

# Sipeed M1 Datasheet

## v1.1



### Key Features:

- CPU : RISC-V Dual Core 64bit, with FPU , 400Mhz-500Mhz, Neural network processor
- Image Recognition: QVGA@60FPS/VGA@30FPS
- Voice Recognition: up to 8 microphones
- Deep learning framework: TensorFlow/Keras/Darknet
- Peripheral: FPIOA、 UART、 GPIO、 SPI、 I<sup>2</sup>C、 I<sup>2</sup>S、 WDT、 TIMER、 RTC etc.

## UPDATE

V1.0	2018/10/25 Published original document
V1.1	2019/3/6: Removed M1w description

## SPECIFICATION

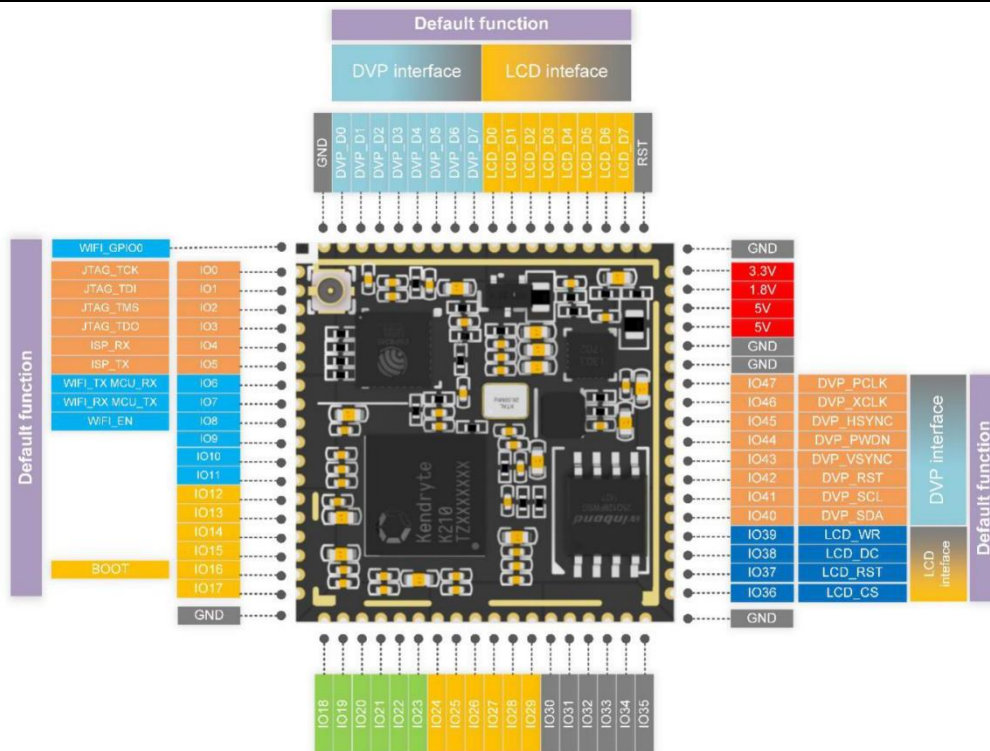
CPU : RISC-V Dual Core 64bit, 400Mh adjustable	Powerful dual-core 64-bit open architecture-based processor with rich community resources
FPU Specifications	IEEE754-2008 compliant high-performance pipelined FPU
Debugging Support	High-speed UART and JTAG interface for debugging
Neural Network Processor (KPU)	<ul style="list-style-type: none"> <li>• Supports the fixed-point model that the mainstream training framework trains according to specific restriction rules</li> <li>• There is no direct limit on the number of network layers, and each layer of convolutional neural network parameters can be configured separately, including the number of input and output channels, and the input and output line width and column height</li> <li>• Support for 1x1 and 3x3 convolution kernels</li> <li>• Support for any form of activation function</li> <li>• The maximum supported neural network parameter size for real-time work is 5MiB to 5.9MiB</li> <li>• The maximum supported network parameter size when working in non-real time is (flash size - software size)</li> </ul>
Audio Processor (APU)	<ul style="list-style-type: none"> <li>• Up to 8 channels of audio input data, ie 4 stereo channels</li> <li>• Simultaneous scanning pre-processing and beamforming for sound sources in up to 16 directions</li> <li>• Supports one active voice stream output</li> <li>• 16-bit wide internal audio signal processing</li> <li>• Support for 12-bit, 16-bit, 24-bit, and 32-bit input data widths • Multi-channel direct raw signal output</li> <li>• Up to 192kHz sample rate</li> <li>• Built-in FFT unit supports 512-point FFT of audio data</li> <li>• Uses system DMAC to store output data in system memory</li> </ul>
Static Random-Access Memory (SRAM)	The SRAM is split into two parts, 6MiB of on-chip general-purpose SRAM memory and 2MiB of on-chip AI SRAM memory, for a total of 8MiB
Field Programmable IO Array (FPIOA/IOMUX)	FPIOA allows users to map 255 internal functions to 48 free IOs on the chip
Digital Video Port (DVP)	Maximum frame size 640x480

