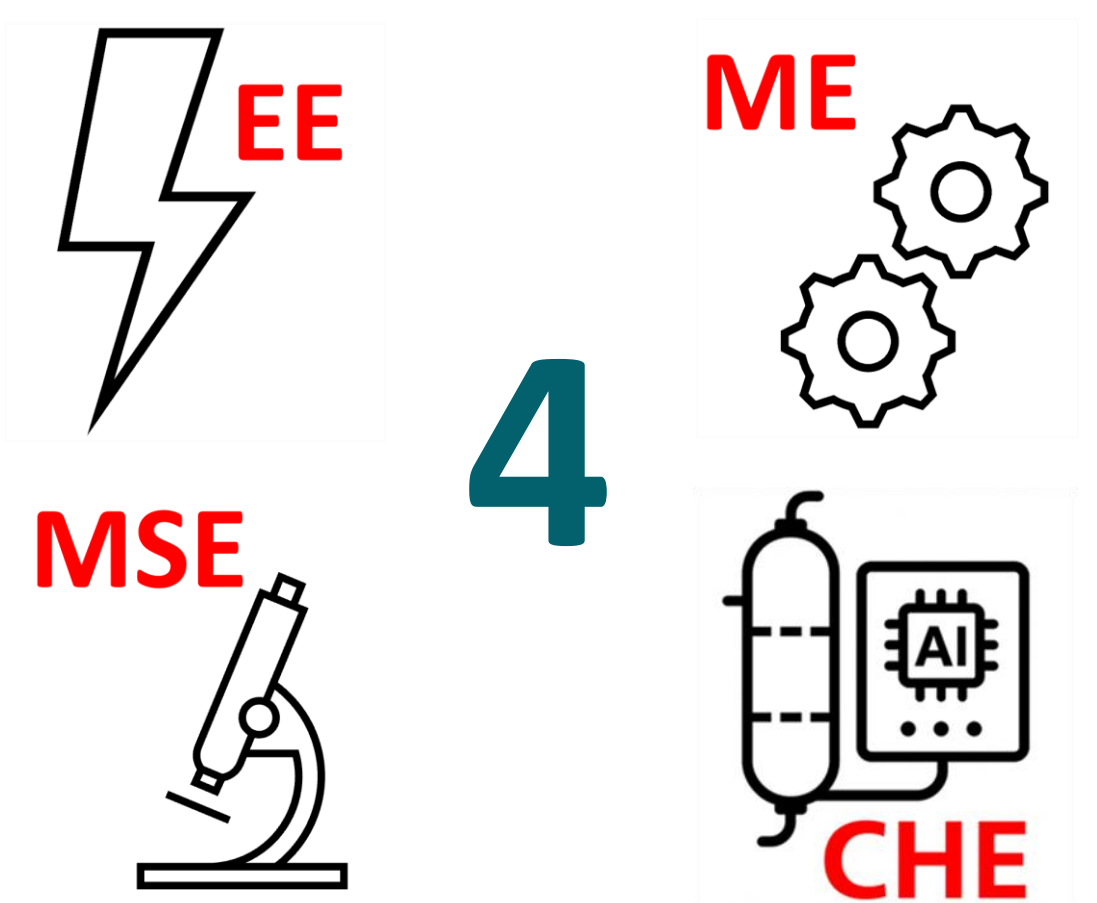


Smart Thermal management system for Smartphones

Majed Mohammed(CHE), Khalid alqarni(CHE), Muath Alotaibi(EE), Mohammed Alshammari(ME), Mohammed Alsamail(MSE), Fahad Almulhim(MSE)
Coach: Dr. Omar Abdulaziz



Project Statement

This project designs a compact clip on cooling device for smartphones to reduce overheating during heavy use and fast charging. It uses an active thermoelectric system (TEC) to move heat to an external heat sink when temperatures rise, improving performance, safety, and device lifespan while maintaining low power use.

