the second semiconductor switch and electrically connected with the corresponding fourth conducting terminals of the second diode. The fifth electrode is electrically connected with the corresponding third conducting terminal. The fourth electrode and the fifth electrode are contacted with the corresponding second conducting parts. The sixth electrode is contacted with the third conducting part.

[0010] In accordance with another aspect of the present invention, there is provided a power module. The power module includes a first sub-module and at least one second sub-module. The first sub-module includes at least one first semiconductor switch, at least one first diode, a first electrode, at least one second electrode, at least one third electrode, at least one first lead electrode, at least one second lead electrode and a substrate. The at least one first semiconductor switch and the at least one first diode are embedded within the substrate. Each first semiconductor switch comprises plural first conducting terminals. Each first diode comprises plural second conducting terminals. The first electrode is electrically connected with the corresponding first conducting terminal of the at least one first semiconductor switch and the corresponding second conducting terminal of the at least one first diode. The third electrode is electrically connected with the corresponding first conducting terminal of the at least one first semiconductor switch and the corresponding second conducting terminal of the at least one first diode. The second electrode is electrically connected with the corresponding first conducting terminal of the at least one first semiconductor switch. The at least one second sub-module is disposed on the first sub-module. The second sub-module includes a second semiconductor switch, a second diode, a fourth electrode, a fifth electrode and a sixth electrode. The second semiconductor switch includes plural third conducting terminals. The second diode includes

the second conductive layer 34, the bottom surface 333 of the first insulation layer 33 is partially covered by the second insulation layer 35.

[0057] Moreover, the first sub-module 8 further comprises a first thermal conduction structure 80 and a second thermal conduction structure 81. The first thermal conduction structure 80 and the second thermal conduction structure 81 are embedded within the first insulation layer 33. The first thermal conduction structure 80 is located near the first semiconductor switch 30, disposed on the junction between the bottom surface 333 of the first insulation layer 33 and the second insulation layer 35, and partially exposed outside the first insulation layer 33. Consequently, the heat generated by the first semiconductor switch 30 may be transferred to the surroundings of the first sub-module 8 through the first thermal conduction structure 80. The second thermal conduction structure 81 is located near the first diode 31, disposed on the second conductive layer 34, and partially exposed outside the first insulation layer 33. Consequently, the heat generated by the first diode 31 may be transferred to the surroundings of the first sub-module 8 through the second thermal conduction structure 81.

[0058] In an embodiment, the first thermal conduction structure 80 and the second thermal conduction structure 81 are made of metallic material. Moreover, the first thermal conduction structure 80 and the second thermal conduction structure 81 may be implemented with the same lead frame or two different lead frames. Consequently, the first thermal conduction structure 80 and the second thermal conduction structure 81 have thermally conductive property and electrically conductive property. Moreover, the second ends of the second conductive vias 331 are contacted with the second thermal conduction structure 81. Consequently, the first conducting terminal 300 of the first semiconductor switch 30 in contact

with the second conductive layer 34 and the second conducting terminal 310 of the first diode 31 in contact with the second conductive layer 34 are electrically connected with the first electrode 320 through the second conductive layer 34, the second thermal conduction structure 81 and the second conductive vias 331. Moreover, at least one auxiliary conductive via 830 is further formed in the first insulation layer 33. A first end of the auxiliary conductive via 830 is contacted with the second electrode 321. A second end of the auxiliary conductive via 830 is contacted with the first thermal conduction structure 80. After the heat generated by the first semiconductor switch 30 is transferred to the second electrode 321, the heat may be further transferred to the first thermal conduction structure 80 through the auxiliary conductive via 830. Under this circumstance, the heat dissipating efficiency is enhanced.

[0059] FIG. 9 is a schematic cross-sectional view illustrating a further exemplary second sub-module of the power module of FIG. 1. The second sub-module 9 comprises a second semiconductor switch 90, a second diode 91, a fourth conductive layer 92, a third insulation layer 93, a fifth conductive layer 94, a fourth insulation layer 95, a sixth conductive layer 96, a first thermal conduction structure 97 and a second thermal conduction structure 98. Moreover, plural third conductive vias 930 and plural fourth conductive vias 931 are formed in the third insulation layer 93. The fourth conductive layer 92 is disposed on a top surface 932 of the third insulation layer 93. The fourth conductive layer 92 is divided into a fourth electrode 920, a fifth electrode 921 and a sixth electrode 922 by an etching process.

