Bus systems: The language of controllers

LIN bus as part of a system

Product news: LIN transceiver 910.43

From the idea to the chip: Assembly and test
„Creating interface chips is one of the most difficult yet prestigious tasks in the field of automotive semiconductors“

Dear customers,

Which one of us is today not „fully connected“?

We can always be contacted via our photo cellphone with integrated internet access, we can have a „chat“ with our friends around the world via the www, we can exchange and call up the latest e-mails and data with the company via „VPN“ and we can get hold of the latest traffic jam information (together with a diversion recommendation) whilst on the way to a customer via the GPS navigation system – none of this would be possible without networking. Welcome to the era of information and communication, where it matters not just to provide, evaluate and process information but to do so fast. This in turn, provides us with recommendations on how to act, behave and react, all of which can significantly affect our lives.

In cars as well, various networking configurations have become daily business. Bus systems for information transmission are now used and not only in the entertainment area. To ensure a smooth working together of the various controllers in a vehicle, e.g. in the safety and comfort area, it is obviously important to achieve a targeted and fast exchange of data and signals. Such bus systems are for the most part highly specialized and have to meet widely varying requirements. It is therefore hardly surprising that - depending on the application - different topologies are brought to use in various ways.

All bus systems generally consist of a transmission system in the form, for example, of copper wires or lightwaves, and transmitting and receiving units, the so-called transceivers. These are found at the interface between transmitter and transmission system or between transmission system and receiver and carry out the physical conversion of the data into electrical or optical signals so that they can, for example, be sent as light pulses through the waveguide or be changed back into electrical signals again.

Transceivers need to fulfill certain requirements: situated at the system interface, they are directly exposed to the harsh ambient influences in the vehicle. They have to resist faults in the bus system, caused by voltage pulses or undefined conditions, as well as high temperatures and mechanical stress. Robust electronics is required, such as ELMOS has been providing for the last 20 years. It is therefore no wonder that ELMOS has a variety of special bus devices in its portfolio. Not only do we have controllers but also, in particular, transceivers for different bus systems ranging from K-BUS, CAN, VAN, LIN, byteflight through to FlexRay.

There is an obvious need to link robustness, reliability and functionality with one another in the field of automotive bus systems - we at ELMOS have risen to the challenge for many years now with our creativity and imagination. Millions of devices and a quality level of more than 1 ppm in field tests underline ELMOS' competence year by year. However we are not resting on our laurels but are developing new solutions for our customers daily. There is so much to network - let’s do it by using the possibilities that ELMOS has.

Dr. Klaus Weyer
Executive Board and Founding Member
Bus Systems: The language of controllers

In a modern vehicle, it is no longer possible to connect the high number of controllers and sub-systems using separate control circuits: innumerable wires would lead a chaotic cable harness which would take up too much space and would increase the total weight of the car. The costs for this would make the vehicles prohibitively expensive for the consumer.

Because of this, a new approach has been pursued since 1991: Mercedes was the first to connect three controllers with a bus system. This development means that the wiring and costs are minimized as several systems are connected by only one circuit. „By standardizing the protocols, the controllers from different manufacturers can easily communicate with each other“, says Uwe Friemann (photo), group leader of LIN Transceivers at ELMOS.

In a bus system, all components communicate with each other via data nodes. Differing automobile-specific conditions require performance-adapted bus systems: after all, safety demands, such as those required in braking systems, are higher than those for electrical seat adjustment.

The criteria for this are:

**Bandwidth**
For example, control information for the air-conditioning system needs a lower data transmission rate than engine block information.

**Interference Immunity**
This criterion is closely linked to the safety relevance of the components. Safety-relevant components must be protected to a much higher degree against disturbances than comfort functions.

**Real Time Ability**
The real time ability of the system is inalienable for data which have direct influence on road performance, for example for the active undercarriage.

**Number of Addressable Nodes**
The more complex the application, the higher the number of addressable nodes has to be, in order to guarantee an individual response of the bus users.

The forerunner of the bus systems is the CAN bus (Controller Area Network). CAN is an event-controlled communication system with transmission rates of up to 1 Mbit/s. At present, with over 100 million nodes installed, it is the most widely-used vehicle network in the car.

