nanosystec
PRECISION AUTOMATION

NanoTest PIC HD

Optical and Electrical Characterization of High-Density Devices

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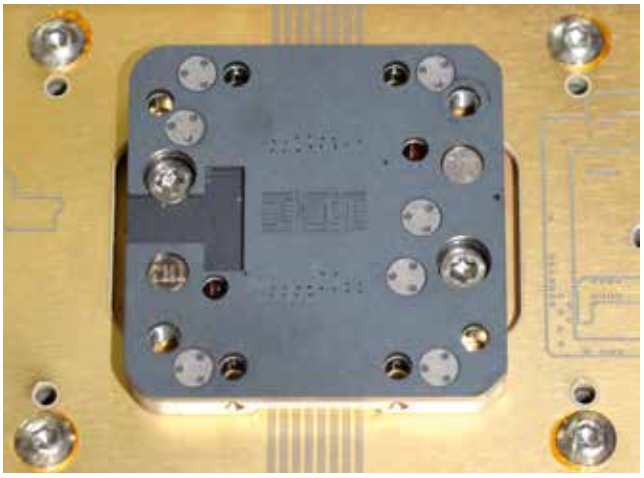
Full Opto-Electronic Characterization of High-Density Devices

The opto-electronic characterization station NanoTest HD complies with all requirements for the testing of high-density photonics integrated circuits, such as highly integrated silicon photonics devices or active PICs. Probe cards with up to several hundreds of contacts provide the electrical connection for DC and RF measurements. Resident optical fibers and arrays transmit the optical supply and signals to the test instrumentation. The NanoTest HD with its modular design works either as a stand-alone station or it is integrated into automated production flows. Its efficient operation and high reliability make it a sound investment.



The probe card is custom designed for each device.

Device Loading and Visual Inspection

Waffle packs, gel packs or custom trays present the integrated chips for pick-up. In the visual inspection station, machine vision compares the appearance of the PIC with a reference model. Any deviation will be measured and registered so that intolerable defects result in rejection of the device. During the inspection, information like serial number, batch code and similar data are stored.

Besides the physical appearance, the position of the contact pads relative to the edges of the PIC are measured as this information is essential for the precise placement of the PIC onto the probe card.

After testing, the well-working devices move either back to the delivery tray or to a second tray for collection while non-performing units are separated.

Device Contacting with Defined Force

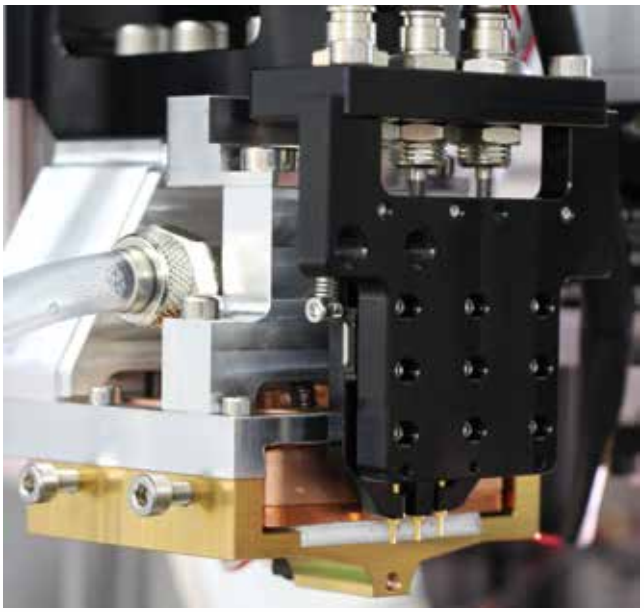
A plunger presses the device onto the probe needles of the electronical board with a well-known force. This force has to be large enough to ensure good contact with minimal resistance but must not exceed a certain level in order to prevent damage. It depends on the number and type of needles which are built into the probe card. A precision motion stage with a resolution of 0.5µm or better and an integrated force sensor with 0.01 N resolution brings the device in the optimum position. In addition, the movement of the plunger is viewed with a side camera for double safety.

Measuring at Various Temperatures

The plunger serves also as heating element to set the device at a temperature between 20°C and 80°C (other temperatures on request). Careful design of the heating circuits results in rapid ramping of the temperature to the selected value within seconds. Equally important is the rapid cooling which minimizes the cycle time.

