

# DATA SHEET

**Class 1, 100 V (DC)  
(flanged types)  
Miniature ceramic plate  
capacitors**

Product specification  
Supersedes data of 04 November 2002

2003 April 18

## Miniature ceramic plate capacitors

## Class 1, 100 V (DC) (flanged types)

### FEATURES

- High-frequency circuits
- Temperature compensating
- High stability
- Space saving.

### APPLICATIONS

In a great variety of electronic circuits, e.g. in filters and tuning circuits where high stability and/or temperature compensation are a requirement. Because of their small size the capacitors are suitable for use in circuitry with high component density.

### DESCRIPTION

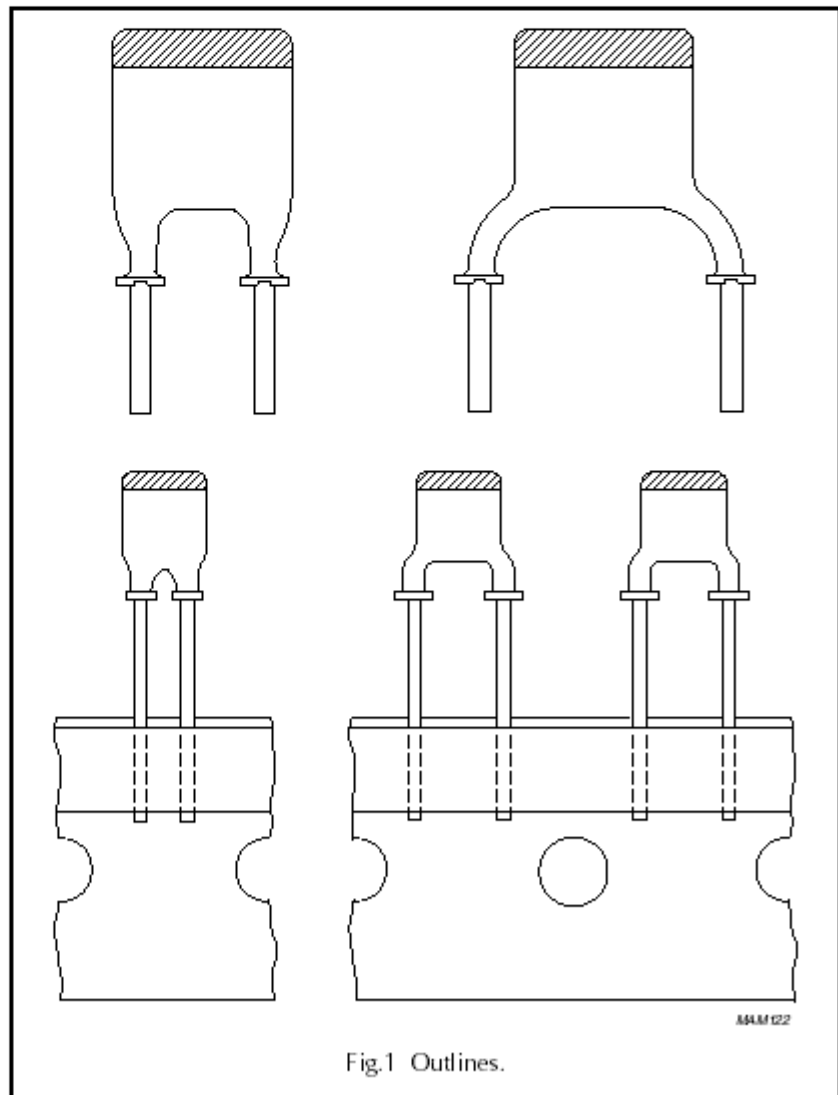
The capacitors consist of a thin rectangular ceramic plate, both sides of which are metallized, and tinned connecting leads are secured using a high melting point solder. The capacitors are encapsulated in epoxy lacquer, which is resistant to all commonly used cleaning solvents. They have small dimensions and narrow tolerances on the lead spacing. The leads are provided with a flange, which guarantees that the leads are free of lacquer, and its shape allows soldering gasses to escape freely, ensuring excellent solderability. This makes the capacitors suitable for both hand-mounting and automatic insertion. The electrical properties are characterized by low losses, a narrow tolerance on capacitance ( $\pm 0.25$  pF or 2%), high stability and, owing to the absence of silver, an extremely good DC behaviour.

