

# DATA SHEET

## SURFACE-MOUNT CERAMIC MULTILAYER CAPACITORS

Class 2, Y5V

16/25/50 V



## Surface-mount ceramic multilayer capacitors

**Class 2, Y5V**  
**16/25/50 V**

### FEATURES

- Five standard sizes
- High capacitance per unit volume
- Supplied in tape on reel
- NiSn terminations.

### APPLICATIONS

- Consumer electronics, for example:
  - Tuners
  - Television receivers
  - Video recorders
  - All types of cameras
  - Mobile telephones.

### DESCRIPTION

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

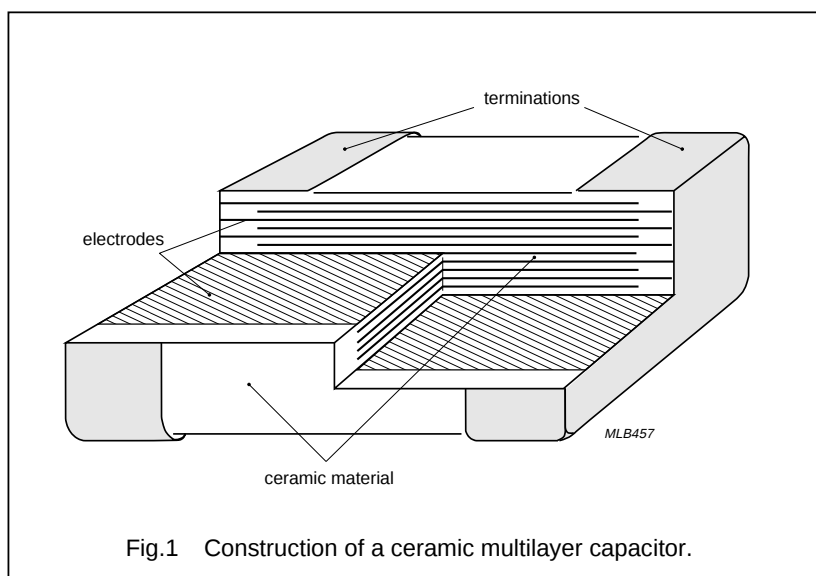
The inner electrodes are connected to the two terminations and finally covered with a layer of plated tin (NiSn). A cross section of the structure is shown in Fig.1.

### QUICK REFERENCE DATA

| DESCRIPTION                     | VALUE                                  |
|---------------------------------|----------------------------------------|
| Rated voltage $U_R$ (DC)        | 16 V, 25 V, 50 V                       |
| Capacitance range (E6 series)   | 10 nF to 10 $\mu$ F; note 1            |
| Tolerance on capacitance        | $\pm 20\%$ (M); $-20\%$ to $+80\%$ (Z) |
| Test voltage (DC) for 1 minute: | $2.5 \times U_R$                       |
| Sectional specifications        | IEC 60384-10, second edition 1989-04   |
| Detailed specification          | based on IEC 60384-10-1                |
| End terminations                | NiSn                                   |
| Climatic category (IEC 60068)   | 30/85/21                               |

### Note

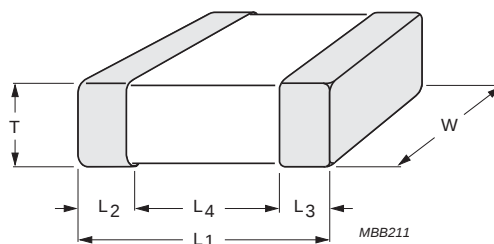
1. Measured at 25 °C, 1 V and 1 kHz, using a four-gauge method.



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## MECHANICAL DATA



For dimensions see Table 1.

Fig.2. Component outline.

## Physical dimensions

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

| 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  | 0.15                                | 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  | 1.75  | 0.25                                | 0.75  | 1.40                   |
| 1210                      | 3.2 ±0.20      | 2.5 ±0.20    | 1.40  | 1.60  | 0.25                                | 0.75  | 1.40                   |
| 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 | 0.069 | 0.010                               | 0.030 | 0.056                  |
| 1210                      | 0.126 ±0.008   | 0.098 ±0.008 | 0.047 | 0.069 | 0.010                               | 0.030 | 0.056                  |

