

|                                         |                                                                                                                                                                                                                                                                                                                                                                    |                                                  |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| <b>SPECIFICATION SHEET NO.</b>          | R1207- 0805N471J631IC                                                                                                                                                                                                                                                                                                                                              |                                                  |
| <b>ORIGINAL MFG/PART NO.</b>            | Aillen Capacitors/M0805N471J631IC                                                                                                                                                                                                                                                                                                                                  |                                                  |
| <b>NEXTGEN PART CODE</b>                | 0805N471J631IC                                                                                                                                                                                                                                                                                                                                                     | Indicate This Code For <a href="#">RFQ/Order</a> |
| <b>DATE</b>                             | Dec. 7, 2024                                                                                                                                                                                                                                                                                                                                                       |                                                  |
| <b>REVISION</b>                         | A7                                                                                                                                                                                                                                                                                                                                                                 | Updated With Most Recent Data                    |
| <b>DESCRIPTION AND MAIN PARAMETRICS</b> | <p>Medium Voltage Multilayer Ceramic Chip Capacitors (MLCC), M Type,<br/>0805 Series, Case 2012 Metric 0805 Dimension L2.00*W1.25*H1.25mm<br/>Thickness: 1.45mm Max. Dielectric NP0, Capacitance 470pF, Tolerance ±5%<br/>Rated Voltage 630V<br/>Operating Temp. Range -55°C ~+125°C<br/>Package in Tape/Reel, 3,000pcs/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. 7, 2024 |                                                                                                                                                                                                                                                                |  |

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

## DESCRIPTION

These Capacitors Feature Series Connection Of Multi-layer Capacitor Units In A MLCC To Realize Medium Voltage Performance. Reliable Performances Are Built-in Through Exact Formulation Of Dielectric Powders, Preparation Of Conductive Paste, Advanced Automatic Manufacturing, And Strict Quality Control To Assure Excellent Control In Dielectric Thickness, Electrode Integrity, And Electrode-to-termination Continuity.



*Image shown is a representation only.*

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

## MAIN FEATURE

- A Wide Selection Of Size Is Available
- High Capacitance and Medium Voltage 200V~630V
- High Reliability And Stability
- Temperature Characteristics: NP0 (COG), X7R And Y5V
- Capacitor With Lead-free Termination
- REACH/RoHS/RoHS III Compliant



## APPLICATION

- DC to DC Converter
- High Voltage Coupling/DC Blocking
- Back-lighting Inverters
- Snubbers In High Frequency Power Convertors.

## ELECTRICAL CHARACTERISTICS

- See Page 4 ~Page 9 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 0805N471J631IC For RFQ and Order.

**RFQ**
[Request For Quotation](#)

## PART CODE GUIDE

| CODE | NAME                    | KEY SPECIFICATION OPTION                                                                                                                                                                                                                                                                                                                                                 |
|------|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0805 | Case Size               | 0402 (1005 Metric): L1.00*W0.50mm; 0603 (1608 Metric ): L1.60*W0.80mm;<br>0805 (2012 Metric): L2.00*W1.25mm; 1206 (3216 Metric): L3.20*W1.60mm;<br>1210 (3225 Metric): L3.20*W2.50mm; 1808 (4520 Metric): L4.50*W2.00mm;<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 |
| N    | Temperature Coefficient | N: NP0 (COG); B: X7R; Y: Y5V                                                                                                                                                                                                                                                                                                                                             |
| 471  | Capacitance             | Two significant digits followed by number of Zero, The 3rd digit signifies the multiplying factor, and letter R is decimal point.<br><br>0R5: 0.5pF; 391: 390pF; 222: 2200pF; 471: 470pF; 332: 3300pF; 333: 0.033μF                                                                                                                                                      |
| J    | Tolerance               | B: ±0.1pF; C: ±0.25pF; D: ±0.5pF; F: ±1%; G: ±2%; J: ±5%; K: ±10% M: ±20%                                                                                                                                                                                                                                                                                                |
| 631  | Rated Voltage           | 201: 200 VDC; 251: 250 VDC; 451: 450 VDC; 501: 500 VDC; 631: 630 VDC                                                                                                                                                                                                                                                                                                     |
| I    | Thickness               | I: 1.25±0.20mm, See Page 10 ~Page 11 (T's Symbol) for Different part code                                                                                                                                                                                                                                                                                                |
| C    | Package                 | K: 0.5 Kpcs/Reel; A: 1Kpcs/Reel; B: 2Kpcs/Reel; C: 3Kpcs/Reel; D: 4Kpcs/Reel;<br>E: 15Kpcs/Reel; I: 10Kpcs/Reel; J: 2.5Kpcs/Reel                                                                                                                                                                                                                                         |
| ( )  | Internal Control        | Blank: N/A;<br><br>XX: Letter A~Z, a~z or digits (0~9) for Special/Custom Parameters                                                                                                                                                                                                                                                                                     |

**ELECTRICAL CHARACTERISTICS** - 200V 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                       | -                             |
| 0603B151K201XD       | X7R                  | 150 pF      | ±10%      | 200     | 1.00                | -55 ~ 125                | ±15%                          |
| 0603N101J201SD       | NP0 (COG)            | 100 pF      | ±5%       | 200     | 0.90                | -55 ~ 125                | ±30ppm/°C                     |
| 0805B101K201BD       | X7R                  | 100 pF      | ±10%      | 200     | 1.00                | -55 ~ 125                | ±15%                          |
| 0805B102K201BD       | X7R                  | 1000 pF     | ±10%      | 200     | 1.00                | -55 ~ 125                | ±15%                          |
| 0805B103K201DC       | X7R                  | 0.01 µF     | ±10%      | 200     | 1.35                | -55 ~ 125                | ±15%                          |
| 0805B104K201DC       | X7R                  | 0.1 µF      | ±10%      | 200     | 1.35                | -55 ~ 125                | ±15%                          |
| 0805B221K201BD       | X7R                  | 220 pF      | ±10%      | 200     | 1.00                | -55 ~ 125                | ±15%                          |
| 0805B222K201BD       | X7R                  | 2200 pF     | ±10%      | 200     | 1.00                | -55 ~ 125                | ±15%                          |
| 0805B471K201BD       | X7R                  | 470 pF      | ±10%      | 200     | 1.00                | -55 ~ 125                | ±15%                          |
| 0805B472K201BD       | X7R                  | 4700 pF     | ±10%      | 200     | 1.00                | -55 ~ 125                | ±15%                          |
| 0805N101J201AD       | NP0 (COG)            | 100 pF      | ±5%       | 200     | 0.70                | -55 ~ 125                | ±30ppm/°C                     |
| 0805N221J201DC       | NP0 (COG)            | 220 pF      | ±5%       | 200     | 1.35                | -55 ~ 125                | ±30ppm/°C                     |
| 0805N470J201AD       | NP0 (COG)            | 47 pF       | ±5%       | 200     | 0.70                | -55 ~ 125                | ±30ppm/°C                     |
| 1206B101K201DC       | X7R                  | 100 pF      | ±10%      | 200     | 1.35                | -55 ~ 125                | ±15%                          |
| 1206B102K201DC       | X7R                  | 1000 pF     | ±10%      | 200     | 1.35                | -55 ~ 125                | ±15%                          |
| 1206B152K201DC       | X7R                  | 1500 pF     | ±10%      | 200     | 1.35                | -55 ~ 125                | ±15%                          |
| 1206B221K201DC       | X7R                  | 220 pF      | ±10%      | 200     | 1.35                | -55 ~ 125                | ±15%                          |
| 1206B222K201DC       | X7R                  | 2200 pF     | ±10%      | 200     | 1.35                | -55 ~ 125                | ±15%                          |
| 1206B471K201DC       | X7R                  | 470 pF      | ±10%      | 200     | 1.35                | -55 ~ 125                | ±15%                          |
| 1206B562K201DC       | X7R                  | 5600 pF     | ±10%      | 200     | 1.35                | -55 ~ 125                | ±15%                          |

### ELECTRICAL CHARACTERISTICS - 200V NPO (C0G) & X7R FOR DIFFERENT PART CODE

[illegible]

**ELECTRICAL CHARACTERISTICS - 250V 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                       | -                             |
| 0603B101K251XD       | X7R                  | 100 pF      | ±10%      | 250     | 1.00                | -55 ~ 125                | ±15%                          |
| 0603N200J251SD       | NP0 (COG)            | 20 pF       | ±5%       | 250     | 0.90                | -55 ~ 125                | ±30ppm/°C                     |
| 0805B102K251BD       | X7R                  | 1000 pF     | ±10%      | 250     | 1.00                | -55 ~ 125                | ±15%                          |
| 0805B103K251DC       | X7R                  | 0.01 µF     | ±10%      | 250     | 1.35                | -55 ~ 125                | ±15%                          |
| 0805B221K251BD       | X7R                  | 220 pF      | ±10%      | 250     | 1.00                | -55 ~ 125                | ±15%                          |
| 0805B221K251DC       | X7R                  | 220 pF      | ±10%      | 250     | 1.35                | -55 ~ 125                | ±15%                          |
| 0805B471K251BD       | X7R                  | 470 pF      | ±10%      | 250     | 1.00                | -55 ~ 125                | ±15%                          |
| 0805B471K251DC       | X7R                  | 470 pF      | ±10%      | 250     | 1.35                | -55 ~ 125                | ±15%                          |
| 0805N101J251AD       | NP0 (COG)            | 100 pF      | ±5%       | 250     | 0.70                | -55 ~ 125                | ±30ppm/°C                     |
| 0805N102J251DC       | NP0 (COG)            | 1000 pF     | ±5%       | 250     | 1.35                | -55 ~ 125                | ±30ppm/°C                     |
| 0805N471J251DC       | NP0 (COG)            | 470 pF      | ±5%       | 250     | 1.35                | -55 ~ 125                | ±30ppm/°C                     |
| 1206B104K251GB       | X7R                  | 0.1 µF      | ±10%      | 250     | 1.80                | -55 ~ 125                | ±15%                          |
| 1206B222K251DC       | X7R                  | 2200 pF     | ±10%      | 250     | 1.35                | -55 ~ 125                | ±15%                          |
| 1206B471K251DC       | X7R                  | 470 pF      | ±10%      | 250     | 1.35                | -55 ~ 125                | ±15%                          |
| 1206B473K251GB       | X7R                  | 0.047 µF    | ±10%      | 250     | 1.80                | -55 ~ 125                | ±15%                          |
| 1206B681K251DC       | X7R                  | 680 pF      | ±10%      | 250     | 1.35                | -55 ~ 125                | ±15%                          |
| 1206B683K251GB       | X7R                  | 0.068 µF    | ±10%      | 250     | 1.80                | -55 ~ 125                | ±15%                          |
| 1206N102J251GB       | NP0 (COG)            | 0.001 µF    | ±5%       | 250     | 1.80                | -55 ~ 125                | ±30ppm/°C                     |
| 1206N332J251GB       | NP0 (COG)            | 3300 pF     | ±5%       | 250     | 1.80                | -55 ~ 125                | ±30ppm/°C                     |
| 1210B224K251MA       | X7R                  | 0.22 µF     | ±10%      | 250     | 2.80                | -55 ~ 125                | ±15%                          |
| 1812B474K251KA       | X7R                  | 0.47 µF     | ±10%      | 250     | 2.20                | -55 ~ 125                | ±15%                          |