### QUICK REFERENCE DATA

| DESCRIPTION                    | VALUE   |
|--------------------------------|---|
| Capacitance range (E12 series) | 0.56 to 680 pF  |
| Rated DC voltage               | 100 V   |
| Tolerance on capacitance       | $\pm 2\%$ or $\pm 0.25$ pF                              |
| Temperature coefficients       | P100, NP0, N150, N750 and N1500; note 1                 |
| Sectional specification        | IEC 60384-8   |
| Climatic category (IEC 60068)  | 55/085/21 (N150, N750);<br>55/125/56 (P100, NP0, N1500) |

### Note

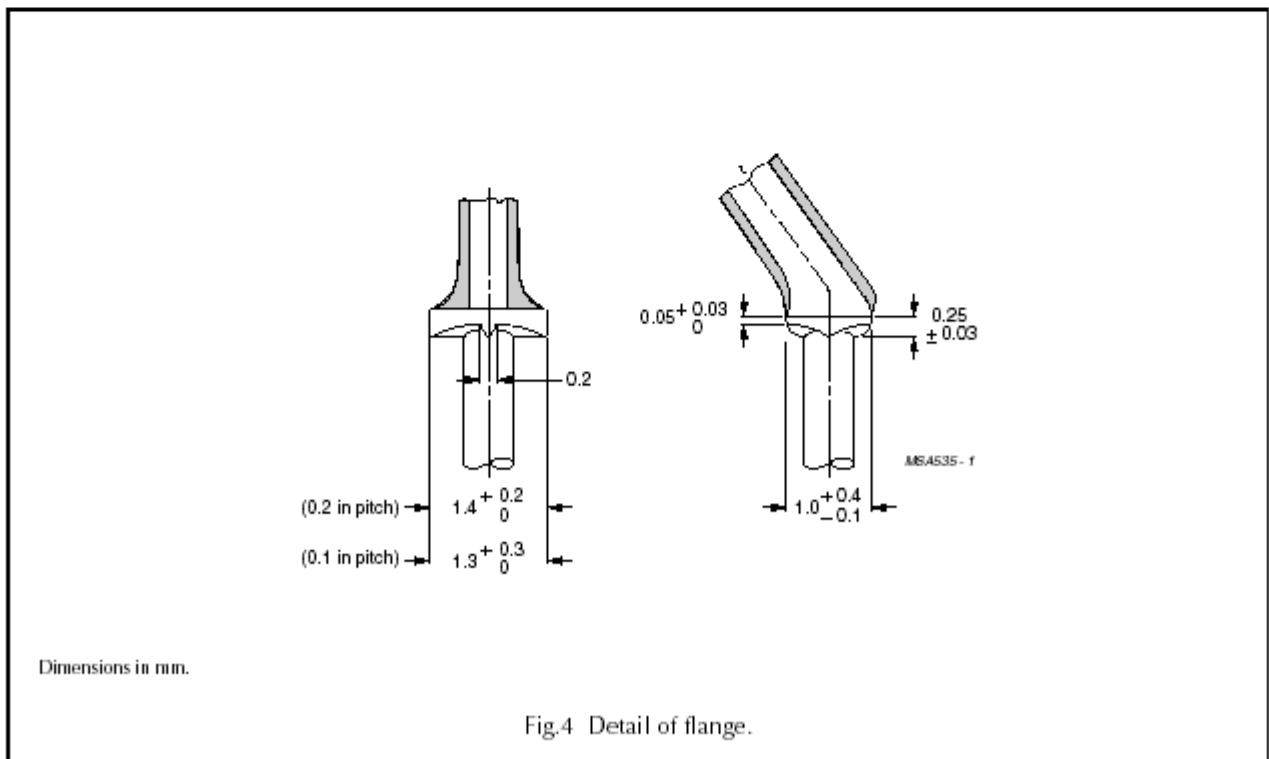
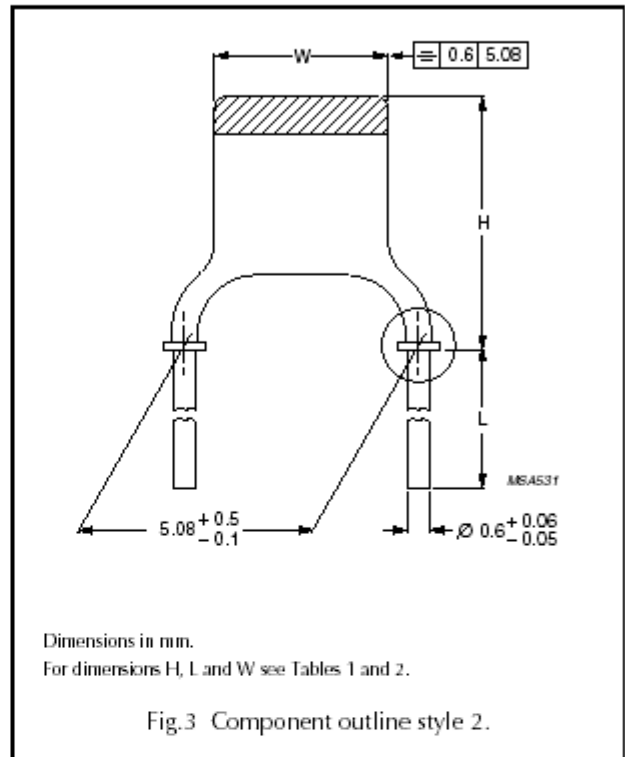
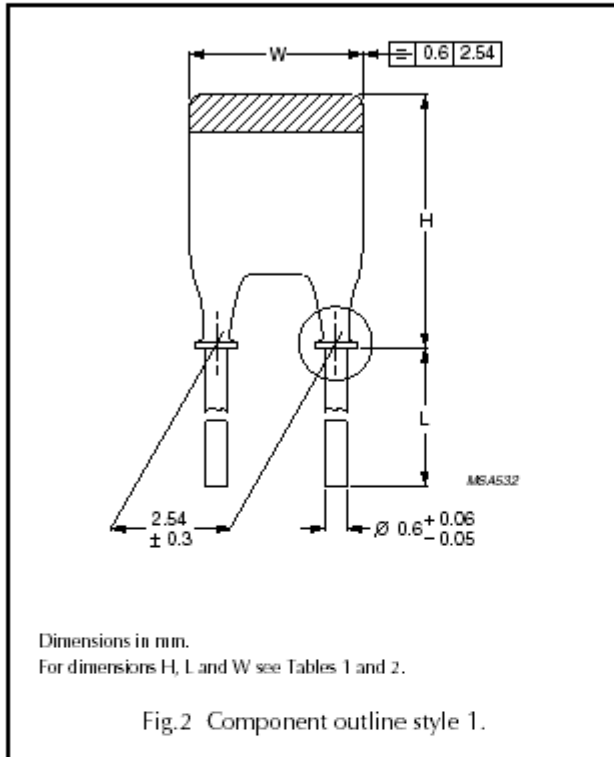
1. N075, N220, N330, N470 available on request.



**Miniature ceramic plate capacitors**

**Class 1, 100 V (DC)  
(flanged types)**

MECHANICAL DATA



## Miniature ceramic plate capacitors

## Class 1, 100 V (DC) (flanged types)

### Marking

The temperature coefficient is indicated by a marking code in accordance with IEC recommendations. Capacitance value is indicated by a marking code on the body. Refer to tables 3 to 12 for temperature coefficient and capacitance marking codes.

### Mounting

When bending, cutting or flattening, the leads should be relieved of the applied load by supporting them at the capacitor body.

### Soldering conditions:

max. 265 °C, max. 10 s.

