



mini_Fieldhub Status

Kalle Sulanke, Marko Kossatz
August 2019

mini_Fieldhub Development, Motivation



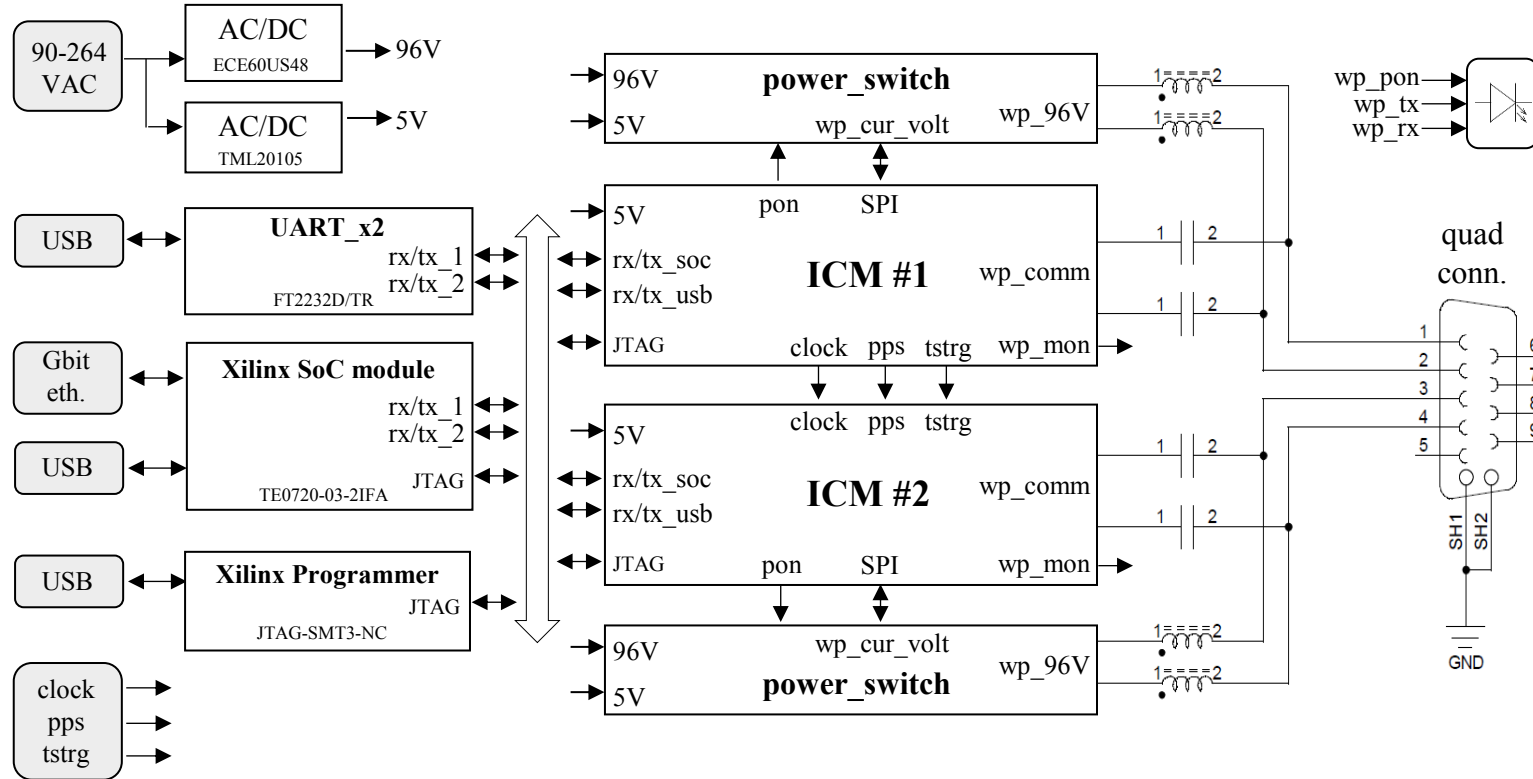
- ❑ saving time and money by using existing hardware modules
- ❑ getting a device, which has all the features of the final design already, allowing:
 - ❑ cable testing, incl. crosstalk evaluation
 - ❑ time calibration tests
 - ❑ firmware / software development
 - ❑ FAT for all types of inice devices, using the ICM as comm. interface
- ❑ will be distributed to labs, being involved in hardware / software development

