

# MINIATURE ALUMINUM ELECTROLYTIC CAPACITORS

## WL Extremely Low Impedance Series

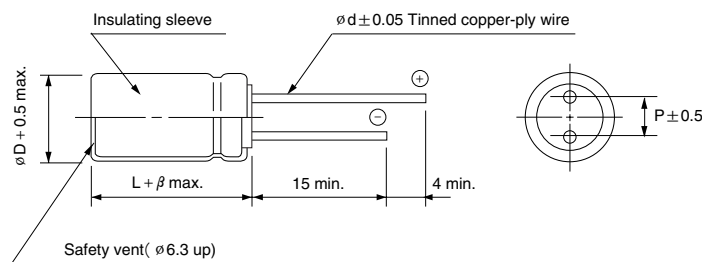
- Wide voltage compared with RZ series
- Operating temperature range of -40 ~ +105°C
- Extremely low impedance at high frequency
- High reliability withstanding 5000 hours load life at 105°C (2000/3000 hours for smaller case size as specified below)
- Complied to the RoHS directive



| Item                                                                          | Characteristics                                                                                                |      |              |              |      |                                   |            |                                  |              |            |         |         |
|-------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|------|--------------|--------------|------|-----------------------------------|------------|----------------------------------|--------------|------------|---------|---------|
| Operating temperature range                                                   | WV                                                                                                             |      | 6.3 ~ 100    |              |      | 160 ~ 350                         |            |                                  | 400 ~ 450    |            |         |         |
|                                                                               | Temperature range                                                                                              |      | -40 ~ +105°C |              |      | -40 ~ +105°C                      |            |                                  | -25 ~ +105°C |            |         |         |
| Leakage current max.                                                          | WV ≤ 100                                                                                                       |      |              |              |      |                                   |            | WV > 100                         |              |            |         |         |
|                                                                               | I = 0.01CV or 3μA whichever is greater (after 2 min.)<br>I = 0.03CV or 4μA whichever is greater (after 1 min.) |      |              |              |      |                                   |            | I = 0.02CV + 15μA (after 5 min.) |              |            |         |         |
| Capacitance tolerance                                                         | ±20% at 120Hz, 20°C                                                                                            |      |              |              |      |                                   |            |                                  |              |            |         |         |
| Dissipation factor max.<br>(at 120Hz, 20°C)                                   | Capacitance > 1000μF : tanδ increases by 0.02 for each 1000μF from below value.                                |      |              |              |      |                                   |            |                                  |              |            |         |         |
|                                                                               | WV                                                                                                             | 6.3  | 10           | 16           | 25   | 35                                | 50         | 63                               | 100          | 160~315    | 350~450 |         |
|                                                                               | tanδ                                                                                                           | 0.22 | 0.19         | 0.16         | 0.14 | 0.12                              | 0.10       | 0.09                             | 0.08         | 0.15       | 0.20    |         |
| Low temperature characteristics<br>(Impedance ratio at 120Hz)                 | WV                                                                                                             |      | 6.3          |              | 10   |                                   | 16         |                                  | 25~100       |            | 160~250 | 315~450 |
|                                                                               | Z-25°C/Z+20°C                                                                                                  |      | 4            |              | 3    |                                   | 2          |                                  | 2            |            | 3       | 8       |
|                                                                               | Z-40°C/Z+20°C                                                                                                  |      | 8            |              | 6    |                                   | 4          |                                  | 3            |            | 4       | -       |
| Load life<br>(after application of the rated voltage for 5000 hours at 105°C) | Leakage current                                                                                                |      |              |              |      | Less than specified value         |            |                                  |              |            |         |         |
|                                                                               | Capacitance change                                                                                             |      |              |              |      | Within ±25% of initial value      |            |                                  |              |            |         |         |
|                                                                               | tanδ                                                                                                           |      |              |              |      | Less than 200% of specified value |            |                                  |              |            |         |         |
|                                                                               | Life time                                                                                                      |      |              | ø D = 5, 6.3 |      |                                   | ø D = 8    |                                  |              | ø D ≥ 10   |         |         |
|                                                                               | WV ≤ 100                                                                                                       |      |              | 2000 hours   |      |                                   | 3000 hours |                                  |              | 5000 hours |         |         |
|                                                                               | WV > 100                                                                                                       |      |              | 2000 hours   |      |                                   |            |                                  |              |            |         |         |
| Shelf life (at 105°C)                                                         | After 1000 hours no load test, leakage current, capacitance and tanδ are same as load life value.              |      |              |              |      |                                   |            |                                  |              |            |         |         |

