

Customer : _____
(客 戶)

Part No. : _____
(貴公司料號)

SPECIFICATION FOR APPROVAL

承 認 書

Description : ALUMINUM ELECTROLYTIC CAPACITORS
(零 件 名 稱)

Lelon Series : RXW Series
(立 隆 系 列)

Lelon Part No.: RXW471M1CBU-0811
(立 隆 料 號)

LELON ELECTRONICS CORP.

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Approval Signatures

貴公司承認印

| Approval 核 准 | Check 確 認 | Design 作 成 |
|---|---|---|
|  |  |  |

Please Return One Copy with Your Approval

承 認 後 請 寄 回 本 圖 一 份

Part Numbering System

Product Code Guide – Radial Type

| | | | | | | | | |
|------------------------|-----------------------------|-------------------------------------|------------------------------|---|---------------------------|----------------------------|---|-----------------------------|
| REA series | 10μF | ±20% | 50V | Lead Forming Tape | Gas Type | 5φx11L | Pb-free Wire + PET Sleeve | |
| REA ① Series | 100 ② Capacitance | M ③ Capacitance Tolerance | 1H ④ Rated Voltage | TA ⑤ Lead Configuration & Package | - ⑥ Rubber Type | 0511 ⑦ Case size | □ ⑧ Lead Wire and Sleeve Type | ⑨ Supplement Code |

① Series:

Series is represented by a three-letter code. When the series name only has two letters, use a hyphen, “-”, to fill the third blank.

② Capacitance:

Capacitance in μF is represented by a three-digit code. The first two digits are significant and the third digit indicates the number of zeros following the significant figure. “R” represents the decimal point for capacitance under $10\mu\text{F}$.

Example:

| | | | | | | | | | | | |
|-------------|-----|------|-----|-----|-----|-----|-----|-----|-------|-------|--------|
| Capacitance | 0.1 | 0.47 | 1 | 4.7 | 10 | 47 | 100 | 470 | 1,000 | 4,700 | 10,000 |
| Part number | 0R1 | R47 | 010 | 4R7 | 100 | 470 | 101 | 471 | 102 | 472 | 103 |

③ Tolerance:

| | | | |
|---------------|-----------------|-----------------|-----------------|
| J = -5% ~ +5% | K = -10% ~ +10% | M = -20% ~ +20% | V = -10% ~ +20% |
|---------------|-----------------|-----------------|-----------------|

④ Rated voltage:

Rated voltage in volts (V) is represented by a two-digit code

| | | | | | | | | | | | | |
|--------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|-----|
| Voltage (WV) | 2.5 | 4 | 6.3 | 10 | 16 | 20 | 25 | 35 | 50 | 63 | 80 | 100 |
| Code | 0E | 0G | 0J | 1A | 1C | 1D | 1E | 1V | 1H | 1J | 1K | 2A |
| Voltage (WV) | 160 | 200 | 250 | 315 | 350 | 400 | 420 | 450 | 500 | 525 | | |
| Code | 2C | 2D | 2E | 2F | 2V | 2G | 2P | 2W | 2H | 2Y | | |

⑤ Lead configuration and package:

| | |
|--------------------------------|---|
| BK = Bulk Package | TA = Formed Lead Taping |
| FC = Formed & Cut Lead | SA = Straight Lead Taping |
| CC = Cut Lead | SD = Bent Cathode Lead |
| SF = Snap-in & Formed Cut Lead | BC = Bent & Cut Lead (Leads in Right Direction) |
| SC = Snap-in & Cut Lead | BU = Bent & Cut Lead (Leads in Left Direction) |

⑥ Rubber type:

| | |
|---------------------|----------------------|
| – = Gas escape type | F = Flat rubber bung |
|---------------------|----------------------|

Note : For case size of $3\varphi\times 5\text{L}$, $12.5\varphi\times 16\text{L}$, $16\varphi\times 16\text{L}$, $16\varphi\times 20\text{L}$, $18\varphi\times 16\text{L}$, $18\varphi\times 20\text{L}$, $18\varphi\times 25\text{L}$ of aluminum e-caps, flat rubber bung is the standard design, In these cases, use a hyphen, “-”, in this digit.

