

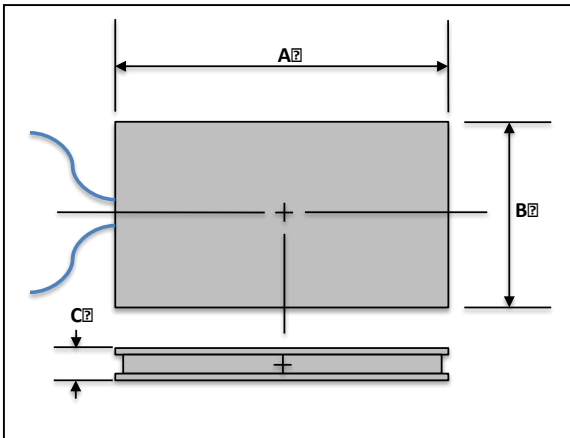
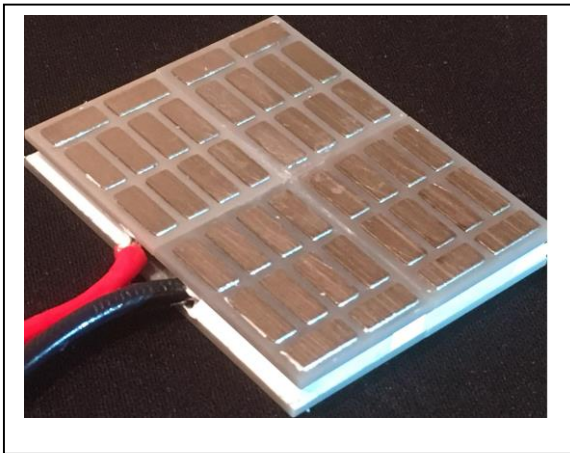


HIGH EFFICIENCY PB/TAGS TEG MODULES

### Thermoelectric Power Generator

#### Features

- Produces up to 12 watts of power at 415C ΔT
- Operates up to 600C<sup>1</sup>
- Projected Max Power 23 watts
- Fully Encapsulated Array  
(Greatly simplifies generator construction)
- High Performance PbTe and TAGS  
(Up to 12% efficient)



A (cm)	B (cm)	C (cm)
3.4	4.2	0.5

#### Description

The Series PBTAGS-200:009A4 Thermoelectric Power Array is designed as a solid state converter of heat to electricity at higher temperatures up to 600°C. It consists of 36 couples of high performing PbTe and TAGS based materials produced using proprietary 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

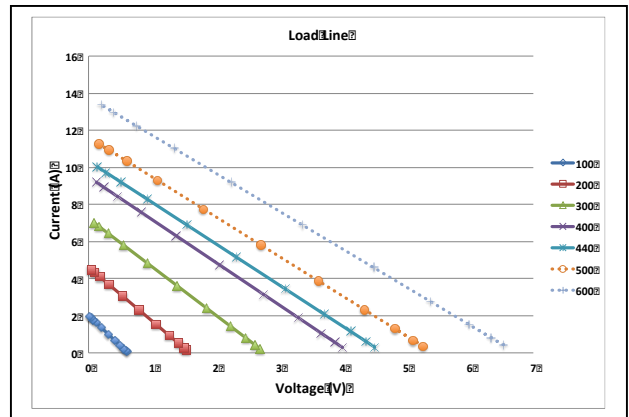
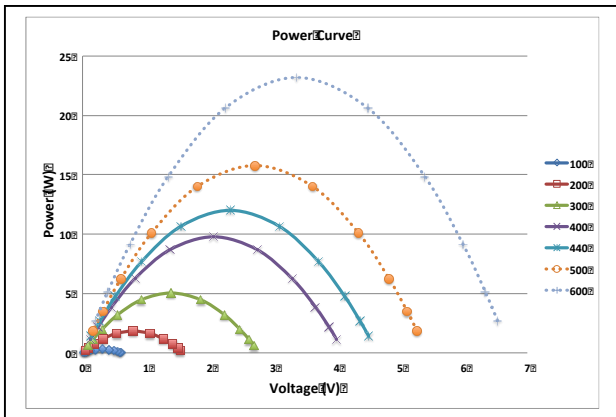
##### Renewable Energy

- 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		12		Watts
Voltage, Open Circuit	$T_h=440C, T_c=25C$		4.5		Volts
Voltage, Matched Load	$T_h=440C, T_c=25C$ @ matched load		2.3		Volts
Internal Resistance	$T_h=440C, T_c=25C$		0.45		Ohms
	$T=25C$		0.29		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 <sup>2</sup>



#### Related Literature

- Quick start guide
- Application & Testing of PBTAGS Modules
- Thermoelectric Calculator



**Application Notes**

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