

HAND HEAT THERMOELECTRIC GENERATOR (TEG) DEMONSTRATOR

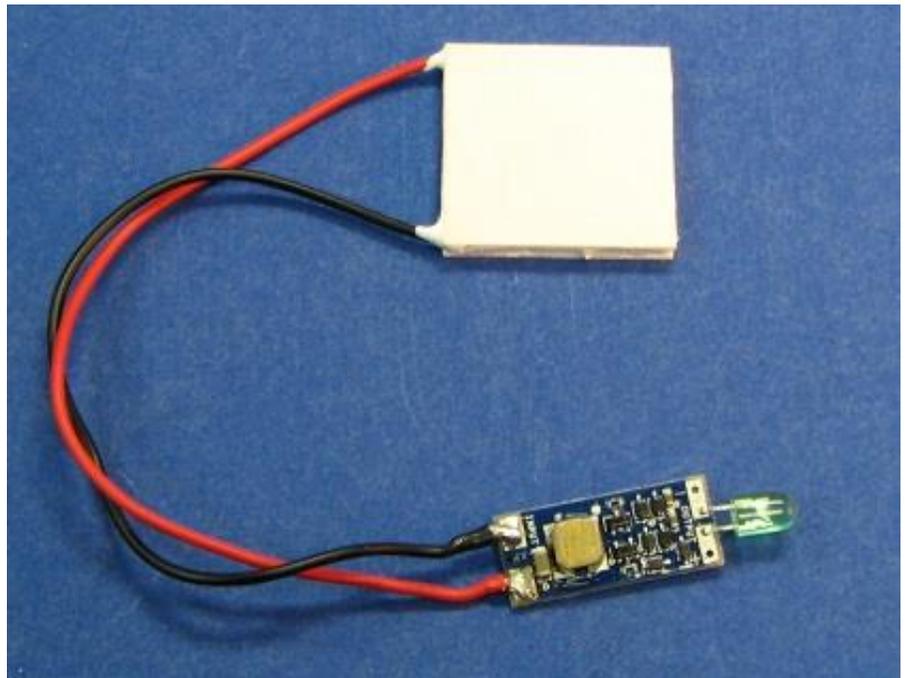
Thermoelectricity is a solid state energy conversion technology that is receiving great interest for energy harvesting applications. By converting the energy from temperature differentials into electricity, it is possible to maintain a battery charge or to directly power devices without batteries, generating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

The Hand Heat TEG Demonstrator contains a prewired assembly to demonstrate the generation of useful electricity from simple body heat. The assembled unit consists of a series connection of:

- A 127-couple high performance thermoelectric generator (TEG) rated at 120 °C
- A VB0410-1 bootstrap converter to convert low voltages from the TEG to higher, more useable voltage levels
- A high brightness LED

Thermoelectric Phenomena

arise out of the intercoupled electrical and thermal currents in specially chosen 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 on a flat surface such as a table top with the orientation shown in the above figure (that is red wire on the upper side when wires come out to the left). This surface should be cooler than your hand. 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 surface below.

Experiment 2: The key to any thermoelectric generation deployment is to maintain a heat flow through the TEG. When the cold side is a good thermal conductor (such as a metal surface) 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 generate only for a short while before it warms up to the temperature of the heat source (the hand). When this happens, there is little heat flow through the module and so there is little electric generation. Improved generation can be obtained by using a heat sink (not included) on the cold side to draw heat away from the bottom of the TEG. So, hand on top, then TEG in the middle, then flat side of a heat sink on the bottom. The bottom is the cold side and will start out at room temperature which is usually cooler than hand temperature. As an alternative to a heat sink, use a frying pan, a cookie sheet or the flat bottom of a kitchen pan as the cold side in your experiments.

Experiment 3: Repeat the above experiments using a heat sink or kitchen pan 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 4: Instead of your hand as a heat source on the top side, 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 5: 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 table, a heat sink or a pan) 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 and record your results.

For Further Investigation, try the TEG-DMO-ADV Advanced Hand Heat Thermoelectric Generator Demonstrator or the TEG-DVK-03 Waste Heat Power Generation Kit, both available for purchase from:



URL: www.customthermoelectric.com
Tel: 1 (443) 926-9135
Email: temodule@customthermoelectric.com



TXL Group, Inc.

URL: www.txlgroup.com
Tel: 1 (915) 533-7800
Email: info@txlgroup.com