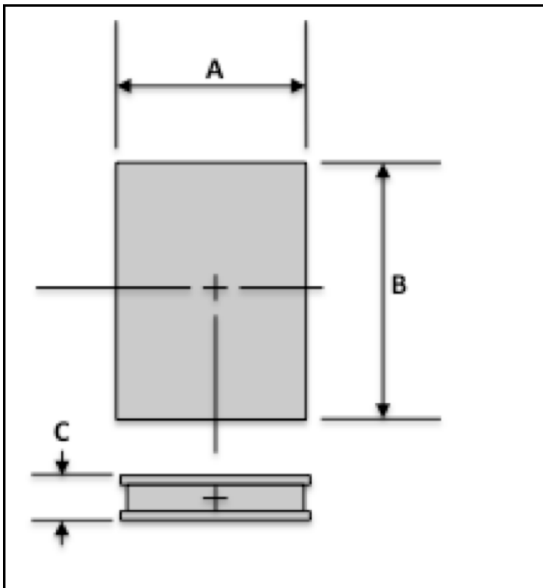
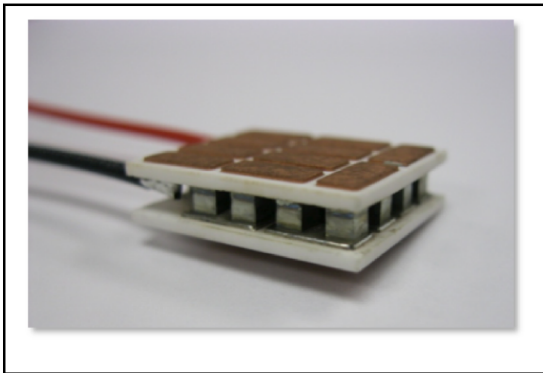




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PBTAGS-200.009A

- **Produce up to 3 watts of power**
- **Operates up to 600C¹**
- **Fully Encapsulated Module**
(Greatly simplifies generator construction)
- **Long Life**
(Up to 20 years)
- **High Performance PbTe and TAGS**
(Up to 12% efficient)



A (cm)	B (cm)	C (cm)
1.7	2.1	0.5

Power Module is designed as a solid state converter of heat to electricity at higher temperatures up to 600°C. It consists of 9 couples of high performing PbTe and TAGS based materials produced using Patented protected proprietary single crystal growth and device technologies. Individual dice are sandwiched between high temperature ceramic plates. Long operational life is possible when used in a reducing atmosphere.

Applications

Power Supplies

- Use waste heat to generate a source of power in remote locations.
- Burn a hydrocarbon fuel to generate a source of power in remote locations.
- Cathodic protection
- Telecommunications

Self Powered Devices

- Heaters
- Water Heaters
- Furnaces
- Vehicle Engine Heaters

Waste Heat Recovery

- Engine exhaust powered alternator replacement
- Industrial operations such as refineries, foundries, glass and cement plants

