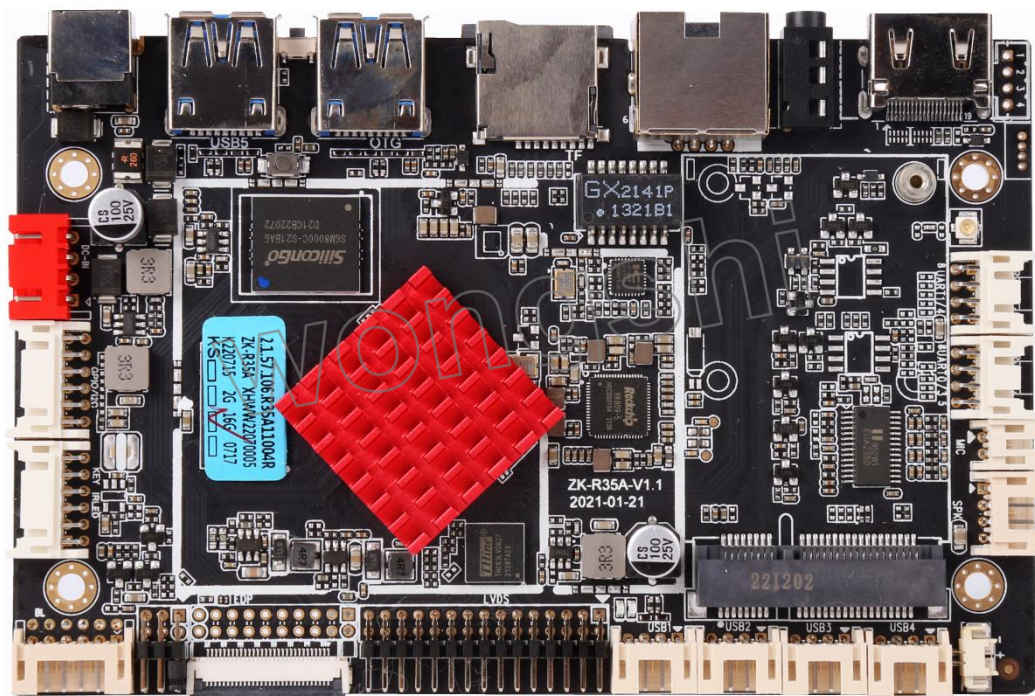


Quad-Core RK3568 Multimedia Control Board

(Product Model: WS-R3568A)



Wongshi Technologies

www.wongshi.com

Motherboard Update Record

Version	Date	Description
V0.1	2021-06	Original Version
V1.0	2021-07	Optimize electrical parameters.
V1.1	2022-02	Add a MIPI display interface.

Note:

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Chapter 1: Product Overview

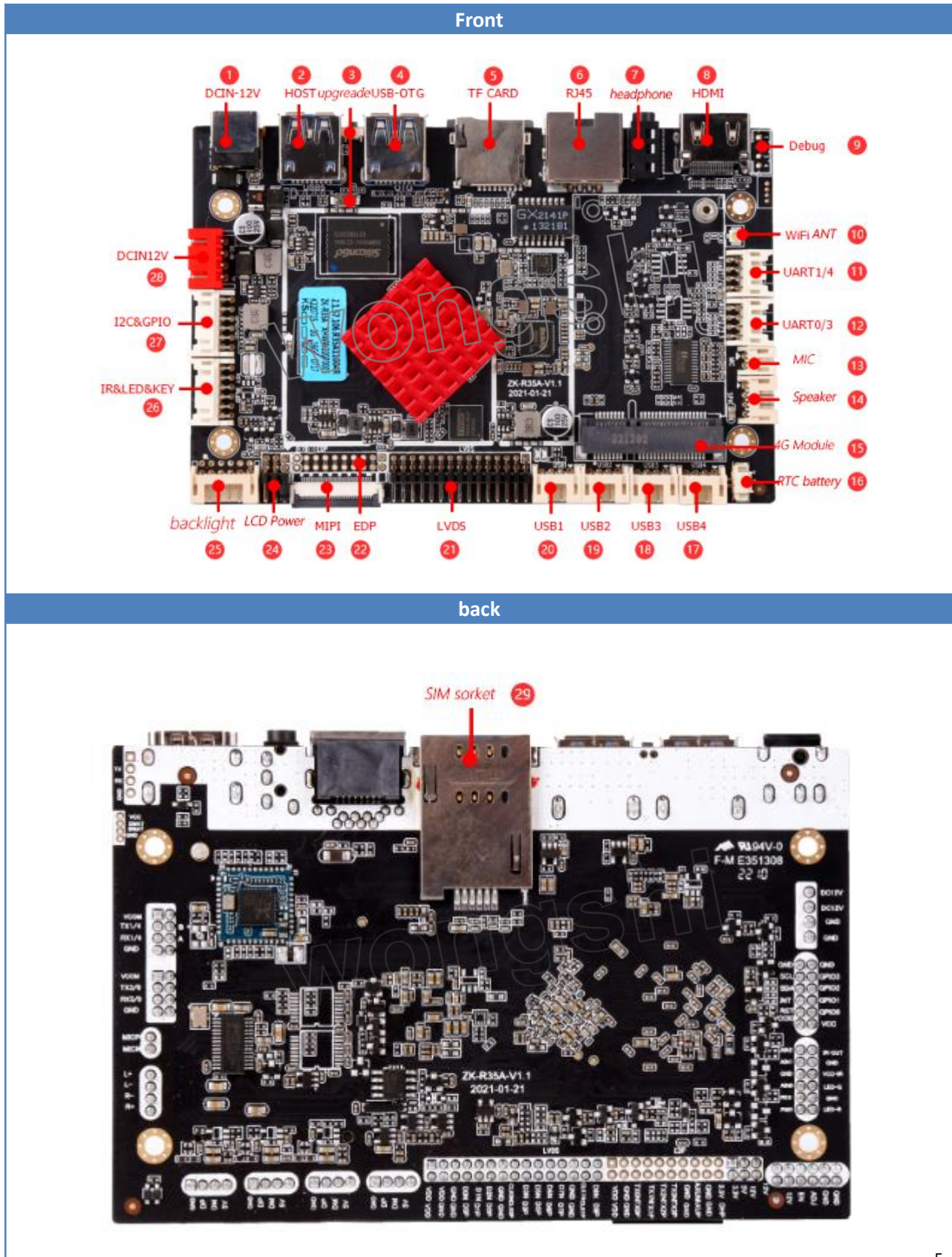
1.1 Overview

- The RK3568 Android intelligent motherboard adopts the Rockchip RK3568 Cortex-A55 quad-core 64-bit chip solution, Mali-G52-2EE GPU, supports Google Android 11 system, and supports decoding of mainstream audio and video formats and pictures. Supports 4K and H.265 hard decoding, multiple video output and input.
- The embedded 3D GPU makes the RK3568 fully compatible with OpenGL ES 1.1/2.0/3.2, OpenCL 2.0 and Vulkan 1.1. The special 2D hardware engine will maximize display performance and provide very smooth operation.
- The built-in NPU (1T) supports INT8/INT16/FP16/BFP16 mixed operations with stronger performance, faster speed and richer interfaces. Supports single and double 6/8-bit LVDS display output, and supports EDP and MIPI display output. Supports HDMI-4K output and 4K video playback.
- Supports 2.4G WIFI+BT, infrared remote control, gravity sensing, IO port expansion and other functions. With rich interfaces, it is widely used in intelligent control fields such as advertising machines, interactive all-in-one machines, security, and industrial control. Due to its hardware platformization and Android intelligent characteristics, it can be used on the intelligent terminal motherboard when human-computer interaction and network device interaction are required.

