

8-Sep-2015

Application note - good thermal management of fitlet

Introduction

Some properties of passively cooled mini PC are silence, reliability, freedom from maintenance and ... heat.

fitlet is a very robust mini PC that can provide surprisingly high performance in a small footprint. A fitlet user does not need to care for under-the-hood heat management. This application note is written for technically inclined users that wish to get the most out of the computer and to better understand heat management issues.

Since the introduction of fitlet Compulab tuned fitlet heat dissipation and heat management. As a result fitlet now runs cooler. This makes for better user experience and easier deployment in extreme conditions.

Below is a break-down of heat management aspects of fitlet.

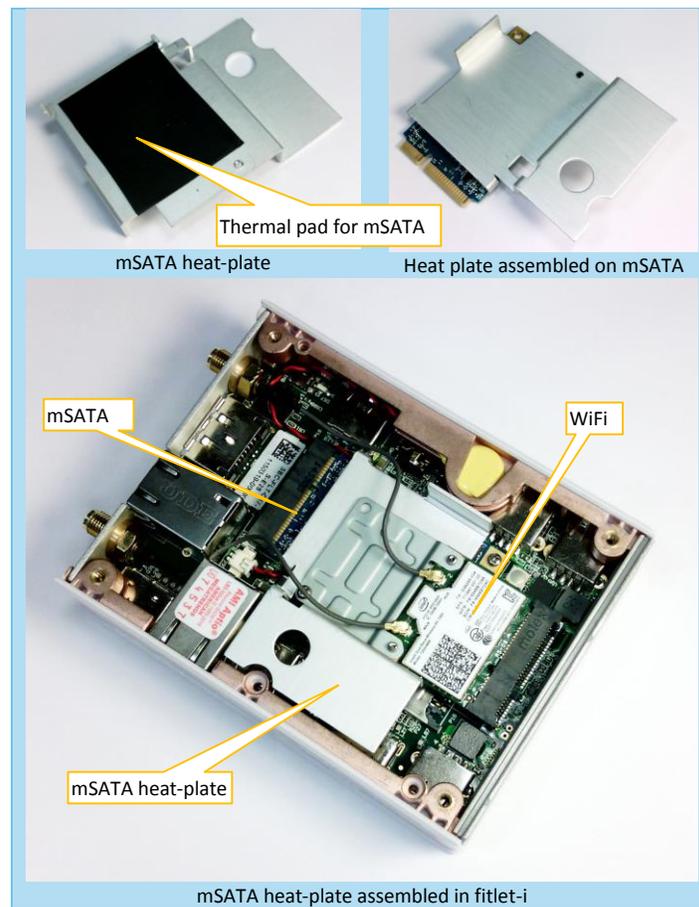
mSATA temperature

With early fitlet units there has been verified reports on high mSATA temperature. The reason was found to be heat dissipated by the mSATA module itself that was not removed effectively.

Compulab designed a heat-plate that conducts heat from the mSATA to the aluminum chassis.

It was found to reduce mSATA temperature by about 20°C.

The mSATA heat-plate is included with any fitlet shipped starting 8-Sep-2015.



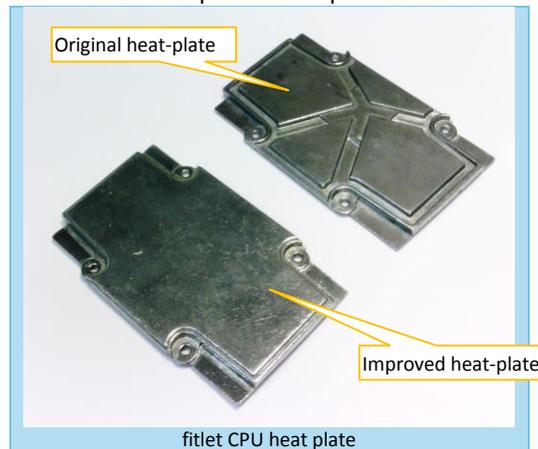
CPU temperature

The CPU in fitlet is rated for 4.5W TDP (thermal design power). fitlet is pre-configured for operating the CPU at that power level, but in practice higher performance can be achieved by allowing the CPU to consume more power. This can be changed in fitlet BIOS settings.

