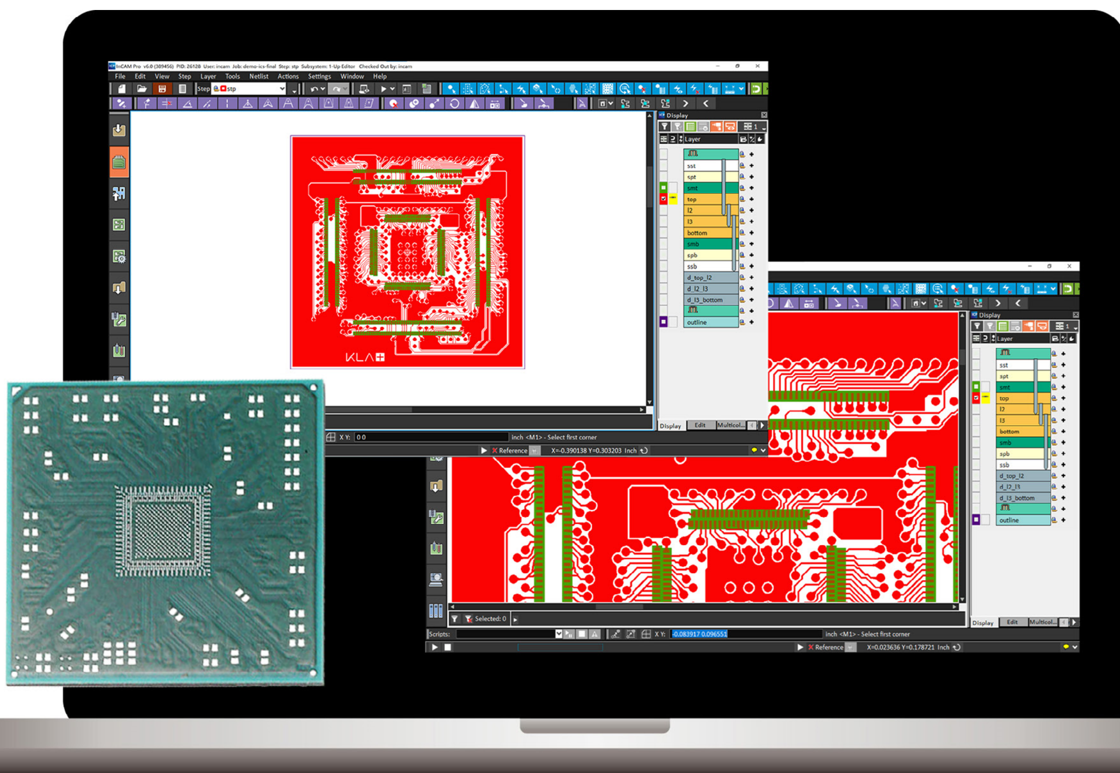
Frontline InCAM® Pro for ICS

Comprehensive CAM system for IC substrate and advanced packaging manufacturers



Frontline InCAM® Pro for IC Substrate and Packaging

Frontline InCAM Pro for ICS is a dedicated CAM (computer aided manufacturing) solution enabling IC substrate and advanced packaging manufacturers to achieve higher yields, improve CAM process cycle time and respond to evolving industry needs.

- Offers the largest set of analysis and optimization DFM (design for manufacturing) tools.
- Enhanced precision and resolution for coordinates, symbols and measurements.
- Advanced Etch Compensation, degassing holes, gold plating and other dedicated IC substrate tools.
- In-process compensation of RDL (redistribution layer) patterning for die shifting on reconstituted substrates.

Higher Resolution for Cu Area and Layer Compare

Supports sub-micron accuracy

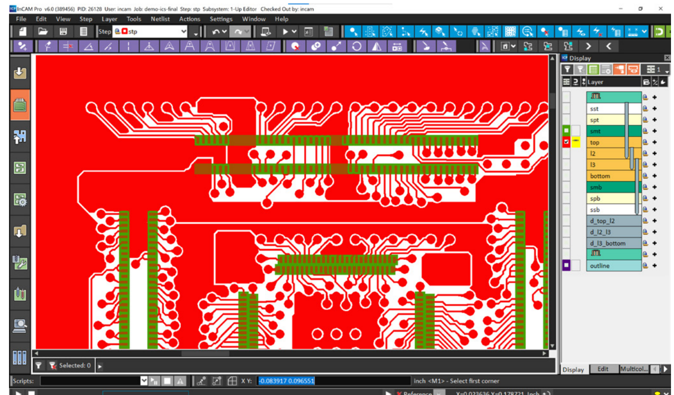
Achieve greater accuracy for symbols, coordinates, DFM and angle measurements with no coordinate or symbol rounding during input and output.

