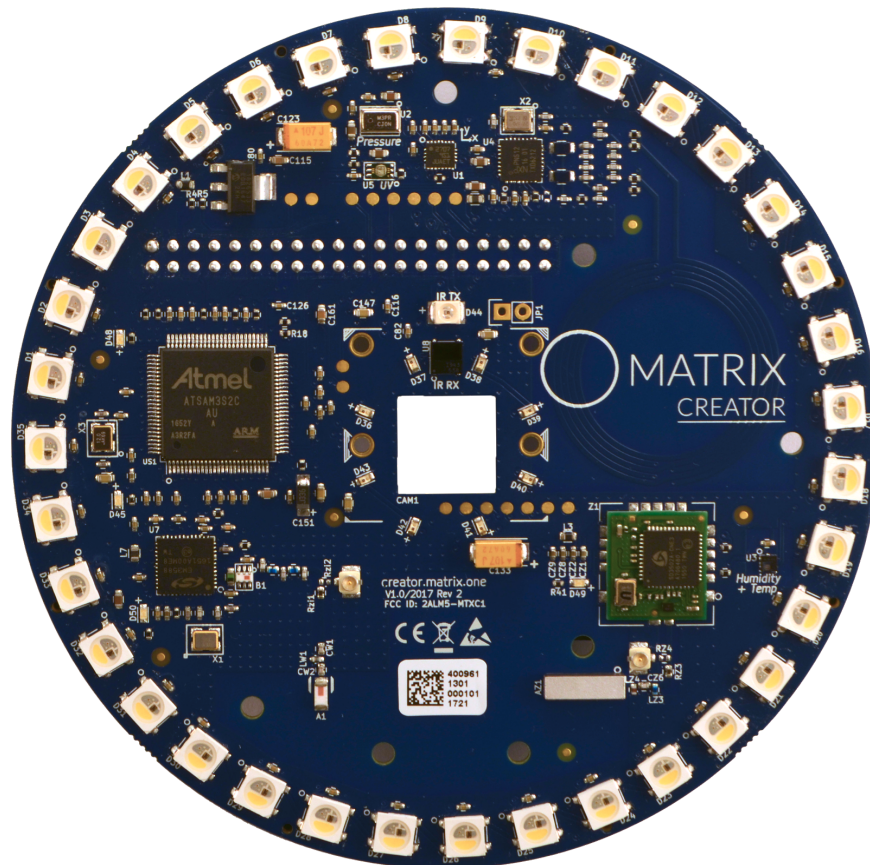


# MATRIX Creator

Datasheet / 2017



# Content

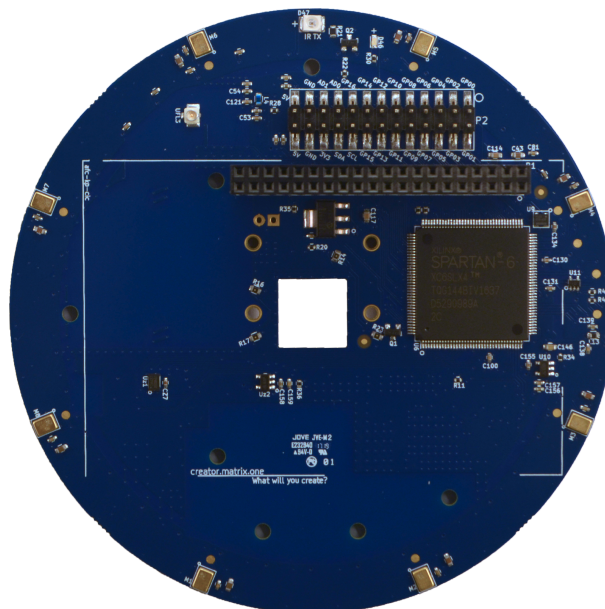
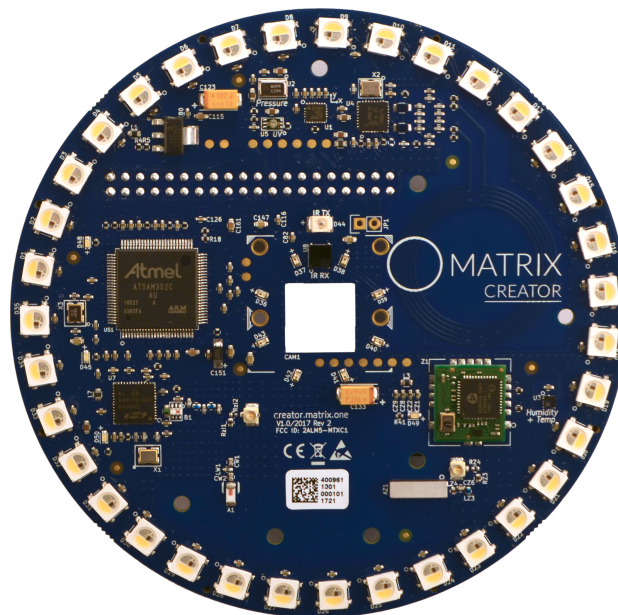
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## Revision History

