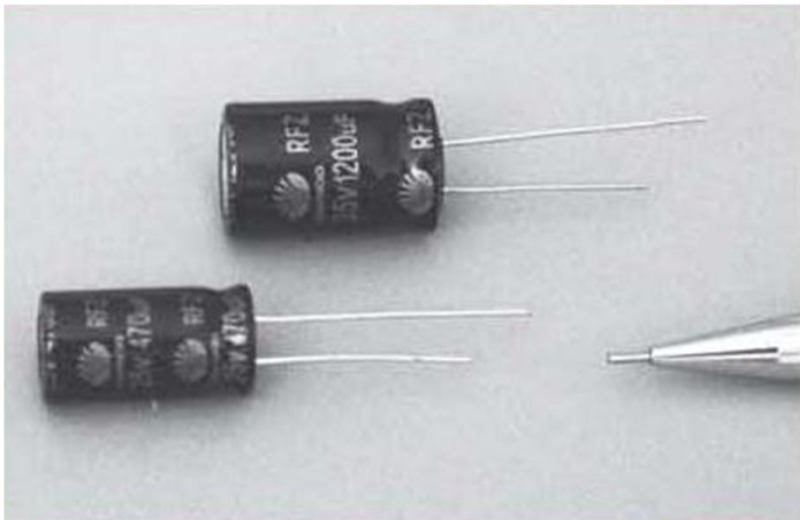


DATE: 2023.03.31
SPEC. SICE - SP - R036

To: MARITEX

SPECIFICATION

FOR AL. ELECTROLYTIC CAPACITORS (RFZ SERIES)



- RFZ1H821MISV
(16x20)

Please return us one copy your signed specification after you approved of it

MANUFACTURE: DAEWOO ELECTRONIC EQUIPMENT CO., LTD

SUPPLIER'S DAEWOO

| Maker | Checker | Approval |
|-------|---------|----------|
| | | |

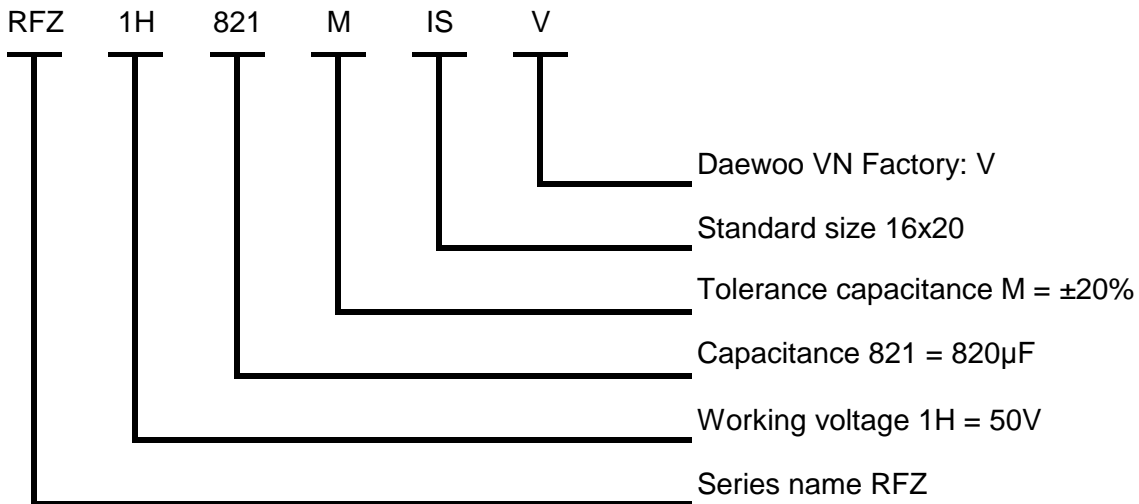
CUSTOMER'S MARITEX

| Maker | Checker | Approval |
|-------|---------|----------|
| | | |

| | | | |
|-------------------------------------------------|---------------------------------------------|-----------|------------|
| SICE - SP - R036 | APPROVAL DATA FOR ELECTROLYTIC CAPACITOR | REV. Date | 2023.03.31 |
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We hand in this specification in order to be approved of electrolytic capacitors (RFZ series) that our company is going to deliver your company.

