

**SPECIFICATION SHEET**

|                                |                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SPECIFICATION SHEET NO.</b> | Q0620- MT02N3R9C500NI                                                                                                                                                                                                                                                                                                                                                                           |
| <b>DATE</b>                    | June 20, 2023                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>REVISION</b>                | A2                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>DESCRIPTION</b>             | <p>Multilayer Ceramic Chip Capacitors MT0402 (1005 Metric) Series,<br/>L1.00*W0.50*H0.50mm, Thickness: 0.55mm Max.</p> <p>Dielectric NP0, Capacitance 3.9pF, Tolerance <math>\pm 0.25\text{pF}</math>, Rated Voltage 50V</p> <p>Operating Temp. Range <math>-55^{\circ}\text{C} \sim +125^{\circ}\text{C}</math></p> <p>Package in Tape/Reel, 10,000pcs/Reel</p> <p>RoHS/RoHS III compliant</p> |
| <b>CUSTOMER</b>                |                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>CUSTOMER PART NUMBER</b>    |                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>CROSS REF. PART NUMBER</b>  |                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>ORIGINAL PART NUMBER</b>    | Aillen MT02N3R9C500NI                                                                                                                                                                                                                                                                                                                                                                           |
| <b>PART CODE</b>               | MT02N3R9C500NI                                                                                                                                                                                                                                                                                                                                                                                  |

|                         |                                                                                     |                                                                                      |                                                                                       |
|-------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| <b>VENDOR APPROVE</b>   |                                                                                     |                                                                                      |                                                                                       |
| Issued/Checked/Approved |  |  |  |
| DATE: June 20, 2023     |                                                                                     |                                                                                      |                                                                                       |

|                         |  |
|-------------------------|--|
| <b>CUSTOMER APPROVE</b> |  |
|                         |  |
| DATE:                   |  |
| 6/20/2023               |  |

## MULTILAYER CERAMIC CHIP CAPACITORS MT SERIES

### MAIN FEATURE

MLCC consists of a conducting material and electrodes. To manufacture a chip-type SMT and achieve miniaturization, high density and high efficiency, ceramic condensers are used. MLCC is made by NP0, X7R, dielectric material and which provides product with high electrical precision, stability and reliability. Besides, MT series MLCC is tighten controlling in quality in line to assure quality performance in automotive applications.

### MAIN FEATURE

- RoHS III Compliant • The MT series meet AEC-Q200 requirement. • High capacitance in given case size
- A wide selection of sizes is available (0201 to 1210) • Capacitor with lead-free termination (pure Tin)

### APPLICATION

- For Navigation & Information equipments. • For entertainment equipments • For comfortable equipments
- For Automotive electronic equipment

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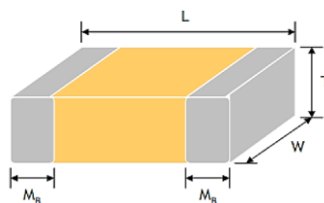
### PART CODE GUIDE

| Code       | Name             | Key Specification Option                                                                                                                                                                                                          |
|------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>MT</b>  | Product code     | MT for Automotive safe concern (with AEC-Q200 qualification)                                                                                                                                                                      |
| <b>02</b>  | Size             | 0201 (0603): L0.60*W0.30mm; <b>0402 (1005): L1.00*W0.50mm</b><br>0603 (1608): L1.60*W0.80mm; 0805 (2012): L2.00*W1.25mm<br>1206 (3216): L3.20*W1.60mm; 1210 (3225): L3.20*W2.50mm                                                 |
| <b>N</b>   | Dielectric       | <b>N: NP0 (C0G);</b> B: X7R;                                                                                                                                                                                                      |
| <b>3R9</b> | Capacitance      | Two significant digits followed by number of Zero, The 3rd digit signifies the multiplying factor, and letter R is decimal point.<br>0R5: 0.5pF; <b>3R9:3.9pF</b> ; 152: 1500pF; 100: 10pF                                        |
| <b>C</b>   | Tolerance        | B=±0.1pF; <b>C=±0.25pF</b> ; D=±0.5pF; F=±1%; G=±2%; J=±5%; K=±10%; M=±20%;                                                                                                                                                       |
| <b>500</b> | Rated Voltage    | Two significant digits followed by No. of zeros. "R" is in place of decimal point.<br>100=10 VDC; 160=16 VDC; 250=25 VDC; <b>500=50 VDC</b> ; 101 =100 VDC; 201 =200 VDC; 251=250 VDC; 501 =500 VDC; 631 =630 VDC; 102 =1000 VDC; |
| <b>N</b>   | Thickness        | <b>N: 0.50±0.05mm, See Table 1</b>                                                                                                                                                                                                |
| <b>I</b>   | Package          | A: 1Kpcs/Reel; B: 2Kpcs/Reel; C: 3Kpcs/Reel; D: 4Kpcs/Reel; <b>I: 10Kpcs/Reel</b> ;<br>F: others                                                                                                                                  |
|            | Internal Control | Internal Code: Letter + Number; Blank: N/A;                                                                                                                                                                                       |

# MULTILAYER CERAMIC CHIP CAPACITORS MT SERIES

**DIMENSION (Unit: mm)**

Image for reference



**Table 1**

| Size Code          | L               | W               | T (Symbol )     |   | Remark | M B             |
|--------------------|-----------------|-----------------|-----------------|---|--------|-----------------|
| <b>0201</b> (0603) | 0.60±0.03       | 0.30±0.03       | 0.3±0.03        | L | #      | 0.15±0.05       |
| <b>0402</b> (1005) | 1.00±0.05       | 0.50±0.05       | 0.50±0.05       | N | #      | 0.25±0.05/-0.10 |
| <b>0603</b> (1608) | 1.60±0.10       | 0.80±0.10       | 0.80±0.07       | S |        | 0.40±0.15       |
|                    | 1.60+0.15/-0.10 | 0.80+0.15/-0.10 | 0.80+0.15/-0.10 | X |        |                 |
| <b>0805</b> (2012) | 2.00±0.15       | 1.25±0.10       | 0.60±0.10       | A |        | 0.50±0.20       |
|                    |                 |                 | 0.80±0.10       | B |        |                 |
|                    |                 |                 | 1.25±0.10       | D | #      |                 |
|                    | 2.00±0.20       | 1.25±0.20       | 1.25±0.20       | I | #      |                 |
| <b>1206</b> (3216) | 3.20±0.15       | 1.60±0.15       | 0.80±0.10       | B |        | 0.60±0.20       |
|                    |                 |                 | 0.95±0.10       | C |        |                 |
|                    |                 |                 | 1.25±0.10       | D | #      |                 |
|                    | 3.20±0.20       | 1.60±0.15       | 1.15±0.15       | J | #      |                 |
|                    | 3.20±0.20       | 1.60±0.20       | 1.60±0.20       | G | #      |                 |
|                    | 3.20+0.3/-0.1   | 1.60+0.3/-0.1   | 1.60+0.30/-0.10 | P | #      |                 |
| <b>1210</b> (3225) | 3.20±0.30       | 2.50±0.20       | 0.95±0.10       | C | #      | 0.75±0.25       |
|                    |                 |                 | 1.25±0.10       | D | #      |                 |
|                    | 3.20±0.40       | 2.50±0.30       | 1.60±0.20       | G | #      |                 |
|                    |                 |                 | 2.00±0.20       | K | #      |                 |
|                    |                 |                 | 2.50±0.30       | M | #      |                 |

# Reflow soldering only is recommended.

6/20/2023

## MULTILAYER CERAMIC CHIP CAPACITORS MT SERIES

### GENERAL ELECTRONICAL CHARACTERISTICS

*Table 2*

|                            |                                                      |                             |
|----------------------------|------------------------------------------------------|-----------------------------|
| Dielectric                 | NPO                                                  | X7R                         |
| Size                       | 0201, 0402, 0603, 0805, 1206, 1210                   | 0402, 0603, 0805, 1206      |
| Capacitance range*         | 0.1pF to 0.047uF                                     | 100pF to 2.2uF              |
| Capacitance Tolerance      | 5pF<Cap<10pF:<br>B (±0.1pF), C (±0.25pF), D (±0.5pF) | J (±5%), K (±10%), M (±20%) |
| Rated Voltage              | 10V, 16V, 25V, 50V, 100V, 200V, 250, 500, 630, 1000  |                             |
| Operating Temperature      | -55 ~+125°C                                          |                             |
| Capacitance Characteristic | ±30ppm                                               | ±15%                        |
| Termination                | Ni/Sn (lead-free termination)                        |                             |

Note:

- 1) #1: NPO, 0.1pF product only provide B tolerance;
- 2) \* Measured at the condition of 30~70% related humidity.
- 3) NPO: Apply  $1.0 \pm 0.2V_{rms}$ ,  $1.0MHz \pm 10\%$  for  $Cap \leq 1000pF$  and  $1.0 \pm 0.2V_{rms}$ ,  $1.0kHz \pm 10\%$  for  $Cap > 1000pF$ , 25°C at ambient temperature.
- 4) X7R: Measured at  $1.0 \pm 0.2V_{rms}$ ,  $1.0kHz \pm 10\%$  for  $C \leq 10\mu F$ ;  $0.5 \pm 0.2V_{rms}$ ,  $120Hz \pm 20\%$  for  $C > 10\mu F$ , 30~70% related humidity, 25° C ambient temperature for X7R.
- 5) \*\* Preconditioning for Class II MLCC: Perform a heat treatment at  $150 \pm 10^\circ C$  for 1 hour and then leave in ambient condition for  $24 \pm 2$  hours before measurement.

## MULTILAYER CERAMIC CHIP CAPACITORS MT SERIES

### CAPACITANCE RANGE - NPO DIELECTRIC 0201, 0402 SIZES

Table 3-A

| Size        | 0201 |    |    |    |     | 0402 |    |    |    |     |
|-------------|------|----|----|----|-----|------|----|----|----|-----|
| VDC (V)     | 10   | 16 | 25 | 50 | 100 | 10   | 16 | 25 | 50 | 100 |
| 0.1pF (0R1) | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 0.2pF (0R2) | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 0.3pF (0R3) | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 0.4pF (0R4) | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 0.5pF (0R5) | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 0.6pF (0R6) | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 0.7pF (0R7) | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 0.8pF (0R8) | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 0.9pF (0R9) | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 1.0pF (1R0) | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 1.2pF (1R2) | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 1.5pF (1R5) | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 1.8pF (1R8) | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 2.0pF (2R0) | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 2.2pF (2R2) | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 2.7pF (2R7) | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 3.0pF (3R0) | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 3.3pF (3R3) | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 3.9pF (3R9) | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 4.0pF (4R0) | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 4.7pF (4R7) | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 5.0pF (5R0) | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 5.6pF (5R6) | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 6.0pF (6R0) | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 6.8pF (6R8) | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 7.0pF (7R0) | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 8.0pF (8R0) | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 8.2pF (8R2) | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 9.0pF (9R0) | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 10pF (100)  | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 12pF (120)  | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 15pF (150)  | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 18pF (180)  | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 22pF (220)  | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 27pF (270)  | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |

## MULTILAYER CERAMIC CHIP CAPACITORS MT SERIES

### CAPACITANCE RANGE - NPO DIELECTRIC 0201, 0402 SIZES

Table 3-B

| Size          | 0201 |    |    |    |     | 0402 |    |    |    |     |
|---------------|------|----|----|----|-----|------|----|----|----|-----|
| VDC (V)       | 10   | 16 | 25 | 50 | 100 | 10   | 16 | 25 | 50 | 100 |
| 33pF (330)    | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 39pF (390)    | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 47pF (470)    | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 56pF (560)    | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 68pF (680)    | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 82pF (820)    | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 100pF (101)   | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 120pF (121)   | L    | L  | L  | L  | L   | N    | N  | N  | N  | N   |
| 150pF (151)   |      |    |    |    |     | N    | N  | N  | N  | N   |
| 180pF (181)   |      |    |    |    |     | N    | N  | N  | N  | N   |
| 220pF (221)   |      |    |    |    |     | N    | N  | N  | N  | N   |
| 270pF (271)   |      |    |    |    |     | N    | N  | N  | N  |     |
| 330pF (331)   |      |    |    |    |     | N    | N  | N  | N  |     |
| 390pF (391)   |      |    |    |    |     | N    | N  | N  | N  |     |
| 470pF (471)   |      |    |    |    |     | N    | N  | N  | N  |     |
| 560pF (561)   |      |    |    |    |     | N    | N  | N  | N  |     |
| 680pF (681)   |      |    |    |    |     | N    | N  | N  | N  |     |
| 820pF (821)   |      |    |    |    |     | N    | N  | N  | N  |     |
| 1,000pF (102) |      |    |    |    |     | N    | N  | N  | N  |     |

### CAPACITANCE RANGE - NPO DIELECTRIC 0603 SIZES

Table 3-C

| Size        | 0603 |    |    |    |     |     |     |
|-------------|------|----|----|----|-----|-----|-----|
| VDC (V)     | 10   | 16 | 25 | 50 | 100 | 200 | 250 |
| 0.5pF (0R5) | S    | S  | S  | S  | S   | S   | S   |
| 0.6pF (0R6) | S    | S  | S  | S  | S   | S   | S   |
| 0.7pF (0R7) | S    | S  | S  | S  | S   | S   | S   |
| 0.8pF (0R8) | S    | S  | S  | S  | S   | S   | S   |
| 0.9pF (0R9) | S    | S  | S  | S  | S   | S   | S   |
| 1.0pF (1R0) | S    | S  | S  | S  | S   | S   | S   |
| 1.2pF (1R2) | S    | S  | S  | S  | S   | S   | S   |
| 1.5pF (1R5) | S    | S  | S  | S  | S   | S   | S   |
| 1.8pF (1R8) | S    | S  | S  | S  | S   | S   | S   |
| 2.0pF (2R0) | S    | S  | S  | S  | S   | S   | S   |

