◆Storage

① The chip capacitors shall be packaged in carrier tapes or bulk cases.

② Keep storage facility temperatures from +5C to +35C, humidity from 45 to 70% RH.

③ The storage atmosphere must be free of gas containing sulfur and chlorine. Also, avoid exposing the product to saline moisture. If the product is exposed to such atmospheres, the terminations will oxidize and solderability will be affected.

④ If the above storage condition is followed, Then the solderability is assured for 12 months from our final inspection date.

◆Circuit Design

① Once application and assembly environments have been checked, the capacitor may be used in conformance with the rating and performance, provided in both the catalog and the specifications. Exceeding the specifications listed may result in inferior performance. It may also cause a short, open or smoking to occur, etc.

② Please use the capacitors in conformance with the operating temperature provided in both the catalog and the specifications. Be especially cautious not to exceed the maximum temperature. If the maximum temperature set forth in both the catalog and specifications is exceeded, the capacitor's insulation resistance may deteriorate. Power may suddenly surge and short-circuit may occur. The capacitor has a loss, and may self-heat due to equivalent series resistance when alternating electric current is passed through. As this effect becomes especially pronounced in high frequency circuits, please exercise caution. When using the capacitor in a (self-heating) circuit, please make sure the surface of the capacitor remains under the maximum temperature for usage. Also, please make certain temperature rise remains below 20℃.

③ Please keep voltage under the Rated Voltage, which is applied to the capacitor. Also, please make certain the Peak Voltage remains below the Rated Voltage when AC or voltage is super-imposed to the DC voltage. In the situation where AC or pulse voltage is employed, ensure average peak voltage does not exceed the Rated Voltage. Exceeding the Rated Voltage provided in both the catalog and specifications may lead to defect with standing voltage. In worse case situations, It may cause the capacitor to smoke or flame.

◆Handling

Chip capacitors should be handled with care to avoid contamination or damage. The use of vacuum pick-up or plastic tweezers is recommended for manual placement. Tape and reeled packages are suitable for automatic pick and placement machines.

◆Flux

①An excessive amount of flux or too rapid temperature rise causes solvent burst, and solder can generate a large quantity of gas. The gas spreads small solder particles which can cause a solder balling effect or bridging problem.

② Flux containing too high a percentage of halide may cause corrosion of termination unless sufficiently cleaned.

③ Use rosin-type flux, and do not use a highly acidic flux (halide content less than 0.2 wt%).

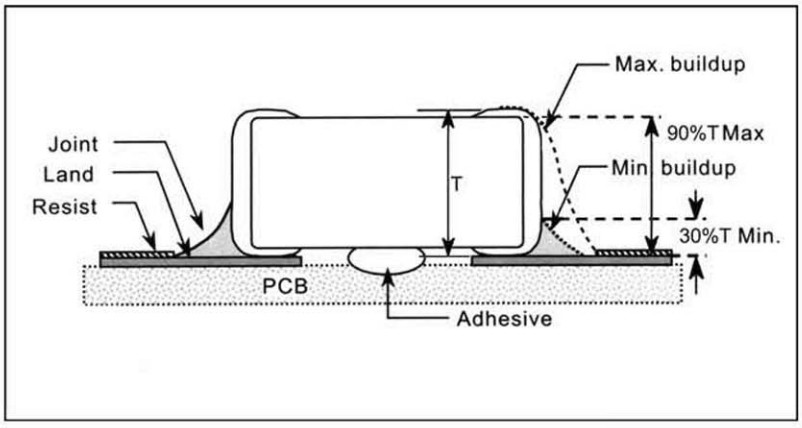
④ The water soluble flux causes deteriorated insulation resistance between outer termination unless sufficiently cleaned.

◆Component Spacing

For wave soldering components, the spacing must be sufficiently far apart to prevent bridging or shadowing. This is not so important for the reflow process, but sufficient space for rework should be considered. The suggested spacing for reflow soldering and wave soldering is 0.5mm and 1.0mm, respectively.

◆Solder Fillet

Too much solder amount may increase solder stress and cause cracking risks. Insufficient solder amount may PCB. When soldering, confirm that the solder is 30%T to reduce adhesive strength and cause parts to fall off 90%T.



