Electronic Key-Tag

Design Review

May 17, 2019

Key-Tag

- This key-tag will start to blink for 30 seconds if it has been at rest for a few hours.
- One can also turn on the LED’s using a switch.

Physical Structure:

Side profile of
Reach Truck with load.

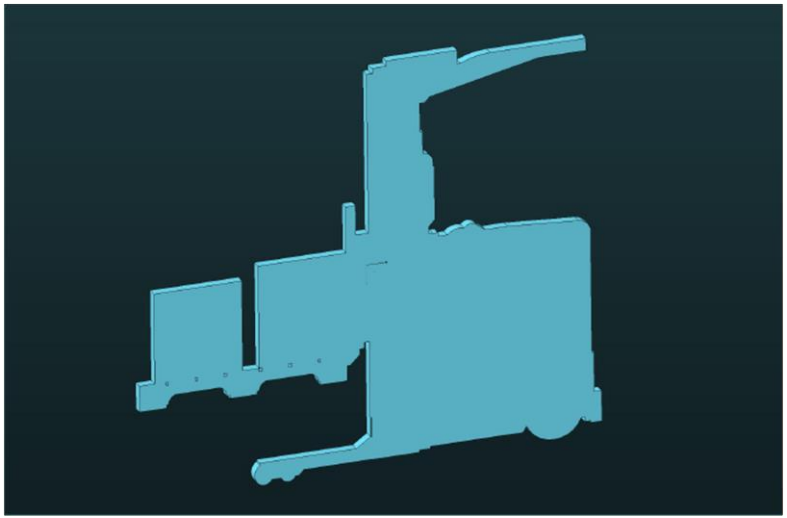


Figure 1 [1]

Key-Tag

Purpose :

- Most of us keep our keys on a counter or hang them to a key-stand after use.
- Some of us, just throw them on a couch or leave them in pockets. In such cases it is easy to find keys when the attached key tag BLINKS or MAKES SOME NOISE.

Extra Features:

- The RGB lights on the Key – Tag can be turned on using a switch button.
- The circuit is re-programmable, a user guide will be provided.
- MSP FET can be used to program the circuit board.

System Requirements

Requirements:

- The system requires a motion sensor that can let us know when the key is in use or at rest.
- A low power microcontroller, to control the LED's and Buzzer based on interrupts from motion sensor and to run an RTC to measure time.
- A battery to power all the system components. (Battery should last for at least six months.)
- Turn on Lights with a switch button.
- Cost: $7.50/key-tag.

How I met my "Requirements":

- The low power Accelerometer - LIS3DHTR
- A low power microcontroller – MSP430FR2422.
- A battery CR2032. (225 mAh). Battery life depends on the duty cycle.
- RGB LED, tactile switch button.
- Cost: $6.24/key-tag.

