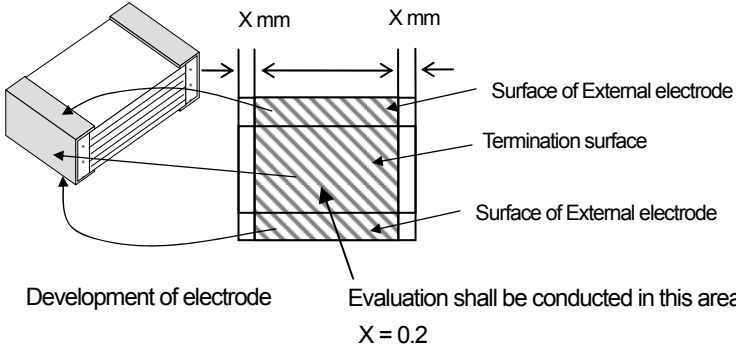


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1. SCOPE	This specification covers the requirement for metallized polyphenylene sulfide dielectric fixed chip capacitor for use in electronic equipments.		
2. PRODUCT NAME	Plastic film chip capacitor Type ECHU(X)		
3. PRODUCT RANGE	Operating temperature range	-55°C to 125°C	[Including temperature-rise on element surface]
	Rated voltage	50VDC (1H)	[For temperature between +105°C to +125°C, 0.12μF to 0.22μF decrease rated voltage. (see Fig. 1)]
	Capacitance range	0.047μF to 0.22μF	
	Capacitance tolerance	±2% (G), ±5% (J)	
4. CONDITIONAL STANDARD TEST	The test shall be conducted at temperature from 15°C to 35°C, relative humidity from 45% to 75% (standard test conditions). However the test shall be conducted at temperature of 20°C ±2°C, relative humidity of 65% ±5% (strict test conditions), when doubt is entertained about judgment .		
5. SOLDERING METHOD	Reflow method only		
6. CONSTRUCTION	The capacitor has a non-inductive construction, stacked with one side metallized polyphenylene sulfide film. The capacitor has outer electrode on both sides. <div style="text-align: center; margin-top: 10px;"> </div>		
7. DIMENSIONS	As specified in the individual drawing.		
8. APPEARANCE	1. Capacitor shall be perfect without cut or turned up film. 2. Plating of outer electrode shall be perfect without defect or rust that matters practical use.		

9. CHARACTER			
No.	Item	Performance	Test Method
1.	Dielectric Withstand Voltage	Between terminals: Nothing abnormal shall be found, when applied a voltage of 150% of the rated voltage for 1 min. However self-healing is not abnormal. (The capacitor shall be applied the voltage through more than 2 kΩ when charge and discharge.)	JIS C 5102-1994 7.1 IEC 384-1-1982 4.6
2.	Insulation Resistance	Between terminals : 3000 MΩ or more When the reading of measuring instrument becomes steady at a value after applying a voltage of DC 50 V ±1.5 V for 1 min ±5 s, at 20°C ±2°C (1H).	JIS C 5102-1994 7.6 IEC 384-1-1982 4.5

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No.	Item	Performance	Test Method
3.	Capacitance	Within a range of specified value. (Measured at a frequency of 1 kHz \pm 0.2 kHz, at 20°C \pm 2°C and with voltage of 5 Vrms or less.)	JIS C 5102-1994 7.8 IEC 384-1-1982
4.	Dissipation Factor	0.6% or less (Measured at a frequency of 1 kHz \pm 0.2 kHz, at 20°C \pm 2°C and with voltage of 5 Vrms or less.)	JIS C 5102-1994 7.9 IEC 384-1-1982 4.8
5.	Connection	The connection of the element shall not open even instantaneously when applied a voltage of 100 mV peak or less and applied light force.	JIS C 5102-1994 7.10 IEC 384-1-1982
6.	Vibration Resistance	The capacitor shall be mounted on the PCB (Printed Circuit Board), and the following vibration shall be applied to the capacitor. Range of vibration frequency 10 Hz to 55 Hz total amplitude 1.5 mm, rate of frequency vibration to be such as varying from 10 Hz to 55 Hz and return to 10 Hz in about 1 min and thus repeated. Thus shall be conducted for a period of 2 hours in each 3 mutually perpendicular directions (total of 6 hours). The connection shall not get short-circuit or open when examined the connection of the element in compliance with the previous item (connection of element) during the last 30 min of the test.	JIS C 5102-1994 8.2.3.(A) IEC 384-1-1982 4.17
7.	Soldering Property	The terminal shall be immersed in methanol solution of resin (about 25%) and the terminal shall be immersed in the solder bath at a temperature of 255°C \pm 5°C for 2.5 s \pm 0.5 s. After test immersion, the solder shall be stuck to 90% or more in the surface of the electrode that shown in blew development. Solder in the solder tank is Sn-Ag-Cu. <div style="text-align: center;">  </div> It is 100% in soldering on the terminal surface, and the net multiplication parts in the above-mentioned electrode development chart.	JIS C 5102-1994 8.4 IEC 384-1-1982 4.15

