

## SEA Series

◆ This series is not recommended for new design

### Features

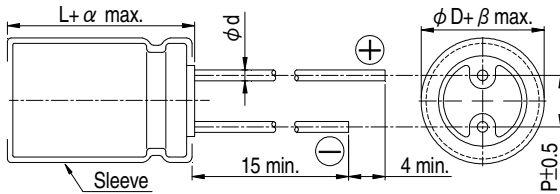
- 85°C, 2,000 hours assured, standard miniature type with 7 ~ 9mm height for compact circuits
- RoHS compliance



### Specifications

| Items                                       | Performance   |               |            |                    |                              |      |                                   |                 |                        |     |            |                 |                     |      |      |      |      |      |             |      |      |                     |      |      |   |   |   |   |   |   |
|---|---|---------------|------------|--------------------|------------------------------|------|-----------------------------------|-----------------|------------------------|-----|------------|-----------------|---------------------|------|------|------|------|------|-------------|------|------|---------------------|------|------|---|---|---|---|---|---|
| Category Temperature Range                  | -40°C ~ +85°C   |               |            |                    |                              |      |                                   |                 |                        |     |            |                 |                     |      |      |      |      |      |             |      |      |                     |      |      |   |   |   |   |   |   |
| Capacitance Tolerance                       | ±20% (at 120 Hz, 20°C)  |               |            |                    |                              |      |                                   |                 |                        |     |            |                 |                     |      |      |      |      |      |             |      |      |                     |      |      |   |   |   |   |   |   |
| Leakage Current (at 20°C)                   | I = 0.01CV or 3 (μA) whichever is greater (after 2 minutes)<br>Where, C = rated capacitance in μF, V = rated DC working voltage in V  |               |            |                    |                              |      |                                   |                 |                        |     |            |                 |                     |      |      |      |      |      |             |      |      |                     |      |      |   |   |   |   |   |   |
| Tanδ (at 120 Hz, 20°C)                      | <table border="1"> <thead> <tr> <th>Rated Voltage</th> <th>4</th> <th>6.3</th> <th>10</th> <th>16</th> <th>25</th> <th>35</th> <th>50</th> <th>63</th> </tr> </thead> <tbody> <tr> <td>Tanδ (max)</td> <td>0.35</td> <td>0.23</td> <td>0.20</td> <td>0.16</td> <td>0.14</td> <td>0.12</td> <td>0.10</td> <td>0.10</td> </tr> </tbody> </table>  | Rated Voltage | 4          | 6.3                | 10                           | 16   | 25                                | 35              | 50                     | 63  | Tanδ (max) | 0.35            | 0.23                | 0.20 | 0.16 | 0.14 | 0.12 | 0.10 | 0.10        |      |      |                     |      |      |   |   |   |   |   |   |
| Rated Voltage                               | 4   | 6.3           | 10         | 16                 | 25                           | 35   | 50                                | 63              |                        |     |            |                 |                     |      |      |      |      |      |             |      |      |                     |      |      |   |   |   |   |   |   |
| Tanδ (max)                                  | 0.35  | 0.23          | 0.20       | 0.16               | 0.14                         | 0.12 | 0.10                              | 0.10            |                        |     |            |                 |                     |      |      |      |      |      |             |      |      |                     |      |      |   |   |   |   |   |   |
| Low Temperature Characteristics (at 120 Hz) | <p>Impedance ratio shall not exceed the values given in the table below.</p> <table border="1"> <thead> <tr> <th colspan="2">Rated Voltage</th> <th>4</th> <th>6.3</th> <th>10</th> <th>16</th> <th>25</th> <th>35</th> <th>50</th> <th>63</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Impedance Ratio</td> <td>Z(-25°C) / Z(+20°C)</td> <td>7</td> <td>4</td> <td>3</td> <td>3</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> </tr> <tr> <td>Z(-40°C) / Z(+20°C)</td> <td>14</td> <td>10</td> <td>8</td> <td>6</td> <td>4</td> <td>4</td> <td>4</td> <td>4</td> </tr> </tbody> </table> | Rated Voltage |            | 4                  | 6.3                          | 10   | 16                                | 25              | 35                     | 50  | 63         | Impedance Ratio | Z(-25°C) / Z(+20°C) | 7    | 4    | 3    | 3    | 2    | 2           | 2    | 2    | Z(-40°C) / Z(+20°C) | 14   | 10   | 8 | 6 | 4 | 4 | 4 | 4 |
| Rated Voltage                               |   | 4             | 6.3        | 10                 | 16                           | 25   | 35                                | 50              | 63                     |     |            |                 |                     |      |      |      |      |      |             |      |      |                     |      |      |   |   |   |   |   |   |
| Impedance Ratio                             | Z(-25°C) / Z(+20°C)   | 7             | 4          | 3                  | 3                            | 2    | 2                                 | 2               | 2                      |     |            |                 |                     |      |      |      |      |      |             |      |      |                     |      |      |   |   |   |   |   |   |
