

## VEJ Series

### Features

- 4  $\phi$  ~ 18  $\phi$ , 105°C, 2,000 hours assured
- Designed for surface mounting on high density PC board
- RoHS compliance
- AEC-Q200 qualified



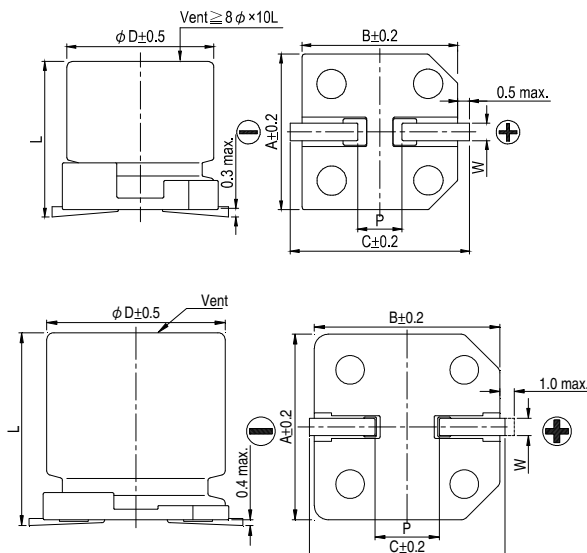
Marking color: Black

### Specifications

|                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |              |                                                                                                         |      |                |                                         |      |      |                    |           |           |               |     |     |     |        |           |    |    |     |           |           |          |      |      |      |                   |      |      |      |      |   |   |             |      |      |      |      |      |      |      |      |      |      |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|---------------------------------------------------------------------------------------------------------|------|----------------|-----------------------------------------|------|------|--------------------|-----------|-----------|---------------|-----|-----|-----|--------|-----------|----|----|-----|-----------|-----------|----------|------|------|------|-------------------|------|------|------|------|---|---|-------------|------|------|------|------|------|------|------|------|------|------|
| Items                                                                             | Performance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |              |                                                                                                         |      |                |                                         |      |      |                    |           |           |               |     |     |     |        |           |    |    |     |           |           |          |      |      |      |                   |      |      |      |      |   |   |             |      |      |      |      |      |      |      |      |      |      |
| Category Temperature Range                                                        | 6.3 ~ 100V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |              |                                                                                                         |      | 160 ~ 400V     |                                         |      |      | 450V               |           |           |               |     |     |     |        |           |    |    |     |           |           |          |      |      |      |                   |      |      |      |      |   |   |             |      |      |      |      |      |      |      |      |      |      |
|                                                                                   | -55°C ~ +105°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |              |                                                                                                         |      | -40°C ~ +105°C |                                         |      |      | -25°C ~ +105°C     |           |           |               |     |     |     |        |           |    |    |     |           |           |          |      |      |      |                   |      |      |      |      |   |   |             |      |      |      |      |      |      |      |      |      |      |
| Capacitance Tolerance                                                             | ±20% (at 120 Hz, 20°C)                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |              |                                                                                                         |      |                |                                         |      |      |                    |           |           |               |     |     |     |        |           |    |    |     |           |           |          |      |      |      |                   |      |      |      |      |   |   |             |      |      |      |      |      |      |      |      |      |      |
| Leakage Current (at 20°C)                                                         | Rated voltage                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |              | 6.3 ~ 100V                                                                                              |      |                |                                         |      |      | 160 ~ 450V         |           |           |               |     |     |     |        |           |    |    |     |           |           |          |      |      |      |                   |      |      |      |      |   |   |             |      |      |      |      |      |      |      |      |      |      |
|                                                                                   | Time                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |              | after 2 minutes                                                                                         |      |                |                                         |      |      | after 5 minutes    |           |           |               |     |     |     |        |           |    |    |     |           |           |          |      |      |      |                   |      |      |      |      |   |   |             |      |      |      |      |      |      |      |      |      |      |
|                                                                                   | Case size                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |              | 4 ~ 10 φ                                                                                                |      |                | 12.5 ~ 18 φ                             |      |      | 12.5 ~ 18 φ        |           |           |               |     |     |     |        |           |    |    |     |           |           |          |      |      |      |                   |      |      |      |      |   |   |             |      |      |      |      |      |      |      |      |      |      |
|                                                                                   | Leakage Current                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |              | I = 0.01CV or 3μA, whichever is greater                                                                 |      |                | I = 0.03CV or 4μA, whichever is greater |      |      | I = 0.04CV + 100μA |           |           |               |     |     |     |        |           |    |    |     |           |           |          |      |      |      |                   |      |      |      |      |   |   |             |      |      |      |      |      |      |      |      |      |      |
|                                                                                   | Where, C = rated capacitance in μF, V = rated DC working voltage in V                                                                                                                                                                                                                                                                                                                                                                                                                             |              |                                                                                                         |      |                |                                         |      |      |                    |           |           |               |     |     |     |        |           |    |    |     |           |           |          |      |      |      |                   |      |      |      |      |   |   |             |      |      |      |      |      |      |      |      |      |      |