# MULTILAYER CERAMIC CHIP CAPACITORS MT SERIES

## CAPACITANCE RANGE - NP0 DIELECTRIC 0603 SIZES

Table 3-D

| Size        | 0603 |    |    |    |     |     |     |
|-------------|------|----|----|----|-----|-----|-----|
| VDC (V)     | 10   | 16 | 25 | 50 | 100 | 200 | 250 |
| 2.2pF (2R2) | S    | S  | S  | S  | S   | S   | S   |
| 2.7pF (2R7) | S    | S  | S  | S  | S   | S   | S   |
| 3.0pF (3R0) | S    | S  | S  | S  | S   | S   | S   |
| 3.3pF (3R3) | S    | S  | S  | S  | S   | S   | S   |
| 3.9pF (3R9) | S    | S  | S  | S  | S   | S   | S   |
| 4.0pF (4R0) | S    | S  | S  | S  | S   | S   | S   |
| 4.7pF (4R7) | S    | S  | S  | S  | S   | S   | S   |
| 5.0pF (5R0) | S    | S  | S  | S  | S   | S   | S   |
| 5.6pF (5R6) | S    | S  | S  | S  | S   | S   | S   |
| 6.0pF (6R0) | S    | S  | S  | S  | S   | S   | S   |
| 6.8pF (6R8) | S    | S  | S  | S  | S   | S   | S   |
| 7.0pF (7R0) | S    | S  | S  | S  | S   | S   | S   |
| 8.0pF (8R0) | S    | S  | S  | S  | S   | S   | S   |
| 8.2pF (8R2) | S    | S  | S  | S  | S   | S   | S   |
| 9.0pF (9R0) | S    | S  | S  | S  | S   | S   | S   |
| 10pF (100)  | S    | S  | S  | S  | S   | S   | S   |
| 12pF (120)  | S    | S  | S  | S  | S   | S   | S   |
| 15pF (150)  | S    | S  | S  | S  | S   | S   | S   |
| 18pF (180)  | S    | S  | S  | S  | S   | S   | S   |
| 22pF (220)  | S    | S  | S  | S  | S   | S   | S   |
| 27pF (270)  | S    | S  | S  | S  | S   | S   | S   |
| 33pF (330)  | S    | S  | S  | S  | S   | S   | S   |
| 39pF (390)  | S    | S  | S  | S  | S   | S   | S   |
| 47pF (470)  | S    | S  | S  | S  | S   | S   | S   |
| 56pF (560)  | S    | S  | S  | S  | S   | S   | S   |
| 68pF (680)  | S    | S  | S  | S  | S   | S   | S   |
| 82pF (820)  | S    | S  | S  | S  | S   | S   | S   |
| 100pF (101) | S    | S  | S  | S  | S   | S   | S   |
| 120pF (121) | S    | S  | S  | S  | S   | S   | S   |
| 150pF (151) | S    | S  | S  | S  | S   | S   | S   |
| 180pF (181) | S    | S  | S  | S  | S   | S   | S   |
| 220pF (221) | S    | S  | S  | S  | S   | S   | S   |
| 270pF (271) | S    | S  | S  | S  | S   | X   | X   |
| 330pF (331) | S    | S  | S  | S  | S   | X   | X   |
| 390pF (391) | S    | S  | S  | S  | S   | X   | X   |

## MULTILAYER CERAMIC CHIP CAPACITORS MT SERIES

### CAPACITANCE RANGE - NP0 DIELECTRIC 0603 SIZES

Table 3-E

| Size          | 0603 |    |    |    |     |     |     |
|---------------|------|----|----|----|-----|-----|-----|
| VDC (V)       | 10   | 16 | 25 | 50 | 100 | 200 | 250 |
| 470pF (471)   | S    | S  | S  | S  | S   | X   | X   |
| 560pF (561)   | S    | S  | S  | S  | S   |     |     |
| 680pF (681)   | S    | S  | S  | S  | S   |     |     |
| 820pF (821)   | S    | S  | S  | S  | S   |     |     |
| 1,000pF (102) | S    | S  | S  | S  | S   |     |     |
| 1,200pF (122) | X    | X  | X  | X  |     |     |     |
| 1,500pF (152) | X    | X  | X  | X  |     |     |     |
| 1,800pF (182) | X    | X  | X  | X  |     |     |     |
| 2,200pF (222) | X    | X  | X  | X  |     |     |     |
| 2,700pF (272) | X    | X  | X  | X  |     |     |     |
| 3,300pF (332) | X    | X  | X  | X  |     |     |     |

### CAPACITANCE RANGE - NP0 DIELECTRIC 0805 SIZES

Table 3-F

| Size        | 0805 |    |    |    |     |     |     |     |     |
|-------------|------|----|----|----|-----|-----|-----|-----|-----|
| VDC (V)     | 10   | 16 | 25 | 50 | 100 | 200 | 250 | 500 | 630 |
| 0.5pF (0R5) | A    | A  | A  | A  | A   | A   | A   | A   | A   |
| 0.6pF (0R6) | A    | A  | A  | A  | A   | A   | A   | A   | A   |
| 0.7pF (0R7) | A    | A  | A  | A  | A   | A   | A   | A   | A   |
| 0.8pF (0R8) | A    | A  | A  | A  | A   | A   | A   | A   | A   |
| 0.9pF (0R9) | A    | A  | A  | A  | A   | A   | A   | A   | A   |
| 1.0pF (1R0) | A    | A  | A  | A  | A   | A   | A   | A   | A   |
| 1.2pF (1R2) | A    | A  | A  | A  | A   | A   | A   | A   | A   |
| 1.5pF (1R5) | A    | A  | A  | A  | A   | A   | A   | A   | A   |
| 1.8pF (1R8) | A    | A  | A  | A  | A   | A   | A   | A   | A   |
| 2.2pF (2R2) | A    | A  | A  | A  | A   | A   | A   | A   | A   |
| 2.7pF (2R7) | A    | A  | A  | A  | A   | A   | A   | A   | A   |
| 3.3pF (3R3) | A    | A  | A  | A  | A   | A   | A   | A   | A   |
| 3.9pF (3R9) | A    | A  | A  | A  | A   | A   | A   | A   | A   |
| 4.7pF (4R7) | A    | A  | A  | A  | A   | A   | A   | A   | A   |
| 5.6pF (5R6) | A    | A  | A  | A  | A   | A   | A   | A   | A   |
| 6.8pF (6R8) | A    | A  | A  | A  | A   | A   | A   | A   | A   |
| 8.2pF (8R2) | A    | A  | A  | A  | A   | A   | A   | A   | A   |

## MULTILAYER CERAMIC CHIP CAPACITORS MT SERIES

### CAPACITANCE RANGE - NP0 DIELECTRIC 0805 SIZES

Table 3-G

| Size          | 0805 |    |    |    |     |     |     |     |     |
|---------------|------|----|----|----|-----|-----|-----|-----|-----|
| VDC (V)       | 10   | 16 | 25 | 50 | 100 | 200 | 250 | 500 | 630 |
| 10pF (100)    | A    | A  | A  | A  | A   | A   | A   | A   | A   |
| 12pF (120)    | A    | A  | A  | A  | A   | A   | A   | A   | A   |
| 15pF (150)    | A    | A  | A  | A  | A   | A   | A   | A   | A   |
| 18pF (180)    | A    | A  | A  | A  | A   | A   | A   | A   | A   |
| 22pF (220)    | A    | A  | A  | A  | A   | A   | A   | A   | A   |
| 27pF (270)    | A    | A  | A  | A  | A   | A   | A   | A   | A   |
| 33pF (330)    | A    | A  | A  | A  | A   | A   | A   | A   | A   |
| 39pF (390)    | A    | A  | A  | A  | A   | A   | A   | A   | A   |
| 47pF (470)    | A    | A  | A  | A  | A   | A   | A   | A   | A   |
| 56pF (560)    | A    | A  | A  | A  | A   | A   | A   | A   | A   |
| 68pF (680)    | A    | A  | A  | A  | A   | A   | A   | A   | A   |
| 82pF (820)    | A    | A  | A  | A  | A   | A   | A   | B   | B   |
| 100pF (101)   | A    | A  | A  | A  | A   | B   | B   | B   | B   |
| 120pF (121)   | A    | A  | A  | A  | A   | B   | B   | D   | D   |
| 150pF (151)   | A    | A  | A  | A  | A   | D   | D   | D   | D   |
| 180pF (181)   | A    | A  | A  | A  | A   | D   | D   | D   | D   |
| 220pF (221)   | A    | A  | A  | A  | A   | D   | D   | D   | D   |
| 270pF (271)   | A    | A  | A  | A  | A   | D   | D   | D   | D   |
| 330pF (331)   | A    | A  | A  | A  | A   | D   | D   | D   | D   |
| 390pF (391)   | B    | B  | A  | A  | A   | D   | D   | D   | D   |
| 470pF (471)   | B    | B  | B  | B  | B   | D   | D   | I   | I   |
| 560pF (561)   | B    | B  | B  | B  | B   | D   | D   | I   | I   |
| 680pF (681)   | B    | B  | B  | B  | B   | D   | D   | I   | I   |
| 820pF (821)   | B    | B  | B  | B  | B   | D   | D   | I   | I   |
| 1,000pF (102) | B    | B  | B  | B  | B   | D   | D   | I   | I   |
| 1,200pF (122) | B    | B  | B  | B  | B   | D   | D   |     |     |
| 1,500pF (152) | B    | B  | B  | B  | B   | D   | D   |     |     |
| 1,800pF (182) | B    | B  | B  | B  | B   | D   | D   |     |     |
| 2,200pF (222) | B    | B  | B  | B  | B   | D   | D   |     |     |
| 2,700pF (272) | D    | D  | D  | D  | D   |     |     |     |     |
| 3,300pF (332) | D    | D  | D  | D  | D   |     |     |     |     |
| 3,900pF (392) | D    | D  | D  | D  | D   |     |     |     |     |
| 4,700pF (472) | D    | D  | D  | D  | D   |     |     |     |     |
| 5,600pF (562) | D    | D  | D  | D  | D   |     |     |     |     |
| 6,800pF (682) | D    | D  | D  | D  | D   |     |     |     |     |
| 8,200pF (822) | D    | D  | D  | D  |     |     |     |     |     |
| 0.01μF (103)  | D    | D  | D  | D  |     |     |     |     |     |

## MULTILAYER CERAMIC CHIP CAPACITORS MT SERIES

### CAPACITANCE RANGE - NP0 DIELECTRIC 1206

Table 3-H

| Size        | 1206 |    |    |    |     |     |     |     |     |      |
|-------------|------|----|----|----|-----|-----|-----|-----|-----|------|
| VDC (V)     | 10   | 16 | 25 | 50 | 100 | 200 | 250 | 500 | 630 | 1000 |
| 1.2pF (1R2) | B    | B  | B  | B  | B   | B   | B   | B   | B   |      |
| 1.5pF (1R5) | B    | B  | B  | B  | B   | B   | B   | B   | B   | B    |
| 1.8pF (1R8) | B    | B  | B  | B  | B   | B   | B   | B   | B   | B    |
| 2.2pF (2R2) | B    | B  | B  | B  | B   | B   | B   | B   | B   | B    |
| 2.7pF (2R7) | B    | B  | B  | B  | B   | B   | B   | B   | B   | B    |
| 3.3pF (3R3) | B    | B  | B  | B  | B   | B   | B   | B   | B   | B    |
| 3.9pF (3R9) | B    | B  | B  | B  | B   | B   | B   | B   | B   | B    |
| 4.7pF (4R7) | B    | B  | B  | B  | B   | B   | B   | B   | B   | B    |
| 5.6pF (5R6) | B    | B  | B  | B  | B   | B   | B   | B   | B   | B    |
| 6.8pF (6R8) | B    | B  | B  | B  | B   | B   | B   | B   | B   | B    |
| 8.2pF (8R2) | B    | B  | B  | B  | B   | B   | B   | B   | B   | B    |
| 10pF (100)  | B    | B  | B  | B  | B   | B   | B   | B   | B   | B    |
| 12pF (120)  | B    | B  | B  | B  | B   | B   | B   | B   | B   | B    |
| 15pF (150)  | B    | B  | B  | B  | B   | B   | B   | B   | B   | B    |
| 18pF (180)  | B    | B  | B  | B  | B   | B   | B   | B   | B   | B    |
| 22pF (220)  | B    | B  | B  | B  | B   | B   | B   | B   | B   | D    |
| 27pF (270)  | B    | B  | B  | B  | B   | B   | B   | B   | B   | D    |
| 33pF (330)  | B    | B  | B  | B  | B   | B   | B   | B   | B   | D    |
| 39pF (390)  | B    | B  | B  | B  | B   | B   | B   | B   | B   | D    |
| 47pF (470)  | B    | B  | B  | B  | B   | B   | B   | B   | B   | D    |
| 56pF (560)  | B    | B  | B  | B  | B   | B   | B   | B   | B   | D    |
| 68pF (680)  | B    | B  | B  | B  | B   | B   | B   | B   | B   | D    |
| 82pF (820)  | B    | B  | B  | B  | B   | B   | B   | B   | B   | D    |
| 100pF (101) | B    | B  | B  | B  | B   | B   | B   | B   | B   | D    |
| 120pF (121) | B    | B  | B  | B  | B   | B   | B   | B   | B   | D    |
| 150pF (151) | B    | B  | B  | B  | B   | B   | B   | B   | B   | D    |
| 180pF (181) | B    | B  | B  | B  | B   | B   | B   | B   | B   | G    |
| 220pF (221) | B    | B  | B  | B  | B   | B   | B   | B   | B   | G    |
| 270pF (271) | B    | B  | B  | B  | B   | B   | C   | C   | C   | G    |
| 330pF (331) | B    | B  | B  | B  | B   | B   | C   | C   | C   | G    |
| 390pF (391) | B    | B  | B  | B  | B   | B   | C   | C   | C   | G    |
| 470pF (471) | B    | B  | B  | B  | B   | C   | C   | C   | C   | G    |
| 560pF (561) | B    | B  | B  | B  | B   | C   | D   | D   | D   | G    |
| 680pF (681) | B    | B  | B  | B  | B   | C   | D   | D   | D   | G    |
| 820pF (821) | B    | B  | B  | B  | B   | C   | G   | G   | G   | G    |

