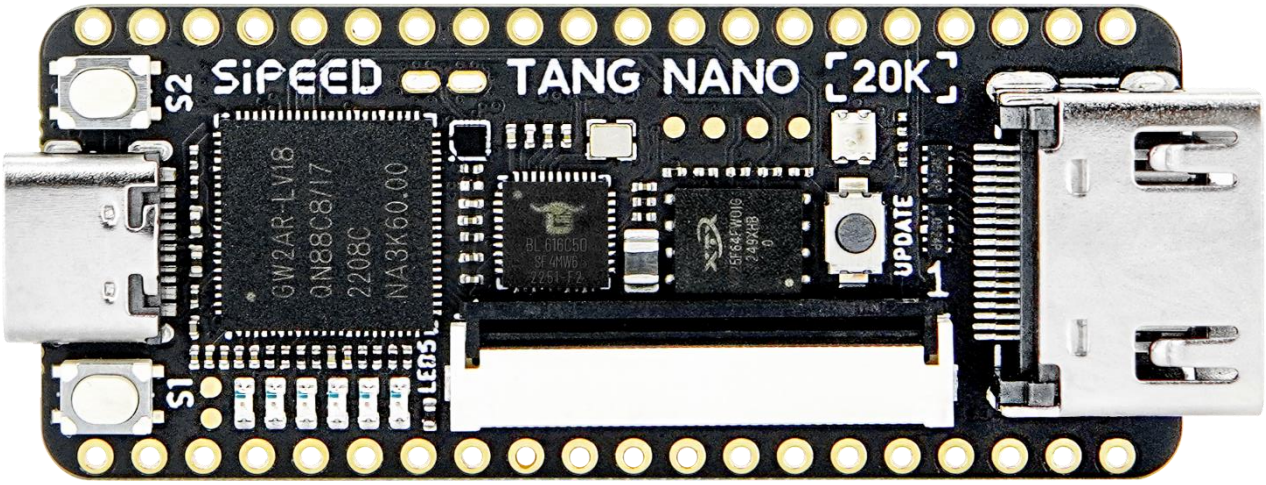
Sipeed Tang Nano 20K

Datasheet v1.3



Characteristics:

- FPGA CHIP: GW2AR-18 with 20,736 LUT4 Logical Units
- 480Mbps High-Speed USB to UART, I2C, SPI and JTAG
- Support TMDS Display Output or MIPI DPI Output
- External PLL IC Provides 2-way Accurate Clock
- Mono Audio CODEC & PA Onboard for Speaker
- 64Mbit SDRAM (SIP) + 64Mbit QSPI FLASH
- Special Design for Retro-Games (Optional)

