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Test and Inspection

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Components and Assembly

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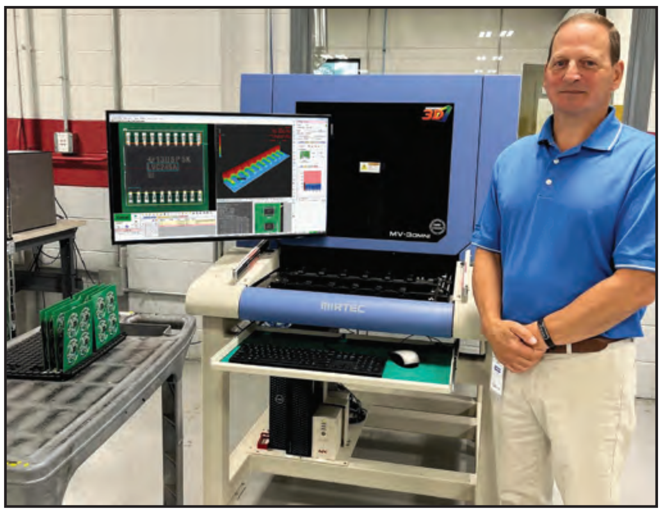
MIRTEC Supplies Cutting-Edge 3D AOI to CIC

By Michael Skinner, Editor

HAMDEN, CT — Carlton Industries Corporation (CIC) is a single source for manufacturing circuit boards, electronic assemblies and cables. To help meet the critical requirements for fast turnaround, high-reliability and exceptional quality, the company recently installed three MIRTEC MV-3 OMNI desktop 3D AOI systems, replacing its MV-2HTL desktop systems.



CIC's Ken Maduri, VP sales and marketing, with MIRTEC's MV-3 OMNI 3D AOI system.

The company excels at satisfying customers in challenging markets, such as industrial, commercial, aerospace, medical, and defense. "Our customers don't compromise on the level of electronics manufacturing services they expect," says Ken Maduri, VP sales and marketing, CIC.

Tailored Manufacturing

Since 1994, CIC has offered complete electronics manufacturing services backed by cutting-edge equipment and a team of professionals with skill, experience and dedication to the customer. CIC's workmanship follows IPC-A-610 guidelines and customer requirements to meet all expectations. CIC is also an expert at tailoring manufacturing services to create an end-to-end process that correctly fits each customer's unique functional, performance, cost, and time-to-market requirements.

From documented best practices to state-of-the-art optical inspection and complete electrical, mechanical, functional test, and failure analysis, CIC places quality first.

The company continually invests in the most up-to-date equipment, conducts ongoing training

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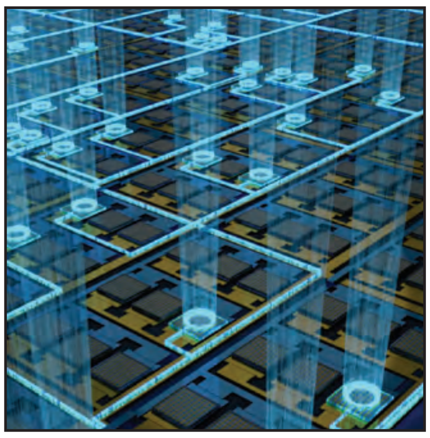
Silicon Image Sensor that Computes

CAMBRIDGE, MA — As any driver knows, accidents can happen in the blink of an eye — so when it comes to the camera system in autonomous vehicles, processing time is critical. The time that it takes for the system to snap an image and deliver the data to the microprocessor for image processing could mean the difference between avoiding an obstacle or getting into a major accident.

In-sensor image processing, in which important features are extracted from raw data by the image sensor itself instead of the separate microprocessor, can speed up the visual processing. To date, demonstrations of in-sensor processing have been limited to emerging research materials which are, at least for now, difficult to incorporate into commercial systems.

