

Halogen Free (Br≦900ppm,Cl≦900ppm) Br + Cl≦1500ppm

Reference Specification

Type RA
Safety Standard Certified Lead Type Disc Ceramic Capacitors for General Purpose

Sep.27,2019

Product specifications in this drawing are subject to change or our products described in this drawing may be discontinued without advance notice.

The parts numbers are specifications listed in this drawing are for information only. You are requested to transact the "Product Specification", before your ordering.

Product Planning Sec.2 Izumo Murata Manufacturing Co., Ltd.

⚠ CAUTION

1. OPERATING VOLTAGE

When DC-rated capacitors are to be used in AC or ripple current circuits, be sure to maintain the Vp-p value of the applied voltage or the Vo-p which contains DC bias within the rated voltage range. When the voltage is started to apply to the circuit or it is stopped applying, the irregular voltage may be generated for a transit period because of resonance or switching. Be sure to use a capacitor within rated voltage containing these irregular voltage.

| Voltage | DC Voltage | DC+AC Voltage | AC Voltage | Pulse Voltage(1) | Pulse Voltage(2) |
|---------------------------|------------|---------------|------------|---------------------|---------------------|
| Positional Measurement | Vo-p Vo-p | Vo-p | Vp-p | Vp-p | Vp-p |

2. OPERATING TEMPERATURE AND SELF-GENERATED HEAT

Keep the surface temperature of a capacitor below the upper limit of its rated operating temperature range. Be sure to take into account the heat generated by the capacitor itself.

When the capacitor is used in a high-frequency current, pulse current or the like, it may have the self-generated heat due to dielectric-loss. Applied voltage should be the load such as self-generated heat is within 20 °C on the condition of atmosphere temperature 25 °C. When measuring, use a thermocouple of small thermal capacity-K of ϕ 0.1mm and be in the condition where capacitor is not affected by radiant heat of other components and wind of surroundings. Excessive heat may lead to deterioration of the capacitor's characteristics and reliability.(Never attempt to perform measurement with the cooling fan running. Otherwise, accurate measurement cannot be ensured.)

3. TEST CONDITION FOR WITHSTANDING VOLTAGE

(1) TEST EQUIPMENT

Test equipment for AC withstanding voltage should be used with the performance of the wave similar to 50/60 Hz sine wave.

If the distorted sine wave or over load exceeding the specified voltage value is applied, the defective may be caused.

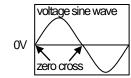
(2) VOLTAGE APPLIED METHOD

When the withstanding voltage is applied, capacitor's lead or terminal should be firmly connected to the out-put of the withstanding voltage test equipment, and then the voltage should be raised from near zero to the test voltage.

If the test voltage without the raise from near zero voltage would be applied directly to capacitor, test voltage should be applied with the *zero cross. At the end of the test time, the test voltage should be reduced to near zero, and then capacitor's lead or terminal should be taken off the out-put of the withstanding voltage test equipment.

If the test voltage without the raise from near zero voltage would be applied directly to capacitor, the surge voltage may arise, and therefore, the defective may be caused.

*ZERO CROSS is the point where voltage sine wave pass 0V.
- See the right figure -



4. FAIL-SAFE

When capacitor would be broken, failure may result in a short circuit. Be sure to provide an appropriate fail-safe function like a fuse on your product if failure would follow an electric shock, fire or fume.

5. VIBRATION AND IMPACT

Do not expose a capacitor or its leads to excessive shock or vibration during use.

6. SOLDERING

When soldering this product to a PCB/PWB, do not exceed the solder heat resistance specification of the capacitor. Subjecting this product to excessive heating could melt the internal junction solder and may result in thermal shocks that can crack the ceramic element.

When soldering capacitor with a soldering iron, it should be performed in following conditions.

Temperature of iron-tip: 400 °C max. Soldering iron wattage: 50W max. Soldering time: 3.5s max.

7. BONDING, RESIN MOLDING AND COATING

In case of bonding, molding or coating this product, verify that these processes do not affect the quality of capacitor by testing the performance of the bonded, molded or coated product in the intended equipment.

In case of the amount of applications, dryness / hardening conditions of adhesives and molding resins containing organic solvents (ethyl acetate, methyl ethyl ketone, toluene, etc.) are unsuitable, the outer coating resin of a capacitor is damaged by the organic solvents and it may result, worst case, in a short circuit.

The variation in thickness of adhesive, molding resin or coating may cause a outer coating resin cracking and/or ceramic element cracking of a capacitor in a temperature cycling.

8. TREATMENT AFTER BONDING, RESIN MOLDING AND COATING

When the outer coating is hot (over 100 $^{\circ}$ C) after soldering, it becomes soft and fragile. So please be careful not to give it mechanical stress.

Failure to follow the above cautions may result, worst case, in a short circuit and cause fuming or partial dispersion when the product is used.

9. OPERATING AND STORAGE ENVIRONMENT

The insulating coating of capacitors does not form a perfect seal; therefore, do not use or store capacitors in a corrosive atmosphere, especially where chloride gas, sulfide gas, acid, alkali, salt or the like are present. And avoid exposure to moisture. Before cleaning, bonding, or molding this product, verify that these processes do not affect product quality by testing the performance of a cleaned, bonded or molded product in the intended equipment. Store the capacitors where the temperature and relative humidity do not exceed -10 to 40 °C and 15 to 85%.

Use capacitors within 6 months after delivered. Check the solderability after 6 months or more.

10. LIMITATION OF APPLICATIONS

Please contact us before using our products for the applications listed below which require especially high reliability for the prevention of defects which might directly cause damage to the third party's life, body or property.

- 1. Aircraft equipment
- 2. Aerospace equipment
- 3. Undersea equipment
- 4. Power plant control equipment
- 5. Medical equipment
- 6. Transportation equipment (vehicles, trains, ships, etc.)
- 7. Traffic signal equipment
- 8. Disaster prevention / crime prevention equipment
- 9. Data-processing equipment exerting influence on public
- 10. Application of similar complexity and/or reliability requirements to the applications listed in the above.

