Federal Communications Commission
Authorization and Evaluation division

Equipment Authorization Branch

7435 Oakland Mills Road
Columbia, MD 21046
U.S.A.

Kamstrup A/S
Industrivej 28, Stilling
DK-8660 Skanderborg
TEL: +45 89 93 10 00
FAX: +45 89 93 10 01
E-MAIL: kamstrup@kamstrup.dk
WEB: www.kamstrup.com

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Subject: Operational description for Kamstrup USB Meter Reader and FCCID OUY-USBEXT thereafter referred to as "USB meter reader"

To Whom It May Concern:

General description

The USB meter reader operates in two modes :

- Meter reader at 915 MHz : Only the receiver is activated.
- Intercom communication channel at 916 MHz between USB devices, where the encrypted signal from the transmitter is set to a low signal strength.

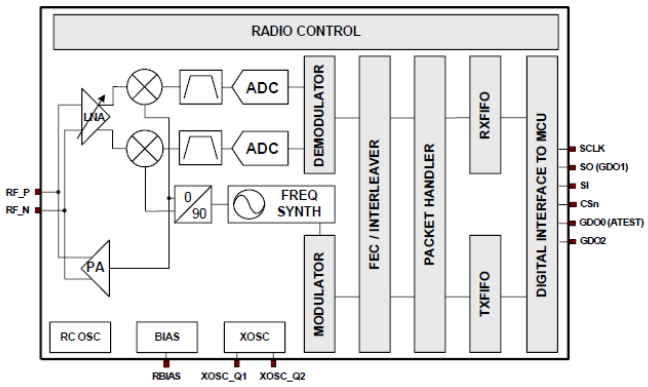
In both cases the baud rate is 250 kb/s to reduce the power consumption on the battery operated devices.
The digital modulation for the transmission is a 2-FSK modulation with a frequency deviation chosen so that the 6-dB bandwidth requirement for FCC15.247 is met.

In the intercom mode, the data packet are transmitted and received within 10 ms every 5 seconds.
The data is AES-128 encrypted.

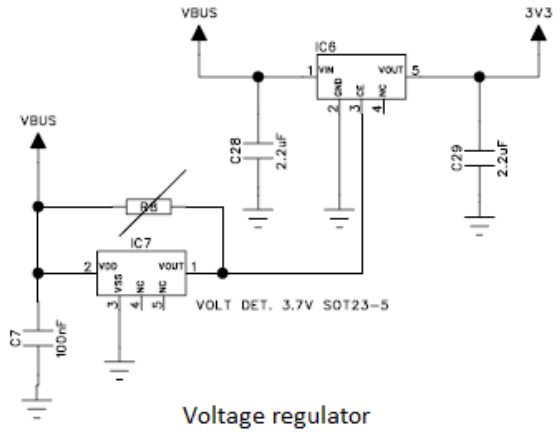
The USB meter reader delivers decrypted and formatted MBUS strings from the Kamstrup water meter or other compatible devices using the same frequency coding and modulation.

The power supply of the USB meter reader is provided either by the USB interface from the PC (stationary setup) or a battery pack (mobile setup).

RF transceiver

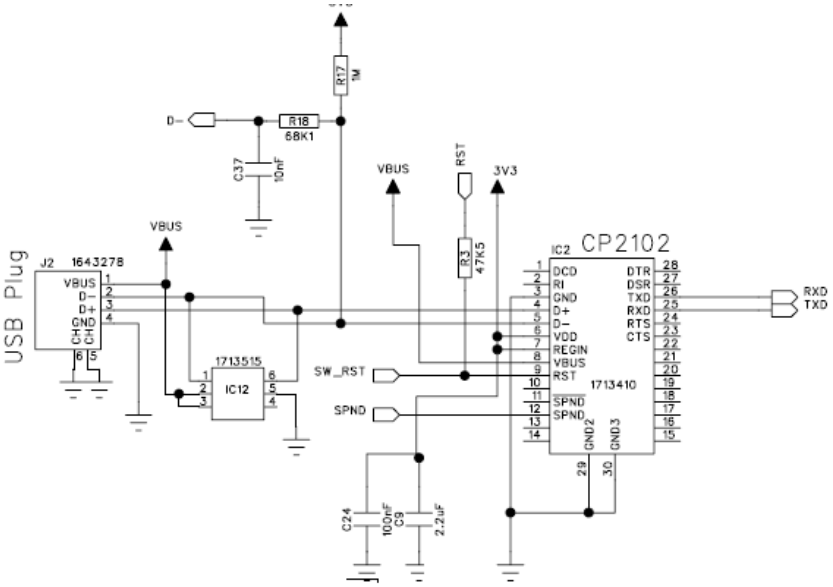


Simplified block diagram for TI C1101 integrated circuit, as described in datasheet SWRS061G from texas instrument

