

RA SERIES – FOR GENERAL PURPOSE, STANDARD SIZE, 85°C

1. Applicable Standard

Characteristic W of JIS C 5141

2. Operating Temperature Range

-40°C ~ +85°C

-25°C ~ +85°C

3. Rated Working Voltage

6.3~250 V.DC

350~450 V.DC

4. Electrical Characteristic

4.1. Capacitance Tolerance (at 25°C, 120Hz)

Measured in accordance with JIS C5141 No.7 MIL-STD-105D

The capacitance shall be within the following tolerance to the nominal capacitance:6.3V~450V

-20%~+20% (M) or -10%~+50% (T)

4.2. Rated Voltage and Surge Voltage

| | | | | | | | | | | | | | | |
|-------------------|-----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|
| Rated Voltage (V) | 6.3 | 10 | 16 | 25 | 35 | 50 | 63 | 100 | 160 | 200 | 250 | 350 | 400 | 450 |
| Surge Voltage (V) | 8 | 13 | 20 | 32 | 44 | 63 | 79 | 125 | 200 | 250 | 300 | 400 | 450 | 500 |

Measured in accordance with JIS C5141 No.8

The capacitor may be subjected for short periods not exceeding approximately 30 Seconds at infrequent intervals of not than five minutes the test shall be conducted 1000 cycles At infrequent at room temperature with voltage applied through a series resistance of 1000 ohms without unless otherwise specified is follows:

| | |
|--------------------|--|
| Capacitance Change | ±20% of the initial measured value. |
| Tan δ | ≤ 200% of the initial specified value. |
| Leakage Current | ≤ The initial specified value. |
| Appearance is good | |

4.3. DC Leakage Current

Measured in accordance with JIS C5141 No.5

Applying the rated DC voltage to the capacitor. The leakage current is measured at 2 minutes after the DC voltage across the capacitor reached the rated voltage. The leakage current shall not exceed the value below. (at 25°C)

 $I \leq 0.01 CV$ or $3 \mu A$, whichever is graterWhere, I: Leakage Current (μA) C: Nominal Capacitance (μF)

V: Rated Voltage (V)

4.4. Tangent of Loss Angle (Tan δ)

Measured in accordance with JIS C5141 No.7

Tan δ shall not exceed the value below. (at 25°C, 120Hz) When nominal capacitance is over 1000 μF .F. Tan δ shall be added 0.02 to the listed value with increase of every 1000 μF .

| | | | | | | | | | | | | | | |
|-------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Rated Voltage (V) | 6.3 | 10 | 16 | 25 | 35 | 50 | 63 | 100 | 160 | 200 | 250 | 350 | 400 | 450 |
| Tan δ | 0.24 | 0.20 | 0.16 | 0.14 | 0.12 | 0.10 | 0.08 | 0.07 | 0.15 | 0.15 | 0.15 | 0.20 | 0.20 | 0.20 |

5. Mechanical Characteristics

5.1. Terminal Strength

5.1.1. Pull Test

| 端子直徑(mm) | 荷重(Kg) |
|----------|--------|
| 0.5 以下 | 0.5 |
| 0.6~0.8 | 1.0 |
| 0.8 以上 | 2.5 |

Test in accordance with JIS C5141No.11

- (1) That with diameter of lead less than 0.5mm and case size less than 10mm be capable of a steady pull of 0.5Kg for a period of 10 seconds.
- (2) That with diameter of lead wire between 0.6~0.8mm be capable withstanding a steady pull of 1.0Kg for a period of 10 seconds.
- (3) That with diameter of lead wire larger than 0.8mm be capable withstanding a steady pull of 2.5Kg for a period of 10 seconds.

