



## MULTILAYER CERAMIC CHIP CAPACITORS



### C Series Low ESL Flip Type

Type: C0510 [EIA CC0204]  
C0816 [EIA CC0306]  
C1220 [EIA CC0508]  
C1632 [EIA CC0612]

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**TDK MLCC  
US Catalog**

Version B11

## REMINDERS

Please read before using this product

### SAFETY REMINDERS



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## C Series

### Low ESL Flip Type

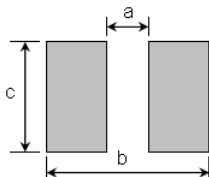
Type: C0510, C0816, C1220, C1632

#### Features



- Positioning the electrodes along the length of the chip device, reduces ESR and ESL components over conventional products.
- Provides high frequency noise suppression effect because the resonating frequency is high.
- Flipped geometry provides low inductance (less than 400 pH).
- Provides stabilization of power line voltage.
- Suitable for IC decoupling application.

#### PC Board Pattern



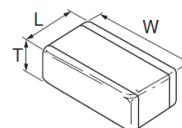
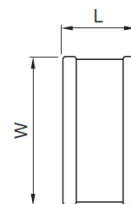
| Case Size | Dimensions (mm) |     |     |
|-----------|-----------------|-----|-----|
|           | a               | b   | c   |
| C0510     | 0.2             | 0.6 | 1.0 |
| C0816     | 0.3             | 1.0 | 1.6 |
| C1220     | 0.5             | 1.6 | 2.0 |
| C1632     | 0.75            | 2.2 | 3.2 |

#### Applications



- Decoupling CPU power line
- Bias line in CPU
- High speed digital IC/decoupling
- PC, cell phones, camcorders, etc.

#### Shape & Dimensions



|   |                |
|---|----------------|
| L | Body Length    |
| W | Body Width     |
| T | Body Height    |
| B | Terminal Width |

Dimensions in mm

#### Part Number Construction

Series Name **C** **1632** **X5R** **0J** **106** **M** **T** **XXXX**

Series Name

Dimensions L x W (mm)

| Case Code     | Length      | Width       |
|---------------|-------------|-------------|
| C0510         | 0.52 ± 0.05 | 1.00 ± 0.05 |
| C0816 (C<1μF) | 0.80 ± 0.10 | 1.60 ± 0.10 |
| C0816 (C≥1μF) | 0.80 ± 0.15 | 1.60 ± 0.20 |
| C1220         | 1.25 ± 0.20 | 2.00 ± 0.20 |
| C1608         | 1.60 ± 0.20 | 3.20 ± 0.20 |

Temperature Characteristic

| Temperature Characteristics | Capacitance Change | Temperature Range |
|-----------------------------|--------------------|-------------------|
| X5R                         | ± 15%              | -55 to +85°C      |
| X6S                         | ± 22%              | -55 to +105°C     |
| X7R                         | ± 15%              | -55 to +125°C     |
| X7S                         | ± 22%              | -55 to +125°C     |

Rated Voltage (DC)

| Voltage Code | Voltage (DC) |
|--------------|--------------|
| 0G           | 4V           |
| 0J           | 6.3V         |
| 1A           | 10V          |
| 1C           | 16V          |
| 1E           | 25V          |
| 1H           | 50V          |

Internal Codes

Packaging Style

| Packaging Code | Style       |
|----------------|-------------|
| T              | Tape & Reel |

Capacitance Tolerance

| Tolerance Code | Tolerance |
|----------------|-----------|
| K              | ±15%      |
| M              | ±20%      |

Nominal Capacitance (pF)

The capacitance is expressed in three digit codes and in units of pico Farads (pF). The first and second digits identify the first and second significant figures of the capacitance. The third digit identifies the multiplier. R designates a decimal point.

| Capacitance Code | Capacitance       |
|------------------|-------------------|
| 0R5              | 0.5pF             |
| 010              | 1pF               |
| 102              | 1,000pF (1nF)     |
| 105              | 1,000,000pF (1μF) |



## Capacitance Range Chart

## C0510 [EIA CC0204]

### Capacitance Range Chart

Temperature Characteristics: X6S ( $\pm 22\%$ )  
Rated Voltage: 4V (0G)

| Capacitance (pF) | Cap Code | Tolerance     | X6S<br>0G<br>(4V) |
|------------------|----------|---------------|-------------------|
| 10,000           | 103      | M: $\pm 20\%$ |                   |
| 22,000           | 223      |               |                   |
| 47,000           | 473      |               |                   |
| 100,000          | 104      |               |                   |
| 220,000          | 224      |               |                   |
| 470,000          | 474      |               |                   |
| 1,000,000        | 105      |               |                   |
| 2,200,000        | 225      |               |                   |

Standard Thickness

0.30 mm



## Capacitance Range Table

## C0510 [EIA CC0204]

### Class 2 (Temperature Stable)

Temperature Characteristics X6S ( $-55$  to  $+105^{\circ}\text{C}$ ,  $\pm 22\%$ )

| TDK Part Number<br>(Ordering Code) | Temperature<br>Characteristics | Rated<br>Voltage | Capacitance<br>(pF) | Capacitance<br>Tolerance | Thickness<br>(mm) |
|------------------------------------|--------------------------------|------------------|---------------------|--------------------------|-------------------|
| C0510X6S0G104M                     | X6S                            | 4V               | 100,000             | $\pm 20\%$               | $0.30 \pm 0.05$   |
| C0510X6S0G224M                     | X6S                            | 4V               | 220,000             | $\pm 20\%$               | $0.30 \pm 0.05$   |
| C0510X6S0G474M                     | X6S                            | 4V               | 470,000             | $\pm 20\%$               | $0.30 \pm 0.05$   |



## Capacitance Range Chart

## C0816 [EIA CC0306]

### Capacitance Range Chart

Temperature Characteristics: X7R, ( $\pm 15\%$ ), X7S ( $\pm 22\%$ ), X5R ( $\pm 15\%$ ), X6S ( $\pm 22\%$ )

Rated Voltage: 16V (1C), 10V (1A), 6.3V (0J), 4V (0G)

| Capacitance (pF) | Cap Code | Tolerance     | X7R      |           | X7S     | X5R      |           | X6S     |
|------------------|----------|---------------|----------|-----------|---------|----------|-----------|---------|
|                  |          |               | 1C (16V) | 0J (6.3V) | 0G (4V) | 1A (10V) | 0J (6.3V) | 0G (4V) |
| 10,000           | 103      | K: $\pm 10\%$ | ■        |           |         |          |           |         |
| 22,000           | 223      | M: $\pm 20\%$ | ■        |           |         |          |           |         |
| 47,000           | 473      |               | ■        |           |         |          |           |         |
| 100,000          | 104      |               | ■        |           |         | ■        |           |         |
| 220,000          | 224      |               |          | ■         |         | ■        |           |         |
| 470,000          | 474      |               |          |           | ■       |          | ■         | ■       |
| 1,000,000        | 105      |               |          |           | ■       |          | ■         |         |
| 2,200,000        | 225      |               |          |           | ■       |          | ■         |         |

