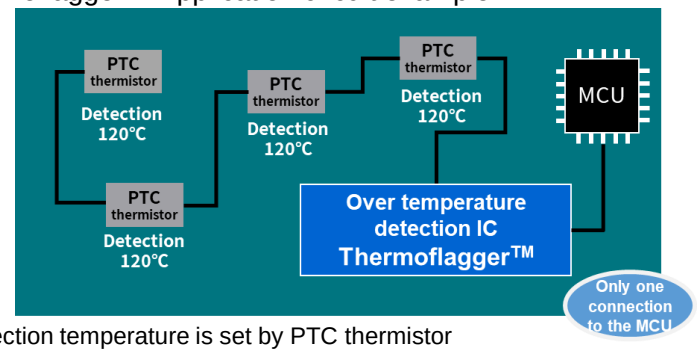
Thermoflagger™ – realizing a simple overheating monitor solution

Thermoflagger™ can be used in conjunction with PTC thermistors (*) to build an overheating monitor solution that detects abnormal heat generation. A simple and space-saving protection circuit can be constructed to deal with abnormal heating of electronic equipment.

Introduction to Thermoflagger™

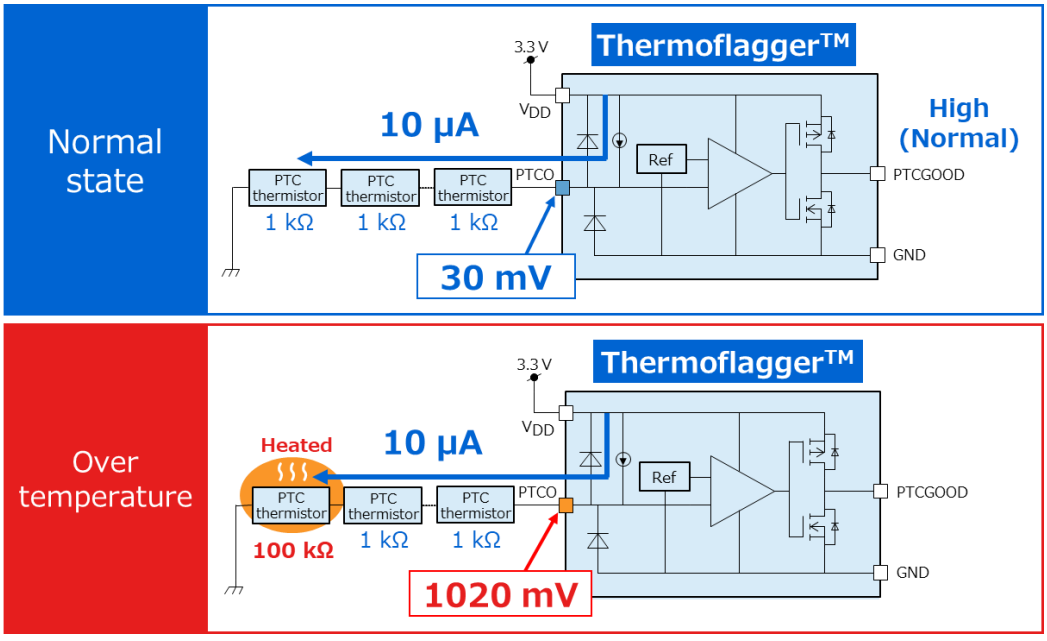
As electronic devices become more sophisticated and dense, the heat generated by semiconductor elements and electronic components is increasing. This challenge underscores the importance of monitoring over temperature to ensure systems are not negatively impacted by severe heat issues. ThermoflaggerTM can be used in conjunction with PTC thermistors to detect abnormal heat generation in a simple configuration.

Thermoflagger™ Application circuit example



Detection temperature is set by PTC thermistor

Thermoflagger™ has a comparator and a constant current source inside the IC and compares the voltage drop with the internal reference voltage by applying a constant current to PTC thermistor. When the temperature around the PTC thermistor rises, the terminal voltage rises due to the exponential resistance increase of the PTC thermistor. Therefore, abnormal heat generation can be easily detected by comparing the voltage with the built-in comparator.



