Innovative Service Around the Globe YAGEO

# DATA SHEET

## SURFACE-MOUNT CERAMIC MULTILAYER CAPACITORS

General purpose

Class 1, NP0

16 V TO 50 V

**0.22 pF to 100 nF**

**RoHS compliant & Halogen Free**

YAGEO

Product Specification – November 26, 2019 V.18

## SCOPE

This specification describes NP0 series chip capacitors with lead-free terminations.

## APPLICATIONS

- Consumer electronics for example
  - Tuners
  - Television receivers
  - All types of cameras
- Telecommunications
- Data processing

## FEATURES

- Supplied in tape on reel
- Nickel-barrier end termination
- 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.

**YAGEO BRAND ordering code**

**GLOBAL PART NUMBER (PREFERRED)**

| CC | XXXX | X | X | NPO | X | BN | XXX |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | | (4) | | (5) |

### (1) SIZE – INCH BASED (METRIC)

0201 (0603)
0402 (1005)
0603 (1608)
0805 (2012)
1206 (3216)
1210 (3225)
1812 (4532)

### (2) TOLERANCE

B = ±0.1 pF
C = ±0.25 pF
D = ±0.5 pF
F = ±1%
G = ±2%
J = ±5%
K = ±10%

### (3) PACKING STYLE

R = Paper/PE taping reel; Reel 7 inch
K = Blister taping reel; Reel 7 inch
P = Paper/PE taping reel; Reel 13 inch
F = Blister taping reel; Reel 13 inch
C = Bulk case

### (4) RATED VOLTAGE

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

### (5) CAPACITANCE VALUE

2 significant digits+number of zeros
The 3rd digit signifies the multiplying factor, and letter R is decimal point
Example: 121 = $12 \times 10^1$ = 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. A cross section of the structure is shown in Fig.1.

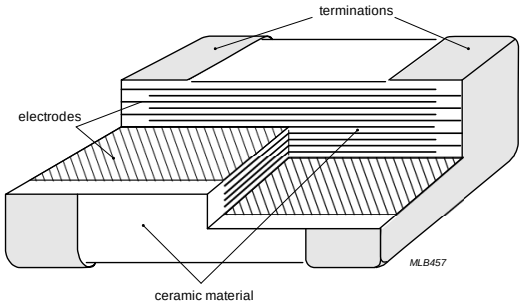


Fig. 1 Surface mounted multilayer ceramic capacitor construction

## DIMENSION

Table 1 For outlines see fig. 2

| TYPE | $L_1$ (mm) | W (mm) | T (MM) | $L_2$ / $L_3$ (mm) | | $L_4$ (mm) |
|---|---|---|---|---|---|---|
| | | | | min. | max. | min. |
| 0201 | 0.6 ±0.03 | 0.3 ±0.03 | Refer to table 2 to 5 | 0.10 | 0.20 | 0.20 |
| 0402 | 1.0 ±0.05 | 0.5 ±0.05 | | 0.15 | 0.35 | 0.40 |
| 0603 | 1.6 ±0.10 | 0.8 ±0.10 | | 0.20 | 0.60 | 0.40 |
| 0805 | 2.0 ±0.10 (1) | 1.25 ±0.10 (1) | | 0.25 | 0.75 | 0.70 |
| | 2.0 ±0.20 (2) | 1.25 ±0.20 (2) | | | | |
| 1206 | 3.2 ±0.15 (1) | 1.6 ±0.15 (1) | | 0.25 | 0.75 | 1.40 |
| | 3.2 ±0.30 (2) | 1.6 ±0.20 (2) | | | | |
| 1210 | 3.2 ±0.20 | 2.5 ±0.20 | | 0.25 | 0.75 | 1.40 |
| 1812 | 4.5 ±0.20 | 3.2 ±0.20 | | 0.25 | 0.75 | 2.20 |