FFT Accelerator	The FFT accelerator is a hardware implementation of the Fast Fourier Transform (FFT)
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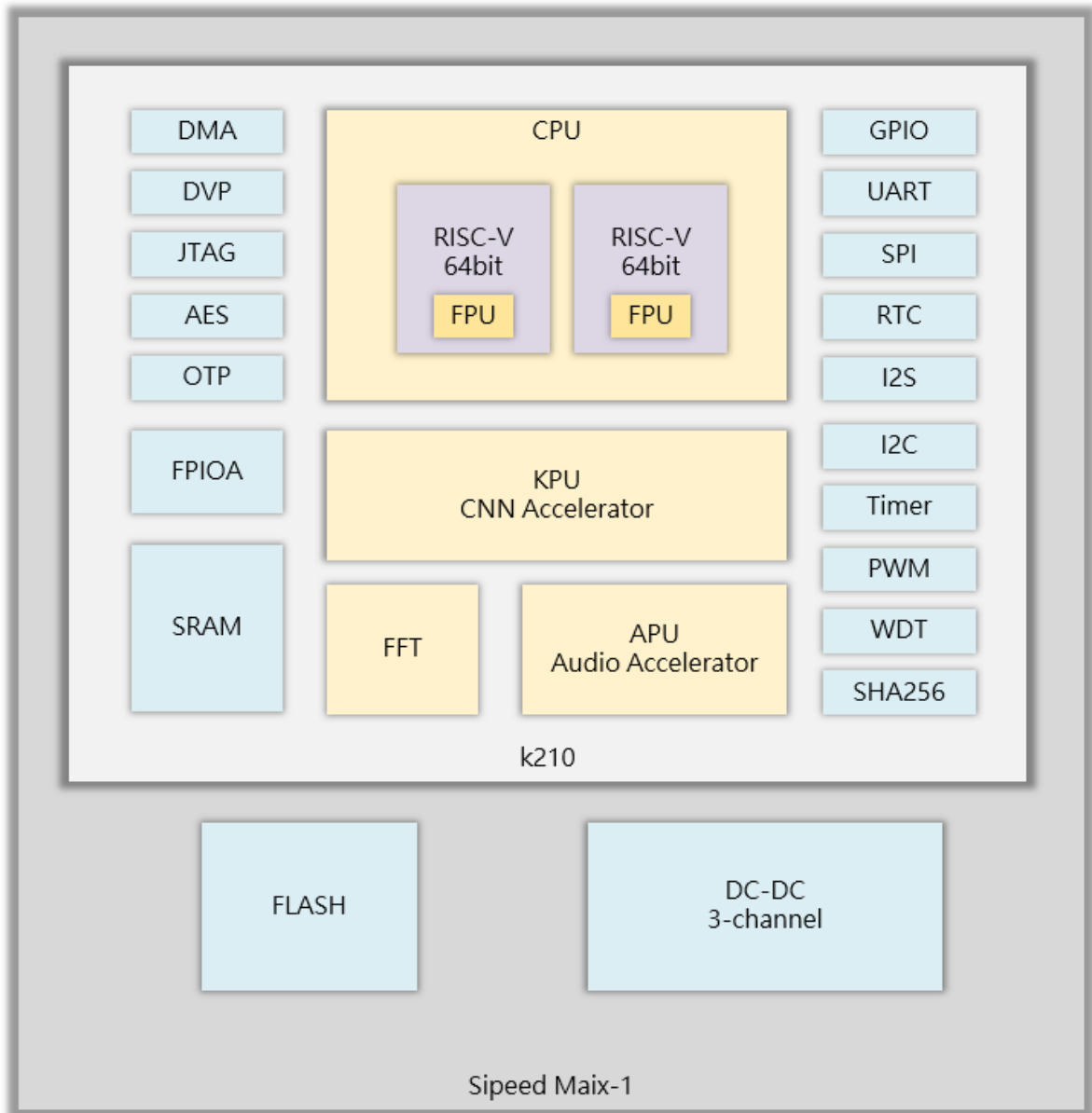
SOFTWARE FEATURES	
FreeRtos & Standard SDK	Support FreeRtos and Standrad development kit.
MicroPython Support	Support MicroPython on M1
Machine vision	Machine vision based on convolucional neural network
Machine hearing	High performance microphone array processor

