Colorlight

K10

Receiving Card

Specification

Overview

K10 is a high-end receiving card developed for fine-pitch LED screens featuring large load capacity and up to 32 parallel data groups or 64 serial data groups. Due to its small form factor, K10 is best fit into concise cabinets. With high-density connectors, it can achieve dustproof and shockproof effect, result in its high stability and reliability.

K10 not only has all the functions of mainstream receiving cards, but also a series of practical and powerful features helping high-end displays to maximize video performance with stunning clarity. K10 can be perfectly used in high-end rentals as well as fine-pitch fix-installed LED screens.

Features

Display effect

- 8bit/10bit/12bit video source input.
- HDR10 and HLG.
- Full gamma independent adjustment.
- Infi-bit color extension.
- Low latency.
- Color temperature adjustment.
- Grayscale refinement.
- Better gray at low brightness.

Calibration

- Low-grayscale calibration.
- Multi-layer calibration.
- High precise per-pixel calibration in brightness and chromaticity.

Easy maintenance

- Seam correction.
- Highlight and OSD.
- Color gamut adjustment.
- Screen rotation.
- Prestore picture.
- Firmware upgrade without power restart.
- Up to 16 intelligent modules.
- Quick firmware upgrade and calibration coefficients download.
- Cabinet temperature, humidity, voltage and power monitoring.

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Stable and reliable

- Loop redundancy.
- Dual receiving card hot backup.
- PSU redundancy.
- Configuration parameter redundancy.
- Calibration coefficient redundancy.
- Firmware redundancy and readback.
- Ethernet cable status monitoring.
- 7×24h uninterrupted work.

Feature details

Display effect	
12bit	Maximum 12bit color depth video input and output, it presents a grayscale 16 times the normal 8bit video source, which offers smoother screen grayscale transition.
HDR	Presenting images with high dynamic range, high contrast and wide color gamut.
High frame rate	Supports not only conventional and non-integer frame rates such as 23.98/24/29.97/30/50/59.94/60Hz, but also outputs and displays 120/144/240Hz high frame rate images, greatly improving picture smoothness and reducing smearing (This feature affects the load capacity).
14bit calibration	Supports the 14bit calibration coefficients, and real-time processing of the calibration coefficient according to the actual playback content to improve the uniformity and consistency of the screen body at different gray levels.
Multi-layer calibration	Storage and processing of multiple copies of the calibration coefficient for different brightness levels, real-time dynamic adjustment of the correction coefficients according to the actual playback content, and improve the uniformity and consistency of the screen under different gray levels.
Infi-bit	Grayscale dynamic compensation technology, it can significantly improve the grayscale of the LED screen, which is at least 64 times higher than the original level, effectively improving the details of low-gray pictures, making the grayscale transition smoother and presenting more vivid colors.
Low-grayscale calibration	The low gray level of the fine-pitch cabinet is independently calibrated, to solve the problem that such cabinet is prone to presenting low gray color bands and level unevenness with conventional calibration.
Grayscale refinement	With the use of a luminance meter, the actual screen display conditions are measured, and the screen grayscale can be accurately calibrated, which perfectly solves the gray level jitters and low gray color cast caused by the hardware.
Shortcuts	
Cabinet highlight	Mark quickly a target cabinet, by displaying a flashing rectangle indicator on the

