C  | C   |
| 0.39μF (394)  | C    | C  | C  | C  | C   |
| 0.47μF (474)  | C    | C  | C  | C  | K   |
| 0.56μF (564)  | C    | C  | C  | C  | K   |
| 0.68μF (684)  | C    | C  | C  | K  | K   |
| 0.82μF (824)  | C    | C  | C  | K  | K   |
| 1.0μF (105)   | C    | C  | C  | K  | K   |
| 1.5μF (155)   |      |    |    | K  | K   |
| 2.2μF (225)   |      |    |    | M  | M   |
|               |      |    |    |    |     |
|               |      |    |    |    |     |
|               |      |    |    |    |     |



**CAPACITANCE RANGE - X7R DIELECTRIC - SIZE 1825, 2220, 2225**

Table 5-K

| SIZE          | 1825 |     | 2220 |    |     | 2225 |    |     |
|---------------|------|-----|------|----|-----|------|----|-----|
|               | 50   | 100 | 25   | 50 | 100 | 25   | 50 | 100 |
| 1,000pF (102) | K    | K   | K    | K  | K   | K    | K  | K   |
| 1,200pF (122) | K    | K   | K    | K  | K   | K    | K  | K   |
| 1,500pF (152) | K    | K   | K    | K  | K   | K    | K  | K   |
| 1,800pF (182) | K    | K   | K    | K  | K   | K    | K  | K   |
| 2,200pF (222) | K    | K   | K    | K  | K   | K    | K  | K   |
| 2,700pF (272) | K    | K   | K    | K  | K   | K    | K  | K   |
| 3,300pF (332) | K    | K   | K    | K  | K   | K    | K  | K   |
| 3,900pF (392) | K    | K   | K    | K  | K   | K    | K  | K   |
| 4,700pF (472) | K    | K   | K    | K  | K   | K    | K  | K   |
| 5,600pF (562) | K    | K   | K    | K  | K   | K    | K  | K   |
| 6,800pF (682) | K    | K   | K    | K  | K   | K    | K  | K   |
| 8,200pF (822) | K    | K   | K    | K  | K   | K    | K  | K   |
| 0.010μF (103) | K    | K   | K    | K  | K   | K    | K  | K   |
| 0.012μF (123) | K    | K   | K    | K  | K   | K    | K  | K   |
| 0.015μF (153) | K    | K   | K    | K  | K   | K    | K  | K   |
| 0.018μF (183) | K    | K   | K    | K  | K   | K    | K  | K   |
| 0.022μF (223) | K    | K   | K    | K  | K   | K    | K  | K   |
| 0.027μF (273) | K    | K   | K    | K  | K   | K    | K  | K   |
| 0.033μF (333) | K    | K   | K    | K  | K   | K    | K  | K   |
| 0.039μF (393) | K    | K   | K    | K  | K   | K    | K  | K   |
| 0.047μF (473) | K    | K   | K    | K  | K   | K    | K  | K   |
| 0.056μF (563) | K    | K   | K    | K  | K   | K    | K  | K   |
| 0.068μF (683) | K    | K   | K    | K  | K   | K    | K  | K   |
| 0.082μF (823) | K    | K   | K    | K  | K   | K    | K  | K   |
| 0.10μF (104)  | K    | K   | K    | K  | K   | K    | K  | K   |
| 0.12μF (124)  | K    | K   | K    | K  | K   | K    | K  | K   |
| 0.15μF (154)  | K    | K   | K    | K  | K   | K    | K  | K   |
| 0.18μF (184)  | K    | K   | K    | K  | K   | K    | K  | K   |
| 0.22μF (224)  | K    | K   | K    | K  | K   | K    | K  | K   |



**CAPACITANCE RANGE - X5R DIELECTRIC - SIZE 0201**

Table 6-A

| SIZE          | 0201 |    |    |    |
|---------------|------|----|----|----|
| VDC (V)       | 10   | 16 | 25 | 50 |
| 100pF (101)   |      | L  | L  | L  |
| 120pF (121)   |      | L  | L  | L  |
| 150pF (151)   |      | L  | L  | L  |
| 180pF (181)   |      | L  | L  | L  |
| 220pF (221)   |      | L  | L  | L  |
| 270pF (271)   |      | L  | L  | L  |
| 330pF (331)   |      | L  | L  | L  |
| 390pF (391)   |      | L  | L  | L  |
| 470pF (471)   |      | L  | L  | L  |
| 560pF (561)   |      | L  | L  | L  |
| 680pF (681)   |      | L  | L  | L  |
| 820pF (821)   |      | L  | L  | L  |
| 1,000pF (102) | L    | L  | L  | L  |
| 1,200pF (122) | L    | L  | L  |    |
| 1,500pF (152) | L    | L  | L  |    |
| 2,200pF (222) | L    | L  | L  |    |
| 2,700pF (272) | L    | L  | L  |    |
| 3,300pF (332) | L    | L  | L  |    |
| 4,700pF (472) | L    | L  | L  |    |

**CAPACITANCE RANGE - X5R DIELECTRIC - SIZE 0201**

Table 6-B

| SIZE          | 0201 |    |    |    |    | 0402 |    |    |    |     |
|---------------|------|----|----|----|----|------|----|----|----|-----|
| VDC (V)       | 6.3  | 10 | 16 | 25 | 50 | 6.3  | 10 | 16 | 25 | 50  |
| 6,800µF (682) |      | L  | L  | L  |    |      |    |    |    |     |
| 0.010µF (103) | L    | L  | L  | L  | L  |      |    |    |    |     |
| 0.015µF (153) | L    | L  |    |    |    |      |    |    |    | H   |
| 0.022µF (223) | L    | L  |    |    |    |      |    |    |    | H   |
| 0.027µF (273) | L    | L  |    |    |    |      |    | H  |    | H   |
| 0.033µF (333) | L    | L  |    |    |    |      |    | H  |    | H   |
| 0.039µF (393) | L    | L  |    |    |    |      |    | H  |    | H   |
| 0.047µF (473) | L    | L  |    |    |    | H    | H  | H  |    | H   |
| 0.056µF (563) | L    | L  |    |    |    | H    | H  | H  |    | H   |
| 0.068µF (683) | L    | L  |    |    |    | H    | H  | H  |    | H   |
| 0.082µF (823) | L    | L  |    |    |    | H    | H  | H  |    | H   |
| 0.10µF (104)  | L    | L  | L  |    |    | H    | H  | H  | H  | H/E |
| 0.15µF (154)  |      |    |    |    |    | H    | H  | H  | H  |     |
| 0.22µF (224)  | L    | L  | L* | L  |    | H    | H  | H  | H  | H   |
| 0.33µF (334)  | L*   | L* |    |    |    | H    | H  |    |    |     |
| 0.47µF (474)  | L    |    |    |    |    | H    | H  | H  | H  | H   |
| 0.68µF (684)  |      |    |    |    |    | H    | H  |    |    |     |
| 1.0µF (105)   | L*   | L* | L* |    |    | H    | H  | H  | H  | H   |
| 2.2µF (225)   | L*   | L* |    |    |    | H    | H  | H  | H  |     |
| 4.7µF (475)   |      |    |    |    |    | H    | H  | H* |    |     |
| 10µF (106)    |      |    |    |    |    | H*   | H* | H* |    |     |
| 22µF (226)    |      |    |    |    |    | H*   |    |    |    |     |

**CAPACITANCE RANGE - X5R DIELECTRIC - SIZE 0603**

Table 6-C

| SIZE         | 0603 |     |    |    |    |
|--------------|------|-----|----|----|----|
| VDC (V)      | 6.3  | 10  | 16 | 25 | 50 |
| 0.22µF (224) | X    | X   | X  | X  |    |
| 0.27µF (274) |      | X   | X  | X  |    |
| 0.33µF (334) | X    | X   | X  | X  |    |
| 0.39µF (394) |      | X   | X  | X  |    |
| 0.47µF (474) | X    | X/B | X  | X  | X  |

