



# Funda Kit

## Technical Manual

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# Contents

<b>Setup</b>	<b>4</b>
Components	4
Power	4
Sensors	4
Xbee Configuration	4
Indicators	4
<b>Technical Specifications</b>	<b>6</b>
Dimensions	6
Electrical Specifications	6
Sensor Specifications	6
<b>Technical Drawings</b>	<b>8</b>
Top View [Silkscreen]	8
Bottom View [Silkscreen]	8
Top View [Copper]	9
Bottom View [Copper]	9
Schematic Design	10

Design and manufacturing files are supplied in digital form:

- schematics
- pcb cad files
- bill of materials/part list, including suppliers
- packaging design

# Setup

## Components

The funda kit is a wireless sensor system that consists of two building blocks:

- the funda reader, a custom-designed board containing:
  - » three housings for batteries (of type AAA)
  - » one plug for an RFID reader (of type Innovation ID-12),
  - » one plug for ZigBee communication device (of type XBee Series 1/2)
  - » three ports for digital/analog sensors (using audio jacks)
- the funda listener, an off-the-shelf XBee-to-USB connector

A funda listener can listen to several readers at once.

## Power

The funda reader is powered by three batteries of type AAA/[LR]03, either rechargeable (3 x 1.2V) or non-rechargeable (3 x 1.5V). A drawing on the bottom side of the board indicates how to place the batteries.

To turn it on slide the power switch – a red LED lights up, if not, check the batteries again. The circuit is reverse polarity protected, so it does not harm to put them in the wrong way.

## Sensors

The funda reader offers three connections for digital or analog sensors. The connectors take standard audio plugs (2.5mm, mono or stereo). An internal voltage-divider circuit allows for easy connection of sensors, using only two contacts.

In addition to the sensors' values, it reports the power status of the batteries.

## Xbee Configuration

The funda reader supports Series 1 and Series 2 XBees, in both default mode and API mode. The XBees can be configured in various ways. Generally, reader and listener should be set to the same channel and network ID, and have corresponding destination/source addresses.

The funda listener should be set to be the coordinator.

The funda reader should be set to read and transmit the input from D0 to D3:

- DIO0: ADC – sensor 1
- DIO1: ADC – sensor 2
- DIO2: ADC – sensor 3
- DIO3: ADC – battery status

## Indicators

The functionality of the funda kit is indicated through various LEDs.

On the funda reader:

- LED1 (green), next to power switch: shows that the board is turned on.

A blinking light when trying to turn it on indicates low battery power.

- LED2 (orange), next to RFID reader: indicates when an RFID tag is detected and read
- LED3 (orange), next to the XBee module: indicates that the XBee module is powered and functioning.

# Technical Specifications

## Dimensions

funda reader

<b>Length</b>	102 mm
<b>Width</b>	57 mm
<b>Height</b>	16 mm
<b>Weight</b>	28 g [PCB] 38 g [PCB with RFID and XBee] 74 g [PCB with RFID, XBee, and batteries]

funda listener

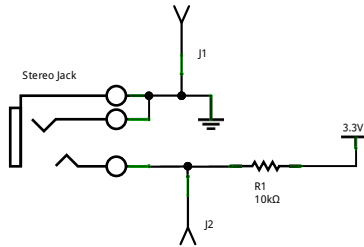
<b>Length</b>	37 mm
<b>Width</b>	28 mm
<b>Height</b>	10 mm
<b>Weight</b>	8 g

## Electrical Specifications

<b>Operating Voltage</b>	3.25V - 5.0V automatic power cut-off at 3.25V
<b>Start-up Voltage</b>	3.6V
<b>Average Current</b>	140mA @ 3.25V-4.99V 90mA @ 5.0V
<b>Runtime</b>	dependant on battery type and XBee configuration example: non-rech. batt, default XBee config: <=8h
<b>Transmitter Range</b>	dependant on XBee and environment example: Series 1 w/ chip ant., indoors: >= 10m
<b>Transmitter Frequency</b>	2.4 GHz
<b>RFID detection range</b>	up to 35 mm [vertical distance]
<b>RFID frequency</b>	125kHz

# Sensor Specifications

## Sensor Plug Schematics



## Battery Level Indication

The battery voltage level is measured at DI03. This value is taken directly from the batteries, before the power is run through the DC-DC-converters.

