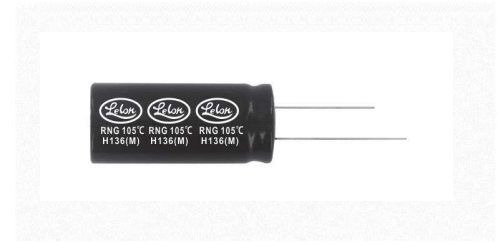


## RNG Series

### Features

- 105°C, 2,000 hours assured, standard bi-polarized series
- Suitable for use in circuits which has a reversed or unknown polarity
- RoHS Compliance

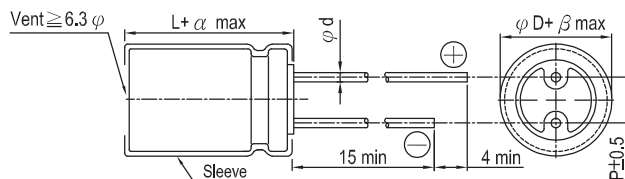


Sleeve & Marking Color: Yellow & Black

### Specifications

|                                                                                                       |                                                                                                                                                                                                                                                                                                                                                         |                 |                                              |      |      |      |                   |      |      |                   |      |      |               |     |    |    |    |    |    |    |     |     |     |     |            |      |      |      |      |      |      |      |      |      |      |      |
|-------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------------------------------------------|------|------|------|-------------------|------|------|-------------------|------|------|---------------|-----|----|----|----|----|----|----|-----|-----|-----|-----|------------|------|------|------|------|------|------|------|------|------|------|------|
| Items                                                                                                 | Performance                                                                                                                                                                                                                                                                                                                                             |                 |                                              |      |      |      |                   |      |      |                   |      |      |               |     |    |    |    |    |    |    |     |     |     |     |            |      |      |      |      |      |      |      |      |      |      |      |
| Category Temperature Range                                                                            | -40℃ ~ +105℃                                                                                                                                                                                                                                                                                                                                            |                 |                                              |      |      |      |                   |      |      |                   |      |      |               |     |    |    |    |    |    |    |     |     |     |     |            |      |      |      |      |      |      |      |      |      |      |      |
| Capacitance Tolerance                                                                                 | ±20%<br>(at 120Hz, 20℃)                                                                                                                                                                                                                                                                                                                                 |                 |                                              |      |      |      |                   |      |      |                   |      |      |               |     |    |    |    |    |    |    |     |     |     |     |            |      |      |      |      |      |      |      |      |      |      |      |
| Leakage Current (at 20℃)                                                                              | Rated voltage                                                                                                                                                                                                                                                                                                                                           |                 | ≤ 100V                                       |      |      |      | > 100V            |      |      |                   |      |      |               |     |    |    |    |    |    |    |     |     |     |     |            |      |      |      |      |      |      |      |      |      |      |      |
|                                                                                                       | Time                                                                                                                                                                                                                                                                                                                                                    |                 | after 2 minutes                              |      |      |      | after 5 minutes   |      |      |                   |      |      |               |     |    |    |    |    |    |    |     |     |     |     |            |      |      |      |      |      |      |      |      |      |      |      |
|                                                                                                       | Leakage Current                                                                                                                                                                                                                                                                                                                                         |                 | I = 0.03CV or 4 (μA)<br>whichever is greater |      |      |      | CV ≤ 1,000        |      |      | CV > 1,000        |      |      |               |     |    |    |    |    |    |    |     |     |     |     |            |      |      |      |      |      |      |      |      |      |      |      |
|                                                                                                       |                                                                                                                                                                                                                                                                                                                                                         |                 |                                              |      |      |      | I = 0.03CV+15(μA) |      |      | I = 0.02CV+25(μA) |      |      |               |     |    |    |    |    |    |    |     |     |     |     |            |      |      |      |      |      |      |      |      |      |      |      |
| Where, C = rated capacitance in μF V = rated DC working voltage in V                                  |                                                                                                                                                                                                                                                                                                                                                         |                 |                                              |      |      |      |                   |      |      |                   |      |      |               |     |    |    |    |    |    |    |     |     |     |     |            |      |      |      |      |      |      |      |      |      |      |      |
| Tanδ (at 120 Hz, 20℃)                                                                                 | <table><tr><td>Rated Voltage</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>100</td><td>160</td><td>200</td><td>250</td></tr><tr><td>Tanδ (max)</td><td>0.25</td><td>0.22</td><td>0.18</td><td>0.16</td><td>0.14</td><td>0.12</td><td>0.10</td><td>0.09</td><td>0.15</td><td>0.15</td><td>0.20</td></tr></table> |                 |                                              |      |      |      |                   |      |      |                   |      |      | Rated Voltage | 6.3 | 10 | 16 | 25 | 35 | 50 | 63 | 100 | 160 | 200 | 250 | Tanδ (max) | 0.25 | 0.22 | 0.18 | 0.16 | 0.14 | 0.12 | 0.10 | 0.09 | 0.15 | 0.15 | 0.20 |
|                                                                                                       | Rated Voltage                                                                                                                                                                                                                                                                                                                                           | 6.3             | 10                                           | 16   | 25   | 35   | 50                | 63   | 100  | 160               | 200  | 250  |               |     |    |    |    |    |    |    |     |     |     |     |            |      |      |      |      |      |      |      |      |      |      |      |
|                                                                                                       | Tanδ (max)                                                                                                                                                                                                                                                                                                                                              | 0.25            | 0.22                                         | 0.18 | 0.16 | 0.14 | 0.12              | 0.10 | 0.09 | 0.15              | 0.15 | 0.20 |               |     |    |    |    |    |    |    |     |     |     |     |            |      |      |      |      |      |      |      |      |      |      |      |
| When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase.                     |                                                                                                                                                                                                                                                                                                                                                         |                 |                                              |      |      |      |                   |      |      |                   |      |      |               |     |    |    |    |    |    |    |     |     |     |     |            |      |      |      |      |      |      |      |      |      |      |      |