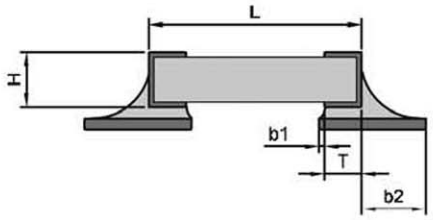
◆Recommended Land Pattern Dimensions

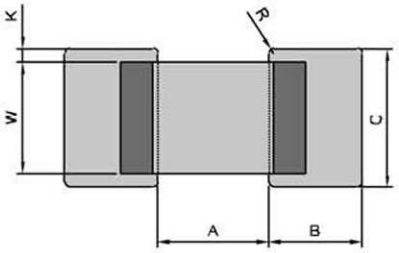
When mounting the capacitor to substrate, it's important to carefully consider that the amount of solder (size of fillet) used has a direct effect upon the capacitor once it's mounted.

① The greater the amount of solder, the greater the stress to the elements. This may cause the substrate to break or crack.

② In the situation where two or more devices are mounted onto a common land, be sure to separate the device into exclusive pads by using soldering resist.

◆Horizontal Mounting

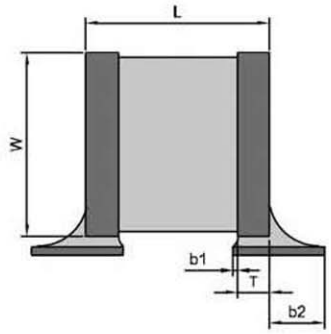


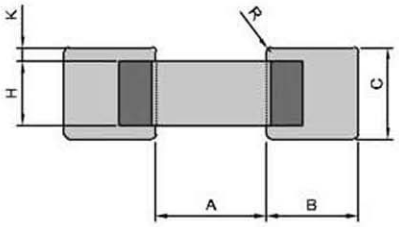


Horizontal Mounting - Recommended Land Pattern Dimensions of Reflow soldering (unit: millimeter)											
	0201	0402	0603	0505	0805	0710	1210	2225	3838	6040	7575
A	0.2-0.3	0.3-0.5	0.70	0.70	1.00	0.90	2.00	4.00	7.10	13.00	16.00
B	0.2-0.35	0.35-0.45	0.90	0.60	0.80	1.00	1.50	2.30	3.00	3.30	3.30
C	0.2-0.4	0.4-0.6	0.90	1.30	1.30	2.80	2.80	7.00	10.00	11.30	19.60
T	-	-	0.40	0.40	0.50	-	0.70	1.00	1.30	1.30	1.30
b1	-	-	0.05	0.05	0.10	-	0.10	0.10	0.10	0.10	0.10
b2	-	-	0.50	0.50	0.60	-	1.00	1.50	1.70	2.00	2.00
K	-	-	0.00	0.00	0.10	-	0.10	0.10	0.10	0.10	0.10
R	-	-	0.00	0.00	0.30	-	0.50	0.80	0.80	1.00	1.00

Horizontal Mounting - Recommended Land Pattern Dimensions of Iron soldering (unit: millimeter)							
	0603	0505	0805	0710	1210	2225	3838
A	0.70	0.70	1.10	0.90	1.90	3.90	7.10
B	2.00	2.00	2.00	2.00	2.50	4.00	5.00
C	0.90	1.40	1.40	2.80	2.90	7.00	10.20
T	0.40	0.40	0.50	-	0.70	1.00	1.30
b1	0.05	0.05	0.10	-	0.10	0.10	0.10
b2	0.50	0.50	0.60	-	1.00	1.50	1.70
K	0.00	0.00	0.10	-	0.10	0.10	0.10
R	0.00	0.00	0.30	-	0.50	0.80	0.80

◆Vertical Mounting





Vertical Mounting - Recommended Land Pattern Dimensions of Reflow soldering (unit: millimeter)						
	0505	0805	1210	2225	3838	0708
A	0.70	1.10	1.90	3.90	7.10	0.90
B	0.90	1.10	1.70	2.50	3.00	1.00
C	1.40	1.40	2.50	4.00	5.00	2.90
T	0.40	0.50	0.70	1.00	1.30	-
b1	0.05	0.10	0.10	0.10	0.10	-
b2	0.50	0.60	1.00	1.50	1.70	-
K	0.00	0.10	0.10	0.10	0.10	-
R	0.00	0.30	0.50	0.80	0.80	-