[0060] The fifth conductive layer 94 is electroplated on bottom surface 933 of the third insulation layer 93. Moreover, by an etching process, the fifth conductive layer 94 is divided into a first conductive

block 940 and a second conductive block 941. The first conductive block 940 is contacted with the second ends of the corresponding third conductive vias 930 and contacted with the second ends of the corresponding fourth conductive vias 931. The second conductive block 941 is contacted with the second end of the corresponding third conductive via 930 and the second ends of the corresponding fourth conductive vias 931. The fourth insulation layer 95 is laminated on the fifth conductive layer 94. The sixth conductive layer 96 is electroplated on the fourth insulation layer 95.

[0061] The configurations and characteristics of the second semiconductor switch 90 are similar to those of the second semiconductor switch 40 of FIG. 5. The second semiconductor switch 90 comprises three third conducting terminals 900. The three third conducting terminals 900 serve as a gate, an emitter and a collector, respectively. The second semiconductor switch 90 is embedded within the third insulation layer 93. The third conducting terminals 900 serving as the gate and the emitter of the second semiconductor switch 90 are disposed on a bottom surface 902 of the second semiconductor switch 90. The third conducting terminal 900 serving as the gate of the second semiconductor switch 90 is contacted with the first end of the corresponding third conductive via 930 so as to be electrically connected with the first conductive block 940. The third conducting terminal 900 serving as the emitter of the second semiconductor switch 90 is contacted with the first ends of the corresponding third conductive vias 930 so as to be electrically connected with the second conductive block 941. The third conducting terminal 900 serving as the collector is disposed on a top surface 901 of the second semiconductor switch 90 and contacted with the sixth electrode 922.

[0062] Similarly, the second diode 91 is embedded within the third insulation layer 93. The fourth conducting terminal 910 on a top surface 911 of the second diode 91 serves as a cathode, and contacted with the sixth electrode 922. The fourth conducting terminal 910 on a bottom surface 912 of the second diode 91 serves as an anode, and contacted with the corresponding third conductive vias 930 so as to be electrically connected with the second conductive block 941.

[0063] The first thermal conduction structure 97 and the second thermal conduction structure 98 are embedded within the third insulation layer 93. The first thermal conduction structure 97 is located near the second semiconductor switch 90, contacted with the fifth electrode 921, and contacted with the first ends of the corresponding fourth conductive vias 931 so as to be electrically connected with the first conductive block 940. Moreover, the first thermal conduction structure 97 is partially exposed outside the first insulation layer 93. Consequently, the heat generated by the second semiconductor switch 90 may be transferred to the surroundings of the second sub-module 9 through the first thermal conduction structure 97. Moreover, the third conducting terminal 900 serving as the gate of the second semiconductor switch 90 is electrically connected with the fifth electrode 921 through the corresponding third conductive via 930, the first conductive block 940, the corresponding fourth conductive vias 931 and the first thermal conduction structure 97. The second thermal conduction structure 98 is located near the second diode 91, contacted with the fourth electrode 920, and contacted with the first ends of the corresponding fourth conductive vias 931 so as to be electrically connected with the second conductive block 941. Moreover, the second thermal conduction structure 98 is partially exposed outside the first insulation layer 93. Consequently, the heat generated by the second

the active heat dissipation device includes but is not limited to cooling water or heat pipe.

[0069] In this embodiment, the first heat dissipation device 110 and the second heat dissipation device 111 are disposed on the substrate 2 of the power module 11 with the controlling device 100. It is noted that the first heat dissipation device 110 and the second heat dissipation device 111 may be included in the power module without the controlling device (e.g. the power module 1 of FIG. 1).

