



**THE DATASHEET OF  
MA1210XF106K100**



# Multilayer Ceramic Chip Capacitor High Capacitance Type

MA Series

MERITEK

## FEATURE

- A wide selection of sized is available (0201 to 2225)
- High capacitance in given case size
- Capacitor with lead-free termination
- RoHS and HALOGEN compliant.



## PART NUMBERING SYSTEM

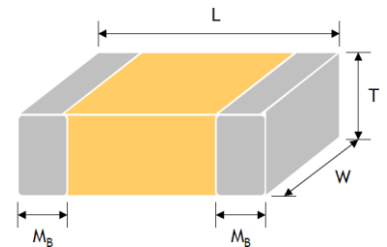
**MA**   **1812**   **XR**   **105**   **C**   **250**  
(1)   (2)   (3)   (4)   (5)   (6)



| No  | Item           | Code | Description                                     | Series Reference   |
|-----|----------------|------|---|--|
| (1) | Meritek Series | MA   | Multilayer Ceramic Chip Capacitor               | High Capacitance Type                                      |
| (2) | Size           | 1812 | EIA size or footprint                           | 0201, 0402, 0603, 0805, 1206, 1210, 1812, 1825, 2220, 2225 |
| (3) | Dielectric     | XR   | XR: X7R   | XF: X5R, YV: Y5V, XM: X6S, XS: X7S                         |
| (4) | Capacitance    | 105  | 105: $10 \times 10^5 \text{pF} = 1 \mu\text{F}$ | $1 \mu\text{F} \sim 220 \mu\text{F}$                       |
| (5) | Tolerance      | K    | K: $\pm 10\%$                                   | K: $\pm 10\%$ , M: $\pm 20\%$ , Z: $-20\% \sim +80\%$      |
| (6) | Rated Voltage  | 250  | Working Voltage: 25VDC                          | 4R0: 4.0VDC $\sim$ 631: 630VDC                             |

## DIMENSIONS

| EIA Size | L(mm)     | W(mm)     | T   | M <sub>B</sub> (mm) |
|----------|-----------|-----------|---|---------------------|
| 0201     | 0.60±0.03 | 0.30±0.03 | See<br>Thickness<br>Specification<br>Reference<br>Table | 0.15±0.05           |
| 0402     | 1.00±0.10 | 0.50±0.10 |   | 0.25+0.05/-0.10     |
| 0603     | 1.60±0.15 | 0.80±0.15 |   | 0.40±0.15           |
| 0805     | 2.00±0.20 | 1.25±0.20 |   | 0.50±0.20           |
| 1206     | 3.20±0.20 | 1.60±0.20 |   | 0.60±0.20           |
| 1210     | 3.20±0.30 | 2.50±0.30 |   | 0.75±0.35           |
| 1812     | 4.50±0.40 | 3.20±0.30 |   | 0.75±0.35           |
| 1825     | 4.50±0.40 | 6.30±0.40 |   | 0.75±0.35           |
| 2220     | 5.70±0.40 | 5.00±0.40 |   | 0.85±0.35           |
| 2225     | 5.70±0.40 | 6.30±0.40 |   | 0.85±0.35           |



## THICKNESS SPECIFICATION REFERENCE

| Code | Thickness (mm)   | Code | Thickness (mm)  | Code | Thickness (mm)   |
|------|------------------|------|-----------------|------|------------------|
| A    | 0.60 ± 0.10      | I    | 1.25 ± 0.20     | Q    | 0.50 +0.02/-0.05 |
| B    | 0.8 + 0.15/-0.10 | J    | 1.15 ± 0.15     | R    | 3.10 ± 0.30      |
| C    | 1.25 ± 0.10      | K    | 0.50 ± 0.20     | S    | 0.80 ± 0.07      |
| D    | 1.40 ± 0.15      | L    | 0.30 ± 0.03     | T    | 0.85 ± 0.10      |
| E    | 1.60 ± 0.20      | M    | 0.95 ± 0.10     | U    | 0.50 ± 0.10      |
| F    | 2.00 ± 0.20      | N    | 0.50 ± 0.05     | V    | 0.20 ± 0.02      |
| G    | 2.50 ± 0.30      | O    | 3.50 ± 0.20     | X    | 0.80 ± 0.10      |
| H    | 2.80 ± 0.30      | P    | 1.60 +0.3/-0.10 | Z    | 0.25 ± 0.03      |

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## ELECTRICAL CHARACTERISTICS

| Item                    | Characteristics                                      |                                     |                                     |                                    |                                     |
|-------------------------|--|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|
|                         | X7R  | X7S                                 | X6S                                 | X5R                                | Y5V                                 |
| Dielectric              |  |                                     |                                     |                                    |                                     |
| Chip Size               | 0402, 0603, 0805, 1206, 1210, 1812, 1825, 2220, 2225 | 0402, 0603, 0805, 1206, 1210        | 0201, 0402, 0603, 0805, 1206, 1210  | 0201, 0402, 0603, 0805, 1206, 1210 | 0402, 0603, 0805, 1206, 1210, 1812  |
| Rated Voltage           | 6.3V, 10V, 16V, 25V, 50V, 100V, 250V, 500V, 630V     | 6.3V, 10V, 16V, 25V, 50V, 100V      | 6.3V, 10V, 16V, 25V, 35V, 50V       | 4V, 6.3V, 10V, 16V, 25V, 35V, 50V  | 6.3V, 10V, 16V, 25V, 35V, 50V, 100V |
| Capacitance             | 1 $\mu$ F ~ 47 $\mu$ F                               | 1 $\mu$ F ~ 100 $\mu$ F             | 1 $\mu$ F ~ 100 $\mu$ F             | 1 $\mu$ F ~ 220 $\mu$ F            | 1 $\mu$ F ~ 100 $\mu$ F             |
| Cap. Tolerance          | K ( $\pm$ 10%), M ( $\pm$ 20%)                       | K ( $\pm$ 10%), M ( $\pm$ 20%)      | K ( $\pm$ 10%), M ( $\pm$ 20%)      | K ( $\pm$ 10%), M ( $\pm$ 20%)     | Z (-20/+80%)                        |
| Dissipation Factor      | See Dissipation Factor Table Below                   |                                     |                                     |                                    |                                     |
| Operating Temperature   | -55 $^{\circ}$ C ~ 125 $^{\circ}$ C                  | -55 $^{\circ}$ C ~ 125 $^{\circ}$ C | -55 $^{\circ}$ C ~ 105 $^{\circ}$ C | -55 ~ 85 $^{\circ}$ C              | -25 ~ 85 $^{\circ}$ C               |
| Temperature Coefficient | $\pm$ 15%  | $\pm$ 22%                           | $\pm$ 22%                           | $\pm$ 15%                          | +30/-80%                            |
| Termination             | Cu or Ag / Ni / Sn or Au (lead-free termination)     |                                     |                                     |                                    |                                     |

## DISSIPATION FACTOR

### X7R/X5R/X6S/X7S

| Rated Vol.  | D.F.        | Exception of D.F. |  |
|-------------|-------------|-------------------|--|
| $\geq$ 100V | $\leq$ 2.5% | $\leq$ 3%         | 1206 $\geq$ 0.47 $\mu$ F   |
|             |             | $\leq$ 5%         | 0805 $\geq$ 0.1 $\mu$ F, 0603 $\geq$ 0.068 $\mu$ F, 1206 $\geq$ 1 $\mu$ F, 1210 $\geq$ 2.2 $\mu$ F   |
|             |             | $\leq$ 10%        | 0805 $\geq$ 0.22 $\mu$ F, 1210 $\geq$ 3.3 $\mu$ F  |
| 50V         | $\leq$ 2.5% | $\leq$ 3%         | 0201(50V), 0603 $\geq$ 0.047 $\mu$ F, 0805 $\geq$ 0.18 $\mu$ F, 1206 $\geq$ 0.47 $\mu$ F, 1210 $\geq$ 3.3 $\mu$ F, 1812 $\geq$ 10 $\mu$ F, 2220 $\geq$ 22 $\mu$ F                      |
|             |             | $\leq$ 5%         | 0201 $\geq$ 0.01 $\mu$ F, 1210 $\geq$ 4.7 $\mu$ F  |
|             |             | $\leq$ 10%        | 0402 $\geq$ 0.1 $\mu$ F, 0603 $\geq$ 0.1 $\mu$ F, 0805 $\geq$ 1 $\mu$ F, 1206 $\geq$ 2.2 $\mu$ F, 1210 $\geq$ 10 $\mu$ F   |
| 35V         | $\leq$ 3.5% | $\leq$ 10%        | 0603 $\geq$ 1 $\mu$ F, 0805 $\geq$ 2.2 $\mu$ F, 1206 $\geq$ 2.2 $\mu$ F, 1210 $\geq$ 10 $\mu$ F  |
| 25V         | $\leq$ 3.5% | $\leq$ 5%         | 0201 $\geq$ 0.01 $\mu$ F, 0805 $\geq$ 1 $\mu$ F, 1210 $\geq$ 10 $\mu$ F  |
|             |             | $\leq$ 7%         | 0603 $\geq$ 0.33 $\mu$ F, 1206 $\geq$ 4.7 $\mu$ F  |
|             |             | $\leq$ 10%        | 0201 $\geq$ 0.1 $\mu$ F, 0402 $\geq$ 0.10 $\mu$ F, 0603 $\geq$ 0.47 $\mu$ F, 0805 $\geq$ 2.2 $\mu$ F, 1206 $\geq$ 6.8 $\mu$ F, 1210 $\geq$ 22 $\mu$ F                                  |
|             |             | $\leq$ 12.5%      | 0402 $\geq$ 0.47 $\mu$ F   |
| 16V         | $\leq$ 3.5% | $\leq$ 5%         | 0201 $\geq$ 0.01 $\mu$ F, 0402 $\geq$ 0.033 $\mu$ F, 0603 $\geq$ 0.15 $\mu$ F, 0805 $\geq$ 0.68 $\mu$ F, 1206 $\geq$ 2.2 $\mu$ F, 1210 $\geq$ 4.7 $\mu$ F                              |
|             |             | $\leq$ 10%        | 0201 $\geq$ 0.1 $\mu$ F (0201/X7R $\geq$ 0.022 $\mu$ F), 0402 $\geq$ 0.22 $\mu$ F, 1206 $\geq$ 4.7 $\mu$ F, 1210 $\geq$ 22 $\mu$ F   |
| 10V         | $\leq$ 5%   | $\leq$ 10%        | 0201 $\geq$ 0.012 $\mu$ F, 0402 $\geq$ 0.33 $\mu$ F (0402/X7R $\geq$ 0.22 $\mu$ F), 0603 $\geq$ 0.33 $\mu$ F, 0805 $\geq$ 2.2 $\mu$ F, 1206 $\geq$ 4.7 $\mu$ F, 1210 $\geq$ 22 $\mu$ F |
|             |             | $\leq$ 15%        | 0201 $\geq$ 0.1 $\mu$ F, 0402 $\geq$ 1 $\mu$ F   |
| 6.3V        | $\leq$ 10%  | $\leq$ 15%        | 0201 $\geq$ 0.1 $\mu$ F, 0402 $\geq$ 1 $\mu$ F, 0603 $\geq$ 10 $\mu$ F, 0805 $\geq$ 4.7 $\mu$ F, 1206 $\geq$ 47 $\mu$ F, 1210 $\geq$ 100 $\mu$ F                                       |
|             |             | $\leq$ 20%        | 0402 $\geq$ 2.2 $\mu$ F  |
| 4V          | $\leq$ 15%  | ---               | ---  |

