**NO.: RD20220314002** **TO: Ozdisan**

**APPROVAL SHEET No. : B-7629C**

**Series No. : KRM**

**Specification No.:**

# Halogen-Free RoHS2.0

## APPROVAL SHEET

## FOR AL. ELECTROLYTIC CAPACITORS

| No. | (Customer No.) | (Koshin Part No.) | Description | ΦD x L |
|---|---|---|---|---|
| 1 | | PKRM-016V222MG200-T/A5.0 | 16V2200μF | 10X20 |

**APPROVED BY:**

**PLEASE SIGN RETURN US ONE COPY OF THE APPROUAL SHEET**

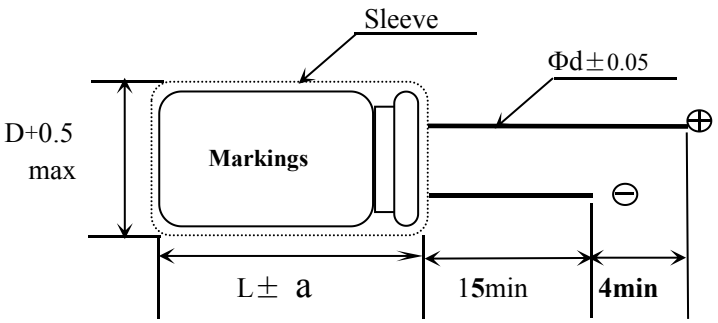
**DESIGNED BY:DENGZHIHUI CHECKED BY:JUANGYUANYUAN APPROVED BY: HAUNGXUEHUI**
**DATE: 2022-3-14**

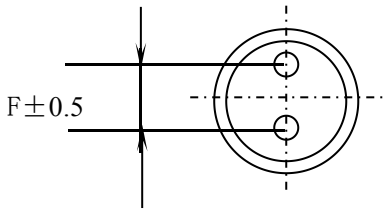
**KOSHIN**

**DJS-DS-0013**

**KOSHIN**

Standard Size map:




| ΦD | 5 | 6.3 | 8 | 10 | 12.5 | 16 | 18 | 22 | 25 |
|---|---|---|---|---|---|---|---|---|---|
| F | 2.0 | 2.5 | 3.5 | 5.0 | 5.0 | 7.5 | 7.5 | 10.0 | 10.0 |
| Φd | 0.5 | 0.5 | 0.6 | 0.6 | 0.6 | 0.8 | 0.8 | 0.8/1.0 | 1.0 |
| a | 1.5 | | | 1.5for L16max<br>2.0for L20min | | | | | |

Coefficient of Frequency for Ripple Current

| Rated voltage (v) | Frequency (Hz) / Capacitance(μF) | 50•60 | 120 | 1K | 10K | 100K |
|---|---|---|---|---|---|---|
| 6.3 to 100 | CAP≤10 | 0.80 | 1.00 | 1.30 | 1.65 | 1.70 |
| | 10<CAP≤100 | 0.80 | 1.00 | 1.23 | 1.48 | 1.53 |
| | 100<CAP≤1000 | 0.80 | 1.00 | 1.16 | 1.35 | 1.38 |
| | 1000<CAP | 0.80 | 1.00 | 1.11 | 1.25 | 1.28 |
| 160 to 500 | 0.47 to 330 | 0.80 | 1.00 | 1.30 | 1.40 | 1.60 |

Coefficient of Temperature for Ripple Current

| Temperature (℃) / Rated voltage (V) | 70 or less | 85 | 105 |
|---|---|---|---|
| 6.3 to 100 | 2.00 | 1.70 | 1.00 |
| 160 to 500 | 1.80 | 1.40 | 1.00 |

**KOSHIN**

## Series KRM Capacitor

**1.Our part No. :** **For example**

| PKRM | 016V | 222 | M | G200 |
|---|---|---|---|---|
| Se rise code | rated voltage | capacitance | tolerance | case size symbol |
| PKRM | 16V | 2200μF | ±20% | Φ10X20 |

**2. Your part No.:**

**3. Marking:**

**Include company's brand "Koshin", series code, rated voltage, capacitance ,rated temperature range, polarity and tolerance of capacitance.**

**4. Specifications:**

**4.1 Temperature range : -55~+105℃**

**4.2 Electrical characteristics**

**4.2.1 Capacitance tolerance : ±20%**

**4.2.2 Tangent of loss angle (tan δ ) :**

| Rated voltage(V) | 6.3 | 10 | 16 | 25 | 35 | 50 | 63 | 100 | 160-500 |
|---|---|---|---|---|---|---|---|---|---|
| tanδ (max.) | 0.22 | 0.19 | 0.16 | 0.14 | 0.12 | 0.10 | 0.09 | 0.08 | 0.15 |

