

## BGA316 Adapter for icoBoard

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This project is about developing flex PCB adapters, that connect BGA316 footprints with an icoBoard

The BGA316 standard is specified in

[http://www.onfi.org/~/media/onfi/specs/onfi\\_3\\_2-gold.pdf?la=en](http://www.onfi.org/~/media/onfi/specs/onfi_3_2-gold.pdf?la=en)

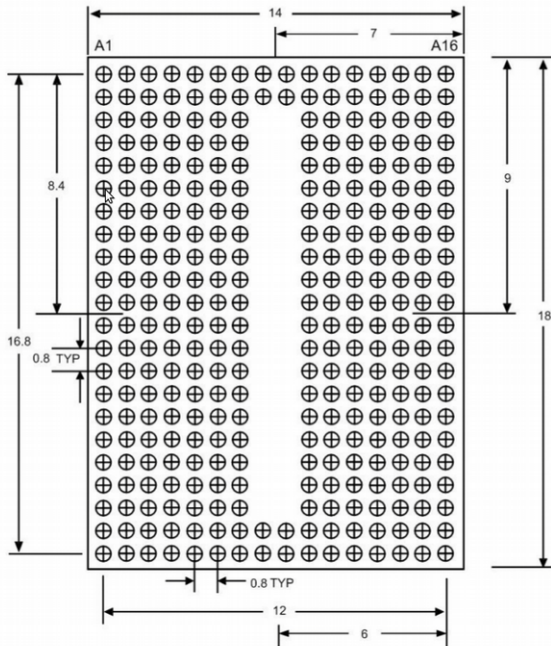


Figure 21 BGA-316 ball spacing requirements (top view, dimensions in millimeters)

The icoBoard is a Raspberry-Pi hat that has an FPGA and provides about 200 GPIOs which is available at

<http://www.icoboard.org/>

icoBoard Schematics: <https://drive.google.com/file/d/0By-zY9AIHqXICXZ6ZWdBR2dPXzg/view>

The icoBoard is providing 4 connectors: FFC 51pol 0,3mm 90° which should be used.

These are the specific connectors used:

<https://www.digikey.com/product-detail/en/molex-llc/5025985193/WM14415CT-ND/6133145>

These are the cables that are normally used with these connectors:

<https://shop.trenz-electronic.de/de/28023-Flat-Flex-Steckverbindung?c=459>

<https://shop.trenz-electronic.de/de/28024-Cable-Flat-Flex?c=459>

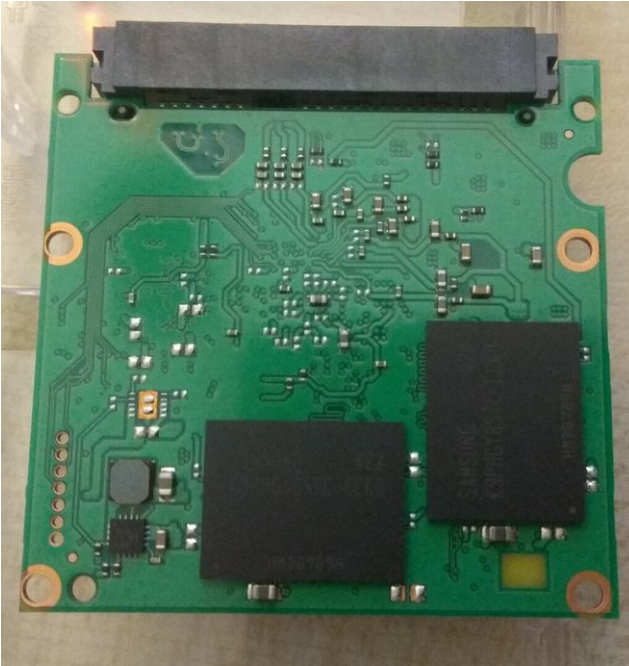
<https://www.mouser.at/productdetail/molex/502598-5193?qs=sGAEpiMZZMs7i6cT6ogu4y0JQF%252b37GT48sZfXS008SY=>

<https://www.digikey.com/product-detail/en/molex-llc/0150150651/WM13118-ND/3467267>