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No.	Item	Performance	Test Method
8.	Moisture Resistance (I)	<p>The capacitor under test shall be kept at condition of the temperature 40°C ±2°C and the humidity at 90%RH to 95%RH for 1000 hours +48/ -0 hours in the testing oven and then kept at ordinary condition (ordinary temperature and humidity) for 1.5 hours ±0.5 hours. After the test, the capacitor shall be satisfied with the following performance.</p> <p>Appearance : No remarkable change.</p> <p>Dielectric Withstand Voltage : Between terminals Nothing abnormal shall be found, when applied a voltage of 130% of the rated voltage for 1 min (the capacitor shall be applied the voltage through 2 kΩ or more when charge and discharge).</p> <p>Insulation Resistance : Between terminals 1000 MΩ or more</p> <p>Change rate of capacitance : Within ±2% of the value before the test.</p> <p>Dissipation Factor: 0.9% or less (at 1 kHz)</p>	<p>JIS C 5102-1994 9.5 IEC 384-1-1982 4.22</p>
9.	Moisture Resistance (II)	<p>The capacitor under test shall be kept at condition of the temperature 60°C ±2°C and the humidity at 90%RH to 95%RH for 500 +24/ -0 hours in the testing oven and then kept at ordinary condition for 1.5 hours ±0.5 hours. After the test, the capacitor shall be satisfied with the following performance.</p> <p>Appearance : No remarkable change.</p> <p>Dielectric Withstand Voltage : Between terminals Nothing abnormal shall be found, when applied a voltage of 130% of the rated voltage for 1 min (the capacitor shall be applied the voltage through more than 2 kΩ when charge and discharge).</p> <p>Insulation Resistance : Between terminals 500 MΩ or more</p> <p>Change rate of capacitance : Within ±2% of the value before the test.</p> <p>Dissipation Factor : 0.9% or less (at 1 kHz)</p>	<p>JIS C 5102-1994 9.5 IEC 384-1-1982 4.22</p>

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No.	Item	Performance	Test Method
10.	Moisture Resistance Loading (I)	<p>The capacitor under test shall be kept at condition of the temperature 40°C ±2°C and the humidity at 90%RH to 95%RH with applying the rated voltage continuously for 1000 hours +48/ -0 hours in the testing oven and then kept at ordinary condition for 1.5 hours ±0.5 hours.</p> <p>After the test, the capacitor shall be satisfied with the following performance.</p> <p>Appearance : No remarkable change.</p> <p>Dielectric Withstand Voltage : Between terminals Nothing abnormal shall be found, when applied a voltage of 130% of the rated voltage for 1 min (the capacitor shall be applied the voltage through more than 2 kΩ when charge and discharge).</p> <p>Insulation Resistance : Between terminals 1000 MΩ or more</p> <p>Change rate of capacitance : Within ±2% of the value before the test.</p> <p>Dissipation Factor : 0.9% or less (at 1 kHz)</p>	JIS C 5102-1994 9.9
11.	Moisture Resistance Loading (II)	<p>The capacitor under test shall be kept at condition of the temperature 60°C ±2°C and the humidity at 90%RH to 95%RH with applying the rated voltage continuously for 500 hours +24/ -0 hours in the testing oven and then kept at ordinary condition for 1.5 hours ±0.5 hours.</p> <p>After the test, the capacitor shall be satisfied with the following performance.</p> <p>Appearance : No remarkable change.</p> <p>Dielectric Withstand Voltage : Between terminals Nothing abnormal shall be found, when applied a voltage of 130% of the rated voltage for 1 min (the capacitor shall be applied the voltage through more than 2 kΩ when charge and discharge).</p> <p>Insulation Resistance : Between terminals 500 MΩ or more</p> <p>Change rate of capacitance : Within ±2% of the value before the test.</p> <p>Dissipation Factor : 0.9% or less (at 1 kHz)</p>	JIS C 5102-1994 9.9

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No.	Item	Performance	Test Method
12.	Moisture Resistance Loading (III)	<p>The capacitor under test shall be kept at condition of the temperature 85°C ±2°C and the humidity at 85%RH +2/ -5%RH with applying the rated voltage continuously for 500 hours +24/ -0 hours in the testing oven and then kept at ordinary condition for 1.5 hours ±0.5 hours. After the test, the capacitor shall be satisfied with the following performance.</p> <p>Appearance : No remarkable change.</p> <p>Dielectric Withstand Voltage : Between terminals Nothing abnormal shall be found, when applied the rate voltage for 1 min (the capacitor shall be applied the voltage through more than 2 kΩ when charge and discharge).</p> <p>Insulation Resistance : Between terminals 10 MΩ or more</p> <p>Change rate of capacitance : Within ±10% of the value before the test.</p> <p>Dissipation Factor : 1.2% or less (at 1 kHz)</p>	JIS C 5102-1994 9.9
13.	High Temperature Loading	<p>The capacitor under test shall be kept at condition of the temperature 125°C ±2°C with applying a voltage of 125% of the rated voltage through a series-connected resistor of from 20 Ω to 1000 Ω per 1 V continuously for 1000 hours +48/ -0 hours in the testing oven and then let alone until the capacitor reaches the heat equilibrium with ordinary condition. After the test, the capacitor shall be satisfied with the following performance.</p> <p>Appearance : No remarkable change.</p> <p>Insulation Resistance : Between terminals 1000 MΩ or more</p> <p>Change rate of capacitance : Within ±2% of the value before the test.</p> <p>Dissipation Factor : 0.66% or less (at 1 kHz)</p>	JIS C 5102-1994 9.10
14.	Heat Resistance	<p>The capacitor under test shall be kept at condition of the temperature at 125°C ±2°C for 2 hours +1/ -0 hour in the testing oven. After the test, the capacitor shall be satisfied with the following performance.</p> <p>Insulation Resistance : Between terminals 100 MΩ or more</p> <p>Change rate of capacitance : Within +3%/ -2% of the value before the test.</p>	JIS C 5102-1994 9.2 IEC 384-1-1982 4.21.2

