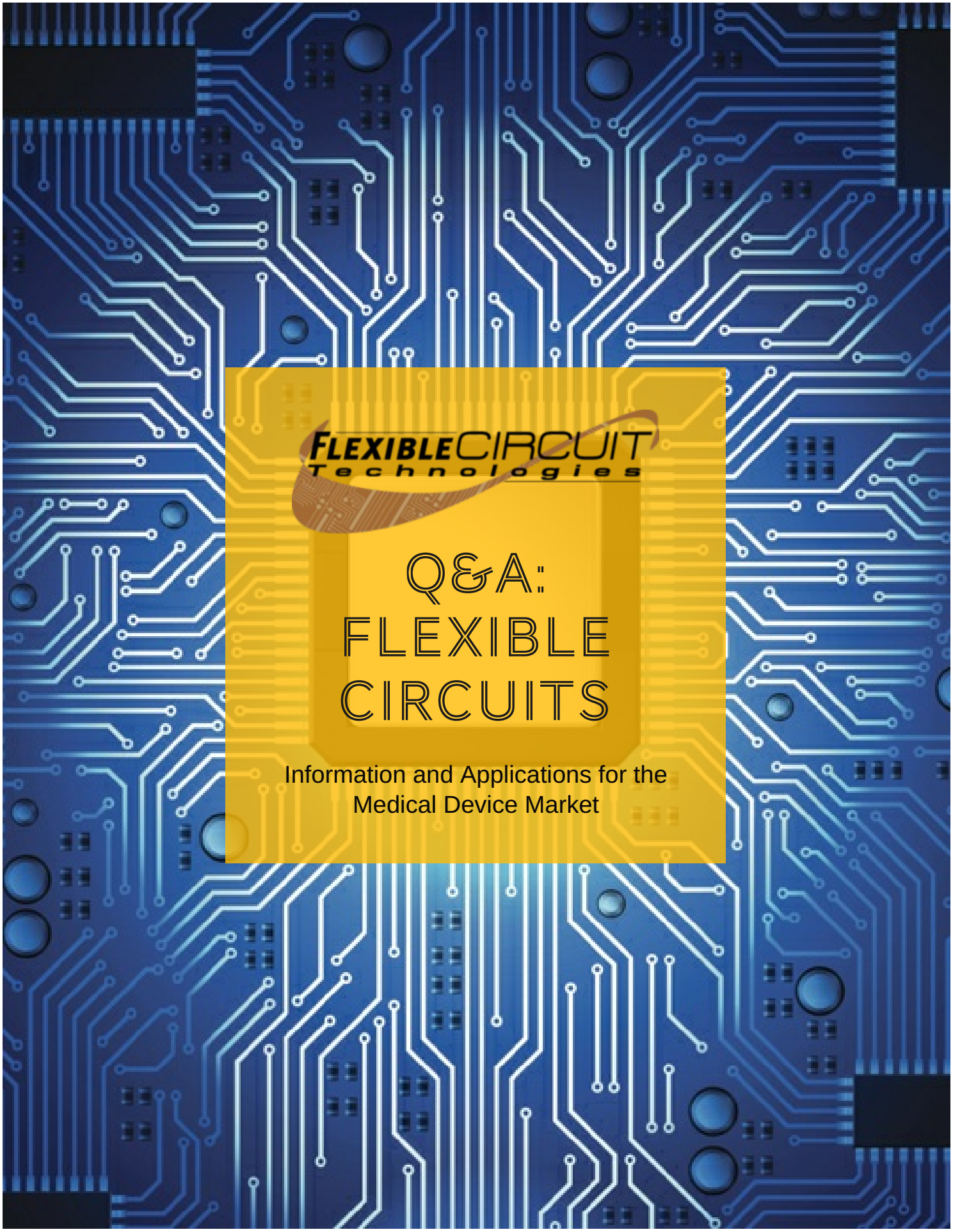
FLEXIBLECIRCUIT
Technologies
Q&A:
FLEXIBLE
CIRCUITS
Information and Applications for the
Medical Device Market

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How have intelligent devices (and the ability to share real-time data) driven significant growth of electronics within the medical device market?

The medical device market is filled with intelligent device applications, including but certainly not limited to: patient monitoring, specific health issue monitoring/treatment, automated treatment, and medical devices/surgical equipment.

Patients and healthcare providers are being connected, and the sharing of data is accomplished through the use of electronic devices. The advent of smaller electronic devices has allowed many of these applications to be wearable virtually anywhere on the body. **IoT, mobility, wearables, and the sharing of data is changing the landscape at a rapid pace within the Medical field.**

Numerous sources predict impressive growth for wearable/mobility applications in healthcare in the foreseeable future.