Note: 0.02 is added to each 1000μF increase over 1000μF

**4.2.3 Leakage current (μA) :**

| Rated voltage (V) | 6.3-500 |
|---|---|
| Leakage Current (μA) | Less than 0.01CV or 3 whichever is large (after 1 minutes) |

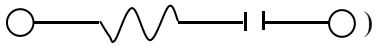
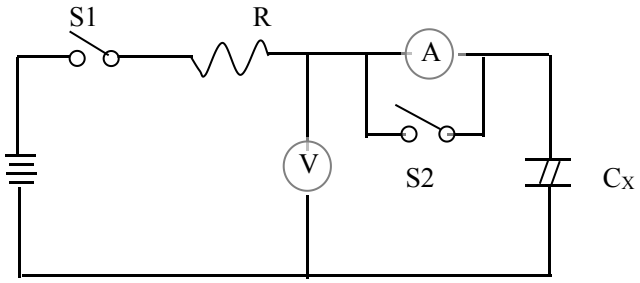
**Note: I : Leakage current (μA) , C : Capacitance (μF) , V : Rated DC working voltage (V)**

**KOSHIN**

1. Scope:

This specification applies to aluminum electrolytic capacitor ,used in electronic equipment.

2. Electrical characteristics:

<table>
<tr><th>NO.</th><th>ITEM</th><th>TEST METHOD</th><th>SPECIFICATION</th></tr>
<tr><td>2.1</td><td>Rated voltage</td><td></td><td rowspan="2">Voltage range、capacitance range ,see specification of this series</td></tr>
<tr><td>2.2</td><td>Capacitance</td><td rowspan="2">1. Measuring frequency:120Hz±12Hz<br>2. Measuring voltage:≤0.5Vrms+1.5VDC~2.0VDC<br>3. Measuring circuit: (  )</td></tr>
<tr><td>2.3</td><td>Dissipation factor</td><td rowspan="2">Dissipation factor, leakage current, see specification of this series.</td></tr>
<tr><td>2.4</td><td>Leakage current</td><td>DC leakage current shall be measured after 1~2minutes application of the DC rated working voltage through the 1000Ω resistor at 20℃<br>  <br><br>R: 1000Ω S1:Switch<br>A: DC current meter S2:Switch for protect of current meter<br>V: DC voltage meter<br>$C_X$: Testing capacitor</td></tr>
<tr><td>2.5</td><td>Temperature characteristics</td><td>
<table>
<tr><th>STEP</th><th>TEMPERATURE</th><th>STORAGE TIME</th></tr>
<tr><td>1</td><td>20℃±2℃</td><td>30minutes</td></tr>
<tr><td>2</td><td>-40℃±3℃ -55℃±3℃</td><td>2hours</td></tr>
<tr><td>3</td><td>20℃±2℃</td><td>4hours</td></tr>
<tr><td>4</td><td>105℃±2℃</td><td>2hours</td></tr>
</table>
Step1.Measure the impedance.<br>( |Z| , 20℃, 120Hz±2HZ)<br>Step2. Measure the impedance at thermal balance after 2 hours.<br>( |Z| , -40℃ -55℃, 120Hz±2HZ)<br>Step4.Measure the leakage current at thermal balance after 2 hours.
</td><td>Step2.<br>Low temperature impedance stability<br>Less than specified value.<br><br>Step4.<br>Capacitance change:<br>within ± 10% of the initial measured value.<br><br>Dissipation factor:<br>Less than specified value.</td></tr>
</table>

**KOSHIN**

| NO. | ITEM | TEST METHOD | SPECIFICATION |
|---|---|---|---|
| 2.6 | Surge test | Rated surge voltage shall be applied (switch on)for 30±5 second and then shall be applied (switch off) with discharge for 5.5min at room temperature. This cycle shall be repeated for 1000 cycles. Duration of one cycle is 6±0.5 minutes | Capacitance change:<br>within ± 15% of the initial specified value.<br><br>Dissipation factor:<br>Less than specified value.<br><br>Leakage current:<br>Within initial specified value. |