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	cabinet screen, which greatly facilitates front and rear maintenance.
Quick OSD	Mark quickly the index of a receiving card corresponding to a specific Ethernet port, allow for setting up the connection relationship of the screen easily.
Seam correction	Quickly and efficiently eliminate the perceptible bright and dark lines caused by physical screen splicing. It can be used repeatedly in rental scenarios, thanks to its advanced one-click reset feature.
Color adjustment	Allow you to quickly and easily adjust the color gamut of individual cabinet or screen. Support customized adjustment and one-click restore. Achieve high-precision color reproduction in combination with the use of the photometer.
Image rotation	Support the rotation of the cabinet image at an angle of 90°/180°/270°. Any angle rotation is also available in combination with supported LED sender models from Colorlight.
Prestore picture	Offering customizable picture display on the LED screen when there is no video signal.
Hardware monitoring	
Bit error rate detection	Quickly identify the cabinet with abnormal connection, thanks to the feature of data transmission quality detection between receiving card and LED sender.
Humidity monitoring	Monitor the cabinet (need the support from the cabinet design), and send to the computer in real-time the running cabinet humidity. With the software, users can monitor current humidity and be alerted on any abnormal condition.
Temperature monitoring	Monitor the cabinet (need the support from the cabinet design), and send to the computer in real-time the running cabinet temperature. With the software, users can monitor current temperature and be alerted on any abnormal condition.
Power supply monitoring	Support 2-way power fault monitoring of the cabinet (need the support from the cabinet design), and send to the computer in real-time the running power status. From the software, users can monitor current power status and be alerted on any abnormal condition.
Voltage monitoring	Support receiving card power voltage and 2-way cabinet power voltage monitoring (need the support from the cabinet design) in real-time. From the software, users can check corresponding voltage status.
Pixel-by-pixel monitoring	Monitoring cabinet pixel health (need the support from the cabinet design), and send to the computer in real-time each pixel status. With the software, users can check current pixels status and be alerted on the amount of bad pixels above a predefined threshold.
Fan control	Control the fan (requires support from the cabinet design) manually from the software, even allow automatic fan switching on current cabinet temperature status (requires support from the cabinet design).
LCD monitoring	Display on the cabinet LCD screen the temperature, voltage, running time and other status, support one-click self-test.
Redundancy	

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Loop redundancy	The receiving card switches signal source to the other Ethernet port, when one receiving channel fail, maintaining the normal display of the LED screen.
Receiving card hot backup	Two receiving cards connect to the HUB board to control a single cabinet at the same time. When the main receiving card is abnormal, the backup card will take over the display immediately.
Firmware redundancy	Support firmware backup. Users can safely upgrade firmware without worrying about losing firmware due to cable disconnections or power failure during the upgrade process.
Configuration parameter redundancy	Provide two sets of configuration parameters in the receiving card, one of them serves as backup parameter.
Calibration coefficient redundancy	The calibration coefficient is stored both in the factory area and user area of the receiving card simultaneously. The coefficient in the user area is used by default, but users can restore the calibration coefficient from the factory area to the user area at any time.

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Basic parameters

Control System Parameters	
Load Capacity	Maximum 512x512 pixels.[1]
Ethernet Port exchange	Ethernet port changeable.
Display Module Compatibility	
Supported Chips	PWM chips.
Scan Type	Up to 128 scan lines.
Module Dimension	Up to 16384 pixels per data group.
Cable Direction	Route from left to right, from right to left, from top to bottom, from bottom to top.
Data Group	32 groups of parallel RGB data and 64 groups of serial RGB data, the later can be extended to 128 groups. Data groups can be exchanged freely.
Data Fold	Horizontal or vertical 2~8 folds.
Monitoring Function (work with the module with corresponding sensor)	
Temperature Monitoring	Operating temperature range:-25°C~75°C.
Humidity Monitoring	Measuring range: 25%~95%RH.
Power Supply Monitoring	Operating power supply status, 2 monitoring ports available each card.
Voltage Monitoring	Monitoring the voltage of the cabinet power supply, 2 monitoring ports available each card. Monitor receiving card's own voltage is built-in.
Net cable Monitoring	Operating total number of packets, error packets and network quality.
Pixel-by-Pixel Calibration	
Brightness Calibration	Up to 14bit calibration accuracy.
Chromaticity Calibration	Up to 14bit calibration accuracy.
Other features	
Redundancy	Loop redundancy, receiving card redundancy, PSU redundancy, firmware redundancy, configuration parameter redundancy and calibration coefficient redundancy.
Optional functions	Cabinet LCD display, module hot swap, irregular screen design etc.

