Flex Circuit news

September 1999

Diskcon '99

3M Developing Two Metal Layer Flex

Look out IFT and Innovex - here comes the 600lb gorilla! According to folks in the Diskcon booth 3M is currently working on two metal layer microflex circuits with key customers, and by the end of the second quarter of 2000 will be offering it to the rest of the world.

Microflex circuits are adhesiveless flex circuits with very fine lines and spaces. They are used in inkjet printer cartridges, FOS circuits for disk drive heads, IC substrates and medical applications.

Check out the 3M web site for microflex products at www.3m.com/microflex.

They also have a microflex design guide on line in PDF and HTML format. Click here.

Throughout *The Flex Circuit News* there are links to the web pages of those companies or individuals mentioned in the articles, as well as links to advertisers web pages. Look for the pointing finger.

Road Trip !!!

Barnstorming the East Coast

By Tom Woznicki

I'd been looking forward to August for some time. Grandma was having her 90th birthday celebration combined with a family reunion in upstate New York and there was no way I was going to miss it. While planning the trip a lightbulb went on - why not visit some of the flex makers on the East Coast and write the whole thing off as a business trip! So after a great time at the reunion I jumped in the rental car and drove across New York and over the White Mountains to Nashua, NH.

Nashua, New Hampshire is where flex circuit manufacturing really began in the USA. I have wanted to visit here for some time because the companies here do so much rigid-flex manufacturing, and we in Silicon Valley work with mostly single and double-sided flex circuits. In this article I'll share some of the cool new flex applications I discovered.

My first stop was at Teledyne Electronic Technologies. Teledyne focuses almost exclusively on high-layer rigid-flex. About sixty percent of their business is military and the other forty percent is hi-rel commercial. Their average rigid-flex circuit has sixteen layers and they rarely build circuits with less than eight circuit layers. They love building circuits that no one else can! Their annual sales are about $25 million.

Teledyne developed and patented the Regal Flex method of making rigid-flex. Regal Flex uses a thin core of FR4 covered with polyimide coverfilm in the bending areas of the rigid-flex circuit. This removes the polyimide and flex adhesive from the rigid areas and makes the plated holes more reliable (no thermal expansion mismatch). It also helps reduce the cost of the circuit. You can see many examples of Regal Flex applications in their brochure at www.tetpct.com/html/about_teledyne.htm.

They also have papers on Regal Flex and other topics you can download at www.tetpct.com/html/white_papers.htm.

Mike Collier, sales engineer and eighteen year veteran at Teledyne gave me thorough tour and answered all my questions. Mike is also a car aficionado who teaches high performance driving for Skip Barber, but what he enjoys most is pro rally racing his fortified Mazda 323. Pro rally racing involves taking stock vehicles, fortifying them with roll cages and other safety equipment, and racing them off road on logging roads, fire roads, etc. What makes it really interesting is that the racers have never seen the course! On race day the driver and his copilot are given a map and a course description and away they go!

For lower-cost, high volume rigid-flex circuits Teledyne has a partnership with Gul Technologies in Singapore (Teledyne owns a small percent of Gul). Gul can make Regal Flex circuits with a maximum of eight layers in the rigid areas.

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After Teledyne, I hopped back in the rented Ford Contour and drove over to Flex Technology, Inc. I have been doing some design work for Flex Tech this year and I was looking forward to meeting the folks I had been speaking to on the phone. Unlike most of the flex shops in New Hampshire, Flex Tech concentrates on mostly single and double-sided flex circuits. They build prototypes and small volumes and are starting to do quick-turn prototypes.

Mike Kittle, the engineering manager, introduced me to everyone and gave me a tour of the factory. Then we were off to lunch at T-Bones with the GM George Scanlon and the production control manager Elaine Rossignol. It's a good thing Mike drove with me because I couldn't keep up with Elaine in her beyoooootiful new Corvette!

The Flex Circuit News is a bimonthly newsletter published by Tom Woznicki and Flex Circuit Design Company in San Jose, California. It is dedicated to providing information about all aspects of and promoting the use of flexible printed circuits in interconnection and electronic packaging.

The Flex Circuit News is a free publication that is delivered to subscribers by e-mail.

To submit a story for *The Flex Circuit News*, send an abstract along with the author's credentials to: Twoznicki@AOL.com.