**NOTE**

1. Dimension for size 0805 and 1206, C ≤ 1 nF
2. Dimension for size 0805 and 1206, C > 1 nF

## OUTLINES

For dimension see Table 1

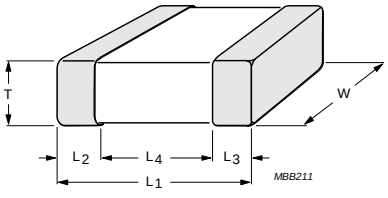


Fig. 2 Surface mounted multilayer ceramic c

## CAPACITANCE RANGE & THICKNESS FOR NP0

Table 2 Sizes from 0201 to 0603

| CAP. | 0201 | | 0402 | | | 0603 | | |
|---|---|---|---|---|---|---|---|---|
| | 25 V | 50 V | 16 V | 25 V | 50 V | 16 V | 25 V | 50 V |
| 0.22 pF | 0.3±0.03 | 0.3±0.03 | | | | | | |
| 0.47 pF | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 0.82 pF | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 1.0 pF | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 1.2 pF | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 1.5 pF | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 1.8 pF | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 2.2 pF | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 2.7 pF | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 3.3 pF | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 3.9 pF | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 4.7 pF | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 5.6 pF | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 6.8 pF | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 8.2 pF | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 10 pF | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 12 pF | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 15 pF | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 18 pF | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 22 pF | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 27 pF | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 33 pF | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 39 pF | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 47 pF | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 56 pF | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 68 pF | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 82 pF | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 100 pF | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |

**NOTE**

1. Values in shaded cells indicate thickness class in mm
2. Capacitance value of non E-12 series is on request

## CAPACITANCE RANGE & THICKNESS FOR NP0

Table 3 Sizes from 0201 to 0603 (continued)

| CAP. | 0201 | | 0402 | | | 0603 | | |
|---|---|---|---|---|---|---|---|---|
| | 25 V | 50 V | 16 V | 25 V | 50 V | 16 V | 25 V | 50 V |
| 120 pF | | | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 150 pF | | | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 180 pF | | | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 220 pF | | | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 270 pF | | | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 330 pF | | | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 390 pF | | | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 470 pF | | | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 560 pF | | | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 680 pF | | | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 820 pF | | | | | | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 1.0 nF | | | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 1.2 nF | | | | | | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 1.5 nF | | | | | | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 1.8 nF | | | | | | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 2.2 nF | | | | | | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 2.7 nF | | | | | | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 3.3 nF | | | | | | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 3.9 nF | | | | | | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 4.7 nF | | | | | | | | |
| 5.6 nF | | | | | | | | |
| 6.8 nF | | | | | | | | |
| 8.2 nF | | | | | | | | |
| 10 nF | | | | | | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 12 nF | | | | | | | | |
| 15 nF | | | | | | | | |
| 18 nF | | | | | | | | |
| 22 nF | | | | | | | | |
| 33 nF | | | | | | | | |

**NOTE**

1. Values in shaded cells indicate thickness class in mm
2. Capacitance value of non E-12 series is on request

## CAPACITANCE RANGE & THICKNESS FOR NP0

Table 4 Sizes from 0805 to 1812

| CAP. | 0805 | | | 1206 | | | 1210 | | 1812 |
|---|---|---|---|---|---|---|---|---|---|
| | 16 V | 25 V | 50 V | 16 V | 25 V | 50 V | 25 V | 50 V | 50 V |
| 0.22 pF | | | | | | | | | |
| 0.47 pF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | | | |
| 0.82 pF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | | | |
| 1.0 pF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | | | |
| 1.2 pF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | | | |
| 1.5 pF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | | | |
| 1.8 pF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | | | |
| 2.2 pF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | | | |
| 2.7 pF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | | | |
| 3.3 pF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | | | |
| 3.9 pF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | | | |
| 4.7 pF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | | | |
| 5.6 pF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | | | |
| 6.8 pF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | | | |
| 8.2 pF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | | | |
| 10 pF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | | | |
| 12 pF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | | | |
| 15 pF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | | | |
| 18 pF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | | | |
| 22 pF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | | | |
| 27 pF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | | | |
| 33 pF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | | | |
| 39 pF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | | | |
| 47 pF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 1.25±0.2 | 1.25±0.2 | |
| 56 pF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 |
| 68 pF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 |
| 82 pF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 |
| 100 pF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 |