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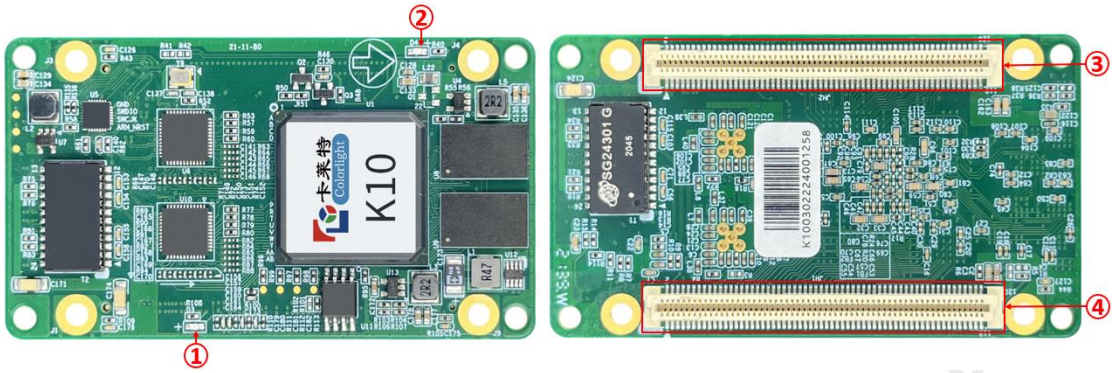
[1] The load capacity may vary on some feature enabled. Please contact Colorlight technical for support.

Hardware

Appearance



Interface

S/N	Name	Function	
1	Signal indicator	Flash once per second	Receiving card: normal. Ethernet cable connection: normal.
		Flash 10 times per second	Receiving card: normal. Cabinet: Highlight.
		Flash 4 times per second	Receiving card: working with back up channel (Loop redundancy status).
2	Power indicator	Constant red: normal.	
3	High-density connector JH1	Connect with the display's HUB or module. See below for pin definition.	
4	High-density connector JH2	Connect with the display's HUB or module. See below for pin definition.	

* K10 uses high-density connectors, please refer to the connector specification for details. The product photos in this article are for reference only.

Equipment Specifications

Physical Specifications	
Hardware interface	High-density connectors
Ethernet port transmission rate	1Gb/s
Communication Distance	Recommended: CAT5e cable≤100m
Compatible with Transmission Equipment	Gigabit switch, Gigabit fiber converter, Gigabit fiber switch

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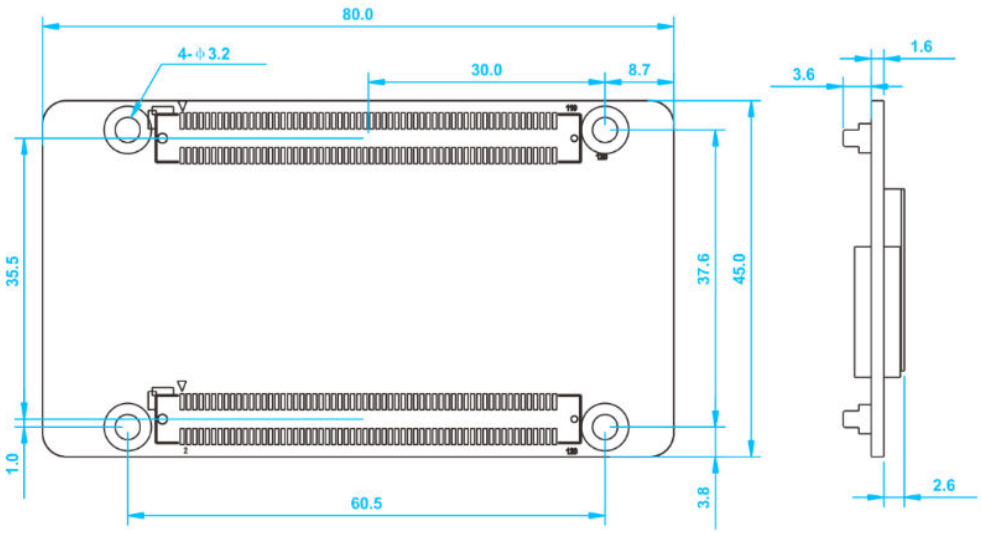
Size[2]	L×W×H / 80.0mm(3.2")×45.0mm(1.8")×7.8mm(0.3")
Weight	22g / 0.051lbs
Electrical specification	
Power input	DC 3.8~5.5V, 0.8A
Rated power consumption	4.0W
ESD Resistance (HBM)	2KV
Operating environment	
Temperature	-25°C~75°C (-13°F~167°F)
Humidity	0%RH-80%RH, no condensation
Storage and transport environment	
Temperature	-40°C~125°C (-40°F~257°F)
Humidity	0%RH-90%RH, no condensation
Packing information	
Packing	Standard blister box, 4 cards per box, 400 cards per carton
Packing size	L×W×H / 550.0mm(21.9")×398.0mm(15.7")×180.0mm(7.1")
Certification	
* RoHS certification, EMC Class B certification, EMC needs to work with the cabinet design, please contact technical support for assistance.	

