

# DATA SHEET

## **SURFACE-MOUNT CERAMIC MULTILAYER CAPACITORS**

Class 1, NP0  
50 V TO 500 V



## Surface-mount ceramic multilayer capacitors

**Class 1, NP0**  
**50 V to 500V**

### FEATURES

- Six standard sizes
- High capacitance per unit volume
- Supplied in tape on reel or in bulk case (case sizes 0402, 0603 and 0805 only)
- For high frequency applications
- NiSn terminations.

### APPLICATIONS

- Consumer electronics
- Telecommunications
- Automotive
- Data processing.

### DESCRIPTION

The capacitor consists of a rectangular block of ceramic dielectric in which a number of interleaved precious metal electrodes are contained. This structure gives rise to a high capacitance per unit volume.

The inner electrodes are connected to the two terminations, silver dipped with a barrier layer of plated nickel 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)                                                           | 50 V, 100 V, 200 V and 500 V (IEC)                                             |
| Capacitance range (E12 series); note 1:<br>50 V; note 2<br>100 V<br>200 V<br>500 V | 0.47 pF to 22 nF<br>10 pF to 22 nF<br>10 pF to 5.6 nF<br>10 pF to 3.3 nF       |
| Tolerance on capacitance:<br>$C \geq 10$ pF<br>$C < 10$ pF                         | $\pm 5\%$ ; $\pm 2\%$ ; $\pm 1\%$<br>$\pm 0.5$ pF; $\pm 0.25$ pF; $\pm 0.1$ pF |
| Test voltage (DC) for 1 minute:<br>50 V and 100 V<br>200 V<br>500 V                | $2.5 \times U_r$<br>$3 \times U_r$<br>$2 \times U_r$                           |
| Sectional specifications                                                           | IEC 60384-10 second edition 1989-04;<br>also based on CECC 32 100              |
| Detailed specification                                                             | based on CECC 32 101-801                                                       |
| Climatic category (IEC 60068)                                                      | 55/125/56                                                                      |

### Notes

1. Other values below 10 pF and non E12 series are available on request.
2. Also applicable for applications up to 63 V.

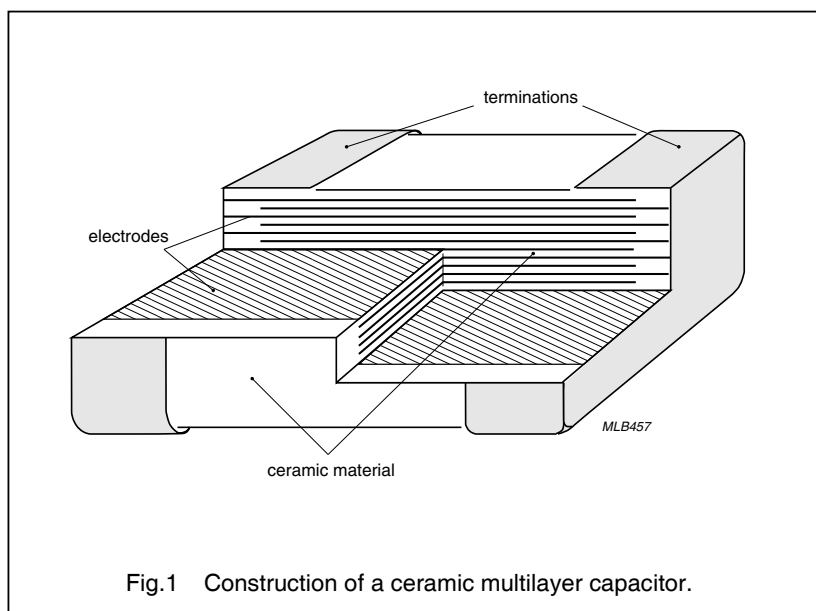
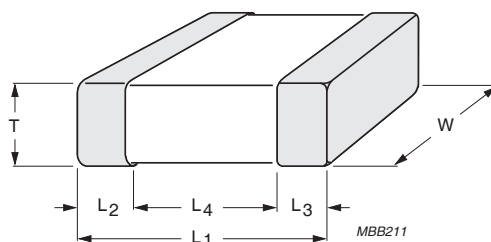


Fig.1 Construction of a ceramic multilayer capacitor.

# Surface-mount ceramic multilayer capacitors

## Class 1, NP0 50 V to 500V

### MECHANICAL DATA



For dimensions see Table 1.

Fig.2. Component outline.

