

# Type AVRF -55 °C to 105 °C

## SMT Aluminum Electrolytic Capacitors - Lowest E.S.R., 105 °C

### Low Impedance and Long-Life for Filtering, Bypassing and Power Supply Decoupling



Type AVRF Capacitors are the best and by a wide margin. With 40% to 60% lower impedance, 30% to 50% smaller case size and more than twice the life compared to low-ESR type AFC, the Type AVRF also excels at cold performance down to -55 °C. In addition, this terrific low-impedance performance, approaching low-ESR tantalum capacitors, is at a significant cost savings compared to tantalum. 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 °C, Up to 5000 Hour Load Life
- Ultra-low Impedance
- Voltage Range: 6.3 Vdc to 35 Vdc

#### Specifications

**Operating Temperature:** -55 °C to +105 °C

**Rated Voltage:** 6.3, 10, 16, 25, 35 Vdc

**Capacitance:** 4.7 µF to 1500 µF

**Capacitance Tolerance:** ±20% @ 120 Hz and +20 °C

**Leakage Current:** 0.01 CV or 3 µA @ +20 °C, after two minutes (whichever is greater)

**Low Temperature**

**Characteristics @ 120 Hz:**

| Rated Voltage (Vdc) |                   | 6.3 | 10 | 16 | 25 | 35 |
|---------------------|-------------------|-----|----|----|----|----|
| Impedance Ratio     | Z(-25°C)/Z(+20°C) | 2   | 2  | 2  | 2  | 2  |
|                     | Z(-40°C)/Z(+20°C) | 3   | 3  | 3  | 3  | 3  |
|                     | Z(-55°C)/Z(+20°C) | 4   | 4  | 4  | 3  | 3  |

**Dissipation Factor:**

| 6.3V | 10 V | 16 V | 25 V | 35 V |
|------|------|------|------|------|
| 0.26 | 0.19 | 0.16 | 0.14 | 0.12 |



Complies with the EU Directive 2002/95/EC requirement restricting the use of Lead (Pb), Mercury (Hg), Cadmium (Cd), Hexavalent chromium (Cr(VI)), PolyBrominated Biphenyls (PBB) and PolyBrominated Diphenyl Ethers (PBDE).

**Life Test:** 2000 h @ 105 °C, 4.0 — 6.3 mm dia.

5000 h @ 105 °C, 8.0 — 10.0 mm dia.

Δ Capacitance ±30% (10 mm Dia.: ±35%)

DF: ≤ 200% of limit (10 mm Dia.: ≤300%)

DCL: ≤ 100% of limit

**Shelf Test:** 1000 h @ 105 °C

Δ Capacitance ±30% (10 mm Dia.: ±35%)

DF: ≤ 200% of limit (10 mm Dia.: ≤300%)

DCL: ≤ 100% of limit

#### Part Numbering System

| AVRF | 106             | M                     | 16           | B           | 12T                                                | -F             |                |
|------|-----------------|-----------------------|--------------|-------------|----------------------------------------------------|----------------|----------------|
| Type | Capacitance     | Capacitance Tolerance | Voltage Code |             | Case Code                                          | Packaging Code | RoHS Compliant |
| AVRF | 475 = 4.7 μF    | M = ±20%              | 06 = 6.3 Vdc | 25 = 25 Vdc | 12 = Carrier tape<br>Width (mm)<br>T = Tape & Reel |                |                |
|      | 106 = 10.0 μF   |                       | 10 = 10 Vdc  | 35 = 35 Vdc |                                                    |                |                |
|      | 107 = 100.0 μF  |                       | 16 = 16 Vdc  |             |                                                    |                |                |
|      | 108 = 1000.0 μF |                       |              |             |                                                    |                |                |