mini_Fieldhub, Main Features



- ❑ box, 19" x 1u, (1u=44.45mm)
 - ❑ to be used indoors only
- ❑ interfaces:
 - ❑ 84-265 VAC, 50-60 Hz
 - ❑ USB #1, two direct terminal connections to ICMs
 - ❑ USB #2, Xilinx programmer, hardware is onboard
 - ❑ USB #3, SoC module
 - ❑ 10/100/1000 Mbit ethernet, SoC module
 - ❑ clock / pps / time string
 - ❑ cable connection for two wire pairs (DSUB) -> up to 8 in ice modules
 - ❑ IceCube „standard“ pinout
 - ❑ status monitoring LEDs, power and comms

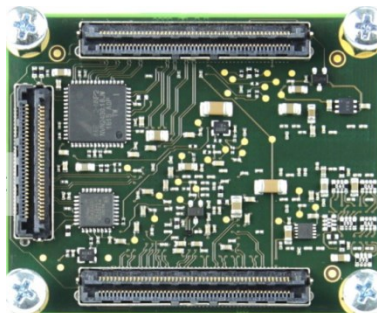
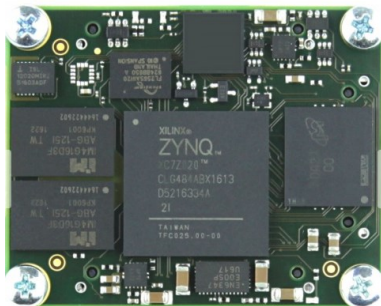
mini_Fieldhub Blockdiagram



TE0720-03-2IFA, Xilinx FPGA Zynq based SoC module

Key Features

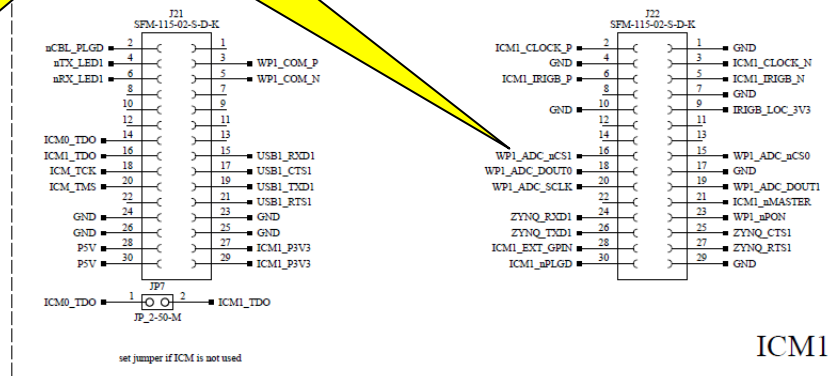
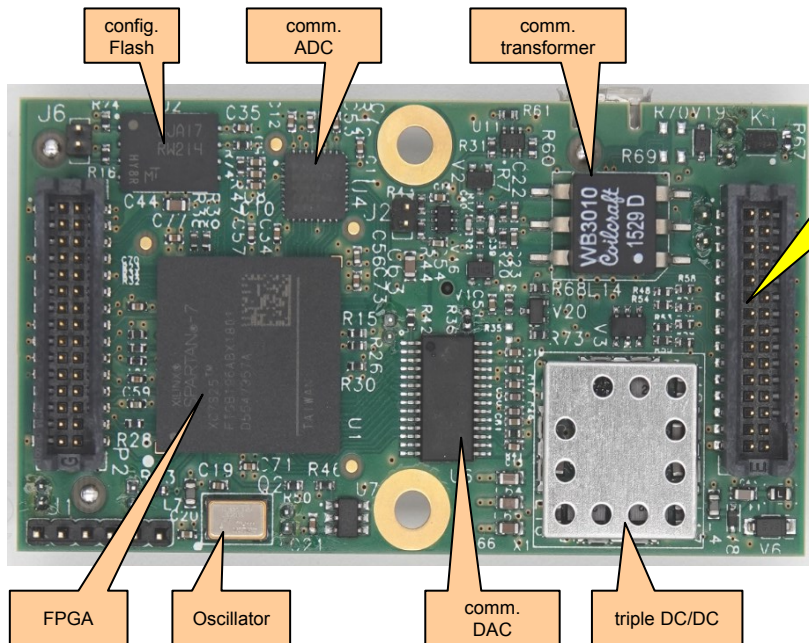
- Xilinx Zynq XC7Z020-2CLG484I
- Rugged for high shock and vibration
- ARM dual-core Cortex-A9 MPCore
- 10/100/1000 tri-speed Gigabit Ethernet transceiver (PHY), SGMII accessible on a board-to-board connector
- USB 2.0 high speed ULPI transceiver
- 32-Bit-wide 1 GByte DDR3 SDRAM
- 32 MByte QSPI Flash memory (for configuration and operation)
- 4 GByte e.MMC (up to 32 GByte)
- Plug-on module with 2 x 100-pin and 1 x 60-pin Razor Beam High-Speed hermaphroditic Terminal/Socket Strips (regular 4 mm)
- 152 FPGA I/O's (75 LVDS pairs possible) and 14 MIOs available on board-to-board connectors