Standard Thickness

■ 0.50 mm



## Capacitance Range Table

## C0816 [EIA CC0306]

### Class 2 (Temperature Stable)

Temperature Characteristics X7R (-55 to +125°C,  $\pm 15\%$ ), X7S (-55 to +125°C,  $\pm 2\%$ ), X5R (-55 to +85°C,  $\pm 15\%$ )

| TDK Part Number (Ordering Code) | Temperature Characteristics | Rated Voltage | Capacitance (pF) | Capacitance Tolerance | Thickness (mm)  |
|---------------------------------|-----------------------------|---------------|------------------|-----------------------|-----------------|
| C0816X7R1C103K                  | X7R                         | 16V           | 10,000           | $\pm 10\%$            | 0.50 $\pm$ 0.10 |
| C0816X7R1C223K                  | X7R                         | 16V           | 22,000           | $\pm 10\%$            | 0.50 $\pm$ 0.10 |
| C0816X7R1C473K                  | X7R                         | 16V           | 47,000           | $\pm 10\%$            | 0.50 $\pm$ 0.10 |
| C0816X7R1C104K                  | X7R                         | 16V           | 100,000          | $\pm 10\%$            | 0.50 $\pm$ 0.10 |
| C0816X7R0J224K                  | X7R                         | 6.3V          | 220,000          | $\pm 10\%$            | 0.50 $\pm$ 0.10 |
| C0816X7S0G474K                  | X7S                         | 4V            | 470,000          | $\pm 10\%$            | 0.50 $\pm$ 0.10 |
| C0816X7S0G105M                  | X7S                         | 4V            | 1,000,000        | $\pm 20\%$            | 0.50 $\pm$ 0.10 |
| C0816X7S0G225M                  | X7S                         | 4V            | 2,200,000        | $\pm 20\%$            | 0.50 $\pm$ 0.10 |
| C0816X5R1A224K                  | X5R                         | 10V           | 220,000          | $\pm 10\%$            | 0.50 $\pm$ 0.10 |
| C0816X5R1A474K                  | X5R                         | 10V           | 470,000          | $\pm 10\%$            | 0.50 $\pm$ 0.10 |
| C0816X5R0J474K                  | X5R                         | 6.3V          | 470,000          | $\pm 10\%$            | 0.50 $\pm$ 0.10 |
| C0816X5R0J105M                  | X5R                         | 6.3V          | 1,000,000        | $\pm 20\%$            | 0.50 $\pm$ 0.10 |
| C0816X5R0J225M                  | X5R                         | 6.3V          | 2,200,000        | $\pm 20\%$            | 0.50 $\pm$ 0.10 |



## Capacitance Range Chart

## C1220 [EIA CC0508]

### Capacitance Range Chart

Temperature Characteristics: X7R, ( $\pm 15\%$ ), X5R ( $\pm 15\%$ )  
 Rated Voltage: 50V (1H), 25V (1E), 16V (1C), 10V (1A), 6.3V (0J)

| Capacitance (pF) | Cap Code | Tolerance     | X7R      |          |          |           | X5R      |
|------------------|----------|---------------|----------|----------|----------|-----------|----------|
|                  |          |               | 1H (50V) | 1E (25V) | 1C (16V) | 0J (6.3V) | 1A (10V) |
| 10,000           | 103      | K: $\pm 10\%$ |          |          |          |           |          |
| 22,000           | 223      | M: $\pm 20\%$ |          |          |          |           |          |
| 47,000           | 473      |               |          |          |          |           |          |
| 100,000          | 104      |               |          |          |          |           |          |
| 220,000          | 224      |               |          |          |          |           |          |
| 470,000          | 474      |               |          |          |          |           |          |
| 1,000,000        | 105      |               |          |          |          |           |          |

Standard Thickness  
 0.85 mm



## Capacitance Range Table

## C1220 [EIA CC0508]

### Class 2 (Temperature Stable)

Temperature Characteristics X7R (-55 to +125°C,  $\pm 15\%$ ), X5R (-55 to +85°C,  $\pm 15\%$ )

| TDK Part Number (Ordering Code) | Temperature Characteristics | Rated Voltage | Capacitance (pF) | Capacitance Tolerance | Thickness (mm)  |
|---------------------------------|-----------------------------|---------------|------------------|-----------------------|-----------------|
| C1220X7R1H103K                  | X7R                         | 50V           | 10,000           | $\pm 10\%$            | 0.85 $\pm$ 0.10 |
| C1220X7R1H223K                  | X7R                         | 50V           | 22,000           | $\pm 10\%$            | 0.85 $\pm$ 0.10 |
| C1220X7R1H473K                  | X7R                         | 50V           | 47,000           | $\pm 10\%$            | 0.85 $\pm$ 0.10 |
| C1220X7R1E104K                  | X7R                         | 25V           | 100,000          | $\pm 10\%$            | 0.85 $\pm$ 0.10 |
| C1220X7R1C224K                  | X7R                         | 16V           | 220,000          | $\pm 10\%$            | 0.85 $\pm$ 0.10 |
| C1220X7R0J474K                  | X7R                         | 6.3V          | 470,000          | $\pm 10\%$            | 0.85 $\pm$ 0.10 |
| C1220X7R0J105M                  | X7R                         | 6.3V          | 1,000,000        | $\pm 20\%$            | 0.85 $\pm$ 0.10 |
| C1220X5R1A474K                  | X5R                         | 10V           | 470,000          | $\pm 10\%$            | 0.85 $\pm$ 0.10 |
| C1220X5R1A105M                  | X5R                         | 10V           | 1,000,000        | $\pm 20\%$            | 0.85 $\pm$ 0.10 |



## Capacitance Range Chart

## C1632 [EIA CC0612]

### Capacitance Range Chart

Temperature Characteristics: X7R, ( $\pm 15\%$ ), X7S ( $\pm 22\%$ ), X5R ( $\pm 15\%$ )  
 Rated Voltage: 50V (1H), 25V (1E), 16V (1C), 10V (1A), 6.3 (0J), 4V (0G)

| Capacitance<br>(pF) | Cap<br>Code | Tolerance                      | X7R         |             |             |              | X7S        | X5R         |              |
|---------------------|-------------|--------------------------------|-------------|-------------|-------------|--------------|------------|-------------|--------------|
|                     |             |                                | 1H<br>(50V) | 1E<br>(25V) | 1C<br>(16V) | 0J<br>(6.3V) | 0G<br>(4V) | 1A<br>(10V) | 0J<br>(6.3V) |
| 10,000              | 103         | K: $\pm 10\%$<br>M: $\pm 20\%$ | 0.70 mm     |             |             |              |            |             |              |
| 22,000              | 223         |                                | 0.70 mm     |             |             |              |            |             |              |
| 47,000              | 473         |                                | 0.70 mm     |             |             |              |            |             |              |
| 100,000             | 104         |                                | 0.70 mm     |             |             |              |            |             |              |
| 220,000             | 224         |                                | 0.70 mm     | 0.70 mm     |             |              |            |             |              |
| 470,000             | 474         |                                |             | 0.70 mm     | 0.70 mm     |              |            |             |              |
| 1,000,000           | 105         |                                |             |             | 0.70 mm     | 0.70 mm      |            | 0.70 mm     |              |
| 2,200,000           | 225         |                                |             |             |             | 0.70 mm      |            | 0.70 mm     |              |
| 4,700,000           | 475         |                                |             |             |             |              | 1.30 mm    |             | 1.30 mm      |
| 10,000,000          | 106         |                                |             |             |             |              | 1.30 mm    |             | 1.30 mm      |

### Standard Thickness



0.70 mm



1.15 mm



1.30 mm



## Capacitance Range Table

## C1632 [EIA CC0612]

### Class 2 (Temperature Stable)

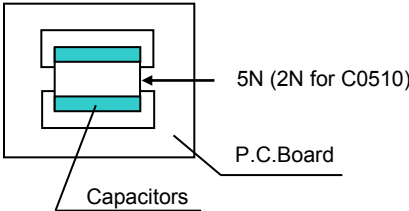
Temperature Characteristics X7R (-55 to +125°C, ±15%), X7S (-55 to +125°C, ±2%), X5R (-55 to +85°C, ±15%)

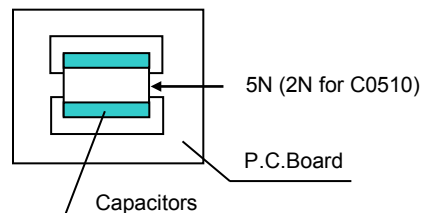
| TDK Part Number<br>(Ordering Code) | Temperature<br>Characteristics | Rated<br>Voltage | Capacitance<br>(pF) | Capacitance<br>Tolerance | Thickness<br>(mm) |
|------------------------------------|--------------------------------|------------------|---------------------|--------------------------|-------------------|
| C1632X7R1H103K                     | X7R                            | 50V              | 10,000              | ± 10%                    | 0.70 ± 0.10       |
| C1632X7R1H223K                     | X7R                            | 50V              | 22,000              | ± 10%                    | 0.70 ± 0.10       |
| C1632X7R1H473K                     | X7R                            | 50V              | 47,000              | ± 10%                    | 0.70 ± 0.10       |
| C1632X7R1H104K                     | X7R                            | 50V              | 100,000             | ± 10%                    | 0.70 ± 0.10       |
| C1632X7R1H224K                     | X7R                            | 50V              | 220,000             | ± 10%                    | 1.15 ± 0.10       |
| C1632X7R1E224K                     | X7R                            | 25V              | 220,000             | ± 10%                    | 0.70 ± 0.10       |
| C1632X7R1E474K                     | X7R                            | 25V              | 470,000             | ± 10%                    | 1.15 ± 0.10       |
| C1632X7R1C474K                     | X7R                            | 16V              | 470,000             | ± 10%                    | 0.70 ± 0.10       |
| C1632X7R1C105K                     | X7R                            | 16V              | 1,000,000           | ± 10%                    | 1.15 ± 0.10       |
| C1632X7R0J105M                     | X7R                            | 6.3V             | 1,000,000           | ± 20%                    | 0.70 ± 0.10       |
| C1632X7R0J225M                     | X7R                            | 6.3V             | 2,200,000           | ± 20%                    | 1.15 ± 0.10       |
| C1632X7S0G475M                     | X7S                            | 4V               | 4,700,000           | ± 20%                    | 1.30 ± 0.10       |
| C1632X7S0G106M                     | X7S                            | 4V               | 10,000,000          | ± 20%                    | 1.30 ± 0.10       |
| C1632X5R1A105M                     | X5R                            | 10V              | 1,000,000           | ± 20%                    | 0.70 ± 0.10       |
| C1632X5R1A225M                     | X5R                            | 10V              | 2,200,000           | ± 20%                    | 1.15 ± 0.10       |
| C1632X5R0J475M                     | X5R                            | 6.3V             | 4,700,000           | ± 20%                    | 1.30 ± 0.10       |
| C1632X5R0J106M                     | X5R                            | 6.3V             | 10,000,000          | ± 20%                    | 1.30 ± 0.10       |



