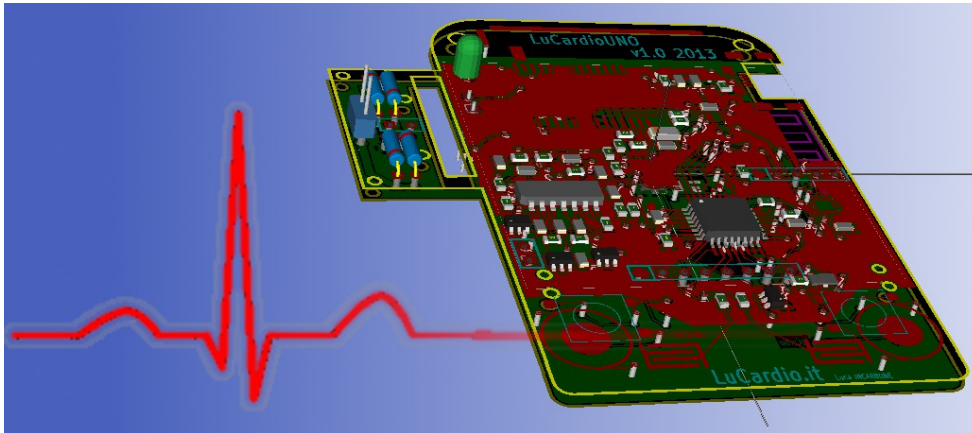


LuCardioUNO v1.0 Specification



High level Fonctional Specifications

Tag	Specification	min	Typ	Max
1	GENERAL SPECIFICATION			
1.0	Turn on time in recording mode	5h	8h	10h
1.0.1	Current consumption in recording mode			150mA
1.0.2	Battery capacity	750mA/h	1500mA/h	-
1.1	Time to full recharge		1h	3h
1.2	Fonctional Temperature Range	-10°	-	40°
1.3	Backlight duration		3 sec	
1.4	Graphic LCD with back-light	LCD NOKIA 5510		
1.5	GPS Antenna (1.575 GHz)	Integrated on PCB		
1.6	Data Connectivity	Bluetooth		
1.7	Power Supply	USB Micro B		
2	ELECTRICAL SPECIFICATION			
2.0.0	Charging voltage	4.7V	5V	6.2V
2.0.1	Charging current	-	-	1A
2.1	System voltage		3.3V	
3	PERFORMANCE SPECIFICATION			
3.0.0	Heart Rate Range	20bpm	-	220bpm
3.0.1	Bike Speed Range	1km/h	-	100km/h
3.0.2	Pedal Rate Range	20 r/min	-	200 r/min
3.1.1	Refresh Data Temperature	-	1 ref/s	-
3.1.2	Recording Rate	-	1 rec/s	-
3.1.3	Refresh LCD output	-	1 ref/s	-

4	MECANICAL SPECIFICATION			
4.1	Touch button		2	
4.2	Size of PCB (2 Layers)	Battery Size		
4.3	Standard plug I/O (idiot-proof)			
4.3.1	Charging/Pedal/Weel	USB Micro B		
4.3.2	ECG contacts	DX female		
4.4.0	Water proof			
5	HUMAN INTERFACE			
5.0	Menu interactive			
5.1	Screen data			
5.2	Android interface (via Bluetooth)			

LCD data screen specification

Welcome screen

To be defined

Recording/Running Mode

Tag	Specification	min	Max	Unit
6.0	Recording Screen			
6.0.0	Distance measure	0	10'000	m
		10	999	km
6.0.1	Total distance measure	0	9999999	km
6.0.2	Speed bike	1	100	km/h
6.0.3	Temperature			°C
6.0.4	Heart Rate	20	220	bpm
6.0.5	Battery level	3.7	4.2	V
6.0.6	Cronometre	00:00:00		
6.0.7	Time	00:00:00		
6.0.6	Pedal rate	20	200	rot/min
6.1	Graphic Hysto filling with gliding FIFO (output filling from right to left)			
6.1.0	Deep hystory	5	30	min
6.1.1	Horizontal Resolution	40	48	pixel
6.1.2	Heart Rate range	50	210	bpm