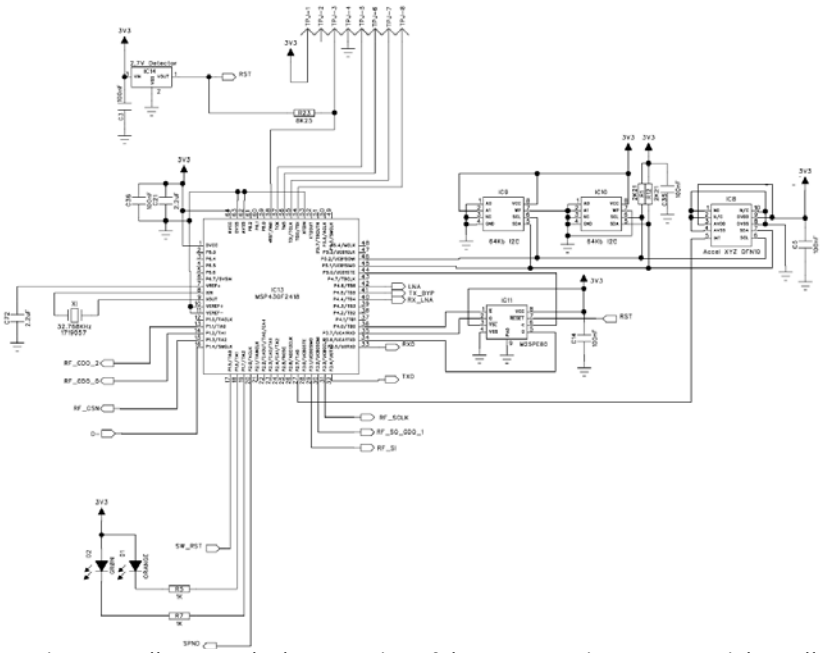


Voltage regulator

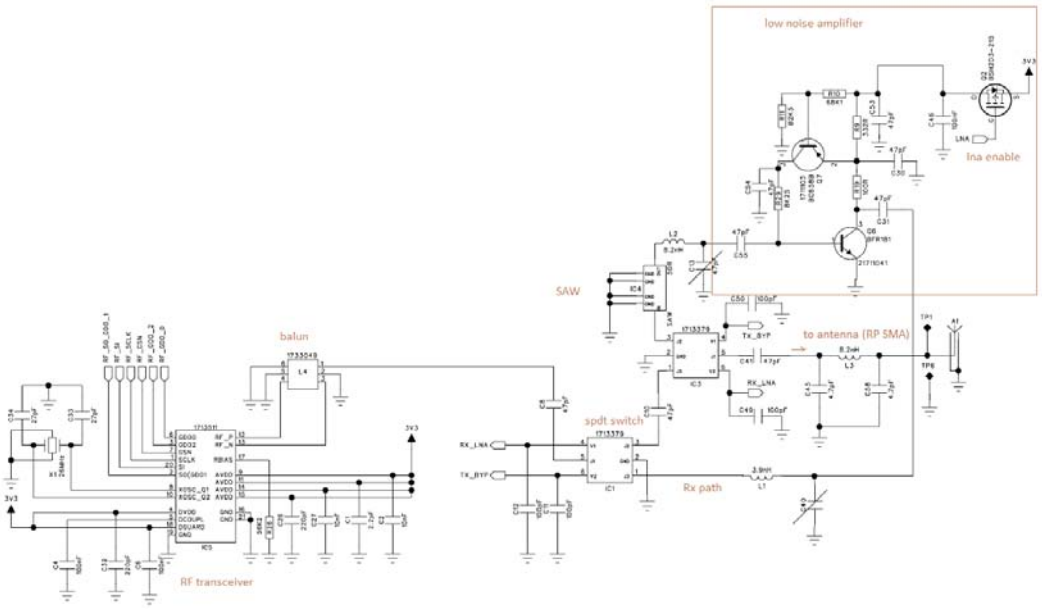
The board voltage supply is provided by the USB interface after some voltage regulator (IC6).



The Silabs integrated circuit IC2 converts the USB signal to microcontroller.



The microcontroller controls the operation of the RF transceiver over a serial-parallel interface. A reset circuit is used to avoid latch up of the microcontroller in an undefined state.



RF transceiver and external LNA

In receive mode the external LNA is turned on and the single pole double throw (SPDT) switch are set accordingly. A saw filter centered at 915 MHz and followed by a low noise amplifier pre-amplifies the signal before processing by the receiver in the CC1101 for optimal RF sensitivity performances.
In transmit mode the 2 SPDT switch are set to connect the RF connector directly to the balun before the CC1101 RF IC and the external LNA is turned off.

The RF transceiver is implemented with the texas instrument CC1101 which supports both transmit and receive mode. The transceiver settings are controlled by a microcontroller which set the registers differently for the supported operation modes mentioned above.

During transmission and receive the fractional-N PLL generate the internal RF frequency from the 26 MHz reference xtal.
The VCO of the PLL operates at 6 times the RF frequency i.e. 6x915 MHz : 5.49 GHz for operation at 915 MHz and 5.496 GHz for 916 MHz.

Please contact me if there is any information you may need.

Sincerely,

Kamstrup A/S

Bjarne Lund Jensen
Product Manager, Remote reading
Meter Division, Heat, Cooling and Water
Direct phone: +45 89 93 11 02
Mobile phone: +45 40 61 34 50
E-mail: blj@kamstrup.dk