**CAPACITANCE RANGE - X5R DIELECTRIC - SIZE 0603, 0805**

Table 6-D

| SIZE         | 0603    |     |    |     |     | 0805 |     |    |    |    |    |
|--------------|---------|-----|----|-----|-----|------|-----|----|----|----|----|
|              | VDC (V) | 6.3 | 10 | 16  | 25  | 50   | 6.3 | 10 | 16 | 25 | 50 |
| 0.68μF (684) | X       | X   | X  | X   |     |      |     |    |    |    |    |
| 0.82μF (824) | X       | X   | X  | X   |     |      |     |    |    |    |    |
| 1.0μF (105)  | X       | X   | X  | X/B | X/B |      | C   | C  | C  | C  |    |
| 1.5μF (155)  | X       |     |    |     |     |      | C   | C  | C  | C  |    |
| 2.2μF (225)  | X/B     | X   | X  | X   | X   |      | C   | C  | C  | C  | C  |
| 3.3μF (335)  | X       | X   |    |     |     |      | C   | C  | C  | C  |    |
| 4.7μF (475)  | X       | X   | X  | X   |     |      | C   | C  | C  | C  | C  |
| 10μF (106)   | X/B     | X   | X  | X*  |     |      | C   | C  | C  | C  | C  |
| 22μF (226)   | X*      | X*  |    |     |     |      | C   | C* | C* | C* |    |
| 47μF (476)   |         |     |    |     |     |      | C*  | C* |    |    |    |
| 100μF (107)  |         |     |    |     |     |      | C*  |    |    |    |    |

**CAPACITANCE RANGE - X5R DIELECTRIC - SIZE 1206, 1210**

Table 6-E

| SIZE        | 1206    |     |    |     |    | 1210 |    |     |    |    |    |    |    |
|-------------|---------|-----|----|-----|----|------|----|-----|----|----|----|----|----|
|             | VDC (V) | 6.3 | 10 | 16  | 25 | 50   | 4  | 6.3 | 10 | 16 | 25 | 35 | 50 |
| 1.5μF (155) |         | J   | J  |     |    |      |    |     | K  | K  |    |    |    |
| 2.2μF (225) |         | J   | J  | P   | P  |      |    |     | K  | K  |    |    |    |
| 3.3μF (335) |         | P   | P  | P   |    |      |    |     |    |    |    |    |    |
| 4.7μF (475) | P       | P   | P  | P   | P  |      |    |     | K  | K  | K  |    |    |
| 6.8μF (685) | P       | P   |    |     |    |      |    |     |    |    |    |    |    |
| 10μF (106)  | P       | P   | P  | P/D | P  |      |    | K   | K  | K  | K  | M  | M  |
| 22μF (226)  | P       | P   | P  | P   |    |      |    | M   | M  | M  | M  | M  |    |
| 47μF (476)  | P       | P   | P* | P/Y |    |      |    | M   | M  | M* | M  |    |    |
| 100μF (107) | P*      |     |    |     |    |      |    | M*  | M* |    |    |    |    |
| 220μF (227) |         |     |    |     |    |      | M* | M*  |    |    |    |    |    |

Note: 1) The letter in cell is expressed the symbol of product thickness. 2) The letter in cell with “ \* ” mark is for “M tolerance” ( 20% ) only

**CAPACITANCE RANGE - X6S DIELECTRIC - SIZE 0201, 0402, 0603**

Table 7-A

| SIZE         | 0201 |     | 0402 |    |    |    | 0603 |     |    |    |    |
|--------------|------|-----|------|----|----|----|------|-----|----|----|----|
| VDC (V)      | 4    | 6.3 | 6.3  | 10 | 16 | 25 | 4    | 6.3 | 10 | 16 | 25 |
| 0.10μF (104) | L    | L   |      |    |    |    |      |     |    |    |    |
| 0.22μF (224) |      | L   |      |    |    |    |      |     |    |    |    |
| 0.47μF (474) |      |     | H    |    |    |    |      |     |    |    |    |
| 1.0μF (105)  | L*   |     | H    | H  | H  | H  |      |     |    |    |    |
| 2.2μF (225)  |      |     | H    | H  | H  |    |      |     |    |    |    |
| 4.7μF (475)  |      |     |      |    |    |    |      | X   |    | X  | X  |
| 10μF (106)   |      |     |      |    |    |    |      | X*  | X* | X* |    |
| 22μF (226)   |      |     |      |    |    |    | X*   | X*  |    |    |    |

**CAPACITANCE RANGE - X6S DIELECTRIC - SIZE 0805, 1206, 1210**

Table 7-B

| SIZE         | 0805 |     |    |    |    |    | 1206 |    |    |    | 1210 |    |    |    |
|--------------|------|-----|----|----|----|----|------|----|----|----|------|----|----|----|
| VDC (V)      | 4    | 6.3 | 10 | 16 | 25 | 50 | 6.3  | 10 | 16 | 25 | 6.3  | 10 | 16 | 25 |
| 0.10μF (104) |      |     |    |    |    |    |      |    |    |    |      |    |    |    |
| 0.22μF (224) |      |     |    |    |    |    |      |    |    |    |      |    |    |    |
| 0.47μF (474) |      |     |    |    |    |    |      |    |    |    |      |    |    |    |
| 1.0μF (105)  |      |     |    |    |    |    |      |    |    |    |      |    |    |    |
| 2.2μF (225)  |      |     |    |    |    |    |      |    |    |    |      |    |    |    |
| 4.7μF (475)  |      |     |    |    | C  | C  |      |    |    |    |      |    |    |    |
| 10μF (106)   | C    | C   | C  | C  | C  |    |      |    |    | D  |      |    |    |    |
| 22μF (226)   |      | C*  | C* | C* |    |    |      | P  | P* |    |      |    |    | M  |
| 47μF (476)   | C*   |     |    |    |    |    | P    |    |    |    | M    | M  | M  |    |
| 100μF (107)  |      |     |    |    |    |    |      |    |    |    | M*   |    |    |    |

Note: 1) The letter in cell is expressed the symbol of product thickness. 2) The letter in cell with “ \* ” mark is for “M tolerance” ( 20% ) only