5.1.2. Bending Test

| 端子直徑(mm) | 荷重(Kg) |
|----------|--------|
| 0.5 以下 | 0.25 |
| 0.6~0.8 | 0.5 |
| 0.8 以上 | 1.0 |

- (1) That with diameter of lead less than 0.5mm can be given a weight of 0.25Kg
- (2) That with diameter of lead wire between 0.6~0.8mm can be given a weight of 0.5Kg
- (3) That with diameter of lead wire larger than 0.8mm can be given a weight of 1.0Kg

5.2. Solder Heat Resistance

Test in accordance with JIS C5141No.13

The section from the base to 4mm of the capacitor terminal must be immersed in $350\pm 10^{\circ}\text{C}$ Liquid tin 3 ± 0.5 seconds. Then, moving out. The following specifications shall be satisfied

When the capacitor terminal is restored to 25°C with 2 hours. Or over 1 hour.

| | |
|--------------------|--|
| Capacitance Change | $\pm 20\%$ of the initial measured value. |
| Tan δ | $\leq 200\%$ of the initial specified value. |
| Leakage Current | \leq The initial specified value. |
| Appearance is good | |

5.3. Solder ability test

Test in accordance with JIS C5141No.14

The section from the base to $4\pm 0.8\text{mm}$ of the capacitor terminal be immersed in $235\pm 0.5^{\circ}\text{C}$ Liquid tin 2 ± 0.5 seconds. Then, moving out. The Liquid tin adsorb at lead wire no less than 95% this section

5.4. Explosion-proof construction

There is a vent on rubber bung or the top of aluminum case, and under 8mm (diameter) is without vent Capacitors to be applied 1.3times of reversed voltage until explosion from aluminum case Vent or break out from rubber bung

6. Temperature Characteristics

6.1. Low Temperature Characteristics

Test in accordance with JIS C5141No.14

Impedance ratio of the -25°C or -40°C value to the 25°C value shall not exceed the value below. (At 120Hz)

| | | | | | | | | | | | | | | |
|-------------------|-----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|
| Rated Voltage (V) | 6.3 | 10 | 16 | 25 | 35 | 50 | 63 | 100 | 160 | 200 | 250 | 350 | 400 | 450 |
| Z(-25°C)/Z(25°C) | 4 | 3 | 2 | | | | | | 4 | 8 | | | 16 | |
| Z(-40°C)/Z(25°C) | 10 | 8 | 6 | 4 | 3 | | | 8 | 12 | | --- | | | |

6.2. High Temperature Characteristics Unload lift Test

Test in accordance with JIS C5141No.15

The following specifications shall be satisfied when the capacitors are restored to 25°C after exposing them for 500 hours at 85°C without voltage applied.

| | |
|---------------------------------|--|
| Capacitance Change | ±20% of the initial measured value. |
| Dissipation Factor | ≤ 200% of the initial specified value. |
| Leakage Current (6.3 to 100VDC) | ≤ The initial specified value. |
| Leakage current (160 to 450VDC) | ≤ 500% of the initial specified value. |
| Appearance is good | |

6.3. Load Life

Test in accordance with JIS C5141No.19

The following specifications shall be satisfied when the capacitors are restored to 25°C after the rated voltage is applied for (5Φ~8Φ)1000 hours or (10Φ~25Φ)2000 hours at 85°C.

| | |
|--------------------|--|
| Capacitance Change | ±20% of the initial measured value. |
| Tan δ | ≤ 200% of the initial specified value. |
| Leakage Current | ≤ The initial specified value. |
| Appearance is good | |

6.4. Moisture Resistance

Test in accordance with JIS C5141No.17

The testing oven used in this test shall capable of maintaining the temperature at 40°C±2 And relative humidity at 90% to 95% for 120±6 hours. The following specified shall be ratified

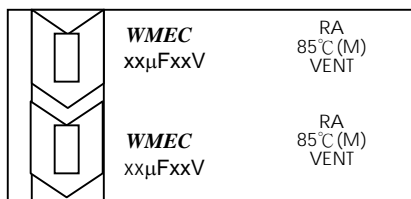
| | |
|--------------------|--|
| Capacitance Change | ±10% of the initial measured value. |
| Tan δ | ≤ 200% of the initial specified value. |
| Leakage Current | ≤ The initial specified value. |
| Appearance is good | |

7 Marking

Color Style: white marking on black-blue sleeve.