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No.	Item	Performance	Test Method
15.	Cold Resistance	<p>The capacitor under test shall be kept at condition of the temperature at $-55^{\circ}\text{C} \pm 3^{\circ}\text{C}$ for 2 hours +1/ -0 hour in the testing oven.</p> <p>After the test, the capacitor shall be satisfied with the following performance.</p> <p>Change rate of capacitance : Within $\pm 2\%$ of the value before the test.</p>	<p>JIS C 5102-1994 9.1 IEC 384-1-1982 4.21.4</p>
16.	Soldering Heat Resistance	<p>1. Reflow method Test condition of the reflow oven shall be adjusted that maximum temperature of the capacitor surface shall be $260^{\circ}\text{C} \pm 3^{\circ}\text{C}$ (see Fig.2). After the test, the capacitor shall be let alone at ordinary temperature and humidity for 1hour ± 0.5 hours. After this, the capacitor shall be satisfied with the following performance.</p> <p>2. Soldering iron method The soldering iron of a 30-watt shall be used and the temperature of the soldering iron shall be adjusted at $260^{\circ}\text{C} \pm 10^{\circ}\text{C}$. The soldering iron together with a solder wire of 1mm diameter shall be put to each outer electrode of the capacitor for 3.5 s ± 0.5 s. After this, the capacitor shall be satisfied with the following performance.</p> <p>Appearance : No remarkable change.</p> <p>Dielectric Withstand Voltage : Between terminals Nothing abnormal shall be found, when applied a voltage of 150% of the rated voltage for 1 min. (The capacitor shall be applied the voltage through 2 kΩ or more when charge and discharge.)</p> <p>Insulation Resistance : Between terminals 1000 MΩ or more</p> <p>Change rate of capacitance : Within $\pm 3\%$ of the value before the test.</p> <p>Dissipation Factor : 0.66% or less (at 1 kHz)</p> <p>Connection : Stable</p>	

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No.	Item	Performance	Test method
17.	Temperature Cycle	<p>The capacitor under the test shall be put in the testing oven and kept at condition of the temperature of $-55^{\circ}\text{C} \pm 3^{\circ}\text{C}$ for 30 min ± 3 min and then kept at the ordinary temperature for 3 min or less.</p> <p>After this, the capacitor under the test shall be kept at condition of the temperature of $125^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for 30 min ± 3 min and then kept at the ordinary temperature for 3 min or less.</p> <p>These two operations shall be counted as 1 cycle, and it shall be repeated for 5 cycles successively.</p> <p>After the test, the capacitor shall be kept at the ordinary condition for 1.5 hours ± 0.5 hours, and shall be satisfied with the following performance.</p> <p>Appearance : No remarkable change.</p> <p>Insulation Resistance : Between terminals 1000 MΩ or more</p> <p>Change rate of capacitance : Within $\pm 2\%$ of the value before the test.</p> <p>Dissipation Factor : 0.66% or less (at 1 kHz)</p>	JIS C 5102-1994 9.3
18.	dV/dt	<p>Permissible current to pulse current.</p> <p>The pulse permissible current is generally obtained by the product of dV/dt (V/μs) value and capacitance (μF).</p> <p style="text-align: center;">$I = C \cdot dV/dt$</p> <p>However, number of repetitions is 10,000 cycles or less.</p> <p>Make sure the rms current is within the permissible value. (See Tab.1)</p> <p>Insulation resistance : Between terminals 500MΩ or more</p> <p>Change rate of capacitance : Within $\pm 2\%$ of the value before the test.</p> <p>Dissipation factor : 0.8% or less (at 1kHz)</p>	

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No.	Item	Performance	Test method
19.	High temperature high frequency loading	<p>The capacitor under test shall be applied a current and rated voltage of 110% of allowable current specified in Fig.3 showed as below, for 1000hours +48/ -0hours in the testing oven and kept at condition of the temperature at 125°C ±3°C and then shall be let alone at ordinary condition for 1.5hours ±0.5hours. After the test, the capacitor shall be satisfied with the following performance.</p> <p>Appearance : No remarkable change.</p> <p>Insulation resistance : Between terminals 1000MΩ or more</p> <p>Change rate of capacitance : Within ±2% of the value before the test.</p> <p>Dissipation factor : 0.66% or less (at 1kHz)</p>	
20.	Moisture Resistant high Frequency loading	<p>The capacitor under test shall be applied a current of allowable current specified in Fig.3 showed as below, for 1000hours +48/ -0hours in the testing oven and kept at condition of the temperature at 40°C ±2°C and the humidity at 90% to 95% and then shall be let alone at ordinary condition for 1.5hours ±0.5hours. After the test, the capacitor shall be satisfied with the following performance.</p> <p>Appearance : No remarkable change.</p> <p>Withstand voltage : Between terminals Nothing abnormal shall be found, when applied a voltage of 130% of the rated voltage for 1 minute. (The capacitor shall be applied the voltage through more than 2kΩ when charge or discharge.)</p> <p>Insulation resistance : Between terminals 1000MΩ or more</p> <p>Change rate of capacitance : Within ±2% of the value before the test.</p> <p>Dissipation factor : 0.9% or less (at 1kHz)</p>	

