



# SMD Aluminum Electrolytic Capacitors

**VLV**

## Features

- 12.5 ~ 16  $\phi$ , 105°C, 5,000 hours assured
- Suitable for automotive application
- Peak acceleration: 50G
- RoHS Compliance

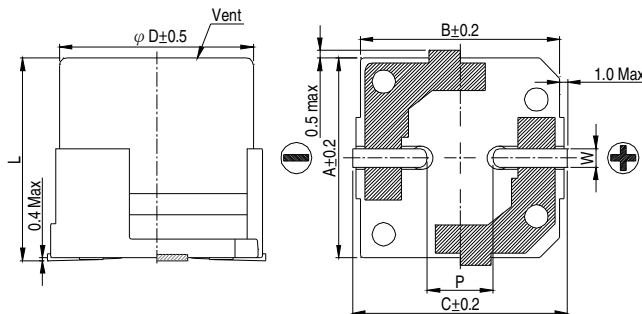


Marking color: Black

## SPECIFICATIONS

| Items  | Performance  |               |           |                    |                              |                    |                                   |                 |                        |      |     |             |           |                   |      |      |      |      |      |      |      |   |   |       |                   |   |   |   |   |   |   |   |   |   |
|--|--|---------------|-----------|--------------------|------------------------------|--------------------|-----------------------------------|-----------------|------------------------|------|-----|-------------|-----------|-------------------|------|------|------|------|------|------|------|---|---|-------|-------------------|---|---|---|---|---|---|---|---|---|
| Category Temperature Range                   | -55 ~ +105°C   |               |           |                    |                              |                    |                                   |                 |                        |      |     |             |           |                   |      |      |      |      |      |      |      |   |   |       |                   |   |   |   |   |   |   |   |   |   |
| Capacitance Tolerance                        | ±20% (at 120Hz, 20°C)  |               |           |                    |                              |                    |                                   |                 |                        |      |     |             |           |                   |      |      |      |      |      |      |      |   |   |       |                   |   |   |   |   |   |   |   |   |   |
| Leakage Current (at 20°C)                    | I = 0.01CV or 3 (μA) whichever is greater (after 2 minutes)<br>Where, C = rated capacitance in μF V = rated DC working voltage in V  |               |           |                    |                              |                    |                                   |                 |                        |      |     |             |           |                   |      |      |      |      |      |      |      |   |   |       |                   |   |   |   |   |   |   |   |   |   |
| Dissipation Factor<br>(Tan δ at 120Hz, 20°C) | <table border="1"> <thead> <tr> <th>Rated Voltage</th> <th>6.3</th> <th>10</th> <th>16</th> <th>25</th> <th>35</th> <th>50</th> <th>63</th> <th>80</th> <th>100</th> </tr> </thead> <tbody> <tr> <td>Tan δ (max)</td> <td>0.30</td> <td>0.26</td> <td>0.22</td> <td>0.16</td> <td>0.13</td> <td>0.10</td> <td>0.08</td> <td>0.08</td> <td>0.07</td> </tr> </tbody> </table> <p>When the capacitance exceeds 1,000 μF, 0.002 shall be added every 1,000 μF increase.</p>  | Rated Voltage | 6.3       | 10                 | 16                           | 25                 | 35                                | 50              | 63                     | 80   | 100 | Tan δ (max) | 0.30      | 0.26              | 0.22 | 0.16 | 0.13 | 0.10 | 0.08 | 0.08 | 0.07 |   |   |       |                   |   |   |   |   |   |   |   |   |   |
| Rated Voltage                                | 6.3  | 10            | 16        | 25                 | 35                           | 50                 | 63                                | 80              | 100                    |      |     |             |           |                   |      |      |      |      |      |      |      |   |   |       |                   |   |   |   |   |   |   |   |   |   |
| Tan δ (max)                                  | 0.30   | 0.26          | 0.22      | 0.16               | 0.13                         | 0.10               | 0.08                              | 0.08            | 0.07                   |      |     |             |           |                   |      |      |      |      |      |      |      |   |   |       |                   |   |   |   |   |   |   |   |   |   |