- **Wearable technology market:** $20 billion (£13.8 billion) in 2015 to $70 billion (£48.4 billion) in 2025. *Source: IDTechEx.*
- **Wearable medical device market**: $41 billion (£28.3 billion) by 2020, 65% CAGR. *Source: Soreon Research.*
- **Clinical and non-clinical wearable patch market:** $3.3 billion (£2.3 billion) or 12.3 million units, by 2020 up from 67,000 units in 2014. *Source: Tractica.*

These medical device solutions are able to capture meaningful data that can be gathered and shared with the patient, the physician, or other healthcare providers. The need for, and use of, electronics is at the heart of this technology. Electronics are required to develop and commercialize broad automated healthcare-related solutions. This is therefore driving significant growth for electronics within the medical field.

What is driving the significant use and growth of Flexible Circuits (FPCs) in the medical device market?

The increased need for electronics within the medical field has led to considerable growth for PCBs (Printed Circuit Boards), and even more so for FPCs (Flexible Printed Circuits). Beyond the need for electronics such as sensors, displays, LEDs, Antennas, and Bluetooth connectivity, is the need to pack more electronic capability into very small or challenging spaces.

"Product development engineers across most industries, including Medical, are being driven to FPCs as they are challenged to do more (electronically) within less space (smaller, sleeker, miniaturized designs)."

If the engineer can utilize a rigid PCB within their solution they should do so, simply based upon the improved costs when compared to FPCs. Yet product development engineers across most industries, including medical, are being driven to FPCs as they are challenged to do more (electronically) within less space (smaller, sleeker, miniaturized designs).

Given this dynamic, using traditional rigid PCBs is often not possible. Product development engineers are driven to utilize smaller, lighter, and more adaptive Flexible Circuits in the applications that they develop.

Innovation in medical devices is driving growth for flexible circuits.

This has created significant growth for Flexible Circuits within the medical arena. Further, customers have needs for highly skilled FPC Application Engineers who can provide guidance to Product Development Engineers to ensure successful and cost-effective solutions. The earlier an expert in FPC design can get involved in the product development life cycle, the better the odds of achieving an optimum design earlier in the development process.

What are the key considerations in choosing an FPC manufacturer?

The answer depends upon the goals of your organization and the level of service that you are seeking.

Geographical Considerations

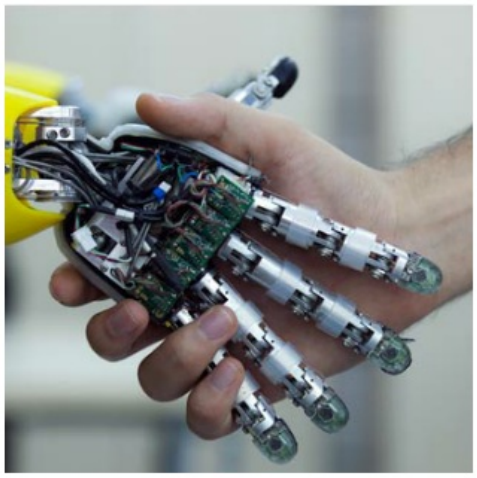
There are a small number of **major global suppliers** that are multibillion dollar companies supplying rigid PCBs and Flexible Circuits. Unfortunately, these suppliers are typically only interested in pursuing extremely large programs and, if you are not able to provide these suppliers with a certain level of annual revenue, they may choose to not work with your organization. An additional consideration has to do with where your organization will sit among all of their current customers related to priorities.

Beyond the very large global organizations, you can find **USA-based suppliers** of Rigid PCBs and FPCs. Most often domestic suppliers are ITAR certified, build their products to FPC Class III standards, and also have higher cost structures in place which lead to higher costs/prices for the customer. ITAR requirements must be in place to serve Aerospace and Military customers, but are not necessary in other industries. Most commercial users of FPCs are dealing in markets such as medical, consumer products, automotive, and they find these suppliers to be very expensive.

One can also find many **Asia-based suppliers** whose production services are being brokered into the USA. Often these suppliers will provide customers with very good production pricing, but they do not have the infrastructure set up to provide other value-added services including superior front-end design support. Rarely do they have true industry experts on staff for consultation to help customers get to more cost effective designs. Further, customers have very limited control over quality, timing, and other factors. If something should go wrong, the steps required to get the issues resolved can be very unclear. Often these brokered relationships provide the customer with added risk on a number of levels.

Expertise and Level of Service

Another consideration has to do with the rapid growth of Flexible Circuits as a product category, which is outpacing the growth of traditional PCBs. This has led many companies to jump into offering FPCs when they have little to no expertise or experience. Since they have limited experience, who is helping the customer with the FPC design?



"With rapid growth in the use of Flexible Circuits, it is very important for customers to find suppliers that offer deep expertise through a roster of highly experienced FPC Application/Design Engineers."