3.Mechanical characteristics ：

| NO. | ITEM 项目 | TEST METHOD | SPECIFICATION |
|---|---|---|---|
| 3.1 | Lead strength | (A)Tensile strength ：<br>wire lead terminal ：<br>d(mm) ≤0.5 \| 0.5<d≤0.8 \| 0.8＜d≤1.25<br>load(kg) 0.5 \| 1.0 \| 2.0<br>The capacitor shall withstand the constant tensile force specified between the body and each lead for 10seconds without damage either mechanical or electrical. | When the capacitance is measured, there shall be no intermittent contacts, or open-or short-circuiting. |
| | | （B）Bending strength ：<br>wire lead terminal ：<br>d(mm) ≤0.5 \| 0.5<d≤0.8 \| 0.8＜d≤1.25<br>load(kg) 0.5 \| 0.5 \| 1.0<br>with the capacitor in a vertical position apply the load specified axially to each lead. The capacitor shall be rotated slowly from the vertical to the horizontal position, back to the vertical position. The 90° in the opposite direction and back the original position. Performance of capacitor shall not have change and leads shall be undamaged. | There shall be no such mechanical damage as terminal damage etc. |

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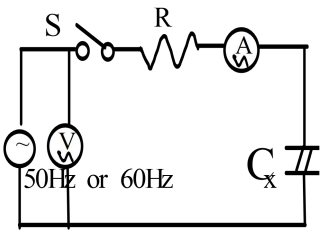
| NO. | ITEM | TEST METHOD | SPECIFICATION |
|---|---|---|---|
| 3.2 | Vibration resistance | The frequency of the vibration shall vary uniformly within the range 10 to 55 Hz with the amplitude of 0.75mm,completing the cycle in the internal of one minute.<br>The capacitor shall be securely mounted by its leads with hold the body of capacitor.<br>The capacitor shall be vibrated in three mutually perpendicular directions for a period of 2 hours in each direction. | Appearance : no abnormal.<br><br>Capacitance change:<br>within ± 5% of initial measured value. |
| 3.3 | Solder ability | The leads are dipped in the solder bath of Sn at 245℃ ± 5℃for 2±0.5 seconds. The dipping depth should be set at 1.5~2.0 mm. | The solder alloy shall cover the 95% or more of dipped lead's area. |

4. Reliability :

| NO. | ITEM | TEST METHOD | SPECIFICATION |
|---|---|---|---|
| 4.1 | Soldering heat resistance | The leads immerse in the solder bath of Sn at 260℃±5℃ for 10±1seconds until a distance of 1.5~2.0mm from the case. | No visible damage or leakage of electrolyte.<br><br>Capacitance change:<br>Within ± 5% of the initial measured value<br><br>Tan δ :<br>Less than specified value.<br><br>Leakage current:<br>Less than specified value |
| 4.2 | Damp head（ steady state） | Subject the capacitor to 40℃ ± 2℃ and 90% to 95% relative humidity for 504 hours. | Capacitance change:<br>Within ± 20% of the initial measured value<br>Tan δ :<br>Less than 1.2 specified value.<br><br>Leakage current:<br>Less than specified value<br>Impedance:<br>Less than 1.2 specified value. |

**KOSHIN**

<table>
<tr><th>NO.</th><th>ITEM</th><th>TEST METHOD</th><th>SPECIFICATION</th></tr>
<tr><td>4.3</td><td>Load life</td><td>After2000 hours continuous application of max allowable ripple current and DC rated voltage at 105 ℃ ± 2 ℃ , Measurements shall be performed after 16 hours exposed at room temperature.</td><td rowspan="2">Capacitance change:<br>Within ± 20% of the initial value.<br>Tan δ :less than 200% specified value<br><br>Leakage current:<br>Less than initial specified value.<br><br>Appearance :no Abnormal</td></tr>
<tr><td>4.4</td><td>Shelf life</td><td>After storage for 1000 hours at 105 ℃ ± 2 ℃ without voltage application ,Measurements shall be performed after exposed for 16 hrs at room temperature after application of Testing</td></tr>
<tr><td>4.5</td><td>Storage at low temperatur e</td><td>The capacitor shall be stored at temperature of -55℃ ± 3℃ for 16 hours, during which time be subjected to standard atmospheric conditions for 16 hours or more. After which measurements shall be made.</td><td>Capacitance change:<br>Within ± 10% of the initial value.<br><br>Tan δ :less than specified value<br><br>Leakage current:<br>Less than specified value.<br><br>Appearance :no Abnormal</td></tr>
<tr><td>4.6</td><td>Pressure relief</td><td>AC test<br>Applied voltage: AC voltage not exceeding 0.7 times of the rated direct voltage or 250V AC whichever is the lower.<br><br>Frequency : 50Hz or 60Hz.<br>Series resistor :refer to the table below<br><br>s* Resistance is equivalent to a half impedance by test frequency.<br><br>
<table>
<tr><th>Capacitance(C)<br>容 量</th><th>Series resistor</th></tr>
<tr><td>C＜1uF</td><td>1000 Ω</td></tr>
<tr><td>1uF＜C≦10uF</td><td>100 Ω</td></tr>
<tr><td>10uF＜C≦100uF</td><td>10 Ω</td></tr>
<tr><td>100uF＜C≦1000uF</td><td>1 Ω</td></tr>
<tr><td>1000uF＜C≦10000uF</td><td>0.1 Ω</td></tr>
<tr><td>10000uF＜C</td><td>*</td></tr>
</table>
</td><td>AC test circuit<br> 

