

KL series Low Leakage Current



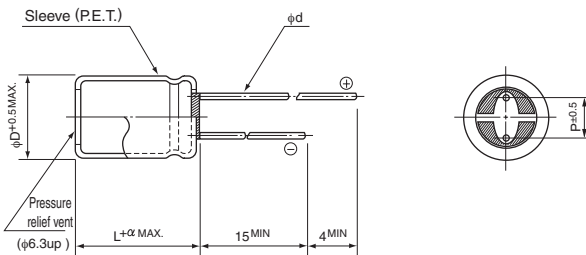
- Standard low leakage current series.
- Compliant to the RoHS directive (2011/65/EU).



Specifications

| Item | Performance Characteristics | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------------|--|--------------------|---|-------|---|-----------------|---|-------|---|-----|-------------|---------------------------------|-------|-------|------|------|------|------|------|------|---|------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Category Temperature Range | -40 to +85°C (※ -40 to +105°C product is also available upon request, but product rated at up to 50V less than or equal to φ10 × 12.5 Lmm) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rated Voltage Range | 6.3 to 100V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rated Capacitance Range | 0.1 to 10000µF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Capacitance Tolerance | ±20% (M), ±10% (K) at 120Hz 20°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Leakage Current | After 1 minute's (for case size 10 × 12.5 or smaller) or 2 minutes' (for case size 10 × 16 or larger) application of rated voltage at 20°C, leakage current is not more than 0.002CV or 0.2 (µA) whichever is greater. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tangent of loss angle (tan δ) | <table border="1"> <thead> <tr> <th>Rated voltage (V)</th> <th>6.3</th> <th>10</th> <th>16</th> <th>25</th> <th>35</th> <th>50</th> <th>63</th> <th>100</th> <th>120Hz, 20°C</th> </tr> </thead> <tbody> <tr> <td>Less than φ10 × 12.5</td> <td>0.18</td> <td>0.15</td> <td>0.12</td> <td>0.08</td> <td>0.08</td> <td>0.08</td> <td>0.07</td> <td>0.07</td> <td rowspan="2">Values in () applicable to φ10 × 16 or larger case size.</td> </tr> <tr> <td>φ10 × 16 or more</td> <td>0.21</td> <td>0.17</td> <td>0.14</td> <td>0.12</td> <td>0.12</td> <td>0.10</td> <td>0.08</td> <td>0.08</td> </tr> </tbody> </table> <p>For capacitance of more than 1000µF, add 0.02 for every increase of 1000µF.</p> | Rated voltage (V) | 6.3 | 10 | 16 | 25 | 35 | 50 | 63 | 100 | 120Hz, 20°C | Less than φ10 × 12.5 | 0.18 | 0.15 | 0.12 | 0.08 | 0.08 | 0.08 | 0.07 | 0.07 | Values in () applicable to φ10 × 16 or larger case size. | φ10 × 16 or more | 0.21 | 0.17 | 0.14 | 0.12 | 0.12 | 0.10 | 0.08 | 0.08 |
| Rated voltage (V) | 6.3 | 10 | 16 | 25 | 35 | 50 | 63 | 100 | 120Hz, 20°C | | | | | | | | | | | | | | | | | | | | | |
| Less than φ10 × 12.5 | 0.18 | 0.15 | 0.12 | 0.08 | 0.08 | 0.08 | 0.07 | 0.07 | Values in () applicable to φ10 × 16 or larger case size. | | | | | | | | | | | | | | | | | | | | | |
| φ10 × 16 or more | 0.21 | 0.17 | 0.14 | 0.12 | 0.12 | 0.10 | 0.08 | 0.08 | | | | | | | | | | | | | | | | | | | | | | |
| stability at Low Temperature | <table border="1"> <thead> <tr> <th>Rated voltage (V)</th> <th>6.3</th> <th>10</th> <th>16</th> <th>25</th> <th>35</th> <th>50</th> <th>63</th> <th>100</th> <th>120Hz</th> </tr> </thead> <tbody> <tr> <td>Impedance ratio Z-25°C / Z+20°C</td> <td>3 (4)</td> <td>2 (3)</td> <td>2</td> <td>1.5</td> <td>1.5</td> <td>1.5</td> <td>1.5</td> <td>1.5</td> <td rowspan="2">Values in () applicable to φ10 × 16 or larger case size.</td> </tr> <tr> <td>ZT / Z20 (MAX.)</td> <td>5 (8)</td> <td>4 (6)</td> <td>3 (4)</td> <td>2 (4)</td> <td>2 (3)</td> <td>2 (3)</td> <td>2 (3)</td> <td>2 (3)</td> </tr> </tbody> </table> | Rated voltage (V) | 6.3 | 10 | 16 | 25 | 35 | 50 | 63 | 100 | 120Hz | Impedance ratio Z-25°C / Z+20°C | 3 (4) | 2 (3) | 2 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | Values in () applicable to φ10 × 16 or larger case size. | ZT / Z20 (MAX.) | 5 (8) | 4 (6) | 3 (4) | 2 (4) | 2 (3) | 2 (3) | 2 (3) | 2 (3) |
| Rated voltage (V) | 6.3 | 10 | 16 | 25 | 35 | 50 | 63 | 100 | 120Hz | | | | | | | | | | | | | | | | | | | | | |
| Impedance ratio Z-25°C / Z+20°C | 3 (4) | 2 (3) | 2 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | Values in () applicable to φ10 × 16 or larger case size. | | | | | | | | | | | | | | | | | | | | | |
| ZT / Z20 (MAX.) | 5 (8) | 4 (6) | 3 (4) | 2 (4) | 2 (3) | 2 (3) | 2 (3) | 2 (3) | | | | | | | | | | | | | | | | | | | | | | |
| Endurance | <p>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, or 1000 hours at 105°C.</p> <table border="1"> <tbody> <tr> <td>Capacitance change</td> <td>Within ±15% of the initial capacitance value (6.3V : Within ±20%)</td> </tr> <tr> <td>tan δ</td> <td>150% or less than the initial specified value</td> </tr> <tr> <td>Leakage current</td> <td>Less than or equal to the initial specified value</td> </tr> </tbody> </table> | Capacitance change | Within ±15% of the initial capacitance value (6.3V : Within ±20%) | tan δ | 150% or less than the initial specified value | Leakage current | Less than or equal to the initial specified value | | | | | | | | | | | | | | | | | | | | | | | |
| Capacitance change | Within ±15% of the initial capacitance value (6.3V : Within ±20%) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| tan δ | 150% 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 | (mm) | | | | | | | |
|----|-----------------------------|-----|-----|-----|-----|------|-----|----|
| | (φ10 × 12.5 or smaller) 1.0 | 5 | 6.3 | 8 | 10 | 12.5 | 16 | 18 |
| P | 2.0 | 2.5 | 3.5 | 5.0 | 5.0 | 7.5 | 7.5 | |
| φd | 0.5 | 0.5 | 0.6 | 0.6 | 0.6 | 0.8 | 0.8 | |

