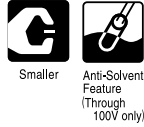
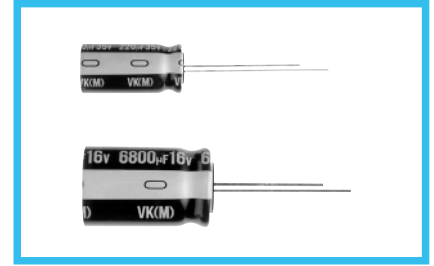
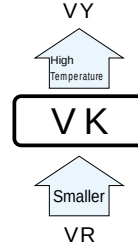


**VK** Miniature Sized  
series



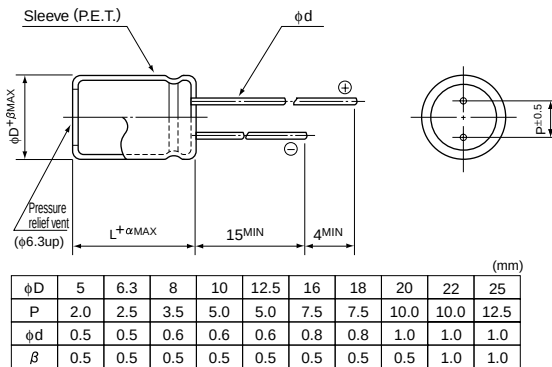
- One rank smaller case sizes than VR series.
- Compliant to the RoHS directive (2011/65/EU).



## Specifications

| Item                          | Performance Characteristics                                                                                                                                                                                                            |                                                                                                                                                                                                                                                        |      |      |      |      |                    |                                                                                                                                                                               |                                                   |            |            |     |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|------|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|------------|------------|-----|
| Category Temperature Range    | -40 to +85°C (6.3V to 400V), -25°C to +85°C (450V)                                                                                                                                                                                     |                                                                                                                                                                                                                                                        |      |      |      |      |                    |                                                                                                                                                                               |                                                   |            |            |     |
| Rated Voltage Range           | 6.3 to 450V                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                        |      |      |      |      |                    |                                                                                                                                                                               |                                                   |            |            |     |
| Rated Capacitance Range       | 0.1 to 68000μF                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                        |      |      |      |      |                    |                                                                                                                                                                               |                                                   |            |            |     |
| Capacitance Tolerance         | ±20% at 120Hz, 20°C                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                        |      |      |      |      |                    |                                                                                                                                                                               |                                                   |            |            |     |
| Leakage Current               | Rated voltage (V)                                                                                                                                                                                                                      | 6.3 to 100V                                                                                                                                                                                                                                            |      |      |      |      |                    | 160 to 450V                                                                                                                                                                   |                                                   |            |            |     |
|                               | _____                                                                                                                                                                                                                                  | After 1 minute's application of rated voltage, leakage current is not more than 0.03CV or 4 (μA), whichever is greater.<br><br>After 2 minutes' application of rated voltage, leakage current is not more than 0.01CV or 3 (μA), whichever is greater. |      |      |      |      |                    | After 1 minute's application of rated voltage, CV ≤ 1000 : I = 0.1CV+40μA or less<br><br>After 1 minute's application of rated voltage, CV>1000 : I = 0.04CV+100 (μA) or less |                                                   |            |            |     |
| Tangent of loss angle (tan δ) | For capacitance of more than 1000μF, add 0.02 for every increase of 1000μF.                                                                                                                                                            |                                                                                                                                                                                                                                                        |      |      |      |      |                    |                                                                                                                                                                               |                                                   |            |            |     |
|                               | Measurement frequency : 120Hz at 20°C                                                                                                                                                                                                  |                                                                                                                                                                                                                                                        |      |      |      |      |                    |                                                                                                                                                                               |                                                   |            |            |     |
|                               | Rated voltage (V)                                                                                                                                                                                                                      | 6.3                                                                                                                                                                                                                                                    | 10   | 16   | 25   | 35   | 50                 | 63                                                                                                                                                                            | 100                                               | 160 to 250 | 350 to 450 |     |
|                               | tan δ (MAX.)                                                                                                                                                                                                                           | 0.28                                                                                                                                                                                                                                                   | 0.24 | 0.20 | 0.16 | 0.14 | 0.12               | 0.10                                                                                                                                                                          | 0.08                                              | 0.20       | 0.25       |     |
| Stability at Low Temperature  | Measurement frequency : 120Hz                                                                                                                                                                                                          |                                                                                                                                                                                                                                                        |      |      |      |      |                    |                                                                                                                                                                               |                                                   |            |            |     |
|                               | Rated voltage (V)                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                        | 6.3  | 10   | 16   | 25   | 35                 | 50 to 100                                                                                                                                                                     | 160 to 200                                        | 250 to 350 | 400        | 450 |
|                               | Impedance ratio                                                                                                                                                                                                                        | Z-25°C / Z+20°C                                                                                                                                                                                                                                        | 5    | 4    | 3    | 2    | 2                  | 2                                                                                                                                                                             | 3                                                 | 4          | 6          | 15  |
|                               | ZT / Z20 (MAX.)                                                                                                                                                                                                                        | Z-40°C / Z+20°C                                                                                                                                                                                                                                        | 12   | 10   | 8    | 5    | 4                  | 3                                                                                                                                                                             | 4                                                 | 8          | 10         | —   |
| Endurance                     | The specifications listed at right shall be met when the capacitors are restored to 20°C after the rated voltage is applied for 2000 hours at 85°C.                                                                                    |                                                                                                                                                                                                                                                        |      |      |      |      | Capacitance change |                                                                                                                                                                               | Within ±20% of the initial capacitance value      |            |            |     |
|                               |                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                        |      |      |      |      | tan δ              |                                                                                                                                                                               | 200% or less than the initial specified value     |            |            |     |
|                               |                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                        |      |      |      |      | Leakage current    |                                                                                                                                                                               | Less than or equal to the initial specified value |            |            |     |
| Shelf Life                    | After storing the capacitors under no load at 85°C for 1000 hours and then performing voltage treatment based on JIS C 5101-4 clause 4.1 at 20°C, they shall meet the specified values for the endurance characteristics listed above. |                                                                                                                                                                                                                                                        |      |      |      |      |                    |                                                                                                                                                                               |                                                   |            |            |     |
| Marking                       | Printed with white color letter on black sleeve.                                                                                                                                                                                       |                                                                                                                                                                                                                                                        |      |      |      |      |                    |                                                                                                                                                                               |                                                   |            |            |     |

