

MICRO-FIN SKIVING · COLD PLATE · HCT-200

Micro-fin thermal components

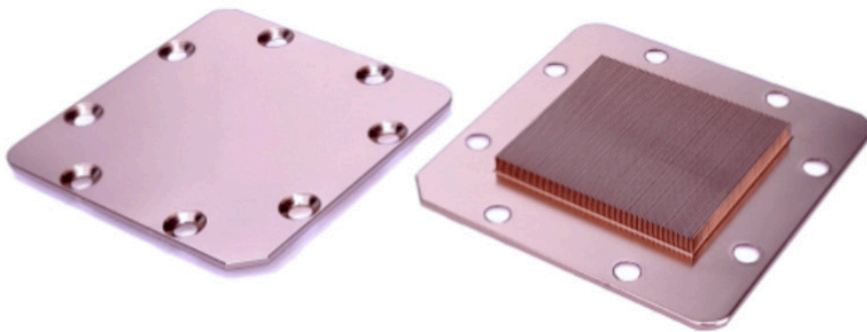
Dedicated skiving CNC machines

HEAT-SOL provides micro-fin design, precision machining and cooling performance evaluation.

A skiving specialist in precision thermal component manufacturing and dedicated equipment development.

HEAT-SOL MICRO-FIN COLD PLATE

PRODUCT PHOTOGRAPH



50-60 μm

Product fin thickness

Base and fins machined
from one piece of copper

A dense fin structure provides heat-transfer area in contact with the cooling fluid.

01 / STRUCTURE

Integral micro-fins

A continuous structure with
no separate fin-to-base joint

02 / GEOMETRY

Special fin designs

V-Y-Tree-Double Twist
Designed for air and coolant flow

03 / MANUFACTURING

Dedicated CNC

The HCT-200 machines fins
to the specified geometry

JAPAN IT WEEK 2026

Oct 21-23 · Makuhari Messe · 10:00-17:00

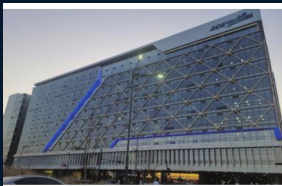
MATERIAL / GEOMETRY / THERMAL DESIGN / MANUFACTURING

COMPANY AT A GLANCE

HEAT-SOL Corp.

2020

Founded



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Certifications & designations

ISO 9001:2015

Quality management system

ISO 14001:2015

Environmental management system

Materials, components & equipment
specialist

Specialized root technology
enterprise

A Korean designation for core
manufacturing technologies

Research & development

Skiving processes & special fin
geometry

Dedicated equipment & process
improvement

SKIVING TOTAL SOLUTION

HEAT-SOL: A specialist in skiving technology.

With expertise in thermal design, HEAT-SOL develops and supplies skived thermal components and dedicated CNC machines. Design, machining, materials and tools are evaluated for each product's requirements.

Core business areas

01 Thermal design

DESIGN

We design fins and flow paths for the heat load, cooling method and available space, reviewing fin thickness, spacing and height, flow rate and pressure drop.

02 Thermal component manufacturing

PRODUCTS

We manufacture skived heatsinks and cold plates, machining copper and aluminum to customer drawings with micro-fins and special fin geometries.

03 Dedicated equipment development

EQUIPMENT

We develop and supply the HCT-200 CNC skiving machine. Controlled cutting angle, rotary position and feed rate enable a wide range of fin geometries.

04 Materials & tools

MATERIALS & TOOLS

We review material and tool specifications for each fin geometry and process, checking material properties and the machining limits of the tools and equipment.

Key milestones

2020

Company founded
PCS / ESS cooling modules

2021

In-house research institute
Special fin patent / PCT filings

2022

ISO 9001 certified
Expanded / relocated to
Cheongna

2023

Venture / Inno-Biz certified
Root technology designation

2024-25

TIPS selected / ISO 14001
certified
CNC prototype completed

2026

HCT-200 launched
Japan IT Week exhibition

Key registered
patents

4

Key registered
designs

6

Skiving technology &
product geometry development

PRODUCTS / THERMAL STRUCTURES

Skived thermal components matched to application requirements

HEAT-SOL designs and manufactures air-cooled heatsinks and internal cold-plate fins. Materials and fin structures are selected for the heat load, space and cooling fluid.

