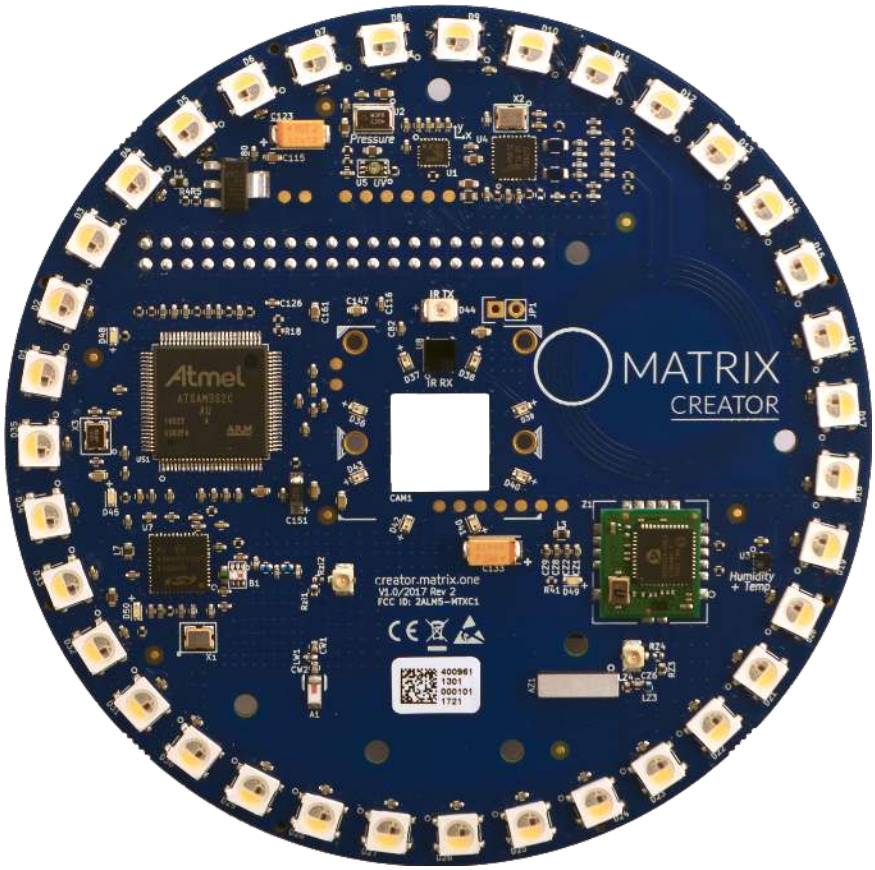
MATRIX Labs

MATRIX Creator

Datasheet / 2017



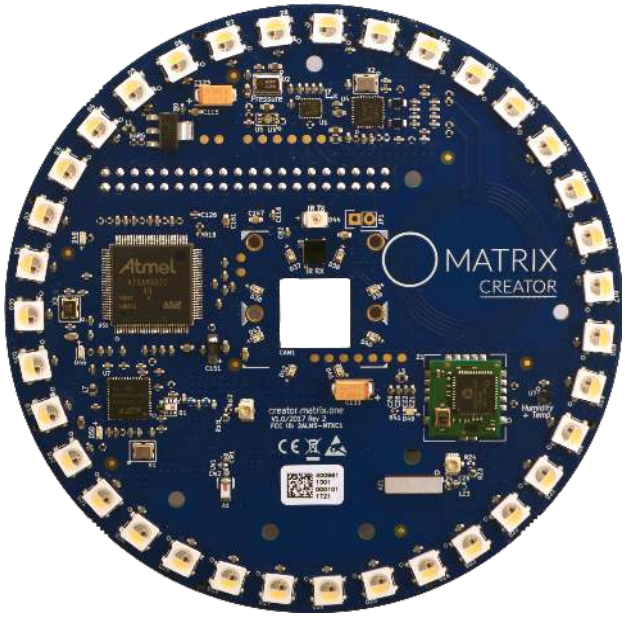
Content

Revision History

Revision	Date	Description
1.0	08/22/2017	First Release

Description

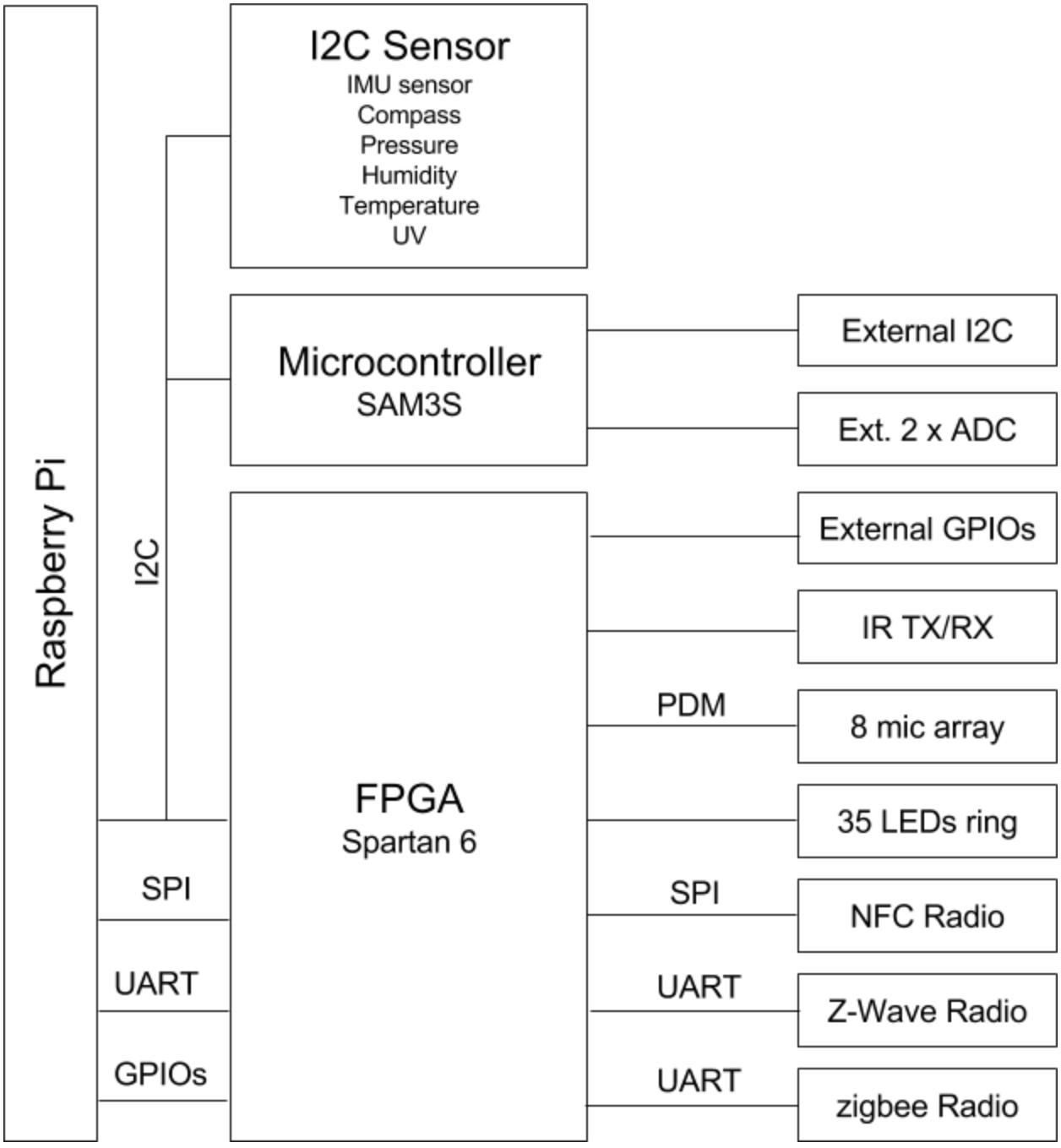
MATRIX Creator is an IoT daughter board for the Raspberry Pi designed to encourage makers and businesses around the world to harness the power of their imagination. It comes fully loaded with sensors, an FPGA, a microcontroller, Z-Wave and zigbee communications, an 8 microphone array, and a beautiful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