Reference dimensions

Unit: mm

Tolerance: ±0.3mm

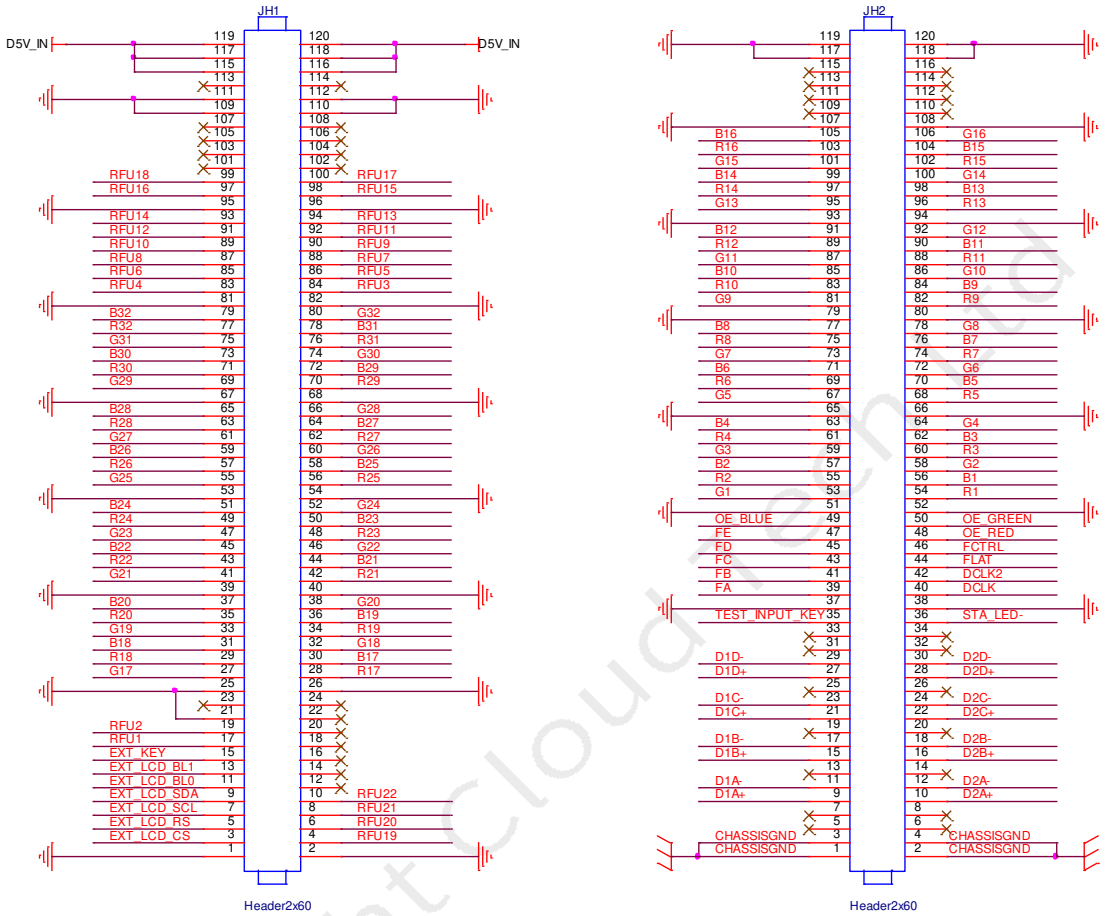


* The distance between outer surfaces of the K10 and HUB boards after their high-density connectors fit together is 5.0mm. A 5-mm copper pillar is recommended.

[2] Size and weight vary by manufacturing process.