| Tanδ (at 120 Hz, 20°C)                                                            | <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 ~ 250</td><td>400 ~ 450</td></tr><tr><td>4 ~ 10 φ</td><td>0.45</td><td>0.35</td><td>0.28</td><td>0.18</td><td>0.16</td><td>0.14</td><td>0.12</td><td>0.12</td><td>-</td><td>-</td></tr><tr><td>12.5 ~ 18 φ</td><td>0.40</td><td>0.38</td><td>0.34</td><td>0.26</td><td>0.22</td><td>0.18</td><td>0.14</td><td>0.10</td><td>0.20</td><td>0.25</td></tr></table> |              |                                                                                                         |      |                |                                         |      |      |                    |           |           | Rated Voltage | 6.3 | 10  | 16  | 25     | 35        | 50 | 63 | 100 | 160 ~ 250 | 400 ~ 450 | 4 ~ 10 φ | 0.45 | 0.35 | 0.28 | 0.18              | 0.16 | 0.14 | 0.12 | 0.12 | - | - | 12.5 ~ 18 φ | 0.40 | 0.38 | 0.34 | 0.26 | 0.22 | 0.18 | 0.14 | 0.10 | 0.20 | 0.25 |
|                                                                                   | Rated Voltage                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 6.3          | 10                                                                                                      | 16   | 25             | 35                                      | 50   | 63   | 100                | 160 ~ 250 | 400 ~ 450 |               |     |     |     |        |           |    |    |     |           |           |          |      |      |      |                   |      |      |      |      |   |   |             |      |      |      |      |      |      |      |      |      |      |
|                                                                                   | 4 ~ 10 φ                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 0.45         | 0.35                                                                                                    | 0.28 | 0.18           | 0.16                                    | 0.14 | 0.12 | 0.12               | -         | -         |               |     |     |     |        |           |    |    |     |           |           |          |      |      |      |                   |      |      |      |      |   |   |             |      |      |      |      |      |      |      |      |      |      |
| 12.5 ~ 18 φ                                                                       | 0.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0.38         | 0.34                                                                                                    | 0.26 | 0.22           | 0.18                                    | 0.14 | 0.10 | 0.20               | 0.25      |           |               |     |     |     |        |           |    |    |     |           |           |          |      |      |      |                   |      |      |      |      |   |   |             |      |      |      |      |      |      |      |      |      |      |
| When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |              |                                                                                                         |      |                |                                         |      |      |                    |           |           |               |     |     |     |        |           |    |    |     |           |           |          |      |      |      |                   |      |      |      |      |   |   |             |      |      |      |      |      |      |      |      |      |      |
| Low Temperature Characteristics (at 120 Hz)                                       | 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 | 400 | 450 |        |           |    |    |     |           |           |          |      |      |      |                   |      |      |      |      |   |   |             |      |      |      |      |      |      |      |      |      |      |
|                                                                                   | Impedance Ratio                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Z(-25°C)     | φ D < 12.5                                                                                              | 4    | 4              | 3                                       | 2    | 2    | 2                  | 2         | 3         | -             | -   | -   | -   |        |           |    |    |     |           |           |          |      |      |      |                   |      |      |      |      |   |   |             |      |      |      |      |      |      |      |      |      |      |
|                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | /Z(+20°C)    | φ D ≥ 12.5                                                                                              | 5    | 4              | 3                                       | 2    | 2    | 2                  | 2         | 2         | 3             | 3   | 3   | 6   | 6      |           |    |    |     |           |           |          |      |      |      |                   |      |      |      |      |   |   |             |      |      |      |      |      |      |      |      |      |      |
|                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Z(-55/-40°C) | φ D < 12.5                                                                                              | 12   | 8              | 6                                       | 4    | 3    | 3                  | 3         | 4         | -             | -   | -   | -   | -      |           |    |    |     |           |           |          |      |      |      |                   |      |      |      |      |   |   |             |      |      |      |      |      |      |      |      |      |      |
| /Z(+20°C)                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | φ D ≥ 12.5   | 10                                                                                                      | 8    | 6              | 4                                       | 3    | 3    | 3                  | 3         | 6         | 6             | 6   | 10  | -   |        |           |    |    |     |           |           |          |      |      |      |                   |      |      |      |      |   |   |             |      |      |      |      |      |      |      |      |      |      |
| Note: The ratio value with " - " is only available for 400V.                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |              |                                                                                                         |      |                |                                         |      |      |                    |           |           |               |     |     |     |        |           |    |    |     |           |           |          |      |      |      |                   |      |      |      |      |   |   |             |      |      |      |      |      |      |      |      |      |      |
| Endurance                                                                         | Test Time                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |              | 2,000 Hrs                                                                                               |      |                |                                         |      |      |                    |           |           |               |     |     |     |        |           |    |    |     |           |           |          |      |      |      |                   |      |      |      |      |   |   |             |      |      |      |      |      |      |      |      |      |      |