⑦ Case size:

The first two digits indicate case diameter and the last two digits indicate case length in mm.

| | | | | | | | | | | |
|------|---------|---------|---------|---------|-------|---------|---------|---------|---------|---------|
| φDxL | 3x5 | 4x5 | 4x7 | 5x5 | 5x7 | 5x11 | 6.3x5 | 6.3x7 | 6.3x11 | 6.3x15 |
| Code | 0305 | 0405 | 0407 | 0505 | 0507 | 0511 | 0605 | 0607 | 0611 | 0615 |
| φDxL | 8x5 | 8x7 | 8x9 | 8x11.5 | 8x15 | 8x20 | 10x9 | 10x12.5 | 10x16 | 10x20 |
| Code | 0805 | 0807 | 0809 | 0811 | 0815 | 0820 | 1009 | 1012 | 1016 | 1020 |
| φDxL | 10x25 | 10x30 | 10x35 | 10x40 | 10x45 | 10x50 | 12.5x16 | 12.5x20 | 12.5x25 | 12.5x30 |
| Code | 1025 | 1030 | 1035 | 1040 | 1045 | 1050 | 1316 | 1320 | 1325 | 1330 |
| φDxL | 12.5x35 | 12.5x40 | 12.5x45 | 12.5x50 | 16x16 | 16x20 | 16x25 | 16x31.5 | 16x35.5 | 16x40 |
| Code | 1335 | 1340 | 1345 | 1350 | 1616 | 1620 | 1625 | 1632 | 1636 | 1640 |
| φDxL | 16x45 | 16x50 | 18x16 | 18x20 | 18x25 | 18x31.5 | 18x35.5 | 18x40 | 18x45 | 18x50 |
| Code | 1645 | 1650 | 1816 | 1820 | 1825 | 1832 | 1836 | 1840 | 1845 | 1850 |
| φDxL | 20x30 | 20x35 | 22x35 | 22x40 | 22x45 | 25x40 | 25x45 | | | |
| Code | 2030 | 2035 | 2235 | 2240 | 2245 | 2540 | 2545 | | | |

Note: When a case size is required and not shown in the table, please contact with us for further discussion.

⑧ Lead Wire and Sleeve Type:

| | |
|--|---|
| None = Standard design | T = Sn-Pb wire + PET sleeve |
| Pb-free wire + PET sleeve (aluminum e-cap) Pb-free wire + Coating case (OP-CAP) | |
| B = Sn-Bi wire + PET sleeve | G = Pb-free wire + Black PET sleeve (for RGA & SG series only) |

K / L = Automotive control code

* When a supplement code following a blank digit code of lead wire and sleeve type (standard design), use a hyphen, “-”, to fill the blank digit.

* When the automotive control code is required, please contact with us for further discussion.

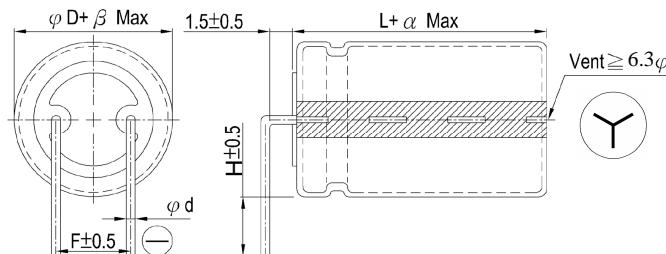
⑨ Supplement code (Optional):

For special control purposes

CUSTOMER :

CUSTOMER P/N:

DIAGRAM OF DIMENSIONS



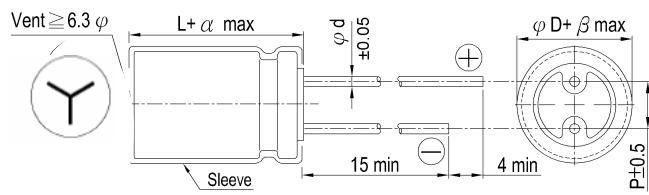
| Unit: mm | |
|----------|------|
| φD | 8 |
| L | 11.5 |
| F | 3.5 |
| φd | 0.6 |
| α | 1.5 |
| β | 0.5 |
| H | 3.5 |

