1 Characteristic

- 3-channel 4K 60fps (3840x2160) coaxial camera input
- 4 HDMI outputs, supports up to 4K60 (3840x2160) resolution
- 5 USB3.0 ports: Support USB storage devices, USB mice, and other peripherals
- 1 Gigabit Ethernet
- 1-channel 12G SDI output
- ADC input: supports up to 16 key extensions
- 4 RS232 ports: Enables light source (MLS0x) synchronization and serial port screen menu operations
- A clock battery interface to keep the real-time clock running after a power failure
- Power input: 12V 3A(8.5V~13V)
- Size: 154.9mmx110mm
- Multiple metering modes: average, center, and peak
- One-click white balance adjustment with built-in color styles and adjustable color parameters
- Prevents color spillage, aiding in identifying surgical details obscured by blood-red during bleeding procedures.
- Support horizontal and vertical mirroring
- Image freeze, video recording, and snapshots
- Dimming level adjustable, smoke elimination
- Store multiple scenario parameters for easy direct access in different scenarios
- Customize shortcut keys
- The system menu can be hidden and authorized for login, providing a set of serial port commands for system control, enabling users to develop customized serial port screen menu applications.
- Supports web applications and provides SDK packages
- Supports DICOM protocol

2 Summary

The ZR5H_v1.10 motherboard is a dual-system platform that supports two camera configurations: either a 4K 3D white light system or a 4K 2D fluorescent system, or three cameras with software-switched modes for both 4K 3D white light and 4K 2D fluorescent outputs. Featuring the latest fifth-generation image processing system with advanced ISP capabilities, it delivers real-time low-latency image processing for up to two 4K60 streams. The system incorporates dual-core NNIE processors with 4TOPS computing power, providing essential hardware support for future intelligent image analysis applications. This design ensures sustainable upgrades and facilitates distributed application deployment planning.

For close-up applications such as endoscopy, surgical microscopy, and industrial inspection, the system has been optimized for white balance locking, automatic metering, bright light suppression, smoke elimination, and red coverage in large bleeding environments, ensuring maximum recognition of tissue or object details in the field of view.

The TX23 series adapter board enables integration with OV series electronic microscopes, creating a portable hard-tube microscope with electronic microscope functionality.

