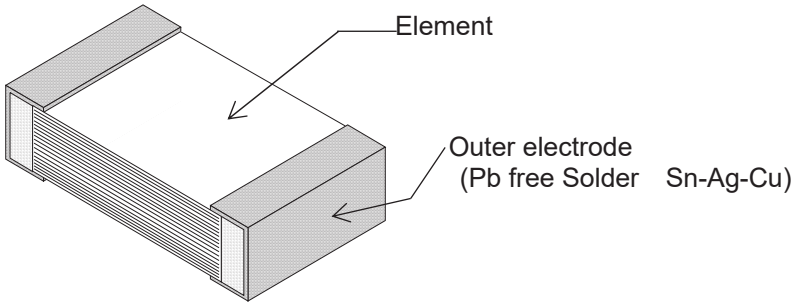
1. SCOPE	This specification covers the requirement for organic dielectric fixed chip capacitor for use in electronic equipment.	
2. PRODUCT NAME	Plastic film chip capacitor Type **ECPU(A)**	
3. PRODUCT RANGE	Operating temperature range	–40 °C to 85 °C [Including temperature-rise on element surface(10 °C)]
	Rated voltage	DC16 V (1C)
	Capacitance range	0.10 µF to 1.0 µF
	Capacitance tolerance	±20% (M)
4. CONDITIONAL STANDARD TEST	The test shall be conducted at a temperature of from 15 °C to 35 °C, a relative humidity of from 45 % to 75 %. However the test shall be conducted at a temperature of 20 °C ±2 °C, a relative humidity of 65 %±5 %, when doubt is entertained about judgment.	
5. SOLDERING METHOD	Reflow method only	
6. CONSTRUCTION	The capacitor has a non-inductive construction, stacked with organic dielectric. The capacitor has outer electrode on both sides.  	
7. DIMENSIONS	As specified in the individual drawing.	
8. APPEARANCE	Plating of outer electrode shall be proper enough to be soldered.	

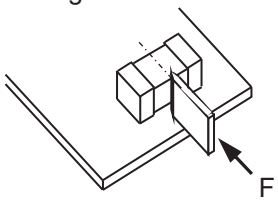
9. CHARACTER

No.	Item	Performance	Testing method
1.	Withstand voltage	Between terminals: Nothing abnormal shall be found, when applied a voltage of 150 % of the rated voltage for 1 minute or 175 % of the rated voltage for 1 second to 5 seconds. (The capacitor shall be applied the voltage through 2 kΩ or more when charge and discharge.)	JIS C 5102-1994 7.1 IEC 384-1-1982 4.6
2.	Insulation Resistance	Between terminals : 1000 MΩ or more(C: 0.33 µF or less) 300 MΩ • µF or more (C: more than 0.33 µF) When the reading of measuring instrument becomes steady at a value after applying a voltage of DC 10 V±1.0 V for 1 minute ±5 seconds, at 20 °C ±2 °C.	JIS C 5102-1994 7.6 IEC 384-1-1982 4.5

No.	Item	Performance	Testing method
3.	Capacitance	Within a range of specified value. (Measured at a frequency of 1 kHz ±0.2 kHz, at 20°C ±2°C and a voltage of 5V or less.)	JIS C 5102-1994 7.8 IEC 384-1-1982
4.	Dissipation Factor	1.5 % or less (Measured at a frequency of 1 kHz ±0.2 kHz, at 20 °C ±2 °C and a voltage of 5 V or less.)	JIS C 5102-1994 7.9 IEC 384-1-1982
5.	Connection	The connection of the element shall not open even instantaneously when applied a voltage of 100 mV (peak value) or less and applied light force.	JIS C 5102-1994 7.10 IEC 384-1-1982
6.	Vibration Proof	The capacitor shall be mounted on the PC 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 to vary from 10 Hz to 55 Hz and return to 10 Hz in about 1 minute and thus repeated. Thus shall be conducted for 2 hours each (total 6 hours) in 3 mutually perpendicular directions. 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 minutes 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 ±5°C for 2.5 seconds ±0.5 seconds. After the immersion test, the surface of the electrodes shall be covered with the solder more than 90 %.	JIS C 5102-1994 8.4 IEC 384-1-1982 4.15
8.	Moisture Resistance	The capacitor under test shall be put in the testing oven and kept at condition of the temperature +40 °C ±2 °C and the relative humidity at 90 % to 95 % for 500 $^{+24}_{0}$ hours and then shall be let alone at ordinary condition for 1.5 hours ±0.5 hours. After the test, the capacitor shall be satisfied with the following performance. Appearance : No remarkable change. 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 2 kΩ or more when charge or discharge.) Insulation resistance : Between terminals 100 MΩ or more (C: 0.33 μF or less) 30 MΩ • μF or more(C: more than 0.33 μF) Change rate of capacitance : Within $^{+20}_{-3}$ % of the value before the test. Dissipation factor : 2.25 % or less (at 1 kHz)	JIS C 5102-1994 9.5 IEC 384-1-1982 4.22