Flex Circuit Design Company is a consulting company that specializes in designing flexible printed circuits for OEMs and flex circuit manufacturers.

Got a question? Send e-mail to Twoznicki@AOL.com or call 408-629-8343 or toll-free 1-888-353-9626

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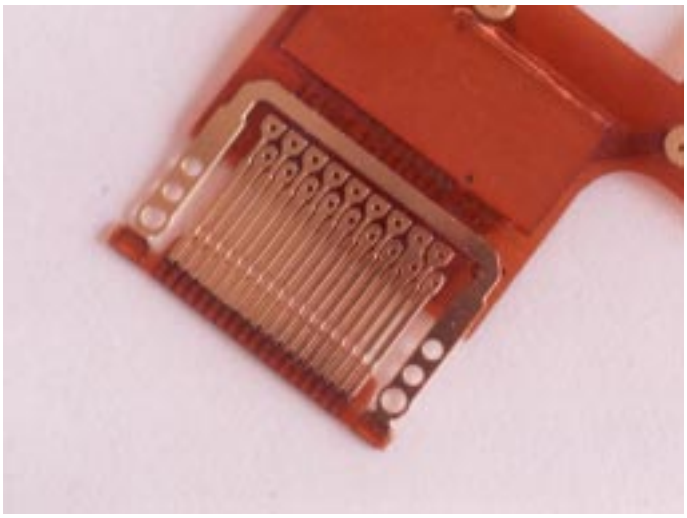
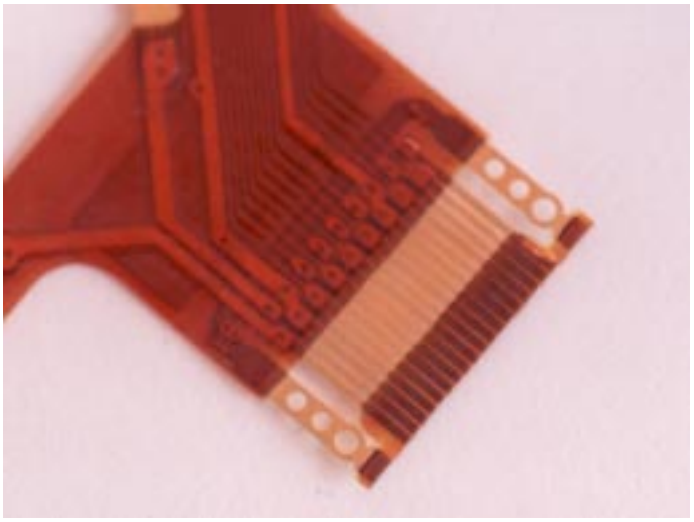
EZ Flex Circuits

Back at Flex Tech I learned more about a unique flex circuit construction called EZ Flex. EZ Flex is a unique way of producing a flex circuit with thick copper fingers that extend beyond the edge of the flex for hot-bar soldering. EZ Flex is a patented technology, invented by Rick Byran of Johnson-Matthey, a large circuit assembly company in Florida. Flex Tech is a licensee of the technology.

To make an EZ Flex a three ounce piece of copper is laminated to a regular piece of base laminate. Vias are drilled and plated to connect the thick copper to the thin copper. The circuit is then etched, coverfilms applied and exposed copper is gold plated.

This manufacturing process can create fingers with





a pitch down to 20 mils. Because the copper fingers are made from thick copper the connection to the circuit board is stronger and can be reworked. Finally, since it's a multilayer process, you can have a ground plane or multiple circuit layers.

The picture above shows the back side of the circuit where the three ounce copper has been etched into fingers. The large trace that wraps around the fingers is a strain relief that will also be soldered to the circuit board. You can also see the vias that tie the fingers to the rest of the circuit and the polyimide strain relief. The other picture is the top side of the circuit. You can see the traces under the coverfilm.

According to Mike Kittle, EZ Flex is useful in replacing complex rigid-flex circuits with EZ Flex jumpers between rigid boards. This increases yields and lowers cost. Two large cellular phones have gone ga-ga over EZ Flex because it is easier to hot-bar solder than a single-layer flex circuit. While

more expensive than a single-layer flex, the improved yields brings down the total assembly cost.