[0070] FIG. 12 is a schematic perspective view illustrating a power module according to a fourth embodiment of the present invention. In comparison with the power module 11 of FIG. 11, the power module 12 of this embodiment further comprises at least one pin 120. The pin 120 is made of metallic material, and disposed on an edge of the first surface 23 of the substrate 2. Moreover, the at least one pin 120, the first sub-module 3 and the second sub-module 4 are located at the same side of the substrate 2. The at least one pin 120 is mounted on the substrate 2 by a solder paste welding process, a ultrasonic welding process, a hot pressure welding process, an electric welding process or a mechanical embedding process. Through the at least one pin 120, the power module 12 may be welded on a system circuit board (not shown).

[0071] FIG. 13 is a schematic perspective view illustrating a power module according to a fifth embodiment of the present invention. FIG. 14 is a schematic cross-sectional view illustrating the relationship between the first sub-module and the plural second sub-modules of the power module of FIG. 13. Please refer to FIGS. 13 and 14. The power module 13 comprises a first sub-module 130 and at least one second sub-module 9. The configurations of the second sub-module 9 of this embodiment are identical to those of the second sub-module 9 of FIG. 9. However, the

second sub-module 9 of this embodiment is upside down. Component parts and elements corresponding to those of the second sub-module 9 of FIG. 9 are designated by identical numeral references, and detailed descriptions thereof are omitted.

[0072] The first sub-module 130 comprises at least one first semiconductor switch 131, at least one first diode 132, a first electrode 133, at least one second electrode 134, at least one third electrode 135, at least one first lead electrode 136, at least one second lead electrode 137 and a substrate 138. The power module 13 of this embodiment may also have the circuitry of the three-phase power converter of FIG. 3. When the power module 13 is applied to the three-phase power converter, the power module 13 comprises the first sub-module 130 and three second sub-modules 9. Under this circumstance, the first sub-module 130 comprises three first semiconductor switches 131, three first diodes 132, three second electrodes 134, three third electrodes 135, three first lead electrodes 136 and three second lead electrodes 137.

[0073] Each first semiconductor switch 131 and the corresponding first diode 132 are in a pair, and embedded within the substrate 138. Each first semiconductor switch 131 comprises plural first conducting terminals 1310. Each first diode 132 comprises plural second conducting terminals 1320. The first electrode 133, the second electrodes 134, the third electrodes 135, the first lead electrodes 136 and the second lead electrodes 137 are disposed on a top surface 1382 of the substrate 138. The first electrode 133 is electrically connected with the corresponding first conducting terminals 1310 of the first semiconductor switches 131. Each third electrode 135 is electrically connected with the corresponding first conducting terminal 1310 of the corresponding first semiconductor switch 131. The first electrode 133 is also electrically connected with the

corresponding second conducting terminals 1320 of the first diodes 132. Each third electrode 135 is also electrically connected with the corresponding second conducting terminal 1320 of the corresponding first diode 132. Each second electrode 134 is electrically connected with the corresponding first conducting terminal 1310 of the corresponding first semiconductor switch 131. Each first lead electrode 136 is aligned with the fourth electrode 920 of the corresponding second sub-module 9. Each second lead electrode 137 is aligned with the fifth electrode 921 of the corresponding second sub-module 9.

[0074] For example, a first conductive layer is firstly electroplated on the top surface 1382 of the substrate 138. Then, the first conductive layer is divided into the first electrode 133, the second electrodes 134 and the third electrodes 135 by an etching process. An example of the first semiconductor switch 131 includes but is not limited to an insulated-gate bipolar transistor (IGBT). Consequently, the first semiconductor switch 131 comprises three first conducting terminals 1310. The three first conducting terminals 1310 serve as a gate, an emitter and a collector, respectively. The first electrode 133 is electrically connected with the collectors of the first semiconductor switches 131. The second electrode 134 is electrically connected with the gate of the corresponding first semiconductor switch 131. The third electrode 135 is electrically connected with the emitter of the corresponding first semiconductor switch 131.

