

## **DESIGN OF HEAT FLUX SENSOR**

**Dr. T. Ewetumo** (Department of Physics, FUTA. E-mail: ewetheo66@gmail.com)

**Adeoye Adewale Peter** (Department of Physics, FUTA, E-mail:combik2000@yahoo.com)

### **Heat Flux Sensor**

Construction of heat flux consists of Al, with thickness of 2mm and diameter of 4cm. The circular Al is grooved from the center for the sensor to pass out. The sensor in k-type thermocouple is gum and passes through the groove to the Al. It consists of two Al circular discs and separated by injecting circular PVC material. A heater made of constantan wire as heating element.

### **Materials**

- Two thermocouple (k-type)
- 2 Al disc of 2mm thickness and 4cm diameter
- Heating made of constantan
- PVC disc of the same diameter

### **Circuit**

The circuit consists of LM324, is configure in non-inverting circuit to amplifier each thermocouple and the output of each non-inverting are connected to differential amplifier to find difference in the temperature of the upper and lower of Al plate sensing by the thermocouples.

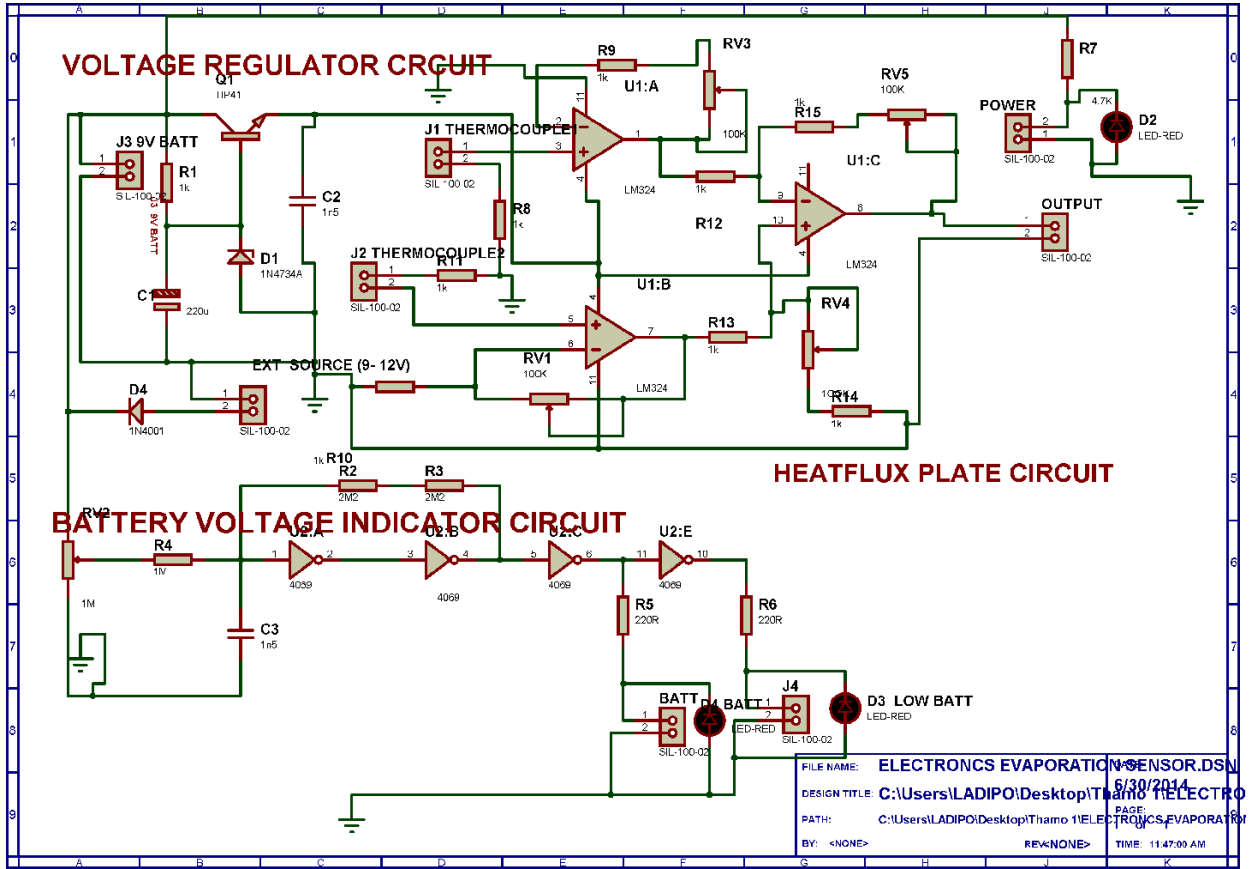
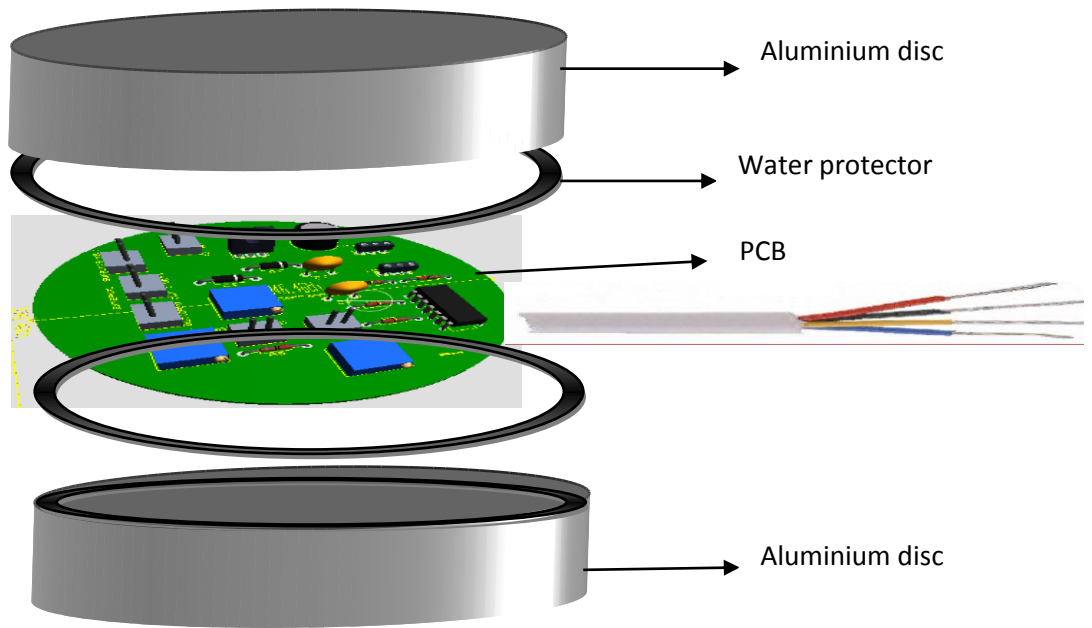
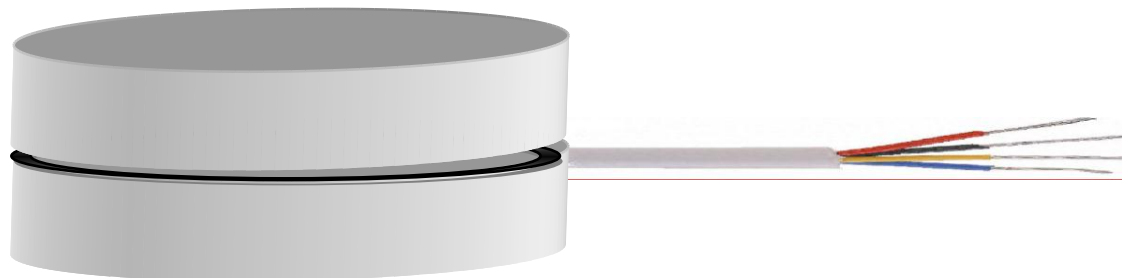