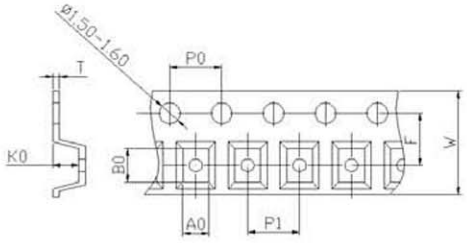
Vertical Mounting - Recommended Land Pattern Dimensions of Iron soldering (unit: millimeter)						
	0505	0805	1210	2225	3838	0708
A	0.70	1.10	1.90	3.90	7.10	0.90
B	2.00	2.00	2.50	4.00	5.00	2.00
C	1.40	1.40	2.50	4.00	5.00	2.90
T	0.40	0.50	0.70	1.00	1.30	-
b1	0.05	0.10	0.10	0.10	0.10	-
b2	0.50	0.60	1.00	1.50	1.70	-
K	0.00	0.10	0.10	0.10	0.10	-
R	0.00	0.30	0.50	0.80	0.80	-

◆Tape & Reel Specifications

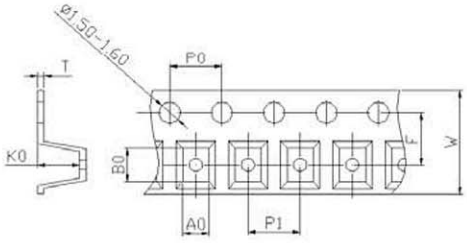
	A0	B0	K0	W	P0	P1	T	F	MIN /REEL	QTY /REEL	TAPE MATERIAL
KEC70/75N(0201) - H	0.406	0.749	0.422	8.00	4.00	2.00	0.42	3.50	500	500	Paper
KEC70/75H(0402) - H	0.60	1.10	1.00	8.00	4.00	2.00	0.20	3.50	500	500	Paper
KEC70/75P(0603) - H	0.95	1.80	0.85	8.00	4.00	4.00	0.20	3.50	500	500	Paper
KEC70/75D(0805) - H	1.60	1.60	2.40	8.00	4.00	4.00	0.20	3.50	500	500	Paper
KEC75R(0608) - H	2.30	3.60	2.70	8.00	4.00	4.00	0.254	3.50	500	500	Plastic
KEC75B(1111) - H	2.92	3.51	2.34	8.00	4.00	4.00	0.254	3.50	500	500	Embossed
KEC75B(1111) - V	2.92	3.51	2.34	8.00	4.00	4.00	0.254	3.50	500	500	Embossed
KEC10/70A(0505) - H	1.38	1.68	0.98	8.00	4.00	4.00	0.22	3.50	500	3000	Plastic
KEC10/70A(0505) - V	1.10	1.60	1.40	12.00	4.00	4.00	0.30	5.50	500	2000	Plastic
KEC10/70B(1111) - H	2.85	3.50	1.95	8.00	4.00	4.00	0.22	3.50	500	2000	Plastic
KEC10/70B(1111) - V	2.00	3.50	2.70	12.00	4.00	4.00	0.40	5.50	500	1500	Plastic
KEC10/70C(2225)-H	6.70	6.20	3.40	16.00	4.00	12.00	0.30	7.50	500	500	Plastic
KEC10/70C(2225) -V	3.50	6.66	6.90	16.00	4.00	8.00	0.50	7.50	500	500	Plastic
KEC10/70E(3838) -H	10.10	10.10	3.30	16.00	4.00	16.00	0.30	7.50	50	200	Plastic

Note: "-H" is internal electrode is horizontal orientation;
"-V" is internal electrode is vertical orientation;

