Company: Orca Technologies AS
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Orca Core

The Orca Core is a Smart Navigation Hub that turns your tablet and phone into true chartplotters.

In brief

The Smart Navigation Hub - Orca Core connects wirelessly to your Orca App and upgrades it to a true chartplotter.

High-precision navigation - The built-in GPS and Motion Processor makes for an accurate and reliable navigation experience.

Boat Connected - Compatible with thousands of NMEA 2000 devices, from transducers to wind sensors and engine gateways.

Wireless Autopilot - Control autopilots from all major manufacturers.

Multiscreen Experience - Use it with all your devices, seamlessly synced and ready for your next adventure.

Product Description

At Orca, we are building a navigation device for recreational boaters. It consists of software and three individual hardware components: A tablet, docking station, and a sensor hub - Orca Core.

- The Orca Core is a proprietary hardware module that runs on a Variscite SOM and has a built-in GPS receiver, 9-axis IMU with an integrated compass.
- The Orca Core integrates with other boat sensors such as a GPS antenna, AIS receiver, transducers, autopilots, and wind sensors over a CANBUS interface called NMEA 2000.
- The Orca Core broadcasts the sensor data via WiFi or Bluetooth to connected devices; either the Orca Tablet or a personal mobile or tablet device running the Orca Application.
- The Orca Core has an Ethernet interface for future use cases - connecting with the radar system aboard.
- The Orca Core also has internal processing and storage capabilities that allow it to record, process, and package sensor data for transfer to a client device so it can be uploaded to the Orca Cloud.

The Orca Sensor Hub has no batteries. It needs to be always powered by the boat network. The input power to the sensor hubs comes from the general boat electric network. It changes from boat to boat, but it typically consists of a 12V or 24V network controlled by the main switch.

Operational description

The Orca Core is a Smart Navigation Hub that seamlessly integrates with the Orca App to transform tablets and smartphones into advanced chartplotters. Designed for precision navigation, it uses built-in GPS chip and a motion processor to ensure reliable and accurate location tracking. The Orca Core connects to various boat sensors and systems via the NMEA 2000 network, enabling comprehensive monitoring and control of the boat's navigation and performance systems. Additionally, the Core sends crucial data such as GPS, motion, sail data and navigation data to the NMEA 2000 network, allowing other connected devices and systems to utilize this information for enhanced functionality. The data collected from these sensors is broadcasted via WiFi, Bluetooth, or Ethernet to connected devices running the Orca App, ensuring real-time updates and seamless synchronization across multiple screens.

Functionality

GPS - Orca Core is precision-engineered for accurate and reliable navigation. With a location accuracy of less than 3 meters, the Core is twice as accurate as a traditional chartplotter, and four times more accurate than your phone and tablet[1].

Integration with boat devices - The Core connects to thousands of devices, from transducers to wind sensors and engine gateways via NMEA 2000. Set up flexible instrument panels on your phone and tablet, and tailor each instrument just the way you want – with perfect legibility day and night.

Sailing Intelligence - Orca Core's built-in motion processor powers advanced sailing instrumentation and next-generation sailing intelligence. Motion Compensated Instruments, Dynamic Filtering, and Adaptive Laylines help you take better decisions in demanding conditions.

Autopilot remote control - Use your phone and tablet as an autopilot remote to control your boat wirelessly. Orca supports full autopilot control for all major autopilot manufacturers.

Multiscreen support - The Core supports up to five simultaneously connected devices – giving you limitless freedom to navigate the way you like it. All devices are seamlessly synced, even when you are offshore and outside internet coverage.