**NOTE**

1. Values in shaded cells indicate thickness class in mm
2. Capacitance value of non E-12 series is on request

## CAPACITANCE RANGE & THICKNESS FOR NP0

Table 5 Sizes from 0805 to 1812 (continued)

| CAP. | 0805 | | | 1206 | | | 1210 | | 1812 |
|---|---|---|---|---|---|---|---|---|---|
| | 16 V | 25 V | 50 V | 16 V | 25 V | 50 V | 25 V | 50 V | 50 V |
| 120 pF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 |
| 150 pF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 |
| 180 pF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 |
| 220 pF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 |
| 270 pF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 |
| 330 pF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 |
| 390 pF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 |
| 470 pF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 |
| 560 pF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 |
| 680 pF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 |
| 820 pF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 |
| 1.0 nF | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 |
| 1.2 nF | 0.85±0.1 | 0.85±0.1 | 0.85±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 |
| 1.5 nF | 0.85±0.1 | 0.85±0.1 | 0.85±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 |
| 1.8 nF | 0.85±0.1 | 0.85±0.1 | 0.85±0.1 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 |
| 2.2 nF | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 |
| 2.7 nF | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 |
| 3.3 nF | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 | 0.85±0.1 | 0.85±0.1 | 0.85±0.1 | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 |
| 3.9 nF | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 | 0.85±0.1 | 0.85±0.1 | 0.85±0.1 | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 |
| 4.7 nF | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 | 0.85±0.1 | 0.85±0.1 | 0.85±0.1 | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 |
| 5.6 nF | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 | 0.85±0.1 | 0.85±0.1 | 0.85±0.1 | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 |
| 6.8 nF | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 | 0.85±0.1 | 0.85±0.1 | 0.85±0.1 | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 |
| 8.2 nF | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 |
| 10 nF | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 |
| 12 nF | | | | 0.85±0.1 | 0.85±0.1 | 0.85±0.1 | | | 1.25±0.2 |
| 15 nF | | | | 0.85±0.1 | 0.85±0.1 | 0.85±0.1 | | | 1.25±0.2 |
| 18 nF | | | | 0.85±0.1 | 0.85±0.1 | 0.85±0.1 | | | 1.25±0.2 |
| 22 nF | | | | 0.85±0.1 | 0.85±0.1 | 0.85±0.1 | 2.0±0.2 | 2.0±0.2 | 1.25±0.2 |
| 33 nF | | | | 0.85±0.1 | 0.85±0.1 | 0.85±0.1 | | | |
| 47 nF | | | | 1.25±0.2 | 1.25±0.2 | 1.25±0.2 | 1.60±0.2 | 1.60±0.2 | |
| 56 nF | | | | | | | | | |
| 68 nF | | | | 1.60±0.2 | 1.60±0.2 | 1.60±0.2 | | | |
| 82 nF | | | | | | | | | |
| 100 nF | | | | 1.60±0.2 | 1.60±0.2 | 1.60±0.2 | | | |