NOTICE

1. CLEANING (ULTRASONIC CLEANING)

To perform ultrasonic cleaning, observe the following conditions.

Rinse bath capacity: Output of 20 watts per liter or less.

Rinsing time: 5 min maximum.

Do not vibrate the PCB/PWB directly.

Excessive ultrasonic cleaning may lead to fatigue destruction of the lead wires.

2. CAPACITANCE CHANGE OF CAPACITORS

· Class 1 capacitors

Capacitance might change a little depending on a surrounding temperature or an applied voltage. Please contact us if you use for the strict time constant circuit.

· Class 2 and 3 capacitors

Class 2 and 3 capacitors like temperature characteristic B, E and F have an aging characteristic, whereby the capacitor continually decreases its capacitance slightly if the capacitor leaves for a long time. Moreover, capacitance might change greatly depending on a surrounding temperature or an applied voltage. So, it is not likely to be able to use for the time constant circuit.

Please contact us if you need a detail information.

3. PERFORMANCE CHECK BY EQUIPMENT

Before using a capacitor, check that there is no problem in the equipment's performance and the specifications.

Generally speaking, CLASS 2 ceramic capacitors have voltage dependence characteristics and temperature dependence characteristics in capacitance. So, the capacitance value may change depending on the operating condition in a equipment. Therefore, be sure to confirm the apparatus performance of receiving influence in a capacitance value change of a capacitor, such as leakage current and noise suppression characteristic.

Moreover, check the surge-proof ability of a capacitor in the equipment, if needed, because the surge voltage may exceed specific value by the inductance of the circuit.

$oldsymbol{\Lambda}$ note

- Please make sure that your product has been evaluated in view of your specifications with our product being mounted to your product.
- 2. You are requested not to use our product deviating from this specification.

EGD08E

1. Application

This specification is applied to Safety Standard Certified Lead Type Disc Ceramic Capacitors Type RA used for General Electric equipment.

Type RA is Safety Standard Certified capacitors of Class X1,Y1.

Do not use these products in any automotive power train or safety equipment including battery chargers for electric vehicles and plug-in hybrids.

Approval standard and certified number

| | Standard number | *Certified number | AC Rated volt. V(r.m.s.) |
|---------------|-----------------|-------------------|-----------------------------|
| UL/cUL | UL60384-14 | E37921 | |
| ENEC (VDE) | EN60384-14 | 40043033 | X1:440 Y1:300 |
| CQC | IEC60384-14 | CQC16001138225 | |

^{*}Above Certified number may be changed on account of the revision of standards and the renewal of certification.

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|----|-------|---|
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2-1. Operating temperature range $-40 \sim +125^{\circ}C$

2-2. Rated Voltage X1:AC440V(r.m.s.) Y1:AC300V(r.m.s.)

2-3. Part number configuration

ex.) DE1 1X RA 680 TM В P01F Individual **Product** Temperature Packing Type Capacitance Capacitance Lead characteristic tolerance code style code specification name code

Product code

DE1 denotes X1,Y1 class.

• Temperature characteristic

| Code | Temperature characteristic |
|------|----------------------------|
| 1X | SL |

Please confirm detailed specification on [Specification and test methods].

Type name

This denotes safety certified type name Type RA.

• Capacitance

The first two digits denote significant figures; the last digit denotes the multiplier of 10 in pF. ex.) In case of 680.

$$68 \times 10^0 = 68 pF$$

• Capacitance tolerance

Please refer to [Part number list].

• Lead code

| 0000 | |
|------|---------------------------|
| Code | Lead style |
| T* | Vertical crimp short type |

^{*} Please refer to [Part number list]

• Packing style code

| Code | Packing type |
|------|--------------|
| В | Bulk type |

Individual specification

In case part number cannot be identified without 'individual specification', it is added at the end of part number.

| end of part number. | |
|---------------------|--|
| Code | Specification |
| | Rated voltage: X1:AC440V(r.m.s.) |
| | Y1:AC300V(r.m.s.) |
| P01F | Halogen free (Br ≤ 900ppm, Cl ≤ 900ppm) Br + Cl ≤ 1500ppm CP wire |

Note) Murata part numbers might be changed depending on lead code or any other changes. Therefore, please specify only the type name(RA) and capacitance of products in the parts list when it is required for applying safety standard of electric equipment.

3. Marking

Type name : RA

Nominal capacitance : Actual value

Capacitance tolerance : Code
Class code and Rated voltage mark : X1 440~
Y1 300~

Manufacturing year : Letter code(The last digit of A.D. year.)

Manufacturing month : Code

Feb./Mar. \rightarrow 2 Aug./Sep. \rightarrow 8 Apr./May \rightarrow 4 Oct./Nov. \rightarrow O Dec./Jan. \rightarrow D

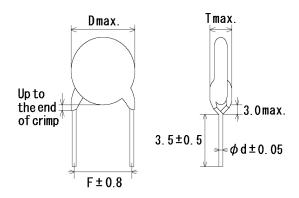
Company name code : (Made in Thailand)

(Example)

RA 68K X1 440~ Y1 300~ 5D (M15

4. Part number list

·Vertical crimp short type
(Lead code:T*)



Note) The mark '*' of lead code differ from lead spacing(F) and lead diameter(d).
Please see the following list about details.