The capacitors are suitable for mounting on printed-circuit boards (hand-mounting or automatic insertion).

### PACKAGING

For details refer to this handbook, chapter "Miniature ceramic plate capacitors", section "General data".

### ORDERING INFORMATION

Table 2 Catalogue numbers

| PITCH<br>P            | LEAD<br>DIAMETER<br>d  | STYLE | CATALOGUE NUMBERS <sup>(1)</sup> |                |                                  |                                      |
|-----------------------|------------------------|-------|----------------------------------|----------------|----------------------------------|--------------------------------------|
|                       |                        |       | BULK PACKED                      |                | ON TAPE <sup>(2)</sup><br>(REEL) | ON TAPE <sup>(2)</sup><br>(AMMOPACK) |
|                       |                        |       | L ≥ 13 mm                        | L = 4 ± 0.5 mm |                                  |                                      |
| 2.54 mm<br>(0.1 inch) | 0.6 mm<br>(0.024 inch) | 1     | 2222 680 .....                   | 2222 682 ..... | 2222 678 .....                   | 2222 688 .....                       |
| 5.08 mm<br>(0.2 inch) | 0.6 mm<br>(0.024 inch) | 2     | 2222 681 .....                   | 2222 683 ..... | 2222 679 .....                   | 2222 689 .....                       |

### Notes

- Catalogue numbers to be completed by adding the last 5-digit suffix for required capacitance value, see Tables 4 to 12.
- H<sub>0</sub> = 18.25 mm.

### Physical dimensions

Table 1 Capacitor dimensions and mass

| SIZE <sup>(1)</sup> | W <sup>(2)</sup><br>(mm) | H <sup>(2)</sup><br>(mm) |             | MASS<br>(g) |
|---------------------|--------------------------|--------------------------|-------------|-------------|
|                     |                          | STYLE 1                  | STYLE 2     |             |
| I                   | 3.6 (-1.1)               | 5.0 (-1.5)               | 6.3 (-1.8)  | ≈0.14       |
| IIA                 | 3.9 (-1.4)               | 5.3 (-1.7)               | 6.7 (-2.0)  | ≈0.15       |
| IIB                 | 4.5 (-1.8)               | 6.0 (-2.1)               | 7.3 (-2.4)  | ≈0.15       |
| III                 | 5.3 (-1.8)               | 6.8 (-2.3)               | 8.1 (-2.6)  | ≈0.17       |
| IV                  | 6.2 (-2.0)               | 7.7 (-2.4)               | 9.0 (-2.7)  | ≈0.20       |
| V                   | 6.2 (-2.0)               | 10.3 (-2.8)              | 11.2 (-3.1) | ≈0.23       |
| VI                  | 6.5 (-2.3)               | 12.3 (-3.5)              | 13.2 (-3.8) | ≈0.25       |

### Notes

- Unless indicated in Tables 4 to 12, the thickness of the capacitors does not exceed 2.3 mm.
- Tolerances are given between parentheses.

## Miniature ceramic plate capacitors

## Class 1, 100 V (DC) (flanged types)

Table 3 Conditions for Table 4; capacitors with temperature coefficient P100 (M7G), rated voltage 100 V (DC)

| DESCRIPTION   | VALUE                      |
|---|----------------------------|
| Capacitance range   | 0.56 to 47 pF (E12 series) |
| Temperature coefficient of the capacitance $\left(\frac{\Delta C}{C \Delta T}\right)$ | $100 \times 10^{-6}/K$     |
| Tolerance on the temperature coefficient  | $\pm 30 \times 10^{-6}/K$  |
| Marking code of the temperature coefficient   | AG                         |
| Climatic category (IEC 60068)   | 55/125/56                  |