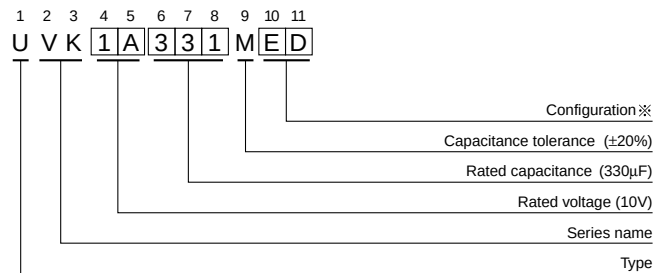
## Radial Lead Type



|   |          |     |
|---|----------|-----|
| α | (L < 20) | 1.5 |
|   | (L ≥ 20) | 2.0 |

- Please refer to page 20 about the end seal configuration.

## Type numbering system (Example : 10V 330μF)



### ※ Configuration

| φ D        | Pb-free leadwire<br>Pb-free PET sleeve |
|------------|----------------------------------------|
| 5          | DD                                     |
| 6.3        | ED                                     |
| 8 · 10     | PD                                     |
| 12.5 to 18 | HD                                     |
| 20 to 25   | RD                                     |

Please refer to page 20, 21, 22 about the formed or taped product spec.  
Please refer to page 4 for the minimum order quantity.

• Dimension table in next page.

