+44 20 8123 2220
info@marketpublishers.com

Silicon MEMS Oscillators – a Global Technology, Industry and Market Analysis

https://marketpublishers.com/r/S391FE0F27CEN.html
Date: February 2009
Pages: 99
Price: US$ 3,250.00 (Single User License)
ID: S391FE0F27CEN

Abstracts

Print Copy - US$2,950.00
Single User License - US$3,250.00
Multi-User License at the Same Location - US$3,750.00
Enterprise License - US$4,950.00

Micro-electromechanical system (MEMS) oscillators are not only smaller than conventional oscillators, but also they can respond quicker and more accurately, because of the smaller distances in use. Moreover, producing them in large batches is inexpensive. The extension of lithography methods and development of new micromachining techniques have allowed the production of freely moving micromechanical parts.

Quartz crystals are currently used for most high performance systems, but they are not economical when used as clocks for integrated circuits (ICs) due to their separate and costly hermetic packaging requirements. With micro-electromechanical systems (MEMS), vibrating mechanical devices and wafer-level vacuum packages can be manufactured with conventional semiconductor technologies. This iRAP market analysis report highlights the shift from quartz to MEMS and illustrates how designers could optimize products to save time and money

Current frequency control and timing products in the market are based on the use of resonators made of non-silicon materials, such as quartz crystal, ceramic and surface acoustic wave (SAW) devices. As ICs continue to shrink, these non-silicon resonators, unfortunately, do not follow the same Moore’s Law for miniaturization and ultimately restrict the ability to reduce the overall IC system size and cost. In comparison, MEMS oscillators made using a complementary metal-oxide-semiconductor (CMOS) silicon process are much smaller and easier to integrate.

+44 20 8123 2220
info@marketpublishers.com

The idea of abandoning quartz oscillators for silicon ones is not new. Researchers at Stanford University, University of Michigan and the University of California, Berkeley have been working on the technology for decades. For the most part, however, the quality of these silicon systems has not matched that of quartz. In recent years, though, advances in the fabrication of micro-electromechanical systems (MEMS) have made high-quality silicon oscillators more practical.

When a quartz crystal is fabricated, it is designed to resonate at a single frequency throughout its lifetime. Changing the function of the quartz clock from one that operates a cell phone to one that runs a high-definition television, for example, requires fabricating an entirely different batch of crystals operating at different frequencies. The high levels of miniaturization achieved by MEMS technology allows a cost-effective solution of having high-Q resonators operating at different frequencies to be simultaneously fabricated within the same device “footprint.” Selection of the desired frequency is subsequently achieved using software.

Additionally, quartz crystal, ceramic and SAW devices are produced through a fairly labor intensive process, wherein each device has to be finely tuned to achieve the desired resonance frequency characteristics. The MEMS oscillator fabrication approach, on the other hand, brings about the economies-of-scale achieved by using the mass-manufacturing capabilities of modern CMOS semiconductor fabrication.

There are several companies involved in making MEMS oscillators a reality for electronics device manufacturers who have been waiting for a reliable, scalable and low-cost alternative to quartz oscillators. Exciting market possibilities exist for MEMS oscillators in new product areas such as frequency control, smart sensors, filters and hybrid solutions for commercial, military and space applications.

The MEMS solution, leverages several decades of development that have created a mature silicon integrated circuit industry. Fabrication techniques are well understood and tuned, with established ISO-certified processes resulting in highly-repeatable, high-yield manufacturing. This strong industry foundation has created an opportunity for emerging MEMS oscillator companies – mainly innovative startups such as SiTime and Discera – to gain considerable ground in creating a new market. Last but not least, MEMS technologies, by virtue of their small size are also extremely rugged and well-suited to low-jitter applications such as in military and aerospace equipment, where resistance to shock and vibration is at a premium.

+44 20 8123 2220
info@marketpublishers.com

STUDY GOAL AND OBJECTIVES

This study focuses on MEMS oscillators, providing market data about the size and growth of application segments, industry trends, new developments including a detailed patent analysis, and company profiles.. Another goal of this report is to provide a detailed and comprehensive multi-client study of the market in North America, Europe, Japan, China, India, Korea and the rest of the world for MEMS oscillators, as well as potential business opportunities emerging in the future.

The study objectives include a thorough coverage of the underlying economic issues driving the MEMS oscillators business, as well as assessments of new advanced MEMS oscillators that are being developed. Particular attention was paid to providing realistic market data and forecasts for the MEMS oscillators industry segment. To our knowledge, this study provides the most thorough and up-to-date assessment that can be found anywhere on the subject. The study also provides extensive quantification of the many important facets of market developments in MEMS oscillators all over the world. Ultimately, the study contributes to the determination of what kinds of strategic responses can be adopted by companies hoping to compete in this dynamic market.