**NOTE**

1. Values in shaded cells indicate thickness class in mm
2. Capacitance value of non E-12 series is on request

## THICKNESS CLASSES AND PACKING QUANTITY

Table 6

| SIZE CODE | THICKNESS CLASSIFICATION | TAPE WIDTH QUANTITY PER REEL | Ø180 MM / 7 INCH | | Ø330 MM / 13 INCH | | QUANTITY PER BULK CASE |
|---|---|---|---|---|---|---|---|
| | | | Paper | Blister | Paper | Blister | |
| 0201 | 0.3 ±0.03 mm | 8 mm | 15,000 | --- | 50,000 | --- | --- |
| 0402 | 0.5 ±0.05 mm | 8 mm | 10,000 | --- | 50,000 | --- | 50,000 |
| 0603 | 0.8 ±0.1 mm | 8 mm | 4,000 | --- | 15,000 | --- | 15,000 |
| 0805 | 0.6 ±0.1 mm | 8 mm | 4,000 | --- | 20,000 | --- | 10,000 |
| | 0.85 ±0.1 mm | 8 mm | 4,000 | --- | 15,000 | --- | 8,000 |
| | 1.25 ±0.2 mm | 8 mm | --- | 3,000 | --- | 10,000 | 5,000 |
| 1206 | 0.6 ±0.1 mm | 8 mm | 4,000 | --- | 20,000 | --- | --- |
| | 0.85 ±0.1 mm | 8 mm | 4,000 | --- | 15,000 | --- | --- |
| | 1.00 / 1.15 ±0.1 mm | 8 mm | --- | 3,000 | --- | 10,000 | --- |
| | 1.25 ±0.2 mm | 8 mm | --- | 3,000 | --- | 10,000 | --- |
| | 1.6 ±0.15 mm | 8 mm | --- | 2,500 | --- | 10,000 | --- |
| | 1.6 ±0.2 mm | 8 mm | --- | 2,000 | --- | 10,000 | --- |
| 1210 | 0.6 / 0.7 ±0.1 mm | 8 mm | --- | 4,000 | --- | 15,000 | --- |
| | 0.85 ±0.1 mm | 8 mm | --- | 4,000 | --- | 10,000 | --- |
| | 1.0 ±0.1 mm | 8 mm | --- | 3,000 | --- | 10,000 | --- |
| | 1.15 ±0.1 mm | 8 mm | --- | 3,000 | --- | 10,000 | --- |
| | 1.15 ±0.15 mm | 8 mm | --- | 3,000 | --- | 10,000 | --- |
| | 1.25 ±0.2 mm | 8 mm | --- | 3,000 | --- | --- | --- |
| | 1.5 ±0.1 mm | 8 mm | --- | 2,000 | --- | --- | --- |
| | 1.6 / 1.9 ±0.2 mm | 8 mm | --- | 2,000 | --- | --- | --- |
| | 2.0 ±0.2 mm | 8 mm | --- | 2,000<br>1,000 | --- | --- | --- |
| | 2.5 ±0.2 mm | 8 mm | --- | 1,000<br>500 | --- | --- | --- |
| 1808 | 1.15 ±0.15 mm | 12 mm | --- | 3,000 | --- | --- | --- |
| | 1.25 ±0.2 mm | 12 mm | --- | 3,000 | --- | --- | --- |
| | 1.35 ±0.15 mm | 12 mm | --- | 2,000 | --- | --- | --- |
| | 1.5 ±0.1 mm | 12 mm | --- | 2,000 | --- | --- | --- |
| | 1.6 ±0.2 mm | 12 mm | --- | 2,000 | --- | --- | --- |
| | 2.0 ±0.2 mm | 12 mm | --- | 2,000 | --- | --- | --- |
| 1812 | 0.6 / 0.85 ±0.1 mm | 12 mm | --- | 2,000 | --- | --- | --- |
| | 1.15 ±0.1 mm | 12 mm | --- | 1,000 | --- | --- | --- |
| | 1.15 ±0.15 mm | 12 mm | --- | 1,000 | --- | --- | --- |
| | 1.35 ±0.15 mm | 12 mm | --- | 1,000 | --- | --- | --- |
| | 1.5 ±0.1 mm | 12 mm | --- | 1,000 | --- | --- | --- |
| | 1.6 ±0.2 mm | 12 mm | --- | 1,000 | --- | --- | --- |
| | 2.0 ±0.2 mm | 12 mm | --- | 1,000 | --- | --- | --- |
| | 2.5 ±0.2 mm | 12 mm | --- | 500 | --- | --- | --- |

## ELECTRICAL CHARACTERISTICS

### NP0 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 7

| DESCRIPTION | | VALUE |
|---|---|---|
| Capacitance range | | 0.22 pF to 100 nF |
| Capacitance tolerance | | |
| | C < 10 pF | ±0.1 pF, ±0.25 pF, ±0.5 pF |
| | C ≥ 10 pF | ±1%, ±2%, ±5%, ±10% |
| Dissipation factor (D.F.) | | |
| | C < 30 pF | ≤ 1 / ( 400 + 20C ) |
| | C ≥ 30 pF | ≤ 0.1 % |
| Insulation resistance after 1 minute at $U_r$ (DC) | | $R_{ins}$ ≥ 10 GΩ or $R_{ins}$ × $C_r$ ≥ 500 seconds whichever is less |
| Maximum capacitance change as a function of temperature (temperature characteristic/coefficient): | | ±30 ppm/°C |
| Operating temperature range: | | –55 °C to +125 °C |

