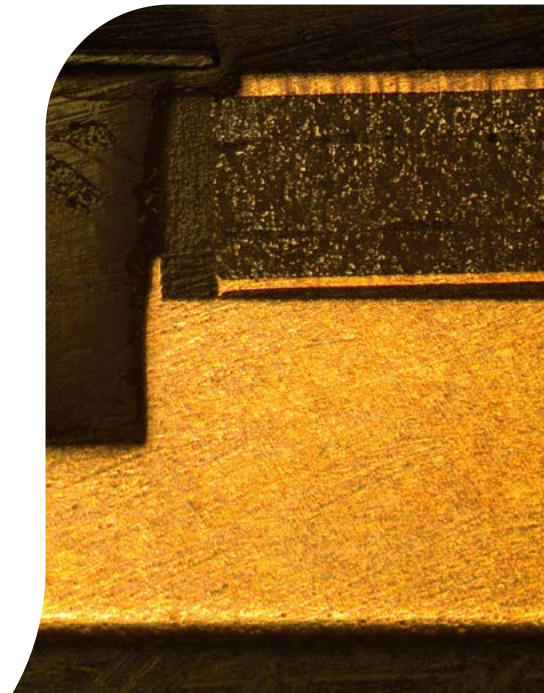




Extreme heat dissipation solution in PWB stage



The Challenge

Providing the customer with an extreme heat dissipation resistant PCB, to be installed in an electronic device releasing a large amount of heat during its operation, thus utilizing the PCBs as a cooling system

The PCB Technologies Way

The original PCB was comprised of 7 layers, as shown in the sketch. Via farm holes connecting all layers were thickly copper electro-plated (35-45 μm), allowing compatibility with speedy heat-dissipation along the Z-Axis. A heat sink attached the PCB from bottom side. The solution required extreme heat dissipation capacity in the shortest possible time.

The Solution

The first step was “undressing” the original PCB - understanding its stack-up structure, and the raw materials used. The second was coming up with a different solution that could overcome previous attempts to tackle problems such as repeated delamination between its layers caused by the extended heat, etc.

At first, we tried to stick with the original PCB design by simply pressing the stack up with the heat sink to the PCB. The outcome was already an improvement, but due to the PCB's extreme operational conditions, the prepreg's flow generated partial capping of the via farm holes. We suggested a different approach.

An additional prepreg (Layer 8 in the sketch) made out of a special material with special characteristics has been utilized. The material at hand featured – High thermal dissipation, with special filler type & volume, including -2.0 W/mK Z-Axis, and - 3.5 W/mK X/Y plane (10 times higher than the original & TYPICAL FR-4 material used).

This characteristic dramatically reduces operating temperature while extending the device's lifetime. It also has a high Tg of 160°C, which can survive lead-free assembly conditions, enhancing the product's reliability.

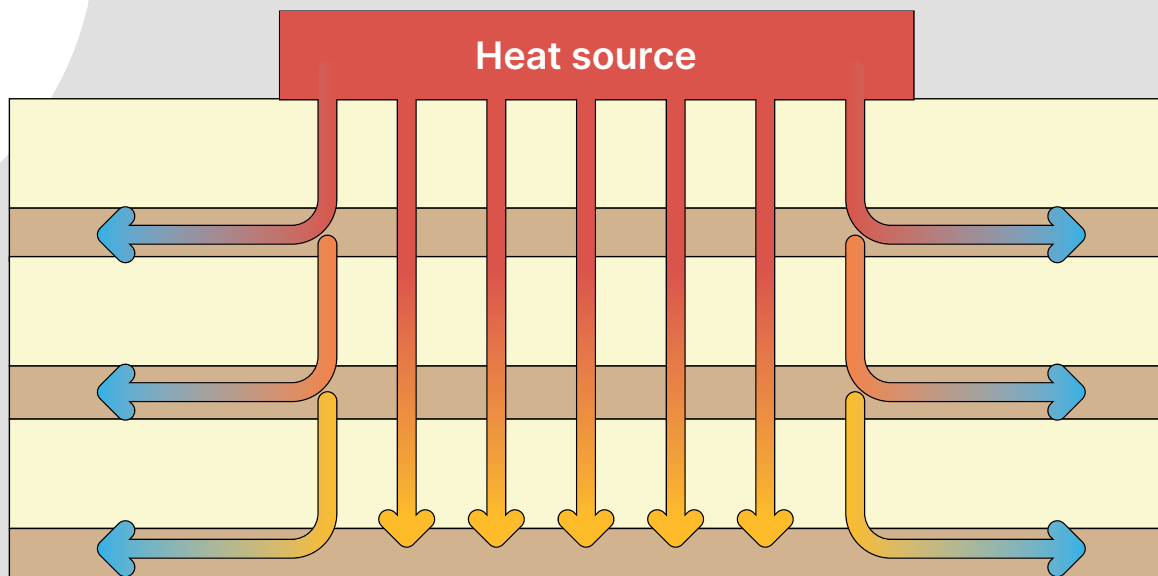
This special material has additional applications:

- Motor Controllers
- Power Supplies
- Converters
- Automotive
- Electronics
- LED Modules
- Lighting

The second element to consider was the positioning of this special prepreg along the via farm. We have placed it just under the 7th layer, making sure gathering all the heat consumed along the via is discharged at one go through the heat sink. Though insignificantly increasing the stack-up height, this additional layer was crucial to solving the problem.

