# DATA SHEET

## Class 2, X7R 10 V
## Surface-mount ceramic multilayer capacitors

Product specification
Supersedes data of 24th May 2000

2001 May 30 Rev.5



Phycomp
A YAGEO COMPANY

# Surface-mount ceramic multilayer capacitors

# Class 2, X7R 10 V

## FEATURES

- Three standard sizes
- For high frequency applications
- Supplied in tape on reel or in bulk case
- NiSn terminations.

## APPLICATIONS

Consumer electronics, for example:

- Tuners
- Television receivers
- Video recorders
- All types of cameras.

## DESCRIPTION

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 terminations and finally covered with a layer of plated tin (NiSn). A cross section of the structure is shown in Fig.1.

## QUICK REFERENCE DATA

| DESCRIPTION | VALUE |
|---|---|
| Rated voltage $U_R$ (DC) | 10 V |
| Capacitance range (E6 series) | 150 nF to 2.2 μF; note 1 |
| Tolerance on capacitance after 1000 hours | ±10% |
| Test voltage (DC) for 1 minute | $2.5 \times U_R$ |
| Sectional specifications | IEC 60384-10, second edition 1989-04; also based on CECC 32 100 |
| Detailed specification | based on CECC 32 101-801 |
| End terminations | NiSn |
| Climatic category (IEC 60068) | 55/125/21 |

**Note**

1. Measured at 20 °C, 1 V and 1 kHz, using a four-gauge method.

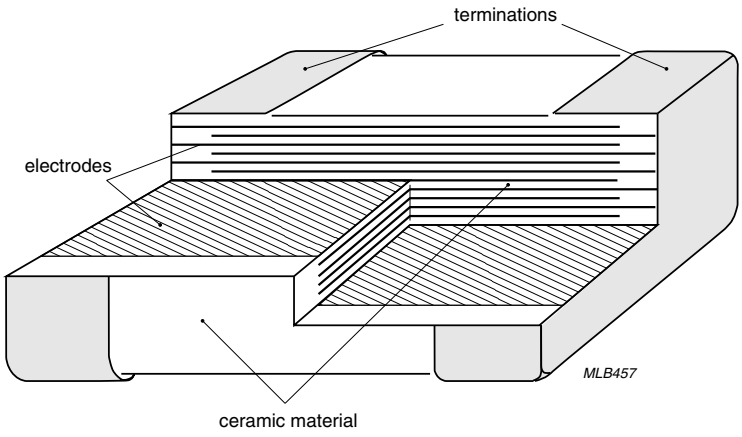
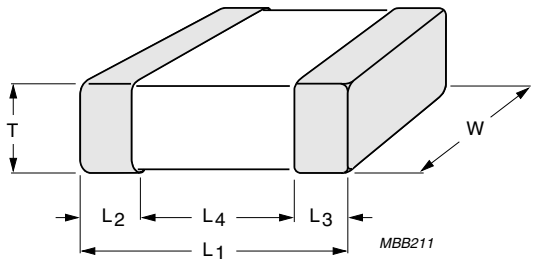



Fig.1 Construction of a ceramic multilayer capacitor.

## MECHANICAL DATA




For dimensions see Table 1.

Fig.2 Component outline.

### Physical dimensions

**Table 1** Capacitor dimensions; see Fig.2

| CASE SIZE | $L_1$ | W | T | | $L_2$ and $L_3$ | | $L_4$ MIN. |
|---|---|---|---|---|---|---|---|
| | | | MIN. | MAX. | MIN. | MAX. | |
| **Dimensions in millimetres** | | | | | | | |
| 0603 | 1.6 ±0.10 | 0.8 ±0.07 | 0.73 | 0.87 | 0.25 | 0.65 | 0.40 |
| 0805 | 2.0 ±0.10 | 1.25 ±0.10 | 0.50 | 1.35 | 0.25 | 0.75 | 0.55 |
| 1206 | 3.2 ±0.15 | 1.6 ±0.15 | 0.50 | 1.75 | 0.25 | 0.75 | 1.40 |
| **Dimensions in inches** | | | | | | | |
| 0603 | 0.063 ±0.004 | 0.032 ±0.003 | 0.029 | 0.035 | 0.010 | 0.026 | 0.016 |
| 1206 | 0.126 ±0.006 | 0.063 ±0.006 | 0.020 | 0.069 | 0.010 | 0.030 | 0.056 |
| 0805 | 0.079 ±0.004 | 0.049 ±0.004 | 0.020 | 0.053 | 0.010 | 0.030 | 0.022 |