In case of 3 PTC thermistors.

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Click

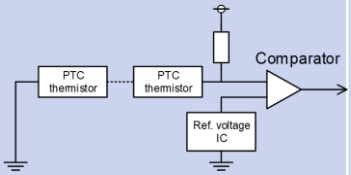
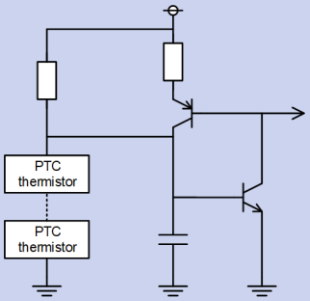
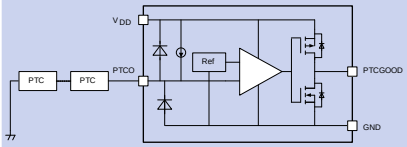
※A thermistor is an element whose electrical resistance value changes as the temperature changes. PTC thermistor is a thermistor whose electric resistivity increases as thetemperature rises.

Advantages of Thermoflagger™

The overheat monitoring solution with Thermoflagger™(TCTH series) and PTC thermistors has the following advantages:

Advantage 1: Simplified circuit design for overheat monitoring

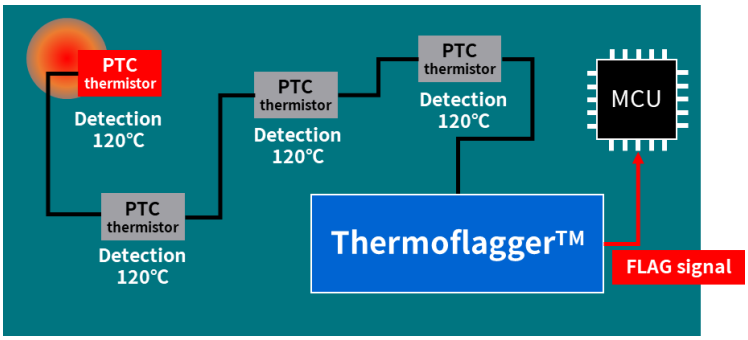
Compared with the discrete configuration example as shown in the table below, the number of parts is reduced and the circuit design is simplified.
It is also possible to reduce the component mounting area.

Composition	Discrete Configuration 1 Individual IC basis		Discrete Configuration 2 Transistor base		Thermoflagger™ Monolithic IC based	
Circuit example						
Number of components (excluding PTC)	○	3pcs	×	5pcs	◎	**1pc**
Mounting area	○	Area for IC2 piece	×	Due to the large number of parts	◎	**Area for IC1 of small packages**
Precision	○	Susceptible to changes in power supply voltage	×	Variations in power supply voltage and transistor variations and temperature characteristics	◎	**Constant current configuration with no effect on power supply voltage change**
Price	△	IC 2 circuitry + resistor	◎	Tr × 2pcs + number of resistors	○	**IC 1 circuitry**
Design for each set	×	Constant change due to power supply voltage change (IC change)	×	Constant change due to power supply voltage change and Tr property	◎	**According to the temperature setting No adjustment required for operation**

◎:Excellent, ○:Good, △:Average, x:Poor

Advantage 2: Wide range of overheat monitoring possible at low cost

Compared to configurations with multiple sensor ICs (e.g. temperature sensors), one Thermoflagger ™ (Overheat Monitoring IC) and a relatively inexpensive PTC thermistor configuration, enable low-cost, extensive overheat monitoring.



Abnormal heat generation is monitored by combining Thermoflagger™ and PTC thermistor located at the heat generating position.