01 / MICRO-FIN COLD PLATE

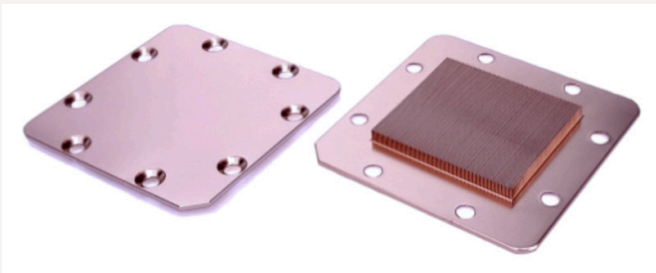
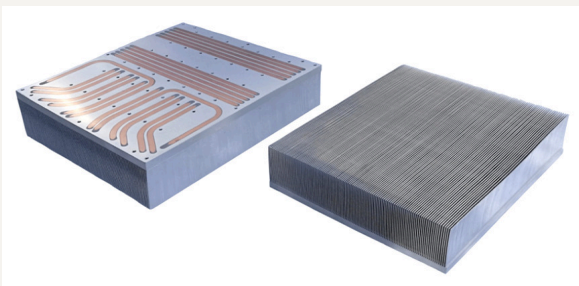
Micro-fin cold plates for high-power chips

50-60 μm

Product fin thickness

Micro-fins fit within the available footprint. Design evaluation covers fin thickness, pitch, height, flow rate and pressure drop.

Applications: CPU / GPU / high-density modules

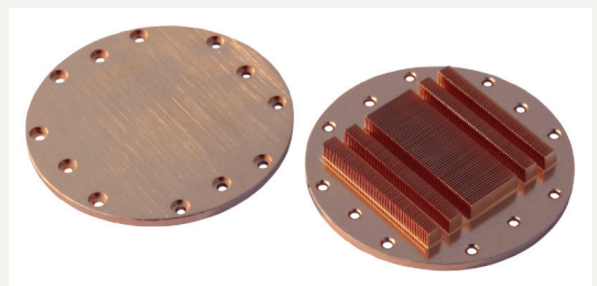


02 / SKIVING HEATSINK

Heatsinks with integral fins

One-piece construction with no joint between the fins and base. Fin height and pitch are designed together with airflow.

Applications: power electronics / inverters / air cooling



03 / CUSTOM GEOMETRY

Custom geometry for the available space

Round or rectangular forms, bases, mounting features and fins are designed to your drawings and space.

Design: overall shape / base / mounting / material

Product selection and design consultation

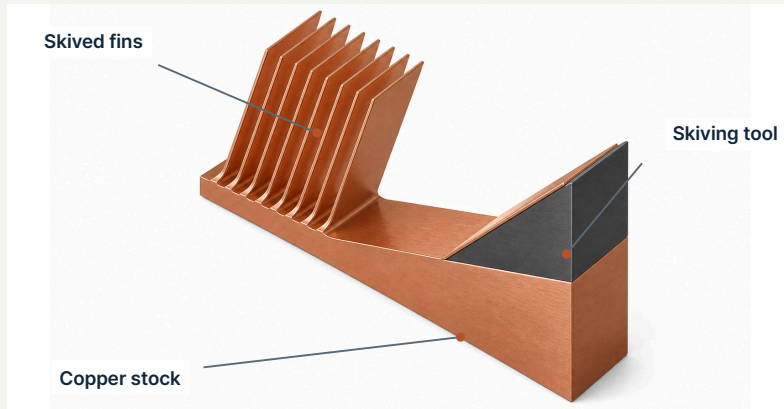
Consultation covers heat load, temperature limits, available space, cooling method, material and quantity. HEAT-SOL proposes a fin structure and manufacturing process suited to these requirements.

50-60 μm refers to product fin thickness, not pitch. Final specifications depend on the material and geometry.

TECHNOLOGY / SKIVING & PROCESSING RANGE

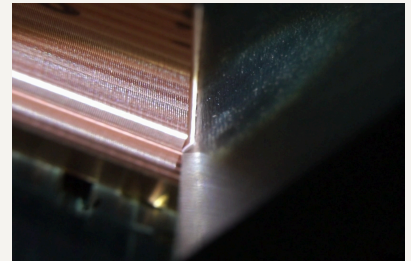
Integral fins formed by precision skiving

Skiving forms fins by cutting thin layers from the surface of metal stock. The base and fins are machined from a single piece of material.



