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Crystal Glossary & Terminology

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▶ Crystal Glossary & Terminology

Quartz Crystal Glossary & Terminology

Aging

The frequency change of the crystal operated at specific conditions for a certain period of time.

AT-Cut

A crystal cut, which the orientation of a synthetic quartz bar is set up at 35°15' from the Z axis and its temperature characteristics show a cubic curve. The mode of vibration is thickness-shear.

Autoclave

A sealed vessel made from special iron that withstands high pressure and heat.

Base-Plating

A process of applying coatings of metal layers on the surface of crystal wafers. There are two main methods: vacuum deposition and sputtering. The vacuum deposition melts metals in the chambers under a vacuum state. The sputtering method occurs by bombarding the surface of the sputtering target with gaseous ions.

BT-Cut

A crystal cut, which the orientation of a synthetic quartz bar is set up at -49° from the Z axis and its temperature characteristics show a turnover curve. The mode of vibration is thickness-shear.

Bypass Capacitor

A component required to lower the impedance of the power-supply system inserted between the power-supply pin and ground pin of the IC. Mount as closely as possible to the IC, using a bypass capacitor with a capacitance suitable for the oscillation frequency. (Example) KHz range 10 μ F to 100 μ F MHz range: 0.01 μ F to 0.1 μ F

Crystal Units with Suppressed Fundamental Mode

The crystals with suppressed fundamental mode are designed to suppress the fundamental oscillation of third overtone resonators to ensure proper overtone oscillation. These crystals enable the oscillation of overtone frequencies on a circuit without using a tuning coil. This has the beneficial effects of reducing the number of components in the circuit, reducing the need for trimming and miniaturization.

Equivalent Circuit

The electrical equivalent circuit of a crystal unit operating at its mechanical resonant frequency.

Frequency

The number of recurrences of a periodic phenomenon (like radio wave or acoustic wave) per one second often measured in Hertz (Hz).

Frequency Characteristics over Temperature

Allowable deviation of frequency at room temperature, in parts per million ($\times 10^{-6}$). This is the maximum value within the operating temperature range.

Frequency Tolerance

Allowable deviation from nominal at room temperature (25°C), indicated in parts per million ($\times 10^{-6}$).

Fundamental Crystal Units

Crystal unit designed to oscillate in the lowest-order (fundamental) oscillation mode.



Operating Temperature Range

Temperature range over which the crystal unit can be operated within allowable deviation range.

Overtone Crystal Units

Crystal unit designed to oscillate in the overtone oscillation mode (third, fifth, and seventh).

Q-Factor

A value which indicates the sharpness of the peak resonance. A crystal has a small loss of vibration energy and high purity.

Reflow

A soldering method which melts the solder paste being applied to the connection pads of the PCB (Printed Circuit Board) to mount electric components.

Sealing

A process in which the package is tightly closed to be leak proof. This process is done under nitrogen gas atmosphere or vacuum state for the prevention of frequency stability degradation over time. There are two methods: seam-welding and glass-sealing.

Seed Quartz

A highly pure crystal stick or a plate used as a crystal nucleus for growing synthetic quartz bars. This crystal stick/plate serves as the seed for the recrystallization process.