Glossary of Crystal & Oscillator Terms

Glossary of Crystal Terms

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Aging

Quartz crystal aging applies to the cumulative change in frequency which results in a permanent change in operating frequency of the crystal unit. The rate of change in frequency is fastest during the first 2 - 3 months of operation. Many interrelated factors are involved in aging, some of the most common being: internal contamination , excessive drive level, surface change of the crystal, various thermal effects , etc...
Proper circuit design incorporating low operating ambients, minimum drive level and static pre-aging will greatly reduce all but the most severe aging problems

Calibration or Adjustment Tolerance

The setting tolerance is the maximum allowable deviation from the nominal frequency at 25°C +- 3°C. It is normally specified in parts per million (ppm)

Drive Level

Drive level is the level of power dissipated in the crystal as a result of the operating circuit. Rated or test drive level is the power at which the crystal is specified and any deviation from the rated level will effect the crystal performance; therefor the actual drive level should reasonable duplicate that specified.
AT - cut crystals generally can withstand a considerable overdrive without physical damage, however the electrical parameters are degrated at excessive drive

Equivalent Serie Resistance (ESR)

For crystal units designed to operate at series resonance, ESR is the equivalent ohmic resistance of the unit when operating in the specified crystal impedance meter adjusted for the rated drive level and tuned to the specified crystal frequency

Load Capacity (CL)

This is an external capacitance which sets a point on the reactance curve at which the crystal will resonate. It is normal to refer to crystals which are operated with a small value of CL as "parallel resonant" and to those which are not as "series resonant"

Nominal Frequency

The nominal frequency of the crystal . This is expressed in Megahertz (Mhz) for frequencies of 1.0 Mhz and over. Frequencies may be specified up to seven significant figures. If less are specified, then we may assume any digits that follow are zero

Operating Temperature Range

This is the temperature range over wich the quoted temperature stability is specified

Pullability

The pullabilty of a crystal refers to a crystal operating in the parallel mode and is a measure of the frequency change as a function of load capacitance. Pullability is important to the circuit designer who wishes to achieve several operating frequencies with a single crystal by means of switching various values of load capacitance

Shunt Capacity (Co)

The "static capacity" or shunt capacity of the electrodes, the holder and the leads. It is usually measured with an ungrounded case

Spurious Response

It is also possible for a crystal to vibrate at a frequency that is not related to its fundamental or overtone frequencies. Such undesired frequencies are referred to as spurious responses.Our processes are designed to minimise (not eliminate) the spurious responses and maximise the crystal activity at the desired frequency. The circuit designer should further guard against spurious responses by ensuring that the oscillator feedback circuit achieves its highest gain at the desired operating frequency

Storage Temperature Range

The temperature range in which the crystal can be stored without damage,i.e. it will resume operation as normal once it is restored to within its operable temperature range

Temperature Stability

The stability tolerance is the maximum allowable deviation from the nominal frequency over a specified temperature range and expressed in terms of ppm. This factor is dependent upon the angle of cut

Glossary of Oscillator Terms

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Aging

A systematic average change of an oscillators output frequency as a function only of time. Aging does not include effects of changing environments

Calibration or Adjustment Tolerance

The setting tolerance is the maximum allowable deviation from the nominal frequency at 25°C +- 3°C. It is normally specified in parts per million (ppm)

Duty Cycle

The percentage of each period that a signal is in logic high. This parameter is measured at a specified voltage treshold or at a percentage of the output waveform amplitude

Fall Time

The waveform fall time from high to low transition

Input Current

The amount of current consumption by an oscillator from the power supply, typically specified in milliamperes (mA)

Jitter

The modulation in phase or frequency of the clock oscillator output

Linearity

The departure from a straight-line relationship of control voltage to output frequency

Load (fan out)

The capacity of the oscillator to drive other devices

Nominal Frequency

The nominal frequency of the oscillator is expressed in Megahertz (Mhz) for frequencies of 1.0 Mhz and over. Frequencies may be specified to seven significant figures. If less are specified, then we may assume any digits that follow are zero

Operating Temperature Range

This is the temperature range over wich the quoted temperature stability is specified

Output

The output of a hybrid crystal clock oscillator is a highly stable reference signal

Phase noise

The ratio of the power density of one phase modulation sideband to the total signal. It is usually specified as the single side band (SSB) power density in a 1Hz bandwidth at a specified offset frequency from the carrier. It is measured in dBc/Hz

Pullability

The frequency shift of a VCXO as a function of control voltage

Rise Time

The rise time of an oscillator is defined as the transition time of the output wave form from a low to a high state. The transition time is measured between 90% and 10% of the falling edge of the switching wave form for TTL and CMOS devices

Start-up Time

The period from the instant voltage is applied to the oscillator until the oscillator output is stabilized

Storage Temperature Range

The temperature range in which the oscillator can be stored without damage, i.e. it will resume operation as normal once it is restored to within its operable temperature range

Temperature Stability

Deviation from the nominal frequency including the frequency deviations due to manufacturing process, temperature, power source variation and load variation

Tristate

The tristate function allows the oscillator to be isolated from the circuit upon application of a command signal. When this feature is activated, the output of the oscillator is in tristate mode. The tristate mode allows the customer to remove the oscillator from their circuit without physically removing it. Useful for tuning, testing or trouble shooting their board.