## MULTILAYER CERAMIC CHIP CAPACITORS MT SERIES

### CAPACITANCE RANGE - NP0 DIELECTRIC 1206 SIZES

Table 3-I

| Size          | 1206 |    |    |    |     |     |     |     |     |      |
|---------------|------|----|----|----|-----|-----|-----|-----|-----|------|
| VDC (V)       | 10   | 16 | 25 | 50 | 100 | 200 | 250 | 500 | 630 | 1000 |
| 1,000pF (102) | B    | B  | B  | B  | B   | C   | G   | G   | G   | G    |
| 1,200pF (122) | B    | B  | B  | B  | B   | C   | G   | G   | G   |      |
| 1,500pF (152) | B    | B  | B  | B  | B   | D   | G   | G   | G   |      |
| 1,800pF (182) | B    | B  | B  | B  | B   | D   | G   | G   | G   |      |
| 2,200pF (222) | B    | B  | B  | B  | B   | D   | G   | G   | G   |      |
| 2,700pF (272) | B    | B  | B  | B  | B   | D   | G   | G   | G   |      |
| 3,300pF (332) | B    | B  | B  | B  | B   | D   | G   | G   | G   |      |
| 3,900pF (392) | B    | B  | B  | B  | B   | D   | G   | G   | G   |      |
| 4,700pF (472) | B    | B  | B  | B  | B   | D   | G   | G   | G   |      |
| 5,600pF (562) | B    | B  | B  | B  | B   |     |     |     |     |      |
| 6,800pF (682) | C    | C  | C  | C  | C   |     |     |     |     |      |
| 8,200pF (822) | D    | D  | D  | D  | D   |     |     |     |     |      |
| 0.01μF (103)  | D    | D  | D  | D  | D   |     |     |     |     |      |

### CAPACITANCE RANGE - NP0 DIELECTRIC 1210 SIZES

Table 3-J

| Size        | 1210 |    |    |    |     |     |     |     |     |      |
|-------------|------|----|----|----|-----|-----|-----|-----|-----|------|
| VDC (V)     | 10   | 16 | 25 | 50 | 100 | 200 | 250 | 500 | 630 | 1000 |
| 10pF (100)  | C    | C  | C  | C  | C   | C   | C   | C   | C   | C    |
| 12pF (120)  | C    | C  | C  | C  | C   | C   | C   | C   | C   | C    |
| 15pF (150)  | C    | C  | C  | C  | C   | C   | C   | C   | C   | C    |
| 18pF (180)  | C    | C  | C  | C  | C   | C   | C   | C   | C   | C    |
| 22pF (220)  | C    | C  | C  | C  | C   | C   | C   | C   | C   | C    |
| 27pF (270)  | C    | C  | C  | C  | C   | C   | C   | C   | C   | C    |
| 33pF (330)  | C    | C  | C  | C  | C   | C   | C   | C   | C   | C    |
| 39pF (390)  | C    | C  | C  | C  | C   | C   | C   | C   | C   | C    |
| 47pF (470)  | C    | C  | C  | C  | C   | C   | C   | C   | C   | C    |
| 56pF (560)  | C    | C  | C  | C  | C   | C   | C   | C   | C   | C    |
| 68pF (680)  | C    | C  | C  | C  | C   | C   | C   | C   | C   | C    |
| 82pF (820)  | C    | C  | C  | C  | C   | C   | C   | C   | C   | C    |
| 100pF (101) | C    | C  | C  | C  | C   | C   | C   | C   | C   | D    |
| 120pF (121) | C    | C  | C  | C  | C   | C   | C   | C   | C   | D    |
| 150pF (151) | C    | C  | C  | C  | C   | C   | C   | C   | C   | D    |
| 180pF (181) | C    | C  | C  | C  | C   | C   | C   | C   | C   | D    |
| 220pF (221) | C    | C  | C  | C  | C   | C   | C   | C   | C   | G    |

## MULTILAYER CERAMIC CHIP CAPACITORS MT SERIES

### CAPACITANCE RANGE - NP0 DIELECTRIC 1210 SIZES

Table 3-K

| Size          | 1210 |    |    |    |     |     |     |     |     |      |
|---------------|------|----|----|----|-----|-----|-----|-----|-----|------|
| VDC (V)       | 10   | 16 | 25 | 50 | 100 | 200 | 250 | 500 | 630 | 1000 |
| 270pF (271)   | C    | C  | C  | C  | C   | C   | C   | C   | C   | G    |
| 330pF (331)   | C    | C  | C  | C  | C   | C   | C   | C   | C   | G    |
| 390pF (391)   | C    | C  | C  | C  | C   | C   | C   | C   | C   | G    |
| 470pF (471)   | C    | C  | C  | C  | C   | C   | C   | C   | C   | G    |
| 560pF (561)   | C    | C  | C  | C  | C   | C   | C   | C   | C   | G    |
| 680pF (681)   | C    | C  | C  | C  | C   | C   | C   | C   | C   | G    |
| 820pF (821)   | C    | C  | C  | C  | C   | C   | C   | C   | C   | G    |
| 1,000pF (102) | C    | C  | C  | C  | C   | D   | D   | D   | D   | G    |
| 1,200pF (122) | C    | C  | C  | C  | C   | D   | D   | D   | D   |      |
| 1,500pF (152) | C    | C  | C  | C  | C   | D   | D   | D   | D   |      |
| 1,800pF (182) | C    | C  | C  | C  | C   | D   | D   | D   | D   |      |
| 2,200pF (222) | C    | C  | C  | C  | C   | D   | D   | D   | D   |      |
| 2,700pF (272) | C    | C  | C  | C  | C   | D   | D   | D   | D   |      |
| 3,300pF (332) | C    | C  | C  | C  | C   | D   | D   | D   | D   |      |
| 3,900pF (392) | C    | C  | C  | C  | C   | D   | D   | D   | D   |      |
| 4,700pF (472) | C    | C  | C  | C  | C   | G   | G   |     |     |      |
| 5,600pF (562) | C    | C  | C  | C  | C   | G   | G   |     |     |      |
| 6,800pF (682) | C    | C  | C  | C  | C   | G   | G   |     |     |      |
| 8,200pF (822) | C    | C  | C  | C  | C   | G   | G   |     |     |      |
| 0.010μF (103) | C    | C  | C  | C  | C   | G   | G   |     |     |      |
| 0.012μF (123) | D    | D  | D  | D  | D   |     |     |     |     |      |
| 0.015μF (153) | D    | D  | D  | D  | D   |     |     |     |     |      |
| 0.018μF (183) | K    | K  | K  | K  | K   |     |     |     |     |      |
| 0.022μF (223) | K    | K  | K  | K  | K   |     |     |     |     |      |
| 0.027μF (273) | K    | K  | K  | K  | K   |     |     |     |     |      |
| 0.033μF (333) | K    | K  | K  | K  | K   |     |     |     |     |      |
| 0.039μF (393) | K    | K  | K  | K  | K   |     |     |     |     |      |
| 0.047μF (473) | K    | K  | K  | K  | K   |     |     |     |     |      |

## MULTILAYER CERAMIC CHIP CAPACITORS MT SERIES

### CAPACITANCE RANGE – X7R DIELECTRIC 0201, 0402 SIZES

Table 4-A

| Size          | 0201 |    |    |    | 0402 |    |    |    |
|---------------|------|----|----|----|------|----|----|----|
| VDC (V)       | 10   | 16 | 25 | 50 | 10   | 16 | 25 | 50 |
| 100pF (101)   | L    | L  | L  | L  | N    | N  | N  | N  |
| 120pF (121)   | L    | L  | L  | L  | N    | N  | N  | N  |
| 150pF (151)   | L    | L  | L  | L  | N    | N  | N  | N  |
| 180pF (181)   | L    | L  | L  | L  | N    | N  | N  | N  |
| 220pF (221)   | L    | L  | L  | L  | N    | N  | N  | N  |
| 270pF (271)   | L    | L  | L  | L  | N    | N  | N  | N  |
| 330pF (331)   | L    | L  | L  | L  | N    | N  | N  | N  |
| 390pF (391)   | L    | L  | L  | L  | N    | N  | N  | N  |
| 470pF (471)   | L    | L  | L  | L  | N    | N  | N  | N  |
| 560pF (561)   | L    | L  | L  | L  | N    | N  | N  | N  |
| 680pF (681)   | L    | L  | L  | L  | N    | N  | N  | N  |
| 820pF (821)   | L    | L  | L  | L  | N    | N  | N  | N  |
| 1,000pF (102) | L    | L  | L  | L  | N    | N  | N  | N  |
| 1,200pF (122) | L    | L  | L  |    | N    | N  | N  | N  |
| 1,500pF (152) | L    | L  | L  |    | N    | N  | N  | N  |
| 1,800pF (182) | L    | L  | L  |    | N    | N  | N  | N  |
| 2,200pF (222) | L    | L  | L  |    | N    | N  | N  | N  |
| 2,700pF (272) | L    | L  | L  |    | N    | N  | N  | N  |
| 3,300pF (332) | L    | L  | L  |    | N    | N  | N  | N  |
| 3,900pF (392) | L    | L  | L  |    | N    | N  | N  | N  |
| 4,700pF (472) | L    | L  | L  |    | N    | N  | N  | N  |
| 5,600pF (562) | L    | L  | L  |    | N    | N  | N  | N  |
| 6,800pF (682) | L    |    |    |    | N    | N  | N  | N  |
| 8,200pF (822) | L    |    |    |    | N    | N  | N  | N  |
| 0.010μF (103) | L    |    |    |    | N    | N  | N  | N  |
| 0.012μF (123) |      |    |    |    | N    | N  | N  |    |
| 0.015μF (153) |      |    |    |    | N    | N  | N  |    |
| 0.018μF (183) |      |    |    |    | N    | N  | N  |    |
| 0.022μF (223) |      |    |    |    | N    | N  | N  |    |
| 0.027μF (273) |      |    |    |    | N    | N  | N  |    |
| 0.033μF (333) |      |    |    |    | N    | N  | N  |    |
| 0.039μF (393) |      |    |    |    | N    | N  | N  |    |
| 0.047μF (473) |      |    |    |    | N    | N  | N  |    |
| 0.056μF (563) |      |    |    |    | N    | N  | N  |    |
| 0.068μF (683) |      |    |    |    | N    | N  | N  |    |
| 0.082μF (823) |      |    |    |    | N    | N  | N  |    |
| 0.10μF (104)  |      |    |    |    | N    | N  | N  |    |

## MULTILAYER CERAMIC CHIP CAPACITORS MT SERIES

### CAPACITANCE RANGE – X7R DIELECTRIC 0603 SIZES

Table 4-B

| Size          | 0603 |    |    |    |     |
|---------------|------|----|----|----|-----|
| VDC (V)       | 10   | 16 | 25 | 50 | 100 |
| 100pF (101)   | S    | S  | S  | S  | S   |
| 120pF (121)   | S    | S  | S  | S  | S   |
| 150pF (151)   | S    | S  | S  | S  | S   |
| 180pF (181)   | S    | S  | S  | S  | S   |
| 220pF (221)   | S    | S  | S  | S  | S   |
| 270pF (271)   | S    | S  | S  | S  | S   |
| 330pF (331)   | S    | S  | S  | S  | S   |
| 390pF (391)   | S    | S  | S  | S  | S   |
| 470pF (471)   | S    | S  | S  | S  | S   |
| 560pF (561)   | S    | S  | S  | S  | S   |
| 680pF (681)   | S    | S  | S  | S  | S   |
| 820pF (821)   | S    | S  | S  | S  | S   |
| 1,000pF (102) | S    | S  | S  | S  | S   |
| 1,200pF (122) | S    | S  | S  | S  | S   |
| 1,500pF (152) | S    | S  | S  | S  | S   |
| 1,800pF (182) | S    | S  | S  | S  | S   |
| 2,200pF (222) | S    | S  | S  | S  | S   |
| 2,700pF (272) | S    | S  | S  | S  | S   |
| 3,300pF (332) | S    | S  | S  | S  | S   |
| 3,900pF (392) | S    | S  | S  | S  | S   |
| 4,700pF (472) | S    | S  | S  | S  | S   |
| 5,600pF (562) | S    | S  | S  | S  | S   |
| 6,800pF (682) | S    | S  | S  | S  | S   |
| 8,200pF (822) | S    | S  | S  | S  | S   |
| 0.010μF (103) | S    | S  | S  | S  | S   |
| 0.012μF (123) | S    | S  | S  | S  | X   |
| 0.015μF (153) | S    | S  | S  | S  | X   |
| 0.018μF (183) | S    | S  | S  | S  | X   |
| 0.022μF (223) | S    | S  | S  | S  | X   |
| 0.027μF (273) | S    | S  | S  | S  | X   |
| 0.033μF (333) | S    | S  | S  | X  | X   |
| 0.039μF (393) | S    | S  | S  | X  | X   |
| 0.047μF (473) | S    | S  | S  | X  | X   |
| 0.056μF (563) | S    | S  | S  | X  |     |
| 0.068μF (683) | S    | S  | S  | X  |     |

# MULTILAYER CERAMIC CHIP CAPACITORS MT SERIES

## CAPACITANCE RANGE – X7R DIELECTRIC 0603 SIZES

Table 4-C

| Size          | 0603 |    |    |    |     |
|---------------|------|----|----|----|-----|
| VDC (V)       | 10   | 16 | 25 | 50 | 100 |
| 0.082μF (823) | S    | S  | S  | X  |     |
| 0.10μF (104)  | S    | S  | S  | X  |     |
| 0.12μF (124)  | X    | X  | X  |    |     |
| 0.15μF (154)  | X    | X  | X  | X  |     |
| 0.18μF (184)  | X    | X  | X  |    |     |
| 0.22μF (224)  | X    | X  | X  | X  |     |
| 0.33μF (334)  | X    | X  | X  | X  |     |

