nanosystec
PRECISION AUTOMATION

NanoTest VCSEL

Fast Optical and Electrical Characterization Station

NanoTest VCSEL

Efficient Characterization of VCSEL Wafers and Chips

Nanotest VCSEL is the ideal instrument to test VCSEL on wafer and CoC level. It measures and qualifies VCSEL according their performance and generates all relevant data which is either stored locally or sent to higher hierarchy computers. Various instruments can be attached to measure wavelength, spectrum, small-signal testing and power. The temperature of the device under test can be varied over a large range.

The wafer chuck presents various vacuum zones which can be activated as necessary. Combined with the excellent flatness over the chuck surface, the wafers are securely held without any distortion.

Wafer positioning

A chuck can accommodate a wafer with a diameter of up to 6 in. and also single devices on a carrier. The wafer is precision ground polished for optimal flatness and is fixed in position with vacuum channels. There is a designated zone on the chuck for single COC. Wafer loading is manual, automated wafer loading is available as an option.

The motion system has a linear axis with a resolution of 5 nm. This resolution is combined with a high acceleration of 10m/s². The structure of the system is made of granite. This material combines stiffness and rigidity with a high thermal stability. Pneumatic isolators support the structure and isolate the set-up against vibration disturbance from the floor or ad-jacent machinery.

The motion axis is equipped with linear motors and linear encoders. These axes run without frequent maintenance and are the true workhorses of industry. Each axis is controlled by advanced electronics with excellent in-position stability. A rotary stage with a resolution of 0,001° helps to turn the wafer in the optimal position.

Measuring at elevated temperatures

The chuck with a diameter of 6 in. is temperature controlled. The maximum is 85°C and the minimum is -15°C. This is sufficient for all development tasks and helps to get assessments of wafer performance at various temperatures. Wafers and COC are fixed in position by vacuum ensuring good thermal contact to the chuck.

A side view camera provides additional information and helps during the setting-up process. For the main camera all pictures can be stored for various purposes, such as quality assurance and statistical process control. The camera is directed to the fiber-tip and the electrical probes. With this camera, the distance between fiber-tip and wafer is supervised to prevent the fiber touching the wafer.

Benefits of NanoTest VCSEL

- **Rapid testing of wafers**
- **Versatile configuration**
- **Accomodates single chips up to 6” wafers**
- **Integration of various test instruments**
- **Precision motion control**
- **Calibrated measurement**
- **Height mapping capability**
- **Color-coded graphic of wafer performance**

A VCSEL on blue tape is undergoing a small signal test.

Visual inspection and setting-up

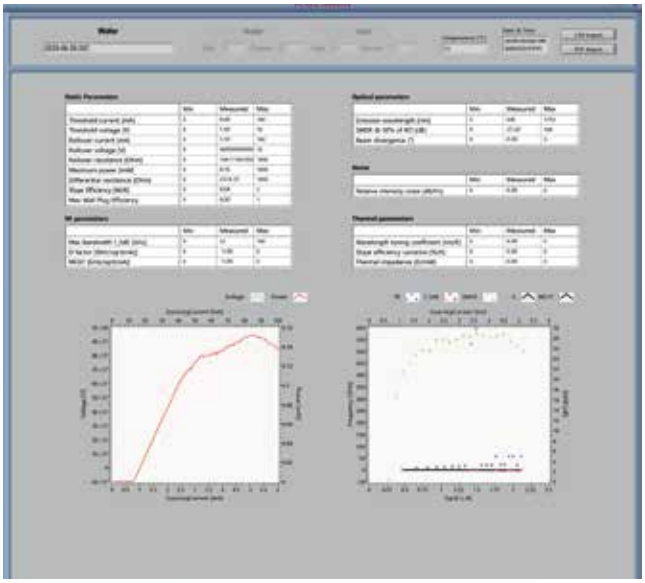
A central zoom camera is used for the visual inspection of the VCSEL and other features of the cell on the wafer. Machine vision compares the acquired pictures with stored pictures of good devices and detects defects on the wafer. Depending of the result, defective VCSEL will not be processed further, so avoiding effort without result.

The zoom camera is also used to align the electrical and optical probes. Once aligned, the probes stay fixed and the wafer is shuttled from VCSEL to VCSEL.