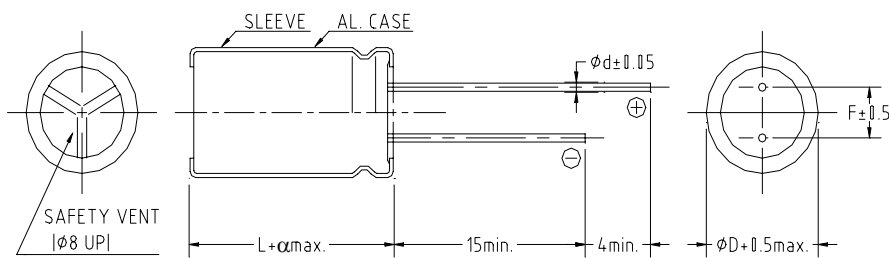
The following items shall be marked on each capacitor.

Example:



- (1) Series Name
- (2) Maximum Operating Temperature
- (3) Capacitance Tolerance
- (4) Safety Device Marking
(Safety vent more than 8mm Diameter product)
- (5) Polarity
- (6) Wanming Electronics Co., Ltd. Marking
- (7) Nominal Capacitance
- (8) Rated Voltage

8. Dimensions (mm)



| | | | | | | | | | | |
|----------|-----|-----|----------|-----|----|----------|-----|-----|----------|------|
| ϕD | 5 | 6.3 | 8 | 10 | 12 | 13 | 16 | 18 | 22 | 25 |
| F | 2.0 | 2.5 | 3.5 | 5.0 | | | 7.5 | | 10 | 12.5 |
| ϕd | 0.5 | | 0.5or0.6 | 0.6 | | 0.6or0.8 | 0.8 | | 0.8or1.0 | 1.0 |
| α | 1.0 | | | 1.5 | | | | 2.0 | | |

9. Ripple Current Coefficients

9.1. Frequency Multipliers

| | | | | | |
|-----------------|--------|------|------|------|------------|
| Freq.(Hz) | 60(50) | 120 | 500 | 1K | $\geq 10K$ |
| Cap.(μF) | | | | | |
| 0.1 ~ 47 | 0.75 | 1.00 | 1.35 | 1.55 | 2.0 |
| 68 ~ 680 | 0.80 | 1.00 | 1.25 | 1.34 | 1.5 |
| 1000 ~ 15000 | 0.85 | 1.00 | 1.10 | 1.13 | 1.15 |

9.2. Temperature Multipliers

| | | | | |
|-----------------------|-----|-----|-----|-----|
| Temp. ($^{\circ}C$) | 40 | 60 | 70 | 85 |
| WV | | | | |
| 6.3 ~ 100 | 2.0 | 1.5 | 1.3 | 1.0 |
| 160 ~ 450 | 2.0 | 1.5 | 1.3 | 1.0 |

10. Case Size & Permissible Max. Ripple Current

Case Size : $\phi D \times L$ (mm)
 Max. Ripple Current : mA (rms) (85 $^{\circ}C$, 120Hz)