Hardware specifications

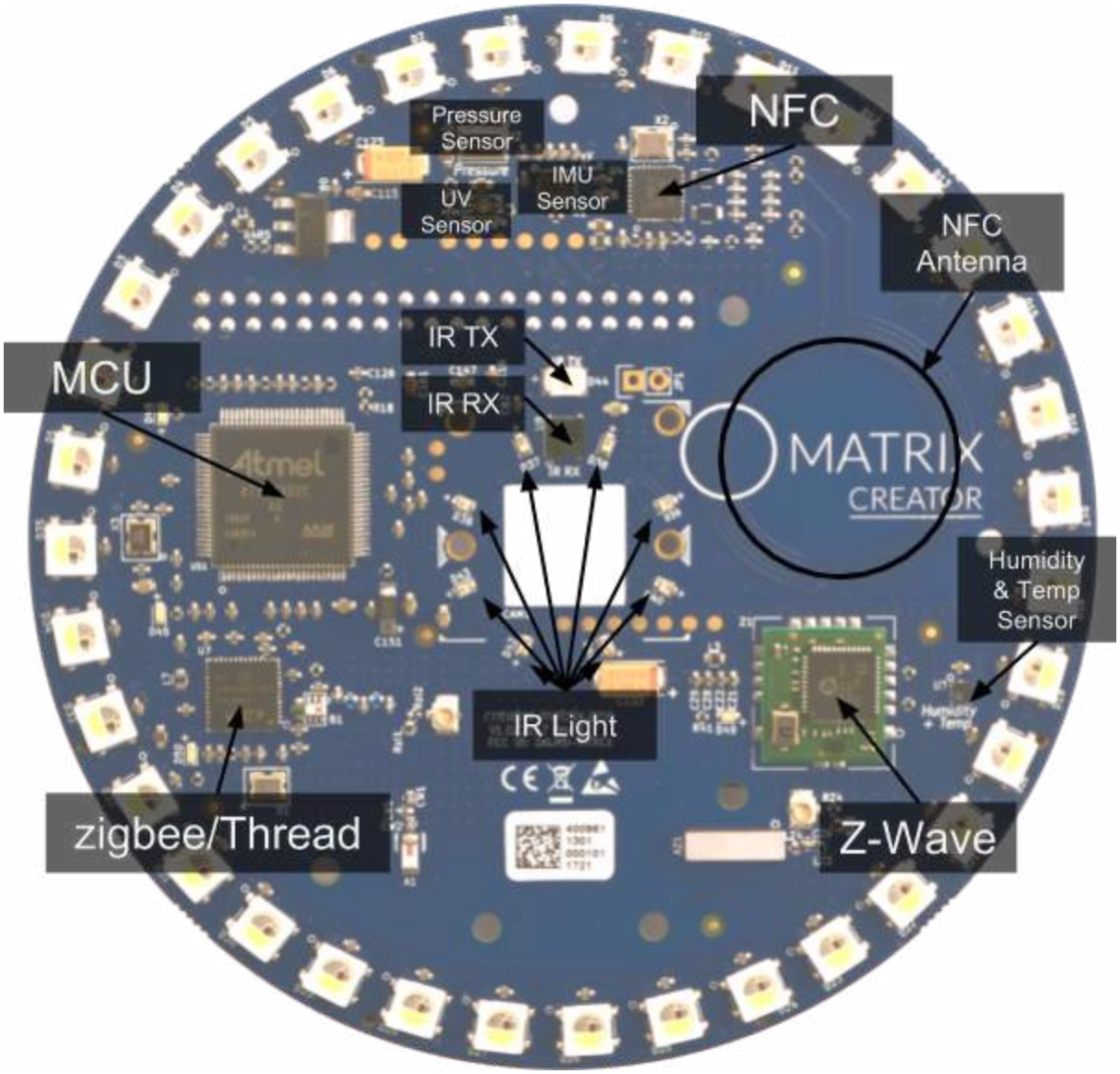
- Microcontroller : Atmel ATSAM3S2C Cortex (link)
- FPGA : Xilinx Spartan 6 FPGA XC6SLX4 (link)
- Wireless
  - zigbee/Thread : Integrated zigbee/802.15.4 System-on-Chip EM3588 (link)
  - Z-Wave : General Purpose Z-Wave® Module ZM5202 (link)
  - NFC : Full NFC Forum-compliant frontend PN512 (link)
- Sensors
  - 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