In modern vehicles, there are two or three separate CAN bus systems working at various speeds: those with speeds of less than 125 kBit/s are used for simpler control tasks in the chassis, such as seat adjustment and window control, CANs with higher speeds of up to 1 Mbit/s couple more time-critical functions, such as engine management and anti-lock braking systems. Other criteria are the fault tolerance of the CAN systems and the number of necessary bus lines.

The LIN bus (Local Interconnect Network) was developed in order to establish a standard sub-bus system below the CAN. It is the youngest serial low-cost communication system in the vehicle. „To avoid shooting sparrows with cannons, LIN is applied where CAN is too costly“, says Friemann. LIN makes economical communication possible for intelligent sensors and actuators for which the bandwidth and flexibility of the CAN is not required.

„The LIN bus interface can be integrated

### Bus systems
A bus system in a vehicle carries out the information exchange between two or several components such as, for example the accelerator pedal and throttle valve regulator. These are connected to each other by transmission circuits. With the bus system, not every component is connected to the other by a separate circuit; there is only one transmission circuit and all data flows via this circuit. The components access the bus only when relevant data is available.
with little effort in each of our high-volt processes and thus reduces the number of components in the controller,” says Friemann. About a dozen products with LIN interfaces are currently in production and more are being developed.

LIN transmits the data at a speed of up to 20 KBit/s which means that an unshielded single-wire circuit is sufficient to connect the controllers. By using a gateway LIN can be connected to CAN systems. LIN controls smart sensors and actors e.g. in seat adjustment, air-conditioning and door control such as automatic windows, locking and mirror adjustment.

New functions and applications in the car require communication with more time-critical requirements.

Unlike classic, event-controlled bus systems such as CAN, all attached nodes communicate constantly in predefined intervals with the TTP protocol - therefore deterministically.

**Bandwidth only if required**

The clever thing about these bus systems is that a certain bus bandwidth is guaranteed for every application.

In the case of a faulty transmission, the non-safety relevant data will not block the bus. TTP is using asynchronous data transmission for the first time - the data blocks are set dynamically in order to occupy the bandwidth only when required. The distributed real-time system works at a speed of 25 Mbit/s.

“In order to be able to provide our customers with an optimal and economical solution, various bus systems have been developed in the past few years with performance-adapted functions,” says Walter Wetzel (photo), Sales Engineer for Byteflight and FlexRay systems at ELMOS.

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**The four Application Areas in the Modern Car**

*Depending on the application area, different bus systems are used for networking in the vehicle:*

**Powertrain**
Networking between brakes, ABS and ESP, regulating the engine control and the pollutant emissions and the drive train requires bandwidth and interference immunity. This means that here, CAN is the predominant solution.

**Infotainment/Entertainment**
Communication and control between the navigation system, radio, web browser, CD/DVD player, telematics and infotainment system are carried out by MOST and IEEE1394 (FireWire, iLink).

**Body/Comfort**
Responsible for control signals and data between seat adjustment, air-conditioning, instrument panel, mirror and door locking etc. The data does not pose any special demands regarding bandwidth and real time ability. CAN and LIN systems are used here.

**Chassis**
Safety systems as found, for example, in the vehicles of the new BMW generation, consist of a network of intelligent sub-systems which require safe and fast communication. The intelligent sub-systems become active components of a redundant network and make more demands on the bus system structures. In addition, new x-by-wire systems which control steering and brakes purely electrically must process large amounts of data and therefore need a net with a very high bandwidth, many addressable nodes and, in particular, a high degree of interference immunity and real time ability as the active safety of the passengers is affected. Standard bus systems such as CAN no longer fulfil these performance requirements adequately which is why TTP/TTCAN and particularly Byteflight are used today.
BMW - together with Motorola, Infineon and ELMOS - has developed its own real-time bus system, the so-called byteflight system. For the byteflight system, BMW has chosen an optical transmission medium in the form of synthetic light waves, in which only one fibre is needed for both transmission directions. The advantage of optical data transmission is its extreme interference immunity with regard to electric magnetic irradiation and corrosion which is important for safety critical functions. The data transmission rate with the byteflight system is 10 Mbit/s. By using intelligent star couplers with diagnostic and disabling electronics, the bus users are attached to a star topology.

Message-oriented system

Analogous to CAN, byteflight is also based on a message-oriented transmission method which means that according to the „Producer Consumer Principle“, all information is given to the bus users simultaneously. The message format is also similar to CAN whereby the maximum length of the data field is 12 bytes.