No.	Item	Performance	Testing method
9.	Moisture Resistant Loading	The capacitor under test shall be applied the rated voltage continuously for 500 $^{+24}_{0}$ hours in the testing oven and kept at condition of the temperature +40 °C ±2 °C and the relative humidity at 90 % to 95 % and then shall be let alone at ordinary condition for 1.5 hours ±0.5 hours. After the test, the capacitor shall be satisfied with the following performance. Appearance : No remarkable change. 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 2 kΩ or more when charge or discharge.) Insulation resistance : Between terminals 100 MΩ or more (C: 0.33 μF or less) 30 MΩ • μF or more(C: more than 0.33 μF) Change rate of capacitance : Within $^{+20}_{-3}$ % of the value before the test. Dissipation factor : 2.25 % or less (at 1 kHz)	JIS C 5102-1994 9.9
10.	High Temperature Loading	The capacitor under test shall be applied the voltage of 125 % of rated voltage through a series-connected resister of from 20 Ω to 1000 Ω per 1 V, continuously for 1000 $^{+48}_{0}$ hours in the testing oven and kept at condition of the temperature +85 °C ±2 °C and then shall be let alone at ordinary condition for 1.5 hours ±0.5 hours. After the test, the capacitor shall be satisfied with the following performance. Appearance : No remarkable change. Insulation resistance : Between terminals 300 MΩ or more (C: 0.33 μF or less) 100 MΩ • μF or more(C: more than 0.33 μF) Change rate of capacitance : Within $^{+7}_{-20}$ % of the value before the test. Dissipation factor : 1.65 % or less (at 1 kHz)	JIS C 5102-1994 9.10
11.	Heat Resistance	Insulation resistance at +85 °C±2 °C after 2^{+1}_{-0} hours. Between terminals 300 MΩ or more (C: 0.33 μF or less) 100 MΩ • μF or more(C: more than 0.33 μF) Change rate of capacitance at +85 °C±2 °C after 2^{+1}_{-0} hours. Within $^{+5}_{-20}$ % of the value before the test.	JIS C 5102-1994 9.2 IEC 384-1-1982 4.21.2

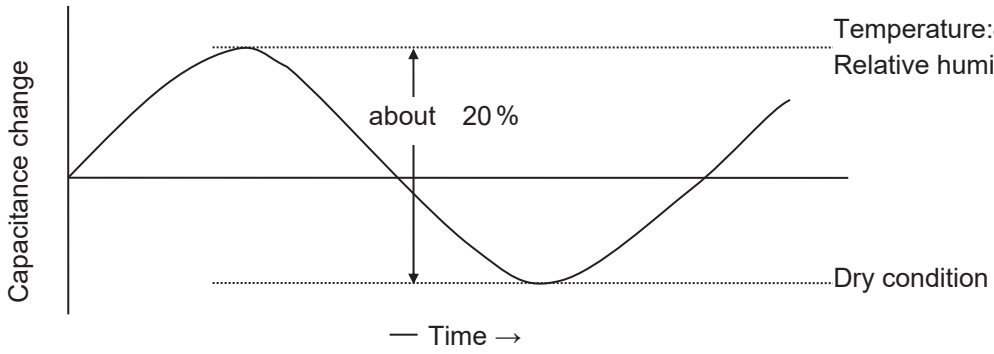
No.	Item	Performance	Testing method
12.	Cold Resistance	Change rate of capacitance at –40 °C ±3 °C after 2^{+1}_{0} hours. Within $^{+5}_{-10}$ % of the value before the test.	JIS C 5102-1994 9.1 IEC 384-1-1982 4.21.4
13.	Soldering Heat Resistance	1. Reflow method Test condition of the reflow oven shall be adjusted that maximum temperature of the capacitor surface shall be 237 °C ±3 °C. (see Figure 1.) After the test, the capacitor shall be let alone at ordinary temperature and humidity for 1 hour±0.5 hours. After this, the capacitor shall be satisfied with the following performance. 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 270 °C ± 10°C. The soldering iron together with a solder wire of 1 mm diameter shall be put to each outer electrode of the capacitor for 3.5 seconds ±0.5 seconds. After this, the capacitor shall be satisfied with the following performance. Appearance : No remarkable change. Withstand voltage : Between terminals Nothing abnormal shall be found, when applied a voltage of 150 % of the rated voltage for 1 minute or 175 % of the rated voltage for 1 second to 5 seconds. (The capacitor shall be applied the voltage through 2 kΩ or more when charge or discharge.) Insulation resistance : Between terminals 500 MΩ or more (C: 0.33 μF or less) 150 MΩ•μF or more(C: more than 0.33 μF) Change rate of capacitance : Within $^{+3}_{-15}$ % of the value before the test. Dissipation factor : 1.65 % or less (at 1 kHz)	