With rapid growth in the use of Flexible Circuits, it is very important for customers to find suppliers that offer deep expertise through a roster of highly experienced FPC Application/Design Engineers. This experience is invaluable and will help customers attain robust, reliable designs early in the product development lifecycle, thereby eliminating costly re-spins.

Additionally, through design consultation, customers may find that they can pull out an additional 25% or more of the costs on a given circuit by incorporating the recommendations made by experienced FPC Application Engineers. Unfortunately, many organizations' procurement will select a production supplier that is quoting a few cents lower on the final piece price of a particular part. Those customers often find out late in the game that working with an experienced design professional on the front end potentially could have provided far greater savings.

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Further Considerations

Certainly, there is much more to consider, such as:

- Does the supplier support low mix high volume programs, high mix low volume programs, or both?
- What kind of localized support do they offer?
- What experience do they have in design, and are they willing to come into your organization to help further educate your product development engineers on FPCs, FPC design, cost drivers, and more?
- Are they willing to come to your facility for specific design workshops for your critical product programs?
- Do they provide JIT stocking programs?
- Can they offer additional services such as component procurement, assembly services, and box-build services?
- Can they support your various locations around the globe?
- Can they offer all of this at a competitive price?

All of these variables must be carefully weighed when choosing your FPC manufacturing partner.

How can organizations attain cost savings when using flexible printed circuits?

The cost of a flex circuit alone is typically higher than a comparable rigid PCB. The point being, if you can use rigid PCBs in your application you should do so as they are less expensive. **There are typically critical design concerns that drive an interconnect to flexible circuitry.** These design concerns include, but are certainly not limited to:

- Limited space to accomplish the interconnect,
- Weight or mass restrictions;
- Elimination of wiring errors on a wire harness;
- The ability to survive high vibration or high shock/G force;
- Electrical integrity between connected PC boards mounted in different planes.

As greater numbers of engineers are being driven into using flex, how can an organization ensure cost savings while not taking unnecessary risks associated with using low cost brokered suppliers?

First and foremost, it is imperative that you get a Flex Design expert involved to support you as early on in your product development lifecycle as possible. Highly qualified and experienced flexible circuit applications engineers are a limited commodity. It would be a very risky choice to have a flex circuit designed by a standard rigid board designer who has little to no experience or expertise in designing flexible circuits.

A flex expert can help to provide you with design consultation and support that can often lead to significant savings. Flex experts will be able to offer help in determining the best approach to addressing your needs.

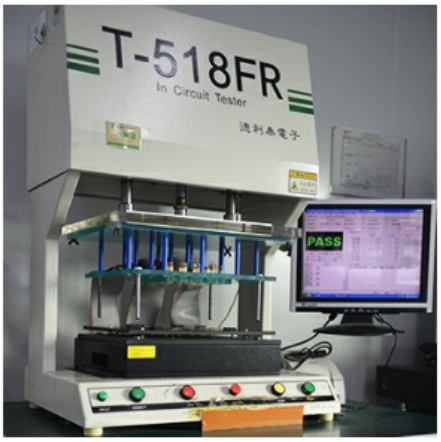
Expert FPC Applications Engineers are able to help you with many aspects of your flex design. They understand the overall cost drivers and details involving:

- Material selection and stack up,
- Acceptable bend radius,
- Mechanical concerns related to dynamic applications,

- Overall design rules (working knowledge of IPC-2223),
- Design layout for panelization,
- Forming considerations,
- IPC industry standards.

They also can help you weigh the considerations and tradeoffs that are most often required in getting to a cost-effective solution that will work within the given application.

Often the most significant savings are a result of the time spent on the front end of the design effort. This ensures that all key considerations were addressed and that the final resul is a reliable, cost-effective solution.



"Often the most significant savings are a result of the time spent on the front end of the design effort. This ensures that all key considerations were addressed and that the final result is a reliable, cost-effective solution."

Once you have achieved a reliable and cost-effective design, many other decisions can impact your ability to save on additional costs.

- Is the best choice a domestic supplier where costs will no doubt be higher?
- Are there suppliers that can provide me with improved pricing from Asia where I am not dealing with a risky brokered relationship?
- Does an Asia-based supplier also offer the other value-added service that I am seeking such as front-end design support, component assembly, JIT stocking programs and more?
- Is it more important for our organization to attain significant savings through a sound circuit design, or is it more important to save a few pennies on the piece price on what could be a circuit design with questionable reliability?

Flexible Circuit Technologies can provide the best of both worlds including highly skilled FPC application engineers who can provide design guidance (resulting in enhanced reliability and cost savings), value added support such as component assembly, and quality service and competitive pricing through its Asia-based operations.