[0075] The second sub-modules 9 are located at a first side of the first sub-module 130, and located near the top surface 1382 of the substrate 138. The fourth electrode 920 of the second sub-module 9 is contacted with the corresponding first lead electrode 136 of the first sub-module 130. The fifth electrode 921 of the second sub-module 9 is contacted with the

corresponding second lead electrode 137 of the first sub-module 130. The sixth electrode 922 of the second sub-module 9 is contacted with the corresponding third electrode 135 of the first sub-module 130.

[0076] The first sub-module 130 further comprises a second conductive layer 140, a second insulation layer 141 and a third conductive layer 142. The second insulation layer 141 is disposed on a bottom surface 1383 of the substrate 138 and exposed outside the substrate 138. The second conductive layer 140 is disposed on a top surface 1410 of the second insulation layer 141 and embedded within the substrate 138. The third conductive layer 142 is disposed on a bottom surface 1411 of the second insulation layer 141. That is, the second conductive layer 140 and the third conductive layer 142 are located at two opposite sides of the second insulation layer 141.

[0077] Moreover, plural first conductive vias 1380 and at least one second conductive via 1381 are formed in the substrate 138. The first electrode 133 is contacted with the first end of the corresponding second conductive via 1381. The second electrode 134 and the third electrode 135 are contacted with the first ends of the corresponding first conductive vias 1380. The second conductive layer 140 is contacted with the second end of the corresponding second conductive via 1381, and electrically connected with the first electrode 133 through the corresponding second conductive via 1381. The first conducting terminals 1310 serving as the gate and the first conducting terminals 1310 serving as the emitter of the first semiconductor switch 1310 are disposed on a top surface 1311 of the first semiconductor switch 131. The first conducting terminals 1310 serving as the collector of the first semiconductor switch 131 is disposed on a bottom surface 1312 of the first semiconductor switch 131. Moreover, the gate of the first semiconductor switch 131 is contacted with a second

end of the corresponding first conductive via 1380 so as to be electrically connected with the corresponding second electrode 134. The emitter of the first semiconductor switch 131 is contacted with the second ends of the corresponding first conductive vias 1380 so as to be electrically connected with the corresponding third electrode 135. The collector of the first semiconductor switch 131 is disposed on and electrically connected with the second conductive layer 140. Moreover, the collector of the first semiconductor switch 131 is electrically connected with the corresponding first electrode 133 through the second conductive layer 140 and the plural second conductive vias 1381. Moreover, the first semiconductor switch 131 is attached on the second conductive layer 140 through a fixing material 38.

[0078] Similarly, the first diode 132 may be attached on the second conductive layer 140 through the fixing material 38. The second conducting terminal 1320 on a top surface 1321 of the first diode 132 serves as an anode. Moreover, the anode of the first diode 132 is contacted with the second ends of the corresponding first conductive vias 1380 so as to be electrically connected with the third electrode 135. The second conducting terminal 1320 on a bottom surface 1322 of the first diode 132 serves as a cathode. Moreover, the cathode of the first diode 132 is disposed on the second conductive layer 140 and electrically connected with the first electrode 133 through the second conductive layer 140 and the plural second conductive vias 1381.

[0079] Moreover, each second sub-module 9 and the corresponding first semiconductor switch 131 and the corresponding first diode 132 of the first sub-module 130 are collaboratively defined as a leg of the bridge circuit. In particular, the second sub-module 9 is formed as a low-voltage-side switching element of the bridge circuit, and the

corresponding first semiconductor switch 131 and the corresponding first diode 132 of the first sub-module 130 are formed as a high-voltage-side switching element of the bridge circuit.

[0080] As mentioned above, the first semiconductor switch 131 and corresponding first diode 132 are embedded within the substrate 138 of the first sub-module 130, and the second semiconductor switch 90 and the second diode 91 are embedded within the third insulation layer 93 of the second sub-module 9. Since the second sub-module 9 and the first sub-module 130 are located at different levels, the connection distance between the high-voltage-side switching element and the low-voltage-side switching element is effectively shortened. Under this circumstance, the on-resistance is effectively reduced, the parasitic effect is reduced, the electrical property is enhanced, and the overall power density of the power module 13 is increased.

