

TAHMO SENSOR COMPETITION 2014

DESIGN OF A SUNSHINE- HOUR SENSOR

The team

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DESIGN OF A SUNSHINE- HOUR SENSOR

A Sunshine hour sensor was designed. The design is based on **Simichieu (1985), that the minimum threshold value of solar intensity which will start a record in a Campbell stoke sunshine recorder is within the limits of 70 to 300W/m².The design comprises of a glass sphere painted black for maximum absorber of radiation. A light dependent resistor (LDR) is used as the sunshine hour sensor because operates at a visible range of wavelength 390 to 750nm.The LDR is covered with the black glass sphere. The output of the sensor is connected to Analog to digital converter (ADC) to convert from analog voltage to four bits digital pulses. The four bits digital outputs is compared with a fixed four bits digital value corresponding to the 70 to 300W/m² of radiation needed to burn the Campbell stokes sunshine card. Both signals is fed to the comparator inputs of a digital comparator (CD7485).The output of the digital comparator is then synchronized with a one minute clock with a digital integrated circuit (AND gate).The pulse output is then connected to a frequency counter. This is then calibrated against a Campbell stokes sunshine hour recorder.Figure1 shows the electronics circuit diagram. Figure2,3 and 4 also shows the printed circuits diagram while figure 5a and 5b, the physical diagram of the design. The design will be made of Aluminum case for ruggedness.

Bill Of Materials For SUNSHINE HOUR SENSOR DESIGN1.DSN

Design Title : SUNSHINE HOUR SENSOR DESIGN1.DSN
Author : LADIPO K..O
Revision : <NONE>
Design Created : Tuesday, March 12, 2013
Design Last Modified : Thursday, JUNE 30, 2014
Total Parts In Design : 54

13 Resistors

<u>Quantity:</u>	<u>References</u>	<u>Value</u>
2	R1, R9	1k
2	R2, R3	2M2
1	R4	1M
4	R5, R6, R21, R22	220R
1	R7	4.7K
2	R8, R10	6.8M

1	R11	330K
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5 Capacitors

<u>Quantity:</u>	<u>References</u>	<u>Value</u>
1	C1	220u
2	C2, C3	1n5
2	C22, C24	33pF

7 Integrated Circuits

<u>Quantity:</u>	<u>References</u>	<u>Value</u>
1	U1	ADC0804
1	U2	4069
1	U3	74LS85
1	U4	74LS04
1	U5	74HC08
1	U6	4027
1	U7	4060

1 Transistors

<u>Quantity:</u>	<u>References</u>	<u>Value</u>
1	Q1	TIP41

5 Diodes

<u>Quantity:</u>	<u>References</u>	<u>Value</u>
1	D1	1N4734A
1	D2	LED-RED
1	D3 LOW BATT	LED-YELLOW
1	D4	1N4001
1	D4 BATT	LED-GREEN

23 Miscellaneous

<u>Quantity:</u>	<u>References</u>	<u>Value</u>
1	BAT1	9V
1	4-way cable mnt skt recptcl.series 2,	
1	5m 2-core screen cable.	

14	J1, J4-J7, J12-J14, J21-J24, J31, J33	SIL-100-02
4	LDR1-LDR4	LDR
2	RV2, RV10	1M
1	X1	32.768KHz CR

Thursday

** Simichieu O.A (1985) Compendium of Lecture Note on Meteorological Instruments for training Class iii and iv Met Personnel, Volume1.pp146-147.

