

# **BB-AN-0003**

## **Thermal Dissipation considerations on the 10GBlox system**

### **Application Note**

October 2022

## 1 Introduction

10GBlox utilises high performance Marvell ICs to achieve networking rates up to 10Gbps. These ICs use a lot of power in a small form factor which, when coupled with the compact design of 10GBlox, means that the bare board alone does not provide adequate heat sinking<sup>1</sup>. This means that 10GBlox must only be operated with additional thermal heat sinking hardware<sup>2</sup>.

## 2 ICs requiring heat sinking

The table below lists the components that consume the largest amount of power on 10GBlox and therefore require heat sinking. You must provide a method to cool these components via passive/active cooling.

Reference designator	Component and manufacturer part number	Power dissipation	Thermal information	Thermal shutdown
U11	<b>Ethernet Switch</b> 88E6393XA0	4.6W	ThetaJA = 22.28°C/W ThetaJC = 5.08°C/W ThetaJB = 12.68°C/W	125°C
U14	<b>Ethernet Phy</b> 88X3310-A1-BUS4 I000	3.52W	ThetaJA = 19.56°C/W ThetaJC = 0.66°C/W ThetaJB = 8.18°C/W	125°C
U17	<b>Ethernet Phy</b> 88X3310-A1-BUS4 I000	3.52W	ThetaJA = 19.56°C/W ThetaJC = 0.66°C/W ThetaJB = 8.18°C/W	125°C
U20	<b>Ethernet Phy</b> 88X3310-A1-BUS4 I000	3.52W	ThetaJA = 19.56°C/W ThetaJC = 0.66°C/W ThetaJB = 8.18°C/W	125°C

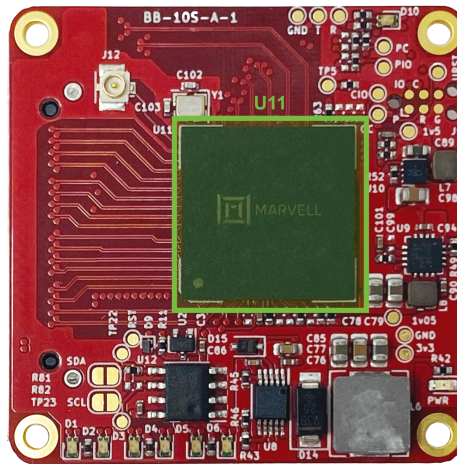
*ThetaJA = Junction to ambient thermal resistance*

*ThetaJC = Junction to case thermal resistance*

*ThetaJB = Junction to board thermal resistance*

<sup>1</sup> It is possible to run 10GBlox without a heatsink for limited periods of time typically not exceeding 5 minutes. Appropriately monitoring board temperature is recommended to avoid overheating.

<sup>2</sup> Without additional heatsinking the switch and phy chips on the board can reach temperatures up to 150°C. These chips have thermal shutdown mechanisms to prevent damage, meaning the board will power off when it gets too hot. This is not to be relied upon as a safe shutdown mechanism, however.



