

# DATA SHEET

## SURFACE-MOUNT CERAMIC MULTILAYER CAPACITORS

C-Array

NP0/X7R/Y5V

16 V TO 50 V

sizes 0508 (4 x 0402) / 0612 (4 x 0603)

RoHS compliant & Halogen Free



SCOPE

This specification describes NP0/X7R/Y5V 4-capacitor Array with lead-free terminations.

APPLICATIONS

- Professional electronics
- High density consumer electronics

FEATURES

- Supplied in tape on reel
- Nickel-barrier end termination
- 0508 (4x0402) / 0612 (4x0603) capacitors (of the same capacitance value) per array
- Less than 50% board space of an equivalent discrete component
- High volumetric efficiency
- Increased throughput, by time saved in mounting
- RoHS compliant
- Halogen Free compliant

ORDERING INFORMATION - GLOBAL PART NUMBER, PHYCOMP

CTC & I2NC

All part numbers are identified by the series, size, tolerance, TC material, packing style, voltage, process code, termination and capacitance value. Please note that 12 digits ordering code will expire at the end of 2010.

**YAGEO BRAND ordering code**

**GLOBAL PART NUMBER (PREFERRED)**

**CA** XXXX X X XXX X **B** X XXX  
 (1) (2) (3) (4) (5) (6) (7)

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**(1) SIZE – INCH BASED (METRIC)**

0508 (1220)  
 0612 (1632)

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**(2) TOLERANCE**

J = ±5%  
 K = ±10%  
 M = ±20%  
 Z = -20% to +80%

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**(3) PACKING STYLE**

R = Paper/PE taping reel; Reel 7 inch  
 P = Paper/PE taping reel; Reel 13 inch

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**(4) TC MATERIAL**

NPO  
 X5R  
 X7R  
 Y5V

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**(5) RATED VOLTAGE**

7 = 16 V  
 8 = 25 V  
 9 = 50 V  
 0 = 100V

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**(6) PROCESS**

N = NPO  
 B = class 2 material

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**(7) CAPACITANCE VALUE**

2 significant digits+number of zeros  
 The 3rd digit signifies the multiplying factor, and letter R is decimal point  
 Example: 121 = 12 × 10<sup>1</sup> = 120 pF

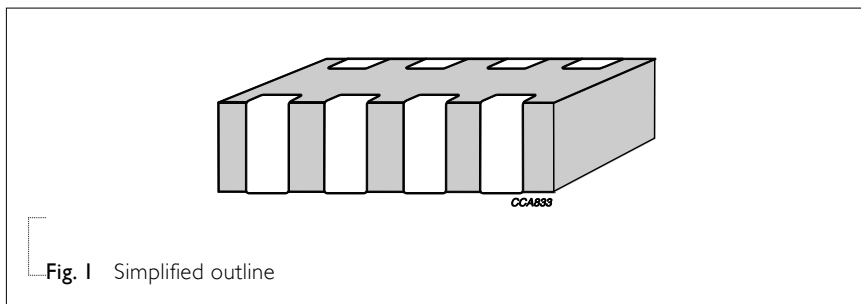
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**CONSTRUCTION**

The capacitor consists of a rectangular block of ceramic dielectric in which a number of interleaved metal electrodes are contained. This structure gives rise to a high capacitance per unit volume.

The inner electrodes are connected to the two end terminations and finally covered with a layer of plated tin (NiSn).

The terminations are lead-free. An outline of the structure is shown in Fig.1.

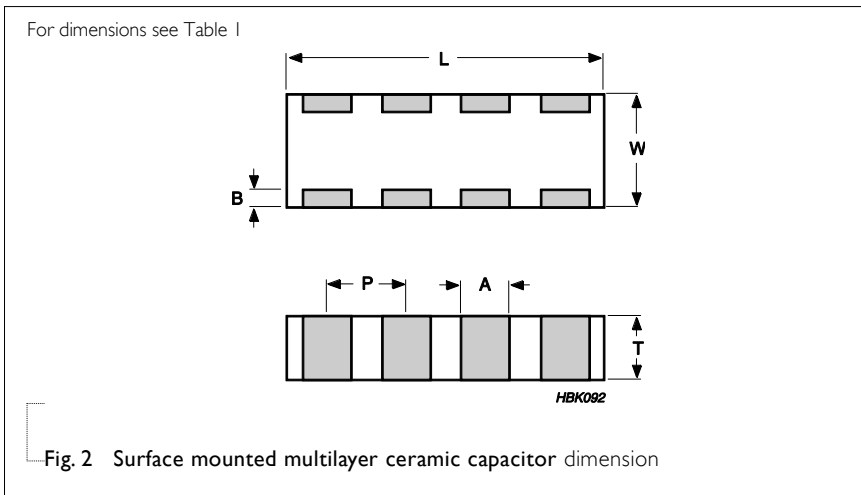


**DIMENSIONS**

Table I

| TYPE                   | 0508<br>(4 X 0402) | 0612<br>(4 X 0603) |
|------------------------|--------------------|--------------------|
| L (mm)                 | 2.0 ±0.15          | 3.2 ±0.15          |
| W (mm)                 | 1.25 ±0.15         | 1.60 ±0.15         |
| T <sub>min.</sub> (mm) | 0.50               | 0.70               |
| T <sub>max.</sub> (mm) | 0.70               | 0.90               |
| A (mm)                 | 0.28 ±0.10         | 0.4 ±0.10          |
| B (mm)                 | 0.2 ±0.10          | 0.3 ±0.20          |
| P (mm)                 | 0.5 ±0.10          | 0.8 ±0.10          |

