CircuitClarity RESOURCE

PCB fabrication and standards handoff

https://circuitclarity.com/resources/pcb-fabrication-and-standards-handoff/

The decision this guide supports

Annular ring, mask slivers, spacing, creepage, bend radius, drill, and other constraints must be resolved against the chosen process and applicable standards.

A useful calculation is not the finish line. It becomes useful when its method, units, source conditions, and omitted effects fit the actual design question. Use this reference to identify that boundary before treating a nominal result as an implementation decision.

DECISION MAP

From first estimate to defensible next step

1. **List every geometric constraint (annular ring, mask web, spacing) the design depends on.**
   Start by naming the physical quantity, operating condition, and decision at stake. A number without that context cannot establish a design margin.

2. **Identify the fabricator's process capability for each constraint.**
   Keep this check explicit. It separates a useful first-pass model from an answer that only looks precise.

3. **Compare the design's nominal and worst-case values against that capability.**
   Keep this check explicit. It separates a useful first-pass model from an answer that only looks precise.

4. **Resolve any violation with the fabricator before release, not after.**
   Treat this as the handoff point. Compare the result with selected-part evidence, the real layout or assembly, and a measurement method that can reveal the remaining uncertainty.

Worked design review

Consider a designer using this method to make a first selection. The initial estimate establishes the nominal target, but it should not silently absorb a rating, curve, parasitic, temperature condition, or measurement setup from a different scenario. The correct outcome is often not a single chosen value: it is a short list of conditions that must be satisfied together.

Begin with the first two steps above, then ask whether the value still fits when the most consequential real-world condition changes. If it does, the estimate has earned a more detailed check. If it does not, the discrepancy identifies the design variable that deserves attention before a board, part, or test plan is committed.

> **Practical interpretation**
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> Process capability varies by fabricator and can change between quotes; a constraint check is only valid for the specific process it was checked against. That is not a weakness in the method. It is the cue to use the correct next source of evidence.

Questions to take into a design review

- Were the design's geometric constraints checked against the specific fabricator's current process capability, not a generic default rule set?
- Does the design meet the specific IPC class (or equivalent standard) the product actually requires?
- Where board density allows, does the design carry margin above the fabricator's stated minimum capability, rather than sitting at the exact limit?

These questions prevent a common failure mode: moving a correct equation into a context where its assumptions no longer hold. They also make it easier for another engineer to reproduce the reasoning and identify which condition needs more evidence.

Common ways this reasoning goes wrong

Trusting a generic CAD design-rule-check default instead of the fabricator's actual process capability

A design-rule check is only as good as the limits configured into it; the fabricator's real, current process capability is the authoritative check, and it should be confirmed for the specific process being quoted.

Designing to one IPC class's limits when the product requires a different class

IPC classes have materially different geometric and inspection requirements; a board built to a lower class's tolerances will not automatically satisfy a higher class's requirements.

Routing at the absolute minimum annular ring or spacing the process allows

Designing with zero margin above the minimum process capability increases fabrication yield risk; where board density allows, leaving margin above the stated minimum reduces that risk.

Where this guide stops

Process capability varies by fabricator and can change between quotes; a constraint check is only valid for the specific process it was checked against.

For a consequential design, preserve the inputs and conditions used here, then compare them with the selected component or system evidence. That makes the follow-up review faster and keeps a useful first estimate from becoming an unsupported claim.

Frequently asked questions

▶ **Why did my board pass design-rule checks in my CAD tool but get flagged by the fabricator?**

▶ **Does a design that meets IPC Class 2 automatically satisfy Class 3?**

▶ **Is it better to design to the tightest possible tolerances for maximum density?**

Related engines

- **Annular-ring and drill tolerance checker**
- **Solder-mask sliver and expansion planner**
- **PCB thermal-via planner**

Method authorities and source conditions

Use this guide alongside the engine-specific method and selected component or system data. The underlying reference families are IPC design references, IPC revision references. Those sources establish condition-specific behavior; CircuitClarity uses them to frame the decision and its limits.