| Low Temperature Characteristics (at 120Hz)   | <p>Impedance ratio shall not exceed the values given in the table below.</p> <table border="1"> <thead> <tr> <th colspan="2">Rated Voltage</th> <th>6.3</th> <th>10</th> <th>16</th> <th>25</th> <th>35</th> <th>50</th> <th>63</th> <th>80</th> <th>100</th> </tr> </thead> <tbody> <tr> <td>Impedance</td> <td>Z(-25°C)/Z(+20°C)</td> <td>4</td> <td>3</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> </tr> <tr> <td>Ratio</td> <td>Z(-55°C)/Z(+20°C)</td> <td>8</td> <td>5</td> <td>4</td> <td>3</td> <td>3</td> <td>3</td> <td>3</td> <td>3</td> <td>3</td> </tr> </tbody> </table> | Rated Voltage |           | 6.3                | 10                           | 16                 | 25                                | 35              | 50                     | 63   | 80  | 100         | Impedance | Z(-25°C)/Z(+20°C) | 4    | 3    | 2    | 2    | 2    | 2    | 2    | 2 | 2 | Ratio | Z(-55°C)/Z(+20°C) | 8 | 5 | 4 | 3 | 3 | 3 | 3 | 3 | 3 |
| Rated Voltage                                |  | 6.3           | 10        | 16                 | 25                           | 35                 | 50                                | 63              | 80                     | 100  |     |             |           |                   |      |      |      |      |      |      |      |   |   |       |                   |   |   |   |   |   |   |   |   |   |
| Impedance                                    | Z(-25°C)/Z(+20°C)  | 4             | 3         | 2                  | 2                            | 2                  | 2                                 | 2               | 2                      | 2    |     |             |           |                   |      |      |      |      |      |      |      |   |   |       |                   |   |   |   |   |   |   |   |   |   |
| Ratio  | Z(-55°C)/Z(+20°C)  | 8             | 5         | 4                  | 3                            | 3                  | 3                                 | 3               | 3                      | 3    |     |             |           |                   |      |      |      |      |      |      |      |   |   |       |                   |   |   |   |   |   |   |   |   |   |
| Endurance                                    | <table border="1"> <thead> <tr> <th>Test Time</th> <th>5,000 Hrs</th> </tr> </thead> <tbody> <tr> <td>Capacitance Change</td> <td>Within ±30% of initial value</td> </tr> <tr> <td>Dissipation Factor</td> <td>Less than 300% of specified value</td> </tr> <tr> <td>Leakage Current</td> <td>Within specified value</td> </tr> </tbody> </table> <p>* The above specifications shall be satisfied when the capacitors are restored to 20°C after the rated voltage applied for 5,000 hours at 105°C.</p>  | Test Time     | 5,000 Hrs | Capacitance Change | Within ±30% of initial value | Dissipation Factor | Less than 300% of specified value | Leakage Current | Within specified value |      |     |             |           |                   |      |      |      |      |      |      |      |   |   |       |                   |   |   |   |   |   |   |   |   |   |
| Test Time                                    | 5,000 Hrs  |               |           |                    |                              |                    |                                   |                 |                        |      |     |             |           |                   |      |      |      |      |      |      |      |   |   |       |                   |   |   |   |   |   |   |   |   |   |
| Capacitance Change                           | Within ±30% of initial value   |               |           |                    |                              |                    |                                   |                 |                        |      |     |             |           |                   |      |      |      |      |      |      |      |   |   |       |                   |   |   |   |   |   |   |   |   |   |
| Dissipation Factor                           | Less than 300% of specified value  |               |           |                    |                              |                    |                                   |                 |                        |      |     |             |           |                   |      |      |      |      |      |      |      |   |   |       |                   |   |   |   |   |   |   |   |   |   |
| Leakage Current                              | Within specified value   |               |           |                    |                              |                    |                                   |                 |                        |      |     |             |           |                   |      |      |      |      |      |      |      |   |   |       |                   |   |   |   |   |   |   |   |   |   |
