How to solder SMD at home

Soldering SMD parts isn't hard task and there are many methods of doing this. Lets go through several SMD soldering methods and examples.

Method 1

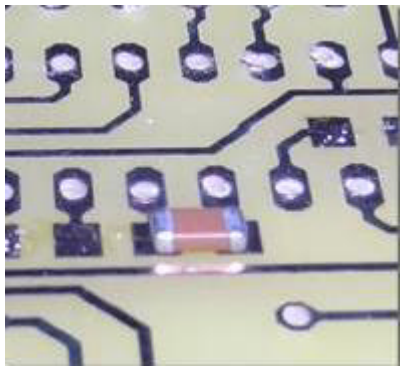
For this you will need:

- Good eyes or magnifying glass. Better one and another;
- Soldering iron with small tip ~10W;
- solder wire with diameter about 0.6mm

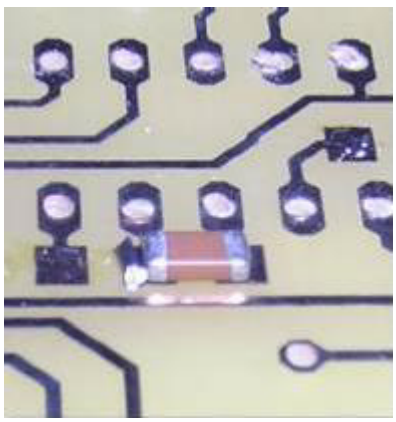
Steps to follow:

- cut solder wire in pieces in length of element width:

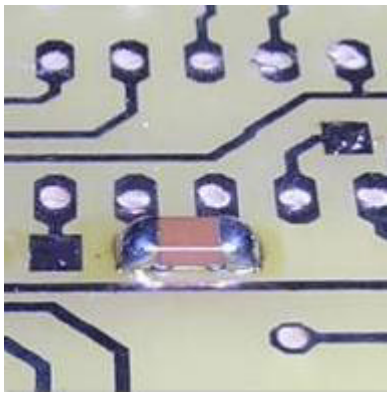
Put SMD element on circuit bord where it has to be soldered:



Put solder wire piece next to SMD:



- While holding SMD component with pincet solder part to the board by applying iron to the solder;
- Once one end is soldered repeat same procedure with another end of SMD element:



Method 2: soldering SMD in the oven

This method is handy when you need to solder SMD packages like LQFP, TQFP64 and so on. If you don't have special oven for soldering SMD then you can use one that you find at home. Of course take all safety precautions while working with ovens!

For this you will need:

- Mini-oven up to 250 ºC. It can be cheapest oven or grill. Dont use microwave!

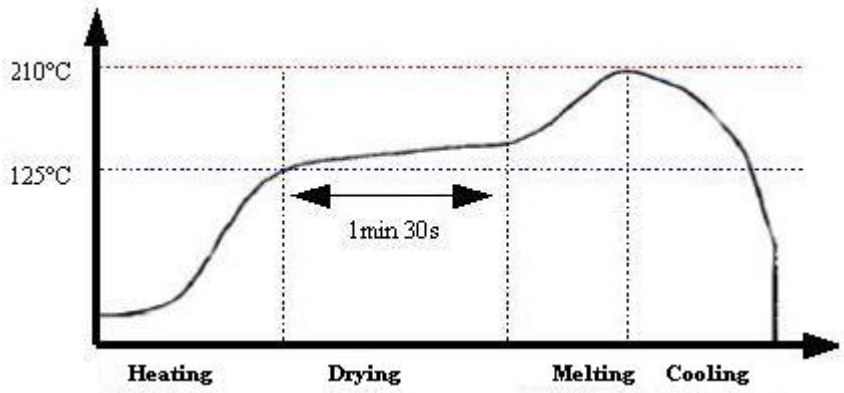
- Thermometer capable to measure temperature in range 20 ºC €“ 300 ºC. Possible solution to use thermocouple and multimeter:

- Soldering paste which contains 85% of solder (eg. Sn62Pb36Ag2) and 15% of flux.

