

# Radial & Axial

## Features

This widely used ceramic capacitors includes both monolithic and multilayer types to provide a wide capacitance range of 1pF through 1 $\mu$ F in respectively one standard size and shape(Radial & Axial).

## Applications

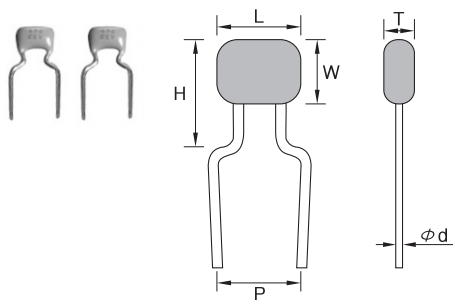
The class1 temperature compensating(C0G) products can be used in circuits to stabilize frequency and temperature characteristics.

The X7R, Z5U, Y5V dielectrics are optimum for by pass capacitors.

## Shape and Dimensions

### Bulk Type

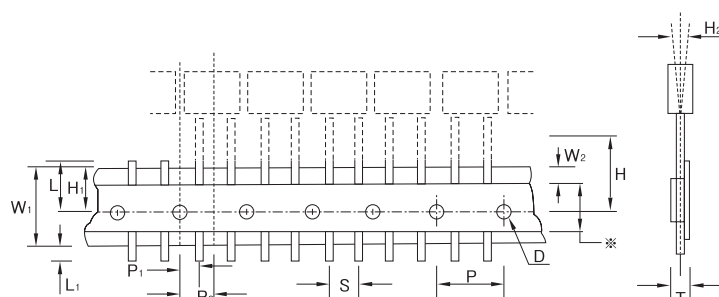
#### Radial Type



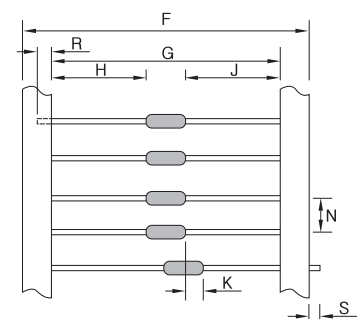
| CODE | L<br>Max. | W<br>Max. | T<br>Max. | H<br>Max. | P<br>±0.7 | Ød  | Color             | Marking |
|------|-----------|-----------|-----------|-----------|-----------|-----|-------------------|---------|
| 051B | 5.5       | 5.5       | 3.2       | 6.4       | 5         | 0.5 | Orange<br>or Gold | Ex) 104 |
| 077B | 7.7       | 7.6       |           | 9.2       |           |     |                   |         |

### Flat Type

#### Radial Type



#### Axial Type



| Code | Dimensions | Tolerance   | Code | Dimensions                 | Tolerance |
|------|------------|-------------|------|----------------------------|-----------|
| D(Ø) | 4          | ±0.3        | P1   | 3.85                       | ±0.7      |
| H    | 16         | ±0.5        | P2   | 6.35                       | ±1.3      |
| H1   | 9          | +0.76, -0.5 | T    | 0.9                        | Max.      |
| H2   | 0          | ±2          | W1   | 18                         | ±0.5      |
| L    | 11         | Max.        | W2   | 0                          | +0.6 Max. |
| L1   | 1.5        | Max.        | S    | 5                          | ±0.7      |
| P    | 12.7       | ±0.3        | *    | No adhesive may be exposed |           |

| Code | Dimensions | Tolerance |
|------|------------|-----------|
| F    | 64.8       | -0, +2    |
| G    | 50.8-53.3  |           |
| H    | =J         | ±1.2      |
| J    | =H         | ±1.2      |
| K    | 0.8        | Max.      |
| N    | 5          | ±0.4      |
| R    | 3.2        | Min.      |

How to Order(Product Identification)

CA 2633 Y5V 104 Z 500 F

1

2

3

4

5

6

7

- 1

Type

CR : Radial Lead Type  
CA : Axial Lead Type
- 2

Dimension Code

The number shows the maximum length of "L" by 1/10 in millimeter, and the alphabet means lead difference.(Refer to above diagram)

3 Temperature Coefficient Code

| Temperature Characteristic | Temperature Range | Capacitance Change or Temperature Coefficient |
|----------------------------|-------------------|-----------------------------------------------|
| C0G                        | -55 to 125℃       | 0±30ppm/℃                                     |
| X7R                        | -55 to 125℃       | ±15%                                          |
| Z5U                        | 10℃ to 85℃        | +22, -56%                                     |
| Y5V                        | -30 to 85℃        | +22, -82%                                     |

- 4

Capacitance Code(Pico Farads)

First two digits are significant; third digit denotes number of zeros.  
Ex.) 101 = 100pF, 1R5 = 1.5pF, 103 = 10,000pF

5 Capacitance Tolerance Code

| Code | Tolerance | Remark   |
|------|-----------|----------|
| J    | ± 5.0 %   | C0G      |
| K    | ±10 %     | X7R, C0G |
| M    | ± 20 %    | Z5U, X7R |
| Z    | +80, -20% | Z5U, Y5V |

6 Rated Voltage Code

| Code | 250    | 500    | 101     |
|------|--------|--------|---------|
| Volt | DC 25V | DC 50V | DC 100V |

7 Packing Code

| Code    | B    | R         | F         |
|---------|------|-----------|-----------|
| Packing | Bulk | Reel Pack | Flat Pack |

