Thermal Management

Year on year, personal computers are required to be of smaller size and have higher processing speeds. This has made the application of traditional cooling methods such as aluminium heat sinks and/or forced fan cooling systems incompatible with the smaller areas available to house them.

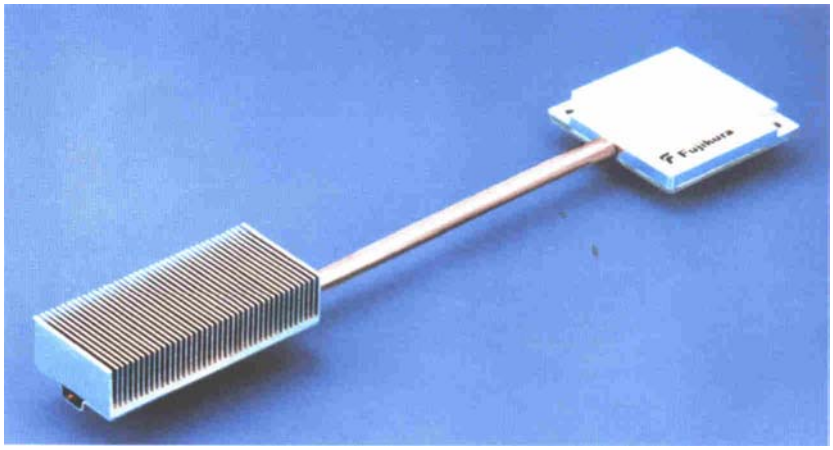
Fujikura's micro heat pipe is one of the best solutions available today to serve the needs of the electronics and computer industries. Fujikura's micro heat pipe offers superior thermal conductivity, excellent heat transfer characteristics, top heat mode operation, lightweight construction and freedom of design.

Applications:

Thermal solutions for desktop, tower & notebook computers are available where constraints restrict the design of conventional cooling methods (e.g. aluminium heat sinks, forced fan cooling)

Design requirements:

- Sketch of heat pipe shape
- Cooling section: space available for heat pipe fins and heat sink, air flow velocity
- Heating section: component heat load (temp.), desired operating temperatures of components
- Heat transfer, size of input area & output area
- Orientation

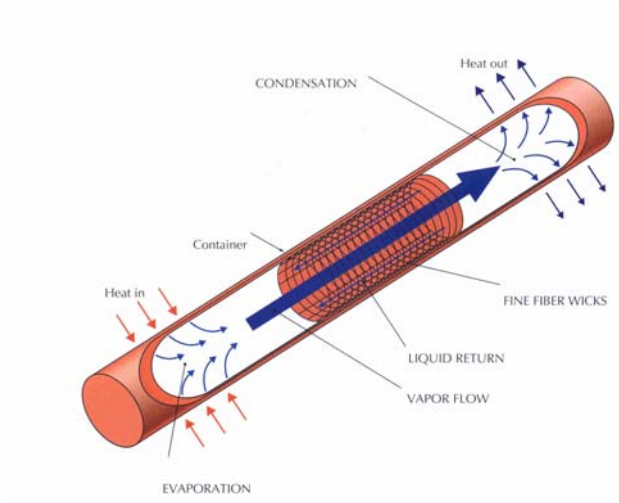


Heat pipes and heat sinks are widely used within electronic & telecommunications equipment and other cooling/heating devices.

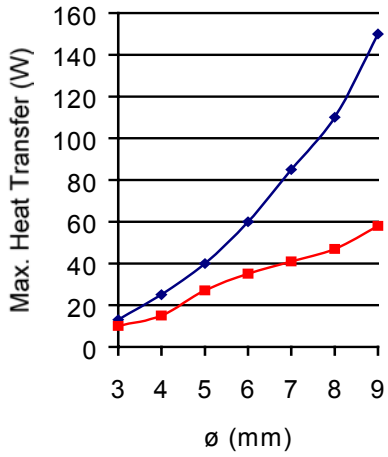
Fujikura's heat pipes and heat sinks offer compact, high performance, maintenance-free thermal management that requires no additional power input.

