

# Crystal Oscillator Market worth \$4.23 billion by 2030, growing at a CAGR of 4.41% - Exclusive Report by 360iResearch

*The Global Crystal Oscillator Market to grow from USD 2.99 billion in 2022 to USD 4.23 billion by 2030, at a CAGR of 4.41%.*

PUNE, MAHARASHTRA, INDIA, December 6, 2023 /EINPresswire.com/ -- The "Crystal Oscillator Market by Type (Butler Oscillator, Colpitts Crystal Oscillator, Pierce Crystal Oscillator), Mounting Type (Surface Mount, Through-hole), General Circuitry, Crystal Cut, Application - Global Forecast 2023-2030" report has been added to 360iResearch.com's offering.



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The crystal oscillators are electronic components that create an electrical signal with a precise frequency by utilizing the mechanical resonance of a vibrating crystal made of piezoelectric material. The scope of the market includes various types of crystal oscillators, such as temperature-compensated crystal oscillators (TCXO), voltage-controlled crystal oscillators (VCXO), oven-controlled crystal oscillators (OCXO), and others, which are used across diverse applications and end-use industries. Growing expansion of the telecommunication sector with increasing 5G rollouts, the demand for high-stability and precision timing components rises, thereby pushing growth in the crystal oscillator market. The proliferation of consumer electronics such as smartphones, wearables, and smart home devices creates a sustained demand for crystal oscillators. With the advent of autonomous and connected vehicles, the need for advanced

electronic components, including crystal oscillators, is expected to boost the market. The trend towards smaller, more densely packed electronic devices challenges the crystal oscillator industry to keep up with the demand for miniaturization while maintaining performance. Research into developing crystal oscillators that operate with high stability in increasingly smaller sizes, which can address the need for compact and reliable components in modern electronics, is expected to create opportunities for market growth.

**Crystal Cut:** Increasing potential of AT cut that remains a preferred general-use standard due to its combination of temperature stability

The AT cut is the most common crystal cut for oscillators due to its excellent frequency stability over a wide temperature range. It operates well between -55°C to +125°C, making it suitable for most applications, including consumer electronics and telecommunications. The BT cut is designed to have a lower frequency deviation with temperature changes than the AT cut and is less common due to its narrow temperature range. It is ideal for applications where space constraints and temperature stability are essential but within a limited temperature scope. The CT cut is specifically tailored for high-precision and high-temperature applications. Unlike AT cut, which can show a reduction in frequency stability at higher temperatures, CT cut compensates for this and maintains performance. It is not as commonly used as AT or BT and is crucial in high-temperature industrial environments. GT cut crystal oscillators are optimized for low-temperature applications, offering better frequency stability in cold environments compared to the AT cut. They are less susceptible to frequency variations due to temperature fluctuations in the negative range. The IT cut is a less commonly utilized cut that provides a balance between temperature stability and angle tolerance. It offers better temperature stability than the AT cut and with a trade-off in the manufacturing precision needed. SC (Stress-Compensated) cut oscillators are known for their excellent frequency stability and low-temperature sensitivity. They are mainly used in precision applications such as military and satellite communications, where a high level of reliability is paramount. XY cut crystal oscillators are less common and tend to be used in applications where size and angle tolerance are more critical than temperature stability. They are typically custom solutions for particular applications and feature niche deployment.

**General Circuitry:** Increasing role of frequency-controlled crystal oscillators for modern electronic devices

Frequency-controlled crystal oscillators are an essential part of modern electronic devices, providing a stable and precise frequency for timing purposes. The FCXO's main characteristic is its capability to maintain a consistent frequency without external control or adjustment. Oven controlled crystal oscillators are known for their high precision and stability. OCXO devices incorporate a thermostatic enclosure to maintain the crystal at a constant temperature, thus offering excellent frequency stability over a wide range of environmental conditions. Simple packaged crystal oscillators are a basic type of oscillator that provides a stable output frequency with minimum additional features. They are often used in applications where cost is a significant consideration and temperature variations are minimal. TCXOs are designed to adjust the frequency of the crystal oscillator to compensate for the crystal's natural frequency variation due to temperature changes, offering a middle ground between high stability and cost. Voltage

controlled crystal oscillators (VCXO) offer frequency tuning capabilities, which are adjusted by a control voltage input. This flexibility makes them useful for applications requiring frequency modulation or phase-locked loop (PLL) systems.

