

INSIDE

poLight's Optical MEMS

Camera module makers have a new next-gen actuator option based on a patented optical polymer technology—one that's positioned to enable a reduction in smartphone thickness, while significantly improving image quality and speed.

Norway-based poLight, a fabless startup that was spun off from Ignis in 2009, is preparing to take its piezo-based autofocus lens technology to volume production next year. This new technology, known as tunable lens or TLens, offers several distinct advantages over the VCM (voice coils motor) technology that is currently in use in about 98% of the world's smartphones and camera phones. Among the key advantages: Lower power consumption (< than 5 mW, including the driver), faster speed of autofocus (< than 1 ms), a smaller footprint (< than 3.0 x 3.0 mm), instant focus for video and picture capture, and the ability to sustain reflowable production (heat resistant to 260°C). And using an entirely wafer-level approach provides manufacturing benefits and lower costs that are difficult to beat.

How does the TLens work?

In short, the TLens consists of a circular piezo ceramic "actuator" embedded on a deformable thin glass membrane upper layer, with a polymer quite similar to a gel sandwiched between the upper layer and a thicker glass bottom layer. When voltage is applied to the piezo, it forces the thin glass to bend. When it's bent with light passing through all three elements, it acts as a gate that enables focusing. Significantly, this focusing is achieved without motion, by altering the curvature of the deformable membrane.

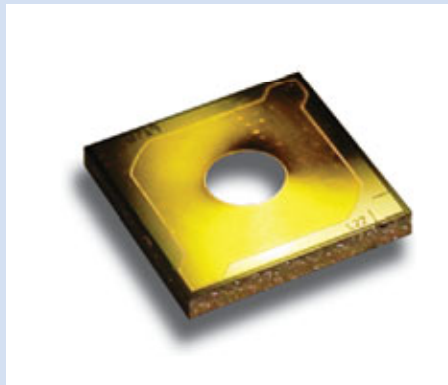
"Our technology is unique in a market that is focused almost entirely on VCM technology, which is purely mechanical. No one else is taking the lens technology in the direction we're going, keeping excellent image quality" notes François Vieillard, poLight's VP of Marketing & Sales.

Improvements

TLens will result in big changes to the experience of shooting photos with your smartphone or camera phone, Vieillard says, which he believes people will really enjoy. Why? Perhaps what people will appreciate first is the speed—fast. If you want to take a shot of a group of people in different depths of field with the current technology, only one or two of the

people will be in proper focus. With poLight's TLens, it's extremely fast, and enables a sharp focus even with several depths of field. It essentially converts a 3D image into 1D. If you try to do the same thing with VCM, it would take much longer—seconds, as opposed to few tenths of ms (depending also on how fast your sensor can go up to).

Another benefit TLens offers is an extremely low power requirement. VCM technology requires in the range of 150 to 200 mW of power to focus, while TLens requires a mere 5 mW. "This means much lower power consumption, and you can also save on batteries, while also extending video recordings from your phone," adds Vieillard.



TLens (Courtesy of poLight)

The size is also considerably reduced. "Today's goal for the industry is to get the camera module into the 8.5 x 8.5 mm range. Now the physical dimension will be linked to the actual physical dimension of the sensor itself," says Vieillard. "If you have a camera module with a footprint of about 4.5 mm x 4.5 mm, for example, this likely means that the sensor is around 1 megapixel. If you increase that sensor to 5 or even 8 megapixels, the camera module will be within the range of 6.5 x 6.5 mm easily, and can power autofocus."

And now that some smartphones are including more than one camera to enable both high resolution video conferencing and taking photos, more of these modules will end up inside smartphones. The



Close up photo with 3MP TLens camera module (Courtesy of poLight)

primary camera for photos will likely involve 5-, 8-, or even 12-megapixels. For second or third cameras, 2 megapixels will be widely used in the future. So this is a rapidly expanding market and poLight will be able to address not only the primary camera business, but also the high resolution subcamera business—icing on the cake, so to speak.



photo with 3MP TLens camera module (Courtesy of poLight)

Heading to market soon

On the road to volume production, poLight demonstrated its product in a camera phone earlier this year during Mobile World Congress in Barcelona, and recently teamed up with US-based SVTC Technologies, a development and manufacturing services provider for emerging silicon-based technologies in areas such as novel transistors, microfluidics, MEMS, photovoltaics and other nanotechnologies.

Access to SVTC's 8-in and 12-in wafer fab is expected to help ease migration to large-volume MEMS manufacturers next year.

François Vieillard,
Vice President Marketing & Sales



François Vieillard has 25 years' experience in the semiconductor industry, including 8 years in the mobile industry at NS, Cirrus Logic, Toshiba and ARC. He held various marketing and sales responsibilities and was Sales Director at Digital Imaging Systems (DIS).

François holds a Master's degree in Electronics from Paris Ecole Centrale D'Electronique.

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