## CAPACITANCE RANGE – X7R DIELECTRIC 0805 SIZES

Table 4-D

| Size          | 0805 |    |    |    |     |     |     |     |     |
|---------------|------|----|----|----|-----|-----|-----|-----|-----|
| VDC (V)       | 10   | 16 | 25 | 50 | 100 | 200 | 250 | 500 | 630 |
| 100pF (101)   | B    | B  | B  | B  | B   | B   | B   | B   | B   |
| 120pF (121)   | B    | B  | B  | B  | B   | B   | B   | B   | B   |
| 150pF (151)   | B    | B  | B  | B  | B   | B   | B   | B   | B   |
| 180pF (181)   | B    | B  | B  | B  | B   | B   | B   | B   | B   |
| 220pF (221)   | B    | B  | B  | B  | B   | B   | B   | B   | B   |
| 270pF (271)   | B    | B  | B  | B  | B   | B   | B   | B   | B   |
| 330pF (331)   | B    | B  | B  | B  | B   | B   | B   | B   | B   |
| 390pF (391)   | B    | B  | B  | B  | B   | B   | B   | B   | B   |
| 470pF (471)   | B    | B  | B  | B  | B   | B   | B   | B   | B   |
| 560pF (561)   | B    | B  | B  | B  | B   | B   | B   | B   | B   |
| 680pF (681)   | B    | B  | B  | B  | B   | B   | B   | B   | B   |
| 820pF (821)   | B    | B  | B  | B  | B   | B   | B   | B   | B   |
| 1,000pF (102) | B    | B  | B  | B  | B   | B   | B   | B   | B   |
| 1,200pF (122) | B    | B  | B  | B  | B   | B   | B   | B   | B   |
| 1,500pF (152) | B    | B  | B  | B  | B   | B   | B   | B   | B   |
| 1,800pF (182) | B    | B  | B  | B  | B   | B   | B   | B   | B   |
| 2,200pF (222) | B    | B  | B  | B  | B   | B   | B   | B   | B   |
| 2,700pF (272) | B    | B  | B  | B  | B   | B   | B   | B   | B   |
| 3,300pF (332) | B    | B  | B  | B  | B   | B   | B   | B   | B   |
| 3,900pF (392) | B    | B  | B  | B  | B   | B   | B   | B   | B   |
| 4,700pF (472) | B    | B  | B  | B  | B   | B   | B   | D   | D   |

## MULTILAYER CERAMIC CHIP CAPACITORS MT SERIES

### CAPACITANCE RANGE – X7R DIELECTRIC 0805 SIZES

Table 4-E

| Size          | 0805 |    |    |    |     |     |     |     |     |
|---------------|------|----|----|----|-----|-----|-----|-----|-----|
| VDC (V)       | 10   | 16 | 25 | 50 | 100 | 200 | 250 | 500 | 630 |
| 5,600pF (562) | B    | B  | B  | B  | B   | B   | B   | D   | D   |
| 6,800pF (682) | B    | B  | B  | B  | B   | B   | B   | D   | D   |
| 8,200pF (822) | B    | B  | B  | B  | B   | B   | B   | D   | D   |
| 0.010μF (103) | B    | B  | B  | B  | B   | D   | D   | D   | D   |
| 0.012μF (123) | B    | B  | B  | B  | B   | D   | D   |     |     |
| 0.015μF (153) | B    | B  | B  | B  | B   | D   | D   |     |     |
| 0.018μF (183) | B    | B  | B  | B  | B   | D   | D   |     |     |
| 0.022μF (223) | B    | B  | B  | B  | B   | D   | D   |     |     |
| 0.027μF (273) | B    | B  | B  | B  | B   |     |     |     |     |
| 0.033μF (333) | B    | B  | B  | B  | B   |     |     |     |     |
| 0.039μF (393) | B    | B  | B  | B  | B   |     |     |     |     |
| 0.047μF (473) | B    | B  | B  | B  | B   |     |     |     |     |
| 0.056μF (563) | B    | B  | B  | B  | B   |     |     |     |     |
| 0.068μF (683) | B    | B  | B  | B  | D   |     |     |     |     |
| 0.082μF (823) | B    | B  | B  | B  | D   |     |     |     |     |
| 0.10μF (104)  | B    | B  | B  | B  | D   |     |     |     |     |
| 0.12μF (124)  | B    | B  | B  | D  |     |     |     |     |     |
| 0.15μF (154)  | D    | D  | D  | D  |     |     |     |     |     |
| 0.18μF (184)  | D    | D  | D  | D  |     |     |     |     |     |
| 0.22μF (224)  | D    | D  | D  | D  |     |     |     |     |     |
| 0.27μF (274)  | D    | D  | D  | I  |     |     |     |     |     |
| 0.33μF (334)  | D    | D  | D  | I  |     |     |     |     |     |
| 0.39μF (394)  | D    | D  | D  | I  |     |     |     |     |     |
| 0.47μF (474)  | D    | D  | D  | I  |     |     |     |     |     |
| 0.56μF (564)  | D    | D  | D  |    |     |     |     |     |     |
| 0.68μF (684)  | D    | D  | D  | I  |     |     |     |     |     |
| 0.82μF (824)  | D    | D  | D  |    |     |     |     |     |     |
| 1.0μF (105)   | D    | D  | D  | I  |     |     |     |     |     |

### CAPACITANCE RANGE – X7R DIELECTRIC 1206 SIZES

Table 4-F

| Size        | 1206 |    |    |    |     |     |     |     |     |
|-------------|------|----|----|----|-----|-----|-----|-----|-----|
| VDC (V)     | 10   | 16 | 25 | 50 | 100 | 200 | 250 | 500 | 630 |
| 100pF (101) |      |    |    |    |     | D   | D   | D   | D   |
| 120pF (121) |      |    |    |    |     | D   | D   | D   | D   |
| 150pF (151) | B    | B  | B  | B  | B   | D   | D   | D   | D   |
| 180pF (181) | B    | B  | B  | B  | B   | D   | D   | D   | D   |

## MULTILAYER CERAMIC CHIP CAPACITORS MT SERIES

### CAPACITANCE RANGE – X7R DIELECTRIC 1206 SIZES

Table 4-G

| Size          | 1206 |    |    |    |     |     |     |     |     |
|---------------|------|----|----|----|-----|-----|-----|-----|-----|
| VDC (V)       | 10   | 16 | 25 | 50 | 100 | 200 | 250 | 500 | 630 |
| 220pF (221)   | B    | B  | B  | B  | B   | D   | D   | D   | D   |
| 270pF (271)   | B    | B  | B  | B  | B   | D   | D   | D   | D   |
| 330pF (331)   | B    | B  | B  | B  | B   | D   | D   | D   | D   |
| 390pF (391)   | B    | B  | B  | B  | B   | D   | D   | D   | D   |
| 470pF (471)   | B    | B  | B  | B  | B   | D   | D   | D   | D   |
| 560pF (561)   | B    | B  | B  | B  | B   | D   | D   | D   | D   |
| 680pF (681)   | B    | B  | B  | B  | B   | D   | D   | D   | D   |
| 820pF (821)   | B    | B  | B  | B  | B   | D   | D   | D   | D   |
| 1,000pF (102) | B    | B  | B  | B  | B   | D   | D   | D   | D   |
| 1,200pF (122) | B    | B  | B  | B  | B   | D   | D   | D   | D   |
| 1,500pF (152) | B    | B  | B  | B  | B   | D   | D   | D   | D   |
| 1,800pF (182) | B    | B  | B  | B  | B   | D   | D   | D   | D   |
| 2,200pF (222) | B    | B  | B  | B  | B   | D   | D   | D   | D   |
| 2,700pF (272) | B    | B  | B  | B  | B   | D   | D   | D   | D   |
| 3,300pF (332) | B    | B  | B  | B  | B   | D   | D   | D   | D   |
| 3,900pF (392) | B    | B  | B  | B  | B   | D   | D   | D   | D   |
| 4,700pF (472) | B    | B  | B  | B  | B   | D   | D   | D   | D   |
| 5,600pF (562) | B    | B  | B  | B  | B   | D   | D   | D   | D   |
| 6,800pF (682) | B    | B  | B  | B  | B   | D   | D   | D   | D   |
| 8,200pF (822) | B    | B  | B  | B  | B   | D   | D   | D   | D   |
| 0.010μF (103) | B    | B  | B  | B  | B   | D   | D   | D   | D   |
| 0.012μF (123) | B    | B  | B  | B  | B   | D   | D   |     |     |
| 0.015μF (153) | B    | B  | B  | B  | B   | D   | D   |     |     |
| 0.018μF (183) | B    | B  | B  | B  | B   | D   | D   |     |     |
| 0.022μF (223) | B    | B  | B  | B  | B   | D   | D   |     |     |
| 0.027μF (273) | B    | B  | B  | B  | B   |     |     |     |     |
| 0.033μF (333) | B    | B  | B  | B  | B   |     |     |     |     |
| 0.039μF (393) | B    | B  | B  | B  | B   |     |     |     |     |
| 0.047μF (473) | B    | B  | B  | B  | B   |     |     |     |     |
| 0.056μF (563) | B    | B  | B  | B  | B   |     |     |     |     |
| 0.068μF (683) | B    | B  | B  | B  | B   |     |     |     |     |
| 0.082μF (823) | B    | B  | B  | B  | D   |     |     |     |     |
| 0.10μF (104)  | B    | B  | B  | B  | D   |     |     |     |     |
| 0.12μF (124)  | B    | B  | B  | B  | D   |     |     |     |     |
| 0.15μF (154)  | C    | C  | C  | C  | G   |     |     |     |     |
| 0.18μF (184)  | C    | C  | C  | C  | G   |     |     |     |     |

## MULTILAYER CERAMIC CHIP CAPACITORS MT SERIES

### CAPACITANCE RANGE – X7R DIELECTRIC 1206 SIZES

Table 4-H

| Size         | 1206 |    |    |    |     |     |     |     |     |
|--------------|------|----|----|----|-----|-----|-----|-----|-----|
| VDC (V)      | 10   | 16 | 25 | 50 | 100 | 200 | 250 | 500 | 630 |
| 0.22μF (224) | C    | C  | C  | C  | G   |     |     |     |     |
| 0.27μF (274) | C    | C  | C  | D  |     |     |     |     |     |
| 0.33μF (334) | C    | C  | C  | D  |     |     |     |     |     |
| 0.39μF (394) | C    | C  | J  | P  |     |     |     |     |     |
| 0.47μF (474) | J    | J  | J  | P  |     |     |     |     |     |
| 0.56μF (564) | J    | J  | J  | P  |     |     |     |     |     |
| 0.68μF (684) | J    | J  | J  | P  |     |     |     |     |     |
| 0.82μF (824) | J    | J  | J  | P  |     |     |     |     |     |
| 1.0μF (105)  | J    | J  | J  | P  |     |     |     |     |     |

### CAPACITANCE RANGE – X7R DIELECTRIC 1210 SIZES

Table 4-I

| Size          | 1210 |    |    |    |     |     |     |      |
|---------------|------|----|----|----|-----|-----|-----|------|
| VDC (V)       | 10   | 16 | 25 | 50 | 100 | 250 | 500 | 1000 |
| 100pF (101)   |      |    |    |    |     | D   | D   | D    |
| 120pF (121)   |      |    |    |    |     | D   | D   | D    |
| 150pF (151)   |      |    |    |    |     | D   | D   | D    |
| 180pF (181)   |      |    |    |    |     | D   | D   | D    |
| 220pF (221)   |      |    |    |    |     | D   | D   | D    |
| 270pF (271)   |      |    |    |    |     | D   | D   | D    |
| 330pF (331)   |      |    |    |    |     | D   | D   | D    |
| 390pF (391)   |      |    |    |    |     | D   | D   | D    |
| 470pF (471)   |      |    |    |    |     | D   | D   | D    |
| 560pF (561)   |      |    |    |    |     | D   | D   | D    |
| 680pF (681)   |      |    |    |    |     | C   | D   | D    |
| 820pF (821)   |      |    |    |    |     | C   | D   | D    |
| 1,000pF (102) | C    | C  | C  | C  | C   | C   | D   | D    |
| 1,200pF (122) | C    | C  | C  | C  | C   | C   | D   | D    |
| 1,500pF (152) | C    | C  | C  | C  | C   | C   | D   | D    |
| 1,800pF (182) | C    | C  | C  | C  | C   | C   | D   | D    |
| 2,200pF (222) | C    | C  | C  | C  | C   | C   | D   | D    |
| 2,700pF (272) | C    | C  | C  | C  | C   | C   | D   | D    |
| 3,300pF (332) | C    | C  | C  | C  | C   | C   | D   | D    |
| 3,900pF (392) | C    | C  | C  | C  | C   | C   | D   | G    |
| 4,700pF (472) | C    | C  | C  | C  | C   | C   | D   | G    |
| 5,600pF (562) | C    | C  | C  | C  | C   | C   | D   | G    |

## MULTILAYER CERAMIC CHIP CAPACITORS MT SERIES

### CAPACITANCE RANGE – X7R DIELECTRIC 1210 SIZES

Table 4-J

| Size          | 1210 |    |    |    |     |     |     |      |
|---------------|------|----|----|----|-----|-----|-----|------|
| VDC (V)       | 10   | 16 | 25 | 50 | 100 | 250 | 500 | 1000 |
| 6,800pF (682) | C    | C  | C  | C  | C   | C   | D   | G    |
| 8,200pF (822) | C    | C  | C  | C  | C   | C   | D   | G    |
| 0.010μF (103) | C    | C  | C  | C  | C   | C   | D   | G    |
| 0.012μF (123) | C    | C  | C  | C  | C   | C   | D   |      |
| 0.015μF (153) | C    | C  | C  | C  | C   | C   | D   |      |
| 0.018μF (183) | C    | C  | C  | C  | C   | C   | D   |      |
| 0.022μF (223) | C    | C  | C  | C  | C   | C   | D   |      |
| 0.027μF (273) | C    | C  | C  | C  | C   | C   |     |      |
| 0.033μF (333) | C    | C  | C  | C  | C   | C   |     |      |
| 0.039μF (393) | C    | C  | C  | C  | C   | C   |     |      |
| 0.047μF (473) | C    | C  | C  | C  | C   | D   |     |      |
| 0.056μF (563) | C    | C  | C  | C  | C   |     |     |      |
| 0.068μF (683) | C    | C  | C  | C  | C   |     |     |      |
| 0.082μF (823) | C    | C  | C  | C  | C   |     |     |      |
| 0.10μF (104)  | C    | C  | C  | C  | C   |     |     |      |
| 0.12μF (124)  | C    | C  | C  | C  |     |     |     |      |
| 0.15μF (154)  | C    | C  | C  | C  |     |     |     |      |
| 0.18μF (184)  | C    | C  | C  | C  |     |     |     |      |
| 0.22μF (224)  | C    | C  | C  | C  |     |     |     |      |
| 0.27μF (274)  | C    | C  | C  | C  |     |     |     |      |
| 0.33μF (334)  | C    | C  | C  | D  |     |     |     |      |
| 0.39μF (394)  | C    | C  | C  | D  |     |     |     |      |
| 0.47μF (474)  | C    | C  | C  | D  |     |     |     |      |
| 0.56μF (564)  | D    | D  | D  | D  |     |     |     |      |
| 0.68μF (684)  | D    | D  | D  | D  |     |     |     |      |
| 0.82μF (824)  | D    | D  | D  | D  |     |     |     |      |
| 1.0μF (105)   | D    | D  | D  | D  |     |     |     |      |
| 1.5μF (155)   |      | K  |    |    |     |     |     |      |
| 2.2μF (225)   |      | K  |    |    |     |     |     |      |

