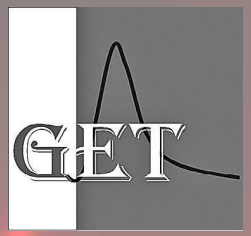


Cooling of the electronics…

How ?

General discussion

Cooling

- To cool electronic ?
- To cool environment ?
- Air cooling ?
- Water cooling ?
- Rack cooling ?
- Cold plate cooling ?

Cooling electronics

- Main contributors in heating:
  - ADC
  - AGET
  - LVPECL
  - FPGAs
  - Supply regulator
  - Buffers
  - …
- Need to evacuate the heat:
  - Outside the AsAd box
  - Outside the CoBo and MUTANT racks

Cooling environment

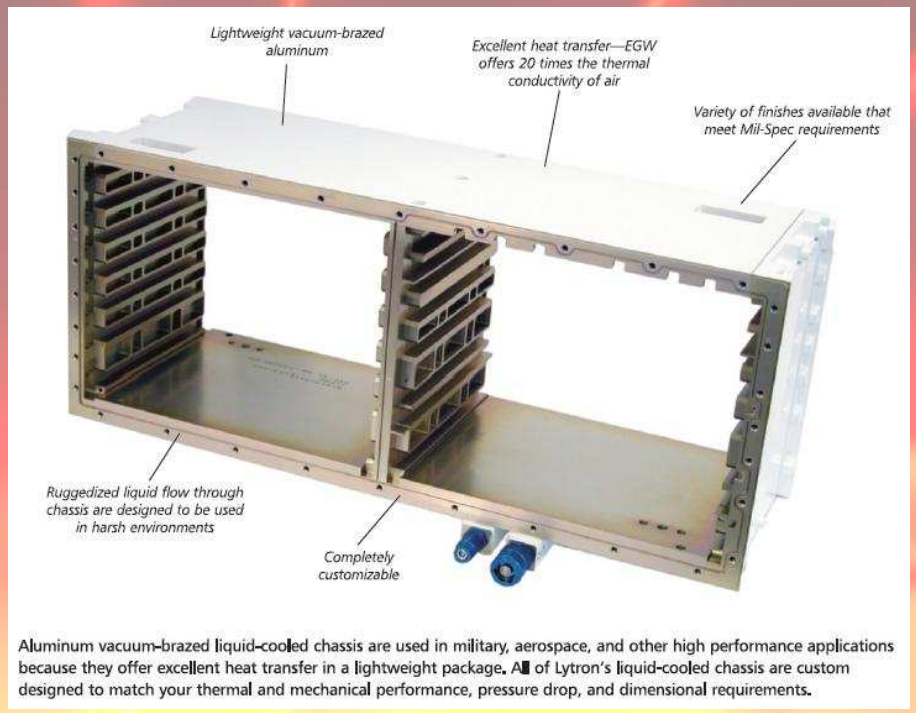
- Mainly near the detectors
  - Magnetic fields → No fans
  - Low space → Heat evacuation efficient

Air cooling

- Easy with fans for the racks
- Not only one solution for AsAd

Rack cooling

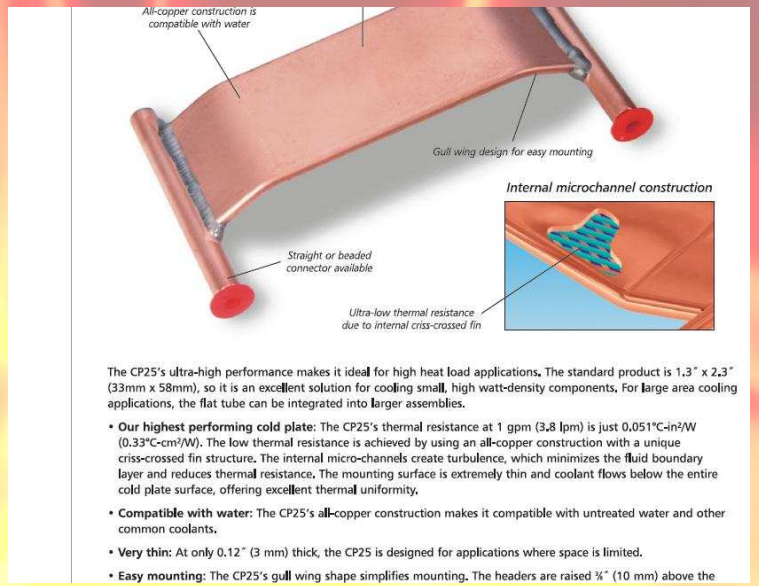
Even for embedded systems



Aluminum vacuum-brazed liquid-cooled chassis are used in military, aerospace, and other high performance applications because they offer excellent heat transfer in a lightweight package. All of Lytron's liquid-cooled chassis are custom designed to match your thermal and mechanical performance, pressure drop, and dimensional requirements.

Water cooling

- Homemade …
- Cots :
  - Cold plates cold in contact with the box



The CP25's ultra-high performance makes it ideal for high heat load applications. The standard product is 1.3″ x 2.3″ (33mm x 58mm), so it is an excellent solution for cooling small, high watt-density components. For large area cooling applications, the flat tube can be integrated into larger assemblies.

- **Our highest performing cold plate**: The CP25's thermal resistance at 1 gpm (3.8 lpm) is just 0.051°C-in²/W (0.33°C-cm²/W). The low thermal resistance is achieved by using an all-copper construction with a unique criss-crossed fin structure. The internal micro-channels create turbulence, which minimizes the fluid boundary layer and reduces thermal resistance. The mounting surface is extremely thin and coolant flows below the entire cold plate surface, offering excellent thermal uniformity.
- **Compatible with water:** The CP25's all-copper construction makes it compatible with untreated water and other common coolants.
- **Very thin:** At only 0.12″ (3 mm) thick, the CP25 is designed for applications where space is limited.
- **Easy mounting**: The CP25's gull wing shape simplifies mounting. The headers are raised ¾″ (10 mm) above the

Cold plates

- Several possible suppliers
- Deeper question
- Consult the experts