MATRIX Voice

Datasheet

(MATRIX.V1)

# Content

Revision History

| Revision	Date	Description
1.0	01/05/2018	First Release
1.1	03/15/2018	Updated Mechanical Specifications. Updated Graphics.

Description

MATRIX Voice is an open-source voice recognition platform consisting of a 3.14-inches in diameter dev board, with a radial array of 7 MEMS microphones connected to a Xilinx Spartan 6 FPGA & 64 Mbit SDRAM with 18 RGBW LED's & GPIO pins. Providing developers the opportunity to integrate custom voice & hardware-accelerated machine learning technology right onto the silicon. It's for makers, industrial and home IoT engineers.
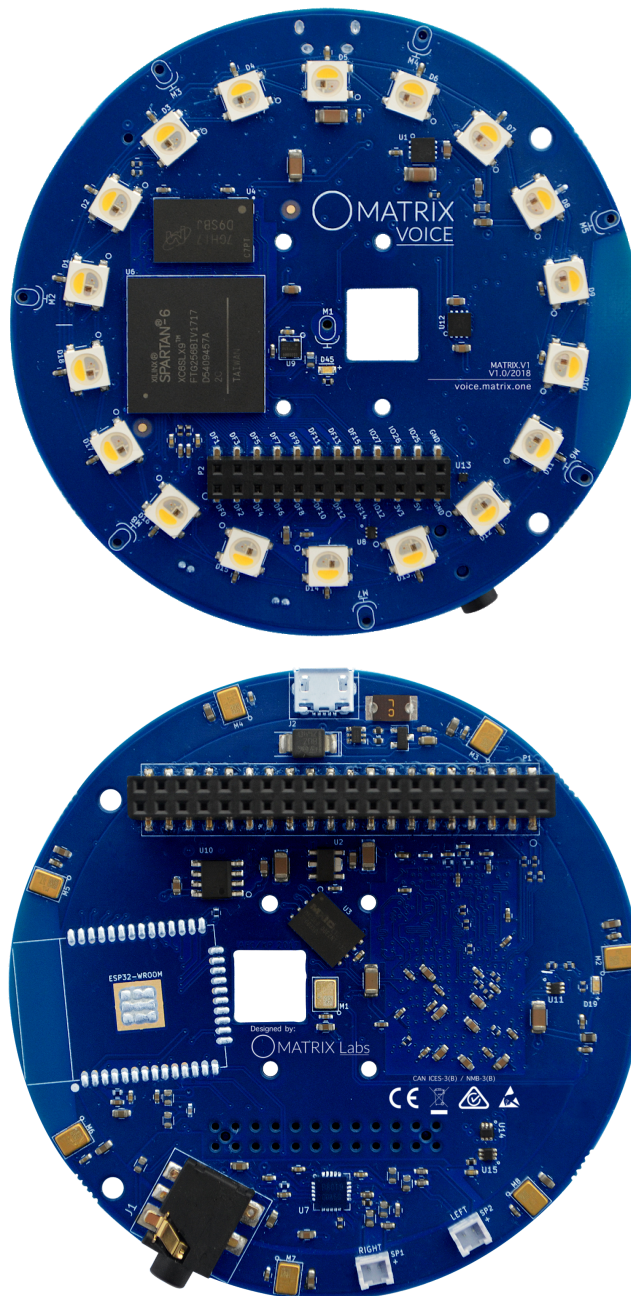
Hardware specifications

- FPGA : Xilinx Spartan 6 FPGA XC6SLX9 ([link](#))
- 18 RGBW LEDs ([link](#))
- 8 MEMS audio sensor MP34DB02 ([link](#))
- 16 external GPIO. These are connected to FPGA so they can implement any digital interface e.eg PWM, Servo, UART, I2C etc.
- Serial Flash 64MBIT - MX25L6406E ([link](#))
- DDR2 SDRAM 512MBIT - MT47H32M16 ([link](#))
- 3W Stereo Class-D Audio Amplifier and Class-AB Headphone Driver - PAM8019 ([link](#))
- 3.5mm audio output jack.

