COFAN THERMAL
Trusted Thermal Management Partner Since 1994

Bonded Fin Heatsink – High-Performance Thermal Management Solutions

Cofan Thermal's **Bonded Fin Heatsinks** deliver exceptional thermal performance across a wide range of applications, from consumer electronics such as laptops and gaming consoles to industrial machinery, medical devices, telecommunications systems, and military hardware.
In all these scenarios, **precise thermal management** is essential to maintain optimal operating temperatures, prevent overheating, and extend the operational life of components.

Why Choose Cofan's Bonded Fin Heatsinks?

Our heatsinks are **custom-engineered** to meet the specific thermal requirements of both small-scale and large-scale applications. This adaptability ensures efficient heat dissipation regardless of device size, power level, or complexity of the thermal challenge.

In addition, **Bonded Fin Heatsinks can be seamlessly integrated** with other advanced cooling technologies to further improve efficiency:

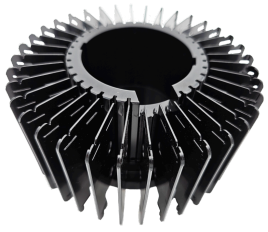
- **Vapor Chambers** help distribute heat evenly across the heatsink surface.
- **Heat Pipes** transfer heat efficiently from hotspots to cooler areas.
- **Liquid Cooling Heat Exchangers** provide additional capacity for extremely high-power applications.

Product Information

- Process: Extrusion
- Material: Copper
- Application: Thermal Management
- Finish: Nickel Plating
- Part No: 70-46-90043

Product Information

- Process: CNC, NCT
- Material: Aluminum
- Application: Lighting Fixture
- Finish: Electrophoresis Grey
- Part No: 70-46-90023



Product Information

- Process: CNC, NCT
- Material: Aluminum
- Application: Thermal Management
- Finish: Nickel Plating
- Part No: 70-16-90042

Thermal Pad / Grease

MCPCBs

Technology Description

Bonded Fin Heatsinks are constructed by joining individual heat-radiating fins to a thermally conductive base plate. Unlike extruded heatsinks—where fins and base are a single piece—Bonded Fin designs allow **thinner, more densely packed fins** for a larger surface area, resulting in **improved thermal performance**.

Advantages Over Extruded Designs

- **Higher Fin Aspect Ratios**: Over 50:1 achievable for maximum surface area.
- **Design Flexibility**: Custom shapes, sizes, and materials for unique thermal and spatial requirements.
- **Material Options**: Mix-and-match aluminum (lightweight, high conductivity) or copper (superior heat spreading).
- **Variable Fin Density & Thickness**: Optimize airflow, minimize pressure drop, and match cooling method (natural or forced convection).
- **Selective Fin Placement**: Leave open zones for hardware clearance without machining.
- **Custom Airflow Paths**: Fin arrangement or airflow deflectors to guide cooling where needed.
- **Large-Format Capability**: Manufacture up to 60” x 40” (1500mm x 1000mm).
- **Hybrid Cooling Ready**: Easily integrate fans, blowers, vapor chambers, or heat pipes.
- **Rapid Prototyping**: No hard tooling required for small batches or concept validation.

Manufacturing Process

1. Material Selection

- **Base Material**: Typically aluminum or copper, chosen based on thermal spreading needs. Can integrate vapor chambers or heat pipes for higher conductivity.
- **Fin Material**: Often the same as the base to ensure thermal compatibility, but may vary for performance or cost optimization. CFD (Computational Fluid Dynamics) analysis helps determine optimal thickness, spacing, and airflow efficiency.

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2. Base Preparation

The base is created with multiple grooves to secure the fins, achieved via:

- **Extrusion**: Efficient for high-volume runs; grooves are formed during the extrusion process.
- **CNC Machining**: Flexible and cost-effective for prototyping or low-volume production.

Extrusion offers lower per-unit cost for mass production, while **machining** offers precision and flexibility for complex designs.

