

Reflow Oven PCB Mount

1. Introduction

The Eos PCB needs to be mounted in the PCB oven in such a way as to keep the board flat and in place as the components are baked on. Currently I believe we use large screw nuts to hold the components. The mount should hold as many boards as possible within the 13.75 in x 11.8 in size of the oven, and the material that the mount is made of should not be affected by the temperatures exposed to during the baking process including any major thermal expansion. 3D printing or any other method of manufacturing can be explored provided the final product is not affected by the oven temperatures. Ceramic materials may be a good candidate for this project.

2. Considerations

- a. Keeps boards flat and in place
- b. Maximum board mounting
- c. No major thermal expansion or thermal transfer to the board
- d. Not too large as to reduce effects on oven temperature

3. Reflow Oven Specifications

UPDATE: This PCB oven will not allow for stacking of PCBs

AS-6070 Precision Lead Free Reflow Oven

Working voltage: AC110V (220V option, order needs to be selected)

Working frequency:60Hz

Maximum output power: 3600W

Two fans internally provide heat evenly distribution

Heating methods: infrared radiation heating and hot air circulation

Working mode: four automatic soldering modes preset up, covered most solder pastes;

Setting up your own temperature program

Temperature curve paragraph: pre-heat, soak, reflow, heat keeping and cooling.

Range of temperature and time on pre-heat: 70~150 °C, 0~5 Min

Range of soak and time: up to 250 °C,0~5 Min

Range of reflow and time on soldering: up to 300 °C, 0~30 s

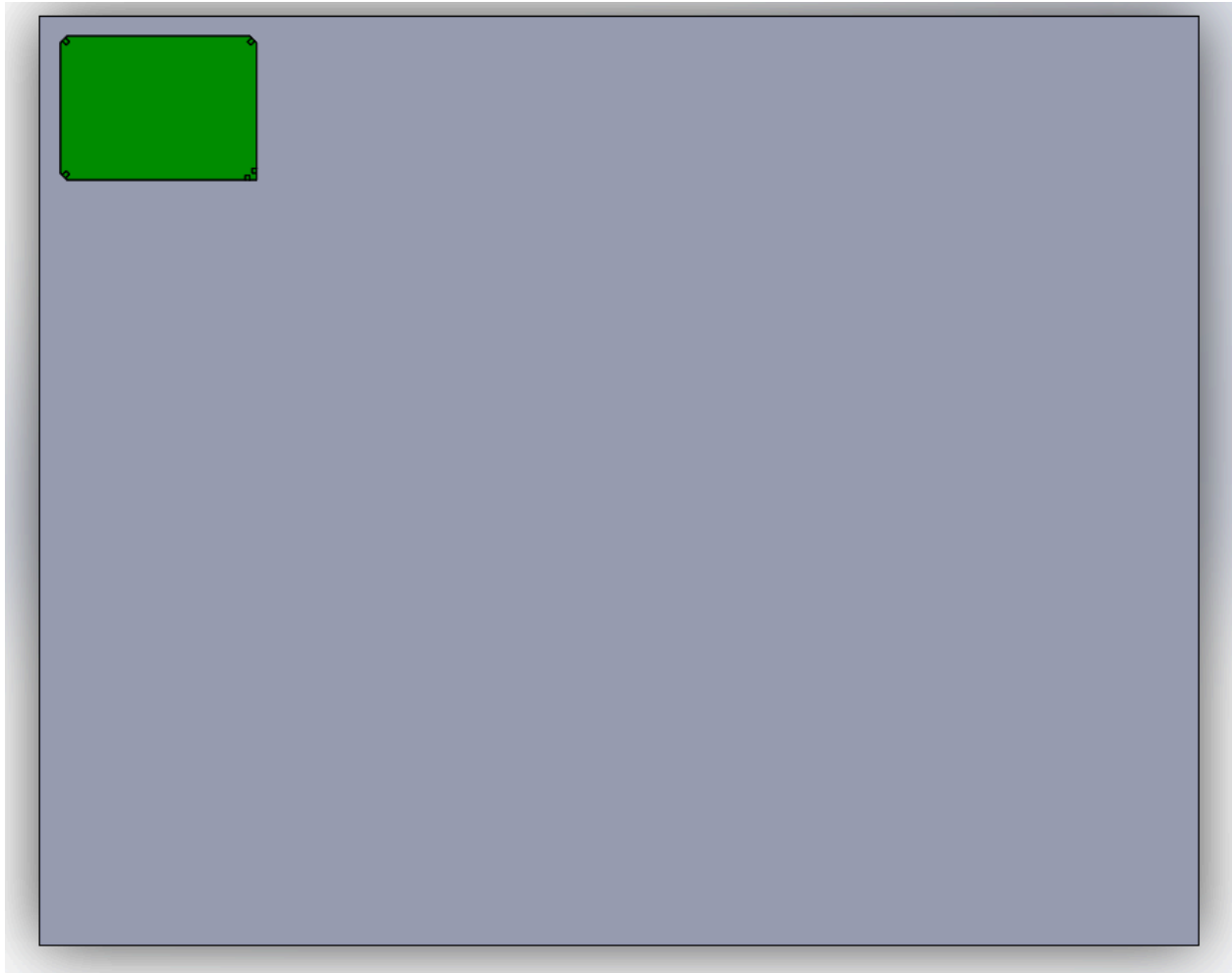
Range of heat keeping and time: (150~250 °C)

