

Advanced Heat Spreaders

VAPOR CHAMBERS

High-Performance Heat Spreaders for Advanced Electronics



WHAT ARE VAPOR CHAMBERS?

A vapor chamber is a planar heat pipe, designed to spread heat in two dimensions. In particular, it is used in high heat flux applications or whenever two-dimensional thermal spreading is required. Thanks to this technology, higher-performance CPUs, GPUs, and LEDs – especially those with a higher TDP or in an overclocked state – **can be efficiently and effectively cooled to safe operating temperatures.**

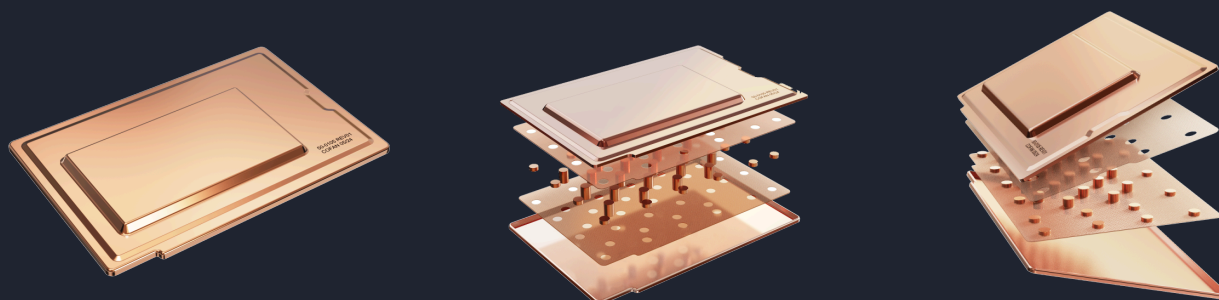
Consequently, this helps extend both component and overall product lifespan. As illustrated in the diagram, the vapor chamber incorporates a wicked structure filled with coolant. When exposed to heat, the coolant undergoes a phase change from liquid to gas and back again. Through this process, heat is transferred quickly and uniformly across the surface.

Benefits

- Elimination of hot spot
- Better fin efficiency and equilibrium temperature

Dimensions

- Size: 350mm x 350mm
- Thickness: 0.5mm - 5.0mm
- Shape: Base on stamping and bending limitation



Vapor Chamber Technology: What It Is and How It Works

Cofan's vapor chamber is an advanced type of heat spreader, specifically engineered for use in **electronics and other thermal management applications**. To begin with, it is designed to efficiently transfer heat away from its source. Then, it distributes that heat across a larger surface area for more effective dissipation. As a result, it enables improved temperature control in high-performance environments. Therefore, it plays a crucial role in **maintaining optimal operating temperatures**. This is particularly important in systems that demand compactness, reliability, and, most importantly, consistent thermal performance.

Structure and Design

Structurally speaking, a vapor chamber consists of a sealed, vacuum-tight enclosure—most commonly made from copper due to its excellent thermal conductivity. Inside this enclosure, **a porous wick structure lines the inner walls, which allows for efficient fluid transport**. Moreover, a small amount of working fluid—typically water—is introduced into the chamber. Since the interior is under vacuum, this liquid is able to vaporize at much lower temperatures. As a result, the system achieves enhanced thermal responsiveness.

Key Benefits of Cofan Vapor Chambers

Cofan's thermal solutions offer numerous advantages over traditional thermal solutions. First and foremost, they provide **exceptionally high thermal conductivity**, thanks to the efficiency of the liquid-vapor phase-change cycle. In contrast to solid metal conductors like copper or aluminum, they spread heat more uniformly across a surface. As a result, they effectively minimize thermal hotspots and help maintain consistent device temperatures.