Definition of Pins

32 groups of parallel data interfaces



JH1					
Instructions	Definition	Pin No.		Definition	Instructions
LCD screen interface	GND	1	2	GND	Ground connection
	EXT_LCD_CS	3	4	RFU19	Reserved
	EXT_LCD_RS	5	6	RFU20	
	EXT_LCD_SCL	7	8	RFU21	
	EXT_LCD_SDA	9	10	RFU22	
	EXT_LCD_BL0	11	12	NC	Empty
	EXT_LCD_BL1	13	14	NC	
	EXT_KEY	15	16	NC	
MCU Reserved	RFU1	17	18	NC	
	RFU2	19	20	NC	
Ground connection	GND	21	22	NC	

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Empty	NC	23	24	NC	
Ground connection	GND	25	26	GND	Ground connection
RGB Output	LED_G17	27	28	LED_R17	RGB Output
	LED_R18	29	30	LED_B17	
	LED_B18	31	32	LED_G18	
	LED_G19	33	34	LED_R19	
	LED_R20	35	36	LED_B19	
	LED_B20	37	38	LED_G20	
Ground connection	GND	39	40	GND	Ground connection
RGB Output	LED_G21	41	42	LED_R21	RGB Output
	LED_R22	43	44	LED_B21	
	LED_B22	45	46	LED_G22	
	LED_G23	47	48	LED_R23	
	LED_R24	49	50	LED_B23	
	LED_B24	51	52	LED_G24	
Ground connection	GND	53	54	GND	Ground connection
RGB Output	LED_G25	55	56	LED_R25	RGB Output
	LED_R26	57	58	LED_B25	
	LED_B26	59	60	LED_G26	
	LED_G27	61	62	LED_R27	
	LED_R28	63	64	LED_B27	
	LED_B28	65	66	LED_G28	
Ground connection	GND	67	68	GND	Ground connection
RGB Output	LED_G29	69	70	LED_R29	RGB Output
	LED_R30	71	72	LED_B29	
	LED_B30	73	74	LED_G30	
	LED_G31	75	76	LED_R31	
	LED_R32	77	78	LED_B31	
	LED_B32	79	80	LED_G32	
Ground connection	GND	81	82	GND	Ground connection
Reserved	RFU4	83	84	RFU3	Reserved
	RFU6	85	86	RFU5	
	RFU8	87	88	RFU7	
	RFU10	89	90	RFU9	

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	RFU12	91	92	RFU11	
	RFU14	93	94	RFU13	
Ground connection	GND	95	96	GND	Ground connection
Reserved	RFU16	97	98	RFU15	Reserved
	RFU18	99	100	RFU17	
Empty	NC	101	102	NC	Empty
	NC	103	104	NC	
	NC	105	106	NC	
	NC	107	108	NC	
Ground connection	GND	109	110	GND	Ground connection
	GND	111	112	GND	
Empty	NC	113	114	NC	Empty
Power supply	D5V_IN	115	116	D5V_IN	Power supply
	D5V_IN	117	118	D5V_IN	
	D5V_IN	119	120	D5V_IN	
JH2					
Instructions	**Definition**	**Pin No.**		**Definition**	**Instructions**
Chassis ground	CHASSISGND	1	2	CHASSISGND	Chassis ground
	CHASSISGND	3	4	CHASSISGND	
Empty	NC	5	6	NC	Empty
	NC	7	8	NC	
Ethernet port 1 signal pin	D1A+	9	10	D2A+	Ethernet port 2 signal pin
	D1A-	11	12	D2A-	
	NC	13	14	NC	
	D1B+	15	16	D2B+	
	D1B-	17	18	D2B-	
	NC	19	20	NC	
	D1C+	21	22	D2C+	
	D1C-	23	24	D2C-	
	NC	25	26	NC	
	D1D+	27	28	D2D+	
	D1D-	29	30	D2D-	
Empty	NC	31	32	NC	Empty
	NC	33	34	NC	
Test button	TEST_ INPUT_KEY	35	36	STA_LED-	Status LED
Ground connection	GND	37	38	GND	Ground connection