Industrial and automotive grade: -40°C to +85°C.

signals redefined, wire pair slow control:

- „cable plugged“
- 96V on / off
- current measurement
- voltage measurement
- Rx / Tx / power LEDs

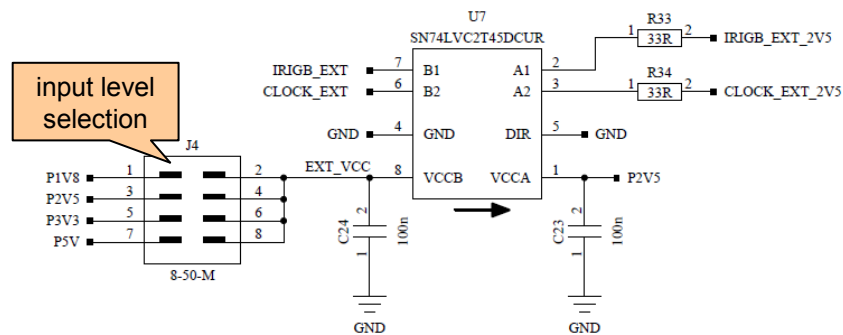
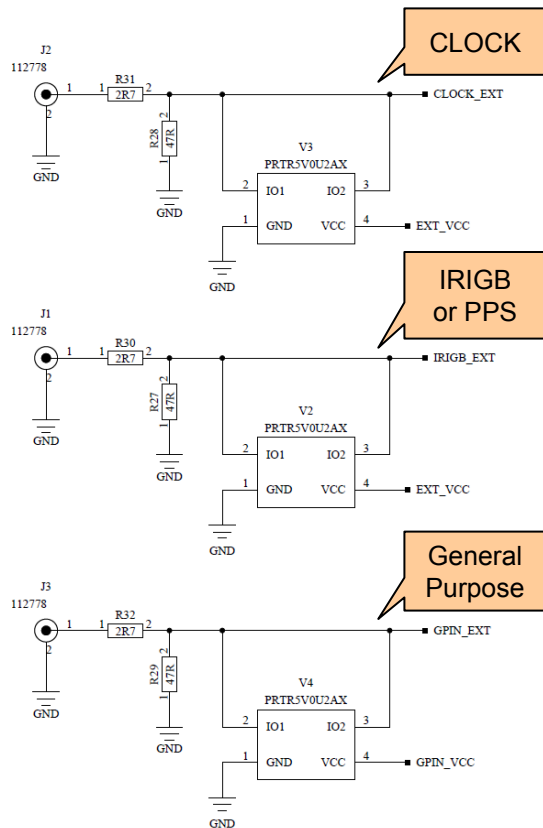