|   | Z(-40°C) / Z(+20°C)   | 14            | 10         | 8                  | 6                            | 4    | 4                                 | 4               | 4                      |     |            |                 |                     |      |      |      |      |      |             |      |      |                     |      |      |   |   |   |   |   |   |
| Endurance                                   | <table border="1"> <thead> <tr> <th>Test Time</th> <th>2,000 Hrs</th> </tr> </thead> <tbody> <tr> <td>Capacitance Change</td> <td>Within ±20% of initial value</td> </tr> <tr> <td>Tanδ</td> <td>Less than 200% of specified value</td> </tr> <tr> <td>Leakage Current</td> <td>Within specified value</td> </tr> </tbody> </table> <p>* The above specifications shall be satisfied when the capacitors are restored to 20°C after the rated voltage applied with rated ripple current for 2,000 hours at 85°C.</p>  | Test Time     | 2,000 Hrs  | Capacitance Change | Within ±20% of initial value | Tanδ | Less than 200% of specified value | Leakage Current | Within specified value |     |            |                 |                     |      |      |      |      |      |             |      |      |                     |      |      |   |   |   |   |   |   |
| Test Time                                   | 2,000 Hrs   |               |            |                    |                              |      |                                   |                 |                        |     |            |                 |                     |      |      |      |      |      |             |      |      |                     |      |      |   |   |   |   |   |   |
| Capacitance Change                          | Within ±20% of initial value  |               |            |                    |                              |      |                                   |                 |                        |     |            |                 |                     |      |      |      |      |      |             |      |      |                     |      |      |   |   |   |   |   |   |
| Tanδ  | Less than 200% of specified value   |               |            |                    |                              |      |                                   |                 |                        |     |            |                 |                     |      |      |      |      |      |             |      |      |                     |      |      |   |   |   |   |   |   |
| Leakage Current                             | Within specified value  |               |            |                    |                              |      |                                   |                 |                        |     |            |                 |                     |      |      |      |      |      |             |      |      |                     |      |      |   |   |   |   |   |   |
| Shelf Life Test                             | Test time: 500 hours; other items are the same as those for the Endurance.  |               |            |                    |                              |      |                                   |                 |                        |     |            |                 |                     |      |      |      |      |      |             |      |      |                     |      |      |   |   |   |   |   |   |
| Ripple Current and Frequency Multipliers    | <table border="1"> <thead> <tr> <th rowspan="2">Cap. (μF)</th> <th colspan="5">Freq. (Hz)</th> </tr> <tr> <th>60 (50)</th> <th>120</th> <th>500</th> <th>1k</th> <th>10k up</th> </tr> </thead> <tbody> <tr> <td>≤ 47</td> <td>0.70</td> <td>1.00</td> <td>1.20</td> <td>1.30</td> <td>1.45</td> </tr> <tr> <td>100 ~ 1,000</td> <td>0.80</td> <td>1.00</td> <td>1.10</td> <td>1.15</td> <td>1.20</td> </tr> </tbody> </table>  | Cap. (μF)     | Freq. (Hz) |                    |                              |      |                                   | 60 (50)         | 120                    | 500 | 1k         | 10k up          | ≤ 47                | 0.70 | 1.00 | 1.20 | 1.30 | 1.45 | 100 ~ 1,000 | 0.80 | 1.00 | 1.10                | 1.15 | 1.20 |   |   |   |   |   |   |
| Cap. (μF)                                   | Freq. (Hz)  |               |            |                    |                              |      |                                   |                 |                        |     |            |                 |                     |      |      |      |      |      |             |      |      |                     |      |      |   |   |   |   |   |   |
|   | 60 (50)   | 120           | 500        | 1k                 | 10k up                       |      |                                   |                 |                        |     |            |                 |                     |      |      |      |      |      |             |      |      |                     |      |      |   |   |   |   |   |   |
| ≤ 47  | 0.70  | 1.00          | 1.20       | 1.30               | 1.45                         |      |                                   |                 |                        |     |            |                 |                     |      |      |      |      |      |             |      |      |                     |      |      |   |   |   |   |   |   |
| 100 ~ 1,000                                 | 0.80  | 1.00          | 1.10       | 1.15               | 1.20                         |      |                                   |                 |                        |     |            |                 |                     |      |      |      |      |      |             |      |      |                     |      |      |   |   |   |   |   |   |

