

The Foresite Umpire Test Board

The Umpire test board is the current qualification vehicle for processes (IPC-ANSI-J-STD-001) and conformal coatings (IPC-CC-830A).

The board is normally 0.062" FR-4, but could be any laminate system. The board is a double sided print and etch with plated copper. The surface is bare copper for materials qualification, but could be any surface metalization desired. This board contains the comb patterns of the B-36, B-24, Bellcore and B-25A

Advantages

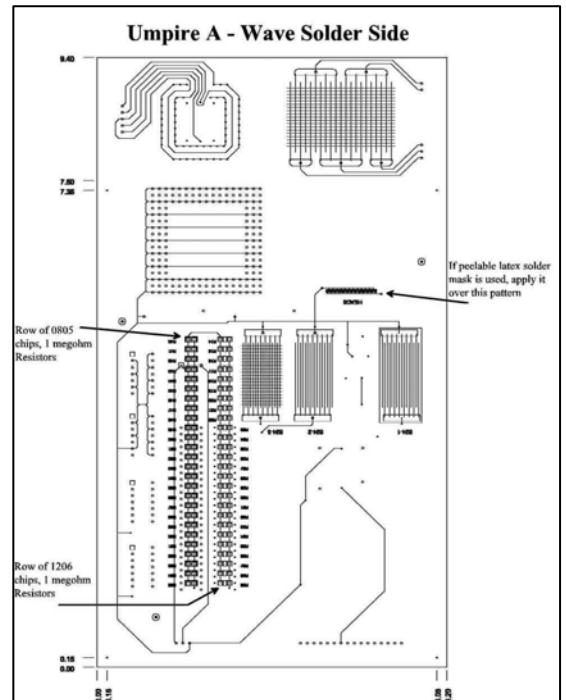
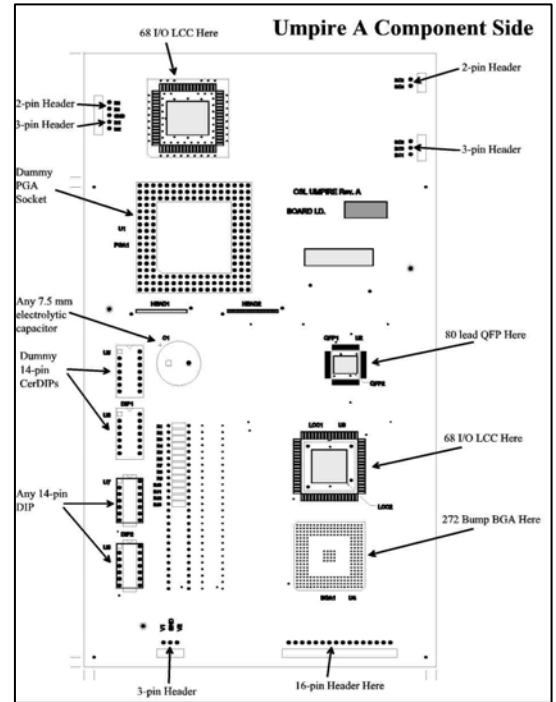
- A good vehicle to use for full process evaluations
- Easy to manufacture and therefore inexpensive
- Has all the common patterns used for SIR and electromigration resistance testing plus the component SIR patterns such as the 80 pin TQFP, 256 BGA
- Can correlate to B-24, B-25A and B36 test boards.
- Is recognized as a valid test vehicle for Bellcore testing (both TR-78 and GR-78)
- Relatively easy to wire and test
- Can do adhesion testing and dielectric strength tests
- Good vehicle for solder mask interactions and effects

Disadvantages

- Higher costs for boards and dummy components.

