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"I appreciate all your help on this, it definitely shows the difference in companies when choosing a source for something."

Mr. Dewayne Bowles
BE Aerospace.

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[Tramonto News](#)

Tramonto Circuits sees positive growth in 2010!

As most companies have reported recently, Tramonto Circuits saw positive growth in 2010. We've seen growth organically from our customer's successes as well as 20% new growth as well. Our competitive prices coupled with fast response seem to allow us to service our customers well and that has helped us to grow in a very difficult economic environment.

See [2010 Growth](#) on page 2.

[Industry News](#)

IPC releases PCB Industry results for November 2010

IPC - Association Connecting Electronics Industries announced the November findings from its monthly North American Printed Circuit Board (PCB) Statistical Program.

Rigid PCB shipments were up 9.7 percent and bookings increased 4.3 percent in November 2010 from November 2009. Year to date, rigid PCB shipments were up 18.6 percent and bookings have grown 23. percent

See [IPC Results](#) on page 2.

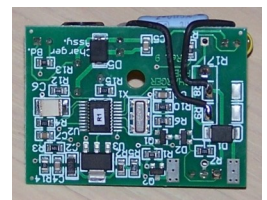
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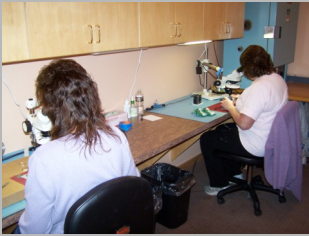
Material Choices: Advantages/Disadvantages

Material Choices for Flexible Circuits

When a flex circuit is decided on as a solution for your product or application that is not where the decisions end. There are many reasons to consider the materials used for your flexible circuits. Some of those reasons include cost, impedance controlled signals, flexibility, overall thickness requirements, component assembly and many more.

See [Material Choices](#) on page 3.





Tramonto Circuits adds assembly to Lake Elmo, Minnesota facility

"Year-on-year growth rates for rigid PCB and flexible circuit sales are still positive, but the rate of growth for rigid PCBs is slowing while the growth rate for flex is now increasing"

IPC President Denny McGuirk.

2010 Growth

New for 2010 was the addition of our assembly department at our headquarters in Lake Elmo, MN. Our local assembly division has allowed us to provide fast response to prototype projects as well as production programs in a manner that is not possible through our facility in SE Asia. Although many of processes are the same, we can tackle more tedious and difficult assembly challenges much faster here in Minnesota. We intend to acquire ITAR registration by the end of Q1 2011 that will allow us to provide services to a new group of customers that to this point we've not been able to support.

The outlook for 2011 is positive. Tramonto Circuits has a healthy backlog that stretches through Q1 and the growth experienced in 2010 seems to have picked up momentum. Most economists as well as others in the industry predict more growth in general during the next six months and we're excited to support our customers during the trek back to "more normal" conditions.

Thanks to all of you who have supported Tramonto Circuits in 2010. We appreciate the opportunity to work with you as development partners.

IPC Results

Compared to the previous month, rigid PCB shipments decreased 3.5 percent and rigid bookings increased 2.3 percent. The book-to-bill ratio for the North American rigid PCB industry in November 2010 fell to 0.96.

Flexible circuit shipments in November 2010 were up 38.8 percent and bookings grew 14.2 percent compared to November 2009. Year to date, flexible circuit shipments increased 13.2 percent and bookings were up 19.0 percent. Compared to the previous month, flexible circuit shipments increased 6.1 percent and flex bookings decreased 5.5 percent. The North American flexible circuit book-to-bill ratio in November 2010 dropped to 0.92.

For rigid PCBs and flexible circuits combined, industry shipments in November 2010 increased 11.8 percent from November 2009, as orders booked increased 5.0 percent from November 2009. Year to date, combined industry shipments were up 18.1 percent and bookings were up 23.0 percent. Compared to the previous month, combined industry shipments for November 2010 decreased 2.7 percent and bookings increased 1.7 percent. The combined (rigid and flex) industry book-to-bill ratio in November 2010 dipped to 0.96.