# Surface-mount ceramic multilayer capacitors

## Class 2, Y5V 16/25/50 V

### SELECTION CHART FOR 16 V AND 25 V

| C<br>(nF) | LAST<br>TWO<br>DIGITS<br>OF<br>12NC | 16 V      |           |           |           |          | 25 V      |           |           |          |
|-----------|-------------------------------------|-----------|-----------|-----------|-----------|----------|-----------|-----------|-----------|----------|
|           |                                     | 0402      | 0603      | 0805      | 1206      | 1210     | 0603      | 0805      | 1206      | 1210     |
| 1         | 23                                  |           |           |           |           |          |           |           |           |          |
| 1.5       | 25                                  |           |           |           |           |          |           |           |           |          |
| 2.2       | 27                                  |           |           |           |           |          |           |           |           |          |
| 3.3       | 29                                  |           |           |           |           |          |           |           |           |          |
| 4.7       | 32                                  |           |           |           |           |          |           |           |           |          |
| 6.8       | 34                                  |           |           |           |           |          |           |           |           |          |
| 10        | 36                                  |           |           |           |           |          |           |           |           |          |
| 15        | 38                                  |           |           |           |           |          |           |           |           |          |
| 22        | 41                                  |           |           |           |           |          | 0.8 ±0.07 |           |           |          |
| 33        | 43                                  | 0.5 ±0.05 |           |           |           |          |           |           |           |          |
| 47        | 45                                  |           |           |           |           |          |           |           |           |          |
| 68        | 47                                  |           |           |           |           |          |           |           |           |          |
| 100       | 49                                  |           |           |           |           |          |           | 0.6 ±0.1  |           |          |
| 150       | 52                                  |           |           |           |           |          |           | 0.85 ±0.1 |           |          |
| 220       | 54                                  |           | 0.8 ±0.07 |           |           |          |           |           | 0.6 ±0.1  |          |
| 330       | 56                                  |           |           |           |           |          |           |           |           |          |
| 470       | 58                                  |           |           | 0.85 ±0.1 |           |          |           |           | 0.85 ±0.1 |          |
| 680       | 61                                  |           |           |           |           |          |           | 1.25 ±0.1 |           |          |
| 1 000     | 63                                  |           |           |           | 0.85 ±0.1 |          |           |           | 1.15 ±0.1 |          |
| 1 500     | 65                                  |           |           | 1.25 ±0.1 |           |          |           |           |           |          |
| 2 200     | 67                                  |           |           |           |           |          |           |           |           |          |
| 3 300     | 69                                  |           |           |           | 1.15 ±0.1 |          |           |           |           |          |
| 4 700     | 72                                  |           |           |           |           |          |           |           |           |          |
| 10 000    | 76                                  |           |           |           |           | 1.5 ±0.1 |           |           |           | 1.5 ±0.1 |

#### Note

1. Values in shaded cells indicate thickness class in mm.

# Surface-mount ceramic multilayer capacitors

# Class 2, Y5V 16/25/50 V

## SELECTION CHART FOR 50 V

| C<br>(nF) | LAST<br>TWO<br>DIGITS<br>OF<br>12NC | 50 V      |           |           |
|-----------|-------------------------------------|-----------|-----------|-----------|
|           |                                     | 0603      | 0805      | 1206      |
| 10        | 05                                  |           |           |           |
| 15        | 06                                  |           |           |           |
| 22        | 07                                  |           |           |           |
| 33        | 08                                  | 0.8 ±0.07 | 0.6 ±0.1  |           |
| 47        | 09                                  |           |           |           |
| 68        | 11                                  |           |           |           |
| 100       | 12                                  |           |           |           |
| 150       | 13                                  |           | 0.85 ±0.1 | 0.6 ±0.1  |
| 220       | 14                                  |           |           |           |
| 330       | 15                                  |           | 1.25 ±0.1 |           |
| 470       | 16                                  |           |           | 0.85 ±0.1 |
| 680       | 17                                  |           |           |           |
| 1 000     | 18                                  |           |           | 1.15 ±0.1 |