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

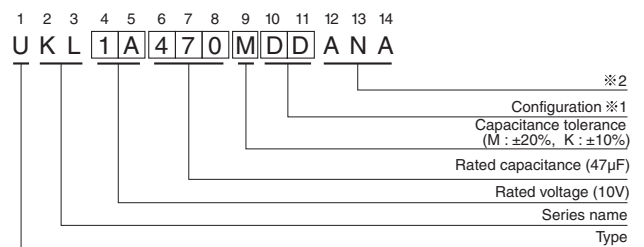
Frequency coefficient of rated ripple current

| Cap.(µF) | Frequency | 50Hz | 120Hz | 300Hz | 1kHz | 10kHz or more |
|---------------|-----------|------|-------|-------|------|---------------|
| 0.1 to 68 | | 0.75 | 1.00 | 1.35 | 1.57 | 2.00 |
| 100 to 680 | | 0.80 | 1.00 | 1.23 | 1.34 | 1.50 |
| 1000 to 10000 | | 0.85 | 1.00 | 1.10 | 1.13 | 1.15 |

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.

Type numbering system (Example : 10V 47µF)



※1 Configuration

| φ D | Pb-free leadwire Pb-free PET sleeve |
|------------|--|
| 5 | DD |
| 6.3 | ED |
| 8 · 10 | PD |
| 12.5 to 18 | HD |

※2 In case 105°C unit is required



■ Dimensions

| V | | 6.3 | | 10 | | 16 | | 25 | |
|----------------|------|-----------|------|-----------|------|-----------|------|-----------|------|
| Cap.(μ F) | Code | 0J | | 1A | | 1C | | 1E | |
| 4.7 | 4R7 | | | | | | | 5 × 11 | 45 |
| 6.8 | 6R8 | | | | | | | 5 × 11 | 55 |
| 10 | 100 | | | | | 5 × 11 | 55 | 5 × 11 | 70 |
| 15 | 150 | | | | | 5 × 11 | 70 | 5 × 11 | 85 |
| 22 | 220 | | | | | 5 × 11 | 85 | 5 × 11 | 100 |
| 33 | 330 | | | | | 5 × 11 | 100 | 6.3 × 11 | 140 |
| 47 | 470 | | | 5 × 11 | 110 | 6.3 × 11 | 140 | 6.3 × 11 | 170 |
| 68 | 680 | | | 6.3 × 11 | 150 | 6.3 × 11 | 160 | 8 × 11.5 | 230 |
| 100 | 101 | | | 6.3 × 11 | 180 | 8 × 11.5 | 230 | 8 × 11.5 | 280 |
| 150 | 151 | | | 8 × 11.5 | 250 | 8 × 11.5 | 280 | 10 × 12.5 | 370 |
| 220 | 221 | | | 8 × 11.5 | 310 | 10 × 12.5 | 370 | 10 × 16 | 400 |
| 330 | 331 | | | 10 × 12.5 | 400 | 10 × 16 | 420 | 10 × 20 | 490 |
| 470 | 471 | 10 × 12.5 | 390 | 10 × 16 | 530 | 10 × 20 | 550 | 12.5 × 20 | 660 |
| 680 | 681 | 10 × 16 | 480 | 10 × 20 | 600 | 12.5 × 20 | 730 | 12.5 × 25 | 810 |
| 1000 | 102 | 10 × 20 | 650 | 12.5 × 20 | 810 | 12.5 × 25 | 910 | 16 × 25 | 1010 |
| 1500 | 152 | 12.5 × 25 | 910 | 12.5 × 25 | 1020 | 16 × 25 | 1150 | 16 × 31.5 | 1270 |
| 2200 | 222 | 12.5 × 25 | 1060 | 16 × 25 | 1200 | 16 × 25 | 1300 | 16 × 35.5 | 1440 |
| 3300 | 332 | 16 × 25 | 1270 | 16 × 31.5 | 1420 | 16 × 35.5 | 1550 | 18 × 40 | 1720 |
| 4700 | 472 | 16 × 31.5 | 1500 | 16 × 35.5 | 1650 | 18 × 35.5 | 1820 | | |
| 6800 | 682 | 18 × 35.5 | 1760 | 18 × 35.5 | 1890 | | | | |
| 10000 | 103 | 18 × 40 | 1900 | | | | | | |

