

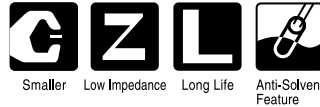
# ALUMINUM ELECTROLYTIC CAPACITORS

# HW

Miniature Sized, High Ripple Current, High Reliability  
series

**NEW**

- Lower impedance at high frequency range.
- smaller case size and high ripple current.
- Compliant to the RoHS directive(2002/95/EC).



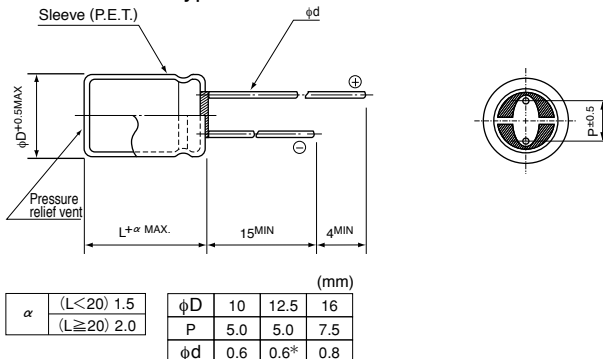
**HW** Long Life **HV**



## Specifications

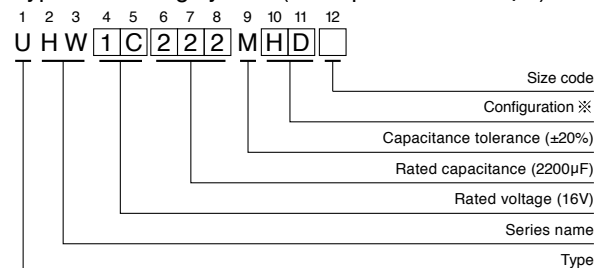
| Item                           | Performance Characteristics                                                                                                                                                                                                  |                 |      |      |                    |      |                                                              |                                                      |                               |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|------|--------------------|------|--------------------------------------------------------------|------------------------------------------------------|-------------------------------|
| Category Temperature Range     | − 40 to +105°C                                                                                                                                                                                                               |                 |      |      |                    |      |                                                              |                                                      |                               |
| Rated Voltage Range            | 6.3 to 50V                                                                                                                                                                                                                   |                 |      |      |                    |      |                                                              |                                                      |                               |
| Rated Capacitance Range        | 220 to 15000μF                                                                                                                                                                                                               |                 |      |      |                    |      |                                                              |                                                      |                               |
| Capacitance Tolerance          | ±20% at 120Hz, 20°C                                                                                                                                                                                                          |                 |      |      |                    |      |                                                              |                                                      |                               |
| Leakage Current                | After 2 minute's application of rated voltage, current is more than $I = 0.01CV$                                                                                                                                             |                 |      |      |                    |      |                                                              |                                                      |                               |
| Tangent of loss angle (tan δ ) | Rated voltage (V)                                                                                                                                                                                                            | 6.3             | 10   | 16   | 25                 | 35   | 50                                                           | Measurement frequency : 120Hz,<br>Temperature : 20°C |                               |
|                                | tan δ (MAX.)                                                                                                                                                                                                                 | 0.21            | 0.18 | 0.15 | 0.13               | 0.11 | 0.10                                                         |                                                      |                               |
| Stability at Low Temperature   | Rated voltage (V)                                                                                                                                                                                                            |                 | 6.3  | 10   | 16                 | 25   | 35                                                           | 50                                                   | Measurement frequency : 120Hz |
|                                | Impedance ratio                                                                                                                                                                                                              | Z−25°C / Z+20°C | 2    | 2    | 2                  | 2    | 2                                                            | 2                                                    |                               |
|                                | ZT / Z20 (MAX.)                                                                                                                                                                                                              | Z−40°C / Z+20°C | 3    | 3    | 3                  | 3    | 3                                                            | 3                                                    |                               |
| Endurance                      | The specifications listed at right shall be met when the capacitors are restored to 20°C after D.C. bias plus rated ripple current is applied for 10000 hours at 105°C, the peak voltage shall not exceed the rated voltage. |                 |      |      | Capacitance Change |      | Within ±25% of the initial capacitance value (6.3V 10V:±30%) |                                                      |                               |
|                                |                                                                                                                                                                                                                              |                 |      |      | tan δ              |      | 200% or less than the initial specified value                |                                                      |                               |
|                                |                                                                                                                                                                                                                              |                 |      |      | Leakage current    |      | Less than or equal to the initial specified value            |                                                      |                               |
| Marking                        | Printed with white color letter on black sleeve.                                                                                                                                                                             |                 |      |      |                    |      |                                                              |                                                      |                               |

## Radial Lead Type



\* : In case  $L > 25$  for the  $\phi 12.5$  dia. Unit, lead dia.  $\phi d = 0.8 \text{ mm}$ .