- Higher input parameter accuracy in Edit functions, DFMs and analysis.
- Higher resolution for raster operations – Layer Compare, Copper Area Calculation – to 0.001µm.
- Lower allowed tolerance for Layer Compare.

Degassing Holes Creation and Analysis

When organic adhesive film such as ABF (ajinomoto build-up film) is used, automatically add degassing holes on large copper planes, usually power-ground planes, to enhance adhesion and avoid delamination.

- Automatic degassing hole creation (round/rectangular) in a specified pitch.
- Avoid holes in proximity to critical features on same or adjacent layers.
- Check whether degassing holes apply to buildup requirements.



Advanced Hammerhead Etch Compensation

Advanced Hammerhead Etch Compensation features enable unprecedented precision and customization:

- Define different compensation for inner and outer corners.
- Work on copper, rather than on features (pads, traces, surfaces) and consider existing shaves.
- Define which type of inner corners to compensate.
- Use new compensation shapes – Triangle compensation on both edges and by measurement; oblong and chevron shapes.

Die Placement Shift and Rotation Compensation

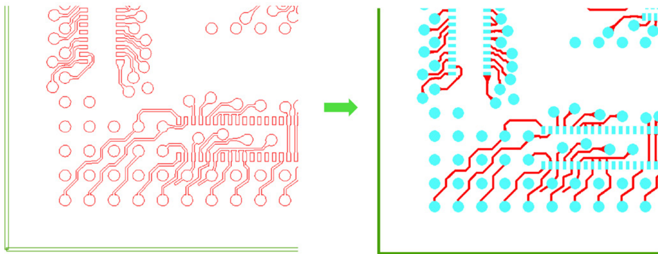
Die-first packaging technology is prone to yield loss due to shifts in die location on reconstituted substrates after pick & place and molding processes. Adjustment of the signal and via layers is required for each die.

- Supports die placement and rotation measurement inputs from metrology tools.
- Automatically adjust layer geometry to measure die locations on the panel to compensate for shifts.
- Outputs corrections to downstream patterning tools on-the-fly, for each die on each panel.

Frontline InCAM® Pro Tools for IC Packaging

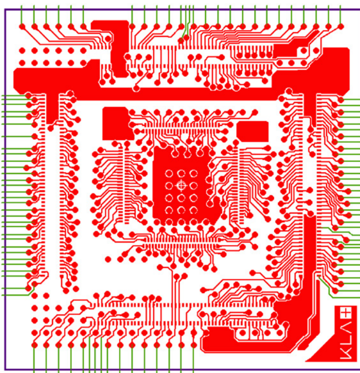
Contour to Circuit Conversion

Contour to Circuit Conversion recognizes pads and traces from designs defined as contours and can be used to clean up DXF data (after Outline to Surface) and badly drawn data (after contourizing).



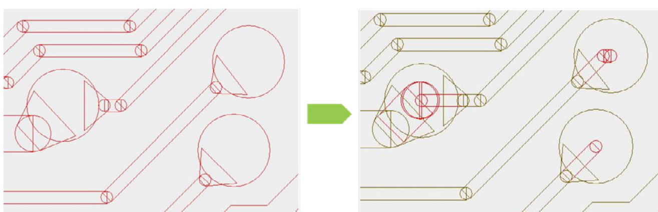
Tieline Recognition

Tieline Recognition recognizes gold tielines on IC substrate boards and marks the tielines with the attribute .tie_line, and optionally with the attribute .n_electric.



Connect Trace to Pad Center

Connect Trace to Pad Center automatically connects traces – that touch the pad or adjacent teardrop – to the pad center. The DFM extends the trace or extends and adds a trace. Prerequisites: Convert Drawn Pads and Teardrop Recognition.

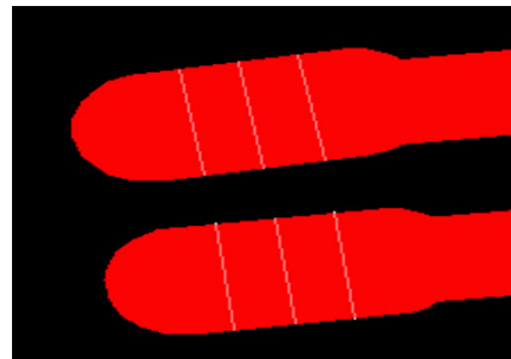


IC Package Feature Classification

IC Package Feature Classification recognizes and assigns attributes to specific parts of IC package jobs in order to treat these features differently during etch compensation and for use in Custom Analysis categories.

