

Type AVES $-55\text{ }^{\circ}\text{C}$ to $+105\text{ }^{\circ}\text{C}$

Low Profile SMT Aluminum Electrolytic Capacitors

For Filtering, Bypassing and Power Supply Decoupling



Type AVES Capacitors are rated for 1000 hours at $105\text{ }^{\circ}\text{C}$ with low impedance characteristics. They are ideal for high density PC board packaging. The Type AVES offers a low in-place-cost for a high quality performer. The vertical cylindrical cases facilitate automatic mounting and reflow soldering into the same footprint of like-rated tantalum capacitors except without the need for voltage derating.

Highlights

- $+105\text{ }^{\circ}\text{C}$, Up to 1000 Hours Load Life
- Capacitance Range: $0.1\text{ }\mu\text{F}$ to $100\text{ }\mu\text{F}$
- Voltage Range: 6.3 Vdc to 50 Vdc

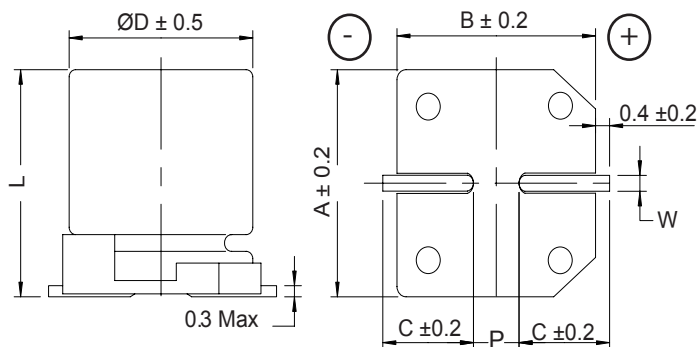
Specifications

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|----------------------|------------|----------------|-----------|-----------|------------------|---------------|----------------------|------------------------------------|--------------------|-----------------------------------|-----------------|------------------------|------|------------|-----------|-----------|-----------|-----------|-----------|------------------------|---|------|------|------|---|---|---|---|---|---|---|---|---|---|
| Capacitance Range | 0.1 μF to 100 μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Capacitance Tolerance | $\pm 20\%$ @ 120 Hz and $+20\text{ }^{\circ}\text{C}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rated Voltage | 6.3, 10, 16, 25, 35, 50 Vdc | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Operating Temperature Range | $-55\text{ }^{\circ}\text{C}$ to $+105\text{ }^{\circ}\text{C}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Leakage Current | $I = 0.01 CV$ or $3\text{ }(\mu\text{A})$ whichever is greater after 2 minutes C = rated capacitance in μF , V = rated DC working voltage | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dissipation Factor (Tan δ at 120 Hz, $20\text{ }^{\circ}\text{C}$) | <table border="1"> <tr> <td>Rated Voltage</td> <td>6.3</td> <td>10</td> <td>16</td> <td>25</td> <td>35</td> <td>50</td> </tr> <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>0.12</td> </tr> </table> | | | | | | Rated Voltage | 6.3 | 10 | 16 | 25 | 35 | 50 | Tan δ Max | 0.30 | 0.26 | 0.22 | 0.16 | 0.13 | 0.12 | | | | | | | | | | | | | | | | |
| Rated Voltage | 6.3 | 10 | 16 | 25 | 35 | 50 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tan δ Max | 0.30 | 0.26 | 0.22 | 0.16 | 0.13 | 0.12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Low Temperature Characteristics @ 120 Hz | <table border="1"> <tr> <td colspan="2"></td> <td colspan="5">Rated Voltage</td> </tr> <tr> <td colspan="2"></td> <td>6.3</td> <td>10</td> <td>16</td> <td>25</td> <td>35</td> <td>50</td> </tr> <tr> <td rowspan="2">Impedance Ratio</td> <td>$Z(-25\text{ }^{\circ}\text{C}) / Z(+20\text{ }^{\circ}\text{C})$</td> <td>4</td> <td>3</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> </tr> <tr> <td>$Z(-40\text{ }^{\circ}\text{C}) / Z(+20\text{ }^{\circ}\text{C})$</td> <td>8</td> <td>5</td> <td>4</td> <td>3</td> <td>3</td> <td>3</td> </tr> </table> | | | | | | | | Rated Voltage | | | | | | | 6.3 | 10 | 16 | 25 | 35 | 50 | Impedance Ratio | $Z(-25\text{ }^{\circ}\text{C}) / Z(+20\text{ }^{\circ}\text{C})$ | 4 | 3 | 2 | 2 | 2 | 2 | $Z(-40\text{ }^{\circ}\text{C}) / Z(+20\text{ }^{\circ}\text{C})$ | 8 | 5 | 4 | 3 | 3 | 3 |