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Row decoding signal	FA	39	40	DCLK	First data serial clock
	FB	41	42	DCLK2	Second data serial clock
	FC	43	44	FLAT	Latch
	FD	45	46	FCTRL	Blanking
	FE	47	48	OE_RED	Display enable
Display enable	OE_BLUE	49	50	OE_GREEN	
Ground connection	GND	51	52	GND	Ground connection
RGB Output	LED_G1	53	54	LED_R1	RGB Output
	LED_R2	55	56	LED_B1	
	LED_B2	57	58	LED_G2	
	LED_G3	59	60	LED_R3	
	LED_R4	61	62	LED_B3	
	LED_B4	63	64	LED_G4	
Ground connection	GND	65	66	GND	Ground connection
RGB Output	LED_G5	67	68	LED_R5	RGB Output
	LED_R6	69	70	LED_B5	
	LED_B6	71	72	LED_G6	
	LED_G7	73	74	LED_R7	
	LED_R8	75	76	LED_B7	
	LED_B8	77	78	LED_G8	
Ground connection	GND	79	80	GND	Ground connection
RGB Output	LED_G9	81	82	LED_R9	RGB Output
	LED_R10	83	84	LED_B9	
	LED_B10	85	86	LED_G10	
	LED_G11	87	88	LED_R11	
	LED_R12	89	90	LED_B11	
	LED_B12	91	92	LED_G12	
Ground connection	GND	93	94	GND	Ground connection
RGB Output	LED_G13	95	96	LED_R13	RGB Output
	LED_R14	97	98	LED_B13	
	LED_B14	99	100	LED_G14	
	LED_G15	101	102	LED_R15	
	LED_R16	103	104	LED_B15	

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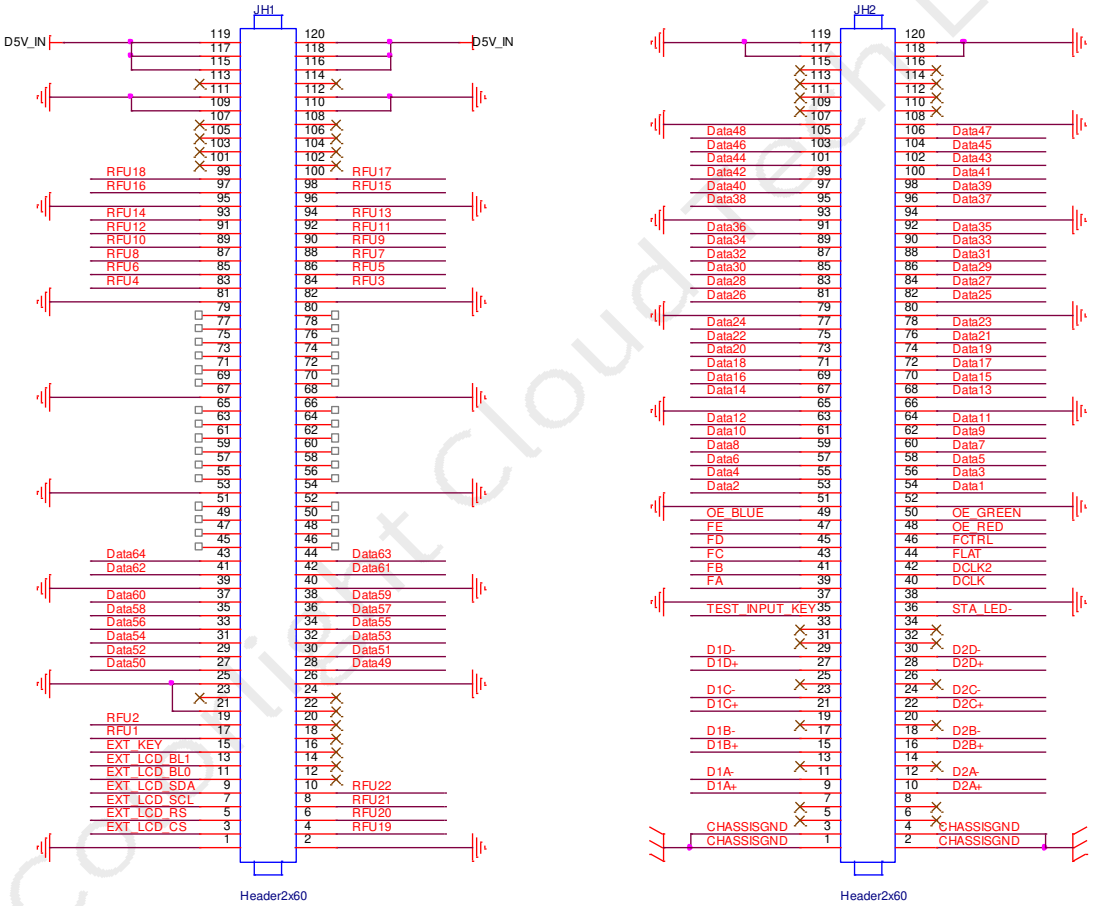
	LED_B16	105	106	LED_G16	
Ground connection	GND	107	108	GND	Ground connection
Empty	NC	109	110	NC	Empty
	NC	111	112	NC	
	NC	113	114	NC	
	NC	115	116	NC	
Ground connection	GND	117	118	GND	Ground connection
	GND	119	120	GND	