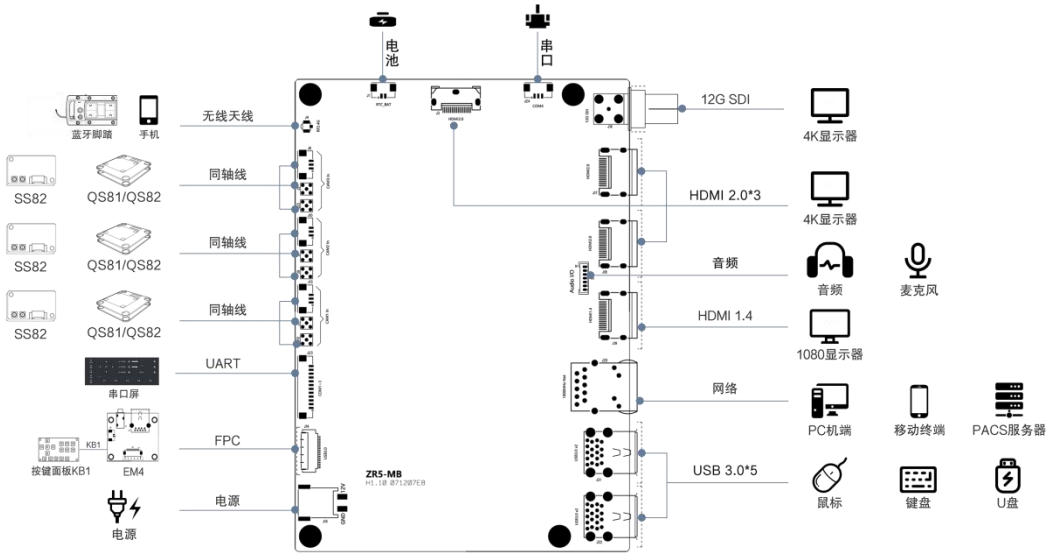
3 Main Application Scenarios

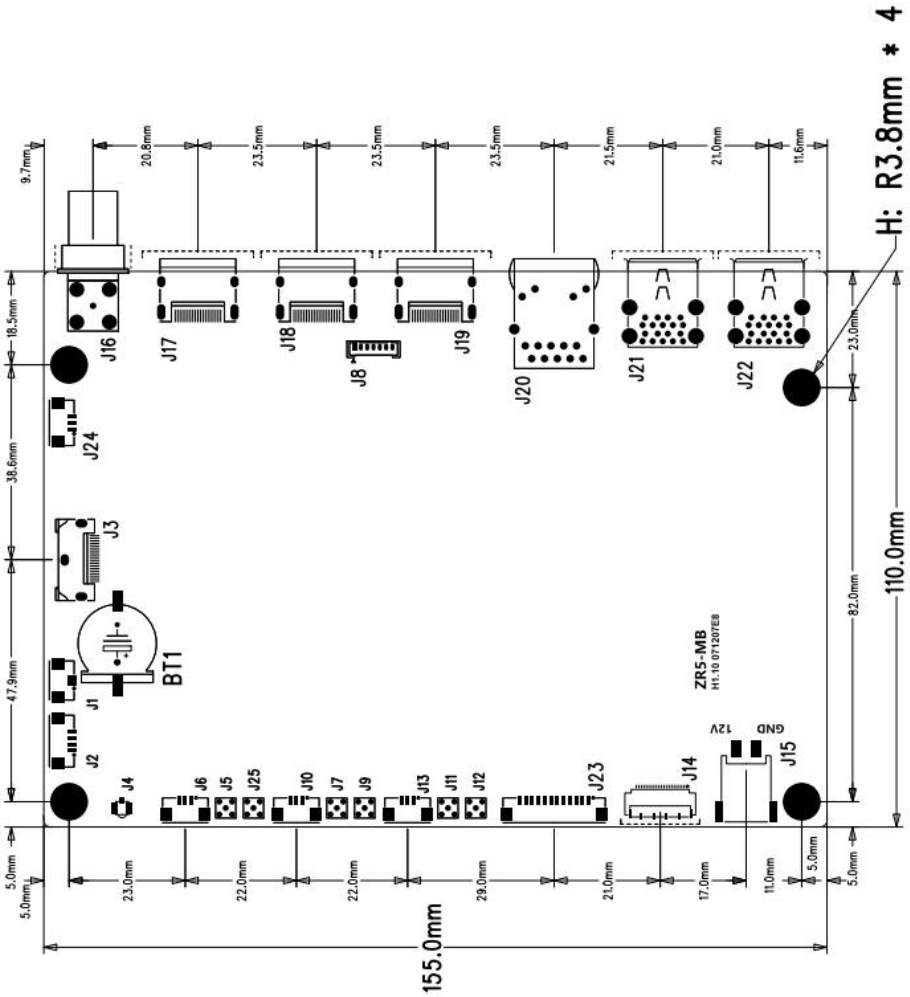
Medical endoscope

surgical robot navigation

surgical microscope

4 Apply Block Diagram





5 Interface Definition

Note: The "△" marks the first pin (Pin1).

name	item	Pin definition	direction for use
USB 3.0	J22	Type A Dual USB 3.0 Port USB 3.0 port	Supports USB storage device recording and snapshot capture, and USB mouse and keyboard operation
USB 3.0	J21	Type A Dual USB 3.0 Port USB 3.0 port	Supports USB storage device recording and snapshot capture, and USB mouse and keyboard operation
Net	J20	1000MHz Ethernet: RJ45	Provide wired Ethernet connection applications
HDMI	J19	HDMI Type A HDMI OUT	HDMI 1.4: Supports up to 1080P60 resolution output
HDMI	J18	HDMI Type A HDMI OUT	HDMI 2.0: Supports up to 4K 60Hz resolution output
HDMI	J17	HDMI Type A HDMI OUT	HDMI 2.0: Supports up to 4K 60Hz resolution output
Audio	J8	Wafer：TH1.25 * 7 PIN1：AC_INR/N PIN2：AC_INL/P PIN3：GND PIN4：Audio_OUT_L PIN5：Audio_OUT_R PIN6：GND PIN7：	Microphone input and audio output
SDI	J16	75-ohm BNC socket SDI OUT	Supports 12G-SDI output and up to 4K60 resolution
CMOS4	J24	Wafer：TH1.25 * 3 PIN1: RS232_TXD4 PIN2: RS232_RXD4 PIN3：GND	The system provides a single RS232 standard level interface.
HDMI	J3	HDMI Type A HDMI OUT	HDMI 2.0: Supports up to 4K 60Hz resolution output
Clock_VCC	J1	Wafer：TH1.25 * 2 PIN1: 3.3V PIN2: GND	The external power supply provides real-time clock power with a maximum voltage of 3.3V.
RF junctor	J4	Chimeric height 2.5mm 2.5H board end	Bluetooth antenna base