# Surface-mount ceramic multilayer capacitors

# Class 2, X7R 10 V

## SELECTION CHART

| C (nF) | LAST TWO DIGITS OF 12NC | 10 V | | |
|---|---|---|---|---|
| | | 0603 | 0805 | 1206 |
| 150 | 52 | | | |
| 180 | 53 | 0.80 ±0.07 | | |
| 220 | 54 | | 0.6 ±0.10 | |
| 270 | 55 | | | |
| 330 | 56 | | | |
| 390 | 57 | | 0.85 ±0.10 | |
| 470 | 58 | | | |
| 560 | 59 | | | |
| 680 | 61 | | 1.25 ±0.10 | |
| 820 | 62 | Values in shaded cells indicate thickness classification. | | |
| 1000 | 63 | | | 0.85 ±0.10 |
| 1200 | 64 | | | |
| 1500 | 65 | | | |
| 1800 | 66 | | | 1.15 ±0.10 |
| 2200 | 67 | | | |

### Thickness classification and packing quantities

| THICKNESS CLASSIFICATION (mm) | 8 mm TAPE WIDTH QUANTITY PER REEL | | | | QUANTITY PER BULK CASE | |
|---|---|---|---|---|---|---|
| | ∅180 mm; 7" | | ∅330 mm; 13" | | 0603 | 0805 |
| | PAPER | BLISTER | PAPER | BLISTER | | |
| 0.6 ±0.10 | 4000 | – | 20000 | – | – | – |
| 0.80 ±0.07 | 4000 | – | 15000 | – | 15000 | – |
| 0.85 ±0.10 | 4000 | – | 15000 | – | – | – |
| 1.15 ±0.10 | – | 3000 | – | 10000 | – | – |
| 1.25 ±0.10 | – | 3000 | – | 10000 | – | 5000 |

## ORDERING INFORMATION

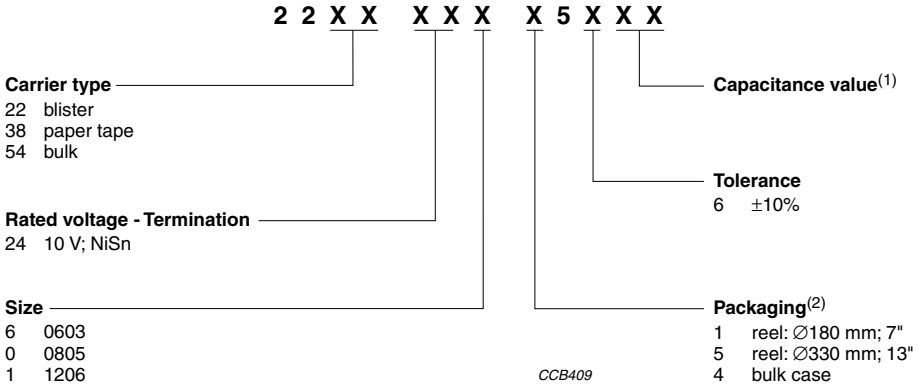
Components may be ordered by using either a simple 15-digit clear text code or Phycomp's unique 12NC.

### Clear text code

Example: 06032R154K6BB0D

| SIZE CODE | TEMP. CHAR. | CAPACITANCE | TOL. | VOLTAGE | TERMINATION | PACKING | MARKING | SERIES |
|---|---|---|---|---|---|---|---|---|
| 0603<br>0805<br>1206 | 2R = X7R | 154 = 150000 pF; the third digit signifies the multiplying factor:<br>4 = × 10000<br>5 = × 100000 | K = ±10% | 6 = 10 V | B = NiSn | 2 = 180 mm; 7" paper<br>3 = 330 mm; 13" paper<br>B = 180 mm; 7" blister<br>F = 330 mm; 13" blister<br>P = bulk case | 0 = no marking | D = BME |

### Ordering code 12NC




(1) Refer to chapter "Selection chart".

(2) Quantity on reel depends on thickness classification, see section "Thickness classification and packing quantities".