### ELECTRICAL CHARACTERISTICS - 450V NPO (C0G) & X7R FOR DIFFERENT PART CODE

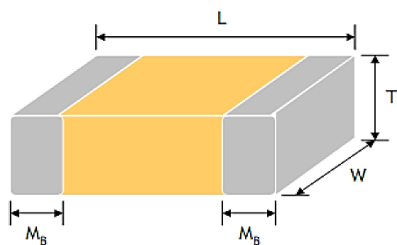
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**ELECTRICAL CHARACTERISTICS - 500V NP0 (COG) & X7R FOR DIFFERENT PART CODE**

| NEXTGEN<br>PART CODE | TEMP.<br>COEFFICIENT | CAPACITANCE | TOLERANCE | VOLTAGE | THICKNESS<br>(MAX.) | OPERATING<br>TEMP. RANGE | CAPACITANCE<br>CHARACTERISTIC |
|----------------------|----------------------|-------------|-----------|---------|---------------------|--------------------------|-------------------------------|
|                      | -                    | -           | -         | V       | mm                  | °C                       | -                             |
| 0805B102K501BD       | X7R                  | 1000 pF     | ±10%      | 500     | 1.00                | -55 ~ 125                | ±15%                          |
| 0805B103K501DC       | X7R                  | 0.01 µF     | ±10%      | 500     | 1.35                | -55 ~ 125                | ±15%                          |
| 0805B221K501BD       | X7R                  | 220 pF      | ±10%      | 500     | 1.00                | -55 ~ 125                | ±15%                          |
| 0805B222K501BD       | X7R                  | 2200 pF     | ±10%      | 500     | 1.00                | -55 ~ 125                | ±15%                          |
| 0805B471K501BD       | X7R                  | 470 pF      | ±10%      | 500     | 1.00                | -55 ~ 125                | ±15%                          |
| 1206B102K501DC       | X7R                  | 1000 pF     | ±10%      | 500     | 1.35                | -55 ~ 125                | ±15%                          |
| 1206B103K501DC       | X7R                  | 0.01 µF     | ±10%      | 500     | 1.35                | -55 ~ 125                | ±15%                          |
| 1206B221K501DC       | X7R                  | 220 pF      | ±10%      | 500     | 1.35                | -55 ~ 125                | ±15%                          |
| 1206B332K501DC       | X7R                  | 3300 pF     | ±10%      | 500     | 1.35                | -55 ~ 125                | ±15%                          |
| 1206B333K501GB       | X7R                  | 0.033 µF    | ±10%      | 500     | 1.80                | -55 ~ 125                | ±15%                          |
| 1206B471K501DC       | X7R                  | 470 pF      | ±10%      | 500     | 1.35                | -55 ~ 125                | ±15%                          |
| 1206B683K501GB       | X7R                  | 0.068 µF    | ±10%      | 500     | 1.80                | -55 ~ 125                | ±15%                          |
| 1206N100J501BD       | NP0 (COG)            | 10 pF       | ±5%       | 500     | 1.00                | -55 ~ 125                | ±30ppm/°C                     |
| 1206N102J501GB       | NP0 (COG)            | 0.001 µF    | ±5%       | 500     | 1.80                | -55 ~ 125                | ±30ppm/°C                     |
| 1206N152J501GB       | NP0 (COG)            | 1500 pF     | ±5%       | 500     | 1.80                | -55 ~ 125                | ±30ppm/°C                     |
| 1206N471J501CC       | NP0 (COG)            | 470 pF      | ±5%       | 500     | 1.05                | -55 ~ 125                | ±30ppm/°C                     |
| 1210B104K501KA       | X7R                  | 0.1 µF      | ±10%      | 500     | 2.20                | -55 ~ 125                | ±15%                          |
|                      |                      |             |           |         |                     |                          |                               |
|                      |                      |             |           |         |                     |                          |                               |
|                      |                      |             |           |         |                     |                          |                               |

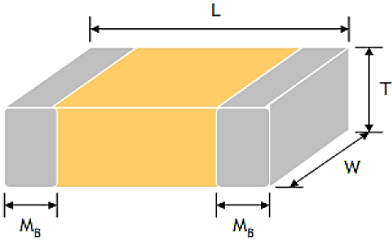
**ELECTRICAL CHARACTERISTICS - 630V NP0 (COG) & X7R FOR DIFFERENT PART CODE**

| NEXTGEN<br>PART CODE  | TEMP.<br>COEFFICIENT | CAPACITANCE | TOLERANCE | VOLTAGE | THICKNESS<br>(MAX.) | OPERATING<br>TEMP. RANGE | CAPACITANCE<br>CHARACTERISTIC |
|-----------------------|----------------------|-------------|-----------|---------|---------------------|--------------------------|-------------------------------|
|                       | -                    | -           | -         | V       | mm                  | °C                       | -                             |
| 0805N470J631AD        | NP0 (COG)            | 47 pF       | ±5%       | 630     | 0.70                | -55 ~ 125                | ±30ppm/°C                     |
| <b>0805N471J631IC</b> | NP0 (COG)            | 470 pF      | ±5%       | 630     | 1.45                | -55 ~ 125                | ±30ppm/°C                     |
| 1206B102K631DC        | X7R                  | 1000 pF     | ±10%      | 630     | 1.35                | -55 ~ 125                | ±15%                          |
| 1206B103K631DC        | X7R                  | 0.01 µF     | ±10%      | 630     | 1.35                | -55 ~ 125                | ±15%                          |
| 1206B221K631DC        | X7R                  | 220 pF      | ±10%      | 630     | 1.35                | -55 ~ 125                | ±15%                          |
| 1206B222K631DC        | X7R                  | 2200 pF     | ±10%      | 630     | 1.35                | -55 ~ 125                | ±15%                          |
| 1206B332K631DC        | X7R                  | 3300 pF     | ±10%      | 630     | 1.35                | -55 ~ 125                | ±15%                          |
| 1206B471K631DC        | X7R                  | 470 pF      | ±10%      | 630     | 1.35                | -55 ~ 125                | ±15%                          |
| 1206N101J631BD        | NP0 (COG)            | 100 pF      | ±5%       | 630     | 1.00                | -55 ~ 125                | ±30ppm/°C                     |
| 1206N102J631GB        | NP0 (COG)            | 1000 pF     | ±5%       | 630     | 1.80                | -55 ~ 125                | ±30ppm/°C                     |
| 1206N152J631GB        | NP0 (COG)            | 1500 pF     | ±5%       | 630     | 1.80                | -55 ~ 125                | ±30ppm/°C                     |
| 1206N220J631BD        | NP0 (COG)            | 22 pF       | ±5%       | 630     | 1.00                | -55 ~ 125                | ±30ppm/°C                     |
| 1206N221J631BD        | NP0 (COG)            | 220 pF      | ±5%       | 630     | 1.00                | -55 ~ 125                | ±30ppm/°C                     |
| 1206N222J631GB        | NP0 (COG)            | 2200 pF     | ±5%       | 630     | 1.80                | -55 ~ 125                | ±30ppm/°C                     |
| 1210B223K631DC        | X7R                  | 0.022 µF    | ±10%      | 630     | 1.35                | -55 ~ 125                | ±15%                          |
| 1210B333K631CC        | X7R                  | 0.033 µF    | ±10%      | 630     | 1.05                | -55 ~ 125                | ±15%                          |
| 1210B393K631GB        | X7R                  | 0.039 µF    | ±10%      | 630     | 1.80                | -55 ~ 125                | ±15%                          |
| 1210B473K631GB        | X7R                  | 0.047 µF    | ±10%      | 630     | 1.80                | -55 ~ 125                | ±15%                          |
| 1812B104K631KA        | X7R                  | 0.1 µF      | ±10%      | 630     | 2.20                | -55 ~ 125                | ±15%                          |
|                       |                      |             |           |         |                     |                          |                               |
|                       |                      |             |           |         |                     |                          |                               |

**DIMENSION** (Unit: mm)


| SIZE CODE | METRIC CODE | L         | W         | T (SYMBOL ) |   | MB        |
|-----------|-------------|-----------|-----------|-------------|---|-----------|
| 0402      | 1005        | 1.00±0.05 | 0.50±0.10 | 0.50 ±0.05  | N | 0.15 Min. |
| 0603      | 1608        | 1.60±0.15 | 0.80±0.15 | 0.80±0.10   | S | 0.20 Min. |
|           |             |           |           | 0.80±0.20   | X |           |
| 0805      | 2012        | 2.00±0.20 | 1.25±0.20 | 0.60±0.10   | A | 0.30 Min. |
|           |             |           |           | 0.85±0.15   | B |           |
|           |             |           |           | 1.25±0.10   | D |           |
|           |             |           |           | 1.25±0.20   | I |           |
| 1206      | 3216        | 3.20±0.20 | 1.60±0.20 | 0.85±0.15   | B | 0.3 Min.  |
|           |             |           |           | 0.95±0.10   | C |           |
|           |             |           |           | 1.25±0.10   | D |           |
|           |             |           |           | 1.60±0.20   | G |           |
| 1210      | 3225        | 3.20±0.40 | 2.50±0.30 | 0.95±0.10   | C | 0.3 Min.  |
|           |             |           |           | 1.25±0.10   | D |           |
|           |             |           |           | 1.60±0.20   | G |           |
|           |             |           |           | 2.00±0.20   | K |           |
|           |             |           |           | 2.50±0.30   | M |           |
| 1808      | 4520        | 4.50±0.40 | 2.00±0.20 | 1.25±0.10   | D | 0.26 Min. |
|           |             |           |           | 1.60±0.20   | G |           |
|           |             |           |           | 2.00±0.20   | K |           |

**DIMENSION** (Unit: mm)



| SIZE CODE | METRIC CODE | L         | W         | T (SYMBOL ) |   | REMARK | MB        |
|-----------|-------------|-----------|-----------|-------------|---|--------|-----------|
| 1812      | 4532        | 4.50±0.40 | 3.20±0.30 | 1.25±0.10   | D |        | 0.26 Min. |
|           |             |           |           | 1.60±0.20   | G |        |           |
|           |             |           |           | 2.00±0.20   | K |        |           |
|           |             |           |           | 2.50±0.30   | M |        |           |
| 1825      | 4563        | 4.50±0.40 | 6.30±0.40 | 2.00±0.20   | K |        | 0.30 Min. |
|           |             |           |           | 2.50±0.30   | M |        |           |
|           |             |           |           | 2.80±0.30   | U |        |           |
| 2220      | 5750        | 5.70±0.40 | 5.00±0.40 | 2.00±0.20   | K |        | 0.30 Min. |
|           |             |           |           | 2.50±0.30   | M |        |           |
|           |             |           |           | 2.80±0.30   | U |        |           |
| 2225      | 5763        | 5.70±0.40 | 6.30±0.40 | 2.00±0.20   | K |        | 0.30 Min. |
|           |             |           |           | 2.50±0.30   | M |        |           |
|           |             |           |           | 2.80±0.30   | U |        |           |

