TONGYU TECHNOLOGY

GLOBAL THERMAL SOLUTIONS PROVIDER & SUPPLIER

TONGYU
ELECTRONICS

Contents

01

PART ONE

Company Profile

About Tongyu

TONGYU ELECTRONICS

3 Production Bases:

Tongyu Electrinics co. Ltd (Headquarter)
Xinyang Tongyu Electronics Co., Ltd (China)
Vietnam Bac Ninh Naxin Electronics Co. LTD

China Offie:

Jinan Office

3 R & D centers:

Taibei Tongyu industrial Ltd (Taiwan)
Naxin Electronics Technology Co.,Ltd (Hongkong)
Tongyu Thermal Technology Co., Ltd (China)

Milestone

TONGYU ELECTRONICS

2005
Dongguan Tongyu founded


2009


Enter the Foxconn system

2011
Xinyang Tongyu founded


2014

Taipei Tongyu founded

2016
Started transforming into a R&D-focused enterprise and entering the server field


2017
BYD
Gain the BYD AVL
中科曙光 Sugon
Gain the Sugon AVL

Tongyu thermal technology founded

2018
entered the automotive and new energy field

Gain Furukawa AVL
FURUKAWA ELECTRIC GROUP
古河電工

2019

Vietnam Bac Ninh Naxin Electronics Co., LTD founded

2020
Dongguan liquid cooling production base established

Inspur&LG AVL
浪潮

2021
TESLA
Gain the Tesla AVL

2023
Into the doubling programme enterprise


Gain the Huawei AVL
HUAWEI

2024
liquid cooling factory capacity

Tencent 腾讯
Gain the Tencent AVL

Product Application

Vehicle-Mounted

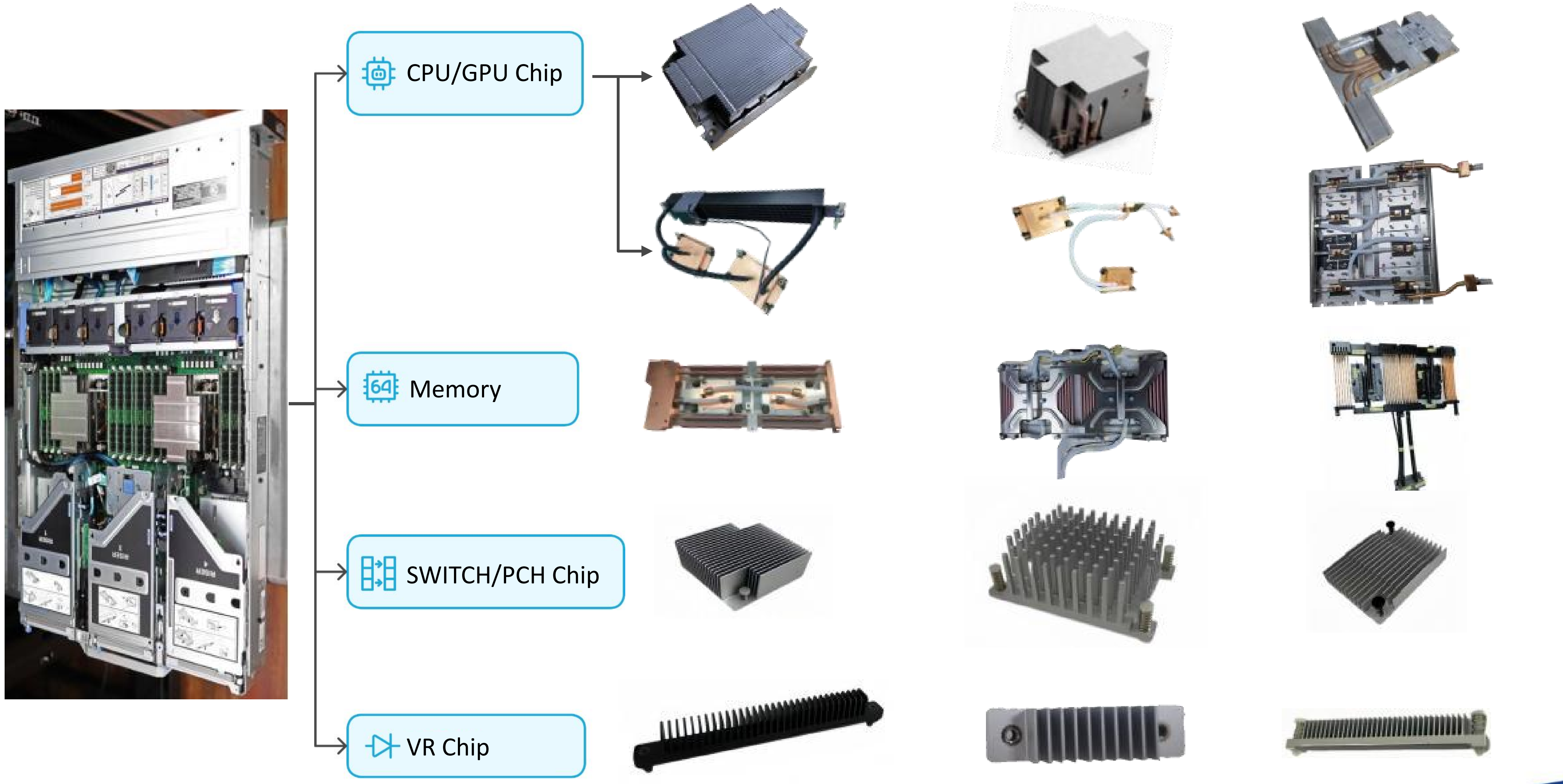
PC/ Server

New energy/storage

Netcom/Consumer Electronics

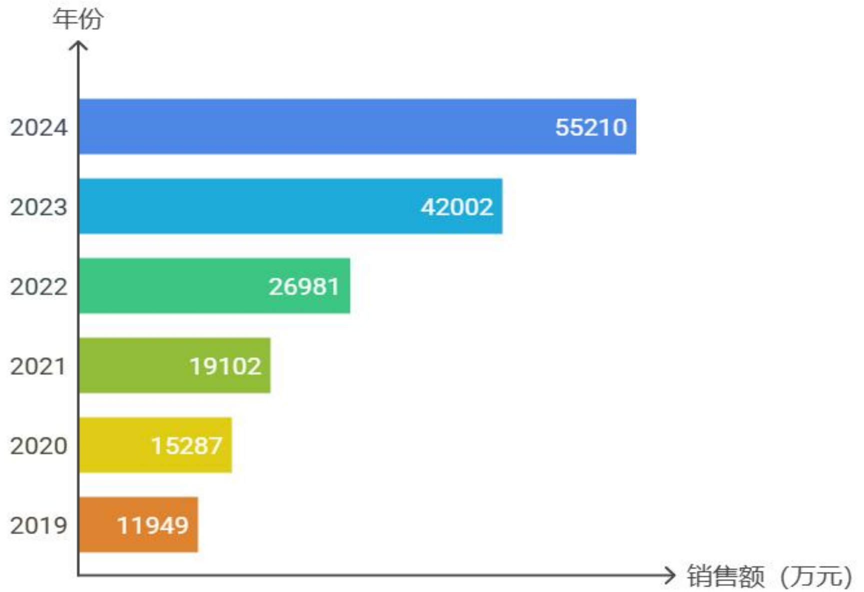
Server

TONGYU ELECTRONICS



Sales Proportion

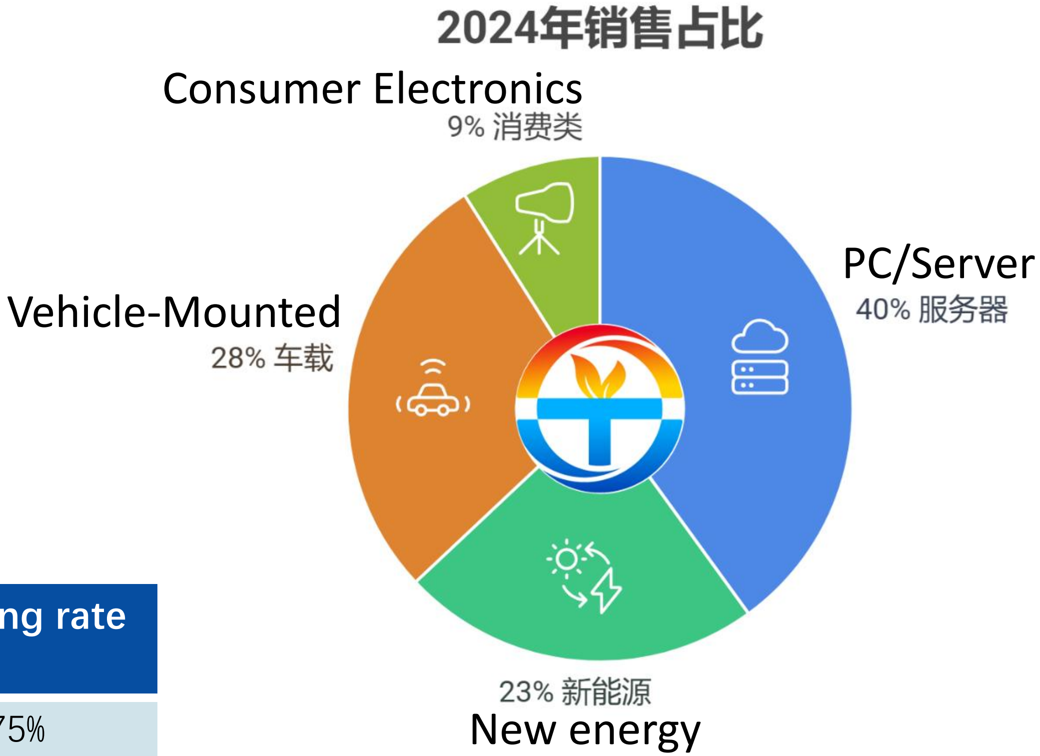
TONGYU ELECTRONICS



Comparison of sales in the last 6 years

Category	Monthly production	Shipments/month	Moving rate
Extrusion	2000K	1500K	75%
Module Soldering	800K	400K	70%
Liquid Cooling	200K	150K	40%

Share of sales in 2024



02

PART TWO

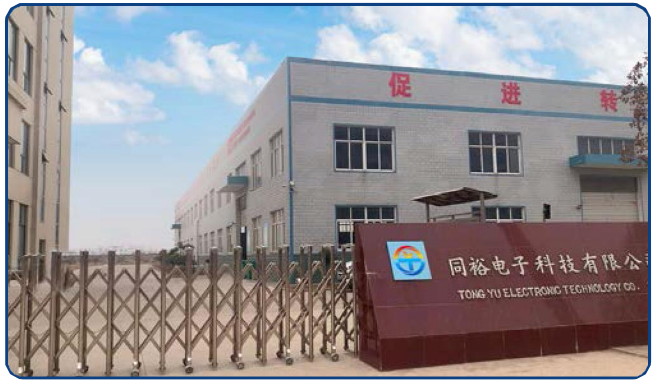
Factory Show

Factory Show

TONGYU ELECTRONICS

Dongkeng | Tongyu Headquarter
（36000 Square meter ）

Dongkeng | Tongyu Liquid Cooling Factory （12000 Square meter ）



Xinyang | Tongyu Central China Factory （20000 Square meter ）

Vietnam | Tongyu Overseas Factory
（7500 Square meter ）

SSL | Tongyu Thermal Technology

Taiwan | Tongyu Industry

Tongyu Employee

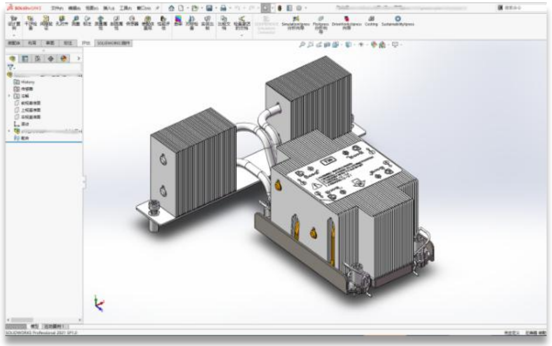
Office

Production line

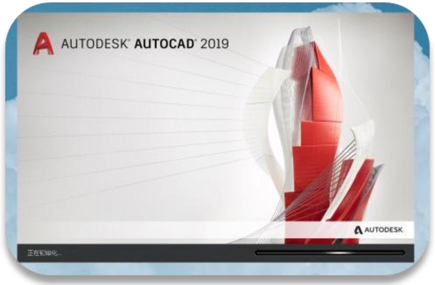
Laboratory

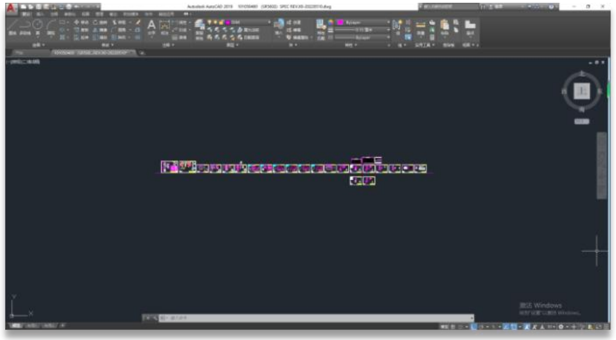
Factory	Total Employees	Number of R&D Staff
Tongyu Headquarter	760	54
Tongyu Liquid Cooling Factory	164	22
Xinyang Factory	200	5
Vietnam Factory	100	4
Taiwan Office	15	6
SSL Office	12	5
Total	1251	96

R&D Software

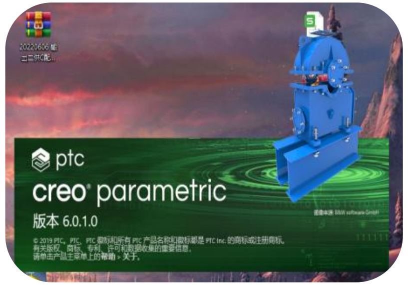


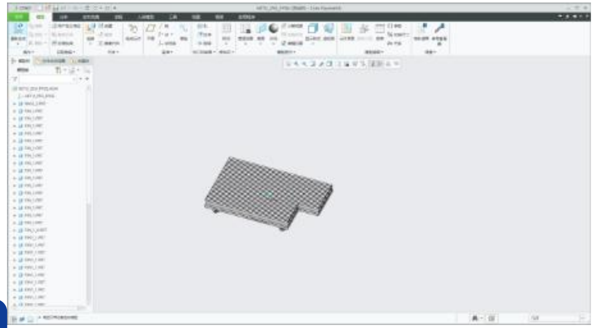
Solideworks 2021



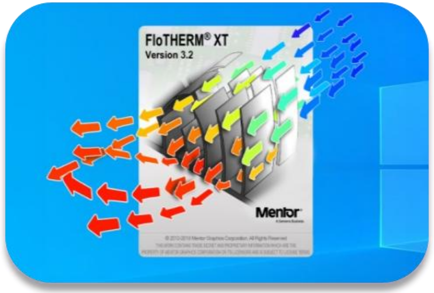


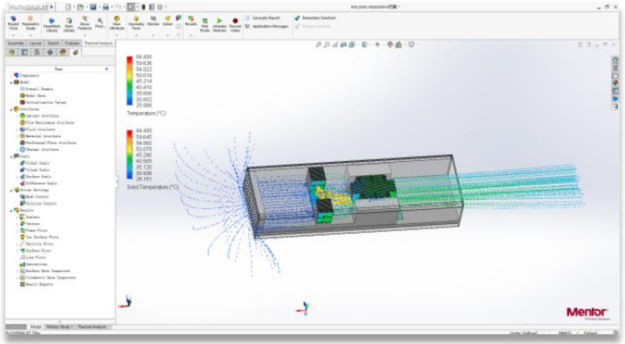
Auto CAD2019





Creo Parametric 6.0





Flotherm XT 3.2

ZW 3D

03

PART THREE

Quality System

Company Core Philosophy

TONGYU
ELECTRONICS

Quality is the lifeline of an enterprise. Without quality, delivery is a disaster and reflects a lack of respect and responsibility to the customer. As a manufacturing company, in our business operations,

Quality First, Delivery Second, Cost Third
is the core philosophy that our company has consistently upheld.

Quality First

Delivery Second

Cost Third

Certificates

TONGYU ELECTRONICS


CERTIFICATE OF QUALITY MANAGEMENT SYSTEM CERTIFICATION

Certificate No.: 19821QH2078R1M

We hereby certify that the organization:
Dongguan Tongyu Electronic Co.,LTD

Is in conformity with Quality Management System Standard:
GB/T 19001-2016/ISO 9001:2015

The certificate is valid to the following product(s)/service:
Production and sales of radiators, cooling fans, metal die-casting products, and metal stamping products

Date of Initial Issuance: Aug 13, 2021
Date of Renewal: Aug 12, 2024
Date of Expiration: Aug 12, 2027

Beijing Xinjiyuan Certification Co.,Ltd.


Certificate of Registration

This is to certify that the Quality Management System of:
Dongguan Tongyu Electronics Co., Ltd.
Building 3, No. 282, Dongkeng Keji Road, Dongkeng Town, Dongguan City, Guangdong Province, 523451, China

applicable to:
The manufacture of radiators for in-vehicle navigation systems

has been assessed and registered by NQA, Warwick House, Houghton Hall Park, Houghton Regis, Dunstable, LU5 5ZX, UK

against the provisions of:
IATF 16949:2016

NQA Certificate No: T87156
IATF Certificate No: 0505799
First Issue Date: 17 March 2024
Valid Until: 16 March 2027


CERTIFICATE OF OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT SYSTEM CERTIFICATION

We hereby certify that the organization:
Dongguan Tongyu Electronics Co., Ltd.

Is in conformity with occupational health and safety Management System Standard:
GB/T 45001-2020/ISO 45001:2018

The certificate is valid to the following product(s)/service:
Production and sales of radiators, cooling fans, hardware die-casting products, and hardware stamping products

Date of Initial Issuance: Feb 03, 2021
Date of Renewal: Jan 31, 2024
Date of Expiration: Feb 02, 2027

Beijing Xinjiyuan Certification Co.,Ltd.


CERTIFICATE OF ENVIRONMENT MANAGEMENT SYSTEM CERTIFICATION

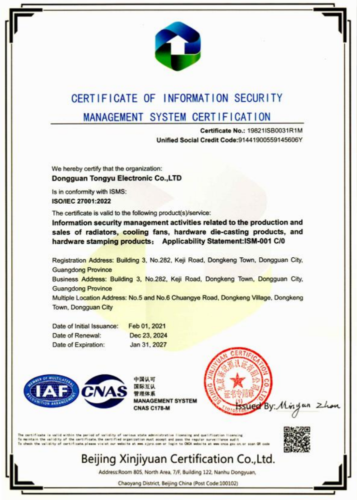
We hereby certify that the organization:
Dongguan Tongyu Electronic Co.,LTD

Is in conformity with Environmental Management System Standard:
GB/T 24001-2016/ISO 14001:2015

The certificate is valid to the following product(s)/service:
Production and sales of radiators, cooling fans, metal die-casting products, and metal stamping products

Date of Initial Issuance: Aug 13, 2021
Date of Renewal: Aug 12, 2024
Date of Expiration: Aug 12, 2027

Beijing Xinjiyuan Certification Co.,Ltd.


CERTIFICATE OF INFORMATION SECURITY MANAGEMENT SYSTEM CERTIFICATION

We hereby certify that the organization:
Dongguan Tongyu Electronic Co.,LTD

Is in conformity with ISMS:
ISO/IEC 27001:2022

Date of Initial Issuance: Feb 01, 2021
Date of Renewal: Dec 23, 2024
Date of Expiration: Jan 31, 2027

Beijing Xinjiyuan Certification Co.,Ltd.


IEC QUALITY ASSESSMENT SYSTEM (IECQ)

IECQ Certificate of Conformity
Hazardous Substance Process Management

Dongguan Tongyu Electronic Co., Ltd.

Issued by the Certification Body: NQA

ISO9001

IATF16949

ISO45001

ISO14001

ISO27001

IECQ QC080000

Honors

TONGYU
ELECTRONICS

OCTC Member

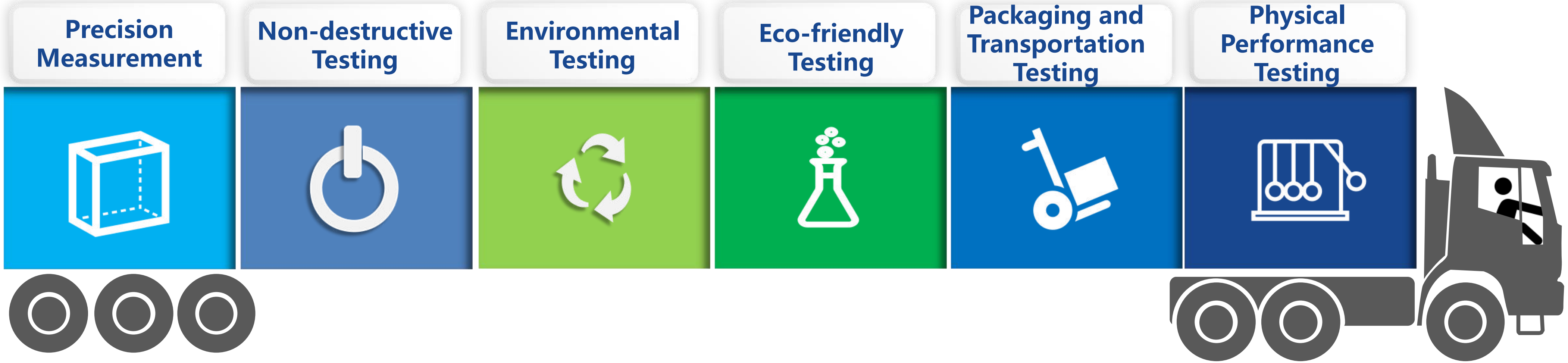
Over 80 patents

Excellent Supplier Trophies

Laboratory

TONGYU ELECTRONICS





Quality Measurement Laboratory (Precision Measurement)

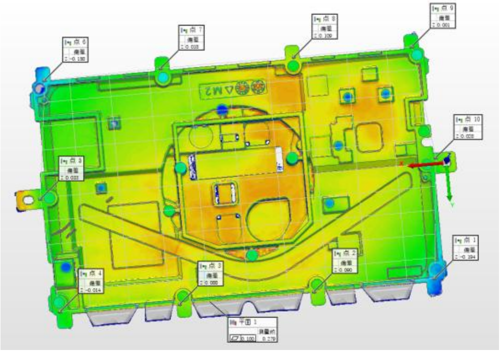
TONGYU ELECTRONICS

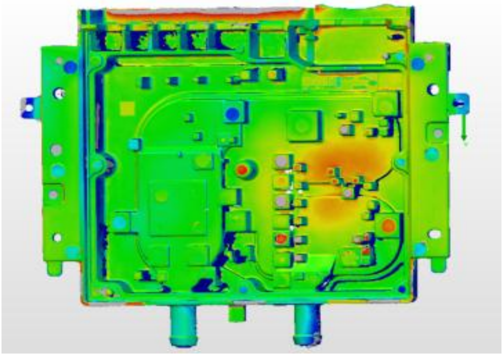
Instrument Name: Coordinate Measuring Machine (CMM)

Model:CROMA8156
Measuring Range:X800mm,Y1500mm,Z600mm
Accuracy:2.5±L/300 um

Model:Daisy8106
Measuring
Range:800mm,Y1000mm,Z600mm
Accuracy2.5±L/300 um

Instrument Name: Blue Light Tracking Scanner



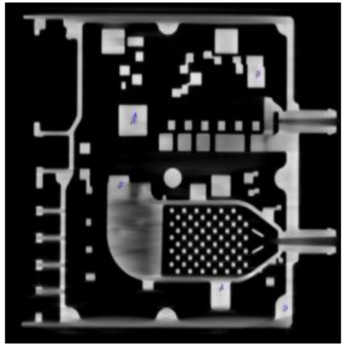


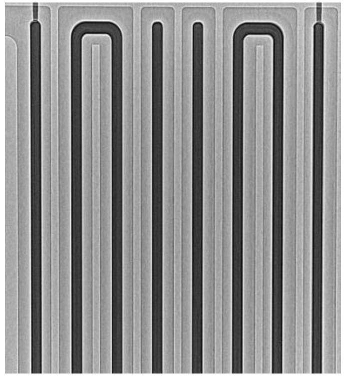
Parameters：
Accuracy:0.025mm； Tracking Range:10.4m³,18m³
Scanning Rate:2,200,000 measurements/second
Scannable Object Size Range:100-8000mm

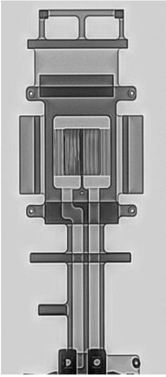
Quality Measurement Laboratory (Non-destructive testing)

TONGYU ELECTRONICS

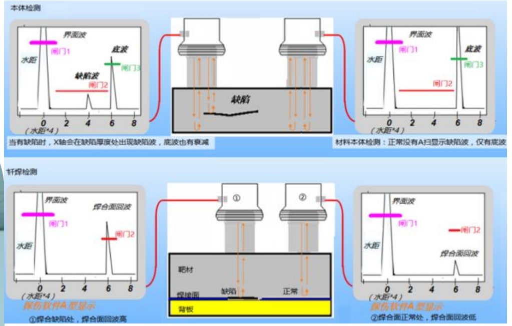
Instrument Name: X-ray CT/3D

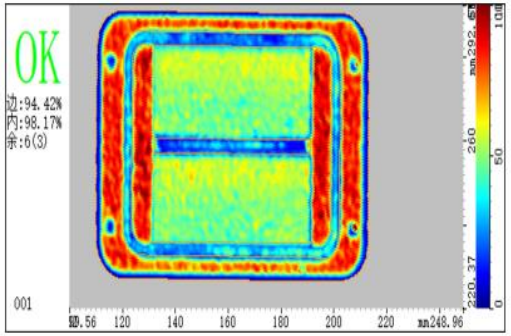


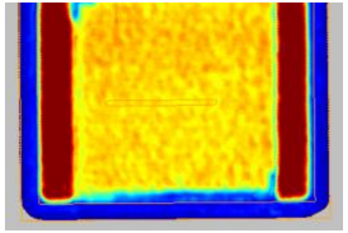




Instrument Name: Ultrasonic (C-Scan) Scanner







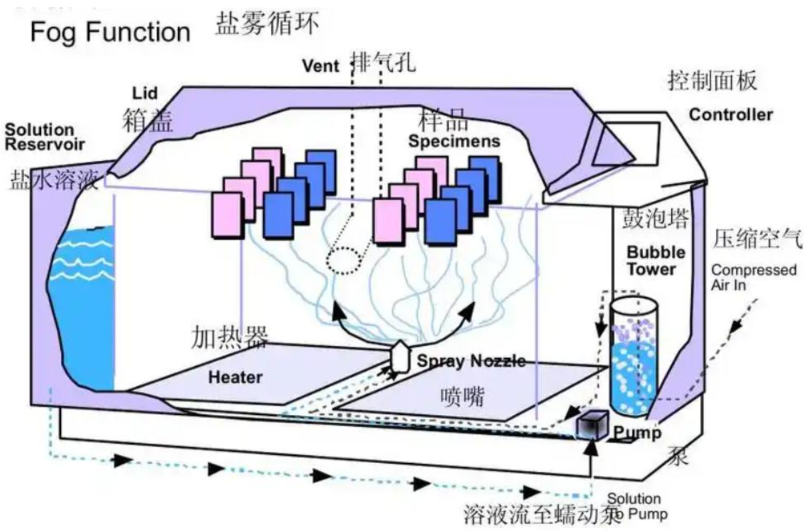
Quality Measurement Laboratory (Environmental Testing)

TONGYU ELECTRONICS

Instrument Name: Composite Salt Spray Test Chamber

Parameter:

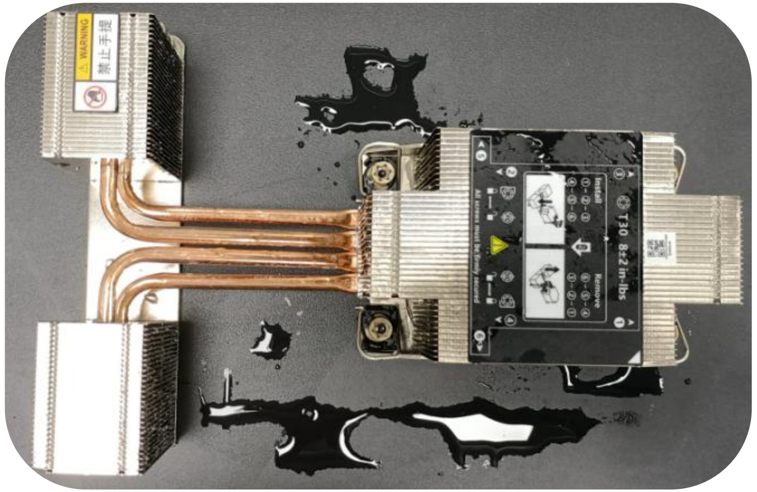
- Model：KM-90L-AF
- Dimension：
  1410×880×1280mm
- Volume：90L



Instrument Name: Programmable Salt Spray Test Chamber

Parameter:

- Model：KD-90
- Dimension:
  1410×880×1280mm
- Volume：90L



Quality Measurement Laboratory (Environmental Testing)

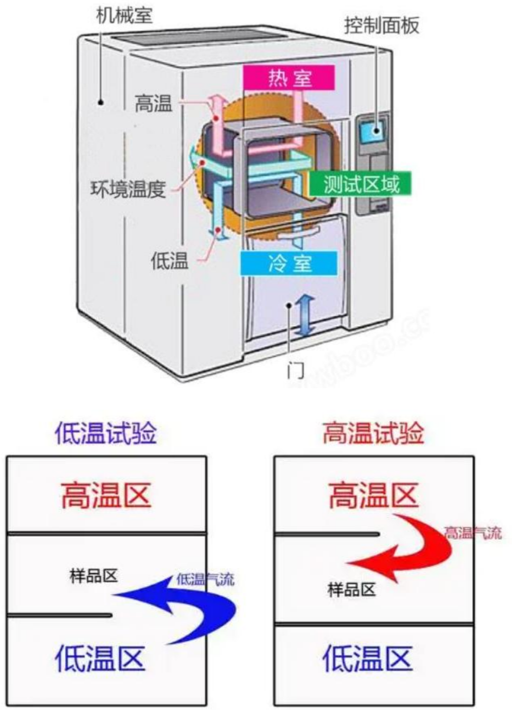
TONGYU ELECTRONICS

Instrument Name:Programmable Constant Temperature and Humidity Chamber

Model: TH-225DH
Temperature Range: -50℃-150℃ ± 2℃
Humidity Range:5%-98%±2%
Volume:225L

Model: FEMI880
Temperature Range:-50℃-150℃±2℃
Humidity Range:20%-98%±2%
Volume:225L

Instrument Name:Thermal Shock Test Chamber

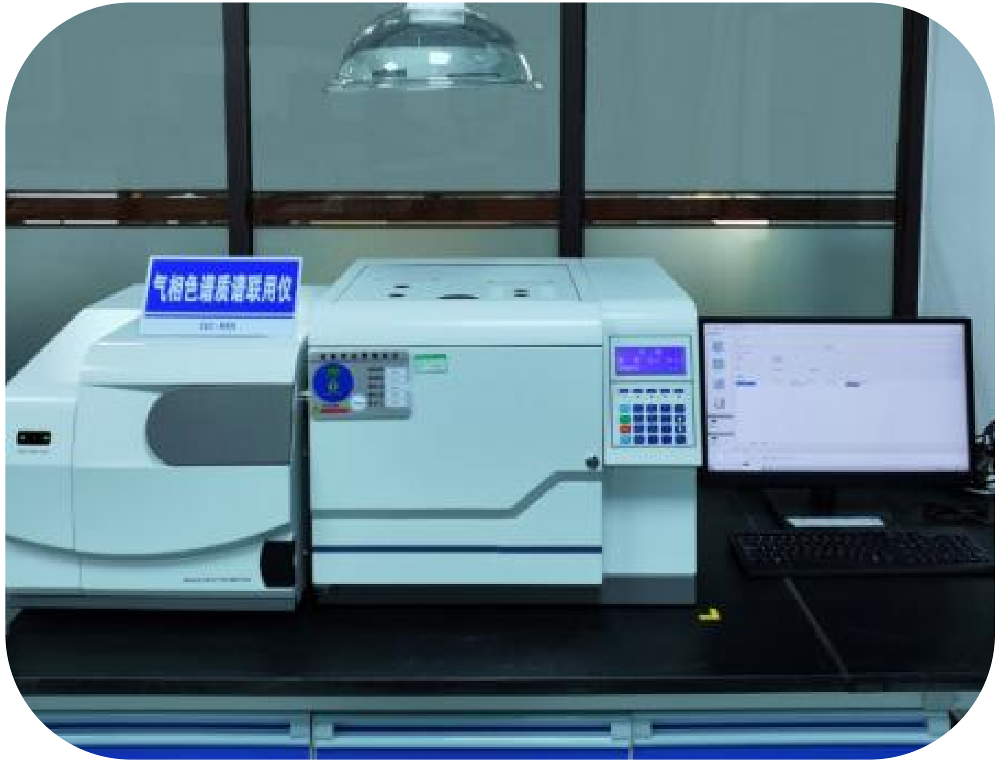


Model: KM-80L-CJ-40、Volume:80L、 Humidity Range:-55℃—150℃ 、Slope: ≦ 5Min 、Control Stability: ±0.2℃