Unit: mm

| | | | | | | | | | O : | |
|------|------|------|----------------------|----------------------|----------------|-----|------|-----|------|---------------|
| 7 | Сар. | Сар. | Customer Part Number | Murata Part Number | Dimension (mm) | | | | Lead | Pack |
| 1.0. | (pF) | tol. | Customer Fait Number | Wulata Fait Nullibel | D | Τ | F | р | code | qty. (pcs) |
| SL | 68 | ±10% | | DE11XRA680KTMBP01F | 8.0 | 4.0 | 10.0 | 0.6 | TM | 500 |

| Appearance and dimensions No marked defect on appearance form and dimensions. Please refer to [Part number list]. The capacitor should be inspected by naked eyes for visible evidence of defect. The capacitor should be measured with slide calipers | | | | | elerence on | ·y | | | | | | |
|--|-----------------------------|---------------------------|--------------|--|-------------------|---------------|---|--------------|--------------|--|--|-------------------|
| Appearance and dimensions No marked defect on appearance form and dimensions. Please refer to [Part number list]. Dimensions should be measured with stafe caligners and the presence of the property | | | | | | | 1 | | | | | |
| form and dimensions. Please refer to [Part number list]. Dimensions should be measured with slide celigient. Dimensions should be inspected by naked eyes. The capacitor should not be damaged when AC4000V(r.m.s.)-56/06/Hz-is applied between the lead wires for 60 s. Body insulation No failure. No failur | No. | | | | | | | | | | | |
| Please refer to [Part number list.] To be easily legible. To be easily legible. No failure. First, the terminals of the capacitor should be inserted to the day wires for 60 s. First, the terminals of the capacitor should be connected together. Then, a metal foil should be closely wrapped around the body of the expactior should be inserted into a container filled with metal balls of about 1 mm diameter. Finally, AC4000V (m.m.s.)-650/60Hz-s is applied for 60 s between the capacitor red wires and metal balls. The insulation resistance should be measured with DoS005-50V within 60Hs of should mine body of the expactior should be inserted into a container filled with metal balls of about 1 mm diameter. Finally, AC4000V (m.m.s.)-650/60Hz-s is applied for 60 s between the capacitor red wires and metal balls. The insulation resistance should be measured with DoS005-50V within 60Hs of charging. The voltage should be applied to the capacitor through a resistor of MM. The capacitance should be measured at 20°C with 1:10.1Hz and AC1-62V(m.m.s.) max. The dissipation factor (D.F.) Step 1 2 3 4 5 5 charging. The capacitance measurement should be made at each step specified in Table. Step 1 2 2 3 4 5 5 charging. The voltage specified in Table. The capacitance measurement should be made at each step specified in Table. The capacitance measurement should be made at each step specified in Table. The capacitance measurement should be made at each step specified in Table. The capacitance measurement should be made at each step specified in Table. The capacitance measurement should be made at each step specified in Table. The capacitance measurement should be made at each step specified in Table. The capacitance measurement should be maintained for 2 min after the last discharge. The capacitance measurement should be made at each step specified in | 1 Appearance and dimensions | | | | | | | | | | | |
| To be easily legible. The capacitor should be inspected by naked eyes. | | | | | | | | | | | | |
| Between lead wires Strength | 2 | Marking | | | | | | | | | | |
| Strength wires Body Insulation No failure. No failure. No failure. No failure. No failure. First, the terminals of the capacitor should be connected together. Then, a metal foil should be closely wrapped around the body of the capacitor to the distance of about 3 to firm. Then, the capacitor should be inserted into a container filled with metal balls of about 1 mm from each terminal. Then, the capacitor lead wires and metal balls. In the insulation Resistance should be measured with DCS00.50V within 80.55 or charging. The voltage should be applied to the capacitor balls. Set the properties of the properties | 3 | | Between lead | | gioro. | The capacitor | | | nould not b | e damaged | when | |
| Body insulation No failure. First, the terminals of the capacitor should be conserved together. Then, a metal foll should be closely wrapped around the body of the capacitor to the distance of about 3 to 6mm from each terminal. Then, the capacitor should be inserted into a container filled with metal balls of about 1 mm diameter. Finally, AC4000V (r.m.s.)-50/60Hz> is applied for 60 s between the capacitor should be measured with DC500±50V within 60±5 s of charging. The voltage should be applied to the capacitor through a resistor of 14M±0. The capacitance should be measured at 20°C with 1-10.14Hz and AC1-02V(r.m.s.) max. The dissipation factor should be measured at 20°C with 1-10.14Hz and AC1-02V(r.m.s.) max. The dissipation factor should be measured at 20°C with 1-10.14Hz and AC1-02V(r.m.s.) max. The capacitance measurement should be measured at 20°C with 1-10.14Hz and AC1-02V(r.m.s.) max. The capacitance measurement should be made at each step specified in Table. The capacitance measurement should be made at each step specified in Table. The capacitance measurement should be made at each step specified in Table. The capacitance measurement should be made at each step specified in Table. The capacitance measurement should be made at each step specified in Table. The capacitance measurement should be made at each step specified in Table. The capacitance measurement should be made at each step specified in Table. The capacitance measurement should be made at each step specified in Table. The capacitance measurement should be made at each step specified in Table. The capacitance measurement should be made at each step specified in Table. The capacitance measurement should be made at each step specified in Table. The capacitance measurement should be made at each step specified in Table. The capacitance measurement should be made at each step specified in Table. The capacitance measurement should be made at each step specified in Table. The capacitance measurement | | | | | | | | | | | | the |
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| closely wrapped around the body of the capacitor to the distance of about 3 to 6mm from each terminal. Then, the capacitor should be inserted into a container filled with metal balls of about 1 mm diameter. Finally, AC4000V (r.m.s.) +50/60Hz-> is applied for 60 s between the capacitor lead wires and metal balls. Then insulation resistance should be measured with DC500±50V within 60±5 s of charging. The voltage should be applied to the capacitor through a resistor of 1M/D. The capacitance should be measured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The capacitance should be measured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The dissipation factor should be measured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The dissipation factor should be measured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The dissipation factor should be measured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The capacitance measurement should be made at each step specified in Table. The capacitance measurement should be made at each step specified in Table. The capacitance measurement should be made at each step specified in Table. The capacitance measurement should be made at each step specified in Table. The capacitance measurement should be made at each step specified in Table. The capacitance measurement should be made at each step specified in Table. The capacitors should be individually wrapped in at least one but more than two complete layers of the capacitance measurement should be made at each step specified in Table. The capacitance measurement should be made at each step specified in Table. The capacitance measurement should be made at each step specified in Table. The capacitance measurement should be made at each step specified in Table. The capacitance measurement should be measured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The capacitance measurement should be measured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The capacitance measurement should be m | | | insulation | | | | | | | | V | |
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| to the distance of about 3 to 6 mm from each terminal. Then, the capacitor should be inserted into a container filled with metal balls of about 1 mm diameter. Finally, ΔC4000V (r.m.s.)-50/60Hz> is applied for 60 s between the capacitor lead wires and metal balls. The insulation resistance should be measured with DC500±50V within 60±5 s of charging. The voltage should be applied to the capacitor flow the rough a resistor of 1 M/D. The capacitance should be measured at 20°C with 1±0.1kHz and ΔC1±0.2V(r.m.s.) max. The dissipation factor should be measured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. Temperature characteristic Char. SL: +350 to −1000 ppm/°C [Tempo, range: +20 to +85°C]. Step 1 2 3 4 5 5 | | | | | | | | | | Maria / | Λ | |