- Injection needles about 1mm diameter:

Soldering in require more skils and right selection of temperatures. Soldering consists of following stages:

- **Heating**. Gradually increasing temperature of SMD element and solder;
- **Drying**. Time when Flux takes action and dries out. Duration about 1min and 30 s;
- **Melting**. Melting soldering paste and heating to maximal temperature about +20 ºC above melting temperature of paste;
- **Cooling**.



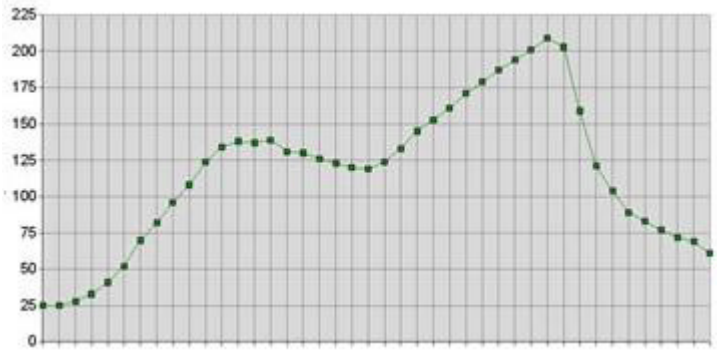
This characteristics depends on soldering paste used. Look in specifications.

Find out the characteristics of your oven.

- Heat oven up to 125 ºC. Curve angle should be 1-4 ºC/min;
- Leave 125 ºC for 1 min and 30s;
- Turn on oven and reach 210 ºC;

- Turn off oven and open the door.

Read characteristic with thermocouple and then construct a chart like this:

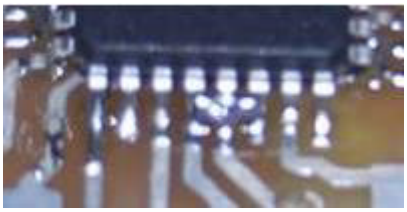


Then you can make some conclusions from this chart:

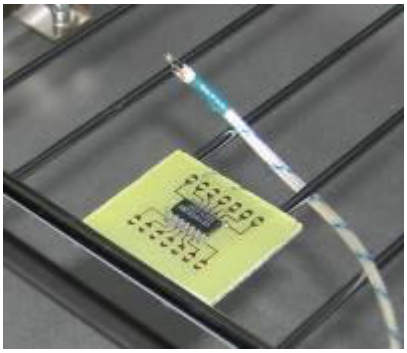
- Heating speed. Lower speed than recommended is OK ;
- Drying stage isn't stabile €“ if temperature drops too fast, add little heat to keep temperature at level. Or maybe oven has automatic heat regulation.
- Melting phase is OK;
- Cooling. Smooth drop of temperature is better. Dont try to take circuit board too fast as solder may still be soft and SMD elements may move. Leave to cool down up to 80 ºC than you can take board off.

Testing oven method

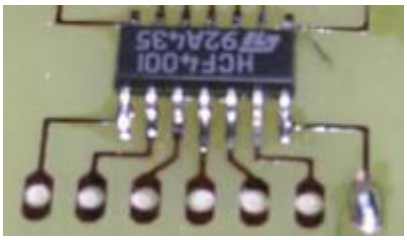
Put some soldering paste on circuit board counting that paste looses about 1/3 of its volume. If applied too much you may get soldering bridges between legs, if not enough €“ Part legs may stay un-soldered.



When paste is applied €“ put SMD component on its place and put Circuit board to the center of oven. Temperature sensor should be close to board:



Then set Oven to 250 ºC and wait until temperature reaches 125 ºC, then turn it off for 1min and 30s. Then turn oven and reach 210 ºC. You should see through window how soldering paste melts and forms a drops which fixes legs SMD elements. When 210 ºC is reached process over. Turn off oven and open the door:



After cooled test if all contacts are well soldered.

