AIONYX

Factsheet

Hive-M

The AIONYX Hive M is a compact, highly modular device engineered for high-performance applications. Its advanced architecture, combining FPGA technology with 4 x ARM Cortex-A53 processors and field-proven NetTimeLogic IP Cores, offers exceptional modularity to meet a wide range of customer requirements. This makes it an ideal solution for laboratory environments, testing, measurement and high-performance networking applications. Designed with customizable configurations, the AIONYX Hive-M delivers maximum flexibility and adaptability. It includes up to two performance slots for AIONYX ZM Modules and four extension slots for AIONYX PM Modules, which support a large range of functionalities, including GNSS Receivers, Clock/RTC Modules, and a variety of Input/Output Modules.

Key Features

- 10/100/1000 BASE-T RJ45 Ethernet Management Port
- **USB-C connector:** Admin access to the CPU and FPGA
- **Modular Design with Flexible Configurations:** Easily adaptable to various needs
- **Two Performance Slots:** Compatible with AIONYX ZM Modules
- **Four Extension Slots:** Supports AIONYX PM Modules for added flexibility
- **FPGA Fabric with Quad-Core ARM Cortex-A53:** High performance and versatility for demanding tasks
- **Isolated Power Supply (9-36V DC):** Flexible power options for different environments
- **Web Interface for Configuration and Monitoring:** Configure via UVM with an intuitive dashboard

Example Configurations

TSN Switched End-Node

- Two switched network ports with redundancy support
- One uplink network port
- One monitoring port
- GNSS Backed TSN Node (Furuno, ComNav or u-blox)
- High-stability oscillator and low-power RTC with 10 MHz and PPS output
- 16x customizable GPIO pins for sensors or actuators

Redundant Grandmaster:

- PTP Slave/Master, NTP Client/Server, PPS Slave/Master, IRIG Slave/Master. etc.
- Parallel Redundancy Protocol (PRP) or the High-availability Seamless Redundancy Protocol (HSR) fully in hardware
- 1x GNSS Reference + 1x GNSS Backup Reference
- High-stability oscillator and low-power RTC with 10 MHz and PPS output
- 2x SMA Inputs or Outputs for any status or control

HSR/PRP RedBox/QuadBox • Two redundant 10/100/1000 BASE-T RJ45 ports • Two redundant 100/1000 BASE-X SFP ports • Support for PRP and HSR with optional ModeX • RedBox support for up to 256 Nodes • Optional PTP Support • GNSS Reference	
Edge Server • High-performance SOC device • Large FPGA for accelerated data processing • Quad-Core ARM Cortex-A53 • 4 GB 64-bit DDR4 • Dual-core Arm Cortex-R5F MPCore (up to 600 MHz) • 5x 10/100/1000 BASE-T RJ45 ports (4 via FPGA, 1 directly to CPU)	

Specification

General

Dimension	165 x 105 x 80 mm (L x W x H)
Weight	1000 g
Housing	Anodized Aluminum
Operating Temperature	0–50 °C
Cooling	Passive Cooling via Headspreader
Humidity	10%-90% (no condensation)
Status/Alarms	3x RGB Status/Alarm LEDs, 1x Power Good indication

Power

Power Connector	9-36V DC
Power Consumption	Typically 15W @ 24V DC

Management/Configuration

USB/UART	FPGA: UCM (NetTimeLogic's Universal Configuration Manager) CPU: Terminal
UART	Command Line via UCM Protocol (ASCII based, allows to use a standard Terminal)
Ethernet	UVM (NetTimeLogic's Universal Web Manager) is a powerful web interface that features user management, statistics, and a customizable dashboard. SSH

Network Interface(s)

Default/Management	1x 10/100/1000 BASE-T RJ45
PTP Option	PTP Master or Slave (Multi-Port)
NTP Option	NTP Server or Client (Multi-Port)
Redundancy Option	HSR and PRP redundancy protocol according to IEC 62439-3 rev 3 Frame Replication & Elimination for Reliability (FRER) according to IEEE 802.1 CB Optional Redbox or Quadbox support
TSN Option	3 Port (2 redundant ports and 1 uplink) Switched End-Node or 1 Port End-Node Frame scheduling according to IEEE 802.1 Qbv Cyclic forwarding according to IEEE 802.1 Qch Credit based shaper according to IEEE 802.1 Qav Frame preemption according to IEEE 802.1 Qbu and IEEE 802.3 br Synchronization with sub-microsecond accuracy according to IEEE 802.1 AS Frame Replication & Elimination for Reliability (FRER) according to IEEE 802.1 CB

Reference Input Options

GNSS	L1, Multi-Constellation (GPS, GLONASS, Beidou, Galileo)
PTP	Slave Device for following Profiles/Modes: Default Profile: Layer 2 (Ethernet) and Layer 3 (Ipv4, Ipv6) support Power Profile: C37.238-2011 and C37.238-2017 including VLAN support Utility Profile: including HSR and PRP tag handling IEEE802.1AS: including IEEE802.1CB tag handling ITU: G8275.1, G8275.1 and G8275.2: 4096 Nodes at 128 frames/s One Step and Two Step support Peer to Peer (P2P) and End to End (E2E) delay measurement