Skiving principle / illustrative diagram

SKIVING OPERATION



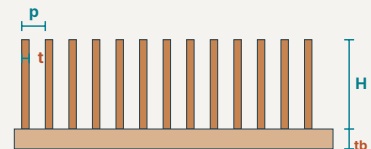
Skiving copper stock

A close-up of the contact area between the skiving tool and copper stock.

Skiving process & fin dimensions



Slice thin layers from the stock → lift each cut layer to form a fin → repeat at the specified settings → form an integral, dense heat-transfer surface



p: pitch / t: fin thickness / H: fin height / tb: base thickness

Machining ranges by material

Units: mm

Material	Range	Fin thickness T	T/P condition	Fin height h	Base thickness h1	Width A	Length L
Copper C1100	Min	0.04-0.3	0.57 Min 0.15 Max	1-10	Cu >3 Al >5 Thinner bases possible by milling	≤600	≤1200
	Avg	0.4-0.5	-	4-50			
	Max	0.6-0.8	0.57 Min 0.15 Max	1-50			
Aluminum AL1060	Min	0.3	0.57 Min 0.15 Max	1-10		25-600	
	Avg	0.4-1.0	-	4-130			
	Max	1.0-1.8	0.57 Min 0.15 Max	1-130 Overall height 150			

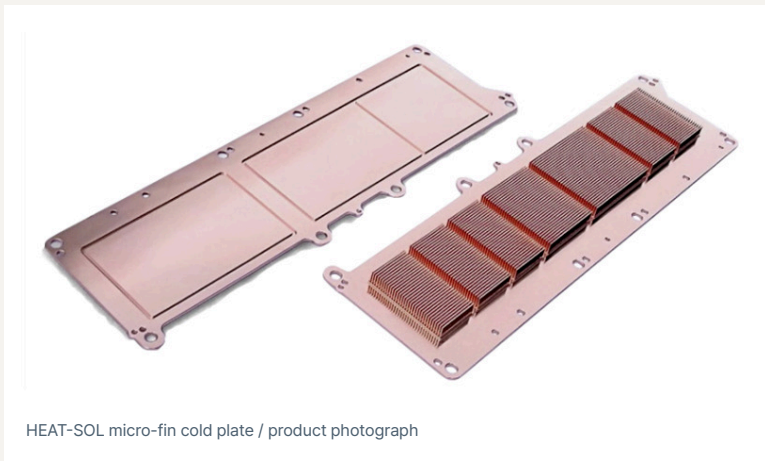
T fin thickness / P fin pitch / h fin height / h1 base thickness / A machining width / L machining length

The listed maximum values cannot all be achieved simultaneously. Final machining ranges are agreed after reviewing material, geometry, tools and quantity.

COLD PLATE / APPLICATION ENGINEERING

Cold plate design and manufacture tailored to equipment requirements

Cold plates are designed and manufactured for the chip contact surface, mounting points and available space. Fin geometry and coolant flow paths are evaluated together with flow rate and pressure drop.



HEAT-SOL micro-fin cold plate / product photograph

DESIGN VARIABLES

01 / FINS & FLOW PATHS

Fin thickness / pitch / height
Flow rate / pressure drop / heat transfer

02 / BASE & MOUNTING

Chip contact surface / flatness
Mounting points / available space

03 / JOINTS & CONNECTIONS

Ports / hoses / cooling fluid
Joining method / service clearance

Joining processes are selected for the geometry and cooling conditions.

Pipe press-fitting

Brazing

Friction stir welding (FSW)

01

Specification review

We review heat load and temperature limits, drawings, coolant, flow and pressure, and agree the product requirements.

02

Prototype fabrication

We review fins, flow paths and mounting, then fabricate test specimens using suitable materials, machining and joining processes.

03

Performance testing

Temperature, flow and pressure data guide design refinement and assessment of suitability for volume production.

Japan IT Week product showcase

The exhibit includes an HCT-200-machined micro-fin cold plate and a workstation fitted with the cold plate, demonstrating component structure, mounting and coolant piping.