**GENERAL ELECTRONICAL CHARACTERISTICS**

| DIELECTRIC                       | NP0 (C0G)                                                                                                                                   | X7R                                                     | Y5V                       |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|---------------------------|
| Size                             | 0402, 0603, 0805, 1206,<br>1210, 1808, 1812, 1825,<br>2220, 2225                                                                            | 0603, 0805, 1206, 1210, 1808,<br>1812, 1825, 2220, 2225 | 0805, 1206, 1210,<br>1812 |
| Capacitance Range*               | 0.5pF to 0.1μF                                                                                                                              | 100pF to 22μF                                           | 10nF to 1.0μF             |
| Capacitance Tolerance            | Cap. ≤5pF:<br>B (±0.1pF), C (±0.25pF)<br>5pF < Cap < 10pF:<br>C (±0.25pF), D (±0.5pF)<br>Cap ≥ 10pF: F (±1%),<br>G (±2%), J (±5%), K (±10%) | J (±5%) #1<br>K (±10%),<br>M (±20%)                     | Z (-20/+80%)              |
| Rated Voltage                    | 200V, 250V, 500V, 630V                                                                                                                      | 200V, 250V, 500V, 630V                                  | 200V, 250V                |
| Q/DF (Tan δ) *                   | Cap < 30pF: Cap ≥ 400 + 20C<br>Cap ≥ 30pF: Q ≥ 1000                                                                                         | DF ≤ 2.5%<br>(Apply 1.0 ± 0.2Vrms,<br>1.0KHz ± 10%)     | ≤ 5%                      |
| Insulation resistance<br>at Ur** | ≥ 100GΩ or R • C ≥ 1000<br>whichever is smaller                                                                                             | ≥ 10GΩ or R • C ≥ 100Ω • F whichever is smaller         |                           |
| Operating Temperature            | -55 ~ +125°C                                                                                                                                |                                                         | -25 ~ +85°C               |
| Capacitance Characteristic       | ±30ppm/°C                                                                                                                                   | ±15%                                                    | +30/-80%                  |
| Termination                      | Cu (or Ag)/Ni/Sn (lead-free termination)                                                                                                    |                                                         |                           |

Note:

- \* Measured at the condition of 30~70% related humidity.
- NP0 (C0G): 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: Apply 1.0 ± 0.2Vrms, 1.0kHz ± 10%, at 25° C ambient temperature
- Y5V: Apply 1.0 ± 0.2Vrms, 1.0kHz ± 10%, at 20° C ambient temperature.
- \*\* Measured at 500VDC for 60 sec, for UR > 500VDC

CAPACITANCE RANGE - NP0 (COG) DIELECTRIC - SIZE 0402, 0603, 0805 Table 1-A

| SIZE        | 0402 |     | 0603 |     | 0805 |     |     |     |
|-------------|------|-----|------|-----|------|-----|-----|-----|
| VDC (V)     | 200  | 250 | 200  | 250 | 200  | 250 | 500 | 630 |
| 0.5pF(0R5)  | N    | N   | S    | S   | A    | A   | A   | A   |
| 1.0pF(1R0)  | N    | N   | S    | S   | A    | A   | A   | A   |
| 1.2pF (1R2) | N    | N   | S    | S   | A    | A   | A   | A   |
| 1.5pF (1R5) | N    | N   | S    | S   | A    | A   | A   | A   |
| 1.8pF (1R8) | N    | N   | S    | S   | A    | A   | A   | A   |
| 2.2pF (2R2) | N    | N   | S    | S   | A    | A   | A   | A   |
| 2.7pF (2R7) | N    | N   | S    | S   | A    | A   | A   | A   |
| 3.3pF (3R3) | N    | N   | S    | S   | A    | A   | A   | A   |
| 3.9pF (3R9) | N    | N   | S    | S   | A    | A   | A   | A   |
| 4.7pF (4R7) | N    | N   | S    | S   | A    | A   | A   | A   |
| 5.6pF (5R6) | N    | N   | S    | S   | A    | A   | A   | A   |
| 6.8pF (6R8) | N    | N   | S    | S   | A    | A   | A   | A   |
| 8.2pF (8R2) | N    | N   | S    | S   | A    | A   | A   | A   |
| 10pF (100)  | N    | N   | S    | S   | A    | A   | A   | A   |
| 12pF (120)  | N    | N   | S    | S   | A    | A   | A   | A   |
| 15pF (150)  | N    | N   | S    | S   | A    | A   | A   | A   |
| 18pF (180)  | N    | N   | S    | S   | A    | A   | A   | A   |
| 20pF (200)  | N    | N   | S    | S   | A    | A   | A   | A   |
| 22pF (220)  | N    | N   | S    | S   | A    | A   | A   | A   |
| 27pF (270)  | N    | N   | S    | S   | A    | A   | A   | A   |
| 33pF (330)  | N    | N   | S    | S   | A    | A   | A   | A   |
| 39pF (390)  | N    | N   | S    | S   | A    | A   | A   | A   |
| 47pF (470)  | N    | N   | S    | S   | A    | A   | A   | A   |
| 56pF (560)  | N    | N   | S    | S   | A    | A   | A   | A   |
| 68pF (680)  | N    |     | S    | S   | A    | A   | A   | A   |
| 82pF (820)  | N    |     | S    | S   | A    | A   | A   | A   |
| 100pF (101) | N    |     | S    | S   | A    | A   | A   | A   |
| 120pF (121) |      |     | S    | S   | A    | B   | D   | D   |
| 150pF (151) |      |     | S    | S   | B    | D   | D   | D   |
| 180pF (181) |      |     | S    | S   | B    | D   | D   | D   |

**CAPACITANCE RANGE - NP0 (COG) DIELECTRIC - SIZE 0402, 0603, 0805**

Table 1-B

| SIZE          | 0402 |     | 0603 |     | 0805 |     |     |     |
|---------------|------|-----|------|-----|------|-----|-----|-----|
| VDC (V)       | 200  | 250 | 200  | 250 | 200  | 250 | 500 | 630 |
| 220pF (221)   |      |     | S    | S   | D    | D   | D   | D   |
| 270pF (271)   |      |     | X    | X   | D    | D   | D   | D   |
| 330pF (331)   |      |     | X    | X   | D    | D   | D   | D   |
| 390pF (391)   |      |     | X    | X   | D    | D   | D   | D   |
| 470pF (471)   |      |     | X    | X   | D    | D   | I   | I   |
| 560pF (561)   |      |     | X    | X   | D    | D   | I   | I   |
| 680pF (681)   |      |     |      |     | D    | D   | I   | I   |
| 820pF (821)   |      |     |      |     | D    | D   | I   | I   |
| 1,000pF(102)  |      |     |      |     | D    | D   | I   | I   |
| 1,200pF (122) |      |     |      |     | D    | D   |     |     |
| 1,500pF (152) |      |     |      |     | D    | D   |     |     |
| 1,800pF (182) |      |     |      |     | D    | D   |     |     |
| 2,200pF (222) |      |     |      |     | D    | D   |     |     |

**CAPACITANCE RANGE - NP0 (COG) DIELECTRIC - SIZE 1206, 1210**

Table 1-C

| SIZE        | 1206 |     |     |     | 1210 |     |     |     |
|-------------|------|-----|-----|-----|------|-----|-----|-----|
| VDC (V)     | 200  | 250 | 500 | 630 | 200  | 250 | 500 | 630 |
| 1.5pF (1R5) | B    | B   | B   | B   |      |     |     |     |
| 1.8pF (1R8) | B    | B   | B   | B   |      |     |     |     |
| 2.2pF (2R2) | B    | B   | B   | B   |      |     |     |     |
| 2.7pF (2R7) | B    | B   | B   | B   |      |     |     |     |
| 3.3pF (3R3) | B    | B   | B   | B   |      |     |     |     |
| 3.9pF (3R9) | B    | B   | B   | B   |      |     |     |     |
| 4.7pF (4R7) | B    | B   | B   | B   |      |     |     |     |
| 5.6pF (5R6) | B    | B   | B   | B   |      |     |     |     |
| 6.8pF (6R8) | B    | B   | B   | B   |      |     |     |     |
| 8.2pF (8R2) | B    | B   | B   | B   |      |     |     |     |
| 10pF (100)  | B    | B   | B   | B   | C    | C   | C   | C   |
| 12pF (120)  | B    | B   | B   | B   | C    | C   | C   | C   |
| 15pF (150)  | B    | B   | B   | B   | C    | C   | C   | C   |

**CAPACITANCE RANGE - NP0 (COG) DIELECTRIC - SIZE 1206, 1210**

Table 1-D

| SIZE          | 1206 |     |     |     | 1210 |     |     |     |
|---------------|------|-----|-----|-----|------|-----|-----|-----|
| VDC (V)       | 200  | 250 | 500 | 630 | 200  | 250 | 500 | 630 |
| 18pF (180)    | B    | B   | B   | B   | C    | C   | C   | C   |
| 20pF (200)    | B    | B   | B   | B   | C    | C   | C   | C   |
| 22pF (220)    | B    | B   | B   | B   | C    | C   | C   | C   |
| 27pF (270)    | B    | B   | B   | B   | C    | C   | C   | C   |
| 33pF (330)    | B    | B   | B   | B   | C    | C   | C   | C   |
| 39pF (390)    | B    | B   | B   | B   | C    | C   | C   | C   |
| 47pF (470)    | B    | B   | B   | B   | C    | C   | C   | C   |
| 56pF (560)    | B    | B   | B   | B   | C    | C   | C   | C   |
| 68pF (680)    | B    | B   | B   | B   | C    | C   | C   | C   |
| 82pF (820)    | B    | B   | B   | B   | C    | C   | C   | C   |
| 100pF (101)   | B    | B   | B   | B   | C    | C   | C   | C   |
| 120pF (121)   | B    | B   | B   | B   | C    | C   | C   | C   |
| 150pF (151)   | B    | B   | B   | B   | C    | C   | C   | C   |
| 180pF (181)   | B    | B   | B   | B   | C    | C   | C   | C   |
| 220pF (221)   | B    | B   | B   | B   | C    | C   | C   | C   |
| 270pF (271)   | B    | C   | C   | C   | C    | C   | C   | C   |
| 330pF (331)   | B    | C   | C   | C   | C    | C   | C   | C   |
| 390pF (391)   | B    | C   | C   | C   | C    | C   | C   | C   |
| 470pF (471)   | C    | C   | C   | C   | C    | C   | C   | C   |
| 560pF (561)   | C    | C   | C   | C   | C    | C   | C   | C   |
| 680pF (681)   | C    | D   | D   | D   | C    | C   | C   | C   |
| 820pF (821)   | C    | D   | D   | D   | C    | C   | C   | C   |
| 1,000pF(102)  | C    | G   | G   | G   | D    | D   | D   | D   |
| 1,200pF (122) | C    | G   | G   | G   | D    | D   | D   | D   |
| 1,500pF (152) | D    | G   | G   | G   | D    | D   | D   | D   |
| 1,800pF (182) | D    | G   | G   | G   | D    | D   | D   | D   |
| 2,200pF (222) | D    | G   | G   | G   | D    | D   | D   | D   |
| 2,700pF (272) | D    | G   |     |     | D    | D   | D   | D   |
| 3,300pF (332) | D    | G   |     |     | D    | D   | D   | D   |

