Case Study:

EX-43Q from CyberOptics Semiconductor Selected for Detection of Nitride-coated Wafers in Rudolph Technologies' Metrology Tools

Rudolph Technologies is a premier provider of thin film metrology and macrodefect inspection systems to the semiconductor manufacturing industry. Its S300-*ultra*™ metrology tool incorporates both laser ellipsometry and deep ultra-violet reflectometry to measure film thicknesses on 300 mm wafers, and its *Meta*PULSE™ 300 Series measures single and multi-layer thickness of metal films. They are widely used in advanced manufacturing processes that produce devices with minimum feature sizes of 100 nm and smaller. These metrology tools are highly automated to meet fab standards for 300 mm wafer handling. In an effort to meet the current and anticipated needs of its customers, Rudolph recently selected CyberOptics Semiconductor's EX-43Q wafer mapping sensor for use in the wafer handler of its S300-*ultra* and *Meta*PULSE tools.

A single 300 mm wafer may contain thousands of devices. Depending on its stage in the manufacturing process, it may represent tens of thousands of dollars of process investment — and even more in potential market value. Semiconductor manufacturers make huge investments in metrology systems to insure that their manufacturing processes yield the greatest possible number of functioning devices. Wafer mishandling during measurement has potentially disastrous effects on yield and is unacceptable.

Rudolph's 300 mm metrology tools have earned a strong reputation for accuracy, precision, and reliability, and have become an industry standard for thin transparent and opaque film characterization. When Rudolph's customers approached them with concerns about reliability of mapping the presence or absence of wafers in the slots of wafer carriers (cassettes and FOUPs) containing "dark" wafers created by next-generation processes, Rudolph moved quickly in a team with CyberOptics Semiconductor to understand the problem and implement a solution. The

dark wafers were coated with nitride and other coatings that reduce reflectivity. In contrast, bare silicon and most metal films are highly reflective.

In addition to its role in advanced semiconductor manufacturing processes, reflectivity is important in automated handling systems as it affects mapping the wafer carrier to determine which slots contain wafers. To do this, a light source in the mapper, which is mounted on the wafer pick-up robot, scans up and down the slots of the wafer carrier illuminating the edge of each wafer with a laser while a detector monitors reflected light. A reflection indicates that a wafer is present. Mapping is important in handling wafers through the semiconductor manufacturing process, and in insuring the safety of the wafers. Errors in detection may result in wafer breakage if the robot tries to place a wafer in an already occupied slot.

Rudolph approached CyberOptics Semiconductor for help in defining a solution. In addition to seeking high reliability for current generation manufacturing processes, they were also looking for a solution that would provide the highest sensitivity and broadest coverage of conditions that might affect detectability in future applications. Furthermore, they required a solution that could be easily retrofitted to systems already in the field. Reflective detectors have an advantage (over through beam detectors) in this regard since the light source and detector are combined in a single compact unit that is easily mounted to an existing design.

After a thorough evaluation and extensive testing, Rudolph selected the EX-43Q from CyberOptics Semiconductor. Initial field installations were accomplished with minimal customer downtime. The retrofit required no hardware modifications to the handler. Data collected to date shows excellent reliability and Rudolph plans to make the retrofit available to all customers, and to offer the EX43Q on both current and future production systems.

“We are very pleased with the performance and reliability we have seen from the EX-43Q from CyberOptics Semiconductor,” said Chris Morath, Director of Marketing, Rudolph Technologies, Inc. “We believe that it has the capability to meet our customers’ requirements now and well into the foreseeable future.”

For more information about EX-Q wafer mapping sensors please contact Sales at CSsales@cyberoptics.com or visit http://www.cyberopticssemi.com/products/EXQ.html.

For more information about upgrading to the EX-Q please contact Tech Support at CSsupport@cyberoptics.com or visit http://www.cyberopticssemi.com/media/html/index.htm.

For more information about the S300-*ultra*™ or *Meta*PULSE™ 300 Series please visit www.rudolphtech.com.

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