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Air Cooled Thermal Tool for System Level High Volume Manufacturing Testing

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INTRODUCTION

Thermal Margining tools are used to:

Accelerate Fault Detection	Identify Bugs
Test and Validate Silicon	Thermal Design Power Extraction
Reduce Escapes	Cooling and Margining capability

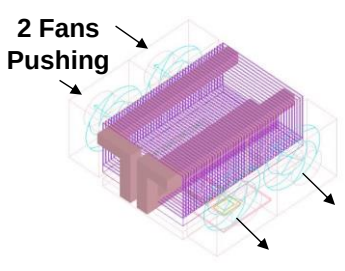
Air-cooled thermal tools (ACTT) remove the liquid detection, harness management issues, and lab infrastructure needs

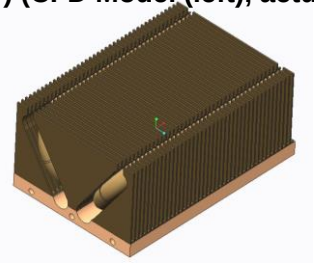
Goal

Design a new low cost high volume manufacturing (HVM) ACTT solution for System level testing automation environment for Client Multi-dies with Central Processing Unit (CPU) and Peripheral Component Hub (PCH) for 2 in 1's, laptop etc.

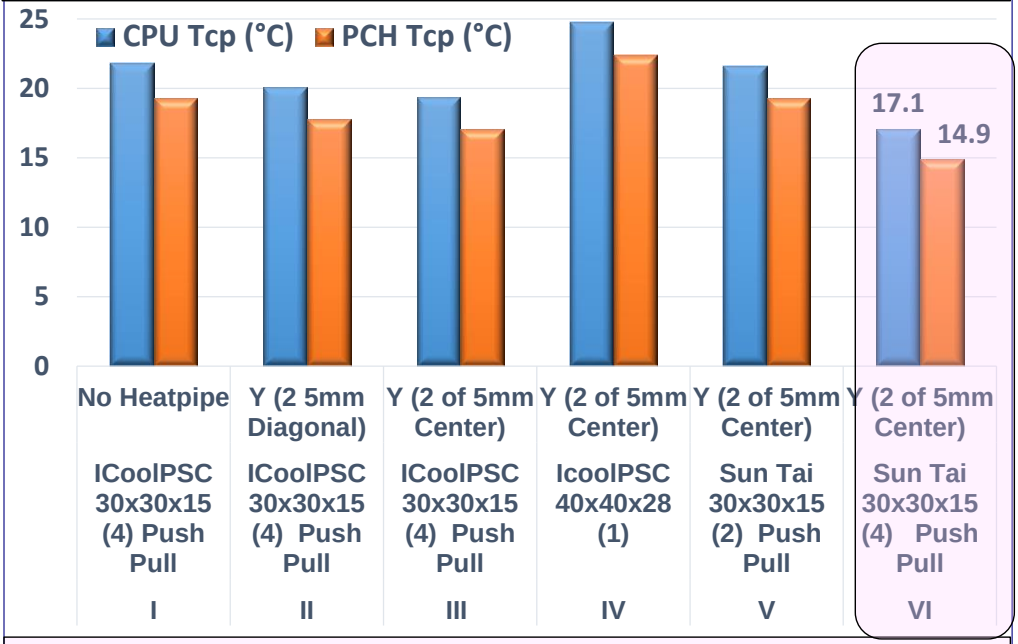
- **Thermal Design Target : CPU Cold Plate Temp (Tcp) 40 °C @ 30 W**
  CPU Tcp 60 °C to 85 °C @ 65 W
- **Keep Out Zone (KOZ) of the ACTT: Active Heatsink (HS) Keep out volume (KOV) of 45 mm x 60 mm x 26 mm, Single-staged Thermoelectric cooler (TEC) and the pedestal Kit**

Active HS design with 2 central heat pipes (HP) (CFD Model (left), actual design (right))