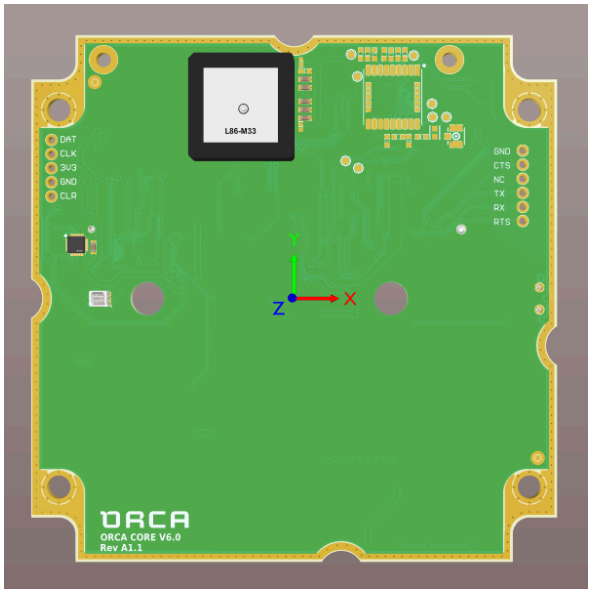
Easy installation - The Core is designed for easy installation and integration with your existing electronics. Orca's installation team is available for assistance via chat and video before and during installations.

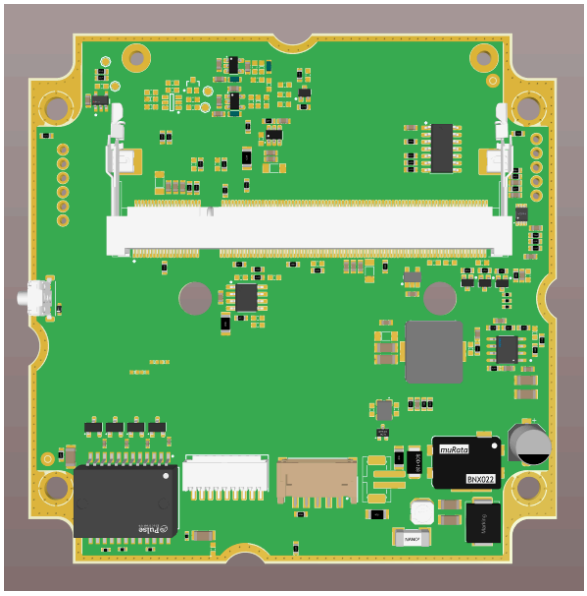
Hybrid AIS - Orca is the world's first navigation system with Hybrid AIS. Hybrid AIS augments AIS data from your onboard AIS receiver with internet-based AIS to give you extended range, photos, and detailed voyage information for target vessels.

