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
Surface-Mount Ceramic Multilayer Capacitors

**Product specification**

**4C-Array**

NP0/X7R/Y5V

**16 V to 50 V**

**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 throughout, by time saved in mounting
- RoHS compliant
- Halogen Free compliant

**ORDERING INFORMATION - GLOBAL PART NUMBER, PHYCOMP CTC & 12NC**

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)**

<table>
<thead>
<tr>
<th>CA</th>
<th>xxxx</th>
<th>x</th>
<th>xxx</th>
<th>B</th>
<th>xx</th>
<th>xxx</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
<td>(7)</td>
</tr>
</tbody>
</table>

(1) SIZE – INCH BASED (METRIC)

| 0508 (1220) |
| 0612 (1632) |

(2) TOLERANCE

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

(3) PACKING STYLE

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

(4) TC MATERIAL

- NP0
- X5R
- X7R
- Y5V

(5) RATED VOLTAGE

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

(6) PROCESS

- N = NP0
- B = class 2 material

(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 x 10^1 = 120 pF
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>
<thead>
<tr>
<th>Table 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYPE</td>
</tr>
<tr>
<td>L (mm)</td>
</tr>
<tr>
<td>W (mm)</td>
</tr>
<tr>
<td>Tmin. (mm)</td>
</tr>
<tr>
<td>Tmax. (mm)</td>
</tr>
<tr>
<td>A (mm)</td>
</tr>
<tr>
<td>B (mm)</td>
</tr>
<tr>
<td>P (mm)</td>
</tr>
</tbody>
</table>

OUTLINES

For dimensions see Table 1

---

**Fig. 1** Simplified outline

**Fig. 2** Surface mounted multilayer ceramic capacitor dimension
<table>
<thead>
<tr>
<th>CAPACITANCE</th>
<th>0508 (4 x 0402)</th>
<th>0612 (4 x 0603)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>50 V</td>
<td>100V</td>
</tr>
<tr>
<td>10 pF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>15 pF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>18 pF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>22 pF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>33 pF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>39 pF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>47 pF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>56 pF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>68 pF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>82 pF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>100 pF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>120 pF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>150 pF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>180 pF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>220 pF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>270 pF</td>
<td>0.8±0.1</td>
<td>0.8±0.1</td>
</tr>
<tr>
<td>330 pF</td>
<td>0.8±0.1</td>
<td>0.8±0.1</td>
</tr>
<tr>
<td>390 pF</td>
<td>0.8±0.1</td>
<td>0.8±0.1</td>
</tr>
<tr>
<td>470 pF</td>
<td>0.8±0.1</td>
<td>0.8±0.1</td>
</tr>
<tr>
<td>560 pF</td>
<td>0.8±0.1</td>
<td>0.8±0.1</td>
</tr>
<tr>
<td>680 pF</td>
<td>0.8±0.1</td>
<td>0.8±0.1</td>
</tr>
<tr>
<td>820 pF</td>
<td>0.8±0.1</td>
<td>0.8±0.1</td>
</tr>
<tr>
<td>1.0 nF</td>
<td>0.8±0.1</td>
<td>0.8±0.1</td>
</tr>
</tbody>
</table>

**NOTE**

Values in shaded cells indicate thickness class in mm
**CAPACITANCE RANGE & THICKNESS FOR 4C-ARRAY**

<table>
<thead>
<tr>
<th>CAPACITANCE</th>
<th>0508 (4 x 0402)</th>
<th>0612 (4 x 0603)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>16 V</td>
<td>25 V</td>
</tr>
<tr>
<td>220 pF</td>
<td>0.8±0.1</td>
<td>0.8±0.1</td>
</tr>
<tr>
<td>330 pF</td>
<td>0.8±0.1</td>
<td>0.8±0.1</td>
</tr>
<tr>
<td>470 pF</td>
<td>0.8±0.1</td>
<td>0.8±0.1</td>
</tr>
<tr>
<td>680 pF</td>
<td>0.8±0.1</td>
<td>0.8±0.1</td>
</tr>
<tr>
<td>1.0 nF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>1.2 nF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>1.5 nF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>1.8 nF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>2.2 nF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>2.7 nF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>3.3 nF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>3.9 nF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>4.7 nF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>5.6 nF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>6.8 nF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>8.2 nF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>10 nF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>12 nF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>15 nF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>18 nF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>22 nF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>27 nF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>33 nF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>47 nF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>56 nF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>68 nF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>82 nF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>100 nF</td>
<td>0.6±0.1</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>220 nF</td>
<td>0.8±0.1</td>
<td>0.8±0.1</td>
</tr>
<tr>
<td>470 nF</td>
<td>0.8±0.1</td>
<td>0.8±0.1</td>
</tr>
</tbody>
</table>