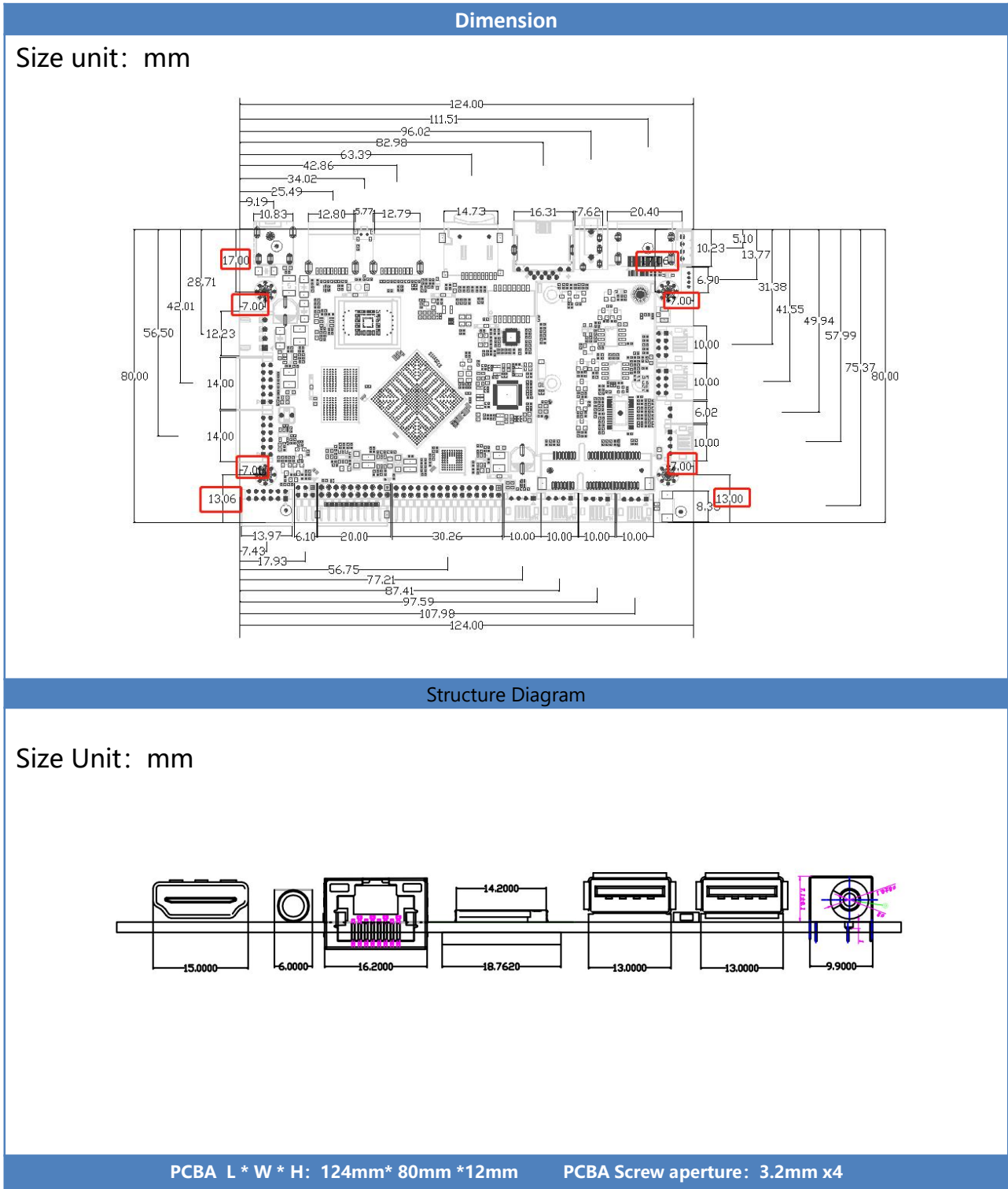
1.2 Application fields

- AI devices
- Access control
- Face recognition and temperature measurement
- Vending machines
- Industrial control equipment