## MULTILAYER CERAMIC CHIP CAPACITORS MT SERIES

### High Temperature Exposure – Requirements–X7R

Table 5

| Rated vol. | DF ≤   | Exception of DF ≤ |                                                                                       |
|------------|--------|-------------------|---------------------------------------------------------------------------------------|
| ≥50V       | ≤ 3%   | ≤ 6%              | 0201(50V); 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF;                                    |
|            |        | ≤ 10%             | 1210≥4.7μF;                                                                           |
|            |        | ≤ 20%             | 0402≥0.1μF; 0603≥1μF; 0805≥1μF; 1206≥2.2μF;                                           |
| 35V        | ≤ 5%   | ≤20%              | 0603≥1μF; 0805≥2.2μF; 1210≥10μF;                                                      |
| 25V        | ≤ 5%   | ≤10%              | 0201≥0.01μF; 0805≥1μF; 1210≥10μF                                                      |
|            |        | ≤15%              | 0603≥0.33μF; 1206≥4.7μF; 0402≥0.10μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥6.8μF; 1210≥22μF; |
| 16V        | ≤5%    | ≤10%              | 0603≥0.15μF;0805≥0.68μF;1206≥2.2μF;1210≥4.7μF                                         |
|            |        | ≤15%              | 0201≥0.01μF;0402≥0.033μF; 0603≥0.68μF;0805≥2.2μF 1206≥4.7μF; 1210≥22μF;               |
| 10V        | ≤ 7.5% | ≤15%              | 0201≥0.012μF;0402≥0.33μF; 0603≥0.33μF;0805≥2.2μF 1206≥2.2μF; 1210≥22μF                |
|            |        | ≤20%              | 0201≥0.1μF ;0402≥1μF;                                                                 |
| 6.3V       | ≤ 15%  | ≤30%              | 0201≥0.1μF;0402≥1μF; 0603≥10μF;0805≥4.7μF; 1206≥47μF;1210≥100μF;                      |
| 4V         | ≤20%   | ---               | ---                                                                                   |

IR.: ≥10GΩ or  $RxC \geq 500\Omega \cdot F$  whichever is smaller

### High Temperature Exposure – Requirements –Class II-X7R

Table 6

| Rated voltage                                                           | Insulation Resistance                                   |
|-------------------------------------------------------------------------|---------------------------------------------------------|
| ≥100V: X7R                                                              | 1GΩ or $RxC \geq 10\Omega \cdot F$ whichever is smaller |
| 50V:0603≥1μF;0805≥1μF; 1206≥4.7μF;1210≥4.7μF                            |                                                         |
| 35V:0805≥2.2μF;1210≥10μF                                                |                                                         |
| 25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF; 1206≥10μF;1210≥10μF                 |                                                         |
| 16V: 0201≥0.1μF;0402≥0.22μF; 0603≥1μF;0805≥2.2μF; 1206≥10μF;1210≥47μF   |                                                         |
| 10V:0201≥47nF;0402≥0.47μF; 0603≥0.47μF;0805≥2.2μF; 1206≥4.7μF;1210≥47μF |                                                         |

## MULTILAYER CERAMIC CHIP CAPACITORS MT SERIES

### Temperature Cycling-Requirements –X7R

Table 7

| Rated vol. | DF ≤   | Exception of DF ≤ |                                                                         |
|------------|--------|-------------------|-------------------------------------------------------------------------|
| ≥50V       | ≤ 3%   | ≤ 6%              | 0201(50V); 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF;                      |
|            |        | ≤ 10%             | 1210≥4.7μF;                                                             |
|            |        | ≤ 20%             | 0402≥0.1μF;0603≥1μF; 0805≥1μF;1206≥2.2μF; 1210≥10μF;                    |
| 35V        | ≤ 5%   | ≤20%              | 0603≥1μF; 0805≥2.2μF; 1210≥10μF;                                        |
| 25V        | ≤ 5%   | ≤10%              | 0201≥0.01μF; 0805≥1μF; 1210≥10μF                                        |
|            |        | ≤14%              | 0603≥0.33μF;1206≥4.7μF                                                  |
|            |        | ≤15%              | 0402≥0.10μF;0603≥0.47μF;0805≥2.2μF;1206≥6.8μF; 1210≥22μF;               |
| 16V        | ≤5%    | ≤10%              | 0603≥0.15μF;0805≥0.68μF;1206≥2.2μF;1210≥4.7μF                           |
|            |        | ≤15%              | 0201≥0.01μF;0402≥0.033μF; 0603≥0.68μF;0805≥2.2μF 1206≥4.7μF; 1210≥22μF; |
| 10V        | ≤ 7.5% | ≤15%              | 0201≥0.012μF;0402≥0.33μF; 0603≥0.33μF;0805≥2.2μF 1206≥2.2μF; 1210≥22μF  |
|            |        | ≤20%              | 0201≥0.1μF ;0402≥1μF;                                                   |
| 6.3V       | ≤ 15%  | ≤30%              | 0201≥0.1μF;0402≥1μF;0603 ≥10μF; 0805≥4.7μF;1206≥47μF;1210≥100μF;        |
| 4V         | ≤20%   | ---               | ---                                                                     |

IR.: ≥10GΩ or RxC≥500Ω-F whichever is smaller

### Temperature Cycling– Requirements –Class II-X7R

Table 8

| Rated voltage                                                           | Insulation Resistance                    |
|-------------------------------------------------------------------------|------------------------------------------|
| ≥100V: X7R                                                              | 1GΩ or RxC≥10Ω-F<br>whichever is smaller |
| 50V:0603≥1μF;0805≥1μF; 1206≥4.7μF;1210≥4.7μF                            |                                          |
| 35V:0805≥2.2μF;1210≥10μF                                                |                                          |
| 25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF; 1206≥10μF;1210≥10μF                 |                                          |
| 16V: 0201≥0.1uF;0402≥0.22μF; 0603≥1μF;0805≥2.2μF; 1206≥10μF;1210≥47μF   |                                          |
| 10V:0201≥47nF;0402≥0.47μF; 0603≥0.47μF;0805≥2.2μF; 1206≥4.7μF;1210≥47μF |                                          |
| 6.3V; 4V;                                                               |                                          |

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### Moisture Resistance – Requirements –X7R

Table 9

| Rated vol. | DF ≤   | Exception of DF ≤ |                                                                                   |
|------------|--------|-------------------|-----------------------------------------------------------------------------------|
| ≥50V       | ≤ 3%   | ≤ 6%              | 0201(50V); 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF;                                |
|            |        | ≤ 10%             | 1210≥4.7μF;                                                                       |
|            |        | ≤ 20%             | 0402≥0.1μF;0603≥1μF; 0805≥1μF;1206≥2.2μF; 1210≥10μF; TT series                    |
| 35V        | ≤ 5%   | ≤20%              | 0603≥1μF; 0805≥2.2μF; 1210≥10μF;                                                  |
| 25V        | ≤ 5%   | ≤10%              | 0201≥0.01μF; 0805≥1μF; 1210≥10μF                                                  |
|            |        | ≤14%              | 0603≥0.33μF;1206≥4.7μF                                                            |
|            |        | ≤15%              | 0402≥0.10μF;0603≥0.47μF;0 805≥2.2μF;1206≥6.8μF; 1210≥22μF; TT series              |
| 16V        | ≤5%    | ≤10%              | 0603≥0.15μF;0805≥0.68μF;1206≥2.2μF;1210≥4.7μF                                     |
|            |        | ≤15%              | 0201≥0.01μF;0402≥0.033μF; 0603≥0.68μF;0805≥2.2μF 1206≥4.7μF; 1210≥22μF; TT series |
| 10V        | ≤ 7.5% | ≤15%              | 0201≥0.012μF;0402≥0.33μF; 0603≥0.33μF;0805≥2.2μF 1206≥2.2μF; 1210≥22μF            |
|            |        | ≤20%              | 0201≥0.1μF ;0402≥1μF; TT series                                                   |
| 6.3V       | ≤ 15%  | ≤30%              | 0201≥0.1μF;0402≥1μF;0603 ≥10μF; 0805≥4.7μF;1206≥47μF;1210≥100μF;                  |
| 4V         | ≤20%   | ---               | ---                                                                               |

IR.: ≥10GΩ or  $R_{xC} \geq 500\Omega \cdot F$  whichever is smaller

### Moisture Resistance– Requirements –Class II-X7R

Table 10

| Rated voltage                                                           | Insulation Resistance                                      |
|-------------------------------------------------------------------------|------------------------------------------------------------|
| ≥100V: X7R                                                              | 1GΩ or $R_{xC} \geq 10\Omega \cdot F$ whichever is smaller |
| 50V:0603≥1μF;0805≥1μF; 1206≥4.7μF;1210≥4.7μF                            |                                                            |
| 35V:0805≥2.2μF;1210≥10μF                                                |                                                            |
| 25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF; 1206≥10μF;1210≥10μF                 |                                                            |
| 16V: 0201≥0.1uF;0402≥0.22μF; 0603≥1μF;0805≥2.2μF; 1206≥10μF;1210≥47μF   |                                                            |
| 10V:0201≥47nF;0402≥0.47μF; 0603≥0.47μF;0805≥2.2μF; 1206≥4.7μF;1210≥47μF |                                                            |
| 6.3V; 4V;                                                               |                                                            |

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### Biased Humidity- Requirements –X7R

Table 11

| Rated vol. | DF ≤   | Exception of DF ≤ |                                                                         |
|------------|--------|-------------------|-------------------------------------------------------------------------|
| ≥50V       | ≤ 3%   | ≤ 6%              | 0201(50V); 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF;                      |
|            |        | ≤ 10%             | 1210≥4.7μF;                                                             |
|            |        | ≤ 20%             | 0402≥0.1μF;0603≥1μF; 0805≥1μF;1206≥2.2μF; 1210≥10μF;                    |
| 35V        | ≤ 5%   | ≤20%              | 0603≥1μF; 0805≥2.2μF; 1210≥10μF;                                        |
| 25V        | ≤ 5%   | ≤10%              | 0201≥0.01μF; 0805≥1μF; 1210≥10μF                                        |
|            |        | ≤14%              | 0603≥0.33μF;1206≥4.7μF                                                  |
|            |        | ≤15%              | 0402≥0.10μF;0603≥0.47μF;0805≥2.2μF;1206≥6.8μF; 1210≥22μF;               |
| 16V        | ≤5%    | ≤10%              | 0603≥0.15μF;0805≥0.68μF;1206≥2.2μF;1210≥4.7μF                           |
|            |        | ≤15%              | 0201≥0.01μF;0402≥0.033μF; 0603≥0.68μF;0805≥2.2μF 1206≥4.7μF; 1210≥22μF; |
| 10V        | ≤ 7.5% | ≤15%              | 0201≥0.012μF;0402≥0.33μF; 0603≥0.33μF;0805≥2.2μF 1206≥2.2μF; 1210≥22μF  |
|            |        | ≤20%              | 0201≥0.1μF ;0402≥1μF;                                                   |
| 6.3V       | ≤ 15%  | ≤30%              | 0201≥0.1μF;0402≥1μF;0603 ≥10μF; 0805≥4.7μF;1206≥47μF;1210≥100μF;        |
| 4V         | ≤20%   | ---               | ---                                                                     |

IR.: ≥10GΩ or RxC≥50Ω-F whichever is smaller

### Biased Humidity- Requirements –Class II-X7R for rated voltage test

Table 12

| Rated voltage                                                           | Insulation Resistance                          |
|-------------------------------------------------------------------------|------------------------------------------------|
| ≥100V: X7R                                                              | 500MΩ or R x C<br>≥5 Ω-F whichever is smaller. |
| 50V:0603≥1μF;0805≥1μF; 1206≥4.7μF;1210≥4.7μF                            |                                                |
| 35V:0805≥2.2μF;1210≥10μF                                                |                                                |
| 25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF; 1206≥10μF;1210≥10μF                 |                                                |
| 16V: 0201≥0.1uF;0402≥0.22μF; 0603≥1μF;0805≥2.2μF; 1206≥10μF;1210≥47μF   |                                                |
| 10V:0201≥47nF;0402≥0.47μF; 0603≥0.47μF;0805≥2.2μF; 1206≥4.7μF;1210≥47μF |                                                |
| 6.3V; 4V;                                                               |                                                |

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### Biased Humidity-- Requirements –Class II-X7R for 1.3V~1.5V

Table 13

| Rated voltage                                                           | Insulation Resistance                         |
|-------------------------------------------------------------------------|-----------------------------------------------|
| ≥100V: X7R                                                              | 1GΩ or R x C<br>≥10 Ω-F whichever is smaller. |
| 50V:0603≥1μF;0805≥1μF; 1206≥4.7μF;1210≥4.7μF                            |                                               |
| 35V:0805≥2.2μF;1210≥10μF                                                |                                               |
| 25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF; 1206≥10μF;1210≥10μF                 |                                               |
| 16V: 0201≥0.1uF;0402≥0.22μF; 0603≥1μF;0805≥2.2μF; 1206≥10μF;1210≥47μF   |                                               |
| 10V:0201≥47nF;0402≥0.47μF; 0603≥0.47μF;0805≥2.2μF; 1206≥4.7μF;1210≥47μF |                                               |
| 6.3V; 4V;                                                               |                                               |

