

## VE Series

### Features

- 3  $\phi$  ~ 18  $\phi$ , 85°C, 2,000 hours assured
- Chip type large capacitance capacitors
- Designed for surface mounting on high density PC board
- RoHS Compliance



Marking color: Black

### Specifications

| Items   | Performance  |  |                      |      |      |        |    |    |    |    |    |     |           |           |
|---|--|--|----------------------|------|------|--------|----|----|----|----|----|-----|-----------|-----------|
| Category Temperature Range  | -40°C ~ +85°C  |  |                      |      |      |        |    |    |    |    |    |     |           |           |
| Capacitance Tolerance   | ±20% (at 120Hz, 20°C)  |  |                      |      |      |        |    |    |    |    |    |     |           |           |
| Leakage Current (at 20°C)   | Rated Voltage  | 6.3 ~ 100V      160 ~ 450V   |                      |      |      |        |    |    |    |    |    |     |           |           |
|   | Time   | after 2 minutes      after 5 minutes   |                      |      |      |        |    |    |    |    |    |     |           |           |
|   | Case size  | 3 ~ 10 $\phi$ 12.5 ~ 18 $\phi$ 12.5 ~ 18 $\phi$  |                      |      |      |        |    |    |    |    |    |     |           |           |
|   | Leakage Current  | I = 0.01CV or 3 $\mu$ A, whichever is greater      I = 0.03CV or 4 $\mu$ A, whichever is greater      I = 0.04CV + 100 $\mu$ A |                      |      |      |        |    |    |    |    |    |     |           |           |
| Where, C = rated capacitance in $\mu$ F      V = rated DC working voltage in V  |  |  |                      |      |      |        |    |    |    |    |    |     |           |           |
| Tan $\delta$ (at 120Hz, 20°C)   | Rated Voltage  | 4   6.3   10   16   25   35   50   63   100   160 ~ 250   400 ~ 450  |                      |      |      |        |    |    |    |    |    |     |           |           |
|   | 3 ~ 10 $\phi$  | 0.42   0.28   0.24   0.20   0.14   0.12   0.10   0.10   0.10   -   -   |                      |      |      |        |    |    |    |    |    |     |           |           |
|   | 12.5 ~ 18 $\phi$   | -   0.38   0.34   0.30   0.26   0.22   0.18   0.14   0.10   0.20   0.25  |                      |      |      |        |    |    |    |    |    |     |           |           |
| When the capacitance exceeds 1,000 $\mu$ F, 0.02 shall be added every 1,000 $\mu$ F increase.   |  |  |                      |      |      |        |    |    |    |    |    |     |           |           |
| Low Temperature Characteristics (at 120Hz)  | Impedance ratio shall not exceed the values given in the table below.  |  |                      |      |      |        |    |    |    |    |    |     |           |           |
|   | Impedance Ratio  | Rated Voltage  |                      | 4.0  | 6.3  | 10     | 16 | 25 | 35 | 50 | 63 | 100 | 160 ~ 250 | 400 ~ 450 |
|   |  | Z(-25°C)   | $\phi$ D < 12.5      | 7    | 4    | 4      | 3  | 2  | 2  | 2  | 2  | 2   | -         | -         |
|   |  | /Z(+20°C)  | $\phi$ D $\geq$ 12.5 | -    | 5    | 5      | 4  | 2  | 2  | 2  | 2  | 2   | 3         | 6         |
|   |  | Z(-40°C)   | $\phi$ D < 12.5      | 15   | 8    | 5      | 4  | 3  | 3  | 3  | 3  | 3   | -         | -         |
| /Z(+20°C)   | $\phi$ D $\geq$ 12.5   | -  | 14                   | 12   | 10   | 5      | 4  | 3  | 3  | 3  | 6  | 10  |           |           |
| Endurance   | Test Time  | 2,000 Hrs  |                      |      |      |        |    |    |    |    |    |     |           |           |
|   | Capacitance Change   | Within ±20% of initial value (4V: ±30%)  |                      |      |      |        |    |    |    |    |    |     |           |           |
|   | Tan $\delta$   | Less than 200% of specified value (4V: ±300%)  |                      |      |      |        |    |    |    |    |    |     |           |           |
|   | 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 85°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 & Frequency Multipliers  | Freq. (Hz)   |  | 50                   | 120  | 1k   | 10k up |    |    |    |    |    |     |           |           |
|   | Under 1,000  |  | 0.80                 | 1.00 | 1.25 | 1.40   |    |    |    |    |    |     |           |           |
|   | 1,000 < C $\leq$ 10,000  |  | 0.85                 | 1.00 | 1.15 | 1.25   |    |    |    |    |    |     |           |           |