[0081] FIG. 15 is a schematic perspective view illustrating a power module according to a sixth embodiment of the present invention. In comparison with the power module 13 of FIG. 13, the power module 15 of this embodiment further comprises a first heat dissipation device 150 and/or a second heat dissipation device 151. The first heat dissipation device 150 is disposed on the top surfaces of the second sub-modules 9, and contacted with the sixth conductive layer 96 of the second sub-modules 9 (see FIG. 14). That is, the first heat dissipation device 150 is located at a first side of the power module 15. Consequently, the heat dissipating efficacy of the second sub-modules 9 will be enhanced. The second heat dissipation device 151 is disposed on a bottom surface of the first sub-module 130 and contacted with the third conductive layer 142 of the first sub-module 130 (see FIG. 14). Consequently, the heat dissipating efficacy of the first sub-module 130 will be enhanced.

[0082] In an embodiment, each of the first heat dissipation device 150 and the second heat dissipation device 151 may be a passive heat dissipation device or an active heat dissipation device. An example of the passive heat dissipation device includes but is not limited to a heat sink, which is made of metallic material or ceramic material. An example of the active heat dissipation device includes but is not limited to cooling water or heat pipe.

[0083] FIG. 16 is a schematic perspective view illustrating a power module according to a seventh embodiment of the present invention. FIG. 17 is a schematic cross-sectional view illustrating the relationship between the first sub-module and the second sub-module of the power module of FIG. 16. Please refer to FIGS. 16 and 17. In comparison with the power module 13 of FIG. 13, the power module 16 of this embodiment has a single second sub-module 160. That is, the plural second sub-modules 9 of the power module 13 of FIG. 13 are integrated into the single second sub-module 160. Component parts and elements corresponding to those of the power module 13 of FIG. 13 are designated by identical numeral references, and detailed descriptions thereof are omitted.

[0084] The second sub-module 160 comprises plural second semiconductor switches 90 and plural second diodes 91. Each second semiconductor switch 90 and the corresponding second diode 91 are collaboratively defined as a low-voltage-side switching element of one leg of a bridge circuit. The second sub-module 160 further comprises a fourth conductive layer 92, a third insulation layer 93, a fifth conductive layer 94, a fourth insulation layer 95, a sixth conductive layer 96, a first thermal conduction structure 97 and a second thermal conduction structure 98. The configurations of each second semiconductor switch 90, each second diode 91, the fourth conductive layer 92, the third insulation layer 93, the

fifth conductive layer 94, the fourth insulation layer 95, the sixth conductive layer 96, the first thermal conduction structure 97 and the second thermal conduction structure 98 are the connecting relationships between these components are similar to those of the plural second sub-modules 9 of FIGS. 14 and 15, and are not redundantly described herein.

[0085] Moreover, the numbers of the first semiconductor switches 131, the first diodes 132, the second electrodes 134, the third electrodes 135, the first lead electrodes 136 and the second lead electrodes 137 of the first sub-module 130 and the fourth electrodes 920, the fifth electrodes 921 and the sixth electrodes 922 of the second sub-module 160 are identical to the numbers of the second semiconductor switches 90 and the second diodes 91 of the second sub-module 160.

[0086] FIG. 18 is a schematic perspective view illustrating a power module according to an eighth embodiment of the present invention. In comparison with the power module 16 of FIG. 16, the power module 18 of this embodiment further comprises a first heat dissipation device 180 and/or a second heat dissipation device 181. The first heat dissipation device 180 is disposed on the top surfaces of the second sub-module 160, and contacted with the sixth conductive layer 96 of the second sub-modules 160 (see FIG. 17). That is, the first heat dissipation device 180 is located at a first side of the power module 18. Consequently, the heat dissipating efficacy of the second sub-modules 160 will be enhanced. The second heat dissipation device 181 is disposed on a bottom surface of the first sub-module 130 and contacted with the third conductive layer 142 of the first sub-module 130 (see FIG. 17). Consequently, the heat dissipating efficacy of the first sub-module 130 will be enhanced.