Block Diagram

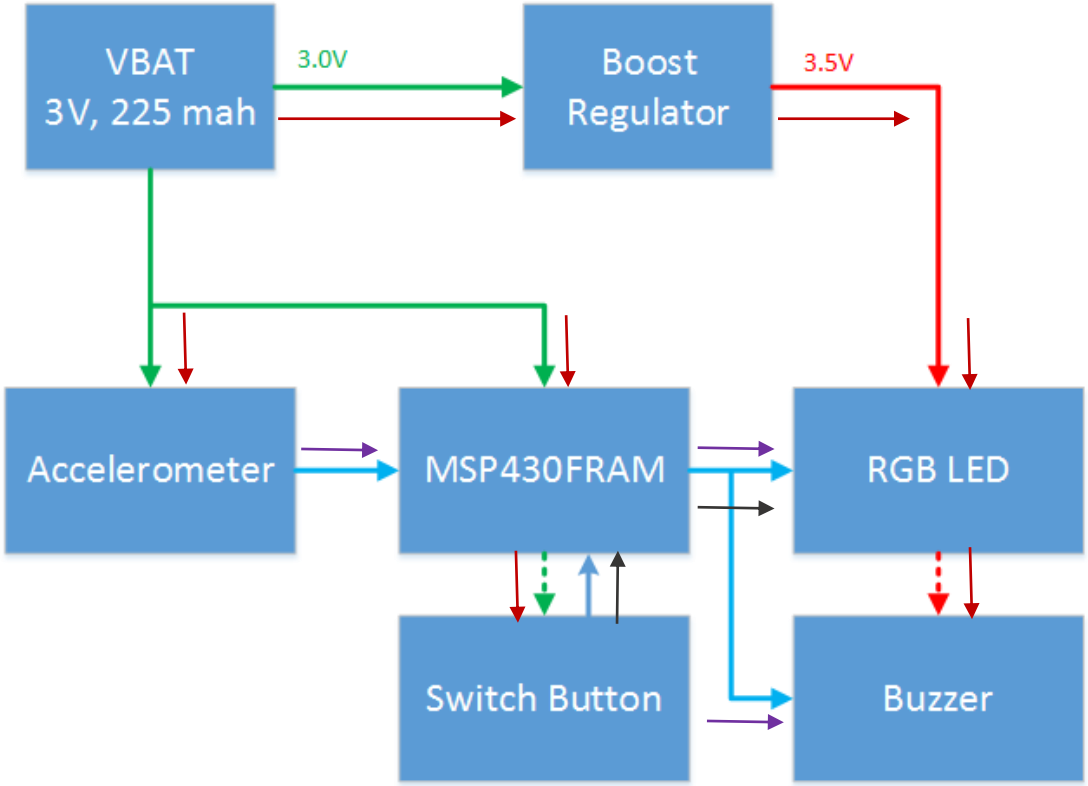
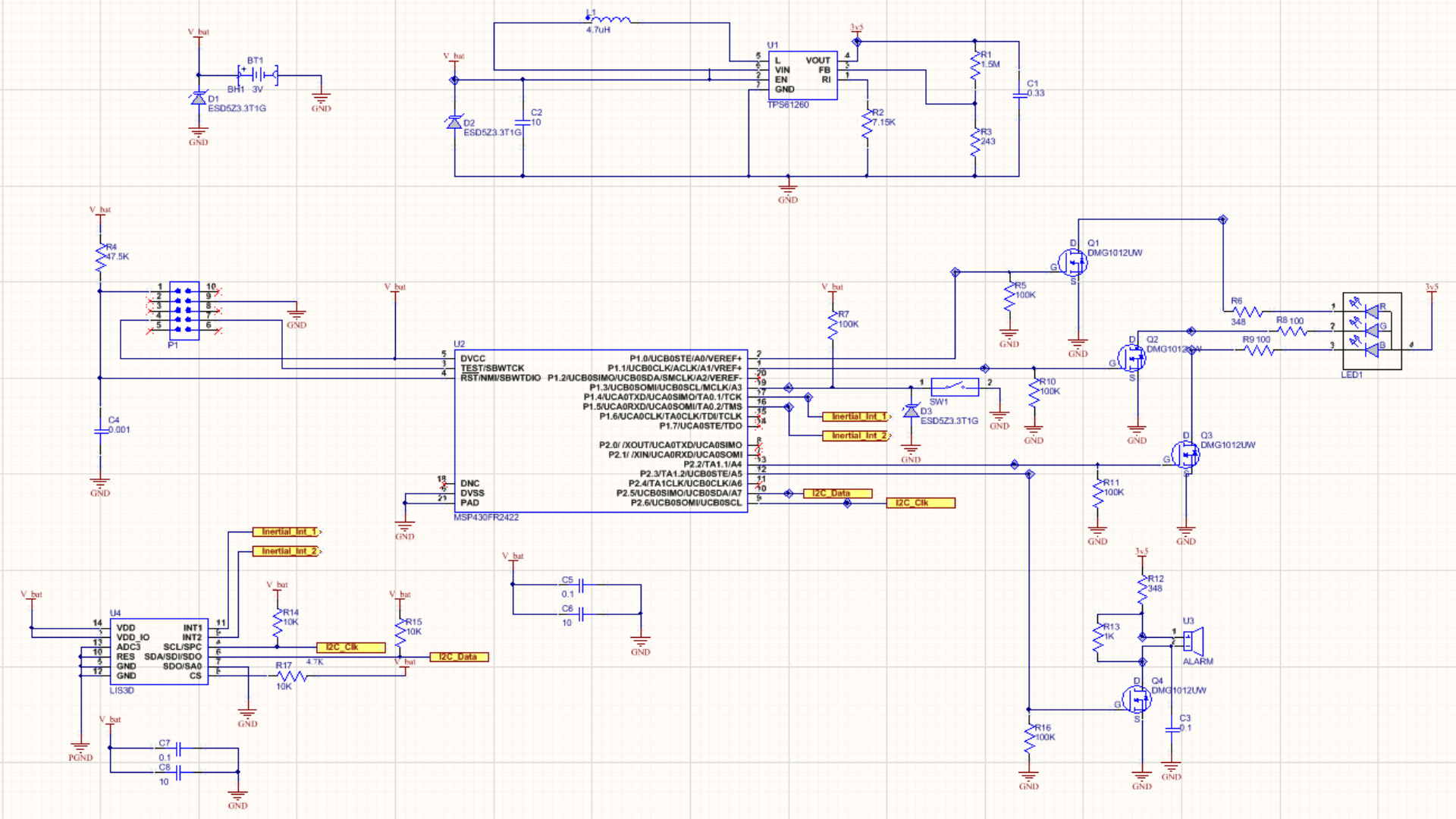