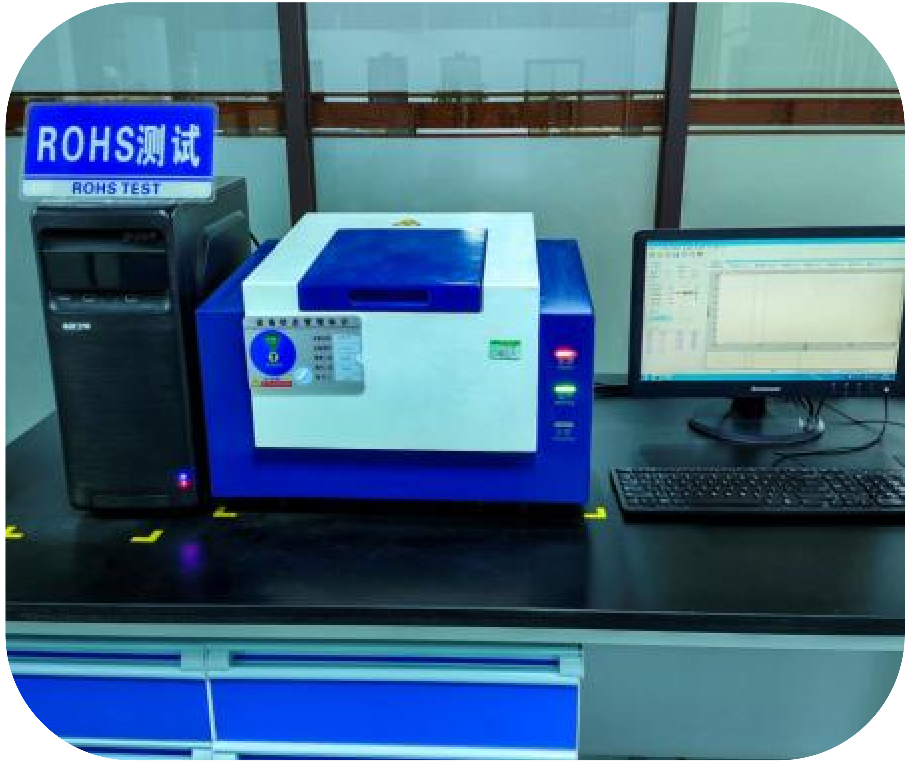
Quality Measurement Laboratory (Environmental Testing)

TONGYU ELECTRONICS

Instrument Name: Gas Chromatograph-Mass Spectrometer (GC-MS)



Instrument Name:X-Ray Fluorescence Spectrometer (XRF)

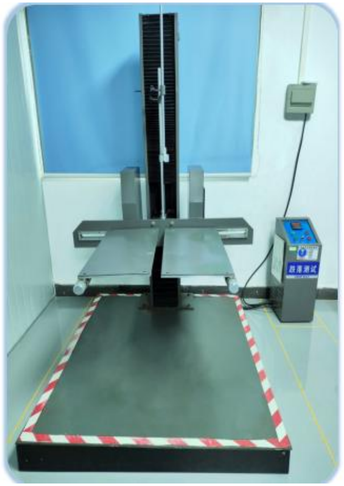


Quality Measurement Laboratory (Packaging and Transportation Testing)

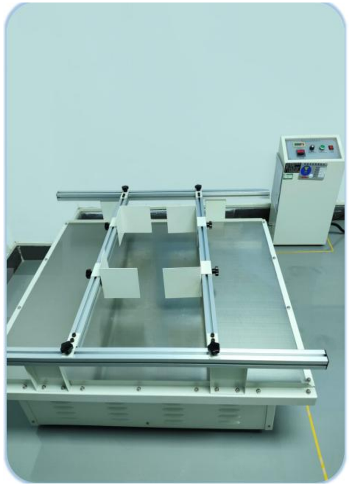
TONGYU ELECTRONICS


Tri-Axial Vibration Tester


Impact/Collision Testing Machine


Drop Test Machine


Ball Drop Impact Tester


Transportation Vibration Simulator

Vickers Hardness Tester

Shore A/D Hardness Tester

Shore A/D Hardness Tester


Rigidity Tester

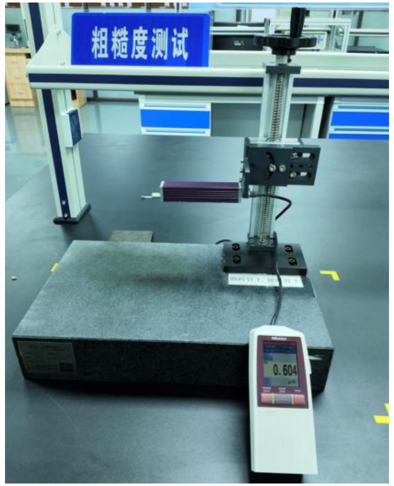

Thermal Conductivity Tester

Quality Measurement Laboratory （Physical Performance Testing）

TONGYU ELECTRONICS

Spring Tester

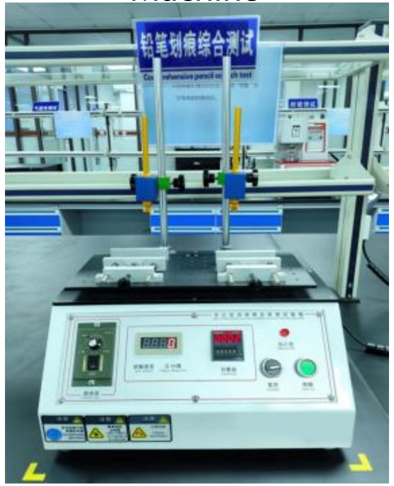
Tensile Testing Machine



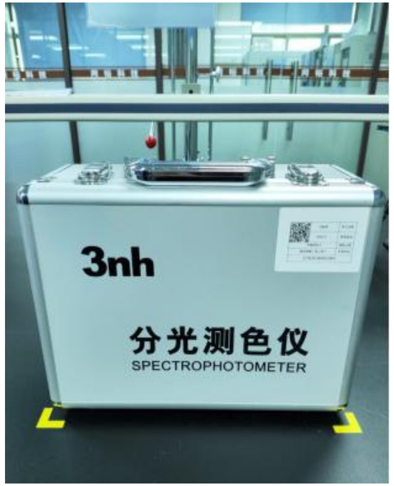
Roughness Tester

Fan Speed Tester

Tape Friction Tester



Pencil Scratch Resistance Tester



Spectrophotometer

Bursting Strength Tester

Automation Equipment Application

TONGYU ELECTRONICS

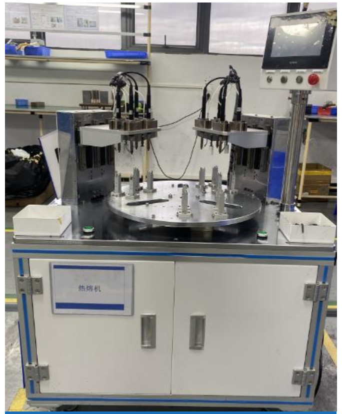

Automatic Locking Threaded Sleeve Machine


Automatic Labeling Machine


Automatic screw Machine


Automatic Laser Welding Machine


Automatic Pipe Rolling Machine


Automatic Hot Melt Machine


Automatic Thermal Pad Labeling Machine


Automatic Riveting Machine

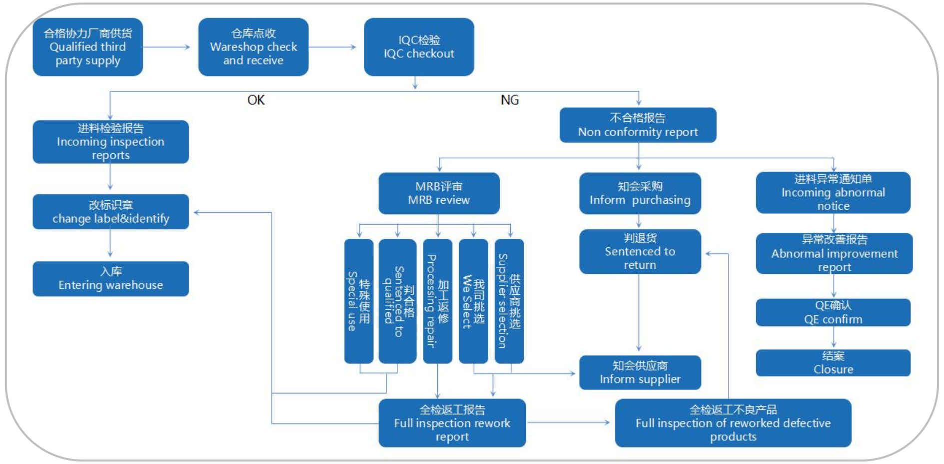

Automatic Dispensing Machine

Quality Inspection Process (Incoming Inspection, In-Process Inspection, Finished Product Inspection)

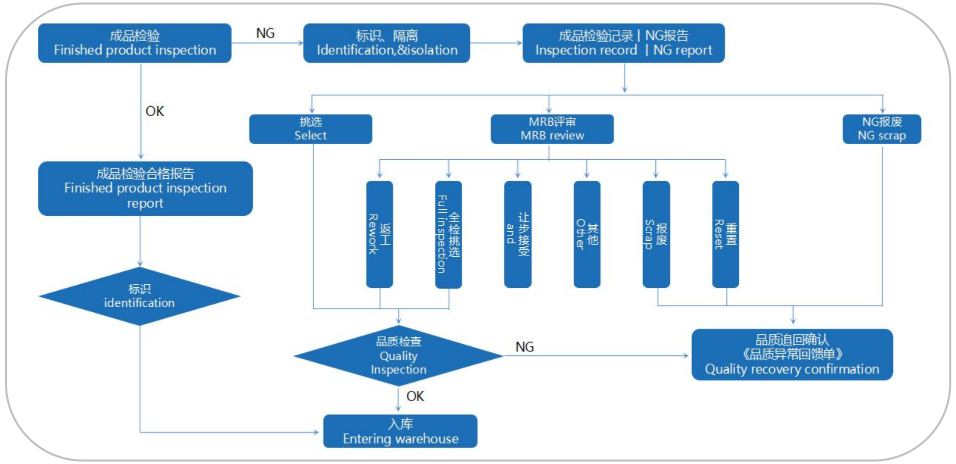
TONGYU ELECTRONICS

Supplier → Input → Process → Output → Customer

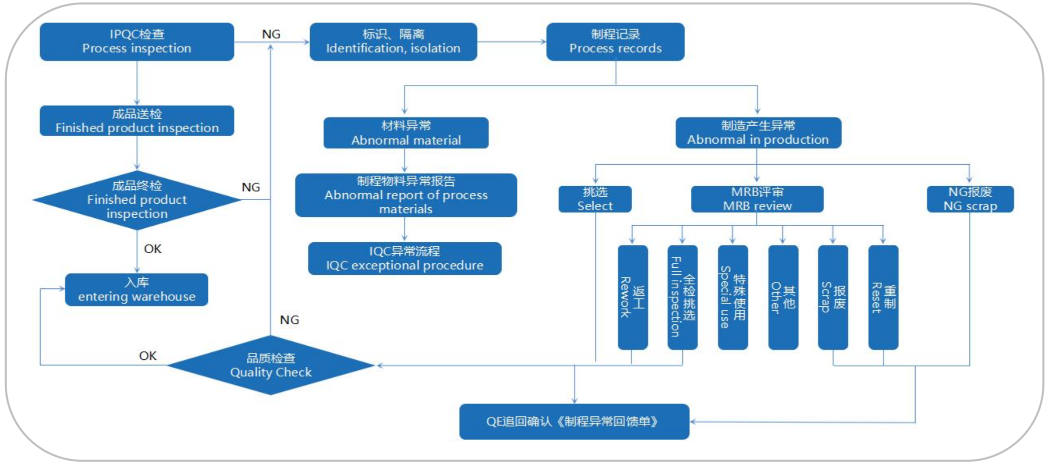
Incoming Inspection Process



Finished Product Inspection Process

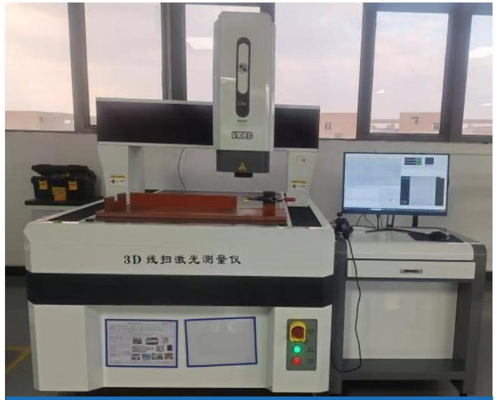


In-Process Inspection

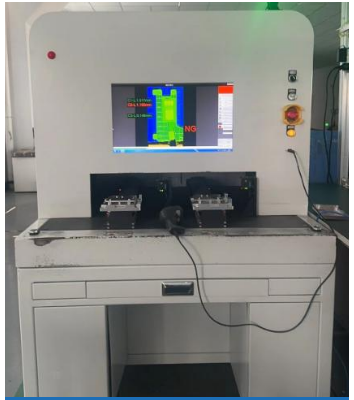


Product Outgoing Quality Assurance (Air Cooling)

TONGYU ELECTRONICS

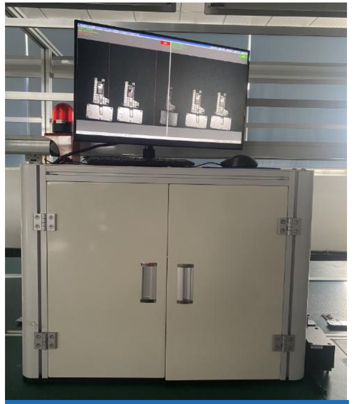


Line Laser Scanning Flatness Inspection Machine



Laser Dimension Inspection Machine

Automatic Tooth Detection Machine



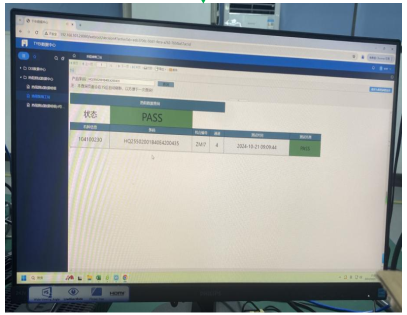
CCD Visual Inspection Machine

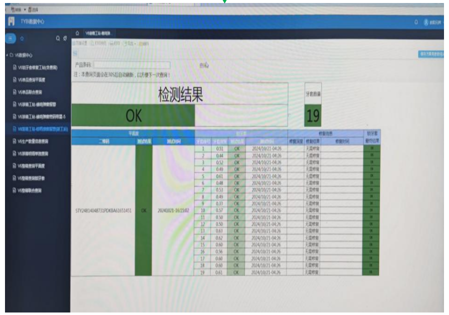
Thermal Resistance Testing Machine

Test Results Automatically Uploaded

Tongyu BI Data Center

Scanning and Control



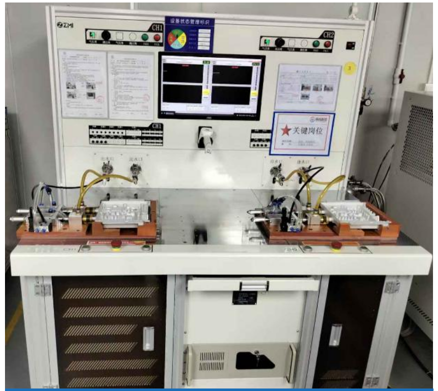


Product Outgoing Quality Assurance (Liquid Cooling)

TONGYU ELECTRONICS

Precision Air Tightness Tester

Precision Air Tightness Tester



Flow Resistance/Thermal Resistance Tester

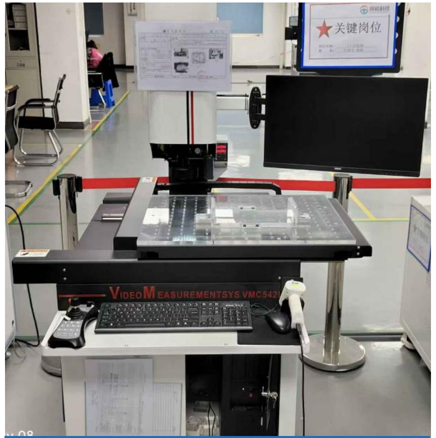
Vacuum Helium Leak Tester

Helium Mass Spectrometer Leak Detector

Flow Channel Cleaning Machine

Flow Channel Dryness Tester

High-Pressure (Pressure Holding) Air Tightness Tester



2.5D Dimensional Measurement Machine

Automatic Thread Inspection Machine

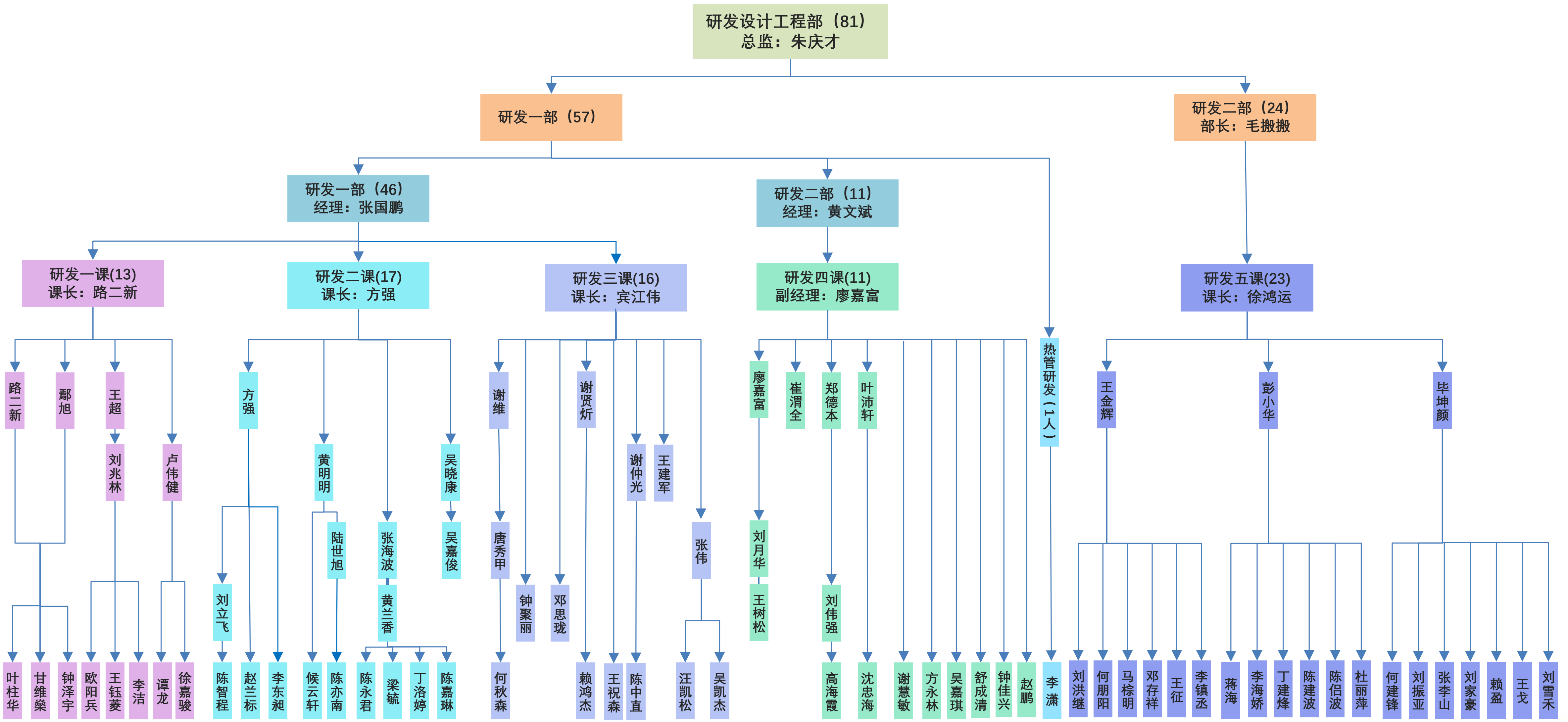
04

PART FOUR

About R&D Team

R&D Department Headquarters Architecture Diagram

TONGYU ELECTRONICS



R&D Design Engineering Department

TONGYU ELECTRONICS

Headquarters R&D---86 people

Taipei R&D---6 people

Vietnam R&D---4 people

Total number of R&D---96 people

Bachelor's degree or above: 35 people, accounting for 36.5%

College education: 46 people, accounting for 47.9%

Other personnel: 15 people, accounting for 15.6%

- ≥ 10 years of experience in the heat dissipation industry 15 people accounting for 15.6%
- ≥5 years of experience in the heat dissipation industry 32 people accounting for 33.3%
- ≥3 years of experience in the heat dissipation industry 40 people accounting for 41.6%
- Other personnel 9 people accounting for 9.5%

05

PART FIVE

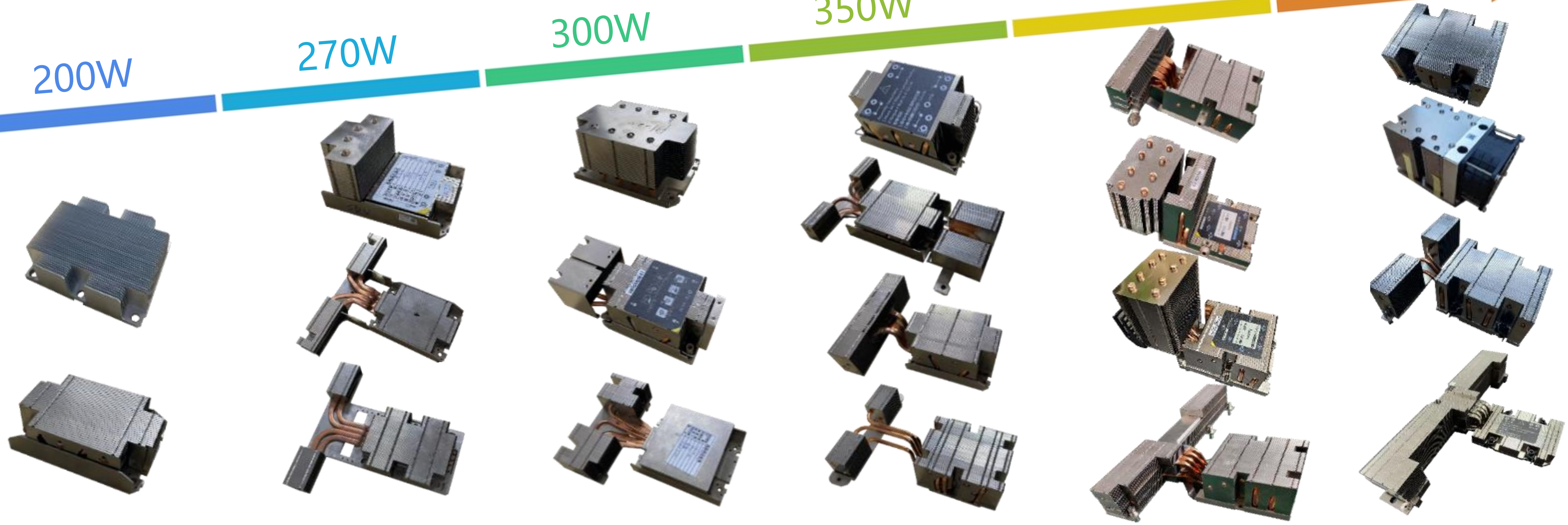
R&D Cases

Technology Study/Product case
Air-Cooled

Product Route of Air-cooled Heat Sink

TONGYU ELECTRONICS

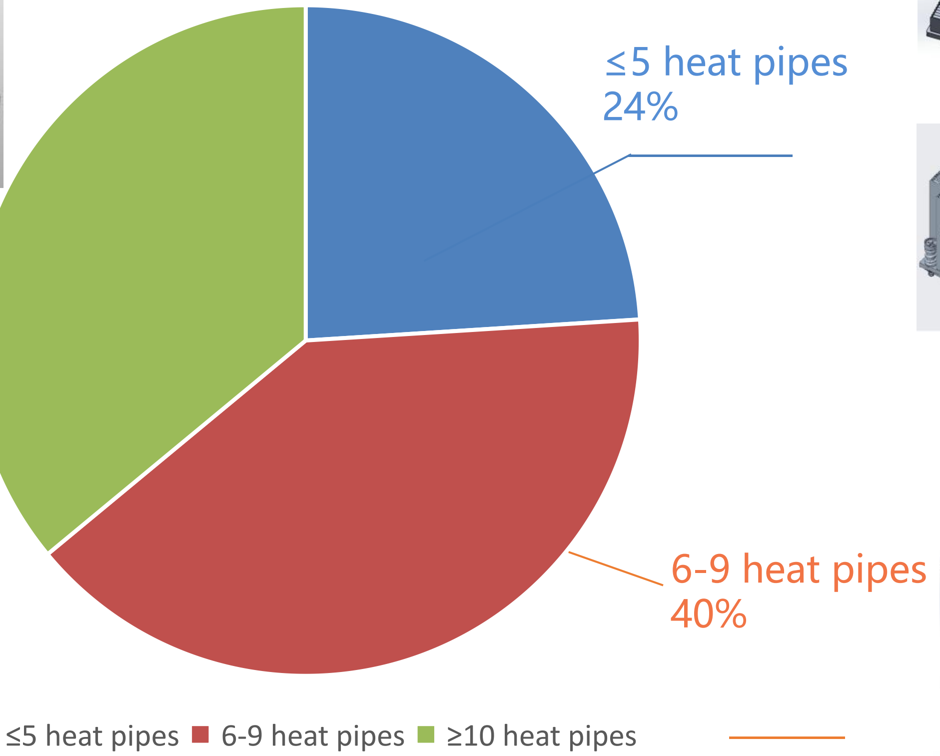
200W → 270W → 300W → 350W → 500W → >500W

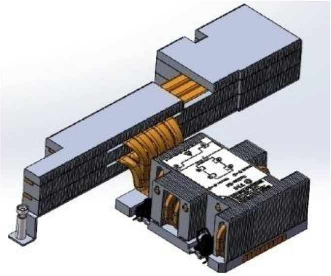


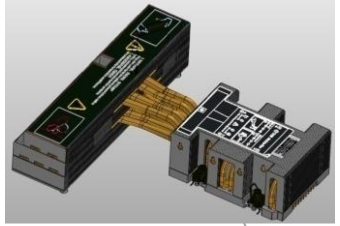
200W	270W	300W	350W	500W	>500W
Product features: Aluminum extruded heat sink; 1U welding module	Product features: L-type 2U welding module; 1U EVAC welding module	Product features: 2U welding module; 1.5U EVAC welding module; 2U EVAC welding module; Applicable: EGS ; SP5 platform	Product features: 2U welding module; 1.5U EVAC welding module at both ends; 2U EVAC welding module; Applicable: EGS ; SP5 platform	Product features: Roller tube 2U EVAC welding module; Roller tube 3U EVAC welding module; Applicable: EGS ; SP5 platform	Product features: Roller tube 2U EVAC welding module; Roller tube 3U EVAC welding module; 3D VC welding module; Applicable: EGS and AP platform; SP5 and SP7 platform

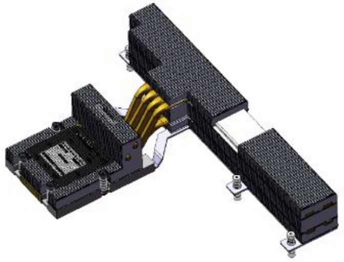
Proportion of Air-Cooled Heat Sink Categories

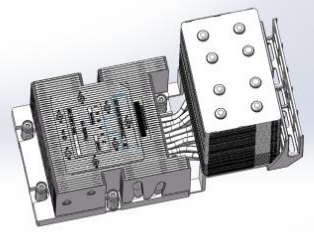
TONGYU ELECTRONICS

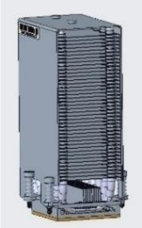


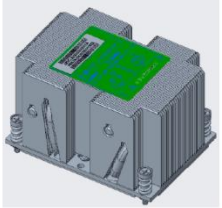


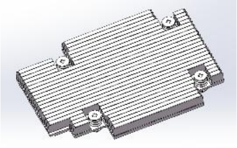


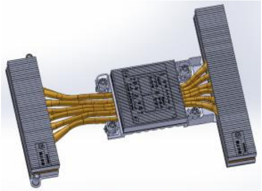


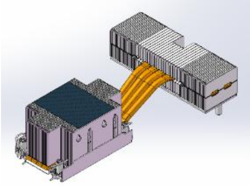


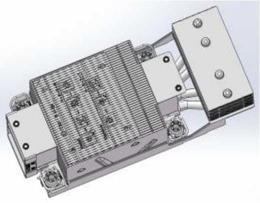


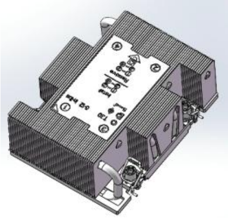












In the company's air-cooled welding module products, complex modules with 6 or more heat pipes account for the vast majority

Aluminum Extrusion/Welding Process

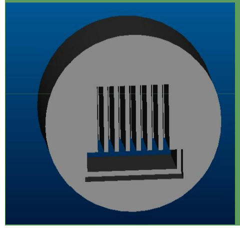
TONGYU ELECTRONICS

Aluminum Extrusion

Deflector

1. The front mold, also known as the deflector, mainly plays a guiding role. The deflector first relieves the extrusion pressure of the aluminum material, allowing it to pass through the guide hole and re converge in the rear cavity. The converged pressure will uniformly act on the mold at the same time.

Molding part



2. The middle mold mainly plays a forming role, finely extruding the aluminum material guided by the front mold. Due to the high processing accuracy of the middle mold, it is an important link to ensure the dimensional accuracy of the extruded shape. Therefore, the processing accuracy of the middle mold will directly affect the quality of the product.

开模的参考数据—平模散热器 Tooling reference date---- Flat heat sink

宽度 Width	高度 Height	齿距 Distance	齿厚 Fin thickness	平面度Flatness	底板厚度Base thickness	模具寿命Tooling life
10-20	12-16	1.4-1.6	齿尖(Tip) 0.5齿根(Root) 0.7	0.05-0.08	2	约(about)2000m
20-35	15-25	1.7-2.0	齿尖(Tip) 0.5齿根(Root) 0.8	0.08-0.1	2	约(about)2000m
35-50	20-30	1.8-2.3	齿尖(Tip) 0.6齿根(Root) 0.9	0.1-0.12	2.3	约(about)2000m
45-60	25-35	2.0-2.6	齿尖(Tip) 0.7齿根(Root) 1.1	0.1-0.15	2.2-2.8	约(about)3~4T
60-80	25-40	2.0-3.0	齿尖(Tip) 0.8齿根(Root) 1.2	0.12-0.18	2.4-3.0	约(about)3~4T
80-100	25-45	2.4-3.2	齿尖(Tip) 0.8齿根(Root) 1.3	0.15-0.2	2.6-3.2	约(about)4~5T
100-125	25-50	2.6-3.4	齿尖(Tip) 0.9齿根(Root) 1.4	0.18-0.25	2.7-3.5	约(about)4~5T
125-150	25-60	2.7-3.6	齿尖(Tip) 1.0齿根(Root) 1.5	0.2-0.3	3.0-4.0	约(about)5~6T
150-165	25-35	2.8-4.0	齿尖(Tip) 1.2齿根(Root) 1.6	0.3-0.4	4.0-6.0	约(about)6~7T

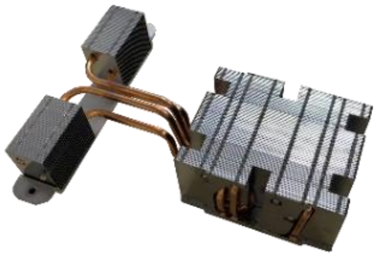
开模的参考数据—圆弧散热器 Tooling reference date---- round heat sink

外径 Outer diameter	实心大小 Size	齿距 Distance	齿厚 Fin thickness	挤压速度(米/分) Extrusion speed(M/min)	棒温 Aluminum temperature	模温 Tooling temperature	模具寿命 Tooling life
50	18-20	1.6-1.8	齿尖(Tip) 0.5齿根(Root) 0.7	3	470-500	450-480	约(about)3~4T
60	22-25	1.7-2.0	齿尖(Tip) 0.6齿根(Root) 0.8	2.7	470-500	450-480	约(about)3~4T
70	25-30	1.8-2.2	齿尖(Tip) 0.6齿根(Root) 0.9	2.5	470-500	450-480	约(about)4~5T
80	28-35	1.9-2.4	齿尖(Tip) 0.7齿根(Root) 1.0	2.2	480-510	450-480	约(about)5~6T
90	35-42	2.0-2.8	齿尖(Tip) 0.8齿根(Root) 1.1	2	480-510	450-480	约(about)6~7T
95	35-44	2.2-2.9	齿尖(Tip) 0.9齿根(Root) 1.2	1.8	480-510	450-480	约(about)6~7T
100	35-48	2.4-3.1	齿尖(Tip) 1.0齿根(Root) 1.3	1.7	480-510	450-480	约(about)6~7T
110	35-52	2.6-3.3	齿尖(Tip) 1.1齿根(Root) 1.4	1.6	480-510	450-480	约(about)6~7T
120	35-54	3.0-3.5	齿尖(Tip) 1.2齿根(Root) 1.5	1.5	480-510	450-480	约(about)6~7T

Welding Process

Reflow soldering: a process that uses solder paste to join the contact areas between heat sinks and heat pipes. The solder pastes currently in use include high-temperature, medium-temperature, and low-temperature variants.