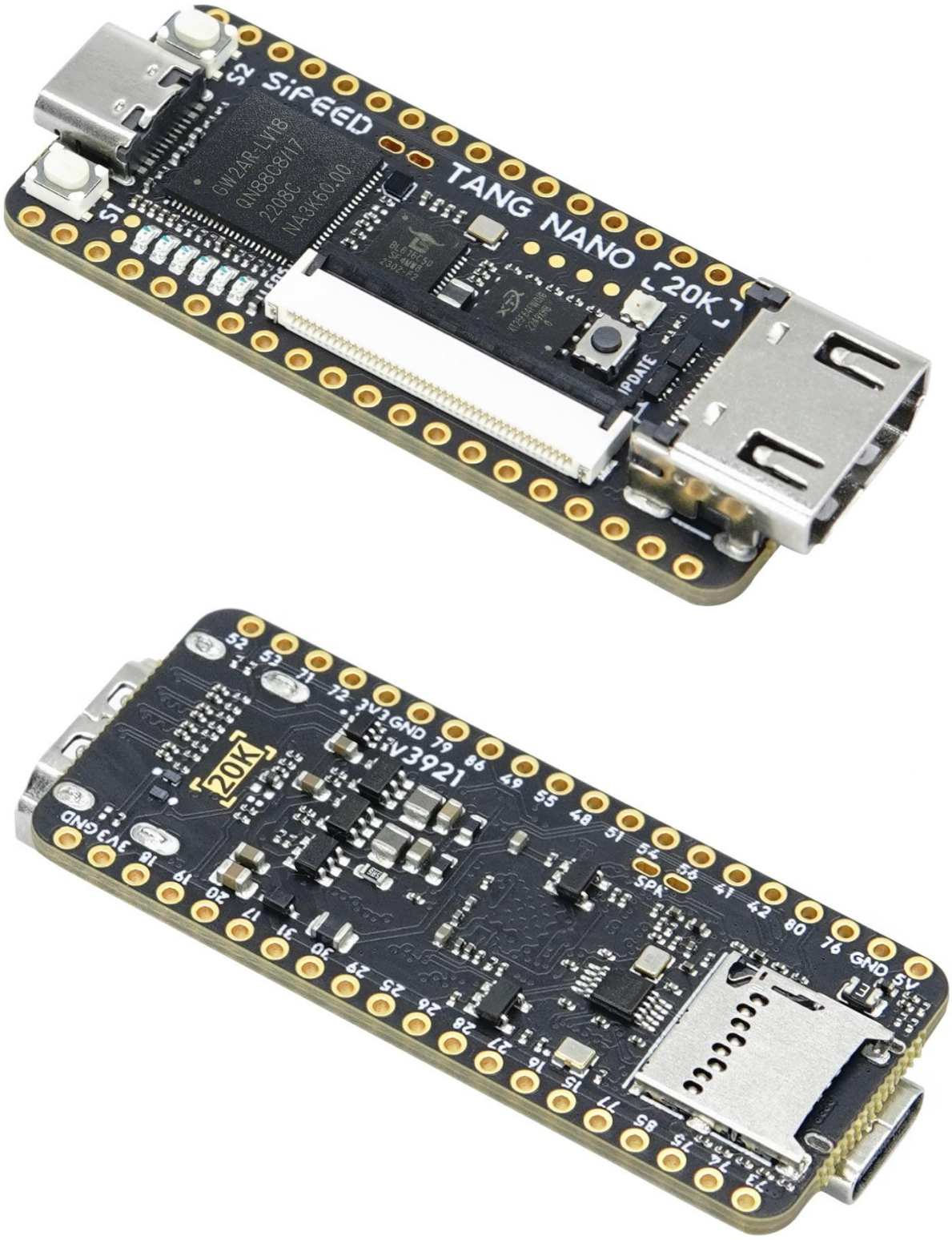
Update Records	
V1.0	Edited on December 23, 2022; Original document
V1.1	Edited on February 18, 2023; Update of hardware version v3920
V1.2	Edited on April 27, 2023; Update of hardware version v3921
V.13	Edited on June 08, 2023; Fixed the issue of pinout picture

Hardware Overview	
LUT4	20,736
Flip-Flop (FF)	15,552
Shadow SRAM SSRAM (bits)	41,472
Block SRAM BSRAM	828K
BSRAM quantity BSRAM	46
DSRAM (bits)	64M
High performance DSP	Support 9x9,18x18,36x36bits multiplier and 54bits accumulator
18 x 18 Multiplier	48
QSPI FLASH (bits)	64M
PLLs	2
Display interface	HDMI Connector, MIPI DPI FPC Connector
Debugger	Onboard BL616, provides USB to UART, I2C, SPI and JTAG
IO Drive capability	• Support 4mA, 8mA, 16mA, 24mA and other driving capabilities • Independent bus keeper, pull-up / pull-down resistor and open drain output options are provided for each I/O
Storage	microSD Card Slot
IO Fanout	2x20P 2.54mm DIP Pin Headers with 34 free IOs
Button	Onboard 2 user buttons
LED	Onboard 6 LED + 1 WS2812