Working area: 20 " x 16 " (508mm X 406.4mm)

Unit Size: 26.5 " x 23.6 " x 12.3 "

Assumed PCB Size: 86x63mm
Best PCBs layout : 30 boards (5 X 6)

PCB & oven bed reference size:



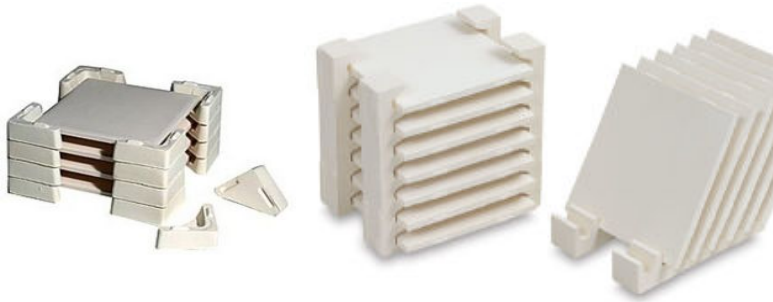
4. Option 1: Ceramic Kiln Mounts

Pros: Ceramic kiln mounts are made for high temperatures and will not have high thermal conductivity or expansion. These mounts can be very cheap, and can be arranged easily to fit our needs. Several will allow for easy stacking of the boards and can be arranged for different board sizes.

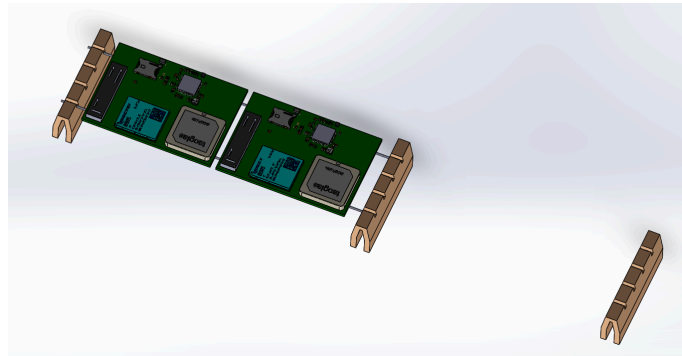
Cons: There aren't custom kiln parts, so we are at mercy of what we can find. It may be a pain to set the mounts and boards in the oven correctly, and the bases will not be fixed so the boards must be set in carefully.

Possible options for stacking tile holder sets:

A) Standard tile kiln mounts can hold the PCBs flat but may take a while to set up



B) Base and pole mounts would be quick and easy to set multiple boards on, but are not stackable and the metal poles would transfer extra heat to the PCB