### Physical dimensions

Table 1 Capacitor dimensions

| CASE SIZE                 | L <sub>1</sub> | W            | T     |       | L <sub>2</sub> and L <sub>3</sub> |       | L <sub>4</sub><br>MIN. |
|---------------------------|----------------|--------------|-------|-------|-----------------------------------|-------|------------------------|
|                           |                |              | MIN.  | MAX.  | MIN.                              | MAX.  |                        |
| Dimensions in millimetres |                |              |       |       |                                   |       |                        |
| 0402                      | 1.0 ±0.05      | 0.5 ±0.05    | 0.45  | 0.55  | 0.20                              | 0.30  | 0.40                   |
| 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  | 1.25  | 0.25                              | 0.75  | 1.40                   |
| 1210                      | 3.2 ±0.20      | 2.5 ±0.20    | 0.50  | 1.75  | 0.25                              | 0.75  | 1.40                   |
| 1812                      | 4.5 ±0.20      | 3.2 ±0.20    | 0.50  | 1.30  | 0.25                              | 0.75  | 2.20                   |
| Dimensions in inches      |                |              |       |       |                                   |       |                        |
| 0402                      | 0.040 ±0.002   | 0.020 ±0.002 | 0.018 | 0.022 | 0.008                             | 0.012 | 0.016                  |
| 0603                      | 0.063 ±0.004   | 0.032 ±0.003 | 0.029 | 0.035 | 0.010                             | 0.026 | 0.016                  |
| 0805                      | 0.079 ±0.004   | 0.049 ±0.004 | 0.020 | 0.053 | 0.010                             | 0.030 | 0.022                  |
| 1206                      | 0.126 ±0.006   | 0.063 ±0.006 | 0.020 | 0.049 | 0.010                             | 0.030 | 0.056                  |
| 1210                      | 0.126 ±0.008   | 0.098 ±0.008 | 0.020 | 0.069 | 0.010                             | 0.030 | 0.056                  |
| 1812                      | 0.177 ±0.008   | 0.126 ±0.008 | 0.020 | 0.051 | 0.010                             | 0.030 | 0.088                  |

# Surface-mount ceramic multilayer capacitors

## Class 1, NP0 50 V to 500V

### SELECTION CHART FOR 50 V

| C<br>(pF) | LAST THREE<br>DIGITS OF<br>12NC | 50 V      |           |          |          |            |      |
|-----------|---------------------------------|-----------|-----------|----------|----------|------------|------|
|           |                                 | 0402      | 0603      | 0805     | 1206     | 1210       | 1812 |
| 0.47      | 477                             |           |           |          |          |            |      |
| 0.56      | 567                             |           |           |          |          |            |      |
| 0.68      | 687                             |           |           |          |          |            |      |
| 0.82      | 827                             |           |           |          |          |            |      |
| 1.0       | 108                             |           |           |          |          |            |      |
| 1.2       | 128                             |           |           |          |          |            |      |
| 1.5       | 158                             |           |           |          |          |            |      |
| 1.8       | 188                             |           |           |          |          |            |      |
| 2.2       | 228                             |           |           |          |          |            |      |
| 2.7       | 278                             |           |           |          |          |            |      |
| 3.3       | 338                             |           |           |          |          |            |      |
| 3.9       | 398                             |           |           |          |          |            |      |
| 4.7       | 478                             |           |           |          |          |            |      |
| 5.6       | 568                             |           |           |          |          |            |      |
| 6.8       | 688                             | 0.5 ±0.05 | 0.8 ±0.07 | 0.6 ±0.1 | 0.6 ±0.1 |            |      |
| 8.2       | 828                             |           |           |          |          |            |      |
| 10        | 109                             |           |           |          |          |            |      |
| 12        | 129                             |           |           |          |          |            |      |
| 15        | 159                             |           |           |          |          |            |      |
| 18        | 189                             |           |           |          |          |            |      |
| 22        | 229                             |           |           |          |          |            |      |
| 27        | 279                             |           |           |          |          | 0.5 to 1.0 |      |
| 33        | 339                             |           |           |          |          |            |      |
| 39        | 399                             |           |           |          |          |            |      |
| 47        | 479                             |           |           |          |          |            |      |
| 56        | 569                             |           |           |          |          |            |      |
| 68        | 689                             |           |           |          |          |            |      |
| 82        | 829                             |           |           |          |          |            |      |