Project Objective

Design and evaluate a compact clip-on thermoelectric cooling device that reduces smartphone overheating with efficient heat removal, reliable control, low power use, and safe multi-device compatibility.

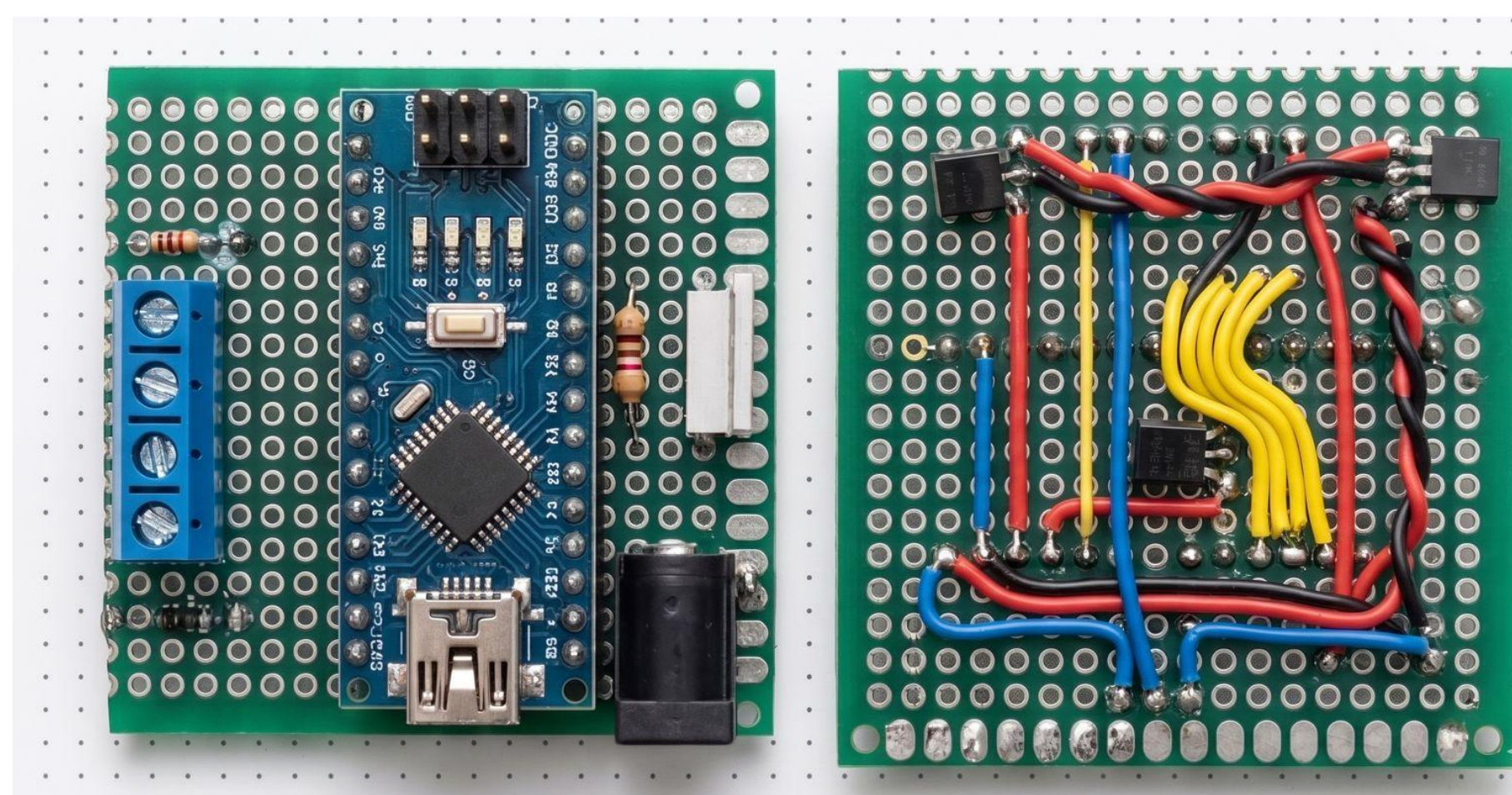
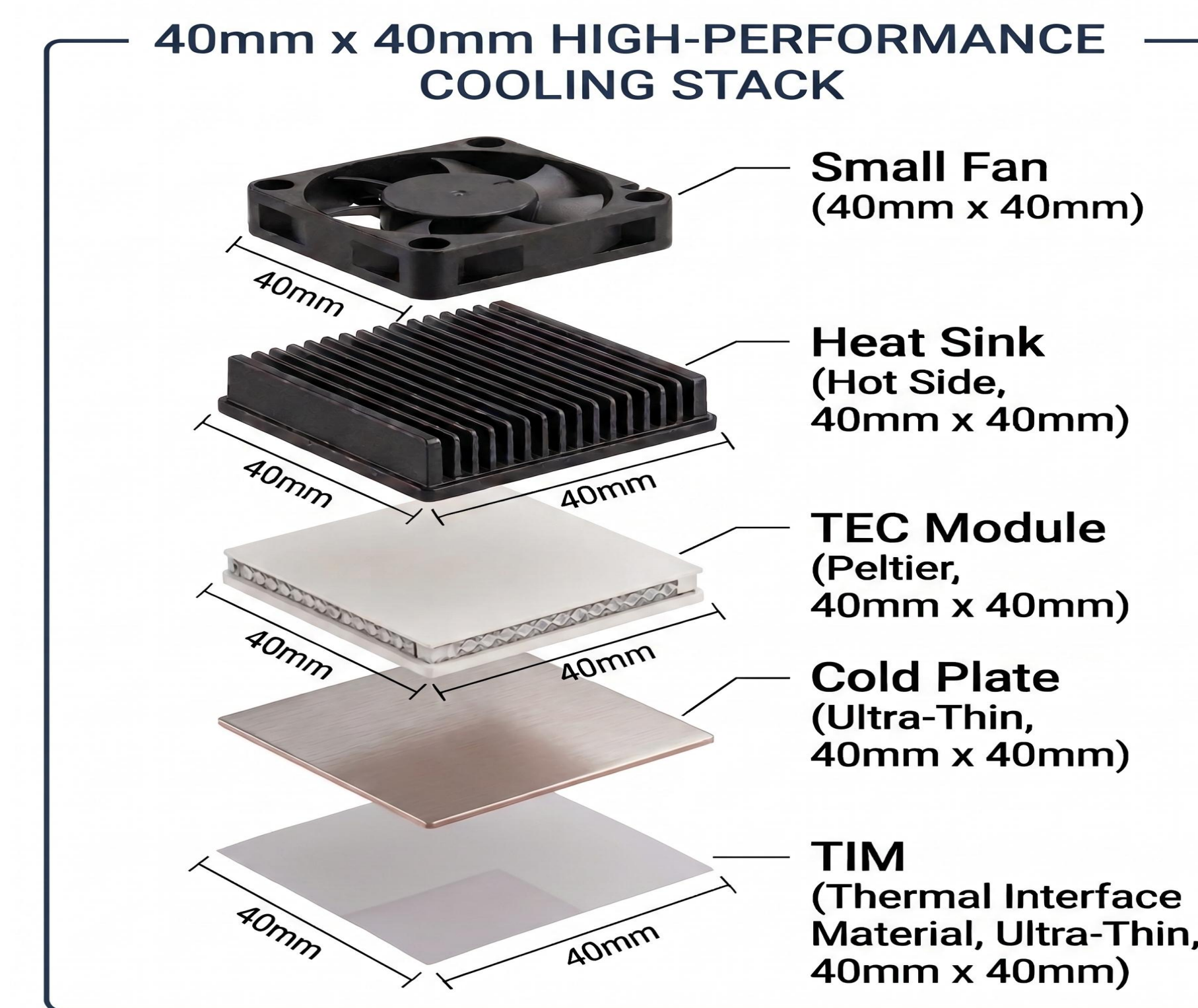
Constraints

- Total prototype cost \leq 6,000 SAR
- Complies with SASO & IEC safety standards
- Operating voltage \leq 5V
- Thermal materials stable up to 80 °C
- Contact materials must be inert and non-damaging
- Housing deformation \leq 0.2 mm at 50°C
- Thermal efficiency \geq 70%

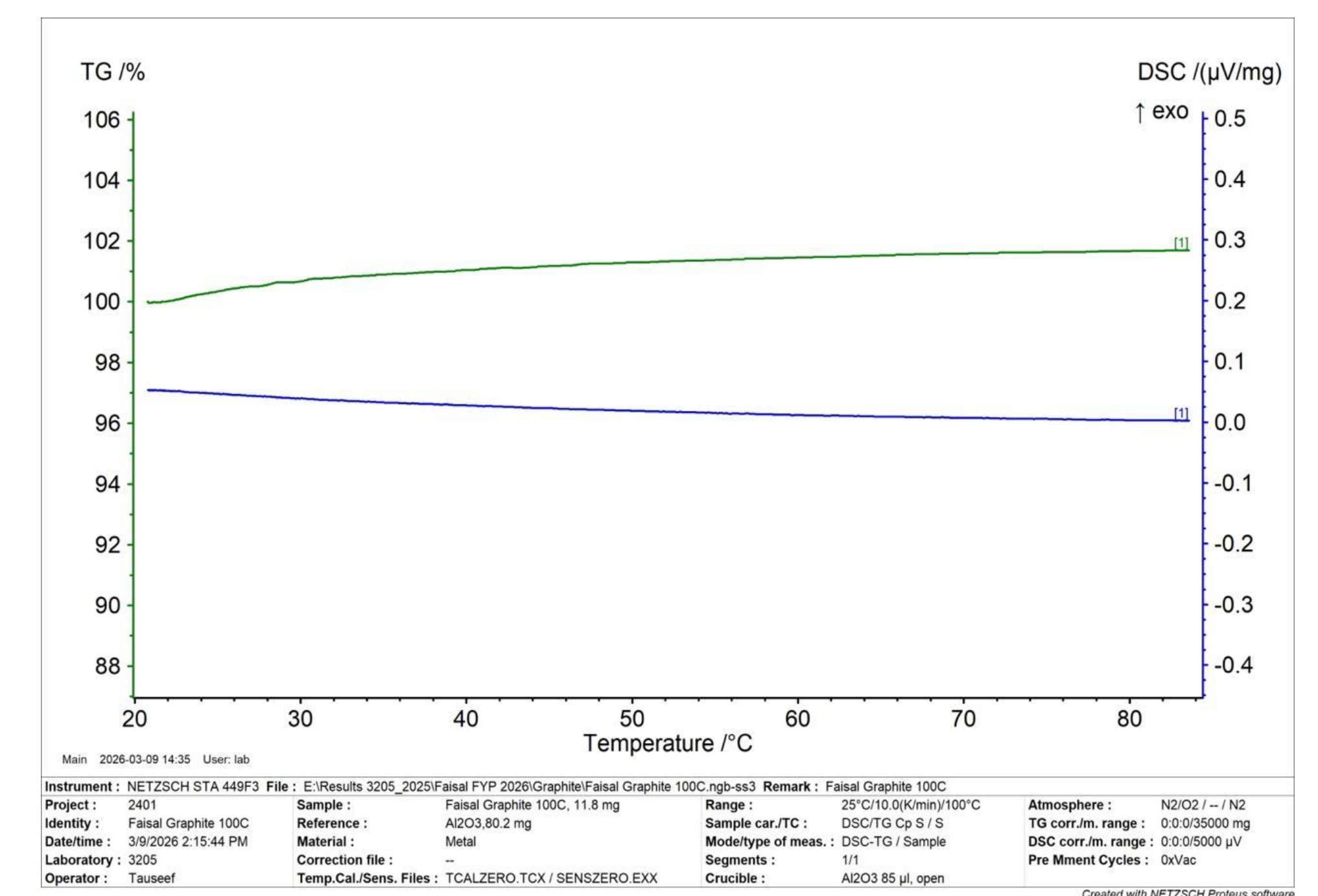
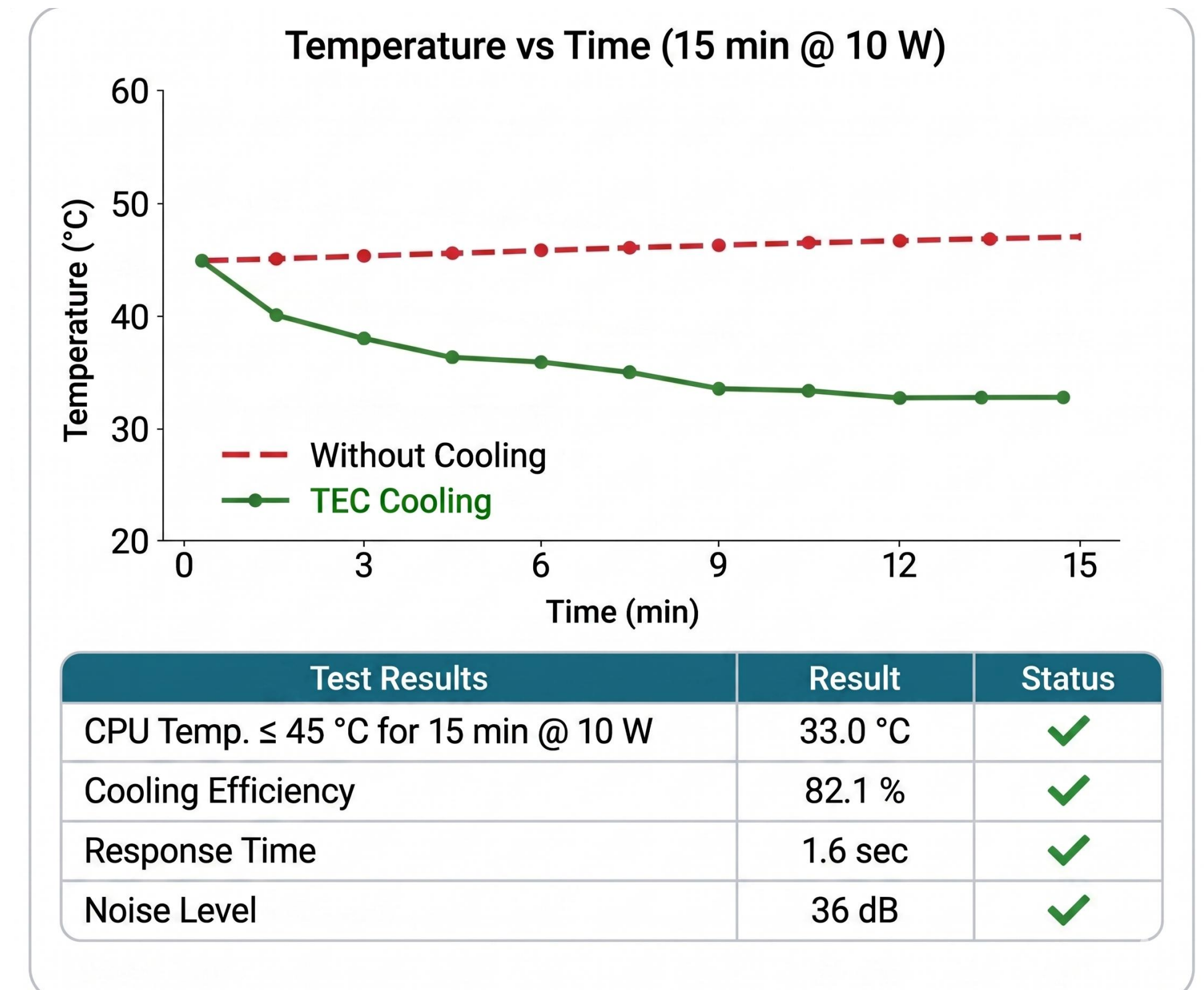
Specification