### Y5V

| Rated Vol.                       | D.F.         | Exception of D.F. $\leq$ |  |
|----------------------------------|--------------|--------------------------|--|
| $\geq$ 50V                       | $\leq$ 5%    | $\leq$ 7%                | 0603 $\geq$ 0.1 $\mu$ F, 0805 $\geq$ 0.47 $\mu$ F, 1206 $\geq$ 4.7 $\mu$ F   |
|                                  |              | $\leq$ 12.5%             | 1210 $\geq$ 6.8 $\mu$ F  |
| 35V                              | $\leq$ 7%    | ---                      | ---  |
| 25V                              | $\leq$ 5%    | $\leq$ 7%                | 0402 $\geq$ 0.047 $\mu$ F, 0603 $\geq$ 0.1 $\mu$ F, 0805 $\geq$ 0.33 $\mu$ F, 1206 $\geq$ 1 $\mu$ F, 1210 $\geq$ 4.7 $\mu$ F |
|                                  |              | $\leq$ 9%                | 0402 $\geq$ 0.068 $\mu$ F, 0603 $\geq$ 0.47 $\mu$ F, 1206 $\geq$ 4.7 $\mu$ F, 1210 $\geq$ 22 $\mu$ F                         |
| 16V<br>(C<1.0<br>$\mu$ F)        | $\leq$ 7%    | $\leq$ 9%                | 0402 $\geq$ 0.068 $\mu$ F, 0603 $\geq$ 0.68 $\mu$ F  |
|                                  |              | $\leq$ 12.5%             | 0402 $\geq$ 0.22 $\mu$ F   |
| 16V<br>(C $\geq$<br>1.0 $\mu$ F) | $\leq$ 9%    | $\leq$ 12.5%             | 0603 $\geq$ 2.2 $\mu$ F, 0805 $\geq$ 3.3 $\mu$ F, 1206 $\geq$ 10 $\mu$ F, 1210 $\geq$ 22 $\mu$ F, 1812 $\geq$ 47 $\mu$ F     |
| 10V                              | $\leq$ 12.5% | $\leq$ 20%               | 0402 $\geq$ 0.47 $\mu$ F   |
| 6.3V                             | $\leq$ 20%   | ---                      | ---  |

### Notes:

- Measured at the condition of 30~70% related humidity.
- Class II (Except Y5V): Apply 1.0 $\pm$ 0.2Vrms, 1.0kHz $\pm$ 10% for Cap $\leq$ 10 $\mu$ F and 0.5 $\pm$ 0.2Vrms, 120Hz $\pm$ 20% for Cap $>$ 10 $\mu$ F, at 20 $^{\circ}$ C at ambient temperature
- Y5V: Apply 1.0 $\pm$ 0.2Vrms, 1.0kHz $\pm$ 10% for Cap. $\leq$ 10 $\mu$ F and 0.5 $\pm$ 0.2Vrms, 120Hz $\pm$ 20% for Cap. $>$ 10 $\mu$ F, at 20 $^{\circ}$ C ambient temperature.
- Preconditioning for class II MLCC: perform a heat treatment at 150 $\pm$ 10 $^{\circ}$ C for 1 hour, then leave in ambient condition for 24 $\pm$ 2 hours before measurement.

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## CAPACITANCE RANGE AND THICKNESS X7R

| Dimension |      | 0402 |      | 0603 |     |     |     | 0805 |     |     |     |     | 1206 |     |     |     |     |      |
|-----------|------|------|------|------|-----|-----|-----|------|-----|-----|-----|-----|------|-----|-----|-----|-----|------|
| Cap.      | Code | 6.3V | 6.3V | 10V  | 16V | 25V | 50V | 6.3V | 10V | 16V | 25V | 50V | 6.3V | 10V | 16V | 25V | 50V | 100V |
| 1.0µF     | 105  | N    | B    | B    | B   | B   | B   |      | C   | C   | C   | I   |      | J   | J   | J   | P   | P    |
| 1.2µF     | 125  |      |      |      |     |     |     |      |     |     |     |     |      |     |     | P   | P   | P    |
| 1.5µF     | 155  |      |      |      |     |     |     |      | I   | I   | I   |     | J    | J   | J   | P   | P   |      |
| 1.8µF     | 185  |      |      |      |     |     |     |      |     |     |     |     |      |     |     | P   | P   |      |
| 2.2µF     | 225  |      | B    | B    | B   |     |     | I    | I   | I   | I   | I   | J    | J   | J   | P   | P   | P    |
| 2.7µF     | 275  |      |      |      |     |     |     |      |     |     |     |     |      |     |     |     |     |      |
| 3.3µF     | 335  |      |      |      |     |     |     |      |     |     |     |     |      | P   | P   | P   | P   |      |
| 3.9µF     | 395  |      |      |      |     |     |     |      |     |     |     |     |      |     |     |     |     |      |
| 4.7µF     | 475  |      | B    |      |     |     |     | I    | I   | I   | I   |     | P    | P   | P   | P   | P   |      |
| 5.6µF     | 565  |      |      |      |     |     |     |      |     |     |     |     |      |     |     |     |     |      |
| 6.8µF     | 685  |      |      |      |     |     |     |      |     |     |     |     |      |     |     |     |     |      |
| 8.2µF     | 825  |      |      |      |     |     |     |      |     |     |     |     |      |     |     |     |     |      |
| 10µF      | 106  |      |      |      |     |     |     | I    | I   | I*  |     |     | P    | P   | P   | P   |     |      |
| 12µF      | 126  |      |      |      |     |     |     |      |     |     |     |     |      |     |     |     |     |      |
| 15µF      | 156  |      |      |      |     |     |     |      |     |     |     |     |      |     |     |     |     |      |
| 18µF      | 186  |      |      |      |     |     |     |      |     |     |     |     |      |     |     |     |     |      |
| 22µF      | 226  |      |      |      |     |     |     |      |     |     |     |     | P    | P   | P*  |     |     |      |
| 47µF      | 476  |      |      |      |     |     |     |      |     |     |     |     |      |     |     |     |     |      |

| Dimension |      | 1210 |     |     |     |     |      | 1812 |     |     |     |      |      | 1825 |     |     |      |      |      |
|-----------|------|------|-----|-----|-----|-----|------|------|-----|-----|-----|------|------|------|-----|-----|------|------|------|
| Cap.      | Code | 6.3V | 10V | 16V | 25V | 50V | 100V | 10V  | 16V | 25V | 50V | 100V | 200V | 250V | 25V | 50V | 100V | 200V | 250V |
| 1.0µF     | 105  |      | C   | C   | C   | C   | F    | C    | C   | C   | F   | F    | G    | G    | G   | F   | F    | F    | F    |
| 1.2µF     | 125  |      |     |     |     | G   | G    |      |     | C   | F   | F    |      |      |     | F   | F    | G    | G    |
| 1.5µF     | 155  |      |     | E   | E   | G   | G    |      |     | C   | F   | F    |      |      |     | F   | F    | G    | G    |
| 1.8µF     | 185  |      |     |     |     | G   | G    |      |     | E   | F   | F    |      |      |     | F   | F    | G    | G    |
| 2.2µF     | 225  |      |     | E   | E   | G   | G    |      |     | E   | F   | G    |      |      |     | F   | F    | G    | G    |
| 2.7µF     | 275  |      |     |     |     | G   | G    |      |     | F   | F   | G    |      |      |     | F   | F    | H    | H    |
| 3.3µF     | 335  |      |     | E   | E   | G   | G    |      |     | F   | F   | G    |      |      |     | F   | F    |      |      |
| 3.9µF     | 395  |      |     |     |     |     |      |      |     | F   | F   | G    |      |      |     | F   | F    |      |      |
| 4.7µF     | 475  |      | F   | F   | F   | G   | G    |      |     | G   | G   | G    |      |      |     | F   | G    |      |      |
| 5.6µF     | 565  |      |     |     |     |     |      |      |     | G   | G   | G    |      |      |     | G   | G    |      |      |
| 6.8µF     | 685  |      |     |     |     |     |      |      |     | G   | G   |      |      |      |     | G   | G    |      |      |
| 8.2µF     | 825  |      |     |     |     |     |      |      |     | G   | G   |      |      |      |     | G   | G    |      |      |
| 10µF      | 106  |      | F   | F   | F   | G   |      |      |     | G   | G   |      |      |      |     | G   | G    |      |      |
| 12µF      | 126  |      |     |     |     |     |      |      |     |     |     |      |      |      |     |     |      |      |      |
| 15µF      | 156  |      |     |     |     |     |      |      |     |     |     |      |      |      |     |     |      |      |      |
| 18µF      | 186  |      |     |     |     |     |      |      |     |     |     |      |      |      |     |     |      |      |      |
| 22µF      | 226  |      | G   | G   | G   |     |      |      |     |     |     |      |      |      |     |     |      |      |      |
| 47µF      | 476  | G    | G   |     |     |     |      |      |     |     |     |      |      |      |     |     |      |      |      |