Reliability and Test Conditions

| No.                                   | Item                               | Characteristic                                                                      |                                                                                                                                                                                                                                                                                                                                                                                              |        |  |  | Test Methods and Conditions |       |                                                                                                                                              |     |     |     |     |       |     |       |       |     |       |   |   |   |     |                                    |     |                                       |        |                                                                                                                                                                                                                                                                                                                                            |  |  |      |                   |                 |                   |          |               |                   |          |            |                                       |          |            |
|---------------------------------------|------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--|--|-----------------------------|-------|----------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|-----|-------|-----|-------|-------|-----|-------|---|---|---|-----|------------------------------------|-----|---------------------------------------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|------|-------------------|-----------------|-------------------|----------|---------------|-------------------|----------|------------|---------------------------------------|----------|------------|
|                                       |                                    | Temperature Compensating Type                                                       | High Dielectric Constant Type                                                                                                                                                                                                                                                                                                                                                                |        |  |  |                             |       |                                                                                                                                              |     |     |     |     |       |     |       |       |     |       |   |   |   |     |                                    |     |                                       |        |                                                                                                                                                                                                                                                                                                                                            |  |  |      |                   |                 |                   |          |               |                   |          |            |                                       |          |            |
| 1.                                    | Operating Temperature Range        | C0G : -55 to +125℃                                                                  | X7R : -55 to +125℃ Z5U : +10 to +85℃<br>Y5V : -30 to 85℃                                                                                                                                                                                                                                                                                                                                     |        |  |  |                             |       |                                                                                                                                              |     |     |     |     |       |     |       |       |     |       |   |   |   |     |                                    |     |                                       |        |                                                                                                                                                                                                                                                                                                                                            |  |  |      |                   |                 |                   |          |               |                   |          |            |                                       |          |            |
| 2.                                    | Insulation Resistance              | More than 10,000MΩ or 500Ω.F (whichever is smaller)                                 |                                                                                                                                                                                                                                                                                                                                                                                              |        |  |  |                             |       | Applied the rated voltage for 2 minute                                                                                                       |     |     |     |     |       |     |       |       |     |       |   |   |   |     |                                    |     |                                       |        |                                                                                                                                                                                                                                                                                                                                            |  |  |      |                   |                 |                   |          |               |                   |          |            |                                       |          |            |
| 3.                                    | Dielectric Strength                | No detects or abnormalities                                                         |                                                                                                                                                                                                                                                                                                                                                                                              |        |  |  |                             |       | - C0G : The rated voltage×300%<br>- X7R, Z5U, Y5V : " ×250%                                                                                  |     |     |     |     |       |     |       |       |     |       |   |   |   |     |                                    |     |                                       |        |                                                                                                                                                                                                                                                                                                                                            |  |  |      |                   |                 |                   |          |               |                   |          |            |                                       |          |            |
| 4.                                    | Capacitance                        | Within the specified tolerance                                                      |                                                                                                                                                                                                                                                                                                                                                                                              |        |  |  |                             |       | Temperature Compensating Type                                                                                                                |     |     |     |     |       |     |       |       |     |       |   |   |   |     |                                    |     |                                       |        |                                                                                                                                                                                                                                                                                                                                            |  |  |      |                   |                 |                   |          |               |                   |          |            |                                       |          |            |
| 5.                                    | Dissipation Factor                 | 30pF Min. :<br>Q≥1,000(DF≤0.1%)<br><br>30pF Max. :<br>Q≥400+20C<br>(DF≤1/(400+20C)) | <table><tr><th>Char.</th><th>50V Min.</th><th>25V</th><th>16V</th><th>10V</th></tr><tr><td>X7R</td><td>≤2.5%</td><td>≤3%</td><td>≤3.5%</td><td>≤5.0%</td></tr><tr><td>Z%V</td><td>≤4.0%</td><td>—</td><td>—</td><td>—</td></tr><tr><td>Y5V</td><td>≤5%<br/>(&lt;220nF)<br/>≤7%<br/>(≥220nF)</td><td>≤7%</td><td>≤9%<br/>(&lt;220nF)<br/>≤12.5%<br/>(≥220nF)</td><td>≤12.5%</td></tr></table> |        |  |  |                             | Char. | 50V Min.                                                                                                                                     | 25V | 16V | 10V | X7R | ≤2.5% | ≤3% | ≤3.5% | ≤5.0% | Z%V | ≤4.0% | — | — | — | Y5V | ≤5%<br>(<220nF)<br>≤7%<br>(≥220nF) | ≤7% | ≤9%<br>(<220nF)<br>≤12.5%<br>(≥220nF) | ≤12.5% | <table><tr><th>Cap.</th><th>Testing Frequency</th><th>Testing Voltage</th></tr><tr><td>C0G<br/>(C≤1000pF)</td><td>1±0.1MHz</td><td>0.5 to 5V rms</td></tr><tr><td>C0G<br/>(C&gt;1000pF)</td><td>1±0.1kHz</td><td>1±0.2V rms</td></tr><tr><td>X7R, Z5U, Y5V<br/>(C≤10μF<br/>10V Min.)</td><td>1±0.1kHz</td><td>1±0.2V rms</td></tr></table> |  |  | Cap. | Testing Frequency | Testing Voltage | C0G<br>(C≤1000pF) | 1±0.1MHz | 0.5 to 5V rms | C0G<br>(C>1000pF) | 1±0.1kHz | 1±0.2V rms | X7R, Z5U, Y5V<br>(C≤10μF<br>10V Min.) | 1±0.1kHz | 1±0.2V rms |
| Char.                                 | 50V Min.                           | 25V                                                                                 | 16V                                                                                                                                                                                                                                                                                                                                                                                          | 10V    |  |  |                             |       |                                                                                                                                              |     |     |     |     |       |     |       |       |     |       |   |   |   |     |                                    |     |                                       |        |                                                                                                                                                                                                                                                                                                                                            |  |  |      |                   |                 |                   |          |               |                   |          |            |                                       |          |            |