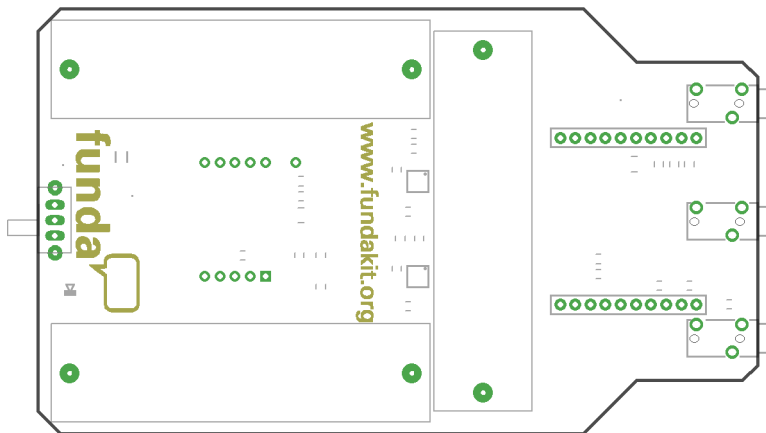
A voltage divider translates the input voltage range of theoretical 0..4.8V to 0..3.3V [value of 0..1024] allowed by the sensor input [coefficient: 0.6875].

	$V_{batt}$	$V_{measure}$	Value
fresh standard batteries	4,5V	3,1V	962
fresh rech. batteries	3,6V	2,48V	770
low batteries	3,25V	2,24V	695

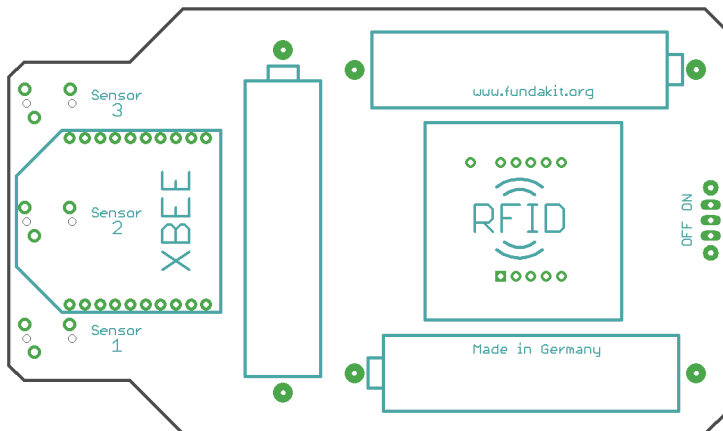
$$\text{Value} = V_{batt} * \text{coeff} * 1024 / 3.3V$$

# Technical Drawings

Top View [Silkscreen]

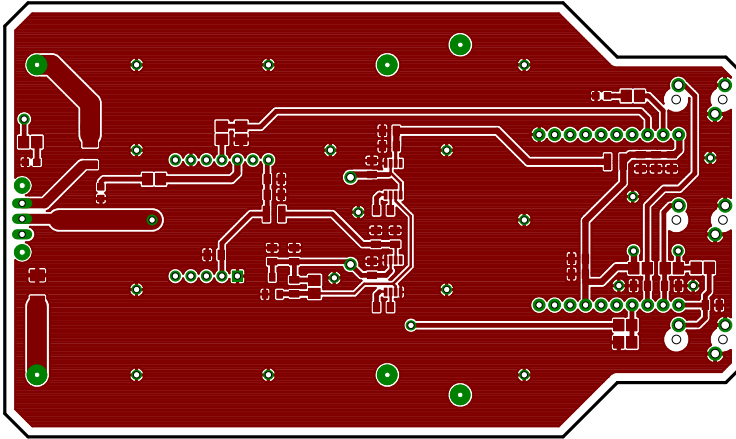


Bottom View [Silkscreen]