Melting point of low-temperature solder paste： 138 ℃
Melting point of medium-temperature solder paste： 160～170 ℃
Melting point of high-temperature solder paste： 210℃



Heat Pipe Insertion into Fins & Roll Pressing Process

TONGYU ELECTRONICS

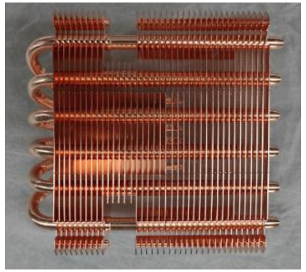
Heat Pipee Process and QMAX

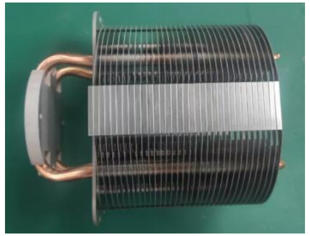
下料 Saw Cut → 清洗 Wash → 缩头 Swaging → 填粉 Fill Powder → 烧结 Sinter → 焊头 Head Welding → 退原 Anneal → 注水 Water Filling → 真空 Vacuum → 升温裁切 Heat Pinch → 焊尾 Tail Welding → 成型 Forming → 老化 Aging → 性能测试 Qmax Test → 表面处理 Surface Treatment → 氦测负压 High Pressure Test → 功能测试 Function Test → 全检 Inspection → 包装 Packing

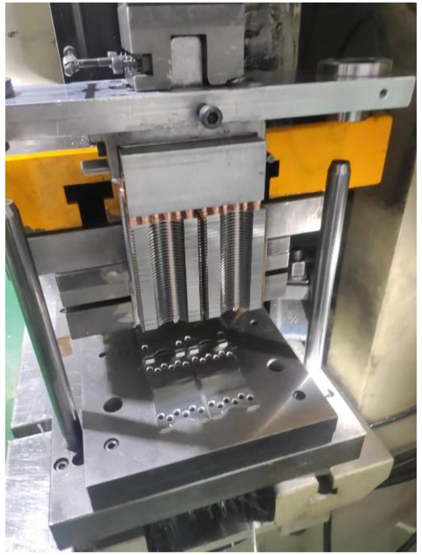
	¢4	¢5	¢6	¢8
80-100 [MM]	28	40	50	60
101-120 [MM]	35	50	65	73
121-150 [MM]	40	57	72	90
151-180 [MM]	37	52	65	80
181-220 [MM]	32	46	57	70
221-270 [MM]	28	40	50	60
271-320 [MM]	22	32	42	50
321-380 [MM]	15	22	30	35

Heat Pipe Insertion Process

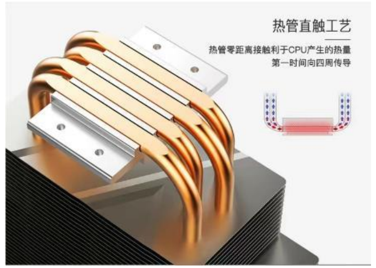
Without the need for any solder or filling medium, the heat pipe is directly inserted between the fins, and the fins wrap around the heat pipe. This increases the contact area between the fins and the heat pipe, effectively improving the heat conduction efficiency. Compared with welding, the FIN process not only optimizes thermal performance by 1-2 ℃, but also has lower costs; However, compared to welded products, FIN products have a slight disadvantage in reliability.

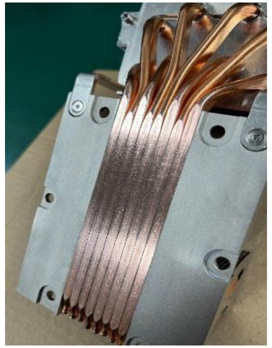


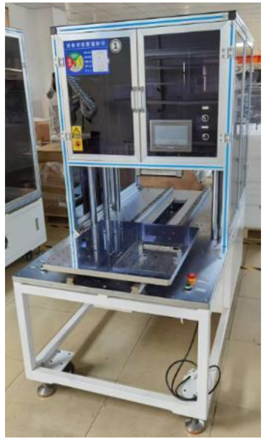




Heat Pipe Roll Bonding Process





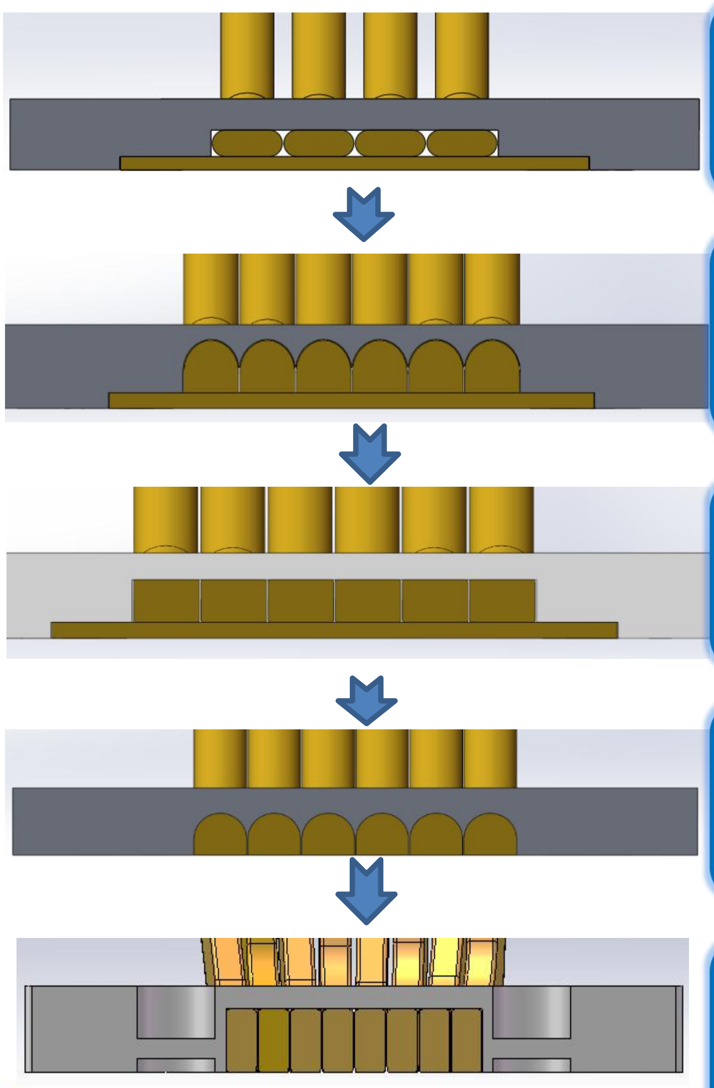


2D Roller Tube Machine

3D Roller Tube Machine

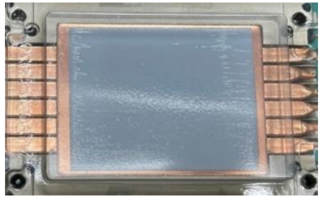
Research on the Performance of EVAC Module Heat Pipe Combination

TONGYU ELECTRONICS



4 Ø 6 heat pipes Normal flattening+copper plate

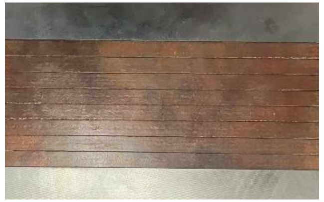
6 Ø 6 heat pipes D-type pipe+copper plate

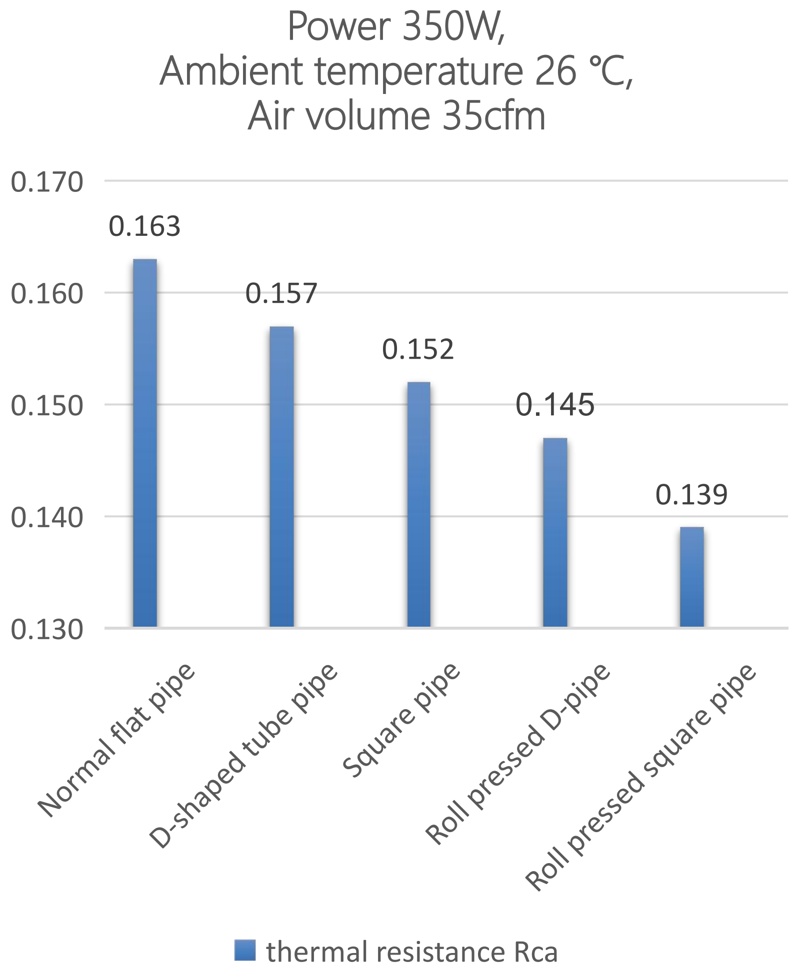


6 Ø 6 heat pipes Square pipe+copper plate

6 Ø 6 heat pipes Rolled pipe without copper plate

8 Ø 6 heat pipes Rolled pipe without copper plate

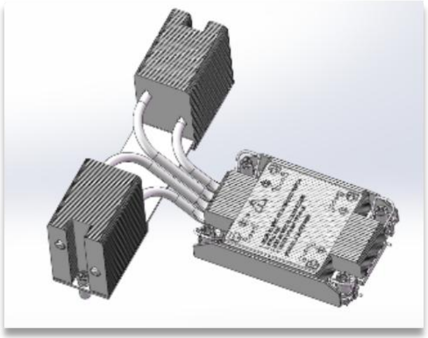


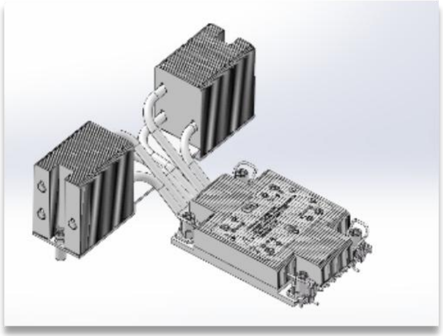


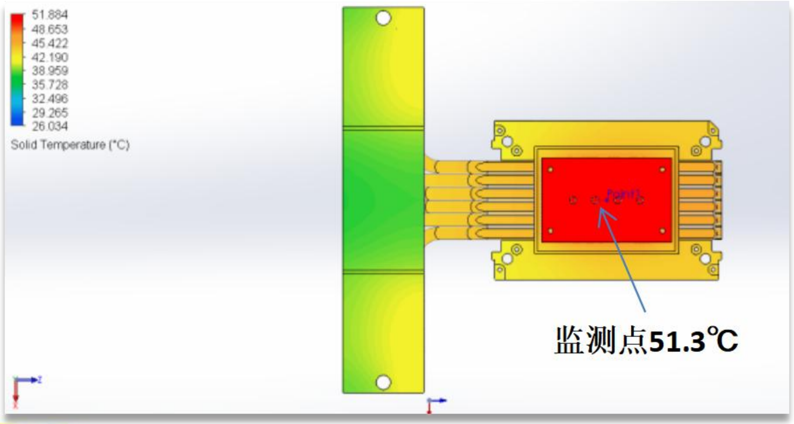
Intel 1U EGS EVAC (normally flattened tube optimized for D-type tube)

TONGYU ELECTRONICS

Project Information:
1U EVAC solves 300W
Request optimized design under 60CFM air volume
Design concept and improvement plan:
Optimization of 4 flattened heat pipes at the far end to 6 D-type heat pipes at the far end







2. Heatsink Photo							
3. Test condition	Heatsink Vendor		TUNG YU ELECTRONIC CO.,LTD.				
	Clip Force (lbf)		（锁固）				
	CPU		300W				
	Mainboard Model		发热块大小（40*46）				
	Test envirnment		open system				
	Ambient Temp (℃)		24±2℃				
	Ambient Humidity (RH)		50%				
	flow(cfm)		60CFM				
	Heatsink grease		SC-102				
Test Result							
Item	flow (cfm)	△P (mm-Aq)	Tc(℃)	Ta (℃)	△T (℃)	Power(w)	Rca(℃/w)
1	60.11	58.9	54.60	25.90	28.70	299.900	0.096
2	60.07	61	55.80	26.40	29.40	299.800	0.098
3	59.93	60.8	56.00	26.80	29.20	299.700	0.097

2. Heatsink Photo							
3. Test condition	Heatsink Vendor		TUNG YU ELECTRONIC CO.,LTD.				
	Clip Force (lbf)		（锁固）				
	CPU		300W				
	Mainboard Model		发热块大小（40*46）				
	Test envirnment		open system				
	Ambient Temp (℃)		24±2℃				
	Ambient Humidity (RH)		50%				
	flow(cfm)		60CFM				
	Heatsink grease		SC-102				
Test Result							
Item	flow (cfm)	△P (mm-Aq)	Tc(℃)	Ta (℃)	△T (℃)	Power(w)	Rca(℃/w)
1	59.94	57.9	48.10	23.20	24.90	300.500	0.083
2	60.15	60.9	48.00	23.10	24.90	300.500	0.083
3	60.03	60.1	48.60	23.50	25.10	300.400	0.084

Simulation results:
Remote 6 heat pipe design: ambient temperature of 26 ℃, thermal resistance of 0.080 ℃/W, temperature rise of 23.9 ℃

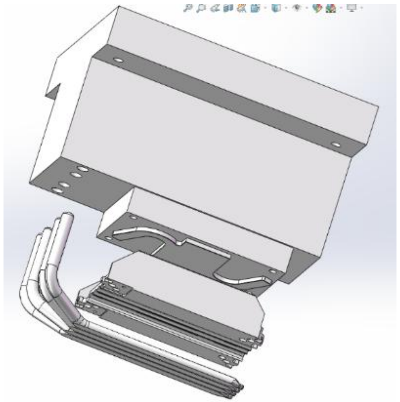
Actual test results:
Actual testing of 4 heat pipe samples at the remote end: ambient temperature of 26.8 ℃, thermal resistance of 0.099 ℃/W, temperature rise of 29.8 ℃
Remote 6 heat pipe sample actual testing: ambient temperature 26.2 ℃, thermal resistance 0.083 ℃/W, temperature rise 24.9 ℃

Intel 2U EGS EVAC (normally flattened tube optimized for rolled pipe)

TONGYU ELECTRONICS

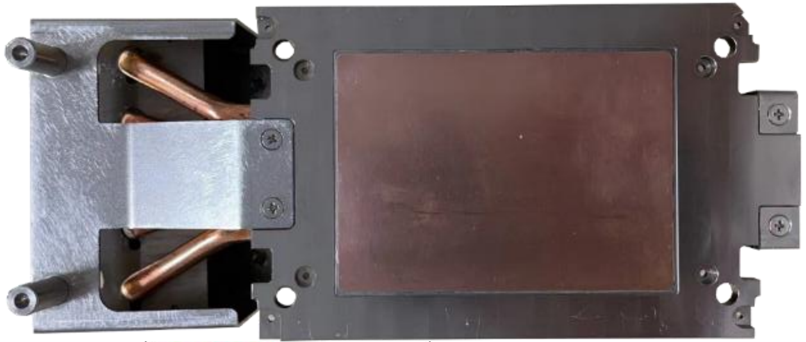
Project Information:
1U EVAC solves 350W
Request optimized design under 70CFM air volume

Design concept and improvement plan:
Optimization of copper plate welding design for double-sided rolling tube design



Optimization design (the bottom is a roller pressed heat pipe contact chip, and the upper surface of the roller pressed heat pipe contacts the main heat pipe to reduce thermal resistance)

Test Result						
flow (cfm)	ΔP (mm-Aq)	Tc(℃)	Ta (℃)	ΔT (℃)	Power(w)	Rca(℃/W)
70	18.3	55.70	25.30	30.40	350.000	0.0869
70	18.4	55.90	25.20	30.70	350.000	0.0877
70	18.3	55.70	25.10	30.60	350.000	0.0874



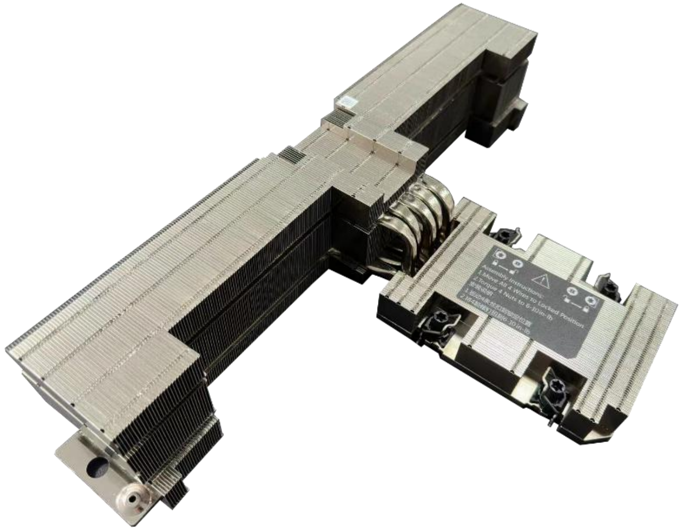
Test Result						
flow (cfm)	ΔP (mm-Aq)	Tc(℃)	Ta (℃)	ΔT (℃)	Power(w)	Rca(℃/W)
70	14	58.70	24.60	34.10	350.000	0.0974
70	14.1	58.80	24.80	34.00	350.000	0.0971

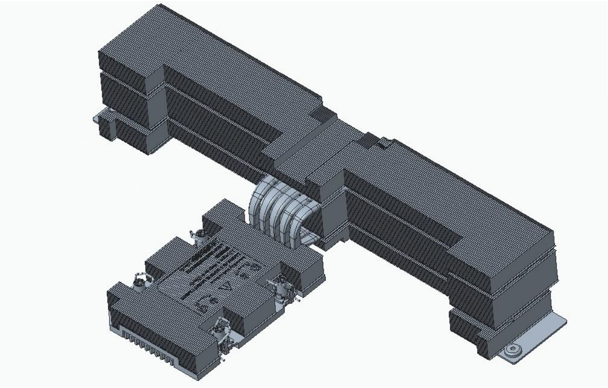
Original design (with copper plate contact chip at the bottom)

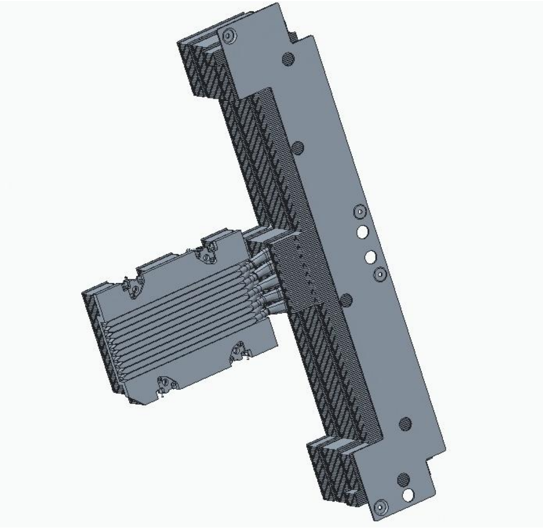
Original design result:
Main body 4D6+remote 4D6: ambient temperature 24.6 ℃, thermal resistance 0.0974 ℃/W, temperature rise 34.1 ℃
Optimization design results:
Main body 4D6+remote 4D8 roller tube: ambient temperature 25.3 ℃, thermal resistance 0.0869 ℃/W, temperature rise 30.4 ℃

Intel BHS AP 1U EVAC

Project Information:
Power 550W
The ambient temperature is 35 degrees Celsius
Thermal resistance requirement: 0.04 ℃/W @ 90CFM
Design ideas and plans:
Ultra long pull far end, increase heat pipe power, reduce heat pipe thermal resistance, and lower overall thermal resistance under low air flow conditions





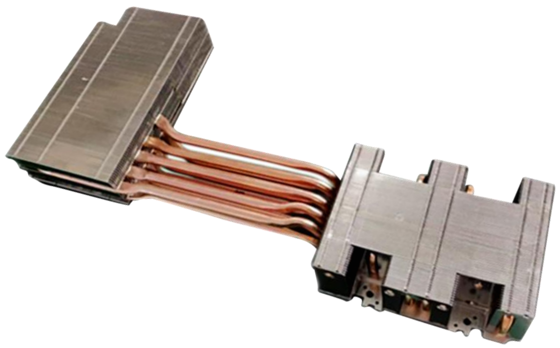


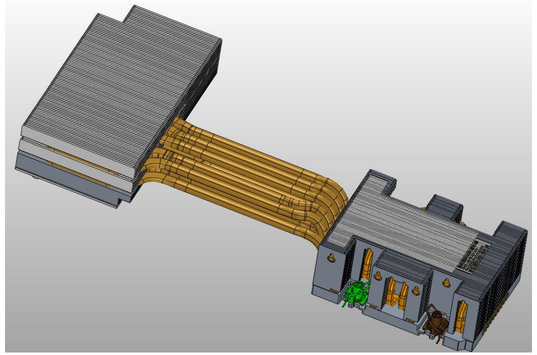
Rca Results						
CFM	△P (mm-Aq)	Tc (℃)	Ta (℃)	△T (℃)	W	Rca(℃/w)
90	1.66	46.00	25.90	**20.10**	550.0	0.037
110	2.3	44.40	26.00	**18.40**	550.0	0.033
130	2.85	42.80	25.80	**17.00**	550.0	0.031
150	3.5	41.90	26.00	**15.90**	550.0	0.029
175	4.23	41.60	26.50	**15.10**	550.0	0.027

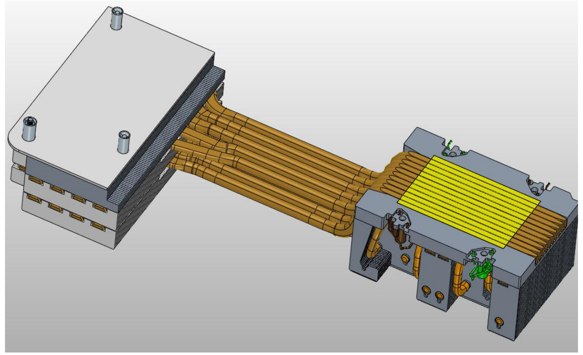
Intel BHS AP 2U EVAC

TONGYU ELECTRONICS

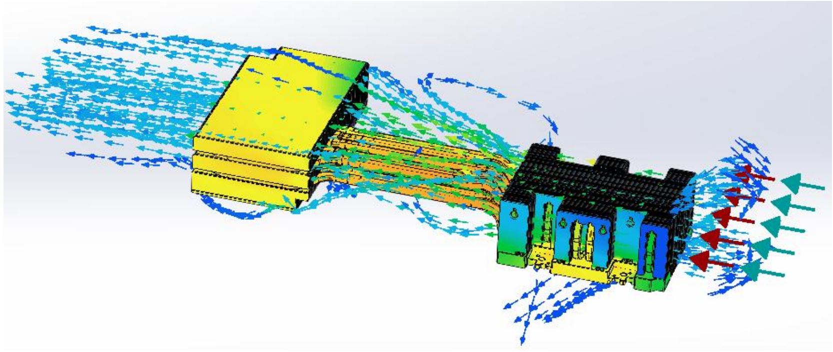
Project Information:
Power 550W
The ambient temperature is 35 degrees Celsius
Thermal resistance requirement: 0.05 ℃/W @ 75CFM
Design ideas and plans:
Ultra long heat pipes need to minimize thermal resistance and increase heat pipe power as much as possible







55	7.56	51.4	20.9	30.5	550	0.055
65	9.83	48.2	20.9	27.3	550	0.050
75	12.60	45.8	21.0	24.8	550	0.045
85	14.70	44.0	21.1	22.9	550	0.042
100	18.50	42.2	21.4	20.8	550	0.038

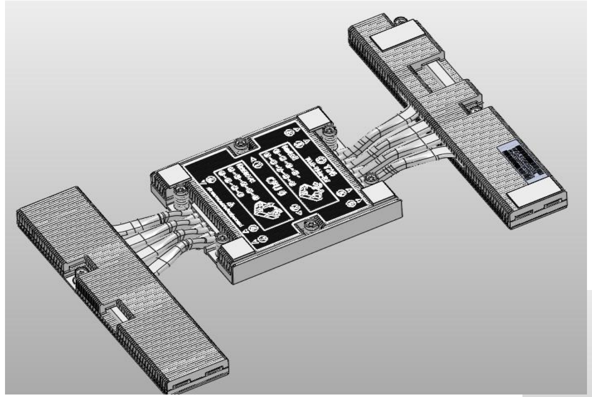


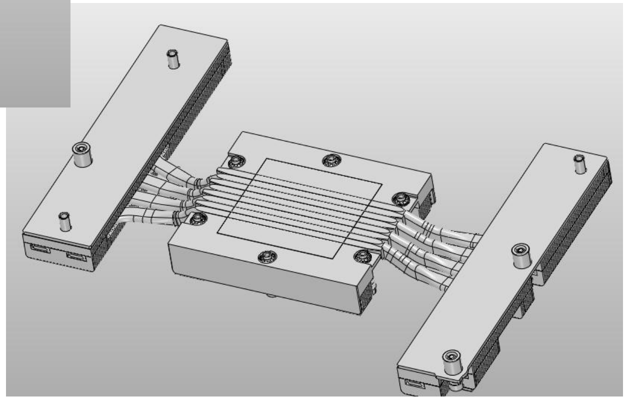
Simulation results:
Airflow of 75FM, ambient temperature of 35 ℃, CPU center temperature of 60.85 ℃, thermal resistance of 0.047
Actual results:
Airflow of 75CFM, ambient temperature of 24.8 ℃, CPU center temperature of 45.8 ℃, thermal resistance of 0.045

AMD SP5 1U EVAC

TONGYU ELECTRONICS

Project Information:
Power 300W
The ambient temperature is 35 degrees Celsius
Thermal resistance requirement: 0.082 ℃/W @ 35CFM
Design ideas and plans:
Double pull remote design, with high power of the inlet pull remote heat pipe and low power of the outlet pull remote heat pipe, differentiated design of heat pipe parameters to achieve optimal thermal resistance design





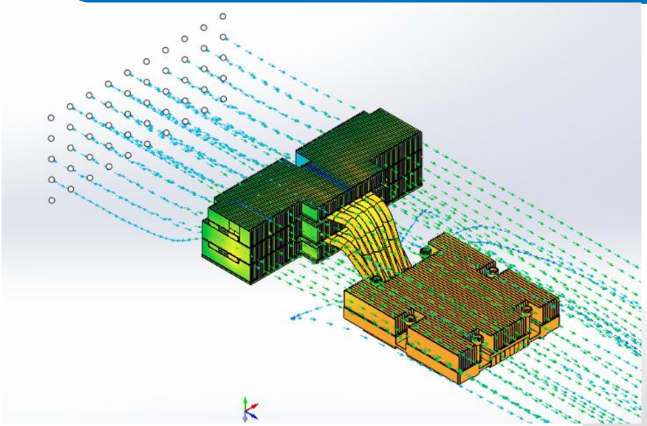
20	8.23	54.5	21.4	33.1	300	0.110
25	11.31	50.9	21.7	29.2	300	0.097
30	15.00	47.6	22.0	25.6	300	0.085
35	19.10	45.2	22.4	22.8	300	0.076
40	24.50	42.1	22.1	20.0	300	0.067

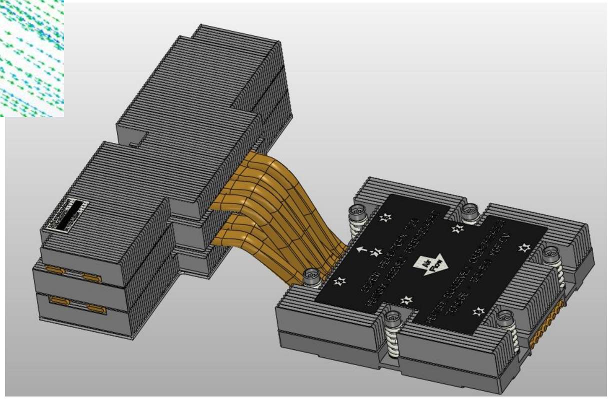
Simulation results:
Airflow of 35CFM, ambient temperature of 35 ℃, CPU center temperature of 57.5 ℃, thermal resistance of 0.075
Actual results:
Airflow of 35CFM, ambient temperature of 22.4 ℃, CPU center temperature of 45.2 ℃, thermal resistance of 0.076

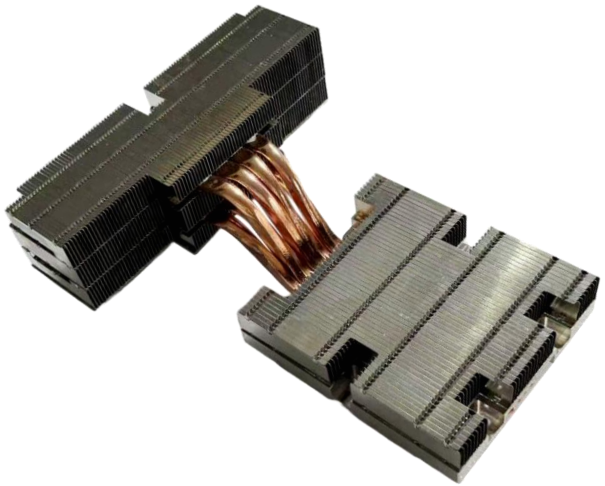
AMD SP5 1U EVAC

TONGYU ELECTRONICS

Project Information:
Power 500W
The ambient temperature is 38 degrees Celsius
Thermal resistance requirement: 0.085 ℃/W @ 40CFM
Design ideas and plans:
Using roller tube method within the 1U space limitation of the main body
Strengthen the remote heat dissipation capability







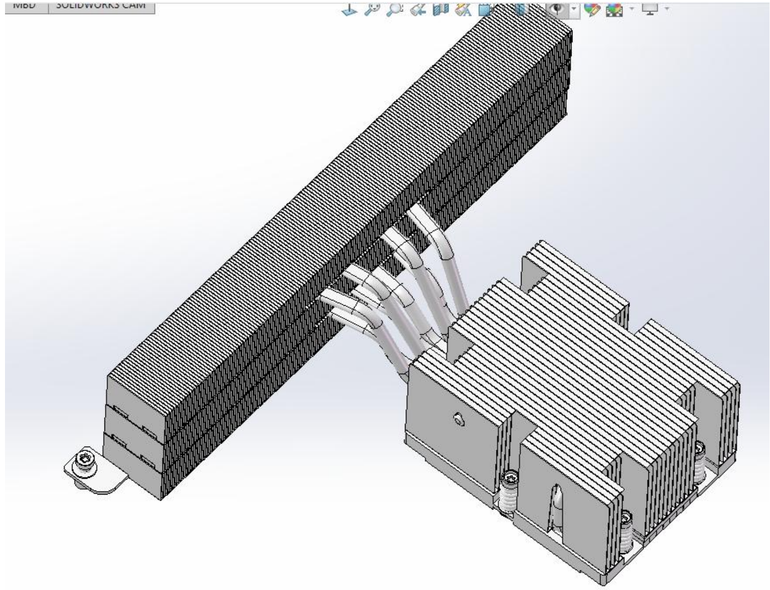
20	2.49	81.4	22.4	59.0	500.0	0.1180
30	4.50	69.1	22.7	46.4	500.0	0.0928
40	6.85	61.6	22.3	39.3	500.0	0.0786
50	9.20	57.7	22.3	35.4	500.0	0.0708
60	12.26	55.0	22.3	32.7	500.0	0.0654
20	1.30	80.6	22.5	58.1	500.0	0.1162

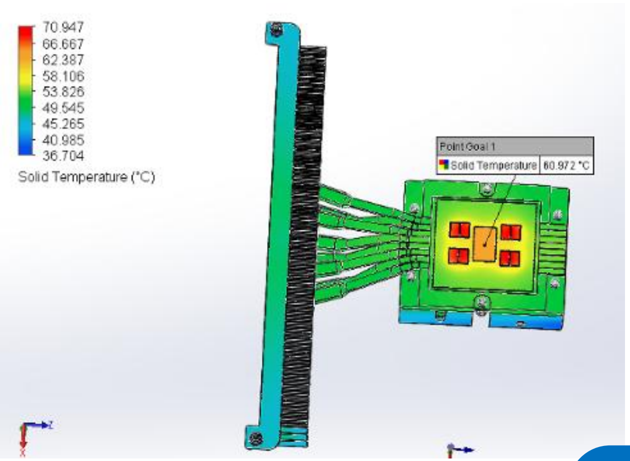
Simulation results:
Airflow of 40CFM, ambient temperature of 38 ℃, CPU center temperature of 78.5 ℃, thermal resistance of 0.081
Actual results:
Airflow of 40CFM, ambient temperature of 22.3 ℃, CPU center temperature of 61.6 ℃, thermal resistance of 0.078