| X7R                                   | ≤2.5%                              | ≤3%                                                                                 | ≤3.5%                                                                                                                                                                                                                                                                                                                                                                                        | ≤5.0%  |  |  |                             |       |                                                                                                                                              |     |     |     |     |       |     |       |       |     |       |   |   |   |     |                                    |     |                                       |        |                                                                                                                                                                                                                                                                                                                                            |  |  |      |                   |                 |                   |          |               |                   |          |            |                                       |          |            |
| Z%V                                   | ≤4.0%                              | —                                                                                   | —                                                                                                                                                                                                                                                                                                                                                                                            | —      |  |  |                             |       |                                                                                                                                              |     |     |     |     |       |     |       |       |     |       |   |   |   |     |                                    |     |                                       |        |                                                                                                                                                                                                                                                                                                                                            |  |  |      |                   |                 |                   |          |               |                   |          |            |                                       |          |            |
| Y5V                                   | ≤5%<br>(<220nF)<br>≤7%<br>(≥220nF) | ≤7%                                                                                 | ≤9%<br>(<220nF)<br>≤12.5%<br>(≥220nF)                                                                                                                                                                                                                                                                                                                                                        | ≤12.5% |  |  |                             |       |                                                                                                                                              |     |     |     |     |       |     |       |       |     |       |   |   |   |     |                                    |     |                                       |        |                                                                                                                                                                                                                                                                                                                                            |  |  |      |                   |                 |                   |          |               |                   |          |            |                                       |          |            |
| Cap.                                  | Testing Frequency                  | Testing Voltage                                                                     |                                                                                                                                                                                                                                                                                                                                                                                              |        |  |  |                             |       |                                                                                                                                              |     |     |     |     |       |     |       |       |     |       |   |   |   |     |                                    |     |                                       |        |                                                                                                                                                                                                                                                                                                                                            |  |  |      |                   |                 |                   |          |               |                   |          |            |                                       |          |            |
| C0G<br>(C≤1000pF)                     | 1±0.1MHz                           | 0.5 to 5V rms                                                                       |                                                                                                                                                                                                                                                                                                                                                                                              |        |  |  |                             |       |                                                                                                                                              |     |     |     |     |       |     |       |       |     |       |   |   |   |     |                                    |     |                                       |        |                                                                                                                                                                                                                                                                                                                                            |  |  |      |                   |                 |                   |          |               |                   |          |            |                                       |          |            |
| C0G<br>(C>1000pF)                     | 1±0.1kHz                           | 1±0.2V rms                                                                          |                                                                                                                                                                                                                                                                                                                                                                                              |        |  |  |                             |       |                                                                                                                                              |     |     |     |     |       |     |       |       |     |       |   |   |   |     |                                    |     |                                       |        |                                                                                                                                                                                                                                                                                                                                            |  |  |      |                   |                 |                   |          |               |                   |          |            |                                       |          |            |
| X7R, Z5U, Y5V<br>(C≤10μF<br>10V Min.) | 1±0.1kHz                           | 1±0.2V rms                                                                          |                                                                                                                                                                                                                                                                                                                                                                                              |        |  |  |                             |       |                                                                                                                                              |     |     |     |     |       |     |       |       |     |       |   |   |   |     |                                    |     |                                       |        |                                                                                                                                                                                                                                                                                                                                            |  |  |      |                   |                 |                   |          |               |                   |          |            |                                       |          |            |
| 6.                                    | Terminal Strength                  | No evidence of damage to body of device of looseness of terminals.                  |                                                                                                                                                                                                                                                                                                                                                                                              |        |  |  |                             |       | A static load of 10N(1kgf) :<br>applied to one terminal in the axial direction and acting in a direction away from the body for 1 to 5 secs. |     |     |     |     |       |     |       |       |     |       |   |   |   |     |                                    |     |                                       |        |                                                                                                                                                                                                                                                                                                                                            |  |  |      |                   |                 |                   |          |               |                   |          |            |                                       |          |            |

