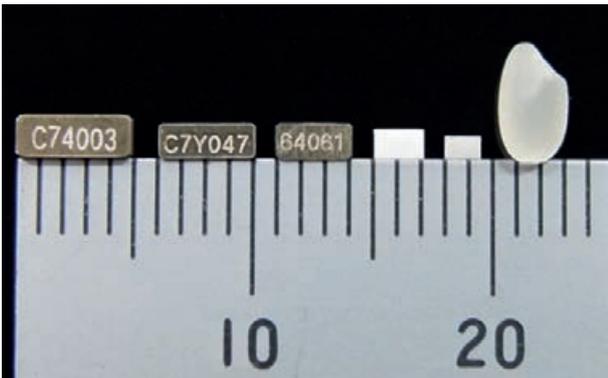


CM315G SERIES— CITIZEN OVERCOMES THE LIMITS OF FREQUENCY STABILITY

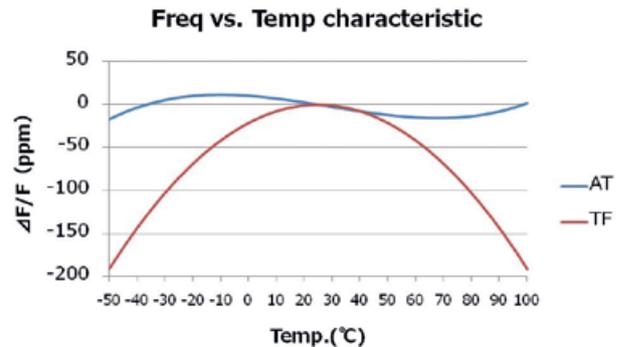


In the course of the continuous miniaturization of electronic devices, the formfactor of the components used must also be further reduced. This also applies to tuning fork quartz. Citizen Finedevice, as one of the trend setters, offers kHz tuning fork crystals down to 1.6×1.0 mm. These can be found in application, as household, metering, mobile phones and many more products, which provide date and time information.



The time reference for these products is generated by the tuning fork quartz with a widely used reference frequency of 32.768 kHz. The final clock information can be generated by dividing this reference by multiple of factor 2.

Talking about applications using wireless communication (M²M, IoT, Metering ...), stability, frequency tolerance over the temperature range of the kHz crystal, is an important feature to synchronise receiver and transmitter. Precise synchronization in systems using duty cycling, result in short wake up time and keep the sleep time long in other words save system power. In particular important for battery powered applications. The Stability over Temperature range is mainly determined by the quartz material and in particular the cutting angle (To carve out wafer from rude ore of crystal with appropriate angle to get the quartz blank. According to a square normal parabola, the frequency drift over temperature is typically $-0.034 \text{ ppm}/^{\circ}\text{C}^2$ (XY-CUT). Compared to the quartz in the MHz range, which mainly use the AT cut, the drift is unequally higher.



As one of market leader in kHz crystals products, Citizen Finedevice has succeeded in designing of first prototypes of a kHz quartz, whose frequency versus temperature profile corresponds to the third-order cubic profile of MHz ATcut quartz crystals. And improve the stability in temperature range significantly by a factor of 2 ~ 3 compared to the conventional versions. A decisive improvement, previously valid limits for the temperature drift are overcome.

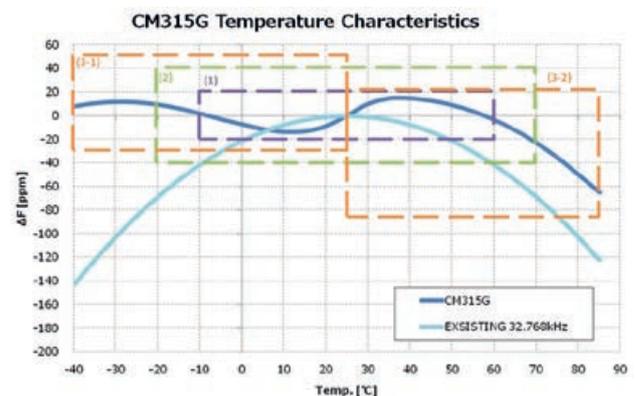
First tests of the CM315G results prove:

Temp.Range (1) -10 °C +60 °C: $\pm 20 \text{ ppm}$

Temp.Range (2) -20 °C +70 °C: $\pm 40 \text{ ppm}$

Temp.Range (3-1) -40 °C +25 °C: -30 ppm...+50 ppm

Temp.Range (3-2) +25 °C +85 °C: +30 ppm...-85 ppm



The frequency tolerance at 25 °C is approx. 20ppm. Equivalent Series Resistance (ESR) corresponds to the usual 70 kΩ for SMD 3.2×1.5×0.9 mm.

The CM315G is particularly suitable for applications as smart metering, or wireless communication modules, in which an exact time synchronization is required in order to save battery power.

Citizen announces first availability of samples for early July 2017. Serial production is scheduled for the second quarter of 2018.