## General Specifications

## C Series – Low ESL Flip Type

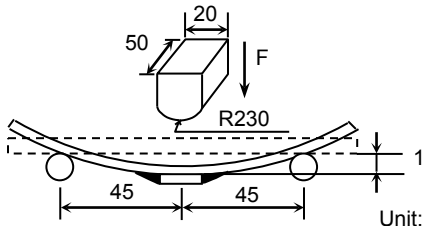
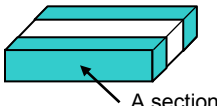
| No.                                          | Item                                                 | Performance                                                                                                                                                                                                                                                                       | Test or Inspection Method                                                                                                                                                                                                                                                                |                     |               |                   |             |            |                          |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                   |                  |           |                                                 |   |                          |   |                     |   |                          |
|----------------------------------------------|------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|---------------|-------------------|-------------|------------|--------------------------|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|------------------|-----------|-------------------------------------------------|---|--------------------------|---|---------------------|---|--------------------------|
| 1                                            | External Appearance                                  | No defects which may affect performance.                                                                                                                                                                                                                                          | Inspect with magnifying glass (3×).                                                                                                                                                                                                                                                      |                     |               |                   |             |            |                          |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                   |                  |           |                                                 |   |                          |   |                     |   |                          |
| 2                                            | Insulation Resistance                                | 10,000MΩ or 500MΩ•μF min. (whichever smaller). As for the capacitor of rated voltage 16, 10, 6.3 and 4V DC, 100MΩ•μF min.                                                                                                                                                         | Apply rated voltage for 60s.                                                                                                                                                                                                                                                             |                     |               |                   |             |            |                          |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                   |                  |           |                                                 |   |                          |   |                     |   |                          |
| 3                                            | Voltage Proof                                        | Withstand test voltage without insulation breakdown or other damage.                                                                                                                                                                                                              | Apply 2.5 x rated voltage for 1 ~ 5s.<br>Charge / discharge current shall not exceed 50mA.                                                                                                                                                                                               |                     |               |                   |             |            |                          |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                   |                  |           |                                                 |   |                          |   |                     |   |                          |
| 4                                            | Capacitance                                          | Within the specified tolerance.                                                                                                                                                                                                                                                   | <table><tr><th>Measuring Frequency</th><th>Rated Voltage</th><th>Measuring Voltage</th></tr><tr><td rowspan="2">1kHz±10%</td><td>50V ~ 6.3V</td><td>1.0±0.2 V<sub>rms</sub></td></tr><tr><td>4V</td><td>0.5 - 5 V<sub>rms</sub></td></tr></table>                                        | Measuring Frequency | Rated Voltage | Measuring Voltage | 1kHz±10%    | 50V ~ 6.3V | 1.0±0.2 V <sub>rms</sub> | 4V                | 0.5 - 5 V <sub>rms</sub>                                                                                                                                                                                                                                                                                                                                                                                                                            |                   |                  |           |                                                 |   |                          |   |                     |   |                          |
| Measuring Frequency                          | Rated Voltage                                        | Measuring Voltage                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                          |                     |               |                   |             |            |                          |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                   |                  |           |                                                 |   |                          |   |                     |   |                          |
| 1kHz±10%                                     | 50V ~ 6.3V                                           | 1.0±0.2 V <sub>rms</sub>                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                          |                     |               |                   |             |            |                          |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                   |                  |           |                                                 |   |                          |   |                     |   |                          |
|                                              | 4V                                                   | 0.5 - 5 V <sub>rms</sub>                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                          |                     |               |                   |             |            |                          |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                   |                  |           |                                                 |   |                          |   |                     |   |                          |
| 5                                            | Dissipation Factor (Class 2)                         | <table><tr><th>T.C.</th><th>Rated Voltage</th><th>D.F.</th></tr><tr><td>X7R</td><td>50V, 25V DC</td><td>0.03 max.</td></tr><tr><td>X7R<br/>X5R</td><td>16V, 10V, 6.3V DC</td><td>0.05 max.</td></tr><tr><td>X7S<br/>X6S<br/>X5S</td><td>4V DC</td><td>0.12 max.</td></tr></table> | T.C.                                                                                                                                                                                                                                                                                     | Rated Voltage       | D.F.          | X7R               | 50V, 25V DC | 0.03 max.  | X7R<br>X5R               | 16V, 10V, 6.3V DC | 0.05 max.                                                                                                                                                                                                                                                                                                                                                                                                                                           | X7S<br>X6S<br>X5S | 4V DC            | 0.12 max. | See No.4 in this table for measuring condition. |   |                          |   |                     |   |                          |
| T.C.                                         | Rated Voltage                                        | D.F.                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                          |                     |               |                   |             |            |                          |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                   |                  |           |                                                 |   |                          |   |                     |   |                          |
| X7R                                          | 50V, 25V DC                                          | 0.03 max.                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                          |                     |               |                   |             |            |                          |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                   |                  |           |                                                 |   |                          |   |                     |   |                          |
| X7R<br>X5R                                   | 16V, 10V, 6.3V DC                                    | 0.05 max.                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                          |                     |               |                   |             |            |                          |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                   |                  |           |                                                 |   |                          |   |                     |   |                          |
| X7S<br>X6S<br>X5S                            | 4V DC                                                | 0.12 max.                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                          |                     |               |                   |             |            |                          |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                   |                  |           |                                                 |   |                          |   |                     |   |                          |
| 6                                            | Temperature Characteristics of Capacitance (Class 2) | <table><tr><th colspan="2">Capacitance Change (%)<br/>No Voltage Applied</th></tr><tr><th>T.C.</th><th>Δ C Percent</th></tr><tr><td>X5R<br/>X7R</td><td>± 15%</td></tr><tr><td>X5S<br/>X6S<br/>X7S</td><td>± 22%</td></tr></table>                                                | Capacitance Change (%)<br>No Voltage Applied                                                                                                                                                                                                                                             |                     | T.C.          | Δ C Percent       | X5R<br>X7R  | ± 15%      | X5S<br>X6S<br>X7S        | ± 22%             | <p>Capacitance shall be measured by the steps shown in the following table after thermal equilibrium is obtained for each step.</p> <p>ΔC be calculated ref. STEP3 reading</p> <table><tr><th>Step</th><th>Temperature (°C)</th></tr><tr><td>1</td><td>Reference temp. ± 2</td></tr><tr><td>2</td><td>Min. operating temp. ± 2</td></tr><tr><td>3</td><td>Reference temp. ± 2</td></tr><tr><td>4</td><td>Max. operating temp. ± 2</td></tr></table> | Step              | Temperature (°C) | 1         | Reference temp. ± 2                             | 2 | Min. operating temp. ± 2 | 3 | Reference temp. ± 2 | 4 | Max. operating temp. ± 2 |
| Capacitance Change (%)<br>No Voltage Applied |                                                      |                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                          |                     |               |                   |             |            |                          |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                   |                  |           |                                                 |   |                          |   |                     |   |                          |
| T.C.                                         | Δ C Percent                                          |                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                          |                     |               |                   |             |            |                          |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                   |                  |           |                                                 |   |                          |   |                     |   |                          |
| X5R<br>X7R                                   | ± 15%                                                |                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                          |                     |               |                   |             |            |                          |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                   |                  |           |                                                 |   |                          |   |                     |   |                          |
| X5S<br>X6S<br>X7S                            | ± 22%                                                |                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                          |                     |               |                   |             |            |                          |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                   |                  |           |                                                 |   |                          |   |                     |   |                          |
| Step                                         | Temperature (°C)                                     |                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                          |                     |               |                   |             |            |                          |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                   |                  |           |                                                 |   |                          |   |                     |   |                          |
| 1                                            | Reference temp. ± 2                                  |                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                          |                     |               |                   |             |            |                          |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                   |                  |           |                                                 |   |                          |   |                     |   |                          |
| 2                                            | Min. operating temp. ± 2                             |                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                          |                     |               |                   |             |            |                          |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                   |                  |           |                                                 |   |                          |   |                     |   |                          |
| 3                                            | Reference temp. ± 2                                  |                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                          |                     |               |                   |             |            |                          |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                   |                  |           |                                                 |   |                          |   |                     |   |                          |
| 4                                            | Max. operating temp. ± 2                             |                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                          |                     |               |                   |             |            |                          |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                   |                  |           |                                                 |   |                          |   |                     |   |                          |
| 7                                            | Robustness of Terminations                           | No sign of termination coming off, breakage of ceramic, or other abnormal signs.                                                                                                                                                                                                  | <p>Reflow solder the capacitor on P.C. board (shown in Appendix 1) and apply a pushing force of 5N (C0510: 2N) for 10 ± 1s.</p> <div><p>5N (2N for C0510)</p><p>P.C.Board</p><p>Capacitors</p></div> |                     |               |                   |             |            |                          |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                   |                  |           |                                                 |   |                          |   |                     |   |                          |