## DRAWING

Unit : mm



| ø D | 5   | 6.3 | 8   | 10  | 12.5 | 16  | 18  |
|-----|-----|-----|-----|-----|------|-----|-----|
| P   | 2.0 | 2.5 | 3.5 | 5.0 | 5.0  | 7.5 | 7.5 |
| ø d | 0.5 | 0.5 | 0.6 | 0.6 | 0.6  | 0.8 | 0.8 |
| β   | 1.5 |     |     | 2.0 |      |     |     |

**WL** series

● DIMENSIONS & MAXIMUM PERMISSIBLE RIPPLE CURRENT

| WV<br>Item<br>μF | 6.3             |                                        |                                                  | 10              |                                        |                                                  | 16              |                                        |                                                  | 25              |                                        |                                                  |
|------------------|-----------------|----------------------------------------|--------------------------------------------------|-----------------|----------------------------------------|--------------------------------------------------|-----------------|----------------------------------------|--------------------------------------------------|-----------------|----------------------------------------|--------------------------------------------------|
|                  | ø D × L<br>(mm) | Impedance<br>(Ω)max.<br>20°C<br>100kHz | Ripple<br>current<br>(mA rms)<br>105°C<br>100kHz | ø D × L<br>(mm) | Impedance<br>(Ω)max.<br>20°C<br>100kHz | Ripple<br>current<br>(mA rms)<br>105°C<br>100kHz | ø D × L<br>(mm) | Impedance<br>(Ω)max.<br>20°C<br>100kHz | Ripple<br>current<br>(mA rms)<br>105°C<br>100kHz | ø D × L<br>(mm) | Impedance<br>(Ω)max.<br>20°C<br>100kHz | Ripple<br>current<br>(mA rms)<br>105°C<br>100kHz |
| 4.7              |                 |                                        |                                                  |                 |                                        |                                                  |                 |                                        |                                                  | 5 × 11          | 0.70                                   | 180                                              |
| 10               |                 |                                        |                                                  |                 |                                        |                                                  | 5 × 11          | 0.70                                   | 180                                              | 5 × 11          | 0.70                                   | 180                                              |
| 22               | 5 × 11          | 0.70                                   | 180                                              | 5 × 11          | 0.70                                   | 180                                              | 5 × 11          | 0.70                                   | 180                                              | 5 × 11          | 0.70                                   | 180                                              |
| 33               | 5 × 11          | 0.70                                   | 180                                              | 5 × 11          | 0.70                                   | 180                                              | 5 × 11          | 0.70                                   | 180                                              | 5 × 11          | 0.70                                   | 180                                              |
| 47               | 5 × 11          | 0.65                                   | 180                                              | 5 × 11          | 0.65                                   | 180                                              | 5 × 11          | 0.65                                   | 180                                              | 5 × 11          | 0.65                                   | 180                                              |
| 100              | 5 × 11          | 0.65                                   | 180                                              | 5 × 11          | 0.65                                   | 180                                              | 6.3 × 11        | 0.30                                   | 280                                              | 6.3 × 11        | 0.30                                   | 280                                              |
| 150              | 6.3 × 11        | 0.30                                   | 280                                              | 6.3 × 11        | 0.30                                   | 280                                              | 6.3 × 11        | 0.30                                   | 280                                              | 8 × 11.5        | 0.14                                   | 450                                              |
| 220              | 6.3 × 11        | 0.30                                   | 280                                              | 6.3 × 11        | 0.30                                   | 280                                              | 8 × 11.5        | 0.14                                   | 450                                              | 8 × 11.5        | 0.14                                   | 450                                              |