|                                                                                   | Capacitance Change                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |              | Within ±25% of initial value for φ D ≤ 6.3 mm;<br>Within ±20% of initial value for φ D ≥ 8 mm           |      |                |                                         |      |      |                    |           |           |               |     |     |     |        |           |    |    |     |           |           |          |      |      |      |                   |      |      |      |      |   |   |             |      |      |      |      |      |      |      |      |      |      |
|                                                                                   | Tanδ                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |              | Less than 300% of specified value for φ D ≤ 6.3 mm;<br>Less than 200% of specified value for φ D ≥ 8 mm |      |                |                                         |      |      |                    |           |           |               |     |     |     |        |           |    |    |     |           |           |          |      |      |      |                   |      |      |      |      |   |   |             |      |      |      |      |      |      |      |      |      |      |
|                                                                                   | Leakage Current                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |              | Within specified value                                                                                  |      |                |                                         |      |      |                    |           |           |               |     |     |     |        |           |    |    |     |           |           |          |      |      |      |                   |      |      |      |      |   |   |             |      |      |      |      |      |      |      |      |      |      |
|                                                                                   | * The above specifications shall be satisfied when the capacitors are restored to 20°C after the rated voltage applied for 2,000 hours at 105°C.                                                                                                                                                                                                                                                                                                                                                  |              |                                                                                                         |      |                |                                         |      |      |                    |           |           |               |     |     |     |        |           |    |    |     |           |           |          |      |      |      |                   |      |      |      |      |   |   |             |      |      |      |      |      |      |      |      |      |      |
| Shelf Life Test                                                                   | Test time: 1,000 hours; other items are the same as those for the Endurance.<br>The rated voltage shall be applied to the capacitors before the measurements for 160 ~ 450V (Refer to JIS C 5101-4 4.1).                                                                                                                                                                                                                                                                                          |              |                                                                                                         |      |                |                                         |      |      |                    |           |           |               |     |     |     |        |           |    |    |     |           |           |          |      |      |      |                   |      |      |      |      |   |   |             |      |      |      |      |      |      |      |      |      |      |
| Ripple Current and Frequency Multipliers                                          | <table><tr><td>Freq. (Hz)</td><td>50</td><td>120</td><td>1k</td><td>10k up</td></tr><tr><td>Cap. (μF)</td><td></td><td></td><td></td><td></td></tr><tr><td>≤ 1,000</td><td>0.80</td><td>1.00</td><td>1.25</td><td>1.40</td></tr><tr><td>1,000 &lt; C ≤ 8,200</td><td>0.85</td><td>1.00</td><td>1.15</td><td>1.25</td></tr></table>                                                                                                                                                                |              |                                                                                                         |      |                |                                         |      |      |                    |           |           | Freq. (Hz)    | 50  | 120 | 1k  | 10k up | Cap. (μF) |    |    |     |           | ≤ 1,000   | 0.80     | 1.00 | 1.25 | 1.40 | 1,000 < C ≤ 8,200 | 0.85 | 1.00 | 1.15 | 1.25 |   |   |             |      |      |      |      |      |      |      |      |      |      |
|                                                                                   | Freq. (Hz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 50           | 120                                                                                                     | 1k   | 10k up         |                                         |      |      |                    |           |           |               |     |     |     |        |           |    |    |     |           |           |          |      |      |      |                   |      |      |      |      |   |   |             |      |      |      |      |      |      |      |      |      |      |
|                                                                                   | Cap. (μF)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |              |                                                                                                         |      |                |                                         |      |      |                    |           |           |               |     |     |     |        |           |    |    |     |           |           |          |      |      |      |                   |      |      |      |      |   |   |             |      |      |      |      |      |      |      |      |      |      |
| ≤ 1,000                                                                           | 0.80                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1.00         | 1.25                                                                                                    | 1.40 |                |                                         |      |      |                    |           |           |               |     |     |     |        |           |    |    |     |           |           |          |      |      |      |                   |      |      |      |      |   |   |             |      |      |      |      |      |      |      |      |      |      |
| 1,000 < C ≤ 8,200                                                                 | 0.85                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1.00         | 1.15                                                                                                    | 1.25 |                |                                         |      |      |                    |           |           |               |     |     |     |        |           |    |    |     |           |           |          |      |      |      |                   |      |      |      |      |   |   |             |      |      |      |      |      |      |      |      |      |      |