REASONS FOR DOING THE STUDY

MEMS oscillators represent an exciting breakthrough technology that can ultimately replace quartz crystal and ceramic resonators as the frequency sources of choice in most electronic systems. In addition to offering significant performance advantages over existing technologies, MEMS oscillators are typically smaller and use less power than conventional oscillators. Because MEMS oscillators can be manufactured in most CMOS fabrication facilities around the world, they offer important advantages in scaling up to high manufacturing capacities and correspondingly lower, per unit cost. MEMS oscillators are a relatively new product and can be expected to follow Moore’s Law on future size and cost reduction capabilities. MEMS oscillators also offer a path towards direct IC integration which is not possible with other discrete, non-CMOS products

CMOS MEMS-based oscillators are a truly disruptive technology that enables electronics companies to remove scalability and cost barriers that face stable oscillator customers today. MEMS technology overcomes some of today’s existing challenges while opening the door to tomorrow’s previously impossible applications through the benefits of micro-fabrication technology. MEMS promises to revolutionize nearly every product category by bringing together silicon-based microelectronics with micromachining technology. By using CMOS MEMS oscillators, manufacturers of

+44 20 8123 2220
info@marketpublishers.com

consumer electronics, hard disc drives and other devices will realize a number of benefits, including reduced footprint requirements, shorter lead times, robust and reliable construction and lower power. Additionally, the technology can be advanced to support high-precision applications.

With this background of new emerging technologies and applications, iRAP felt a need to conduct a detailed study including current and emerging technologies, new developments and market market opportunites. The report identifies and evaluates silicon MEMS oscillator devices and technologies which show potential growth.

CONTRIBUTIONS OF THE STUDY

MEMS oscillators are projected to provide the market with higher frequencies and lower phase noise while maintaining the size and cost benefits associated with wafer-level encapsulation technology. The cell phone is one such application that will benefit from such second-generation products. Research has shown that even the tough standards for GSM and CDMA cell phone temperature-controlled oscillators (TCXOs) can be met as this MEMS technology matures in 2009 and beyond.

The study is intended to benefit existing users of quartz products such as manufacturers of consumer computational products – notebook computers, digital cameras, gaming boxes, video recorders, portable media players, set-top boxes, high definition televisions, and printers. The study profiles manufacturers of these products who are now enabled with a new technology that allows the integration of small oscillators with high Q, low ppm (parts per million) frequency error consisting of single or multiple micro fabricated resonators, at a cost below that for quartz crystal products. For example, PC motherboards require numerous quartz crystals, quartz oscillators, voltage controlled oscillators (VCXOs) and CMOS phase-locked loop (PLL) chips, all of which present opportunities for MEMS oscillators.

This study also provides the most complete accounting of MEMS oscillators' growth in North America, Europe, Japan, and the rest of the world currently available in a multi-client format. The markets have also been estimated according to the type of materials used, such as silicon-based MEMS fabrication of oscillators via CMOS processes. The report provides the most thorough and up-to-date assessment that can be found anywhere on the subject. The study also provides extensive quantification of the many important facets of market developments in the emerging markets for MEMS oscillators, such as resonator applications for IF ranges from 1MHz to 100 MHz.

+44 20 8123 2220
info@marketpublishers.com

SCOPE AND FORMAT

The market data contained in this report quantifies opportunities for MEMS oscillators. In addition to product types, it also covers the many issues concerning the merits and future prospects of the MEMS oscillators business, including corporate strategies, information technologies, and the means for providing these highly advanced products and service offerings. It also covers in detail the economic and technological issues regarded by many as critical to the industry's current state of change. The report provides a review of the MEMS oscillators industry, its structure, and the companies involved in providing these products. The competitive position of the main players in the MEMS oscillators market and the strategic options they face are also discussed, as well as such competitive factors as marketing, distribution and operations.

The qualitative and quantitative judgments embodied in this report are a valuable contribution to the current knowledge of silicon MEMS oscillators. Moreover, this study has been conducted at a vital stage when large use of these devices are expected in computer, networking, consumer and communications industries.

TO WHOM THE STUDY CATERS

This study will benefit the existing users of crystal oscillators such as electronic circuit manufacturers of hand-held electronic consumer products (such as mobile phones and laptops), who seek to lower costs by replacing crystal oscillators with MEMS oscillators, which are positioned to become a preferred solution for many types of consumer and communication applications.

This study provides a technical overview of the MEMS oscillators, especially recent technology developments and existing barriers. Therefore, audiences for this study include marketing executives, business unit managers and other decision makers in companies producing mobile phones, digi-cams, camcorders and laptops, as well as those in companies peripheral to these businesses.