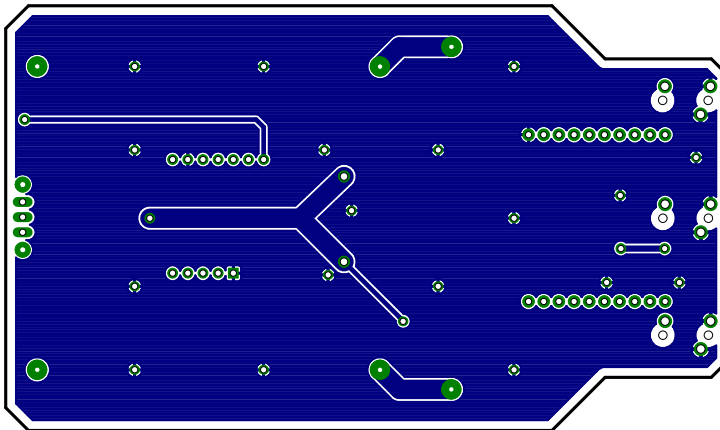




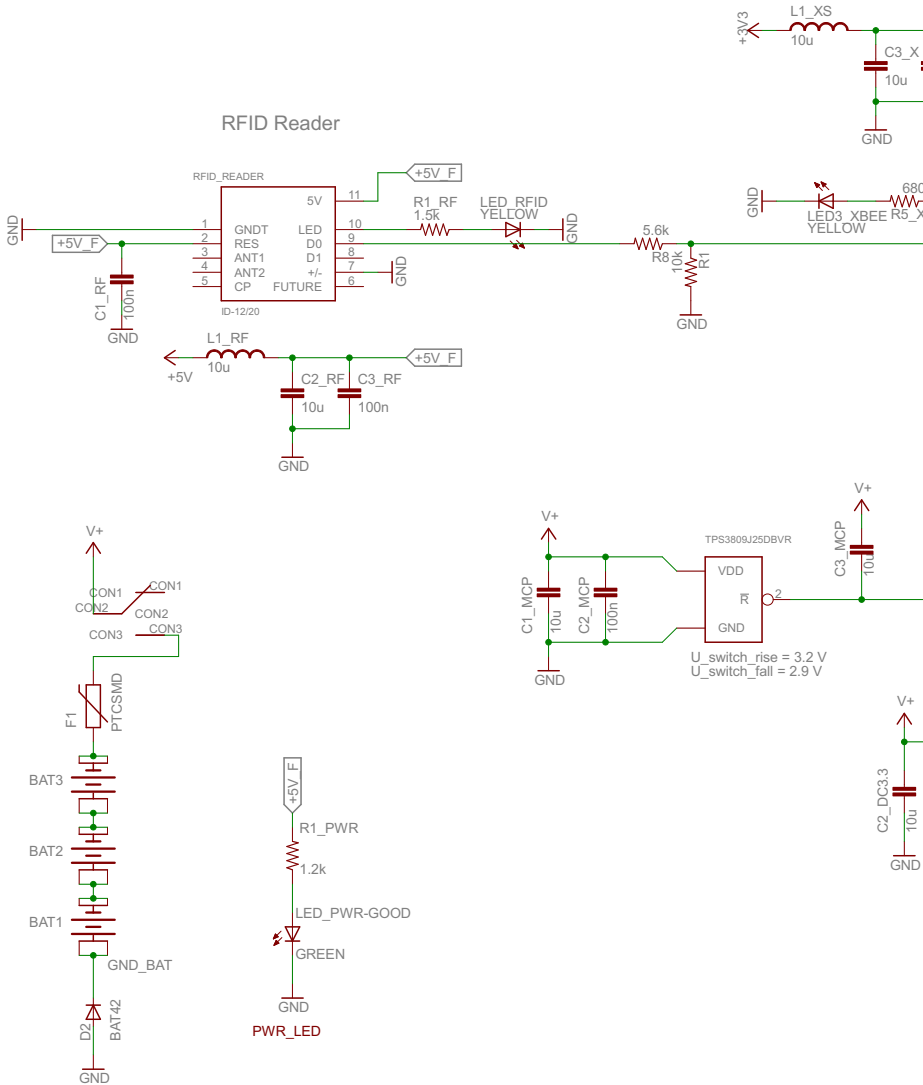
Top View [Copper]

