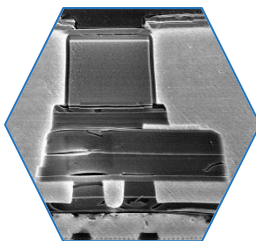
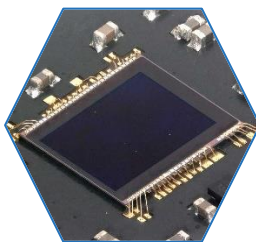


Liquid Lens Camera Module in the Xiaomi Mi MIX FOLD

Deep technical and cost analysis of the first-ever liquid lens in a consumer product.



Title: Liquid Lens Camera Module in the Xiaomi Mi MIX FOLD

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Reference: SPR21625

Tunable lens technology promises to revolutionize the way smartphones achieve zoom. Conventionally, smartphone cameras simulate zoom by employing multiple modules that are each optimized for different focusing distances.

Then, image-processing algorithms blend the information captured by these modules to create a sharp photograph. Tunable lenses would allow a single camera module to vary its focusing distance, which not only achieves a true optical zoom but also reduces the number of modules necessary. Xiaomi has partnered with OFILM and NEXTLENS to bring the first smartphone tunable lens to market. NEXTLENS is a spinoff of Optotune, which specializes in tunable optics for scientific applications.

The liquid lens module is comprised of a transparent fluid wrapped in a deformable membrane that can be shaped by a voice coil motor system. By working in tandem with conventional fixed lenses, the liquid lens camera module is capable of focusing distances between 3 cm – 8 cm. It can therefore achieve a 2.7x optical zoom and perform double duty as both a macro and telephoto camera module, all while coming in at a cost comparable to typical telephoto modules found in Samsung and Apple flagships.

This report presents optical, X-ray and SEM imaging, and EDX and FTIR chemical analysis used to analyze the liquid lens and the entire liquid lens camera module in

the Xiaomi Mi MIX FOLD. We analyze each major system in the module, including the liquid lens, the fixed optics, the voice coil motor, and the CMOS image sensor (CIS). Cross-sectional analysis reveals the structures of each component and how they fit together to achieve the tunable camera module. Delayering analysis allows us to determine the processes and technology node of the CIS, while chemical analysis identifies the materials used in the liquid lens and infrared filter. This information is used to determine the manufacturing processes of the liquid lens and CIS, which are presented in this report. We then calculate the cost of each step and present itemized manufacturing and BoM costs that cover every major system and use this to estimate the selling price of the camera module.

COMPLETE TEARDOWN WITH:

- Detailed photos
- Explanation of new technology
- Precise measurements
- Materials analysis
- Manufacturing process flow
- Supply chain evaluation
- Manufacturing cost analysis
- Selling price estimate

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AUTHORS



Peter Bonanno, PhD. is a Technology & Cost Analyst, Imaging at System Plus Consulting. With a strong expertise in the field of imaging and optical sensors, Peter performs reverse engineering & costing analyses as well as custom projects.

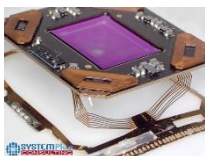


Sylvain Hallereau has been Project Manager at System Plus Consulting since 2000. He is in charge of costing analyses for Integrated Circuits, Power semiconductors and LEDs. He has significant experience in the modeling of manufacturing costs for electronics components, Sylvain holds a Master degree in Microelectronics from the University of Nantes, France.



Léo Vatan is a Microelectronic Laboratory Technician. He has a Master degree in material science majoring Ceramics from the University of Limoges. He previously worked on different subject among which solar cells or tellurite glasses for optical fibre application.

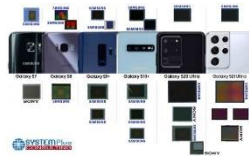
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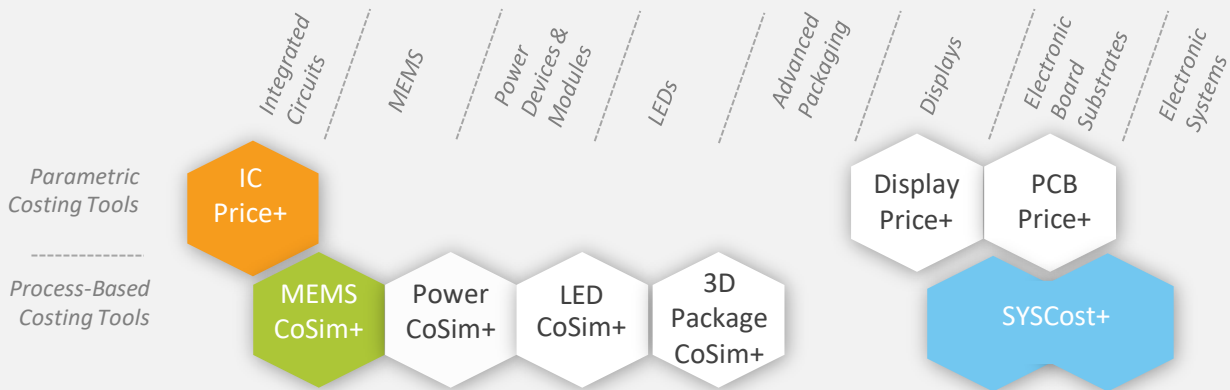


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CONTACTS

Headquarters

22, bd Benoni Goullin
Nantes Biotech
44200 Nantes
France
+33 2 40 18 09 16
sales@systemplus.fr

Europe Sales Office

Lizzie LEVENEZ
Frankfurt am Main
Germany
+49 151 23 54 41 82
llevenez@systemplus.fr

America Sales Office

Hal LEVY
Western USA & Canada
+1 408 334 0554
hal.levy@yole.fr

Chris YOUUMAN

Eastern USA & Canada
+1 919-607-9839
chris.youman@yole.fr

Asia Sales Office

Takashi ONOZAWA
Japan & Rest of Asia
+81 80 4371 4887
onozawa@yole.fr

Mavis WANG

Greater China
TW +886 979 336 809
CN +8613661566824
wang@yole.fr

Peter OK

Korea
+82 10 4089 0233
peter.ok@yole.fr

System Plus Consulting is specialized in the cost analysis of electronics from semiconductor devices to electronic systems.

A complete range of services and costing tools to provide in-depth production cost studies and to estimate the objective selling price of a product is available.

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www.systemplus.fr
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