The difference to CAN is its method of access. It is carried out based on the so-called „Time Division Multiple Access“ principle (TDMA), which contains the defining of „time slots“ within which a certain message may be sent.

For this time slot, the components have exclusive access to the bus. „The time at which a message will be transmitted via the bus, can be exactly predetermined - bus access is executed deterministically“, explains Wetzel.

FlexRay: The future standard

„In spite of the already-mentioned systems, not all requirements can be sufficiently covered with the present bus systems“, continis Wetzel. To simplify the relatively difficult integration of the numerous solutions such as TTCAN, TTP and byteflight, several car manufacturers, suppliers and semiconducor companies joined to form the „FlexRay Consortium“ in the year 2000. They defined FlexRay as the common future standard for high performance areas. FlexRay is based on both byteflight and TTP bus elements. Originally, byteflight was developed for use in passive safety systems but by combining it with TTP, FlexRay can also support active safety systems. FlexRay works with an extended fault tolerance by using, for example, redundant transmission channels and a fault-tolerant synchronization mechanism.

Optimal use of bandwidth

With FlexRay, the physical transmission of data may be carried out either electrically or optically (keyword: interference immunity). FlexRay also works deterministically according to the TDMA method. However, assigning the bus bandwidth to the components in a fixed way, or assigning messages to fixed time slots, means that the bandwidth is not used optimally. Therefore, FlexRay divides the cycle into a static part and a dynamic part. The fixed time slots for synchronous transmission are found at the beginning of a bus cycle in the static part. Herein after, the allocating of time slots is carried out dynamically and therefore asynchronously. This means that the bandwidth is only occupied when it is actually needed. FlexRay, as the future standard bus for applications with high communication requirements offers the following advantages: it supports active and passive safety systems on the one hand, and synchronous and asynchronous data transmission on the other.

Moreover, in special communications, FlexRay communicates via two physically separated circuits each with a data rate of 10 Mbit/s.

The two channels mainly serve the redundant and thus fault-tolerant transmission of messages, but can however also transfer different messages, thus doubling the data rate.

Flexible overall system

ELMOS’ FlexRay approach provides further advantages: depending on the customer’s wish, the „system on a chip“ solution unites the single FlexRay components, such as bus guardian, communication controller and transceiver in a functional package. „These technical advantages mean that we can offer the customer a flexible, configurable complete system with high failure immunity“, says Wetzel.

Standardizing the individual components means that the customer not only has the added advantages of low product and development costs but also a variety of application possibilities and a high compatibility to other bus systems. (twy)
By establishing the LIN standard, we now have for the first time, a sub-bus system which is supported by several automobile manufacturers. What has already asserted with higher bus systems is now possible in lower bus structures in the so-called sub-bus systems.

The advantages are obvious. Due to the different bus systems of car manufacturers in the past, high demands were placed on the suppliers with regard to the required interface. The costs which were incurred hereby were passed on the customer. Even if the physical interfaces were still comparable, the individual systems differed at least in terms of the kind and scope of the protocol.

The new standard offers the following solution: the development in the area of bus accessibility has been reduced to LIN-concurring standard components. The usability of these components in various applications and also with different OEMs means that the supplier can reckon with much higher quantities therefore fulfilling both the cost requirements and functionality demands. At the same time, the potential for sales of widely differing configurations of standard components is increased. The user can select the component most favourable to him depending on the kind and scope of the required functions.

ELMOS also provides many different types of LIN transceivers. As well as the straight transceiver ICs, combinations with varying voltage regulators and reset generators are also available.

Sinking Development Costs

The LIN bus as part of a system in an ASIC is particularly interesting. Standardisation means that it is possible to re-use LIN-concurring development modules (e.g. the transceiver) in different ASICs. While minimising the “time-to-market”, customers can participate in reducing development costs without sacrificing the ASIC-typical advantages such as know-how protection and extensive integration. As a result, the user has access to a cost and area-optimised application. Moreover, otherwise impracticable special solutions can be created. This “system on a chip” concept has always been the basis for ELMOS’ activities. The increase in electronics in vehicles means that systems like these will become more and more important. These rising demands mean that IC providers are faced with new challenges: the growing complexity of the systems means that new integration possibilities are required. Both higher temperature strength and dielectric strength will lead to additional demands in future process technologies.

