Application Bulletin

Comparing Vectron's Crystal-Based 125MHz Oscillator with a SAW-based solution

Jitter is a difficult parameter to clearly understand and compare by reviewing manufactures data sheets. Although largely unintentional, variations in jitter specifications include the method of test and equipment used as well as the number of samples acquired. In order to alleviate this, a side by side test was performed using the same test equipment, methods, fixturing and number of samples of Vectron's crystal-based 125MHz CMOS oscillator, VCC1-B3A-125M000, versus a equivalent SAW-based 125.000MHz CMOS oscillator.

The following jitter results were measured using a Tektronix TDS7254D and differential probe, acquiring 25,000 samples.

Period jitter compares the length of each cycle to the average period of an ideal clock using the long term averaged frequency.

	Period Jitter rms, ps	Period Jitter p/p, ps
SAW-based	1.103	8.716
Vectron	0.962	8.160

Cycle to cycle jitter compares the difference in the cycle length of adjacent cycles.

	Cycle to Cycle Jitter rms, ps	Cycle to Cycle Jitter p/p, ps
SAW-based	1.744	15.795
Vectron	1.665	14.842

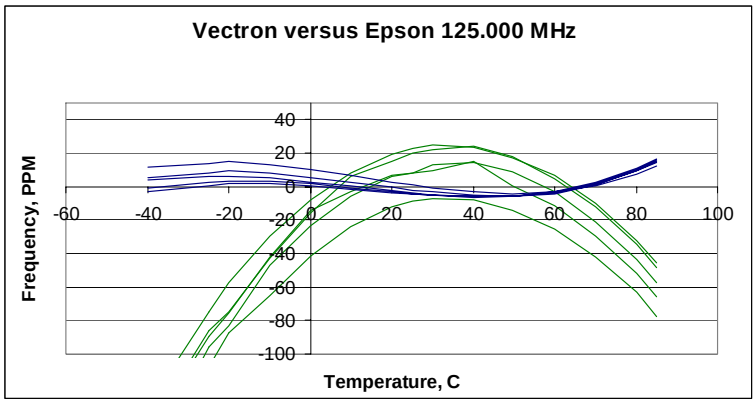
TIE or accumulated jitter is the variation in a clock's transition from its ideal position over many cycles.

	Accumulated Jitter rms, ps	Accumulated Jitter p/p, ps
SAW-based	2.800	18.766
Vectron	2.377	15.219

While data shows excellent results for both devices, the crystal based VCC1 series has an advantage in all three measurements; period, cycle to cycle and TIE jitter.

Another key parameter for reference clocks is temperature stability. Unlike VCXO's, which are used in a self-correcting PLL's rendering temperature drift negliable, temperature stability

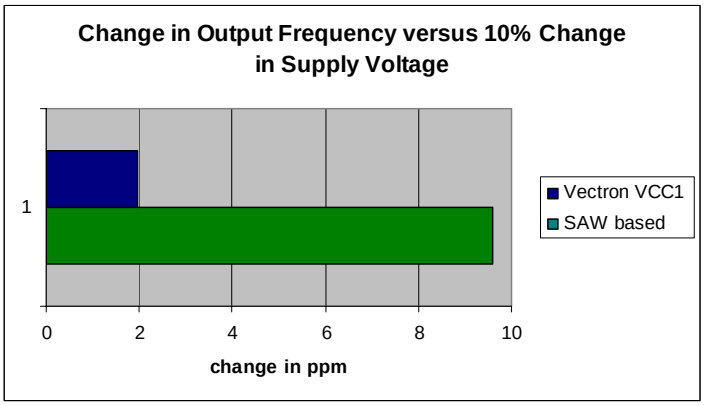
becomes more critical in fixed frequency clocks. The graph below shows relatively good stability in the -20 to 70˚C range, and while the SAW based device meets rated specification, performance quickly degrades below -25˚C.



Compare this to the crystal-based VCC1 performance curve, which is the data in blue, and advantages over extended temperature become apparent. In fact even +/-20ppm – including aging – can be provided which is Vectron's VCC1-103 and VCC1-107 series.

The third critical characteristic which effects stability and jitter performance is power supply sensitivity. Measurements were made under DC conditions and the power supply was varied by +/-10% and then compared to measurements made at 3.3volts. The results are graphed below and the advantage of the crystal based VCC1 solution is almost 5 times better.

For tight stability/low cost/low jitter applications, a crystal based solution should be the preferred choice.



For Additional Information Please Contact:

Vectron a Knowles company

USA: Tel: 1-88-VECTRON-1 • Fax: 1-888-FAX-VECTRON

EUROPE: Tel: 49 (0) 3328 4784 17 · Fax: 49 (0) 3328 4784 30

ASIA: Tel: +86 21 28909740 / 41 / 42 ·
Fax: +86 21 28909240 / 2890999