Horizontal Orientation



Vertical Orientation



◆Chip Capacitor Dimensions

Series	Size	Dimensions inch(mm)			Termination(B)
		Length(Lc)	Width(Wc)	Thickness(Tc)	
KEC70H	0402	.040±.004 (1.02±0.10)	.020±.004 (0.51±0.10)	.020±.004 (0.51±0.10)	.006~.012 (0.15~0.30)
KEC70P	0603	.060±.006 (1.52±0.15)	.030±.006 (0.81±0.15)	.030+.005~-.003 (0.76+0.13~-0.08)	.008~.020 (0.20~0.50)
KEC70A KEC10A	0505	.055+.015~-.010 (1.40+0.38~-0.25)	.055+.010 (1.40±0.25)	.057 (1.45) max	.024 (0.60) max
KEC70D	0805	.080±.010 (2.03±0.25)	.050±.010 (1.27±0.25)	.057 (1.45) max	.014~.028 (0.35~0.70)
KEC70R	0710	.070±.015 (1.78±0.38)	.010±.015 (2.54±0.38)	.120 (3.05) max	-
KEC70B KEC10B	1210	.110+.020~-.010 (2.79+0.51~-0.25)	.110±.010 (2.79±0.25)	.100 (2.54) max	.040 (1.00) max
KEC70C KEC10C	2225	.225+.025~-.010 (5.72+0.51~-0.25)	.250±.015 (6.35±0.38)	.165 (4.19) max	.047 (1.20) max
KEC70E KEC10E	3838	.380+.015~-.010 (9.65+0.38~-0.25)	.380±.010 (9.65±0.25)	.170 (4.32) max	.063 (1.60) max
KEC70F	6040	.614+.015~-.010 (15.60+0.38~-0.25)	.433±.010 (11.00±0.25)	.197 (5.00) max	.063 (1.60) max
KEC70G	7575	.760+.015~-.010 (19.30+0.38~-0.25)	.760±.010 (19.30±0.25)	.197 (5.00) max	.063 (1.60) max
KEC70L	130130	1.300+.015~-.010 (33.40+0.38~-0.25)	1.300±.010 (33.40±0.25)	.197 (5.00) max	.063 (1.60) max
KEC75H	0402	.040±.004 (1.02±0.10)	.020±.004 (0.51±0.10)	.020±.004 (0.51±0.10)	.010±.008 (0.25±0.15)
KEC75P	0603	.062±.006 (1.57±0.15)	.032±.006 (0.81±0.15)	.030+.005~-.003 (0.76+0.13~-0.08)	.140±.006 (0.35±0.15)
KEC75A	0505	.055+.015~-.010 (1.40+0.38~-0.25)	.055+.010 (1.40±0.25)	.057 (1.45) max	.024 (0.60) max
KEC75D	0805	.080±.008 (2.03±0.20)	.050±.008 (1.27±0.20)	.040±.006 (1.02±0.15)	.200±.010 (0.50±0.25)
KEC75R	0718	.070±.015 (1.78±0.38)	.080±.010 (2.03±0.25)	.120 (3.04) max	.200±.010 (0.50±0.25)
KEC75B	1210	.110+.020~-.010 (2.79+0.51~-0.25)	.110±.010 (2.79±0.25)	.100 (2.54) max	.024 (1.00) max

◆Resin Mold

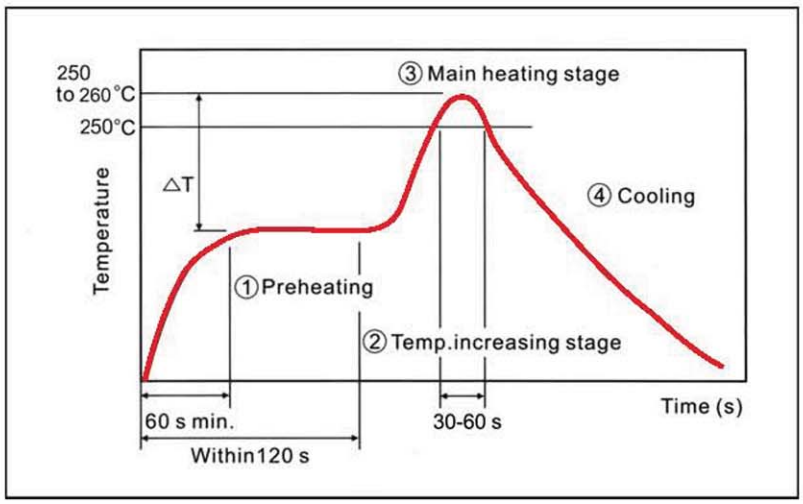
If a large amount of resin is used for molding the chip, cracks may occur due to contraction stress during curing. To avoid such cracks, use a low shrinkage resin. The insulation resistance of the chip will degrade due to moisture absorption. Use a low moisture absorption resin. Check carefully that the resin does not generate a decomposition gas or reaction gas during the curing process or during normal storage. Such gases may crack the chip capacitor or damage the device itself.

