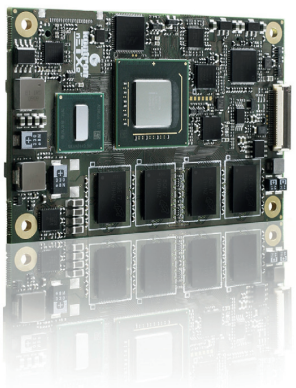
» Application Story «

Mobile vision screening device using COM Express® mini COM

Farsighted system development

Mobile vision screening device based on credit card-sized COM Express® mini module



Vistec AG has developed Optovist, a patented mobile vision screening device for vision testing which features innovative computer technology. b-plus GmbH, a company based in Deggendorf and specializing in embedded designs, was commissioned with the development of the electronics. In their search for the right computing platform, high performance, the integration of specific functions and dual display support - all housed in the minimum amount of space – were the major criteria. b-plus found the CPU module to fit the bill in the COM Express® standard, which Kontron has been offering for a number of years – also in the credit card-sized 'mini' form factor ' which features for example the COMe-mSP1 module.

Correct vision is crucial, especially in the workplace and in road traffic. Trade association rules i.e. G25 and G37 in Germany are generally accepted guidelines which stipulate, for example, when employees have to have their vision tested, either to check their suitability for a certain profession, i.e. as a pilot or vehicle operator, or to detect any type of defective vision or inadequate vision correction with glasses. The latter is especially relevant for working at a computer screen. For these occupational medical checks which predominantly are carried out by companies' and works' doctors, mobile vision screening devices became established in the market during the 70s and 80s.

Analog goes digital

In the past, there were limitations on the number of optotype tests which could be carried out on vision testing equipment as these were only available either as optical discs, as slides or as printed foils. This purely mechanical design hinders flexibility when selecting different vision tests and, what's more important, it is comparatively costly when adaptations have to be made to comply with new testing regulations and special customers requests. This was the reason why Vistec set about developing Optovist, a mobile vision screening device which presents optotype tests digitally on the integrated high resolution 1.8" LCD display. This paves the way for a practically unlimited variety of vision tests, including vision acuity, eye position and even color sense testing. The series of tests can be easily changed to conform with latest testing regulations or for screening abroad where different regulations have to be adhered to. Customer-specific testing is easy to carry out as well. All this is possible with one completely digital device. In addition, over 28 integrated light diodes can carry out a field of vision measurement which underlines the versatility of this efficient solution.

Flexibly adjustable via electric motors

A further advantage is that the height of the new system can be flexibly adjusted which ensures extremely ergonomic handling and optimal test results. Height adjustment of the Optovist is carried out electrically to cater for the subject's size etc., resulting in particularly comfortable testing environment. Furthermore, the internal display which provides the optotypes, can be tilted continuously. This makes vision testing much more comfortable for multi-focal and progressive lenses wearers. Subjects can even carry out adjustments themselves by using a rotary knob on the device thus obtaining the optimal test field position according to his visual aid – i.e. for looking straight ahead to test farsightedness or to check a 40cm reading distance at a tilted test field angle of 35°. Multi-focal glasses wearers often experience problems with other systems without the tilting display feature when testing of nearsightedness was being carried out. With the Optovist it is easy to determine whether special visual aids, like for example for VDU glasses for screen work, are necessary.

Operation via digital touch display

For operating and configuring vision tests the device can be connected via USB to a PC or notebook. To enable even more convenient operation the new system now has a separate high resolution operating tablet with touch control, which makes operation as intuitive and easy as it is with a modern smartphone or tablet PC. Apart from the intuitive control concept, carrying out the vision screening is self-explanatory and promotes secure operation thanks to the written instructions and symbols on the 17.8 cm / 7 " sized high resolution touch display.

New hardware: COM Express® mini format = maximum performance

So the demands on the hardware were clear. First and foremost a small form factor with a low power dissipation processor technology was required, as the Optovist vision screening device had to keep to a small footprint (39 x 24 x 44 cm) in order to be really manageable and portable. Further ticks on the specification list had to be its light weight and a high level of robustness without vulnerable fans for year-long, reliable mobile usage. Apart from the ultra-small format, the new hardware had more than anything to deliver good performance: fast and precise graphic performance is an absolute necessity to vision testing. And last but not least dual display support was a requirement, so that high resolution graphic signals could be attached to transmit high resolution graphic signals both to the internal display for the eye test as well as to the external operating panel. Furthermore, specific interfaces were required, to connect the operating panel via a cable, for the control of the stepper motors for the electrical height adjustment of the device and for the control of the 28 LEDs for the orientating field of vision measurement. In order to accommodate all these requirements under one roof, a standard single board computer was out of the question. That's why Vistec looked for an embedded design partner with the right hardware and design-in know-how to realize this custom design on the baseboard – from the joint planning of the system right up to the final realization of the serial product. In b-plus, Vistec found a partner with great expertise in connecting displays and a long list of references with board designs and firmware solutions as well as in housing integrations.