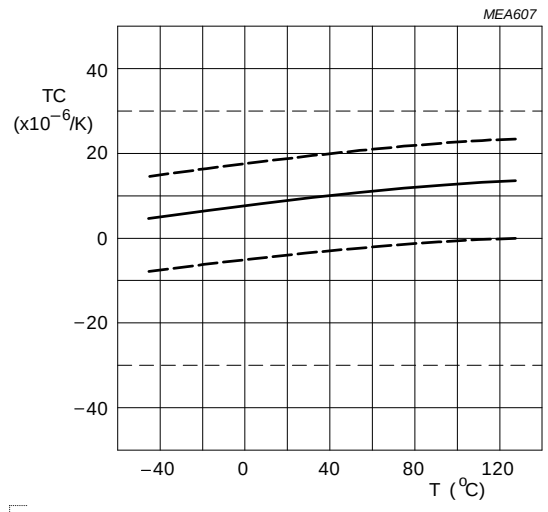


Fig. 3 Typical temperature coefficient as a function of temperature

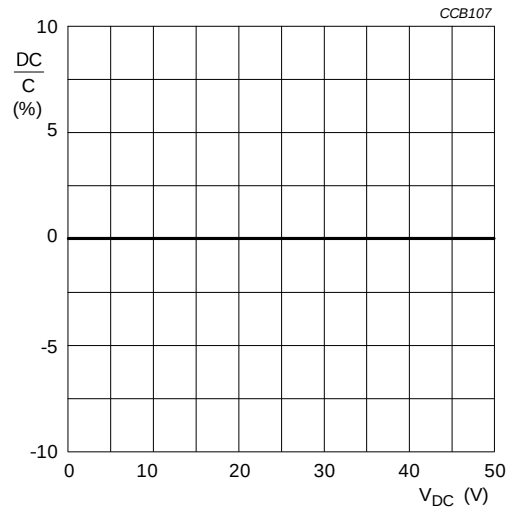


Fig. 4 Typical capacitance change with respect to the capacitance at 1 V as a function of DC voltage

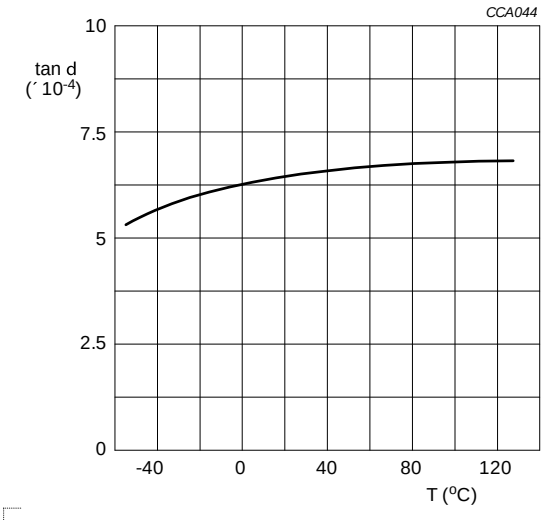


**Fig. 5** Typical tan δ as a function of temperature

## SOLDERING RECOMMENDATION

Table 8

| SOLDERING METHOD | SIZE 0201 | 0402 | 0603 | 0805 | 1206 | ≥ 1210 |
|---|---|---|---|---|---|---|
| Reflow | Reflow only | ≥ 0.1 µF | ≥ 1.0 µF | ≥ 2.2 µF | ≥ 4.7 µF | Reflow only |
| Reflow/Wave | --- | < 0.1 µF | < 1.0 µF | < 2.2 µF | < 4.7 µF | --- |

