

# DATA SHEET

## SURFACE-MOUNT CERAMIC MULTILAYER CAPACITORS

Hi Q Series

Class 1, NP0

16 V TO 250 V

0.2 pF to 100 pF

RoHS compliant & Halogen Free



**SCOPE**

This specification describes NPO 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/ PHYCOMP BRAND ordering code**

**GLOBAL PART NUMBER (PREFERRED)**

**CQ** 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)

**(2) TOLERANCE**

- 0.2pF to 2.0pF
  - A = ±0.05 pF
  - B = ±0.1 pF
  - C = ±0.25 pF

- 2.1pF to 5.0pF
  - A = ±0.05 pF
  - B = ±0.1 pF
  - C = ±0.25 pF
  - D = ±0.5 pF

- 5.1pF to 9.9pF
  - B = ±0.1 pF
  - C = ±0.25 pF
  - D = ±0.5 pF

- 10pF and over
  - F = ±1%
  - G = ±2%
  - J = ±5%

**(3) PACKING STYLE**

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

**(4) RATED VOLTAGE**

- 7 = 16 V      0=100V
- 8 = 25 V      A=200V
- 9 = 50 V      Y=250V

**(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 × 10<sup>1</sup> = 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 I For outlines see fig. 2

| TYPE | L <sub>1</sub> (mm) | W (mm)     | T (MM)                   | L <sub>2</sub> / L <sub>3</sub> (mm) |      | L <sub>4</sub> (mm) |
|------|---------------------|------------|--------------------------|--------------------------------------|------|---------------------|
|      |                     |            |                          | min.                                 | max. | min.                |
| 0201 | 0.6 ±0.03           | 0.3 ±0.03  | Refer to<br>table 2 to 5 | 0.10                                 | 0.20 | 0.20                |
| 0402 | 1.0 ±0.05           | 0.5 ±0.05  |                          | 0.15                                 | 0.30 | 0.40                |
| 0603 | 1.6 ±0.10           | 0.8 ±0.10  |                          | 0.20                                 | 0.60 | 0.40                |
| 0805 | 2.0 ±0.20           | 1.25 ±0.20 |                          | 0.25                                 | 0.75 | 0.55                |

**OUTLINES**

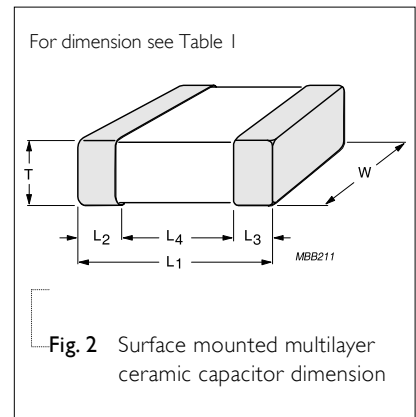


Fig. 2 Surface mounted multilayer ceramic capacitor dimension

**CAPACITANCE RANGE & THICKNESS FOR NPO**

**Table 2** Sizes from 0201 to 0402

| CAP.    | 0201     |          | 0402     |          |          | CAP.       | 0201     |          | 0402     |          |          |
|---------|----------|----------|----------|----------|----------|------------|----------|----------|----------|----------|----------|
|         | 25 V     | 50 V     | 50 V     | 100V     | 250V     |            | 25 V     | 50V      | 50 V     | 100V     | 250V     |
| 0.2 pF  | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 2.6 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 0.3 pF  | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 2.7 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 0.4 pF  | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 2.8 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 0.5 pF  | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 2.9 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 0.6 pF  | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 3.0 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 0.7 pF  | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 3.1 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 0.8 pF  | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 3.2 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 0.9 pF  | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 3.3 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 1.0 pF  | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 3.4 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 1.1 pF  | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 3.5 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 1.2 pF  | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 3.6 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 1.3 pF  | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 3.7 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 1.4 pF  | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 3.8 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 1.5 pF  | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 3.9 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 1.6 pF  | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 4.0 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 1.7 pF  | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 4.1 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 1.8 pF  | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 4.2 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 1.9 pF  | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 4.3 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 2.0 pF  | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 4.4 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 2.1 pF  | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 4.5 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 2.2 pF  | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 4.6 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 2.3 pF  | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 4.7 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 2.4 pF  | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 4.8 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 2.5 pF  | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 4.9 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| Tape Wi | 8mm      |          | Tape Wid |          |          | 8mm        |          |          |          |          |          |
|         |          |          |          |          |          | Tape Width |          | 8mm      |          |          |          |