**OUTLINES**



**CAPACITANCE RANGE & THICKNESS FOR 4C-ARRAY**
**Table 2** Temperature characteristic material from NP0

| CAPACITANCE | 0508 (4 x 0402) |         | 0612 (4 x 0603) |         |
|-------------|-----------------|---------|-----------------|---------|
|             | 50 V            | 100V    | 50 V            | 100V    |
| 10 pF       | 0.6±0.1         | 0.6±0.1 | 0.8±0.1         | 0.8±0.1 |
| 15 pF       | 0.6±0.1         | 0.6±0.1 | 0.8±0.1         | 0.8±0.1 |
| 18 pF       | 0.6±0.1         | 0.6±0.1 | 0.8±0.1         | 0.8±0.1 |
| 22 pF       | 0.6±0.1         | 0.6±0.1 | 0.8±0.1         | 0.8±0.1 |
| 33 pF       | 0.6±0.1         | 0.6±0.1 | 0.8±0.1         | 0.8±0.1 |
| 39 pF       | 0.6±0.1         | 0.6±0.1 | 0.8±0.1         | 0.8±0.1 |
| 47 pF       | 0.6±0.1         | 0.6±0.1 | 0.8±0.1         | 0.8±0.1 |
| 56 pF       | 0.6±0.1         | 0.6±0.1 | 0.8±0.1         | 0.8±0.1 |
| 68 pF       | 0.6±0.1         | 0.6±0.1 | 0.8±0.1         | 0.8±0.1 |
| 82 pF       | 0.6±0.1         | 0.6±0.1 | 0.8±0.1         | 0.8±0.1 |
| 100 pF      | 0.6±0.1         | 0.6±0.1 | 0.8±0.1         | 0.8±0.1 |
| 120 pF      | 0.6±0.1         |         | 0.8±0.1         | 0.8±0.1 |
| 150 pF      | 0.6±0.1         |         | 0.8±0.1         | 0.8±0.1 |
| 180 pF      | 0.6±0.1         |         | 0.8±0.1         | 0.8±0.1 |
| 220 pF      | 0.6±0.1         |         | 0.8±0.1         | 0.8±0.1 |
| 270 pF      |                 |         | 0.8±0.1         | 0.8±0.1 |
| 330 pF      |                 |         | 0.8±0.1         | 0.8±0.1 |
| 390 pF      |                 |         | 0.8±0.1         | 0.8±0.1 |
| 470 pF      |                 |         | 0.8±0.1         | 0.8±0.1 |
| 560 pF      |                 |         |                 |         |
| 680 pF      |                 |         |                 |         |
| 820 pF      |                 |         |                 |         |
| 1.0 nF      |                 |         |                 |         |

**NOTE**

Values in shaded cells indicate thickness class in mm

**CAPACITANCE RANGE & THICKNESS FOR 4C-ARRAY**
**Table 3** Temperature characteristic material from X7R

| CAPACITANCE | 0508 (4 x 0402) |         |         | 0612 (4 x 0603) |         |         |          |
|-------------|-----------------|---------|---------|-----------------|---------|---------|----------|
|             | 16 V            | 25 V    | 50 V    | 16 V            | 25 V    | 50 V    | 100V     |
| 1.0 nF      | 0.6±0.1         | 0.6±0.1 | 0.6±0.1 | 0.8±0.1         | 0.8±0.1 | 0.8±0.1 |          |
| 1.2 nF      | 0.6±0.1         | 0.6±0.1 |         | 0.8±0.1         | 0.8±0.1 | 0.8±0.1 |          |
| 1.5 nF      | 0.6±0.1         | 0.6±0.1 |         | 0.8±0.1         | 0.8±0.1 | 0.8±0.1 |          |
| 1.8 nF      | 0.6±0.1         | 0.6±0.1 |         | 0.8±0.1         | 0.8±0.1 | 0.8±0.1 |          |
| 2.2 nF      | 0.6±0.1         | 0.6±0.1 |         | 0.8±0.1         | 0.8±0.1 | 0.8±0.1 |          |
| 2.7 nF      | 0.6±0.1         | 0.6±0.1 |         | 0.8±0.1         | 0.8±0.1 | 0.8±0.1 |          |
| 3.3 nF      | 0.6±0.1         | 0.6±0.1 |         | 0.8±0.1         | 0.8±0.1 | 0.8±0.1 |          |
| 3.9 nF      | 0.6±0.1         | 0.6±0.1 |         | 0.8±0.1         | 0.8±0.1 | 0.8±0.1 |          |
| 4.7 nF      | 0.6±0.1         | 0.6±0.1 |         | 0.8±0.1         | 0.8±0.1 | 0.8±0.1 |          |
| 5.6 nF      | 0.6±0.1         | 0.6±0.1 |         | 0.8±0.1         | 0.8±0.1 | 0.8±0.1 |          |
| 6.8 nF      | 0.6±0.1         | 0.6±0.1 |         | 0.8±0.1         | 0.8±0.1 | 0.8±0.1 |          |
| 8.2 nF      | 0.6±0.1         | 0.6±0.1 |         | 0.8±0.1         | 0.8±0.1 | 0.8±0.1 |          |
| 10 nF       | 0.6±0.1         | 0.6±0.1 |         | 0.8±0.1         | 0.8±0.1 | 0.8±0.1 | 0.85±0.1 |
| 12 nF       | 0.6±0.1         |         |         | 0.8±0.1         | 0.8±0.1 | 0.8±0.1 | 0.85±0.1 |
| 15 nF       | 0.6±0.1         |         |         | 0.8±0.1         | 0.8±0.1 | 0.8±0.1 | 0.85±0.1 |
| 18 nF       | 0.6±0.1         |         |         | 0.8±0.1         | 0.8±0.1 | 0.8±0.1 | 0.85±0.1 |
| 22 nF       | 0.6±0.1         |         |         | 0.8±0.1         | 0.8±0.1 | 0.8±0.1 | 0.85±0.1 |
| 27 nF       | 0.6±0.1         |         |         | 0.8±0.1         | 0.8±0.1 | 0.8±0.1 |          |
| 33 nF       | 0.6±0.1         |         |         | 0.8±0.1         | 0.8±0.1 | 0.8±0.1 |          |
| 47 nF       | 0.6±0.1         |         |         | 0.8±0.1         | 0.8±0.1 | 0.8±0.1 |          |
| 56 nF       | 0.6±0.1         |         |         | 0.8±0.1         | 0.8±0.1 | 0.8±0.1 |          |
| 68 nF       | 0.6±0.1         |         |         | 0.8±0.1         | 0.8±0.1 | 0.8±0.1 |          |
| 82 nF       | 0.6±0.1         |         |         | 0.8±0.1         | 0.8±0.1 | 0.8±0.1 |          |
| 100 nF      | 0.6±0.1         |         |         | 0.8±0.1         | 0.8±0.1 | 0.8±0.1 |          |
| 220 nF      |                 |         |         | 0.8±0.1         |         |         |          |
| 470 nF      |                 |         |         | 0.8±0.1         |         |         |          |