| No.                      | Item                                                                                                                                   |                                                                            | Characteristic                                                                                                                           |                                                                                                                                                                                              |                                                                      |              |             | Test Methods and Conditions |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |      |   |   |   |   |                             |            |                             |            |            |          |        |          |        |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|--------------|-------------|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---|---|---|---|-----------------------------|------------|-----------------------------|------------|------------|----------|--------|----------|--------|
|                          |                                                                                                                                        |                                                                            | Temperature Compensating Type                                                                                                            | High Dielectric Constant Type                                                                                                                                                                |                                                                      |              |             |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |      |   |   |   |   |                             |            |                             |            |            |          |        |          |        |
| 7.                       | Resistance to Soldering Heat                                                                                                           | Appearance                                                                 | No marked defect                                                                                                                         |                                                                                                                                                                                              |                                                                      |              |             |                             | <div>- Soldering Temp : <math>260\pm5^{\circ}\text{C}</math></div> <div>- Immersion Time : <math>5\pm0.5\text{sec}</math></div> <div>- Take it out and set it for <math>24\pm2</math> hours(temperature compensating type)or <math>48\pm4</math>hours(high dielectric constant type) then measure.</div>                                                                                                                                                                                              |      |   |   |   |   |                             |            |                             |            |            |          |        |          |        |
|                          |                                                                                                                                        | Capacitance Change                                                         | Within $\pm2.5\%$ or $\pm0.25\text{pF}$ (whichever is larger)                                                                            | X7R : $\leq \pm 7.5\%$<br>Z5U, Y5V : $\leq \pm 20\%$                                                                                                                                         |                                                                      |              |             |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |      |   |   |   |   |                             |            |                             |            |            |          |        |          |        |
|                          |                                                                                                                                        | Dissipation Factor(or Q)                                                   | 30pF Min. :<br>$Q\geq1,000$ ( $\text{DF}\leq0.1\%$ )<br><br>30pF Max. :<br>$Q\geq400+20\text{C}$ ( $\text{DF}\leq1/(400+20\text{C})$ )   | Char.                                                                                                                                                                                        | 50V Min.                                                             | 25V          | 16V         | 10V                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |      |   |   |   |   |                             |            |                             |            |            |          |        |          |        |
|                          |                                                                                                                                        |                                                                            |                                                                                                                                          | X7R                                                                                                                                                                                          | $\leq 2.5\%$                                                         | $\leq3\%$    | $\leq3.5\%$ | $\leq5.0\%$                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |      |   |   |   |   |                             |            |                             |            |            |          |        |          |        |
|                          |                                                                                                                                        | Z5U                                                                        | $\leq4.0\%$                                                                                                                              | —                                                                                                                                                                                            | —                                                                    | —            |             |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |      |   |   |   |   |                             |            |                             |            |            |          |        |          |        |
|                          |                                                                                                                                        | Y5V                                                                        | $\leq5\%$ ( $<220\text{nF}$ )<br>$\leq7\%$ ( $\geq220\text{nF}$ )                                                                        | $\leq7\%$                                                                                                                                                                                    | $\leq9\%$ ( $<220\text{nF}$ )<br>$\leq12.5\%$ ( $\geq220\text{nF}$ ) | $\leq12.5\%$ |             |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |      |   |   |   |   |                             |            |                             |            |            |          |        |          |        |
|                          | I.R.                                                                                                                                   | More than $10,000\text{M}\Omega$ or $500\Omega$ , F (whichever & smaller)  |                                                                                                                                          |                                                                                                                                                                                              |                                                                      |              |             |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |      |   |   |   |   |                             |            |                             |            |            |          |        |          |        |
| 8.                       | Temperature Cycle                                                                                                                      | Appearance                                                                 | No marking defects                                                                                                                       |                                                                                                                                                                                              |                                                                      |              |             |                             | <table><tr><th>Step</th><th>1</th><th>2</th><th>3</th><th>4</th></tr><tr><td>Min. Operating Temp. +0, -3</td><td>Room Temp.</td><td>Max. Operating Temp. +3, -0</td><td>Room Temp.</td></tr><tr><td>Time (min)</td><td><math>30\pm3</math></td><td>2 to 3</td><td><math>30\pm3</math></td><td>2 to 3</td></tr></table> <div>Take it out and set it for <math>24\pm2</math> hours [tempeature compensating or <math>48\pm4</math> hours(high dielectric Type) at room temperature, than measure.</div> | Step | 1 | 2 | 3 | 4 | Min. Operating Temp. +0, -3 | Room Temp. | Max. Operating Temp. +3, -0 | Room Temp. | Time (min) | $30\pm3$ | 2 to 3 | $30\pm3$ | 2 to 3 |
|                          |                                                                                                                                        | Step                                                                       | 1                                                                                                                                        | 2                                                                                                                                                                                            | 3                                                                    | 4            |             |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |      |   |   |   |   |                             |            |                             |            |            |          |        |          |        |
|                          |                                                                                                                                        | Min. Operating Temp. +0, -3                                                | Room Temp.                                                                                                                               | Max. Operating Temp. +3, -0                                                                                                                                                                  | Room Temp.                                                           |              |             |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |      |   |   |   |   |                             |            |                             |            |            |          |        |          |        |
|                          |                                                                                                                                        | Time (min)                                                                 | $30\pm3$                                                                                                                                 | 2 to 3                                                                                                                                                                                       | $30\pm3$                                                             | 2 to 3       |             |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |      |   |   |   |   |                             |            |                             |            |            |          |        |          |        |
| Capacitance Change       | Within $\pm2.5\%$ or $\pm0.25\text{pF}$                                                                                                | X7R : Within + 7.5%<br>Z5U, Y5V : Within $\pm 20\%$                        |                                                                                                                                          |                                                                                                                                                                                              |                                                                      |              |             |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |      |   |   |   |   |                             |            |                             |            |            |          |        |          |        |