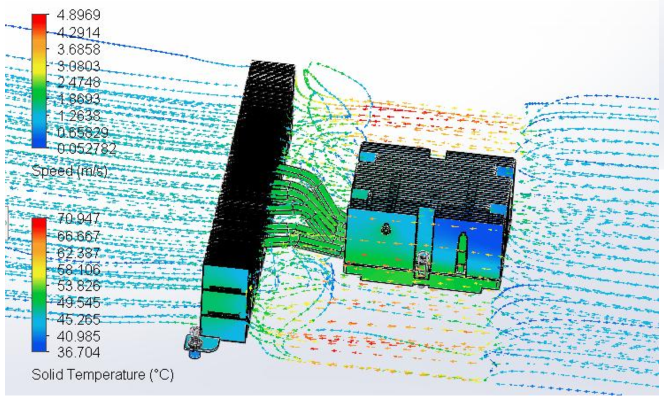
AMD SP5 2U EVAC

TONGYU ELECTRONICS

Project Information:
Power 500W
The ambient temperature is 30 degrees Celsius
Thermal resistance requirement: 0.065 ℃/W @ 51.1CFM
Design ideas and plans:
According to the customer's usage conditions, the encrypted and stretched FIN pieces and the thinned main FIN pieces can achieve the customer's thermal resistance target through both simulation and actual samples





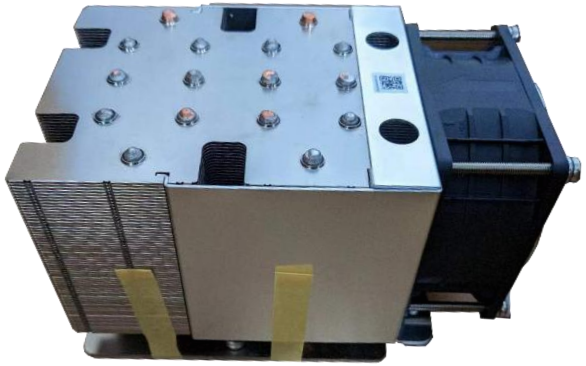


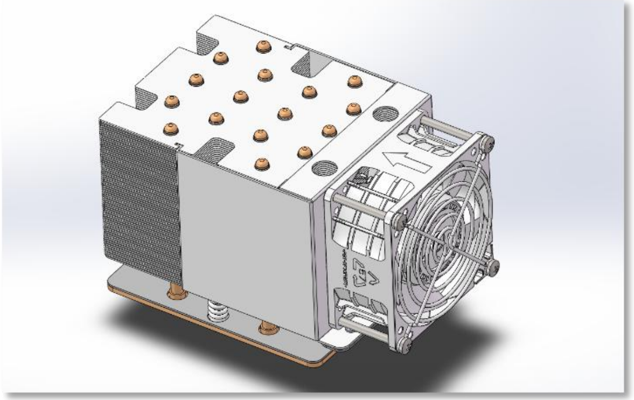
Simulation results:
Airflow of 51.1CFM, ambient temperature of 30 ℃, CPU center temperature of 60.972 ℃, thermal resistance of 0.062
Actual results:
The thermal resistance is 0.062

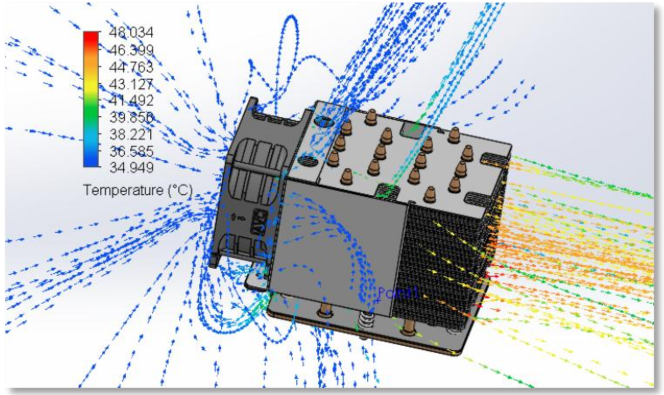
3D VC

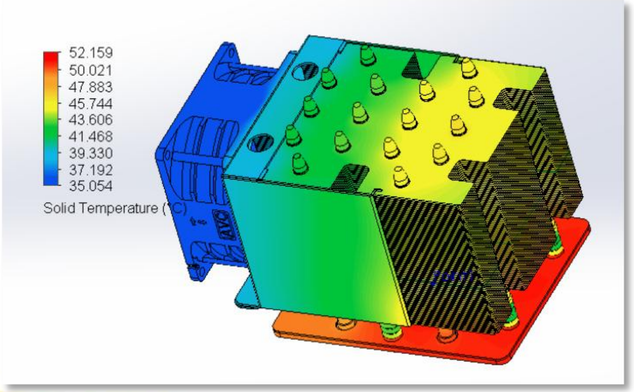
TONGYU ELECTRONICS

Project Information:
Power 500W
The ambient temperature is 35 degrees Celsius
Thermal resistance requirement: 0.05 ℃/W @ 110 CFM
Design ideas and plans:
Design and select fans based on customer requirements to achieve customer thermal resistance targets









Test Result

T2(℃)	T4(℃)	DT2 (℃)	Power(w)	Rca(℃/w)
46.7	23.5	23.2	500.000	0.0464
45.6	23	22.6	500.000	0.0452
45.6	22.8	22.8	500.000	0.0456
46.3	23.4	22.9	500.000	0.0458
45.4	22.8	22.6	500.000	0.0452

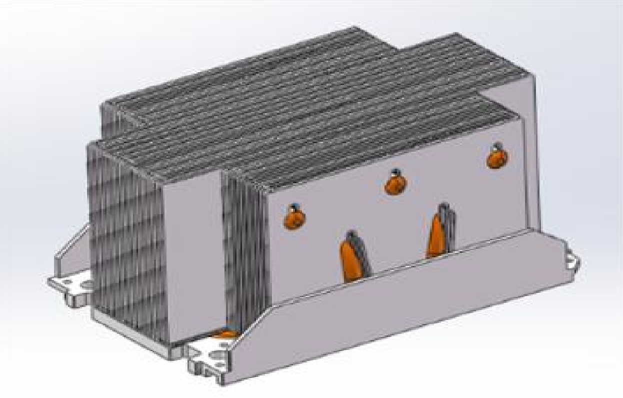
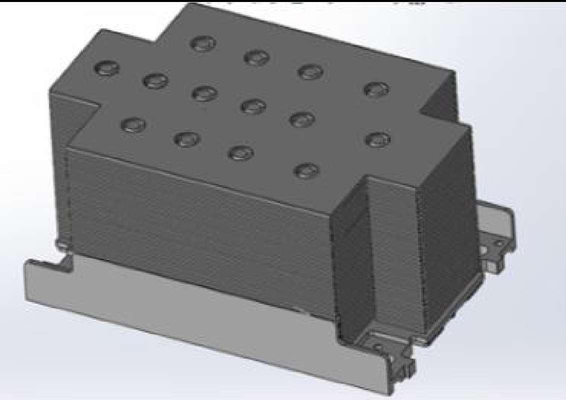
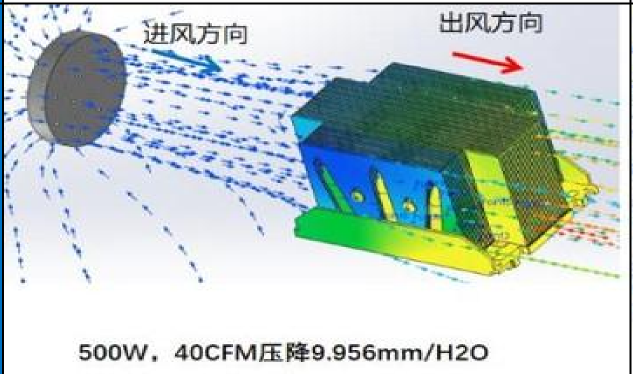
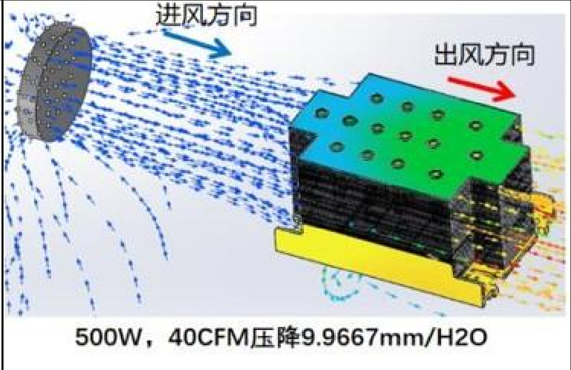
Simulation results:
500W: ambient temperature of 35 ℃, thermal resistance of 0.0450 ℃/W, temperature rise of 22.5 ℃
Actual test results:
500W: ambient temperature 23.5 ℃, thermal resistance 0.0464 ℃/W, temperature rise 23.2 ℃

Intel EGS (comparison between heat pipe and 3DVC)

TONGYU ELECTRONICS

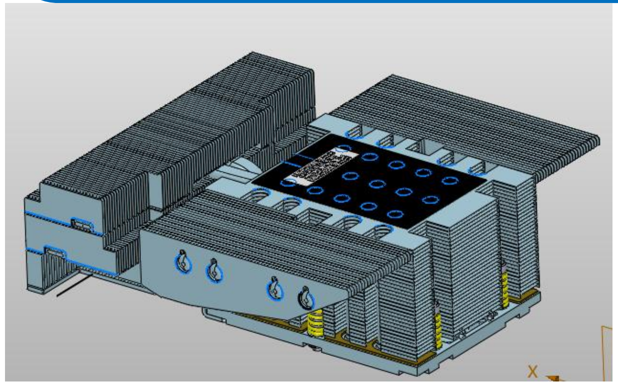
Project Information:
Power 500W, ambient temperature 38 ℃
Air volume 40cfm
Thermal paste TC-5888

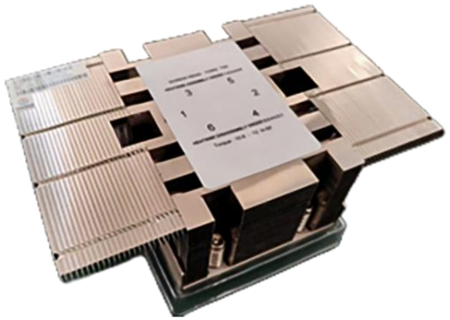
The 3D VC heat sink can achieve higher heat flux density and better thermal performance under the same FIN design conditions. This model has been optimized by 5 degrees

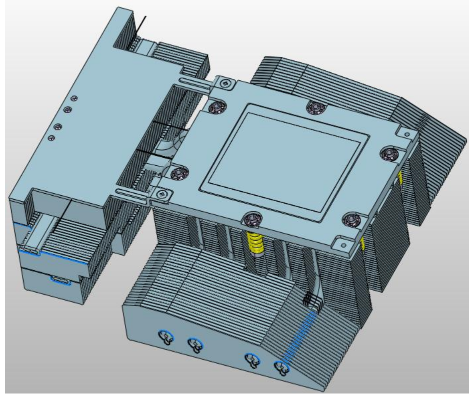
	Standard heat pipe design	3D VC design
type		
simulation		
	Tc82.251℃ Rca0.089	Tc79.229℃ Rca0.0825
actual testing	Rca0.092	Rca0.082

3D VC

Project Information:
Power 400W, ambient temperature 35 ℃
Require thermal resistance<0.055 ℃/W @ 60CFM
Design ideas and plans:
Integrating the remote welding heat pipe into a 3D VC to reduce thermal resistance and increase the heat dissipation area of the main body





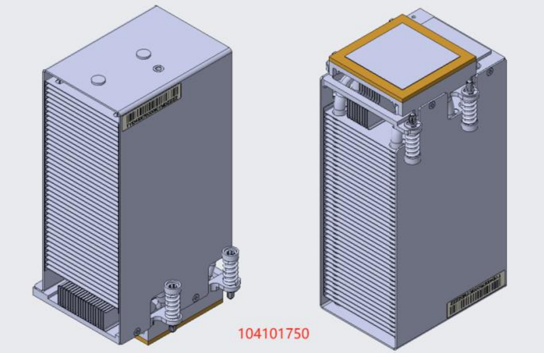


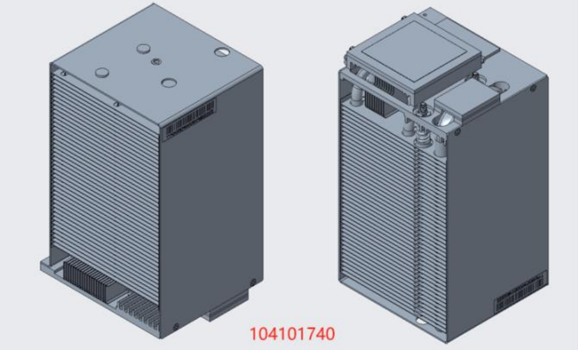
Flow (cfm)	△P (mm-Aq)	Tc (℃)	Ta (℃)	△T (℃)	Power(w)	Rca(℃/w)
40	6.83	49.20	26.20	23.00	400	0.058
60	12.00	44.50	25.90	18.60	400	0.047
80	18.80	41.80	25.70	16.10	400	0.040
100	26.70	39.90	25.60	14.30	400	0.036

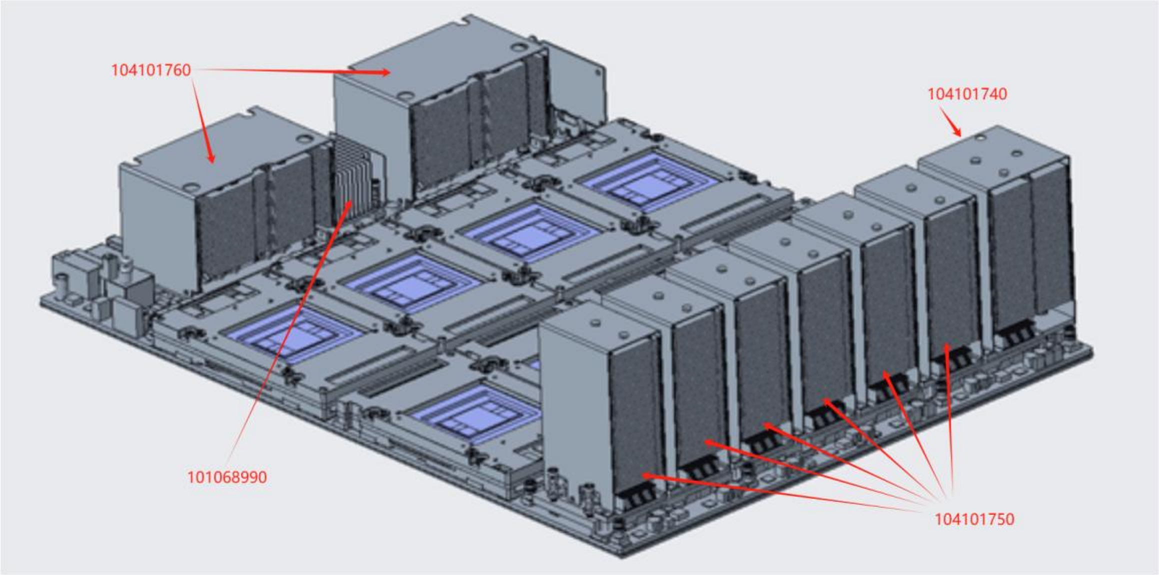
Simulation results:
400W: ambient temperature of 35 ℃, thermal resistance of 0.05 ℃/W, temperature rise of 55 ℃
Actual test results:
400W: ambient temperature 25.9 ℃, thermal resistance 0.047 ℃/W, temperature rise 18.6 ℃

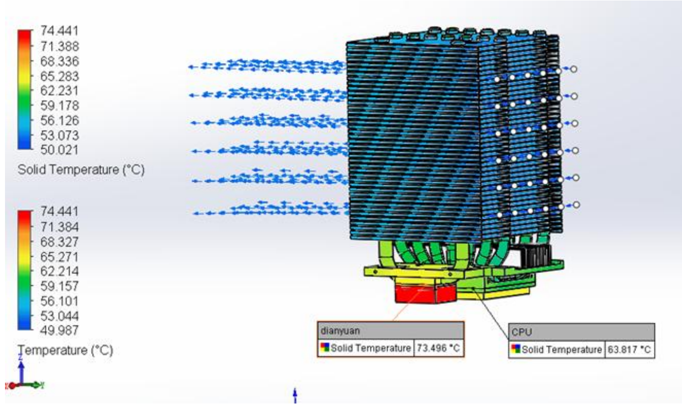
AI Server

Project Information:
Power 8 * 80W, 4 * 20W, ambient temperature 50 ℃
Require all chips to meet the thermal performance specification of @ 50cfm
Design ideas and plans:
Based on the system's inlet and outlet air and GPU heat sink layout, comprehensively design the Switch and Retimer heat sinks as well as their locking methods







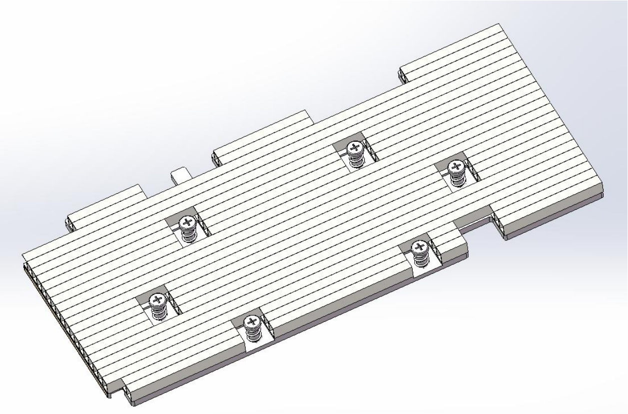


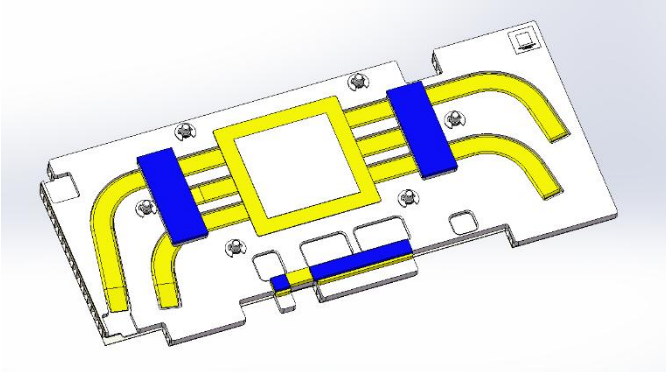
Simulation results:
80W: ambient temperature of 50 ℃, Tc63.82, Temperature rise 13.82 ℃
Actual test results:
80W: ambient temperature 24 ℃, Tc 36.5 ℃/W, temperature rise 12.5 ℃

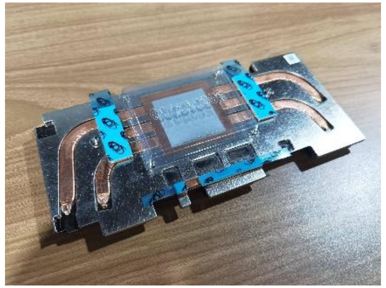
ByteDance Project

TONGYU ELECTRONICS

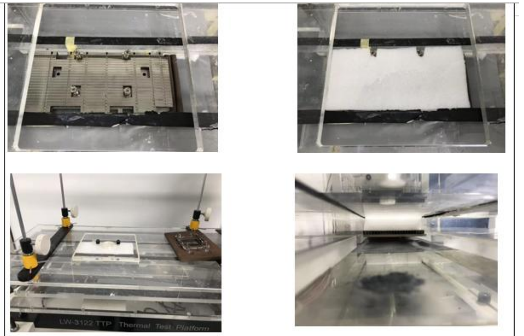
Project Information:
Power 100W
Request air volume of 15cfm, thermal resistance < 0.0275 ℃/W







2. Heatsink Photo



3. Test condition

Heatsink Vendor	TUNG YU ELECTRONIC CO., LTD.
Clip Force (lbf)	N/A
CPU	100W
Mainboard Model	***
Test envirnment	open system
Ambient Temp (℃)	25±2℃
Ambient Humidity (RH)	50%
flow(cfm)	15CFM&5-7
Heatsink grease	SC-102

Test Result

Item	flow (cfm)	ΔP (mm-Aq)	Tc(℃)	Ta (℃)	ΔT (℃)	Power(W)	Rca(℃/W)
1	15	23.7	45.00	19.00	26.00	100.000	0.260
2	15	23.3	45.70	19.30	26.40	100.000	0.264
3	15	23.5	46.00	19.60	26.40	100.000	0.264

Actual test results:
100W: ambient temperature of 26 ℃, thermal resistance of 0.264 ℃/W, temperature rise of 26.4 ℃

Technology Study / Product case
Liquid-Cooled

Liquid Cooling Technology Approach

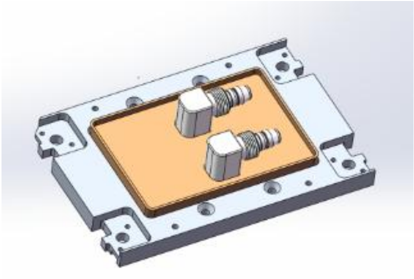
TONGYU ELECTRONICS

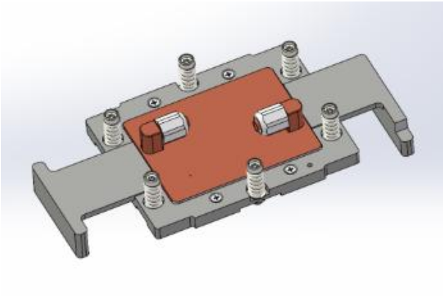
Product Features:
Cold plate material: Copper T2 with skived fin channels, ensuring high thermal efficiency.
Vacuum-brazed construction for high reliability and low thermal resistance.
Operating pressure: 4 Bar; Burst pressure: 10 Bar.
Compatible with Intel EGS CPU cooling solutions.
TDP ≤500W

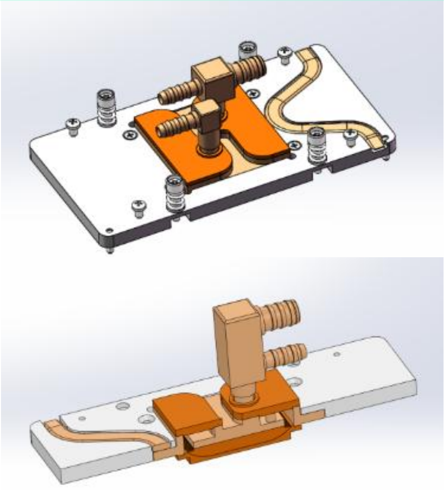
Product Features:
Cold plate material: Copper T2 with skived fin channels, delivering high thermal efficiency.
Vacuum-brazed construction ensures high reliability and low thermal resistance.
Design pressure: 4 Bar; Burst pressure: 10 Bar.
Compatible with AMD SP5 CPU cooling solutions.
TDP ≤600W

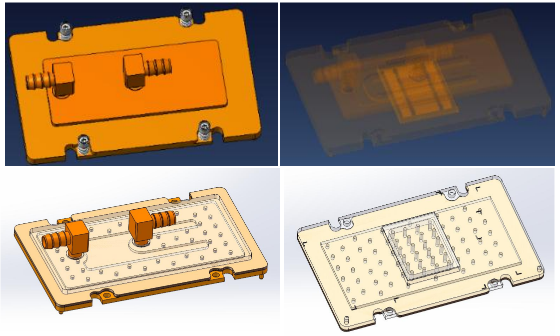
Product Features:
Cold plate material: Copper T2 with T-shaped skived fin channels, ensuring ultra-high thermal efficiency.
Vacuum-brazed construction guarantees exceptional reliability and ultra-low thermal resistance.
Design pressure: 4 Bar; Burst pressure: 10 Bar.
Compatible with NV H100 GPU cooling solutions.
TDP ≤1200W.

Product Features:
Cold plate material: Copper T2 with novel high-efficiency, low-flow-resistance structure, embedded with graphene strips to enhance thermal diffusion.
Hybrid 3D vapor chamber (3DVC) and cold plate design (under development) for further thermal resistance reduction.
Design pressure: 4 Bar; Burst pressure: 10 Bar.
Compatible with high-power thermal management solutions.
TDP ≤2000W.









Skiving Process

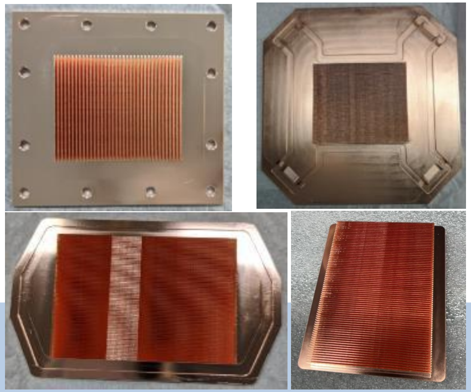
Precision CNC Micro Cold Plate Relieving Machine

Advantages of skived-fin heat sinks

- The heat sink and base plate are integrally extruded from a single profile, achieving 100% thermal conductivity of the material without thermal resistance junctions.
- Skiving technology enables ultra-thin fin manufacturing with minimized pitch, maximizing heat dissipation surface area within confined spaces to optimize thermal performance.
- This process features simplified manufacturing and reduced tooling costs.

Copper Fin length limit 60mm		
Fin Height (mm)	Fin Thickness （mm）	Min Fin Gap （mm）
1	0.05	0.05
2	0.07	0.07
3	0.1	0.1
4	0.15	0.15
5	0.2	0.2

Amulinum Fin length limit 60mm		
Fin Height (mm)	Fin Thickness （mm）	Min Fin Gap （mm）
1	0.07	0.07
2	0.1	0.1
3	0.1	0.1
4	0.15	0.15
5	0.2	0.2

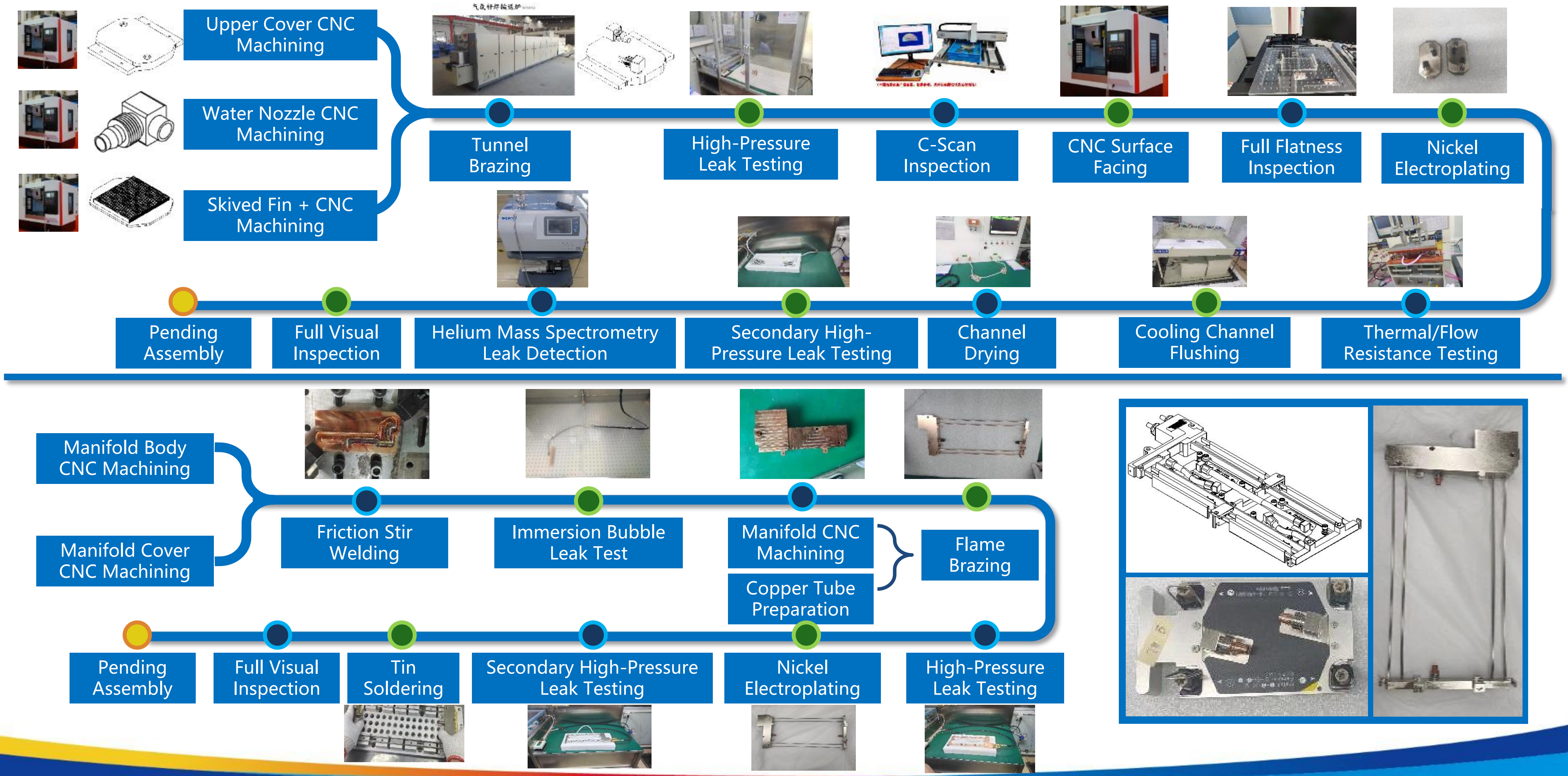


Heavy-duty Precision CNC Shovel Tooth Grinding Machine

Work table size/ mm	x -axis	Z -axis	max width	Fin max Thickness	Fin min Thickness	Max stepdo wn	Min Stepdown	Fin Height	precision
800*1600	1500	700	AL 600 CU 300	AL 2.0 CU 1.0	0.2	10 mm	1:1	AL 140 CU 40	±0.003

Split-type Liquid Cooling Heatsinks Manufacturing Process

TONGYU ELECTRONICS

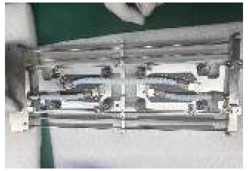


Manufacturing Process and Techniques for Modular Liquid Cooling Heatsinks

TONGYU ELECTRONICS

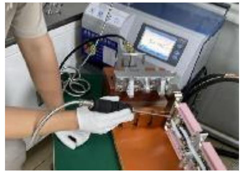
Single Cold Plate

Liquid Cooling Module

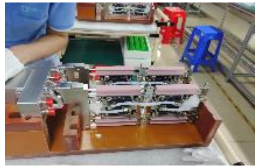


Assembly

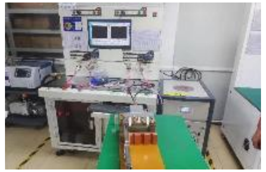
High-Pressure Leak Testing



Helium Mass Spectrometry Leak Detection



Pressure Holding Test (30min)



Flow Resistance Test

Cooling Channel Flushing

Channel Drying

Full Flatness Inspection

Leakage Detection Wire Integration

Pending Final Assembly

Pressure Holding Test (24h)

Full Quality Inspection

Packaging

01

Assemble the single cold plate, then integrate with the liquid cooling module per assembly drawings.

02

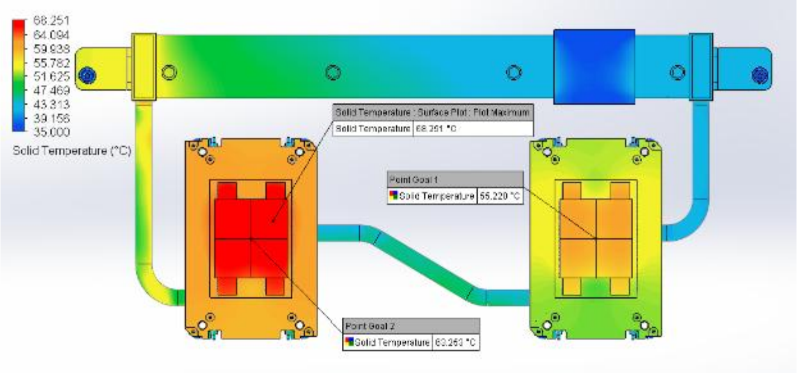
Perform:
High-pressure leak test. Helium mass spectrometry leak detection. 30-minute pressure holding test. Flow resistance test. Cooling channel flushing & nitrogen-purge drying. Full flatness inspection (tolerance: ±0.05mm).
Assemble: leakage detection wire, thermal grease (≥5 W/m·K), thermal pads, PSA, and protective cover. Conduct 24-hour pressure holding test.

03

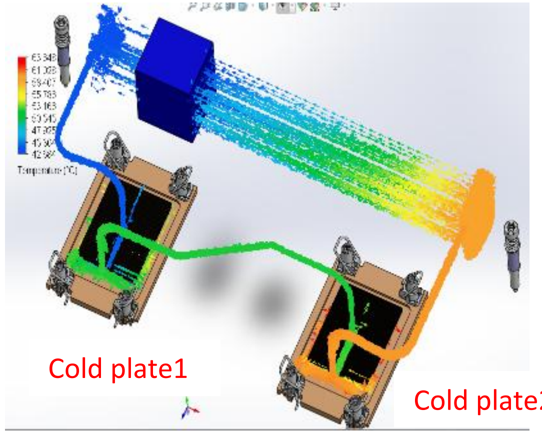
Full quality inspection (dimensional, visual, functional).
Package per ESD/moisture-proof specifications.