| Revision | Date       | Description   |
|----------|------------|---------------|
| 1.0      | 08/22/2017 | First Release |

## Description

MATRIX Creator is an IoT daughter board for the Raspberry Pi designed to encourage makers and businesses around the world to harness the power of their imagination. It comes fully loaded with sensors, an FPGA, a microcontroller, Z-Wave and zigbee communications, an 8 microphone array, and a beautiful LED ring to allow novice and expert software developers alike to easily build hardware applications.

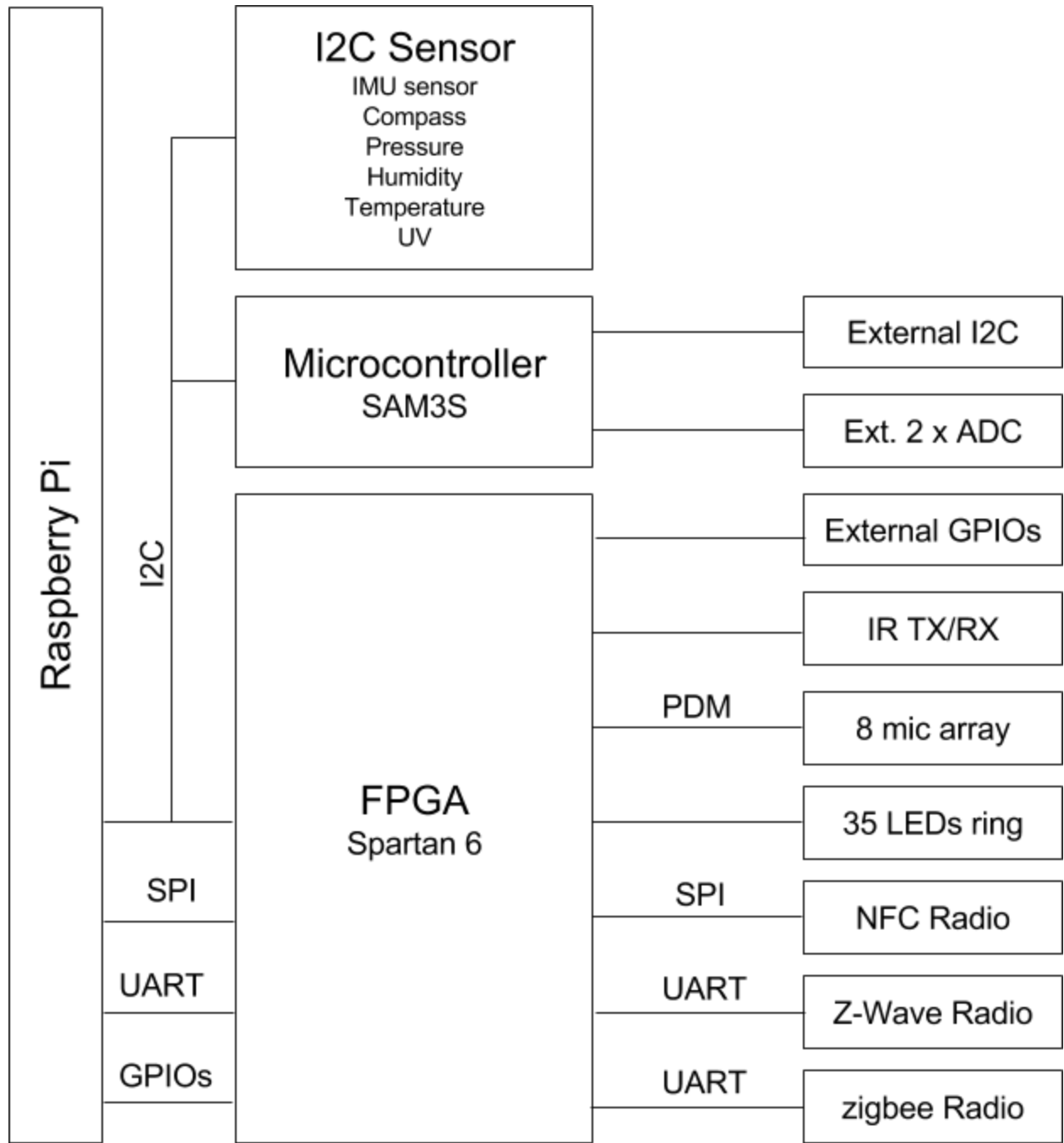




## Hardware specifications

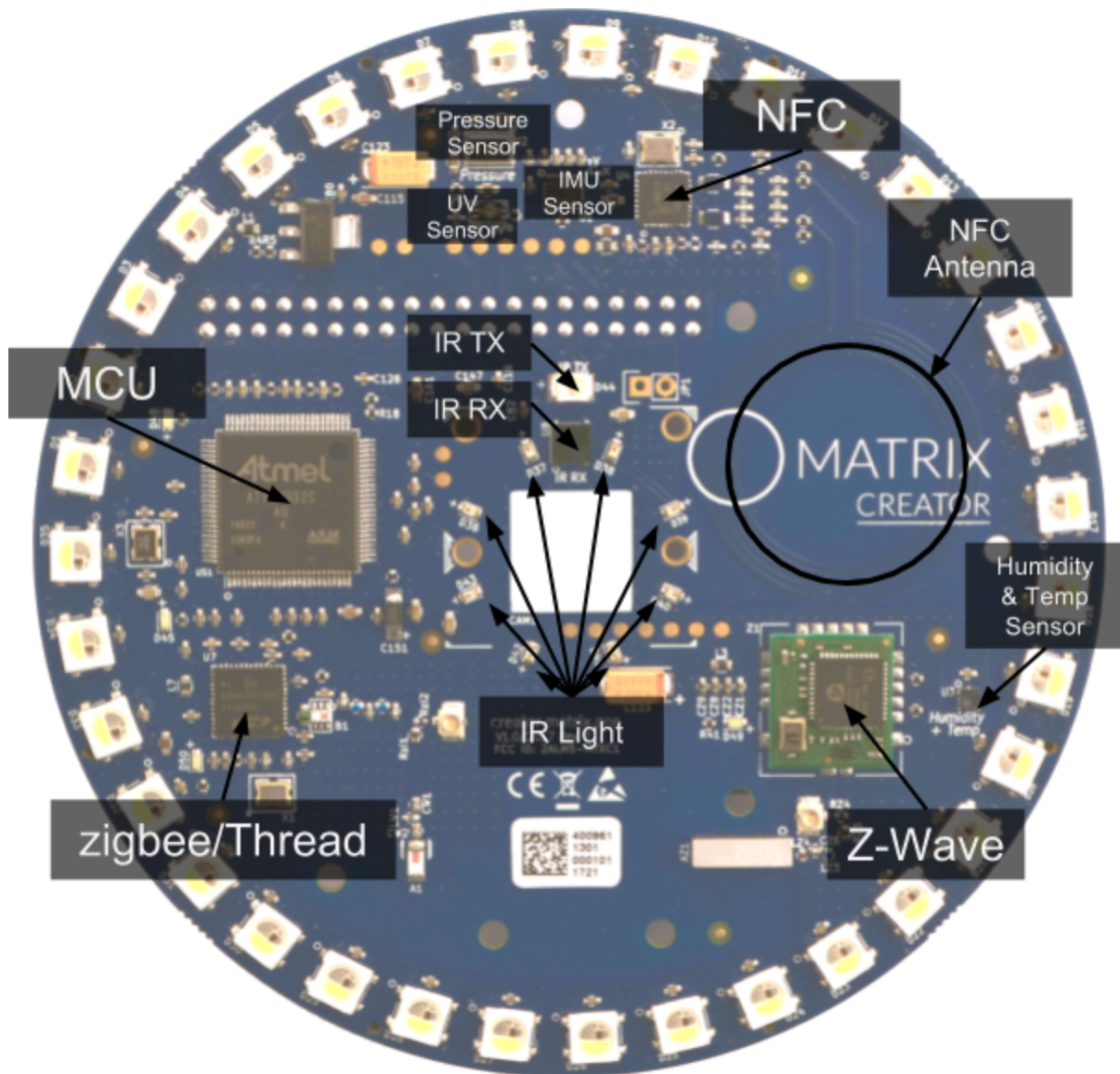
- Microcontroller : Atmel ATSAM3S2C Cortex ([link](#))
- FPGA : Xilinx Spartan 6 FPGA XC6SLX4 ([link](#))
- Wireless
  - zigbee/Thread : Integrated zigbee/802.15.4 System-on-Chip EM3588 ([link](#))
  - Z-Wave : General Purpose Z-Wave® Module ZM5202 ([link](#))
  - NFC : Full NFC Forum-compliant frontend PN512 ([link](#))
- Sensors
  - UVA Light Sensor VEML6070 ([link](#))
  - Precision pressure sensor with altimetry MPL3115A2 ([link](#))
  - Humidity and temperature sensor HTS221 ([link](#))
  - 3D accelerometer, 3D gyroscope, 3D magnetometer LSM9DS1 ([link](#)).
- Additional features
  - 35 RGBW LEDs ([link](#))
  - IR Receiver Module TSOP57X ([link](#))
  - IR Emitter Diode APT1608SF4C-PRV([link](#))
  - 8 MEMS audio sensor MP34DB02 ([link](#))
- I/O
  - 2 x ADC channels.
  - 17 external GPIO. These are connected to FPGA so they could potentially implement any digital interface e.eg PWM, Servo, UART, I2C etc.
  - SPI
  - I2C