| Low Temperature Characteristics (at 120Hz)                                                            | Impedance ratio shall not exceed the values given in the table below.                                                                                                                                                                                                                                                                                   |                 |                                              |      |      |      |                   |      |      |                   |      |      |               |     |    |    |    |    |    |    |     |     |     |     |            |      |      |      |      |      |      |      |      |      |      |      |
|                                                                                                       | Rated Voltage                                                                                                                                                                                                                                                                                                                                           |                 | 6.3                                          | 10   | 16   | 25   | 35                | 50   | 63   | 100               | 160  | 200  | 250           |     |    |    |    |    |    |    |     |     |     |     |            |      |      |      |      |      |      |      |      |      |      |      |
|                                                                                                       | Impedance Ratio                                                                                                                                                                                                                                                                                                                                         | Z(-25℃)/Z(+20℃) | 4                                            | 3    | 3    | 2    | 2                 | 2    | 2    | 2                 | 2    | 2    | 2             |     |    |    |    |    |    |    |     |     |     |     |            |      |      |      |      |      |      |      |      |      |      |      |
|                                                                                                       |                                                                                                                                                                                                                                                                                                                                                         | Z(-40℃)/Z(+20℃) | 8                                            | 6    | 6    | 4    | 4                 | 3    | 3    | 3                 | 4    | 4    | 4             |     |    |    |    |    |    |    |     |     |     |     |            |      |      |      |      |      |      |      |      |      |      |      |
| Endurance<br>(After application of the rated voltage at 105℃, the polarity inverted every 250 hours.) | Test Time                                                                                                                                                                                                                                                                                                                                               |                 | 2,000 Hrs                                    |      |      |      |                   |      |      |                   |      |      |               |     |    |    |    |    |    |    |     |     |     |     |            |      |      |      |      |      |      |      |      |      |      |      |
|                                                                                                       | Capacitance Change                                                                                                                                                                                                                                                                                                                                      |                 | Within ±20% of initial value                 |      |      |      |                   |      |      |                   |      |      |               |     |    |    |    |    |    |    |     |     |     |     |            |      |      |      |      |      |      |      |      |      |      |      |
|                                                                                                       | Tanδ                                                                                                                                                                                                                                                                                                                                                    |                 | Less than 200% of specified value            |      |      |      |                   |      |      |                   |      |      |               |     |    |    |    |    |    |    |     |     |     |     |            |      |      |      |      |      |      |      |      |      |      |      |
|                                                                                                       | Leakage Current                                                                                                                                                                                                                                                                                                                                         |                 | Within specified value                       |      |      |      |                   |      |      |                   |      |      |               |     |    |    |    |    |    |    |     |     |     |     |            |      |      |      |      |      |      |      |      |      |      |      |
|                                                                                                       | * The above specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage applied with rated ripple current for 2,000 hours at 105℃.                                                                                                                                                                                |                 |                                              |      |      |      |                   |      |      |                   |      |      |               |     |    |    |    |    |    |    |     |     |     |     |            |      |      |      |      |      |      |      |      |      |      |      |
| Shelf Life Test                                                                                       | Test Time                                                                                                                                                                                                                                                                                                                                               |                 | 1,000 Hrs                                    |      |      |      |                   |      |      |                   |      |      |               |     |    |    |    |    |    |    |     |     |     |     |            |      |      |      |      |      |      |      |      |      |      |      |
|                                                                                                       | Capacitance Change                                                                                                                                                                                                                                                                                                                                      |                 | Within ±20% of initial value                 |      |      |      |                   |      |      |                   |      |      |               |     |    |    |    |    |    |    |     |     |     |     |            |      |      |      |      |      |      |      |      |      |      |      |
|                                                                                                       | Tanδ                                                                                                                                                                                                                                                                                                                                                    |                 | Less than 200% of specified value            |      |      |      |                   |      |      |                   |      |      |               |     |    |    |    |    |    |    |     |     |     |     |            |      |      |      |      |      |      |      |      |      |      |      |
|                                                                                                       | Leakage Current                                                                                                                                                                                                                                                                                                                                         |                 | Within specified value                       |      |      |      |                   |      |      |                   |      |      |               |     |    |    |    |    |    |    |     |     |     |     |            |      |      |      |      |      |      |      |      |      |      |      |
|                                                                                                       | * The above specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors before the measurements for 160 ~ 250V (Refer to JIS C 5101-4 4.1).                                                                     |                 |                                              |      |      |      |                   |      |      |                   |      |      |               |     |    |    |    |    |    |    |     |     |     |     |            |      |      |      |      |      |      |      |      |      |      |      |