## Type numbering system (Example : 16V 2200µF)



※ Configuration

| $\phi D$   | Pb-free lead finishing<br>Pb-free PET sleeve |
|------------|----------------------------------------------|
| 10         | PD                                           |
| 12.5 to 16 | HD                                           |

## Frequency coefficient of rated ripple current

| Cap.(µF)      | Frequency | 120Hz | 1kHz | 10kHz | 100kHz or more |
|---------------|-----------|-------|------|-------|----------------|
| 220 to 560    |           | 0.50  | 0.85 | 0.94  | 1.00           |
| 680 to 1800   |           | 0.60  | 0.87 | 0.95  | 1.00           |
| 2200 to 3900  |           | 0.75  | 0.90 | 0.95  | 1.00           |
| 4700 to 15000 |           | 0.85  | 0.95 | 0.98  | 1.00           |

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# ALUMINUM ELECTROLYTIC CAPACITORS

**HW** series

## ■ Dimensions

| <div> <div>V</div> <div> <div>(μF)<br/>Cap.</div> <div>Code</div> </div> </div> |     | Item | 6.3 (0J)                     |                    |               |                                           | 10 (1A)                      |                    |               |                                           |
|---------------------------------------------------------------------------------|-----|------|------------------------------|--------------------|---------------|-------------------------------------------|------------------------------|--------------------|---------------|-------------------------------------------|
|                                                                                 |     |      | Case size<br>φ D × L<br>(mm) | Impedance (Ω) MAX. |               | Rated ripple<br>(mAmps)<br>105°C / 100kHz | Case size<br>φ D × L<br>(mm) | Impedance (Ω) MAX. |               | Rated ripple<br>(mAmps)<br>105°C / 100kHz |
|                                                                                 |     |      |                              | 20°C /100kHz       | -10°C /100kHz |                                           |                              | 20°C /100kHz       | -10°C /100kHz |                                           |
| 1200                                                                            | 122 |      |                              |                    |               |                                           | 10 × 16                      | 0.030              | 0.090         | 2000                                      |
| 1500                                                                            | 152 |      |                              |                    |               |                                           | 10 × 16                      | 0.030              | 0.090         | 2000                                      |
| 1800                                                                            | 182 |      | 10 × 16                      | 0.030              | 0.090         | 2000                                      | 10 × 20                      | 0.019              | 0.057         | 2500                                      |
| 2200                                                                            | 222 |      | 10 × 20                      | 0.019              | 0.057         | 2500                                      | 10 × 25                      | 0.017              | 0.051         | 2900                                      |
| 2700                                                                            | 272 |      | 10 × 20                      | 0.019              | 0.057         | 2500                                      | 12.5 × 20                    | 0.016              | 0.048         | 2600                                      |
| 3300                                                                            | 332 |      | 10 × 25                      | 0.017              | 0.051         | 2900                                      | 12.5 × 20                    | 0.016              | 0.048         | 2600                                      |
| 3900                                                                            | 392 |      | 12.5 × 20                    | 0.016              | 0.048         | 2600                                      | 12.5 × 25                    | 0.015              | 0.045         | 3200                                      |
| 4700                                                                            | 472 |      | 12.5 × 25                    | 0.015              | 0.045         | 3200                                      | 12.5 × 31.5                  | 0.012              | 0.036         | 3795                                      |
|                                                                                 |     |      |                              |                    |               |                                           | ▲16 × 20                     | 0.014              | 0.042         | 3575                                      |
| 5600                                                                            | 562 |      | 12.5 × 31.5                  | 0.012              | 0.036         | 3795                                      | 12.5 × 35.5                  | 0.011              | 0.033         | 4120                                      |
|                                                                                 |     |      | ▲12.5 × 25                   | 0.015              | 0.045         | 3200                                      | ▲16 × 25                     | 0.013              | 0.039         | 3810                                      |
| 6800                                                                            | 682 |      | 12.5 × 31.5                  | 0.011              | 0.033         | 3795                                      | 16 × 25                      | 0.013              | 0.039         | 3810                                      |
|                                                                                 |     |      | ▲16 × 20                     | 0.014              | 0.042         | 3575                                      |                              |                    |               |                                           |
| 8200                                                                            | 822 |      | 16 × 25                      | 0.013              | 0.039         | 3810                                      | 16 × 31.5                    | 0.011              | 0.033         | 4000                                      |
| 10000                                                                           | 103 |      | 16 × 25                      | 0.013              | 0.039         | 3810                                      | 16 × 31.5                    | 0.011              | 0.033         | 4000                                      |
| 12000                                                                           | 123 |      | 16 × 31.5                    | 0.011              | 0.033         | 4000                                      | 16 × 35.5                    | 0.010              | 0.030         | 4200                                      |
| 15000                                                                           | 153 |      | 16 × 35.5                    | 0.010              | 0.030         | 4200                                      |                              |                    |               |                                           |