## ■ Dimensions

| Cap.(μF) | Code | V       |      | 6.3     |        | 10      |        | 16      |         | 25      |         | 35      |         | 50      |         | 63                     |                 |
|----------|------|---------|------|---------|--------|---------|--------|---------|---------|---------|---------|---------|---------|---------|---------|------------------------|-----------------|
|          |      |         |      | 0J      |        | 1A      |        | 1C      |         | 1E      |         | 1V      |         | 1H      |         | 1J                     |                 |
| 0.1      | 0R1  |         |      |         |        |         |        |         |         |         |         |         |         | 5×11    | 13      |                        |                 |
| 0.22     | R22  |         |      |         |        |         |        |         |         |         |         |         |         | 5×11    | 2.9     |                        |                 |
| 0.33     | R33  |         |      |         |        |         |        |         |         |         |         |         |         | 5×11    | 4.3     |                        |                 |
| 0.47     | R47  |         |      |         |        |         |        |         |         |         |         |         |         | 5×11    | 6.2     |                        |                 |
| 1        | 010  |         |      |         |        |         |        |         |         |         |         |         |         | 5×11    | 17      |                        |                 |
| 2.2      | 2R2  |         |      |         |        |         |        |         |         |         |         |         |         | 5×11    | 28      |                        |                 |
| 3.3      | 3R3  |         |      |         |        |         |        |         |         |         |         |         |         | 5×11    | 35      |                        |                 |
| 4.7      | 4R7  |         |      |         |        |         |        |         |         |         |         |         |         | 5×11    | 40      |                        |                 |
| 10       | 100  |         |      |         |        |         |        |         |         |         |         |         |         | 5×11    | 60      |                        |                 |
| 22       | 220  |         |      |         |        |         |        |         |         |         |         |         |         | 5×11    | 95      | 5×11                   | 100             |
| 33       | 330  |         |      |         |        |         |        |         |         |         |         |         |         | 5×11    | 125     | 6.3×11                 | 140             |
| 47       | 470  |         |      |         |        |         |        |         |         |         |         | 5×11    | 130     | 6.3×11  | 155     | 6.3×11                 | 170             |
| 68       | 680  |         |      |         |        |         |        |         |         |         |         | 6.3×11  | 160     | 6.3×11  | 210     | 8×11.5                 | 220             |
| 100      | 101  |         |      |         |        |         |        |         |         | 5×11    | 180     | 6.3×11  | 210     | 8×11.5  | 260     | 8×11.5                 | 280             |
| 220      | 221  |         |      |         | 5×11   | 220     | 6.3×11 | 260     | 6.3×11  | 280     | 8×11.5  | 350     | 10×12.5 | 430     | 10×16   | 490                    |                 |
| 330      | 331  |         |      |         | 6.3×11 | 290     | 6.3×11 | 320     | 8×11.5  | 390     | 10×12.5 | 490     | 10×16   | 590     | 10×20   | 710                    |                 |
| 470      | 471  |         |      |         | 6.3×11 | 350     | 8×11.5 | 440     | 10×12.5 | 550     | 10×16   | 650     | 10×20   | 760     | 12.5×20 | 900                    |                 |
| 1000     | 102  | 8×11.5  | 540  | 10×12.5 | 650    | 10×12.5 | 700    | 10×16   | 860     | 12.5×20 | 1150    | 12.5×25 | 1350    | 16×25   | 1300    |                        |                 |
| 2200     | 222  | 10×16   | 890  | 10×16   | 990    | 10×20   | 1000   | 12.5×25 | 1550    | 16×25   | 1800    | 16×31.5 | 1980    | 18×35.5 | 2300    |                        |                 |
| 3300     | 332  | 10×20   | 1190 | 12.5×20 | 1450   | 12.5×25 | 1700   | 16×25   | 1980    | 16×31.5 | 2100    | 18×35.5 | 2500    | 20×40   | 2700    |                        |                 |
| 4700     | 472  | 12.5×20 | 1550 | 12.5×25 | 1800   | 16×25   | 2100   | 16×25   | 2200    | 16×35.5 | 2500    | 20×40   | 2900    | 22×50   | 3400    |                        |                 |
| 6800     | 682  | 12.5×25 | 1920 | 16×25   | 2250   | 16×25   | 2250   | 16×35.5 | 2600    | 18×40   | 2800    | 22×50   | 3500    | 25×50   | 3900    |                        |                 |
| 10000    | 103  | 16×25   | 2350 | 16×31.5 | 2550   | 16×35.5 | 2710   | 18×40   | 2800    | 22×50   | 3700    | 25×50   | 4000    |         |         |                        |                 |
| 15000    | 153  | 16×31.5 | 2550 | 16×35.5 | 2880   | 18×40   | 3100   | 22×50   | 3800    | 25×50   | 4300    |         |         |         |         |                        |                 |
| 22000    | 223  | 18×35.5 | 3200 | 18×40   | 3400   | 22×40   | 3800   | 25×50   | 4500    |         |         |         |         |         |         |                        |                 |
| 33000    | 333  | 20×40   | 3500 | 22×50   | 4500   | 25×50   | 4800   |         |         |         |         |         |         |         |         |                        |                 |
| 47000    | 473  | 22×50   | 3900 | 25×50   | 5000   |         |        |         |         |         |         |         |         |         |         |                        |                 |
| 68000    | 683  | 25×50   | 4300 |         |        |         |        |         |         |         |         |         |         |         |         | Case size<br>φD×L (mm) | Rated<br>ripple |