COLD PLATE / SPECIAL FIN / VALIDATION / HCT-200

HCT-200 / DEDICATED SKIVING CNC

Precision CNC skiving machine HCT-200

The HCT-200 CNC skiving machine controls cutting angle, rotary position and feed rate. Straight and special fins are machined to the specified thickness, pitch and height.

MICRO-FIN / X · Z · C AXES

40 μm

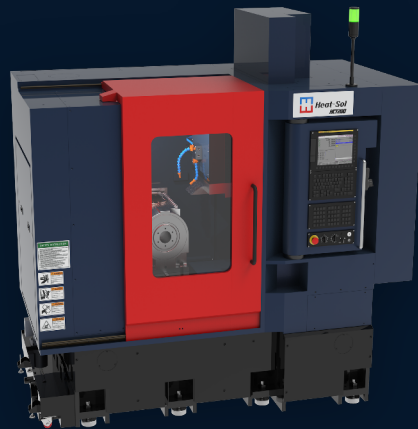
Minimum machined fin thickness

3 axes

X / Z / C axis configuration

FANUC Oi-MF controller

Linear feed / C-axis rotary control



HEAT-SOL HCT-200

HCT-200 key specifications

Item	Specification
Minimum machined fin thickness	40 μm
Controller / axes	FANUC Oi-MF / X-Z-C
X / Z axis travel	430 / 420 mm
Maximum feed rate	5,000 mm/min
C-axis rotation / max. rotary speed	360° / 1,000°/min

The HCT-200 has a minimum fin thickness specification of 40 μm . Applicability is confirmed for the material, geometry and process conditions.

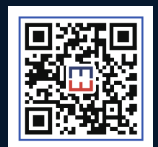
Item	Specification
Maximum stock dimensions	400 × 190 mm
Maximum knife size	400 mm
Overall dimensions (W×D×H)	2,255 × 1,230 × 2,245 mm
Machine weight	4,450 kg
Power supply / rated capacity	3-phase AC 220 V / 28.6 kVA

TECHNICAL CONSULTATION

Skiving process and equipment consultation

Fin thickness / pitch / height / machining range / quantity / inspection criteria / delivery schedule

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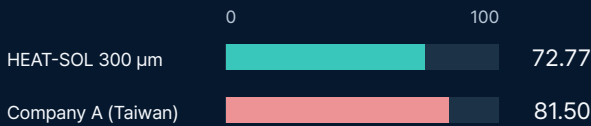
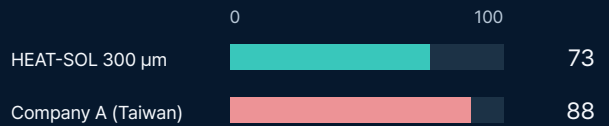
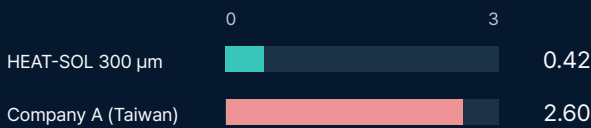
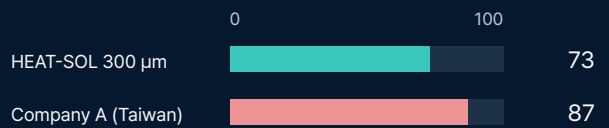


VALIDATION / TWO-PHASE IMMERSION

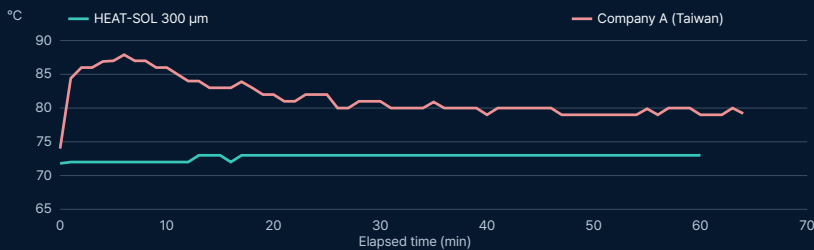
Two-phase immersion cooling

Two samples under identical conditions

In this test, the HEAT-SOL 300 μm sample was **8.73°C** lower on average and **15°C** lower at peak than Company A (Taiwan).