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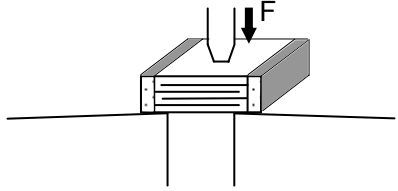
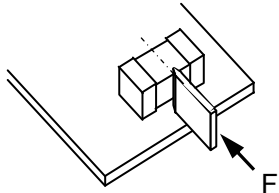
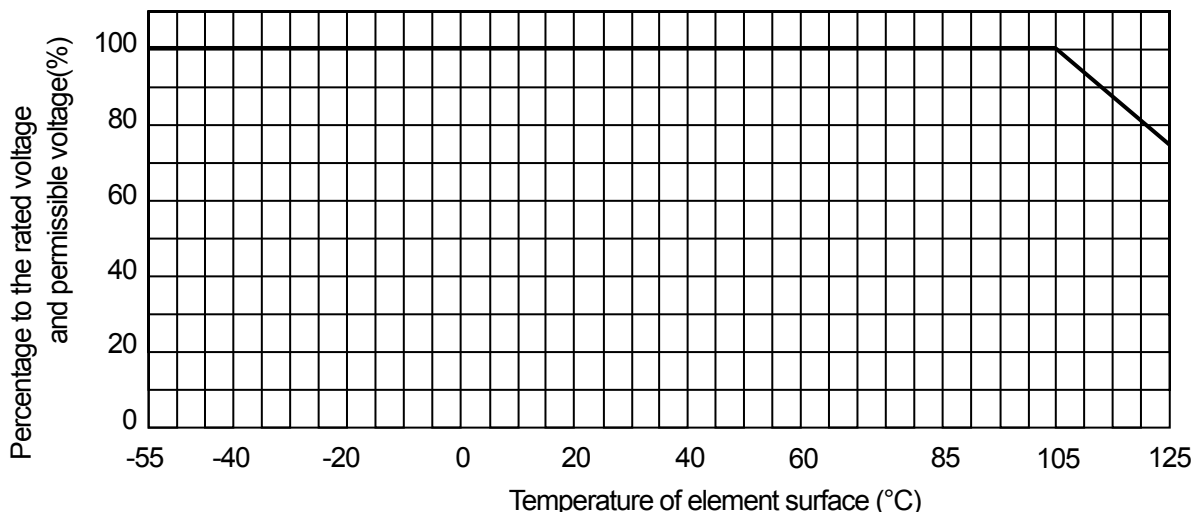
No.	Item	Performance	Test method
21.	Robustness of Capacitor body	The equipment shall permit pressurizing. Apply a force to the center of specimen, using a pressurizing jig as shown in the drawing, for 10 s. The force shall be 5 N. <div style="text-align: center;">  </div> Appearance : No remarkable change.	JIS C 5102-1994 8.12
22.	Adhesive Strength	Mount the specimen to the testing PCB. Examine the appearance of specimen with a magnifying glass of 10 magnifications. As shown in below, apply the pressurizing jig to the center in the longitudinal direction of specimen. Apply a force to the pressurizing jig gradually in the horizontal direction with the testing PCB. The pressure shall be 5N, and the holding duration for 10 s ± 1 s. After the test, use a magnifying glass of 10 magnifications, and check for cracks of soldering position. <div style="text-align: center;">  </div> Appearance : No remarkable change.	JIS C 5102-1994 8.11.2
23.	Resistance of Board to bending	The bending stroke shall be 1 mm. Pressurizing shall be carried out at the rate of 1 mm/s. After reaching the specified bending, keep it for 5 s. After the test, no breaking of the terminal shall be found.	JIS C 5102-1994 8.11.1

Fig.1 Delating of rated voltage, permissible voltage and permissible current to operating temperature

