



Thermoelectric  
Materials • Devices • Systems

# 9 watt module Data Sheet

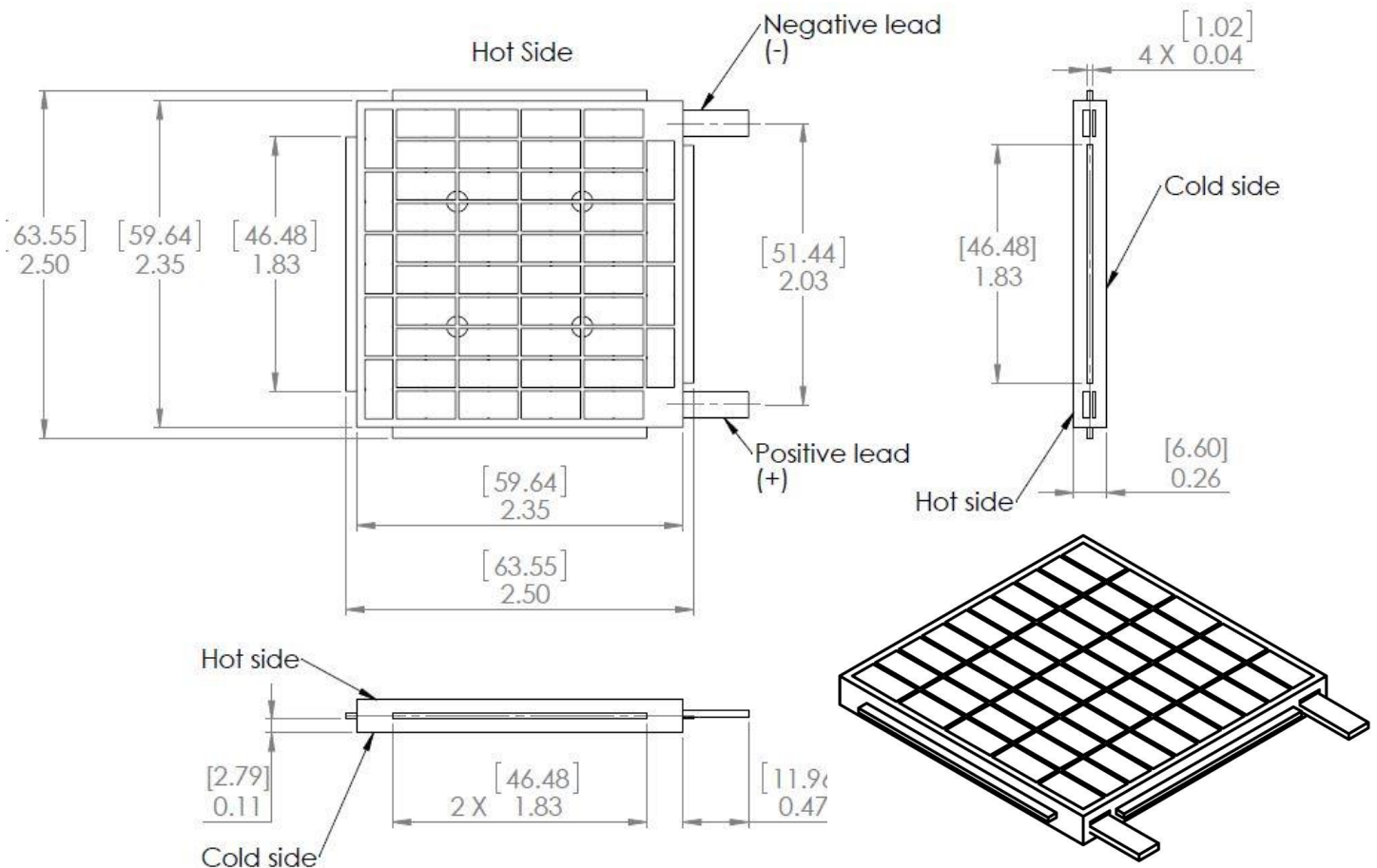
## FEATURES

- **Produces > 9 watts of power**  
( $T_h=250^{\circ}\text{C}$ ,  $T_c=50^{\circ}\text{C}$ )
- **Intermittent Operation up to  $350^{\circ}\text{C}$**
- **Intermittent Power up to 14 watts**
- **Rugged Construction** (no ceramic, no solders, fiber reinforced construction makes module tolerant to abuse)
- **Long life** (> 10 years when properly used)
- **97 couples**  $(\text{Bi,Sb})_2(\text{Te,Se})_3$
- **Produce 7mW @  $\Delta T=5^{\circ}\text{C}$**