| about 3 to 6mm from each terminal. Then, the capacitor should be inserted time to a container filled with metal balls of about 1 mm diameter. Finally, ΔC4000V (r.m.s.)-\$6060Hz> is applied for 60 s between the capacitor lead wires and metal balls. The insulation resistance should be measured with DC500+50V within 60°s to charging. The voltage should be applied to the capacitor through a resistor of 1 M/D. The capacitance should be measured at 20°C with 1±0.1Hz and AC1±0.2V(r.m.s.) max. The dissipation factor should be measured at 20°C with 1±0.1Hz and AC1±0.2V(r.m.s.) max. The dissipation factor should be measured at 20°C with 1±0.1Hz and AC1±0.2V(r.m.s.) max. The dissipation factor should be measured at 20°C with 1±0.1Hz and AC1±0.2V(r.m.s.) max. The dissipation factor should be measured at 20°C with 1±0.1Hz and AC1±0.2V(r.m.s.) max. The dissipation factor should be measured at 20°C with 1±0.1Hz and AC1±0.2V(r.m.s.) max. The capacitance reasurement should be made at each step specified in Table. The capacitor should be made at each step specified in Table. The capacitor should be individually wrapped in at least one but more than two complete layers of cheese-cloth. The capacitor should be subjected to 20 discharges. The interval between successive discharges should be 5. The UAcs should be maintained for 2min after the last discharge. The Capacitance reasurement should be subjected to 20 discharges. The interval between successive discharges should be 5. The UAcs should be maintained for 2min after the last discharge. The capacitor should be 5. The UAcs should be 3. The UAcs should be | | | | | | | | | | foil 😽 | | About 3 to 6 m |
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| container filled with metal balls of about 1mm diameter. Finally, AC4000V (r.m.s.) spicial-resistance spicial-resistance (I.R.) 10 000MΩ min. 10 000MΩ min. 10 10 000MΩ min. 11 The insulation resistance should be measured with DC500±50V within 60±5 s of charging. The votage should be applied to the capacitor through a resistance should be measured at 20°C with ±0.11 Hz and AC1±0.2V(r.m.s.) max. 12 The capacitance should be measured at 20°C with ±0.11 Hz and AC1±0.2V(r.m.s.) max. 12 The dissipation factor should be measured at 20°C with ±10.11 Hz and AC1±0.2V(r.m.s.) max. 13 The dissipation factor should be measured at 20°C with ±10.11 Hz and AC1±0.2V(r.m.s.) max. 14 The dissipation factor should be measured at 20°C with ±10.11 Hz and AC1±0.2V(r.m.s.) max. 15 The capacitance measurement should be made at each step specified in Table. 16 The cheese-cloth should not be on fire. 17 The capacitors should be disdivibulated to the one fire. 18 Active flammability 18 Active flammability 19 The cheese-cloth should not be one fire. 10 The capacitors should be disdivibulated by the distinct of cheese-cloth. The capacitor should be subjected to 20 discharges. The interval between successive discharges should be 5 s. The UAc should be maintained for 2min after the last discharge. 10 The capacitors should be 4 s. The UAc should be maintained for 2min after the last discharge. 11 The capacitors should be 20 s. The UAc should be maintained for 2min after the last discharge. 12 The table. 13 The capacitors should be 4 s. The UAc should be maintained for 2min after the last discharge. 14 The capacitors should be 5 s. The UAc should be maintained for 2min after the last discharge. 15 The capacitor should be 4 s. The UAc should be maintained for 2min after the last discharge. 16 The capacitor should be 4 s. The UAc should be 4 s. The UAc should be 5 s. The | | | | | | | from | each termir | nal. | 00000 | ************************************** | balls |
| diameter. Finally, AC4000V (r.m.s.) -50/60Hz> is applied for 60 s between the capacitor lead wires and metal balls. The insulation resistance should be measured with DC500±50V within 60±5 s of charging. The voltage should be applied to the capacitor through a resistor of 1MΩ. The capacitance should be measured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The dispation factor fold the measured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The dispation factor should be measured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The dispation factor should be measured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The dispation factor should be measured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The dispation factor should be measured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The capacitance measurement should be made at each step specified in Table. Active flammability The cheese-cloth should not be on fire. The capacitor should be individually wrapped in at least one but more than two complete layers of cheese-cloth. The capacitor should be subjected to 20 discharges. The intert he last discharge. The capacitor rule the last discharge. The capacitor rule the last discharge. The capacitor for the last discharge. The capacitor for the last discharge. The capacitor for the last discharge. The capacitor rule the last discharge. | | | | | | | | | | | | |
| Finally, AC4000V (r.m.s.)-S0/60Hzz is applied for 60 s between the capacitor lead wires and metal balls. The insulation Resistance (I.R.) 10000MΩ min. The insulation resistance should be measured with DC500/50V within 60:5 s of charging. The voltage should be applied to the capacitor through a resistor of 1MΩ. The capacitance should be measured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The dissipation Factor should be measured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The dissipation factor should be measured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The dissipation factor should be measured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The dissipation factor should be made at at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The dissipation factor should be made at at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The capacitance measurement should be made at each step specified in Table. The capacitance measurement should be made at each step specified in Table. The capacitors should be individually wrapped in at least one but more than two complete layers of cheese-cloth. The capacitor should be subjected to 20 discharges. The interval between successive discharges should be 5 s. The UAc should be maintained for 2min after the last discharge. The capacitor should be maintained for 2min after the last discharge. The capacitor should be | | | | | | | | | ith metal b | alls of abo | ut 1mm | |
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| balls. The insulation resistance should be measured with DCS00±50V within 60±5 s of charging. The voltage should be after the capacitor through a resistor of 1MΩ. The capacitance should be measured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The dissipation Factor (D.F.) The dissipation Factor should be measured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The dissipation factor should be measured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The dissipation factor should be measured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The dissipation factor should be measured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The dissipation factor should be made at each step specified in Table. The capacitance measurement should be made at each step specified in Table. Active flammability The cheese-cloth should not be on fire. The capacitors should be individually wrapped in at least one but more than two complete layers of cheese-cloth. The capacitor should be subjected to 20 discharges. The interval between successive discharges should be 5 s. The UAc should be maintained for 2min after the last discharge. The capacitor should should be made at each step specified in Table. The capacitors should be individually wrapped in at least one but more than two complete layers of cheese-cloth. The capacitor should be subjected to 20 discharges. The interval between successive discharges should be 5 s. The UAc should be maintained for 2min after the last discharge. The capacitors should be subjected to 20 discharges. The interval between successive discharges should be 5 s. The UAc should be subjected to 20 discharges. The interval between successive discharges should be 5 s. The UAc should be subjected to 20 discharges. The interval between successive discharges should be 5 s. The UAc should be subjected to 20 discharges. The interval between successive discharges should be 5 s. The UAc should be subjected to 20 discharges. The interval between successive discharges should be 5 s. The UAc should b | | | | | | | | | | | | |
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| DCS00±50V within 60±5 s of toAraging. The voltage should be applied to the capacitor through a resistor of 1MΩ. The capacitance should be measured at 20°C with 1±0.14k±2 and AC1±0.2V(c.m.s.) max. The dissipation factor should be measured at 20°C with 1±0.1kk±2 and AC1±0.2V(c.m.s.) max. The dissipation factor should be measured at 20°C with 1±0.1kk±2 and AC1±0.2V(c.m.s.) max. The dissipation factor should be measured at 20°C with 1±0.1kk±2 and AC1±0.2V(c.m.s.) max. The capacitance measurement should be made at each step specified in Table. Char. E. Within ±10 % Char. E. Within ±20°C5% (Temp. range : -25 to +85°C) Step 1 2 3 4 5 Temp. ("C) 20±2 -25±2 20±2 85±2 20±2 B Active flammability The cheese-cloth should not be on fire. The capacitors should be individually wrapped in at least one but more than two complete layers of cheese-cloth. The capacitors should be subjected to 20 discharges. Should be 5 s. The UAc should be maintained for 2min after the last discharge. C1,2 : 1µF±10% C3 : 0.033µF±5% 10kV UAc solved by the complete state of the complete state of 20 discharges. The interval between successive discharges should be 5 s. The UAc should be maintained for 2min after the last discharge. C1,2 : 1µF±10% C3 : 0.033µF±5% 10kV UAc Should be maintained for 2min after the last discharge. C2 : 2apacitor under test F : F. F. See, Rated 10A Ut : Voltage applied to C1 | 4 | Insulation Resistan | nce (I.R.) | 10 000MΩ min | | | | | sistance s | hould be m | neasured w | vith |