### Operational Life-Requirements –X7R

Table 14

| Rated vol. | DF ≤   | Exception of DF ≤ |                                                                         |
|------------|--------|-------------------|-------------------------------------------------------------------------|
| ≥50V       | ≤ 3%   | ≤ 6%              | 0201(50V); 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF;                      |
|            |        | ≤ 10%             | 1210≥4.7μF;                                                             |
|            |        | ≤ 20%             | 0402≥0.1μF;0603≥1μF; 0805≥1μF;1206≥2.2μF; 1210≥10μF;                    |
| 35V        | ≤ 5%   | ≤20%              | 0603≥1μF; 0805≥2.2μF; 1210≥10μF;                                        |
| 25V        | ≤ 5%   | ≤10%              | 0201≥0.01μF; 0805≥1μF; 1210≥10μF                                        |
|            |        | ≤14%              | 0603≥0.33μF;1206≥4.7μF                                                  |
|            |        | ≤15%              | 0402≥0.10μF;0603≥0.47μF;0805≥2.2μF;1206≥6.8μF; 1210≥22μF;               |
| 16V        | ≤5%    | ≤10%              | 0603≥0.15μF;0805≥0.68μF;1206≥2.2μF;1210≥4.7μF                           |
|            |        | ≤15%              | 0201≥0.01μF;0402≥0.033μF; 0603≥0.68μF;0805≥2.2μF 1206≥4.7μF; 1210≥22μF; |
| 10V        | ≤ 7.5% | ≤15%              | 0201≥0.012μF;0402≥0.33μF; 0603≥0.33μF;0805≥2.2μF 1206≥2.2μF; 1210≥22μF  |
|            |        | ≤20%              | 0201≥0.1μF ;0402≥1μF;                                                   |
| 6.3V       | ≤ 15%  | ≤30%              | 0201≥0.1μF;0402≥1μF;0603 ≥10μF; 0805≥4.7μF;1206≥47μF;1210≥100μF;        |
| 4V         | ≤20%   | ---               | ---                                                                     |

IR.: ≥10GΩ or RxC≥50Ω-F whichever is smaller

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## Operational Life-Requirements –X7R-Class II

Table 15

| Rated voltage                                                           | Insulation Resistance                                       |
|-------------------------------------------------------------------------|-------------------------------------------------------------|
| ≥100V: X7R                                                              | 1GΩ or $RxC \geq 100\Omega \cdot F$<br>whichever is smaller |
| 50V:0603≥1μF;0805≥1μF; 1206≥4.7μF;1210≥4.7μF                            |                                                             |
| 35V:0805≥2.2μF;1210≥10μF                                                |                                                             |
| 25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF; 1206≥10μF;1210≥10μF                 |                                                             |
| 16V: 0201≥0.1μF;0402≥0.22μF; 0603≥1μF;0805≥2.2μF; 1206≥10μF;1210≥47μF   |                                                             |
| 10V:0201≥47nF;0402≥0.47μF; 0603≥0.47μF;0805≥2.2μF; 1206≥4.7μF;1210≥47μF |                                                             |
| 6.3V; 4V;                                                               |                                                             |

## Moisture Resistance II, Mechanical Shock, Vibration, Resistance to Soldering Heat , Thermal Shock, Electrical Characterization-Requirements –X7R

Table 16

| Rated vol. | DF ≤   | Exception of DF ≤ |                                                                         |
|------------|--------|-------------------|-------------------------------------------------------------------------|
| ≥50V       | ≤2.5%  | ≤ 3%              | 0201(50V);0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF                        |
|            |        | ≤ 5%              | 1210≥4.7μF;                                                             |
|            |        | ≤ 10%             | 0402≥0.1μF;0603≥1μF; 0805≥1μF;1206≥2.2μF; 1210≥10μF;                    |
| 35V        | ≤ 3.5% | ≤10%              | 0603≥1μF; 0805≥2.2μF; 1210≥10μF;                                        |
| 25V        | ≤ 3.5% | ≤5%               | 0201≥0.01μF; 0805≥1μF; 1210≥10μF                                        |
|            |        | ≤7%               | 0603≥0.33μF;1206≥4.7μF                                                  |
|            |        | ≤10%              | 0402≥0.10μF;0603≥0.47μF;0805≥2.2μF;1206≥6.8μF; 1210≥22μF;               |
| 16V        | ≤3.5%  | ≤5%               | 0603≥0.15μF;0805≥0.68μF;1206≥2.2μF;1210≥4.7μF                           |
|            |        | ≤10%              | 0201≥0.01μF;0402≥0.033μF; 0603≥0.68μF;0805≥2.2μF 1206≥4.7μF; 1210≥22μF; |
| 10V        | ≤ 5%   | ≤10%              | 0201≥0.012μF;0402≥0.33μF; 0603≥0.33μF;0805≥2.2μF 1206≥2.2μF; 1210≥22μF  |
|            |        | ≤15%              | 0201≥0.1μF ;0402≥1μF;                                                   |
| 6.3V       | ≤ 10%  | ≤15%              | 0201≥0.1μF;0402≥1μF;0603 ≥10μF; 0805≥4.7μF;1206≥47μF;1210≥100μF;        |
|            |        | ≤20%              | 0402≥2.2μF;                                                             |
| 4V         | ≤15%   | ---               | ---                                                                     |

IR.: ≥10GΩ or  $RxC \geq 500\Omega \cdot F$  whichever is smaller

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## MULTILAYER CERAMIC CHIP CAPACITORS MT SERIES

### ESD-Requirements –X7R

Table 17

| Rated vol. | DF ≤   | Exception of DF ≤ |                                                                         |
|------------|--------|-------------------|-------------------------------------------------------------------------|
| ≥50V       | ≤2.5%  | ≤ 3%              | 0201(50V);0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF                        |
|            |        | ≤ 5%              | 1210≥4.7μF;                                                             |
|            |        | ≤ 10%             | 0402≥0.1μF;0603≥1μF; 0805≥1μF;1206≥2.2μF; 1210≥10μF;                    |
| 35V        | ≤ 3.5% | ≤10%              | 0603≥1μF; 0805≥2.2μF; 1210≥10μF;                                        |
| 25V        | ≤ 3.5% | ≤5%               | 0201≥0.01μF; 0805≥1μF; 1210≥10μF                                        |
|            |        | ≤7%               | 0603≥0.33μF;1206≥4.7μF                                                  |
|            |        | ≤10%              | 0402≥0.10μF;0603≥0.47μF;0805≥2.2μF;1206≥6.8μF; 1210≥22μF;               |
| 16V        | ≤3.5%  | ≤5%               | 0603≥0.15μF;0805≥0.68μF;1206≥2.2μF;1210≥4.7μF                           |
|            |        | ≤10%              | 0201≥0.01μF;0402≥0.033μF; 0603≥0.68μF;0805≥2.2μF 1206≥4.7μF; 1210≥22μF; |
| 10V        | ≤ 5%   | ≤10%              | 0201≥0.012μF;0402≥0.33μF; 0603≥0.33μF;0805≥2.2μF 1206≥2.2μF; 1210≥22μF  |
|            |        | ≤15%              | 0201≥0.1μF ;0402≥1μF;                                                   |
| 6.3V       | ≤ 10%  | ≤15%              | 0201≥0.1μF;0402≥1μF;0603 ≥10μF; 0805≥4.7μF;1206≥47μF;1210≥100μF;        |
|            |        | ≤20%              | 0402≥2.2μF;                                                             |
| 4V         | ≤15%   | ---               | ---                                                                     |

IR.: ≥10GΩ or RxC≥50Ω-F whichever is smaller

### Mechanical Shock, Vibration – Requirements –X7R-Class II

Table 18

| Rated voltage                                                           | Insulation Resistance                           |
|-------------------------------------------------------------------------|-------------------------------------------------|
| ≥100V: X7R                                                              | 10GΩ or R x C<br>≥100 Ω-F whichever is smaller. |
| 50V:0603≥1μF;0805≥1μF; 1206≥4.7μF;1210≥4.7μF                            |                                                 |
| 35V:0805≥2.2μF;1210≥10μF                                                |                                                 |
| 25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF; 1206≥10μF;1210≥10μF                 |                                                 |
| 16V: 0201≥0.1uF;0402≥0.22μF; 0603≥1μF;0805≥2.2μF; 1206≥10μF;1210≥47μF   |                                                 |
| 10V:0201≥47nF;0402≥0.47μF; 0603≥0.47μF;0805≥2.2μF; 1206≥4.7μF;1210≥47μF |                                                 |
| 6.3V; 4V;                                                               |                                                 |

## MULTILAYER CERAMIC CHIP CAPACITORS MT SERIES

**Terminal Strength-Requirements –X7R**
**Table 19**

| Rated vol. | DF ≤   | Exception of DF ≤ |                                                                             |
|------------|--------|-------------------|-----------------------------------------------------------------------------|
| ≥50V       | ≤2.5%  | ≤ 3%              | 0201(50V);0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF                            |
|            |        | ≤ 5%              | 1210≥4.7μF;                                                                 |
|            |        | ≤ 10%             | 0402≥0.1μF;0603≥1μF; 0805≥1μF;1206≥2.2μF; 1210≥10μF;                        |
| 35V        | ≤ 3.5% | ≤10%              | 0603≥1μF; 0805≥2.2μF; 1210≥10μF;                                            |
| 25V        | ≤ 3.5% | ≤5%               | 0201≥0.01μF; 0805≥1μF; 1210≥10μF                                            |
| 16V        | ≤3.5%  | ≤5%               | 0201≥0.01μF;0402≥0.033μF;0603 ≥0.15μF;0805≥0.68μF;<br>1206≥2.2μF;1210≥4.7μF |
|            |        | ≤10%              | 0201≥0.1uF; 0402≥ 0.22uF; 0603≥0.68μF;0805≥2.2μF; 1206≥4.7μF;<br>1210≥22μF; |
| 10V        | ≤ 5%   | ≤10%              | 0201≥0.012μF;0402≥0.33μF; 0603≥0.33μF;0805≥2.2μF 1206≥2.2μF;<br>1210≥22μF   |
|            |        | ≤15%              | 0201≥0.1μF ;0402≥1μF;                                                       |
| 6.3V       | ≤ 10%  | ≤15%              | 0201≥0.1μF;0402≥1μF;0603 ≥10μF; 0805≥4.7μF;1206≥47μF;1210≥100μF;            |
|            |        | ≤20%              | 0402≥2.2μF;                                                                 |
| 4V         | ≤15%   | ---               | ---                                                                         |

**Moisture Resistance II, Resistance to Soldering Heat- Requirements –X7R-Class II**
**Table 20**

| Rated voltage                                                           | Insulation Resistance                          |
|-------------------------------------------------------------------------|------------------------------------------------|
| ≥100V: X7R                                                              | 10GΩ or R x C<br>≥10 Ω-F whichever is smaller. |
| 50V:0603≥1μF;0805≥1μF; 1206≥4.7μF;1210≥4.7μF                            |                                                |
| 35V:0805≥2.2μF;1210≥10μF                                                |                                                |
| 25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF; 1206≥10μF;1210≥10μF                 |                                                |
| 16V: 0201≥0.1uF;0402≥0.22μF; 0603≥1μF;0805≥2.2μF; 1206≥10μF;1210≥47μF   |                                                |
| 10V:0201≥47nF;0402≥0.47μF; 0603≥0.47μF;0805≥2.2μF; 1206≥4.7μF;1210≥47μF |                                                |
| 6.3V; 4V;                                                               |                                                |

## MULTILAYER CERAMIC CHIP CAPACITORS MT SERIES

### Thermal Shock –Requirements –X7R-Class II

Table 21

| Rated voltage                                                           | Insulation Resistance                         |
|-------------------------------------------------------------------------|-----------------------------------------------|
| ≥100V: X7R                                                              | 1GΩ or R x C<br>≥10 Ω-F whichever is smaller. |
| 50V:0603≥1μF;0805≥1μF; 1206≥4.7μF;1210≥4.7μF                            |                                               |
| 35V:0805≥2.2μF;1210≥10μF                                                |                                               |
| 25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF; 1206≥10μF;1210≥10μF                 |                                               |
| 16V: 0201≥0.1uF;0402≥0.22μF; 0603≥1μF;0805≥2.2μF; 1206≥10μF;1210≥47μF   |                                               |
| 10V:0201≥47nF;0402≥0.47μF; 0603≥0.47μF;0805≥2.2μF; 1206≥4.7μF;1210≥47μF |                                               |
| 6.3V; 4V;                                                               |                                               |

### ESD –Requirements –X7R-Class II

Table 22

| Rated voltage                                                           | Insulation Resistance                          |
|-------------------------------------------------------------------------|------------------------------------------------|
| ≥100V: X7R                                                              | 1GΩ or R x C<br>≥100 Ω-F whichever is smaller. |
| 50V:0603≥1μF;0805≥1μF; 1206≥4.7μF;1210≥4.7μF                            |                                                |
| 35V:0805≥2.2μF;1210≥10μF                                                |                                                |
| 25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF; 1206≥10μF;1210≥10μF                 |                                                |
| 16V: 0201≥0.1uF;0402≥0.22μF; 0603≥1μF;0805≥2.2μF; 1206≥10μF;1210≥47μF   |                                                |
| 10V:0201≥47nF;0402≥0.47μF; 0603≥0.47μF;0805≥2.2μF; 1206≥4.7μF;1210≥47μF |                                                |
| 6.3V; 4V;                                                               |                                                |

### Electrical Characterization –Requirements –X7R-Class II

Table 23

| Rated voltage                                                           | Insulation Resistance                           |
|-------------------------------------------------------------------------|-------------------------------------------------|
| ≥100V: X7R                                                              | 10GΩ or R x C<br>≥100 Ω-F whichever is smaller. |
| 50V:0603≥1μF;0805≥1μF; 1206≥4.7μF;1210≥4.7μF                            |                                                 |
| 35V:0805≥2.2μF;1210≥10μF                                                |                                                 |
| 25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF; 1206≥10μF;1210≥10μF                 |                                                 |
| 16V: 0201≥0.1uF;0402≥0.22μF; 0603≥1μF;0805≥2.2μF; 1206≥10μF;1210≥47μF   |                                                 |
| 10V:0201≥47nF;0402≥0.47μF; 0603≥0.47μF;0805≥2.2μF; 1206≥4.7μF;1210≥47μF |                                                 |
| 6.3V; 4V; TT series                                                     |                                                 |