### Diagram of Dimensions

Fig. 1



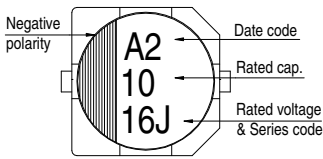
### Lead Spacing and Diameter

Unit: mm

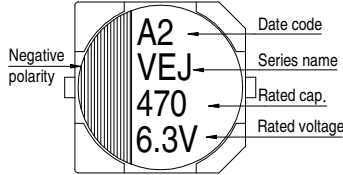
| $\phi D$ | L              | A    | B    | C    | W         | P $\pm 0.2$ | Fig. No. |
|----------|----------------|------|------|------|-----------|-------------|----------|
| 4        | 5.7 $\pm$ 0.3  | 4.3  | 4.3  | 5.1  | 0.5 ~ 0.8 | 1.0         | 1        |
| 5        | 5.7 $\pm$ 0.3  | 5.3  | 5.3  | 5.9  | 0.5 ~ 0.8 | 1.5         | 1        |
| 6.3      | 5.7 $\pm$ 0.3  | 6.6  | 6.6  | 7.2  | 0.5 ~ 0.8 | 2.0         | 1        |
| 6.3      | 7.7 $\pm$ 0.3  | 6.6  | 6.6  | 7.2  | 0.5 ~ 0.8 | 2.0         | 1        |
| 8        | 6.5 $\pm$ 0.3  | 8.3  | 8.3  | 9.0  | 0.5 ~ 0.8 | 2.3         | 1        |
| 8        | 10 $\pm$ 0.5   | 8.3  | 8.3  | 9.0  | 0.7 ~ 1.1 | 3.1         | 1        |
| 10       | 7.7 $\pm$ 0.3  | 10.3 | 10.3 | 11.0 | 0.7 ~ 1.3 | 4.7         | 1        |
| 10       | 10 $\pm$ 0.5   | 10.3 | 10.3 | 11.0 | 0.7 ~ 1.3 | 4.7         | 1        |
| 12.5     | 13.5 $\pm$ 0.5 | 13.0 | 13.0 | 13.7 | 1.1 ~ 1.4 | 4.4         | 2        |
| 12.5     | 16 $\pm$ 0.5   | 13.0 | 13.0 | 13.7 | 1.1 ~ 1.4 | 4.4         | 2        |
| 16       | 16.5 $\pm$ 0.5 | 17.0 | 17.0 | 18.0 | 1.1 ~ 1.4 | 6.4         | 2        |
| 16       | 21.5 $\pm$ 0.5 | 17.0 | 17.0 | 18.0 | 1.1 ~ 1.4 | 6.4         | 2        |
| 18       | 16.5 $\pm$ 0.5 | 19.0 | 19.0 | 20.0 | 1.1 ~ 1.4 | 6.4         | 2        |
| 18       | 21.5 $\pm$ 0.5 | 19.0 | 19.0 | 20.0 | 1.1 ~ 1.4 | 6.4         | 2        |

## Marking

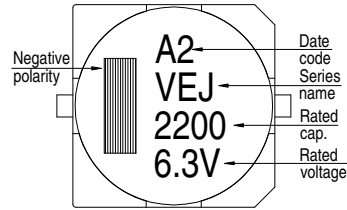
$\phi D \leq 6.3 \text{ mm}$



$\phi D = 8 \sim 10 \text{ mm}$



$\phi D \geq 12.5 \text{ mm}$



## Dimension and Permissible Ripple Current

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

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

| Rated Volt. (Vdc)  | 6.3V (0J)         | 10V (1A)      | 16V (1C)          | 25V (1E)      | 35V (1V)          | 50V (1H)      | 63V (1J)          | 100V (2A)     |
|--------------------|-------------------|---------------|-------------------|---------------|-------------------|---------------|-------------------|---------------|
| Cap. (μF) Contents | $\phi D \times L$ | mA            | $\phi D \times L$ | mA            | $\phi D \times L$ | mA            | $\phi D \times L$ | mA            |
| 1 010              |                   |               |                   |               |                   | 4×5.7 8       | 4×5.7 8           |               |
| 2.2 2R2            |                   |               |                   |               |                   | 4×5.7 12      | 4×5.7 12          |               |