| through a resistor of 1MD. The capacitance should be measured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The dissipation factor should be measured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The dissipation factor should be measured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The dissipation factor should be measured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The dissipation factor should be measured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The dissipation factor should be made at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The dissipation factor should be made at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The dissipation factor should be made at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The dissipation factor should be masured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The dissipation factor should be masured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The dissipation factor should be masured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The dissipation factor should be masured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The dissipation factor should be masured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The dissipation factor should be masured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The dissipation factor should be masured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The dissipation factor should be measured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The dissipation factor should be measured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The dissipation factor should be factor should be made at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The dissipation factor should be fac | | | • | | | | | | | | , | |
| The capacitance should be measured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. The dissipation Factor (D.F.) | | | | | | | | | | ied to the c | apacitor | |
| 1±0.1kHz and AC1±0.2V(rm.s.) max. The dissipation factor should be measured at 20°C with 1±0.1kHz and AC1±0.2V(rm.s.) max. | _ | O-n-n-it- | | \\/:\\\:\\\\:\\\\\\\\\\\\\\\\\\\\\\\\\ | | | | | | | -+ 0000 | .:41- |
| The dissipation factor should be measured at 20°C with 1±0.1kHz and AC1±0.2V(r.m.s.) max. Temperature characteristic Char. St.: +350 to -1000 ppm/°C (Temp. range: +20 to +85°C) Char. B: Within ±10 % Char. E: Within ±10 % Char. E: Within ±20/55% (Temp. range: -25 to +85°C) Step 1 2 3 4 5 Temp.(°C) 20±2 -25±2 20±2 85±2 20±2 Active flammability The cheese-cloth should not be on fire. The capacitors should be individually wrapped in at least one but more than two complete layers of cheese-cloth. The capacitor should be subjected to 20 discharges. The interval between successive discharges should be 5 s. The UAC should be maintained for 2min after the last discharge. C1,2 : 1µF±10%, C3: 0.033µF±5% 10kV L1 to L4: 1.5mH±20%, 16A Rod core choke R: 100/±2%, C1: 3µF±5% 10kV UAC: UR±5% UR: Rated voltage Cx: Capacitor under test F: F: Fuse, Rated 10A Ut: Voltage applied to Ct | 5 | Capacitance | | vv itnin specifie | ea tolerance. | | | | | | | vitn |
| Temperature characteristic Char. SL: +350 to -1000 ppm/°C (Temp. range: +20 to +85°C) Char. B. Within ±10% Char. E: Within ±20/-55% (Temp. range: -25 to +85°C) Step Temp.(°C) The capacitors should be individually wrapped in at least one but more than two complete layers of cheese-cloth. The capacitor should be 5 s. The UAc should be maintained for 2min after the last discharge. C1,2: 1µF±10%, C3: 0.033µF±5% 10kV L1 to L4: 1.5mH±20% 16A Rod core choke R: 100;12%, C1: 3µF±5% 10kV UAc: UR ±5% UR; Rated voltage Cx: Capacitor under test F: Fuse, Rated 10A Ut: Voltage applied to Ct Ux | 6 | Dissipation Factor | (D.F.) | 2.5% max. | | | | | | | | |
| Temperature characteristic Char. SL: +350 to -1000 ppm/°C (Temp. range: +20 to +85°C) Char. B: Within ±10 % Char. E: Within ±10 % Char. E: Within ±20-55% (Temp. range: -25 to +85°C) Step | 5 | biooipation ractor (b.r.) | | 2.3% IIIdX. | | | | • | | | | ax |
| Cemp. range : +20 to +85°C Char. B : Within ±10 % Char. E : Within ±20/-55% (Temp. range : -25 to +85°C) | | | | | | | | | | | | |
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| Char. E: Within +20/-55% (Temp. range: -25 to +85°C) Step 1 2 3 4 5 Temp.(°C) 20±2 -25±2 20±2 85±2 20±2 8 Active flammability The cheese-cloth should not be on fire. The capacitors should be individually wrapped in at least one but more than two complete layers of cheese-cloth. The capacitor should be subjected to 20 discharges. The interval between successive discharges should be 5. The UAc should be maintained for 2min after the last discharge. C1,2 : 1µF±10%, C3: 0.033µF±5% 10kV L1 to L4: 1.5mH±20% 16A Rod core choke R: 1002±2%, C1: 3µF±5% 10kV UAc: UR: 5% UR: Rated voltage Cx: Capacitor under test F: Fuse, Rated 10A Ut: Voltage applied to Ct Ux SkV | | | | | | | each step specified in Table. | | | | | |
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| Step 1 2 3 4 5 Temp.(°C) 20±2 -25±2 20±2 85±2 20±2 The cheese-cloth should not be on fire. The cheese-cloth should not be on fire. The capacitors should be individually wrapped in at least one but more than two complete layers of cheese-cloth. The capacitor should be subjected to 20 discharges. The interval between successive discharges should be 5 s. The UAc should be maintained for 2min after the last discharge. C1,2 : 1µF±10%, C3: 0.033µF±5% 10kV L1 to L4: 1.5mH±20% 16A Rod core choke R: 100Ω±2%, C1: 3µF±5% 10kV UAc: UR ±5% UR: Rated voltage Cx: Capacitor under test F: Fuse, Rated 10A Ut: Voltage applied to Ct Ux | | | | | | | | | | | | |
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| The cheese-cloth should not be on fire. The capacitors should be individually wrapped in at least one but more than two complete layers of cheese-cloth. The capacitor should be subjected to 20 discharges. The interval between successive discharges should be 15 s. The UAc should be maintained for 2min after the last discharge. C1,2 : 1μF±10%, C3:0.033μF±5% 10kV L1 to L4:1.5mH±20% 16A Rod core choke R:100Ω±2%, C1:3μF±5% 10kV UAc: UR ±5% UR: Rated voltage Cx: Capacitor under test F: Fuse, Rated 10A Ut: Voltage applied to Ct | | | | | Step | | 1 2 3 4 | | 4 | 5 | | |
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| UAC : UR ±5% UR : Rated voltage Cx : Capacitor under test F : Fuse, Rated 10A Ut : Voltage applied to Ct | | | | | | | | | | | | |
| Cx : Capacitor under test F : Fuse, Rated 10A Ut : Voltage applied to Ct | | | | | | | | | | | | |
| Ut : Voltage applied to Ct | | | | | | | | : Capac | itor under t | | - | |
| Ux 5kV | | | | | | | | | | | | |
| 5kV T | | | | | | | Ut | : Voltag | e applied to | o Ct | | |
| 5kV T | | | | | | | | no l | | | | |
| 5kV time | | | | | | | | UX | | | | |
| time | | | | | | | | | 5kV ∬ | | | |
| time | | | | | | | | | | \sim | | |
| time | | | | | | | | | - - | _ | | |
| time | | | | | | | | | | | | |
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|---------|----------------------------|------------------------|---|--|
| No. | Item | | Specification | Test method |
| 9 | Robustness of terminations | Tensile | Lead wire should not cut off. Capacitor should not be broken. | Fix the body of capacitor, a tensile weight gradually to each lead wire in the radial direction of capacitor up to 10N and keep it for 10±1 s. |
| | | Bending | | With the termination in its normal position, the capacitor is held by its body in such a manner that the axis of the termination is vertical; a mass applying a force of 5N is then suspended from the end of the termination. The body of the capacitor is then inclined, within a period of 2 to 3 s, through an angle of approximately 90° in the vertical plane and then returned to its initial position over the same period of time; this operation constitutes one bend. One bend immediately followed by a second bend in the opposite direction. |
| 10 | Vibration | Appearance | No marked defect. | The capacitor should be firmly soldered to the |
| | resistance | Capacitance D.F. | Within the specified tolerance. 2.5% max. | supporting lead wire and vibration which is 10 to 55Hz in the vibration frequency range,1.5mm in total amplitude, and about 1 min in the rate of vibration change from 10Hz to 55Hz and back to |
| | | | | 10Hz is applied for a total of 6 h; 2 h each in 3 mutually perpendicular directions. |
| 11 | Solderability of leads | | Lead wire should be soldered With uniformly coated on the axial direction over 3/4 of the circumferential direction. | The lead wire of a capacitor should be dipped into a ethanol solution of 25wt% rosin and then into molten solder for 2±0.5 s. In both cases the depth of dipping is up to about 1.5 to 2.0mm from the root of |
| | | | | lead wires. Temp. of solder: 245±5°C Lead Free Solder (Sn-3Ag-0.5Cu) |
| 12 | Soldering effect | Appearance | No marked defect. | Solder temperature: 350±10°C or 260±5°C |
| | (Non-preheat) | Capacitance change | Within ±10% | Immersion time : 3.5±0.5 s (In case of 260±5°C : 10±1 s) |
| | | I.R. Dielectric | 1 000M Ω min. Per item 3 | The depth of immersion is up to about 1.5 to 2.0mm from the root of lead wires. |
| | | strength | | Pre-treatment: Capacitor should be stored at 125±2°C for 1 h, and apply the AC4000V(r.m.s.) 60s then placed at *¹room condition for 24±2 h before initial measurements. (Do not apply to Char. SL) |
| | | | | Post-treatment: Capacitor should be stored for 1 to 2 h at *1 room condition. |
| 13 | Soldering effect | Appearance | No marked defect. | First the capacitor should be stored at 120+0/-5°C |
| | (On-preheat) | Capacitance | Within ±10% | for 60+0/-5 s. |
| | | change I.R. | 1000MΩ min. | Then, as in figure, the lead wires should be immersed solder of 260+0/-5°C up to 1.5 to 2.0mm from |
| | | Dielectric strength | Per item 3 | the root of terminal for 7.5+0/-1 s. |
| | | | | insulating 1.5 to 2.0mm Molten solder |
| | | | | Pre-treatment: Capacitor should be stored at 125±2°C for 1 h, and apply the AC4000V(r.m.s.) 60s then placed at *1room condition for 24±2 h before initial measurements. (Do not apply to Char. SL) |
| *1 "roo | om condition" Tempera | ture: 15 to 35°C, | Relative humidity: 45 to 75%, Atmos | Post-treatment: Capacitor should be stored for 1 to 2 h at *1room condition. pheric pressure: 86 to 106kPa |