1. Composition Type: RFZ1H821MISV "16x20"



2. Operating temperature range:

50WV: -40°C to +105°C (-40°F to +211°F)

3. Electrical characteristic:

3.1 Capacitance.

The capacitance is measured at a frequency of 120Hz at a temperature of 20°C ± 2°C (68°F ± 3.6°F) with a maximum of 0.5 Vrms applied.

| | |
|-----------------------|------------------|
| Capacitance tolerance | (M): -20% ~ +20% |
|-----------------------|------------------|

3.2 Leakage current (L.C)

| | |
|-----|----------------------------------------------------------------------|
| 50V | $I \leq 0.01CV$ or $3\mu A$, Whichever is greater (After 2 minutes) |
|-----|----------------------------------------------------------------------|

I = DC Leakage current (µA)

C = Nominal capacitance (µF)

V = Rated Voltage (WV.DC)

| | | | |
|------------------------------------------------------------------------|---------------------------------------------|-----------|------------|
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3.3 Tangent of Loss Angle (Tanδ)

The tangent of the loss angle when measured at a frequency of 120Hz at a temperature of (20°C ± 2°C) (68°F ± 3.6°F) shall be less than the values indicated below:

| | |
|----------------------------|------|
| Tanδ (max., at 20°C,120Hz) | 50V |
| | 0.10 |

When capacitance is over 1000µF, Tanδ shall be added 0.02 to the listed value with increase of every each 1000µF.

4. Test.

4.1 Damp heat

The capacitor shall be stored at a temperature of 40 ± 2°C and relative humidity of 90% to 95% for 240 ± 8hours. And then the capacitor shall be subjected to standard atmospheric conditions for 1 to 2 hours, after which measurements shall be made.

| | |
|------------------------|------------------------------------|
| Capacitance change Max | Within ± 20% of the initial value. |
| Dissipation factor | Within value specified above. |
| Leakage current | Within value specified above. |

4.2 Load life

After applying rated voltage for 10000hours at +105°C and then listed being stabilized at +20°C capacitors shall meet following limits .

| | |
|--------------------|---------------------------------------------|
| Capacitance change | Within ± 20% of the initial measured value. |
| Tanδ | ≤ 200% of the initial specified value |
| Leakage current | ≤ The initial specified value. |

| | | | |
|------------------------------------------------|---------------------------------------------|-----------|------------|
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4.3 Shelf life

After storage for 1000hours at +105°C with no voltage applied and then being stabilized at +20°C, capacitors shall meet following limits.

| | |
|------------------------|-------------------------------------------------|
| Capacitance change Max | Within $\pm 25\%$ of the intial measured value. |
| Dissipation factor | $\leq 200\%$ of the initial specified value |
| Leakage current | \leq The initial specified value |

4.4 Impedance ratio at low temperature

When capacitor are stored at the temperature of $-40^{\circ}\text{C} \pm 3^{\circ}\text{C}$ and $20^{\circ}\text{C} \pm 2^{\circ}\text{C}$ respectively the ratio of impedance measured at each test temperature with the frequency of 120 Hz shall be less than value.

| | |
|--------------|----|
| W.V (V) | 50 |
| Z-25°C/Z20°C | 2 |
| Z-40°C/Z20°C | 3 |

4.5 Resistance to soldering heat

For other procedures than those specified below soldering iron method.

+ Temperature: $260 \pm 5^{\circ}\text{C}$

+ Application time of soldering iron: 10 sec

| | |
|------------------------|-----------------------------------------|
| Capacitance change Max | Within $\pm 20\%$ of the initial value. |
| Dissipation factor | Within values specified above |
| Leakage current | Within values specified above |

| | | | |
|------------------------------------------------|---------------------------------------------|-----------|------------|
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5. Recommended cleaning solvents

Methanol, isopropanol, isobutanol, ethanol, petroleum ether, propanol and or commercial detergents.

