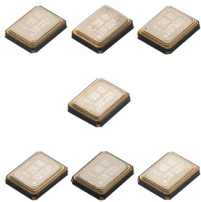
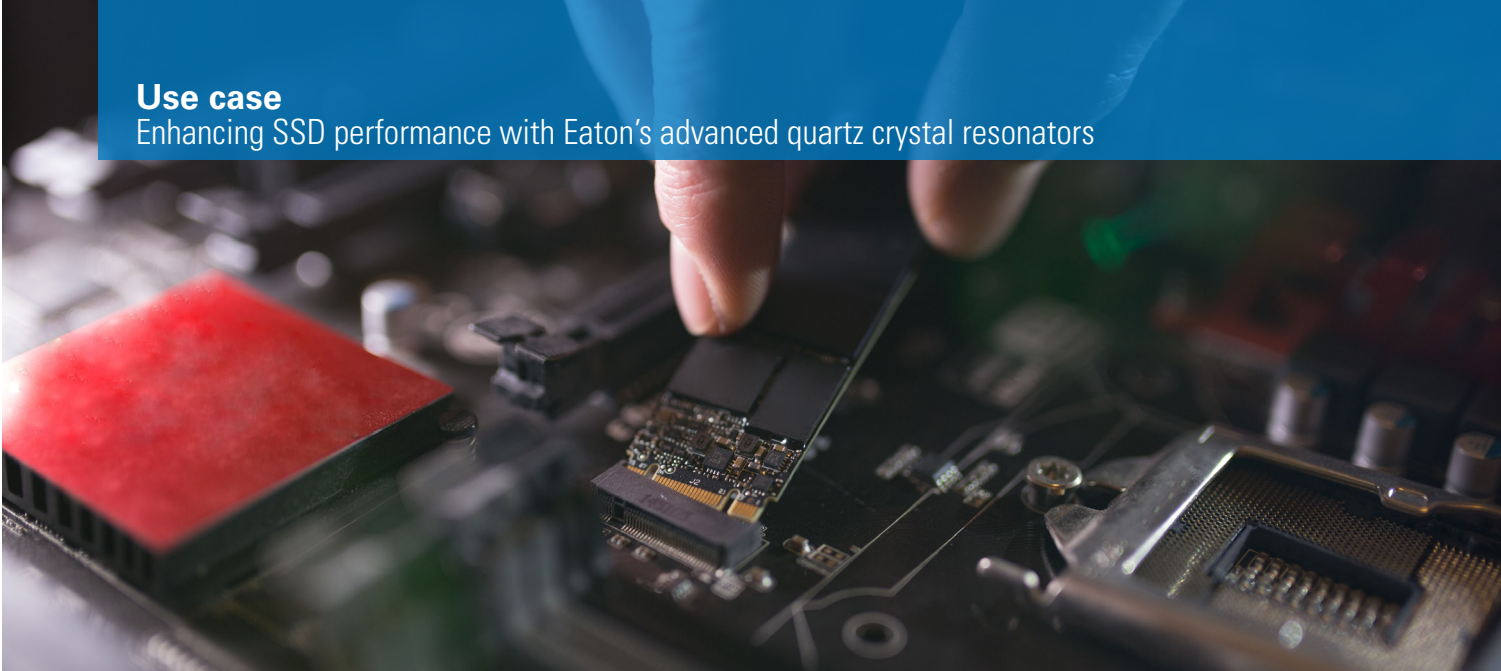


Use case

Enhancing SSD performance with Eaton's advanced quartz crystal resonators



Enhancing SSD performance with advanced quartz crystal resonators from Eaton

Due to their superior speed, durability, and efficiency, solid-state drives (SSDs) are ubiquitous in diverse applications from personal computing devices to enterprise-level data centers. Core to SSD functionality is managing data operations at high speeds, where timing and frequency control are critical requirements. Quartz crystal resonators provide the precision required for these tasks.

In SSDs, the process of reading and writing data is meticulously synchronized by clock signals provided by timing and frequency control components. Piezoelectric materials, such as quartz crystal resonators, are ideal choices for generating the level of precision of clock signals required. Piezoelectricity refers to the ability of certain materials

to generate an electric charge in response to applied mechanical stress. Crystal resonators are designed to resonate at a specific frequency, known as the resonant frequency. Essentially, crystal resonators provide a high-precision frequency reference.

In SSD controllers responsible for managing the flow of data to and from storage cells, a stable and consistent signal source can also be beneficial for handling multiple I/O requests efficiently, avoiding delays or bottlenecks. Moreover, SSDs incorporate error correction algorithms that detect and correct data corruption. Timing devices assist these algorithms in processing data consistently, thereby maintaining the integrity of the data stored on the drive. Precise timing and frequency control are also beneficial in

processes such as wear-leveling and garbage collection. These background tasks are crucial for maintaining SSD longevity and performance. The clock signals generated by quartz-based crystal resonators allow these processes to work systematically, thus extending the life of the NAND cells.

SSDs are typically deployed in environments characterized by temperature variations, vibration, or electronic noise. Thus, timing and frequency control devices must be able to withstand these conditions while maintaining stable frequencies. Frequency stability is especially crucial in data centers or industrial settings where SSDs operate under varying workloads and temperatures.

Eaton's quartz crystal resonators

ensure that SSDs are not only faster and more reliable but also more durable. Integrating these components into SSDs can extend device lifespans, lower the power consumption, and enhance the overall performance. Eaton's quartz crystal resonators are notable for their exceptional piezoelectric properties and compact sizes, making them suitable for space-constrained applications. Their broad operating temperature range (-40 °C to +125 °C) allows versatile application and compatibility with various product requirements. Each product offers distinct features and customization in terms of nominal frequency, load capacitance, frequency stability, and tolerance, etc. Eaton's quartz crystal products are RoHS compliant and compatible with lead-free soldering requirements.

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