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Note: This document was generated to serve as an aid to create a testable PCB while minimizing fixture costs. It is based upon our experiences in developing test fixtures and is in no way dogmatic or all encompassing. There will be variances in it as per your PCB manufacturing specifications and capabilities. Please contact us if there are bullets we can add to this spec or clarifications we can make. Thank you and Happy Testing.

1. General

- **The PCB should have a minimum thickness of 0.062"**

2. Tooling Holes

- **A minimum of two tooling holes should be placed on the PCB.**
- **They should be as far apart as possible (diagonally opposite is best) and should be asymmetrically placed on the PCB to prevent misloading by the operator**
- **The diameter should be greater than 0.100" (preference is >0.125")**
- **They should NOT be plated through.**
- **The tolerances should be less than +0.002/-0.001.**
- **A 0.125" minimum annular area around tooling holes on the bottom-side of the PCB must be kept clear from components and test pads.**
- **Tooling holes should be dedicated for test purposes and not used for fixing mechanical items etc. at a later assembly stage.**

3. Test Points

- **Joule can accommodate the deviations in the following but to minimize fixture costs,**
 - **All test points should be on one side of the PCB**
 - **All vias should be filled**
 - **Component leads should not exceed 0.095"; preferred max length is 0.062"**
 - **Component height on the probed side of the PCB should not exceed 0.120"**
 - **Center to center test pad spacing should be kept to ≥ 0.100 ".**
 - **The priority for test points is 1) test pads; 2) component leads then 3) vias.**
 - **The tolerance between tooling hole and test pad should be ± 0.002 "**
 - **Test points should not be on SMT devices as this can cause damage to the device.**
 - **Test pads should be allocated evenly over the PCB and not concentrated in specific areas. This allows the PCB to be pulled onto test probes without flexing and thus reduces areas of poor contact and latent defects.**
 - **Test pads should be circular and have a minimum diameter of 0.030". Smaller test pad diameters are possible on densely packed or double-sided SMT boards.**
 - **The minimum distance between test pad centers and test pad to component should be 0.100" (for**
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0.040" pads). Smaller test probes are available at increased cost but are less reliable.

- All probe areas must be coated with solder or an equivalent conductive, non-oxidizing surface to provide best electrical contact during test and to minimize risk of damage to PCB trace and test probes.
- A minimum 0.020" annulus, free from components or other intrusions, should be left around each test pad.
- Test pads should not be covered with solder-resist or legend ink.
- Test pads located on the component side of the PCB must have a minimum 0.040" clearance from components to prevent slightly misaligned components from obscuring the test location.
- Where components exceeding 0.120" are absolutely necessary on the bottom side, test pads should be placed at least 0.200" away from such components to allow for milling tolerances.
- No components or test pads should be located within 0.200" of the PCB edges; this includes PCBs within a panel to allow space for the urethane vacuum seal on the test fixture.

4. Test Point Access

- Unused pins of integrated circuits (ICs), connectors, etc. should be included as short circuits because unused pins can still damage devices internally and lead to premature failure.
 - A test access point should be provided for every circuit node - this assignment will take place during the initial PCB layout stage. A node is defined as an electrical connection between two or more components, either analogue or digital.
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