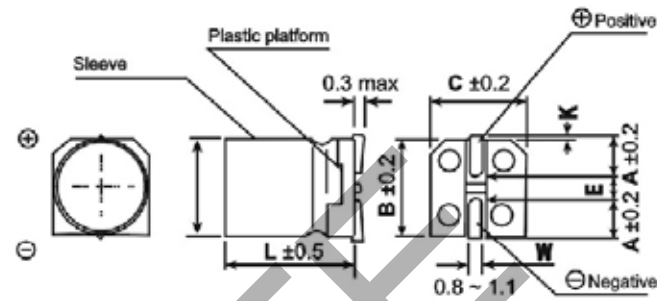
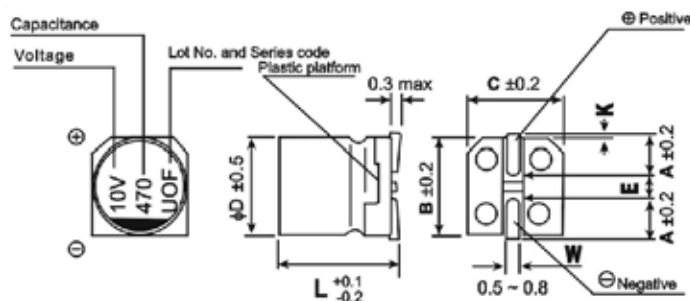
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### Outline Drawing & Marking

(4.0 - 6.3 mm Dia.)

(8.0 - 10.0 mm Dia.)



### Case Dimensions

| Case Code | D ± .05 (mm) | L (mm)     | B, C (mm) | A (ref) | W (mm)     | E (ref) | K (mm)           |
|-----------|--------------|------------|-----------|---------|------------|---------|------------------|
| B         | 4.0          | 5.4 ± 0.2  | 4.3       | 1.8     | 0.65 ± 0.1 | 1.0     | 0.35 +0.15/-0.20 |
| C         | 5.0          | 5.4 ± 0.3  | 5.3       | 2.2     | 0.65 ± 0.1 | 1.5     | 0.35 +0.15/-0.20 |
| D         | 6.3          | 5.4 ± 0.2  | 6.6       | 2.6     | 0.65 ± 0.1 | 1.8     | 0.35 +0.15/-0.20 |
| F         | 8.0          | 10.2 ± 0.5 | 8.3       | 3.4     | 0.90 ± 0.2 | 3.1     | 0.70 ± 0.20      |
| G         | 10.0         | 10.2 ± 0.5 | 10.3      | 3.5     | 0.90 ± 0.2 | 4.6     | 0.70 ± 0.20      |

### Ratings

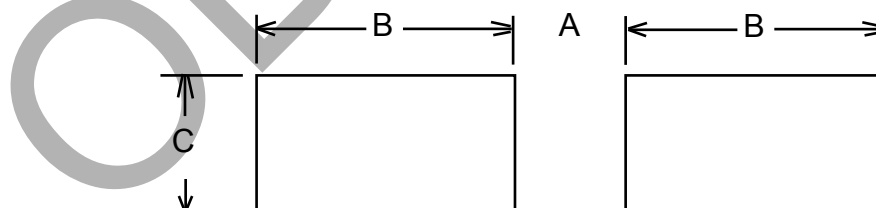
| Cap. (μF) | Catalog Part Number | Max. DCL 2 min. (μA) | Max. DF @ 120Hz/20°C | Max. E.S.R. @ 100kHz/20°C (Ω) | Max. Impedance @ 100kHz/20°C (Ω) | Max. Ripple Current @ 100kHz/105°C (mA) | Case Code | Size DxL (mm) | Quantity /Reel (Ea) |
|-----------|---------------------|----------------------|----------------------|-------------------------------|----------------------------------|-----------------------------------------|-----------|---------------|---------------------|
| 6.3 Vdc   |                     |                      |                      |                               |                                  |                                         |           |               |                     |
| 22        | AVRF226M06B12T-F    | 3.0                  | 0.26                 | 1.65                          | 1.65                             | 70                                      | B         | 4x5.4         | 2000                |
| 47        | AVRF476M06B12T-F    | 3.0                  | 0.26                 | 1.65                          | 1.65                             | 70                                      | B         | 4x5.4         | 2000                |
| 100       | AVRF107M06C12T-F    | 6.3                  | 0.26                 | 0.90                          | 0.90                             | 100                                     | C         | 5x5.4         | 1000                |