| | | Rated Voltage | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 6.3 | 10 | 16 | 25 | 35 | 50 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Impedance Ratio | $Z(-25\text{ }^{\circ}\text{C}) / Z(+20\text{ }^{\circ}\text{C})$ | 4 | 3 | 2 | 2 | 2 | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | $Z(-40\text{ }^{\circ}\text{C}) / Z(+20\text{ }^{\circ}\text{C})$ | 8 | 5 | 4 | 3 | 3 | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ripple Current Multipliers | <table border="1"> <tr> <td rowspan="2">Vdc \ Freq. (Hz)</td> <td>50, 60</td> <td>120</td> <td>1 k</td> <td>10 k up</td> </tr> <tr> <td>Under 16</td> <td>0.8</td> <td>1.00</td> <td>1.15</td> <td>1.25</td> </tr> <tr> <td>25 ~ 35</td> <td>0.8</td> <td>1.00</td> <td>1.25</td> <td>1.40</td> </tr> <tr> <td>50</td> <td>0.8</td> <td>1.00</td> <td>1.35</td> <td>1.50</td> </tr> </table> | | | | | | Vdc \ Freq. (Hz) | 50, 60 | 120 | 1 k | 10 k up | Under 16 | 0.8 | 1.00 | 1.15 | 1.25 | 25 ~ 35 | 0.8 | 1.00 | 1.25 | 1.40 | 50 | 0.8 | 1.00 | 1.35 | 1.50 | | | | | | | | | | |
| Vdc \ Freq. (Hz) | 50, 60 | 120 | 1 k | 10 k up | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Under 16 | 0.8 | 1.00 | 1.15 | 1.25 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 25 ~ 35 | 0.8 | 1.00 | 1.25 | 1.40 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 50 | 0.8 | 1.00 | 1.35 | 1.50 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Load Life Test | <table border="1"> <tr> <td>Test Time</td> <td>1,000 Hours</td> </tr> <tr> <td>Capacitance Change</td> <td>Within $\pm 20\%$ of initial value</td> </tr> <tr> <td>Dissipation Factor</td> <td>Less than 200% of specified value</td> </tr> <tr> <td>Leakage Current</td> <td>Within specified value</td> </tr> </table> <p>The above specifications shall be satisfied when the capacitors are restored to $20\text{ }^{\circ}\text{C}$ after the rated voltage is applied for 1,000 hrs at $105\text{ }^{\circ}\text{C}$</p> | | | | | | Test Time | 1,000 Hours | Capacitance Change | Within $\pm 20\%$ of initial value | Dissipation Factor | Less than 200% of specified value | Leakage Current | Within specified value | | | | | | | | | | | | | | | | | | | | | | |
| Test Time | 1,000 Hours | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Capacitance Change | Within $\pm 20\%$ of initial value | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dissipation Factor | Less than 200% of specified value | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Leakage Current | Within specified value | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Shelf Life Test | Test time: 1000 hours; other items are the same as those for life test. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RoHS Compliant | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Type AVES -55 °C to +105 °C

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Outline Drawing, Case Code & Dimensions Table



| Case Code | Ø D (mm) | L (mm) | A (mm) | B (mm) | C (mm) | W (mm) | P ±0.2 (mm) |
|-----------|----------|----------|--------|--------|--------|------------|-------------|
| B | 4.0 | 5.3 ±0.2 | 4.3 | 4.3 | 2.0 | 0.5 to 0.8 | 1.0 |
| C | 5.0 | 5.3 ±0.2 | 5.3 | 5.3 | 2.3 | 0.5 to 0.8 | 1.5 |
| D | 6.3 | 5.3 ±0.2 | 6.6 | 6.6 | 2.7 | 0.5 to 0.8 | 2.0 |

Part Numbering System

| | | | | | | |
|---------------|--|------------------------------|--|------------------|--|-----------------------|
| AVES | 106 | M | 16 | B | 12T | - F |
| Series | Capacitance | Capacitance Tolerance | Voltage | Case Code | Packaging Information | RoHS Compliant |
| AVES | 104 = 0.1 µF 105 = 1.0 µF 106 = 10.0 µF 107 = 100.0 µF 108 = 1000.0 µF | M = ±20% | 06 = 6.3 Vdc 10 = 10 Vdc 16 = 16 Vdc 25 = 25 Vdc 50 = 50 Vdc | B = B | 12 = Carrier Tape Width (mm) T = Tape & Reel | |