| Cap.(μF) | Code | V       |      | 100     |      | 160     |      | 200     |      | 250     |      | 350     |     | 400     |     | 450                    |                 |
|----------|------|---------|------|---------|------|---------|------|---------|------|---------|------|---------|-----|---------|-----|------------------------|-----------------|
|          |      |         |      | 2A      |      | 2C      |      | 2D      |      | 2E      |      | 2V      |     | 2G      |     | 2W                     |                 |
| 0.1      | 0R1  | 5×11    | 2.1  |         |      |         |      | 6.3×11  | 2.1  |         |      |         |     |         |     |                        |                 |
| 0.22     | R22  | 5×11    | 4.7  |         |      |         |      | 6.3×11  | 4.7  |         |      |         |     |         |     |                        |                 |
| 0.33     | R33  | 5×11    | 7    |         |      |         |      | 6.3×11  | 7    |         |      |         |     |         |     |                        |                 |
| 0.47     | R47  | 5×11    | 10   |         |      |         |      | 6.3×11  | 15   |         |      |         |     | 6.3×11  | 12  |                        |                 |
| 1        | 010  | 5×11    | 21   |         |      |         |      | 6.3×11  | 22   |         |      |         |     | 6.3×11  | 20  |                        |                 |
| 2.2      | 2R2  | 5×11    | 30   |         |      |         |      | 6.3×11  | 33   |         |      | 6.3×11  | 30  | 8×11.5  | 38  | 8×11.5                 | 28              |
| 3.3      | 3R3  | 5×11    | 40   |         |      |         |      | 6.3×11  | 40   | 6.3×11  | 40   | 8×11.5  | 43  | 8×11.5  | 48  | 10×12.5                | 40              |
| 4.7      | 4R7  | 5×11    | 45   |         |      |         |      | 6.3×11  | 50   | 6.3×11  | 50   | 8×11.5  | 55  | 10×12.5 | 60  | 10×12.5                | 46              |
| 10       | 100  | 5×11    | 70   | 8×11.5  | 80   | 8×11.5  | 80   | 10×12.5 | 100  | 10×12.5 | 90   | 10×16   | 90  | 10×20   | 80  |                        |                 |
| 22       | 220  | 6.3×11  | 130  | 10×12.5 | 130  | 10×16   | 150  | 10×20   | 150  | 12.5×20 | 150  | 12.5×25 | 200 | 12.5×25 | 140 |                        |                 |
| 33       | 330  | 8×11.5  | 180  | 10×16   | 180  | 10×20   | 200  | 10×20   | 200  | 12.5×25 | 240  | 16×25   | 240 | 16×25   | 180 |                        |                 |
| 47       | 470  | 8×11.5  | 200  | 10×20   | 210  | 12.5×20 | 270  | 12.5×20 | 270  | 16×25   | 300  | 16×25   | 280 | 16×31.5 | 220 |                        |                 |
| 68       | 680  | 10×12.5 | 270  | 12.5×20 | 350  | 12.5×25 | 350  | 16×25   | 380  | 16×25   | 400  | 16×31.5 | 340 | 18×35.5 | 260 |                        |                 |
| 100      | 101  | 10×16   | 340  | 12.5×25 | 430  | 16×25   | 450  | 16×25   | 440  | 18×35.5 | 520  | 18×35.5 | 440 | 18×40   | 280 |                        |                 |
| 220      | 221  | 12.5×20 | 550  | 16×31.5 | 580  | 16×35.5 | 700  | 18×35.5 | 680  | 22×50   | 760  | 22×50   | 650 | 25×50   | 350 |                        |                 |
| 330      | 331  | 12.5×25 | 760  | 18×35.5 | 800  | 18×40   | 950  | 20×40   | 1000 | 25×50   | 1000 |         |     |         |     |                        |                 |
| 470      | 471  | 16×25   | 1000 | 18×40   | 1200 | 22×40   | 1300 | 22×50   | 1400 |         |      |         |     |         |     |                        |                 |
| 1000     | 102  | 18×35.5 | 1350 | 25×50   | 1900 |         |      |         |      |         |      |         |     |         |     |                        |                 |
| 2200     | 222  | 22×50   | 2400 |         |      |         |      |         |      |         |      |         |     |         |     |                        |                 |
| 3300     | 332  | 25×50   | 2900 |         |      |         |      |         |      |         |      |         |     |         |     | Case size<br>φD×L (mm) | Rated<br>ripple |

Rated ripple current (mA rms) at 85°C 120Hz

## ● Frequency coefficient of rated ripple current

| V          | Cap.(μF)   | Frequency     | 50Hz | 120Hz | 300Hz | 1 kHz | 10kHz or more |
|------------|------------|---------------|------|-------|-------|-------|---------------|
| 6.3 to 100 | 0.1 to 68  |               | 0.75 | 1.00  | 1.35  | 1.57  | 2.00          |
|            |            | 100 to 470    | 0.80 | 1.00  | 1.23  | 1.34  | 1.50          |
|            |            | 1000 to 68000 | 0.85 | 1.00  | 1.10  | 1.13  | 1.15          |
| 160 to 450 | 0.1 to 220 |               | 0.80 | 1.00  | 1.25  | 1.40  | 1.60          |
|            |            | 330 to 1000   | 0.90 | 1.00  | 1.10  | 1.13  | 1.15          |