## General Specifications

## C Series – Low ESL Flip Type

| No.         | Item                      | Performance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Test or Inspection Method                                                                                                                                                                           |                                   |         |                                   |         |     |         |     |     |     |                                                                                                                                                                                                                                                                                                                                                       |
|-------------|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------|-----------------------------------|---------|-----|---------|-----|-----|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8           | Bending                   | No mechanical damage.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Reflow solder the capacitor on P.C. board (shown in Appendix 2) and bend it for 1mm.<br><br>Unit: mm              |                                   |         |                                   |         |     |         |     |     |     |                                                                                                                                                                                                                                                                                                                                                       |
| 9           | Solderability             | New solder to cover over 75% of termination.<br><br>25% may have pinholes or rough spots but not concentrated in one spot.<br><br>Ceramic surface of "A sections" shall not be exposed due to melting or shifting of termination material.<br>                                                                                                                                                                                                                                                    | Completely soak both terminations in solder at 235 ± 5°C for 2 ± 0.5s.<br><br>Solder:<br>H63A (JIS Z 3282)<br><br>Flux:<br>Isopropyl alcohol (JIS K 8839)<br>Rosin (JIS K 5902) 25% solid solution. |                                   |         |                                   |         |     |         |     |     |     |                                                                                                                                                                                                                                                                                                                                                       |
| 10          | Resistance to solder heat | External appearance<br>No cracks are allowed and terminations shall be covered at least 60% with new solder.<br><table><tr><td rowspan="5">Capacitance</td><td colspan="2">Characteristics</td><td rowspan="5">Change from the value before test</td></tr><tr><td rowspan="4">Class 2</td><td>X7R</td><td rowspan="4">± 7.5 %</td></tr><tr><td>X7S</td></tr><tr><td>X5R</td></tr><tr><td>X6S</td></tr></table><br>D.F. (Class 2)<br>Meet the initial spec.<br><br>Insulation Resistance<br>Meet the initial spec.<br><br>Voltage proof<br>No insulation breakdown or other damage. | Capacitance                                                                                                                                                                                         | Characteristics                   |         | Change from the value before test | Class 2 | X7R | ± 7.5 % | X7S | X5R | X6S | Completely soak both terminations in solder at 260 ± 5°C for 5 ± 1s.<br><br>Preheating condition<br>Temp. : 150 ± 10°C<br>Time: 1 ~ 2min.<br><br>Flux:<br>Isopropyl alcohol (JIS K 8839)<br>Rosin (JIS K 5902) 25% solid solution.<br><br>Solder : H63A (JIS Z 3282)<br><br>Leave the capacitor in ambient conditions for 24 ± 2h before measurement. |
| Capacitance | Characteristics           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                     | Change from the value before test |         |                                   |         |     |         |     |     |     |                                                                                                                                                                                                                                                                                                                                                       |
|             | Class 2                   | X7R                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                     |                                   | ± 7.5 % |                                   |         |     |         |     |     |     |                                                                                                                                                                                                                                                                                                                                                       |
|             |                           | X7S                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                     |                                   |         |                                   |         |     |         |     |     |     |                                                                                                                                                                                                                                                                                                                                                       |
|             |                           | X5R                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                     |                                   |         |                                   |         |     |         |     |     |     |                                                                                                                                                                                                                                                                                                                                                       |
|             |                           | X6S                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                     |                                   |         |                                   |         |     |         |     |     |     |                                                                                                                                                                                                                                                                                                                                                       |



## General Specifications

## C Series – Low ESL Flip Type

| No.                   | Item                                                                                                                                                        | Performance                                                                                                                                                                          | Test or Inspection Method                                                                                                    |  |                                   |         |                          |          |                                                                           |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|--|-----------------------------------|---------|--------------------------|----------|---------------------------------------------------------------------------|
| 11                    | <b>Vibration</b>                                                                                                                                            |                                                                                                                                                                                      | Solder the capacitors on P.C. board (shown in Appendix 1) before testing.                                                    |  |                                   |         |                          |          |                                                                           |
|                       | External appearance                                                                                                                                         | No mechanical damage.                                                                                                                                                                | Vibrate the capacitor with amplitude of 1.5mm P-P changing the frequencies from 10Hz to 55Hz and back to 10Hz in about 1min. |  |                                   |         |                          |          |                                                                           |
|                       | Capacitance                                                                                                                                                 | <table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 2</td><td>X7R<br/>X7S<br/>X5R<br/>X6S</td><td>± 7.5 %</td></tr></table>  | Characteristics                                                                                                              |  | Change from the value before test | Class 2 | X7R<br>X7S<br>X5R<br>X6S | ± 7.5 %  | Repeat this for 2h each in 3 perpendicular directions.                    |
|                       | Characteristics                                                                                                                                             |                                                                                                                                                                                      | Change from the value before test                                                                                            |  |                                   |         |                          |          |                                                                           |
|                       | Class 2                                                                                                                                                     | X7R<br>X7S<br>X5R<br>X6S                                                                                                                                                             | ± 7.5 %                                                                                                                      |  |                                   |         |                          |          |                                                                           |
| D.F. (Class 2)        | Meet the initial spec.                                                                                                                                      |                                                                                                                                                                                      |                                                                                                                              |  |                                   |         |                          |          |                                                                           |
|                       |                                                                                                                                                             |                                                                                                                                                                                      |                                                                                                                              |  |                                   |         |                          |          |                                                                           |
| 12                    | <b>Temperature cycle</b>                                                                                                                                    |                                                                                                                                                                                      | Solder the capacitors on P.C. board (shown in Appendix 1) before testing.                                                    |  |                                   |         |                          |          |                                                                           |
|                       | External appearance                                                                                                                                         | No mechanical damage.                                                                                                                                                                | Expose the capacitor in the conditions step1 through 4 and repeat 5 times consecutively.                                     |  |                                   |         |                          |          |                                                                           |
|                       | Capacitance                                                                                                                                                 | <table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 2</td><td>X7R<br/>X7S<br/>X5R<br/>X6S</td><td>± 7.5 %</td></tr></table>  | Characteristics                                                                                                              |  | Change from the value before test | Class 2 | X7R<br>X7S<br>X5R<br>X6S | ± 7.5 %  | Leave the capacitor in ambient conditions for 24 ± 2h before measurement. |
|                       | Characteristics                                                                                                                                             |                                                                                                                                                                                      | Change from the value before test                                                                                            |  |                                   |         |                          |          |                                                                           |
|                       | Class 2                                                                                                                                                     | X7R<br>X7S<br>X5R<br>X6S                                                                                                                                                             | ± 7.5 %                                                                                                                      |  |                                   |         |                          |          |                                                                           |
|                       | D.F. (Class 2)                                                                                                                                              | Meet the initial spec.                                                                                                                                                               |                                                                                                                              |  |                                   |         |                          |          |                                                                           |
|                       | Insulation Resistance                                                                                                                                       | 1,000MΩ or 50MΩ•μF min. whichever smaller.                                                                                                                                           |                                                                                                                              |  |                                   |         |                          |          |                                                                           |
| Voltage Proof         | No insulation breakdown or other damage.                                                                                                                    |                                                                                                                                                                                      |                                                                                                                              |  |                                   |         |                          |          |                                                                           |
|                       |                                                                                                                                                             |                                                                                                                                                                                      |                                                                                                                              |  |                                   |         |                          |          |                                                                           |
| 13                    | <b>Moisture Resistance (Steady State)</b>                                                                                                                   |                                                                                                                                                                                      | Solder the capacitor on P.C. board (shown in Appendix 1) before testing.                                                     |  |                                   |         |                          |          |                                                                           |
|                       | External appearance                                                                                                                                         | No mechanical damage.                                                                                                                                                                | Leave at temperature 40 ± 2°C, 90 to 95%RH for 500 +24, 0h.                                                                  |  |                                   |         |                          |          |                                                                           |
|                       | Capacitance                                                                                                                                                 | <table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 2</td><td>X7R<br/>X7S<br/>X5R<br/>X6S</td><td>± 12.5 %</td></tr></table> | Characteristics                                                                                                              |  | Change from the value before test | Class 2 | X7R<br>X7S<br>X5R<br>X6S | ± 12.5 % | Leave the capacitor in ambient conditions for 24 ± 2h before measurement. |
|                       | Characteristics                                                                                                                                             |                                                                                                                                                                                      | Change from the value before test                                                                                            |  |                                   |         |                          |          |                                                                           |
|                       | Class 2                                                                                                                                                     | X7R<br>X7S<br>X5R<br>X6S                                                                                                                                                             | ± 12.5 %                                                                                                                     |  |                                   |         |                          |          |                                                                           |
| D.F. (Class 2)        | Characteristics<br>X7R: 200% of initial spec. max.<br>X7S: 200% of initial spec. max.<br>X5R: 200% of initial spec. max.<br>X6S: 200% of initial spec. max. |                                                                                                                                                                                      |                                                                                                                              |  |                                   |         |                          |          |                                                                           |
| Insulation Resistance | 1,000MΩ or 50MΩ•μF min. (whichever smaller). As for the capacitor of rated voltage 16, 10, 6.3 and 4V DC, 10MΩ•μF min.                                      |                                                                                                                                                                                      |                                                                                                                              |  |                                   |         |                          |          |                                                                           |