### Diagram of Dimensions

Fig. 1



Fig. 2



### Lead Spacing and Diameter

Unit: mm

| $\phi$ D | L          | A    | B    | C    | W           | P ± 0.2 | Fig. No. |
|----------|------------|------|------|------|-------------|---------|----------|
| 3        | 5.3 ± 0.2  | 3.3  | 3.3  | 4.1  | 0.45 ~ 0.75 | 0.8     | 1        |
| 4        | 5.3 ± 0.2  | 4.3  | 4.3  | 5.1  | 0.5 ~ 0.8   | 1.0     | 1        |
| 5        | 5.3 ± 0.2  | 5.3  | 5.3  | 5.9  | 0.5 ~ 0.8   | 1.5     | 1        |
| 6.3      | 5.3 ± 0.2  | 6.6  | 6.6  | 7.2  | 0.5 ~ 0.8   | 2.0     | 1        |
| 6.3      | 7.7 ± 0.3  | 6.6  | 6.6  | 7.2  | 0.5 ~ 0.8   | 2.0     | 1        |
| 8        | 6.5 ± 0.3  | 8.4  | 8.4  | 9.0  | 0.5 ~ 0.8   | 2.3     | 1        |
| 8        | 10 ± 0.5   | 8.4  | 8.4  | 9.0  | 0.7 ~ 1.1   | 3.1     | 1        |
| 10       | 7.7 ± 0.3  | 10.4 | 10.4 | 11.0 | 0.7 ~ 1.3   | 4.7     | 1        |
| 10       | 10 ± 0.5   | 10.4 | 10.4 | 11.0 | 0.7 ~ 1.3   | 4.7     | 1        |
| 12.5     | 13.5 ± 0.5 | 13.0 | 13.0 | 13.7 | 1.1 ~ 1.4   | 4.4     | 2        |
| 12.5     | 16 ± 0.5   | 13.0 | 13.0 | 13.7 | 1.1 ~ 1.4   | 4.4     | 2        |
| 16       | 16.5 ± 0.5 | 17.0 | 17.0 | 18.0 | 1.1 ~ 1.4   | 6.4     | 2        |
| 16       | 21.5 ± 0.5 | 17.0 | 17.0 | 18.0 | 1.1 ~ 1.4   | 6.4     | 2        |
| 18       | 16.5 ± 0.5 | 19.0 | 19.0 | 20.0 | 1.1 ~ 1.4   | 6.4     | 2        |
| 18       | 21.5 ± 0.5 | 19.0 | 19.0 | 20.0 | 1.1 ~ 1.4   | 6.4     | 2        |

## Marking

φ D = 3 mm



φ D = 4 ~ 6.3 mm



φ D = 8 ~ 10 mm



φ D ≥ 12.5 mm



Dimension: φ D × L(mm)

