Far infrared thermal sensors are finding increased uses in myriad applications, from consumer to industrial. The ideal for this component type is to miniaturize it, because it is more cost-competitive compared to microbolometers and it is adapted to smart home/smart building applications (presence and movement detection, high-precision non-contact temperature measurements, visual infrared thermometers, etc.) which represent a growing market. The consumer market means more quantity and the most integration in order to improve the component’s dimensions and minimize cost. For example, integrating the lenses directly onto the die would allow switching to wafer-level packaging.

Based on a low-definition, thermopile/far infrared thermal sensor, the Melexis Sensor MLX90640 32 x 24 is dedicated to these markets. Cheaper than a microbolometer and easier to integrate, the thermopile offers very good performance for applications that do not require high-resolution images or a high frame rate.

The thermopile array sensor consists of only a 1cm³ camera (with lens). The system is made very compact and easy for integrators with a digital I²C interface, and it includes a silicon lens for low-cost applications. The 32 x 24 array sensor uses a 100µm pixel based on a thermopile technology for a very compact design.

This report provides a detailed teardown and cost analysis of the thermopile die where the memory is directly integrated, along with the silicon lens and the packaging. Also included is a comparison between the characteristics of both versions of the thermopile sensors from the Melexis MLX90640 Sensor, as well as a comparison with the Heimann sensor HTPA 32 x 32d. The latter comparison highlights the differences in technical choices made by each company.

**COMPLETE TEARDOWN WITH**
- Detailed optical and SEM photos
- Precise measurements
- Materials analysis
- Comparison between Melexis, Heimann Sensor, and Flir Microbolometers
- Manufacturing process flow
- Supply chain evaluation
- Manufacturing cost analysis
- Estimated sales price
# TABLE OF CONTENTS

## Overview /Introduction
- Melexis Company Profile
  - MLX90640 Datasheet

## Physical Analysis
- Synthesis of the Physical Analysis
- Physical Analysis Methodology
  - Package
    - Package views, dimensions and marking
    - Package opening
    - Package cross-section (with lens details)
- Thermopile Die
  - View, dimensions & marking
  - Pixels, thermocouples
  - EEPROM memory
  - Cross-section
  - ROIC characteristics

## Manufacturing Process Flow
- Global Overview
- ROIC Front-End Process & Wafer Fabrication Unit
- Thermopile Front-End Process & Wafer Fabrication Unit
- Thermopile Back-End 0: Probe Test & Dicing
- Silicon Lens Front-End Process
- Back-End: Final Test

## Cost Analysis
- Synthesis of the Cost Analysis
- Yields Explanation & Hypotheses
  - Thermopile die: Front-end cost and wafer and die cost
  - Silicon lens: Front-end cost and wafer and die cost
- Component
  - Back-end: Packaging cost
  - Back-end: Final test cost
  - Component cost

## Estimated Price Analysis

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