## General Specifications

## C Series – Low ESL Flip Type

| No.                   | Item                                                                                                                                                        | Performance                                                                                                                                                                          | Test or Inspection Method                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |                                   |         |                          |          |  |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-----------------------------------|---------|--------------------------|----------|--|
| 14                    | Moisture Resistance                                                                                                                                         |                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |                                   |         |                          |          |  |
|                       | External appearance                                                                                                                                         | No mechanical damage.                                                                                                                                                                | Solder the capacitors on P.C. board (shown in Appendix 1) before testing.<br><br>Apply the rated voltage at temperature 40 ± 2°C and 90 to 95%RH for 500 +24, 0h.<br><br>Charge/discharge current shall not exceed 50mA.<br><br>Leave the capacitor in ambient conditions for 48 ± 4h before measurement.<br><br>Voltage conditioning:<br>Voltage treats the capacitor under testing temperature and voltage for 1hour.<br><br>Leave the capacitor in ambient conditions for 24 ± 2h before measurement.<br><br>Use this measurement for initial value.    |  |                                   |         |                          |          |  |
|                       | Capacitance                                                                                                                                                 | <table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 2</td><td>X7R<br/>X7S<br/>X5R<br/>X6S</td><td>± 12.5 %</td></tr></table> | Characteristics                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  | Change from the value before test | Class 2 | X7R<br>X7S<br>X5R<br>X6S | ± 12.5 % |  |
|                       | Characteristics                                                                                                                                             |                                                                                                                                                                                      | Change from the value before test                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |                                   |         |                          |          |  |
|                       | Class 2                                                                                                                                                     | X7R<br>X7S<br>X5R<br>X6S                                                                                                                                                             | ± 12.5 %                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |                                   |         |                          |          |  |
| D.F. (Class 2)        | Characteristics<br>X7R: 200% of initial spec. max.<br>X7S: 200% of initial spec. max.<br>X5R: 200% of initial spec. max.<br>X6S: 200% of initial spec. max. |                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |                                   |         |                          |          |  |
| Insulation Resistance | 500MΩ or 25MΩ•μF min. (whichever smaller). As for the capacitor of rated voltage 16, 10, 6.3 and 4V DC, 5MΩ•μF min.                                         |                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |                                   |         |                          |          |  |
| 15                    | Life                                                                                                                                                        |                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |                                   |         |                          |          |  |
|                       | External appearance                                                                                                                                         | No mechanical damage.                                                                                                                                                                | Reflow Solder the capacitor on P.C. board (shown in Appendix 1) before testing.<br><br>Apply rated voltage at maximum operating temperature ± 2°C for 1,000 +48, 0h.<br><br>Charge/discharge current shall not exceed 50mA.<br><br>Leave the capacitor in ambient conditions for 24 ± 2h before measurement.<br><br>Voltage conditioning:<br>Voltage treats the capacitor under testing temperature and voltage for 1hour.<br><br>Leave the capacitor in ambient conditions for 48 ± 4h before measurement.<br><br>Use this measurement for initial value. |  |                                   |         |                          |          |  |
|                       | Capacitance                                                                                                                                                 | <table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 2</td><td>X7R<br/>X7S<br/>X5R<br/>X6S</td><td>± 15 %</td></tr></table>   | Characteristics                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  | Change from the value before test | Class 2 | X7R<br>X7S<br>X5R<br>X6S | ± 15 %   |  |
|                       | Characteristics                                                                                                                                             |                                                                                                                                                                                      | Change from the value before test                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |                                   |         |                          |          |  |
|                       | Class 2                                                                                                                                                     | X7R<br>X7S<br>X5R<br>X6S                                                                                                                                                             | ± 15 %                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |                                   |         |                          |          |  |
| D.F. (Class 2)        | Characteristics<br>X7R: 200% of initial spec. max.<br>X7S: 200% of initial spec. max.<br>X5R: 200% of initial spec. max.<br>X6S: 200% of initial spec. max. |                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |                                   |         |                          |          |  |
| Insulation Resistance | 1,000MΩ or 50MΩ•μF min. whichever smaller. As for the capacitor of rated voltage 16, 10, 6.3 and 4V DC, 10MΩ•μF min.                                        |                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |                                   |         |                          |          |  |

\*As for the initial measurement of capacitors on number 6, 10, 11, 12 and 13, leave capacitor at 150 -10, 0°C for 1h and measure the value after leaving capacitor for  $24 \pm 2\text{h}$  in ambient condition.