| Items | Performance | | | | | | | | | | | | | | |
|--|--|------|------|---------|--|--------------------|------------------------------------|---------------------------------|-----------------------------------|-----------------|------------------------|------|------|------|-----|
| Category Temperature Range | -55°C ~ +105°C | | | | | | | | | | | | | | |
| Capacitance Tolerance | -20 % ~ +20 % (120 Hz, 20°C) | | | | | | | | | | | | | | |
| Surge Voltage | 18.4VDC | | | | | | | | | | | | | | |
| Leakage Current | $I \leq 75.2\mu A$ After 2 minutes | | | | | | | | | | | | | | |
| Tan δ | ≤ 0.16 (120 Hz, 20°C) | | | | | | | | | | | | | | |
| Impedance | $< 0.117 \Omega$ (100kHz, 20°C) | | | | | | | | | | | | | | |
| Ripple Current (rms) | 650mA (100kHz, 105°C) | | | | | | | | | | | | | | |
| Low Temperature Characteristics (120 Hz) | <table border="1"> <tr> <td>Rated Voltage</td><td>16</td></tr> <tr> <td>$Z(-55^\circ C)/Z(+20^\circ C)$</td><td>3</td></tr> </table> | | | | | Rated Voltage | 16 | $Z(-55^\circ C)/Z(+20^\circ C)$ | 3 | | | | | | |
| Rated Voltage | 16 | | | | | | | | | | | | | | |
| $Z(-55^\circ C)/Z(+20^\circ C)$ | 3 | | | | | | | | | | | | | | |
| Ripple Current & Frequency Multipliers | <table border="1"> <tr> <td>Frequency (Hz)</td><td>120</td><td>1k</td><td>10k</td><td>100k up</td></tr> <tr> <td>Multiplier</td><td>0.55</td><td>0.77</td><td>0.94</td><td>1.0</td></tr> </table> | | | | | Frequency (Hz) | 120 | 1k | 10k | 100k up | Multiplier | 0.55 | 0.77 | 0.94 | 1.0 |
| Frequency (Hz) | 120 | 1k | 10k | 100k up | | | | | | | | | | | |
| Multiplier | 0.55 | 0.77 | 0.94 | 1.0 | | | | | | | | | | | |
| Life Test: | | | | | | | | | | | | | | | |
| Endurance: | <table border="1"> <tr> <td>Capacitance Change</td><td>Within $\pm 25\%$ of initial value</td></tr> <tr> <td>Tan δ</td><td>Less than 200% of specified value</td></tr> <tr> <td>Leakage Current</td><td>Within specified value</td></tr> </table> | | | | | Capacitance Change | Within $\pm 25\%$ of initial value | Tan δ | Less than 200% of specified value | Leakage Current | Within specified value | | | | |
| Capacitance Change | Within $\pm 25\%$ of initial value | | | | | | | | | | | | | | |
| Tan δ | Less than 200% of specified value | | | | | | | | | | | | | | |
| Leakage Current | Within specified value | | | | | | | | | | | | | | |
| After 5000 Hrs at 105°C | | | | | | | | | | | | | | | |
| Shelf Life Test: | | | | | | | | | | | | | | | |
| After 1000 Hrs at 105°C | | | | | | | | | | | | | | | |
| Solder Heat-resistance | Dip of wave soldering capacitors should be less than 260±5°C, 10±1seconds. | | | | | | | | | | | | | | |
| Standards | JIS C 5101-4 | | | | | | | | | | | | | | |
| Remarks | RoHS Compliance & Halogen-free | | | | | | | | | | | | | | |

* Please refer to " Precautions and Guidelines for Aluminum Electrolytic Capacitors " of Lelon's catalog.

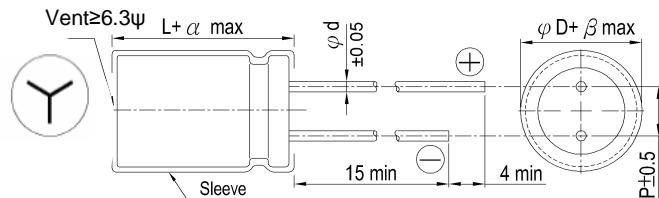
| Publish Date | August 29, 2016 | Approval Signatures: | Approved | Checked | Designed |
|--------------|-----------------|----------------------|---|---------|----------|
| Revise Date | | | | | |
| Edition No. | 1 | | Please return one copy with your approval | | |

Diagram of Dimensions:



| Lead Spacing & Diameter | | Unit: mm | | | | | | | | | |
|-------------------------|--------------------------|----------|-----|-----|------|-----|-----|--|--|--|--|
| φD | 5 | 6.3 | 8 | 10 | 12.5 | 16 | 18 | | | | |
| P | 2.0 | 2.5 | 3.5 | 5.0 | 5.0 | 7.5 | 7.5 | | | | |
| φd | 0.5 | | 0.6 | | 0.8 | | | | | | |
| α | L < 20: 1.5, L ≥ 20: 2.0 | | | | | | | | | | |
| β | 0.5 | | | | | | | | | | |

The case size of 16x20, 18x20 and 18x25 are suitable for below diagram:



Marking:

Each capacitor shall be marked with the following information.

(The Front)

120μF 50V → Rated capacitance and rated DC working voltage
 — — → Polarity

(The Back)



→ Brand name

RXW 105°C
 H 6 01 (M)

→ Series & maximum operating temperature
 → Date code

- Tolerance of capacitance
- Week of manufacture
- The last digit of A. D.
- Place of manufacture

T: Taiwan
 H: Huizhou
 A: Suzhou

Appearance:

Marking color: Golden

Sleeve color: Black ----- RXW Series

Sleeve material: PET

Packaging Quantity:

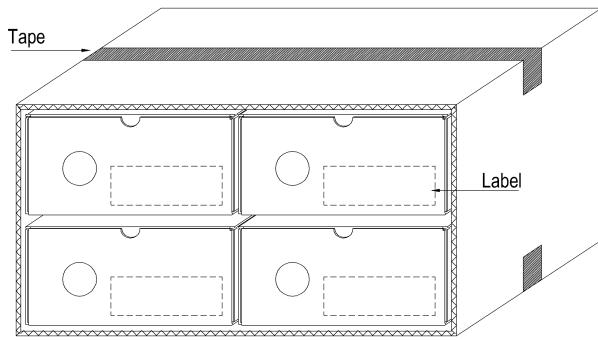
3. Radial Type in CC/FC/SC/SF/BC/BU Pack:

| Case Size | pcs / Bag | Inner Box / Carton | Pcs / Carton | Case Size | pcs / Bag | Inner Box / Carton | Pcs / Carton |
|------------------|-----------|--------------------|--------------|--------------------|-----------|--------------------|--------------|
| 3φ × 5 | 1,000 | 8 | 80,000 | *10φ × 8 ~ 10L | *500 | 8 | *8,000 |
| 4φ × 5 ~ 7L | 1,000 | 8 | 80,000 | 10φ × 12.5 ~ 16L | 500 | 8 | 8,000 |
| 5φ × 5 ~ 7L | 1,000 | 8 | 56,000 | 10φ × 20L | 400 | 8 | 6,400 |
| 5φ × 11L | 1,000 | 8 | 40,000 | 10φ × 25L | 300 | 8 | 4,800 |
| *5φ × 8L | *1000 | 8 | *40,000 | 10φ × 30 ~ 40L | 250 | 8 | 4,000 |
| 6.3φ × 5 ~ 7L | 1,000 | 8 | 40,000 | 10φ × 45 ~ 50L | 200 | 8 | 3,200 |
| *6.3φ × 5.5 ~ 8L | *1000 | 8 | *40,000 | 12.5φ × 16 ~ 25L | 200 | 8 | 3,200 |
| 6.3φ × 11L | 1,000 | 8 | 24,000 | 12.5φ × 30 ~ 40L | 150 | 8 | 2,400 |
| | *1000 | 8 | *24,000 | 12.5φ × 45 ~ 50L | 100 | 8 | 1,600 |
| 6.3φ × 15L | 500 | 8 | 12,000 | 16φ × 16 ~ 31.5L | 100 | 8 | 1,600 |
| 8φ × 5 ~ 9L | 1,000 | 8 | 24,000 | 16φ × 35.5 ~ 40L | 75 | 8 | 1,200 |
| 8φ × 11.5L | 1,000 | 8 | 16,000 | 16φ × 45 ~ 50L | 50 | 8 | 800 |
| *8φ × 8 ~ 12L | *1000 | 8 | *16,000 | 18φ × 16 ~ 25L | 100 | 8 | 1,600 |
| 8φ × 15L | 800 | 8 | 12,800 | 18φ × 31.5 ~ 35.5L | 75 | 8 | 1,200 |
| 8φ × 20L | 500 | 8 | 8,000 | 18 ~ 40L | 50 | 8 | 800 |
| 8φ × 25 ~ 30L | 500 | 8 | 8,000 | 18 ~ 45φ × 50L | 50 | 8 | 400 |
| 8φ × 35 ~ 50L | 250 | 8 | 4,000 | 20 ~ 25φ | --- | --- | 400 |
| 10φ × 9L | 500 | 8 | 12,000 | | | | |

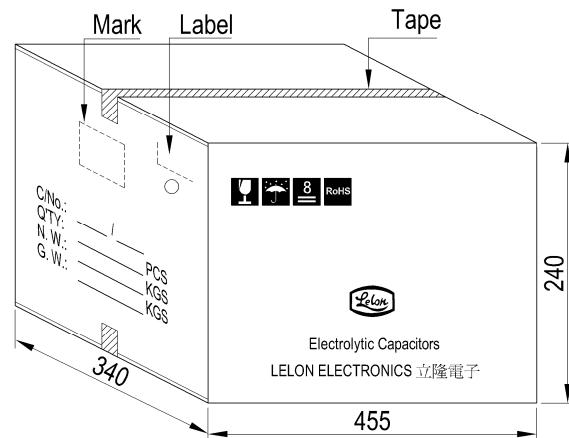
Remark: “*” Suitable for CA04 type (OP-CAP).

Packing Figure:

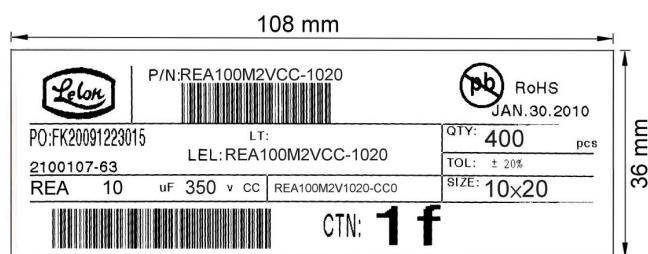
a) Inner Box



b) Outer Box:



c) Label:



Endurance Characteristic:

| No. | Item | Conditions | Specification | |
|-----|--------------------------------------|---|--------------------|-----------------------------------|
| 1 | Rotational Temperature Test | <p>Capacitor is placed in an oven whose temperature follow specific regulation to “+25°C (3 min.) → -55 / -40°C (30 min.) → +25°C (3 min.) → +105°C (30 min.) → +25°C (3 min.)”, and it is called a cycle. The test totals 10 cycles. And then the capacitor shall be subjected to standard atmospheric conditions for 4 hours, after which measurements shall be made.</p> <p>1. 6.3 ~ 63V for -55°C 2. 80V~100V for -40°C</p> | Capacitance change | Within ± 10% of initial value. |
| | | | Tanδ | Within specified value |
| | | | Leakage Current | Within specified value |
| | | | Physical | No broken and undamaged |
| 2 | High Temperature Endurance Life Test | <p>1. Capacitors shall be placed in oven with application of ripple current and rated voltage 4000 +72 / -0 hours for $\phi D \leq 6.3$ mm, 5000 +72 / -0 hours for $\phi D = 8$ mm, 6000 +72 / -0 hours for $\phi D = 10$ mm, 7000 +72 / -0 hours for $\phi D \geq 12.5$ mm at 105°C</p> <p>2. The capacitor should be used within specified permissible ripple current in each standard products table (the sum of DC voltage and AC peak voltage shall be equal to the rated DC working voltage).</p> <p>3. The specified maximum permissible ripple current in defined at 105°C and 100K Hz (unless otherwise specified).</p> <p>4. Then the capacitor shall be subjected to standard atmospheric conditions for 4 hours, after which measurements shall be made.</p> | Capacitance change | Within ± 25% of initial value. |
| | | | Tanδ | Less than 200% of specified value |
| | | | Leakage Current | Within specified value |
| | | | Physical | No broken and undamaged |
| 3 | High Temperature Unload Life Test | <p>After 1000 +48 / -0 hours test at 105°C without rated working voltage. And then the capacitor shall be subjected to standard atmospheric conditions for 4 hours, after which measurements shall be made.</p> | Capacitance change | Within ± 25% of initial value. |
| | | | Tanδ | Less than 200% of specified value |
| | | | Leakage Current | Within specified value |
| | | | Physical | No broken and undamaged |
| 4 | Humidity Test | <p>Capacitors shall be exposed for 1000 +48 / -0 hours in an atmosphere of 90 ~ 95% R. H. at 60 ± 3°C And then the capacitor shall be subjected to standard atmospheric conditions for 4 hours, after which measurements shall be made.</p> | Capacitance change | Within ± 10% of initial value. |
| | | | Tanδ | Less than 120% of specified value |
| | | | Leakage Current | Within specified value |
| | | | Physical | No broken and undamaged |
| 5 | Low Temperature Test | <p>Capacitors are placed at -55 / -40 ± 3°C for 96 ± 4 hours. And then the capacitor shall be subjected to atmospheric conditions for 4 hours, after which measurements shall be made.</p> <p>1. 6.3 ~ 63V for -55°C 2. 80V~100V for -40°C</p> | Capacitance change | Within ± 10% of initial value. |
| | | | Tanδ | Within specified value |
| | | | Leakage Current | Within specified value |
| | | | Physical | No broken and undamaged |
| 6 | Vibration Test | <p>1. Fix it at the point 4mm or less from body. For ones of 12.5mm or more in diameter or 25mm or more length, use separate fixture.</p> <p>2. Direction and during of vibration: 3 orthogonal directions mutually each for 2 hours (total of 6 hours).</p> <p>3. Frequency: 10 to 55 Hz reciprocation for 1min.</p> <p>4. Total amplitude : 1.5mm</p> | Capacitance change | Within ± 10% of initial value. |
| | | | Tanδ | Within specified value |
| | | | Leakage Current | Within specified value |
| | | | Physical | No broken and undamaged |
| 7 | Solder Heat-Resistance Test | <p>The section of lead below 4mm from the body of capacitor must be immersed in 260 ± 5°C liquid tin 10 ± 1 seconds, than, after removing the following specifications shall be satisfied when capacitor terminal is restored to 20°C over 4 hours.</p> | Capacitance Change | Within ± 10% of initial value. |
| | | | Tanδ | Within specified value |
| | | | Leakage Current | Within specified value |
| | | | Physical | No broken and undamaged |