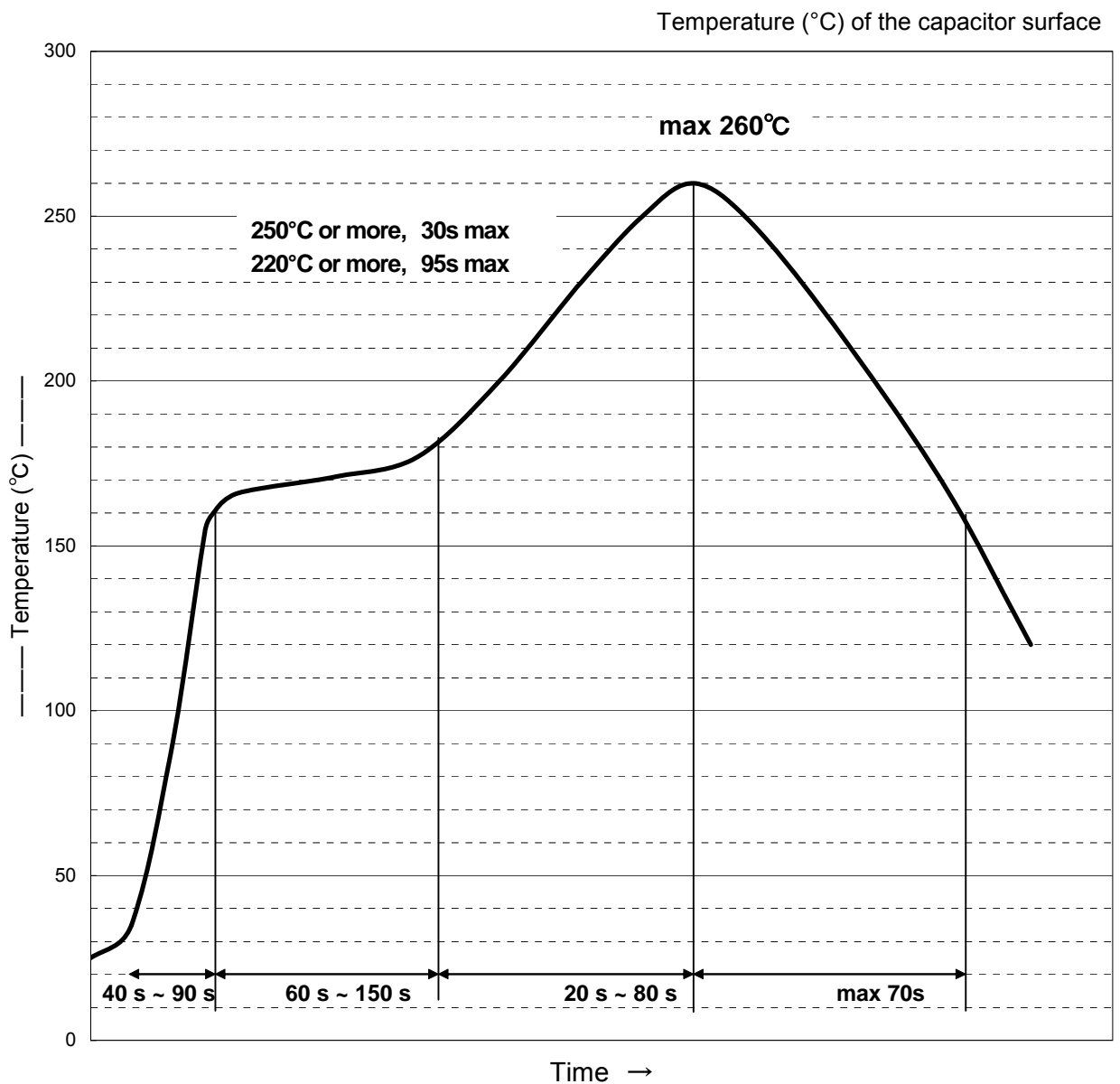
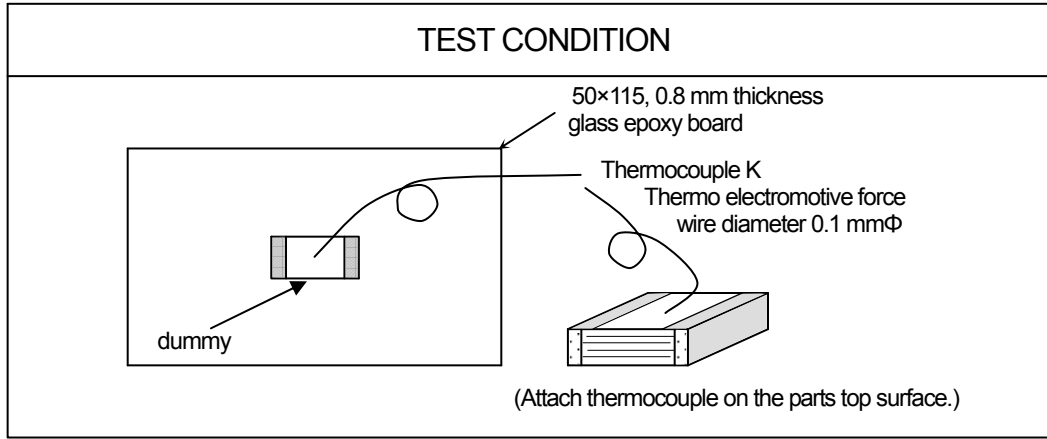


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Fig.2 Standard surface temperature curve of the capacitor for reflow method.
 Please confirm the test of the reflow method within the range of the under mentioned profile.
 (The guarantee temperature and time are numerical values of the bold-faced type in the profile.)



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10. Caution about safety in use

I. Operating range (voltage, current, operating temperature)

Use the capacitor within the specified limits listed below (a to d). Over rated conditions might cause deterioration, damage, smoke and fire. Do not use capacitor beyond range of the condition.

a) Permissible voltage

- DC rated voltage of this product is 50V. Use the capacitor within DC rated voltage.
- When used beyond 105°C at temperature of capacitor surface for 0.12μF to 0.22μF, be in accordance with Fig.1.
- When used in AC applied circuit, less than 30Vrms should be applied.

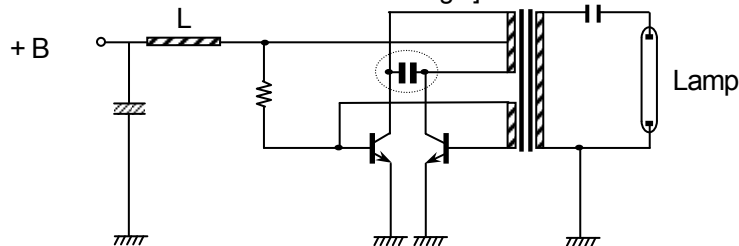
When used in a high frequency, less than 30Vrms should be applied and current applied should be less than the value of permissible current in Fig.3 in page 17. Please consult in advance when capacitors are used between 60Hz to 10 kHz at frequency.

Not to be in connected directly to Primary or AC line. Guarantee contents refer to No.19 and No.20 of CHARACTER.

- Use the peak of pulse voltage applied the capacitor within the DC rated voltage.
- Caution about safety in inverter circuit for LCD back light use:

Use the +B voltage applied within 9.5V, as shown below [Typical electronic inverter circuit for LCD back light]. And please use the peak of pulse voltage (especially, in case of the using PWM brightness circuit) applied the capacitor within the DC rated voltage.