ICM1

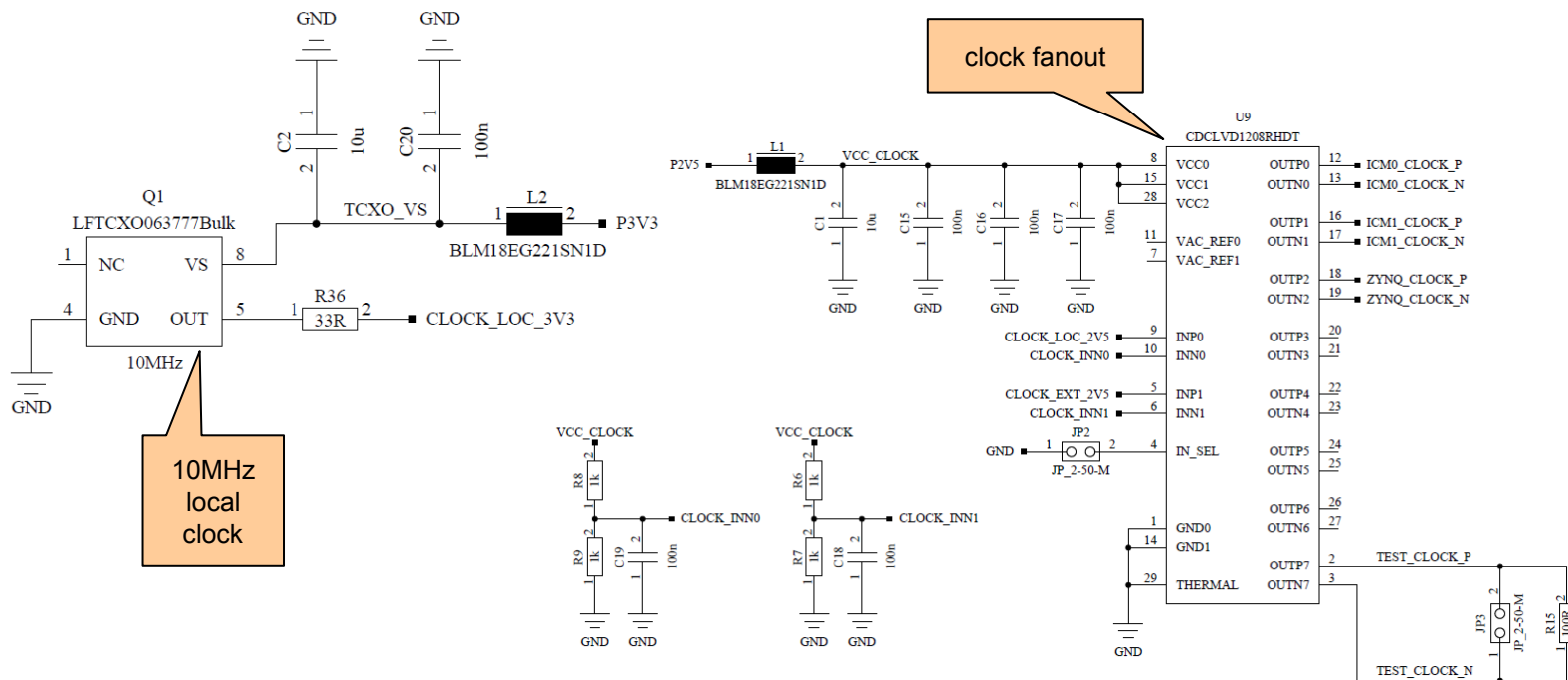
ICECUBE
UPGRADE



Timing Signals (BNC inputs)



Clock Distribution



Local Clock

- ❑ 10MHz local oscillator, LFTCXO063777

Frequency Parameters

- Frequency 10.0MHz
- Frequency Tolerance $\pm 0.50\text{ppm}$
- Frequency Stability $\pm 0.14\text{ppm}$
- Operating Temperature Range -40.00 to 85.00°C
- Ageing $\pm 0.02\text{ppm}$ max per day, $\pm 1\text{ppm}$ max per year

