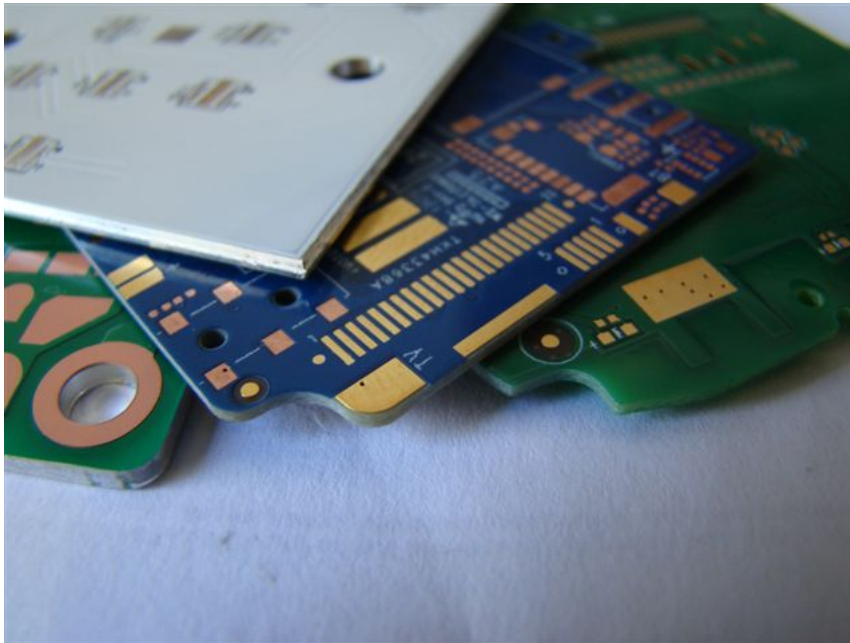


## Research - Aluminium Printed Circuit Boards (PCB) tested for thermal conductivity

Posted on Mar 07, Posted by [P&A International](#) Category [General Talk](#)



There are many test results floating around the internet talking about thermal conduction of [he at sinks](#)

or other dedicated heat dissipating devices. This test focus on PCB's thermal parameters that concern developers during the design stages of high power circuits. We are going to test 1.7mm Aluminium PCB, 4 layers PCB and 6 layers PCB.

The test device consists of power diode that dissipates 25Watt of heat and aluminium heat sink of fixed size and airflow. We measure temperature of the diode at fixed load and subtract ambient temperature from it to get 'temperature rise above ambient'. To test PCB thermal conduction we sandwich fragment of PCB between diode and heat sink, therefore adding thermal resistance. By comparing 'base line' values to newly generated data, we can see how much thermal insulation each fragment of PCB have added to the system.

First we will create the 'base line' test that indicates test device native performance. This will allow us to subtract those values at the later stage from performance figures obtained during the Printed Circuit Boards tests. Data table below is representation of the raw data collected. [PCB](#)

[manufactures](#)

normally do not indicate thermal conduction values of the PCB's, unless it's aluminium or copper based printed circuit board that is designed with heat dissipation in mind. What we have found intriguing is that 6 layer PCB thermally is more conductive than 4 layer PCB. At a closer look this is due to more copper being present in the same volume of PCB material. Copper acts as a heat conductor and helps heat to travel between the layers of the PCB, displacing space otherwise occupied by thermal insulator: fiberglass.

We have been pleasantly surprised by excellent thermal conductance of [Aluminium PCB](#) used for LED lighting solutions. It generated temperature rise of 33C after 25 minutes. This is excellent considering that

[4 layer PCB](#)

caused power diode thermal runaway due to temperature rise exceeding 70C after just 4 minutes of operation. A second chart on the right indicates component temperature rise over the 'base-line'.

| Thermal baseline test |        |                  | 6 layer GREEN PCB |        |                  | 4 layer BLUE PCB |        |                  | Aluminium base GR |        |     |
|-----------------------|--------|------------------|-------------------|--------|------------------|------------------|--------|------------------|-------------------|--------|-----|
| Minutes               | Temp C | Component Temp C | Minutes           | Temp C | Component Temp C | Minutes          | Temp C | Component Temp C | Minutes           | Temp C | Com |
| 0                     | 0      |                  | 0                 | 0      |                  | 0                | 0      |                  | 0                 | 0      |     |
| 1                     | 24     |                  | 1                 | 57     |                  | 1                | 66     |                  | 1                 | 31     |     |
| 2                     | 31     |                  | 2                 | 72     |                  | 2                | 89     | 83               | 2                 | 39     |     |
| 3                     | 33     |                  | 3                 | 80     |                  | 3                | 98     | 104              | 3                 | 45     |     |
| 5                     | 37     |                  |                   |        |                  |                  |        |                  | 4                 | 50     |     |
| 7                     | 40     | 68               |                   |        |                  |                  |        |                  | 7                 | 60     |     |
| 11                    | 44     |                  |                   |        |                  |                  |        |                  | 17                | 73     |     |
| 17                    | 46     | 71               |                   |        |                  |                  |        |                  | 27                | 80     |     |
| 27                    | 47     |                  |                   |        |                  |                  |        |                  |                   |        |     |