# Block Diagram

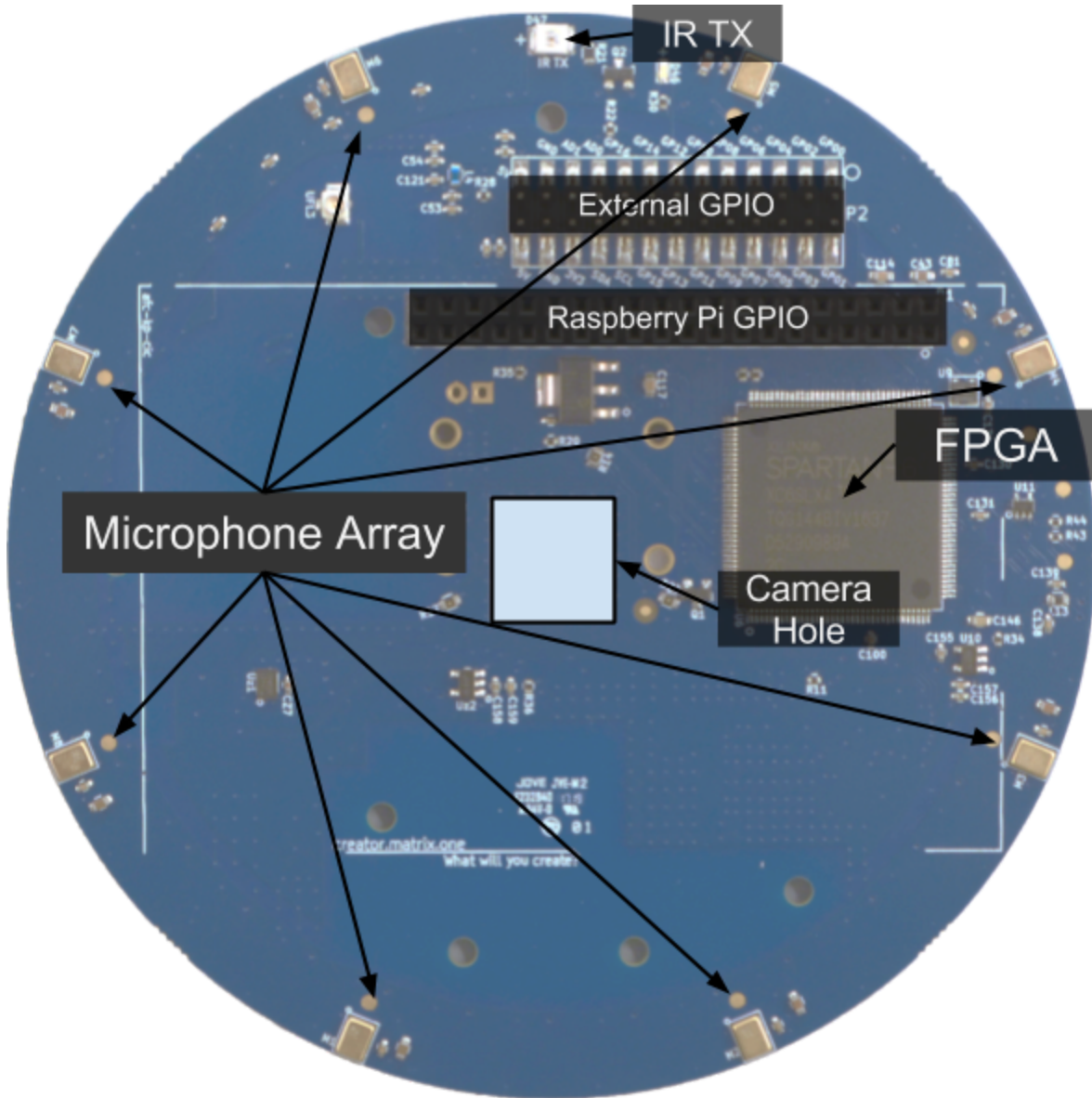


# Components localization

Front



Back



# Pin Assignments

## Raspberry Pi GPIO

| MATRIX VOICE FUNCTION    | MATRIX CREATOR CONNECTION | RPI FUNCTION  | RPI PINS | RPI GPIO | RPI PINS | RPI FUNCTION  | MATRIX CREATOR CONNECTION | MATRIX CREATOR FUNCTION  |
|--------------------------|---------------------------|---------------|----------|----------|----------|---------------|---------------------------|--------------------------|
|                          | NC                        | DC Power      | 3V Power | 1 2      | 5V       | 5V            | 5V                        | 5V                       |
| I2C SDA                  | FPGA, Sensors             | SDA1 I2C      | GPIO2    | 3 4      | 5V       | 5V            | 5V                        | 5V                       |
| I2C SCL                  | FPGA, Sensors             | SCL1 I2C      | GPIO3    | 5 6      | GND      | GND           | GND                       | GND                      |
| JTAG_TMS                 | FPGA, Zigbee, SAM3S       | GPIO          | GPIO4    | 7 8      | GPIO14   | UART TXD0     | FPGA                      | UART TX                  |
| GND                      | GND                       | GND           | GND      | 9 10     | GPIO15   | UART RXD0     | FPGA                      | UART RX                  |
| JTAG_TCK                 | FPGA, Zigbee, SAM3S       | GPIO          | GPIO17   | 11 12    | GPIO18   | GPIO          | FPGA, Zigbee, SAM3S       | NRST JTAG Reset          |
| JTAG_TDO                 | FPGA, Zigbee, SAM3S       | GPIO          | GPIO27   | 13 14    | GND      | GND           | GND                       | GND                      |
| JTAG_TDI                 | FPGA, Zigbee, SAM3S       | GPIO          | GPIO22   | 15 16    | GPIO23   | GPIO          | EM3588                    | Zigbee Chip Power Enable |
| 3.3V                     | 3.3V                      | 3.3V          | 3.3V     | 17 18    | GPIO24   | GPIO          | NC                        |                          |