Ratings

| Cap (µF) | Catalog Part Number | Max DCL 2 min. (µA) | Max DF 120 Hz 20 °C | Max ESR 120 Hz 20 °C (ohms) | Max Ripple Current 120 Hz 105 °C (mA) | Case Code | Size D x L (mm) | Quantity per Reel (each) |
|-------------------------------|---------------------|---------------------|---------------------|-----------------------------|---------------------------------------|-----------|-----------------|--------------------------|
| 6.3 Vdc (8 Vdc Surge) | | | | | | | | |
| 22 | AVES226M06B12T-F | 3.0 | 0.30 | 22.6 | 21 | B | 4 x 5.3 | 2000 |
| 33 | AVES336M06C12T-F | 3.0 | 0.30 | 15.1 | 30 | C | 5 x 5.3 | 1000 |
| 47 | AVES476M06C12T-F | 3.0 | 0.30 | 10.6 | 46 | C | 5 x 5.3 | 1000 |
| 100 | AVES107M06D16T-F | 6.3 | 0.30 | 5.0 | 61 | D | 6.3 x 5.3 | 1000 |
| 10 Vdc (13 Vdc Surge) | | | | | | | | |
| 10 | AVES106M10B12T-F | 3.0 | 0.26 | 43.1 | 15 | B | 4 x 5.3 | 2000 |
| 22 | AVES226M10C12T-F | 3.0 | 0.26 | 19.6 | 25 | C | 5 x 5.3 | 1000 |
| 33 | AVES336M10C12T-F | 3.3 | 0.26 | 13.1 | 31 | C | 5 x 5.3 | 1000 |
| 47 | AVES476M10D16T-F | 4.7 | 0.26 | 9.2 | 43 | D | 6.3 x 5.3 | 1000 |
| 100 | AVES107M10D16T-F | 10.0 | 0.26 | 4.3 | 65 | D | 6.3 x 5.3 | 1000 |

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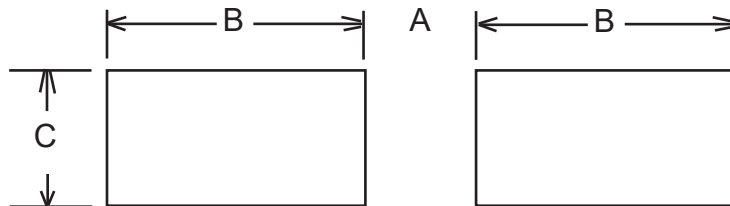
| Cap (μ F) | Catalog Part Number | Max DCL 2 min. (μ A) | Max DF 120 Hz 20 °C | Max ESR 120 Hz 20 °C (ohms) | Max Ripple Current 120 Hz 105 °C (mA) | Size D x L (mm) | Quantity per Reel (each) |
|-------------------------------|------------------------|------------------------------------|---------------------------|--|--|-----------------------|--------------------------------|
| 16 Vdc (20 Vdc Surge) | | | | | | | |
| 10 | AVES106M16B12T-F | 3.0 | 0.22 | 36.5 | 16 | 4 x 5.3 | 2000 |
| 22 | AVES226M16C12T-F | 3.5 | 0.22 | 16.6 | 28 | 5 x 5.3 | 1000 |
| 33 | AVES336M16D16T-F | 5.3 | 0.22 | 11.1 | 40 | 6.3 x 5.3 | 1000 |
| 47 | AVES476M16D16T-F | 7.5 | 0.22 | 7.8 | 47 | 6.3 x 5.3 | 1000 |
| 100 | AVES107M16D16T-F | 16.0 | 0.22 | 3.6 | 70 | 6.3 x 5.3 | 1000 |
| 25 Vdc (31 Vdc Surge) | | | | | | | |
| 4.7 | AVES475M25B12T-F | 3.0 | 0.16 | 56.4 | 12 | 4 x 5.3 | 2000 |
| 10 | AVES106M25C12T-F | 3.0 | 0.16 | 26.5 | 21 | 5 x 5.3 | 1000 |
| 22 | AVES226M25D16T-F | 5.5 | 0.16 | 12.1 | 36 | 6.3 x 5.3 | 1000 |
| 33 | AVES336M25D16T-F | 8.3 | 0.16 | 8.0 | 44 | 6.3 x 5.3 | 1000 |
| 47 | AVES476M25D16T-F | 11.8 | 0.16 | 5.6 | 60 | 6.3 x 5.3 | 1000 |
| 35 Vdc (44 Vdc Surge) | | | | | | | |
| 4.7 | AVES475M35B12T-F | 3.0 | 0.13 | 45.9 | 14 | 4 x 5.3 | 2000 |
| 10.0 | AVES106M35C12T-F | 3.5 | 0.13 | 21.6 | 23 | 5 x 5.3 | 1000 |
| 22.0 | AVES226M35D16T-F | 7.7 | 0.13 | 9.8 | 50 | 6.3 x 5.3 | 1000 |
| 50 Vdc (63 Vdc Surge) | | | | | | | |
| .10 | AVES104M50B12T-F* | 3.0 | 0.12 | 1989.4 | 2 | 4 x 5.3 | 2000 |
| .22 | AVES224M50B12T-F* | 3.0 | 0.12 | 904.3 | 3 | 4 x 5.3 | 2000 |
| .33 | AVES334M50B12T-F* | 3.0 | 0.12 | 602.8 | 4 | 4 x 5.3 | 2000 |
| .47 | AVES474M50B12T-F* | 3.0 | 0.12 | 423.3 | 5 | 4 x 5.3 | 2000 |
| 1.0 | AVES105M50B12T-F | 3.0 | 0.12 | 198.9 | 7 | 4 x 5.3 | 2000 |
| 2.2 | AVES225M50B12T-F | 3.0 | 0.12 | 90.4 | 10 | 4 x 5.3 | 2000 |
| 3.3 | AVES335M50B12T-F | 3.0 | 0.12 | 60.3 | 12 | 4 x 5.3 | 2000 |
| 4.7 | AVES475M50C12T-F | 3.0 | 0.12 | 42.3 | 17 | 5 x 5.3 | 1000 |
| 10.0 | AVES106M50D16T-F | 5.0 | 0.12 | 19.9 | 26 | 6.3 x 5.3 | 1000 |
| 22.0 | AVES226M50D16T-F | 11.0 | 0.12 | 9.0 | 51 | 6.3 x 5.3 | 1000 |

