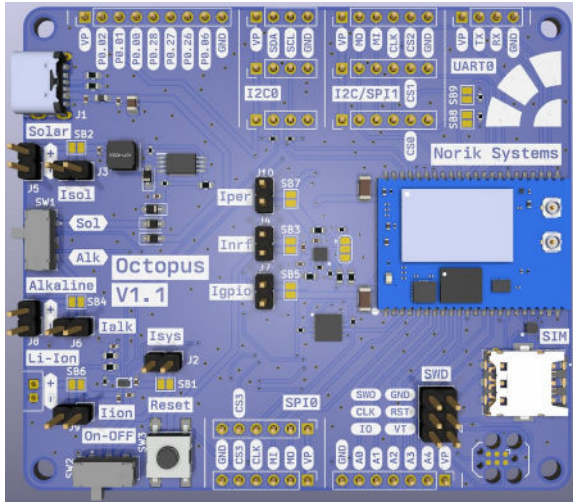


Octopus IO-Board



Overview

Octopus IO-Board is an expansion to the Octopus SoM, which is built around the nRF9160 SiP offering NB-IoT and LTE-M connectivity, GPS and accelerometer. Octopus IO-Board expands the capabilities of the Octopus SoM by providing additional peripherals and interfaces for development and prototyping of low-power IoT applications.

Features

- **Application processor:**
 - ARM® Cortex M33 with 1 MB Flash and 256 kB RAM
 - ARM® Trustzone®, ARM® Cryptocell 310
- **LTE-M / NB-IoT modem**
 - LTE Cat-M1, LTE CAT-NB1 (NB-IoT) with Global Coverage
 - Throughput (DL / UL): LTE-M: 300/375 kbps, NB-IoT: 30/60 kbps
 - SSL / TLS & Secure FOTA support
- **Power:**
 - PSM and eDRX support
 - On-board eSIM & switching circuit for external SIM
 - GPS (L1 C/A)
 - Power the board via 4 inputs:
 - USB-C (power only)
 - Solar cells
 - Alkaline battery
 - Li-Ion battery
 - Multiple headers for measuring current consumption of specific part or the whole system.
 - BQ25180 battery charger
 - 2 channel LDO regulator
 - Dedicated ADC for battery monitoring
- **Peripherals:**
 - Dedicated connectors for GPIO, ADC, SPI, I2C, UART.
 - Up to 2x SPI
 - Up to 2x I2C
 - 7x GPIO
 - 5x ADC 12-bit, 200ksps ADC
 - 4x PWM, PDM, I2S
 - 3x TIMER, 2x RTC, WDT
 - SWD programming pin header and Tag-Connect TC2030-IDC
 - Nano SIM holder
- **Devices:**
 - ADXL362 3-axis low-power accelerometer
 - W25Q64J 64 Mb NOR SPI Flash

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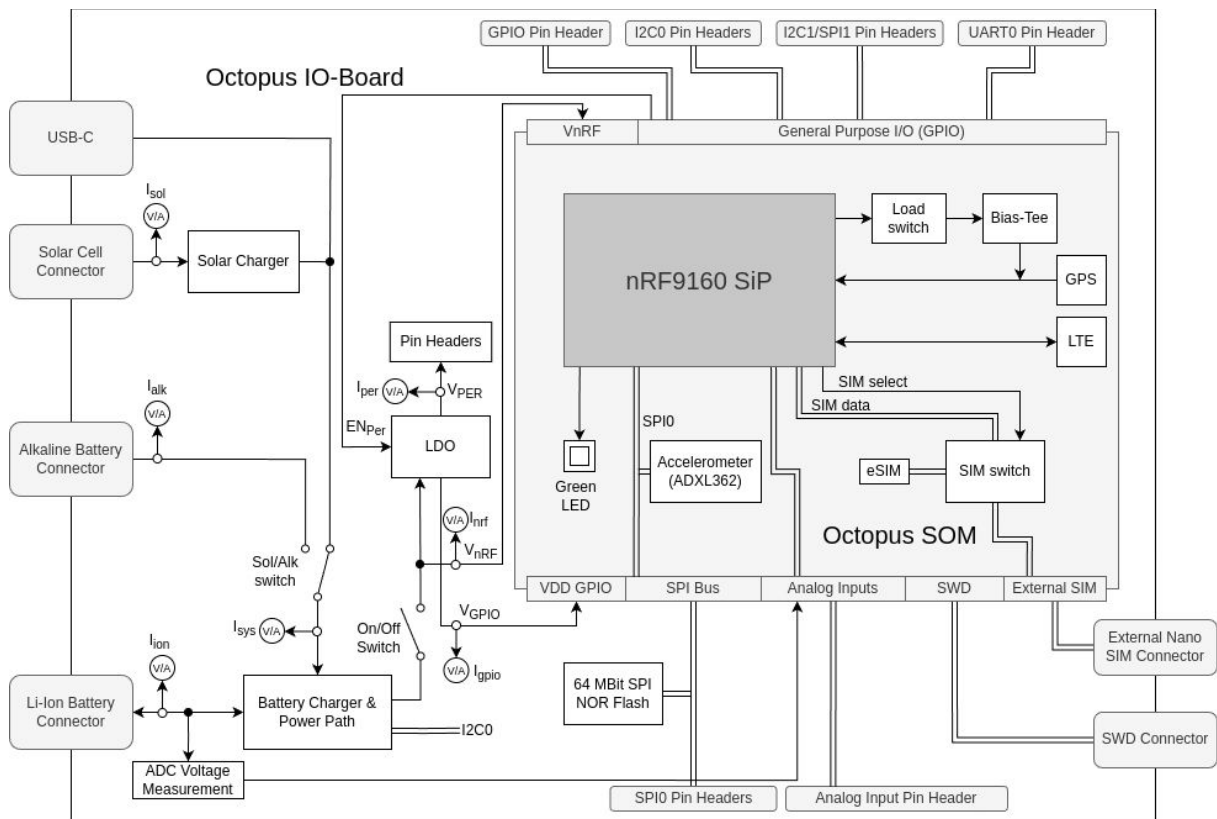
Recommended Operating Conditions