6.1.3	Speed Bike range	10	80	Km/h
6.1.4	Heart Rate resolution	10	5	Bpm
6.1.5	Speed Bike resolution	10	5	Km/h
6.1.6	Distance, Speed,HeartRate			
7	Recording Screen ECG visualization mode			
7.0.0	Heart Rate	20	220	bpm
7.1.0	Filling fifo from left to Right			
7.2.0	Resolution	1/48		s
7.3.0	Distance,Speed,.HeartRate			
8	Recording Screen GPS mode			
8.0.1	Distance measure unit	0	10 km	m
		10 km	-	km
8.0.2	Speed bike	1	100	km/h
8.0.3	Temperature			°C
8.0.4	Heart Rate	20	220	bpm
8.0.5	Battery level	3.7	4.2	V
8.0.6	Pedal rate	20	200	rot/min
8.1	GPS info			
8.1.0	Speed	0.1	1854	km/h
8.1.1	Latitude	ddmm.mmmm		
8.1.2	Longitude	dddmm.mmmm		
8.1.3	Satellites Used	0	12	sat
8.1.4	Altitude	0	18000	meters
9	Fonction Menu mode			
9.0.0	Starting record			
9.0.1	Recording Pause			
9.0.2	Stop Recording			
9.1.0	TurnON Bluetooth			
9.1.1	TurnOFF Bluetooth			
9.2.0	The selected function has to be Highlighted			
9.3.0	In the last row the arrow as to be plotted to rapprsent the direction of selection correspond to touch buttons			

Function Menu Mode

5.0.0 In this mode the user can activate recording stop it and other things. To move up or down there will be

Buttons

5.0.1 The mode and others functionallitys of LuCardio is driven by 2 touch buttons. The following true table specified the buttons effects.

From State	To STATE (condition below)				
	GBTN		RBTN		RGBTN
RS	RS-GPS		RS-ECG		FMM
RS-ECG	RS		RS-GPS		FMM
RS-GPS	RS-ECG		RS		FMM
FMM	---		---		---

5.0.2 Table describing effect of buttons.

STATE	GBTN		RBTN		RGBTN
RS	changeSTATE		changeSTATE		changeSTATE
RS-ECG	changeSTATE		changeSTATE		changeSTATE
RS-GPS	changeSTATE		changeSTATE		changeSTATE
FMM	HighlightedUP		HighlightedDOWN		Select

GBTN, RBTN and RGBTN

4.1.1 The capacitive button needs a basic coding to filter some possible effect with water. For this reason the button it will be considered pushed if two short touch are made.

Tag	specification	min	MAX	unit
4.1.2	Duration of single touch	0.1	0.5	s
4.1.3	Time between two touch	0.1	1	s
4.1.4	Number of touch	2		

Android Interface

To Do

Data Recording

10.0.0 Data recording as to be recorded on file.csv with ';' as separator (for Excel is the standard column separation for csv importing).

10.0.1 All available data will be stored one per second in SD card (to be listed)

10.0.2 File name will be MMDDHHmm.CSV (month day hour minute .csv)

Function check_switch

Switch button

This function test both buttons and update the boolean value *green_pushed* and *red_pushed*.

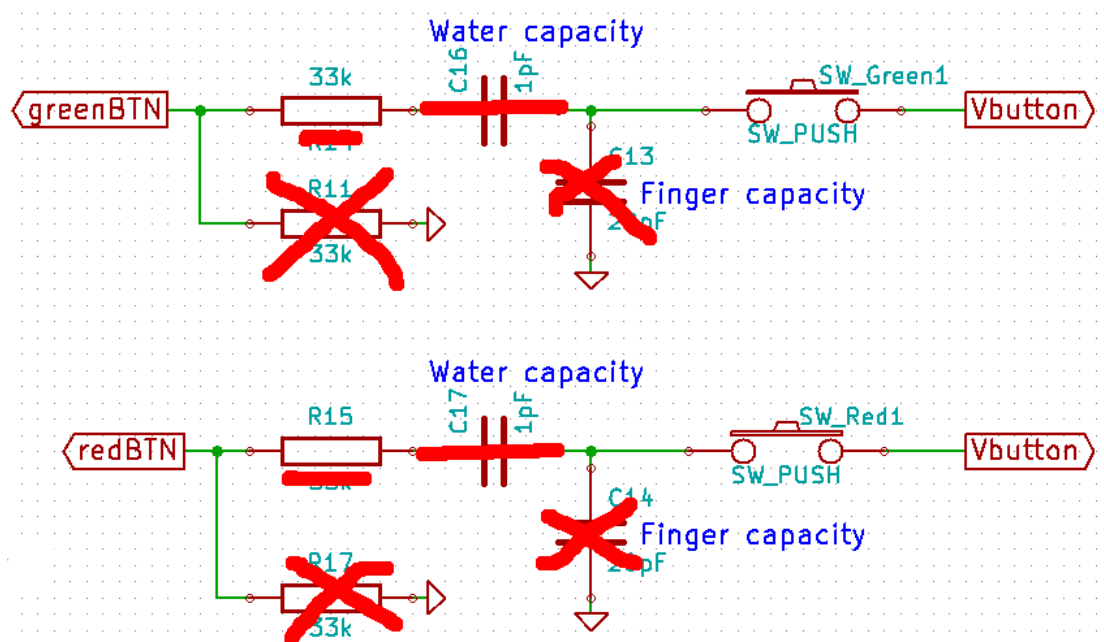
This function have to work with two different schematics, first is the simple “switch” one, the capacitor C13, C14, C16, C17 and resistor R11 and R17 are not mounted and R14 and R15 have 0Ohms values.(C16 and C17 are shortcircuited too).