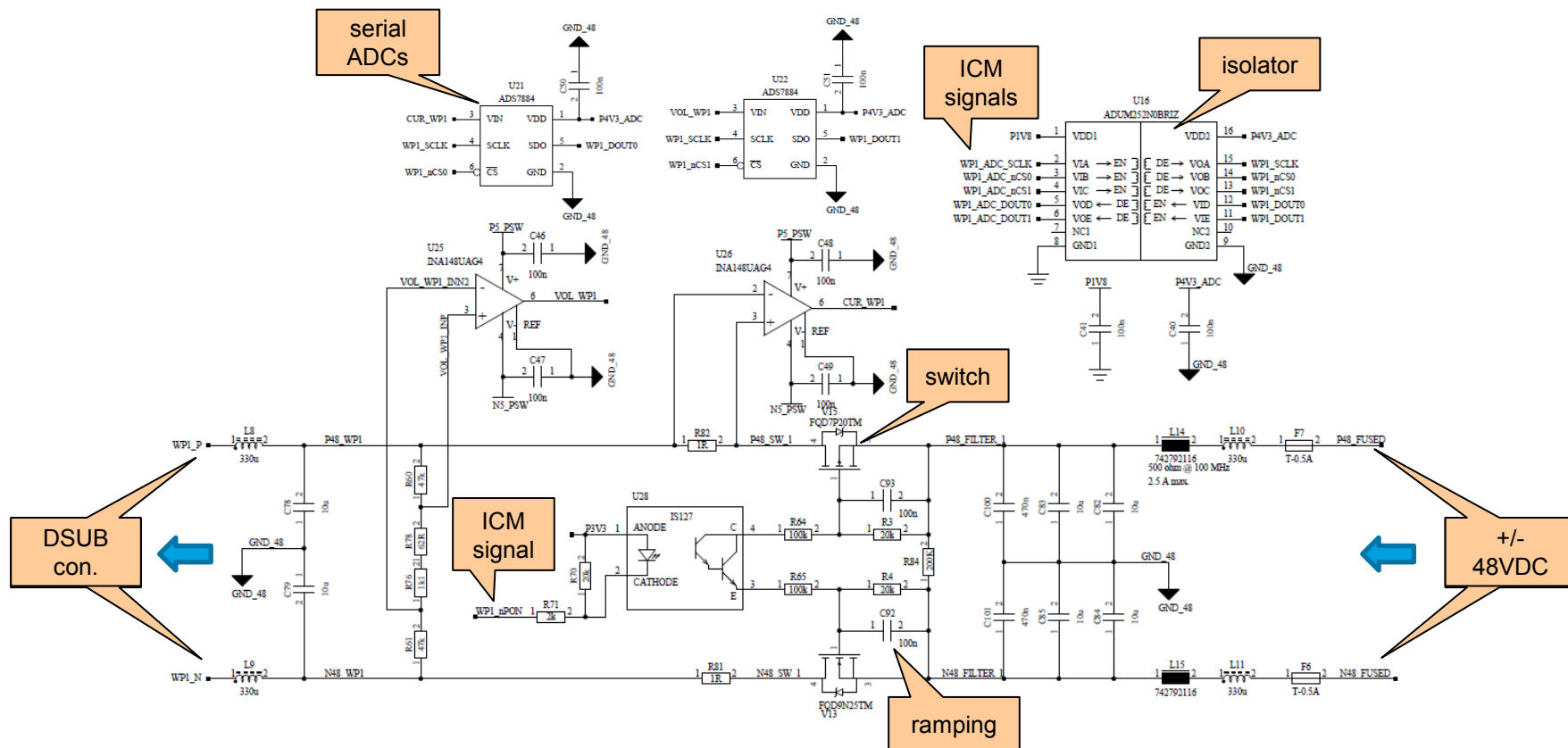
Noise Parameters

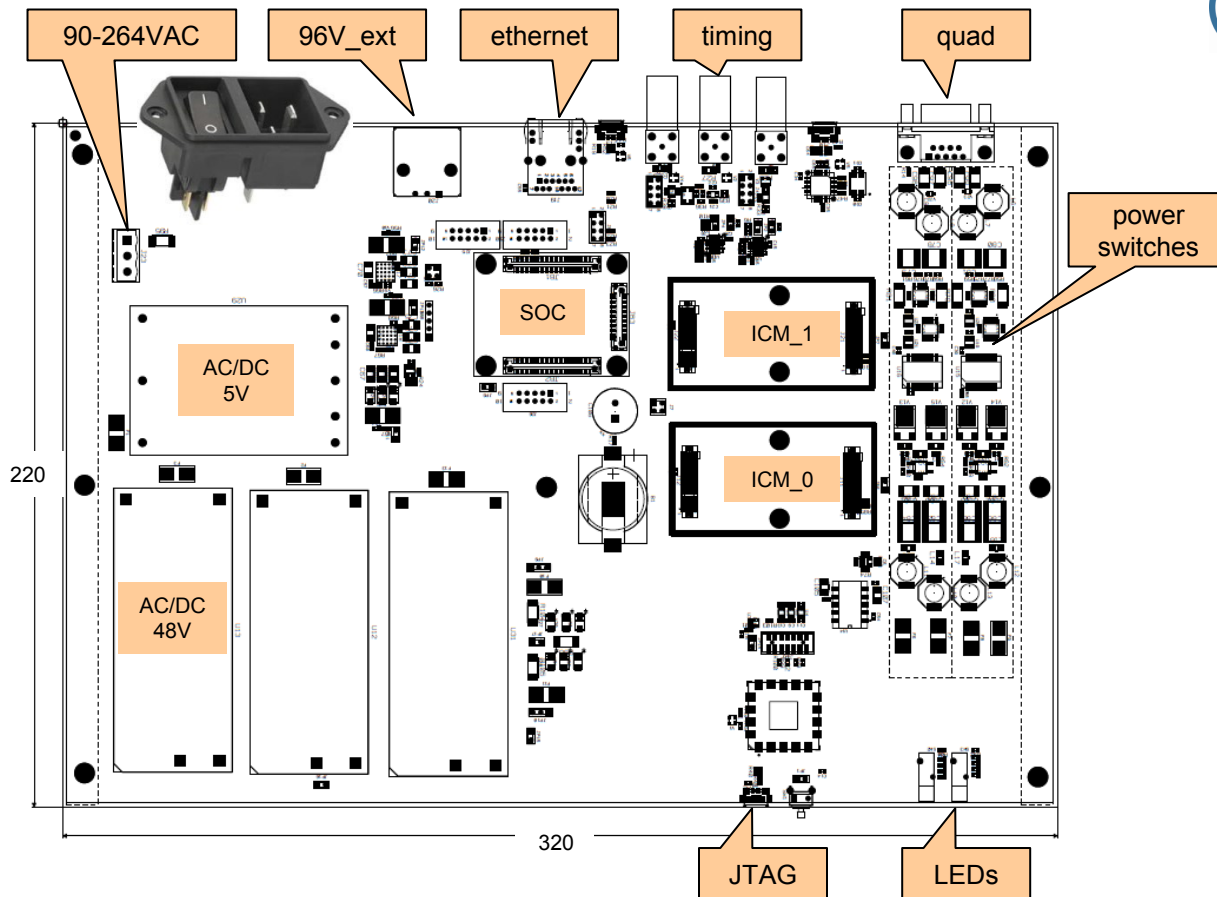
- Phase Noise (@ 10MHz typ):
 - 90dBc/Hz @ 10Hz
 - 115dBc/Hz @ 100Hz
 - 135dBc/Hz @ 1kHz
 - 145dBc/Hz @ 10kHz
 - 148dBc/Hz @ 100kHz
 - 150dBc/Hz @ 1MHz