| No. | lton | 1 | 0 | nacification | | | Test method | | |
|-------------------------|----------------------|-------------------|--|---------------------------------|-----|--|--|--|--|
| No. Item 14 Flame test | | 11 | Specification The capacitor flame discontinue | | | The capacitor should be subjected to applied flam | | | |
| 14 | Tiane test | | as follows. | | nue | | n removed for 15 s until 5 cycle. | | |
| | | | | Time | | | Capacitor | | |
| | | | Cycle 1 to 4 | 30 s max. | | | | | |
| | | | 5 | 60 s max. | | | /\forall \forall \fora | | |
| | | | | 00 3 max. |] | 8 | Gas Burner | | |
| 15 | Passive flammability | у | | time should not | be | The capacitor un | der test should be held in the flame | | |
| | | | | e time 30 s. aper should not | | | nich best promotes burning. e to flame is for 30 s. | | |
| | | | ignite. | | | Lenath | of flame : 12±1mm | | |
| | | | | | | | urner : Length 35mm min. | | |
| | | | | | | | Inside Dia. 0.5±0.1mm | | |
| | | | | | | | Outside Dia. 0.9mm max. | | |
| | | | | | | Gas : E | Butane gas Purity 95% min. | | |
| | | | | | | About 8mm Capacitor | | | |
| | | | | | | Gas burner - | Flame | | |
| | | | | | | 200±5mm | | | |
| | | | | | | | | | |
| | | | | | | | Tissue | | |
| | | | | | | Abo | ut 10mm thick board | | |
| 16 | Humidity | Appearance | No marked o | lefect. | | Set the capacitor | for 500±12 h at 40±2°C in 90 to | | |
| | (Under steady | Capacitance | Char. SL: Within ±5% | | | 95% relative hum | nidity. | | |
| | state) | change | | Char. B: Within ±10% | | 5 | 0 1 11 11 1 | | |
| | | D.F. | Char. E : W | | | Pre-treatment: | Capacitor should be stored at 125±2°C for 1 h, and apply the | | |
| | | D.F. | Char. SL : 2 Char. B, E : | | | | AC4000V(r.m.s.) 60s then placed at *1room condition for 24±2 h | | |
| | | I.R. | 3000MΩ mi | n. | | | before initial measurements. | | |
| | | Dielectric | Per item 3 | | | | (Do not apply to Char. SL) | | |
| | | strength | | | | Post-treatment : | | | |
| 17 | Humidity loading | Appearance | No marked o | | | | m.s.) for 500±12 h at 40±2°C in | | |
| | | Capacitance | Char. SL : W | | | 90 to 95% relative | e humidity. | | |
| | | change | Char. B: W | | | Des territories | One as it as about the atoms to | | |
| | | 5.5 | Char. E : W | | | Pre-treatment: | Capacitor should be stored at | | |
| | | D.F. | Char. SL : 2 Char. B, E : | | | | 125±2°C for 1 h, and apply the AC4000V(r.m.s.) 60s then placed at | | |
| | | I.R. | - | | | | *1room condition for 24±2 h | | |
| | Dielectric strength | | 3000MΩ min. Per item 3 | | | | before initial measurements. | | |
| | | | | | | | (Do not apply to Char. SL) | | |
| | | | | | | Post-treatment: Capacitor should be stored for 2 h at *1 room condition. | | | |
| | | ature: 15 to 35°C | 1 | | | | | | |