### Note

1. Values in shaded cells indicate thickness class in mm.

### Thickness classification and packing quantities

| THICKNESS<br>CLASSIFICATION<br>(mm) | 8 mm TAPE WIDTH QUANTITY PER REEL |         |              |         | QUANTITY PER BULK CASE |        |        |
|-------------------------------------|-----------------------------------|---------|--------------|---------|------------------------|--------|--------|
|                                     | Ø180 mm; 7"                       |         | Ø330 mm; 13" |         | 0402                   | 0603   | 0805   |
|                                     | PAPER                             | BLISTER | PAPER        | BLISTER |                        |        |        |
| 0.5 ±0.05                           | 10 000                            | –       | 50 000       | –       | 50 000                 | –      | –      |
| 0.6 ±0.10                           | 4 000                             | –       | 20 000       | –       | –                      | –      | 10 000 |
| 0.8 ±0.07                           | 4 000                             | –       | 15 000       | –       | –                      | 15 000 | –      |
| 0.85 ±0.10                          | 4 000                             | –       | 15 000       | –       | –                      | 15 000 | 8 000  |
| 1.15 ±0.10                          | –                                 | 3 000   | –            | 10 000  | –                      | –      | –      |
| 1.25 ±0.10                          | –                                 | 3 000   | –            | 1 000   | –                      | –      | 5 000  |
| 1.5 ±0.10                           | –                                 | 3 000   | –            | –       | –                      | –      | –      |

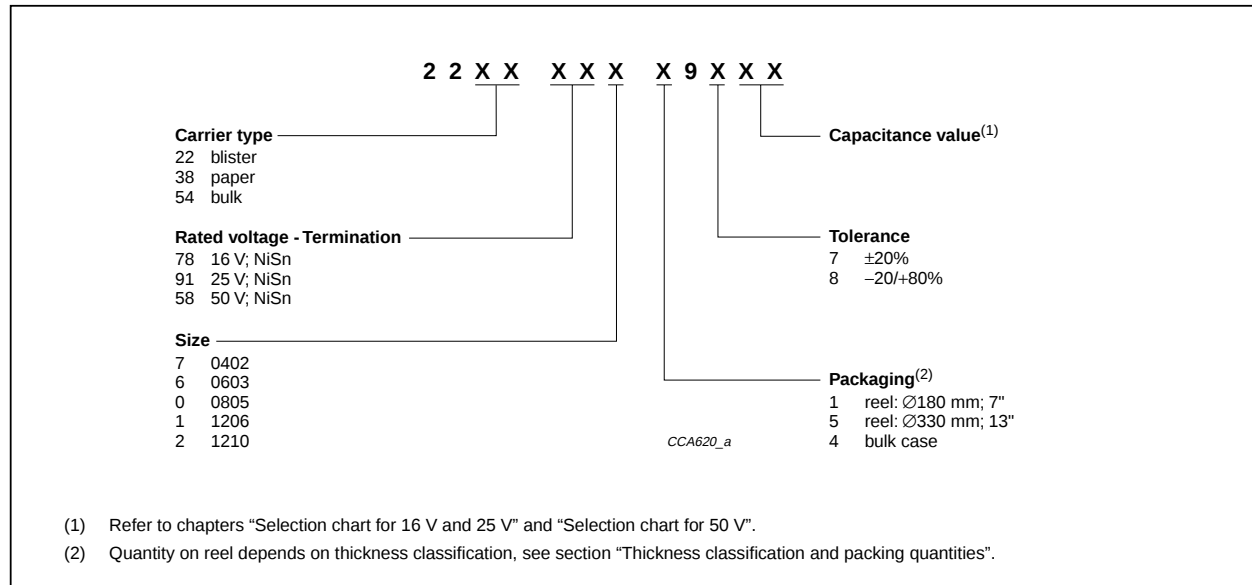
# Surface-mount ceramic multilayer capacitors

## Class 2, Y5V 16/25/50 V

### ORDERING INFORMATION

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

#### Ordering code 12NC (preferred)



#### Phycomp Clear text code

EXAMPLE: 12062F105M8BB0D

| Size Code                            | Temp. Char. | Capacitance                                                                                                                                                                               | Tol.                                  | Vol.                             | Termination | Packing                                                                                                             | Marking        | Series  |
|--------------------------------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|----------------------------------|-------------|---------------------------------------------------------------------------------------------------------------------|----------------|---------|
| 0402<br>0603<br>0805<br>1206<br>1210 | 2F = Y5V    | 105 = 1000000 pF; the third digit signifies the multiplying factor:<br>2 = $\times 100$<br>3 = $\times 1000$<br>4 = $\times 10\,000$<br>5 = $\times 100\,000$<br>6 = $\times 1\,000\,000$ | M = $\pm 20\%$<br>Z = $-20\% / +80\%$ | 7 = 16 V<br>8 = 25 V<br>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 | D = BME |

