## *Theory of Operation*

**DataTag circuit description**

### *1. Functional Description*

1.1. 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 wake up, it performs seal wire test and integrity test of its stored data. The LF receiver is always opened for data. The LF channel is used to interrogate the DataTag by short range link for set-up or manual verification.

### *2. Hardware Description*

2.1. There are 2 PCBs in the DataTag unit. Main (Digital & RF) PCB and antenna PCB. The main PCB includes a battery, µP, LF transceiver and HF transciever. The antenna PCB is located on the main PCB ( internal in the unit).

### *3. Main PCB circuit description.*

Block Diagram:

3.1. U1: MSP430F149 : System-µP.

3.2. U4: EEPROM.

3.3. U6: 2.2V voltage detector, interrupt the µP if voltage drops below 2.2V.

3.4. U3: 2.5V voltage regulator (system main supply).

3.5. BT1: TL2134, 3.6V lithium battery.

3.6. Tilt and Motion sensors. the sensors may or may not be populated, according to product model. Connection for ON/OFF sensors. Their location may vary according to product model.(refer to DataTag models table in page 2 in this document )

3.7. H1,H2: Tamper sensor - Connection for resistance measurement. A wire loop (short circuit sensing) is connected to these pins.

3.8. U2: Reset & watchdog supervisory.

3.9. U5 Analog Switch, connects battery voltage to a divider for measurement.

3.10. Y1: 4MHz µP crystal.

3.11. Y2: 32768Hz Crystal, for system clock.

3.12. Q3A: Power ON/OFF to the RF circuit.

3.13. Q3B: Battery load for battery life test.

3.14. LF Transceiver: transmit/receive at 125KHz, AM modulated (on-off key,OOK) with 4KHz data rate. The LF transmitter includes two sets of push-pull transistors Q1A,Q1B and Q2A,Q2B. They drive a resonance circuit C23,C24 & ANT1 which is a ferrite antenna. U12 is the LF receiver.

3.15. HF Transceiver: transmit/receive at 916.5MHz, FSK modulated with 40KHz deviation and 16KHz data. U8 is integrated UHF transceiver. It has a 14.7456MHz crystal (Y3). The RF-IN and RF-OUT are connected to the antenna switch (U9) via passive filtering circuits. The switch (U9) output goes to the antenna pads (A1,A2).

## *4. 916 MHz Antenna PCB circuit description.*

4.1. The antenna is a printed custom made antenna.