Moreover, their thin and lightweight construction makes them ideal for compact designs where space is limited. Even so, they deliver excellent thermal performance, **helping to improve both the longevity and reliability of sensitive electronic components.**

How It Works

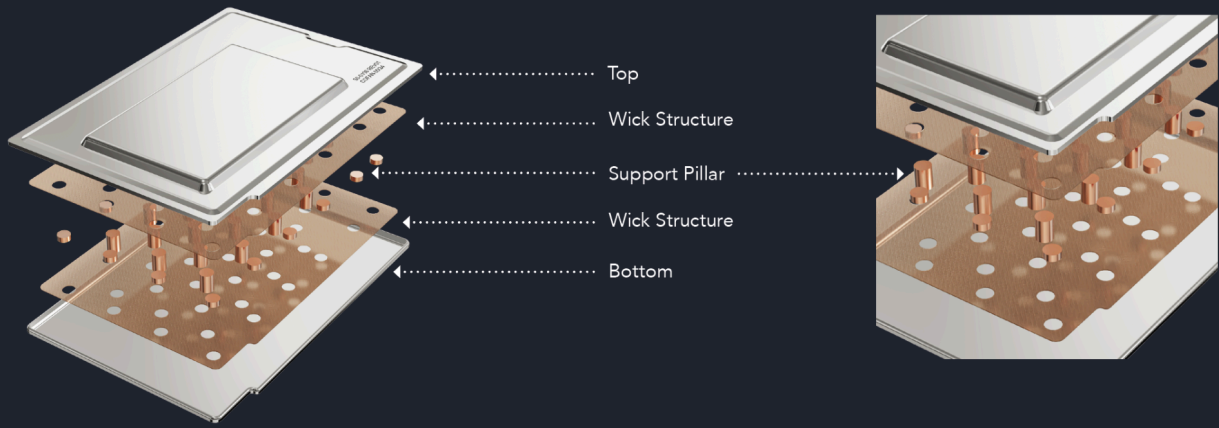
This technology operates through a continuous, passive phase-change cycle. To begin with, **heat is applied to one area of the chamber, causing the nearby working fluid to absorb energy and evaporate**. Subsequently, the resulting vapor moves toward cooler regions inside the chamber. Upon reaching these cooler zones, it condenses back into liquid form, releasing the stored heat in the process. Following that, **the wick structure transports the liquid back to the heated area via capillary action, thus completing the cycle**. Overall, this loop repeats constantly, ensuring consistent and efficient thermal regulation—all without any moving parts.

Common Applications

Cofan's vapor chambers are used across a variety of industries because of their versatility and high-performance capabilities. In the realm of consumer electronics, **they are integrated into CPUs, GPUs, and chipsets in order to prevent overheating and maintain system stability**. Meanwhile, in aerospace applications, they manage onboard thermal loads in avionics and spacecraft systems, where both precision and reliability are critical. Additionally, vapor chambers are widely adopted in LED lighting systems to dissipate heat from high-power LEDs, thereby ensuring better performance as well as a longer lifespan.

In summary, Cofan's vapor chambers serve as a **trusted solution for applications that demand compactness, consistent performance, and, most importantly, superior thermal efficiency.**

VAPOR CHAMBER STRUCTURE



Vapor Chamber's Structure

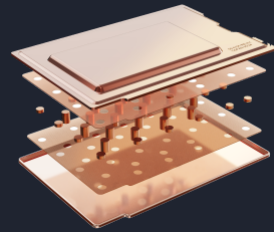
A vapor chamber is a highly efficient heat spreader used in various thermal management applications. At its core, its structure is designed to utilize the principles of phase change and capillary action in order to effectively spread and dissipate heat across its surface.

VAPOR CHAMBER OPERATION

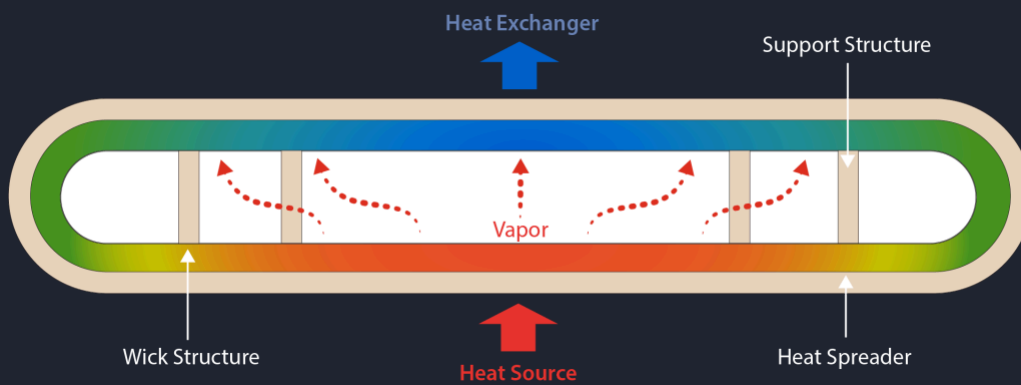
Vapor chambers operate through repeated heat cycles that continuously regulate temperature. To put it simply, they function similarly to planar heat pipes. Because of this, **they are especially well-suited for thin, high-performance systems where space is limited and efficient cooling is essential.**

Thanks to the continuous phase-change cycle, temperature remains stable and consistent throughout operation. Inside the chamber, **the wick structure plays a critical role by effectively facilitating fluid movement.** As a result, vaporization, condensation, and liquid return take place in a seamless, ongoing loop. In turn, this ensures reliable thermal regulation without relying on bulky or heavy cooling hardware.

Moreover, the elimination of large cooling components supports more compact and lightweight system designs. Ultimately, vapor chambers enable engineers to create **efficient, high-performance products** that meet the demands of today's space-constrained and thermally intense applications.



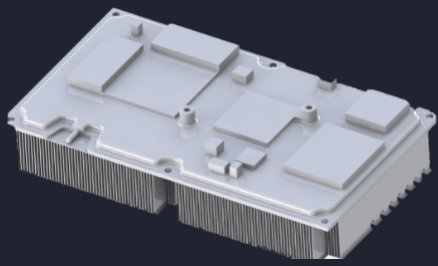
VAPOR CHAMBER INTRODUCTION



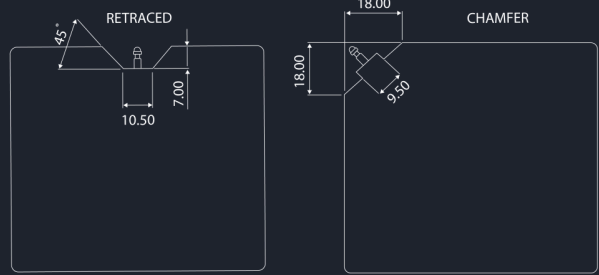
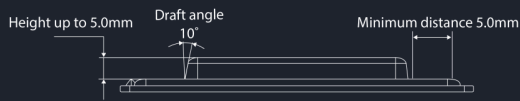
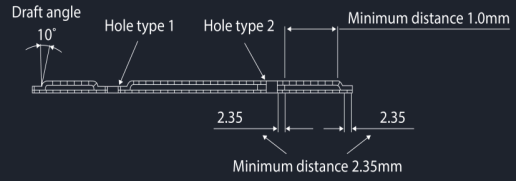
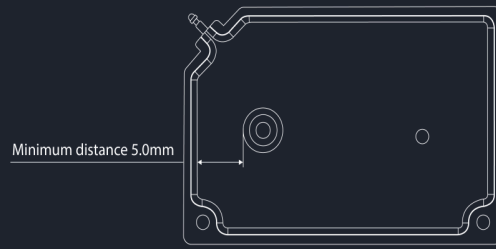
Vapor Chamber's Structure

- Two-phase flow heat transfer
- Heat turns working fluid from liquid to vapor which travel to heat exchanger side
- Heat exchanger cooling down vapor back to liquid and return back to heat source side by capillary action
- Suitable for high power density heat source