| SPI_MOSI                 | FPGA, SAM3S               | SPI_MOSI      | GPIO10   | 19 20    | GND      | GND           | GND                       | GND                      |
| SPI_MISO                 | FPGA, SAM3S               | SPI_MISO      | GPIO9    | 21 22    | GPIO25   | GPIO          | FPGA                      | IRQ NFC                  |
| SPI_CLK                  | FPGA, SAM3S               | SPI_CLK       | GPIO11   | 23 24    | GPIO8    | SPI0_CE0_N    | FPGA                      | SPI Chip Enable 0        |
| GND                      | GND                       | GND           | GND      | 25 26    | GPIO7    | SPI0_CE1_N    | FPGA                      | SPI Chip Enable 1        |
|                          | NC                        | I2C ID EEPROM | ID_SD    | 27 28    | ID_SC    | I2C ID EEPROM | NC                        |                          |
| IR Ring Enable           | FPGA                      | GPIO          | GPIO5    | 29 30    | GND      | GND           | GND                       | GND                      |
| MIC IRQ from PPGA to RPI | RPI_GPIO06                | GPIO          | GPIO6    | 31 32    | GPIO12   | GPIO          | FPGA                      | nReset                   |
| IR TX                    | FPGA                      | GPIO          | GPIO13   | 33 34    | GND      | GND           | GND                       | GND                      |
| Zigbee Chip Boot Enable  | EM3588                    | GPIO          | GPIO19   | 35 36    | GPIO16   | GPIO          | FPGA                      | IR RX                    |
|                          | NC                        | GPIO          | GPIO26   | 37 38    | GPIO20   | GPIO          | EM3588                    | Zigbee Chip Reset        |
| GND                      | GND                       | GND           | GND      | 39 40    | GPIO21   | GPIO          | ZM5202                    | ZWave Chip Power Enable  |