**RELIABILITY TEST CONDITIONS AND REQUIREMENTS**

| ITEM                          | TEST CONDITION  | REQUIREMENTS   |
|-------------------------------|---|--|
| Visual and Mechanical         | -   | <ul style="list-style-type: none"> <li>* No remarkable defect.</li> <li>* Dimensions to conform to individual spec. sheet.</li> </ul>  |
| Capacitance                   | Class I: (NP0)<br>$\leq 1000\text{pF}$ , $1.0 \pm 0.2\text{Vrms}$ , $1\text{MHz} \pm 10\%$<br>$> 1000\text{pF}$ , $1.0 \pm 0.2\text{Vrms}$ , $1\text{KHz} \pm 10\%$   | * Shall not exceed the limits given in the detailed spec.  |
| Q/D.F<br>(Dissipation Factor) | Class II: (X7R, X6S, X5R)<br>$C \leq 10\mu\text{F}$ , $1.0 \pm 0.2\text{Vrms}$ , $1\text{KHz} \pm 10\%$<br>** $C > 10\mu\text{F}$ , $0.5 \pm 0.2\text{Vrms}$ , $120\text{Hz} \pm 20\%$<br>** Test condition: $0.5 \pm 0.2\text{Vrms}$ , $1\text{KHz} \pm 10\%$<br>X7R: 0805=106(6.3V), 0603/475(6.3V)<br>X5R: 0201 $\geq 224$ (6.3V,10V,16V)*, 0402 $\geq 475$ (6.3V,16V), 0402 $\geq 225$ (10V), 0603=106 (6.3V,10V)TT18X $\geq 475$ (10V) , TT15X series<br>X6S: 0201/474(4V),0201 $\geq 104$ (6.3V,10V)*, 0402 $\geq 225$ (6.3V), 0402/475 (10V), 0603/106 (6.3V),<br>* Excluding X5R/0201/105(6.3V); 225(10V),<br>X6S/0201/104(10V) ( $1.0 \pm 0.2\text{Vrms}$ , $1\text{KHz} \pm 10\%$ )<br>* Before initial measurement (Class II only):<br>To apply de-aging at $150^\circ\text{C}$ for 1hr for $24 \pm 2$ hrs at room temp. | NP0:<br>$\text{Cap} \geq 30\text{pF}$ , $Q \geq 1000$ ;<br>$\text{Cap} < 30\text{pF}$ , $Q \geq 400 + 20C$<br>X7R, See <Table 1><br>X5R, See <Table 2><br>X6S: See <Table 3>   |
| Dielectric Strength           | <ul style="list-style-type: none"> <li>* To apply voltage (<math>\leq 100\text{V}</math>) 250%.</li> <li>* Duration: 1 to 5 sec.</li> <li>* Charge and discharge current less than 50mA.</li> </ul>   | * No evidence of damage or flash over during test.   |
| Insulation Resistance         | <ul style="list-style-type: none"> <li>* Preconditioning for Class II MLCC: Perform a heat treatment at <math>150 \pm 10^\circ\text{C}</math> for 1 hour, then leave in ambient condition for <math>24 \pm 2</math> hours before measurement.</li> <li>To apply rated voltage for max. 120 sec.</li> </ul>  | Class I: (NP0)<br>$10\text{G}\Omega$ or $R \times C \geq 500\Omega\text{-F}$ whichever is smaller.<br>Class II (X7R, X5R, X6S)<br>$10\text{G}\Omega$ or $R \times C \geq 500\Omega\text{-F}$ whichever is smaller. See <Table 8> |

**RELIABILITY TEST CONDITIONS AND REQUIREMENTS**

| ITEM                                    | TEST CONDITION   | REQUIREMENTS  |
|---|--|---|
| <p>Temperature Coefficient</p>          | <p>With no electrical load. @Oprating Temp. Range<br/>           NP0/X7R: @ -55~125° C; X5R: -55~ 85° C ;<br/>           X6S: -55~105° C ;<br/>           * Before initial measurement (Class II only): To apply de-aging at 150° C for 1hr then set for 24±2 hrs at room temp.<br/>           • Measurement voltage for Class II: See &lt;Table 9&gt;</p>   | <p>NP0: Within ±30ppm/° C<br/>           X7R: Within ±15%<br/>           X5R: Within ±15%<br/>           X6S: Within ±22%</p>   |
| <p>Adhesive Strength of Termination</p> | <p>*Pressurizing force: 2N (0201) and 5N (≤0603) and 10N (&gt;0603);<br/>           * Test time: 10±1 sec.</p>   | <p>* No remarkable damage or removal of the terminations.</p>   |
| <p>Vibration Resistance</p>             | <p>Vibration frequency: 10~55 Hz/min.<br/>           * Total amplitude: 1.5mm<br/>           * Test time: 6 hrs. (Two hrs each in three * mutually perpendicular directions.)<br/>           * Before initial measurement (Class II only):<br/>           To apply de-aging at 150° C for 1hr then set for 24±2 hrs at room temp.<br/>           * Cap./DF(Q) Measurement to be made after de-aging a 150° C for 1hr then set for 24±2 hrs at room temp.</p> | <p>* No remarkable damage or removal of the terminations.<br/>           * No remarkable damage.<br/>           * Cap change and Q/D.F.:<br/>           To meet initial spec.</p>   |
| <p>Bending Test</p>                     | <p>* The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1 mm per second until the deflection becomes 1 mm and then the pressure shall be maintained for 5±1 sec.<br/>           *Before initial measurement (Class II only):<br/>           To apply de-aging at 150° C for 1hr then set for 24±2 hrs at room temp.<br/>           Measurement to be made after keeping at room temp. for 24±2 hrs.</p>   | <p>* No remarkable damage.<br/>           * Cap change:<br/>           NP0: within ±5% or 0.5pF whichever is larger X7R, X5R, X6S: within ±12.5%<br/>           (This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)</p> |



**RELIABILITY TEST CONDITIONS AND REQUIREMENTS**

| ITEM                         | TEST CONDITION  | REQUIREMENTS   |
|------------------------------|---|--|
| Resistance to Soldering Heat | <ul style="list-style-type: none"> <li>* Solder temperature: 260±5° C</li> <li>* Dipping time: 10±1 sec</li> <li>* Preheating: 120 to 150° C for 1 minute before immerse the capacitor in a eutectic solder.</li> <li>* Before initial measurement (Class II only): To apply de-aging at 150° C for 1hr then set for 24±2 hrs at room temp.</li> <li>* Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150° C for 1hr then set for 24±2 hrs at room</li> </ul>   | <ul style="list-style-type: none"> <li>* No remarkable damage.</li> <li>* Cap change:<br/>NP0: within ±2.5% or 0.25pF whichever is larger X7R, X5R, X6S: within ±7.5%</li> <li>* Q/D.F., I.R. and dielectric strength: To meet initial requirements.</li> <li>* 25% max. leaching on each edge.</li> </ul> |
| Temperature Cycle            | <ul style="list-style-type: none"> <li>*Conduct the five cycles according to the temperatures and time.</li> <li>Time (min.): 30±3 @ Min. operating temp.+0/-3 ° C</li> <li>Time (min.): 2~3 @ Room temperture</li> <li>Time (min.): 30±3 @ Max. operating temp.+3/-0 ° C</li> <li>Time (min.): 2~3 @ Room temperture</li> <li>* Before initial measurement (Class II only):<br/>Perform 150+0/-10° C for 1 hr and then set for 24±2 hrs at room temp.</li> <li>* Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150° C for 1hr then set for 24±2 hrs at room.</li> </ul> | <ul style="list-style-type: none"> <li>* No remarkable damage.</li> <li>* Cap change:<br/>NP0: within ±2.5% or 0.25pF whichever is larger X7R, X5R, X6S: within ±7.5%</li> <li>* Q/D.F., I.R. and dielectric strength: To meet initial requirements.</li> </ul>  |
| Solder ability               | <ul style="list-style-type: none"> <li>* Solder temperature: 235±5° C</li> <li>* Dipping time: 2±0.5 sec.</li> </ul>  | <p>95% min. coverage of all metalized area</p>   |

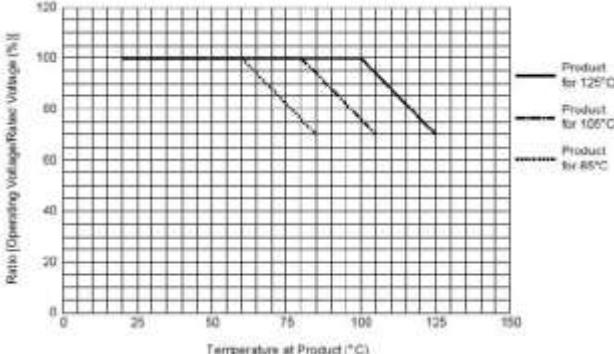
**RELIABILITY TEST CONDITIONS AND REQUIREMENTS**

| ITEM                                    | TEST CONDITION   | REQUIREMENTS   |
|---|--|--|
| Humidity<br>(Damp Heat)<br>Steady State | <ul style="list-style-type: none"> <li>* Test temp.: 40±2° C</li> <li>* Humidity: 90~95% RH</li> <li>* Test time: 500+24/-0hrs.</li> <li>• Before initial measurement (Class II only):<br/>Perform 150+0/-10° C for 1 hr and then set for 24±2 hrs at room temp.</li> <li>* Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150° C for 1hr then set for 24±2 hrs at room temp.</li> </ul> | <ul style="list-style-type: none"> <li>* No remarkable damage.</li> <li>* Cap change:<br/>NPO: within ±5% or 0.5pF<br/>whichever is larger</li> <li>X7R, X5R, X6S: ≥10V**, within ±12.5%; 6.3V within ±25%;</li> <li>** 10V: 0603≥4.7μF; 0402≥1μF; 0201 ≥0.1μF, within ±25%;</li> <li>* Q/D.F. value:<br/>NPO: More than 30pF Q≥350, 10pF≤C≤30pF, Q≥275+2.5C<br/>Less than 10pF Q≥200+10C<br/>X7R, X5R, X6S: See &lt;Table 10&gt;</li> <li>*I.R.: ≥10V, 1GΩ or 50 Ω-F<br/>whichever is smaller.<br/>Class II (X7R, X5R, X6S)<br/>See &lt;Table 13&gt;</li> </ul> |