| 3.3 3R3            |                   |               |                   |               |                   | 4×5.7 14      | 5×5.7 17          |               |
| 4.7 4R7            |                   |               |                   | 4×5.7 17      | 4×5.7 17          | 5×5.7 20      | 6.3×5.7 22        |               |
| 10 100             |                   |               | 4×5.7 20          | 4×5.7 20      | 5×5.7 27          | 6.3×5.7 32    | 6.3×5.7 32        |               |
| 22 220             | 4×5.7 22          | 4×5.7 22      | 5×5.7 30          | 5×5.7 30      | 6.3×5.7 44        | 6.3×5.7 38    | 6.3×7.7 58        | 8×10 100      |
| 33 330             | 5×5.7 34          | 5×5.7 34      | 5×5.7 34          | 6.3×5.7 46    | 6.3×5.7 46        | 6.3×7.7 65    | 8×10 140          | 10×10 150     |
| 47 470             | 5×5.7 38          | 5×5.7 38      | 6.3×5.7 48        | 6.3×5.7 48    | 6.3×7.7 80        | 6.3×7.7 70    | 8×10 170          | 12.5×13.5 250 |
| 100 101            | 6.3×5.7 69        | 6.3×5.7 69    | 6.3×5.7 69        | 6.3×7.7 100   | 8×10 240          | 8×10 210      | 10×10 310         | 12.5×13.5 380 |
| 220 221            | 6.3×7.7 120       | 6.3×7.7 120   | 6.3×7.7 120       | 8×10 270      | 8×10 270          | 10×10 330     | 12.5×13.5 470     | 16×16.5 450   |
| 330 331            | 8×10 290          | 8×10 290      | 8×10 290          | 8×10 290      | 10×10 370         | 12.5×13.5 490 | 16×16.5 650       | 18×16.5 590   |
| 470 471            | 8×10 320          | 8×10 320      | 10×10 380         | 10×10 380     | 12.5×13.5 520     | 12.5×16 550   | 16×16.5 700       | 18×21.5 980   |
| 1,000 102          | 10×10 410         | 10×10 410     | 12.5×13.5 500     | 12.5×16 550   | 16×16.5 800       | 18×16.5 990   |                   |               |
| 2,200 222          | 12.5×13.5 680     | 12.5×13.5 680 | 16×16.5 900       | 16×16.5 900   | 18×16.5 1,050     |               |                   |               |
| 3,300 332          | 12.5×16 850       | 16×16.5 950   | 16×16.5 950       | 18×16.5 1,150 |                   |               |                   |               |
| 4,700 472          | 16×16.5 1,000     | 16×16.5 1,000 | 18×16.5 1,225     | 18×21.5 1,300 |                   |               |                   |               |
| 6,800 682          | 18×16.5 1,290     | 18×16.5 1,290 |                   |               |                   |               |                   |               |
| 8,200 822          | 18×21.5 1,450     | 18×21.5 1,450 |                   |               |                   |               |                   |               |

