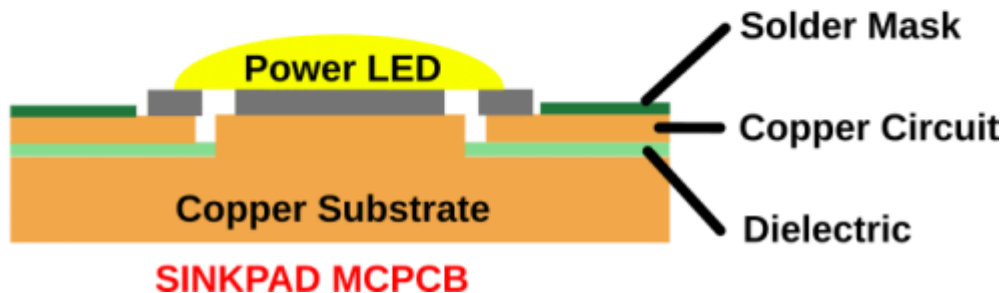
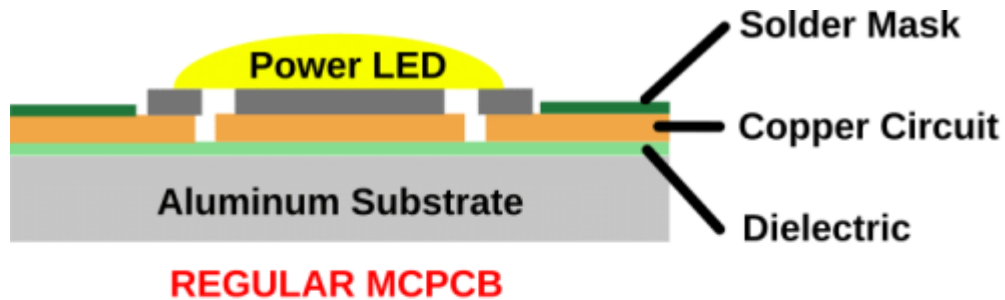




# Everything you need to know about Sinkpad MCPCBs--Hitech Circuits



## Everything you need to know about Sinkpad MCPCBs

Hitech Circuits is a leading PCB manufacturer, offering various high-quality printed circuit boards using advanced technologies for special applications. One of our innovative LED solutions is the Sinkpad MCPCB.

### WHAT IS A SINKPAD MCPCB?

Sinkpad is a special type of metal core PCB or MCPCB. Conventional MCPCBs have a metal core at their base. This acts as the heat spreader for dissipating heat from hot components on the board. These boards have a thick layer of aluminum on the bottom side of the board, while the top side has a regular circuit for mounting SMDs. A thermally conducting thin insulating dielectric layer separates the two.

The purpose of the metal core in an MCPCB is to remove the heat generated by hot board components and transfer it to a larger heatsink. The heat must pass to the metal core through the insulating layer, which is the weakest link in the thermal path and is the reason the insulating material must have a high thermal conductivity.

In a Sinkpad MCPCB, parts of the metal substrate penetrate the dielectric layer and are at the same level as the circuit layer. The heat pad of the hot component can, therefore, attach directly to the metal substrate without the intervention of the dielectric layer.

## Advantages of Sinkpad PCBs

Compared to a conventional MCPCB, a Sinkpad MCPCB can conduct heat out of a hot component and transfer it to a suitable heat sink or into the atmosphere much faster and more efficiently. Therefore, for medium- to high-power components like LEDs, a Sinkpad MCPCB provides a substantially superior thermal performance. It provides for the most scalable and economical direct thermal path solution for LED applications.

MCPCB Type	Heat Transfer Rate	Units
Conventional MCPCB	1-5	W/m.K
Sinkpad MCPCB Aluminum Core	210	W/m.K
Sinkpad MCPCB Copper Core	385	W/m.K

The Sinkpad technology offers many magnitudes of higher thermal efficiency than the best MCPCB can. Although most popular Sinkpad MCPCBs are available with Aluminum as the base metal, those with copper as the base metal are also available.

Following are the advantages of Sinkpad MCPCB:

- Very high thermal conductivity (about 400 W/m.K)
- Low LED Junction temperature
- Long LED life
- Economical solution with a direct thermal path
- Improved lumens output
- Improved color rendering and stability
- Smaller heat sink requirement
- More densely packed LED designs
- Reduced cost due to fewer LEDs producing same light output
- Wide selection of compatible optics

## How sinkpad technology works?

To understand the mechanism of the Sinkpad technology, it is necessary to first understand the primary thermal path in LED applications. Heat inside an LED originates at the chip level in the same way as in an incandescent bulb the heat originates in the filament. However, the key difference between the two is that while the incandescent bulb can radiate this heat into the

atmosphere, heat in the LED chip must conduct itself through a series of mediums before it can reach the atmosphere.