Halogenated hydrocarbon cleaning agents such as freon (MF, TF, TMC or TC) trichloroethylene, trichloroethane, or methylchloride are not recommended as they may damage the capacitor.

6. Marking

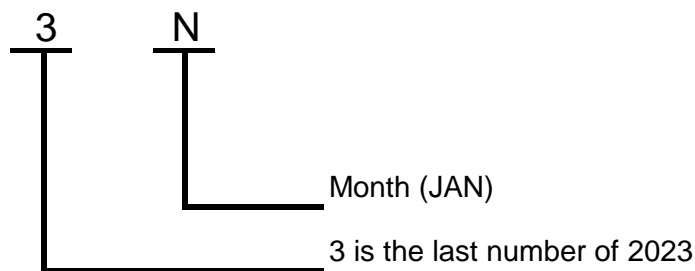
The following items shall be marked indelibly and legibly on the spoci-fled location.

- 1). Brand: DAEWOO
- 2). Series Designation: RFZ
- 3). Rated Voltage (DC): 50V
- 4). Capacitance (µF): 820µF
- 5). Capacitance Tolerance: (M): ±20%
- 6). Maximum Operating Temperature: 105°C
- 7). Lot No: 3N
- 8). Sleeve Colour: Black

7. Lot Number

The lot number regulates the following formula. But 1, 0, I are exception

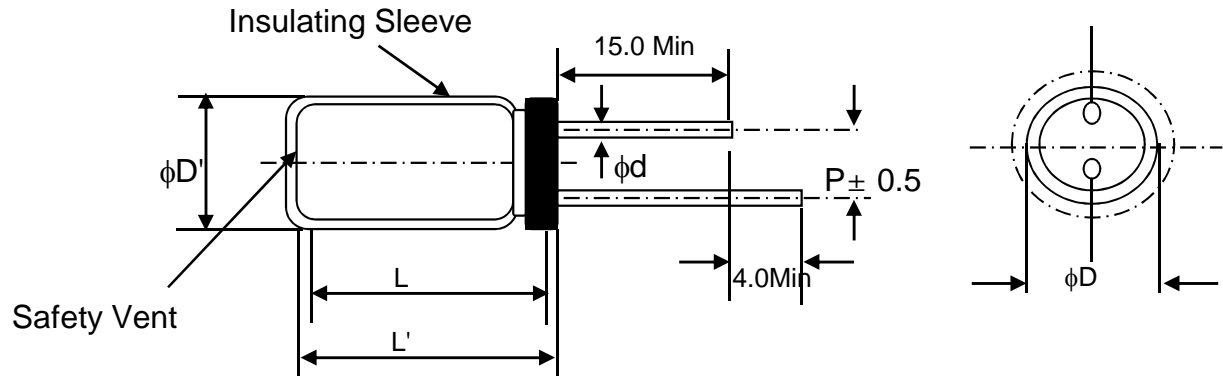
Ex: JAN 2023



| MONTH YEAR | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---------------|---|---|---|---|---|---|---|---|---|----|----|----|
| 2020 | N | P | Q | R | S | T | U | V | W | X | Y | Z |
| 2029 | | | | | | | | | | | | |

| | | | |
|------------------------------------------------|---------------------------------------------|-----------|------------|
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8. CASE SIZE AND DIMENSION



* Standard lead style:

| | |
|----------|-----|
| ϕD | 16 |
| P | 7.5 |
| ϕd | 0.8 |

$$D' = [D + 0.5] \text{Max}$$

$$L' = [L+1.0] \text{Max. at } D \leq 8.0$$

$$L' = [L+1.5] \text{Max. at } D \geq 10.0$$

9. RIPPLE CURRENT COEFFICIENT

* Frequency

| Cap(μ F) | Freq(Hz) | 120 | 1K | 10K | 100K |
|---------------|----------|------|------|------|------|
| 820 | | 0.55 | 0.77 | 0.94 | 1.0 |