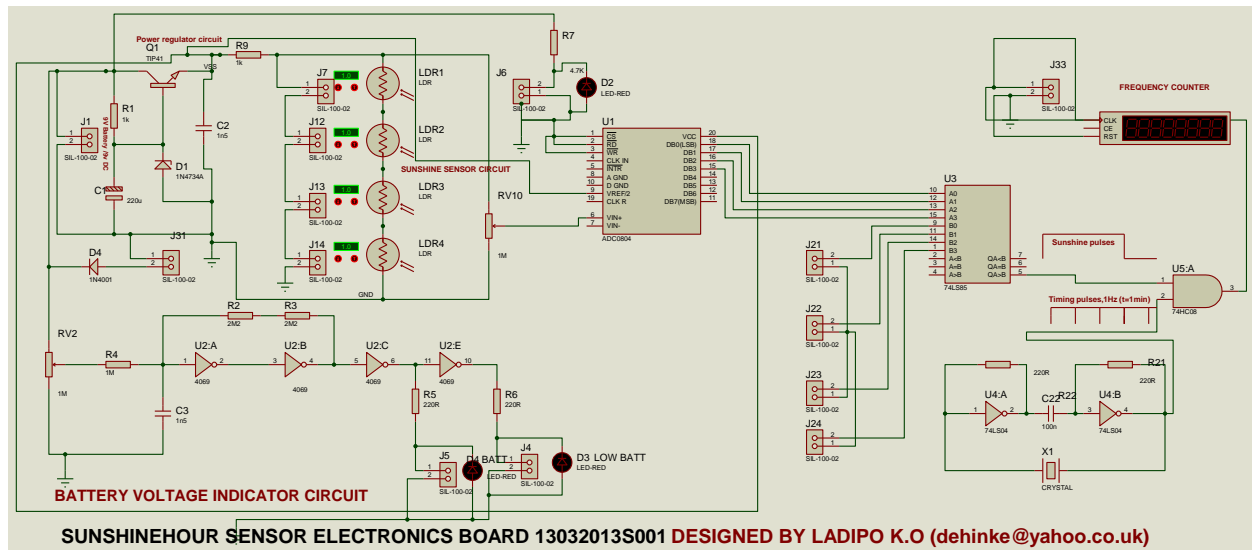


Figure1, the electronics diagram of the Sunshine sensor

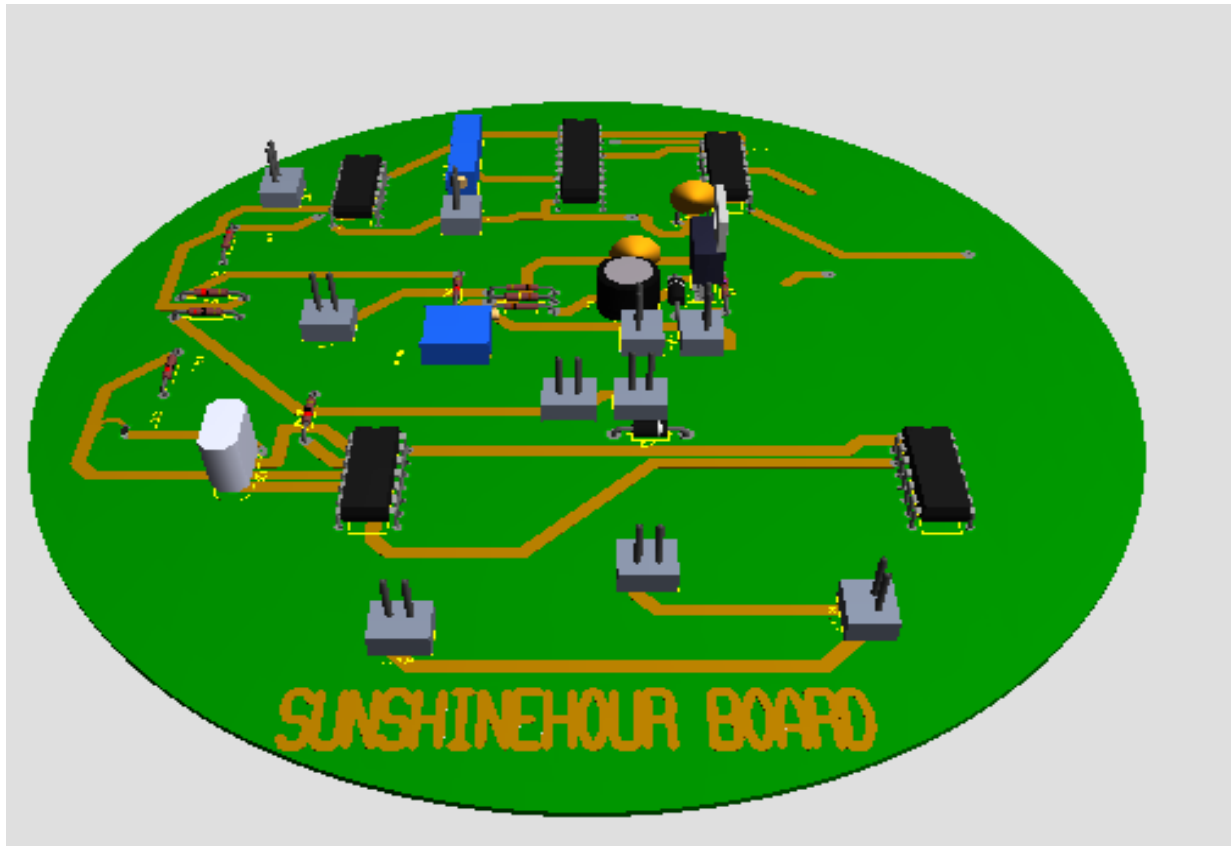