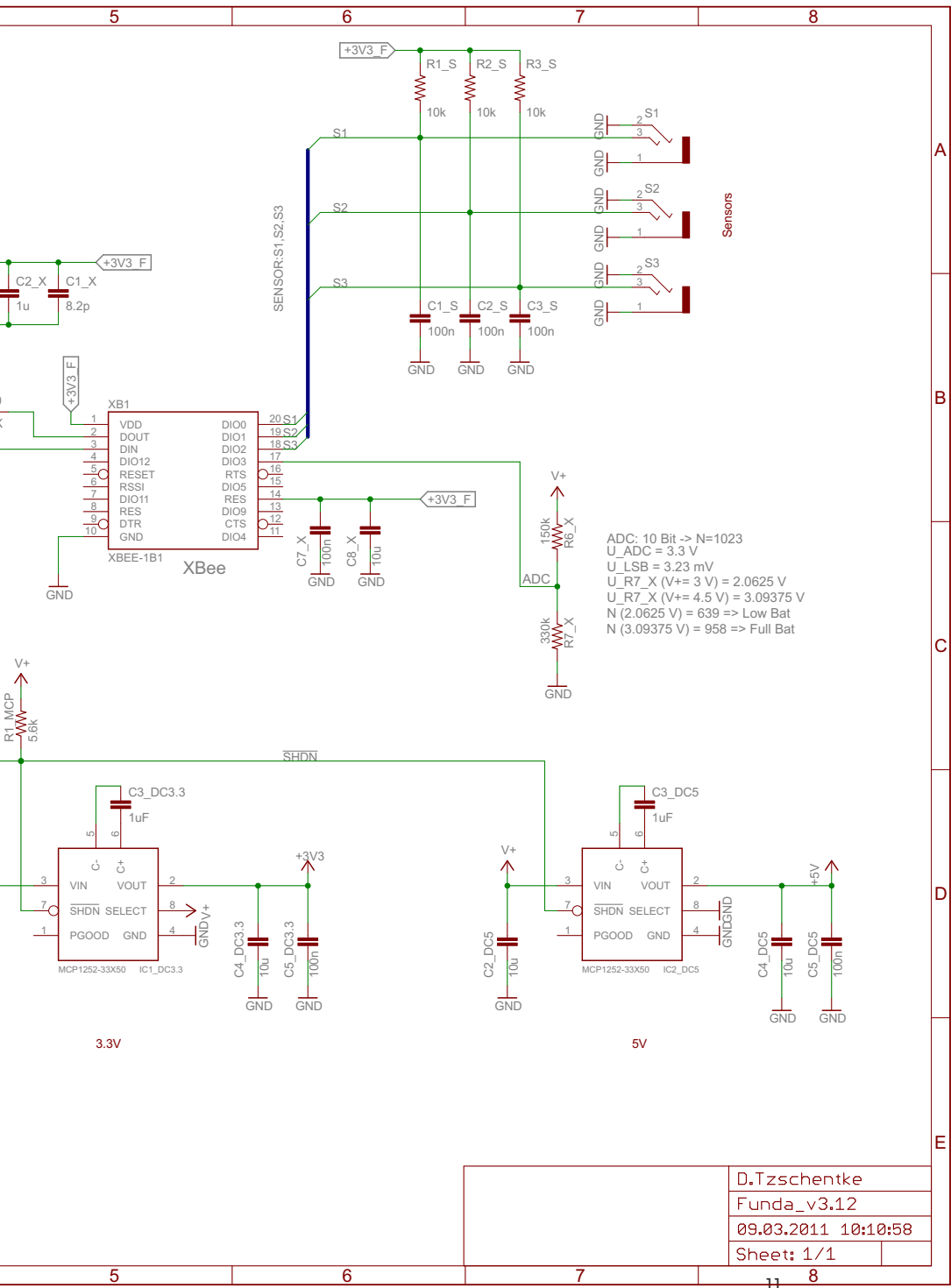


Bottom View [Copper]



# Schematic Design





D.Tzschentke
Funda_v3.12
09.03.2011 10:10:58
Sheet: 1/1



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