

# Flex Circuit news

November 1999

## Scott & Helen Russell Join Cordova Circuits Leave Dynaflex - Parlex

Cordova Circuits took a big step into the flex proto market by hiring flex aces Scott and Helen Russell from Dynaflex.

Cordova has built flex circuits in the past, but flex has been typically only about 10 percent of their yearly sales volume (about \$5 million per year). Since arriving last month Scott has trained a team who are the only ones in the shop to build the flex protos - an important step if a shop wants to build both flex and rigid boards. Helen is providing marketing support to the inside and outside salespeople, and bookings are brisk.

Cordova is located in Milpitas, CA. They're not on the web yet, but you can send e-mail to [cordova1@ix.netcom.com](mailto:cordova1@ix.netcom.com).

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## Flexible Soldermasks

### They're good - why not use them?

By Tom Woznicki

Flexible soldermasks - why don't we see them used more often? The majority of flex circuits only bend during assembly of the final product - most of these circuits could use flexible soldermask instead of coverfilm! This article will discuss the benefits of using flexible soldermask and which companies sell them.

There many reasons to consider using flexible soldermasks instead of coverfilm. Cost savings is the biggest one - you save the cost of the coverfilm material, tooling, and lamination. Lead times are also shortened. Finally, with soldermask the fabricator can make smaller solder pads that are closer together than punched coverfilm.

First, a quick glossary for those of us mechanical types that don't deal with the printed circuit board industry. There are three types of soldermasks - screened, photoimageable and dry film. Screened soldermask is applied using a squeegee and a silk screen - the silk screen prevents the mask from getting on any solder pads. The liquid mask is then cured. Liquid photoimageable soldermasks are applied over the entire circuit by either silk screening or spraying. After drying the mask is exposed to UV light using plotted artwork. The exposed circuit is then run through a stripper (must resist making cheap joke...must resist) where the undeveloped soldermask is washed away exposing the copper pads. Dry film masks are photoimageable masks sold in sheet or roll form. They are applied to the etched circuit by either vacuum lamination or heated rollers and then photoimaged.

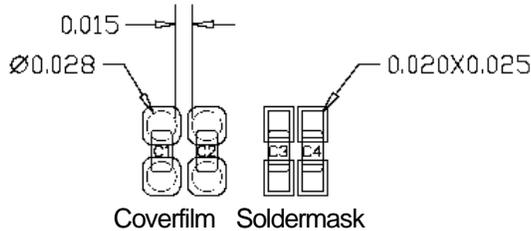
Each mask type has it's advantages and disadvantages. Screened masks are cheaper and there are fewer manufacturing steps needed to use them. Liquid photoimageable masks make more precise openings than the screenable masks and can be aligned more precisely to the etched circuitry. Dry film masks are easier to handle than liquid masks but are the most expensive of the three.

I like to use the photoimageable stuff when I have to pack lots of components in a

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.



small area. The illustration below shows two 0402 component patterns for coverfilm and two for photoimageable soldermask. The soldermask part is 25% narrower because there is no adhe-



sive squeezeout or punching/drilling tolerances to deal with. The soldermask parts can be much closer to one another because the minimum distance between coverfilm features must be larger (typically 15 to 20 mils) than for soldermask (about 8 mils). This may not seem like much, but when you are stuffing lots of parts in a small area every mil counts.

The fact that there is no adhesive squeezeout is useful when designing high end disk drive circuits. Often the solder pads needed to attach the heads to the actuator flex are so small that any adhesive squeezeout would leave very little solderable area. By using soldermask just in head area the fabricator can make tiny solder pads where needed and still use standard coverfilm in the dynamic area to balance the circuit - placing the copper in the neutral axis. However, not just any soldermask can be used - it must be specially formulated to be free of silicone so it can be in the hard disk area.

So with all these benefits you would think that customers would embrace flexible soldermask

faster than I can scarf a cheeseburger (unbelievably fast). Why isn't it more widely used?