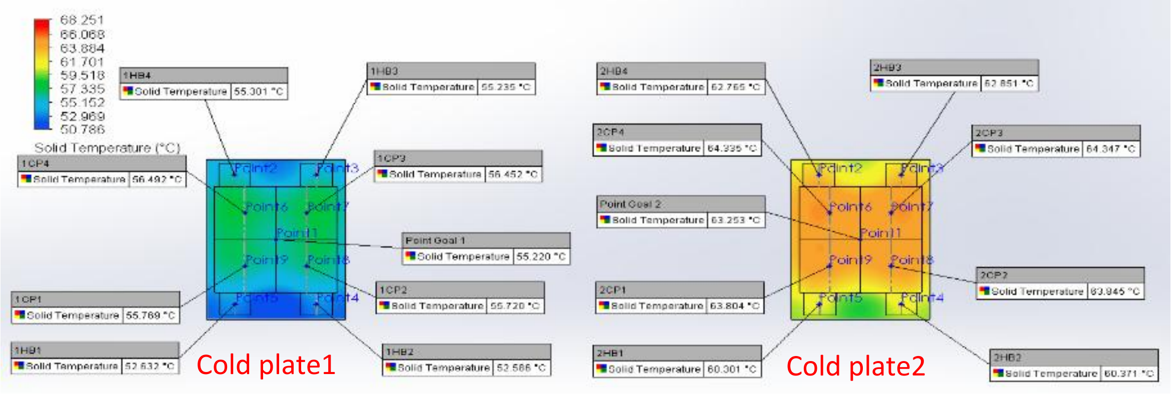
Intel-Integrated Liquid Cooling Heatinks

Flow Rate: 0.693 L/min
Ambient Temperature: 35°C
Power Dissipation: 350 W
Design Approach & Solution:
Design the cold plate geometry in accordance with client specifications and select fans to achieve the target thermal resistance per client requirements



Thermal contour map of the cold plate and corresponding chip. The maximum chip temperature is 68.2°C.

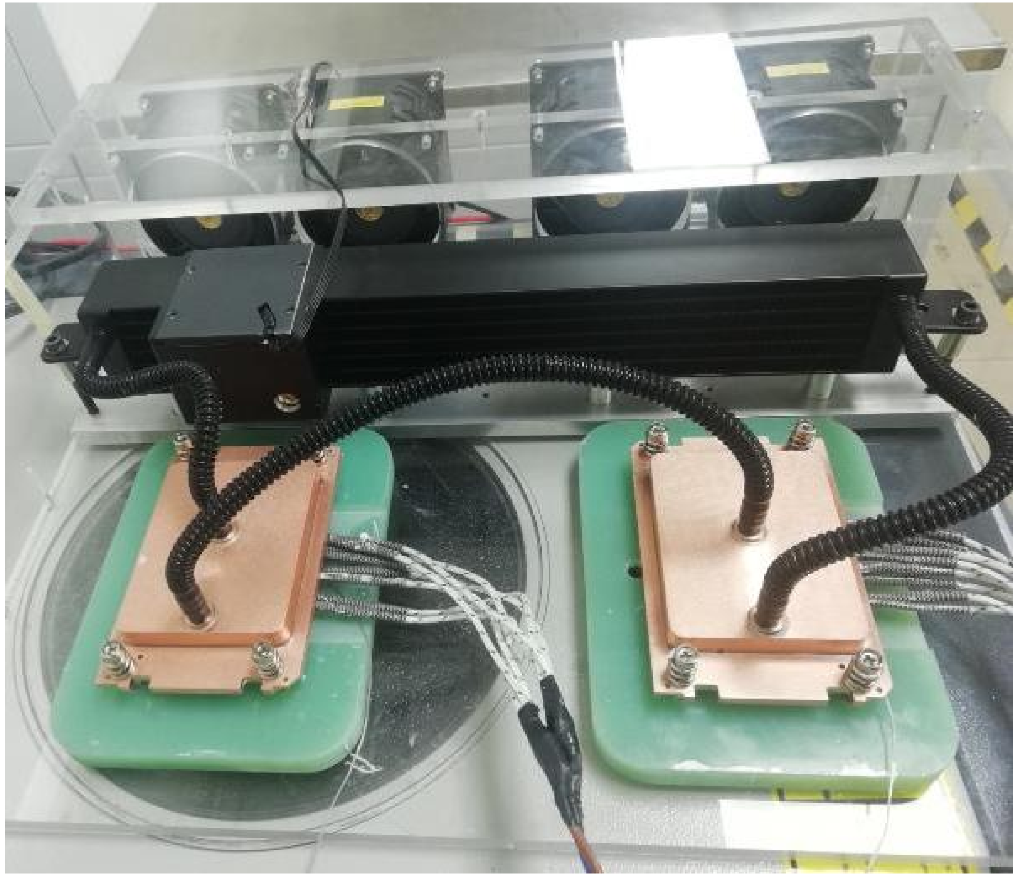




The thermal map of the liquid cooling plate and corresponding chips shows Tc CPU1 at 55.22°C and Tc CPU2 at 63.25°C, both satisfying the requirement of remaining below 70°C.

	IN OUT R	Diff	Fluid Temp...	Ave	-7.8501	°C	✓
	IN OUT L	Diff	Fluid Temp...	Ave	-8.2362	°C	✓
	IN OUT LP	Diff	Fluid Temp...	Ave	-15.904	°C	✓
	IN OUT R	Diff	Press Diff	Ave	1698.2	Pa	✓
	IN OUT LP	Diff	Press Diff	Ave	5012.4	Pa	✓
	IN OUT L	Diff	Press Diff	Ave	1698.3	Pa	✓
	PUMP IN OUT	Diff	Press Diff	Ave	-8719.6	Pa	✓
	FAN-HGD1-JY-1/Flow Devic	Diff	Press Diff	Ave	-172.57	Pa	✓
	FAN-HGD1-JY-1/Flow Devic	Diff	Press Diff	Ave	-140.45	Pa	✓
	FAN-HGD1-JY-1/Flow Devic	Diff	Press Diff	Ave	-62.142	Pa	✓

Integrated Liquid Cooling Heatinks

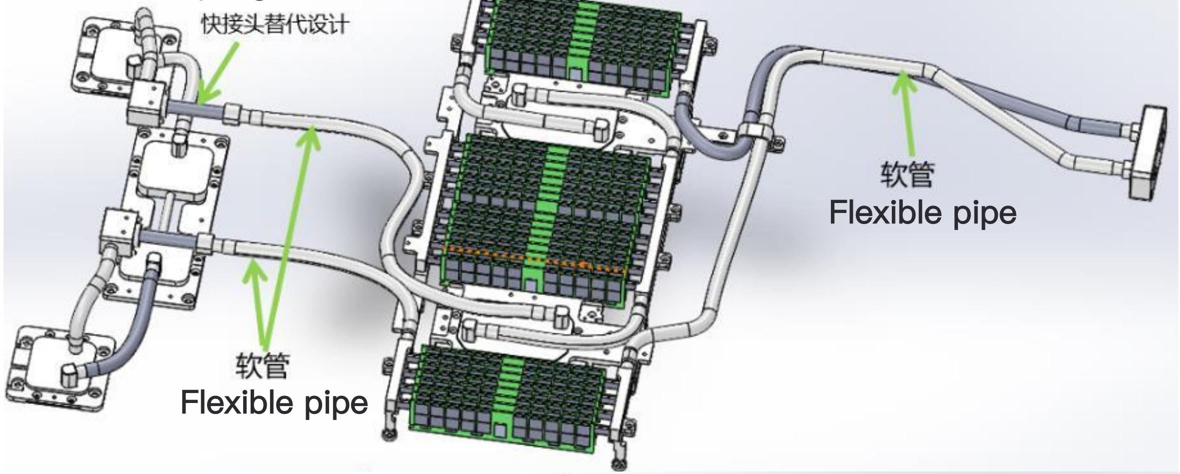


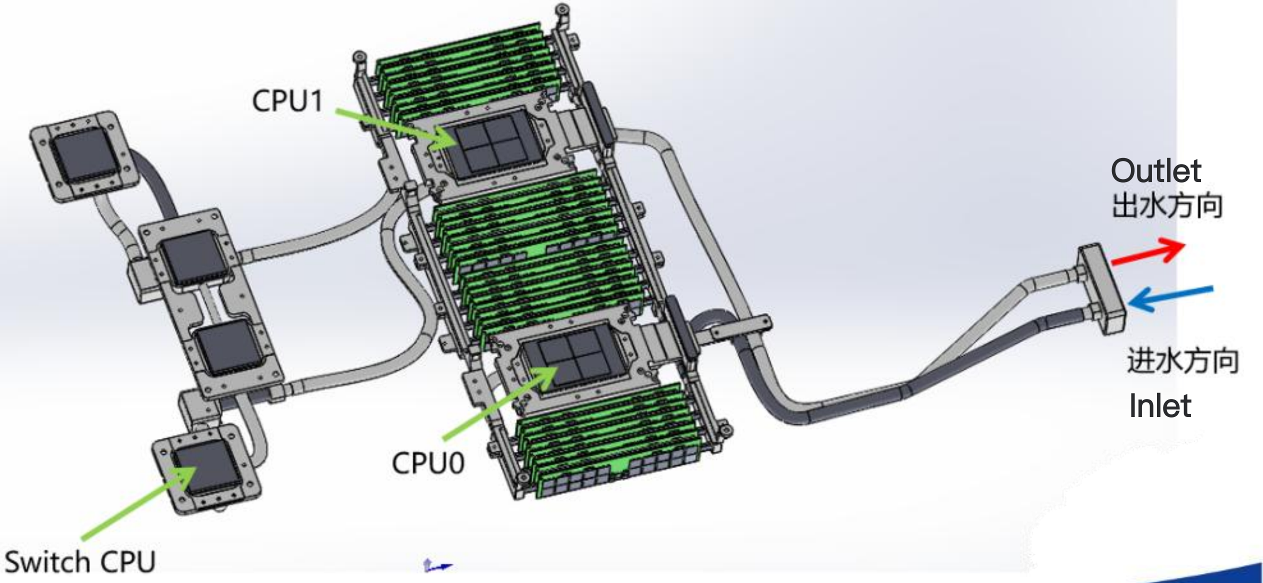
Thermal Block Simulation Test Results (Closely Matching Simulation Data):
Load Power: 350W
Ambient Temp (T4): 26°C
DT = 46.9°C - 26°C = 20.9°C
DT = 51.9°C - 26°C = 25.9°C

CPU+DIMM+GPU Liquid Cooling Project

Design Approach & Solution:
Developed the integrated cold plate configuration based on client specifications, achieving the 1U height constraint and thermal resistance target.

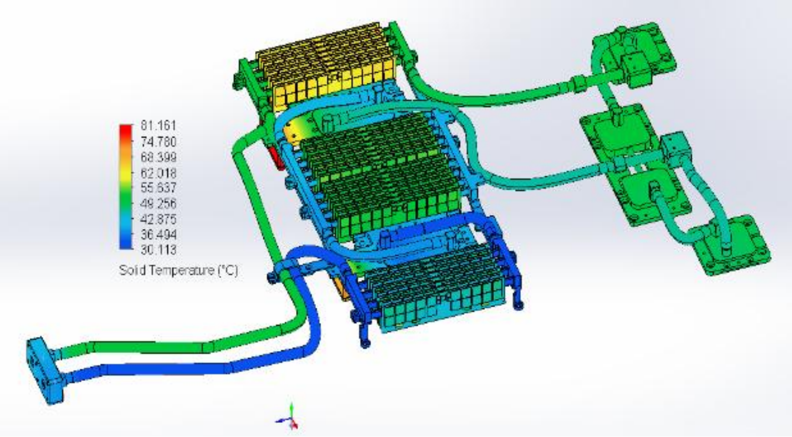
Design parameter	Requirement
CPU Configuration	EGS, 350W*2
Ambient Temperature	35（℃）
Coolant Fluid	25% PGW (Deionized Water + Corrosion Inhibitor + Biocide)
Cold Plate Inlet Temperature	30（℃）
Flow Rate（LPM）	1.0 (Series Configuration)
Tcase（℃）	＜56℃（1LPM）
Thermal Resistance（℃/W）	≤0.075(@1LPM, incl. TIM: Dow Corning TC-5888, 0.1mm thickness)
Pressure Drop（kPa）	≤ Kpa (@1LPM, incl. cold plate, tubing, quick connectors)
Cold Plate Pressure Rating	≥10
Material	Cu
TDP	CPU chip total power consumption TDP = 350W2 = 700W; CPUVR: 2 groups in total, each group contains 8 chips of 3.375W, total power consumption = 3.375W x 8 x 2 = 272 = 54W; Memory total power consumption TDP = 10W32 = 320W; PCIe Gen5 Switch total power consumption = 59.2W4 = 236.8W;
Tcase	CPU chip Tcase ≤56℃; CPUVR chip Tcase ≤120℃; Memory Tcase ≤82℃; PCIe Gen5 Switch chip Tcase ≤102℃;



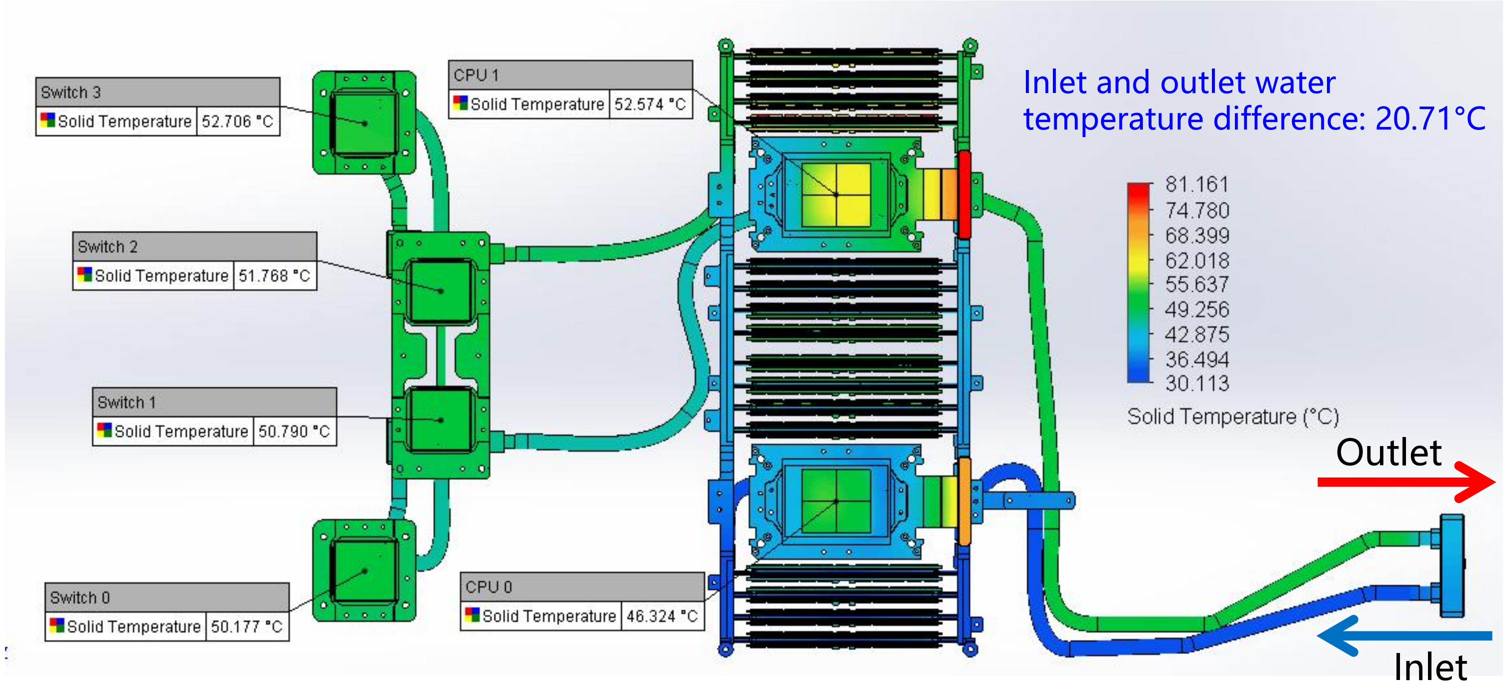


CPU+DIMM+GPU Liquid Cooling Project

Simulation Boundary Conditions	Operating Parameters
CPU Power Consumption	350 W*2
Ambient Temperature (℃)	35
Coolant	25% PGW
Cold Plate Inlet Water Temperature (℃)	30
Flow Rate(LPM)	1.0 (Series)
Material	Cu
Heat Source Type	EGS
Switch CPU Power Consumption	59.2 W*8
Memory Power Consumption	10 W*32
VR Power Consumption	27W*2



(1LPM PG25 inlet water temperature 30°C) Power 350W * 2



Name	Type	Para...	Calc	Value	Unit	%
IN OUT CPU 1	Diff	Fluid Te...	Ave	-5.499	°C	✓
IN OUT	Diff	Fluid Te...	Ave	-20.717	°C	✓
IN OUT Switch	Diff	Fluid Te...	Ave	-3.3467	°C	✓
IN OUT CPU 0	Diff	Fluid Te...	Ave	-5.5165	°C	✓
IN OUT	Diff	Press Diff	Ave	28551	Pa	✓
IN OUT Switch	Diff	Press Diff	Ave	9622.0	Pa	✓
IN OUT CPU 1	Diff	Press Diff	Ave	3365.2	Pa	✓
IN OUT CPU 0	Diff	Press Diff	Ave	2177.0	Pa	✓

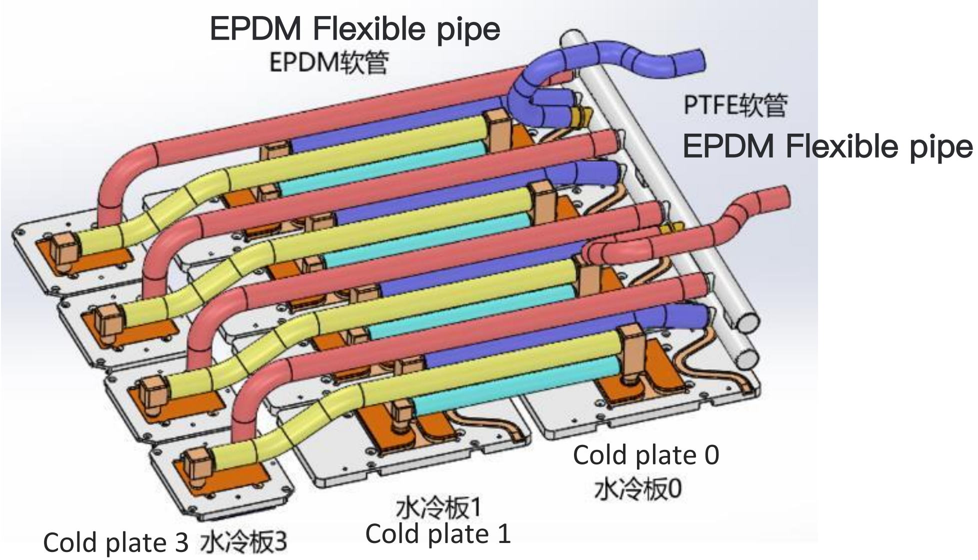
CPU chip surface maximum temperature: 52.57°C
Specification Tc < 56°C
Switch chip surface maximum temperature: 52.7°C
Specification Tc < 102°C
VR chip surface maximum temperature: 81.16°C
Specification Tc < 120°C
Memory chip surface maximum temperature: approximately 80°C
Specification Tc < 82°C

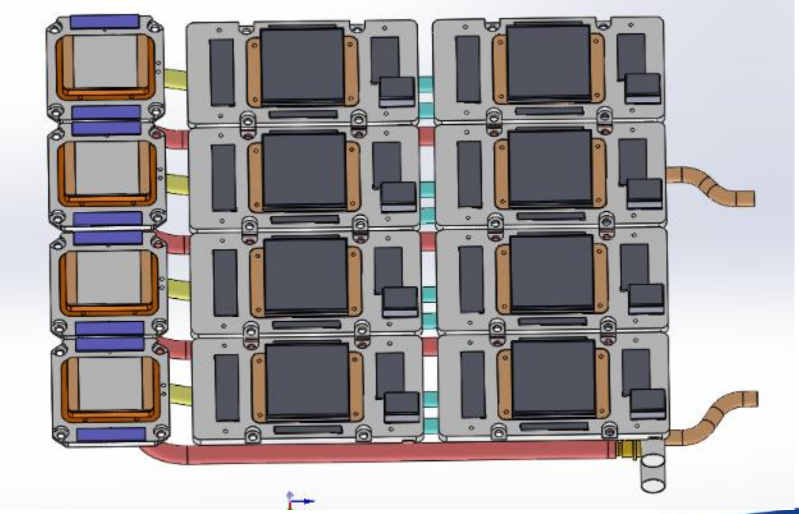
Multi-GPU Liquid Cooling Project

TONGYU ELECTRONICS

Design Approach and Solution:
Develop an overall cold plate layout based on client requirements to meet uniform flow distribution specifications and thermal resistance targets.

Design Parameters	Requirements
GPU/Switch Specifications	700W*2 + 150W (IBC 18W, other power ratings see attached table)
Ambient Temperature (°C)	35
Coolant	25% PGW (Deionized water + Corrosion inhibitor + Biocide)
Cold Plate Inlet Water Temp (°C)	45℃
Flow Rate (LPM)	8 (Parallel/Series)
Tcase（℃）	<75°C (at 8 LPM) Preliminary estimate
Thermal Resistance (°C/W)	≤ (at 8 LPM, incl. thermal grease - Dow Corning TC-5888, thickness 0.1mm)
Flow Resistance (kPa)	≤ kPa (at 8 LPM, incl. cold plate, piping, quick connectors)
Cold Plate Pressure Rating (bar)	≥10
Material	Cu



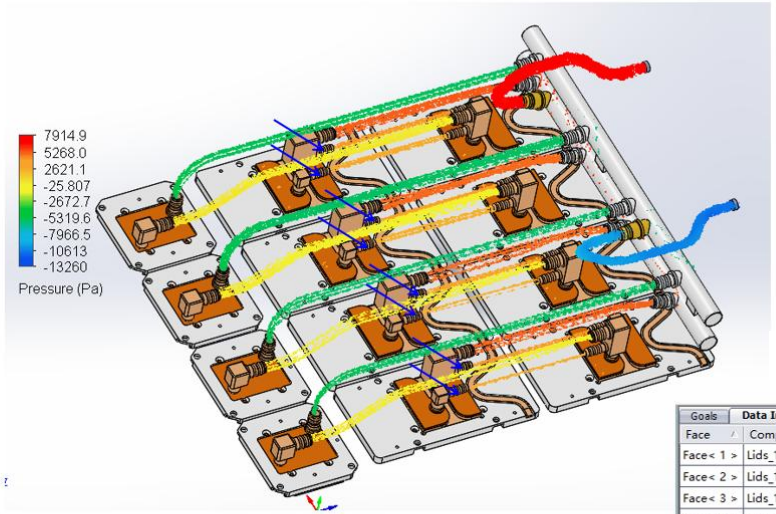


Multi-GPU Liquid Cooling Project

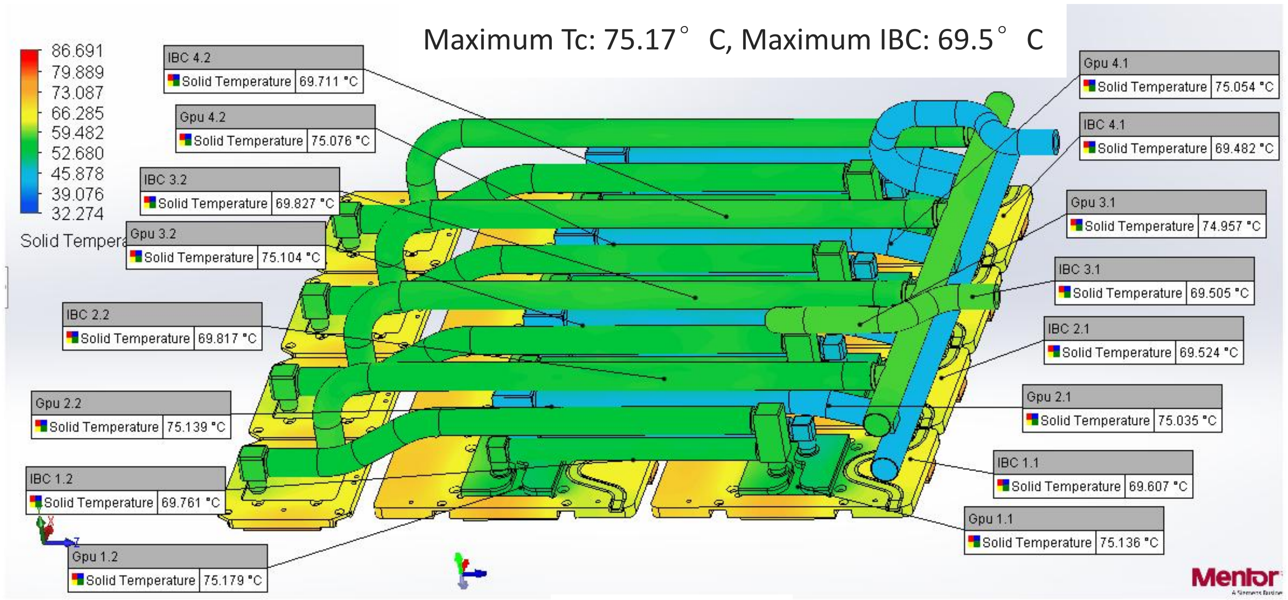
TONGYU ELECTRONICS

Simulation Boundary Conditions	Operating Parameters
GPU/Switch Power Consumption	700W*2 + 150W
Ambient Temperature (°C)	35
Coolant	25% PGW
Cold Plate Inlet Water Temp (°C)	45
Flow Rate (LPM)	8.0 (Parallel/Series)
Material	Cu
Heat Source Type	

(8LPM PG25 inlet water temperature 45° C) Power 700W * 2 + 150W



Multi-Branch Uniform Flow Design



Front-Side Temperature Contour Map

The flow rates of each waterway are shown in the table below

Goals | Data Inspector | Messages | Parametric Study

Face	Component	Parameter	Min	Max	Average	Surface [m²]
Face< 1 >	Lids_10-2	Volume Flow Rate [l/min]			1.0390	1.7827E-05
Face< 2 >	Lids_12-2	Volume Flow Rate [l/min]			1.0186	1.7827E-05
Face< 3 >	Lids_14-2	Volume Flow Rate [l/min]			1.0449	1.7827E-05
Face< 4 >	Lids_16-2	Volume Flow Rate [l/min]			1.0147	1.7827E-05
Face< 5 >	Lids_18-2	Volume Flow Rate [l/min]			1.0453	1.7827E-05
Face< 6 >	Lids_20-2	Volume Flow Rate [l/min]			1.0147	1.7827E-05
Face< 7 >	Lids_22-2	Volume Flow Rate [l/min]			1.0408	1.7827E-05
Face< 8 >	Lids_24-2	Volume Flow Rate [l/min]			1.0170	1.7827E-05

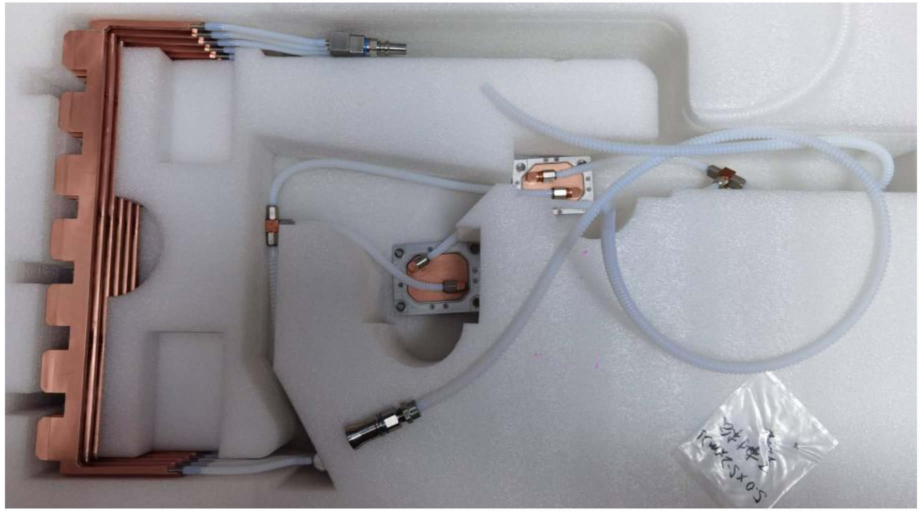
Liquid Cold Wall Project

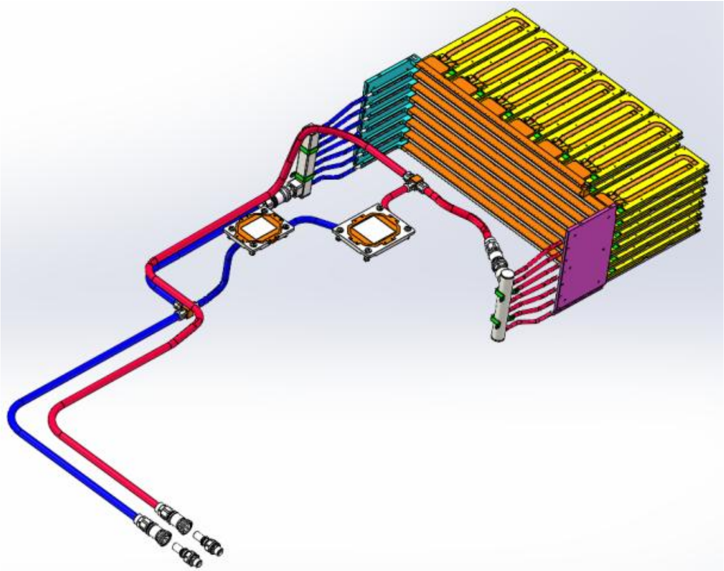
TONGYU ELECTRONICS

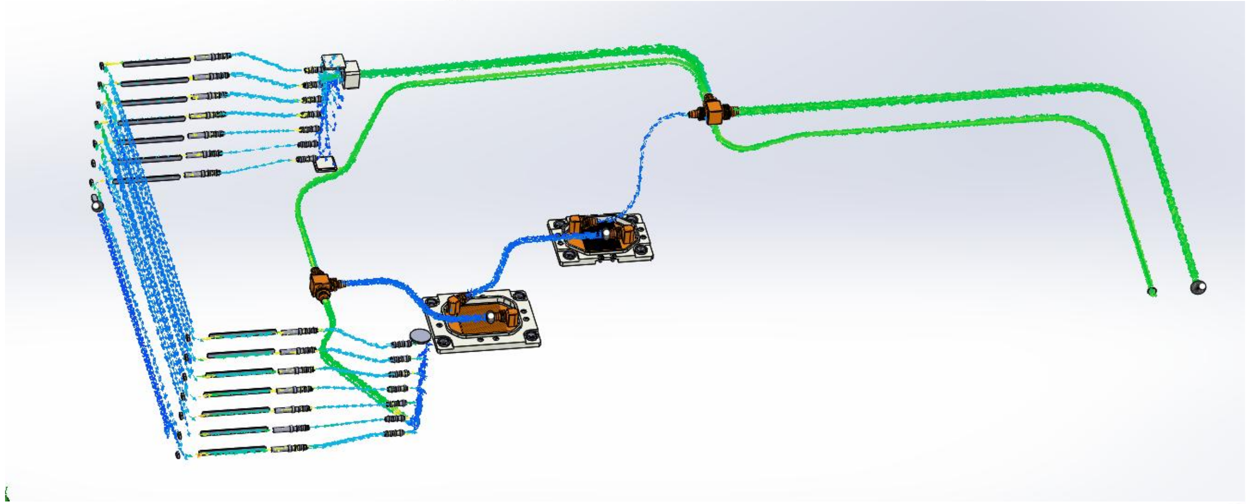
Project Overview:

The liquid cold wall serves as the thermal exchange zone, requiring direct thermal interfacing with 36 PCIe cards.

The highly complex internal flow channels pose significant design challenges and even greater manufacturing complexities.