**NOTE**

Values in shaded cells indicate thickness class in mm

CAPACITANCE RANGE & THICKNESS FOR 4C-ARRAY

Table 4 Temperature characteristic material from Y5V

|                    |         |                        |
|--------------------|---------|------------------------|
| <b>CAPACITANCE</b> |         | <b>0612 (4 x 0603)</b> |
|                    |         | <b>25 V</b>            |
| 10 nF              | 0.6±0.1 |                        |
| 22 nF              |         |                        |
| 47 nF              |         |                        |
| 100 nF             |         |                        |

**NOTE**

Values in shaded cells indicate thickness class in mm

THICKNESS CLASSES AND PACKING QUANTITY

Table 5

| SIZE CODE   | THICKNESS CLASSIFICATION | TAPE WIDTH | QUANTITY PER REEL | Ø180 MM / 7 INCH Paper | Ø180 MM / 13 INCH Paper |
|-------------|--------------------------|------------|-------------------|------------------------|-------------------------|
| <b>0508</b> | 0.6 ±0.1 mm              | 8 mm       | 8 mm              | 4,000                  | 20,000                  |
| <b>0612</b> | 0.8 ±0.1 mm              | 8 mm       | 8 mm              | 4,000                  | 15,000                  |

**ELECTRICAL CHARACTERISTICS**
**4C-ARRAY DIELECTRIC CAPACITORS; NISN TERMINATIONS**

Unless otherwise stated all electrical values apply at an ambient temperature of  $20 \pm 1$  °C, an atmospheric pressure of 86 to 106 kPa, and a relative humidity of 63 to 67%.

Table 6

| DESCRIPTION                                                                                          | VALUE                                                                                                                    |
|------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| Capacitance range                                                                                    | 10 pF to 100 nF                                                                                                          |
| Rated voltage                                                                                        | NP0 50 V                                                                                                                 |
|                                                                                                      | X7R 16 V to 50 V                                                                                                         |
|                                                                                                      | Y5V 0612: 25 V                                                                                                           |
| Capacitance tolerance                                                                                | NP0 $\pm 5\%$ , $\pm 10\%$                                                                                               |
|                                                                                                      | X7R $\pm 10\%$ , $\pm 20\%$                                                                                              |
|                                                                                                      | Y5V $-20\%$ to $+80\%$                                                                                                   |
| Dissipation factor (D.F.)                                                                            | NP0 $\leq 0.1\%$                                                                                                         |
|                                                                                                      | X7R $16\text{ V} \leq 3.5\%$ , $25\text{ V} \leq 2.5\%$ , $50\text{ V} \leq 2.5\%$<br>0508/12nF~100nF/16V, Df $\leq 5\%$ |
|                                                                                                      | Y5V 0508 $\leq 9\%$ , 0612 $\leq 7\%$                                                                                    |
| Insulation resistance after 1 minute at $U_r$ (DC)                                                   | $R_{ins} \geq 10\text{ G}\Omega$ or $R_{ins} \times C_r \geq 500$ seconds whichever is less                              |
| Maximum capacitance change as a function of temperature<br>(temperature characteristic/coefficient): | NP0 $\pm 30\text{ ppm}/^\circ\text{C}$                                                                                   |
|                                                                                                      | X7R $\pm 15\%$                                                                                                           |
|                                                                                                      | Y5V $+22\%$ to $-82\%$                                                                                                   |
| Operating temperature range:                                                                         | NP0 $-55$ °C to $+125$ °C                                                                                                |
|                                                                                                      | X7R $-55$ °C to $+125$ °C                                                                                                |
|                                                                                                      | Y5V $-30$ °C to $+85$ °C                                                                                                 |

**NP0 0508/0612 50 V**

Sample limits (broken lines)  
Requirement levels (dotted lines)