Type: Growing usage of Colpitts oscillators due to their high-frequency capabilities

The butler oscillator is a type of electronic oscillator that employs a crystal in its feedback path to stabilize the frequency. Characterized by a relatively simple design, it generates a very pure and stable output frequency. It is commonly used in situations where temperature stability and low-phase noise are crucial, particularly in communication and instrumentation applications. Butler oscillators are less prevalent in the market compared to other types, thereby having fewer specialized manufacturers. The Colpitts crystal oscillator uses a crystal within its LC circuit to provide the necessary resonance for oscillation. Known for its ability to generate high-frequency oscillations, it is a favorable choice for RF transmission and in ham radio operations. Pierce crystal oscillator is one of the most commonly used crystal oscillators due to its simplicity and stability. It's found extensively in microprocessors and clocks, where low-power consumption and a compact footprint are essential. The tri-tet oscillator, which is less common than the other types, employs a crystal in a unique circuit configuration that allows for stable frequency generation. This oscillator type serves highly specific applications that require fine-tuned stability characteristics.

Mounting Type: Expanding significance of through-hole mounting offering greater mechanical stability

Surface-mount technology (SMT) is preferred in modern electronic device manufacturing because of its ability to facilitate automation and its space-saving characteristics. Crystal oscillators that utilize surface mount technology are directly placed onto the surface of printed circuit boards (PCBs). Through-hole mounting technology involves the insertion of leaded components through holes drilled in the PCB and then soldering them in place. This traditional method is known for creating strong mechanical bonds, making it preferable for applications requiring high reliability.

Application: Emerging application of crystal oscillators across automotive applications emphasizing durability under harsh conditions

In aerospace & defense, crystal oscillators are employed primarily for their precision timing capabilities, as they are essential in navigation systems, satellite communication, and other avionics that require accurate and stable timekeeping. The size, weight, and power (SWaP) characteristics are also critical considerations, with a preference for ruggedized and miniature crystal oscillators that can withstand harsh environmental conditions. The automotive industry utilizes crystal oscillators for a multitude of applications, including infotainment, navigation, and driver assistance systems. There is an increasing need for higher temperature range and vibration resistance in addition to timing precision. The shift towards electric vehicles and autonomous driving technologies makes the role of crystal oscillators ever more critical. Consumer electronics, including smartphones, wearables, and smart home devices, predominantly favor crystal oscillators that offer compact size and low power consumption,

without sacrificing accuracy. As devices become smarter and more integrated, the precision of the oscillator helps maintain efficient and reliable operation. Research & measurement applications necessitate the utmost precision in timekeeping and frequency control, making stability over temperature variations and immunity to electronic noise vital characteristics. These oscillators are used in high-end test and measurement equipment, scientific research, and laboratory instruments. Telecommunication & networking rely heavily on crystal oscillators for synchronization in base stations, routers, switches, and other network infrastructure. The key requirements include low jitter and phase noise to maintain high data integrity and reliable network performance over various temperature ranges.

#### Regional Insights:

The Asia Pacific region is a hub for electronics manufacturing, with countries such as China, Japan, and India. The high concentration of consumer electronics, automotive electronics, and telecommunication industries in this region creates significant demand for crystal oscillators. China, being one of the producers and consumers of electronic devices, accounts for a substantial share of the crystal oscillator market. In the Americas, the United States leads in the crystal oscillator market, supported by its robust aerospace, military, and telecommunications sectors. The U.S. market is characterized by a high demand for precision and stability, which drives the need for advanced crystal oscillators in critical applications. Canada's growing tech industry also contributes to the market, albeit on a smaller scale. Research and investments in North America are centered around enhancing the performance of crystal oscillators in extreme conditions and minimizing size for portable devices. The EU's stringent regulations on electronic components ensure high-quality standards for crystal oscillators utilized in European-manufactured equipment. Europe's automotive and industrial sectors are the primary users of crystal oscillators, and the pivot toward electric vehicles and Industry 4.0 could spur further growth. The Middle East, while smaller in market size, sees demand primarily from its burgeoning telecommunications infrastructure. In Africa, demand is gradually rising in tandem with the growing adoption of consumer electronics and improvements in communication networks.

#### FPNV Positioning Matrix:

The FPNV Positioning Matrix is essential for assessing the Crystal Oscillator Market. It provides a comprehensive evaluation of vendors by examining key metrics within Business Strategy and Product Satisfaction, allowing users to make informed decisions based on their specific needs. This advanced analysis then organizes these vendors into four distinct quadrants, which represent varying levels of success: Forefront (F), Pathfinder (P), Niche (N), or Vital(V).

#### Market Share Analysis:

The Market Share Analysis offers an insightful look at the current state of vendors in the Crystal Oscillator Market. By comparing vendor contributions to overall revenue, customer base, and other key metrics, we can give companies a greater understanding of their performance and

what they are up against when competing for market share. The analysis also sheds light on just how competitive any given sector is about accumulation, fragmentation dominance, and amalgamation traits over the base year period studied.