### Diagram of Dimensions



### Lead Spacing and Diameter Unit: mm

| φD | 4    | 5   | 6.3 | 8   | 10  |
|----|------|-----|-----|-----|-----|
| P  | 1.5  | 2.0 | 2.5 | 3.5 | 5.0 |
| φd | 0.45 | 0.5 |     | 0.6 |     |
| α  | 1.0  |     |     |     | 1.5 |
| β  | 0.5  |     |     |     |     |

### Dimension and Permissible Ripple Current

Dimension: φD × L (mm)

Ripple Current: mA/rms at 120 Hz, 85°C

| Rated Volt. (Vdc) | μF  | Contents | 4V (0G) |        | 6.3V (0J) |       | 10V (1A) |        | 16V (1C) |       | 25V (1E) |        | 35V (1V) |        | 50V (1H) |        | 63V (1J) |    |
|-------------------|-----|----------|---------|--------|-----------|-------|----------|--------|----------|-------|----------|--------|----------|--------|----------|--------|----------|----|
|                   |     |          | φD×L    | mA     | φD×L      | mA    | φD×L     | mA     | φD×L     | mA    | φD×L     | mA     | φD×L     | mA     | φD×L     | mA     | φD×L     | mA |
| 1                 | 010 |          |         |        |           |       |          |        |          |       |          |        |          |        | 4×7      | 10     | 4×7      | 11 |
| 2.2               | 2R2 |          |         |        |           |       |          |        |          |       |          |        |          |        | 4×7      | 15     | 4×7      | 17 |
| 3.3               | 3R3 |          |         |        |           |       |          |        |          |       |          |        |          |        | 4×7      | 18     | 4×7      | 21 |
| 4.7               | 4R7 |          |         |        |           |       |          |        |          |       |          |        | 4×7      | 22     | 5×7*     | 23     | 5×7*     | 26 |
| 10                | 100 |          |         |        |           |       |          | 4×7    | 25       | 4×7   | 26       | 5×7*   | 30       | 6.3×7* | 34       | 6.3×7* | 40       |    |
| 22                | 220 |          |         | 4×7    | 31        | 4×7   | 32       | 5×7*   | 39       | 5×7*  | 41       | 6.3×7* | 47       | 6.3×7  | 53       | 8×7*   | 70       |    |
| 33                | 330 | 4×7      | 32      | 4×7    | 32        | 4×7   | 35       | 5×7    | 43       | 6.3×7 | 53       | 8×7*   | 71       | 8×7*   | 76       | 8×7    | 80       |    |
| 47                | 470 | 4×7      | 38      | 4×7    | 38        | 5×7*  | 47       | 6.3×7* | 59       | 6.3×7 | 65       | 8×7*   | 83       | 8×7    | 85       | 8×7    | 95       |    |
| 100               | 101 | 5×7      | 61      | 6.3×7* | 75        | 6.3×7 | 80       | 6.3×7  | 90       | 8×7   | 125      | 8×7    | 115      | 8×9    | 130      | 10×9   | 170      |    |
| 220               | 221 | 6.3×7    | 90      | 6.3×7  | 99        | 8×7   | 140      | 8×7    | 146      | 8×9   | 190      | 10×9   | 215      |        |          |        |          |    |
| 330               | 331 | 8×7      | 129     | 8×7    | 156       | 8×7   | 165      | 8×9    | 185      | 10×9  | 265      |        |          |        |          |        |          |    |
| 470               | 471 | 8×7      | 154     | 8×7    | 175       | 8×9   | 215      | 10×9   | 255      |       |          |        |          |        |          |        |          |    |
| 1,000             | 102 | 8×9      | 200     | 10×9   | 205       |       |          |        |          |       |          |        |          |        |          |        |          |    |

Note: Case size in mark of "\*" is available to product down size.

### Part Numbering System

SEA Series    470μF    ±20%    6.3V    Bulk Package    Gas Type    8φ × 7L    Pb-free and PET sleeve

**SEA**    **471**    **M**    **0J**    **BK**    -    **0807**

Series Name    Capacitance    Capacitance Tolerance    Rated Voltage    Lead Configuration and 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.