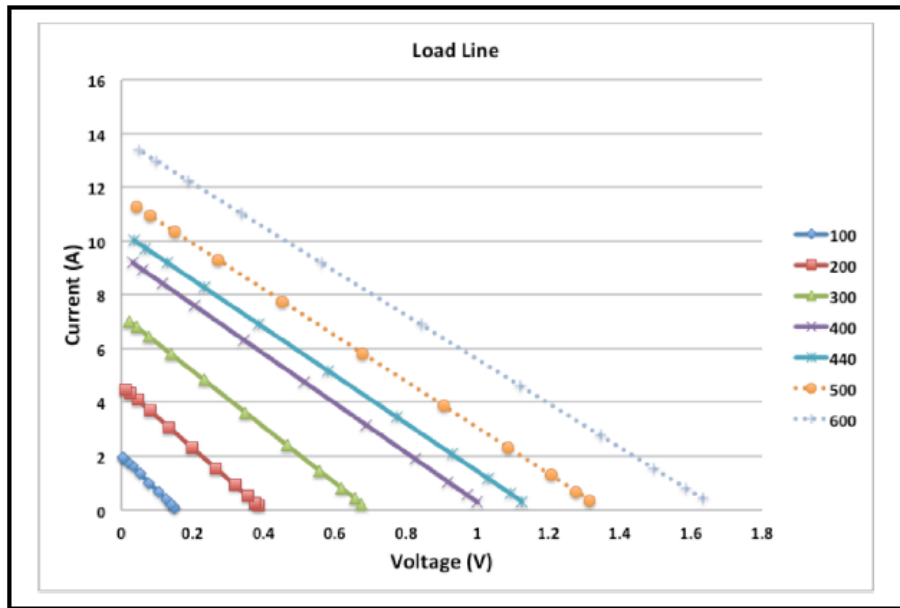
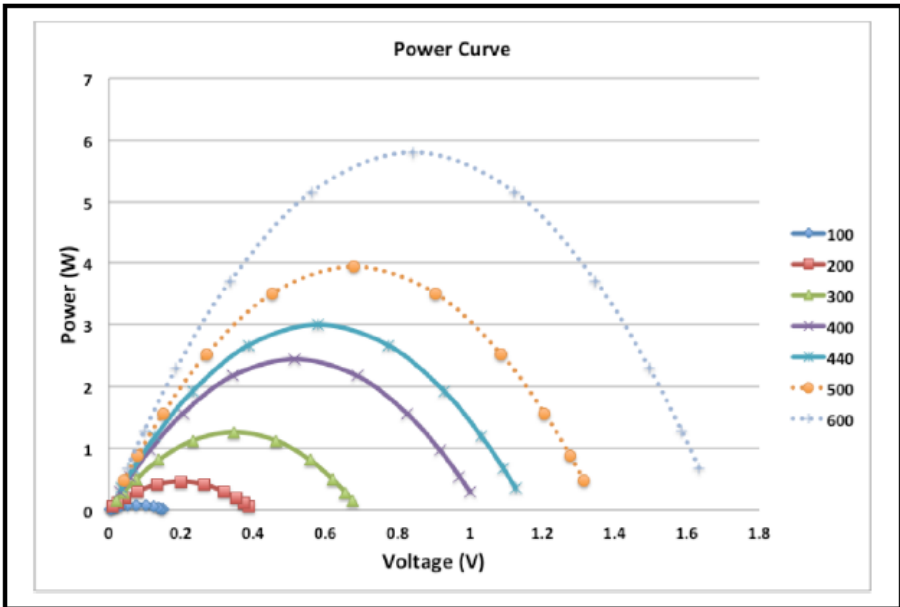
Renewable Energy

- Solar Concentrators
- Wood burning stoves
- Geothermal
- Incinerators



Thermal and Electrical Characteristics

Parameter	Conditions	Min.	Typ.	Max.	Units
Power	$T_h=440C, T_c=25C$ @ matched load		3.0		Watts
Voltage, Open Circuit	$T_h=440C, T_c=25C$		1.2		Volts
Voltage, Matched Load	$T_h=440C, T_c=25C$ @ matched load		0.6		Volts
Internal Resistance	$T_h=440C, T_c=25C$		0.11		Ohms
	$T=25C$		0.09		Ohms
Current	$T_h=440C, T_c=25C$ @ matched load		5		Amps
	$T_h=440C, T_c=25C$ @ short circuit		10		Amps
Heat Flux	$T_h=440C, T_c=25C$ @ matched load				Watts
	$T_h=440C, T_c=25C$ @ open circuit				Watts
Heat Flux Density	$T_h=440C, T_c=25C$ @ matched load				W/cm^2



Application Notes

Topic	Notes
Beta Prototype	<ul style="list-style-type: none">• Test modules have received bench testing consisting of multiple temperature cycles to a temperature difference (DT) of 350C• Base materials have received bench evaluations to 440C• Delivered modules have been tested once up to 300C to ensure internal electrical interconnect forms• High temperature performance based upon previous test experience• High temperature electrical connections (up to 700C) are implemented on the hot side providing better performance stability over multiple heat cycles and sustained high temperatures
Mechanical Interface	<ul style="list-style-type: none">• Plates: AlN with external isolated interconnect metal• Orientation: External connectors tied to cold side• Positive normal compression required at all times (180-240 psi) with stress relief at temperature• Hot Side: Recommend use of high temperature sheet (e.g. Grafoil sheet)• Cold Side: Recommend use of thermal paste
Electrical Connection	<ul style="list-style-type: none">• High temperature wire with male quick connect terminals• All terminals attached on cold side plates• Recommend attaching large interconnect wire (No. 3 or larger)• Fixed support for stress relief
¹ Reliability & Lifetime	<ul style="list-style-type: none">• Some slow degradation may occur at 600C,• Tested to XXX hot/cold cycles to 300C with < 15% degradation