Figure2, the printed circuit diagram of the Sunshine hour sensor

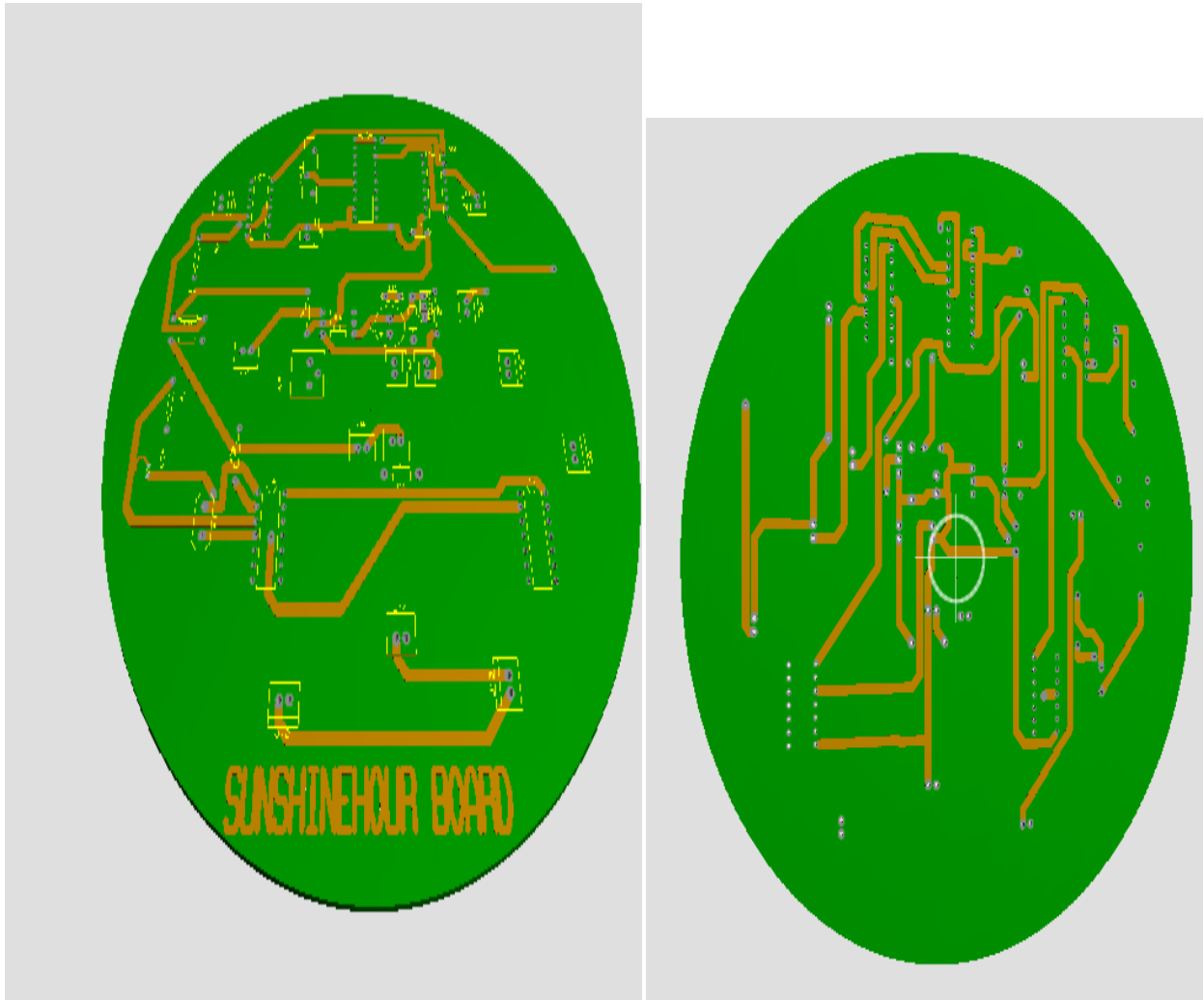
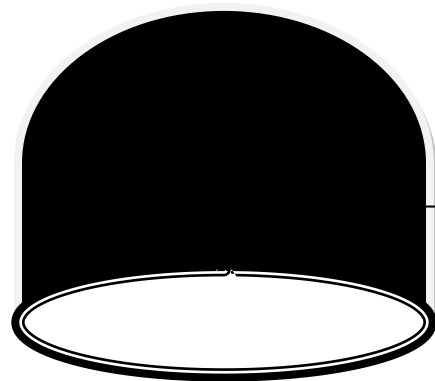
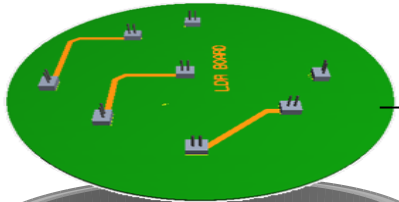