Power measurement and LVI curve

The precision current source within NanoTest delivers currents from a few nA to a few A. The measurement of the voltage at the device is equally sensitive. The power measurement circuit is capable of detecting power from a few nW to W and covers the range of practically all devices.

The current source works in cw mode as well as in pulsed mode. The acquisition of LVI curves and their mathematical treatment is fast and precise.



Graphical display of LVI Curve and numerical values

NanoTest has been set-up to accept many more instruments, primarily OSA to determine spectral properties like wavelength, linewidth, side modes suppression ratio and more. The VI for most of the commercially available OSA is part of the NanoTest software.

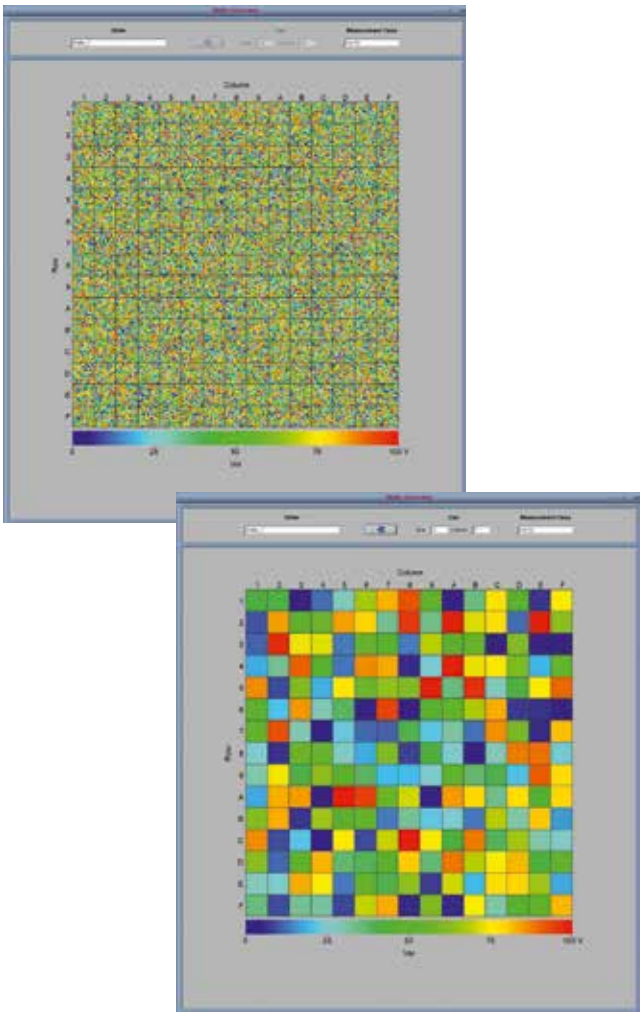
For small-signal measurements, the device driver for the Network Analyzer is part of the standard software package. A VI for spectrum analyzer to determine RIN is also part of the software package.

Modular Software Package

The process software TestMaster controls all system functions and interfaces with other programs such as Python or MATLAB. Various instruments can be integrated into the process flow. Standard instrumentation includes current sources, light sources, optical spectrum analyzers, network analyzers and many more.

The graphic interface displays panels for system functions, such as LIV curves, OSA measurement and S factors of the network measurements.

All measured data can be stored in a local database or transferred into the customer's system.



All measurement results will be displayed with a color code and show the wafer performance at a glance. Each cell can be called individually for further investigation.

Electrical probes

The large mounting area offers ample space to position the electrical probes. Stiff cables to be connected to the Network Analyzer are routed as directly as possible in order to avoid errors due to bending.

Optical probes

A multimode fiber with 50µm core diameter is used to collect the light emitted by the VCSEL under test. The intensity of the light is then measured by a photodiode and the corresponding electrical signal is routed to the instrumentation.

If additional instrumentation like an optical spectrum analyzer is integrated, an optical switch or a splitter directs a fraction of the light to that instrument.

Enclosure

Nanotest operates with or without an enclosure. The enclosure is recommended if an extremely clean environment is needed. It can have an integrated HEPA filter inside the enclosure to meet ISO 2.

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