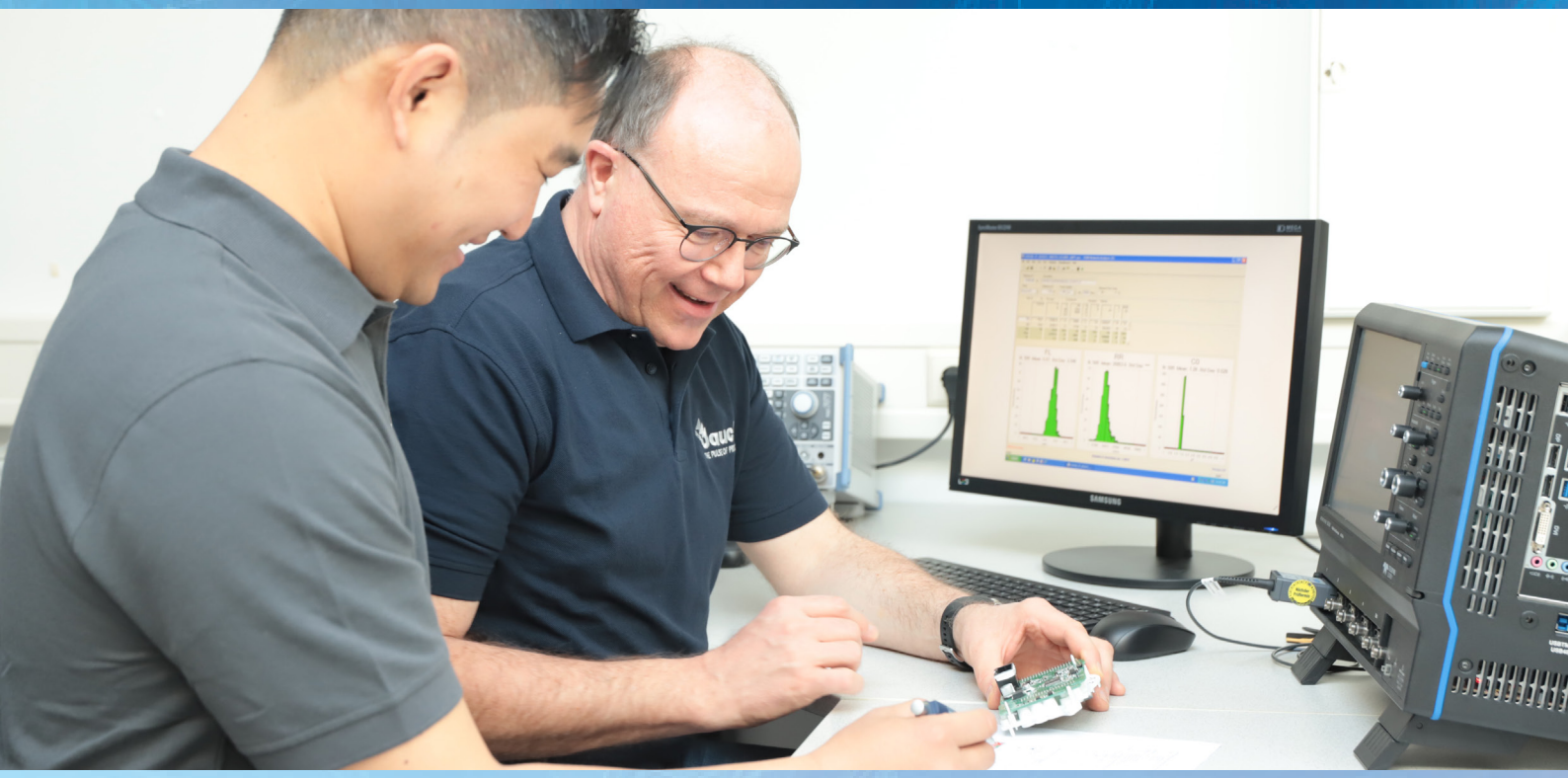
Jauch
THE PULSE OF PROGRESS

QUARTZ CRYSTALS & OSCILLATORS CHECKLIST FOR A SUCCESSFUL RE-DESIGN



CHECKLIST

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1. Current design-in trends for frequency control products

Technological progress and digitalization are continuously driving the development of modern applications. Particularly in the Internet of Things (IoT), in large data centers, in high-speed data transmission, in industrial IoT solutions (IIoT), and in e-mobility, the demand for precise and reliable frequency control products such as quartz crystals and oscillators is growing steadily. These components form the backbone for the clocking and synchronization of complex systems – whether for data transmission, process control, or time measurement.

One dominant trend is ongoing miniaturization: the demand for compact, powerful end devices means that printed circuit boards are also becoming smaller and more space-saving. Accordingly, crystals and oscillators must be available in ever smaller housing designs without compromising performance, stability, or reliability. Modern design-in processes therefore specifically take into account component sizes, automated placement, and thermal management in order to reliably implement even the most demanding applications.

In addition, aspects such as energy efficiency, frequency stability in different operating environments, and the integration of smart functionalities are becoming increasingly important.

