CLAIMS

1. A system comprising:

a first air chamber;

a burn-in board in thermal communication with the first air chamber, wherein there is a first thermal resistance between the first air chamber and the burn-in board, the burn-in board comprising a socket in which to receive a device under test;

a device package disposed in the socket comprising an electronic device, the electronic device is disposed in the device package, wherein there is a second thermal resistance between the device package and the burn-in board;

a second air chamber; and

a temperature controller comprising a heater and a heat sink, the temperature controller is in thermal communication with the device package, wherein there is a third thermal resistance between the temperature controller and the device package and a fourth thermal resistance between the heater and the heat sink, wherein the fourth thermal resistance between the heater and the heat sink is a variable thermal resistance which is modulated to accommodate higher or lower device power dissipation to provide dynamic control;

wherein the variable thermal resistance allows the fourth thermal resistance between the heater and the heat sink to be varied and is placed between opposing surfaces of the heat sink and a contact element on the device package and the variable thermal resistance is provided by a variable resistance material selected from the group consisting of: a shaped conductive elastomer material, a gallium material, or a phase change material;

wherein a distance between the heat sink and the contact element on the device package is variable, and a surface area and length of the variable resistance material changes as the distance between the heat sink and the device package changes and at least one of the opposing surfaces of the heat sink and the contact element is a contoured surface such that the distance between the opposing surfaces of the heat sink and the contact element is varied due to the contoured surface;

wherein the temperature controller is also in thermal communication with the air chamber, wherein there is a fifth thermal resistance between the heat sink and the second air chamber.

2. The system of claim 1, wherein the phase change material is a solid at room temperature and softens and flows at or above a transition temperature that is above room temperature.

3. The system of claim 1, wherein both opposing surface are contoured and both contours are complementary to each other.

4. The system of claim 1, wherein the shaped conductive elastomer material is impregnated silicone.

5. A system comprising:

a first air chamber

a burn-in board in thermal communication with the first air chamber, wherein there is a first thermal resistance between the first air chamber and the burn-in board, the burn-in board comprising a socket in which to receive a device under test;

a device package disposed in the socket comprising an electronic device, the electronic device disposed in the device package, wherein there is a second thermal resistance between the device package and the burn-in board;

a second air chamber; and

a temperature controller comprising a heater and a heat sink, the temperature controller is in thermal communication with the device package, wherein there is a third thermal resistance between the temperature controller and the device package and a fourth thermal resistance between the heater and the heat sink, wherein the thermal resistance between the heater and the heat sink is a variable thermal resistance which is modulated to accommodate higher or lower device power dissipation to provide dynamic control;

wherein the variable thermal resistance allows the fourth thermal resistance between the heater and the heat sink to be varied; wherein the variable thermal resistance is placed between the heat sink and a contact element on the device package and the variable thermal resistance is provided by a moveable conductor element; wherein the moveable conductor element varies a thermal contact area between the heat sink and the contact element has at least two raised contact surfaces, wherein a surface area of a first raised contact surface is different than a surface area of a second raised contact surface and the moveable conductor element has a first position wherein the first raised contact surface is interposed between the heat sink and the contact element and a second position; wherein the second raised contact surface is interposed between the heat sink and the contact element;

wherein the temperature controller is also in thermal communication with the air chamber, wherein there is a fifth thermal resistance between the heat sink and the air chamber.

6. The system of claim 5, wherein the moveable conductor element has a conductor element with variable dimensions and the moveable conductor element varies the fourth thermal resistance by moving the moveable conductor element to adjust an amount of surface area of the conductor element in contact with the heat sink and the conductor element.

7. A system comprising:

a first air chamber

a burn-in board in thermal communication with the first air chamber, wherein there is a first thermal resistance between the first air chamber and the burn-in board, the burn-in board comprising a socket in which to receive a device under test;

a device package disposed in the socket comprising an electronic device, the electronic device disposed in the device package, wherein there is a second thermal resistance between the device package and the burn-in board;

a second air chamber; and

a temperature controller comprising a heater and a heat sink, the temperature controller is in thermal communication with the device package, wherein there is a third thermal resistance between the temperature controller and the device package and a fourth thermal resistance between the heater and the heat sink, wherein the thermal resistance between the heater and the heat sink is a variable thermal resistance which is modulated to accommodate higher or lower device power dissipation to provide dynamic control;

wherein the variable thermal resistance allows the fourth thermal resistance between the heater and the heat sink to be varied and is placed between opposing surfaces of the heat sink and a contact element on the device package and the variable thermal resistance is provided by a liquid material; wherein the liquid material is retained in a thermally conductive container;

wherein the temperature controller is also in thermal communication with the air chamber, wherein there is a fifth thermal resistance between the heat sink and the air chamber.

8. The system of claim 7, wherein a boiling point of the liquid material is about 25^{o}C to about 150^{o}C and a thermal conductivity of the liquid material is about 0.1 watt/meter ^{o}K to about 0.2 watt/meter ^{o}K.

9. The system of claim 8, wherein the liquid material has conductive rods disposed therein.

10. A system comprising:

a first air chamber

a burn-in board in thermal communication with the first air chamber, wherein there is a first thermal resistance between the first air chamber and the burn-in board, the burn-in board comprising a socket in which to receive a device under test;

a device package disposed in the socket comprising an electronic device, the electronic device disposed in the device package, wherein there is a second thermal resistance between the device package and the burn-in board;

a second air chamber; and

a temperature controller comprising a heater and a heat sink, the temperature controller is in thermal communication with the device package, wherein there is a third thermal resistance between the temperature controller and the device package and a fourth thermal resistance between the heater and the heat sink, wherein the thermal resistance between the heater and the heat sink is a variable thermal resistance which is modulated to accommodate higher or lower device power dissipation to provide dynamic control;

wherein the variable thermal resistance allows the fourth thermal resistance between the heater and the heat sink to be varied and is placed between opposing surfaces of the heat sink and a contact element on the device package and the variable thermal resistance is provided by a sectioned variable thermal resistance comprising at least two sections, a gas section a liquid section; wherein adjusting a pressure in the gas section moves liquid in the liquid section into a thermally conductive path between the heat sink and the contact element;

wherein the temperature controller is also in thermal communication with the air chamber, wherein there is a fifth thermal resistance between the heat sink and the air chamber.

11. The system of claim 1 or claim 10, wherein the heat sink comprises a variable number of fins or sections such that a surface area of the heat sink is adjustable.

12. The system of claim 10, wherein a distance between opposing surfaces of the heat sink and the contact element on the device package is adjustable.

13. The system of claim 10, wherein the liquid section is in a container placed between opposing surfaces of the heat sink and the contact element on the device package, wherein the container receives a liquid spray, wherein a thermal conductivity between the contact element and the heat sink varies with a quantity and a temperature of the liquid spray.

14. The system of claim 10, wherein the liquid is disposed in a closed fluid loop placed between opposing surfaces of the heat sink and the contact element on the device package.

15. The system of claim 1 or claim 10, wherein the variable thermal resistance is further provided by a thermoelectric element placed between opposing surfaces of the heat sink and the contact element on the device package.