| Dissipation Factor(or Q) | 30pF Min. :<br>$Q\geq1,000$ ( $\text{DF}\leq0.1\%$ )<br><br>30pF Max. :<br>$Q\geq400+20\text{C}$ ( $\text{DF}\leq1/(400+20\text{C})$ ) | Char.                                                                      | 50V Min.                                                                                                                                 | 25V                                                                                                                                                                                          | 16V                                                                  | 10V          |             |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |      |   |   |   |   |                             |            |                             |            |            |          |        |          |        |
|                          |                                                                                                                                        | X7R                                                                        | $\leq 2.5\%$                                                                                                                             | $\leq3\%$                                                                                                                                                                                    | $\leq3.5\%$                                                          | $\leq5.0\%$  |             |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |      |   |   |   |   |                             |            |                             |            |            |          |        |          |        |
|                          |                                                                                                                                        | Z5U                                                                        | $\leq4.0\%$                                                                                                                              | —                                                                                                                                                                                            | —                                                                    | —            |             |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |      |   |   |   |   |                             |            |                             |            |            |          |        |          |        |
|                          |                                                                                                                                        | Y5V                                                                        | $\leq5\%$ ( $<220\text{nF}$ )<br>$\leq7\%$ ( $\geq220\text{nF}$ )                                                                        | $\leq7\%$                                                                                                                                                                                    | $\leq9\%$ ( $<220\text{nF}$ )<br>$\leq12.5\%$ ( $\geq220\text{nF}$ ) | $\leq12.5\%$ |             |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |      |   |   |   |   |                             |            |                             |            |            |          |        |          |        |
|                          | I.R.                                                                                                                                   | More than $10,000\text{M}\Omega$ or $500\Omega$ , F (Whichever is smaller) |                                                                                                                                          |                                                                                                                                                                                              |                                                                      |              |             |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |      |   |   |   |   |                             |            |                             |            |            |          |        |          |        |
| 9.                       | Humidity Load                                                                                                                          | Appearance                                                                 | No marking defects                                                                                                                       |                                                                                                                                                                                              |                                                                      |              |             |                             | <div>- Temperature : <math>40\pm2^{\circ}\text{C}</math></div> <div>- Humidity : 90~95%RH</div> <div>- Hour : <math>500\pm12\text{hrs}</math></div> <div>- Test Voltage : Tge rated voltage</div> <div>- Take it out and set it for <math>24\pm2</math> hours (temperature compensatig) or <math>48\pm4</math> hours(high dielectric constant type) at room temperature, then measure. The charge/discharge current is less than 50mA.</div>                                                          |      |   |   |   |   |                             |            |                             |            |            |          |        |          |        |
|                          |                                                                                                                                        | Capacitance Change                                                         | Within $\pm7.5\%$ or $\pm0.75\text{pF}$ (whichever is larger)                                                                            | X7R : Within $\pm12.5\%$<br>Z5U : Within $\pm30\%$<br>Y5V : Within + 30%, -40% ( $\text{Y5V}/1.0\mu\text{F}$ , $2.2\mu\text{F}$ , $4.7\mu\text{F}/10\text{V}$ )<br>Within $\pm30\%$ (others) |                                                                      |              |             |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |      |   |   |   |   |                             |            |                             |            |            |          |        |          |        |
|                          |                                                                                                                                        | Dissipation Factor(or Q)                                                   | 30pF Min. :<br>$Q\geq200$ ( $\text{DF}\leq0.5\%$ )<br><br>30pF Max. :<br>$Q\geq100+10/3\text{C}$ ( $\text{DF}\leq1/(100+10/3\text{C})$ ) | Char.                                                                                                                                                                                        | 50V Min.                                                             | 25V          | 16V         | 10V                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |      |   |   |   |   |                             |            |                             |            |            |          |        |          |        |
|                          |                                                                                                                                        |                                                                            |                                                                                                                                          | X7R                                                                                                                                                                                          | $\leq5\%$                                                            | $\leq5\%$    | $\leq5\%$   | $\leq5\%$                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |      |   |   |   |   |                             |            |                             |            |            |          |        |          |        |
|                          |                                                                                                                                        | Z5U                                                                        | $\leq4.0\%$                                                                                                                              | —                                                                                                                                                                                            | —                                                                    | —            |             |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |      |   |   |   |   |                             |            |                             |            |            |          |        |          |        |
|                          |                                                                                                                                        | Y5V                                                                        | $\leq7.5\%$                                                                                                                              | $\leq10\%$ ( $<1\mu\text{F}$ )<br>$\leq12.5\%$ ( $\geq1\mu\text{F}$ )                                                                                                                        | $\leq12.5\%$                                                         | $\leq15\%$   |             |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |      |   |   |   |   |                             |            |                             |            |            |          |        |          |        |
|                          | I.R.                                                                                                                                   | More than $500\text{M}\Omega$ or $25\Omega$ , F (whichever is smaller)     |                                                                                                                                          |                                                                                                                                                                                              |                                                                      |              |             |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |      |   |   |   |   |                             |            |                             |            |            |          |        |          |        |
| 10.                      | High Temperature Load                                                                                                                  | Appearance                                                                 | No marked defect                                                                                                                         |                                                                                                                                                                                              |                                                                      |              |             |                             | <div>- Testing Time : <math>1000\pm12\text{hrs}</math></div> <div>- Applied Voltage : Rated Voltage <math>\times200\%</math></div> <div>- Temperature :<br/>C0G, X7R <math>\rightarrow 125\pm3^{\circ}\text{C}</math><br/>Z5U, Y5V <math>\rightarrow 85\pm3^{\circ}\text{C}</math></div>                                                                                                                                                                                                              |      |   |   |   |   |                             |            |                             |            |            |          |        |          |        |
|                          |                                                                                                                                        | Capacitance change                                                         | Within $\pm3\%$ or $\pm0.3\text{pF}$ (whichever is larger)                                                                               | X7R : Within $\pm12.5\%$ , Z5U : Within $\pm30\%$<br>Y5V : Within $\pm30\%$ (Cap. $<1.0\mu\text{F}$ )<br>Within +30% , -40%(Cap. $\geq1.0\mu\text{F}$ )                                      |                                                                      |              |             |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |      |   |   |   |   |                             |            |                             |            |            |          |        |          |        |