#### Note

1. Values in shaded cells indicate thickness class.

# Surface-mount ceramic multilayer capacitors

## Class 1, NP0 50 V to 500V

### SELECTION CHART FOR 50 V (CONTINUED)

| C<br>(pF) | LAST THREE<br>DIGITS OF<br>12NC | 50 V      |           |           |           |            |            |
|-----------|---------------------------------|-----------|-----------|-----------|-----------|------------|------------|
|           |                                 | 0402      | 0603      | 0805      | 1206      | 1210       | 1812       |
| 100       | 101                             |           |           |           |           |            |            |
| 120       | 121                             |           |           |           |           |            |            |
| 150       | 151                             | 0.5 ±0.05 |           |           |           |            |            |
| 180       | 181                             |           |           |           |           |            |            |
| 220       | 221                             |           |           |           |           |            |            |
| 270       | 271                             |           | 0.8 ±0.07 |           |           |            |            |
| 330       | 331                             |           |           | 0.6 ±0.1  |           |            |            |
| 390       | 391                             |           |           |           |           |            |            |
| 470       | 471                             |           |           |           | 0.6 ±0.1  |            |            |
| 560       | 561                             |           |           |           |           |            |            |
| 680       | 681                             |           |           |           |           |            |            |
| 820       | 821                             |           |           |           |           |            |            |
| 1,000     | 102                             |           |           |           |           | 0.5 to 1.0 |            |
| 1,200     | 122                             |           |           |           |           |            |            |
| 1,500     | 152                             |           |           | 0.85 ±0.1 |           |            |            |
| 1,800     | 182                             |           |           |           |           |            |            |
| 2,200     | 222                             |           |           | 1.25 ±0.1 |           |            | 0.5 to 1.0 |
| 2,700     | 272                             |           |           |           |           |            |            |
| 3,300     | 332                             |           |           |           |           |            |            |
| 3,900     | 392                             |           |           |           | 0.85 ±0.1 |            |            |
| 4,700     | 472                             |           |           |           |           |            |            |
| 5,600     | 562                             |           |           |           | 1.15 ±0.1 |            |            |
| 6,800     | 682                             |           |           |           |           |            |            |
| 8,200     | 822                             |           |           |           |           |            |            |
| 10,000    | 103                             |           |           |           |           |            |            |
| 12,000    | 123                             |           |           |           |           |            |            |
| 15,000    | 153                             |           |           |           |           |            |            |
| 18,000    | 183                             |           |           |           |           |            | 0.9 to 1.3 |
| 22,000    | 223                             |           |           |           |           |            |            |

#### Note

1. Values in shaded cells indicate thickness class.

# Surface-mount ceramic multilayer capacitors

## Class 1, NP0 50 V to 500V

### Thickness classification and packing quantities

| THICKNESS<br>CLASSIFICATION<br>(mm) | 8 mm TAPE WIDTH<br>QUANTITY PER REEL |         |              |         | 12 mm TAPE<br>WIDTH<br>QUANTITY PER<br>REEL | QUANTITY PER BULK<br>CASE |        |        |
|-------------------------------------|--------------------------------------|---------|--------------|---------|---------------------------------------------|---------------------------|--------|--------|
|                                     | Ø180 mm; 7"                          |         | Ø330 mm; 13" |         | Ø180 mm; 7"<br>BLISTER                      |                           |        |        |
|                                     | PAPER                                | BLISTER | PAPER        | BLISTER | 1812                                        | 0402                      | 0603   | 0805   |
| 0.5 ±0.05                           | 10,000                               | –       | 50,000       | –       | –                                           | 50,000                    | –      | –      |
| 0.6 ±0.1                            | 4,000                                | –       | 20,000       | –       | –                                           | –                         | –      | 10,000 |
| 0.8 ±0.07                           | 4,000                                | –       | 15,000       | –       | –                                           | –                         | 15,000 | –      |
| 0.85 ±0.1                           | 4,000                                | –       | 15,000       | –       | –                                           | –                         | –      | 8,000  |
| 0.5 to 1.0                          | –                                    | 4,000   | –            | 10,000  | 2,000                                       | –                         | –      | –      |
| 0.9 to 1.3                          | –                                    | 3,000   | –            | 10,000  | 1 500                                       | –                         | –      | –      |
| 1.15 ±0.1                           | –                                    | 3,000   | –            | 10,000  | –                                           | –                         | –      | –      |
| 1.25 ±0.1                           | –                                    | 3,000   | –            | 10,000  | –                                           | –                         | –      | 5,000  |

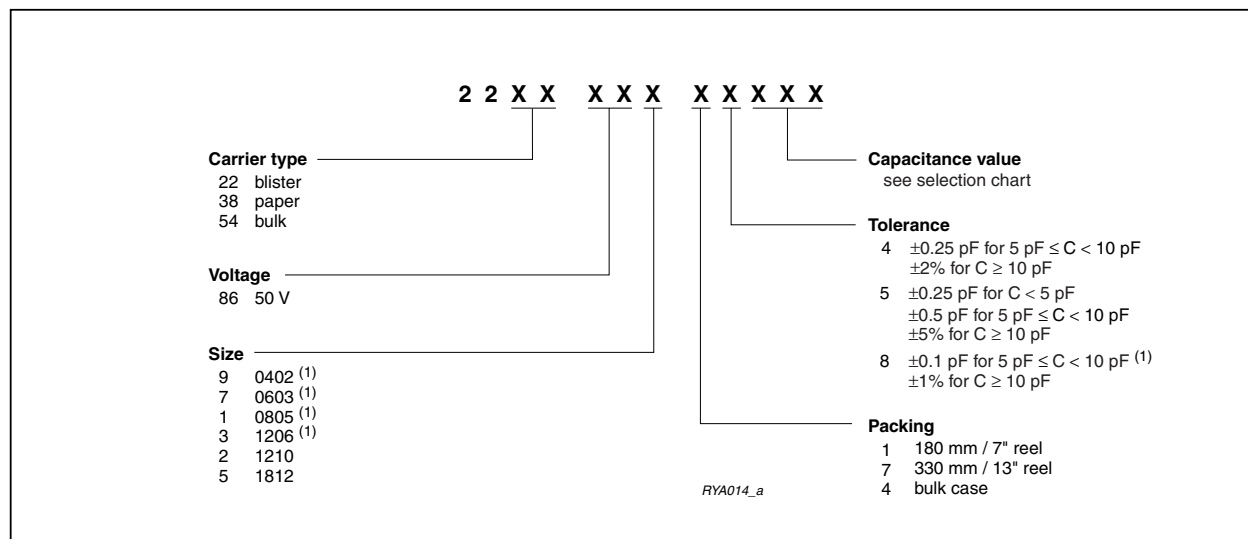
## Surface-mount ceramic multilayer capacitors