| 220       | AVRF227M06D16T-F    | 13.9                 | 0.26                 | 0.50                          | 0.50                             | 160                                     | D         | 6.3x5.4       | 1000                |
| 470       | AVRF477M06F24T-F    | 29.6                 | 0.26                 | 0.16                          | 0.16                             | 600                                     | F         | 8x10.2        | 500                 |
| 1000      | AVRF108M06F24T-F    | 63.0                 | 0.26                 | 0.16                          | 0.16                             | 600                                     | F         | 8x10.2        | 500                 |
| 1500      | AVRF158M06G24T-F    | 94.5                 | 0.26                 | 0.08                          | 0.08                             | 850                                     | G         | 10x10.2       | 500                 |
| 10 Vdc    |                     |                      |                      |                               |                                  |                                         |           |               |                     |
| 22        | AVRF226M10B12T-F    | 3.0                  | 0.19                 | 1.65                          | 1.65                             | 70                                      | B         | 4x5.4         | 2000                |
| 33        | AVRF336M10B12T-F    | 3.3                  | 0.19                 | 1.65                          | 1.65                             | 70                                      | B         | 4x5.4         | 2000                |
| 150       | AVRF157M10D16T-F    | 15.0                 | 0.19                 | 0.50                          | 0.50                             | 160                                     | D         | 6.3x5.4       | 1000                |
| 330       | AVRF337M10F24T-F    | 33.0                 | 0.19                 | 0.16                          | 0.16                             | 600                                     | F         | 8x10.2        | 500                 |
| 470       | AVRF477M10F24T-F    | 47.0                 | 0.19                 | 0.16                          | 0.16                             | 600                                     | F         | 8x10.2        | 500                 |
| 1000      | AVRF108M10G24T-F    | 100.0                | 0.19                 | 0.08                          | 0.08                             | 850                                     | G         | 10x10.2       | 500                 |

