# Datasheet

## RS PRO Through Hole Aluminium Electrolytic Capacitor Low-ESR

EN


| Article No | Description | uF | WV | Size | Ripple Current | Impedance |
|---|---|---|---|---|---|---|
| 1815042 | 1UF M(±20%) 100V 5*11 L.ESR | 1 | 100 | 5x11 | 30 | 1.5 |
| 1815043 | 1UF M(±20%) 50V 5*11 L.ESR | 1 | 50 | 5x11 | 25 | 3.3 |
| 1815044 | 10UF M(±20%) 100V 6*11 L.ESR | 10 | 100 | 6x11 | 135 | 1.2 |
| 1815045 | 10UF M(±20%) 160V 10*12 L.ESR | 10 | 160 | 10x12 | 175 | 3.1 |
| 1815046 | 10UF M(±20%) 25V 5*11 L.ESR | 10 | 25 | 5x11 | 56 | 1.3 |
| 1815047 | 10UF M(±20%) 50V 5*11 L.ESR | 10 | 50 | 5x11 | 100 | 1.2 |
| 1815048 | 10UF M(±20%) 63V 5*11 L.ESR | 10 | 63 | 5x11 | 118 | 1.2 |
| 1815050 | 100UF M(±20%) 16V 5*11 L.ESR | 100 | 16 | 5x11 | 300 | 0.36 |
| 1815051 | 100UF M(±20%) 25V 6*11 L.ESR | 100 | 25 | 6x11 | 370 | 0.29 |
| 1815052 | 100UF M(±20%) 35V 6*11 L.ESR | 100 | 35 | 6x11 | 390 | 0.24 |
| 1815053 | 100UF M(±20%) 35V 8*11 L.ESR | 100 | 35 | 8x11 | 400 | 0.22 |
| 1815054 | 100UF M(±20%) 50V 8*11 L.ESR | 100 | 50 | 8x11 | 440 | 0.26 |
| 1815056 | 100UF M(±20%) 63V 10*12 L.ESR | 100 | 63 | 10x12 | 500 | 0.2 |
| 1815057 | 1000UF M(±20%)10V 8*11 L.ESR | 1000 | 10 | 8x11 | 750 | 0.095 |
| 1815058 | 1000UF M(±20%) 16V 10*15 L.ESR | 1000 | 16 | 10x15 | 1100 | 0.058 |
| 1815059 | 1000UF M(±20%)16V 8*16 L.ESR | 1000 | 16 | 8x16 | 1050 | 0.062 |
| 1815060 | 1000UF M(±20%) 25V 10*20 L.ESR | 1000 | 25 | 10x20 | 1380 | 0.04 |
| 1815062 | 1000UF M(±20%) 35V 13*21 L.ESR | 1000 | 35 | 13x21 | 1650 | 0.037 |
| 1815063 | 1000UF M(±20%) 35V 13*26 L.ESR | 1000 | 35 | 13x26 | 1700 | 0.035 |
| 1815064 | 1000UF M(±20%) 50V 13*26 L.ESR | 1000 | 50 | 13x26 | 2000 | 0.036 |
| 1815065 | 22UF M(±20%) 50V 5*11 L.ESR | 22 | 50 | 5x11 | 160 | 0.9 |
| 1815066 | 22UF M(±20%) 63V 6*11 L.ESR | 22 | 63 | 6x11 | 220 | 0.8 |
| 1815067 | 220UF M(±20%) 100V 13*21 L.ESR | 220 | 100 | 13x21 | 850 | 0.095 |
| 1815068 | 220UF M(±20%) 10V 6*11 L.ESR | 22 | 10 | 6x11 | 350 | 0.25 |
| 1815069 | 220UF M(±20%) 16V 6*11 L.ESR | 220 | 16 | 6x11 | 420 | 0.28 |
| 1815070 | 220UF M(±20%) 16V 8*11 L.ESR | 220 | 16 | 8x11 | 440 | 0.2 |
| 1815071 | 220UF M(±20%) 25V 10*12 L.ESR | 220 | 25 | 10x12 | 600 | 0.105 |