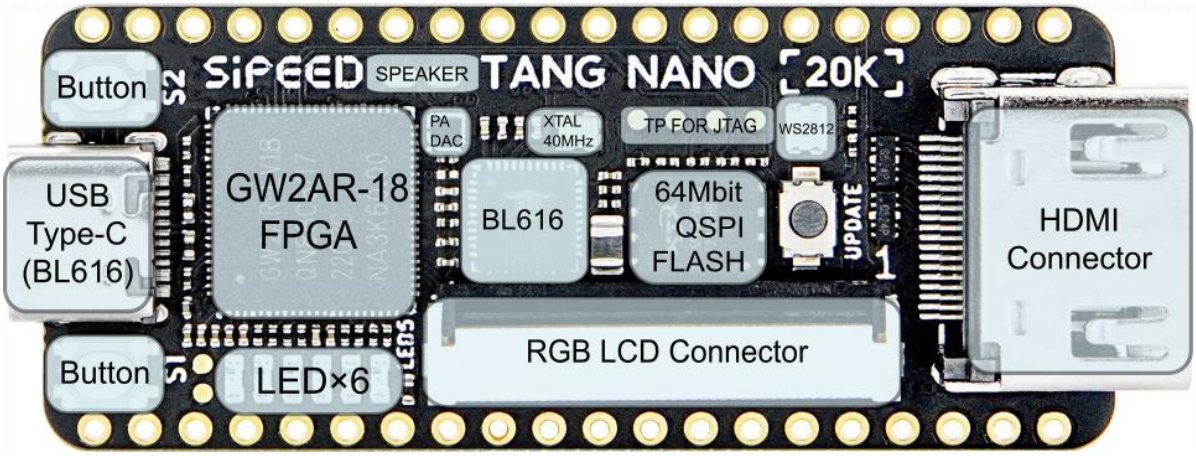
Software Overview	
IDE	Support Gowin IDE(Version>1.9.8)； Support Gowin Synthesis
Home Page	https://www.gowinsemi.com/en/support/home/
GOAI Brief introduction	https://www.gowinsemi.com/en/support/ip_detail/119/
GOAI Official project	https://github.com/gowinsemi/GoAI
Sipeed Reference example	https://github.com/sipeed/TangNano-20K-example

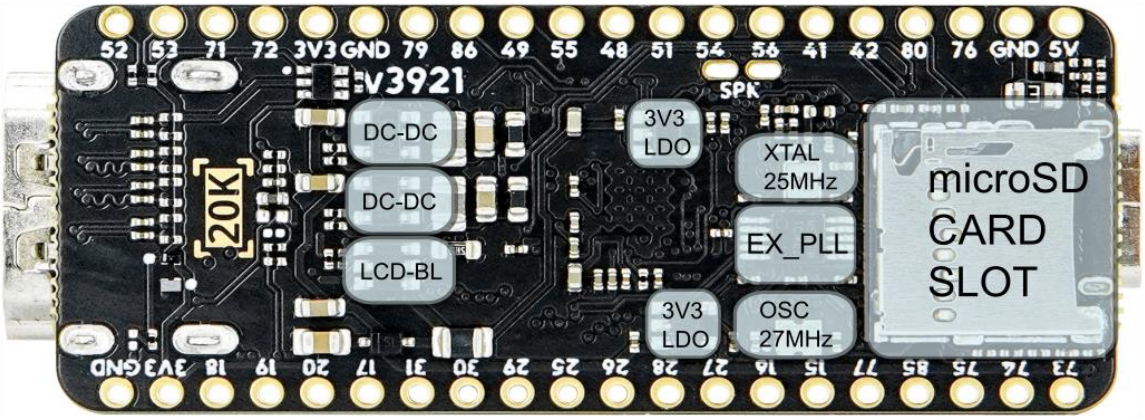
Working Conditions	
Power supply demand	Via USB-C：5V±10% 0.5A
Temperature rise	<30K
Operating ambient temperature range	0°C ~ 65°C