Chapter 2 Product Appearance, Interface and Size



2.1 Schematic diagram of product appearance, interface and size.

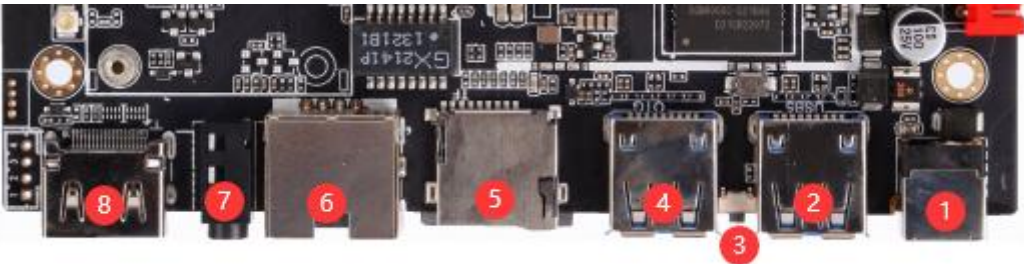


Chapter 3: Basic Function List

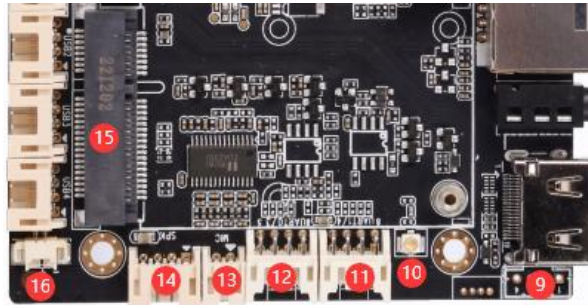
Core Components	
CPU	Rockchip RK3568, 2GHz, Cortex-A55 quad-core, Mali-G52-2EE GPU. Equipped with NPU supporting 1T computing power
GPU	ARM G52 2EE, supports OpenGL ES 1.1/2.0/3.2, OpenCL 2.0, Vulkan 1.1, and is embedded with high-performance 2D acceleration hardware
Memory	LPDDR4 2GB, maximum support 8GB
Storage	EMMC 16G, maximum support 256GB
Storage Expansion	Supports up to 128GB TF card expansion
Basic Interfaces	
USB Port	4 USB 2.0 ports, 2 USB 3.0 ports (one of which is USB OTG)
Serial Port	4 serial ports, default TTL (optional RS232); among them, UART4 can be optionally equipped with 485
I2C Interface	1 standard I2C interface, communication level is 3.3V, can be used for touch and communication
GPIO Interface	4 GPIO ports, communication level is all 3.3V, GPIO level can be optionally equipped with 5V/12V
G- Sensor	On-board G-sensor (reserved function, optional)
Timed Power On/Off	Supported
Timing	Supported
Network Support	
Ethernet	1 standard RJ45 interface, 10/100M adaptive Ethernet
WiFi/Bluetooth	Equipped with WIFI module, default 2.4G WIFI (BT and 5G WIFI optional)
Wireless	1 built-in MINI PCI_E socket slot, expand and connect 3G/4G module.
Display Interface	
LVDS Output	1 Dupont header 30p double-row pin socket (supports single/double 6/8 bits), maximum support 19201080 resolution
EDP Output	1 Dupont header 20p double-row pin socket, maximum support 25601600
MIPI Output	1 30P FPC connector, maximum support 19201080
HDMI Output	1 HDMI high-definition socket, 19Pin female socket type A, supports 4K/1080P output
Audio Interface	
Speaker Output	Left and right stereo output, maximum support 8R5W/4R10W dual speakers, default 8R1.5W/4R3W
Headphone Socket Interface	1 audio stereo output (analog signal output)
Microphone Interface	1 microphone mono input (analog signal input)
Others	
Operating System	Android 11
Power Socket	1 external DC12V input socket (DC-5.52.0MM female socket), one 2.54mm-4P input socket
Power Adapter	Input: AC100-240V.50-60HZ, Output: DC12V 3A (depending on the screen)
System Upgrade	Supports PC/USB flash drive/TF card upgrade

Chapter 4: Interface Description and Definitions

4.1 Interface Description

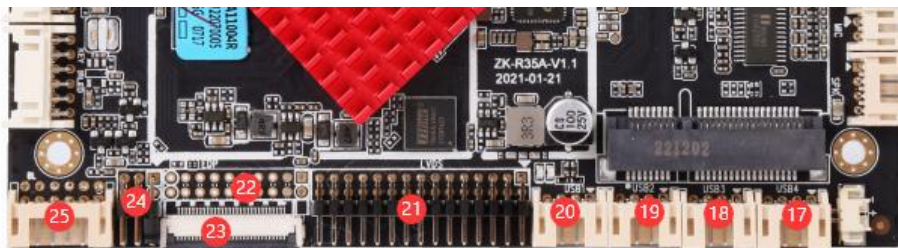
Front Interface		
		
NO.	Interface	Description
1	12V DC	The DC interface specification is (inner diameter 2.0mm, outer diameter 5.5mm), and a 12V/3A DC input is recommended.
2	USB3.0	USB3.0 Type-A interface, fixed Host mode, current limit 1.5A
3	Recover	Motherboard upgrade button
4	USB3.0	USB3.0 Type-A interface, default Host mode, current limit 1.5A, optional OTG
5	TF Card	Support up to 128GB TF card expansion
6	Earthnet	Standard 10/100M Ethernet interface
7	Headphone	Standard 3.5mm, 3-segment headphone socket with microphone, supporting audio input and output
8	HDMI-OUT	Type-A interface, HDMI2.0 output display, maximum support 4K@60Hz

Left Interface



NO.	Interface	Description
9	Serial Port 2	TTL serial port, default Debug mode, used for debugging and log printing. It can be configured as a TTL serial port to connect peripherals. It is not pasted by default.
10	Antenna Interface	WIFI antenna female socket, connecting IPEX first-generation antenna
11	Serial Port 1/4	Serial ports 1 and 4 are default TTL (3.3V level) communication, can be optionally configured as RS232 serial ports, and serial port 4 can be optionally configured as RS485 serial port
12	Serial Port 0/3	Serial ports 0 and 3 are default TTL (3.3V level) communication, can be optionally configured as RS232 serial ports
13	Microphone Interface	System MIC audio input interface
14	Speaker Interface	Power amplifier output interface, dual-channel, maximum output 5W@8Ω, default configuration is 1.5W@8Ω.
15	4G Module Interface	MINI-PCIE socket 52Pin 0.6PH, connecting 4G module
16	Battery Interface	RTC battery interface, 3.3V button battery interface

