Hi-G-TEK

Hi-G-Tek Ltd. Microelectronics & Asset Tracking Technology

DataTag circuit description

1. General

1.1. Reference documents

1.1.1. Circuit diagram, document 47G10050.

1.2. Page numbers referenced in the following description, are referred to the schematics.

2. General Description

2.1. The DataTag is used to track assets during storage or shipment. If the tag is removed or tampered, the tag records an event and reports to the interrogator (DataReader).

2.2. The DataTag is a stand-alone unit. It is battery operated, it has RF receiver, transmitter and microprocessor (uP), which controls the DataTag operation.

2.3. The DataTag has two RF channels, high frequency (HF) and low frequency (LF). The HF is 916.5MHz carrier with FSK modulated data by 40KHz deviation. The LF is 125KHz carrier with OOK modulated data.

3. Functional Description

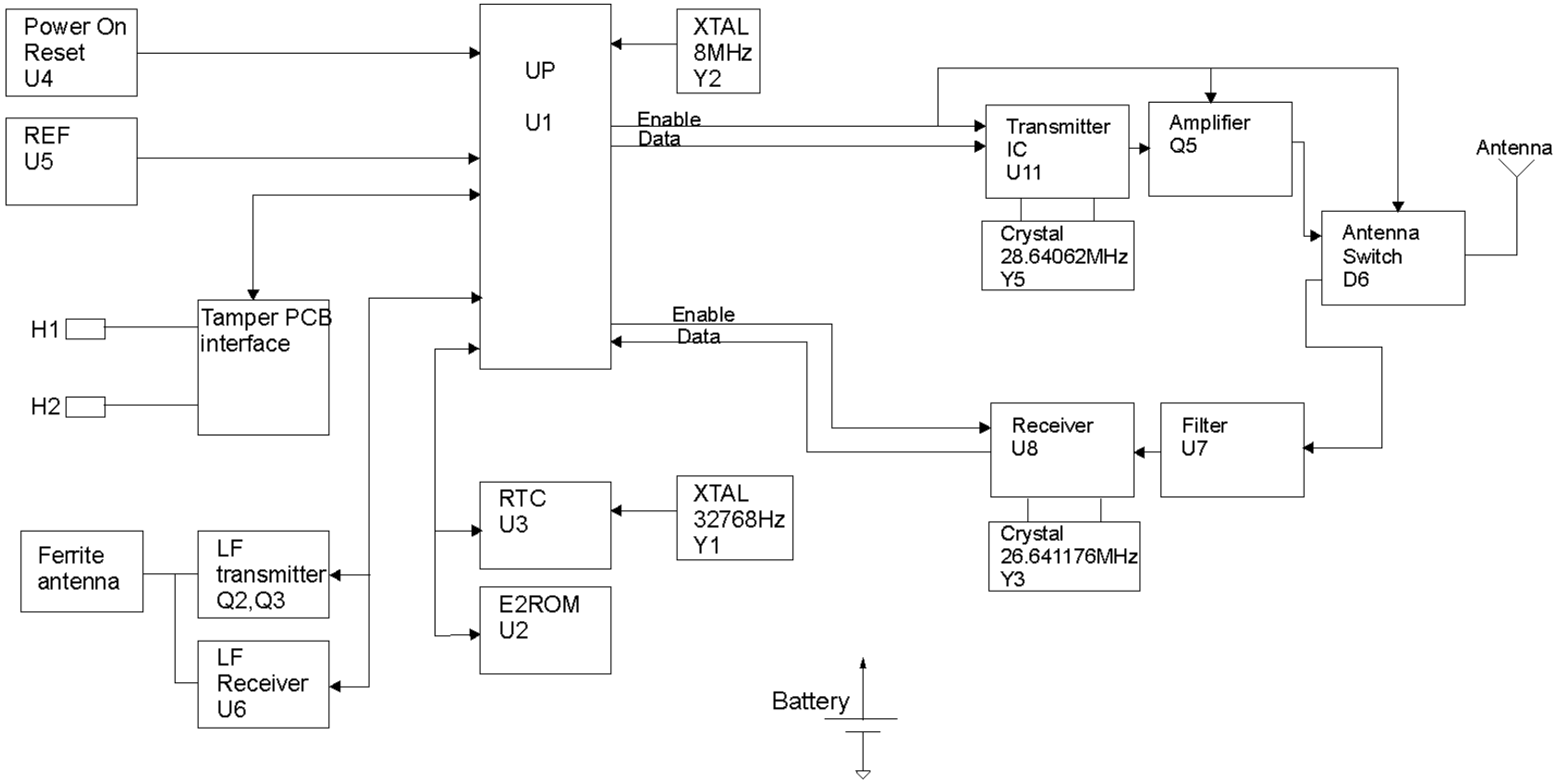
3.1. The DataTag opens its HF receiver once every 3 seconds to look for an interrogator. If an interrogator is not found, the DataTag goes to sleep for another 3 s. If an interrogator is found, the DataTag receives the command and transmits a message according to the command received. During the DataTag wakes up, it performs tamper PCB test and integrity test of its stored data. The LF receiver is always opened for data.