Appearance Drawing

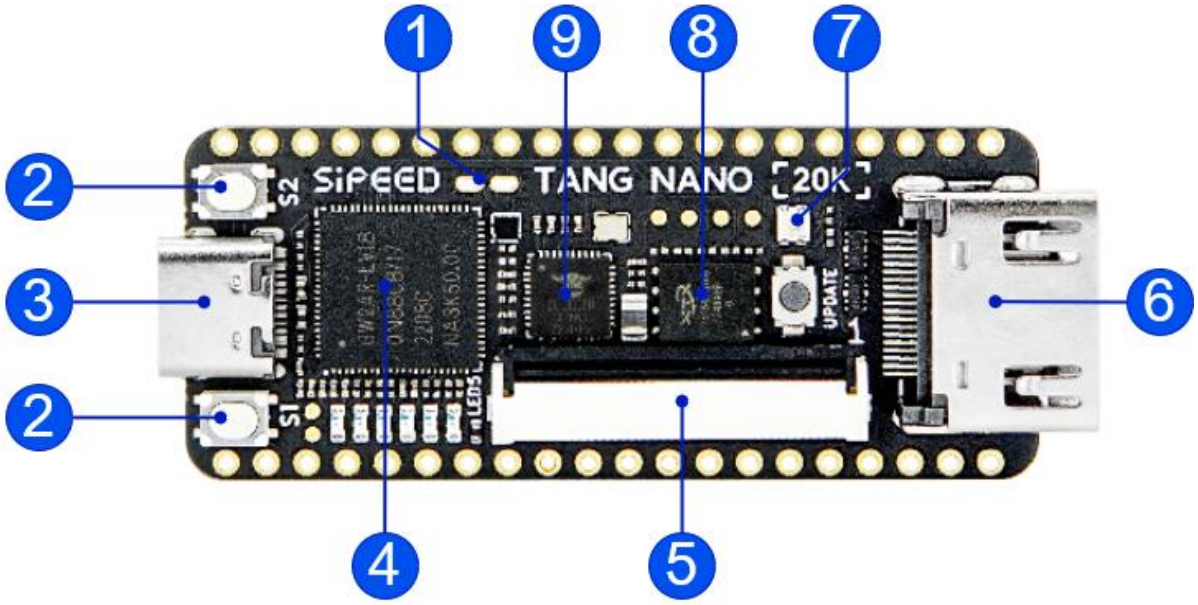


Functional Annotation I



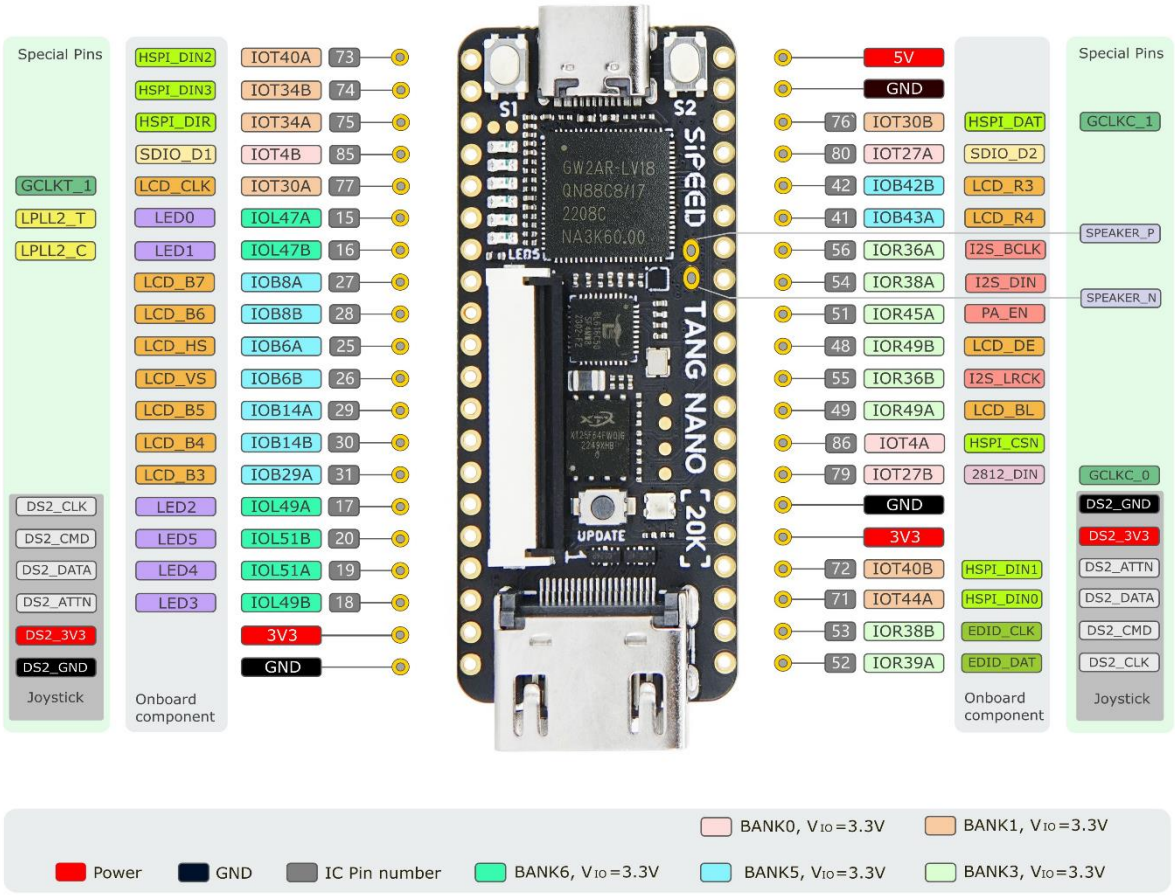


Functional Annotation II

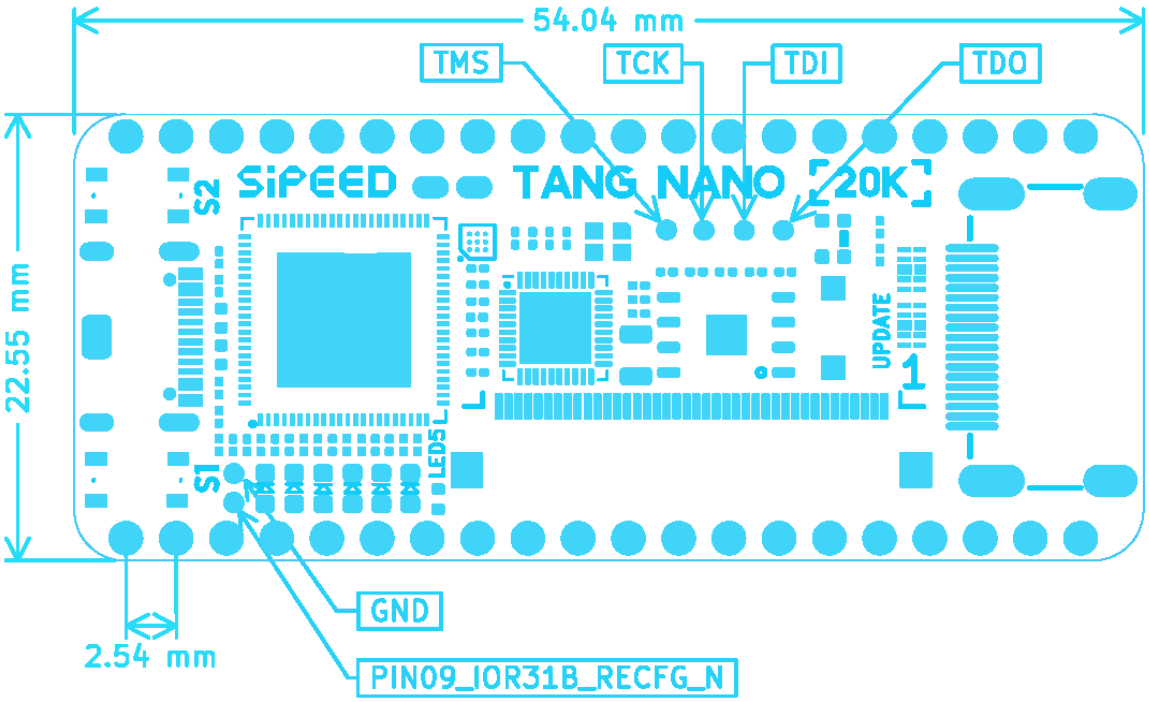


1 Speaker Out
2 User Buttons
3 USB Debug
4 GA2AR-LV18
5 MIPI DPI Conn.
6 TMDS Video Out
7 WS2812 LED
8 Flash
9 BL616

Pinout


Special Pins
GCLKT_1
LPLL2_T
LPLL2_C
DS2_CLK
DS2_CMD
DS2_DATA
DS2_ATTN
DS2_3V3
DS2_GND
Joystick
HSPI_DIN2
HSPI_DIN3
HSPI_DIR
SDIO_D1
LCD_CLK
LED0
LED1
LCD_B7
LCD_B6
LCD_HS
LCD_VS
LCD_B5
LCD_B4
LCD_B3
LED2
LED5
LED4
LED3
Onboard component
IOT40A 73
IOT34B 74
IOT34A 75
IOT4B 85
IOT30A 77
IOL47A 15
IOL47B 16
IOB8A 27
IOB8B 28
IOB6A 25
IOB6B 26
IOB14A 29
IOB14B 30
IOB29A 31
IOL49A 17
IOL51B 20
IOL51A 19
IOL49B 18
3V3
GND
S1
S2
SiPEED
TANG NANO 20K
UPDATE
5V
GND
76 IOT30B
80 IOT27A
42 IOB42B