Our solution allowed the product to withstand an environmental temperature of 90°C(!), as opposed to 65°C-71°C required by the military standard - complete heat dissipation.

Heat dissipation in the works



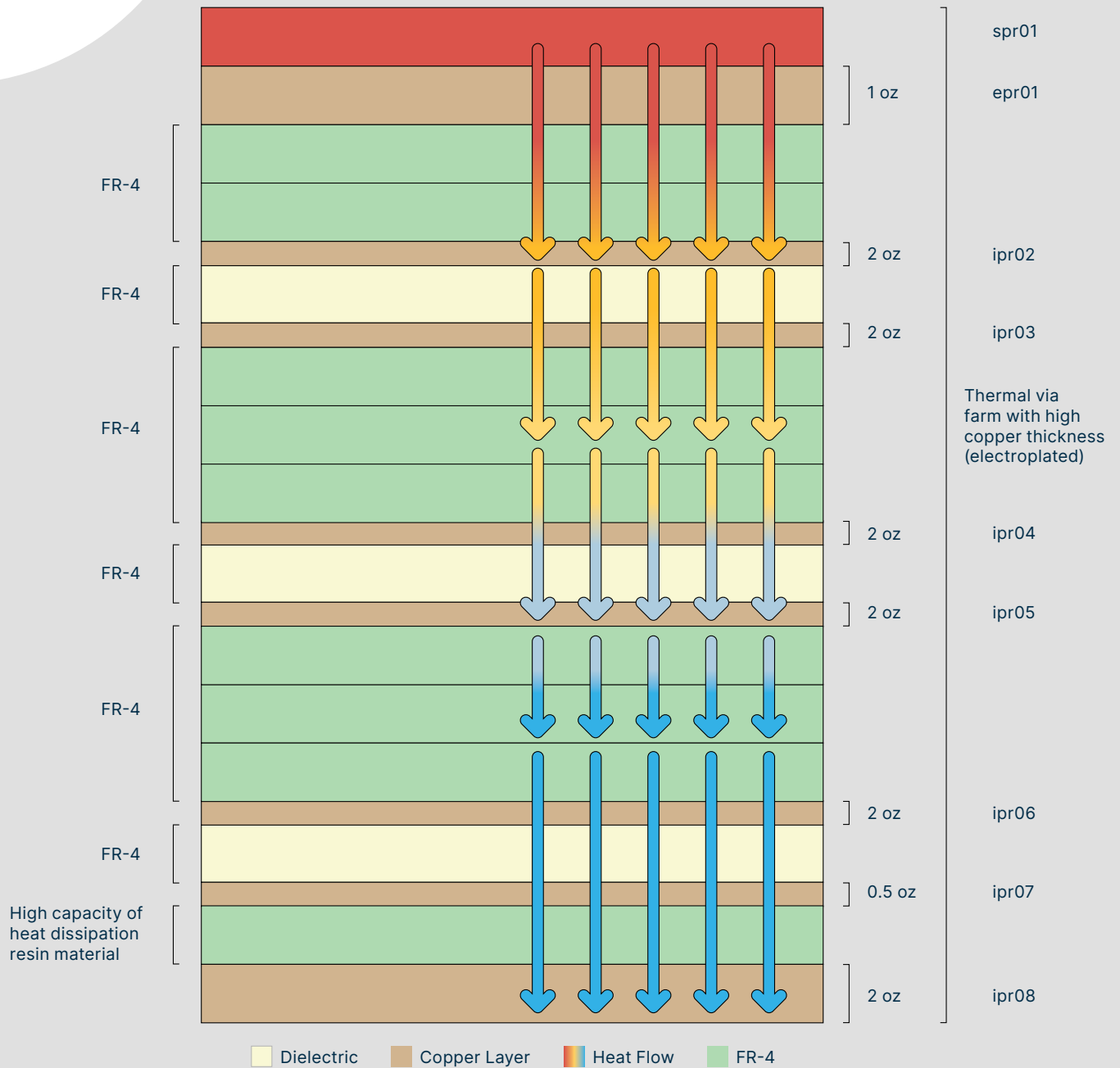
- Dielectric
- Copper Layer
- Heat Flow

Thermal / Electrical vias

The enhanced heat dissipation capacity was also successfully tested on a thermocouple through which the heat was discharged. The test proved beyond doubt the effect this had on the durability of the critical components assembled to the PCB. We believe getting our engineering team involved in the earliest stages of the PCB design, would have been a game-changer in both time and money spent.

Our long experience with multiple raw materials, high quality standards, and different operational environment requirements provide our customers with complex, high-end PCBs.

Our unique addition to the stack-up



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