| <div> <div>V</div> <div> <div>(μF)<br/>Cap.</div> <div>Code</div> </div> </div> |     | Item | 16 (1C)                      |                    |               |                                           | 25 (1E)                      |                    |               |                                           |
|---------------------------------------------------------------------------------|-----|------|------------------------------|--------------------|---------------|-------------------------------------------|------------------------------|--------------------|---------------|-------------------------------------------|
|                                                                                 |     |      | Case size<br>φ D × L<br>(mm) | Impedance (Ω) MAX. |               | Rated ripple<br>(mAmps)<br>105°C / 100kHz | Case size<br>φ D × L<br>(mm) | Impedance (Ω) MAX. |               | Rated ripple<br>(mAmps)<br>105°C / 100kHz |
|                                                                                 |     |      |                              | 20°C /100kHz       | -10°C /100kHz |                                           |                              | 20°C /100kHz       | -10°C /100kHz |                                           |
| 680                                                                             | 681 |      |                              |                    |               |                                           | 10 × 16                      | 0.030              | 0.090         | 2000                                      |
| 820                                                                             | 821 |      | 10 × 16                      | 0.030              | 0.090         | 2000                                      | 10 × 20                      | 0.019              | 0.057         | 2500                                      |
| 1000                                                                            | 102 |      | 10 × 16                      | 0.030              | 0.090         | 2000                                      | ▲10 × 16                     | 0.030              | 0.090         | 2000                                      |
|                                                                                 |     |      |                              |                    |               |                                           | 10 × 20                      | 0.019              | 0.057         | 2500                                      |
| 1200                                                                            | 122 |      | 10 × 20                      | 0.019              | 0.057         | 2500                                      | 10 × 25                      | 0.017              | 0.051         | 2900                                      |
|                                                                                 |     |      | ▲10 × 16                     | 0.030              | 0.090         | 2000                                      |                              |                    |               |                                           |
| 1500                                                                            | 152 |      | 10 × 20                      | 0.019              | 0.057         | 2500                                      | 12.5 × 20                    | 0.016              | 0.048         | 2600                                      |
| 1800                                                                            | 182 |      | 10 × 25                      | 0.017              | 0.051         | 2900                                      | 12.5 × 25                    | 0.015              | 0.045         | 3200                                      |
| 2200                                                                            | 222 |      | 12.5 × 20                    | 0.016              | 0.048         | 2600                                      | 12.5 × 25                    | 0.015              | 0.045         | 3200                                      |
|                                                                                 |     |      |                              |                    |               |                                           | ▲16 × 20                     | 0.014              | 0.042         | 3575                                      |
| 2700                                                                            | 272 |      | 12.5 × 25                    | 0.015              | 0.045         | 3200                                      | 12.5 × 31.5                  | 0.012              | 0.036         | 3795                                      |
|                                                                                 |     |      |                              |                    |               |                                           | ▲16 × 20                     | 0.014              | 0.042         | 3576                                      |
| 3300                                                                            | 332 |      | 12.5 × 25                    | 0.015              | 0.045         | 3200                                      | 12.5 × 35.5                  | 0.011              | 0.033         | 4120                                      |
|                                                                                 |     |      | ▲16 × 20                     | 0.014              | 0.042         | 3575                                      | ▲16 × 25                     | 0.013              | 0.039         | 3810                                      |
| 3900                                                                            | 392 |      | 12.5 × 31.5                  | 0.012              | 0.036         | 3795                                      | 16 × 25                      | 0.013              | 0.039         | 3810                                      |
|                                                                                 |     |      | ▲16 × 20                     | 0.014              | 0.042         | 3575                                      |                              |                    |               |                                           |
| 4700                                                                            | 472 |      | 12.5 × 35.5                  | 0.011              | 0.033         | 4120                                      | 16 × 31.5                    | 0.011              | 0.033         | 4000                                      |
|                                                                                 |     |      | ▲16 × 25                     | 0.013              | 0.039         | 3810                                      |                              |                    |               |                                           |
| 5600                                                                            | 562 |      | 16 × 25                      | 0.013              | 0.039         | 3810                                      | 16 × 35.5                    | 0.010              | 0.030         | 4200                                      |
| 6800                                                                            | 682 |      | 16 × 31.5                    | 0.011              | 0.033         | 4000                                      |                              |                    |               |                                           |
| 8200                                                                            | 822 |      | 16 × 35.5                    | 0.010              | 0.030         | 4200                                      |                              |                    |               |                                           |

▲ : In this case, [6] will be put at 12th digit of type numbering system.

