

# **Non-contact infrared temp sensors monitor heat sinks and pipes**

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Measuring temperatures using infrared (IR) sensors without direct contact with an object, is the new paradigm in optimizing thermal monitoring and control. In this article we introduce the idea of this approach by taking advantage of new and very small IR temperature sensors available on the market. The thermal management of high-power electronic components is an area that can benefit significantly.

High-power electronic components require effective heat removal and thermal management to ensure their performance and reliability. This is achieved by using heat sinks and heat pipes of different materials and various shapes that conducts heat away from the components. Typically the sinks and pipes are designed based on the system's thermal modeling, and often are over-designed to account for unexpected environmental inputs.

For demanding applications, monitoring the heat sink temperature and implementing a feedback control is required. The current practice is to attach a thermistor or another type of direct-contact temperature sensor to the sink, and run wires to connect it to the printed circuit board (PCB) where the measurement and control units are located. This complicates manufacturing and the process often involves manual assembly. Ultimately this affects the solution's cost and reliability.

An improved approach is monitoring the heat sink's temperature or a heat pipe with an IR temperature sensor. The advancement of thermopile sensor technology has led to significant reductions in size and power consumption. Added digital processing and other functionalities allow them to be placed in space-constrained locations and operate independently of an embedded controller or microprocessor in calculating the object temperature from the IR radiation. The sensor can be mounted directly on the circuit board with standard surface-mount technology (SMT). It then provides information for both the local temperature of the PCB on which it is mounted, through its on-die temperature sensor. It also monitors the temperature of the heat sink or pipe directly in front by measuring its IR radiation and computing its corresponding temperature.

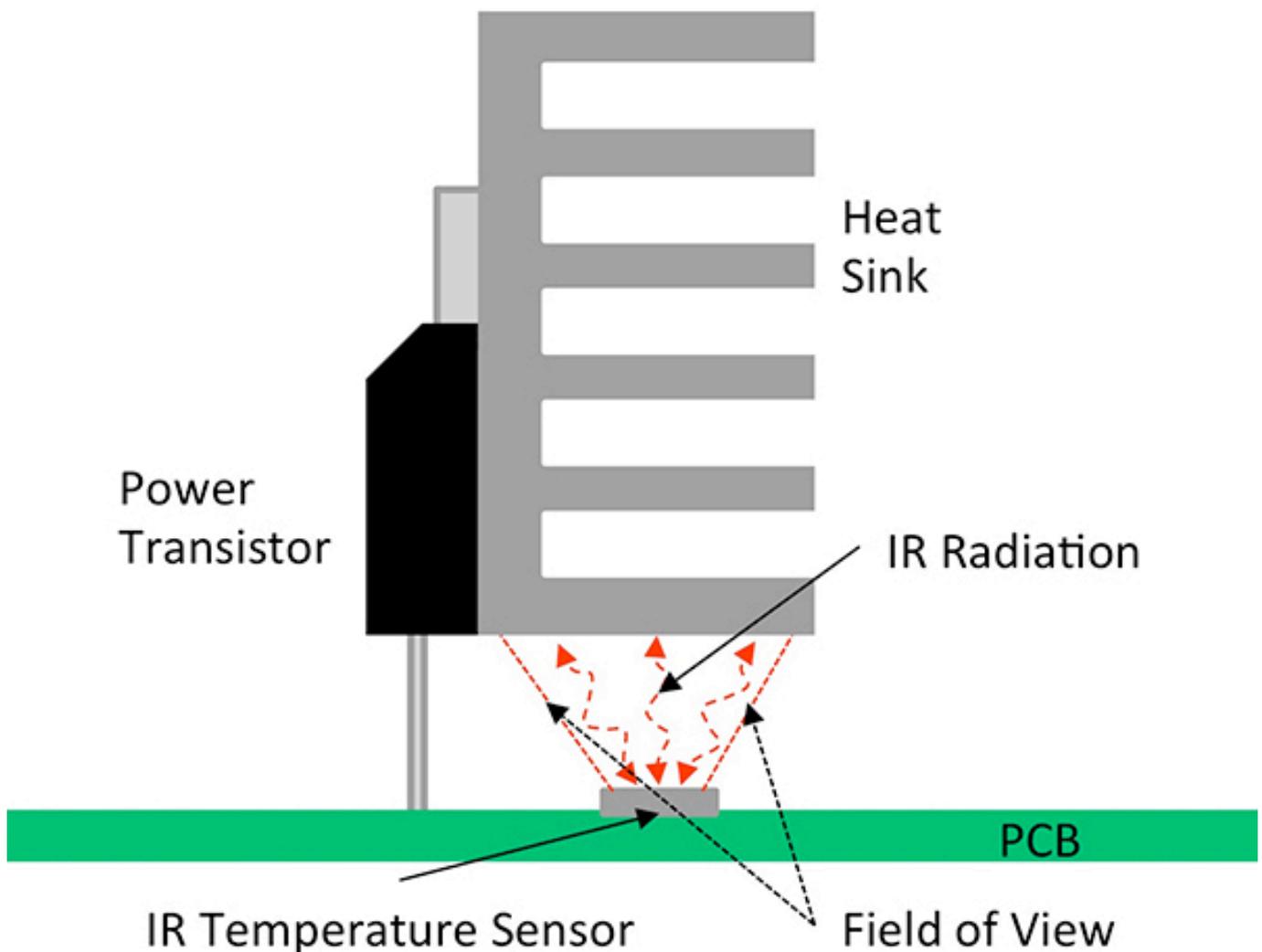


Figure 1 illustrates where the sensor is placed, which is directly underneath the heat sink. The sensor's field of view (straight dash lines) is completely encompassed by the heat sink - an important requirement to ensure that only the sink's IR radiation (and temperature) is picked up by the sensor, and not the surrounding components or case walls. Some newer sensors on the market allow temperature limits to be stored in their built-in memory. Then these limits are used to compare the temperature result and control a shut-down pin or to interrupt a controller. In this way, the system takes action only in the case of an over- or under-temperature event. The controller or processor is offloaded from having to poll the sensor for measurement data while the temperature is in the acceptable range. That brings further optimization in the control algorithm and reduces the requirements for the controller's processing power.

In summary, the non-contact monitoring of heat sinks and pipes with IR temperature sensors offers numerous opportunities for improved and optimized thermal management of critical components, as well as the ability for standard SMT assembly and placement in tight spaces.

## References

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