<br>~ : AC power<br>S : Switch<br>V : AC voltage meter<br><br>A : AC current meter<br><br>R : protection resistor<br><br>Cx : testing capacitor</td></tr>
</table>

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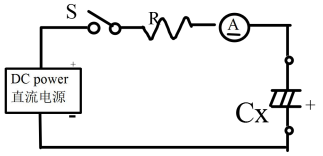
| NO. | ITEM | TEST METHOD | SPECIFICATION |
|---|---|---|---|
| 4.6 | Pressure relief | DC test<br>Send the following electricity while applying the inverse voltage.<br><br>Where case size<br>D≤22.4mm:1 A D.C.fixed<br>D＞ 22.4mm:10 A D.C.fixed<br>Note 1.When the pressure relief device does not open even 30 minutes after commencement of test, the test may be ended. | DC test circuit<br>  <br>S : Switch<br>Ⓐ: DC current meter<br><br>Cx: testing capacitor<br><br>The pressure relief device shall open in such a way as to avoid any damage of fire or explosion of capacitor elements (terminal and metal foil etc.) or cover. |
| 4.7 | Temp cycle | LSL temperature(℃):-55 ± 3 time(H)： 0.5H/timeX5 times USL temperature(℃):105 ± 2 time(H)：0.5H/timeX5 times Judgement：CAP：△C/C≤±10%，Appearance no Abnormal. No electrolyte leakage。 | |
| 4.8 | Thermal shock | dry heat temperature（℃)：105±2 time(H)：16 moist heat temperature(℃)：55 time(H)：24/ cold temperature(℃)：-55±2 time(H)： 2/ moist heat temperature(℃)： 55 time(H)： 24 ： Judgement： CAP,△C/C≤±10%, Tan δ :Less than 1.2 specified value, Leakage current: Less than specified value. Appearance no Abnormal. No electrolyte leakage。 | |

5．Marking

Marking on capacitors include:

Koshin trade-mark

Koshin
Working voltage

Normal capacitance

Tolerance

Polarity

Operating temperature range

**Sleeving pipe basic: Black PET**

**Printing color: White**

**Required space above the valve (mm): 2.0mm**

**KOSHIN**

Detergent needing attention

Hydrogen carbide liquid and halogen liquid can cause Aluminum Electrolytic Capacitor to corrode. Some of Safe and Unsafe detergent are as follows

| Safe | Unsafe |
|---|---|
| Dimethylbenzene | 1,1,2-trichloroethane |
| Ethanol | 1,2,2- trichloroethane |
| Butanol | Tetrachloroethylene |
| Methanol | Chloroform(colorless volatilizable liquid) |
| Propanol | Dichloromethane |
| Detergent | Trichloroethylene |

