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PRODUCTION

Automated Burn-in and Test for Photonic Integrated Devices

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The need for faster photonic integrated technology is about to skyrocket. In fact, this market may even become much bigger than anyone is expecting. More people use social media sites and apps to share pictures, videos, live streams, and virtual reality experiences than ever before. Generations after us will continue to be brought up in the age of social media, Internet of Things (IoT), digital healthcare, and cloud computing, which each require ever-increasing network speeds and greater bandwidths.

Photonic integrated circuits (PICs) are the bedrock of this market. The use of optical components in the large-scale data center market is expected to grow by approximately 700 percent over the next eight years, with a value of over $400 million by 2024. This demand is creating a need for optical components with a speed of 100 Gb/s, low power consumption, small die size, 20 µm tolerances, and 100 µm electrical pad sizes.

Ensuring Reliability

To succeed, PICs need to be fast, and reliably so. For light sources, this means applying a burn-in process — a continuous period of operation in order to check for defects. The goal of production burn-in is to subject the laser diode crystal structure to a higher operating current and higher temperatures than normal. Under these conditions, there will be a point where the laser will fail. Typical soak temperatures range from 85 to 150°C (185 to 302°F) with current ranges from 50 to 150 percent of normal operating current.

This reliability information is essential to device makers winning repeat orders and can justify a premium price. The data can also be used when designing new layouts and optimizing manufacturing.

The challenge for companies is how to scale up to meet high-volume requirements and how to speed up the assembly, packaging and testing of optical devices. Automation is the obvious answer. Automating processes increases throughput, speeding time-to-market. As the demand for optical devices increases, the companies that successfully capture market share will be those that have scaled-up, automated processes in place.

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There are still companies that are avoiding automating burn-in and test processes, believing that doing it manually is more cost-effective. There are two major issues with this. One issue involves the labor costs and engineering time assigned to testing, where engineers need to be paid multiple times for the same job. The other is the risk of human error, such as engineers forgetting to perform certain tests, or choosing not to, artificially speeding up the process. A result: these companies are more likely to see an increase in warranty costs.

Automation can reduce labor costs and eliminate human error. A company's engineering resource can then be used more efficiently in other areas, along with a significant reduction in warranty costs. If the proper resource and test procedures are not put in place, it can cause problems including product delays, which may cost a company millions in lost sales.

Automated Solutions

Yelo has developed ways to tackle the problem of how device makers can scale up production to meet demand. The company's burn-in systems, along with its support and maintenance services, are widely used in the telecommunications and data communications industries.

The company recently worked with a leading U.S.-based scientific instrumentation organization that needed its devices to have a 10-year lifespan. The company's devices were failing after only six months and were late getting to market. To help, Yelo developed a four-part life test strategy that included current and temperature conditions, multiple current zones, multiple temperature zones, and analysis and provisions of lifetime for each optical device.

Yelo's most recent development is its light/current/voltage (LIV) test instrument that is an integral part of its testing processes. The company's typical approach to a new device is to perform a burn-in LIV measurement, burn-in at the conditions required by the client, and then another post-LIV measurement to monitor any changes in threshold.

Any expert in the industry will say that the goal will always be faster network speeds. The use of services including Facebook, Instagram, Snapchat and others that soak up bandwidth, and more advances in wearable technology and connected healthcare have combined to result in astronomical growth for photonic integrated devices. Currently, we can achieve 100 Gb/s speeds, but this is expected to grow to 400, then to 800, and finally to 1 Tb/s speeds. In the meantime, traffic on the information superhighway shows no signs of slowing down.

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