

## The „pitfall“ of miniaturization

### Assessing technical limits correctly

Standard board design is usually based on the common specification of large quartz crystals. This is incorrect because developers are increasingly choosing smaller package sizes, and the smaller packages have completely different specifications than their larger counterparts.

When looking at the circuit board, the relatively large crystals immediately catch the eye. Why not try a smaller design? The choice is huge, and after all, it can't be that difficult due to the advancing miniaturization. Again this is wrong! An Engineer using the specification of the large quartz crystals to apply the small quartz crystals encounters resistance in the truest sense of the word – namely, the resonance resistance. The smaller the inner quartz disk, the greater the ESR.

Some circuits are not able to tolerate this, so, if you want to use a smaller layout, the circuit must be tuned even more precisely to the quartz than before.

Prior to the new design, some points have to be clarified in advance, such as: Is there a need to selectively change the frequency of the quartz, to ensure good pullability? If so, a larger quartz crystal is preferable, one that can react better to changes of the load. Even if there is continuous progress regarding the parameters of small crystals, one should stick to larger packages for small frequencies.

A sensitive issue regarding device selection is price. While the coating systems for large quartz crystals can still use robust oil diffusion pumps, coating of small quartz crystals is no longer possible without complex high-tech pump technology. Small quartz crystals can only be produced in appropriate clean rooms. Thus, investment and production costs increase for smaller quartz components, which explains the higher price for small crystal cases.

Selecting the right component for the application is therefore not an easy task. To support our customers the best possible way, GEYER Electronic pay great importance to consultation and close cooperation during development of new applications. As a special service we offer the inspection and debugging of electronic circuit diagrams or the printed circuit boards.

It is Geyer Electronic custom to provide our customers with appropriate sample components for new developments or approval processes.