◆Soldering For Chip Capacitors

●Reflow Soldering

When sudden heat is applied to the elements, the mechanical strength of the components decrease because change can cause deformity of components inside. In order to avoid mechanical damage in the elements, preheating should be requested for both of components and the PCB board. Preheating conditions are given in the table below, It is requested to keep the temperature gap between the soldering and the elements surface (△T) as small as possible.

When elements are submerged in solvent after mounting, be sure to maintain the temperature gas (△T) between the element and solvent within the range shown in the table below.



Chip Capacitor	0402/0603/0505/0805/1111	2225/3838
Preheating	△T≤190℃	△T≤150℃

◆Hand Soldering Chip Capacitors

Among the most common reasons multilayer ceramic chip capacitors (MLCCs) fail is improper hand soldering to printed circuit boards. Typically, one or more hairline cracks develop in the ceramic, defects that may even have an imperceptible effect on initial performance, but that manifest with time, circuit board flexure, or temperature excursions. Herein are a few tips, suggestions, and caveats to be aware of in performing a reliable hand soldering attachment.

◆Solders.

Before selecting a solder, one should know the metallization on the chip. Starting at the component ceramic surface from which the electrodes protrude (typically < 1 mil), a contacting "termination" is applied that most often contains silver (Ag) or nickel (Ni). Over this is plated a barrier metal, typically nickel or copper (for non-magnetic applications), followed by a finishing metallization of tin (Sn) or lead (Pb)-tin. Other finishes may include palladium-silver (Pd/Ag), Ag, or gold (Au).

For finishes that include Ag, a silver bearing solder such as Sn62 is recommended to combat leaching of the component's silver into the solder joint. Silver bearing solders also improve resistance to thermal fatigue. For finishes that include Au, a solder such as In50 is suggested to avoid gold scavenging that may cause embrittlement (which occurs when gold comprises approximately 3% or greater by weight of the solder joint). For finishes that do not contain noble metals, SN63 is often used, or Sn95.5 or Sn96 where there is a no-lead, e.g. ROHS, requirement.

◆Fluxes.

An appropriate flux helps to clean the surfaces to be soldered and facilitates solder spread; it may also remove oxidation. Check with the solder manufacturer for a recommended flux. Rosin based fluxes are most common, but require post solder cleaning.

Fluxes are available both separately as pastes and as internal cores within wire solder. Each form has advantages and disadvantages. Use of an external flux permits precise placement in exact quantities, but consideration must be given to the activation temperature of the flux, which will be lower than that of the solder liquidus, and the time spent at this temperature. Too long at the latter will result in boiling off the flux and reducing its effectiveness. Flux core solder is easy and convenient to use, but may require more solder than desirable to have sufficient flux for good coverage.

In practice, external flux seems to work best for parts of size 0603 or 0505 and below, while flux core solder appears satisfactory for larger component sizes.

◆Soldering iron.

A temperature controlled iron of suitable wattage is strongly recommended. The iron temperature should typically be set 20-30 0C above the solder liquids temperature. Tip size is important; it should be about the same size as the part. Too small a tip (corresponding to an iron of insufficient wattage) will take too long to heat the printed circuit board land and part, while too large a tip (too high a wattage iron) may damage the board or component.

◆Soldering Procedure.

The initial consideration is which end of the capacitor to solder first. The choice can generally be decided by recognizing that it is desirable to minimize the heat flowing directly through the component. Thus, it is best to start from the end that has the poorest heat conduction (equals highest thermal resistance) to a heat sink. (Were one to start from the opposite end, a good heat path would have been created through the capacitor to the heat sink when one soldered the second joint.) If it is not apparent which land has the poorer connection to a heat sink, begin with the one having the smallest area.