*Figure 1 - U11 on 10GBlox Switch*

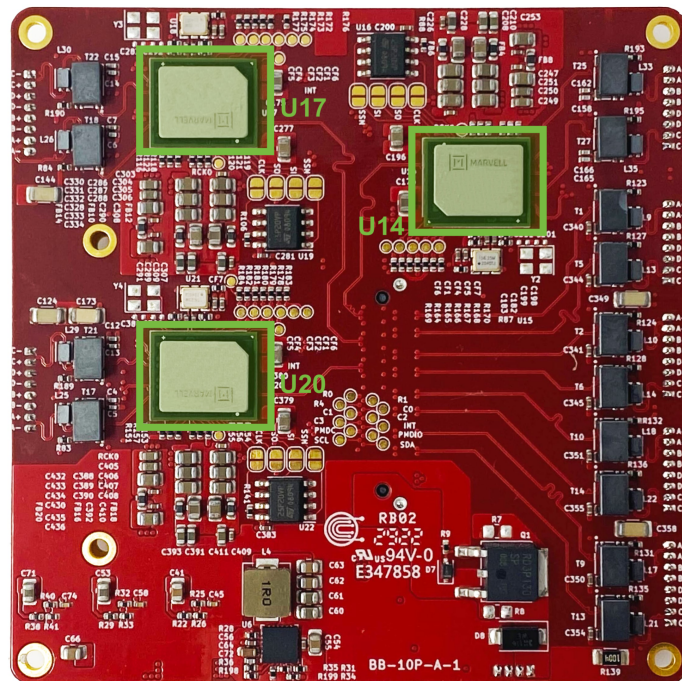
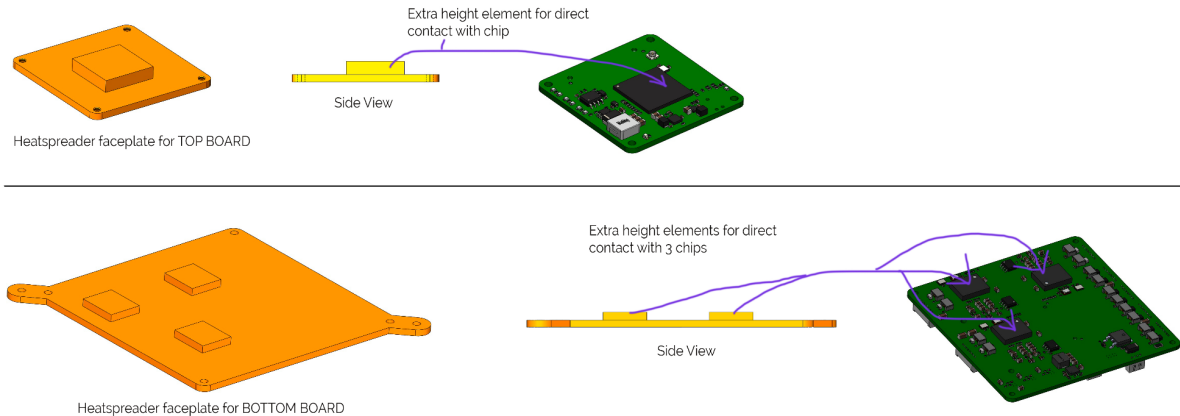


Figure 2 - U14, U17 and U20 on 10GBlox BASE-T PHY

### 3 Heatsink design

To create a heatsink solution for the 10GBlox system, we recommend first placing heat-spreader plates on the top and bottom of the assembled system. These plates (shown in figure 3) provide physical contact with main chips on both 10GBlox BASE-T PHY and 10GBlox Switch, and spread the heat onto a larger surface area.



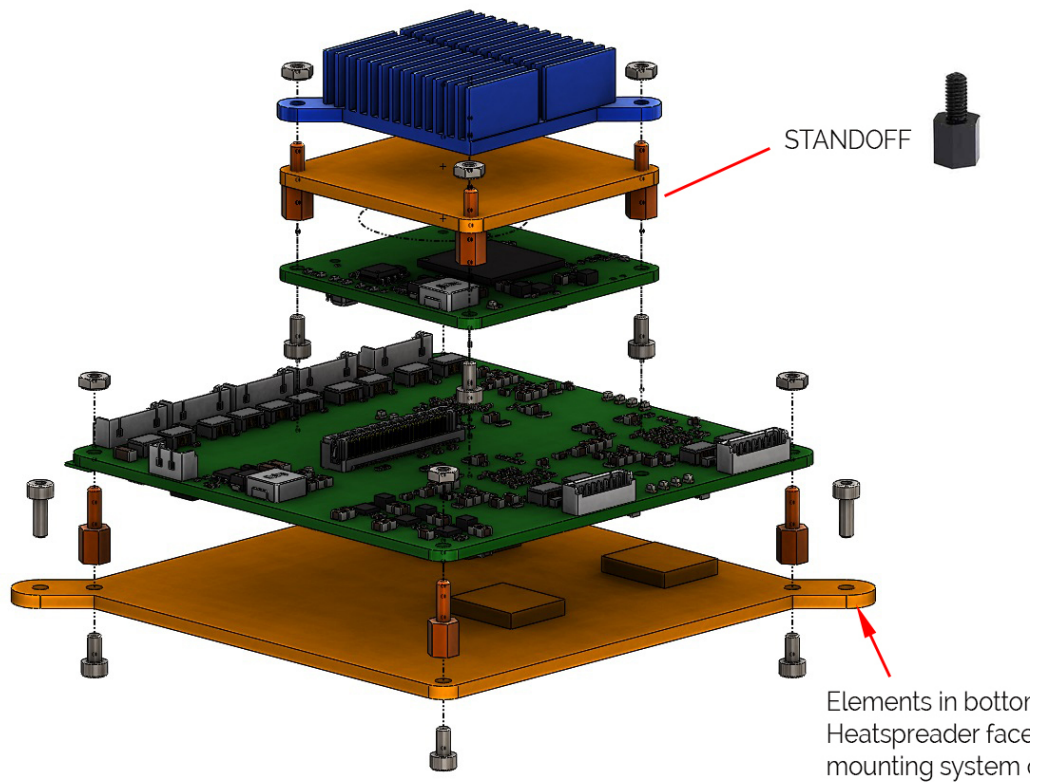
*Figure 3 - Heat spreader plates for the two 10GBlox boards.*

CAD files for both heat spreader plates and the boards can be found at the GrabCAD link below.

