SUNSTONE CIRCUITS®
A Division of American Standard Circuits

EXAMINING THE VALUE OF MANUFACTURING QUALITY DURING PROTOTYPING

Higher quality prototype manufacturing shortens product design cycles and delivers a supersized return on investment.

A smoother electronic product development cycle means getting to market faster and more profitably. Minimizing PCB design iterations is key to an innovative, problem-free process. Prototyping offers an early opportunity to save time, eliminate the need for rework, and discover opportunities for improvement.

THE MORE INPUT AND GUIDANCE A MANUFACTURING PROVIDER CAN PROVIDE FOR THIS LIST, THE LESS TIME IS SPENT ON DEBUGGING AND ENGINEERING CHANGES.

As the product team prepares their first PCB prototype for manufacture, they must consider the following:

- Schematic design
- Layout
- Interaction with firmware or software required for operation.
- Operation of chosen parts as listed in the component datasheet documentation, functional specifications, and schematic-driven simulation data.
- The PCB manufacturer's ability to manufacture the board to spec.

The more input and guidance a manufacturing provider can provide for this list, the less time is spent on debugging and engineering changes. That consultative process and the manufacturer's quality rate can contribute a great deal to creating a smoother, shorter design cycle.

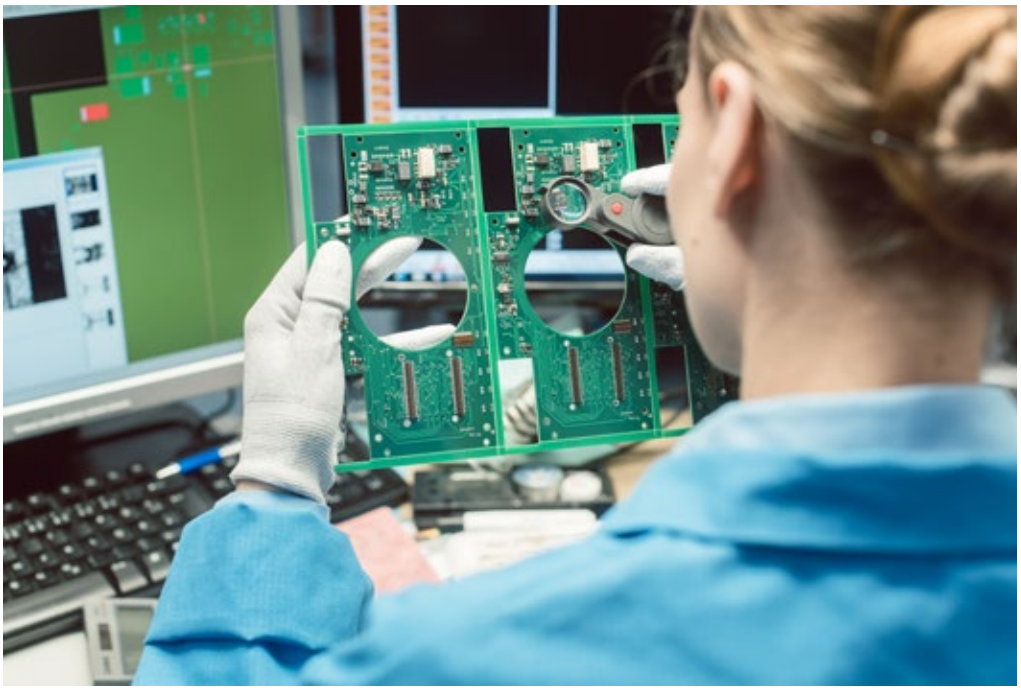
This paper will lay out the key considerations and best practices used by fabricators who deliver high quality prototype manufacturing.

OPTIMIZATION FOR PRODUCTION

The key is to improve the overall design cycle when prototyping. Prototypes optimized for production make the difference between profits and losses for some products because they can make an oversized impact in several key areas:

- Higher yield
- Quicker turns
- Fewer design iterations
- Lower component costs
- Increased functionality
- Reduced manufacturing costs.

These outcomes result when manufacturers embrace quality as culture and adhere to best practices throughout the prototyping process.



BEST PRACTICES FOR MANUFACTURING QUALITY

At a high level, best practices for prototype manufacturing quality fall into four categories:

1. Schedule Adherence (on-time delivery)
2. Design Adherence
3. Responsiveness
4. Yield

Designers and product teams should evaluate potential prototyping partners based on how well they adhere to these best practices.

1 Schedule Adherence

Reliability is a key quality component with regard to prototype manufacturing. It does not matter how good the boards are if they are not available for production. Delays in an early phase like prototyping will create a ripple effect felt throughout the product development cycle. That means it is vital for fabricators to deliver boards on time, every time.

DESIGNERS AND PRODUCT TEAMS SHOULD EVALUATE POTENTIAL PROTOTYPING PARTNERS BASED ON HOW WELL THEY ADHERE TO THESE BEST PRACTICES.

No manufacturer bats a thousand. Many PCB manufacturers claim a 95% on-time delivery rate in the prototype space. 95% sounds impressive, and the difference between that benchmark and something in the upper nineties seems marginal at first glance. It's not.

If a prototype manufacturer ships an average of 1,000 orders per day, the difference between 95% and 99% annualizes to over 11,000 additional late shipments per year. That delta in on-time shipments causes project delays for over 11,000 product development teams, on 11,000 different time-critical projects.