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# ALUMINUM ELECTROLYTIC CAPACITORS

**HW** series

## ■ Dimensions

| (μF)<br>Cap. | Code | Item        | V                            |                    |                |                                           |                              |                    |                |                                           |
|--------------|------|-------------|------------------------------|--------------------|----------------|-------------------------------------------|------------------------------|--------------------|----------------|-------------------------------------------|
|              |      |             | 35 (1V)                      |                    |                |                                           | 50 (1H)                      |                    |                |                                           |
|              |      |             | Case size<br>φ D × L<br>(mm) | Impedance (Ω) MAX. |                | Rated ripple<br>(mArms)<br>105°C / 100kHz | Case size<br>φ D × L<br>(mm) | Impedance (Ω) MAX. |                | Rated ripple<br>(mArms)<br>105°C / 100kHz |
|              |      |             |                              | 20°C / 100kHz      | -10°C / 100kHz |                                           |                              | 20°C / 100kHz      | -10°C / 100kHz |                                           |
| 220          | 221  |             |                              |                    |                |                                           | 10 × 16                      | 0.042              | 0.126          | 1650                                      |
| 270          | 271  |             |                              |                    |                |                                           | 10 × 20                      | 0.030              | 0.090          | 2060                                      |
| 330          | 331  |             |                              |                    |                |                                           | 10 × 20                      | 0.030              | 0.090          | 2060                                      |
| 390          | 391  | 10 × 16     | 0.030                        | 0.090              | 2000           |                                           | 10 × 25                      | 0.028              | 0.084          | 2420                                      |
|              |      |             |                              |                    |                |                                           | ▲10 × 20                     | 0.030              | 0.090          | 2060                                      |
| 470          | 471  | 10 × 16     | 0.030                        | 0.090              | 2000           |                                           | 10 × 25                      | 0.028              | 0.084          | 2420                                      |
|              |      |             |                              |                    |                |                                           | ▲12.5 × 20                   | 0.027              | 0.081          | 2300                                      |
| 560          | 561  | 10 × 20     | 0.019                        | 0.057              | 2500           |                                           | 12.5 × 20                    | 0.027              | 0.081          | 2300                                      |
| 680          | 681  | 10 × 25     | 0.017                        | 0.051              | 2900           |                                           | 12.5 × 25                    | 0.023              | 0.069          | 2800                                      |
|              |      | ▲10 × 20    | 0.019                        | 0.057              | 2500           |                                           |                              |                    |                |                                           |
| 820          | 821  | 10 × 25     | 0.017                        | 0.051              | 2900           |                                           | 12.5 × 25                    | 0.023              | 0.069          | 2800                                      |
|              |      | ▲12.5 × 20  | 0.016                        | 0.048              | 2600           |                                           | ▲16 × 20                     | 0.023              | 0.069          | 3070                                      |
| 1000         | 102  | 12.5 × 20   | 0.016                        | 0.048              | 2600           |                                           | 12.5 × 31.5                  | 0.020              | 0.060          | 3500                                      |
|              |      |             |                              |                    |                |                                           | ▲16 × 25                     | 0.021              | 0.063          | 3270                                      |
| 1200         | 122  | 12.5 × 25   | 0.015                        | 0.045              | 3200           |                                           | 16 × 25                      | 0.021              | 0.063          | 3270                                      |
| 1500         | 152  | 16 × 20     | 0.014                        | 0.042              | 3575           |                                           | 12.5 × 35.5                  | 0.019              | 0.057          | 3810                                      |
|              |      |             |                              |                    |                |                                           | ▲16 × 25                     | 0.021              | 0.063          | 3270                                      |
| 1800         | 182  | 12.5 × 31.5 | 0.012                        | 0.036              | 3795           |                                           | 16 × 31.5                    | 0.019              | 0.057          | 3430                                      |
|              |      | ▲16 × 25    | 0.013                        | 0.039              | 3810           |                                           |                              |                    |                |                                           |
| 2200         | 222  | 12.5 × 35.5 | 0.011                        | 0.033              | 4120           |                                           | 16 × 31.5                    | 0.019              | 0.057          | 3430                                      |
|              |      | ▲16 × 25    | 0.013                        | 0.039              | 3810           |                                           |                              |                    |                |                                           |
| 2700         | 272  |             |                              |                    |                |                                           | 16 × 35.5                    | 0.018              | 0.054          | 3600                                      |
| 3300         | 332  | 16 × 31.5   | 0.011                        | 0.033              | 4000           |                                           |                              |                    |                |                                           |
| 3900         | 392  | 16 × 35.5   | 0.010                        | 0.030              | 4200           |                                           |                              |                    |                |                                           |

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