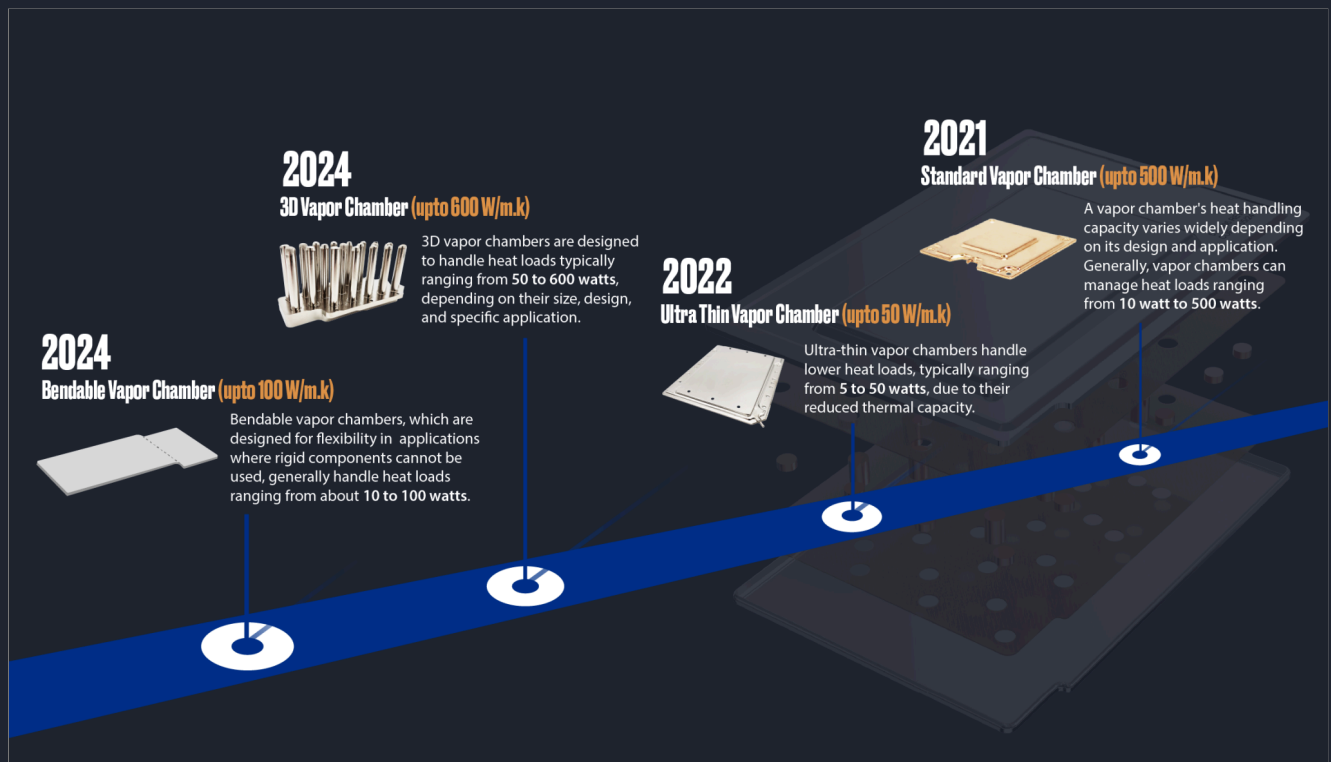
DESIGN CONSIDERATION



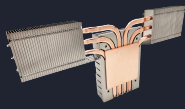
We offer **bespoke vapor chamber designs**, ensuring **quick turnaround times** at every stage—from prototyping to full-scale production. In every phase, our team is dedicated to delivering high-quality solutions tailored to suit specific application needs. From initial concept to final product realization, we provide support that is both responsive and detail-focused. As a result, our customers receive thermal solutions that are **optimized, efficient, and ready for real-world deployment**.