| No. 18 | Life | Appearance Capacitance | Specification No marked defect. | | pulse v | | nethod | | | |
|-----------|----------------------|---------------------------|--|--|--|---|--------------------|--------------------|--|--|
| | - | | | | 1 | | | | | |
| | | Capacitatice | Within ±20% | Ea | ach indiv | vidual capacitor sl | hould be su | biected to a | | |
| | | change | VVIIII1 ±20 /0 | | Each individual capacitor should be subjected to a 8kV impulses for three times. Then the capacitors | | | | | |
| | | I.R. | 3000MΩ min. | | | d to life test. | | · | | |
| | | Dielectric | Per item 3 | | • • • | | | | | |
| | | strength | | | 100 | %) F | Front time (T1) = | 1.7 μ s=1.67T | | |
| | | ou or igur | | | 90- | | Time to half-value | $e(T2) = 50 \mu s$ | | |
| | | | | | 50 - 30 - | | _ | | | |
| | | | | | 0307 | | | | | |
| | | | | | L | <u>'T1'</u> | • | | | |
| | | | | | ļ | T2 | | | | |
| | | | | | | | | | | |
| | | | | | | citors are placed i | n a circulati | ng air oven | | |
| | | | | | | od of 1000 h. | | | | |
| | | | | | | the oven is maint | | | | |
| | | | | | | -0 °C, and relative | | | | |
| | | | | | | ut the test, the ca 0V(r.m.s.)<50/60 | | | | |
| | | | | | | requency, except | | | | |
| | | | | | | e is increased to | | | | |
| | | | | | | 2 .3 34004 107 | | | | |
| | | | | Pr | e-treatn | nent : Capacito | r should be | stored at | | |
| | | | | | | 125±2°C | for 1 h, and | d apply the | | |
| | | | | | | AC4000' | V(r.m.s.) 60 | s then placed a | | |
| | | | | | | *1room c | ondition for | 24±2 h | | |
| | | | | | | before in | itial measur | ements. | | |
| | | | | | | | apply to Cha | | | |
| | | | | Post-treatment: Capacitor should be stored for | | | | | | |
| | | | | | | | *1room con | | | |
| 19 | Temperature and | Appearance | No marked defect. | | | citor should be su | | | | |
| | immersion cycle | Capacitance | Char. SL: Within ±5% | СУ | cies, the | en consecutively | to 2 immers | ion cycles. | | |
| | | change | Char. B: Within ±10% Char. E: Within ±20% | _T | Temnera | ture cycle> | | | | |
| | | D.F. | Char. SL : 2.5% max. | `' | Ste | | ature(°C) | Time | | |
| | | D.1. | Char. B, E : 5.0% max. | | 1 | | -0/-3 | 30 min | | |
| | | I D | | | 2 | | temp. | 3 min | | |
| | | I.R. | 3000MΩ min. | | 3 | | +3/-0 | 30 min | | |
| | | Dielectric strength | Per item 3 | | 4 | | temp. | 3 min | | |
| | | Strength | | | | | • | | | |
| | | | | رار | mmorci | on cycle> | Cycle tim | e:5 cycles | | |
| | | | | | | • | | Immersion | | |
| | | | | ; | Step | Temperature(°C) | Time | water | | |
| | | | | | | | | Clean | | |
| | | | | | 1 | +65+5/-0 | 15 min | water | | |
| | | | | | _ | 0.0 | 45 | Salt | | |
| | | | | | 2 | 0 <u>±</u> 3 | 15 min | water | | |
| | | | | | | | Cycle tim | e:2 cycles | | |
| | | | | | | | -,5.0 | , | | |
| | | | | Pr | e-treatn | nent : Capacito | r should be | stored at | | |
| | | | | | 125±2°C for 1 h, and apply the | | | | | |
| | | | | | | AC4000' | V(r.m.s.) 60 | s then placed a | | |
| | | | | | | | ondition for | | | |
| | | | | | | | itial measur | | | |
| | | | | | | | apply to Cha | | | |
| | | | | Po | ost-treat | | r should be | | | |
| | | | | | | 24±2 h a | at *1room co | | | |
| | | | | | | 00 t- 400l D | | | | |
| ¹ "roc | om condition" Temper | ature: 15 to 35°C | Relative humidity: 45 to 75%, A | atmospneri | c press | ure: 86 to 106KPa | a . | | | |