Signal Layer Checks

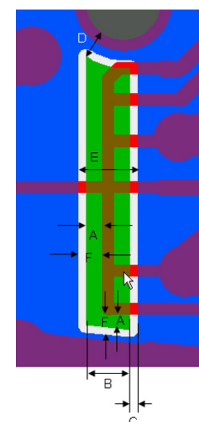
- Measure Finger Width – Run this IC packages check to measure rectangle and oval pads on $\frac{1}{3}$, $\frac{1}{2}$ and $\frac{2}{3}$ of its length. In addition, run Signal Layer Checks to measure spacing, annular ring and line width on copper layers.



- Custom Analysis Categories – Split existing result categories into different categories according to user-defined criteria (feature type, attribute).

Etchback Mask Analysis

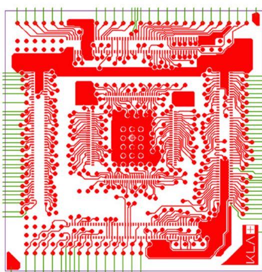
Check etchback mask validity against exposed or covered copper and solder mask. Etchback mask clears the parts of the design used inside the layer to connect pads to be gold plated together, and is etched away after the gold plating process.



Plating Line SM Clearance :	101.6	µm
Plating Line Etchback Clearance :	101.6	µm
Etchback SM Clearance :	101.6	µm
Etchback to SM Coverage :	101.6	µm
Etchback SM Width :	101.6	µm
Etchback Width :	101.6	µm
Etchback to Gold Area :	101.6	µm
Etchback to Drill :	101.6	µm

Gold Tiebar Creation

Gold Tiebar Creation adds gold plating tielines to complex BGA (ball grid array) packages enabling routing to the opposite side of the board and routing tielines through via holes when there is no space to connect all the gold-plated pads on one side.



Bonding Pads Compensation

Bonding Pads Compensation creates additional compensation for oval bonding pads by adding an arc or square surface to the edge of each oval bonding pad on the end(s) of the pad not connected to a trace.

Degassing Hole Creation

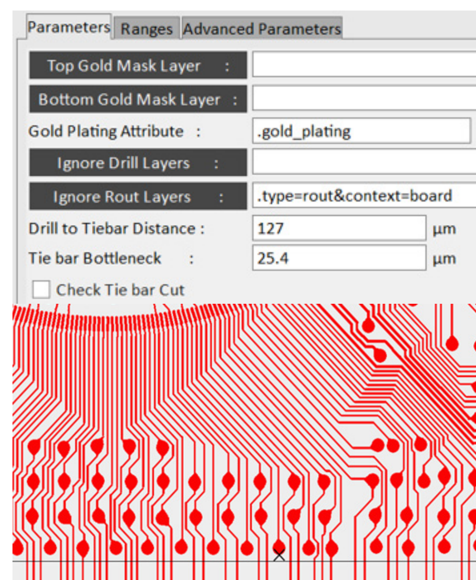
Degassing Hole Creation automatically adds degassing holes on IC substrate layers according to predefined parameters and rules.

Hammerhead Etch Compensation

- Add extra compensation to the rectangular corners of pads and surfaces.
- Ensure that die bond finger SMDs (surface mount devices) remain rectangular after the chemical etching process by automatically adding hammerhead shapes to each corner of a die bond finger pad, where spacing allows.

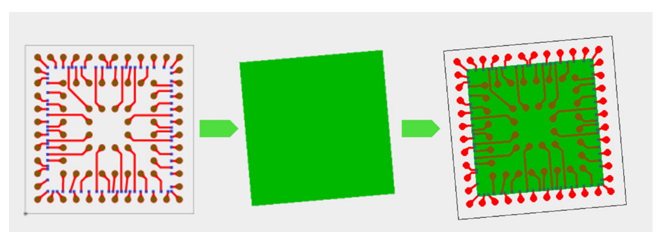
Panel Gold Plating Checks

View reports on gold-plated nets in the PCB (marked by attribute or gold mask) that are not connected to the gold plating bar in the panel.



Die Location Compensation

After die placement and molding, Die Location Compensation adjusts the formation of subsequent layers to the die's actual measured position to compensate for machine placement errors. Supports in-process automation.



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