HEATPIPE MODULES
THERMAL MANAGEMENT
TUBULAR / FLATTENED HEAT PIPES & VAPOR CHAMBERS FOR HEAT TRANSFER & HEAT SPREADING
HEATPIPE MODULES
THERMAL MANAGEMENT
MAKING YOUR HEATPIPE MODULES MOST EFFICIENT AND THERMALLY BEST

TUBULAR-/ VAPOR CHAMBER PLANAR HEAT PIPES
HALA supplies 2 Phase Modules of two basic configurations: Tubular Heat Pipes and Vapor Chamber Planar Heat Pipes.

HEAT PIPES
- Outer diameter: From 2.0 mm up to and over 50 mm
- Internal structures: sintered, mesh, groove or hybrid (sintered-groove)
- Cross section geometry: round, rectangular, flattened
- Flattening down to 0.4 mm
- Length: up to 70 cm
- Geometry: straight or multiple bends
- Bonding of heat pipes to the assembly: soldering, press fit, epoxy
- Heat pipe surface coating: nickel or tin plated

All copper/water heat pipes are designed to survive numerous freeze/thaw cycles without any degradation. Copper/water heat pipes are made of copper, use water as a working fluid and typically operate in the temperature range of 20 up to 150°C (and over). The planar heat pipes are called Vapor Chambers (VC) which are used as heat spreaders.

Copper/water 2 phase systems can be combined with other components to form heat transfer modules:
- Extruded heat sinks
- Die cast heat sinks
- Fin Stack heat sinks
- Skived heat sinks

Connected by:
- Thermal Interface Materials

DIMENSION AND PERFORMANCE RANGE (mm)

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Recommended Overall Length</th>
<th>Recommended Bending Radius</th>
<th>Recommended Flattened Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>70 – 750</td>
<td>&gt;9</td>
<td>&gt;2.0</td>
</tr>
<tr>
<td>4</td>
<td>70 – 750</td>
<td>&gt;12</td>
<td>&gt;2 [e.g. 2.4]</td>
</tr>
<tr>
<td>5</td>
<td>70 – 750</td>
<td>&gt;15</td>
<td>&gt;2 [e.g. 3.0]</td>
</tr>
<tr>
<td>6</td>
<td>70 – 750</td>
<td>&gt;18</td>
<td>&gt;2.5 [e.g. 3.6]</td>
</tr>
<tr>
<td>6.35 (¼&quot;)</td>
<td>70 – 750</td>
<td>&gt;19</td>
<td>&gt;2.5 [e.g. 3.5]</td>
</tr>
<tr>
<td>8</td>
<td>70 – 750</td>
<td>&gt;24</td>
<td>&gt;3 [e.g. 4.0]</td>
</tr>
<tr>
<td>9.52 (⅜&quot;)</td>
<td>70 – 750</td>
<td>&gt;28.6</td>
<td>&gt;3 [e.g. 4.5]</td>
</tr>
<tr>
<td>10</td>
<td>70 – 750</td>
<td>&gt;30</td>
<td>&gt;3 [e.g. 5.0]</td>
</tr>
<tr>
<td>12</td>
<td>70 – 750</td>
<td>&gt;36</td>
<td>&gt;3 [e.g. 6.0]</td>
</tr>
<tr>
<td>12.7 (½&quot;)</td>
<td>70 – 750</td>
<td>&gt;38</td>
<td>&gt;3 [e.g. 6.3]</td>
</tr>
<tr>
<td>15.875 (⅜&quot;)</td>
<td>70 – 750</td>
<td>&gt;47</td>
<td>&gt;3 [e.g. 8.0]</td>
</tr>
<tr>
<td>19.05 (¾&quot;)</td>
<td>70 – 750</td>
<td>&gt;57</td>
<td>&gt;3 [e.g. 9.5]</td>
</tr>
<tr>
<td>25.4 (1&quot;)</td>
<td>70 – 750</td>
<td>&gt;76</td>
<td>&gt;3 [e.g. 12.0]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Qmax (w)</th>
<th>Pipe Diameter ø 3 mm</th>
<th>Pipe Diameter ø 4 mm</th>
<th>Pipe Diameter ø 5 mm</th>
<th>Pipe Diameter ø 6 mm</th>
<th>Pipe Diameter ø 8 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>T = 2.0 mm</td>
<td>10 W</td>
<td>15 W</td>
<td>21 W</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>T = 2.5 mm</td>
<td>14 W</td>
<td>17 W</td>
<td>32 W</td>
<td>46 W</td>
<td>65 W</td>
<td></td>
</tr>
<tr>
<td>T = 3.0 mm</td>
<td>15 W</td>
<td>19 W</td>
<td>42 W</td>
<td>56 W</td>
<td>75 W</td>
<td></td>
</tr>
<tr>
<td>Rounded</td>
<td>16 W</td>
<td>20 W</td>
<td>46 W</td>
<td>60 W</td>
<td>85 W</td>
<td></td>
</tr>
</tbody>
</table>

