FLIR ONE: the first consumer thermal imager with a microbolometer

Details

Imaging

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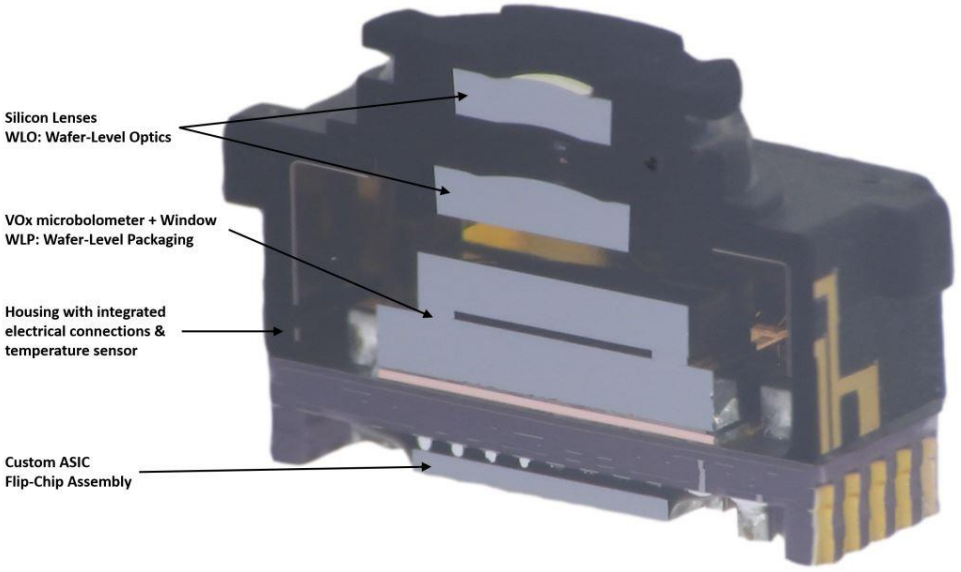
System Plus Consulting's newly-published reports on the FLIR ONE camera and LEPTON core module provide complete teardown analyses. Our infrared (IR) camera report also provides bill-of-material (BOM) and manufacturing cost, and the module report includes a complete physical analysis and manufacturing cost estimation.

Initially focused on the military market, uncooled thermal camera sales have grown significantly due to substantial cost reduction of microbolometers and growing adoption in commercial markets. FLIR is the world's largest long wave IR (LWIR) camera manufacturer and main microbolometer supplier, and as such it drives the price war in the commercial market. FLIR's strategy is to take volume leadership in multiple markets, make economies of scale and further decrease price. To achieve this it exploits a vertically-integrated business model and a fabless structure, with manufacturing subcontracted to ON Semiconductor. FLIR also boosted that strategy by acquiring Indigo's IR imager business in 2004 and Tessera's Digital Optics wafer-level optics (WLO) division in 2013.

FLIR introduced two disruptive products in 2014: the LEPTON core and FLIR ONE smartphone plugin. Plugged into the back of an IPhone 5 or 5S, the FLIR ONE is the first consumer thermal camera featuring LWIR technology. It contains a visible VGA (640x480) camera and a thermal camera which provide images blended using FLIR MSX Technology.

The thermal camera uses FLIR's new LEPTON core, where costs have been reduced in every element. The most expensive component, the sensor, is an uncooled vanadium-oxide (VOx) microbolometer featuring an 80x60 pixel resolution with 17µm pixel size. VOx provides a high temperature coefficient of resistance (TCR) and low 1/f noise, resulting in excellent thermal sensitivity and stable uniformity. The microbolometer array is grown monolithically on top of a readout integrated circuit (ROIC) to comprise the complete focal plane array (FPA). An anti-reflection (AR) coated window is bonded above the sensor array via a wafer-level packaging (WLP) process, encapsulating the array in a vacuum. The purpose of the vacuum is to provide high thermal resistance between the microbolometer elements and the ROIC substrate, allowing for maximum temperature change in response to incident radiation.

The system electronics that receive and process the signal are a custom application-specific integrated circuit (ASIC) device mounted in flip-chip on the substrate. Digital Optics' WLO brings an important part of the cost reduction. The silicon lenses are made at the wafer level with lithography and etching processes. The final cost reduction comes from the core housing, which is a three-dimensional molded interconnected device (3D-MID). Incorporating a conductive circuit pattern inside the housing provides grounding and allows FLIR to integrate a temperature sensor. Thanks to its strong integration at the core level with innovative WLO, wafer-level packaging (WLP) and custom ASIC use, the FLIR Lepton is the world's smallest microbolometer-based thermal imaging camera core.



LEPTON Infrared Camera Module Cross-Section
(Source: LEPTON Infrared Camera Module Report, Dec. 2014, System Plus Consulting)

Learn more about the FLIR Systems FLIR ONE & LEPTON Consumer Thermal Imager with Microbolometer.

Source: www.systemplus.fr