**RELIABILITY TEST CONDITIONS AND REQUIREMENTS**

| ITEM                         | TEST CONDITION   | REQUIREMENTS   |
|------------------------------|--|--|
| Humidity<br>(Damp Heat) Load | <ul style="list-style-type: none"> <li>*Test temp.: 40±2° C</li> <li>* Humidity: 90~95%RH</li> <li>* Test time: 500+24/-0 hrs.</li> <li>* To apply voltage: rated voltage.</li> <li>* Before initial measurement (Class II only): To apply de-aging at 150° C for 1hr then set for 24±2 hrs at room temp.</li> <li>* Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150° C for 1hr.then set for 24±2 hrs at room temp</li> </ul> | <ul style="list-style-type: none"> <li>* No remarkable damage.</li> <li>Cap change:<br/>NP0: ±7.5% or 0.75pF whichever is larger.</li> <li>X7R, X5R, X6S: ≥10V**, within ±12.5%; ≤ 6.3V within ±25%;</li> <li>**10V: 0603 4.7≥μF; 0402 ≥1μF; 0201≥0.1 μF, within ±25%;</li> <li>value:<br/>NP0: C≥30pF, Q≥200; C&lt;30pF, Q≥100+10/3C</li> <li>X7R, X5R, X6S: See &lt;Table 11&gt;</li> <li>* I.R.: ≥10V, 500MΩ or 25 Ω-F whichever is smaller.</li> <li>Class II (X7R, X5R, X6S)</li> <li>See &lt;Table 13&gt;</li> </ul> |

**RELIABILITY TEST CONDITIONS AND REQUIREMENTS**

| ITEM                                     | TEST CONDITION  | REQUIREMENTS   |
|--|---|--|
| <p>High Temperature Load (Endurance)</p> | <p>* Test temp.: NP0, X7R: 125±3° C X6S: 105±3° C<br/>X5R: 85±3° C</p> <p>* Test time: 1000+24/-0 hrs.</p> <p>* To apply voltage:</p> <p>(1) <math>\leq 6.3V</math> or <math>C \geq 10\mu F</math> : 150% of rated voltage.<br/>           (2) <math>10V \leq U_r &lt; 500V</math>: 200% of rated voltage.<br/>           (3) 500V: 150% of rated voltage.<br/>           (4) <math>U_r \geq 630V</math>: 120% of rated voltage.<br/>           (5) 100% of rated voltage for below range<br/> <i>See Table 14</i></p> <p>(6) 150% of rated voltage for below range.<br/> <i>See Table 15</i></p> <p>* Before initial measurement (Class II only): To apply de-aging at 150° C for 1hr then set for 24±2 hrs at room temp.</p> <p>* Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150° C for 1hr then set for 24±2 hrs at room temp.</p> <p>** De-rating conditions:</p>  | <p>* No remarkable damage. Cap change:</p> <p>NP0: <math>\pm 3.0\%</math> or <math>\pm 0.3pF</math> whichever is larger</p> <p>X7R, X5R, X6S: <math>\geq 10V^{**}</math>, within <math>\pm 12.5\%</math>; <math>\leq 6.3V</math> within <math>\pm 25\%</math>;</p> <p>** 10V: 0603<math>\geq 4.7\mu F</math>; 0402<math>\geq 1\mu F</math>;<br/>0201<math>\geq 0.1\mu F</math>, within <math>\pm 25\%</math>;</p> <p>Q/D.F. value:</p> <p>NP0: More than 30pF, <math>Q \geq 350</math><br/> <math>10pF \leq C &lt; 30pF</math>, <math>Q \geq 275 + 2.5C</math><br/>           Less than 10pF,<br/> <math>Q \geq 200 + 10C</math> X7R, X5R,<br/>           X7R, X5R, X6S: <i>See &lt;Table 12&gt;</i></p> <p>*I.R.: <math>\geq 10V</math>, 1GΩ or 50Ω-F whichever is smaller. Class II (X7R, X5R, X6S)<br/> <i>See &lt;Table 13&gt;</i></p> |

**INSULATION RESISTANCE** – Requirement - Class II (X7R, X5R, X6S)

Table 8

| RATED VOLTAGE  | IR   |
|--|--|
| 100V: All X7R  | 10GΩ or $RxC \geq 100 \Omega\text{-F}$<br>whichever is smaller |
| 50V: 0402 > 0.01μF; 0603 $\geq 1\mu\text{F}$ ; 0805 $\geq 1\mu\text{F}$ ; 1206 $\geq 4.7\mu\text{F}$ ; 1210 $\geq 4.7\mu\text{F}$  |  |
| 35V: 0805 $\geq 2.2\mu\text{F}$ ; 1206 $\geq 2.2\mu\text{F}$ ; 1210 $\geq 10\mu\text{F}$   |  |
| 25V: 0402 $\geq 1\mu\text{F}$ ; 0603 $\geq 2.2\mu\text{F}$ ; 0805 $\geq 2.2\mu\text{F}$ ; 1206 $\geq 10\mu\text{F}$ ; 1210 $\geq 10\mu\text{F}$                                |  |
| 16V: 0201 $\geq 0.1\mu\text{F}$ ; 0402 $\geq 0.22\mu\text{F}$ ; 0603 $\geq 1\mu\text{F}$ ; 0805 $\geq 2.2\mu\text{F}$ ; 1206 $\geq 10\mu\text{F}$ ; 1210 $\geq 47\mu\text{F}$  |  |
| 10V: 0201 $\geq 47\text{nF}$ ; 0402 $\geq 0.47\mu\text{F}$ ; 0603 $\geq 0.47\mu\text{F}$ ; 0805 $\geq 2.2\mu\text{F}$ ; 1206 $\geq 4.7\mu\text{F}$ ; 1210 $\geq 47\mu\text{F}$ |  |
| 6.3V; 4V; Size $\geq 1812$   |  |
| All X6S items  | $RxC \geq 50 \Omega\text{-F}$ .                                |
| 100V: 1210 $\geq 3.3\mu\text{F}$   |  |
| 50V: 0402 $\geq 0.1\mu\text{F}$ ; 0603 $\geq 2.2\mu\text{F}$ ; 0805 $\geq 10\mu\text{F}$ ; 1206 $\geq 10\mu\text{F}$   |  |
| 35V: 0603 $\geq 1\mu\text{F}$  |  |
| 25V: 0201 $\geq 0.1\mu\text{F}$ ; 0402 $\geq 0.22\mu\text{F}$ ; 0603 $\geq 10\mu\text{F}$ ; 0805 $\geq 10\mu\text{F}$ ; 1206 $\geq 22\mu\text{F}$                              |  |
| 16V: 0201 $\geq 0.22\mu\text{F}$ ; 0402 $\geq 1\mu\text{F}$ ; 0603 $\geq 10\mu\text{F}$  |  |
| 10V: 0201 > 0.1μF; 0402 $\geq 1\mu\text{F}$ ; 0603 $\geq 10\mu\text{F}$ ; 0805 $\geq 47\mu\text{F}$  |  |
| 6.3V: 0201 $\geq 0.1\mu\text{F}$ ; 0603 $\geq 4.7\mu\text{F}$ ; 0805 $\geq 47\mu\text{F}$ ; 1206 $\geq 10\mu\text{F}$  |  |
| 4V: 0603 $\geq 22\mu\text{F}$ ; 0805 $\geq 47\mu\text{F}$ ; 1206 $\geq 100\mu\text{F}$   |  |

