

- **Inova Semiconductors was recently named one of "Germany's most innovative companies". What factors do you see as the basis for this success?**

Even though after 23 years we are, of course, not a "start up" but a highly successful company, we have been able to maintain this spirit and curiosity about new technical territory over all these years; "In(n)ova(tion)" is even in our company name.

After 16 years of being known for transmitting bits from A to B ever faster – first with GigaSTaR and then, since 2006, with APIX – we suddenly entered the market with the idea of ISELED, the "Digital LED", in 2016. This caused established lighting companies to shake their heads, often attracting only a weary smile: Inova; they are the ones with APIX; what do they know about LEDs?

APIX is now one of the globally established standards for Gbps SerDes solutions with licensees such as Socionext, Analog Devices and Cypress and around 170 million nodes installed worldwide. With ISELED, sales figures are literally exploding, with the billion "Digital LEDs" already on the horizon by 2025. ISELED was not the result of extensive market needs analyses or innovation workshops, but rather of a conversation with a gentleman from BMW in the autumn of 2015, in which we more or less coincidentally also came to talk about LEDs and "...whether we could do things completely differently with their control, because the current solutions are too slow, a component pit and not affordable for hundreds of LEDs in the vehicle in the future...". At home, our CTO – who has been with Inova since it was founded and is currently fully involved with the development of APIX3 – immediately had his first thoughts on the subject. With the well-known result, the "Digital LED". Incidentally, the "gentleman from BMW" is the same one who 14 years earlier – in 2001 – passed by our stand at an exhibition in Ludwigsburg, saw our industrial GigaSTaR SerDes products there and asked whether the concept could also be made suitable for automotive use – the idea of APIX, the Automotive Pixel Link, was born.

And speaking of innovations, there is also ILaS: the "ISELED Light and Sensor Network" where we currently have the first functional samples on the table and BMW announced at the last ISELED conference in October 2021 that they will use ILaS with the launch of their "New Class" and a completely redefined architecture in all models from 2025. You can probably guess how this innovation came about. At the beginning, there was once again the question of whether the ISELED transmission, originally designed for short distances only, could not also be rolled out to the entire vehicle.

But to come back to your question: at the beginning of every innovation there is always an idea, but then you need the right minds and the will to turn this idea into a product and to inspire others and get them on board. Last but not least, staying power is also needed to make the whole thing commercially successful. But to ensure that innovation does not remain a flash in the pan or a product of chance, I think it is one of the most important things to constantly "exemplify" a culture of innovation, this curiosity and enjoyment in finding new solutions, and thus to pass on the "innovation gene" in the company to the new engineers – and in our case to an increasing number of female engineers as well. And our CTO does that brilliantly.

- **APIX is now available in the third generation and enables transmission rates of up to 6 Gbps via a shielded twisted pair cable or max. 12 Gbps via a quad twisted pair connection. What's next for APIX – where is the development heading?**

We have already briefly talked about the success story of APIX – premiered in the vehicle at BMW in 2008 and now in its 3rd generation – whereby we are still gaining new designs today with 2<sup>nd</sup> generation APIX2 and its 3 Gbps data rate,. APIX2 was launched on the market back in 2012, and is still being used for new designs, currently by a Japanese OEM.

APIX3 had its premiere in 2018 on BMW's MGU (Media Graphics Unit) platform, still in APIX2 compatibility mode with 3 Gbps. We are currently already working on the second evolutionary stage of APIX3 with full 12 Gbps, Display Port Multi Stream Transport (MST), HDC2.3 encryption and other features and have recently gained a premium platform with SOP2025.

So the "APIX story" is set to continue, even from today's perspective, well into the next decade. With APIX3 Evo2, however, we are fully exploiting the possibilities of the current technology node and, of course – like you – our customers are also asking us what the future holds for APIX and whether an APIX4 is coming?

The answer is a clear "yes, it will continue". We are currently thinking seriously about the concept of APIX4 – there is even an internal white paper with target specifications – and we have also already thought about the future technology node of APIX4. But I'm sure you'll understand that I don't want to say any more at this stage, just this much: let us surprise you, we want to show numerous innovations at the "electronica" trade fair in November – not only for ISELED and ILaS...

- **In 2016, you introduced the ISELED technology. In 2020, a Chinese vehicle manufacturer implemented ISELED as a standard for the first time, and the technology is also already being used in Korea. ISELED is also used in the new BMW iX, which has been available since November last year. Which other vehicles will feature the technology?**

As already mentioned, ISELED was born from an idea and in close cooperation with BMW and premiered in the new iX in November last year – as the first OEM in Europe. In Asia, however, things are moving much faster with regard to ISELED. In addition to its debut in China FAW Group's premium Hongqi H9 model in 2020, ISELED is already being used in other Chinese models such as Leap Motors' all-electric C01 and Zeekr 001, Geely's premium electric brand. In Korea, there is the Sprinter "Noble Class L13" from Mercedes Benz and the "Carnival Hi-Limousine" from KIA. A few days ago, I learned that another major Korean manufacturer will be using ISELED in more models. Although this list does not claim to be exhaustive, our Alliance partner from the very beginning, Dominant Opto from Malaysia, is very successful with it in Asia. And with Everlight, another major Taiwanese LED manufacturer is now offering ISELED LEDs in Asia. In the US, it is Rivian, among others, that uses ISELED not only in their EVs but also in the charging stations. This is where we also have the first industrial applications, such as dynamic lighting for petrol stations. And in aircraft interior lighting, our Alliance partners have already won their first projects with a major aircraft supplier.