4. Hardware Description

4.1. There are 3 PCBs in the DataTag unit. Main, antenna & tamper. The main PCB includes all circuitry. The antenna PCB serves as the HF antenna. The tamper PCB is external to the unit, and is used to detect removing the tag from the asset.

5. ***Circuit description.***

5.1. Block Diagram



5.2. **uP** (U1 Pg.2): PIC16F876 uP timed by a 8MHz ceramic resonator (Y2).

5.3. **POR** (U4 Pg.2): Power on and low voltage reset.

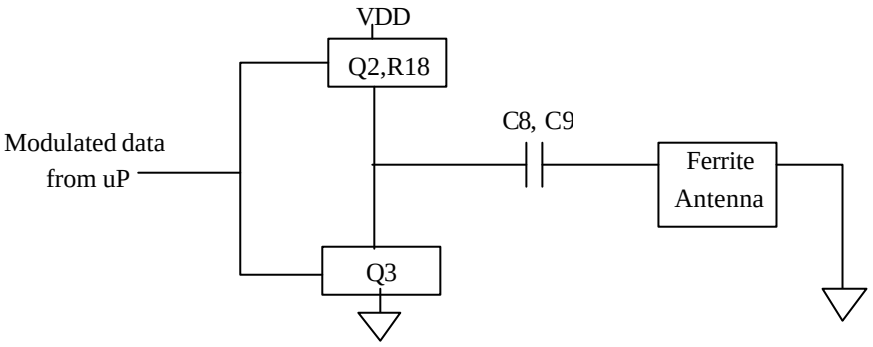
5.4. **REF** (U5 Pg.2): uP A/D voltage reference.

5.5. **Tamper PCB Interface** (Q1 Pg.2): A small current flows to the tamper PCB contacts via R11, R15. If the tamper PCB is detached , an interrupt is generated in U1(26). The uP measures tamper PCB resistance by opening Q1 and measuring voltage in U1(5). D1 is surge protector.

5.6. **RTC** (U3 Pg.2): Real time clock IC with 32768Hz crystal used as calendar IC. It is serially connected to the uP.

5.7. **E2ROM** (U2 Pg.2): Serial E2ROM stores unit parameters and data.

5.8. **LF Transmitter** (Q2, Q3 Pg.3): OOK modulated data comes from the uP to the driver transistors Q2,Q3 which drive a ferrite antenna, connected between pads ANT1 and GND1.



5.9. **LF Receiver** (R21 to U6 Pg.3): Data received in the ferrite antenna, is chopped by D5, then clamped by D3, D4 and Q4. Data then rectified by D2 and demodulated by U6.

5.10. **Battery** (BT1 Pg.2): 3.6V Lithium battery, TL4934 by TADIRAN.

5.11. **HF Transmitter** (U11 Pg.4): U11 is integrated transmitter; it has a 26.64062MHz crystal with PLL to generate 916.5MHz. Data is FSK modulated with 40KHz deviation. Data rate is 15625bps. A modulated carrier goes out at U11(13).

5.12. **Amplifier** (Q5 Pg.4): The transmitted RF is filtered by L10, C54, amplified by Q5, and filtered again by C55, C51,L9,C56.

5.13. **Antenna Switch** (D6 Pg.4): D6, is a PIN diode which functions as antenna switch. It is controlled by the uP.

5.14. **Filter** (U7 Pg.4): HF SAW filter.

5.15. **Receiver** (U8 Pg. 4): U8 is integrated receiver; it has 26.641176MHz crystal. IF is filtered by U9, a ceramic 10.7MHz filter. Data is demodulated by Y4, goes out at U8(23,24) and shaped by comparator U10. The receiver is controlled by the uP.

5.16. **Antenna** (Pads A1, A2 Pg.4): Antenna is internal and is connected to pads A1, A2 of PCB.