CASE STUDY – Smart Utility Meters Wireless RF Application

PROJECT

Small scale utility meter that measures customer utility usage and wirelessly transmits data to collection point via mesh or cellular networks.

APPLICATION CHALLENGES

Size Constraints- Board size is extremely small and may include as many as 20 different components, including the frequency control.

Power- Low power components are essential as a result of battery life requirements in the application. Components that offer supply voltages as low as 1.8V with wide voltage range functionality and input current as low as 2mA are ideal in these situations.

Extreme Environment- Customers typically require industrial operating temperature range as most meter products functions in extreme environments.

FREQUENCY CONTROL REQUIREMENTS

Due to the complexity of most wireless applications, a temperature compensated crystal oscillator or TCXO is required instead of a standard clock oscillator. The TCXO ensures that the frequency stays as close to the nominal frequency as possible, which is more challenging when transmitting the signal over longer distances.

A standard crystal is also required in most RF applications to pace the execution of the code inside the processor.

Finally, a watch crystal is also required for real time clocking or RTC. This crystal keeps track of the current time for the microprocessor; it's usually powered by a battery so the clock can run when the entire systems is powered off.

PRODUCT SOLUTIONS

TCXO
- I589/I789 Series
  2.0x1.6x0.80mm, +/-0.5ppm @ -40°C to + 85°C
- I547/I747 Series
  2.5x3.2x1.0mm, +/-0.5ppm @ -40°C to + 85°C

Crystals
- ILCX19 Series
  1.6x2.0x0.45mm, +/-15ppm @ -40°C to + 85°C
- ILCX18 Series
  2.0x2.5x0.65mm, +/-15ppm @ -40°C to +85°C

Watch Crystals
- IL3W Series
  1.6x1.0x0.50mm, +/-20ppm @ -40°C to + 85°C
- IL3T Series
  1.2x2.0x0.60mm, +/-20ppm @ -40°C to + 85°C

SUMMARY

Smart meters utilize RF to transmit and receive data for gas, water and electric usage for utility companies. These applications can be challenging when the transmission distance is long, over rough terrain or in extreme climates which can impact the accuracy or consistency of the data.

Other RF applications like wearables, GPS, medical monitoring and RFID, they all also require frequency control products. Typically, the data is transmitted over shorter distances (for example, your wrist to your cell phone) and therefore, the challenge for frequency control is much less complex. While a watch crystal will still be required, a standard crystal and TCXO may be required as well.