No.	Item	Performance	Testing method
14.	Temperature Cycle	The capacitor under the test shall be kept in the testing oven and kept at condition of the temperature of –40 °C ±3 °C for 30 minutes ±3 minutes. After this, the capacitor shall be let alone at the ordinary temperature for 3 minutes or less. After this, the capacitor under the test shall be kept in the testing oven and kept at condition of the temperature of +85 °C ±2 °C for 30 minutes ±3 minutes. Then the capacitor shall be let alone at the ordinary temperature for 3 minutes or less. This operation shall be counted as 1 cycle, and it shall be repeated for 5 cycles successively. After the test, the capacitor shall be let alone at the ordinary condition for 1.5 hours±0.5 hours, and shall be satisfied with the following performance. Appearance : No remarkable change. Insulation resistance : Between terminals 100 MΩ or more (C: 0.33 μF or less) 30 MΩ • μF or more(C: more than 0.33 μF) Change rate of capacitance : Within $^{+5}_{-20}$ % of the value before the test. Dissipation factor : 1.65 % or less (at 1 kHz)	JIS C 5102-1994 9.3
15	Adhesiveness	Mount the specimen to the testing wiring printed board. Examine, with a magnifier of magnification of 10, the appearance of specimen. 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 printed wiring board. The pressure shall be 5 N ±0.5 N, and the holding duration, 10 s ±1 s. After the test, use magnifier of magnification of 10, and Check for cracks of soldering position. Appearance No remarkable change.  	JIS C 5102-1996 8.11.2

10. ⚠ Caution about safety in use

(1) Capacitance change due to humidity absorption

In environment with humidity change, capacitance of this capacitor changes (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 condition of the temperature 40 °C and the relative humidity 95 %.]



(2) High impedance circuit use.

In case of used in high impedance circuit, be careful of guarantee for insulation resistance.

(3) AC voltage

In case AC voltage applied to this capacitor shall be used under 12 V (effective value).

(4)Current

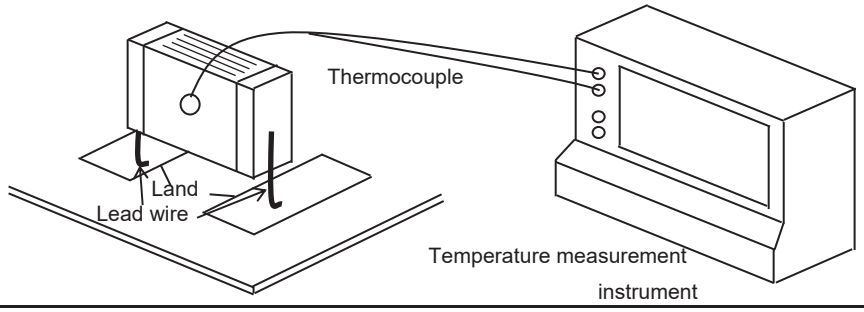
In case of current applied to this capacitor shall be careful of continuous current and pulse current shown below.

