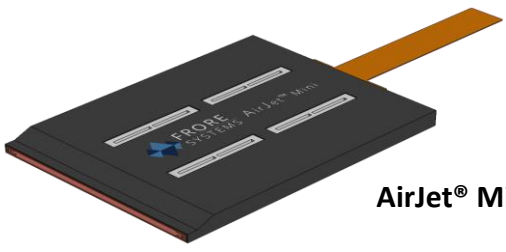
Super Slim 13" Notebooks

4 x AirJet® Mini

Fanless, 13” Notebooks are known for their low-noise super slim design, coming in at a mere 11.3 mm thickness. But the downside has always been their thermal limit. Their “Passive” heat removal supports only 10 Watts of sustained processor power, resulting in severe processor throttling. Using AirJet®, the thermal limit can be improved to 20 Watts in the same super slim design, thus improving processor performance by 2x, while keeping the Notebook silent.

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® Mini

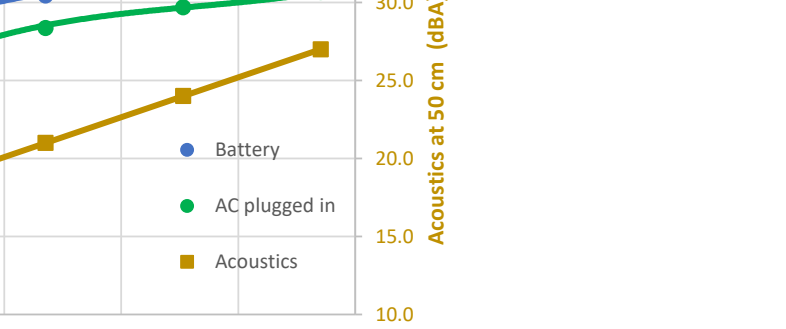
AirJet® Mini generates 1750 Pascals of back pressure, ensuring air flow into and out from product enclosures. When integrated into a compute platform with processor die temperature of 85C, AirJet® Mini removes a net 4.25 Watts of heat at a silent 21 dBA noise level, while consuming 1 Watt of power.

Metric	AirJet® Mini
Total heat dissipation (@ 85C die temperature, 25C ambient)	5.25 W (net 4.25 W)
Maximum noise inside device at 50 cm	21 dBA
Maximum power consumption	1 W
Back pressure	1750 Pa
Dimensions (width x length x thickness)	27.5 x 41.5 x 2.8 mm
Weight	11g

Inside an 8.1 mm base thickness Notebook, each AirJet® Mini, after discounting for lower processor die temperature and voltage regulator overhead, contributes 2.5 Watts of “Active” heat removal to sustained processor power. 4 x AirJet® Mini equal 10 Watts of “Active” heat removal.

10 Watts of “Active” heat removal combined with 10 Watts of “Passive” heat removal inherent to the Notebook, equals 20 Watts of sustained processor power. The 4 x AirJet® Mini solution runs at maximum acoustics of 27 dBA – quieter than a whisper. 8.1 mm base plus 2.7 mm OELD display add up to 10.8 mm Notebook thickness. Thus, with AirJet®, thermal limit is increased to 20 Watts and the processor runs 2x faster, without making the Notebook thicker or noisy.

13" Fanless 11.3 mm thick Notebook



Let’s dig deeper into how these 4 x AirJet® Mini are designed into the Notebook. First, a thermal solution subassembly is created with 4 x AirJet® Mini mounted on a vapor chamber - 2 x AirJet® Mini on either side. Second, a one-sided 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 4 x AirJet® Mini.

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 4 x AirJet® Mini 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 4 x AirJet® Mini generate a strong airflow by pulling ambient air in through the inlet vents and channelling it all around the PCB before entering the 4 x AirJet® Mini. This movement of air inside the Notebook helps keep the skin temperatures below 46C. Further, inside the 4 x AirJet® Mini more heat is efficiently transferred to air until saturation. This hot air is then expelled out of the Notebook through the rear exit vents.

The 4 x AirJet® Mini solution increases the thermal limit to 20 Watts, enabling the processor to run 2x faster, without making the Notebook thicker or noisy.