"Year-on-year growth rates for rigid PCB and flexible circuit sales are still positive, but the rate of growth for rigid PCBs is slowing while the growth rate for flex is now increasing" said IPC President & CEO Denny McGuirk. "Although sales are still strong, orders have slowed in both segments, due in part to seasonal effects this month. Slowing orders have driven the book-to-bill ratio downward over the past six months," he added.

The book-to-bill ratios are calculated by dividing the value of orders booked over the past three months by the value of sales billed during the same period from companies in IPC's survey sample. A ratio of more than 1.00 suggests that current demand is ahead of supply, which is a positive indicator for sales growth over the next two to three months.

See [More IPC Results](#) on next page.

More IPC Results

Book-to-bill ratios and growth rates for rigid PCBs and flexible circuits combined are heavily affected by the rigid PCB segment. Rigid PCBs represent an estimated 89 percent of the current PCB industry in North America, according to IPC's *World PCB Production Report*.

The Role of Domestic Production

IPC's monthly survey of the North American PCB industry tracks bookings and shipments from U.S. and Canadian facilities, which provide indicators of regional demand. These numbers do not measure U.S. and Canadian PCB production. To track regional production trends, IPC asks survey participants for the percent of their reported shipments that were produced domestically (i.e., in the USA or Canada). In November 2010, 83 percent of total PCB shipments reported were domestically produced. Domestic production accounted for 82 percent of rigid PCB and 84 percent of flexible circuit shipments in November by IPC's survey participants. These numbers are significantly affected by the mix of companies in IPC's survey sample, which changed slightly in January, but are kept constant through the remainder of the year.

Bare Circuits versus Assembly

Flexible circuit sales typically include value-added services such as assembly, in addition to the bare flex circuits. In November, the flexible circuit manufacturers in IPC's survey sample indicated that bare circuits accounted for about 47 percent of their shipment value reported for the month. Assembly and other services make up a large and growing segment of flexible circuit producers' businesses. This figure is also sensitive to changes in the survey sample, which may occur at the beginning of each calendar year.

Interpreting the Data

Year-on-year and year-to-date growth rates provide the most meaningful view of industry growth. Month-to-month comparisons should be made with caution as they may reflect cyclical effects. Because bookings tend to be more volatile than shipments, changes in the book-to-bill ratios from month to month may not be significant unless a trend of more than three consecutive months is apparent. It is also important to consider changes in bookings and shipments to understand what is driving changes in the book-to-bill ratio.

The information in IPC's monthly PCB industry statistics is based on data provided by a representative sample of both rigid and flexible PCB manufacturers in the USA and Canada. IPC publishes the PCB Book-to-Bill Ratio and the PCB Statistical Program Report each month. Statistics for the previous month are not available until the last week of the following month.

Material Choices

It's not always clear when materials should be considered, but we'll try to identify some of the scenarios and help clarify some of the choices and the reasons for those choices.

Most commonly used Materials The two most common materials used in today's flexible circuit industry are polyester and polyimide. We will keep this discussion general as it is intended to support the reader as a guideline and not as a technical investigation. Polyester is considered to be the most economical and is used extensively for cables because of that. Polyimide is typically used in applications that require components to be soldered to the flex circuit because it can handle the higher temperatures much better than polyester can. There are processes that allow component attachment to polyester circuits, but they are typically conductive adhesives that are used typically in the membrane switch industry. Polyimide, however, allows any shape, size and component arrangement you can imagine. All components can be soldered to polyimide circuits using industry standard techniques/process.

Cost Cost is a common reason to consider flex circuit materials. If the product will be built in high volumes then cost certainly will be a high priority. Also, if the product will be used in cost sensitive industries such as automotive or consumer products cost will be a high priority.