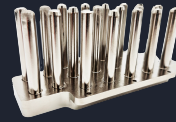
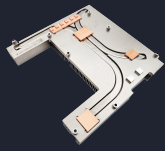
COFAN TECHNOLOGY ROADMAP



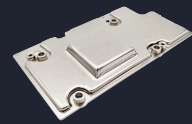
HEAT PIPE VS VAPOR CHAMBER



Heat Pipes



Vapor Chambers

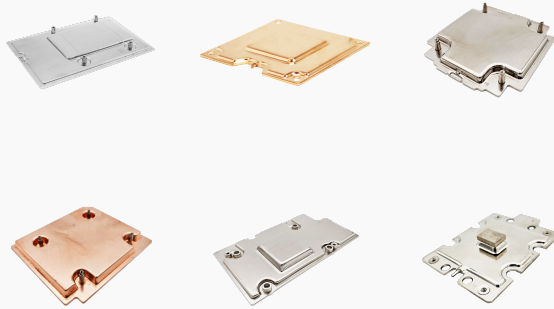


Heat Pipes		Vapor Chamber
Two Phase Flow - Linear Heat Transfer	Heat Transfer Theory	Two Phase Flow 2-D and 3-D Heat Transfer
1-D Heat Distribution	Heat Flow	2-D and 3-D Heat Distribution
Heat Spreading (PC, Military, Aerospace, 5G/6G, LED, Projector, Graphic, New Energy)	Application	Heat Spreading (PC, Military, Aerospace, 5G/6G, LED, Projector, Graphic, New Energy)
Good for Multi Heat Sources on Different Surface, Complicated Structure and Anti-gravity	Advantage	Good for Higher Power Density, Thin and Large Area Solution
D12>100W, D10>80W, D6>40W, D5>20W, D4>18W, D3>12W, D2>8W	Qmax	300*300*3(MM) >2000W, 200*200*3(MM) >800W, 100*100*3(MM) > 600W, 80*80*3(MM) >400W, 60*60*3(MM) >200W
T0.5 (20%), T0.6-1.2 (16%), T1.3-2.5 (13%), T2.5 (10%)	Performance after bending(90°)	T6 (10%), T6-T3 (20%), T3 (25%)
Tube Flattened or Bent	Shape	Complex Shape
Base Plate or Flattened / Machined	Mount with Heat Source	Direct Contact
Small Contact Area	Contact with Heat Source	Large Contact Area
Low Cost	Cost	High Cost

VAPOR CHAMBER TYPE

Standard

Two-piece vapor chambers feature separate evaporator and condenser sections, allowing flexible layouts and customization for specific cooling needs. They offer easy integration into various devices. One-piece vapor chambers are cost-effective, mass-produced cooling solutions, offer reliable heat dissipation for budget-friendly consumer electronics.



Ultra Thin

Ultra-thin vapor chambers, less than 1mm thick, are perfect for tight spaces, providing efficient heat transfer and high thermal conductivity in compact devices.



3D Type

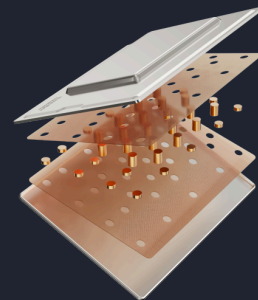
3D vapor chambers have complex structures that boost heat dissipation, making them ideal for high-power electronics and gaming systems.