In terms of an individual project, late delivery is five times more likely when working with a 95% on-time fabricator versus one who delivers on time 99% of the time.

Perfection may be unattainable, but fabricators committed to delivering quality still strive for it. At Sunstone, we work every day to improve on our 99+% on-time delivery rate.

2 Design Adherence

DESIGNS WITH MANUFACTURABILITY ISSUES CAUSE PRODUCTION DELAYS AND DRIVE UP COSTS, SO IT IS PARAMOUNT TO IDENTIFY DESIGN ADHERENCE ISSUES EARLY.

The key question facing every designer: Can the manufacturer build the board I designed?

Failure to maintain design adherence can be traced back to common issues like opens or shorts in the PCB, manufacturing issues, components that do not perform exactly as specified in the data sheet, or flaws in the design itself.

Designs with manufacturability issues cause production delays and drive up costs, so it is paramount to identify design adherence issues early. In the prototype phase, design adherence helps the design team concentrate on the behavior of the design during debugging, not on whether the PCB manufacturer built what the design team specified.

So how does one evaluate a manufacturer's design adherence capabilities? Volume or rate of returned boards can offer insight. The standard or widely accepted return materials authorization (RMA) rate for PCB manufacturers is in the 2% neighborhood.

Depending on the number of projects in development, the cost per day of delay, and the time required for rebuild, a 2% RMA rate can create significant costs over the course of a quarter or fiscal year. Sunstone's RMA rate of less than 1% would reduce those costs by more than half.

Sunstone keeps its RMA rate well below industry standard by adhering to proven best practices such as:

- Clearly and proactively publishing manufacturing criteria.
- Providing tools and utilities that design teams can use to incorporate the criteria into designs.
- Ensuring that Sunstone complies with all customer- supplied production manufacturing instructions.
- Offering 25-point design reviews by request, ensuring that customers can make full use of Sunstone's manufacturing expertise.

By working so carefully to ensure accurate prototypes, Sunstone plays a key part in making the move from prototype to production more effective and problem-free for design teams. The attention to these details at Sunstone pays off for the customer design team in the long run.

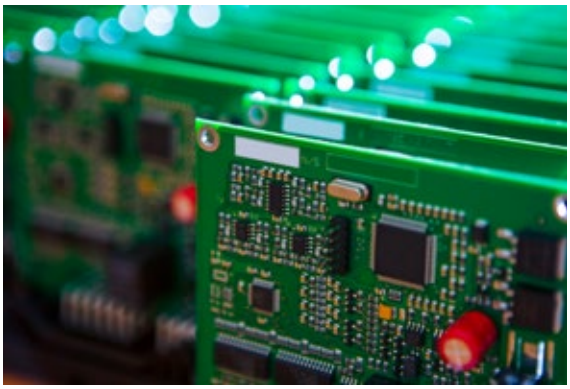
3 Responsiveness

Prototyping is a collaborative process, and a good prototype manufacturing partner will help the design team keep revision cycles to a minimum and move the project along as fast as possible. Responsiveness is key to achieving this goal. Design teams are often working on tight project deadlines, often on nights and weekends, and they sometimes need access to their fabricator at odd times.

If a PCB partner isn't available for technical assistance during those times, the design team may be delayed until the next day on a key piece of technical information. Many companies operate globally, and design teams often work in different time zones than the one the manufacturing facility operates in. If a design team working with an offshore production team has to wait for a manufacturer adhering to banker's hours, delays can be measured in days, not hours.

This is why industry leaders like Sunstone Circuits offer 24/7/365 technical support coverage. Sunstone makes experts available all the time (average customer service phone call wait time is 6 seconds), because the customer calling might be working nights on a critical project or based in a time zone on the other side of the planet. Electronics design and manufacturing is a global business, not a regional one; serving the industry is now a round-the-clock enterprise.

4 Yield



As previously mentioned, production yield levels are a key leading indicator for ongoing service levels during the product's lifecycle. Though yield becomes critically important for production, it is still of importance through the prototyping process. Sunstone's build processes, coupled with the consultative expertise and accessible experts, deliver a higher level of prototype yield overall. And since this higher yield reduces waste and production costs, Sunstone is able to offer more reliable, cost effective prototyping services.

PROTOTYPING FOR SUCCESS

A PCB MANUFACTURING PARTNER FOCUSED ON QUALITY AND EFFICIENCY CAN HAVE A NUMBER OF DIRECT IMPACTS ON THE PRODUCT DEVELOPMENT CYCLE.

A PCB manufacturing partner focused on quality and efficiency can have a number of direct impacts on the product development cycle. When the design team uses a prototype manufacturing partner that places a deep-rooted cultural value on quality and working together with customers, this helps ensure accurate, efficient, speedy fulfillment of orders for prototype boards. This can result in a more cost effective, accelerated product development because of:

- Reduced waste
- Fewer budget over-runs caused by manufacturing delays
- Streamlined testing due to reduced debug factors
- Maximized progress per design spin
- Fewer design spins
- Lower number of delays from the PCB fabrication process

This helps keep costs down overall and improves the ROI for each product developed. New or improved products developed with higher performance, higher value and higher margin have a greater impact on the bottom line.

To learn more about Sunstone's prototyping capabilities CLICK HERE

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