

18. Immersion Cooling Setup

- Purpose: This setup is intended to test the electronics cooling performance of water and other working fluids.
- Thermal Setup: The experiments are performed inside an insulated tank to minimize heat interference with the environment. Two immersion heaters are used to control the water temperature inside the tank. The temperature of the transistor is measured by an 80 μm diameter K-type thermocouple attached on its surface via a high thermal conductivity epoxy bead. A transparent immersion tank is used when visualization is performed.
- Electronic Setup: The printed circuit boards (PCB) used generate heat inside Gallium Nitride (GaN) transistors through two different electric modes: conduction and switching. In order to prevent any shorting due to the immersion in tap water, the PCBs are coated with a 5 μm thick layer of Parylene C. Power generation in the transistor is varied to obtain different cooling modes in both the natural convection and nucleate boiling regimes.
- Working Fluids: Tap water, ethylene glycol–water mixtures and 3M Novec 72DE and 7300 dielectric fluids.
- Electric equipment used: HP6633A DC power supply as the gate voltage source
HP6031A DC power supply as the drain current source
Yokogawa WT3000 Digital Sampling Power Analyzer to measure V_{DS} , drain current and switching power
- Imaging equipment used: Photron Mini AX200 high speed camera. InfiniProbe TS-160 lens