## Class 1, NP0 50 V to 500V

### ORDERING INFORMATION FOR 50 V

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

#### Ordering code 12NC (preferred)



#### Note

1. ±1 % only available in 0402, 0603, 0805, and 1206.

#### Clear text code

Example: 0805CG102J9B200

| Size Code                                                                                                | Temp. Char. | Capacitance                                                                                                                                   | Tol.                                                                         | Vol.     | Termination | Packing                                                                                                             | Marking        | Series            |
|----------------------------------------------------------------------------------------------------------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|----------|-------------|---------------------------------------------------------------------------------------------------------------------|----------------|-------------------|
| 0402 <sup>(1)</sup><br>0603 <sup>(1)</sup><br>0805 <sup>(1)</sup><br>1206 <sup>(1)</sup><br>1210<br>1812 | CG = NP0    | 102 = 1000 pF; the third digit signifies the multiplying factor:<br>8 = × 0.01<br>9 = × 0.1<br>0 = × 1<br>1 = × 10<br>2 = × 100<br>3 = × 1000 | B = ±0.1 pF<br>C = ±0.25 pF<br>D = ±0.5 pF<br>F = ±1 %<br>G = ±2%<br>J = ±5% | 9 = 50 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 | 0 = conv. ceramic |

#### Note

1. ±1 % only available in 0402, 0603, 0805, and 1206.

# Surface-mount ceramic multilayer capacitors

## Class 1, NP0 50 V to 500V

### SELECTION CHART FOR 100 V

| C<br>(pF) | LAST<br>TWO DIGITS<br>OF 12NC | 100 V     |          |          |      |      |
|-----------|-------------------------------|-----------|----------|----------|------|------|
|           |                               | 0603      | 0805     | 1206     | 1210 | 1812 |
| 10        | 23                            |           |          |          |      |      |
| 12        | 24                            |           |          |          |      |      |
| 15        | 25                            |           |          |          |      |      |
| 18        | 26                            |           |          |          |      |      |
| 22        | 27                            |           |          |          |      |      |
| 27        | 28                            |           |          |          |      |      |
| 33        | 29                            |           |          |          |      |      |
| 39        | 31                            |           |          |          |      |      |
| 47        | 32                            |           |          |          |      |      |
| 56        | 33                            |           |          |          |      |      |
| 68        | 34                            |           |          |          |      |      |
| 82        | 35                            | 0.8 ±0.07 | 0.6 ±0.1 | 0.6 ±0.1 |      |      |
| 100       | 36                            |           |          |          |      |      |
| 120       | 37                            |           |          |          |      |      |
| 150       | 38                            |           |          |          |      |      |
| 180       | 39                            |           |          |          |      |      |
| 220       | 41                            |           |          |          |      |      |
| 270       | 42                            |           |          |          |      |      |
| 330       | 43                            |           |          |          |      |      |
| 390       | 44                            |           |          |          |      |      |
| 470       | 45                            |           |          |          |      |      |
| 560       | 46                            |           |          |          |      |      |
| 680       | 47                            |           |          |          |      |      |
| 820       | 48                            |           |          |          |      |      |

### Note

1. Values in shaded cells indicate thickness class.

**Surface-mount ceramic  
multilayer capacitors**
**Class 1, NP0  
50 V to 500V**
**SELECTION CHART FOR 100 V (CONTINUED)**

| C<br>(pF) | LAST<br>TWO DIGITS<br>OF 12NC | 100 V |           |           |            |            |
|-----------|-------------------------------|-------|-----------|-----------|------------|------------|
|           |                               | 0603  | 0805      | 1206      | 1210       | 1812       |
| 1,000     | 49                            |       | 0.6 ±0.1  |           |            |            |
| 1,200     | 51                            |       |           |           |            |            |
| 1,500     | 52                            |       | 0.85 ±0.1 | 0.6 ±0.1  |            |            |
| 1,800     | 53                            |       |           |           |            |            |
| 2,200     | 54                            |       | 1.25 ±0.1 |           |            |            |
| 2,700     | 55                            |       |           |           |            |            |
| 3,300     | 56                            |       |           |           |            |            |
| 3,900     | 57                            |       |           | 0.85 ±0.1 |            |            |
| 4,700     | 58                            |       |           |           |            |            |
| 5,600     | 59                            |       |           | 1.15 ±0.1 |            |            |
| 6,800     | 61                            |       |           |           |            |            |
| 8,200     | 62                            |       |           |           | 0.5 to 1.0 |            |
| 10,000    | 63                            |       |           |           |            |            |
| 12,000    | 64                            |       |           |           |            | 0.5 to 1.0 |
| 15,000    | 65                            |       |           |           |            |            |
| 18,000    | 66                            |       |           |           |            | 0.9 to 1.3 |
| 22,000    | 67                            |       |           |           |            |            |

