

## GEYER Electronic sets the right beat for energy efficiency

### Choose the right product for Smart Metering

The world-wide climate targets and transition programs towards renewable energies, require smart grids, in which electricity generators and consumers will communicate digitally. This implies a device, known as Smart Meter, allowing this communication.

The GEYER products are used in a variety of intelligent designs for demand-driven control of heating, cooling, ventilation and lightning solutions.

A Smart Meter system consists of a digital measuring device and a communication unit, which is called SMGW (smart meter gateway).

Through this gateway, which is connected via LAN or mobile radio, electricity consumption measured by the second can be transmitted to the corresponding electricity network operators.

The concept is not limited to Smart Metering but applies to all smart building and intelligent network applications, where any type of consumption needs to be controlled.

While the rollout of intelligent metering systems has started already some years ago, it is estimated to reach its peak within the next couple of years.

### How do the GEYER components fit into this space?

All smart meters, regardless of the type require:

- Precise time synchronization for accurate data analysis and reliable data transmission within the network
- Wide temperature range for usage in different environments
- Low power consumption to allow long life on battery power

GEYER Quartz Technology offers the right crystals for these requirements:

- Bus independent components
- Crystals for the frequency in use, with low tolerances of  $\pm 10-15$  ppm over the entire temperature range
- An industrial standard operating and storage temperature
- An aging of  $\pm 10$  ppm over 20 years
- **Overall tolerance of  $\pm 20-25$  ppm after 20 years**
- Tuning fork crystals for the RTC function

The choice of the right product for Smart Metering depends on multiple factors. However, the **key factor** for this application is the overall tolerance over the years.

One of the Top Choices for 2023 in the Smart Metering sector is the 12.86664.

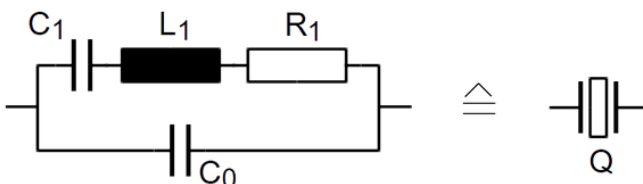
Model	KX-6
Dimensions	2.5   2.0   0.55 mm
Frequency	40.0 MHz
Load Capacitance	10 pF
Tolerance at +25°C	± 10 ppm
Temperature Tolerance	± 10 ppm
ESR R1 max.	40 Ohm
Operating Temperature	-30°C to +85°C
Overall tolerance after 20 years	+/- 20ppm

## Use the GEYER Y-Design App to verify your design with the crystal of your choice

With just a few clicks you can create new designs, and check or optimize existing circuits.

Taking the example of an application, operating at 40 MHz, you can simulate and optimize the characteristics of a Pierce crystal oscillator by inputting the corresponding values. You can visualize and vary the amplitude and phase characteristic of the feedback circuit, consisting of the quartz crystal and surrounding components, for reliable oscillation without exceeding the maximal drive level of the quartz crystal.

Use the characteristics of the quartz crystal indicated in the datasheet:



$f_L$	nominal frequency of quartz crystal
$R_1$	ESR of quartz crystal (usually specified as upper limit)
$C_0$	static capacitance of quartz crystal (usually specified as upper limit)
$C_1$	dynamic (motional) capacitance of quartz crystal (rarely specified)
$C_L$	nominal load capacitance of quartz crystal
$L_1$	dynamic inductance of quartz crystal (rarely specified)

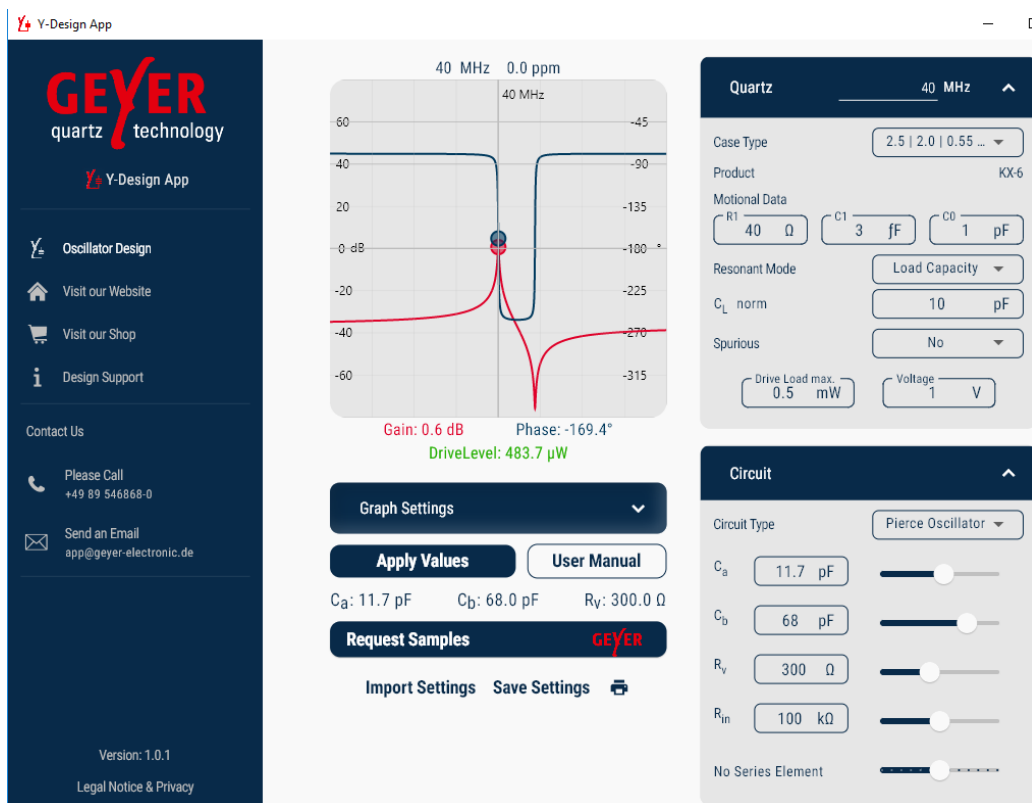
The values for the **12.86664** are specified in the datasheet. Exact values can be found by analyzing a batch of quartz crystals with a network analyzer.

$$C_0 = 0,8 \dots 1 \text{ pF}$$

$$C_1 = 2,9 \dots 3 \text{ fF}$$

$$C_L = 10 \text{ pF}$$

$$L_1 = 5,4 \dots 5,5 \text{ mH}$$



Verification of the dimensioning should be made on a prototype of the circuit, whether the controller can cope with the proposed circuit, i.e., whether the frequency is correct, the stray capacitances have been correctly recorded, and whether there is sufficient transient margin.

**Support:** For questions and support, please contact us at any time at +49 89546868-0 or via the e-mail address [app@geyer-electronic.de](mailto:app@geyer-electronic.de)

GEYER Electronic GmbH  
Behringstraße 6  
D-82152 Planegg/ München  
+49 89 546868-0