**TEMPERATURE COEFFICIENT**- Test Condition Measurement voltage for Class II:

Table 9

| MEASUREMENT VOLTAGE   | SIZE      |
|---|-----------|
| Cap $\leq 0.01\mu\text{F}$ : 0.5V; Cap. > 0.01μF: 0.2V  | 01005     |
| Cap < 0.1μF: 1.0V; 0.1μF* $\leq$ Cap. < 1.0μF: 0.2V; Cap. $\geq 1.0\mu\text{F}$ : 0.1V<br>(*: 0201x104/16V: 0.5V) | 0201      |
| Cap < 1μF: 1.0V; Cap. = 1μF: 0.5V; 1μF < Cap. < 10μF: 0.2V; Cap. $\geq 10\mu\text{F}$ : 0.1V                      | 0402      |
| Cap < 1.0μF: 1.0V; 1.0μF* $\leq$ Cap. $\leq 4.7\mu\text{F}$ : 0.5V; Cap. > 4.7μF: 0.2V                            | 0603      |
| Cap < 10μF: 1.0V; Cap. = 10μF: 0.5V; Cap. > 10μF: 0.2V  | 0805      |
| Cap $\leq 10\mu\text{F}$ : 1.0V; 10μF < Cap. $\leq 100\mu\text{F}$ : 0.5V; Cap. > 100μF: 0.2V                     | 1206/1210 |

**HUMIDITY (DAMP HEAT) STEADY STATE** -Requirement - (X7R, X5R, X6S)

Table 10

| RATED VOL. | D.F. ≤ | EXCEPTION OF D.F. ≤ |   |
|------------|--------|---------------------|---|
| ≥100V      | ≤ 3%   | ≤ 6%                | 1206 ≥ 0.47μF   |
|            |        | ≤ 7.5%              | 0603 ≥ 0.068μF; 0805 > 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF;   |
|            |        | ≤ 20%               | 0805 > 0.22μF; 1210 ≥ 3.3μF   |
| 50V        | ≤ 3%   | ≤6%                 | 0201(50V); 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF   |
|            |        | ≤10%                | 0201≥0.01uF; 1210≥4.7μF   |
|            |        | ≤20%                | 0402≥0.012μF; 0603>0.1μF; 0805≥1μF(0805/X7R>0.47μF); 1206≥2.2μF; 1210≥10μF;                             |
| 35V        | ≤ 5%   | ≤20%                | 0603≥1μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥10μF   |
| 25V        | ≤ 5%   | ≤10%                | 0201≥0.01μF; 0805≥1μF; 1210≥10μF  |
|            |        | ≤14%                | 0603≥0.33μF   |
|            |        | ≤15%                | 0201≥0.1μF; 0402≥0.10μF&(0402/X7R≥0.056μF);0603≥0.47μF; 0805≥2.2μF; 1206≥4.7μF;1210≥22μF(1210/X5R≥10μF) |
|            |        | ≤20%                | 0402≥0.47μF   |
| 16V        | ≤5%    | ≤10%                | 0603≥0.15μF; 0805≥0.68μF; 1206≥2.2μF; 1210≥4.7μF  |
|            |        | ≤15%                | 0201≥0.01μF(0201/X7R≥0.022μF);0402≥0.033μF; 0603>0.47μF;0805≥2.2μF;1206≥4.7μF; 1210≥22μF                |
| 10V        | ≤ 7.5% | ≤15%                | 0201≥0.012μF;0402≥0.22μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF;1210≥22μF                                 |
|            |        | ≤20%                | 0201≥0.1μF; 0402≥1μF  |
| 6.3V       | ≤ 15%  | ≤30%                | 0201≥0.1μF; 0402≥1μF(0402/X6S≥0.47μF); 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210 ≥100μF                    |
| 4V         | ≤20%   | -                   | -   |

**HUMIDITY (DAMP HEAT) LOAD -REQUIREMENT - (X7R, X5R, X6S)**

Table 11

| RATED VOL. | D.F. ≤ | EXCEPTION OF D.F. ≤ |   |
|------------|--------|---------------------|---|
| ≥100V      | ≤ 3%   | ≤ 6%                | 1206 ≥ 0.47μF   |
|            |        | ≤ 7.5%              | 0603 ≥ 0.068μF; 0805 > 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF;                                   |
| 50V        | ≤ 3%   | ≤6%                 | 0201(50V); 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF   |
|            |        | ≤10%                | 1210≥4.7μF  |
|            |        | ≤20%                | 0402≥0.01μF; 0603>0.1μF; 0805≥1μF; 1206≥2.2μF; 1210≥10μF;                                 |
| 35V        | ≤ 5%   | ≤20%                | 0603≥1μF; 0805≥2.2μF; 1210≥10μF   |
| 25V        | ≤ 5%   | ≤10%                | 0201≥0.01μF; 0805≥1μF; 1210≥10μF  |
|            |        | ≤14%                | 0603≥0.33μF; 1206≥4.7μF   |
|            |        | ≤15%                | 0402≥0.10μF;0603≥0.47μF;0805≥2.2μF;1206≥6.8μF ; 1210≥22μF                                 |
|            |        | ≤20%                | 0402≥1μF  |
| 16V        | ≤5%    | ≤10%                | 0201≥0.01μF;0402≥0.033μF;0603≥0.15μF; 0805≥0.68μF; 1206≥2.2μF;<br>1210≥4.7μF              |
|            |        | ≤15%                | 0201≥0.01μF; 0402≥0.22μF;<br>0603>0.68μF;0805≥2.2μF;1206≥4.7μF; 1210≥22μF                 |
| 10V        | ≤ 7.5% | ≤15%                | 0201≥0.012μF;0402≥0.33μF(0402/X7R≥0.22μF)<br>;0603≥0.33μF;0805≥2.2μF;1206≥2.2μF;1210≥22μF |
|            |        | ≤20%                | 0201≥0.1μF; 0402≥1μF  |
| 6.3V       | ≤ 15%  | ≤30%                | 0201≥0.1μF; 0402≥1μF; 0603≥10μF;<br>0805≥4.7μF; 1206≥47μF; 1210 ≥100μF                    |
| 4V         | ≤20%   | -                   | -   |