Best Use

This vehicle is best used to look at process qualifications for the primary steps (wave solder, SMT, cleaning, and not cleaning) and secondary steps (temporary solder mask, rework flux, and rework cleaning). It also works well to look at solder mask and interactions of solder mask with fluxes and/or solder pastes, or materials characterization tests in general. This board is a good selection if you are trying to do correlations between different specifications, ex. IPC and Bellcore. The two B-24 comb patterns allow you to do SIR for both Bellcore and J-STD-004. Pattern D can be used to correlate to existing B-25 data or for Bellcore electromigration testing. The military Y pattern can be used for many military qualification tests. Then a direct comparison between the military Y pattern and the C3 localized test can be made.



The IPC-B-24 Standard Test Board

The IPC-B-24 standard test board was designed for the IPC Phase 3 Cleaning and Cleanliness Test Program. It was designed to be a vehicle for examining the interactions between laminate, surface metalizations, and fluxes. As such, it is the primary qualification vehicle for ANSI J-STD-004, which is the IPC specification on fluxes.

The four comb patterns are identical and have 16 mil lines and 20 mil spaces. These values were chosen both for ease of stencil printing solder paste, and so the board could be wave soldered with minimal chance of bridging.

Advantages

- Very simple board (print and etch)
- Has ground circuits to isolate the combs
- Least expensive test board
- Pinout similar to the IPC-B-36 board
- Can compare results to other programs which use this board
- If a flux/paste is J-STD-004 qualified, SIR data for this board already exists
- An acceptable SIR test vehicle for both IPC and Bellcore materials testing
- No component assembly (easy to process, nearly goof-proof)

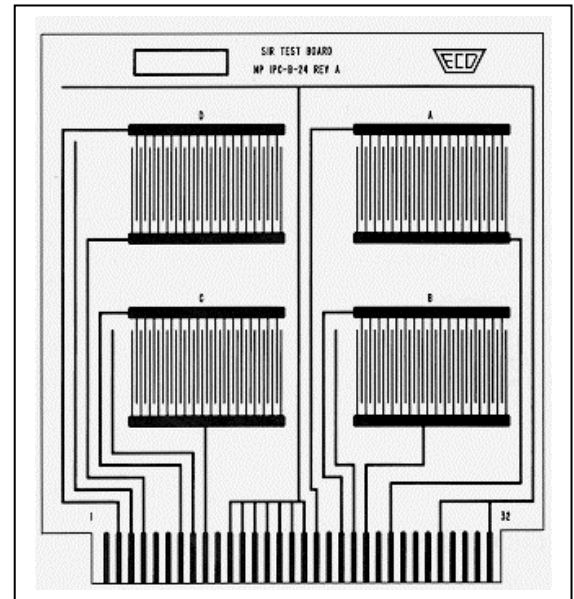
Disadvantages

- It is a very simple board (may not reflect product complexity)
- 20 mil spacings may not be representative of product
- Solder mask not normally part of this board (but can be added)
- J-STD-004 qualifications done only on unprotected bare copper
- Technically cannot be used for Bellcore electromigration resistance testing
- No component assembly (no reflow or cleaning challenges)

Best Use

This is an excellent vehicle for screening or down-selecting a large number of fluxes or solder pastes, or for testing for materials interaction effects. We have used this board to qualify fluxes and solder pastes, to examine interactive effects of solder paste and wave solder fluxes, surface mount adhesives, adhesive/flux interactions, some conformal coatings, alternative metalizations, etc.

This would not be a good test vehicle for a final qualification of an assembly process because of the vast leap needed to try and equate the data to a more real-world assembly.