| 1815072 | 220UF M(±20%) 25V 8*11 L.ESR | 220 | 25 | 8x11 | 500 | 0.14 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 1815073 | 220UF M(±20%) 35V 10*12 L.ESR | 220 | 35 | 10x12 | 660 | 0.085 |
| 1815074 | 220UF M(±20%) 35V 8*11 L.ESR | 220 | 35 | 8x11 | 580 | 0.1 |
| 1815075 | 220UF M(±20%) 50V 10*12 L.ESR | 220 | 50 | 10x12 | 730 | 0.084 |
| 1815076 | 220UF M(±20%) 63V 10*17 L.ESR | 220 | 63 | 10x17 | 790 | 0.11 |
| 1815078 | 2200UF M(±20%) 25V 13*21 L.ESR | 2200 | 25 | 13x21 | 1480 | 0.024 |
| 1815079 | 2.2UF M(±20%) 160V 6*11 L.ESR | 2.2 | 160 | 6x11 | 44 | 10 |
| 1815080 | 2.2UF M(±20%) 63V 5*11 L.ESR | 2.2 | 63 | 5x11 | 38 | 2.2 |
| 1815081 | 330UF M(±20%)16V 8*11 L.ESR | 330 | 16 | 8x11 | 560 | 0.1 |
| 1815082 | 330UF M(±20%) 25V 8*11 L.ESR | 330 | 25 | 8x11 | 600 | 0.085 |
| 1815083 | 47UF M(±20%) 25V 5*11 L.ESR | 47 | 25 | 5x11 | 210 | 0.6 |
| 1815084 | 47UF M(±20%) 35V 6*11 L.ESR | 47 | 35 | 6x11 | 250 | 0.53 |
| 1815085 | 470UF M(±20%) 10V 6*11 L.ESR | 470 | 10 | 6x11 | 450 | 0.13 |
| 1815086 | 470UF M(±20%)10V 8*11 L.ESR | 470 | 10 | 8x11 | 520 | 0.1 |
| 1815087 | 470UF M(±20%) 16V 8*11 L.ESR | 470 | 16 | 8x11 | 600 | 0.095 |
| 1815088 | 470UF M(±20%) 25V 10*12 L.ESR | 470 | 25 | 10x12 | 790 | 0.066 |
| 1815089 | 470UF M(±20%) 25V 8*14 L.ESR | 470 | 25 | 8x14 | 780 | 0.068 |
| 1815090 | 470UF M(±20%) 35V 10*15 L.ESR | 470 | 35 | 10x15 | 1000 | 0.065 |
| 1815091 | 470UF M(±20%) 35V 10*17 L.ESR | 470 | 35 | 10x17 | 1070 | 0.058 |
| 1815092 | 470UF M(±20%) 35V 10*20 L.ESR | 470 | 35 | 10x20 | 1120 | 0.055 |
| 1815093 | 470UF M(±20%) 50V 10*20 L.ESR | 470 | 50 | 10x20 | 1200 | 0.057 |
| 1815094 | 470UF M(±20%)6.3V 6*11 L.ESR | 470 | 6.3 | 6x11 | 370 | 0.145 |
| 1815095 | 470UF M(±20%) 63V 13*21 L.ESR | 470 | 63 | 13x21 | 1500 | 0.055 |
| 1815096 | 470UF M(±20%) 63V 13*26 L.ESR | 470 | 63 | 13x26 | 1650 | 0.048 |
| 1815097 | 4.7UF M(±20%) 400V 8*12 L.ESR | 4.7 | 400 | 8x12 | 110 | 9.2 |
| 1815098 | 4.7UF M(±20%) 63V 5*11 L.ESR | 4.7 | 63 | 5x11 | 80 | 1.8 |
| 1815099 | 6.8UF M(±20%) 400V 10*12 L.ESR | 6.8 | 400 | 10x12 | 140 | 3.5 |
| 1815100 | 6.8UF M(±20%) 50V 5*11 L.ESR | 6.8 | 50 | 5x11 | 78 | 1.6 |
| 1815101 | 820UF M(±20%) 6.3V 8*11 L.ESR | 820 | 6.3 | 8x11 | 700 | 0.1 |