(4)-1.Continuous current

Continuous current applied to this capacitor should be under inherent temperature rise within 10 °C and within permissible current shown in figure 2.
And temperature of capacitor should be kept within the operating temperature including inherent temperature rise.

<Measuring method for 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 mm 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 convention and wind, put the capacitor into the box or the like, and measure in wind-free condition.



(4)-2.Pulse current

Pulse current applied to this capacitor should be used within permissible pulse current (Max.10000 cycles) shown in table 1, and permissible continuous current (shown in figure 2).

In case of pulse current is over the specified Table 1, inquire of our engineering section.

Table 1: Permissible pulse current (Max.10000 cycles)

Item	dV/dt(V/μs)
ECPU1C104MA5	19
ECPU1C154MA5	15
ECPU1C224MA5	13
ECPU1C334MA5	10
ECPU1C474MA5	7
ECPU1C684MA5	5
ECPU1C105MA5	3

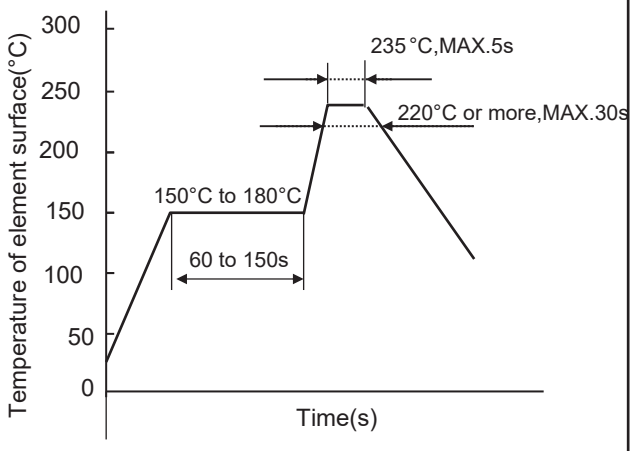
(5)Soldering

(5)-1.Solderig method

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

(5)-2.Recommendable reflow soldering conditions

Recommendable conditions



<Note>

- Soldering frequency shall be less than two (2) times. The second soldering should be carried after the capacitor itself has returned to normal temperature.
- When further conditions are required except figure1.
  Please keep the soldering heat resistance shown in page 4.

(6) Soldering conditions used in soldering iron

(6)-1.Conditions

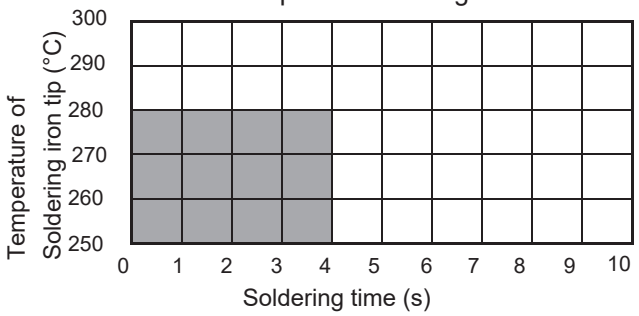
Pre-conditioning		Temperature	Soldering time	Other conditions
No pre-conditioning	----------	280 °C maximum	4.0 seconds maximum	Power of soldering iron:30 W Pre-heating is not needed
Pre-conditioning	125 °C±5 °C • 3 h±1 h Soldering shall be used in 5hours after pre-conditioning	330 °C maximum	5.0 seconds maximum	Power of soldering iron:30 W Pre-heating is not needed

Pre-conditioning shall be less than two (2) times.

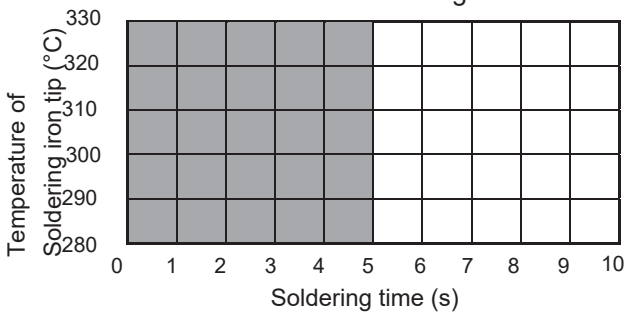
Long time of drying will affect the performance of the capacitor. Please pre-processing is performed within the scope of the table.