## Surface-mount ceramic multilayer capacitors

**Class 2, Y5V**  
**16/25/50 V**

## ELECTRICAL CHARACTERISTICS

**Class 2 capacitors; Y5V dielectric; NiSn terminations**

Unless otherwise stated all electrical values apply at an ambient temperature of  $25 \pm 1$  °C, an atmospheric pressure of 86 to 105 kPa, and a relative humidity of 63 to 67%.

| DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                           | VALUE                                                                                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| Capacitance range (E6 series); note 1                                                                                                                                                                                                                                                                                                                                                                                                                 | 10 nF to 10 $\mu$ F                                                                    |
| Tolerance on capacitance after 1000 hours                                                                                                                                                                                                                                                                                                                                                                                                             | $\pm 20\%$ (M); $-20\%$ to $+80\%$ (Z)                                                 |
| Tan $\delta$ ; note 1:<br>all 25 V and 50 V<br>except 0805 $\geq 330$ nF; 0603 /100 nF; 1206 /1 $\mu$ F; 1210 /10 $\mu$ F<br>sizes 0805 / 330 nF; 0603 / 100 nF; 1206 /1 F<br>25 V<br>0805 $\geq 470$ nF<br>1210 /10 $\mu$ F<br>all 16 V<br>except 0402; 0603 $\geq 330$ nF; 0805 $\geq 1.5$ $\mu$ F; 1206 $\geq 3.3$ $\mu$ F; 1210 /10 $\mu$ F<br>sizes 0402; 0603 $\geq 330$ nF; 0805 $\geq 1.5$ $\mu$ F; 1206 $\geq 3.3$ $\mu$ F; 1210 /10 $\mu$ F | $\leq 5\%$<br>$\leq 7\%$<br>$\leq 9\%$<br>$\leq 12.5\%$<br>$\leq 9\%$<br>$\leq 12.5\%$ |
| Insulation resistance after 1 minute at $U_R$ (DC):                                                                                                                                                                                                                                                                                                                                                                                                   | $R_{ins} > 10$ G $\Omega$ or $R_{ins} \times C \geq 500$ seconds whichever is less     |
| Maximum capacitance change with respect to capacitance at 25 $^{\circ}$ C (for typical values see Fig.5)                                                                                                                                                                                                                                                                                                                                              | $+22\%$ to $-82\%$                                                                     |
| Ageing                                                                                                                                                                                                                                                                                                                                                                                                                                                | typical 7% per time decade                                                             |
| Resistance to soldering heat                                                                                                                                                                                                                                                                                                                                                                                                                          | 260 $^{\circ}$ C; 10 seconds                                                           |

### Note

1. Measured at 25 °C, 1 V, 1 kHz, using a four-gauge method.

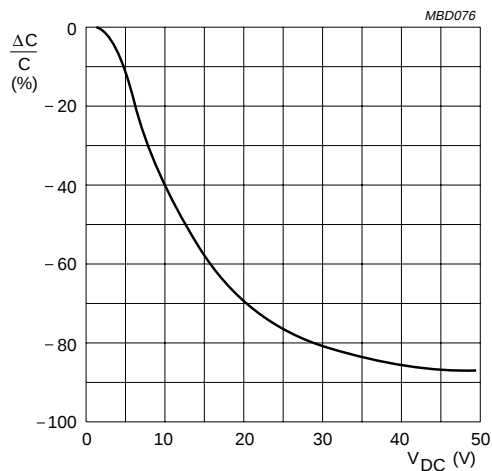
**Surface-mount ceramic  
multilayer capacitors****Class 2, Y5V  
16/25/50 V**

Fig.3 Typical capacitance change with respect to the capacitance at 1 V as a function of DC voltage at 25 °C.

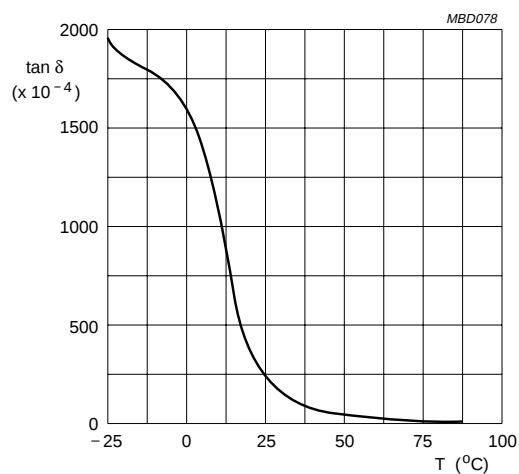


Fig.4 Typical  $\tan \delta$  as a function of temperature.

