

Uncooled IR Cameras & Detectors for Thermography and Vision

TECHNOLOGIES & MARKETS REPORT - JUNE 2010

Driven by dramatic cost reduction of detectors, the market volume for thermography and infrared vision will triple by 2015!

MARKET TRENDS

Initially developed for the military market by US defense companies, use of uncooled infrared (IR) cameras in commercial applications has been growing over the last ten years. In the infrared spectrum, Long Wave Infrared (LWIR) is the most commonly used wavelength (8-12 microns). Thermography and a variety of vision enhancement applications are the main growth markets for uncooled IR cameras. Camera prices have been significantly reduced in the thermography business, which has allowed expansion of the use of IR cameras to maintenance engineers and building inspectors.

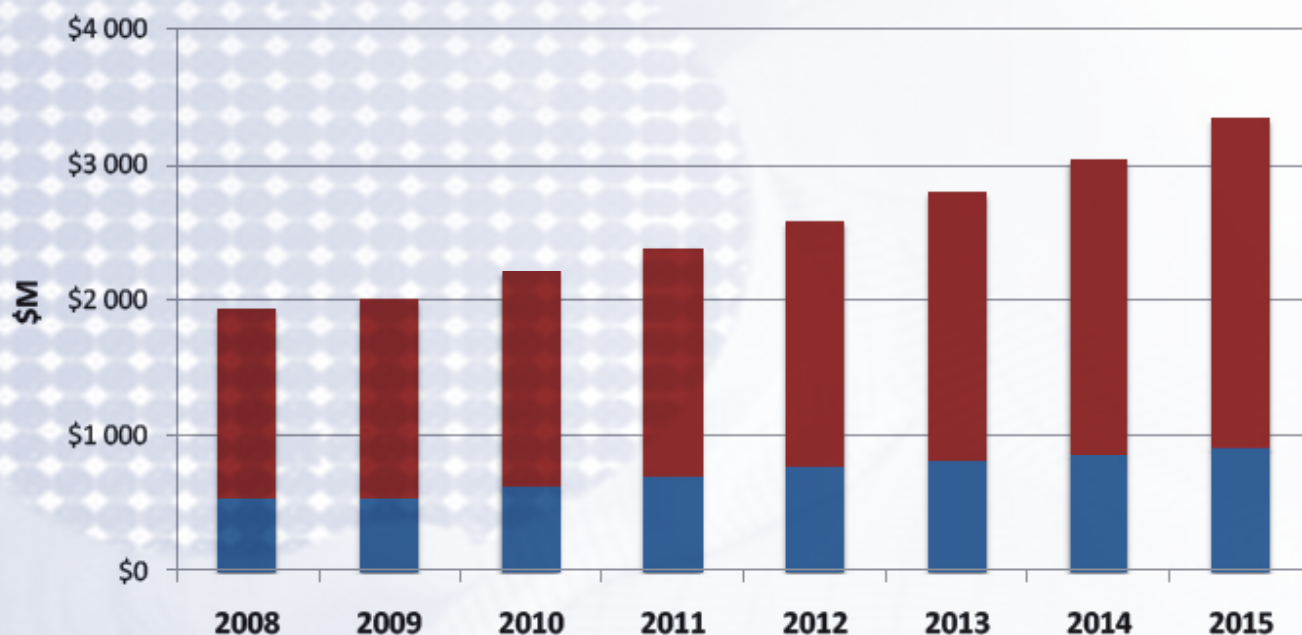
This camera cost reduction will continue through 2015 in the thermography business and will also be a strong factor in the vision market (also called night vision or vision enhancement) with the growth of the security/surveillance and automotive markets.

Driven by the continued cost reductions, the volumes of camera sold will **triple by 2015** from more than 200,000 cameras today to **more than 700,000 units**, meaning +23 % annual growth rate. The revenue growth will be about + 9% as market prices for the cameras decrease.

FLIR (US) has been, and remains, the pioneer of uncooled IR cameras with a vertically integrated business model (internal detector production) and a presence in all markets. This domination will be challenged at two levels in the future:

- At the camera level: camera manufacturers specialized in each market have strong distribution networks and market presence. In the thermography business, Fluke will take market share from FLIR. In the security/surveillance market, visible camera leaders will enter the IR camera business (Axis, Bosch, Pelco).
- At the detector level: new detector suppliers will arrive on the market from the MEMS and semiconductor industry with low cost/high volume product capabilities (Sensoror, Bosch, Faun Infrared...).

Thermography & Vision Enhancement Forecast



One of the major cost components for uncooled IR cameras is the IR detector. Hence, detector cost reduction is one of the major keys to further widespread use of IR cameras.

Microbolometers are the dominant uncooled IR detector technology with **more than 95 % of the market in 2010**. Microbolometer manufacturers were few up to now, often owned by camera manufacturers, which limited the cost competition at the detector level. More than 75 % of the production is based in USA, due the original development of the technology by US Defense Department. This landscape will change in the next five years: many new players (Sensoror, Faun Infrared, Bosch...), focusing only on selling detectors, often in Europe, will enter on the market place with aggressive price strategies.