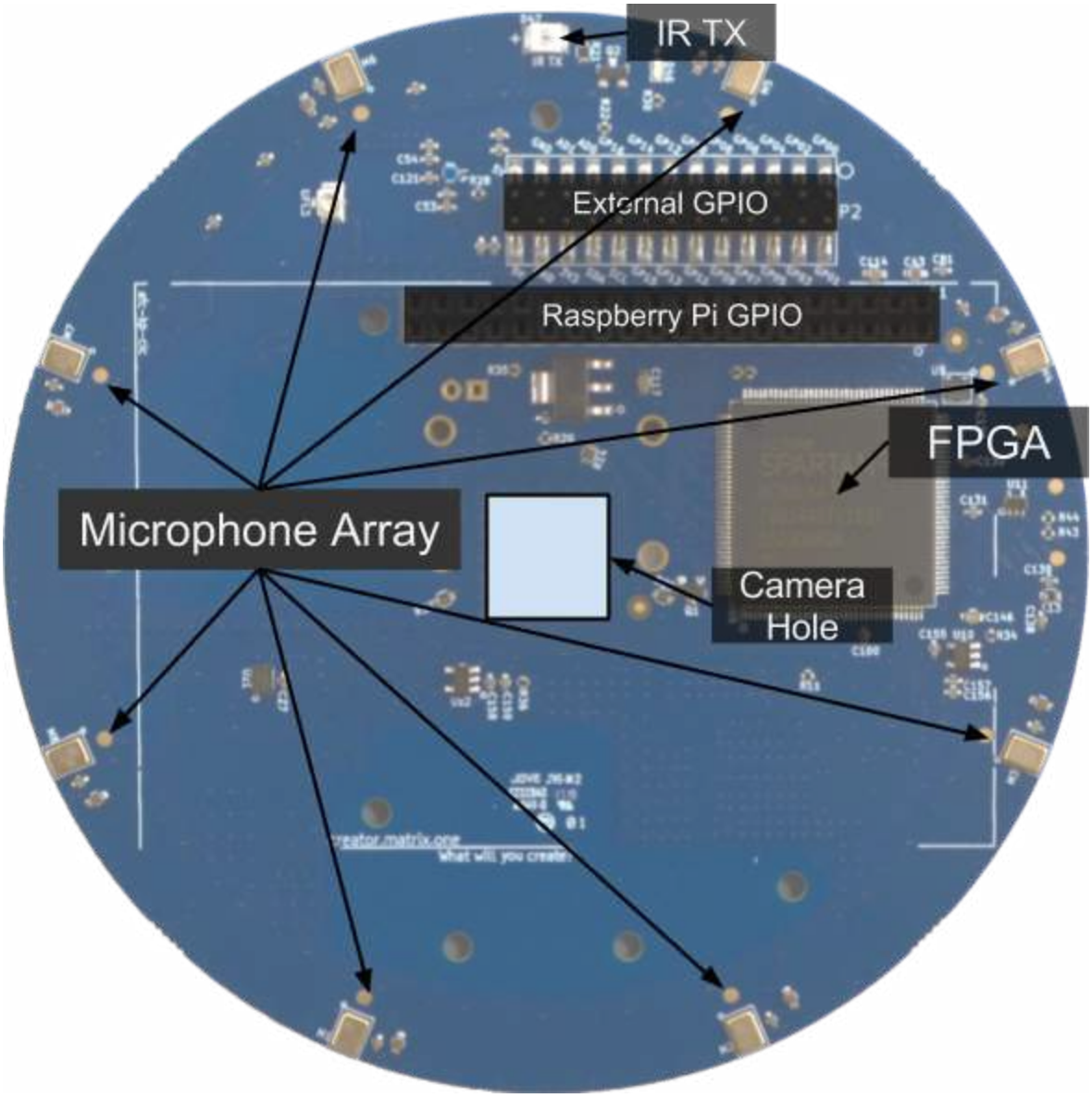


Components localization

Front



Back


IR TX
External GPIO
Raspberry Pi GPIO
FPGA
Microphone Array
Camera Hole

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 PFGA 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 Enalble