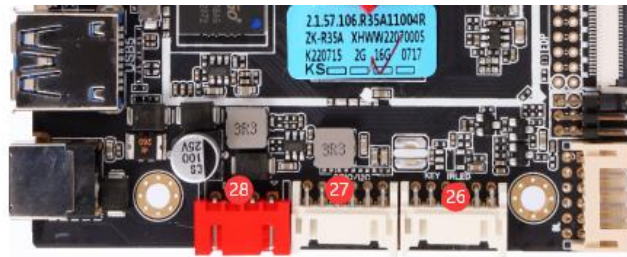
Upper side interface



NO.	Interface	Description
17	USB1	Fixed Host mode, USB current limit 0.5A
18	USB2	Fixed Host mode, USB current limit 0.5A
19	USB3	Fixed Host mode, USB current limit 0.5A
20	USB4	Fixed Host mode, USB current limit 0.5A
21	LVDS	LVDS display output, maximum support 1920*1080 resolution
22	EDP	EDP display output, maximum support 2560*1600 resolution
23	MIPI	MIPI display output, maximum support 1920*1080 resolution

24	LVDS screen voltage	LVDS screen voltage selection interface, 3.3V/5V/12V optional (connected by jumper cap, default 3.3V)
25	Backlight interface	LVDS screen backlight interface, supporting screen backlight enable switch and brightness adjustment

Right Interface



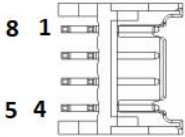
No.	Interface	Description
26	KEY/IR/LED interface	Infrared interface, with power-on status signal light signal, reset signal, POWER signal, and two channels of ADC signals
27	GPIO/I2C interface	4 GPIO interfaces, 1 I2C interface, communication levels are all 3.3V, GPIO level can be optionally configured as 5V/12V
28	Power interface	Recommended 12V/3A DC input

4.2 Interface Definitions

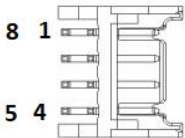
- ◆Serial Port 2 (DEBUG) (PH socket - straight insertion, 1*4pin, 2.0mm): Label No. 9.

Outlook	NO.	Define	Property	Description
	1	NC	NC	NC
	2	TX	Output	Serial Port 2 Data Transmission
	3	RX	Input	Serial Port 2 Data Reception
	4	GND	GND	GND


◆ Serial Port 1/4 (PH socket, 2*4pin, 2.0mm): Label No. 11.

Outlook	NO.	Define	Property	Description
	1	VCC	Power	Defaulted 5V (Optional 3V/12V)
	2	TX1	Output	Serial Port 1 Data Transmission
	3	RX1	Input	Serial Port 1 Data Reception
	4	GND	GND	GND
	5	GND	GND	GND
	6	RX4	Input	Serial Port 4 Data Reception
	7	TX4	Output	Serial Port 4 Data Transmission
	8	VCC	Power	Defaulted 5V (Optional 3V/12V)

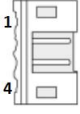
◆ Serial Port 0/3 (PH socket, 2*4pin, 2.0mm): Label No. 12.

Outlook	NO.	Define	Property	Description
	1	VCC	Power	Defaulted 5V (Optional 3V/12V)
	2	TX3	Output	Serial Port 3 Data Transmission
	3	RX3	Input	Serial Port 3 Data Reception
	4	GND	GND	GND
	5	GND	GND	GND
	6	RX0	Input	Serial Port 0 Data Reception
	7	TX0	Output	Serial Port 0 Data Transmission
	8	VCC	Power	Defaulted 5V (Optional 3V/12V)

◆ MIC interface (PH socket, 1*2pin, 2.0mm): Label No. 13.

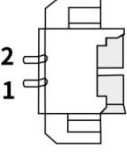
Outlook	NO.	Define	Property	Description
	1	MIC+	Input	Microphone input +
	2	MIC-	Input	Microphone input -

- ◆ Speaker interface (PH socket, 1*4pin, 2.0mm): Label No. 14.


Outlook	NO.	Define	Property	Description
	1	SPK-L+	Output	Audio Output Left +
	2	SPK-L-	Output	Audio Output Left -
	3	SPK-R-	Output	Audio Output Right -
	4	SPK-R+	Output	Audio Output Right +

Note: The maximum output is 5W@8Ω, and the default output is 1.5W@8Ω

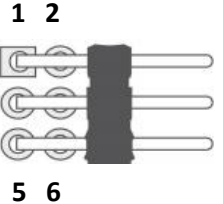
- ◆ Battery interface (SMT horizontal mounting socket, 1*2pin, 1.25mm): Label No. 16.