**Note:**
* Ripple Current (mA,rms) at 105˚C 100Khz
* Max Impedance {Ω} at 20˚C 100Khz

| Specification | |
|---|---|
| **Item** | **Performance Characteristics** |
| Operating Temperature Range | -40 to +105˚C |
| Rated voltage Range | 6.3 to 100 VDC |
| Capacitance Range | 0.47 to 10000 uF |
| Capacitance Tolerance | ±20%(120Hz, +20˚C) |
| Leakage Current (+20℃, max.) | I≦0.01 CV or 2(uA) After 2minute whichever is greater measured with rated working voltage applied. / I≦0.03 CV or 3(uA) After 2minute with rated working voltage applied.. |

**Dissipation Factor ( tanδ)**

| Working Voltage (VDC) | 6.3 | 10 | 16 | 25 | 35 | 50 | 63 | 100 |
|---|---|---|---|---|---|---|---|---|
| D.F.(%)max | 22 | 19 | 16 | 14 | 12 | 10 | 9 | 8 |

For Capacitance > 1000uF, add 2% per another 1000uF(+20˚C, at 120Hz)

**Low Temperature Characteristics (120Hz)**

Impedance ratio max.

| Working Voltage (VDC) | 6.3 | 10 | 16 | 25 | 35 | 50 | 63 | 100 |
|---|---|---|---|---|---|---|---|---|
| Z(-25˚C)/Z(+20˚C) | 4 | 3 | 3 | 3 | 3 | 3 | 2 | 2 |
| Z(-40˚C)/Z(+20˚C) | 8 | 6 | 4 | 3 | 3 | 3 | 3 | 3 |

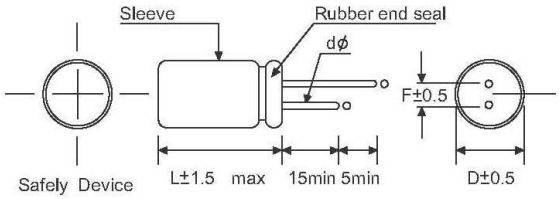
**Load Life**

Test conditions
- Duration time : 5φ~6φ 1000Hrs
  D≧8φ 2000Hrs
- Ambient temperature:+105˚C
- Applied voltage: Rated DC working voltage
- After test requirements:at+20˚C
- Capacitance change:≦±20%of the initial measured value
- Dissipation Factor: ≦200% of the initial specified value
- Leakage current: ≦The initial specified value

**Shelf Life**

Test conditions
- Duration time :1000Hrs
- Ambient temperature:+105˚C
- Applied voltage: None
- After test requirements at +20˚C: Some limits as Load life.
- Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.

## Diagram of Dimensions: (Unit: mm)




| Dφ | 5 | 6.3 | 8 | 10 | 13 | 16 | 18 |
|---|---|---|---|---|---|---|---|
| F | 2.0 | 2.5 | 3.5 | 5.0 | 5.0 | 7.5 | 7.5 |
| dφ | 0.5 | | | 0.6 | | 0.8 | |

## Multiplier For Ripple Current VS, Frequency

| CAP(uF) \ Hz | | 50(60) | 120 | 400 | 1K | 10K | 50K-100K |
|---|---|---|---|---|---|---|---|
| Multiplier | CAP≦10 | 0.47 | 0.59 | 0.76 | 0.85 | 0.97 | 1.0 |
| | 10<CAP≦100 | 0.52 | 0.62 | 0.80 | 0.89 | 0.97 | 1.0 |
| | 100<CAP≦1000 | 0.58 | 0.72 | 0.84 | 0.90 | 0.98 | 1.0 |
| | 1000<CAP | 0.63 | 0.78 | 0.87 | 0.91 | 0.98 | 1.0 |

## Multiplier for Ripple Current VS. Temperature

| Temperature(℃) | 45 | 60 | 70 | 85 | 85 | 105 |
|---|---|---|---|---|---|---|
| Multiplier | 1.8 | 1.5 | 1.4 | 1.3 | 1.2 | 1.0 |

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### Performance

Unless otherwise specified, the capacitors shall be measured at +15℃ to +35℃ , 45to75%RH. However, if any doubt arises on the judgment, the measurement conditions shall be +20±1℃, 60to70%RH the test Conditions shall comply with IEC-60384-4.