Figure 1: Circuit Diagram



**Figure 2:** Exploded View of Heat Flux



**Figure 3:** Physical Structure of Heat Flux

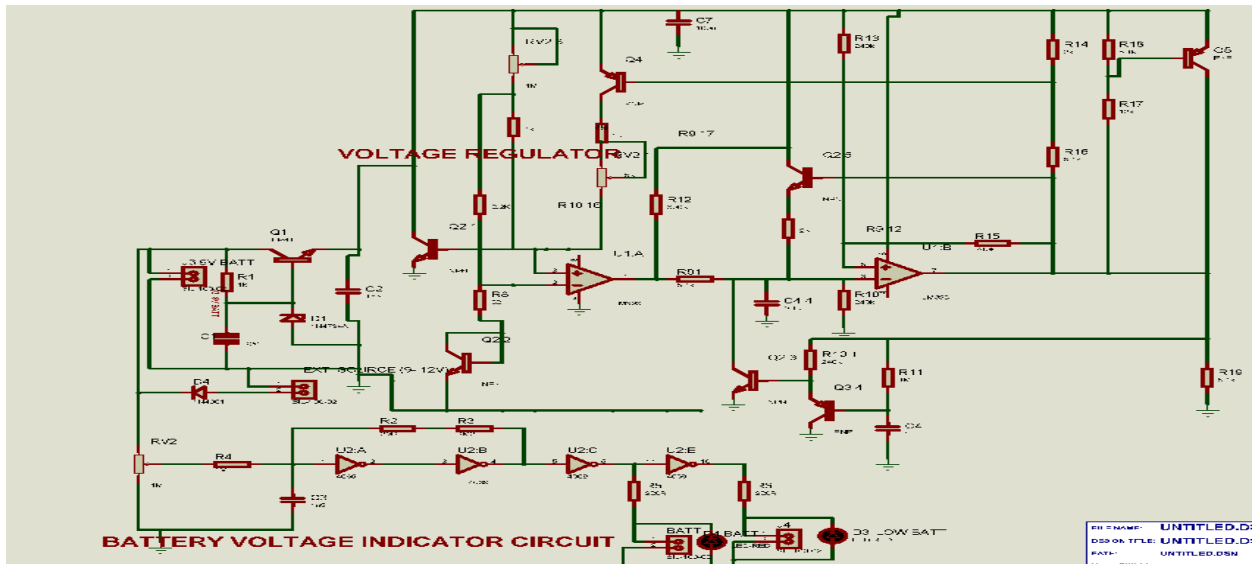


Figure 4a: Circuit Diagram

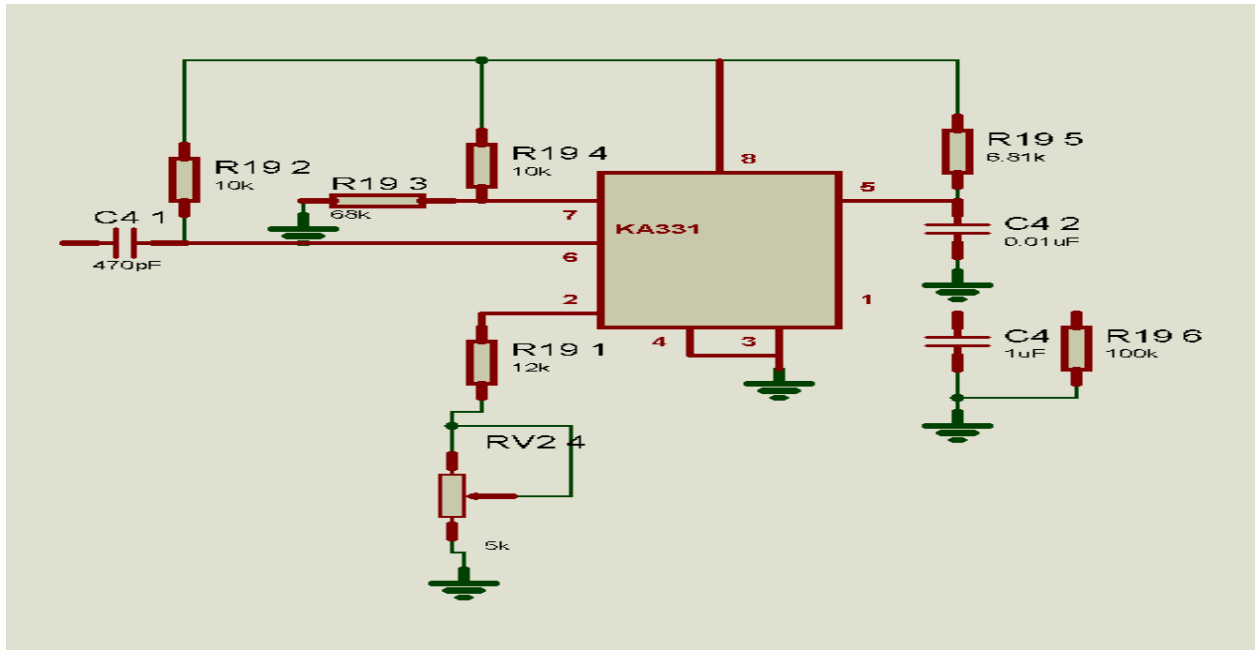


Figure 4b: Circuit Diagram

## Bill Of Materials For HEATFLUX PLATE.DSN

**Design Title** : HEATFLUX PLATE.DSN  
**Author** : <NONE>  
**Revision** : <NONE>  
**Design Created** : Tuesday, February 12, 2013  
**Design Last Modified** : Sunday, June 29, 2014  
**Total Parts In Design** : 39

### 15 Resistors

<u>Quantity:</u>	<u>References</u>	<u>Value</u>	<u>Order Code</u>
9	R1, R8-R15	1k	M1k
2	R2, R3	2M2	M2M2
1	R4	1M	M1M
2	R5, R6	220R	M1k
1	R7	4.7K	M1k

### 3 Capacitors

<u>Quantity:</u>	<u>References</u>	<u>Value</u>	<u>Order Code</u>
1	C1	220u	Maplin VH41U
2	C2, C3	1n5	Maplin WX70M

### 2 Integrated Circuits

<u>Quantity:</u>	<u>References</u>	<u>Value</u>	<u>Order Code</u>
1	U1	LM324	
1	U2	4069	

### 1 Transistors

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

### 5 Diodes

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<u>Quantity:</u>	<u>References</u>	<u>Value</u>	<u>Order Code</u>
1	D1	1N4734A	
3	D2-D4 BATT	LED-RED	
1	D4	1N4001	

### 13 Miscellaneous

<u>Quantity:</u>	<u>References</u>	<u>Value</u>	<u>Order Code</u>
8	BATT, EXT SOURCE (9- 12V), J1 THERMOCOUPLE1, J2 THERMOCOUPLE2, J3 9V BATT, J4, OUTPUT, POWER	SIL-100-02	
3	RV1, RV3, RV5	100K	Digikey 3252P-103LF-ND
1	RV2	1M	Digikey 3252P-103LF-ND
1	RV4	100K	Digikey 3252P-103LF-ND

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1 4- way cable mnt skt recptcl. Series 2, 7.5A

1 5m 2-core screen wire.