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| Cap.<br>(μF)  | Catalog<br>Part Number | Max. DCL<br>2 min.<br>(μA) | Max. DF<br>@ 120Hz/20°C | Max. E.S.R.<br>@ 100kHz/20°C<br>(Ω) | Max. Impedance<br>@ 100kHz/20°C<br>(Ω) | Max. Ripple<br>Current<br>@ 100kHz/105°C<br>(mA) | Case<br>Code | Size<br>DxL<br>(mm) | Quantity<br>/Reel<br>(Ea) |
|---------------|------------------------|----------------------------|-------------------------|-------------------------------------|----------------------------------------|--------------------------------------------------|--------------|---------------------|---------------------------|
| <b>16 Vdc</b> |                        |                            |                         |                                     |                                        |                                                  |              |                     |                           |
| 10            | AVRF106M16B12T-F       | 3.0                        | 0.16                    | 1.65                                | 1.65                                   | 70                                               | B            | 4x5.4               | 2000                      |
| 22            | AVRF226M16B12T-F       | 3.5                        | 0.16                    | 1.65                                | 1.65                                   | 70                                               | B            | 4x5.4               | 2000                      |
| 47            | AVRF476M16C12T-F       | 7.5                        | 0.16                    | 0.90                                | 0.90                                   | 100                                              | C            | 5x5.4               | 1000                      |
| 68            | AVRF686M16D16T-F       | 10.9                       | 0.16                    | 0.50                                | 0.50                                   | 160                                              | D            | 6.3x5.4             | 1000                      |
| 330           | AVRF337M16F24T-F       | 52.8                       | 0.16                    | 0.16                                | 0.16                                   | 600                                              | F            | 8x10.2              | 500                       |
| 470           | AVRF477M16F24T-F       | 75.2                       | 0.16                    | 0.16                                | 0.16                                   | 600                                              | F            | 8x10.2              | 500                       |
| <b>25 Vdc</b> |                        |                            |                         |                                     |                                        |                                                  |              |                     |                           |
| 10            | AVRF106M25B12T-F       | 3.0                        | 0.14                    | 1.65                                | 1.65                                   | 70                                               | B            | 4x5.4               | 2000                      |
| 22            | AVRF226M25C12T-F       | 5.5                        | 0.14                    | 0.90                                | 0.90                                   | 100                                              | C            | 5x5.4               | 1000                      |
| 33            | AVRF336M25D16T-F       | 8.3                        | 0.14                    | 0.50                                | 0.50                                   | 160                                              | D            | 6.3x5.4             | 1000                      |
| 47            | AVRF476M25D16T-F       | 11.8                       | 0.14                    | 0.50                                | 0.50                                   | 160                                              | D            | 6.3x5.4             | 1000                      |
| 68            | AVRF686M25D16T-F       | 17.0                       | 0.14                    | 0.50                                | 0.50                                   | 160                                              | D            | 6.3x5.4             | 1000                      |
| 150           | AVRF157M25F24T-F       | 37.5                       | 0.14                    | 0.16                                | 0.16                                   | 600                                              | F            | 8x10.2              | 500                       |
| 220           | AVRF227M25F24T-F       | 55.0                       | 0.14                    | 0.16                                | 0.16                                   | 600                                              | F            | 8x10.2              | 500                       |
| 330           | AVRF337M25F24T-F       | 82.5                       | 0.14                    | 0.16                                | 0.16                                   | 600                                              | F            | 8x10.2              | 500                       |
| 470           | AVRF477M25G24T-F       | 117.5                      | 0.14                    | 0.08                                | 0.08                                   | 850                                              | G            | 10x10.2             | 500                       |
| <b>35 Vdc</b> |                        |                            |                         |                                     |                                        |                                                  |              |                     |                           |
| 4.7           | AVRF475M35B12T-F       | 3.0                        | 0.12                    | 1.65                                | 1.65                                   | 70                                               | B            | 4x5.4               | 2000                      |
| 10            | AVRF106M35C12T-F       | 3.5                        | 0.12                    | 0.90                                | 0.90                                   | 100                                              | C            | 5x5.4               | 1000                      |
| 22            | AVRF226M35D16T-F       | 7.7                        | 0.12                    | 0.50                                | 0.50                                   | 160                                              | D            | 6.3x5.4             | 1000                      |
| 33            | AVRF336M35D16T-F       | 11.6                       | 0.12                    | 0.50                                | 0.50                                   | 160                                              | D            | 6.3x5.4             | 1000                      |
| 47            | AVRF476M35F24T-F       | 16.5                       | 0.12                    | 0.16                                | 0.16                                   | 600                                              | F            | 8x10.2              | 500                       |
| 100           | AVRF107M35F24T-F       | 35.0                       | 0.12                    | 0.16                                | 0.16                                   | 600                                              | F            | 8x10.2              | 500                       |
| 150           | AVRF157M35F24T-F       | 52.5                       | 0.12                    | 0.16                                | 0.16                                   | 600                                              | F            | 8x10.2              | 500                       |
| 220           | AVRF227M35F24T-F       | 77.0                       | 0.12                    | 0.16                                | 0.16                                   | 600                                              | F            | 8x10.2              | 500                       |
| 330           | AVRF337M35G24T-F       | 115.5                      | 0.12                    | 0.08                                | 0.08                                   | 850                                              | G            | 10x10.2             | 500                       |