A first step to integration is the so-called “system in a package”. For this, indivi-
dual components are not packed in one package (as of till now), but several, as a rule, different components are brought together to a system in one package. In this way, ELMOS is able to combine a pressure sensor with the necessary evaluation component in a custom-specific package. For this, ELMOS relies on the long-standing experience of its subsidiary eurasem (Assembly) and SMI (sensorics). This excellent integration possibility of active and passive components covers the function of whole printed circuit boards.

In order to meet the requirements of higher IC temperature and dielectric strengths, new semiconductor technologies are needed to surpass present limitations. With the ELMOS-specific BSOI process, a dielectric strength of 100 V is reached and temperatures of up to 200°C in the silicon are permitted. Components which must fulfill these requirements can be found for example in the engine and gear area. Applications like „electrical valve drive“, „switch on coil“ and „alternator controller“ usually mean that these electronics are placed at or in immediate proximity to the engine. Next to as electrical loads, they have to bear extreme mechanical stress. Based on the company-specific BSOI process, an alternator controller has been developed at ELMOS which is directly attached to the brush collar within the generator. For this new technology, ELMOS was awarded, together with Valeo, the innovation price „9es trophées EPCOS/SIA de l’électronique automobile“ in June 2003.

SOI-ASICs: Economical and standardised communication

Using the BSOI process is advantageous because, besides the permitted high depletion layer temperatures, disturbances which affect the power element of the chip via external inductivities are not perceptible with the LIN bus. The appearance of substrate currents with conventional technologies is prevented by using the BSOI process. Conversely, disturbances which are coupled through the LIN bus, are not visible in the sensitive signal processing. Therefore the BSOI process makes it possible to place complete systems ranging from signal processing to the actuator control, on the smallest possible area. By using the LIN-bus transceiver, which exists as a fully developed cell, these BSOI-ASICs can communicate with the outside world in an economical and standardised way.

With the previously mentioned alternator, as well as the LIN Interface, driver final stages of up to 10 A, as well as diverse analogous periphery blocks and an 8-bit microcontroller are integrated on the smallest possible area to a „system on a chip“. For this, a robustness is achieved which withstands the internal as well as the extreme external influences occurring directly at the generator.

Advantages through integration

To summarise, the integration of the LIN bus in a system or application offers the advantages of a standardised sub-bus system. Dispensing with high data rates and fault tolerances in the bus connection reduces costs.

More information about the listed topics can be gained at sales@elmos.de.

This article was first printed in the „Elektronik Automotive LIN Special 2004“.
Product news

LIN-Transceiver 910.43

On the basis of its experience and competence, ELMOS has developed a further device for the LIN bus portfolio. The E910.43 LIN bus transceiver in the common SO8 package is the physical interface between micro controller and LIN bus system. The main field of application for this advantageous device is an automotive sub-system with a transmission rate of up to 20 kBit/s.

To meet the high requirements of the automotive industry, this device not only fulfills the current LIN 2.0 specification but also guarantees, via its internal protection structures, an ESD strength of 4kV at the physical bus. (tsp)

Obtain your copy of our standard product catalog by contacting sales@elmos.de now.

Features

- LIN 2.0 conform
- Wake-up output, activated by:
  - LIN Bus
  - Power on
  - External input (µC)
- ESD strength at bus > 4kV
- Very low operation and quiescent current consumption (typically 15µA)
- Input voltage range -24 V to + 30 V
- Optimized EMV behaviour
- Jump-start and load-dump capable
- Operating temperature range -40°C to 125°C
- SO 8 package

Other ELMOS LIN-Transceiver:

- 910.15: K-/LIN-Bus-Transceiver
- 910.18: LIN-Transceiver with voltage regulator (5V/100mA)
- 910.48: ReLIN-Transceiver with voltage regulator (5V/100mA) and watchdog (coming soon)
Part 3: Assembly and Test

If you think that, after having processed the wafers in semiconductor production, everything is done, then you are wrong! The following article will describe which individual steps are necessary to obtain the final parts from a processed wafer. We are talking about those tiny insect-like components with silver legs containing highly-sophisticated electronics.

Up until now the production process has led to the finished wafer on whose surface lots of tiny rectangles can be identified. These represent the individual chips which will be characterized more precisely later on.

The secret of PT structures

After having left the Frontend production area, the wafers are systematically scrutinized in the Backend division. The first step is the parameter test (PT). For this test, PT structures as standard components depending on the process technology, are produced in the gaps between the single ships (scribeline). These resistors, capacitors, diodes and transistors are now individually contacted and measured on a PT tester in a random sample testing.