| μF | 6.3 | | 10 | | 16 | | 25 | | 35 | |
|---------|-------------------|------|-------------------|------|-------------------|------|-------------------|------|-------------------|------|
| | $\phi D \times L$ | R.C. | $\phi D \times L$ | R.C. | $\phi D \times L$ | R.C. | $\phi D \times L$ | R.C. | $\phi D \times L$ | R.C. |
| 0.47 | | | | | 5x11 | 9 | | | | |
| 3.3 | | | | | 5x11 | 20 | 5x11 | 32 | | |
| 4.7 | | | | | 5x11 | 42 | 5x11 | 40 | | |
| 10 | | | | | 5x11 | 55 | 5x11 | 65 | 5x11 | 60 |
| 22 | | | 5x11 | 50 | 5x11 | 55 | 5x11 | 90 | 5x11 | 95 |
| 33 | | | 5x11 | 65 | 5x11 | 85 | 5x11 | 95 | 5x11 | 110 |
| 47 | | | 5x11 | 105 | 5x11 | 130 | 5x11 | 130 | 5x11 | 151 |
| 68 | | | 5x11 | 132 | 5x11 | 134 | 5x11 | 158 | 6.3x11 | 182 |
| 100 | 5x11 | 134 | 5x11 | 165 | 5x11 | 180 | 6.3x11 | 190 | 8x12 | 247 |
| 220 | 5x11 | 240 | 6.3x11 | 250 | 6.3x11 | 290 | 8x12 | 320 | 8x14 | 375 |
| 330 | 6.3x11 | 300 | 6.3x11 | 330 | 8x11 | 360 | 10x12 | 415 | 10x13 | 490 |
| 470 | 6.3x11 | 350 | 8x12 | 400 | 8x12 | 470 | 8x16 | 530 | 10x20 | 620 |
| 680 | 8x11 | 468 | 8x12 | 500 | 8x14 | 560 | 10x16 | 610 | 10x20 | 700 |
| 1000 | 8x12 | 580 | 8x12 | 625 | 10x17 | 770 | 10x20 | 935 | 13x21 | 1060 |
| 2200 | 10x17 | 980 | 10x20 | 1130 | 10x20 | 1200 | 13x21 | 1530 | 16x26 | 1770 |
| 3300 | 10x20 | 1200 | 13x21 | 1410 | 13x25 | 1710 | 16x26 | 1965 | 16x31 | 2200 |
| 4700 | 13x21 | 1650 | 13x26 | 1800 | 13x25 | 2000 | 16x32 | 2370 | 18x35 | 2390 |
| 6800 | 13x26 | 1900 | 16x26 | 2160 | 16x26 | 2500 | 18x35 | 2640 | 22x40 | 3215 |
| 10000 | 16x26 | 2200 | 16x32 | 2530 | 18x32 | 2750 | 22x40 | 3060 | | |
| 15000 | 16x32 | 2650 | 18x36 | 2960 | 18x40 | 3240 | | | | |

Case Size: Φ d×L (mm)

Max. Ripple Current : Ma (rms) (85°C, 120Hz)

| WV μ F | 50 | | 63 | | 100 | | 160 | | 200 | |
|---------------|------------|------|------------|------|------------|------|------------|------|------------|------|
| | Φ d×L | R.C. | Φ d×L | R.C. | Φ d×L | R.C. | Φ d×L | R.C. | Φ d×L | R.C. |
| 0.1 | 5×11 | 6.4 | 5×11 | 7 | 5×11 | 7.2 | | | | |
| 0.22 | 5×11 | 9.5 | 5×11 | 11 | 5×11 | 11 | | | | |
| 0.33 | 5×11 | 11 | 5×11 | 13 | 5×11 | 13 | | | | |
| 0.47 | 5×11 | 14 | 5×11 | 15 | 5×11 | 16 | 5×11 | 12 | 5×11 | 12 |
| 0.68 | 5×11 | 17 | 5×11 | 19 | 5×11 | 20 | 5×11 | 15 | 5×11 | 15 |
| 1.0 | 5×11 | 20 | 5×11 | 22 | 5×11 | 25 | 6.3×11 | 18 | 6.3×11 | 18 |
| 2.2 | 5×11 | 25 | 5×11 | 34 | 5×11 | 30 | 6.3×11 | 25 | 6.3×11 | 25 |
| 3.3 | 5×11 | 35 | 5×11 | 40 | 5×11 | 38 | 6.3×11 | 35 | 6.3×11 | 35 |
| 4.7 | 5×11 | 42 | 5×11 | 48 | 5×11 | 44 | 6.3×12 | 42 | 8×12 | 45 |
| 6.8 | 5×11 | 50 | 5×11 | 60 | 5×11 | 55 | 8×12 | 58 | 10×12 | 58 |
| 10 | 5×11 | 65 | 5×11 | 65 | 6.3×11 | 80 | 8×14 | 71 | 10×16 | 80 |
| 22 | 5×11 | 100 | 5×11 | 120 | 8×11 | 124 | 10×16 | 124 | 10×20 | 124 |
| 33 | 6.3×11 | 128 | 6.3×11 | 145 | 8×14 | 177 | 10×20 | 170 | 13×21 | 170 |
| 47 | 6.3×11 | 159 | 8×11 | 200 | 10×13 | 230 | 13×21 | 210 | 13×21 | 225 |
| 68 | 6.3×11 | 225 | 8×11 | 290 | 10×17 | 278 | 13×26 | 265 | 13×26 | 310 |
| 100 | 8×12 | 260 | 10×12 | 335 | 10×20 | 405 | 16×26 | 380 | 16×26 | 380 |
| 220 | 10×17 | 460 | 10×20 | 490 | 13×26 | 680 | 16×32 | 700 | 18×36 | 720 |
| 330 | 10×16 | 560 | 10×20 | 700 | 16×26 | 860 | 18×36 | 900 | 22×35 | 900 |
| 470 | 13×21 | 765 | 13×21 | 880 | 16×26 | 1117 | 22×35 | 1130 | 25×40 | 1130 |
| 680 | 13×21 | 786 | 13×26 | 1110 | 16×32 | 1573 | 25×40 | 1667 | | |
| 1000 | 13×25 | 1350 | 16×26 | 1500 | 18×36 | 1800 | | | | |
| 2200 | 16×32 | 2070 | 18×36 | 2200 | | | | | | |
| 3300 | 18×36 | 2380 | 22×40 | 2590 | | | | | | |
| 4700 | 18×40 | 2540 | 25×40 | 3200 | | | | | | |
| 6800 | 25×40 | 3640 | | | | | | | | |