Block Diagram
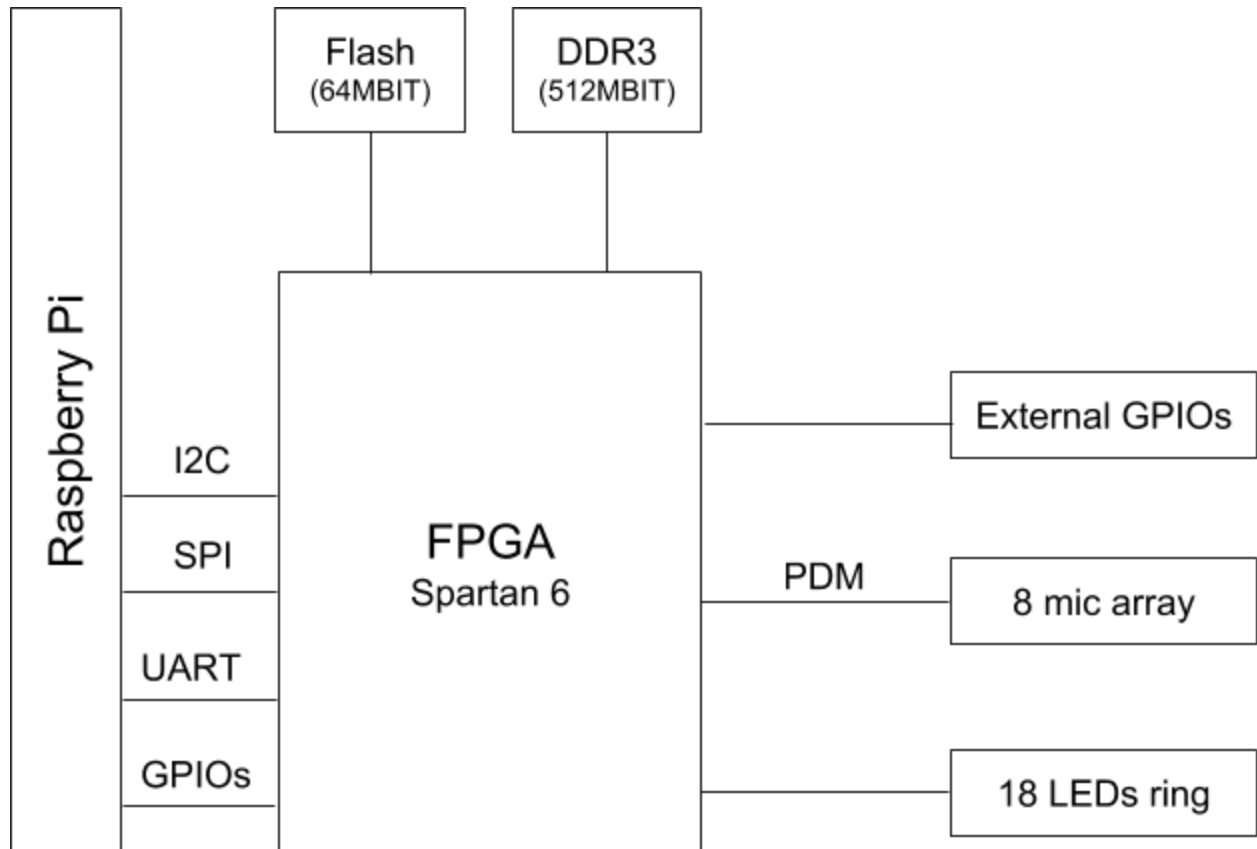
Components localization

Front
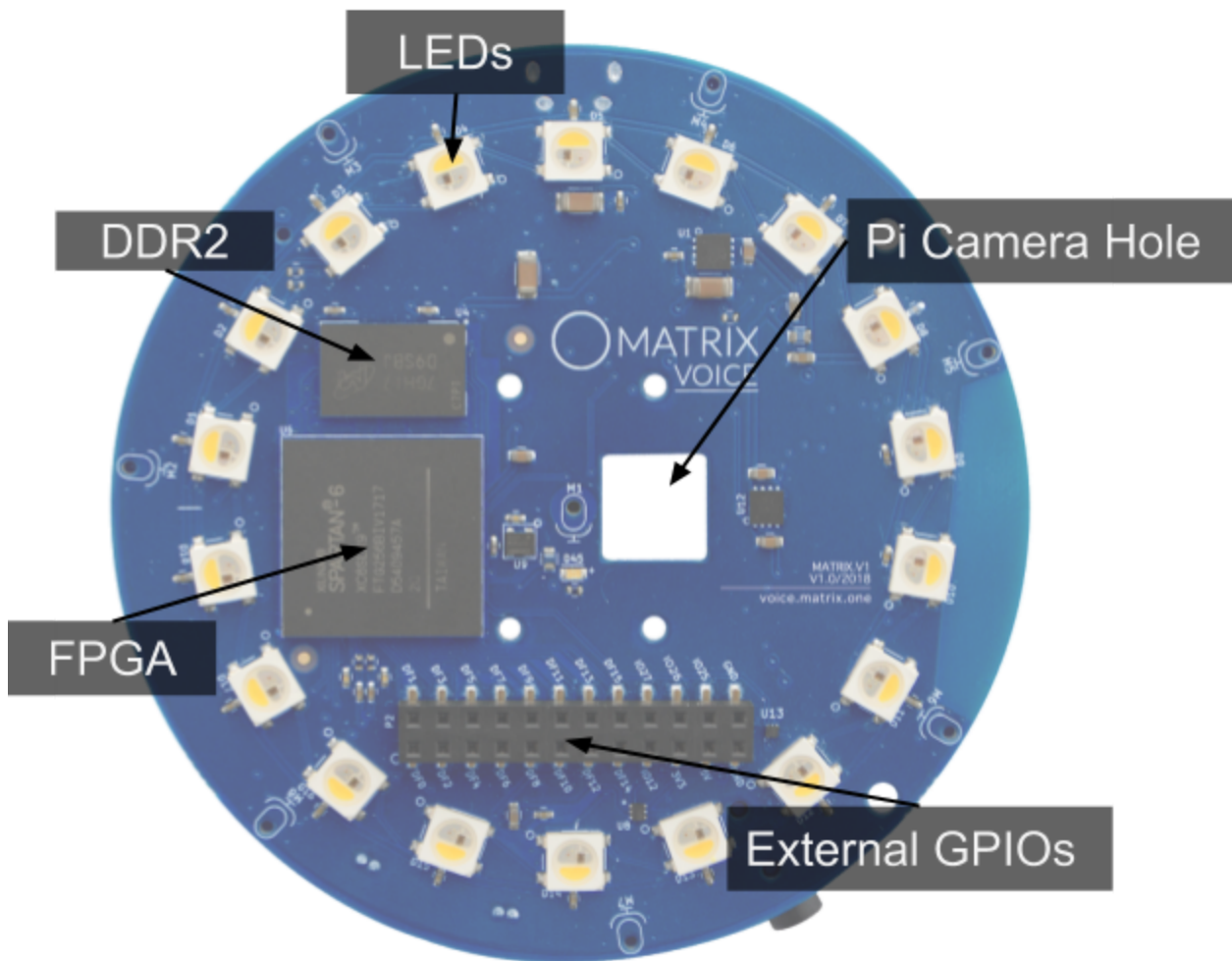
Back

Pin Assignments
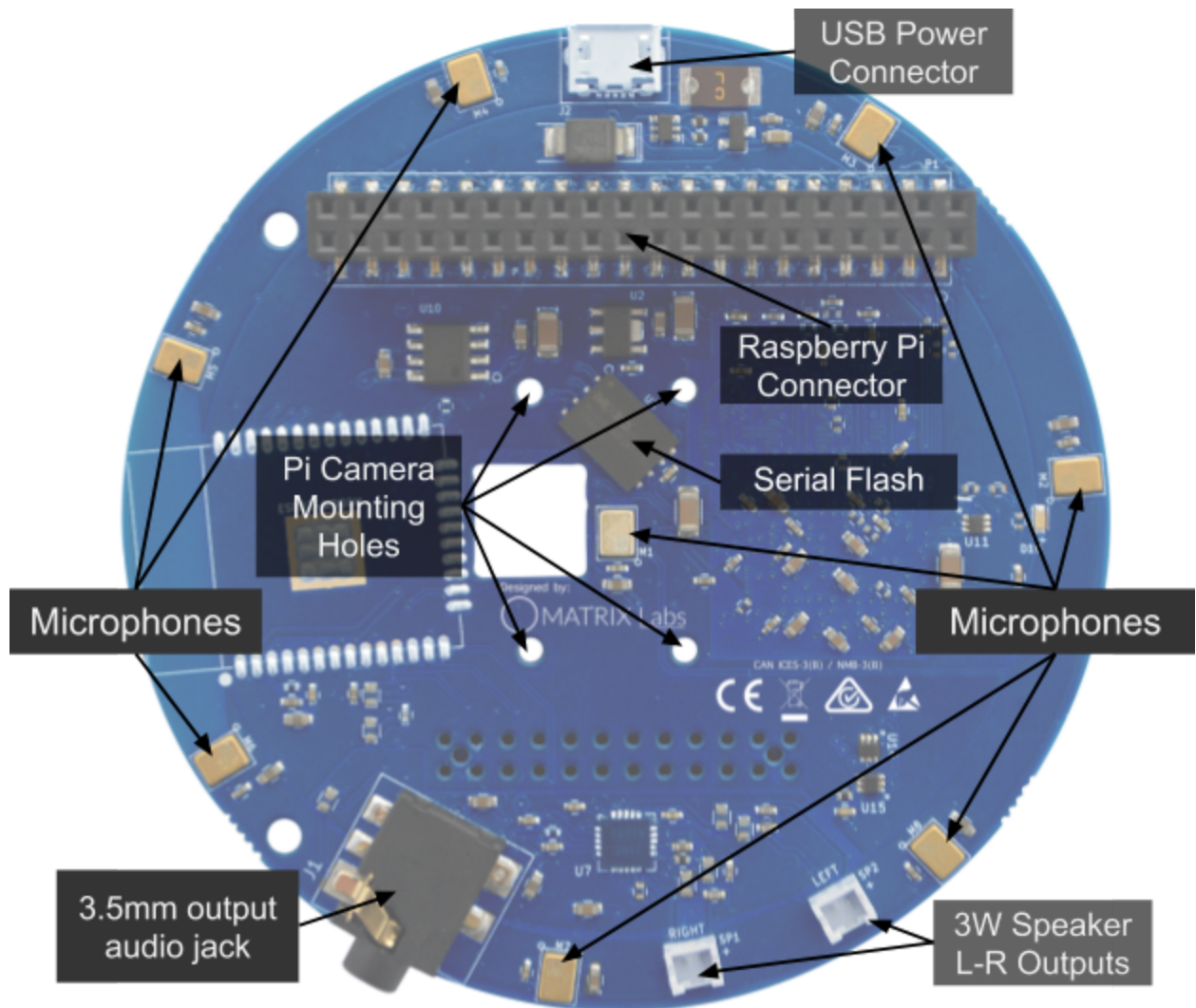
Raspberry Pi Connector

MATRIX VOICE FUNCTION	MATRIX VOICE CONNECTION	MATRIX VOICE PIN	RPI FUNCTION	RPI PINS	RPI 3 B		RPI PINS	RPI FUNCTION	MATRIX VOICE PIN	MATRIX VOICE CONNECTION	MATRIX VOICE FUNCTION
3.3V	3.3V	3.3V	3.3V	3.3V	1	2	5V	5V	5V	5V	5V
	FPGA C11	RPI_I2C_SDA	SDA1 I2C	GPIO2	3	4	5V	5V	5V	5V	5V
	FPGA C13	RPI_I2C_SCL	SCL1 I2C	GPIO3	5	6	GND	Ground	Ground	Ground	Ground
	FPGA B10	RPI_GPIO04	GPIO_GCLK	GPIO4	7	8	GPIO14	UART TXD0	RPI_TXD0	FPGA A12	ESP_RX
