



## Oscillator terms and application notes

**Nominal frequency:** The center or nominal output frequency of a crystal oscillator.

**Package:** Crystal oscillators are packaged in various styles from lead through holes to surface-mount types. Various sizes and functions are suitable for different applications.

**Frequency tolerance:** The deviation from the nominal frequency in terms of parts per millions (ppm) at room temperature. ( $25^{\circ} \pm 5^{\circ}\text{C}$ )

**Frequency range:** The frequency band that the oscillator type or model can be offered.

**Frequency stability:** The maximum allowable frequency deviation compared to the measured frequency at  $25^{\circ}\text{C}$  over the temperature window, i.e.,  $0^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$ . The typical stability is  $\pm 0.01\%$  ( $\pm 100$  ppm).

**Operating temperature:** Temperature range within which output frequency and other electrical, environmental characteristics meet the specifications.

**Aging:** The relative frequency change over a certain period of time. This rate of change of frequency is normally exponential in character. Typically, aging is  $\pm 5$  ppm over 1 year maximum.

**Storage temperature:** The temperature range within which the unit is safely stored (supply voltage not applied) without damaging or changing the performance of the unit.

**Frequency vs. power supply variation:** Maximum frequency change allowed when the power supply voltage is changed within its specified limits (typical  $\pm 10\%$  in  $V_{cc}$  or  $\pm 5\%$  change).

**Supply voltage ( $V_{dd\ max}$ ):** The maximum voltage which can safely be applied to the  $V_{cc}$  terminal with respect to ground. Maximum supply voltage for TTL is 5.5V and for HCMOS is 6V.

**Input voltage ( $V_{IN}$ ):** The maximum voltage that can be safely applied to any input terminal of the oscillator.

**Output HIGH voltage ( $V_{OH}$ ):** The minimum voltage at an output of the oscillator under proper loading.

**Output LOW voltage ( $V_{OL}$ ):** The maximum voltage at an output of the oscillator under proper loading.

**Input HIGH voltage ( $V_{IH}$ ):** The minimum voltage to guarantee threshold trigger at the input of the oscillator.

**Input LOW voltage ( $V_{IL}$ ):** The maximum voltage to guarantee the threshold trigger at the input of the oscillator.

**Supply current ( $I_{cc}$ ):** The current flowing into  $V_{cc}$  terminal with respect to ground. Typical supply current is measured without load.

**Symmetry or duty cycle:** The symmetry of the output wave form at the specified level (at 1.4V for TTL, at  $1/2V_{cc}$  for HCMOS, or  $1/2$  waveform peak level for ECL).

$\text{SYM} = \text{TH} / \text{T} \times 100 (\%)$ ; See Fig. 1.

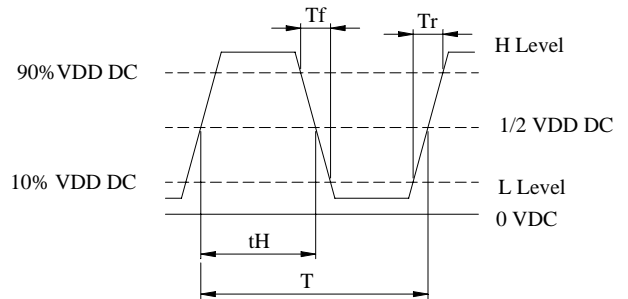


Figure 1

**Rise time ( $T_r$ ):** Waveform rise time from Low to High transition, measured at the specified level (20% to 80% for HCMOS, ECL, and 0.4V to 2.4V for TTL).

**Fall time ( $T_f$ ):** The waveform fall time from High to Low transition, measured at the specified level (80% to 20% for HCMOS, ECL, and 2.4V to 0.4V for TTL).

**Fan out:** The measure of driving ability of an oscillator, expressed as the number of inputs that can be driven by a single output. It can be represented by an equivalent load capacitance ( $C_L$ ) or a TTL load circuit consisting of diodes, load resistor, and a capacitor.

**Jitter:** The modulation in phase or frequency of the oscillator output.

**HCMOS/TTL compatible:** The oscillator is designed with ACMOS logic with driving capability of TTL and HCMOS loads while maintaining minimum logic HIGH of the HCMOS.

**Tri-state enable:** When the input is left OPEN or tied to logic "1", the normal oscillation occurs. When the input is Grounded (tied to logic "0"), the output is in HIGH IMPEDANCE state. The input has an internal pull-up resistor, allowing the input to be left open.

**Output logic:** The output of an oscillator is designed to meet various specified logics, such as TTL, HCMOS, ECL, Sine, Clipped-Sine (DC cut).

**Harmonic distortion:** The non-linear distortion due to unwanted harmonic spectrum component related with target signal frequency. Each harmonic component is the ratio of electric power against desired signal output electric power and is expressed in terms of dBc, i.e. -20dBc. Harmonic distortion specification is important especially in sine output when a clean and less distorted signal is required.

**Phase noise:** The measure of the short-term frequency fluctuations of the oscillator. It is usually specified as the single side band (SSB) power density in a 1 Hz bandwidth at a specified offset frequency from the carrier. It is measured in dBc/Hz.

**Standby:** A function that temporary turns off the oscillator and other dividers to save power. Logic "0" will enable stand by mode. The disable current at stand by mode varies from few microamperes to tens of microamperes (5pA typical). Because oscillation is halted, there is a maximum of 10 ms (same amount of start-up time) before output stabilizes.