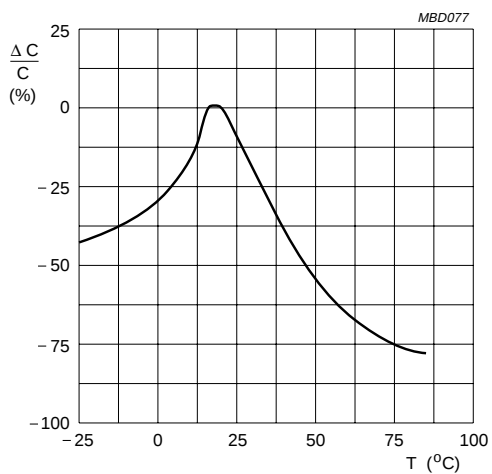


Fig.5 Typical capacitance change as a function of temperature.

# Surface-mount ceramic multilayer capacitors

## Class 2, Y5V 16/25/50 V

### TESTS AND REQUIREMENTS

**Table 2** Test procedures and requirements

| IEC<br>60384-10/<br>CECC 32 100<br>CLAUSE | IEC<br>60068-2<br>TEST<br>METHOD | TEST                                  | PROCEDURE                                                                                                                                                                            | REQUIREMENTS                                                                                                                                                          |
|-------------------------------------------|----------------------------------|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4.4                                       |                                  | mounting                              | the capacitors may be mounted on printed-circuit boards or ceramic substrates by applying wave soldering, reflow soldering (including vapour phase soldering) or conductive adhesive | no visible damage                                                                                                                                                     |
| 4.5                                       |                                  | visual inspection and dimension check | any applicable method using $\times 10$ magnification                                                                                                                                | in accordance with specification                                                                                                                                      |
| 4.6.1                                     |                                  | capacitance                           | $f = 1 \text{ kHz}$ ; Y5V measuring voltage $1 V_{\text{rms}}$ at $25^\circ\text{C}$                                                                                                 | within specified tolerance                                                                                                                                            |
| 4.6.2                                     |                                  | $\tan \delta$                         | $f = 1 \text{ kHz}$ ; Y5V measuring voltage $1 V_{\text{rms}}$ at $25^\circ\text{C}$                                                                                                 | in accordance with specification                                                                                                                                      |
| 4.6.3                                     |                                  | insulation resistance                 | at $U_R$ (DC) for 1 minute                                                                                                                                                           | $R_{\text{ICR}} \geq 500 \text{ s}$                                                                                                                                   |
| 4.6.4                                     |                                  | voltage proof                         | $2.5 \times U_R$ for 1 minute                                                                                                                                                        | no breakdown or flashover                                                                                                                                             |
| 4.7.1                                     |                                  | temperature coefficient               | between minimum and maximum temperature                                                                                                                                              | in accordance with specification                                                                                                                                      |
| 4.8                                       |                                  | adhesion                              | a force of 5 N applied for 10 s to the line joining the terminations and in a plane parallel to the substrate                                                                        | no visible damage                                                                                                                                                     |
| 4.9                                       |                                  | bond strength of plating on end face  | mounted in accordance with IEC 60384-1, paragraph 4.35                                                                                                                               | no visible damage                                                                                                                                                     |
|                                           |                                  |                                       | conditions:<br>bending 1 mm at a rate of 1 mm/s, radius jig 340 mm                                                                                                                   | $\Delta C/C: \leq 30\%$                                                                                                                                               |
| 4.10                                      | Tb                               | resistance to soldering heat          | preconditioning:<br>120 to $150^\circ\text{C}$ during 1 minute;<br>$260 \pm 5^\circ\text{C}$ for $10 \pm 0.5 \text{ s}$ in a static solder bath                                      | the terminations shall be well tinned<br>after recovery $\Delta C/C: \pm 20\%$<br>$\tan \delta$ : original specification<br>$R_{\text{ins}}$ : original specification |
|                                           |                                  | resistance to leaching                | $260 \pm 5^\circ\text{C}$ for $30 \pm 1 \text{ s}$ in a static solder bath                                                                                                           | using visual enlargement of $\times 10$ , dissolution of the terminations shall not exceed 10%                                                                        |