**NOTE**

I. Values in shaded cells indicate thickness class in mm

**CAPACITANCE RANGE & THICKNESS FOR NPO**

| CAP.       | 0201     |          | 0402     |          |          | CAP.       | 0201     |          | 0402     |          |          |
|------------|----------|----------|----------|----------|----------|------------|----------|----------|----------|----------|----------|
|            | 25 V     | 50 V     | 50 V     | 100 V    | 250 V    |            | 25 V     | 50 V     | 50 V     | 100 V    | 250 V    |
| 5.1 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 8.2 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 5.2 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 8.3 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 5.3 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 8.4 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 5.4 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 8.5 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 5.5 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 8.6 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 5.6 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 8.7 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 5.7 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 8.8 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 5.8 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 8.9 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 5.9 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 9.0 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 6.0 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 9.1 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 6.1 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 9.2 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 6.2 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 9.3 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 6.3 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 9.4 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 6.4 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 9.5 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 6.5 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 9.6 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 6.6 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 9.7 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 6.7 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 9.8 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 6.8 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 9.9 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 6.9 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 10 pF      | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 7.0 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 12 pF      |          |          | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 7.1 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 15 pF      |          |          | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 7.2 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 18 pF      |          |          | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 7.3 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 22 pF      |          |          | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 7.4 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 27 pF      |          |          | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 7.5 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 33 pF      |          |          | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 7.6 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 39 pF      |          |          | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 7.7 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 47 pF      |          |          | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 7.8 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 56 pF      |          |          | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 7.9 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 68 pF      |          |          | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 8.0 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 82 pF      |          |          | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| 8.1 pF     | 0.3±0.03 | 0.3±0.03 | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 | 100 pF     |          |          | 0.5±0.05 | 0.5±0.05 | 0.5±0.05 |
| Tape Width |          |          | 8mm      |          |          | Tape Width |          |          | 8mm      |          |          |

**NOTE**

Values in shaded cells indicate thickness class in mm

**CAPACITANCE RANGE & THICKNESS FOR NPO**

**Table 4** Sizes from 0603 to 0805

| CAP.       | 0603    |           | 0805    |         |         |
|------------|---------|-----------|---------|---------|---------|
|            | 50 V    | 100/250 V | 50 V    | 100V    | 250V    |
| 0.2 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 0.3 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 0.4 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 0.5 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 0.6 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 0.7 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 0.8 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 0.9 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 1.0 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 1.1 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 1.2 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 1.3 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 1.4 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 1.5 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 1.6 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 1.7 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 1.8 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 1.9 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 2.0 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 2.1 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 2.2 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 2.3 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 2.4 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 2.5 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| Tape Width |         | 8mm       |         |         |         |

| CAP.       | 0603    |           | 0805    |         |         |
|------------|---------|-----------|---------|---------|---------|
|            | 50 V    | 100/250 V | 50 V    | 100V    | 250V    |
| 2.6 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 2.7 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 2.8 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 2.9 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 3.0 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 3.1 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 3.2 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 3.3 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 3.4 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 3.5 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 3.6 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 3.7 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 3.8 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 3.9 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 4.0 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 4.1 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 4.2 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 4.3 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 4.4 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 4.5 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 4.6 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 4.7 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 4.8 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 4.9 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 5.0 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| Tape Width |         | 8mm       |         |         |         |

**NOTE**

2. Values in shaded cells indicate thickness class in mm

CAPACITANCE RANGE & THICKNESS FOR NPO

| CAP.       | 0603    |           | 0805    |         |         |
|------------|---------|-----------|---------|---------|---------|
|            | 50 V    | 100/250 V | 50 V    | 100 V   | 250 V   |
| 5.1 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 5.2 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 5.3 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 5.4 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 5.5 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 5.6 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 5.7 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 5.8 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 5.9 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 6.0 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 6.1 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 6.2 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 6.3 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 6.4 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 6.5 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 6.6 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 6.7 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 6.8 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 6.9 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 7.0 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 7.1 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 7.2 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 7.3 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 7.4 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 7.5 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 7.6 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 7.7 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 7.8 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 7.9 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 8.0 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 8.1 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| Tape Width | 8mm     |           |         |         |         |