**NOTE**

Values in shaded cells indicate thickness class in mm
CAPACITANCE RANGE & THICKNESS FOR 4C-ARRAY

| Table 4 | Temperature characteristic material from Y5V |

CAPACITANCE

<table>
<thead>
<tr>
<th>CAPACITANCE</th>
<th>0612 (4 x 0603)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 nF</td>
<td>25 V</td>
</tr>
<tr>
<td>22 nF</td>
<td></td>
</tr>
<tr>
<td>47 nF</td>
<td>0.6 ± 0.1</td>
</tr>
<tr>
<td>100 nF</td>
<td></td>
</tr>
</tbody>
</table>

NOTE
Values in shaded cells indicate thickness class in mm

THICKNESS CLASSES AND PACKING QUANTITY

| Table 5 |

<table>
<thead>
<tr>
<th>SIZE CODE</th>
<th>THICKNESS CLASSIFICATION</th>
<th>TAPE WIDTH QUANTITY PER REEL</th>
<th>Ø180 MM / 7 INCH Paper</th>
<th>Ø180 MM / 13 INCH Paper</th>
</tr>
</thead>
<tbody>
<tr>
<td>0508</td>
<td>0.6 ± 0.1 mm</td>
<td>8 mm</td>
<td>4,000</td>
<td>20,000</td>
</tr>
<tr>
<td>0612</td>
<td>0.8 ± 0.1 mm</td>
<td>8 mm</td>
<td>4,000</td>
<td>15,000</td>
</tr>
</tbody>
</table>
**ELECTRICAL CHARACTERISTICS**

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

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

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

**Fig. 6** Typical capacitance change with respect to the capacitance at 1 V as a function of DC voltage at 20 °C

**Fig. 7** Typical tan δ as a function of temperature

**Fig. 8** Typical capacitance change as a function of temperature
**X7R 0612 16 V to 50 V**

**Fig. 9** Typical capacitance change with respect to the capacitance at 1 V as a function of DC voltage at 25 °C

**Fig. 10** Typical tan δ as a function of temperature

**Fig. 11** Typical capacitance change as a function of temperature
YSV 0612 25 V

Fig. 12 Typical capacitance change with respect to the capacitance at 1 V as a function of DC voltage at 25 °C

Fig. 13 Typical tan δ as a function of temperature

Fig. 14 Typical capacitance change as a function of temperature
<table>
<thead>
<tr>
<th>TEST</th>
<th>TEST METHOD</th>
<th>PROCEDURE</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting</td>
<td>IEC 60384-21/22</td>
<td>The capacitors may be mounted on printed-circuit boards or ceramic substrates</td>
<td>No visible damage</td>
</tr>
<tr>
<td>Visual Inspection and Dimension Check</td>
<td>4.4</td>
<td>Any applicable method using ×10 magnification</td>
<td>In accordance with specification</td>
</tr>
<tr>
<td>Capacitance</td>
<td>4.5.1</td>
<td>Class 1:</td>
<td>Within specified tolerance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>f = 1 MHz for C ≤ 1 nF, measuring at voltage 1 Vrms at 20 °C</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>f = 1 kHz for C &gt; 1 nF, measuring at voltage 1 Vrms at 20 °C</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Class 2:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>f = 1 kHz for C ≤ 10 µF, measuring at voltage 1 Vrms at 20 °C</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>f = 120 Hz for C &gt; 10 µF, measuring at voltage 0.5 Vrms at 20 °C</td>
<td></td>
</tr>
<tr>
<td>Dissipation Factor (D.F.)</td>
<td>4.5.2</td>
<td>Class 1:</td>
<td>In accordance with specification</td>
</tr>
<tr>
<td></td>
<td></td>
<td>f = 1 MHz for C ≤ 1 nF, measuring at voltage 1 Vrms at 20 °C</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>f = 1 kHz for C &gt; 1 nF, measuring at voltage 1 Vrms at 20 °C</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Class 2:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>f = 1 kHz for C ≤ 10 µF, measuring at voltage 1 Vrms at 20 °C</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>f = 120 Hz for C &gt; 10 µF, measuring at voltage 0.5 Vrms at 20 °C</td>
<td></td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>4.5.3</td>
<td>At Uj (DC) for 1 minute</td>
<td>In accordance with specification</td>
</tr>
</tbody>
</table>
TEST          TEST METHOD  PROCEDURE                                                REQUIREMENTS
---           ----------    ---------------                                                     
Temperature  4.6         Capacitance shall be measured by the steps shown in the following    Class1: Δ C/C: ±30ppm
Coefficient   Method       table.                                                                 Class2: X7R: Δ C/C: ±15%
                                                          The capacitance change should be measured after 5 min at each   Y5V: Δ C/C: 22~82%
                                                          specified temperature stage.
Step | Temperature(℃) |
-----|-----------------|
a    | 25±2            |
b    | Lower temperature±3℃ |
c    | 25±2            |
d    | Upper Temperature±2℃ |
e    | 25±2            |

