Articles

It's Getting Hot in Here: PCB Cooling Techniques

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Today's PCB driven devices are becoming smaller, resulting in less area for cooling of PCB components and an increased amount of heat per square inch. For every 10 degrees Celsius rise in temperature, the device rate of failure doubles if the wasted heat is not removed. Thermally conscious systems determine if the design will function or potentially fail.

PCB design decisions can be made and implemented from the start to optimize product performance, reliability and delivery schedules. Several techniques that can be used to assist in heat dissipation are listed below:

- **Strategic PCB Layout** – Strategic PCB layouts should be used whether your device is small or large to increase reliability and performance. High power components should be placed in such a way that the maximum amount of board space possible will separate them from each other. This allows for the most heat dissipation space between components.

- **Maximize PCB Material and Construction** – When selecting the PCB material and construction, some elements can be chosen that will increase the heath dissipation of the entire board. Thermal performance increases with the increase of copper in the PCB construction. To take advantage of this fact, the design should include the largest possible number and thickness of copper ground layers in the design.

- **Dedicated Heat Spreading Plane** – Utilizing a cold plate or heat spreading plane attached to the underside of the PCB offers a thermal connection to the devices that allows for much greater cooling.
- **Increase Possible Heat Paths** – Increasing the number of possible heat dissipation paths will improve the heat reduction of the complete board. As devices become smaller, it becomes more important to take advantage of every available thermal control opportunity. Thermal vias will help carry heat down to the inner board layers and underside of the board. Wider traces leading away from high power devices will provide additional heat paths for dissipation and using metal PCB stiffening plates that are connected to the heat-spreading plane will all provide more effective cooling.

- **Addition of Heat Sinks and Fans** – For systems where the simpler design changes above do not dissipate enough heat, add a heat sink or fan and heat sink combination provides direct cooling of critical high power components.

- **Larger PCB Housing** – When it's possible to use a larger PCB housing, the ambient air surrounding the PCB permits heat to escape into the enclosure.

- **Venting** – Strategically placing of vents within the PCB enclosure will maximize the natural air current flow and allows designers to take advantage of ambient air moving over the PCB to improve cooling.

- **Enclosure Fan** – For more extreme heat conditions, an enclosure fan can be added to significantly increase air flow and lower the temperature of critical devices.

Good thermal design can make the difference between a successful product and one that is prone to failure. For PCB components and advice, VCC representatives are always available to handle a variety of questions and propose solutions for thermal PCB design parameters. Contact VCC today fore more information.

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