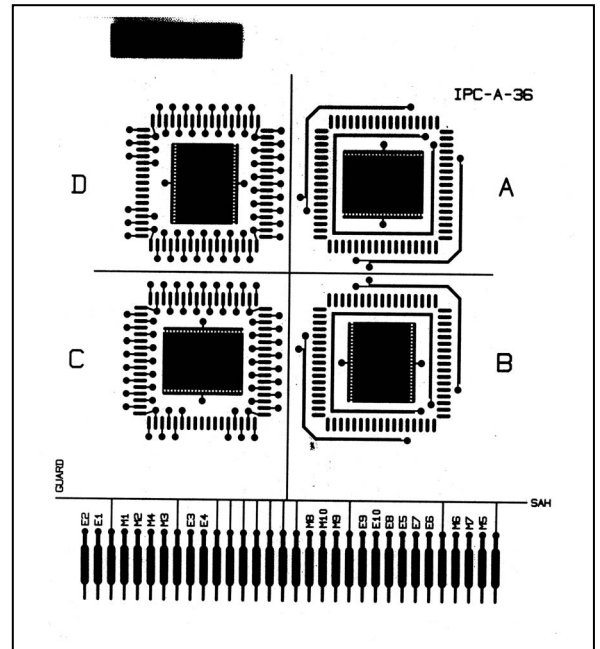
The IPC-B-36 Standard Test Assembly

The IPC-B-36 standard test board was designed for the IPC Cleaning and Cleanliness Test Program, Phase 1 Benchmark (see IPC-TR-580). It was designed to be a vehicle for examining the ability of a cleaning solvent to remove flux residues, and to examine the effects of entrapped residues under low standoff devices.

As a result of the original Phase 1 work, the B-36 board became the process qualification vehicle for MIL-STD-2000A (now cancelled). As a result of MIL-STD-2000A, the B-36 board was also used as the process qualification vehicle for J-STD-001, revision A (now superseded), and for revision B (currently in use).

This board has 10 SIR test patterns. Two patterns (#2 and #4) are the interdigitated mounting pads in quadrants C and D. The pad spacing is 25 mils. The remaining 8 patterns are all 6 mil spaces.

The contact fingers of the board are normally gold plated for compatibility with edge card connectors. The remaining metalization is normally bare copper, but could be any surface finish. In most cases, four leadless ceramic chip carriers (LCCs) are mounted on the board, one in each quadrant. A very limited amount of solder mask is used (dots or bumps) to give the LCCs a 5 mil standoff.



Advantages

- Mixed technology board – can test both solder paste and wave solder effects
- Has ground circuits to isolate all SIR test patterns
- Relatively inexpensive with both SMT and through holes
- Can compare results to other programs which use this board
- A fair amount of process qualification information is available using this vehicle
- Can test for cleaning effects and flux entrapment
- Presents a thermal challenge or thermal shadow area
- 6 mil patterns more representative of actual product
- Has some solder mask
- Can use to test rework or touch-up soldering

Disadvantages

- Difficult to process if you have no SMT capabilities (e.g. wave solder only)
- Solder mask only in very limited areas
- Generally more expensive to test (if paying by the connection)
- Generally the materials are more expensive and it is more expensive to process

Best Use

The B-36 board is best used as a qualification vehicle to test a limited number of combinations of flux and solder paste. The board was originally designed to test the ability to clean under low standoff components and works well for examining alternative cleaning materials or processes. It can be used to examine conformal coatings and their interactions with paste and flux residues.

This board would not be our recommendation for a screening vehicle.

The IPC-B-25 Test Board

The IPC-B-25 board was originally used as the materials qualification vehicle for solder masks (IPC-SM-840, revisions A and B). This board was also frequently used to test fluxes and solder pastes for SIR performance for both IPC and Bellcore standards.

This board has six (5-point) test patterns (labeled A-F). In reality, people seldom used anything other than patterns B or E (both 12.5 mil lines/space pattern), so the board was largely a waste of materials and space. There are also certain SIR-related deficiencies linked to the unbalanced design of the 5-point comb patterns. Most of these were corrected when the IPC Solder Mask Task Group designed a new solder mask qualification vehicle (the IPC-B-25A - see below).

This board is technically obsolete but it is still used by several flux and paste vendors so they can compare results to their existing historical databases. The B-25 B or E pattern is also still a valid qualification vehicle for Bellcore.