Remember that:

- Hot air in oven oxides tracks. So after oven soldering usual soldering may be harder. One way isto clean tracks from oxide;
- melting flux produces flammable gasses which flames at 100 ºC. Dont smoke while opening the door of oven;
- Soldering paste is dangerous. Ventilate the area where you are working.

How to solder SMD at home even better

Oven isolation

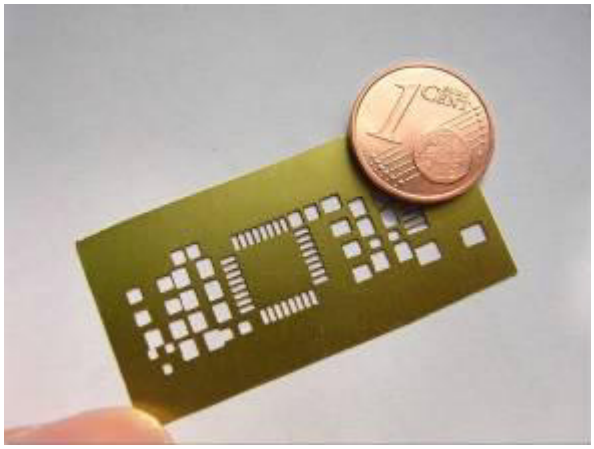
As isolation material there can glass insulation be used. In this case glass insulation was packed in aluminum foil:

Inspected improvement in heating speed:

- 0.95% without isolation;
- 1.50% with isolation only inside oven;
- 1.72% full isolation.

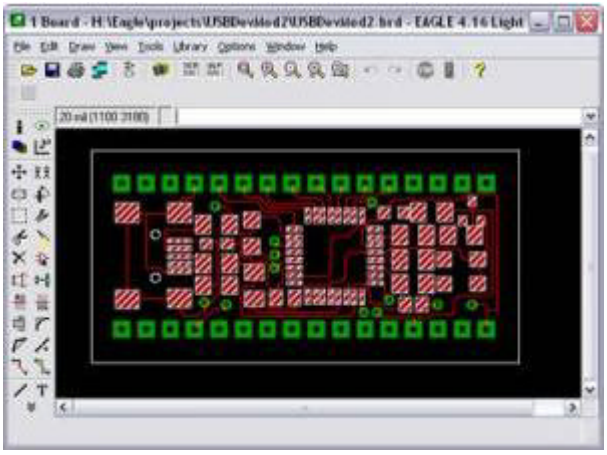
Preparing the mask for applying solder

Using the mask for applying solder paster may improve solder quality and board may look more professional.

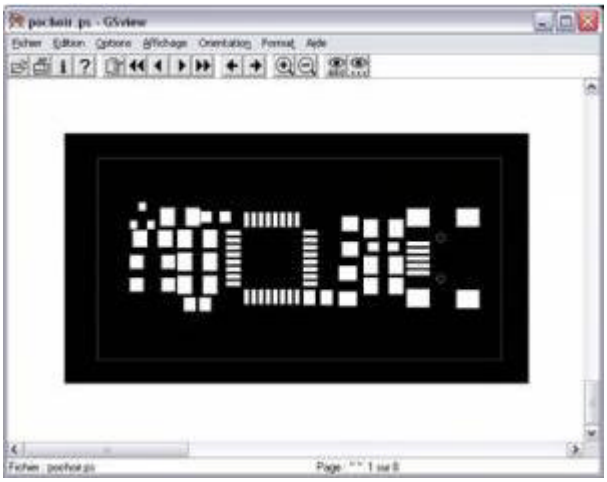


As mask material is plastic plate of 0.2mm used. Mask also can be etched as usual circuit board.