64 groups of serial data interfaces



JH1				
Instructions	Definition	Pin No.	Definition	Instructions
LCD screen interface	GND	1	2	GND	Ground connection
	EXT_LCD_CS	3	4	RFU19	Reserved
	EXT_LCD_RS	5	6	RFU20	
	EXT_LCD_SCL	7	8	RFU21	
	EXT_LCD_SDA	9	10	RFU22	

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	EXT_LCD_BL0	11	12	NC	Empty
	EXT_LCD_BL1	13	14	NC	
	EXT_KEY	15	16	NC	
MCU Reserved	RFU1	17	18	NC	
	RFU2	19	20	NC	
Ground connection	GND	21	22	NC	
Empty	NC	23	24	NC	
Ground connection	GND	25	26	GND	Ground connection
RGB Output	Data50	27	28	Data49	RGB Output
	Data52	29	30	Data51	
	Data54	31	32	Data53	
	Data56	33	34	Data55	
	Data58	35	36	Data57	
	Data60	37	38	Data59	
Ground connection	GND	39	40	GND	Ground connection
RGB Output	Data62	41	42	Data61	RGB Output
	Data64	43	44	Data63	
Empty	NC	45	46	NC	Empty
	NC	47	48	NC	
	NC	49	50	NC	
	NC	51	52	NC	
Ground connection	GND	53	54	GND	Ground connection
Empty	NC	55	56	NC	Empty
	NC	57	58	NC	
	NC	59	60	NC	
	NC	61	62	NC	
	NC	63	64	NC	
	NC	65	66	NC	
Ground connection	GND	67	68	GND	Ground connection
Empty	NC	69	70	NC	Empty
	NC	71	72	NC	
	NC	73	74	NC	
	NC	75	76	NC	
	NC	77	78	NC	

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	NC	79	80	NC	
Ground connection	GND	81	82	GND	Ground connection
Reserved	RFU4	83	84	RFU3	Reserved
	RFU6	85	86	RFU5	
	RFU8	87	88	RFU7	
	RFU10	89	90	RFU9	
	RFU12	91	92	RFU11	
	RFU14	93	94	RFU13	
Ground connection	GND	95	96	GND	Ground connection
Reserved	RFU16	97	98	RFU15	Reserved
	RFU18	99	100	RFU17	
Empty	NC	101	102	NC	Empty
	NC	103	104	NC	
	NC	105	106	NC	
	NC	107	108	NC	
Ground connection	GND	109	110	GND	Ground connection
	GND	111	112	GND	
Empty	NC	113	114	NC	Empty
Power supply	D5V_IN	115	116	D5V_IN	Power supply
	D5V_IN	117	118	D5V_IN	
	D5V_IN	119	120	D5V_IN	

JH2

Instructions	Definition	Pin No.		Definition	Instructions
Chassis ground	CHASSISGND	1	2	CHASSISGND	Chassis ground
	CHASSISGND	3	4	CHASSISGND	
Empty	NC	5	6	NC	Empty
	NC	7	8	NC	
Ethernet port 1 signal pin	D1A+	9	10	D2A+	Ethernet port 2 signal pin
	D1A-	11	12	D2A-	
	NC	13	14	NC	
	D1B+	15	16	D2B+	
	D1B-	17	18	D2B-	
	NC	19	20	NC	
	D1C+	21	22	D2C+	
	D1C-	23	24	D2C-	
	NC	25	26	NC	
	D1D+	27	28	D2D+	