## TESTS AND REQUIREMENTS

Table 9 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 × 10 magnification | In accordance with specification |
| Capacitance | | 4.5.1 | Class 1:<br>f = 1 MHz for C ≤ 1 nF, measuring at voltage 1 $V_{rms}$ at 20 °C<br>f = 1 KHz for C > 1 nF, measuring at voltage 1 $V_{rms}$ at 20 °C | Within specified tolerance |
| Dissipation factor (D.F.) | | 4.5.2 | Class 1:<br>f = 1 MHz for C ≤ 1 nF , measuring at voltage 1 $V_{rms}$ at 20 °C<br>f = 1 KHz for C > 1 nF, measuring at voltage 1 $V_{rms}$ at 20 °C | In accordance with specification |
| Insulation resistance | | 4.5.3 | At $U_r$ (DC) for 1 minute | In accordance with specification |
| Temperature coefficient | | 4.6 | Capacitance shall be measured by the steps shown in the following table.<br>The capacitance change should be measured after 5 min at each specified temperature stage. | <General purpose series><br>Class1:<br>Δ C/C: ±30ppm<br><br>Class2:<br>X7R: Δ C/C: ±15%<br>Y5V: Δ C/C: 22~-82%<br><br><High Capacitance series><br>Class2:<br>X7R/X5R: Δ C/C: ±15%<br>Y5V: Δ C/C: 22~-82% |

| Step | Temperature(℃) |
|---|---|
| a | 25±2 |
| b | Lower temperature±3℃ |
| c | 25±2 |
| d | Upper Temperature±2℃ |
| e | 25±2 |

(1) Class 1

Temperature Coefficient shall be calculated from the formula as below

$$\text{Temp, Coefficient} = \frac{C2 - C1}{C1 \times \Delta T} \times 10^6 \ [\text{ppm/℃}]$$

C1: Capacitance at step c

C2: Capacitance at 125℃

ΔT: 100℃(=125℃-25℃)

(2) Class II

Capacitance Change shall be calculated from the formula as below

$$\Delta C = \frac{C2 - C1}{C1} \times 100\%$$

C1: Capacitance at step c

C2: Capacitance at step b or d

| TEST | TEST METHOD | PROCEDURE | REQUIREMENTS |
|---|---|---|---|
| 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 |
| Bond strength of plating on end face | 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><General purpose series><br>ΔC/C<br>Class 1:<br>NP0: within ±1% or 0.5 pF whichever is greater |
| Resistance to soldering heat | IEC 60384-21/22 4.9 | Precondition: 150 +0/–10 °C for 1 hour, then keep for 24 ±1 hours at room temperature<br>Preheating: for size ≤ 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 ±5 °C<br>Dipping time: 10 ±0.5 seconds<br>Recovery time: 24 ±2 hours | Dissolution of the end face plating shall not exceed 25% of the length of the edge concerned<br><br><General purpose series><br>ΔC/C<br>Class 1:<br>NP0: within ±0.5% or 0.5 pF whichever is greater<br><br>D.F. within initial specified value<br>$R_{ins}$ within initial specified value |
| Solderability | 4.10 | Preheated the temperature of 80 °C to 140 °C and maintained for 30 seconds to 60 seconds.<br><br>1. Temperature: 235±5°C / Dipping time: 2 ±0.5 s<br>2. Temperature: 245±5°C / Dipping time: 3 ±0.5 s (lead free)Depth of immersion: 10mm | The solder should cover over 95% of the critical area of each termination |
| Rapid change of temperature | 4.11 | Preconditioning:<br>150 +0/–10 °C for 1 hour, then keep for 24 ±1 hours at room temperature<br><br>5 cycles with following detail:<br>30 minutes at lower category temperature<br>30 minutes at upper category temperature<br><br>Recovery time 24 ±2 hours | No visual damage<br><br><General purpose series><br>ΔC/C<br>Class 1:<br>NP0: within ±1% or 1 pF whichever is greater<br><br>D.F. meet initial specified value<br>$R_{ins}$ meet initial specified value |