If the thermal conduction rate of the series of mediums is high, heat can easily move out from the LED chip. However, if the thermal conduction rate is low, heat will build up within the LED chip and this can consequently lead to a burnout. If the series of mediums has the same thermal conduction rate, there would not be a problem for the conduction of heat to the atmosphere.

However, this is not the case, and the heat must pass through different mediums each of which have different thermal conduction rates. To increase the efficiency of heat transfer out of the chip level, manufacturers tend to remove all mediums with low thermal conductivity and high thermal resistance from the path. They do this by creating a heat pad that connects directly to the chip level, and thereby, effectively conducts heat out of the chip to the atmosphere. However, considering the small size of the LED itself, the heat pad cannot be very large, and therefore, must externally connect to a larger heat sink to effectively remove the heat.

In conventional MCPCBs, a thermally conducting thin dielectric layer separates the heat pad of the LED and the metal core. Although the dielectric layer is thermally conducting, it is still the weakest link in the thermal conduction path, as its thermal conductivity is lower than that of the metals it separates.

The Sinkpad MCPCB overcomes this limitation by eliminating the dielectric path completely between the heat pad and the metal core. As the heat pad can now connect directly to the metal core, the thermal conductivity of the path increases many times. Therefore, the Sinkpad technology provides a direct thermal path, effectively raising the thermal conductivity of the path, thereby lowering the LED junction temperature to a safe level.

The thermal pads of a hot component like an LED can solder directly to the copper substrate. The absence of any dielectric layer between the LED thermal pad and the metal core reduces the thermal resistance to a very low level. Depending on the metal substrate in the Sinkpad MCPCB, the thermal conductivity could be as high as 400 W/m.K as compared to 5 W/m.K for a conventional MCPCB.

## **Applications of Sinkpad MCPCB**

Sinkpad MCPCBs are available with high density copper core. They offer a high thermal conductivity and good thermal transfer capability. This allows for smaller form factors for the

same power handling. By adopting the thermoelectric separation technology, Sinkpad MCPCBs minimize the lumens depreciation of the LED, thereby helping to prolong its life.

Sinkpad MCPCBs are suitable for single high-power lamps, such as Osram, XHP, XML, Cree XPL, and COB packaged LEDs.

It is possible to use Sinkpad MCPCBs for components other than LEDs also. Therefore, they are suitable for high-power resistors, and semiconductors like transistors, thyristors, diodes, and many more.

Manufacturers offer a variety of surface finishes depending on the application. Therefore, one can have ENIG, OSP, Immersion Tin, ENEPIG, HAL etc, with excellent reliability of the surface layer.

Depending on the design need of the LED, manufacturers can provide various structures, such as copper concave blocks, copper bumps, and more.

The base copper material can be of standard thicknesses like 0.8 mm, 1 mm, 1.2 mm, 1.4 mm, 1.5 mm.

Board thickness may be available between 1 mm and 2 mm

Copper thickness can be 0.5 oz, 1.0 oz, 2 oz, and 3-10 oz in special cases.

Outlines can be provided such as routing, punching, and V-cut.

Soldermask in various colors are available.

Silkscreen/Legend is possible.

### **Considerations while using sinkpad MCPCB**

While assembling the sinkpad MCPCB, the operator must be careful in mounting the LED to achieve maximum cooling so that the temperature of the LED junction remains well below the maximum rating as its manufacturer has specified.

The operator can mount the assembly on to the heat sink in one of the following three ways:

1. Using a pressure sensitive, thermally conducting tape

2. Using a thermally conductive adhesive
3. Using mechanical fasteners, although this is not recommended.

As the bottom of the LED (the thermal pad) is electrically neutral, it is not necessary to electrically isolate the base from the sinkpad cooling surface.

After mounting, the operator must confirm the assembly cools adequately by testing the temperature of the operating LED, and measuring the LED junction temperature at its thermal pad.

Failure to ensure the LED junction temperature is below the specified rating will result in:

- Poor color rendering
- Degradation of the light output
- Premature LED failure

## **Conclusion**

Eliminating the dielectric layer between the LED thermal pad and the metal base means that a Sinkpad MCPCB can easily outperform even the best MCPCB boards available. Hitech has extensive experience in manufacture of high-quality printed circuit boards using advanced technologies for special applications. Email us now for your PCB quote:

[sales3@hitechcircuits.com](mailto:sales3@hitechcircuits.com) For understanding more information about our products, please visit <https://hitechcircuits.com/>