| 330              | 6.3 × 11        | 0.30                                   | 280                                              | 8 × 11.5        | 0.14                                   | 450                                              | 8 × 11.5        | 0.14                                   | 450                                              | 10 × 12.5       | 0.10                                   | 660                                              |
| 470              | 8 × 11.5        | 0.14                                   | 450                                              | 8 × 11.5        | 0.14                                   | 450                                              | 10 × 12.5       | 0.10                                   | 660                                              | 10 × 16         | 0.080                                  | 850                                              |
| 680              | 10 × 12.5       | 0.10                                   | 660                                              | 10 × 12.5       | 0.10                                   | 660                                              | 10 × 16         | 0.080                                  | 850                                              | 10 × 20         | 0.054                                  | 1100                                             |
| 1000             | 10 × 12.5       | 0.10                                   | 660                                              | 10 × 16         | 0.080                                  | 850                                              | 10 × 20         | 0.054                                  | 1100                                             | 12.5 × 20       | 0.050                                  | 1400                                             |
| 1500             | 10 × 20         | 0.054                                  | 1100                                             | 10 × 20         | 0.054                                  | 1100                                             | 12.5 × 20       | 0.050                                  | 1400                                             | 16 × 20         | 0.030                                  | 2100                                             |
| 2200             | 12.5 × 20       | 0.050                                  | 1400                                             | 12.5 × 20       | 0.050                                  | 1400                                             | 12.5 × 25       | 0.038                                  | 1700                                             | 16 × 25         | 0.030                                  | 2100                                             |
| 3300             | 12.5 × 20       | 0.050                                  | 1400                                             | 12.5 × 25       | 0.038                                  | 1700                                             | 16 × 25         | 0.030                                  | 2100                                             | 16 × 31.5       | 0.025                                  | 2600                                             |
| 4700             | 16 × 25         | 0.030                                  | 2100                                             | 16 × 25         | 0.030                                  | 2100                                             | 16 × 31.5       | 0.025                                  | 2600                                             | 18 × 35.5       | 0.022                                  | 3000                                             |
| 6800             | 16 × 25         | 0.030                                  | 2100                                             | 16 × 31.5       | 0.025                                  | 2600                                             | 18 × 35.5       | 0.022                                  | 3000                                             |                 |                                        |                                                  |
| 10000            | 16 × 31.5       | 0.025                                  | 2600                                             | 18 × 35.5       | 0.022                                  | 3000                                             |                 |                                        |                                                  |                 |                                        |                                                  |
| 15000            | 18 × 35.5       | 0.022                                  | 3000                                             |                 |                                        |                                                  |                 |                                        |                                                  |                 |                                        |                                                  |