**HIGH TEMPERATURE LOAD (ENDURANCE) -REQUIREMENT - (X7R, X5R, X6S)**

Table 12

| RATED VOL.  | D.F. $\leq$  | EXCEPTION OF D.F. $\leq$ |  |
|-------------|--------------|--------------------------|--|
| $\geq 100V$ | $\leq 3\%$   | $\leq 6\%$               | 1206 $\geq 0.47\mu F$  |
|             |              | $\leq 7.5\%$             | 0603 $\geq 0.068\mu F$ ; 0805 $> 0.1\mu F$ ; 1206 $> 1\mu F$ ;   |
| 50V         | $\leq 3\%$   | $\leq 6\%$               | 0201(50V); 0603 $\geq 0.047\mu F$ ; 0805 $\geq 0.18\mu F$ ; 1206 $\geq 0.47\mu F$  |
|             |              | $\leq 10\%$              | 1210 $\geq 4.7\mu F$   |
|             |              | $\leq 20\%$              | 0402 $\geq 0.1\mu F$ ; 0603 $> 0.1\mu F$ ; 0805 $\geq 1\mu F$ ; 1206 $\geq 2.2\mu F$ ; 1210 $\geq 10\mu F$   |
| 35V         | $\leq 5\%$   | $\leq 20\%$              | 0603 $\geq 1\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1210 $\geq 10\mu F$  |
| 25V         | $\leq 5\%$   | $\leq 10\%$              | 0201 $\geq 0.01\mu F$ ; 0805 $\geq 1\mu F$ ; 1210 $\geq 10\mu F$   |
|             |              | $\leq 14\%$              | 0603 $\geq 0.33\mu F$ ; 1206 $\geq 4.7\mu F$   |
|             |              | $\leq 15\%$              | 0402 $\geq 0.10\mu F$ ; 0603 $\geq 0.47\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 6.8\mu F$ ; 1210 $\geq 22\mu F$  |
|             |              | $\leq 20\%$              | 0402 $\geq 1\mu F$   |
| 16V         | $\leq 5\%$   | $\leq 10\%$              | 0201 $\geq 0.01\mu F$ ; 0402 $\geq 0.033\mu F$ ; 0603 $\geq 0.15\mu F$ ; 0805 $\geq 0.68\mu F$ ; 1206 $\geq 2.2\mu F$ ; 1210 $\geq 4.7\mu F$                               |
|             |              | $\leq 15\%$              | 0201 $\geq 0.01\mu F$ ; 0402 $\geq 0.22\mu F$ ;<br>0603 $> 0.68\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 4.7\mu F$ ; 1210 $\geq 22\mu F$                                  |
| 10V         | $\leq 7.5\%$ | $\leq 15\%$              | 0201 $\geq 0.012\mu F$ ; 0402 $\geq 0.33\mu F$ (0402/X7R $\geq 0.22\mu F$ )<br>; 0603 $\geq 0.33\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 2.2\mu F$ ; 1210 $\geq 22\mu F$ |
|             |              | $\leq 20\%$              | 0201 $\geq 0.1\mu F$ ; 0402 $\geq 1\mu F$  |
| 6.3V        | $\leq 15\%$  | $\leq 30\%$              | 0201 $\geq 0.1\mu F$ ; 0402 $\geq 1\mu F$ ; 0603 $\geq 10\mu F$ ;<br>0805 $\geq 4.7\mu F$ ; 1206 $\geq 47\mu F$ ; 1210 $\geq 100\mu F$                                     |
| 4V          | $\leq 20\%$  | -                        | -  |



**REQUIREMENT** - CLASS II (X7R, X5R, X6S)

Table 13

| MEASUREMENT VOLTAGE  | IR   |
|--|--|
| 100V: X7R; 1210 $\geq$ 3.3 $\mu$ F   | 1G $\Omega$ or RxC $\geq$ 10 $\Omega$ -F<br>whichever is smaller |
| 50V: 0402 $>$ 0.01 $\mu$ F; 0603 $\geq$ 1 $\mu$ F; 0805 $\geq$ 1 $\mu$ F; 1206 $\geq$ 4.7 $\mu$ F; 1210 $\geq$ 4.7 $\mu$ F                               |  |
| 35V: 0603 $\geq$ 1 $\mu$ F; 0805 $\geq$ 2.2 $\mu$ F; 1210 $\geq$ 10 $\mu$ F  |  |
| 25V: 0201 $\geq$ 0.1 $\mu$ F; 0402 $\geq$ 0.22 $\mu$ F; 0603 $\geq$ 2.2 $\mu$ F; 0805 $\geq$ 2.2 $\mu$ F; 1206 $\geq$ 10 $\mu$ F; 1210 $\geq$ 10 $\mu$ F |  |
| 16V: 0201 $\geq$ 0.1 $\mu$ F; 0402 $\geq$ 0.22 $\mu$ F; 0603 $\geq$ 1 $\mu$ F ;0805 $\geq$ 2.2 $\mu$ F; 1206 $\geq$ 10 $\mu$ F; 1210 $\geq$ 47 $\mu$ F   |  |
| 10V: 0201 $\geq$ 47nF; 0402 $\geq$ 0.47 $\mu$ F; 0603 $\geq$ 0.47 $\mu$ F; 0805 $\geq$ 2.2 $\mu$ F; 1206 $\geq$ 4.7 $\mu$ F; 1210 $\geq$ 47 $\mu$ F      |  |
| 6.3V; 4V; All X6S items; Size $\geq$ 1812  |  |

**HIGH TEMPERATURE LOAD (ENDURANCE)** – Test Condition-100% of Rated Voltage

Table 14

| SIZE | DIELECTRIC  | RATED VOLTAGE | CAPACITANCE |
|------|-------------|---------------|-------------|
| 0201 | X5R/X7R/X6S | ≤10V          | C≥0.1μF     |
|      |             | ≥16V          | C>0.1μF     |
| 0402 | X5R         | ≤16V          | C>1.0μF     |
|      |             | 25V,50V       | C≥1.0μF     |
|      | X6S         | 6.3V,10V      | C>1.0μF     |
|      |             | 16V,25V       | C≥1.0μF     |
| X7R  | 6.3V,10V    | C≥1.0μF       |             |
| 0603 | X5R/X7R/X6S | 4V            | C≥22μF      |
|      |             | 6.3V,10V      | C≥4.7μF     |
|      | X5R/X6S     | 25V           | C≥1.0μF     |
|      | X7R         | 35V           | C≥1.0μF     |
| 0805 | X5R/X7R/X6S | 4V            | C≥47μF      |
|      |             | 6.3V          | C≥22μF      |
|      |             | 10V, 50V      | C≥10μF      |
|      | X6S/X7R     | 16V, 25V      | C≥10μF      |
|      | X5R         |               | C≥22μF      |
| 1206 | X5R/X7R/X6S | ≤6.3V         | C≥47μF      |
| 1210 | X5R/X7R/X6S | 16V           | C≥47μF      |
|      | X7R         | 100V          | C≥3.3μF     |

**HIGH TEMPERATURE LOAD (ENDURANCE) – Test Condition-150% of Rated Voltage**

Table 15

| DIELECTRIC           | RATED VOLTAGE | CAPACITANCE | DIELECTRIC |
|----------------------|---------------|-------------|------------|
| 0201                 | X5R/X6S       | 16V, 25V    | C= 0.1μF   |
|                      | X7R           | 16V         | C≥0.022μF  |
| 0402                 | X5R/X7R/X6S   | 50V         | C>0.01μF   |
|                      |               | 10-25V      | C≥0.22μF   |
| 0603                 | Y7R           | 50V         | C>0.1μF    |
|                      |               | 25V         | C=1.0μF    |
|                      | X5R           | 50V         | C≥1.0μF    |
|                      | X5R/X7R/X6S   | 10V, 16V    | C≥1.0μF    |
| 0805                 | X5R/X7R/X6S   | 100V        | C≥0.47μF   |
|                      |               | 50V         | C≥1.0μF    |
|                      |               | 35V         | C≥2.2μF    |
|                      |               | 10-25V      | C≥4.7μF    |
| 1206                 | X7R           | 100V        | C≥1.0μF    |
|                      |               | 50V         | C=4.7μF    |
|                      | X5R/X6S       | 100V        | C>1.0μF    |
|                      |               | 50V         | C=4.7μF    |
| 1210                 | X5R/X7R/X6S   | 50-100V     | C≥2.2μF    |
| 1825<br>2220<br>2225 | X7R           | 100V-250V   | C≥1.0μF    |

**RECOMMENDED PROFILE CONDITIONS**

The lead-free termination MLCCs are not only to be used on SMT against lead-free solder paste, but also suitable against lead-containing solder paste.

If the optimized solder joint is requested, increasing soldering time, temperature and concentration of N2 within oven are recommended.



Reflow Soldering Profile For SMT Process with SnAgCu series Solder Paste



Wave Soldering Profile For SMT Process with SnAgCu series Solder Paste

## STORAGE AND HANDLING CONDITIONS

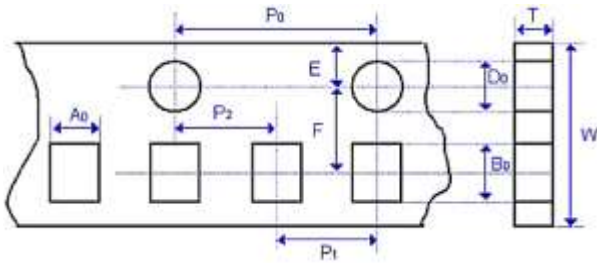
- To store products at 5 to 40°C ambient temperature and 20 to 70% related humidity conditions.
- The product is recommended to be used within one year after shipment. Check solder ability in case of shelf life extension is needed.
- Don't open the tape until the parts are to be used, use the chips within 3 months after the tape is opened.
- For product of high dielectric constant (Class2 & 3, characteristics B/W & Y), the Electro static capacity changes with the passage of time due to the inherent characteristics of ceramic dielectric materials. The changed capacity reverts to nominal at the temperature it reaches during the soldering process.