<https://grabcad.com/library/10gblox-1>

Once the heat spreader plates have been mounted, further heat sinking solutions can be applied to the heatsinks to move the heat away from the system. These solutions can take the form of finned metal assemblies, or can incorporate more advanced thermal solutions such as heat pipes for sinking to an external assembly.





*Figure 4 - An example heat spreader assembly on 10Gblos*

At present, we leave the design of heat sinking hardware up to the customer. As our design progresses we are working to provide a complete heat sinking solution as part of the product as a whole.

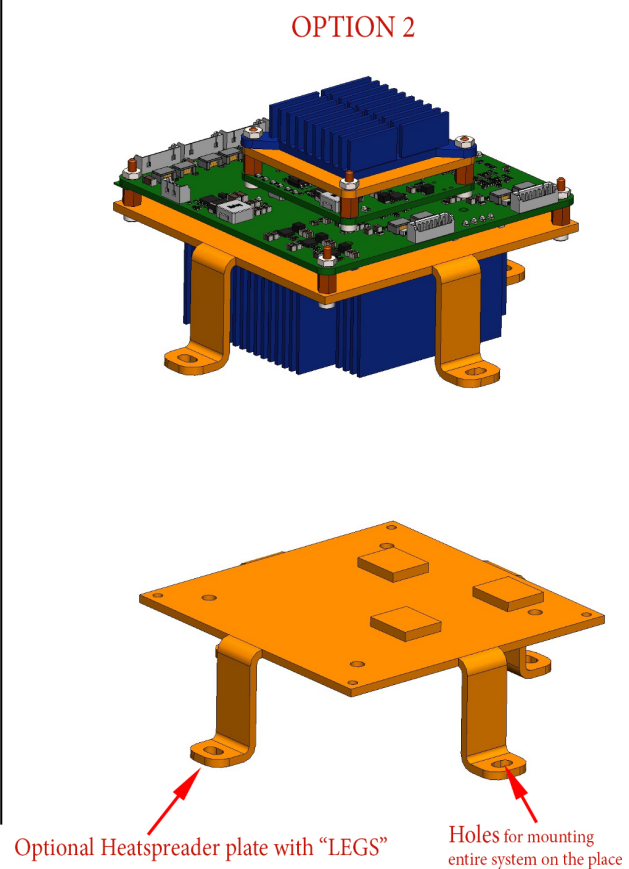
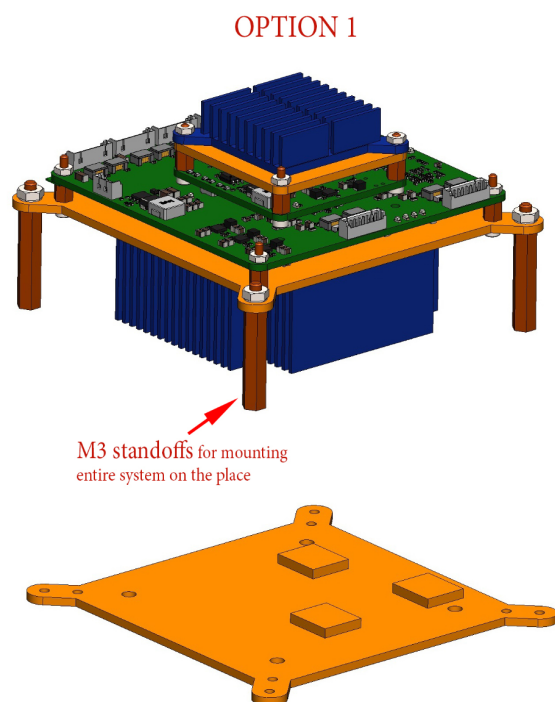


Figure 4 - More options for heatsinking on 10GBlox

## 5 Datasheet Changelog

Date	Datasheet Version	Author	Notes
13/03/2022	A_A	Josh Elijah	Initial release

## 6 Contact

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