| Dimension |      | 2220 |     |      |      |      |      |      | 2225 |     |      |      |      |      |      |
|-----------|------|------|-----|------|------|------|------|------|------|-----|------|------|------|------|------|
| Cap.      | Code | 25V  | 50V | 100V | 200V | 250V | 500V | 630V | 25V  | 50V | 100V | 200V | 250V | 500V | 630V |
| 1.0µF     | 105  | F    | F   | F    | F    | F    | H    | H    | F    | F   | F    | F    | F    | G    | G    |
| 1.2µF     | 125  | F    | F   | F    | G    | G    |      |      | F    | F   | F    | G    | G    | H    | H    |
| 1.5µF     | 155  | F    | F   | F    | G    | G    |      |      | F    | F   | F    | G    | G    | H    | H    |
| 1.8µF     | 185  | F    | F   | F    | G    | G    |      |      | F    | F   | F    | G    | G    |      |      |
| 2.2µF     | 225  | F    | F   | F    | G    | G    |      |      | F    | F   | F    | G    | G    |      |      |
| 2.7µF     | 275  | F    | F   | F    | H    | H    |      |      | F    | F   | F    | G    | G    |      |      |
| 3.3µF     | 335  | F    | F   | F    |      |      |      |      | F    | F   | F    | H    | H    |      |      |
| 3.9µF     | 395  | F    | F   | F    |      |      |      |      | F    | F   | F    | H    | H    |      |      |
| 4.7µF     | 475  | F    | F   | F    |      |      |      |      | F    | F   | G    |      |      |      |      |
| 5.6µF     | 565  | F    | F   | F    |      |      |      |      | F    | F   | G    |      |      |      |      |
| 6.8µF     | 685  | F    | F   | F    |      |      |      |      | F    | F   | G    |      |      |      |      |
| 8.2µF     | 825  | G    | G   | G    |      |      |      |      | G    | G   | G    |      |      |      |      |
| 10µF      | 106  | G    | G   | G    |      |      |      |      | G    | G   | G    |      |      |      |      |
| 12µF      | 126  | H    |     |      |      |      |      |      | H    |     |      |      |      |      |      |
| 15µF      | 156  | H    |     |      |      |      |      |      | H    |     |      |      |      |      |      |
| 18µF      | 186  | H    |     |      |      |      |      |      | H    |     |      |      |      |      |      |
| 22µF      | 226  | H    | H   |      |      |      |      |      | H    | H   |      |      |      |      |      |
| 47µF      | 476  |      |     |      |      |      |      |      |      |     |      |      |      |      |      |

Note: \* indicates M tolerance only.

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## CAPACITANCE RANGE AND THICKNESS (CONTINUED)

### X7S

| Dimension |      | 0402 |     | 0603 |     |     | 0805 |     |     |      | 1206 |     | 1210 |
|-----------|------|------|-----|------|-----|-----|------|-----|-----|------|------|-----|------|
| Cap.      | Code | 6.3V | 10V | 10V  | 16V | 25V | 16V  | 25V | 50V | 100V | 6.3V | 16V | 6.3V |
| 1.0μF     | 105  |      | K   |      |     |     |      |     |     | I    |      |     |      |
| 2.2μF     | 225  | K    | K   |      | B   | B   |      |     |     |      |      |     |      |
| 2.7μF     | 275  |      |     |      |     |     |      |     |     |      |      |     |      |
| 4.7μF     | 475  |      |     | B    | B   |     |      | I   | I   |      |      |     |      |
| 6.8μF     | 685  |      |     |      |     |     |      |     |     |      |      |     |      |
| 10μF      | 106  |      |     |      |     |     | I    | I   |     |      |      |     |      |
| 22μF      | 226  |      |     |      |     |     |      |     |     |      |      | P*  |      |
| 47μF      | 476  |      |     |      |     |     |      |     |     |      |      | P*  |      |
| 100μF     | 107  |      |     |      |     |     |      |     |     |      |      |     | G*   |

### X6S

| Dimension |      | 0201 |      | 0402 |     |     |     | 0603 |      |     |     |     | 0805 |      |     |     |     |     |
|-----------|------|------|------|------|-----|-----|-----|------|------|-----|-----|-----|------|------|-----|-----|-----|-----|
| Cap.      | Code | 4V   | 6.3V | 6.3V | 10V | 16V | 25V | 4V   | 6.3V | 10V | 16V | 25V | 4V   | 6.3V | 10V | 16V | 25V | 50V |
| 1.0μF     | 105  | L    | L*   | K    | K   | K   | K   |      |      |     |     |     |      |      |     |     |     |     |
| 2.2μF     | 225  |      |      | K    | K   | K   |     |      |      |     | B   | B   |      |      |     |     |     |     |
| 4.7μF     | 475  |      |      |      | K*  |     |     |      |      | B   | B   | B   |      |      |     |     | I   | I   |
| 10μF      | 106  |      |      | K*   |     |     |     |      | B*   | B*  | B*  | B*  | I    | I    | I   | I   | I   | I   |
| 22μF      | 226  |      |      |      |     |     |     | B*   | B*   |     |     |     |      | I*   | I*  | I*  | I*  |     |
| 47μF      | 476  |      |      |      |     |     |     |      |      |     |     |     | I*   | I*   |     |     |     |     |
| 100μF     | 107  |      |      |      |     |     |     |      |      |     |     |     | I*   |      |     |     |     |     |

| Dimension |      | 1206 |     |     |     | 1210 |     |     |     |
|-----------|------|------|-----|-----|-----|------|-----|-----|-----|
| Cap.      | Code | 6.3V | 10V | 16V | 25V | 6.3V | 10V | 16V | 25V |
| 1.0μF     | 105  |      |     |     |     |      |     |     |     |
| 2.2μF     | 225  |      |     |     |     |      |     |     |     |
| 4.7μF     | 475  |      |     |     |     |      |     |     |     |
| 10μF      | 106  |      |     |     | P   |      |     |     |     |
| 22μF      | 226  |      | P   | P*  | P   |      |     |     | G   |
| 47μF      | 476  | P    |     |     |     | G    | G   | G   |     |
| 100μF     | 107  |      |     |     |     | G*   | G*  |     |     |

### X5R

| Dimension |      | 0201 |     |     | 0402 |      |     |     |     | 0603 |      |     |     |     |     |
|-----------|------|------|-----|-----|------|------|-----|-----|-----|------|------|-----|-----|-----|-----|
| Cap.      | Code | 6.3V | 10V | 16V | 4V   | 6.3V | 10V | 16V | 25V | 4V   | 6.3V | 10V | 16V | 25V | 50V |
| 1.0μF     | 105  | L    | L   | L   |      | N    | N   | N   | N   |      | B    | B   | B   | B   | B   |
| 1.5μF     | 155  |      |     |     |      |      |     |     |     |      | B    |     |     |     |     |
| 2.2μF     | 225  | L    |     |     |      | N    | N   | K   | K   |      | B    | B   | B   | B   | B   |
| 3.3μF     | 335  |      |     |     |      |      |     |     |     |      | B    | B   |     |     |     |
| 4.7μF     | 475  |      |     |     |      | K    | K   | K   |     |      | B    | B   | B   | B   |     |
| 6.8μF     | 685  |      |     |     |      |      |     |     |     |      |      |     |     |     |     |
| 10μF      | 106  |      |     |     | K    | K    | K   |     |     | B    | B    | B   | B   | B   |     |
| 22μF      | 226  |      |     |     |      |      |     |     |     | B    | B    | B   |     |     |     |
| 47μF      | 476  |      |     |     |      |      |     |     |     | B    | B    |     |     |     |     |
| 100μF     | 107  |      |     |     |      |      |     |     |     |      |      |     |     |     |     |
| 220μF     | 227  |      |     |     |      |      |     |     |     |      |      |     |     |     |     |

| Dimension |      | 0805 |      |     |     |     | 1206 |    |      |     |     | 1210 |     |    |      |     |     |     |     |     |
|-----------|------|------|------|-----|-----|-----|------|----|------|-----|-----|------|-----|----|------|-----|-----|-----|-----|-----|
| Cap.      | Code | 4V   | 6.3V | 10V | 16V | 25V | 50V  | 4V | 6.3V | 10V | 16V | 25V  | 50V | 4V | 6.3V | 10V | 16V | 25V | 35V | 50V |
| 1.0μF     | 105  |      |      | C   | C   | C   | I    |    |      |     |     |      | P   |    |      |     |     |     |     |     |
| 1.5μF     | 155  |      | I    | I   | I   | I   |      |    |      | J   | J   |      |     |    | F    | F   |     |     |     |     |
| 2.2μF     | 225  |      | I    | I   | I   | I   |      |    |      | J   | J   | P    | P   |    | F    | F   |     |     |     |     |
| 3.3μF     | 335  |      | I    | I   | I   | I   |      |    |      | P   | P   | P    |     |    |      |     |     |     |     |     |
| 4.7μF     | 475  |      | I    | I   | I   | I   |      |    | P    | P   | P   | P    | P   |    |      | F   | F   | F   |     |     |
| 6.8μF     | 685  |      |      |     |     |     |      |    | P    | P   |     |      |     |    |      |     |     |     |     |     |
| 10μF      | 106  |      | I    | I   | I   | I   | I    |    | P    | P   | P   | P    | P   |    | F    | F   | F   | F   | G   | G   |
| 22μF      | 226  |      | I    | I   | I   | I   |      |    | P    | P   | P   | P    |     |    | G    | G   | G   | G   | G   |     |
| 47μF      | 476  |      | I    | I   |     |     |      |    | P    | P   | P   |      |     |    | G    | G   | G   | G   |     |     |
| 100μF     | 107  | I    | I    |     |     |     |      |    | P    |     |     |      |     |    | G    | G   | G   |     |     |     |
| 220μF     | 227  |      |      |     |     |     |      | P  |      |     |     |      |     | G  | G    |     |     |     |     |     |