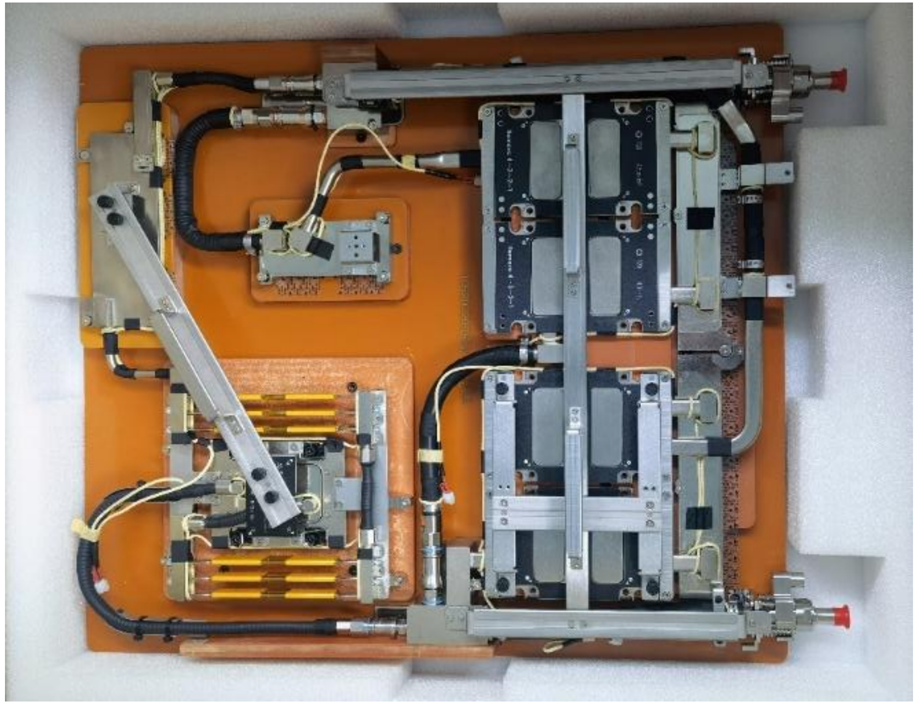


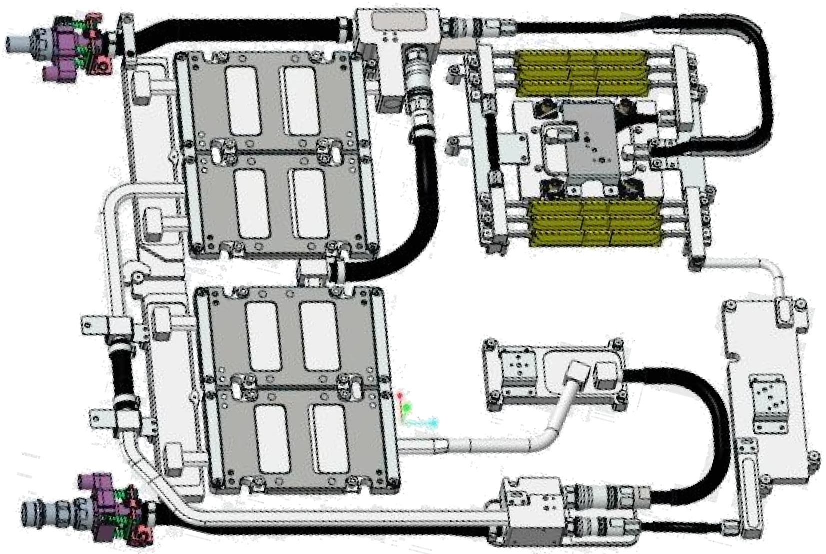


Full-Coverage Liquid Cooling Project

TONGYU ELECTRONICS

Project Overview:
Full-coverage liquid cooling implementation within 1U height constraints, with GPU modules restricted to a 0.5U vertical profile. This configuration presents extreme thermal design challenges requiring advanced microchannel optimization and precision manufacturing.



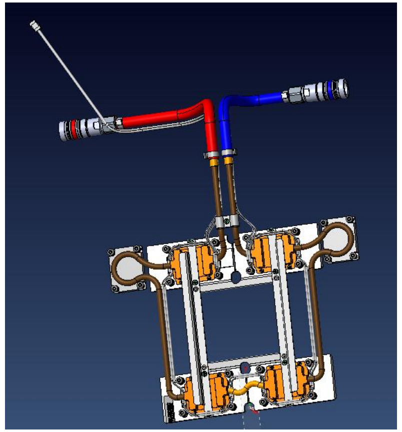


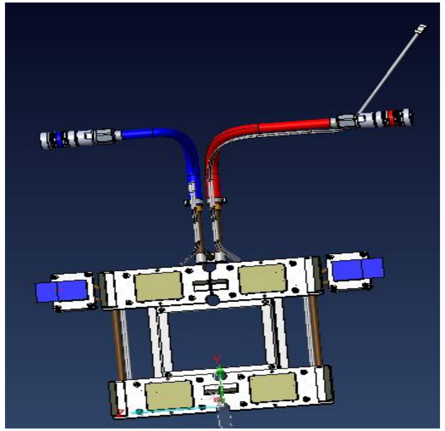
Switch Liquid Cooling Project

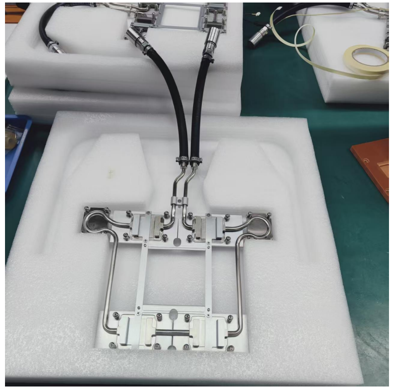
TONGYU ELECTRONICS

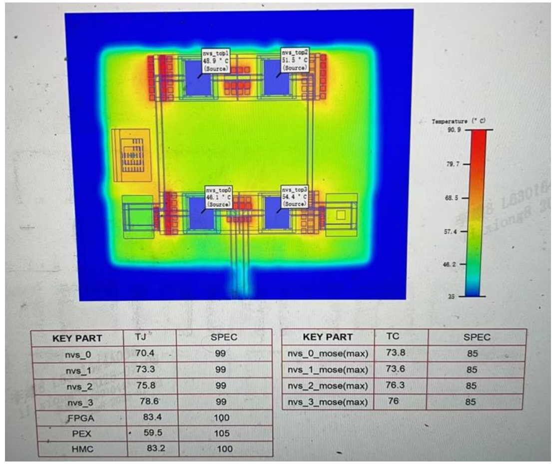
Project Overview:

Power: 200W
Tcase Requirement: <60°C (JEDEC JS-709 compliant)
Total System Pressure Drop: <20 kPa (ISO 5167 validated)



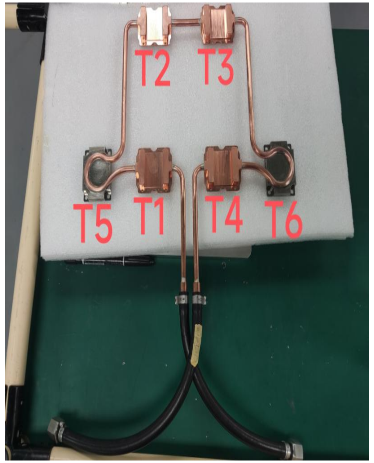


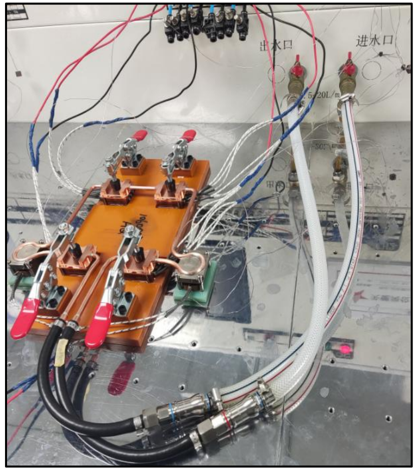




KEY PART	TJ	SPEC
nvs_0	70.4	99
nvs_1	73.3	99
nvs_2	75.8	99
nvs_3	78.6	99
FPGA	83.4	100
PEX	59.5	105
HMC	83.2	100

KEY PART	TC	SPEC
nvs_0_mose(max)	73.8	85
nvs_1_mose(max)	73.6	85
nvs_2_mose(max)	76.3	85
nvs_3_mose(max)	76	85

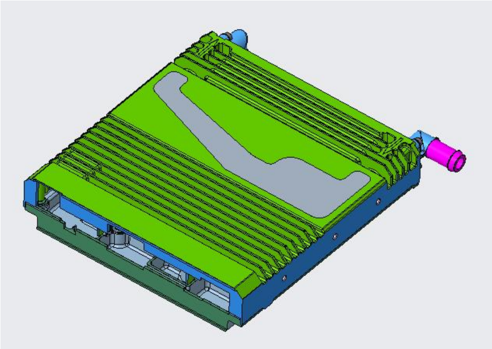


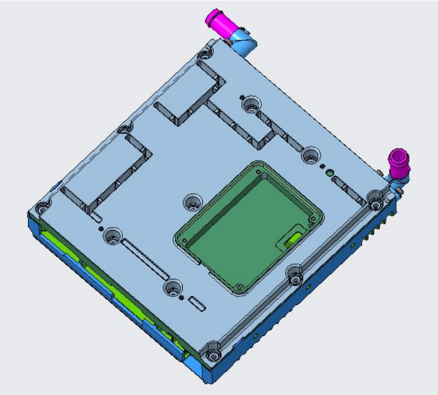


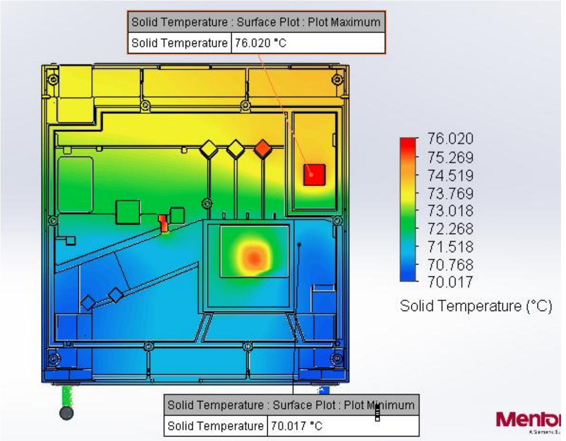
Item	流量(L)	T1(°C)	T2(°C)	T3(°C)	T4(°C)	T5(°C)	T6(°C)	环温(°C)	T进(°C)	T出(°C)	功率*4(W)	功率*2(W) (T5 & T6并联)	温差1(°C) (T1-T进)	温差2(°C) (T2-T进)	温差3(°C) (T3-T进)	温差4(°C) (T4-T进)	温差5(°C) (T5-T进)	温差6(°C) (T6-T进)	总流阻(Kpa)
1#	1.01	45.35	47.30	49.90	52.75	45.65	49.85	26.45	38.75	45.30	200.00	50.00	6.60	8.55	43.30	14.00	6.90	11.10	13.91
流阻测试 0.95L	0.96																		12.65

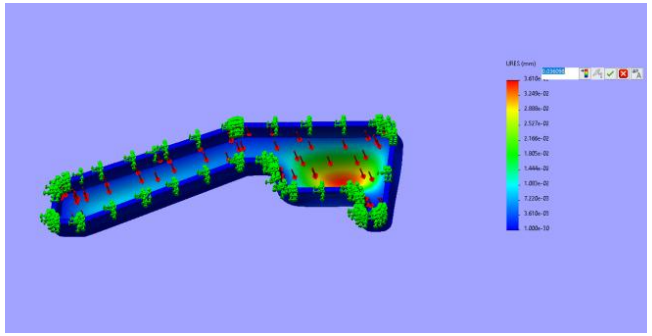
Vehicle-mounted Liquid Cooling Project

Project Overview:
Power: 30W
Coolant Temperature (TC) <80℃
Deformation <0.04mm under 1MPa pressure







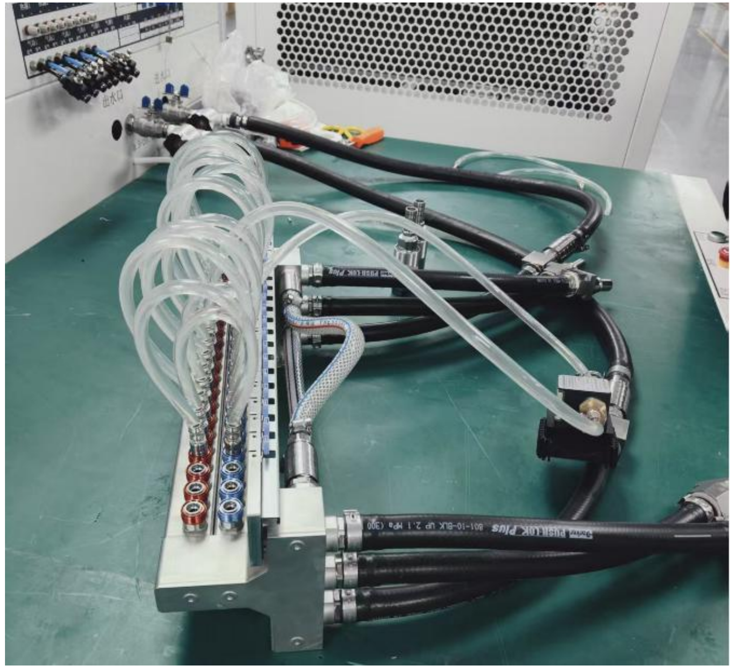


Both thermal and stress simulations meet customer requirements, with physical testing results aligning with simulation data.

Manifold Project

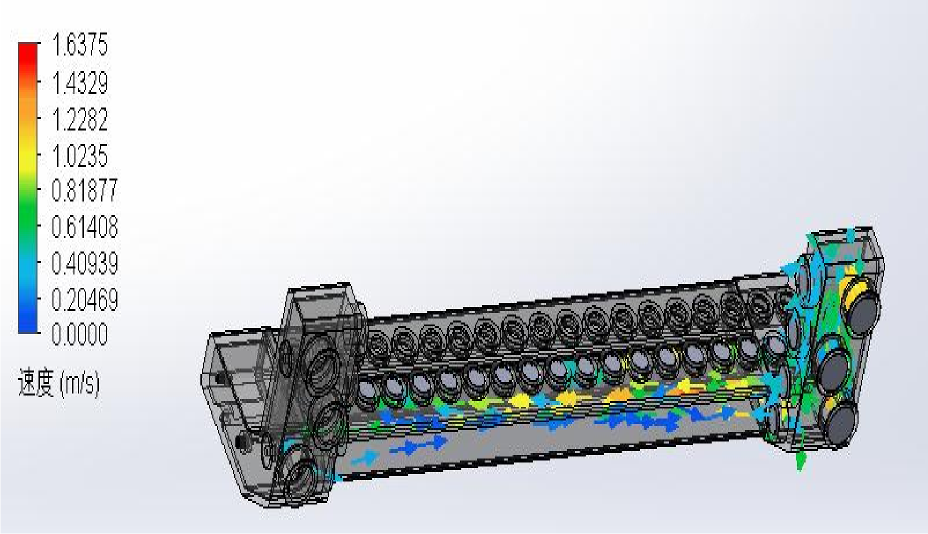
TONGYU ELECTRONICS

Project Overview:
Single-tube inlet flow rate: 15 LPM
Simulation requirements: Pressure drop and branch flow distribution evaluation
(Single-inlet configuration only)



Flow Simulation Results:

Inlet flow per tube: 15 LPM
Total flow rate: 45 L/min
Minimum CPU inlet/outlet flow rate: 1.9 L/min (meets requirements).

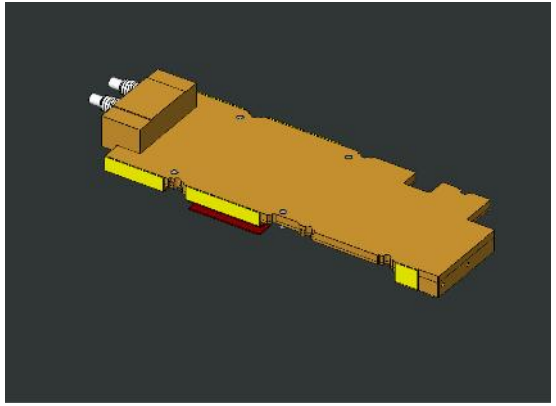


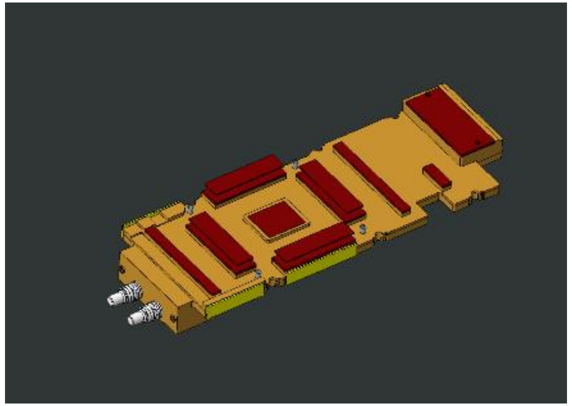
目标 | 数据检查器 | 消息 | 参数研究

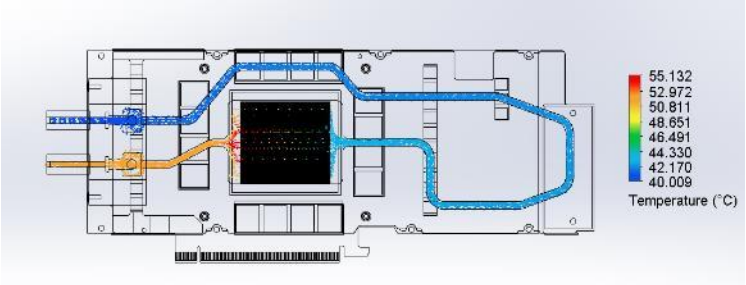
面	组件	参数	最小值	最大值	平均值	表面积 [m²]
Face< 1 >	封盖_2-1	ngp体积流量 [l/min]			14.995	0.00022463
Face< 2 >	封盖_1-1	ngp体积流量 [l/min]			14.997	0.00022466
Face< 3 >	封盖-1	ngp体积流量 [l/min]			15.008	0.00022483
Face< 4 >	封盖_3-1	ngp体积流量 [l/min]			-2.3304	9.3622E-05
Face< 5 >	封盖_4-1	ngp体积流量 [l/min]			-2.3241	9.337E-05
Face< 6 >	封盖_5-1	ngp体积流量 [l/min]			-2.3291	9.357E-05
Face< 7 >	封盖_6-1	ngp体积流量 [l/min]			-1.9112	7.6782E-05
Face< 8 >	封盖_7-1	ngp体积流量 [l/min]			-1.8974	7.6225E-05

Graphics Card Liquid Cooling Project

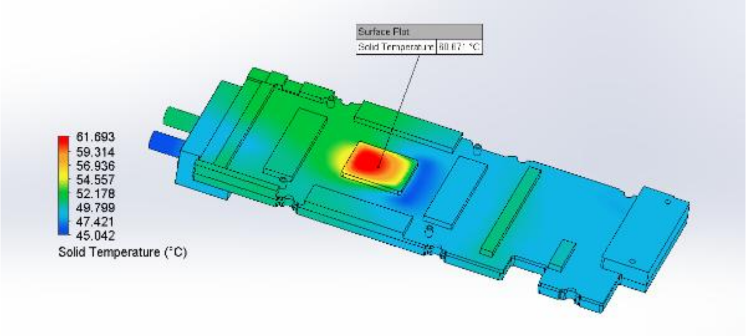
Project Overview:
Main chip: 360W; 32 DDR chips: 64W; 23 VR chips: 57.5W → Total 481.5W
Ambient temp: 50℃
Coolant: 25% ethylene glycol, inlet temp 40℃, flow rate 0.6LPM
Requirement: Main chip temperature rise <25℃.

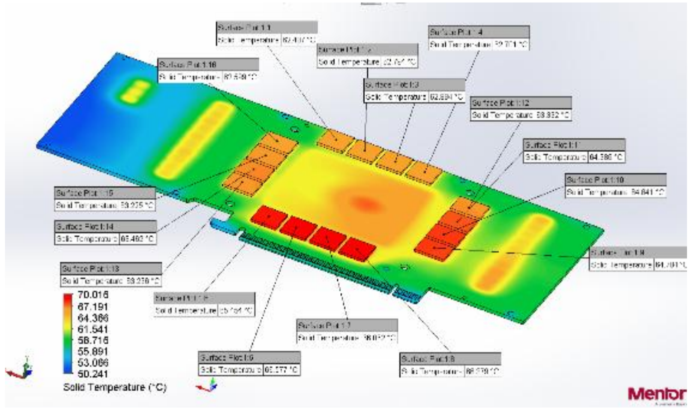






Differential pressure: 6.54KPa





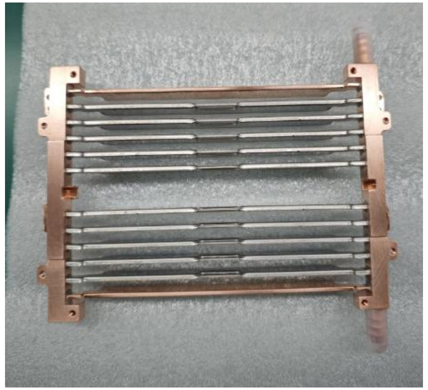
Simulation result:

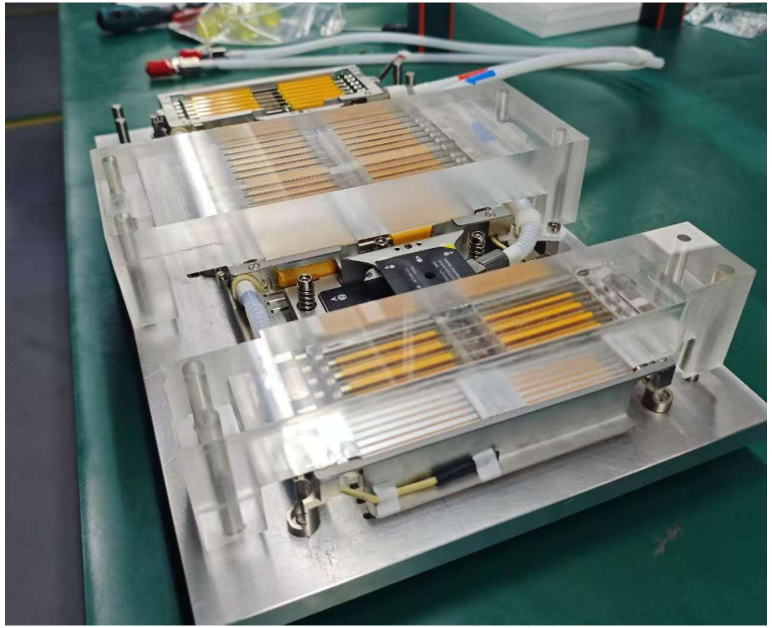
Main chip 60.671 ℃ ,temperature rise20.671 ℃
actual test:
main chip   temperature rise19.1℃

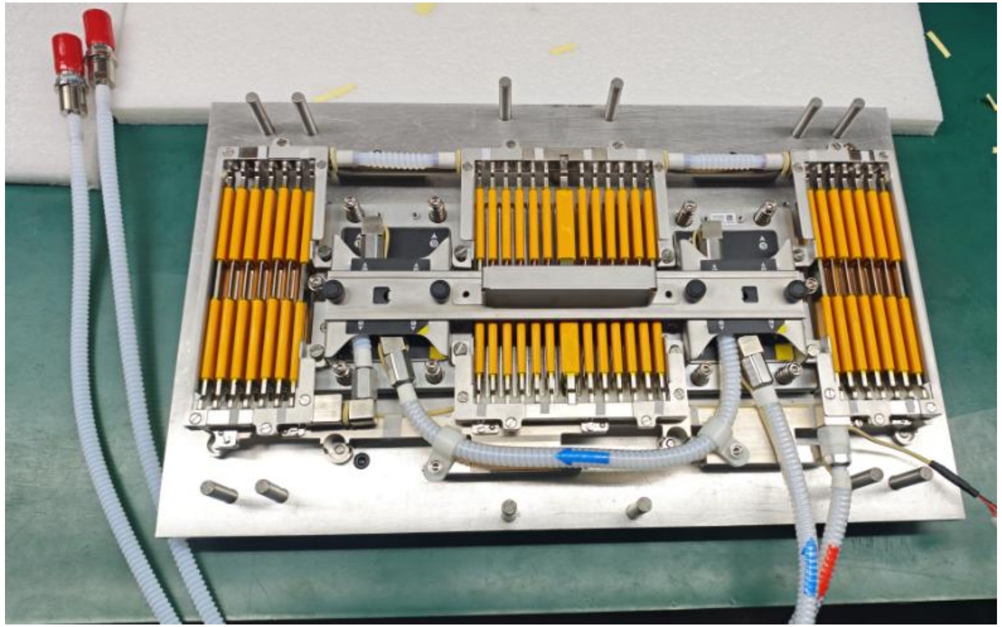
DIMM Cold Plate Process Control Inspection

TONGYU ELECTRONICS

Project Overview:
The DIMM cold plate also serves structural functions. DIMM pitch, straightness, and positional tolerance critically affect assembly. Jigs are used throughout the process to verify and inspect dimensions, ensuring smooth memory module installation/removal after assembly.



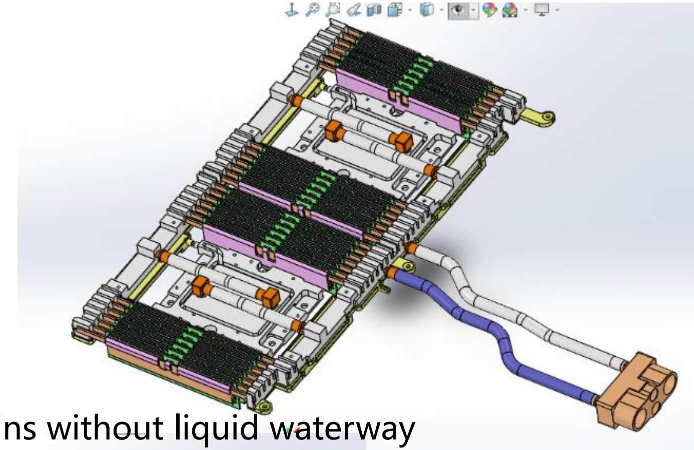




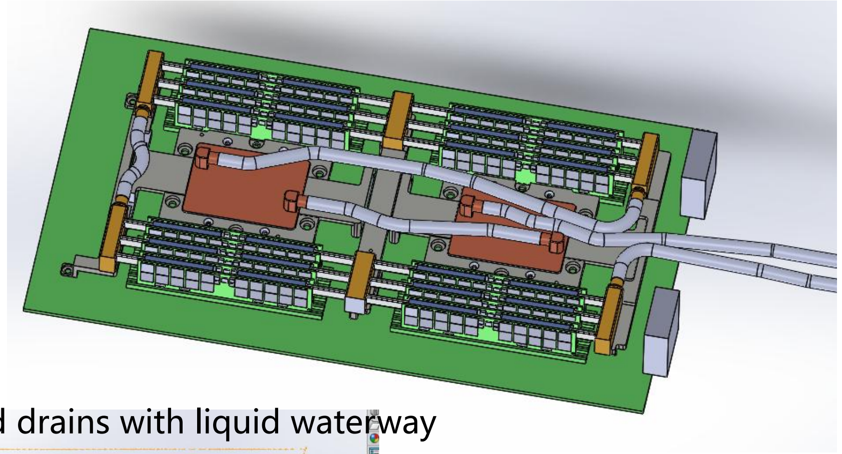
DIMM Cold Type System with Liquid & without Liquid Design

TONGYU ELECTRONICS

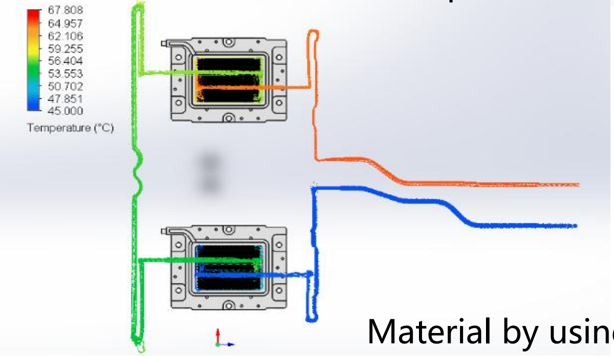
DIMM cold drains without liquid



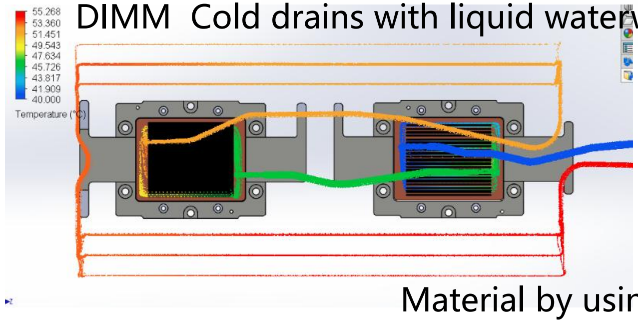
DIMM cold drains with liquid



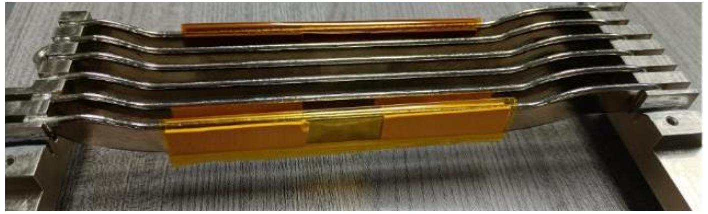
DIMM Cold drains without liquid waterway



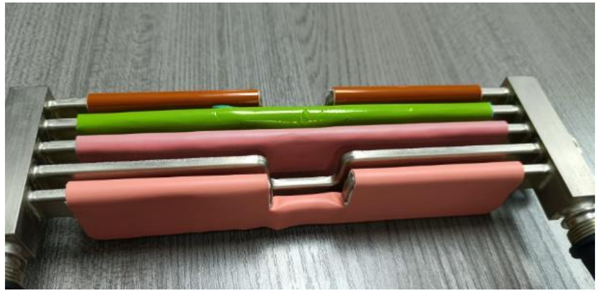
DIMM Cold drains with liquid waterway



Material by using heat pipe or copper plate

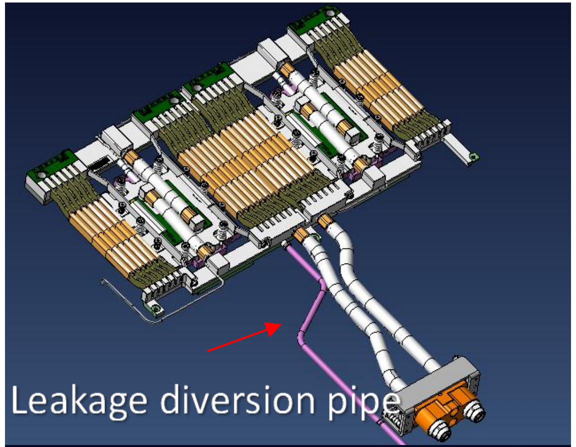


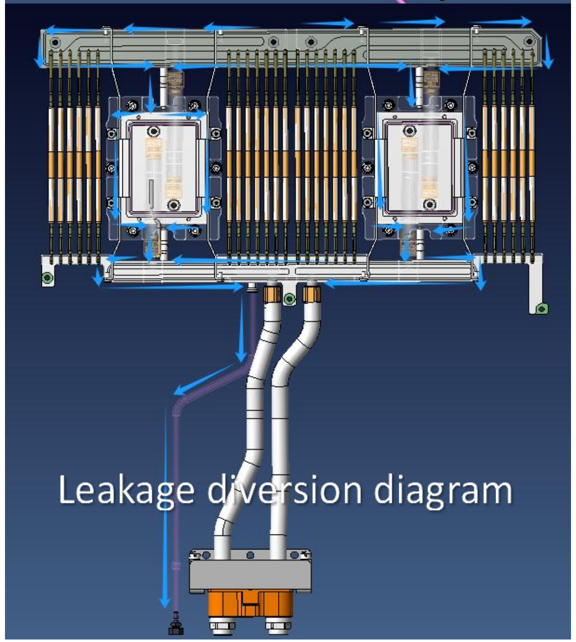
Material by using stainless steel or flat copper tube