◆Follow these steps in soldering:

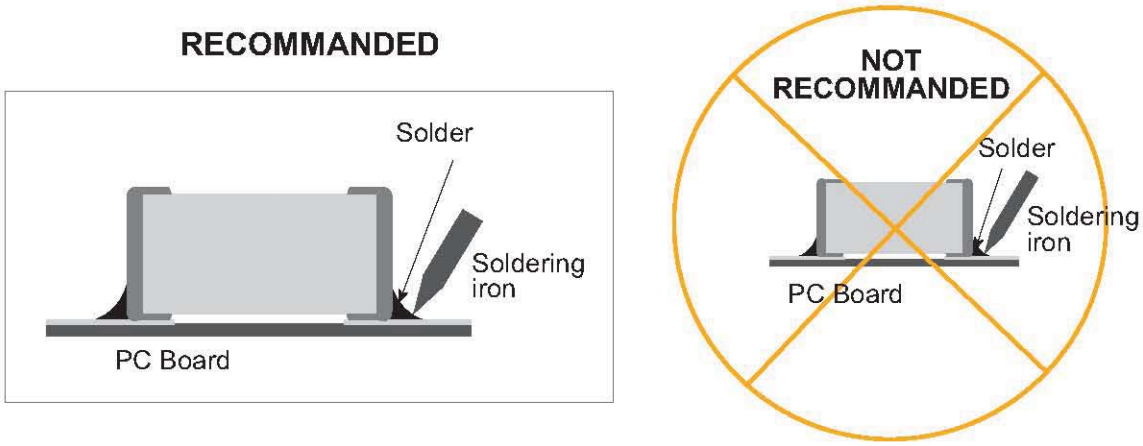
① Pre-heat the substrate. Where possible, it is very desirable to gradually pre-heat the substrate, e.g. on a hotplate, to about 30 0C below the solder liquids temperature. Two steps are usually sufficient: Start the hotplate at a temperature about halfway to the desired pre-heat temperature, place the board on it and wait till the board temperature stabilizes, then increase the hotplate temperature to the desired final pre-heat value.

② Pre-"tin" the traces. Select one of the PC board lands and clean it with isopropyl alcohol. If the solder you are using does not contain its own flux, place a small quantity of flux on the land, and a small amount of solder into the flux. (A razor may be used to cut a tiny custom preform from solid wire.) Place the iron on the printed circuit trace adjacent to the flux (but not touching) and heat the land until the solder melts into a flat, shallow pool. Remove the iron, then clean off any remaining flux with isopropyl alcohol. Repeat the procedure for the second land, then add fresh flux and a fresh solder preform (if not using flux-core solder) to each tinned land. (The preform should have sufficient mass to create a proper fillet - see step 5 - on the component.)

③ Pick up the component with either a hand tweezer or vacuum tweezer. (Stainless steel or ceramic-tipped tweezers are preferred.)

④ Place the component so that it straddles the circuit board lands, and make sure it lies flat on the board. As shown in Fig. 1, Do not touch the component directly with the soldering iron. Rather, touch the iron to the land adjacent to the capacitor until the solder begins to flow; then move the iron slowly toward the component.

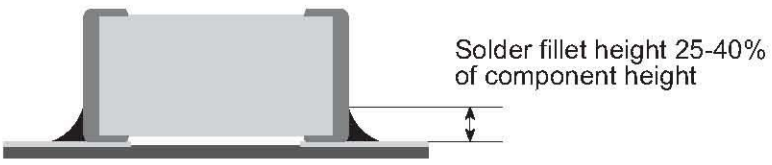
Fig.1



⑤ When a fillet forms, remove the iron. As shown in Fig. 2, solder fillets should occupy about 25-40% of the component's height, have a concave profile, and be free of peaks and voids.

⑥ Repeat steps 1-5 for the second joint, then let the board cool gradually to room temperature. Use isopropyl alcohol to remove any residual flux from each joint.

