Silicon Labs Si504 CMEMS Oscillator

First fully integrated, monolithic CMOS+MEMS oscillator device
Innovative Poly-SiGe Surface-Micromachining Process

The frequency control market is largely dominated by quartz products, but silicon timing solutions have a strong value proposition for some sub-markets.

The Si504 is the first silicon oscillator from Silicon Labs. Manufactured with the CMEMS process (CMOS + MEMS), the crystal elements are replaced by micromachined semiconductor resonators.

CMEMS process consists in a monolithic integration of a CMOS circuit with innovative Poly-SiGe (polycrystalline silicon-germanium) MEMS resonator structures manufactured directly above CMOS metallization.

The resonator is then vacuum encapsulated with a silicon cap using an eutectic wafer bonding process.

With a die size below 1mm², the Si504 is optimized to support high-volume, low-cost applications such as consumer electronics market.

This report will provide a complete teardown of the MEMS oscillator with:

- Detailed photos
- Material analysis
- Schematic assembly description
- Manufacturing Process Flow
- In-depth manufacturing cost analysis
- Supply chain evaluation
- Selling price estimation

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The present document is valid 6 months after its publishing date: January 8h, 2014.

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System Plus Consulting specializes in the **cost analysis** of electronics, from **semiconductor devices** to **electronic systems,** and has developed 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.

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Cost Simulation Tools, process flow based
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✓ LED CoSim+   ✓ TSV CoSim+ (thru silicon vias)
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