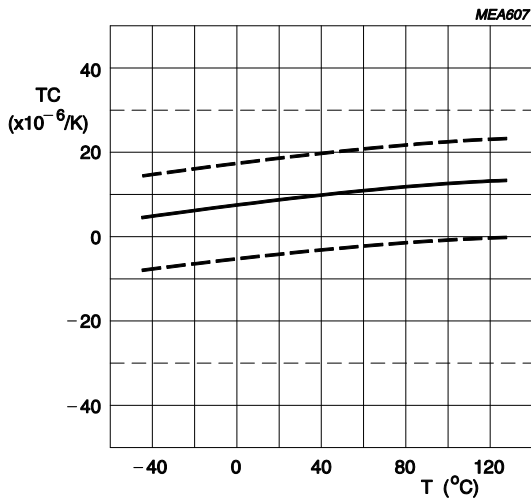


Fig. 3 Typical temperature coefficient as a function of temperature

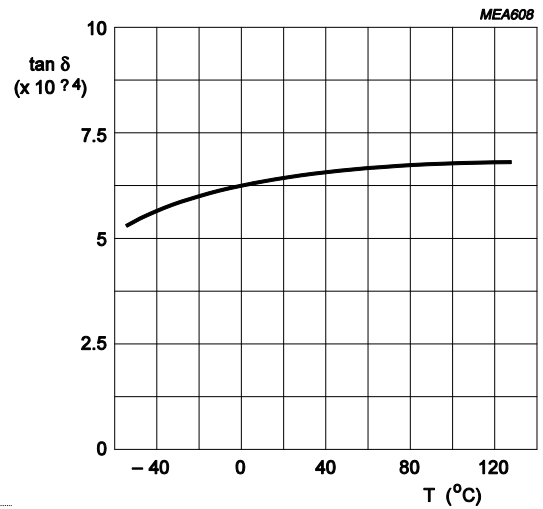


Fig. 4 Typical tan δ as a function of temperature

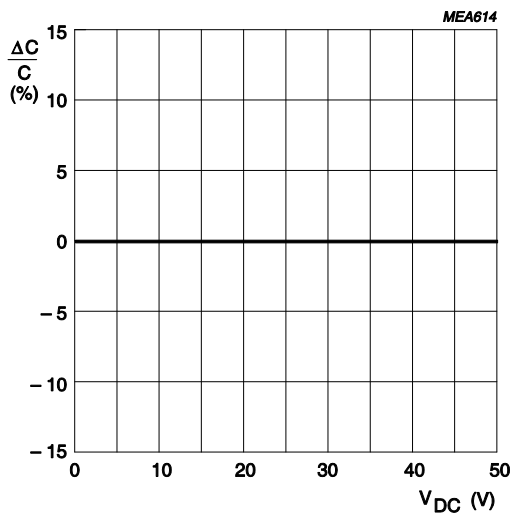