*denotes discontinued part number

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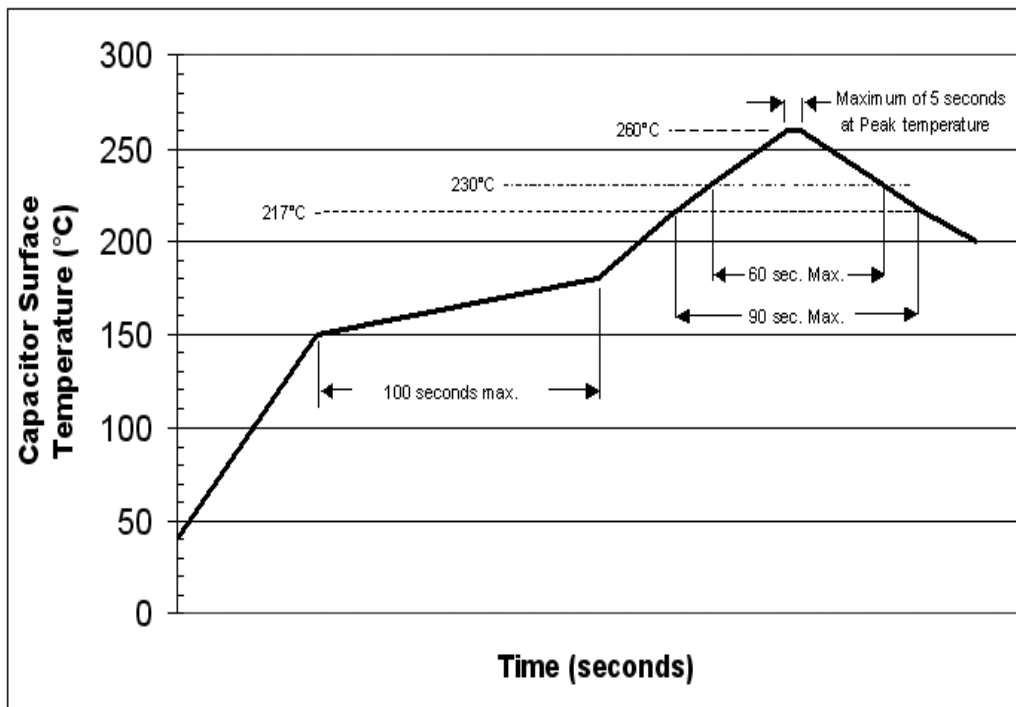
Recommended Land Patterns by case size for AVES series



| Case Code | Case Size | Land Dimensions (mm) | | |
|-----------|-----------|----------------------|-----|-----|
| | | C | B | A |
| B | 4x5.3 | 1.6 | 2.6 | 1 |
| C | 5x5.3 | 1.6 | 3 | 1.4 |
| D | 6.3x5.3 | 1.6 | 3.5 | 1.9 |

Recommended Soldering Methods

Recommended Reflow Soldering Profile:



Parts should be subjected to just one reflow soldering process.

Soldering with a solder iron should be performed with a maximum soldering iron tip temperature of $350 \pm 5^\circ\text{C}$ for 3 to 4 seconds.

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