Ground	Ground	Ground	Ground	GND	9	10	GPIO15	UART RXD0	RPI_RXD0	FPGA B12	ESP_TX
JTAG_TMS	FPGA A15	RPI_GPIO17	GPIO_GEN0	GPIO17	11	12	GPIO18	GPIO_GEN1	RPI_GPIO18	FPGA A13	
JTAG_TCK	FPGA C14	RPI_GPIO27	GPIO_GEN2	GPIO27	13	14	GND	Ground	Ground	Ground	Ground
JTAG_TDO	FPGA E14	RPI_GPIO22	GPIO_GEN3	GPIO22	15	16	GPIO23	GPIO_GEN4	RPI_GPIO23	FPGA C12	JTAG_TDI
3.3V	3.3V	3.3V	3.3V	3.3V	17	18	GPIO24	GPIO_GEN5	RPI_GPIO24	FPGA A14	EN_PROG_ESP
SPI_MOSI	FPGA M10	RPI_SPI_MOSI	SPI_MOSI	GPIO10	19	20	GND	Ground	Ground	Ground	Ground
SPI_MISO	FPGA M9	RPI_SPI_MISO	SPI_MISO	GPIO9	21	22	GPIO25	GPIO_GEN6	RPI_GPIO25	FPGA B14	EN_ESP