### Diagram of Dimensions



### Lead Spacing and Diameter

|     | 5                        | 6.3 | 8   | 10  | 12.5 | 16  | 18  |
|-----|--------------------------|-----|-----|-----|------|-----|-----|
| φ D | 5                        | 6.3 | 8   | 10  | 12.5 | 16  | 18  |
| P   | 2.0                      | 2.5 | 3.5 | 5.0 | 5.0  | 7.5 | 7.5 |
| φ d | 0.5                      |     |     | 0.6 |      | 0.8 |     |
| α   | L < 20: 1.5, L ≥ 20: 2.0 |     |     |     |      |     |     |
| β   | 0.5                      |     |     |     |      |     |     |



Dimension:  $\phi D \times L(\text{mm})$

## Dimension and Permissible Ripple Current

Ripple Current: mA/rms at 120 Hz, 105°C

| $\mu\text{F}$ | V. DC<br>Contents | 6.3V (0J)         |     | 10V (1A)          |     | 16V (1C)          |       | 25V (1E)          |       | 35V (1V)          |     | 50V (1H)          |     | 63V (1J)          |     | 100V (2A)         |     |
|---------------|-------------------|-------------------|-----|-------------------|-----|-------------------|-------|-------------------|-------|-------------------|-----|-------------------|-----|-------------------|-----|-------------------|-----|
|               |                   | $\phi D \times L$ | mA  | $\phi D \times L$ | mA  | $\phi D \times L$ | mA    | $\phi D \times L$ | mA    | $\phi D \times L$ | mA  | $\phi D \times L$ | mA  | $\phi D \times L$ | mA  | $\phi D \times L$ | mA  |
| 1             | 010               |                   |     |                   |     |                   |       |                   |       |                   |     | 5×11              | 10  | 5×11              | 11  | 5×11              | 12  |
| 2.2           | 2R2               |                   |     |                   |     |                   |       |                   |       |                   |     | 5×11              | 15  | 5×11              | 16  | 6.3×11            | 20  |
| 3.3           | 3R3               |                   |     |                   |     |                   |       |                   |       |                   |     | 5×11              | 18  | 5×11              | 20  | 6.3×11            | 25  |
| 4.7           | 4R7               |                   |     |                   |     |                   |       |                   |       | 5×11              | 21  | 5×11              | 22  | 6.3×11            | 24  | 6.3×11            | 30  |
| 10            | 100               |                   |     |                   |     | 5×11              | 27    | 5×11              | 27    | 5×11              | 30  | 6.3×11            | 37  | 6.3×11            | 40  | 8×11.5            | 50  |
| 22            | 220               | 5×11              | 34  | 5×11              | 34  | 5×11              | 40    | 6.3×11            | 46    | 6.3×11            | 51  | 8×11.5            | 63  | 8×11.5            | 68  | 10×16             | 97  |
| 33            | 330               | 5×11              | 45  | 5×11              | 45  | 5×11              | 49    | 6.3×11            | 56    | 8×11.5            | 72  | 8×11.5            | 77  | 10×12.5           | 98  | 10×20             | 140 |
| 47            | 470               | 5×11              | 54  | 5×11              | 54  | 6.3×11            | 67    | 6.3×11            | 67    | 8×11.5            | 86  | 10×12.5           | 105 | 10×16             | 130 | 12.5×20           | 170 |
| 100           | 101               | 6.3×11            | 90  | 6.3×11            | 90  | 8×11.5            | 110   | 8×11.5            | 110   | 10×16             | 160 | 10×20             | 190 | 12.5×20           | 225 | 16×25             | 300 |