Now, researchers from the Harvard John A. Paulson School of Engineering and Applied Sciences (SEAS) have developed the first in-sensor processor that



In-sensor processors could simplify image processing for autonomous vehicles.

could be integrated into commercial silicon imaging sensor chips

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Modified Microwave Oven Cooks Up Semiconductors

ITHACA, NY — A household microwave oven modified by a Cornell Engineering professor is helping to cook up the next generation of cellphones, computers and other electronics after the invention was shown to overcome a major challenge faced by the semiconductor industry. The prototype was built by James Hwang, a research professor in the Department of Materials Science and Engineering.

Producing the materials that make up transistors and other microchip components is similar to baking, in that material ingredients must be mixed to-

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Top Research Institutions Begin to Unlock 6G

By Greg Rankin

While the rollout of 5G is still in its infancy, bleeding-edge research around the world is now heavily focused on solving a significant problem that is expected to arise within the next few years.

Antenna-to-antenna links or the "backhaul of the network" are essentially limited to frequencies under 100 GHz. However, experts are predicting that by around 2025 these lower frequencies, under 80 GHz, will no longer be enough to support the evolution of 5G or 5G plus, especially in densely populated areas.

"For 5G networks, at some point, every user will expect to have at least 1 GB/s or higher," says Dr. Guillaume Ducournau. "So, if you're running 5G in a crowded place, like a commercial center or a big city, we have to be able to manage the huge data rates at the antenna collecting point." Dr. Ducournau is a professor at Université de Lille in France and a top academic researcher in THz communications.

"Currently there is a dearth of components capable of operating in excess of 100 GHz and then even fewer when you push into the THz regime where 6G is expected to excel," continues Dr. Ducournau. "So, unless the industry can come up with better components the problem is going to grow exponentially."

Pushing Towards THz

The issue with creating components at frequencies above 100 GHz comes down to physics. At such a small-scale, available power and device power handling become a big challenge. Therefore, components at these frequencies must operate with exceptionally low insertion loss and extremely high performance.

In addition to sufficient device power handling, high isolation between active components becomes of critical importance to minimize signal degradation and potential device destruction from signal reflections between components.

For example, Faraday rotation isolators — commonly referred to simply as isolators — are two-port components that allow EM signals to pass in one direction but absorb them in the opposite direction.

"Isolators have low insertion loss within the microwave bands, but at mmWave frequencies, where we were working at, the loss becomes increasingly problematic," explains Dr. Ducournau.

A Boost for mmWave Components

"After doing significant research a few years ago, I discovered NASA had awarded a project to Micro Harmonics to develop mmWave isolators all the way to 300 GHz, and they showed very good performance," recalls Dr. Ducournau. "I immediately called them up."

Micro Harmonics Corporation specializes in components for mmWave applications and successfully developed an advanced line of commercial off-the-shelf (COTS) circulators, isolators, and hybrid circulators, many of which can operate well into the THz regime.

Professor Ducournau selected an isolator that operates with WR-3.4 (220-325 GHz) and features a large usable bandwidth of dozens of GHz on either side of the center frequency. "This allowed us to get the first-ever device characterization of a low noise amplifier operating at 300 GHz," states Dr. Ducournau.

His research team successfully characterized the noise floor (NF) along with the IP3 and IP5 of the amplifier, which are measurements of nonlinear frequency performance.

In addition to isolators, "there's also a need for circulators at these very high frequencies," explains Dr. Ducournau. "Circulators form part of the core system for communication applications but also for radar. Having these available could be a big boost for system implementation of early prototypes."

For example, a new hybrid circulator recently developed operates in the 100+ GHz range which will be crucial to solving many of the 6G bottlenecks within the backhaul of the network.

The hybrid circulator has a much larger working bandwidth from 150 GHz to 190 GHz. The current state-of-the-art Y-junction circulator has a bandwidth of only a few GHz at these frequencies.

A Small Footprint

Simply attaining higher frequencies is not the only consideration when moving new research from the lab to commercial production. Minimizing the size and weight of mmWave components is especially important in today's wireless applications.

These types of improvements in commercial components, along with leading researchers in the field, are pushing towards widespread commercial 6G technologies potentially by the end of this decade.

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