# Multilayer Ceramic Chip Capacitor High Capacitance Type

MA Series

MERITEK

## CAPACITANCE RANGE AND THICKNESS (CONTINUED)

Y5V

| Dimension   |      | 0402 |     | 0603 |     |     |     | 0805 |     |     |     |     | 1206 |     |     |     |     |     |
|-------------|------|------|-----|------|-----|-----|-----|------|-----|-----|-----|-----|------|-----|-----|-----|-----|-----|
| Cap.        | Code | 6.3V | 10V | 6.3V | 10V | 16V | 25V | 6.3V | 10V | 16V | 25V | 50V | 6.3V | 10V | 16V | 25V | 35V | 50V |
| 1.0 $\mu$ F | 105  | N    | N   |      | S   | B   | B   |      | X   | X   | C   | C   |      | M   | M   | M   |     | M   |
| 1.5 $\mu$ F | 155  |      |     |      | S   |     |     |      | C   | C   |     |     |      | M   | M   | M   |     |     |
| 2.2 $\mu$ F | 225  |      |     | S    | S   | B   |     |      | C   | C   | I   | I   |      | M   | M   | M   |     | J   |
| 3.3 $\mu$ F | 335  |      |     |      |     |     |     |      | C   | C   |     |     |      | J   | J   | J   |     |     |
| 4.7 $\mu$ F | 475  |      |     | B    | B   |     |     |      | C   | C   | I   |     |      | J   | J   | J   | J   | P   |
| 6.8 $\mu$ F | 685  |      |     |      |     |     |     |      | I   |     |     |     |      | J   | J   |     |     |     |
| 10 $\mu$ F  | 106  |      |     |      |     |     |     | I    | I   | I   |     |     |      | J   | J   | P   |     |     |
| 22 $\mu$ F  | 226  |      |     |      |     |     |     | I    | I   |     |     |     |      | P   | P   |     |     |     |
| 47 $\mu$ F  | 476  |      |     |      |     |     |     |      |     |     |     |     | P    |     |     |     |     |     |
| 100 $\mu$ F | 107  |      |     |      |     |     |     |      |     |     |     |     |      |     |     |     |     |     |

| Dimension   |      | 1210 |     |     |     |     |     | 1812 |     |     |     |      |
|-------------|------|------|-----|-----|-----|-----|-----|------|-----|-----|-----|------|
| Cap.        | Code | 6.3V | 10V | 16V | 25V | 35V | 50V | 10V  | 16V | 25V | 50V | 100V |
| 1.0 $\mu$ F | 105  |      | M   | M   | M   |     | M   | C    | C   | C   | C   | C    |
| 1.5 $\mu$ F | 155  |      | M   | M   | M   |     |     | C    | C   | C   | C   |      |
| 2.2 $\mu$ F | 225  |      | M   | M   | M   |     | E   | C    | C   | C   | C   |      |
| 3.3 $\mu$ F | 335  |      | M   | M   | M   |     |     | C    | C   | C   | C   |      |
| 4.7 $\mu$ F | 475  |      | M   | M   | C   |     | E   | C    | C   | C   | C   |      |
| 6.8 $\mu$ F | 685  |      | M   | M   | C   |     | F   | C    | C   | C   | C   |      |
| 10 $\mu$ F  | 106  |      | C   | C   | E   | F   | F   | C    | C   | C   | F   |      |
| 22 $\mu$ F  | 226  |      | F   | F   |     |     |     |      |     |     |     |      |
| 47 $\mu$ F  | 476  | F    | F   |     |     |     |     | G    |     |     |     |      |
| 100 $\mu$ F | 107  | G    |     |     |     |     |     |      |     |     |     |      |

## RELIABILITY TEST CONDITIONS AND REQUIREMENTS

| Item   | Test Condition  | Requirements   |           |            |                    |                      |                    |                      |                    |     |                    |   |
|--|---|--|-----------|------------|--------------------|----------------------|--------------------|----------------------|--------------------|-----|--------------------|---|
| Visual and Dimensions                          | - - -   | No remarkable defect.<br>Dimensions to confirm to individual specification sheet.  |           |            |                    |                      |                    |                      |                    |     |                    |   |
| Capacitance<br>Q/ D.F.<br>(Dissipation Factor) | Class II: X7R,X7S, X6S, X5R,Y5V<br>Cap $\leq$ 10 $\mu$ F, 1.0 $\pm$ 0.2Vrms, 1kHz $\pm$ 10%<br>Cap $>$ 10 $\mu$ F, 0.5 $\pm$ 0.2Vrms, 120Hz $\pm$ 20%<br><br>Test condition: 0.5 $\pm$ 0.2Vrms, 1KHz $\pm$ 10%<br>X7R: 0603=475(6.3V), 0805=106(6.3V&10V)<br>X6S: 0201 $\geq$ 104(6.3V&10V), 0402 $\geq$ 225(6.3V),<br>0402/475(10V), 0603/106(6.3V).<br>X5R: 01R5 $\geq$ 103, 0201 $\geq$ 224 (6.3V, 10V, 16V),<br>0402 $\geq$ 475 (6.3V, 16V), 0402 $\geq$ 225(10V),<br>0603=106 (6.3V, 10V)  | Within specification   |           |            |                    |                      |                    |                      |                    |     |                    |   |
| Dielectric Strength                            | To apply voltage :<br><table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Rated Voltage</th> <th>Condition</th> </tr> </thead> <tbody> <tr> <td><math>\leq</math>100</td> <td>2.5 times of <math>U_R</math></td> </tr> <tr> <td>100<math>&lt;</math>V<math>\leq</math>250</td> <td>2.0 times of <math>U_R</math></td> </tr> <tr> <td>250<math>&lt;</math>V<math>\leq</math>500</td> <td>1.5 times of <math>U_R</math></td> </tr> <tr> <td>630</td> <td>1.2 times of <math>U_R</math></td> </tr> </tbody> </table><br>Duration: 1 to 5 sec.<br>Charge and discharge current less than 50mA. | Rated Voltage  | Condition | $\leq$ 100 | 2.5 times of $U_R$ | 100 $<$ V $\leq$ 250 | 2.0 times of $U_R$ | 250 $<$ V $\leq$ 500 | 1.5 times of $U_R$ | 630 | 1.2 times of $U_R$ | No evidence of damage or flashover during test. |
| Rated Voltage                                  | Condition   |  |           |            |                    |                      |                    |                      |                    |     |                    |   |
| $\leq$ 100                                     | 2.5 times of $U_R$  |  |           |            |                    |                      |                    |                      |                    |     |                    |   |
| 100 $<$ V $\leq$ 250                           | 2.0 times of $U_R$  |  |           |            |                    |                      |                    |                      |                    |     |                    |   |
| 250 $<$ V $\leq$ 500                           | 1.5 times of $U_R$  |  |           |            |                    |                      |                    |                      |                    |     |                    |   |
| 630  | 1.2 times of $U_R$  |  |           |            |                    |                      |                    |                      |                    |     |                    |   |
| Solderability                                  | Solder temperature: 235 $\pm$ 5 $^{\circ}$ C for (0201~1210)<br>Solder temperature: 245 $\pm$ 5 $^{\circ}$ C for (1808~2225)<br>Dipping time: 2 $\pm$ 0.5 sec.  | 75% min. coverage of all metalized area.   |           |            |                    |                      |                    |                      |                    |     |                    |   |
| Resistance to Soldering Heat                   | Solder temperature: 260 $\pm$ 5 $^{\circ}$ C, Dipping time: 10 $\pm$ 1 sec<br>Preheating: 120 to 150 $^{\circ}$ C for 1 minute before immerse the capacitor in a eutectic solder.<br>Before initial measurement (Class II only): Perform 150 $^{\circ}$ C for 1 hr. and then set for 24 $\pm$ 2 hrs. at room temp.<br>Measurement to be made after keeping at room temp. for 48 $\pm$ 4 hrs   | <ul style="list-style-type: none"> <li>No remarkable damage.</li> <li>Cap change:<br/>Class II (Except Y5V): within <math>\pm</math>7.5%<br/>Y5V: within <math>\pm</math>20%</li> <li>D.F., I.R. and dielectric strength : To meet initial requirements.</li> <li>25% max. leaching on each edge.</li> </ul> |           |            |                    |                      |                    |                      |                    |     |                    |   |



