Knowing the thermal properties of the rocks constituting a geothermal play is critical for the development of robust temperature predictions and evaluations of the potential deliverability and sustainability of thermal energy. Thermal conductivity is the controlling factor of the temperature gradient of cover sequences and is necessary for temperature projections; specific heat capacity controls the bulk thermal energy stored within the resource; and thermal diffusivity influences rate of cooling within a resource and the temperature draw-downs during production. The Portable Electronic Divided Bar (PEDB) is an apparatus for measuring the thermal conductivity and specific heat capacity of rock samples recovered from down-hole drilling. Electronically controlled heating and cooling units regulate the temperature gradient across the rock sample for steady-state and transitory operation, enabling contemporaneous measurement of thermal conductivity and specific heat capacity, while digital data logging records the temperature data to be processed. The PEDB is empirically calibrated to measure the thermal properties of rock samples within a range of surface areas and thicknesses. Advantages of PEDB use are portability and ease of laboratory set up, ability to use a variety of core sizes and shapes, a repeatability of ±1% for thermal conductivity measurements and ±3% for specific heat capacity measurements, measurement of bulk thermal properties for application to formation characterization, and ability to measure poorly consolidated samples.