

Caravel M.V.PCB

Sample of a minimum viable PCB for ASICs with Caravel on QFN. The REQUIRED support elements are:

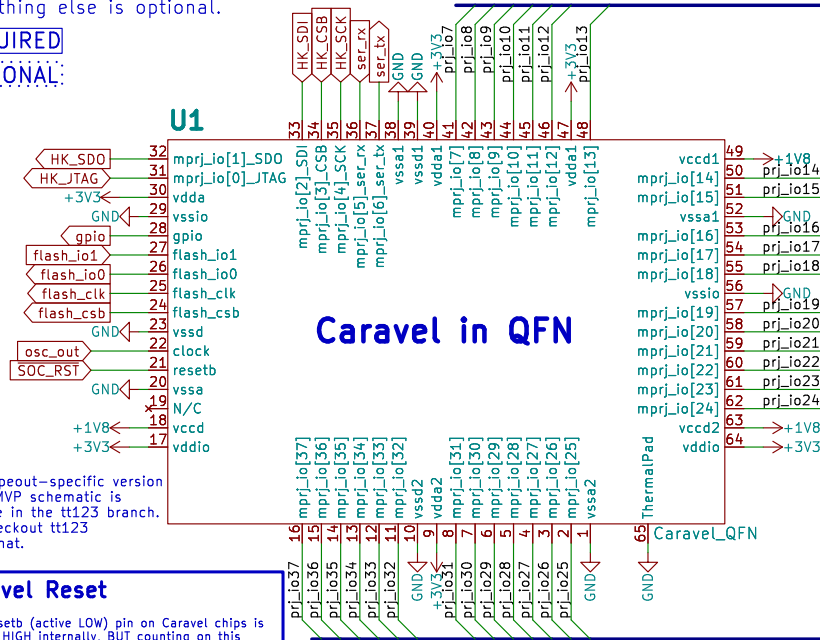
- * power: regulated 3v3 and 1v8
- * flash: some memory for executable
- * osc: a CMOS clock signal
- * a bit of reset management

and a way to access the HK SPI is a good idea, or some other way to program the flash (note that there will be SPI line contention if you try to access directly). Everything else is optional.

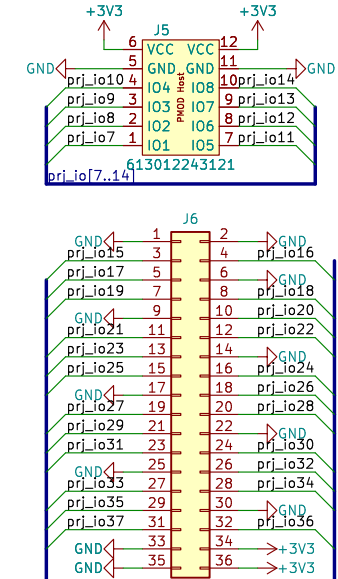
REQUIRED

OPTIONAL

Caravel in QFN



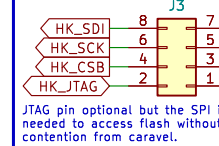
I/O headers



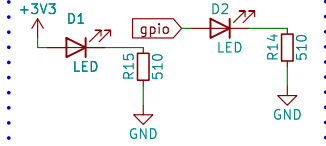
Sample I/O headers give access to all gpio pins from mprio[7] to mprio[37], on either the PMOD or the 2x18. Modify as required.

Housekeeping SPI

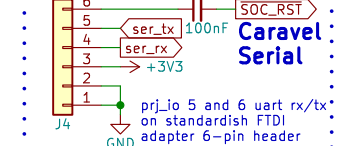
prj_io 0 to 4, special purpose, use to program flash



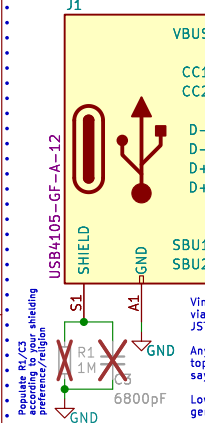
Power Good and GPIO LED



Caravel Serial



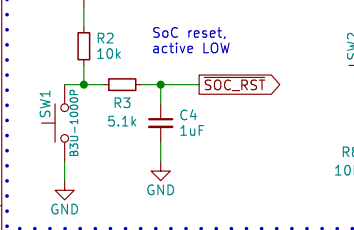
Power Supply



Vin may be provided via USB or basic JST or 100mil header. Any voltage suitable for top level LDO should do, say 3v3 <= Vin <= 15V here. Lower is more efficient, gens less heat.

Voltage regulators provide vdd* (3v3) and vcc* 1v8. These are staggered to allow for more efficiency on 1v8 regulation but should also allow backpowering via vdd*/3v3

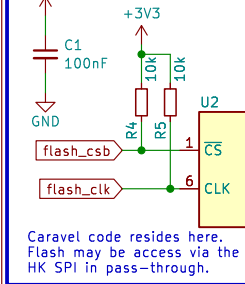
Debounced Switches



Sample active HIGH switch sent to GPIO37

A TinyTapeout-specific version of this MVP schematic is available in the tt123 branch. git checkout tt123 to use that.

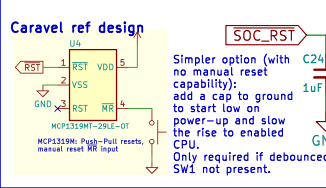
Flash Memory



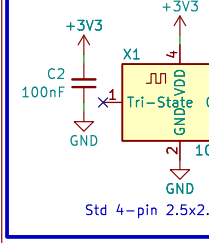
Caravel code resides here. Flash may be access via the HK SPI in pass-through.

Caravel Reset

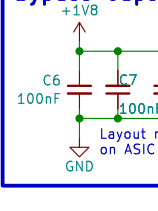
The resetb (active LOW) pin on Caravel chips is pulled HIGH internally, BUT counting on this is glitchy and dangerous. Caravel reference designs use a MCP1319M, as shown here, as a voltage supervisor to manage this and allow debounced reset switch.



CMOS Clock Osc



Bypass Caps



Fids for PnP

- FID1 Fiducial
- FID2 Fiducial
- FID3 Fiducial

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Sheet: /
File: caravel-mvp.kicad_sch

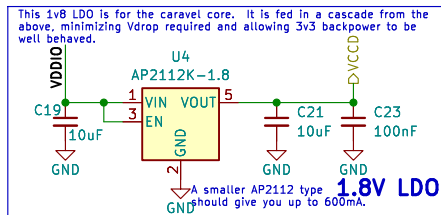
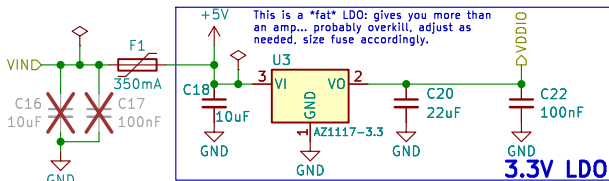
Title: Caravel Minimum Viable PCB Example

Size: A4
KiCad E.D.A. kicad 7.0.8-7.0.8-ubuntu22.04.1

Rev: 1.2
Id: 1/2

Voltage Regulators

Simple voltage regulation for logic and core. In a distinct sheet to allow you to easily do fancy stuff, like use switchers or whatever is needed.



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Sheet: /Power_Regulation/

File: power_reg.kicad_sch

Title: Voltage Regulation

Size: User Date: 2023-09-30

Rev: 1.1

KiCad E.D.A. kicad 7.0.8-7.0.8-ubuntu22.04.1

Id: 2/2