41 IOB43A
56 IOR36A
54 IOR38A
51 IOR45A
48 IOR49B
55 IOR36B
49 IOR49A
86 IOT4A
79 IOT27B
GND
3V3
72 IOT40B
71 IOT44A
53 IOR38B
52 IOR39A
HSPI_DAT
SDIO_D2
LCD_R3
LCD_R4
I2S_BCLK
I2S_DIN
PA_EN
LCD_DE
I2S_LRCK
LCD_BL
HSPI_CSN
2812_DIN
HSPI_DIN1
HSPI_DIN0
EDID_CLK
EDID_DAT
Onboard component
Special Pins
GCLKC_1
SPEAKER_P
SPEAKER_N
GCLKC_0
DS2_GND
DS2_3V3
DS2_ATTN
DS2_DATA
DS2_CMD
DS2_CLK
Joystick
BANK0, VIO=3.3V
BANK1, VIO=3.3V
Power
GND
IC Pin number
BANK6, VIO=3.3V
BANK5, VIO=3.3V
BANK3, VIO=3.3V

Dimension Information	
Length	54.04 mm
Width	22.55mm
Thickness	Please check the 3D drawing



Precautions	
ESD protection	Please pay attention to avoid static electricity hitting PCBA. Please release the static electricity from the handle before contacting PCBA
Tolerance voltage	The working voltage of each GPIO has been marked in the schematics. Please do not let the actual working voltage of GPIO exceed the rated value, otherwise it will cause permanent damage to PCBA
FPC connector	When connecting FPC flexible cable, please ensure that the cable is completely inserted into the cable without offset; Note: Pin 1 of the cable must correspond to the connector's Pin 1;
Plugging	Please disconnect the power completely before plugging in and out the camera
Avoid short circuit	Please avoid any liquid or metal touching the pads of components on PCBA during power on, otherwise it will cause short circuit and burn PCBA

Resources	
Official website	www.sipeed.com
Github	github.com/Sipeed
BBS	bbs.sipeed.com
Wiki	wiki.sipeed.com
SDK /HDK Relevant information	dl.sipeed.com/
E-mail (For Technical support & Business cooperation)	support@sipeed.com