# Multilayer Ceramic Chip Capacitor High Capacitance Type

MA Series

MERITEK

## RELIABILITY TEST CONDITIONS AND REQUIREMENTS (CONTINUED)

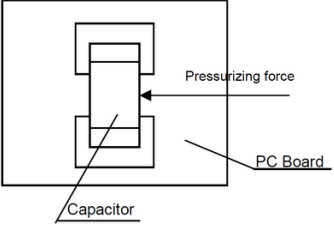
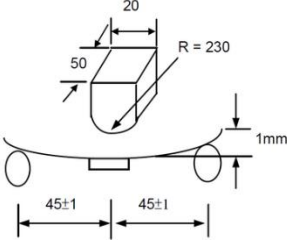
| Item  | Test Condition   | Requirements  |   |                     |                            |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
|---|--|---|---|---------------------|----------------------------|---|--|--|--|--|---|---------------------------------------|---------|-----------------|----------------------|---------------------|-----------------|--------|-----------------|-----|--------|-----------|---------|----------|---------|--------|-----------------|---------------|---------|------|--------|---------|--------|-----------------|-----------------|---------|--------|---------|-----------------|----------|--------|-----|---------|---------|-----------------|----------|---------|------|-----------------|----------|---------|-----|-----------|----------|------|-----|------|---------|-----------|----------|----------------------|-----|-----------|---------|
| <b>High Temperature Load (Endurance)</b>    | Test temp. :<br>X7R, X7S : 125±3°C.<br>X6S : 105±3°C.<br>X5R, Y5V : 85±3°C.<br>To apply voltage :<br>(1) ≤6.3V or Cap.≥10μF : 150% of rated voltage.<br>(2) 10V≤Ur<500V : 200% of rated voltage.<br>(3) 500V : 150% of rated voltage.<br>(4) Ur≥630V : 120% of rated voltage.<br>(5) 100% of rated voltage for below range :   | <ul style="list-style-type: none"> <li>No remarkable damage.</li> <li>Cap change:<br/>Class II (Except Y5V): within ±12.5% for ≥10V<sup>1</sup>, within ±25% for 6.3V.<br/>(Note1: 10V: within ±25% for 0603≥4.7μF, 0402≥1μF, 0201≥0.1μF)<br/>Y5V: within ±30% for ≥10V, with in +30/-40% for 6.3V</li> <li>D.F.: ≤200% of initial requirements.</li> <li>I.R.: for ≥10V, ≥1GΩ or RxC≥50Ω-F, whichever is smaller.</li> </ul> Except: <table border="1" style="width: 100%;"> <thead> <tr> <th>Rated Voltage</th> <th>I.R.</th> </tr> </thead> <tbody> <tr> <td>≥100V: All X7R, 1210≥3.3μF</td> <td rowspan="8">≥1GΩ or RxC≥10Ω-F, whichever is smaller</td> </tr> <tr> <td>50V: 0402&gt;0.01μF, 0603≥1μF, 0805≥1μF, 1206≥4.7μF, 1210≥4.7μF</td> </tr> <tr> <td>35V: 0603≥1μF, 0805≥2.2μF, 1206≥2.2μF, 1210≥10μF</td> </tr> <tr> <td>25V: 0201≥0.1μF, 0402≥0.22μF, 0603≥2.2μF, 0805≥2.2μF, 1206≥10μF, 1210≥10μF</td> </tr> <tr> <td>16V: 0201≥0.1μF, 0402≥0.22μF, 0603≥1μF, 0805≥2.2μF, 1206≥10μF, 1210≥47μF</td> </tr> <tr> <td>10V: 0201≥47nF, 0402≥0.47μF, 0603≥0.47μF, 0805≥2.2μF, 1206≥4.7μF, 1210≥47μF</td> </tr> <tr> <td>6.3V, 4V All X6S/X7S items, size≥1812</td> </tr> </tbody> </table> | Rated Voltage                           | I.R.                | ≥100V: All X7R, 1210≥3.3μF | ≥1GΩ or RxC≥10Ω-F, whichever is smaller | 50V: 0402>0.01μF, 0603≥1μF, 0805≥1μF, 1206≥4.7μF, 1210≥4.7μF | 35V: 0603≥1μF, 0805≥2.2μF, 1206≥2.2μF, 1210≥10μF | 25V: 0201≥0.1μF, 0402≥0.22μF, 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 All X6S/X7S items, size≥1812 |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
|   | Rated Voltage  |   | I.R.                                    |                     |                            |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
|   | ≥100V: All X7R, 1210≥3.3μF   |   | ≥1GΩ or RxC≥10Ω-F, whichever is smaller |                     |                            |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
|   | 50V: 0402>0.01μF, 0603≥1μF, 0805≥1μF, 1206≥4.7μF, 1210≥4.7μF   |   |   |                     |                            |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
|   | 35V: 0603≥1μF, 0805≥2.2μF, 1206≥2.2μF, 1210≥10μF   |   |   |                     |                            |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
|   | 25V: 0201≥0.1μF, 0402≥0.22μF, 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 All X6S/X7S items, size≥1812  |   |   |                     |                            |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
|   | <table border="1"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated</th> <th>Capacitance</th> </tr> </thead> <tbody> <tr> <td rowspan="2">0201</td> <td rowspan="2">X5R/X7R/X7S/X6S</td> <td>≤10V</td> <td>C≥0.1μF</td> </tr> <tr> <td>≥16V</td> <td>C&gt;0.1μF</td> </tr> <tr> <td>0402</td> <td>X5R/X7R/X7S/X6S /Y5V</td> <td>6.3V, 10V, 16V, 25V</td> <td>C≥1.0μF</td> </tr> <tr> <td rowspan="3">0603</td> <td rowspan="3">X5R/X7R/X7S/X6S</td> <td>4V</td> <td>C≥22μF</td> </tr> <tr> <td>6.3V, 10V</td> <td>C≥4.7μF</td> </tr> <tr> <td>25V, 35V</td> <td>C≥1.0μF</td> </tr> <tr> <td rowspan="3">0805</td> <td rowspan="3">X5R/X7R/X7S/X6S</td> <td>4V</td> <td>C≥47μF</td> </tr> <tr> <td>6.3V</td> <td>C≥22μF</td> </tr> <tr> <td>10V~50V</td> <td>C≥10μF</td> </tr> <tr> <td>1206</td> <td>X5R/X7R/X7S/X6S</td> <td>≤6.3V</td> <td>C≥47μF</td> </tr> <tr> <td rowspan="2">1210</td> <td rowspan="2">X5R/X7R/X7S/X6S</td> <td>16V</td> <td>C≥47μF</td> </tr> <tr> <td>X7R</td> <td>100V</td> <td>C≥3.3μF</td> </tr> </tbody> </table>   |   |   | Size                | Dielectric                 | Rated                                   | Capacitance  | 0201   | X5R/X7R/X7S/X6S  | ≤10V   | C≥0.1μF   | ≥16V                                  | C>0.1μF | 0402            | X5R/X7R/X7S/X6S /Y5V | 6.3V, 10V, 16V, 25V | C≥1.0μF         | 0603   | X5R/X7R/X7S/X6S | 4V  | C≥22μF | 6.3V, 10V | C≥4.7μF | 25V, 35V | C≥1.0μF | 0805   | X5R/X7R/X7S/X6S | 4V            | C≥47μF  | 6.3V | C≥22μF | 10V~50V | C≥10μF | 1206            | X5R/X7R/X7S/X6S | ≤6.3V   | C≥47μF | 1210    | X5R/X7R/X7S/X6S | 16V      | C≥47μF | X7R | 100V    | C≥3.3μF |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
|   | Size   |   | Dielectric                              | Rated               | Capacitance                |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
|   | 0201   |   | X5R/X7R/X7S/X6S                         | ≤10V                | C≥0.1μF                    |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
|   |  |   |   | ≥16V                | C>0.1μF                    |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
|   | 0402   |   | X5R/X7R/X7S/X6S /Y5V                    | 6.3V, 10V, 16V, 25V | C≥1.0μF                    |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
|   | 0603   |   | X5R/X7R/X7S/X6S                         | 4V                  | C≥22μF                     |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
|   |  |   |   | 6.3V, 10V           | C≥4.7μF                    |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
|   |  |   |   | 25V, 35V            | C≥1.0μF                    |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
|   | 0805   |   | X5R/X7R/X7S/X6S                         | 4V                  | C≥47μF                     |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
|   |  |   |   | 6.3V                | C≥22μF                     |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
|   |  |   |   | 10V~50V             | C≥10μF                     |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
| 1206  | X5R/X7R/X7S/X6S  | ≤6.3V   | C≥47μF                                  |                     |                            |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
| 1210  | X5R/X7R/X7S/X6S  | 16V   | C≥47μF                                  |                     |                            |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
|   |  | X7R   | 100V                                    | C≥3.3μF             |                            |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
| (6) 150% of rated voltage for below range : | <table border="1"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated</th> <th>Capacitance</th> </tr> </thead> <tbody> <tr> <td rowspan="2">0201</td> <td>X5R/X7R/X7S/X6S</td> <td>16V/25V</td> <td>C≥0.1μF</td> </tr> <tr> <td>X7R</td> <td>16V</td> <td>C&gt;0.022μF</td> </tr> <tr> <td rowspan="3">0402</td> <td>X5R/X7R/X7S/X6S</td> <td>50V</td> <td>C≥0.1μF</td> </tr> <tr> <td>X5R/X7R/X7S/X6S</td> <td>10~25V</td> <td>C≥0.22μF</td> </tr> <tr> <td>Y5V</td> <td>16V</td> <td>C≥0.47μF</td> </tr> <tr> <td rowspan="3">0603</td> <td rowspan="2">X7R</td> <td>50V</td> <td>C≥22μF</td> </tr> <tr> <td>X5R/X7R/X7S/X6S</td> <td>10V, 16V, 50V</td> <td>C≥1.0μF</td> </tr> <tr> <td>Y5V</td> <td>16V</td> <td>C≥2.2μF</td> </tr> <tr> <td rowspan="4">0805</td> <td rowspan="4">X5R/X7R/X7S/X6S</td> <td>10~50V</td> <td>C≥4.7μF</td> </tr> <tr> <td>50V</td> <td>C≥2.2μF</td> </tr> <tr> <td>100V</td> <td>C≥0.12μF</td> </tr> <tr> <td>Y5V</td> <td>16V</td> <td>C≥4.7μF</td> </tr> <tr> <td>1206</td> <td>X5R/X7R/X7S/X6S</td> <td>50V~100V</td> <td>C≥1.0μF</td> </tr> <tr> <td rowspan="2">1210</td> <td rowspan="2">X5R/X7R/X7S/X6S</td> <td>50V~100V</td> <td>C≥1.0μF</td> </tr> <tr> <td>X7R</td> <td>200V~250V</td> <td>C≥0.22μF</td> </tr> <tr> <td rowspan="2">1812</td> <td rowspan="2">X7R</td> <td>100V</td> <td>C≥1.0μF</td> </tr> <tr> <td>200V~250V</td> <td>C≥0.47μF</td> </tr> <tr> <td>1825<br/>2220<br/>2225</td> <td>X7R</td> <td>100V~250V</td> <td>C≥1.0μF</td> </tr> </tbody> </table> | Size  | Dielectric                              | Rated               | Capacitance                | 0201                                    | X5R/X7R/X7S/X6S  | 16V/25V  | C≥0.1μF  | X7R  | 16V   | C>0.022μF                             | 0402    | X5R/X7R/X7S/X6S | 50V                  | C≥0.1μF             | X5R/X7R/X7S/X6S | 10~25V | C≥0.22μF        | Y5V | 16V    | C≥0.47μF  | 0603    | X7R      | 50V     | C≥22μF | X5R/X7R/X7S/X6S | 10V, 16V, 50V | C≥1.0μF | Y5V  | 16V    | C≥2.2μF | 0805   | X5R/X7R/X7S/X6S | 10~50V          | C≥4.7μF | 50V    | C≥2.2μF | 100V            | C≥0.12μF | Y5V    | 16V | C≥4.7μF | 1206    | X5R/X7R/X7S/X6S | 50V~100V | C≥1.0μF | 1210 | X5R/X7R/X7S/X6S | 50V~100V | C≥1.0μF | X7R | 200V~250V | C≥0.22μF | 1812 | X7R | 100V | C≥1.0μF | 200V~250V | C≥0.47μF | 1825<br>2220<br>2225 | X7R | 100V~250V | C≥1.0μF |
| Size  | Dielectric   | Rated   | Capacitance                             |                     |                            |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
| 0201  | X5R/X7R/X7S/X6S  | 16V/25V   | C≥0.1μF                                 |                     |                            |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
|   | X7R  | 16V   | C>0.022μF                               |                     |                            |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
| 0402  | X5R/X7R/X7S/X6S  | 50V   | C≥0.1μF                                 |                     |                            |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
|   | X5R/X7R/X7S/X6S  | 10~25V  | C≥0.22μF                                |                     |                            |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
|   | Y5V  | 16V   | C≥0.47μF                                |                     |                            |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
| 0603  | X7R  | 50V   | C≥22μF                                  |                     |                            |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
|   |  | X5R/X7R/X7S/X6S   | 10V, 16V, 50V                           | C≥1.0μF             |                            |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
|   | Y5V  | 16V   | C≥2.2μF                                 |                     |                            |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
| 0805  | X5R/X7R/X7S/X6S  | 10~50V  | C≥4.7μF                                 |                     |                            |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
|   |  | 50V   | C≥2.2μF                                 |                     |                            |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
|   |  | 100V  | C≥0.12μF                                |                     |                            |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
|   |  | Y5V   | 16V                                     | C≥4.7μF             |                            |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
| 1206  | X5R/X7R/X7S/X6S  | 50V~100V  | C≥1.0μF                                 |                     |                            |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
| 1210  | X5R/X7R/X7S/X6S  | 50V~100V  | C≥1.0μF                                 |                     |                            |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
|   |  | X7R   | 200V~250V                               | C≥0.22μF            |                            |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
| 1812  | X7R  | 100V  | C≥1.0μF                                 |                     |                            |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
|   |  | 200V~250V   | C≥0.47μF                                |                     |                            |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
| 1825<br>2220<br>2225                        | X7R  | 100V~250V   | C≥1.0μF                                 |                     |                            |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
| (7) 120% of rated voltage for below range : | <table border="1"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated</th> <th>Capacitance</th> </tr> </thead> <tbody> <tr> <td>1210</td> <td>X7R</td> <td>100V</td> <td>C≥3.3μF</td> </tr> </tbody> </table>  | Size  | Dielectric                              | Rated               | Capacitance                | 1210                                    | X7R  | 100V   | C≥3.3μF  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
| Size  | Dielectric   | Rated   | Capacitance                             |                     |                            |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
| 1210  | X7R  | 100V  | C≥3.3μF                                 |                     |                            |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
|   | Test time : 1000 +24/-0 hrs.<br>Before initial measurement (Class II only) : To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.<br>Measurement to be made after keeping at room temp. for 48±4 hrs (Class II).<br>De-rating conditions :   |   |   |                     |                            |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |
|   |  |   |   |                     |                            |   |  |  |  |  |   |                                       |         |                 |                      |                     |                 |        |                 |     |        |           |         |          |         |        |                 |               |         |      |        |         |        |                 |                 |         |        |         |                 |          |        |     |         |         |                 |          |         |      |                 |          |         |     |           |          |      |     |      |         |           |          |                      |     |           |         |