| 220           | 221               | 8×11.5            | 150 | 8×11.5            | 150 | 10×12.5           | 195   | 10×16             | 215   | 12.5×20           | 290 | 12.5×25           | 340 | 16×25             | 405 | 16×35.5           | 510 |
| 330           | 331               | 8×11.5            | 185 | 10×16             | 240 | 10×16             | 265   | 12.5×20           | 320   | 12.5×20           | 350 | 16×25             | 460 | 16×31.5           | 535 |                   |     |
| 470           | 471               | 10×12.5           | 260 | 10×20             | 290 | 10×20             | 345   | 12.5×25           | 380   | 12.5×25           | 465 | 16×31.5           | 590 | 18×35.5           | 680 |                   |     |
| 1,000         | 102               | 10×20             | 460 | 12.5×20           | 510 | 12.5×25           | 605   | 16×25             | 670   | 16×31.5           | 805 |                   |     |                   |     |                   |     |
| 2,200         | 222               | 12.5×25           | 820 | 16×25             | 940 | 16×31.5           | 1,070 | 18×35.5           | 1,140 |                   |     |                   |     |                   |     |                   |     |

| $\mu\text{F}$ | V. DC<br>Contents | 160V (2C)         |     | 200V (2D)         |     | 250V (2E)         |     |
|---------------|-------------------|-------------------|-----|-------------------|-----|-------------------|-----|
|               |                   | $\phi D \times L$ | mA  | $\phi D \times L$ | mA  | $\phi D \times L$ | mA  |
| 0.47          | R47               | 5×11              | 8   | 5×11              | 9   | 6.3×11            | 10  |
| 1             | 010               | 6.3×11            | 11  | 8×11.5            | 12  | 8×11.5            | 13  |
| 2.2           | 2R2               | 8×11.5            | 18  | 8×11.5            | 22  | 10×12.5           | 26  |
| 3.3           | 3R3               | 8×11.5            | 26  | 10×12.5           | 30  | 10×16             | 37  |
| 4.7           | 4R7               | 10×12.5           | 31  | 10×16             | 37  | 10×20             | 50  |
| 10            | 100               | 10×16             | 60  | 10×20             | 66  | 10×20             | 79  |
| 22            | 220               | 12.5×20           | 117 | 12.5×20           | 117 | 12.5×25           | 138 |
| 33            | 330               | 12.5×20           | 143 | 12.5×25           | 158 | 16×25             | 169 |
| 47            | 470               | 16×25             | 188 |                   |     |                   |     |

## Part Numbering System

|             |                   |                       |               |                              |             |                               |                           |
|-------------|-------------------|-----------------------|---------------|------------------------------|-------------|-------------------------------|---------------------------|
| RNG Series  | 470 $\mu\text{F}$ | ±20%                  | 6.3V          | Bulk Package                 | Gas Type    | 10 $\phi \times 12.5\text{L}$ | Pb-free and PET sleeve    |
| <b>RNG</b>  | <b>471</b>        | <b>M</b>              | <b>0J</b>     | <b>BK</b>                    | -           | <b>1012</b>                   |                           |
| Series Name | Capacitance       | Capacitance Tolerance | Rated Voltage | Lead Configuration & Package | Rubber Type | Case Size                     | Lead Wire and Sleeve type |

Note: For more details, please refer to "Part Numbering System (Radial Type)" on page 13.