| CAP.       | 0603    |           | 0805    |         |         |
|------------|---------|-----------|---------|---------|---------|
|            | 50 V    | 100/250 V | 50 V    | 100 V   | 250 V   |
| 8.2 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 8.3 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 8.4 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 8.5 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 8.6 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 8.7 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 8.8 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 8.9 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 9.0 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 9.1 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 9.2 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 9.3 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 9.4 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 9.5 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 9.6 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 9.7 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 9.8 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 9.9 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 10 pF      | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 12 pF      | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 15 pF      | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 18 pF      | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 22 pF      | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 24 pF      | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 27 pF      | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 33 pF      | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 39 pF      | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 47 pF      | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 56 pF      | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 68 pF      | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 82 pF      | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| 100 pF     | 0.8±0.1 | 0.8±0.1   | 0.6±0.1 | 0.6±0.1 | 0.6±0.1 |
| Tape Width | 8mm     |           |         |         |         |

**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 |         | Ø330 MM / 13 INCH |         | QUANTITY PER BULK CASE |
|-----------|--------------------------|------------------------------|------------------|---------|-------------------|---------|------------------------|
|           |                          |                              | Paper/PE         | Blister | Paper/PE          | 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            | ---     | ---                    |
| 0603      | 0.8 ±0.1 mm              | 8 mm                         | 4,000            | ---     | 15,000            | ---     | ---                    |
| 0805      | 0.6 ±0.1 mm              | 8 mm                         | 4,000            | ---     | 20,000            | ---     | ---                    |

**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 6

| DESCRIPTION   | VALUE   |
|---|---|
| Capacitance range   | 0.2 pF to 100 pF  |
| Capacitance tolerance   |   |
| C < 10 pF   | ±0.05 pF, ±0.1 pF, ±0.25 pF, ±0.5 pF  |
| C ≥ 10 pF   | ±1%, ±2%, ±5%   |
| Q value   |   |
| C < 30 pF      ≤ 50V  | Q ≥ ( 400 + 20C )   |
| ≥ 100V  | Q ≥ ( 800 + 20C )   |
|   | C: pF   |
| C ≥ 30 pF      ≤ 50V  | Q ≥ 1000  |
| ≥ 100V  | Q ≥ 1400  |
| Insulation resistance after 1 minute at U <sub>r</sub> (DC)                                       | R <sub>ins</sub> ≥ 10 GΩ or R <sub>ins</sub> × C <sub>r</sub> ≥ 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   |

**SOLDERING RECOMMENDATION**

Table 7

| SOLDERING METHOD | SIZE 0201 | 0402 | 0603 | 0805 |
|------------------|-----------|------|------|------|
| Reflow           | ○         | ○    | ○    | ○    |
| Wave             | ---       | ---  | ○    | ○    |



**TESTS AND REQUIREMENTS**

**Table 8** 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 I:<br>f = 1 MHz for C ≤ 1 nF, measuring at voltage 1 V <sub>rms</sub> at 20 °C<br>f = 1 KHz for C > 1 nF, measuring at voltage 1 V <sub>rms</sub> at 20 °C | Within specified tolerance       |
| Q value                               |                 | 4.5.2 Class I:<br>f = 1 MHz for C ≤ 1 nF, measuring at voltage 1 V <sub>rms</sub> at 20 °C<br>f = 1 KHz for C > 1 nF, measuring at voltage 1 V <sub>rms</sub> at 20 °C | In accordance with specification |
| Insulation resistance                 |                 | 4.5.3 At U <sub>r</sub> (DC) for 1 minute  | In accordance with specification |