* Temperature

| Temperature | $\leq 70^\circ\text{C}$ | 85°C | 105°C |
|-------------|-------------------------|--------------------|---------------------|
| Factor | 2.1 | 1.7 | 1.0 |

10. DIMENSION & PERMISSIBLE RIPPLE CURRENT [mA(rms) at 105°C , 100KHz]

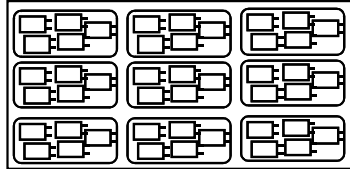
| WV (V) | CAP (μ F) | SIZE | Z | I_R |
|--------|----------------|-------|------|-------|
| 50 | 820 | 16x20 | 0.03 | 2732 |

| | | | |
|------------------------------------------------|-----------------------------------------------------|-----------|------------|
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11. Packing methode

11.1 Cutting products shall be packed in a vinyl bag then put un inner box.

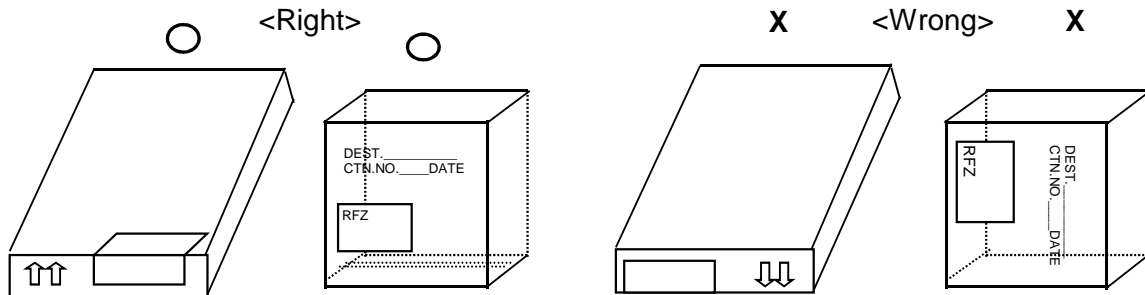
There shall be a single part number in a inner carton.



11.2 Polarity identifications on a cardboard box shall match the polarity of products.

11.3 Inner carton box shall be handled as follows.

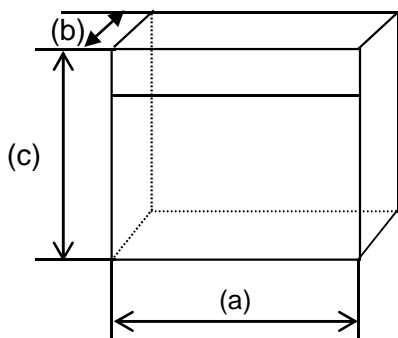
- * No more than 10 inner carton boxes shall be piled.
- * In case of putting the boxes lengthways, the indication of porarity shall face up.
- * The products shall be handled with care.



11.4 The inner cartons shall be packed in a cardboard box for transportation.

Various part number can be packed in a outer carton.

11.5 Shape & dimensions of inner carton shall be as follows.



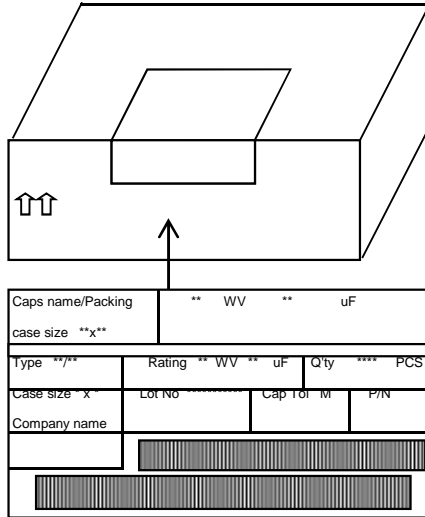
| Case size | | (a) | (b) | (c) |
|-----------|----|-----|-----|-----|
| ϕD | L | | | |
| $\phi 16$ | 20 | 350 | 260 | 310 |



* Note: The dimensions listed above may be changed without notice. The carton shall be suitable for the auto-insert machines after change.