[Typical electronic inverter circuit for LCD back light]



b) Permissible current

- The permissible current must be considered by dividing into pulse current (peak current) and continuous current (rms current). When using, therefore, make sure the both current are within the permissible values. In the case that a continuous current value is able not to be measured, use the capacitor within 10°C as the inherent temperature rise confirmed by the measuring method shown in page 16.
- When used beyond 105°C at temperature of capacitor surface for 0.12μF to 0.22μF, be in accordance with Fig.1.
- Continuous current should be within specified figure in Fig.3. Contact us when the waveforms are totally different from the sine wave.
- Pulse current should be within the figures calculated by Tab. 1. Use within 10000 cycles of pulse current. When pulse current applied more than 10000 cycles, please consult us before use.

c) Operating temperature range

- It must be noted, however the operating temperature range is the surface temperature of the capacitor, not the ambient temperature of the capacitor.
- In actual use, make sure the sum of the ambient temperature + own temperature rise value (Within specified value), that is the capacitor surface temperature is within the rated operating temperature range.
- If there is cooling plate of the other part of any resistance heated to high temperature near the capacitor, the capacitor may be locally heated by the radiation heat, exceeding the operating temperature range, and smoking or firing may be caused. Check the capacitor surface temperature at the heat source side.

d) For safety handling, check worst conditions within the specification range.

Protective means for safety should be provided in case the pulse and rms current may exceed the permissible values due to abnormal action of elsewhere in the circuit.

Please consult in advance when capacitors are connected in parallel to supplement capacitance.

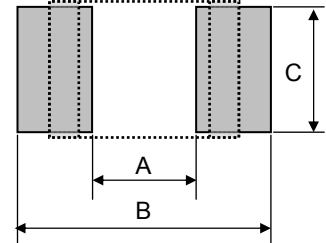
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II. Recommendable land dimensions

For designing land dimensions, refer to the following recommendable land dimensions.

unit: mm

Dimensions	A	B	C
Size code			
E1, E2 (4833)	3.0	5.6	3.0
D1, D3, D4 (6041)	4.0	7.0	3.8



<Note>

- A recommended solder paste thickness is between 0.10 mm and 0.15 mm.

III. Selection of Printed Circuit Board

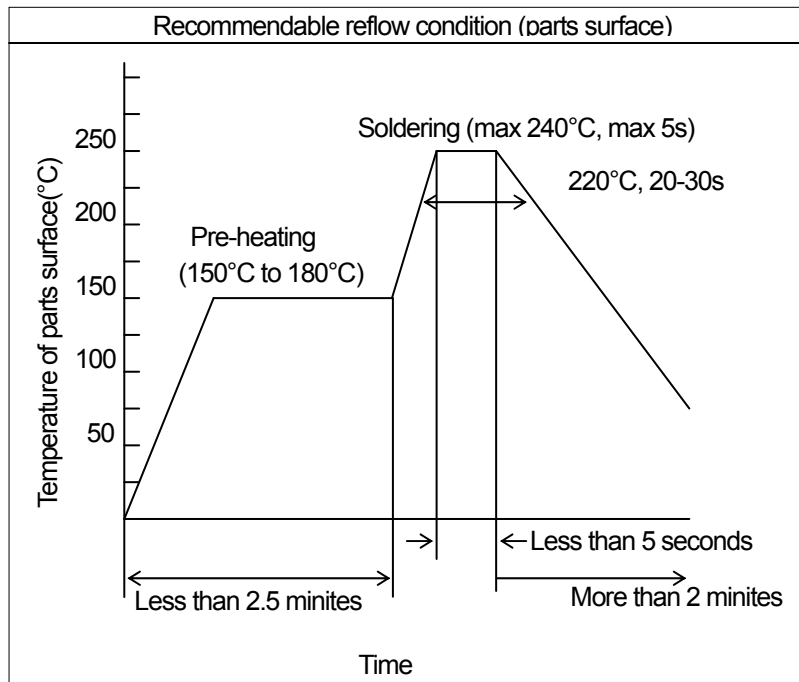
Do not use ceramic and metal board, because they have a large thermal expansion coefficient that is different from that of this capacitor, which are liable to cause a deterioration of thermal cycle endurance.

IV. Soldering

a) Soldering method

This capacitor only used in reflow method. Don't use in flow, dipping, and VPS soldering method.

b) Recommendable reflow soldering conditions



<Note>

- The above figure is recommendable conditions.
- Soldering frequency shall be maximum two times. In soldering of second time, solder after capacitor body temperature returned to room temperature.
- When require further conditions except for the above, use within the range of test "Soldering Heat Resistance" shown in page 6.
- The reflow method recommends the hot wind circulation method. The heat influence on the capacitor is different in the methods other than the hot wind circulation method. Please confirm there is no problem in the characteristic of the capacitor beforehand when it is mounted excluding the hot wind circulation method. Please inquire when it is uncertain.

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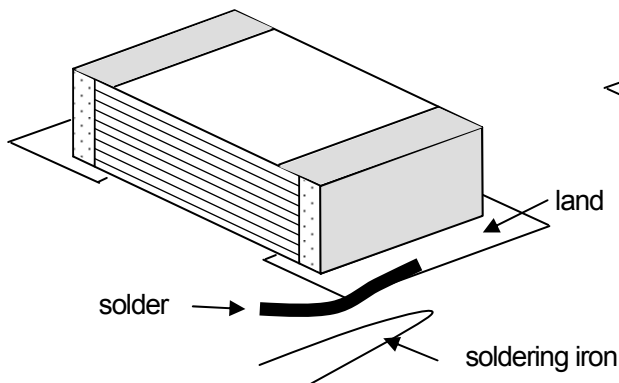
c) Soldering conditions used in soldering iron