*Challenge:*

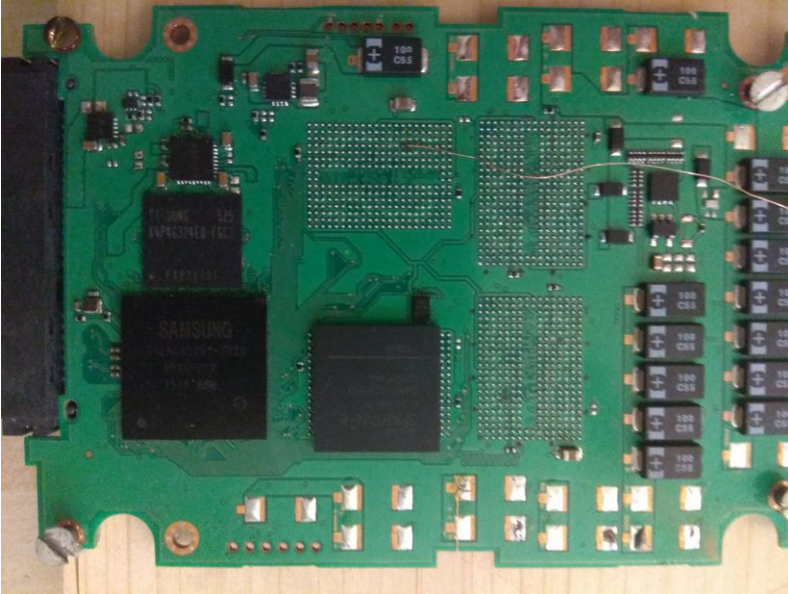
*The challenge is to create an adapter that provides an interface to a BGA316 pinout, both to the footprint on a PCB and to a chip that would normally be soldered on the PCB.*

*This is a PCB where you can see 2 black BGA316 chips, soldered on the PCB.*

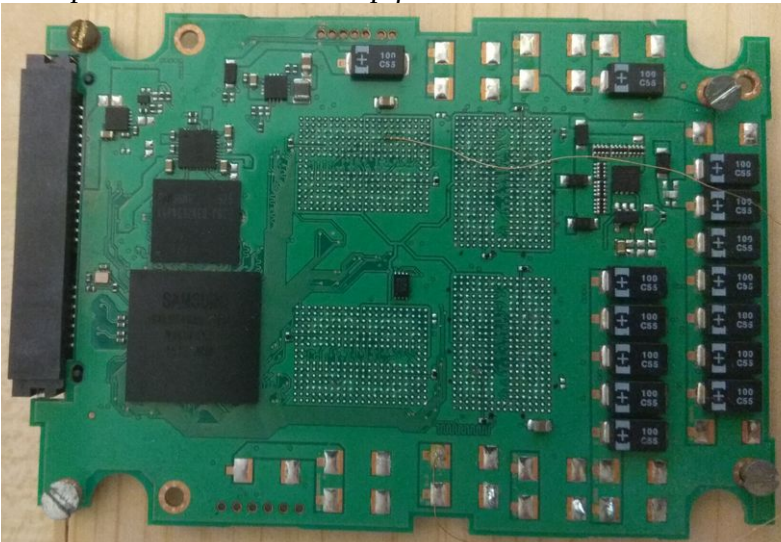


*To use the adapter, a BGA chip should be removed (desoldered) from the PCB, then the adapter should be soldered on one side to the PCB*