2. HOW LONG DOES A RE-DESIGN TAKE?

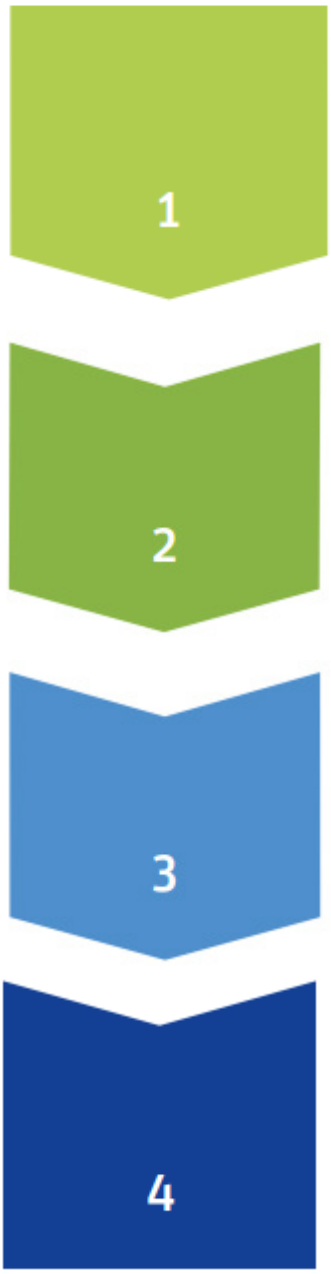
The time required to re-design your oscillator circuit depends on its complexity. As a rule, a re-design of the layout is unavoidable in order to reduce the footprint of the product.

If an oscillator is used as a replacement, the output frequency is more immune to changes in stray radiation, what simplifies the situation. However, the EMI issue must be considered when a new oscillator is installed into a circuit.

If the replacement is a crystal resonator, the designer must pay more attention to the scattering, especially at the tracks connected to the Xin pin and the Xout pin. The layout design for these two pins can greatly affect the output frequency and stability of the crystal resonator. In addition, the smaller the profile of the crystal resonator and the higher the ESR value, the more important the safety factor for oscillation.

The most important steps of the re-design process are listed below. Based on our experience from previous projects and technical services, you will find an approximate time frame for each of the steps.

3. THE WORK STEPS AT A GLANCE



Selection and definition of the frequency control product
Duration: 1-4 weeks, depending on stock and specification for delivery samples

The most important step is the selection of the appropriate frequency control product. Our experienced team will help you find the best solution to start the re-design project. Supporting product information can be requested for the preliminary evaluation.

Development of the oscillation circuit
Duration: 4-10 weeks, depending on complexity and desired characteristics

At this stage, our team assists in reviewing the circuit design and provides necessary recommendations. Technical support is available to provide specific information for the mechanical design of the system, such as dimensions or mechanical properties.

Measurement and analysis of the circuit
Duration: 2-4 weeks

In the measurement lab at our location in Villingen-Schwenningen, our engineers are able, if required, to support you with measurements for quartz qualification and to provide suggestions for theoptimization of the layout or exis-ting components in the oscillation circuit.

Approval process for modifications and re-designs:
Duration: 1-2 weeks

The customer determines the final re-design or modification based on Jauch's recommendation report. Our technical support specialists are available for individual inquiries. This includes topics such as required certifications (e.g. RoHs, REACH or AEC-Q200).

3. YOUR CHECKLIST FOR THE RE-DESIGN OF OSCILLATOR CIRCUITS

As you can see, re-designing an oscillator circuit is an elaborate and complex process with many aspects to consider. Good preparation as well as careful preliminary considerations lead to a successful re-design project. To give you an overview, we have compiled a short checklist for you. There is space for your notes below the different points.

What is your goal with the re-design?
Do you want to reduce the risk of allocation by using a more modern quartz crystal or oscillator? Or would you like to use the re-design for further development with a higher frequency accuracy, a higher safety oscillation margin or similar?

Have the requirements of your application for the oscillator circuit changed?
What is the required tolerance of the frequency deviation? What is the required operating temperature range? For a robust re-design, is it possible to replace a quartz crystal with a crystal oscillator or TCXO? Is the system module suitable for automotive applications? All these factors are crucial for functionality.

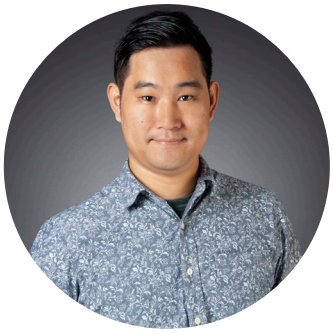
How much time do you have for the new development?
Quartz crystals and crystal-based oscillators are our core competence. Through a large co-operation network, we ensure that our customers receive high quality products within a certain period of time. Usually, 1 - 10 weeks can be expected, depending on the specificati-on of the product. For certain requirements or special components this period can extend up to 30 weeks.

Is the long-term availability of the newly designed-in frequency control product guaran-teed?
The risk of allocation is particularly present with the older ceramic packages with larger dimensi-ons. In order to maintain product life as long as possible, we advise our customers to change to smaller package sizes. Specifically, we recommend the JXS32, JXS22, JXS21 and JXS11 for quartz crystals in the MHz range. For quartz crystals in the kHz range, the JTX310, JTX210 and JTX110 are preferable. If customers are interested in crystal oscillators or TCXOs, we recommend all series with a package size of 3.2 x 2.5 mm or smaller.

If you can answer all these points on this checklist, then your are already in a good position with your re-design and you can start the implementation.

As an experienced expert in quartz technology, we at Jauch Quartz are happy to support you in this process. We will accompany you through the entire development process and ensure that your project is a success. Contact us and tell us about your project via this link.

AUTHORS



Ting-Hao Peng
Technical Manager

Axel Gensler
Product Management

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Jauch Quartz GmbH
In der Lache 24
78056 Villingen-Schwenningen
Germany

frequencyproducts@jauch.com
+49 7720 945-0
www.jauch.com