WHAT IS CLAIMED IS:

1. A power module, comprising:

a substrate comprising plural first conducting parts, plural second conducting parts and at least one third conducting part;

at least one first sub-module disposed on the substrate, wherein each of the at least one first sub-module comprises a first semiconductor switch, a first diode, a first electrode, a second electrode and a third electrode, wherein the first semiconductor switch comprises plural first conducting terminals, and the first diode comprises plural second conducting terminals, wherein the first electrode and the third electrode are electrically connected with corresponding ones of the first conducting terminals of the first semiconductor switch and electrically connected with corresponding ones of the second conducting terminals of the first diode, and the second electrode is electrically connected with a corresponding one of the first conducting terminals, wherein the first electrode and the second electrode are contacted with corresponding ones of the first conducting parts, and the third electrode is contacted with the at least one third conducting part; and

at least one second sub-module disposed on the substrate, wherein each of the at least one second sub-module comprises a second semiconductor switch, a second diode, a fourth electrode, a fifth electrode and a sixth electrode, wherein the second semiconductor switch comprises plural third conducting terminals, and the second diode comprises plural fourth conducting terminals, wherein the fourth electrode and the sixth electrode are electrically connected with corresponding ones of the third conducting terminals of the second semiconductor switch and electrically connected with corresponding ones of the fourth conducting terminals of the second diode, and the fifth electrode is electrically connected with a corresponding one of the third conducting terminals, wherein the fourth electrode and the

fifth electrode are contacted with the corresponding one of the second conducting parts, and the sixth electrode is contacted with the third conducting part.

2. The power module according to claim 1, wherein each of the at least one first sub-module is formed as a high-voltage-side switching element of a bridge circuit, and each of the at least one second sub-module is formed as a low-voltage-side switching element of the bridge circuit.

3. The power module according to claim 2, wherein the first semiconductor switch is an insulated-gate bipolar transistor, and the first semiconductor switch comprises three of the first conducting terminals, wherein the three of the first conducting terminals serve as a gate, an emitter and a collector, respectively, wherein the first electrode is electrically connected with the collector of the first semiconductor switch, the second electrode is electrically connected with the gate of the first semiconductor switch, and the third electrode is electrically connected with the emitter of the first semiconductor switch.

4. The power module according to claim 3, wherein each of the at least one first sub-module further comprises:

a first insulation layer, wherein plural first conductive vias and plural second conductive vias are formed in the first insulation layer;

a first conductive layer disposed on a top surface of the first insulation layer, and divided into the first electrode, the second electrode and the third electrode, wherein the first electrode is contacted with a first end of a corresponding one of the second conductive vias, and the second electrode and the third electrode are contacted with a first end of the corresponding one of the first conductive vias;

a second insulation layer disposed on a bottom surface of the first insulation layer;

a second conductive layer disposed on a top surface of the second insulation layer and embedded within the first insulation layer, wherein the second conductive layer is contacted with a second end of the corresponding second conductive via; and

a third conductive layer disposed on a bottom surface of the second insulation layer.

5. The power module according to claim 4, wherein the first semiconductor switch and the first diode are embedded within the first insulation layer, wherein the first conducting terminal serving as the gate of the first semiconductor switch is contacted with the second end of the corresponding one of the first conductive vias so as to be electrically connected with the second electrode, the first conducting terminal serving as the emitter of the first semiconductor switch is contacted with the second end of the corresponding one of the first conductive vias so as to be electrically connected with the third electrode, and the corresponding one of the first conducting terminals serving as the collector of the first semiconductor switch is disposed on and electrically connected with the second conductive layer, wherein a first one of the second conducting terminals serving as an anode of the first diode is contacted with the second end of the corresponding one of first conductive vias so as to be electrically connected with the third electrode, and a second one of the second conducting terminals serving as a cathode of the first diode is disposed on and electrically connected with the second conductive layer.

6. The power module according to claim 5, wherein the second conductive layer further comprises a first cavity, wherein the first cavity is concavely formed in a top surface of the second conductive layer, and the first semiconductor switch and the first diode are accommodated within the first cavity.