| TEST | TEST METHOD | | PROCEDURE | REQUIREMENTS |
|---|---|---|---|---|
| Damp heat with $U_r$ load | IEC 60384-21/22 | 4.13 | 1. Preconditioning, class 2 only: 150 +0/-10 °C /1 hour, then keep for 24 ±1 hour at room temp<br>2. Initial measure: Spec: refer to initial spec C, D, IR<br>3. Damp heat test: 500 ±12 hours at 40 ±2 °C; 90 to 95% R.H. 1.0 $U_r$ applied<br>4. Recovery: Class 1: 6 to 24 hours<br>5. Final measure: C, D, IR<br><br>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 preconditioned according to *"IEC 60384 4.1"* and then the requirement shall be met. | No visual damage after recovery<br><General purpose series><br>ΔC/C<br>Class 1:<br>NP0: within ±2% or 1 pF whichever is greater<br>D.F.<br>Class 1:<br>NP0: ≤ 2 x specified value<br>$R_{ins}$<br>Class 1:<br>NP0: ≥ 2,500 MΩ or $R_{ins} \times C_r \geq 25s$ whichever is less |
| Endurance | | 4.14 | 1. Preconditioning, class 2 only: 150 +0/-10 °C /1 hour, then keep for 24 ±1 hour at room temp<br>2. Initial measure: Spec: refer to initial spec C, D, IR<br>3. Endurance test: Temperature: NP0: 125 °C Specified stress voltage applied for 1,000 hours: Applied 2.0 x $U_r$ for general product.<br>4. Recovery time: 24 ±2 hours<br>5. Final measure: C, D, IR<br><br>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 preconditioned according to *"IEC 60384 4.1"* and then the requirement shall be met. | No visual damage<br><General purpose series><br>ΔC/C<br>Class1:<br>NP0: within ±2% or 1 pF whichever is greater<br>D.F.<br>Class1:<br>NP0: ≤ 2 x specified value<br>$R_{ins}$<br>Class1:<br>NP0: ≥ 4,000 MΩ or $R_{ins} \times C_r \geq 40s$ whichever is less |
| Voltage proof | IEC 60384-1 | 4.6 | Specified stress voltage applied for 1 minute<br>$U_r \leq 100$ V: series applied 2.5 $U_r$<br>100 V < $U_r \leq 200$ V series applied (1.5 $U_r$ + 100)<br>200 V < $U_r \leq 500$ V series applied (1.3 $U_r$ + 100)<br>$U_r > 500$ V: 1.3 $U_r$<br>I: 7.5 mA | No breakdown or flashover |

## REVISION HISTORY

| REVISION | DATE | CHANGE NOTIFICATION | DESCRIPTION |
|---|---|---|---|
| Version 18 | Nov. 26, 2019 | - | - Update 1206/12nF to 47nF dimension |
| Version 17 | Jul. 29, 2019 | - | - Update 0805/10nF dimension |
| Version 16 | Mar. 7, 2017 | - | - 0805 L4 spec updated |
| Version 15 | Nov. 21, 2016 | - | - Product range updated |
| Version 14 | Jul. 22, 2016 | - | - Add 0805/8.2nF and 10nF/ 16V to 50V, T=1.25mm |
| Version 13 | May. 16, 2016 | - | - Product range updated |
| Version 12 | Feb. 16, 2016 | - | - Product range updated |
| Version 11 | Sep. 11, 2014 | - | - Product range updated |
| Version 10 | Feb. 18, 2014 | - | - Product range updated |
| Version 9 | Jun. 17, 2013 | - | - Product range updated |
| Version 8 | Aug 05, 2011 | - | - Dimension updated |
| Version 7 | Jun 14, 2011 | - | - Size1210 T=1.0mm SPQ added<br>- Dimension updated |
| Version 6 | Jan 06, 2011 | - | - Dimension updated |
| Version 5 | Dec 29, 2010 | - | - Dimension updated |
| Version 4 | Nov 23, 2010 | - | - Dimension updated |
| Version 3 | Apr 20, 2010 | - | - The statement of "Halogen Free" on the cover added<br>- Dimension updated |
| Version 2 | Oct 26, 2009 | - | - Typo updated |
| Version 1 | Jun 02, 2009 | - | - 12NC code updated |
| Version 0 | Apr 15, 2009 | - | - New datasheet for general purpose NP0 series with RoHS compliant<br>- Replace the "16V to 50V" part of pdf files: NP0_16V_7, NP0_16V-to-100V_6, NP0_25V_7, NP0_50-to-500V_11<br>- Combine 0201 from pdf files: UP-NP0X5RX7RY5V_0201_6.3-to-50V_2 and UY-NPOX5RX7RY5V_0201_6.3-to-50V_2<br>- Define global part number<br>- Description of "Halogen Free compliant" added<br>- Test method and procedure updated |