**CAPACITANCE RANGE - NP0 (COG) DIELECTRIC - SIZE 1206, 1210**

Table 1-E

| SIZE          | 1206 |     |     |     | 1210 |     |     |     |
|---------------|------|-----|-----|-----|------|-----|-----|-----|
| VDC (V)       | 200  | 250 | 500 | 630 | 200  | 250 | 500 | 630 |
| 3,900pF (392) | D    | G   |     |     | D    | D   | D   | D   |
| 4,700pF (472) | D    | G   |     |     | G    | G   |     |     |
| 5,600pF (562) |      |     |     |     | G    | G   |     |     |
| 6,800pF (682) |      |     |     |     | G    | G   |     |     |
| 8,200pF (822) |      |     |     |     | G    | G   |     |     |
| 0.010μF (103) |      |     |     |     | G    | G   |     |     |
| 0.022μF (223) |      |     |     |     | M    | M   |     |     |
| 0.033μF (333) |      |     |     |     | M    | M   |     |     |

**CAPACITANCE RANGE - NP0 (COG) DIELECTRIC - SIZE 1808, 1812**

Table 1-F

| SIZE        | 1808 |     | 1812 |     |     |     |
|-------------|------|-----|------|-----|-----|-----|
| VDC (V)     | 500  | 630 | 200  | 250 | 500 | 630 |
| 1.8pF (1R8) | D    | D   |      |     |     |     |
| 2.2pF (2R2) | D    | D   |      |     |     |     |
| 2.7pF (2R7) | D    | D   |      |     |     |     |
| 3.3pF (3R3) | D    | D   |      |     |     |     |
| 3.9pF (3R9) | D    | D   |      |     |     |     |
| 4.7pF (4R7) | D    | D   |      |     |     |     |
| 5.6pF (5R6) | D    | D   |      |     |     |     |
| 6.8pF (6R8) | D    | D   |      |     |     |     |
| 8.2pF (8R2) | D    | D   |      |     |     |     |
| 10pF (100)  | D    | D   | D    | D   | D   | D   |
| 12pF (120)  | D    | D   | D    | D   | D   | D   |
| 15pF (150)  | D    | D   | D    | D   | D   | D   |
| 18pF (180)  | D    | D   | D    | D   | D   | D   |
| 20pF (200)  | D    | D   | D    | D   | D   | D   |
| 22pF (220)  | D    | D   | D    | D   | D   | D   |
| 27pF (270)  | D    | D   | D    | D   | D   | D   |
| 33pF (330)  | D    | D   | D    | D   | D   | D   |

**CAPACITANCE RANGE - NP0 (C0G) DIELECTRIC - SIZE 1808, 1812**

Table 1-G

| SIZE          | 1808 |     | 1812 |     |     |     |
|---------------|------|-----|------|-----|-----|-----|
| VDC (V)       | 500  | 630 | 200  | 250 | 500 | 630 |
| 39pF (390)    | D    | D   | D    | D   | D   | D   |
| 47pF (470)    | D    | D   | D    | D   | D   | D   |
| 56pF (560)    | D    | D   | D    | D   | D   | D   |
| 68pF (680)    | D    | D   | D    | D   | D   | D   |
| 82pF (820)    | D    | D   | D    | D   | D   | D   |
| 100pF (101)   | D    | D   | D    | D   | D   | D   |
| 120pF (121)   | D    | D   | D    | D   | D   | D   |
| 150pF (151)   | D    | D   | D    | D   | D   | D   |
| 180pF (181)   | D    | D   | D    | D   | D   | D   |
| 220pF (221)   | D    | D   | D    | D   | D   | D   |
| 270pF (271)   | K    | K   | D    | D   | D   | D   |
| 330pF (331)   | K    | K   | D    | D   | D   | D   |
| 390pF (391)   | K    | K   | D    | D   | D   | D   |
| 470pF (471)   | K    | K   | D    | D   | D   | D   |
| 560pF (561)   | K    | K   | D    | D   | D   | D   |
| 680pF (681)   | K    | K   | D    | D   | D   | D   |
| 820pF (821)   | K    | K   | D    | D   | D   | D   |
| 1,000pF(102)  | K    | K   | D    | D   | D   | D   |
| 1,200pF (122) | K    | K   | D    | D   | D   | D   |
| 1,500pF (152) | K    | K   | D    | D   | D   | D   |
| 1,800pF (182) | K    | K   | D    | D   | D   | D   |
| 2,200pF (222) | K    | K   | D    | D   | D   | D   |
| 2,700pF (272) |      |     | D    | D   | D   | D   |
| 3,300pF (332) |      |     | D    | D   | D   | D   |
| 3,900pF (392) |      |     | D    | D   | D   | D   |
| 4,700pF (472) |      |     | D    | D   | D   | D   |
| 5,600pF (562) |      |     | D    | D   | D   | D   |
| 6,800pF (682) |      |     | D    | D   | D   | D   |
| 8,200pF (822) |      |     |      |     | D   | D   |
| 0.010μF (103) |      |     |      |     | D   | D   |
| 0.022μF (223) |      |     |      |     | K   | K   |
| 0.033μF (333) |      |     |      |     | M   | M   |

CAPACITANCE RANGE - NP0 (C0G) DIELECTRIC - SIZE 1825, 2220, 2225

Table 1-H

| SIZE          | 1825 |     |     |     | 2220 |     |     |     | 2225 |     |     |     |
|---------------|------|-----|-----|-----|------|-----|-----|-----|------|-----|-----|-----|
| VDC (V)       | 200  | 250 | 500 | 630 | 200  | 250 | 500 | 630 | 200  | 250 | 500 | 630 |
| 10pF (100)    | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 12pF (120)    | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 15pF (150)    | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 18pF (180)    | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 22pF (220)    | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 27pF (270)    | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 33pF (330)    | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 39pF (390)    | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 47pF (470)    | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 56pF (560)    | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 68pF (680)    | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 82pF (820)    | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 100pF (101)   | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 120pF (121)   | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 150pF (151)   | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 180pF (181)   | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 220pF (221)   | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 270pF (271)   | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 330pF (331)   | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 390pF (391)   | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 470pF (471)   | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 560pF (561)   | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 680pF (681)   | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 820pF (821)   | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 1,000pF (102) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 1,200pF (122) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 1,500pF (152) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 1,800pF (182) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 2,200pF (222) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 2,700pF (272) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |

**CAPACITANCE RANGE - NPO (COG) DIELECTRIC - SIZE 1825, 2220, 2225** Table 1-I

| SIZE          | 1825 |     |     |     | 2220 |     |     |     | 2225 |     |     |     |
|---------------|------|-----|-----|-----|------|-----|-----|-----|------|-----|-----|-----|
| VDC (V)       | 200  | 250 | 500 | 630 | 200  | 250 | 500 | 630 | 200  | 250 | 500 | 630 |
| 3,300pF (332) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 3,900pF (392) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 4,700pF (472) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 5,600pF (562) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 6,800pF (682) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 8,200pF (822) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 0.010uF (103) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 0.012uF (123) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 0.015uF (153) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 0.018uF (183) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 0.022uF (223) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 0.027uF (273) | K    | K   | K   | K   | K    | K   | K   |     | K    | K   | K   | K   |
| 0.033uF (333) | K    | K   | K   | K   | K    | K   | K   |     | K    | K   | K   | K   |
| 0.039uF (393) | K    | K   | M   | M   | K    | K   | M   |     | K    | K   | K   | K   |
| 0.047uF (473) | K    |     |     |     | M    | M   | M   |     | K    | K   | K   | K   |
| 0.056uF (563) | M    |     |     |     | M    | M   |     |     | M    | M   | M   | M   |
| 0.068uF (683) | M    |     |     |     | M    | M   |     |     | M    | M   | M   | M   |
| 0.082uF (823) |      |     |     |     |      |     |     |     | M    | M   | M   |     |
| 0.1uF (104)   |      |     |     |     |      |     |     |     | M    | M   |     |     |

**CAPACITANCE RANGE – X7R DIELECTRIC - SIZE 0603, 0805, 1206**

Table 2-A

| SIZE          | 0603 |     | 0805 |     |     |     | 1206 |      |     |     |
|---------------|------|-----|------|-----|-----|-----|------|------|-----|-----|
| VDC (V)       | 200  | 250 | 200  | 250 | 500 | 630 | 200  | 250  | 500 | 630 |
| 100pF (101)   | X    | X   | B    | B   | B   | B   | D    | D    | D   | D   |
| 120pF (121)   | X    | X   | B    | B   | B   | B   | D    | D    | D   | D   |
| 150pF (151)   | X    | X   | B    | B   | B   | B   | D    | D    | D   | D   |
| 180pF (181)   | X    | X   | B    | B   | B   | B   | D    | D    | D   | D   |
| 220pF (221)   | X    | X   | B    | B   | B   | B   | D    | D    | D   | D   |
| 270pF (271)   | X    | X   | B    | B   | B   | B   | D    | D    | D   | D   |
| 330pF (331)   | X    | X   | B    | B   | B   | B   | D    | D    | D   | D   |
| 390pF (391)   | X    | X   | B    | B   | B   | B   | D    | D    | D   | D   |
| 470pF (471)   | X    | X   | B    | B   | B   | B   | D    | D    | D   | D   |
| 560pF (561)   | X    | X   | B    | B   | B   | B   | D    | D    | D   | D   |
| 680pF (681)   | X    | X   | B    | B   | B   | B   | D    | D    | D   | D   |
| 820pF (821)   | X    | X   | B    | B   | B   | B   | D    | D    | D   | D   |
| 1,000pF (102) | X    | X   | B    | B   | B   | B   | D    | D    | D   | D   |
| 1,200pF (122) | X    | X   | B    | B   | B   | B   | D    | D    | D   | D   |
| 1,500pF (152) | X    | X   | B    | B   | B   | B   | D    | D    | D   | D   |
| 1,800pF (182) | X    | X   | B    | B   | B   | B   | D    | D    | D   | D   |
| 2,200pF (222) | X    | X   | B    | B   | B   | B   | D    | D    | D   | D   |
| 2,700pF (272) | X    | X   | B    | B   | B   | B   | D    | D    | D   | D   |
| 3,300pF (332) | X    | X   | B    | B   | B   | B   | D    | D    | D   | D   |
| 3,900pF (392) | X    | X   | B    | B   | B   | B   | D    | D    | D   | D   |
| 4,700pF (472) | X    | X   | B    | B   | D   | D   | D    | D    | D   | D   |
| 5,600pF (562) | X    | X   | D    | D   | D   | D   | D    | D    | D   | D   |
| 6,800pF (682) | X    | X   | D    | D   | D   | D   | D    | D    | D   | D   |
| 8,200pF (822) | X    | X   | D    | D   | D   | D   | D    | D    | D   | D   |
| 0.010μF (103) | X    | X   | D    | D   | D   | D   | D    | B/ D | D   | D   |
| 0.012μF (123) |      |     | D    | D   | D   | D   | D    | D    | D   | D   |
| 0.015μF (153) |      |     | D    | D   | D   | D   | D    | D    | D   | D   |
| 0.018μF (183) |      |     | D    | D   | D   | D   | D    | D    | D   | D   |
| 0.022μF (223) |      |     | D    | D   | D   | D   | D    | D    | G   | G   |
| 0.027μF (273) |      |     | D    | D   |     |     | D    | D    | G   | G   |