7. The power module according to claim 6, wherein when the first semiconductor switch and the first diode are accommodated within the first cavity, a top surface of the first semiconductor switch and a top surface of the first diode are at a same level with the top surface of the second conductive layer.

8. The power module according to claim 4, wherein the second conductive layer, the second insulation layer and the third conductive layer are collaboratively defined as a direct bond copper assembly.

9. The power module according to claim 3, wherein each of the at least one first sub-module further comprises:

a first insulation layer, wherein plural first conductive vias and at least one second conductive via are formed in the first insulation layer;

a first conductive layer disposed on a top surface of the first insulation layer, and divided into the first electrode, the second electrode and the third electrode, wherein the first electrode is contacted with a first end of the at least one second conductive via, and the second electrode and the third electrode are contacted with a first end of a corresponding one of the first conductive vias;

a second conductive layer electroplated on a bottom surface of the first insulation layer, and covering a first part of the bottom surface of the first insulation layer;

a second insulation layer laminated on the second conductive layer, and covering a second part of the bottom surface of the first insulation layer; and

a third conductive layer electroplated on a bottom surface of the second insulation layer.

10. The power module according to claim 9, wherein each of the at least one first sub-module further comprises:

a first thermal conduction structure embedded within the first insulation layer, wherein the first thermal conduction structure is located near the first semiconductor switch, disposed on a junction between the bottom surface of the first insulation layer and the second insulation layer, and partially exposed outside the first insulation layer, so that heat generated by the first semiconductor switch is transferred to surroundings of each of the at least one first sub-module through the first thermal conduction structure; and

a second thermal conduction structure embedded within the first insulation layer, wherein the second thermal conduction structure is located near the first diode, disposed on the second conductive layer, and partially exposed outside the first insulation layer, so that heat generated by the first diode is transferred to the surroundings of each of the at least one first sub-module through the second thermal conduction structure.

11. The power module according to claim 10, wherein the first thermal conduction structure and the second thermal conduction structure are made of metallic material, a second end of the second conductive via is contacted with the second thermal conduction structure, and at least one auxiliary conductive via is further formed in the first insulation layer, wherein a first end of the auxiliary conductive via is contacted with the second electrode, and a second end of the auxiliary conductive via is contacted with the first thermal conduction structure.

12. The power module according to claim 2, wherein the second semiconductor switch is an insulated-gate bipolar transistor, and the second semiconductor switch comprises three third conducting terminals, wherein the three third conducting terminals serve as a gate, an emitter and a collector, respectively, wherein the fourth electrode is electrically connected with the emitter of the second semiconductor switch, the fifth electrode is electrically connected with the gate of the second

semiconductor switch, and the sixth electrode is electrically connected with the collector of the second semiconductor switch.

13. The power module according to claim 12, wherein each of the at least one second sub-module further comprises:

a third insulation layer, wherein plural third conductive vias and plural fourth conductive vias are formed in the third insulation layer;

a fourth conductive layer disposed on a top surface of the third insulation layer, and divided into the fourth electrode, the fifth electrode and the sixth electrode, wherein the fourth electrode and the fifth electrode are contacted with a first end of corresponding ones of the corresponding fourth conductive vias, and the sixth electrode is contacted with a first end of corresponding ones of the third conductive vias;

a fourth insulation layer disposed on a bottom surface of the third insulation layer;

a fifth conductive layer disposed on a top surface of the fourth insulation layer and embedded within the third insulation layer, wherein the fifth conductive layer is divided into a first conductive block and a second conductive block, wherein the first conductive block is contacted with a second end of the corresponding fourth conductive via so as to be electrically connected with the fourth electrode, and second conductive block is contacted with the second end of the corresponding ones of the fourth conductive vias so as to be electrically connected with the fifth electrode; and

a sixth conductive layer disposed on a bottom surface of the fourth insulation layer.