To be honest, I have lost track of where else ISELED is already being used. Ultimately, however, we are seeing production figures that exceed our expectations and by far. As mentioned earlier, we are already in the upper double-digit millions this year with the one

billion mark on the horizon. Luckily, we have a partner in Globalfoundries who, despite the current semiconductor crisis, supports us as best possible with these massive growth rates.

- **The ISELED Alliance, as an industry association for a corresponding ecosystem, is growing steadily, there are now 40 members. What role does the Alliance play, what developments are currently underway?**

I have to correct you slightly: there are currently "only" 39 logos to be seen in our Alliance overview. The companies "Osram Opto Semiconductors" and "Osram Continental" are still members but now operate under the joint umbrella of "ams OSRAM", so two logos have become one. However, we already have several further enquiries on the table from companies that want to join the Alliance. We will then announce the new members after our next Alliance meeting in May.

When you have such an ingenious idea as ISELED – the "Digital LED" – the question quickly arises as to how you – especially as a smaller company that has had nothing to do with light before – can get others interested in it and excited about it, i.e., attract those all-important "followers". Even more so in a market where there are some big "top dogs", and which is also very fragmented. This eventually led to the idea of the ISELED Alliance, which was then founded in autumn 2016, with its announcement at "electronica" in November – by five companies – Dominant Opto, Inova Semi, NXP, Pforzheim University and Tyco Connectivity. And with the sole objective of continuously expanding the ISELED ecosystem and thus making this new technology attractive for users.

Today, as already mentioned, 40 companies from all over the world are members of the ISELED Alliance – leading "light" Tier 1s, LED and semiconductor manufacturers, specialist lighting designers and many others – and the great success and global acceptance of ISELED are largely due to the successful work of this industry consortium. In addition, the large ISELED conferences (there have now been four), the last one in October 2021, with around 400 participants – on site in Munich and at the same time online for the worldwide ISELED community. And – no question – the well-functioning structures of this Alliance are now, of course, also fully benefiting ILaS.

For example, one major semiconductor manufacturer is already working on an "Ethernet-to-ILaS" bridge chip that connects the ILaS bus directly to the fast Ethernet, and another is working on a matrix RGB component with an integrated ILaS interface. Similar ideas are already being considered for chips with sensors, and software developments are already taking place at Alliance members in a bid to offer complete system solutions.

In addition to the development of future ILaS semiconductor components, there is also a major focus on new housing technologies; the limited installation space in vehicles is a central issue in modern lighting applications. Compact, highly integrated SiP (System-in-Package) solutions with low power dissipation are a prerequisite here in order to implement the car manufacturers' plans to soon use hundreds of LEDs, combined with sensors and actuators, in their vehicles. And of course, ISELED itself is moving ahead at full speed: the next generation, "ISELED 2.0", with a significantly expanded range of functions, is already in the starting blocks.

- **To ensure security of supply for the iX, a direct agreement was concluded with BMW at the end of last year. By your own admission, this is uncharted territory for you. What are your expectations in this regard, and what are the challenges?**

This is actually uncharted territory for us only in that we have concluded a formal agreement for the first time to ensure the security of supply at BMW. And of course, that is absolutely understandable given the large volumes ISELED will involve in future.

But then again, not in the matter itself, because as a sole-source supplier, we have always considered it one of our most important tasks to ensure the supply of our products to our customers – and of course not only to BMW. Even in the first Covid crisis in 2020, when demand suddenly soared again in the fourth quarter after the severe slump in the summer and many manufacturers had delivery problems, it became apparent that our supply chain and risk management worked well even in such a "stress test": even then, we were able to reliably supply all our customers. With BMW in particular, we have enjoyed a close, successful cooperation for many years, which is characterised by openness and transparency – in both directions. The same applies to Globalfoundries, our chip supplier since the company was founded in 1999, where we have all our APIX and ISELED chips manufactured. And they not only provide us with excellent support now – as a fast-growing customer with ever higher volumes – but have already done so when we were still a very small customer with "very modest" volumes in the GigaStaR days: in the first few years, we had just one wafer lot with 25 wafers produced there – mind you, per year!

So signing the agreement with BMW only documented something "in black and white" that we have been experiencing for a long time anyway: now, with ever-increasing volumes but a little more formally and even more consciously and on the basis of a close partnership that has proven itself for many years.

- **2022 has, so far, been dominated by the Covid crisis and, since the end of February, by the Russia-Ukraine war. What are your expectations and objectives for this year?**

Having come through the Coronavirus pandemic well so far – we had sales growth of over 40% from 2020 to 2021 – we have set ourselves a similarly ambitious target for this year. In the first quarter, we were still on track, but with a first small dip now in March. Of course, we will also feel the effects of the Russia-Ukraine war; BMW, for example, reduced production in some plants in March or halted it completely for a short time. How this will develop remains to be seen, one can only hope that this nonsensical war will end soon, and that politics will find a solution. However, our objective for this year has not changed. We are working flat out on our new products, looking for and hiring new staff in all areas to cope with our tremendous growth. And, we are already looking forward to the electronica trade fair, which we hope will take place this year.