



Product description for ED1600 generic Sigfox Module

The ED1600 Sigfox Module is mainly developed for container tracking purposes. To avoid the development of many different types of modules and just as many expensive certifications we decided to fill the PCB surface with as much optional sensors and circuits as we could think of. The PCB size is dictated by the antennas and batteries, and more than half of it would remain empty otherwise.

For projects other than container tracking we can mount different sets of components, as required by the application.

Time to market is very important at this moment. There is an ongoing development of a very similar module based on a Nordic CPU and TI radio. This development will take several months from now and eventually replace this module.

The ED1600 module is developed to be able to get on the market in a matter of weeks. It is based on an ATXMEGA128 and an existing Telecom Design Sigfox modem.

A list of on-board sensors and interfaces:

- One 2.4 GHz short range radio for short range wireless sensor networks and active RFID
- One 868 MHz transceiver for short range wireless sensor networks
- One 5V power output (200mA) for external sensors and servos.
- One universal 2 bit bidirectional 5V sensor/actuator interface
- two digital inputs, optimized for switches or relay outputs
- two analog inputs, range 0..5V 5mV resolution
- two LED's for diagnose/feedback
- two 3D magnetometers
- one 3D accelerometer
- one high accuracy temperature/RHD sensor,
- one barometer (resolution 30cm air pressure)
- one GPS/Glonass receiver
- one EEPROM memory for data logging or OTA firmware updates.
- Optionally a power regulator for external power supply (8 to 30VDC)
- One "High Side Switch" that can switch power to heavy loads (5--30V 20A)
- One SPDT Relay 3A 24VAC. If not used then 2 additional open collector outputs are available that can sink up to 3A to ground (Maximum voltage 12.0V)
- One differential pressure sensor (0 – 25 kPa) with external nozzles.



On board there is a Sigfox antenna and a GPS/Glonass 25x25 patch antenna. Optionally the 868 MHz Sigfox antenna can be replaced by a SMA connector so an external antenna can be used.

The universal 5V power supply and the 5V sensor interface is an attempt to support as many external sensors as possible with a simple circuit. When enabled it can supply a 5V external device with a maximum of 200mA, and supports 2 bidirectional 5V I/O lines. These lines can be used as a TTL-UART, IIC interface, simple digital I/O, to control a mechanical servo drive, LED's, iButton and many more. Of course there are only 2 pins, so if an interface type needs 2 pins you cannot use another interface in parallel. It is however possible to have one pin as serial TX and the other as servo control or generic I/O.

The digital inputs are optimized to be used for mechanical switches or OC outputs of sensors. When open the voltage is 3V. These lines are sampled once per second by default when enabled.

The analog inputs have a 10 bit accuracy and a 5V range by default. Impedance is 122 KOhm. These lines are sampled once per second by default when enabled.

The magnetometer is also called compass, but without calibration it cannot really be used as a compass. It can be used however to detect changes in earth magnetic field lines or to detect magnetic fields from permanent magnets or AC power lines. Depending on the type and interval of measurements the power consumption can be as low as 10uA so keeping it active full time is possible on a battery.

The accelerometer can be used to detect vibration, motion and to see the orientation in the earth's gravity field. Depending on the type and interval of measurements the power consumption can be as low as 10uA so keeping it active full time is possible on a battery.

The temperature/humidity is a high precision sensor that can be used in applications like weather stations.

The barometer is also a high precision sensor, it has a resolution of 30 cm air pressure. Range is 50 to 110kPa, absolute accuracy +-0.4kPa, resolution +-0.05kPa. Please consider that pressures changes as a result of wind and movement can be much larger than the static pressure as a result of height. Changes in atmospheric pressure are also much larger than pressure changes as a result of height.

The optional L76 GPS/Glonass receiver including patch antenna is a very sensitive receiver that combines GPS as well as Glonass satellites to get an optimal position fix. This receiver is a serious power consumer if enabled at full speed. It has a lot of power saving modes, which can be optimized for the type of application.

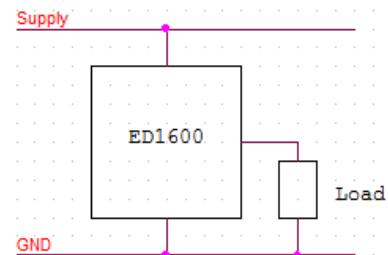


The EEprom memory is for data logging or can be used to store new firmware images that can be downloaded either over the air or by the 5V serial interface.

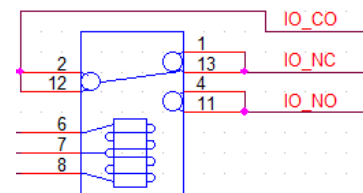
The power regulator cannot be used together with 3Volt batteries. 3.6V batteries and higher need the regulator. External supply can be a 12 or 24V lead acid battery or a mains adapter.

The high side switch is a very robust solid state switch that can connect the external supply input wire to the PwrOut output wire. It is protected against short circuit, overload, reverse voltages etc. The current that the load is using is monitored, the MCU measures this current with an accuracy of 20mA.