SPI_CLK	FPGA R9	RPI_SPI_CLK	SPI_CLK	GPIO11	23	24	GPIO8	SPI0_CE0_N	RPI_SPI_CE0_N	FPGA N9	
Ground	Ground	Ground	Ground	GND	25	26	GPIO7	SPI0_CE1_N	RPI_SPI_CE1_N	FPGA P9	
	NC	NC	I2C ID EEPROM	ID_SD	27	28	ID_SC	I2C ID EEPROM	NC	NC	
	FPGA P7	RPI_GPIO05	GPIO	GPIO5	29	30	GND	Ground	Ground	Ground	
MIC_IRQ_0	FPGA R7	RPI_GPIO06	GPIO	GPIO6	31	32	GPIO12	GPIO	RPI_GPIO12	FPGA N8	
	FPGA P6	RPI_GPIO13	GPIO	GPIO13	33	34	GND	Ground	Ground	Ground	
	FPGA T6	RPI_GPIO19	GPIO	GPIO19	35	36	GPIO16	GPIO	RPI_GPIO16	FPGA P8	
	FPGA N6	RPI_GPIO26	GPIO	GPIO26	37	38	GPIO20	GPIO	RPI_GPIO20	FPGA T8	
Ground	Ground	Ground	Ground	GND	39	40	GPIO21	GPIO	RPI_GPIO21	FPGA M7	

External GPIO

CONNECTIONS	PINS	Ext GPIO		PINS	CONNECTIONS
FPGA G1	DF0	1	2	DF1	FPGA G3
FPGA H1	DF2	3	4	DF3	FPGA H2
FPGA J1	DF4	5	6	DF5	FPGA J3
FPGA K1	DF6	7	8	DF7	FPGA K2
FPGA L1	DF8	9	10	DF9	FPGA M1
FPGA M2	DF10	11	12	DF11	FPGA N1
FPGA P1	DF12	13	14	DF13	FPGA P2
FPGA R1	DF14	15	16	DF15	FPGA R2
NC	IO12	17	18	IO27	NC
3.3V	3.3V	19	20	IO26	NC
5V	5V	21	22	IO25	NC
GND	GND	23	24	GND	GND

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Electrical Specifications

External GPIO Pin	Connected to	Logic Level	Max current
[1...16]	FPGA pins	3.3v	10mA
17	-	-	-
18	-	-	-
19	-	-	-
20	3.3V	3.3v	100mA
21	-	-	-
22	5.0V	5.0v	100mA
23	GND	-	-
24	GND	-	-