| Shelf Life Test                              | <table border="1"> <thead> <tr> <th>Test Time</th> <th>1,000 Hrs</th> </tr> </thead> <tbody> <tr> <td>Capacitance Change</td> <td>Within ±30% of initial value</td> </tr> <tr> <td>Dissipation Factor</td> <td>Less than 300% of specified value</td> </tr> <tr> <td>Leakage Current</td> <td>Within specified value</td> </tr> </tbody> </table> <p>* The above specifications shall be satisfied when the capacitors are restored to 20°C after exposing them for 1,000 hours at 105°C without voltage applied.</p>  | Test Time     | 1,000 Hrs | Capacitance Change | Within ±30% of initial value | Dissipation Factor | Less than 300% of specified value | Leakage Current | Within specified value |      |     |             |           |                   |      |      |      |      |      |      |      |   |   |       |                   |   |   |   |   |   |   |   |   |   |
| Test Time                                    | 1,000 Hrs  |               |           |                    |                              |                    |                                   |                 |                        |      |     |             |           |                   |      |      |      |      |      |      |      |   |   |       |                   |   |   |   |   |   |   |   |   |   |
| Capacitance Change                           | Within ±30% of initial value   |               |           |                    |                              |                    |                                   |                 |                        |      |     |             |           |                   |      |      |      |      |      |      |      |   |   |       |                   |   |   |   |   |   |   |   |   |   |
| Dissipation Factor                           | Less than 300% of specified value  |               |           |                    |                              |                    |                                   |                 |                        |      |     |             |           |                   |      |      |      |      |      |      |      |   |   |       |                   |   |   |   |   |   |   |   |   |   |
| Leakage Current                              | Within specified value   |               |           |                    |                              |                    |                                   |                 |                        |      |     |             |           |                   |      |      |      |      |      |      |      |   |   |       |                   |   |   |   |   |   |   |   |   |   |
| Ripple Current & Frequency Multipliers       | <table border="1"> <thead> <tr> <th>Frequency(Hz)</th> <th>50, 60</th> <th>120</th> <th>1k</th> <th>10k up</th> </tr> </thead> <tbody> <tr> <td>Multiplier</td> <td>0.60</td> <td>0.70</td> <td>0.85</td> <td>1.0</td> </tr> </tbody> </table>   | Frequency(Hz) | 50, 60    | 120                | 1k                           | 10k up             | Multiplier                        | 0.60            | 0.70                   | 0.85 | 1.0 |             |           |                   |      |      |      |      |      |      |      |   |   |       |                   |   |   |   |   |   |   |   |   |   |
| Frequency(Hz)                                | 50, 60   | 120           | 1k        | 10k up             |                              |                    |                                   |                 |                        |      |     |             |           |                   |      |      |      |      |      |      |      |   |   |       |                   |   |   |   |   |   |   |   |   |   |
| Multiplier                                   | 0.60   | 0.70          | 0.85      | 1.0                |                              |                    |                                   |                 |                        |      |     |             |           |                   |      |      |      |      |      |      |      |   |   |       |                   |   |   |   |   |   |   |   |   |   |
| Vibration                                    | <p>Peak acceleration: 50G<br/>Peak to peak amplitude: 1.5mm<br/>Frequency: 5 to 2,000 Hz reciprocation for 20 min.<br/>Direction and duration of vibration: 3 orthogonal directions mutually each for 4 Hrs.</p>   |               |           |                    |                              |                    |                                   |                 |                        |      |     |             |           |                   |      |      |      |      |      |      |      |   |   |       |                   |   |   |   |   |   |   |   |   |   |