**CAPACITANCE RANGE – X7R DIELECTRIC - SIZE 0603, 0805, 1206**

Table 2-B

| SIZE          | 0805 |     |     |     | 1206 |     |     |     |     |     |
|---------------|------|-----|-----|-----|------|-----|-----|-----|-----|-----|
| VDC (V)       | 200  | 250 | 500 | 630 | 200  | 250 | 400 | 450 | 500 | 630 |
| 0.033μF (333) | D    | D   |     |     | G    | G   |     |     | G   | G   |
| 0.039μF (393) | D    | D   |     |     | G    | G   |     |     | G   | G   |
| 0.047μF (473) | D    | D   |     |     | G    | G   |     |     | G   | G   |
| 0.056μF (563) | D    | D   |     |     | G    | G   |     |     | G   | G   |
| 0.068μF (683) | D    | D   |     |     | G    | G   | G   | G   |     |     |
| 0.082μF (823) | D    |     |     |     | G    | G   | G   | G   |     |     |
| 0.10μF (104)  | D    |     |     |     | G    | G   | G   | G   |     |     |
| 0.12μF (124)  |      |     |     |     | G    | G   |     |     |     |     |
| 0.15μF (154)  |      |     |     |     | G    | G   |     |     |     |     |
| 0.18μF (184)  |      |     |     |     | G    | G   |     |     |     |     |
| 0.22μF (224)  |      |     |     |     | G    | G   |     |     |     |     |

**CAPACITANCE RANGE – X7R DIELECTRIC - SIZE 1210, 1808, 1812**

Table 2-C

| SIZE          | 1210 |     |     |     | 1808 |     | 1812 |     |     |     |
|---------------|------|-----|-----|-----|------|-----|------|-----|-----|-----|
| VDC (V)       | 200  | 250 | 500 | 630 | 500  | 630 | 200  | 250 | 500 | 630 |
| 100pF (101)   | D    | D   | D   | D   |      |     |      |     |     |     |
| 120pF (121)   | D    | D   | D   | D   |      |     |      |     |     |     |
| 150pF (151)   | D    | D   | D   | D   | D    | D   |      |     |     |     |
| 180pF (181)   | D    | D   | D   | D   | D    | D   |      |     |     |     |
| 220pF (221)   | D    | D   | D   | D   | D    | D   |      |     |     |     |
| 270pF (271)   | D    | D   | D   | D   | D    | D   |      |     |     |     |
| 330pF (331)   | D    | D   | D   | D   | D    | D   |      |     |     |     |
| 390pF (391)   | D    | D   | D   | D   | D    | D   |      |     |     |     |
| 470pF (471)   | D    | D   | D   | D   | D    | D   |      |     |     |     |
| 560pF (561)   | D    | D   | D   | D   | D    | D   |      |     |     |     |
| 680pF (681)   | C    | C   | D   | D   | D    | D   |      |     |     |     |
| 820pF (821)   | C    | C   | D   | D   | D    | D   |      |     |     |     |
| 1,000pF (102) | C    | C   | D   | D   | D    | D   | D    | D   | D   | D   |
| 1,200pF (122) | C    | C   | D   | D   | D    | D   | D    | D   | D   | D   |
| 1,500pF (152) | C    | C   | D   | D   | D    | D   | D    | D   | D   | D   |

**CAPACITANCE RANGE – X7R DIELECTRIC - SIZE 1210, 1808, 1812**

Table 2-D

| SIZE          | 1210 |     |     |     | 1808 |     | 1812 |     |     |     |
|---------------|------|-----|-----|-----|------|-----|------|-----|-----|-----|
| VDC (V)       | 200  | 250 | 500 | 630 | 500  | 630 | 200  | 250 | 500 | 630 |
| 1,800pF (182) | C    | C   | D   | D   | D    | D   | D    | D   | D   | D   |
| 2,200pF (222) | C    | C   | D   | D   | D    | D   | D    | D   | D   | D   |
| 2,700pF (272) | C    | C   | D   | D   | D    | D   | D    | D   | D   | D   |
| 3,300pF (332) | C    | C   | D   | D   | D    | D   | D    | D   | D   | D   |
| 3,900pF (392) | C    | C   | D   | D   | D    | D   | D    | D   | D   | D   |
| 4,700pF (472) | C    | C   | D   | D   | D    | D   | D    | D   | D   | D   |
| 5,600pF (562) | C    | C   | D   | D   | K    | K   | D    | D   | D   | D   |
| 6,800pF (682) | C    | C   | D   | D   | K    | K   | D    | D   | D   | D   |
| 8,200pF (822) | C    | C   | D   | D   | K    | K   | D    | D   | D   | D   |
| 0.010μF (103) | C    | C   | D   | D   | K    | K   | D    | D   | D   | D   |
| 0.012μF (123) | C    | C   | D   | D   | K    | K   | D    | D   | D   | D   |
| 0.015μF (153) | C    | C   | D   | D   | K    | K   | D    | D   | D   | D   |
| 0.018μF (183) | C    | C   | D   | D   | K    | K   | D    | D   | D   | D   |
| 0.022μF (223) | C    | C   | D   | D   | K    | K   | D    | D   | D   | D   |
| 0.027μF (273) | C    | C   | G   | G   | K    | K   | D    | D   | D   | D   |
| 0.033μF (333) | C    | C   | G   | G   | K    | K   | D    | D   | D   | D   |
| 0.039μF (393) | C    | C   | G   | G   | K    | K   | D    | D   | D   | D   |
| 0.047μF (473) | D    | D   | G   | G   | K    | K   | D    | D   | D   | D   |
| 0.056μF (563) | D    | D   | G   | G   | K    | K   | D    | D   | K   | K   |
| 0.068μF (683) | G    | G   | K   | K   | K    | K   | D    | D   | K   | K   |
| 0.082μF (823) | G    | G   | K   | K   | K    | K   | D    | D   | K   | K   |
| 0.10μF (104)  | G    | G   | K   | K   |      |     | D    | D   | K   | K   |

**CAPACITANCE RANGE – X7R DIELECTRIC - SIZE 1210, 1808, 1812**

Table 2-E

| SIZE         | 1210 |     |     |     |     |     | 1812 |     |     |     |
|--------------|------|-----|-----|-----|-----|-----|------|-----|-----|-----|
| VDC (V)      | 200  | 250 | 400 | 450 | 500 | 630 | 200  | 250 | 500 | 630 |
| 0.12μF (124) | G    | G   | M   | M   | M   | M   | D    | D   | M   | M   |
| 0.15μF (154) | M    | M   | M   | M   | M   | M   | K    | K   | M   | M   |
| 0.18μF (184) | M    | M   | M   | M   |     |     | K    | K   | M   | M   |
| 0.22μF (224) | M    | M   | M   | M   |     |     | K    | K   | M   | M   |
| 0.27μF (274) | M    | M   | M   | M   |     |     | K    | K   | M   |     |
| 0.33μF (334) | M    | M   | M   | M   |     |     | K    | K   | M   |     |
| 0.39μF (394) | M    | M   |     |     |     |     | K    | K   | M   |     |
| 0.47μF (474) | M    | M   |     |     |     |     | K    | K   | M   |     |
| 0.56μF (564) | M    | M   |     |     |     |     | M    | M   |     |     |
| 0.68μF (684) | M    | M   |     |     |     |     | M    | M   |     |     |
| 0.84μF (844) |      |     |     |     |     |     | M    | M   |     |     |
| 1.0μF (105)  |      |     |     |     |     |     | M    | M   |     |     |

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

Table 2-F

| Size          | 1825 |     |     |     | 2220 |     |     |     | 2225 |     |     |     |
|---------------|------|-----|-----|-----|------|-----|-----|-----|------|-----|-----|-----|
| VDC (V)       | 200  | 250 | 500 | 630 | 200  | 250 | 500 | 630 | 200  | 250 | 500 | 630 |
| 1,000pF (102) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 1,200pF (122) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 1,500pF (152) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 1,800pF (182) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 2,200pF (222) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 2,700pF (272) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 3,300pF (332) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 3,900pF (392) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 4,700pF (472) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 5,600pF (562) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |

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

Table 2-G

| SIZE          | 1825 |     |     |     | 2220 |     |     |     | 2225 |     |     |     |
|---------------|------|-----|-----|-----|------|-----|-----|-----|------|-----|-----|-----|
| VDC (V)       | 200  | 250 | 500 | 630 | 200  | 250 | 500 | 630 | 200  | 250 | 500 | 630 |
| 6,800pF (682) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 8,200pF (822) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 0.010μF (103) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 0.012μF (123) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 0.015μF (153) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 0.018μF (183) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 0.022μF (223) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 0.027μF (273) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 0.033μF (333) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 0.039μF (393) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 0.047μF (473) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 0.056μF (563) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 0.068μF (683) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 0.082μF (823) | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 0.10μF (104)  | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 0.12μF (124)  | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 0.15μF (154)  | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 0.18μF (184)  | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 0.22μF (224)  | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 0.27μF (274)  | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 0.33μF (334)  | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 0.39μF (394)  | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 0.47μF (474)  | K    | K   | K   | K   | K    | K   | K   | K   | K    | K   | K   | K   |
| 0.56μF (564)  | K    | K   | M   | M   | K    | K   | M   | M   | K    | K   | K   | K   |
| 0.68μF (684)  | K    | K   |     |     | K    | K   | M   | M   | K    | K   |     |     |
| 0.82μF (824)  | K    | K   |     |     | K    | K   | U   | U   | K    | K   |     |     |
| 1.0μF (105)   | K    | K   |     |     | K    | K   | U   | U   | K    | K   |     |     |
| 1.5μF (155)   |      |     |     |     | M    | M   |     |     | M    | M   |     |     |
| 2.2μF (225)   |      |     |     |     | M    | M   |     |     | M    | M   |     |     |