| No. | Item | Conditions | Specification | | | | | | | | | | | | | | | | | | | |
|---|---------------------------------|--|--------------------|-----------------------------------|------------------|-------------------------|-------------|-------|-----|-----------|-----|-------|-----|-------------------------|-------------|-------|------|-----------|------|-------|------|----|
| 8 | Surge Voltage Test | The capacitor shall be subjected to 1000 cycles at 15 ~ 35°C. Protective series resistor a 1KΩ each consisting of a charge period of 30 ± 5 seconds, followed by discharge period of approximately 5.5 minutes. | Capacitance change | Within ± 20% of initial value. | | | | | | | | | | | | | | | | | | |
| | | | Tanδ | Less than 175% of specified value | | | | | | | | | | | | | | | | | | |
| | | | Leakage Current | Within specified value | | | | | | | | | | | | | | | | | | |
| | | | Physical | No broken and undamaged | | | | | | | | | | | | | | | | | | |
| Applying voltage: | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1"> <tr> <td>Rated Voltage(V)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>80</td></tr> <tr> <td>Surge Voltage(V)</td><td>7.2</td><td>11.5</td><td>18.4</td><td>28.8</td><td>40.3</td><td>57.5</td><td>72.5</td><td>92</td></tr> </table> | | | | | Rated Voltage(V) | 6.3 | 10 | 16 | 25 | 35 | 50 | 63 | 80 | Surge Voltage(V) | 7.2 | 11.5 | 18.4 | 28.8 | 40.3 | 57.5 | 72.5 | 92 |
| Rated Voltage(V) | 6.3 | 10 | 16 | 25 | 35 | 50 | 63 | 80 | | | | | | | | | | | | | | |
| Surge Voltage(V) | 7.2 | 11.5 | 18.4 | 28.8 | 40.3 | 57.5 | 72.5 | 92 | | | | | | | | | | | | | | |
| 9 | Mechanical Characteristics Test | <ol style="list-style-type: none"> The test is about lead tabs strength. 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 secs. <table border="1"> <tr> <th>Lead tabs diameter (mm)</th><th>Weight (Kg)</th></tr> <tr> <td>≤ 0.5</td><td>0.5</td></tr> <tr> <td>0.6 ~ 0.8</td><td>1.0</td></tr> <tr> <td>> 0.8</td><td>2.0</td></tr> </table> <ol style="list-style-type: none"> Bending Test: The 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 / cycle). The lead tabs shall not be broken or cracked. <table border="1"> <tr> <th>Lead tabs diameter (mm)</th><th>Weight (Kg)</th></tr> <tr> <td>≤ 0.5</td><td>0.25</td></tr> <tr> <td>0.6 ~ 0.8</td><td>0.50</td></tr> <tr> <td>> 0.8</td><td>1.00</td></tr> </table> | | | | Lead tabs diameter (mm) | Weight (Kg) | ≤ 0.5 | 0.5 | 0.6 ~ 0.8 | 1.0 | > 0.8 | 2.0 | Lead tabs diameter (mm) | Weight (Kg) | ≤ 0.5 | 0.25 | 0.6 ~ 0.8 | 0.50 | > 0.8 | 1.00 | |
| Lead tabs diameter (mm) | Weight (Kg) | | | | | | | | | | | | | | | | | | | | | |
| ≤ 0.5 | 0.5 | | | | | | | | | | | | | | | | | | | | | |
| 0.6 ~ 0.8 | 1.0 | | | | | | | | | | | | | | | | | | | | | |
| > 0.8 | 2.0 | | | | | | | | | | | | | | | | | | | | | |
| Lead tabs diameter (mm) | Weight (Kg) | | | | | | | | | | | | | | | | | | | | | |
| ≤ 0.5 | 0.25 | | | | | | | | | | | | | | | | | | | | | |
| 0.6 ~ 0.8 | 0.50 | | | | | | | | | | | | | | | | | | | | | |
| > 0.8 | 1.00 | | | | | | | | | | | | | | | | | | | | | |
| 10 | Solderability Test | After the lead wire fully immersed in the solder for 2 ± 0.5 secs at a temperature of 245 ± 5°C, the solder coating must be more than 95%. | | | | | | | | | | | | | | | | | | | | |
| 11 | Venting Test | <ol style="list-style-type: none"> Applicable to the capacitors with case diameter is 6.3 mm and larger. Test condition: <ol style="list-style-type: none"> AC test The capacitor shall be connected across a applying 50 or 60 Hz AC which is 0.7 times of rated voltage or 250Vrms AC whichever is the lower. DC test: Applying inverse DC rated voltage with current to the capacitor. Where case diameter: $\phi D \leq 22.4\text{mm}$: 1 A DC max $\phi D > 22.4\text{mm}$: 10 A DC max <p>Note:</p> <ol style="list-style-type: none"> When the pressure relief vent operated, the capacitor shall avoid any danger of fire or explosion of capacitor element (terminal and metal foil etc.) or cover. When the pressure relief device does not open with the voltage applied over 30 minutes, the test is considered to be passed. | | | | | | | | | | | | | | | | | | | | |
| 12 | Standards | Satisfies Characteristic JIS C 5101-4 | | | | | | | | | | | | | | | | | | | | |

Precautions and Guidelines for Aluminum Electrolytic Capacitors

1. Guidelines for Circuit Design

Selecting the capacitors to suit installation and operating conditions, and using the capacitors to meet the performance limits prescribed in this catalogue or the product specifications.