## CAUTIONS

- The corrosive gas reacts on the terminal electrodes of capacitors, and results in the poor solder ability. Do not store the capacitors in the ambience of corrosive gas (e.g., hydrogen sulfide, sulfur dioxide, chlorine, ammonia gas etc.)
- In corrosive atmosphere, solder ability might be degraded, and silver migration might occur to cause low reliability.
- Due to the dewing by rapid humidity change, or the photochemical change of the terminal electrode by direct sun light, the solder ability and electrical performance may deteriorate. Do not store capacitors under direct sunlight or dewing condition. To store products on the shelf and avoid exposure to moisture.

**TAPE DIMENSION** (Unit: mm)

Paper Tape



Plastic Tape



| SIZE      | 0201         | 0402         | 0603         | 0805         |              |              |
|-----------|--------------|--------------|--------------|--------------|--------------|--------------|
| Thickness | L            | H            | H, S, B, X   | A, H         | B, X         | C            |
| A0        | 0.40 ±0.10   | 0.70 ±0.20   | 1.05 ±0.30   | 1.5±0.20     | 1.5 ±0.20    | < 1.80       |
| B0        | 0.70 ±0.10   | 1.20 ±0.20   | 1.80 ±0.30   | 2.30 ±0.20   | 2.30 ±0.20   | < 2.70       |
| T         | ≤0.55        | ≤0.80        | ≤1.20        | ≤1.15        | ≤1.20        | 0.23 ±0.1    |
| K0        | -            | -            | -            | -            | -            | < 2.50       |
| W         | 8.00 ±0.30   | 8.00 ±0.30   | 8.00 ±0.30   | 8.00 ±0.30   | 8.00 ±0.30   | 8.00 ±0.30   |
| P0        | 4.00 ±0.10   | 4.00 ±0.10   | 4.00 ±0.10   | 4.00 ±0.10   | 4.00 ±0.10   | 4.00 ±0.10   |
| 10xP0     | 40.0 ±0.10   | 40.0 ±0.10   | 40.0 ±0.20   | 40.0 ±0.20   | 40.0 ±0.20   | 40.0 ±0.20   |
| P1        | 2.00 ±0.05   | 2.00 ±0.05   | 4.00 ±0.10   | 4.00 ±0.10   | 4.00 ±0.10   | 4.00 ±0.10   |
| P2        | 2.00 ±0.05   | 2.00 ±0.05   | 2.00 ±0.05   | 2.00 ±0.05   | 2.00 ±0.05   | 2.00 ±0.05   |
| D0        | 1.50 +0.1/-0 | 1.50 +0.1/-0 | 1.50 +0.1/-0 | 1.50 +0.1/-0 | 1.50 +0.1/-0 | 1.50 +0.1/-0 |
| D1        | -            | -            | -            | -            | -            | 1.00 ±0.10   |
| E         | 1.75 ±0.10   | 1.75 ±0.10   | 1.75 ±0.10   | 1.75 ±0.10   | 1.75 ±0.10   | 1.75 ±0.10   |
| F         | 3.50 ±0.05   | 3.50 ±0.05   | 3.50 ±0.05   | 3.50 ±0.05   | 3.50 ±0.05   | 3.50 ±0.05   |

**TAPE DIMENSION** (Unit: mm)

| SIZE      | 1206         |              |              | 1210         |              |              |
|-----------|--------------|--------------|--------------|--------------|--------------|--------------|
|           | B            | I, C, J      | D, P         | B            | I, C, D, K   | M            |
| Thickness | B            | I, C, J      | D, P         | B            | I, C, D, K   | M            |
| A0        | 1.90 ±0.50   | < 2.00       | < 2.30       | < 3.05       | < 3.05       | < 3.20       |
| B0        | 3.50 ±0.50   | < 3.70       | < 4.00       | < 3.80       | < 3.80       | < 4.00       |
| T         | ≦1.20        | 0.23 ±0.1    | 0.23 ±0.1    | 0.23 ±0.1    | 0.23 ±0.1    | 0.23 ±0.1    |
| K0        | -            | < 2.50       | < 2.50       | < 1.50       | < 2.50       | < 3.20       |
| W         | 8.00 ±0.30   | 8.00 ±0.30   | 8.00 ±0.30   | 8.00 ±0.30   | 8.00 ±0.30   | 8.00 ±0.30   |
| P0        | 4.00 ±0.10   | 4.00 ±0.10   | 4.00 ±0.10   | 4.00 ±0.10   | 4.00 ±0.10   | 4.00 ±0.10   |
| 10xP0     | 40.0 ±0.20   | 40.0 ±0.20   | 40.0 ±0.20   | 40.0 ±0.20   | 40.0 ±0.20   | 40.0 ±0.20   |
| P1        | 4.00 ±0.10   | 4.00 ±0.10   | 4.00 ±0.10   | 4.00 ±0.10   | 4.00 ±0.10   | 4.00 ±0.10   |
| P2        | 2.00 ±0.05   | 2.00 ±0.05   | 2.00 ±0.05   | 2.00 ±0.05   | 2.00 ±0.05   | 2.00 ±0.05   |
| D0        | 1.50 +0.1/-0 | 1.50 +0.1/-0 | 1.50 +0.1/-0 | 1.50 +0.1/-0 | 1.50 +0.1/-0 | 1.50 +0.1/-0 |
| D1        | -            | 1.00 ±0.10   | 1.00 ±0.10   | 1.00 ±0.10   | 1.00 ±0.10   | 1.00 ±0.10   |
| E         | 1.75 ±0.10   | 1.75 ±0.10   | 1.75 ±0.10   | 1.75 ±0.10   | 1.75 ±0.10   | 1.75 ±0.10   |
| F         | 3.50 ±0.05   | 3.50 ±0.05   | 3.50 ±0.05   | 3.50 ±0.05   | 3.50 ±0.05   | 3.50 ±0.05   |

**TAPE DIMENSION** (Unit: mm)

| SIZE      | 1812         |              | 1825         |              | 2220         |              |
|-----------|--------------|--------------|--------------|--------------|--------------|--------------|
| Thickness | C, D, K      | M, U         | K            | M, U         | K            | M, U         |
| A0        | < 3.90       | < 3.90       | < 6.80       | < 6.80       | < 5.80       | < 5.80       |
| B0        | < 5.30       | < 5.30       | < 5.30       | < 5.30       | < 6.50       | < 6.50       |
| T         | 0.25 ±0.1    | 0.25 ±0.1    | 0.30 ±0.1    | 0.30 ±0.1    | 0.30 ±0.1    | 0.30 ±0.1    |
| K0        | < 2.50       | < 3.50       | < 2.50       | < 3.50       | < 2.50       | < 3.50       |
| W         | 12±0.30      | 12±0.30      | 12±0.30      | 12±0.30      | 12±0.30      | 12±0.30      |
| P0        | 4.00 ±0.10   | 4.00 ±0.10   | 4.00 ±0.10   | 4.00 ±0.10   | 4.00 ±0.10   | 4.00 ±0.10   |
| 10xP0     | 40.0 ±0.20   | 40.0 ±0.20   | 40.0 ±0.20   | 40.0 ±0.20   | 40.0 ±0.20   | 40.0 ±0.20   |
| P1        | 8.00 ±0.10   | 8.00 ±0.10   | 8.00 ±0.10   | 8.00 ±0.10   | 8.00 ±0.10   | 8.00 ±0.10   |
| P2        | 2.00 ±0.10   | 2.00 ±0.10   | 2.00 ±0.10   | 2.00 ±0.10   | 2.00 ±0.10   | 2.00 ±0.10   |
| D0        | 1.50 +0.1/-0 | 1.50 +0.1/-0 | 1.50 +0.1/-0 | 1.50 +0.1/-0 | 1.50 +0.1/-0 | 1.50 +0.1/-0 |
| D1        | 1.50 ±0.10   | 1.50 ±0.10   | 1.50 ±0.10   | 1.50 ±0.10   | 1.50 ±0.10   | 1.50 ±0.10   |
| E         | 1.75 ±0.10   | 1.75 ±0.10   | 1.75 ±0.10   | 1.75 ±0.10   | 1.75 ±0.10   | 1.75 ±0.10   |
| F         | 5.50 ±0.10   | 5.50 ±0.10   | 5.50 ±0.05   | 5.50 ±0.05   | 5.50 ±0.05   | 5.50 ±0.05   |