- Polymer/adhesive mass change \leq 1% at 0.75 x Tlimit
- Cooling activates \leq 2 s when $T > 35$ °C
- Power consumption: 7.5–8.5 W
- Current limit \leq 2 A
- TIM thermal resistance \leq 0.10 K·cm²/W
- Back surface reduced from 35 °C to ~31 °C
- TIM conductivity \geq 3 W/m·K
- Cold plate conductivity \geq 200 W/m·K
- Temperature reduction \geq 3 °C vs no cooling

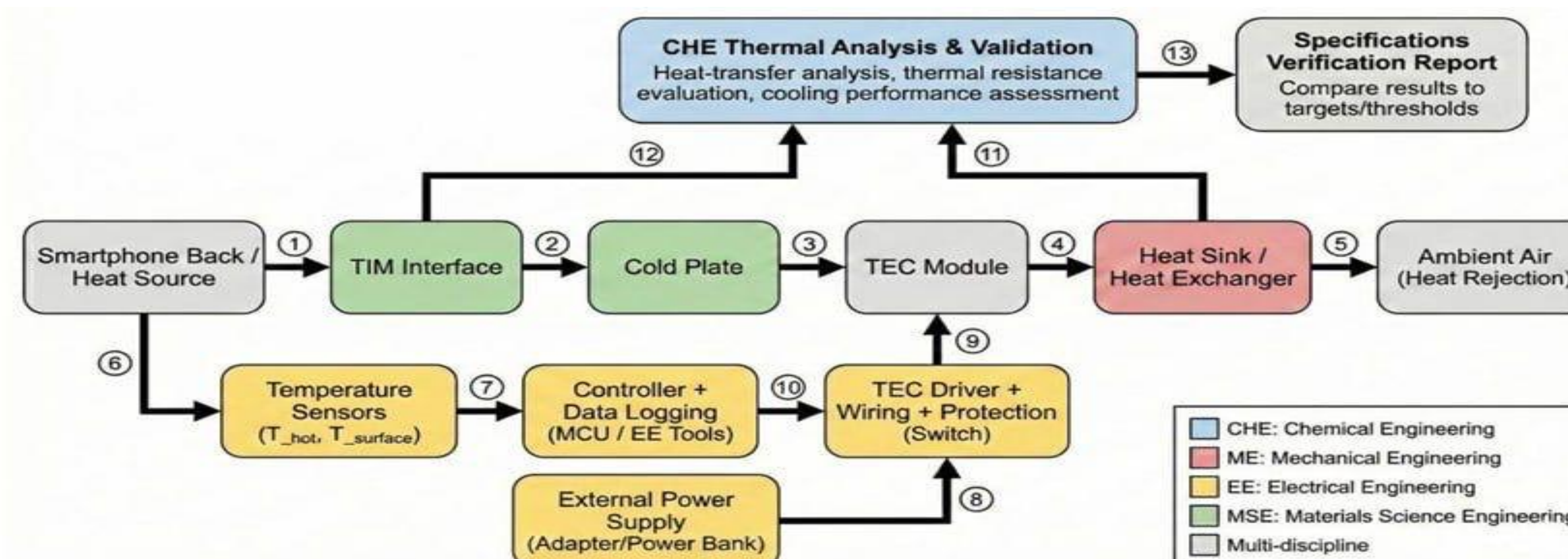
Prototype Design



Testing & Validation



Concept Design



Conclusion

The proposed smart cooling system effectively reduces smartphone overheating using thermoelectric cooling and real-time control. The prototype meets key specifications, maintaining safe temperatures while improving performance.