## DIAGRAM OF DIMENSIONS



## LEAD SPACING AND DIAMETER

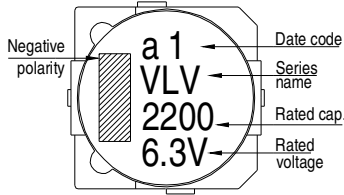
Unit: mm

| $\phi D$ | L          | A    | B    | C    | W         | P ± 0.2 |
|----------|------------|------|------|------|-----------|---------|
| 12.5     | 13.5 ± 0.5 | 13.0 | 13.4 | 15.4 | 1.1 ~ 1.4 | 4.4     |
| 12.5     | 16 ± 0.5   | 13.0 | 13.4 | 15.4 | 1.1 ~ 1.4 | 4.4     |
| 16       | 16.5 ± 0.5 | 16.5 | 16.9 | 18.9 | 1.1 ~ 1.4 | 6.4     |



## MARKING

$\phi D \geq 12.5\text{mm}$



Dimension:  $\phi D \times L(\text{mm})$

Ripple Current: mA/rms at 100k Hz, 105°C

Impedance:  $\Omega/$  at 100k Hz, 20°C

## DIMENSION & PERMISSIBLE RIPPLE CURRENT

| V. DC         |          | 6.3V (0J)         |       |       | 10V (1A)          |       |       | 16V (1C)          |       |       | 25V (1E)          |       |       | 35V (1V)          |       |       | 50V (1H)          |       |       |
|---------------|----------|-------------------|-------|-------|-------------------|-------|-------|-------------------|-------|-------|-------------------|-------|-------|-------------------|-------|-------|-------------------|-------|-------|
| $\mu\text{F}$ | Contents | $\phi D \times L$ | Imp.  | mA    | $\phi D \times L$ | Imp.  | mA    | $\phi D \times L$ | Imp.  | mA    | $\phi D \times L$ | Imp.  | mA    | $\phi D \times L$ | Imp.  | mA    | $\phi D \times L$ | Imp.  | mA    |
| 330           | 331      |                   |       |       |                   |       |       |                   |       |       |                   |       |       | 12.5×13.5         | 0.066 | 850   | 12.5×13.5         | 0.11  | 700   |
| 470           | 471      |                   |       |       |                   |       |       |                   |       |       |                   |       |       | 12.5×16           | 0.058 | 950   | 16×16.5           | 0.070 | 1,100 |
| 680           | 681      |                   |       |       |                   |       |       |                   |       |       | 12.5×13.5         | 0.066 | 850   | 12.5×16           | 0.058 | 950   | 16×16.5           | 0.070 | 1,100 |
| 1,000         | 102      |                   |       |       |                   |       |       | 12.5×13.5         | 0.066 | 850   | 12.5×16           | 0.058 | 950   | 16×16.5           | 0.052 | 1,300 |                   |       |       |
| 1,500         | 152      |                   |       |       | 12.5×13.5         | 0.066 | 850   | 12.5×16           | 0.058 | 950   | 16×16.5           | 0.052 | 1,300 |                   |       |       |                   |       |       |
| 2,200         | 222      | 12.5×13.5         | 0.066 | 850   | 12.5×16           | 0.058 | 950   | 16×16.5           | 0.052 | 1,300 | 16×16.5           | 0.052 | 1,300 |                   |       |       |                   |       |       |
| 3,300         | 332      | 12.5×16           | 0.058 | 950   | 16×16.5           | 0.052 | 1,300 | 16×16.5           | 0.052 | 1,300 |                   |       |       |                   |       |       |                   |       |       |
| 4,700         | 472      | 16×16.5           | 0.052 | 1,300 | 16×16.5           | 0.052 | 1,300 |                   |       |       |                   |       |       |                   |       |       |                   |       |       |

| V. DC         |          | 63V (1J)          |       |     | 80V (1K)          |      |     | 100V (2A)         |      |     |
|---------------|----------|-------------------|-------|-----|-------------------|------|-----|-------------------|------|-----|
| $\mu\text{F}$ | Contents | $\phi D \times L$ | Imp.  | mA  | $\phi D \times L$ | Imp. | mA  | $\phi D \times L$ | Imp. | mA  |
| 100           | 101      |                   |       |     |                   |      |     | 12.5×13.5         | 0.32 | 450 |
| 150           | 151      | 12.5×13.5         | 0.140 | 700 | 12.5×13.5         | 0.32 | 450 | 12.5×16           | 0.26 | 550 |
| 220           | 221      | 12.5×13.5         | 0.140 | 700 | 12.5×16           | 0.26 | 550 | 16×16.5           | 0.17 | 650 |
| 330           | 331      | 16×16.5           | 0.080 | 900 | 16×16.5           | 0.17 | 650 |                   |      |     |
| 470           | 471      | 16×16.5           | 0.080 | 900 |                   |      |     |                   |      |     |