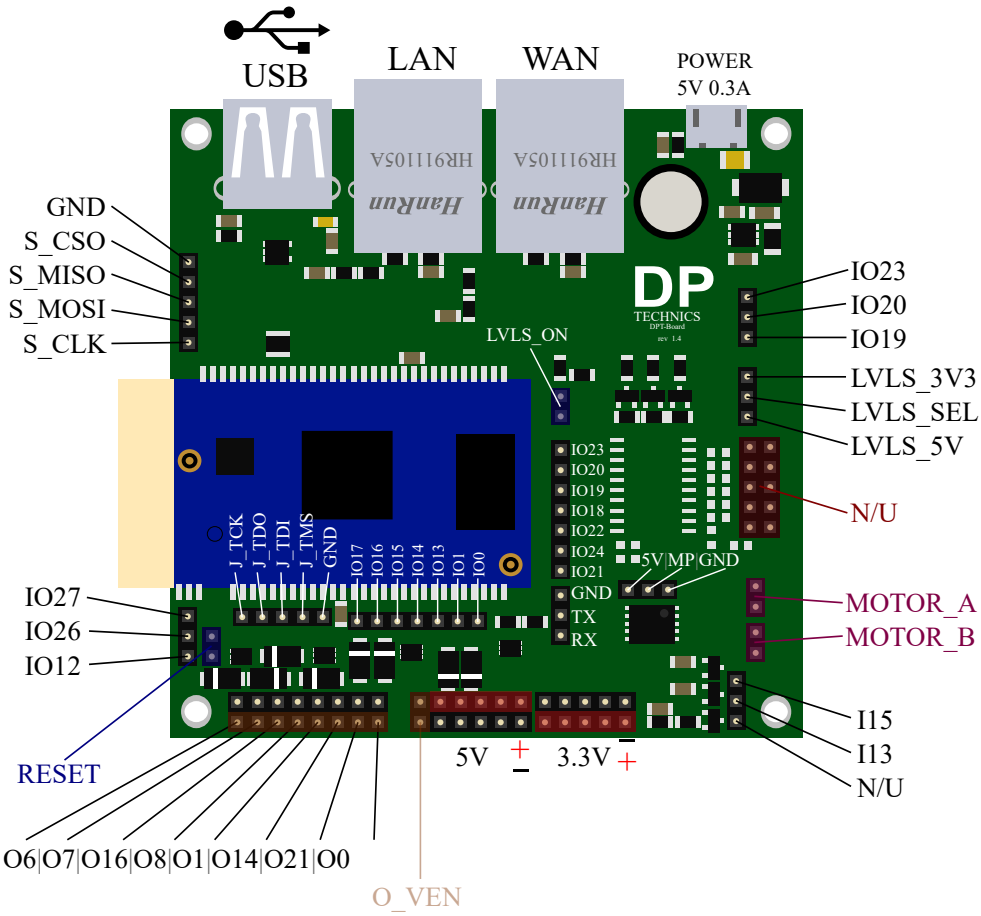
Board layout and pin descriptions

The DPT-Board has many connections. The layout in which they are placed is shown below:



The following connections are available on the DPT-Board model. **N/U** means the pins are not used in the current version.

Pin name	Pin description
$\overline{\text{C\_CSO}}$	Onboard SPI flash chip's 'chip select' line
S_MISO	SPI Master In Slave Out
S_MOSI	SPI Master Out Slave In
S_CLK	SPI clock
J_TCK	JTAG Test Clock
J_TDO	JTAG Test Data Out
J_TDI	JTAG Test Data In
J_TMS	JTAG Test Mode Select

Pin name	Pin description
IO27	General Purpose pin 27, bidirectional 2.5V maximum
IO26	General Purpose pin 26, bidirectional 2.5V maximum
IO12	General Purpose pin 12, bidirectional 2.5V maximum
IO17	General Purpose pin 17, bidirectional 2.5V maximum
IO16	General Purpose pin 16, bidirectional 2.5V maximum
IO15	General Purpose pin 15, bidirectional 2.5V maximum
IO14	General Purpose pin 14, bidirectional 2.5V maximum
IO13	General Purpose pin 13, bidirectional 2.5V maximum
IO1	General Purpose pin 1, bidirectional 2.5V maximum
IO0	General Purpose pin 0, bidirectional 2.5V maximum
IO21	General Purpose pin 21, bidirectional 2.5V maximum
IO24	General Purpose pin 24, bidirectional 2.5V maximum
IO22	General Purpose pin 22, bidirectional 2.5V maximum
IO18	General Purpose pin 18, bidirectional 2.5V maximum
IO19	General Purpose pin 19, bidirectional 2.5V maximum
IO20	General Purpose pin 20, bidirectional 2.5V maximum
IO23	General Purpose pin 23, bidirectional 2.5V maximum
RESET	Reset the board, or go into recovery mode when bridged
O6	High voltage (18V, 1.8A max) output 6
O7	High voltage (18V, 1.8A max) output 7
O16	High voltage (18V, 1.8A max) output 16
O8	High voltage (18V, 1.8A max) output 8
O1	High voltage (18V, 1.8A max) output 1
O14	High voltage (18V, 1.8A max) output 14
O21	High voltage (18V, 1.8A max) output 21