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3. Fin Preparation

Cooling fins are cut and formed from metal sheets. Manufacturing methods include stamping, extrusion, or machining, allowing for:

- **Flow-through Ventilation**
- **Airflow Turbulators or Disrupters** for enhanced convection
- **Serrated Fins** for increased surface area

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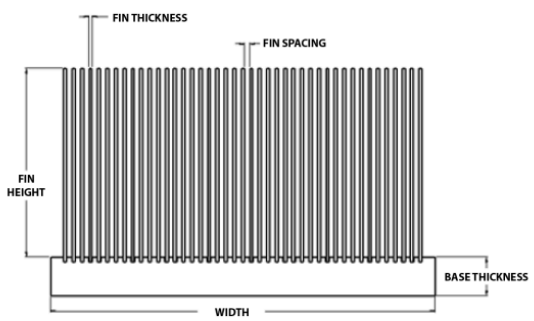
4. Assembly & Bonding

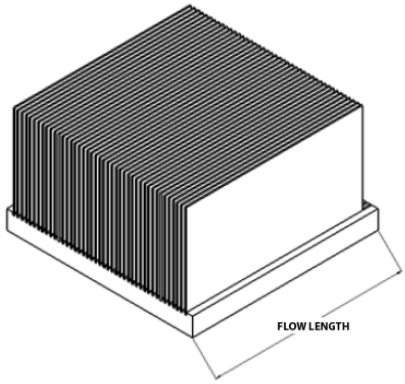
Fins are inserted into the grooves (grooved bases) or positioned on a flat base. Bonding techniques include:

- **Soldering**: Creates a strong, thermally conductive joint; ideal for high thermal performance.
- **Brazing**: Higher temperature metal-to-metal bonding; provides maximum conductivity.
- **Epoxy Bonding**: Thermally conductive adhesives; cost-effective for complex shapes or temperature-sensitive materials.

Figure 1

Figure 2





Advanced Thermal Integration

Bonded Fin Heatsinks can be combined with:

- **Vapor Chambers** – Spreads heat evenly, improving thermal uniformity.
- **Heat Pipes** – Transfers heat from hotspots to cooler areas.
- **Liquid Cooling** – Adds cooling capacity for extreme heat loads.

Typical Applications

- Consumer electronics (laptops, gaming consoles)
- Industrial control systems
- Medical imaging devices
- Telecom base stations
- Military-grade radar and avionics systems

Bonded-Fin Capabilities Chart

Feature	Inches				Metric (mm)				Notes
	Minimum		Maximum		Minimum		Maximum		
Base Construction	Extruded	Machined	Extruded	Machined	Extruded	Machined	Extruded	Machined	
Width	1.00	1.00	19.00	60.00	25.40	25.40	482.60	1524.00	Maximum machined width currently limited by existing equipment
Flow Length	0.25	0.50	48.00	48.00	6.40	12.70	1219.20	1219.20	Flow lengths shown are practical limits. Above 48" additional design engineering require
Fin Height	0.02	0.02	6.00	6.00	0.50	0.50	152.40	152.40	Maximum height shown is practical limit. Talle heights are capable. After this height fin efficiency dec
Fin Thickness	0.02	0.02	0.13	0.13	0.50	0.50	3.20	3.20	Machined bases can accommodate thicker fins but shown is practical limit.
Fin Spacing	0.05	0.05	1.00	1.00	1.30	1.30	25.40	25.40	There is no maximum limit on fin spacing. Shown is a practical limit.
Base Thickness	0.15	0.15	1.50	3.00	3.80	3.80	38.10	76.20	Extruded maximum is limited by weight/foot prop machined based thickness has no pracical limi

Options

Fin Material	Aluminum alloy : 1060, 6061, 6063
	Copper alloy : C110

Base Material	Aluminum alloy : 1060, 6061, 6063
	Copper alloy : C110

Fin / Base Bonding Methods	Thermally Conductive Epoxy

	Soldering
	Crimping
	Brazing

Enhanced Thermal Management Options	DC or AC Fans and Blowers
	Heat Pipes
	Vapor Chambers
	Thermal Interface Materials
	Liquid Cooling Channels

Design Options	Mounting Flanges or Brackets
	Ducting Shrouds

Contract Manufacturing Services	Electromechanical Assembly

Finishing	Chem Film
	Anodize
	Ni Plate
	Paint
	Powder Coating

Frequently Asked Questions (FAQ)

Q1: How do Bonded Fin Heatsinks differ from Extruded Fin models?

A: Bonded Fin allows higher fin density and more surface area, improving cooling performance. Extruded designs are limited by extrusion die constraints.

Q2: What materials are available?

A: Aluminum for lightweight, cost-effective designs; copper for superior thermal conductivity. Mixed-material designs are also possible.

Q3: Can they be customized for unusual form factors?

A: Yes. Fin placement, thickness, density, and airflow direction can all be tailored to your specific thermal and spatial constraints.