Mean temperature (°C)

Peak temperature (°C)

Temperature standard deviation σ (°C)

P95 temperature (°C)


First minute excluded; GPU utilization at 100%. P95 is the temperature at or below which 95% of readings fall.

GPU temperature over time


Values are approximate readings from the source graph. Unreadable intervals are not plotted.

Steady-state temperature measurements

Sample	Reading count	Minimum (°C)	Median (°C)
HEAT-SOL 300 μm	61	72	73
Company A (Taiwan)	64	79	80

Same test rig, low-boiling-point dielectric fluid and ambient conditions / two-phase immersion / single GPU at 100% load / approx. 60–65 min

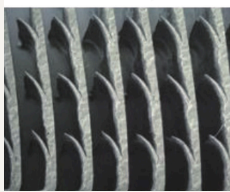
TEST PHOTOGRAPH / TWO-PHASE IMMERSION


GPU cold-plate immersion-cooling test photograph

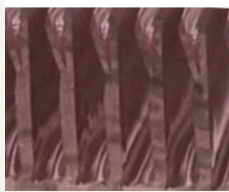
SPECIAL FIN / FLOW & BOILING SURFACES

Fin geometry, fluid flow and cooling performance

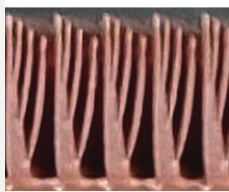
Controlled cutting angles and rotary positions produce a range of fin geometries.
Fin structures are designed for air and coolant flow and bubble behavior during boiling.



V-Fin
Forced convection



Y-Fin
Natural convection



Tree-Fin
Liquid cooling

Branched fin structures control surface area and fluid flow characteristics.
Fin geometry is selected for the cooling fluid, flow rate and installation orientation.

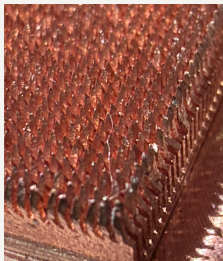
SIMULATION / EV INVERTER

Relative cooling performance

Geometry	Relative index
Pin-Fin	100.0
V-Fin	106.8
Y-Fin	106.4
Tree-Fin	107.4

EV inverter liquid-cooling simulation results.
Normalized to Pin-Fin = 100; results apply to these simulation conditions only.

DOUBLE TWIST FIN / BOILING TEST



Double Twist Fin
For boiling heat transfer



S1
Dense fin array



S10
Giant Bubble

Photographs from the technical study at the same heat flux (approx. 50 W/cm²), showing instantaneous bubble behavior.

Bubble departure with the S10 structure

195 W/cm²

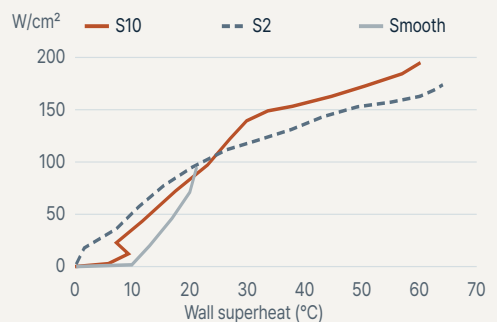
S10 critical heat flux (CHF)
vs. S2: **12.1% increase**

Fin structures are designed to allow coolant replenishment after bubble departure.

Fin geometry & boiling test results

Sample ID	Fin width W (mm)	Pitch P (mm)	Fin count	Fin side area (mm ²)	Total area (mm ²)	Superheat (°C)	CHF (W/cm ²)
S1	0.05	0.1	100	4,000	4,100	46.2	156.7
S2	0.05	0.15	66	2,640	2,740	64.1	173.9
S4	0.1	0.15	66	2,640	2,740	39.1	141.5
S9	0.3	0.45	22	880	980	44.1	160.3
S10 Double Fin	0.3	0.45	22	—	—	60.2	195.0
Smooth Flat surface	—	—	—	—	—	21.2	95.2

Selected boiling curves



Tests used 10 × 10 mm specimens; superheat was measured at each specimen's CHF. S10 uses the same fin width and pitch as S9 with a Double Fin structure; its area was not calculated separately. In this test, CHF increased from 160.3 to 195.0 W/cm². Fin count alone does not determine boiling performance.