| WV μ F | 250 | | 350 | | 400 | | 450 | |
|---------------|------------|------|------------|------|------------|------|------------|------|
| | Φ d×L | R.C. | Φ d×L | R.C. | Φ d×L | R.C. | Φ d×L | R.C. |
| 0.47 | 5×11 | 12 | 5×11 | 16 | 6.3×11 | 17 | | |
| 0.68 | 5×11 | 15 | 6.3×11 | 20 | 6.3×11 | 20 | | |
| 1.0 | 6.3×11 | 18 | 8×11 | 24 | 6.3×11 | 24 | 8×11 | 24 |
| 2.2 | 8×11 | 28 | 8×12 | 37 | 8×12 | 37 | 10×12 | 37 |
| 3.3 | 8×12 | 40 | 8×14 | 45 | 10×12 | 45 | 10×16 | 50 |
| 4.7 | 8×14 | 45 | 10×12 | 52 | 10×16 | 56 | 10×20 | 60 |
| 6.8 | 10×12 | 58 | 10×16 | 70 | 10×20 | 76 | 13×21 | 76 |
| 10 | 10×16 | 80 | 13×21 | 92 | 13×21 | 108 | 13×26 | 108 |
| 22 | 13×21 | 139 | 13×26 | 170 | 13×26 | 170 | 16×26 | 190 |
| 33 | 13×26 | 186 | 13×26 | 210 | 16×26 | 232 | 16×32 | 254 |
| 47 | 13×26 | 246 | 16×26 | 270 | 16×32 | 312 | 18×36 | 312 |
| 68 | 16×26 | 310 | 16×32 | 376 | 20×25 | 405 | 22×40 | 424 |
| 100 | 16×32 | 416 | 18×36 | 520 | | 586 | 22×40 | 586 |
| 320 | 22×40 | 780 | 25×40 | 1058 | | | | |
| 330 | 25×40 | 910 | | | | | | |