**1. Capacitance(CAP.)**

| | |
|---|---|
| Measuring frequency | :120Hz±20% |
| Measuring voltage | :0.5V rms. +1.5 to 2.0V dc |
| Measuring circuit | :Series equivalent circuit. |

Criteria: Shall be within the specified capacitance tolerance.

**2. Dissipation Factor (tanδ)**

| | |
|---|---|
| Measuring frequency | :120Hz±20% |
| Measuring voltage | :0.5V rms. +1.5 to 2.0V dc |
| Measuring circuit | :Series equivalent circuit. |

Criteria: Shall not exceed the specified in the table of Ratings.

**3. Leakage Current (L.C.)**

DC leakage current shall be measure with rate voltage, which is applied through a resistor of 1,000±10Ω connected in series with the capacitors , at the end of a specified period after the capacitors reached the rated voltage across the terminals.
Criteria: Shall not exceed the specified in the table of Ratings.

**4. Surge Voltage**

4.1 The surge DC rating is the maximum voltage to which the capacitor should be subjected under any conditions. This includes transients and peak ripple at the highest line voltage.

4.2 Capacitors, connected in series with 1000 ohm resistors, shall withstand the surge test voltage applied at the rated of 1/2 minute on, 4 1/2 minutes off, for 1000 successive test cycles at 20°C (see the following table)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Rated Voltage (WV) | 6.3 | 10 | 16 | 25 | 35 | 50 | 63 |
| Surge Voltage (SV) | 10 | 13 | 20 | 32 | 44 | 63 | 79 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Rated Voltage (WV) | 100 | 160 | 200 | 250 | 350 | 400 | 450 |
| Surge Voltage (SV) | 125 | 200 | 250 | 300 | 400 | 450 | 500 |

Criteria:

| | |
|---|---|
| Capacitance change | :≦±15% of initial value |
| Dissipation Factor | :within specified value |
| Leakage Current | :within specified value |
| Physical | :no broken and undamaged |

## Endurance characteristic

**5. High temperature load life test**

| Condition | | Specification |
|---|---|---|
| 1. Capacitors shall be placed in oven with application of ripple current and rate voltage for 2000±12hrs at 105℃<br>2. The capacitors should be use within specified permissible ripple current in each standard products table(the sum of DC working voltage and AC peak voltage shall be equal to the rated DC working voltage<br>3. The specified maximum permissible ripple current in defined at 105℃ and 120 Hz<br>4. Then the capacitor shall be subjected to standard atmospheric conditions for 16 hours, after witch measurements shall be made. | Capacitance change | Within ±20% of the initial value |
| | TANδ | Less than 200% of specified value |
| | Leakage Current | Within specified value |
| | Physical | no broken and undamaged |

**6. High temperature shelf life test**

| | | |
|---|---|---|
| After 1000-2000hrs test at 105℃ without rated working voltage.<br>And then the capacitor shall be subjected to standard atmospheric conditions for 16 hours, after witch measurements shall be made. | Capacitance change | Within ±20% of the initial value |
| | TANδ | Less than 200% of specified value |
| | Leakage Current | Less than 200% of specified value |
| | Physical | no broken and undamaged |

**7. Rotational temperature test**

| | | |
|---|---|---|
| Capacitor is place in a oven whose temperature follow specific regulation to change. The specific regulations is "+25℃ (1 hr) → +105℃ (2 hrs) → +25℃ (0.5 hr) → -40 ℃ (2 hrs) →+25℃ (0.5 hr)",and it called a cycle. The test totals 10 cycles.<br>And then the capacitor shall be subjected to standard atmospheric conditions for 16 hours, after witch measurements shall be made. | Capacitance change | Within ±10% of the initial value |
| | TANδ | Within specified value |
| | Leakage Current | Within specified value |
| | Physical | no broken and undamaged |

