

Designing for Testability

MECHANICAL ASPECTS

Test Pad Spacing

- Test Probe Pads will be a minimum of .100 inches apart, pad center to pad center.
- Test Pad Centerlines must be located a minimum of .200 inches from the edge of components over .200 inches high.
- Test Pads near components less than .200 high should be placed so that the centerline of the pad is located a minimum of .060 inches away from the component.

MECHANICAL ASPECTS

Tooling Requirements

- **Provide two tooling holes .125 inch diameter with a tolerance of +/- .002 hole to hole.**
- **The tooling holes must be diagonally opposite each other and include a component free area of .125 annular radius.**
- **Tolerance of tooling hole diameter should be +/- .003 inches.**
- **Tooling hole to probe pad tolerance should be +/- .002 inches.**

MECHANICAL ASPECTS

Component Placement

- **Component should not be placed within .150 inches (prefererably .250 inches) from the edge of the board.**
- **There should be a .125 inch annulus free of components and test pads around tooling holes.**

MECHANICAL ASPECTS

Test Pads

- **A minimum of one and preferably two test points per node.**
- **A minimum of three test points per power node and 1 additional test point per every 1/2 amp being used.**
- **Ground test points should have a minimum of 2 test points or 1 per square inch.**
- **Components or component leads should never be used as a test probe point.**
- **Avoid heavy concentrations of test probes in any one area.**
- **A minimum pad size of .035 inches should be used for test probe points.**

ELECTRICAL ASPECTS

Test Node Determination

- **Method 1**
For boards under 200 nodes or less than 50 IC's the best technique would be to add a test pad or via for every node as the parts are being placed for layout. This will ensure full testability.
- **Method 2**
Layout the board initially without any regards for testability. Before design rule checking is done, test points that occur naturally by placing them in convenient locations. Based on a number of studies, the maximum number of test points to be added would usually be less than 150 and there would be very little redundancy.

ELECTRICAL ASPECTS

Method 1

- **ADVANTAGES**
 - Assured Testability**
 - Node Identification in the Beginning**
 - Control over Test Point Location**
 - Test Point Stability**
- **DISADVANTAGES**
 - More Vias than Necessary**
 - Requires More Board Area for Routing if Dense**
 - Extra Time to Place Pads**

SMT TEST CONSIDERATIONS

*There are 3 major characteristics of SMT boards
that have an impact on test strategy.*

- **Production process may include additional steps which naturally will lead to more faults.**
- **SMT boards will typically be more complex than through-hole boards. The component placement will be more dense and there can be more components on a board.**
- **The fault types of an SMT process will affect the test strategy.**