| | | | |
|------------------------------------------------|-----------------------------------------------------|-----------|------------|
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* Inner box packing standard cut type:

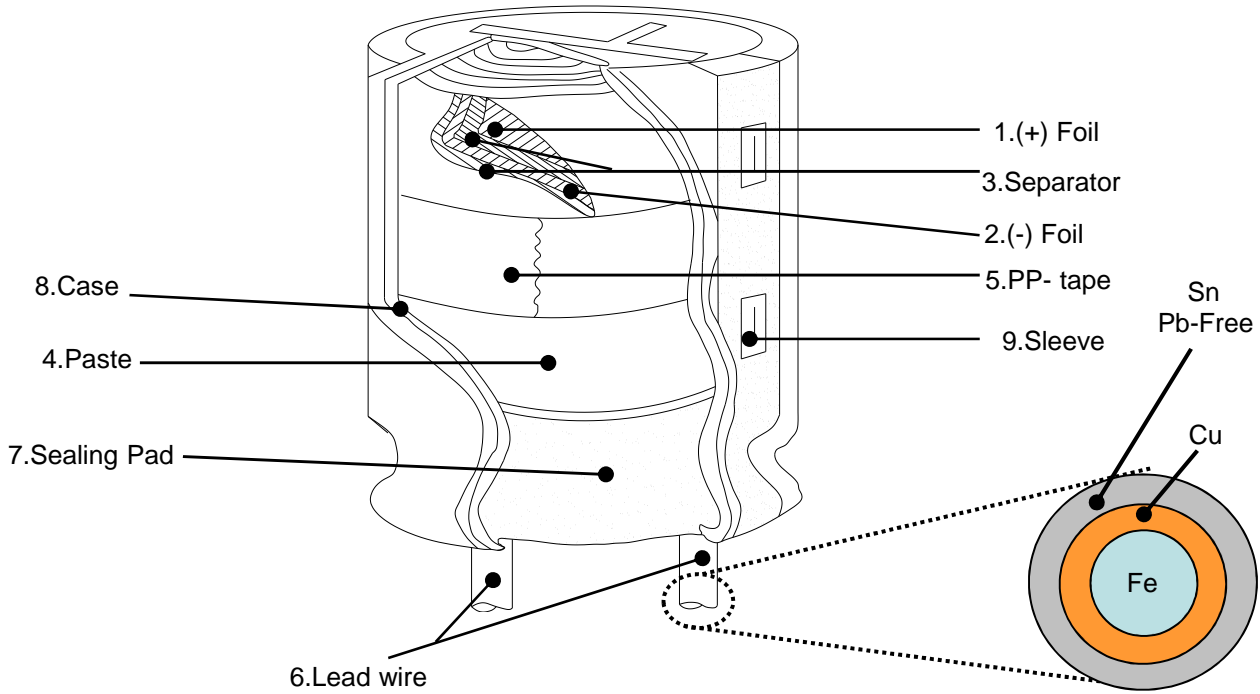


11.6 Packing quantity Cut type:

| Product diameter [mm] | Inner carton quantity min. Packing quantity [Pcs] | Outer carton quantity [Pcs] |
|--------------------------|------------------------------------------------------|--------------------------------|
| φ 16x20 | 600 | 1200 |

| | | | |
|------------------------------------------------|---------------------------------------------|-----------|------------|
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12.CONSTRUCTION RADIAL TYPE CAPACITORS.