| No.                     | Item                                                                                                                                                  |                           | Characteristic                                                                                                                                                                                     |                               |                                                                                                                                                                                                                                                                                                                                        |              |          | Test Methods and Conditions                                                                                                                                                                                                                                                                                                                                                                                                   |       |             |                 |             |                |              |      |             |       |             |                  |     |                |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   |     |       |                           |        |      |                                                                                                                                                                                                 |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------|-----------------|-------------|----------------|--------------|------|-------------|-------|-------------|------------------|-----|----------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|-----|-------|---------------------------|--------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                         |                                                                                                                                                       |                           | Temperature Compensating Type                                                                                                                                                                      | High Dielectric Constant Type |                                                                                                                                                                                                                                                                                                                                        |              |          |                                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |                 |             |                |              |      |             |       |             |                  |     |                |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   |     |       |                           |        |      |                                                                                                                                                                                                 |
| 10                      | High Temperature Load                                                                                                                                 | Dissipation Factor(or Q)  | 30pF Min. :<br>Q≥350 (DF≤0.3%)<br><br>10pF≤Cp≤30pF:<br>Q≥275+5/2C<br>(DF≤1/(275+5/2C))<br><br>10pF Max. :<br>Q≥200+10C<br>(DF≤1/(200+10C))                                                         |                               | <table><tr><th>Char.</th><th>50V Min.</th><th>25V</th><th>16V</th><th>10V</th></tr><tr><td>X7R</td><td>≤5%</td><td>≤5%</td><td>≤5%</td><td>≤5%</td></tr><tr><td>Z5U</td><td>≤4.0%</td><td>—</td><td>—</td><td>—</td></tr><tr><td>Y5V</td><td>≤7.5%</td><td>≤10% (&lt;1μF)<br/>≤7% (≥1μF)</td><td>≤12.5%</td><td>≤15%</td></tr></table> |              |          |                                                                                                                                                                                                                                                                                                                                                                                                                               |       | Char.       | 50V Min.        | 25V         | 16V            | 10V          | X7R  | ≤5%         | ≤5%   | ≤5%         | ≤5%              | Z5U | ≤4.0%          | —                | —                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | — | Y5V | ≤7.5% | ≤10% (<1μF)<br>≤7% (≥1μF) | ≤12.5% | ≤15% | Take it out and set it for 24±2 hours (temperature compensatig) or 48±4 hours(high dielectric constant type) at room temperature, then measure. The charge/discharge current is less than 50mA. |
|                         |                                                                                                                                                       | Char.                     | 50V Min.                                                                                                                                                                                           | 25V                           | 16V                                                                                                                                                                                                                                                                                                                                    | 10V          |          |                                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |                 |             |                |              |      |             |       |             |                  |     |                |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   |     |       |                           |        |      |                                                                                                                                                                                                 |
| X7R                     | ≤5%                                                                                                                                                   | ≤5%                       | ≤5%                                                                                                                                                                                                | ≤5%                           |                                                                                                                                                                                                                                                                                                                                        |              |          |                                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |                 |             |                |              |      |             |       |             |                  |     |                |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   |     |       |                           |        |      |                                                                                                                                                                                                 |
| Z5U                     | ≤4.0%                                                                                                                                                 | —                         | —                                                                                                                                                                                                  | —                             |                                                                                                                                                                                                                                                                                                                                        |              |          |                                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |                 |             |                |              |      |             |       |             |                  |     |                |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   |     |       |                           |        |      |                                                                                                                                                                                                 |
| Y5V                     | ≤7.5%                                                                                                                                                 | ≤10% (<1μF)<br>≤7% (≥1μF) | ≤12.5%                                                                                                                                                                                             | ≤15%                          |                                                                                                                                                                                                                                                                                                                                        |              |          |                                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |                 |             |                |              |      |             |       |             |                  |     |                |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   |     |       |                           |        |      |                                                                                                                                                                                                 |
| I.R.                    | More than 1000MΩ or 50ΩF(Whichever is smaller)                                                                                                        |                           |                                                                                                                                                                                                    |                               |                                                                                                                                                                                                                                                                                                                                        |              |          |                                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |                 |             |                |              |      |             |       |             |                  |     |                |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   |     |       |                           |        |      |                                                                                                                                                                                                 |
| 11                      | Capacitance Temperature Characteristics                                                                                                               | Capacitance Change        |                                                                                                                                                                                                    |                               | <table><tr><th>Char.</th><th>Temp. Range</th><th>Reference Temp.</th><th>Cap. Change</th></tr><tr><td>X7R</td><td>-55 to +125℃</td><td rowspan="3">25℃</td><td>Within ±15%</td></tr><tr><td>Z5U</td><td>-10 to +85℃</td><td>Within +22% -56%</td></tr><tr><td>Y5V</td><td>-30 to +85℃</td><td>Within +22% -82%</td></tr></table>       |              |          |                                                                                                                                                                                                                                                                                                                                                                                                                               | Char. | Temp. Range | Reference Temp. | Cap. Change | X7R            | -55 to +125℃ | 25℃  | Within ±15% | Z5U   | -10 to +85℃ | Within +22% -56% | Y5V | -30 to +85℃    | Within +22% -82% | (1) Temperature Compensating Type :<br>The temperature coefficient is determined using the capacitance measured in step 3 as a reference. When cycling the temperature sequentially from step 1 through 5. (SL: +25 to 85℃) the capacitance shall be with in the specified tolerance for the temperature coefficient. The capacitance drift is calculated dividing the difference between the maximum measured values in the step 1, 3 and 5 by Cap. value in step 3. |   |     |       |                           |        |      |                                                                                                                                                                                                 |
|                         |                                                                                                                                                       | Char.                     | Temp. Range                                                                                                                                                                                        | Reference Temp.               | Cap. Change                                                                                                                                                                                                                                                                                                                            |              |          |                                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |                 |             |                |              |      |             |       |             |                  |     |                |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   |     |       |                           |        |      |                                                                                                                                                                                                 |
| X7R                     | -55 to +125℃                                                                                                                                          | 25℃                       | Within ±15%                                                                                                                                                                                        |                               |                                                                                                                                                                                                                                                                                                                                        |              |          |                                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |                 |             |                |              |      |             |       |             |                  |     |                |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   |     |       |                           |        |      |                                                                                                                                                                                                 |