Pin name	Pin description
O0	High voltage (18V, 1.8A max) output 0
O_VEN	Output Voltage Enable, when bridged the output pins deliver 5V from the board
I15	High voltage input 15, up to 50V@1kHz maximum
I13	High voltage input 13, up to 50V@1kHz maximum
TX	Hardware UART Transmit
RX	Hardware UART Receive
LVLS_ON	Low Voltage Level Shifter ON, when bridged enable I2C compatible level shifter
LVLS_SEL	Low Voltage Level Shifter Select, common pin for level shifter voltage selection
LVLS_5V	When bridged to LVLS_SEL, makes the level shifter operate at 5V levels
LVLS_3V3	When bridged to LVLS_SEL, makes the level shifter operate at 3.3V levels
IO19	Low Voltage Level Shifter IO port 19
IO20	Low Voltage Level Shifter IO port 20
IO23	Low Voltage Level Shifter IO port 23

The DPT-Board+ model, with integrated dual H-bridge has the following extra connections:

Pin name	Pin description
MP	The motor controller power input pin, when bridged with the 5V the motors will be driven via the on-board 5V supply.
MOTOR_A	Motor output A
MOTOR_B	Motor output B

GPIO pins

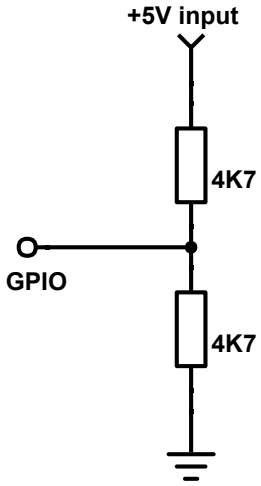
If you are looking on how to control the GPIO's from software, please follow one of the GPIO guides. They will be online soon.

The DPT-Board has many GPIO pins. Most of them have built in weak pull-up or pull-down resistors. The GPIO's without a specific function have the following **electrical characteristics**:

Parameter	Minimum	Typical	Maximum	Unit
Output high voltage	2.44	--	--	V
Output low voltage	--	--	0.1	V
Input high voltage	0.7	--	2.5	V
Input low voltage	0.3	--	--	ns
Output drive current	--	--	24	mA

The non-special function GPIO's are directly connected to the AR9331 SoC and are only protected by low power internal clamping diodes. This is fine when you want to drive LED or similar low power, non-inductive loads. But you cannot drive inductive loads such as motors or relays directly.

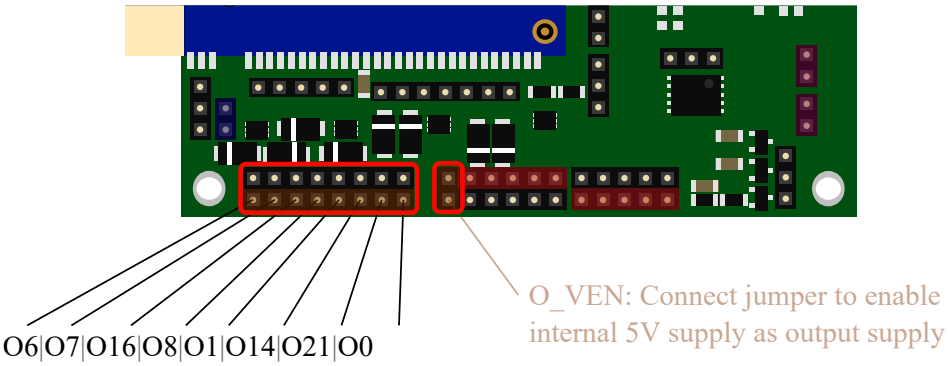
The same precautions must be taken if you use a normal GPIO as input. If you need to detect slow TTL (5V) signals, the simplest solution is to use a simple resistor divider.