## RELIABILITY TEST CONDITIONS AND REQUIREMENTS

| ITEM                          | TEST CONDITION                                                                                                                                                                                                                     | REQUIREMENTS                                                                          |            |           |                   |     |                   |     |                  |                                                                                                                                                                                                            |     |                    |           |                  |     |             |     |                  |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|------------|-----------|-------------------|-----|-------------------|-----|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|--------------------|-----------|------------------|-----|-------------|-----|------------------|
| Visual and Mechanical         | -                                                                                                                                                                                                                                  | * No remarkable defect.<br>* Dimensions to conform to individual spec. sheet.         |            |           |                   |     |                   |     |                  |                                                                                                                                                                                                            |     |                    |           |                  |     |             |     |                  |
| Capacitance                   | * Test temp.: Room Temperature.<br>Class I: NP0 (C0G)<br>Cap.≤1000pF, 1.0±0.2Vrms, 1MHz±10%<br>Cap.>1000pF, 1.0±0.2Vrms,1KHz±10%<br>Class II: (X7R, Y5V) : 1.0±0.2Vrms, 1KHz±10%                                                   | * Shall not exceed the limits given in the detailed spec.                             |            |           |                   |     |                   |     |                  |                                                                                                                                                                                                            |     |                    |           |                  |     |             |     |                  |
| Q/D.F<br>(Dissipation Factor) |                                                                                                                                                                                                                                    | NP0 (C0G):<br>• Cap≥30pF, Q≥1000;<br>• Cap<30pF,Q≥400+20C<br>X7R: ≤2.5%<br>Y5V: ≤5.0% |            |           |                   |     |                   |     |                  |                                                                                                                                                                                                            |     |                    |           |                  |     |             |     |                  |
| Temperature Coefficient       | With no electrical load. <table><tr><td>T.C</td><td>Temp. (°C)</td></tr><tr><td>NP0 (C0G)</td><td>-55~125°C at 25°C</td></tr><tr><td>X7R</td><td>-55~125°C at 25°C</td></tr><tr><td>Y5V</td><td>-25~85°C at 20°C</td></tr></table> | T.C                                                                                   | Temp. (°C) | NP0 (C0G) | -55~125°C at 25°C | X7R | -55~125°C at 25°C | Y5V | -25~85°C at 20°C | <table><tr><td>T.C</td><td>Capacitance Change</td></tr><tr><td>NP0 (C0G)</td><td>Within ±30ppm/°C</td></tr><tr><td>X7R</td><td>Within ±15%</td></tr><tr><td>Y5V</td><td>Within +30%/-80%</td></tr></table> | T.C | Capacitance Change | NP0 (C0G) | Within ±30ppm/°C | X7R | Within ±15% | Y5V | Within +30%/-80% |
| T.C                           | Temp. (°C)                                                                                                                                                                                                                         |                                                                                       |            |           |                   |     |                   |     |                  |                                                                                                                                                                                                            |     |                    |           |                  |     |             |     |                  |
| NP0 (C0G)                     | -55~125°C at 25°C                                                                                                                                                                                                                  |                                                                                       |            |           |                   |     |                   |     |                  |                                                                                                                                                                                                            |     |                    |           |                  |     |             |     |                  |
| X7R                           | -55~125°C at 25°C                                                                                                                                                                                                                  |                                                                                       |            |           |                   |     |                   |     |                  |                                                                                                                                                                                                            |     |                    |           |                  |     |             |     |                  |
| Y5V                           | -25~85°C at 20°C                                                                                                                                                                                                                   |                                                                                       |            |           |                   |     |                   |     |                  |                                                                                                                                                                                                            |     |                    |           |                  |     |             |     |                  |
| T.C                           | Capacitance Change                                                                                                                                                                                                                 |                                                                                       |            |           |                   |     |                   |     |                  |                                                                                                                                                                                                            |     |                    |           |                  |     |             |     |                  |
| NP0 (C0G)                     | Within ±30ppm/°C                                                                                                                                                                                                                   |                                                                                       |            |           |                   |     |                   |     |                  |                                                                                                                                                                                                            |     |                    |           |                  |     |             |     |                  |
| X7R                           | Within ±15%                                                                                                                                                                                                                        |                                                                                       |            |           |                   |     |                   |     |                  |                                                                                                                                                                                                            |     |                    |           |                  |     |             |     |                  |
| Y5V                           | Within +30%/-80%                                                                                                                                                                                                                   |                                                                                       |            |           |                   |     |                   |     |                  |                                                                                                                                                                                                            |     |                    |           |                  |     |             |     |                  |
| Insulation Resistance         | UR=100V: To apply voltage at UR for max. 120 sec.<br>UR>100V: To apply voltage at UR (500V max.) for 60 sec.                                                                                                                       | ≥10GΩ or RxC≥100Ω-F<br>whichever is smaller.                                          |            |           |                   |     |                   |     |                  |                                                                                                                                                                                                            |     |                    |           |                  |     |             |     |                  |
| Dielectric Strength           | * To apply voltage:<br>• 200V/250V =2 times of UR<br>• 500V/630V =1.5 times of UR<br>* Duration: 1 to 5 sec                                                                                                                        | * No evidence of damage or flash over during test.                                    |            |           |                   |     |                   |     |                  |                                                                                                                                                                                                            |     |                    |           |                  |     |             |     |                  |
| Solderability                 | * Solder temperature: 235±5° C<br>* Dipping time: 2±0.5 sec.                                                                                                                                                                       | 95% min. coverage of all metalized area.                                              |            |           |                   |     |                   |     |                  |                                                                                                                                                                                                            |     |                    |           |                  |     |             |     |                  |

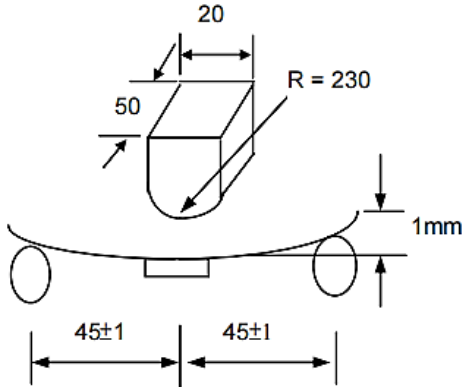
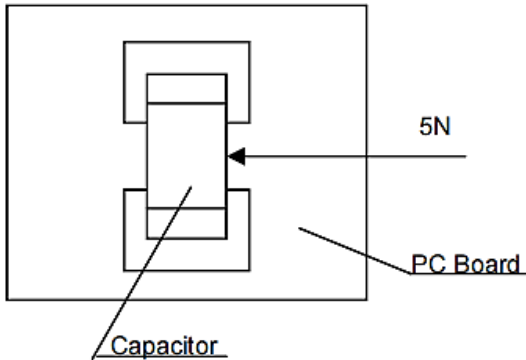
## RELIABILITY TEST CONDITIONS AND REQUIREMENTS

| ITEM                            | TEST CONDITION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | REQUIREMENTS                                                                                                                                                                                                                                                               |            |           |   |                           |      |   |            |     |   |                           |      |   |            |     |                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----------|---|---------------------------|------|---|------------|-----|---|---------------------------|------|---|------------|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Resistance to Soldering<br>Heat | <p>* Solder temperature: 260±5°C</p> <p>* Dipping time: 10±1 sec</p> <p>* Preheating: 120 to 150°C for 1 minute before immerse the capacitor in a eutectic solder.</p> <p>* Before initial measurement (Class II only): Perform 150+0/-10°C for 1 hr and then set for 48±4 hrs at room temp.</p> <p>* Measurement to be made after keeping at room temp. for 24±2hrs (Class I) or 48±4 hrs (Class II).</p>                                                                                                                                                                                                                                                                                     | <p>* No remarkable damage.</p> <p>* Cap change:<br/>NP0 (C0G): within ±2.5% or ±0.25pF whichever is larger.<br/>X7R: within ±7.5%<br/>Y5V: within ±20%</p> <p>* Q/D.F.:<br/>NP0 (C0G)/ X7R/ Y5V : ≤ 1.0 × Initial requirement</p> <p>* 25% max. leaching on each edge.</p> |            |           |   |                           |      |   |            |     |   |                           |      |   |            |     |                                                                                                                                                                                                                                                                                                                                                                                                          |
| Temperature Cycle               | <p>*Conduct the five cycles according to the temperatures and time.</p> <table border="1"> <thead> <tr> <th>Step</th><th>Temp. (°C)</th><th>Time(min)</th></tr> </thead> <tbody> <tr> <td>1</td><td>Min. operating temp.+0/-3</td><td>30±3</td></tr> <tr> <td>2</td><td>Room temp.</td><td>2~3</td></tr> <tr> <td>3</td><td>Max. operating temp.+3/-0</td><td>30±3</td></tr> <tr> <td>4</td><td>Room temp.</td><td>2~3</td></tr> </tbody> </table> <p>* Before initial measurement (Class II only): Perform 150+0/-10° C for 1 hr and then set for 48 ± 4 hrs at room temp.</p> <p>* Measurement to be made after keeping at room temp. for 24 ± 2 hrs (Class I) or 48 ± 4 hrs (Class II).</p> | Step                                                                                                                                                                                                                                                                       | Temp. (°C) | Time(min) | 1 | Min. operating temp.+0/-3 | 30±3 | 2 | Room temp. | 2~3 | 3 | Max. operating temp.+3/-0 | 30±3 | 4 | Room temp. | 2~3 | <p>* No remarkable damage.</p> <p>* Cap change:</p> <ul style="list-style-type: none"> <li>NP0 (C0G): within ± 2.5% or 0.25pF whichever is larger</li> <li>X7R: within ± 7.5%</li> <li>Y5V: within ± 20%</li> </ul> <p>* Q/D.F.:</p> <ul style="list-style-type: none"> <li>NP0(C0G)/X7R/Y5V: ≤1.0 × Initial * I.R. ≥ 0.25 × initial requirement</li> </ul> <p>* I.R. ≥ 0.25 × initial requirements.</p> |
| Step                            | Temp. (°C)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Time(min)                                                                                                                                                                                                                                                                  |            |           |   |                           |      |   |            |     |   |                           |      |   |            |     |                                                                                                                                                                                                                                                                                                                                                                                                          |
| 1                               | Min. operating temp.+0/-3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 30±3                                                                                                                                                                                                                                                                       |            |           |   |                           |      |   |            |     |   |                           |      |   |            |     |                                                                                                                                                                                                                                                                                                                                                                                                          |
| 2                               | Room temp.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 2~3                                                                                                                                                                                                                                                                        |            |           |   |                           |      |   |            |     |   |                           |      |   |            |     |                                                                                                                                                                                                                                                                                                                                                                                                          |
| 3                               | Max. operating temp.+3/-0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 30±3                                                                                                                                                                                                                                                                       |            |           |   |                           |      |   |            |     |   |                           |      |   |            |     |                                                                                                                                                                                                                                                                                                                                                                                                          |
| 4                               | Room temp.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 2~3                                                                                                                                                                                                                                                                        |            |           |   |                           |      |   |            |     |   |                           |      |   |            |     |                                                                                                                                                                                                                                                                                                                                                                                                          |