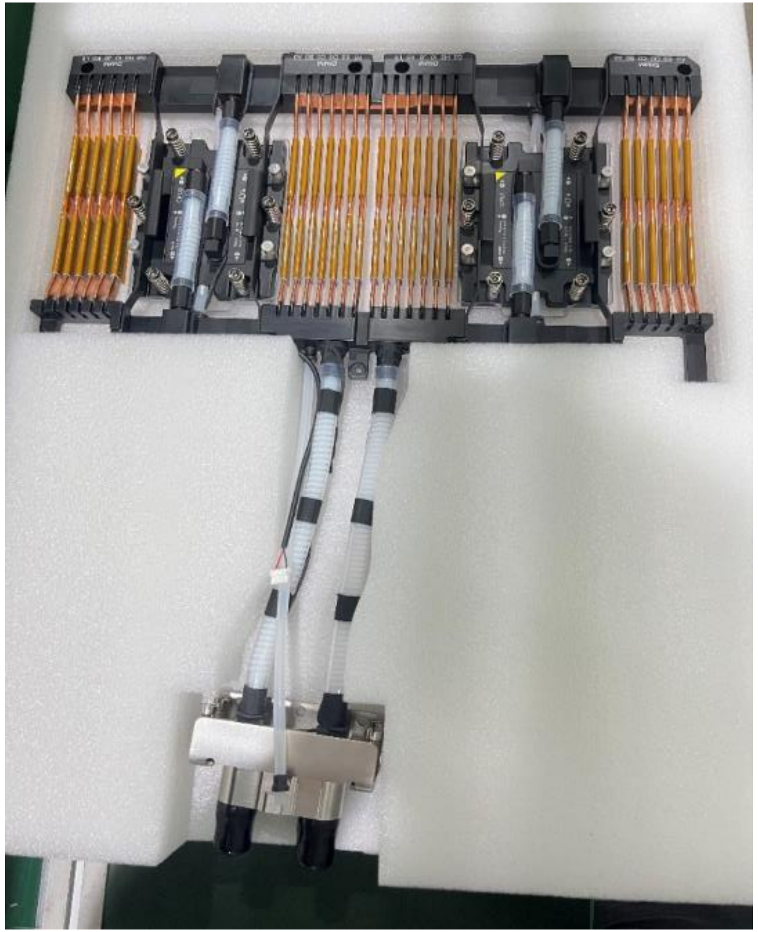


Leakage Diversion Design

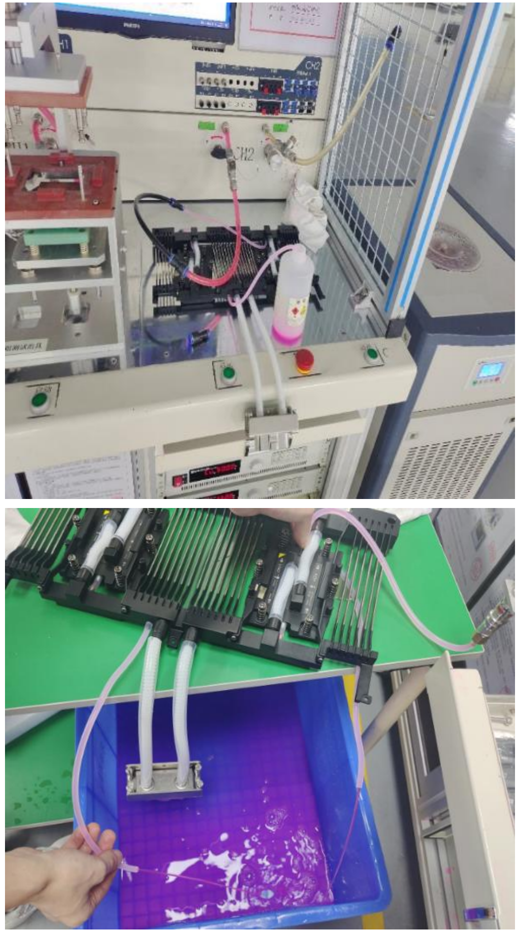
TONGYU ELECTRONICS







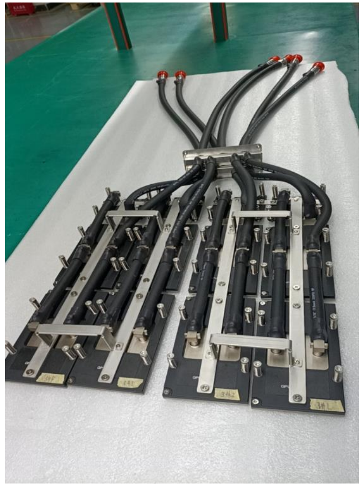
Actual product

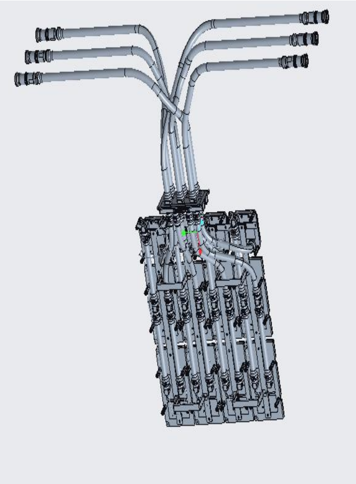


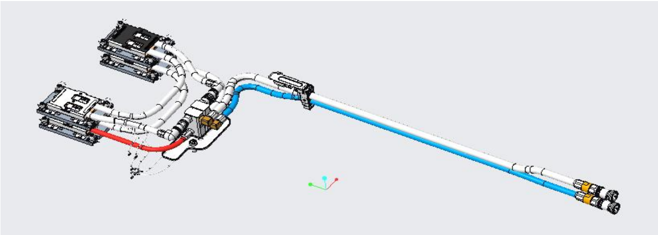
Plugging test

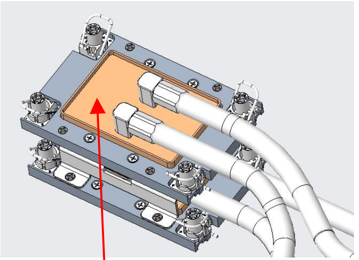
Leak-Free Collection Design

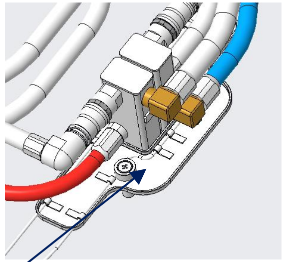
TONGYU ELECTRONICS

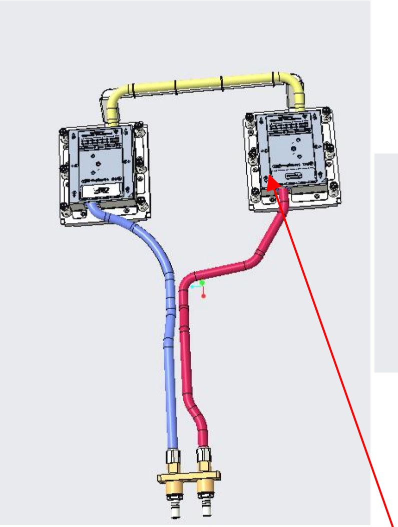


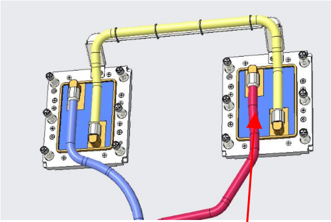


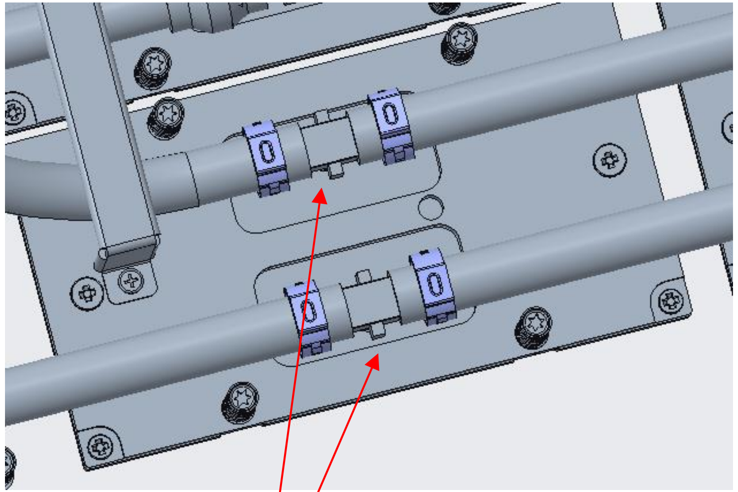




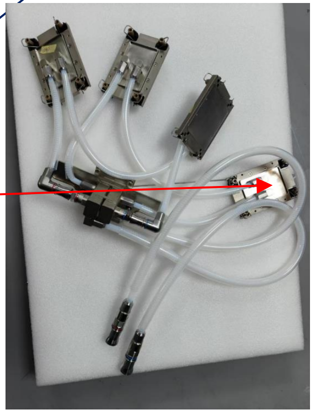


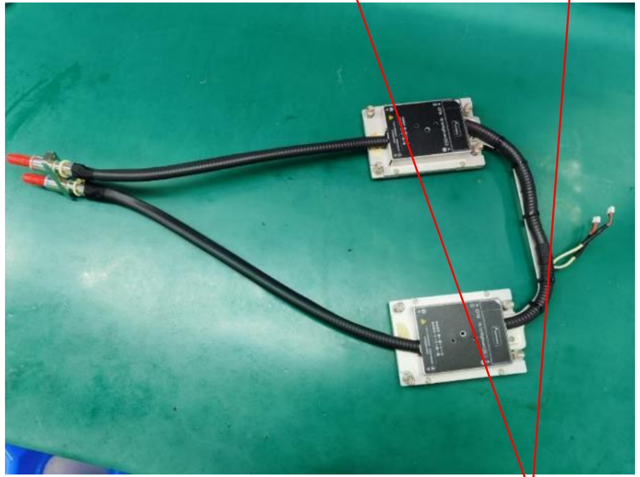






Leakage collection solution for CPU cold head and water manifold junctions

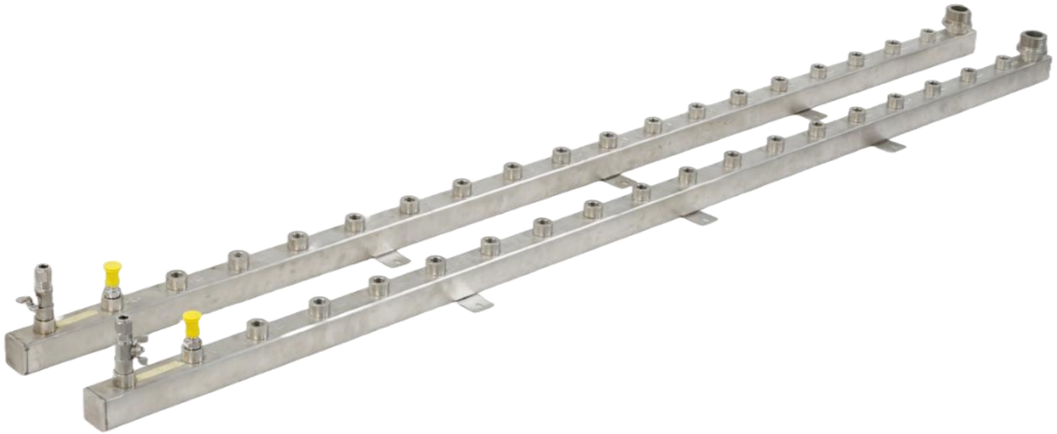




Leakage collection solution designed for GPU cold head water ports

Leakage collection solution at CPU cold head water ports

Manifold



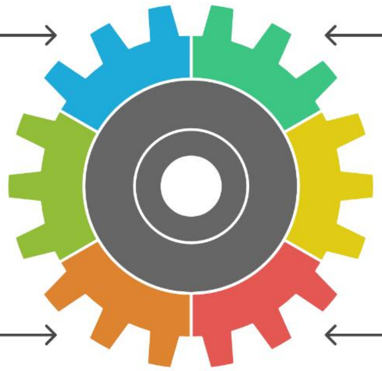
Process Flow:

1. Steel Pipe Incoming Inspection
2. Laser Cutting and Blanking
3. CNC Hole Machining
4. Deburring
5. Cleaning and Degreasing
6. Welding
7. Air Tightness Test
8. Flow Channel Flushing
9. Flow Channel Drying
10. Assembly
11. Air Tightness Test
12. Pressure Holding Test
13. Helium Leak Detection
14. Packaging
15. Warehousing

Unique Inlet and Liquid Distribution Structure Design →

Mechanical Theory and Numerical Calculations →

Compatibility and Pressure Resistance Technology →



← Flow Channel Design and Simulation

← Study on Liquid Flow Impact

← Radial Structure and Sealing Technology

Manifold Design and Simulation Capabilities

06

PART SIX

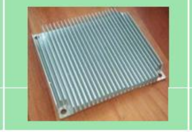
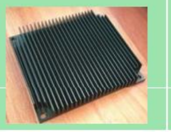
R&D of New Technologies

Graphene Composite Material Heat Sink

TONGYU ELECTRONICS

Principle Overview

Principle: By modifying the resin and carbon functional materials, the carbon materials are fully dispersed and integrated within the resin matrix, forming interconnected networks. This transforms the originally insulating and thermally resistant resin into a novel composite material with enhanced electrical and thermal conductivity.

	Bare aluminum extruded heatsink	Graphene composite heatsink
Specifications	70*65*9mm 	70*65*9mm 
Ambient temperature	31.9	31.8
Power (W)	5.06A*2.2V	5.06A*2.2V
MOS tube flat meal	89.4	89.5
Temperature rise	57. 5	57. 7

(Figure 1 Compares test results)

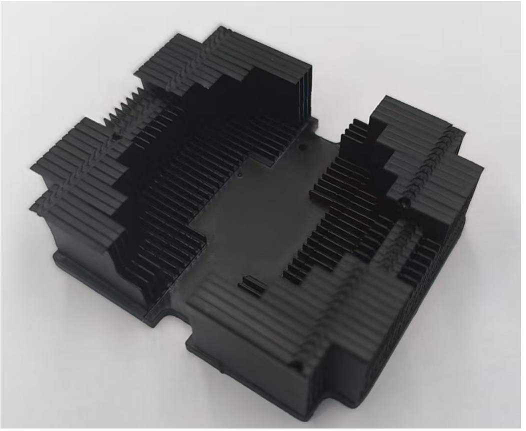
Item	Graphite Composite	Aluminum Alloy	Remarks / Conclusion
Cost	Manufacturing cost is 20-50% lower compared to aluminum alloy	–	Graphite composite offers lower manufacturing costs.
Density	1.6–1.7 g/cm³	2.7 g/cm³	–
Thermal Conductivity	5-120	30–270 W/(m·K)	Wider conductivity range; heat dissipation efficiency can exceed that of aluminum alloy.
Thermal Emissivity	>0.9	0.05	Higher emissivity improves radiative heat dissipation.
Heat Dissipation	Flexible structural design	Related to structural design	Overall thermal performance is better; can be significantly improved through design optimization.
Comprehensive Performance	Excellent	Excellent	Meets high-strength, high-rigidity requirements; graphite-based composites have excellent overall performance.

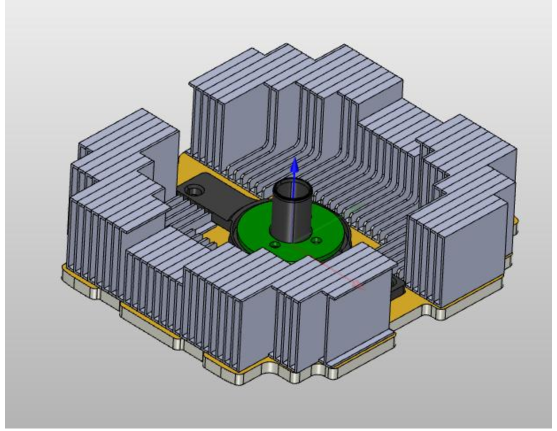
(See Figure 1 to compare test results)

Fuxene Aluminum Heat Sink

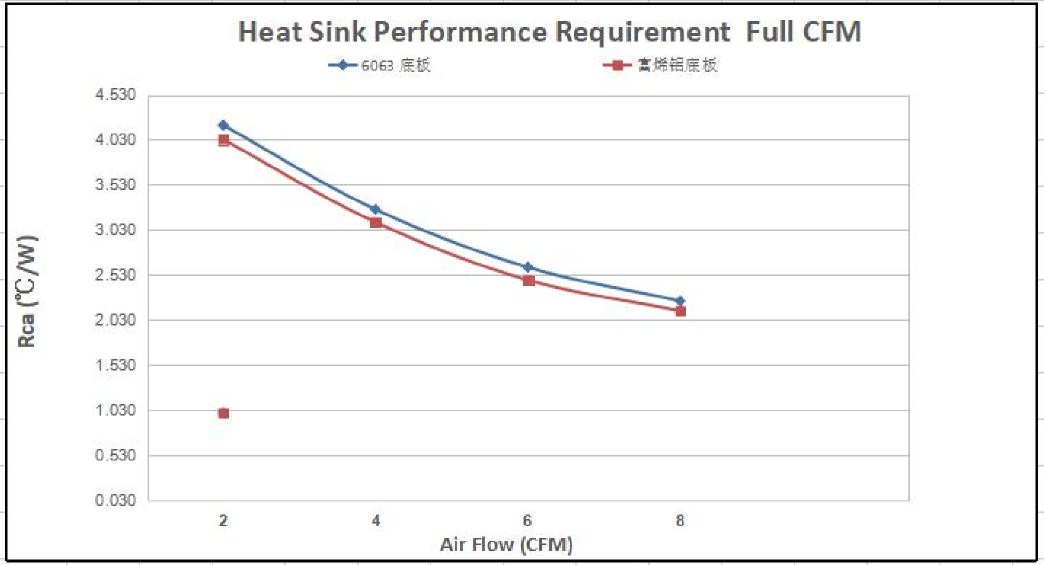
TONGYU ELECTRONICS

Heat sinks welded with Fuxi aluminum base plates perform approximately 2° C better than those with 6063 aluminum bases under identical test conditions.

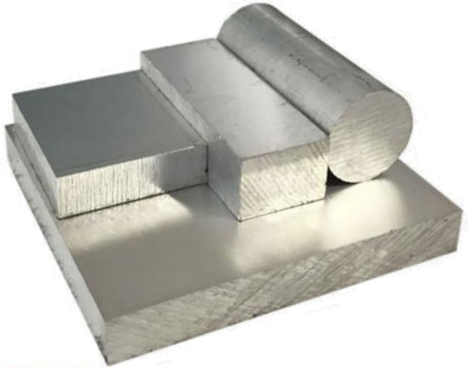


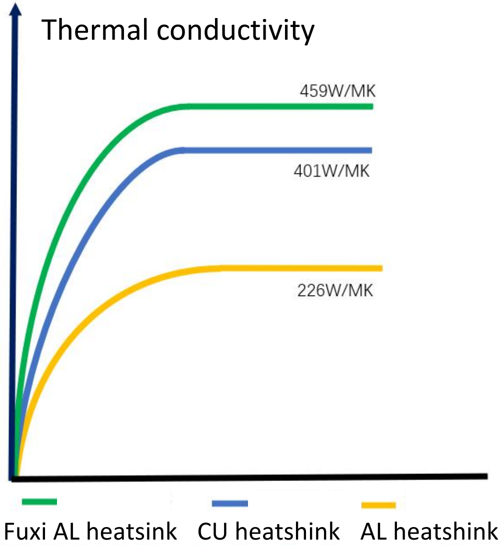


All Flow-12 w						
Sample no.	Tc(℃)	Ta(℃)	ΔTc(℃)	Power(W)	Rca(℃/W)	Q(CFM)
6063 底板	74.1	23.8	50.3	12	4.192	2.0
	63.0	23.9	39.1	12	3.258	4.0
	55.5	24.1	31.4	12	2.617	6.0
	50.8	23.9	26.9	12	2.242	8.0
富烯铝底板	72.6	24.2	48.4	12	4.033	2.0
	61.5	24.1	37.4	12	3.117	4.0
	53.8	24.1	29.7	12	2.475	6.0
	49.7	24.1	25.6	12	2.133	8.0



Fuxi aluminum can be manufactured as flat plates or extruded into structural profiles.

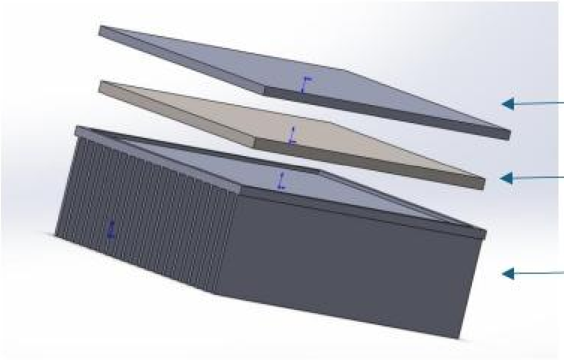




Graphene-Aluminum Composite Heat Sink

TONGYU ELECTRONICS

Graphene Composite Heat Sink Overview



Graphene Composite Heat Sink Exploded View Diagram

Product Name: Graphene Composite Heat Sink

Specifications: 80mm*80mm*32mm

Structure: Composed of graphene layers with longitudinal thermal conductivity as the core, encapsulated within an aluminum alloy outer shell.

Connection Method: High-Pressure Brazing

Performance		
Indicators	parameter	unit
Color	grey	-
Specifications & Dimensions	<280*280	mm
Thickness	0.7-150	mm
Hardness	65-70	Shore D
Density	2.4-2.6（±0.2）	g/cm³
Specific Heat	800	J/kg.k
Bending Hardness	60	MPa
Operating Temperature	-40-200	℃
Thermal Performance		
Z-Direction Thermal Conductivity	40-60	W/m-K
In-Plane Thermal Conductivity	500-600	W/m-K
Thermal Diffusivity	280-300	mm²/s
In-Plane Coefficient of Thermal Expansion	6-8	10-6/K

Composition: As shown in the diagram, the middle layer is graphene, the upper section is an aluminum structure, and the base is also aluminum.
Process: Encapsulates graphene sheets into the aluminum heat sink using a high-pressure brazing process, currently under iterative testing of various high-pressure brazing methods.
Objective: Similar to the vapor chamber principle, aims to maximize graphene's high in-plane thermal conductivity to reduce the heat sink's thermal resistance.
Status: The project is under development, with no estimated completion timeline due to technical challenges in high-pressure brazing.

Liquid Metal Thermal Paste

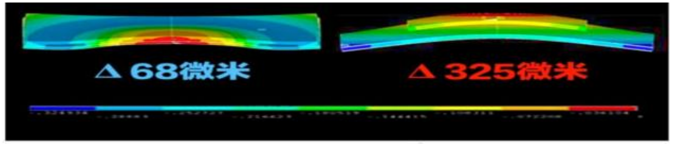
Liquid Metal Thermal Paste LM-188J

Product advantages:

low thermal resistance,
high thermal conductivity,
thin thickness,
low thermal expansion,
and good applicability.

Suitable for use in low installation pressure, large-size, and high-power chips.

Curved chip with cover	Curved bare chip



68 microns	325 microns

Project	Unit	Value
Appearance Color	-	Silver
Status	-	Paste
Odor	-	none
Thermal Conductivity	W/（m-K）	
Thermal Resistanc (20psi@80° ℃)	℃-cm2/W	0.0248
	K/W	0.0034
Thickness	mm	0.04
Density	g/cm³	6.36
Corrosiveness	Corrosive to Aluminum	Non-corrosive to gold, silver, copper, nickel, and their alloys
Shelf Life	Months	12

Under 500W@60CFM conditions: Liquid metal outperforms TC-5888 thermal grease by 0.6℃

Under 600W@60CFM conditions: Liquid metal outperforms TC-5888 thermal grease by 1.0℃.

Disadvantages: Liquid metal thermal paste can corrode aluminum, but it can be used on all-copper heat sinks, especially for higher power, where the benefits are greater.

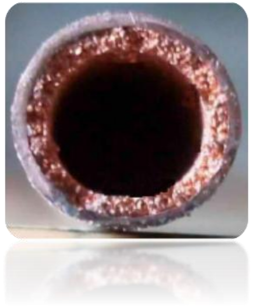
Challenges: Since it is liquid metal, it cannot be brushed onto the heat sink and must be applied by the customer on the chip surface.

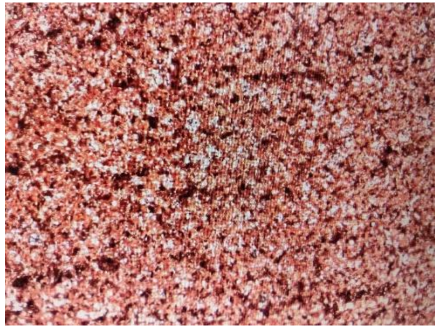
Advantages: According to comparative test results, under 600W@60CFM conditions, using liquid metal thermal paste results in a temperature rise 1° C lower than when using TC-5888 thermal grease.

Sintered Capillary Structure of Micro-Nano Materials in Heat Pipes

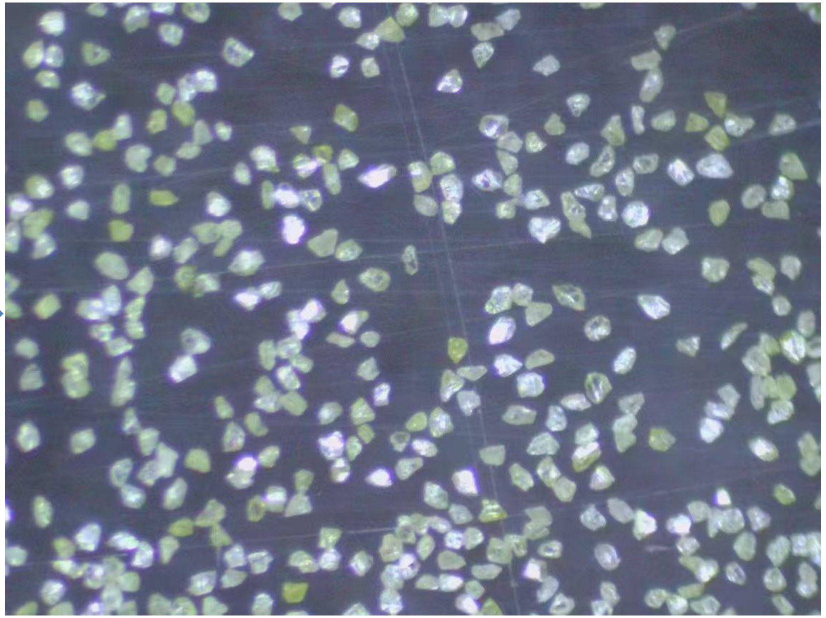
TONGYU ELECTRONICS

Traditional heat pipes use copper powder sintering for the internal structure.





The internal sintering incorporates micro-nano thermal conductive materials, achieving a thermal conductivity 2 to 2.5 times that of copper powder and increasing capillary force by more than three times.



Objective: Improve the heat pipe's Qmax while reducing its thermal resistance to lower the overall module's thermal resistance.

Expectation: Under 550W module conditions, △T is expected to decrease by 4-5° C.

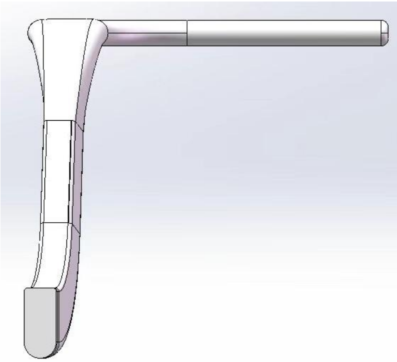
Cost: The unit price of a single heat pipe is expected to increase by approximately 1%.

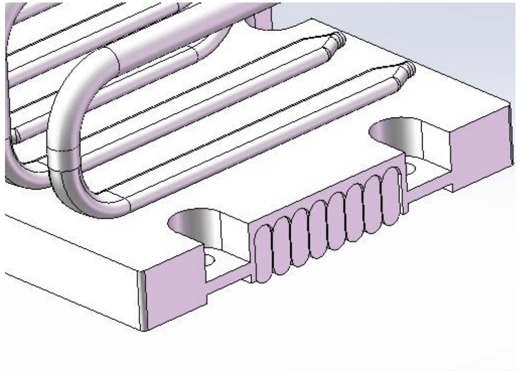
Verification: There are currently process limitations, and technical development is ongoing. Module verification is expected to be completed by June 2025.

D-shaped heat pipe roll-pressed direct contact design

TONGYU ELECTRONICS

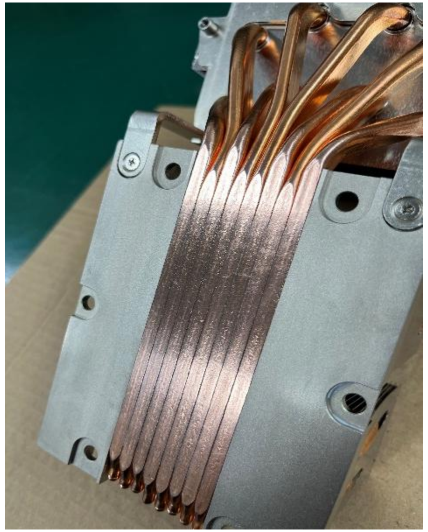
The D-shaped heat pipe roll-pressing process only requires flattening the convex side of the heat pipe. The pressing stroke is shorter than that of standard flatting processes, and both sides of the heat pipe are more evenly stressed. As a result, the heat pipe experiences less indentation and deformation after roll-pressing, achieving a flatness of less than 0.077. Additionally, the R-angle gap between heat pipes is smaller, ensuring tighter pipe alignment
and reducing thermal conduction resistance.





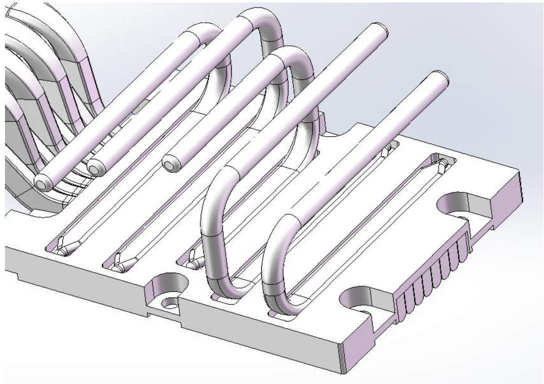
Standard flattened pipe aluminum plate archaed groove

The aluminum plate groove for D-shaped heat pipe roll-pressing only needs to be designed as a rectangular groove, which simplifies aluminum extrusion mold design and machining control for roll-pressing dimensions. In contrast, standard flattened heat pipes require an arched groove, which poses greater challengesfor aluminum extrusion mold design, cannot be processed by CNC, and requires wire cutting to adjust the groove shape, making it more difficult to manufacture.

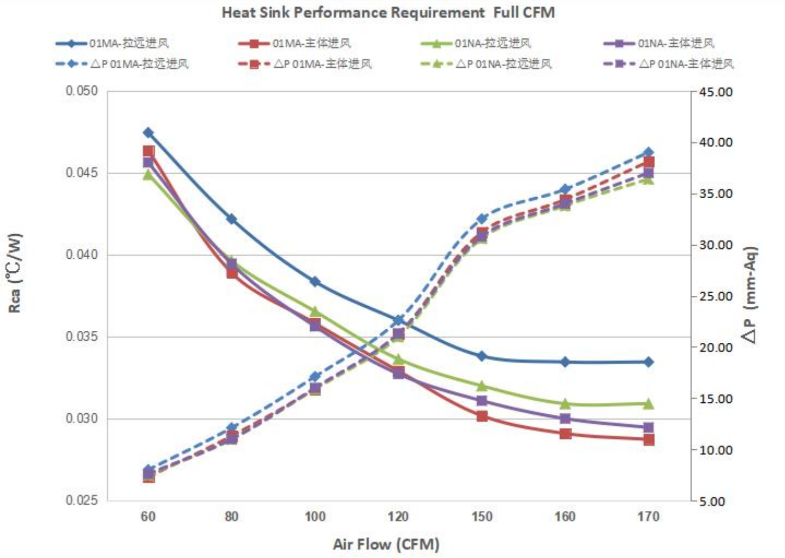


Standard flattened pipe: Side indentation after roll-pressing

D-shaped pipe: No side indentation after roll-pressing



D-shaped pipe aluminum plate rectangular groove

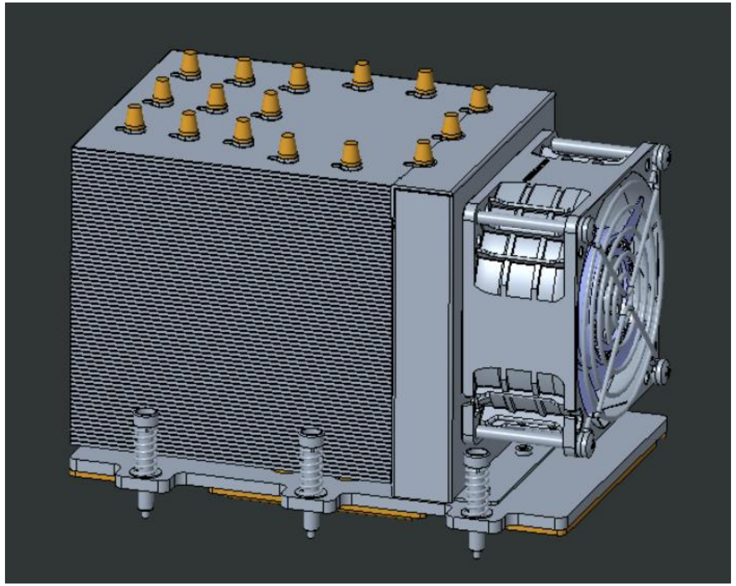


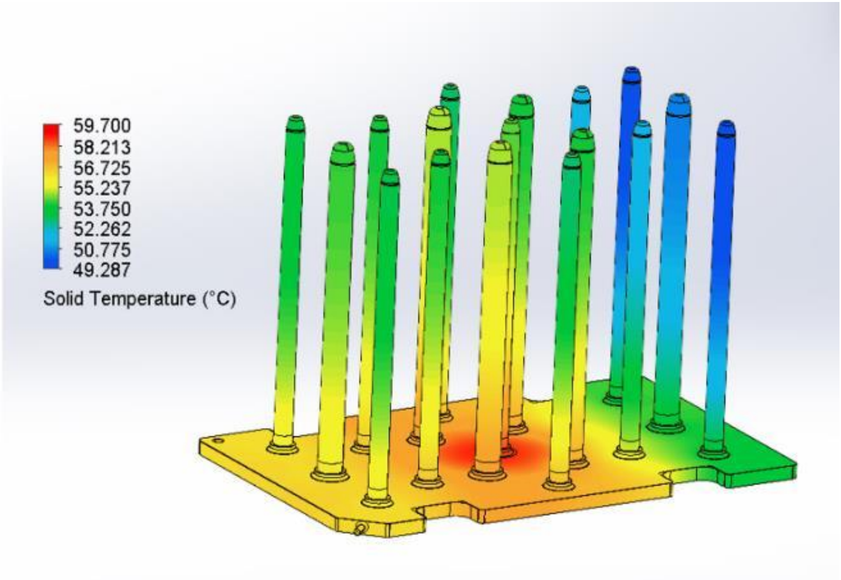
Thermal resistance <0.05° C/W @ 60CFM, approximately 4° C lower temperature rise compared to similar heat sinks

High Heat Flux Density 3DVC

TONGYU ELECTRONICS

Develop high heat flux density (125W/cm ^ 2) 3D VC, Simulation design, 3D VC internal layout and design to ensure no dry burning under high heat flux density conditions. Project solution: 750W, chip area of 20 * 30mm.