NTP	SNTP Client according to RFC 4330/5905 IPv4 and IPv6 Support for Unicast or Multicast NTP mode
IRIG	IRIG-B006/IRIG-G006 format (compatible with B004, B005, B006 and B007 IRIG-B Masters)
PPS	PPS Slave with Accuracy Encoding or embedded PPS
CLK	Reference Clock Input (100Hz – 10MHz)
DCF	DCF-77 Slave

Reference Output Options

GNSS	Generating NMEA Messages including NMEA UTC
PTP	Master Device for following Profiles/Modes: Default Profile: Layer 2 (Ethernet) and Layer 3 (Ipv4, Ipv6) support Power Profile: C37.238-2011 and C37.238-2017 including VLAN support Utility Profile: including HSR and PRP tag handling IEEE802.1AS: including IEEE802.1CB tag handling ITU: G8275.1, G8275.1 and G8275.2: One Step and Two Step support Peer to Peer (P2P) and End to End (E2E) delay measurement
NTP	Server according to RFC 4330/5905 (NTPv4) IPv4 and IPv6 Support for Unicast, Multicast or Broadcast NTP mode
IRIG	IRIG-B007 and IRIG-G006 format (compatible with B004, B005, B006 and B007 IRIG-B Slaves)
PPS	PPS Master with Accuracy Encoding or embedded PPS
CLK	Reference Clock Output (100Hz – 10MHz)
DCF	DCF-77 Master

Network Performance

PTP ITU	4096 Nodes at 128 frames/s
CSPTP	~1'000'000 requests/s
NTP	~1'000'000 requests/s

Typical Synchronization Accuracy

GNSS	+/- 50 ns
PTP	+/- 25 ns
NTP	+/- 500 ns
IRIG	+/- 50 ns
PPS	+/- 10 ns
CLK	+/- 10 ns
DCF	+/- 100 us

Typical Signal Accuracy

Timestamping	Signal Timestamping Resolution: 1 ns
Signal-/Frequency Generation	Signal-/Frequency Generation resolution: 1 ns Frequencies up to 10 MHz

Holdover

Holdover after 10h locked	< 10 us within 24h (with Clock/RTC module)
Holdover after 7d locked	< 1 us within 24h (with Clock/RTC module)

Performance Slot Options (2x)

RJ45 Ethernet	2x 10/100/1000 PHY with RJ45 connection and SyncE support
SFP Ethernet	2x 100/1000 PHY with SFP connection and SyncE support

Extension Slot Options (4x)

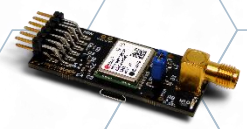
GNSS Receiver	Furuno GT88, ComNav K801 or u-blox M9N
Clock/RTC	SiT5356 (100 ppb precision MEMS Super-TCXO) and RV-3028-C7 (extremely low-power (45nA) RTC)
Input/Outputs	Per slot following configurations are possible: 8x 3.3V IOs (PMOD Connector) 6x 1.65V-5.5V IOs with external Voltage (3.3V with internal Voltage) 2x 1.65V-5.5V SMA IOs with external Voltage (3.3V with internal Voltage) 1x Fiber Optical Input from DC up to 50MBd 1x Fiber Optical Output from DC up to 50MBd
Ethernet	10/100BASE-T RJ45 with PM ETH
DPLL	AD9544 with two SMA Outputs

Your Vision, Our Tailored Solutions!

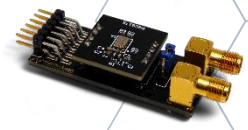
AIONYX Extension Slot Module Options

PM Furuno GT88

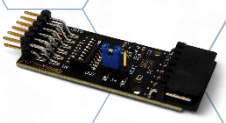
PM ComNav K801



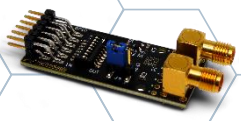
PM u-blox M9N



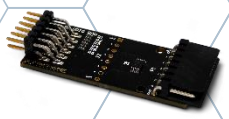
PM CLK RTC



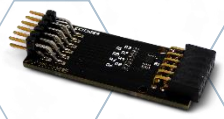
PM GPIO



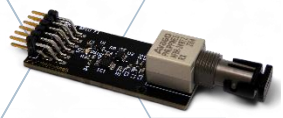
PM GPIO SMA



PM GPIO RAW

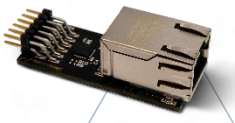


PM Extender

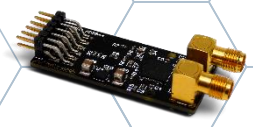


PM GPIO FI

PM GPIO FO

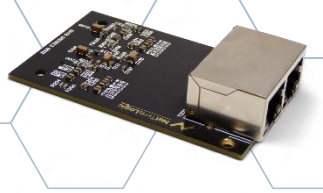


PM ETH

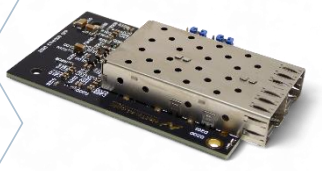


PM AD9544

AIONYX Performance Slot Module Options



ZM ETH 1000 RJ45



ZM ETH 1000 SFP

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