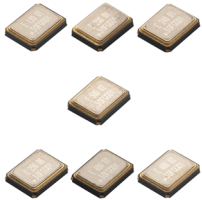
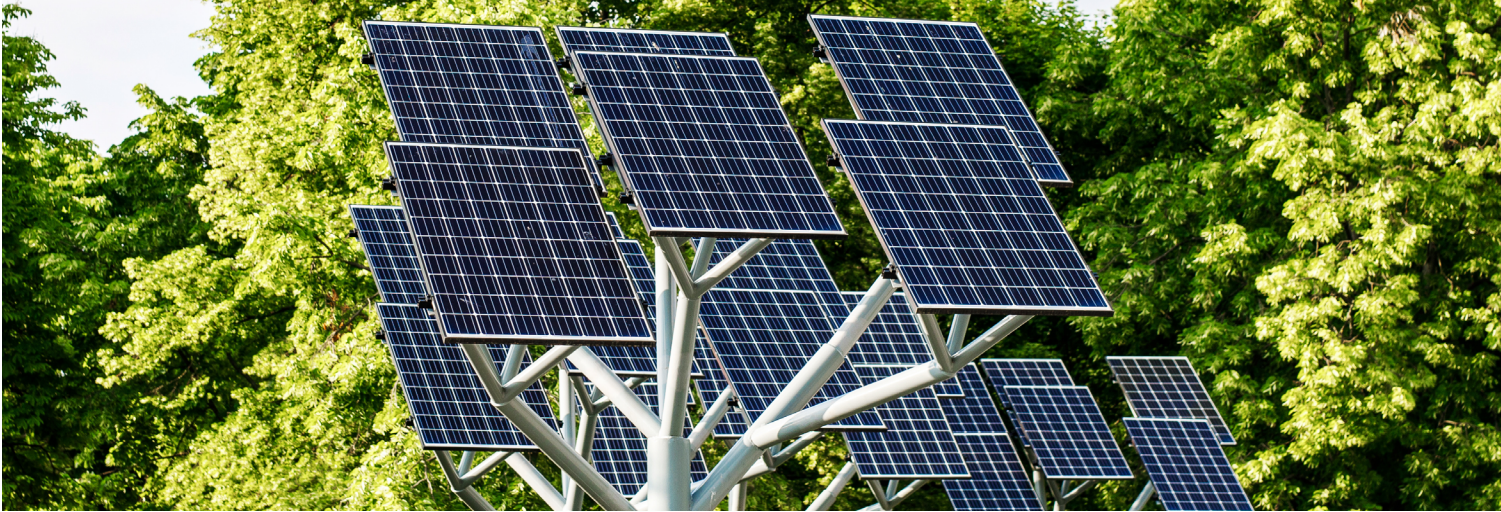


## Use case

### Eaton quartz crystal resonators for solar inverters



# Utilizing Eaton's quartz crystal resonators in solar inverters

As the world moves away from overreliance on fossil fuels, solar power installations are playing a crucial role in driving clean energy initiatives around the world. According to a new report by SEIA<sup>1</sup>, the first quarter of 2023 saw the installation of ~6.1 GWdc of solar capacity in the United States alone, representing a 47% increase from the first quarter of 2022. Central to solar power systems are solar inverters, which play a crucial role in converting the direct current (DC) output of photovoltaic (PV) solar panels into alternating current (AC) that can be fed into a commercial electrical grid or used by off-grid electrical networks.

Solar inverters help to maintain grid stability with features like anti-islanding, voltage regulation,

and frequency control. In commercial applications, frequency control in solar inverters is crucial for integrating solar energy into the power grid and ensuring the stability and reliability of both the grid and the solar installation. Since power grids operate at a specific frequency (50 Hz or 60 Hz), inverters must match this frequency to synchronize solar-generated electricity with the grid. Any considerable deviation in frequency can result in grid instability, affecting the quality of power supply to consumers.

Due to their piezoelectric properties, materials such as quartz crystals can generate electrical charges under mechanical stress, allowing them to produce consistent oscillations in electronic circuits.

This property is valuable in PV inverters, where precise timing and frequency control is necessary for effective energy conversion and synchronization with the grid. Crystal resonators are designed to vibrate or resonate at a specific frequency, known as its resonant frequency. In essence, a crystal resonator serves as a high-precision frequency reference, and the oscillator utilizes this property to produce a stable electrical signal at that frequency.

Eaton's quartz crystal resonators are designed to provide precise timing and frequency control in electronic applications. Eaton's quartz crystal resonators offer stability and precision in frequency generation, which is crucial for ensuring the solar

inverter's output matches the grid frequency. They are also applicable in maximum power point tracking (MPPT), which ensures that PV panels operate at their optimal power point, enhancing harvest under varying sunlight conditions. Eaton's quartz crystal resonators are designed to be compact for ease of integration into various inverter designs, including space-constrained models. They are offered in a broad range of operating frequencies and tolerances, and are RoHS compliant and designed to perform reliably in high-temperature applications, meeting lead-free soldering requirements.

1. [2023 solar market insight report](#)

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