Figure 2


V_bat
BT1
BH1 3V
D1
ESD5Z3.3T1G
GND
L3
4.7uH
U1
L
VIN
EN
GND
VOUT
FB
RI
TPS61260
3v5
R1
1.5M
R2
7.15K
R3
243
C1
0.33
C2
10
D2
ESD5Z3.3T1G
R4
47.5K
P1
C4
0.001
U2
DVCC
TEST/SBWTCK
RST/NMI/SBWTDIO
P1.0/UCB0STE/A0/VEREF+
P1.1/UCB0CLK/ACLK/A1/VREF+
P1.2/UCB0SIMO/UCB0SDA/SMCLK/A2/VEREF-
P1.3/UCB0SOMI/UCB0SCL/MCLK/A3
P1.4/UCA0TXD/UCA0SIMO/TA0.1/TCK
P1.5/UCA0RXD/UCA0SOMI/TA0.2/TMS
P1.6/UCA0CLK/TA0CLK/TDI/TCLK
P1.7/UCA0STE/TDO
P2.0/ /XOUT/UCA0TXD/UCA0SIMO
P2.1/ /XIN/UCA0RXD/UCA0SOMI
P2.2/TA1.1/A4
P2.3/TA1.2/UCB0STE/A5
P2.4/TA1CLK/UCB0CLK/A6
P2.5/UCB0SIMO/UCB0SDA/A7
P2.6/UCB0SOMI/UCB0SCL
DNC
DVSS
PAD
MSP430FR2422
R7
100K
R5
100K
Q1
DMG1012UW
Q2
DMG1012UW
Q3
DMG1012UW
R6
348
R8 100
R9 100
LED1
SW1
D3
ESD5Z3.3T1G
R10
100K
R11
100K
Inertial_Int_1
Inertial_Int_2
I2C_Data
I2C_Clk
U4
VDD
VDD_IO
ADC3
RES
GND
GND
INT1
INT2
SCL/SPC
SDA/SDI/SDO
SDO/SA0
CS
LIS3D
R14
10K
R15
10K
R17
10K
4.7K
C5
0.1
C6
10
C7
0.1
C8
10
PGND
R12
348
R13
1K
U3
ALARM
Q4
DMG1012UW
R16
100K
C3
0.1

System Specifications

Component	Specs
Boost Regulator	I/P - 3.0V; O/P - 3.5 V; DC/DC; I_out - 30mA; 91% efficient;
RGB LED	Red: 4 mA @ 1.8V; Green: 3 mA @ 2.8V; Blue: 3mA @ 2.8V;
Buzzer	10mA @ 3.2V; 2.7KHz; 85dB max;
Accelerometer	2uA – low power mode; 11uA – Normal mode; supply voltage range 1.7V to 3.6V
MSP430fr2422	0.7uA – low power mode; 120uA – Active mode; supply voltage range: 1.8V to 3.6V
Battery	225mAh, 3V

System Specs Cont..