Table 4 Preferred capacitance range, temperature coefficient P100 (M7G)

| CAPACITANCE VALUE <sup>(1)</sup><br>(pF) | TOLERANCE | SIZE<br>(see Table 1) | MARKING | SUFFIX OF CATALOGUE NUMBER<br>(see Table 2) |
|--|-----------|-----------------------|---------|---|
| 0.56                                     | ±0.25 pF  | I <sup>(2)</sup>      | p56     | 03567                                       |
| 0.68                                     | ±0.25 pF  | I <sup>(2)</sup>      | p68     | 03687                                       |
| 0.82                                     | ±0.25 pF  | I <sup>(2)</sup>      | p82     | 03827                                       |
| 1.0                                      | ±0.25 pF  | I <sup>(3)</sup>      | 1p0     | 03108                                       |
| 1.2                                      | ±0.25 pF  | I                     | 1p2     | 03128                                       |
| 1.5                                      | ±0.25 pF  | I                     | 1p5     | 03158                                       |
| 1.8                                      | ±0.25 pF  | I                     | 1p8     | 03188                                       |
| 2.2                                      | ±0.25 pF  | I                     | 2p2     | 03228                                       |
| 2.7                                      | ±0.25 pF  | I                     | 2p7     | 03278                                       |
| 3.3                                      | ±0.25 pF  | I                     | 3p3     | 03338                                       |
| 3.9                                      | ±0.25 pF  | I                     | 3p9     | 03398                                       |
| 4.7                                      | ±0.25 pF  | I                     | 4p7     | 03478                                       |
| 5.6                                      | ±0.25 pF  | I                     | 5p6     | 03568                                       |
| 6.8                                      | ±0.25 pF  | I                     | 6p8     | 03688                                       |
| 8.2                                      | ±0.25 pF  | IIA                   | 8p2     | 03828                                       |
| 10                                       | ±2%       | IIA                   | 10p     | 04109                                       |
| 12                                       | ±2%       | IIB                   | 12p     | 04129                                       |
| 15                                       | ±2%       | IIB                   | 15p     | 04159                                       |
| 18                                       | ±2%       | III                   | 18p     | 04189                                       |
| 22                                       | ±2%       | III                   | 22p     | 04229                                       |
| 27                                       | ±2%       | IV                    | 27p     | 04279                                       |
| 33                                       | ±2%       | IV                    | 33p     | 04339                                       |
| 39                                       | ±2%       | V                     | 39p     | 04399                                       |
| 47                                       | ±2%       | V                     | 47p     | 04479                                       |

### Notes

- Other capacitance values and tolerances are available on request.
- Maximum thickness 2.7 mm.
- Maximum thickness 2.5 mm.

## Miniature ceramic plate capacitors

## Class 1, 100 V (DC) (flanged types)

Table 5 Conditions for Table 6; capacitors with temperature coefficient NP0 (C0G), rated voltage 100 V (DC)

| DESCRIPTION   | VALUE                      |
|---|----------------------------|
| Capacitance range   | 1.8 to 330 pF (E12 series) |
| Temperature coefficient of the capacitance $\left(\frac{\Delta C}{C \Delta T}\right)$ | $0 \times 10^{-6}/K$       |
| Tolerance on the temperature coefficient  | $\pm 30 \times 10^{-6}/K$  |
| Marking code of the temperature coefficient   | CG                         |
| Climatic category (IEC 60068)   | 55/125/56                  |

Table 6 Preferred capacitance range, temperature coefficient NP0 (C0G)