(6)-2.Specified area

<No pre-conditioning>



<Pre-conditioning>



<Note>

- Refrain from using soldering iron except for the case of parts exchange. Even on that case, observe the soldering conditions shown above.
- Don't reuse the product removed by the soldering iron.
- Soldering frequency used with soldering iron shall be less than two (2) times. The second soldering should be carried after the capacitor itself has returned to normal temperature.
- When measuring temperature, it shall be operated with solder on soldering iron.
- Please pay attention to the soldering iron not to touch a capacitor body (except electrode), especially not to touch cut edge side.
- Consult with our engineering section in advance when require further conditions except for above.

(7) Warning about solder paste

- Solder paste shall be used which contains halogen with less than 0.1 wt%. (In case of reflow soldering and using soldering iron.)
- Consult with our engineering section in advance when using flux with more than 0.1 wt% of the halogen content.

(8) Cleaning

(8)-1.Applicable solvent

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

(8)-2.Cleaning method

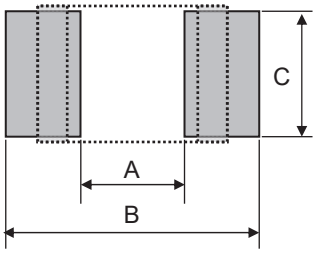
Item / Conditions	Temperature	Period
Immersion	Room temperature	Within 5 minutes
Vaporized cleaning	less than 50 °C	Within 5 minutes
Ultrasonic cleaning	less than 50 °C	Within 5 minutes

<Note>

- Do not wash it with water.
- It is necessary to remove cleaner from P.W.B. by drying thoroughly after cleaning.
- Cleaner shall contain halogen with less than 0.1 wt%, 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.

(9) Recommendable land size

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



unit: mm

Size code \ Dimensions	A	B	C
J1 (2012)	0.8	2.4	1.1
H1 • H2 • H3(3216)	1.8	3.6	1.4
G2 (3225)	1.8	3.6	2.3

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

(10) Design of P.W.B.

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

(11) 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.

(12) Resin coating

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

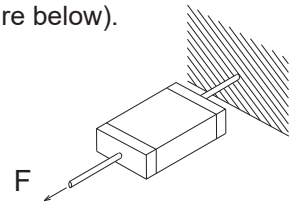
(13) Rated voltage

Do not apply over the rated voltage, because, if used beyond the rating voltage, it may induce insulation breakdown of the dielectric and cause short circuit.

(14) Be careful not to scratch the capacitor surface with sharp edges (such as screwdriver, soldering iron, pincers, chassis), and not to give hard mechanical-stress.

(14)-1.Tensile strength of termination

Minimum tensile strength of termination is about 2 N. Be careful not to give hard tension to terminal, especially take care to direction F (see figure below).



(14)-2.Chip mounting consideration

The locating crow, when worn out, impose uneven forces on the capacitor when positing, causing failed capacitors.

An excessively low bottom dead point of suction nozzle imposes great force on the capacitor during mounting, causing failed capacitors.

In mounting the capacitors on a printed circuit board, be careful not to give large bending and expanding force against them

The printed circuit board shall be supported by means of adequate supporting pins.

(15) Operating environment

Avoid to use in a place of corrosive and oxidizing gas atmosphere (hydrogen chloride, hydrogen sulfide, sulfuric acid etc.)

(16) Singular using

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

(17) 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 a reactive oxidizing gas (hydrogen chloride, hydrogen sulfide, sulfuric acid) .

Avoid location with particularly high temperature and high humidity, and store in conditions not exceeding at temperature 35 °C and relative humidity 75 %. Storage period limit is 1 year (use within 1 year).

The unpacked products shall be kept in dry pack together of well-dried silica-gel (3 g, 4 packs) or be kept in storage conditioned at a temperature less than 20 °C, a relative humidity less than 50 %. Storage period limit is six month (use within six month).

(18) Period of soldering from opening dry pack.

These capacitors are sensitive to the moisture. The capacitors should be soldered in 72 hours in conditions a temperature less than 25 °C, a relative humidity less than 70 %, after opening dry pack.

In case of over 72 hours, should be kept in dry pack together of well-dried silica-gel (3 g, 4 packs) or be kept in storage conditioned at a temperature less than 20°C,a relative humidity less than 50%.