This provides a simple way to interface with 3V3/5V logic on every GPIO pin. Off course you can also use the DPT-Board's high voltage inputs or level-shifted GPIO's if you want to interface bidirectional communication busses such as 1-Wire and I2C. You can find more information under the designated paragraphs.

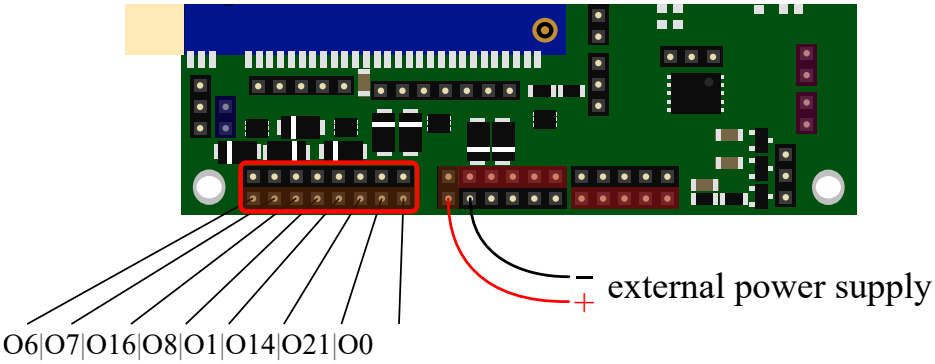
High-power outputs

The DPT-Board has 8 high power outputs which enable you to control motors, relays, lightbulbs, ... directly from the DPT-board without any extra interfacing components. This High-Power GPIO's are located at the bottom of the board:



The GPIO's shown in the drawing above are equipped with a high power MOSFET (MCH6662) and a protection diode (S1A). This enables them to switch high current inductive loads.
The **O_VEN** can be connected with a jumper if the internal 5V supply must be used to drive the loads connected to the high power outputs.

It is also possible to connect an external power supply, with a maximum voltage of 19VDC. This allows you to connect various standard relays, motors, solenoids, ... When you connect an external power supply it is very important to remove the **O_VEN** jumper, as you would otherways connect the internal 5V bus to the external supply. You can connect the external power source as follows:

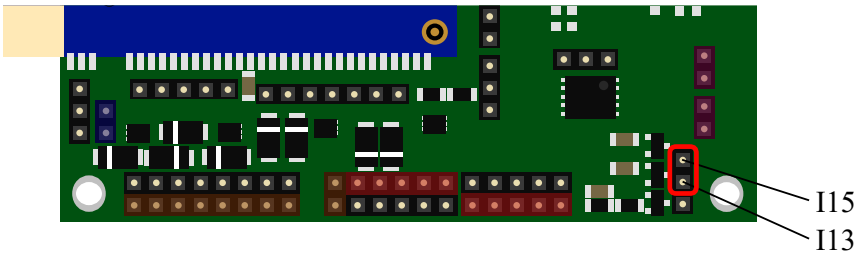


The outputs have the following characteristics:

Parameter	Typical	Maximum	Unit
Supply voltage	5	19	V
Switch current	1	2	V

High-voltage inputs

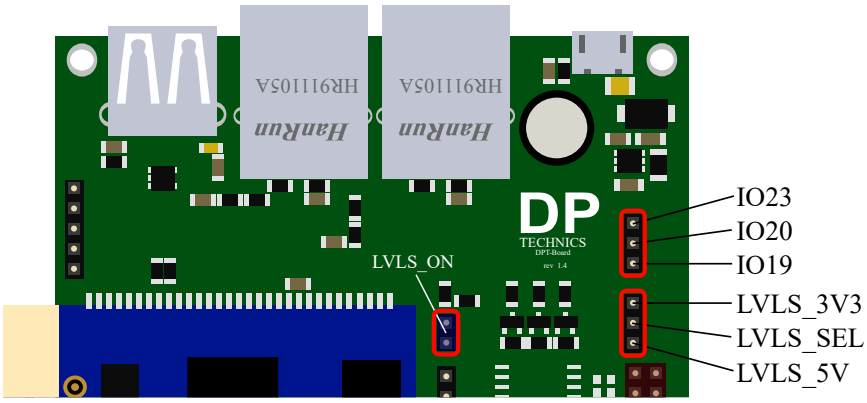
Sometimes it is easy to be able to read inputs with a high level of 12V or 24V. This can be done without the need for any external components via the two high-power inputs. You can see where these inputs are located on the following drawing:



The inputs are pull-up by default and you can make them low by connecting to ground. The high voltage inputs are protected by BAT54S diodes and an RC-circuit. This means the **absolute**maximum input voltage is 30V. The RC-circuit protects against spikes when the input frequency is high.