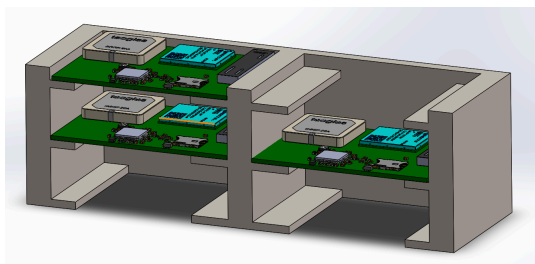


5. Option 2: Ceramic 3D Printing

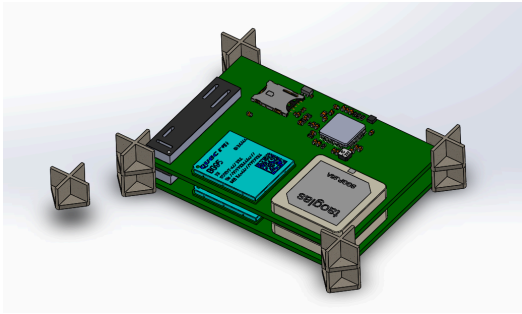
Pros: It is possible to purchase 3d printed ceramic parts. This would be beneficial because we can design exactly how we would like our fixtures to look. These parts would also have great thermodynamic properties for our oven.

Cons: these parts would have a longer lead time and would be more expensive to make

A) A shelf method would be very quick and easy to set up, but would take up a lot of space and could affect the heating of the oven



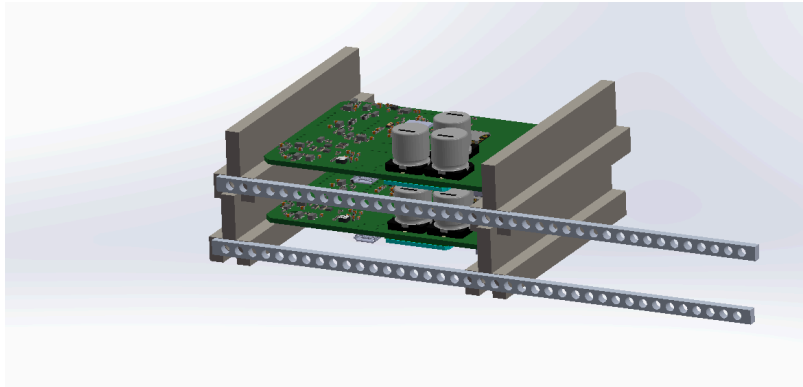
- B) A similar method to the tile kiln mounts could be made to reduce parts and fixture space, but it may still take a while to set up.



Ceramic 3D printing:

https://global.kyocera.com/prdct/fc/lp/3d-printing.html?gclid=Cj0KCQiA2ZCOBhDiARIsAMRfv9JmBi7-jZULE_n1ilje_70D65uYDS5vHaGNX7dPTr9-3v0n51gXTjlaAsvdEALw_wcB

- C) 3D printed trusses connected with a rail. This would be adjustable for different board sizes and could be stackable

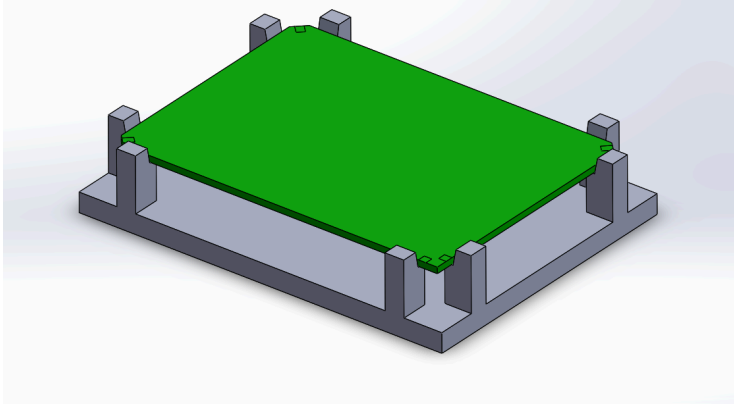


6. Option 3: Machined Design

Pros: It would be easy and cheap to CNC machine a mount for the PCBs, and these can be custom made to fit the PCBs.

Cons: Machined plastics may melt or get deformed in the oven and metals will have a higher thermal expansion and thermal conductivity.

- A) Modular design with each post fastened to a base would be necessary to reduce costs but would resemble the design below. This could still be an expensive option as each post would need to be machined.



7. Option 4: Sheet Metal

Pros: Cheap to manufacture and can develop custom designs to match our needs. Thin mounts can be used to reduce the amount of metal in the oven and reduce thermal mass

Cons: Metals will have a higher thermal expansion and thermal conductivity, and design will need to conform to sheet metal requirements (bend radii, minimum bend length, etc)