## External GPIO

| CONNECTIONS   | PINS   | Ext GPIO | PINS   | CONNECTIONS     |
|---------------|--------|----------|--------|-----------------|
| FPGA P78      | GPIO0  | 1 2      | GPIO01 | FPGA P79        |
| FPGA P80      | GPIO02 | 3 4      | GPIO03 | FPGA P81        |
| FPGA P82      | GPIO04 | 5 6      | GPIO05 | FPGA P83        |
| FPGA P85      | GPIO06 | 7 8      | GPIO07 | FPGA P88        |
| FPGA P92      | GPIO08 | 9 10     | GPIO09 | FPGA P93        |
| FPGA P94      | GPIO10 | 11 12    | GPIO11 | FPGA P95        |
| FPGA P98      | GPIO12 | 13 14    | GPIO13 | FPGA P99        |
| FPGA P101     | GPIO14 | 15 16    | GPIO15 | FPGA P102       |
| FPGA P106     | GPIO16 | 17 18    | SCL    | FPGA P75, SAM3S |
| SAM3S AD0 P12 | AD0    | 19 20    | SDA    | FPGA P74, SAM3S |
| SAM3S AD0 P14 | AD1    | 21 22    | 3.3V   | 3.3V            |
| GND           | GND    | 23 24    | GND    | GND             |
| 5.5V          | 5.5V   | 25 26    | 5.5V   | 5.5V            |