Fig. 2



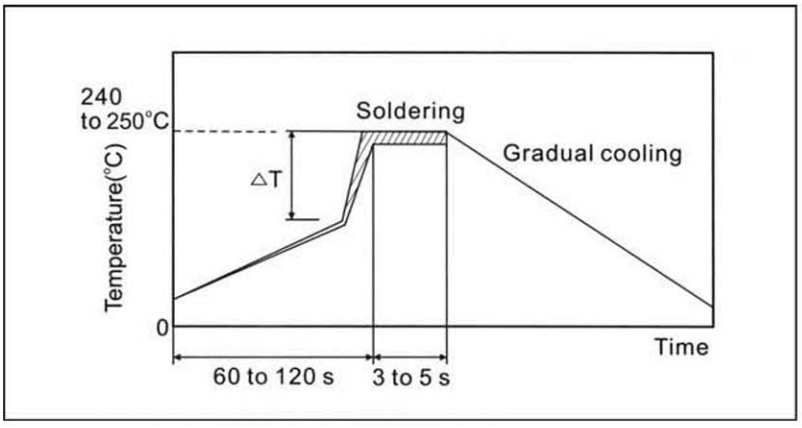
◆Wave Soldering

When sudden heat is applied to the elements, the mechanical strength of the components should decrease because remarkable temperature change can cause deformity of components inside. Also long soldering time or high soldering temperatures, result in leaching by the external electrodes, causing poor adhesion or a reduction in capacitance value due to loss of contact between electrodes and end termination.

In order to avoid mechanical damage in the elements, preheating should be requested for both of the components and the PCB board. Preheating conditions are given in the table below. It is requested to keep the temperature gap between the soldering and the elements surface (.T) as small as possible.

When elements are submerged in solvent after mounting, be sure to maintain the temperature gas (.T) between the element and solvent within the range shown in the table below.

Do not apply the flow soldering to capacitors not listed in the table below.

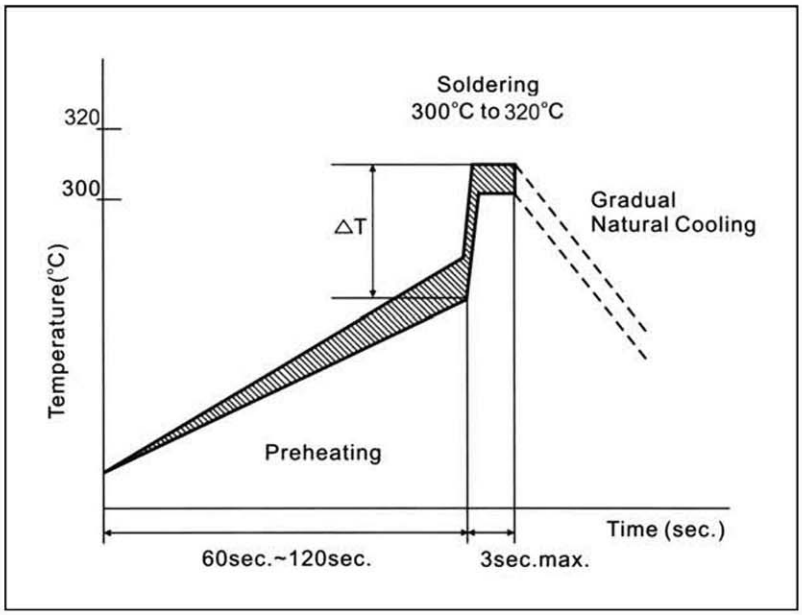


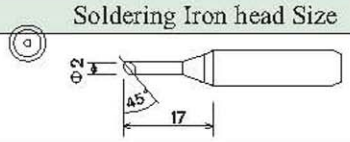
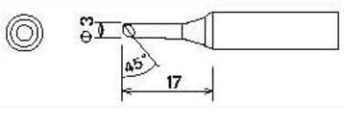
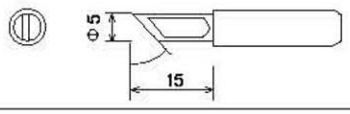
Chip Capacitor	0402/0603/0505/0805
Preheating	△T≤150℃

Kete does not recommend flow soldering for its KEC10/70B(1111), KEC10/70C(2225), KEC10/70E(3838).

◆Soldering Iron

When sudden heat is given to the elements by soldering iron, the mechanical strength of the components should weaken because sharp temperature change can cause deformity of components inside. In order to avoid mechanical damage in the elements, preheating should be requested for both of the components and the PCB board. Preheating conditions are given in the below table. It is requested to keep the temperature gap between the soldering and the elements surface (△T) as small as possible. After the soldering, it should not be allowed to cool down suddenly.



Size	Soldering Iron	Temperature	Soldering Iron head Size	Solder
0505/0805	70W Thermostat Iron	330℃		63Sn/37Pb, 95.5Sn/3.8Ag /0.7Cu
1111		350℃		
2225		370℃		
3838		370℃		