| Z5U                     | -10 to +85℃                                                                                                                                           |                           | Within +22% -56%                                                                                                                                                                                   |                               |                                                                                                                                                                                                                                                                                                                                        |              |          |                                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |                 |             |                |              |      |             |       |             |                  |     |                |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   |     |       |                           |        |      |                                                                                                                                                                                                 |
| Y5V                     | -30 to +85℃                                                                                                                                           |                           | Within +22% -82%                                                                                                                                                                                   |                               |                                                                                                                                                                                                                                                                                                                                        |              |          |                                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |                 |             |                |              |      |             |       |             |                  |     |                |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   |     |       |                           |        |      |                                                                                                                                                                                                 |
| Temperature Coefficient | <table><tr><th>Char.</th><th>Temp. Range</th><th>Temperature Coefficient</th></tr><tr><td>C0G</td><td>-55 to +125℃</td><td>±30ppm/℃</td></tr></table> | Char.                     | Temp. Range                                                                                                                                                                                        | Temperature Coefficient       | C0G                                                                                                                                                                                                                                                                                                                                    | -55 to +125℃ | ±30ppm/℃ | <table><tr><th>Step</th><th>Temperature(℃)</th></tr><tr><td>1</td><td>25±2</td></tr><tr><td>2</td><td>-55±3</td></tr><tr><td>3</td><td>25±2</td></tr><tr><td>4</td><td>125±3(for C0G)</td></tr><tr><td>5</td><td>25±2</td></tr></table><br>(2) High Dielectric Constant Type :<br>The ranges of capacitance change compared with the 25℃ value over the temperature range shown in the table shall be in the specified range. |       |             |                 | Step        | Temperature(℃) | 1            | 25±2 | 2           | -55±3 | 3           | 25±2             | 4   | 125±3(for C0G) | 5                | 25±2                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |   |     |       |                           |        |      |                                                                                                                                                                                                 |
| Char.                   | Temp. Range                                                                                                                                           | Temperature Coefficient   |                                                                                                                                                                                                    |                               |                                                                                                                                                                                                                                                                                                                                        |              |          |                                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |                 |             |                |              |      |             |       |             |                  |     |                |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   |     |       |                           |        |      |                                                                                                                                                                                                 |
| C0G                     | -55 to +125℃                                                                                                                                          | ±30ppm/℃                  |                                                                                                                                                                                                    |                               |                                                                                                                                                                                                                                                                                                                                        |              |          |                                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |                 |             |                |              |      |             |       |             |                  |     |                |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   |     |       |                           |        |      |                                                                                                                                                                                                 |
| Step                    | Temperature(℃)                                                                                                                                        |                           |                                                                                                                                                                                                    |                               |                                                                                                                                                                                                                                                                                                                                        |              |          |                                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |                 |             |                |              |      |             |       |             |                  |     |                |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   |     |       |                           |        |      |                                                                                                                                                                                                 |
| 1                       | 25±2                                                                                                                                                  |                           |                                                                                                                                                                                                    |                               |                                                                                                                                                                                                                                                                                                                                        |              |          |                                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |                 |             |                |              |      |             |       |             |                  |     |                |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   |     |       |                           |        |      |                                                                                                                                                                                                 |
| 2                       | -55±3                                                                                                                                                 |                           |                                                                                                                                                                                                    |                               |                                                                                                                                                                                                                                                                                                                                        |              |          |                                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |                 |             |                |              |      |             |       |             |                  |     |                |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   |     |       |                           |        |      |                                                                                                                                                                                                 |
| 3                       | 25±2                                                                                                                                                  |                           |                                                                                                                                                                                                    |                               |                                                                                                                                                                                                                                                                                                                                        |              |          |                                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |                 |             |                |              |      |             |       |             |                  |     |                |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   |     |       |                           |        |      |                                                                                                                                                                                                 |
| 4                       | 125±3(for C0G)                                                                                                                                        |                           |                                                                                                                                                                                                    |                               |                                                                                                                                                                                                                                                                                                                                        |              |          |                                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |                 |             |                |              |      |             |       |             |                  |     |                |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   |     |       |                           |        |      |                                                                                                                                                                                                 |
| 5                       | 25±2                                                                                                                                                  |                           |                                                                                                                                                                                                    |                               |                                                                                                                                                                                                                                                                                                                                        |              |          |                                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |                 |             |                |              |      |             |       |             |                  |     |                |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   |     |       |                           |        |      |                                                                                                                                                                                                 |
| 12                      | The regulation of environmental pollution materials                                                                                                   |                           | ※Never use materials mentioned below in leaded MLCC products regulated this document.<br>Pb, Cd, Hg, Cr <sup>+6</sup> , PBB(polybromida biphenyl), PBDE(polybrominated diphenyl ethers), asbestos. |                               |                                                                                                                                                                                                                                                                                                                                        |              |          |                                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |                 |             |                |              |      |             |       |             |                  |     |                |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   |     |       |                           |        |      |                                                                                                                                                                                                 |
| 13                      | The regulation about destructive materials of the ozone layer                                                                                         |                           | Never use the ODS(ozone depleting substance) materials below in leaded MLCC products regulated this document.                                                                                      |                               |                                                                                                                                                                                                                                                                                                                                        |              |          |                                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |                 |             |                |              |      |             |       |             |                  |     |                |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   |     |       |                           |        |      |                                                                                                                                                                                                 |