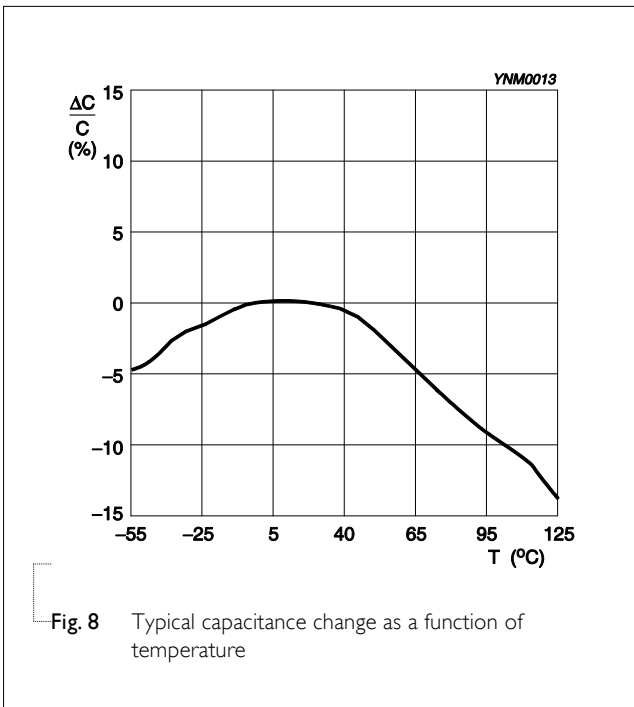
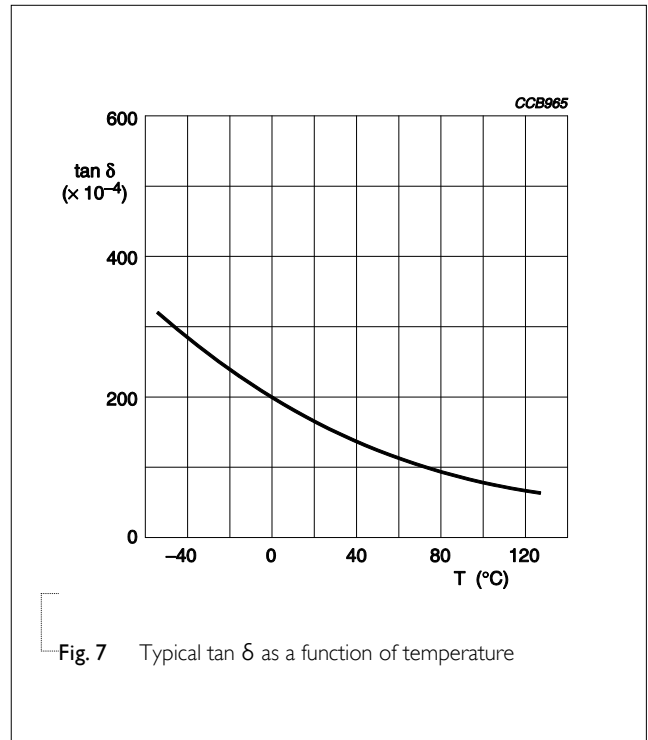
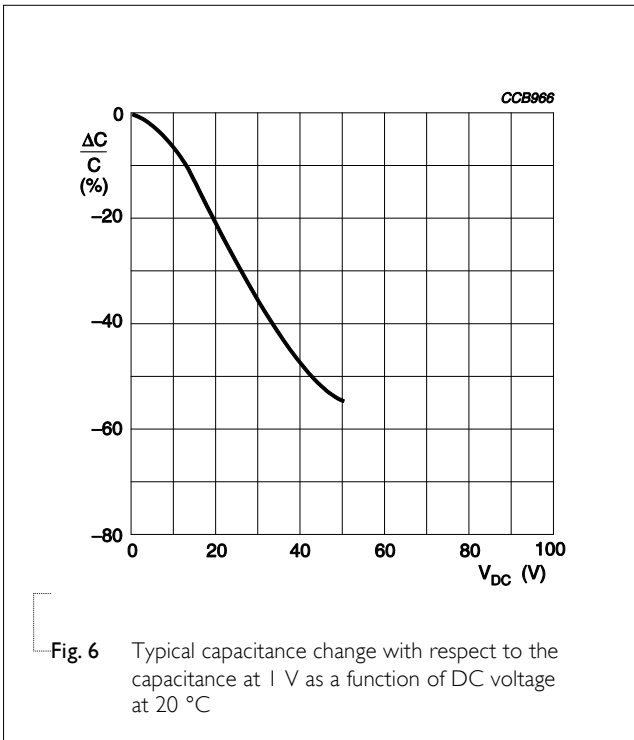
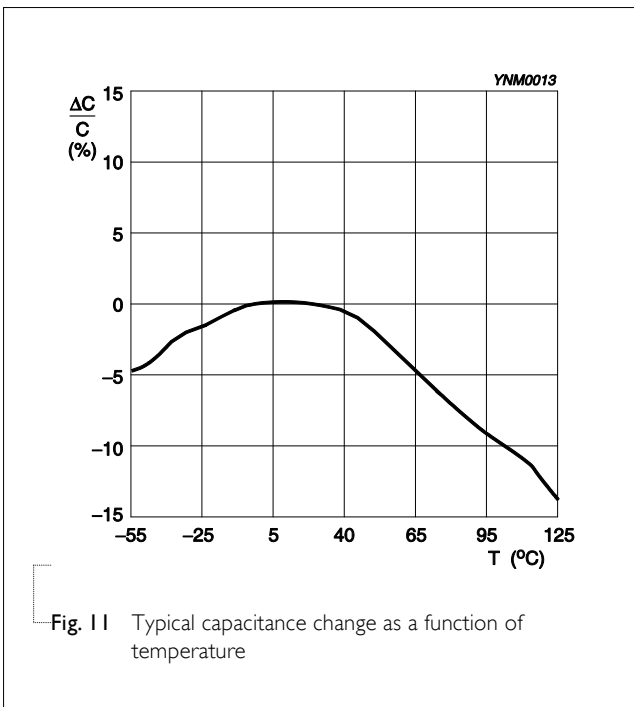
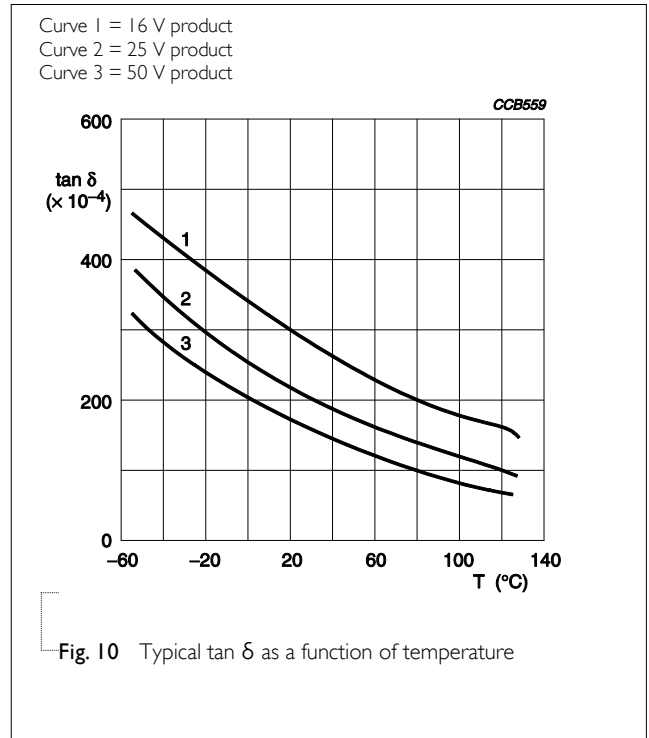
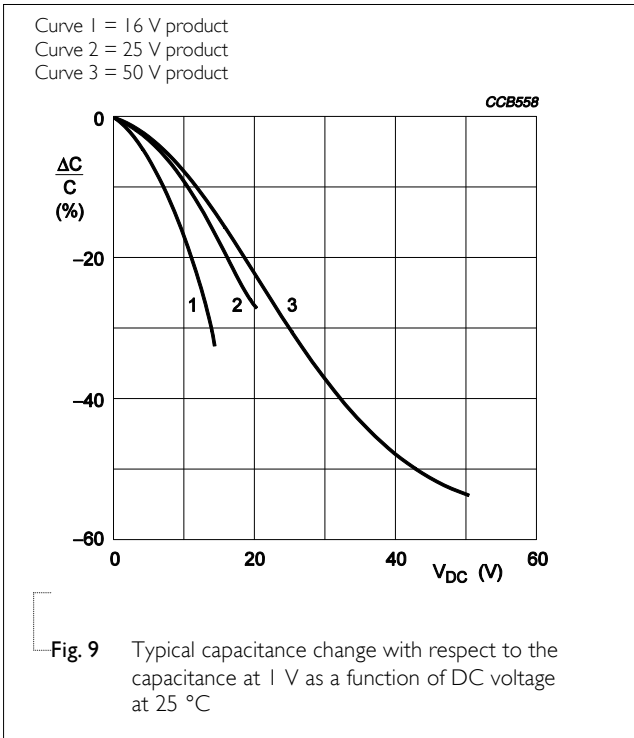