It can be used to power external loads like lamps, relays, electro motors, anything that uses less power than 30V and 4 Amps.



The relay is a mechanical switch that has 3 connections. Normally Open, Normally Closed and Common. Max current and voltage for this design is 3 Amp 24VAC. Inductive loads must be clamped to prevent sparks inside the relay that can cause unwanted EMC behavior.



The differential pressure meter is available for measuring liquid heights in tanks with liquids like water or diesel fuel. It can also be used for measuring water heights in canals or ditches.

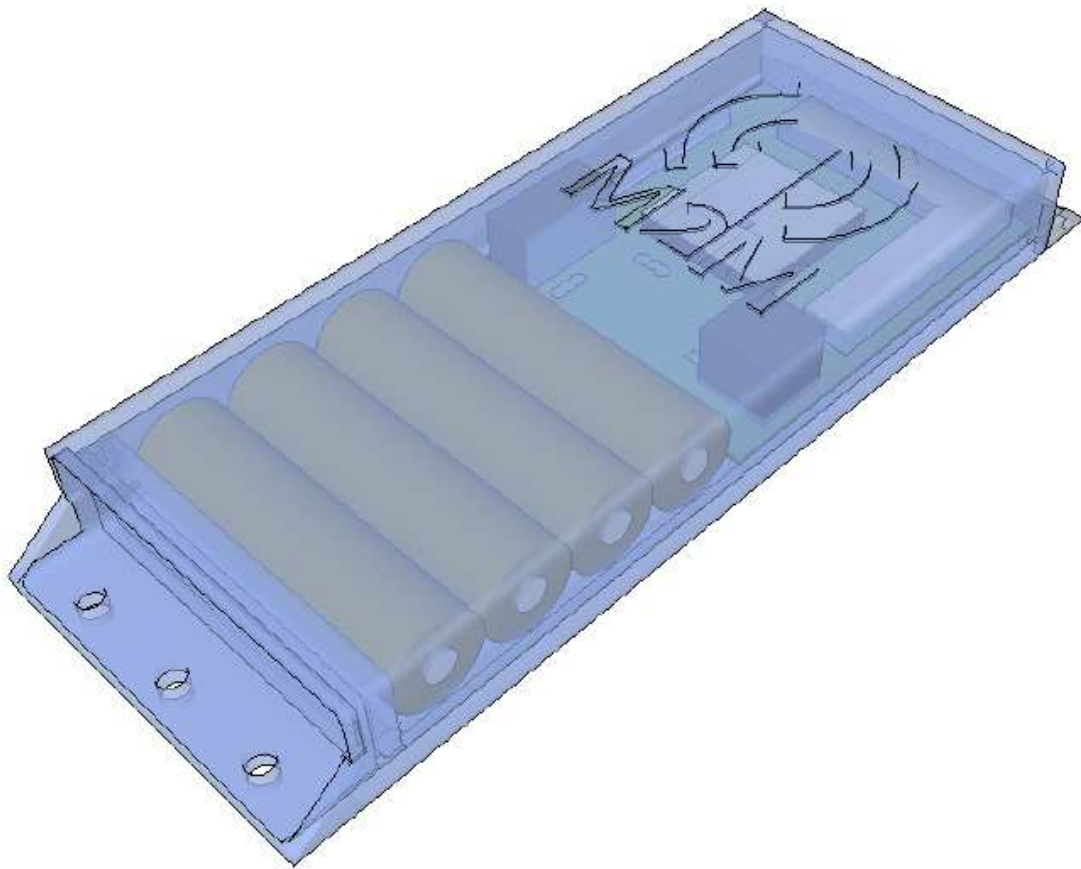
One nozzle takes the atmospheric pressure, the other one the pressure on the bottom of the tank or canal. The pressure difference is proportional with the weight of a column of fluid between the pressure input and the surface of the fluid.

Range 0..25kPa which is 2549 mm of water. Resolution is about 2.5 mm.



At this moment one enclosure is available that was developed for container use. It supports a large battery pack (10800 mAh) which supports GPS/Glonass use for months. For applications without GPS a much smaller battery can be used, and as a result of that a much smaller enclosure.

The container enclosure with 10AH battery:



Size: 19 by 57 by 156 mm



Option	POC	Container
Sigfox radio	X	X
2.4GHz radio	?	
GPS/Glonass receiver	X	X
Power regulator	X	X
Accelerometer	X	X
Magnetometer	X	
Barometer	X	
Temperature sensor	X	
Battery sensor	X	X
Humidity sensor	X	
Pressure sensor	X	
Extra NVM	X	
5V generator	X	
2 channel 5V IO-expander	X	
2 digital inputs	X	
2 digital outputs	X	
Bistable power relay	X	
High power high side switch	X	
2 diagnostic LED's	X	
1 diagnostic pushbutton	X	
4*2700mAh primary battery	X	X
2*9000mAh primary battery		
2*20000mAh primary battery		