## DESCRIPTION

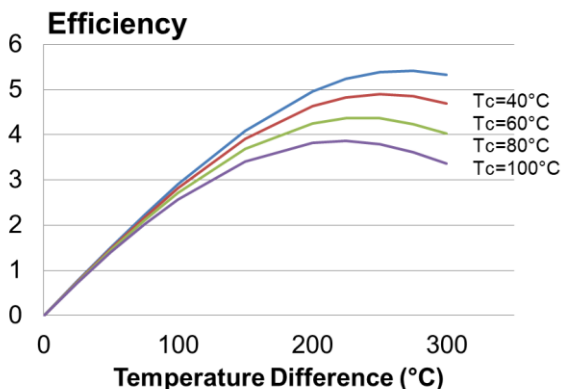
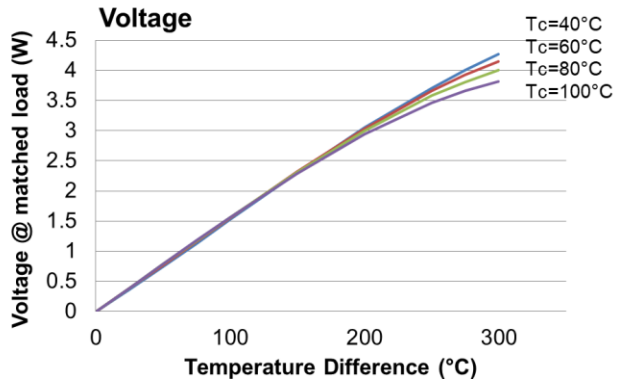
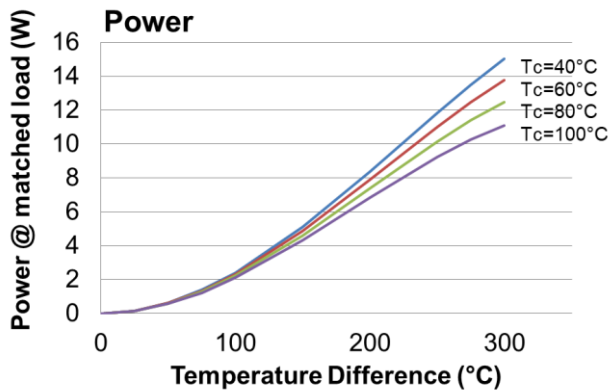
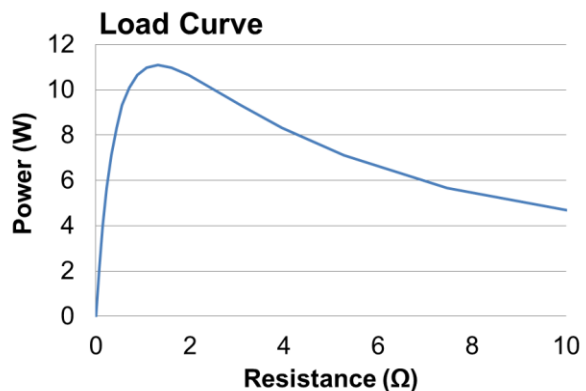
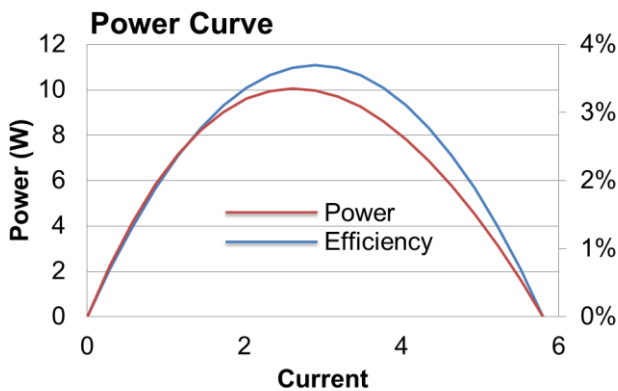
The HZ-9 module is designed for power generation and is able to tolerate intermittent temperatures up to  $350^{\circ}\text{C}$ , but for maximum life expectancy it should not exceed  $250^{\circ}\text{C}$ . These high temperature properties are made possible by the bonded metal conductors that eliminate the presence of all solders.

While the module is optimized for waste heat recovery its reversible properties make it suitable as a thermoelectric cooler, especially for high temperature applications where sensitive electronic equipment must be cooled to below the ambient temperatures.



# 9 watt module Data Sheet

| Thermal and Electrical Characteristics |                                   |      |     |      |                   |
|--|-----------------------------------|------|-----|------|-------------------|
| Parameter                              | Conditions                        | min  | typ | max  | units             |
| Power                                  | Th=250°C, Tc=50°C @ matched load  | 8.5  | 9.0 | 9.5  | Watts             |
| Open Circuit Voltage                   | Th=250°C, Tc=50°C                 | 5.7  | 6.0 | 6.3  | Volts             |
| Matched load Voltage                   | Th=250°C, Tc=50°C                 | 2.85 | 3.0 | 6.15 | Volts             |
| Internal Resistance                    | Th=250°C, Tc=50°C                 | 1.0  | 1.1 | 1.2  | Ω                 |
|  | T = 25°C                          | 0.6  | 0.7 | 0.8  | Ω                 |
| Current                                | Th=250°C, Tc=50°C @ matched load  | 2.5  | 2.6 | 2.7  | Amps              |
|  | Th=250°C, Tc=50°C @ short circuit | 5.0  | 5.2 | 5.4  | Amps              |
| Heat Flux                              | Th=250°C, Tc=50°C @ matched load  | 175  | 185 | 195  | Watts             |
|  | Th=250°C, Tc=50°C open circuit    | 124  | 130 | 136  | Watts             |
| Heat Flux Density                      | Th=250°C, Tc=50°C @ matched load  | 5.2  | 5.5 | 5.8  | W/cm <sup>2</sup> |
| Mass                                   |                                   | 109  | 110 | 111  | grams             |



Stated temperatures are assumed to be on the module surface and not the heat exchangers. Module surfaces are conductive and require the use of an insulator when used against metal heat exchangers. Ceramic wafers with thermal grease provide optimum performance.

Recommended mounting pressure is 100 to 200 psi uniformly distributed over the module surface.

All statements, technical information and recommendations contained herein are based on tests Hi-Z believes to be reliable, but the accuracy or completeness is not guaranteed. Neither seller nor manufacturer shall be liable for any injury, loss or damage including but not limited to special, incidental or consequential damages arising out of the use or the inability to use the product. Before using, user shall determine the suitability of the product for its intended use, and user assumes all risk and liability whatsoever in connection therewith. No statement or recommendation contained herein shall have any force or effect without a signed agreement by all parties.