Ultra Thin 15" Notebooks

3 x AirJet® Pro

The holy grail of 15" ultra-thin Notebooks is the support of 28 Watts sustained processor power. Today's best 15" Notebooks, which exhibit a 12 mm thickness – 8.9 mm base and 3.1 mm display – have a thermal limit of only 18 Watts, far below the desired 28 Watts. To even support this lower processor power, the fans used to cool the processor run at a very noisy 42 dBA – the sound level of a refrigerator. By replacing fans with AirJet®, the thermal limit can be increased to 28 Watts in the same ultra-thin design, improving processor performance by 1.5x, while reducing noise to 29 dBA - quieter than a whisper.

Frore Systems has developed a revolutionary active cooling chip, AirJet®, the first ever solid state thermal solution. AirJet® is a fully self contained active heat sink module. AirJet® is silent, thin, light and outperforms fans.

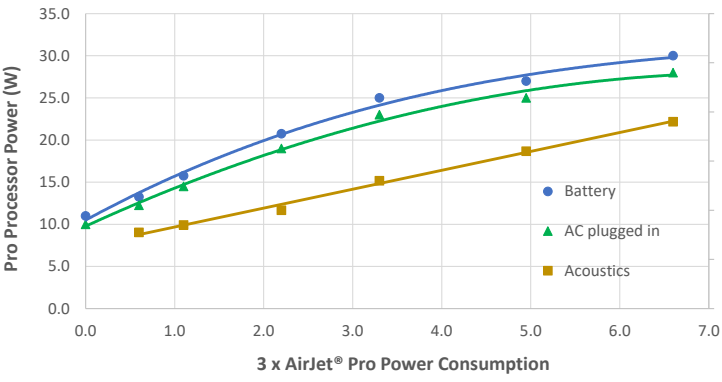
AirJet® Pro

AirJet® Pro generates 1750 Pascals of back pressure, ensuring air flow into and out from product enclosures. When integrated into a compute platform with processor die temperature of 85C, AirJet® Pro removes a net 8.75 Watts of heat at a silent 24 dBA noise level, while consuming 1.75 Watts of power.

Metric	AirJet® Pro
Total heat dissipation (@ 85C die temperature, 25C ambient)	10.5 W (net 8.75 W)
Maximum noise inside device at 50 cm	24 dBA
Maximum power consumption	1.75 W
Back pressure	1750 Pa
Dimensions (width x length x thickness)	31.5 x 71.5 x 2.8 mm
Weight	22g

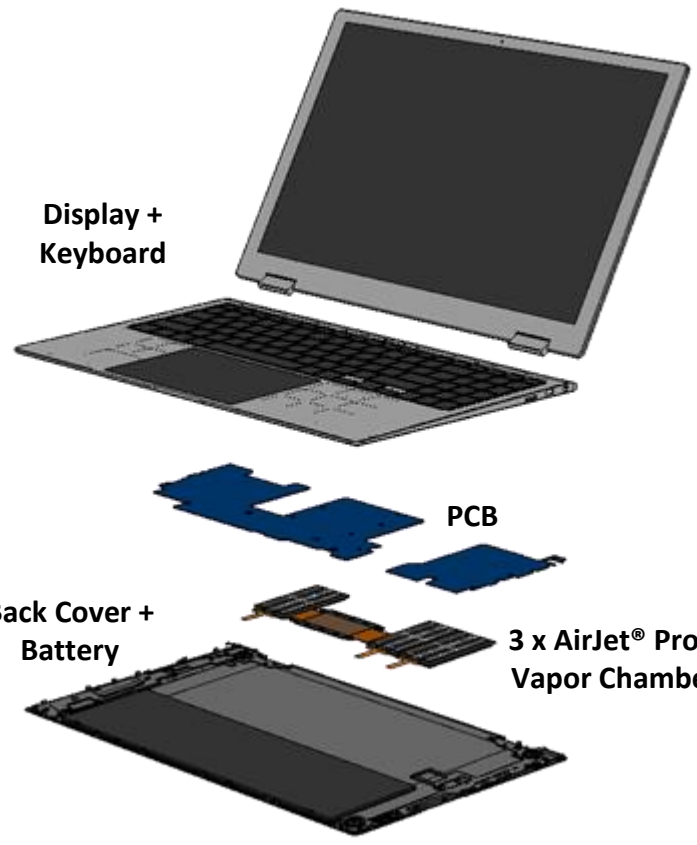
Inside an 8.9 mm base thickness Notebook, each AirJet® Pro, after discounting for lower processor die temperature and voltage regulator overhead, contributes 6 Watts of "Active" heat removal to sustained processor power. 3 x AirJet® Pro equal 18 Watts "Active" heat removal.