| WV<br>Item<br>μF | 35              |                                        |                                                  | 50              |                                        |                                                  | 63              |                                        |                                                  | 100             |                                        |                                                  |
|------------------|-----------------|----------------------------------------|--------------------------------------------------|-----------------|----------------------------------------|--------------------------------------------------|-----------------|----------------------------------------|--------------------------------------------------|-----------------|----------------------------------------|--------------------------------------------------|
|                  | ø D × L<br>(mm) | Impedance<br>(Ω)max.<br>20°C<br>100kHz | Ripple<br>current<br>(mA rms)<br>105°C<br>100kHz | ø D × L<br>(mm) | Impedance<br>(Ω)max.<br>20°C<br>100kHz | Ripple<br>current<br>(mA rms)<br>105°C<br>100kHz | ø D × L<br>(mm) | Impedance<br>(Ω)max.<br>20°C<br>100kHz | Ripple<br>current<br>(mA rms)<br>105°C<br>100kHz | ø D × L<br>(mm) | Impedance<br>(Ω)max.<br>20°C<br>100kHz | Ripple<br>current<br>(mA rms)<br>105°C<br>100kHz |
| 0.22             |                 |                                        |                                                  | 5 × 11          | 8.0                                    | 18                                               |                 |                                        |                                                  |                 |                                        |                                                  |
| 0.47             |                 |                                        |                                                  | 5 × 11          | 5.0                                    | 25                                               |                 |                                        |                                                  |                 |                                        |                                                  |
| 1.0              |                 |                                        |                                                  | 5 × 11          | 3.5                                    | 40                                               |                 |                                        |                                                  |                 |                                        |                                                  |
| 2.2              |                 |                                        |                                                  | 5 × 11          | 3.0                                    | 55                                               |                 |                                        |                                                  | 5 × 11          | 2.5                                    | 52                                               |
| 3.3              |                 |                                        |                                                  | 5 × 11          | 2.6                                    | 65                                               | 5 × 11          | 2.0                                    | 64                                               | 5 × 11          | 2.5                                    | 64                                               |
| 4.7              | 5 × 11          | 0.70                                   | 180                                              | 5 × 11          | 2.3                                    | 90                                               | 5 × 11          | 2.0                                    | 76                                               | 5 × 11          | 2.5                                    | 76                                               |
| 10               | 5 × 11          | 0.70                                   | 180                                              | 5 × 11          | 1.4                                    | 120                                              | 5 × 11          | 2.0                                    | 111                                              | 6.3 × 11        | 1.0                                    | 128                                              |
| 22               | 5 × 11          | 0.70                                   | 180                                              | 5 × 11          | 1.2                                    | 150                                              | 6.3 × 11        | 0.60                                   | 190                                              | 8 × 11.5        | 0.60                                   | 224                                              |
| 33               | 5 × 11          | 0.65                                   | 180                                              | 6.3 × 11        | 0.60                                   | 200                                              | 6.3 × 11        | 0.60                                   | 233                                              | 10 × 12.5       | 0.40                                   | 319                                              |
| 47               | 6.3 × 11        | 0.30                                   | 280                                              | 6.3 × 11        | 0.43                                   | 250                                              | 8 × 11.5        | 0.50                                   | 328                                              | 10 × 16         | 0.30                                   | 417                                              |
| 100              | 8 × 11.5        | 0.14                                   | 450                                              | 8 × 11.5        | 0.24                                   | 340                                              | 10 × 16         | 0.12                                   | 456                                              | 12.5 × 20       | 0.15                                   | 570                                              |
| 150              | 8 × 11.5        | 0.14                                   | 450                                              | 10 × 12.5       | 0.17                                   | 490                                              | 10 × 20         | 0.10                                   | 610                                              | 12.5 × 25       | 0.12                                   | 762                                              |
| 220              | 10 × 12.5       | 0.10                                   | 660                                              | 10 × 16         | 0.12                                   | 650                                              | 10 × 25         | 0.090                                  | 809                                              | 16 × 25         | 0.070                                  | 1250                                             |
| 330              | 10 × 16         | 0.080                                  | 850                                              | 10 × 20         | 0.10                                   | 810                                              | 12.5 × 20       | 0.085                                  | 1036                                             | 16 × 31.5       | 0.050                                  | 1404                                             |
| 470              | 10 × 20         | 0.054                                  | 1100                                             | 12.5 × 20       | 0.085                                  | 1100                                             | 16 × 20         | 0.050                                  | 1411                                             | 18 × 40         | 0.030                                  | 1980                                             |
| 680              | 12.5 × 20       | 0.050                                  | 1400                                             | 12.5 × 25       | 0.065                                  | 1200                                             | 16 × 25         | 0.043                                  | 1843                                             |                 |                                        |                                                  |
| 1000             | 12.5 × 25       | 0.038                                  | 1700                                             | 16 × 25         | 0.043                                  | 1600                                             | 16 × 35.5       | 0.025                                  | 1967                                             |                 |                                        |                                                  |
| 1500             | 16 × 25         | 0.030                                  | 2100                                             | 16 × 31.5       | 0.038                                  | 2000                                             |                 |                                        |                                                  |                 |                                        |                                                  |
| 2200             | 16 × 31.5       | 0.025                                  | 2600                                             | 18 × 35.5       | 0.034                                  | 2300                                             |                 |                                        |                                                  |                 |                                        |                                                  |
| 3300             | 18 × 35.5       | 0.022                                  | 3000                                             |                 |                                        |                                                  |                 |                                        |                                                  |                 |                                        |                                                  |