Diameter: 3 / 4 / 5 / 6 / 6.35 (¼") / 8 / 9.52 (⅜") / 10 / 12 / 12.7 (½")
Tube Wall Thickness: 0.9 mm / 0.5 mm / 0.3 mm / 0.2 mm
Diameter Tolerance: ±0.05 mm
Length Tolerance: ±0.5 to ±1.0 mm
Thickness Tolerance: ±0.05 mm
Width Tolerance: ±0.10 to ±0.15 mm
HEATPIPE MODULES
CONFIGURATIONS
HALA HEATPIPES

FLATTENED HEAT PIPES

VAPOR CHAMBER
a. interior structure and sealed
b. with copper sockets

HEAT SPREADER

HEAT COLUMN

HEAT TRANSFER

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HEATPIPE MODULES
APPLICATION CASES

ELECTRONICS COOLING
LED COOLING
AVIONICS / AIRBORNE ELECTRONICS
DESKTOP / NOTEBOOK / SERVER
HVAC ENERGY RECOVERY
ANALYZERS AND METERS
MEDICAL DEVICES
MILITARY / AEROSPACE
SAFETY TECHNOLOGY
CAMERA & SURVEILLANCE SYSTEMS
PHOTOVOLTAICS
SENSOR CONTROL
AUTOMOTIVE
<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/</td>
<td>NO. OF HEAT SOURCES</td>
<td>No. of heat sources and hot spots to be cooled</td>
</tr>
<tr>
<td>2/</td>
<td>OPERATING POWER</td>
<td>Maximum total power demand</td>
</tr>
<tr>
<td>3/</td>
<td>DIMENSIONS OF HEAT SOURCES</td>
<td>Heat input area</td>
</tr>
<tr>
<td>4/</td>
<td>HEAT SOURCE LAYOUT</td>
<td>Hot spots can be off-center, sketch of positions</td>
</tr>
<tr>
<td>5/</td>
<td>MAXIMUM VC DIMENSIONS</td>
<td>Max. allowable function length and width</td>
</tr>
<tr>
<td>6/</td>
<td>OPERATING ORIENTATION</td>
<td>Angle from horizontal (positive if downside evaporator)</td>
</tr>
<tr>
<td>7/</td>
<td>MAX. COMPONENT TEMPERATURE</td>
<td>Maximum temperature requirement for multiple components</td>
</tr>
<tr>
<td>8/</td>
<td>AMBIENT TEMPERATURE</td>
<td>Operating temperature range</td>
</tr>
<tr>
<td>9/</td>
<td>STORAGE TEMPERATURE</td>
<td>Storage temperature range</td>
</tr>
<tr>
<td>10/</td>
<td>COOLING</td>
<td>Heat sink with forced convection (flow rate), natural convection or liquid cooling</td>
</tr>
<tr>
<td>11/</td>
<td>SURFACE REQUIREMENTS</td>
<td>Evenesses, roughness, plated, unplated, sealed, etc.</td>
</tr>
<tr>
<td>12/</td>
<td>NOTES</td>
<td>Performance specifications, drawings, sketches, special requirements, etc.</td>
</tr>
</tbody>
</table>
# HEATPIPE & HEATPIPE ASSEMBLY CHECKLIST

FILL IN YOUR DATA AND SEND BACK TO US

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1/ OPERATING POWER</strong></td>
<td>Watts</td>
</tr>
<tr>
<td><strong>2/ HEAT PIPE LENGTH</strong></td>
<td>mm</td>
</tr>
<tr>
<td><strong>3/ EVAPORATOR DIMENSIONS</strong></td>
<td>(LxWxT)</td>
</tr>
<tr>
<td><strong>4/ CONDENSOR DIMENSIONS</strong></td>
<td>(LxWxT)</td>
</tr>
<tr>
<td><strong>5/ HEAT SINK DIMENSIONS</strong></td>
<td>(LxWxT)</td>
</tr>
<tr>
<td><strong>6/ OPERATING ORIENTATION</strong></td>
<td>°C</td>
</tr>
<tr>
<td><strong>7/ MAX. COMPONENT TEMPERATURE</strong></td>
<td>°C to °C</td>
</tr>
<tr>
<td><strong>8/ AMBIENT TEMPERATURE</strong></td>
<td>°C to °C</td>
</tr>
<tr>
<td><strong>9/ STORAGE TEMPERATURE</strong></td>
<td>°C to °C</td>
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<tr>
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<td><strong>11/ SURFACE REQUIREMENTS</strong></td>
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<td><strong>12/ NOTES</strong></td>
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