Fig. 5 Typical capacitance change with respect to the capacitance at 1 V as a function of DC voltage

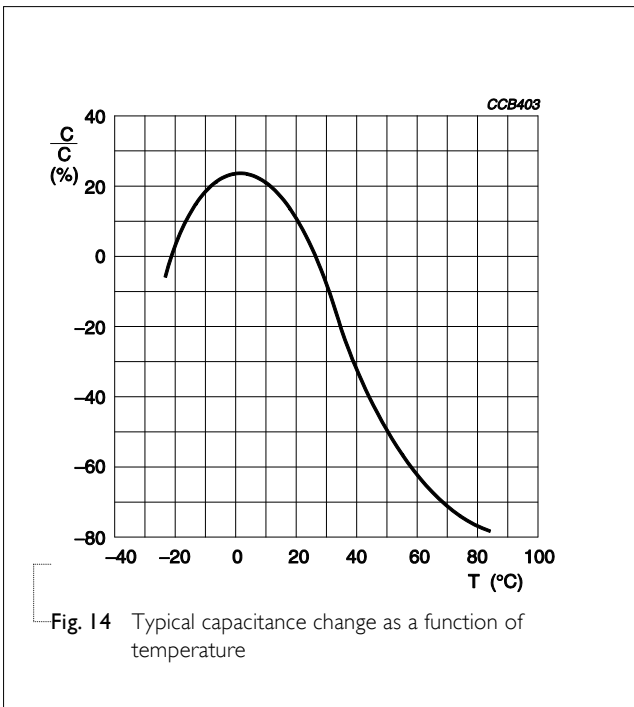
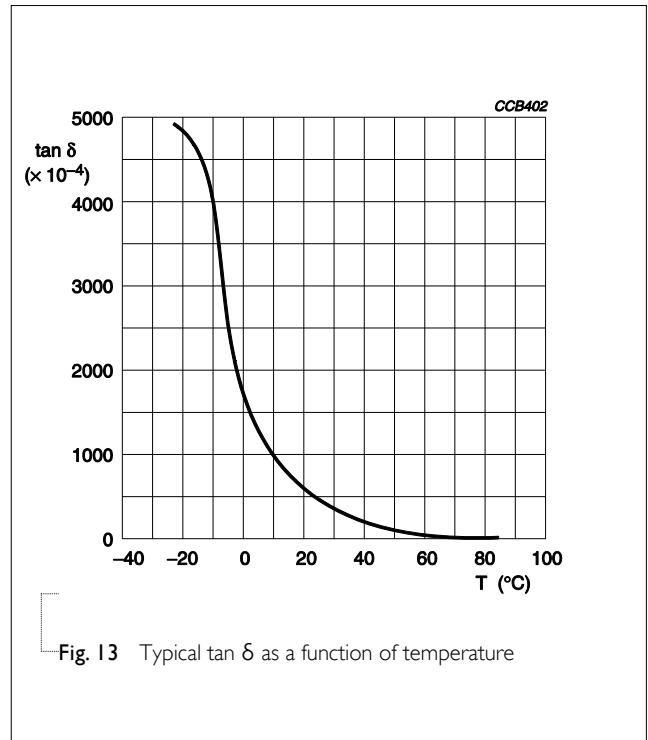
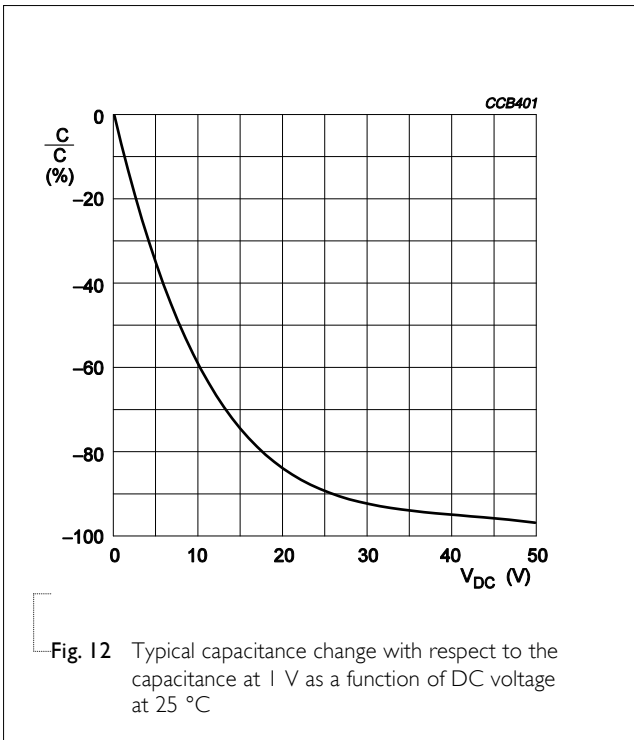
**X7R 0508 16 V**