| TEST                                 | TEST METHOD           | PROCEDURE   | REQUIREMENTS  |                 |   |      |   |                       |   |      |   |                       |   |      |  |
|--------------------------------------|-----------------------|---|---|-----------------|---|------|---|-----------------------|---|------|---|-----------------------|---|------|--|
| Temperature coefficient              | 4.6                   | <p>Capacitance shall be measured by the steps shown in the following table.</p> <p>The capacitance change should be measured after 5 min at each specified temperature stage.</p> <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>(I) Class I</p> <p>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/>                     ΔT: 100°C(=125°C-25°C)</p> | Step  | Temperature(°C) | a | 25±2 | b | Lower temperature±3°C | c | 25±2 | d | Upper Temperature±2°C | e | 25±2 | <p>Class I:<br/>                     Δ C/C: ±30ppm</p> |
| 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                   | <p>A force applied for 10 seconds to the line joining the terminations and in a plane parallel to the substrate</p>   | <p>Force</p> <p>size ≥ 0603: 5N<br/>                     size = 0402: 2.5N<br/>                     size = 0201: 1N</p>   |                 |   |      |   |                       |   |      |   |                       |   |      |  |
| Bond strength of plating on end face | 4.8                   | <p>Mounting in accordance with IEC 60384-22 paragraph 4.3</p> <p>Conditions: bending 1 mm at a rate of 1 mm/s, radius jig 5 mm</p>  | <p>No visible damage</p> <p>ΔC/C</p> <p>NPO: within ±1% or 0.5 pF whichever is greater</p>  |                 |   |      |   |                       |   |      |   |                       |   |      |  |
| ESR                                  |                       | <p>Measuring frequency: 1 ± 0.2GHz at room temperature.</p> <hr/> <p>Measuring frequency: 500 ± 50MHz at room temperature.</p>  | <p>0.2pF ≤ C ≤ 1pF : 350mΩ / C max<br/>                     1pF &lt; C ≤ 5pF : 300mΩ max<br/>                     5pF &lt; C ≤ 10pF : 250mΩ max<br/>                     C : Nominal cap (pF)</p> <hr/> <p>10pF &lt; C ≤ 100pF :400mΩ max</p> |                 |   |      |   |                       |   |      |   |                       |   |      |  |

| TEST                         | TEST METHOD         | PROCEDURE  | REQUIREMENTS  |
|------------------------------|---------------------|--|---|
| Resistance to soldering heat | IEC 60384-21/22 4.9 | <p>Precondition: 150 +0/-10 °C for 1 hour, then keep for 24 ±1 hours at room temperature</p> <p>Preheating: for size ≤ 1206: 120 °C to 150 °C for 1 minute</p> <p>Preheating: for size &gt;1206: 100 °C to 120 °C for 1 minute and 170 °C to 200 °C for 1 minute</p> <p>Solder bath temperature: 260 ±5 °C</p> <p>Dipping time: 10 ±0.5 seconds</p> <p>Recovery time: 24 ±2 hours</p>  | <p>Dissolution of the end face plating shall not exceed 25% of the length of the edge concerned</p> <p><math>\Delta C/C</math></p> <p>NP0: within ±0.5% or 0.5 pF whichever is greater</p> <p>Q value within initial specified value</p> <p><math>R_{ins}</math> within initial specified value</p> |
| Solderability                | 4.10                | <p>Preheated the temperature of 80 °C to 140 °C and maintained for 30 seconds to 60 seconds.</p> <p>Test conditions for lead containing solder alloy</p> <p>Temperature: 235 ±5 °C</p> <p>Dipping time: 2 ±0.2 seconds</p> <p>Depth of immersion: 10 mm</p> <p>Alloy Composition: 60/40 Sn/Pb</p> <p>Number of immersions: 1</p> <p>Test conditions for lead-free containing solder alloy</p> <p>Temperature: 245 ±5 °C</p> <p>Dipping time: 3 ±0.3 seconds</p> <p>Depth of immersion: 10 mm</p> <p>Alloy Composition: SAC305</p> <p>Number of immersions: 1</p> | <p>The solder should cover over 95% of the critical area of each termination</p>  |
| Rapid change of temperature  | 4.11                | <p>Preconditioning: 150 +0/-10 °C for 1 hour, then keep for 24 ±1 hours at room temperature</p> <p>5 cycles with following detail:<br/>30 minutes at lower category temperature<br/>30 minutes at upper category temperature</p> <p>Recovery time 24 ±2 hours</p>  | <p>No visual damage</p> <p><math>\Delta C/C</math></p> <p>NP0: within ±1% or 1 pF whichever is greater</p> <p>Q value meet initial specified value</p> <p><math>R_{ins}</math> meet initial specified value</p>   |