1. Step: PCB with BGA chip on it:



2. Step: Remove the BGA chip from the PCB:

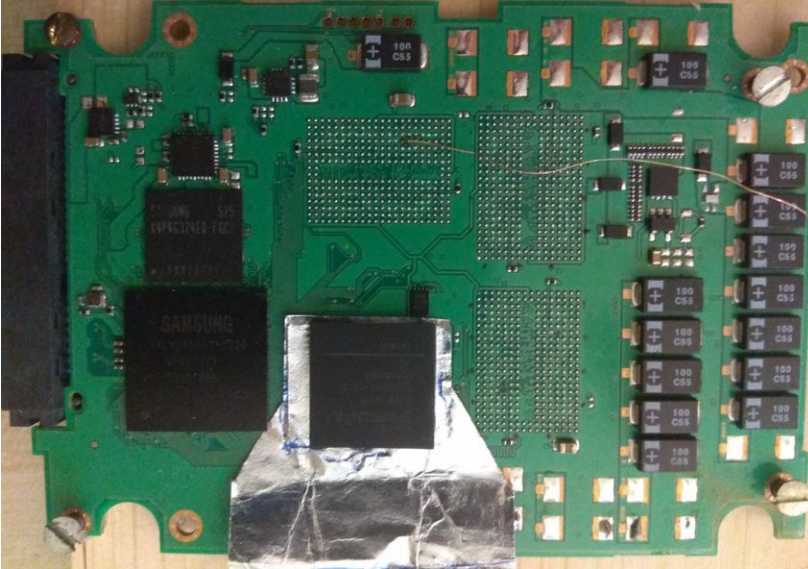


3. Step: Solder the Adapter onto the board:





4. Solder the BGA chip on the adapter:



5. Connect the adapter to the icoBoard

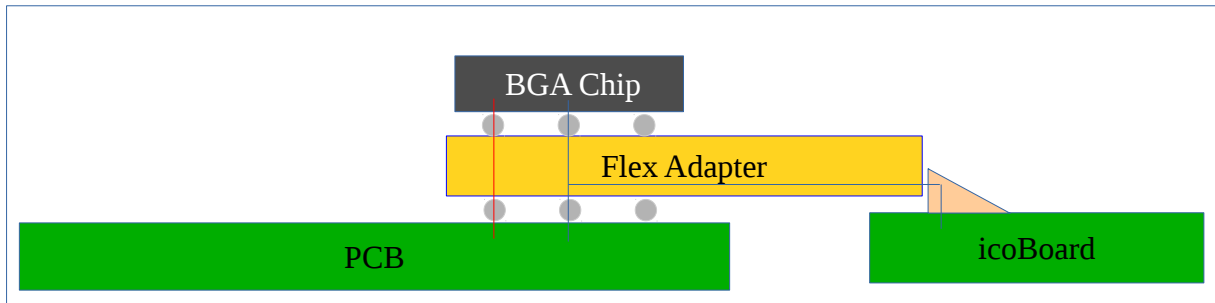


## Product variants

There are 2 variants of the adapter:

### 1. Variant: Logic Analyzer variant

In this variant, the power lines are directly connected from the PCB footprint to the BGA chip. All the control and data pins are also directly connected from the PCB footprint to the BGA chip and additionally to the icoBoard.

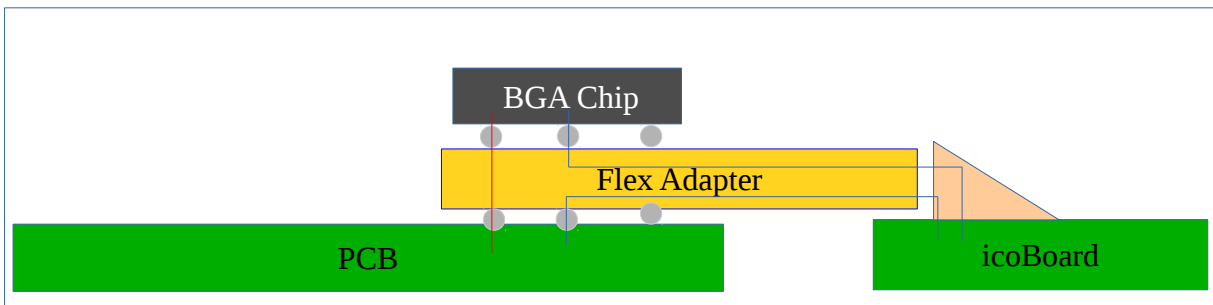


This variant needs less pins (<100) from the icoBoard, has less routing demands  
A fully assembled adapter could look like this:



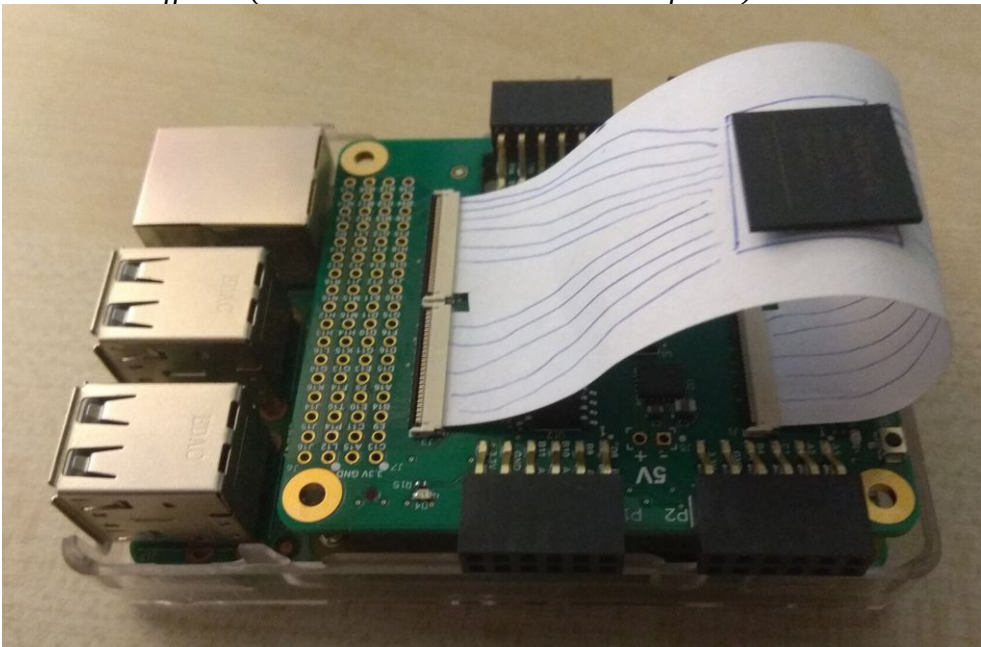
## 2. Variant: Mezzanine variant

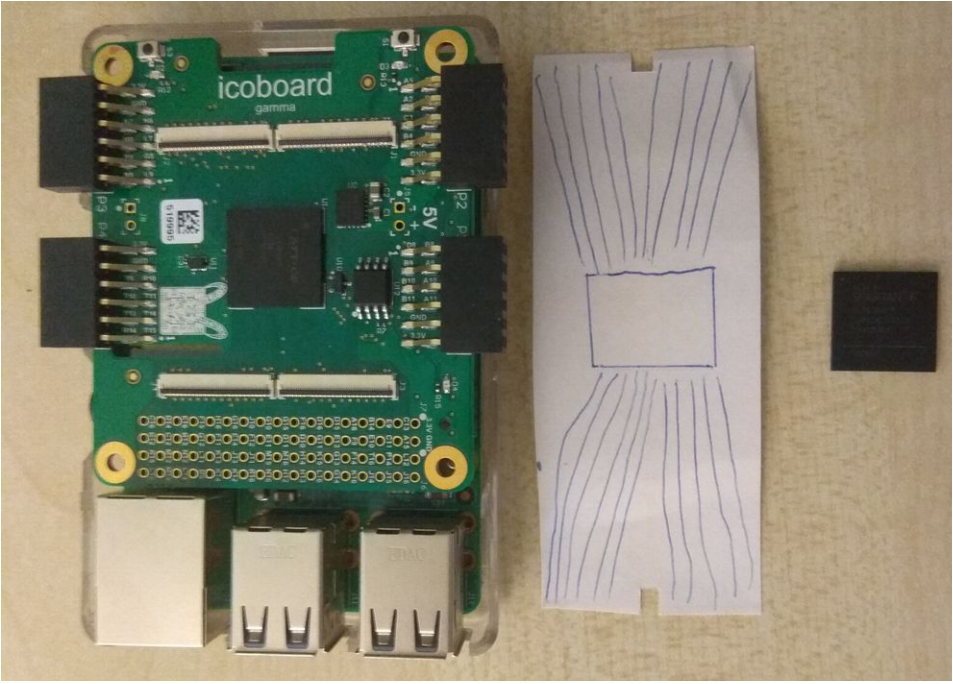
In this variant, the power lines (red) are directly connected from the PCB footprint to the BGA chip.  
All the control pins and data pins from the PCB footprint are connected to the icoBoard.  
All the control pins and data pins from the BGA chip are connected to the icoBoard.



The variant needs about twice as many pins (<200) from the icoBoard

Due to the higher amount of pins needed, we have to interface all 4 connectors of the icoBoard:  
This should be hopefully achievable with a rigid-flex adapter like this, the area where the BGA goes should be stiffened (and not bend like it does in this photo).







When the adapter is soldered on the board, the whole assembly would look like this:



In this case, the BGA chip would be on the downside of the adapter.

FAQ:

Q: Why should it be a flex or rigid flex adapter, instead of a rigid one?

A: The problem is that there are components next to the BGA footprint on the PCB, so I think that there is not enough space for additional FFC adapters on a rigid board. A stiffened Flex cable on the other hand should be able to break out of the valley more easily.

