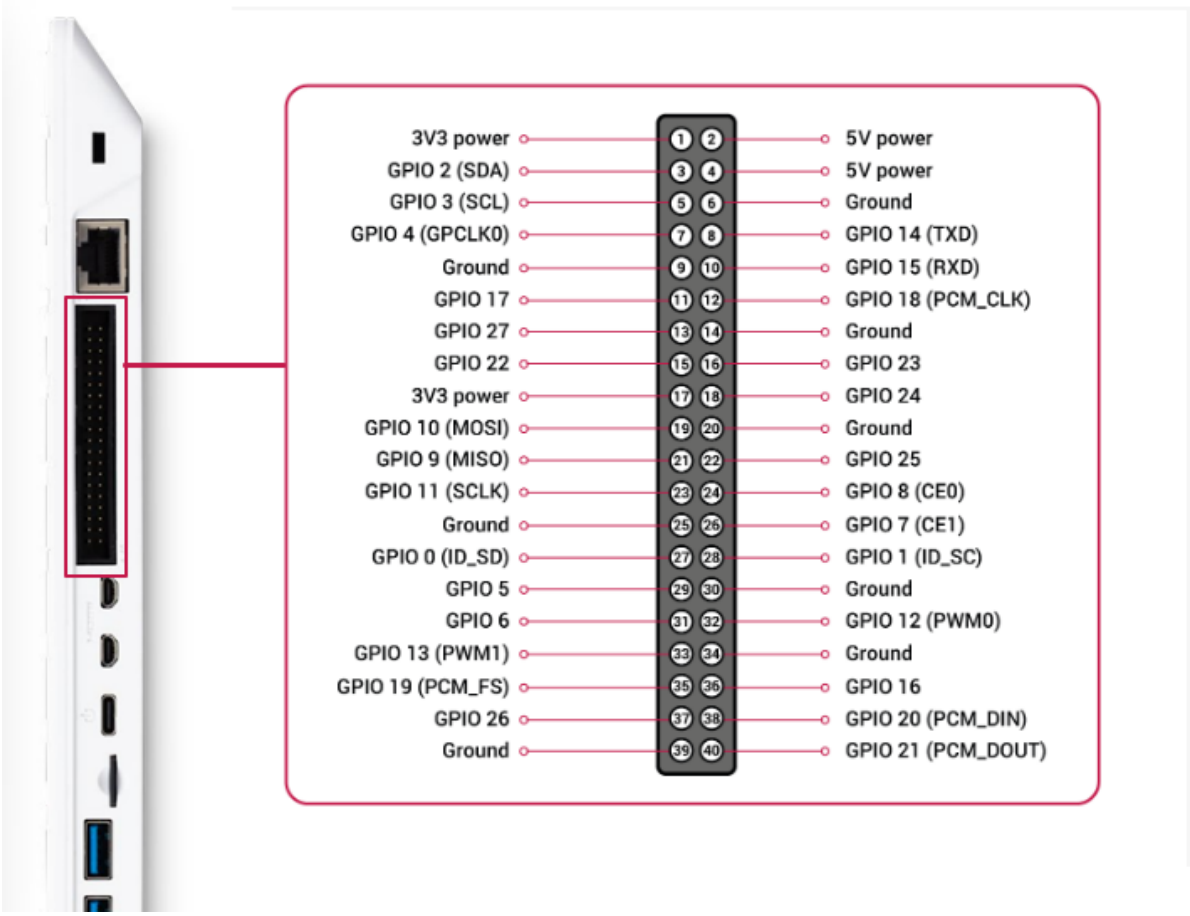
# 6. GPIO and 40-pin pins

## 6.1. Raspberry Pi 500 pin diagram




## 6.2. GPIO pin functions

### Voltage

There are two 5V pins and two 3.3V pins on the board, as well as some non-configurable ground pins (0V). The remaining pins are all general 3.3V pins, which means that the output is set to 3.3V and the input can be connected to 3.3V.