Following this, „empirical values” serve to assess the measurement results. If the results comply with the expectations, every single wafer is released to subsequent testing. However, if the wafer does not fulfill these expectations, it must be scrapped.

What are these „empirical values” which serve to evaluate functionality? A little bit of statistics is necessary for this. Every single parameter, for example a leak current, which is checked in a test, is subject to statistical random distribution. This means there is not any „one” value which is right but the targeted results are scattered around one value in accordance with Gaussian’s normal distribution. This normal distribution reflects the frequency with which individual values are measured. The highest point of the normal distribution is also called the mean average value „µ” and describes the position of the distribution. The form of the Gaussian curve, and thus the scope of the distribution, is described by the standard deviation σ, also called scattering. For example, 99.73% of all values lie around the area of the mean average value µ, if we talk about a 3σ distribution.

Conversely, via dynamic test limits, conditions can be fixed in such a way, that a test can only be passed, if a 6σ distribution lies within the test limits. That means that only a few „strays” do not pass the test; all other measurement results lie within the typically very narrow test limits for a parameter.

Test on wafer level

After the parameter test, further examinations can now be carried out on the circuits. The chips, which still exist as wafers, now reach the test area where the semiconductor chips themselves are electrically characterized. For this, the wafer is brought into a wafer handler which puts every wafer one by one on the so-called test table. This table automatically adjusts the wafer so that numerous fine probing needles can specifically target the contact pads of every single chip from above.

In this way, every single IC can be stimulated with electrical signals and the „answer” can be detected. The signals needed for this are generated in a universal check sample generator and evaluated in a multi-channel measuring system. This takes place in a tester which, in turn, is controlled by a test computer and its software. This software represents the test program which has been programmed in coordination with the designers whilst developing the ASIC.

Depending on the complexity and profundity of the test, this first electrical test can last a few milliseconds or some ten seconds.

After this the test results are characterized and saved as „ok” or „not ok” in a data base, the so-called wafer map. After the „on-wafer test” the wafers are sent away to be assembled, to either one of our sub-contractors in the Far East or to eurasem, our subsidiary in the Netherlands. Here, the wafers are thinned by means of a backside grinding process so that they will fit into the plastic packages. For this, the wafers are put onto an extension tape (blue tape) and mechanically ground.

After remounting the wafers onto another tape, the chips are then separated. Here, the wafers are cut along the scribeline by a circular saw with a diamond-studded sawing blade. Fortunately, the sticking tape prevents the chips from flying everywhere! After sawing, there are depending on the die size – hundreds or thousands of single chips which can be further processed after cleaning.

In the next process step, in accordance with the information on the wafer map, only the good dies will be stuck onto a leadframe which will later be formed onto the pins of the packaged IC. After the glue has dried, the bond pads of the IC are connected to the pins.

This method which is known as wire bonding calls for the highest quality and the greatest possible speed. On the one hand, no loose contacts are allowed to be produced which will lead to later malfunction, on the other hand every pin must be connected to the electrical circuit: sometimes as many as 100 times per IC, thousands of times per production lot from what used to be 25 wafers, millions of times a week etc.

In the next step all the ICs are encapsulated on a leadframe with the familiar black mould compound in an injection moulding process. This serves to protect the IC against adverse external effects and must therefore be sealed hermetically. After that, the chips are stamped from the leadframe, the electric pins are trimmed and formed and the surfaces of the pins are protected against corrosion to achieve a better solderability.

After putting the encapsulated parts into transport tubes, they are sent back...
to Dortmund for the final test. Though the semiconductor chips already look like proper chips, one can not be certain as to whether every IC works electrically according to the customer’s requirements.

**Sweating and freezing for quality**

This is ascertained in extensive tests which are also carried out in the Backend division. Depending on the customers’ requirements, several function tests are carried out on every single semiconductor chip at different ambient temperatures. Typically, the chips are heated to an upper test temperature, which may be either 85°C, 125°C or sometimes 150°C. Conversely, the chips will be cooled down to minus 40°C.

Both tests take place in special machines, the test handlers. They ensure that the single chips are transported from trays to a temperature chamber, where they are either heated or cooled. They are then contacted at the testing station and according to the test result sent back to the respective trays which are characterized as OK or NOK (not ok).