## RELIABILITY TEST CONDITIONS AND REQUIREMENTS

| ITEM                                       | TEST CONDITION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | REQUIREMENTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                    |      |         |           |      |            |                    |      |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|------|---------|-----------|------|------------|--------------------|------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Humidity<br>(Damp Heat)<br>Load            | <ul style="list-style-type: none"><li>* Test temp.: <math>40 \pm 2^{\circ} \text{C}</math></li><li>* Humidity: 90~95%RH</li><li>* Test time: 500+24/-0 hrs.</li><li>* To apply voltage: rated voltage (Max. 500V)</li><li>* Measurement to be made after keeping at room temp. for <math>24 \pm 2</math> hrs. (Class I) or <math>48 \pm 4</math> hrs. (Class II)..</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <ul style="list-style-type: none"><li>* No remarkable damage.</li><li>* Cap change: NP0: within <math>\pm 7.5\%</math> or <math>\pm 0.75\text{pF}</math> whichever is larger.</li><li>X7R: within <math>\pm 12.5\%</math></li><li>Y5V: within <math>\pm 30\%</math></li><li>* Q/D.F. value:<br/>NP0: <math>\text{Cap} \geq 30\text{pF}</math>, <math>Q \geq 200</math>;<br/><math>\text{Cap} &lt; 30\text{pF}</math>, <math>Q \geq 100 + 10/3C</math></li><li>X7R: <math>\leq 3.0\%</math></li><li>Y5V: <math>\leq 7.5\%</math></li><li>* I.R.: <math>\geq 500\text{M}\Omega</math> or <math>\text{RxC} \geq 25\Omega\text{-F}</math> whichever is smaller.</li></ul> |                    |      |         |           |      |            |                    |      |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| High<br>Temperature<br>Load<br>(Endurance) | <ul style="list-style-type: none"><li>* Test temp.:<br/>C0G(NP0), X7R: <math>125 \pm 3^{\circ}\text{C}</math><br/>Y5V: <math>85 \pm 3^{\circ}\text{C}</math></li><li>* To apply voltage:<br/>(1) <math>\text{UR} \leq 250\text{V}</math>: 200% of rated voltage.<br/>Exception item:<br/>UR Size Cap Voltage</li></ul> <table><tr><td>UR</td><td>Size</td><td>Cap.</td><td>Voltage</td></tr><tr><td rowspan="2">200V/250V</td><td>1210</td><td><math>\geq 224</math></td><td rowspan="2">1.5 times<br/>of UR</td></tr><tr><td>1812</td><td><math>\geq 474</math></td></tr></table> <ul style="list-style-type: none"><li>(2) <math>250 &lt; \text{UR} \leq 500\text{V}</math>: 150% of rated voltage.</li><li>(3) <math>\text{UR} &gt; 500\text{V}</math>: 120% of rated voltage.</li><li>(4) 1206, NP0 <math>\geq 1.5\text{pF}</math>: 100% of rated voltage.</li><li>* Test time: 1000+24/-0 hrs.</li><li>* Measurement to be made after keeping at room temp. for <math>24 \pm 2</math> hrs (Class I) or <math>48 \pm 4</math> hrs (Class II).</li></ul> | UR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Size               | Cap. | Voltage | 200V/250V | 1210 | $\geq 224$ | 1.5 times<br>of UR | 1812 | $\geq 474$ | <ul style="list-style-type: none"><li>* No remarkable damage.</li><li>* Cap change:<br/>C0G(NP0) : within <math>\pm 3\%</math> or <math>\pm 0.3\text{pF}</math> whichever is larger</li><li>X7R : within <math>\pm 12.5\%</math></li><li>Y5V : within <math>\pm 30\%</math></li><li>* Q/D.F Value:<br/>C0G(NP0): <math>\text{Cap} \geq 30\text{pF}</math> : <math>Q \geq 350</math>;<br/><math>10\text{pF} \leq \text{Cap} &lt; 30\text{pF}</math> : <math>Q \geq 275 + 2.5C</math>;<br/><math>\text{Cap} &lt; 10\text{pF}</math> : <math>Q \geq 200 + 10C</math></li><li>X7R: <math>\leq 3.0\%</math></li><li>Y5V: <math>\leq 7.5\%</math></li><li>* I.R.: <math>\geq 1\text{G}\Omega</math> or <math>\text{RxC} \geq 50\Omega\text{-F}</math> whichever is smaller.</li></ul> |
| UR                                         | Size                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Cap.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Voltage            |      |         |           |      |            |                    |      |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 200V/250V                                  | 1210                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | $\geq 224$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1.5 times<br>of UR |      |         |           |      |            |                    |      |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                            | 1812                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | $\geq 474$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                    |      |         |           |      |            |                    |      |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

RELIABILITY TEST CONDITIONS AND REQUIREMENTS

| ITEM                               | TEST CONDITION                                                                                                                                                                                                                                                                                                                   | REQUIREMENTS                                                                                                                                                                                                                                                                                                                                                                                |
|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Resistance to Flexure of Substrate | <p>* The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1mm per second until the deflection becomes 1 mm.</p>                                                                                | <p>* No remarkable damage.</p> <p>* Cap change:<br/> COG(NP0): within <math>\pm 5.0\%</math> or <math>\pm 0.5\text{pF}</math> whichever is larger.<br/> X7R: within <math>\pm 12.5\%</math><br/> Y5V: within <math>\pm 30\%</math></p> <p>(This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)</p> |
| Adhesive Strength of Termination   | <p>* Capacitors mounted on a substrate. A force of 5N(<math>\leq 0603</math>) or 10N(&gt; 0603) applied perpendicular to the place of substrate and parallel the line joining the center of terminations for 10<math>\pm</math>1 second.</p>  | <p>* No remarkable damage or removal of the terminations.</p>                                                                                                                                                                                                                                                                                                                               |
| Vibration Resistance               | <p>* Vibration frequency: 10~55 Hz/min.</p> <p>* Total amplitude: 1.5mm</p> <p>* Test time: 6 hrs. (Two hrs each in three mutually perpendicular directions.)</p>                                                                                                                                                                | <p>* No remarkable damage.</p> <p>* Cap change and Q/D.F.: To meet initial spec.</p>                                                                                                                                                                                                                                                                                                        |

## **STORAGE AND HANDLING CONDITIONS**

- To prevent the damage of solderability of terminations, the following storage conditions are recommended:  
Indoors under 5 ~ 40°C and 20% ~ 70% RH.
- No harmful gases containing sulfuric acid, ammonia, hydrogen sulfide or chlorine.
- Packaging should not be opened until the capacitors are required for use. If opened, the pack should be re-sealed as soon as is practicable. Taped product should be stored out of direct sunlight, which might promote deterioration in tape or adhesion performance. The capacitors should be used within 6 months and checked the solderability before use.

## **HANDLING**

- Chip capacitors are dense, hard, brittle, and abrasive materials. They are liable to suffer mechanical damage, in the form of cracks or chips. Chip Capacitors should be handled with care to avoid contamination or damage. To use vacuum or plastic tweezers to pick up or plastic tweezers is recommended for manual placement. Tape and reeled packages are suitable for automatic pick and placement machine.

## **PREHEAT**

- In order to minimize the risk of thermal shock during soldering, a carefully controlled preheat is required. The rate of preheat should not exceed 4°C per second and the final preheat temperature should be within 100°C of the soldering temperature for small chips such as 0402, 0603, 0805 and 1206, within 50°C of the soldering temperature for bigger chips such as 1210, 1808, 1812, 1825, 2220 and 2225, etc.

## **SOLDERING – PART I**

- Use mildly activated rosin RA and RMA fluxes do not use activated flux. The amount of solder in each solder joint should be controlled to prevent the damage of chip capacitors caused by the stress between solder, chips, and substrate.
- Hand soldering with temperature-controlled iron not exceeding 30 watts and diameter of tip less than 1.2mm is recommended, tip of iron should not contact the ceramic body directly, and the temperature of iron should be set to not more than 260°C. For bigger chips such as 1210, 1808, 1812, 2220 and 2225, etc. wave soldering and hand soldering are not recommended.

**SOLDERING – PART II**

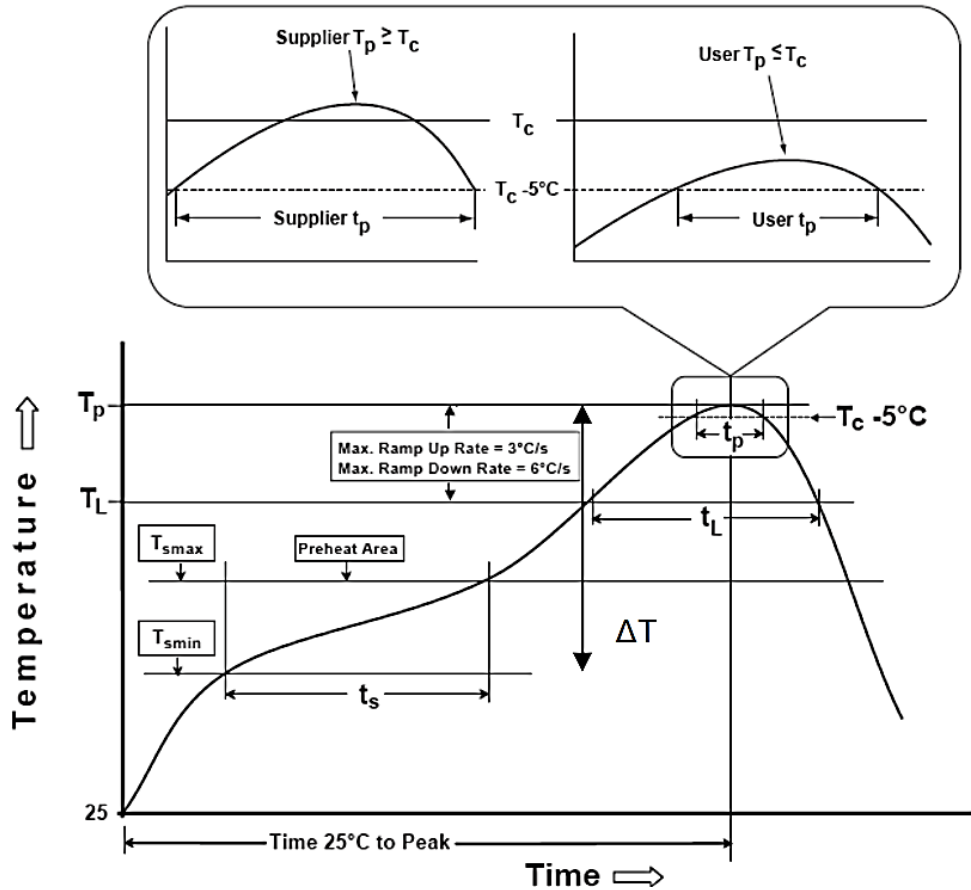
- Refer IPC/JEDEC J-STD-020D Method recommended soldering profiles :

Reflow not sooner than 15 minutes and not longer than 4 hrs after removal from the temperature/humidity chamber, subject the sample to 3 cycle of the appropriate reflow conditions as defined as blow Table description.

| PROFILE FEATURE                                                       |                 |                    | PB-FREE ASSEMBLY                                                                                                                                                                         |
|-----------------------------------------------------------------------|-----------------|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Preheat                                                               | Temperature Min | Ts Min.            | 150°C                                                                                                                                                                                    |
|                                                                       | Temperature Max | Ts Max.            | 200°C                                                                                                                                                                                    |
|                                                                       | Time            | ts Min. to ts Max. | 60 ~ 120 seconds                                                                                                                                                                         |
| Ramp-up rate                                                          |                 | TL to Tp           | 3 °C /Second Max.                                                                                                                                                                        |
| Liquidous temperature                                                 |                 | TL                 | 217 °C                                                                                                                                                                                   |
| Time(tL) maintained above TL                                          |                 |                    | 60 to 150 seconds                                                                                                                                                                        |
| Peak package body temperature                                         |                 | Tp                 | <ul style="list-style-type: none"> <li>For user Tp must not exceed the Classification temp 260°C</li> <li>For suppliers Tp must equal or exceed the Classification temp 260°C</li> </ul> |
| Time(Tp)* within 5 of the specified °C classification temperature(Tc) |                 |                    | 30* seconds                                                                                                                                                                              |
| Ramp-down rate                                                        |                 | Tp to TL           | 6 °C /Second Max.                                                                                                                                                                        |
| Time 25 °C to Peak Temperature                                        |                 |                    | 8 minutes Max.                                                                                                                                                                           |
| Suggest reflow times                                                  |                 |                    | 3 Times Max.                                                                                                                                                                             |

- Lead-free : Soldering temperature = 235 to 260°C, depending on product.
- Max. Temperature = Min. Temperature (235°C)+ΔT+ Tolerance for oven process and Measurement (5 ~ 7°C)
- Time at peak temperature = 10sec, Dwell above 217°C = 90sec, Ramping rate = 3°C/sec(heating) and 6 °C/sec (heating).

RECOMMENDED PROFILE CONDITIONS



| CHIP SIZE                                | $\Delta T$ |
|------------------------------------------|------------|
| 0402, 0603, 0805, 1206                   | 100 °C     |
| 1210, 1808, 1812, 1825, 2211, 2220, 2225 | 50 °C      |

| SOLDERING | SOLDER TIME T) | SOLDERING TEMP.(t) |
|-----------|----------------|--------------------|
| Reflow    | 235 – 260 °C   | < 15 sec.          |
| Wave      | 230 – 260 °C   | < 5 sec.           |

Note :

- For example,  $T_c$  is 260°C and time  $t_p$  is 15sec.
- for user : The peak temperature must not exceed 260°C. The time above 255°C must not exceed 15 seconds.

