STAR Computerized Utility Module

ESP32-S3-FN8 Microcontroller
Solder wires to SPI flash as backup?
50 Ohm Impedance Matching

ESP32 Buttons
For proper boot + enable
Will be designed before flight
Also external header

SAM-M10Q Integrated GPS + Antenna

EMMC Module
Kingston 32GB+ 11.5x13
CLKnet is most critical
All signals should have same trace length
Use shortest signal length possible
wide spacing between signals

Cap X5R or X7R >6.3V, 0402, low ESL/ESR, close to C6 pin
DS only needed for HS400 enhanced mode (400MB/s)
DAT0-3 needed for 4 bit
DAT0-7 needed for 8bit (400MB/s)

Size should be standardized at 11.5x13mm
Any emmc should be compatible
so get cheapest for highest capacity
(FEMDNN128G-A3A56)
EMMC4.5 1 bit config (5MB/s max)

STM32H723 Peripheral Microcontroller
100nf as close to each VDD pin, 4.7uF connected to one
1uf connected to VDD33USB

Battery Voltage Monitor
Cannot use ADC2 as its used by wifi
Only GPIO1-10
Consumes only 21uA

Arming LED
Get away if this is on
mostly safety and debugging
for other arming warnings

3 x Barometers
In I2C Config (0x77)
MS5611 - 10cm accuracy
MS5607 - 20cm accuracy, same as on COTS flight controllers
1 x MS5607 for comparison to telemega for competition altitude
2 x MS5611 for dual redundancy, 1 high update rate, and 1 high accuracy
for kalman filter and very accurate 'real altitude' for airbrakes
Both are pin compatible, so should be a drop in replacement

LoRa1262 915mhz Module + Antenna
SMA for external
ideally AE2 for on board antenna
Matching check by u.fl

I2C

2S-6S LiPo Battery Connectors
must supply 400+mA
LM1086 = 1.5A
Test points for both Testing + 9V battery

SPI2   **UART1**

ESP32 USB-C Connector
Protections:
Overcurrent, Reverse current,
Overtemperature, Voltage spikes,
ESD, Noise Filter
Max 5V 3A, 15W

Voltage calculation:
+5V
= 1.35V (@A.5A) LDO
= 0.35 (@3A) Schottky
= 3.3V
Realistic Current draw from USB
is only around 1A

Screw Holes M3 Screws

CORDIC for atan2 function for quaternion euler conversion on bmi270
RNG + SHA256 encryption for secure wireless communication to ground station
USB high speed data
550MHz max clock speed
will handle all data aquisition and data processing
sends data to ESP32 via uart for wireless communication

Needs USB DFU option
Should have 6 pin plug of nails debug programmer
Should support JTAG / SWD
Preferably SWIM (single wire interface)
Final pins: USB support via switch on 1 usb, swd, and uart (via test pads and ESP

Seems like Boot0 high allows for programming via DFU
and boot0 low runs the program

ADXL375 Accelerometers
Decoupling Resistor = 100ohm
ADXL2 SPI on ADXL2 and 3
Not enough SPI pins, separate CS pins

BMI270 6 Axis IMU + BMM150 Magnetometer
4 Wire SPI to MCU
I2C sensor interconnect

Pyro Channel Outputs
What is the purpose of this circuit??
Isolated High Current Outputs
Wago connectors
Voltage can be 2s-6s lipo and outputs up to 20A
Low power loss
Simulation checked, Automotive certified
ESD protection built in and optoisolated
Overvoltage and Overheat protection with auto-restart
Current Sense + Fault Detection + Current limiting + Continuity check
Stage 1: main, drogue, staging
Stage 2: main, drogue, airstart (angle optimization)
100ms signal time ematch
250Dish ms signal staging

Pyro Channel must be disabled before sensing
SEN and SEL pins multiplex channels
Max 1.35A per channel

Title: Stage Sep. Flight Computer PCB
Conor Van Bibber
Size: A1   Rev: A
KiCad E.D.A. kicad (7.0.0)