Running the CPU at higher power results in higher CPU temperature and higher case temperature.

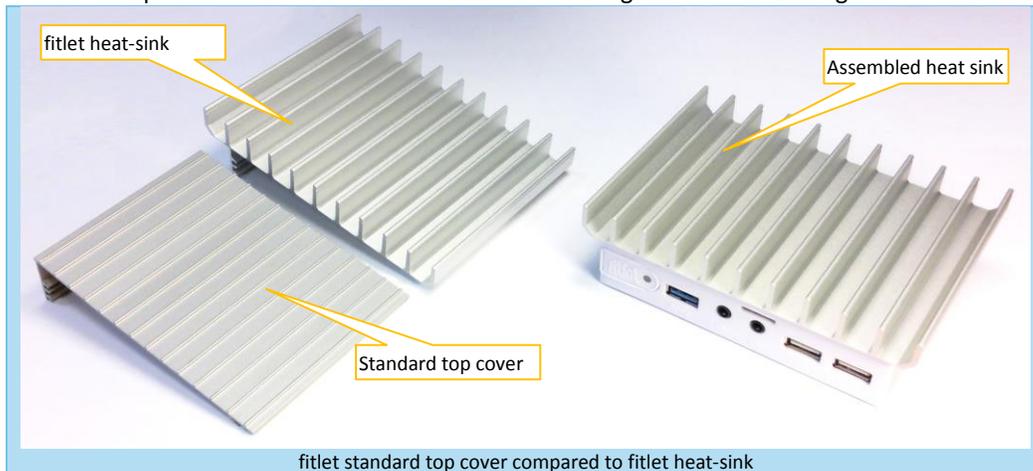
Compulab improved several aspects of CPU heat dissipation in fitlet.

1. **Improved thermal interface material (TIM) between CPU and heatplate**
Currently using **Arctic Silver 5** thermal paste.
2. **Redesign of the heat-plate to increase contact area between heat-plate and top cover**
Tip: User may apply thermal paste between heat-plate and top cover to further reduce CPU temperature.



3. **Introduction of an optional top cover with integrated heat-sink**

fitlet heat-sink is made of extruded and machined aluminum with anodize finish. It has much larger surface area therefore it can dissipate more heat. The heat-sink allows running fitlet at full TDP regardless of ambient temperature.



4. Introduction of fitlet-H

fitlet-H is the hardened version of fitlet. One of its properties is larger surface area of the all-aluminum body which allows very good heat dissipation. fitlet-H hardware is fully compatible with other fitlet models.



Touch temperature

Since in passive cooling all the heat is dissipated through the case, touch temperature depends mostly on the case surface area and on the device power. Other factors are the ambient temperature and the airflow around the device.

fitlet, being a small passively cooled device has relatively high touch temperature under load. It is worth noting that the touch temperature does not affect fitlet safety and reliability, yet some users find high touch temperature inconvenient.

The following methods can be applied to reduce touch temperature

1. Tune fitlet TDP to the required performance. fitlet is pre-configured for acceptable touch temperature. TDP can be lowered to run fitlet cooler or increased to obtain higher performance.
2. Disable unused devices. e.g. if using wired Ethernet, WiFi can be disabled to reduce heat dissipation (and save power).
3. Choose where to install fitlet. Installing fitlet in open air with some natural airflow can reduce touch temperature.
4. Consider using fitlet heat-sink. It has a dual effect – it reduces the case temperature and also reduces the contact surface with your hand to minimize inconvenience.

Further information

www.fit-pc.com/fitlet

www.fit-pc.com/wiki

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