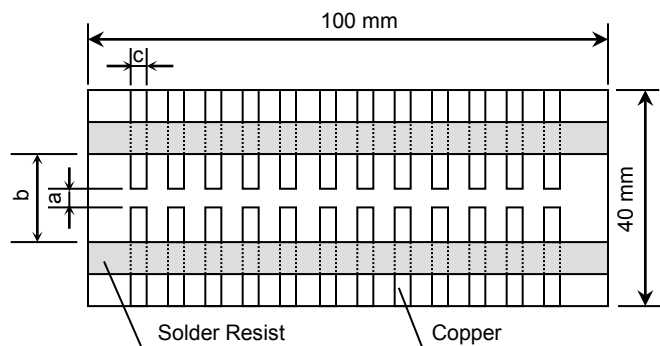


## General Specifications

## C Series – Low ESL Flip Type

### Appendix - 1

#### P.C. Board for reliability test



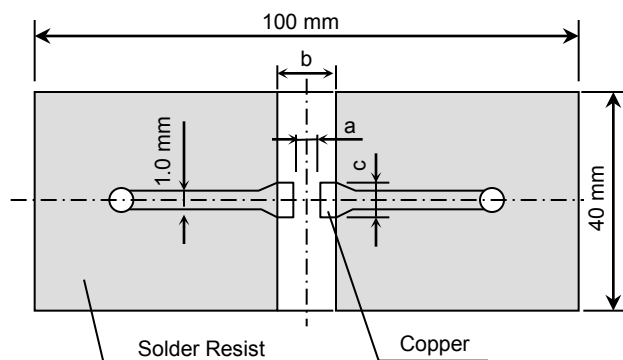
Material : Glass Epoxy ( As per JIS C6484 GE4 )

P.C. Board thickness : Appendix 1,2      1.6mm

- Copper ( thickness 0.035mm )
- Solder resist

### Appendix - 2

#### P.C. Board for bending test



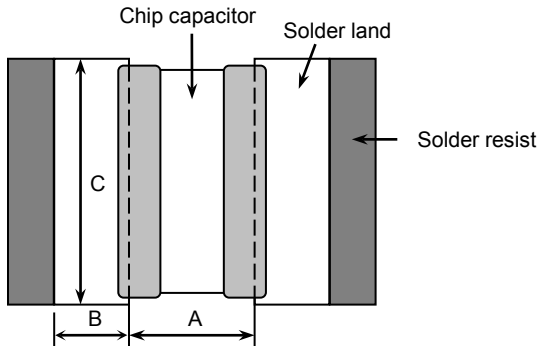
| Case Code |        | Dimensions (mm) |     |     |
|-----------|--------|-----------------|-----|-----|
| JIS       | EIA    | a               | b   | c   |
| C0510     | CC0204 | 0.2             | 0.6 | 1.0 |
| C0816     | CC0306 | 0.3             | 1.0 | 1.6 |
| C1220     | CC0508 | 0.5             | 1.6 | 2.0 |
| C1632     | CC0612 | 0.75            | 2.2 | 3.2 |



## Soldering Information

## C Series – Low ESL Flip Type

### Recommended Soldering Land Pattern

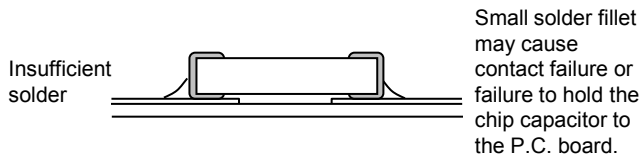
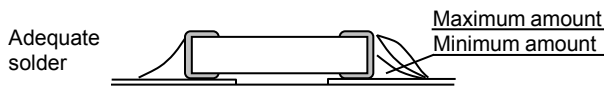
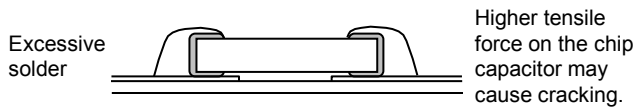


#### Reflow Soldering

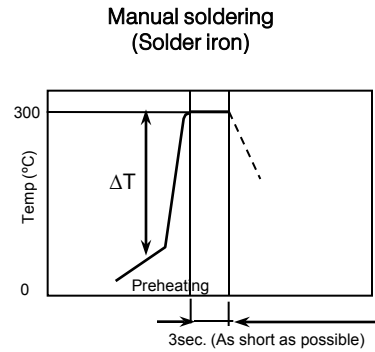
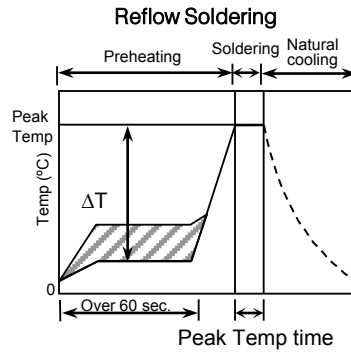
Unit: mm

| Type   | C0510<br>[CC0204] | C0816<br>[CC0306] | C1220<br>[CC0508] | C1632<br>[CC0612] |
|--------|-------------------|-------------------|-------------------|-------------------|
| Symbol |                   |                   |                   |                   |
| A      | 0.20              | 0.30              | 0.50              | 0.75              |
| B      | 0.20              | 0.35              | 0.55              | 0.725             |
| C      | 1.00              | 1.60              | 2.00              | 3.20              |

### Recommended Solder Amount



### Recommended Soldering Profile



#### Recommended soldering duration

| Solder           | Temp./Dura. | Reflow Soldering |                 |
|------------------|-------------|------------------|-----------------|
|                  |             | Peak temp (°C)   | Duration (sec.) |
| Sn-Pb Solder     |             | 230 max.         | 20 max.         |
| Lead-Free Solder |             | 260 max.         | 10 max.         |

Recommended solder compositions

Sn-37Pb (Sn-Pb solder)

Sn-3.0Ag-0.5Cu (Lead Free Solder)

#### Preheating Condition

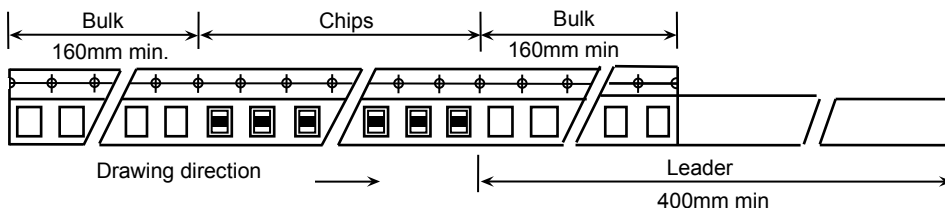
| Soldering        | Temp. (°C)          |
|------------------|---------------------|
| Reflow soldering | $\Delta T \leq 150$ |
| Manual soldering | $\Delta T \leq 150$ |