CMOS	J23	TH1.25 * 12H PIN1: RS232_TXD0 PIN2: RS232_RXD0 PIN3: GND PIN4: RS232_TXD1 PIN5: RS232_RXD1 PIN6: GND PIN7: RS232_TXD2 PIN8: RS232_RXD2 PIN9: GND PIN10: LIGHT_ADJ PIN11: GND PIN12: 5V/12V	The system provides three RS232 standard level interfaces. • Designed to adjust the parameters of the MLS0xx series light source, it connects to the constant current board (EP1) via a serial port. • Connect the serial port touch screen and access the touch screen operating system menu.
CSI3	J5 J25 J6	J5： MMCX CS5 IN J25： MMCX CS6 IN J6： Wafer：TH1.25 * 3 PIN1：CAM 5V PIN2：GND PIN3：key signal in	Supports dedicated cameras such as QS81/QS82 series
CSI2	J7 J9 J10	J7： MMCX CS3 IN J9： MMCX CS4 IN J10： Wafer：TH1.25 * 3 PIN1：CAM 5V PIN2：GND PIN3：key signal in	Supports dedicated cameras such as QS81/QS82 series
CSI1	J11 J12 J13	J11： MMCX CS2 IN J12： MMCX CS1 IN J13： Wafer：TH1.25 * 3 PIN1：CAM 5V PIN2：GND	Supports dedicated cameras such as QS81/QS82 series

		PIN3：key signal in	
USB Ext	J14	FPC socket: FH41-20S-0.5SH PIN1: ADC PIN2: GND PIN3: USB31_DM PIN4: USB31_DP PIN5: GND PIN6: 5V0_USB3_1 PIN7: 5V0_USB3_1 PIN8: USB31_RXP PIN9: USB31_RXM PIN10: GND PIN11: USB31_TXP PIN12: USB31_TXM PIN13: GND PIN14: SYS_PWRON# PIN15: GPIO_UART_TXD PIN16: GPIO_UART_RXD PIN17: 5V PIN18: GND PIN19: 3.3V PIN20: 3.3V	One USB3.0 expansion port and one ADC input
DC IN	J15	3.96 terminal block PIN1: GND PIN2: DC12V IN	To ensure stable system operation, the 12V supply must provide 3A drive capability with ripple not exceeding 60mVp-p.

6 Electrical Specifications

1) work environment

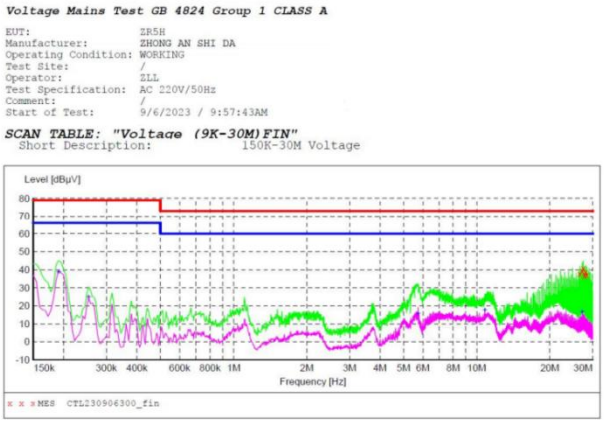
parameter	minimum	typical case	maximum	explain
input voltage （V）	7.5	12	13.5	
working current （mA）		3000		
ambient temperature （℃）	5	25	45	
humidity （%rh）	5	55	85	
atmos （kPa）	50	101	106	

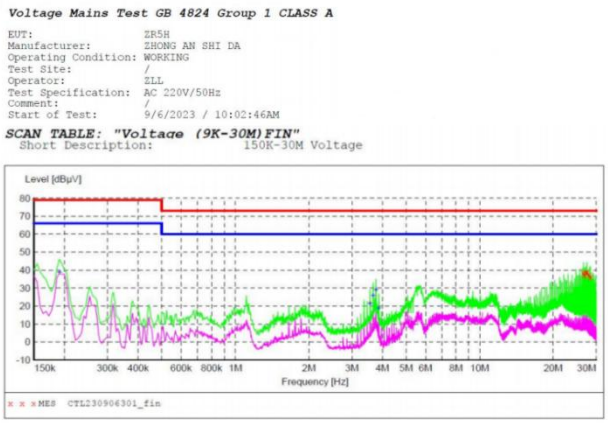
2) **Electromagnetic compatibility (YY9706.102-2021:6.1.1 Electromagnetic Interference: Conductive and Radiated Emissions; 6.2.x Antenna Interference)**