**COOLING**

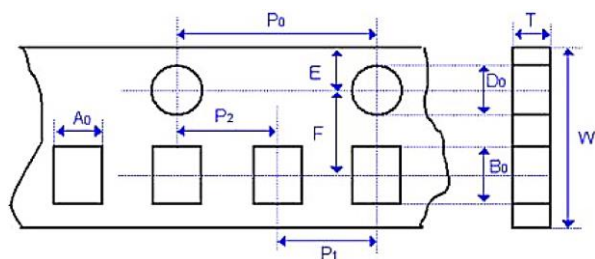
- After soldering, cool the chips and the substrate gradually to room temperature. Natural cooling in air is recommended to minimize stress in the solder joint. A cooling rate not exceeding 4°C per second should be used when forced cooling is necessary.

**CLEANING**

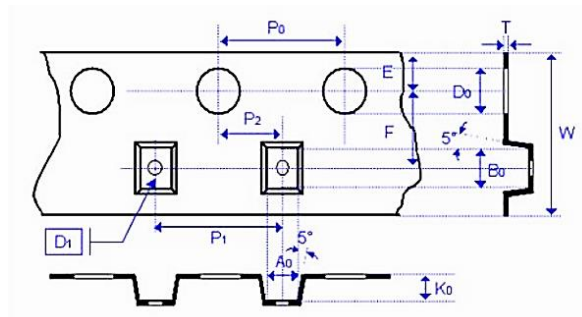
- All flux residues must be removed by using suitable electronic-grade vapor-cleaning solvents to eliminate contamination that could cause electrolytic surface corrosion. Good results can be obtained by using ultrasonic cleaning of the solvent. The choice of the proper system is depends upon many factors such as component mix, flux, and solder paste and assembly method. The ability of the cleaning system to remove flux residues and contamination from under the chips is very important.

**TAPE DIMENSION** (Unit: mm)

Paper Tape



Plastic Tape



| SIZE      | 0201             | 0402             | 0603             |
|-----------|------------------|------------------|------------------|
| Thickness | L                | H                | H, S, B, X       |
| A0        | $0.40 \pm 0.10$  | $0.70 \pm 0.20$  | $1.05 \pm 0.30$  |
| B0        | $0.70 \pm 0.10$  | $1.20 \pm 0.20$  | $1.80 \pm 0.30$  |
| T         | $\leq 0.55$      | $\leq 0.80$      | $\leq 1.20$      |
| K0        | -                | -                | -                |
| W         | $8.00 \pm 0.30$  | $8.00 \pm 0.30$  | $8.00 \pm 0.30$  |
| P0        | $4.00 \pm 0.10$  | $4.00 \pm 0.10$  | $4.00 \pm 0.10$  |
| 10xP0     | $40.00 \pm 0.10$ | $40.00 \pm 0.10$ | $40.00 \pm 0.20$ |
| P1        | $2.00 \pm 0.05$  | $2.00 \pm 0.05$  | $4.00 \pm 0.10$  |
| P2        | $2.00 \pm 0.05$  | $2.00 \pm 0.05$  | $2.00 \pm 0.05$  |
| D0        | $1.50 + 0.1/-0$  | $1.50 + 0.1/-0$  | $1.50 + 0.1/-0$  |
| D1        | -                | -                | -                |
| E         | $1.75 \pm 0.10$  | $1.75 \pm 0.10$  | $1.75 \pm 0.10$  |
| F         | $3.50 \pm 0.05$  | $3.50 \pm 0.05$  | $3.50 \pm 0.05$  |

**TAPE DIMENSION** (Unit: mm)

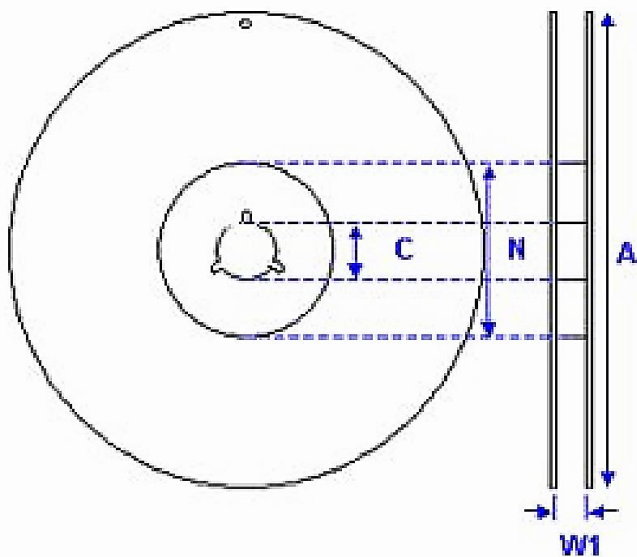
| SIZE      | 0805        |             |             | 1206        |             |             |
|-----------|-------------|-------------|-------------|-------------|-------------|-------------|
| Thickness | A, H        | B, X        | C           | B           | I, C, J     | D, P        |
| A0        | 1.50±0.20   | 1.50±0.20   | <1.80       | 1.90±0.50   | < 2.00      | <2.30       |
| B0        | 2.30±0.20   | 2.30±0.20   | < 2.70      | 3.50±0.50   | < 3.70      | < 4.00      |
| T         | ≤1.15       | ≤1.20       | 0.23±0.1    | ≤1.20       | 0.23±0.1    | 0.23±0.1    |
| K0        | -           | -           | < 2.50      | -           | < 2.50      | < 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     | 40.00±0.20  | 40.00±0.20  | 40.00±0.20  | 40.00±0.20  | 40.00±0.20  | 40.00±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   |
| 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      | 1210        |             |             | 1812        |             |
|-----------|-------------|-------------|-------------|-------------|-------------|
| Thickness | B           | I, C, D, K  | M           | C, D, K     | M, U        |
| A0        | < 3.05      | < 3.05      | < 3.20      | < 3.90      | < 3.90      |
| B0        | < 3.80      | < 3.80      | < 4.00      | < 5.30      | < 5.30      |
| T         | 0.23±0.1    | 0.23±0.1    | 0.23±0.1    | 0.25±0.1    | 0.25±0.1    |
| K0        | < 1.50      | < 2.50      | < 3.20      | < 2.50      | < 3.50      |
| W         | 8.00±0.30   | 8.00±0.30   | 8.00±0.30   | 12.00±0.30  | 12.00±0.30  |
| P0        | 4.00±0.10   | 4.00±0.10   | 4.00±0.10   | 4.00±0.10   | 4.00±0.10   |
| 10xP0     | 40.00±0.20  | 40.00±0.20  | 40.00±0.20  | 40.00±0.20  | 40.00±0.20  |
| P1        | 4.00±0.10   | 4.00±0.10   | 4.00±0.10   | 8.00±0.10   | 8.00±0.10   |
| P2        | 2.00±0.05   | 2.00±0.05   | 2.00±0.05   | 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 |
| D1        | 1.00±0.10   | 1.00±0.10   | 1.00±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   |
| F         | 3.50±0.05   | 3.50±0.05   | 3.50±0.05   | 5.50±0.10   | 5.50±0.10   |

**TAPE DIMENSION** (Unit: mm)

| SIZE      | 1825         |              | 2220         |              | 2225         |              |
|-----------|--------------|--------------|--------------|--------------|--------------|--------------|
| Thickness | K            | M, U         | K            | M, U         | K            | M, U         |
| A0        | < 6.80       | < 6.80       | < 5.80       | < 5.80       | < 6.80       | < 6.80       |
| B0        | < 5.30       | < 5.30       | < 6.50       | < 6.50       | < 6.50       | < 6.50       |
| T         | 0.30 +/-0.1  | 0.30 +/-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 +/-0.10 | 5.50 +/-0.10 | 5.50 +/-0.10 | 5.50 +/-0.10 |

**REEL DIMENSION** (Unit: mm)


| SIZE CODE | 0201, 0402, 0603, 0805, 1206, 1210, 1812 |               |               | 1808, 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     | 100.0±1.0     | 60.0+1.0/-0                  |

**PACKAGING STYLE AND QUANTITY OER REEL**

| SIZE        | THICKNESS (SYMBOL) |   | PAPER TAPE |          | PLASTIC TAPE |          |
|-------------|--------------------|---|------------|----------|--------------|----------|
|             |                    |   | 7" REEL    | 13" REEL | 7" REEL      | 13" REEL |
| 0402 (1005) | 0.50±0.05          | N | 10,000     | 50,000   | -            | -        |
| 0603 (1608) | 0.80±0.10          | S | 4,000      | 15,000   | -            | -        |
|             | 0.80±0.20          | X | 4,000      | 15,000   |              |          |
| 0805 (2012) | 0.60±0.10          | A | 4,000      | 15,000   | -            | -        |
|             | 0.85±0.15          | B | 4,000      | 15,000   | -            | -        |
|             | 1.25±0.10          | D | -          | -        | 3,000        | 10,000   |
|             | 1.25±0.20          | I | -          | -        | 3,000        | 10,000   |
| 1206 (3216) | 0.85±0.15          | B | 4,000      | 15,000   | -            | -        |
|             | 0.95±0.10          | C | -          | -        | 3,000        | 10,000   |
|             | 1.25±0.10          | D | -          | -        | 3,000        | 10,000   |
|             | 1.60±0.20          | G | -          | -        | 2,000        | 10,000   |
|             | 1.60+0.30/-0.10    | P | -          | -        | 2,000        | 9,000    |
| 1210 (3225) | 0.95±0.10          | C | -          | -        | 3,000        | 10,000   |
|             | 1.25±0.10          | D | -          | -        | 3,000        | 10,000   |
|             | 1.60±0.20          | G | -          | -        | 2,000        | -        |
|             | 2.00±0.20          | K | -          | -        | 1,000        | 6,000    |
|             | 2.50±0.30          | M | -          | -        | 1,000        | 6,000    |
| 1808 (4520) | 1.25±0.10          | D | -          | -        | 2,000        | 10,000   |
|             | 1.60±0.20          | G | -          | -        | 2,000        | 8,000    |
|             | 2.00±0.20          | K | -          | -        | 1,000        | 6,000    |
| 1812 (4532) | 1.25±0.10          | D | -          | -        | 1,000        | 5,000    |
|             | 1.60±0.20          | G | -          | -        | 1,000        | -        |
|             | 2.00±0.20          | K | -          | -        | 1,000        | -        |
|             | 2.50±0.30          | M | -          | -        | 500          | 3,000    |

PACKAGING STYLE AND QUANTITY OER REEL

| SIZE                                      | THICKNESS (SYMBOL) |   | PAPER TAPE |          | PLASTIC TAPE |          |
|-------------------------------------------|--------------------|---|------------|----------|--------------|----------|
|                                           |                    |   | 7" REEL    | 13" REEL | 7" REEL      | 13" REEL |
| 1825 (4563)<br>2220 (5750)<br>2225 (5763) | 2.00±0.20          | K | -          | -        | 1,000        | -        |
|                                           | 2.50±0.30          | M | -          | -        | 500          | -        |
|                                           | 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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