Open source hardware and software PocketQube family of satellite modules

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UPSat

The first open source satellite
EPS, OBC, COMMS, ADCS and Structure
Deployed on May 2017 from ISS
Part of the QB50 flock
Currently in orbit
Intermittent operation due to power-safe mode
PocketQube

Let’s bring open source in PQ Ecosystem
PQ9
PQ9

https://gitlab.com/librespacefoundation/lsf-kicad-lib
PQ9
PQ9-ish

Because we CAN ;)
Dev Board

- Two PQ9 board stacks
- Configurable power source
- Coupling among board stacks

https://gitlab.com/librespacefoundation/pq9ish/
PocketQube COMMS

Combined COMMS/OBC module
SD Data logging
UHF Transceiver GFSK 9600 Reconfigurable with PA
RTC
Designed around STM32L476RGT

STM32 proven in space (UPSat and various other missions)

CAN bus:
  · 3 transmit mailboxes
  · 2 receive FIFOs with 3 stages
  · 14 scalable filter banks

FreeRTOS + HAL
System Blocks
AX5043 Transceiver

- 27 MHz -1050 MHz Bands
- FSK, 4-FSK, GFSK
- MSK, GMSK
- ASK
- AFSK
- FM
- PSK
- Data Rates from 0.1 kbps to 125 kbps
- Optional Forward Error Correction (FEC)
- 16 dBm Power Level in 0.5 dB Steps
CAN bus

Added both options for testing

Single line CAN bus allows dual CAN bus operation

Bus speed up to 1Mbps (UART 204kbps)

Multiple application layer options

  UAVCAN best candidate due to developed ecosystem

  Open libraries using STM32 HAL
CAN bus connection
Transceiverless CAN
Transceiverless CAN

Siemens AP2921
Author: Dr. Jens Barrenscheen
Generic sensor module

- I2C
- UART
- 2 Controlable Power lines
- 2 PWM power lines
- 8 (4 differential) ADC channels
- 3.3V Buck/Boost DC/DC converter
- Secondary Buck/Boost DC/DC converter
DummyPS

- Testing PQ9ISH modules
- No Logic or MCU
- Solar MPPT battery charger
- 2 DC/DC buck/boost converters
- Powers V1 & V4 from DC/DC or VBat/VSolar
What’s next

● Move to COMMS version 1.0
  ○ Expose more STM32 connectivity
  ○ Reduce RF components
  ○ Add RF shield

● Verify and Test
  ○ Vacuum and thermal testing
  ○ High-altitude balloon and rocket flights
  ○ Fly to space on a mission