CHIPS.

Newsletter
November 2014

It's better to do things approximately right than exactly wrong!

Goethe

CEO's Note

Dear Readers,

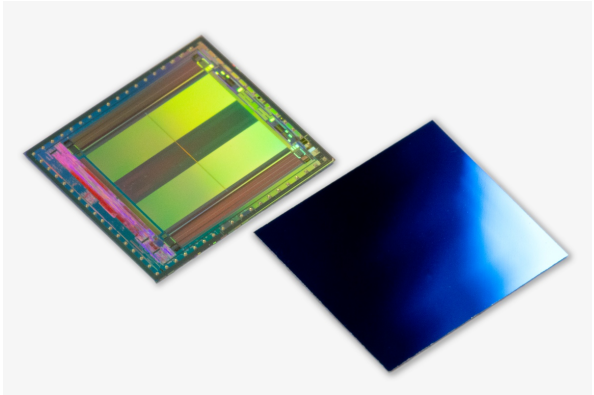
A lot of things happened in the semiconductor industry in the last couple of years. Even when the shrinkage process of semiconductor structures started struggling due to economic reasons but not to technological limitations, the amount of memory and computing power available in our gadgets is increasing probably still according to Moore's Law. What happened is that engineers kept going to find new ways to improve the performance of their products by better usage of the available technology. Four CPU cores instead of one, stacked memory dice instead of just one die etc. It seems that the wide field of innovation in the industry is now focusing more on clever usage than on applying brute force. I personally like this trend because it uses the available resources better than throwing away things which would do the job for many more years.

We are happy that we are in market segment which is just at the beginning of it's development. It gives us the freedom to innovate, this time also with brute force. Today, we are proud to announce the epc660 chip. A full 3D TOF QVGA imager based on our OHC15L technology. Backside illumination, extremely high sensitivity in the NIR domain and pixels with 100% fill factor push the limits in 3D imaging. Market leaders already decided to go with our technology which allows completely new applications even under full sunlight conditions. Check it out!

Beat De Coi

It's here – epc660 QVGA TOF imager

Finally – it's here! After a demanding development and design cycle our new baby was born. The epc660 QVGA TOF imager. The epc660 is a fully integrated 3D-TOF imager with a resolution of 320 x 240 pixels. It is a highly integrated system-on-chip camera system. Apart from the actual CCD pixel field, it includes the complete control logic to operate the device. Data communication is done through a high-speed digital 12-bit parallel video interface. 66 full frame TOF images are delivered in maximal configuration. By using the advanced operation modes, this can be boosted up to more than 1000 TOF images per second!



epc660 QVGA TOF Imager

All configuration (and there is plenty) is done via I2C control interface. An integrated EEPROM holds factory settings and production and configuration data. And like its smaller siblings - the epc600 and the epc610 – this imager features an integrated LED driver, capable of driving more than 200mA peak current.

Even for mobile devices, only a few additional components are needed to integrate 3D camera capability. Depending on the system design, a resolution in the millimeter range for measurements up to 100 meters can be achieved. The high degree of integration lays base for straight-forward camera system design with minimal part count. The extremely high sensitivity of the optical front end allows for a reduced illumination subsystem and reduces the power consumption of the overall system significantly. Good news for all those outdoor applications too: The advanced CCD pixel architecture is an enabler for camera systems that can tolerate ambient light levels of up to 130kLux!

Advanced operation modes

Like most of our imager designs, the epc660 features a complete digital on-chip subsystem. We used this to implement a few nifty features for dedicated tuning in order to cope with specific application requirements.

The deployment of several TOF systems on the same scene has always been a hassle. These actively illuminated systems have the tendency to interfere with each other as since they typically use modulation patterns with common frequency ranges. But the epc660 features various other modulation schemes on-chip. And if this is not sufficient, there is a dedicated modulation input that can be externally fed with any desired modulation signal. Frequency hopping, random modulation, CSMA/CD and the like a easily possible.