Benefits of NanoTest PIC HD

- **Full characterization of HD PICs for DC and RF values**
- **Advanced machine vision for optical inspection**
- **Automated processes allow for maximum throughput**
- **Easily adaptable for various device geometries and signal configurations**
- **Accepts gel packs, waffle packs or custom trays**
- **Works as stand-alone system or in-line in production flows**



The plunger holds the device safely in place and provides a stable test temperature.

Automated Machine Vision

The PIC orientation needs to be perfectly co-planar to the probe card, therefore two cameras control exactly the distance between the device and the probe card. This avoids damage of the probe needles of the card but ensures reliable electrical contact.

After visual inspection, the PIC is precisely placed onto the probe card. A side-view camera monitors the distance between the PIC and the probes during placement.

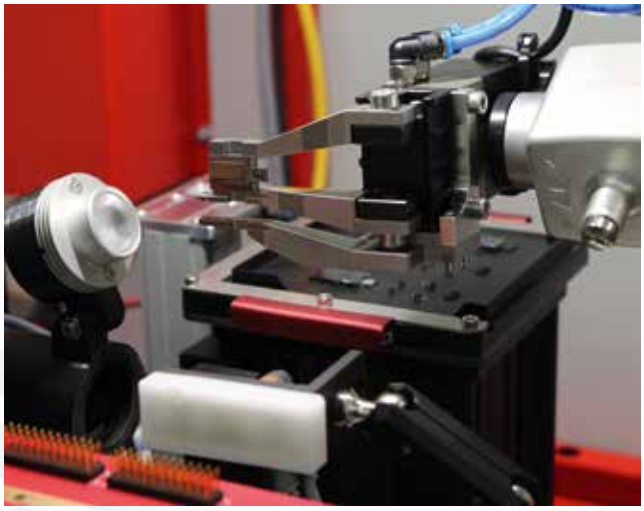
In addition, machine vision measures the physical dimensions of the PIC and the position of the contact pads to execute subsequent corrective movements for perfect placement of the contact pads on the needles of the probe card.

Integrated Scrubbing Station

The contact needles of the probe card require regular cleaning after a number of cycles. The frequency of the cleaning depends on the contact areas of the chip. Working with devices using soft solder balls requires shorter cleaning intervals compared to units with gold pads.

The scrubbing tool moves gently against the contact needles with a controlled force. Then the pre-programmed scrubbing movements are executed.

The board with the contact needles has to match the specifics of the PIC, therefore it is designed specifically for the device. NanoTest HD accommodates various sizes of boards and provides all relevant support electronics.



The visual inspection of the PIC detects the features in order to place the device precisely onto the probe card.

Fiber-Optic Coupling

Optical fibers connect the PIC with the measurement instrumentation. These fibers are resident and stay within the station for an extended time. NanoTest offers two coupling methods, either passive or active.

With passive placement, the device has a precise structure which holds the fiber or fiber array in the correct position for optimal coupling.

If active coupling is the desired, NanoTest HD uses an alignment stack with linear and rotary motion to align to the best coupling efficiency in a matter of few seconds. As the fiber or fiber arrays are resident, the short travel range minimizes the alignment time.

NanoTest PIC HD

Modular Software Package

The TestMaster software package controls all system functions and interfaces with other programs such as Python or MATLAB. Various instruments can be integrated into the process flow. The local database NanoTest DB collects all measurement results for further processing and analysis. Alternatively, data can be transferred into the customer's database directly.

Reports can be generated per device including pass/fail criteria, curves and other critical data.

Automated Loading

The receiving area of NanoTest HD accommodates various trays like gel packs, waffle packs and custom trays for carrying the PICs to be tested. Depending on the volume and desired degree of automation, various methods for handling the trays are available. For low volume during development and initial production, manual loading will be executed.

Conveyor belts, robots and feeders ensure unattended operation and manage large volumes. The principle organization of the factory has to be considered as well. The modular system design allows for upgrade of automated loading capability at a later point in time.

Feeders for waffle packs, gel packs and Jedec size trays allow for unattended operation of the NanoTest.

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11/2022 by nanosystec GmbH