Packing Quantity

Unit : pcs

| Radial Type |           |                                          | Axial Type |           |                                          |
|-------------|-----------|------------------------------------------|------------|-----------|------------------------------------------|
| Inner Box   | Outer Box | Remark                                   | Inner Box  | Outer Box | Remark                                   |
| 2,500       | 15,000    | Packing set on the basis of flat tapping | 5,000      | 50,000    | Packing set on the basis of flat tapping |

# Capacitance Range

| Type<br>Char. | Volt | Radial |     |     |     |     |     |    | Axial |     |     |     |
|---------------|------|--------|-----|-----|-----|-----|-----|----|-------|-----|-----|-----|
|               |      | C0G    |     | X7R |     | Z5U | Y5V |    | C0G   | X7R | Z5U | Y5V |
| Cap(pF)       |      | 50     | 100 | 50  | 100 | 50  | 16  | 50 | 50    | 50  | 50  | 50  |
| 1             |      |        |     |     |     |     |     |    |       |     |     |     |
| 2             |      |        |     |     |     |     |     |    |       |     |     |     |
| 3             |      |        |     |     |     |     |     |    |       |     |     |     |
| 4             |      |        |     |     |     |     |     |    |       |     |     |     |
| 5             |      |        |     |     |     |     |     |    |       |     |     |     |
| 6             |      |        |     |     |     |     |     |    |       |     |     |     |
| 7             |      |        |     |     |     |     |     |    |       |     |     |     |
| 8             |      |        |     |     |     |     |     |    |       |     |     |     |
| 9             |      |        |     |     |     |     |     |    |       |     |     |     |
| 10            |      |        |     |     |     |     |     |    |       |     |     |     |
| 12            |      |        |     |     |     |     |     |    |       |     |     |     |
| 15            |      |        |     |     |     |     |     |    |       |     |     |     |
| 16            |      |        |     |     |     |     |     |    |       |     |     |     |
| 18            |      |        |     |     |     |     |     |    |       |     |     |     |
| 20            |      |        |     |     |     |     |     |    |       |     |     |     |
| 22            |      |        |     |     |     |     |     |    |       |     |     |     |
| 24            |      |        |     |     |     |     |     |    |       |     |     |     |
| 27            |      |        |     |     |     |     |     |    |       |     |     |     |
| 30            |      |        |     |     |     |     |     |    |       |     |     |     |
| 33            |      |        |     |     |     |     |     |    |       |     |     |     |
| 36            |      |        |     |     |     |     |     |    |       |     |     |     |
| 39            |      |        |     |     |     |     |     |    |       |     |     |     |
| 43            |      |        |     |     |     |     |     |    |       |     |     |     |
| 47            |      |        |     |     |     |     |     |    |       |     |     |     |
| 51            |      |        |     |     |     |     |     |    |       |     |     |     |
| 56            |      |        |     |     |     |     |     |    |       |     |     |     |
| 62            |      |        |     |     |     |     |     |    |       |     |     |     |
| 68            |      |        |     |     |     |     |     |    |       |     |     |     |
| 75            |      |        |     |     |     |     |     |    |       |     |     |     |
| 82            |      |        |     |     |     |     |     |    |       |     |     |     |
| 91            |      |        |     |     |     |     |     |    |       |     |     |     |
| 100           |      |        |     |     |     |     |     |    |       |     |     |     |
| 120           |      |        |     |     |     |     |     |    |       |     |     |     |
| 150           |      |        |     |     |     |     |     |    |       |     |     |     |
| 180           |      |        |     |     |     |     |     |    |       |     |     |     |
| 220           |      |        |     |     |     |     |     |    |       |     |     |     |
| 270           |      |        |     |     |     |     |     |    |       |     |     |     |
| 330           |      |        |     |     |     |     |     |    |       |     |     |     |
| 390           |      |        |     |     |     |     |     |    |       |     |     |     |
| 470           |      |        |     |     |     |     |     |    |       |     |     |     |
| 560           |      |        |     |     |     |     |     |    |       |     |     |     |
| 680           |      |        |     |     |     |     |     |    |       |     |     |     |
| 820           |      |        |     |     |     |     |     |    |       |     |     |     |
| 1.000         |      |        |     |     |     |     |     |    |       |     |     |     |
| 1.200         |      |        |     |     |     |     |     |    |       |     |     |     |
| 1.500         |      |        |     |     |     |     |     |    |       |     |     |     |
| 1.800         |      |        |     |     |     |     |     |    |       |     |     |     |
| 2.200         |      |        |     |     |     |     |     |    |       |     |     |     |
| 2.700         |      |        |     |     |     |     |     |    |       |     |     |     |
| 3.300         |      |        |     |     |     |     |     |    |       |     |     |     |
| 3.900         |      |        |     |     |     |     |     |    |       |     |     |     |
| 4.700         |      |        |     |     |     |     |     |    |       |     |     |     |
| 5.600         |      |        |     |     |     |     |     |    |       |     |     |     |
| 6.800         |      |        |     |     |     |     |     |    |       |     |     |     |
| 8.200         |      |        |     |     |     |     |     |    |       |     |     |     |
| 10.000        |      |        |     |     |     |     |     |    |       |     |     |     |
| 15.000        |      |        |     |     |     |     |     |    |       |     |     |     |
| 22.000        |      |        |     |     |     |     |     |    |       |     |     |     |
| 33.000        |      |        |     |     |     |     |     |    |       |     |     |     |
| 47.000        |      |        |     |     |     |     |     |    |       |     |     |     |
| 68.000        |      |        |     |     |     |     |     |    |       |     |     |     |
| 100.000       |      |        |     |     |     |     |     |    |       |     |     |     |
| 150.000       |      |        |     |     |     |     |     |    |       |     |     |     |
| 220.000       |      |        |     |     |     |     |     |    |       |     |     |     |
| 330.000       |      |        |     |     |     |     |     |    |       |     |     |     |
| 470.000       |      |        |     |     |     |     |     |    |       |     |     |     |
| 680.000       |      |        |     |     |     |     |     |    |       |     |     |     |
| 1.000.000     |      |        |     |     |     |     |     |    |       |     |     |     |