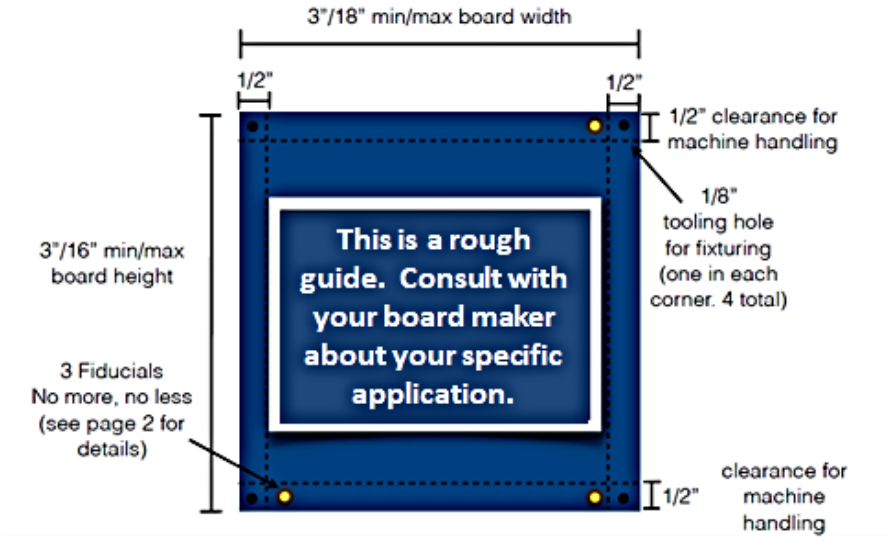
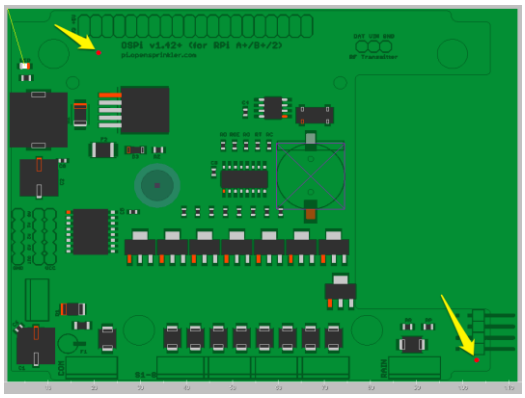
Printed Circuit Board Design
Best Practices/Design for Manufacturing for Automated Handling



Ideal Board Size

An ideal panel size would be roughly 4" square. Obviously the dimensions of your individual boards within the panel will dictate the overall panel size, but keeping the board to a nice small size enables a smoother production flow for small volume/ prototype projects. Thin boards (less than 1.6mm thick) should be even smaller.

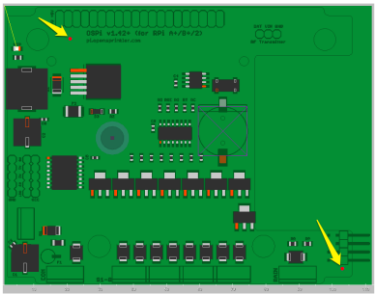


** Provided by Worthington Assembly**
Chris Denney, cdenney@worthingtonassembly.com
www.worthingtonassembly.com Podcast: www.pickplacepodcast.com

ScaleFor ClimateTech

What Are Fiducials and Why Are They Useful?

You may wonder why there seems to be a random piece of copper on your PCB when it is not part of your electronics design! It is a fiducial.



Fiducials are reference points on the PCB for automated equipment.

The machines recognizes where an object is in its space. For PCB assembly this means that our stencil printing machine, pick and place machine, and AOI machine can recognize where the PCB is when it goes to perform its task.

Consider the use of 3 fiducials. If you can't fit 3 fiducials then 2 fiducials will generally suffice. Each one serves a purpose.

1st - The first fiducials help the machine recognize where the PCB is in its space in the X and Y dimensions.

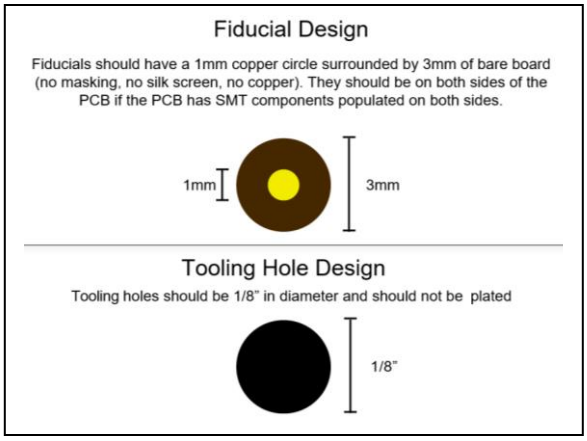
2nd - The second fiducial helps the machine recognize what orientation the PCB is in and how skewed the PCB is in the clamps. If the PCB is rotated even 1/10th of a degree this could completely ruin the assembly if it weren't for fiducials. The machine can measure the angle that the board is rotated in the machine down to the nearest 1/100th of a degree and compensate all the placements accordingly.

3rd - Finally, the third fiducials help the machine compensate for any shrink or stretch of the PCB. PCB's do vary by exceedingly small amounts over a long enough distance. This is particularly important for larger PCB's and especially true for double-sided SMT assemblies. After the first side is reflowed in the oven the board may have slight distortion. Having the third fiducials can help compensate for this effect.

Why stop at 3? Why not have a 4th? Well, imagine this scenario. Your PCB is placed inside the machine rotated 180 degrees. What happens when the machine goes to inspect the 3 fiducials? It will find your 4th fiducial and start populating the entire PCB thinking that it understands it orientation correctly.

Fiducials are necessary whenever SMT components are going to be placed onto a circuit board. This includes double-sided SMT assemblies. Make sure to put fiducials on both sides of the PCB because cameras can't see through circuit boards. It needs those fiducials on both sides.

When you are designing your next PCB or revising and existing PCB, consider adding fiducials to your design. Using a 1mm round fiducial with a 2mm masking area around it works best. This masking area eliminates any glare that might reflect into the camera from the glossy finish of the masking. The best placement of these fiducials would be at the corners of your PCB. Not all the way up to the edge. This could cause the clamps of the machines to cover the fiducials. Try keeping them about 5mm from the edge or so. You can probably squeeze them in as tightly as 3mm but that's cutting it close. 5mm leaves plenty of breathing room.



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Additional Recommendations for Design

Links to Information

If you're using any of these in your design, it's worth reading these articles before you export your gerber data.

FINE PITCH BGA ROUTING
THE PERFECT 0201 FOOTPRINT
THE PERFECT 0402 FOOTPRINT
THE MICRO USB PORT
THE USB-C PORT
THRU-HOLE SIZES
MINIMUM SILKSCREEN PARAMETERS

Know Before You Order

Before placing an order with us, it's especially important to know this information.

DOCUMENTATION
USE FIDUCIALS
PANELIZATION
CONSIGNED MATERIAL
WAI BOARD DESIGN - BEST PRACTICES FOR AUTOMATED HANDLING

Recommended Tools

We recommend using these tools as we have found them useful even for ourselves.

EXPORING XY DATA FROM EAGLE

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