**X7R 0612 16 V to 50 V**



**Y5V 0612 25 V**



**TESTS AND REQUIREMENTS**
**Table 7** Test procedures and requirements

| TEST                                  | TEST METHOD     | PROCEDURE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | REQUIREMENTS                     |
|---------------------------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| Mounting                              | IEC 60384-21/22 | 4.3 The capacitors may be mounted on printed-circuit boards or ceramic substrates                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | No visible damage                |
| Visual Inspection and Dimension Check |                 | 4.4 Any applicable method using $\times 10$ magnification                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | In accordance with specification |
| Capacitance                           |                 | 4.5.1 Class 1:<br>$f = 1 \text{ MHz}$ for $C \leq 1 \text{ nF}$ , measuring at voltage $1 V_{\text{rms}}$ at $20 \text{ }^\circ\text{C}$<br>$f = 1 \text{ KHz}$ for $C > 1 \text{ nF}$ , measuring at voltage $1 V_{\text{rms}}$ at $20 \text{ }^\circ\text{C}$<br>Class 2:<br>$f = 1 \text{ KHz}$ for $C \leq 10 \text{ } \mu\text{F}$ , measuring at voltage $1 V_{\text{rms}}$ at $20 \text{ }^\circ\text{C}$<br>$f = 120 \text{ Hz}$ for $C > 10 \text{ } \mu\text{F}$ , measuring at voltage $0.5 V_{\text{rms}}$ at $20 \text{ }^\circ\text{C}$ | Within specified tolerance       |
| Dissipation Factor (D.F.)             |                 | 4.5.2 Class 1:<br>$f = 1 \text{ MHz}$ for $C \leq 1 \text{ nF}$ , measuring at voltage $1 V_{\text{rms}}$ at $20 \text{ }^\circ\text{C}$<br>$f = 1 \text{ KHz}$ for $C > 1 \text{ nF}$ , measuring at voltage $1 V_{\text{rms}}$ at $20 \text{ }^\circ\text{C}$<br>Class 2:<br>$f = 1 \text{ KHz}$ for $C \leq 10 \text{ } \mu\text{F}$ , measuring at voltage $1 V_{\text{rms}}$ at $20 \text{ }^\circ\text{C}$<br>$f = 120 \text{ Hz}$ for $C > 10 \text{ } \mu\text{F}$ , measuring at voltage $0.5 V_{\text{rms}}$ at $20 \text{ }^\circ\text{C}$ | In accordance with specification |
| Insulation Resistance                 |                 | 4.5.3 At $U_r$ (DC) for 1 minute                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | In accordance with specification |

| TEST                    | TEST METHOD           | PROCEDURE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | REQUIREMENTS                                                                                                       |      |                 |   |      |   |                       |   |      |   |
|-------------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|------|-----------------|---|------|---|-----------------------|---|------|---|
| Temperature Coefficient | 4.6                   | Capacitance shall be measured by the steps shown in the following table.<br><br>The capacitance change should be measured after 5 min at each specified temperature stage.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Class I: $\Delta C/C: \pm 30\text{ppm}$<br>Class 2: X7R: $\Delta C/C: \pm 15\%$<br>Y5V: $\Delta C/C: 22\sim -82\%$ |      |                 |   |      |   |                       |   |      |   |
|                         |                       | <table border="1"> <thead> <tr> <th>Step</th> <th>Temperature(°C)</th> </tr> </thead> <tbody> <tr> <td>a</td> <td>25±2</td> </tr> <tr> <td>b</td> <td>Lower temperature±3°C</td> </tr> <tr> <td>c</td> <td>25±2</td> </tr> <tr> <td>d</td> <td>Upper Temperature±2°C</td> </tr> <tr> <td>e</td> <td>25±2</td> </tr> </tbody> </table> <p>(1) Class I<br/>Temperature Coefficient shall be calculated from the formula as below</p> $\text{Temp, Coefficient} = \frac{C2 - C1}{C1 \times \Delta T} \times 10^6 \text{ [ppm/°C]}$ <p>C1: Capacitance at step c<br/>C2: Capacitance at 125°C<br/><math>\Delta T: 100\text{°C}(=125\text{°C}-25\text{°C})</math></p> <p>(2) Class II<br/>Capacitance Change shall be calculated from the formula as below</p> $\Delta C = \frac{C2 - C1}{C1} \times 100\%$ <p>C1: Capacitance at step c<br/>C2: Capacitance at step b or d</p> |                                                                                                                    | Step | Temperature(°C) | a | 25±2 | b | Lower temperature±3°C | c | 25±2 | d |
| Step                    | Temperature(°C)       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                    |      |                 |   |      |   |                       |   |      |   |
| a                       | 25±2                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                    |      |                 |   |      |   |                       |   |      |   |
| b                       | Lower temperature±3°C |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                    |      |                 |   |      |   |                       |   |      |   |
| c                       | 25±2                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                    |      |                 |   |      |   |                       |   |      |   |
| d                       | Upper Temperature±2°C |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                    |      |                 |   |      |   |                       |   |      |   |
| e                       | 25±2                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                    |      |                 |   |      |   |                       |   |      |   |
| Adhesion                | 4.7                   | A force applied for 10 seconds to the line joining the terminations and in a plane parallel to the substrate                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Force<br>size ≥ 0603: 5N<br>size = 0402: 2.5N<br>size = 0201: 1N                                                   |      |                 |   |      |   |                       |   |      |   |