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	D1D-	29	30	D2D-	
Empty	NC	31	32	NC	Empty
	NC	33	34	NC	
Test button	TEST_ INPUT_KEY	35	36	STA_LED-	Status LED
Ground connection	GND	37	38	GND	Ground connection
Row decoding signal	FA	39	40	DCLK	First data serial clock
	FB	41	42	DCLK2	Second data serial clock
	FC	43	44	FLAT	Latch
	FD	45	46	FCTRL	Blanking
	FE	47	48	OE_RED	Display enable
Display enable	OE_BLUE	49	50	OE_GREEN	
Ground connection	GND	51	52	GND	Ground connection
RGB Output	Data2	53	54	Data1	RGB Output
	Data4	55	56	Data3	
	Data6	57	58	Data5	
	Data8	59	60	Data7	
	Data10	61	62	Data9	
	Data12	63	64	Data11	
Ground connection	GND	65	66	GND	Ground connection
RGB Output	Data14	67	68	Data13	RGB Output
	Data16	69	70	Data15	
	Data18	71	72	Data17	
	Data20	73	74	Data19	
	Data22	75	76	Data21	
	Data24	77	78	Data23	
Ground connection	GND	79	80	GND	Ground connection
RGB Output	Data26	81	82	Data25	RGB Output
	Data28	83	84	Data27	
	Data30	85	86	Data29	
	Data32	87	88	Data31	
	Data34	89	90	Data33	
	Data36	91	92	Data35	
Ground	GND	93	94	GND	Ground

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connection					connection
RGB Output	Data38	95	96	Data37	RGB Output
	Data40	97	98	Data39	
	Data42	99	100	Data41	
	Data44	101	102	Data43	
	Data46	103	104	Data45	
	Data48	105	106	Data47	
Ground connection	GND	107	108	GND	Ground connection
Empty	NC	109	110	NC	Empty
	NC	111	112	NC	
	NC	113	114	NC	
	NC	115	116	NC	
Ground connection	GND	117	118	GND	Ground connection
	GND	119	120	GND	

* FE and LED_SCLK2 are signal multiplexing pins, which are used as row decoding signals in parallel data and as the second serial clock in serial data to achieve 128 sets of serial data expansion, DATA65～DATA128 are multiplexed into DATA1～DATA64.

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Expanded Functions

Descriptions			
Reserved pin	Recommended smart module pin	Recommended module Flash pin	Description
RFU1	Reserved	Reserved	MCU Reserved
RFU2	Reserved	Reserved	MCU Reserved
RFU3	HUB_CODE0	HUB_CODE0	Flash 1
RFU4	Reserved	HUB_SPI_CLK	Clock signal of serial pin
RFU5	HUB_CODE1	HUB_CODE1	Flash 2
RFU6	Reserved	HUB_SPI_CS	CS Signal of serial pin
RFU7	HUB_CODE2	HUB_CODE2	Flash 3
RFU8	/	HUB_SPI_MOSI	Flash storage data input
	HUB_UART_TX	/	TX signal of smart module
RFU9	HUB_CODE3	HUB_CODE3	Flash 4
RFU10	/	HUB_SPI_MISO	Flash storage RGB output
	HUB_UART_RX	/	RX signal of smart module
RFU11	HUB_H164_CSD	HUB_H164_CSD	Data signal of 74HC164
RFU12	Reserved	Reserved	MCU Reserved
RFU13	HUB_H164_CLK	HUB_H164_CLK	Clock signal of 74HC164
RFU14	POWER_STA1	POWER_STA1	Dual power detection signal 1
RFU15	MS_DATA	MS_DATA	Dual card backup connection signal
RFU16	POWER_STA2	POWER_STA2	Dual power detection signal 2
RFU17	MS_ID	MS_ID	Dual card backup identification signal
RFU18	HUB_CODE4	HUB_CODE4	Flash 5
RFU19	HUM	HUM	Humidity monitoring
RFU20	Voltage_STA1	Voltage_STA1	Power voltage monitoring 1
RFU21	Voltage_STA2	Voltage_STA2	Power voltage monitoring 2
RFU22	TEMP	TEMP	Temperature monitoring

* RFU8 and RFU10 are signal multiplex extension pins. Only one pin from either the ARM Smart Module Pin or the Module Flash Pin can be selected at the same time.

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