**Note**

1. Values in shaded cells indicate thickness class.

# Surface-mount ceramic multilayer capacitors

## Class 1, NP0 50 V to 500V

### SELECTION CHART FOR 200 V AND 250 V

| C<br>(pF) | LAST TWO<br>DIGITS OF<br>12NC | 200 V     |           |            |            | 250 V     |           |            |            |
|-----------|-------------------------------|-----------|-----------|------------|------------|-----------|-----------|------------|------------|
|           |                               | 0805      | 1206      | 1210       | 1812       | 0805      | 1206      | 1210       | 1812       |
| 10        | 23                            |           |           |            |            |           |           |            |            |
| 12        | 24                            |           |           |            |            |           |           |            |            |
| 15        | 25                            |           |           |            |            |           |           |            |            |
| 18        | 26                            |           |           |            |            |           |           |            |            |
| 22        | 27                            |           |           |            |            |           |           |            |            |
| 27        | 28                            |           |           |            |            |           |           |            |            |
| 33        | 29                            |           |           |            |            |           |           |            |            |
| 39        | 31                            |           |           |            |            |           |           |            |            |
| 47        | 32                            | 0.6 ±0.1  | 0.6 ±0.1  |            |            | 0.6 ±0.1  | 0.6 ±0.1  |            |            |
| 56        | 33                            |           |           |            |            |           |           |            |            |
| 68        | 34                            |           |           |            |            |           |           |            |            |
| 82        | 35                            |           |           |            |            |           |           |            |            |
| 100       | 36                            |           |           |            |            |           |           |            |            |
| 120       | 37                            |           |           |            |            |           |           |            |            |
| 150       | 38                            |           |           |            |            |           |           |            |            |
| 180       | 39                            |           |           |            |            |           |           |            |            |
| 220       | 41                            |           |           |            |            |           |           |            |            |
| 270       | 42                            |           |           |            |            |           |           |            |            |
| 330       | 43                            | 0.85 ±0.1 |           |            |            | 0.85 ±0.1 |           |            |            |
| 390       | 44                            |           |           |            |            |           |           |            |            |
| 470       | 45                            |           | 0.85 ±0.1 |            |            |           | 0.85 ±0.1 |            |            |
| 560       | 46                            | 1.25 ±0.1 |           |            |            | 1.25 ±0.1 |           |            |            |
| 680       | 47                            |           |           |            |            |           |           |            |            |
| 820       | 48                            |           |           |            |            |           |           |            |            |
| 1,000     | 49                            |           |           |            |            |           |           |            |            |
| 1,200     | 51                            |           |           |            |            |           |           |            |            |
| 1,500     | 52                            |           | 1.15 ±0.1 |            |            |           | 1.15 ±0.1 |            |            |
| 1,800     | 53                            |           |           | 0.8 to 1.0 |            |           |           | 0.8 to 1.0 |            |
| 2,200     | 54                            |           |           |            |            |           |           |            |            |
| 2,700     | 55                            |           |           | 0.9 to 1.3 |            |           |           | 0.9 to 1.3 |            |
| 3,300     | 56                            |           |           |            |            |           |           |            |            |
| 3,900     | 57                            |           |           |            | 0.8 to 1.0 |           |           |            | 0.8 to 1.0 |
| 4,700     | 58                            |           |           |            | 0.9 to 1.3 |           |           |            | 0.9 to 1.3 |
| 5,600     | 59                            |           |           |            |            |           |           |            |            |

#### Note

1. Values in shaded cells indicate thickness class.

# Surface-mount ceramic multilayer capacitors

## Class 1, NP0 50 V to 500V

### SELECTION CHART FOR 500 V

| C<br>(pF) | LAST TWO<br>DIGITS OF<br>12NC | 500 V     |             |            |
|-----------|-------------------------------|-----------|-------------|------------|
|           |                               | 1206      | 1210        | 1812       |
| 10        | 23                            |           |             |            |
| 12        | 24                            |           |             |            |
| 15        | 25                            |           |             |            |
| 18        | 26                            |           |             |            |
| 22        | 27                            |           |             |            |
| 27        | 28                            |           |             |            |
| 33        | 29                            |           |             |            |
| 39        | 31                            |           |             |            |
| 47        | 32                            | 0.6 ±0.1  |             |            |
| 56        | 33                            |           |             |            |
| 68        | 34                            |           |             |            |
| 82        | 35                            |           |             |            |
| 100       | 36                            |           |             |            |
| 120       | 37                            |           |             |            |
| 150       | 38                            |           |             |            |
| 180       | 39                            |           |             |            |
| 220       | 41                            |           | 0.8 to 1.0  |            |
| 270       | 42                            |           |             |            |
| 330       | 43                            | 0.85 ±0.1 |             |            |
| 390       | 44                            |           |             |            |
| 470       | 45                            |           |             |            |
| 560       | 46                            |           |             |            |
| 680       | 47                            | 1.15 ±0.1 |             |            |
| 820       | 48                            |           |             |            |
| 1,000     | 49                            |           |             |            |
| 1,200     | 51                            |           | 0.9 to 1.3  |            |
| 1,500     | 52                            |           |             |            |
| 1,800     | 53                            |           | 1.2 to 1.75 |            |
| 2,200     | 54                            |           |             |            |
| 2,700     | 55                            |           |             | 0.9 to 1.3 |
| 3,300     | 56                            |           |             |            |
| 3,900     | 57                            |           |             |            |
| 4,700     | 58                            |           |             |            |
| 5,600     | 59                            |           |             |            |