(1) Polarity

Aluminum electrolytic capacitors are polarized. Make sure of the polarity, if used in reverse polarity, the circuit life may be shortened or the capacitor may be damaged. When the polarity in a circuit sometimes can be reversed or unknown, a bi-polar capacitor shall be used. Also, note that DC capacitors cannot be used for AC application. Reverse voltage 1 voltage acceptable within specified temperature and working voltage.

(2) Operating Voltage

Do not apply DC voltage, which exceeds the rated voltage of the capacitor and not be reverse voltage. If a voltage exceeding the capacitor's voltage rating is applied, the capacitor may be damaged as leakage current increase. Using capacitors at recommended working voltage prolongs capacitor life. The surge voltage rating is the maximum DC over-voltage to which the capacitors may be subjected of short periods.

(3) Ripple Current

- (a) The combined value of DC voltage and the peak AC voltage shall not exceed the rated voltage. When an excessive ripple current passes, the capacitor may be damaged with the vent operating, etc. Use the electrolytic capacitor within the permissible ripple range current at specified frequency and temperature.
- (b) The temperature coefficient shows the limit of ripple current exceeding the rated ripple current that can be applied to the capacitor at the temperature. The expected life of a capacitor is nearly equal to the lifetime at the upper category temperature.

(4) Operating Temperature

Use the capacitors according to the specified operating temperature range. If used the capacitor outside the maximum rated temperature will considerably shorten the life or cause the capacitor to vent. Usage at room ambient will ensure longer life.

(5) Leakage Current

The leakage current shall be within specified levels. When capacitors are applied at a lower voltage, the actual leakage current will be reduced proportionately.

(6) Charge and Discharge

The capacitor is not suitable for a circuit in which charge and discharge are frequently repeated. The capacitance value may drop by forming oxide layer on the cathode foil, or the capacitor may be damaged by generating heat due to continuous rapid charge and discharge.

(7) Condition of Use

- (a) The capacitors shall not be exposed to water, saltwater spray, oil or fumes, high humidity or humidity condensation and direct sunlight.
- (b) Ambient conditions that include hazardous gases / fumes such as hydrogen sulfide, sulfuric acid, nitrous acid, chlorine or bromine gas, ammonia, etc.
- (c) Exposed to ozone, ultraviolet rays and radiation.
- (d) Severe vibration or physical shock that exceeds the condition in specification sheets.

(8) Consideration to Circuit Design

- (a) Please make sure the application and mounting conditions that the capacitor will be used are within the conditions specified in the catalog. If the conditions are beyond the conditions specified in the catalog, please contact Lelon.
- (b) Do not design a circuit board so that heat-generating components are places near an aluminum electrolytic capacitor or reverse side of PCB. A cooling system is recommended.
- (c) Operating temperature, applied voltage and ripple current shall be within specification. The ambient temperature shall not exceed the operating temperature and applied ripple current shall not exceed the allowable ripple current specified in the specification.
- (d) Performances of electrical characteristics of aluminum electrolytic capacitors are affected by variation of operating

temperature and frequency. Consider this variation designing the circuit.

- (e) When two or more aluminum capacitors are connected in parallel, consider the current balance that flow through the capacitors.
- (f) If more than two capacitors are connected in series, make sure the applied voltage will be lower than the rated voltage and that voltage will be applied to each equally using a balancing resistor in parallel with each capacitor.
- (g) For appropriate choice of capacitors for circuit that repeat rapid charge and discharge, please consult Lelon.
- (h) Outer sleeve of the capacitor is not guaranteed as an electrical insulator. Do not use a standard sleeve on a capacitor that requires the electrical insulation. When the application requires special electrical insulation, please contact Lelon.
- (i) Do not tilt lay down or twist the capacitor's body after the capacitor is soldered to the PCB.

2. Caution for Assembling Capacitors

(1) Mounting

- (a) Aluminum electrolytic capacitors cannot be re-used once the capacitor has assembled in the set and power applied.
- (b) Aluminum electrolytic capacitors may have electrical potential between positive and negative terminal, please discharge through a $1\text{K}\Omega$ resistor before use.
- (c) Leakage current of Aluminum electrolytic capacitors may be increased after storage a long period of time. When leakage current has increased, please perform a voltage treatment before use.

Voltage treatment:

The capacitors shall be applied with DC rated voltage through a resistor of $1\text{K}\Omega$ in series for one hour, and then discharge through a resistor of $1\text{K}\Omega$. When the capacitors have been assembled in the board, use a volt regulator to input voltage gradually to the rated voltage of the board.

- (d) Please confirm the rated voltage before mounting.
- (e) Please confirm the polarity before mounting.
- (f) Do not use the capacitor that once dropped on the hard floor.
- (g) Do not damage the capacitor while mounting.
- (h) Capacitors shall be mounted that hold spacing on PCB matches the lead pitch of the capacitors.
- (i) During the auto-insertion process and parts inspection, capacitors shall avoid the excessive force and shock.
- (j) Do not design to locate any wiring or circuit around the capacitor's pressure relief vent. The following clearance should be made above the pressure relief vent. The pressure relief vent will not open without the appropriate free space.