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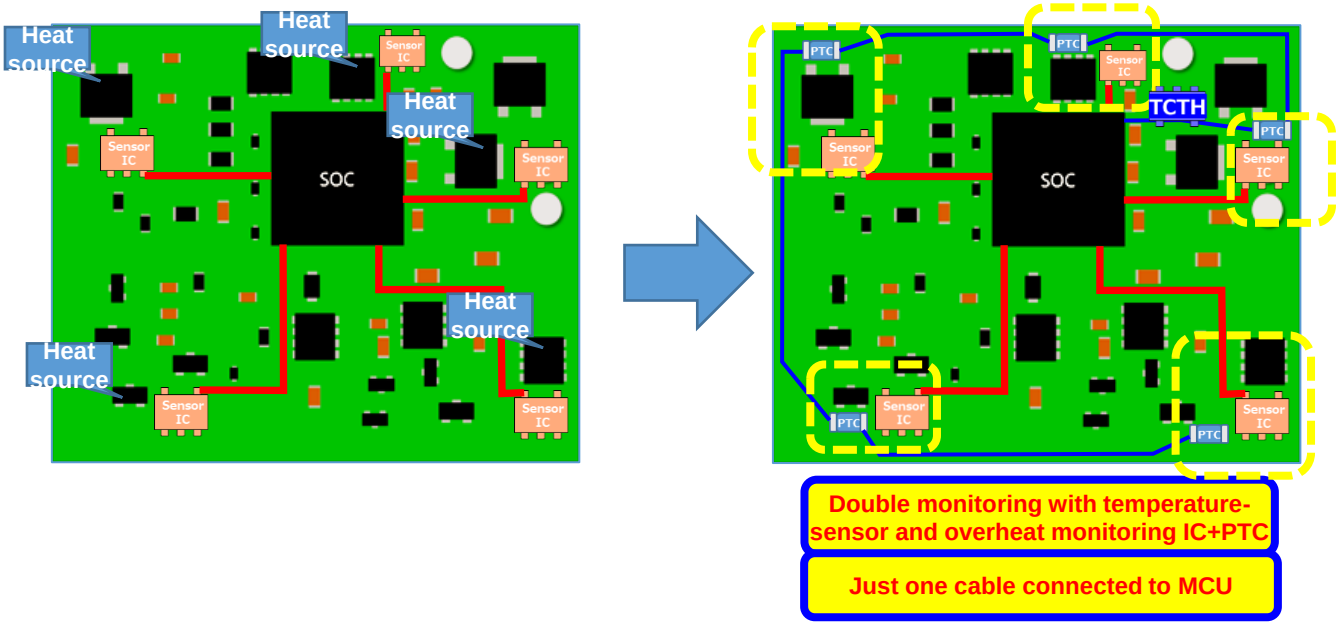
Advantage 3: Create a fail-safe circuit combined with other protection ICs

In addition to monitoring with a sensor IC (e.g. temperature sensor), combining an additional layer of monitoring with Thermoflagger ™ and PTC thermistors creates a robust and fail-safe overheat monitor solution to protect the circuitry.



Thermoflagger™ lineup

Product name	PTCO Output current (typ.)	PTC Thermistor Selection range	Abnormal time Latch function	PTCGOOD Output type	Package
TCTH011AE	1μA	4.7 kΩ to 10 kΩ	-	Push-pull	SOT-553 (ESV)
TCTH012AE	1μA	4.7 kΩ to 10 kΩ	✓ Yes	Push-pull	
TCTH021AE	10μA	470 Ω to 1 kΩ	-	Push-pull	
TCTH022AE	10μA	470 Ω to 1 kΩ	✓ Yes	Push-pull	
TCTH011BE	1μA	4.7 kΩ to 10 kΩ	-	Open-drain	
TCTH012BE	1μA	4.7 kΩ to 10 kΩ	✓ Yes	Open-drain	
TCTH021BE	10μA	470 Ω to 1 kΩ	-	Open-drain	
TCTH022BE	10μA	470 Ω to 1 kΩ	✓ Yes	Open-drain	

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