| TEST                                 | TEST METHOD         | PROCEDURE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | REQUIREMENTS                                                                                                                                                                                                                                                                                                                         |
|--------------------------------------|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bond Strength of Plating on End Face | IEC 60384-21/22 4.8 | Mounting in accordance with IEC 60384-22 paragraph 4.3<br><br>Conditions: bending 1 mm at a rate of 1 mm/s, radius jig 5 mm                                                                                                                                                                                                                                                                                                                                                                                                          | No visible damage<br><br>$\Delta$ C/C Class 1:<br>NP0: within $\pm 1\%$ or 0.5 pF, whichever is greater<br>Class2:<br>X5R/X7R/Y5V: $\pm 10\%$                                                                                                                                                                                        |
| Resistance to Soldering Heat         | 4.9                 | Precondition: 150 $\pm 0/-10$ °C for 1 hour, then keep for 24 $\pm 1$ hours at room temperature<br>Preheating: for size $\leq$ 1206: 120 °C to 150 °C for 1 minute<br>Preheating: for size $>$ 1206: 100 °C to 120 °C for 1 minute and 170 °C to 200 °C for 1 minute<br>Solder bath temperature: 260 $\pm 5$ °C<br>Dipping time: 10 $\pm 0.5$ seconds<br>Recovery time: 24 $\pm 2$ hours                                                                                                                                             | Dissolution of the end face plating shall not exceed 25% of the length of the edge concerned<br><br>$\Delta$ C/C Class 1:<br>NP0: within $\pm 0.5\%$ or 0.5 pF, whichever is greater<br>Class2:<br>X5R/X7R: $\pm 10\%$ Y5V: $\pm 20\%$<br><br>D.F. within initial specified value<br>R <sub>ins</sub> within initial specified value |
| Solderability                        | 4.10                | Preheated the temperature of 80 °C to 140 °C and maintained for 30 seconds to 60 seconds.<br><br>Test conditions for lead containing solder alloy<br>Temperature: 235 $\pm 5$ °C<br>Dipping time: 2 $\pm 0.2$ seconds<br>Depth of immersion: 10 mm<br>Alloy Composition: 60/40 Sn/Pb<br>Number of immersions: 1<br><br>Test conditions for leadfree containing solder alloy<br>Temperature: 245 $\pm 5$ °C<br>Dipping time: 3 $\pm 0.3$ seconds<br>Depth of immersion: 10 mm<br>Alloy Composition: SAC305<br>Number of immersions: 1 | The solder should cover over 95% of the critical area of each termination                                                                                                                                                                                                                                                            |



| TEST      | TEST METHOD          | PROCEDURE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | REQUIREMENTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Endurance | IEC 60384-21/22 4.14 | 1. Preconditioning, class 2 only:<br>150 +0/-10 °C /1 hour, then keep for<br>24 ±1 hour at room temp<br><br>2. Initial measure:<br>Spec: refer initial spec C, D, IR<br><br>3. Endurance test:<br>Temperature: NP0/X7R: 125 °C<br>X5R/Y5V: 85 °C<br><br>Specified stress voltage applied for 1,000 hours:<br>Applied 2.0 × U <sub>r</sub> for general product.<br><br>4. Recovery time: 24 ±2 hours<br><br>5. Final measure: C, D, IR<br><br>P.S. If the capacitance value is less than the<br>minimum value permitted, then after the other<br>measurements have been made the capacitor shall<br>be precondition according to "IEC 60384 4.1" and<br>then the requirement shall be met. | No visual damage<br><br><hr/> <b>&lt;General purpose series&gt;</b><br>ΔC/C<br>Class I:<br>NP0: within ±2% or 1 pF, whichever is greater<br>Class2:<br>X5R/X7R: ±15%; Y5V: ±30%<br>D.F.<br>Class I:<br>NP0: ≤ 2 × specified value<br>Class2:<br>X5R/X7R: ≤ 16V: ≤ 7%<br>≥ 25V: ≤ 5%<br>Y5V: ≤ 15%<br>R <sub>ins</sub><br>Class I:<br>NP0: ≥ 4,000 MΩ or<br>R <sub>ins</sub> × C <sub>r</sub> ≥ 40s whichever is less<br>Class2:<br>X5R/X7R/Y5V: ≥ 1,000 MΩ or<br>R <sub>ins</sub> × C <sub>r</sub> ≥ 50s whichever is less |
|           |                      | Specified stress voltage applied for 1 minute<br>U <sub>r</sub> ≤ 100 V: series applied 2.5 U <sub>r</sub><br>100 V < U <sub>r</sub> ≤ 200 V series applied (1.5 U <sub>r</sub> + 100)<br>200 V < U <sub>r</sub> ≤ 500 V series applied (1.3 U <sub>r</sub> + 100)<br>U <sub>r</sub> > 500 V: 1.3 U <sub>r</sub><br>I: 7.5 mA                                                                                                                                                                                                                                                                                                                                                             | No breakdown or flashover                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

REVISION HISTORY

| REVISION  | DATE          | CHANGE NOTIFICATION | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------|---------------|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Version 4 | Nov. 10, 2015 | -                   | - Product range updated                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Version 3 | May 21, 2014  | -                   | - Product range updated                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Version 2 | Jun. 17, 2013 | -                   | - Product range updated                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Version 1 | Feb 05, 2010  | -                   | - The statement of "Halogen Free" on the cover added                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Version 0 | Jun 22, 2009  | -                   | <ul style="list-style-type: none"> <li>- New datasheet for 4C-Array series with RoHS compliant</li> <li>- Replace from pdf files: 0508_16V to 50V_1, 0612_16V to 50V_0, C-Array_NP0_50V_0508_7, C-Array_NP0_50V_0612_7, C-Array_X7R_16V_25V_50V_0612_6, C-Array_X7R_16V_0508_5, C-Array_Y5V_25V_0508_0, C-Array_Y5V_25V_0612_5</li> <li>- Define global part number</li> <li>- Description of "Halogen Free compliant" added</li> <li>- Test method and procedure updated</li> </ul> |

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