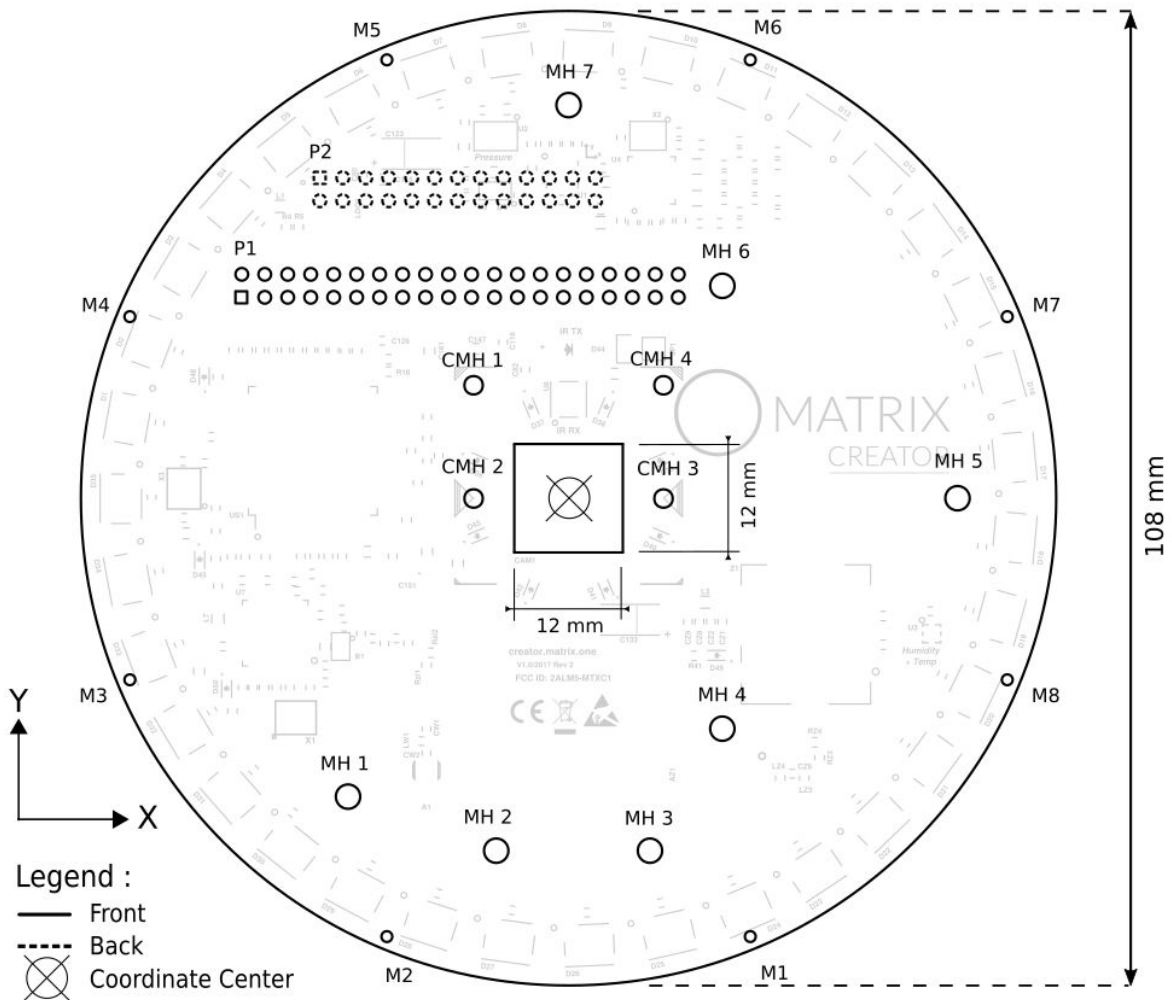


## Electrical Specifications

| External GPIO Pin | Name      | Logic Level | Max current |
|-------------------|-----------|-------------|-------------|
| [1...17]          | FPGA pins | 3.3v        | 10mA        |
| 18                | SCL       | 3.3v        | 10mA        |
| 19                | AD0       | 3.3v        | 10mA        |
| 20                | SDA       | 3.3v        | 10mA        |
| 21                | AD1       | 3.3v        | 10mA        |
| 22                | 3.3V      | -           | 100mA       |
| 23                | GND       | -           | -           |
| 24                | GND       | -           | -           |
| 25                | 5.0V      | -           | 100mA       |
| 26                | 5.0V      | -           | 100mA       |

# Mechanical Specifications

Front view





| Label | X [mm] | Y [mm] | Description                          |
|-------|--------|--------|--------------------------------------|
| M1    | 20.09  | -48.50 | Microphone                           |
| M2    | -20.09 | -48.50 | Microphone                           |
| M3    | -48.50 | -20.09 | Microphone                           |
| M4    | -48.50 | 20.09  | Microphone                           |
| M5    | -20.09 | 48.50  | Microphone                           |
| M6    | 20.09  | 48.50  | Microphone                           |
| M7    | 48.50  | 20.09  | Microphone                           |
| M8    | 48.50  | -20.09 | Microphone                           |
| MH1   | -24.38 | -33.02 | Mounting hole                        |
| MH2   | -8.00  | -39.00 | Mounting hole                        |
| MH3   | 9.00   | -39.00 | Mounting hole                        |
| MH4   | 17.00  | -25.50 | Mounting hole                        |
| MH5   | 43.00  | 0.00   | Mounting hole                        |
| MH6   | 17.00  | 23.50  | Mounting hole                        |
| MH7   | 0.00   | 43.50  | Mounting hole                        |
| CMH1  | -10.50 | 12.50  | Camera mounting hole                 |
| CMH2  | -10.50 | 0.00   | Camera mounting hole                 |
| CMH3  | 10.50  | 0.00   | Camera mounting hole                 |
| CMH4  | 10.50  | 12.50  | Camera mounting hole                 |
| P1    | -36.13 | 22.23  | Raspberry Pi GPIO connector (Pin #1) |
| P2    | -27.51 | 35.44  | External GPIO connector (Pin #1)     |

## Online Documentation and Support

For additional documentation and support please refer to:

<https://creator.matrix.one/>

<http://community.matrix.one/>

<https://matrix-io.github.io/matrix-documentation/>

<https://github.com/matrix-io>

<https://matrix-io.github.io/matrix-documentation/Reference/creator/#technical-datasheets>