The information regarding the signal pattern and measurements are carried by a test computer similar to that used in the wafer test. A test program is also run here, depending on the project. Parameters outside the agreed specifications lead to that chip being rejected. By filtering these potential early failures, the quality standard of the product can clearly be increased. The result is low failure rates of only a few ppm (parts per million), which must be achieved in the automotive semiconductor business.

**The secret of the bathtub curve**

If safety-relevant devices have to be tested or if the customer requires an even higher quality coverage, semiconductor chips will become subject to an artificial ageing process. The thinking behind this is the behaviour of potential failure mechanisms in the semiconductor, which occur earlier with increased temperatures.

Therefore it is obvious to operate the chips passively for a few hours at a higher temperature of, for example, 130°C, which means supplying the chips with voltage but without testing all their functions.

What happens with this method, also known as Burn-in? If one looks at the failure probability of the devices with regard to the time factor, then it can be seen that the failure probability at the time of \( T_0 \) takes on a finite value, but that it is almost at zero after a short time, at \( T_1 \). At the end of a life expectancy of a few decades, the failure probability increases again at the time \( T_x \). With artificial ageing the first period between \( T_0 \) and \( T_1 \) can be skipped in a time-lapse. The early failures can be filtered in a new test, typically at room temperature.

After several device-specific tests at wafer level, two extreme temperature tests and Burn-in, the parts can be delivered to the customer.

At first the chips are dried in a nitrogen atmosphere so that no humidity remains in the hygroscopic plastic package which could lead to the destruction of the chip in the later soldering process. They are then inserted separately into a machine-compatible transport tape with little bags. For this, the chips are taken separately from the transport trays and photographed. By means of image recognition software one can see if the pins are not bent in accordance with the package specification and whether the marking on the chip top side is clearly legible.

If these criteria have been fulfilled, several hundreds or thousands of chips are filled on to the tape. This tape is shrink-wrapped by a cover tape and coiled up on a reel. The reel in turn, will be packed together with a humidity indicator and desicant in a vacuumized transport bag and is delivered to the customer in a cardboard box.

Every week, around two million chips from widely-varying projects leave the production line in Dortmund. They are delivered to customers all around the world. Once at their destination, the rolls are placed in equipping machines which place the sensitive devices one by one onto the circuit boards, where they are finally soldered. You will read more about this in the final part of the series: ELMOS chips in use - Applications and Quality. (jgo)
Guido Meyer manages the department „Final Test Backend“ at ELMOS. The 38-year old studied Electrical Engineering at the technical university of Dortmund. He has worked for ELMOS since October 1995 and for the Backend Division since 1997. He is responsible for 60 employees. Newsletter spoke to him about his daily work and the trends for the future in the Backend Division.

newsletter: Where does your main emphasis lie?

Meyer: The main focus of my job is coordinating the test area in order to guarantee quality assurance for the devices delivered to the customer. For us the quality of the delivered parts is the first commandment, whereby the term quality does not just stand for the delivery of products according to specifications but also includes fulfilling the required quantities and adhering to the agreed delivery dates.

In today’s automotive business, where just-in-time deliveries are the main prerequisite for a stable delivery chain leading up to the end-customer, the Backend test is becoming more and more important for our customers with its direct, fast link to the production line. To ensure this, I determine the necessary performance figures with my team and also supervise the keeping to schedules, the output and yields.

newsletter: What distinguishes the Backend at ELMOS from others?

Meyer: To be successful we have installed clearly-structured job procedures for the complete final test process, which are traceable for every customer. In addition, the Backend division is sustained by highly motivated employees who identify totally with the company and this is also a benefit to our customers. The team knows about the importance of a good customer-supplier relationship. In comparison with other test areas we achieve a high level of productivity.

newsletter: What has changed within the past few years in Backend?

Meyer: We have been able to increase the efficiency of the test area from year to year. This has been achieved by the continuous improvement of the work processes in which the complete Backend team has been involved, from the operator, the shift leader right through to the engineer. As a result, output has increased continuously without the costs increasing by the same amount. We have noticed that the “time to market” time spans for a new product are getting shorter from year to year. The basis for a successful, smooth serial production-start for the customer is given by a close co-operation between design and the wafer fab.

newsletter: With which developments and advances have you been closely involved?