## MULTILAYER CERAMIC CHIP CAPACITORS MT SERIES

### RELIABILITY TEST CONDITIONS AND REQUIREMENTS

| Item                                                             | AEC-Q200 Test Condition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Requirements                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Pre-and Post-Stress Electrical Test                              | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| High Temperature Exposure (Storage)<br>MIL-STD-202<br>Method 108 | <ul style="list-style-type: none"> <li>* Test temp.: <math>150 \pm 3^{\circ} \text{C}</math></li> <li>* Unpowered.</li> <li>* Test time: 1000+24/-0 hrs. * Measurement to be made after keeping at room temp. for <math>24 \pm 2</math> hrs.</li> </ul>                                                                                                                                                                                                                                                                                                                                   | <ul style="list-style-type: none"> <li>*No remarkable damage.</li> <li>*Cap change:<br/>NPO: within <math>\pm 2.5\%</math> or <math>\pm 0.25\text{pF}</math> whichever is larger.<br/>X7R: within <math>\pm 10.00\%</math>.</li> <li>* Q/D.F. value:<br/>NPO: <math>\text{Cap} \geq 30\text{pF}</math>, <math>Q \geq 1000</math> ;<br/><math>\text{Cap} &lt; 30\text{pF}</math>, <math>Q \geq 400+20\text{C}</math>.</li> <li>X7R, See &lt;Table 5&gt;<br/>Class II (X7R) , See &lt;Table 6&gt;</li> </ul> |
| Temperature :<br>Cycling JESD22<br>Method JA-104                 | <ul style="list-style-type: none"> <li>*Conduct 1000 cycles according to the temperatures and time.</li> <li>Step 1: <math>-55^{\circ} \text{C} +0/-3^{\circ} \text{C}</math> @ <math>5 \pm 1</math> min.</li> <li>Step 2: <math>+125^{\circ} \text{C} +3/-0^{\circ} \text{C}</math> @ <math>5 \pm 1</math> min.</li> <li>Before initial measurement (X7R only): Perform <math>150+0/-10^{\circ} \text{C}</math> for 1 hr and then set for <math>24 \pm 2</math> hrs at room temp.</li> <li>*Measurement to be made after keeping at room temp. for <math>24 \pm 2</math> hrs.</li> </ul> | <ul style="list-style-type: none"> <li>* No remarkable damage.</li> <li>*Cap change:<br/>NPO: within <math>\pm 2.5\%</math> or <math>\pm 0.25\text{pF}</math> whichever is larger.<br/>X7R: within <math>\pm 10.00\%</math>.</li> <li>*Q/D.F. value:<br/>NPO: <math>\text{Cap} \geq 30\text{pF}</math>, <math>Q \geq 1000</math> ;<br/><math>\text{Cap} &lt; 30\text{pF}</math>, <math>Q \geq 400+20\text{C}</math></li> <li>X7R, See &lt;Table 7&gt;<br/>Class II (X7R) , See &lt;Table 8&gt;</li> </ul>  |

## MULTILAYER CERAMIC CHIP CAPACITORS MT SERIES

### RELIABILITY TEST CONDITIONS AND REQUIREMENTS

| Item                                              | AEC-Q200 Test Condition                                                                                                                                                                                                                                                                                                                                | Requirements                                                                                                                                                                                                                                                                          |
|---------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Destructive Physical Analysis EIA-469</b>      | Per EIA-469                                                                                                                                                                                                                                                                                                                                            | No defects or abnormalities                                                                                                                                                                                                                                                           |
| <b>Moisture Resistance MIL-STD-202 Method 106</b> | Test temp.: 25~65° C<br>Humidity: 80~100% RH<br>Test time: 10 cycles, t=24hrs/cycle.<br>Measurement to be made after keeping at room temp. for 24±2 hrs.                                                                                                                                                                                               | * No remarkable damage.<br>* Cap change:<br>NPO: within ±3.0% or ±0.30pF whichever is larger.<br>X7R: within ±12.5%.<br>*Q/D.F. value:<br>NPO: More than 30pF Q≥350 ;<br>10pF≤C≤30pF, Q≥275+2.5C<br>Less than 10pF Q≥200+10.<br>X7R, See <Table 9><br>Class II (X7R) , See <Table 10> |
| <b>Biased Humidity MIL-STD-202 Method 103</b>     | Test temp.: 85±3° C<br>Humidity: 85%RH<br>Test time: 1000+24/-0 hrs.<br>To apply voltage: rated voltage and 1.3~1.5Vdc. (add 100k ohm resistor)<br>Before initial measurement (Class II only) : To apply test voltage for 1hr at test temp. and then set for 24±2 hrs at room temp.<br>Measurement to be made after keeping at room temp. for 24±2hrs. | * No remarkable damage.<br>* Cap change:<br>NPO: within ±3.0% or ±0.30pF whichever is larger.<br>X7R: within ±12.5%.<br>*Q/D.F. value:<br>NPO: C≥30pF Q≥200 ; C≤30pF, Q≥100+10/3C<br>X7R, See <Table 11><br>Class II (X7R) , See <Table 12><br><Table 13>                             |

## MULTILAYER CERAMIC CHIP CAPACITORS MT SERIES

### RELIABILITY TEST CONDITIONS AND REQUIREMENTS

| Item                                                                               | AEC-Q200 Test Condition                                                                                                                                                                                                                                                                                                                        | Requirements                                                                                                                                                                                                                                                                                                                                                                        |
|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Operational Life</b><br><b>MIL-STD-202</b><br><b>Method 108</b>                 | Test temp.: $125 \pm 3^{\circ} \text{C}$<br>To apply voltage: full rated voltage.<br>* Test time: 1000+24/-0 hrs. Before initial measurement (X7R only): Apply rated voltage for 1 hr at $125^{\circ}\text{C}$ . Remove and let set for $24 \pm 2$ hrs at room temp.<br>Measurement to be made after keeping at room temp. for $24 \pm 2$ hrs. | * No remarkable damage.<br>* Cap change:<br>NPO: within $\pm 3.0\%$ or $\pm 0.30\text{pF}$ whichever is larger.<br>X7R: within $\pm 12.5\%$ .<br>*Q/D.F. value:<br>NPO: More than $30\text{pF}$ $Q \geq 350$ ;<br>$10\text{pF} \leq C \leq 30\text{pF}$ , $Q \geq 275 + 2.5C$ Less than $10\text{pF}$ $Q \geq 200 + 10$ .<br>X7R, See <Table 14><br>Class II (X7R) , See <Table 15> |
| <b>External Visual</b><br><b>MIL-STD-883</b><br><b>Method 2009</b>                 | Visual inspection                                                                                                                                                                                                                                                                                                                              | No remarkable defect.                                                                                                                                                                                                                                                                                                                                                               |
| <b>Physical</b><br><b>Dimension JESD22</b><br><b>Method JB-100</b>                 | Using by calipers                                                                                                                                                                                                                                                                                                                              | Within the specified dimensions                                                                                                                                                                                                                                                                                                                                                     |
| <b>Moisture</b><br><b>Resistance II</b><br><b>MIL-STD-202</b><br><b>Method 106</b> | * Temperature: $25 \pm 5^{\circ} \text{C}$<br>* Time: 3+0.5/-0 min.<br>*Solvent: Iso - propyl alcohol.                                                                                                                                                                                                                                         | * No remarkable damage.<br>* Cap change: within the specified tolerance.<br>*Q/D.F. value:<br>NPO: $\text{Cap} \geq 30\text{pF}$ , $Q \geq 1000$ ;<br>$\text{Cap} < 30\text{pF}$ , $Q \geq 400 + 20C$<br>X7R, See <Table 16><br>Class II (X7R) , See <Table 20>                                                                                                                     |

## MULTILAYER CERAMIC CHIP CAPACITORS MT SERIES

### RELIABILITY TEST CONDITIONS AND REQUIREMENTS

| Item                                                                           | AEC-Q200 Test Condition                                                                                                                                                                                                                                                      | Requirements                                                                                                                                                                                                                                                                  |
|--------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Mechanical Shock</b><br><b>IL-STD-202</b><br><b>Method 213</b>              | Peak value: 1500g's.<br>Wave: 1/2 sine.<br>Velocity: 15.4 ft/sec<br>Three shocks in each direction should be applied along 3 mutually perpendicular axes of the test specimen (18 shocks)                                                                                    | * No remarkable damage.<br>* Cap change: within the specified tolerance.<br>*Q/D.F. value:<br>NPO: Cap $\geq$ 30pF, Q $\geq$ 1000 ;<br>Cap<30pF, Q $\geq$ 400+20C<br>X7R, See <Table 16><br>Class II (X7R) , See <Table 18>                                                   |
| <b>Vibration MIL-STD-202 Method 204</b>                                        | Vibration<br>frequency:10~2000Hz/min. (5g's for 20 min)<br>Total amplitude: 1.5mm 12 cycles each of 3 orientations (36 times)                                                                                                                                                | * No remarkable damage.<br>* Cap change: within the specified tolerance.<br>*Q/D.F. value:<br>NPO: Cap $\geq$ 30pF, Q $\geq$ 1000 ;<br>Cap<30pF, Q $\geq$ 400+20C<br>X7R, See <Table 16><br>Class II (X7R) , See <Table 18>                                                   |
| <b>Resistance to Soldering Heat</b><br><b>MIL-STD-202</b><br><b>Method 210</b> | *Solder temperature: 270 $\pm$ 5° C<br>*Dipping time: 10 $\pm$ 1 sec<br>*Before initial measurement (X7R only): Perform 150+0/-10° C for 1 hr and then set for 24 $\pm$ 2 hrs at room temp.<br>* Measurement to be made after keeping X7R: at room temp. for 24 $\pm$ 2 hrs. | * No remarkable damage.<br>* Cap change:<br>NPO: within $\pm$ 2.5% or 0.25pF whichever is larger<br>X7R: within $\pm$ 7.5%<br>*Q/D.F. value:<br>NPO: Cap $\geq$ 30pF, Q $\geq$ 1000 ;<br>Cap<30pF, Q $\geq$ 400+20C<br>X7R, See <Table 16><br>Class II (X7R) , See <Table 20> |

## MULTILAYER CERAMIC CHIP CAPACITORS MT SERIES

### RELIABILITY TEST CONDITIONS AND REQUIREMENTS

| Item                                        | Test Condition                                                                                                                                                                                                                                                                                                                                                                                                 | Requirements                                                                                                                                                                                                                                                                            |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Thermal Shock IL-STD-202 Method 107</b>  | <p>*Conduct 300 cycles according to the temperatures and time. transfer time: 20 sec.</p> <p>Step 1: -55° C +0/-3° C @ 15±3 min.</p> <p>Step 2: +125° C +3/-0° C @ 15±3 min.</p> <p>*Max.transfer time:20 sec</p> <p>*Before initial measurement (X7R only): Perform 150+0/-10° C for 1 hr and then set for 24±2 hrs at room temp.</p> <p>*Measurement to be made after keeping at room temp. for 24±2 hrs</p> | <p>* No remarkable damage.</p> <p>* Cap change:<br/>NPO: within ±2.5% or 0.25pF<br/>whichever is larger<br/>X7R: within ±10.0%</p> <p>*Q/D.F. value:<br/>NPO: Cap≥30pF, Q≥1000 ;<br/>Cap&lt;30pF, Q≥400+20C<br/>X7R, See &lt;Table 16&gt;<br/>Class II (X7R) , See &lt;Table 21&gt;</p> |
| <b>ESD AEC-Q200-002</b>                     | Per AEC-Q200-002                                                                                                                                                                                                                                                                                                                                                                                               | <p>* No remarkable damage.</p> <p>* Cap change: within the specified tolerance.</p> <p>*Q/D.F. value:<br/>NPO: Cap≥30pF, Q≥1000 ;<br/>Cap&lt;30pF, Q≥400+20C<br/>X7R, See &lt;Table 17&gt;<br/>Class II (X7R) , See &lt;Table 22&gt;</p>                                                |
| <b>Solderability J-STD-002 JESD22-B102E</b> | <p>*Condition A<br/>Un-mounted chips 4hrs / 155° C</p> <p>*dry then completely immersed for 5±0.5 sec in solder bath at 245±5° C.</p> <p>*Condition B<br/>Un-mounted chips steam 8 hrs then completely immersed for 10±1sec in solder bath at 220+5/-0° C.</p> <p>*Condition C<br/>Un-mounted chips steam 8 hrs then completely immersed for 10±1 sec. in solder bath at 260+0/-5° C.</p>                      | All terminations shall exhibit a continuous solder coating free from defects from a minimum of 95% of the critical surface area of any individual termination.                                                                                                                          |

## MULTILAYER CERAMIC CHIP CAPACITORS MT SERIES

### RELIABILITY TEST CONDITIONS AND REQUIREMENTS

| Item                               | Test Condition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Requirements                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Electrical Characterization</b> | <p>*Capacitance</p> <p>*Q/ D.F. (Dissipation Factor) Cap≤1000pF<br/>1.0±0.2Vrms, 1MHz±10%</p> <p>Cap&gt;1000pF 1.0±0.2Vrms, 1KHz±10%</p> <p>*Insulation Resistance To apply rated voltage(500V max.) for max. 120 sec.</p> <p>*Dielectric Strength<br/>To apply voltage:<br/> ≤100                    ≥2.5 times VDC<br/> 200V~300V           ≥2 times VDC<br/> 400V~450V           ≥1.2 times<br/> VDC 500V~999V    ≥1.5 times<br/> VDC 1000V~3000V ≥1.2 times VDC , duration 1~5 sec,<br/> charge and discharge current less than 50mA.</p> <p>*Temperature Coefficient (with no electrical load)<br/> Operation temperature: -55~125° C at 25° C</p> | <p>* Cap change: within the specified tolerance.</p> <p>*Q/D.F. value:<br/> NPO: Cap≥30pF, Q≥1000 ;<br/> Cap&lt;30pF, Q≥400+20C<br/> X7R, See &lt;Table 16&gt;<br/> Class II (X7R) , See &lt;Table 23&gt;</p> <p>*Dielectric strength No evidence of damage or flash over during test.</p> <p>*Temperature Coefficient<br/> Capacitance Change:<br/> NPO: Within ±30ppm/° C<br/> X7R: Within ±15%</p> |
| <b>Board Flex AEC-Q200-005</b>     | <p>* The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1 mm per second until the deflection becomes 3mm (2mm for X7R) and then the pressure shall be maintained for 5±1 sec.</p> <p>* Measurement to be made after keeping at room temp. for 24±2 hrs.</p>                                                                                                                                                                                                                                                                                                                                          | <p>* No remarkable damage.</p> <p>*Cap change: NPO: within ±5.0% or ±0.5pF whichever is larger.<br/> X7R: within ±12.5%. (This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)</p>                                                                                                                            |

