

V I T A L

In diodes, special glass has the function of hermetic encapsulation. One of the leading manufacturers of these glass electrodes is Vishay Semiconductor of Austria.



*Vishay Division Head Gerhard Speidel:
"No mobile phone, television set or car
can work without diodes."*

The right timing for expansion

After a slow period in the electronics industry, sales started to boom again last year. In Speidel's opinion this has very much to do with the daring policy of Vishay Semiconductors to predict future growth in such a strongly cyclical industry. In the end, production capacity doubled to 14 billion diodes per year and global market share increased to 26 percent. Clients include leading names in the home electronics, telecommunications and automobile supply industries such as Philips, Thomson, Samsung, Delta, Temic, Siemens, Bosch,

Delphi, Compaq and Nokia. In these dynamic branches, the complexity of electronic systems increases dramatically with every passing year. Already today, there are about 380 discrete components in one mobile phone! As a result, an increasing number of components must be squeezed into the boards while keeping with the trend of lighter weight and lesser volume.

The world's smallest diode

One solution to this dilemma is the increased packing density of the electronic components on the board. "Thanks to special geometries and the miniaturization of our diodes, we offer our clients considerable advantages", said Franz Mathe, Head of Research and Development and Engineering. The star in Vishay's product range is QuadroMELF. Compared to the classic round diodes, its angular form allows one to run a faster insertion speed. "Make the world square" is the catchy advertising slogan coming from Vishay, the world's only manufacturer of the unique part. With a length of only two millimeters, MicroMELF is the world's smallest glass diode and it is manufactured in the Austrian facility. Another miniature is the 3.6-mm-long MiniMELF.

Since 1965, the specialist manufacturer of electronic components (diodes, rectifiers and transistors) has been headquartered in Voecklabruck, 70 km east of Salzburg (Austria). It was only in 1998, that the company, then called Temic-Telefunken, was acquired by Vishay Intertechnology, Inc. of the United States. This group of companies, with sales of US\$ 1.8 billion last year, employs 20,000 people in more than 60 factories located in 14 countries.

"The Voecklabruck plant functions as a competence center, especially for glass diodes," said Division Head Gerhard Speidel. The development, construction and the testing of new production lines takes place at this location. The responsibility for uniform worldwide quality standards, global production planning and distribution, as well as certain areas of marketing, development and application lie in Voecklabruck. The actual transfer work is done mostly in the high-volume glass diode plants located in Gyoengyoes (Hungary) and Shanghai (China). Vishay Semiconductor employs about 2,000 workers throughout the world, a fourth of them in Voecklabruck.

*The precision tube
sections supplied by
Schott are to be
inserted into
individual slots.*



MINIATURES



Vishay Semiconductor has doubled its manufacturing capacity to 14 billion diodes per year.

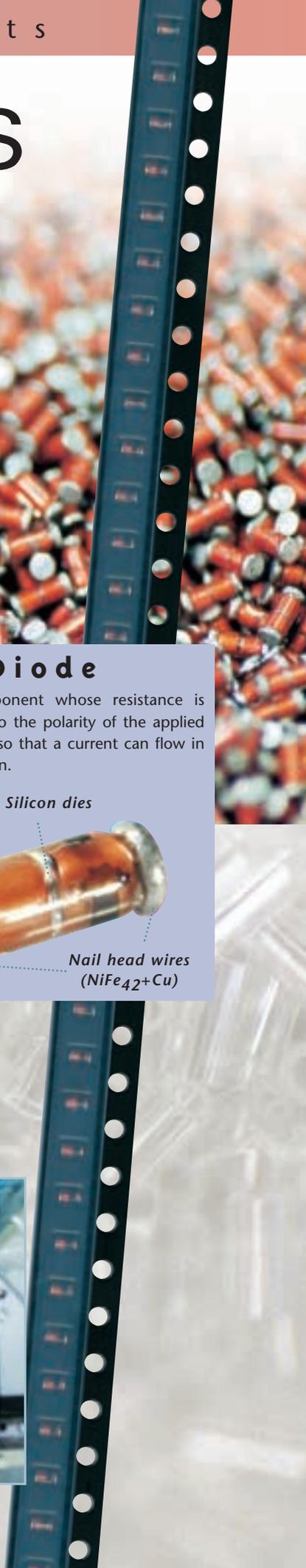
Although management has automated as much of the manufacturing process as possible, there are still some manual tasks to be done at Voecklabruck. For instance, the cut-to-size precision tube sections supplied by Schott Rohrglas of Mitterteich (Germany) are separated into individual slots of a graphite tray. The tube sections are fitted with two metallic feed lines and a chip. The tray is then placed on a conveyor belt, which moves slowly through a melting furnace. After one hour the glass and the metal wire are melted together. The diode is then chemically cleaned and the wires are hot tinned and dried with hot air, before polarization and the attaching of the cathode ring. Once finished, the diode is inserted with lightning speed into a narrow blister belt. An astounding 80,000 pieces per hour and machine are packed into the belts and then wound up in reels, which the client later unwinds during the assembly process. The diode is then inserted into

Diode

Electronic component whose resistance is directly related to the polarity of the applied electric voltage, so that a current can flow in only one direction.



The blister belts with the inserted diodes are wound into reels.



the electronic part using the fully automated pick-and-place principle.

“The precision glass sections are a decisive factor for guaranteeing the best possible manufacturing process as well as the quality of the diodes. An inexact measurement, the wrong length or coarse breaks and the whole production process is slowed or can come to a total standstill in extreme cases”, explains Purchasing Director Helmut Fink. 95 percent of the glass parts processed in the Austrian, Hungarian and Chinese plants are supplied by Schott Rohrglas. Schott has been a reliable and high-quality supplier and development partner for three decades. For this reason, we have largely done away with inspections. We accept the supplier’s certification, testing records and random tests performed within the framework of their own QS 9000 obligations.”



Rectifier diodes for high voltage and high temperature applications.

Rectifier diodes meet high standards

Another one of the main production areas in the Voecklabruck plant is rectifier diodes, which are extensively used as components in high voltage and high temperature applications, for

example in main frame computers, automobiles and televisions. The powder used for molding the resistor comes from Schott Glas in Landshut (Germany). In the first production step, the raw material is mixed with ionized water. Then a drop of the mixture is pressed onto the wire in a pumping process. By rotating the diode, a symmetrical form is achieved. Since after the drying process the small powder balls are only as solid as a piece of chalk, a sinter process follows. After the subsequent tinning, the diodes are measured twice in all parameters and then glued in place on belts at a rate of 40,000 pieces per hour. “With products having a volume this high, the error rate is smaller than 1 ppm, meaning that less than one part in a million is expected to be defective.”

Quality control through an opto-electric measuring process.

Ready to be electroplated: Rectifier diodes inserted into a tray and ready for the tin bath.



Vishay Semiconductor wants to remain successful. “We try our best as suppliers not to limit the growth dynamism of our clientele”, said Speidel. The planning certainly expresses his optimism: By 2001, the annual turnover is forecast to increase by 15 percent, to about 200 million euros, with 60 percent of total sales coming from glass diodes ■