Meyer: My team and I have re-organised and implemented the complete structure of the test area and we have also carried out continuous improvement measures to the work processes. I am particularly proud of the team’s ability which enables new challenges on the market to be realized in a determined and reliable way.

newsletter: What are the trends for the forthcoming years?

Meyer: With our test area now established at the Dortmund location, we can compete with test areas all over the world. Our customers can also confirm this. To retain this status, further optimizations of the complete test procedure are necessary for the future.

We are focussing on the further improvement of the targeted productivity. In the future, the establishment of multi-site tests, i.e. the simultaneous testing of several components in one test cycle, will become more and more important for the effective and economical execution of final tests. Because of this, the production area, test time and test hardware per tested IC can be further optimized. To guarantee further growth, an additional test area will be established in Nijmegen at eurasem, our subsidiary company. Through this the capacity will be increased substantially to meet the customer’s requirements of increased delivery quantities. (maku)
News from and about ELMOS

20 additional trainees owing to ELMOS 20th anniversary

Owing to its 20th anniversary in 2004 ELMOS Semiconductor AG provides 20 additional apprenticeship positions. Apart from these 20 trainees additional 15 entrants have already signed for their apprenticeship with ELMOS in Dortmund. „We are proud that we can allow 20 further young people their start into their professional career thanks to our jubilee“, says Knut Hinrichs, CEO of ELMOS.

Dr. Gerhard Langemeyer, lord mayor of the city of Dortmund, congratulates ELMOS for its additional trainees. „Especially in today’s difficult economic environment it is even better that a future-oriented company like ELMOS is willing to provide additional positions for apprentices“, Langemeyer says pleased. „This has to be underlined especially because the traditional class of trainees at ELMOS already offers numerous apprenticeship positions.“

In total the number of trainees - including this year’s 35 new starters - amounts to roughly 10% of all of ELMOS’ employees in Dortmund. „In this way ELMOS Semiconductor AG fully copes with its responsibility derived from the „Pact for trainees 2004 (Ausbildungspakt 2004)“, says Hinrichs. Just less than half of the trainees will be trained as specialists for micro technology. Only four years ago this professional education has been developed to which ELMOS has contributed significantly. „These specialists will quickly become high performers due to its special training“, says Dr. Klaus Weyer, Member of the Board of Management, responsible for technology. Following their apprenticeship these trainees work for example as socalled operators in the clean room. There they are responsible for overseeing processes in the production of semiconductor chips. (jwie)

20 Years of ELMOS

1984 - 2004: 20 years of ELMOS. A youthful age: resilient, conscientious, unspent, eager to learn, full of energy, vigorous, receptive, mobile, flexible, an age with prospects.

From 16th September till 18th September 2004, ELMOS will look at its history and will of course look expectantly to the future together with the press and guests from the worlds of politics and business.

In the context of the company anniversary, ELMOS will be holding a workshop on the future of both automotive semiconductor technology and sensors. We will be discussing the challenges of the coming years - how to push forward innovations, create optimal solutions and find new ways of working together.

ELMOS is expecting, amongst others, Dr. Neumann from VW, Dr. Grote from BMW, and Mr. Thiemann from Hella. (jwie)

Human Resource Management honoured

The initiative “New Deals” has awarded a prize to the human resources management at ELMOS whereby the company’s commitment to education, particularly for micro-technicians, was highlighted. Moreover, ELMOS supports education centres which are pushing for structural change in the region of the Ruhr. The initiative aims to promote regional employment ideas. (maku)

ELMOS confirms environmental certificate ISO 14001

ELMOS has received the internationally recognized ISO 14001 certification for its environmental management system for its Dortmund site. TÜV-Rheinland (Technical observance organization) acknowledged the recertification without any deviations at the audit. By means of this audit ELMOS proves the high environmental standard of ISO 14001 for both new product developments and serial production. In 2003 ELMOS was awarded the certificate for the first time. (jwie)

Prize draw

newsletter is giving away three ballpoint pens with an integrated USB memory stick. To take part in this draw, you have to answer the following question:

How high is the transmission rate with byteflight bus systems?

a) 100 kBit/s  
b) 433 MBit/s  
c) 10 MBit/s

Please send the correct answer to: redaktion-newsletter@elmos.de by 31st October 2004

The winners will be notified by e-mail.

Employees and members of ELMOS are excluded from taking part in the draw. ELMOS accepts no liability.

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