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

## Dimension & Permissible Ripple Current

| V. DC<br>μF | Contents | 4V (0G)            |           | 6.3V (0J)          |                | 10V (1A)                 |                   | 16V (1C)                    |                  | 25V (1E)           |                | 35V (1V)           |                | 50V (1H)           |                | 63 (1J)          |          |
|-------------|----------|--------------------|-----------|--------------------|----------------|--------------------------|-------------------|-----------------------------|------------------|--------------------|----------------|--------------------|----------------|--------------------|----------------|------------------|----------|
|             |          | φ D×L              | mA        | φ D×L              | mA             | φ D×L                    | mA                | φ D×L                       | mA               | φ D×L              | mA             | φ D×L              | mA             | φ D×L              | mA             | φ D×L            | mA       |
| 1           | 010      |                    |           |                    |                |                          |                   |                             |                  |                    |                |                    |                | 4×5.3              | 10             | 4×5.3            | 8        |
| 2.2         | 2R2      |                    |           |                    |                |                          |                   |                             |                  |                    |                |                    |                | 4×5.3              | 14             | 4×5.3            | 12       |
| 3.3         | 3R3      |                    |           |                    |                |                          |                   |                             |                  | 3×5.3              | 14             | 3×5.3              | 14             | 4×5.3              | 17             | 5×5.3            | 22       |
| 4.7         | 4R7      |                    |           |                    |                | 3×5.3                    | 14                | 3×5.3                       | 14               | 4×5.3              | 26             | 4×5.3              | 26             | 4×5.3              | 20             | 5×5.3            | 25       |
| 10          | 100      |                    |           | 3×5.3              | 16             | 4×5.3                    | 26                | 4×5.3                       | 26               | 5×5.3              | 44             | 5×5.3              | 44             | 5×5.3              | 35             | 6.3×5.3<br>8×6.5 | 40<br>46 |
| 22          | 220      | 3×5.3              | 16        | 4×5.3              | 26             | 5×5.3                    | 44                | 4×5.3<br>5×5.3              | 30<br>44         | 5×5.3<br>6.3×5.3   | 47<br>59       | 5×5.3<br>6.3×5.3   | 47<br>59       | 6.3×5.3<br>6.3×7.7 | 50<br>65       | 8×10             | 139      |
| 33          | 330      | 4×5.3              | 31        | 4×5.3              | 31             | 4×5.3<br>5×5.3           | 31<br>55          | 5×5.3                       | 55               | 5×5.3<br>6.3×5.3   | 55<br>67       | 6.3×5.3<br>6.3×7.7 | 67<br>85       | 6.3×7.7<br>8×6.5   | 75<br>95       | 8×10             | 139      |
| 47          | 470      | 4×5.3              | 34        | 4×5.3<br>5×5.3     | 34<br>55       | 6.3×5.3                  | 75                | 5×5.3<br>6.3×5.3            | 55<br>75         | 6.3×5.3<br>6.3×7.7 | 75<br>98       | 6.3×7.7<br>8×6.5   | 98<br>105      | 6.3×7.7<br>8×10    | 75<br>190      | 10×10            | 200      |
| 68          | 680      | 5×5.3              | 58        | 5×5.3<br>6.3×5.3   | 58<br>89       | 5×5.3<br>6.3×5.3         | 58<br>89          | 6.3×5.3                     | 89               | 6.3×7.7            | 109            | 6.3×7.7            | 109            | 8×10               | 190            | 10×10            | 226      |
| 100         | 101      | 5×5.3<br>6.3×5.3   | 58<br>89  | 6.3×5.3            | 89             | 6.3×5.3<br>6.3×7.7       | 89<br>109         | 6.3×5.3<br>6.3×7.7<br>8×6.5 | 89<br>109<br>125 | 6.3×7.7            | 109            | 8×10               | 252            | 8×10               | 190            | 10×10            | 226      |
| 150         | 151      |                    |           |                    |                |                          |                   |                             |                  |                    |                | 10×7.7             | 252            |                    |                |                  |          |
| 220         | 221      | 6.3×5.3<br>6.3×7.7 | 89<br>124 | 6.3×5.3<br>6.3×7.7 | 89<br>124      | 6.3×7.7<br>8×6.5<br>8×10 | 124<br>175<br>270 | 6.3×7.7<br>8×10             | 124<br>270       | 8×10<br>10×7.7     | 270<br>270     | 8×10<br>10×10      | 270<br>370     | 10×10              | 320            | 12.5×13.5        | 500      |
| 330         | 331      | 6.3×7.7            | 124       | 6.3×7.7<br>8×6.5   | 124<br>190     | 8×10                     | 290               | 8×10<br>10×7.7              | 290<br>290       | 10×10              | 400            | 10×10              | 400            | 12.5×13.5          | 600            | 12.5×16          | 600      |
| 470         | 471      | 8×10               | 290       | 8×10               | 290            | 10×7.7<br>10×10          | 290<br>400        | 10×10                       | 400              | 10×10              | 400            | 12.5×13.5          | 680            | 12.5×16            | 740            | 16×16.5          | 850      |
| 680         | 681      |                    |           | 10×7.7             | 290            | 10×10                    | 410               | 10×10                       | 410              | 12.5×13.5          | 680            | 12.5×13.5          | 680            | 16×16.5            | 1,000          | 18×16.5          | 1,100    |
| 1,000       | 102      |                    |           | 10×10              | 430            | 10×10                    | 430               | 12.5×13.5                   | 750              | 12.5×13.5          | 750            | 16×16.5            | 1,100          | 18×16.5<br>16×21.5 | 1,350<br>1,400 |                  |          |
| 2,200       | 222      |                    |           | 12.5×13.5          | 890            | 12.5×13.5                | 890               | 16×16.5                     | 1,100            | 16×16.5            | 1,100          | 18×16.5<br>16×21.5 | 1,450<br>1,500 |                    |                |                  |          |
| 3,300       | 332      |                    |           | 12.5×16            | 1,000          | 16×16.5                  | 1,300             | 16×16.5                     | 1,300            | 18×16.5<br>16×21.5 | 1,450<br>1,500 | 18×21.5            | 1,750          |                    |                |                  |          |
| 4,700       | 472      |                    |           | 16×16.5            | 1,400          | 16×16.5                  | 1,400             | 18×16.5<br>16×21.5          | 1,600<br>1,650   | 18×21.5            | 1,750          |                    |                |                    |                |                  |          |
| 6,800       | 682      |                    |           | 18×16.5<br>16×21.5 | 1,700<br>1,750 | 18×16.5<br>16×21.5       | 1,700<br>1,750    | 18×21.5                     | 2,000            |                    |                |                    |                |                    |                |                  |          |
| 10,000      | 103      |                    |           | 18×21.5            | 2,000          | 18×21.5                  | 2,000             |                             |                  |                    |                |                    |                |                    |                |                  |          |

