

June 2012

*the*

# pcb magazine

AN  PUBLICATION

- 14 Solderless Aluminum Rigid-Flex Circuit Assembly: An Alternative Approach  
*by Joseph Fjelstad*
- 22 Fine-Line Imaging for 2.5-D Circuit Traces  
*by George Gregoire*
- 32 Metal in the Board—A Return to the Future  
*by Nick Pearne and Bill Burr*
- 40 Optical Layer-to-Layer Alignment  
*by Anthony Faraci*



# THE NEW CROP OF PCBs

[www.atotech.com](http://www.atotech.com)



**ATOTECH**

Technology for Tomorrow's Solutions

## Circuit Materials Enabling Future PCB Technologies

### A Review of Rogers' Innovations in Laminate Technology

by John Coonrod  
ROGERS CORPORATION

**SUMMARY:** *In general, the high-volume PCBs that are manufactured today are using yesterday's technology. Mindset is one reason why recent breakthroughs in PCB technology are not used in high-volume production today. A designer may find a useful PCB configuration and keep using that technology until forced to pursue something different. The same is true for the PCB fabricator who has well-defined processes for particular constructions.*

Some technologies that have been known and used in a limited capacity for PCB applications are: laminated via structures, buried passives, innerlayer waveguides, buried actives, and embedded fiber optics. In some cases, these technologies have been or are being used in volume production, but most are not. For a new technology to be embraced in the PCB industry it will need to have a robust material system, well-understood circuit fabrication processes and a proven benefit to the performance of the end-use application.

Many new materials introduced to the market target specific end-use applications and sometimes neglect circuit fabrication issues. The opposite concern does occur as well. Finding the balance between these two worlds and getting the word out to the enablers of the new technology can be a daunting task; however, most materials suppliers for the PCB industry understand these hurdles.

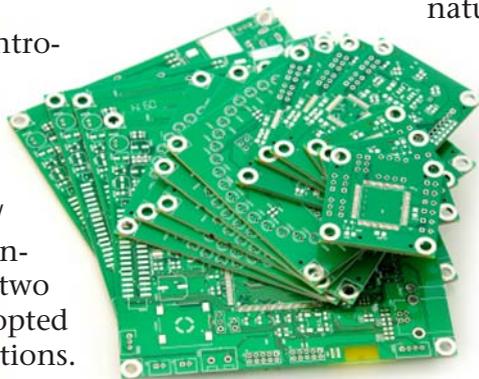
Some recent materials introduced to the market have been well embraced in some cases and in other cases only embraced for niche applications. One example is the Rogers RT/duroid® 6035HTC laminate, introduced to the market about two years ago and now being adopted into more and more applications.

The material was formulated to support thermal management issues where a laminate of high thermal conductivity (1.44 W/m/K) is beneficial. Combined with very low loss ( $D_f=0.0013$ ) and stable electrical performance at high frequencies, this material has been getting attention in high power amplifier applications, but there are many other markets that could stand to benefit.

A second material brought to the market a few years ago was the Rogers SYRON® laminate. Relatively thin, it has good electrical performance and very good long-term thermal aging capabilities as well as excellent chemical resistance. This laminate has been employed in PCB applications where the environment is very demanding—hot and sometimes exposed to aggressive chemistries. The SYRON® laminate has an estimated relative thermal index (RTI) of 210°C, which is unusually high for most PCB laminates.

A material that has been known for decades to have very good electrical properties as a dielectric or substrate is liquid crystalline polymer (LCP). Rogers Corporation brought ULTRA-LAM® 3000 to the market many years ago and this circuit material features a unique combination of properties. The material is very good for electrical performance at high frequencies, homogeneous, isotropic, naturally flame-retardant, extremely low in moisture absorption,

naturally halogen-free and can be used for a nearly hermetically sealed circuit. The historical issue with LCP used in PCB applications was difficult or unusual fabrication needs. Over time, the fabrication issues have been well studied and now LCP circuits can be manufactured reliably and with good circuit yields. Un-



fortunately, as with all industries, when a product is initially known to have an issue and that issue is later corrected, often the masses are unaware. This is the case with LCP circuit fabrication, where circuits are now being made with very good yields and reliability.

Hybrid multilayers have been gaining more acceptance in recent applications. In the high-frequency PCB segment, it is becoming more common to see multilayers with a combination of layers using high-frequency circuit materials and other layers using more common FR-4. There are several reasons for using hybrids; sometimes it is cost-driven, sometimes performance-driven, and many times both. The cost-driven issues are typically a multilayer that has only a few layers considered high-frequency or critical for electrical performance. On those layers the high-frequency laminates and prepregs are used and the other layers may employ more common FR-4 materials. Of course it is recommended to involve the material supplier when considering hybrids, since there can be material

interactions when combining unlike materials in a multilayer PCB.

As materials suppliers continue to research and bring to the market new products to assist in the progression of PCB technology, advancement in our industry must remain a team effort, which is why Rogers works closely with some of the largest PCB fabricators and OEMs in the world when developing new technologies. **PCB**



John Coonrod is a market development engineer for Rogers Corporation, Advanced Circuit Materials Division. About half of his 25 years of professional experience has been spent in the flexible PCB industry doing circuit design, applications, processing and materials engineering. Coonrod has also supported the high-frequency, rigid PCB materials made by Rogers for the past 10 years. Reach Coonrod at [john.coonrod@rogerscorporation.com](mailto:john.coonrod@rogerscorporation.com).

## Rogers: New Thermal Product Developments

by *Real Time with...IPC APEX EXPO 2012*



Rogers Corporation's John Coonrod talks with Guest Editor Dan Beaulieu about new product development, including the company's new thermal material, and describes how his company selects new product technologies in which to invest.



[realtimewith.com](http://realtimewith.com)