This report is directed to various types of companies that are interested in the developments in this field, such as:

- companies involved in the development, manufacturing and supplying of electronic devices;

+44 20 8123 2220
info@marketpublishers.com

manufacturers of MEMS devices;

manufacturers and suppliers of piezoelectric elements and devices;

manufacturers of telecommunication equipment and cellular telephones, digi-cams, camcorders and laptops;

companies involved in smart materials, nanotechnology and MEMS devices;

manufacturers of advanced materials and electronic components interested in diversification;

venture capital companies, angel investors and financial institutions interested in new and emerging investments.

REPORT SUMMARY

Frequency references and oscillators are essential components for a broad range of applications. They are central to all electronics, which is a big, fragmented market (in 2007, more than an estimated 10 billion quartz crystals and oscillators were manufactured). Frequency generators are integral components of all electronics and systems that need to communicate data.

Integrating MEMS devices on the ASIC chip is one of the attractive features of silicon MEMS resonators. There are three possible approaches to the integration of MEMS devices with Si ICs. Hybrid integration involves co-packaging of MEMS chips and SIC chips that have been separately fabricated and optimized for performance. Alternate approaches include direct fabrication of the MEMS devices on the IC chip or vice versa, direct fabrication of the CMOS integrated circuits on the MEMS device chip. By adopting a wafer-scale integrated fabrication approach, one can lower the cost of the ultimate product. Till now, the first approach has been found to be the most cost efficient.

The basic idea of using MEMS technology is to be able to microfabricate a resonator or an array of resonators and subsequently adapt the resonance frequency to the desired specification. The resonator is a fundamental building block of the MEMS oscillator. Microfabrication allows the resonator to be very small, and the manufacturing process is amenable to achieve complete integration with the IC driver circuits and linked passive elements on a single chip.

+44 20 8123 2220
info@marketpublishers.com

The potential for smaller footprint components and resistance to electromagnetic interference also supports new cell phone designs, for example. Moreover, MEMS oscillators meet price points set by crystal oscillators by leveraging established high-volume silicon manufacturing processes. This combination of size, performance, functionality and low cost is highly desirable for OEMs and consumers alike.

Major findings of this report

The major findings of this report are summarized as follows:

MEMS resonator companies will evolve to ultimately become time module companies, taking market share away from quartz crystal oscillator manufacturers and silicon timing device manufacturers. They will target applications where the size and degree of integration are key, leading to the ultimate usage of MEMS oscillators in almost all portable systems like PDAs, camcorders and MP3 players.

The global silicon MEMS oscillators industry is characterized by about a dozen companies and institutions involved as device developers and manufacturers.

The 2007 global market for MEMS oscillators is still small to the tune of $5.2 million in 2008. However, it is expected to grow at very fast pace to reach $217 million by 2013 with an average annual growth rate (AAGR) of about 111%.

Computers and networking will have the largest share in 2008 – as much as 60%.

By 2013, consumer and communications products will take over the lead, at a 55% share of the market, because of the segment’s large growth rate, as much as 125% AAGR from 2008 to 2013.

+44 20 8123 2220
info@marketpublishers.com

Contents

+44 20 8123 2220
info@marketpublishers.com

GLOBAL MARKETS FOR MEMS OSCILLATORS

+44 20 8123 2220
info@marketpublishers.com

INDUSTRY STRUCTURE AND MARKET DYNAMICS

PATENTS AND PATENT ANALYSIS

+44 20 8123 2220
info@marketpublishers.com

+44 20 8123 2220
info@marketpublishers.com

+44 20 8123 2220
info@marketpublishers.com

I would like to order

Product name: Silicon MEMS Oscillators – a Global Technology, Industry and Market Analysis
Product link: https://marketpublishers.com/r/S391FE0F27CEN.html
Price: US$ 3,250.00 (Single User License / Electronic Delivery)

If you want to order Corporate License or Hard Copy, please, contact our Customer Service:
info@marketpublishers.com

Payment

To pay by Credit Card (Visa, MasterCard, American Express, PayPal), please, click button on product page https://marketpublishers.com/r/S391FE0F27CEN.html

To pay by Wire Transfer, please, fill in your contact details in the form below:

First name:
Last name:
Email:
Company:
Address:
City:
Zip code:
Country:
Tel:
Fax:
Your message:

**All fields are required

Custumer signature _____

Please, note that by ordering from marketpublishers.com you are agreeing to our Terms & Conditions at https://marketpublishers.com/docs/terms.html

To place an order via fax simply print this form, fill in the information below and fax the completed form to +44 20 7900 3970