Oscillator terms and application notes

VCXO TECHNICAL TERMS

Control Voltage (Vc): An external voltage applied to the input of the VCXO. By changing the voltage, the frequency varies accordingly.
Typical Vc is 0 VDC to 5 VDC, 0.5 VDC to 4.5 VDC, and 0.15 VDC to 3.15 VDC.

Deviation or frequency pullability: The minimum change in the output frequency with respect to the change in control voltage. Unit is measured in ppm. Standard pullability is ± 50 ppm minimum, ± 100 ppm minimum.

Maximum pullability: The maximum frequency change allowed for a maximum control voltage (for positive transfer function). Measured in ppm.

Transfer function: Direction of change in frequency vs. change in control voltage. The transfer is said to be positive if the frequency rises when increasing control voltage. The transfer function is negative if the frequency drops when increasing Vc.

Input Impedance: A measure of isolation between the input port of the VCXO network and the voltage control source. Typical Input impedance is >50kohms @ 10KHz.

Linearity: The deviation from the best straight line slope of the frequency vs. control voltage curve. Typical linearity is ± 20% or ± 10%.

Modulation bandwidth: The minimum ± 3dB bandwidth frequency, relative to a lKHz input modulation frequency.

Center frequency or nominal frequency: User specified frequency at center control voltage. Unit in Hz, kHz, MHz. Standard control voltage for center frequency is 2.5 VDC for Vcc = 5 VDC and 1.65 VDC for Vcc = 3.3 VDC.

OSCILLATOR APPLICATION NOTES

An oscillator is a circuit which produces a continuous output signal; thus it is called a signal generator. When the signal produced is a sine wave of constant amplitude and frequency, the oscillator circuit is called a sine wave generator. The oscillator can produce a square wave signal in digital logic families such as TTL, CMOS, or ECL / PECL.

An oscillator can be divided into three definite sections:
(1)an amplifier
(2)the feedback connections
(3)the frequency determining components.

REQUIREMENTS FOR OSCILLATION

A circuit will oscillate if it consists of two minimum requirements:
(1)Positive feedback
(2)Loop gain greater than 1
Feedback is provided when we connect the output of an amplifier to its input. If the output fed back is 'out of phase' with the input, then the circuit has *negative feedback* (NFB). if the feedback from the output is in phase with the input, the circuit has *positive feedback* (PFB).

PIERCE OSCILLATOR CIRCUIT

Advantages:

(1) Operate at or near series resonance (about 5ppm to 200 ppm from Fs).
(2) Very good short-term stability.
(3) Work at any frequency from 1 kHz to 200MHz.
(4) Circuit provides a large output signal.
(5) Drives the crystal at a low power level.
(6) Oscillation frequency almost insensitive to small changes in the series resistance or shunt capacitance.

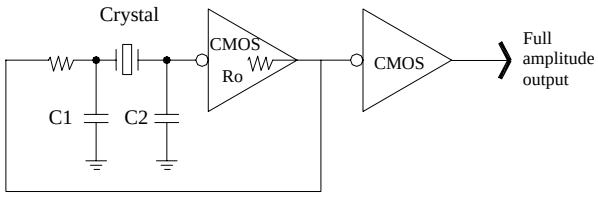

Figure 2. Pierce Oscillator Circuit

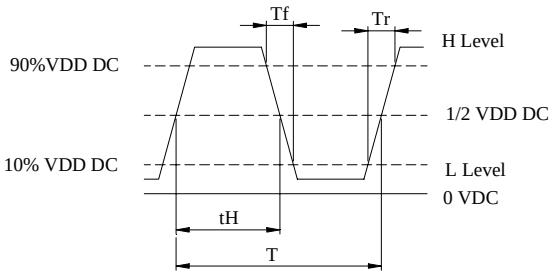

Figure 3

Circuit configuration:
•In most Pierce circuits, the amplifier consists of just one transistor. The output can be buffered to provide a digital logic compatible output (TTL, or HC-CMOS

•The Pierce amplifier can be designed with digital logic elements in CMOS, TTL, and ECL; CMOS for low frequencies, TTL for medium frequencies, and ECL for high frequencies.

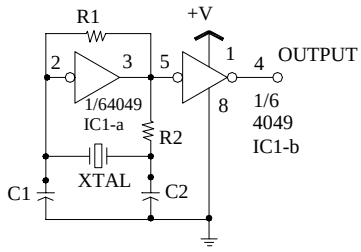

Figure 4