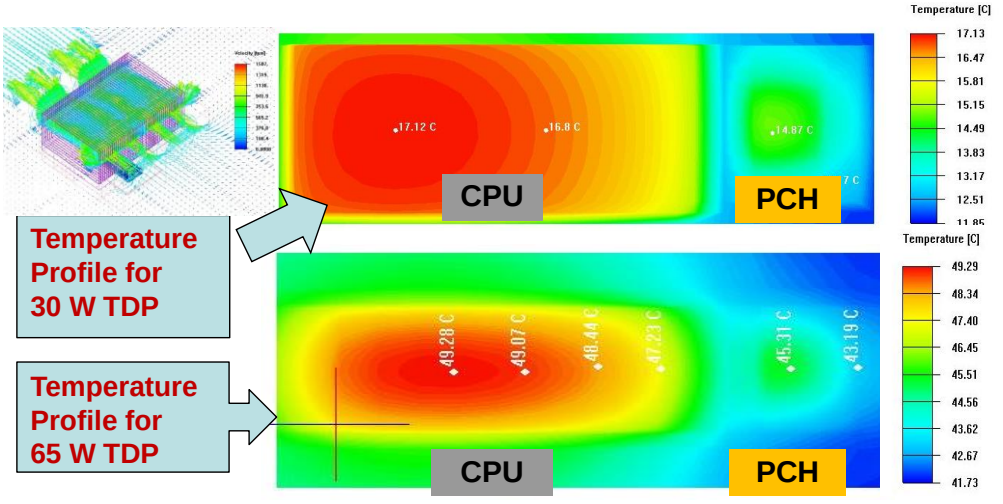




Lowest Temp of CPU (TDP=26.8 W) and PCH (TDP = 3.2 W)



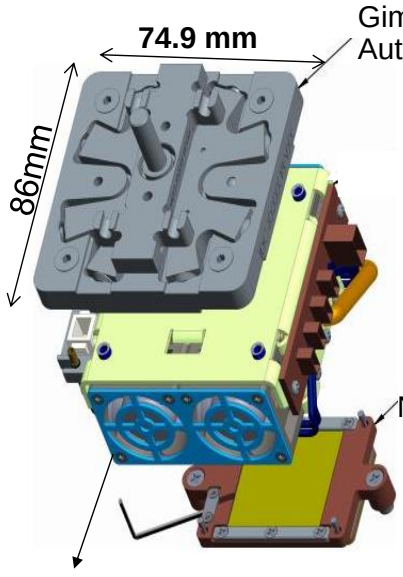
Final Design for TDP = 30 W with 1 30x30 mm TEC, 2 of 5 mm heatpipe, Fan Size: 30 x 30 x 15 mm (Sun Tai 24 V) 2 PUSH 2 PULL (QUAD FAN)



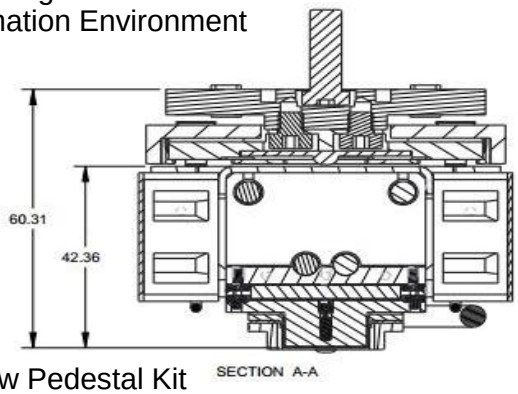
Uniform TDP (W)		Tcp (°C)	
CPU	PCH	CPU	PCH
58	7	52.9	47.9

Same Finalized Design HVM Air Cooled Thermal Tool for 65 W also meets the requirements

Finalized Mechanical Design and Actual Prototype

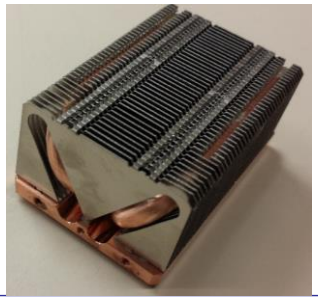


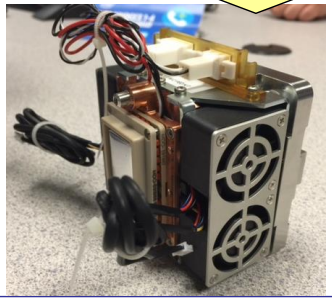
Gimbaling Mechanism for HVM Automation Environment

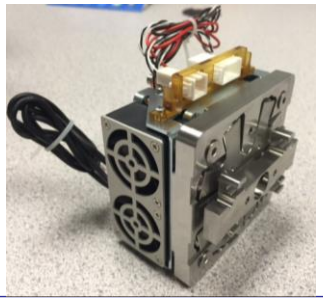


New Pedestal Kit design

Actual Prototypes of HVM Client ACTT Received, Functional Testing and Characterization Complete







Performance of HVM ACTT latest design w/ updated cold plate/pedestal and all TIM layers w/ 30 x 30 x 15 mm fan w/pedestal

Uniform TDP (W)		Tcp (°C)	
CPU	PCH	CPU	PCH
26.8	3.2	15.4	13.7
58	7	49.3	45.3

Summary

New HVM ACTT meets all the design requirements removing the liquid detection, harness management issues and lab infrastructure needs

- Reduces the cost by 80% compared to the existing liquid cooled thermal tools
- Next step is to collect the field testing data at HVM