#### Note

1. Values in shaded cells indicate thickness class.

# Surface-mount ceramic multilayer capacitors

## Class 1, NP0 50 V to 500V

### Thickness classification and packing quantities

| THICKNESS<br>CLASSIFICATION<br>(mm) | 8 mm TAPE WIDTH<br>QUANTITY PER REEL |         |              |         | 12 mm TAPE WIDTH<br>QUANTITY PER REEL | QUANTITY PER<br>BULK CASE |        |
|-------------------------------------|--------------------------------------|---------|--------------|---------|---------------------------------------|---------------------------|--------|
|                                     | Ø180 mm; 7"                          |         | Ø330 mm; 13" |         | Ø180 mm; 7" BLISTER                   |                           |        |
|                                     | PAPER                                | BLISTER | PAPER        | BLISTER | 1812                                  | 0603                      | 0805   |
| 0.6 ±0.1                            | 4,000                                | –       | 20,000       | –       | –                                     | –                         | 10,000 |
| 0.8 ±0.07                           | 4,000                                | –       | 15,000       | –       | –                                     | 15,000                    | –      |
| 0.85 ±0.1                           | 4,000                                | –       | 15,000       | –       | –                                     | –                         | 8,000  |
| 0.8 to 1.0                          | –                                    | 4,000   | –            | 10,000  | 2,000                                 | –                         | –      |
| 0.9 to 1.3                          | –                                    | 3,000   | –            | 10,000  | 1 500                                 | –                         | –      |
| 1.15 ±0.1                           | –                                    | 3,000   | –            | 10,000  | –                                     | –                         | –      |
| 1.25 ±0.1                           | –                                    | 3,000   | –            | 10,000  | –                                     | –                         | 5,000  |
| 1.2 to 1.75                         | –                                    | 2 500   | –            | 10,000  | 1 200                                 | –                         | –      |

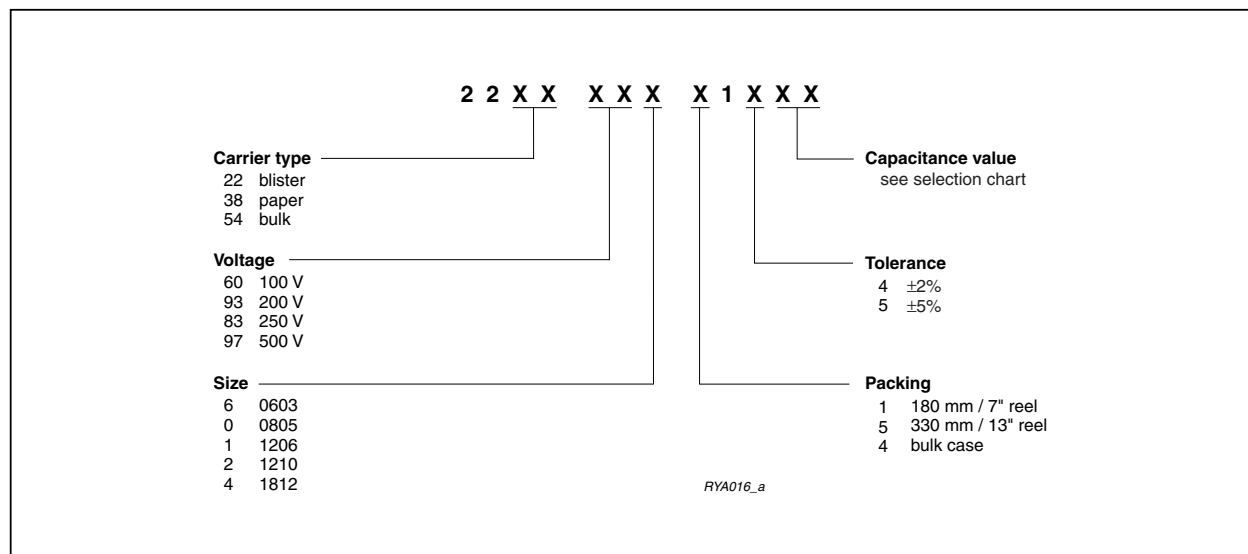
## Surface-mount ceramic multilayer capacitors