### Recommended Land Patterns by case size for AVRF series



| Case<br>Code | Case<br>Size | Land Dimensions (mm) |     |     |
|--------------|--------------|----------------------|-----|-----|
|              |              | C                    | B   | A   |
| B            | 4x5.4        | 1.6                  | 2.6 | 1.0 |
| C            | 5x5.4        | 1.6                  | 3.0 | 1.4 |
| D            | 6.3x5.4      | 1.6                  | 3.5 | 1.9 |
| F            | 8x10.2       | 2.5                  | 3.5 | 3.0 |
| G            | 10x10.2      | 2.5                  | 4.0 | 4.0 |

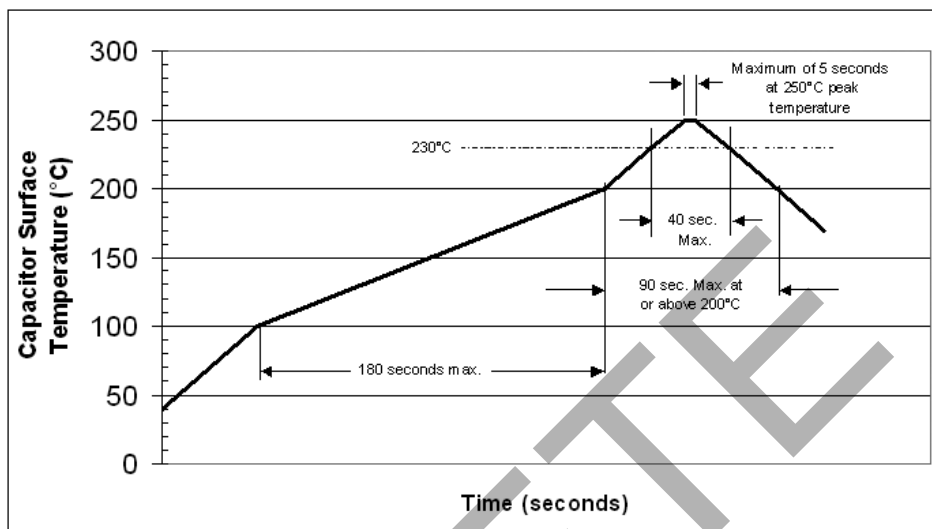
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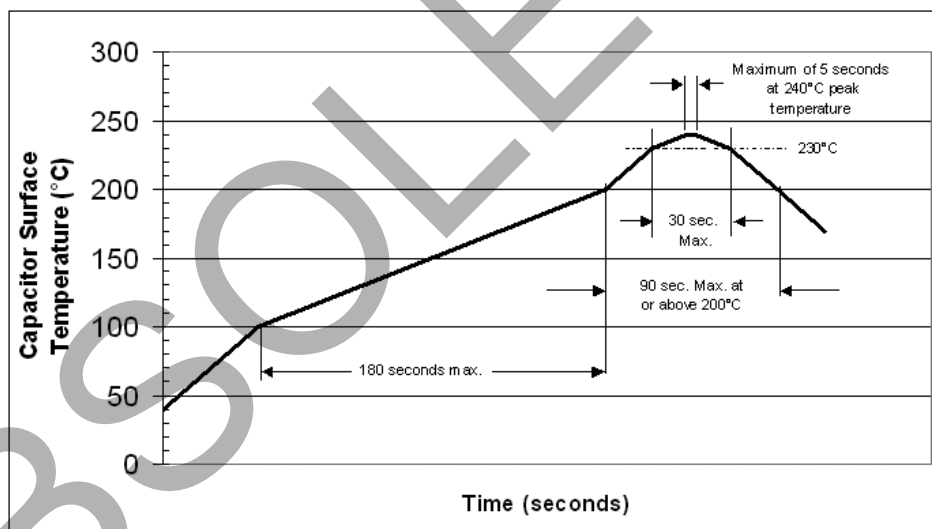
#### Recommended Soldering methods

Recommended Reflow Soldering Profiles:

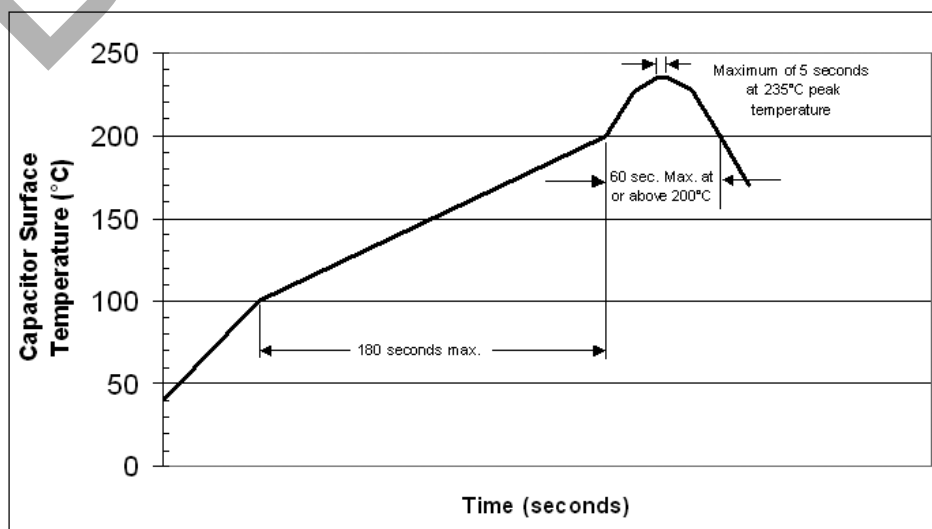
For case diameters  
4 thru 6.3 mm



For 8 mm  
case diameter



For 10 mm  
case diameter



Soldering with a solder iron should be performed with a maximum soldering iron tip temperature of 350±5°C for 3 to 4 seconds.

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