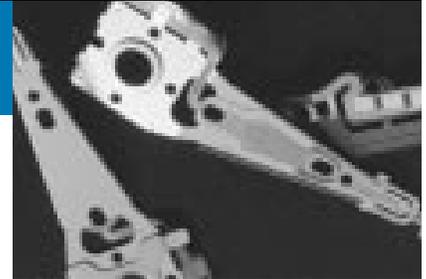
From a quality and reliability standpoint, coverfilm (or coverlay as it is sometimes called) is superior to soldermask. It really protects the etched traces, has no pinholes and is really the only choice for

dynamic circuits or circuits with really tight bend radii. In addition, many flex makers do not have soldermask capability. Unless they make rigid-flex boards they have no need to have the equipment or personnel. Sometimes if flexible soldermask is called out on the drawing they will persuade the customer to use coverfilm instead, but when soldermask is absolutely neces-

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sary they will use a soldermask service bureau. But now more flex shops are doing it themselves.

### Soldermask Producers

Now that we've extolled the virtues of flexible soldermasks, who makes them?

The Circuit Materials Division of Rogers Corporation offers a product called R/Flex 8080. It is a liquid photoimageable soldermask with five different formulations - each one with slightly different properties for different applications. Two of the five formulations are silicone-free for disk drive applications. The datasheet for R/Flex 8080 soldermasks is available at

[www.rogers-corp.com/cmu/pdf/rf8080.pdf](http://www.rogers-corp.com/cmu/pdf/rf8080.pdf).



Lackwerke Peters of Germany produces a product called ELPEMER SD 2463 FLEX, a liquid photoimageable soldermask for flex circuits. The data sheet for ELPEMER products is at [www.peters.de/saved/Pi/pi\\_elpee.htm](http://www.peters.de/saved/Pi/pi_elpee.htm).



Peters is represented in the US by Paradigm, Inc. Reps and agents in other parts of the world can be found at [www.peters.de/vertret.htm](http://www.peters.de/vertret.htm).



The circuit products group of Coates Screen (formerly ASI Coates) produces a photoimageable mask called Imageflex XV601T and a screened mask called ScreenFlex. They have a web page but there was no info on these products.

Taiyo-America, the US arm of the world's biggest soldermask company, produces two liquid photoimageable soldermasks for flex. PSR9000 is for regular flex circuits and PSR4000 for IC substrates. The PSR9000 is not UL rated so it's usually found in low power applications, such as cell phones, pagers, etc. They are in the process of



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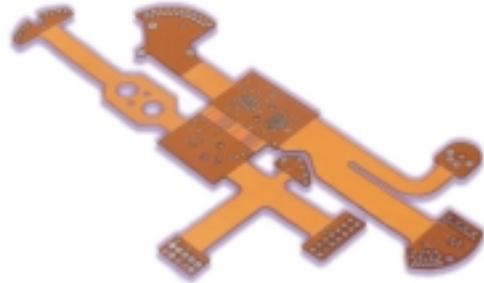
Finally, DuPont produces a dry film product called Pyralux® PC, a photoimageable coverlay that is vacuum laminated to the etched circuit. It provides better protection to the etched circuitry because it is thicker than the liquid masks. However, it is more expensive than the liquid mask and it has a shelf life. You can get more info on Pyralux® PC at [www.dupont.com/fcm/html/pyralux\\_pc.html](http://www.dupont.com/fcm/html/pyralux_pc.html). 

Big thanks to Frank Kurisu at Soldermask Inc. in Southern California for all his help with this article. Soldermask Inc. is a top-drawer service bureau for soldermask application. In addition to their soldermask business, I found out that they also make solder paste stencils, competing with my cousin's company Chepaume Industries (see the September issue). Soldermask Inc. is in Huntington Beach and can be reached at 714-842-1987. Their web page is [www.soldermask.com](http://www.soldermask.com).  Sorry cousin.

The next issue will cover which flex manufacturers use flexible soldermasks and which ones they use. If you need to find a shop before then feel free to give me a call or send me an e-mail.

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## Q-Flex Wins Supplier Award From Lockheed Martin

Kudos to the folks at Q-Flex! They earned a 1999 Supplier Excellence Award from Lockheed Martin. According to Pete Uka, Q-Flex Director of Technology, out of the entire supplier base only four companies were presented with the award. Q-Flex was the only vendor chosen from the electronics sector.