Battery Life:

- Sleep mode: 2.7uA
- Active mode: 30mA
- Total average current consumption: 177uA
- Estimated battery life: 53 days assuming the circuit is in fully active mode for 60 seconds every once in 3 hours.
- Worst case: Always fully active: 5.2 hrs. to 7.5 hrs. based on consumption rate. (9 hrs. to 6.3 hrs. if current drawn is 25mA).

ESD Protection:

TVS diodes are used to protect the circuit from ESD.

Reverse Voltage Protection:

Since the battery container is “one way” only, circuit for reverse voltage protection has not been implemented.

Software Design Flow

- The accelerometer will interrupt the MSP430, every time it senses acceleration.
- MSP430 will start a timer when there is no acceleration for a period of time.
- If the MSP is interrupted before the counter overflows, MSP resets the timer.
- If the timer is set and the MSP is interrupted by Switch button, Interrupt from switch will be given priority and the timer will be reset.

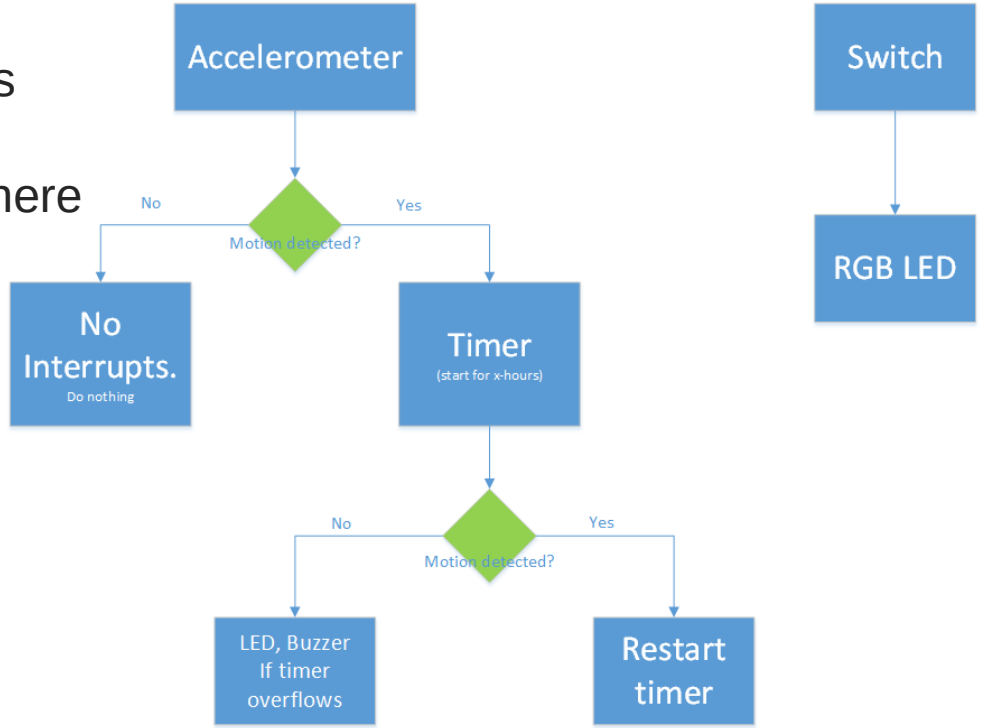


Figure 4


FEEDBACK


thanK
you

References

[1] Physical Structure of keychain - Josh Smith, Designer, Mechanical development.
[2] Feedback – google images
[3] Thank you – google images