| V | | 35 | | 50 | | 63 | | 100 | |
|----------------|------|-----------|------|-----------|------|-----------|------|--------------------------------|-----------------|
| Cap.(μ F) | Code | 1V | | 1H | | 1J | | 2A | |
| 0.1 | 0R1 | | | 5 × 11 | 1.1 | | | 5 × 11 | 2.1 |
| 0.15 | R15 | | | 5 × 11 | 1.6 | | | 5 × 11 | 3.2 |
| 0.22 | R22 | | | 5 × 11 | 2.3 | | | 5 × 11 | 4.7 |
| 0.33 | R33 | | | 5 × 11 | 3.5 | | | 5 × 11 | 7.0 |
| 0.47 | R47 | | | 5 × 11 | 5.0 | | | 5 × 11 | 10.1 |
| 0.68 | R68 | | | 5 × 11 | 7.3 | | | 5 × 11 | 14.5 |
| 1 | 010 | | | 5 × 11 | 10.7 | | | 5 × 11 | 19 |
| 1.5 | 1R5 | | | 5 × 11 | 16 | | | 5 × 11 | 23 |
| 2.2 | 2R2 | | | 5 × 11 | 23 | | | 5 × 11 | 28 |
| 3.3 | 3R3 | | | 5 × 11 | 40 | | | 5 × 11 | 45 |
| 4.7 | 4R7 | | | 5 × 11 | 45 | | | 5 × 11 | 50 |
| 6.8 | 6R8 | | | 5 × 11 | 55 | 5 × 11 | 59 | 6.3 × 11 | 65 |
| 10 | 100 | | | 5 × 11 | 70 | 6.3 × 11 | 75 | 8 × 11.5 | 90 |
| 15 | 150 | 5 × 11 | 85 | 6.3 × 11 | 95 | 6.3 × 11 | 100 | 8 × 11.5 | 110 |
| 22 | 220 | 6.3 × 11 | 110 | 6.3 × 11 | 110 | 8 × 11.5 | 115 | 10 × 12.5 | 136 |
| 33 | 330 | 6.3 × 11 | 140 | 8 × 11.5 | 165 | 8 × 11.5 | 170 | 10 × 16 | 180 |
| 47 | 470 | 8 × 11.5 | 190 | 8 × 11.5 | 190 | 10 × 12.5 | 200 | 10 × 20 | 220 |
| 68 | 680 | 8 × 11.5 | 230 | 10 × 12.5 | 250 | 10 × 16 | 270 | 10 × 20 | 290 |
| 100 | 101 | 10 × 12.5 | 300 | 10 × 16 | 320 | 10 × 20 | 330 | 12.5 × 20 | 370 |
| 150 | 151 | 10 × 16 | 400 | 10 × 20 | 420 | 12.5 × 20 | 450 | 12.5 × 25 | 470 |
| 220 | 221 | 10 × 20 | 440 | 12.5 × 20 | 490 | 12.5 × 20 | 550 | 16 × 25 | 580 |
| 330 | 331 | 12.5 × 20 | 550 | 12.5 × 20 | 600 | 12.5 × 25 | 710 | 16 × 31.5 | 730 |
| 470 | 471 | 12.5 × 25 | 680 | 16 × 25 | 760 | 16 × 25 | 850 | 18 × 35.5 | 910 |
| 680 | 681 | 16 × 25 | 840 | 16 × 25 | 910 | 16 × 31.5 | 1050 | | |
| 1000 | 102 | 16 × 25 | 1100 | 16 × 31.5 | 1140 | 18 × 35.5 | 1330 | | |
| 1500 | 152 | 16 × 35.5 | 1390 | 18 × 40 | 1480 | | | Case size ϕ D × L (mm) | Rated ripple |
| 2200 | 222 | 18 × 35.5 | 1580 | | | | | | |

Rated ripple current (mArms) at 85°C 120Hz

Rated ripple current (mArms) of 105°C product : 70 percent value of rated ripple of 85°C product at 105°C 120Hz