| No | Raw Materials | | | Contents(ppm=mg/kg) | | | | | | ICP Data |
|------------------------------|---------------|---------------|---------------|---------------------|-----|-----|------|-----|------|----------|
| | Part Name | Vendor | Material | cd | pb | Hg | Cr6+ | PBB | PBDE | |
| 1 | FOIL(+) | HAIXING, HFCC | Aluminium | 0 | 0 | 0 | 0 | 0 | 0 | #1 |
| 2 | FOIL(-) | ELE-CON | Aluminium | 0 | 0 | 0 | 0 | 0 | 0 | #2 |
| 3 | Paper | KAN | Pulp | 0 | 0 | 0 | 0 | 0 | 0 | #3 |
| 4 | PASTE | CAPCHEM | MEG | 0 | 0 | 0 | 0 | 0 | 0 | #4 |
| 5 | Adhesive Tape | TAPEX | Polypropylene | 0 | 0 | 0 | 0 | 0 | 0 | #5 |
| 6 | Lead wire | LITON | Al,Fe+Sn | 0 | 0 | 0 | 0 | 0 | 0 | #6 |
| 7 | Rubber | LIEN EKI | Rubber | 0 | 0 | 0 | 0 | 0 | 0 | #7 |
| 8 | Case | OAKLEY | Aluminium | 0 | 0 | 0 | 0 | 0 | 0 | #8 |
| 9 | Sleeve | MOODEUNG | PET | 0 | 0 | 0 | 0 | 0 | 0 | #9 |
| 10 | Sleeve Ink | MOODEUNG | INK | 0 | 0 | 0 | 0 | 0 | 0 | #10 |
| 11 | Box Packing | TRUONG HUNG | Kraft | 0 | 0 | 0 | 0 | 0 | 0 | #11 |
| TOL | | | | 0 | 0 | 0 | 0 | 0 | 0 | |
| SAMSUNG Eco-Partner Standard | | | | 5 | 100 | 800 | 800 | 100 | 100 | |

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| RAW MATERIAL SUPPLIERS LIST | | | | | |
| Items | Company name | Country | Contents | Using of CE | Remark |
| Anode Foil | - HFCC | - CHINA | * Low and high gain Anode Foil | * All series of CE | * Forming(+) |
| | - HAIXING | - CHINA | * High voltage (160Fv up) Foil | | |
| Cathode Foil | - ELE-CON | - CHINA | * Cathode Foil (20, 40, 50 μ m) | * All series of CE | * Etching(-) * PURITY : 98.4% |
| Lead wire | - LITON | - CHINA | * Lead-wire welding and press | * 04 type only | * Sn 100% coated |
| Case | - OAKLEY | - CHINA | - 04 ~ 18 Al-case press | * All series of CE | |
| Sleeve | - MOODEUNG | - KOREA | * PET tube | * 04, Snap-in all | |
| Paper | - KAN | - CHINA | * 100% from CHINA | * All series of CE | |
| Rubber | - LIEN EKI | - MALAYSIA | * Normal and butyl Rubber | * All series of CE | |
| Paste | - CAPCHEM | - CHINA | * Adipic Acid, Boric Acid | * All series CE | |
| Adhesive Tapex | - TAPEX | - KOREA | * Element winding film | * 04, Snap-in all | |

| | | | |
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CONFIRMATION AND ACTION PLAN TABLE

| No | Banned Substances and total abolish | PART OR RAW MATERIAL MANUFACTURER | | ACTION PLAN TO ELIMINATE IF STILL USING |
|----|-------------------------------------------------------------------------|-----------------------------------|-----|-----------------------------------------|
| | | NOT USE | USE | |
| 1 | Cadmium and cadmium compounds | X | | |
| 2 | PBB and PBDE | X | | |
| 3 | Chlorinated paraffins (chlorine flame retarding materials/plasticizers) | X | | |
| 4 | Polychlorinated biphenyl (PCB) category | X | | |
| 5 | Polychlorinated naphthalene category | X | | |
| 6 | Organic tin compounds(Tributyl tin category/Triphenyl tin category) | X | | |
| 7 | Asbestos | X | | |
| 8 | Azo compounds | X | | |
| 9 | Lead and its compounds | X | | |
| 10 | Mercury and its inorganic compounds | X | | |
| 11 | Hexavalent chromium compounds | X | | |
| 12 | Polyethylene terephthalate (PET) | | X | |
| 13 | Organic bromine compound except PBB and PBDE | X | | |
| 14 | Manufacturing Process : Ozone Depleting Substances | X | | |
| 15 | Manufacturing Process : Chlorined organic solvent | X | | |