| CAPACITANCE VALUE <sup>(1)</sup> (pF) | TOLERANCE | SIZE (see Table 1) | MARKING | SUFFIX OF CATALOGUE NUMBER (see Table 2) |
|---------------------------------------|-----------|--------------------|---------|--|
| 1.8                                   | ±0.25 pF  | I <sup>(2)</sup>   | 1p8     | 09188                                    |
| 2.2                                   | ±0.25 pF  | I                  | 2p2     | 09228                                    |
| 2.7                                   | ±0.25 pF  | I                  | 2p7     | 09278                                    |
| 3.3                                   | ±0.25 pF  | I                  | 3p3     | 09338                                    |
| 3.9                                   | ±0.25 pF  | I                  | 3p9     | 09398                                    |
| 4.7                                   | ±0.25 pF  | I                  | 4p7     | 09478                                    |
| 5.6                                   | ±0.25 pF  | I                  | 5p6     | 09568                                    |
| 6.8                                   | ±0.25 pF  | I                  | 6p8     | 09688                                    |
| 8.2                                   | ±0.25 pF  | I                  | 8p2     | 09828                                    |
| 10                                    | ±2%       | I                  | 10p     | 10109                                    |
| 12                                    | ±2%       | I                  | 12p     | 10129                                    |
| 15                                    | ±2%       | I                  | 15p     | 10159                                    |
| 18                                    | ±2%       | I                  | 18p     | 10189                                    |
| 22                                    | ±2%       | I                  | 22p     | 10229                                    |
| 27                                    | ±2%       | I                  | 27p     | 10279                                    |
| 33                                    | ±2%       | I                  | 33p     | 10339                                    |
| 39                                    | ±2%       | IIA                | 39p     | 10399                                    |
| 47                                    | ±2%       | IIA                | 47p     | 10479                                    |
| 56                                    | ±2%       | IIA                | 56p     | 10569                                    |
| 68                                    | ±2%       | IIB                | 68p     | 10689                                    |
| 82                                    | ±2%       | IIB                | 82p     | 10829                                    |
| 100                                   | ±2%       | III                | n10     | 10101                                    |
| 120                                   | ±2%       | III                | n12     | 10121                                    |
| 150                                   | ±2%       | IV                 | n15     | 10151                                    |
| 180                                   | ±2%       | IV                 | n18     | 10181                                    |
| 220                                   | ±2%       | V                  | n22     | 10221                                    |
| 270                                   | ±2%       | VI                 | n27     | 10271                                    |
| 330                                   | ±2%       | VI                 | n33     | 10331                                    |

### Notes

1. Other capacitance values and tolerances are available on request.
2. Maximum thickness 2.5 mm.

## Miniature ceramic plate capacitors

## Class 1, 100 V (DC) (flanged types)

Table 7 Conditions for Table 8; capacitors with temperature coefficient N150 (P2G), rated voltage 100 V (DC)

| DESCRIPTION   | VALUE                      |
|---|----------------------------|
| Capacitance range   | 3.9 to 330 pF (E12 series) |
| Temperature coefficient of the capacitance $\left(\frac{\Delta C}{C \Delta T}\right)$ | $-150 \times 10^{-6}/K$    |
| Tolerance on the temperature coefficient  | $\pm 30 \times 10^{-6}/K$  |
| Marking code of the temperature coefficient   | PG                         |
| Climatic category (IEC 60068)   | 55/085/21                  |

Table 8 Preferred capacitance range, temperature coefficient N150 (P2G)

| CAPACITANCE VALUE <sup>(1)</sup><br>(pF) | TOLERANCE | SIZE<br>(see Table 1) | MARKING | SUFFIX OF CATALOGUE NUMBER<br>(see Table 2) |
|--|-----------|-----------------------|---------|---|
| 3.9                                      | ±0.25 pF  | I <sup>(2)</sup>      | 3p9     | 33398                                       |
| 4.7                                      | ±0.25 pF  | I                     | 4p7     | 33478                                       |
| 5.6                                      | ±0.25 pF  | I                     | 5p6     | 33568                                       |
| 6.8                                      | ±0.25 pF  | I                     | 6p8     | 33688                                       |
| 8.2                                      | ±0.25 pF  | I                     | 8p2     | 33828                                       |
| 10                                       | ±2%       | I                     | 10p     | 34109                                       |
| 12                                       | ±2%       | I                     | 12p     | 34129                                       |
| 15                                       | ±2%       | I                     | 15p     | 34159                                       |
| 18                                       | ±2%       | I                     | 18p     | 34189                                       |
| 22                                       | ±2%       | I                     | 22p     | 34229                                       |
| 27                                       | ±2%       | I                     | 27p     | 34279                                       |
| 33                                       | ±2%       | I                     | 33p     | 34339                                       |
| 39                                       | ±2%       | IIA                   | 39p     | 34399                                       |
| 47                                       | ±2%       | IIA                   | 47p     | 34479                                       |
| 56                                       | ±2%       | IIB                   | 56p     | 34569                                       |
| 68                                       | ±2%       | IIB                   | 68p     | 34689                                       |
| 82                                       | ±2%       | III                   | 82p     | 34829                                       |
| 100                                      | ±2%       | III                   | n10     | 34101                                       |
| 120                                      | ±2%       | IV                    | n12     | 34121                                       |
| 150                                      | ±2%       | IV                    | n15     | 34151                                       |
| 180                                      | ±2%       | IV                    | n18     | 34181                                       |
| 220                                      | ±2%       | V                     | n22     | 34221                                       |
| 270                                      | ±2%       | VI                    | n27     | 34271                                       |
| 330                                      | ±2%       | VI                    | n33     | 34331                                       |