| Rated Volt. (Vdc) |          | 160V (2C) |     | 200V (2D) |     | 250V (2E) |     | 400V (2G) |     | 450V (2W) |     |
|-------------------|----------|-----------|-----|-----------|-----|-----------|-----|-----------|-----|-----------|-----|
| Cap. (μF)         | Contents | φ D×L     | mA  | φ D×L     | mA  | φ D×L     | mA  | φ D×L     | mA  | φ D×L     | mA  |
| 4.7               | 4R7      |           |     |           |     | 12.5×13.5 | 65  | 12.5×13.5 | 45  | 12.5×13.5 | 45  |
| 10                | 100      |           |     | 12.5×13.5 | 80  | 12.5×13.5 | 70  | 12.5×13.5 | 50  | 12.5×16   | 75  |
| 22                | 220      |           |     | 12.5×16   | 110 | 12.5×13.5 | 105 | 16×16.5   | 85  | 16×16.5   | 85  |
| 33                | 330      | 12.5×13.5 | 95  | 12.5×16   | 120 | 16×16.5   | 180 | 18×16.5   | 100 | 18×16.5   | 100 |
| 47                | 470      | 12.5×16   | 205 | 16×16.5   | 220 | 16×16.5   | 220 | 18×21.5   | 130 |           |     |
| 100               | 101      | 16×16.5   | 250 | 18×16.5   | 280 | 18×21.5   | 290 |           |     |           |     |

## Part Numbering System

|             |             |                       |               |              |               |                         |
|-------------|-------------|-----------------------|---------------|--------------|---------------|-------------------------|
| VEJ Series  | 470μF       | ±20%                  | 6.3V          | Carrier Tape | 8φ×10L        | Pb-free and Coated Case |
| <b>VEJ</b>  | <b>471</b>  | <b>M</b>              | <b>0J</b>     | <b>TR</b>    | <b>-</b>      | <b>0810</b>             |
| Series Name | Capacitance | Capacitance Tolerance | Rated Voltage | Package Type | Terminal Type | Case Size               |
|             |             |                       |               |              |               | Lead Wire and Case Type |

Note: For more details, please refer to "Part Numbering System - SMD Type" on page 106.