**KOSHIN**

Taping size Φ10

TP5.0mm pitch tape packing

Taping code number: T/A5.0

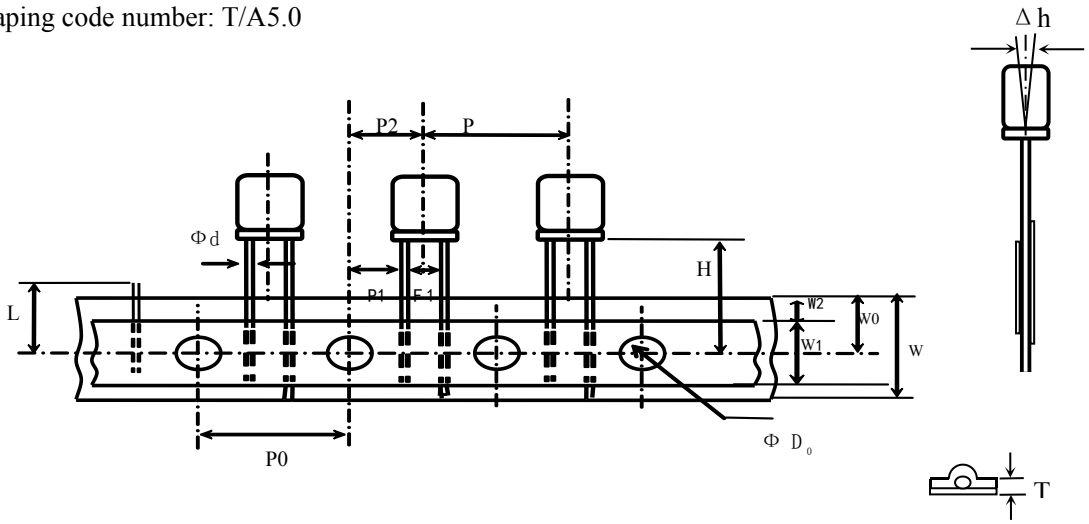



Table of dimensions

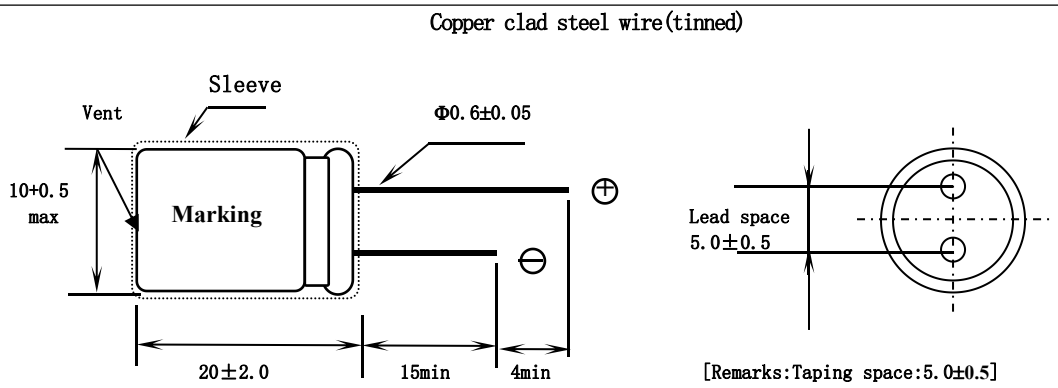
| Item | Symbol | Dimension | Tolerance | Reference |
|---|---|---|---|---|
| Lead-wire diameter | Φd | 0.6 | ±0.05 | |
| Distance between centers of leads | F1 | 5.0 | ±0.5 | |
| Height of component form tape center | H | 18.5 | +0.75<br>-0.5 | |
| Component spacing | P | 12.7 | ±1.0 | |
| Perforation pitch | P0 | 12.7 | ±0.3 | |
| Hole center to lead distance | P1 | 3.85 | ±0.7 | |
| Hole center to component center | P2 | 6.35 | ±1.0 | |
| Carrier tape width | W | 18.0 | ±0.5 | |
| Hole down tape width | W0 | 9.0 | ±0.5 | |
| Feed hole position | W1 | 10.0 | ±0.5 | |
| Hole down tape width | W2 | 0.5-1.5 | ----- | |
| Diameter of sprocket holes | ΦD0 | 4.0 | ±0.2 | |
| Body inclination forward or backward | △h | 0 | ±1.0 | |
| Tape base thickness | t0 | 0.38 | ±0.05 | |
| Total thickness of the combined carrier tape and hold down tape | T | 0.7 | ±0.2 | |
| Cut off position of defectives | L | 11.0 | or less | |

KOSHIN

# Aluminum Electrolytic Capacitor Specification

| | | | | |
|---|---|---|---|---|
| Series | PKRM | 16 V 2200μF | Part No. | PKRM-016V222MG200-T/A5.0 |
| Customer No. | | | Case size | ΦD10 X L20 |

| | | |
|---|---|---|
| Specification | Items | Standard |
| | Operating temperature range | - 55～+ 105 ℃ |
| | Capacitance tolerance | ±20% ( 20℃ ,120Hz ) |
| | Dissipation factor (MAX) | ( Less than ) 16% ( 20℃ ,120Hz ) |
| | Leakage current (MAX) | ( Less than ) 352μA ( 20℃ 16 V 1 min ) |
| | Impedance(MAX) | / |
| | Ripple current (MAX) | 800mArms ( 120Hz ,105℃ ) |
| | Load life | 2000hrs |
| Outline | Sleeving pipe basic | Black PET |
| | Marking color | White |
| | ( Dimensions ) | |




(unit):mm

| | |
|---|---|
| Recorder | (The first edition) :2022-3-14 |

| | | |
|---|---|---|
| Wrote by: Dengzhihui | Checked by: Jiangyuanyuan | Approved by: Huangxuehui |

(Issue No.): DJJ-2875