### Notes

- Other capacitance values and tolerances are available on request.
- Maximum thickness 2.5 mm.

## Miniature ceramic plate capacitors

## Class 1, 100 V (DC) (flanged types)

Table 9 Conditions for Table 10; capacitors with temperature coefficient N750 (U2J), rated voltage 100 V (DC)

| DESCRIPTION   | VALUE                      |
|---|----------------------------|
| Capacitance range   | 3.9 to 330 pF (E12 series) |
| Temperature coefficient of the capacitance $\left(\frac{\Delta C}{C \Delta T}\right)$ | $-750 \times 10^{-6}/K$    |
| Tolerance on the temperature coefficient  | $\pm 120 \times 10^{-6}/K$ |
| Marking code of the temperature coefficient   | UJ                         |
| Climatic category (IEC 60 068)  | 55/085/21                  |

Table 10 Preferred capacitance range, temperature coefficient N750 (U2J)

| CAPACITANCE VALUE <sup>(1)</sup><br>(pF) | TOLERANCE | SIZE<br>(see Table 1) | MARKING | SUFFIX OF CATALOGUE NUMBER<br>(see Table 2) |
|--|-----------|-----------------------|---------|---|
| 3.9                                      | ±0.25 pF  | I <sup>(2)</sup>      | 3p9     | 57398                                       |
| 4.7                                      | ±0.25 pF  | I                     | 4p7     | 57478                                       |
| 5.6                                      | ±0.25 pF  | I                     | 5p6     | 57568                                       |
| 6.8                                      | ±0.25 pF  | I                     | 6p8     | 57688                                       |
| 8.2                                      | ±0.25 pF  | I                     | 8p2     | 57828                                       |
| 10                                       | ±2%       | I                     | 10p     | 58109                                       |
| 12                                       | ±2%       | I                     | 12p     | 58129                                       |
| 15                                       | ±2%       | I                     | 15p     | 58159                                       |
| 18                                       | ±2%       | I                     | 18p     | 58189                                       |
| 22                                       | ±2%       | I                     | 22p     | 58229                                       |
| 27                                       | ±2%       | I                     | 27p     | 58279                                       |
| 33                                       | ±2%       | I                     | 33p     | 58339                                       |
| 39                                       | ±2%       | I                     | 39p     | 58399                                       |
| 47                                       | ±2%       | I                     | 47p     | 58479                                       |
| 56                                       | ±2%       | IIA                   | 56p     | 58569                                       |
| 68                                       | ±2%       | IIA                   | 68p     | 58689                                       |
| 82                                       | ±2%       | IIB                   | 82p     | 58829                                       |
| 100                                      | ±2%       | IIB                   | n10     | 58101                                       |
| 120                                      | ±2%       | III                   | n12     | 58121                                       |
| 150                                      | ±2%       | III                   | n15     | 58151                                       |
| 180                                      | ±2%       | IV                    | n18     | 58181                                       |
| 220                                      | ±2%       | IV                    | n22     | 58221                                       |
| 270                                      | ±2%       | V                     | n27     | 58271                                       |
| 330                                      | ±2%       | V                     | n33     | 58331                                       |

### Notes

- Other capacitance values and tolerances are available on request.
- Maximum thickness 2.5 mm.