Among the circuits they supplied to Lockheed Martin was an 88 layer rigid-flex with five mil lines and spaces on the signal layers. That really wowed the judges!

Q-Flex is in Santa Ana, CA. Phone 714-835-2868 or got to the web at [www.q-flex.com](http://www.q-flex.com). 

## Packard Hughes Expands Gold Dot™ Manufacturing For Commercial Market

Last month I got a chance to visit Packard Hughes in Irvine, CA and **whoa!** - you've never seen so much new equipment! They are taking their Gold Dot™ connector technology and launching a line of off-the-shelf flex jumpers for the commercial applications.

Gold Dot™ has been one of those gee-whiz technologies that unfortunately was expensive - you didn't use it unless you needed to. But Packard Hughes has decided to build a highly automated factory that will build Gold Dot™ flex in very high volume. This will drive the cost down to where commercial applications can use it. It seems to be working - they just received a design win from Ericsson cellular phones!

These commercial Gold Dot™ flex circuits will have flexible soldermask on them, so while I was there I got a chance to talk with their head manufacturing engineer, Bob Jones, about which masks he uses. For the high volume circuits that they will build in-house they will be using Rogers R/Flex 8080. According to Bob, thickness control is very important



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to the Gold Dot™ flexes because of tight bending requirements and the Rogers material was able to give him the thickness control he wanted. He also uses Coates Imageflex for an engine module that goes in the Chevy Corvette. He uses Soldermask Inc. to do the screening and developing of the soldermask on this program.

You can call Packard Hughes at (949) 660-5772. Info on the Gold Dot™ flex products as well as the other products from Packard Hughes at [www.packardhughes.com](http://www.packardhughes.com). 

## IPC Flex Fundamentals Workshop Announced

Those two wild and crazy guys, Bill Jacobi and Tom Stearns, will be presenting another of their fine flex workshops on January 25, 2000 (assuming we all survive Y2K) in Tempe, Arizona. You can get the brochure on-line at [www.ipc.org/html/FCFwksp.pdf](http://www.ipc.org/html/FCFwksp.pdf). 

## Carving Eyeballs

On a personal note, four weeks ago I had LASIK laser eyeball surgery to correct my vision. Did I say correct? I should say to give me vision because I was blind as a bat - my doc said I was something like 20/3000 (that's not a misprint). I was in the same league as Mr. Magoo.

LASIK surgery is sometimes called "flap and zap." They make a very precise cut in the cornea and pull back a circular flap - just like a submarine hatch. Then they take an Excimer laser and remove a precise amount of cornea to make you see properly. Then they put the flap back and it heals. No stitches!

The whole thing only took about five minutes. You just watch a flashing red light and try to keep as still as possible. After the flap is cut it takes about a minute for the laser to do it's job - you don't feel a thing! The next day I drove myself home - with no glasses!



Doc Reed and me a few minutes after surgery.

If I sound nonchalant now, that was not the case the day of the surgery. The thought of someone carving on my eyeballs made me more than a little nervous. Signing the release form didn't help - there was a full page of every possible thing that could go wrong, from cornea transplants to toenail fungus. Now I was sure I was going to end up blind and be forced to sell pencils on the sidewalk. But a half hour before the surgery they gave some great tranquilizers and my courage miraculously returned!

I can now see 20/25 in my left eye and 20/40 in my right eye - really good results considering how bad my eyes were. Next week I go back to see if there's enough cornea left for a second pass. If so, they can do a touch-up to get my eyes to 20/20.

Big thanks to Doc Reed and all his folks at Griffin & Reed Eye Care in Sacramento, California - they were great. I went to him because my baby brother Mark had his eyeballs done by Doc Reed six months ago, and now he sees like an eagle. Mark had scoped out eyeball docs (bad joke) and was really impressed with Doc Reed's credentials. Since Mark had such good results I figured I'd go to the same guy. If you live close to Sacramento and are thinking about getting your eyeballs fixed I would highly recommend them. Their phone number is 916-483-2525.

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