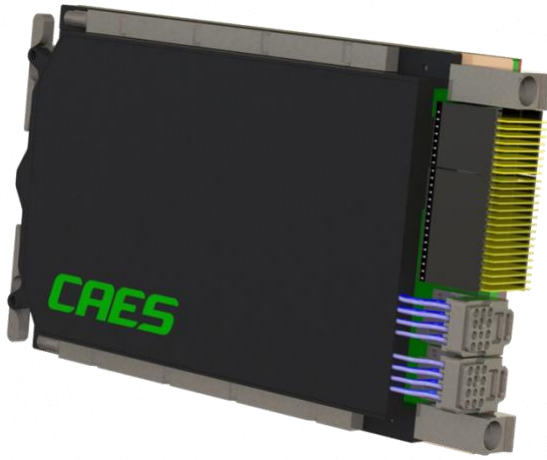# TORNADO – Direct-to-Digital RF Converter x4 PCIe/x8 LVDS
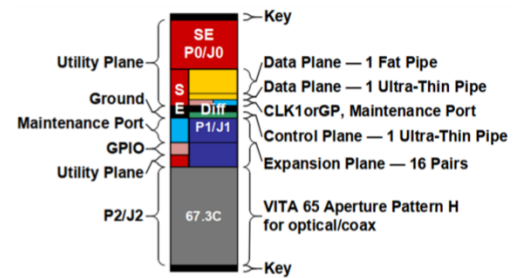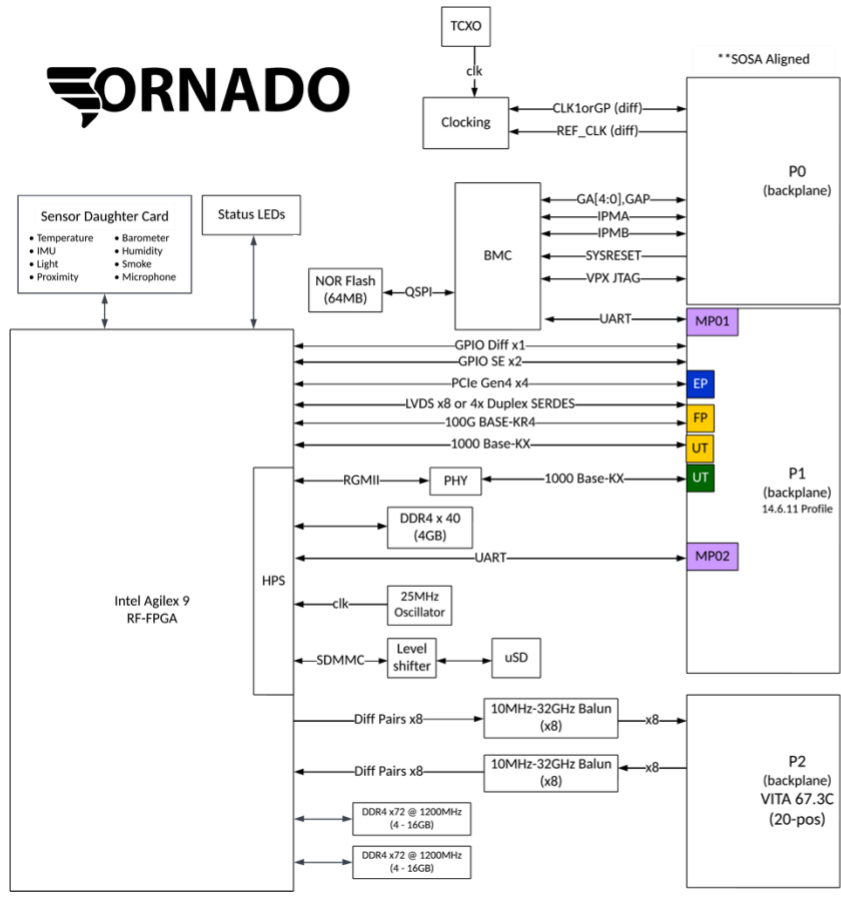
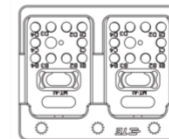≋ORNADO

Model#: 3U-MCP2-64GSPS-xTxR-C-LP

Unlock the true potential of your radar, communication, Electronic Warfare (EW) and Signal Intelligence (SIGINT) solution with CAES' state-of-the-art TORNADO, a direct-to-digital data converter.

Designed to meet the stringent requirements of the latest defense and aerospace applications, TORNADO boasts an unprecedented 8x transmit and 8x receive channels supporting up to 64 GSPS with 32 GHz bandwidth, paired with a 9th Generation Intel Agilex™ FPGA in a 3U, conductive cooled, VPX, SOSA aligned configuration.

System Block Diagram

TORNADO

Intel's Agilex™ 9th FPGA Direct RF-Series is a highly integrated solution that combines an FPGA fabric and an RF transceiver in a single package. It is designed to address the growing demand for flexibility and programmability in radar, communications, EW, and SIGINT systems. The FPGA fabric allows for dynamic reconfiguration, enabling the device to support a multitude of defense and commercial applications. The integrated 64 GSPS RF transceivers (ADC and DAC) provide high-speed connectivity and support a broad range of frequencies, making it suitable for use in diverse applications. With Intel's Agilex™ 9th Direct RF-Series, system designers can reduce development time and costs while also improving system performance and flexibility.

Performance
- 8 ADC, 8 DAC – 64 GSPS
- Bit Resolution: 10/10
- Power: 170W*
- Hardened BFLOAT16 and up to 25 TFLOPS
- Intel's 2nd Gen Hyperflex architecture
- 40/100 GbE full-duplex FPGA
- Gen 4 PCIe x4
- LVDS x8
- 16GB (2 ch.) DDR4 FPGA (32GB optional)
- 4 GB DDR4 HPS
- 1 GbE HPS
- 1 GbE FPGA
- HPS micro-SD
- BMC

Mechanical / Electrical
- 3U OpenVPX, VITA 48.2 conduction cooled
- SOSA aligned
- 14.6.11-n backplane profile
- Power source +12V

CAES Advanced Solutions
- Full Board Support Package (BSP)
- Advanced algorithm development – Digital Signal Processing (DSP)/artificial intelligence algorithms
- Drivers to enterprise software solutions
- Design customization
- Ruggedization
- Industry leading manufacturing and test

What's Included
Hardware
Tornado board
- Intel Agilex™ 9th AX direct-to-digital FPGA (OPN: AGRW027R28A3I3V)
- 16GB DDR4 (2 ch.) (32 GB optional) FPGA
- 4 GB DDR4 – HPS
- Up to 16x 10 Mhz – 32 GHz Baluns
- Conduction-cooled
- Sensor micro-daughter card (optional)
    - Temperature
    - IMU
    - Light
    - Proximity
    - Barometer/pressure
    - Humidity
    - Smoke
    - Microphone

Software/Firmware
Board Support Package (BSP)
- Device drivers
- Memory controllers
- I/O interfaces
    - PCIe
    - LVDS
    - 100 GbE+ 2x 1GbE
- Interrupt handling
- Device tree/hardware description
- Board-specific configuration files, libraries, and utilities
- Board management commands as defined in VITA 46.11
- HPS Linux OS (version TBD)

Documentation
- User's manual
- Warranty
    - 1-year manufacturer's warranty

* Assumes moderate FPGA utilization