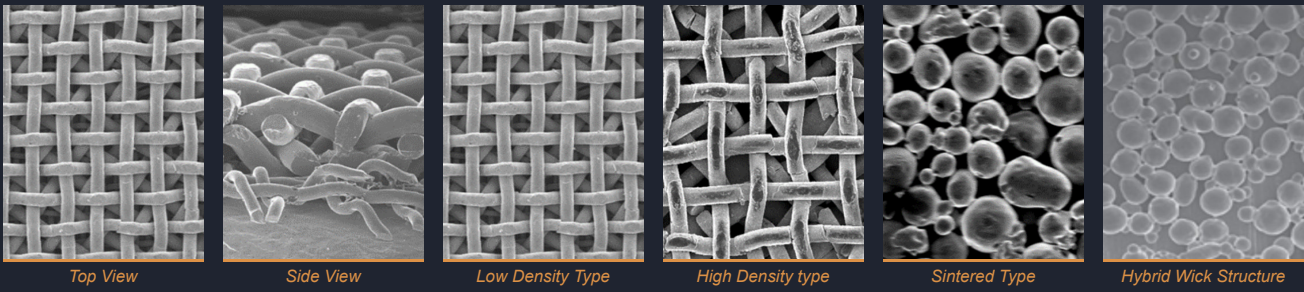


WICK STRUCTURE

Cofan's wick structure inside a vapor chamber is a crucial component that facilitates effective heat transfer. Essentially, it functions as a flat, planar heat spreader that operates on the principles of phase change, much like traditional heat pipes. Because of this, the wick structure plays a significant role in the chamber's performance.

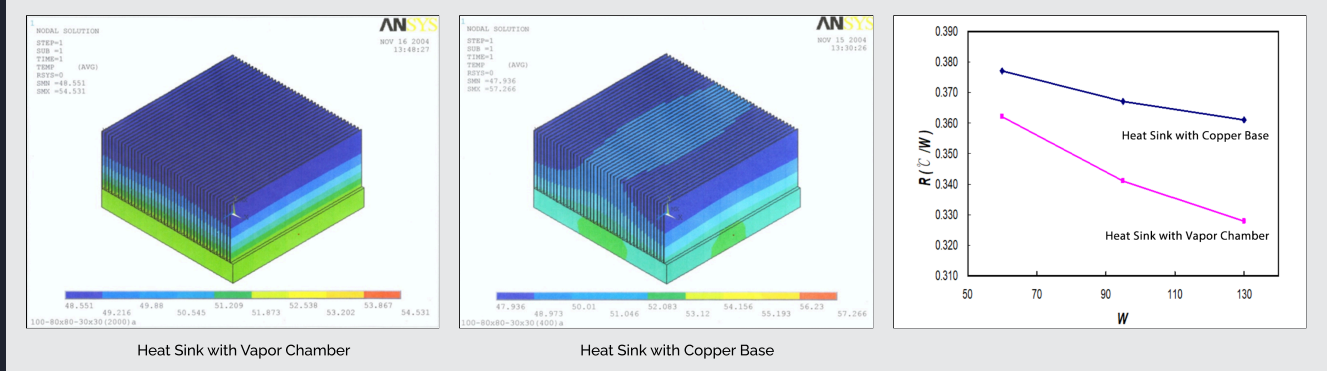
Typically, the wick is made from porous materials such as sintered metal powders, metal meshes, or grooves etched into the chamber walls. This design enables capillary action, which evenly distributes the working fluid—usually water—across the entire surface area of the vapor chamber. As a result, the system maintains consistent thermal regulation even under varying load conditions.





PERFORMANCE COMPARISON

A heatsink with a vapor chamber typically outperforms a traditional copper heatsink, particularly in applications that demand efficient heat spreading, reduced hotspots, and compact design. As a result, it provides **better cooling efficiency** for high-power electronics. However, this performance often comes at a higher cost compared to standard copper heatsinks.

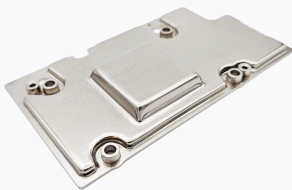


VAPOR CHAMBERS IN INDUSTRIES

GPU/CPU

Vapor chambers efficiently spread heat across GPUs, significantly enhance heat dissipation to prevent thermal throttling, and improve device longevity and reliability by maintaining consistently lower operating temperatures.

- Process: Forming, Welding, Annealing
- Material: Aluminum
- Finish: Nickel Plating
- Part No : 91.04.90021



GPU/CPU

Vapor chambers efficiently spread heat across GPUs, significantly enhance heat dissipation to prevent thermal throttling, and improve device longevity and reliability by maintaining consistently lower operating temperatures.