**8. Humidity test**

| | | |
|---|---|---|
| Capacitors shall be exposed for 500±8hrs in an atmosphere of 90~ 95%R.H<br>at 40℃. And then the capacitor shall be subjected to standard atmospheric conditions for 16 hours, after witch measurements shall be made. | Capacitance change | Within ±10% of the initial value |
| | TANδ | Less than 120% of specified value |
| | Leakage Current | Within specified value |
| | Physical | no broken and undamaged |

**9. Low temperature test**

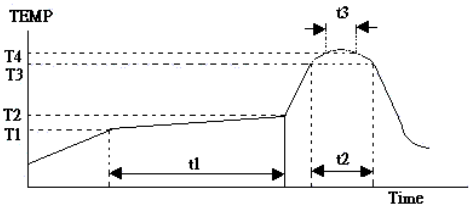
| | | |
|---|---|---|
| Capacitor are place at -40±3℃ for 72±4hrs.And then the capacitor shall be subjected to standard atmospheric conditions for 16 hours, after witch measurements shall be made. | Capacitance change | Within ±10% of the initial value |
| | TANδ | Within specified value |
| | Leakage Current | Within specified value |
| | Physical | no broken and undamaged |

**10. Vibration test**

| | | |
|---|---|---|
| 1. Fix it at the point 4mm or less form body. For ones of 12.5mm or 25mm or more length, use separate fixture.<br>2. Direction and during of vibration:3 orthogonal direction each for 2hrs total 6hrs.<br>3. Mutually frequency:<br>10 to55Hz reciprocation for 1 min.<br>4.Total amplitude:1.5mm | Capacitance change | Within ±10% of the initial value |
| | TANδ | Within specified value |
| | Leakage Current | Within specified value |
| | Physical | no broken and undamaged |

**11. Reflow test**

1. IR Reflow




| | | |
|---|---|---|
| Preheat | Temp (T1~T2) | 100~150℃ |
| | Time (t1) max | 40 sec |
| Duration | Temp(T3) | 260℃ |
| | Time (t2) max | 10 sec |
| Peck | Temp(T4) | 270℃ |
| | Time (t3) max | 5 sec |
| Reflow cycle | Twice or less | |

2. Solder bath method:
Solder temperature:260±3℃

| | |
|---|---|
| Capacitance change | Within ±10% of the initial value |
| TANδ | Within specified value |
| Leakage Current | Within specified value |

| | | |
|---|---|---|
| Immersion time:5+1/-0 sec<br>Thickness of heat shunt<br>(Printed wiring board):1.6mm<br>3. Soldering iron method:<br>Bit temperature: 350±10℃<br>Application time of soldering Iron:3+1/-0 sec | Physical | no broken and undamaged |

**12. Solderability test**

After the lead wire fully immersed in the solder for 2±0.1 sec at a temperature of 245±2℃, the solder coating must be more than 95%

**13. Mechanical**

1. The test is about lead tabs strength.
2. Tension test:
   The lead tabs shall not be broken or any malformed condition after fixing capacitor vertically and pressing the following weight on the lead tabs of capacitor for 10±1 sec.

| Lead tabs diameter(mm) | Weight(Kg) |
|---|---|
| ≦0.5 | 0.5 |
| 0.6~0.8 | 1.0 |
| >0.8 | 2.5 |

3. Bending test:
   capacitor is held in vertical position. Attach a weight to the lead tabs, slowly rotate the capacitor 90°to a same way in the opposite direction. Repeat it again (5 secs per cycle). The lead tabs shall not be broken or cracked.

| Lead tabs diameter(mm) | Weight(Kg) |
|---|---|
| ≦0.5 | 0.5 |
| 0.6~0.8 | 1.0 |
| >0.8 | 2.5 |

**14. Safety vent**

Condition: Apply a reverse voltage with current 1 amp.(DC reverse voltage test)
Criteria: When the pressure relief vent operated, the capacitor shall not flame although gas generation or expulsion of a part of the inside element is allowable. If the vent does not operate with the voltage applied for 30 minutes, the test is Considered to be passed.

**15. Standards**

Satisfies Characteristic W of IEC-60384-4,18