14. The power module according to claim 13, wherein the second semiconductor switch and the second diode are embedded within the third insulation layer, wherein a first one of the third conducting terminals

serving as the collector of the second semiconductor switch is contacted with the second end of the corresponding ones of the third conductive vias so as to be electrically connected with the sixth electrode, a second one of the third conducting terminals serving as the emitter of the second semiconductor switch is disposed on and electrically connected with the first conductive block, a third one of the third conducting terminals serving as the gate of the second semiconductor switch is disposed on and electrically connected with the second conductive block, wherein a first one of the fourth conducting terminals serving as a cathode of the second diode is contacted with the second end of the corresponding ones of the third conductive vias so as to be electrically connected with the sixth electrode, and a second one of the fourth conducting terminals serving as an anode of the second diode is disposed on and electrically connected with the first conductive block.

15. The power module according to claim 12, wherein each of the at least one second sub-module further comprises:

a third insulation layer, wherein plural third conductive vias and plural fourth conductive vias are formed in the third insulation layer, wherein the second semiconductor switch and the second diode are embedded within the third insulation layer, wherein a first one of the third conducting terminals serving as the gate of the second semiconductor switch, a second one of the third conducting terminals serving as the emitter of the second semiconductor switch and a first one of the fourth conducting terminals serving as the anode of the second diode are contacted with a first end of the corresponding ones of third conductive vias;

a fourth conductive layer disposed on a top surface of the third insulation layer, and comprising the fourth electrode, the fifth electrode and the sixth electrode, wherein a third one of the third conducting terminals

serving as the collector of the second semiconductor switch and a second one of the fourth conducting terminals serving as the cathode of the second diode are contacted with the sixth electrode;

a fifth conductive layer electroplated on a bottom surface of the third insulation layer, and divided into a first conductive block and a second conductive block, wherein the first conductive block is contacted with a second end of the corresponding ones of the third conductive vias so as to be electrically connected with the first one of the third conducting terminals serving as the gate of the second semiconductor switch, and the first conductive block is contacted with a second end of corresponding ones of the fourth conductive vias, wherein the second conductive block is contacted with the second end of the corresponding ones of the third conductive vias so as to be electrically connected with the second one of the third conducting terminals serving as the emitter of the second semiconductor switch, the second conductive block is contacted with the second end of the corresponding ones of the third conductive vias so as to be electrically connected with the first one of the fourth conducting terminals serving as the anode of the second diode, and the second conductive block is contacted with the second end of the corresponding ones of the fourth conductive vias;

a fourth insulation layer laminated on the fifth conductive layer;

a sixth conductive layer electroplated on the fourth insulation layer;

a first thermal conduction structure made of metallic material and embedded within the third insulation layer, wherein the first thermal conduction structure is located near the second semiconductor switch, contacted with the fifth electrode, contacted with a first end of the corresponding ones of the fourth conductive vias so as to be electrically connected with the first conductive block, and partially exposed outside the

third insulation layer, so that heat generated by the second semiconductor switch is transferred to surroundings of each of the at least one second sub-module through the first thermal conduction structure; and

a second thermal conduction structure made of metallic material and embedded within the third insulation layer, wherein the second thermal conduction structure is located near the second diode, contacted with the fourth electrode, contacted with the first end of the corresponding ones of the fourth conductive vias so as to be electrically connected with the second conductive block, and partially exposed outside the first insulation layer, so that heat generated by the second diode is transferred to the surroundings of each of the at least one second sub-module through the second thermal conduction structure.

16. The power module according to claim 2, further comprising a controlling device, which is disposed on a first surface of the substrate, wherein the controlling device, each of the at least one first sub-module and each of the at least one second sub-module are located at a same side of the substrate, wherein the controlling device is electrically connected with the high-voltage-side switching element and the low-voltage-side switching element for controlling on/off states of the high-voltage-side switching element and the low-voltage-side switching element.

17. The power module according to claim 16, further comprising at least one of a first heat dissipation device in contact with each of the at least one first sub-module and each of the at least one second sub-module or a second heat dissipation device disposed on a second surface of the substrate, wherein the second surface of the substrate is opposed to the first surface of the substrate.

18. The power module according to claim 17, further comprising at least one pin, wherein the at least one pin is made of metallic material, and

disposed on an edge of the first surface of the substrate.