## Miniature ceramic plate capacitors

## Class 1, 100 V (DC) (flanged types)

Table 11 Conditions for Table 12; capacitors with temperature coefficient N1500 (P3K), rated voltage 100 V (DC)

| DESCRIPTION   | VALUE                                   |
|---|---|
| Capacitance range   | 18 to 680 pF (E12 series)               |
| Temperature coefficient of the capacitance $\left(\frac{\Delta C}{C \Delta T}\right)$ | $-1500 \times 10^{-6}/K$                |
| Tolerance on the temperature coefficient  | $(0 \text{ to } +500) \times 10^{-6}/K$ |
| Marking code of the temperature coefficient   | VK                                      |
| Climatic category (IEC 60068)   | 55/125/56                               |

Table 12 Preferred capacitance range, temperature coefficient N1500 (P3K)

| CAPACITANCE VALUE <sup>(1)</sup><br>(pF) | TOLERANCE | SIZE<br>(see Table 1) | MARKING | SUFFIX OF CATALOGUE NUMBER<br>(see Table 2) |
|--|-----------|-----------------------|---------|---|
| 18                                       | ±2%       | I <sup>(2)</sup>      | 18p     | 70189                                       |
| 22                                       | ±2%       | I                     | 22p     | 70229                                       |
| 27                                       | ±2%       | I                     | 27p     | 70279                                       |
| 33                                       | ±2%       | I                     | 33p     | 70339                                       |
| 39                                       | ±2%       | I                     | 39p     | 70399                                       |
| 47                                       | ±2%       | I                     | 47p     | 70479                                       |
| 56                                       | ±2%       | I                     | 56p     | 70569                                       |
| 68                                       | ±2%       | I                     | 68p     | 70689                                       |
| 82                                       | ±2%       | I                     | 82p     | 70829                                       |
| 100                                      | ±2%       | IIA                   | n10     | 70101                                       |
| 120                                      | ±2%       | IIA                   | n12     | 70121                                       |
| 150                                      | ±2%       | IIB                   | n15     | 70151                                       |
| 180                                      | ±2%       | IIB                   | n18     | 70181                                       |
| 220                                      | ±2%       | III                   | n22     | 70221                                       |
| 270                                      | ±2%       | III                   | n27     | 70271                                       |
| 330                                      | ±2%       | IV                    | n33     | 70331                                       |
| 390                                      | ±2%       | IV                    | n39     | 70391                                       |
| 470                                      | ±2%       | V                     | n47     | 70471                                       |
| 560                                      | ±2%       | V                     | n56     | 70561                                       |
| 680                                      | ±2%       | VI                    | n68     | 70681                                       |

### Notes

1. Other capacitance values and tolerances are available on request.
2. Maximum thickness 2.5 mm.

**Miniature ceramic plate capacitors**

**Class 1, 100 V (DC) (flanged types)**

**ELECTRICAL CHARACTERISTICS**

The capacitors meet the essential requirements of "IEC 60384-8". Unless stated otherwise 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%.

| DESCRIPTION   | VALUE  |
|---|--|
| Capacitance values (note 1) measured at 1 MHz, ≤5 V | see Tables 4 to 12   |
| Rated DC voltage                                    | 100 V  |
| DC test voltage; duration 1 minute                  | 300 V  |
| DC test voltage of coating; duration 1 minute       | 300 V  |
| Insulation resistance at 100 V (DC) after 1 minute  | ≥10000 MΩ  |
| Tan δ (note 1) measured at 1 MHz, ≤5 V:             |  |
| C ≤ 50 pF   | $\leq 15 \left( \frac{15}{C} + 0.7 \right) \times 10^{-4}$ ; $< 55 \times 10^{-4}$ |
| C > 50 pF   | $\leq 15 \times 10^{-4}$   |
| Category temperature range                          | -55 to +85 °C (N150, N750);<br>-55 to +125 °C (P100, NP0, N1500)                   |

**Note**

- Including 2 mm per connecting lead.