HARDWARE FEATURES	
Supply voltage of external power supply	5.0V ±0.2V
Supply current of external power supply	> 300mA @ 5V
Temperature rise	<30K
Range of working temperature	-30°C ~ 85°C

## M1 PIN MAP

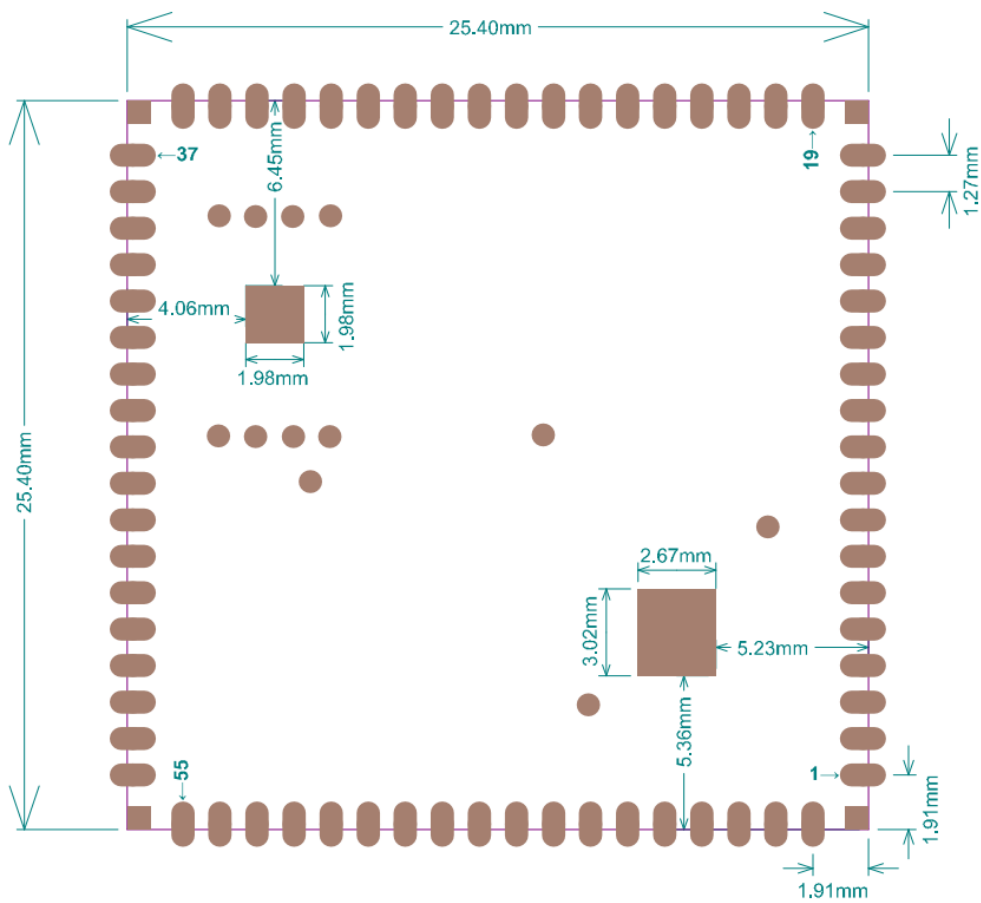


## M1 BLOCK DIAGRAM



SIZE	
Length	25.4mm
Width	25.4mm
Height	3.3 mm

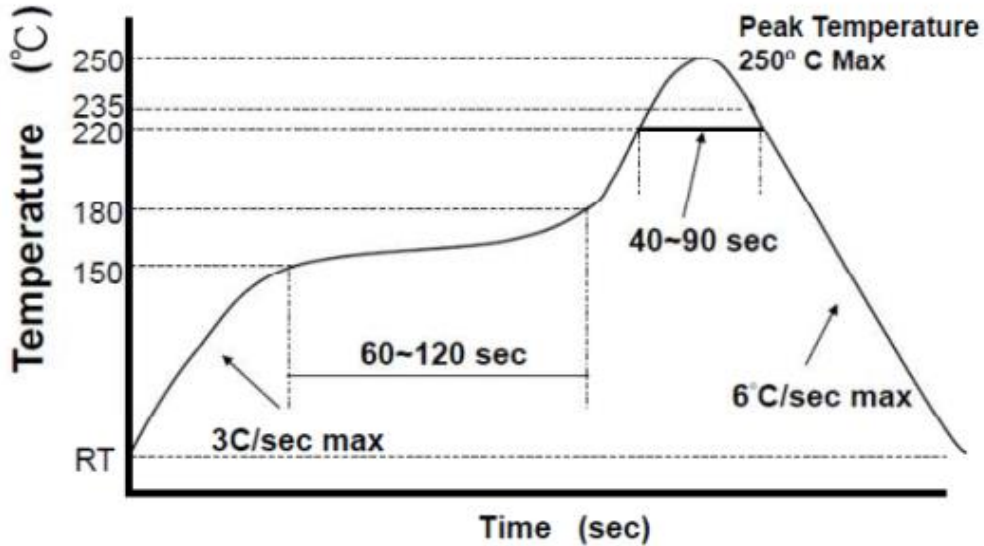
### Speed M1 PIN ASSIGNMENT



#	PIN	#	PIN	#	PIN	#	PIN
1	JTAG_TCK	19	MIC_BCK	37	LCD_CS	55	RST
2	JTAG_TDI	20	MIC_WS	38	LCD_RST	56	LCD_D7
3	JTAG_TMS	21	MIC_DAT3	39	LCD_DC	57	LCD_D6
4	JTAG_TDO	22	MIC_DAT2	40	LCD_WR	58	LCD_D5
5	ISP_RX	23	MIC_DAT1	41	DVP_SDA	59	LCD_D4
6	ISP_TX	24	MIC_DAT0	42	DVP_SCL	60	LCD_D3
7	WIFI_TX MCU_RX	25	MIC_LED_DAT	43	DVP_RST	61	LCD_D2
8	WIFI_RX MCU_TX	26	SPI0_CS1	44	DVP_VSYNC	62	LCD_D1
9	WIFI_EN	27	SPI0_MISO	45	DVP_PWDN	63	LCD_D0
10	IO9	28	SPI0_SCLK	46	DVP_HSYNC	64	DVP_D7
11	IO10	29	SPI0_MOSI	47	DVP_XCLK	65	DVP_D6
12	IO11	30	SPI0_CS0	48	DVP_PCLK	66	DVP_D5
13	LED_G	31	MIC0_WS	49	GND	67	DVP_D4
14	LED_B	32	MIC0_DATA	50	GND	68	DVP_D3
15	LED_R	33	MIC0_BCK	51	5V	69	DVP_D2
16	IO15	34	I2S_WS	52	5V	70	DVP_D1
17	BOOT KEY0	35	I2S_DA	53	1V8	71	DVP_D0
18	IO17	36	I2S_BCK	54	3V3	72	GND

Note: The small square pad in the lower right corner of the dimension drawing is WIFI\_GPIO0, and the other three corners are GND.

