

A Boost converter with water cooling unit whose flow rate is controlled by a thermal comparator

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In recent years, the importance of consideration for heat has increased in the design of in-vehicle power units.

In order to deal with this, we have dealt with this by verification using a model that supports self-heating and a thermal network for the element.

This thermal network is a method that utilizes the similarity between heat and electricity, and begins with the use of the circuit simulator SPICE. Therefore, the thermal resistance and heat capacity used in the thermal network are fixed values.

However, since the step-up converter of the in-vehicle power unit has a large power, a water cooling unit is mainly used. This cooling unit controls the temperature by switching and controlling the flow rate according to the temperature of the step-up converter. This time, we realized and verified a system that switches the water cooling unit from temperature detection to the water pump and its rotation speed with a thermal circuit network that changes with the flow rate parameter and a heat comparator, and the cooling capacity that was not possible with the conventional thermal circuit network was realized. We have verified the changing system, so we will report it here.

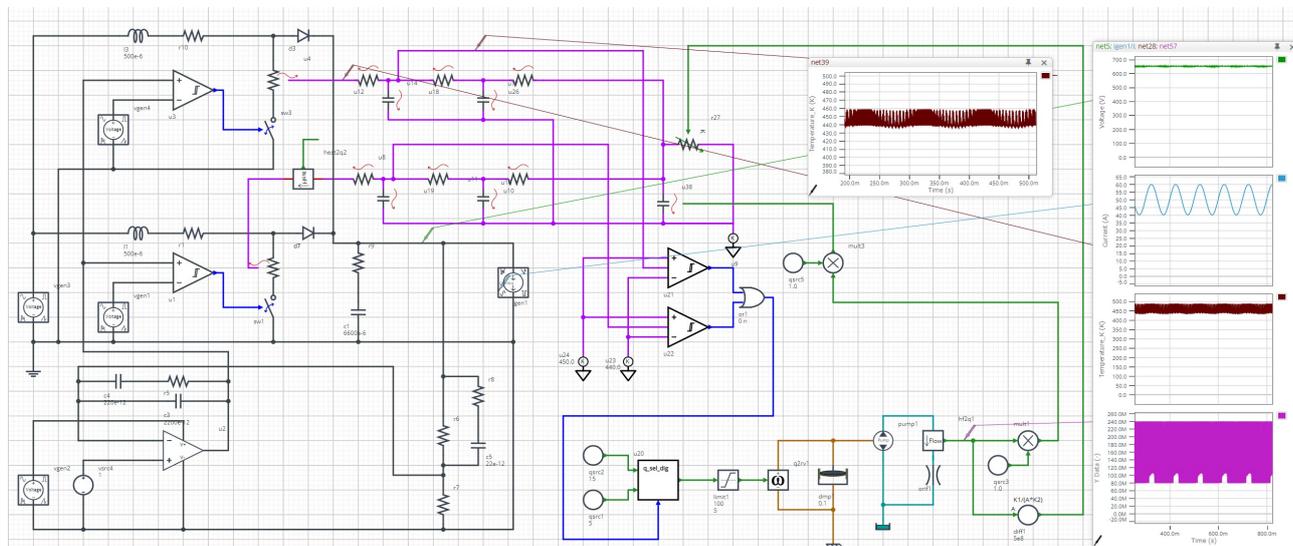


Fig.1 Simulation circuit