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DriCiruit - Making Flex Without Etching

After saying good-bye to the folks at Flex Tech, I went back across the river and to see Advanced Circuit Technology (ACT). ACT is a fairly large flex manufacturer - about $30M in sales this year. They recently were acquired by Amphenol. They do no rigid-flex to speak of - mostly single and double layer circuits and complete circuit assemblies.

ACT is best known as the folks who invented Sculptured Flex, a patented process that allows you to have thick copper fingers that extend beyond the edge of the flex circuit. These fingers can be formed to insert into connectors, solder into plated-through holes or be hot-bar soldered directly to a circuit board. These circuits are available as standard off-the-shelf jumpers and as custom-made flex circuits. According to Dennis Bonnette, president of ACT, Sculptured Flex accounts for about twenty percent of their business.

The most interesting part of the tour was a new process of making low cost, high volume flex circuits without etching called DriCircuit. It starts with a single-sided base laminate with B stage adhesive (not fully cured). The material is forced over a heated roller with the circuit pattern carved into it. This roller pushes the copper down in selective areas and cures the adhesive (Figure 1). Then using a high-tech lawnmower they shave off the raised copper areas leaving a conductor pattern without etching (Figure 2). Screen on a flexible soldermask, punch out the circuit and viola! - a flex circuit without wet processing. Hence the name DriCircuit.

DriCircuit uses either PEN or polyimide as the

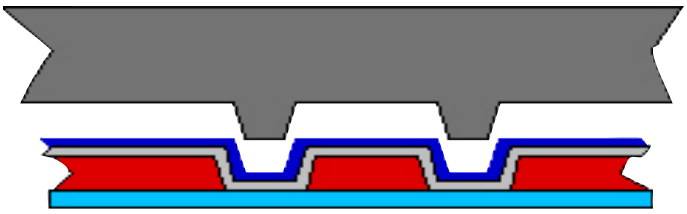
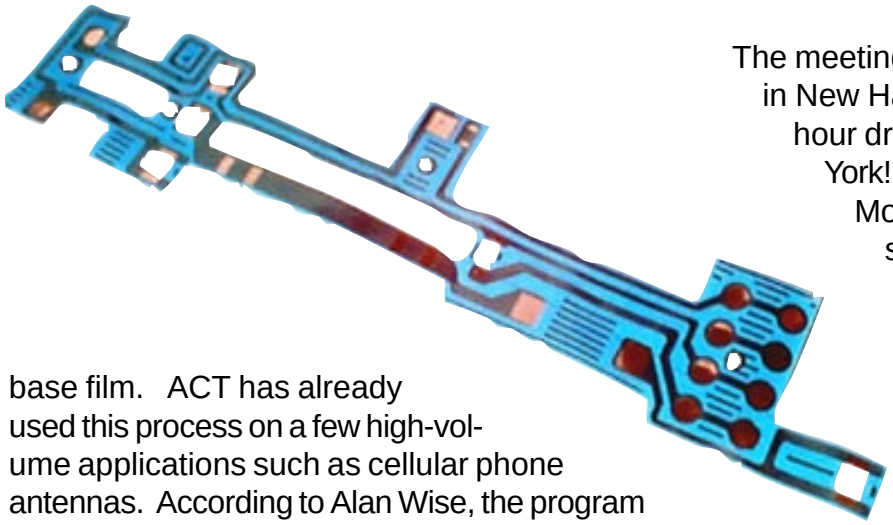


Figure One - Heated roller embosses conductor pattern in base laminate

Figure Two - Waste copper is shaved off forming individual conductors



base film. ACT has already used this process on a few high-volume applications such as cellular phone antennas. According to Alan Wise, the program manager for DriCircuit, they can make circuitry down to 10 mil lines and spaces and are working on 5 mil lines and spaces. The picture above is a circuit for the automobile industry.

DriCircuit is not on ACT's web page yet but you can get more info about Sculptured Flex and other products from ACT on their web page.

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www.act-flexcircuit.com

The meeting and tour of ACT concluded my day in New Hampshire. All that was left was a six hour drive all the way to Binghampton, New York! No more leisurely drive over the White Mountains - I jumped on the Massachusetts Turnpike and drove faster than a scalded cat. I arrived at my cousin's house at 10:45 that night, drank some Jack Daniels and slept like a baby until 8:00 the next morning.