# Multilayer Ceramic Chip Capacitor High Capacitance Type

MA Series

MERITEK

## RELIABILITY TEST CONDITIONS AND REQUIREMENTS (CONTINUED)

| Item  | Test Condition   | Requirements   |               |            |                            |  |  |  |  |  |   |                                       |
|---|--|--|---------------|------------|----------------------------|--|--|--|--|--|---|---------------------------------------|
| <b>Humidity (Damp Heat) Steady State</b>                                    | <ul style="list-style-type: none"> <li>Test temp.: 40±2°C</li> <li>Humidity: 90~95% RH</li> <li>Test time: 500+24/-0hrs.</li> <li>Before initial measurement (Class II only) : To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.</li> <li>Measurement to be made after keeping at room temp. for 48±4 hrs. (Class II).</li> </ul>   | <ul style="list-style-type: none"> <li>No remarkable damage.</li> <li>Cap change:<br/>Class II (Except Y5V): within ±12.5% for ≥10V<sup>1</sup>, within ±25% for 6.3V.<br/>(Note1: 10V: within ±25% for 0603≥4.7μF, 0402≥1μF, 0201≥0.1μF)<br/>Y5V: within ±30% for ≥10V, with in +30/-40% for 6.3V</li> <li>D.F.: ≤200% of initial requirements.</li> <li>I.R.: for ≥10V, ≥1GΩ or RxC≥50Ω-F, whichever is smaller.<br/>6.3V, RxC≥10Ω-F.</li> </ul>   |               |            |                            |  |  |  |  |  |   |                                       |
| <b>Humidity (Damp Heat) Load</b>  | <ul style="list-style-type: none"> <li>Test temp.: 40±2°C</li> <li>Humidity: 90~95% RH</li> <li>Test time: 500+24/-0hrs.</li> <li>To apply voltage :rated voltage (500V max.)</li> <li>Before initial measurement (Class II only) : To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.</li> <li>Measurement to be made after keeping at room temp. for 48±4 hrs (Class II).</li> </ul>         | <ul style="list-style-type: none"> <li>No remarkable damage.</li> <li>Cap change:<br/>Class II (Except Y5V): within ±12.5% for ≥10V<sup>1</sup>, within ±25% for 6.3V.<br/>(Note1: 10V: within ±25% for 0603≥4.7μF, 0402≥1μF, 0201≥0.1μF)<br/>Y5V: within ±30% for ≥10V, with in +30/-40% for 6.3V</li> <li>D.F.: ≤200% of initial requirements.</li> <li>I.R.: for ≥10V, ≥500MΩ or RxC≥25Ω-F, whichever is smaller.</li> </ul> <p>Except:</p> <table border="1"> <thead> <tr> <th>Rated Voltage</th> <th>I.R.</th> </tr> </thead> <tbody> <tr> <td>≥100V: All X7R, 1210≥3.3μF</td> <td rowspan="7">≥500MΩ or RxC≥5Ω-F, whichever is smaller</td> </tr> <tr> <td>50V: 0402&gt;0.01μF, 0603≥1μF, 0805≥1μF, 1206≥4.7μF, 1210≥4.7μF</td> </tr> <tr> <td>35V: 0603≥1μF, 0805≥2.2μF, 1206≥2.2μF, 1210≥10μF</td> </tr> <tr> <td>25V: 0201≥0.1μF, 0402≥0.22μF, 0603≥2.2μF, 0805≥2.2μF, 1206≥10μF, 1210≥10μF</td> </tr> <tr> <td>16V: 0201≥0.1μF, 0402≥0.22μF, 0603≥1μF, 0805≥2.2μF, 1206≥10μF, 1210≥47μF</td> </tr> <tr> <td>10V: 0201≥47nF, 0402≥0.47μF, 0603≥0.47μF, 0805≥2.2μF, 1206≥4.7μF, 1210≥47μF</td> </tr> <tr> <td>6.3V, 4V All X6S/X7S items, size≥1812</td> </tr> </tbody> </table> | Rated Voltage | I.R.       | ≥100V: All X7R, 1210≥3.3μF | ≥500MΩ or RxC≥5Ω-F, whichever is smaller | 50V: 0402>0.01μF, 0603≥1μF, 0805≥1μF, 1206≥4.7μF, 1210≥4.7μF | 35V: 0603≥1μF, 0805≥2.2μF, 1206≥2.2μF, 1210≥10μF | 25V: 0201≥0.1μF, 0402≥0.22μF, 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 All X6S/X7S items, size≥1812 |
| Rated Voltage   | I.R.   |  |               |            |                            |  |  |  |  |  |   |                                       |
| ≥100V: All X7R, 1210≥3.3μF  | ≥500MΩ or RxC≥5Ω-F, whichever is smaller   |  |               |            |                            |  |  |  |  |  |   |                                       |
| 50V: 0402>0.01μF, 0603≥1μF, 0805≥1μF, 1206≥4.7μF, 1210≥4.7μF                |  |  |               |            |                            |  |  |  |  |  |   |                                       |
| 35V: 0603≥1μF, 0805≥2.2μF, 1206≥2.2μF, 1210≥10μF                            |  |  |               |            |                            |  |  |  |  |  |   |                                       |
| 25V: 0201≥0.1μF, 0402≥0.22μF, 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 All X6S/X7S items, size≥1812                                       |  |  |               |            |                            |  |  |  |  |  |   |                                       |
| <b>Adhesive Strength of Termination</b>                                     | <ul style="list-style-type: none"> <li>Capacitors mounted on a substrate. A force of 5N(≤0603) or 10N(&gt; 0603) applied perpendicular to the place of substrate and parallel the line joining the center of terminations for 10±1 second.</li> </ul>  <ul style="list-style-type: none"> <li>Test time: 10±1 sec.</li> </ul>   | <ul style="list-style-type: none"> <li>No remarkable damage or removal of the terminations.</li> </ul>   |               |            |                            |  |  |  |  |  |   |                                       |
| <b>Benting Test</b>   | <ul style="list-style-type: none"> <li>The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1 mm per second until the deflection becomes 1 mm.</li> </ul>    | <ul style="list-style-type: none"> <li>No remarkable damage.</li> </ul> <table border="1"> <thead> <tr> <th>Dielectric</th> <th>Cap Change</th> </tr> </thead> <tbody> <tr> <td>Class II (Except Y5V)</td> <td>within ±12.5%</td> </tr> <tr> <td>Class II (Y5V)</td> <td>within ±30%</td> </tr> </tbody> </table> <p>(This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)</p>   | Dielectric    | Cap Change | Class II (Except Y5V)      | within ±12.5%                            | Class II (Y5V)   | within ±30%                                      |  |  |   |                                       |
| Dielectric  | Cap Change   |  |               |            |                            |  |  |  |  |  |   |                                       |
| Class II (Except Y5V)   | within ±12.5%  |  |               |            |                            |  |  |  |  |  |   |                                       |
| Class II (Y5V)  | within ±30%  |  |               |            |                            |  |  |  |  |  |   |                                       |
| <b>Vibration Resistance</b>   | <ul style="list-style-type: none"> <li>Vibration frequency: 10~55 Hz/min.</li> <li>Total amplitude: 1.5mm</li> <li>Test time: 6 hrs. (Two hrs. each in three mutually perpendicular directions.)</li> <li>Before initial measurement (Class II Only): To apply de-aging at 150°C for 1 hr then set for 24±2 hrs at room temp.</li> <li>Measurement to be made after keeping at room temp. for 48±4 hrs.</li> </ul> | <ul style="list-style-type: none"> <li>No remarkable damage.</li> <li>Cap change and Q/D.F.: To meet initial spec.</li> </ul>  |               |            |                            |  |  |  |  |  |   |                                       |