Temperature	Soldering time	Other conditions
max 270°C	max 4.0 s	Wattage of soldering iron: 30 W Pre-heating is not needed

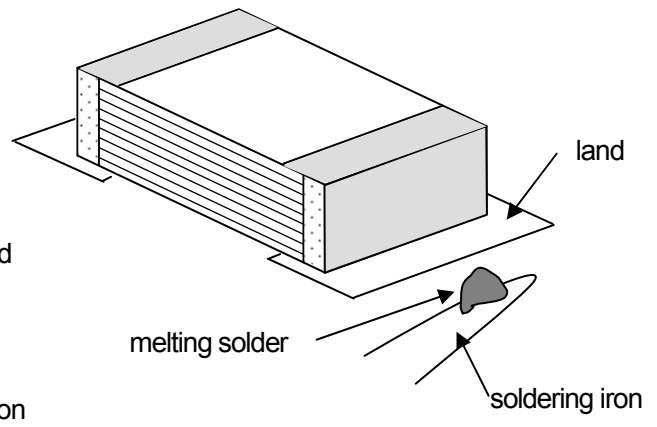
- In the case of sketch (a)
 - Put a soldering iron to an electrode (for less than 4 s) with solder like sketch (a) shows.
 - *Put soldering iron lightly.
 - *Soldering is allowed as one side by one side (without interval) or as both sides at the same time.

- In the case of sketch (b)
 - After a solder is melted on a soldering iron like sketch (b), put them to an electrode (for less than 4 s).
 - *Put soldering iron lightly.
 - *Soldering is allowed as one side by one side (without interval) or as both sides at the same time.

Sketch (a)



Sketch (b)



<Note>

- Soldering frequency shall be maximum two times. In soldering of a second time, solder after capacitor body temperature returned for room temperature.
- The above condition shall be applied also on modifying by solder iron after reflow soldering. Modifying by solder iron after reflow soldering within once. Because there is heat career once by reflow soldering.
- When measuring temperature, it shall be operated with solder on soldering iron.
- Pay attention to the soldering iron tip not to touch directly to film dielectric, especially cut edge side.
- Consult with our engineering section in advance when require further conditions except for the above.

d) Others

- It is too much heat record that solders or solders removal this product or the other part which approaches this product using hot air-blow. Consult us before use.
- Do not to use soldering this product by light beam or laser beam. If used these method, consult us before using.
- Consult us before using, when soldering in other method.

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V. Soldering flux and solder

- The content of halogen in the flux of solder paste and solder wire shall be 0.1 wt% or less Rosin-based and non-activated soldering flux is recommended.
- Consult with our engineering section in advance when using flux with more than 0.1 wt% of the halogen content.

VI. Cleaning

a) Case of wash free

Please use a recommended flux, like low residue flux ULF-500VS or inactivated flux AM-173.

b) Applicable solvent

Type	Cleaner	Manufacturer
Alcohol	IPA (isopropyl alcohol)	General industrial use

c) Cleaning method

Item Conditions	Temperature	Period
Immersion	Room temperature	Within 5 min
Vaporized cleaning	Less than 50°C	Within 5 min
Ultrasonic cleaning	Less than 50°C	Within 5 min

<Note>

- Do not wash it with water.
- When cleaning after soldering, check temperature of capacitor surface is below 60°C.
- It is necessary to remove cleaner from PCB by drying thoroughly after cleaning.
- Cleaner shall contain halogen within less than 0.1wt%, because in case of cleaning after mounting, halogen in flux will dissolve into cleaner.
- Consult with our engineering section in advance when further information for cleaning solvent, conditions are required.

VII. Storage and preservation

- It must be noted that the solderability of the external electrode may deteriorated when stored in an atmosphere filled with moisture, dust, or reactive gas such as hydrogen chloride, hydrogen sulfide, sulfurous acid, or ammonia etc.
- Avoid location with particularly high temperature and high humidity, and store in conditions not exceeding 35°C and 85%RH. Storage period limit is 6 months (use within 6 months).
- Consult with our engineering section in advance when require further conditions except for the above.

VIII. Operating environment

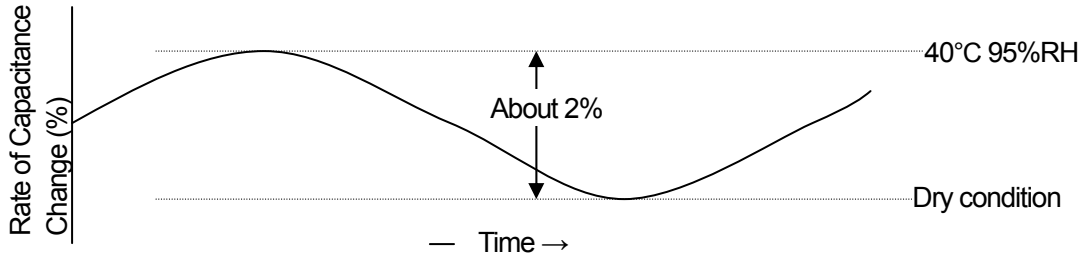
- Consult us about usage for a long period in humid environments, because characteristic deterioration by low insulation resistance or oxidization of metallized film may occur due to moisture absorption with the passing of the time.
- The Capacitor shall not be operated under following environmental conditions. These conditions may be generated to deteriorated the characteristic in the capacitor.
 - a) Under conditions of corrosive atmosphere such as hydrogen chloride, hydrogen sulfide, sulfurous acid, or ammonia etc.
 - b) Under conditions of water or frost formation.
 - c) To be exposed directly to water, oil, or sunlight.
 - d) To be exposed to ozone, radioactive rays, or ultraviolet rays.
- No dust should be permitted to remain on the surface of the product as this may cause electrical leakage.