**Class 1, NP0**  
**50 V to 500V**

### ORDERING INFORMATION FOR 100 V TO 500 V

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

#### Ordering code 12NC (preferred)



#### Clear text code

Example: 1206CG102GBB200

| Size Code                    | Temp. Char. | Capacitance                                                                                                                                             | Tol.                           | Vol.                                             | Termination | Packing                                                                                                             | Marking        | Series               |
|------------------------------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|--------------------------------------------------|-------------|---------------------------------------------------------------------------------------------------------------------|----------------|----------------------|
| 0805<br>1206<br>1210<br>1812 | CG = NP0    | 102 = 1000 pF;<br>the third digit<br>signifies the<br>multiplying factor:<br>0 = $\times 1$<br>1 = $\times 10$<br>2 = $\times 100$<br>3 = $\times 1000$ | G = $\pm 2\%$<br>J = $\pm 5\%$ | 0 = 100 V<br>B = 200 V<br>C = 250 V<br>D = 500 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 | 0 = conv.<br>ceramic |

## Surface-mount ceramic multilayer capacitors

**Class 1, NP0**  
**50 V to 500V**

### ELECTRICAL CHARACTERISTICS

#### Class 1 capacitors; NP0 dielectric; NiSn terminations

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

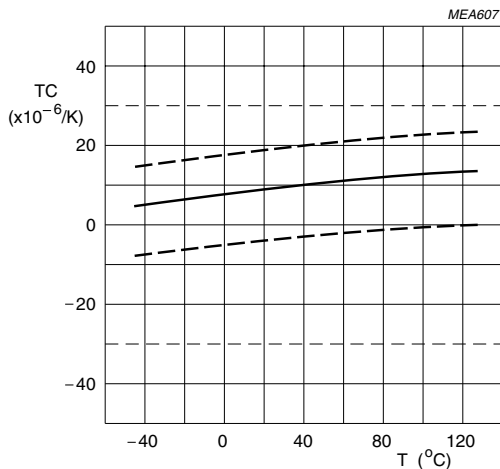
| DESCRIPTION                                        | VALUE                                                                                                    |
|----------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| Capacitance range (E12 series); note 1             |                                                                                                          |
| 50 V                                               | 0.47 pF to 22 nF                                                                                         |
| 100 V                                              | 10 pF to 22 nF                                                                                           |
| 200 V                                              | 10 pF to 5.6 nF                                                                                          |
| 500 V                                              | 10 pF to 3.3 nF                                                                                          |
| Tolerance on capacitance after 1,000 hours         |                                                                                                          |
| $C \geq 10$ pF                                     | $\pm 5\%$ ; $\pm 2\%$                                                                                    |
| $5 \text{ pF} \leq C < 10 \text{ pF}$              | $\pm 0.5$ pF, $\pm 0.25$ pF                                                                              |
| $C < 5$ pF                                         | $\pm 0.25$ pF                                                                                            |
| Tan $\delta$ ; note 1                              |                                                                                                          |
| $C < 10$ pF                                        | $\leq 10 \left( \frac{3}{C} + 0.7 \right) \times 10^{-4}$ or $30 \times 10^{-4}$ , whichever is smallest |
| $C \geq 10$ pF                                     | $\leq 10 \times 10^{-4}$                                                                                 |
| Insulation resistance after 1 minute at $U_r$ (DC) | $R_{ins} > 10 \text{ G}\Omega$                                                                           |
| Temperature coefficient:                           |                                                                                                          |
| $C < 10$ pF                                        | $(0 \pm 150) \times 10^{-6}/\text{K}$ ; note 2                                                           |
| $C \geq 10$ pF                                     | $(0 \pm 30) \times 10^{-6}/\text{K}$ ; note 2                                                            |
| Ageing                                             | not applicable                                                                                           |

#### Notes

1. Measured at 1 V, 1 MHz for  $C \leq 1000$  pF and 1 V, 1 kHz for  $C > 1,000$  pF, using a four-gauge method.
2. For sizes 0402 and 0603 all capacitance values from 0.47 pF to 150 pF have a temperature coefficient of  $(0 \pm 30) \times 10^{-6}/\text{K}$ .

# Surface-mount ceramic multilayer capacitors

## Class 1, NP0 50 V to 500V



Sample limits (broken lines).  
Requirement levels (dotted lines).

Fig.3 Typical temperature coefficient as a function of temperature.

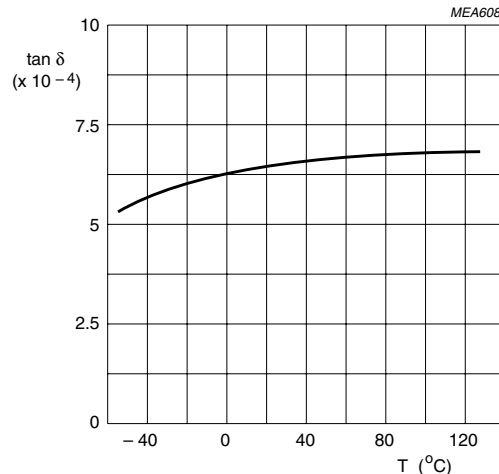


Fig.4 Typical  $\tan \delta$  as a function of temperature.