External GPIO

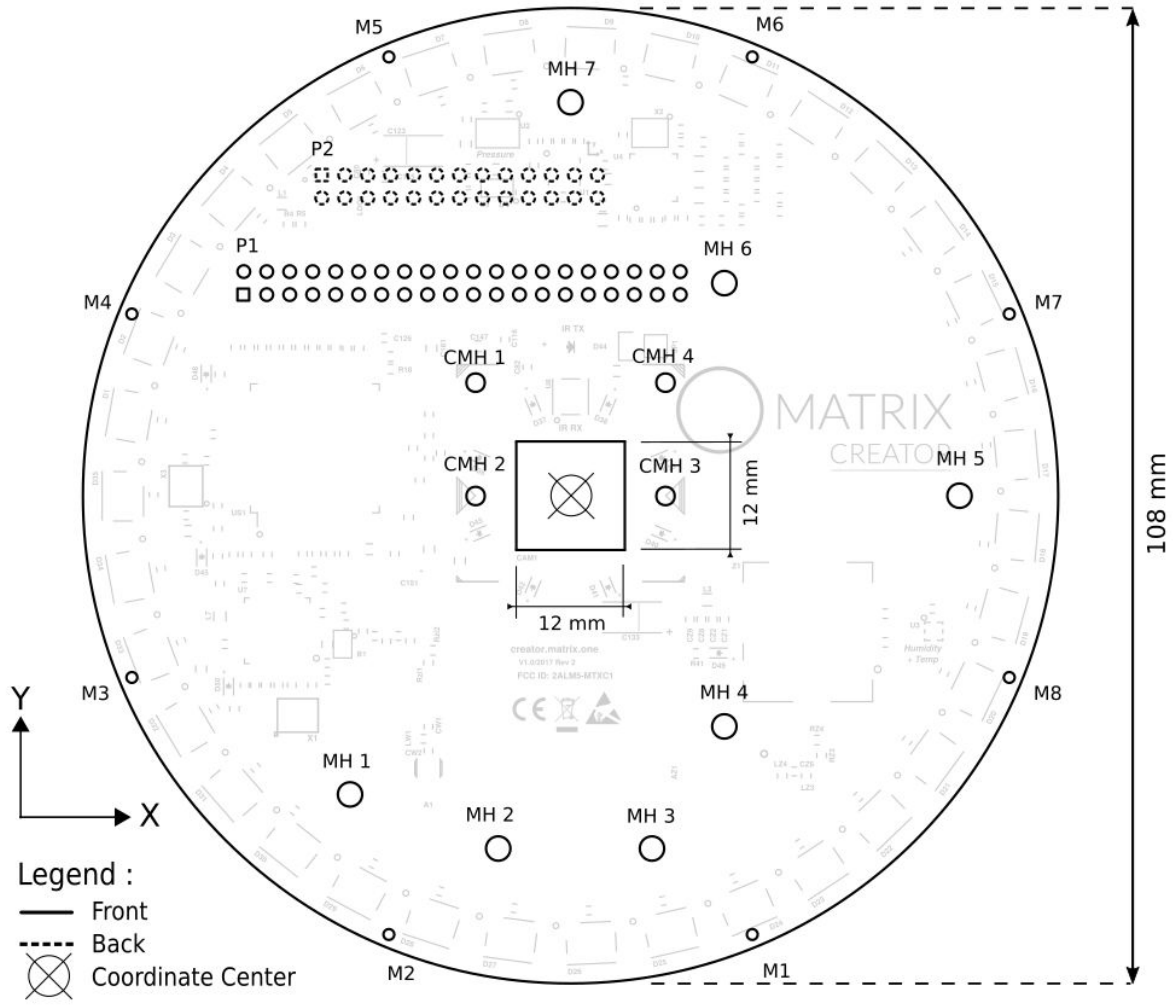
CONNECTIONS	PINS	Ext GPIO		PINS	CONNECTIONS
FPGA P78	GPIO0	1	2	GPIO01	FPGA P79
FPGA P80	GPIO02	3	4	GPIO03	FPGA P81
FPGA P82	GPIO04	5	6	GPIO05	FPGA P83
FPGA P85	GPIO06	7	8	GPIO07	FPGA P88
FPGA P92	GPIO08	9	10	GPIO09	FPGA P93
FPGA P94	GPIO10	11	12	GPIO11	FPGA P95
FPGA P98	GPIO12	13	14	GPIO13	FPGA P99
FPGA 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