6. Packing specification

•Bulk type (Packing style code : B)

The size of packing case and packing way

Partition
Partition

270 max.

Unit: mm

The number of packing = *1 Packing quantity \times *2 n

*1 : Please refer to [Part number list].

*2 : Standard n = 20 (bag)

Note)

The outer package and the number of outer packing be changed by the order getting amount.

7. Standard of Outgoing Inspection

Please refer to Appendix: "OUTGOING INSPECTION STANDARD FOR Safety Certified Ceramic Capacitors/ High Voltage Ceramic Capacitors "(SKMKE01).



SKMKE01K

OUTGOING INSPECTION STANDARD FOR Safety Certified Ceramic Capacitors/High Voltage Ceramic Capacitors

Inspection Method: Based on ISO2859—1 Normal Inspection Single Sampling Plan.

The meaning of AQL 0.25n is that if rejected unit is more than or equal to one at sample size of AQL 0.25(%), the whole lot will be rejected.

Inspection Lot : Outgoing inspection is carried out by the Quality Control Section of the production factory for all production lots after sorting in the manufacturing process.

Performed for every mfg. lot.

| NO. | Inspection Item | Sampling | |
|-----|--------------------------|----------|----------------|
| | | Level | AQL |
| 1. | Appearance | П | Critical 0.25n |
| | | П | Major 0.25% |
| | | П | Minor 2.5% |
| 2. | Dimension | S-3 | 0.65% |
| 3. | Capacitance | П | 0.25n |
| 4. | DF/Q | П | 0.25% |
| 5. | Withstanding voltage | П | 0.04n |
| 6. | Insulation Resistance | П | 0.04n |

Capacitor Division
Quality Assurance Dept 2.
Quality Assurance Section 1.
IZUMO MURATA MFG. CO., LTD