Outlook	NO.	Define	Property	Description
	1	VCC_RTC	Power	RTC Positive Terminal
	2	GND	GND	GND

- ◆ USB*4 (PH socket, 1*4pin, 2.0mm): Label Nos. 17-20.

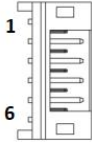
Outlook	NO.	Define	Property	Description
	1	GND	GND	GND
	2	DP	Input/Output	Fixed Host mode
	3	DM	Input/Output	
	4	5V	Power	5VOutput(500MA Limited)

- ◆ LVDS screen voltage selection (Dupont pin header, 2*3pin, 2.0mm): Label No. 24.

Outlook	NO.	Define	Property	Description
	1	3.3V	Power	3.3V power supply
	2	LVDS_VDD	Power	LVDS screen voltage
	3	5V	Power	5V power supply
	4	LVDS_VDD	Power	LVDS screen voltage
	5	12V	Power	12V power supply
	6	LVDS_VDD	Power	LVDS screen voltage

Note: For LVDS screens, a jumper cap is used to select the screen power supply. By default, 3.3V is connected to VCC_LCD. Therefore, the screen voltage is 3.3V by default

- ◆ LCD-BL backlight interface (PH socket, 1*6pin, 2.0mm): Label No. 25.

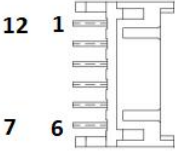
Outlook	NO.	Define	Property	Description
	1	DC-12V	Power	LCD backlight Power 12V
	2	DC-12V	Power	LCD backlight Power 12V
	3	EN	Output	Backlight enable signal (5V level)
	4	ADJ	Output	PWM backlight adjustment signal (5V level)
	5	GND	GND	GND
	6	GND	GND	GND

- ◆ KEY&IR&LED interface (PH socket, 2*6pin, 2.0mm): Label No. 26.

Outlook	NO.	Define	Property	Description
	1	LED-R	Power	Red light interface
	2	GND	GND	GND
	3	LED-G	Power	Green light interface
	4	VCC	Power	infrared receiver Power
	5	GND	GND	GND
	6	IR	Input	Data pin of infrared receiver
	7	ADC2	Input	1.8V level analog signal input pin
	8	ADC1	Input	1.8V level analog signal input pin
	9	GND	GND	GND
	10	RECOVER	Upgrade	Upgrade switch
	11	RST	reset	Reset switch
	12	KEY	Power on	Power on/off switch

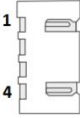
- ◆ GPIO&I2C interface (PH socket, 2*6pin, 2.0mm): Label No. 27.

Outlook	NO.	Define	Property	Description
	1	VCC	Power	Defaulted 5V(Optional 3.3V)
	2	GPIO0	I/O	

	3	GPIO1	I/O	Defaulted 3.3V (Optional 5V/12V)
	4	GPIO2	I/O	
	5	GPIO3	I/O	
	6	GND	GND	GND
	7	GND	GND	GND
	8	SCL	O	I2C Time
	9	SDA	I/O	I2C Data
	10	INT	Input	break
	11	RST	Output	reset
	12	VCC	Power	Defaulted 3.3V

Note: The I2C signal only supports a signal level of 3.3V. Please pay attention to the communication level matching

◆ Power input interface (XH socket, 1*4pin, 2.54mm): Label No. 28.

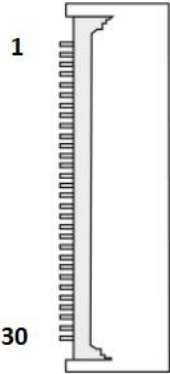
Outlook	NO.	Define	Property	Description
	1	GND	GND	GND
	2	GND	GND	GND
	3	DCIN	Input	DCIN (12V)
	4	DCIN	Input	DCIN (12V)

Remarks:

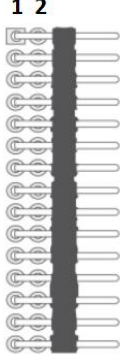
- ① For power input, only powering the board from the DC jack and the red power socket is allowed.
- ② The specification of the DC interface is (inner diameter 2.0mm, outer diameter 5.5mm)

- ◆ MIPI screen interface (FPC, bottom connection with 0.5MM pitch / 30PIN): Label No.

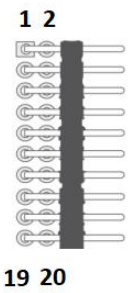
23.