Vanadium Oxide (VOx), the current dominant microbolometer material, will be challenged by a-Si material and new silicon based materials introduced by new market entrants, thanks to their cost structure, and easier manufacturability.

Detector/Microbolometer product lines are mainly segmented by format from small format (typically 160 x 120) to large format (640 x 480). Price reduction will be huge with **-58 %** expected between 2010 and 2015 for small format. Larger format will be under less price pressure.

The following technical trends make detector cost reduction possible:

- At the packaging level: Wafer Level Packaging and even Pixel Level Packaging will play a huge part in reducing cost, -20 % at least.
- At the pixel level: smaller pixel size (17 microns is becoming a standard) will allow smaller detectors.
- At the integration level: 3D integration, wafer bonding techniques will allow the production of microbolometers in standard MEMS or CMOS foundries.

OBJECTIVES OF THE REPORT

- To provide **market data on both camera and detector levels**:
 - Cameras and detectors unit shipments and revenues
 - Detectors/microbolometer sales and price evolution by format
 - Market share of the detector manufacturers
- To provide an overview of the **IR camera supply chain**:
 - Who are the main camera players in each market and their relationships with detector manufacturers
 - Evolution of the camera and detector manufacturers business models
 - Who are the periphery players involved: ROIC, optics, foundries...
- To analyze the **main technological trends** for detector/microbolometer :
 - Pixel size reduction, Wafer Level Packaging, 3D integration, Wafer Level Optics, Pixel Level Packaging

WHO SHOULD BUY THIS REPORT

- **Microbolometer manufacturers**:
 - Identify and evaluate IR camera markets with market size, growth and key customers
 - Analyze the threads and opportunities of new emerging technologies (WLP, WLO...)
 - Monitor and benchmark your competitor's advancements
- **Financial & Strategic investors**:
 - Understand the main market dynamics and main technological trends
 - Get the list of the key players and emerging start-ups of the camera and detector industries
- **Equipment & Material manufacturers**:
 - Understand the IR camera and detector supply chain and its evolution
 - Identify new opportunities and prospects
- **Camera manufacturers**:
 - Get the list of the top microbolometer detectors manufacturers
 - Spot the new potential suppliers with disruptive technologies
 - Roadmap potential cost reduction of microbolometer

Technical evolutions for microbolometers

Technical evolution for microbolometers are at **4 different levels**: IR optics, packaging/ROIC (Read Out Integrated Circuit) integration and at the pixel level. Main motivations are to reduce cost and to increase integration.

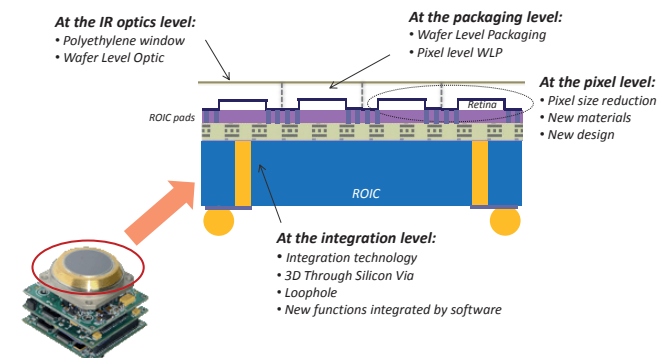


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COMPANIES CITED IN THE REPORT

Axis Communications, Acreeo, Aeries, Agiltron, Argus, e2v, Audi, Autoliv, BAE systems, BMW, Bosch, Automotive, Bosch Security Systems, Bullard, Dali, Chauvin Arnoux, Current Corporation, Dalsa, DAS Photonics, Draeger, DRS technologies, Electro Optic Sensors, EOC, ETH, Extech, GE Security, FocalPlane Santa Barbara, Fraunhofer IMS, Faun Infrared, FLIR, Fluke, GM, Goodrich, Guide Infrared, Honda, Honeywell, Infrared Solutions, INO, Ipht Jena, Invisage, Irisys, ISG, Jenoptik, KTH, L3Com, Leti, Metu MET, Mikrosistemler, Mitsubishi Electric, MSA, Murata, NEC Avio, NTT, Noble Peak Vision, OKSI, Omnivision, Panasonic, Pelco, QinetiQ, Raytheon, Redshift, Sarnoff, Satir, Samsung, Scott, SCD Semiconductors, SensArray Infrared, Sensoror, Silex, Sirica, Sony, Sumitomo Electric, Testo, Thermoteknix Systems, Toshiba, Tyco, Tyndall, Umicore, Ullis, Vigo, Xenics, Ziptronix.

BIOs



Dr. Eric Mounier has a PhD in microelectronics from the INPG in Grenoble. Since 1998 he is a co-founder of Yole Développement, a market research company based in France. At Yole, Dr. Eric Mounier is in charge of market analysis for MEMS, equipment & material. He is Chief Editor of Micronews, a monthly magazine dedicated to micro and nano technologies.



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