That morning I stopped in to see the folks at International Flex Technology. I had done a few TBGA designs for them and I wanted to touch base with their new CAD folks to make sure there the data was in the format they preferred. Everything checked out fine, (**Warning**: shameless plug ahead) in fact the designer said it was the cleanest data she'd ever seen! After a great Italian lunch with the product manager Chris Angulus I headed for the airport and flew back to the left coast.

I wish I had more time because I didn't get a chance to visit more of the flex manufacturers such as Tyco in Manchester, NH and Parlex in Methuen, MA. Guess I'll have to come back next summer! Thanks to everyone at Teledyne, Flex Tech and ACT!

Back issues of The Flex Circuit News are now available on our web page - www.flexdude.com!

DILBERT

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Each edition of the *Flex Circuit News* contains a vintage Dilbert comic strip. Under our agreement with United Features Syndicate, we cannot include Dilbert in our archieved editions. Please be sure to subscribe to *Flex Circuit News* at: www.flexdude.com

Grandma - 90 years young!

Pictures from New York and New Hampshire

More pics from New York and New Hampshire

More Cool Stuff

High End Solder Stencils

While at the reunion I was talking to my cousin Melissa and found out she is in a related industry! She is part owner of Chepaume Industries, a company that makes high end solder paste stencils. They make stencils with sooooper fine openings for BGA and flip chip applications by using additive technology. Just like making flex circuits additively produces much finer features than etching, their additive solder stencils are superior to any etched or laser produced stencils.

Located in Oriskany, NY, the name Chepaume is from an old Indian phrase that means "Whoa - what a solder stencil!" Your can call them at 315-768-7001 or reach them on the web at www.chepaume.com.

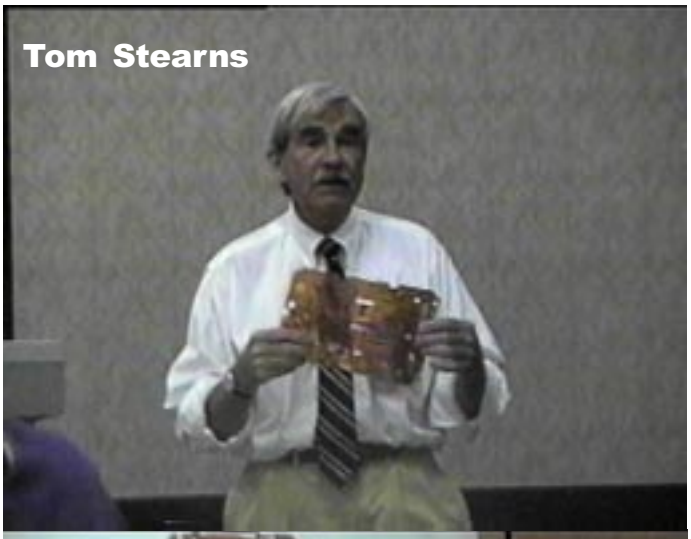
Mektec Proto Shop Delivers

Ever since I wrote about proto shops (see back issues - January 99 issue) Larry Frank, who manages the proto shop at Mektec, has been on my case to write about his proto shop. After years of either farming out protos to local proto shops or building them in Japan, Mektec has set up an honest-to-goodness proto shop here in Fremont, CA. Larry has been telling me he can turn parts in two to three days just like the other guys and I finally got a chance to test him.

Larry Frank

One of my customers, a large disk drive company, needed a some flex protos built very quickly. Since Mektec was already doing business with this company and the circuit had very high volume potential, I called Larry to see he wanted to take it on and he jumped at it. I finished the design and sent the files to the sales engineer Lori Metzler, who promptly replied "Larry promised WHAT?" True to his word, the parts were done in three business days and they looked beautiful. Larry is pictured below holding up one of the finished circuits, which couldn't be shown for confidentiality reasons.

You can reach the folks at Mektec at 510-413-2400 or on the web at www.mektec.com.



Course on Flex Design & Applications

Bill Jacobi and Tom Stearns are still on the loose teaching their three day course on designing and using flex circuits. This course is sponsored by the University of Wisconsin - Milwaukee.

The next session will be on October 25-27, 1999 in Andover, Massachusetts. The cost of the course is $1,025.00.

For information call the University of Wisconsin-Milwaukee and ask for Alex Wallace, program director, or Mark Schmidt, program assistant. The phone number is 414-227-3157. You can also e-mail them at awallace@uwm.edu or dschmidt@uwm.edu.