## MULTILAYER CERAMIC CHIP CAPACITORS MT SERIES

### RELIABILITY TEST CONDITIONS AND REQUIREMENTS

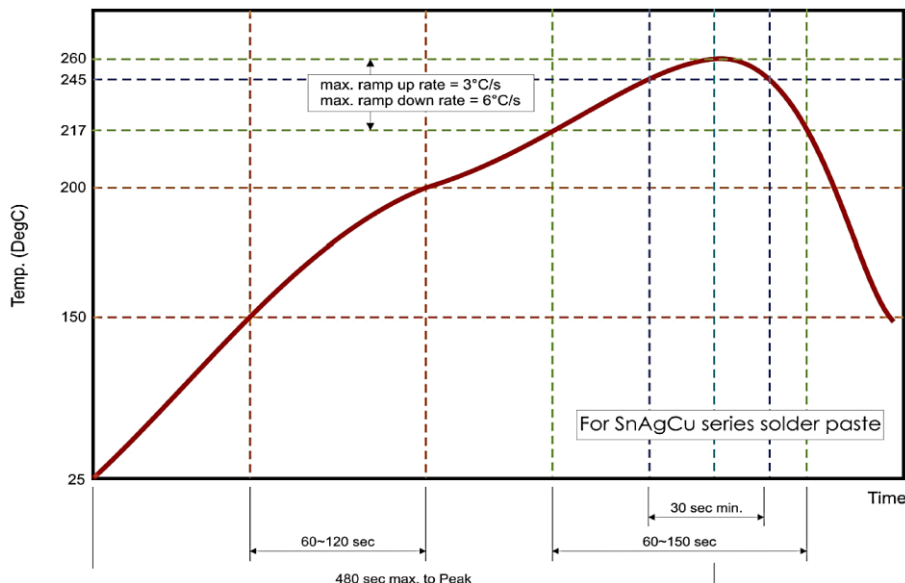
| Item                                            | Test Condition                                                                        | Requirements                                                                                                                                                                                                                    |
|-------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Terminal Strength</b><br><b>AEC-Q200-006</b> | * Pressurizing force: 2N (0402), 10N(0603) 18N(0805).<br>* Test time: $60 \pm 1$ sec. | * No remarkable damage or removal of the terminations.<br>* Capacitance within the specified tolerance<br>* Q/D.F. value:<br>NPO: $Cap \geq 30pF$ , $Q \geq 1000$ ;<br>$Cap < 30pF$ , $Q \geq 400 + 20C$<br>X7R, See <Table 19> |
| <b>Beam Load Test</b><br><b>AEC-Q200-003</b>    | * Break strength test<br>* Beam speed: $2.5 \pm 0.25$ mm/se                           | The chip endure following force<br>* Chip length $\leq 2.5mm$ : Thickness $> 0.5mm$ (20N), $\leq 0.5mm$ (8N)<br>* Chip length $\geq 3.2mm$ : Thickness $\geq 1.25mm$ (54.5N), $< 1.25mm$ (15N)                                  |

## MULTILAYER CERAMIC CHIP CAPACITORS MT SERIES

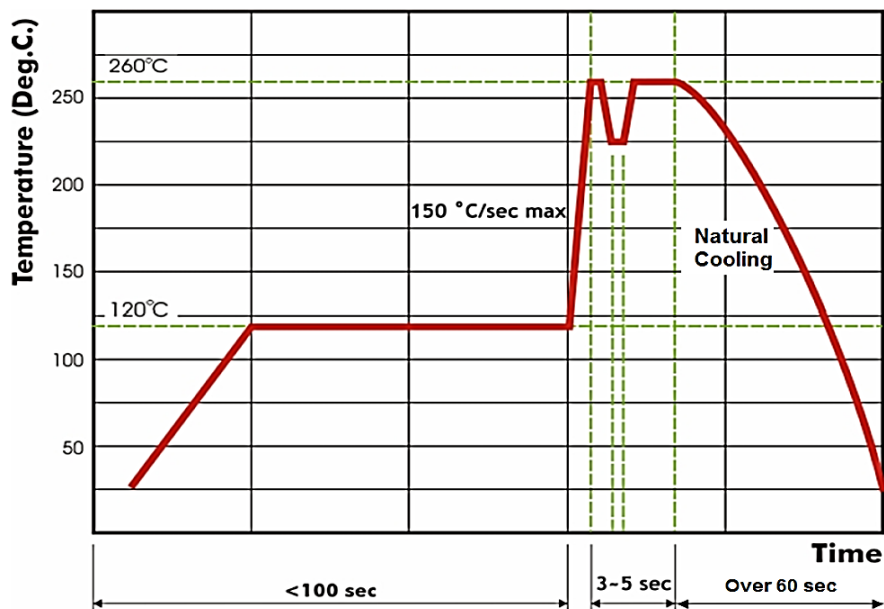
### RECOMMENDED PROFILE CONDITIONS

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

If the optimized solder joint is requested, increasing soldering time, temperature and concentration of N<sub>2</sub> within oven are recommended.



Reflow Soldering Profile For SMT Process with SnAgCu series Solder Paste



Wave Soldering Profile For SMT Process with SnAgCu series Solder Paste

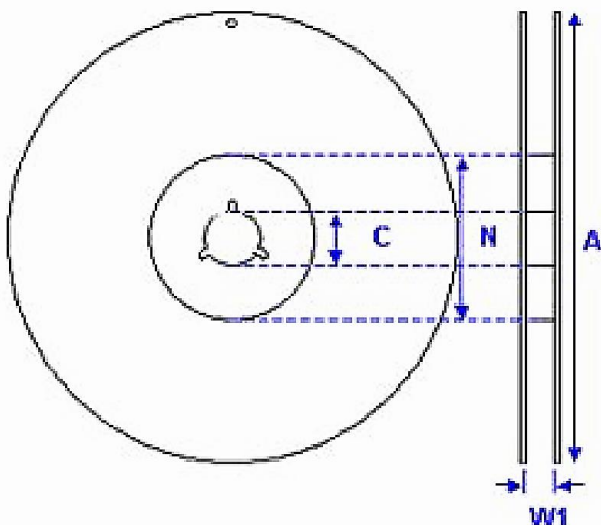
## MULTILAYER CERAMIC CHIP CAPACITORS MT SERIES

### PACKAGING STYLE AND QUANTITY

| Size        | Thickness (Symbol) |   | Paper Tape |          | Plastic Tape |          |
|-------------|--------------------|---|------------|----------|--------------|----------|
|             |                    |   | 7" Reel    | 13" Reel | 7" Reel      | 13" Reel |
| 0201 (0603) | 0.30±0.03          | L | 15,000     | 70,000   | -            | -        |
| 0402 (1005) | 0.50±0.05          | N | 10,000     | 50,000   |              |          |
| 0603 (1608) | 0.80±0.07          | S | 4,000      | 15,000   |              |          |
|             | 0.80+0.15/-0.10    | X | 4,000      | 15,000   |              |          |
| 0805 (2012) | 0.60±0.10          | A | 4,000      | 15,000   |              |          |
|             | 0.85±0.10          | 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) | 0.80±0.10          | B | 4,000      | 15,000   |              |          |
|             | 0.95±0.10          | C |            |          | 3,000        | 10,000   |
|             | 1.15±0.15          | J |            |          | 3,000        | 10,000   |
|             | 1.25±0.10          | D |            |          | 3,000        | 10,000   |
|             | 1.60±0.20          | G |            |          | 2,000        | 10,000   |
|             | 1.60+0.30/-0.10    | P |            |          | 2,000        | 9,000    |
| 1210 (3225) | 0.95±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    |

# MULTILAYER CERAMIC CHIP CAPACITORS MT SERIES

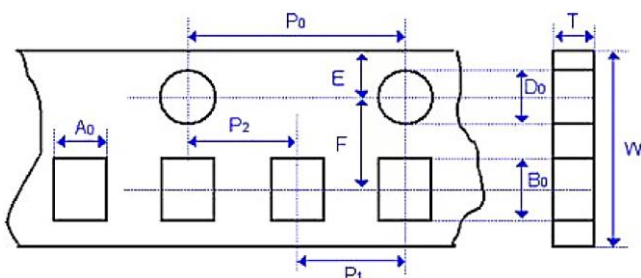
## REEL DIMENSION (Unit: mm)



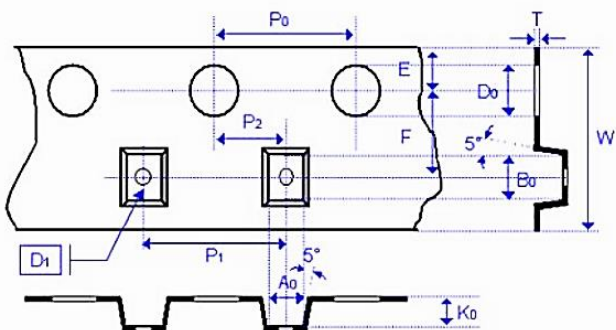
| Size Code | 0201, 0402, 0603, 0805, 1206, 1210 |               |               |
|-----------|------------------------------------|---------------|---------------|
| Reel Size | 7"                                 | 10"           | 13"           |
| C         | 13.0+0.5/-0.2                      | 13.0+0.5/-0.2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

## TAPE DIMENSION (Unit: mm)

Paper Tape



Plastic Tape



## MULTILAYER CERAMIC CHIP CAPACITORS MT SERIES

### TAPE DIMENSION (Unit: mm)

| Size      | 0201         | 0402         | 0603         | 0805         |              |              |
|-----------|--------------|--------------|--------------|--------------|--------------|--------------|
| Thickness | L            | N, E         | S, H, X      | A, H         | B, T         | D, I         |
| A0        | 0.39+/-0.07  | 0.70+/-0.2   | 1.05+/-0.30  | 1.50+/-0.20  | 1.50+/-0.20  | < 1.80       |
| B0        | 0.69+/-0.07  | 1.20+/-0.2   | 1.80+/-0.30  | 2.30+/-0.20  | 2.30+/-0.20  | < 2.70       |
| T         | ≤0.50        | ≤0.80        | ≤1.20        | ≤1.15        | ≤1.30        | 0.23+/-0.1   |
| W         | 8.00+/-0.10  | 8.00+/-0.10  | 8.00+/-0.10  | 8.00+/-0.10  | 8.00+/-0.10  | 8.00+/-0.20  |
| 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+/-0.10 | 40.00+/-0.10 | 40.00+/-0.20 | 40.00+/-0.20 | 40.00+/-0.20 | 40.00+/-0.20 |
| P1        | 2.00+/-0.05  | 2.00+/-0.05  | 4.00+/-0.10  | 4.00+/-0.10  | 4.00+/-0.10  | 4.00+/-0.10  |
| P2        | 2.00+/-0.05  | 2.00+/-0.05  | 2.00+/-0.05  | 2.00+/-0.05  | 2.00+/-0.05  | 2.00+/-0.05  |
| D0        | 1.55+/-0.05  | 1.55+/-0.05  | 1.55+/-0.05  | 1.55+/-0.05  | 1.55+/-0.05  | 1.50+0.1/-0  |
| D1        | -            | -            | -            | -            | -            | 1.00+/-0.10  |
| E         | 1.75+/-0.05  | 1.75+/-0.05  | 1.75+/-0.05  | 1.75+/-0.05  | 1.75+/-0.05  | 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  |

| Size      | 1206         |              |              | 1210         |              |              |
|-----------|--------------|--------------|--------------|--------------|--------------|--------------|
| Thickness | B, T         | C, J, D      | G, P         | T            | C, D, G, K   | M            |
| A0        | 1.90 +/-0.50 | < 2.00       | < 2.30       | < 3.05       | < 3.05       | < 3.20       |
| B0        | 3.50 +/-0.50 | < 3.70       | < 4.00       | < 3.80       | < 3.80       | < 3.95       |
| T         | ≤1.30        | 0.23 +/-0.1  | 0.23 +/-0.1  | 0.23 +/-0.1  | 0.23 +/-0.1  | 0.23 +/-0.1  |
| W         | 8.00 +/-0.10 | 8.00 +/-0.20 | 8.00 +/-0.20 | 8.00 +/-0.20 | 8.00 +/-0.20 | 8.00 +/-0.20 |
| P0        | 4.00 +/-0.10 | 4.00 +/-0.10 | 4.00 +/-0.10 | 4.00 +/-0.10 | 4.00 +/-0.10 | 4.00 +/-0.10 |
| 10xP0     | 40.0 +/-0.20 | 40.0 +/-0.20 | 40.0 +/-0.20 | 40.0 +/-0.20 | 40.0 +/-0.20 | 40.0 +/-0.20 |
| P1        | 4.00 +/-0.10 | 4.00 +/-0.10 | 4.00 +/-0.10 | 4.00 +/-0.10 | 4.00 +/-0.10 | 4.00 +/-0.10 |
| P2        | 2.00 +/-0.05 | 2.00 +/-0.05 | 2.00 +/-0.05 | 2.00 +/-0.05 | 2.00 +/-0.05 | 2.00 +/-0.05 |
| D0        | 1.50 +0.1/-0 | 1.50 +0.1/-0 | 1.50 +0.1/-0 | 1.50 +0.1/-0 | 1.50 +0.1/-0 | 1.50 +0.1/-0 |
| D1        | -            | 1.00 +/-0.10 | 1.00 +/-0.10 | 1.00 +/-0.10 | 1.00 +/-0.10 | 1.00 +/-0.10 |
| E         | 1.75 +/-0.05 | 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 |

## MULTILAYER CERAMIC CHIP CAPACITORS MT SERIES

### STORAGE AND HANDLING CONDITIONS

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

### CAUTIONS

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

### DISCLAIMER

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