If circuit design is made by using Eagle CAD software, then for making mask go to Tools->DRC->Masks. In the field CREAM choose minimum 0, maximum10mil. In the field % valuescan be corrected.

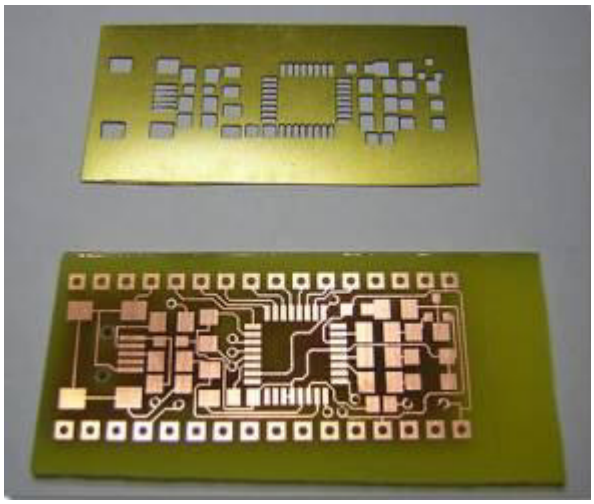


In order to expose negative of SMD plates in Eagle select layer tCream:



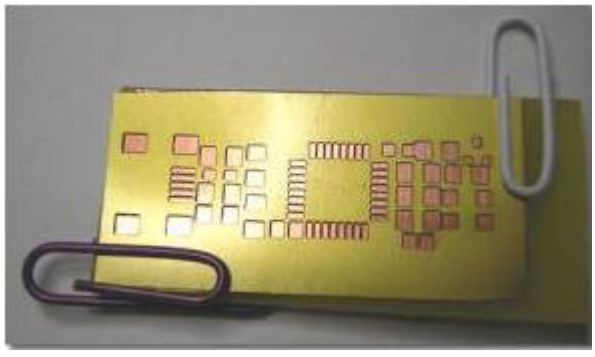
- File->CAM Processor;
- Select layer Dimensions and tCream;
- Select in Devices option PS_INVERTED;
- make sure that Scale is equal to 1;
- File: name.ps
- Process Job;
- File name.ps should be placed in working directory of project;
- Set GSView or other environment for reading .ps files;
- Open name.ps file and print it.

It is most convenient to etch the mask plate as usual circuit board. For this special brass plate may be used which has both sides covered with photo-resistive coating. Peal one protective film other leave asit is. This way you can etch through hole not the all plate.

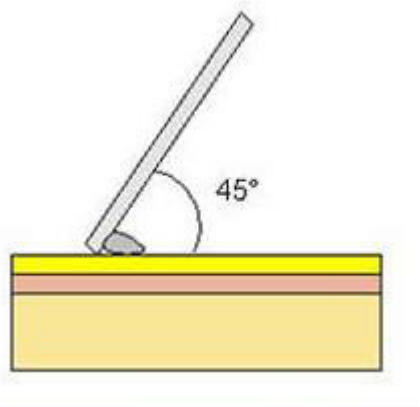


Next stage is putting cream on

First of all fix the mask to the board so that mask areas matches SMD solder areas:

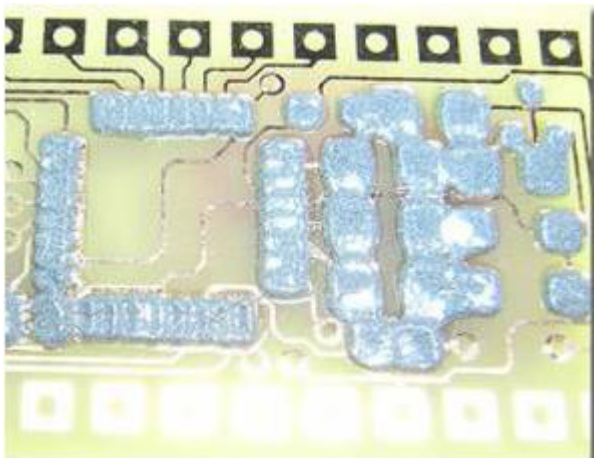


apply cream smoothly by using a strip:

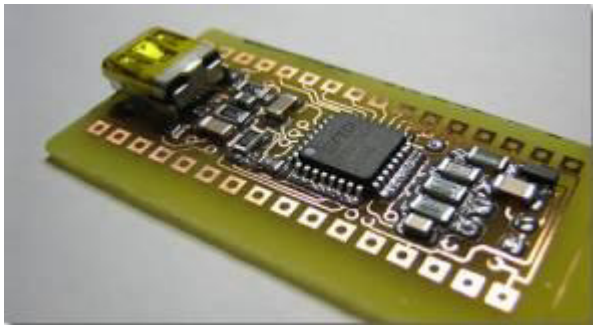


Hold the strip at the angle of 45 degrees so the paste distributes evenly:

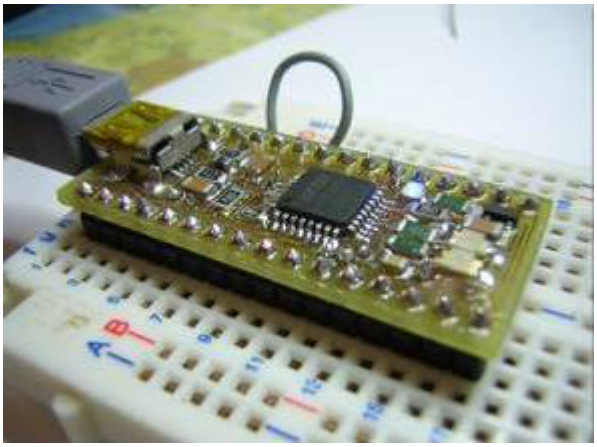
Take the mask off the circuit boar. Try to remove it vertically so that solder nicely stays on the board.



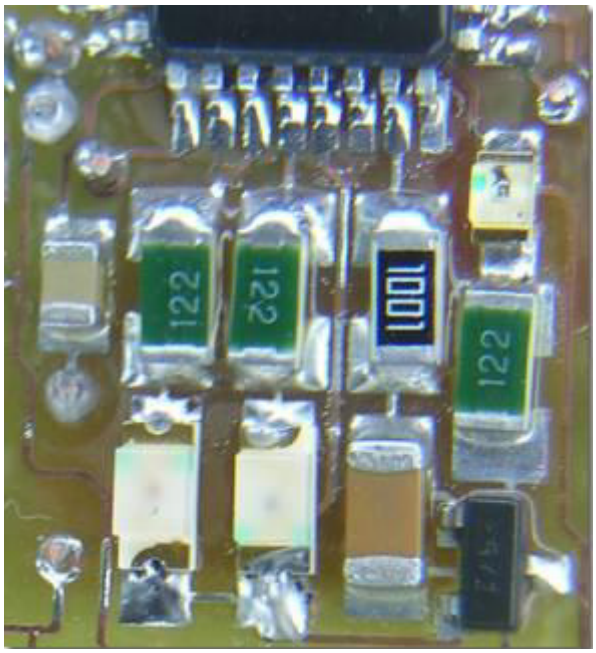
Then put SMD components on the mask by slightly pressing them down. Make sure SMD parts are well centered.



Put board in to the oven as discussed earlier. And you should get nice circuit board:



Soldered SMD board looks more beautiful and smooth



Few problems may occur while soldering with soldering paste in oven. One of them short circuit beween SMD legs. Dont panic, just apply enough flux and use solder remover. Next time make mask holes smaller when designingin Eagle.

Sometimes solder paste may dry out without soldering parts. This means that oven heats too slowly. One os solutions may be to shorten drying time.