# MINIATURE ALUMINUM ELECTROLYTIC CAPACITORS

**WL** series

## ● DIMENSIONS & MAXIMUM PERMISSIBLE RIPPLE CURRENT

| WV<br>Item<br>μF | 160             |                                        |                                                  | 200             |                                        |                                                  | 250             |                                        |                                                  |
|------------------|-----------------|----------------------------------------|--------------------------------------------------|-----------------|----------------------------------------|--------------------------------------------------|-----------------|----------------------------------------|--------------------------------------------------|
|                  | φ D × L<br>(mm) | Impedance<br>(Ω)max.<br>20°C<br>100kHz | Ripple<br>current<br>(mA rms)<br>105°C<br>100kHz | φ D × L<br>(mm) | Impedance<br>(Ω)max.<br>20°C<br>100kHz | Ripple<br>current<br>(mA rms)<br>105°C<br>100kHz | φ D × L<br>(mm) | Impedance<br>(Ω)max.<br>20°C<br>100kHz | Ripple<br>current<br>(mA rms)<br>105°C<br>100kHz |
| 10               |                 |                                        |                                                  |                 |                                        |                                                  | 10 × 20         | 3.5                                    | 300                                              |
| 22               | 10 × 20         | 1.3                                    | 440                                              | 10 × 20         | 1.5                                    | 440                                              | 12.5 × 20       | 2.3                                    | 480                                              |
| 33               | 10 × 20         | 1.3                                    | 565                                              | 12.5 × 20       | 0.91                                   | 590                                              | 12.5 × 25       | 1.7                                    | 630                                              |
| 47               | 12.5 × 20       | 0.91                                   | 725                                              | 12.5 × 20       | 0.91                                   | 780                                              | 12.5 × 25       | 1.7                                    | 630                                              |
| 68               | 12.5 × 25       | 0.63                                   | 950                                              | 12.5 × 25       | 0.63                                   | 950                                              | 16 × 25         | 0.78                                   | 1000                                             |
| 100              | 16 × 25         | 0.27                                   | 1280                                             | 16 × 25         | 0.27                                   | 1280                                             | 16 × 31.5       | 0.63                                   | 1400                                             |
| 150              | 16 × 31.5       | 0.22                                   | 1300                                             | 18 × 25         | 0.27                                   | 1500                                             | 18 × 31.5       | 0.42                                   | 1450                                             |
| 220              | 16 × 31.5       | 0.22                                   | 1300                                             | 18 × 31.5       | 0.22                                   | 1700                                             | 18 × 40         | 0.35                                   | 1485                                             |
| 330              | 18 × 31.5       | 0.22                                   | 1700                                             |                 |                                        |                                                  |                 |                                        |                                                  |

| WV<br>Item<br>μF | 350             |                                        |                                                  | 400             |                                        |                                                  | 450             |                                        |                                                  |
|------------------|-----------------|----------------------------------------|--------------------------------------------------|-----------------|----------------------------------------|--------------------------------------------------|-----------------|----------------------------------------|--------------------------------------------------|
|                  | φ D × L<br>(mm) | Impedance<br>(Ω)max.<br>20°C<br>100kHz | Ripple<br>current<br>(mA rms)<br>105°C<br>100kHz | φ D × L<br>(mm) | Impedance<br>(Ω)max.<br>20°C<br>100kHz | Ripple<br>current<br>(mA rms)<br>105°C<br>100kHz | φ D × L<br>(mm) | Impedance<br>(Ω)max.<br>20°C<br>100kHz | Ripple<br>current<br>(mA rms)<br>105°C<br>100kHz |
| 3.3              |                 |                                        |                                                  |                 |                                        |                                                  | 10 × 20         | 6.5                                    | 150                                              |
| 4.7              |                 |                                        |                                                  |                 |                                        |                                                  | 12.5 × 20       | 3.6                                    | 200                                              |
| 10               | 10 × 20         | 2.9                                    | 180                                              | 10 × 20         | 2.9                                    | 180                                              | 12.5 × 25       | 2.5                                    | 315                                              |
| 22               | 12.5 × 20       | 2.1                                    | 270                                              | 12.5 × 25       | 1.3                                    | 300                                              | 16 × 25         | 1.7                                    | 570                                              |
| 33               | 16 × 20         | 0.91                                   | 600                                              | 16 × 20         | 0.91                                   | 600                                              | 16 × 31.5       | 1.1                                    | 620                                              |
| 47               | 16 × 25         | 0.73                                   | 700                                              | 16 × 25         | 0.73                                   | 700                                              | 18 × 31.5       | 0.93                                   | 900                                              |
| 68               | 16 × 31.5       | 0.49                                   | 1100                                             | 16 × 31.5       | 0.49                                   | 1100                                             | 18 × 35.5       | 0.71                                   | 980                                              |
| 100              | 18 × 31.5       | 0.40                                   | 1170                                             | 18 × 40         | 0.34                                   | 1250                                             |                 |                                        |                                                  |