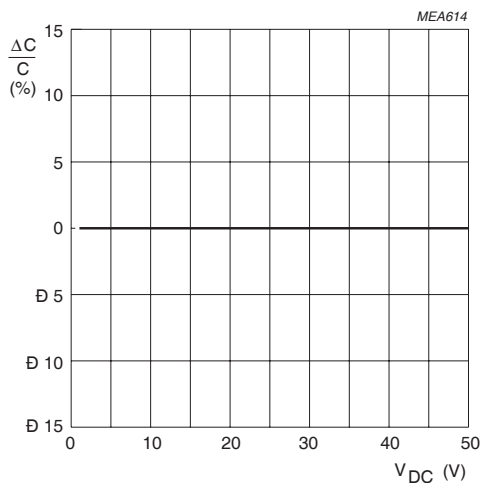
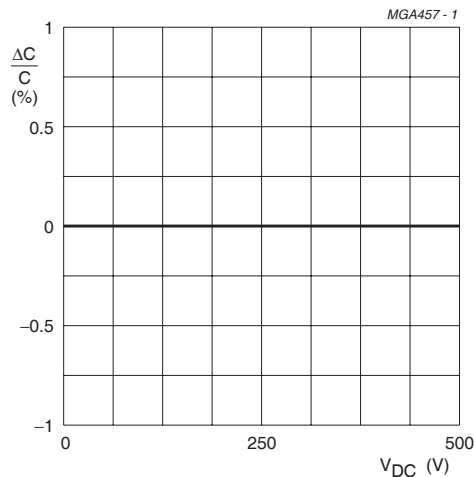


Fig.5 Typical capacitance change with respect to the capacitance at 1 V as a function of DC voltage.



High voltage series.

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

**Surface-mount ceramic  
multilayer capacitors****Class 1, NP0  
50 V to 500V****REVISION HISTORY**

| Revision | Date        | Change Notification | Description                                                                                                                                                                                                                                                                                             |
|----------|-------------|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Rev.6    | 2001 Jul 16 | —                   | <ul style="list-style-type: none"><li>- Converted to Phycomp brand</li><li>- Highest value in 50 V range reduced from 47 nF to 33 nF</li><li>- Various thickness classes corrected</li><li>- Products in 2020 case size removed</li><li>- AgPd finishing for terminations no longer supported</li></ul> |
| Rev.7    | 2003 Mar 21 | -                   | - Updated company logo                                                                                                                                                                                                                                                                                  |
| Rev.8    | 2003 Jul 24 | -                   | - Cover page revised                                                                                                                                                                                                                                                                                    |
| Rev.9    | 2004 Apr 27 | -                   | - "Silver palladium (AgPd)" in the description on page 2 deleted                                                                                                                                                                                                                                        |
| Rev.10   | 2004 Jul 06 | -                   | - Insulation resistance updated!!                                                                                                                                                                                                                                                                       |



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### Product Detail Information

|                          |                                                            |
|--------------------------|------------------------------------------------------------|
| Product Group            | Multilayer Capacitor Chips and Arrays                      |
| Ordering Code            | CC1206ZRY5V9BB104                                          |
| Ordering Code            | 223858119812                                               |
| Unified CTC              | C1206ZRY5V9BB104                                           |
| Additional Product Code  | 12062F104Z9B20D                                            |
| Description              | General purpose, 1206, Y5V, 100nF, -20/+80%, 50V, 7" paper |
| Status                   | Standard                                                   |
| Size Code                | 1206                                                       |
| Capacitance Tolerance    | -20/+80%                                                   |
| Packing Style            | Paper Tape & 180mm (7") Reel                               |
| Dielectric Material (TC) | Y5V                                                        |
| Rated Voltage            | 50V                                                        |
| Capacitance              | 100 nF                                                     |

Related Data Sheets, Catalogs and Application Notes:

[Datasheet - Y5V 16/25/50 V, Rev.11 \[246 kb\]](#)

[Product Selection Guide 2008 \(revision 1\) \[3.65 MB\]](#)

[Yageo Passive Components 2008 \[3.26 mb\]](#)

[Environmental declaration](#)

[Appl. note - DC, AC and Pulse load of Multilayer Ceramic Capacitors \[308 kb\]](#)

[MLCC sample kits \[177 kb\]](#)

[Appl. manual - MLCC application manual \[577 kb\]](#)

[Datasheet - MLCC introduction, Rev.9 \[98 kb\]](#)

[Datasheet - MLCC general data of packing, labelling, mounting, tests & requirements; Rev.7 \[159 kb\]](#)

[Flowchart - Quality Flowchart, Rev.4 \[80kb\]](#)

[Calculation tool - MLCC Spice Data](#)

[General info - Standard Values in a Decade \[8.39 kb\]](#)

[Requirements, Rev.7 \[158 kb\]](#)

For optimal printing of Data sheets print from page 2 of the PDF.

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