11. Packaging Specification

| Case size Φd×L (mm) | Plastic Bag Capacity | Small Box Capacity | | Carton Box Capacity | | Small Box Size | | | Carton Box Size | | |
|------------------------|-------------------------|------------------------|-------------------------|----------------------------------|--------------------------|----------------|-----------|-----------|-----------------|-----------|-----------|
| | pcs. / per bag | Bag / per small box | pcs. / per small box | small box / per carton box | pcs. / per carton box | L (mm) | H (mm) | W (mm) | L (mm) | H (mm) | W (mm) |
| 4x5 | 500 | 50 | 25,000 | 2 | 50,000 | 300 | 295 | 225 | 470 | 310 | 310 |
| 5x5 | 500 | 50 | 25,000 | 2 | 50,000 | 300 | 295 | 225 | 470 | 310 | 310 |
| 6.3x5 | 500 | 50 | 25,000 | 2 | 50,000 | 300 | 295 | 225 | 470 | 310 | 310 |
| 4x7 | 500 | 50 | 25,000 | 2 | 50,000 | 300 | 295 | 225 | 470 | 310 | 310 |
| 5x7 | 500 | 50 | 25,000 | 2 | 50,000 | 300 | 295 | 225 | 470 | 310 | 310 |
| 6.3x7 | 500 | 40 | 25,000 | 2 | 50,000 | 300 | 295 | 225 | 470 | 310 | 310 |
| 5x11 | 500 | 40 | 20,000 | 2 | 40,000 | 300 | 295 | 225 | 470 | 310 | 310 |
| 6.3x11 | 500 | 30 | 15,000 | 2 | 30,000 | 300 | 295 | 225 | 470 | 310 | 310 |
| 8x12 | 250 | 40 | 10,000 | 2 | 20,000 | 300 | 295 | 225 | 470 | 310 | 310 |
| 8x14/16 | 250 | 30 | 7,500 | 2 | 15,000 | 300 | 295 | 225 | 470 | 310 | 310 |
| 8x20 | 200 | 25 | 5,000 | 2 | 10,000 | 300 | 295 | 225 | 470 | 310 | 310 |
| 10X12 | 200 | 25 | 5,000 | 2 | 10,000 | 300 | 295 | 225 | 470 | 310 | 310 |
| 10x16/17 | 200 | 25 | 5,000 | 2 | 10,000 | 300 | 295 | 225 | 470 | 310 | 310 |
| 10x20 | 200 | 25 | 5,000 | 2 | 10,000 | 300 | 295 | 225 | 470 | 310 | 310 |
| 10x25 | 200 | 25 | 5,000 | 2 | 10,000 | 300 | 295 | 225 | 470 | 310 | 310 |
| 13x21 | 100 | 25 | 2,500 | 2 | 5,000 | 300 | 295 | 225 | 470 | 310 | 310 |
| 13x25 | 100 | 25 | 2,500 | 2 | 5,000 | 300 | 295 | 225 | 470 | 310 | 310 |
| 16x26 | 100 | 6 | 600 | 4 | 2,400 | 300 | 145 | 225 | 470 | 310 | 310 |
| 16x32 | 50 | 10 | 500 | 4 | 2,000 | 300 | 145 | 225 | 470 | 310 | 310 |
| 16x36 | 50 | 8 | 400 | 4 | 1,600 | 300 | 145 | 225 | 470 | 310 | 310 |
| 18x31 | 50 | 6 | 300 | 4 | 1,200 | 300 | 145 | 225 | 470 | 310 | 310 |
| 18x40 | 50 | 6 | 300 | 4 | 1,200 | 300 | 145 | 225 | 470 | 310 | 310 |
| 20x25 | 50 | 4 | 200 | 4 | 800 | 300 | 145 | 225 | 470 | 310 | 310 |
| 25x40 | 25 | 8 | 200 | 4 | 800 | 300 | 145 | 225 | 470 | 310 | 310 |

12. The following items shall be marked on the box.

| | | | |
|---------------|--|-------------|------|
| WMEC ® | | Customer | |
| Wanming P/N | | PO. No. | |
| Lot No. | | Customer | |
| Final Date | | Description | |
| Inspection | | Quantity | PCS. |

13. Other

For other specifications, Characteristic W of JIS C 5141 shall be satisfied.

Aluminum Electrolytic Capacitors may be damaged by corrosion, which is caused by and halogenated hydrocarbon solvents.

Please let us know in advance the solvent name and conditions for your P.C.B. cleaning.

We guarantee our products without any prohibited substance about environment.