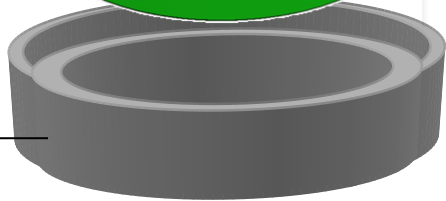
Figure3 and 4, the PCB layout without components, front and back



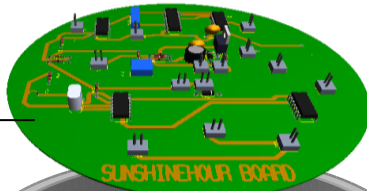
Black Glass sphere



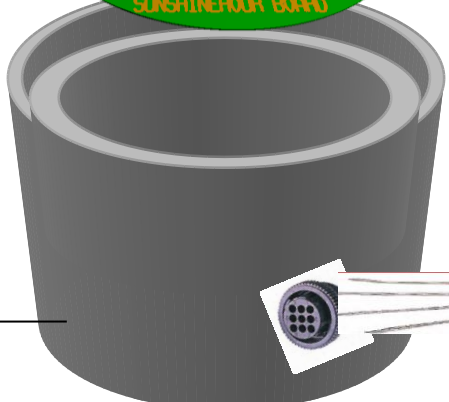
Light Dependent Resistors (LDR) printed circuit board.



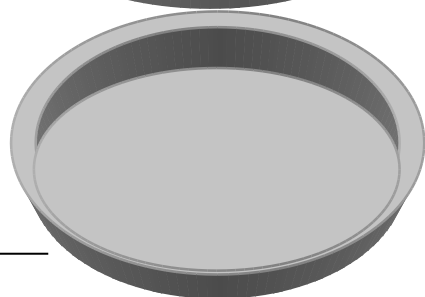
LDR Aluminium Housing



Main sunshine-hour sensor board



Base Aluminium Housing



Aluminium cover

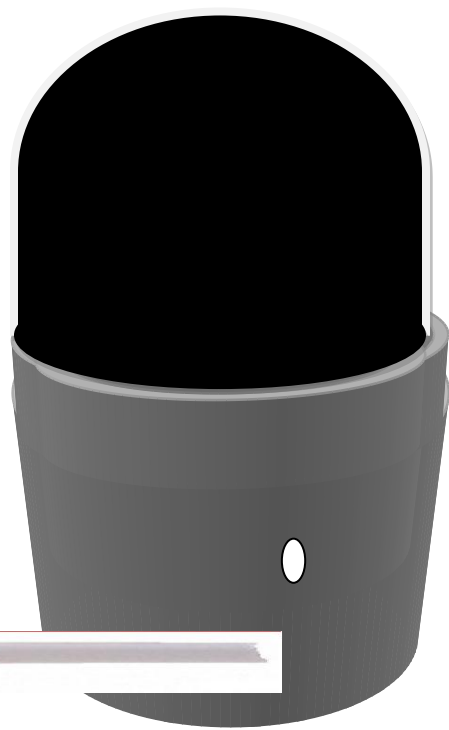


Figure5b

Figure5a

Figure 5a and 5b, Physical features of the Sunshine hour sensor