- Process: Forming, Welding, Annealing
- Material: Aluminum
- Finish: Nickel Plating
- Part No : 91.04.90035



Medical

Vapor chambers efficiently manage heat in medical devices like MRI machines, CT scanners, and portable monitors. They offer uniform heat distribution, compact size, reliability, and quiet operation, thereby enhancing device performance and safety.

- Process: Forming, Welding, Annealing
- Material: Aluminum
- Finish: Nickel Plating
- Part No : 91.04.90268



Server

3D vapor chambers ensure CPUs and components stay cool, enable higher server performance without overheating, and improve energy efficiency by reducing cooling needs.

- Process: Forming, Welding
- Material: Aluminum
- Finish: Clear Anodizing
- Part No : 91.04.90067

Server

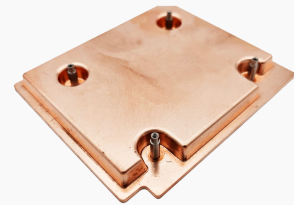
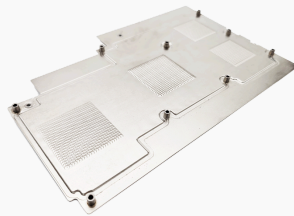
Vapor chambers ensure CPUs and components stay cool, enable higher server performance without overheating, and improve energy efficiency by reducing cooling needs.

- Process: Welding, Annealing
- Material: Aluminum
- Finish: Anodizing
- Part No : 91.04.90354

Server

Vapor chambers ensure CPUs and components stay cool, enable higher server performance without overheating, and improve energy efficiency by reducing cooling needs.

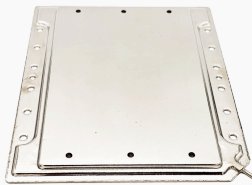
- Process: Forming, Welding, Annealing
- Material: Copper
- Finish: Anti Oxidant
- Part No : 91.04.90521



Automotive

Vapor chambers in automobiles enhance EV battery performance, prevent LED overheating, ensure reliable power electronics, and maintain optimal temperatures for infotainment systems, ECUs, and autonomous vehicle sensors.

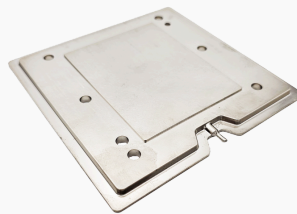
- Process: Forming, Welding, Annealing
- Material: Aluminum
- Finish: Nickel Plating
- Part No : 91.04.90213



Automotive

Vapor chambers in automobiles enhance EV battery performance, prevent LED overheating, ensure reliable power electronics, and maintain optimal temperatures for infotainment systems, ECUs, and autonomous vehicle sensors.

- Process: Forming, Welding, Annealing
- Material: Aluminum
- Finish: Nickel Plating
- Part No : 91.04.90057



Laptop

Vapor chambers manage heat from light sources and internal components, effectively prevent overheating and image distortion, and ensure consistent performance and reliability during prolonged and intensive use.

- Process: Forming, Welding, Annealing
- Material: Aluminum
- Finish: Nickel Plating
- Part No : 91.04.90298



Military

Vapor chambers ensure thermal stability in extreme conditions, enhance durability and performance of critical devices, and reduce the risk of overheating and equipment failure.

- Process: Forming, Welding, Annealing
- Material: Copper
- Finish: Anti Oxidant
- Part No : 91.04.90687



Military

Vapor chambers ensure thermal stability in extreme conditions, enhance durability and performance of critical devices, and reduce the risk of overheating and equipment failure.

- Process: Forming, Welding, Annealing
- Material: Copper
- Finish: Anti Oxidant
- Part No : 91.04.90105



Projector

Vapor chambers evenly distribute heat, prevent hot spots, and enable thinner, lighter designs without compromising cooling. They also improve battery life and performance by maintaining optimal CPU and GPU temperatures.

- Process: Forming, Welding, Annealing
- Material: Aluminum
- Finish: Nickel Plating
- Part No : 91.04.90205