(19) Life time

These capacitors' life shall be as follows.

At condition of the temperature of 85 °C or less and the applied voltage of rated voltage or less, then these capacitor s' life are over 50 000hours.

Figure1: Standard surface temperature curve of the capacitor for reflow method

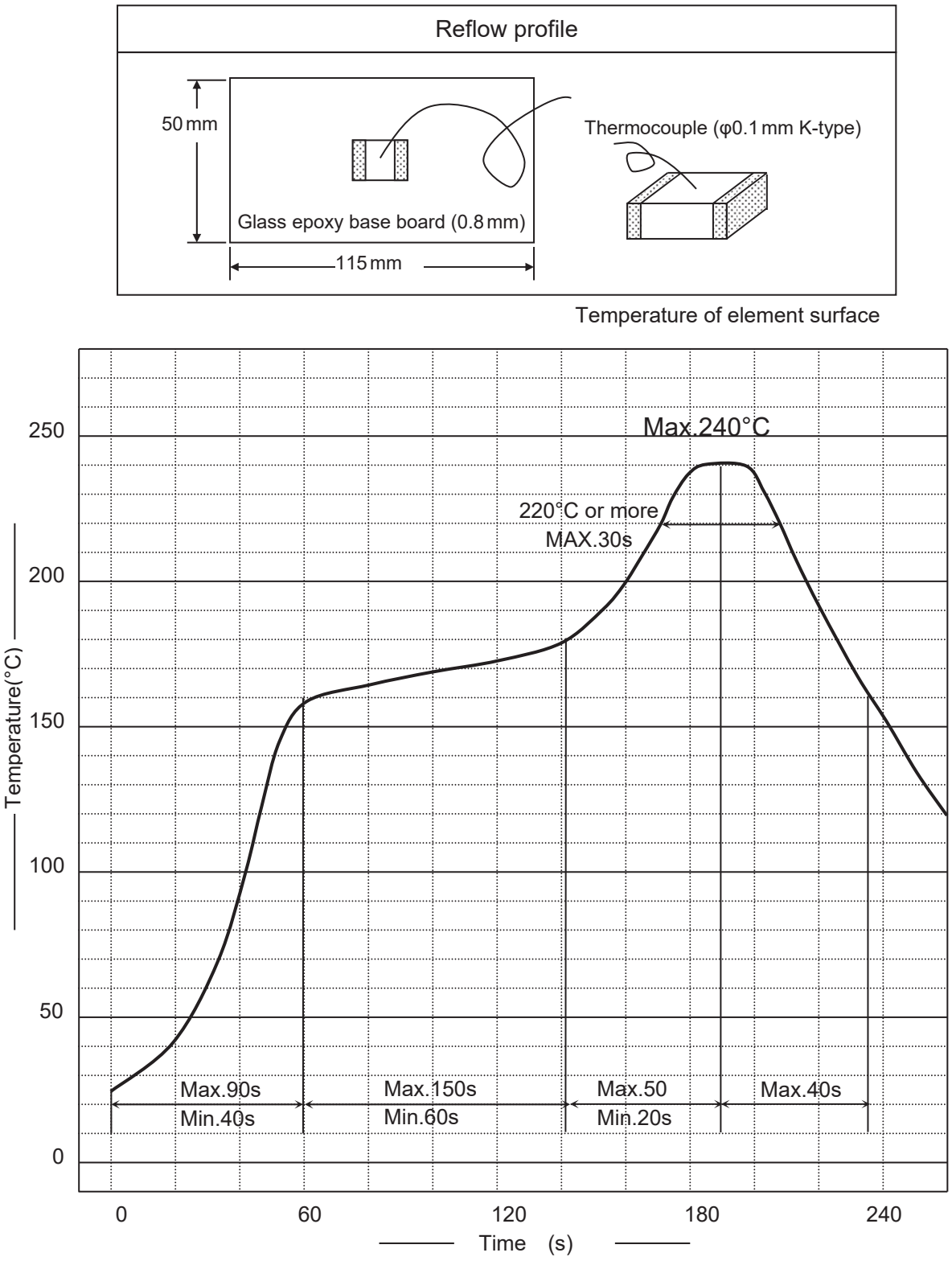


Figure 2 Permissible current