

Crystal Glossary

Aging: A change in the frequency and/or the resistance of a quartz crystal unit with the passage of time. Aging does not include effect of changing environments.

Blank: A quartz resonator plate. Also known as wafer, plate or resonator.

C0: The abbreviation for Shunt Capacitance.

C1: The abbreviation for Motional Capacitance. Motional capacitance is also abbreviated as C_m .

C.I.: The abbreviation for Crystal Impedance sometimes used in place of the word resistance.

Crystal: A generic term for “piezoelectric quartz crystal”.

Deviation: The amount by which a frequency differs from the nominal or a specified frequency.

Drive Level: The amount of power dissipated by the oscillating crystal unit. Usually expressed in terms of microwatt (μW).

ESR: The abbreviation for “Equivalent Series Resistance.” As a crystal unit has a resistive element, this term is required in order to define and quantify that characteristic.

Fundamental: The lowest frequency at which a resonator plate will oscillate. The physical dimensions of the plate determine this frequency.

Load Capacitance: The value of capacitance used in conjunction with the crystal unit. Load capacitance is a parameter specified by the customer, typically expressed in pF.

Operating Temperature Range: Temperature range over which the crystal’s characteristics are guaranteed.

Overtone: An odd numbered multiple of the fundamental frequency.

PPM: The abbreviation for Parts Per Million, a method of calculation used to specify the permissible frequency deviation of a crystal or oscillator. May also be seen as ppm.

Pullability: The change in frequency of a crystal unit, either from the natural resonant frequency (F_r) to a load resonant frequency (F_L), or from one load resonant frequency to another. The frequency can be pulled in a parallel resonant circuit by changing the value of load capacitance. A decrease in load capacitance causes an increase in frequency, and an increase in load capacitance causes a decrease in frequency.

Shunt Capacitance: A parameter associated with a quartz crystal unit, used to identify the capacitance resulting from the presence of the electrodes plus stray capacitance associated with the holder.

Stability: The allowable deviation, in parts per million (ppm), over a specified temperature range. Deviation is referenced to the measured frequency at +25°C.

STD Calibration Tolerance: The allowable deviation from nominal, in parts per million (ppm), at a specific temperature, usually +25°C.

Tape and Reel: Refers to the packaging method used to accommodate automated pick & place equipment.

Trim Sensitivity: The derivative of the load frequency with respect to load capacitance.

$$TS = 500,000 * C1 / (C0 + CL)^2$$

Where C1=motional capacitance, C0=shunt capacitance, CL=load capacitance

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