❑ clock fanout, CDCLVD1208RHDT

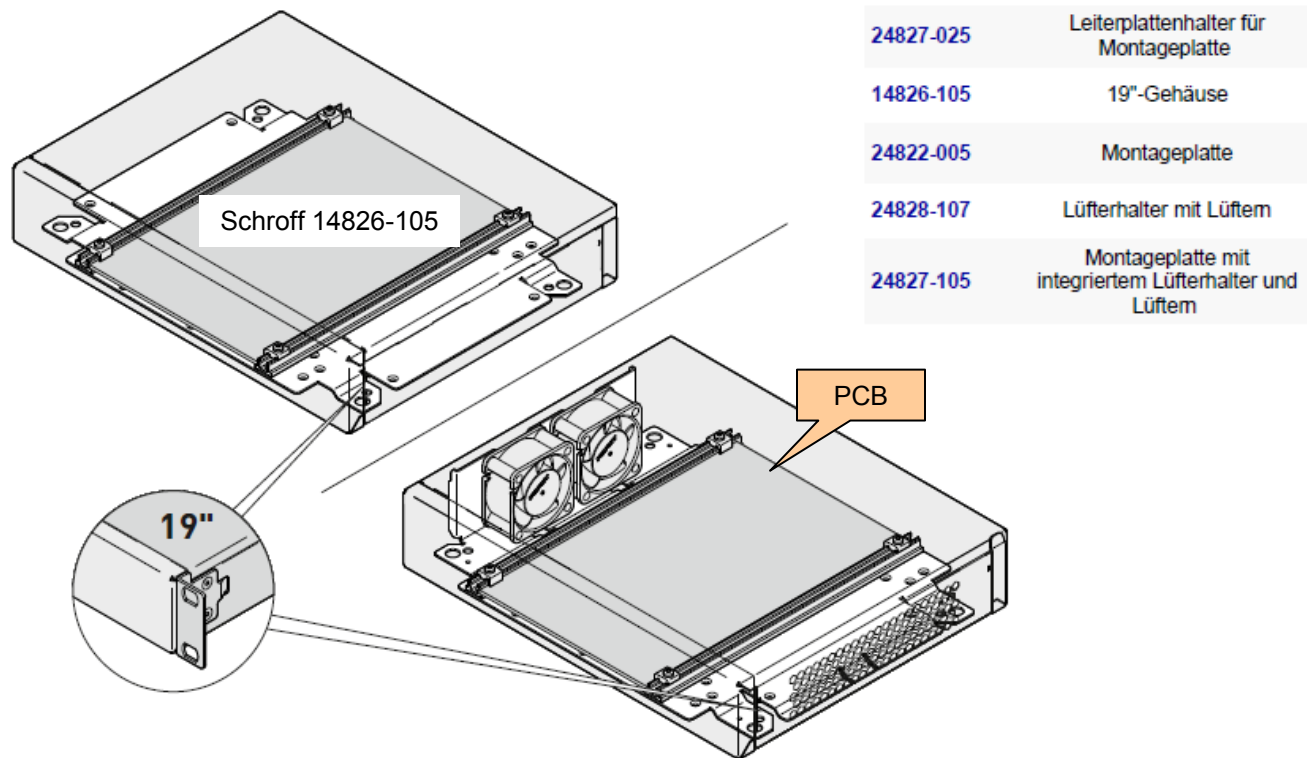
- **2:8 Differential Buffer**
- **Low Additive Jitter: <300 fs RMS in 10 kHz to 20 MHz**
- **Low Output Skew of 45 ps (Max)**
- **Universal Inputs Accept LVDS, LVPECL, LVCMOS**
- **Selectable Clock Inputs through Control Pin**
- **8 LVDS Outputs, ANSI EIA/TIA-644A Standard Compatible**

Wire Pair Power Switch





Mechanics, 19" x 1u, (also used for the TAXI-board)



mini_Fieldhub, Design Status and Plans



- ❑ PCB design (by Anakonda GmbH) started
- ❑ first assembled board, end of September
- ❑ planning for 12 mini_Fieldhubs
 - ❑ two should be sent to each of the involved labs
 - ❑ UW, MSU, PSU, Chiba, Munich, DESY
- ❑ some critical parts (AC/DC converters) procured already
- ❑ SOC firmware / software design by Marko Kossatz
- ❑ sharepoint: [mini_Fieldhub](#)

Thanks !