Full custom design vs. Computer-on-Module

Right at the start of the planning, the question arose as to whether it made sense to develop a completely new customer-specific board - especially due to the requirements in terms of space-saving design and the specific interfaces. It quickly became clear that a solution with standardized Computer-on-Modules and individual carrierboard would result in significant advantages in comparison to a full custom design. For one thing solutions based on compact COTS solutions are not just as space-saving but they can be realized much faster and more cost-efficiently than individually developed designs. Apart

from that future-safety of the new system design was right at the top of Vistec's list of requirements. That meant that the selected hardware had to be available years from now and upgrades can be made totally hassle-free – while maintaining full hard- and software compatibility to the existing designs. Simply exchanging CPUs and chipsets on full custom boards is no easy task. COTS modules, however, can be easily changed and mounted onto the existing carrierboard, as they are based on a widely supported and future-safe standard – and this will hold for a large number of years. A further advantage of standard-based modules is the fact that customers are not dependent on only one single manufacturer and can, if necessary, easily integrate modules from different manufacturers into their systems.

COM Express®: Future-safe module standard with farsightedness

b-plus identified the COM Express® standard as the most suitable amongst the different module specifications available in the market. For one thing, COM Express® is the world's leading standard for Computer-on-Modules and thus enjoys especially wide support from manufacturers. On the other hand, this standard includes COM Express® mini, the extremely small credit card-sized form factor which is ideal for compact and mobile system designs. As modules which correspond to the interface specifications of COM Express® are easily exchangeable and carrierboard designs and development effort can be re-used, COM Express® stands for resource-savings and high design security.

Kontron COMe-mSP1: compact, energy-efficient, dual display support

The Kontron COM Express® mini module, COMe-mSP1 is applied in Vistec's Optovist system. This ultra-compact COM Express® mini credit card-sized Computer-on-Module offers high performance x86 processor technology on a space of just 55 mm x 84 mm. In addition to this, the Kontron COMe-mSP1 is based on the highly efficient Intel® Atom™ 5XX series processor and the Intel® System Controller Hub. This integrated chip combines the memory and graphic controller as well as the I/Os on a single chip. The COMe-mSP1 manages with a typical Thermal Design Power of less than 5 watts, making it the ideal platform for developing fanless, energy-saving mobile applications which require x86 processor performance and high resolution graphics in combination with long battery operating time and a fanless system design. It was decisive though that the Kontron COMe-mSP1 as the first COM Express® mini module also supports SDVO alongside the standard LVDS support, facilitating the connection of two displays as required for this vision screening solution. It was possible to fulfill all the system design requirements with an off-the-shelf COM Express® module from Kontron.

Hardware and software design from a single source

b-plus was therefore in a position to concentrate on the design-in of the standard module. The team developed a carrierboard which was tailored to exactly fit the compact form of the housing on which the Kontron COMe-mSP1 had to be mounted. Apart from the slot for the add-on module for controlling the stepper motors for display positioning, b-plus created a customer-specific interface on the underside of the board where LVDS, the power supply and the USB signals for the touch operating panel are carried out over just one cable. This resulted in a space-saving solution which underlines b-plus' high design and solution expertise.

Beside the hardware design, b-plus was also largely responsible for the standard software implementation. b-plus created a Windows CE image for the application including all the required functionalities and drivers which had either to be adapted in parts or developed from scratch – for example for the stepper motor height and tilt adjusting. That left the Vistec software developers to concentrate on the application development of the vision screening device and then to revert to a highly integrated hardware platform, which also has been optimally tailored from the software point of view to meet the demands of the application. Also, this meant having just one contact person.

"We are extremely pleased with the overall solution which b-plus delivered and the extensive development work which b-plus has carried out. Nearly all our requests have been implemented, for example the extremely compact size of the system, intuitive operation via touchpad and the future-safety of the hardware," Brigitte Elsässer, Vistec AG confirms. "The fact that we were in a position to bring together all these requirements on a standard-based COTS platform, meant that the whole process was accelerated significantly. The farsightedness of the design deserves a special mention too. As due to the standardization of the COM Express® mini form factor by the worldwide standardization organisation PICMG® we are not aware of any other available alternative solution which would guarantee such design security."