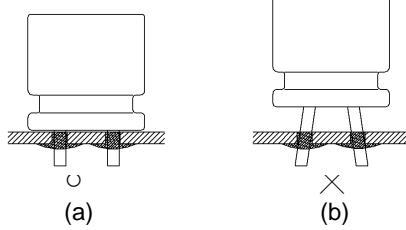
| Case Diameter | $\varphi 6.3 \sim \varphi 16$ | $\varphi 18 \sim \varphi 35$ | $\varphi 40$ or more |
|-----------------|-------------------------------|------------------------------|----------------------|
| Clearance (min) | 2 mm | 3 mm | 5 mm |

(2) Soldering

- (a) Be careful of temperature and time when soldering. Dip of flow soldering of the capacitors should be limited at less than $260 \pm 5^\circ\text{C}$ and 10 ± 1 seconds or soldering iron with $350 \pm 10^\circ\text{C}$ for $3 \pm 1/0$ seconds. Do not dip capacitor's body into melted solder.
- (b) High humidity will affect the solder ability of lead wire and terminals. High temperature will reduce long-term operating life.
- (c) Except SMD type, reflow soldering can not be used for any types of aluminum electrolytic capacitors. When using SMD type capacitor, please check the reflow profile. The temperature and duration shall not exceed the specified temperature and duration in the specification. If the temperature or duration is higher than the value specified, please consult Lelon before usage.
- (d) Standard aluminum electrolytic capacitors cannot withstand more than one reflow process. Please consult our engineering department when needed.

(e) Defective mounting on PCB and improper external strength applied on the lead wires or case body after soldering (see below drawings) may damage inside structure of the capacitor and may cause short circuit, high leakage current or leakage problems.

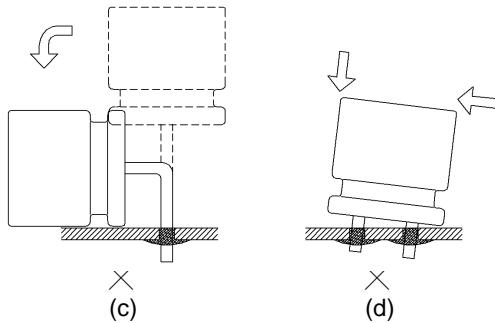
(i) Good soldering.



(ii) Hole-to-hole space on board differs from the lead space of lead wires.

(iii) Lead wires are bent after soldering.

(iv) Case body doesn't stand vertical on board after soldering.
Do not bend or twist the capacitor's body after soldering.



(3) Cleaning Circuit Boards After Soldering

Halogenated solvent cleaning is not available for aluminum electrolytic capacitors. IPA (Isopropyl Alcohol) is one of the most acceptable cleaning agents; it is necessary to maintain a flux content in the cleaning liquid at a maximum limit of 2 Wt. %. If you use other cleaning agents, please consult Lelon.

3. Maintenance Inspection

Periodical inspection is necessary for using the aluminum capacitors with industrial equipment. The following items should be checked:

(1) Appearance: Vent operation, leaking electrolyte, etc.
(2) Electrical characteristic: Capacitance, dissipation factor, leakage current, and other specified items listed in specification.
Lelon recommend replacing the capacitors if the parts are out of specification.

4. Storage

(1) Aluminum electrolytic capacitor should not be stored in high temperature or high humidity condition. The suitable condition is 5°C ~ 35°C and less than 75% in relative humidity indoor.

(2) Do not store the capacitors in damp conditions such as water, brine or oil.

(3) Do not store the capacitors that exposed to hazardous gas such as hydrogen sulfide, sulfuric acid, nitrous acid, chlorine, ammonium, etc.
(4) Do not store the capacitors that exposed to ozone, ultraviolet rays or radiation.
(5) Do not expose the capacitors to acidic or alkaline solutions.
(6) It is not applied to a regulation of JEDEC J-STD-020 (Rev. C).

5. Disposal

Please consult with a local industrial waste disposal specialist when disposing of aluminum electrolytic capacitors.

6. Environmental Consideration

Lelon already have received ISO 14000 certificate. Cadmium (Cd), Lead (Pb), Mercury (Hg), Hexavalent Chromium (Cr+6), PBB and PBDE have never been using in capacitor. If you need "Halogen-free" products, please consult with us.

For further details, please refer to

IEC 60384-4- Fixed capacitors for use in electronic equipment – Part 4: Sectional specification – Aluminium electrolytic capacitors with solid (MnO₂) and non-solid electrolyte (Established in January 1995, Revised in March 2007), and

EIAJ RCR-2367B- Guideline of notabilia for fixed aluminium electrolytic capacitors for use in electronic equipment [Technical Standardization Committee on Passive Components (Established in March 1995, Revised in March 2002)].