Test conditions: AC 220V/50Hz, ZR5H (ZS04E metal housing)

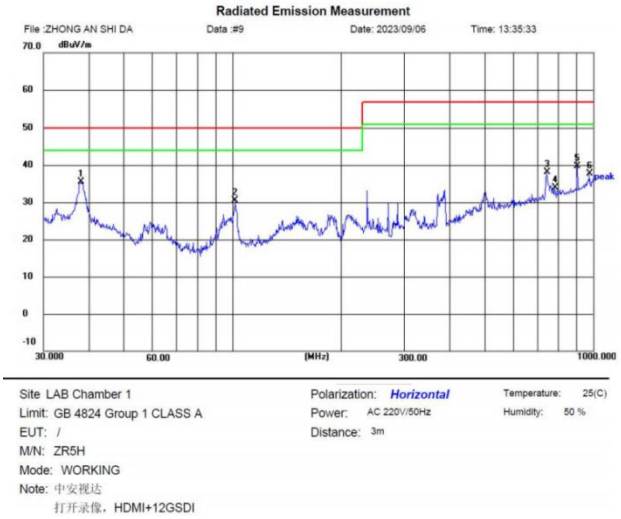
A. **electromagnetic distrubance ：**

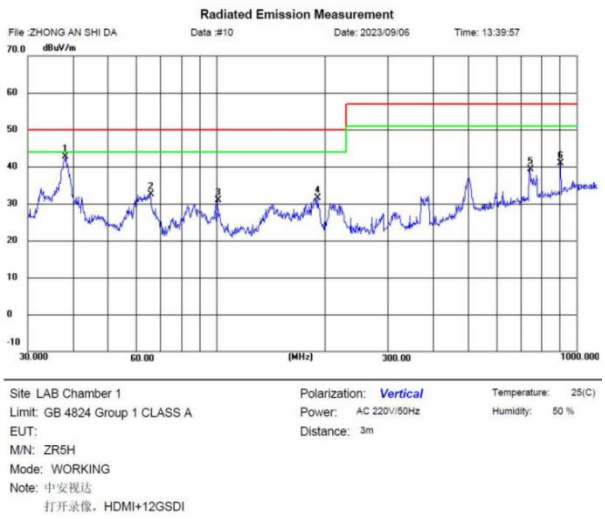
a) **Conduction emission: Meets the GB 4824-2019 power terminal electromagnetic interference (EMI) voltage limit (Group 1, Class B) requirements**





b) **Radiation emission: Meets the limit requirements of GB 4824-2019 for radiation disturbance (Group 1, Class A)**





B. Robustness: Meets the performance criteria specified in YY 9706.102-2021

YY 9706.102-2021	project	grade	bear fruit
6.2.2	electrostatic discharge	Contact discharge (±6 kV) Air discharge (Air): ±8KV	qualified
6.2.3	Radio frequency electromagnetic field radiation immunity	3V/m, 80%AM (1kHz)	qualified
6.2.4	Fast transient pulse cluster	At the AC power supply port: Test voltage peak ±2 kV, repetition frequency 5 kHz or 100 kHz, 5/50 ns Tr/Td waveform	qualified
6.2.5	surge	At the AC power supply port: Line-to-line: ±1 kV peak voltage, open-circuit voltage waveform 1.2/50μs Line-to-ground: ±2 kV peak voltage, open-circuit voltage waveform 1.2/50μs	qualified
6.2.6	RF field induced conducted immunity	3V,80%AM (1kHz)	qualified
6.2.7	The voltage on the power supply input line is temporarily Down, short interruptions, and voltage changes	1. Test voltage <5%Ut, lasting 0.5 cycles 2. Test voltage at 40% of Ut for 5 cycles 3. Test voltage at 70% of Ut for 25 cycles 4. Test voltage <5%Ut, for 250 cycles	qualified
6.2.8.1	Power frequency magnetic field	3A/m	qualified

7 Related components: SS82, QS82T, MLS0x, TX23