

# Thermoelectric Cooling Pad

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**Abstract**—The basic idea behind thermoelectric cooling pad is the power production using thermoelectric effect known as Seebeck effect. The extra heat which emitted by the laptop will be used as thermal source for Thermo-Couple which will convert input thermal energy to electrical energy. This electric energy is used to operate the cooling pad. Hence the excessive heat produced is used to run the cooling pad there by reducing the power consumption.

## 1. INTRODUCTION

A laptop/notebook cooler, cooler pad or chill mat is an accessory for laptop computers that helps reduce their operating temperature, which is normally used when the laptop is unable to sufficiently cool itself. Laptop coolers are intended to protect both the laptop from overheating and the user from suffering heat related discomfort. Poorly designed coolers may use fans which draw more current than allowed by the USB standard. Without correct protection, such devices can cause damage to the USB power supply. Inside the laptop, the USB power-supply has to output an additional amount of watts for the USB-powered fan, thus generating a small amount of additional heat. Thermoelectric cooling pad will utilize this heat to perform work. Hence there is no additional power requirement for cooling it using cooling pad.

## 2. REQUIREMENTS

### 2.1. Thermoelectric module

- The module used is TEC1-12706
- Dimensions: 40mm x 40mm x 3.5mm
- Max. Voltage =12V
- Max. Power=92W
- 127 Thermocouples/Plate

### 2.2. Heat sink with cooling fans

- Deepcool GAMMA ARCHER CPU Cooler sink”
- 20mm Big Airflow Fan ,or similar to it.

### 2.3. Joule Thief Circuit with voltage regulator

- Self-oscillating voltage booster of about 30 times voltage amplification.
- 6V D.C. voltage regulator

### 2.4. Cooling pad skin

- Cooling pad skin will encapsulate all the setup such that the module will touch the hot part of laptop.

## 3. OPERATION

1. When laptop is put over the cooling pad, TEC comes in contact with heating parts.
2. On the other side, sink will extract heat from TEC module.
3. It gives rise to a temperature difference across the opposite faces of module.
4. Hence there will be a production of thermoelectric voltage in the module.
5. Joule thief circuit will magnify the voltage by more than 20-30 folds.
6. DC voltage regulator will regulate the voltage at 6 volts.
7. This output voltage is then supplied to cooling pad fans.
8. The output voltage and speed of cooling fans changes with the temperature of laptop.
9. The essence of setup is that the cooler fans will cool down the laptop as well as the sink giving rise to a stable voltage output.

## 4. RESULTS AND DISCUSSION

The thermoelectric module together with joule-thief circuit and voltage is able to provide approximately 6 Volts which is sufficient for the coolers to work. The total power production depends on the temperature difference on the opposite faces of thermocouple. It is easy to maintain, reliable and energy efficient. No external wires makes the setup simpler than the current pads. Even though this cooling pad is costlier as compared to prevailing cooling pads, the cost can be reduced by using new incoming future technologies and further research on it.

## REFERENCES

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