See [More Flex vs. PCB](#) on last page.

"Although sales are still strong, orders have slowed in both segments, due in part to seasonal effects this month. Slowing orders have driven the book-to-bill ratio downward over the past six months,"

**IPC President
Denny McGuirk**

For any products where cost is a priority the best decision is to use the most widely used materials to take advantage of economies of scale. In the flex circuit industry the most widely used materials are 1.0 mil thick polyimide with 1 oz copper. The copper material is typically bonded to the polyimide with 1.0 mil thick adhesive. This material is by far the most widely used and therefore the least expensive and easiest to procure for typical flexible circuits. Most flex circuit fabricators stock this material in the highest numbers which results in no lead time concerns. Also it is available in single and double sided constructions. The two most common constructions used for flexible circuits.

Impedance Control For impedance controlled designs the materials 'must be' considered as they play an integral part of the formula for impedance. The dielectric constant for polyimide materials may be considered constant for all intents and purposes. The thickness of the polyimide, however, coupled with signal trace width allow many options to unveil themselves. Once the value of the impedance is set and the type of requirement either single ended or differential for example, the next step is to choose a combination of dielectric thickness and trace width that allow for the proper value. The choices made at this point can have a big impact on cost and availability of materials. If materials that are not standard are necessary or chosen, the lead time will undoubtedly be affected as well as a higher cost for the lesser used material.

It's a good idea to consult with your fabrication partner at this point to either design around material they already stock or design for the lower cost solution. A few minutes spent with your supply partner at this stage of the product development will be well worth it in the long run.

Flexibility This section is sure to cause some head scratching. First of all there are two common types of flexibility to consider. The first is dynamic flexibility - a circuit that is in motion and one time flexibility or so called flex to fit. The common opinion is that the thinner the materials, the more flexible the circuit. It makes sense on the surface, but sometimes the cost difference doesn't surpass the gain in flexibility. For instance if you have a design with few signal traces and more copper etched away than remains the flexibility will be determined by the polyimide itself. And in this case the thicker albeit more standard materials may be the better choice as the flexibility gained by going to thinner material is negligible, but the cost may be much higher. Another example may be a dynamic flex circuit that you would want "as flexible as possible". A dynamic flex may actually be more robust with the thicker 1 oz copper than going to ½ oz copper materials.

With all of the possible scenarios that exist for this discussion it is another good opportunity to solicit suggestions from your supply partner. Those few minutes on the phone discussing the application and possible solutions will be time well spent.

Thickness Requirements Sometimes the application simply requires the thinnest circuit available. Sometimes the application requires a specific thickness for the circuit as it doubles as a spacer or for some other reasons. When faced with these or similar situations the material choices are reduced, but discussion is valuable. You may find that the specific thickness requirements will put you into a situation that increases typical price and lead-time, but generally, you'll want the best price and lead time. Your supply partner will be able to help you choose the best solutions for your application with the least amount of inconvenience in this situation. After all, the ultimate goal is to design the product for high quality and robustness and this can be done more easily when all of the options are spelled out clearly.

Component Assembly When your flex circuit requires component assembly via traditional soldering methods, you'll most likely use polyimide material as discussed above. However if the circuit you've designed utilizes crimp on connectors or conductive adhesive attached LEDs, R's & C's for instance on Membrane Switches you'll most likely use polyester material. Both materials hold up well in common practices and the assembly methods decided upon generally dictate the material choice.

Conclusions So from the discussion above you can see that most decisions will fall generally into two categories, polyester and polyimide. After that the cost, design, flexibility, temperature and assembly requirements will all play a part in your material choices. It's not terribly complicated as you've seen so go ahead and design your circuits with confidence. Then consult your supply partner for the best and most economical material choices available for your new design.



Flexible Circuits, Rigid Flex and Printed Circuit Boards

The mission of Tramonto Circuits is "To consistently provide its customers with high quality electronic products and services that meet or exceed their expectations."