Mechanical Specifications
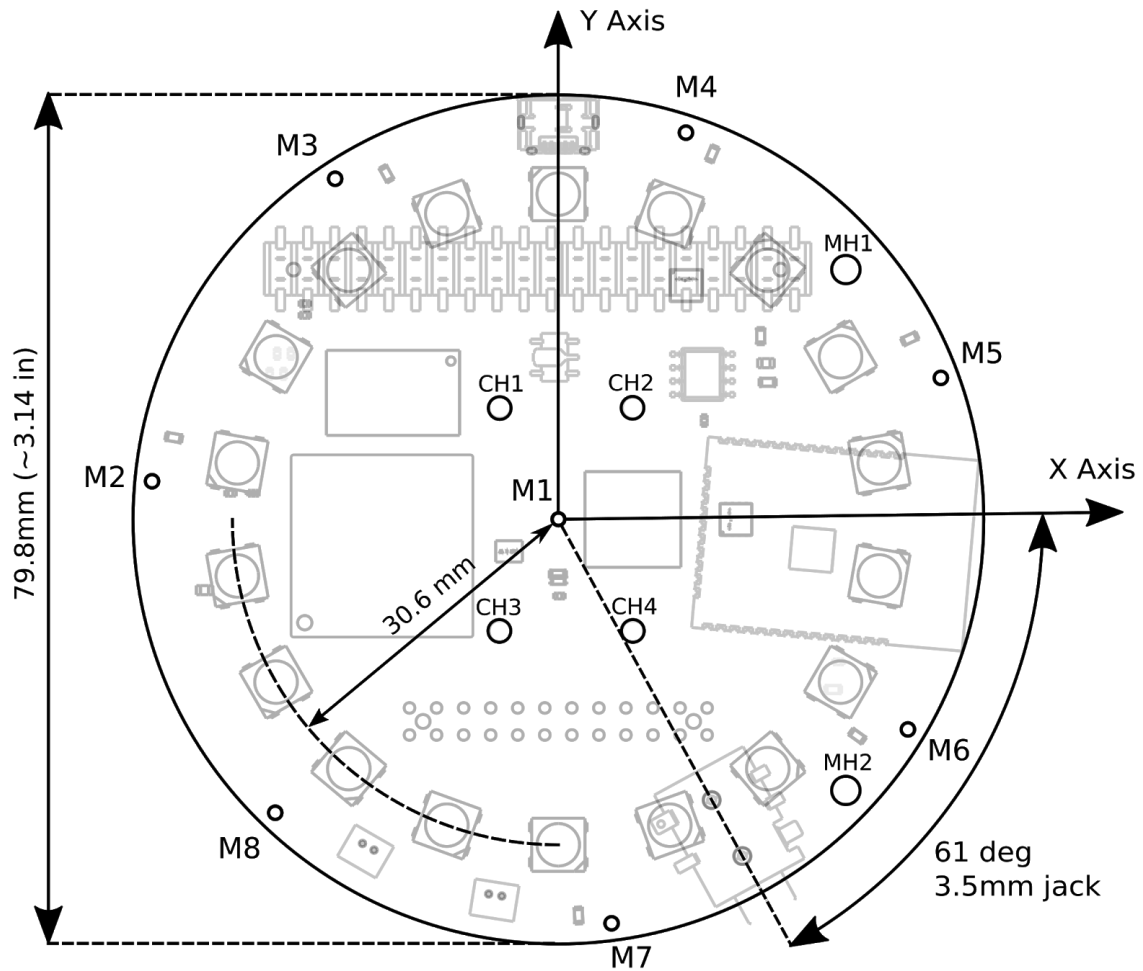
Label	X [mm]	Y [mm]	Description
M1	0.00	0.00	Microphone #1
M2	-38.13	3.58	Microphone #2
M3	-20.98	32.04	Microphone #3
M4	11.97	36.38	Microphone #4
M5	35.91	13.32	Microphone #5
M6	32.81	-19.77	Microphone #6
M7	5.00	-37.97	Microphone #7
M8	-26.57	-27.58	Microphone #8

MH1	27.00	23.50	Mounting hole #1
MH2	27.00	-25.50	Mounting hole #2
CH1	-5.50	10.50	Camera mounting hole #1
CH2	7.00	10.50	Camera mounting hole #2
CH3	-5.50	-10.50	Camera mounting hole #3
CH4	7.00	-10.50	Camera mounting hole #4

Online Documentation and Support

For additional documentation and support please refer to:

- https://voice.matrix.one/
- http://community.matrix.one/
- https://matrix-io.github.io/matrix-documentation/
- https://github.com/matrix-io

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