### Output

GPIO pins designated as output pins can be set to high (3.3V) or low (0V).

### Input

GPIO pins designated as input pins can be read as high (3.3V) or low (0V). This can be more easily achieved by using internal pull-up or pull-down resistors. Pins GPIO2 and GPIO3 have fixed pull-up resistors, but for other pins this is configurable in software.

### Other Pins

Besides simple inputs and outputs, GPIO pins can be used for various alternative functions, some functions are available on all pins, others are available on specific pins.

- PWM (Pulse Width Modulation)
- Software PWM available on all pins
- Hardware PWM available on GPIO12, GPIO13, GPIO18, GPIO19
- SPI
- SPI0: MOSI (GPIO10); MISO (GPIO9); SCLK (GPIO11); CE0 (GPIO8), CE1 (GPIO7)
- SPI1: MOSI (GPIO20); MISO (GPIO19); SCLK (GPIO21); CE0 (GPIO18); CE1 (GPIO17); CE2 (GPIO16)
- I2C
- Data: (GPIO2); Clock (GPIO3)
- EEPROM Data: (GPIO0); EEPROM Clock (GPIO1)
- Serial
- TX (GPIO14); Receive (GPIO15)

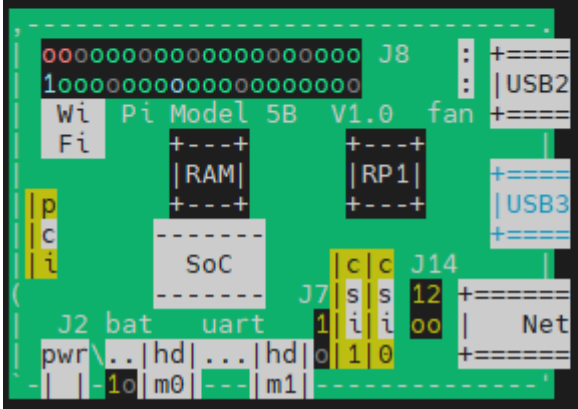
## 6.3, GPIO Pinout

We can get a reference to the pinouts on the Raspberry Pi by opening a terminal window and running the command:

```
pinout
```

This tool is provided by the GPIO Zero Python library, which is installed by default in the Raspberry Pi OS.

```
Description          : Raspberry Pi 5B rev 1.0
Revision             : d04170
SoC                  : BCM2712
RAM                  : 8GB
Storage              : MicroSD
USB ports            : 4 (of which 2 USB3)
Ethernet ports       : 1 (1000Mbps max. speed)
Wi-fi                : True
Bluetooth            : True
Camera ports (CSI)   : 2
Display ports (DSI): 2
```




```
J8:
   3V3  (1) (2)  5V
 GPIO2  (3) (4)  5V
 GPIO3  (5) (6)  GND
 GPIO4  (7) (8)  GPIO14
   GND  (9) (10) GPIO15
GPIO17 (11) (12) GPIO18
GPIO27 (13) (14) GND
GPIO22 (15) (16) GPIO23
   3V3 (17) (18) GPIO24
GPIO10 (19) (20) GND
 GPIO9 (21) (22) GPIO25
GPIO11 (23) (24) GPIO8
   GND (25) (26) GPIO7
 GPIO0 (27) (28) GPIO1
 GPIO5 (29) (30) GND
 GPIO6 (31) (32) GPIO12
GPIO13 (33) (34) GND
GPIO19 (35) (36) GPIO16
GPIO26 (37) (38) GPIO20
   GND (39) (40) GPIO21
```

For more details on the advanced functionality of the GPIO pins, see gadgetoid's [interactive pinout diagram](#).

**Note:**

> While connecting simple components to GPIO pins is safe, be careful how you wire things up. LEDs should have resistors to limit the current passing through them. Do not use 5V for 3.3V components. Do not connect motors directly to the GPIO pins, instead use an H-bridge circuit or a motor controller board.