Level-shift GPIO's

Many digital sensors use I2C, SPI or 1-wire on 3V3 or 5V. The DPT-Board has 3 built in level-shifted GPIO pins which can be used for this purpose. The level shifter mechanism uses MOSFET technology wich support 1-wire and I2C communication.



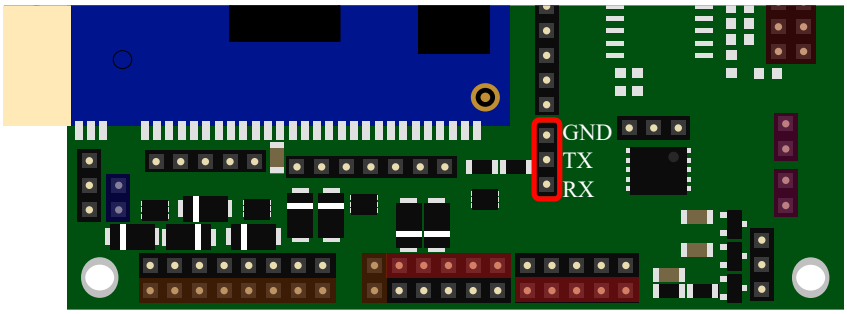
To enable the level shifter you need two jumpers:

- **LVLS_ON**: this jumper enables the low-level side supply voltage. This also means there is a very small power consumption from the onboard voltage divider providing the 2.5V IO voltage.
- **LVLS_SEL**: this enables the user to select between IO voltage levels.
  Connect **LVLS_SEL** to **LVLS_3V3** if you want to use 3V3 IO or
  connect **LVLS_SEL** to **LVLS_V** if you wish to use 5V IO.

When you have selected a voltage to work with you can start connecting your favorite sensors, logic or other components to IO23, IO20 or IO19.

Serial port

The board is equipped with a built in high-speed UART. This can be used to connect to various other devices such as a PC/Mac, Arduino, Microcontroller, ... The UART has a built in resistor divider wich enables you to use a 3V3 or even 5V serial device without problems, if you want to connect to an RS232 device you will however need a level-shifter such as the MAX232. The UART port is show on the following drawing:



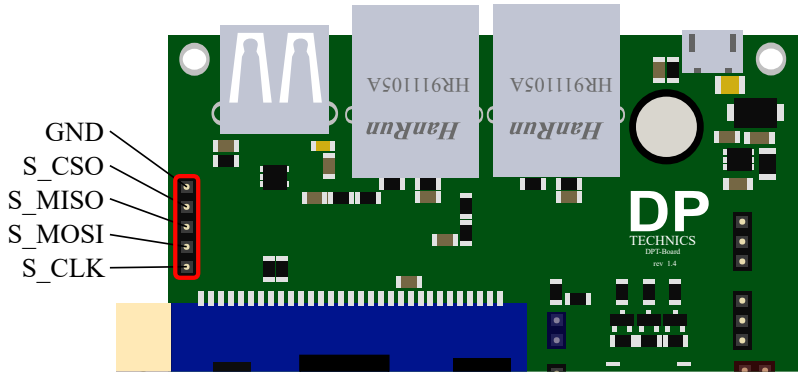
The bootloader and Linux image will both talk via the serial port, the linux talk however can be turned off. The communication settings to read the info on the serial port are the following:

Software	Baud rate	Data bits	Parity bit	Stop bit	Short notation
Bootloader	115200	8	No	1	115200 8N1
Linux	19200	8	No	1	19200 8N1

The lower baudrate for Linux was used so you can easely connect low performance hardware such as an 8-bit microcontroller which runs on 4MHz.

SPI Port

The SPI port is actively used by the onboard flash memory (16MiB), but at the same time we have made it possible to use this hardware SPI port for other peripherals to. This means you can control displays and other high speed devices which can handle the 2.5V logic. The SPI port is shown on the following drawing:



The **S_CSO** pin is actually the chip select used for the internal SPI flash. This active-low pin can be used by external circuitry to check for flash disk activity. When you use the hardware SPI port for another peripheral **GPIO26** is the chip select for the second device. You can off course also use another GPIO and control it separately.