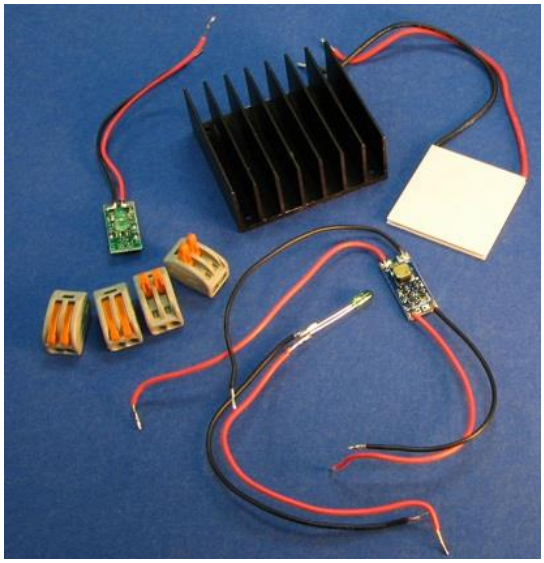
TEG-DMO-ADV DATA SHEET rev 1.1

ADVANCED HAND HEAT THERMOELECTRIC GENERATOR (TEG) DEMONSTRATOR

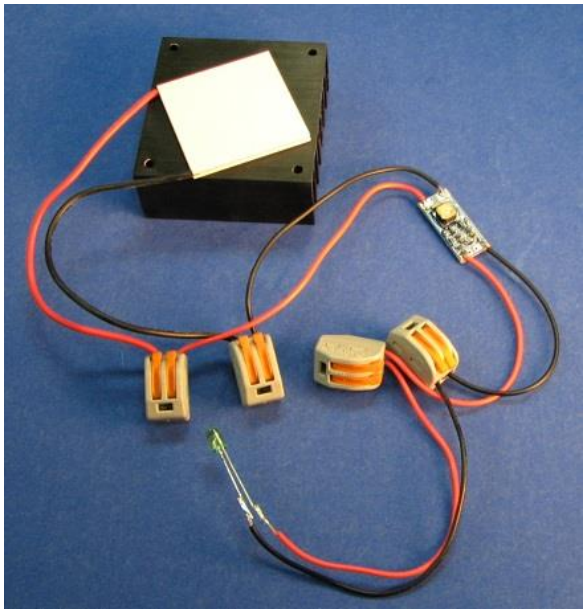
Thermoelectricity is a solid state energy conversion technology that is receiving great interest for energy harvesting applications. By converting the energy from temperature differentials into electricity, it is possible to maintain a battery charge or to directly power devices without batteries, generating power as needed from the environment.

The Advanced Hand Heat TEG Demonstrator contains all the components needed to explore the potential of thermoelectric generation from simple body heat. Kit contents include:



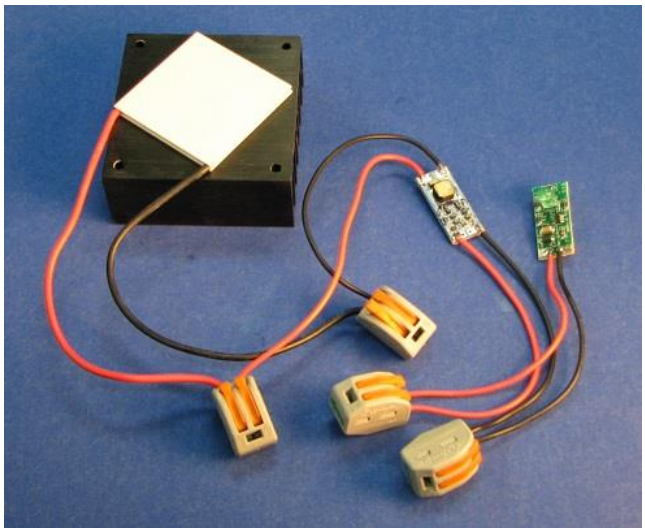
- A 199-couple high performance thermoelectric generator (TEG) rated at 200 °C
- A VB0410-1 bootstrap converter to convert low voltages from the TEG to higher, more useable voltage levels
- A VBStrobe converter that accumulates power and then releases it in bursts
- An anodized heat sink
- A high brightness LED
- Four reusable wire junction “lever nut” connectors
- This instruction sheet with experiments

Thermoelectric Phenomena arise out of the intercoupled electrical and thermal currents in specially designed thermoelectric couples. These couples are connected inside the module in electrical series and thermal parallel. Electricity is generated as heat flows through the elements. This requires a temperature difference between the top and the bottom of the module to drive the thermal currents. If the top of the module is warmer than the bottom then electricity will be generated and will flow in one direction. If the bottom of the module is warmer than the top then electricity will flow in the opposite direction.



Experiment 1: Place the TEG flat on the heat sink with the bootstrap converter and LED attached using the wire junction connectors as shown. Red to red, black to black. Note: to use these, pull the levers up 90° (it takes some effort), insert wires on either side and close the levers. Now place your hand on top of the TEG. Within a few seconds you should see the LED turn on --- you are generating electricity as heat flows from your hand, through the TEG and to the heat sink below.

Experiment 2: Repeat Experiment 1 but this time connect the VBStrobe converter to the output of the bootstrap converter as shown to the right. The VBStrobe converter accumulates energy and then releases it in bursts. A high brightness LED that is built into the VBStrobe will flash brightly at about a 1 Hertz frequency.



Experiment 3: The key to any thermoelectric generation deployment is to maintain a heat flow through the TEG. When the cold side is a heat sink, then that heat sink helps to draw out the heat energy from your hand through the TEG. But if there is no place for the heat to go then the TEG will only generate for a short period before it warms up to the temperature of the heat source (the hand). After it reaches hand temperature, the heat flow through the TEG becomes quite small and so little electricity is generated. To investigate this, repeat the above experiments but this time placing the TEG on top of a cloth or several pieces of paper. Cloth and paper are thermal insulators so you will observe a reduced ability to generate power. This is a key point --- in a TEG application, the cold side is every bit as important as the hot side.

Experiment 4: Repeat the above experiments with a heat sink that has been precooled by placing it in the freezer or immersing it in ice water. You should see a substantial increase in generation.

Experiment 5: Instead of your hand as a heat source, try a warmer object such as a mug of hot coffee (make sure it has a flat bottom) or a pan of hot water. Again, there is a substantial increase in generated power due to higher ΔT across the module. The greater the temperature difference across a module, the greater the generated electrical power.

Experiment 6: In order to maximize generated power it is important to ensure that most of the temperature difference between the source (eg: a hand) and the sink (eg: the heat sink) occurs across the TEG. Temperature drops that occur between the source and the TEG or between the TEG and the sink are non-productive. These “parasitic” drops can be minimized by using a wetting agent like thermal compound, grease or even water. So, repeat one of the earlier experiments with and without a wetting compound between the various interfaces to investigate the difference improved thermal contacts can make.

For further investigations, try the TEG-DVK-03 Waste Heat Power Generation Kit available from: