HEAT DISSIPATION MODULE

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ABSTRACT
A heat dissipation module suitable for performing heat dissipation on a heat source is provided. The heat dissipation module includes a first base, a first radiator, a thermoelectric cooler and a second radiator. The first base has a first surface and a second surface, wherein the first surface contacts the heat source. Both the first radiator and the thermoelectric cooler contact the second surface, while the second radiator is disposed on the thermoelectric cooler.
FIG. 1 (PRIOR ART)
HEAT DISSIPATION MODULE

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims the priority benefit of China application serial no. 200610001054.5, filed on Jan. 16, 2006. All disclosure of the Taiwan application is incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002] 1. Field of Invention
[0003] The present invention relates to a heat dissipation module, and more particularly to a heat dissipation module with high dissipation effect achieved by using multiple dissipation paths.
[0004] 2. Description of the Related Art
[0005] Along with the continuously increased integration and heat power of the internal components of a modern IC chip, the heat dissipation effect of the heat dissipation system for an IC chip must be accordingly advanced. Usually for a PC (personal computer), the CPU (central processing unit), the graphics processing chips and the chip sets thereof are more likely to become major heat sources under high speed operations, where IC chips are employed to keep running accompanied with generating significant heat energy and increasing the temperatures of electronic components. To enable the IC chips of those electronic components to keep long-time and normal running under high speed operations, the generated heat energy must be quickly removed for reducing an excessive temperature in the IC chips. Otherwise, the temperatures of IC chips are easily beyond the upper limit of operation temperature, which makes the IC chips malfunctioned, even the computer system crashed.

[0006] FIG. 1 is a diagram of a conventional heat dissipation module and the heat source using the same. Referring to FIG. 1, a conventional heat dissipation module 100 includes a thermoelectric cooler 110, wherein a cold side of the thermoelectric cooler 110 directly contacts the surface of a heat source 50, while a hot side of the thermoelectric cooler 110 directly contacts a radiator 120 for obtaining a larger dissipation area. In assistance of a cooling fan disposed inside a computer system, a cooling airflow is provided, and by means of thermal-conduction and thermal-convection, the heat dissipation module 100 is able to quickly dissipate the heat generated by a heat source 50 into the cooler ambient.

[0007] Although the temperature at the cold side of the thermoelectric cooler 110 can fall below the normal ambient temperature, thus a larger temperature-difference is provided to the heat source 50. However, in the conventional heat dissipation module 100, the thermoelectric cooler 110 directly contacting the heat source 50 serves as the only thermal-conduction path for the heat source 50, therefore, the cooling effect is limited. In particular, when the heat power of the heat source 50 is higher than the cooling rate of the thermoelectric cooler 110, the heat generated by the heat source 50 is unable to be quickly dissipated by means of thermal-conduction, which leads to the nonstop temperature increasing with the heat source 50. In the end, an excessive high temperature would spoil the electronic components in the form of temporary or permanent malfunction.

SUMMARY OF THE INVENTION

[0008] An object of the present invention is to provide a heat dissipation module with high dissipation effect.
[0009] To achieve the above-mentioned or other objects, the present invention provides a heat dissipation module suitable for dissipating a heat source. The heat dissipation module includes a first base, a first radiator, a thermoelectric cooler and a second radiator. The first base has a first surface and a second surface, wherein the first surface contacts a heat source. Both the first radiator and the thermoelectric cooler contact the second surface, while the second radiator is disposed on the thermoelectric cooler.
[0010] In an embodiment of the present invention, a cold side of the thermoelectric cooler contacts the second surface, while a hot side of the thermoelectric cooler contacts the second radiator.
[0011] In an embodiment of the present invention, the first radiator and the second radiator are spaced apart at a distance.
[0012] In an embodiment of the present invention, the first radiator includes a base, while the first radiator and the first base are integrated together.
[0013] In an embodiment of the present invention, the first radiator and the first base are formed into a single body.
[0014] In an embodiment of the present invention, the heat dissipation module further includes a heat pipe, wherein the heat pipe is disposed in the first base and contacts the thermoelectric cooler.
[0015] In an embodiment of the present invention, the first radiator includes a plurality of first fins and a second base, while the second radiator includes a plurality of second fins and a third base. Whereas, the first fins are connected to the second base, the second fins are connected to the third base, the second base contacts the first base and the third base contacts the thermoelectric cooler.
[0016] In an embodiment of the present invention, the first radiator includes a heat pipe, wherein the heat pipe contacts the thermoelectric cooler and the second base.
[0017] The heat dissipation module of the present invention uses the first radiator contacting a heat source as the major dissipation path, and uses the thermoelectric cooler and the second radiator coordinated therewith as the auxiliary dissipation path in applications. In comparison with the conventional heat dissipation module, the heat dissipation module of the present invention has two or more than two dissipation paths for removing the heat energy of the heat source. Thus, the heat dissipation module of the present invention is able to have a better dissipation effect.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] The accompanying drawings are included to provide a further understanding of the invention, and are incorporated in and constitute a part of this specification. The drawings illustrate embodiments of the invention and, together with the description, serve for explaining the principles of the invention.
[0019] FIG. 1 is a diagram of a conventional heat dissipation module and the heat source using the same.
FIG. 2 is a schematic exploded drawing of a heat dissipation module provided by the first embodiment of the present invention.

FIG. 3 is a schematic assembly drawing of the heat dissipation module in FIG. 2.

FIG. 4 is a schematic exploded drawing of a heat dissipation module provided by the second embodiment of the present invention.

FIG. 5 is a schematic assembly drawing of the heat dissipation module in FIG. 4.

DESCRIPTION OF THE EMBODIMENTS

FIG. 2 is a schematic exploded drawing of a heat dissipation module provided by the first embodiment of the present invention, while FIG. 3 is a schematic assembly drawing of the heat dissipation module in FIG. 2. Referring to FIGS. 2 and 3, a heat dissipation module 200 of the first embodiment is suitable for cooling a heat source 150, which is, for example, a calorific electronic component, such as a CPU, or a north bridge chip. The heat dissipation module 200 includes a first base 212, a first radiator 214, a thermoelectric cooler 220 and a second radiator 230. The first base 212 has a first surface 212a and a second surface 212b, wherein the first surface 212a of the first base 212 directly contacts the heat source 150. The first radiator 214 is disposed on the first base 212, and the first radiator 214 contacts the second surface 212b of the first base 212. In the embodiment, the first radiator 214 is fixed on the first base 212, so as to integrate with the first base 212 together. In other embodiments, the first radiator 214 and the first base 212 may be formed into a single body. The thermoelectric cooler 220 contacts the second surface 212b of the first base 212, while the second radiator 230 is disposed on the thermoelectric cooler 220.

In the first embodiment, the first radiator 214 includes a plurality of first fins 216 and a second base 218, wherein the first fins 216 are connected to the second base 218, and the second base 218 contacts the first base 212, so that a thermal-conduction is conducted between the first radiator 214 and the heat source 150. The heat energy from the heat source 150 is able, through the first fins 216 of the first radiator 214, to be dissipated into the cooler ambient. In the embodiment, the first fins 216 are used for providing dissipation surfaces required by thermal-convection.

In the first embodiment, the thermoelectric cooler 220 is disposed on the first base 212; the thermoelectric cooler 220 has a cold side 222 and a hot side 224 opposite to the cold side 222, wherein the cold side 222 contacts the second surface 212b of the first base 212, while the hot side 224 contacts the second radiator 230.

In the first embodiment, the second radiator 230 includes a plurality of second fins 234 and a third base 232, wherein the second fins 234 are connected to the third base 232, the third base 232 is disposed on the thermoelectric cooler 220, and the hot side 224 of the thermoelectric cooler 220 directly contacts the third base 232 of the second radiator 230, so that a thermal-conduction is conducted between the thermoelectric cooler 220 and the second radiator 230 and the heat energy at the hot side 224 transferred from the cold side 222 is able, through the second fins 234 of the second radiator 230, to be further dissipated into the cooler ambient. In the embodiment, the second fins 234 of the second radiator 230 are used for providing dissipation surfaces required by thermal-convection.

Note that the second fins 234 of the second radiator 230 and the first fins 216 of the first radiator 214 are spaced apart at a distance. In other words, the first radiator 214 and the second radiator 230 are independent from each other and have no direct contact, which means no thermal-conduction occurs between the first radiator 214 and the second radiator 230. Accordingly in the first embodiment, the heat energy produced by the heat source 150 is able, through the first fins 216 of the first radiator 214, to be dissipated into the ambient; meantime, the heat energy produced by the heat source 150 is also able, through the first base 212, the thermoelectric cooler 220 and the second fins 234 of the second radiator 230, to be dissipated into the ambient.

For better understanding the heat dissipation module of the present invention, the steps for assembling the heat dissipation module 200 provided by the first embodiment of the present invention and the operation manner thereof are described hereinafter.

Continuing to FIG. 2, first, the surfaces of the cold side 220 and the hot side 224 of the thermoelectric cooler 220 are spread with thermally conductive grease, respectively, followed by placing the thermoelectric cooler 220 between the first base 212 and the third base 232 of the second radiator 230. Next, the second radiator 230 is assembled with the first base 212 and it is verified whether or not the second radiator 230 normally contacts the thermoelectric cooler 220. Afterwards, on the first surface 212a of the first base 212 where it would be contacted by the heat source 150, it is spread with thermally conductive glues, followed by assembling the heat dissipation module 200 with the heat source 150. Finally, the thermoelectric cooler 220 is plugged into a power supply, so that the thermoelectric cooler 220 is provided with a voltage to activate the same after the heat source 150 begins to generate heat energy.

Referring to FIGS. 2 and 3, once the heat source 150 begins to generate heat energy, since the first base 212 directly contacts the heat source 150, thus, most of the heat energy of the heat source 150 is conducted to the first radiator 214, and then, through the first fins 216 of the first radiator 214, the heat energy is dissipated into the cooler ambient in thermal-convection manner. Meanwhile, the rest heat energy of the heat source 150 would be conducted to the thermoelectric cooler 220 and further, through the cold side 222 of the thermoelectric cooler 220 (as shown in FIG. 2), the rest heat energy is conducted to the hot side 224 (as shown in FIG. 2). After that, the heat energy is conducted from the hot side 224 to the second radiator 230 and, through the second fins 234 of the second radiator 230, is dissipated into the cooler ambient in thermal-convection manner.

In summary, the heat dissipation module 200 of the first embodiment uses the first radiator 214 coordinated with the thermoelectric cooler 220 and the second radiator 230 to provide two dissipation paths for removing the heat energy come from the heat source 150, so that the heat dissipation module 200 of the first embodiment has a good dissipation effect. Obviously, the user is allowed to increase the numbers of the thermoelectric cooler 220 and the second radiator 230, depending on the real requirement, to provide the heat energy come from the heat source 150 with more dissipation paths for advancing the dissipation effect of the heat dissipation module 200. In addition, at a side of the heat dissipation module 200 or over the heat dissipation module 200, a fan can be disposed (not shown), which would...
provides the heat dissipation module 200 with a forced airflow to further advance the dissipation effect of the heat dissipation module 200.

**[0033]** FIG. 4 is a schematic exploded drawing of a heat dissipation module provided by the second embodiment of the present invention, while FIG. 5 is a schematic assembly drawing of the heat dissipation module in FIG. 4. Referring to FIGS. 2 and 4, any same or similar indication mark in FIGS. 2 and 4 represents a same or similar component. Besides, the disposition positions and the functions of the components in FIG. 4 are the same as or similar to those in FIG. 2 of the first embodiment, thus for simplicity they are omitted to be described and only the differences are explained in the following. The differences of the heat dissipation module 300 of the second embodiment from the heat dissipation module 200 of the first embodiment are: the first radiator 214 of the heat dissipation module 300 of the second embodiment further includes a heat pipe 219; the first base 313 has a different shape from the first base 212 of the first embodiment; the heat dissipation module 300 of the second embodiment further includes another heat pipe 316 which is fixed in the first base 313.

**[0034]** Continuing to FIGS. 4 and 5, the heat pipe 316 is fixed in the first base 313 and an end of the heat pipe 316 contacts the cold side 222 of the thermoelectric cooler 220. The heat pipe 316 is based on an operation principle that the working fluid filling the capillary structure of the heat pipe is thermally vaporized by heat and becomes hot vapor air, and then between the hot vapor air and the cool air at a place with lower temperature, a natural convection is spontaneously generated, which enables the heat energy of the heat source 150 to be evenly diffused into the first base 313. In the embodiment, the heat pipe 316 can be integrated with the first base 313, or the heat pipe 316 and the heat pipe 316 are formed into a single body.

**[0035]** Continuing to FIGS. 4 and 5, an end of the heat pipe 219 is disposed between the second base 218 and the first fins 216, while another end thereof is fixed in the first base 313 and contacts the cold side 222 of the thermoelectric cooler 220. In this way, by using the heat pipe 219 to connect the second base 218 of the first radiator 214 to the cold side 222 of the thermoelectric cooler 220, the heat energy come from the heat source 150 can be dissipated into the ambient through the first fins 216 of the first radiator 214. Furthermore, a portion of the heat energy come from the heat source 150 is, through the thermoelectric cooler 220, conducted to the second radiator 230 and then is, through the second radiator 230, dissipated into the ambient.

**[0036]** Note that although the heat dissipation module 300 of the second embodiment in FIGS. 4 and 5 possesses both the heat pipe 316 and the heat pipe 219, but anyone skilled in the art should be aware that a single heat pipe 316 or 219 is capable of advancing the heat dissipation effect of the heat dissipation module 300 already. Accordingly, the second embodiment does not limit that the heat dissipation module 300 must possess both heat pipes 316 and 219. In addition, a fan can be disposed either at a side of or over the heat dissipation module 300 of the second embodiment for advancing the heat dissipation effect of the heat dissipation module 300.

**[0037]** In summary, the heat dissipation module of the present invention uses the first radiator contacting a heat source as the major dissipation path, and uses the thermoelectric cooler and the second radiator coordinated therewith as the auxiliary dissipation path to provide two or more than two dissipation paths in an application, so that the heat energy of the heat source can be more quickly removed. In comparison with the conventional heat dissipation module where only a single dissipation path is provided, the heat dissipation module of the present invention with multiple dissipation paths has a better dissipation effect.

**[0038]** It will be apparent to those skilled in the art that various modifications and variations can be made to the structure of the present invention without departing from the scope or spirit of the invention. In view of the foregoing, it is intended that the specification and examples to be considered as exemplary only, with a true scope and spirit of the invention being indicated by the following claims and their equivalents.

What is claimed is:

1. A heat dissipation module, suitable for performing heat dissipation on a heat source, the heat dissipation module comprising:
   a first base, having a first surface and a second surface, wherein the first surface contacts the heat source;
   a first radiator, contacting the second surface;
   a thermoelectric cooler, contacting the second surface; and
   a second radiator, disposed on the thermoelectric cooler.

2. The heat dissipation module as recited in claim 1, wherein a cold side of the thermoelectric cooler contacts the second surface, while a hot side of the thermoelectric cooler contacts the second radiator.

3. The heat dissipation module as recited in claim 1, wherein the first radiator and the second radiator are spaced apart at a distance.

4. The heat dissipation module as recited in claim 1, wherein the first radiator and the first base are integrated together.

5. The heat dissipation module as recited in claim 1, wherein the first radiator and the first base are formed into a single body.

6. The heat dissipation module as recited in claim 1, further comprising a heat pipe, disposed in the first base and contacting the thermoelectric cooler.

7. The heat dissipation module as recited in claim 1, wherein the first radiator comprises a plurality of first fins and a second base, the second radiator comprises a plurality of second fins and a third base, the first fins are connected to the second base, the second fins are connected to the third base, the second base contacts the first base, and the third base contacts the thermoelectric cooler.

8. The heat dissipation module as recited in claim 7, wherein the first radiator further comprises a heat pipe and the heat pipe contacts the thermoelectric cooler and the second base.