(1) Class I
Temperature Coefficient shall be calculated from the formula as below
Temp, Coefficient = \(\frac{C_2 - C_1}{C_1 \times \Delta T} \times 10^6\) [ppm/℃]
C1: Capacitance at step c
C2: Capacitance at 125℃
\(\Delta T\): 100℃ (=125℃-25℃)

(2) Class II
Capacitance Change shall be calculated from the formula as below
\(\Delta C = \frac{C_2 - C_1}{C_1} \times 100\%\)
C1: Capacitance at step c
C2: Capacitance at step b or d

Adhesion  4.7         A force applied for 10 seconds to the line joining the terminations      Force
size ≥ 0603: 5N
size = 0402: 2.5N  and in a plane parallel to the substrate
size = 0201: 1N
<table>
<thead>
<tr>
<th>TEST</th>
<th>TEST METHOD</th>
<th>PROCEDURE</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
</table>
| Bond Strength of Plating on End Face | IEC 60384-21/22 | 4.8 Mounting in accordance with IEC 60384-22 paragraph 4.3  
Conditions: bending 1 mm at a rate of 1 mm/s, radius jig 5 mm | No visible damage |
| Resistance to Soldering Heat | | 4.9 Precondition: 150 +0/-10 °C for 1 hour, then keep for 24 ± 1 hours at room temperature  
Preheating: for size ≤ 1206: 120 °C to 150 °C for 1 minute  
Preheating: for size >1206: 100 °C to 120 °C for 1 minute and 170 °C to 200 °C for 1 minute  
Solder bath temperature: 260 ±5 °C  
Dipping time: 10 ±0.5 seconds  
Recovery time: 24 ±2 hours | Dissolution of the end face plating shall not exceed 25% of the length of the edge concerned  
ΔC/C Class 1:  
NP0: within ±1% or 0.5 pF, whichever is greater  
Class2:  
X5R/X7R/Y5V: ±10%  
D.F. within initial specified value  
R_{ins} within initial specified value |
| Solderability | | 4.10 Preheated the temperature of 80 °C to 140 °C and maintained for 30 seconds to 60 seconds.  
Test conditions for lead containing solder alloy  
Temperature: 235 ±5 °C  
Dipping time: 2 ±0.2 seconds  
Depth of immersion: 10 mm  
Alloy Composition: 60/40 Sn/Pb  
Number of immersions: 1  
Test conditions for leadfree containing solder alloy  
Temperature: 245 ±5 °C  
Dipping time: 3 ±0.3 seconds  
Depth of immersion: 10 mm  
Alloy Composition: SAC305  
Number of immersions: 1 | The solder should cover over 95% of the critical area of each termination  
D.F. within initial specified value  
R_{ins} within initial specified value |
<table>
<thead>
<tr>
<th>TEST</th>
<th>TEST METHOD</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rapid Change of Temperature</td>
<td>IEC 60384-21/22</td>
<td><strong>No visual damage</strong></td>
</tr>
<tr>
<td></td>
<td>4.1.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Δ C/C</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Class 1:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NP0: within ±1% or 1 pF, whichever is greater</td>
</tr>
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<td></td>
<td></td>
<td>Class 2:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X5R/X7R: ±15%, Y5V: ±20%</td>
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<tr>
<td></td>
<td></td>
<td><strong>D.F.</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Class 1:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NP0: ≤ 2 × specified value</td>
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<tr>
<td></td>
<td></td>
<td>Class 2:</td>
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<tr>
<td></td>
<td></td>
<td>X5R/X7R: ≤ 16V: ≤ 7%</td>
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<tr>
<td></td>
<td></td>
<td>Y5V: ≤ 15%</td>
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<tr>
<td></td>
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<td><strong>R_{ins}</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Class 1:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NP0: ≥ 2,500 Ω or $R_{ins} \times C_r ≥ 25s$ whichever is less</td>
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<td></td>
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<td>Class 2:</td>
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<tr>
<td></td>
<td></td>
<td>X5R/X7R/Y5V: ≥ 500 Ω or $R_{Vin} \times C_r ≥ 25s$ whichever is less</td>
</tr>
<tr>
<td>Damp Heat with U, Load</td>
<td>4.13</td>
<td><strong>No visual damage after recovery</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Δ C/C</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Class 1:</td>
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<tr>
<td></td>
<td></td>
<td>NP0: within ±2% or 1 pF, whichever is greater</td>
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<td>Class 2:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X5R/X7R: ±15%, Y5V: ±30%</td>
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<tr>
<td></td>
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<td><strong>D.F.</strong></td>
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<tr>
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<td>Class 1:</td>
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<tr>
<td></td>
<td></td>
<td>NP0: ≤ 2 × specified value</td>
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<td>Class 2:</td>
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<td>X5R/X7R: ≤ 16V: ≤ 7%</td>
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<td>Y5V: ≤ 15%</td>
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<td></td>
<td><strong>R_{ins}</strong></td>
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<td>Class 2:</td>
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<tr>
<td></td>
<td></td>
<td>X5R/X7R/Y5V: ≥ 500 Ω or $R_{Vin} \times C_r ≥ 25s$ whichever is less</td>
</tr>
</tbody>
</table>