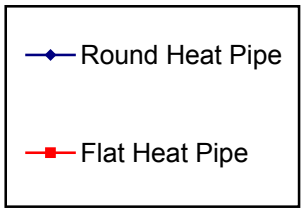
Heat Pipe Heat Sink

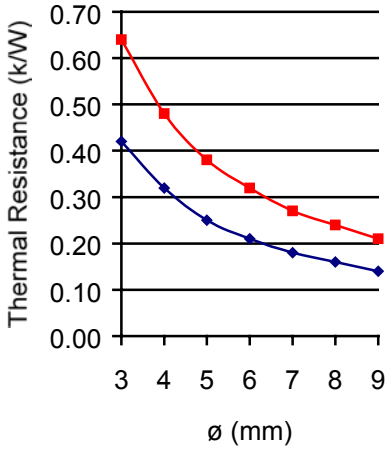
Heat Pipe



Heat pipes utilise the exchange of latent heat when a medium contained within a sealed pipe evaporates and condenses. Fujikura's heat pipe has a high heat transfer rate and is able to operate in top heat mode due to its patented fine fibre wick construction. By utilising fine fibre wicks, Fujikura's heat pipe has a high capillary force, high permeability, flow separator (preventing entrainment, reducing frictional loss at the liquid and vapour interfaces) and flexibility to bending & pressing.





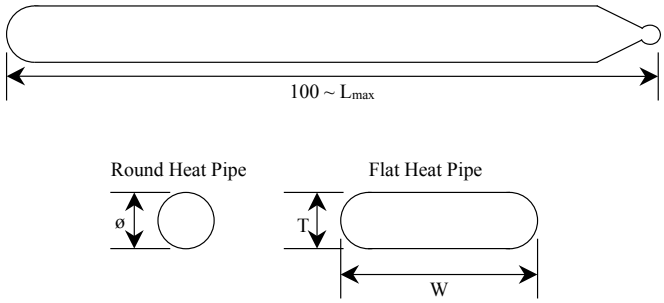


Maximum Heat Transfer Rate

Thermal Resistance

- Superior Thermal Conductivity — 80 times greater than that of an equivalent copper bar
- Temperature Uniformity — ±0.5°C
- Excellent Heat Transfer — vapour transfer at sonic speed
- Top Heat Mode — highly efficient top-down transference achieved by excellent capillary action
- Compact & Lightweight — easily bent, pressed and assembled to aluminium plates, blocks, fins, etc.
- Maintenance Free — no moving parts to wear out
- No Power Supply Required

Standard Heat Pipe

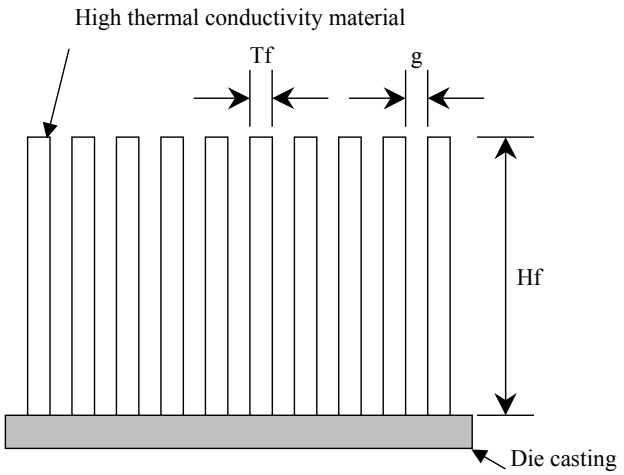


ø±0.1	L_{max}		W	T±0.1
3.0	300		3.6	2.0
4.0	350		5.2	2.0
5.0	400		6.2	3.0
6.0	800		7.8	3.0
8.0	800		10.9	3.0
9.5	800		13.3	3.0

Dimensions in mm

Heat Sink

A high aspect ratio heat sink has been developed for high performance. The ratio of fin height to fin thickness is larger than that of conventional heat sinks. This heat sink may be applied for cooling notebooks, servers and telecommunications equipment.