Parameter	MIN	TYP	MAX	Units
Operating Temperature	-20	25	85	°C
VUSB-C	4.5	5	5.5	V
VPV (solar cells)	0.3	3	5.5	V
VALK (alkaline batteries)	3.6	4.5	5.5	V
VBAT	3.6	3.7	4.2	V

Dimensions

Parameter	Value
Height	71.63 mm
Width	81.28 mm

Block Diagram



Pin Diagram

See norik.com for interactive pin diagram.

Peripherals

The Octopus IO-Board features multiple peripherals that are located on IO-Board itself or Octopus SoM.

Accelerometer

On board accelerometer is the **ADXL362** from Analog Devices. It's an ultra-low-power 3-axis accelerometer that is connected to nRF9160 via SPI and features an interrupt pin. The interrupt pin is connected to P0 . 12. It can be configured for multiple purposes, described in [ADXL362 datasheet](#).

The accelerometer is defined in Octopus SoM device-tree under spi3 node with adxl362 sub-node and accel0 alias.

See Accelerometer sample for an example on how to read the accelerometer data.

Battery charger

BQ25180 battery charger enables the user to power the Octopus IO-Board from Li-Ion battery. It supports up to 1A charging current.

Battery charger is defined in Octopus IO-Board device-tree under i2c1 node with bq25180 sub-node. Maximum constant charge current can be setup in the device-tree.

eSIM

The Octopus SoM and by extension Octopus IO-Board provides the users 2 options for SIM. Option 1 is on board eSIM. Option 2 is external nano SIM, which can be connected to the board via castellated pads. User can switch between these two options using on-board switch that is controlled via P0 . 25 pin:

Selection pin	Selected SIM
HIGH	External nano SIM
LOW	On-board eSIM

NOR Flash

The Octopus IO-Board features 64Mb NOR Flash **W25Q64JV** from Winbond Electronics. It's defined in Octopus IO-Board device-tree under `spi3` node with `w25q64` sub-node and `flash0` alias.

SIM select configuration

The SIM can be selected through device-tree using a device-tree overlay file in your project.

1. Create a new directory in your project named `boards`:

```
$ cd <your-project-directory>
$ mkdir boards
$ cd boards
```

1. Create an overlay file with the exact name of the board:

```
$ touch octopus_io_board_ns.overlay
```

1. Add the following device-tree node to the overlay file:

```
&sim_select {
    sim = "external"
}
```

By changing the value of `sim` to `on-board` you select on-board eSIM. By changing the value to `external` you select external nano SIM.

GPS

The GPS receiver is integrated into the RF modem of the nRF9160. To receive location data from satellites, active external GPS antenna must be connected to the on-board GPS u.fl connector. [Taoglas Active Patch Antenna](#) is an example of an compatible antenna.

nRF9160 controls the powering of the antenna using a MAGPIO pin. This saves power when the antenna isn't active.

See the GPS sample for more information regarding the use of GPS receiver.

LED

The Octopus SoM board features on-board LED that is defined using `led0` device-tree alias. To test this LED see the `blinky` sample.

LTE-M / NB-IoT

The cellular modem is integrated into the nRF9160 SiP. **Compatible antenna MUST be attached to the on-board LTE u.fl connector to prevent the damage to the modem.** An example of such antenna is [Taoglas Flexible Wideband Antenna](#).

Power Supply

The Octopus IO-Board can be powered from the following power sources:

Power source	Min voltage	Max voltage
USB-C	4.5 V	5.5 V
Solar cells	0.3 V	5.5 V
Alkaline batteries	3.6 V	4.5 V
Li-Ion battery	3.6 V	4.2 V

USB-C and solar cells can be both used to charge Li-ion battery when SW1 is positioned to “Sol”.