P.S. If the capacitance value is less than the minimum value permitted, then after the other measurements have been made the capacitor shall be precondition according to “IEC 60384 4.1” and then the requirement shall be met.
<table>
<thead>
<tr>
<th>TEST</th>
<th>TEST METHOD</th>
<th>PROCEDURE</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endurance</td>
<td>IEC 60384-21/22</td>
<td>4.14 1. Preconditioning, class 2 only: 150 +0/-10 °C /1 hour, then keep for 24 ±1 hour at room temp 2. Initial measure: Spec: refer initial spec C, D, IR 3. Endurance test: Temperature: NP0/X7R: 125 °C X5R/Y5V: 85 °C Specified stress voltage applied for 1,000 hours: Applied 2.0 x U_r for general product. 4. Recovery time: 24 ±2 hours 5. Final measure: C, D, IR P.S. If the capacitance value is less than the minimum value permitted, then after the other measurements have been made the capacitor shall be precondition according to “IEC 60384 4.1” and then the requirement shall be met.</td>
<td></td>
</tr>
<tr>
<td>Voltage Proof</td>
<td>IEC 60384-1</td>
<td>4.6 Specified stress voltage applied for 1 minute U_r ≤ 100 V: series applied 2.5 U_r 100 V &lt; U_r ≤ 200 V series applied (1.5 U_r + 100) 200 V &lt; U_r ≤ 500 V series applied (1.3 U_r + 100) U_r &gt; 500 V: 1.3 U_r I ≤ 7.5 mA</td>
<td>No breakdown or flashover</td>
</tr>
</tbody>
</table>

<General purpose series> ΔC/C Class 1: NP0: within ±2% or 1 pF, whichever is greater Class 2: X5R/X7R: ±15%; Y5V: ±30% D.F. Class 1: NP0: ≤ 2 x specified value Class 2: X5R/X7R: ≤ 16V: ≤ 7% ≥ 25V: ≤ 5% Y5V: ≤ 15% R_ins Class 1: NP0: ≥ 4,000 MΩ or R_ins x C_r ≥ 40s whichever is less Class 2: X5R/X7R/Y5V: ≥ 1,000 MΩ or R_ins x C_r ≥ 50s whichever is less
## REVISION HISTORY

<table>
<thead>
<tr>
<th>REVISION</th>
<th>DATE</th>
<th>CHANGE NOTIFICATION</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version 5</td>
<td>Jun. 16, 2017</td>
<td>-</td>
<td>X7R/0612 product range updated</td>
</tr>
<tr>
<td>Version 4</td>
<td>Nov. 10, 2015</td>
<td>-</td>
<td>Product range updated</td>
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<tr>
<td>Version 3</td>
<td>May 21, 2014</td>
<td>-</td>
<td>Product range updated</td>
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<tr>
<td>Version 2</td>
<td>Jun. 17, 2013</td>
<td>-</td>
<td>Product range updated</td>
</tr>
<tr>
<td>Version 1</td>
<td>Feb 05, 2010</td>
<td>-</td>
<td>The statement of &quot;Halogen Free&quot; on the cover added</td>
</tr>
</tbody>
</table>
| Version 0| Jun 22, 2009  | -                   | New datasheet for 4C-Array series with RoHS compliant
- 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
- Define global part number
- Description of "Halogen Free compliant" added
- Test method and procedure updated