| TEST                      | TEST METHOD             | PROCEDURE  | REQUIREMENTS   |
|---------------------------|-------------------------|--|--|
| Damp heat with $U_r$ load | IEC 60384-21/22<br>4.13 | <ol style="list-style-type: none"> <li>Preconditioning, class 2 only:<br/>150 +0/-10 °C /1 hour, then keep for 24 ±1 hour at room temp</li> <li>Initial measure:<br/>Spec: refer to initial spec C</li> <li>Damp heat test:<br/>500 ±12 hours at 40 ±2 °C;<br/>90 to 95% R.H. 1.0 <math>U_r</math> applied</li> <li>Recovery:<br/>Class 1: 6 to 24 hours</li> <li>Final measure: C</li> </ol> <p>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.</p>  | <p>No visual damage after recovery</p> <p><math>\Delta C/C</math></p> <p>NP0: within ±7.5% or 0.75pF whichever is greater</p> <p>Q value:<br/>≥30pF: <math>Q \geq 200</math><br/>≤30pF: <math>Q \geq 100+10C/3</math></p> <p>I.R.:<br/>NP0: ≥ 500 MΩ or <math>R_{ins} \times C_r \geq 25s</math> whichever is less</p>                           |
| Endurance                 | 4.14                    | <ol style="list-style-type: none"> <li>Preconditioning, class 2 only:<br/>150 +0/-10 °C /1 hour, then keep for 24 ±1 hour at room temp</li> <li>Initial measure:<br/>Spec: refer to initial spec C</li> <li>Endurance test:<br/>Temperature: NP0: 125 °C<br/>Specified stress voltage applied for 1,000 hours:<br/>Applied 2.0 × <math>U_r</math> for 16V to 100V product.<br/>Applied 1.5 × <math>U_r</math> for 200V to 250V product.</li> <li>Recovery time: 24 ±2 hours</li> <li>Final measure: C</li> </ol> <p>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.</p> | <p>No visual damage</p> <p><math>\Delta C/C</math></p> <p>NP0: within ±3% or 0.3pF whichever is greater</p> <p>Q value:<br/>≥30pF: <math>Q \geq 350</math><br/>10pF to 30pF: <math>Q \geq 275+5C/2</math><br/>≤10pF: <math>Q \geq 200+10C</math></p> <p>NP0: ≥ 1,000 MΩ or <math>R_{ins} \times C_r \geq 50\Omega.F</math> whichever is less</p> |
| Voltage proof             | IEC 60384-1<br>4.6      | <p>Specified stress voltage applied for 1 minute</p> <p><math>U_r \leq 100</math> V: series applied 2.5 <math>U_r</math><br/> <math>100</math> V &lt; <math>U_r \leq 200</math> V series applied (1.5 <math>U_r</math> + 100)<br/> <math>200</math> V &lt; <math>U_r \leq 500</math> V series applied (1.3 <math>U_r</math> + 100)<br/> <math>U_r &gt; 500</math> V: 1.3 <math>U_r</math><br/>                     I: 7.5 mA</p>   | No breakdown or flashover  |

**REVISION HISTORY**

| REVISION   | DATE          | CHANGE NOTIFICATION | DESCRIPTION  |
|------------|---------------|---------------------|--|
| Version 15 | Mar.30, 2018  | -                   | - Add 0603/100V, 250 V capacitance range               |
| Version 14 | Feb. 14, 2018 | -                   | - Revised ESR requirements (0.2pF to 1pF)              |
| Version 13 | Jul. 5, 2016  | -                   | - Add 0201/50V and 0402/100V, 250V Capacitance range   |
| Version 12 | Feb. 23, 2016 | -                   | - Size update  |
| Version 11 | Mar 19, 2014  | -                   | - Size update  |
| Version 10 | Mar 19, 2014  | -                   | - Tests and requirements                               |
| Version 9  | Feb. 27, 2014 | -                   | - Tolerance update                                     |
| Version 8  | Oct. 28, 2013 | -                   | - Rated voltage update                                 |
| Version 7  | Oct. 09, 2013 | -                   | - Rated voltage update                                 |
| Version 6  | Jun. 24, 2013 | -                   | - Tolerance update                                     |
| Version 5  | Apr. 15, 2013 | -                   | - Tolerance update                                     |
| Version 4  | Mar. 28, 2013 | -                   | - Capacitance range & thickness update                 |
| Version 3  | Feb. 07, 2013 | -                   | - Capacitance range & thickness update                 |
| Version 2  | Dec. 25, 2012 | -                   | - Capacitance range & thickness update                 |
| Version 1  | Dec. 03, 2012 | -                   | - Capacitance range & thickness update                 |
| Version 0  | Nov. 23, 2012 | -                   | - New datasheet for HiQ NP0 series with RoHS compliant |