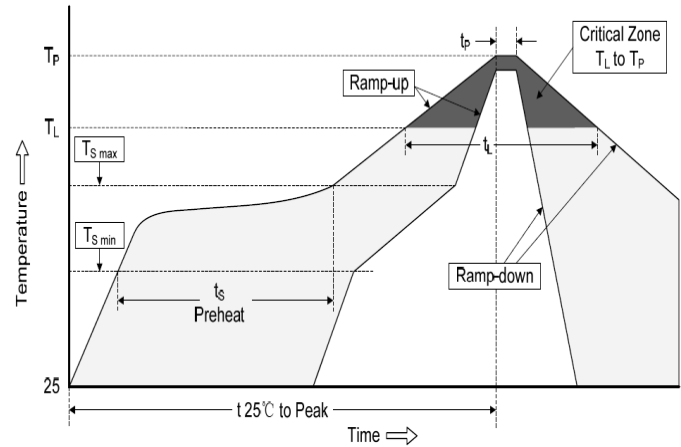
# Multilayer Ceramic Chip Capacitor High Capacitance Type

MA Series

MERITEK

## RECOMMENDED SOLDERING PROFILES

| Reflow Condition                                     |                               |                 |
|--|-------------------------------|-----------------|
| Pre Heat   | Temp. Min $T_{s(min)}$        | 150°C           |
|  | Temp. Max $T_{s(max)}$        | 200°C           |
|  | Time (min. to max.) ( $t_s$ ) | 60~120 seconds  |
| $T_{s(max)}$ to $T_L$ (Ramp-up rate)                 |                               | 3°C/second max. |
| Average ramp up rate ( $T_L$ ) to peak               |                               | 3°C/second max. |
| Reflow   | Temp. ( $T_L$ )               | 217°C           |
|  | Time (min. to max.) ( $t_L$ ) | 60~150 seconds  |
| Peak Temperature ( $T_P$ )                           |                               | 255°C ~260°C    |
| Time within 5°C of actual peak Temperature ( $t_p$ ) |                               | 30 seconds max. |
| Ramp-down Rate                                       |                               | 6°C/second      |



## REEL DIMENSION AND QUANTITY (UNIT: PCS)

| Size                 | Thickness (mm)  | Paper Tape |          | Plastic Tape |          |
|----------------------|-----------------|------------|----------|--------------|----------|
|                      |                 | 7" reel    | 13" reel | 7" reel      | 13" reel |
| 0201                 | 0.30±0.03       | 15k        | 70k      | -            | -        |
|                      | 0.30±0.05       | 15k        | -        | -            | -        |
|                      | 0.30±0.09       | 15k        | -        | -            | -        |
| 0402                 | 0.50±0.05       | 10k        | 50k      | -            | -        |
|                      | 0.50+0.02/-0.05 | 10k        | 50k      | -            | -        |
|                      | 0.50±0.20       | 10k        | -        | -            | -        |
| 0603                 | 0.50±0.10       | 4k         | -        | -            | -        |
|                      | 0.80±0.07       | 4k         | 15k      | -            | -        |
|                      | 0.80+0.15/-0.10 | 4k         | 15k      | -            | -        |
| 0805                 | 0.50±0.10       | 4k         | 15k      | -            | -        |
|                      | 0.60±0.10       | 4k         | 15k      | -            | -        |
|                      | 0.80±0.10       | 4k         | 15k      | -            | -        |
|                      | 0.85±0.10       | 4k         | 15k      | -            | -        |
|                      | 1.25±0.10       | -          | -        | 3k           | 10k      |
|                      | 1.25±0.20       | -          | -        | 3k           | 10k      |
| 1206                 | 0.80±0.10       | 4k         | 15k      | -            | -        |
|                      | 0.85±0.10       | 4k         | 15k      | -            | -        |
|                      | 0.95±0.10       | -          | -        | 3k           | 10k      |
|                      | 1.15±0.15       | -          | -        | 3k           | 10k      |
|                      | 1.25±0.10       | -          | -        | 3k           | 10k      |
|                      | 1.60±0.20       | -          | -        | 2k           | 10k      |
| 1210                 | 1.60+0.30/-0.10 | -          | -        | 2k           | 9k       |
|                      | 0.85±0.10       | -          | -        | 3k           | 10k      |
|                      | 0.95±0.10       | -          | -        | 3k           | 10k      |
|                      | 1.25±0.10       | -          | -        | 3k           | 10k      |
|                      | 1.60±0.20       | -          | -        | 2k           | -        |
|                      | 2.00±0.20       | -          | -        | 1k           | 6k       |
| 1808                 | 2.50±0.30       | -          | -        | 1k           | 6k       |
|                      | 1.25±0.10       | -          | -        | 2k           | 10k      |
|                      | 1.60±0.20       | -          | -        | 2k           | 8k       |
|                      | 2.00±0.20       | -          | -        | 1k           | 6k       |
|                      | 1.25±0.10       | -          | -        | 1k           | 5k       |
| 1812                 | 1.60±0.20       | -          | -        | 1k           | -        |
|                      | 2.00±0.20       | -          | -        | 1k           | -        |
|                      | 2.50±0.30       | -          | -        | 0.5k         | -        |
|                      | 2.80±0.30       | -          | -        | 0.5k         | -        |
| 1825<br>2220<br>2225 | 1.60±0.20       | -          | -        | 1k           | -        |
|                      | 2.00±0.20       | -          | -        | 1k           | -        |
|                      | 2.50±0.30       | -          | -        | 0.5k         | -        |
|                      | 2.80±0.30       | -          | -        | 0.5k         | -        |

# Multilayer Ceramic Chip Capacitor High Capacitance Type

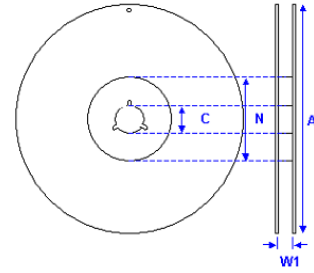
MA Series

MERITEK

## PACKAGE DIMENSION

### Reel Dimension (mm)

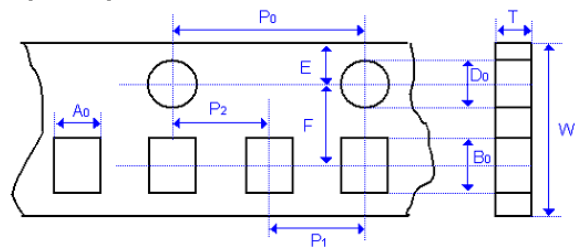
| Reel Size | 7"             | 7"             | 13"           |
|-----------|----------------|----------------|---------------|
| C         | 13.0 +0.5/-0.2 | 13.0 +0.5/-0.2 | 13.0+0.5/-0.2 |
| W1        | 8.4 +1.5/-0    | 12.4 +2.0/-0   | 8.4+1.5/-0    |
| A         | 178.0 ±0.10    | 178.0 ±0.10    | 330.0±1.0     |
| N         | 60.0 +1.0/-0   | 80.0±1.0       | 100±1.0       |