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IX. Capacitance change due to humidity absorption

In environment with humidity change, capacitance of this capacitor change (increases and decreases). Because capacitor absorbing and dis-absorbing due to humidity of environment. Consult with our engineering section detail of this capacitance change.

[For example : The data shown below is capacitance change from dry condition to 40°C, 95%RH condition.]



X. In case of using resin for fixing the chip parts

In case of using resin for fixing the chip parts, inquiring in advance of our engineering section is recommended.

XI. Resin coating

When capacitors are coated or embedded with resin, inquiring of our engineering section is recommended.

XII. Handling of a element

When handle an element of the capacitor with tweezers, care must be taken to avoid mechanical damage. We recommend:

- Use tweezers made of resin and should apply stress to the element less than 5N.
- Avoid any contact with the cut surface (except outer electrode surface).

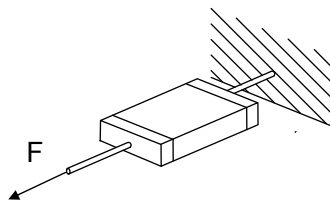
XIII. Mechanical stress, damage

Please pay attention to the following points, when mechanical stress or damage is applied to the capacitor, it may become the cause of malfunction.

- Do not apply 5N or more as pull, stress and pressure etc.
- Do not apply strong stress to cut edge side of the capacitor and not give the damage of scratch etc.

XIII-(1). Terminal strength (pull direction)

Pay attention to the pull force of terminal (F direction) so as not to damage to the capacitor.



XIII-(2). Chip mounting consideration

In mounting the capacitors any bending and expanding force against them shall be kept minimum to prevent them from bending damaged or cracked, following precautions and recommendations shall be observed carefully in the process.

- Motion of vacuum nozzle or clump shall be adjusted so that the capacitors shall not be damaged by pushing force.
- Maximum stroke of the nozzle shall be adjusted to avoid damage so that the maximum bending of PCB becomes not too much.
- The PCB shall be supported by means of adequate supporting pins.

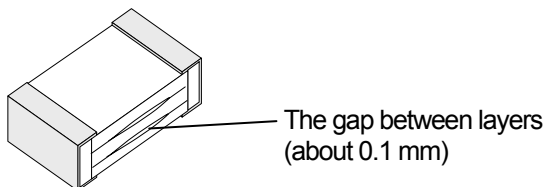
Standard Doc.	PLASTIC FILM CHIP CAPACITOR TYPE ECHU(X)	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="font-size: small;">Clst</td> <td style="text-align: center;">28-175</td> </tr> <tr> <td style="font-size: small;">No.</td> <td style="text-align: center;">1-29</td> </tr> <tr> <td style="font-size: small;">Revision Code</td> <td style="text-align: center;">R0</td> </tr> <tr> <td></td> <td style="text-align: center;">16 / 17 P.</td> </tr> </table>	Clst	28-175	No.	1-29	Revision Code	R0		16 / 17 P.
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XIV. Singular using

This capacitor is generally surface mount device. Do not use singular using.

XV. Appearance

- The gap among a film about 0.1 mm on the cut edge side may occur by structure and process. But there is not a problem in reliability.
- We make assurance double sure about quality of the appearance. If it obstructs the reliability and performance of the electronic equipment requested, we exchange the appearance boundary sample.



XVI. Life designed

This product is designed as its life time is more than 10 year (actual working hours of capacitor are 50,000h) under the following conditions:

- 0.047 to 0.1μF: operating temperature is less than 105°C and applied voltage is than rated voltage×0.85.
- 0.12 to 0.22μF: operating temperature is less than 85°C and applied voltage is than rated voltage×0.85.

Measuring method of inherent temperature rise

As shown in the drawing, attach a thermocouple to the capacitor surface with adhesive, and measure the surface temperature and capacitor surface temperature while avoiding radiation heat from peripheral parts. At this time, use a thermocouple with small thermal capacity (Φ0.1 T wire), and to avoid heat release to the board, lift the parts to be measure from the board by using lead wire or the like, and install as shown in the drawing. To avoid effects of convection and wind, put the capacitor into the box or the like, and measure in wind-free condition.

The diagram illustrates the measurement setup. On the left, a capacitor is mounted on a PCB. A thermocouple is attached to its top surface. The thermocouple's wires are connected to a "Temperature measurement instrument" shown on the right. The capacitor is lifted from the board using "Lead wire" attached to "Land" pads. The entire setup is enclosed in a box to ensure wind-free conditions.

Tab.1 Permissible pulse current (Max 10000 cycles)

Pulse current applied to this capacitor should be used within permissible pulse current (Max 10000 cycles) shown in Tab.1

The pulse current = C (μF) × dV/dt value (V/ μs)

In case of pulse current is over the specified table, inquire of our engineering section.

Part No. (Capacitance: μF)	dV/dt (V/ μs)
	ECHU1H(X)
473 (0.047)	72
563 (0.056)	68
683 (0.068)	62
823 (0.082)	56
104 (0.10)	52
124 (0.12)	48
154 (0.15)	44
184 (0.18)	40
224 (0.22)	36

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PLASTIC FILM CHIP CAPACITOR
TYPE ECHU(X)

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Fig.3 Permissible Current

- Measuring condition: Sine wave
- Caution about safety in inverter circuit for LCD back light use:
Use the +B voltage applied within 9.5V, as shown [typical electronic inverter circuit for LCD back light], page 11 of 17 .