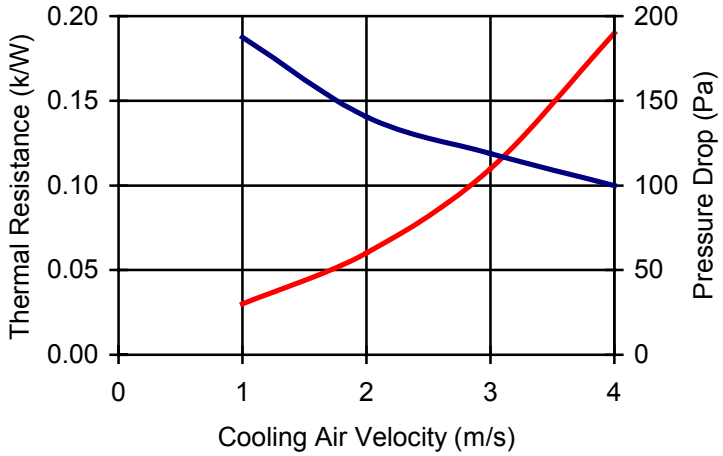


$T_f \infty 0.3mm$

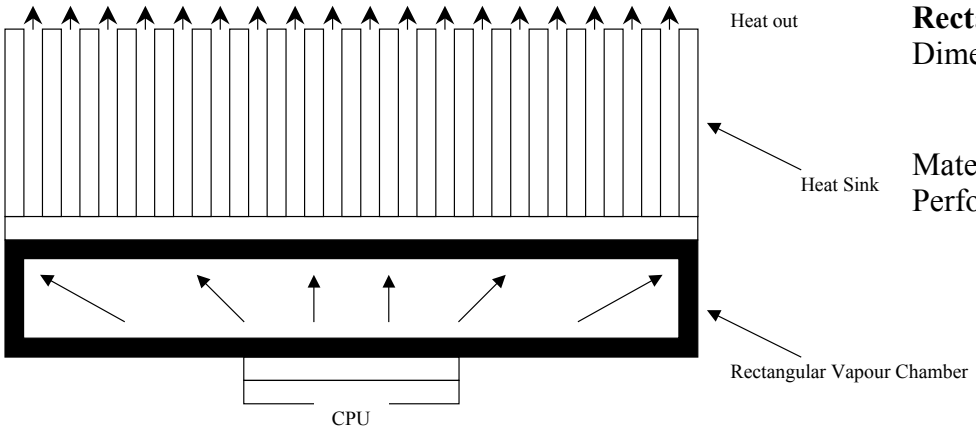
$g \infty 0.8mm$

Comparison of Heat Sink Manufacturing

Type Of Manufacturing	Geometry	Aspect Ratio	Remarks
Modified Die Casting	T_f ∞ 0.3mm g ∞ 0.8mm	No limitation	Low thermal resistance due to application of high thermal conductivity fin
Extrusion	T_f ∞ 2mm g ∞ 3mm	10	Poor heat transfer, easy mass production
Die Casting	T_f ∞ 2mm g ∞ 3mm H_f □ 10mm	5	Easy mass production, poor heat transfer
Cold Forging	T_f ∞ 1mm g ∞ 3mm H_f □ 30mm	30	Stable for large production, expensive tool
Bonding Fins	No limitation	No limitation	Poor interface joint



Heat Sink with Rectangular Vapour Chamber



Rectangular Heat Pipe

Dimension: W= 72.4mm
H = 50.8mm
T = ~5mm

Material: Copper/water heat pipe

Performance: Thermal resistance 0.05k/W at any orientation
Heat input: 120W

Heat Sink with Embedded Heat Pipe