Outlook	NO.	Define	Property	Description
	1	LED+	LED+	LED+
	2			
	3	VGH(NC)	NC	VGH
	4	VGL(NC)	NC	VGL
	5	UPDN(Defaulted 1.8V)	Power	Defaulted 1.8V (UPDN)
	6	SHLR(NC)	NC	SHLR(Compatible with 5V)
	7	LED-	LED-	LED-
	8			
	9	AVDD(NC)	NC	LCD-AVDD
	10	GND	GND	GND
	11	D3+	Output	MIPI_TX_D3P
	12	D3-	Output	MIPI_TX_D3N
	13	GND1	GND	GND
	14	D2+	Output	MIPI_TX_D2P
	15	D2-	Output	MIPI_TX_D2N
	16	GND2	GND	GND
	17	DCLK+	Output	MIPI_TX_CLKP
	18	DCLK-	Output	MIPI_TX_CLKN
	19	GND3	GND	GND
	20	D1+	Output	MIPI_TX_D1P
	21	D1-	Output	MIPI_TX_D1N
	22	GND4	GND	GND
	23	D0+	Output	MIPI_TX_D0P
	24	D0-	Output	MIPI_TX_D0N
	25	GND5	GND	GND
	26	STBYB(NC)	NC	STBYB
	27	LRSTB	Output	MIPI_RESET(1.8V)
	28	VDD	Output	LCD_VDD(3.3V/1.8V,Default ed3.3V)
	29	PWM(NC)	NC	PWM
	30	VCOM(NC)	NC	VCOM

◆ LVDS interface (Dupont header double-row pin header, 2*15pin, 2.0mm): Label No. 21.

Outlook	NO.	Define	Property	Description
	1	LCD-VDD	Power Output	LCD power output, +3.3V / +5V / +12V optional, default 3.3V, selected by jumper cap
	2			
	3			
	4	GND	GND	GND
	5			
	6			
	7	TA1-	Output	Pixel0 Negative Data (Odd)
	8	TA1+	Output	Pixel0 Positive Data (Odd)
	9	TB1-	Output	Pixel1 Negative Data (Odd)
	10	TB1+	Output	Pixel1 Positive Data (Odd)
	11	TC1-	Output	Pixel2 Negative Data (Odd)
	12	TC1+	Output	Pixel2 Positive Data (Odd)
	13	GND	GND	GND
	14	GND	GND	GND
	15	TCLK1-	Output	Negative Sampling Clock (Odd)
	16	TCLK1+	Output	Positive Sampling Clock (Odd)
	17	TD1-	Output	Pixel3 Negative Data (Odd)
	18	TD1+	Output	Pixel3 Positive Data (Odd)
	19	TA2-	Output	Pixel0 Negative Data (Even)
	20	TA2+	Output	Pixel0 Positive Data (Even)
	21	TB2-	Output	Pixel1 Negative Data (Even)
	22	TB2+	Output	Pixel1 Positive Data (Even)
	23	TC2-	Output	Pixel2 Negative Data (Even)
	24	TC2+	Output	Pixel2 Positive Data (Even)
	25	GND	GND	GND
	26	GND	GND	GND
	27	TCLK2-	Output	Negative Sampling Clock (Even)
	28	TCLK2+	Output	Positive Sampling Clock (Even)
	29	TD2-	Output	Pixel3 Negative Data (Even)
	30	TD2+	Output	Pixel3 Positive Data (Even)

- ◆ EDP interface (double-row pin header, 2*10pin, 2.0mm): Label No. 22.

Outlook	NO.	Define	Property	Description
	1	VDDA	Power Output	LCD power output, +3.3V
	2	VDDA	Power Output	
	3	GND	GND	GND
	4	GND	GND	
	5	EDP-TX0N	Output	EDP TX channel 0 negative
	6	EDP-TX0P	Output	EDP TX channel 0 positive
	7	EDP-TX1N	Output	EDP TX channel 1 negative
	8	EDP-TX1P	Output	EDP TX channel 1 positive
	9	EDP-TX2N	Output	EDP TX channel 2 negative
	10	EDP-TX2P	Output	EDP TX channel 2 positive
	11	EDP-TX3N	Output	EDP TX channel 3 negative
	12	EDP-TX3P	Output	EDP TX channel 3 positive
	13	GND	GND	GND
	14	GND	GND	
	15	EDP-AXUN	Output	EDP AUX CH negative
	16	EDP-AXUP	Output	EDP AUX CH positive
	17	GND	GND	GND
	18	GND	GND	
	19	GND	GND	Defaulted GND,cover 3.3V
	20	HDP	Output	Hot pulg detect