# Surface-mount ceramic multilayer capacitors

## Class 2, Y5V 16/25/50 V

| IEC<br>60384-10/<br>CECC 32 100<br>CLAUSE | IEC<br>60068-2<br>TEST<br>METHOD | TEST                        | PROCEDURE                                                                                                                                                                                              | REQUIREMENTS                                                                                                                                                                                                                         |
|-------------------------------------------|----------------------------------|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4.11                                      | Ta                               | solderability               | zero hour test, and test after storage (20 to 24 months) in original packing in normal atmosphere;<br>unmounted chips completely immersed for $2 \pm 0.5$ s in a solder bath at $235 \pm 5$ °C         | the terminations shall be well tinned                                                                                                                                                                                                |
| 4.12                                      | Na                               | rapid change of temperature | preconditioning:<br>between minimum and maximum temperature, 5 cycles                                                                                                                                  | no visible damage after 48 hours recovery:<br>$\Delta^\circ\text{C}/\text{C}$ : $\leq \pm 20\%$                                                                                                                                      |
| 4.14                                      | Ca                               | damp heat, steady state     | initialization:<br>48 $\pm$ 4 hours after $U_R$ at 40 °C for 1 hour (for initial value measurement);<br>500 $\pm$ 12 hours at 40 °C;<br>90 to 95% RH; $U_R$ applied                                    | no visible damage after 48 hours recovery:<br>$\Delta^\circ\text{C}/\text{C}$ : +30%/-40%<br>$\tan \delta$ : $\leq 15\%$<br>$R_{\text{ins}}$ : 500 M $\Omega$ or $R_i C_R \geq 100$ s, whichever is less                             |
|                                           |                                  | damp heat; with $U_R$ load  | initialization:<br>48 hours after $U_R$ at 40 °C; for 1 hour (for initial value measurement);<br>500 $\pm$ 12 hours at 40 °C;<br>90 to 95% RH; $U_R$ applied                                           | preconditioning:<br>$U_R$ at 40 °C for 1 hour, after 48 hours recovery:<br>$\Delta^\circ\text{C}/\text{C}$ : +30%/-40%<br>$\tan \delta$ : $\leq 15\%$<br>$R_{\text{ins}}$ : 500 M $\Omega$ or $R_i C_R \geq 25$ s, whichever is less |
| 4.15                                      |                                  | endurance                   | initialization:<br>$2 \times U_R$ at 85 °C for 1 hour, (initial value measurement after 48 $\pm$ 4 hours) ;<br>$2 \times U_R$ at 85 °C for 1000 hours<br>recovery 48 $\pm$ 4 hours at room temperature | after 48 hours recovery:<br>$\Delta^\circ\text{C}/\text{C}$ : +30%/-40%<br>$\tan \delta$ : $\leq 15\%$<br>$R_{\text{ins}}$ : 1000 M $\Omega$ or $R_i C_R \geq 50$ s, whichever is less                                               |

**Surface-mount ceramic  
multilayer capacitors****Class 2, Y5V  
16/25/50 V****REVISION HISTORY**

| Revision | Date        | Change<br>Notification | Description            |
|----------|-------------|------------------------|------------------------|
| Rev.7    | 2003 Jul 08 | –                      | - Updated company logo |



**Стандарт  
Электрон  
Связь**

Мы молодая и активно развивающаяся компания в области поставок электронных компонентов. Мы поставляем электронные компоненты отечественного и импортного производства напрямую от производителей и с крупнейших складов мира.

Благодаря сотрудничеству с мировыми поставщиками мы осуществляем комплексные и плановые поставки широчайшего спектра электронных компонентов.

Собственная эффективная логистика и склад в обеспечивает надежную поставку продукции в точно указанные сроки по всей России.

Мы осуществляем техническую поддержку нашим клиентам и предпродажную проверку качества продукции. На все поставляемые продукты мы предоставляем гарантию .

Осуществляем поставки продукции под контролем ВП МО РФ на предприятия военно-промышленного комплекса России , а также работаем в рамках 275 ФЗ с открытием отдельных счетов в уполномоченном банке. Система менеджмента качества компании соответствует требованиям ГОСТ ISO 9001.

Минимальные сроки поставки, гибкие цены, неограниченный ассортимент и индивидуальный подход к клиентам являются основой для выстраивания долгосрочного и эффективного сотрудничества с предприятиями радиоэлектронной промышленности, предприятиями ВПК и научно-исследовательскими институтами России.

С нами вы становитесь еще успешнее!

**Наши контакты:**

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