| V. DC<br>μF | Contents | 100V (2A)          |            | 160V (2C)          |            | 200V (2D)          |            | 250V (2E)          |            | 400V (2G) |     | 450V (2W) |     |
|-------------|----------|--------------------|------------|--------------------|------------|--------------------|------------|--------------------|------------|-----------|-----|-----------|-----|
|             |          | φ D×L              | mA         | 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 | 120 | 12.5×13.5 | 120 |
| 10          | 100      | 8×10               | 90         |                    |            |                    |            | 12.5×13.5          | 150        | 12.5×13.5 | 120 | 12.5×16   | 130 |
| 22          | 220      | 8×10               | 90         |                    |            | 12.5×13.5          | 240        | 12.5×13.5          | 150        | 16×16.5   | 140 | 16×16.5   | 140 |
| 33          | 330      | 10×10              | 120        | 12.5×13.5          | 290        | 12.5×16            | 310        | 12.5×16            | 240        | 16×16.5   | 140 | 18×16.5   | 180 |
| 47          | 470      | 10×10              | 120        | 12.5×16            | 370        | 16×16.5            | 420        | 16×16.5            | 340        | 18×16.5   | 280 | 18×21.5   | 250 |
| 68          | 680      | 12.5×13.5          | 380        | 16×16.5            | 500        | 16×16.5            | 420        | 18×16.5<br>16×21.5 | 440<br>450 | 18×21.5   | 350 |           |     |
| 100         | 101      | 12.5×13.5          | 440        | 18×16.5<br>16×21.5 | 650<br>690 | 18×16.5<br>16×21.5 | 550<br>590 | 18×21.5            | 490        |           |     |           |     |
| 220         | 221      | 16×16.5            | 600        |                    |            |                    |            |                    |            |           |     |           |     |
| 330         | 331      | 18×16.5<br>16×21.5 | 780<br>850 |                    |            |                    |            |                    |            |           |     |           |     |

## Part Numbering System

VE series    470μF    ±20%    6.3V    Carrier Tape    8 φ ×10L    Pb-free and PET coating case

**VE-**    **471**    **M**    **OJ**    **TR**    -    **0810**

Series name    Capacitance    Capacitance Tolerance    Rated Voltage    Package Type    Terminal Type    Case size    Lead Wire and Coating Type

Note: For more details, please refer to "Part Numbering System (SMD Type)" on page 12.

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