COM Express®: a success story

The COM Express® standard for Computer-on-Modules looks back on a long history of success. The foundation was laid in 2004, when Kontron introduced a module to the market which today is known as the COM Express® basic form factor. In 2006 Kontron followed on with modules in the COM Express® compact format. Kontron completed the COM Express® trio in 2008 with the introduction of the nanoETXexpress® form factor which is now named COM Express® mini. With this, the tried and tested credit card-sized form factor is also part of the COM Express® standard and extends it to include SFF application areas with design solutions for ultra-mobile handheld devices.

COM Express® mini in brief

With a footprint of 84mm x 55mm COM Express® mini modules are just the size of a credit card which makes them ideal for the development of ultra-compact applications. Via the standardized COM Express® connector LVDS and Digital Display Interfaces (DDI) can be executed which, depending on the module, can be configured to SDVO, DisplayPort or HDMI and two independent digital displays can be controlled. COM Express® mini modules offer a broad range of interfaces: 4x PCI Express Lanes, 1x Gigabit Ethernet, 2x SATA, up to 8x USB 1.1/ 2.0 with optional USB 3.0 support and up to two serial interfaces which can be used for different purposes. One can be defined as a CAN bus which gives developers a great amount of flexibility when it comes to application-specific extensions.

The PICMG® did not however just extend the COM Express® standard by a very compact form factor, but opened it up to a complete eco-system. As Kontron's COM Express® mini (nanoETXexpress) Computer-on-Modules have already been on the market since 2008, already a wide variety of application-ready modules, evaluation boards and starter-kits as well as design guidelines are available. Consequently, OEMs using COM Express® mini can profit from the advantages of extremely wide support from VARs, system integrators and independent development providers. Thus, OEMs can comfortably and successfully enter the world of ultra-compact appliances by deploying credit card-sized COM Express® modules.

Photo 1: Based on the COM Express® mini module, b-plus developed the hardware design for Optovist vision screening device from Vistec AG.

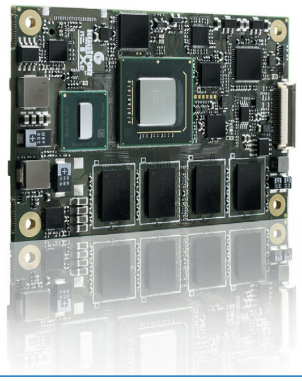


Photo 2: The Kontron COMe-mSP1 in the ultra-compact COM Express® mini form factor offers powerful x86 processor technology and dual display support on a surface not larger than a credit card.

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About Vistec AG

With its founding in 2000, Vistec AG achieved its goal in creating an institution for all vision testing-related issues. The company focuses exclusively on the health and safety needs of the industrial, corporate, preventive, paramedic and transport medical areas. A logical step, considering that 25 million people alone who work at screens require occupational health care. Vistec AG supports corporate doctors and transport medical specialists not only with technical support but in all aspects of vision.

Vistec AG takes care of more than 10 000 users of Rodenstock and Vistec vision testing equipment. The portfolio consists of occupational medical perimeters with the Perivist FeV and Perivist Compact as well as the psychometric test system Corporal A. The brand new, patented and extremely successful vision testing device Optovist represents the top of the product range. Vistec seminars for occupational doctors and assistant health staff and the technical services, which its customer service carries out, round off Vistec's range of products and services.

Vistec AG is known for its reliability and expertise. This is reflected not only in the sales of equipment but also in the growing number of callers who use the complimentary advisory hotline which deals with any questions regarding vision testing, visual aids and perimetry. This day-to-day service for Vistec's customers also ensures that a permanent experience interchange takes place which, in turn, helps the company to constantly finetune its services to meet the needs of the market.

About b-plus

B-plus GmbH was founded 1996 in Deggendorf and is specialized as a innovative system provider with state-of-the-art technologies in the business segments automotive, automation and embedded system solutions.
Equipped with long experience and profound know-how in project and product area, like industrial networking, design of complex control system software or the design of embedded µController and PC hardware solutions, several development teams realize qualified solutions for challenging industrial and automotive applications.
We consider ourselves as a competent full service provider beginning with professional consulting through the conception and management phase of a project up to its realisation. Thus we are a professional partner of our customers comencing at the development phase to the series production and the system integration.

About Kontron

Kontron is a global leader in embedded computing technology. With more than 40% of its employees in research and development, Kontron creates many of the standards that drive the world's embedded computing platforms. Kontron's product longevity, local engineering and support, and value-added services, helps create a sustainable and viable embedded solution for OEMs and system integrators.

Kontron works closely with its customers on their embedded application-ready platforms and custom solutions, enabling them to focus on their core competencies. The result is an accelerated time-to-market, reduced total-cost-of-ownership and an improved overall application with leading-edge, highly-reliable embedded technology.

Kontron is listed on the German TecDAX stock exchanges under the symbol "KBC". For more information,please visit:
www.kontron.com

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