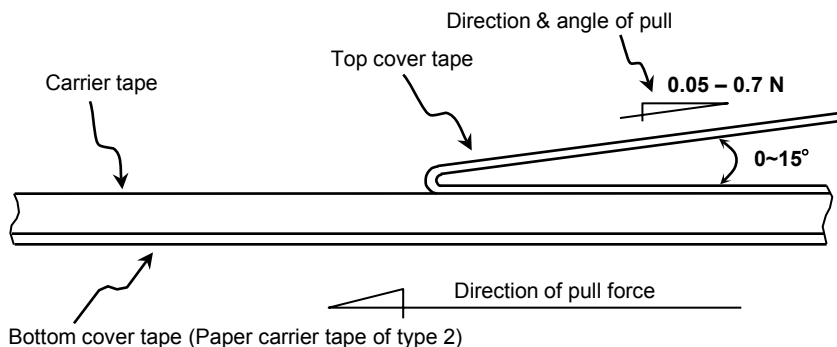
## Packaging Information

## C Series – Low ESL Flip Type

### Carrier Tape Configuration



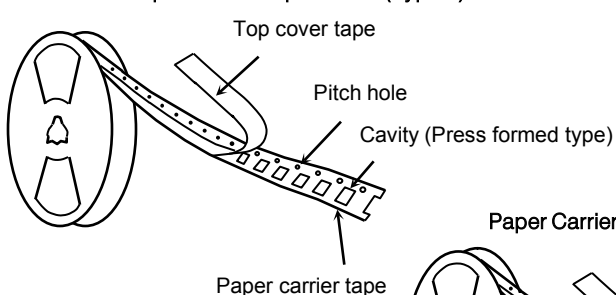
### Peel Back Force (Top Tape)



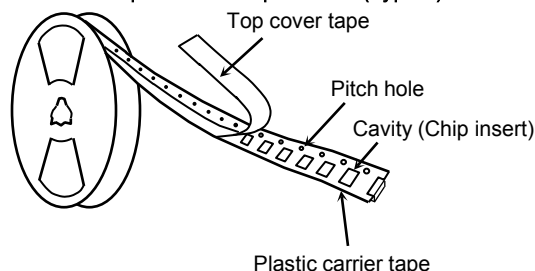
- Carrier tape shall be flexible enough to be wound around a minimum radius of 30mm with components in tape.
- The missing of components shall be less than 0.1%
- Components shall not stick to the cover tape.
- The cover tape shall not protrude beyond the edges of the carrier tape not shall cover the sprocket holes.

### Chip Quantity Per Reel and Structure of Reel (Paper & Plastic)

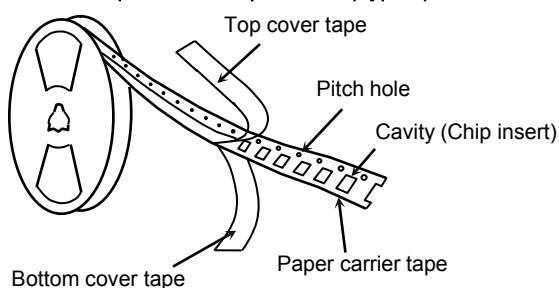
Paper Carrier Tape & Reel (Type 1)



Paper Carrier Tape & Reel (Type 2)



Paper Carrier Tape & Reel (Type 3)



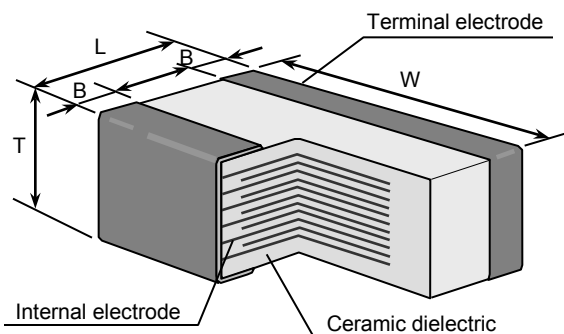
| Case Code |        | Chip Thickness | Taping Material  | Chip quantity (pcs.) |                   |
|-----------|--------|----------------|------------------|----------------------|-------------------|
| JIS       | EIA    |                |                  | φ178mm (7") reel     | φ330mm (13") reel |
| C0510     | CC0204 | 0.50 mm        | Paper (Type 1)   | 15,000               | 50,000            |
| C0816     | CC0306 | 0.80 mm        | Plastic (Type 3) | 4,000                | 10,000            |
| C1220     | CC0508 | 0.85 mm        | Paper (Type 2)   | 4,000                | 10,000            |
| C1632     | CC0612 | 0.70 mm        | Plastic (Type 3) | 4,000                | 10,000            |
|           |        | 1.15 mm        |                  | 2,000                |                   |
|           |        | 1.30 mm        |                  |                      |                   |



## Additional Information

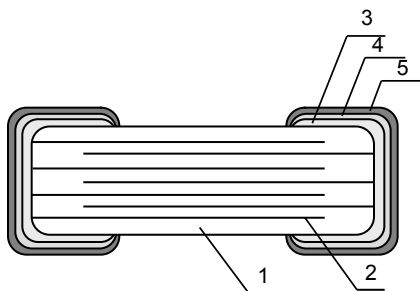
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### • Shape & Dimensions



| Case Code |        | Dimensions (mm) |      |      |           |           |
|-----------|--------|-----------------|------|------|-----------|-----------|
| JIS       | EIA    | L               | W    | T    | B         | G         |
| C0510     | CC0204 | 0.52            | 1.00 | 0.50 | 0.10 min. | 0.09 min. |
| C0816     | CC0306 | 0.80            | 1.60 | 0.80 | 0.10 min. | -         |
| C1220     | CC0508 | 1.25            | 2.00 | 0.85 | 0.20 min. | 0.40 min. |
| C1632     | CC0612 | 1.60            | 3.20 | 0.70 | 0.20 min. | 0.50 min. |
|           |        |                 |      | 1.15 |           |           |
|           |        |                 |      | 1.30 |           |           |

### • Inside Structure & Material System



| No. | NAME               | MATERIAL           |
|-----|--------------------|--------------------|
|     |                    | Class 2            |
| (1) | Ceramic Dielectric | BaTiO <sub>3</sub> |
| (2) | Internal Electrode | Nickel (Ni)        |
| (3) | Termination        | Copper (Cu)        |
| (4) |                    | Nickel (Ni)        |
| (5) |                    | Tin (Sn)           |

### • Environmental Information

TDK Corporation established internal product environmental assurance standards that include the six hazardous substances banned by the EU RoHS Directive<sup>1</sup> enforced on July 1, 2006 along with additional substances independently banned by TDK and has successfully completed making general purpose electronic components conform to the RoHS Directive<sup>2</sup>.

1. Abbreviation for Restriction on Hazardous Substances, which refers to the regulation EU Directive 2002/95/EC on hazardous substances by the European Union (EU) effective from July 1, 2006. The Directive bans the use of six specific hazardous substances in electric and electronic devices and products handled within the EU. The six substances are lead, mercury, cadmium, hexavalent chromium, PBB (polybrominated biphenyls), and PBDE (polybrominated diphenyl ethers).
2. This means that, in conformity with the EU Directive 2002/95/EC, lead, cadmium, mercury, hexavalent chromium, and specific bromine-based flame retardants, PBB and PBDE, have not been used, except for exempted applications.

For REACH (SVHC : 15 substances according to ECHA / October 2008) : All TDK MLCC do not contain these 15 substances.

For European Directive 2000/53/CE and 2005/673/CE : Cadmium, Hexavalent Chromium, Mercury, Lead are not contained in all TDK MLCC.

For European Directive 2003/11/CE : Pentabromodiphenyl-ether, Octabromodiphenyl-ether are not contained in all TDK MLCC.