#### Key Company Profiles:

The report delves into recent significant developments in the Crystal Oscillator Market, highlighting leading vendors and their innovative profiles. These include AXTAL GmbH by Q-Tech Corporation, Bliley Technologies Inc., Crystek Corporation, CTS Corporation, Diodes Incorporated, ECS Inc., Edutek Instrumentation, Gorman-Redlich Mfg. Co., Greenray Industries, Inc., Hosonic Technology (Group) Co., Ltd., Jauch Quartz GmbH, KYOCERA Corporation, Microchip Technology Inc., Murata Manufacturing Co. Ltd., Nihon Dempa Kogyo Co., Ltd., Pletronics, Inc., QVS Tech, Inc., Rakon Limited, Renesas Electronics Corporation, River Eletec Corporation, Seiko NPC Corporation, ShenZhen Yangxing Technology Co., Ltd., SIWARD Crystal Technology Co., Ltd., SPK Electronics Co., Ltd., and Yoketan Corporation.

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#### Market Segmentation & Coverage:

This research report categorizes the Crystal Oscillator Market in order to forecast the revenues and analyze trends in each of following sub-markets:

Based on Type, market is studied across Butler Oscillator, Colpitts Crystal Oscillator, Pierce Crystal Oscillator, and Tri-tet Oscillator. The Colpitts Crystal Oscillator is projected to witness significant market share during forecast period.

Based on Mounting Type, market is studied across Surface Mount and Through-hole. The Surface Mount is projected to witness significant market share during forecast period.

Based on General Circuitry, market is studied across Frequency-Controlled Crystal Oscillators (FCXO), Oven Controlled Crystal Oscillators (OCXO), Simple Packaged Crystal Oscillators (SPXO), Temperature Compensated Crystal Oscillators (TCXO), and Voltage Controlled Crystal Oscillators (VCXO). The Oven Controlled Crystal Oscillators (OCXO) is projected to witness significant market share during forecast period.

Based on Crystal Cut, market is studied across AT, BT, CT, GT, IT, SC, and XY. The IT is projected to witness significant market share during forecast period.

Based on Application, market is studied across Aerospace & Defence, Automotive, Consumer Electronics, Research & Measurement, and Telecom & Networking. The Consumer Electronics is projected to witness significant market share during forecast period.

Based on Region, market is studied across Americas, Asia-Pacific, and Europe, Middle East & Africa. The Americas is further studied across Argentina, Brazil, Canada, Mexico, and United States. The United States is further studied across California, Florida, Illinois, New York, Ohio, Pennsylvania, and Texas. The Asia-Pacific is further studied across Australia, China, India, Indonesia, Japan, Malaysia, Philippines, Singapore, South Korea, Taiwan, Thailand, and Vietnam. The Europe, Middle East & Africa is further studied across Denmark, Egypt, Finland, France, Germany, Israel, Italy, Netherlands, Nigeria, Norway, Poland, Qatar, Russia, Saudi Arabia, South Africa, Spain, Sweden, Switzerland, Turkey, United Arab Emirates, and United Kingdom. The Europe, Middle East & Africa commanded largest market share of 36.43% in 2022, followed by Asia-Pacific.

#### Key Topics Covered:

1. Preface
2. Research Methodology
3. Executive Summary
4. Market Overview
5. Market Insights
6. Crystal Oscillator Market, by Type
7. Crystal Oscillator Market, by Mounting Type
8. Crystal Oscillator Market, by General Circuitry
9. Crystal Oscillator Market, by Crystal Cut
10. Crystal Oscillator Market, by Application
11. Americas Crystal Oscillator Market
12. Asia-Pacific Crystal Oscillator Market
13. Europe, Middle East & Africa Crystal Oscillator Market
14. Competitive Landscape
15. Competitive Portfolio
16. Appendix

The report provides insights on the following pointers:

1. Market Penetration: Provides comprehensive information on the market offered by the key players
2. Market Development: Provides in-depth information about lucrative emerging markets and analyzes penetration across mature segments of the markets
3. Market Diversification: Provides detailed information about new product launches, untapped geographies, recent developments, and investments
4. Competitive Assessment & Intelligence: Provides an exhaustive assessment of market shares, strategies, products, certification, regulatory approvals, patent landscape, and manufacturing capabilities of the leading players
5. Product Development & Innovation: Provides intelligent insights on future technologies, R&D activities, and breakthrough product developments

The report answers questions such as:

1. What is the market size and forecast of the Crystal Oscillator Market?
2. Which are the products/segments/applications/areas to invest in over the forecast period in the Crystal Oscillator Market?
3. What is the competitive strategic window for opportunities in the Crystal Oscillator Market?
4. What are the technology trends and regulatory frameworks in the Crystal Oscillator Market?
5. What is the market share of the leading vendors in the Crystal Oscillator Market?
6. What modes and strategic moves are considered suitable for entering the Crystal Oscillator Market?

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