The reader is operating at frequency 13.56MHz and is consisted of digital and analog circuits. Digital circuit has LED indicators, a buzzer, a debug module, USB port, a RTC and flash memory. Analog circuit has a RFID transceiver, a matching circuit and an antenna and RF power management.

Input and output interface

LEDs and buzzer are the output interface of the reader. They received signal from the MCU and than generate images, sound or light to interface with the user.

Peripherals

Flash memory is used to save the reader configuration and the bootloader data. RTC is used to keep the real time and date.

Communication interface

USB is used to obtain power from PC and to communicate with LOG-IC application with PC.

Debug is used for firmware development and programming in house only.

Power

Power management manages the USB power. It converts the input voltage to 3.3 voltages and provides voltage to digital and analog circuits.

RF

It consists of 4 sub-modules. They are the transceiver, the matching circuit, the antenna and the RF power control.

Transceiver

Transceiver is configured every time while the reader is start-up. It obtains the signal from transceiver control signal to set-up the transceiver to demodulate the signal from the antenna. It also provide IF signal input/output to the MCU so that MCU can send data to the tag though the antenna.

Matching circuit

Matching circuit is used to provide the impedance matched between the antenna and the transceiver in 50 Ohm. It is also used as a low pass filter to suppress the harmonics generated by the transceiver.

Antenna

Antenna is designed to have 50-Ohm impedance. The copper loop has inductance around 380nH. However, the process of the components and PCB has tolerance of 20%. Therefore, variable components are needed to obtain the optimal performance.

They two variable capacitors are used to obtain the optimal performance. One of them is C43 and is in the antenna module. By trimming C43, the impedance of the antenna and the resonant frequency will be changed. The other one is C52 and is in the matching circuit. By trimming C52, impedance of source will be changed. Both capacitors must be trimmed until maximum rate of communication is obtained

RF power

RF power control is used to control the radiate power from the antenna.