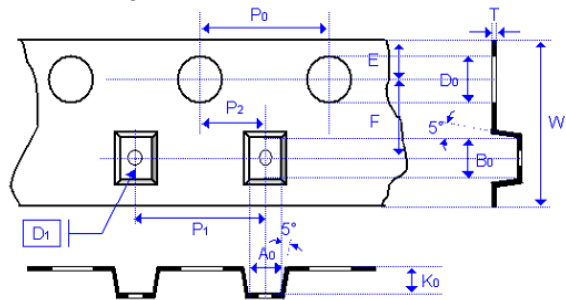
### Tape Dimension (mm)

| Chip Size         | 0201       |            | 0402           |                 | 0603 |  |
|-------------------|------------|------------|----------------|-----------------|------|--|
|                   | 0.30±0.03  | 0.50±0.10  | 0.80±0.07      | 0.80 ±0.15/-0.1 |      |  |
| A <sub>0</sub>    | 0.39±0.07  | 0.70±0.2   | 1.00±0.05/-0.1 | 1.02±0.05/-0.1  |      |  |
| B <sub>0</sub>    | 0.69±0.07  | 1.20±0.2   | 1.80±0.10      | 1.80±0.10       |      |  |
| T                 | ≤0.50      | ≤0.80      | 0.95±0.05      | 0.97±0.05       |      |  |
| K <sub>0</sub>    | -          | -          | -              | -               |      |  |
| W                 | 8.00±0.10  | 8.00±0.10  | 8.00±0.10      | 8.00±0.10       |      |  |
| P <sub>0</sub>    | 4.00±0.10  | 4.00±0.10  | 4.00±0.10      | 4.00±0.10       |      |  |
| 10xP <sub>0</sub> | 40.00±0.10 | 40.00±0.10 | 40.00±0.20     | 40.00±0.20      |      |  |
| P <sub>1</sub>    | 2.00±0.05  | 2.00±0.05  | 4.00±0.10      | 4.00±0.10       |      |  |
| P <sub>2</sub>    | 2.00±0.05  | 2.00±0.05  | 2.00±0.05      | 2.00±0.05       |      |  |
| D <sub>0</sub>    | 1.55±0.05  | 1.55±0.05  | 1.55±0.05      | 1.55±0.05       |      |  |
| D <sub>1</sub>    | -          | -          | -              | -               |      |  |
| E                 | 1.75±0.05  | 1.75±0.05  | 1.75±0.05      | 1.75±0.05       |      |  |
| F                 | 3.50±0.05  | 3.50±0.05  | 3.50±0.05      | 3.50±0.05       |      |  |

### Paper Tape:



### Plastic Tape:



### Tape Dimension (mm)

| Chip Size         | 0805      |                        | 1206       |                        |                            | 1210                                |              | 1812                                |              |
|-------------------|-----------|------------------------|------------|------------------------|----------------------------|-------------------------------------|--------------|-------------------------------------|--------------|
|                   | 0.80±0.10 | 1.25±0.10<br>1.25±0.20 | 0.80±0.10  | 0.95±0.10<br>1.25±0.10 | 1.60±0.20<br>1.60±0.3/-0/1 | 0.95±0.10<br>1.25±0.10<br>1.60±0.20 | 2.50±0.30    | 1.25±0.10<br>1.60±0.20<br>2.00±0.20 | 2.50±0.30    |
| A <sub>0</sub>    | 1.50±0.10 | <1.65                  | 2.00±0.10  | <2.00                  | <2.00                      | <3.05                               | <3.10        | <3.90                               | <3.90        |
| B <sub>0</sub>    | 2.30±0.10 | <2.40                  | 3.50±0.10  | <3.60                  | <3.70                      | <3.80                               | <4.00        | <5.30                               | <5.30        |
| T                 | 0.95±0.05 | 0.23±0.05              | 0.95±0.05  | 0.23±0.05              | 0.23±0.05                  | 0.23±0.05                           | 0.23±0.05    | 0.25±0.05                           | 0.25±0.05    |
| K <sub>0</sub>    | -         | <2.50                  | -          | <2.50                  | <2.50                      | <2.50                               | <3.50        | <2.50                               | <3.00        |
| W                 | 8.00±0.10 | 8.00±0.10              | 8.00±0.10  | 8.00±0.10              | 8.00±0.10                  | 8.00±0.10                           | 8.00±0.10    | 12.0±0.20                           | 12.0±0.20    |
| P <sub>0</sub>    | 4.00±0.10 | 4.00±0.10              | 4.00±0.10  | 4.00±0.10              | 4.00±0.10                  | 4.00±0.100                          | 4.00±0.10    | 4.00±0.10                           | 4.00±0.10    |
| 10xP <sub>0</sub> | 40.00±0.2 | 40.00±0.20             | 40.00±0.20 | 40.00±0.20             | 40.00±0.20                 | 40.00±0.20                          | 40.0±0.10    | 40.00±0.20                          | 40.00±0.20   |
| P <sub>1</sub>    | 4.00±0.10 | 4.00±0.10              | 4.00±0.10  | 4.00±0.10              | 4.00±0.10                  | 4.00±0.10                           | 4.00±0.10    | 8.00±0.10                           | 8.00±0.10    |
| P <sub>2</sub>    | 2.00±0.05 | 2.00±0.05              | 2.00±0.05  | 2.00±0.05              | 2.00±0.05                  | 2.00±0.05                           | 2.00±0.05    | 2.00±0.05                           | 2.00±0.05    |
| D <sub>0</sub>    | 1.55±0.05 | 1.50±0.10/-0           | 1.55±0.05  | 1.50±0.10/-0           | 1.50±0.10/-0               | 1.50±0.10/-0                        | 1.50±0.10/-0 | 1.50±0.10/-0                        | 1.50±0.10/-0 |
| D <sub>1</sub>    | -         | 1.00±0.10              | -          | 1.00±0.10              | 1.00±0.10                  | 1.00±0.10                           | 1.00±0.10    | 1.50±0.10                           | 1.50±/-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                           | 1.75±0.10    | 1.75±0.10                           | 1.75±/-0.1   |
| F                 | 3.50±0.05 | 3.50±0.05              | 3.50±0.05  | 3.50±0.05              | 3.50±0.05                  | 3.50±0.05                           | 3.50±0.05    | 5.50±0.05                           | 5.50±/-0.05  |

# Multilayer Ceramic Chip Capacitor High Capacitance Type

MA Series

**MERITEK**

## Tape Dimension (mm)

| Chip Size         | 1825                   |              | 2220                                |              | 2225                   |              |
|-------------------|------------------------|--------------|-------------------------------------|--------------|------------------------|--------------|
| Thickness         | 1.60±0.20<br>2.00±0.20 | 2.50±0.30    | 1.40±0.15<br>1.60±0.20<br>2.00±0.20 | 2.50±0.30    | 1.60±0.20<br>2.00±0.20 | 2.50±0.30    |
| A <sub>0</sub>    | <6.80                  | <6.80        | <5.80                               | <5.80        | <6.80                  | <6.80        |
| B <sub>0</sub>    | <5.30                  | <5.30        | <6.50                               | <6.50        | <6.50                  | <6.50        |
| T                 | 0.30±0.10              | 0.30±0.10    | 0.30±0.10                           | 0.30±0.10    | 0.30±0.10              | 0.30±0.10    |
| K <sub>0</sub>    | <2.50                  | <3.10        | <2.50                               | <3.10        | <2.50                  | <3.10        |
| W                 | 12.0±0.20              | 12.0±0.20    | 12.0±0.20                           | 12.0±0.20    | 12.0±0.20              | 12.0±0.20    |
| P <sub>0</sub>    | 4.00±0.10              | 4.00±0.10    | 4.00±0.10                           | 4.00±0.10    | 4.00±0.10              | 4.00±0.10    |
| 10xP <sub>0</sub> | 40.00±0.20             | 40.00±0.20   | 40.00±0.20                          | 40.00±0.20   | 40.00±0.20             | 40.00±0.20   |
| P <sub>1</sub>    | 8.00±0.10              | 8.00±0.10    | 8.00±0.10                           | 8.00±0.10    | 8.00±0.10              | 8.00±0.10    |
| P <sub>2</sub>    | 2.00±0.05              | 2.00±0.05    | 2.00±0.05                           | 2.00±0.05    | 2.00±0.05              | 2.00±0.05    |
| D <sub>0</sub>    | 1.50+0.10/-0           | 1.50+0.10/-0 | 1.50+0.10/-0                        | 1.50+0.10/-0 | 1.50+0.10/-0           | 1.50+0.10/-0 |
| D <sub>1</sub>    | 1.50±0.10              | 1.50±0.10    | 1.50±0.10                           | 1.50±0.10    | 1.50±0.10              | 1.50±0.10    |
| E                 | 1.75±0.1               | 1.75±0.10    | 1.75±0.1                            | 1.75±0.10    | 1.75±0.10              | 1.75±0.10    |
| F                 | 5.50±0.05              | 5.50±0.05    | 5.50±0.05                           | 5.50±0.05    | 5.50±0.05              | 5.50±0.05    |

## APPLICATION NOTES

### STORAGE

- To prevent the damage of solderability of terminations, the following storage conditions are recommended:  
Indoors under 5°C~ 40°C and 20% ~ 70% RH.  
No harmful gases containing sulfuric acid, ammonia, hydrogen sulfide or chlorine.
- Packaging should not be opened until the capacitors are required for use. If opened, the pack should be re-sealed as soon as is practicable. Taped product should be stored out of direct sunlight, which might promote deterioration in tape or adhesion performance. The product is recommended to be used within 12 months and checked the solderability before use.

### HANDLING

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

### PREHEAT

- In order to minimize the risk of thermal shock during soldering, a carefully controlled preheat is required. The rate of preheat should not exceed 3°C per second.

### SOLDERING

- Use midly activated rosin RA and RMA fluxes do not use activated flux. The amount of solder in each solder joint should be controlled to prevent the damage of chip capacitors caused by the stress between solder, chips, and substrate.
- Hand soldering with temperature-controlled iron not exceeding 20 watts and diameter of tip less than 1.0 mm is recommended, tip of iron should not contact the ceramic body directly, and the temperature of iron should be set to not more than 260°C.

### COOLING

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



### CLEANING

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

\*Specifications subject to change without notice.

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