Chapter 5: Electrical Performance

Project		Min	Classic	Max
Power Supply Voltage	Voltage	10	12V	14
	Ripple	--	--	±3%
Current(HDMI Output,Without Other Peripheral)	Working Current	--	200mA	350mA
	Standby Current	--	110mA	130mA
Current(LVDS)	Working Current	Depending		
	Standby Current			
	LCD Current	--	--	1A(5V)/2A(12V)
RTC Shutdown Power	Working Current	--	3uA	--
USB3.0	Current	--	500mA	1.5A
USB2.0	Current		500mA	--

Note: The total current for the mainboard's 5V power supply is recommended not to exceed 3000mA; otherwise, the machine may not operate normally

Chapter 6: Precautions

During the assembly and usage process, please pay attention to the following (and not limited to) problem points

Environment	
Relative humidity of this product: 10% - 90%, no condensation	
Storage temperature of this product: -20°C - +70°C	
Operating temperature of this product: -10°C - + 60°C	
When designing the entire machine product, the height limit and heat dissipation of the board need to be considered.	
Transportation	
Anti-static treatment should be noted during the transportation of the mainboard	
It is noted that the bare boards cannot be stacked or stacked with other conductive objects.	
Assembly	
Regarding Installation	Before installation, please wear anti-static tools such as an electrostatic wristband Ensure that the mainboard is not connected to the power supply, and then perform the installation and assembly of peripheral operations.
Regarding Screws	When fixing the mainboard with screws, pay attention to make the board evenly stressed to avoid PCB open circuit caused by the deformation of the board.
Regarding Jumper Caps	When installing interfaces where the screen voltage can be selected (such as LVDS, serial port, etc.), please note that the selected voltage is consistent with the specifications of the screen or serial port device.
Regarding Peripherals	<p>((USB, GPIO, serial port, I2C, SPI, HDMI, etc.) When connecting external devices, pay attention to whether the IO level and current of the peripheral device meet the requirements. When using the power pins on the mainboard connector to supply power to the peripheral device, pay attention to 2 points:</p> <p>①The pin definition corresponds to the mainboard socket.</p> <p>②The current of the regular power pin is strictly prohibited to exceed 500mA, and the current of the USB power pin is strictly prohibited to exceed 500mA.</p>
Regarding Serial Port	During installation, pay particular attention to the matching of the level type (such as 3.3V TTL level, RS-232 level and RS-485 level) and the corresponding connection of TX, RX, 485-A, and 485-B.
Regarding Screen	<p>When connecting an external LVDS or eDP LCD screen, pay attention to whether the drive screen voltage and current meet the requirements, and pay attention to the direction of pin 1 of the screen cable socket. Pay attention to whether the backlight voltage and current meet the requirements.</p> <p>If the backlight power of the LCD screen is above 20W, it is recommended to use a separate power board for backlight power supply.</p>
Regarding Power	The input power of the mainboard must be connected to the power input interface or socket, and evaluate whether the entire board current meets the requirements according to the total peripherals; it is strictly prohibited to supply power to the mainboard directly from the backlight socket interface for the convenience of operation.
Regarding Wiring	The internal of the entire machine should be wired reasonably, and each connecting line should not cross directly from the PCB board as much as possible.
Regarding Interference	<p>To achieve a better EMC effect for the entire machine, pay attention to 2 points:</p> <p>①It is recommended to use shielded cables for the screen cables between the mainboard and the screen;</p> <p>②The communication module part is at least 5 millimeters away from the metal housing to avoid signal interference.</p>

ABOUT US

WONGSHI company, is a group enterprise.

We are providing **electronic device manufacture services (EMS)** to customers. Including SMT mounting, DIP plug-in processing, PCBA assembly, Testing and packaging; Plastic and silicone products, metal hardware stamping and CNC products; And BOM electronic material procurement;

The factory covers an area of 6000 square meters and employs over 300 people, including the marketing department, procurement department, research and development department, engineering department, quality department, warehousing department, etc;

The company has a fully automatic high-speed SMT production line and DIP plug-in line, with a daily production capacity of up to 14 million points. The key equipment of the company are products manufactured by well-known companies, including YAMAHA high-speed mounter, Jintuo ten temperature zone reflow welder, Shansi X-RAY perspective detector, Zhenhua Xing AOI optical detector, blue eye first article detector and other high-precision advanced production equipment; Adopting MES system management, materials are scanned and used uniformly from the beginning of feeding to prevent material mismatching;

We passed the ISO9001:2008 Quality Management System certification.

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