Of course, the epc660 features binning and Region of Interest (ROI). But the real novelty comes with the possibility

to independently operate adjacent pixel rows with different integration times or demodulation phases. This comes in very handy for example with moving objects. The principle of modulated TOF requires 4 individual frames to be taken sequentially (DCS frames). But this sequencing naturally leads to motion blur with moving objects. Short integration times will help with this problem but it will not solve it completely. With the epc660 it is now possible to assign different DCS frames to adjacent pixel rows and these frames can be taken concurrently!

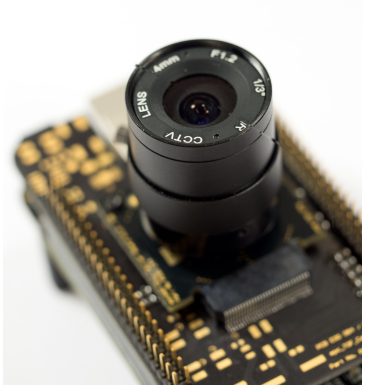
epc660 on Chip Carrier Module

Further options allow the reduction of readout data by skipping one or several rows or columns. This may be an interesting feature for applications that do not require full resolution shots constantly but still should be able to detect changes in the scene observed and then go to full frame operation (e.g. for energy critical applications).

All the above operation modes can be combined and matched to precisely meet the application requirements. Plus, there is also a greyscale imaging option. And the best of all, these operation modes can be configured on the fly through the I2C control interface. Have it your way with the epc660!

Evaluation Kit

The epc660 is available with an appropriate development kit. Hardware base for this kit is a BeagleBone processor board module. With plenty of I/O and processing power for real-time analysis provided by an AM335x 720MHz ARM® processor, BeagleBone is the solid tool to not only meet the requirements of operating the epc660. This open-source hardware is an ideal platform for evaluation and prototype system development. The large user community provides a great pool of ideas and solutions for all kind of developments.



Standard Industry lenses can be used on the epc660 Eval Kit

The BeagleBone mainboard is completed by a custom developed illumination board, equipped with 850nm IR LEDs. We opted for the 850nm band for this kit. But like any epc imager, the epc660 features a very broad sensitivity range from the visual spectrum up to over 1000nm. Therefore, the operation wavelength in your application is your choice.

The epc600 itself is mounted on its own chip carrier board that plugs into the TOF cape board which supplies the chip and the illumination board and bridges the communication to the BeagleBone. The carrier board is designed to accept standard CS and 12mm mount lenses. With a pixel field size a little smaller than an 1/2' imager, this leaves plenty of off the shelf lens options to choose from.

The Evaluation Kit is delivered with documented firmware which includes the necessary routines to configure and operate the chip. An API facilitates development work and system integration. A PC/Mac software for visualization and data logging software completes the package.

The first epc660 samples and the epc660 Evaluation Kit will be available early next year. And for those attending the SPIE Photonics West exhibition in February 2015 – come and see us please. We are exhibitor and there will surely be a live demo at our booth.

Learn more: info@espros.ch.

Save the date! SPIE. PHOTONICS WEST **February 7-12, 2105 Booth 5543**

ESPROS is nominated for the SPIE PrismAward 2015 in the field of imagers and cameras!

Sales

Worldwide	**ESPROS Photonics AG,** 7320 Sargans, Switzerland, phone +41 58 411 0300, www.espros.ch
Switzerland	**Ineltro AG**, 8105 Regensdorf, phone +41 43 343 73 00, www.ineltro.ch
Italy	**Kevin Schurter SPA**, 20020 Arese MI, phone +39 02 30465311, www.schurter.it
Austria	**Tecams Handelsagentur**, 2392 Sulz, phone +43 664 1206900, www.tecams.at
Israel	**E.D.E Electronics Ltd.**, Netanya 42504, phone +972-9-8634000, www.ede.co.il
Germany	**Polytec GmbH**, 76337 Waldbronn, phone +49 7243 604-0, www.polytec.de
	Neumüller Elektronik GmbH, 91085 Weisendorf, phone +49 9135 73666-0, www.neumueller.com
BeNeLux	**Neumüller Elektronik GmbH**, 91085 Weisendorf, phone +49 9135 73666-0, www.neumueller.com
Taiwan	**Prohubs International Corp.**, New Taipei City, phone +886-2-26988800, www.prohubs.com.tw