	Power	DCU Die Top	DCU Die Centenr	HBM A Top	HBM B Top	HBM C Top	HBM D Top	Ambient temperature	DCU Die Thermal Resistance
Scheme 1	750W	66.925℃	68.503℃	59.401℃	59.38℃	59.613℃	59.626	43℃	0.034
Scheme 2	750W	66.337℃	67.75℃	59.378℃	59.354℃	59.584℃	59.601℃	43℃	0.033

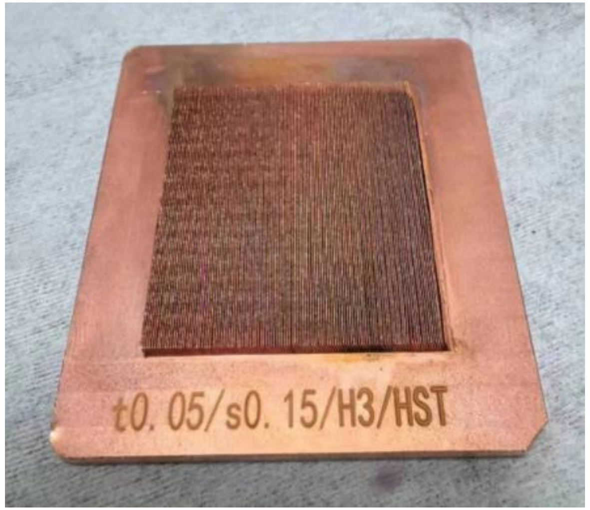
Currently, the heat flux density that the 3D VC module can solve is below 100W/cm ^ 2, and if it exceeds this heat flux density, it will dry burn.
Goal: Improve the 3D VC Qmax and achieve a heat flux density of 125W/cm ^ 2 that the module can solve
Expected: Under the condition of 750W module, the thermal resistance requirement is less than 0.04 ℃/W
Verification: We are currently discussing and verifying the internal layout and design of 3D VC, and expect to have a formal 3D VC solution by the end of May/June 2025

Diamond Composite Material Skived Fin Bottom Plate

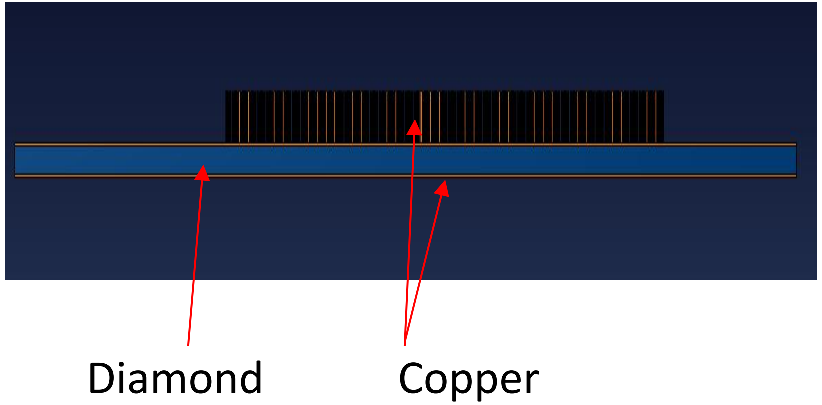
TONGYU ELECTRONICS

Diamond copper composite material skived fin bottom plate

It is an isotropic lightweight thermal conductive composite material with high thermal conductivity and low thermal expansion coefficient. Its organizational structure consists of diamond powder and copper matrix made under high temperature and high pressure. It is suitable for chip packaging substrates, with high thermal conductivity and a thermal expansion coefficient that matches the chip. Its performance can be adjusted in a wide range to meet the needs of chip packaging.



性能		
指标	参数	单位
颜色	黄色	-
尺寸规格	<200*200	mm
厚度	>0.3	mm
密度	5.8-7.0(±0.1)	g/cm^3
比热	430	J/kg.k
弯曲强度	>220	MPa
使用温度	-65~200	℃
热性能		
热导率	600-950	W/m·K
热膨胀系数	4-10	10^{-6}/K

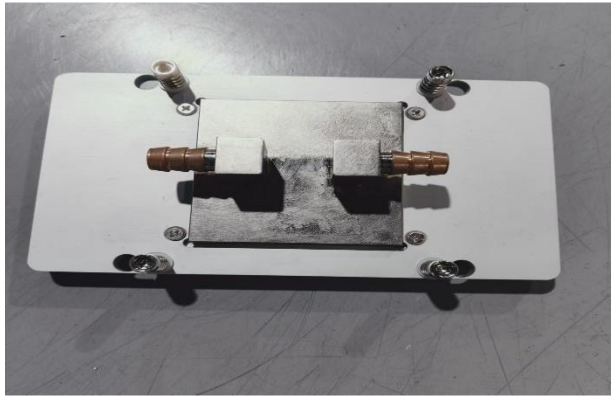


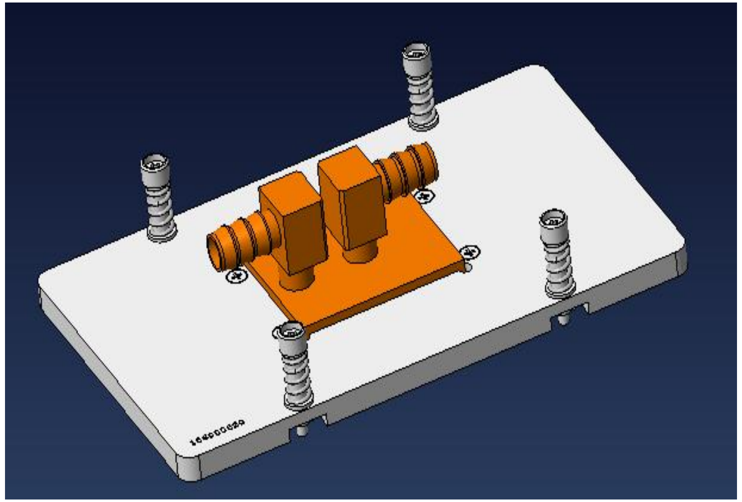
High Heat Flux Density Copper Cold Plate

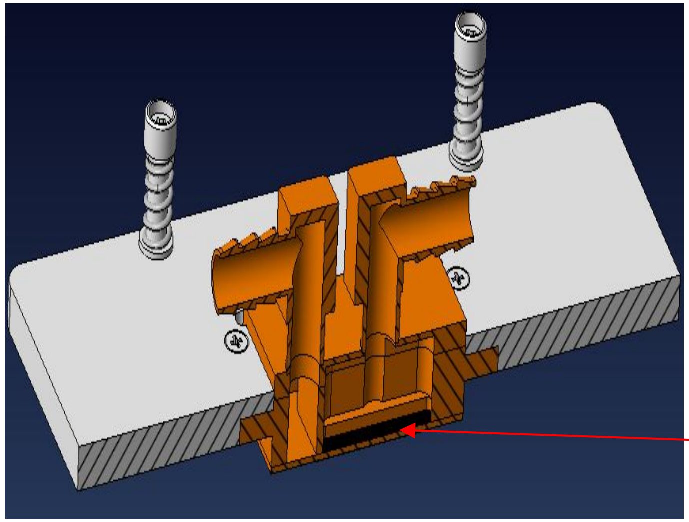
TONGYU ELECTRONICS

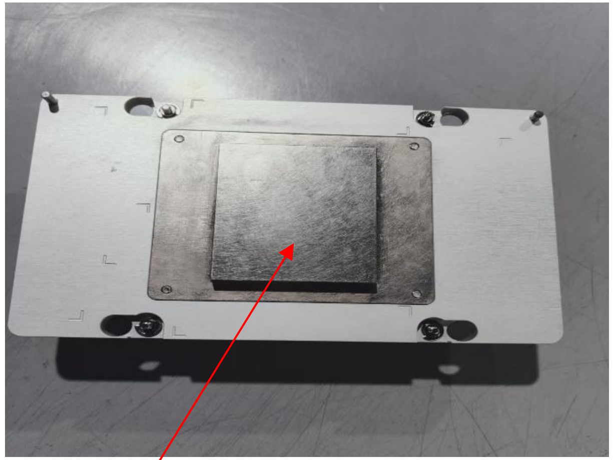
Application of diamond copper composite material skived fin in the design of high heat flux density copper cold plates

The thermal conductivity reaches 600-950W/mk, and the heat of the chip can be quickly conducted to the copper teeth through the diamond composite material at the bottom. Then, efficient heat exchange occurs between the liquid in the microchannel and the fin to improve heat dissipation efficiency and reduce thermal resistance. It is expected to achieve a power output of 1200W.







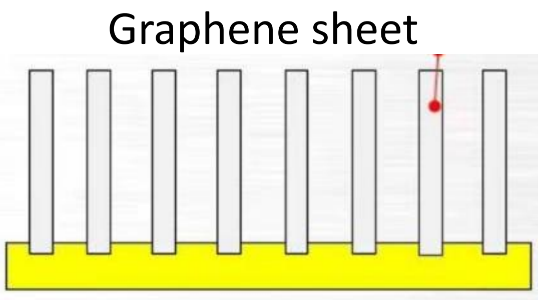


Diamond copper composite material skived fin bottom plate

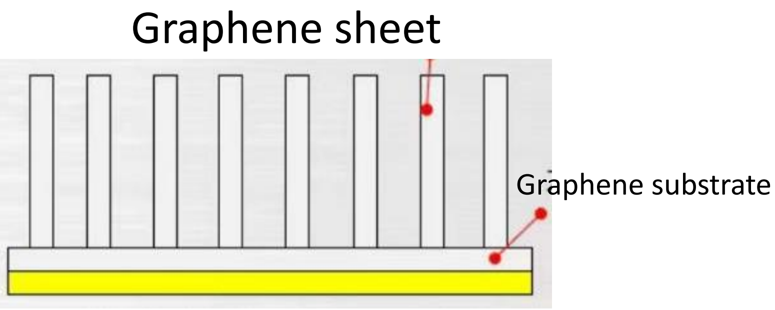
High Heat Flux Density Copper Cold Plate 2

TONGYU ELECTRONICS

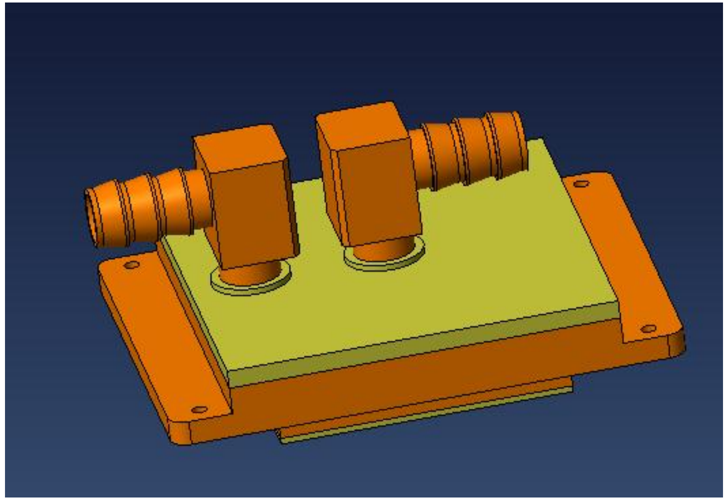
Using graphene copper composite material to skived fin
By utilizing the high thermal conductivity of graphene (500-600W/mk), heat is evenly distributed to the skived fin to reduce thermal resistance, as shown in the figure on the right. It is expected to achieve a power output of 1200W.

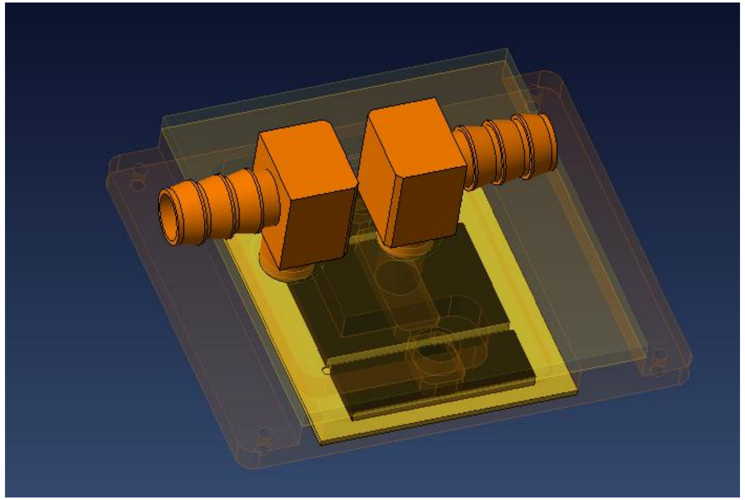


Graphene sheet and groove welding



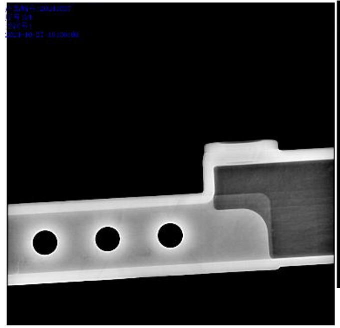
Graphene sheet is integrated with the substrate and then welded to the copper substrate



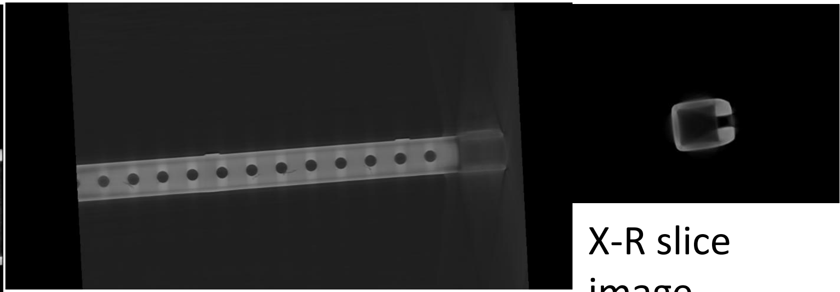


New Technology - Integrated Precision Casting Manifold

TONGYU ELECTRONICS

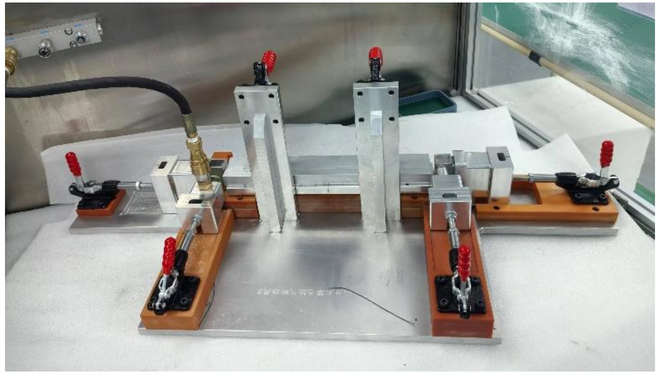


X-R perspective view



X-R slice image

The main part of the product is integrated precision casting, the post-process processing is less, saving cost; Only the two ends of the cover need to be welded and sealed, the welding length is short, the precision casting process has less sand holes, and the reliability is high.



Air Tightness Test Drawing for Precision Cast Blanks

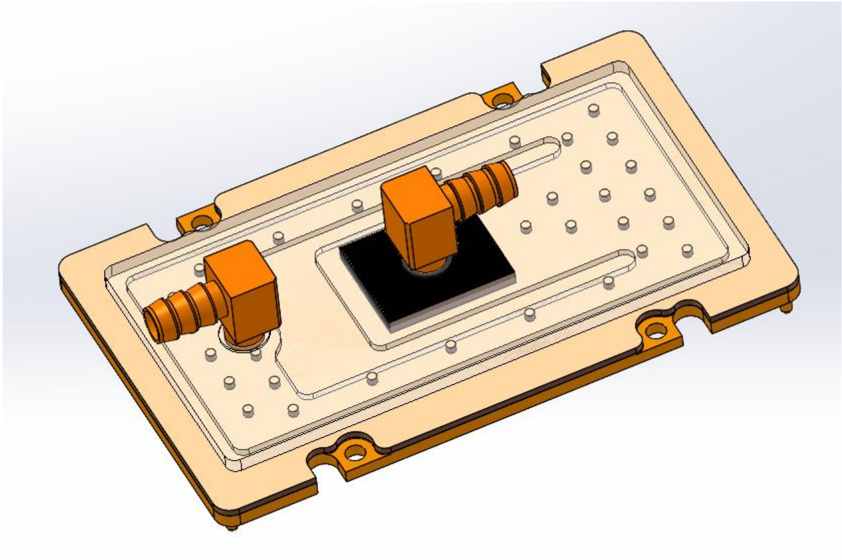
Additional equipment required：
Laser welding machine, argon arc welding machine, high temperature vacuum brazing furnace

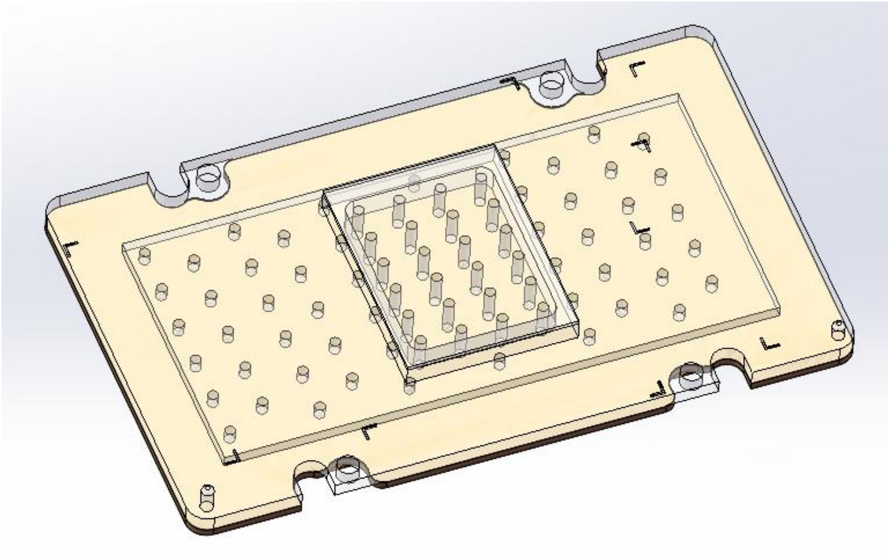
HIGH VACUUM BRAZING FURNACE

New Solution - Integrated VC Cold Plate Heatsink

TONGYU ELECTRONICS

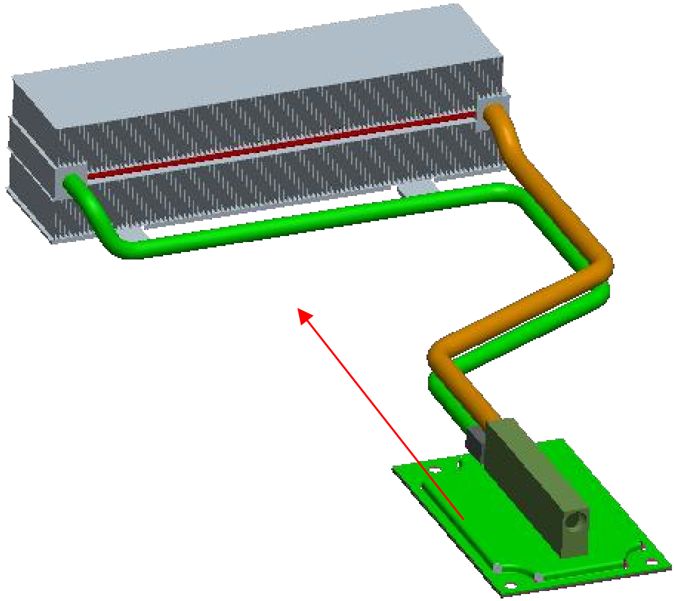
The bottom of the product is VC, and the top half is a liquid-cooled chamber. Using the fast soaking property of VC, the heat transmitted by the chip is quickly divided into the bottom of the entire water-cooled plate, and then the liquid is quickly exchanged to achieve the goal of reducing the thermal resistance.



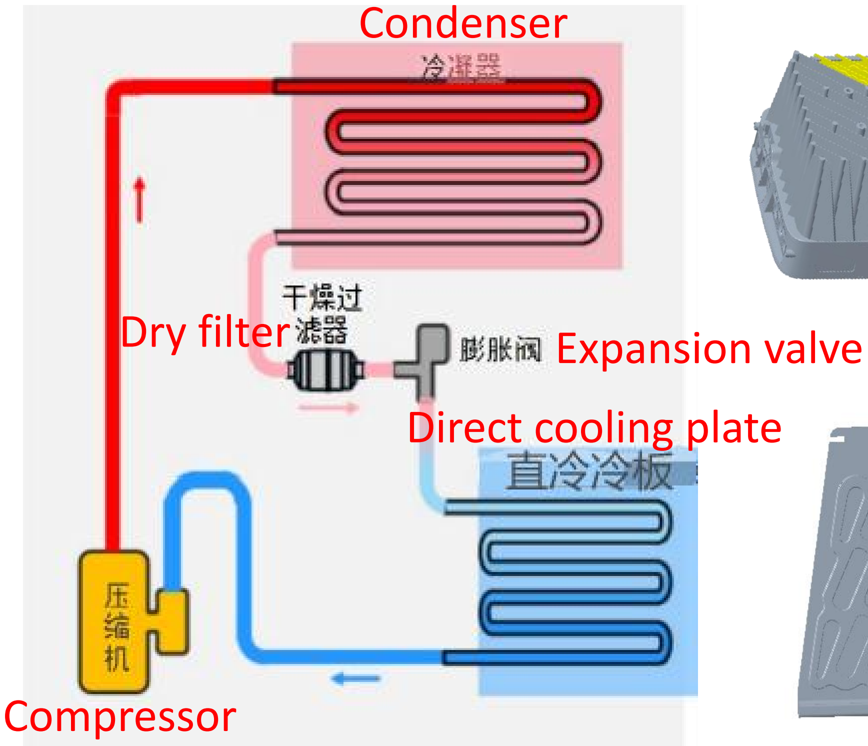


New Solution - Refrigerant Straight Cold Plate

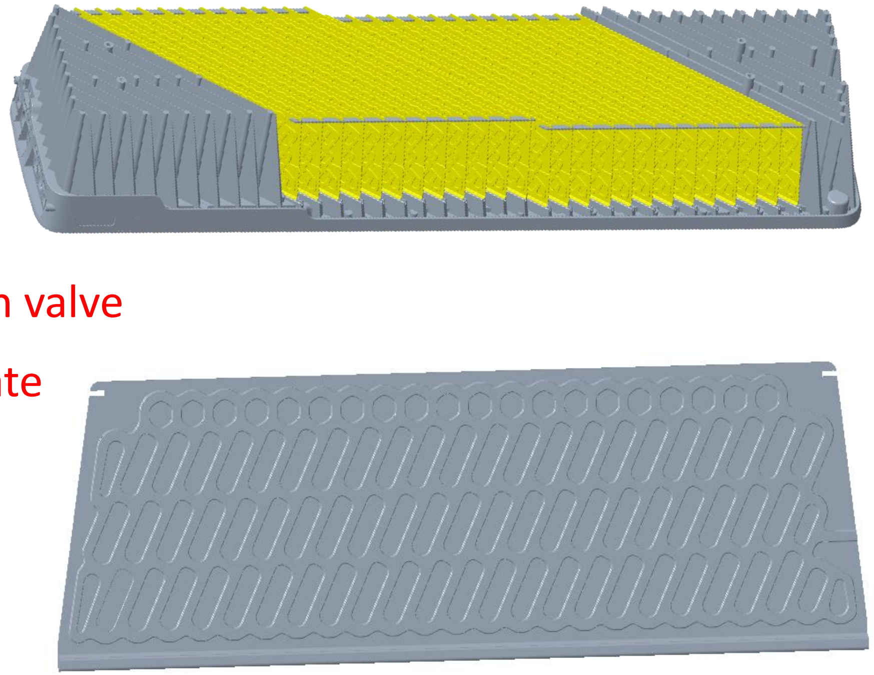
TONGYU ELECTRONICS



Pump-free two-phase liquid cooling system



Refrigerant direct cooling system schematic



R1234YF direct cooling plate

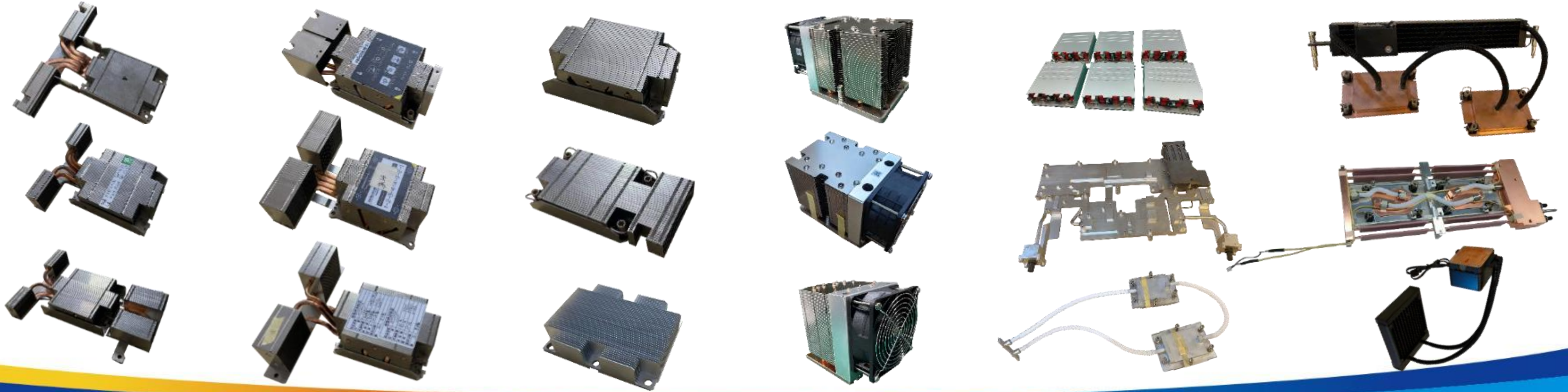
07

PART SEVEN

Our Partner

PC / Server

中科曙光 Sugon	IEIT SYSTEMS	Lenovo 联想	HUAQIN 华勤技术	xFUSION
FURUKAWA ELECTRIC GROUP	FOXCONN 鴻海科技集團	RAMAXEL 记忆	H3C	Nettrix 宁畅
inspur 浪潮	Inventec	CNIT 云尖信息	METAX 沐曦	HYGON 中科海光
Tencent 腾讯	美团 Meituan	JD.COM 京东	快手	Bai du 百度
ByteDance 字节跳动	Alibaba 阿里巴巴	Google	intel	hp



Consumer Electronics

FOXCONN 鴻海科技集團

PEGATRON

USI®

美的 Midea

ASUS®

雷尊 LEIZUN™

COMMSCOPE®

CyberTAN

DELL

Energy / Photovoltaic

HUAWEI

i-brights 中国航发・阳天电子

CHINT 正泰

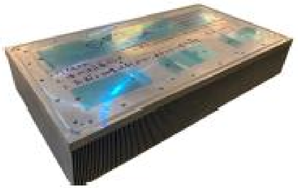
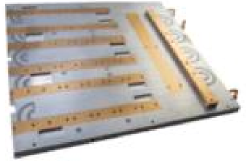
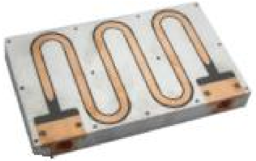
浩洋股份 GOLDENSEA

bodor laser

锦浪科技 GINLONG

MITAC

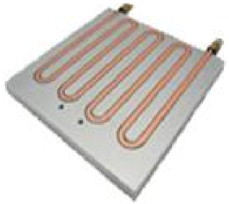










Vehicle

TESLA

BYD

广汽传祺

Wabtec CORPORATION

东风汽车 DONGFENG MOTOR

五洲龙 WUZHOULONG

08

PART EIGHT

Future Development Plans

Optimization of Production Base Layout

TONGYU ELECTRONICS

Build a world-class manufacturing base for heat dissipation products

New energy/vehicle mounted liquid cooling production line

Server liquid cooling production line

Scientific planning;
Reasonable division of labor

New factory planning

- Implement vehicle mounted liquid cooling product lines and server liquid cooling production lines in a layered manner.

Capacity expansion of liquid cooling factory

- Build a domestic first-class data center liquid cooling product production base

Vehicle Mounted Dedicated Line Planning

TONGYU ELECTRONICS

Class 100.000 cleanroom

- Floor area: 2800 square meters
- Number of production lines: 3
- Monthly production capacity: 30k
- Annual production capacity: 360K

Advantages of liquid cooling production line

Dust free environment

Ensure product quality and effectiveness of quick connector installation

Scientific plan

Diversification and full category coverage of liquid cooled server cooling products

Paperless office

RTF

Electronic control, visual management, improve work efficiency

Data traceability

Scan and save test data, product testing data can be traced

Material turnover

AGV robot vehicle material turnover improves product material turnover efficiency

Start of Production: Mid April

Vehicle Mounted Dedicated Line Planning

TONGYU ELECTRONICS

Vehicle mounted product dedicated line planning

Add new equipment

- CNC Machine Tools: 100 units (High-precision, High-efficiency Machining)
- Die Casting Machines: 10 units (High-strength Aluminum Alloy Component Molding)
- Friction Stir Welding Equipment: 20 units (High-strength, Low-deformation Joining)

Capacity planning

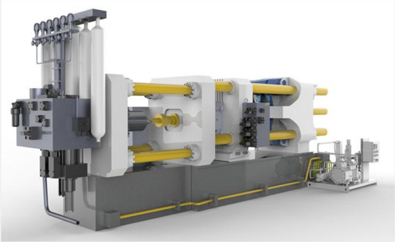
- Daily production capacity: 12K
- Monthly production capacity: 360K

Quality control

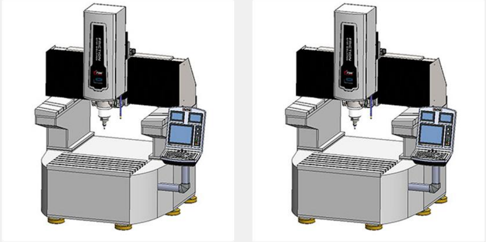
- ISO/TS 16949 certification standard | Full process automated testing system

Floor area: 8000 square meters

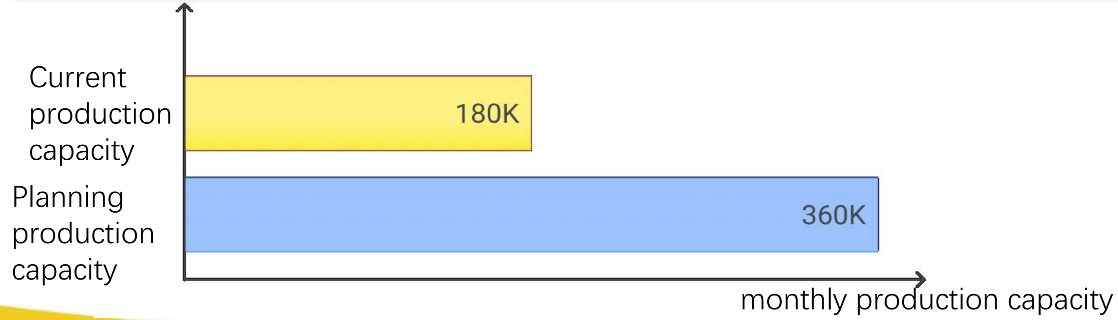
CNC Machining Area



Die Casting Area



Friction Stir Welding Zone



Project timeline

Start of Feb.	Start of Mar.	End of Mar.	Mid April
Equipment procurement	Equipment installation	Equipment commissioning	Start of Production

Upgrade Smart Manufacturing & Promote Automation Transformation

TONGYU ELECTRONICS

1. Equipment Upgrades:

Laser welding and vacuum brazing equipment are scheduled for delivery by the end of February.

High-precision reflow soldering: temperature control within ±3°C.

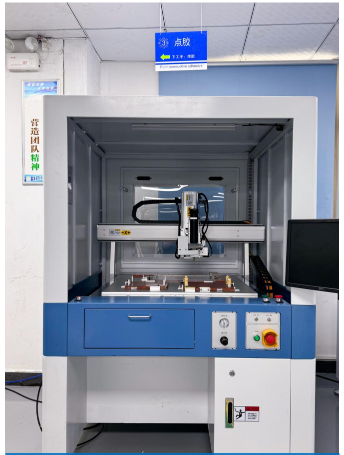
2. Increase automation targets for liquid cooling and air cooling to over 50%. Ensure delivery schedules and optimize costs.

High-precision reflow soldering production line

Vacuum Brazing Furnace

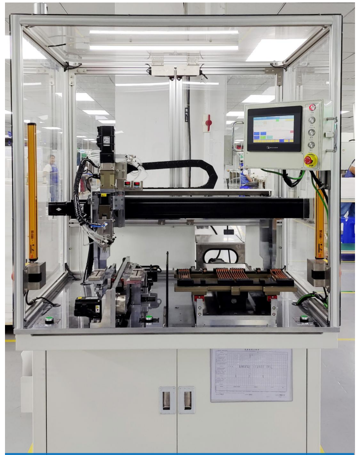
Automatic loading robot

Automatic Thread Hole Inspection Machine



Automatic Dispensing Machine

3D Roller Tube Machine



Automatic Back Adhesive Labeling Machine

TONGYU ELECTRONICS

THANKS!

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