15" 12mm thick Notebook with fans

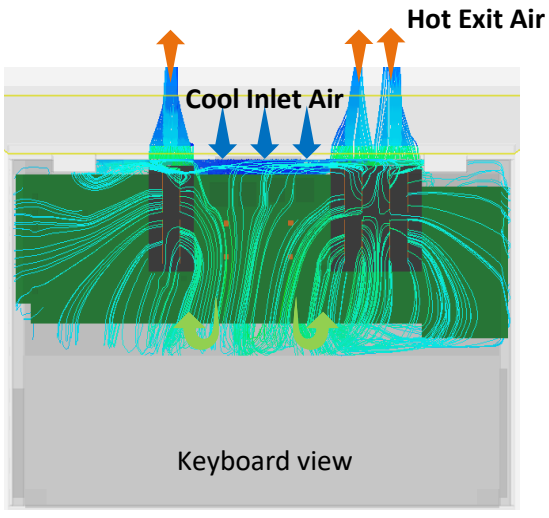


18 Watts "Active" heat removal combined with 10 Watts "Passive" heat removal inherent to the Notebook, equal 28 Watts of sustained processor power. The 3 x AirJet® Pro solution runs at maximum acoustics of 29 dBA – quieter than a whisper. Thus, with AirJet®, the thermal limit is increased to 28 Watts and the processor runs 1.5x faster, without making the Notebook thicker and while significantly reducing the noise level.

Let's dig deeper into how these 3 x AirJet® Pro are designed into the Notebook. First, a thermal solution subassembly is created with 3 x AirJet® Pro mounted on a vapor chamber - 2 x AirJet® Pro on side and 1 x AirJet® Pro on the other side. Second, the Notebook PCB is shaped to accommodate the subassembly while ensuring the vapor chamber handle rests on top of the hot processor located at the center of the PCB. The vapor chamber acts as a super conductor of heat, transporting heat from the processor to the 3 x AirJet® Pro.



The Notebook casing is designed with discrete air vents in the rear, an inlet air vent in the center directly behind the processor for cool ambient air to enter and exit vents directly behind the 3 x AirJet® Pro to facilitate easy ejection of hot air. No other air vents are needed anywhere else in the Notebook casing making for a sleek design. Moreover, thanks to AirJet®'s high back pressure, the inlet vent can be covered with air filter material rendering the Notebook dust-proof. When activated, the 3 x AirJet® Pro generate a strong airflow, pulling ambient air in through the inlet vents and channeling it all around the PCB before entering the 3 x AirJet® Pro. This movement of air inside the Notebook helps keep the skin temperatures low. Further, inside the 3 x AirJet® Pro, more heat is efficiently transferred to the air until saturation. This hot air is then expelled out of the Notebook through the rear exit vents.



Compared to fan-based solutions where air inlet vents are located on the bottom of the Notebook, inlet vents for the AirJet® Pro are in the rear and not the bottom. Locating the inlet vents in the rear maintains maximum "Active" heat removal not only when the Notebook is sitting on a table, but also your lap or on a pillow. Contrast that with fan-based solutions with inlet vents on the bottom, which results in airflow getting completely chocked off on your lap or pillow, and creates uncomfortably hot devices and lowers the thermal limit.

The 3 x AirJet® Pro solution increases the thermal limit to 28 Watts, enabling the processor to run 1.5x faster, while reducing the noise level and maintaining the same Notebook thickness.