This will be selected by the no definition of BUTTON_touch.

In this case the function has to test the Vbutton pin value with following combination of output:

	RedBTN '0'	RedBTN '1'
GreenBTN '0'		X
GreenBTN '1'	X	

By this way is possible to determinate the update value for *red_pushed* and *green_pushed*.

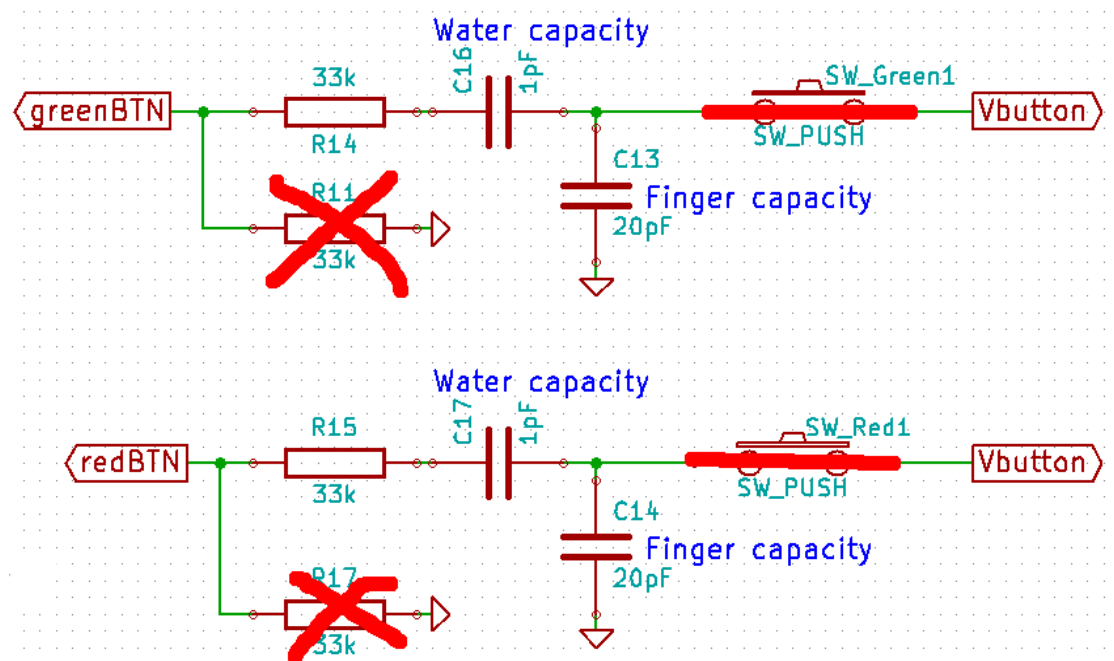


Or we can set Vbutton to HIGH value and test in the function the input for redBTN and greenBTN. In this case the pulldown resistor R11 and R17 is needed (and pull-down pin set-up in code).

Touch button

In the second case (BUTTON_touch is defined) the switches are short-circuited, the resistance R11 and R17 are disconnected. In this function mode the output *greenBTN* and *redBTN* have to be driven by this way.

greenBTN	'0'	'1'	'1'	'1'	'0'	'0'	'0'
redBTN	'0'	'0'	'0'	'0'	'0'	'0'	'1'
Vbutton	read value	read value	read value	read value	r.v.	r.v.	r.v.
Treshold reach	no	no	no	yes	no	no	no



To found experimentally the clock period to wait from a checking button to the other (wait for decharging capacitor and the treshold to get the capacity variation du to finger).

List of case defined

Name	def	Not def
BUTTON_touch	Touch button are used	Simple switch used
INSTALLATION_PROCEDURE	Factory setup (RTC for ex.)	Normal