Advantages

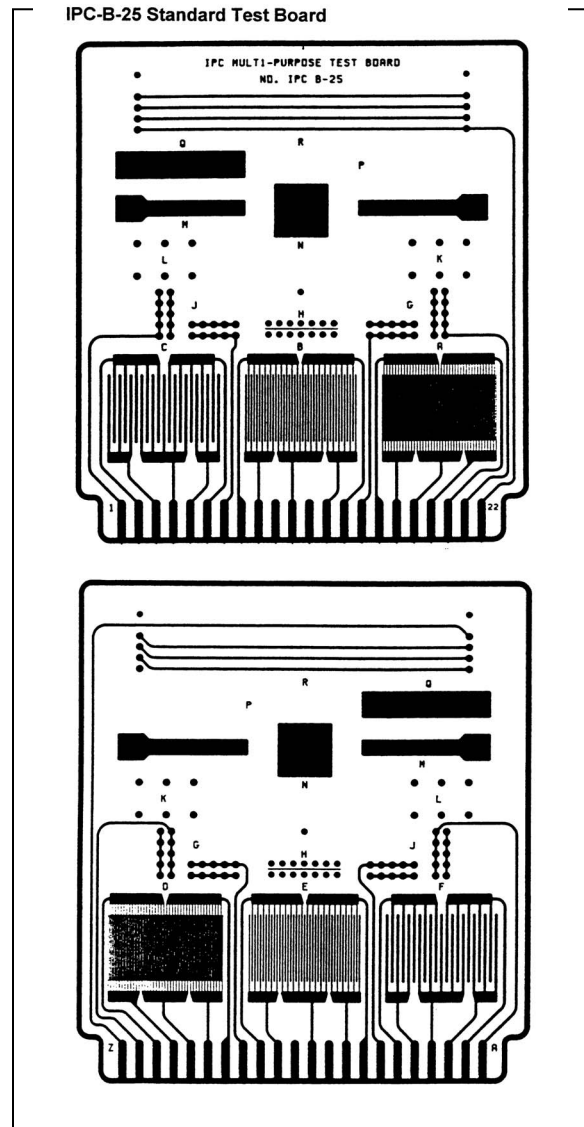
- Relatively inexpensive
- Large historical database available
- Can look at multiple spacings (25 vs. 12.5 vs. 6 mil) on same board
- Pattern B or E still allowed for Bellcore electromigration qualification

Disadvantages

- Waste of space
- Unbalanced comb design
- Not easy to test
- Can't wave solder the board with any expectation of yield for either the 6 or 12.5 mil patterns

Best Use

Not many. Bellcore electromigration or Bellcore SIR is the only place this is used anymore, and the B-25A board is a better choice. Still used in many places which are fixtured for B-25 boards.



The IPC-B-25A Standard Test Board

The IPC-B-25A test board is the current qualification vehicle for solder masks (IPC-SM-804C) and conformal coatings (IPC-CC-830A).

The board is normally 0.062" FR-4, but could be any laminate system. The board is simple print-and-etch with no plated through holes. The surface is bare copper for materials qualification, but could be any surface metalization desired.

Advantages

- Easy to manufacture and therefore inexpensive
- Has all the common patterns used for SIR and electromigration resistance testing
- Can correlate to both B-24 and B-25 test boards
- Is recognized as a valid test vehicle for Bellcore testing (both TR-78 and GR-78)
- Relatively easy to wire and test
- Can do adhesion testing and dielectric strength tests
- Good vehicle for solder mask interactions and effects

Disadvantages

- Not a good vehicle to use for full process evaluations

Best Use

This vehicle is best used to look at solder mask and interactions of solder mask with fluxes and/or solder pastes, or materials characterization tests in general. This board is a good selection if you are trying to do correlations between different specifications, ex. IPC and Bellcore. The two B-24 comb patterns allow you to do SIR for both Bellcore and J-STD-004. Pattern D can be used to correlate to existing B-25 data, or for Bellcore electromigration testing. The military Y pattern can be used for many military qualification tests.