**TAPE DIMENSION** (Unit: mm)

| SIZE      | 2225         |              |
|-----------|--------------|--------------|
| Thickness | K            | M, U         |
| A0        | < 6.80       | < 6.80       |
| B0        | < 6.50       | < 6.50       |
| T         | 0.30 ±0.1    | 0.30 ±0.1    |
| K0        | < 2.50       | < 3.50       |
| W         | 12±0.30      | 12±0.30      |
| P0        | 4.00 ±0.10   | 4.00 ±0.10   |
| 10xP0     | 40.0 ±0.20   | 40.0 ±0.20   |
| P1        | 8.00 ±0.10   | 8.00 ±0.10   |
| P2        | 2.00 ±0.10   | 2.00 ±0.10   |
| D0        | 1.50 +0.1/-0 | 1.50 +0.1/-0 |
| D1        | 1.50 ±0.10   | 1.50 ±0.10   |
| E         | 1.75 ±0.10   | 1.75 ±0.10   |
| F         | 5.50 ±0.05   | 5.50 ±0.05   |

**REEL DIMENSION** (Unit: mm)



| SIZE CODE | 0201, 0402, 0603, 0805, 1206, 1210 |               |               | 1812, 1825, 2220, 2225 |
|-----------|------------------------------------|---------------|---------------|------------------------|
| Reel Size | 7"                                 | 10"           | 13"           | 7"                     |
| C         | 13.0+0.5/-0.2                      | 13.0+0.5/-0.2 | 13.0+0.5/-0.2 | 13.0+0.5/-0.2          |
| W 1       | 8.4+1.5/-0                         | 8.4+1.5/-0    | 8.4+1.5/-0    | 12.4+2.0/-0            |
| A         | 178.0±0.10                         | 250.0±1.0     | 330.0±1.0     | 178.0±0.10             |
| N         | 60.0+1.0/-0                        | 100.0±1.0     | 100±1.0       | 60.0+1.0/-0            |

**PACKAGING STYLE AND QUANTITY PER REEL**

| SIZE        | THICKNESS (SYMBOL)<br>(MM) |   | PAPER TAPE |          | PLASTIC TAPE |          |
|-------------|----------------------------|---|------------|----------|--------------|----------|
|             |                            |   | 7" REEL    | 13" REEL | 7" REEL      | 13" REEL |
| 0201 (0603) | 0.30±0.09                  | L | 15,000     | -        | -            | -        |
|             |                            |   | 15,000     | -        | -            | -        |
|             |                            |   | 15,000     | -        | -            | -        |
| 0402 (1005) | 0.50±0.05                  | N | 10,000     | 50,000   | -            | -        |
|             | 0.50±0.10                  | E | 10,000     | 50,000   | -            | -        |
|             | 0.50±0.20                  | H | 10,000     | -        | -            | -        |
| 0603 (1608) | 0.50±0.20                  | H | 4,000      | -        | -            | -        |
|             | 0.80±0.10                  | S | 4,000      | 15,000   | -            | -        |
|             | 0.80±0.20                  | X | 4,000      | 15,000   | -            | -        |
| 0805 (2012) | 0.50±0.20                  | N | 4,000      | 15,000   | -            | -        |
|             | 0.60±0.10                  | A | 4,000      | 15,000   | -            | -        |
|             | 0.85±0.15                  | B | 4,000      | 15,000   | -            | -        |
|             | 1.25±0.15                  | C | -          | -        | 3,000        | 10,000   |
| 1206 (3216) | 0.85±0.15                  | B | 4,000      | 15,000   | -            | -        |
|             | 0.95±0.10                  | I | -          | -        | 3,000        | 10,000   |
|             | 1.15±0.15                  | J | -          | -        | 3,000        | 10,000   |
|             | 1.25±0.20                  | C | -          | -        | 3,000        | 10,000   |
|             | 1.60±0.15                  | D | -          | -        | 2,000        | 10,000   |
|             | 1.60+0.30/-0.10            | P | -          | -        | 2,000        | 9,000    |
| 1210 (3225) | 0.85±0.15                  | B | -          | -        | 3,000        | 10,000   |
|             | 0.95±0.10                  | I | -          | -        | 3,000        | 10,000   |
|             | 1.25±0.20                  | C | -          | -        | 3,000        | 10,000   |
|             | 1.60±0.20                  | D | -          | -        | 2,000        | -        |
|             | 2.00±0.20                  | K | -          | -        | 1,000        | 6,000    |
|             | 2.50±0.30                  | M | -          | -        | 1,000        | 6,000    |

**PACKAGING STYLE AND QUANTITY PER REEL**

| SIZE        | THICKNESS (SYMBOL)<br>(MM) |   | PAPER TAPE |          | PLASTIC TAPE |          |
|-------------|----------------------------|---|------------|----------|--------------|----------|
|             |                            |   | 7" REEL    | 13" REEL | 7" REEL      | 13" REEL |
| 1808 (4520) | 1.25±0.20                  | C | -          | -        | 2,000        | 10,000   |
|             | 1.60±0.20                  | D | -          | -        | 2,000        | 8,000    |
|             | 2.00±0.20                  | K | -          | -        | 1,000        | 6,000    |
| 1812 (4532) | 1.25±0.20                  | C | -          | -        | 1,000        | 5,000    |
|             | 1.60±0.20                  | D | -          | -        | 1,000        | -        |
|             | 2.00±0.20                  | K | -          | -        | 1,000        | -        |
|             | 2.50±0.30                  | M | -          | -        | 500          | 3,000    |
|             | 2.80±0.30                  | U | -          | -        | 500          | -        |
| 1825 (4563) | 2.00±0.20                  | K | -          | -        | 1,000        | -        |
| 2220 (5750) | 2.50±0.30                  | M | -          | -        | 500          | -        |
| 2225 (5763) | 2.80±0.30                  | U | -          | -        | 500          | -        |

## IMPORTANT NOTES AND DISCLAIMER

1. **ROHS COMPLIANCE:** The levels of RoHS restricted materials in this product are below the maximum concentration values (also referred to as the threshold limits) permitted for such substances, or are used in an exempted application, in accordance with EU RoHS Directive (EU) 2015/863 EC (RoHS3). RoHS Test Report for this product can be obtained at Download Center.
2. **REACH COMPLIANCE:** REACH substances of high concern (SVHCs) information is available for this product. Since the European Chemical Agency (ECHA) has published notice of their intent to frequently revise the SVHC listing for the foreseeable future, REACH Test Report for this product can be obtained at Download Center.
3. All Product parametric performance is indicated in the Electrical Characteristics for the listed herein test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.
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8. *NextGen* requires that customers first obtain an RMA (Returned Merchandise Authorization) number prior to returning any products. Returns must be made within 30 days of the date of invoice, be in the original packaging, unused and like-new condition. At the time of quoting or purchasing, a product may say that it is Non-Cancelable/ Non-Returnable (NCNR). These products are not returnable and not refundable.