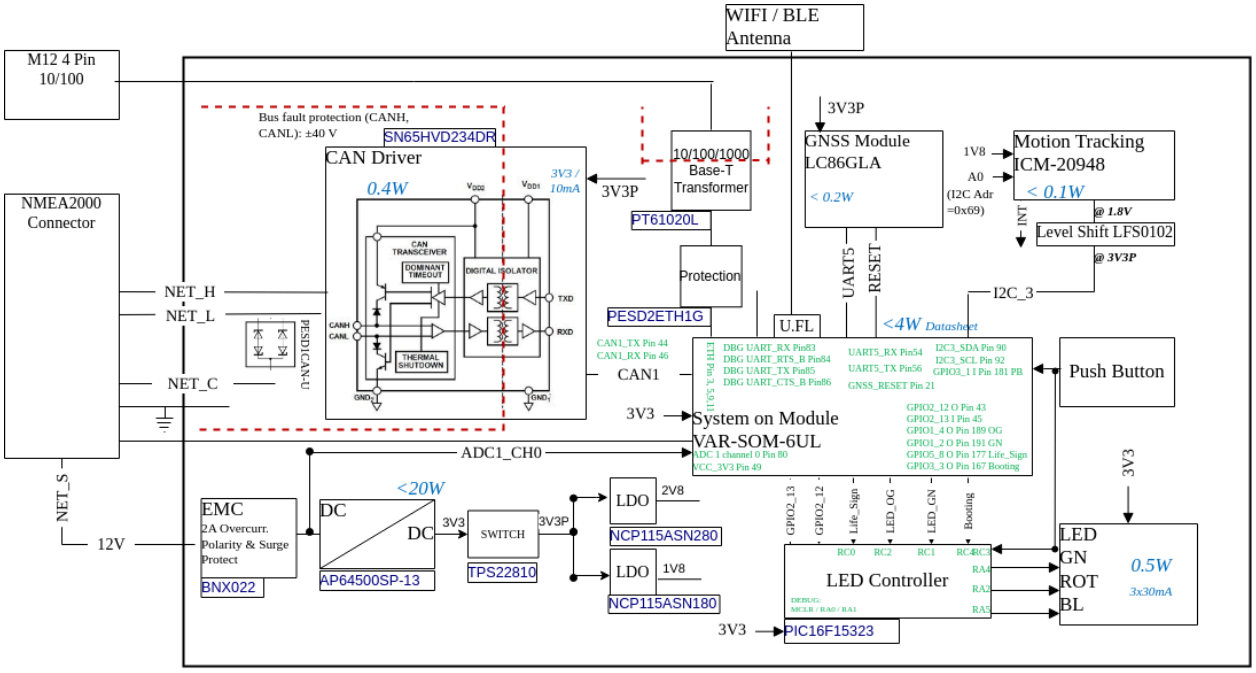
Tech information

- Size: 118 x 118 mm footprint. 35 mm height + 15 mm with mounting bracket
- Mounting options: Drill-through mounting bracket and industrial grade 3M bonding tape
- Internal sensors: 9-axis inertial motion unit, compass & 10Hz GNSS receiver
- Wireless connectivity: WiFi 2.4GHz and BLE 4.2
- Physical connectors: 1x NMEA2000 Micro-C port (1 LEN), 1 x M12 Ethernet connector
- Processor: 800MHz single core ARM
- Storage and RAM: 8 GB internal storage, 512 MB SDRAM
- Power: 9-32.2 V DC supply voltage. Approximately 200mA consumption
- Operating temperature: -15 to 60 ℃
- Waterproofing: IPX6

Electrical & Block Diagram







The Orca Core's internal design includes the following key components:

1. **Power Supply**: The system is powered by a wide-range input DC-DC converter, ensuring stable operation with an input voltage of 9-32V (up to 6-40V). Voltage regulators provide necessary 3.3V, 3.3VP, 2.8V, and 1.8V power to various components.
2. **System on Module (SoM)**: The core of the Orca Core is powered by the VAR-SOM-6UL module, which includes the i.MX 6UL Y2 processor running at a maximum of 792MHz. The module utilizes crystals and oscillators provided by Variscite; there are no external crystals on the PCB. According to Variscite's block diagrams, only one external 32 kHz oscillator is added to power the WiFi and Bluetooth module, operating on the 3.3V domain.
3. **Wireless Communications**: Powered by the Variscite SOM using a Ezurio Sterling LWB single-band chip, the Orca Core supports WiFi 2.4 GHz and Bluetooth 4.2. It is equipped with a Ezurio 001-0014 FlexPIFA antenna, featuring a peak gain of 2dBi, a frequency range of 2400-2480 MHz and linear polarization. The WiFi operates in 802.11 b/g/n modes.
4. **NMEA 2000 Network**: This interface provides the device power supply and a CAN interface to communicate with boat networks. Being compliant with NMEA 2000, it runs at 250 kbps and operates on the 3.3VP domain.
5. **Ethernet Connector**: The device features a 10/100 Mbps Ethernet connection using an M12 4-pin connector. The PCB design includes protection for up to 1 Gbps and incorporates protection circuits, transformers and Ethernet shielding.
6. **GNSS Module and Motion Tracking**: Integrated sensors provide accurate positioning and movement data, essential for navigation and tracking. The GNSS module operates on the 2.8V domain and communicates via UART. It includes an integrated antenna on top and an integrated Low Noise Amplifier (LNA). The module supports a Multi-GNSS engine for GPS, GLONASS, Galileo, BDS, and QZSS. The motion tracking sensor, running on the 1.8V domain, communicates via I2C.
7. **Control and Indicators**: The device includes an LED indicator running on the 3.3V domain and a push button for user interaction and status monitoring. A PIC16F15323 MCU is responsible for managing the LED and displaying the board status (booting, running, fail).

FCC Warning Statement

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver
- is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Caution: Any changes or modifications to this device not explicitly approved by the manufacturer could void your authority to operate this equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

RF Exposure Information
This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

Product Guide

This is an online document. Check here: https://getorca.com/overview