## REFLOW PROFILE GUIDELINE



## Matters needing attention

Boot mode selection	At startup, BOOT pin is used to select one of two boot options: <ul style="list-style-type: none"> <li>• Boot from main flash memory (Set BOOT pin 3.3V)(Float or pull up to 3.3V)</li> <li>• Enter ISP download mode (Set BOOT pin 0V)</li> </ul>
RST pin	Vrst range : 0 to 1.8V ; Active low ; Do not let the voltage of RST pin be greater than 1.8V
Thermal design	It is recommended to connect the pad on the bottom of the module to a large piece of copper on the bottom plate to help heat dissipation

RESOURCES	
Official Website	<a href="http://www.sipeed.com">www.sipeed.com</a>
Github	<a href="https://github.com/sipeed">https://github.com/sipeed</a>
BBS	<a href="http://bbs.sipeed.com">http://bbs.sipeed.com</a>
Wiki	<a href="http://maixpy.sipeed.com">maixpy.sipeed.com</a>
Sipeed Model Store	<a href="https://maixhub.com/">https://maixhub.com/</a>
SDK Reference	<a href="http://dl.sipeed.com/MAIX/SDK">dl.sipeed.com/MAIX/SDK</a>
HDK Reference	<a href="http://dl.sipeed.com/MAIX/HDK">dl.sipeed.com/MAIX/HDK</a>
E-mail (Technical Support)	<a href="mailto:support@sipeed.com">support@sipeed.com</a>
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