## ELECTRICAL CHARACTERISTICS

**Class 2 capacitors; X7R dielectric; NiSn terminations**

Unless otherwise stated all electrical values apply at an ambient temperature of 20 ±1 °C, an atmospheric pressure of 86 to 105 kPa, and a relative humidity of 63 to 67%.

| DESCRIPTION | VALUE |
|---|---|
| Capacitance range (E6 series); note 1 | 150 nF to 2.2 μF |
| Tolerance on capacitance after 1000 hours | ±10% |
| Tan δ; note 1 | ≤5% |
| Insulation resistance after 1 minute at $U_R$ (DC) | $R_{ins} \times C \geq 500$ seconds |
| Maximum capacitance change as a function of temperature | ±15% |
| Ageing | typical 3% per time decade |
| Resistance to soldering heat | 260 °C; 10 seconds |

**Note**

1. Measured at 20 °C, 1 V and 1 kHz, using a four-gauge method.

## TESTS AND REQUIREMENTS

**Table 2** Test procedures and requirements

| IEC 60384-10/ CECC 32 100 CLAUSE | IEC 60068-2 TEST METHOD | TEST | PROCEDURE | REQUIREMENTS |
|---|---|---|---|---|
| 4.4 | | mounting | the capacitors may be mounted on printed-circuit boards or ceramic substrates by applying wave soldering, reflow soldering (including vapour phase soldering) or conductive adhesive | no visible damage |
| 4.5 | | visual inspection and dimension check | any applicable method using ×10 magnification | in accordance with specification |
| 4.6.1 | | capacitance | f = 1 kHz; measuring voltage 1 $V_{rms}$ at 20 °C | within specified tolerance |
| 4.6.2 | | tan δ | f = 1 kHz; measuring voltage 1 $V_{rms}$ at 20 °C | in accordance with specification |
| 4.6.3 | | insulation resistance | at $U_R$ (DC) for 1 minute | in accordance with specification |
| 4.6.4 | | voltage proof | 2.5 × $U_R$ for 1 minute | no breakdown or flashover |
| 4.7.1 | | temperature characteristic | between minimum and maximum temperature | in accordance with specification |
| 4.8 | | adhesion | a force of 5 N applied for 10 s to the line joining the terminations and in a plane parallel to the substrate | no visible damage |
| 4.9 | | bond strength of plating on end face | mounted in accordance with CECC 32 100, paragraph 4.4 | no visible damage |
| | | | conditions: bending 1 mm at a rate of 1 mm/s, radius jig 340 mm | ΔC/C: ≤10% |
| 4.10 | Tb | resistance to soldering heat | precondition: 120 to 150 °C for 1 minute; 260 ±5 °C for 10 ±0.5 s | the terminations shall be well tinned after recovery<br>ΔC/C: ≤10% |
| | | resistance to leaching | 260 ±5 °C for 30 ±1 s in a static solder bath | using visual enlargement of ×10, dissolution of the terminations shall not exceed 10% |
| 4.11 | Ta | solderability | zero hour test, and test after storage (20 to 24 months) in original packing in normal atmosphere; unmounted chips completely immersed for 2 ±0.5 s in a solder bath at 235 ±5 °C | the terminations shall be well tinned |

| IEC 60384-10/ CECC 32 100 CLAUSE | IEC 60068-2 TEST METHOD | TEST | PROCEDURE | REQUIREMENTS |
|---|---|---|---|---|
| 4.12 | Na | rapid change of temperature | preconditioning;<br>5 cycles in the following sequence:<br>30 minutes at –55 °C, change within 30 minutes to +125 °C | no visible damage after 48 hours recovery:<br>$\Delta C/C$: ≤15% |
| 4.14 | Ca | damp heat, steady state | initialization:<br>48 hours after $U_R$<br>at 40 °C for 1 hour<br>(for initial value measurement);<br>500 ±12 hours at 40 °C;<br>90 to 95% RH; $U_R$ applied | preconditioning:<br>$U_R$ at 40 °C for 1 hour<br>after 48 hours recovery:<br>$\Delta C/C$: ±15%<br>tan $\delta$: 7%<br>$R_{ins}$: 500 MΩ or $R_i C_R \geq 25$ s, whichever is less |
| 4.15 | | endurance | initialization:<br>$2 \times U_R$ at 125 °C for 1 hour (initial value is measured after 48 hours, recovery at room temperature);<br>1000 hours at 125 °C and<br>$2 \times U_R$ applied | after 48 hours recovery:<br>$\Delta C/C$: ±20%<br>tan $\delta$: 7%<br>$R_{ins}$: 1000 MΩ or $R_i C_R \geq 50$ s, whichever is less |

**REVISION HISTORY**

| Revision | Date | Change Notification | Description |
|---|---|---|---|
| Rev.5 | 2001 May 30 | – | - Converted to Phycomp brand |
| | | | |